

Pushing innovation to create intelligent power and sensing technologies that solve the most challenging customer problems.



Trusted Source

With headquarters in Phoenix, Arizona, and on-shore design and manufacturing centers, **onsemi** offers a secure, stable environment for the development of advanced semiconductor solutions for aerospace and defense applications.

onsemi has been granted Category 1A Trusted Design, Trusted Test, and Trusted Foundry accreditation by the Defense Microelectronics Activity (DMEA), enabling trusted support from design through product shipment. The Trusted Foundry accreditation allows **onsemi** to support its digital and mixed-signal designs at the 40,000 square foot (ft2) cleanroom manufacturing space in Pocatello, ID, the 100,000 ft² clean room in the Gresham, OR, and the 282,000 ft² of fab and backend cleanroom space in East Fishkill, NY. The accreditation program is part of the DoD strategy to ensure that electronic components used in U.S. military and national security applications are trustworthy and secure. An assured "chain of custody," supply chain integrity, and prevention of tampering are critical for Application-Specific Integrated Circuits (ASIC) used by national security agencies. A crucial part of the Trusted Foundry program is that it uniquely provides the U.S. Government with guaranteed access to leading-edge trusted microelectronics services for low volume applications. **onsemi**'s accreditation confirms its commitment to meet these government requirements.

onsemi has also been granted "Trusted Broker" accreditation by DMEA, enabling the company to support the entire trusted manufacturing process through engagement with other trusted suppliers. The combination of the four accreditations benefits military and defense customers by providing a fully integrated trusted manufacturing solution.

In addition, **onsemi** maintains ITAR certification and QML flows required for military designs.







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Processes and Capabilities

onsemi is certified to the following process standards:

- MIL-PRF-38535
- ESCC-9020
- ISO9001

- IATF 16949
- ESCC-2269000
- AS 9100 Rev. D
- Category 1A

For more information on the current status of certifications held by **onsemi**, visit our website at: www.onsemi.com/about/quality-reliability/certifications-qualified-sites

Environmental Performance

onsemi provides robust silicon technologies for ASIC products characterized over an extended temperature range from cryogenic to 200°C, as well as a portfolio of plastic and hermetic packaging suitable for high-reliability end applications.

Process Longevity

onsemi operates modularized wafer fabrication processes that enable the company to offer extended process lifetimes, meeting the market need for secure, long lifecycle processes to support long product lives of ten years or more. This approach also allows the company to support the low-volume requirements of aerospace and defense customers. An established, flexible EOL process enables adequate transition or EOL planning.







onsemi added 300 mm production capability to the current 200 mm production capability through the 2019 acquisition of Global Foundries' 300 mm fab located in East Fishkill, New York. Through this purchase, **onsemi** can now offer development and production in the fab's 65nm CMOS technology. A system platform is under development, allowing ONK65 technology to replace ONC110, **onsemi**'s 110 nm CMOS node, for future projects needing higher performance and radiation requirements beyond ONC18, **onsemi**'s 180 nm CMOS technology.

Solutions Characterized for Neutron Soft Error Rates

Robust ASICs for Aerospace Applications

onsemi offers Application Specific Integrated Circuit (ASIC) solutions critical for aerospace applications and products requiring rigorous FIT rates due to terrestrial radiation exposure. A combination of characterization test data, soft-error-aware design flow methodology, qualification, and handling flows allow customers multiple options in planning and designing ASICs in a wide variety of applications. Available in the company's 110 nm (ONC110) and 180 nm (ONC18) digital and mixed signal processes, the standard cell and SRAM architectures achieved strong neutron test results across voltage and temperature. To further reduce Single Event Effects (SEE), the design offering includes enhanced substrates, redundancy and error correction code (ECC) options. Leveraging the company's existing commercial digital ASIC flow, customers benefit from superior pricing, development spans and manufacturing cycle times. Characterization of 65 nm (ONK65) IP and libraries for neutron soft error rates is planned for 2023 and beyond.

ONC18 FIT (Sea Level, NYC)	1.8 V FIT Per M Bit	1.5 V FIT Per M Bit							
Dual-Port SRAM	618	778							
Single-Port SRAM	492	704							
Flip Flop*	313	529							
* Single bit FIT only. Redundancy will significantly reduce FIT. No SEL at 85°C, 1.93 V. No MBU or SEFI.									

Soft Error Mitigation Solutions for Aerospace

onsemi has a wide range of design solutions to mitigate soft errors while taking density, power, and performance into account. A combination of proven Rad Hard by Design (RHBD) techniques and process enhancements deliver outstanding neutron test results. Be it partial, sequential, or full Triple Modular Redundancy (TMR), **onsemi** can tailor an ASIC development flow to meet the design and application needs of a wide range of aerospace applications.







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Technology Integrations for Foundry and ASICs

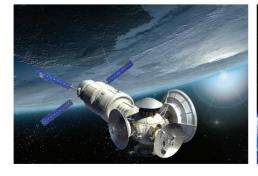
Robust ASICs for Military, Aerospace, and High Reliability Applications

onsemi continues to invest in new technologies to provide our customers with ASIC and Foundry options that meet or exceed the rigor of today's Military, Aerospace, and High Reliability Applications. Two up-and-coming technologies to watch for include ONK65, a 65 nm CMOS ASIC technology produced on 300 mm wafers enabled by onsemi's acquisition of the East Fishkill, NY fabrication facility in 2019. Introduction of ONK65 is ongoing as the Process Design Kit (PDK), Digital Design Kit (DDK), and Intellectual Property offerings are updated and modernized for high-volume production. ONK65 is expected to provide a path for onsemi to continue offering neutron soft error rate (nSER) characterized ASICs, Radiation Hardened by Design (RHBD) ASICs and ASSPs, and high voltage ASICs – all part of onsemi's long term ONK65 roadmap. The planned ONK65 ASIC offering is exciting as onsemi remains one of the few Integrated Device Manufacturers (IDM) with on-shore fabrication capabilities.

ONK65 Technology Overview

- 65nm Technology
- Low Power and Performance Offerings
- Multi-Vt Devices
 - 1.3 Vt's HVT/RVT/LVT
 - Wide variety of devices options to support diverse design objectives: Low Power, High Speed, Mixed Voltage, etc.
- Dual and Triple Well n-mos/p-mos
- Two Gate Oxide options
 - Thin oxide devices at 1.2V
 - Thick oxide 2.5V for 1.8V, 2.5V and 3.3V
- Standard, high performance and low leakage FFTs
- 1.0V or 1.2V core

- Standard Cells & Memories
 - 10 track
 - 13 track
 - 1R/1RW/2RW
- Mixed-signal Ready/RF Devices
 - Precision Poly Resistor
 - Varactor/Inductor
 - VNCAP/MIMC
 - Ultra Thick Top Metal
 - Natives
 - High Gain FETs (ADFET)
- -40°C to 125°C
 - Extended temp (-55°C/150°C) under investigation.





Technology Integrations for Foundry and ASICs

onsemi is currently working to offer I4Te SOI; an extended voltage version of the existing I4Te technology based in **onsemi**'s 180 nm BCD technology produced in our Gresham, Oregon fabrication facility. I4Te SOI will utilize existing I4Te IP, SOI substrate, and introduction of devices capable of 120V and 160V. Use of Deep Trench Isolation (DTI) on SOI wafers will provide full isolation where desired. Process integration and PDK development is under way and will result in an on-shore, high voltage ASIC and Foundry offering, further extending the technologies **onsemi** offers to customers with Military, Aerospace, and High Reliability applications.

14Te SOI Technology Overview

- 180 nm Technology
- Benefits of I4Te SOI over I4Te
 - Reduced parasitics
 - Reduced complexity
 - Higher voltage capability
- 3.3Vg, up to 160Vds
 - 45Vds, 70Vds, 90Vds, 120Vds, and 160Vds devices
- Max Isolation Capability; 300V+
- Operating Temperature -40°C up to 225°C

- Pocket to Pocket Injection and Pocket to Substrate is blocked by buried oxide
- Backwards compatibility for I4Te devices is the goal!
- Timeline
 - Released PDK expected Q2 2023
 - Production release expected Q3 2023







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Product Processing

Special Packaging

- Custom package developments
- Drop-in replacement for ASICs/FPGAs
 - No need to modify the board footprint
- Aerospace/defense packaging
 - From ceramic packages to complex flip-chip BGAs
 - On-shore assembly and test capabilities
 - Thermally enhanced packages

Extended Temperature

- onsemi supports extended temperature in several technologies
 - -55 to +125°C for 0.5 μm and 0.35 μm process technology
 - -55 to +150°C for 180 nm process technology
 - -40 to +150°C for 65 nm process technology

Security Capability

- onsemi partners with third-party IP providers
 - Offers anti-tamper, error correction, and encryption capabilities with third parties

Avionics

- Demonstrated SEL immunity
 - Soft error rate data available for logic and memories for 180 nm process technologies

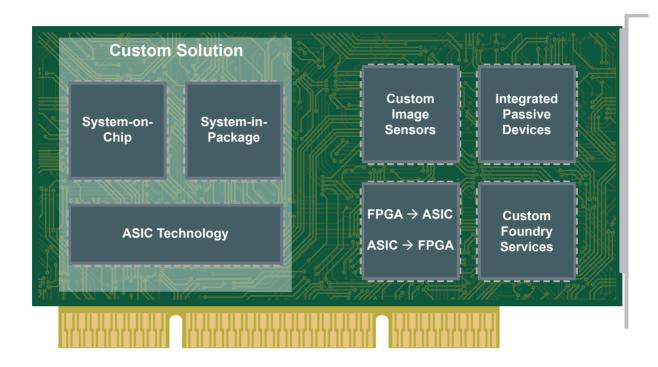
Non-Volatile Memory

- 0.5 μ m and 0.35 μ m process technologies offer up to 1 kb EEPROM with a maximum configuration of 32 \times 32; temperature ranges vary
- ONC18 (180 nm) offers two memory options
 - One Time Programmable (OTP) up to 256 kb;
 -40 to +125°C
 - EE Array up to 1 kb
 - -40 to +125°C up to 312 kb





SoC, SiP, and Custom Products



onsemi is a leading supplier of System-on-Chip (SoC), Application Specific Integrated Circuit (ASIC), and other custom solutions, supporting a wide range of applications in the automotive, industrial, medical, and aerospace & defense markets. **onsemi** has designed and manufactured more than 5,000 custom integrated circuits over the last 50 years.

onsemi SoC, ASIC, and Custom Product Benefits

Advanced, integrated SoC and ASIC devices enable optimized performance and power efficiency, through integration. Hardware embedding may enhance the security of intellectual property. The elimination of inter-package connections may reduce noise.

In addition, the reduction in the number of components may:

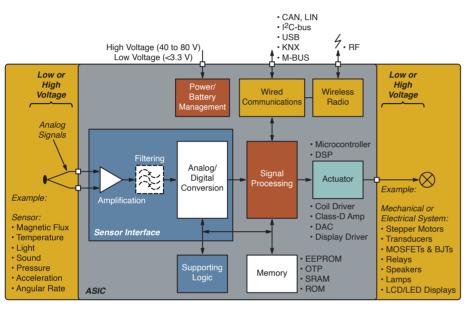
- Reduce required board space
- · Simplify board routing
- Simplify board testing
- Improve reliability
- Lower BOM cost

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Mixed-Signal ASIC Solutions

Value Proposition

- Experienced resources and assets to bring customers' design objectives successfully to market
- Ability to integrate customers' IP into single-chip solution, thereby protecting the IP
- Flexible cost models to reduce customers' total cost



Design Engineering

- Approximately 200 expert mixedsignal designers with extensive SoC and SiP experience
- Robust custom development process
- Dedicated project managers track
 & report development progress
- Flexible customer development engagement – from complete turnkey to subcontractor production services
- Design expertise in:
 - Sensor interface
 - Medical imaging
 - Energy management
 - Building & home control

IP & Fab Processes

- Analog-focused CMOS/BCDMOS and SOI technologies utilizing internal fabs and external foundry partners
- Low, medium, high voltages ≤1 V to 160 V
- Low current optimization active & standby
- Low noise design "count the electrons"
- High temperature ≤200°C (profile, for selected technologies)
- Non-Volatile Memory (EEPROM, OTP), RAM & ROM
- Embedded digital IP
- Robust ESD protection
- Extensive building blocks consisting of amplifiers, references, DACs, ADCs, linear & switching regulators, power management, etc.

Category	Mixed Signal Intellectual Property (IP)
Serial Interfaces	USB 3.0/2.0/1.1, HDMI, MIPI, I2C, SPI, CAN, UART
Microprocessors	ARM, RCore DSP, R8051, AMBA/AHB/APB Peripherals
Memory	SRAM, DPRAM, ROM, EEPROM, OTP, FLASH
Clocking	Oscillators, PLLs, DLLs
Encryption	ECC, AES, 3-DES, DES, RSA
Data Converters	DAC, ADC (8 - 20 bits, 1 KSPS - 120 MSPS)
Power Management	Efficient Switching Regulators, LDOs, Charge Pumps, Thermal Protection
References	Precision Bandgaps, Current References, Temperature Sensors
Analog and High Voltage Interfaces	High-Voltage Drivers, Display and LCD Drivers, Class D Amplifiers
Signal Conditioning	PGA, Instrumentation Amps, Digital and Analog Filters

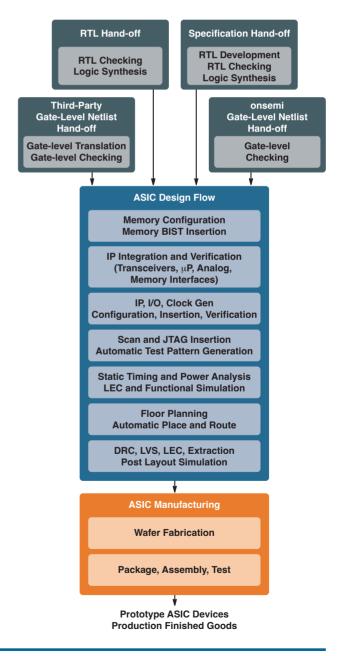
Digital ASIC Solutions

Proven Expertise

The comprehensive digital ASIC offering from **onsemi** includes multiple manufacturing locations with state-of-the-art and legacy technologies to support your design requirements. We provide complete solutions from product development, manufacturing, test, and packaging, to quality engineering support and supply. We offer early engagement with our product definers to assess the best overall technical solution enabling a solid partnership throughout each step of the project lifecycle, from concept to production. **onsemi** supports reliable long-term manufacturing to meet the requirements of aerospace/defense, automotive, industrial, communication and other markets. With over 50 years of IC experience, we guide our customers to the best technical and most economical ASIC solution.

Digital solutions from 0.5 m to 22 nm

- Flexible ASIC design interfaces including whole or partial RTL, Netlist, and GDSII content
- Robust FPGA proof-of-concept validation flow when targeting an ASIC
- FPGA-to-ASIC, ASIC-to-ASIC, and multi-chipto-ASIC conversions
- EOL support with ASIC-to-ASIC conversion approach
- Big D (Digital)/Small A (Analog) ASIC capability to increase integration and simplify board design
- Up to 50 million gates and 50 Mb of memory
- Product Definers to advise on best overall solution
- Proven technologies to ensure long term, continuous supply
- Secure supply with domestic manufacturing
- Support for long-life, small volume applications
- High reliability, high temperature, special packaging and handling
- Complete solutions including product development, test, package engineering, quality engineering, and failure analysis
- · Full ITAR handling available
- QML Flow, Trusted Supplier
- DO-254 compliance support
- Custom packaging capability to match most pin-outs and package types



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Process and Intellectual Property Offerings

Digital Standard Cell Product Families

Standard Cel	Standard Cell Product Families										
Family	Core Voltage (V)	I/O Voltage (V)	I/O Types	System Performance	Special Features						
SC5 0.5 μm	5.0	5.0, 3.3	PCI, TTL, LVTTL, LVCMOS	75 MHz	Long-Term 5 V Support, High Temp						
SC3 0.35 μm	3.3, 2.5	5.0, 3.3	PCI, GTL, HSTL, SSTL, LVTTL, LVCMOS, LVPECL	100 MHz	EEPROM, High Temp						
ONC18 180 nm	3.3, 1.8, 1.5, 5.0	3.3, 2.5, 1.8, 5.0	PCI33/66, DCI, HSTL, SSTL, LVTTL, LVCMOS, LVPECL, LVDS	266 MHz	NVM, OTP, High Vt, High Temp						
ONK65 SP65/55 65 nm, 55 nm	1.2, 1.0	3.3, 2.5, 1.8, 1.5, 1.2	PCI33/66, DCI, HSTL, SSTL, LVTTL, LVCMOS, LVPECL, LVDS, CML, PCIX	600 MHz	Extensive IP Portfolio						
SP40 40 nm	1.1, 0.9	3.3, 2.5, 1.8, 1.5, 1.2	PCI33/66, DCI, HSTL, SSTL, LVTTL, LVCMOS, LVPECL, LVDS, CML, PCIX	850 MHz	Extensive IP Portfolio						
SP32/28 32 nm, 28 nm	0.85 ~ 1.05	3.3, 2.5, 1.8	PCI, DCI, HSTL, SSTL, LVCMOS, LVPECL, LVDS, CML	1000 MHz	Extensive IP Portfolio						
GF22 FDX/FDS0I	0.88, 0.72, 0.40	3.3, 1.8, 1.5, 1.2	PCI, DCI, HSTL, SSTL, LVCMOS, LVPECL, LVDS, CML	1.8 GHz, 2.1 GHz w/BB	Body Bias, Ultra-Low Power, Extensive IP Portfolio						

Comprehensive Intellectual Property Offering

onsemi offers a suite of system IP suitable for a variety of applications, including those requiring highspeed serial I/O (SerDes), external high-performance memory interfaces, processors, and a variety of other hard and soft IP. Combined with support for a diverse family of I/O standards, our digital ASIC technologies and IP provide optimal solutions for aerospace/defense, automotive, communications, industrial, consumer, computing, and medical applications. **onsemi** is an Arm® microprocessor licensee, and has access to multiple Arm cores for integration into silicon products.



Category	IP Cores
Hi-Speed SerDes	PCI Express Gen 1/2/3, XAUI, SATA I/II/II, EPON, Serial Rapid I/O (SRIO), 1G Ethernet, 10G Ethernet
Serial Interfaces	USB 3.0/2.0/1.1, HDMI, I2C, CAN, UART
Application Layer Support	10/100 Ethernet, 1G Ethernet, 10G Ethernet, PCI Express Gen 1/2/3, SATA I/II/III, SRIO, USB 3.0/2.0/1.1, DDRX Controllers, EMAC4, MII, RMII, SMII, XFI, HDMI
Bus Interfaces	PCI, AMBA/AHB, ARM7, PLB, PCMCIA
Microprocessors	Arm, ARC, PowerPC, R-Core, M8051, AMBA/AHB Peripherals
Memory Interfaces	DDR, DDR2, DDR3, DDR4, QDR-II
Data Converters	ADC, DAC
Memory	SRAM, DPRAM, Register File, ROM, OTP
Clocking	PLLs, DLLs, MSDLL
Error Correction, Encryption & Anti-Tamper	ECC, DES, 3DES, Reed-Solomon, RNG, PK Processor, Secure SRAM
DSP Functions	FFT, Mult, Divide, Accumulate, Up/Down Converter, FIR
FPGA Conversion IP	Memory Wrappers, LUT RAM, I/O Standards, Hardware DSP Functions, FIFOs, Clocking Emulation

ASIC Conversions: FPGA-to-ASIC, ASIC-to-ASIC

ASIC Conversions and EOL Solutions

onsemi provides long-term solutions to customers facing device or process obsolescence with their current ASIC or FPGA vendor. We offer reliable second sourcing options and cost reduction solutions to help you maintain your competitive edge. Conversion of an older technology to an optimized ASIC solution can provide a mid-life enhancement and extended life cycle.

FPGA Conversions

onsemi is the industry leader specializing in converting FPGAs to ASICs. We provide significant cost savings, performance enhancement, and product assurance. Our customers have reduced system costs considerably by successfully substituting their high-cost FPGAs with drop-in ASIC replacements in over 4,000 applications. Using ASICs can achieve higher performance, lower power, and better thermal performance in most cases. **onsemi** offers a parallel development path for FPGA development. This leverages the FPGA development benefits while accelerating the path to production with an ASIC.

FPGA to ASIC Conversion – The Best of Both Worlds

METRIC	FPGA	ASIC	
Development Cost	①		
HW/SW Co-Design	1		
ECO Turn-Around	①		
Time to Market	①		
System Performance		①	
Power Consumption		①	
Unit Cost		①	
Security		①	
Non-volatility (LAPU)		①	
Life Cycle Support		①	
Harsh Environments		①	





Conversion Features and Benefits

- Automatic design migration to a Standard Cell ASIC
- Low NRE, low-cost drop-in replacements
- Multiple-to-one conversions for a higher level of integration
- Original circuit functionality and performance maintained
- Optional performance enhancements for a competitive edge
- ASIC IP optimized for FPGA migrations

- Single-chip, non-volatile solution results in Live-at-Power-Up (LAPU); enhanced security; immunity to configuration logic errors resulting from SEE
- Significant reduction in power usage
- Improved cost through die size reduction
- Directly owned and operated fabs, plus access to industry-standard third-party foundries
- Long fabrication process life
- On-shore production paths for most technologies

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Custom Foundry Services Overview

onsemi has a broad portfolio of custom and standard foundry offerings, including mixed-signal processes.

Our mixed-signal processes with high voltage and low power options are ideally suited for products in ROIC applications and in military, aerospace, automotive, medical and industrial markets.

Other offerings include custom process installation & modification, custom short-loop wafer processing, and back-end services, such as backside metallization, wafer thinning, probe, packaging, test, and logistics.

Service-Oriented

onsemi understands customer needs and is dedicated to meeting them, from unsorted wafers to tested and packaged units. Customers are paired with a single contact for all business and technical issues for consistent support from initial engagement to production.

With high-quality manufacturing facilities in the U.S., Europe, and Asia, **onsemi** delivers prompt, cost-effective solutions to electronic manufacturers worldwide.

Our technology is design-ready with excellent, easy-to-download design kits through the MyON link on the www.onsemi.com Web site.

Trusted Source

onsemi is a registered ITAR supplier and has also been granted Category 1A Trusted Design, Trusted Test, and Trusted Foundry accreditation for its onshore fabrication facilities in Idaho and Oregon.

Company Certifications

IATF 16949, ISO 9001, AS 9100, ISO 14001, MIL-PRF-38535, OHSAS-18000, CTPAT, STACK, and QML.

Process Longevity

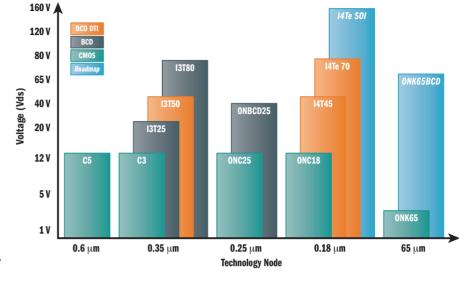
onsemi's philosophy for process longevity means we keep needed processes around to accommodate your long-term needs. We are committed to supporting long-life products and are dedicated to building long-term relationships. Supporting this is the company's financial strength and commitment to the effective use of resources. As a result, our customers have the confidence to make long-term product decisions without the concern of process obsolescence.

Node	Process	No. Metal	Wafer Size	Operating Voltage	HV Devices	N-Ch	P-Ch			Memories			
Noue (μm)	Name	Layers	(mm)	(Vgs)	(Vds)	DMOS	DMOS	Bi-Polars	Linear Cap	RAM	ROM	OTP	EEPROM
0.005	ONK65BCD*	5-8	300	1.2, 1.8, 2.5, 3.3	24, 45	Yes	Yes	Yes	MIM	Υ	Υ	Υ	Υ
0.065	ONK65	5-8	300	1.2, 1.8, 2.5, 3.3	3.3	No	No	Yes	MIM	Y	Y	Y	N
	14T + 14Te + 14Te SOI	4-6	200	1.8, 3.3	45, 60, 70, 120, 160	Yes	Yes	No	MIM	Υ	Y	Y	Y
0.18	ONC18 18v18v	4-6	200	5, 18	18	Yes	Yes	No	MIM	Υ	Υ	Υ	Υ
	ONC18 5v30v	4-6	200	1.8, 5	30	Yes	Yes	No	MIM	Υ	Υ	Υ	Υ
	ONC18 G/MS	4-6	200	1.8, 3.3	15	Yes	Yes	No	MIM	Υ	Y	Y	Υ
0.05	ONBCD25	2-5	200	1.8, 3.3	40	Yes	Yes	No	MIM	N	N	Υ	N
0.25	ONC25	2-5	200	2.5, 3.3, 5	5	No	No	Yes	MIM	N	N	Y	N
	C3	3-5	200	3.3, 5	5	No	No	No	PIP	Υ	Υ	N	Υ
0.35	I3T80	3-5	200	3.3	70	Yes	Yes	Yes	MIM	Υ	Υ	Υ	Υ
	I3T50	3-5	200	3.3	40	Yes	Yes	Yes	MIM	Υ	Υ	Υ	Υ
	13T25	3-5	200	3.3, 12	18	Yes	Yes	Yes	MIM	Υ	Y	Y	N
0.5	C5	2-3	200	5, 12	20	Yes	Yes	No	PIP	Υ	Υ	N	Υ

^{*} In development.

Flexible Manufacturing

- Wide variety of standard CMOS, BCD and high voltage process offerings
- Flexible manufacturing available (process modifications, lot splits, etc.)
- Multiple fab strategy to enable dual sourcing
- Specialty services such as advanced die stitching
- Shuttle services & MLR for low volume prototyping
- DMEA Accredited Trusted Foundry and Broker
- Low volume strategic engagements
- Partial fab processing, assembly & test services



Our commitment to long-term technology support and a wide range of process offerings enable our customers to provide the highest quality end products at the most cost-effective rate.

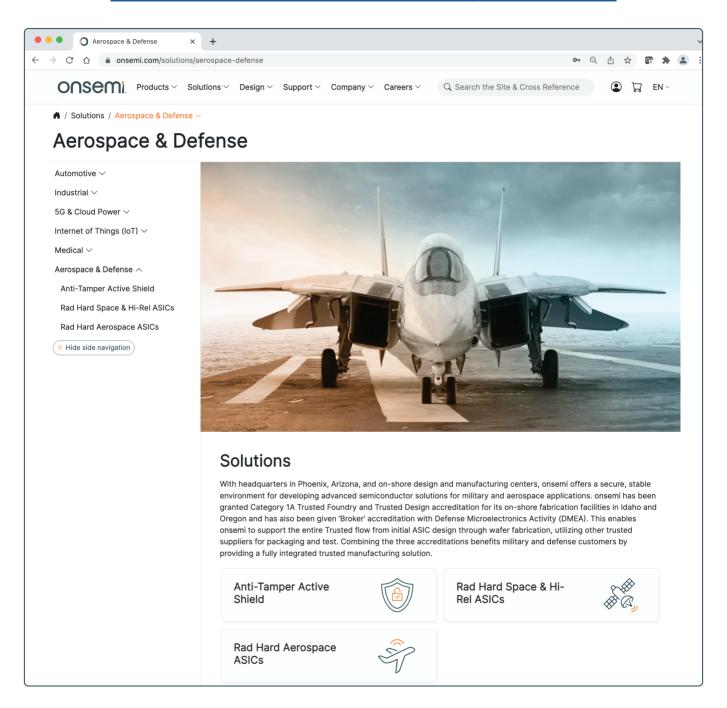
Full-Service Custom Foundry



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For additional information, please visit our website at:

www.onsemi.com/solutions/aerospace-defense



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Worldwide Technical Support www.onsemi.com/support

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Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative