



## Quick selection guide

# High-performance memory portfolio

Our differentiated portfolio of non-volatile and volatile memories features: the SEMPER™ family of safe, secure, and reliable NOR Flash, the EXCELON™ family of ultra-low power, high-performance, reliable F-RAM products, and our HYPERBUS™ interface-based

HYPERFLASH™ NOR Flash and HYPERRAM™ pSRAM memories. We introduced our first random access memory in 1982, and have grown from that auspicious beginning to a broad range of products spanning NOR Flash, pSRAM, SRAM, nvSRAM, and F-RAM.

Non-volatile memory			Volatile memory		Others
<b>NOR Flash</b> [8 Mb to 4 Gb] <ul style="list-style-type: none"> <li>▶ SEMPER™ NOR</li> <li>▶ HYPERFLASH™</li> <li>▶ Standard serial NOR</li> <li>▶ Standard parallel NOR</li> <li>▶ Burst parallel NOR</li> </ul>	<b>F-RAM</b> [4 Kb to 16 Mb] <ul style="list-style-type: none"> <li>▶ EXCELON™ F-RAM               <ul style="list-style-type: none"> <li>&gt; EXCELON™ LP</li> <li>&gt; EXCELON™ Auto</li> <li>&gt; EXCELON™ Ultra</li> </ul> </li> <li>▶ Standard serial F-RAM</li> <li>▶ Standard parallel F-RAM</li> </ul>	<b>nvSRAM (non-volatile SRAM)</b> [64 Kb to 16 Mb] <ul style="list-style-type: none"> <li>▶ Serial nvSRAM</li> <li>▶ Parallel nvSRAM</li> </ul>	<b>HYPERRAM™ (pSRAM)</b> [64 Mb to 512 Mb] <ul style="list-style-type: none"> <li>▶ HYPERBUS™ HYPERRAM™               <ul style="list-style-type: none"> <li>&gt; Gen 2.0</li> <li>&gt; Gen 3.0</li> </ul> </li> <li>▶ Octal xSPI HYPERRAM™</li> </ul>	<b>SRAM</b> [256 Kb to 64 Mb] <ul style="list-style-type: none"> <li>▶ Async SRAM               <ul style="list-style-type: none"> <li>&gt; Fast</li> <li>&gt; Micropower</li> <li>&gt; ECC SRAMs</li> </ul> </li> <li>▶ Sync SRAM               <ul style="list-style-type: none"> <li>&gt; Standard sync</li> <li>&gt; NoBL</li> <li>&gt; QDR-II/II+/Xtreme</li> <li>&gt; QDR-IV</li> </ul> </li> </ul>	<b>Solutions</b> <ul style="list-style-type: none"> <li>▶ HYPERBUS™ MCP</li> <li>▶ KGD/Wafer/WLCSP solutions</li> <li>▶ Radiation hardened products</li> </ul>

### Applications

<b>Automotive</b> <ul style="list-style-type: none"> <li>&gt; Instrument cluster</li> <li>&gt; Body and comfort</li> <li>&gt; Infotainment</li> <li>&gt; ADAS</li> </ul>	<b>Consumer &amp; Internet of Things (IoT)</b> <ul style="list-style-type: none"> <li>&gt; Wearables</li> <li>&gt; Smart home</li> <li>&gt; Personal electronics</li> <li>&gt; Remote controls</li> </ul>	<b>Industrial, medical, aerospace &amp; defense</b> <ul style="list-style-type: none"> <li>&gt; Industry automation</li> <li>&gt; Smart healthcare</li> <li>&gt; Smart grid</li> <li>&gt; Office automation</li> </ul>
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### Memory solution at-a-glance



NOR Flash Memory

		Interface	Voltage [V]	Density	Speed	Help me choose
Serial	SEMPER™ Safety and high density	Q-SPI, Octal, HYPERBUS™ (xSPI)	1.8 3.0	256 Mb – 4 Gb	Up to 400 MB/s	<b>Architected and designed for functional safety</b> <b>Applications:</b> Where safety and reliability meet, e.g., PLC, motor drive, factory robotics, ADAS <b>Use cases:</b> Execute-in-place, fast boot, instant-on systems, safety-critical storage
	SEMPER™ Nano Tiny footprint/low power	Q-SPI	1.8	256 Mb	Up to 40 MB/s	<b>Compact footprint and low power</b> <b>Applications:</b> For small form factor products, e.g., wearables and hearables, IoT sensor nodes <b>Use cases:</b> Code, parameter and data storage
	HYPERFLASH™ High performance	HYPERBUS™	1.8 3.0	128 Mb – 512 Mb	Up to 333 MB/s	<b>High throughput with HYPERBUS™ interface</b> <b>Applications:</b> For systems tailored to the HYPERBUS™ interface, e.g., HMI, digital signage <b>Use cases:</b> Execute-in-place, fast boot, instant-on systems
	Standard SPI Wide product range	Q-SPI	1.8 3.0	64 Mb – 1 Gb	Up to 80 MB/s	<b>Wide range of industry-proven solutions</b> <b>Applications:</b> Standard memory for industrial, communications and automotive, e.g., IoT edge devices, medical electronics <b>Use cases:</b> Boot device, datalogging, FPGA configuration
Parallel	Standard Parallel Conventional NOR Flash	16/8-bit page 8-bit page/burst	1.8 3.0	8 Mb – 2 Gb	Down to 70/15 ns Down to 55/20 ns	<b>Dependable memory with parallel interfaces</b> <b>Applications:</b> Scales to high density and performance for traditional designs and mature products <b>Use cases:</b> Code, parameter and data storage

F-RAM (Ferroelectric RAM) memory

	Family	Density [Mb]	Interface	Voltage [V]	Frequency [MHz]	Temperature grade	Endurance (R/W cycles)	Data retention (@ max temp)	Help me choose
Serial	EXCELON™ Ultra	2 4 8 16	QSPI	1.8 to 3.6 1.71 to 1.89	108	Industrial	10 <sup>14</sup> cycles	10 years @ 85°C	<b>High-performance, low-pin-count nonvolatile memory</b> <b>Applications:</b> Industrial automation, test and measurement, motor controls, smart meters, programmable logic controllers <b>Use cases:</b> Mission-critical datalogging, Instant datacapture on power loss
		8 16							
	EXCELON™ Auto	1 2	SPI	1.8 to 3.6 1.71 to 1.89	50	Automotive Grade 1	10 <sup>13</sup> cycles	11,000 h @ 125°C	<b>AEC-Q100 qualified high-reliability, instant write nonvolatile memory</b>
		8 16	QSPI	1.8 to 3.6 1.71 to 1.89	108	Automotive Grade 2	10 <sup>14</sup> cycles	½ year @ 105°C	<b>Applications:</b> Camera and sensor data capture for ADAS vision systems, event data recorders, infotainment <b>Use cases:</b> Datalogging, last second data capture
	EXCELON™ LP	2 4	SPI	1.8 to 3.6 1.71 to 1.89	50	Industrial	10 <sup>15</sup> cycles	10 years @ 85°C	<b>Ultra-low-power, small form factor nonvolatile memory</b>
		16	SPI	1.8 to 3.6 1.71 to 1.89	50	Industrial Plus	10 <sup>14</sup> cycles	1 year @ 105°C	<b>Applications:</b> Portable medical devices, wearable and IoT devices <b>Use cases:</b> Mission-critical datalogging
Parallel	F-RAM STD	4 Kb to 1 Mb	I <sup>2</sup> C	2.0 to 3.6 2.7 to 5.5 4.5 to 5.5	1 – 3.4	Industrial/ Industrial Plus/ Automotive Grade 1-3	10 <sup>14</sup> cycles	10 years @ 85°C 10 years @ 105°C 11,000 h @ 125°C	<b>High reliability, instant write EEPROM replacement</b> <b>Applications:</b> Smart metering (water, power, gas), BMS, Solar inverter, Industrial automation, Smart building, POS, Hearing aids, Medical <b>Use cases:</b> Mission-critical datalogging, Instant data capture on power loss without additional components for power back-up
		4 Kb to 4 Mb	SPI	2.0 to 3.6 2.7 to 5.5 4.5 to 5.5	16 – 40				
	64 Kb to 4 Mb	Parallel	55 – 70 ns						

HYPERRAM™ PSRAM (Pseudostatic RAM) memory

	Family	Density [Mb]	Data bus width	Interface	Voltage [V]	Speed [MHz]	Throughput [MBps]	Help me choose
HYPERBUS™	HYPERRAM™ 2.0	64 128	8-bit	HYPERBUS™ (x8)	1.8 3.0	200	400	<b>Low pin-count and low power memories</b> <b>Applications:</b> Wearable devices, IoT devices, HMI Systems, Industrial Machine Vision and Automotive Instruments Clusters <b>Use cases:</b> Expansion memory for scratchpad or buffering purposes
		256 512			1.8			
HYPERBUS™ Ext.	HYPERRAM™ 3.0	256	16-bit	HYPERBUS™ Extended I/O (x16)	1.8	200	800	<b>High performance/high throughput memories</b> <b>Applications:</b> Industrial and IoT devices, Automotive V2X <b>Use cases:</b> Expansion memory for scratchpad or buffering purposes
Octal xSPI	Octal xSPI RAM	64 128	8-bit	Octal xSPI (x8)	1.8 3.0	200	400	<b>Low pin-count and low power memories</b> <b>Applications:</b> Smart home, industrial and medical HMI displays <b>Use cases:</b> Expansion/Scratchpad memory
		256 512			1.8			