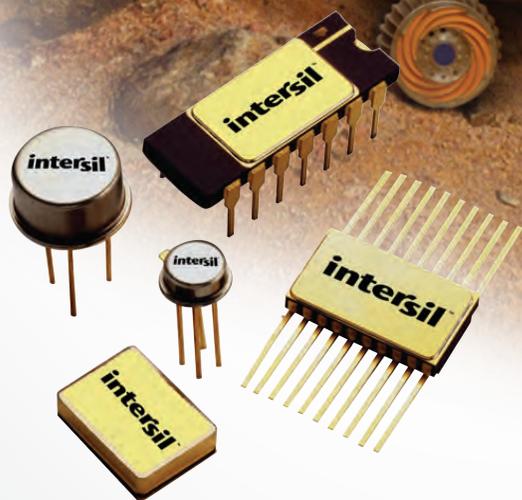


SELECTION  
GUIDE

# SPACE PRODUCTS

2013



Intersil Rad-Hard Technology Supports  
Historic Mission

Onboard Curiosity are 34 unique radiation-hardened and single-event effects hardened ICs built and tested by Intersil

[INTERSIL.COM](http://INTERSIL.COM)

**intersil**™

SIMPLY SMARTER™

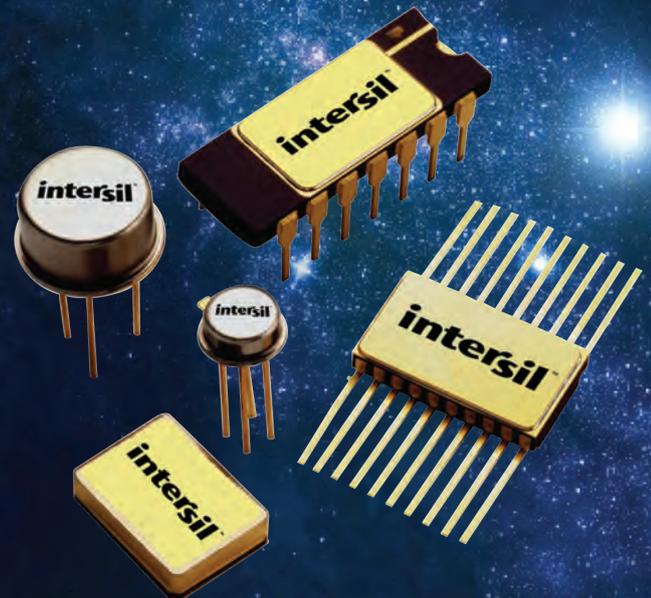
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## Who is Intersil?

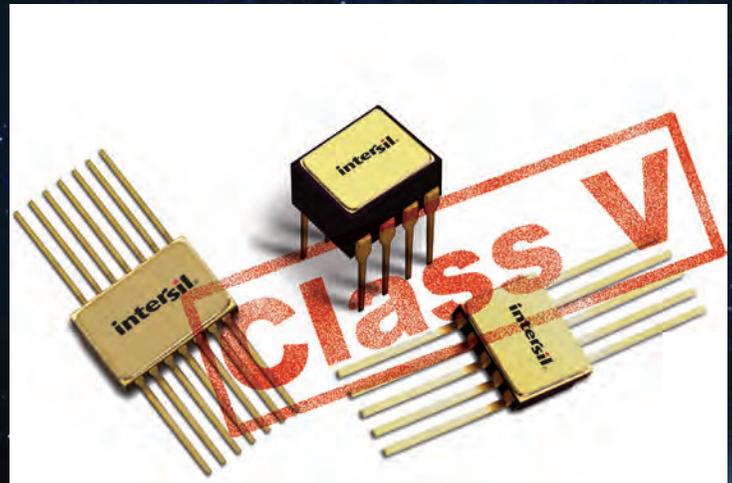
- Pure-play high-performance analog company
  - Headquartered in Milpitas, CA
  - Design centers N.A., U.K., India
  - Sales locations around the globe
- Over 40 diverse product families
- Experts in high-efficiency power management
- 40+ years supplying high-reliability ICs into space and defense applications
- Stable balance sheet

## Over 40 Years Supplying High-Reliability ICs



# Intersil's Space Solutions

- ~300 space-qualified radiation hardened products available.
- Consistent design and manufacturing in Intersil's MIL-PRF-38535-qualified facility located in Palm Bay, Florida.
- Intersil is one of only 15 RHA Defense Logistics Agency (Land and Maritime) QML suppliers.
- All products are fully Class V (space level) compliant.
- All products are on individual DLA SMD drawings.



## Intersil's Approach to Radiation Environments in Space

### TID (Total Ionizing Dose)

TID is the progressive, long-term ionizing radiation damage caused by protons, electrons and other sources. Total ionizing dose testing of semiconductor components has historically been performed at 'qualification' dose rates in the 50 - 300rad(Si)/s. Modern sub-micron technologies tend to be more resistant to total dose effects.

**Intersil's approach:** TID hardness is tested and guaranteed on a wafer by wafer basis to MIL-STD-883 Method 1019 using an in-house Gammacell 220™ <sup>60</sup>Co irradiator. This is now done at both high dose rates (50rad(Si)/s) and low dose rates (0.01rad(Si)/s).

### SEE (Single-Event Effects)

The intense heavy ion environment encountered in space applications can cause a variety of effects in electronic circuitry, including Single-Event Transient (SET), Single-Event Latchup (SEL) and Single-Event Burnout (SEB). These Single-Event Effects (SEE) can lead to system-level performance issues including disruption, degradation and destruction.

**Intersil's approach:** SEE characterizations are performed at Texas A&M and complete reports can be found at [www.intersil.com](http://www.intersil.com) [Rad Test Reports](#) 

## ELDRS PROGRAM

Intersil is performing wafer-by-wafer production testing qualification at both low and high dose rate under biased and unbiased conditions.



External view of the low dose rate <sup>60</sup>Co irradiator.

### Intersil's Approach to ELDRS (Enhanced Low Dose Rate Sensitivity)

Researchers have noted strong dose rate dependence in the total dose response of bipolar analog integrated circuits. Many industry-standard devices show severe degradation of key parameters when irradiated at very low dose rates. The de facto standard for low dose rate is 0.01 rad(Si)/s, which is now included in MIL-STD-883 Method 1019.

**Intersil's approach:** Intersil is performing wafer-by-wafer production testing qualification at both low and high dose rate under biased and unbiased conditions which started in 2011. A vault-type low dose rate irradiator has been constructed to support this activity. Baseline ELDRS testing continues and complete reports can be found on the Intersil web site. The Intersil part number will now have an EH vs. RH if that part is released on this new low dose flow.

### Wafer-by-wafer Production Low Dose Rate (ELDRS) Acceptance Testing at Intersil



**Watch Video**

New ELDRS Facility and Program.

[intersil.com/space/ELDRS](http://intersil.com/space/ELDRS)

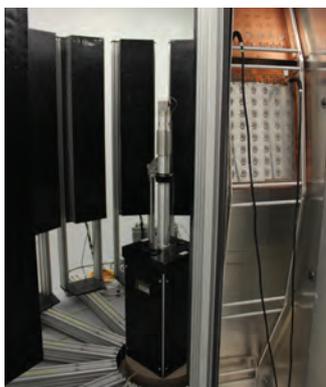
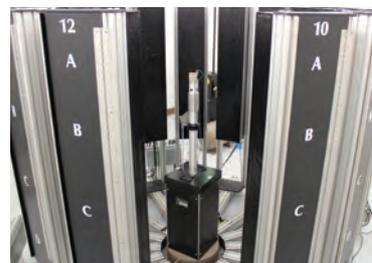


Image showing a single vertical test board holder and PbAl spectrum hardening filter box with the access door open.



View of 'pop-up' source (center) and surrounding test racks.

Intersil will be releasing all of our new products on this EH flow going forward and are in the process of converting over all of our already released products on this flow. Below is a list of the products already released. This will be an ongoing process, so please check back often.

### Released EH Products

| Rad Hard Analog       |   |   |
|-----------------------|---|---|
| VREF                  | ISL71090SEH25   | Rad Hard Ultra Low Noise, Precision Voltage Reference                                 |
| MUXes                 | HS-1840AEH  | Rad Hard 16 Channel CMOS Analog Multiplexer   |
|                       | HS-1840BEH  | Rad Hard 16 Channel BiCMOS Analog Multiplexer   |
|                       | HS-508BEH   | Rad Hard 8 Channel CMOS Analog Multiplexer  |
| Switches              | HS-302EH  | Rad Hard CMOS Dual DPST Analog Switch   |
|                       | HS-303AEH,<br>HS-303BEH,<br>HS-303CEH                           | Rad Hard CMOS Dual SPDT Analog Switch   |
|                       | HS-201HSEH  | Quad SPST CMOS Analog Switch  |
|                       | HS-26CLV31EH,<br>HS-26CLV32EH                                   | Rad Hard 3.3V Quad Differential Line Receiver   |
| Interface             | HS-26C31EH,<br>HS-26CT31EH                                      | Rad Hard Quad Differential Line Driver  |
|                       | HS-26C32EH,<br>HS-26CT32EH                                      | Rad Hard Quad Differential Line Receiver  |
|                       | ISL70218SEH   | Rad Hard Dual 36V Precision Single-Supply, Rail-to-Rail Output, Low-Power Op Amp      |
| Op-Amps               | ISL70227SEH   | 36V Rad Hard Dual Precision Op Amp  |
|                       | ISL70417SEH   | Rad Hard 40V Quad Precision Low Power Op Amp  |
|                       | ISL70444SEH   | 19MHz Rad Hard 40V Quad Rail-to-Rail Input - Output, Low-Power Op Amp                 |
|                       | ISL7124SEH  | Single Supply Quad Op Amp   |
|                       | HS-5104AEH  | Rad Hard Low Noise Quad Op Amp  |
|                       | HS-OP470AEH   | Rad Hard Very Low Noise Quad Op Amp   |
| Con-verters           | HS-3530AEH  | Rad Hard Programmable Low Power Op Amp  |
|                       | HS-565BEH   | High Speed, Monolithic Digital-To-Analog Converter                                    |
| Com-parators          | ISL7119EH   | High Speed Dual Voltage Comparator  |
|                       | IS-139ASEH  | Single Event Rad Hard Quad Voltage Comparators  |
|                       | HS-139EH  | Rad Hard Quad Voltage Comparator  |
| Rad Hard Power        |   |   |
| Linear Regulator      | ISL75052SEH   | 1.5A, Rad Hard, Positive, High Voltage LDO  |
|                       | ISL75051SEH   | 3A, Rad Hard, Positive, Ultra Low Dropout Regulator                                   |
|                       | HS-117EH  | Rad Hard Adjustable Positive Voltage Regulator  |
| Switching Regulators  | ISL70001SEH   | Rad Hard and SEE Hard 6A Synchronous Buck Regulator                                   |
|                       | ISL70001ASEH  | Rad Hard and SEE Hard 6A Synchronous Buck Regulator                                   |
|                       | ISL70002SEH   | Rad Hard and SEE Hard 12A Synchronous Buck Regulator                                  |
| Supervisory           | ISL705AEH,<br>ISL705BEH,<br>ISL705CEH                           | Rad Hard, 5.0V $\mu$ -Processor Supervisory Circuits                                  |
|                       | ISL706AEH,<br>ISL706BEH,<br>ISL706CEH                           | Rad Hard, 3.3V $\mu$ -Processor Supervisory Circuits                                  |
|                       | IS-1825BSEH   | Single Event and Total Dose Hardened, High-Speed, Dual Output PWM                     |
| Switching Controllers | IS-1845ASEH   | Single Event Rad Hard High Speed, Current Mode PWM                                    |
|                       | ISL78840ASEH,<br>ISL78841ASEH,<br>ISL78843ASEH,<br>ISL78845ASEH | Rad Hard, High Performance Industry Standard Single-Ended Current Mode PWM Controller |
|                       | IS-2100AEH  | Rad Hard High Frequency Half Bridge Drivers   |
|                       | IS-2981EH   | 8 Channel Source Driver   |

## Rad-Hard QML SMD

### Standard Data Package

| Nomenclature, Example   | Class Q                             |   | Class V                             |   |  |
|---|-------------------------------------|---|-------------------------------------|---|--|
|   | RH Packaged Part                    | RH Packaged Part                                | EH Packaged Part                    | RH Die - Authorized Die Processors Only                                       | EH Die - Authorized Die Processors Only                    |
| Part Types  | "RH-8" "RHQ" XXXXRH-8 in the part # | "MSR" "NSR" "RHV" "RH-Q" XXXXRH-Q in the part # | "EHV" "EH-Q" XXXXEH-Q in the part # | HS0-XXXXRH-Q<br>IS0-XXXXRH-Q<br>ISL7XXXXRHVX<br>"HSR" or "HMSR" in the part # | HS0-XXXXEH-Q<br>IS0-XXXXEH-Q<br>ISL7XXXXEHVX in the part # |
| Shipper/Pack Slip   | X                                   | X   | X                                   | X   | X  |
| P.O. Number   | X                                   | X   | X                                   | X   | X  |
| Customer Part Number, Rev (as applicable on the P.O.)   | X                                   | X   | X                                   | X   | X  |
| Intersil Part Number  | X                                   | X   | X                                   | X   | X  |
| Lot Date Code / Trace Code  | X                                   | X   | X                                   |   |  |
| Lot Number  | X                                   | X   | X                                   | X   | X  |
| Quantity  | X                                   | X   | X                                   | X   | X  |
| Certificate of Conformance  | X                                   | X   | X                                   | X   | X  |
| Screening Attributes Data   |                                     | X   | X                                   | X   | X  |
| Post seal thru end of 100% screening operations   |                                     | X   | X                                   |   |  |
| Test Operations   |                                     | X   | X                                   |   |  |
| Test Methods  |                                     | X   | X                                   |   |  |
| Quantity of units in/out by operation   |                                     | X   | X                                   |   |  |
| Date of each test   |                                     | X   | X                                   |   |  |
| PDA as applicable   |                                     | X   | X                                   |   |  |
| Visual Inspection   |                                     | X   | X                                   | X   | X  |
| Document Review   |                                     | X   | X                                   | X   | X  |
| Screening Variables & Delta Data - Variables data for all read/record and/or delta operations pre/post burn-in @25C are provided on electronic media. |                                     | X   | X                                   |   |  |
| Group A Attributes (located in Screening Attribute Data if performed)   |                                     | X   | X                                   |   |  |
| Group B Attributes Summary  |                                     | X   | X                                   |   |  |
| Group C Attributes Summary  |                                     | X   | X                                   |   |  |
| Group C Variables & Delta Data - Variables data for all read/record and/or delta operations pre/post life test are provided on electronic media.      |                                     |   | X                                   |   |  |
| Group D Attributes Summary  |                                     | X   | X                                   |   |  |
| Group E Variables Data for HDR & LDR - Variables data for all read/record operations pre/post rad are provided on electronic media.                   |                                     |   | X                                   |   | X  |
| SEM C of C & Photos (if performed)  |                                     | X   | X                                   | X   | X  |
| Radiation C of C (High Dose Rate and/or Low Dose Rate)  | HDR                                 | HDR   | HDR & LDR                           | HDR   | HDR & LDR  |
| X-Ray Report (Film kept on file and available on request. Request must be documented on P.O.)   |                                     | X   | X                                   |   |  |

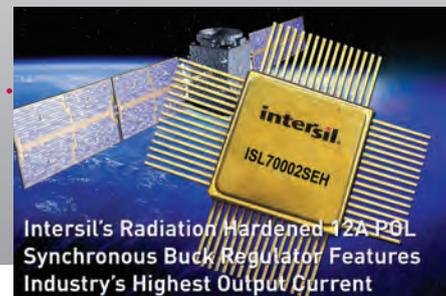
★ All EH product shipments will now come with Group C and E variables data in the data package.

► To view our complete ELDRS and SEE test reports, go to: [www.intersil.com](http://www.intersil.com) [Rad Test Reports](#)  
or, go to: [www.intersil.com/en/products/space-and-harsh-environment/rad-test-reports.html](http://www.intersil.com/en/products/space-and-harsh-environment/rad-test-reports.html)

# RAD-HARD FPGA POWER SOLUTION

Intersil offers a complete solution for powering Rad-Hard FPGAs

- ✓ Designed for SET immunity
- ✓ Optimized to power multi-channel FPGA devices



Intersil's Radiation Hardened 12A P-OL Synchronous Buck Regulator Features Industry's Highest Output Current

ISL70002SEH

## FPGA Power Solution

Many space grade FPGAs require a core voltage of 1.0V, which is supplied by the ISL70002SEH, an auxiliary voltage of 2.5V, which is supplied by the ISL70001SEH, and an I/O voltage of 3.3V which is supplied by the ISL75051RH (see Figure 1).

The ISL70001SEH and ISL70002SEH are total dose and SEE hardened high efficiency, monolithic synchronous buck regulators with integrated MOSFETs. These single chip power solutions operate over an input voltage range of 3V to 5.5V and provide a tightly regulated output voltage that is externally adjustable from 0.8V to ~85% of the input voltage. The ISL70001SEH can provide up to 6A ( $T_J \leq +145^\circ\text{C}$ ) of output current while the ISL70002SEH can provide up to 12A ( $T_J \leq +150^\circ\text{C}$ ) of output current.

The ISL75051SRH is a radiation hardened, low voltage, high current, single output LDO specified for up to 3.0A of continuous output current. It can operate over an input voltage range of 2.2V to 6.0V and is capable of providing output voltages of 0.8V to 5V with an external resistor divider. Dropout voltages as low as 65mV can be realized with this device.

► For more Information, see app note: **AN1707** (Intersil's Radiation Hardened FPGA Power Solutions)

|             |   |
|-------------|---|
| ISL70002SEH | Rad Hard and SEE Hard 12A Synchronous Buck Regulator with Multi-Phase Current Sharing |
| ISL70001SEH | Rad Hard and SEE Hard 6A Synchronous Buck Regulator                                   |
| ISL75051SEH | 3A, Rad Hard, Positive, Ultra Low Dropout Regulator                                   |

The FPGA reference board schematic and board layout Gerber files can be downloaded on any of these product info pages.

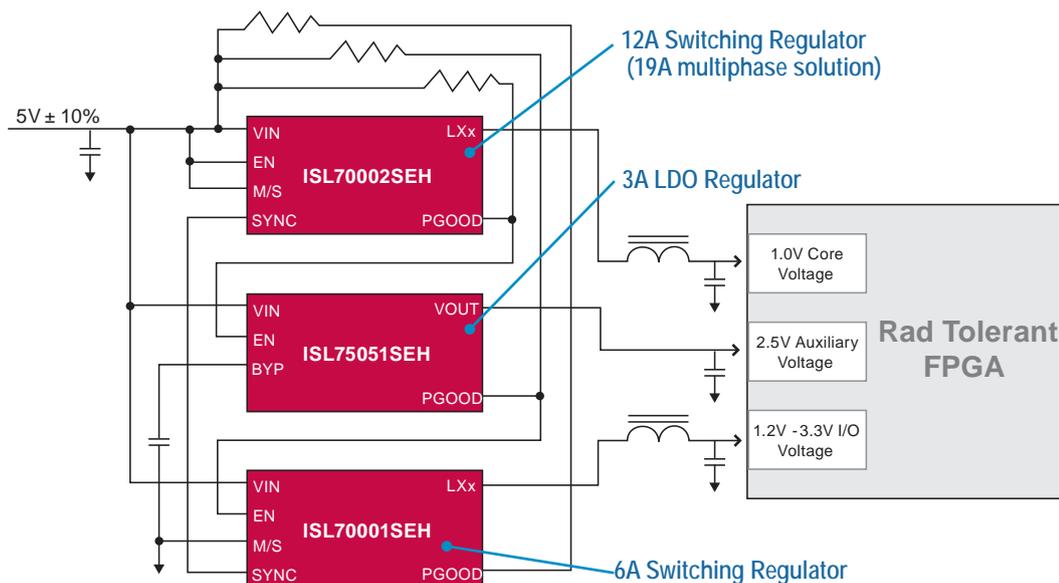


Figure 1. VIRTEX5MEZPWREV1Z Block Diagram

**Rad Hard Switching Regulator**  
**ISL70002SEH**



**SET Immune 12A Sync Buck Regulator w/Current Share**

The ISL70002SEH is a radiation hardened and SEE hardened high efficiency monolithic synchronous buck regulator with integrated MOSFETs. This single chip power solution operates over an input voltage range of 3V to 5.5V and provides a tightly regulated output voltage that is externally adjustable from 0.8V to ~85% of the input voltage. Output load current capacity is 12A for  $T_J \leq +150^\circ\text{C}$ . Two ISL70002SEH devices configured to current share can provide 19A total output current, assuming  $\pm 27\%$  worst-case current share accuracy.

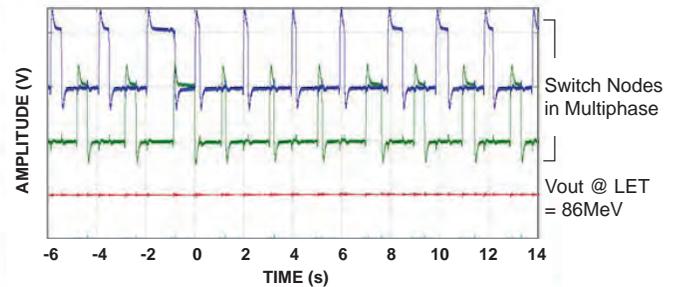
**Key Features**

- **SEE Hardness**
  - SEL and SEB  $\text{LET}_{\text{TH}}$  ..... 86MeV.cm<sup>2</sup>/mg
  - SEFI  $\text{LET}_{\text{TH}}$  ..... 43MeV.cm<sup>2</sup>/mg
  - SET  $\text{LET}_{\text{TH}}$  ..... 86MeV.cm<sup>2</sup>/mg
- **Total Dose Hardness**
  - Total Dose, High Dose Rate ..... 100krad(Si)
  - Total Dose, Low Dose Rate ..... 100krad(Si)\*
- **$\pm 1\%$  Ref. Voltage (Line, Load, Temp. & Rad.)**
- **Redundancy/Junction Isolation: Exceptional SET Performance**
- **1MHz or 500kHz Switching Frequency**
- **Excellent Transient Response**

\*Level guaranteed by characterization; "EH" version is production tested to 50 krad(Si).

**SET Immune**

Single event transient scope shot showing no change in output voltage when the control loop is disturbed.



**SET PERFORMANCE**

**Rad Hard Linear Regulation**  
**ISL75052SEH**



**1.5A, Rad Hard, Positive, High Voltage LDO**

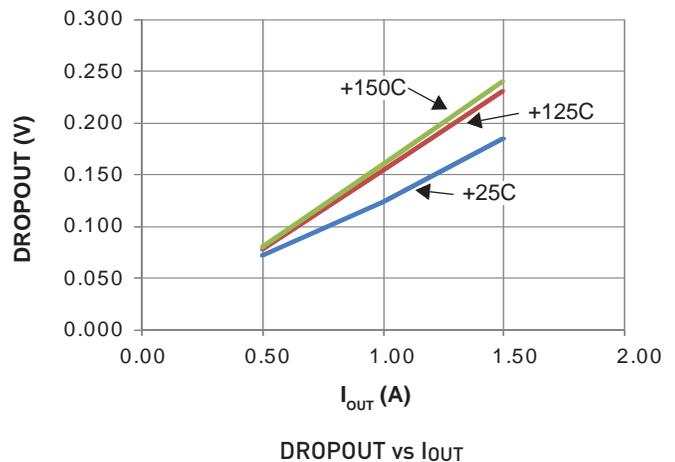
The ISL75052SEH is a radiation hardened, single output LDO specified for an output current of 1.5A. The device operates from an input voltage range of 4.0V to 13.2V and provides for output voltages of 0.6V to 12.7V. The output is adjustable based on a resistor divider setting. Dropout voltages as low as 75mV (at 0.5A) typical can be realized using the device. This allows the user to improve the system efficiency by lowering  $V_{\text{IN}}$  to nearly  $V_{\text{OUT}}$ .

**Key Features**

- **Radiation Environment**
  - High Dose Rate (50-300rad(Si)/s) ..... 100krad(Si)
  - Low Dose Rate (0.01rad(Si)/s) ..... 100krad(Si)\*
  - SET/SEL/SEB ..... 86MeV.cm<sup>2</sup>/mg
- **Input Supply Range 4V to 13.2V**
- **Best in Class Accuracy  $\pm 1.5\%$**
- **Ultra Low Dropout:**
  - 75mV Dropout (typ) @ 0.5A
  - 225mV Dropout (typ) @ 1.5A
- **Noise of 100 $\mu\text{V}_{\text{RMS}}$  (typ) between 300Hz to 300kHz**
- **SET Mitigation with No Added Filtering/Diodes**
- **Shutdown Current of 165 $\mu\text{A}$  (typ)**

\*Level guaranteed by characterization; "EH" version is production tested to 50 krad(Si).

**Ultra Low Dropout**



**Rad Hard Op Amp**  
**ISL70444SEH**

**19MHz Rad Hard 40V Quad Rail-to-Rail Input - Output, Low-Power Op Amps**

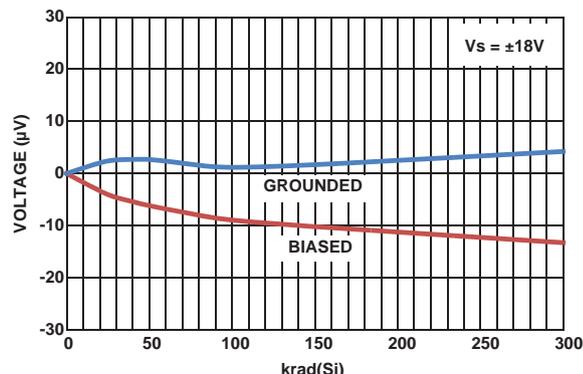
The ISL70444SEH features four low-power amplifiers optimized to provide maximum dynamic range. These op amps feature a unique combination of rail to rail operation on the input and output as well as a slew enhanced front end that provides ultra fast slew rates positively proportional to a given step size; thereby increasing accuracy under transient conditions, whether it's periodic or momentary. They also offer low power, low offset voltage, and low temperature drift, making it ideal for applications requiring both high DC accuracy and AC performance. With <math><5\mu\text{s}</math> recovery for Single Event Transients (SET) ( $\text{LET}_{\text{TH}} = 86.4\text{MeV}\cdot\text{cm}^2/\text{mg}</math>), the number of filtering components needed is drastically reduced. The ISL70444SEH is also immune to Single Event Latch-up as it is fabricated in Intersil's Proprietary PR40 Silicon On Insulator (SOI) process.$

**Key Features**

- **Radiation Effects**
  - High Dose Rate (50-300rad(Si)/s) ..... 100krad(Si)
  - Low Dose Rate (0.01rad(Si)/s) ..... 100krad(Si)\*
  - SEL/SEB  $\text{LET}_{\text{TH}}$  ..... 86.4 MeV $\cdot\text{cm}^2/\text{mg}$
- **Acceptance Tested to 50krad(Si) (LDR) Wafer-by-wafer**
- **<math><5\mu\text{s}</math> Recovery from SEE ( $\text{LET}_{\text{TH}} = 86.4\text{MeV}\cdot\text{cm}^2/\text{mg}</math>)$**
- **Unity Gain Stable**
- **Rail-to-rail Input and Output**
- **Wide Gain-Bandwidth Product..... 19MHz**
- **Wide Single and Dual Supply Range ..... 2.7V to 40V Max**
- **Low Input Offset Voltage ..... 300 $\mu\text{V}$**

\*Level guaranteed by characterization; "EH" version is production tested to 50 krad(Si).

Offset Voltage Over Radiation



$V_{OS}$  vs HIGH DOSE RATE RADIATION

**Rad Hard Voltage Reference**  
**ISL71090SEH25**

**Rad Hard Ultra Low Noise, Precision Voltage Reference**

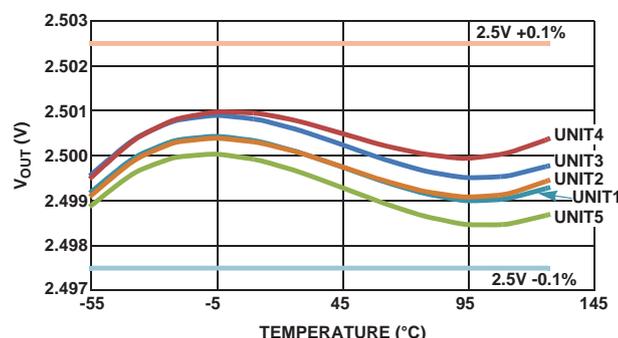
The ISL71090SEH25 is an ultra low noise, high DC accuracy precision voltage reference with a wide input voltage range from 4V to 30V. The ISL71090SEH25 uses the Intersil Advanced Bipolar technology to achieve sub 2 $\mu\text{V}$ P-P 0.1Hz noise with an accuracy over temperature and radiation of 0.15%.

**Key Features**

- **Radiation Environment**
  - High Dose Rate (50-300rad(Si)/s) ..... 100krad(Si)
  - Low Dose Rate (0.01rad(Si)/s) ..... 100krad(Si)\*
  - SET/SEL/SEB ..... 86MeV $\cdot\text{cm}^2/\text{mg}$
- **Reference Output Voltage ..... 2.5V $\pm$ 0.05%**
- **Accuracy Over Temperature and Radiation .....  $\pm$ 0.15%**
- **Output Voltage Noise ..... 2 $\mu\text{V}$ P-P Typ (0.1Hz to 10Hz)**
- **Supply Current ..... 930 $\mu\text{A}$  (Typ)**
- **Tempco (box method) ..... 10ppm/ $^{\circ}\text{C}$  Max**
- **Output Current Capability..... 20mA**

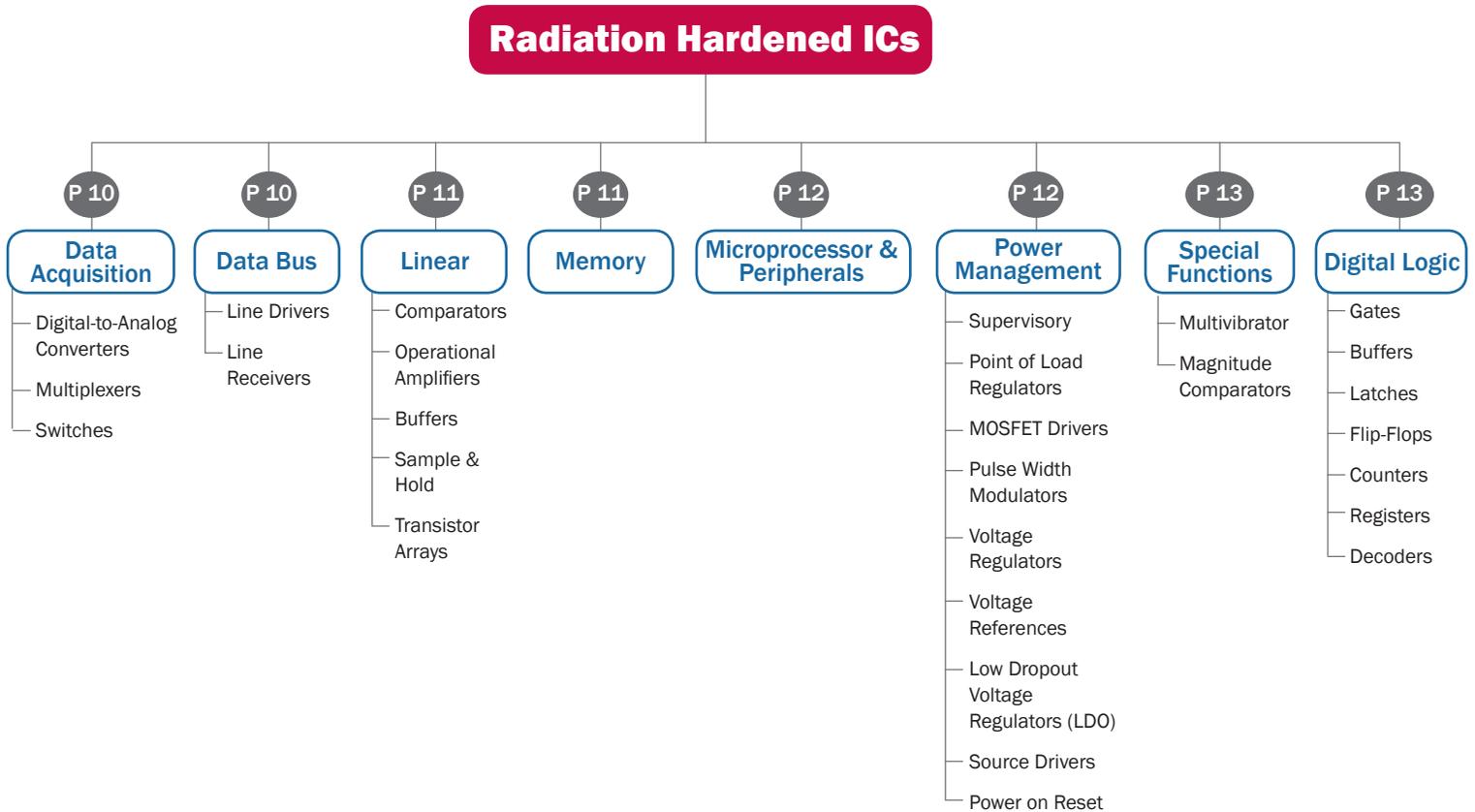
\*Level guaranteed by characterization; "EH" version is production tested to 50 krad(Si).

Temperature Drift (Coefficient)



## Rad-Hard Product Tree

Intersil offers a broad range of radiation hardened and Single-Event Effects (SEE) hardened IC products for RH and space applications.



## Radiation Hardened IC Selection Chart

| Device Description   | Device     | DLA SMD    | Package                     | Class        | Production Guaranteed      |                              | SEL (MeV. cm <sup>2</sup> /mg) | Note                  |
|--|------------|------------|-----------------------------|--------------|----------------------------|------------------------------|--------------------------------|-----------------------|
|  |            |            |                             |              | High Dose Rate (krad (Si)) | Low Dose Rate (krad (Si))    |                                |                       |
| <b>Data Acquisition</b>  |            |            |                             |              |                            |                              |                                |                       |
| <b>Digital-to-Analog Converters</b>  |            |            |                             |              |                            |                              |                                |                       |
| High-Speed, Monolithic Digital-to-Analog Converter   | HS-565BRH  | 5962R96755 | 24 Ld FlatPack, 24 Ld SBDIP | V, Q, /PROTO | 100                        | Report Available             | SEL free                       |                       |
|  | HS-565BEH  |            |                             | V            | 100                        | 50                           | SEL free                       |                       |
| <b>Multiplexers - 16-Channel</b>   |            |            |                             |              |                            |                              |                                |                       |
| 16 Channel BiCMOS Analog Multiplexer with High-Z Analog Input Protection                             | HS-1840BRH | 5962F95630 | 28 Ld SBDIP, 28 Ld FlatPack | V, Q, /PROTO | 300                        |                              | SEL free                       |                       |
|  | HS-1840BEH |            |                             | V            | 300                        | 50                           | SEL free                       | V <sub>S</sub> = ±12V |
| 16 Channel BiCMOS Analog Multiplexer with High-Z Analog Input Protection                             | HS-1840ARH | 5962F95630 | 28 Ld FlatPack, 28 Ld SBDIP | V, Q, /PROTO | 300                        | ELDRS Free, report available | SEL free                       |                       |
|  | HS-1840AEH |            |                             | V            | 300                        | 50                           | SEL free                       | V <sub>S</sub> = ±15V |
| Single 16/Differential 8-Channel CMOS Analog Multiplexer with Active Overvoltage Protection          | HS-0546RH  | 5962D95693 | 28 Ld SBDIP                 | V, Q, /PROTO | 10                         |                              | SEL free                       |                       |
| <b>Multiplexers - 8-Channel</b>  |            |            |                             |              |                            |                              |                                |                       |
| CMOS 8-Input Multiplexer   | HCS151MS   | 5962R95728 | 16 Ld FlatPack              | V            | 200                        | ELDRS free                   | SEL free                       |                       |
| 8-Channel CMOS Analog Multiplexer with Overvoltage Protection  | HS-508BRH  | 5962F96742 | 16 Ld FlatPack, 16 Ld SBDIP | V, Q, /PROTO | 300                        |                              | SEL free                       |                       |
|  | HS-508BEH  |            |                             | V            | 300                        | 50                           | SEL free                       |                       |
| Rad-Hard Single 16/Differential 8-Channel CMOS Analog Multiplexer with Active Overvoltage Protection | HS-0547RH  | 5962D95693 | 28 Ld SBDIP                 | V, Q, /PROTO | 10                         |                              | SEL free                       |                       |
| Single 8/Differential 4-Channel CMOS Analog Multiplexer with Active Overvoltage Protection           | HS-0548RH  | 5962D95694 | 16 Ld SBDIP                 | V, Q, /PROTO | 10                         |                              | SEL free                       |                       |
| <b>Multiplexers - 4-Channel</b>  |            |            |                             |              |                            |                              |                                |                       |
| CMOS Analog Multiplexers/Demultiplexer   | CD4052BMS  | 5962R96651 | 16 Ld FlatPack, 16 Ld SBDIP | V            | 100                        | ELDRS free                   | 75                             |                       |
| <b>Switches - SPST</b>   |            |            |                             |              |                            |                              |                                |                       |
| Quad SPST CMOS Analog Switch   | HS-201HSRH | 5962F99618 | 16 Ld FlatPack, 16 Ld SBDIP | V, Q, /PROTO | 300                        |                              | SEL free                       |                       |
|  | HS-201HSEH |            |                             | V            | 300                        | 50                           | SEL free                       |                       |
| <b>Switches - DPST</b>   |            |            |                             |              |                            |                              |                                |                       |
| CMOS Dual DPST Analog Switch   | HS-302RH   | 5962R95812 | 14 Ld FlatPack, 14 Ld SBDIP | V            | 100                        |                              | SEL free                       |                       |
|  | HS-302EH   |            |                             | V            | 100                        | 50                           | SEL free                       |                       |
| <b>Switches - SPDT</b>   |            |            |                             |              |                            |                              |                                |                       |
| CMOS Dual SPDT Analog Switch   | HS-303ARH  | 5962F95813 | 14 Ld FlatPack, 14 Ld SBDIP | V, Q, /PROTO | 300                        |                              | SEL free                       | V <sub>S</sub> = ±15V |
|  | HS-303AEH  |            |                             | V            | 300                        | 50                           | SEL free                       |                       |
| CMOS Dual SPDT Analog Switch   | HS-303BRH  | 5962F95813 | 14 Ld FlatPack, 14 Ld SBDIP | V, Q, /PROTO | 300                        |                              | SEL free                       | V <sub>S</sub> = ±12V |
|  | HS-303BEH  |            |                             | V            | 300                        | 50                           | SEL free                       |                       |
| BiCMOS Dual SPDT Analog Switch   | HS-303CEH  | 5962-95813 | 14 Ld FlatPack              | V, /PROTO    | 100                        | 50                           | SEL free                       |                       |
| CMOS Dual SPDT Analog Switch   | HS-307RH   | 5962F95813 | 14 Ld FlatPack, 14 Ld SBDIP | V            | 300                        |                              | SEL free                       |                       |

## Data Bus

### Line Drivers - Quad

|  |              |            |                             |              |     |    |     |                       |
|--|--------------|------------|-----------------------------|--------------|-----|----|-----|-----------------------|
| 3.3V Quad Differential Line Drivers                                | HS-26CLV31RH | 5962F96663 | 16 Ld FlatPack, 16 Ld SBDIP | V, Q, /PROTO | 300 |    | 100 |                       |
|  | HS-26CLV31EH |            |                             | V            | 300 | 50 | 100 |                       |
| Quad Differential Line Driver                                      | HS-26C31RH   | 5962F96663 | 16 Ld FlatPack, 16 Ld SBDIP | V, Q, /PROTO | 300 |    | 100 |                       |
|  | HS-26C31EH   |            |                             | V            | 300 | 50 | 100 |                       |
| Quad Differential Line Receivers                                   | HS-26CT32RH  | 5962F95631 | 16 Ld FlatPack, 16 Ld SBDIP | V, Q, /PROTO | 300 |    | 100 |                       |
|  | HS-26CT32EH  |            |                             | V            | 300 | 50 | 100 | TTL compatible inputs |
| 3.3V Quad Differential Line Receiver                               | HS-26CLV32RH | 5962F95689 | 16 Ld FlatPack, 16 Ld SBDIP | V, Q, /PROTO | 300 |    | 100 |                       |
|  | HS-26CLV32EH |            |                             | V            | 300 | 50 | 100 |                       |
| Quad Differential Line Drivers                                     | HS-26CT31RH  | 5962F95632 | 16 Ld FlatPack, 16 Ld SBDIP | V, Q, /PROTO | 300 |    | 100 |                       |
|  | HS-26CT31EH  |            |                             | V            | 300 | 50 | 100 | TTL compatible inputs |
| Quad, 5.0V Differential Line Driver, CMOS Enable Class T Datasheet | HS-26C31RH-T | 5962R96663 | 16 Ld FlatPack, 16 Ld SBDIP | T            | 100 |    |     |                       |
| Quad Differential Line Receiver                                    | HS-26C32RH-T | 5962R95689 | 16 Ld FlatPack, 16 Ld SBDIP | T            | 100 |    |     |                       |
| Quad Differential Line Receiver                                    | HS-26C32RH   | 5962F95689 | 16 Ld FlatPack, 16 Ld SBDIP | V, Q, /PROTO | 300 |    | 100 |                       |
|  | HS-26C32EH   |            |                             | V            | 300 | 50 | 100 |                       |

| Device Description                                | Device       | DLA SMD    | Package                     | Class        | Production Guaranteed      |                           | SEL (MeV. cm <sup>2</sup> /mg) | Note |
|---|--------------|------------|-----------------------------|--------------|----------------------------|---------------------------|--------------------------------|------|
|   |              |            |                             |              | High Dose Rate (krad (Si)) | Low Dose Rate (krad (Si)) |                                |      |
| <b>Line Receivers - Triple</b>                    |              |            |                             |              |                            |                           |                                |      |
| Triple Line Receiver                              | HS-246RH     | 5962R96723 | 14 Ld FlatPack, 14 Ld SBDIP | V, Q, /PROTO | 200                        |                           | SEL free                       |      |
| Triple Party-line Receiver                        | HS-248RH     | 5962R96723 | 14 Ld FlatPack, 14 Ld SBDIP | V, Q, /PROTO | 200                        |                           | SEL free                       |      |
| <b>Line Receivers - Quad</b>                      |              |            |                             |              |                            |                           |                                |      |
| Quad Differential Line Receiver                   | HS-26C32RH   | 5962F95689 | 16 Ld FlatPack, 16 Ld SBDIP | V, Q, /PROTO | 300                        |                           | 100                            |      |
| 3.3V Quad Differential Line Receiver              | HS-26CLV32RH | 5962F95689 | 16 Ld FlatPack, 16 Ld SBDIP | V, Q, /PROTO | 300                        |                           | 100                            |      |
| Quad, 5.0V Differential Line Receiver, TTL Enable | HS-26CT32RH  | 5962F95631 | 16 Ld FlatPack, 16 Ld SBDIP | V, Q, /PROTO | 300                        |                           | 100                            |      |
|   | HS-26CT32EH  | 5962F95631 | 16 Ld FlatPack, 16 Ld SBDIP | V            | 300                        | 50                        | 100                            |      |

## Linear

### Comparators

|                                    |            |            |                             |              |     |                  |          |  |
|------------------------------------|------------|------------|-----------------------------|--------------|-----|------------------|----------|--|
| Quad Voltage Comparator            | HS-139RH   | 5962F98613 | 14 Ld FlatPack, 14 Ld SBDIP | V, Q, /PROTO | 300 | Report Available | SEL free |  |
| Quad Voltage Comparator            | IS-139ASEH | 5962F98613 | 14 Ld FlatPack, 14 Ld SBDIP | V            | 300 | 50               | SEL free |  |
|                                    | IS-139ASRH | 5962F01510 | 20 Ld FlatPack              | V, Q, /PROTO | 300 |                  | SEL free |  |
| CMOS 4-Bit Magnitude Comparator    | CD4063BMS  | 5962R96757 | 16 Ld FlatPack              | V            | 100 | ELDRS free       | 75       |  |
| High-Speed Dual Voltage Comparator | ISL7119RH  | 5962F07215 | 10 Ld FlatPack              | V, Q, /PROTO | 300 |                  | SEL free |  |
|                                    | ISL7119EH  | 5962F07215 | 10 Ld FlatPack              | V            | 300 | 50               | SEL free |  |

### Operational Amplifiers - Quad

|   |             |            |                             |              |     |    |          |  |
|---|-------------|------------|-----------------------------|--------------|-----|----|----------|--|
| Low Noise Quad Operational Amplifier  | HS-5104ARH  | 5962R95690 | 14 Ld FlatPack, 14 Ld SBDIP | V, Q, /PROTO | 100 |    | SEL free |  |
|   | HS-5104AEH  |            |                             | V            | 100 | 50 | SEL free |  |
| Very Low Noise Quad Operational Amplifier   | HS-OP470ARH | 5962R98533 | 14 Ld FlatPack              | V, Q, /PROTO | 100 |    | SEL free |  |
|   | HS-OP470AEH |            |                             | V            | 100 | 50 | SEL free |  |
| Single-Event Hardened, Single Supply, Quad Operational Amplifier                      | ISL7124SRH  | 5962F02542 | 14 Ld FlatPack              | V, Q, /PROTO | 300 |    | SEL free |  |
|   | ISL7124SEH  |            |                             | V, /PROTO    | 300 | 50 | SEL free |  |
| 19MHz Rad Hard 40V Quad Rail-to-Rail Input - Output, Low-Power Operational Amplifiers | ISL70444SEH | 5962R13214 | 14 Ld FlatPack              | V, /PROTO    | 100 | 50 | 86.4     |  |

### Operational Amplifier - Single - Low Power

|  |             |            |                          |              |     |                  |          |  |
|--|-------------|------------|--------------------------|--------------|-----|------------------|----------|--|
| Programmable Low Power Operational Amplifier   | HS-3530ARH  | 5962F95687 | 10 Ld FlatPack, 8 Ld Can | V, Q, /PROTO | 300 | In Qualification | SEL free |  |
|  | HS-3530AEH  |            |                          | V, Q, /PROTO | 300 | 50               | SEL free |  |
| Dual 36V Precision Single-Supply, Rail-to-Rail Output, Low-Power Operational Amplifier | ISL70218SEH | 5962R12222 | 10 Ld FlatPack           | V, /PROTO    | 100 | 50               | 86       |  |
| 36V Rad Hard Dual Precision Operational Amplifier                                      | ISL70227SEH | 5962R12223 | 10 Ld FlatPack           | V, /PROTO    | 100 | 50               | 86       |  |
| Precision Low Noise Operational Amplifier  | ISL70417SEH | 5962F12228 | 14 Ld FlatPack           | V, /PROTO    | 300 | 50               | 86       |  |

### Buffers - Single

|   |           |            |                            |              |     |  |          |  |
|---|-----------|------------|----------------------------|--------------|-----|--|----------|--|
| High-Speed, Low Power Output Limiting, Closed-Loop-Buffer Amplifier | HS-1115RH | 5962F96785 | 8 Ld SBDIP                 | V, Q, /PROTO | 300 |  | SEL free |  |
| Ultra High-Speed Current Feedback Amplifier                         | HS-1100RH | 5962F94676 | 8 Ld SBDIP                 | V, Q, /PROTO | 300 |  | SEL free |  |
| Current Feedback Amp W/VIO Adjust                                   | HS-1135RH | 5962F96767 | 8 Ld SBDIP, 14 Ld FlatPack | V, Q, /PROTO | 300 |  | SEL free |  |
| Video Op-Amp With Output Disable                                    | HS-1145RH | 5962F96830 | 8 Ld SBDIP                 | V, Q, /PROTO | 300 |  | SEL free |  |

### Sample & Hold

|                      |           |            |             |              |     |  |          |  |
|----------------------|-----------|------------|-------------|--------------|-----|--|----------|--|
| Fast Sample and Hold | HS-2420RH | 5962R95669 | 14 Ld SBDIP | V, Q, /PROTO | 100 |  | SEL free |  |
|----------------------|-----------|------------|-------------|--------------|-----|--|----------|--|

### Transistor Arrays - NPN

|   |            |            |                |              |     |  |          |  |
|---|------------|------------|----------------|--------------|-----|--|----------|--|
| Ultra High Frequency NPN-PNP Transistor Array | ISL73096RH | 5962F07218 | 16 Ld FlatPack | V, Q, /PROTO | 300 |  | SEL free |  |
| Ultra High Frequency NPN Transistor Array     | ISL73127RH | 5962F07218 | 16 Ld FlatPack | V, Q, /PROTO | 300 |  | SEL free |  |
| Ultra High Frequency PNP Transistor Array     | ISL73128RH | 5962F07218 | 16 Ld FlatPack | V, Q, /PROTO | 300 |  | SEL free |  |

## Memory

|                  |           |            |                             |              |     |  |     |  |
|------------------|-----------|------------|-----------------------------|--------------|-----|--|-----|--|
| 8K x 8 CMOS PROM | HS-6664RH | 5962F95626 | 28 Ld FlatPack, 28 Ld SBDIP | V, Q, /PROTO | 300 |  | 100 |  |
|------------------|-----------|------------|-----------------------------|--------------|-----|--|-----|--|

## Radiation Hardened IC Selection Chart

| Device Description                      | Device      | DLA SMD    | Package                     | Class        | Production Guaranteed      |                           | SEL (MeV, cm <sup>2</sup> /mg) | Note |
|---|-------------|------------|-----------------------------|--------------|----------------------------|---------------------------|--------------------------------|------|
|   |             |            |                             |              | High Dose Rate (krad (Si)) | Low Dose Rate (krad (Si)) |                                |      |
| <b>Microprocessor &amp; Peripherals</b> |             |            |                             |              |                            |                           |                                |      |
| 16-Bit CMOS Microprocessor              | HS-80C86RH  | 5962R95722 | 40 Ld SBDIP, 42 Ld FlatPack | V, Q, /PROTO | 100                        | ELDRS free                | 50                             |      |
| CMOS Programmable Interval Timer        | HS-82C54RH  | 5962R95713 | 24 Ld FlatPack, 24 Ld SBDIP | V, Q, /PROTO | 100                        | ELDRS free                | 50                             |      |
| CMOS Programmable Peripheral Interface  | HS-82C55ARH | 5962R95819 | 40 Ld SBDIP                 | V, Q, /PROTO | 100                        | ELDRS free                | 50                             |      |
| CMOS Static Clock Controller/Generator  | HS-82C85RH  | 5962R95820 | 24 Ld FlatPack, 24 Ld SBDIP | V, Q, /PROTO | 100                        | ELDRS free                | 50                             |      |

## Power Management

### Supervisory

|   |           |            |               |              |     |            |    |                          |
|---|-----------|------------|---------------|--------------|-----|------------|----|--------------------------|
| 5.0V/3.3V Microprocessor Supervisory Circuits | ISL706CRH | 5962R11213 | 8 Ld FlatPack | V, Q, /PROTO | 100 | 50         | 86 | V <sub>RST</sub> = 3.08V |
| 5.0V/3.3V Microprocessor Supervisory Circuits | ISL705BEH | 5962R11213 | 8 Ld FlatPack | V, /PROTO    | 100 | 50         | 86 | V <sub>RST</sub> = 4.65V |
| 5.0V/3.3V Microprocessor Supervisory Circuits | ISL705AEH | 5962R11213 | 8 Ld FlatPack | V, /PROTO    | 100 | 50         | 86 | V <sub>RST</sub> = 4.65V |
| 5.0V/3.3V Microprocessor Supervisory Circuits | ISL706BRH | 5962R11213 | 8 Ld FlatPack | V, Q, /PROTO | 100 | 50         | 86 | V <sub>RST</sub> = 3.08V |
| 5.0V/3.3V Microprocessor Supervisory Circuits | ISL705ARH | 5962R11213 | 8 Ld FlatPack | V, Q, /PROTO | 100 | 50         | 86 | V <sub>RST</sub> = 4.65V |
| 5.0V/3.3V Microprocessor Supervisory Circuits | ISL706AEH | 5962R11213 | 8 Ld FlatPack | V, /PROTO    | 100 | 50         | 86 | V <sub>RST</sub> = 3.08V |
| 5.0V/3.3V Microprocessor Supervisory Circuits | ISL706BEH | 5962R11213 | 8 Ld FlatPack | V, /PROTO    | 100 | 50         | 86 | V <sub>RST</sub> = 3.08V |
| 5.0V/3.3V Microprocessor Supervisory Circuits | ISL705CEH | 5962R11213 | 8 Ld FlatPack | V, /PROTO    | 100 | 50         | 86 | V <sub>RST</sub> = 4.65V |
| Power-Up/Down Microprocessor Reset Circuit    | IS-705RH  | 5962R00538 | 8 Ld FlatPack | V, Q, /PROTO | 100 | ELDRS free | 87 |                          |
| 5.0V/3.3V Microprocessor Supervisory Circuits | ISL705CRH | 5962R11213 | 8 Ld FlatPack | V, Q, /PROTO | 100 | 50         | 86 | V <sub>RST</sub> = 4.65V |
| 5.0V/3.3V Microprocessor Supervisory Circuits | ISL706CEH | 5962R11213 | 8 Ld FlatPack | V, /PROTO    | 100 | 50         | 86 | V <sub>RST</sub> = 3.08V |
| 5.0V/3.3V Microprocessor Supervisory Circuits | ISL706ARH | 5962R11213 | 8 Ld FlatPack | V, Q, /PROTO | 100 | 50         | 86 | V <sub>RST</sub> = 3.08V |
| 5.0V/3.3V Microprocessor Supervisory Circuits | ISL705BRH | 5962R11213 | 8 Ld FlatPack | V, Q, /PROTO | 100 | 50         | 86 | V <sub>RST</sub> = 4.65V |

### Point of Load Regulators

|  |              |            |            |           |     |                              |    |                         |
|--|--------------|------------|------------|-----------|-----|------------------------------|----|-------------------------|
| 6A Synchronous Buck Regulator with Integrated MOSFETs                    | ISL70001SRH  | 5962R09225 | 48 Ld QFP  | V, /PROTO | 100 | ELDRS Free, report available | 86 |                         |
| SEE Hard 6A Synchronous Buck Regulator                                   | ISL70001SEH  | 5962R09225 | 48 Ld CQFP | V, /PROTO | 100 | 50                           | 86 |                         |
| SEE Hard 6A Synchronous Buck Regulator                                   | ISL70001ASEH | 5962R09225 | 48 Ld CQFP | V, /PROTO | 100 | 50                           | 86 | Lower power consumption |
| SEE Hard 12A Synchronous Buck Regulator with Multi-Phase Current Sharing | ISL70002SEH  | 5962R09225 | 64 Ld CQFP | V, /PROTO | 100 | 50                           | 86 |                         |

### MOSFET Drivers - Half-Bridge

|                                   |            |            |                |              |     |    |          |  |
|-----------------------------------|------------|------------|----------------|--------------|-----|----|----------|--|
| High Frequency Half Bridge Driver | IS-2100ARH | 5962F99536 | 16 Ld FlatPack | V, Q, /PROTO | 300 |    | SEL free |  |
|                                   | IS-2100AEH | 5962F99536 | 16 Ld FlatPack | V, /PROTO    | 300 | 50 | SEL free |  |

### MOSFET Drivers - Full-Bridge

|                                     |            |            |                |              |     |  |          |  |
|-------------------------------------|------------|------------|----------------|--------------|-----|--|----------|--|
| Full Bridge N-Channel MOSFET Driver | HS-4080ARH | 5962F99617 | 20 Ld FlatPack | V, Q, /PROTO | 300 |  | SEL free |  |
|-------------------------------------|------------|------------|----------------|--------------|-----|--|----------|--|

### MOSFET Drivers - Dual

|   |            |            |                |              |     |  |          |  |
|---|------------|------------|----------------|--------------|-----|--|----------|--|
| Dual, Inverting Power MOSFET Driver     | HS-4423RH  | 5962F99511 | 16 Ld FlatPack | V, Q, /PROTO | 300 |  | SEL free |  |
| Dual, Non-Inverting Power MOSFET Driver | HS-4424RH  | 5962F99560 | 16 Ld FlatPack | V, Q, /PROTO | 300 |  | SEL free |  |
| Complementary Switch MOSFET Driver      | IS-1715ARH | 5962F00521 | 16 Ld FlatPack | V, Q, /PROTO | 300 |  | SEL free |  |
| Dual, Non-Inverting Power MOSFET Driver | HS-4424BRH | 5962F99560 | 16 Ld FlatPack | V, Q, /PROTO | 300 |  | SEL free |  |

### MOSFET Drivers - Single

|  |             |            |                |              |     |  |          |  |
|--|-------------|------------|----------------|--------------|-----|--|----------|--|
| 9A, Non-Inverting Power MOSFET Driver  | ISL74422ARH | 5962F01521 | 16 Ld FlatPack | V, Q, /PROTO | 300 |  | SEL free |  |
| 9A, Non-Inverting Power MOSFET Drivers | ISL74422BRH | 5962F03248 | 16 Ld FlatPack | V, Q, /PROTO | 300 |  |          |  |

### Pulse Width Modulators

|  |              |            |                             |              |     |    |          |  |
|--|--------------|------------|-----------------------------|--------------|-----|----|----------|--|
| High-Speed, Dual Output PWM  | HS-1825AEH   | 5962F99558 | 16 Ld FlatPack, 16 Ld SBDIP | V            | 300 | 50 | SEL free |  |
|  | HS-1825ARH   | 5962F99558 | 16 Ld FlatPack, 16 Ld SBDIP | V, Q, /PROTO | 300 |    | SEL free |  |
| Single Event and Total Dose Hardened, High-Speed, Dual Output PWMs | IS-1825ASRH  | 5962F02511 | 16 Ld SBDIP, 20 Ld Flatpack | V, Q, /PROTO | 300 |    | SEL free |  |
|  | IS-1825BSRH  | 5962F02511 | 16 Ld SBDIP, 20 Ld Flatpack | V, Q, /PROTO | 300 |    | SEL free |  |
|  | IS-1825BSEH  | 5962F02511 | 16 Ld SBDIP, 20 Ld Flatpack | V, Q, /PROTO | 300 | 50 | SEL free |  |
|  | ISL71823ASRH | 5962F02511 | 16 Ld SBDIP, 20 Ld Flatpack | V, Q, /PROTO | 300 |    | SEL free |  |
|  | ISL71823BSRH | 5962F02511 | 16 Ld SBDIP, 20 Ld Flatpack | V, Q, /PROTO | 300 |    | SEL free |  |

| Device Description  | Device   | DLA SMD    | Package                   | Class        | Production Guaranteed      |                              | SEL (MeV. cm <sup>2</sup> /mg) | Note |
|---|--|------------|---------------------------|--------------|----------------------------|------------------------------|--------------------------------|------|
|   |  |            |                           |              | High Dose Rate (krad (Si)) | Low Dose Rate (krad (Si))    |                                |      |
| Rad-Hard, High Performance Industry Standard Single-Ended Current Mode PWM Controller | ISL78840ASRH, ISL78841ASRH, ISL78843ASRH, ISL78845ASRH | 5962R07249 | 8 Ld SBDIP, 8 Ld FlatPack | V, Q, /PROTO | 100                        | ELDRS Free, report available | 86                             |      |
|   | V, /PROTO  |            |                           | 100          | 50                         | 86                           |                                |      |

### Voltage Regulators

|                                       |          |            |                     |              |     |                  |          |  |
|---------------------------------------|----------|------------|---------------------|--------------|-----|------------------|----------|--|
| Adjustable Positive Voltage Regulator | HS-117RH | 5962F99547 | 3 Ld Can, 3 Ld CLCC | V, Q, /PROTO | 300 | Report Available | SEL free |  |
|                                       | HS-117EH |            |                     | V            | 300 | 50               |          |  |

### Low Dropout Voltage Regulators (LDO)

|   |             |            |                |              |     |                  |          |  |
|---|-------------|------------|----------------|--------------|-----|------------------|----------|--|
| Negative Low Dropout Adjustable Voltage Regulator   | ISL72991RH  | 5962F02503 | 28 Ld FlatPack | V, Q, /PROTO | 300 | Report Available | SEL free |  |
| 3A, Rad Hard, Positive, Ultra Low Dropout Regulator | ISL75051SRH | 5962R11212 | 18 Ld FlatPack | V, Q, /PROTO | 100 |                  | 86       |  |
|   | ISL75051SEH |            |                | V, /PROTO    | 100 | 50               | 86       |  |
| 1.5A, Rad Hard, Positive, High Voltage LDO          | ISL75052SEH | 5962R13220 | 16 Ld FlatPack | V, /PROTO    | 100 | 50               | 86       |  |

### Voltage Reference

|   |               |            |                     |              |     |                  |          |  |
|---|---------------|------------|---------------------|--------------|-----|------------------|----------|--|
| 2.5V Reference  | IS-1009RH     | 5962F00523 | 3 Ld CLCC, 3 Ld Can | V, Q, /PROTO | 300 | Report Available | SEL free |  |
| Radiation Hardened Ultra Low Noise, Precision Voltage Reference | ISL71090SEH25 | 5962R13211 | 8 Ld FlatPack       | V, /PROTO    | 100 | 50               | 86       |  |

### Source Drivers

|   |            |            |                |              |     |    |          |  |
|---|------------|------------|----------------|--------------|-----|----|----------|--|
| 8-Channel Source Driver                       | IS-2981RH  | 5962R00520 | 18 Ld SBDIP    | V, Q, /PROTO | 100 |    | SEL free |  |
|   | IS-2981EH  |            |                | V, /PROTO    | 100 | 50 | SEL free |  |
| SEE Hardened, Non-Inverting, Quad CMOS Driver | ISL7457SRH | 5962D08230 | 16 Ld FlatPack | V, Q, /PROTO | 10  |    | 40       |  |

### Power on Reset

|  |          |            |               |              |     |            |    |  |
|--|----------|------------|---------------|--------------|-----|------------|----|--|
| Power-Up/Down Microprocessor Reset Circuit | IS-705RH | 5962R00538 | 8 Ld FlatPack | V, Q, /PROTO | 100 | ELDRS free | 87 |  |
|--|----------|------------|---------------|--------------|-----|------------|----|--|

## Special Functions

### Multivibrators

|   |           |            |                             |   |     |            |    |  |
|---|-----------|------------|-----------------------------|---|-----|------------|----|--|
| CMOS Dual Monostable Multivibrator              | CD4098BMS | 5962R96614 | 16 Ld FlatPack, 16 Ld SBDIP | V | 100 | ELDRS free | 75 |  |
| CMOS Low-Power Monostable/Astable Multivibrator | CD4047BMS | 5962R96635 | 14 Ld FlatPack, 14 Ld SBDIP | V | 100 | ELDRS free | 75 |  |

### Magnitude Comparator

|                                 |          |            |             |   |     |            |          |  |
|---------------------------------|----------|------------|-------------|---|-----|------------|----------|--|
| CMOS 4-Bit Magnitude Comparator | HCTS85MS | 5962R95768 | 16 Ld SBDIP | V | 200 | ELDRS free | SEL free |  |
|---------------------------------|----------|------------|-------------|---|-----|------------|----------|--|

## Digital Logic

### Gates - AND

|                              |           |            |                             |   |     |            |          |  |
|------------------------------|-----------|------------|-----------------------------|---|-----|------------|----------|--|
| CMOS AND Gate                | CD4081BMS | 5962R96655 | 14 Ld FlatPack, 14 Ld SBDIP | V | 100 | ELDRS free | 75       |  |
| CMOS Triple 3-Input AND Gate | HCS11MS   | 5962R95720 | 14 Ld FlatPack, 14 Ld SBDIP | V | 200 | ELDRS free | SEL free |  |

### Gates - NAND

|  |           |            |                             |   |     |            |          |  |
|--|-----------|------------|-----------------------------|---|-----|------------|----------|--|
| CMOS NAND Gate                         | CD4023BMS | 5962R96621 | 14 Ld FlatPack, 14 Ld SBDIP | V | 100 | ELDRS free | 75       |  |
| CMOS Quad 2-Input NAND Schmitt Trigger | HCS132MS  | 5962R95726 | 14 Ld FlatPack, 14 Ld SBDIP | V | 200 | ELDRS free | SEL free |  |
| CMOS Dual 4-Input NAND Gate            | HCTS20MS  | 5962R95733 | 14 Ld FlatPack              | V | 200 | ELDRS free | SEL free |  |

### Gates - NOR

|                             |           |            |                             |   |     |            |    |                |
|-----------------------------|-----------|------------|-----------------------------|---|-----|------------|----|----------------|
| CMOS NOR Gate               | CD4001BMS | 5962R95826 | 14 Ld FlatPack, 14 Ld SBDIP | V | 100 | ELDRS free | 75 | Quad 2 Input   |
| CMOS NOR Gate               | CD4025BMS | 5962R95826 | 14 Ld FlatPack, 14 Ld SBDIP | V | 100 | ELDRS free | 75 | Triple 3 Input |
| CMOS Quad 3 State R/S Latch | CD4043BMS | 5962R96634 | 16 Ld FlatPack, 16 Ld SBDIP | V | 100 | ELDRS free | 75 |                |

### Gates - OR

|                             |           |            |                             |   |     |            |          |  |
|-----------------------------|-----------|------------|-----------------------------|---|-----|------------|----------|--|
| CMOS Quad Exclusive-OR Gate | CD4030BMS | 5962R96646 | 14 Ld SBDIP                 | V | 100 | ELDRS free | 75       |  |
| CMOS OR Gate                | CD4071BMS | 5962R96654 | 14 Ld FlatPack, 14 Ld SBDIP | V | 100 | ELDRS free | 75       |  |
| CMOS Quad 2-Input OR Gate   | HCS32MS   | 5962R95781 | 14 Ld FlatPack, 14 Ld SBDIP | V | 200 | ELDRS free | SEL free |  |

## Radiation Hardened IC Selection Chart

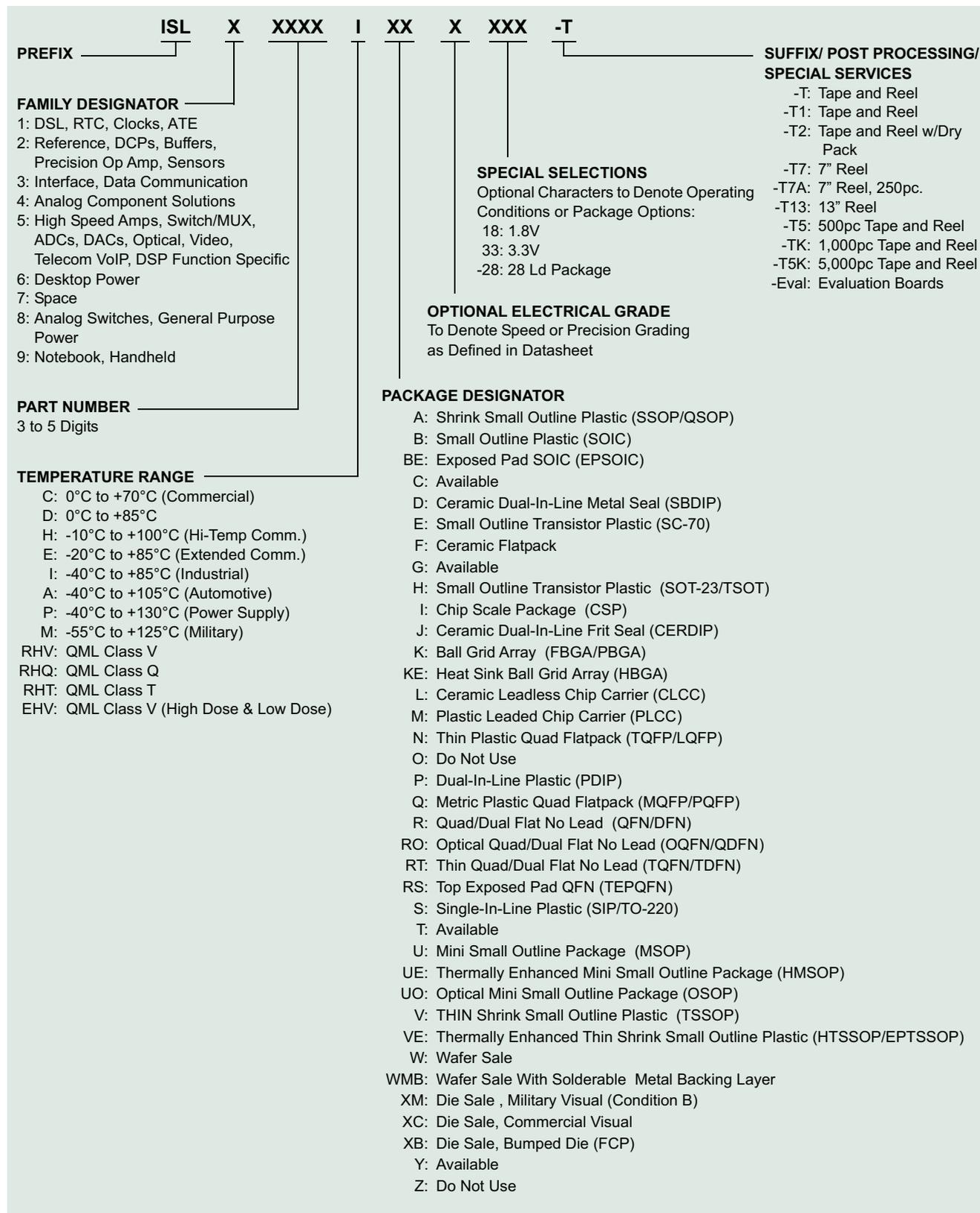
| Device Description  | Device     | DLA SMD    | Package                     | Class | Production Guaranteed      |                           | SEL (MeV, cm <sup>2</sup> /mg) | Note                  |
|---|------------|------------|-----------------------------|-------|----------------------------|---------------------------|--------------------------------|-----------------------|
|   |            |            |                             |       | High Dose Rate (krad (Si)) | Low Dose Rate (krad (Si)) |                                |                       |
| <b>Gates - Exclusive-OR</b>                                   |            |            |                             |       |                            |                           |                                |                       |
| CMOS Quad Exclusive OR and Exclusive NOR Gate                 | CD4070BMS  | 5962R96611 | 14 Ld FlatPack, 14 Ld SBDIP | V     | 100                        | ELDRS free                | 75                             |                       |
| CMOS Quad 2-Input Exclusive OR Gate                           | HCS86MS    | 5962R95783 | 14 Ld FlatPack, 14 Ld SBDIP | V     | 200                        | ELDRS free                | SEL free                       |                       |
| <b>Gates - Exclusive-NOR</b>                                  |            |            |                             |       |                            |                           |                                |                       |
| CMOS Quad Exclusive OR and Exclusive NOR Gate                 | CD4077BMS  | 5962R96611 | 14 Ld FlatPack, 14 Ld SBDIP | V     | 100                        | ELDRS free                | 75                             |                       |
| <b>Buffers</b>  |            |            |                             |       |                            |                           |                                |                       |
| CMOS Dual 2-Input NAND Buffer/Driver                          | CD40107BMS | 5962R96644 | 14 Ld FlatPack, 14 Ld SBDIP | V     | 100                        | ELDRS free                | 75                             |                       |
| <b>Buffers - Hex</b>  |            |            |                             |       |                            |                           |                                |                       |
| CMOS Hex Buffer/Converter                                     | CD4049UBMS | 5962R96636 | 16 Ld FlatPack, 16 Ld SBDIP | V     | 100                        | ELDRS free                | 75                             |                       |
| CMOS Hex Inverter   | CD4069UBMS | 5962R96653 | 14 Ld FlatPack, 14 Ld SBDIP | V     | 100                        | ELDRS free                | 75                             |                       |
| CMOS Hex Buffer   | CD4503BMS  | 5962R96643 | 16 Ld FlatPack, 16 Ld SBDIP | V     | 100                        | ELDRS free                | 75                             |                       |
| CMOS Hex Inverter with Open Drain                             | HCS05MS    | 5962R95801 | 14 Ld FlatPack              | V     | 200                        | ELDRS free                | SEL free                       |                       |
| <b>Buffers - Octal</b>  |            |            |                             |       |                            |                           |                                |                       |
| CMOS Non-Inverting Octal Buffer/Line Driver, Three-State      | ACS541MS   | 5962F96710 | 20 Ld FlatPack              | V     | 300                        | ELDRS free                | SEL free                       |                       |
| CMOS Octal Buffer/Line Driver, Three-State, Inverting         | ACTS240MS  | 5962F96717 | 20 Ld FlatPack, 20 Ld SBDIP | V     | 300                        | ELDRS free                | SEL free                       |                       |
| CMOS Octal Buffer/Line Driver, Three-State, Inverting         | HCS240MS   | 5962R95809 | 20 Ld FlatPack, 20 Ld SBDIP | V     | 200                        | ELDRS free                | SEL free                       |                       |
| CMOS Inverting Octal Buffer/Line Driver, Three-State          | HCTS540MS  | 5962R95776 | 20 Ld FlatPack              | V     | 200                        | ELDRS free                | SEL free                       |                       |
| CMOS Non-Inverting Octal Buffer/Line Driver, Three-State      | HCTS541MS  | 5962R95751 | 20 Ld FlatPack, 20 Ld SBDIP | V     | 200                        | ELDRS free                | SEL free                       | TTL compatible inputs |
| CMOS Non-Inverting Octal Buffer/Line Driver, Three-State      | HCS244MS   | 5962R95731 | 20 Ld FlatPack, 20 Ld SBDIP | V     | 200                        | ELDRS free                | SEL free                       |                       |
| <b>Latches - Octal</b>  |            |            |                             |       |                            |                           |                                |                       |
| CMOS Octal Transparent Latch, Three-State                     | ACTS373MS  | 5962F95661 | 20 Ld FlatPack, 20 Ld SBDIP | V     | 300                        | ELDRS free                | SEL free                       |                       |
| CMOS Octal Transparent Latch, Three-State                     | HCS573MS   | 5962R95794 | 20 Ld FlatPack              | V     | 200                        | ELDRS free                | SEL free                       |                       |
| <b>Latches - Quad</b>   |            |            |                             |       |                            |                           |                                |                       |
| CMOS Quad D Latch, Clocked                                    | CD4042BMS  | 5962R96633 | 16 Ld FlatPack, 16 Ld SBDIP | V     | 100                        | ELDRS free                | 75                             |                       |
| <b>Latches - Addressable</b>                                  |            |            |                             |       |                            |                           |                                |                       |
| CMOS 8-Bit Addressable Latch                                  | CD4099BMS  | 5962R96615 | 16 Ld FlatPack, 16 Ld SBDIP | V     | 100                        | ELDRS free                | 75                             |                       |
| <b>Flip-Flops - Octal</b>                                     |            |            |                             |       |                            |                           |                                |                       |
| CMOS Octal D Flip-Flop, +Edge Triggered, Three-State          | ACS374MS   | 5962F95656 | 20 Ld FlatPack, 20 Ld SBDIP | V     | 300                        | ELDRS free                | SEL free                       |                       |
| <b>Flip-Flops - Dual</b>                                      |            |            |                             |       |                            |                           |                                |                       |
| CMOS Dual D Type Flip Flop with Set and Reset, Advanced Logic | ACS74MS    | 5962F96799 | 14 Ld FlatPack, 14 Ld SBDIP | V     | 300                        | ELDRS free                | SEL free                       |                       |
| CMOS Dual D Type Flip Flop with Set and Reset, Advanced Logic | ACTS74MS   | 5962F96713 | 14 Ld FlatPack, 14 Ld SBDIP | V     | 300                        | ELDRS free                | SEL free                       | TTL compatible inputs |
| CMOS Dual J-K Master-Slave Flip-Flop                          | CD4027BMS  | 5962R96629 | 16 Ld FlatPack              | V     | 100                        | ELDRS free                | 75                             |                       |
| CMOS Dual JK Flip Flop  | HCS109MS   | 5962R95784 | 16 Ld FlatPack, 16 Ld SBDIP | V     | 200                        | ELDRS free                | SEL free                       |                       |
| CMOS Dual-D Flip-Flop with Set and Reset                      | HCTS74MS   | 5962R95763 | 14 Ld FlatPack, 14 Ld SBDIP | V     | 200                        | ELDRS free                | SEL free                       |                       |
| <b>Flip-Flops - Hex</b>                                       |            |            |                             |       |                            |                           |                                |                       |
| CMOS Hex D-Type Flip-Flop                                     | CD40174BMS | 5962R96605 | 16 Ld FlatPack, 16 Ld SBDIP | V     | 100                        | ELDRS free                | 75                             |                       |
| CMOS Schmitt Trigger, Hex, Inverting                          | CD40106BMS | 5962R96603 | 14 Ld FlatPack, 14 Ld SBDIP | V     | 100                        | ELDRS free                | 75                             |                       |
| <b>Counters - 4-Bit</b>                                       |            |            |                             |       |                            |                           |                                |                       |
| CMOS 4-Bit Synchronous Counter                                | ACTS161MS  | 5962F96716 | 16 Ld FlatPack, 16 Ld SBDIP | V     | 300                        | ELDRS free                | SEL free                       |                       |

All Intersil radiation hardened parts are fully compliant with class V of MIL-PRF-38535 (QML)

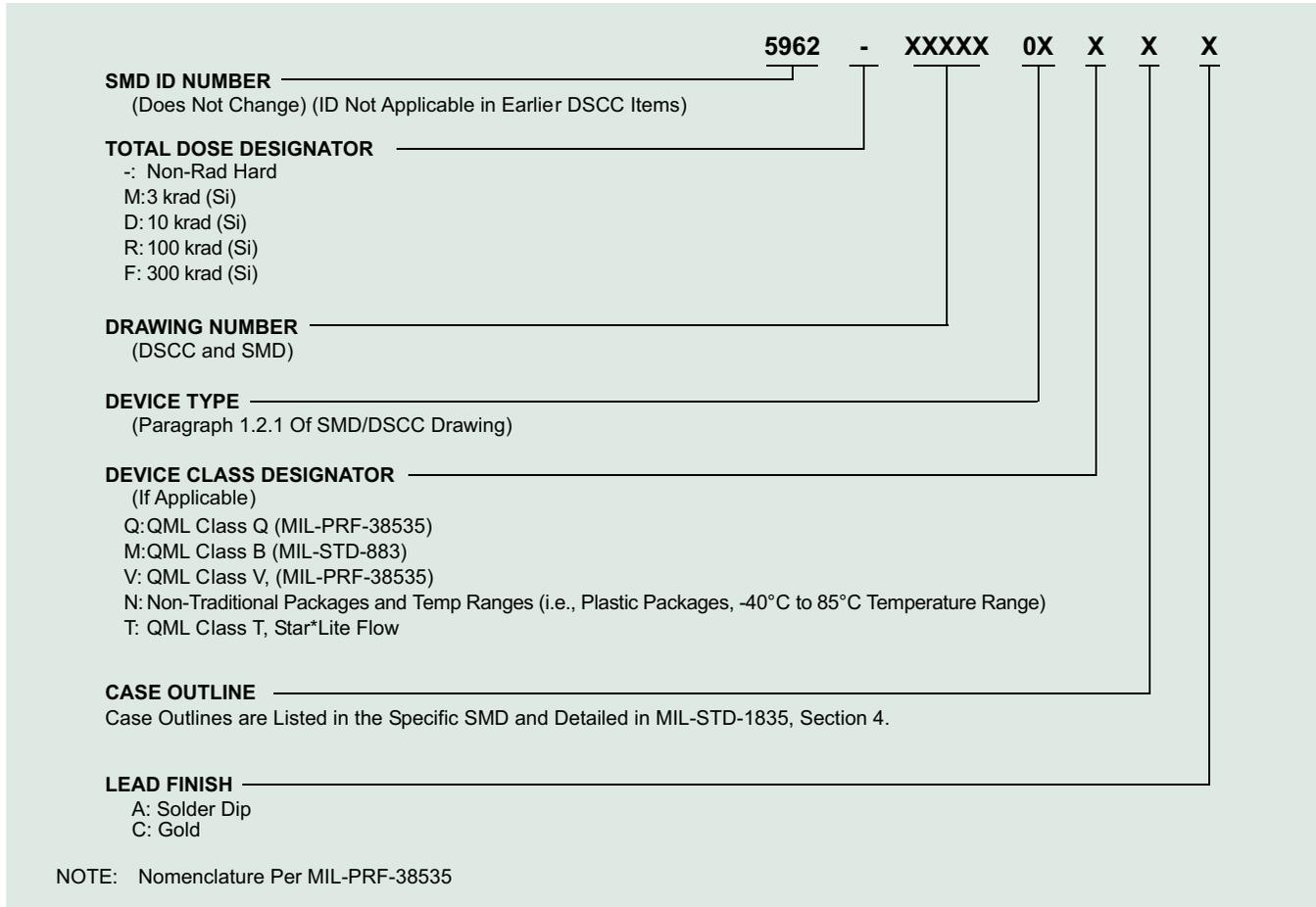
| Device Description  | Device     | DLA SMD    | Package                        | Class | Production Guaranteed            |                                 | SEL<br>(MeV.<br>cm <sup>2</sup> /mg) | Note                  |
|---|------------|------------|--------------------------------|-------|----------------------------------|---------------------------------|--------------------------------------|-----------------------|
|   |            |            |                                |       | High Dose<br>Rate<br>(krad (Si)) | Low Dose<br>Rate<br>(krad (Si)) |                                      |                       |
| <b>Counters - Binary</b>  |            |            |                                |       |                                  |                                 |                                      |                       |
| CMOS Presetable Up/Down Counter (Dual Clock With Reset)                   | CD40193BMS | 5962R96608 | 16 Ld FlatPack,<br>16 Ld SBDIP | V     | 100                              | ELDRS free                      | 75                                   |                       |
| CMOS Ripple-Carry Binary Counter/Divider                                  | CD4024BMS  | 5962R96628 | 14 Ld FlatPack,<br>14 Ld SBDIP | V     | 100                              | ELDRS free                      | 75                                   |                       |
| CMOS Presetable Up/Down Counter   | CD4029BMS  | 5962R95621 | 16 Ld FlatPack,<br>16 Ld SBDIP | V     | 100                              | ELDRS free                      | 75                                   |                       |
| CMOS Synchronous Counter  | HCS161MS   | 5962R95730 | 16 Ld FlatPack,<br>16 Ld SBDIP | V     | 200                              | ELDRS free                      | SEL free                             |                       |
| CMOS Synchronous Presetable Counter                                       | HCS163MS   | 5962R95807 | 16 Ld FlatPack,<br>16 Ld SBDIP | V     | 200                              | ELDRS free                      | SEL free                             |                       |
| CMOS Synchronous 4-Bit Up/Down Counter                                    | HCTS193MS  | 5962R95757 | 16 Ld FlatPack                 | V     | 200                              | ELDRS free                      | SEL free                             |                       |
| CMOS Rad-Hard Dual 4-Stage Binary Counter                                 | HCTS393MS  | 5962R95750 | 14 Ld FlatPack                 | V     | 200                              | ELDRS free                      | SEL free                             |                       |
| <b>Registers - FIFO</b>   |            |            |                                |       |                                  |                                 |                                      |                       |
| CMOS FIFO Register  | CD40105BMS | 5962R96602 | 16 Ld FlatPack,<br>16 Ld SBDIP | V     | 100                              | ELDRS free                      | 75                                   |                       |
| <b>Registers - Shift</b>  |            |            |                                |       |                                  |                                 |                                      |                       |
| CMOS Dual 4-Stage Static Shift Register With Serial Input/Parallel Output | CD4015BMS  | 5962R96624 | 16 Ld FlatPack,<br>16 Ld SBDIP | V     | 100                              | ELDRS free                      | 75                                   |                       |
| CMOS 8-Stage Static Shift Register  | CD4021BMS  | 5962R96623 | 16 Ld FlatPack,<br>16 Ld SBDIP | V     | 100                              | ELDRS free                      | 75                                   |                       |
| <b>Registers - 4-Bit</b>  |            |            |                                |       |                                  |                                 |                                      |                       |
| CMOS 4 -Bit D-Type Register   | CD4076BMS  | 5962R96656 | 16 Ld FlatPack,<br>16 Ld SBDIP | V     | 100                              | ELDRS free                      | 75                                   |                       |
| <b>Registers - 8-Bit</b>  |            |            |                                |       |                                  |                                 |                                      |                       |
| CMOS 8-Bit Serial-In/Parallel-Out Register                                | HCS164MS   | 5962R95785 | 14 Ld FlatPack,<br>14 Ld SBDIP | V     | 200                              | ELDRS free                      | SEL free                             |                       |
| CMOS 8-Bit Serial-In/Parallel-Out Shift Register                          | HCTS164MS  | 5962R95663 | 14 Ld FlatPack,<br>14 Ld SBDIP | V     | 200                              | ELDRS free                      | SEL free                             | TTL compatible inputs |
| CMOS 8-Bit Universal Shift Register; Three-State                          | HCTS299MS  | 5962R95746 | 20 Ld FlatPack                 | V     | 200                              | ELDRS free                      | SEL free                             |                       |
| <b>Decoders - 4 to 16</b>   |            |            |                                |       |                                  |                                 |                                      |                       |
| CMOS 4-to-16 Line Decoder/Demultiplexer                                   | HCS154MS   | 5962R95729 | 24 Ld FlatPack,<br>24 Ld SBDIP | V     | 200                              | ELDRS free                      | SEL free                             |                       |
| <b>Decoders - Binary</b>  |            |            |                                |       |                                  |                                 |                                      |                       |
| CMOS Dual Binary to 1 of 4 Decoder/Demultiplexer                          | CD4555BMS  | 5962R96673 | 16 Ld FlatPack,<br>16 Ld SBDIP | V     | 100                              | ELDRS free                      | 75                                   |                       |
| <b>Decoders - 3 to 8</b>  |            |            |                                |       |                                  |                                 |                                      |                       |
| CMOS Inverting 3-to-8 Line Decoder/Demultiplexer                          | HCS138MS   | 5962R95727 | 16 Ld FlatPack,<br>16 Ld SBDIP | V     | 200                              | ELDRS free                      | SEL free                             |                       |
| CMOS Inverting 3-to-8 Line Decoder/Demultiplexer                          | ACS138MS   | 5962F98534 | 16 Ld FlatPack,<br>16 Ld SBDIP | V     | 300                              | ELDRS free                      | SEL free                             |                       |
| <b>Decoders - 2 to 4</b>  |            |            |                                |       |                                  |                                 |                                      |                       |
| CMOS Dual 2-to-4 Line Decoder/Demultiplexer                               | HCS139MS   | 5962R95804 | 16 Ld FlatPack,<br>16 Ld SBDIP | V     | 200                              | ELDRS free                      | SEL free                             |                       |
| CMOS Dual 2-to-4 Line Decoder/Demultiplexer                               | HCTS139MS  | 5962R95753 | 16 Ld FlatPack,<br>16 Ld SBDIP | V     | 200                              | ELDRS free                      | SEL free                             | TTL compatible inputs |
| <b>Decoders - BCD</b>   |            |            |                                |       |                                  |                                 |                                      |                       |
| CMOS BCD-To-Decimal Decoder   | CD4028BMS  | 5962R96630 | 16 Ld FlatPack                 | V     | 100                              | ELDRS free                      | 75                                   |                       |

All Intersil radiation hardened parts are fully compliant with class V of MIL-PRF-38535 (QML)

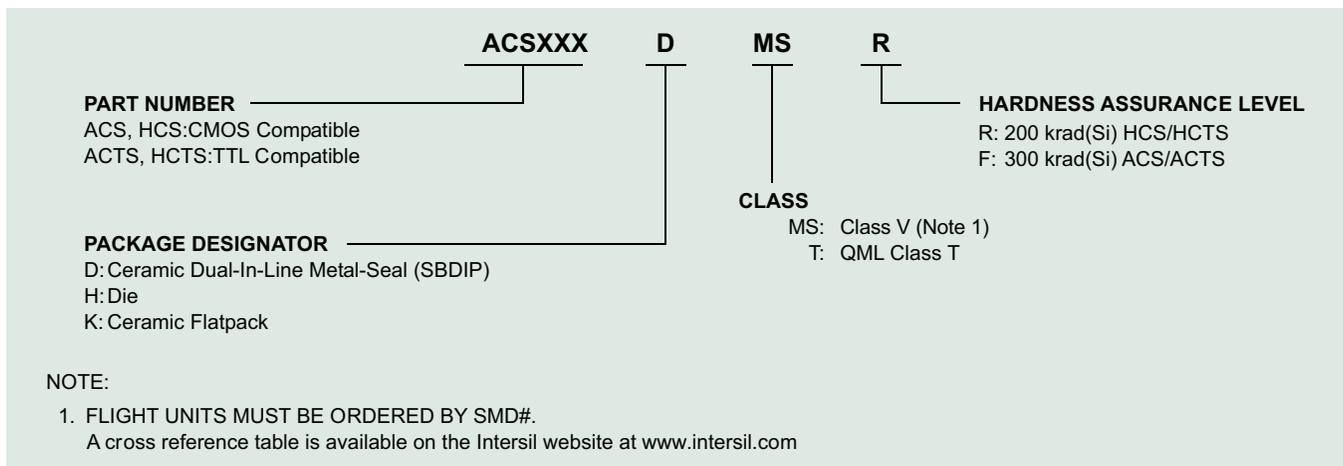
## ISL Types



## 5962 SMD/DSCC - QML Types



## ACS, ACTS, HCS, HCTS Radiation Hardened Types



### CD4000 Radiation Hardened Types

**CD4000 B D MS R**

**PART NUMBER**  
CD4000

**SERIES**  
B: Buffered  
UB: Un-Buffered

**PACKAGE DESIGNATOR**  
D: Ceramic Dual-In-Line Metal-Seal (SBDIP)  
H: Die  
K: Ceramic Flatpack

**CLASS**  
MS: Class V (Note 1)  
NS: Class V with Neutron Irradiation (Note 1)  
T: Class T

**HARDNESS ASSURANCE LEVEL**  
R: 100 krad(Si)

NOTE:  
1. FLIGHT UNITS MUST BE ORDERED BY SMD#. A cross reference table is available on the Intersil website at <http://www.intersil.com>

### HS/IS Radiation Hardened Types

**H S 1 - 6664 RH -8**

**PREFIX**  
H: Heritage Products  
I: New Products

**FAMILY**  
Rad Hard/High-Rel Products

**PACKAGE DESIGNATOR**  
1: Ceramic Dual-In-Line Frit-Seal (CERDIP) or Ceramic Dual-In-Line Metal-Seal (SBDIP)  
2: Can  
4: Ceramic Leadless Chip Carriers (CLCC)  
7B: 8 Lead Ceramic Dual-In-Line Side-Brazed (SBDIP)  
8: Ceramic Pin Grid Array (CPGA)  
9: Ceramic Flatpack  
9G: Ceramic Flatpack with Grounded Lid  
0: Die  
YE: SMD 0.5  
9S: TO-257 Hermetic Surface Mount

**PART NUMBER**  
6664

**CLASS**  
-8: -55°C to 125°C QML SMD Class Q (Note 1)  
-Q: -55°C to 125°C QML SMD Class V (Note 1)  
-T: -55°C to 125°C QML SMD Class T (Note 1)  
/PROTO: -55°C to 125°C Temperature Tested (Note 2)

**HARDNESS**  
RH: Radiation Hardened (Note 3)

NOTES:  
1. FLIGHT UNITS MUST BE ORDERED BY SMD#. A cross reference table is available on the Intersil website at <http://www.intersil.com/>  
2. /PROTO available for design-in/breadboarding - NOT FOR FLIGHT.  
3. Refer to specific device type SMD for radiation hardness level.

Intersil offers most of its radiation hardened products in die form. The Class V (Space Level) die are manufactured/ screened in accordance with Appendix A of the applicable DLA SMD and MIL-PRF-38535.

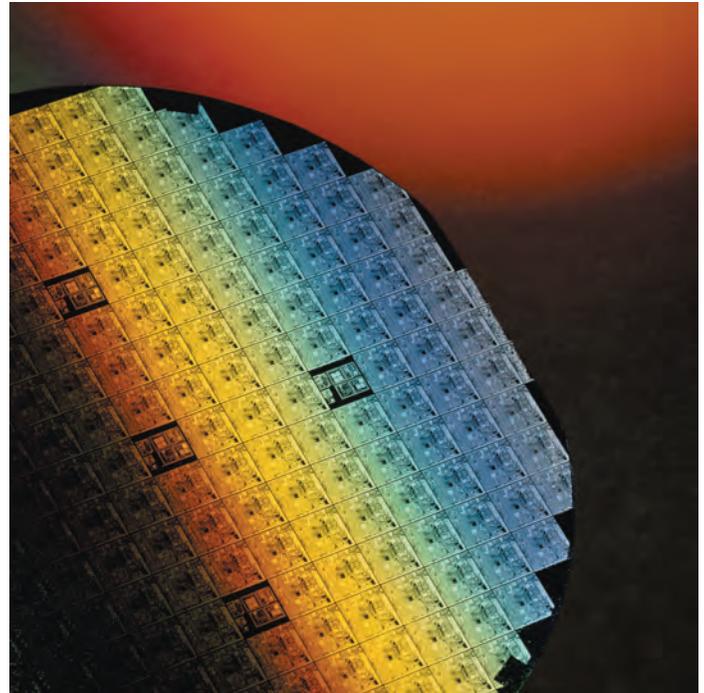
For more information on die characteristics, please refer to the applicable DLA SMD or product datasheet.

### Intersil Die Contact

#### Micross Components

##### Headquarters

11150 Santa Monica Boulevard,  
Suite 750  
Los Angeles, CA 90025-0528  
Phone: 407.298.7100  
<http://www.micross.com>



## Applications Support on the Web



### iSim™ Online Design Simulation Tool

[www.intersil.com/isim](http://www.intersil.com/isim)



### Application Block Diagrams

[www.intersil.com/applications](http://www.intersil.com/applications)



### Design Models

[www.intersil.com/design/designmodels.asp](http://www.intersil.com/design/designmodels.asp)



### Product Cross Reference

[www.intersil.com/products/xref](http://www.intersil.com/products/xref)



### Ask Our Staff and FAQ Knowledge Base

[www.intersil.com/askourstaff](http://www.intersil.com/askourstaff)



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### **NORTH AMERICA**

#### **WEST COAST**

Intersil Headquarters  
1001 Murphy Ranch Road  
Milpitas, CA 95035  
(TEL) 408-432-8888  
(FAX) 408-434-5351  
1-888-INTERSIL  
1-888-468-3774

#### **EAST COAST**

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(FAX) 321-729-7320  
1-888-INTERSIL  
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### **ASIA PACIFIC**

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(TEL) +886-2-2515-8508

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(TEL) +82 31 713 8480

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(TEL) +65 6748 4200

#### **Shenzhen**

(TEL) +86-755-8246-5118

#### **Shanghai**

(TEL) +86-21-6335-1198

#### **Beijing**

(TEL) +86-10-8225-5181

### **JAPAN**

6F, Mita Nitto Daibiru  
3-11-36, Mita, Minato-ku  
Tokyo, 108-0073 Japan  
(TEL) +81-3-5439-2311  
(FAX) +81-3-5439-2300

### **EUROPE**

Oskar-Messter-Str. 29  
D-85737 Ismaning  
Germany  
(TEL) +49-89-46263-0  
(FAX) +49-89-46263-148