



# Space power management solutions

[www.infineon.com/hirel](http://www.infineon.com/hirel)





**Optimize system size, efficiency & power density with rad hard power solutions**

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# Trusted source for space power solutions

Infineon Technologies and its subsidiary, International Rectifier HiRel Products, Inc. (IR HiRel), is a leader in high reliability, radiation-hardened (rad hard) power conversion for space flight applications, from space exploration to national security programs and more.

Our design, operations and quality systems exceed military standards. Infineon offers standard semiconductor-based products specifically designed for space applications where commercial electronics cannot meet the requirements.

Applications include bus platforms and payloads for planetary exploration vehicles, satellites, classified missions and similar programs where failure-free performance is required in severe mechanical, thermal and radiation environments.

Infineon's specialized team of experts provides proven, high performance and fully documented products to expedite approval paths with management and end customers.

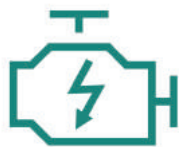
## Satellite bus & payload types

- › Bus platform subsystems
  - Attitude & orbit control (AOCS)
  - Command & data handling (CD&H)
  - Communications & antennas
  - Electrical power
  - Propulsion
  - Thermal control
- › Payloads
  - Telecom
  - Navigation
  - Government
  - Remote sensing
  - Scientific

# Thousands of programs, decades in space

Infineon has a long history serving the space industry. We understand the engineering and manufacturing requirements and challenges of designing for reliable performance in the extreme thermal, mechanical and radiation environments of space. For decades, customers have relied on our rad hard power solutions in thousands of mission-critical space, aerospace and national security programs. Many of these spacecraft are still in flight today.

Infineon combines its world-class heritage with deep technical expertise and product innovation to deliver benchmark power solutions for customers. Our rad hard power management portfolio is recognized globally for its excellent performance, reliability, longevity and unparalleled design heritage.



**Power distribution**



**DC-DC**



**Motor control**

# Continuous innovation

Infineon continues to invest and develop next-generation rad hard technologies that maintain the rigorous performance standards required in space. Our advances in rad hard silicon platforms, packaging and die sizes help improve size, performance and efficiency, while preserving the quality and reliability levels our customers need.

## Radiation hardness assurance (RHA)

Infineon's rad hard MOSFETs are tested to verify their radiation hardness capability, with an assurance program based on the requirements outlined in ESCC-5000, MIL-PRF-19500 and associated slash sheets. Our IR HiRel-branded products exceed the standard requirements with a sampling size up to two times greater than is required for every manufacturing lot. Both pre- and post-irradiation performance are tested and specified using the same drive circuitry and test conditions in order to provide a direct comparison. Radiation harden by design techniques virtually eliminate the possibility of SEGR and SEB in the rad hard power MOSFETs. Robust performance is then verified through extensive single event effects testing.

## Quality conformance inspection

Unlike standard commercial products, Infineon and IR HiRel products undergo various levels of quality conformance inspection (QCI) to ensure that the products are capable of performing to specifications in the application's harshest environments. Our program supports a breadth of screening and QCI levels in accordance with specified quality levels. Additional testing eliminates nonconforming parts, increasing confidence in the reliability of long-lasting, high performance specification compliance.

### Infineon IR HiRel discretes

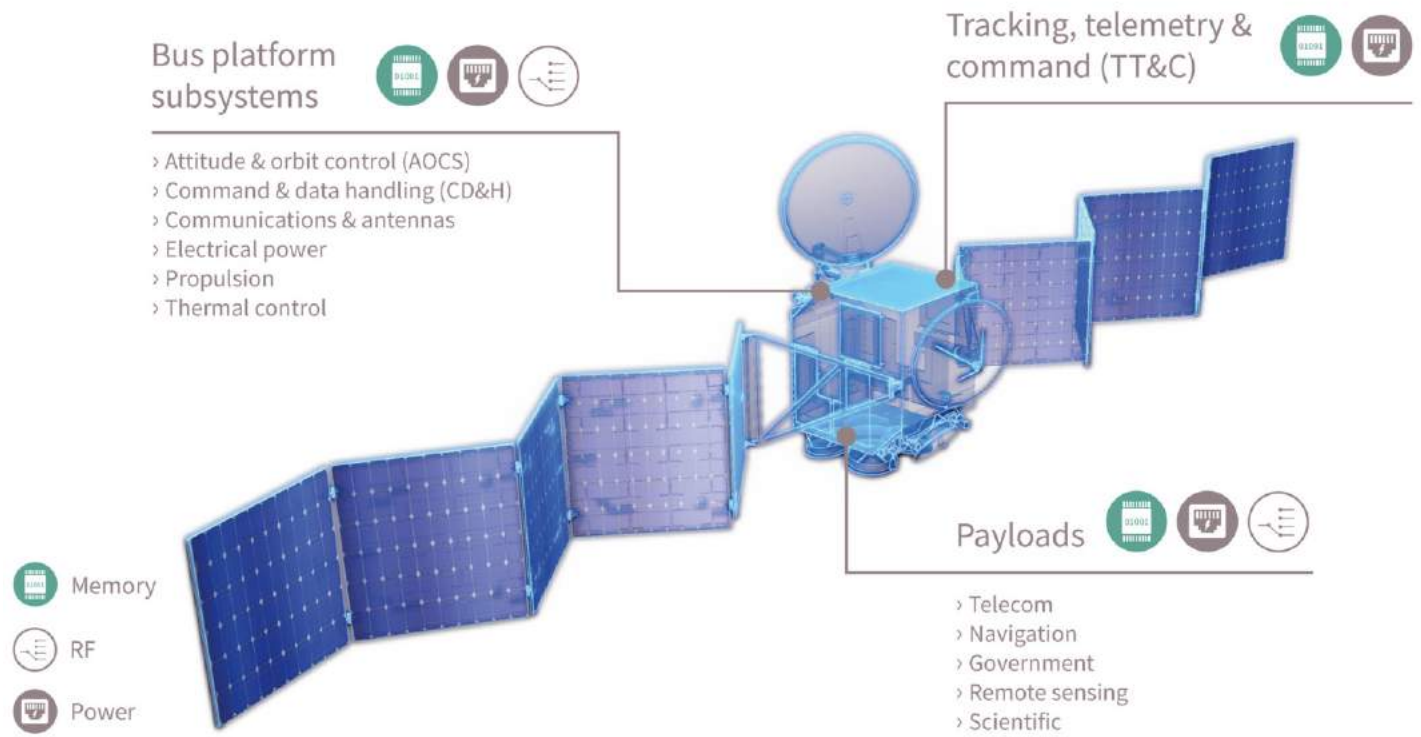
- › ESCC-5000 for discrete semiconductors, hermetically sealed and die (Infineon)
- › MIL-PRF-19500 and MIL-STD-750 for discrete MOSFET and diode semiconductors manufactured to either JANTXV or JANS screening level
- › MIL-PRF-38534 and MIL-STD-883 for solid state relays (SSR) and power hybrids manufactured to class H or class K level
- › Source Control Drawing (SCD)

### IR HiRel rad hard ICs

- › Class S-level equivalent microcircuits screened per MIL-PRF-38535 and MIL-STD-883 Test Methods 5004 and 5005, manufactured and tested on a DLA certified production line. Class S-level part numbers have SCS suffixes.
- › Class B-level equivalent microcircuits screened per MIL-PRF-38535 and MIL-STD-883 Test Methods 5004 and 5005, manufactured and tested on a DLA certified production line. Class B-level part numbers have SCB suffixes.
- › Commercial off the shelf (COTS) with no QCI have no suffix

# Space power solutions portfolio

Infineon's rad hard discrete power management portfolio for space is the industry's broadest. Combining decades of experience and a unique diversity of expertise and talents, Infineon is the ideal partner for robust power solutions that meet mission-critical customer needs.

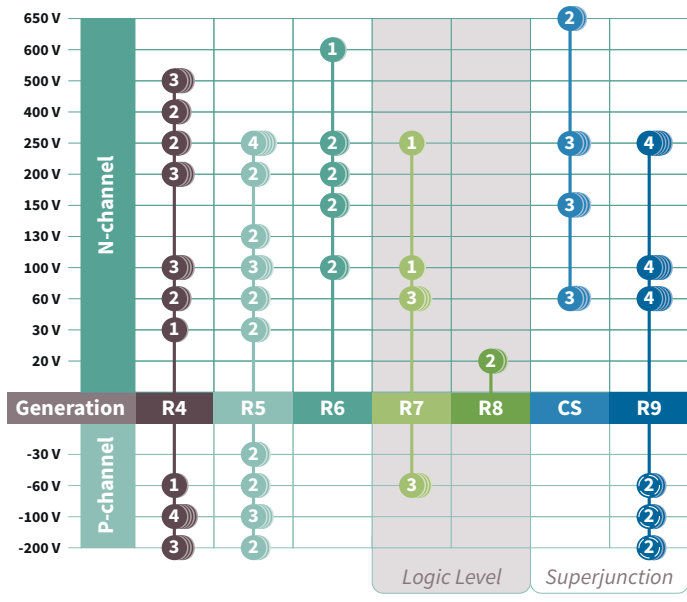


## Rad hard MOSFETs

Infineon is a renowned leader in high-reliability power solutions, with our subsidiary, IR HiRel, being the first manufacturer to offer rad hard power MOSFETs for space in 1987. Over the last three decades, IR HiRel has continuously innovated in silicon design, packaging technology and quality with US DLA QPL products up to MIL-PRF-19500 JANS level.

Infineon offers a broad selection of N-channel and P-channel rad hard MOSFETs in a wide range of hermetic packaging options screened to MIL-PRF-19500 and ESCC-5000, and available as QPLs. Select rad hard MOSFETs are also available as bare die.

Infineon rad hard MOSFETs are rated at 100 krad(Si) for TID and have been characterized for SEE up to 84 MeV-cm<sup>2</sup>/mg. Select rad hard MOSFETs are available with optional TID ratings up to 500 krad(Si).



**N-channel: 20 V to 650 V**  
**P-channel: -30 V to -200 V**

<b>R9</b>	Improved SWaP over prior rad hard MOSFET generations
<b>CS</b>	License-free, based on Infineon CoolMOS™ technology
<b>R8</b>	Designed for low voltage POL designs
<b>R7</b>	Designed for logic level gate drives
<b>R6</b>	Best performance for mid to high-voltage designs
<b>R5</b>	Optimized performance for low to mid-voltage designs
<b>R4</b>	All purpose MOSFET, legacy design with extensive space heritage

# Die sizes available

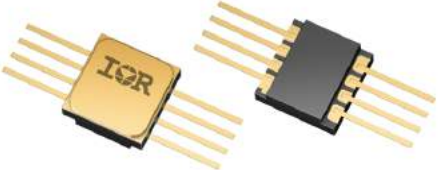


**SupIR-SMD™**  
 Better than SMD-2 on carrier,  
 37% smaller and 45% lighter



**SMD-0.5e**  
 Improved design  
 Direct-to-PCB mounting

## Rad hard gate driver ICs

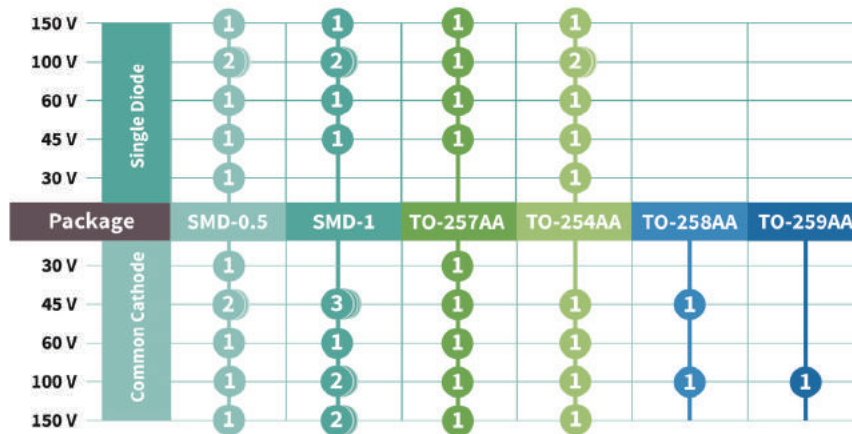


Engineered to match our rad hard MOSFETS for maximum performance, IR HiRel's space-grade high-side and low-side MOSFET drivers are rated at 100 krad(Si) for TID and have been characterized for SEE up to 81.9 MeV-cm<sup>2</sup>/mg. These gate drivers feature a wide operating supply range up to 20 V, low propagation delay and high drive currents. Increase reliability and reduce solution size and weight by replacing bulky magnetic or opto-coupler based gate driver designs with IR HiRel's space-grade gate driver ICs.

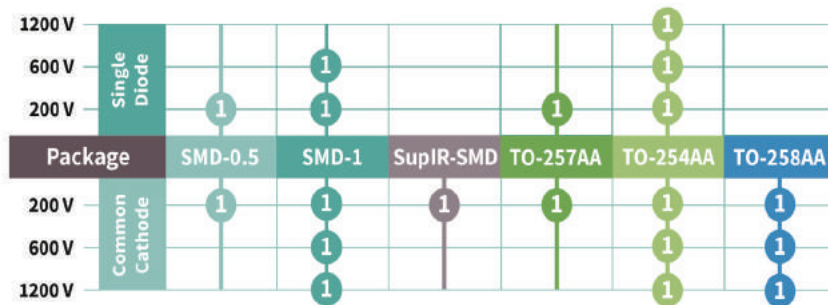
# Schottkys & rectifiers

IR HiRel's portfolio includes high-reliability, hermetically packaged Schottky and ultra-fast rectifiers. Offered in variety of voltages and industry standard surface mount and through-hole packages, our Schottky and ultra-fast rectifiers are available in single and common cathode. Schottky quality screening levels include MIL-PRF-19500 JANTX, JANTXV and JANS. The ultrafast rectifiers are screened to MIL-PRF-19500 equivalent.

## Space grade power Schottky diode portfolio



## Space grade ultrafast rectifier portfolio



# of die variants

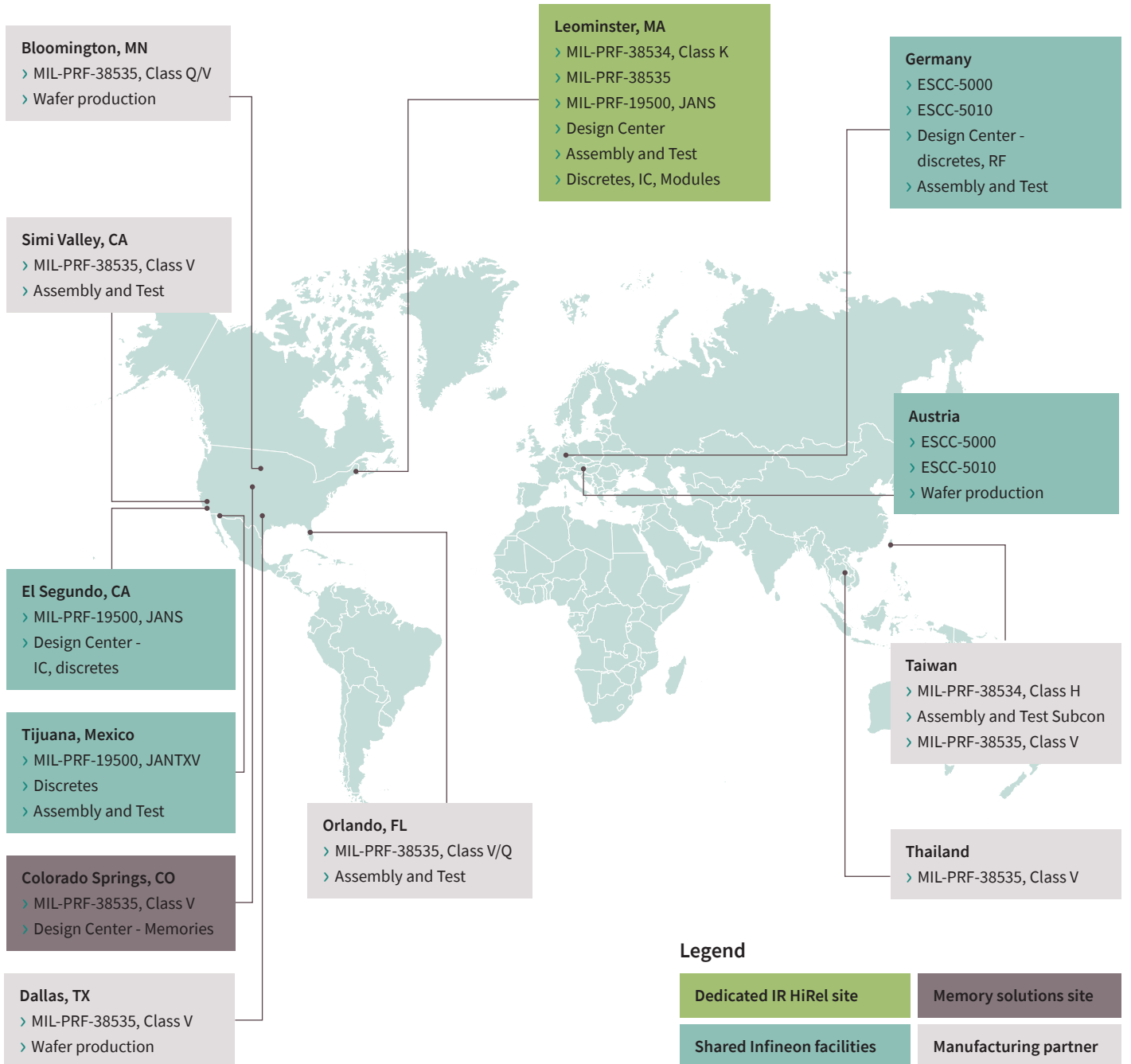
# Solid state relays

IR HiRel's solid state relay (SSR) portfolio includes rad hard single, dual and octal devices in hermetically sealed packages and tested up to 100 krad(Si) total ionizing dose. The family includes optically coupled, buffered and non-buffered solid state relays, with input and output MOSFETs using IR HiRel's industry-leading rad hard MOSFET technology. Choose our SSRs for high-reliability applications including solar array management, heater controls, bus switching, and ground power isolation.





# HiRel locations and certified sites



# High reliability custom services

Infineon's high reliability and extreme environment custom services simplify your design process by offering quick-turn solutions. Our worldwide partner network and technology expertise help our customers develop innovative products and accelerate time to market with shorter qualification cycles.

Custom services include:

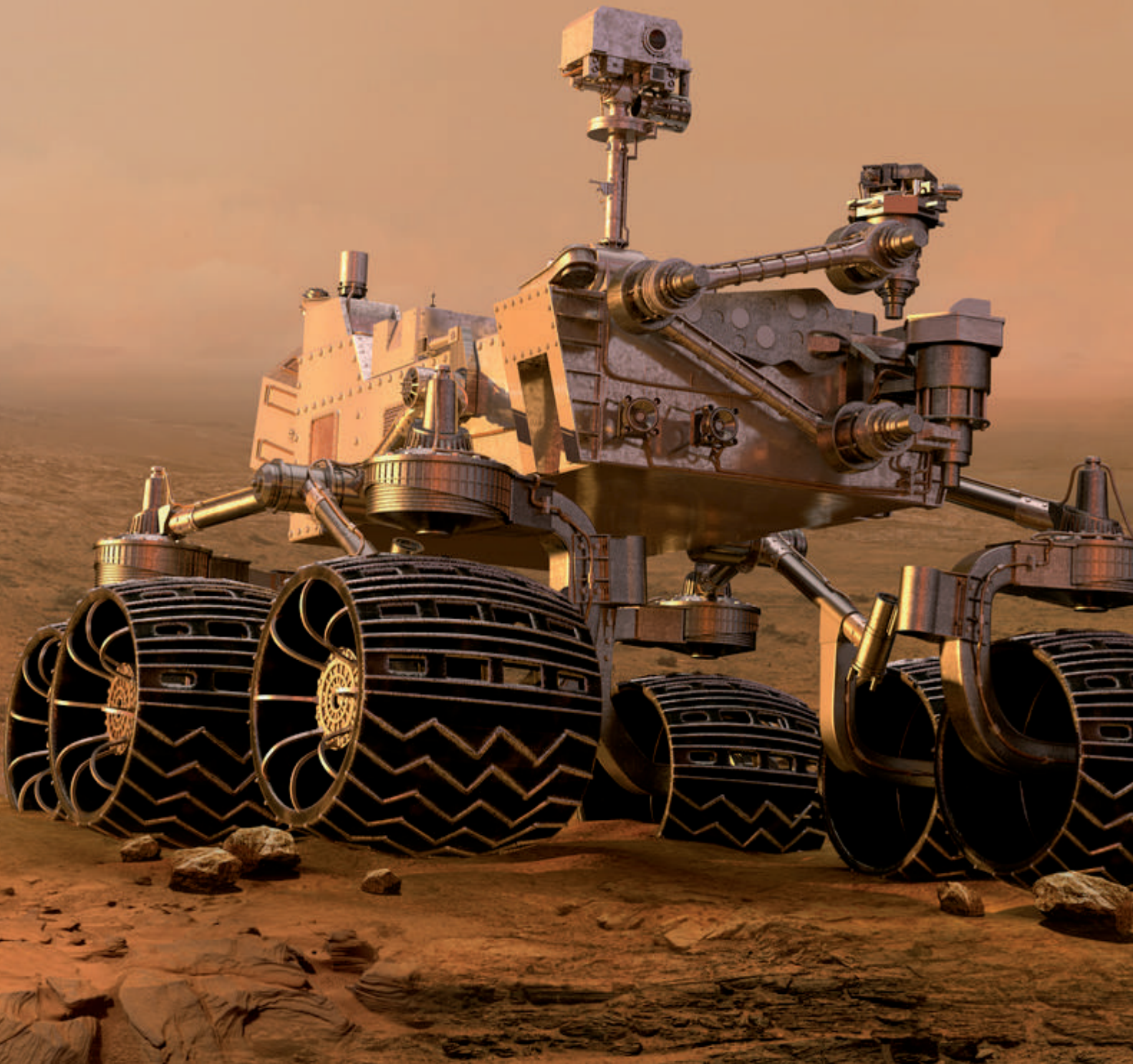
- **COTS+ extended product qualification and screening:** through Infineon's IR HiRel subsidiary, select Infineon commercial and automotive power components solutions can be up-screened according more stringent requirement such as MIL temperature range qualification, 100% burn-in testing, and more.
- **Die and wafer sales:** Infineon offers select products from its radiation hardened and high reliability memory and power portfolios as qualified bare die and wafer. The die and wafers are tested to the same quality and reliability standards as their packaged equivalents.
- **Longevity programs:** Product life extension and die and wafer bank services are also available through IR HiRel for Infineon COTS and automotive power components that may be used in high reliability electronic designs in space, avionics, defense, medical, and more. This ensures supply longevity, avoiding obsolescence-induced support issues and requalification costs, which can be significant in high reliability applications.
- **RF foundry services:** Infineon's RF foundry services enable access to our industry leading microwave technology for developing markets and low-volume applications. Our B11HFC microwave process is a state-of-the-art mature technology. Automotive qualified with extended temperature range, it is well-established for high volume production and ideal for applications up to 100GHz.

Contact [hirel-sales@infineon.com](mailto:hirel-sales@infineon.com) for more info.

# A world leader in rad hard space solutions

Infineon offers a broad selection of solutions certified to ESA and DLA standards for our global customers. Our industry-leading space portfolio includes high reliability and rad hard memory, RF, rad hard power management and conversion solutions.

We power space



## Where to buy

Infineon distribution partners and sales offices:  
[www.infineon.com/WhereToBuy](http://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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### **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.

Infineon Technologies Components may only be used in life-support devices or systems with the expressed written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system, or to affect the safety or effectiveness of that device or system.

Life support devices or systems are intended to be implanted in the human body, or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.