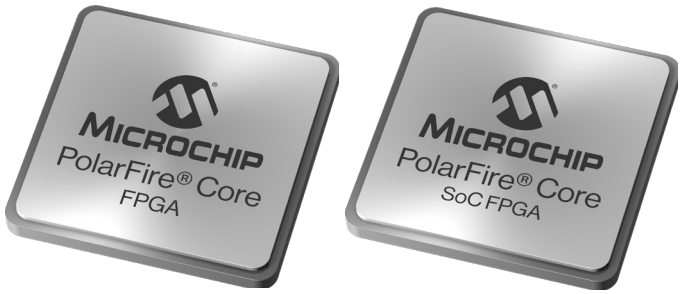
PolarFire® Core FPGAs and SoC FPGAs

Streamlined, Secure and Power-Efficient FPGAs and SoCs for Cost-Sensitive Designs



Low-Power, Reliable, Secure, Cost-Optimized

The PolarFire Core FPGA and SoC FPGA familes deliver the same proven performance, power efficiency and reliability of classic PolarFire FPGAs and SoC FPGAs in a streamlined, transceiver-free platform designed for cost-sensitive, I/O-centric applications.

Key Features

- Low Power, Small Footprint: Industry-leading power efficiency and thermal performance, well-suited for the intelligent edge and embedded systems
- Up to 481K Logic Elements: Scalable logic resources for a wide range of control and compute workloads
- Embedded RISC-V® SoC Options: SoC variants integrate a quad-core, 64-bit RISC-V processor for running Linux®, deterministic real-time systems and a combination of them in asymmetric multiprocessor (AMP) configurations.
- Robust I/O Capabilities: Rich General-Purpose I/O (GPIO) and High-Speed I/O (HSIO) support for interfacing with sensors, actuators and custom logic
- Native DDR4 Support: High-bandwidth memory interface that is optimal for real-time data processing and buffering
- Military-Grade Security and SEU Immunity: Hardware root of trust, secure boot and Single Event Upset (SEU) protection for mission-critical environments

PolarFire® Core FPGAs and SoC FPGAs bring the power efficiency, security and reliability of the original PolarFire family to a streamlined platform that eliminates SerDes and PCIe® to reduce cost and complexity for a broad range of applications.

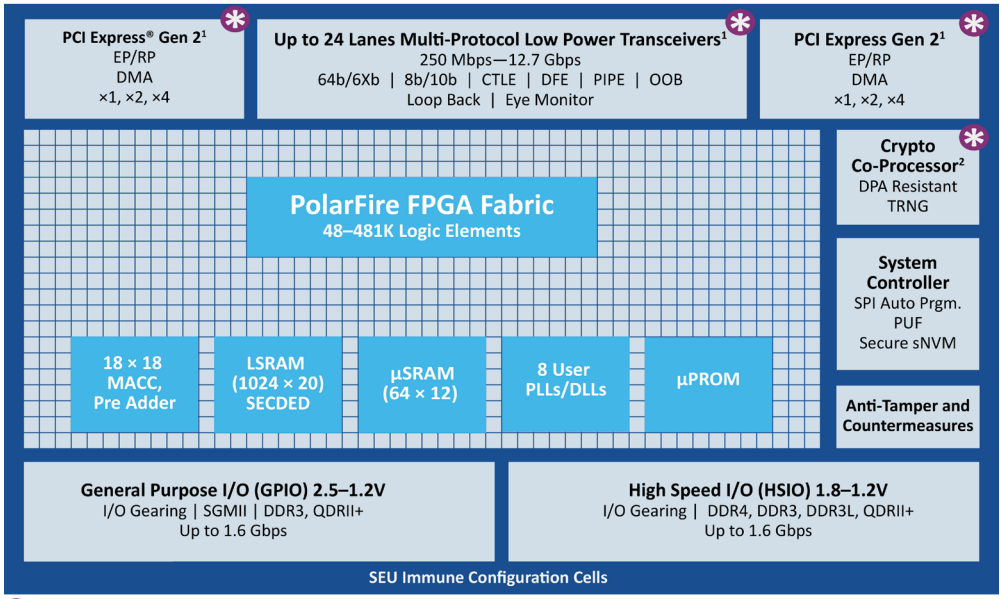
Unlike SRAM-based FPGAs, which are plagued by high static power and configuration volatility, PolarFire Core devices leverage nonvolatile Flash technology for up to 50% lower power consumption, instant-on capability and built-in resistance to SEUs. This makes them excellent options for power- and thermally constrained environments such as industrial control, medical imaging, automotive and aerospace systems.

These devices offer up to 481K programmable logic elements, and the SoC variants integrate a 64-bit quad-core RISC-V processor, enabling real-time control and Linux®-capable processing on the same chip. With their rich GPIO, HSIO and native DDR4 support, they are well suited for sensor and memory interfacing without needing high-speed serial connectivity.

Security is built in, not bolted on. PolarFire Core FPGAs and SoC FPGAs include secure boot, tamper detection, data security and bitstream encryption—features that are often considered optional in SRAM-based alternatives.

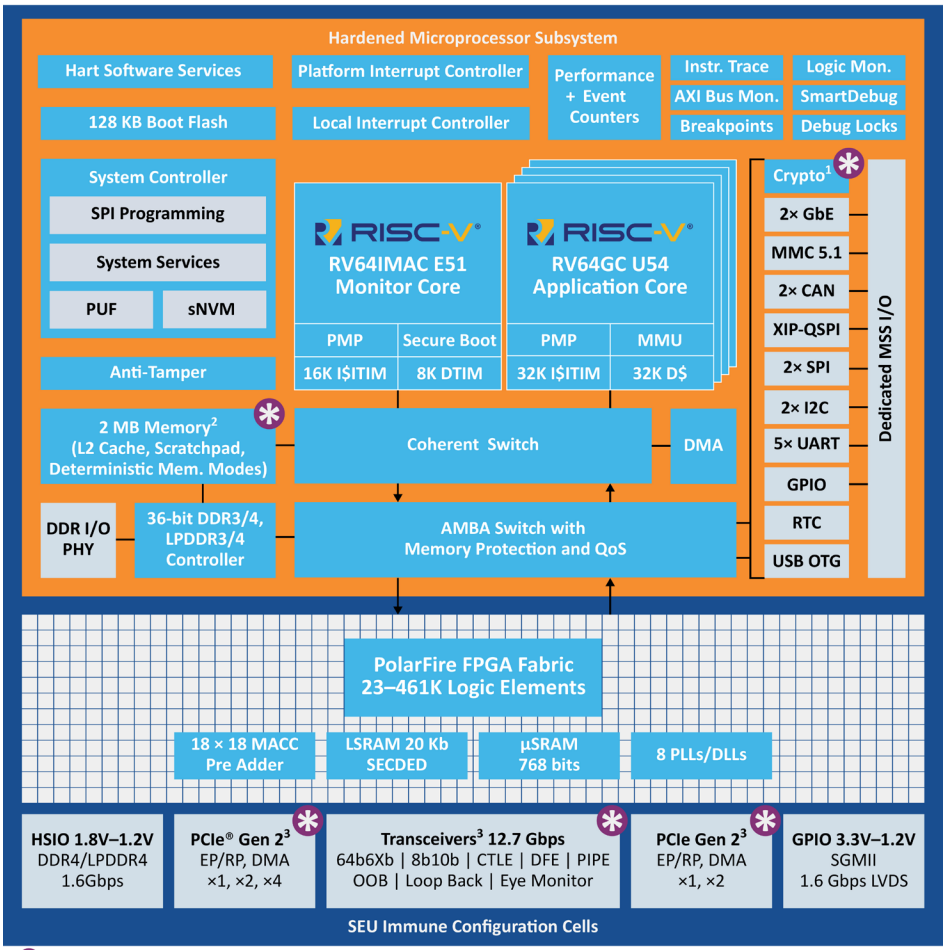
Backed by our stable pricing and long-term availability, PolarFire Core devices deliver the essential features you need for reliable, secure and efficient embedded designs without the unnecessary extras.

PolarFire® FPGA



Notes:
1. PCIe® and Transceivers **not available** in PolarFire Core devices
2. DPA-Safe Crypto Co-Processor supported in S devices

PolarFire® SoC FPGA



Notes:
1. DPA-Safe Crypto Co-Processor supported in S devices
2. SECDED supported on all MSS memories
3. PCIe and Transceivers not available in PolarFire Core devices

Engineered for Demanding Environments

- Industrial control, automation and robotics
- Medical imaging and diagnostics
- Aerospace and defense systems
- Automotive electronics
- Smart sensors and Edge AI

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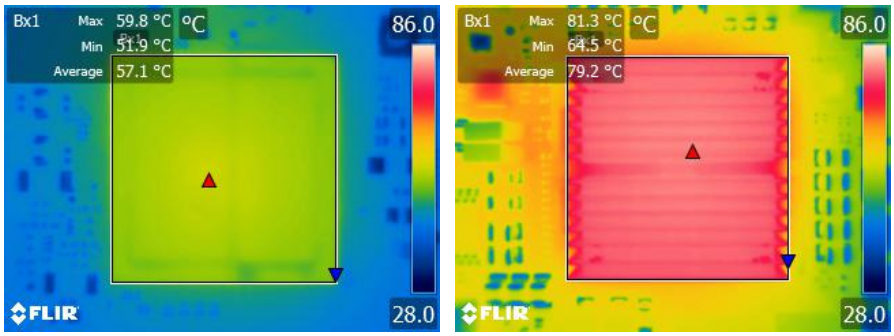
Power Efficiency and Thermal Performance

PolarFire Core FPGAs dissipate up to 50% lower total power compared to competitor FPGAs. Cooler operation, which reduces or eliminates the need for complex thermal management (heatsinks, fans) and lowers system-level costs.



PolarFire Core FPGA
3.5W, 59.8˚C, 24.2 FIT, 28 nm

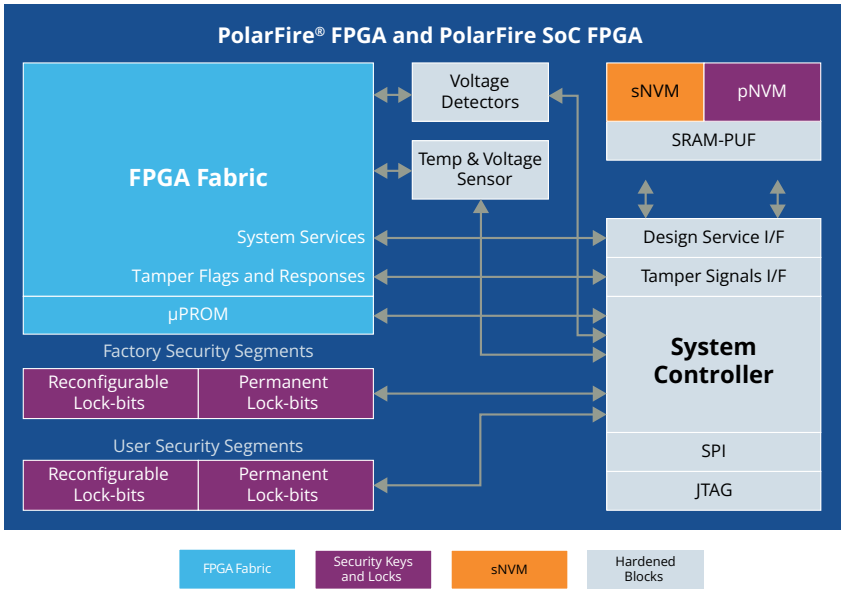
Competitor X FPGA,
6.0W, 81.3˚C,96.3 FIT, 16 nm

Built-In Security You Can Trust

PolarFire Core FPGAs and SoC FPGAs deliver robust, hardware-enforced security without compromise. Built on the same nonvolatile architecture as classic PolarFire devices, they feature bitstream encryption, authentication and hardware access control to protect design IP and enable safe deployment throughout the lifecycle.

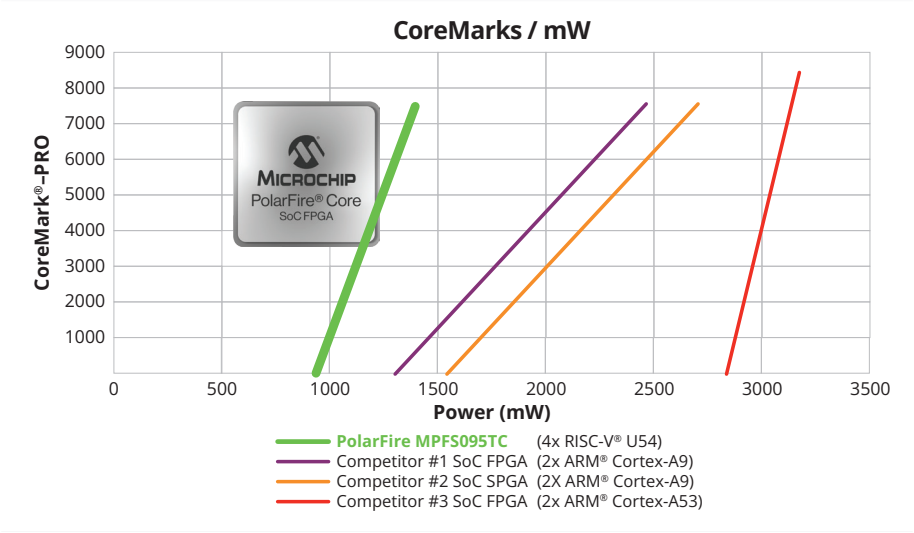
Design security features include key management, encrypted bitstream loading and permanent and reconfigurable security locks to safeguard logic, configuration and user settings. Devices support secure key provisioning through sNVM and pNVM, ensuring tamper-resistance and traceability without external dependency.

Although PolarFire Core devices exclude the integrated crypto processor found in “S” variants, they retain advanced anti-tamper protection, voltage and temperature monitoring and optional zeroization mechanisms to deliver a hardened defense against both physical and side-channel attacks.



RISC-V Performance With Ultra-Low Power Consumption

In the example below, with an embedded RISC-V core consuming only 1.3W, a PolarFire Core SoC FPGA achieves a CoreMark-PRO score of 6500 while competing SRAM-based SoCs deliver a CoreMark®-PRO score of 0.



SEU-Immune, Nonvolatile Reliability

Our proprietary nonvolatile architecture ensures true SEU immunity, preventing bit flips in the configuration memory caused by radiation events, which is an issue that can compromise system logic and require a full system reboot in other technologies. Features like Live-at-Power-Up and Single-Chip implementation mean that PolarFire Core FPGAs and SoC FPGAs are instantly operational on power-up, without the need for external boot devices or lengthy reconfiguration cycles. In environments where reliability is paramount—such as aerospace, industrial automation and medical systems—our devices provide consistent, error-free operation and immediate recovery from power interruptions, making them a robust choice for demanding applications.

Proven Reliability, Trusted Longevity

Our FPGA and SoC FPGAs have delivered trusted performance for over 35 years in the most demanding environments, from automobiles used around the world to spacecraft used across our solar system. They're relied on in commercial aviation, satellite communications, defense and industrial automation applications for their resilience and reliability.

Built on nonvolatile, radiation-immune technology, they withstand extreme conditions and resist configuration upsets. With product lifespans of 20–30 years and a customer-driven obsolescence policy, we offer long-term availability and design stability for mission-critical applications.

PolarFire Core FPGA Family

	Features	MPF050TC	MPF100TC	MPF200TC	MPF300TC	MPF500TC
FPGA Fabric	Logic Elements (K)	48	109	192	300	481
	Math Blocks (18 × 18 MACC)	150	336	588	924	1480
	LSRAM Blocks (20 Kbits)	160	352	616	952	1520
	µSRAM Blocks (64 × 12)	460	1008	1764	2772	4440
	Total RAM (Mbits)	3.6	7.6	13.3	20.6	33
	µPROM (Kbits)	216	297	297	459	513
	User DLLs/PLLs	8 each	8 each	8 each	8 each	8 each
Packaging[1]	**Type (Size, Pitch mm)**		**Total User I/O (HSIO/GPIO) GPIO CDRs**			
Extended Commercial (0–100°C) Industrial (-40–100°C) Automotive T2 (-40–125°C)	FCSG325 (11 × 11, 11 × 14.5, 0.5 mm)[2]	164 (84/80) 6	170 (84/86) 7	170 (84/ 86) 7		
	FCSG536 (16 × 16, 0.5 mm)			300 (120/180) 15	300 (120/180) 15	
	FCVG484 (19 × 19, 0.8 mm)	176 (96/92) 7	284 (120/164) 13	284 (120/164) 13	284 (120/164) 13	
	FCG484 (23 × 23, 1.0 mm)		244 (96/148) 12	244 (96/148) 12	244 (96/148) 12	
	FCG784 (29 × 29, 1.0 mm)			364 (132/232) 18	388 (156/232) 18	388 (156/232) 18
	FCG1152 (35 × 35, 1.0 mm)		512 (276/236) 19	584 (324/260) 19		

Notes:

1. Devices in the same package and family type are pin compatible
2. The FCSG325 package has dimensions of 11 × 11mm for MPF050 and MPF100 devices and 11 × 14.5 mm for MPF200 devices

PolarFire Core SoC FPGA Family

	Features	MPFS025TC	MPFS095TC	MPFS160TC	MPFS250TC	MPFS460TC
FPGA Fabric	Logic Elements (K)	23	93	161	254	461
	Math Blocks (18 × 18 MACC)	68	292	498	784	1420
	LSRAM blocks (20 Kbit)	84	308	520	812	1460
	µSRAM Blocks (64 × 12)	204	876	1494	2352	4260
	Total RAM (Mbits)	1.8	6.7	11.3	17.6	31.6
	µPROM (Kbits)	194	387	415	470	553
	User DLLs/PLLs	8 each	8 each	8 each	8 each	8 each
MSS	Application Cores	4 × U54 cores; RISC-V RV64GC, 625 MHz				
	Boot/Monitor Core	1 × E51 core: RISC-V RV64IMAC, 625 MHz				
	L2 Cache1	2 MB; Configurable as Cache, Loosely Integrated Memory (LIM) or Scratchpad				
	Peripherals	2 × GbE, MMC 5.1, 2 × CAN, 1 × QSPI, 2 × SPI, 2 × I2C, 5 × UART, 1 × USB 2.0 OTG				
MSS DDR	MSS DDR Data Bus	162/32	162/32	32	32	32
MSS I/O	Total	136	136	136	136	136
FPGA I/O	HSIO+GPIO	108	276	312	372	468
Packaging	**Type (Size mm, Pitch mm)**	**MSS IO/HSIO/GPIO**				
Extended Commercial (0–100°C) **Industrial (-40–100°C)** **Automotive T2 (-40–125°C)**	FCSG325 (11 × 11, 11 × 14.5, 0.5)[2] [3]					
	102/32/48	102/32/48				
	FCSG536 (16 × 16, 0.5)		136/60/108	136/60/108	136/60/108	
	FCVG484 (19 × 19, 0.8)	136/60/48	136/60/84	136/60/84	136/60/84	
	FCVG784 (23 × 23, 0.8)		136/144/132	136/144/168	136/144/180	
	FCG1152 (35 × 35, 1.0)				136/144/228	136/180/288

Notes:

1. L2 can be configured as cache or RAM. The minimum cache size is 128 KB and the maximum RAM size is 1920 KB. This can be allocated in blocks of 128 KB.
2. 16-bit DDR data bus width for the FCSG325 package
3. FCSG325 package dimensions for MPFS095T = 11 × 14.5 mm, 0.5 mm

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