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Microelectronic  
Solutions**

Digital,  
Analog,  
Power,  
RFMW,  
Motion...Solutions

**for HiRel Applications**

PDF.Support

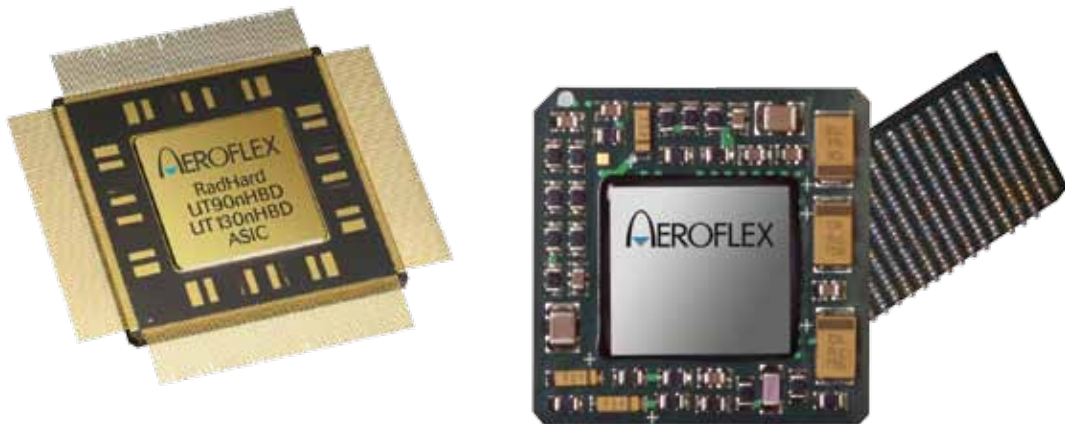
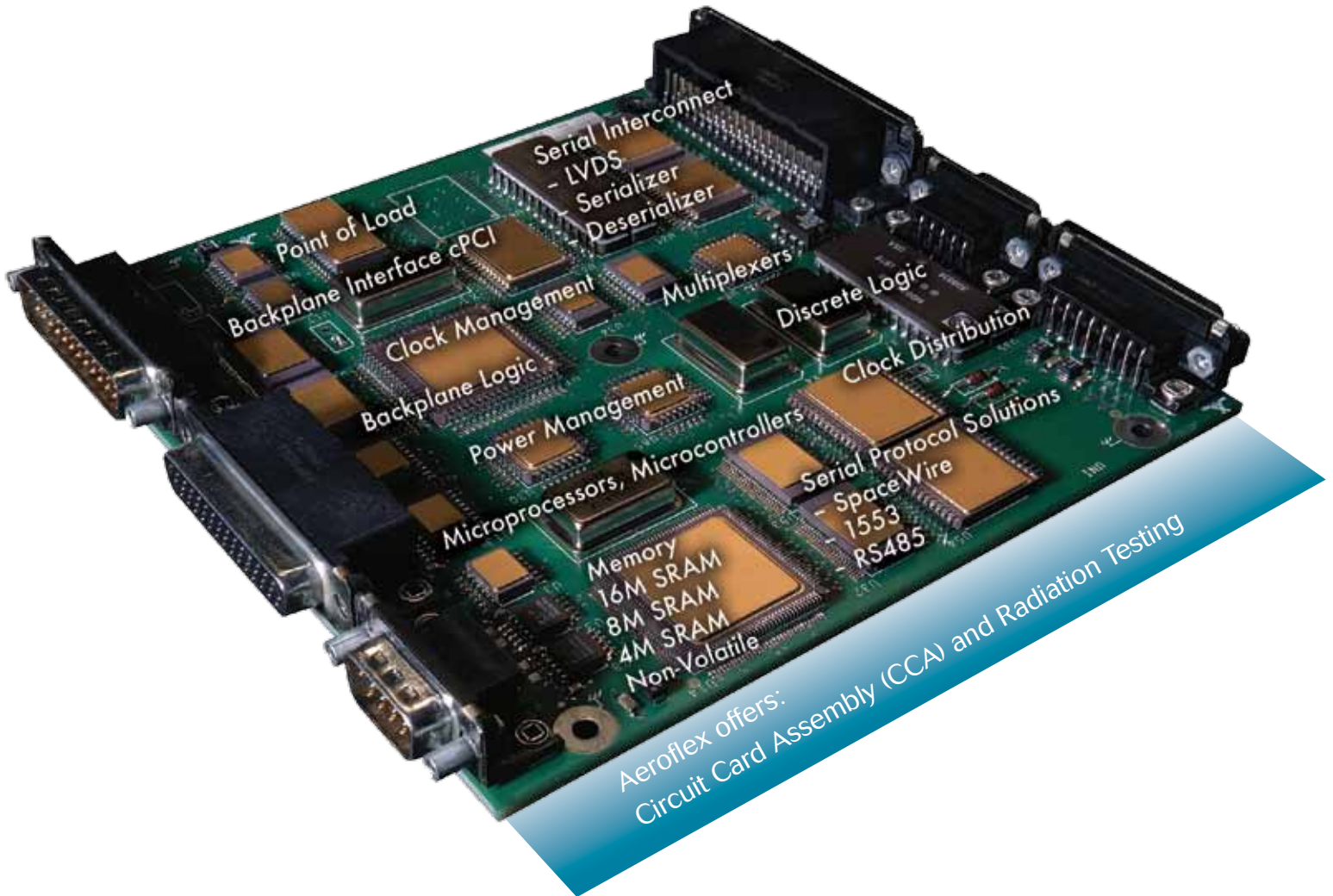


# Product Short Form

December 2012

# Aeroflex Microelectronic Solutions Product Short Form

Aeroflex Microelectronic Solutions is comprised of ten divisions – Colorado Springs, Gaisler, Motion Control, Plainview, RAD, RFMW (ACC, Inmet, Metelics/Metelics Hi-Rel, Nanjing, Weinschel) – offering digital, analog, power, RFMW and Motion Solutions for HiRel Applications with their standard and custom ASIC integrated circuits, Circuit Card Assembly, IP and Radiation Effects Testing.



Custom ASICs and Hybrids with Trusted Accreditation available from Aeroflex

# Aeroflex Microelectronic Solutions Product Short Form

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# Standard Products for HiRel Applications

LEON Microprocessors <i>aeroflex.com/LEON</i>		Description	Total Dose krad(Si)	LET <sub>eff</sub> (0.25) MeV - cm <sup>2</sup> /mg	Saturated Cross Section (cm <sup>2</sup> ) per device	Latch-Up Immune MeV - cm <sup>2</sup> /mg	Package	QML Q & V	SMD #
GR712RC Dual-Core LEON 3FT SPARC™ V8 32-bit Microprocessor	GR712RC is a dual-core LEON3FT 32-bit processor, with two full SPARC V8 compliant integer units and two high performance fully pipelined IEEE-754 floating point units capable of running at up to 125 MHz, equating to 300 DMIPS and 250 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 supported.	300*	> 118	240 FP	**	***			
UT699 32-bit Fault-Tolerant SPARC™ V8/LEON 3FT Processor	LEON 3FT 32-bit SPARC™ Microprocessor, full SPARC™ V8 compliant integer unit, capable of running up to a systems 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 supported.	300*	> 100	352 FP and 484 LGA	Q,V	5962-08228			
UT699E 32-bit Fault-Tolerant SPARC™ V8/LEON 3FT Processor †	LEON 3FT 32-bit SPARC™ Microprocessor, full SPARC™ V8 compliant integer unit, with 16kB of both instruction and data cache, capable of running up to a systems 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 4 SpaceWire ports, 32bit/33MHz PCI, 10/100 Ethernet, 2 CAN ports, and 1 debug port. Industry standard development tools supported.	100*	> 100	484 LGA	Q,V****	TBD			
UT700 32-bit Fault-Tolerant SPARC™ V8/LEON 3FT Processor †	LEON 3FT 32-bit SPARC™ Microprocessor, full SPARC™ V8 compliant integer unit, with 16kB of both instruction and data cache, capable of running up to a systems 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 supported.	100*	> 100	484 LGA	Q,V****	TBD			
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 up to 200Mbits/s, two CAN ports, on-board FLASH, SRAM, and SDRAM. 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.								
UT699 Single Board Computer	Off-the-shelf 3U cPCI form factor Single Board Computer (SBC) based on the UT699 LEON 3FT 32-bit SPARC™ V8 Microprocessor. The UT699 SBC addresses size (160mm x 100mm), weight (<4 pounds) and power (<5.5W). The UT699 SBC has a path to flight (non-flight and flight variants to be available). The UT699 SBC includes an FPGA, volatile and non-volatile memory, 10 user defined A/D channels, 194-pin mezzanine connectors (2) and the following interfaces: SpW (4), RS-485 (1), cPCI 33MHz/32bit (1), JTAG (2), 10/100 Ethernet (1) for terrestrial use. The non-flight UT699 SBC is also available in the ALEXIS (Aeroflex LEON Experimenter's Interface System) development platform.								
ALEXIS Development System	Aeroflex LEON Experimenter's Interface System is a ready-to-run development platform for customer applications with flexible architecture supporting quick path-to-flight after development. The ALEXIS platform is a 3U cPCI chassis which comes with one non-flight UT699 SBC, a video card, a power card and two cPCI slots for future card expansion. Pre-loaded operating systems and applications drivers are also included with the ALEXIS.								

†Product in development. Please call 800-645-8862 for more information or visit the web site [aeroflex.com/LEON](http://aeroflex.com/LEON).

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

Microcontrollers/ Microprocessors <i>aeroflex.com/microcontrollers</i>		Description	Total Dose krad(Si)	LET <sub>eff</sub> (0.25) MeV - cm <sup>2</sup> /mg	Saturated Cross Section (cm <sup>2</sup> ) per device	Latch-Up Immune MeV - cm <sup>2</sup> /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.

# Standard Products for HiRel Applications

## HiRel Memories

[aeroflex.com/memories](http://aeroflex.com/memories)

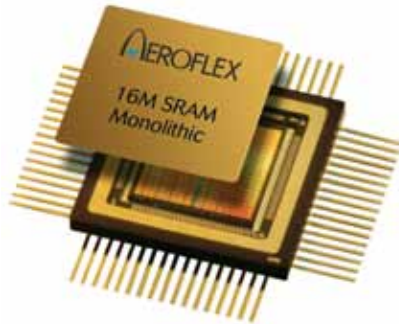
	Configuration	Voltages	Access/Clock	Total Dose (krad(Si))	LET <sub>crit</sub> (0.25) MeV - cm <sup>2</sup> /mg	Saturated Cross Section (cm <sup>2</sup> ) Per bit	Latch-Up Immune MeV - cm <sup>2</sup> /mg	CMOS Inputs	Package	QML Q & V	SMD #
UT8R128K32 SRAM	128K x 32	3.3V*	15 ns	300	50	1.7E-7	>100	■	68 FP	Q,V	5962-03236
UT8R512K8 SRAM	512K x 8	3.3V*	15 ns	300	50	1.7E-7	>100	■	36 FP	Q,V	5962-03235
UT8CR512K32 SRAM	512K x 32	3.3V*	17 ns	300	50	1.7E-7	>100	■	68 FP	Q,V	5962-04227
UT8ER512K32 SRAM Monolithic	512K x 32	3.3V*	20 ns	100	N/A**	N/A**	>100	■	68 FP	Q,V	5962-06261
UT8Q512E 4M SRAM	512K x 8	3.3V	20 ns	30	50	2.8E-8	>100	■	36 FP	Q,V	5962-99607
UT8Q512K32E 16M SRAM MCM	512K x 32	3.3V	25 ns	30	50	2.8E-8	>100	■	68 FP	Q,V	5962-01533
UT9Q512E 4M SRAM	512K x 8	5V	20 ns	30	50	2.8E-8	>100	■	36 FP	Q,V	5952-00536
UT9Q512K32E 16M SRAM MCM	512K x 32	5V	25 ns	30	50	2.8E-8	>100	■	68 FP	Q,V	5962-01511
UT8ER1M32 32M SRAM MCM	1M x 32	3.3V*	20 ns	30	N/A**	N/A**	>100	■	132 FP	Q,V	5962-10202
UT8ER2M32 64M SRAM MCM	2M x 32	3.3V*	22 ns	100	N/A**	N/A**	>100	■	132 FP	Q,Q+	5962-10203
UT8ER4M32 128M SRAM MCM	4M x 32	3.3V*	25 ns	100	N/A**	N/A**	>100	■	132 FP	Q,Q+***	5962-10204
UT8R1M39 40M SRAM MCM	1M x 39	3.3V*	20 ns	100	15	8.0E-8	>100	■	132 FP	Q,V	5962-10205
UT8R2M39 80M SRAM MCM	2M x 39	3.3V*	22 ns	100	15	8.0E-8	>100	■	132 FP	Q,Q+	5962-10206
UT8R4M39 160M SRAM MCM	4M x 39	3.3V*	25 ns	100	15	8.0E-8	>100	■	132 FP	Q,V***	5962-10207
UT8MR2M8 16M MRAM	2M x 8	3.3V	40 ns	1000	N/A****	N/A****	>100	■	40 FP	Q,V***	5962-12227
UT8MR8M8 64M MRAM	4 - 2M x 8	3.3V	50 ns	1000	N/A****	N/A****	>100	■	64 FP	Q,V***	TBD
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.										

\* 1.8V core.

\*\* The SEU error rate is driven by particle flux and EDAC scrub rate. The error rate is 6x10<sup>-16</sup> errors/bit-day.

\*\*\* QML qualification in process.

\*\*\*\* No upsets at LET of 100 MeV - cm<sup>2</sup>/mg.



# Standard Products for HiRel Applications



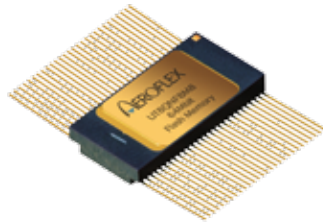
## QCOTS™ Memories (Quantified Commercial Off-the-Shelf)

[aeroflex.com/memories](http://aeroflex.com/memories)

	Configuration	Voltages	Access/Clock	Total Dose krad(Si)	LET <sub>T10</sub> (0.25) MeV - cm <sup>2</sup> /mg	Saturated Cross Section (cm <sup>2</sup> ) per bit	Latch-Up Immune MeV - cm <sup>2</sup> /mg	CMOS Inputs	TTL Inputs	Package	QML Q, T & V	SMD #
UT7Q512 4M SRAM	512K x 8	5V	100 ns	30	5	1.0E-7	>80	■	■	32 FP	Q,T	5962-99606
UT8Q512 4M SRAM*	512K x 8	3.3V	20 ns	50	10	5.0E-9	>80	■	■	36 FP	Q,T	5962-99607
UT8Q1024K8 8M SRAM*	1024K x 8	3.3V	25 ns	50	10	5.0E-9	>80	■	■	44 FP	Q,T	5962-01532
UT8Q512K32 16M SRAM MCM*	512K x 32	3.3V	25 ns	50	10	5.0E-9	>80	■	■	68 FP	Q,T	5962-01533
UT8SDMQ64M40 2.5Gb SDRAM MCM	64M x 40	3.3V	7.5 ns	100	21	7.6E-10	>100	■	■	128 FP	Q,Q+	5962-10229
UT8SDMQ64M48 3.0Gb SDRAM MCM	64M x 48	3.3V	7.5 ns	100	21	7.6E-10	>100	■	■	128 FP	Q,Q+	5962-10230
UT8QNFM8 64M NOR Flash	8M x 8 and 4M x 16	3.3V	60 ns	30 and 50**	29	5.0E-13	>80	■	■	48 FP	Q,Q+	5962-12204

\* Contact factory for availability.

\*\* Device 10% powered on and 90% powered off.



## Legacy Memories

[aeroflex.com/memories](http://aeroflex.com/memories)

	Configuration	Voltages	Access/Clock	Total Dose krad(Si)	LET <sub>T10</sub> (0.25) MeV - cm <sup>2</sup> /mg	Saturated Cross Section (cm <sup>2</sup> ) per bit	Latch-Up Immune MeV - cm <sup>2</sup> /mg	CMOS Inputs	TTL Inputs	Package	QML Q, T & V	SMD #
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
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

\* Saturated Cross Section (cm<sup>2</sup>) per device.

# Standard Products for HiRel Applications

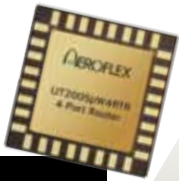


## Clocks

[aeroflex.com/clocks](http://aeroflex.com/clocks)

	Frequency	# of Clocks	Crystal Capable	LVDS Ref	LVCMOS Outputs	LVDS Outputs	Total Dose krad(Si)	LET <sub>ONSET</sub> MeV - cm <sup>2</sup> /mg	Saturated Cross Section (cm <sup>2</sup> /per bit MeV - cm <sup>2</sup> /mg	V <sub>DD</sub> Core	V <sub>DD</sub> 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 V thru 3.6 V	2.0 V thru 3.6 V	14 CFP	Q,V	5962-06233
UT7R2XLR816	2 to 200 MHz	16	■	■	■	■	100	109	*	>109	3.3 V	2.25 to 3.6 V	168 CLGA 168 CBGA 168 CCGA	Q,V	5962-08243
UT7R995C-EVB	Includes user selected crystal or digital interface, flexible feedback selection series, 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

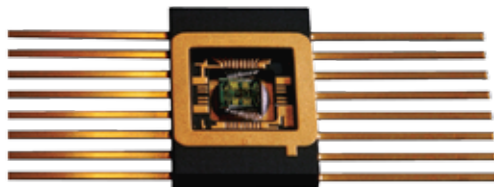
[aeroflex.com/spacewire](http://aeroflex.com/spacewire)

	Links	Data Rates Mbps	Voltages	Total Dose krad(Si)	LET <sub>TN</sub> (0.25) MeV - cm <sup>2</sup> /mg	Saturated Cross Section (cm <sup>2</sup> per device	Latch-Up Immune MeV - cm <sup>2</sup> /mg	Package	QML Q & V	SMD #
UT200SpWPHY01 SpaceWire Physical Layer Transceiver	1	200	3.3V	100	109	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	100	*	>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 Aeroflex 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

# Standard Products for HiRel Applications

LVDS aeroflex.com/LVDS	Description								
								+3.3V	+5V
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
UT54LVDS031 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
UT54LVDS032 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 $\mu$ A (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 $\mu$ A (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. 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





# Standard Products for HiRel Applications

## MIL-STD-1553 Databus

[aeroflex.com/databus](http://aeroflex.com/databus)  
[aeroflex.com/avionics](http://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 $\mu$ MMIT™ E	■	■			■		■	■	■	■	■			132	84		HR1, AV	Q,V	5962-92118
UT69151 $\mu$ MMIT™ LXE	■			■	■		■	■	■	■	■			100	96		HR2, AV	Q,V	5962-94663
UT69151 $\mu$ MMIT™ DXE	■					■	■	■	■	■	■			100	96		HR1, AV	Q,V	5962-94663
UT69151 $\mu$ MMIT™ XTE	■			■	■		■	■	■	■	■	■		140	139		AV	Q	5962-94758
UT69151 $\mu$ MMIT™ RTE	■					■	■		■	■	■	■		132, 140	139		AV	Q	5962-98587
UT1553B BCRT	■	■				■	■		■	■	■			84	84		AV	Q,V	5962-88628
UT1553B BCRTM	■	■				■	■	■	■	■	■			84	84		AV	Q,V	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

\* End of Life (EOL) for +15V and +12V.

## MIL-STD-1553/RS485 Transceivers

[aeroflex.com/transceivers](http://aeroflex.com/transceivers)  
[aeroflex.com/avionics](http://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	HR3	Q,V	5962-93226
UT63M1XX Bus Transceiver*		■ 1553A	■	■		■	100	36 FP	AV	Q,V	5962-88644
UT63M143 Bus Transceiver		■			■	■	100	24 FP	HR3	Q,V	5962-07242
ACT4453 Dual Transceiver				■			100	36 FP		H,K	5962-89522
DRS4485 RS485/422 Dual Transceiver	■			■		■	100	18 FP		K	5962-09226

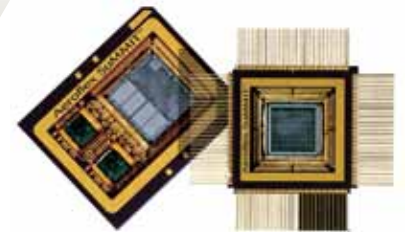
\* End of Life (EOL) for UT63M1XX Bus Transceiver.

## Application Options

	Total Dose krad(Si)	LET <sub>Ti</sub> (0.25) MeV - cm <sup>2</sup> /mg	Saturated Cross Section (cm <sup>2</sup> ) per bit	Latch-Up Immune MeV - cm <sup>2</sup> /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.



# Standard Products for HiRel Applications

## MSI Logic

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

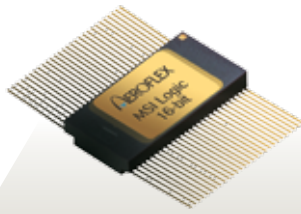
[www.aeroflex.com/Logic](http://www.aeroflex.com/Logic)

SMD #	Aeroflex Part #	Description	SMD #	Aeroflex Part #	Description
5962-96512 5962-96513 5962-96513	UT54ACS00 UT54ACTS00 ★UT54ACTS00E	Quadruple 2-Input NAND Gates	5962-96560 5962-96561	UT54ACS169 UT54ACTS169	4-Bit Up-Down Binary Counters
5962-96514 5962-96514 5962-96515 5962-96515	UT54ACS02 ★UT54ACS02E UT54ACTS02 ★UT54ACTS02E	Quadruple 2-Input NOR Gates	5962-96562 5962-96563	UT54ACS190 UT54ACTS190	Synchronous 4-Bit Up-Down BCD Counters
5962-96516 5962-96517 5962-96517	UT54ACS04 UT54ACTS04 ★UT54ACTS04E	Hex Inverters	5962-96564 5962-96565	UT54ACS191 UT54ACTS191	Synchronous 4-Bit Up-Down Binary Counters
5962-96518 5962-06518 5962-06519 5962-96519	UT54ACS08 ★UT54ACS08E UT54ACTS08 ★UT54ACTS08E	Quadruple 2-Input AND Gates	5962-96566 5962-96567 5962-96566	UT54ACS193 UT54ACTS193 ★UT54ACS193E	Synchronous 4-Bit Up-Down Dual Clock
5962-96520 5962-96521	UT54ACS10 UT54ACTS10	Triple 3-Input NAND Gates	5962-96753	UT54ACTS220	Clock & Wait-State Generation Circuit
5962-96522 5962-96523	UT54ACS11 UT54ACTS11	Triple 3-Input AND Gates	5962-96568 5962-96569	UT54ACS240 UT54ACTS240	Octal Buffers w/Inverted Three-State Outputs
5962-96524 5962-96524 5962-96525 5962-96525	UT54ACS14 ★UT54ACS14E UT54ACTS14 ★UT54ACTS14E	Hex Inverter Schmitt Trigger	5962-96570 5962-96571	UT54ACS244 UT54ACTS244	Octal Buffers & Line Drivers, Three-State Outputs
5962-96526 5962-96527	UT54ACS20 UT54ACTS20	Dual 4-Input NAND Gates	5962-96572	UT54ACS245S	Schmitt Trigger Octal Bus Tran- sceivers w/Three-State Outputs
5962-96528 5962-96529	UT54ACS27 UT54ACTS27	Triple 3-Input NOR Gates	5962-96572 5962-96573 5962-96573	UT54ACS245 UT54ACTS245 ★UT54ACTS245E	Octal Bus Transceivers with Three-State Outputs
5962-96530 5962-96531	UT54ACS34 UT54ACTS34	Hex Noninverting Buffers	5962-96574 5962-96575	UT54ACS253 UT54ACTS253	Dual 4-Input Multiplexers
5962-96532 5962-96533	UT54ACS54 UT54ACTS54	4-Wide AND-OR- INVERT Gates	5962-96576 5962-96577	UT54ACS264 UT54ACTS264	Look-Ahead Carry Generators for Counters
5962-96534 5962-96535 5962-90535	UT54ACS74 UT54ACTS74 ★UT54ACTS74E	Dual D Flip-Flops with Clear & Preset	5962-96578 5962-96579	UT54ACS273 UT54ACTS273	Octal D Flip-Flops with Clear
5962-96536 5962-96537	UT54ACS85 UT54ACTS85	4-Bit Comparators	5962-96580 5962-96581	UT54ACS279 UT54ACTS279	Quadruple S-R Latches
5962-96538 5962-96539	UT54ACS86 UT54ACTS86	Quadruple 2-Input Exclusive OR Gates	5962-96582 5962-96583	UT54ACS280 UT54ACTS280	9-Bit Parity Generators/Checkers
5962-96540 5962-96540 5962-96541	UT54ACS109 ★UT54ACS109E UT54ACTS109	Dual J-K Flip-Flops	5962-96584 5962-96584 5962-96585	UT54ACS283 ★UT54ACS283E UT54ACTS283	4-Bit Binary Full Adders
5962-96542 5962-96542 5962-96543	UT54ACS132 ★UT54ACS132E UT54ACTS132	Quadruple 2-Input NAND Schmitt Triggers	5962-06238	★UT54ACS299E	Universal Shift/Storage Register
5962-96544 5962-96544 5962-96545	UT54ACS138 ★UT54ACS138E UT54ACTS138	3-Line to 8-Line Decoders/Demultiplexers	5962-96586 5962-96587	UT54ACS365 UT54ACTS365	Hex Buffer/Line Driver with Three-State Outputs
5962-96546 5962-96547	UT54ACS139 UT54ACTS139	Dual 2-Line to 4-Line Decoders/Demultiplexers	5962-96588 5962-96589	UT54ACS373 UT54ACTS373	Octal Transparent Latches with Three-State Outputs
5962-96548 5962-96549	UT54ACS151 UT54ACTS151	1 of 8 Data Selectors/Multiplexers	5962-96590 5962-96591	UT54ACS374 UT54ACTS374	Octal D Flip-Flops with Three-State Outputs
5962-96550 5962-96551 5962-96551	UT54ACS153 UT54ACTS153 ★UT54ACTS153E	Dual 4-Input Multiplexer	5962-96592 5962-96593	UT54ACS540 UT54ACTS540	Octal Driver, with Inverted Three-State Output
5962-96552 5962-96553 5962-96553	UT54ACS157 UT54ACTS157 ★UT54ACTS157E	Quadruple 2 to 1 Multiplexers	5962-96594 5962-96595 5962-96595	UT54ACS541 UT54ACTS541 ★UT54ACTS541E	Octal Driver, with Three-State Output
5962-96554 5962-96555	UT54ACS163 UT54ACTS163	4-Bit Synchronous Counters	5962-06239	UT54ACS630	EDAC
5962-96556 5962-96556 5962-96557 5962-96557	UT54ACS164 ★UT54ACS164E UT54ACTS164 ★UT54ACTS164E	8-Bit Shift Registers	5962-96596 5962-96597	UT54ACS4002 UT54ACTS4002	Dual 4-Input NOR Gate
5962-96558 5962-96558 5962-96559	UT54ACS165 ★UT54ACS165E UT54ACTS165	8-Bit Parallel Shift Registers	5962-06240	UT54ACTS899	Latchable Transceiver with Parity Generator/Checker
			5962-94754	UT22VP10	RadPal One Time Programmable Logic Array

★ 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<sup>2</sup>/mg. We offer 14, 16, and 20 flatpack and 14, 16, and 20 DIP.

# Standard Products for HiRel Applications



## MSI Logic (16-bit wide)

[aeroflex.com/16BitLogic](http://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 Transceiver 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

## RadTol Eclipse FPGAs

[aeroflex.com/FPGA](http://aeroflex.com/FPGA)

	SRAM bits	Logic Cells	Total Dose krad(Si)	LET <sub>eff</sub> (0.25) MeV - cm <sup>2</sup> /mg	Saturated Cross Section (cm <sup>2</sup> ) per bit	Latch-Up Immune MeV - cm <sup>2</sup> /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 Rapid Prototyping	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
UT6325 Factory Programming Flow	Aeroflex provides an in-house solution for FPGA programming, HTOL/LTOL stress and electrical/parametric test. Requires customer input for programming and test vector files. Options exist for program only through full program, stress and test flow.									
UT100SpW02 SpaceWire IP Protocol Handler	The UT100SpW02 SpaceWire Protocol Handler IP is designed specifically for use with Aeroflex'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.									

# Standard Products for HiRel Applications



## Analog-to-Digital Converters

[aeroflex.com/AtoD](http://aeroflex.com/AtoD)

Description	Total Dose krad(Si)	Latch-Up Immune MeV - cm <sup>2</sup> /mg	Voltage (V)	Package	Class S	QML Q & V	SMD #
RAD1419	800 kSPS, 14-bit sampling analog-to-digital converter	100	55	±5V	28 FP	S	N/A
UT14AD20P	14-bit, 20-MSPS pipeline analog-to-digital converter	300	120	1.8/3.3V	100 CQFP		Q,V* TBD
UT16AD40P †	16-bit, 40-MSPS pipeline analog-to-digital converter	300	120	1.8/3.3V	100 CQFP		Q,V* TBD
UT16AD40DC †	16-bit, 40-MSPS pipeline analog-to-digital converter for DC Inputs	300	120	1.8/3.3V	100 CQFP		Q,V* TBD
UT16AD80P †	16-bit, 80-MSPS pipeline analog-to-digital converter	300	120	1.8/3.3V	100 CQFP		Q,V* TBD

† Product in development. Please call 800-645-8862 for more information or visit the web site [aeroflex.com/HiRel](http://aeroflex.com/HiRel).

\* QML V pending.

## Multiplexed Analog-to-Digital Converters

[aeroflex.com/AtoD](http://aeroflex.com/AtoD)

Description	Package	SMD #
Single power supply operation: 3.3V to 5V Radiation performance: CMOS ELDRS Immune Total dose > 1 Mrad(Si) SEL Immune > 100 MeV-cm <sup>2</sup> /mg Displacement Damage > 10 <sup>14</sup> neutrons/cm <sup>2</sup>		
RHD5940 50 kSPS, 14-bit, tri-state output analog-to-digital converter	24 SOIC	5962-1220701KXC
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 very high level of telemetry integration interfacing many sensor voltage readings to the digital processor data bus.	48 CQFP	5962-1220301KXC
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 very high level of telemetry integration interfacing many sensor voltage readings to the digital processor data bus.	40 CQFP	5962-1220302KXC



## Digital-to-Analog Converters

[aeroflex.com/AtoD](http://aeroflex.com/AtoD)

Description	Package	SMD #
Single power supply operation: 3.3V to 5V Radiation performance: CMOS ELDRS Immune Total dose > 1 Mrad(Si) SEL Immune > 100 MeV-cm <sup>2</sup> /mg Displacement Damage > 10 <sup>14</sup> neutrons/cm <sup>2</sup>		
RHD5930 Digital to Analog Converter, 11-bit, ladder output	16 SOIC	5962-1120801KXC
RHD5931 Digital to Analog Converter, 11-bit, buffered output	16 SOIC	5962-1120802KXC
RHD5932 Digital to Analog Converter, 14-bit, buffered output	20 SOIC	5962-1120803KXC

# Standard Products for HiRel Applications

## Multiplexers, Analog

[aeroflex.com/Mux](http://aeroflex.com/Mux)

	Total Channels	Common	Kelvin Measurement	Transorb Input ESD Protection	# Address Busses	# Enable Lines	V+	V-	V <sub>DIg</sub>	R <sub>DS(on)</sub> (Ω Typical)	Access Time (ns Typical)	Input Range - Min(V)	Input Range - Max(V)	Total Dose krad(Si)	SEL - LET <sub>TH</sub> MeV - cm <sup>2</sup> /mg	Package	SMD #
RHD5928 *	8	8			1	1	+5V	GND	N/A	<750	150	0V	+5V	1000	100	16 SOIC	5962-1220801KXC
MUX8520	16	16	■		1	1	+15V	-15V	+5V	<2000	<1500	-5V	+15V	300	120	56 CQFP	5962-0922901KXC
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	5962-1024301KXC
RHD5921 * Buffered	16	16			1	1	+5V	GND	N/A	N/A	<2000	0V	+5V	1000	100	24 SOIC	5962-1024302KXC
RHD5922 * Sample/Hold	16	16			1	1	+5V	GND	N/A	N/A	<5000	0V	+5V	1000	100	24 SOIC	5962-1024303KXC
MUX8521	16		16	■	1	1	+15V	-15V	+5V	<2000	<1500	-5V	+15V	300	120	56 CQFP	5962-0922902KXC
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	5962-0922903KXC
MUX8523	32	32	■		2	2	+15V	-15V	+5V	<2000	<1500	-5V	+15V	300	120	56 CQFP	5962-0922904KXC
MUX8532	32	32			2	2	+15V	-15V	+5V	<1200	<600	-5V	+15V	150	90	56 CQFP	5962-0923003KXC
MUX8533	32	32	■		2	2	+15V	-15V	+5V	<1200	<600	-5V	+15V	150	90	56 CQFP	5962-0923004KXC
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	5962-1220901KXC
MUX8503	48	48	■		1	3	+15V	-15V	+5V	<2000	<1500	-5V	+15V	300	120	96 CQFP	5962-0323403KXC
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	5962-1221001KXC
MUX8502	48		48	■	1	3	+15V	-15V	+5V	<2000	<1500	-5V	+15V	300	120	96 CQFP	5962-0323401KXC
MUX8506	48		48		1	3	+15V	-15V	+5V	<2000	<1500	-5V	+15V	300	120	96 CQFP	5962-0323402KXC
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	5962-0050201KXC
MUX8507	64	32	32		2	4	+15V	-15V	+5V	<2000	<1500	-5V	+15V	300	120	96 CQFP	5962-1021201KXC
MUX8510	64	32	32	■	2	4	+15V	-15V	+5V	<1200	<600	-5V	+15V	150	90	96 CQFP	5962-0920201KXC
MUX8501	64	64		■	2	4	+15V	-15V	+5V	<2000	<1500	-5V	+15V	300	120	96 CQFP	5962-0050202KXC
MUX8509	64	64			2	4	+15V	-15V	+5V	<2000	<1500	-5V	+15V	300	120	96 CQFP	5962-1021202KXC
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	5962-1221101KXC

\* Power Supply requirements: Only +5V and ground.



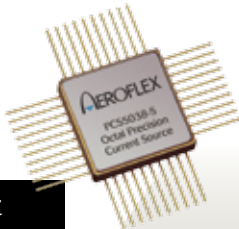
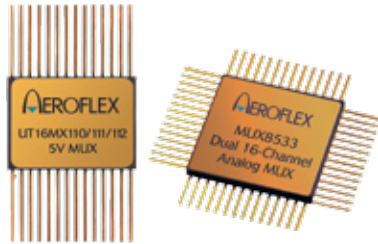
# Standard Products for HiRel Applications

## Multiplexers, Analog

[aeroflex.com/Mux](http://aeroflex.com/Mux)

	Asynchronous LVC MOS Interface	Synchronous LVC MOS Interface	LVC MOS SPI™ Interface	CMOS	Digital I/O Supply	Total Dose krad(Si)	LET <sub>DNSET</sub> MeV · cm <sup>2</sup> /mg	Latch-Up Immune MeV · cm <sup>2</sup> /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.



## Precision Current Sources (PCS)

[aeroflex.com/PCS](http://aeroflex.com/PCS)

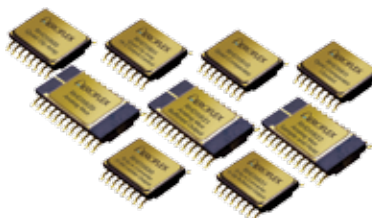
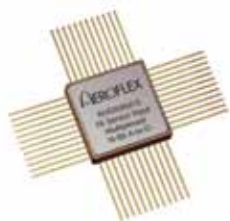
	Description	Total Dose krad(Si)	Package	SMD #
PCS5035 Quintet Precision Current Source	Monolithic quintet (5) precision current sources (each at 80µA) designed for thermistor current monitor and resistive sensor applications. Built-in comparators and precision internal 2.0VDC reference further simplifies the application design.	100	18 FP	5962-0923401KXC
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	5962-1223201KYC

# Standard Products for HiRel Applications

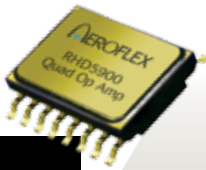
## RadHard-by-Design Analog Function Series

aeroflex.com/rhdseries

	Description	Package	SMD #
	Single power supply operation: 3.3V to 5V Radiation performance: CMOS ELDRS Immune Total dose > 1 Mrad(Si) SEL Immune > 100 MeV-cm <sup>2</sup> /mg Displacement Damage > 10 <sup>14</sup> neutrons/cm <sup>2</sup>		
<b>Quad Op Amps</b>			
RHD5900	Quad Operational Amplifier with rail-to-rail inputs and outputs for general purpose operational amplifier applications.	16 SOIC	5962-1024101KXC
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	5962-1024102KXC
RHD5902	Higher-speed version of RHD5901 providing wider bandwidth and faster slew rate.	16 SOIC	5962-1024103KXC
RHD5903	Quad Differential output operational amplifier. Outputs are centered at VDD/2.	20 SOIC	5962-1223701KXC
<b>Quad Instrumentation Amps</b>			
RHD5904	Quad Instrumentation Amplifier. Gain 1, output centered at VDD/2.	16 SOIC	5962-1024104KXC
RHD5905	Differential output version of RHD5904.	20 SOIC	5962-1223702KXC
<b>Quad Comparators</b>			
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	5962-1024201KXC
RHD5911	Quad Comparator with clocked comparator pairs to access & hold data until needed.	16 SOIC	5962-1024202KXC
RHD5912	Quad Comparator with open drain outputs.	16 SOIC	5962-1024203KXC
<b>Analog Multiplexers</b>			
RHD5920	16:1 analog multiplexer. Channel selection is controlled by 4-bit binary addressing and an active low enable.	24 SOIC	5962-1024301KXC
RHD5921	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	5962-1024302KXC
RHD5922	16:1 sample-and-hold multiplexer. Channel selection is controlled by a 4-bit binary address bus. Signal acquisition is controlled by internal low leakage sample-and-hold circuitry buffered by a unity gain rail-to-rail amplifier.	24 SOIC	5962-1024303KXC
RHD5928	8:1 analog multiplexer. Channel selection is controlled by 3-bit binary addressing and an active low enable.	16 SOIC	5962-1220801KXC
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	5962-1221101KXC
RHD8543	48 channels. Triple 16:1, common address inputs A(0-3), separate enable and output.	96 CQFP	5962-1221001KXC
RHD8544	32 channels. Dual 16:1, separate address inputs A(0-3) and B(0-3), separate enable and output.	56 CQFP	5962-1220901KXC
<b>Digital-to-Analog Converters</b>			
RHD5930	Digital to Analog Converter, 11-bit, ladder output.	16 SOIC	5962-1120801KXC
RHD5931	Digital to Analog Converter, 11-bit, buffered output.	16 SOIC	5962-1120802KXC
RHD5932	Digital to Analog Converter, 14-bit, buffered output.	20 SOIC	5962-1120803KXC
<b>Analog-to-Digital Converters</b>			
RHD5940	14-bit, tri-state output, 50 kSPS Analog-to-Digital Converter	24 SOIC	5962-1220701KXC
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 very high level of telemetry integration interfacing many sensor voltage readings to the digital processor data bus.	48 CQFP	5962-1220301KXC
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 very high level of telemetry integration interfacing many sensor voltage readings to the digital processor data bus.	40 CQFP	5962-1220302KXC
<b>Voltage Level Translators</b>			
RHD5980	Octal Bidirectional Voltage Level Shifter	24 SOIC	5962-1221301KXC



# Standard Products for HiRel Applications



## Op Amps

[aeroflex.com/opamp](http://aeroflex.com/opamp)

	Description	Package	SMD #
	Single power supply operation: 3.3V to 5V Radiation performance: CMOS ELDRS Immune Total dose > 1 Mrad(Si) SEL Immune > 100 MeV-cm <sup>2</sup> /mg Displacement Damage > 10 <sup>14</sup> neutrons/cm <sup>2</sup>		
RHD5900 Quad Op Amp	Quad Operational Amplifier with rail-to-rail input and outputs for general purpose operational amplifier applications.	16 SOIC	5962-1024101KXC
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	5962-1024102KXC
RHD5902 Quad Op Amp	Higher-speed version of RHD5901 providing wider bandwidth and faster slew rate.	16 SOIC	5962-1024103KXC
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	5962-1024104KXC
RHD5905 Quad Instrumentation Amplifiers	Differential output version of RHD5904.	20 SOIC	5962-1223702KXC

## Comparators

[aeroflex.com/opamp](http://aeroflex.com/opamp)

	Description	Package	SMD #
	Single power supply operation: 3.3V to 5V Radiation performance: CMOS ELDRS Immune Total dose > 1 Mrad(Si) SEL Immune > 100 MeV-cm <sup>2</sup> /mg Displacement Damage > 10 <sup>14</sup> neutrons/cm <sup>2</sup>		
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	5962-1024201KXC
RHD5911 Quad Comparator	Quad Comparator with clocked comparator pairs to access & hold data until needed.	16 SOIC	5962-1024202KXC
RHD5912 Quad Comparator	Quad Comparator with open drain outputs with Vol < 1.0 V with sink current 20 mA.	16 SOIC	5962-1024203KXC



## Pulse Width Modulators (PWM)

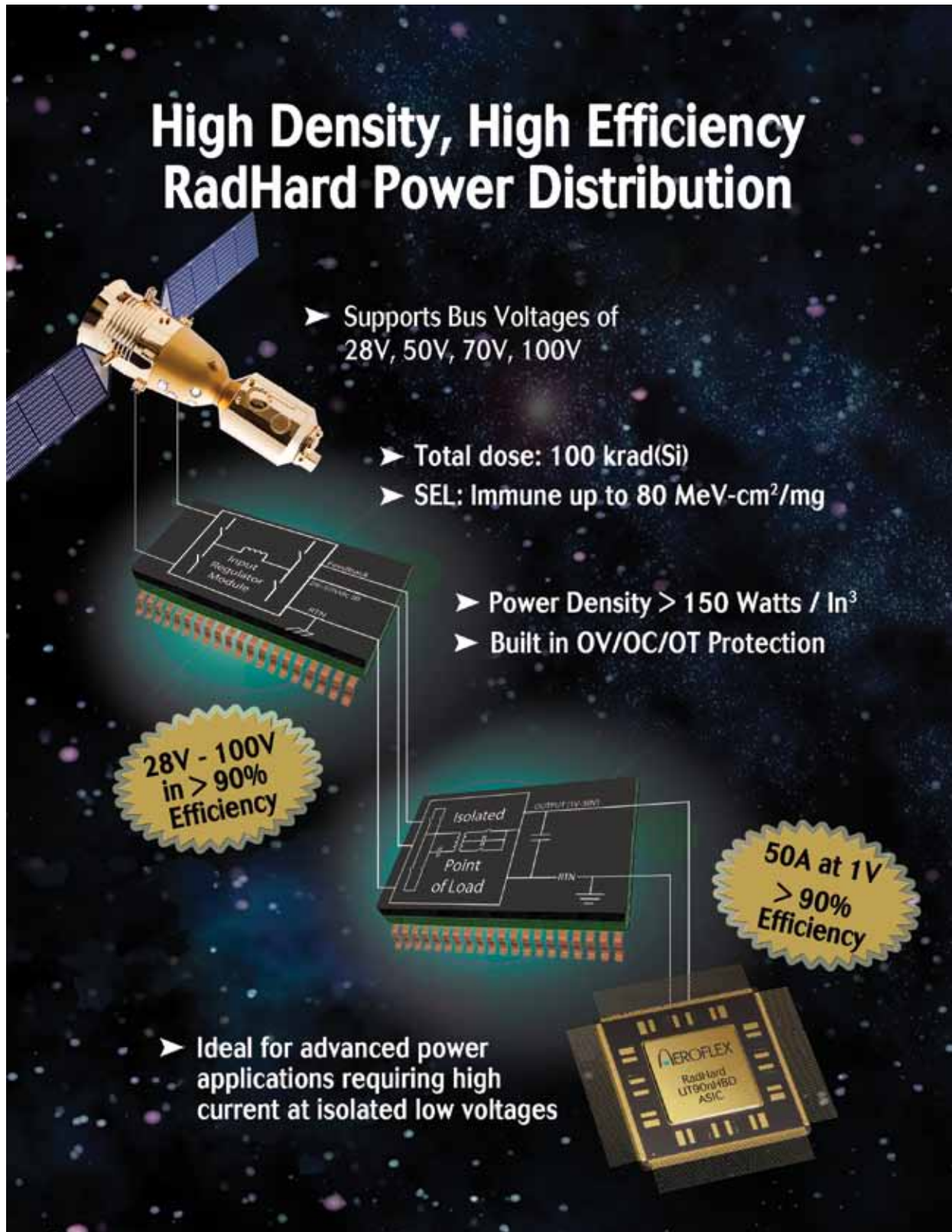
[aeroflex.com/PWM](http://aeroflex.com/PWM)

	Description	Total Dose krad(Si)	LET <sub>onset</sub> MeV - cm <sup>2</sup> /mg	Latch-Up Immune MeV - cm <sup>2</sup> /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



## Switching Regulators – Coming Soon

Email [info-ams@aeroflex.com](mailto:info-ams@aeroflex.com) for more information.



**High Density, High Efficiency  
RadHard Power Distribution**

- Supports Bus Voltages of 28V, 50V, 70V, 100V
- Total dose: 100 krad(Si)
- SEL: Immune up to 80 MeV-cm<sup>2</sup>/mg
- Power Density > 150 Watts / In<sup>3</sup>
- Built in OV/OC/OT Protection

**28V - 100V  
in > 90%  
Efficiency**

**50A at 1V  
> 90%  
Efficiency**

➤ Ideal for advanced power applications requiring high current at isolated low voltages

**AEROFLEX  
RadHard  
UT50n150  
ASIC**



## DIODES

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# Standard Products for HiRel Applications

MOSFETS aeroflex.com/MOSFETS	Breakdown Potential (V)	$R_{DS(on)}$ (mOhms)	Drain Current (A)	Gate Charge (nC)	Total Dose krad(Si)	SEE *	Die Size	Package	Screening
RAD7110-NCx	100	220	3.5	15	100	Au, Xe	1	Bare Die	Prototype, EM, Space
RAD7110-NFx	100	250	3.5	15	100	Au, Xe	1	TO-39	Prototype, EM, Space
RAD7130-NCx	100	80	TBD	50	100	Au, Xe	3	Bare Die	Prototype, EM, Space
RAD7130-NNJx	100	80	TBD	50	100	Au, Xe	3	SMD 0.5	Prototype, EM, Space
RAD7130-Nyx	100	TBD	TBD	50	100	Au, Xe	3	TO-257AA	Prototype, EM, Space
RAD7160-NCx	100	10	60	150	100	Au, Xe	6	Bare Die	Prototype, EM, Space
RAD7160-NNAx	100	13	45	150	100	Au, Xe	6	SMD 2	Prototype, EM, Space
RAD7160-NMx	100	18	35	150	100	Au, Xe	6	TO-254AA	Prototype, EM, Space
RAD7114-NCx	150	600	2.2	15	100	Au, Xe	1	Bare Die	Prototype, EM, Space
RAD7114-NFx	150	630	2.2	15	100	Au, Xe	1	TO-39	Prototype, EM, Space
RAD7134-NCx	150	100	TBD	50	100	Au, Xe	3	Bare Die	Prototype, EM, Space
RAD7134-NNJx	150	100	TBD	50	100	Au, Xe	3	SMD 0.5	Prototype, EM, Space
RAD7134-Nyx	150	TBD	TBD	50	100	Au, Xe	3	TO-257AA	Prototype, EM, Space
RAD7164-NCx	150	24	35	150	100	Au, Xe	6	Bare Die	Prototype, EM, Space
RAD7164-NNAx	150	27	35	150	100	Au, Xe	6	SMD 2	Prototype, EM, Space
RAD7164-NMx	150	32	35	150	100	Au, Xe	6	TO-254AA	Prototype, EM, Space
RAD7210-NCx	200	700	2.0	15	100	Au, Xe	1	Bare Die	Prototype, EM, Space
RAD7210-NFx	200	730	2.0	15	100	Au, Xe	1	TO-39	Prototype, EM, Space
RAD7230-NCx	200	150	TBD	50	100	Au, Xe	3	Bare Die	Prototype, EM, Space
RAD7230-NNJx	200	150	TBD	50	100	Au, Xe	3	SMD 0.5	Prototype, EM, Space
RAD7230-Nyx	200	TBD	TBD	50	100	Au, Xe	3	TO-257AA	Prototype, EM, Space
RAD7260-NCx	200	34	30	150	100	Au, Xe	6	Bare Die	Prototype, EM, Space
RAD7260-NNAx	200	37	30	150	100	Au, Xe	6	SMD 2	Prototype, EM, Space
RAD7260-NMx	200	42	30	150	100	Au, Xe	6	TO-254AA	Prototype, EM, Space

\* SEE (Single Event Effects)

Units exhibit immunity to SEGR and SEB at listed ion when tested at full rated drain potential and in the off-state. The following ion characteristics were used: Xe, 10MeV/n Berkeley beam. Initial LET of approximately 60MeV-cm<sup>2</sup>/mg. Au, 1.7MeV/n Brookhaven beam. Initial LET of approximately 84MeV-cm<sup>2</sup>/mg. See SEB/SEGR reports for full details.

x = P for prototypes, E for engineering samples, S for Class S.



# Standard Products for HiRel Applications

## MOSFETs aeroflex.com/MOSFETS

	Breakdown Potential (V)	$R_{DS(on)}$ (mOhms)	Drain Current (A)	Gate Charge (nC)	Total Dose krad(Si)	SEE *	Die Size	Package	Screening
RAD7214-NCx	250	1200	1.5	15	100	Au, Xe	1	Bare Die	Prototype, EM, Space
RAD7214-NFx	250	1200	1.5	15	100	Au, Xe	1	TO-39	Prototype, EM, Space
RAD7214-NQx	250	1200	1.2	15	100	Au, Xe	Quad	LCC-28	Prototype, EM, Space
RAD7214-NGx	250	1200	1.2	15	100	Au, Xe	Quad	DIP-14	Prototype, EM, Space
RAD7234-NCx	250	250	9.0	50	100	Au, Xe	3	Bare Die	Prototype, EM, Space
RAD7234-NNJx	250	250	9.0	50	100	Au, Xe	3	SMD 0.5	Prototype, EM, Space
RAD7234-NYx	250	250	9.0	50	100	Au, Xe	3	TO-257AA	Prototype, EM, Space
RAD7264-NCx	250	51	28	150	100	Au, Xe	6	Bare Die	Prototype, EM, Space
RAD7264-NNAx	250	54	28	150	100	Au, Xe	6	SMD 2	Prototype, EM, Space
RAD7264-NMx	250	59	28	150	100	Au, Xe	6	TO-254AA	Prototype, EM, Space

### \* SEE (Single Event Effects)

Units exhibit immunity to SEGR and SEB at listed ion when tested at full rated drain potential and in the off-state. The following ion characteristics were used: Xe, 10MeV/n Berkeley beam. Initial LET of approximately 60MeV-cm<sup>2</sup>/mg. Au, 1.7MeV/n Brookhaven beam. Initial LET of approximately 84MeV-cm<sup>2</sup>/mg. See SEB/SEGR reports for full details.

x = P for prototypes, E for engineering samples, S for Class S.

## Aeroflex RAD MOSFET Numbering

RAD	7	1	1	0	-	N	M	P	X
	TID Level	Breakdown	Die Size	Breakdown Adder		Channel Type	Package	Screening	Technology
	7-100 krad(Si)	1 - 100V 2 - 200V	1 - Size 1 3 - Size 3 6 - Size 6	0 - None 3 - 30V 4 - 50V		N - N Type P - P Type M - Mixed	C - Bare Die F - TO39 NJ - SMD 0.5 M - TO-254AA Q - LCC 28 Pin G - DIP 14 Pin NA - SMD 2 Y - TO-257AA	P - Proto E - EM S - Space	Reserved

# Standard Products for HiRel Applications



## NPN Transistors

[aeroflex.com/transistors](http://aeroflex.com/transistors)

	Slash Sheet	$V_{CE0}$ (V <sub>US</sub> )	$V_{CB0}$	$I_{C(max)}$	$f_{FE}$ @ $I_C / V_{CE}$	$C_{ob0}$	$f_T$	Package
NPN Transistors		Volts	Volts	Amps	min/max@A/V	pF	MHz	
2N3055	407	70	100	15	20/60 @ 4/4	700	0.8	TO-3
2N3418*	393	60	85	3	20/60 @ 1/2	150	26	TO-5 / TO-39
2N3419*	393	80	125	3	20/60 @ 1/2	150	26	TO-5 / TO-39
2N3420*	393	60	85	3	40/20 @ 1/2	150	26	TO-5 / TO-39
2N3421*	393	80	125	3	40/20 @ 1/2	150	26	TO-5 / TO-39
2N3715	408	60	80	10	30/120 @ 3/2	500	4	TO-3
2N3716	408	80	100	10	30/120 @ 3/2	500	4	TO-3
2N3766	518	60	80	4	40/160 @ .5/5	50	10	TO-66
2N3767	518	80	100	4	40/160 @ .5/5	50	10	TO-66
2N3879	526	75	120	7	20/80 @ 4/5	175	40	TO-66
2N3902	371	400	700	3.5	30/90 @ 1/5	250	2.5	TO-3
2N4150	394	70	100	10	40/120 @ 5/5	350	15	TO-5 / TO-39
2N4237	581	40	50	1	30/150 @ .25/1	100	30	TO-39
2N4238	581	60	80	1	30/150 @ .25/1	100	30	TO-39
2N4239	581	80	100	1	30/150 @ .25/1	100	30	TO-39
2N5152*	544	80	100	2	30/90 @ 2.5/5	250	60	TO-5 / TO-39
2N5154*	544	80	100	2	70/200 @ 2.5/5	250	70	TO-5 / TO-39
2N5157	371	500	700	3.5	30/90 @ 1/5	250	2.5	TO-3
2N5339*	560	100	100	5	60/240 @ 2/2	250	30	TO-39
2N5681	583	100	100	1.0	40/150 @ .25/2	50	30	TO-39
2N5682	583	120	120	1.0	40/150 @ .25/2	50	30	TO-39
2N6058	502	80	80	12	1K/18K @ 6/3	300	10	TO-3
2N6059	502	100	100	12	1K/18K @ 6/3	300	10	TO-3
2N6249	510	200	300	10	10/50 @ 10/3	500	2.5	TO-3
2N6250	510	275	375	10	8/50 @ 10/3	500	2.5	TO-3
2N6251	510	350	450	10	6/50 @ 10/3	500	2.5	TO-3
2N6283	504	80	80	20	1.25K/18K @ 10/3	350	8	TO-3
2N6284	504	100	100	20	1.25K/18K @ 10/3	350	8	TO-3
2N6300	539	60	60	8	750/18K @ 4/3	200	25	TO-66
2N6301	539	80	80	8	750/18K @ 4/3	200	25	TO-66
2N6383	523	40	40	10	1K/20K @ 5/3	200	20	TO-3
2N6384	523	60	60	10	1K/20K @ 5/3	200	20	TO-3
2N6385	523	80	80	10	1K/20K @ 5/3	200	20	TO-3
2N6674	537	300	450	15	8/20 @ 10/2	500	15	TO-3
2N6675	537	400	650	15	8/20 @ 10/2	500	15	TO-3
2N6676	538	300	450	15	8/20 @ 15/3	500	15	TO-3
2N6678	538	400	650	15	8/20 @ 15/3	500	15	TO-3

AVAILABLE IN JAN, JANTX AND JANTXV PER APPLICABLE SLASH SHEET.

\* JANS QUALIFICATION COMING SOON.



## NPN RadHard Small Signal Transistors

[aeroflex.com/transistors](http://aeroflex.com/transistors)

	Slash Sheet	$V_{CE0}$ (V <sub>US</sub> )	$V_{CB0}$	$I_{C(max)}$	$f_{FE}$ @ $I_C / V_{CE}$	$C_{ob0}$	$f_T$	Package
RadHard Small Signal Transistors		Volts	Volts	Amps	min/max@A/V	pF	MHz	
JANS2N2219*	251	50	75	0.8	100/300 @ .15/10	8	250	TO-5 / TO-39
JANS2N2222A	255	50	75	0.8	100/300 @ .15/10	8	250	TO-18, UA, UB
JANS2N2484*	376	60	60	0.05	250/800 @ .001/5	5	60	TO-18, UA, UB
JANS2N3019*	391	80	140	1	100/300 @ .15/10	12	100	TO-5 / TO-39
JANS2N3700*	391	80	140	1	100/300 @ .15/10	12	100	TO-18, UA, UB


JANS2N2222A, UA AND UB QUALIFIED TO MIL-PRF-19500/255 RAD HARD QUALIFICATION COMING SOON.

\* JANS AND JANSR COMING SOON.

# Standard Products for HiRel Applications

## PNP Transistors

aeroflex.com/transistors




	Slash Sheet	$V_{CE0}(sus)$	$V_{CB0}$	$I_{C(max)}$	$f_{FE} @ I_C / V_{CE}$	$C_{ob0}$	$f$	Package
PNP Transistors		Volts	Volts	Amps	min/max@A/V	pF	MHz	
2N3740*	441	60	60	4	30/120 @ .25/1	100	5	TO-66
2N3741*	441	80	80	4	30/120 @ .25/1	100	5	TO-66
2N3791	379	60	60	10	30/120 @ 3/2	500	4	TO-3
2N3792	379	80	80	10	30/120 @ 3/2	500	4	TO-3
2N3867*	350	40	40	3	40/200 @ 1.5/2	120	60	TO-5 / TO-39
2N3868*	350	60	60	3	30/150 @ 1.5/2	120	60	TO-5 / TO-39
2N4234	580	40	40	1	30/150 @ .25/1	100	30	TO-39
2N4235	580	60	60	1	30/150 @ .25/1	100	30	TO-39
2N4236	580	80	80	1	30/150 @ .25/1	100	30	TO-39
2N5151*	545	80	100	2	30/90 @ 2.5/5	250	60	TO-5 / TO-39
2N5153*	545	80	100	2	70/200 @ 2.5/5	250	70	TO-5 / TO-39
2N6051	501	80	80	12	1K/18K @ 6/3	300	10	TO-3
2N6052	501	100	100	12	1K/18K @ 6/3	300	10	TO-3
2N6193*	561	100	100	5	60/240 @ 2/2	300	30	TO-39
2N6286	505	80	80	20	1.25K/18K @ 10/3	400	8	TO-3
2N6287	505	100	100	20	1.25K/18K @ 10/3	400	8	TO-3
2N6298	540	60	60	8	750/18K @ 4/3	200	25	TO-66
2N6299	540	80	80	8	750/18K @ 4/3	200	25	TO-66

AVAILABLE IN JAN, JANTX, AND JANTXV. QUALIFICATION ON /350 COMING SOON.

\* JANS QUALIFICATION COMING SOON.

## PNP RadHard Small Signal Transistors

aeroflex.com/transistors




	Slash Sheet	$V_{CE0}(sus)$	$V_{CB0}$	$I_{C(max)}$	$f_{FE} @ I_C / V_{CE}$	$C_{ob0}$	$f$	Package
RadHard Small Signal Transistors		Volts	Volts	Amps	min/max@A/V	pF	MHz	
JANS2N2905A*	290	60	60	0.6	100/300 @ .15/10	8	200	TO-5 / TO-39
JANS2N2907A*	291	60	60	0.6	100/300 @ .15/10	8	250	TO-18, UA, UB

\* JANS AND JANSR COMING SOON.

## Silicon Controlled Rectifiers

aeroflex.com/transistors



	Slash Sheet	$V_{DRM}$	$I_C$	$I_{Tmax}$	$V_{GT}$	$I_{GT}$	$I_{HOX}$	Package
Silicon Controlled Rectifiers		Volts	mA	$\mu A$	Volts min/max	$\mu A$	mA	
2N2323	276	50	220	10	0.35/0.80	200	2	TO-5
2N2323S	276	50	220	10	0.35/0.80	200	2	TO-39
2N2323A	276	50	220	10	0.35/0.60	20	2	TO-5
2N2323AS	276	50	220	10	0.35/0.60	20	2	TO-39
2N2324	276	100	220	10	0.35/0.80	200	2	TO-5
2N2324S	276	100	220	10	0.35/0.80	200	2	TO-39
2N2324A	276	100	220	10	0.35/0.60	20	2	TO-5
2N2324AS	276	100	220	10	0.35/0.60	20	2	TO-39
2N2326	276	200	220	10	0.35/0.80	200	2	TO-5
2N2326S	276	200	220	10	0.35/0.80	200	2	TO-39
2N2326A	276	200	220	10	0.35/0.60	20	2	TO-5
2N2326AS	276	200	220	10	0.35/0.60	20	2	TO-39
2N2328	276	300	220	10	0.35/0.80	200	2	TO-5
2N2328S	276	300	220	10	0.35/0.80	200	2	TO-39
2N2328A	276	300	220	10	0.35/0.60	20	2	TO-5
2N2328AS	276	300	220	10	0.35/0.60	20	2	TO-39
2N2329	276	400	220	10	0.35/0.80	200	2	TO-5
2N2329S	276	400	220	10	0.35/0.80	200	2	TO-39
2N2329A	276	400	220	10	0.35/0.60	20	2	TO-5
2N2329AS	276	400	220	10	0.35/0.60	20	2	TO-39

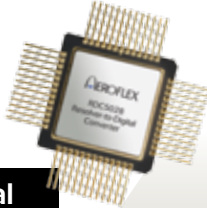
AVAILABLE IN JAN, JANTX AND JANTXV.

# Standard Products for HiRel Applications

## Nuclear Event Detector (NED)

[aeroflex.com/HiRel](http://aeroflex.com/HiRel)

	Description					Package		
		Total Dose krad(Si)	LET <sub>ONSET</sub> MeV - cm <sup>2</sup> /mg	Latch-Up Immune MeV - cm <sup>2</sup> /mg	Voltage (V)		QML Q & V	SMD #
UTNEDCC301	Dual channel, multi-radiation, nuclear event detector. User-selectable dose rate thresholds from 1E5 to 1E7 rad(Si)/sec using threshold adjust resistor. Response time of < 10 nsec.	1000	100	110	5	14 CFP	N/A	SCD



## Resolver-to-Digital Converter (RDC)

[aeroflex.com/RDC](http://aeroflex.com/RDC)

	Description				Package	SMD #
		Total Dose krad(Si)	Latch-Up Immune MeV - cm <sup>2</sup> /mg			
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	5962-0423503KXC	



# Battery Power Management (BEU) for HiRel Applications

Battery Electronics Units <i>aeroflex.com/BEU</i>		Cells	Description	Size
Aeroflex Plainview'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 or visit the web site [aeroflex.com/BEU](http://aeroflex.com/BEU).

Battery Interface Electronic Assembly <i>aeroflex.com/BEU</i>		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 includes 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



# Processing Solutions for HiRel Applications

## Licensable IP Cores and Processors

[aeroflex.com/Gaisler](http://aeroflex.com/Gaisler)

	Description
LEON3 SPARC V8 Processor Core	The LEON3 is a synthesisable 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 netlist.
LEON3FT for Actel RTAX FPGAs	The LEON3FT adapted for optimum performance using the Actel RTAX 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 netlist.
LEON4 SPARC V8 Processor Core	The LEON4 is a synthesisable VHDL model of a 32-bit processor compliant with the SPARC V8 architecture. The LEON4 implements 64/128 bit buses and caches which improves the performance. The model is highly configurable, and particularly suitable for system-on-a-chip (SOC) designs. Delivery format is source code.

## Licensable IP Cores

[aeroflex.com/Gaisler](http://aeroflex.com/Gaisler)

	Description
GRLIB - Portable IP library	The GRLIB IP Library is an integrated set of about 70 reusable IP cores, designed for system-on-chip (SOC) development. The IP cores are centered around the common 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 netlist.
GRPCI - Master/Target PCI Bridge	The GRPCI 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 source code.
GRSPW2 - SpaceWire Link	The GRSPW2 implements a SpaceWire Codec 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 transfers. Delivery format is netlist.
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 netlist.
GRETH - 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 transfers. 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. UTM1, UTM1+ 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. Separate transmit and receive buffers are assumed. Reception and transmission of sets of messages can be ongoing simultaneously. Delivery format is source code.
GRI2C - Inter IC Bus Interface	The IC 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.
GRSPI - 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 - Cryptography 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.
Spacecraft Data Handling	The 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.

# Processing Solutions for HiRel Applications

## Components

[aeroflex.com/Gaisler](http://aeroflex.com/Gaisler)

	Description
GR701A	GR701A is a PCI to SpaceWire and 1553 Bridge. Its fault tolerant design is implemented using the Actel RTAX FPGA technology to enable total immunity to radiation effects.
LEON3FT - RTAX	LEON3FT-RTAX is an implementation of the LEON3FT SPARC V8 processor using the Actel RTAX FPGA technology. The fault tolerant design of the processor in combination with the radiation tolerant FPGA gives total immunity to radiation effects.
RT-SPW-ROUTER	The Radiation-Tolerant SpaceWire Router family is available as standard components using the Actel 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.
GR712RC	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 total immunity to radiation effects.

## Software Tools

[aeroflex.com/Gaisler](http://aeroflex.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.
TSIM ERC32/LEON Simulator	TSIM is an instruction-level simulator capable of emulating ERC32- and LEON-based computer systems. TSIM is developed for near-real time performance and cycle true behaviour. Using the simulators, it is possible to develop and debug target applications before the real hardware is available, thereby shortening the product development cycle.
GRSIM LEON Multi-Processor Simulator	The GRSIM simulator emulates a multi-processor LEON3 system, and has an accurate modelling of the on-chip IP cores and AMBA buses. It is time-based rather than instruction-based (as TSIM) and can be attached to other simulation frameworks such as System-C.

## Compilers and Operating Systems

[aeroflex.com/Gaisler](http://aeroflex.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 4.8.0 or 4.6.5, 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.
SnapGear Embedded LINUX for LEON	LINUX is open source and royalty-free. SnapGear Linux is a full source package, containing kernel, libraries and application code for rapid development of embedded Linux systems. The LEON port of SnapGear supports both MMU and non-MMU LEON configurations, as well as the optional V8 mul/div instructions and Floating-Point Unit (FPU). The port includes Symmetric Multi-Processing (SMP) support for LEON3 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.
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

[aeroflex.com/Gaisler](http://aeroflex.com/Gaisler)

	Description
GR712RC-Board	Development board with GR712RC dual core LEON3FT SPARC V8 microprocessor capable of running at a system clock speed of 100MHz. The board supports Ethernet, 6 SpaceWire ports capable of running up to 200Mbit/s, 2 CAN ports, dual I553, SPI, I <sup>2</sup> C, on-board FLASH, SRAM and SDRAM. A USB debug port is provided.
GR-CPCI-LEON4-N2X	Development board with a quad core LEON3FT 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, 8 SpaceWire ports capable of running up to 200Mbit/s, SpaceWire router, I553, SPI, on-board FLASH, DDR2, and SDRAM. A USB debug port is provided.
GR-CPCI-UT699	Development board with the UT699 LEON3FT SPARC V8 microprocessor is 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 USB, Ethernet, Video, PS2, SO-DIMM, SRAM, FLASH, DSU UART, user and memory expansion connectors.
GR-LEON4-ITX	Low cost, dual core LEON4 development board. The board provides USB, Ethernet, PCI, Video, PS2, I2C, SPI, DDR2 SDRAM, 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

[aeroflex.com/Gaisler](http://aeroflex.com/Gaisler)

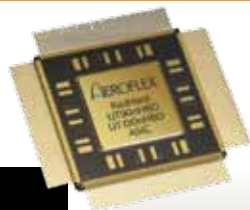
	Description
GR-RASTA Spacecraft Avionics Development Platform	LEON3FT based avionics development platform in standalone, bench-top configuration. Supports 32-bit/33MHz PCI, Ethernet, CAN, I553, CCSDS TM/TC, SpaceWire links capable of running up to 200Mbit/s. The platform is configurable and built to customer needs.

## Test Equipment

[aeroflex.com/Gaisler](http://aeroflex.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 of transmission bit rate.
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](http://aeroflex.com/RadHardASIC)

### Description

UT0.6μCRH - 0.6μm	<p>&gt; 500 K usable gates; clock rates &gt; 150 MHz; +5 V and +3.3 V operation; CMOS processed in commercial fab; RadHard from 100 to 300 krad(Si). QML V &amp; Q.</p> <ul style="list-style-type: none"> <li>• Ideal for small FPGA and CPLD conversions</li> <li>• Lowest NRE</li> <li>• Fully Trusted supply chain</li> <li>• True 5 V drive capability</li> <li>• RadHard process</li> </ul>
UT0.25μHBD - 0.25μm	<p>Up to 3.0 M usable gates; toggle rates &gt; 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 &amp; Q.</p> <ul style="list-style-type: none"> <li>• Bigger FPGA conversions</li> <li>• 5 V tolerant inputs</li> <li>• RadHard-by-Design</li> <li>• Cost effective NRE</li> </ul>
UT130nHBD - 130nm	<p>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).</p> <ul style="list-style-type: none"> <li>• SoC Platform design re-use with Leon SPARC V8 Processor-based standard products</li> <li>• Proven IP from Gaisler and Aeroflex</li> <li>• FPGA development boards for prototyping</li> <li>• Highest density silicon for cost effective unit prices</li> </ul>
UT90nHBD - 90nm †	<p>HBD performance ASICs. Up to 40 M usable gates; toggle rates up to 10 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).</p> <ul style="list-style-type: none"> <li>• Configurable High Speed serial I/O supports SerDes, Rapid I/O and XAUI standards</li> <li>• State of the Art Trusted On shore fab</li> <li>• Ready for Design starts – RadHard Library available now!</li> </ul>
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

† Product in development. Please call 800-645-8862 for more information or visit the web site [aeroflex.com/RadHardASIC](http://aeroflex.com/RadHardASIC).

## RadHard Mixed-Signal ASIC Products

[aeroflex.com/RadHardASIC](http://aeroflex.com/RadHardASIC)

### Description

UT0.6μCRH-0.6μm	<ul style="list-style-type: none"> <li>• 3.3 and 5.0 V Digital Core and/or I/O supplies</li> <li>• Up to 20 V HV transistors</li> <li>• RadHard from 100 to 300 krad(Si), Latch-Up Immune &gt; 110 MeV cm<sup>2</sup>/mg</li> <li>• QML Q&amp;V</li> <li>• 500 K gates with toggle rates up to 215 MHz.</li> <li>• Extensive analog IP including bandgaps, op-amps, ADCs, DACs, oscillators, level-translators</li> </ul>
UT0.35μCRH-0.35μm	<ul style="list-style-type: none"> <li>• 3.3 and 5.0 V Digital Core and/or I/O supplies</li> <li>• Substrate Isolated: Bipolar supplies from ±1.65 V to ±20 V</li> <li>• Up to 40 V HV transistors</li> <li>• RadHard from 100 to 300 krad(Si), Latch-Up Immune &gt; 110 MeV cm<sup>2</sup>/mg</li> <li>• Commercial, Hi-Rel, QML Q&amp;V</li> <li>• 1.5 M gates with toggle rates up to 375 MHz</li> <li>• Extensive analog IP including 8-bit to 21-bit ADCs, DACs, op-amps, prog. filters, bandgaps, switched-cap circuits, voltage regulators, low R<sub>DS(on)</sub> switches, oscillators, level translators, Aeroflex proprietary RadHard One-Time Electrically Programmable Metal Fuse NV Memory</li> </ul>
UT0.18μCRH-0.18μm	<ul style="list-style-type: none"> <li>• 1.8, 3.3 and 5.0 V Digital Core and/or I/O supplies</li> <li>• Substrate Isolated: Bipolar supplies from ±0.9 V to ±2.5 V</li> <li>• RadHard from 100 krad(Si) to 1 Mrad(Si), Latch-Up Immune &gt; 110 MeV cm<sup>2</sup>/mg</li> <li>• Commercial, Hi-Rel, QML pending</li> <li>• 8 M gates with toggle rates up to 2.4 GHz</li> <li>• 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</li> </ul>
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.

# Electronic Manufacturing Services (EMS)

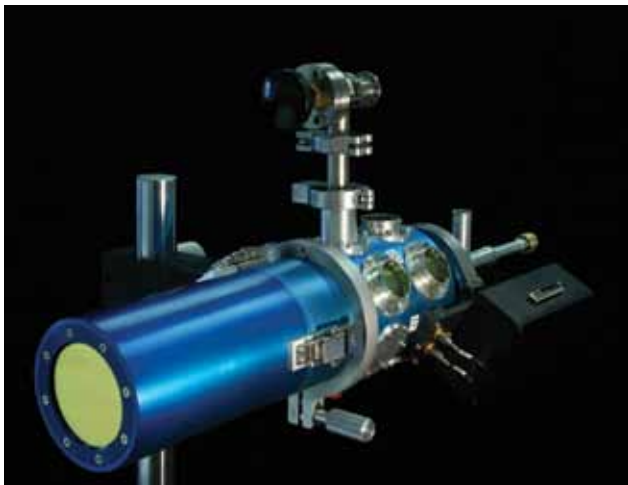
## MIL-STD Radiation Effects Test Services

[aeroflex.com/RAD](http://aeroflex.com/RAD)

- Total Ionizing Dose (TID) RLAT (50 to 300 rads/sec)
  - MIL-STD-883 TM 1019, Cond. A
- TID ELDRS (10 to 100 mrad/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



*Aeroflex RAD's 14MeV Neutron Irradiator*



*Cryogenic Dewar Test Chamber*

## Single Event Effects Testing

[aeroflex.com/SEE](http://aeroflex.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

[aeroflex.com/RAD](http://aeroflex.com/RAD)

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

Backside thinning to 35 $\mu$ m allows for SEE testing at TAMU or Berkeley without repackaging of ICs.

### Finished Package Backside Thinning

- Package backside thinning to 35 $\mu$ m  $\pm$ 5 $\mu$ m
- 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 ( $\pm$ 5 $\mu$ m)

### 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

## Device Screening and Element Evaluation

[aeroflex.com/RAD](http://aeroflex.com/RAD)

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

### Screening Test Method Capabilities

Test Description	MIL-STD Test Methods	
	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
Hermeticity (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

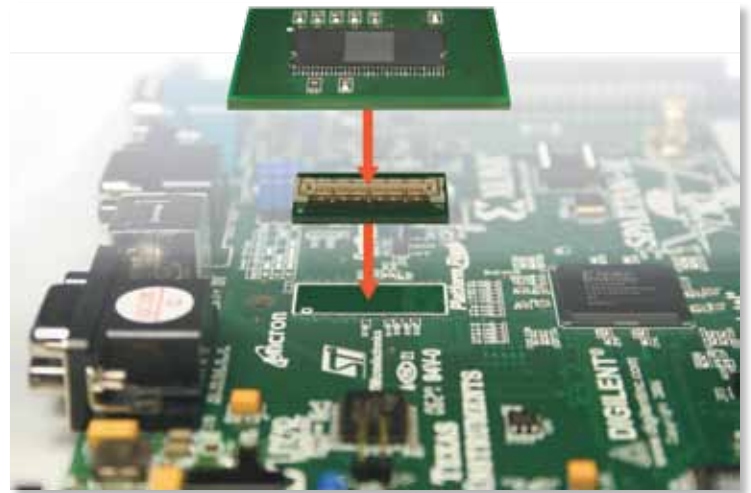
## Quick-Turn Prototype IC Assembly

[aeroflex.com/RAD](http://aeroflex.com/RAD)

Aeroflex 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, Sidebrazed, 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](http://aeroflex.com/CCA)

The Aeroflex Colorado Springs 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. Aeroflex 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.

## Aerospace Advantages

- High-reliability standards
- Board layout
- Low volume orders
- Supplier and BOM management
- Access to Aeroflex 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 Aeroflex 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





# Electronic Manufacturing Services (EMS)

## Aeroflex Trusted Accreditation [aeroflex.com/trusted](http://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. government users. The scope of the accreditation includes:

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

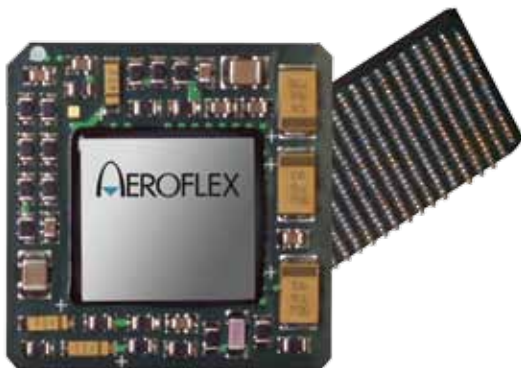
Aeroflex Plainview received Category 1A Trusted Accreditation in 2010. Their scope includes:

- Multi-Chip Module and Hybrid Microcircuit Packaging and Assembly

## Custom Hybrid, MCM, Module, Box Assembly and Testing Services [aeroflex.com/ems](http://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 / MW Manufacturing Services for High Volume Phased Array Antennas



# Motion Solutions for HiRel Applications

## Motion Control Products

[aeroflex.com/motion](http://aeroflex.com/motion)

### Description

Aeroflex Motion Control Products provides complete and integrated motion solutions for space, military, avionics, and strategic industrial customers such as motors, actuators, controllers, gimbals, slip rings, twist capsules and custom designed products.

## Actuators

[aeroflex.com/motion](http://aeroflex.com/motion)

### Description

### Operating Torque



Aeroflex has a significant heritage in actuation. This extensive experience allows us to build-in application-dependent customer design options for: motor selection; gear set; special interfaces; position feedback; pass-through for cabling/RF. We can modify existing designs to fit a specific application, or formulate a complete custom design. These designs can accommodate tough environmental requirements, including extreme temperatures, vacuum, radiation, dust, and corrosive atmospheres.

16239	16:1 planetary gearhead with 10 MM Ø stepper motor	1.1 in-oz
16356	16:1 planetary gearhead with 10 MM Ø BDC motor	1.3 in-oz
16250	21.8:1 planetary gearhead with stepper motor	13 in-oz
16240	256:1 planetary gearhead with 10 MM Ø stepper motor	13.5 in-oz
16358	256:1 planetary gearhead with 10 MM Ø BDC motor	18.5 in-oz
16229	4:1 planetary gearhead with 1.8 degree hybrid stepper motor	140 in-oz
16243	10:1 planetary gearhead with 1.8 degree hybrid stepper motor	345 in-oz
16401	60:1 Harmonic Drive with 3.75 degree stepper motor	16 in-lb
16434	3954:1 planetary gearhead with BDC motor and integrated electronics	60 in-lb
16379	200:1 planetary gearhead with BDC motor and optional brake	65 in-lb
16283	200:1 planetary gearhead with 45 degree stepper motor	75.2 in-lb
16423	160:1 Harmonic Drive with 1.5 degree stepper motor, large thru hole	190 in-lb
16378	4000:1 planetary gearhead with BDC motor and optional brake	1100 in-lb
16362	200:1 planetary gearhead with BDC motor and optional brake	1600 in-lb
16385	8000:1 planetary gearhead with BDC motor and optional brake	2200 in-lb
16296	320,890:1 planetary gearhead with BDC motor and brake	232 ft-lb

## Controllers

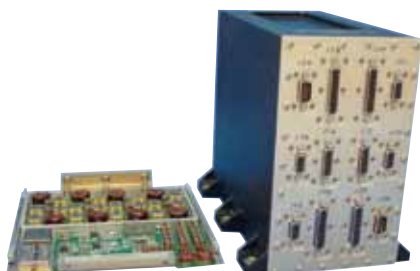
[aeroflex.com/motion](http://aeroflex.com/motion)

### Description

With extensive design and manufacturing capabilities in-house, Aeroflex can handle any aerospace electronic controller requirement. We offer a variety of drive schemes and interfaces, including MIL-STD-1553 and RS422/485. Aeroflex controllers can read a variety of position feedback devices, including resolvers, encoders, potentiometers, and hall sensors. Aeroflex offers a variety of custom and standard controller products featuring a wide selection of characteristics: FPGA based; radiation hardened; variety of external interfaces; BDCM or stepper motor drive schemes; hall, resolver or encoder commutation and position feedback; micro-stepping and closed-loop operation schemes; multiple motor driving capability

Stepper Controller

Brushless DC Controller



# Motion Solutions for HiRel Applications

## DC Motors

[aeroflex.com/motion](http://aeroflex.com/motion)

### Description



Our portfolio includes a wide range of DC motors specifically designed for HiRel applications. Aeroflex can customize all motors for specific requirements, and supply them as framed or frameless, housed or with custom mounting interfaces.

Brushless DC motors

- 2 or 3 phase
- Optional commutation

Zero cogging motors

- Ideal for precise pointing apps
- 1 to 20-inch diameters

Limited-angle torque motors

- Wide variety of catalog sizes
- Cog-free motion in a limited range

Voice coils

- Standard or custom designs
- Linear or rotary motion

Stepper motors

- Unipolar or bipolar
- 1° to 90° step angles

Operating Torque

16225	1.8 degree hybrid housed stepper motor	36 in-oz
16298	1.8 degree hybrid housed stepper motor	27 in-oz
16345	1.8 degree hybrid housed stepper motor	25 in-oz
16262	2.0 degree frameless stepper motor	75 in-oz
16334	3.75 degree frameless stepper motor	75 in-oz
16305	30 degree housed stepper motor - 10 MM Ø	0.6 in-oz
Size 8	90 degree housed stepper motor - Unipolar	1.2 in-oz
Size 11	90 degree housed stepper motor - Bipolar	1.2 in-oz
Size 11	15 degree housed stepper motor - Unipolar	1.4 in-oz
Size 11	90 degree housed stepper motor - Unipolar	1.2 in-oz
Size 13	15 degree housed stepper motor - Bipolar	1.3 in-oz
Size 15	90 degree housed stepper motor - Bipolar	1.2 in-oz
Size 15	90 degree housed stepper motor - Unipolar	1.2 in-oz

## Gimbals

[aeroflex.com/motion](http://aeroflex.com/motion)

### Description



Precision gimbals for pointing and tracking, stabilized platforms, and pedestals have been a specialty of Aeroflex Motion Control since the early 1940s. We have deep and broad experience in both terrestrial and space applications. Whatever the application — intersatellite communications, stabilized shipboard uplinks, remote sensing systems, designators, tracking systems, or a host of others — we have expertise. Over several decades, we have provided thousands of systems and components. Coupled with our electronic motion controllers, we can provide a complete turnkey multi-axis gimbal system built to your requirements.

# Motion Solutions for HiRel Applications

## Slip Ring Assemblies

[aeroflex.com/sliprings](http://aeroflex.com/sliprings)



### Description

A variety of applications require cable management systems to pass power, signals, video, fluids, and RF through a moving interface. Our slip ring assemblies are an ideal cable management option when the rotation is greater than 360°. We can fully customize our high-reliability slip ring assemblies to fit application requirements – or supply one of our standard products. Our slip rings can include: RF rotary joints; position feedback including resolvers and encoders; fiber optic rotary joints; fluid rotary joints. Aeroflex can also provide separate brush block and ring assemblies for applications that require this level of assembly. In addition, our slip ring products can be joined with one of our DC motor products for a complete solution for your particular application.

## Twist Capsules

[aeroflex.com/motion](http://aeroflex.com/motion)



### Description

Aeroflex's twist capsule products are designed for limited angle rotation applications. We customize our twist capsules for the number of lines, the range of motion, and the envelope available for each application. Like our slip ring assemblies, our twist capsules can transmit these signals: power; signal; RF; video; high frequency; telemetry.

## Custom Designs

[aeroflex.com/sliprings](http://aeroflex.com/sliprings)



### Description

Aeroflex can fully customize slip ring and twist capsule assemblies to fit commercial or military application requirements. We can also provide separate brush block and ring assemblies. Our slip rings and twist capsules can include the below signal types and options.

	Description	Slip Rings	Twist Capsules
Power	We have developed long life slip rings for constant rotation applications. We reduce the wear and debris generated in power slip rings through the use of proprietary materials and lengthen the life of the slip ring.	■	■
Analog / RF	We can transmit Analog, RF, HF and UHF signals through our assemblies. We impedance match the signal lines for minimum crosstalk and insertion losses.	■	■
High Speed Data	We can transmit high speed data signals through our assemblies. Below is a partial list of the signal types our slip rings have transmitted.	■	■
	RS-422	■	■
	USB	■	■
	Serial EIA-422	■	■
	Serial EIA-485	■	■
	GPIB/HPIB (IEEE-488.1)	■	■
	10BASE-T / 100BASE-T / 1000BASE-T	■	■
	USB Hi-Speed (USB 2.0)	■	■
	Camera Link	■	■
	Fibre Channel 2GB SCSI	■	■
	eSATA (SATA 300)		■
	FireWire (IEEE 1394b)	■	■
	Fibre Channel 4GB SCSI		■
	USB Super Speed (USB 3.0)		■
	Camera Link Full		■
Thunderbolt		■	
Digital Video	We can process high speed digital video signals through our assemblies. Below is a partial list of video signal we can transmit. We continue to develop new designs as video technologies evolve.		
	SD-SDI (SMPTE 259M)	■	■
	HD-SDI (SMPTE 292M)	■	■
	LVDS Display Interface	■	■
	3G-SDI (SMPTE 424M)	■	■
	Single Link DVI	■	■
	HDMI	■	■
	DisplayPort		■
Dual Link DVI		■	
RF	We can integrate DC - 40 GHz non-contacting rotary joints up to 20 KW of power as well as rotating waveguide systems.	■	■
Fiber Optics	We can integrate fiber optic rotary joints into our slip ring assemblies: • Single mode or multi-mode • 1 through 36 fiber channels	■	■
Position feedback	We can sense speed, direction and position by integrating these products: • Resolvers • Encoders • Potentiometers	■	■
Fluid	We can integrate media rotary joints into our slip ring assemblies: • Air • Water • Fluids (Coolant, hydraulics, similar fluids)	■	■

# Motion Solutions for HiRel Applications



## Web Site Available Slip Rings

[aeroflex.com/sliprings](http://aeroflex.com/sliprings)

	Power	Analog	Digital Data	High Speed Digital Video	High Speed Data	Number of Circuits	Outer Diameter (inches)	Length (inches)	Current Rating per Ring	Voltage Rating (V)	Electrical Noise	Lead Wire	Maximum Speed
1002010-206	■	■	■	■		6	0.440	0.490	2A	210 VDC / 240 VAC	50 mΩ	28 AWG	60 rpm
1002010-212	■	■	■	■		12	0.440	0.640	2A	210 VDC / 240 VAC	50 mΩ	28 AWG	60 rpm
1002010-218	■	■	■	■	■	18	0.440	0.780	2A	210 VDC / 240 VAC	50 mΩ	28 AWG	60 rpm
1002010-224	■	■	■	■	■	24	0.440	0.920	2A	210 VDC / 240 VAC	50 mΩ	28 AWG	60 rpm
1002010-106	■	■	■	■		6	0.870	0.520	2A	210 VDC / 240 VAC	30 mΩ	26 AWG	250 rpm
1002010-112	■	■	■	■		12	0.870	0.760	2A	210 VDC / 240 VAC	30 mΩ	26 AWG	250 rpm
1002010-118	■	■	■	■	■	18	0.870	1.000	2A	210 VDC / 240 VAC	30 mΩ	26 AWG	250 rpm
1002010-124	■	■	■	■	■	24	0.870	1.240	2A	210 VDC / 240 VAC	30 mΩ	26 AWG	250 rpm
1002010-136	■	■	■	■	■	36	0.870	1.720	2A	210 VDC / 240 VAC	30 mΩ	26 AWG	250 rpm
1002010-140	■	■	■	■	■	40	0.870	1.880	2A	210 VDC / 240 VAC	30 mΩ	26 AWG	250 rpm
1002010-338	■	■	■	■	■	38	1.000	2.150	2A	210 VDC / 240 VAC	30 mΩ	26 AWG	250 rpm



## Standard Slip Rings \*

[aeroflex.com/sliprings](http://aeroflex.com/sliprings)

	Power	Analog	Digital Data	High Speed Digital Video	High Speed Data	Number of Circuits	Outer Diameter (inches)	Length (inches)	Through Bore	Inner Diameter (inches)	Current Rating per Ring	Voltage Rating (V)	Electrical Noise	Lead Wire	Maximum Speed
1001544	■	■	■			12	0.225	0.840			0.5A	150 VAC / VDC	<10 mΩ	30 AWG	390 rpm
1001398	■	■	■	■	■	12	0.372	0.603			1A	150 VAC / VDC	<10 mΩ	30 AWG	1000 rpm
1000604	■	■	■	■		40 Max	0.562	1.665			1A	110 VAC / VDC	<10 mΩ	30 AWG	200 rpm
1000245	■	■	■	■	■	20 Max	0.690	1.700			1A	110 VAC / VDC	<10 mΩ	30 AWG	200 rpm
1001671	■	■	■	■	■	12	0.700	0.750	■	0.196	1A	120 VAC / VDC	<15 mΩ	28 AWG	500 rpm
1001884	■	■	■	■	■	10	1.000	2.150			1A/5A	24 VDC	<20 mΩ	18/20 AWG	500 rpm
1000110	■	■	■			30 Max	1.000	2.560			1A	150 VDC	<5 mΩ	28 AWG	750 rpm
1001847	■	■	■	■	■	18	1.250	1.270	■	0.375	2A	210 VDC	<20 mΩ	26 AWG	500 rpm
1001877	■	■	■	■	■	18	1.250	1.275	■	0.375	2A	110 VAC / VDC	<20 mΩ	26 AWG	1000 rpm
1001808	■	■	■	■	■	36	1.250	3.385	■	0.500	2A/8A	210 VDC	<10 mΩ	18/26 AWG	60 rpm
	■	■	■			48 Max	1.720	4.500			2A	400 VDC	<10 mΩ	28 AWG	750 rpm
1000150	■	■	■			80 Max	1.720	6.600			2A	400 VDC	<10 mΩ	22 AWG	750 rpm
1001666	■	■	■			8	1.800	1.990	■	0.501	5A	150 VAC / VDC	<10 mΩ	24 AWG	900 rpm
1001030	■	■				30 Max	2.500	5.750	■	0.500	5A	250 VDC	<10 mΩ	22 AWG	5000 rpm
1001611	■	■	■			42 Max	2.700	2.710	■	0.312	2A	100 VAC / VDC	<10 mΩ	22/26 AWG	500 rpm
1001675	■	■	■			66 Max	2.700	4.310	■	0.312	2A/5A	100 VAC / VDC	<10 mΩ	22/26 AWG	500 rpm
	■	■	■			80	2.750	4.921	■	0.310	3A	110 VAC / VDC	<10 mΩ	22 AWG	150 rpm
	■	■	■			170	2.750	8.661	■	0.310	3A	110 VAC / VDC	<10 mΩ	22 AWG	150 rpm
1001498	■	■	■			235	2.750	11.500	■	0.310	3A	110 VAC / VDC	<10 mΩ	22 AWG	150 rpm
	■	■	■			280	2.750	13.230	■	0.310	3A	110 VAC / VDC	<10 mΩ	22 AWG	150 rpm
1000490	■	■				100 Max	4.000	10.500	■	1.000	10A	250 VAC / VDC	<10 mΩ	Per request	5000 rpm
1000491	■	■				100 Max	5.000	10.500	■	1.750	10A	250 VAC / VDC	<10 mΩ	Per request	4000 rpm
1000492	■	■				100 Max	6.500	10.500	■	2.750	10A	250 VAC / VDC	<10 mΩ	Per request	3000 rpm
1000493	■	■				100 Max	7.500	10.500	■	3.750	10A	250 VAC / VDC	<10 mΩ	Per request	2500 rpm
1000494	■	■				100 Max	8.500	10.500	■	4.750	10A	250 VAC / VDC	<10 mΩ	Per request	2000 rpm
1001727	■	■	■			178	9.000	28.000	■	6.000	2A/20A	110 VAC / VDC	<10 mΩ	Per request	150 rpm
1000495	■	■				100 Max	9.500	10.500	■	5.750	10A	250 VAC / VDC	<10 mΩ	Per request	1500 rpm
1000496	■	■				100 Max	10.500	10.500	■	6.750	10A	250 VAC / VDC	<10 mΩ	Per request	1500 rpm
1001821	■	■	■	■	■	30	11.250	1.300	■	6.500	2A	110 VAC / VDC	<20 mΩ	24/26 AWG	50 rpm
1000497	■	■				100 Max	11.500	10.500	■	7.750	10A	250 VAC / VDC	<10 mΩ	Per request	1000 rpm
1000498	■	■				100 Max	13.000	10.500	■	8.750	10A	250 VAC / VDC	<10 mΩ	Per request	1000 rpm
1000499	■	■				100 Max	14.000	10.500	■	9.750	10A	250 VAC / VDC	<10 mΩ	Per request	750 rpm

\* Product part numbers are listed by outer diameter size.

# Standard Products for Avionic Applications

## MIPS RISC 64Bit Microprocessors

[aeroflex.com/MIPS](http://aeroflex.com/MIPS)

	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)
MIP7965-668F24(X)	64 bit SysAD bus interface in a cavity-down hermetic CQFP with EJTAG debug port.	668	208 CQFP (1.12"sq)
MIP7965-750B1(X)	64 bit SysAD bus interface in a TBGA with EJTAG debug port.	750	Plastic 256 TBGA (26mm sq)

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



## Memory Modules

[aeroflex.com/avionics](http://aeroflex.com/avionics)

	Description	Access Speed (ns)	Package
	High-Speed, low-noise, low-voltage TTL (LVTTTL) compatible outputs. 3.3V operation with separate logic and output driver power pins. All inputs and outputs 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. LVTTTL compatible outputs. 3.3V operation with separate logic and output driver power pins. Internal pipelined operation; column address can be changed every clock cycle. Programmable 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](http://aeroflex.com/power)

	Description	Package
ACT5101-1 Three Phase Brushless DC Motor Driver	High-voltage three phase motor driver features a 500 VDS rating, 50A continuous current (up to 85°C) with 4 quadrant control, 6-step trapezoidal drive cap, isolated upper and lower gate drivers.	26 Plug-in package 3.0" x 2.1"

# Standard Products for Avionic Applications

## MIL-STD-1553 Encoder-Decoder [aeroflex.com/avionics](http://aeroflex.com/avionics)

Description	SMD #
CT1820 Series	5962-90636

## MIL-STD-1553 Integrated Terminals [aeroflex.com/avionics](http://aeroflex.com/avionics)

Description	SMD #
CT2512 / CT2512-FP	5962-8753503
CT2512-PCB / CT2512-FP-PCB	N/A
CT2542 / CT2542-FP	5962-8979803
CT2553 / CT2553-FP	5962-8869201
CT2553-PCB / CT2553-FP-PCB	N/A
CT2554 / CT2554-FP	5962-8869202
CT2554-PCB / CT2554-FP-PCB	N/A
CT2555 / CT2555-FP	5962-8869203
CT2555-PCB / CT2555-FP-PCB	N/A
CT2577-P119*	N/A
CT2578-P119	N/A
CT2578-F84	N/A
CT2579-P119*	N/A
ACT3492	N/A
ACT7005	N/A
ACT7006	N/A

N/A = not actively pursuing an SMD.

\* Contact Aeroflex at 800-645-8862; these are not in full production.



# Standard Products for Avionic Applications

**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	■	TBD
ACT4402I	■		0.62" x 1.25"	Plug-in	24	High	+5V, ±15V	1.4:1	■	TBD
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	■	TBD
ACT4444 (see ACT4462D)	■	■	9 mm x 9 mm	BCC++	64	Low/High	+5V, ±12V to ±15V	1:1	Open	TBD
ACT4445 (see ACT4487D)	■		9 mm x 9 mm	BCC++	64	Low/High	+5V, ±12V to ±15V	1.4:1	■	TBD
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	TBD
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	■	TBD
ACT4489	■			Plug-in and Flatpack	24		+5V, ±12V	1:1		
ACT4440N	■			Plug-in and Flatpack	24	Low	+5V, ±12V to ±15V	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](http://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	■	TBD
ACT4419DF	■		0.3" x 1.2"	Flatpack	20	■	+5V	2.5:1	■	TBD
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	■	TBD
ACT4468D (equiv NHI-1567)	■		0.3" x 1.0"	Plug-in	20		+5V	2.5:1	■	TBD
ACT4468DF	■		0.3" x 1.0"	Flatpack	20		+5V	2.5:1	■	TBD
ACT4462D (pin selectable H009 transmitter)	■	■ H009	0.62" x 1.25"	Plug-in	24	■	+5V, ±12V to 15V	1:1	Open	TBD
ACT4469D		H009	0.62" x 1.25"	Plug-in	24	■	+5V, ±15V	1:1	■	TBD
ACT4479D		H009	0.775" x 1.5"	Plug-in	28		+5V, ±15V	1:1	■	TBD
ACT4479DF		H009	0.775" x 1.5"	Flatpack	28		+5V, ±15V	1:1	■	TBD
ACT4489D	■		0.775" x 1.9"	Plug-in	36		+5V, ±12V	1:1	■	TBD
ACT4489DF	■		0.775" x 1.9"	Flatpack	36		+5V, ±12V	1:1	■	TBD
ACT4433D	■		0.775" x 1.5"	Plug-in	28		+5V, ±12V	1:1	■	TBD
ACT4433DF	■		0.775" x 1.5"	Flatpack	28		+5V, ±12V	1:1	■	TBD
ACT4487D (replaces CT 1487D)	■		0.775" x 1.9"	Plug-in	36		+5V, ±15V	1.4:1	■	5962-87579
ACT4487DI (replaces CT 1487DI)	■		0.775" x 1.9"	Plug-in	36		+5V, ±15V	1.4:1	■	5962-89447
ACT4487DF (replaces CT 1487DFP)	■		0.775" x 1.9"	Flatpack	36		+5V, ±15V	1.4:1	■	5962-87579
ACT4487DFI (replaces CT 1487DIFP)	■		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	■	TBD
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	■	TBD
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	TBD
ACT4808N-DF	■	■	0.775" x 1.9"	Flatpack	36		+5V, ±12V to ±15V	1:1	Open	TBD
ACT4454	■	■		Flatpack	24		+5V	2.5:1		5962-92061
ACT4460	■	■		Flatpack	24		+5V	2.5:1		5962-92061

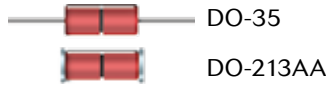
\* See individual data sheets for receiver output idle low/high.



# Diode Product Listing

## Zener Diodes

Available in JAN, JANTX and JANTXV levels to MIL-PRF-19500 slash sheets /117, /127, and /437 and JAN, JANTX, JANTXV and JANS levels for /435 in both axial leaded and MELF packages.



**Zener Diodes**  
1N4099-1 to 1N4135-1,  
1N4614-1 to 1N4627-1  
[aeroflex.com/MetelicsHRC](http://aeroflex.com/MetelicsHRC)

Types (Note 1)	Nominal Zener Voltage, $V_Z$ (Note 2)	Zener Test Current, $I_{ZT}$	Maximum Zener Impedance, $Z_T$ (Note 3)	Maximum Reverse Current, $I_R$ @ $V_R$	Maximum Noise Density, $N_b$ @ $I_{ZT}$	Maximum Zener DC Current, $I_{ZM}$
	Volts	$\mu A$	Ohms	$\mu A$ Volts	$\mu V / \sqrt{Hz}$	mA
1N4614-1, 1N4614UR-1	1.8	250	1200	7.5      1	1	120
1N4615-1, 1N4615UR-1	2.0	250	1250	5.0      1	1	110
1N4616-1, 1N4616UR-1	2.2	250	1300	4.0      1	1	100
1N4617-1, 1N4617UR-1	2.4	250	1400	2.0      1	1	95
1N4618-1, 1N4618UR-1	2.7	250	1500	1.0      1	1	90
1N4619-1, 1N4619UR-1	3.0	250	1600	0.8      1	1	87
1N4620-1, 1N4620UR-1	3.3	250	1650	7.5      1.5	1	85
1N4621-1, 1N4621UR-1	3.6	250	1700	7.5      2	1	83
1N4622-1, 1N4622UR-1	3.9	250	1650	5.0      2	1	80
1N4623-1, 1N4623UR-1	4.3	250	1600	4.0      2	1	77
1N4624-1, 1N4624UR-1	4.7	250	1550	10.0    2	1	75
1N4625-1, 1N4625UR-1	5.1	250	1500	10.0    3	2	70
1N4626-1, 1N4626UR-1	5.6	250	1400	10.0    4	4	65
1N4627-1, 1N4627UR-1	6.2	250	1200	10.0    5	5	61
1N4099-1, 1N4099UR-1	6.8	250	200	10.0    5.17	40	56
1N4100-1, 1N4100UR-1	7.5	250	200	10.0    5.70	40	51
1N4101-1, 1N4101UR-1	8.2	250	200	1.0      6.24	40	46
1N4102-1, 1N4102UR-1	8.7	250	200	1.0      6.61	40	44
1N4103-1, 1N4103UR-1	9.1	250	200	1.0      6.92	40	42
1N4104-1, 1N4104UR-1	10	250	200	1.0      7.60	40	38
1N4105-1, 1N4105UR-1	11	250	200	0.05    8.44	40	35
1N4106-1, 1N4106UR-1	12	250	200	0.05    8.12	40	32
1N4107-1, 1N4107UR-1	13	250	200	0.05    9.857	40	29
1N4108-1, 1N4108UR-1	14	250	200	0.05    10.65	40	27
1N4109-1, 1N4109UR-1	15	250	100	0.05    11.40	40	25
1N4110-1, 1N4110UR-1	16	250	100	0.05    12.15	40	24
1N4111-1, 1N4111UR-1	17	250	100	0.05    12.92	40	22
1N4112-1, 1N4112UR-1	18	250	100	0.05    13.67	40	21
1N4113-1, 1N4113UR-1	19	250	150	0.05    14.44	40	20
1N4114-1, 1N4114UR-1	20	250	150	0.01    15.20	40	19
1N4115-1, 1N4115UR-1	22	250	150	0.01    16.72	40	17
1N4116-1, 1N4116UR-1	24	250	150	0.01    18.25	40	16
1N4117-1, 1N4117UR-1	25	250	150	0.01    19.00	40	15
1N4118-1, 1N4118UR-1	27	250	150	0.01    20.45	40	14
1N4119-1, 1N4119UR-1	29	250	200	0.01    21.28	40	14
1N4120-1, 1N4120UR-1	30	250	200	0.01    22.80	40	13
1N4121-1, 1N4121UR-1	33	250	200	0.01    25.08	40	12
1N4122-1, 1N4122UR-1	36	250	200	0.01    27.38	40	11
1N4123-1, 1N4123UR-1	39	250	200	0.01    29.65	40	9.8
1N4124-1, 1N4124UR-1	43	250	250	0.01    32.65	40	8.9
1N4125-1, 1N4125UR-1	47	250	250	0.01    35.75	40	8.1
1N4126-1, 1N4126UR-1	51	250	300	0.01    38.76	40	7.5
1N4127-1, 1N4127UR-1	56	250	300	0.01    42.60	40	6.7
1N4128-1, 1N4128UR-1	60	250	400	0.01    45.60	40	6.4
1N4129-1, 1N4129UR-1	62	250	500	0.01    47.10	40	6.1
1N4130-1, 1N4130UR-1	68	250	700	0.01    51.68	40	5.6
1N4131-1, 1N4131UR-1	75	250	700	0.01    57.00	40	5.1
1N4132-1, 1N4132UR-1	82	250	800	0.01    62.32	40	4.6
1N4133-1, 1N4133UR-1	87	250	1000	0.01    66.12	40	4.4
1N4134-1, 1N4134UR-1	91	250	1200	0.01    69.16	40	4.2
1N4135-1, 1N4135UR-1	100	250	1500	0.01    76.00	40	3.0

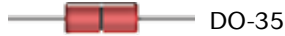
Electrical specifications @  $T_A = +25^\circ C$  (unless otherwise specified).

NOTE 1: The JEDEC type numbers shown have a  $\pm 5\%$  tolerance on nominal Zener Voltage. The suffix C is used to identify  $\pm 2\%$ ; and suffix D is used to identify  $\pm 1\%$ .

NOTE 2: Zener voltage is measured with the device junction in thermal equilibrium at an ambient temperature of  $25^\circ C \pm 3^\circ C$ .

NOTE 3: Zener impedance is derived by superimposing on  $I_{ZT}$  A 60 Hz rms a.c. current equal to 10% of  $I_{ZT}$ .

# Diode Product Listing



DO-35



DO-213AA

## Low Noise Zener Diodes 1N5518B-1 to 1N5546B-1

aeroflex.com/MetelicsHRC

Types (Note 1)	Nominal Zener Voltage, $V_Z$ @ $I_{ZT}$ (Note 2)	Zener Test Current $I_{ZT}$	Maximum Zener Impedance B, C, D suffix $Z_{ZT}$ @ $I_{ZT}$ (Note 3)	Maximum Reverse Current, $I_R$ $V_R = \text{Volts}$	B, C, D Suffix Maximum Zener DC Current, $I_{ZM}$	B, C, D Suffix Maximum Noise Density, @ $I_{ZT} = 250 \text{ mA ND}$	Regulation Factor, $\Delta V_Z$	Low $V_Z$ Current, $I_{ZL}$		
	Volts	mA	Ohms	$\mu\text{A dc}$	NON & A- Suffix	B- C- D- Suffix	mA dc	$\mu\text{V} / \sqrt{\text{Hz}}$	Volts	mA dc
1N5518B-1, 1N5518BUR-1	3.3	20	26	5.0	0.90	1.0	115	0.5	0.90	2.0
1N5519B-1, 1N5519BUR-1	3.6	20	24	3.0	0.90	1.0	105	0.5	0.90	2.0
1N5520B-1, 1N5520BUR-1	3.9	20	22	1.0	0.90	1.0	98	0.5	0.85	2.0
1N5521B-1, 1N5521BUR-1	4.3	20	18	3.0	1.0	1.5	88	0.5	0.75	2.0
1N5522B-1, 1N5522BUR-1	4.7	10	22	2.0	1.5	2.0	81	0.5	0.60	1.0
1N5523B-1, 1N5523BUR-1	5.1	5.0	26	2.0	2.0	2.5	75	0.5	0.65	0.25
1N5524B-1, 1N5524BUR-1	5.6	3.0	30	2.0	3.0	3.5	68	1.0	0.30	0.25
1N5525B-1, 1N5525BUR-1	6.2	1.0	30	1.0	4.5	5.0	61	1.0	0.20	0.01
1N5526B-1, 1N5526BUR-1	6.8	1.0	30	1.0	5.5	6.2	56	1.0	0.10	0.01
1N5527B-1, 1N5527BUR-1	7.5	1.0	35	0.5	6.0	6.8	51	2.0	0.05	0.01
1N5528B-1, 1N5528BUR-1	8.2	1.0	40	0.5	6.5	7.5	46	4.0	0.05	0.01
1N5529B-1, 1N5529BUR-1	9.1	1.0	45	0.1	7.0	8.2	42	4.0	0.05	0.01
1N5530B-1, 1N5530BUR-1	10.0	1.0	60	0.05	8.0	9.1	38	4.0	0.10	0.01
1N5531B-1, 1N5531BUR-1	11.0	1.0	80	0.05	9.0	9.9	35	5.0	0.20	0.01
1N5532B-1, 1N5532BUR-1	12.0	1.0	90	0.05	9.5	0.8	32	10	0.20	0.01
1N5533B-1, 1N5533BUR-1	13.0	1.0	90	0.01	10.5	11.7	29	15	0.20	0.01
1N5534B-1, 1N5534BUR-1	14.0	1.0	100	0.01	11.5	12.6	27	20	0.20	0.01
1N5535B-1, 1N5535BUR-1	15.0	1.0	100	0.01	12.5	13.5	25	20	0.20	0.01
1N5536B-1, 1N5536BUR-1	16.0	1.0	100	0.01	13.0	14.4	24	20	0.20	0.01
1N5537B-1, 1N5537BUR-1	17.0	1.0	100	0.01	14.0	15.3	22	20	0.20	0.01
1N5538B-1, 1N5538BUR-1	18.0	1.0	100	0.01	15.0	16.2	21	20	0.20	0.01
1N5539B-1, 1N5539BUR-1	19.0	1.0	100	0.01	16.0	17.1	20	20	0.20	0.01
1N5540B-1, 1N5540BUR-1	20.0	1.0	100	0.01	17.0	18.0	19	20	0.20	0.01
1N5541B-1, 1N5541BUR-1	22.0	1.0	100	0.01	18.0	19.8	17	20	0.25	0.01
1N5542B-1, 1N5542BUR-1	24.0	1.0	100	0.01	20.0	21.6	16	20	0.30	0.01
1N5543B-1, 1N5543BUR-1	25.0	1.0	100	0.01	21.0	22.4	15	20	0.35	0.01
1N5544B-1, 1N5544BUR-1	28.0	1.0	100	0.01	23.0	25.2	14	20	0.40	0.01
1N5545B-1, 1N5545BUR-1	30.0	1.0	100	0.01	24.0	27.0	13	20	0.45	0.01
1N5546B-1, 1N5546BUR-1	33.0	1.0	100	0.01	28.0	29.7	12	20	0.50	0.01

Electrical specifications @  $T_A = +25^\circ\text{C}$  (unless otherwise specified).

NOTE 1: No Suffix type numbers are  $\pm 20\%$  with guaranteed limits for only  $V_Z$ ,  $I_R$ , and  $V_F$ . Units with "A" suffix are  $\pm 10\%$  with guaranteed limits for  $V_Z$ ,  $I_R$ , and  $V_F$ . Units with guaranteed limits for all six parameters are indicated by a "B" suffix for  $\pm 5.0\%$  units, "C" suffix for  $\pm 2.0\%$  and "D" suffix for  $\pm 1.0\%$ .

NOTE 2: Zener voltage is measured with the device junction in thermal equilibrium at an ambient temperature of  $25^\circ\text{C} \pm 3^\circ\text{C}$ .

NOTE 3: Zener impedance is derived by superimposing on  $I_{ZT}$  A 60 Hz rms a.c. current equal to 10% of  $I_{ZT}$ .



DO-35



DO-213AA

## Zener Diodes 1N746A-1N759, 1N4370A-1N4372A

aeroflex.com/MetelicsHRC

Types (Note 1)	Nominal Zener Voltage, $V_Z$ @ $I_{ZT}$ (Note 2)	Zener Test Current $I_{ZT}$ (Note 2)	Maximum Zener Impedance $Z_{ZT}$ @ $I_{ZT}$ (Note 3)	Maximum Reverse Current, $I_R$ @ $V_R$	Maximum Zener Current, $I_{ZM}$
	Volts	mA	Ohms ( $\Omega$ )	$\mu\text{A}$	Volts
1N4370A-1, 1N4370AUR-1	2.4	20	30	100	155
1N4371A-1, 1N4371AUR-1	2.7	20	30	60	140
1N4372A-1, 1N4372AUR-1	3.0	20	29	30	125
1N746A-1, 1N746AUR-1	3.3	20	28	5	120
1N747A-1, 1N747AUR-1	3.6	20	24	3	110
1N748A-1, 1N748AUR-1	3.9	20	23	2	100
1N749A-1, 1N749AUR-1	4.3	20	22	2	90
1N750A-1, 1N750AUR-1	4.7	20	19	5	85
1N751A-1, 1N751AUR-1	5.1	20	17	5	75
1N752A-1, 1N752AUR-1	5.6	20	11	5	70
1N753A-1, 1N753AUR-1	6.2	20	7	5	65
1N754A-1, 1N754AUR-1	6.8	20	5	2	60
1N755A-1, 1N755AUR-1	7.5	20	6	2	55
1N756A-1, 1N756AUR-1	8.2	20	8	1	50
1N757A-1, 1N757AUR-1	9.1	20	10	1	45
1N758A-1, 1N758AUR-1	10.0	20	17	1	40
1N759A-1, 1N759AUR-1	12.0	20	30	1	35

Electrical specifications @  $T_A = +25^\circ\text{C}$  (unless otherwise specified).

NOTE 1: Zener voltage tolerance on "A" suffix is  $\pm 5\%$ . No Suffix denotes  $\pm 10\%$  tolerance, "C" suffix denotes  $\pm 2\%$  tolerance and "D" suffix denotes  $\pm 1\%$  tolerance.

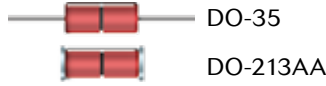
NOTE 2: Zener voltage is measured with the device junction in thermal equilibrium at an ambient temperature of  $25^\circ\text{C} \pm 3^\circ\text{C}$ .

NOTE 3: Zener impedance is derived by superimposing on  $I_{ZT}$  A 60 Hz rms a.c. current equal to 10% of  $I_{ZT}$ .

# Diode Product Listing

## Silicon Zener Diodes

1N957B-1 thru 1N986B-1. 1N962B-1 thru 1N986B-1 available in JAN, JANTX and JANTXV per MIL-PRF-19500/117



Zener Diodes 1N957B-1 to 1N986B-1 <i>aeroflex.com/MetelicsHRC</i>	Nominal Zener Voltage, $V_Z$ (Note 2)	Zener Test Current $I_{ZT}$	Maximum Zener Impedance $Z_{ZT}$ @ $I_{ZT}$ (Note 3)	Maximum Zener Knee Impedance $Z_{ZK}$ @ $I_{ZK}$ (Note 3)	Maximum DC Zener Current, $I_{ZM}$	Maximum Surge Current, $I_{ZSM}$	Maximum Reverse Leakage, $I_R$ @ $V_R$	Maximum Temperature Coefficient, $\alpha_{VZ}$		
	Volts	mA	Ohms	Ohms	mA	mA	$\mu$ A	%/°C		
Types (Note 1)										
1N957B-1	6.8	18.5	4.5	700	1.0	55	300	150	5.2	+0.050
1N958B-1	7.5	16.5	5.5	700	.5	50	275	75	5.7	+0.058
1N959B-1	8.2	15.0	6.5	700	.5	45	250	50	6.2	+0.065
1N960B-1	9.1	14.0	7.5	700	.5	41	225	25	6.9	+0.068
1N961B-1	10	12.5	8.5	700	.25	38	200	10	7.6	+0.075
1N962B-1	11	11.5	9.5	700	.25	35	590	1.0	8.4	+0.073
1N963B-1	12	10.5	11.5	700	.25	32	540	1.0	9.1	+0.076
1N964B-1	13	9.5	13	700	.25	30	500	0.5	9.9	+0.079
1N965B-1	15	8.5	16	700	.25	26	433	0.5	11	+0.082
1N966B-1	16	7.8	17	700	.25	25	406	0.5	12	+0.083
1N967B-1	18	7.0	21	750	.25	21	361	0.5	14	+0.085
1N968B-1	20	6.2	25	750	.25	19	325	0.5	15	+0.086
1N969B-1	22	5.6	29	750	.25	17	295	0.5	17	+0.087
1N970B-1	24	5.2	33	750	.25	16	271	0.5	18	+0.088
1N971B-1	27	4.6	41	750	.25	14	240	0.5	21	+0.090
1N972B-1	30	4.2	49	1000	.25	13	216	0.5	23	+0.091
1N973B-1	33	3.8	58	1000	.25	12	197	0.5	25	+0.092
1N974B-1	36	3.4	70	1000	.25	11	180	0.5	27	+0.093
1N975B-1	39	3.2	80	1000	.25	9.1	166	0.5	30	+0.094
1N976B-1	43	3.0	93	1000	.25	8.8	151	0.5	33	+0.095
1N977B-1	47	2.7	105	1500	.25	7.9	138	0.5	36	+0.095
1N978B-1	51	2.5	125	1500	.25	7.4	127	0.5	39	+0.096
1N979B-1	56	2.2	150	2000	.25	6.9	116	0.5	43	+0.096
1N980B-1	62	2.0	185	2000	.25	6.0	105	0.5	47	+0.097
1N981B-1	68	1.8	230	2000	.25	5.5	95	0.5	52	+0.097
1N982B-1	75	1.7	270	2000	.25	5.1	86	0.5	56	+0.098
1N983B-1	82	1.5	330	3000	.25	4.6	79	0.5	62	+0.098
1N984B-1	91	1.4	400	3000	.25	4.2	71	0.5	69	+0.099
1N985B-1	100	1.3	500	3000	.25	3.7	65	0.5	76	+0.110
1N986B-1	110	1.1	750	4000	.25	3.3	59	0.5	84	+0.110

Electrical specifications @  $T_A = +25^\circ\text{C}$  (unless otherwise specified).

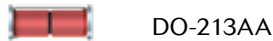
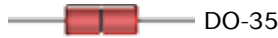
NOTE 1: The JEDEC type numbers shown (B Suffix) have a  $\pm 5\%$  tolerance on nominal Zener Voltage. The suffix A is used to identify  $\pm 10\%$  tolerance; suffix C is used to identify  $\pm 2\%$ ; and suffix D is used to identify  $\pm 1\%$ ; no suffix indicates  $\pm 20\%$ .

NOTE 2: Zener voltage is measured with the device junction in thermal equilibrium at an ambient temperature of  $25^\circ\text{C} \pm 3^\circ\text{C}$ .

NOTE 3: Zener impedance is derived by superimposing on  $I_{ZT}$  A 60 Hz rms a.c. current equal to 10% of  $I_{ZT}$ .

## Temperature Compensated (TC) Zener Reference Diodes 6.4V Nominal Zener Voltage

Available in JAN, JANTX, JANTXV and JANS levels to MIL-PRF-19500 slash sheets /159 and /452 in both axial leaded and MELF packages. Other features include metallurgically bonded and double plug construction.



### TC Zener Diodes 1N4565UR to 1N4584UR, -1

[aeroflex.com/MetelicsHRC](http://aeroflex.com/MetelicsHRC)

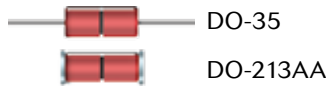
	Zener Test Current $I_{ZT}$	Effective Temperature Coefficient	Voltage Temperature Stability ( $\Delta V_Z / T$ ) (Note 1)	Temperature Range	Maximum Dynamic Zener Impedance (Note 2)
Types 6.4V $\pm$ 5% (Note 1)	mA	% / °C	mV	°C	Ohms ( $\Omega$ )
1N4565-1, 1N4565UR-1	0.5	0.01	48	0 to +75°C	200
1N4565A-1, 1N4565AUR-1	0.5	0.01	100	-55 to +100°C	200
1N4566-1, 1N4566UR-1	0.5	0.005	24	0 to +75°C	200
1N4566A-1, 1N4566AUR-1	0.5	0.005	50	-55 to +100°C	200
1N4567-1, 1N4567UR-1	0.5	0.002	10	0 to +75°C	200
1N4567A-1, 1N4567AUR-1	0.5	0.002	20	-55 to +100°C	200
1N4568-1, 1N4568UR-1	0.5	0.001	5	0 to +75°C	200
1N4568A-1, 1N4568AUR-1	0.5	0.001	10	-55 to +100°C	200
1N4569-1, 1N4569UR-1	0.5	0.0005	2.5	0 to +75°C	200
1N4569A-1, 1N4569AUR-1	0.5	0.0005	5	-55 to +100°C	200
1N4570-1, 1N4570UR-1	1.0	0.01	48	0 to +75°C	100
1N4570A-1, 1N4570AUR-1	1.0	0.01	100	-55 to +100°C	100
1N4571-1, 1N4571UR-1	1.0	0.005	24	0 to +75°C	100
1N4571A-1, 1N4571AUR-1	1.0	0.005	50	-55 to +100°C	100
1N4572-1, 1N4572UR-1	1.0	0.002	10	0 to +75°C	100
1N4572A-1, 1N4572AUR-1	1.0	0.002	20	-55 to +100°C	100
1N4573-1, 1N4573UR-1	1.0	0.001	5	0 to +75°C	100
1N4573A-1, 1N4573AUR-1	1.0	0.001	10	-55 to +100°C	100
1N4574-1, 1N4574UR-1	1.0	0.0005	2.5	0 to +75°C	100
1N4574A-1, 1N4574AUR-1	1.0	0.0005	5	-55 to +100°C	100
1N4575-1, 1N4575UR-1	2.0	0.01	48	0 to +75°C	50
1N4575A-1, 1N4575AUR	2.0	0.01	100	-55 to +100°C	50
1N4576, 1N4576UR	2.0	0.005	24	0 to +75°C	50
1N4576A, 1N4576AUR-1	2.0	0.005	50	-55 to +100°C	50
1N4577-1, 1N4577UR-1	2.0	0.002	10	0 to +75°C	50
1N4577A-1, 1N4577AUR-1	2.0	0.002	20	-55 to +100°C	50
1N4578-1, 1N4578UR-1	2.0	0.001	5	0 to +75°C	50
1N4578A-1, 1N4578AUR-1	2.0	0.001	10	-55 to +100°C	50
1N4579-1, 1N4579UR-1	2.0	0.0005	2.5	0 to +75°C	50
1N4579A-1, 1N4579AUR-1	2.0	0.0005	5	-55 to +100°C	50
1N4580-1, 1N4580UR-1	4.0	0.01	48	0 to +75°C	25
1N4580A-1, 1N4580AUR-1	4.0	0.01	100	-55 to +100°C	25
1N4581-1, 1N4581UR-1	4.0	0.005	24	0 to +75°C	25
1N4581A-1, 1N4581AUR-1	4.0	0.005	50	-55 to +100°C	25
1N4582-1, 1N4582UR-1	4.0	0.002	10	0 to +75°C	25
1N4582A-1, 1N4582AUR-1	4.0	0.002	20	-55 to +100°C	25
1N4583-1, 1N4583UR-1	4.0	0.001	5	0 to +75°C	25
1N4583A-1, 1N4583AUR-1	4.0	0.001	10	-55 to +100°C	25
1N4584-1, 1N4584UR-1	4.0	0.0005	2.5	0 to +75°C	25
1N4584A-1, 1N4584AUR-1	4.0	0.0005	5	-55 to +100°C	25

Electrical specifications @ +25°C (unless otherwise specified).

NOTE 1: The maximum allowable change observed over the entire temperature range i.e., the diode voltage will not exceed the specified mV at any discrete temperature between the established limits, per JEDEC standard No. 5.

NOTE 2: Zener impedance is derived by superimposing on  $I_{ZT}$  A 60 Hz rms a.c. current equal to 10% of  $I_{ZT}$ .

# Diode Product Listing



## TC Zener Diodes 1N821 to 1N828, -1 1N821UR-1N828UR, -1 aeroflex.com/MetelicsHRC

Types	Zener Voltage $V_Z$ @ $I_{ZT}$	Zener Test Current $I_{ZT}$	Maximum Zener Impedance $Z_{ZT}$ (Note 1)	Voltage Temperature Stability, $\Delta V_{ZT}$ -55°C to +100°C (Note 2)	Effective Temperature Coefficient
	Volts	mA	Ohms ( $\Omega$ )	mV	% / °C
1N821-1, 1N821UR-1	5.9-6.5	7.5	15	96	0.01
1N821A-1, 1N821AUR-1	5.9-6.5	7.5	10	96	0.01
1N822-1, 1N822UR-1 †	5.9-6.5	7.5	15	96	0.01
1N823-1, 1N823UR-1	5.9-6.5	7.5	15	48	0.005
1N823A-1, 1N823AUR-1	5.9-6.5	7.5	10	48	0.005
1N824-1, 1N824UR-1 †	5.9-6.5	7.5	15	48	0.005
1N825-1, 1N825UR-1	5.9-6.5	7.5	15	19	0.002
1N825A-1, 1N825AUR-1	5.9-6.5	7.5	10	19	0.002
1N826-1, 1N826UR-1	6.2-6.9	7.5	15	20	0.002
1N827-1, 1N827UR-1	5.9-6.5	7.5	15	9	0.001
1N827A-1, 1N827AUR-1	5.9-6.5	7.5	10	9	0.001
1N828-1, 1N828UR-1	6.2-6.9	7.5	15	10	0.001
1N829-1, 1N829UR-1	5.9-6.5	7.5	15	5	0.0005
1N829A-1, 1N829AUR-1	5.9-6.5	7.5	10	5	0.0005

† Double Anode: Electrical Specifications Apply Under Both Bias Polarities.

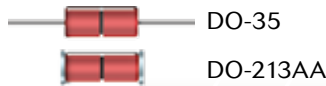
Electrical specifications @ +25°C (unless otherwise specified).

NOTE 1: Zener impedance is derived by superimposing on  $I_{ZT}$  A 60 Hz rms a.c. current equal to 10% of  $I_{ZT}$ .

NOTE 2: The maximum allowable change observed over the entire temperature range i.e., the diode voltage will not exceed the specified mV at any discrete temperature between the established limits, per JEDEC standard No. 5.

## Silicon Switching Diodes

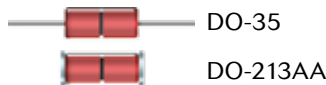
Available in JAN, JANTX, JANTXV levels to MIL-PRF-19500 slash sheets /116, /144, /231, and JAN, JANTX, JANTXV, and JANS /578 & /609 in both axial leaded and MELF packages. Other features include Metallurgically Bonded; Hermetically Sealed and Double Plug Construction.



## Switching Diodes 1N3600, 1N4150-1 aeroflex.com/MetelicsHRC

Types	$V_{BR}$ $I_R = 10 \mu A$	$V_{RWM}$	$I_{R1}$ $V_R = 50 V_{dc}$ $T_A = 25^\circ C$	$I_{R2}$ $V_R = 50 V_{dc}$ $T_A = 150^\circ C$	$C$ $I_R = 0; f = 1 MHz$ AC signal = 50 mV (p-p)	$t_{rr}$ $I_R = 10 - 100 mA$ $I_F = 10 - 100 mA$ $R_L = 100 \Omega$	$V_{I1}$ $I_F = 1 mA dc$	$V_{I2}$ $I_F = 10 mA dc$	$V_{I3}$ $I_F = 50 mA dc$ (pulsed)	$V_{I4}$ $I_F = 100 mA dc$ (pulsed)	$V_{I5}$ $I_F = 200 mA dc$ (pulsed)					
	Volts	V(pk)	$\mu A$ dc	$\mu A$ dc	pF	nA	V dc min	V dc max	V dc min	V dc max	V dc min	V dc max	V dc min	V dc max	V dc min	V dc max
1N3600	75	50	0.1	100	2.5	4.0	0.54	0.62	0.66	0.74	0.76	0.86	0.82	0.92	0.87	1.00
1N4150-1, 1N4150UR-1	75	50	0.1	100	2.5	4.0	0.54	0.62	0.66	0.74	0.76	0.86	0.82	0.92	0.87	1.00

Electrical specifications @ +25°C (unless otherwise specified).



## Switching Diodes 1N914 & 1N4148-1 aeroflex.com/MetelicsHRC

Types	$V_{BR}$ @ 100 $\mu A$	$V_{RWM}$	$I_O$	$V_{I1}$ $I_F = 10 mA$	$V_{I2}$ $I_F = 50 mA$	$t_{rr}$ $I_R = 10 mA$ $I_F = 10 mA$ $R_L = 100 \Omega$	$I_{R1}$ @ 20 Vdc	$I_{R2}$ @ 75 Vdc	$I_{R3}$ $V_R = 20 V$ $T_A = 150^\circ C$	$I_{R4}$ $V_R = 20 V$ $T_A = 150^\circ C$	Capacitance @ 0 V	Capacitance @ 1.5 V
	Volts	V(pk)	mA	V dc	V dc	nsec	nA	$\mu A$	$\mu A$	$\mu A$	pF	pF
1N914, 1N914UR	100	75	75	0.8	1.2	5	25	0.5	35	75	4.0	2.8
1N4148-1, 1N4148UR-1	100	75	200	0.8	1.2	5	35	0.5	35	75	4.0	2.8

Electrical specifications @ +25°C (unless otherwise specified).

# Diode Product Listing



D-5D

## Switching Diodes 1N6638 Series

aeroflex.com/MetelicsHRC

Types	$V_{BR} @ I_R$		$V_{RWM}$	$V_{FR} / t_{FR} @ I_F = 200 \text{ mA}$		$C_{T1} V_R = 0.0 \text{ V}$		$C_{T2} V_R = 1.5 \text{ V}$		$t_{tr} I_R = 10 \text{ mA}$ $I_F = 10 \text{ mA}$		$I_{R1} V_R = V_{RWM}$		$I_{R2} V_R = 20 \text{ V}$ $T_A = 150^\circ\text{C}$		$I_{R3} V_R = 20 \text{ V}$ $T_A = 150^\circ\text{C}$		$I_{R4} V_R = V_{RWM}$		$V_F @ I_F$		$V_F @ I_F$ $T_A = -55^\circ\text{C}$	
	V(pk)	$\mu\text{A}$		V(pk)	$\frac{V_{FR}}{V(pk)}$	$t_{FR}$ ns	pF	pF	ns	nA dc	nA dc	$\mu\text{A}$ dc	$\mu\text{A}$ dc	V dc min	V dc max	V dc max	mA pulsed						
1N6638	150	100	125	5.0	20	2.5	2.0	4.5	35	500	50	100	-	1.1	1.2	200							
1N6639	100	10	75	5.0	10	2.5	-	4.0	-	100	-	90	-	1.2	1.3	500							
1N6640	75	10	50	5.0	10	2.5	-	4.0	-	100	-	90	0.54 0.76 0.82 0.87	0.62 0.86 0.92 1.0	-	1 50 100 200							
1N6641	75	10	50	5.0	10	3.0	-	5.0	-	100	-	90	-	1.1	1.2	200							
1N6642	100	100	75	5.0	20	5.0	2.8	5.0	25	500	50	100	-	1.0	-	10							
1N6643	75	100	50	5.0	20	5.0	2.8	6.0	50	500	75	100	-	1.0	-	10							
														1.2	1.4	100							

Electrical specifications @  $T_A = +25^\circ\text{C}$  (unless otherwise specified).



D-5DUS



UB

## Switching Diodes 1N6638U Series

aeroflex.com/MetelicsHRC

Types	$V_{BR} @ I_R$		$V_{RWM}$	$V_{FR} / t_{FR} @ I_F = 200 \text{ mA}$		$C_{T1} V_R = 0.0 \text{ V}$		$C_{T2} V_R = 1.5 \text{ V}$		$t_{tr} I_R = 10 \text{ mA}$ $I_F = 10 \text{ mA}$		$I_{R1} V_R = V_{RWM}$		$I_{R2} V_R = 20 \text{ V}$ $T_A = 150^\circ\text{C}$		$I_{R3} V_R = 20 \text{ V}$ $T_A = 150^\circ\text{C}$		$I_{R4} V_R = V_{RWM}$		$V_F @ I_F$		$V_F @ I_F$ $T_A = -55^\circ\text{C}$	
	V(pk)	$\mu\text{A}$		V(pk)	$\frac{V_{FR}}{V(pk)}$	$t_{FR}$ ns	pF	pF	ns	nA dc	nA dc	$\mu\text{A}$ dc	$\mu\text{A}$ dc	V dc min	V dc max	V dc max	mA pulsed						
1N6638U and US	150	100	125	5.0	20	2.5	2.0	4.5	35	500	50	100	-	1.1	1.2	200							
1N6639U and US	100	10	75	5.0	10	2.5	-	4.0	-	100	-	90	-	1.2	1.3	500							
1N6640U and US	75	10	50	5.0	10	2.5	-	4.0	-	100	-	90	0.54 0.76 0.82 0.87	0.62 0.86 0.92 1.0	-	1 50 100 200							
1N6641U and US	75	10	50	5.0	10	3.0	-	5.0	-	100	-	90	-	1.1	1.2	200							
1N6642U, US and UB	100	100	75	5.0	20	5.0	2.8	5.0	25	500	50	100	-	1.0	-	10							
1N6643U and US	75	100	50	5.0	20	5.0	2.8	6.0	50	500	75	100	-	1.0	-	10							
														1.2	1.4	100							

Electrical specifications @  $T_A = +25^\circ\text{C}$  (unless otherwise specified).



DO-34

## Switching Diodes 1N4531

aeroflex.com/MetelicsHRC

Types	$V_F$		$I_R$			$V_{BR}$			$t_{tr} I_R = 10 \text{ mA}$ $I_F = 10 \text{ mA}$ $I_{rec} = 100 \Omega$		$T_{FR} @ I_F = 50 \text{ mA}$		$V_{FR} @ I_F = 50 \text{ mA}$		Capacitance @ 0 V		Capacitance @ 1.5 V	
	Ambient ( $^\circ\text{C}$ )	$I_F$ mA	V dc max	Ambient ( $^\circ\text{C}$ )	V dc	A max	Ambient ( $^\circ\text{C}$ )	$I_R$ $\mu\text{A}$	V dc max	V dc max	nsec	nsec	V(pk)	pF	pF			
1N4531-1	25	10	0.8	25	20	0.025	25	100	100	25	5	20	5	4	2.8			
	25	100	1.2	25	75	0.500												
	150	10	0.8	150	20	35.0												
	-55	100	1.3	150	75	75.0												



DO-35



DO-213AA

## Switching Diodes 1N4454-1

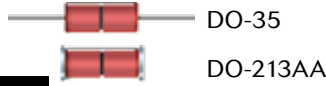
aeroflex.com/MetelicsHRC

Types	$V_{BR} @ 5 \mu\text{A}$		$V_{RWM}$	$I_O$	$V_{T1} I_F = 10 \text{ mA}$		$V_{T2} I_F = 10 \text{ mA}$		$t_{tr}$	$I_{R1} @ 50 \text{ Vdc}$		$I_{R2} @ 75 \text{ Vdc}$ $T_A = 150^\circ\text{C}$		Capacitance @ 0 V
	Volts	V(pk)			V dc	V dc	nsec	$\mu\text{A}$		$\mu\text{A}$	pF			
1N4454-1, 1N4454UR-1	75	50	200	0.8	0.7	4	0.1	100	2.0					

# Diode Product Listing

## Current Regulators

Available in JAN, JANTX and JANTXV levels to MIL-PRF-19500 slash sheet /463 in both axial leaded and MELF packages.



**Current Regulator Diode Series**  
1N5283-1 to 1N5314-1,  
1N7041-1 to 1N7055-1  
[aeroflex.com/MetelicsHRC](http://aeroflex.com/MetelicsHRC)

Regulator Current  
 $I_p$  (mA) @  $V_S = 25V$

Maximum Dynamic  
Impedance  
@  $V_S = 25V$   
 $Z_S$  (M) (Note 1)

Minimum Knee  
Impedance  
@  $V_K = 6.0V$   
 $Z_K$  (M) (Note 2)

Maximum Limiting  
Voltage  
@  $I_L = 0.8 I_p$  (min)  
 $V_L$  (volts)

Peak Operating  
Voltage

Types	Nominal	Minimum	Maximum				Volts
1N5283-1, 1N5283UR-1	0.22	0.198	0.242	25.0	2.75	1.00	100
1N5284-1, 1N5284UR-1	0.24	0.216	0.264	19.0	2.35	1.00	100
1N5285-1, 1N5285UR-1	0.27	0.243	0.297	14.0	1.95	1.00	100
1N5286-1, 1N5286UR-1	0.30	0.270	0.330	9.0	1.60	1.00	100
1N5287-1, 1N5287UR-1	0.33	0.297	0.363	8.0	1.35	1.00	100
1N5288-1, 1N5288UR-1	0.39	0.351	0.429	4.10	1.000	1.05	100
1N5289-1, 1N5289UR-1	.043	0.387	0.473	3.30	0.870	1.05	100
1N5290-1, 1N5290UR-1	0.47	0.423	0.517	2.70	0.750	1.05	100
1N5291-1, 1N5291UR-1	0.56	0.504	0.616	1.90	0.560	1.10	100
1N5292-1, 1N5292UR-1	0.62	0.558	0.682	1.55	0.470	1.13	100
1N5293-1, 1N5293UR-1	0.68	0.612	0.748	1.35	0.400	1.15	100
1N5294-1, 1N5294UR-1	0.75	0.675	0.825	1.15	0.335	1.20	100
1N5295-1, 1N5295UR-1	0.82	0.738	0.902	1.00	0.290	1.25	100
1N5296-1, 1N5296UR-1	0.91	0.819	1.001	0.88	0.240	1.29	100
1N5297-1, 1N5297UR-1	1.00	0.900	1.100	0.80	0.205	1.35	100
1N5298-1, 1N5298UR-1	1.10	0.99	1.21	0.70	0.180	1.40	100
1N5299-1, 1N5299UR-1	1.20	1.08	1.32	0.64	0.155	1.45	100
1N5300-1, 1N5300UR-1	1.30	1.17	1.43	0.58	0.135	1.50	100
1N5301-1, 1N5301UR-1	1.40	1.26	1.54	0.54	0.115	1.55	100
1N5302-1, 1N5302UR-1	1.50	1.35	1.65	0.51	0.105	1.60	100
1N5303-1, 1N5303UR-1	1.60	1.44	1.76	0.475	0.092	1.65	100
1N5304-1, 1N5304UR-1	1.80	1.62	1.98	0.420	0.074	1.75	100
1N5305-1, 1N5305UR-1	2.00	1.80	2.20	0.395	0.061	1.85	100
1N5306-1, 1N5306UR-1	2.20	1.98	2.42	0.370	0.052	1.95	100
1N5307-1, 1N5307UR-1	2.40	2.16	2.54	0.345	0.044	2.00	100
1N5308-1, 1N5308UR-1	2.70	2.43	2.97	0.320	0.035	2.15	100
1N5309-1, 1N5309UR-1	3.00	2.70	3.30	0.300	0.029	2.25	100
1N5310-1, 1N5310UR-1	3.30	2.97	3.63	0.280	0.024	2.35	100
1N5311-1, 1N5311UR-1	3.60	3.24	3.96	0.265	0.020	2.50	100
1N5312-1, 1N5312UR-1	3.90	3.51	4.29	0.255	0.017	2.60	100
1N5313-1, 1N5313UR-1	4.30	3.87	4.73	0.245	0.014	2.75	100
1N5314-1, 1N5314UR-1	4.70	4.23	5.17	0.235	0.012	2.90	100
1N7048-1, 1N7048UR-1	5.10	4.59	5.61	100	4.0	3.67	80
1N7049-1, 1N7049UR-1	5.60	5.04	6.16	90	4.0	4.03	80
1N7050-1, 1N7050UR-1	6.20	5.58	6.82	80	3.0	4.46	70
1N7051-1, 1N7051UR-1	6.80	6.12	7.48	70	2.0	4.90	70
1N7052-1, 1N7052UR-1	7.50	6.75	8.25	50	1.5	5.40	60
1N7053-1, 1N7053UR-1	8.20	7.38	9.02	30	1.5	5.90	60
1N7054-1, 1N7054UR-1	9.10	8.19	10.01	20	1.0	6.55	50
1N7055-1, 1N7055UR-1	10.00	9.00	11.10	10	1.0	7.20	50

Electrical specifications @ +25°C (unless otherwise specified).

NOTE 1:  $Z_S$  is derived by superimposing A 90 Hz RMS signal equal to 10% of  $V_S$  on  $V_S$

NOTE 2:  $Z_K$  is derived by superimposing A 90 Hz RMS signal equal to 10% of  $V_K$  on  $V_K$

Available in chip form.



# Diode Product Listing

## Zener Diode Chip Series CD5518B – CD5546B aeroflex.com/MetelicsHRC

Types	Nominal Zener Voltage, $V_Z$ @ $I_{ZT}$ (Note 1)	Zener Test Current, $I_{ZT}$	Maximum Zener Impedance, $Z_{ZT}$ @ $I_{ZT}$ (Note 2)	Maximum Reverse Leakage Current, $I_R$	Maximum Reverse Leakage Current, $V_R$	Regulation Factor $V_Z$ (Note 3)	Low $V_Z$ Current, $I_{ZL}$
	Volts	mAdc	Ohms	mAdc	Volts	Volts	mAdc
CD5518B	3.3	20	26	5.0	1.0	0.90	2.0
CD5519B	3.6	20	24	3.0	1.0	0.90	2.0
CD5520B	3.9	20	22	1.0	1.0	0.90	2.0
CD5521B	4.3	20	18	3.0	1.5	0.75	2.0
CD5522B	4.7	10	22	2.0	2.0	0.60	1.0
CD5523B	5.1	5.0	26	2.0	2.5	0.65	0.25
CD5524B	5.6	3.0	30	2.0	3.5	0.30	0.25
CD5525B	6.2	1.0	30	1.0	5.0	0.20	0.01
CD5526B	6.8	1.0	30	1.0	6.2	0.10	0.01
CD5527B	7.5	1.0	35	0.5	6.8	0.05	0.01
CD5528B	8.2	1.0	40	0.5	7.5	0.05	0.01
CD5529B	9.1	1.0	45	0.1	8.2	0.05	0.01
CD5530B	10.0	1.0	60	0.05	9.1	0.10	0.01
CD5531B	11.0	1.0	80	0.05	9.9	0.20	0.01
CD5532B	12.0	1.0	90	0.05	10.8	0.20	0.01
CD5533B	13.0	.0	90	0.01	11.7	0.20	0.01
CD5534B	14.0	1.0	100	0.01	12.6	0.20	0.01
CD5535B	15.0	1.0	100	0.01	13.5	0.20	0.01
CD5536B	16.0	1.0	100	0.01	14.4	0.20	0.01
CD5537B	17.0	1.0	100	0.01	15.3	0.20	0.01
CD5538B	18.0	1.0	100	0.01	16.2	0.20	0.01
CD5539B	19.0	1.0	100	0.01	17.1	0.20	0.01
CD5540B	20.0	1.0	100	0.01	18.0	0.20	0.01
CD5541B	22.0	1.0	100	0.01	19.8	0.25	0.01
CD5542B	24.0	1.0	100	0.01	21.6	0.30	0.01
CD5543B	25.0	1.0	100	0.01	22.4	0.35	0.01
CD5544B	28.0	1.0	100	0.01	25.2	0.40	0.01
CD5545B	30.0	1.0	100	0.01	27.0	0.45	0.01
CD5546B	33.0	1.0	100	0.01	29.7	0.50	0.01

Electrical specifications @ +25°C (unless otherwise specified). **AVAILABLE IN JANHC AND JANKC PER MIL-PRF-19500/437.**

NOTE 1: Suffix "B" voltage range equals nominal Zener voltage.  $\pm 5\%$ . Suffix "A" equals  $\pm 10\%$ . "C" suffix =  $\pm 2\%$  and "D" suffix =  $\pm 1\%$ . No Suffix equals  $\pm 20\%$ . Zener voltage is read using a pulse measurement, 10 milliseconds maximum.

NOTE 2: Zener impedance is derived by superimposing on  $I_{ZT}$  a 60 Hz rms ac current equal to 10 % of  $I_{ZT}$ .

NOTE 3:  $\Delta V_Z$  is the maximum difference between  $V_Z$  @  $I_{ZT}$  and  $V_Z$  at  $I_{ZL}$  measured with the device junction in thermal equilibrium at an ambient temperature of  $+25^\circ \pm 3^\circ\text{C}$ .

## Zener Diode Chip Series CD4614 – CD4627 aeroflex.com/MetelicsHRC

Types	Nominal Zener Voltage, $V_Z$ @ $I_{ZT}$ (Note 1)	Zener Test Current, $I_{ZT}$	Maximum Zener Impedance, $Z_{ZT}$ @ $I_{ZT}$ (Note 2)	Maximum Reverse Leakage Current, $I_R$ @ $V_R$
	Volts	A	Ohms	A
CD4614	1.8	250	1200	7.5
CD4615	2.0	250	1250	5.0
CD4616	2.2	250	1300	4.0
CD4617	2.4	250	1400	2.0
CD4618	2.7	250	1500	1.0
CD4619	3.0	250	1600	0.8
CD4620	3.3	250	1650	7.5
CD4621	3.6	250	1700	7.5
CD4622	3.9	250	1650	5.0
CD4623	4.3	250	1600	4.0
CD4624	4.7	250	1550	10.0
CD4625	5.1	250	1500	10.0
CD4626	5.6	250	1400	10.0
CD4627	6.2	250	1200	10.0

Electrical specifications @ +25°C (unless otherwise specified). **AVAILABLE IN JANHC AND JANKC PER MIL-PRF-19500/435.**

NOTE 1: Zener voltage range equals nominal Zener voltage  $\pm 5\%$  for no suffix types. Zener voltage is read using a pulse measurement, 10 milliseconds maximum. "C" suffix =  $\pm 2\%$  and "D" suffix =  $\pm 1\%$ .

NOTE 2: Zener impedance is derived by superimposing on  $I_{ZT}$  a 60 Hz rms AC current equal to 10 % of  $I_{ZT}$ .

# Diode Product Listing

**Zener Diode  
Chip Series  
CD4565 – CD4584A**  
aeroflex.com/MetelicsHRC

	Zener Test Current $I_{ZT}$	Effective Temperature Coefficient	Voltage Temperature Stability, $\Delta V_{ZT, Max}$ -55° to +100° (Note 1)	Temperature Range	Maximum Zener Impedance $Z_{ZT}$ (Note 2)
Types 6.4 V $\pm 5\%$	mA	% / °C	Ohms	°C	Ohms
CD4565	0.5	0.01	48	0 to +75 °C	200
CD4565A	0.5	0.01	100	-55 to +100 °C	200
CD4566	0.5	0.005	24	0 to +75 °C	200
CD4566A	0.5	0.005	50	-55 to +100 °C	200
CD4567	0.5	0.002	10	0 to +75 °C	200
CD4567A	0.5	0.002	20	-55 to +100 °C	200
CD4568	0.5	0.001	5	0 to +75 °C	200
CD4568A	0.5	0.001	10	-55 to +100 °C	200
CD4569	0.5	0.0005	2.5	0 to +75 °C	200
CD4569A	0.5	0.0005	5	-55 to +100 °C	200
CD4570	1.0	0.01	48	0 to +75 °C	100
CD4570A	1.0	0.01	100	-55 to +100 °C	100
CD4571	1.0	0.005	24	0 to +75 °C	100
CD4571A	1.0	0.005	50	-55 to +100 °C	100
CD4572	1.0	0.002	10	0 to +75 °C	100
CD4572A	1.0	0.002	20	-55 to +100 °C	100
CD4573	1.0	0.001	5	0 to +75 °C	100
CD4573A	1.0	0.001	10	-55 to +100 °C	100
CD4574	1.0	0.0005	2.5	0 to +75 °C	100
CD4574A	1.0	0.0005	5	-55 to +100 °C	100
CD4575	2.0	0.01	48	0 to +75 °C	50
CD4575A	2.0	0.01	100	-55 to +100 °C	50
CD4576	2.0	0.005	24	0 to +75 °C	50
CD4576A	2.0	0.005	50	-55 to +100 °C	50
CD4577	2.0	0.002	10	0 to +75 °C	50
CD4577A	2.0	0.002	20	-55 to +100 °C	50
CD4578	2.0	0.001	5	0 to +75 °C	50
CD4578A	2.0	0.001	10	-55 to +100 °C	50
CD4579	2.0	0.0005	2.5	0 to +75 °C	50
CD4579A	2.0	0.0005	5	-55 to +100 °C	50
CD4580	4.0	0.01	48	0 to +75 °C	25
CD4580A	4.0	0.01	100	-55 to +100 °C	25
CD4581	4.0	0.005	24	0 to +75 °C	25
CD4581A	4.0	0.005	50	-55 to +100 °C	25
CD4582	4.0	0.002	10	0 to +75 °C	25
CD4582A	4.0	0.002	20	-55 to +100 °C	25
CD4583	4.0	0.001	5	0 to +75 °C	25
CD4583A	4.0	0.001	10	-55 to +100 °C	25
CD4584	4.0	0.0005	2.5	0 to +75 °C	25
CD4584A	4.0	0.0005	5	-55 to +100 °C	25

Electrical specifications @ +25 °C (unless otherwise specified). **AVAILABLE IN JANHC AND JANKC PER MIL-PRF-19500/452.**

NOTE 1: The maximum allowable change observed over the entire temperature range, i.e., the diode voltage will not exceed the specialized mV at any discrete temperature between the established limits, per JEDEC standard No.5.

NOTE 2: Zener impedance is derived by superimposing on  $I_{ZT}$  a 60 Hz rms ac current equal to 10% of  $I_{ZT}$ .

# Diode Product Listing

**Zener Diode  
Chip Series  
CD4099 – CD4135**  
aeroflex.com/MetelicsHRC

Types	Nominal Zener Voltage, $V_Z$ @ $I_{ZT}$ (Note 1)	Zener Test Current, $I_{ZT}$	Maximum Zener Impedance, $Z_{ZT}$ @ $I_{ZT}$ (Note 2)	Maximum Reverse Leakage Current, $I_R$ @ $V_R$	Volts
CD4099	6.8	250	200	10.0	5.17
CD4100	7.5	250	200	10.0	5.70
CD4101	8.2	250	200	1.0	6.24
CD4102	8.7	250	200	1.0	6.61
CD4103	9.1	250	200	1.0	6.92
CD4104	10	250	200	1.0	7.60
CD4105	11	250	200	0.05	8.44
CD4106	12	250	200	0.05	9.12
CD4107	13	250	200	0.05	9.87
CD4108	14	250	200	0.05	10.65
CD4109	15	250	100	0.05	11.40
CD4110	16	250	100	0.05	12.15
CD4111	17	250	100	0.05	12.92
CD4112	18	250	100	0.05	13.67
CD4113	19	250	150	0.05	14.44
CD4114	20	250	150	0.01	15.20
CD4115	22	250	150	0.01	16.72
CD4116	24	250	150	0.01	18.25
CD4117	25	250	150	0.01	19.00
CD4118	27	250	150	0.01	20.46
CD4119	28	250	200	0.01	21.28
CD4120	30	250	200	0.01	22.80
CD4121	33	250	200	0.01	25.08
CD4122	36	250	200	0.01	27.38
CD4123	39	250	200	0.01	29.65
CD4124	43	250	250	0.01	32.56
CD4125	47	250	250	0.01	35.75
CD4126	51	250	300	0.01	38.76
CD4127	56	250	300	0.01	42.60
CD4128	60	250	400	0.01	45.60
CD4129	62	250	500	0.01	47.10
CD4130	68	250	700	0.01	51.68
CD4131	75	250	700	0.01	57.00
CD4132	82	250	800	0.01	62.32
CD4133	87	250	1000	0.01	66.12
CD4134	91	250	1200	0.01	69.16
CD4135	100	250	1500	0.01	76.00

Electrical specifications @ +25°C (unless otherwise specified). **AVAILABLE IN JANHC AND JANKC PER MIL-PRF-19500/435.**

NOTE 1: Zener voltage range equals nominal Zener voltage  $\pm$  5% for no suffix types. Zener voltage is read using a pulse measurement, 10 milliseconds maximum. "C" suffix =  $\pm$  2% and "D" suffix =  $\pm$  1%.

NOTE 2: Zener impedance is derived by superimposing on  $I_{ZT}$  a 60 Hz rms AC current equal to 10 % of  $I_{ZT}$ .

# Diode Product Listing

**Zener Diode  
Chip Series  
CD957B – CD986B**  
aeroflex.com/MetelicsHRC

	Nominal Zener Voltage, $V_Z$ (Note 1)	Zener Test Current, $I_{ZT}$	Maximum Zener Impedance, $Z_{ZT}$ @ $I_{ZT}$ (Note 2)	Maximum Zener Impedance, $Z_{ZK}$ @ $I_{ZK}$ (Note 2)		Maximum DC Zener Current, $I_{ZM}$		Maximum Reverse Leakage Current, $I_R$ @ $V_R$
Types	Volts	mA	Ohms	Ohms	mA	mA	$\mu$ A	Volts
CD957B	6.8	18.5	4.5	700	1.0	55	5.0	5.2
CD958B	7.5	16.5	5.5	700	0.5	50	5.0	5.7
CD959B	8.2	15.0	6.5	700	0.5	45	5.0	6.2
CD960B	9.1	14.0	7.5	700	0.5	41	5.0	6.9
CD961B	10	12.5	8.5	700	0.25	38	2.0	7.6
CD962B	11	11.5	9.5	700	0.25	32	1.0	8.4
CD963B	12	10.5	11.5	700	0.25	31	1.0	9.1
CD964B	13	9.5	13	700	0.25	28	0.5	9.9
CD965B	15	8.5	16	700	0.25	25	0.5	11
CD966B	16	7.8	17	700	0.25	24	0.5	12
CD967B	18	7.0	21	750	0.25	20	0.5	14
CD968B	20	6.2	25	750	0.25	18	0.5	15
CD969B	22	5.6	29	750	0.25	16	0.5	17
CD970B	24	5.2	33	750	0.25	15	0.5	18
CD971B	27	4.6	41	750	0.25	13	0.5	21
CD972B	30	4.2	49	1000	0.25	12	0.5	23
CD973B	33	3.8	58	1000	0.25	11	0.5	25
CD974B	36	3.4	70	1000	0.25	10	0.5	27
CD975B	39	3.2	90	1000	0.25	9.5	0.5	30
CD976B	43	3.0	93	1500	0.25	8.8	0.5	33
CD977B	47	2.7	105	1500	0.25	7.9	0.5	36
CD978B	51	2.5	125	1500	0.25	7.4	0.5	39
CD979B	56	2.2	150	2000	0.25	6.8	0.5	43
CD980B	62	2.0	185	2000	0.25	6.0	0.5	47
CD981B	68	1.8	230	2000	0.25	5.5	0.5	52
CD982B	75	1.7	270	2000	0.25	5.0	0.5	56
CD983B	82	1.5	330	3000	0.25	4.6	0.5	62
CD984B	91	1.4	400	3000	0.25	4.1	0.5	69
CD985B	100	1.3	500	3000	0.25	3.7	0.5	76
CD986B	110	1.1	750	4000	0.25	3.3	0.5	84

Electrical specifications @ +25°C (unless otherwise specified). **AVAILABLE IN JANHC AND JANKC PER MIL-PRF-19500/117.**

NOTE 1: Zener voltage range equals nominal voltage  $\pm 5\%$  for "B" Suffix. "A" Suffix denotes  $\pm 10\%$ . No Suffix denotes  $\pm 20\%$ . "C" suffix =  $\pm 2\%$  and "D" suffix =  $\pm 1\%$ . Zener voltage is read using a pulse measurement, 10 milliseconds maximum.

NOTE 2: Zener impedance is derived by superimposing on  $I_{ZT}$  a 60 Hz rms a.c. current equal to 10 % of  $I_{ZT}$ .

**Zener Diode  
Chip Series**  
CD746A – CD759A,  
CD4370A – CD4372A  
aeroflex.com/MetelicsHRC

	Nominal Zener Voltage, $V_Z @ I_{ZT}$ (Note 1)	Zener Test Current, $I_{ZT}$	Maximum Zener Impedance, $Z_{ZT} @ I_{ZT}$ (Note 2)	Maximum Reverse Leakage Current $I_R @ V_R$	Maximum Zener Current, $I_{ZM}$	
Types	Volts	mA	Ohms	$\mu A$	Volts	mA
CD4370A	2.4	20	30	100	1.0	155
CD4371A	2.7	20	30	75	1.0	140
CD4372A	3.0	20	29	50	1.0	125
CD746A	3.3	20	28	10	1.0	120
CD747A	3.6	20	24	5	1.0	110
CD748A	3.9	20	23	5	1.0	100
CD749A	4.3	20	22	2	1.0	90
CD750A	4.7	20	19	5	1.5	85
CD751A	5.1	20	17	5	2.0	75
CD752A	5.6	20	11	5	2.5	70
CD753A	6.2	20	7	5	3.5	85
CD754A	6.8	20	5	2	4.0	60
CD755A	7.5	20	6	2	5.0	55
CD756A	8.2	20	8	1	6.0	50
CD757A	9.1	20	10	1	7.0	45
CD758A	10.0	20	17	1	8.0	40
CD759A	12.0	20	30	1	9.0	35

Electrical specifications @ +25°C (unless otherwise specified). **AVAILABLE IN JANHC AND JANKC PER MIL-PRF-19500/127.**

NOTE 1: Zener voltage range equals nominal voltage  $\pm 5\%$  for "A" Suffix. No Suffix denotes  $\pm 10\%$ . "C" suffix =  $\pm 2\%$  and "D" suffix =  $\pm 1\%$ . Zener voltage is read using a pulse measurement, 10 milliseconds maximum.

NOTE 2: Zener impedance is derived by superimposing on  $I_{ZT}$  a 60 Hz rms a.c. current equal to 10 % of  $I_{ZT}$ .

**Silicon Switching  
Diode Chips**  
CD914, CD4148,  
CD4531, CD6642 &  
CD4454  
aeroflex.com/MetelicsHRC

	$V_{BR} @ 100 \text{ mA}$	$V_{RWM}$	$I_O$	$V_{F1}$ $I_F = 10 \text{ mA}$	$V_{F2}$ $I_F = 50 \text{ mA}$	$V_{F3}$ $I_F = 100 \text{ mA}$	$t_{rr}$	$I_{R1} @ 20 \text{ Vdc}$	$I_{R2}$	$I_{R3} @ 20 \text{ Vdc}$ $T_A = 150^\circ\text{C}$	$I_{R4}$ $T_A = 150^\circ\text{C}$	Capacitance @ 0 V	Capacitance @ 1.5 V
Types	Volts (min)	Volts (pk)	mA	Vdc	Vdc	Vdc	nsec	nA	$\mu A @ V$	$\mu A$	$\mu A @ V$	pF	pF
CD914	100	75	75	0.8	1.2	N/A	5	25	0.5 @ 75	35	75 @ 75	4.0	2.8
CD4148	100	75	200	0.8	N/A	1.2	5	35	0.5 @ 75	35	75 @ 75	4.0	2.8
CD4531 CD6642													
CD4454	75	50	200	1.0	N/A	N/A	4	N/A	0.1 @ 50	N/A	100 @ 50	2.0	N/A

Electrical specifications @ +25°C (unless otherwise specified).

**CD914, CD4148, CD4531, AVAILABLE IN JANHC AND JANKC PER MIL-PRF-19500/116. CD6642 AVAILABLE IN JANHC AND JANKC PER MIL-PRF-19500/1578.**

**Silicon Switching  
Diode Chips**  
CD3600, CD4150,  
CD6640 & CD4153  
aeroflex.com/MetelicsHRC

	$V_{BR}$ $I_R = 10 \mu A^*$	$V_{RWM}$	$I_{R1}$ $V_R = 50 \text{ Vdc}$ $T_A = 150^\circ\text{C}$	$I_{R2}$ $V_R = 50 \text{ Vdc}$ $T_A = 150^\circ\text{C}$	Capacitance $V_R = 0, f = 1 \text{ MHz}$ ; ac signals = 50 mV (p-p)	$t_{rr}$
Types	Volts (min)	Volts (pk)	$\mu A \text{ Vdc}$	$\mu A \text{ Vdc}$	pF	nsec
CD3600	75	50	0.10	100	2.5	4
CD4150 CD6640	75	50	0.10	100	2.5	4
CD4153	75*	50	0.05	150	2.0	4

\* @ 5 mA for CD4153

Electrical specifications @ +25°C (unless otherwise specified). **CD6640 AVAILABLE IN JANHC AND JANKC PER MIL-PRF-19500/609.**

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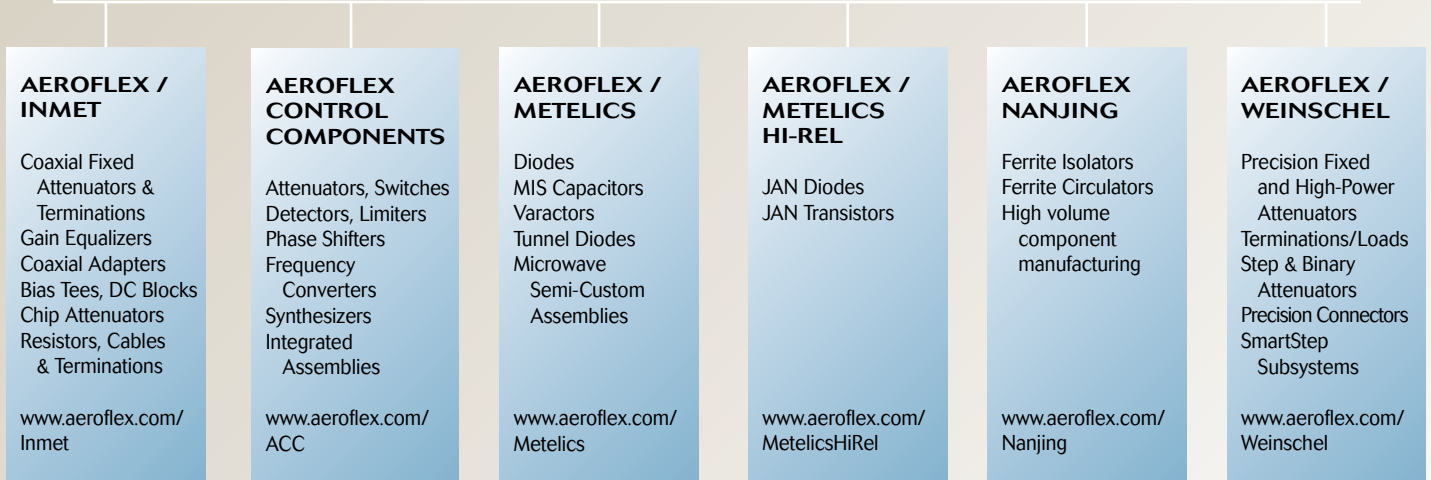


# AEROFLEX MICROELECTRONIC SOLUTIONS

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Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused.