



Automotive Solutions

FROM CONCEPT TO PRODUCTION



Actel, the world's leading supplier of high-reliability FPGAs, now offers the industry's broadest automotive product portfolio that addresses the unique needs of vehicle designers. FPGAs are being used today in under-the-hood powertrain systems, occupant safety applications, and a variety of control functions. Actel's Automotive FPGAs deliver an optimal combination of features and benefits to automotive designers. Automotive antifuse technology provides the highest security and reliability in the industry. Automotive flash devices offer reprogrammability in a cost-effective, nonvolatile device, speeding time-to-market and reducing design costs.

Designed for Extreme Conditions

Actel has developed a comprehensive product portfolio targeted at the demanding requirements of the automotive design community. Based on popular antifuse and flash product offerings, Actel Automotive silicon provides new choices for advanced automotive systems. Actel's Automotive product families cover a wide range of densities, voltages, and features to enable rapid development for cost-sensitive products. The new ProASIC³ T-Grade automotive temperature offering from Actel supports -40°C to +135°C junction temperatures and is ideal for high-reliability automotive powertrain and safety applications.

Key Features

- Nonvolatile, High-Reliability
- ACEQ100 Grade 1 Available ($T_A = 125^\circ\text{C}$ and $T_J = 135^\circ\text{C}$)
- Support for PPAP and TS16949
- Firm-Error Immune
- Low-Power
- Single-Chip/Live-at-Power-Up
- Cost-Effective ASIC Alternative
- 3,000 to 1 M Equivalent System Gates





Targeted Intellectual Property (IP)

Bundling optimized, award-winning IP and world-class software with personalized support, Actel provides an integrated solution to automotive manufacturers. The Actel automotive IP offering includes the following soft cores: ARM7™, Cortex-M1, LIN, CAN, I²C, SPI, 8051, Z80, 6809, Reed Solomon, DES/3DES/AES, and many others. The Actel solution combines a best-in-class silicon platform with all the tools a designer needs to deliver tomorrow's products.

Design Tools and Services

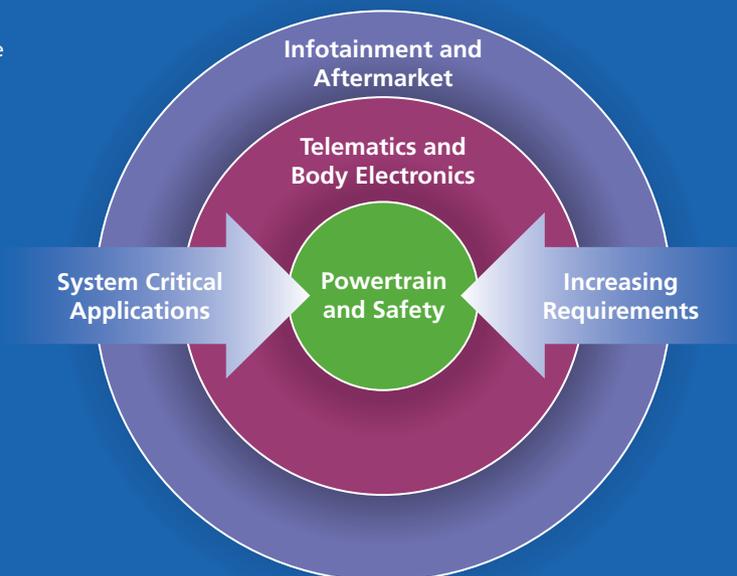
DESIGN ENVIRONMENT Actel's Automotive family of FPGAs is fully supported by Actel Libero® Integrated Design Environment (IDE) and Actel Designer FPGA development software. Actel Designer software provides a comprehensive suite of backend development tools for FPGA development. The Designer software includes timing-driven place-and-route, an integrated static timing analyzer and constraints editor, a design netlist schematic viewer, and SmartPower, a tool that enables the user to quickly estimate the power consumption in a design.

Libero IDE provides an integrated design manager that seamlessly integrates design tools while guiding the user through the design flow, managing all design and log files, and passing necessary design data among tools. Libero IDE includes Synplify® AE and Synplify Pro® from Synplicity®, ViewDraw® AE from Mentor Graphics®, ModelSim® AE from Mentor Graphics, and WaveFormer Lite™ AE from SynaptiCAD™

PROGRAMMING Programming support is provided through Actel's Silicon Sculptor 3, a single-site programmer driven via a PC-based GUI. Programming with Silicon Sculptor 3 is as easy as pushing a button. Flash-based devices can be programmed using Silicon Sculptor 3, Actel's low-cost FlashPro3 USB-based programmer, or via in-system programming. In addition, for in-system programming, Actel provides C-code examples (DirectC) to help speed development of embedded programming code. There is minimal interaction between the device programmer and the designer, which reduces the chances of error. Factory programming is also available for high-volume production needs.

VERIFICATION Silicon Explorer II is an integrated hardware and software solution that, in conjunction with the Designer software tools, enables designers to examine any of the internal nodes of an antifuse device operating in a prototype or a production system. Silicon Explorer II's noninvasive method does not alter any timing or loading, thus helping to shorten the debugging cycle. In-system debugging of Actel's flash FPGAs with Identify Actel Edition (AE) allows the FPGA designer to quickly find and correct functional design bugs by probing internal signals of the design directly from the hardware at the system speed. The probed signals can be viewed directly onto the RTL view for easy interpretation of the data. Identify AE offers an advanced triggering mechanism that focuses on a certain area of the design and sets breakpoints in RTL.

Actel's system-critical automotive solutions are uniquely suited to your most demanding automotive applications.



Advanced Packaging

Actel offers an extensive traditional lead solder and lead-free package portfolio, certified to perform in extended-temperature automotive applications, including small form factor Chip Scale (0.8 mm pitch), Fine Pitch Ball Grid Array (1.0 mm pitch), and a variety of other packages.

Reliability and Qualification

Actel FPGAs are not susceptible to neutron-based firm errors. Unlike SRAM-based FPGAs, Actel devices are not susceptible to single-event upsets in the configuration memory used to define the personality of the logic in the FPGA. This allows Actel FPGAs to be used in the most demanding

and safety-critical areas of the powertrain and safety systems without the risk of changes in critical logic due to neutron-induced single-event upsets. Actel offers the lowest-power FPGA technology available, which allows for high-temperature operation without the risk of thermal runaway due to

power-based self-heating. Only Actel ProASIC3 flash-based FPGAs offer AECQ100 Grade 1 (135°C junction temperature) support. High-temperature support also makes Actel firm-error-immune-devices appropriate for use in poorly ventilated, space-constrained sub-systems.

Secure Your System with FuseLock® and FlashLock®

All Actel products are nonvolatile, single-chip FPGAs that offer virtually unbreakable design security to meet the most demanding system requirements. Security and tamper resistance are especially important

to remove the customer temptation to interfere with the electronics. Additionally, secure designs reduce the probability of unauthorized parts suppliers producing aftermarket replacement parts.



Low Power

Maximizes power savings with very limited power-on current surge and no high-current transition period. Offers low dynamic power consumption.



Live at Power-Up

Greatly simplifies system design. Additionally the device is available to perform critical system setup tasks. Reduces bill-of-materials costs and PCB area.



Single Chip

The most ASIC-like FPGA available—one chip is all you need.



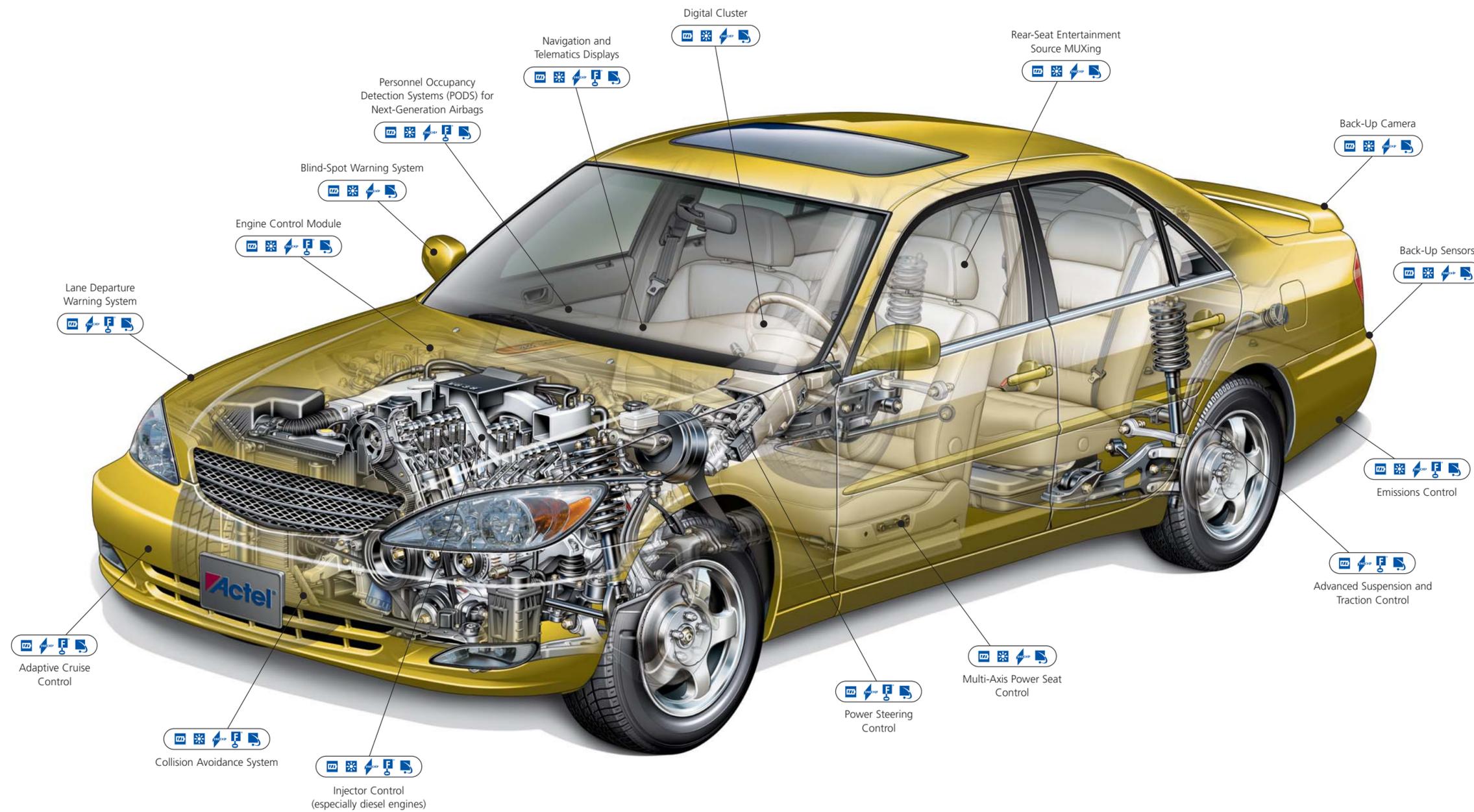
Secure

FlashLock and FuseLock technology provide the most impenetrable anti-tamper security.



Neutron Immune

Flash cell configuration element cannot be altered by high-energy neutrons and is therefore immune to firm errors, unlike SRAM-based FPGAs.



ProASIC3 Family

ProASIC3, Actel's most popular flash family, now offers AECQ-compliant T-Grade automotive products for advanced automotive systems. Actel's Automotive product families cover a wide range of densities, voltages, and features to enable rapid development for cost-sensitive products. With densities up to 1 M system gates, the Automotive ProASIC3 T-Grade family is the only FPGA solution offering 135°C junction temperature on a high-density, feature-rich FPGA. ProASIC3 T-Grade devices deliver an optimal combination of high reliability, neutron immunity, low power, features, and density to powertrain, safety, telematics, and infotainment applications.

ProASIC3	A3P060	A3P125	A3P250	A3P1000
System Gates	60 k	125 k	250 k	1 M
Embedded RAM Bits	18 k	36 k	36 k	144 k
Embedded RAM Blocks (4,608-bit block)	4	8	8	32
Maximum User I/Os (Std+LVDS)	96	97	157/38	300/74
Packages	VQ100 FG144	VQ100 FG144	VQ100 FG144 FG256	FG144 FG256 FG484

ProASICPLUS Family

ProASICPLUS, Actel's second-generation flash product, provides the capabilities of an ASIC in a single-chip, high-density, reprogrammable device. Based on 0.22 μm flash technology, ProASICPLUS offers the unique combination of reprogrammability and nonvolatility in an extended temperature range for the most demanding automotive systems.

ProASICPLUS	APA075	APA150	APA300	APA450	APA600	APA750	APA1000	
System Gates	75 k	150 k	300 k	450 k	600 k	750 k	1 M	
Maximum Registers	3,072	6,144	8,192	12,288	21,504	32,768	56,320	
Embedded RAM Bits	27 k	36 k	72 k	108 k	126 k	144 k	198 k	
Embedded RAM Blocks (256x9)	12	16	32	48	56	64	88	
Maximum User I/Os	158	242	290	344	454	562	712	
Packages	PQ208 FG144 TQ100	PQ208 FG144 FG256 TQ100	PQ208 FG144 FG256	PQ208 FG144 FG256 FG484	PQ208 BG456 FG256	PQ208 FG896	PQ208 FG896	PQ208 FG896

eX Family

The combination of performance, low power, low heat dissipation, and the ability to withstand demanding environmental conditions makes the eX family of products ideal for a wide variety of automotive applications.

eX	eX64	eX128	ex256
System Gates	3 k	6 k	12 k
Dedicated Registers	64	128	256
Maximum User I/Os	84	100	132
Packages	TQ64 TQ100 CS49 CS128	TQ64 TQ100 CS49 CS128	TQ100 CS128 CS180

SX-A Family

SX-A FPGAs are ideal for cost-optimized, in-cab applications or integrating multiple circuit elements in a single-chip, low-price solution. SX-A devices allow users to reduce total system cost and maintain the security of valuable intellectual property.

SX-A	A54SX08A	A54SX16A	A54SX32A	A54SX72A
System Gates	12 k	24 k	48 k	108 k
Dedicated Registers	256	528	1,080	2,012
Maximum User I/Os	130	180	249	360
Packages	PQ208 TQ100 TQ144 FG144	PQ208 TQ100 TQ144 FG144 FG256	PQ208 TQ100 TQ144 FG144 FG256	PQ208 FG256 FG484

MX Family

The MX family is the optimal solution for your 5.0 V system requirements. Combining the industry's leading price and performance benefits at 5.0 V, Actel offers extended temperature versions specially targeted for in-cab and telematic automotive applications.

MX	A40MX02	A40MX04	A42MX09	A42MX16	A42MX24	A42MX36
System Gates	3 k	6 k	14 k	24 k	36 k	54 k
Dedicated Registers	147	273	348	624	954	1,230
Maximum User I/Os	57	69	104	140	176	202
Packages	PL68 PQ100 VQ80	PL68 PQ100 VQ80	PL84 PQ100 PQ160 VQ100 TQ176	PL84 PQ100 PQ160 PQ208 VQ100 TQ176	PQ160 PQ208 TQ176	PQ208 PQ240

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