



Products you can count on in the toughest environments

High reliability power management products

www.infineon.com/IRHiRel

IOR HiRel
An Infineon Technologies Company

Leading the way in high reliability power management

For over 30 years, **International Rectifier HiRel Products**, an Infineon Technologies Company, has offered a unique portfolio of high-reliability power management products for extreme environments, such as those found in space, aerospace, defense, and other industries. Our design, operations and quality systems meet and exceed military standards.

IR HiRel continues to offer excellence and dependability as part of Infineon Technologies. We focus on the quality and reliability of our products so that you can focus on your business.

Agility in a changing environment

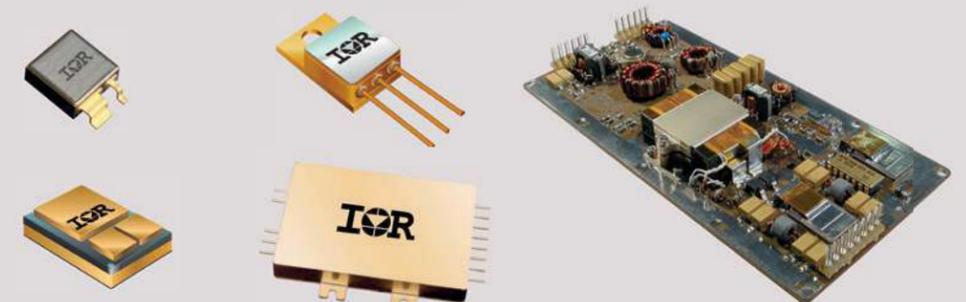
IR HiRel offers standard and custom products specifically designed for the tough applications where commercial electronics will not succeed. We have been part of most major defense, civil, and commercial space missions around the world.

We respond to market changes such as the emergence of NewSpace ventures with new, innovative and cost-effective solutions. In addition to market-specific service and support, IR HiRel offers the benefits of being part of Infineon Technologies, a world leader in semiconductor solutions.

Product categories

IR HiRel products include a variety of RadHard, RadTolerant, and high-reliability power semiconductors and system solutions

- > RadHard MOSFETs
- > Schottkys & Rectifiers
- > Power Integrated Circuits (ICs)
- > DC/DC Converters
- > Solid-State Relays
- > Multi-Chip Modules



Power management for the toughest applications

Powering the space economy

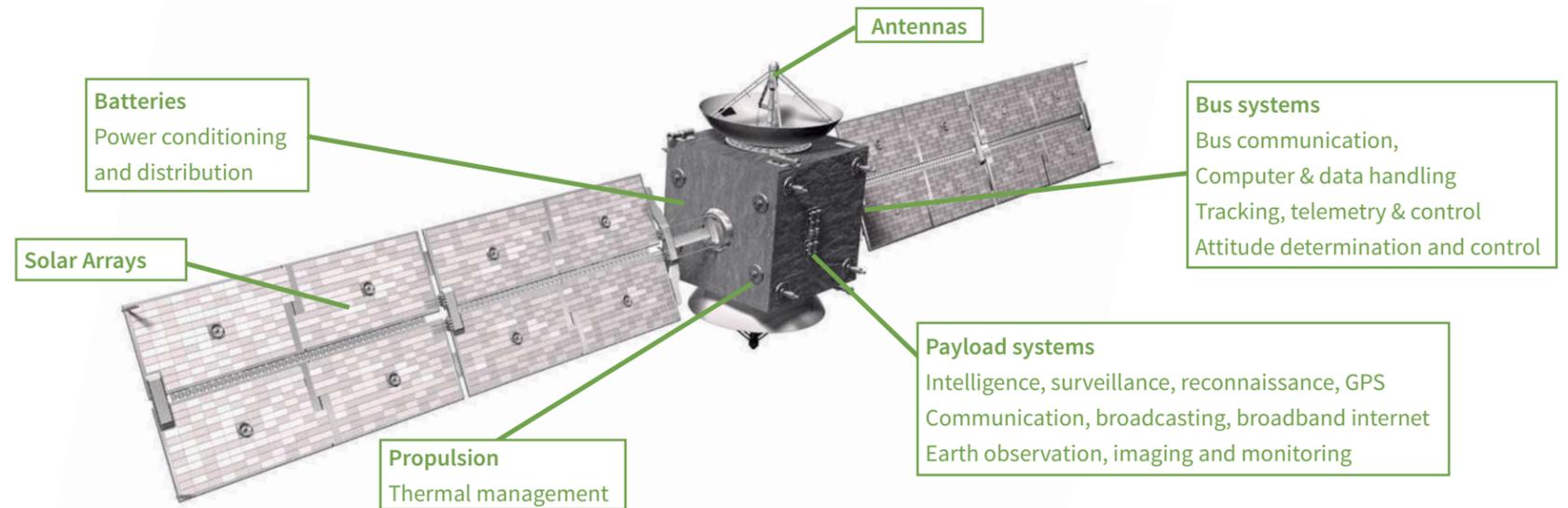
International Rectifier HiRel products are used in most space applications with long-life requirements such as most major GPS satellite programs, commercial communication satellites, earth observation satellites, launchers, defense and classified programs.

We play a major role in space exploration, supporting the International Space Station, Mars Rovers, the Hubble and James Webb Space Telescopes, Space Launch System, and Orion spacecraft.

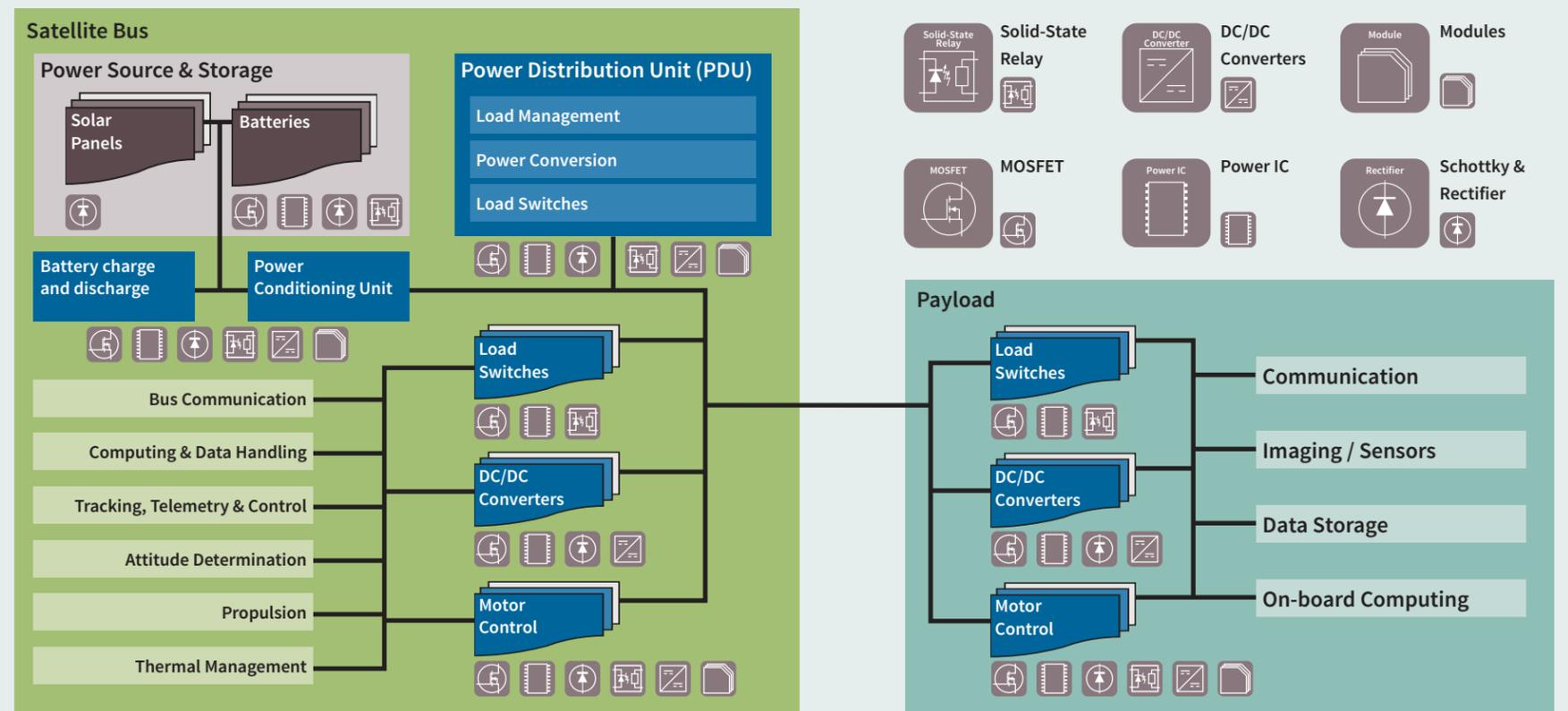


World class heritage

- > Customers around the world trust our products and our people for the most demanding missions
- > Our experts have unparalleled know-how at supporting the most challenging applications with proven solutions
- > We offer world-class quality, reliability and support
- > Our products operate in extreme environments with long-life expectancies
- > We offer innovative technologies and products to solve problems more effectively



IR HiRel products are used throughout the electrical power system of the satellite and for powering its payloads.



Application focus

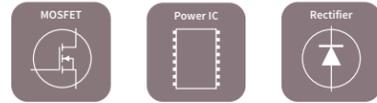
The need for power management is ever-present in satellites and each system has different power management requirements. That is what we keep in mind when designing our products: enabling us to provide system solutions with engineering, quality and comprehensive application support. IR HiRel power management semiconductors and DC/DC converters are used throughout space and defense systems to manage the main power bus and to power payloads.

The markets we serve

IR HiRel products have been used in over 1,500 satellites orbiting the Earth, space exploration programs, military and civil aviation and defense programs. They are also used in sectors such as oil exploration, undersea communication networks and implantable medical devices.



High reliability discretes and ICs



International Rectifier HiRel Products is a leader in Radiation Hardened (RadHard) power MOSFETs and has continuously brought innovation in silicon design, packaging technology and quality over the last three decades with US DoD DLA QPL products up to MIL-PRF-19500 JANS level.

We have unparalleled understanding of power MOSFET radiation testing and have designed them for improved performance under radiation. IR HiRel offers the broadest catalog of products available in the market, with license-free exportable products as well as radiation hardness ratings up to 1 Mrad(Si) TID and 86 MeV.cm²/mg LET.

IR HiRel new generations of RadHard MOSFETs improve performance and reliability while meeting the changing power requirements of new electronics and applications.

Discretes and ICs

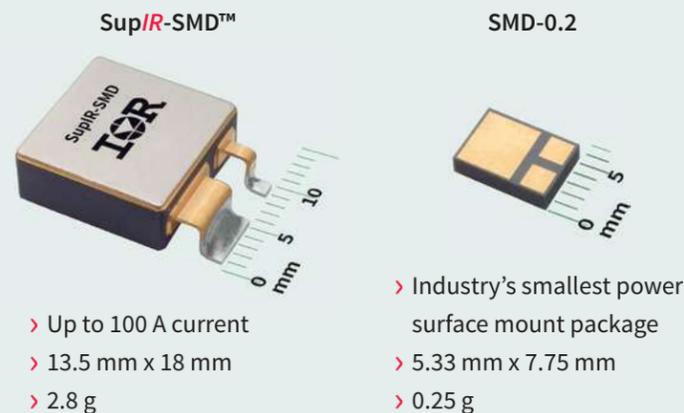
- > Hermetic Power MOSFETs
- > RadHard Power MOSFETs
- > Hermetic and RadHard Power ICs
- > Hermetic Schottkys
- > Hermetic Ultrafast Diodes

RadHard power MOSFET technologies



Innovation in packaging

IR HiRel has driven innovation and performance in power packaging such as low ohmic TO-254 and TO-257 packages, SMD-0.2 and SupIR-SMD™ to make packages more efficient and more reliable, including in system assembly level qualification.



High reliability isolated DC/DC converters



IR HiRel offers a broad catalog of DC/DC converters which are fully qualified and documented, ready to use in aerospace applications and with a tremendous heritage: thanks to these products, you can use your valuable engineering resources in the other critical tasks of your project.

IR HiRel DC/DC converters offer benchmark performance in very compact outlines using proprietary designs. We can customize our standard products and offer fully custom designs based on proven standard topology and platforms.

Hermetic hybrid DC/DC converters

- > Wide range of standard full featured, certified SMD products per MIL-PRF-38534 Class H and K
- > Up to 1 Mrad(Si) TID and 86 MeV.cm²/mg LET
- > Benchmark efficiency and power density
- > Full power up to 125°C operating temperature with select models operating up to 215°C



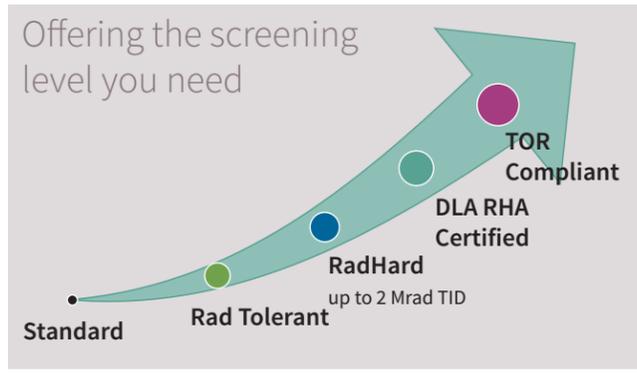
Open-frame or enclosed PWB power supply units

- > Advanced power supply design expertise, tools and standard platforms delivered by passionate designers with solid space product experience
- > Proven, proprietary topology and magnetic design delivering high efficiency and overall performance implemented in thousands of flight units
- > Unique expertise and extensive heritage in complex power supplies, Rad-Hard EPC for SSPAs and on-board processing power with solid space heritage

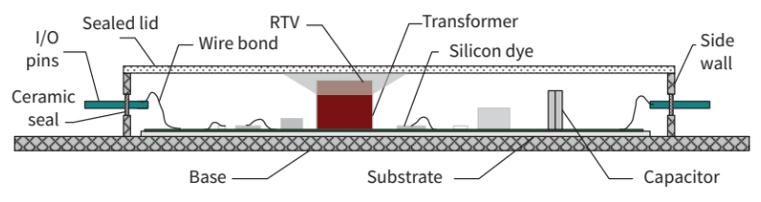


High reliability hermetic hybrid DC/DC converters

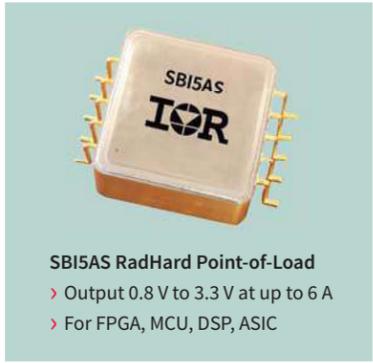
- > General purpose and application specific converters including MIL-STD-461 filters
- > Standard and advanced functionality and protections
- > License-free exportable RadHard products (EAR-99)
- > MIL-PRF-38534 Class H and K SMD with RHA plan
- > High temperature DC/DC converters up to 215°C in 1 inch wide package for downhole tools



Proven compact hermetic hybrid packaging for high-reliability



- > Low mass, low profile
- > Moisture free environment
- > Short thermal path
- > Mitigates radiated EMI
- > Minimizes parasitic impedances
- > Ruggedized for shock & vibration



Class K SMD RadHard isolated DC/DC converters

size comparison

ARA Series (5 W) NEW

- > Compact
- > 28 V or 100 V input

S Series (10 W)

- > Compact
- > External 461 filter available

LS Series (30 W)

- > Integrated 461 filter
- > LSO with telemetry and overvoltage protection

M3GB Series (40 W)

- > Best selling isolated converter
- > Input 28 V, 50 V, 70 V, 120 V

GH Series (50 W)

- > First hybrid DC/DC converter with synchronous rectification
- > Best efficiency for output voltages of 1 V to 5 V

GHP Series (120 W)

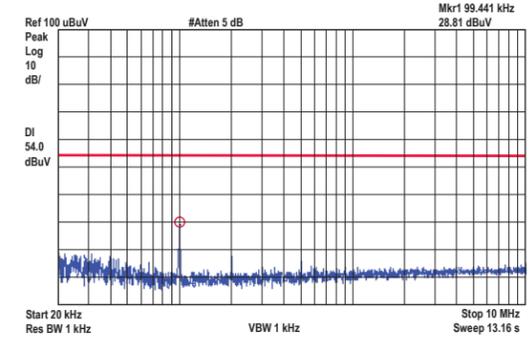
- > Highest power density (40 W/in³)*
- > Input 28 V, 70 V, 120 V with single & dual output

High reliability PWB space level DC/DC converters

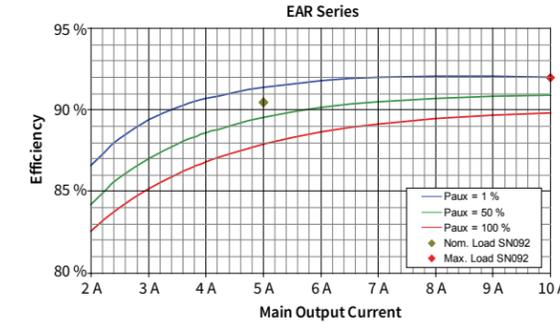
The IR HiRel RadHard PWB Power Supply Units (PSU) support high current (>50 A), high power (400 W), complex designs, advanced topology and magnetic design, delivering high-efficiency and overall performance while interfacing smoothly with the satellite bus with optional telemetry. Design practices follow military standards and de-ratings.

We offer a range of standard platforms based on a general design philosophy which can be tailored to the customer's program requirements. Fully customized designs are also supported. All models and variants are supplied with full analysis data package.

Excellent EMC performance



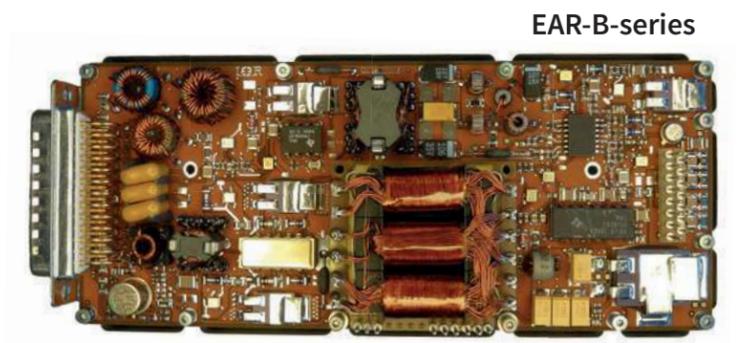
Excellent efficiency



RadHard EPCs for GaN SSPAs

To date we have manufactured thousands of world-class EPCs that feature:

- > Small size and weight
- > Output sequencing
- > Low output ripple
- > Output overvoltage Single Point Failure Free
- > Integrated active OR-ing

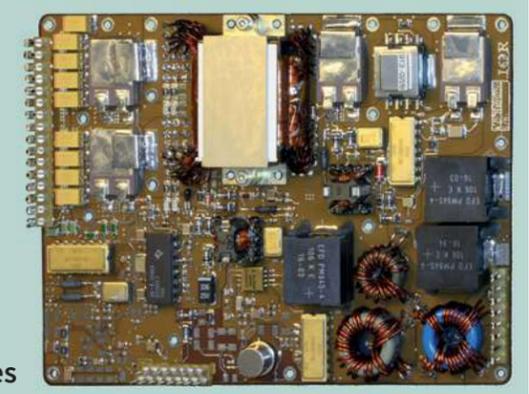


RadHard PSU for on-board processing, ASICs & FPGAs

- > Over 90 percent efficiency
- > High power density
- > Synchronous rectification
- > Lower output voltage to 0.8 V
- > High output current to 50 A
- > Cold or hot redundancy with built-in O-Ring
- > Strong space heritage
- > Active OR-ing

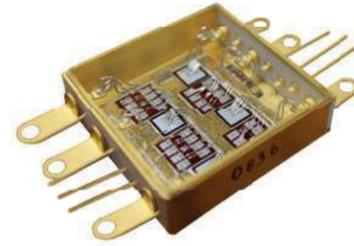
IR HiRel PWB DC/DC platforms have also been used to quickly and cost-effectively provide lower specification PSUs for NewSpace constellations while maintaining reliability and radiation tolerance.

ZB-series



High reliability power hybrid modules

IR HiRel offers standard and custom hybrid Multi-Chip Modules (MCM) leveraging its semiconductor, packaging, application, manufacturing and quality expertise. Examples of standard MCM include Rad-Hard Solid State Relays and Linear Voltage Regulators.



MCM benefits

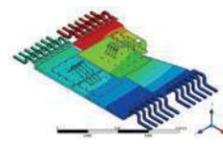
- > Reduction of footprint and weight
- > Improvement of electrical performance
- > Reduction of bill of materials, documentation, qualification, procurement and assembly
- > Reliable in harsh environment
- > Compliant to MIL-PRF-38534 H and K levels

Custom power modules & assemblies

- > Turnkey design-to-specification and build-to-print hybrid power modules and circuit card assemblies deliver products that fit perfectly to the application in a compact, reliable package
- > We follow a gated product development process that provides all necessary analyses and documentation, verification and validation to ensure smooth release to manufacturing and successful qualification



Specification review and development plan



Design, analysis and verification



Process engineering and design validation



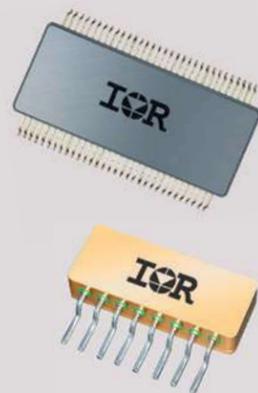
Manufacturability readiness and qualification

RadHard solid-state relays

- > Standard and custom
- > Multiple outputs, voltage and current
- > Metal and ceramic packages

Applications

- > Solar array motor control
- > Heater controls
- > Bus switching
- > Ground power isolation

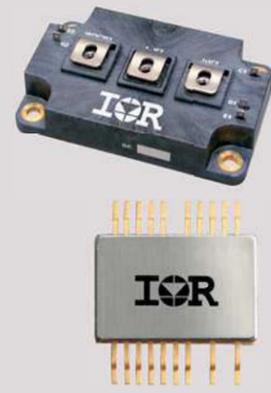


Motor control and power MCM

- > Standard and RadHard
- > Hermetic and plastic encapsulated

Applications

- > Antenna, solar panel, reaction wheel assembly
- > Flight control actuators
- > Aircraft starter generators
- > Thrust Vector actuators



IR HiRel locations and DLA certified sites

Temecula / El Segundo, California

Design Center - Discretes, ICs, wafer fab
Certifications:
 ISO9001:2008, ISO14001:2004,
 DLA MIL-PRF-19500 JANS

San Jose, California

Design Center - Assembly and Test
 Hybrids and PWB DC/DC
Certifications:
 ISO9001:2015/AS9100D
 DLA MIL-PRF-38534, Class K
 IPC-A-610, J-STD-001

IR HiRel, Denmark

Design Center - PWB DC/DC
Certifications:
 ISO9001:2015/AS9100D

Leominster Massachusetts

Design Center - Assembly and Test
 Discretes, ICs, Modules, SMT assemblies
Certifications:
 ISO9001:2015/AS9100D
 DLA MIL-PRF-19500, JANS
 DLA MIL-PRF-38534, Class K
 IPC-A-610, J-STD-001

Over 30 years of heritage in thousands of programs

Select Aeronautics and Defense Programs

- > F-35 JSF
- > F-16
- > F-22
- > Eurofighter
- > SAAB Gripen
- > AJ-64
- > Trident Missile
- > Patriot Missile
- > THAAD
- > M1A2 Tank
- > Airbus 320, 380
- > Boeing 737, 777, 787

Select Satellite Platforms and Space Programs

- > GPS II and GPS III
- > GOES
- > GLONASS
- > Galileo
- > Iridium NEXT
- > MUOS
- > MetOp
- > Meteosat
- > NPOESS
- > AEHF
- > JPSS
- > OneWeb

Select Space Exploration Programs

- > Space Launch System and Orion Capsule
- > International Space Station
- > Lunar Reconnaissance Orbiter
- > Deep Space Probe
- > NASA Mars Rovers
- > James Webb Space Telescope
- > Hubble Telescope
- > ExoMars

Where to buy

Infineon distribution partners and sales offices:

www.infineon.com/WhereToBuy

Service hotline

Infineon offers its toll-free 0800/4001 service hotline as one central number, available 24/7 in English, Mandarin and German.

- > Germany 0800 951 951 951 (German/English)
- > China, mainland 4001 200 951 (Mandarin/English)
- > India 000 800 4402 951 (English)
- > USA 1-866 951 9519 (English/German)
- > Other countries 00* 800 951 951 951 (English/German)
- > Direct access +49 89 234-0 (interconnection fee, German/English)

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Mobile product catalog

Mobile app for iOS and Android.

More information

www.infineon.com/irhirel

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Warnings

Due to technical requirements, our products may contain dangerous substances. For information on the types in question, please contact your nearest Infineon Technologies office.