When product reliability really matters, you can rely on Ultra.

Contract Electronics Manufacturing Services
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Introduction

Ultra Electronics, Contract Electronics Manufacturing Services (CEMS)

Offers a full range of turnkey electronics and micro-electronics manufacturing services to customers in demanding market sectors requiring high reliability product. Part of the Aircraft & Vehicle Systems division of Ultra Electronics, the business employs skilled staff with state-of-the-art equipment and independently audited processes. Supported by a financially strong design engineering team, the business is experienced in the design and assembly of thick film hybrids, PCBs and systems, working to the highest international standards of quality and workmanship.

CEMS has secured and fulfilled many high profile contracts for the manufacture of leading edge systems in aerospace, defence, nuclear, instrumentation, marine, medical, oil and transport sectors. Supporting it’s annually-reviewed five-year strategic plan, CEMS continues to invest in new processes, equipment and facilities, differentiating itself from its competitors and extending it’s range of world-class services.

Ultra Electronics Group at a glance

Ultra Electronics is a group of specialist businesses designing, manufacturing and supporting electronic, electromechanical and software systems, sub-systems and products for defence, security, transport and energy applications worldwide. The Group has over 4,300 employees based in the UK, North America, Middle East and Australia.

Ultra Group activities are formalised by a structure of five divisions:

- Aircraft & Vehicle Systems
- Airport & Power Systems
- Information & Intelligence Systems
- Tactical Systems
- Sonar & Undersea Systems

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Overview

Established for more than 45 years, Ultra Electronics, CEMS is an electronic manufacturing services provider focused on high-reliability sectors including aerospace, defence, oil and gas, mass transportation, nuclear energy and scientific instrumentation.

CEMS has invested heavily in capital equipment, people and processes in order to be able to satisfy the needs of these demanding business sectors. Specialising in the design and fabrication of PCB assemblies, thick film hybrids and complete systems, the business offers independently audited skills in electronics, mechanical and mechatronics assembly services, holding the following accreditations.

Accreditations
- ISO9001: 2008
- AS9100
- NADCAP AC7120 Electronics
- UK Government approved
- CECC 63000
- B59450
- ISO14001

Workmanship standards
- IPC J-STD-001E Workmanship Standard
- IPC 610 Class 2 & 3 Acceptability Standard

Supply chain
Having developed an international network of audited and approved suppliers, CEMS strives to source material as cost effectively as possible. As a founding signatory to SC21, much work is being done both within the business and with suppliers to increase the effectiveness of the supply chain and improve customer satisfaction throughout the supply chain.

Innovation design engineering
The CEMS design team provides an innovative approach to product design. Incorporating skills in PCB, thick film hybrid and system design, it is strong in digital and analogue electronics, mechanical, mechatronics design as well as software authoring.
**PCB assembly**

Covering conventional through-hole and surface mount technologies on both rigid and flexible circuits, Ultra offers a wide range of externally audited assembly processes for all current component packages including beam lead diodes, 0201 and chip scale package, micro-bga.

**Microelectronics**

Ultra’s microelectronics capabilities were established in 1986. The business has developed a comprehensive range of skills and processes in the design and fabrication of hybrids, including opto-electronics, power, sensors, chip-on-board, microwave and special projects. Having designed and fabricated, for a marine application, some of the largest and most complex hybrids ever conceived, the business is also active in the aerospace, defence, space, automotive and medical industry sectors.

**System assembly**

Since the early 1960s the Weymouth facility has provided a full system assembly service for products of all shapes and sizes including hand held terminals, chassis and 19” cabinets, supplied to customers fully tested and configured.

**Mechatronics assembly**

With many years experience of building products with moving mechanical actions with integrated electrical sensing and control circuitry, CEMS has developed an impressive pedigree in the field of mechatronics assembly.

**Test & diagnostics services**

- Analogue MDA In-Cct test
- Digital In-Cct test
- Flying probe test
- Boundary scan and Corellis JTAG
- Combinational test
- ESS test and vibration test
- X-Ray inspection and Ersa scope
- Helium leak testing
- Automated optical inspection

Equipped to provide almost every test and diagnostics technique, CEMS electronic engineers have the experience and the equipment required to supply working product regardless of technology or application.

**Parylene conformal coating**

CEMS has two in-house Parylene vacuum coating installations, providing the ultimate coating technology for PCBs in critical applications such as avionics. Infinitely adjustable in thickness, the typical deposit is 20 to 25microns providing robust high-voltage insulation and isolation to safeguard boards exposed to high humidity and condensation. Parylene imposes no parasitic effects on coated boards of whatever circuit frequency, due to the formulation of the coating material and its uniform thinness across the board. CEMS also offers both dip-coating and spray-coating of Humiseal and other acrylic materials.

**Ultra Synergy design services**

Wrapped around CEMS manufacturing and in-house design services is a group of individually successful independent design companies specialising in mechanical, electronics, software and PCB design services. CEMS guides these businesses on design for cost effective manufacture, testability and identifying the optimum supply chain.
Quality and accreditations

CEMS goal is to meet customers’ expectations in terms of value, functionality and the presentation of high reliability product.

In order to deliver product on time, to the required and expected level of quality and with the planned cost-of-quality, the manufacturer has to have in place an appropriate infrastructure of policies, standards and procedures. The holding of independently audited external accreditations is a good indication of the underlying quality culture within a business whilst the gathering of customer feedback on their level of service and the action of incorporating such feedback into the business to fuel continuous improvement is essential.

**Accreditations held by CEMS**
- ISO9001
- CECC 63000
- ISO14001
- BS 9450
- AS9100
- NADCAP AC 7120 Electronics (Full service accreditation)
- UK Government approved
- SC21 founder signatory

**Workmanship and acceptability**

Electronic assembly is carried out in compliance with IPC J-STD-001E and workmanship acceptability is in accordance with IPC-A-610E and IPC WHMA-A-620A (as required by contract). CEMS has a formally IPC accredited training facility at Weymouth, where all levels of process training are carried out by IPC qualified CEMS training instructors. The culture is based on achieving right first time processing through process management and works instructions.

**Works instruction and procedures**

By using CEMS’ comprehensive on-line business management system and by adhering to its matrix of standard works instructions and procedures, the business achieves a high level of process repeatability. Applied to standard and non-standard procedures, CEMS provides consistently high quality and correctly built product to its customers. CEMS has a heritage of successfully surmounting process difficulties brought about by the rigorous demands of customers working at the front edge of their respective technologies. There is a mature culture of documented processes and procedures used to improve standard and non-standard requirements.

**Customer feedback**

CEMS operates a Relationship Management Matrix (RMM) programme of mutual evaluation of the relationship between supplier and customer, whilst also gathering feedback from customers by way of regular survey. Feedback, both negative and positive, is then turned back into the business to fuel continuous improvement.

**In summary:**

CEMS strives to meet the customer requirements in terms of value, functionality and presentation.
PCB assembly

Since 1965, the Weymouth facility has been servicing the requirements of high reliability sectors such as aerospace, defence, oil and gas, nuclear power, mass transportation and scientific instrumentation, supplying PCB assemblies made to the very highest standards of quality and reliability.

Surface Mount Technology (SMT)

Employing state-of-the-art DEK printers, Europlacer placement machines and BTU convection air reflow ovens, CEMS achieves industry standards and beyond in the accurate placement of surface mount devices. With many years experience of placing BGA, uBGA, CSP, LGA and small profile passives including 0201 and the smaller Beam Lead Diode packages, the plant offers a cost effective high yield solution to any SMT requirement.

Conventional leaded technology

Despite the rapidly increasing use of surface mount technology in new products, the use of conventional through-hole technology persists where space and weight are not critical factors. CEMS’ assembly staff have decades of combined experience of hand assembly, working to the international workmanship standard IPC J-STD-001E. With a long established infrastructure of works instructions and procedures, the Weymouth facility continues to satisfy demanding customers for whom consistent high quality is essential.

Special processes

CEMS offers a variety of less common processes, including the use of high melting point solders, special conformal coating agents, intrusive reflow and secure enclosure assembly.

RoHS regulations

CEMS continues to provide full lead based processing for exempt category product, whilst also having invested in lead-free equipment, training and process control for the manufacture of RoHS compliant product.

Conformal coating

The provision of traditional spray, dip and auto-spray applications of Humiseal and other coatings is strengthened by an in-house vacuum deposition Parylene coating process.

DFM&T Support

CEMS in Weymouth and Cambridge is pleased to provide early feedback on new PCB layouts. As time-to-market shortens and the cost of design iterations increases, it is vitally important for design engineers to achieve the required electronic functionality whilst creating a cost effective, manufacturable PCB design. CEMS seeks to provide assistance to its customers in achieving those goals.
System assembly

Manufacturing whole systems since its formation in 1965, Ultra Electronics, CEMS has substantial experience in supplying fully assembled, tested and commissioned finished products.

Enclosures
Whether the simple enclosure of a PCB assembly within two plastic mouldings or the fabrication of a complex metal card frame, cabinet or rack, CEMS has the necessary skills and equipment to provide a high level of service.

Mechatronics
CEMS has extensive experience in the manufacture of mechatronics based systems. The moving harmony of mechanical parts and electronic controls demands a co-ordinated and structured approach to product assembly. A precision mechanical assembly skill-set coupled with competence in electronic assembly and wiring is uncommon amongst general assembly staff, however, CEMS has many staff with significant experience in these areas.

Low cost sourcing
Having extensive experience of off-shore sourcing, CEMS offers the benefits of attractively priced, low cost sources for PCBs, sheet metal fabrications, CNC machined metal parts, plastic mouldings and cable assemblies. Covering all volumes, CEMS low cost sources are located in Asian and Malaysian regions.

Cable assemblies
CEMS has many years experience in the field of producing cable assemblies, from the simplest form of a few wires stripped, twisted and tinned at each end to large and complex bundles of different ID marked wires and cables laced and terminated on large military connectors. Amongst a wide range of critical applications, CEMS produces wiring harnesses for civil and military aircraft including the long established wire wrap technology.

Sub-assemblies
CEMS manufactures a wide range of sub-assemblies, incorporating PCBs, fabricated metal parts, machined metal parts and plastic mouldings. The ability to go beyond pure PCB assembly to sub-assembly and full system assembly is well established at CEMS.
Microelectronics

Formed in 1986 as a specialist thick film hybrid design and fabrication operation, our Portsmouth facility offers a wide range of proven production techniques and processes in microelectronics and allied fields, supported by an experienced and innovative design team.

Hybrids are “game changers” in terms of the functionality that can be achieved within a given space.

For our many customers, spread across the aerospace, defence, oil & gas, medical, automotive, communications and scientific instrumentation sectors of industry, it is the hybrid microcircuit’s broad based flexibility that is fundamental in their adoption of this technology. The hybrid microcircuit, whether it is a complete sub-assembly in itself, or a complementary element of a pcb based design, offers a number of key advantages in the physical realisation of a product design and can be a ‘game changer’ in terms of the functionality that can be achieved within a given space and weight.

Performance characteristics

The high component density of a hybrid and the efficient combining of analogue and digital circuitry, supports performance gain when compared to a printed wiring board due to shorter circuit paths and improved component tracking. Sustainable high temperature operation is supported through intimate thermal coupling of devices using direct bonding to high thermal conductivity substrates. Hybrids have fewer connections, fewer intermetallic interfaces – no tin-whiskers in a hybrid - a high immunity to shock and vibration and inherent robustness to ESD, all features that combine to promote high reliability. In many applications, a hybrid microcircuit can also offer significant reductions in both size and weight.

Qualification and test

A hybrid is regarded as a single component, regardless of the number of devices held within it. A single hybrid, therefore, containing any number of parts can be qualified in a single process. System test is simplified, as a hybrid device forms a pre-tested functional bloc of the overall circuit design. RoHS regulations do not apply to parts internal to a device, only to the external packaging and terminations.

Long term Nitrogen storage

Ultra Electronics offers dual redundant Nitrogen storage split between their Weymouth and Portsmouth facilities. Bare die and other electronic components stored in Nitrogen remain in pristine condition, in terms of solderability and general condition for 25+ years. This makes it practical to purchase whole wafers/minimum order quantities for gradual consumption over many years, or to build PCB assemblies for long term spares requirements during an original manufacturing contract, where the spares must be in new condition when issued.
Hybrid or monolithic IC?
The ability to intermix device types of different technologies, the multichip hybrid circuit, affords a high degree of design flexibility far beyond that which can be achieved with a custom monolithic IC. Hybrids are readily adaptable to design modifications, offer a fast turnaround for prototypes and early production, and incur lower NRE, design and tooling costs for low to medium volume manufacture.

Flexibility and cost reduction in design and manufacture
Typically, the simplified assembly afforded by a hybrid design enables cost reduction in areas such as development, rapid prototyping and NRE. The functional, active laser trimming of resistors allows circuits to be dynamically tuned as an automated production process. When bare die cannot be procured, circuit design can be apportioned between the hybrid assembly and the host pcb, accommodating any packaged die not available in its bare form.

Mitigating obsolescence management
Within a hybrid microcircuit, die are the single most critical components of the design and are the part most likely to either change in design characteristics (for example die shrink introduced at fabrication) or to be declared obsolete (often with only minimal notice). In planning a products life-cycle management, early consideration needs to be given to the all-time procurement of bare die, which can be safely stored for extended time periods. Bare die represents product in its smallest state and, often, at its lowest cost, and its assured availability enables the on-going production of ‘fresh’ parts. In support of this strategy, we offer dual site long-term nitrogen storage under temperature and humidity controlled conditions and in full compliance with the industry guidelines of IEC 62258 Part 3.

Hybrid technical information

<table>
<thead>
<tr>
<th>Substrate</th>
<th>96% Alumina</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power applications</td>
<td>Aluminium Nitride</td>
</tr>
<tr>
<td>Maximum substrate size</td>
<td>150 x 100mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conductors</th>
<th>Gold</th>
<th>4 – 7 mohms / square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wire bondable</td>
<td>Palladium – silver</td>
<td>20 – 30 mohms / square</td>
</tr>
<tr>
<td>Solderable</td>
<td>Platinum – gold</td>
<td>50 – 60 mohms / square</td>
</tr>
<tr>
<td>Solderable over gold</td>
<td>0.25mm width, 0.25mm gap</td>
<td></td>
</tr>
<tr>
<td>Standard track/gap</td>
<td>5 each side</td>
<td></td>
</tr>
<tr>
<td>Through-printed holes</td>
<td>Gold</td>
<td>&lt;20 mohms thru-hole</td>
</tr>
<tr>
<td>Double-sided printing</td>
<td>Palladium, silver</td>
<td>&lt;50 mohms thru-hole</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resistors</th>
<th>Resistance</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range &lt;1 ohm to &gt;50 mohms</td>
<td>&lt;10 ohms</td>
<td>+/- 0.5 ohms</td>
</tr>
<tr>
<td></td>
<td>10 to 100 ohms</td>
<td>+/- 0.5%</td>
</tr>
<tr>
<td></td>
<td>100 ohms to 300 kohms</td>
<td>+/- 0.3%</td>
</tr>
<tr>
<td></td>
<td>&gt;300 kohms</td>
<td>+/- 0.5%</td>
</tr>
<tr>
<td>Stability</td>
<td>100 ohms to 1 Mohm</td>
<td>+/- 0.5%</td>
</tr>
<tr>
<td>Absolute TCR standard</td>
<td>+/- 100ppm/ºC</td>
<td>+/- 0.5%</td>
</tr>
<tr>
<td>Absolute TCR special</td>
<td>+/- 50ppm/ºC</td>
<td>+/- 0.1%</td>
</tr>
<tr>
<td>Matching</td>
<td>Mid-range values</td>
<td>+/- 0.1%</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>77 mW / mm²</td>
<td></td>
</tr>
<tr>
<td>Adjust on test facility</td>
<td>Active trim of circuit function (R)</td>
<td></td>
</tr>
<tr>
<td>Close tolerance resistors</td>
<td>Thin film chip resistors</td>
<td></td>
</tr>
</tbody>
</table>
### Wire bonding

<table>
<thead>
<tr>
<th>Material</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gold</td>
<td>Thermosonic, 17µ to 50µ.</td>
</tr>
<tr>
<td>Aluminium</td>
<td>Ultrasonic, 17µ to 50µ.</td>
</tr>
<tr>
<td>Aluminium power</td>
<td>Ultrasonic, 125µ to 500µ max.</td>
</tr>
</tbody>
</table>

### Add-on components

<table>
<thead>
<tr>
<th>Component Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chip and wire</td>
<td>Transistors, FETs, Diodes.</td>
</tr>
<tr>
<td></td>
<td>Digital and analogues ICs.</td>
</tr>
<tr>
<td></td>
<td>Microprocessors and memory</td>
</tr>
<tr>
<td></td>
<td>Thin film resistors</td>
</tr>
<tr>
<td></td>
<td>Inductors, transformers, crystals.</td>
</tr>
<tr>
<td></td>
<td>Capacitors, ceramic, tantalum or MOS.</td>
</tr>
</tbody>
</table>

### Solder Surface Mount

- All the above mounted as small outline plastic packs, LCC or PLCC, D-Packs (Power Devices)
- Chip resistors
- All the above mounted as small outline plastic packs, LCC or PLCC, D-Packs (Power Devices)
- Chip resistors

### Packages

<table>
<thead>
<tr>
<th>Specification</th>
<th>Packaging Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mil Spec chip and wire</td>
<td>Seam-sealed metal packs</td>
</tr>
<tr>
<td>MIL Spec chip and wire</td>
<td>Epoxy-sealed ceramic packs</td>
</tr>
<tr>
<td>Industrial Spec chip and wire</td>
<td>Silicone bond protected, epoxy coated</td>
</tr>
<tr>
<td>Industrial and commercial</td>
<td>Epoxy coated</td>
</tr>
<tr>
<td>Surface mounted Format</td>
<td>Epoxy coated</td>
</tr>
<tr>
<td></td>
<td>Single-in-line</td>
</tr>
<tr>
<td></td>
<td>Double-sided, mixed build customised format to suit the application</td>
</tr>
</tbody>
</table>

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## Mechatronics assembly

Matching CEMS’ strength in PCB and system assembly, the business also offers a comprehensive mechatronics assembly service, bringing together electrical, electronic and mechanical assembly skill-sets in the construction of moving sub-assemblies.

### Mechanical assembly

Production staff at Ultra Electronics have considerable experience in the assembly of moving mechanical assemblies, requiring a sound knowledge of engineering tolerances and the use of mechanical tools and gauges. CEMS operates a rigorous vendor selection process, ensuring that custom made parts, whether metal or plastic, are sourced with the best choice vendor, taking account of economic, technical and strategic requirements. CEMS has audited and approved suppliers of custom metal and plastic parts in both Asia and CEE for small to large volumes.
Electrical assembly

Primarily between electronic assemblies, controls and sub-assemblies; electrical assembly commonly involves wire and cable interconnection. The consistent use of best practice is essential; achieved by way of bench-made cable forms or point-to-point wiring and often with critical routing to ensure long term co-existence with mechanically moving parts, CEMS staff work to the highest standards of workmanship and have experience in a range of wire and cable management techniques. Incorporation of stress relief in wiring, often undocumented by the client, can be critical. The years of experience, coupled with comprehensive works instructions and procedures, ensures that product assembled by CEMS has a long and reliable service life in the field. The practice at CEMS is for solder termination of wires complying with IPC/WHMA-A-620 standards to further ensure reliability of product.

Structural plastic mouldings

As the universal cost of time increases, designers look to reduce the number of piece parts that combine to form the whole product. Reducing assembly and material costs, whilst also increasing MTBF are important goals when designing new products.

By the use of sophisticated design skills and modern advanced materials the overall cost of a modern mechatronic product can be significantly reduced.

The incorporation of multiple mechanical features within a small number of precision plastic mouldings brings direct cost and reliability benefits. With the use of mechanically strong and stable plastic mouldings comes the requirement for different assembly skill-sets and CEMS can demonstrate a wealth of experience in this field experience in this field.

Test strategies

Engineering staff at CEMS are experienced in incorporating elements of electronic, electrical and mechanical engineering to define and produce the optimum test strategy for mechatronics product. It is essential that production tests exercise elements of all aspects of a mechatronic product to the extent required to provide adequate assurance of product correctness and function whilst remaining within economic limits. Designers focussed on achieving net functionality of their product are able to enlist the services of CEMS test engineering staff to resolve production test issues.
Test and diagnostics

The test philosophy
Increasingly, customers expect more than just PCB assembly from today’s contract electronics manufacturers. The benefits of outsourcing assembly work are enhanced where the test and diagnostics are also outsourced, freeing the customers’ valuable electronics engineers for other duties. Receiving fully tested assemblies increases confidence and reduces timescales in the subsequent stages of system integration, helping achieve on-time delivery to the end customer. The most appropriate level and nature of testing can be determined to balance complexity, style and product function.

The route to cost-effective testing includes the ability to provide comprehensive diagnostics such that manufacturing or component defects can be corrected in the minimum of time with the least impact on the production cycle. High speed and high coverage tests will only be rewarded if faults are diagnosed and remedied quickly. Contract electronics manufacturing service providers are increasingly being asked to meet those demands and that is why Ultra Electronics, CEMS has a broad range of test services.

The benefits of investment
Using state-of-the-art equipment, CEMS test engineers develop the optimum regime of test procedures and functions for each individual product in order to reduce debug and overall product manufacturing time. As products become increasingly complex, the test strategy must also become more comprehensive, addressing the progressively increasing levels of functionality found on today’s PCBs. By analysing trends in test results, CEMS Test Engineers are able to propose improvements to the production process and/or the product design, thereby improving production yield and potentially extending product life in the field.

The range of test and verification services
- **In-circuit test (analogue and digital)**
  MDA or more comprehensive incorporating Boundary Scan, Test Jet and Q-test vectorless tests.
- **Flying probe test**
  Fixture-less MDA test including elements of functional test
- **Automated functional test ATE**
  Interfacing to simulated and real loads.
- **Combinational test**
  Full coverage ATE testing with tailored requirements to provide a fully functional unit that might include Flash or other programming demands.
• Manual functional test
  - Simulation and real time testing
  - RF test and diagnostics
  - Pressure testing of sub-sea equipment
  - JTAG test and diagnostics
  - X-Ray inspection
  - Automatic optical inspection
  - Vibration testing
  - XRF analysis
  - ESS thermal stress testing

• Design and implementation of optimum test solutions
  CEMS can provide the conversion of a customer product performance specification into a test strategy and test solution, whether for a single PCB or multi-level assembly. This can be via a custom design or the customer’s own test method and equipment.

Supply chain

Effective management of material is key to successful Contract Electronics Manufacture. To achieve the right part in the right place, at the right time and at the right price is of inescapable importance. Ultra Electronics, CEMS have the following approach to crucial aspects of Materials Management.

Customer focussed stocking profile

Each customer requires a unique materials solution in terms of buffer stock, kanban, just in time, bulk purchase, VMI etc. Starting with a definition of the service level that each individual customer requires, CEMS maps out the optimum strategy that maintains the required level of flexibility whilst ensuring cost competitiveness, the minimum of inventory and an acceptable assurance of supply.
Commodity buying structure
Whilst strategic purchasing activity is a central business service, all project purchasing is delegated to a number of commodity buying teams, each of which includes a buyer, an inventory controller and a supply chain co-ordinator. Regular customer focus meetings and reviews ensure a close identity with the customer requirement whilst maintaining product and market expertise. Appraised of the specific requirements and arrangements defined for each customer, the commodity buyers are able to draw on centrally negotiated purchase agreements with vendors of common parts and/or to set up supply chains more specifically suited to the customer.

Obsolescence management
A significant number of the products manufactured by CEMS are required to have long service lives and consequently the need for after sales repair and upgrade services often entails the sourcing of aged parts. In order to provide customers with the maximum visibility of component obsolescence, CEMS subscribes to a worldwide component obsolescence monitoring service which alerts clients to any intelligence that might result in foreseeable unavailability of parts. That service, coupled with the requirement upon all vendors to CEMS to notify any signs of short supply, result in a reliable and comprehensive obsolescence management service.

Live vendor portal
Substantial investment in a bespoke software system has provided CEMS with a sophisticated secure vendor portal within which all performance statistics for each vendor are made available and through which all vendors are advised of any non-compliance. All resulting corrective action reports are lodged at the portal and peer-to-peer performance information is provided to allow vendors to see how they have performed in comparison with their competitors, encouraging improvements in performance.

SC21 (performance improvement)
As a founding signatory to the Aerospace 21st Century Supply Chain initiative (SC21), CEMS has adopted the SC21 framework for its own continuous improvement activity. It has also engaged with key customers on the same basis to provide company wide improvement.
Design engineering services

Ultra offers a comprehensive array of contract design and design verification services. Servicing the medical, aerospace, defence, naval, space, nuclear, instrumentation, automotive and oil industries, the design team has accumulated a broad range of expertise and experience, amplifying their contribution to engineering projects and so shortening time to market for new products.

Services:

- Electronic circuit design, to customer functional specification
- Miniatursation; converting PCB assemblies to hybrids / chip-on-board
- Pre-production design verification of build-to-print requirements
- Secure communications design
- PCB layout
- Production test box design and fabrication
- Feasibility study
- Project management
- Software authoring; both embedded firmware and application software

Design engineering scope:

- Electronics - digital / analogue / RF circuit design
- Micro-electronics - hybrid / chip-on-board / optical design
- Mechanical - mechanism / enclosure / actuator design
- Cryptographic - all types, levels and waveforms
- Optical - hybrid / lens / laser / detector design
- Rapid fabrication of prototypes of all the above
Request for quotation checklist

Where available, please provide the following information, in electronic format, so that an assembly/material costing of your product can be carried out.

- Prototype: How many and how quickly?
- Production quantity: Estimated annual volumes / batch sizes / batch frequency (ie. monthly, weekly etc) / PO commitment period (ie. three months rolling or single delivery etc)
- Bill of Materials (part description, part number and circuit reference)
- Approved vendor / manufacturer list or mandatory suppliers
- Sample PCB assembly (where available)
- CAD file(s) or Gerber R274 (X or D) (or for prototype quote, a text description of PCB including number of holes, PCB dimensions in X,Y and Z, board finish, if solder mask, minimum track gap and width if known, number of hole sizes if known)
- Component layout diagram (if Gerber files not available)
- Known testing requirements / specification (strategy, circuit diagram, test times if available)
- Packaging requirements (where different to standard bag and box production packaging)
- Procedure for unique processes (if any)
- Mechanical / GA drawings (if applicable)
- Any compliance approvals required (RoSH, BABT, BASEEFA, CE, UL and IPC 610)
- Timescales (quote deadline, vendor selection date and production delivery date(s) required)
- Where there is an established PCB panel size please indicate size and number of circuits per panel.
- Is First Article Inspection (FAI) required?
- Delivery address: UK or international?
- Please state in writing the RoHS status of your product at this time
- Whether there are any special tooling or process requirements
- Whether any tooling currently exists
- Whether any registered or supported pricing exists
- Whether there would be any free issue components
- Whether there are any device or system programming requirements
- Whether there is an environmental or stress screening requirement
- Whether there is a burn in requirement and if passive or dynamic?

Most file formats can be read including; doc, xls, eps, jpeg, igs, bmp, dxf, dwg, pdf, Gencad and R274 (X or D) Gerber files.
Contact information

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