Semiconductor Solutions

HiRel Product Short Form
March 2017

COBHAM

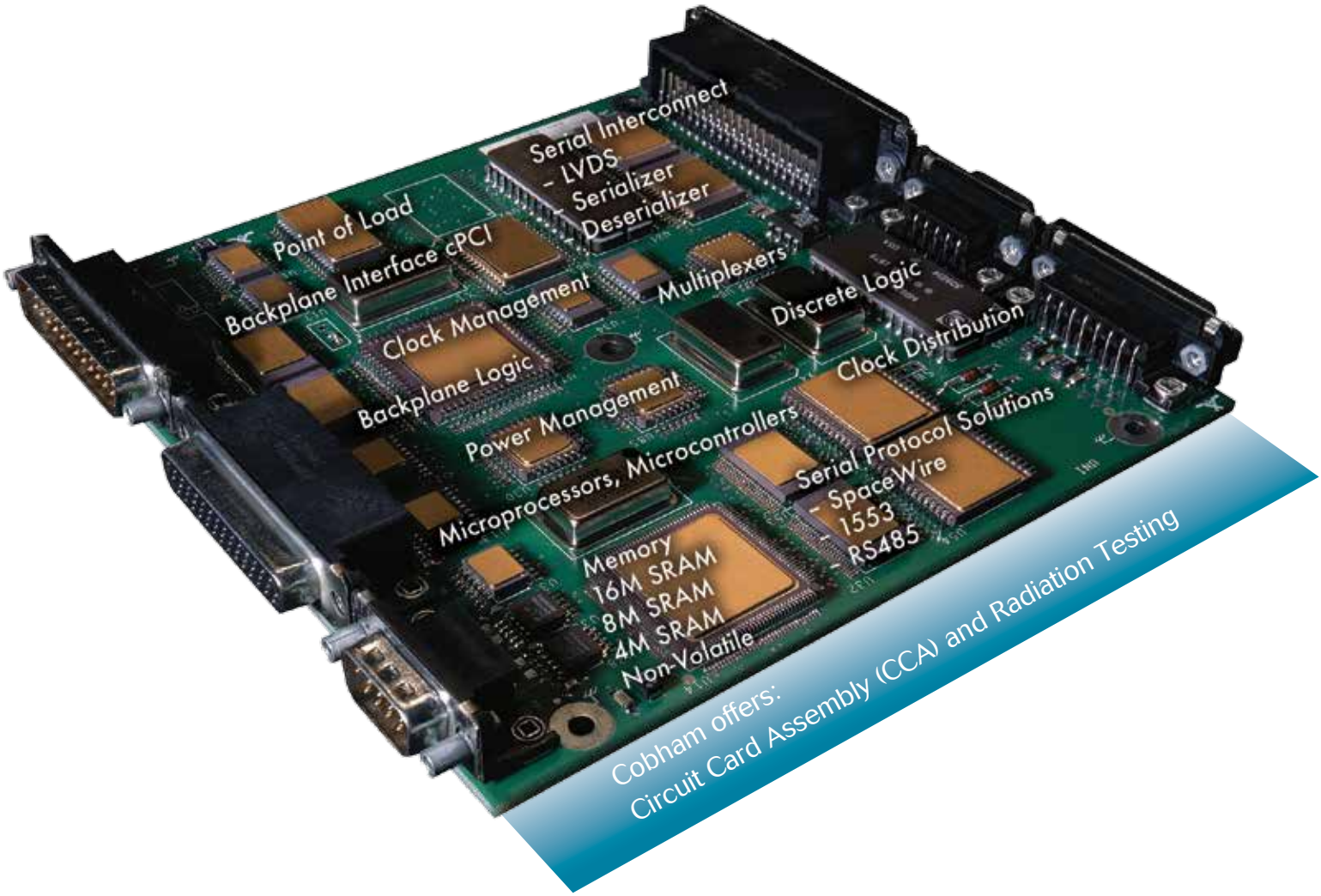
Semiconductor Solutions

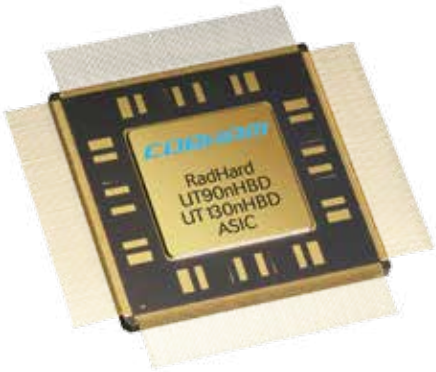
- Digital, Analog, and Power

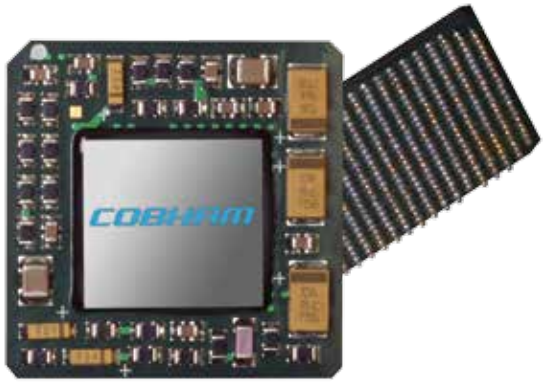
For HiRel Applications

Product Short Form

Cobham Semiconductor Solutions (formerly Aeroflex) – offers digital, analog, and power Solutions for HiRel Applications with their standard and custom ASIC integrated circuits, IP, Circuit Card Assembly, and Radiation Effects Testing.







Custom ASICs and Hybrids with Trusted Accreditation available from Cobham Semiconductor Solutions

Standard Products for HiRel Applications

LEON Microprocessors *aeroflex.com/LEON*	Description	Total Dose krad(Si)	Latch-Up Immune MeV - cm²/mg	Package	QML Q & V	SMD #
GR740 Quad-Core LEON 4FT SPARC™ V8 32-bit Microprocessor with four IEEE-754 floating point units	GR740 quad-core LEON4FT 32-bit processor, with four fully SPARC V8 compliant integer units and four high performance fully pipelined IEEE-754 floating point units capable of running at up to 250 MHz. Connected through a 128-bit wide AMBA AHB bus to 2 MiB L2-cache, the four cores provide unparalleled throughput, performance and processing resources. The main memory interface is 64-bit PC100 SDRAM with Reed-Solomon EDAC protection, with a separate interface to boot-PROM memory and I/O. The system is built around a total of five interconnected AMBA AHB buses. Communication interfaces include a SpaceWire router with eight 200 Mbit/s SpaceWire links, two 10/100/1000 Mbit Ethernet, 32-bit 33MHz PCI, MIL-STD-1553, two CAN ports, two UART, SPI and GPIO. The GR740 is part of the ESA roadmap for standard microprocessor components. Industry standard development tools are supported.	100	TBD	625 LGA, CGA	TBD	TBD
GR712RC Dual-Core LEON 3FT SPARC™ V8 32-bit Microprocessor	GR712RC is a dual-core LEON3FT 32-bit processor, with two fully SPARC V8 compliant integer units and two high performance fully pipelined IEEE-754 floating point units capable of running at up to 100 MHz, equating to 200 DMIPS and 200 MFLOPS throughput. GR712RC includes a memory controller with BCH and Reed-Solomon EDAC, 192 kByte on-chip memory with EDAC, 6 SpaceWire ports (2 with RMAP), 10/100 Ethernet, redundant Mil-Std-1553B BC/RT/BM interfaces, redundant CAN ports, CCSDS/ECSS TM/TC, SPI, I2C, 6 UARTs, JTAG debug port, etc. Industry standard development tools are supported.	100	> 118 *	240 FP	**	***
UT700 32-bit Fault-Tolerant SPARC™ V8/LEON 3FT Processor	LEON 3FT 32-bit SPARC™ Microprocessor, fully SPARC™ V8 compliant integer unit, with 16kB of both instruction and data cache, capable of running up to a system clock speed of 166MHz, with 1.2 DMIPS / MHz performance. Includes a high performance fully pipelined IEEE-754 Floating Point Unit and Multi-functional Memory Controller. Integrated peripherals include MIL-STD-1553, SPI, 4 SpaceWire ports, 32bit/33MHz PCI, 10/100 Ethernet, 2 CAN ports, and 1 debug port. Industry standard development tools are supported.	100	≤ 110 *	484 LGA, CGA	Q,V****	5962-13238
UT699E 32-bit Fault-Tolerant SPARC™ V8/LEON 3FT Processor	LEON 3FT 32-bit SPARC™ Microprocessor, fully SPARC™ V8 compliant integer unit, with 16kB of both instruction and data cache, capable of running up to a system clock speed of 100MHz, with 1.2 DMIPS / MHz performance. Includes a high performance fully pipelined IEEE-754 Floating Point Unit and Multi-functional Memory Controller. Integrated peripherals include 4 SpaceWire ports, 32bit/33MHz PCI, 10/100 Ethernet, 2 CAN ports, and 1 debug port. Industry standard development tools are supported.	100	≤ 110 *	484 LGA, CGA	Q,V****	5962-13237
UT699 32-bit Fault-Tolerant SPARC™ V8/LEON 3FT Processor	LEON 3FT 32-bit SPARC™ Microprocessor, fully SPARC™ V8 compliant integer unit, capable of running up to a system clock speed of 66MHz, equating to a 89 DMIPs throughput. Includes a high performance fully pipelined IEEE-754 Floating Point Unit and Multi-functional Memory Controller. Integrated peripherals include 4 SpaceWire ports, 32bit/33MHz PCI, 10/100 Ethernet, 2 CAN ports, and 1 debug port. Industry standard development tools are supported. Flight heritage.	100	≤ 108 *	352 FP and 484 LGA, CGA	Q,V	5962-08228
GR-CPCI-GR740 Development Board	The GR-CPCI-GR740 development board has been designed to support the development and fast prototyping of systems based on the Cobham Gaisler GR740 quad-core 32-bit fault tolerant LEON4FT SPARC V8 processor. The board supports MIL-STD-1553B, 10/100/1000 Base-T Ethernet, eight SpaceWire ports, 32-bit PCI, two CAN ports, two UARTs, Serial Peripheral Interface, on-board Flash and SDRAM. On-board USB and SpaceWire debug ports are also available.					
GR712RC-BOARD Dual-Core LEON 3FT Development Board	The GR712RC-BOARD evaluation board is capable of running at a system clock speed of 100MHz. The board is a double Eurocard form factor used in a standalone bench-top configuration. The board supports MIL-STD-1553B, 10/100 Base-T Ethernet, six SpaceWire ports capable of running at up to 200Mbits/s, two CAN ports, on-board FLASH, SRAM, and SDRAM. A USB debug port is also available on-board.					
GR-CPCI-UT699 Fault-Tolerant SPARC™ V8 Processor ASIC Evaluation Board	Development board with the UT699 LEON3FT SPARC V8 microprocessor. The board is cPCI form factor and can also be used in a standalone bench-top configuration. The board supports 32-bit/33MHz PCI, Ethernet, 4 SpaceWire ports capable of running up to 200Mbit/s, 2 CAN ports, on-board FLASH, SRAM, SDRAM, and socket for a PROM device. A USB debug port is provided.					
4250252-00x UT700 LEAP with or without MEZ 43502740-000 – MEZ (Mezzanine Card) Only	The Cobham LEAP provides a flexible development platform for customers wanting to develop software that works on the Cobham UT700 Standard Product with minimal cost investment. The Cobham LEAP has a Cobham UT700 LEON 3 FT prototype grade device with 8 Mbytes NV memory storage and 32Mbytes SDRAM (both commercial memory), along with one USB UART interface and one 10T/100 Mbit/s Ethernet port. It also includes a JTAG interface for programming and debug of UT700 LEON 3FT (requires XILINX USB Platform Cable) along with one 192-pin mezzanine card expansion connector and an on-board Programmable LEAP main clock. The optional Mezzanine (Mez) card has an SPI display, two CAN bus, two SpaceWire and a dual-redundant CHA/CHB 1553B.					
Gen 6 LEON 3FT SBC	GEN 6 LEON 3FT 3U cPCI SBC is a flight ready TRL-8 board for LEO, GEO and Planetary Missions. Flexible Architecture, enabled for use of LEON 3FTs Microprocessors, including the UT699, UT699E, UT700. It supports up to 95 Dhrystone MIPS performance with a 132MHz System Clock. On board memory supported is 64MB of SRAM Memory and 32MB of NV Memory, along with two cPCI bus I/F connectors (Hypertronics) and two SpW connectors. IPC-6012 Class 3A compliance.					

* Contact factory for SEU report.
** Class S screening and qualification.
*** Per Cobham procurement specification.
**** QML V pending.

Gen 6 LEON 3FT Single Board Computer (SBC) *cobham.com/HiRel*

GEN 6 LEON 3FT 3U cPCI SBC is a flight ready TRL-8 board for LEO, GEO and Planetary Missions. Flexible Architecture, enabled for use of LEON 3FTs Microprocessors, including the UT699, UT699E, UT700. It supports up to 95 Dhrystone MIPS performance with a 132MHz System Clock. On board memory supported is 64MB of SRAM Memory and 32MB of NV Memory, along with two cPCI bus I/F connectors (Hypertronics) and two SpW connectors. IPC-6012 Class 3A compliance.

With our Electronic Manufacturing Service (EMS) experience on the LEAP board, and various flight board builds, Cobham can serve your needs with an off-the-shelf Single Board Computer (SBC) option specifically designed for Command and Control Applications.

Gen 6 LEON 3FT Single Board Computer (SBC) *cobham.com/HiRel*	LEON	Main Clock (MHz)	AMBA Clock (MHz)	Memory Access (MHz)/ wait states (W-S)	Estimated DMIPS	SpW Clk (MHz)	Typical Power Consumption (W)	Maximum Power (W)
DS4350272-x00	UT699E	33	33	33 / 0 W-S	44.2	33	3.0	5.1
DS4350272-x01	UT699E	66	66	66 / 3 W-S	70.4	132	3.5	6.6
DS4350272-x02	UT700	33	33	33 / 0 W-S	44.2	33	3.0	5.1
DS4350272-x03	UT700	66	66	66 / 3 W-S	70.4	132	3.5	6.6
DS4350272-x04	UT700	132	66	66 / 3 W-S	94.9	132	4.2	7.3
DS4350272-x05	UT699	49.5	49.5	49.5 / 3 W-S	50.9	99	5.5	8.5

Conditions: cPCI active/Memory Access [Typ = no Access | Max = 50%
All other IP Functions Disabled via Clock gating register.

GEN VI Single Board Computer EM, FM Designations
Several models of the GEN VI SBCs can be manufactured based on usage purpose, delivery schedule, mass, and cost. The following types of assemblies are identified:
a) Flight Modules (FM): Designated by a -3xx in the part number, the FMs are used in spacecraft final production. These units meet full specifications.
b) Engineering Model (EM): Designated by a -1xx in the part number, the EMs are flight-like units used in the flight design checkout, software development and qualification, upper assembly unit checkout and initial flight unit integration (pre-environmental). EMs meet full design specifications less the Flight Parts and board level environmental tests/screening.

Standard Products for HiRel Applications

Microcontrollers/ Microprocessors**
aeroflex.com/microcontrollers

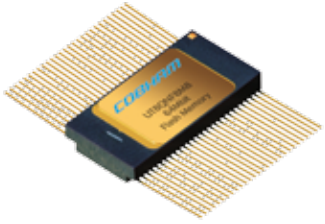
	Description	Total Dose krad(Si)	LET_{TH}(0.25) MeV - cm^2/mg	Saturated Cross Section (cm^2) per device	Latch-Up Immune MeV - cm^2/mg	Package	QML Q & V	SMD #
UT69RH051 Microcontroller***	Fully-compatible with MCS-51 ISA, 256 bytes data RAM, 32 programmable I/O ports, 7 interrupt sources; flexible clock operation 1-20 MHz.	1000	86	1.0E-4	*	40 DIP and 44 FP	Q,V	5962-95638
UT80CRH196KDS Microcontroller***	Fully-compatible with MCS-96 ISA, 1K bytes data RAM, 3 programmable I/O ports, enhanced memory interface support and SEU performance, 18 interrupt sources; flexible clock operation 1-20 MHz, FirstPass Core IP.	300	48	6.0E-7	>128	68 FP	Q,V	5962-02523
UT80CRH196KD Microcontroller**	Fully-compatible with MCS-96 ISA, 1K bytes data RAM, 3 programmable I/O ports, 18 interrupt sources; flexible clock operation 1-20 MHz, FirstPass Core IP.	100	25	3.1E-7	>128	68 FP	Q,V	5962-98583
UT69R000 Microcontroller***	Harvard and Register-oriented architecture, 8 MIPs @ 16 MHz, 15 interrupt levels, 16-bit or 32-bit register configurations, SEU < 7.1E-10 E/B-D.	1000	60	1.2E-7	*	144 CGA/PGA and 132 FP	Q,V	5962-98552
UT1750AR RISC Microprocessor***	Operates in RISC or MIL-STD-1750A mode, full 64K word address space, 16-bit and 32-bit registers.	1000	*	*	*	144 CGA/PGA and 132 FP	Q,V	5962-01502

* Contact factory for SEU report.
** Obsolete: Obsolete products have run out of supply. Cobham can no longer produce obsolete products.
*** End of Life (EOL): EOL products have reached a limited supply status and are not recommended for new designs.

Non-Volatile Memories
aeroflex.com/memories

	Configuration	Voltages	Access Time	Total Dose krad(Si)	LET_{TH}(0.25) MeV - cm^2/mg	Saturated Cross Section (cm^2) per bit	Latch-Up Immune MeV - cm^2/mg	CMOS Inputs	TTL Inputs	Package	QML Q & V	SMD #
UT8MR2M8 16M MRAM	2M x 8	3.3V	45 ns	1000	N/A*	N/A*	>100	■		40 FP	Q,V	5962-12227
UT8MR8M8 64M MRAM	8M x 8	3.3V	50 ns	1000	N/A*	N/A*	>100	■		64 FP	Q,V	5962-13207
UT8MR8M8-EVB	The UT8MR8M8-EVB allows the user access to most all the features of the 64Mb MRAM via bench top evaluation or using the UT699 LEON-3FT evaluation board.											
UT8QNF8M8 64M NOR Flash	8M x 8 and 4M x 16	3.3V	60 ns	10 and 50**	29	5.0E-13	>80	■		48 FP	Q,Q+	5962-12204
UT28F64 PROM†	8K x 8	5V	35 ns	1000	100	1.0E-11	>100		■	28 FP and 28 DIP	Q,V	5962-96873
UT28F64LV PROM†	8K x 8	3.3V	55 ns	1000	100	1.0E-11	>100		■	28 FP and 28 DIP	Q,V	5962-01516
UT28F256LVQLE	32K x 8	3.3V	65 ns	100-1000	50	2.5E-6***	>100		■	28 FP	Q,V	5962-01517
UT28F256QLE	32K x 8	5V	45 ns	100-1000	50	9.4E-7***	>100		■	28 FP	Q,V	5962-96891

† Contact factory for availability.
* Upset immune at LET of 112 MeV-cm^2/mg.
** Device 10% powered on and 90% powered off.
*** Saturated Cross Section (cm^2) per device.



Volatile Memories
aeroflex.com/memories

	Configuration	Supply Voltage I/O, Core	Access/Clock	Total Dose krad(Si)	LET_{th}(0.25) MeV - cm^2/mg	Saturated Cross Section (cm^2) per bit	Latch-Up Immune MeV - cm^2/mg	CMOS Inputs	TTL Inputs	Package	QML Q, T & V	SMD #
Monolithics												
UT8SP2M48 96M SSRAM	2M x 48	2.5V or 3.3V	7 ns	100	2.8	1.0E-8	>100	■		288 CLGA CCGA CBGA	Q,Q+	5962-15213
UT8SP2M40 80M SSRAM	2M x 40	2.5V or 3.3V	7 ns	100	2.8	1.0E-8	>100	■		288 CLGA CCGA CBGA	Q,Q+	5962-15226
UT8SP2M32 64M SSRAM	2M x 32	2.5V or 3.3V	7 ns	100	N/A*	N/A*	>100	■		288 CLGA CCGA CBGA	Q,Q+	5962-15212
UT8SF2M48 96M SSRAM	2M x 48	2.5V or 3.3V	12 ns	100	2.8	1.0E-8	>100	■		288 CLGA CCGA CBGA	Q,Q+	5962-15225
UT8SF2M40 80M SSRAM	2M x 40	2.5V or 3.3V	12 ns	100	2.8	1.0E-8	>100	■		288 CLGA CCGA CBGA	Q,Q+	5962-15227
UT8SF2M32 64M SSRAM	2M x 32	2.5V or 3.3V	12 ns	100	N/A*	N/A*	>100	■		288 CLGA CCGA CBGA	Q,Q+	5962-15214
UT8R512K8 SRAM	512K x 8	3.3V, 1.8V	15 ns	300	50	1.7E-7	>100	■		36 FP	Q,V	5962-03235
UT8ER512K32 SRAM	512K x 32	3.3V, 1.8V	20 ns	100	N/A**	N/A**	>100	■		68 FP	Q,V	5962-06261
UT8R128K32 SRAM	128K x 32	3.3V, 1.8V	15 ns	300	50	1.7E-7	>100	■		68 FP	Q,V	5962-03236
UT8Q1024K8 8M SRAM	1024K x 8	3.3V	25 ns	50	10	5.0E-9	>80		■	44 FP	Q,T	5962-01532
UT7Q512 4M SRAM †	512K x 8	5V	100 ns	30	5	1.0E-7	>80		■	32 FP	Q,T	5962-99606
UT8Q512E 4M SRAM	512K x 8	3.3V	20 ns	50	50	2.8E-8	>100	■		36 FP	Q,V	5962-99607
UT9Q512E 4M SRAM	512K x 8	5V	20 ns	50	50	2.8E-8	>100	■		36 FP	Q,V	5952-00536
UT7C138/139RH Dual-Port SRAM †	4K x 8/9	5V	45 ns	1000	85	3.8E-8	>100	■	■	68 FP and 68 DIP	Q,V	5962-96845
Multi-Chip Modules (MCMs)												
UT8SDMQ64M48 3.0Gb SDRAM	64M x 48	3.3V	7.5 ns	100	21	7.6E-10	>100	■		128 FP	Q,Q+	5962-10230
UT8SDMQ64M40 2.5Gb SDRAM	64M x 40	3.3V	7.5 ns	100	21	7.6E-10	>100	■		128 FP	Q,Q+	5962-10229
UT8ER4M32 128M SRAM	4M x 32	2.5V or 3.3V, 1.8V	25 ns	100	N/A**	N/A**	>100	■		132 FP	Q,Q+	5962-10204
UT8ER2M32 64M SRAM	2M x 32	2.5V or 3.3V, 1.8V	22 ns	100	N/A**	N/A**	>100	■		132 FP	Q,V	5962-10203
UT8ER1M32 32M SRAM	1M x 32	2.5V or 3.3V, 1.8V	20 ns	100	N/A**	N/A**	>100	■		132 FP	Q,V	5962-10202
UT8R4M39 160M SRAM	4M x 39	2.5V or 3.3V, 1.8V	25 ns	100	15	8.0E-8	>100	■		132 FP	Q,Q+	5962-10207
UT8R2M39 80M SRAM	2M x 39	2.5V or 3.3V, 1.8V	22 ns	100	15	8.0E-8	>100	■		132 FP	Q,V	5962-10206
UT8R1M39 40M SRAM	1M x 39	2.5V or 3.3V, 1.8V	20 ns	100	15	8.0E-8	>100	■		132 FP	Q,V	5962-10205
UT8CR512K32 SRAM	512K x 32	2.5V or 3.3V, 1.8V	17 ns	300	50	1.7E-7	>100	■		68 FP	Q,V	5962-04227
UT8Q512K32E 16M SRAM	512K x 32	3.3V	25 ns	50	50	2.8E-8	>100	■		68 FP	Q,V	5962-01533
UT9Q512K32E 16M SRAM	512K x 32	5V	25 ns	50	50	2.8E-8	>100	■		68 FP	Q,V	5962-01511

† Contact factory for availability.
* The SEU error rate is driven by particle flux and internal error correction is $1x10^{-15}$ errors/bit-day.
** The SEU error rate is driven by particle flux and EDAC scrub rate. At the default scrub rate the error rate is $8.1x10^{-16}$ errors/bit-day.

Standard Products for HiRel Applications

Clocks
aeroflex.com/clocks

	Frequency	# of Clocks	Crystal Capable	LVDS Ref	LVCMOS Outputs	LVDS Outputs	Total Dose krad(Si)	LET_{ONSET} MeV - cm^2/mg	Saturated Cross Section (cm^2/per bit	Latch-Up Immune MeV - cm^2/mg	V_{DD} Core	V_{DD} I/O	Package	QML Q & V	SMD #
UT7R995	6 to 200 MHz	8			■		100	109	*	≤109	3.3 V	2.25 to 3.6 V	48 CFP	Q,V	5962-05214
UT7R995C	6 to 200 MHz	8	■		■		100	109	*	≤109	3.3 V	2.25 to 3.6 V	48 CFP	Q,V	5962-05214
UT54ALVC2525		8			■		100-1000	109	*	≤111	2.0 to 3.6 V	2.0 to 3.6 V	14 CFP	Q,V	5962-06233
UT7R2XLR816	750 KHz to 200 MHz	16	■	■	■	■	100	109	*	≤109	3.3 V	2.25 to 3.6 V	168 CLGA 168 CBGA 168 CCGA	Q,Q+	5962-08243
UT7R995C-EVB	Includes user selected crystal or digital interface, flexible feedback selection, series or thevenin termination options for output clocks, and independent core and output power supplies. Includes all cabling accessories needed for quick set up.														

* The device memory storage elements do not upset.

SpaceWire
aeroflex.com/spacewire

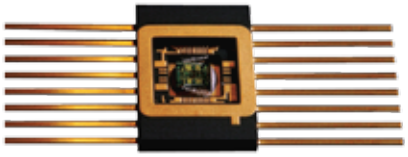
	Links	Data Rates Mbps	Voltages	Total Dose krad(Si)	LET_{ONSET} MeV - cm^2/mg	Saturated Cross Section (cm^2) per device	Latch-Up Immune MeV - cm^2/mg	Package	QML Q & V	SMD #
GR718B 18-port SpaceWire Router	18	200	3.3V, 1.8V	300	**	**	>118	256 CQFP	***	†
UT200SpWPHY01 SpaceWire Physical Layer Transceiver	1	200	3.3V	100	38	5.0E-7 2.0E-7	>109	28 FP	Q,V	5962-06232
UT200SpW4RTR SpaceWire 4-port Router	4	200	2.5V, 3.3V	100	26	*	>100	255 CLGA	Q,V	5962-08244
UT200SpW4RTR-EVB 4-port Router Evaluation Board	The UT200SpWRTR-EVB is a 4-Port SpaceWire Router evaluation board designed to allow the system designer access to all the features of the UT200spW4RTR 4-Port Router as defined in the datasheet. The evaluation board can also be plugged into the Cobham Gaisler LEON 3-FT evaluation board.									
UT100SpW02 SpaceWire Protocol Handler IP	The UT100SpW02 SpaceWire Protocol Handler IP is designed specifically for use with Aeroflex's RadHard Eclipse FPGA. Dual ECSS-E-ST-50-KC compliant links; data rates from 2 to 100 Mbps; 9 bit transmit and receive FIFO user interface.									

* Contact factory for SEU report
** The SEU error rate is below 1E-12 errors/bit-day
*** ESCC 9000 screening and lot validation.
† Per Cobham procurement specification.

LVDS
aeroflex.com/LVDS

	Description	+3.3V	+5V	Package	Total Dose krad(Si)	QML Q & V	SMD #
UT54LVDS031 Quad Driver	Operates at >155.5 Mbps (77.7 MHz) switching ranges with ultra low power CMOS technology.		■	16 FP	300-1000	Q,V	5962-95833
UT54LVDS032 Quad Receiver	Operates at >155.5 Mbps (77.7 MHz) switching ranges with ultra low power CMOS technology. Receiver fail-safe.		■	16 FP	300-1000	Q,V	5962-95834
UT54LVDSC031 Quad Driver*	Operates at >155.5 Mbps (77.7 MHz) switching ranges with ultra low power CMOS technology. Cold spare all LVDS outputs.		■	16 FP	300	Q,V	5962-95833
UT54LVDSC032 Quad Receiver*	Operates at >155.5 Mbps (77.7 MHz) switching ranges with ultra low power CMOS technology. Receiver fail-safe. Cold spare all LVDS inputs.		■	16 FP	300	Q,V	5962-95834
UT54LVDS031LV/E Quad Driver	Operates at >400.0 Mbps (200 MHz) switching ranges with ultra low power CMOS technology. Cold spare all pins.	■		16 FP	300-1000	Q,V	5962-98651
UT54LVDS032LV/E Quad Receiver	Operates at >400.0 Mbps (200 MHz) switching ranges with ultra low power CMOS technology. Receiver fail-safe. Cold spare all pins.	■		16 FP	300-1000	Q,V	5962-98652
UT54LVDS217 Serializer	15 to 75 MHz shift clock support, power-down mode <60 µA (max), narrow bus reduces cable size and cost, cold spare all pins.	■		48 FP	300-1000	Q,V	5962-01534
UT54LVDS218 Deserializer	15 to 75 MHz shift clock support, power-down mode <60 µA (max), narrow bus reduces cable size and cost, cold spare all pins.	■		48 FP	300-1000	Q,V	5962-01535
UT54LVDM328 Octal 400 Mbps Bus LVDS Repeater	Operates at >400.0 Mbps (200 MHz) with 10mA LVDS output drivers. Cold spare all pins.	■		48 FP	300-1000	Q,V	5962-01536
UT54LVDM228 Quad 2x2 400 Mbps Crosspoint Switch	Operates at >400.0 Mbps (200 MHz) with 10mA LVDS output drivers. Cold spare all pins. Configurable as quad 2:1 mux, 1:2 demux, repeater or 1:2 signal splitter.	■		64 FP	300-1000	Q,V	5962-01537
UT54LVDS032LVT Low Voltage Quad Receiver with Integrated Termination Resistor	Operates at >400.0 Mbps (200 MHz) switching ranges with ultra low power CMOS technology, nominal 105 ohms integrated termination resistor. Cold spare all pins.	■		16 FP	300-1000	Q,V	5962-04201
UT54LVDM031LV Low Voltage Bus LVDS Quad Driver	Operates at >400.0 Mbps (200 MHz) with 10mA LVDS output drivers. Cold spare all pins.	■		16 FP	300	Q,V	5962-06201
UT54LVDM055LV Dual Driver and Receiver	Operates at >400.0 Mbps (200 MHz) with 10mA LVDS output drivers. Receiver fail-safe. Cold spare all pins.	■		18 FP	300	Q,V	5962-06202

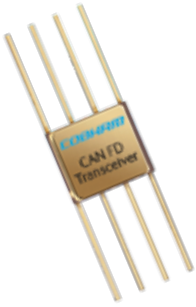
* Not recommended for new designs.



Controller Area Network (CAN) Flexible Data Rate (FD) Transceivers*
aeroflex.com/hirel

	Description	Baud Rate	Total Dose krad(Si)	Latch-Up Immune MeV - cm²/mg	Package	QML Q & V	SMD #
UT64CAN3330	Controller Area Network (CAN) Transciever - Sleep Mode	10 kbps to 8 Mbps	100	117	8 FP	Q, V	5962-15232
UT64CAN3331	Controller Area Network (CAN) Transciever - Diagnostic Loopback Mode	10 kbps to 8 Mbps	100	117	8 FP	Q, V	5962-15232
UT64CAN3332	Controller Area Network (CAN) Transciever - Auto-baud Loopback Mode	10 kbps to 8 Mbps	100	117	8 FP	Q, V	5962-15232

* Evaluation board available. Contact factory.



Standard Products for HiRel Applications

MIL-STD-1553 Databus

aeroflex.com/databus
aeroflex.com/avionics

	MIL-STD-1553B	MIL-STD-1773	Multi-Protocol	±15V*	+12V*	+5V	Int. Transceiver	Bus Controller	Remote Terminal	Monitor	Dual Redundant	8-bit I/O	16-bit I/O	Internal RAM	Flatpack	Pin Grid Array	LCC	Application Options	QML Q & V	SMD #
UT69151 SµMMIT™ E	■	■				■		■	■	■	■		■		132	84		HR1, AV	Q,V	5962-92118
UT69151 SµMMIT™ LXE	■			■	■		■	■	■	■	■		■		100	96		HR2, AV	Q,V	5962-94663
UT69151 SµMMIT™ DXE	■					■	■	■	■	■	■		■		100	96		HR1, AV	Q,V	5962-94663
UT69151 SµMMIT™ XTE	■			■	■	■	■	■	■	■	■	■	■	■	140	139		AV	Q	5962-94758
UT69151 SµMMIT™ RTE	■					■	■		■		■	■	■	■	132, 140	139		AV	Q	5962-98587
UT1553B BCRT**	■	■				■		■	■		■		■		84	84		AV	Q	5962-88628
UT1553B BCRTM**	■	■				■		■	■	■	■		■		84	84		AV	Q	5962-89577
UT1553 BCRTMP**	■	■	■			■		■	■		■		■		132	144		AV	Q	5962-89501
UT1553B RTI**	■	■				■			■		■		■		84			AV		M38510/55501
UT1553 RTMP**	■	■	■			■			■		■		■		84	84	84	AV	Q	5962-88645
UT1553B RTR**	■	■				■			■		■		■	■		68		AV	Q	5962-89576
UT1760A RTS**	■	■				■			■		■		■	■		68		AV	Q	5962-89575

* Obsolete: Obsolete products have run out of supply. Cobham can no longer produce obsolete products.
** End of Life (EOL): EOL products have reached a limited supply status and are not recommended for new designs.

MIL-STD-1553/ RS485 Transceivers

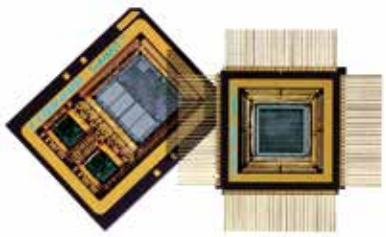
aeroflex.com/transceivers
aeroflex.com/avionics

	RS-485	MIL-STD-1553B	±15V*	+5V	+3V	Dual Redundant	Total Dose krad(Si)	Package	Application Options	QML Q & V	SMD #
UT63M147 Bus Transceiver		■		■		■	100	24 FP/ 36 DIP	HR3	Q,V	5962-93226
UT63M125C Bus Transceiver*		■ 1553A	■	■		■	100	24 DIP/ 36 FP/ 36 DIP	AV	Q,V	5962-88644
UT63M143 Bus Transceiver		■			■	■	100	24 FP/ 36 DIP	HR3	Q,V	5962-07242
DRS4485 RS485/422 Dual Transceiver	■			■		■	100	18 FP		K	5962R09226

* End of Life (EOL): EOL products hve reached a limited supply status and are not recommended for new designs.

Application Options

	Total Dose krad(Si)	LET_{TH}(0.25) MeV - cm^2/mg	Saturated Cross Section (cm^2) per bit	Latch-Up Immune MeV - cm^2/mg
HR1	300*	42	1.5E-4	>128
HR2	100*	42	1.5E-4	>128
HR3	1000*	**	**	>111
AV	N/A	N/A	N/A	N/A

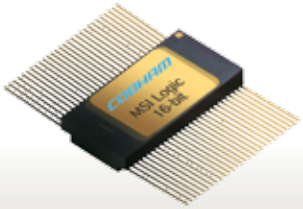


* Maximum tolerance for product. Reduced tolerance products may be available.
** Device has no memory storage elements to upset.

RadTol Eclipse FPGAs
aeroflex.com/FPGA

	SRAM bits	Logic Cells	Total Dose krad(Si)	LET_{th}(0.25) MeV - cm^2/mg	Saturated Cross Section (cm^2) per bit	Latch-Up Immune MeV - cm^2/mg	I/O	Package	QML Q & V	SMD #
UT6325	55K	1536	300	>42 logic cell flip flops >64 embedded SRAM	5.0E-7 2.0E-7	≤120	99 I/O, 25 input 163 I/O, 25 input 316 I/O, 25 input	208 CQFP 288 CQFP 484 CCGA	Q, V	5962-04229
UT6325 Commercial*	55K	1536	300	>42 logic cell flip flops >64 embedded SRAM	5.0E-7 2.0E-7	≤120	99 I/O, 25 input 163 I/O, 25 input 310 I/O, 25 input	208 PQFP 280 PBGA 484 PBGA	N/A	N/A
UT100SpW02 SpaceWire IP Protocol Handler	The UT100SpW02 SpaceWire Protocol Handler IP is designed specifically for use with Cobham's Eclipse FPGA. Dual ECSS-E-50-12A compliant links; data rates from 2 to 100 Mbits/sec; 9 bit transmit and receive FIFO user interface.									

* Contact factory for more information.



MSI Logic (16-bit wide)
aeroflex.com/16BitLogic

	Description	Package	Total Dose krad(Si)	QML Q & V	SMD #
UT54ACTQ16244 Buffer/Line Driver	16-bit wide Buffer/Line Driver, 16 non-inverting buffers with three-state outputs. 24mA slew rate limited buffers; low simultaneously switching noise.	48 FP	100	Q,V	5962-06243
UT54ACTQ16245 Transceiver	16-bit Bidirectional Transcever with TTL Inputs, and Three-State Outputs. 24mA slew rate limited buffers; low simultaneously switching noise.	48 FP	100	Q,V	5962-06244
UT54ACS164245S/ UT54ACS164245SE Transceiver	16-bit Wide MultiPurpose Transceiver with Schmitt Trigger Input, Cold Spare I/O, Mixed Supply Operation (5V to 3V Translation), 3V/3V and 5V/5V.	48 FP	100	Q,V	5962-98580
UT54ACS164245SEI Transceiver	16-bit Bidirectional MultiPurpose Transceiver with Schmitt Trigger Input, Cold and Warm Spare I/O, Mixed Supply Operation (5V to 3V translation), 3V/3V and 5V/5V.	48 FP	100	Q,V	5962-98580
UT54ACS162245SLV Transceiver	16-bit Wide MultiPurpose Transceiver with Schmitt Trigger Input, Cold and Warm Spare I/O, Mixed Supply Operation (3.3V to 2.5V Translation), 3.3V/2.5V and 2.5V/3.3V.	48 FP	100	Q,V	5962-02543
UT54ACTQ16374 D Flip-Flop TTL Inputs	16-bit wide D Flip-Flop TTL Inputs with Three-State Outputs. 24mA slew rate limited buffers; low simultaneously switching noise and 100MHz maximum clock.	48 FP	100	Q,V	5962-06245
UT54ACS164646S Transceiver	16-bit Wide MultiPurpose Registered Transceiver with Schmitt Trigger Input, Cold and Warm Spare I/O, Mixed Supply Operation (5V to 3V Translation), 3V/3V and 5V/5V.	56 FP	100	Q,V	5962-06234

MSI ManyGate Devices
aeroflex.com/hirel

	Type Description	+3.3/+5.0 V	Package	Total Dose krad(Si)	Input Buffer	Output Buffer	QML Q & V	SMD #
UT54ACS2S99S	Pin-configurable Logic Solution. Dual, Sequential, Configurable Logic Gate w/ Schmitt Trigger Inputs and Tri-state outputs. Also supports configuration as a D-flip flop (1R99S) or transparent latch (1L99S).	■	20 FP	1000	Schmitt CMOS	12mA	Q,V	5962-15239
UT54ACS3G99S	Pin-configurable Logic Solution. Triple, Combinatorial, Configurable Logic Gate w/ Schmitt Trigger Inputs and Tri-state outputs.	■	20 FP	1000	Schmitt CMOS	12mA	Q,V	5962-15238

MSI Logic

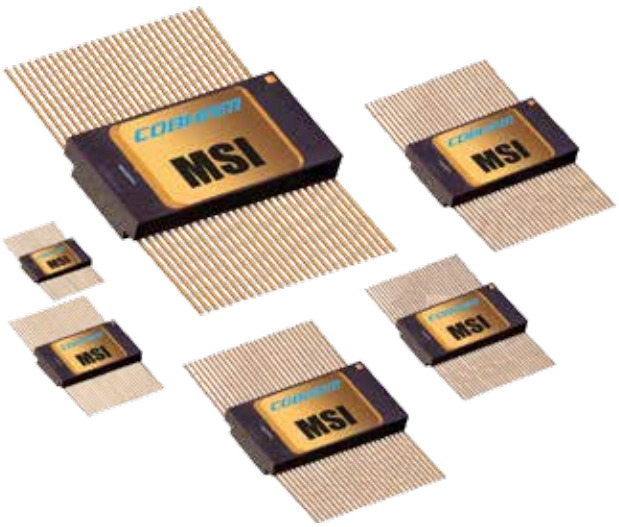
Standard Microcircuit Drawing (SMD) to Aeroflex Colorado Springs Part Number *www.aeroflex.com/Logic*

SMD #	Cobham Part #	Description
5962-96512 5962-96512 5962-96513 5962-96513	UT54ACS00 ★UT54ACS00E UT54ACTS00 ★UT54ACTS00E	Quadruple 2-Input NAND Gates
5962-96514 5962-96514 5962-96515 5962-96515	UT54ACS02 ★UT54ACS02E UT54ACTS02 ★UT54ACTS02E	Quadruple 2-Input NOR Gates
5962-96516 5962-96516 5962-96517 5962-96517	UT54ACS04 ★UT54ACS04E † UT54ACTS04 ★UT54ACTS04E†	Hex Inverters
5962-96518 5962-06518 5962-06519 5962-96519	UT54ACS08 ★UT54ACS08E UT54ACTS08 ★UT54ACTS08E	Quadruple 2-Input AND Gates
5962-96520 5962-96521	UT54ACS10 UT54ACTS10	Triple 3-Input NAND Gates
5962-96522 5962-96523	UT54ACS11 UT54ACTS11	Triple 3-Input AND Gates
5962-96524 5962-96524 5962-96525 5962-96525	UT54ACS14 ★UT54ACS14E UT54ACTS14 ★UT54ACTS14E	Hex Inverter Schmitt Trigger
5962-96526 5962-96527 5962-96527	UT54ACS20 UT54ACTS20 ★UT54ACTS20E†	Dual 4-Input NAND Gates
5962-96528 5962-96529	UT54ACS27 UT54ACTS27	Triple 3-Input NOR Gates
5962-96530 5962-96531	UT54ACS34 UT54ACTS34	Hex Noninverting Buffers
5962-96532 5962-96533	UT54ACS54 UT54ACTS54	4-Wide AND-OR-INVERT Gates
5962-96534 5962-96534 5962-96535 5962-90535	UT54ACS74 ★UT54ACS74E† UT54ACTS74 ★UT54ACTS74E	Dual D Flip-Flops with Clear & Preset
5962-96536 5962-96537	UT54ACS85 UT54ACTS85	4-Bit Comparators
5962-96538 5962-96538 5962-96539	UT54ACS86 ★UT54ACS86E UT54ACTS86	Quadruple 2-Input Exclusive OR Gates

SMD #	Cobham Part #	Description
5962-96540 5962-96540 5962-96541	UT54ACS109 ★UT54ACS109E UT54ACTS109	Dual J-K Flip-Flops
5962-96542 5962-96542 5962-96543 5962-96543	UT54ACS132 ★UT54ACS132E UT54ACTS132 ★UT54ACTS132E†	Quadruple 2-Input NAND Schmitt Triggers
5962-96544 5962-96544 5962-96545	UT54ACS138 ★UT54ACS138E UT54ACTS138	3-Line to 8-Line Decoders/Demultiplexers
5962-96546 5962-96547	UT54ACS139 UT54ACTS139	Dual 2-Line to 4-Line Decoders/Demultiplexers
5962-96548 5962-96549	UT54ACS151 UT54ACTS151	1 of 8 Data Selectors/Multiplexers
5962-96550 5962-96551 5962-96551	UT54ACS153 UT54ACTS153 ★UT54ACTS153E	Dual 4-Input Multiplexer
5962-96552 5962-96553 5962-96553	UT54ACS157 UT54ACTS157 ★UT54ACTS157E	Quadruple 2 to 1 Multiplexers
5962-96554 5962-96555	UT54ACS163 UT54ACTS163	4-Bit Synchronous Counters
5962-96556 5962-96556 5962-96557 5962-96557	UT54ACS164 ★UT54ACS164E UT54ACTS164 ★UT54ACTS164E	8-Bit Shift Registers
5962-96558 5962-96558 5962-96559	UT54ACS165 ★UT54ACS165E UT54ACTS165	8-Bit Parallel Shift Registers
5962-96560 5962-96561	UT54ACS169 UT54ACTS169	4-Bit Up-Down Binary Counters
5962-96562 5962-96563	UT54ACS190 UT54ACTS190	Synchronous 4-Bit Up-Down BCD Counters
5962-96564 5962-96564 5962-96565	UT54ACS191 ★UT54ACS191E UT54ACTS191	Synchronous 4-Bit Up-Down Binary Counters
5962-96566 5962-96566 5962-96567 5962-96567	UT54ACS193 ★UT54ACS193E UT54ACTS193 ★UT54ACTS193E†	Synchronous 4-Bit Up-Down Dual Clock

† SMD update pending. Please call 800-645-8862 for more information.

★ 3.0V to 5.0V Supply Range



The MSI Logic Family is compatible to ACS and ACTS logic and has high speed, lower power consumption, 3- and 5-volt supply, and SEU threshold 80 MeV - cm^2/mg. We offer 14, 16, and 20 flatpack and 14, 16, and 20 DIP.

MSI Logic

Standard Microcircuit Drawing (SMD) to Aeroflex Colorado Springs Part Number (Cont.)

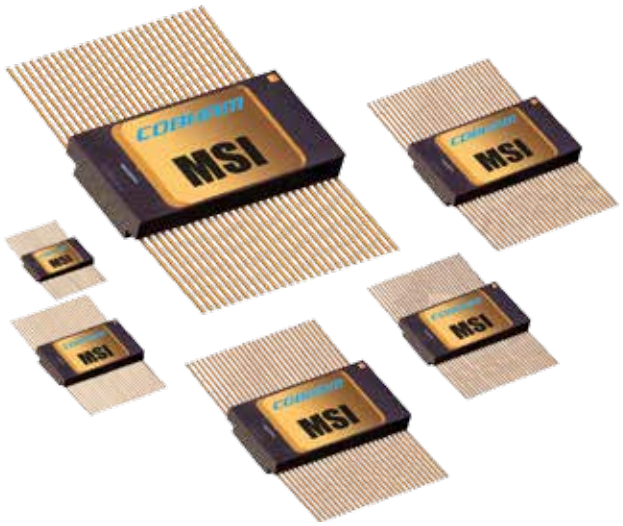
SMD #	Cobham Part #	Description
5962-96753	UT54ACTS220	Clock & Wait-State Generation Circuit
5962-96568 5962-96569	UT54ACS240 UT54ACTS240	Octal Buffers w/Inverted Three-State Outputs
5962-96570 5962-96570 5962-96571 5962-96571	UT54ACS244 ★UT54ACS244E UT54ACTS244 ★UT54ACTS244E†	Octal Buffers & Line Drivers, Three-State Outputs
5962-96572 5962-96572	UT54ACS245S ★UT54ACS245SE†	Schmitt Trigger Octal Bus Transceivers w/Three-State Outputs
5962-96572 5962-96573 5962-96573	UT54ACS245 UT54ACTS245 ★UT54ACTS245E	Octal Bus Transceivers with Three-State Outputs
5962-96574 5962-96575	UT54ACS253 UT54ACTS253	Dual 4-Input Multiplexers
5962-96576 5962-96577	UT54ACS264 UT54ACTS264	Look-Ahead Carry Generators for Counters
5962-96578 5962-96578 5962-96579	UT54ACS273 ★UT54ACS273E UT54ACTS273	Octal D Flip-Flops with Clear
5962-96580 5962-96581	UT54ACS279 UT54ACTS279	Quadruple S-R Latches
5962-96582 5962-96583	UT54ACS280 UT54ACTS280	9-Bit Parity Generators/Checkers
5962-96584 5962-96584 5962-96585	UT54ACS283 ★UT54ACS283E UT54ACTS283	4-Bit Binary Full Adders
5962-06238	★UT54ACS299E	Universal Shift/Storage Register
5962-96586 5962-96587	UT54ACS365 UT54ACTS365	Hex Buffer/Line Driver with Three-State Outputs
5962-96588 5962-96589	UT54ACS373 UT54ACTS373	Octal Transparent Latches with Three-State Outputs
5962-96590 5962-96591	UT54ACS374 UT54ACTS374	Octal D Flip-Flops with Three-State Outputs
5962-96592 5962-96593	UT54ACS540 UT54ACTS540	Octal Driver, with Inverted Three-State Output

SMD #	Cobham Part #	Description
5962-96594 5962-96595 5962-96595	UT54ACS541 UT54ACTS541 ★UT54ACTS541E	Octal Driver, with Three-State Output
5962-06239	UT54ACS630	EDAC
5962-06240	UT54ACTS899	Latchable Transceiver with Parity Generator/Checker
5962-96596 5962-96597	UT54ACS4002 UT54ACTS4002	Dual 4-Input NOR Gate
5962-94754	★★UT22VP10	RadPal One Time Programmable Logic Array

† SMD update pending. Please call 800-645-8862 for more information.

★ 3.0V to 5.0V Supply Range
★★ End of Life (EOL): EOL products have reached a limited supply status and are not recommended for new designs.

The MSI Logic Family is compatible to ACS and ACTS logic and has high speed, lower power consumption, 3- and 5-volt supply, and SEU threshold 80 MeV - cm^2/mg. We offer 14, 16, and 20 flatpack and 14, 16, and 20 DIP.



Standard Products for HiRel Applications

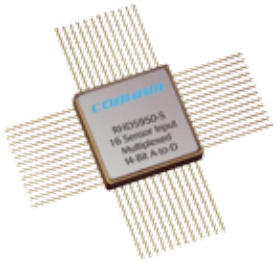
Analog-to-Digital Converters
aeroflex.com/AtoD

	Description	Total Dose krad(Si)	Latch-Up Immune MeV - cm²/mg	Voltage (V)	Package	Class S	SCD
RAD1419A	800 kSPS, 14-bit sampling analog-to-digital converter. Also available in 825 kSPS.	100	60	±5V	28 FP	S	■

Analog-to-Digital Converters
aeroflex.com/AtoD

	Description	Package	SMD #
RHD5950†*	The RHD5950 takes 16 analog sensor signals and using 4 address inputs and an enable input, selects one of the 16 analog inputs and converts the signal to 14 digital output bits. The 14-bit digital output has a tri-state control allowing the connection of multiple RHD5950s. This provides a very high level of telemetry integration interfacing many sensor voltage readings to the digital processor data bus.	48 CQFP	5962R1220301KXC
RHD5958†*	The RHD5958 takes 8 analog sensor signals and using 3 address inputs and an enable input, selects one of the 8 analog inputs and converts the signal to 14 digital output bits. The 14-bit digital output has a tri-state control allowing the connection of multiple RHD5958s. This provides a very high level of telemetry integration interfacing many sensor voltage readings to the digital processor data bus.	40 CQFP	5962R1221101KXC

* Multiplexed, 5V or 3.3V I/O
† Contact factory for more information.



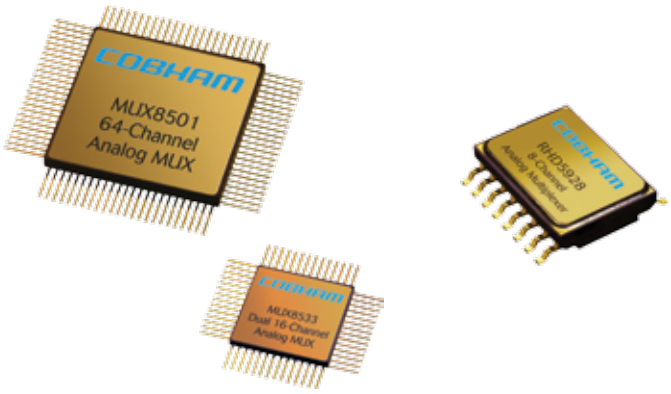
Digital-to-Analog Converters
aeroflex.com/AtoD

	Description	Package	SMD #
RHD5930	Digital to Analog Converter, 11-bit, ladder output	16 SOIC	5962H1120801KXC
RHD5931	Digital to Analog Converter, 11-bit, buffered output	16 SOIC	5962H1120802KXC
RHD5932	Digital to Analog Converter, 14-bit, buffered output	20 SOIC	5962H1320101KXC

Multiplexers, Analog
aeroflex.com/Mux

	Total Channels	Common	Kelvin Measurement	Transorb Input ESD Protection	# Address Busses	# Enable Lines	V+	V-	V_{DIG}	$R_{DS(on)}$ (Ω Typical)	Access Time (ns Typical)	Input Range Min(V)	Input Range Max(V)	Total Dose krad(Si)	SEL: LET_{TH} MeV - cm^2/mg	Package	SMD #
RHD5928 *	8	8			1	1	+5V	GND	N/A	<750	<150	0V	+5V	1000	100	16 SOIC	5962H1220801KXC
MUX8520	16	16		■	1	1	+15V	-15V	+5V	<2000	<1500	-5V	+15V	300	120	56 CQFP	5962F0922901KXC
MUX8530	16	16		■	1	1	+15V	-15V	+5V	<1200	<600	-5V	+15V	150	90	56 CQFP	5962-0923001KXC
MUX8560 * **	16	16			1	1	+5V	GND	+5V	<2000	<500			300	90	56 CQFP	5962-1021001KXC
RHD5920 *	16	16			1	1	+5V	GND	N/A	<750	<150	0V	+5V	1000	100	24 SOIC	5962H1024301KXC
RHD5921 * Buffered	16	16			1	1	+5V	GND	N/A	N/A	<2000	0V	+5V	1000	100	24 SOIC	5962H1024302KXC
MUX8521	16		16	■	1	1	+15V	-15V	+5V	<2000	<1500	-5V	+15V	300	120	56 CQFP	5962F0922902KXC
MUX8531	16		16	■	1	1	+15V	-15V	+5V	<1200	<600	-5V	+15V	150	90	56 CQFP	5962-0923002KXC
MUX8561 * **	16		16		1	1	+5V	GND	+5V	<2000	<500			300	90	56 CQFP	5962-1021002KXC
MUX8522	32	32			2	2	+15V	-15V	+5V	<2000	<1500	-5V	+15V	300	120	56 CQFP	5962F0923101KXC
MUX8523	32	32		■	2	2	+15V	-15V	+5V	<2000	<1500	-5V	+15V	300	120	56 CQFP	5962F0923102KXC
MUX8532	32	32			2	2	+15V	-15V	+5V	<1200	<600	-5V	+15V	150	90	56 CQFP	5962-0923201KXC
MUX8533	32	32		■	2	2	+15V	-15V	+5V	<1200	<600	-5V	+15V	150	90	56 CQFP	5962-0923202KXC
MUX8562 * **	32	32			2	2	+5V	GND	+5V	<2000	<500			300	90	56 CQFP	5962-1020901KXC
RHD8544 *	32	32			2	2	+5V	GND	N/A	<750	<150	0V	+5V	1000	100	56 CQFP	5962H1220901KXC
RHD8545 Buffered*	32	32			2	2	+5V	GND	N/A	N/A	<2000	0V	+5V	1000	100	56 CQFP	5962H1220902KXC
MUX8503	48	48		■	1	3	+15V	-15V	+5V	<2000	<1500	-5V	+15V	300	120	96 CQFP	5962F0323403KXC
MUX8513	48	48		■	1	3	+15V	-15V	+5V	<1200	<600	-5V	+15V	150	90	96 CQFP	5962-0920302KXC
RHD8543 *	48	48			1	3	+5V	GND	N/A	<750	<150	0V	+5V	1000	100	96 CQFP	5962H1221002KXC
MUX8502	48		48	■	1	3	+15V	-15V	+5V	<2000	<1500	-5V	+15V	300	120	96 CQFP	5962F0323401KXC
MUX8506	48		48		1	3	+15V	-15V	+5V	<2000	<1500	-5V	+15V	300	120	96 CQFP	5962F0323402KXC
RHD8542 *	48		48		1	3	+5V	GND	N/A	<750	<150	0V	+5V	1000	100	96 CQFP	5962H1221001KXC
MUX8512	48		48	■	1	3	+15V	-15V	+5V	<1200	<600	-5V	+15V	150	90	96 CQFP	5962-0920301KXC
MUX8500	64	32	32	■	2	4	+15V	-15V	+5V	<2000	<1500	-5V	+15V	300	120	96 CQFP	5962F0050201KXC
MUX8507	64	32	32		2	4	+15V	-15V	+5V	<2000	<1500	-5V	+15V	300	120	96 CQFP	5962F1021201KXC
MUX8510	64	32	32	■	2	4	+15V	-15V	+5V	<1200	<600	-5V	+15V	150	90	96 CQFP	5962-0920201KXC
RHD8540 *	64	32	32		2	4	+5V	GND	N/A	<750	<150	0V	+5V	1000	100	96 CQFP	5962H1124001KXC
MUX8501	64	64		■	2	4	+15V	-15V	+5V	<2000	<1500	-5V	+15V	300	120	96 CQFP	5962F0050202KXC
MUX8509	64	64			2	4	+15V	-15V	+5V	<2000	<1500	-5V	+15V	300	120	96 CQFP	5962F1021202KXC
MUX8511	64	64		■	2	4	+15V	-15V	+5V	<1200	<600	-5V	+15V	150	90	96 CQFP	5962-0920202KXC
RHD8541 *	64	64			2	4	+5V	GND	N/A	<750	<150	0V	+5V	1000	100	96 CQFP	5962H1124002KXC

* Power Supply requirements: Only +5V and ground.
** Product in Development. Please call 800-645-8862 for more information.
† Contact factory for more information.

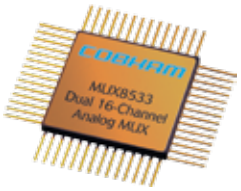


Standard Products for HiRel Applications

Multiplexers, Analog
aeroflex.com/Mux

	Asynchronous LVCMOS Interface	Synchronous LVCMOS Interface	LVCMOS SPI™ Interface	CMOS	Digital I/O Supply	Total Dose krad(Si)	LET_{ONSET} MeV - cm^2/mg	Latch-Up Immune MeV - cm^2/mg	Analog Supply Voltage (V)	Package	QML Q & V	SMD #
UT16MX110	■				*	300	62.3	110	4.5 to 5.5V	28 CFP	Q,V	5962-10233
UT16MX111		■			*	300	62.3	110	4.5 to 5.5V	28 CFP	Q,V	5962-10233
UT16MX112			■		*	300	62.3	110	4.5 to 5.5V	28 CFP	Q,V	5962-10233
UT16MX113	■				3.0 to 3.6	300	62.3	110	4.5 to 5.5V	28 CFP	Q,V	5962-10236
UT16MX114		■			3.0 to 3.6	300	62.3	110	4.5 to 5.5V	28 CFP	Q,V	5962-10236
UT16MX115			■		3.0 to 3.6	300	62.3	110	4.5 to 5.5V	28 CFP	Q,V	5962-10236
UT16MX116	■			■	3.0 to 5.5	300	62.3	110	4.5 to 5.5V	28 CFP	Q,V	5962-10237
UT16MX117			■		3.0 to 5.5	300	62.3	110	4.5 to 5.5V	28 CFP	Q,V	5962-10237

* Generated on chip.
NOTE: RON < 300



Precision Current Source (PCS)
aeroflex.com/PCS

	Description	Total Dose krad(Si)	Package	SMD #
PCS5035 Quintet Precision Current Source	Monolithic quintet (5) precision current sources (each at 80µA) designed for thermistor current monitor and resistive sensor applications. Built-in comparators and precision internal 2.0VDC reference further simplifies the application design.	100	18 FP	5962R0923401KXC
PCS5038 Octal Precision Current Source	The PCS5038 was designed to provide the flexibility needed to support a very wide range of resistive sensors. It contains eight precision current sources that can be set to source from 100uA to 2mA each with a single external resistor. Any number of the eight current source outputs can be tied together allowing the PCS5038 to drive multiple current source values.	100	40 CQFP	5962R1223201KXC

Precision References and Thermometers
aeroflex.com/rhdseries

	Description	Package	SMD #
Precision References and Thermometers			
RHD5961	Precision Reference, 2.00V, Temperature Coefficient < 35 ppm/°C	SMD-0.5	5962H1422101KXC
RHD5964†	Precision Reference, 2.50V, Temperature Coefficient < 35 ppm/°C	SMD-0.5	5962-1422104KXC
RHD5962	Thermometer, Buffered Output, Initial Accuracy: 1.00V ± 50mV, Temperature Coefficient: 10 mV/°C	SMD-0.5	5962H1422102KXC
RHD5963	Integrated RHD5961 2.00V Precision Reference and RHD5962 Buffered Thermometer	SMD-5Pad	5962H1422103KYC

† Contact factory for more information.

RadHard-by-Design Analog Function Series

aeroflex.com/rhdseries

Single power supply operation: 3.3V to 5V
Radiation performance: CMOS ELDRS Immune
Total dose > 300 krad(Si) to 1 Mrad(Si)
SEL Immune > 100 MeV-cm^2/mg
Displacement Damage > 10^{14} neutrons/cm^2

Description	Package	SMD #
Quad Op Amps		
RHD5900	Quad Operational Amplifier with rail-to-rail inputs and outputs for general purpose operational amplifier applications.	16 SOIC	5962H1024101KXC
RHD5901	Quad Operational Amplifier configured with enable/disable control. Pairs of amplifiers are put in a power-down condition with their outputs in a high impedance state.	16 SOIC	5962H1024102KXC
RHD5902	Higher-speed version of RHD5901 providing wider bandwidth and faster slew rate.	16 SOIC	5962H1024103KXC
RHD5903	Quad Differential output operational amplifier. Outputs are centered at VDD/2.	20 SOIC	5962-1223701KXC
Quad Instrumentation Amps		
RHD5904†	Quad Instrumentation Amplifier. Gain 1, output centered at VDD/2.	16 SOIC	5962-1221302KXC
RHD5905†	Differential output version of RHD5904.	20 SOIC	5962-1221302KXC
Quad Comparators		
RHD5910	Quad Comparator, High Speed, for operation with dynamic signals on either or both inputs. Comparison is continuous as the circuit functions as a high gain open loop amplifier with a digital output.	16 SOIC	5962H1024201KXC
RHD5912	Quad Comparator with open drain outputs.	16 SOIC	5962H1024203KXC
Analog Multiplexers		
RHD5920*	16:1 analog multiplexer. Channel selection is controlled by 4-bit binary addressing and an active low enable.	24 SOIC	5962H1024301KXC
RHD5921* Buffered	16:1 buffered output voltage multiplexer. Channel selection is controlled by 4-bit binary addressing and an active low enable. Multiplexed voltages are buffered by a unity gain rail-to-rail amplifier.	24 SOIC	5962H1024302KXC
RHD5928*	8:1 analog multiplexer. Channel selection is controlled by 3-bit binary addressing and an active low enable.	16 SOIC	5962H1220801KXC
RHD8541*	64 channels provided by four 16:1 multiplexers. Two address busses A(0-3) and B(0-3) and four enable lines afford flexible organization.	96 CQFP	5962H1124002KXC
RHD8542*	48 channels channels are configured for Kelvin Measurement by connecting the addressed channel to the "Voltage" output and "Current" input pins. This enables selecting and reading a remote resistive sensor without the multiplexer on resistance being part of the measurement. Address bus A(0-3) and three enable lines afford flexible organization.	96 CQFP	5962H1221001KXC
RHD8543*	48 channels. Triple 16:1, common address inputs A(0-3), separate enable and output.	96 CQFP	5962H1221002KXC
RHD8544*	32 channels. Dual 16:1, separate address inputs A(0-3) and B(0-3), separate enable and output.	56 CQFP	5962H1220901KXC
RHD8545* Buffered	Same configuration as RHD8544 with multiplexed outputs buffered by a unity gain rail-to-rail amplifier.	56 CQFP	5962H1220902KXC
Digital-to-Analog Converters		
RHD5930	Digital to Analog Converter, 11-bit, ladder output.	16 SOIC	5962H1120801KXC
RHD5931	Digital to Analog Converter, 11-bit, buffered output.	16 SOIC	5962H1120802KXC
RHD5932	Digital to Analog Converter, 14-bit, buffered output.	20 SOIC	5962H1320101KXC
Analog-to-Digital Converters		
RHD5950 Multiplexed†	16:1 Multiplexed, 14-bit Analog-to-Digital Converter takes 16 analog sensor signals and using 4-bit binary addressing and an enable input, selects one of the 16 analog inputs and converts the signal to 14 digital output bits. The 14-bit digital output has a tri-state control allowing the connection of multiple RHD5950s. This provides a very high level of telemetry integration interfacing many sensor voltage readings to the digital processor data bus.	48 CQFP	5962R1220301KXC
RHD5958 Multiplexed†	The RHD5958 takes 8 analog sensor signals and using 3 address inputs and an enable input, selects one of the 8 analog inputs and converts the signal to 14 digital output bits. The 14-bit digital output has a tri-state control allowing the connection of multiple RHD5958s. This provides a very high level of telemetry integration interfacing many sensor voltage readings to the digital processor data bus.	40 CQFP	5962R1221101KXC

* Power Supply requirements: Only +5V and ground.
** Product in Development. Please call 800-645-8862 for more information.
† Contact factory for more information.

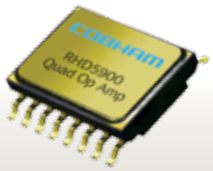
Standard Products for HiRel Applications

RadHard-by-Design Analog Function Series (continued)

aeroflex.com/rhdseries

	Description	Package	SMD #
Precision References and Thermometers			
RHD5961	Precision Reference, 2.00V, Temperature Coefficient < 35 ppm/°C	SMD-0.5	5962H1422101KXC
RHD5964†	Precision Reference, 2.50V, Temperature Coefficient < 35 ppm/°C	SMD-0.5	5962-1422104KXC
RHD5962	Thermometer, Buffered Output, Initial Accuracy: 1.00V ± 50mV, Temperature Coefficient: 10 mV/°C	SMD-0.5	5962H1422102KXC
RHD5963	Integrated RHD5961 2.50V Precision Reference and RHD5962 Buffered Thermometer	SMD-5Pad	5962H1422103KYC
Voltage Level Translators			
RHD5980	Octal Bidirectional Voltage Level Shifter	24 SOIC	5962H1222601KXC

† Contact factory for more information.



Op Amps

aeroflex.com/opamp

	Description	Package	SMD #
RHD5900 Quad Op Amp	Quad Operational Amplifier with rail-to-rail input and outputs for general purpose operational amplifier applications.	16 SOIC	5962H1024101KXC
RHD5901 Quad Op Amp	Quad Operational Amplifier configured with enable/disable control. Pairs of amplifiers are put in a power-down condition with their outputs in a high-impedance state.	16 SOIC	5962H1024102KXC
RHD5902 Quad Op Amp	Higher-speed version of RHD5901 providing wider bandwidth and faster slew rate.	16 SOIC	5962H1024103KXC
RHD5903 Quad Op Amp†	Differential output operational amplifier. Outputs are centered at VDD/2.	20 SOIC	5962-1223701KXC
RHD5904 Quad Instrumentation Amplifiers†	Quad version of the standard instrumentation configuration. Gain 1, output centered at VDD/2.	16 SOIC	5962-1221301KXC
RHD5905 Quad Instrumentation Amplifiers†	Differential output version of RHD5904.	20 SOIC	5962-1223702KXC

† Contact factory for more information.

Comparators

aeroflex.com/opamp

	Description	Package	SMD #
RHD5910 Quad Comparator	Quad Comparator, High Speed, for operation with dynamic signals on either or both inputs. Comparison is continuous as the circuit functions as high gain open loop amplifier with a digital output.	16 SOIC	5962H1024201KXC
RHD5912 Quad Comparator	Quad Comparator with open drain outputs with Vol < 1.0 V with sink current 20 mA.	16 SOIC	5962H1024203KXC

Pulse Width Modulators (PWM)

aeroflex.com/PWM

	Description	Total Dose krad(Si)	LET_{ONSET} MeV - cm^2/mg	Latch-Up Immune MeV - cm^2/mg	Package	SMD #
PWM5032 High-Speed PWM Controller	Optimized for power applications: Buck, Boost, Flyback, Forward and Center-Tapped Push-Pull converters. 1 V thru 12 V @ 1.0 A drive capability. Selectable 50%/100% duty cycle. Low power CMOS technology.	1000	20	100	24 SOIC	5962-0625102KXC
PWM5034 High-Speed PWM Controller	Optimized for power applications: Buck, Boost, Flyback, Forward and Center-Tapped Push-Pull converters. 1 V thru 12 V @ 1.0 A drive capability. Selectable 50%/100% duty cycle. Low power CMOS technology with unformed leads.	1000	20	100	24 FP	5962-0625102KYC

Resolver-to-Digital Converter (RDC)

aeroflex.com/RDC

	Description	Total Dose krad(Si)	Latch-Up Immune MeV - cm²/mg	Package	SMD #
RDC5028 Resolver-to-Digital Converter	16-bit with accuracy to 5.3 arc minutes, single +5 volt @ 20mA represents HiRel best in class power consumption, selectable for 16-, 14-, 12- and 10-bit modes with velocity output. -55°C to 125°C operation.	1000	100	52 CQFP	5962H0423503KXC

Bus Switch

aeroflex.com/busswitch

	Description	Voltage (V)	R_{ON} (Typ Ω)	Radiation	Package	QML Q & V	SMD #
UT64BS1X433*	Matrix-A 64-Channel 1:4 Bus Switch	3.3V	5	TID>300 krad(Si) SEL>100 MeV-cm²/mg	400 CLGA 400 CBGA 400 CCGA	*	5962-15242
UT32BS1X833*	Matrix-D 32-Channel 1:8 Bus Switch	3.3V	5	TID>300 krad(Si) SEL>100 MeV-cm²/mg	400 CLGA 400 CBGA 400 CCGA	*	5962-15243
UT54BS32245	32-Bit 1:1 Bus Switch	3.3 & 5.0V	11 & 5	TID>300 krad(Si) SEL>100 MeV-cm²/mg	99 BGA	Q,V	5962-15241
UT54BS16210	20-Bit 1:1 Bus Switch	3.3 & 5.0V	11 & 5	TID>300 krad(Si) SEL>100 MeV-cm²/mg	48 Lead CFP	Q,V	5962-15245
UT54BS16245	16-Bit 1:1 Bus Switch	3.3 & 5.0V	11 & 5	TID>300 krad(Si) SEL>100 MeV-cm²/mg	48 Lead CFP	Q,V	5962-15240
UT54BS3245	8-Bit 1:1 Bus Switch	3.3 & 5.0V	11 & 5	TID>300 krad(Si) SEL>100 MeV-cm²/mg	20 Lead CFP	Q,V	5962-15244

* Contact factory for more information.

Standard Products for HiRel Applications

Linear Adjustable Voltage Regulators
aeroflex.com/VoltReg

	Total # Regulators	LDO Regulator Dropout Voltage	# Positive Regulators	Positive Voltage Range (V)	# Negative Regulators	Negative Voltage Range (V)	Positive Output Current (A)	Negative Output Current (A)	Total Dose krad(Si)	Package	Package Size L x W x H (inches)	Thru-Hole	Surface Mount	# Leads	SMD #
VRG8601	2		1	1.2 to 37	1	-1.2 to -27	1.5	1.5	100	TO-257	0.65x0.42x0.220	■		6	5962R0521901KXC
VRG8602	2		1	1.2 to 37	1	-1.2 to -27	1.5	1.5	100	TO-257	0.65x0.42x0.220		■	6	5962R0521901KYC
VRG8607	2		2	1.2 to 37			1.5		100	TO-257	0.65x0.42x0.220	■		6	5962R0521903KXC
VRG8608	2		2	1.2 to 37			1.5		100	TO-257	0.65x0.42x 0.220		■	6	5962R0521903KYC
VRG8609	2				2	-1.2 to -27		1.5	100	TO-257	0.65x0.42x0.220	■		6	5962R0521904KXC
VRG8610	2				2	-1.2 to -27		1.5	100	TO-257	0.65x0.42x 0.220		■	6	5962R0521904KYC
VRG8651	2	1.30	1	1.3 to 23	1	-2.5 to -25	1.0	3.0	100	TO-257	0.75x0.42x0.220	■		8	5962R0920101KUC
VRG8652	2	1.30	1	1.3 to 23	1	-2.5 to -25	1.0	3.0	100	TO-257	0.75x0.42x0.220		■	8	5962R0920101KZC
VRG8657	2	1.30	2	1.3 to 23			1.0		100	TO-257	0.65x0.42x0.220	■		6	5962R0920102KXC
VRG8658	2	1.30	2	1.3 to 23			1.0		100	TO-257	0.65x0.42x0.220		■	6	5962R0920102KYC
VRG8660	1		1	1.2 to 37			1.5		100	SMD-0.5	0.40x0.30x0.130		■	3	5962R0920601KXC
VRG8661	1				1	-1.2 to -27		1.5	100	SMD-0.5	0.40x0.30x0.130		■	3	5962R0920602KXC
VRG8662	1	1.30	1	1.3 to 23			1.0		100	SMD-0.5	0.40x0.30x0.130		■	3	5962R0920701KXC
VRG8663	1	1.05			1	-2.5 to -25		3.0	100	SMD	0.55x0.30x0.130		■	5	5962R0920702KYC
VRG8666	1	0.60	1	0.1 to 34			0.9		100	SMD	0.55x0.30x0.130		■	5	5962R1120501KYC
VRG8667	2	0.60	2	0.1 to 34			0.9		100	TO-257	0.75x0.42x0.220	■		8	5962R1320301KUC
VRG8668	2	0.60	2	0.1 to 34			0.9		100	TO-257	0.75x0.42x0.220		■	8	5962R1320301KZC
VRG8669 †	1	0.75	1	0.1 to 22			2.5		100	SMD	0.55x0.30x0.130		■	5	5962R1420101KYC
VRG8691	1	0.50	1	1.0 to 3.3			7.5		100	Power	0.90x1.00x0.220	■		12	5962R0923701KXC
VRG8692	1	0.50	1	1.0 to 3.3			7.5		100	Power	0.90x1.00x0.220		■	12	5962R0923701KYC
VRG8697 †	2	0.75	2	0.1 to 22			2.5		100	TO-257	0.75x0.42x0.220	■		8	5962R1420201KUC
VRG8698 †	2	0.75	2	0.1 to 22			2.5		100	TO-257	0.75x0.42x0.220		■	8	5962R1420201KZC

† Contact factory for more information.

Voltage Supervisors
aeroflex.com/voltsupv

	Total Channels	Fixed Voltage Thresholds	Adj. Thresholds	Over-voltage Detect Mode	Watch-dog Timer	Open Drain Output Drive	Total Dose krad(Si)	Latch-Up Immune MeV - cm²/mg	Package	QML Q & V	SMD #
UT04VS50P	4	3.3, 2.5, 1.8, 1.5, 1.2, 1.0	Yes	Yes	No	Yes	> 300	≤ 110	28-lead CFP	Q,V	5962-13206
UT04VS33P	4	3.3, 2.5, 1.8, 1.5, 1.2, 1.0	Yes	Yes	No	Yes	> 300	≤ 110	28-lead CFP	Q,V	5962-13206
UT01VS50L	1	1.25, V_{DD}	No	No	Yes	No	> 300	≤ 110	8-lead CFP	Q,V	5962-11213
UT01VS50D	1	1.25, V_{DD}	No	No	Yes	Yes	> 300	≤ 110	8-lead CFP	Q,V	5962-11213
UT01VS33L	1	0.6, V_{DD}	No	No	Yes	No	> 300	≤ 110	8-lead CFP	Q,V	5962-11213
UT01VS33D	1	0.6, V_{DD}	No	No	Yes	Yes	> 300	≤ 110	8-lead CFP	Q,V	5962-11213

Power Distribution Modules *cobham.com/power*

Input Regulator Modules (IRM)
cobham.com/power

	Description	V_{in} (V)	V_{out} (adj.) (V)	P_{out} (max) (W)	Efficiency (typ) (%)	Size
PDM621100	100 Vdc Input Regulator Module	95-105	26-48	75	92	1.65"L x 1.31"W x 0.315"H
PDM621070	70 Vdc Input Regulator Module	63-77	26-48	75	92	1.65"L x 1.31"W x 0.315"H
PDM621028	28 Vdc Input Regulator Module	22-36	26-48	100	94	1.65"L x 1.31"W x 0.315"H

TID Tolerance (krad(Si)) = 50

Isolated Point of Load Modules (iPOL)
cobham.com/power

	Description	K-Factor	V_{in} (V)	V_{out} (V)	R_{out} (typ) (mΩ)	I_{out} (max) (A)	Efficiency (typ) (%)	Size
PDM613140	Vout = 1/40 x Vin iPOL	1/40	26-48	0.65-1.2	1.00	50.0	89	1.10"L x 1.21"W x 0.315"H
PDM613132	Vout = 1/32 x Vin iPOL	1/32	26-48	0.81-1.5	1.30	50.0	89	1.10"L x 1.21"W x 0.315"H
PDM613124*	Vout = 1/24 x Vin iPOL	1/24	26-48	1.081-2.0	1.60	37.5	89	1.10"L x 1.21"W x 0.315"H
PDM612116	Vout = 1/16 x Vin iPOL	1/16	26-48	1.63-3.0	6.40	16.7	91	1.10"L x 1.31"W x 0.315"H
PDM612112	Vout = 1/12 x Vin iPOL	1/12	26-48	2.17-4.0	8.40	12.5	91	1.10"L x 1.31"W x 0.315"H
PDM612108	Vout = 1/8 x Vin iPOL	1/8	26-48	3.25-6.0	21.0	8.33	91	1.10"L x 1.31"W x 0.315"H
PDM612106	Vout = 1/6 x Vin iPOL	1/6	26-48	4.33-8.0	35.0	6.25	91	1.10"L x 1.31"W x 0.315"H
PDM612105*	Vout = 1/5 x Vin iPOL	1/5	26-48	5.20-9.60	37.0	5.20	90	1.10"L x 1.31"W x 0.315"H
PDM612104*	Vout = 1/4 x Vin iPOL	1/4	26-48	6.50-12.0	44.0	4.20	92	1.10"L x 1.31"W x 0.315"H
PDM612103*	Vout = 1/3 x Vin iPOL	1/3	26-48	8.67-16.0	71.0	3.10	95	1.10"L x 1.31"W x 0.315"H
PDM612102*	Vout = 1/2 x Vin iPOL	1/2	26-48	13.0-24.0	80.0	2.10	91	1.10"L x 1.31"W x 0.315"H
PDM612203*	Vout = 2/3 x Vin iPOL	2/3	26-48	17.3-32.0	85.0	1.50	91	1.10"L x 1.31"W x 0.315"H
PDM612101*	Vout = 1/1 x Vin iPOL	1/1	26-48	26.0-48.0	96.0	1.00	90	1.10"L x 1.31"W x 0.315"H

TID Tolerance (krad(Si)) = 100
* Product in Development. Please call 800-645-8862 for more information.

Evaluation Board Available

Battery Power Management (BEU) for HiRel Applications

Battery Electronics Units
aeroflex.com/BEU

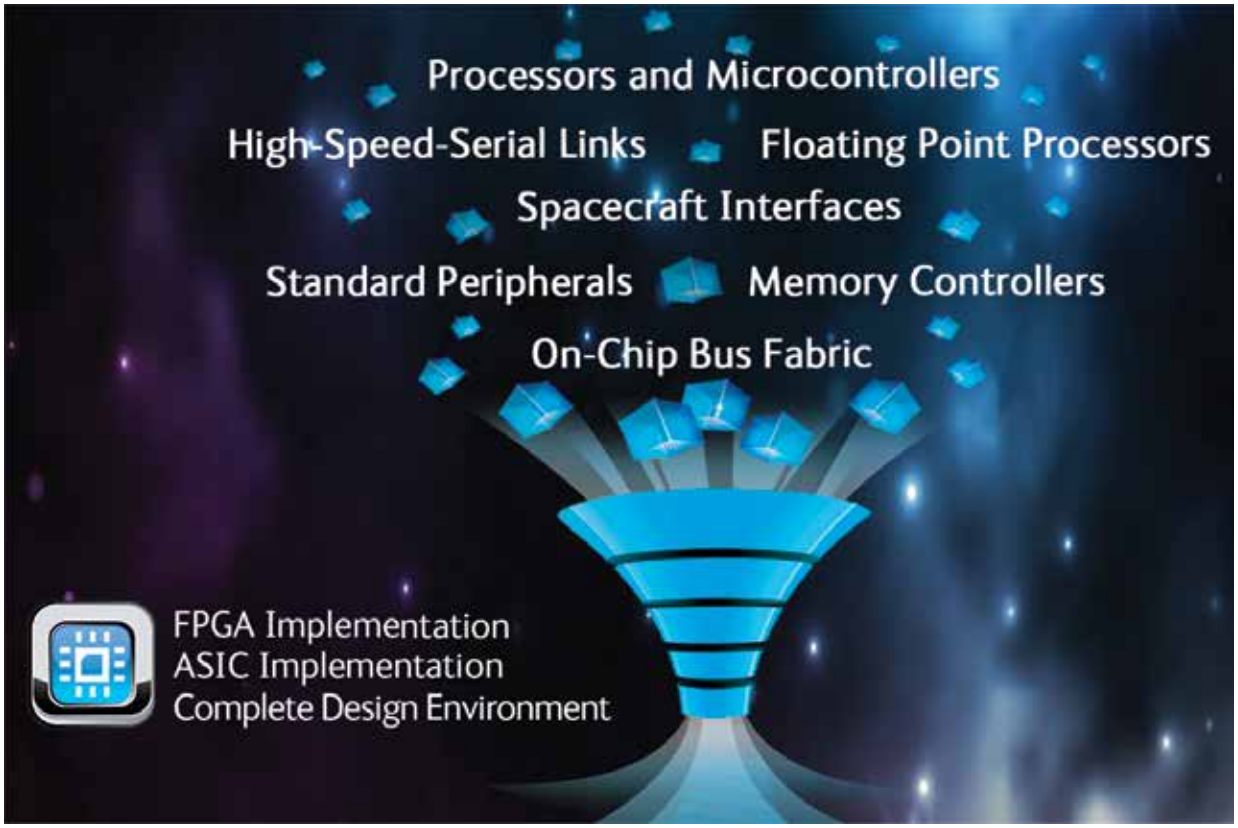
	Cells	Description	Size
		Cobham's new Battery Electronics Units provide autonomous cell balancing for Lithium-Ion batteries. A series stack of Lithium- Ion cells are accurately charge balanced so the battery can be utilized to its fullest capacity. The cell balancing circuitry uses a set of bi-directional DC-DC converters that tie the cells of the battery to a common share bus. Cell charge is distributed among the multiple cells so that the charge of each cell is brought to the average charge of the other cells. Cell balancing can, therefore, be performed at any state of charge of the battery. Individual cell voltage monitors keep track of cells that may exceed charge limits. Precise voltage telemetry is provided for all cells and the battery. Optional features include reconditioning load control and cell bypass device drivers.	
BEU8635 †	8, 12, 24	Balancing for 24-cell battery, with cell voltage monitoring and telemetry	11.50″ L x 2.30″ W x 5.25″ H
BEU8636 †	8, 12, 24	Balancing for 24-cell battery, with cell voltage monitoring and telemetry and cell bypass device drivers	11.50″L x 3.30″W x 5.25″H
BEU8637	8, 12	Independent balancing for two 12-cell batteries or redundant balancing for a single 12-cell battery, with cell voltage monitoring and telemetry	11.50″ L x 4.00″ W x 5.25″H
BEU8638 †	8, 12	Independent balancing for two 12-cell batteries or redundant balancing for a single 12-cell battery, with cell voltage monitoring and telemetry, reconditioning load control and cell bypass device drivers	11.50″ L x 5.20″ W x 5.25″ H
BEU8640	24	Dual redundant balancing for up to 24-cell battery, with cell voltage monitoring and telemetry, reconditioning load control and cell bypass device drivers	11.50″ L x 5.30″ W x 5.25″ H
BEU8642-EVAL	8	Balancing for 8-cell battery, with cell voltage monitoring and telemetry, temperature monitoring, built-in test, RS-232 output for data logging, LCD display for cell voltage, temperature and status	12.00″ L x 9.00″ W x 2.65″ H
BEU8642-EVAL1	8	Balancing for 8-cell battery, with cell voltage monitoring and telemetry, temperature monitoring, built-in test, RS-232 output for data logging, LCD display for cell voltage, temperature and status with external fuses	12.00″ L x 9.00″ W x 2.65″ H

† Product in development. Please call 800-645-8862 for more information.

Battery Interface Electronic Assembly
aeroflex.com/BEU

	Cells	Description	Size
BIE8678	8 – 32	The Battery Interface Electronic (BIE) assembly provides an interface between a space vehicle electrical power system (EPS) and its' Lithium Ion batteries (comprised of 8 to 32 cells). The BIE provides real time battery status monitoring, telemetry and control, and insures safe battery operation throughout the mission life. It is fully space qualified and is designed to support a wide range of missions including LEO, MEO, GEO, HEO, interplanetary and manned flight. The BIE assembly inludes three primary components: the Voltage/Temperature Monitoring Module (VTM), the Over Charge Protection Module (OCP), and the Battery Isolation Switch.	6.95″ W x 11.71″ L x 4.50″ H

Licensable IP Cores and Processors *cobham.com/Gaisler*	Description
LEON3 SPARC V8 Processor Core	The LEON3 is a synthesizable VHDL model of a 32-bit processor compliant with the SPARC V8 architecture. The model is highly configurable, and particularly suitable for system-on-a-chip (SOC) designs. Delivery format is source code.
LEON3FT Fault-tolerant SPARC V8 Processor Core	The LEON3FT is a fault-tolerant version of the standard LEON3 SPARC V8 Processor. It has been designed for operation in the harsh space environment, and includes functionality to detect and correct (SEU) errors in all on-chip RAM memories. Delivery format is encrypted VHDL.
LEON3FT for Microsemi Space-Grade FPGAs	The LEON3FT adapted for optimum performance using the Microsemi RTG4, RTAX and RT ProASIC3 FPGAs. It has been designed for operation in the harsh space environment, and includes functionality to detect and correct (SEU) errors in all on-chip RAM memories. Delivery format is encrypted VHDL.
LEON3FT for Xilinx Virtex-5QV FPGAs	The LEON3FT adapted for optimum performance using the Xilinx Virtex-5QV FPGAs. It has been designed for operation in the harsh space environment, and includes functionality to detect and correct (SEU) errors in all on-chip RAM memories. Delivery format is encrypted VHDL.
LEON4 SPARC V8 Processor Core	The LEON4 is a synthesisable VHDL model of a 32-bit processor compliant with the SPARC V8 architecture. The new 64/128 bit bus width architecture significantly improves performance over previous generations. The model is highly configurable, and particularly suitable for system-on-a-chip (SOC) designs. Delivery format is source code.
LEON4FT Fault-tolerant SPARC V8 Processor Core	The LEON4FT is a fault-tolerant version of the standard LEON4 SPARC V8 Processor. It has been designed for operation in the harsh space environment, and includes functionality to detect and correct (SEU) errors in all on-chip RAM memories. Delivery format is encrypted VHDL.



Licensable IP Cores *cobham.com/Gaisler*	Description
GRLIB - Portable IP library	The GRLIB IP Library is an integrated set of over 100 reusable IP cores, designed for system-on-chip (SOC) development. The IP cores are centered around the common AMBA 2.0 on-chip bus, and use a coherent method for simulation and synthesis. A unique plug & play method is used to configure and connect the IP cores without the need to modify any global resources. Delivery format is source code.
GRFPU - IEEE-754 Floating-Point Unit	The GRFPU is an IEEE-754 compliant floating-point unit, supporting both single and double precision operands. The advanced design combines high throughput with low latency, providing up to 250 MFLOPS on a 0.13µm ASIC process. Delivery format is encrypted VHDL.
GRFPU Lite - IEEE-754 Floating-Point Unit	The GRFPU Lite is an IEEE-754 compliant floating-point unit, supporting both single and double precision operands. The lightweight, non-pipelined design makes it particularly suitable for FPGA technologies with limited logic resources. Delivery format is encrypted VHDL.
GRPCI2 - Master/Target PCI Bridge	The GRPCI2 provides a 32-bit master/target interface for AMBA AHB-2.0 systems. It includes parameterizable FIFOs for both master and target operation, and can optionally be provided with an independent DMA engine. Delivery format is source code.
GR1553B	The GR1553B core implements the MIL-STD-1553B (Notice 2) data bus protocol, with ability to serve as Bus Controller (BC), Remote Terminal (RT) or - Bus Monitor (BM). The core is connected to the MIL-STD-1553B bus via a dual transceiver interface (txP/N/en, rxP/N/en). On the system side, the core connects to the AMBA bus as an AHB master for DMA transfers and an APB slave for register access. The core uses a separate 20 MHz clock for the MIL-STD-1553B codec, and runs at any AMBA clock frequency from 10 MHz and upwards. Delivery format is encrypted VHDL.
GRSPW2 - SpaceWire Link	The GRSPW2 implements a SpaceWire Link with RMAP support and AMBA host interface. The core implements the SpaceWire standard with the protocol identification extension (ECSS-E- 50-12 part 2) and RMAP protocol. Receive and transmit data is autonomously transferred between the SpaceWire Codec and the AMBA AHB bus using DMA. Delivery format is encrypted VHDL.
GRSPWROUTER - SpaceWire Router	The SpaceWire router core implements a SpaceWire router as defined in the ECSS-E-ST-50-12C standard. It supports from 0 to 31 ports (excluding the mandatory configuration port) which can be individually configured to be external SpaceWire links, FIFO ports or AHB ports. The AHB ports are limited to a maximum of 16 in a single router. Delivery format is encrypted VHDL.
GRETH/GRETH_GBIT - 10/100/1000 Mbit Ethernet MAC	The GRETH_GBIT implements a 10/100/1000 Mbit/s Ethernet Media Access Controller (MAC) with AMBA host interface. The core implements the 802.3-2002 Ethernet standard. Receive and transmit data is autonomously transferred between the Ethernet MAC and the AMBA AHB bus using DMA. Delivery format is source code.
GRUSBHC - USB 2.0 Host Controller	The USB 2.0 Host Controller provides a link between the AMBA on-chip bus and the Universal Serial Bus (USB). The host controller supports High- Full- and Low-Speed USB traffic. USB 2.0 High-Speed functionality is supplied by an enhanced host controller implementing the Enhanced Host Controller Interface (EHCI). Full- and Low-Speed functionality (USB 2.0 and USB 1.1) is supplied by one or more companion controllers implementing the Universal Host Controller Interface (UHCI). Delivery format is source code.
GRUSBDC - USB 2.0 Device Controller	The USB 2.0 Device Controller provides an interface between an USB 2.0 bus and an AMBA-AHB bus. The core is used for implementing USB 2.0 functions providing access to the USB through either an AHB slave or an AHB master interface. The master interface is capable of higher bandwidths but is more complex and requires external memory. The slave interface is simpler and does not require external memory but is more bandwidth limited. UTMI, UTMI+ and ULPI PHYs are supported. Delivery format is source code.
GRCAN - CAN 2.0 Controller	The GRCAN provides a CAN 2.0 controller for AMBA AHB-2.0 systems. The CAN controller supports transmission and reception of sets of messages by use of circular buffers located in memory external to the core. Transmit and receive buffers are organized separately. Reception and transmission of sets of messages can be ongoing simultaneously. Delivery format is source code.
I2CMST - Inter IC Bus Interface	The I2C bus is a simple 2-wire serial multi-master bus with collision detection and arbitration. The bus consists of a serial data line (SDA) and a serial clock line (SCL). Both the master and a slave cores are provided. Delivery format is source code.
SPICTRL - Serial Peripheral Interface	The core provides a link between the AMBA APB bus and the Serial Peripheral Interface (SPI) bus. Through registers mapped into APB address space, the core can be configured to work either as a master or a slave. Delivery format is source code.
GRAES/GRECC - Crypotography Cores	The GRAES - Advanced Encryption Standard (AES) cryptography and the GRECC - Elliptic Curve Cryptography (ECC) cryptography cores combine high throughput performance with seamless integration with the LEON3 32-bit SPARC processor core. Delivery format is source code.
CCSDS/ECSS Spacecraft Data Handling	The CCSDS/ECSS Spacecraft Data Handling IP cores represent a collection of cores that have been developed specifically for the space sector. These IP cores implement functions commonly used in spacecraft data handling and management systems. Delivery format is source code.
GRDMAC	The GRDMAC is a flexible Direct Memory Access controller with an integrated AHB/APB bridge. Access to APB peripherals is performed bypassing the processor AHB bus, consequently reducing AHB bus load and avoiding congestion. Delivery format is source code.
L2C - Level 2 Cache Controller	The Level 2 Cache Controller instantiates EDAC protected cache memory in configurations of up to four cache ways and way sizes of up to 512 KiB. The Level 2 Cache acts as an AHB to AHB bridge between the processor bus and the memory bus, both configurable to a data width of up to 128 bit. Delivery format is source code.
MEMSCRUB	The Memory Scrubber can be programmed to read through a memory area and write back the contents whenever a correctable error is detected. It monitors an AMBA AHB bus for accesses triggering an error response, as well as correctable error signals from cores containing EDAC, and triggers an interrupt in case of errors. It can be programmed to initialize a memory area to known values. Delivery format is source code.

Components
cobham.com/Gaisler

	Description
GR701A	GR701A is a PCI to SpaceWire and 1553 Bridge. Its fault tolerant design is implemented using the Microsemi RTAX FPGA technology and provides outstanding immunity to radiation effects.
LEON3FT - RTAX/RT3PE	LEON3FT-RTAX is an implementation of the LEON3FT SPARC V8 processor as pre-programmed Microsemi RTAX and RT ProASIC3 FPGA.
RT-SPW-ROUTER	The radiation tolerant SpaceWire Router family is available as pre-programmed Microsemi RTAX and RT ProASIC3 Field Programmable Gate Arrays. The fault tolerant design of the router in combination with the radiation tolerant FPGA makes it ideally suited for space and other high-rel applications.
GR718B 18-port SpaceWire Router	The GR718B is a radiation tolerant 18-port SpaceWire Router with integrated on-chip LVDS on 16 ports and 2 ports with LVTTL for use with off-chip LVDS transceivers. All SpaceWire links operate at up to 200 Mbit/s. The fault tolerant design of the router in combination with the radiation tolerant technology provides outstanding immunity to radiation effects. See page 8 for details.
GR712RC dual-core LEON3FT processor	The GR712RC is an implementation of the dual-core LEON3FT SPARC V8 processor using RadSafe™ technology. The fault tolerant design of the processor in combination with the radiation tolerant technology provides outstanding immunity to radiation effects. See page 4 for details.
GR740 quad-core LEON4FT processor	The GR740 is an implementation of the quad-core LEON4FT SPARC V8 microprocessor. The fault tolerant design of the processor in combination with the radiation tolerant technology provides outstanding immunity to radiation effects. See page 4 for details.

Software Tools
cobham.com/Gaisler

	Description
GRMON	GRMON is a hardware debug monitor for LEON processors. It communicates with the LEON Debug Support Unit (DSU) and allows non-intrusive debugging of the complete target system. GRMON can be used for automatic board testing using Tcl scripts.
TSIM ERC32/LEON Simulator	TSIM is an instruction set simulator capable of emulating ERC32- and LEON-based computer systems, developed for near-real time performance. The simulator enables development and debugging of target applications before real hardware is available, thereby shortening the product development cycle. TSIM can be extended by user modules and operated by a library API, allowing for integration of the simulator into a larger simulation framework.
GRSIM LEON Multi-Processor Simulator	The GRSIM simulator emulates a multi-processor LEON system, and functionally models on-chip peripherals and AMBA buses. It is time-based rather than instruction-based (as TSIM). GRSIM can be extended by user modules and operated by a library API, allowing for integration of the simulator into a larger simulation framework.

Compilers and Operating Systems
cobham.com/Gaisler

	Description
Bare-C Cross-Compiler System (BCC)	BCC is open source and royalty-free. It includes: GNU C/C++ Compiler with binutils, Simple bare-C runtime with interrupt support, optional Pthreads support, GNU gdb debugger with DDD front-end.
RTEMS Cross-Compiler System (RCC)	RCC is open source and royalty-free. It includes: GNU C/C++ Compiler with binutils, RTEMS real-time kernel 4.X, Network and file system support, GNU gdb debugger with DDD front-end.
eCOS Real-Time O/S for LEON	eCos is an open source, royalty-free, real-time operating system intended for embedded applications. The highly configurable nature of eCos allows the operating system to be customised to precise application requirements, delivering the best possible run-time performance and an optimised hardware resource footprint.
LINUXBUILD Embedded LINUX for LEON	LINUX is open source and royalty-free. LINUXBUILD is a LEON Linux 3.x development environment including kernel, LEON tools and the buildroot distribution. Buildroot is a full source embedded Linux distribution containing libraries and applications for rapid development of embedded Linux systems. Support for V8 mul/div instructions and Floating Point Unit (FPU) is included. There is Symmetric Multi-processing (SMP) support for LEON systems with multiple processors.
VxWorks 6.X port and BSP for LEON	The VxWorks-6.X-LEON is a port of Wind River VxWorks 6.X operating system to the LEON processor. A BSP and drivers for all standard on-chip peripherals are included. Development can be done on Linux or Windows hosts. The port and BSP are provided in full source code with example projects supplied. Requires source code license for VxWorks. BSPs support the UT699, UT700, GR712RC and LEON4-N2X devices.
Nucleus port and BSP for LEON	The Nucleus-LEON is a port of the Mentor Graphics Nucleus operating system. A BSP and drivers for all standard on-chip peripherals are included. Development can be done on Linux or Windows hosts. The port and BSP are provided in full source code.
ThreadX port and BSP for LEON	The ThreadX-LEON is a port of the Express Logic ThreadX operating system. A BSP and drivers for Ethernet and UARTS are included. Development can be done on Linux or Windows hosts. The port and BSP are provided in full source code.

Processing Solutions for HiRel Applications

Boards
cobham.com/Gaisler

	Description
GR-CPCI-GR740	Development board with the GR740 LEON4FT quad-core SPARC V8 microprocessor capable of running at a system clock speed of 250 MHz. The board is cPCI form factor and can also be used in a standalone bench-top configuration. The board supports 32-bit/33MHz PCI, dual Ethernet, 8 SpaceWire ports capable of running up to 200Mbit/s, on-board FLASH, SDRAM and a socket for a PROM device. 2 CAN ports, 2 UART, dual MIL-STD-1553 and secondary GPIO are available through an accessory board. A USB debug port is provided.
GR-CPCI-XC7K	Xilinx Kintex-7, XC7K325T FPGA 6U cPCI board, especially developed for LEON development, with on-board DDR3 memory, SRAM, FLASH, six SpaceWire MDM9 connectors, redundant MIL-STD-1553B and CAN 2.0B connectors, two E-SATA GTX connectors, USB and Ethernet debug interface, user and memory expansion connectors. The board is capable of operating stand-alone, as a Compact-PCI plug-in card, and as a Compact-PCI system controller.
GR712RC-BOARD	Development board with GR712RC dual core LEON3FT SPARC V8 microprocessor capable of running at a system clock speed of 100Hz. The board supports Ethernet, 6 SpaceWire ports capable of running up to 200Mbit/s, 2 CAN ports, dual 1553, SPI, I^2C, on-board FLASH, SRAM and SDRAM. A USB debug port is provided.
GR718B-BOARD	Development board with GR718B radiation tolerant 18-port SpaceWire router. The board is 6U cPCI form factor and can also be used in a standalone bench-top configuration. The board supports 18 SpaceWire ports capable of running up to 200Mbit/s through front-panel MDM9S connectors. Two SpaceWire ports are driven by on-board LVDS transceivers, the remaining 16 ports are driven by the GR718B on-chip LVDS transceivers. A USB debug port is provided.
GR-CPCI-LEON4-N2X	Development board with a quad core LEON SPARC V8 microprocessor capable of running at a system clock speed of 200MHz. The board is cPCI form factor and can also be used in a standalone bench-top configuration. The board supports 32-bit/66MHz PCI, Ethernet, SpaceWire router with four internal ports and eight external ports capable of 200 Mbit/s, MIL-STD-1553B, Dual10/100/1000 Mbit Ethernet, SPI, on-board Flash, DDR2-600 SDRAM, PC100 SDRAM. A USB debug port is provided.
GR-CPCI-UT699	Development board with the UT699 LEON3FT SPARC V8 microprocessor capable of running at a system clock speed of 66MHz. The board is cPCI form factor and can also be used in a standalone bench-top configuration. The board supports 32-bit/33MHz PCI, Ethernet, 4 SpaceWire ports capable of running up to 200Mbit/s, 2 CAN ports, on-board FLASH, SRAM, SDRAM, and socket for a PROM device. A USB debug port is provided.
GR-PCI-XC5V	Xilinx Virtex 5, XC5VLX50 FPGA PCI format plug in board, especially developed for LEON development, with on-board SO-DIMM, SRAM, FLASH, GBit Ethernet, USB 2.0, DSU UART, user and memory expansion connectors .
GR-CPCI-XC4V	Xilinx Virtex 4, XC4VLX100 FPGA cPCI format plug in board, especially developed for LEON development, with on-board SO-DIMM, SRAM, FLASH, DSU UART, user and memory expansion connectors. The board is capable of operating stand-alone, as a Compact-PCI plug-in card, and as a Compact-PCI system controller.
GR-CPCI-AX	The board supports the early development and fast prototyping of LEON3/RTAX designs. The board incorporates a socket for an Actel AX2000/ RTAX2000 FPGA, with on-board SO-DIMM, SRAM, FLASH, DSU UART, user and memory expansion connectors. The board is capable of operating stand-alone, as a Compact-PCI plug-in card, and as a Compact-PCI system controller.
GR-XC6S-LX75	Low cost, Xilinx Spartan 6 FPGA, especially developed for LEON development. The board provides Ethernet, Video, PS2, SO-DIMM, SRAM, FLASH, DSU UART, user and memory expansion connectors.
GR-MCC-C	Actel ProASIC3L / RT ProASIC3 FPGA board, especially developed for LEON3 / LEON3-FT development, with on-board SRAM, Flash PROM, ADC devices, LVDS and CAN transceivers, user I/O expansion connectors, etc.

Development Platforms
cobham.com/Gaisler

	Description
GR-RASTA Spacecraft Avionics Development Platform	LEON based avionics development platform in standalone, bench-top configuration. Supports 32-bit/33MHz PCI, Ethernet, CAN, 1553, CCSDS TM/TC, SpaceWire links capable of running up to 200Mbit/s, UARTs, SRAM, SDRAM and FLASH. The platform is configurable and built to customer needs.

Test Equipment
cobham.com/Gaisler

	Description
GRESB SpaceWire/Ethernet Bridge	The GRESB bridge facilitates rapid development and testing of equipment with SpaceWire interfaces. It provides three bi-directional SpaceWire links with a maximum bit rate of 100 Mbit/s and six "virtual" links that are interfaced through TCP sockets. Each SpaceWire link can be individually configured with respect to the transmission bit rate. The GRESB also supports one CAN 2.0B interface.
Telemetry and Telecommand EGSE	The CCSDS / ECSS Telemetry and Telecommand EGSE (Electrical Ground Support Equipment) provides the necessary means for communicating with the on-board space segment. It has been designed to support satellite integration and test activities, on-board space segment development, ground segment applications, etc.

Custom RadHard ASICs for HiRel Applications

RadHard Digital ASIC Products *aeroflex.com/RadHardASIC*	Description
UT90nHBD - 90nm	Hardened-by-Design performance ASICs. Up to 30 M usable gates; toggle rates up to 5 GHz; +2.5 V/1.8 V I/O and +1.0 V core operation; CMOS processed in commercial fab; RadHard from 100 to 300 krad(Si). QML V & Q. • Configurable High Speed serial I/O supports SerDes, Rapid I/O and XAUI standards • State of the Art Trusted On shore fab • Ready for Design starts – RadHard Library available now! • QML Q and V Qualified.
UT130nHBD - 130nm	Ultra-low-power ASICs. Up to 15 M usable gates; toggle rates up to 4 GHz; +3.3 V/2.5 V/1.8 V I/O and +1.2 V core operation; CMOS processed in commercial fab; RadHard from 100 to 300 krad(Si). Class S. • SoC Platform design re-use with Leon SPARC V8 Processor-based standard products • Proven IP from Gaisler and Aeroflex • FPGA development boards for prototyping • Highest density silicon for cost effective unit prices
UT0.25µHBD - 0.25µm	Up to 3.0 M usable gates; toggle rates > 1 GHz; single +3.3 V supply or +3.3 V I/O and +2.5 V core operation; CMOS processed in commercial fab; RadHard from 100 krad(Si) to 1E6 rads(Si). QML V & Q. • Bigger FPGA conversions • 5 V tolerant inputs • RadHard-by-Design • Cost effective NRE
UT0.6µCRH - 0.6µm	500 K usable gates; clock rates > 150 MHz; +5 V and +3.3 V operation; CMOS processed in commercial fab; RadHard from 100 to 300 krad(Si). QML V & Q. • Ideal for small FPGA and CPLD conversions • Lowest NRE • Fully Trusted supply chain • True 5 V drive capability • RadHard *process*
ASIC Design System	Supports design signoff in Synopsys and Mentor tools, and tools using VHDL and Verilog languages.
FPGA to ASIC Conversions	Convert RadHard (or non-RadHard) FPGAs (Field Programmable Gate Arrays) to high reliability RadHard ASICs.
Category 1A Trusted	Design, Assembly, and Backend Screening Services

RadHard Mixed-Signal ASIC Products *aeroflex.com/RadHardASIC*	Description
UT0.18µCRH-0.18µm	• 1.8, 3.3 and 5.0 V Digital Core and/or I/O supplies • Substrate Isolated: Bipolar supplies from ±0.9 V to ±2.5 V • RadHard from 100 krad(Si) to 1 Mrad(Si), Latch-Up Immune > 110 MeV cm^2/mg • Commercial, Hi-Rel, QML pending • 8 M gates with toggle rates up to 2.4 GHz • Extensive analog IP including 8-bit to 21-bit ADCs, DACs, op-amps, prog. filters, bandgaps, switched-cap circuits, voltage regulators, oscillators, level translators, Aeroflex proprietary RadHard One-Time Electrically Programmable Metal Fuse NV Memory
UT0.35µCRH-0.35µm	• 3.3 and 5.0 V Digital Core and/or I/O supplies • Substrate Isolated: Bipolar supplies from ±1.65 V to ±20 V • Up to 40 V HV transistors • RadHard from 100 to 300 krad(Si), Latch-Up Immune > 110 MeV cm^2/mg • Commercial, Hi-Rel, QML Q&V • 1.5 M gates with toggle rates up to 375 MHz • Extensive analog IP including 8-bit to 21-bit ADCs, DACs, op-amps, prog. filters, bandgaps, switched-cap circuits, voltage regulators, low $R_{DS(on)}$ switches, oscillators, level translators, Aeroflex proprietary RadHard One-Time Electrically Programmable Metal Fuse NV Memory
UT0.6µCRH-0.6µm	• 3.3 and 5.0 V Digital Core and/or I/O supplies • Up to 20 V HV transistors • RadHard from 100 to 300 krad(Si), Latch-Up Immune > 110 MeV cm^2/mg • QML Q&V • 500 K gates with toggle rates up to 215 MHz. • Extensive analog IP including bandgaps, op-amps, ADCs, DACs, oscillators, level-translators
ASIC Design System	Full custom design to customer performance specification and/or supports design signoff in Synopsys/Mentor tools, and tools using VHDL/Verilog languages.

MIL-STD Radiation Effects Test Services

cobham.com/RAD

- Total Ionizing Dose (TID) RLAT (50 to 300 rads/sec)
  — MIL-STD-883 TM 1019, Cond. A
- TID ELDRS (10 to 100 mrads/sec)
  — MIL-STD-883 TM 1019, Cond. D, ESA/SCC22900
- Prompt Dose / Flash X-Ray
  — MIL-STD-883 TM 1020 and 1021
- Neutron SEE
  — MIL-STD-750 and MIL-STD-883, Method 1017
- Heavy Ion SEE (SEL, SEU, SET, SEB, SEGR)
  — EIA/JESD 57, ASTM F1192
- Proton: Heavy Ion SEE
- Cryogenic FPA testing (25 K)
  — Two Color Dynamic Infrared Scene Projection

Cobham RAD's 14Mev Neutron Irradiator

Cobham RAD e-beam machine

Single Event Effects Testing

cobham.com/SEE

- Design and development of test hardware and software
- Optimized test planning and management for efficient use of the cyclotron
- Comprehensive SEE test reports and data collection
- Tests can be designed to evaluate:
  — Single Event Latch Up (SEL)
  — Single Event Upset (SEU)
  — Single Event Transients(SET)
  — Single Event Burnout (SEB)
  — Single Event Functional Interrupts (SEFI)
  — Single Event Gate Rapture (SEGR)
    - **EIA/JESD 57**
    - **ASTM F1192**

SEE Testing of memory devices, including NAND, SDRAM and DDR, is efficiently performed using our FPGA based test solutions. The majority of SEE tests are conducted using cyclotrons at either Lawrence Berkeley National Laboratory (LBNL) or at Texas A&M University (TAMU) and on occasion at Brookhaven National Laboratory (BNL).

Device Preparation for Single Event Effects Testing

cobham.com/RAD

Preparation for Single Event Effects (SEE) Testing can be quite demanding. Cobham RAD can significantly lessen these demands by using Cobham RAD proprietary processes and techniques that simplify this task.

Backside thinning to 35µm allows for SEE testing at TAMU or Berkeley without repackaging of ICs.

Finished Package Backside Thinning

- Package backside thinning to 35µm ±5µm
- Custom PC board design in preparation for SEE Testing
- Custom DUT Socket Solutions for SEE Testing of multiple interchangeable ICs for at-speed testing on a test board

Die Thinning

- Die thinning is available as required to any thickness (±5µm)

Die Extraction / Repackaging

- When package backside thinning is not a solution, we routinely perform die extraction and repackaging in preparation for SEE Testing
- Custom PC board design for SEE testing is available

Extreme High Dose Radiation for Materials and Mechanical Devices

cobham.com/RAD

Cobham RAD and Cobham RAD Europe offers a cost effective and efficient service to exposure materials and large mechanical devices to very high levels of gamma radiation. Certain industries, such as nuclear power generation, require hundreds of megarads to qualify materials, components, sensors, actuators, etc. Cobham can also assist with medical device radiation qualification requirements.

Device Screening and Element Evaluation

cobham.com/RAD

Cobham RAD offers comprehensive screening services for your flight devices, lot conformance, and individual die element evaluation.

Screening Test Method Capabilities		
	MIL-STD Test Methods	
Test Description	883	750
Adhesion of Lead Finish	2025	n/a
Bond Strength	2011	2037
Burn-in	1015	1039
Constant Acceleration	2001	2006
Die Shear	2019	2017
External Visual	2009	2071
Hermiticity (Krypton 85)	1014	1071
Internal Visual	2010	2072
Internal Water Vapor	1018	1018
Lead Integrity	2004	2036
Lid Torque	2024	n/a
Mechanical Shock	2002	2016
Moisture Resistance	1004	1021
Physical Dimensions	2016	2066
PIND	2020	2052
Radiography X-ray (Digital)	2012	2076
Resistance to Solvents	2015	1022
Salt Atmosphere	1009	1041
Solderability	2003	2026
Steady State Life	1005	1026
Temperature Cycling	1010	1051
Thermal Shock	1011	1056
Vibration Variable Frequency	2007	2056

Facilities in Colorado Springs, Colorado and Harwell, UK

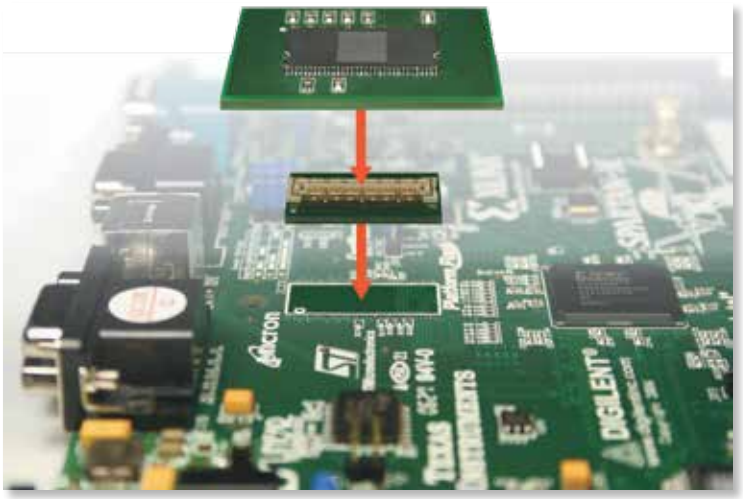
Quick-Turn Prototype IC Assembly

cobham.com/RAD

Cobham RAD offers the following services: Quick-Turn Prototype IC Assembly in ceramic, etched out plastic, COB and flip chip.

Quick-Turn Prototype IC Assembly Capabilities

- Dicing, Die Visual and Die Attach
  - **Wafer Dicing (up to 12inch wafers)**
  - **Visual Inspection (50-500X)**
  - **Conductive and non-conductive epoxy die attach**
  - **Silver Glass and Eutectic die attach**
  - **Flip Chip**
- Wirebond, Encapsulation and Marking
  - **Gold and Aluminum Wirebond (to 35µm pitch)**
  - **Epoxy, Solder, and Glass Frit Lid Seal**
  - **Dam and Fill (Plastic Encapsulation)**
    - **Plastic Equivalent Devices**
    - **COB Glob Top**
  - **Package Ink Marking or Laser Marking**
- Package Options
  - **Multi-chip / Stacked Modules, Chip-On-Board (COB), and Custom Substrates**
  - **Ceramic Packages Including: BGA, PGA, J-Lead, Flat Pack, QFP, Sidebraze, Cerdip and others**
  - **Etched Cavity Plastic Packages Including: J-Lead, QFP, SOIC, TSSOP, QFN /MLF and others**



Electronic Manufacturing Services (EMS)

Circuit Card Assembly *aeroflex.com/CCA*

The Circuit Card Assembly (CCA) capability consists of assembly, test and conformal coat in a high-mix/low-to-medium volume operation. Our process equipment and test capabilities provide for state-of-the-art manufacturing and are ISO 9001 and AS-9100 approved. We provide full turnkey or consignment sub-contract assembly services for high-reliability products including J-STD-001 and NASA 8739. We combine best commercial practices of circuit card assembly with our radiation-hardened integrated circuits to provide CCA solutions for the commercial space industry including a long history of installing Column Grid and other unique assembly technologies. Cobham works with our customers to develop and qualify unique assembly processes. We utilize 2D real-time X-rays to inspect hidden or critical assembly inspection concerns. Our CCAs are manufactured for space, military, and commercial programs where quality and process control are essential for mission success. Our new automated circuit card assembly line to help asseble your high volumes - view our video at www.Cobham.com/ems

Aerospace Advantages

- High-reliability standards
- Board layout
- Low volume orders
- Supplier and BOM management
- Access to Cobham Standard Products and RadHard ASICs
- QML Q, T and V products
- Flown on commercial aircraft and commercial/military satellites

CCA Services

- Quick turn assembly
- Material management
- Flying probe testing
- Board layout
- Dock-to-stock with Cobham ICs
- SMT, through-hole, test and coat
- Customer-specific processes

Production Services

- Build to print
- Prototype
- Engineering
- Qualification
- Very low to moderate production
- Quick turn, typically less than 6 weeks from receipt of components and documents

Material Management

- Full turnkey or consigned material acquisition
- Supplier management
- BOM management
- Value-added component screening

IC Screening and Value-Added Capabilities

- PIND, RLAT, DPA, fine and gross leak
- Packaging, electrical testing, tinning, forming, and programming

Aeroflex Trusted Accreditation *aeroflex.com/trusted*

Aeroflex Colorado Springs received Category 1A Trusted Accreditation by the Defense Microelectronics Activity as a Microelectronics Trusted Source for DoD and all other U.S. goverment users. The scope of the accreditation includes:

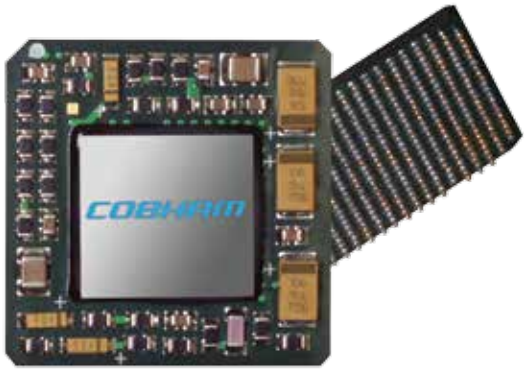
- Design Services
- Aggregation Services
- Broker Services
- Packaging and Assembly Services
- Test Services

Aeroflex Plainview received Category 1A Trusted Accreditation in 2010. Their scope includes:

- Multi-Chip Module and Hybrid Microcircuit Packaging and Assembly

Custom Hybrid, MCM, Module, Box Assembly and Testing Services *aeroflex.com/ems*

- Space & MIL Qualified Assembly Services – Certified Class K per MIL-PRF-38534
- Vertically Integrated Die to Box Facility
- DoD Microelectronics Trusted Source, Category 1A
- Quick turn capable
- ISO 9001 and AS9100:2004 certified
- Element evaluation and component screening
- Class 10,000 clean room for thick film substrate manufacturing
- Class 100,000 clean room for hybrid, SMT and box assembly
- High Reliability Chip on Board Design & Manufacturing Services
- Full turnkey “Design to Spec” services for SMT Assemblies & Boxes
- RF Microwave Services for High Volume Phased Array Antennas



RF Microwave Products

Cobham Semiconductor Solutions, A Trusted Supplier, has been providing RF Microwave custom products for over 15 years. Our engagement models include build to spec and build to print. Components include amplifiers, attenuators, couplers, mixers, power dividers and switches.

Microwave Module Capabilities

Cobham.com/HiRel

- Conventional thick/thin film substrate "chip and wire" metal or ceramic packages
- Analog/Digital circuit design & packaging
- High temp co-fired ceramic (HTCC) and low temp co-fired ceramic (LTCC) packaging
- Fluxless flip chip attach on ceramic substrate
- RF Microwave – GaAs, Si, SiGe, & GaN die attach using DAP vacuum furnace, wire bonding and electrical test
- ASIC Integration linear, digital, and mixed signal in MCM packages
- Value added surface mount board assemblies
- RF and microwave module design, fab and test up to 65 GHz
- Stand-off Stitch, Substrate Attach, LTCO, Aluminum Nitride Substrate, Microwave Isolation Techniques

Highly Integrated RF Modules

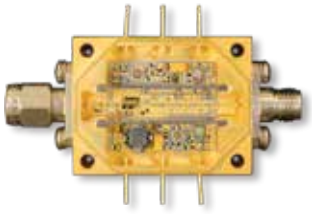
Cobham.com/HiRel

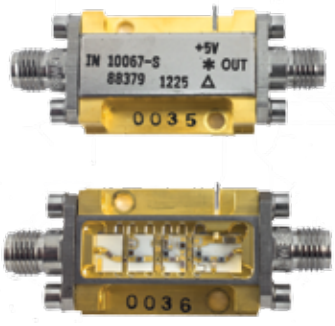
- 50 kHz to 15 GHz High Gain Modulator Driver Amplifier
- Component integration on a single board to reduce size, cost and improve performance
- Cobham designed & manufactured multilayer thick-film substrate
- Built in DC Control Circuitry
- Conductive Walls with Solid Vias under Walls to Optimize Ground and Provide Superior Isolation
- Co-planar waveguide thin film for Impedance Matching
- Laser Trimmed Resistors to Facilitate Active Trimming
- Seam Welded Hermetic Construction (10^{-8})

Features of a Cobham L-Band Low Noise Amplifier

Cobham.com/HiRel

- Input Supply Voltage: +4.9 to +5.1 V_{DC}
- DC Supply Current: 40 mA
- RF Input Power with internal power limiter: +27dBm CW/Peak
- Baseplate Temperature, Operating & Non-Operating: -55°C to +125°C
- Noise Figure, 0.5dB 1.400 GHz to 1.427 GHz, from -20°C to +40°C
- Noise Figure versus Temperature: 0.01 dB/°C
- Gain: 29 – 31 dB
- Gain Flatness: 0.1dB from 1.400 GHz to 1.427 MHz
- Gain Matching (Unit to Unit): -0.5dB to 0.5dB from 1.400 GHz to 1.427 GHz
- Gain Variation versus Temperature: 0.015 dB/°C
- Phase Linearity: -5 to +5 Degrees from 1.400 GHz to 1.427 GHz
- Phase Stability vs Temperature: 0.07 Degrees/°C from 1.400 GHz to 1.427 GHz
- Phase Matching (Unit to Unit): -5 to +5 Degrees from 1.400 GHz to 1.427 GHz
- Total Output Noise Power: -37dBm from DC to 26GHz when terminated in a 50W input load
- Output Power at 1dB Compression: +7.5dBm from 1.200 GHz to 1.616 GHz
- Input / Output VSWR: 1.5 : 1 from 1.400 GHz to 1.427 GHz
- Total Ionizing Dose (TID): 100 krad(Si) with dose rates of 0.005 krad(Si)/sec and 50 rad(Si)/sec
- Single Event Effects (SEE): 37 MeV cm^2/mg
- Single Event Latch-Up (SEL): 75 MeV cm^2/mg
- Dimensions: 1.72" L X 0.70" W X 0.29" H (43.68 mm x 17.78 mm x 7.36 mm)





Typical Screening Levels *cobham.com/HiRel*

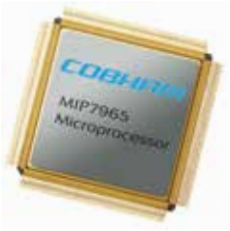
- Screened & Qualified to the requirements of MIL-PRF-38534 Class K
- Element Evaluation IAW the requirements of MIL-PRF-38534 Class K
- Additional Screens include Random Vibration

MIPS RISC 64Bit Microprocessors

aeroflex.com/avionics

	Description	CPU Speed (MHz)	Package
ACT-7000ASC-300F17(X)	64 bit SysAD bus interface in a cavity-up hermetic CQFP.	300	208 CQFP (1.12"sq)
ACT-7000ASC-300F24(X)	64 bit SysAD bus interface in a cavity-down hermetic CQFP.	300	208 CQFP (1.12"sq)
MIP7365-450B1(X)	64 bit SysAD bus interface in a TBGA.	450	Plastic 256 TBGA (26mm sq)
MIP7965-668F17(X)	64 bit SysAD bus interface in a cavity-up hermetic CQFP with EJTAG debug port.	668	208 CQFP (1.12"sq)

(X) = Temperature range and screening code (see data sheet).



Memory Modules

aeroflex.com/avionics

	Description	Access Speed (ns)	Package
	High-Speed, low-noise, low-voltage TTL (LVTTL) compatible outputs. 3.3V operation with separate logic and output driver power pins. All inputs and out puts are synchronized with the CLK input to simplify system design and enhance use with high-speed microprocessors. Internal pipelined operation; column address can be changed every clock cycle. CAS latency (CL) programmable to 2 cycles from column-address entry. Cycle-by-cycle DQ-bus write mask capability with upper and lower byte control. Chip select and clock enable for enhanced-system interfacing. Auto-Refresh.		
Model: ACT-D1M96S-020F20X Ordering Part Number: 3369-BF20-M01C	6 low power 1M x 16 banks of SDRAM die packaged into a single SDRAM MCM organized as 2 independent 512K x 48 x 2 banks. Programmable burst lengths: 4 or 8. Serial Burst Sequence. 2 banks for on-chip interleaving (gapless accesses). 4K refresh (Total for Both Banks) Operates from 3.3V Power Supply +/-10%.	20	200 CQFP (1.45" sq)
Model: ACT-D16M96S-020F20X Ordering Part Number: 3370-BF20-M21C-1	6 low power 4M x 16 x 4 banks of SDRAM die packaged into a single SDRAM MCM organized as 2 independent 4M x 48 x 4 banks. LVTTL compatible outputs. 3.3V operation with separate logic and output driver power pins. Internal pipe-lined operation; column address can be changed every clock cycle. Program-mable burst lengths: 1, 2, 4, 8, or full page. 64ms, 8,192-cycle refresh. Auto precharge, includes concurrent auto precharge, and auto refresh modes. Operates from 3.3V power supply ±5%.	20	200 CQFP (1.45" sq)

Motor Drivers

aeroflex.com/power

	Description	Package
ACT5101-1 Three Phase Brushless DC Motor Driver	The ACT5101-1 is a three phase, 500V rated, motor driver intended for high power/high reliability trapezoidal and sinusoidal applications. The ACT5101-1 features highly efficient IGBT output transistors capable of delivering 50 Amps of continuous current. Each IGBT is independently driven which enables 4-quadrant motion control and dynamic braking. Self-protection circuitry is employed to eliminate shoot-through events of in-line transistors. IGBT gates are driven with individually isolated floating supplies, not bootstrapping. This configuration allows for the use of sense resistors in any or all legs of the motor. Additionally, the ACT501-1 is capable of supplying continuous stall currents.	26 Plug-in package 3.0" x 2.1" x 0.39"

Standard Products for Avionic Applications

MIL-STD-1553 Encoder-Decoder

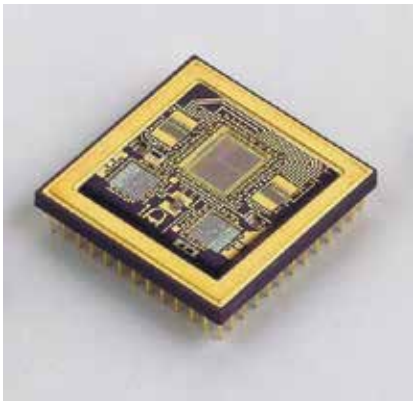
aeroflex.com/avionics

	Description	SMD #
CT1820	Data terminal bit processor for MIL-STD-1553 A & B, +5V 56-pin plug-in 2.2" x 1.2" also available in a 1.0" x 1.7" 60-lead flatpack.	5962-90636

MIL-STD-1553 Integrated Terminals

aeroflex.com/avionics

	Description	SMD #
CT2542 / CT2542-FP	78-pin quad plug-in 1.9" x 2.1" or 82-lead flatpack; dual redundant remote terminal with dual transceivers; +5V, -15V; 16-bit bus; 16 MHz; direct replacement for BUS65142.	5962-8979803
CT2553 / CT2553-FP	78-pin quad plug-in 1.9" x 2.1" or 82-lead flatpack; dual redundant BC/RT/MT protocol unit with dual transceivers; 8K x 16 Ram; +5V, -15V; direct replacement for BUS61553.	5962-8869201
CT2554 / CT2554-FP	Same as CT2553 except +5V, -12V; direct replacement for BUS61554.	5962-8869202
CT2555 / CT2555-FP	Same as CT2553 except +5V only; direct replacement for BUS61555.	5962-8869203
CT2578-P119	119-pin CPGA 1.3" sq.; Simple RT protocol unit with dual MIL-STD-1553 A/B transceivers; DMA handshake; +5V.	
CT2578-F84	Similar to CT2578-P119 except 84-lead CQFP 1.16" sq.	
ACT7006	Same as ACT7005 except with external SSF status bit control.	



MIL-STD-1553 Databus Transceivers Single Channel

aeroflex.com/avionics

	1553/1760	MacAir	Size	Package Type	Leads	Idle RCVR Outputs	Power Supplies	Turns Ratio	Transformer Center Tap Ground	SMD #
ACT4402	■		0.62″ x 1.25″	Plug-in	24	Low	+5V, ±15V	1.4:1	■	5962-86049
ACT4402I	■		0.62″ x 1.25″	Plug-in	24	High	+5V, ±15V	1.4:1	■	
ACT4404N** (replaces CT3232M)	■	■	1.27″ x 1.27″	Plug-in or Flatpack	24	High	+5V, ±12V to ±15V	1:1	Open	5962-91749
ACT4438-1, ACT4438-3	■		8 mm x 8 mm	BCC++	56	Low	+5V	2.5:1	■	
ACT4455	■		0.445″ x 0.445″	LCC	28	Low	+5V	2.5:1	■	5962-96741
ACT4459	■		0.445″ x 0.445″	LCC	28	High	+5V	2.5:1	■	5962-96741
ACT4406N (replaces ARX3404)	■	■	1.27″ x 1.27″	Plug-in or Flatpack	24	High	+5V, ±12V to ±15V	1:1	Open	5962-89592
ACT4407N (replaces CT3231M)	■		1.27″ x 1.27″	Plug-in or Flatpack	24	High	+5V, ±12V to ±15V	1:1	Open	5962-91749
ACT4418N*	■	■	1.27″ x 1.27″	Plug-in or Flatpack	24	Low	+5V, ±12V to ±15V	1:1	Open	5962-92085
ACT4435N (replaces CT1816 and CT1641)		H009	1.27″ x 1.27″	Plug-in or Flatpack	24	High	+5V, ±12V to ±15V	1:1	Open	
ACT4487 (equiv BUS8553) (replaces CT1487 and CT1487M)	■		0.805″ x 1.385″ 0.735″ x 1.315″	Plug-in and Flatpack	24	High	+5V, ±15V	1.4:1	■	
ACT4489	■			Plug-in and Flatpack	24		+5V, ±12V	1:1		
ACT4467N	■			Plug-in and Flatpack	24	Low	+5V, ±12V to ±15V	1:1		

* Variable Amplitude Transceiver (similar to ARX4418) - contact factory for information.
** Has external threshold control.

Standard Products for Avionic Applications

MIL-STD-1553 Databus Transceivers Dual Channel*

aeroflex.com/avionics

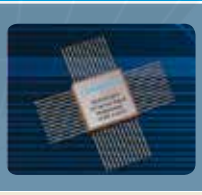
	1553/1760	MacAir	Size	Package Type	Leads	Variable Amplitude Transmitter	Power Supplies	Turns Ratio	Transformer Center Tap Ground	SMD #
ACT4419D	■		0.3″ x 1.2″	Plug-in	20	■	+5V	2.5:1	■	
ACT4419DF	■		0.3″ x 1.2″	Flatpack	20	■	+5V	2.5:1	■	
ACT4453	■		0.775″ x 1.9″	Plug-in or Flatpack	36		+5V	2.12:1	■	5962-89522
ACT4458	■		0.6″ x 0.8″	Flatpack	24		+5V	2.5:1	■	5962-92061
ACT4464	■		0.6″ x 0.8″	Flatpack	24		+5V	2.5:1	■	5962-92061
ACT4461DF	■		0.6″ x 0.8″	Flatpack	24		+5V	2.5:1	■	
ACT4468D (equiv NHI-1567)	■		0.3″ x 1.0″	Plug-in	20		+5V	2.5:1	■	
ACT4468DF	■		0.3″ x 1.0″	Flatpack	20		+5V	2.5:1	■	
ACT4462D (pin selectable H009 transmitter)	■	■ H009	0.62″ x 1.25″	Plug-in	24	■	+5V, ±12V to15V	1:1	Open	
ACT4469D		H009	0.62″ x 1.25″	Plug-in	24	■	+5V, ±15V	1:1	■	
ACT4479D		H009	0.775″ x 1.5″	Plug-in	28		+5V, ±15V	1:1	■	
ACT4479DF		H009	0.775″ x 1.5″	Flatpack	28		+5V, ±15V	1:1	■	
ACT4480-DFI		H009	0.6″ x 0.8″	Flatpack	24		+5V, ±12V to15V	1:1	■	N/A
ACT4489D	■		0.775″ x 1.9″	Plug-in	36		+5V, ±12V	1:1	■	
ACT4489DF	■		0.775″ x 1.9″	Flatpack	36		+5V, ±12V	1:1	■	
ACT4433D	■		0.775″ x 1.5″	Plug-in	28		+5V, ±12V	1:1	■	
ACT4433DF	■		0.775″ x 1.5″	Flatpack	28		+5V, ±12V	1:1	■	
ACT4487D (replaces CT1487D)	■		0.775″ x 1.9″	Plug-in	36		+5V, ±15V	1.4:1	■	5962-87579
ACT4487DI (replaces CT1487DI)	■		0.775″ x 1.9″	Plug-in	36		+5V, ±15V	1.4:1	■	5962-89447
ACT4487DF (replaces CT1487DFP)	■		0.775″ x 1.9″	Flatpack	36		+5V, ±15V	1.4:1	■	5962-87579
ACT4487DFI (replaces CT1487DIFP)	■		0.775″ x 1.9″	Flatpack	36		+5V, ±15V	1.4:1	■	5962-89447
ACT4436D	■		0.775″ x 1.5″	Plug-in	28		+5V, ±15V	1.4:1	■	
ACT4436DI	■		0.775″ x 1.5″	Plug-in	28		+5V, ±15V	1.4:1	■	5962-89447
ACT4436DF	■		0.775″ x 1.5″	Flatpack	28		+5V, ±15V	1.4:1	■	
ACT4436DFI	■		0.775″ x 1.5″	Flatpack	28		+5V, ±15V	1.4:1	■	5962-89447
ACT4808N-D	■	■	0.775″ x 1.9″	Plug-in	36		+5V, ±12V to ±15V	1:1	Open	
ACT4808N-DF	■	■	0.775″ x 1.9″	Flatpack	36		+5V, ±12V to ±15V	1:1	Open	
ACT4454	■	■		Flatpack	24		+5V	2.5:1		5962-92061
ACT4460	■	■		Flatpack	24		+5V	2.5:1		5962-92061

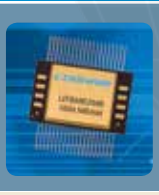
* See individual data sheets for receiver output idle low/high.

Alphabetical Product Index

Notes

Notes





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