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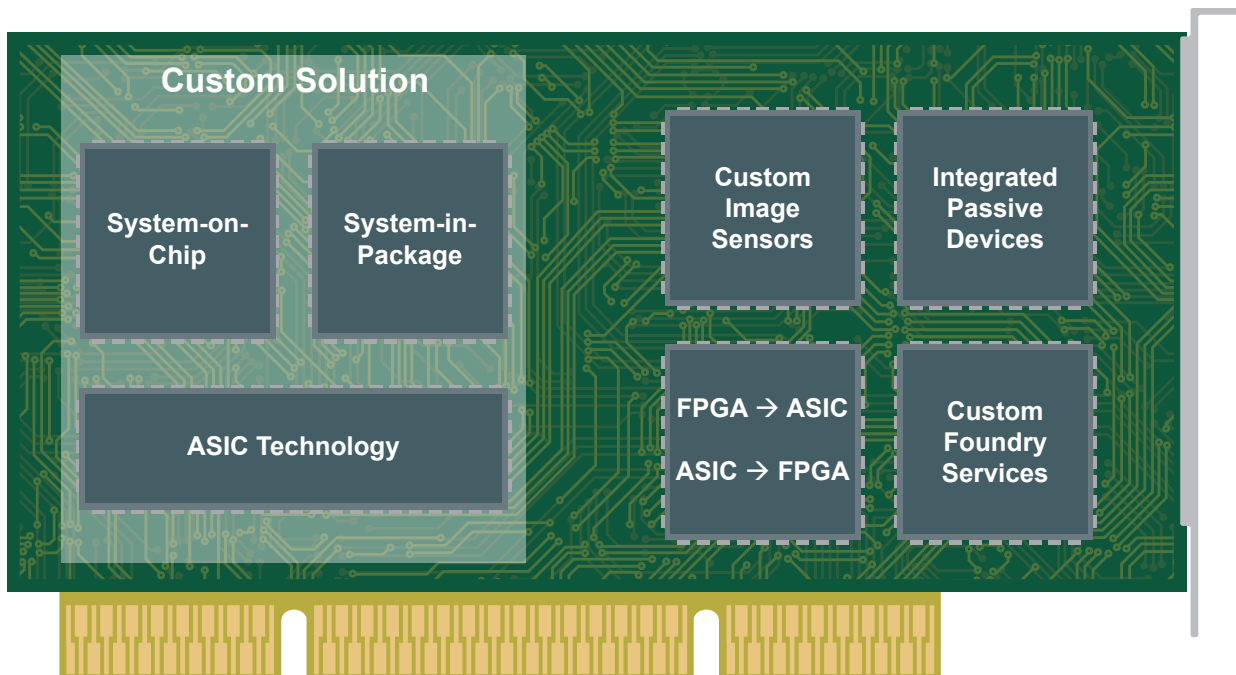
# Custom Foundry Solutions

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

**onsemi**<sup>™</sup>

[onsemi.com](https://www.onsemi.com)

## 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

### *Design and Manufacturing Expertise*

System Architects at **onsemi** have detailed knowledge of fabrication process technologies and packaging capabilities, and can advise on system architecture, refine design specifications, identify IP, and align to the most appropriate technology.

**onsemi** has been granted Category 1A Trusted Design, Trusted Test, Trusted Foundry, and Trusted Broker accreditation by the Defense Microelectronics Activity (DMEA).

**onsemi** owns and operates wafer fabs, assembly and test facilities. In-house capabilities include CMOS and BCDMOS process technologies, with line widths of 65 nm to 0.5  $\mu\text{m}$ , on wafer diameters of 200 and 300 mm. Third-party relationships augment the company's internal manufacturing capability as required.

### *Responsive, Reliable World-Class Supply Chain and Quality Program*

**onsemi** operates a flexible, reliable, responsive supply chain that supports complex manufacturing networks and dynamic global market conditions, including multiple manufacturing and logistics sites located near our customers to ensure supply continuity. The company shipped over 64 billion units through its global logistics network during 2020, representing ~8 units per person on earth. **onsemi** sustains world-class quality performance, and is certified to multiple international quality standards and programs.

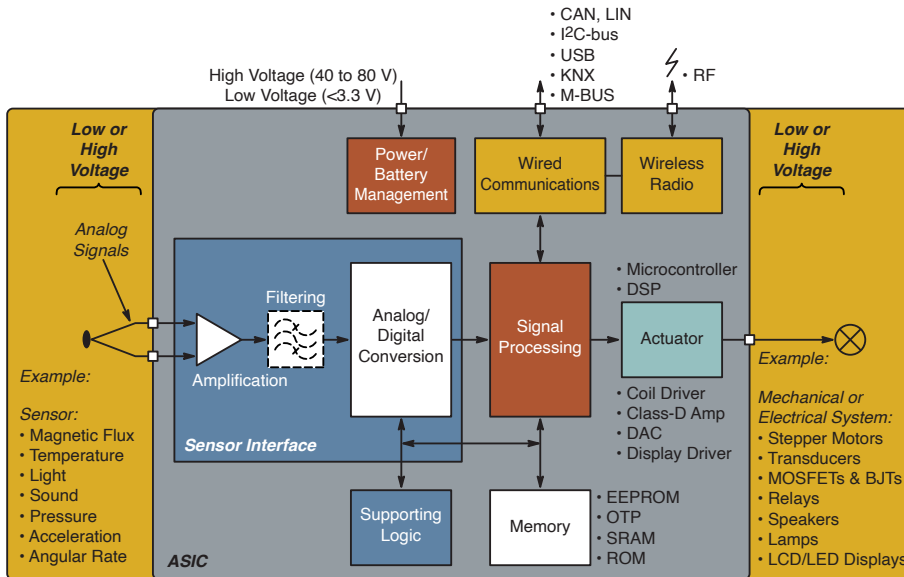
#### *Certifications*

- IATF 16949 ISO 9001
- AS 9100 Rev. D
- MIL-PRF-38535
- Trusted Foundry, Design, Test, and Broker Accreditation
- ISO 9001
- ISO 14001
- QML, CTPAT, STACK
- ISO 26262

## 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 mixed-signal designers with extensive SoC and SiP experience
- Robust custom development process
- Dedicated project managers track & report development progress
- Flexible customer development engagement – from full 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 –  $\leq 1\text{ V}$  to  $160\text{ V}$
- Low current optimization – active & standby
- Low noise design – “count the electrons”
- High temperature –  $\leq 200^\circ\text{C}$  (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

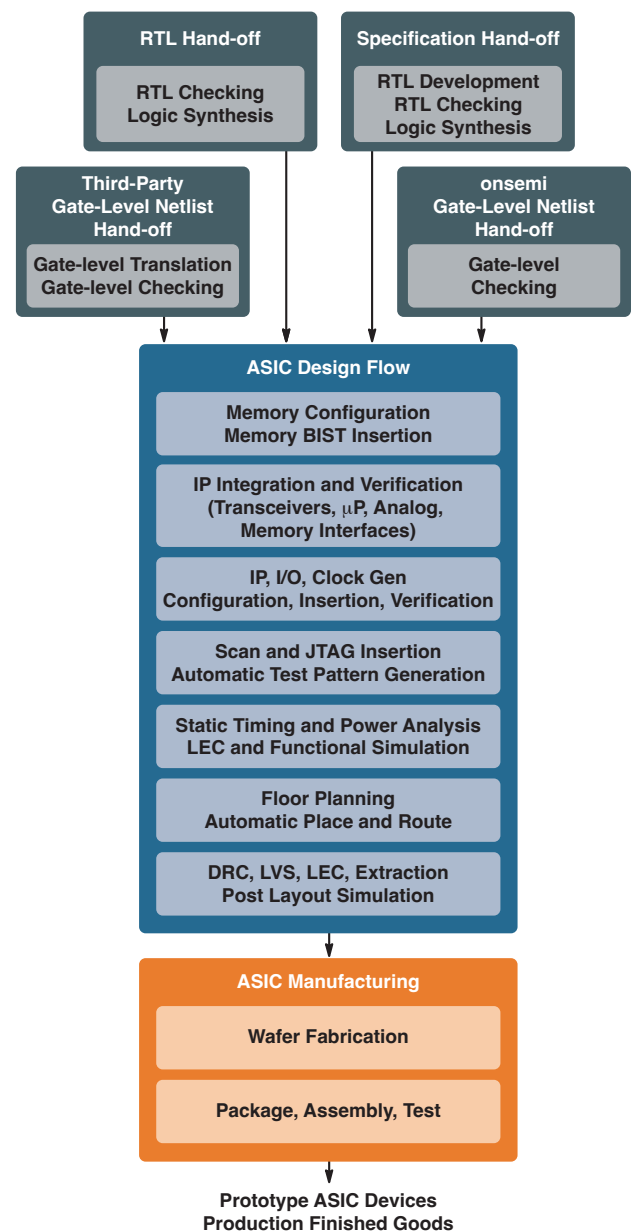
## Digital ASIC Solutions

### 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-chip-to-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 the 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



## Digital Standard Cell Product Families

### Digital Standard Cell Product Families

Standard Cell Product Families					
Family	Core Voltage (V)	I/O Voltage (V)	I/O Types	System Performance	Special Features
<b>SC5</b> 0.5 $\mu\text{m}$	5.0	5.0, 3.3	PCI, TTL, LVTTTL, LVCMOS	75 MHz	Long-Term 5 V Support, High Temp
<b>SC3</b> 0.35 $\mu\text{m}$	3.3, 2.5	5.0, 3.3	PCI, GTL, HSTL, SSTL, LVTTTL, LVCMOS, LVPECL	100 MHz	EEPROM, High Temp
<b>ONC18</b> 180 nm	3.3, 1.8, 1.5, 5.0	3.3, 2.5, 1.8, 5.0	PCI33/66, DCI, HSTL, SSTL, LVTTTL, LVCMOS, LVPECL, LVDS	266 MHz	NVM, OTP, High Vt, High Temp
<b>ONK65</b> <b>SP65/55</b> 65 nm, 55 nm	1.2, 1.0	3.3, 2.5, 1.8, 1.5, 1.2	PCI33/66, DCI, HSTL, SSTL, LVTTTL, LVCMOS, LVPECL, LVDS, CML, PCIX	600 MHz	Extensive IP Portfolio
<b>SP40</b> 40 nm	1.1, 0.9	3.3, 2.5, 1.8, 1.5, 1.2	PCI33/66, DCI, HSTL, SSTL, LVTTTL, LVCMOS, LVPECL, LVDS, CML, PCIX	850 MHz	Extensive IP Portfolio
<b>SP32/28</b> 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
<b>GF22</b> <b>FDX/FDS01</b>	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



## Digital Standard Cell Product Families

### Comprehensive Intellectual Property Offering

**onsemi** offers a suite of system IP suitable for a variety of applications, including those requiring high-speed 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/III, 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

**onsemi** is integrating 300 mm production capability through the recently announced acquisition of a 300 mm fab located in East Fishkill, New York. It includes agreements for technology transfer and development, and a technology license. **onsemi** has immediate access to advanced CMOS capability, including 65 nm technology node. **onsemi** expects to assume complete operational control of the fab at the end of 2022. **onsemi** also plans to include the East Fishkill fab and technologies within the portfolio of Trusted, ITAR, and QML capable manufacturing technologies.

## 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.

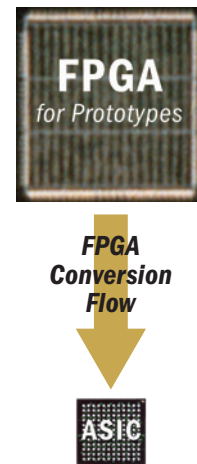
### FPGA Conversions

**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, leveraging 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

Single-chip solution  
 3-4x typical power reduction with ASIC solution  
 ASIC price 25 to 75% of the FPGA piece price  
 No configuration boot-up vulnerabilities  
 Cold-start, hot-swap enabling  
 ASIC production stability  
 Radiation effects, flight-criticality, on-shore



### 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



## 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](http://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 on-shore 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

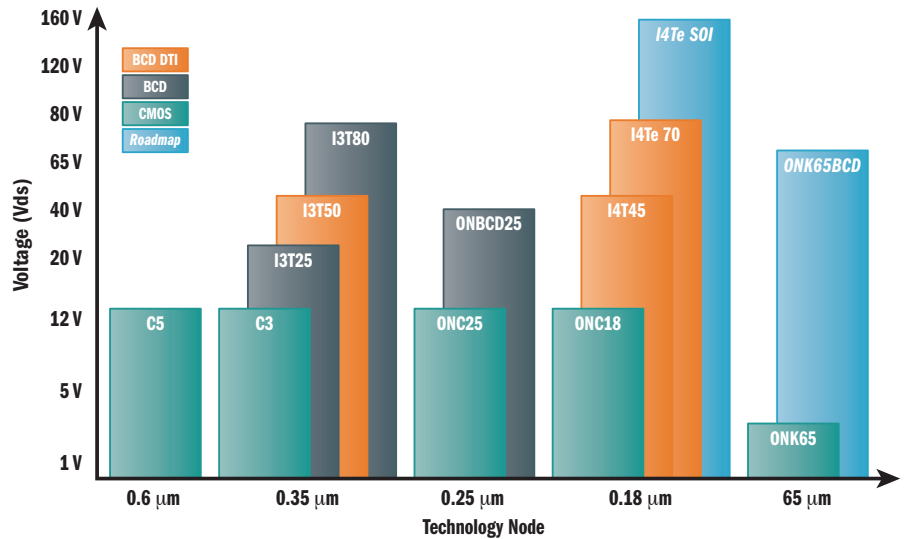
**onsemi's** philosophy for process longevity means we keep needed processes around to accommodate your long-term needs. We are committed to supporting long-life products and are dedicated to building long-term relationships. Supporting this is the company's financial strength and commitment to the effective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

Node ( $\mu\text{m}$ )	Process Name	No. Metal Layers	Wafer Size (mm)	Operating Voltage (V <sub>gs</sub> )	HV Devices (V <sub>ds</sub> )	N-Ch DMOS	P-Ch DMOS	Bi-Polars	Linear Cap	Memories			
										RAM	ROM	OTP	EEPROM
0.065	ONK65BCD*	5-8	300	1.2, 1.8, 2.5, 3.3	24, 45	Yes	Yes	Yes	MIM	Y	Y	Y	Y
	ONK65	5-8	300	1.2, 1.8, 2.5, 3.3	3.3	No	No	Yes	MIM	Y	Y	Y	N
0.18	I4T + I4Te + I4Te SOI	4-6	200	1.8, 3.3	45, 60, 70, 120, 160	Yes	Yes	No	MIM	Y	Y	Y	Y
	ONC18 18v18v	4-6	200	5, 18	18	Yes	Yes	No	MIM	Y	Y	Y	Y
	ONC18 5v30v	4-6	200	1.8, 5	30	Yes	Yes	No	MIM	Y	Y	Y	Y
	ONC18 G/MS	4-6	200	1.8, 3.3	15	Yes	Yes	No	MIM	Y	Y	Y	Y
0.25	ONBCD25	2-5	200	1.8, 3.3	40	Yes	Yes	No	MIM	N	N	Y	N
	ONC25	2-5	200	2.5, 3.3, 5	5	No	No	Yes	MIM	N	N	Y	N
0.35	C3	3-5	200	3.3, 5	5	No	No	No	PIP	Y	Y	N	Y
	I3T80	3-5	200	3.3	70	Yes	Yes	Yes	MIM	Y	Y	Y	Y
	I3T50	3-5	200	3.3	40	Yes	Yes	Yes	MIM	Y	Y	Y	Y
	I3T25	3-5	200	3.3, 12	18	Yes	Yes	Yes	MIM	Y	Y	Y	N
0.5	C5	2-3	200	5, 12	20	Yes	Yes	No	PIP	Y	Y	N	Y

\* In development.

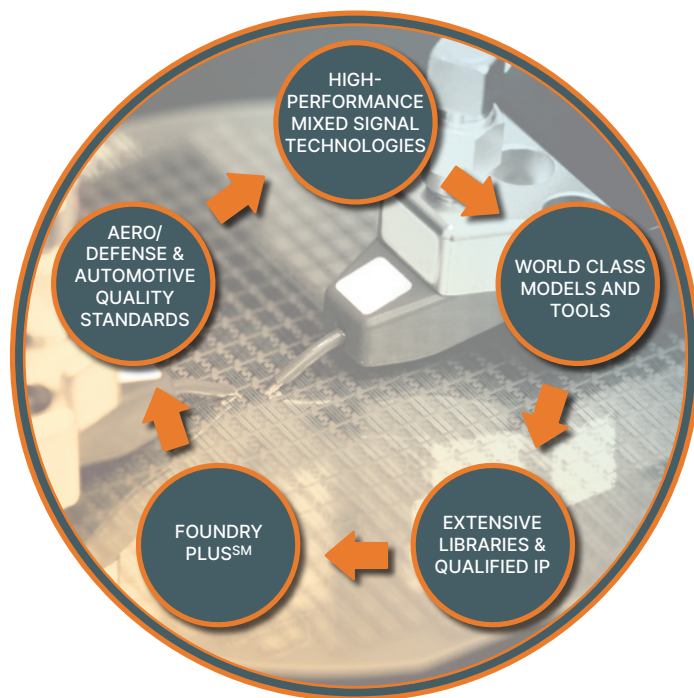
### Flexible Manufacturing

- 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



**Capability**

- Design Kits for 0.5 μm to 65 nm BCD & High-Voltage Technologies
- Internal & external IP offerings
- FoundryPlus<sup>SM</sup> Added-Value Services – wafer sort, thinning, backside metalization, packaging, testing
- Custom Process Expertise – development, transfers, & modifications

**Experience**

- Servicing Foundry customers in aerospace, defense, industrial, automotive, & consumer markets for over 50 years
- Long-term strategic relationships
- Flexible manufacturing options
- Process longevity
- Full service optimized supply chain

**Quality**

- Quality culture – Road To Zero Defects
- QML (DoD) Certifications
- ISO-9001, AS9100
- TS-16949, ISO-26262, AEC-Q100
- Trusted Supplier, ITAR Certification
- OHSAS 18001

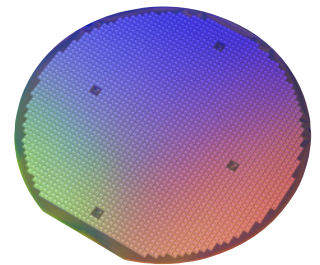
## Automotive Die/Wafer Sales

The automotive die sales program from **onsemi** is designed to meet the requirements of today's automotive market. Demands for increased component density, improved subsystem reliability, and reduced functional costs accompany the increasing complexity of electronic systems. **onsemi** offers thousands of discrete and integrated circuit devices in chip form to address today's market needs. Built around our manufacturing Center of Excellence, we offer thorough electrical testing and visual inspection of every die we produce under our bare die program.

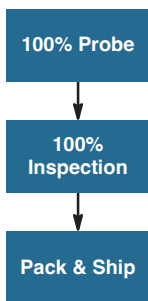
### The onsemi Advantage



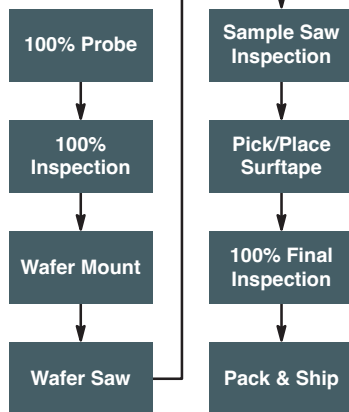
- Dedicated die center of excellence
- 100% electrical testing per device specification
- 100% visual inspection
- Whole wafers or Surftape®
- Certified to ISO/TS-16949
- Certified to ISO 9001
- AEC qualified die/wafers available



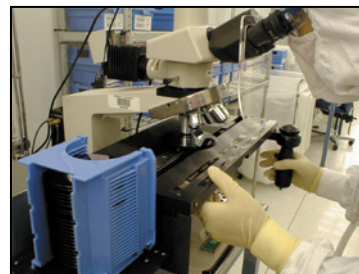
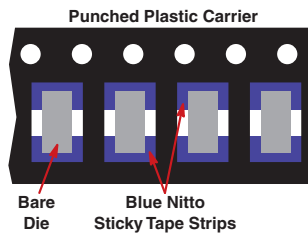
#### Wafer Sales



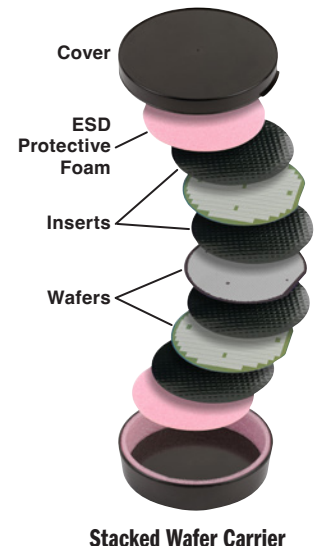
#### Surftape



#### Surftape Detail



100% Probe and Inspection

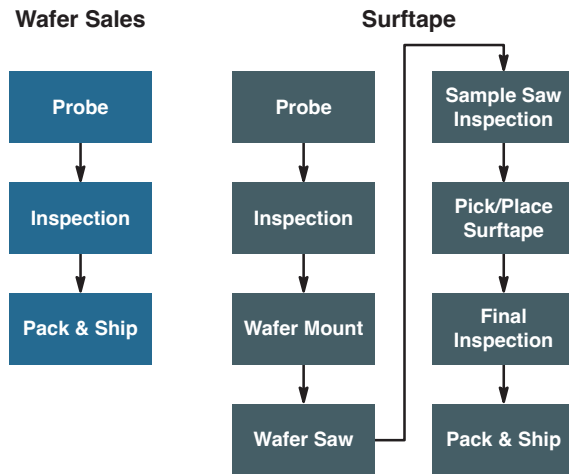
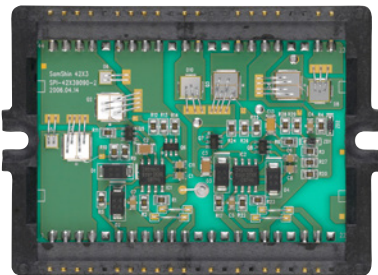


## Commercial Die/Wafer Sales

The commercial die sales program from **onsemi** is designed to meet the challenges of today's consumer market. Rapid device miniaturization, increased thermal and electrical performance and improved reliability requires module designs utilizing bare die. **onsemi** offers thousands of products in various packaging options to meet these evolving market requirements. Our manufacturing Center of Excellence performs electrical and visual inspection testing to ensure our bare die exceed customer requirements.

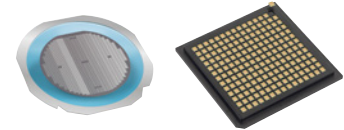
### The **onsemi** Advantage

- Dedicated die center of excellence
- Sample electrical testing per device specification
- Whole wafers or Surftape
- Certified to ISO 9001



### Third-Party Partners

- Micross
- Semi Dice



## Sales and Design Assistance

**Worldwide Technical Support**  
[www.onsemi.com/support](http://www.onsemi.com/support)



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Phone: 00421 33 790 2910

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