This publication commissioned by the Department for Business, Enterprise and Regulatory Reform (BERR) has been compiled by the National Microelectronics Institute (NMI).

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Electronics underpins the digital economy. Worth £23 billion a year, the UK’s electronics industry is the fifth largest in the world. We are widely acknowledged as a European leader in independent electronics system design with a 40 per cent share of the market. And we are recognised for our creativity and exploitation of university technology and research.

The sector has transformed over the past decade and now employs around 250,000 people in 11,500 companies across the country. There is a vibrant start-up community which supports the strong clusters in south-west England, Cambridge and central Scotland.

We are pioneering new technology including Bluetooth, other wireless connections and microprocessor design. Companies such as ARM, CSR and Wolfson are developing technology that is changing the way we live our lives through its deployment in iconic products like MP3 players, smart phones and portable computers.

The sector also excels in electronics design, which requires a high degree of familiarity with complex state-of-the-art components and technologies. We have a strong base in analogue design, which remains an important aspect of many leading electronic products. And UK expertise in power management devices is improving the energy efficiency of products, helping in the battle against climate change.

This guide highlights the industry’s key companies. Many of them offer access to intellectual property that can drastically cut time to market, and independent design services that can be accessed very easily by business. It also illustrates the electronics research activities of our world-class UK universities, many of which have excellent track records of collaborating with design and manufacturing businesses both at home and abroad.

The UK is the number one destination for foreign direct investment into the European Union, with a growing proportion coming in high technology sectors. The UK Government wants to facilitate further investment in electronics particularly in the creation of research and development. UK Trade and Investment can help companies who are interested in the UK as an investment location.

This is an exciting area with significant future potential. I strongly encourage you to make use of the contacts we have provided and to seize the opportunities that are available.

Stephen Carter
Minister for Communications, Technology and Broadcasting
This guide highlights the UK’s capabilities in the electronics systems design sector. It includes an overview of the UK scene and provides more detailed information about developments in design technologies and their use, details of opportunities for collaborative research and advice on support for business. The guide also lists key commercial organisations and academic institutions that comprise the unique network that gives the UK industry its great strength. Each entry gives a brief description of activities and primary contact points for follow-up discussions.

The guide is designed to be used by commercial and academic groups, both within the UK and overseas, that may be looking for development partners or suppliers. The Government is keen to promote collaboration between UK companies and universities as well as with inward investors. UK Trade & Investment, for example, operates a comprehensive service for those looking to establish facilities in the UK.

The UK has Europe’s largest independent semiconductor design industry, with about half the market in application-specific integrated circuit design. It is also home to Europe’s largest concentration of electronics systems design houses, and many UK companies are leaders in their fields. It offers a large pool of hardware and software designers with relevant experience within equipment manufacturers, silicon vendors, fabless semiconductor manufacturers, IP providers, EDA tool vendors, embedded systems suppliers and independent design houses, as well as a large and well-respected university structure for joint research and development and recruitment purposes. There is activity across all kinds of applications and devices, from System-on-Chip (SoC), digital signal processing (DSP), Field-Programmable Gate Arrays (FPGA) and analogue, to EDA tools and devices. Companies and universities in the UK (many of which are listed in this guide) provide systems design and intellectual property for many of the world’s leading consumer and industrial products and semiconductors. There are also major strengths in electronic manufacturing services and PCB fabrication.

The UK is thus an obvious choice for companies looking for world-class technology and design, but it has much to offer potential investors in other respects too. Companies locating in the UK benefit from a highly competitive business environment that gives them every incentive to grow. They also have access to an unrivalled research and development and design base.

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The opportunities presented by today’s electronic components and software are immense. Products that could only be dreamed of a few years ago are now in every home and this trend is set to continue into the future, driven largely by advances in semiconductor technology.
The UK is a world leader in the development of many electronics’ technologies, both hardware based and software based. This is due not only to the academic excellence of its Universities and inventiveness of its industry, but also due to the market leading position in key technology areas and its ‘first adopter’ nature of its consumers.

The UK’s vibrant and diverse economy is the ideal location for companies to realise their international business potential.

The fifth largest economy in the world, the UK has a gross domestic product (GDP) of US$2,345 billion (Source: World Bank, 2007) and is forecast to have the strongest business environment of all major European economies for the period 2007 to 2011 (Source: EIU, 2007).

With a population of 60.6 million (Source: ONS, 2007) and unemployment well below the EU average, the UK has a strong workforce to support the economy.

The UK is a leading global trading nation, is the second largest exporter and third largest importer of commercial services, and the seventh largest exporter and fourth largest importer of merchandise (Source: World Trade Organization, 2007).

The UK is Europe’s largest consumer electronics market and the largest market for MP3 players, flat panel TV’s and games systems.

The UK also has the largest personal communications market in Europe, when measured by ‘ARPU’, with consumers owning more than 70 Million handsets and being ‘first adopters’ of many new technologies.

Renowned for the being one of the safest countries in the world, the UK is the world’s largest market for Intelligent Transport Systems (ITS) and surveillance related technologies with over 25% of the world’s CCTV installations being based here.

So what makes the UK Europe’s leading investment destination for companies relocating and developing their global business? Here are 10 reasons setting the UK apart from other countries

1. An Internationally Competitive tax environment for foreign investors:
   The top corporate rate is 28 percent, the lowest in the G7 and below most of the UK’s core competitors. The UK has reduced its corporate tax rate from over 50% in the early 1980s down to one of the lowest in the industrialised world. The UK’s highest personal tax band, at 40 percent, is one of the lowest in the EU. Source: Deloitte

2. One of the most flexible labour markets in Europe: The World Bank ranks the UK the second best place in Europe to employ workers, just
behind Denmark. Source World Bank.

3. Least barriers to entrepreneurship in the world: The OECD noted that the UK is second in the world for Product Market Regulation behind Australia, has the least barriers to entrepreneurship in the world and has the third least barriers to trade and investment in the world. Source: OECD.

4. World leader in innovation: The UK is one of the most productive places for innovation firms in the world, ranking second only to the USA for the quality of its research base.

5. Progressive communications network: The UK has the most extensive broadband market among the G7 countries and one of the strongest ICT infrastructures in the world.

6. Top talent: According to the Times Higher Education Supplement (THES), the UK has the top six universities in Europe and two of the top three globally. Source: The Times.

7. Springboard to Europe: The UK is the number one gateway to Europe giving easy access to the 27 member states of the European Union, the world’s largest single market, with its population of nearly 500 million.

8. Number one location for European headquarters: More overseas companies set up their European headquarters in the UK than anywhere else.

9. Olympic opportunities: London will host the Olympic games in 2012. Procurement is now underway and contracts, totaling more than $13 billion over the next 4 years, are available for firms of all sizes and the total budget will run into billions.

10. Magnet for foreign investment: In 2007, the UK attracted and retained over one trillion US dollars of investment: the highest in Europe and the second largest in the world.

In 2007/8 some 1573 projects were created in the UK by foreign company investments from over 48 countries. The 10 largest investors into the UK came from: -

The US; Germany; Japan; Australia; France; Ireland; India; Canada; China and Sweden. These projects created over 45,000 new employment positions and consolidated 58,000 further positions. These investments are helping to grow foreign owned businesses, both large and small, based in the UK to both access the highly lucrative UK markets as well as using the UK as a base to springboard into Europe. These figures confirm the UK’s reputation as an innovative, knowledge-based economy which last year saw a staggering increase in R&D investment of 83%.

For further advice about taking advantage of the skills and market in the UK contact UK Trade and Investment. www.uktradeinvest.gov.uk
THE CHALLENGE faced by companies throughout the world lies in how to make the best use of technologies that are becoming more and more complex and how to bring the technologies together into successful products.

UK designers are at the forefront of complex system design. Increasingly, semiconductor design can no longer be performed in isolation but must include an optimum combination of hardware and software, reflecting system needs and the overall market requirements of the product. This requires engineers at all points in the design chain to have a detailed understanding of the complete picture and the ability to work with complex technologies and interactions.

For example, a mobile phone or high-definition television may now contain hundreds of millions of lines of software. Similarly, a complex digital chip may now contain hundreds of millions of logic gates, whilst its counterpart in the early 1990s contained around 100,000. As the complexity of each individual technology increases, the total system complexity multiplies.

Innovation and management of complexity have long been great strengths of UK engineering, and this continues to be the case in the UK electronics industry, whether engineers are working in-house for equipment and semiconductor manufacturers in one of the many subcontract design houses, or as suppliers of intellectual property (IP).

World leadership in areas such as the design of mobile communications shows that UK engineers are experienced in understanding all aspects of complex electronics systems, and the embodiment of new technology in successful products.

Recent announcements in mobile communications, from companies such as Icera and picoChip, and in Bluetooth, from companies such as Cambridge Silicon Radio, demonstrate this expertise. But it does not stop with communications.

Low-power and power efficient design features strongly in the UK with companies like CamSemi and Diodes Zetex developing solutions to improve the efficiency of power supplies while Ember and Air Semiconductor are designing ultra low-power devices which open up new application areas.

UK designers have extensive experience of system design in consumer electronics, automotive electronics, medical electronics and defence electronics, to name but a few areas of excellence. The time when electronics engineers could stay within a single discipline is long gone. Today’s electronics systems designers need to understand the complete design process, from the marketing concept through to the manufacture of a complete product. They need to be familiar with technologies ranging from integrated circuits and System-on-Chip (SoC) through to PCBs. It is also vital
that they understand how to incorporate the embedded software that now forms an important, and growing, proportion of the final product. An understanding of manufacturing technologies is becoming increasingly important in getting quality products to market in the shortest possible time and at minimum cost.

UK design teams have shown, time after time, that they lead the world in the knowledge of the system level aspects of design, and the incorporation of that knowledge into new and innovative products that can be manufactured throughout the world. They have demonstrated that they can bring real competitive advantages to the companies that produce and market electronics products. For example, Aptina Imaging’s CMOS camera sensors have been incorporated in many mobile handsets. Many overseas companies take advantage of this design capability by creating their own design teams in the UK.

Excellence in system design flows from all areas of the UK electronics industry. It is fostered in academic-based institutions such as the Institute for System Level Integration, associated with the Alba Centre, and the Mobile Virtual Centre of Excellence, and flourishes in design groups in industry. The strong academic base, and its ability to work closely with industry, means that UK electronics designers will continue to lead the world as new and exciting technologies emerge from research into commercial reality, and as new design tools make the design process easier.

**STRUCTURE OF THE INDUSTRY**

UK designers work in a wide variety of companies: systems builders; captive and independent design houses; research establishments; CAD/EDA tool vendors; chip suppliers, including fabless and chipless semiconductor companies and technical distributors. Many work on a freelance contract design basis.

What makes the UK electronics design industry so powerful? It is the unique network of companies and academia working interactively within an environment that the UK government has ensured is conducive to business. Significant elements of that network include:

- equipment and system manufacturers, with internal design teams
- semiconductor and specialist component manufacturers, often with internal design teams
- design houses and freelance designers offering third party design to clients
- EDA/CAD tool vendors
- IP developers and suppliers offering hardware and software building blocks to designers
- sub-contract manufacturers offering CEM services
- test houses offering qualification services to international standards
- universities, supplying qualified graduates and advanced research and development
CamSemi

CamSemi is focused on ‘cost efficient’ power conversion. In other words, helping the world’s consumer electronics manufacturers to introduce ‘greener’, more energy-efficient power conversion products – such as offline power supplies and lighting – but at low cost. New regulations are already encouraging the move towards higher efficiencies but smart power conversion has traditionally been too expensive for many highly price-sensitive sectors of the market.

CamSemi was spun out from Cambridge University by two internationally-renowned academics, with first round funding in 2002, to commercialise a promising portfolio of breakthrough approaches. Novel technologies that could quickly deliver the efficiency improvements required by Energy Star and other regulatory bodies but with low cost solutions that are also simpler and easier to design than competitive approaches.

The company’s innovative forward converter topology and C2470 mixed signal controllers are just one example of its cost-efficient strategy. These novel controllers target applications up to 60 W and are unique in offering the efficiency performance, size and weight advantages of more expensive switched-mode approaches but at a fraction of the price. Safety features are built in, the solutions have exceptionally low EMI making them perfect for audio, cordless phone and other demanding applications and on the performance front, they easily meet and beat Energy Star 2.0.

For example: CamSemi’s reference design for a 12 W modem supply delivers an average efficiency of 86.1% and no-load consumption of 211 mW, against the ES2 requirements of 77.8% and 300 mW.

The company’s core engineering team is based in Cambridge with application design centres in Taipei and Shenzhen. CamSemi is fast becoming a leader in power management ICs and in 2008 was nominated as Europe’s third most promising clean technology company.
The UK scene – international manufacturers capitalise on UK design strengths

DESIGNERS WITHIN EQUIPMENT MANUFACTURERS
The UK is home to some of the world’s most successful suppliers of electronic products, systems and components. These companies complement those which are indigenous to the UK. For example, there is a strong defence and aerospace sector with BAE Systems, QinetiQ, Goodrich Engine Control Systems and Rolls-Royce. In the communications market, companies like Applied Technology specialise in TETRA radio systems. In the consumer sector, Pace is a leading designer and producer of set-top boxes.

Most of the world’s major electronics companies have established their own facilities in the UK – companies such as Agilent, Broadcom, Cisco, Epson, Ericsson, Freescale, Fujitsu, Intel, IBM, Infineon, National Semiconductor, MediaTek, Mitsubishi, Motorola, NEC, Nortel, Nokia, Qualcomm, Panasonic, Renesas, Philips, Samsung, Sony and Toshiba. Many of these companies have long-established manufacturing, design or R&D facilities and are supplying products and services worldwide.

These companies operate across most areas of the electronics industry, but particular strengths are evident in mobile communications, consumer electronics, medical electronics, defence electronics and automotive electronics.

While many of these companies use in-house design teams, the skills level of those teams is often augmented by using readily available third-party services to bring specialist skills in areas such as radio frequency (RF) design and complex semiconductor design. This allows complex designs to be achieved in a very cost-effective manner and in the shortest possible time.

DESIGNERS WITHIN SEMICONDUCTOR SUPPLIERS
Most of the world’s major semiconductor companies have a UK design and support operation and many also manufacture in the UK. Those that have built design operations in the UK include Alcatel, Analog Devices, Dialog Semiconductor, Freescale, Fujitsu, Infineon, NEC, Renesas, Sony, STMicroelectronics and Texas Instruments. Companies that also have manufacturing facilities include such world leaders as Agilent, International Rectifier, MHS Electronics, National Semiconductor, NXP and X-Fab. The UK boasts manufacturing strength in power, analogue and RF wafer processing.

While most of these design teams are engaged in developing standard parts, some offer their customers design services in ASIC devices across a range of technologies, including digital, analogue and mixed signal. The UK’s particular strength in the design of RF chips has enabled a number of companies to become world players in advanced telecommunications.

An extensive and mature network of electronic component distributors provides design help and technical support with qualified engineering staff, as well as a reliable supply of components.

FABLESS CHIP COMPANIES
While the companies mentioned above design and manufacture their chips in their own factories, many innovative semiconductor companies choose to design their own chips but have them manufactured by third party silicon foundries. Some of these companies have bases in the UK, including 3dlabs,
DisplayLink

DisplayLink is a successful technology firm that has pioneered the ability to connect multiple screens to any PC or laptop via a standard USB connection, enhancing the computing experience for everyone, without the need for complicated hardware upgrades. The company was founded in 2003 by Dr Quentin Stafford Fraser, co-inventor of the webcam, and Martin King, inventor of predictive text messaging.

For today’s information-saturated employees adding another monitor to a PC can dramatically increase productivity, as users can spread their applications out across multiple screens, enabling a higher level of interactivity. However, the VGA (video graphics array) cable has traditionally locked users into a one-to-one PC to screen ratio. Using USB 2.0 connections, DisplayLink removes the limitations of the conventional VGA cable and offers computer users low cost, easy to deploy, multi-monitor computing with no loss of performance for typical business applications.

DisplayLink is venture capital-backed. To date, the company has attracted USD 51 million from world leading global investors, including Atlas Ventures, Balderton Capital, Benchmark, DAG Ventures and DFJ Esprit. The company has also signed lucrative contracts with some of the world's leading technology brands, including Samsung, LG, Sony and Toshiba, building on the success of its early collaboration with Kensington; a partnership it has enjoyed since 2006.

Looking to the future, DisplayLink is working on extending its network display technology to incorporate wireless functionality – a development that will further unleash the monitor from the host PC, enabling applications such as digital signage and multi-user computing to take off in years to come.
Altera, Cambridge Silicon Radio, ClearSpeed Technology, DisplayLink, Innovision Research & Technology, Oxford Semiconductor, Icera Semiconductor, Phyworks, Swindon Silicon Systems, Toumaz Technology, Wolfson Microelectronics and Xilinx. Most of these companies have in-house design teams, but a significant proportion supplement their skills by using the UK’s third party design network.

**CHIPLESS CHIP COMPANIES**
Over the past few years, the UK has seen dozens of small and innovative start-ups developing and marketing semiconductor intellectual property (IP). Some of these ‘chipless’ semiconductor firms have grown rapidly and have become internationally renowned.

Cambridge-based ARM is the world’s number one IP provider and its processors, designed and developed in the UK, are the processor cores of choice for telecoms and networking applications. Virtually every major semiconductor company and many original equipment manufacturer (OEM) companies have acquired licences to use ARM technology. This trend has done much to attract world-class companies to the UK, growing and evolving the electronics systems design sector.

Newer UK companies, such as Imagination Technologies are now well on the way to emulating this success. Imagination Technologies is licensing its embedded graphics technology to companies worldwide for use in markets ranging from digital radio and audio, mobile phone multimedia to car navigation & driver information, set-top box and mobile TV.

**UK ATTRACTIONS**
Key attractions of the UK:
- access to global markets, especially Europe
- access to an extensive electronics network
- access to the technical skills of UK designers
- access to the huge R&D resources of UK universities
- access to a supply of skilled graduates
University of Kent’s Embedded Systems group helps to optimise image based people counter

The Embedded Systems group at the University of Kent has worked with Neuricam SpA (Italy) for many years and has recently completed a consultancy contract with them to optimise the real-time signal processing necessary to process and extract data from two CMOS cameras. The stereo camera system designed for use as a “people” or “object” counter and the new techniques developed as part of this agreement have enabled a reduction of over 20% in the firmware implemented on the FPGA chip used for the signal processing. These savings could result in a reduction in production costs for the current generation of systems and, more importantly, for developing new systems with enhanced resolution and accuracy. The device shown below has been developed by Neuricam for access control in mass transportation and is currently being deployed in a number of applications on buses, trains and trams and in stations and airports. A similar hardware architecture has also been used to develop an Automatic Number Plate Recognition System which is currently being field tested.
The UK – university-powered research and development

UNIVERSITIES THROUGHOUT the UK provide the basis of an extended research environment for electronics, and for semiconductor design in particular.

There are more than 70 establishments involved in semiconductor design research projects or higher level education and training, or both. Practically all have strong mutually beneficial relationships with industry in one form or another.

Some universities have gained international recognition in certain areas, such as the University of Manchester’s work on Advanced Processor Technologies while the University of Southampton is working on novel sensors and energy harvesting. A number of universities are collaborating on a series of Grand Challenges in Microelectronics to develop a consensus and address the major research challenges.

With the UK’s strong market in telecommunications, it’s not surprising that many universities focus on electronics and communications technologies, some of these specialising in RF design. These include Aberdeen, Essex, Leeds, Newcastle and Sussex.

System-on-Chip (SoC) design has already been picked up as a study topic by universities including Bristol, Edinburgh, Imperial College London, Lancaster, Manchester, Sheffield and Southampton. The Institute for System Level Integration in Livingston and Lancaster University have established a major UK resource in SoC test engineering.

Meanwhile, high level language design is a focus at the universities of Surrey, Portsmouth and Napier. Digital signal processing is a particularly popular topic, covered by some 30 universities around the country.

Collaboration with industry is important to UK universities, and some very strong partnerships have been forged over many years. There are major joint ventures, such as Toshiba’s in the field of wireless telecoms technology with the University of Bristol.

Then there is project-based research, much undertaken by postgraduates. NXP Semiconductors works very closely with the University of Southampton and Cardiff University, amongst others. Xilinx has a relationship with the universities of Hertfordshire and Strathclyde. ARM works closely on a number of different projects with many UK universities including Cambridge, Glasgow, Manchester, Plymouth and Southampton. National Semiconductor collaborates strongly with the University of Glasgow.

For more details of the work being undertaken in the UK’s universities, along with contact information, see the Universities section which starts on page TBC.

Collaboration with industry is important to UK universities, and some very strong partnerships have been forged over many years.
The UK – a comprehensive network of independent services

A KEY feature of the UK industry network is the widespread availability of a complete range of design, manufacturing, test and other support services that companies can use to complement their in-house core competencies at all stages of the value chain.

**DESIGN HOUSES**
There is a growing trend to use independent design houses and contract design services to enable the swifter adoption of the latest technologies, to overcome the steep learning curve and to reduce costs.

The UK has more electronics systems design houses than any other country in Europe, with some 150 independent design houses. Although this sector has grown significantly in recent years, there is a strong base, with some companies having over 20 years of experience in the business. There is a wide range of sizes, from a handful of people to companies employing 200 or more designers.

Some design houses, especially the smaller ones, specialise in particular aspects of electronics design. On the other hand, the larger design houses, such as Cambridge Consultants, Sagentia, and Plextek can typically perform complete electronics systems design, using specialists with skills as diverse as RF design, semiconductor design and aesthetic and industrial design. UK design houses may also undertake embedded and application software design and provide project management services to address issues of complexity management inherent in advanced product design.

- **Plextek**, in Essex, is an example of one of Europe's largest design consultancies, with expertise in digital, analogue and RF design aimed primarily at the communications market. It makes extensive use of some of the most advanced analogue and RF design tools available.
- **Nallatech**, in Glasgow, is a medium-sized company specialising in complex FPGA computing solutions for a wide range of markets from communications to aerospace.
- **Analogue Integration**, in Wiltshire, is a small design house offering analogue, RF and mixed signal ASIC design, with a strong focus on the consumer as well as communications sectors.
- **Jennic**, in Sheffield, generates revenue from licensing value-added complex IP in wireless and networking, together with consulting and design services.
- Other design services companies include EnSilica, Roke Manor Research, Sondrel, Garfield/Matrics, Moortec and eoSemi.

Major companies in the Pacific Rim and USA benefit from the complete system design capability offered by UK design houses, and many have been working with the UK for many years. These long-term relationships have led to the introduction of many successful and innovative products.

In addition to those employed in-house, there are several thousand design engineers in the UK working on freelance contract or consultancy basis, hired through specialist recruitment agencies.
DESIGN TOOL VENDORS
With such a strong electronics design industry in the UK, it is not surprising that there is an equally strong presence of electronic design automation (EDA) and computer aided design (CAD) vendors located in the UK. Zuken is one of the longest established, with Pulsic and Azuro being up-and-coming EDA companies.

All of the major US-based EDA Suppliers (Cadence, Magma, Mentor Graphics & Synopsys) have significant support operations in the UK. As well as running training courses, supporting academia and operating well-established user groups they also carry out some development activity in the UK.

UK universities have a long-standing reputation in this field and have produced many innovative engineers now working for UK and international companies.

Many of the newest tools are developed in conjunction with and first tried out by UK-based users – a testimony to the fact that leading-edge designs are undertaken here.

TEST AND VALIDATION SERVICES
No product design is complete before it is subjected to a full range of test and validation, often including conformance to national and international standards. Examples include CE marking, telecommunications and EMC standards. The UK has a complete range of independent test houses able to assess products during design so as to ensure compliance or to test large volumes of finished product prior to shipment.

Examples include UNISEM, Eltek Semiconductor and TS2 Micro, who operate integrated circuit test facilities, while ERA and EMC Projects, who operate EMC and compliance testing facilities for complete products. Smaller operations are able to provide pre-compliance testing.

SUPPORTING INFRASTRUCTURE
Supporting electronics design activities in the UK is a variety of Government-backed organisations, commercial firms, consultancies and support services. These cover issues ranging from business and legal advice to methodology assessment, training and recruitment.

- The Alba Centre in Livingston, Scotland is the home to the Institute for System-Level Integration (ISLI) and is also an innovation centre for incubation of technology businesses.
- The National Microelectronics Institute (NMI) is the trade association representing the semiconductor industry in the UK and Ireland. A not-for-profit organisation funded by its members, the NMI has a membership that spans the supply chain. Its aim is to help build and support a strong semiconductor community by acting as a catalyst and facilitator for commercial and technological development.
- Companies such as Doulos, Feabhas and Bores offer training courses in specific aspects of electronics design and software, including high level design languages and digital signal processing. Many universities offer further training and professional development courses for people in industry.
Case Study

picoChip

picoChip, founded in 2000, is a fabless semiconductor product company focused on wireless infrastructure. The heart of the company’s technology is the picoArray, a very efficient multi-core digital signal processor (DSP). The picoArray is the leading multi-core DSP architecture, with dramatically better price-performance than competing approaches such as FPGAs or traditional programmable DSPs. It is the most powerful signal-processing device in the world.

Traditional DSPs work a bit like an old fashioned craftsman who does everything himself, by hand, changing from one task to the next, to the next in succession,” explains Doug Pulley, co-founder and Chief Technical Officer of picoChip.

“Most multi-core chips change that a little. They are more like a small team of craftsmen. But our picoArray is more like a factory assembly line, with hundreds of people each dedicated to one task. Our chip divides tasks across hundreds of independent processors in the array, and because each processor is only involved in one task at a time, they are much more efficient. So, the picoArray can deliver much greater performance, much more efficiently, than traditional processors.”

picoChip is the industry-standard architecture for WiMAX infrastructure and is the dominant supplier of silicon for femtocells (very small-scale wireless basestations). The efficiency and performance of the picoArray enable these products at consumer price points.

picoChip has design wins and revenues from the sale of silicon and software in all these segments. The company has over 100 customers, including 7 out of the top ten telecoms OEMs. Over 100 operators are using equipment based on picoChip processors.
The UK – support for start-ups

SETTING UP a company in the UK is not a difficult process, whether you are already based here, or whether you are arriving from overseas.

SCIENCE PARKS
The UK is proud to have over 70 science parks, most allied geographically to universities. They provide an excellent environment for start-ups, research spin-offs and a first home for inward investors.

In addition, most major cities and large towns have ‘technoparks’. Local councils and Chambers of Commerce often have special incentives for new companies. Local universities can help with small offices or ‘incubator’ units.

- SETsquared helps early-stage, high-tech, high-growth potential ventures get on the road to success. It provides serviced office space, business guidance and mentoring as well as access to a high-calibre network of experienced entrepreneurs, potential investors and business professionals. A partnership between the universities of Bath, Bristol, Southampton and Surrey, SETsquared is the largest government-funded, privately-backed support programme of its kind in the UK. Since being set up in 2002 it has supported more than 100 ventures.

- Cambridge is home to one of the UK’s most successful science parks, with over 100 high-tech companies. There are many links with the university.

- Innovation Centres (Scotland) provides incubation and a home for entrepreneurs and companies who are engaged in providing the next generation of Scottish high-technology businesses and new jobs. They operate incubators which provide support through business services and advice to a rapidly-growing number of start-ups at two centres in Hillington Park and Alba, Livingston. www.innovationcentre.org

VENTURE CAPITAL
The UK has a range of high-tech focused venture capital companies. The British Private Equity and Venture Capital Association’s website (www.bvca.co.uk) details some of these funds.

- Schroder Ventures and 3i UK are significant investors in electronics companies

- Amadeus, founded by Dr Herman Hauser, a founder of Acorn Computer, makes early stage investments in electronics companies. Its successes include Cambridge Silicon Radio, Icera and Plastic Logic.

- The Forward Group’s Forward Innovation Fund specialises in university spin-offs and is currently an investor in The Mercia Technology Seed Fund which will invest in young technology based ventures in the West Midlands region.

TRADE ASSOCIATIONS
Trade associations are an excellent source of market, industry and technical information. In the electronics sector, a number of highly active organisations maintain strong relationships with the
SiGe Semiconductor

SiGe Semiconductor is a leading global supplier of radio frequency integrated circuits and multi-chip modules enabling wireless multimedia in consumer electronics. SiGe’s products simplify the addition of wireless communications and navigation capability to a wide array of home entertainment, mobile and computing products. SiGe has shipped more than 300 million components, and has experienced significant annual product sales growth.

SiGe’s vice president marketing Mr. Alistair Manley, states “Our UK design team is a fundamental key to the success of many of our products including a WiFi IC which was selected by a major gaming platform manufacturer for use in one of its popular gaming systems”. “Other key developments from our UK operations include the award winning GPS receiver ICs that appears in PNDs. Current areas of development continue in the areas of high performance power amplifiers”.

Every SiGe product on the market today delivers a unique combination of benefits: low power consumption for longer battery life; high power output for superior signal strength; and remarkable noise reduction for maximum efficiency. Our power amplifiers and RF front-end modules exploit the advantages of silicon germanium process technology to achieve integrated, feature-rich solutions that set the industry’s best cost-performance ratios.

SiGe Semiconductor has three product lines:

- **WiMAX**: SiGe’s WiMAX power amplifiers and front-end modules (FEMs) to meet global standards for high-performance broadband wireless access applications.
- **GPS**: Satellite navigation radio ICs supporting the GPS and Galileo technology standards provide leading integration and power efficiency to support location-based services in PNDs, cellular, handheld and automotive telematic applications.
- **Wi-Fi**: Power amplifiers and front-end modules (FEMs) for 802.11a/b/g/n WLAN systems boost data throughput and transmission range to optimize wireless access in support of media distribution, gaming, voice and data services.
Government, influencing both UK and EU policy, and keeping abreast of upcoming legislation with working groups. These include the National Microelectronics Institute (NMI), Intellect, and the Association of Franchised Distributors of Electronic Components (AFDEC). The Institution of Engineering and Technology (IET), as a professional society, is also active in this area.

In addition, the UK Electronics Alliance (UKEA) brings together the diverse group of trade associations within the electronics sector ensuring the electronics sector speaks with a co-ordinated voice.

**GOVERNMENT SUPPORT**
The UK Government provides a great deal of support, help and advice and, in some cases, financial assistance for start-up companies and inward investors. UK Trade & Investment exists to develop the export potential of UK firms and to help inward investing companies to establish themselves in the UK. Business Link provides a range of services for small companies and start-ups.

In addition, the Government actively supports technology transfer activities designed to bring the benefits of new electronics system technologies and ways of working to small- and medium-sized companies and start-ups. These range from free advice and consultancy on design methodologies, to graduate employment schemes providing companies with a source of newly qualified high calibre graduates.

A number of Knowledge Transfer Networks (KTNs) have been established covering a wide range of subjects including Electronics, Photonics and Displays & Lighting. The main role of the KTNs is to put companies and innovators in contact with the knowledge and funding that they need to bring new products and processes to market. KTNs are funded by the Technology Strategy Board (TSB).

The full list of KTNs is available at ktn.globalwatchonline.com. The Electronics KTN (www.electronics-ktn.com) provides a searchable directory covering the UK electronics sector.

Whatever the area of technology in which your company needs help, there is likely to be a scheme that can address your needs and help build the knowledge base of your business.

**The UK Government provides a great deal of support, help and advice and, in some cases, financial assistance for start-up companies and inward investors.**
XMOS

To meet the electronics sector’s demand for accelerated product design cycles and product customisation, right up to the point of sale, XMOS has created a programmable semiconductor technology that unifies hardware and software worlds into a single environment, such that hardware is software.

Addressing the performance and cost limitations of many existing solutions, including ASIC and FPGA, XMOS’ unique Software Defined Silicon (SDS) has single-handedly succeeded in revolutionising electronics.

XMOS devices combine a small number of processing cores called ‘XCores’, each with its own memory and I/O system, on a single chip. An event-driven, multi-threaded processor engine with a tightly integrated I/O pin structure, XCore can react very quickly to changes of state on pins and then drive an appropriate response.

Applications for this new class of programmable chips are created using high level languages such as C. Multi-core parallel processing and concurrency are supported by XC, a version of the C language created by XMOS.

A high-performance switch supports communication between processors, and inter-chip XLInks are provided so that systems can easily be constructed from multiple chips. Any thread can communicate with any other thread in the system using single-cycle communication instructions.

A world first in many respects, XMOS Software Defined Silicon makes it practical to use software to perform many functions that traditionally have had to be implemented in hardware. By substantially reducing development costs and time to market and dramatically increasing design flexibility, the impact of SDS on electronics design will be far reaching.
UK HIGHER education institutes are key to preparing tomorrow’s engineers. With over 100 accredited electronic engineering undergraduate courses in the UK, the annual output of all graduates in electronics-related degree courses is in the region of 15,000. Most of these universities also offer postgraduate, masters degree and doctorate courses covering a wide range of specialist topics within the electronics engineering discipline. In addition to providing an excellent opportunity for companies to collaborate on research projects, industry-sponsored postgraduate courses allow technology-driven companies to make contact with this valuable source of highly qualified engineers.

CONTINUOUS PROFESSIONAL DEVELOPMENT (CPD)
Increasingly, universities are gearing up to meet the demand for continuous professional development (CPD), particularly in the engineering sector. A range of distance learning and modular courses are available for experienced engineers wanting to learn new skills and broaden their knowledge.

- The Institute for System Level Integration (ISLI) www.sli-institute.ac.uk, based at the Alba Centre, is a joint venture between four Scottish universities: Edinburgh, Glasgow, Heriot-Watt and Strathclyde Established in 1998, it was the world’s first centre of excellence to concentrate on postgraduate education and research in the methodology and applications of system-on-chip design, system level integration and related software and hardware technologies.

- an MSc in advanced microelectronics, run by the University of Bolton, can be studied remotely via the internet (www.ami.ac.uk)

- an MSc at the University of Southampton addresses applied Radio Frequency Communication Systems.

- Engineering Doctorate (EngD) is a four-year postgraduate award intended for the UK’s leading research engineers who want a managerial career in industry. An alternative to the traditional PhD it is better suited to the needs of industry, and provides a more vocationally oriented doctorate in engineering. Full details of all EngD centres are on the Engineering and Physical Sciences Research Council (EPSRC) website.

The Engineering and Physical Sciences Research Council (EPSRC) part funds the above courses as well as many others covering DSP, RF design, VLSI design, SoC and VHDL at dozens of universities throughout the UK.

In addition, trade associations run CPD courses for the benefit of the industry. One example is the National Microelectronics Institute (NMI) which offers a Certificate in Team Leading, accredited by the Chartered Management Institute.

INDUSTRIAL SPONSORSHIPS
Industrial sponsorships are encouraged, as all these courses have a significant project-based element. Again, sponsors benefit significantly from the research resources available and attracting this new talent on a permanent basis.
University of Manchester ‘Brain-Box’ computer

Understanding the human brain remains as one of the great frontiers of science, and a UK team is building a large-scale computer to help neuroscientists test theories about the internal workings of the brain. We know that our brains work by billions of cells exchanging messages in the form of electrical ‘spikes’, but what do all those spikes actually mean? What information do they convey?

The first computer will be switched on in 2009, and then the following years will see it scaled up to its final form with a million ARM processors all collectively talking the brain’s language to each other. The research programme presents huge challenges to both hardware and software engineers as new scales of complexity are tackled in both domains.

The work is expected to deliver benefits both in terms of new medical knowledge – better treatments for mental illness and brain injury should emerge from a better understanding of how the brain works – and in terms of the discovery of new ways to build massively-parallel computations and fault-tolerant computers.

The computer is being constructed at the University of Manchester in collaboration with the universities of Southampton (who are developing much of the software), Cambridge (architecture exploration) and Sheffield (application development). There is input from industry, including ARM Ltd (whose microprocessor technology is key to the project), University of Manchester spin-out Silistix Ltd (who provide advanced Network on Chip solutions for managing chip complexity and multi-processor communications) and Thales (who are watching the application space). The work is funded by the UK Engineering and Physical Sciences Research Council, EPSRC.
The engineering organisation
The Institution of Engineering and Technology (IET), www.theiet.org, has more than 122,000 members in the UK. It promotes CPD to its members and works with employers to support and encourage lifelong learning. It was established in 2006 following the merger of the Institution of Electrical Engineers (IEE) and the Institute of Incorporated Engineers (IIE).

The UK Government regularly supports industry-based initiatives to improve the skills base. One example is the Continuing Education in Electronic System Integration (CEESI) scheme, www.ceesi.ac.uk, which encourages electronics graduates and industry employees to enhance their skills in advanced electronics design.

Please note that CEESI has a separate entry under the universities section of this guide.

There are European sources of training too, from organisations like Europractice, www.europractice.com, with courses provided in the UK through Technology for Industry (Tfi), www.tfi-ltd.co.uk, to meet a European curriculum.

Commercial organisations are important in maintaining the skills of the UK’s semiconductor design workforce. The design tool vendors run particularly useful courses which often include advice and guidance on methodology and technology as well as use of the tools.

The technology vendors too, such as the programmable logic companies, provide a significant contribution to keeping engineers up-to-date when they run seminars explaining their latest offerings and how to design with them.

With over 100 accredited electronic engineering undergraduate courses in the UK, the annual output of all graduates in electronics-related degree courses is in the region of 15,000
The Engineering and Physical Sciences Research Council (EPSRC) funds research and postgraduate training in universities and related organisations throughout the UK. More details are in the Support Organisations section of this guide.
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The Engineering and Physical Sciences Research Council (EPSRC) funds research and postgraduate training in universities and related organisations throughout the UK. More details are in the Support Organisations section of this guide.
Electronics research in the Department of Electronic and Electrical Engineering at the University of Bath is mostly focussed in the Centre for Advanced Sensor Technologies (CAST). This University research centre includes members of staff from the Mechanical Engineering and Physics Departments and we hope in future to enlarge our membership to involve staff from other departments (e.g. chemistry).

The work undertaken within CAST covers a wide area and includes biomedical engineering, applied device physics, materials science, device fabrication and related areas of optoelectronics and microelectronics. Sensors are inherently interdisciplinary in nature and CAST provides a focus for these activities in applications such as sensing in the human body and other harsh environments.

The main areas of current interest are:

- Biomedical engineering
- Optoelectronics
- Gallium nitride (GaN) growth technology
- Device design and modelling
- Solid-state lighting systems
- Digital microelectronics (FPGA and full-custom)
The Department of Electronic, Electrical and Computer Engineering teaches internationally acknowledged undergraduate and Masters-level degree programmes in most areas of electronic engineering, computer systems engineering, interactive systems and human centred systems.

In order to focus on major technical developments and to facilitate interdisciplinary activities, advanced research is organised into two research centres: Interactive Electronic and Communications Systems (IECS) and Emerging Device Technology (EDT). Each centre has academic staff, research fellows and associates, research students and expert technical and support staff. The centres conduct fundamental and applied research of international standing, funded by the EPSRC, EU, industry and other sources, often in collaboration with other universities, government departments or industry.

The department is committed to technology transfer through its technology transfer centre, Wave Solutions, and the School of Engineering’s business development staff. It is possible to use the expertise of the staff and the facilities available in the department for product development or basic research, for investments as little as a few hundred pounds.
Electronics at the University of Bolton is part of the School of Built Environment and Engineering. Approximately 130 students are currently studying electronics with us, with 12 academic staff involved in the delivery of the electronics programmes. The teaching provision ranges from HND through BEng (Hons) to MSc and on to research, offering multi-entry, multi-exit opportunities. All of the degree programmes are characterised by applications-focused and problem-based activities underpinned by academic rigour. Our electronics provision includes:

- HND and BEng(Hons) programmes studied full time
- MSc programmes studied full time and part time by distance learning (www.ami.ac.uk)
- MSc programmes running in Soest, Germany, under a dual award arrangement
- Research – PhD supervisions
- Collaborative programmes (www.ceesi.ac.uk)

In addition the electronics team is closely involved with industry, innovation and enterprise. Our Technology Development Centre helps local companies by undertaking electronics development work, finding partners, research contracts and development funds.

The Department of Electrical and Electronic Engineering is committed to excellence in both teaching and research, and is ranked consistently highly in the UK university league tables. In addition to a range of accredited undergraduate programmes, it runs a taught MSc in Communication Systems and Signal Processing and collaborates with the Department of Computer Science on the taught MSc in Advanced Microelectronic Systems Engineering (AMSE). The AMSE programme was created because of demand from local IC design companies: one third of all chip design in Europe is done in the Bristol region. Many of the AMSE student projects are run in association with industry, with access to industry standard CAD tools. The Centre of Excellence in Microelectronics provides a vehicle for collaboration between the companies and the University.

Electrical and Electronic Engineering’s research is organised under the Centre for Communications Research and the Energy Management Group. Thirty-two staff are represented in the latest Research Assessment Exercise (RAE) submission. The period 2001-2008 has seen a 36% uplift in research income, with half of it coming from industry facilitated through our well equipment experimental facilities and technology transfer.
The Department of Engineering at the University of Cambridge is a world-leading institution with teaching and research interests covering all branches of engineering. The Department has over 130 academic staff, 600 PhD students, and 1,000 undergraduates.

The Electrical Engineering Division has research interests spanning materials, devices and systems with applications in communications, displays, sensors, imaging, power control and renewable energy. The Division has a new purpose-built laboratory which is home to: the Centre for Advanced Photonics and Electronics (CAPE); the Centre for Macromolecular Materials for Photonics and Electronics (CMMPE); the Cambridge Integrated Knowledge Centre (CIKC); and the Nanoscience Centre. These centres together with the Cambridge Nanoworks initiative offer great flexibility for companies wishing to collaborate as strategic partners on research or access facilities, skills and knowhow.
Within the School of Physics and Astronomy, the Photons and Matter Group’s research into the design and characterisation of semiconductor laser diodes covers computational methods and the investigation of fundamental behaviour.

Experimental facilities include cleanroom fabrication for edge-emitting and VCSEL devices, a 5-400K, 100ps laser characterisation suite and laboratories for assessment of static device characteristics. Current research is also concerned with the design of laser diodes tailored to specific applications in biology, medicine and sensing.

Previous and on going collaborations with industry have involved companies such as British Telecom, Motorola, IQE, BAE systems and Bookham in the development of laser diodes with designated performance requirements for specific applications, such as high temperature 650nm lasers for DVD, 670nm red VCSELs for optical communications, 1550nm laser diodes and high power visible wavelength quantum dot lasers.

The group is interested in collaborative research into fundamental level laser development including the use of new materials and advanced structures such as quantum dot and composite and hybrid devices. It also offers advice and design expertise through consultancy contracts.
Involved primarily in the characterisation of semiconductor materials, the department has purpose-built cleanrooms equipped for the fabrication of semiconductor devices and complete silicon chips. Equipment includes a pattern generator and photorepeater, which make the development of prototypes very convenient. It has a full range of microbeam characterisation facilities. Systems are available to grow amorphous silicon films and amorphous silicon alloy films and to carry out electronic and optical measurements on semiconductor materials. Electron paramagnetic resonance (EPR) spectroscopy and positron annihilation spectroscopy are available.

Examples of projects currently underway include:

- optical and electronic characterisation measurements on amorphous, microcrystalline and polycrystalline films of amorphous silicon and silicon alloys
- development of large area display and sensor devices, as well as novel non-volatile digital and analogue memory devices with the potential for ultra-fast, radiation hard, high packing density and multi-state memory

The department is keen to pursue collaborative research with industry in new techniques for the production of photomasks and X-ray masks and materials and new techniques for visual displays.
The department runs a full-time MSc course on electronic circuit design and manufacture, a modular degree in displays called Displaymasters, an MSc in renewable energy and is looking at running all postgraduate MSc courses via distance learning.

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The School of Engineering is a nationally recognised centre of research excellence, reflected in its quality rating in the Research Assessment Exercise. The Centre for Electronic Systems (CES) was created to provide academic leadership in a wide variety of research contracts and reach out programmes for industry. The aim of the centre is to provide a focus for research and technology transfer activities associated with electronics and information engineering systems. Grant-funded research topics range from novel transducers, silicon design and signal processing to digital communication systems, with the main objective of making new knowledge accessible through publication in learned journals and at conferences.

CES has been actively involved in forming the Faraday Partnership EPPIC which evolved into the new KTNs in electronics and photonics. Research contributions include novel holographic lithography techniques carried out jointly with colleagues at Sheffield University and advances in Radio Tracking technology.

With the shift toward nano systems and molecular engineered devices we have recently introduced a new outreach project called the Centre for Electronic Nano Systems. This project has proved highly successful in adding value to the fundamental nano research by identifying target markets, building demonstrators and developing new products for businesses in the North East and Worldwide.
The Institute for Integrated Micro and Nano Systems (IMNS) brings together researchers from integrated circuit design, SoC design, microfabrication, micro-electro mechanical systems (MEMS), micro-machining and neural computation. Research activities range from industrially-focused process development and low power System-on-Chip design, to long-term research into circuit design, system architectures, micro-stereolithography, novel structures on silicon, and autonomous and adaptive hardware, networks and system architectures. With strong links to the life sciences, bioelectronics and biomechanics now provide an area of rapid growth linking core activities within the institute. Facilities include one of the UK’s leading silicon and MEMS fabrication operations, based at the Scottish Microelectronics Centre (SMC). This is a £4.2m purpose-built facility with 350m2 of class 10 cleanrooms, housing over £15m of microfabrication and chip repair equipment together with state-of-the-art simulation software. Research activities within the institute include:

- Neural and neuromorphic computation research on mixed-mode VLSI hardware with increasing interest in biological applications
- Reconfigurable and multi-functional hardware and sensor design together with novel ways for their integration
- Adaptive and autonomous system design.
- Long life wireless networks.
- Robust architectures for automotive and aerospace.
- Technology-based research with projects ranging from the fabrication of deep sub-micron MOS devices through to microsystem technology.
The University of Essex has comprehensive teaching and research activities covering all aspects of Electronics Systems Design, in its School of Computer Science and Electronic Engineering. The University has been ranked tenth nationally for its research quality, and is a leading exponent in this design field. Areas of expertise include:

- Analogue systems and circuit techniques, including electronic devices, circuit design, with analysis and computer simulation and modelling.
- Digital system design at system and register transfer level, with an emphasis on implementation on chip, using FPGAs and various hardware description languages.
- Embedded systems involving the design, programming and interfacing of embedded processors, their present and future applications, and their technological trends.
- Intelligent networks and systems, including evolutionary algorithms, brain-computer interfaces, robotics and computational intelligence.
- Interdisciplinary research within the Digital Lifestyles Centre, bridging the gap between the social and technological sciences by focusing on the development of innovative electronics systems and how we use them.

The School of Computer Science and Electronic Engineering is keen to collaborate with companies across this broad range of topics.
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University of Glasgow provides a vertically integrated electronics research environment from high level design to device and circuit fabrication. This capability is supported by a £4.7m electronics design centre funded by EPSRC, SHEFC and the University, and the James Watt Nanofabrication Centre built and equipped at a cost of £7m.

Research activities cover control systems, bio- and opto- electronic devices and systems, nano-electronics devices and systems, and device and system modelling – all with strong links to analogue and mixed-signal system design.

Areas of strength include:

- VLSI design (analogue/mixed-signal and digital) for sophisticated sensor/actuator hybrid systems including novel sensors and RF components designed and fabricated in-house. Projects include wireless video, integrated olfactory sensing and ingestible diagnostic devices.
- Design and realisation of Ultra-low power radio transceivers (6 & 24 GHz) for autonomous distributed sensor networks, and low noise mm-wave receivers (>94 GHz) for imaging and sensing.
- The impact of atomic scale variability in ultrasmall MOSFETs on circuit and system design.

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EECE is a leading international centre for learning, innovation and knowledge transfer in electrical, electronic and computer systems engineering. EECE equips students and employees for rewarding careers and provides competitive advantage to industrial sponsors and employers. We achieve this by delivering both broad and hands-on courses focused onto industrially relevant topics, and through cutting edge, world-class technological research. Our specialities in Microsystems, Robotics, Intelligent Systems, Signal and Image Processing, Embedded Systems, Power Electronics and High Voltage engineering are uniquely applied internationally across industries such as Communications, Medical Electronics, Transport, Offshore Oil and Gas, Defence, Energy Generation/Distribution and beyond. Rated Excellent at the last UK-wide Teaching Assessment Exercise, the department is at the hub of the engineering disciplines that form people and technology for our future. We pride ourselves in providing life enrichment in a caring environment for the transition to graduate and postgraduate engineer, and in delivering word class research outputs that are consistently used by industry as differentiators to generate economic wealth.
The University of Hertfordshire has active teaching and research in microelectronics and digital broadcast technologies. It was a DTI-approved electronics design support centre for eight years, having completed more than 50 collaborative projects with industry with both EU and UK DTI funding.

It has formed training partnerships with companies such as Cadence, Xilinx, Analog Devices, Mitsubishi, Crouzet and Philips. Material developed at the University of Hertfordshire has been marketed internationally and our staff have led training workshops across Europe and the US.

The University was recently designated a centre of excellence in System-on-Chip (SoC) design by Altium Systems, who have sponsored a SoC laboratory to the value of $500,000. The University is seeking collaboration in the following areas: IP creation; digital ASIC and FPGA design; baseband and RF DSP design for digital broadcast; design methodology issues; novel computing architectures and embedded internet solutions.

Relevant postgraduate courses on offer include:

- MSc Data Communications and Networks
- MSc Advanced Digital Systems; MSc Embedded
- Intelligent Systems; MSc Optical Communication
- Systems and Networks; MSC Radio and Mobile
- Communication Systems, MSc Computer
- Engineering and MSc Multimedia Technology.
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The Department of Electrical and Electronic Engineering is active in Communications and Signal Processing; Optics, MEMS; Digital and Analogue Circuits and Systems, Power and Control Engineering.

Under the general banner of SoC design, research activity is sustained in the areas of Reconfigurable Digital systems, Micropower and RF Analogue Electronics, Optical and RF MEMS, and novel devices including power scavengers and THz detectors. The circuit engineering activity is increasingly focused on process and fault tolerant methodology.

The in-house expertise in Control Engineering (optimal, non-linear and stochastic control), Communications (adaptive and spatial diversity comms, intelligent networks), Signal processing (real time DSP, audio and image processing) and power electronics allows the department to address all aspects of demanding applications including implantable biomedical and self-powered electronics, MEMS based systems, and audio and visual tracking, to name a few examples.

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iSLI sits at the critical interface between the academic and commercial engineering worlds. iSLI’s mission is to produce highly skilled design engineers and researchers to meet the needs of the rapidly changing global Microelectronics industry. As a collaboration between four leading UK universities (Edinburgh, Glasgow, Heriot-Watt and Strathclyde), iSLI is an intermediary for the commercial sector to reach academia and vice versa, enabling the free flow of information between academics and industry. The Institute provides masters (MSc) and doctoral (EngD) level post-graduate education, continuing professional development, leading edge research access and design consultation to the commercial sector. With its own design team specialising in development of wireless sensor networks and optical MEMS research, iSLI is about making technology relevant and attractive to the commercial sector to enable the success of new companies and next generation products.
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The Electronics Department at the University of Kent has three main research groups: Image Processing and Vision; Broadband and Wireless Communications; and Instrumentation, Control and Embedded Systems. Each group has an active research portfolio with funding from both the UK and Europe. Current research activities within the groups include image analysis, document processing, handwriting analysis, biometrics, neural systems, intelligent vision systems, SoC design and test, intelligent optical sensors, parallel processing architectures, reconfigurable systems, antennas and adaptive antenna arrays, non-linear systems, RF and microwave engineering, optical components and optical communications.

The Electronics Systems Design Centre (ESDC) is also based in the department. The ESDC is responsible for technology transfer activities in the department and in the past has supported the DTI Microelectronics in Business and Electronics Design programmes. During this time it has provided support for over 100 design projects with companies in the region. It is now a regional representative for the electronics KTN. Using funding from South East England Development Agency (SEEDA) it has recently established a small volume surface mount technology facility which is used for prototyping.

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- Micro & Nano Systems
- Design for Testability
- Integration & Packaging Technology
- Mixed Signal & Analogue Engineering
- System-on-Chip and System-in-package Design Technology

Electronic Systems Research at the Centre for Microsystems Engineering at Lancaster University is focused around industrially-linked projects that address design challenges associated with next generation integration technologies and the optimisation of quality, reliability and manufacturing economics in systems based on micro- and nano-technology. The team lead a European Network of Excellence in Design technology for MNT based systems and are executive Board members for the UK Innovative Electronics Manufacturing Research Centre. Specific projects include:

- Design-for-Testability and Self-Test strategies for mixed signal systems and the extension of to full HW/SW based condition monitoring solutions for multi-technology designs around System-in-Package and silicon/polymer platforms.
- Design challenges around 3D integration platforms including methods of distributing processor and memory resources across multiple stacked devices, modelling performance and reliability issues for interconnect structures including TSV’s and systems design methodologies for emerging nanoscale devices that bridge the gap between quantum level models and circuit simulation.

- Application of 3D integration and System-in-Package Technology to miniaturised health and usage monitoring systems.

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The Research Assessment Exercise (RAE) 5* School is an internationally-recognized centre of excellence for both teaching and research. Research is consolidated into two Institutes: the Institute of Microwaves and Photonics (IMP) and the Institute of Integrated Information Systems (IIIS). The IMP has a history of pre-eminence in high frequency electronics, incorporating fundamental understanding, design, modelling, and fabrication of devices, components, and subsystems from 1 GHz through to terahertz (THz) frequencies. Its scope now includes the design, modelling, and fabrication of quantum-electronic devices, semiconductor nanotechnology, and the emerging field of bio-nanoelectronics. The IIIS has an established international reputation for communications, wireless systems, signal processing, control systems and instrumentation. Recent expansion into optical communications and networking has broadened its capability and expertise in heterogeneous IP networks, complexity and self-organisation in systems, sensors, intelligent wired-wireless systems and user-controlled networks. Industrial links include all major telecommunications companies.

Excellent facilities include GaAs-AlGaAs-InGaAs MBE growth, a nanotechnology cleanroom (including electron and focused ion beam lithography), microwave measurement facilities (for system design, and characterization to 320 GHz), a terahertz photonics laboratory (including
broadband and quantum cascade laser systems), and a bioelectronics laboratory suite. High-end computing/CAD tools for modelling/simulation, traffic characterization facilities, a purpose-built wireless infrared test-bed, a wireless sensor networks test-bed, and ultra-wideband equipment for implementation of signal processing algorithms are also available.

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The Solid State Electronics group has about 25 staff, has been active for 30 years and encompasses both silicon and polymer based electronics. Device work includes full design, simulation, realisation and characterisation of novel structures, dual gate vertical MOSFETs with SiGe HBT on SOI and polymer transistors with Schottky contacts.

Design of low voltage/low power analogue and mixed signal circuits on Si and SOI substrates continues the strong track record in SOI and is aimed mainly at medical applications. There is collaboration through the group’s membership of EUROSIO EU Thematic Network. The group also has design and fabrication experience of fully-depleted SOI and low power adder circuits incorporating a variety of logic styles (PowerPack consortium).

There is activity on novel neuromorphic devices for spike dependent plasticity, which can be implemented in a CMOS technology (funded by EPSRC). A Technology Strategy Board (TSB) Project ‘PPM2’ is concerned with precision passive components. A micro-machining project has realised the world’s smallest miniature mass spectrometer.
The major activity on semiconducting polymers has been instrumental in the development of the EPSRC carbon-based electronics initiative; a collaboration between 11 top UK universities which is co-ordinated by Liverpool.

The group are also a partner in the EU Integrated Project ‘Poly Apply’ and are engaged in 2 TSB projects on RFID Organics Design.

London South Bank University’s research activities within the electronics sector are concentrated in the Centre for Concurrent Systems and VLSI (CCSV) and the Electronic and Functional Materials (EFM) group. The CCSV and EFM are concerned with design technologies and device technologies, respectively.

The CCSV is led by Prof Mark Josephs, a member of the UK Computing Research Committee. Research into asynchronous circuit design focuses on formal methods and tools for verification and synthesis. The CCSV has been a main contractor under multiple Framework Programmes of the European Commission, with industrial collaborators including Philips Research, Eindhoven, and Infineon Technologies, Munich.

EFM is led by Prof Hari Reehal, a member of the EPSRC Peer Review College. Research into photovoltaic (PV) solar electricity generation focuses on novel thin film materials and opto-electronic devices, in particular solar cells. Strong collaborative links exist with academia and industry, with EFM participating in the PV-21 Consortium, supported by the EPSRC’s SUPERGEN initiative.

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The Advanced Processor Technologies (APT) group in the School of Computer Science has a decade of experience in the design of self-timed (clockless) embedded processor cores and related SoC technology, and is a recognised world leader in the application of self-timed techniques to large-scale embedded designs. Its programme of research currently includes multi-core processor architecture, hardware support for large-scale neural networks, tools for asynchronous design and advanced signal processing systems.

There is significant electronic systems activity in the School of Electrical and Electronic Engineering in the areas of fine-grain processor arrays and vision systems. The Microelectronics and Nanostructures group’s activity embraces new nano-technology materials through novel devices to integrated circuit design and SoCs. Devices spanning the 1GHz to 1THz bands are fabricated and tested. The group is also also developing technologies for the international Square Kilometre Array (SKA) radio telescope including super low noise receivers at ~2GHz using advanced InP technology.

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The EECE Research Groups known nationally and internationally for expertise in key technology areas provide knowledge to address crucial problems between technology and design in the following areas:

● Strained Si technology for high speed low power Integrated circuits; SiC for high temperature high power electronics; reliability of IC interconnects; Nanowires; sensors; device fabrication; novel electrical and material characterization; nm scale strain characterization; C-AFM techniques; technology CAD; Diffusion and vacancy engineering; Atomic Layer Deposition. The School maintains class 100 cleanrooms together with extensive electrical and material characterization facilities.

● Microelectronics system design: asynchronous system, secure hardware and synchroniser design; synthesis and verification; metastability modelling and characterisation; on-chip timing measurements; logarithmic scale processors; self test for SoC, concurrent error detection; design for testability and testing for high temperature SOI technologies.
• Communications and Signal Processing: 4G systems; Nonlinear signal processing and blind source separation; Mobile pervasive devices; Coding, and security; Biomedicine; Biometrics; Digital video coding and image analysis; Neural networks.

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The Department of Engineering Science at Oxford is the only unified department in the UK which offers accredited courses in all the major branches of engineering – our students develop a broad view of the subject much appreciated by employers, but can also choose from a very wide range of specialist options.

Every year the Department of Engineering Science, one of the largest departments in the University, produces around 160 new engineering graduates. They go off to a huge variety of occupations – into designing cars, building roads and bridges, developing new electronic devices, manufacturing pharmaceuticals, into healthcare and aerospace, into further study for higher degrees and in many other directions. Some of our graduates also develop their managerial, financial or entrepreneurial skills, and go into commerce, financial services, or start their own companies.

We see 60 to 70 students each year take higher degrees, either MSc or DPhil by research, and since October 2006 a number take a taught MSc course in Biomedical Engineering.
We have a substantial research portfolio, including much that is directly supported by industry. In the Department there are no barriers between the different branches of engineering, and we are involved in a great deal of multi-disciplinary research collaborating with groups in other departments from Archaeology to Zoology.

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The Department of Computing and Electronics engages in teaching, research, and development in a wide range of disciplines including: wired and wireless data communications, software engineering, computer vision, media-rich computer networks, and web technology. Electronic design expertise includes high performance electronic circuits and systems, low-voltage high-speed CMOS line drivers, non-contact infra-red thermometers, transmission of multimedia data over 3G and future 4G mobile networks, mobile ad-hoc networks, and voice over IP. There is a prizewinning research group in computer vision, spanning the range from new probabilistic approaches for solving hard vision problems, to practical applications in 3D scene analysis and content manipulation, surveillance, and special effects for the film and computer game industry. The department engages in consultancy with industry and government, and has a number of teaching and research partnerships with companies including Oxford Metrics Group, Vicon, Avid, Microsoft, Cisco, Nominet, Sony Entertainment and Texas Instruments and Calex Electronics. The department can provide a complete service ranging from initial conception to a complete device or software prototype.

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ECIT brings together, under one roof, internationally renowned research groups from Queen’s University of Belfast specialising in key areas of advanced digital and communications technology. The institute’s unique focus on blue skies, strategic and industrial research projects puts it in the same league as other major worldclass R&D centres, with a £40m investment over five years. The following are the key research areas: advanced wired and wireless networks; high frequency electronic circuits and antennas; telecommunications software; DSP for communications; System-on-Chip; image and vision systems and speech and language processing. There are a number of state-of-the-art laboratories which play a key role in the development of the research.

ECIT also has a strong business and entrepreneurial focus, providing hot-housing facilities to encourage and support the development and initial growth of new companies. Links with industry are an integral part of the research performed within ECIT.

The Semiconductor Research Centre has expertise and capability in the following areas: enabling technology for advanced bipolar and MOS Integrated circuits; novel applications of SOI and buried metal silicide technology; ground plane noise protection for integration of digital and analogue systems; silicon bread-boarding for mm wave integrated circuits; applications requiring silicon micro-machining and wafer bonding; thin film circuits and RF MEMS.
The Electronic and Electrical Engineering Department is one of only two UK EEE departments that have been awarded the highest rating in two consecutive national Research Assessment Exercises. The major research groups are in Semiconductor Materials & Devices (hosting the National Centre for III-V Technologies), Electrical Machines and Drives (hosting the Rolls-Royce University Technology Centre in Advanced Electrical Machines and Drives), and Communications.

Electronic systems design form part of the Vision and Information Engineering Research Group’s activities. The Group is primarily concerned with the acquisition, transmission, processing and understanding of images and other high-dimensional data – from basic research to commercial exploitation. Within this wide spectrum, current systems activities include:

CMOS-based imaging sensors (Active Pixel Sensors) and systems for scientific, medical and security applications. We lead or contribute to several collaborative teams, with public funding in excess of £10m, who are expanding the performance envelope of these devices. Furthermore, we have unique access to the design and fabrication of APS devices for customised needs.

Core expertise exists in video coding technology, especially scalable video coding and compressed domain analysis for context-aware robust video delivery for applications ranging from low-resolution mobile devices to high-resolution display systems.

The main thrust in the Department’s long-standing interest in packaging technology is the development of holographic maskless non-planar photolithography.
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The School of Electronics and Computer Science at the University of Southampton is the largest of its kind in the UK. The department turns over around £23m every year, over half of which is derived from collaborative research.

Research interests encompass a wide spectrum of disciplines, covered by research groups: communications, declarative systems and software engineering, electronic systems design, image, speech and intelligent systems, nanoscale systems integration, intelligent agents and multimedia, optoelectronics, parallel and distributed computing and electrical power. These research groups have spawned over a dozen spinout companies over the last three decades.

The school engages in consultancy projects with industry and government and has a range of activities from a single day to strategic research partnerships with some of the worlds leading companies and research agencies, including IBM, BAE, Rolls-Royce, and DSTL. The school also hosts a state-of-the-art fabrication capability for silicon-based devices which is open for commercial use. The school can provide everything for an initial idea through to complete device or software system.

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With wide-ranging expertise in semiconductor research, development and testing, work is taking place in a number of departments. Physics and applied physics specialises in the spectroscopy and microscopy of semiconductors useful in devices. Electronic and electrical engineering offers facilities and expertise in bulk silicon micromachining. The pure and applied chemistry department is a centre of international excellence in chemical vapour deposition (CVD).

The Institute of Photonics bridges the gap between academic research and industrial application and development. Key areas of research include optoelectronic devices, novel uses of silicon, chemical vapour deposition, next generation lasers, piezoelectric superlattices, optoelectronic modulators, cathodoluminescence microscopy, photovoltaic devices, novel waveguiding, photonic lattice structures, micromachining, resonant microbridges and surface second harmonic generation (SHG) for semiconductor characterisation.
The Department of Electronic Engineering encompasses four research centres whose activities are varied and are briefly summarised as follows:

- **Advanced Technology Institute** – interdisciplinary research investigating materials and devices for future electronics and photonics addressing challenges in renewable energy, healthcare and information technology. Research activities focus on: nanoelectronics, photonics, ion beams, and theory and advanced computation.

- **Centre for Communication Systems Research** – the largest academic research group in communications in Europe. Research covers beyond 3G wireless, mobile and terrestrial systems as well as satellite and fixed networks in physical, network and higher layer applications areas, new services and sensor networks and future internet systems.

- **Centre for Vision, Speech and Signal Processing** – one of the largest multimedia centres in the UK. Research is structured into four main areas: multimedia signal processing and interpretation, visual media, medical imaging and remote sensing and robot vision.

- **Surrey Space Centre** – research into low cost small satellite and space system technologies and applications. Research teams that specialise in RF, digital on-board processing, dynamic control, propulsion, remote sensing, robotics, signal processing and planetary environments for space systems.
The School of Engineering, Swansea University, has the vision to provide an excellent research and teaching environment with international recognition for the advancement, dissemination and exploitation of knowledge in engineering and related disciplines. School's researchers focus on a number of distinct key technologies, but have a multidisciplinary approach to their application across the traditional engineering disciplines and sectors. The School has very strong links with industry; in particular, we are one of four UK universities to hold a Technology Partnership with Rolls Royce and are Preferred Academic Partners with BAE Systems in multiple research areas.

The School’s Electronics Systems Design Centre is one of the UK leaders in developing state-of-the-art semiconductor technology for System-on-Chip Applications. Another key research area in the group is development of the SiC and diamond semiconductor materials based microelectronics devices and sensors. The Centre is a world leader in semiconductor device modelling, finite element as well as compact modelling. The application of power electronics is an area of rapid growth.

Current research in engineering focuses on wireless optical and radio communications, digital signal and image processing including 3-dimensional object reconstruction from video images, infrared sensing and imaging, mathematical modelling of systems, Intelligent Systems (e.g. neural networks, fuzzy systems, evolutionary techniques), systems modelling and control, electrical power systems, nanotechnology and micro-engineering, silicon sensors and electronic noses, ultrasonic transducers and systems and VLSI, ASICs and programmable devices.

Further research is undertaken in: condensed matter-materials physics and spectroscopies; superconductivity and magnetism; ferroelectrics and crystallography; electron paramagnetic resonance (EPR); solid state NMR; ultrasonics; X-ray synchrotron studies; semiconducting materials; secondary ion mass spectrometry and surface and interface science.

Research at Warwick is supported by a wide variety of UK and EU funding bodies. The University works with a wide range of companies from the UK and worldwide and has successfully brought research results to the marketplace in the fields of printing, sensors, communications (optical and radio) and semiconductors.
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The Department of Electronics at York is a leading centre of electronic engineering education, research and technology transfer. It is home to world-leading research in areas such as nano-technology, computer architectures based on biological systems, electromagnetic compatibility, advanced wireless communications systems, and more. Research is based within three main research groups: Physical Layer, Communications, and Intelligent systems. Physical Layer works on electronic hardware aspects and its underlying physical principles, including nanotechnology, spintronics and electron microscopy, applied electromagnetics and EMC, and microwave and optical systems. Communications embraces wireless networking and cognitive radio, MIMO systems, and signal processing and coding for communications, including FPGA implementation. Intelligent Systems covers systems ranging from video processing and music technology to flight control, including especially bio-inspired computing architectures such as artificial immune systems, and multi-agent systems. There is also research in engineering management and enterprise, including the White Rose Centre for Excellence in the Teaching and Learning of Enterprise.
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3DLABS is a pioneering developer of fully programmable media-rich application processors. Using 3DLABS designed SIMD media array with 2x ARM® cores the DMSTM Processors are capable of delivering a rich mix of accelerated video, imaging, 2D and 3D graphics, audio and floating point capabilities within a low-power environment and supporting a wide range of peripheral devices.

The unmatched performance, flexibility and low power consumption of our SoC processors make them ideally suited to a broad range of multimedia devices and markets such as portable media players, portable navigation devices, mobile internet devices, IP set top boxes or smart phones.

Founded in 1994, 3DLABS forged a global reputation as a leading developer of advanced 3D graphics products for the PC. Our vast experience in developing fully programmable graphics processors is now being successfully applied to low-power media-rich application processors.

3DLABS has its primary R&D facilities in Egham, England, with offices in Milpitas, California and HangZhou, China.

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Air Semiconductor has developed the World's first Always-On GPS (Global Positioning System) satellite positioning receiver solution for mobile devices such as mobile phones, digital cameras, mp3 players and other handheld, battery operated consumer products. Our unique technology allows our GPS receivers to operate with up to 100 times lower power consumption than other solutions, allowing the GPS to remain switched on at all times. This Always-On operation is unique in battery operated equipment and is enabling a new generation of applications and services which can behave proactively based on the location of the device. Air is a fabless semiconductor company conducting research and product development in the UK and subcontracting manufacturing to the Far East. Our customers are manufacturers of handheld consumer electronics products throughout the world.
Altera Corporation (NASDAQ: ALTR) is the leader in innovative custom logic solutions, and has been ever since inventing the world’s first programmable logic device in 1983. Today, over 2,600 employees in 19 countries are providing even more ingenious custom logic solutions – addressing a range of concerns, from power consumption to performance to cost – for customers in a wide variety of industries, including automotive, broadcast, computer and storage, consumer, industrial, medical, military, test and measurement, wireless, and wireline. In addition to devices, Altera’s comprehensive solutions portfolio contains fully integrated software development tools, versatile embedded processors, optimized intellectual property (IP) cores, reference designs examples, and a variety of development kits.

Altera’s presence in the UK includes the European Technology Centre (ETC) in High Wycombe. Part of the company’s worldwide R&D organization, the ETC is responsible for development of IP cores, system level reference designs and system design tools for use in key application areas for Altera products. Applications include wireless and wireline communications, multimedia, and automotive infotainment.

Analog Devices is a world leader in the design of high performance analogue, mixed signal and digital signal processing (DSP) integrated circuits. Analog Devices has two design centres in the UK.

The Edinburgh Design Centre incorporates both DSP tools and IC design. The DSP tools group has the primary responsibility for the development of the optimising compilers that enable developers to efficiently exploit the capabilities of Analog Devices’ range of DSP processors, and is closely involved in the development and support of all the related tools. The IC group designs and develops analogue standard product ICs in a variety of fields including power interface, supply supervisory, and precision data conversion.

The Newbury Design Centre is involved in the design, layout, and prototype evaluation of a broad range of ADCs, high-speed networking, and system integrations with experience in fixed function DSPs, including both high-speed structured custom and synthesized designs.
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www.analog.co.uk

A design house providing full custom analogue, RF and mixed signal ASIC design to specification. Analogue Integration (AI) can adapt the customer’s system, design and supply prototype ASICs and either supply production quantities or arrange for direct purchase from the silicon foundry depending on volume. AI specialises in: signal processing from 6GHz to audio, including RF standard BiCMOS; SiGe and pure CMOS in the 100MHz to 2.8GHz region; switched capacitor solutions for filtering, gm continuous time filtering; micro-power and all ASIC development requiring expert analogue experience. Designs are always fully-customised to optimise performance and back-extracted net-lists are re-simulated for parasitic true analysis.

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Born from Micron Imaging, Aptina is the world’s foremost imaging-solutions company. We enable our customers to capture, analyze, and render the clearest and most vibrant images possible regardless of application through the development of CMOS image sensors used in the handset camera, digital still camera, PC video camera and medical markets.

Aptina’s UK Imaging Design Centre is based in Bracknell, Berkshire where it was originally established in 1998. The UK Imaging Design Centre develops reusable circuit, interface & logic IP, as well as complete CMOS image sensor & SoC products requiring the design and integration of complex analogue and digital circuits and subsystems.
In 1993, ARC developed a configurable microprocessor core that developers could customise to fit almost any embedded application. Today, ARC International (LSE:ARK) is the world leader in configurable processor technology with over 150 licensees worldwide, including seven of the top 10 Semiconductor companies and over 300 Million ARC-based chips shipping each year.

ARC licenses configurable CPU and DSP processor cores and application-specific subsystems that enable customers to design low cost products for high-volume markets such as the digital consumer, storage and communications markets. ARC’s silicon proven configurable processor IP has been expanded to vertically integrate Consumer IP for Audio and Video applications. We deliver Semiconductor IP with a complete embedded software Codec solutions to the Semiconductor industry and Post Processing “consumer experience enhancing” software IP to the Consumer OEM industry (The semiconductor companies customers). ARC’s unique Audio Post Processing solution, Sonic Focus, is designed into many brand leading consumer products today.

ARC’s family of configurable CPU and DSP cores span the broadest range of end applications of any in the semiconductor IP industry delivering an optimal balance of performance, small die area and low power consumption.

ARC International employs approximately 200 people in research and development, sales and marketing offices across North America, Europe and Asia.
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ARM is a semiconductor intellectual property (SIP) company. It designs the technology that lies at the heart of advanced digital products, from wireless, networking and consumer entertainment solutions to imaging, automotive, security and storage devices. ARM’s comprehensive product offering includes 32 bit RISC microprocessors, graphics processors, enabling software, cell libraries, embedded memories, high-speed connectivity products, peripherals and development tools. combined with comprehensive design services, training, support and maintenance, and the company’s broad Partner community, they provide a total system solution that offers a fast, reliable path to market for leading electronics companies.

ARM’s partnering business model is key to the fast uptake of the ARM architecture. The model includes licensing to semiconductor partners, who focus on manufacturing, applications and marketing, partnering with EDA companies, to assure their technology is readily integrated into end-products, and partnering with system companies, to develop the total embedded system market. Many of the world’s leading technology businesses are ARM partners and these Partners now ship more than three billion ARM Powered® processors each year.

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Atmel EKB is part of the Secure Microcontroller product line and specialises in designing custom microcontrollers with high security capability targeted at a wide range of electronic security applications including SIM cards, bank cards, electronic ID, passports, Pay TV and embedded security. A mix of design competencies is required, including digital, analogue, custom and non-volatile memory. There is also an embedded software content. The facility in East Kilbride employs over 150 people. Fabrication takes place at Atmel’s wafer fab in the south of France and at foundry companies. Product design, validation, security certification and production test are handled at the East Kilbride site.
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Bores is a well-established and highly respected provider of DSP training, specialising in this field since 1988, and well placed to understand the application of DSP as well as the technology itself.

1-day to 5-day courses, registered under the Institution of Engineering and Technology (IET) scheme for continuing professional development are offered.

These include:

- technical courses – for engineers who work with DSP, helping them to use DSP and implement projects effectively
- executive overviews – for executives and managers, helping them evaluate and guide the application of the technology

Courses include:

- DSP and digital filters
- streaming media processing
- video processing
- streaming media software architectures
- component-based software architectures for DSP
- triMedia and Nexperia programming
- developing effective technical training for DSP Courses can be offered on-site.

The company also offers a web-based learning programme for digital signal processing. The course is aimed at engineers wishing to learn about DSP in a practical way. It starts with the basics, covering filtering and frequency analysis and concludes with a look at DSP programming tools and operating systems.
Broadcom Corporation is a major technology innovator and global leader in semiconductors for wired and wireless communications. Broadcom(R) products enable the delivery of voice, video, data and multimedia to and throughout the home, the office and the mobile environment. Broadcom provides the industry’s broadest portfolio of state-of-the-art system-on-a-chip and software solutions to manufacturers of computing and networking equipment, digital entertainment and broadband access products, and mobile devices. These solutions support Broadcom’s core mission: Connecting everything(R).

Broadcom is one of the world’s largest fabless semiconductor companies, with 2007 revenue of $3.78 billion, and holds over 2,900 U.S. and 1,300 foreign patents, more than 7,600 additional pending patent applications, and one of the broadest intellectual property portfolios addressing both wired and wireless transmission of voice, video, data and multimedia.

Broadcom is headquartered in Irvine, California, and has offices and research facilities in North America, Asia and Europe. It has UK centres in Cambridge and Bristol.

Cambridge Consultants develops breakthrough products, creates and licenses intellectual property, and provides business consulting on technology critical issues for clients worldwide. For almost 50 years, the company has enabled its clients to turn business opportunities into commercial successes, whether by launching first-to-market products, entering new markets or expanding in existing markets through the introduction of new technology.

We are a results-driven company dedicated to delivering competitive advantage through the innovative application of engineering and technology. From our offices in Cambridge UK and Boston USA we employ 300 staff including world-class designers, engineers, scientists and consultants. We develop products and solutions across a diverse range of industries including medical, industrial, consumer, automotive, transport, energy, semiconductor and wireless communications.

Cambridge Consultants combines its multi-disciplinary expertise with real market insight. Our in-depth understanding of a broad spectrum of technology allows us to offer valued consulting expertise, whether you are looking to optimise your R&D function, license emerging products, introduce new products or planning a strategic acquisition or disposal.
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CamSemi is a fabless semiconductor company that designs, develops, manufactures and supplies the most ‘cost efficient’ power management ICs to the offline (AC:DC) power conversion market.

The company’s products are based on a portfolio of patented, proprietary technologies including intelligent control architectures and PowerBraneTM which allows near-ideal switching performance of power devices such as LIGBTs and MOSFETs. These breakthrough approaches can benefit multiple markets, although initial products address the switch mode power supply and lighting sectors.

For example: CamSemi’s C2470 controllers target high volume consumer markets up to 60 W and offer SMPS performance coupled with low levels of EMI but at the price of a linear solution or less.

All products are supported by full reliability quality testing, the company is certified to ISO 9001:2000 and ISO 14001:2004, and design support is available worldwide through offices in Cambridge, UK; Shenzhen and Taipei.

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ClearSpeed Technology (LSE:CSD), a provider of a range of high performance silicon intellectual property components which encapsulate an advanced low energy parallel processor, low energy on-chip network and sophisticated software programming tools and libraries. With full span design and systems integration capability and a proven track record of successful implementation of complex designs in excess of 250 million transistors, the company has delivered the technology to meet customer needs, from tape-out ready soft IP, silicon proven hard macros or licensed chip-sets.

The technology has been designed to manage high data rate throughputs with the ease and programmability of software, providing system level profiling of computation, data rates and power usage, combined with source level debugging and optimized libraries for high data rate digital signal processing and advanced imaging applications.

By partnering, ClearSpeed has enabled its customers to apply its deep knowledge of silicon processes to build high performance processors for low power embedded systems. The technology is suited to harsh environments by meeting the stringent criteria for performance, energy efficiency, reliability and error resilience.

ClearSpeed’s technology is enabling a new generation of functionality across
the spectrum from including wireless communications, imaging and information processing, such as consumer level intelligent wireless beam forming, advanced low power radars and advanced low power imaging.

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CSR is a leading global provider of single-chip short-range wireless devices for the consumer electronics market – with a broad portfolio that covers Bluetooth, Bluetooth low energy, enhanced GPS (eGPS), FM, UWB and Wi-Fi.

CSR is ranked number one in every Bluetooth market segment with a unit market share in excess of 65%. CSR’s leading position in the Bluetooth business has been won by a unique approach to IC design based on extremely high levels of integration, providing compelling performance and cost advantages to OEMs.

CSR provides the industry’s lowest power and most highly integrated hardware and software solutions to enable designers to easily embed wireless functionality into a wide range of applications, especially power-conscious portable devices. CSR’s innovation can be found in many of the industry’s leading consumer electronics products including mobile phones, wireless headsets, MP3 players, laptops and personal computers, PC peripherals and in-car communication systems.
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David Munns Consulting provides freelance consultancy services in ASIC and VLSI design from concept to tape-out. Usually working on-site at locations all over Europe, either independently or as part of a team on projects lasting between one or two days and many months.

Main strengths are in the implementation phases of digital design from writing RTL and running verification, through synthesis and simulation to semi-custom layout, verification and timing analysis and in full-custom, transistor level design and layout.

Full custom design of RAMs, processor circuits, peripheral controllers, cell libraries and mixed signal integration.

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Dialog Semiconductor creates energy-efficient, highly integrated, mixed-signal integrated circuits. These are optimised for personal mobile and automotive applications. The company provides flexible and dynamic support, world-class innovation, and the assurance of dealing with an established business partner.

With its unique focus and expertise in system power management, Dialog brings decades of experience to the rapid development of integrated circuits for power and motor control, and audio and display processing.

Dialog’s processor companion chips are essential for enhancing both the performance of hand-held products and the consumers’ multimedia experience. Automotive applications include intelligent motor control for comfort and safety systems. Over one billion parts have been shipped to date.

With world-class manufacturing partners, Dialog operates a fabless business model.

Dialog Semiconductor plc is headquartered near Stuttgart, Germany with operations in Austria, China, Germany, Japan, Korea, Taiwan, UK, and the USA. The company employs 250 worldwide, and is listed on the Frankfurt (FWB: DLG) stock exchange.
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DisplayLink is a successful network display chip and software company that has developed a technology which allows users to easily expand visual workspace in just a few seconds by attaching up to six additional monitors to a PC or laptop via a standard USB 2.0 connection, significantly reducing cost and power consumption compared with traditional solutions. Using universally accepted wired or wireless networking protocols and proprietary software compression techniques, graphically rich content can be transmitted easily between a single device and multiple displays over a network. Leading global manufacturers have integrated network display technology into an array of consumer electronics including USB-enabled monitors, video docking stations and display adapters.

Founded in 2003, DisplayLink operates globally with its headquarters in Silicon Valley, R&D offices in Cambridge UK and Poland, and Sales & Support teams in Taiwan.

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Doulos is the global leader for the development and delivery of world class, training solutions for SoC, FPGA and ASIC design and verification. An independent company, they set the industry standard for high quality technical training and project services in VHDL, Verilog, SystemVerilog, SystemC, Perl, Tcl/Tk and ARM-based design.

Since 1991, their in-house expertise and world-leading know-how in key technology areas has contributed to the success of more than 700 companies across 35 countries. Independent of product ties, Doulos focuses on the application of the languages and methodologies across tool boundaries. They work closely with their clients and leading vendors to support projects requiring the highest technical expertise and design innovation. Public classes run regularly at training centres in the UK, France, Germany and the USA while in-house and team-based training is delivered worldwide. Best-in-class training and reference materials, including the sought-after Doulos Golden Reference Guides, are the signature of Doulos methodology training. Free Doulos technical resources are available to download from www.doulos.com/knowhow.
Ember Europe Ltd, based in Cambridge, is the IC Design centre for Ember Corporation, and Ember’s Sales and Support centre for EMEA and Russia. The chip design team in Cambridge is responsible for the design of Ember’s system-on-chip IEEE 802.15.4 / ZigBee products. The EM250 SoC and EM260 Network Coprocessor, containing the XAP2 microprocessor core and their own 2.4GHz IEEE 802.15.4 radio design, have been the most successful ZigBee chips on the market since their release on the market in 2006.

They have the lowest power consumption in sleep mode (which dictates battery life) and best in class RF performance for ZigBee low power wireless mesh networks. The next generation of ZigBee chips from Ember’s Cambridge-based design team due out in 2009 are set to be even more successful, with lower power consumption and even better RF performance.

Ember’s ZigBee SoC chips are used in many ZigBee Smart Energy and home energy management products, in electric, gas and heat meters, in-home displays, thermostats, heating controllers, smart plugs etc.

EnSilica is a UK-based design services company with comprehensive skills in digital ASIC and FPGA design from concept to implementation, and applications knowledge in video and wired/wireless communications. EnSilica has an excellent track record of project success with customers ranging from start-ups to global companies. End products for EnSilica’s solutions include HDTV, studio equipment, broadcast, security cameras, automotive entertainment, wireless handsets and display systems.

By utilizing design and verification IP from its own library and from 3rd parties, EnSilica can deliver solutions within aggressive timescales. EnSilica’s team produces efficient implementation of designs in ASIC or FPGA technologies using industry-leading Electronics Design Automation (EDA) tools. Functional verification services cover both traditional techniques and advanced methodologies.

EnSilica delivers a tailored service through a quality management system accredited to ISO9001:2000. Proven project management skills mitigate risk and ensure projects meet technical and commercial objectives. EnSilica engineers typically have between 10 and 25 years postgraduate industry experience.
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Specialises in software development for a range of licensable programmable and embedded DSP/RISC cores. Its DSP software and DSP software consultancy services enable clients to maximise the benefits provided by these embedded cores, together with application specific peripherals. Espico believes the key to efficient DSP implementation is the combination of a good algorithm and good software, and it boasts detailed knowledge of both aspects. Other challenges include the API and ease of integration and the code maintainability and re-usability.

Consultancy services include feasibility studies, complexity estimation, design studies to identify the best DSP core for the task, and development tool evaluation. The company has expertise in speech and audio codec implementation on a variety of DSP/RISC cores including Ceva, ZSP, ARM and ARC.

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Fen Technology is an electronic design services company located in the heart of ‘Silicon Fen’. Fen’s engineers have experience with the different challenges faced by high and low volume products, from concept to production. Its multi-disciplined teams have developed products in a number of different areas including consumer, industrial, automotive and medical and can either take full product responsibility, or work alongside a client’s own development team.

Fen’s extensive product development skills and experience can be used in a variety of environments across a number of market areas. Some of the products that Fen’s engineers have been involved in include: mobile data communications systems; digital TV and Home Gateway platforms; real-time MPEG transport stream FPGA processor and analyser; high-end audio consumer products; Bluetooth access point and data over DECT systems; image inspection system for the pharmaceutical industry; fault-tolerant memory array systems; warehouse tracking systems; GPS computer aided despatch systems and technology demonstrator and reference development platforms.
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Freescale Semiconductor is a design and manufacturing company established in 1953. With a vision to be the global leader in embedded processing and connectivity solutions, Freescale is focussed on Automotive, Networking, Industrial and Consumer sectors. We are engaged with 10,000+ customers globally including more than 100 of the top electronic manufacturers. Revenue was $5.7 billion in 2007 with over 20,000 employees.

From its facilities in East Kilbride and Aylesbury, Freescale UK contributes significantly to the company’s overall strategy and direction through competencies in

- Systems engineering for Networking, Industrial and Automotive.
- Industrial product marketing innovation
- Microcontroller technology & product introduction
- Multi-core systems and software
- Wireless software development & system integration
- Advanced Mezzanine Card hardware development
- Microcontroller product and applications engineering for automotive and industrial
- Business and operational management

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Established in 2001 as a privately-funded fabless semiconductor company, Frontier Silicon has rapidly become the world’s leading supplier of innovative semiconductor, module and software solutions for digital radio and connected audio systems.

Headquartered in Watford, near London, Frontier Silicon has around 140 staff, 70% engineers, with R&D, sales, support and manufacturing liaison centres in several locations including Cambridge, Dublin, Shannon, Japan, China, Hong Kong and the United States.

Our goal is to equip manufacturers with turnkey solutions to rapidly deliver sophisticated and profitable products in the highly-competitive and fast-moving consumer electronics market. Our range of platforms include the necessary hardware and software for digital radio manufacturers to develop products from start to mass production in as little as two months.

As the number one supplier to the DAB/DAB+ market and a leader in connected audio, we supply practically all major consumer electronics brands. Our multimode connected audio platforms support over 10,000 Internet radio stations, innovative on-line music services and features such as sophisticated displays including both mono and full colour UI’s.
As digital broadcast standards evolve, Frontier Silicon works closely with international standards bodies to create innovations such as our unified receiver module which enables manufacturers to produce a single digital radio for the whole of Europe and Australia.

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The company has a semiconductor design centre in the UK employing more than 25 people. This centre concentrates on the development and support of ASICs and increasingly SoC. Prime market areas are telecoms, multimedia, mobile and automotive. Working with a range of IP partners guarantees access to the latest techniques and functional elements. The mixed signal division creates high performance mixed-signal devices used primarily in broadband, terrestrial and satellite digital set-top boxes and in mobile communications handsets and base stations. The division’s activities include a global role in defining design and test methodology, as well as advising on future process technology. They have access to the latest 0.18μm, 0.11μm and 90nm and 65nM CMOS processes as well as the more mature 0.25μm and 0.35μm, enabling process selection to be made on a price/performance basis. The division has links to Fujitsu’s other European and worldwide design centres covering all technologies.
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GarField Microelectronics is an independent silicon design house and fabless semiconductor supplier. Since its acquisition of Matrics Ltd it can now offer a wide range of services associated with custom silicon products. We offer ASIC/FPGA design from specification to layout and right through to fabrication and test of the final product. We can offer a FULL CUSTOM design service using our highly experienced Analogue Engineers, completing the process with our chip layout team for onwards to one of the many silicon foundries we currently work with. We also have a wide range of custom IP blocks from simple to PLL to complete product designs.

Our Company has a very strong technical team of engineers capable of engaging with our clients at all levels. Added to this is our experience with silicon vendors and EDA tool manufacturers from a commercial perspective too. All this gives our customers a qualified route to turn designs and ideas into silicon, both in time and within cost and with minimal risks.

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Icera, a fabless semiconductor company, delivers the world’s first soft baseband modem for datacards, USB sticks, laptops, mobile internet devices and smartphones.

The Livanto® chip delivers the fastest HSPA 3G mobile broadband performance, supporting all legacy GSM, GPRS, EDGE and UMTS standards, with a roadmap for even higher speed next generation standards. Wireless products powered by Livanto® are commercially available across the world.

Livanto® is based on Icera’s custom wireless signal processor, DXP®. DXP® allows the entire modem functionality to be implemented in software on a single core device, with no need for hardware acceleration blocks, separate ARM processor, duplicated tightly-coupled memories or distributed memories. This results in an extremely small and flexible device with low power and cost. Compute resources can be dynamically switched and different algorithms deployed to enhance performance in real network conditions. New standards can be tracked at a faster pace than competitors and the integration of multiple air interfaces onto the same chip is accelerated.
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Imagination Technologies Group is a leader in semiconductor System on Chip Intellectual Property (SoC IP) and creates and licenses market-leading embedded graphics, video and display accelerators, multi-threaded processors and multi-standard receiver technologies. These IP solutions are complemented by dynamic and extensive developer and middleware ecosystems. Target markets include digital radio and audio; mobile phone multimedia; personal media players (PMP); in-car navigation and driver information; personal navigation devices (PND); Ultra Mobile PC (UMPC) and Mobile Internet Device (MID); digital TV & set-top box; and mobile TV. Its licensees include leading semiconductor and consumer electronics companies, as well as innovative leading edge start-up and fabless semiconductor companies. Imagination has corporate headquarters in the United Kingdom, with sales and R&D offices worldwide.

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Infineon Technologies is one of the top three European full service semiconductor companies. It opened its UK development centre in June 1999 as one of a growing network of European centres. The centre now has about 80 staff engaged in the development of advanced cores and methodologies. Infineon is also playing its part in helping the NMI to advance the status of integrated circuit design in the UK by participating in its design forums. The Bristol Design Centre is a competence centre for microprocessor and core development for Infineon.
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Specialises in providing professional services including commercial and project management, technical trouble shooting, reviews of design teams and products, identifying and sourcing design and manufacturing services. Innotec consultants also have technical skills in areas such as semiconductor design, electronic product design, software design and manufacturing. Focus industries are: telecommunications, consumer electronics, automotive electronics and IT. Innotec clients include major electronics companies, investment institutions, UK and overseas government departments and legal firms.

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Innovision R&T delivers innovative and market leading ICs for wireless connectivity solutions. Our primary focus is on short-range data communication from one device to another, passive and/or active, with a special emphasis on Near Field Communications (NFC) and RFID solutions.

As a leading fabless custom RF IC design and systems provider we offer a complete engineering capability to our clients, including research engineering, custom IC design and production, and system design engineering.

The company develops innovative semiconductor technologies, ICs, RF systems (HF/UHF) and complete end product applications for mass volume commercialisation and then licenses customers for its incorporation into their own products.

At the heart of the emerging Near Field Communication (NFC) market, Innovision R&T designs and develops NFC/RFID IC solutions for the global mobile handset and consumer device sectors.

Products include Topaz, mandated by the NFC Forum as the NFC number one tag type format, Jewel for mass transit ticketing applications, and io, the world’s smallest standards compatible Near-Field RFID reader.
Headquartered in the UK, Innovision R&T was listed in 2001 on the Alternative Investment Market (AIM) of the London Stock Exchange (ticker symbol:INN).

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International Rectifier is a world leader in power management technology. IR’s digital, analog and mixed signal ICs, advanced circuit devices, integrated power systems and components enable high performance computing and reduce energy waste from motors, the world’s single largest consumer of electricity. Leading manufacturers of computers, energy efficient appliances, lighting, automobiles, satellites, aircraft and defense systems rely on IR’s power management benchmarks to power their next generation products. Some of IR’s flagship products include the iMOTION(TM) integrated design platform, XPhase(TN) DC/DC distributed power chipsets, SupIRBuck, DirectFET® Power MOSFETS, iPOWIR(TM) DC/DC building blocks, and an expanding family of low-voltage and high-voltage ICs. With headquarters in El Segundo, California, International Rectifier maintains operations in 20 countries throughout North America, Europe, Japan and Asia. International Rectifier’s stock is listed on the New York Stock Exchange under the ticker symbol IRF. The company’s website is located at www.irf.com.
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Jaltek are a leading international service provider offering an effective end-to-end capability in the design and manufacture of complex electronic assemblies. Based in the UK, Jaltek provide professional and accessible electronic services to a wide range of clients from start-up through to blue chip and have in depth knowledge and broad experience of a wide range of market sectors and product technologies.

We’re already well-known for our work with big names, such as ARM, Goodrich and Curtiss Wright, but as a company we now operate across a range of highly-diverse market sectors for an ever-growing number of customers.

When you’re comparing Electronic Manufacturing Service (EMS) providers, it’s not a level playing field. Not all providers offer industry-leading ideas, such as IDMS (Integrated Design & Manufacturing Services). Not all providers have the ability to take you from design, through prototyping, NPI and into volume production, and not all providers are open and honest about information and costs relating to your project.

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Jennic is a fabless semiconductor company leading the wireless connectivity revolution by providing wireless microcontrollers for a broad range of applications. Its expertise in systems and software combined with world class RF and digital chip design provides low cost, highly integrated wireless microcontrollers with a focus on the IEEE802.15.4 and ZigBee standards. The company’s products include state-of-the-art low power wireless microcontrollers, modules, development platforms, protocol and application software. These provide a complete package for customers to develop low-cost, low-power, easy to use products for commercial and industrial networks and for the home.

Headquartered in Sheffield, UK, Jennic also has offices in China, Japan, Korea, Taiwan and the USA for world wide sales and support.
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Nallatech is a leading supplier of FPGA Computing solutions, delivering commercial off-the-shelf (COTS) systems comprising all of the hardware, firmware and software components required for users to develop high performance processing applications. When the range of COTS products offered by Nallatech do not exactly meet customer application requirements, or need to be supplemented, Nallatech design services can provide custom solutions and services.

- High-speed digital design and simulation
- Analogue design
- Mechanical design
- Software development
- FPGA programming
- OS/RTOS drivers

These design service engagements vary from adding new I/O capability to full custom designs of modules and carrier cards. In each instance, Nallatech works closely with the customer to create a partnership with the common objective of customer success.

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The design centre in Greenock comprises two distinct business units. The first focuses on the design, development, test and production release of devices for the portable power market. The devices designed by this group cover a wide range of power management products with core blocks used both stand-alone in mobile power applications (eg mobile phones) and also reused in larger multifunction power management devices. Design disciplines range from circuit design at transistor level to mixed signal design and system level understanding. National’s approach to IP shareability and reuse allows complex devices to be taken to the market more quickly, maximising the competitiveness of its end customers. National’s device applications engineering team works very closely with circuit designers to create device datasheets and liaise with customers.
The other unit focuses on the design of highly complex digital cores, partly based around National’s proprietary RISC core, and partly mixed signal systems for the audio market. These cores also support internal groups within the company and devices find applications in a wide variety of markets. Design techniques emphasise reusability and methods to reduce time-to-market and skill sets range from digital design, DSP and mixed signal techniques to system architecture. The group can take a customer’s requirement from initial concept through system architecture to product engineering.

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Established in 1993, NEuW is an international business and high technology consultancy. The company has strong links to, and capabilities in, Asia Pacific and has customers throughout the world. NEuW’s consultancy team delivers business, markets and technology analysis and action for our multinational customers, investors and professionals worldwide. NEuW’s team also acts in advisory and interim leadership roles to deliver success for technology ventures operating in Europe. NEuW provides deep business and technology expertise in product design and silicon, combining strategic market, industry and engineering experience.
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Nujira’s mission is to dramatically improve the energy efficiency of cellular network base stations, cellular handsets and digital broadcast transmitters by reducing the amount of waste energy dissipated as heat in the RF transmission circuit. Nujira Coolteq™ modules use its High Accuracy Tracking (HAT™) technology that dynamically controls the power supply to the circuit in line with the transmission power required, reducing the power consumption of transmitters in cellular base stations and handsets for 3G and 4G services and DVB digital broadcast transmitters by 40-50%.

Nujira was founded in 2002 by a team led by Nujira’s CEO, Tim Haynes and is supported by private investment and venture funding. Nujira modules are currently either being evaluated under contract or embedded into products by fifteen top cellular and broadcast infrastructure vendors. The company has a commercial presence in the Europe (UK), US (New Jersey) and Japan (Tokyo). Its R&D centre is based in Cambridge and Bath, UK. Nujira employs 56 staff.

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NXP is a top 10 semiconductor company founded by Philips more than 50 years ago. Headquartered in Europe, the company has 37,000 employees working in more than 20 countries and posted sales of USD 6.3 billion in 2007. NXP creates semiconductors, system solutions and software that deliver better sensory experiences in TVs, set-top boxes, identification applications, cars and a wide range of other electronic devices.

NXP’s Nexperia-based Home system solutions and audio/video components enable manufacturers to offer consumers more digital content via a better viewing and listening experience. The Home business unit innovates embedded multimedia features and next-generation, connected multimedia appliances for a connected living experience – making it easier than ever to enjoy and share multimedia content, anytime and in every room.

NXP has one of the largest portfolios of multimarket semiconductors in the industry, from basic building blocks like timers and amplifiers to sophisticated ICs that improve media processing, wireless connectivity, and broadband communications. These are designed to save space, extend battery life, enable customized solutions tailored to customers’ needs, and make it easy to implement last-minute changes.
In the UK, NXP has development centres in Southampton and Belfast (Home Systems) and Hazel Grove in Cheshire (Multimarket).

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Oxford Semiconductor designs a wide range of highly integrated data communication and interface chips. It provides solutions for emerging standards. The company has two main focuses; Storage Solutions including applications such as network attached storage and direct attached storage and Connectivity Solutions covering interfaces including USB Controllers and PCMCIA, PCI and PClexpress to single and multi-channel UARTs and/or parallel interfaces.

An in-depth customer support service provides evaluation boards, reference designs and device driver software. With more than 110 employees worldwide, Oxford Semiconductor has its main R&D, product development and product support and applications centre near Oxford and has offices in the US (HQ), Singapore, China and Taiwan, as well as a comprehensive worldwide distribution network.
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This leading management, systems and technology consultancy employs 3,000 people in more than 35 countries. With many years experience of designing mixed signal and digital asics, PA has developed considerable strength in the wireless, telecoms and satellite communications sectors. GSM chipsets for handsets and base stations are a speciality as well as circuits for Bluetooth, UMTS, DECT, PMR, CDMR and a range of wireless communications devices. Additional projects have included RF ASICs exceeding 1.8GHz and satellite phones. Consultancy services cover technology and innovation, as well as strategy, project management and human resources. The company has manufacturing capability as well as extensive hardware and software design and development labs.

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Panasonic Strategic Semiconductor Development Centre Europe (PSDCE) has been established with the specific mission to develop the D-Fabrix reconfigurable algorithm processing architecture to a cost/performance point that makes it compelling for widespread adoption in consumer electronics (CE) products. The focus of current production application within Panasonic is in Audio/Video (AV) coding and processing.

Such products, for which functions and services can be changed and added even after shipment are considered to be important for the future amidst the advancing digital CE industry. The D-Fabrix technology, combined with the ‘UniPhier’ Panasonic platform technology, will be a key enabler for semiconductors in order to achieve such products.

The D-Fabrix technology was acquired from Elixent Ltd. in July 2006. Elixent spun out from HP Labs in Bristol in 2000. In total over 12 years of development effort has resulted in the current successful product. Although reconfigurable logic has been an intense area of startup activity over the years, Panasonic/Elixent’s development of D-Fabrix to volume production emphasises a particular achievement.
picoChip has developed a complete solution for wireless signal processing, for WiMAX, 3G and now LTE and beyond, which radically changes the economics of advanced communications infrastructure. It provides innovative, flexible wireless solutions to help equipment makers minimize time-to-market, costs and system power consumption.

The company’s products are powerful baseband processors that combine the computational density of a dedicated ASIC with the programmability of a traditional high end DSP. This delivers 20 times the price/performance of any current processing architecture, but can be programmed in standard ANSI C.

As well as its processors, picoChip provides complete software reference designs with proven IP for seamless integration with the radio frequency elements of a basestation. Its technology platform also includes tools and development boards.

The company demonstrated the world’s first software defined 3G basestation in Spring 2003 and is the market leader in reference designs for WiMAX. It also offers solutions for WCDMA/HSDPA (‘3.5G’) and TD-SCDMA, with cdma2000 available through partners.

More recently picoChip announced products for UMTS LTE (Long Term Evolution). Its technology is an excellent fit for sophisticated algorithms such as MIMO, smart antennas, linear radios/digital predistortion, dynamic spectral management and the like.
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Plextek is one of the largest independent electronics design houses in Europe. Established in 1989, and with 100 staff, design capabilities range from design and technology studies to complete product and system design. Where appropriate, Plextek can also organise a total product solution including both design and supply.

Plextek has been involved with developments in GSM, GPRS, DECT, 3G PMR, Bluetooth, data/telemetry systems, wireless local loop system, vehicle location and short-range man-portable radar systems and is an approved supplier to the defence and security industries. Introduction to manufacture is regarded as a priority and projects regularly include factory selection and design of functional test equipment.

Plextek has the latest RF test equipment, analysers, software and microprocessor development tools, CAD for PCB layout, RF design, digital design and integrated circuit design and has an open field test site and environmental and EMC test chambers.

Plextek's knowledge of the competitive communication markets means it can offer advice on market strategy and the identification of features and requirements for future products and additional market opportunities. Its client list ranges from entrepreneurs to multinationals, including leading manufacturers, operators and silicon vendors.

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Pulsic Limited is a fast growing EDA company focused on custom design automation (CDA). CDA is a new class of EDA tool pioneered and developed by Pulsic that releases engineers from the constraints imposed by ASIC design styles and automates complex custom design layout to yield faster design and more accurate design iteration. CDA brings together planning, placement and shape-based routing in a single hierarchical environment, enabling productivity boosts of up to 50% in custom layout to be realised. Pulsic's leading physical design software improves the design productivity at nine of the top ten memory companies by automating the layout of peripheral and control logic. Pulsic's product range includes hierarchical floorplanning, detailed placement, automatic routing and interactive editing. Pulsic has delivered more than 150 tape-outs with over 40 customers worldwide and is the only supplier of specialized layout automation for memory. Pulsic was founded in January 2000 and is a privately held company, headquartered in Bristol, UK.
Quadrics designs and manufactures interconnect technology for high performance computing (HPC) based on internally developed ASICs.

Quadrics’ flagship proprietary interconnect, QsNet, links even thousands of Linux computers into a single ‘cluster’ supercomputer. QsNet is particularly suited to large simulation programs that require the combination of outstanding network performance and 24*7 production execution.

Quadrics has also developed 10 Gigabit Ethernet products, typically used within the data-centre, where state of the art systems generating many Terabytes of data per day need their results to be stored in a reliable central file-system, analyzed on the fly, transferred to visualisation systems, moved to archival storage, and recovered for subsequent analysis.

Both QsNet and QsTenG setups are often cheaper than traditional supercomputers. Clusters also offer another advantage: with traditional supercomputers when customers require more computational power they need to buy a new supercomputer; with a cluster they simply network more computers onto it.

The interconnect is really the supercomputing bone of a cluster. As more and faster computers are added, networking becomes more complicated especially when there are thousands of them. Quadrics’ unique solution lies in combining the performance of QsNet with a management software to ensure that clusters spanning thousands of processors can be used, administered and run effectively.
QUALCOMM Incorporated designs, manufactures, and markets digital wireless telecommunications products and services based on its CDMA technology and other technologies. It operates in four segments: Qualcomm CDMA Technologies (QCT), Qualcomm Technology Licensing (QTL), Qualcomm Wireless and Internet (QWI), and Qualcomm Strategic Initiatives (QSI).

The QCT segment develops and supplies CDMA-based integrated circuits and system software for wireless voice and data communications and multimedia functions, as well as GPS products used in wireless devices, such as mobile phones, data cards, and infrastructure equipment. It also offers system reference designs and development tools to assist in customizing wireless devices and user interfaces; to integrate its products with components developed by others; and to test interoperability with existing and planned networks.

The QTL segment grants licenses to use portions of its intellectual property portfolio comprising patent rights useful in the manufacture and sale of wireless products. QSI segment makes strategic investments to promote the worldwide adoption of CDMA-based products and services.

The company was founded in 1985 and is based in San Diego, California.

Renesas Technology Corporation Ltd is one of the world’s largest semiconductor companies and is the market leader in a number of product and market sectors. The company was formed in April 2003 when Hitachi and Mitsubishi Electric merged their semiconductor businesses. Renesas Technology Europe (RTE) is responsible for developing and managing the Europe-originated business of Renesas.

RTE-Engineering Division provides advanced intellectual property development and design-engineering services for customers and creates solutions that become part of Renesas’ product and technology portfolio.

RTE-ED’s activities are built around expertise in the areas of LSI, software applications development and board level design. These fundamental skills may be applied individually in projects, but usually they are combined to realise complete system solutions based around Renesas’ extensive microcontroller portfolio. System level solutions in RTE-ED are currently concentrated in the areas of Mobile Telephony, Digital Consumer and Automotive Systems.

There are approximately 100 Engineers at the Bourne End site. The total engineering community working on RTE-ED projects is typically much larger through extensive cooperation with external technology partners and customers.
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Roke is a contract electronic engineering research and development business owned by, but operating independently within, Siemens. Founded in 1956 and employing 350 professional engineers and scientists, Roke produces cost effective and innovative solutions for a diverse customer base including government and commercial organisations by drawing on a unique mix of skills across the areas of communications, information systems and electronic sensors.

As well as being an innovative solutions provider, the company provides systems engineering, incorporating requirements capture, systems design and modelling and prime contracting. In terms of products, Roke can offer a design, prototyping and manufacturing service. The company is approved to BS EN ISO 9001 with TickIT accreditation for software development. Contracts can also be undertaken to AQAP 1 and 13.

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Sagentia is a global technology management and product development company. Established in 1986, our unwavering commitment to innovation has led to the launch of new technologies, services and breakthrough products that have helped change the basis of competition for our clients.

We operate in five global market sectors: chemicals, materials & energy; consumer products; industrial products; medical; telecoms & media. In each of these we assist business leaders and policy makers create strategies for technology, innovation and growth. Sagentia employs more than 200 staff and has offices in four locations worldwide.

Sagentia is headquartered in Cambridge and is able to undertake all aspects of hardware and software, electronic and mechanical design. Sagentia has specific expertise in the practical application of fundamental sciences, such as optics and magnetics, particularly in industrial and medical markets. Mechanical and electronic CAD design flows are fully integrated and can be interfaced to 3rd party systems. Matlab and Mathcad are used for design modelling, with Mentor Graphics tools being used for design capture, synthesis, simulation, library management, platform targeting and PCB design and layout.
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Saul Research offers a research-based ASIC design activity, taking a product concept through to a full ASIC, usually in prototype quantities. It is approved to ISO 9001:2000 by Lloyd’s Register QA.

The company specialises in analogue active filters at low and high frequencies, sensor interfaces, RF design, high speed/low power digital design and data converters. Although it works mostly in deep sub-micron CMOS analogue, Saul Research also does bipolar and SiGe bipolar work. Recent successes include a cell for a 1GHz CMOS PLL, a 350µW Hilbert transformer and a range of analogue computing functions. It does full voltage mode op-amps, with low noise and 500MHz plus unity gain bandwidth. Saul Research works very closely with their customers, to define exactly what they want – and then it makes it!

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Primarily a 4” CMOS, bipolar and BiCMOS (2.55µm feature size) wafer fabrication facility, Semefab offers design services including circuit and system partitioning, device design, prototype approval and volume production.

Semefab specialises in consumer, automotive, industrial and telecom chips of medium complexity with full custom layout. The company is increasingly active in MEMS production (30% of current business) with a wide range of CMOS compatible wafer processing and an expanding post CMOS processing capability with special emphasis of active components on MEMS substrates. A 6” wafer fabrication capability is now being planned.
SiGe Semiconductor is a leading global supplier of products that are enabling wireless multimedia in a variety of computing, entertainment and mobile systems. Our innovated radio frequency integrated circuits and multi-chip modules simplify the addition of mobile broadband access and location-based capabilities to consumer electronics. SiGe products are designed specifically for these applications, providing the unequaled performance that is necessary for high-quality, user-focused applications on the go. Offering exceptional performance, our products comply with WiFi, WiMAX and GPS technology standards. We deliver solutions designed for the end system applications enabling ease of integration and reduced time to market. SiGe operates worldwide, servicing leading consumer electronics OEMs and ODMs from five key sites as well as through an extensive global distribution network.

Silicon Microsystems is an independent supplier of ASICs, providing a complete service from specification to the supply of production parts. Silicon Microsystems will also provide feasibility studies or consultancy on any aspect of ASIC design and supply.

The company has completed more than 100 ASICs for small and medium production quantities into telecommunications, aerospace, automotive, security and industrial electronic applications.

The ASICs supplied cover a range of circuit design skills – digital, analogue, mixed signal, non volatile, low voltage and low current in CMOS and bipolar processes. The full range of ASIC design styles are available – FPGAs, gate arrays, analogue transistor arrays, cell-based and full custom. The final choice depends on the available budget, technical requirements, and production quantities.
Silvaco Data Systems (Europe)
Silvaco Technology Centre
Compass Point
St Ives
Cambridgeshire
PE27 5JL

Contact: Tim Whiteley
Sales Manager
T: +44 (0)1480 484400
tim.whiteley@silvaco.com
www.silvaco.com

Silvaco is a leading provider of electronic design automation (EDA) software for analogue RF and mixed-signal integrated circuit design.

Founded in 1984, the company supplies proven products for semiconductor process and device simulation (TCAD), Spice parameter extraction, circuit simulation, and custom IC design/verification tools. The company delivers these best-in-class products with experienced support and engineering services to provide complete analogue/mixed signal semiconductor process, device and design automation solutions in CMOS, bipolar, SiGe, compound and organic technologies.

Worldwide customers include leading fabless semiconductor companies, integrated semiconductor manufacturers, foundries, universities and designers of analogue/mixed signal integrated circuits who require the utmost accuracy and speed.

The company is headquartered in Santa Clara, California, with 11 offices worldwide. UK operations are based in Cambridgeshire.

Sondrel
18 Theale Lakes Business Park
Moulden Way
Sulhampstead
Berkshire
RG7 4GB

Contact: Caroline Morgan
VP Sales
T: +44 (0)118 983 8550
caroline.morgan@sondrel.com
www.sondrel.com

Sondrel Ltd was established in 2002 in the UK, to provide expert IC implementation services to the electronics industry. Sondrel specialises in offering full RTL to GDSII design services, including RTL optimization, DFT, synthesis, place and route, extraction, and verification and now has offices in Europe, Israel and China. Sondrel’s engineers have completed well in excess of 100 designs with the first 45nm large SOC tapeout in 2008. Sondrel’s engineers use best-in-class EDA tools, coupled tightly within HELIUM, a highly flexible and well proven proprietary flow management software suite. The methodology is underpinned by the NEON design process, which allows flexible and yet high quality results, and ensures fast time to market. Sondrel supports the newest technologies from all the major foundries, all EDA tools, and advanced design flows (such as those required for extremely low power designs). In late 2007, the combination of HELIUM and NEON was a finalist in the IET Innovation in Engineering Awards. Sondrel engineers are regular speakers at worldwide technology events, contributing papers in fields such as advanced test methodology and power reduction techniques.

Sondrel operates throughout the world and customers include both blue chip companies and VC backed startups in countries such as USA, India, Japan, France, Germany, Sweden, Israel and the UK.
STMicroelectronics is a global leader in developing and delivering semiconductor solutions across the spectrum of microelectronics applications. An unrivalled combination of silicon and system expertise, manufacturing strength, Intellectual Property (IP) portfolio and strategic partners positions the Company at the forefront of System-on-Chip (SoC) technology and its products play a key role in enabling today’s convergence markets. The Company’s shares are traded on the New York Stock Exchange, on Euronext Paris and on the Milan Stock Exchange. In 2007, the Company’s net revenues were $10 billion. ST has a significant presence in the UK and Ireland, with six sites at Bristol, Edinburgh, Daventry, Dublin, Fleet and Marlow.

Swindon Silicon Systems Ltd (SSSL) is a wholly owned subsidiary of Tomkins PLC, a £3B UK enterprise. SSSL offers comprehensive full custom mixed signal ASIC design, test and supply. It’s primary areas of design expertise are precision analogue and RF and general mixed analogue/digital designs. SSSL designs not only from customer specifications and base principles but also adds its 30 years of design and supply experience in assisting the customer in ensuring that a quality product is delivered to the market in a short a time as possible. SSSL specialises in Automotive and Industrial applications with extensive experience in sensor interfaces. With access to the latest CMOS, BiCMOS, SiGe and bipolar processes, SSSL offers a turn key solution and delivers a 100% fully automated tested product to anywhere in the world.

The company is approved to TS 16949:2002 and ISO 9001:2000 both as a designer and volume supplier of ASICs.
Texas Instruments
800 Pavilion Drive
Northampton
NN4 7YL

Contact: Richard Williams
Design Centre Manager
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richard@ti.com

Texas Instruments, Inc. (TI) provides innovative DSP and analogue technologies to meet its customers’ real world signal processing requirements. TI is headquartered in Dallas, Texas, and has manufacturing, design or sales operations in more than 25 countries.

The UK design team has been at the forefront of integrated circuit design for more than 20 years. In that time, products have grown from 4bit microcontrollers to multi-million gate mixed signal integrated circuits (ICs). The team specialises in design at the very limits of the latest technologies. It operates where analogue and digital design techniques merge, mixing custom analogue circuit design with high-speed digital design in deep sub-micron technologies to produce multi-gigabyte data interfaces for chip-to-chip and board-to-board applications. Creating such designs requires contributions from many disciplines ranging from telecommunications, data communications and networking knowledge, through transistor level design to physical cell design, layout and placement. Integrating this technology into products requires packaging design, robust verification techniques and design for test. All of these disciplines are represented in the UK design team.

Our customers use the technology generated in the latest super computing platforms, very high speed routers for 10GbE, cellular base stations and for connecting peripherals and consumer products.

Toumaz Technology
Building 3
115 Milton Park
Abingdon
Oxfordshire
OX14 4RZ

Contact: Keith Errey
Co-founder & CEO
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keith.errey@toumaz.com

Toumaz Technology is the leading provider of ultra-low power wireless infrastructure for body monitoring solutions. Toumaz’s ultra low-power smart sensor interface and transceiver platform – Sensium(TM) – enables non-intrusive, real-time wireless monitoring of multiple vital signs for a wide range of healthcare and lifestyle management applications. Based on Toumaz’s patented ultra-low power Advanced Mixed Signal (AMx)(TM) technology, Sensium provides the enabling technology to connect the mobile individual to healthcare providers – simply, affordably and unobtrusively. For healthcare professionals, this transforms the possibilities for pro-active monitoring and improved quality of care. For patients, it delivers new opportunities for lifestyle-compatible, personalised healthcare, as well as better therapeutic outcomes.

Toumaz was founded in 2000 to exploit developments in ultra-low power silicon chip technology at Imperial College London. The company’s proprietary AMx technology resulted from development of ultra low power techniques in signal processing and wireless systems leading to chips consuming up to 100 times less power than other state-of-the art devices. The company is based in Abingdon, UK.
The Technology Partnership (TTP) is Europe’s leading independent technology development organisation with a world-class reputation in new product and business development.

TTP’s primary activity is creating new business based on advances in technology. TTP’s technology lies behind many products and processes in areas as diverse as digital printing, RFID, communications, microfabrication, lasers, and drug delivery. Specialist skills include digital communications, digital broadcasting, FPGAs, DSPs, advanced software development and optoelectronic devices. Our customers include some of the world’s largest and most successful companies as well as some of the smallest and most ambitious. They benefit from TTP’s advanced technologies provided under licence, and from TTP’s innovation and development services. TTP incubates new companies and manages a venture capital fund which invests in early stage technology start-ups.

At the heart of everything that TTP does lies innovation.

Wolfson Microelectronics is a global leader in the supply of high performance mixed-signal semiconductors to the consumer electronics market.

Renowned worldwide for high performance audio and ultra low power consumption, Wolfson delivers the audio technology at the heart of many of the world’s highest profile digital consumer goods. In the home, in the office and on the move, their innovative products can be found in a wide spectrum of end applications, including mobile phones, portable media players, portable navigation devices, digital still cameras, flat panel televisions, gaming consoles, sound systems, all-in-one printers and scanners, automotive infotainment systems and bluetooth headsets.

Wolfson is committed to the design and supply of ground-breaking products that provide high performance and high value to our global customers with innovative technology that creates whole new end user experiences, enabling their customers to better differentiate their digital consumer devices in the eyes and ears of the end user.
Wolfson’s headquarters are in Edinburgh, UK. Their customers are located worldwide with sales and engineering teams in the USA, Japan, China, Taiwan, Korea, Singapore and India. Wolfson is dedicated to supplying high quality products in a manner consistent with the environmental and ethical requirements of its customers. Wolfson is qualified to ISO 19001:2000, ISO 14001:2004 and is a Sony Green Partner.

Xilinx
Darwin House
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Edinburgh
EH26 OPY

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Senior Manager – Xilinx Scotland
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www.xilinx.com/company/contact.htm
www.xilinx.com

In 1984, Xilinx invented the field programmable gate array (FPGA) and was the first semiconductor company to establish the fabless manufacturing model, outsourcing everything but the design, marketing and support of its products. Today there are approximately 700 fabless semiconductor companies around the world. Xilinx has long maintained its industry leadership by consistently products implementing cutting edge technologies – Xilinx was the first to employ 180nm, 150nm, 130nm, 90nm, and 65nm process technology and currently delivers approximately 90 percent of all high-end 65nm FPGAs in the world.

Xilinx programmable solutions fuel product innovation in diverse markets worldwide and are designed in a wide range of applications. Xilinx customers can change or upgrade product features and functions “on the fly” – adapting to new standards and reconfiguring the hardware for a specific application. This “on the fly” technology enables faster time-to-market, product differentiation and reduced cost.

Xilinx has 3,500 employees worldwide, and the focus of the team in Edinburgh is the development and delivery of Intellectual Property (IP) cores for Xilinx FPGAs.
XMOS is a fabless semiconductor company. We provide a new type of programmable chip, Software Defined Silicon (SDS), based on an array of high-performance, event-driven processors. Designs are created in high-level languages, delivering hardware performance from a software-based design flow. XMOS devices blend a high-performance processor architecture with responsive I/O ports to provide designers custom silicon that they can use to solve a broad class of design problems.

Our development tools are available in web-hosted and desktop versions, and support a range of hardware development platforms. A rich library of demonstration and reference code is available on our community website www.xlinkers.org.

XMOS chips are reprogrammable, so designs may be changed even after products have been shipped to customers. This allows systems developers to explore new products and features without costly ASIC respins. Finally, our chips are priced to meet the lifecycle cost requirements for most applications.

Zuken specialises in printed circuit board (PCB) design tools, and is widely regarded as one of the leading vendors of powerful and sophisticated electronic design automation (EDA) tools for PCB and electronic product design. The company invests heavily in these areas and today offers the most advanced solutions for both enterprise-wide and single-seat design of electronic devices. In particular, Zuken’s outstanding expertise in the design of high-speed PCBs and systems is well established, with a leading 57% share in Japan.

Zuken provides a comprehensive portfolio for meeting all PCB design requirements, from the CR-5000 enterprise-wide environment, through to CADSTAR the Windows-based desktop design solution. Zuken’s design tools help designers meet board-related issues such as increased complexity, density and the requirement for reduced design cycles, including functionality for creating PCBs that are flexible, feature embedded components, and are plagued with electromagnetic compatibility and signal integrity issues.

The Zuken Technology Centre, based in Bristol, is home to some of the most capable designers in the global EDA field. This extensive team works closely on developing Zuken’s global tools with international design teams from countries including Germany and Japan.
Knowledge Transfer Networks are initiatives supported by the Technology Strategy Board designed to promote specific market sectors or technologies.

The Electronics Knowledge Transfer Network supports the UK’s electronic design community, driving innovation to maintain our competitive edge and our reputation for excellence in electronic design. We achieve this by bridging the gap between science and business, building a dynamic network of UK companies and universities across the full electronics value chain, from research through to design and product development, sales and operations.

We harness and promote the sector’s global potential and facilitate knowledge transfer to help companies realise best practice, while creating a community rich with potential collaborative partners.

The Electronics KTN was formed as a result of a strategic review, conducted by the Electronics Industry Growth Team (EIGT). In 2004 the EIGT published its report, ‘Electronics 2015 – making a visible difference’. The Electronics KTN aims to address the issues revealed by this report and help to align and focus all stakeholders in the industry, by concentrating on four key areas of activity:

- Building the community (establishing contact with the electronics design community)
- Making connections (connecting members of the community to each other)
- Sharing best practice
- Delivering business tools

ELECTRONICS LEADERSHIP COUNCIL (ELC)
Chairman: Harry Tee CBE
www.electronicsleadershipcouncil.org

The Electronics Leadership Council (ELC) was formed in October 2005 in response to the first recommendation of the Electronics Innovation and Growth Team’s (EIGT) report of December 2004. This report was commissioned by the Department of Trade and Industry (DTI) to examine how best to support innovation and sustain growth within the UK electronics sector. The Council consists of a Chairman (Harry Tee) and a team of senior individuals from the electronics sector, supported by a number of public sector observers. The ELC provides a strategic view of the sector to Government and provides focused and high-profile leadership for
the electronics sector as it pursues its longer-term objectives.

**UK ELECTRONICS ALLIANCE (UKEA)**
Chairman: Derek Boyd
www.ukelectronicsalliance.org.uk

The UKEA pulls together the diverse group of trade associations within the electronics sector, presenting a unique opportunity for the electronics sector to speak with a co-ordinated voice. It provides a resource for government departments and agencies to enable them to have greater confidence when forming policy and support programmes for the sector. These activities require focused co-ordination, and typically would not be delivered through a “piecemeal” approach with each association “sharing” tasks or activities.

By pulling together the various associations across the sector into a co-ordinated group, the Alliance provides:

- a resource to co-ordinate activity on behalf of the electronics industry
- an interface with government departments, specifically for the collection of evidence for consultations
- a marketing tool to raise the profile of the sector and to promote the skills agenda

In this way, the Alliance adds value for the sector and for the government and other industry stakeholders.

**TRADE ASSOCIATIONS AND PROFESSIONAL BODIES**

**ASSOCIATION OF FRANCHISED DISTRIBUTORS OF ELECTRONIC COMPONENTS (AFDEC)**
The Manor House, High Street, Buntingford, Herts SG9 9AB
T: +44 (0)1763 274748
E: enquiries@afdec.org.uk
www.afdec.org.uk

afdec was formed in 1970 and has grown to include over one hundred member companies with an almost equal mix of distributors and manufacturers (manufacturers are known as “Sustaining Members”). The distributors account for over half the distribution business in the UK.

afdec’s aim is to further the cause of franchised distribution throughout the United Kingdom and to expand the market, optimising the benefits to all concerned – manufacturers, distributors and end users.

**ASSOCIATION OF INDEPENDENT RESEARCH AND TECHNOLOGY ORGANISATIONS (AIRTO)**
AIRTO Ltd c/o CCFRA, Station Road, Chipping Campden, Gloucestershire, GL55 6LD
T: +44 (0)1386 842247
E: airto@campden.co.uk
www.airto.co.uk

The Association of Independent Research and Technology Organisations (airto) is the largest community of techno-business consultants and contract research organisations in Europe. It consists of some 35 independent companies with a combined annual turnover in excess of UK £1.5 billion. The airto member companies together employ around 20,000 scientists and engineers.
CAMBRIDGE WIRELESS
St Johns Innovation Centre, Cowley Road, Cambridge, CB4 0WS
Contact: Soraya Jones
T: +44 (0)1223 422365
E: soraya.jones@cambridgewireless.co.uk
www.cambridgewireless.co.uk

Cambridge Wireless is one of the UK’s leading wireless communities with a rapidly expanding network of companies interested in the application of wireless technologies. Member organisations are predominantly based in the UK and range in size from large multi-national companies to small start-ups.

Cambridge Wireless is a not-for-profit organisation, funded by its members to enable like-minded companies in the wireless sector to network and debate the latest developments in the industry, and find commercial opportunities for mutual collaboration.

Its activities are based around a number of Special Interest Groups (SIGs), each focussed on a specific technology and/or market area. These SIGs examine all major wireless technologies and cover: 3G/WCDMA/HSPA, Bluetooth, WiMAX, Ultra Wide Band (UWB), LTE, NFC, CDMA, WiFi, ZigBee and RFID.

INSTITUTION OF ENGINEERING AND TECHNOLOGY (IET)
Savoy Place, London, WC2R 0BL
T: +44 (0)20 7240 1871
E: postmaster@theiet.org
www.theiet.org

The Institution of Engineering and Technology is one of the world’s leading professional societies for the engineering and technology community. The IET has more than 150,000 members in 127 countries and offices in Europe, North America and Asia-Pacific. The IET provides a global knowledge network to facilitate the exchange of ideas and promote the positive role of science, engineering and technology in the world.

ELECTRONICS SCOTLAND
PO Box 13731, North Berwick, East Lothian, EH39 4AA
T: +44 (0)131 550 3774
E: info@electronics-scotland.com
www.electronics-scotland.com

Electronics Scotland is an independent trade association representing the electronics sector in Scotland, with the remit to serve its membership and represent the voice of the Electronics Community in Scotland.

Membership spans the value chain from research and design through to manufacturing and service operations, and with activities covering a broad range of market sectors.

With a board comprised of senior business leaders from the sector, which represents the interests of multi-nationals and SME’s alike, Electronics Scotland has an open membership policy to encourage like-minded individuals who are interested in developing the sector in a global market.

INTELLECT
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www.intellectuk.org

Intellect is the trade association for the UK technology industry.

Intellect provides a collective voice for its members and drives connections with government and business to create a commercial environment in which they can thrive. Intellect represents over
800 companies ranging from SMEs to multinationals. As the hub for this community, Intellect is able to draw upon a wealth of experience and expertise to ensure that our members are best placed to tackle challenges now and in the future.

**NATIONAL MICROELECTRONICS INSTITUTE (NMI)**

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E: derek.boyd@nmi.org.uk  
www.nmi.org.uk

The National Microelectronics Institute (NMI) is the trade association representing the semiconductor industry in the UK and Ireland. Its aim is to help build and support a strong semiconductor community by acting as a catalyst and facilitator for commercial and technological development.

A not-for-profit organisation funded by its members, the NMI has a membership that spans the supply chain and includes fabless semiconductor manufacturers, IDMs, foundries, design services, IP providers, EDA tool providers, research and academic institutions and the wider stakeholder community.

The NMI’s work includes: encouraging innovation, communication and collaboration through networking, brokering and sign-posting activities; representing the microelectronics sector to government, policy makers and regulators; supporting skills development, education and training; helping to improve operational efficiency through benchmarking and best practice initiatives; providing an industry specific information flow.

The NMI has offices in Bath and Edinburgh.

**SILICON SOUTH WEST**

Carpenter House Innovation Centre,  
Broad Quay, Bath, BA1 1UD  
T: +44 (0)1225 388682  
www.siliconsouthwest.com

The South West is home to the UK’s largest concentration of silicon designers, second only to the USA. It is estimated that this cluster is 50% bigger than the next largest, which is in Cambridge. Silicon design companies located here enjoy the advantage of a supportive ecosystem and, importantly, a highly skilled and experienced workforce. This skills pool owes its origins to Inmos in Bristol and GEC-Plessey Semiconductor in Swindon. These two organisations effectively trained a generation of silicon designers and while the enterprises themselves have since changed beyond recognition, the individual designers have remained at the forefront of developments, particularly in the key areas of RF, video, multicore processor and reconfigurable components as well as wireless, telecoms and networking system design.

Today, the cluster consists of around 50 companies which directly employ some 5,000 people. A feature of the cluster is its active start-up culture and these companies have raised around £250 million of venture capital in recent years. The cluster has also attracted high levels of inward investment from HP Labs, Motorola, Panasonic, ST Microelectronics and Toshiba Telecoms Research Europe all of which have substantial R&D sites in the region. Additionally other international electronics companies such as Intel, Broadcom and Infineon each have a significant presence in the region, while semiconductor design companies such as Wolfson Microelectronics and Dialog Semiconductors have set-up design centres in the South West in order to tap into the local skills.
UNIVERSITY OF YORK
The University of York is one of the top ten universities in the UK for research and teaching excellence. The School of Mathematics and Statistics is internationally renowned for its research in pure and applied mathematics, statistics, and operational research. The university is committed to promoting the development of science, technology, engineering, and mathematics (STEM) education and training.

STAFFED BY...
BERR – the Department for Business – was created to help ensure business success in an increasingly competitive world. Its role is to boost productivity and keep the UK competitive and an attractive place to do business, especially in challenging economic times, as well as to help companies succeed overseas and to bring foreign investment to the UK.

They focus on raising and sustaining the UK’s economic performance, nationally and in the regions, to create the jobs, wealth and ideas which support a healthy economy and social wellbeing. They work on this directly, or through those who have an interdependent interest in a successful business environment. These include consumers, employees, investors, small & medium-sized enterprises, large corporates and representative bodies.

They are also the ‘voice for business in Government’, listening carefully to what these different groups have to say and weigh up the evidence behind their various views. They then represent the arguments for business success effectively around the rest of Whitehall and Brussels. They work with other government departments and at Cabinet to influence Government and European policy in a way which puts the UK’s economic interests first.

The Engineering and Physical Sciences Research Council (EPSRC) funds research and postgraduate training in universities and related organisations throughout the UK. EPSRC’s training support is delivered through Doctoral Training Accounts (DTA) targeted at the academic end of the research spectrum and constitute a flexible allocation of funding awarded to universities based on grant income; Centres for Doctoral Training (CDT) consisting of 4 year allocations of funding awarded to centres to provide a doctoral training package more tailored to the specific strategic needs of thematic communities; Industrial Doctoral Centres (IDC) targeted at supporting training which has strong connectivity to industry and project studentships awarded on individual grant applications. The DTA and centre mechanisms have inherent benefits, namely that organisations can use funds allocated strategically and flexibly. Thus, under this agile funding arrangement, they can respond quickly to changes in the demand for trained individuals.

The EPSRC strongly encourages and supports knowledge transfer and exploitation of research from the UK academic sector into industry. It has a budget allocated to support a wide range of activities in this area with an
overall vision of accelerating the exploitation of research outputs and increasing business focussed skills development and postgraduate training. Activities include, among others, IDCs, Industrial CASE studentships, Knowledge Transfer Partnerships (KTP) and working in partnership with the Technology Strategy Board (TSB) and the Energy Technologies Institute ETI).

Details of all of the schemes mentioned can be found on the EPSRC website.

UK TRADE & INVESTMENT (UKTI)
www.uktradeinvest.gov.uk

UK Trade & Investment is the Government organisation that helps UK-based companies succeed in international markets and assists overseas companies to bring high quality investment to the UK’s vibrant economy.

UKTI’s mission to deliver maximum value for the UK economy and for business in an increasingly globalised and competitive world; and market the UK as a springboard for global growth.

DEPARTMENT FOR INNOVATION, UNIVERSITIES AND SKILLS (DIUS)
www.dius.gov.uk

DIUS have responsibility for policy for further and higher education, innovation, science and technology, intellectual property, and supporting evidence-based policy making across government and is therefore essential to national prosperity. They aim to create the environment in which researchers and businesses can work together to turn their ideas into high-value products and services. They support the Government’s agenda in many areas – from climate change to national security – through their work. And they support better Government by building skills for those working in Government, and supporting excellent use of science and research policy making.

TECHNOLOGY STRATEGY BOARD (TSB)
www.innovateuk.org

The Technology Strategy Board is all about driving innovation.

The Technology Strategy Board’s role is to stimulate technology-enabled innovation in the areas which offer the greatest scope for boosting UK growth and productivity. We promote, support and invest in technology research, development and commercialisation. The TSB spreads knowledge, bringing people together to solve problems or make new advances.

As well as investing in programmes and projects, much of our work is in spreading knowledge, understanding policy, spotting opportunities and bringing people together to solve problems or make new advances. To prioritise and guide our work, we have identified a number of key technology areas (KTAs) and key application areas where efforts will be focused. We also use other approaches to targeting our activities – particularly Innovation Platforms and Emerging technologies.

We invest in projects involving business and researchers working together to deliver successful new technology-based products and services. Over 700 projects have received investment since 2004, amounting to over £1 billion (about half from ourselves and half from the businesses involved). The Technology Strategy Board has a UK coordination role within EUREKA, a pan-European initiative for promoting collaborative business-led R&D. It is also responsible for the FP7 UK National Contact Point service, which provides advice to help UK businesses participate in the Seventh Framework Programme for Research and Technological
Development. This is the EU’s main instrument for funding research in Europe and will run from 2007 to 2013.

The activities of the Technology Strategy Board are jointly supported and funded by DIUS and other Government Departments, the Devolved Administrations, Regional Development Agencies and Research Councils.

**SECTOR SKILLS COUNCIL FOR SCIENCE, ENGINEERING AND MANUFACTURING TECHNOLOGIES (SEMTA)**
www.semta.org.uk

Semta is the Sector Skills Council for Science, Engineering and Manufacturing Technologies. Semta supports UK businesses in achieving global competitiveness through investment in skills.

Semta represents a number of sectors including electronics and its aim is to raise the skills levels and competitiveness of the sectors and ensure each sector has the right people with the right skills at the right time.

Semta research and represent employer skills needs to governments and work with those who plan, fund and deliver education and training to raise sector competitiveness. Every part of the skills agenda is of concern – whether it’s making sure enough suitable college courses are on offer, upskilling on the shopfloor or developing managers and leaders. They also work with businesses of all sizes – from the smallest micro-companies to the largest corporations.

Science, engineering and manufacturing are strategic UK industries. Our remit is large and important:

- 75,000 companies and a workforce of 2 million make up our ‘footprint’.
- UK engineering and science turnover was £204 billion in 2006.
- UK engineering exports amounted to £137 billion in 2006: 40% of total UK exports of goods and services.
- The UK generates 5.5% of all world research.

**NATIONAL SKILLS ACADEMY FOR MANUFACTURING (NSAM)**
www.manufacturing.nsacademy.co.uk

NSAM is an employer-led, world-class centre of excellence delivering the skills required by the manufacturing sector.

The National Skills Academy for Manufacturing represents an exciting evolution in the way the UK trains its workforce. For the first time, employers can take control of the design and delivery of learning in their industry, working in partnership with government and top training providers, from both the public and private sectors.

The National Skills Academy for Manufacturing is dedicated to working with UK manufacturers to deliver an independent national standard for manufacturing training content, advice and delivery. All training solutions developed and accredited by The Skills Academy possess the badge of quality against these national standards.

**BUSINESS LINK**
www.businesslink.gov.uk

Business Link provides the information, advice and support needed to start, maintain and grow a business in England. It provides information and advice to help customers make the most of their opportunities. Rather than providing all the advice and help itself, it fast-tracks customers to the expert help they need.

The Business Link service is a crucial part of the government’s campaign to promote enterprise and to make the UK the best place in the world to start and grow a business. Business Link is
available locally and quality assured regionally to clear national standards. Local Business Link services are primarily funded by the Regional Development Agencies, supported by a number of other government departments, agencies and local authorities.

The website contains links to equivalent services covering Northern Ireland, Scotland and Wales.

ENGLAND’S REGIONAL DEVELOPMENT AGENCIES
www.englandsrdas.com

The mission of the English Regional Development Agencies (RDAs) is to spread economic prosperity and opportunity to everyone in the nine regions of England. When establishing the RDAs, the Prime Minister said he wanted to ‘bring fresh vitality to the task of economic development and social and physical regeneration in the regions’ through a business-led approach.

The RDAs do this through providing strategic direction for economic development, ensuring the needs and opportunities for every region are taken into account. They work to make lasting improvements in the economic performance of all regions and to reduce the gap in growth rates between the regions.

SCOTTISH ENTERPRISE
www.scottish-enterprise.com

Scottish Enterprise is Scotland’s main economic, enterprise, innovation and investment agency with the goal to stimulate sustainable growth of Scotland’s economy.

WALES SUPPORT FOR BUSINESS
www.business-support-wales.gov.uk

The Welsh Assembly Government (www.wales.gov.uk) offers support to businesses through the Flexible Support for Business service.

DEPARTMENT OF ENTERPRISE TRADE AND INVESTMENT NORTHERN IRELAND (DETI)
www.detini.gov.uk

DETI is responsible for economic policy development, energy, tourism, mineral development, health and safety at work, Companies Registry, Insolvency Service, consumer affairs, and labour market and economic statistics services. It also has a role in ensuring the provision of the infrastructure for a modern economy. Economics, financial and personnel management services are provided centrally within the Department.

Invest Northern Ireland (www.investni.com) supports business growth and inward investment, promotes innovation, research and development and in-company training, encourages exports and supports local economic development and company start up.
Glossary

3G
Third Generation: refers to the current generation of mobile phones that incorporate web access, GPS and similar features.

ASIC
Application specific integrated circuit: a device designed specifically for use in a particular product or system.

ASSP
Application specific standard part: a device designed to perform a particular function but available commercially.

BiCMOS
Bipolar complementary metal oxide semiconductor: a process used to fabricate semiconductors having the best features of bipolar (speed) and CMOS (low power).

Bipolar
A process used to fabricate semiconductors particularly for analogue, mixed signal and power devices, it generally gives higher speed than CMOS, but is power hungry.

Bluetooth
An emerging platform for personal wireless communications products, developed by Ericsson in Europe, but becoming adopted globally. It provides a way to connect and exchange information between devices like PDAs, mobile phones, laptops, PCs, printers and digital cameras via low-cost, encrypted, globally available short range radio frequencies in the 2.4 GHz ISM band. Bluetooth is also known as IEEE 802.15.1.

CAD/CAE
Computer Aided Design/Engineering: generic terms for software-based design tools used by engineers on a PC or workstation to design engineering products (devices, boards or systems).

CDMA
Code-Division Multiple Access: protocols used in so-called second-generation (2G) and third-generation (3G) wireless communications.

CEM
Contract electronics manufacture: Organisations that make electronics assemblies and products to their customers’ design.
**Chipless**
A term used to describe a company that designs devices or circuit blocks within devices and licences these designs to other companies to use. A chipless company does not manufacture the devices it designs or supply them as hardware.

**CMOS**
Complementary metal oxide semiconductor: a process technology used to fabricate integrated circuits, particularly appropriate for low power devices.

**Co-design and co-verification**
The process of concurrently designing and testing the hardware and software aspects of a SoC. Can also be used in reference to the concurrent design and test of the SoC and its host system.

**Core**
An interchangeable term with IP or circuitry building block used in a SoC design.

**DSP**
Digital signal processor: a device like a microprocessor used widely in communications systems and other equipment that requires conversion of an analogue signal (audio, voice etc) to a digital format.

**EDA**
Electronic design automation: Computerised tools for designing, laying out, verifying and producing electronic systems ranging from printed circuit boards to integrated circuits. The term EDA is used as an umbrella term for computer aided engineering, computer aided design and computer aided manufacturing of electronics.

**Fabless**
A term used to describe a company that designs and sells hardware devices implemented on semiconductor chips. It achieves an advantage by outsourcing the fabrication of the devices to a specialised semiconductor manufacturer called a semiconductor foundry or fab. The chip is sold to end users by the fabless company and branded with its name.

**Femtocell**
A small cellular base station, typically designed for use in residential or small business environments. It connects to the service provider’s network via broadband (such as DSL or cable). A femtocell allows service providers to extend service coverage indoors, especially where access would otherwise be limited or unavailable.

**Foundry**
A company that specialises in manufacturing devices designed by fabless companies for resale, or designed by OEMs for immediate use in end-user products.

**FPGA**
Field-programmable gate array: a device that can be purchased ‘off the shelf’ and customised through programming to perform specific functions. Sometimes used as a prototype for an ASIC.

**GaAs**
Gallium arsenide: an alternative to silicon for fabricating very high-speed devices, not in common use due to its expense.

**GPS**
Global positioning by satellite: a technology used in many products to determine precise geographic location by accessing coordinates via satellites.
GSM
Global System for Mobile communications: the most popular standard for mobile phones in the world; a second-generation (2G) mobile phone system.

HBT
Heterojunction bipolar transistors: transistors using more than one semiconductor material eg SiGe for the base region to gain higher frequency performance.

HDL Hardware description language: a high level language used to simplify the design of very complex devices.

IC
Integrated Circuit: a generic term for a semiconductor chip containing multiple devices connected to form a circuit

IEEE
Institute of Electrical and Electronics Engineers: the world’s leading professional association for the advancement of technology, headquartered in the United States. It is also a leading developer of international standards that underpin many of today’s telecommunications, information technology and power generation products and services.

IP
Intellectual property: a term adopted by the SoC community to mean functional building blocks of circuitry or cores that can be licensed and used by IC designers. IP comes in different complexities from commodity functions through to ‘star’ IP such as microprocessor cores.

ISO
International Organization for Standardization: the world’s largest developer and publisher of International Standards, including generic management system standards for quality (ISO 9001) and environment (ISO 14001).

LTE
Long Term Evolution: a project to improve the 3G UMTS mobile phone standard to cope with future technology evolutions.

MEMS
Micro-Electro-Mechanical Systems (MEMS): the integration of mechanical elements, sensors, actuators, and electronics on a common silicon substrate through microfabrication technology.

MOSFET
Metal-oxide semiconductor field-effect transistor: alternative to bipolar transistors and much more widely used in digital circuits, though use of metal gates has largely been replaced by poly-silicon.

NFC
Near Field Communication: a short-range high frequency wireless communication technology which enables the exchange of data between devices over about a 10 centimetre (around 4 inches) distance.

OEM
Original equipment manufacturer: typically a company that uses electronic components in its end products, sometimes designing its own devices, more often buying devices or design services from third parties.
PCB
Printed circuit board: the carrier for integrated circuits. One or several boards will be used as the basis of an electronic product.

RF
Radio frequency: that part of the frequency spectrum used by a wide variety of today’s electronic products including mobile phones, cordless equipment and wireless networks.

RFID
Radio-Frequency Identification: an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags. An RFID tag is an object that can be applied to or incorporated into a product, animal, or person for the purpose of identification and tracking using radio waves.

RISC
Reduced instruction set computer: a code efficient microprocessor or microcontroller.

RTL
Register transfer level: a format for describing an electronic circuit design.

Semiconductor
A solid material with electrical conductivity between those of a conductor and an insulator. Semiconductor devices, electronic components made of semiconductor materials, are essential in modern electronics. Silicon is used to create most semiconductors but other materials can used.

SoC
System-on-Chip: a generic term used to mean a very highly integrated device containing the functionality that in earlier product generations would have taken dozens of chips on several boards.

SOI
Silicon-on-insulator: electronic devices and circuits built using silicon on an insulating layer of usually silicon oxide or sapphire to provide e.g. electrical isolation, radiation resistance.

SiGe
Silicon germanium: an alternative semiconductor material to straight silicon used in HBTs.

Synthesis
An important tool for engineers using high level design techniques to generate automatically the design detail needed to fabricate the device.

UMTS
Universal Mobile Telecommunications System: one of the third-generation (3G) mobile phone technologies.

Verilog
A hardware description language favoured by US design teams for commercial use and used widely in Europe too.

VHDL
A hardware description language adopted as a standard by the US Department of Defense and widely used throughout Europe.

VLSI
Very large scale integration: a term used to describe highly complex ICs
**WiMAX**

Worldwide Interoperability for Microwave Access (WiMAX) is a telecommunications technology for wireless transmission of data using a variety of transmission modes. The technology, based on the IEEE 802.16 standard (also called Broadband Wireless Access), provides up to 75 Mb/s symmetric broadband speed.

**ZigBee**

One type of wireless personal area network (WPAN) using small, low-power digital radios based on the IEEE 802.15.4 standard. ZigBee is targeted at radio-frequency (RF) applications that require low data rates, long battery life and secure networking enabling development of large wireless networks of sensors and controllers.

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