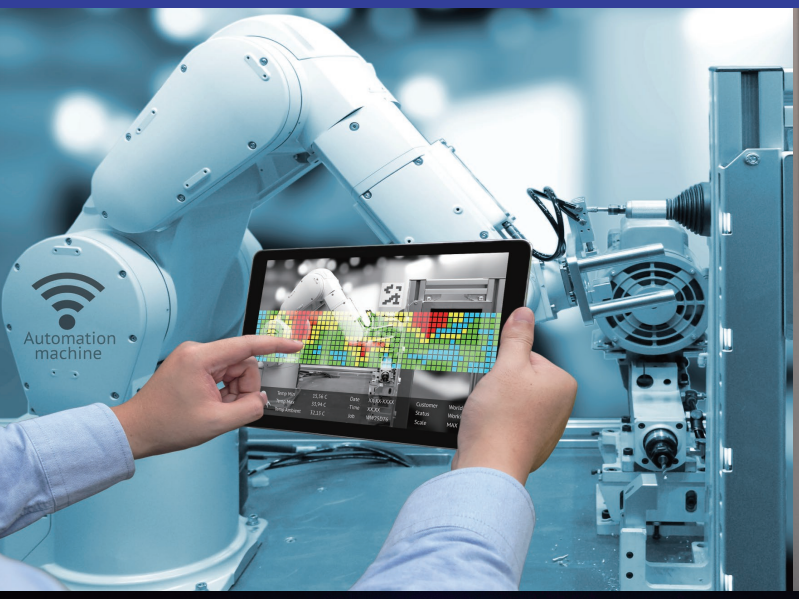
LOW POWER SRAMs

Advanced technology with superior performance and industry-leading support



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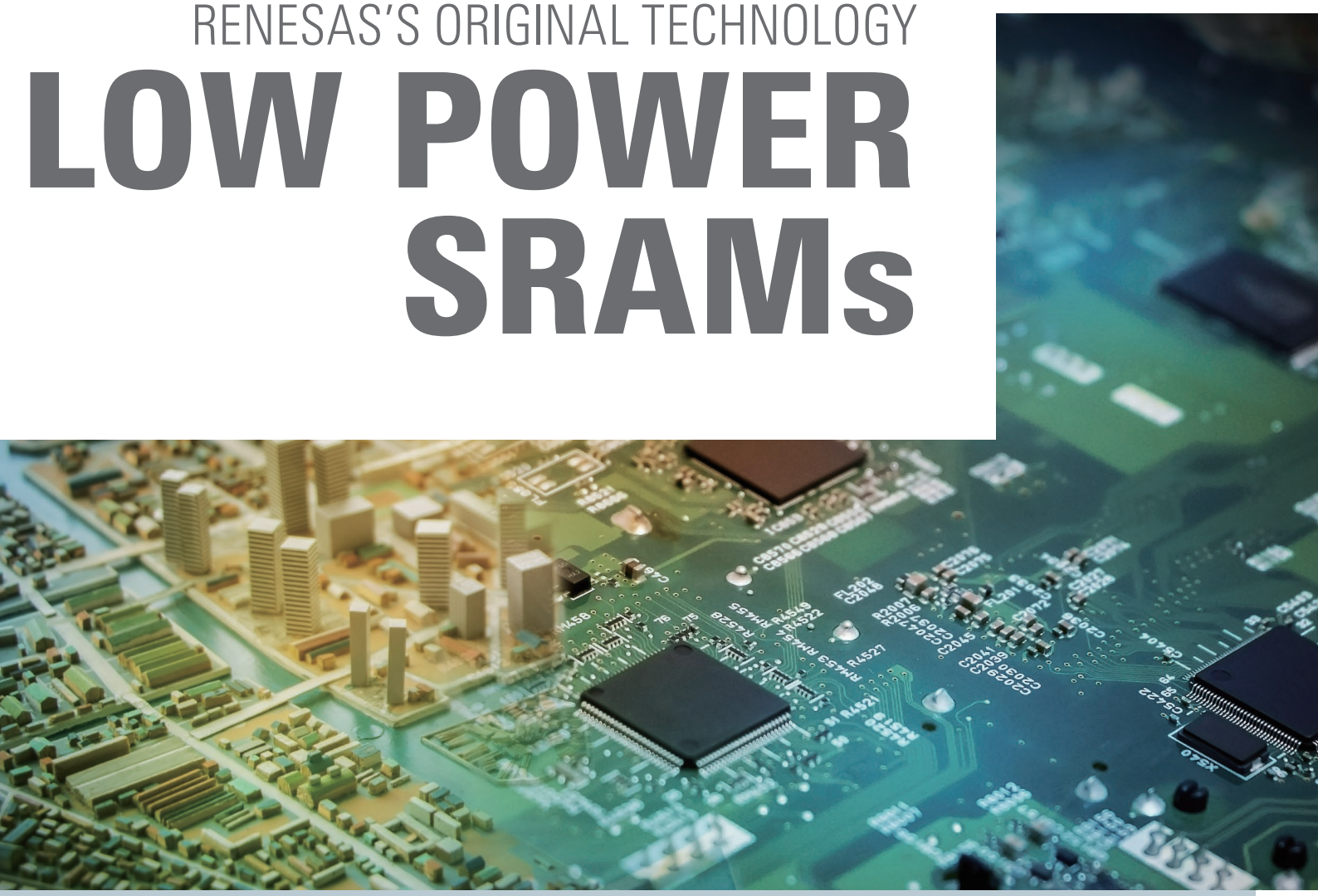
HIGH PERFORMANCE AND
HIGH RELIABILITY USING
RENESAS'S ORIGINAL TECHNOLOGY

LOW POWER SRAMs



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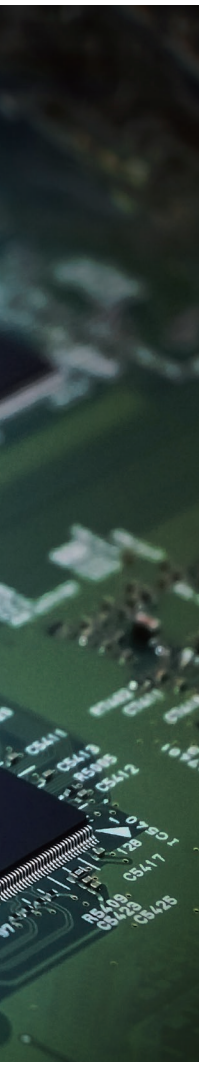


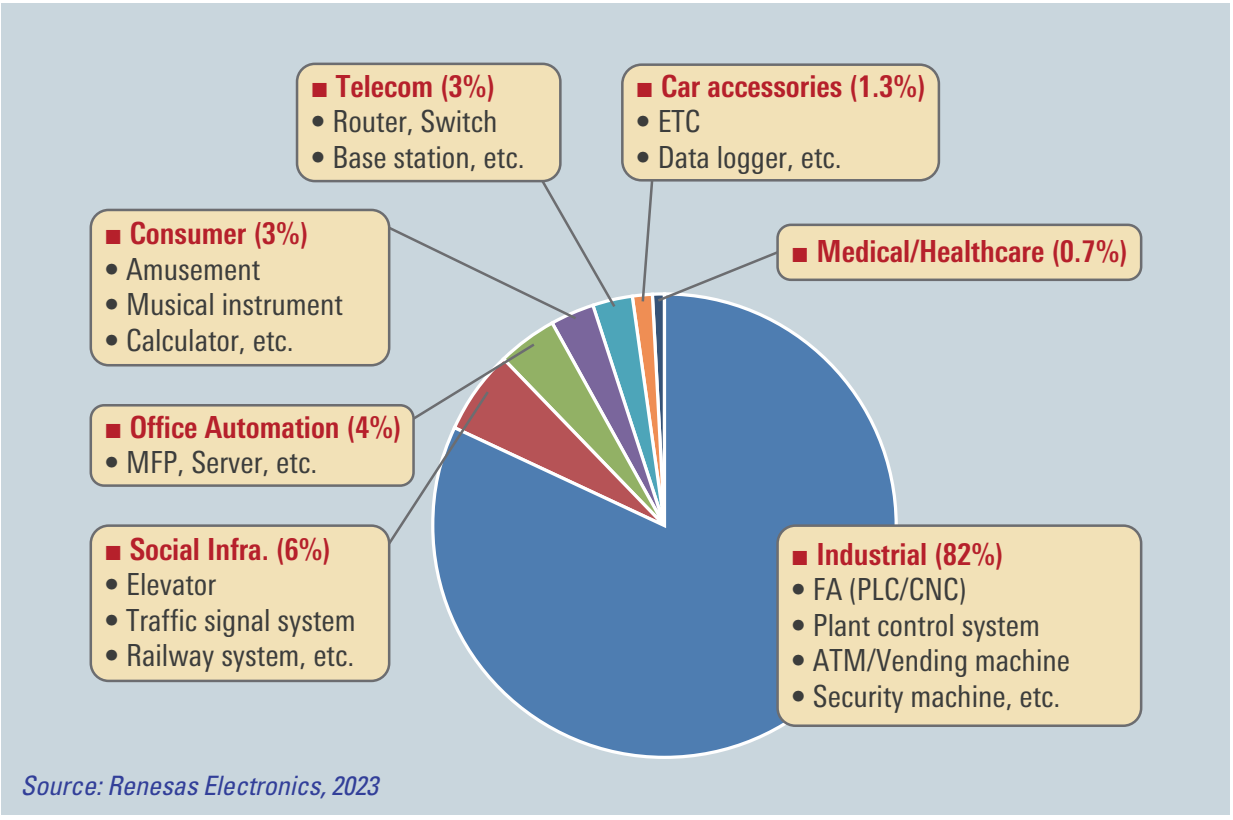
Low Power SRAM Roadmap

Mass Production　Under Development

SRAM Type	Density (Voltage)	~2023	2024	2025	2026	2027	2028~
Low Power SRAM	256Kb, 1Mb (5V/3V) 2Mb (3V) 4Mb (5V)	0.15µm Advanced LPSRAM					
	4Mb (3V) 8Mb, 16Mb (3V) 32Mb, 64Mb (3V)	0.11µm Advanced LPSRAM					
	16Mb (3V) R1LV1616H series <EOL products>	0.13µm (ECC embedded)					
	16Mb (3V) RMLV1616A-U series Alternative to R1LV1616H series		0.11µm Advanced LPSRAM MP: Now				

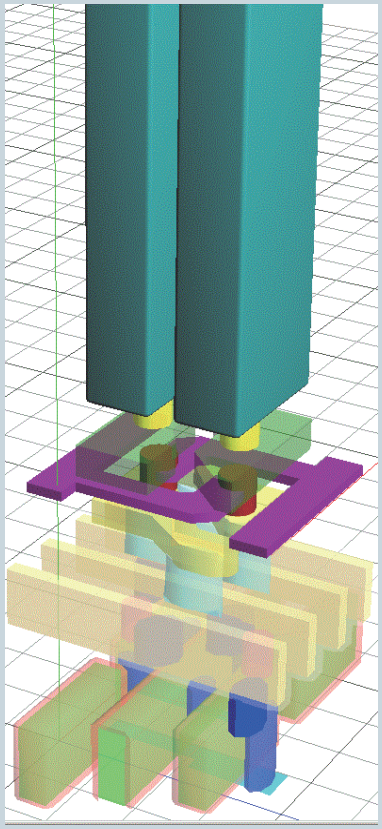
- Widest product lineup from 256Kbit to 64Mbit
- Long term and stable support
- Highest quality with Renesas core advanced technology
- Easy switch to higher density in the same package

Industry-Leading Support, Application of Renesas Low Power SRAM



Source: Renesas Electronics, 2023

Advanced Low Power SRAM Technology with Superior Performance and Reliability



2nd stacked structure:
Separate physical capacitor
(not parasitic capacitance)

1st stacked structure:
p-type TFT
(thin film transistor)

Infrastructure:
NMOS formed in Si substrate

Soft error free:
Increasing critical charge (Qcrit)
Drastically decreases the sensitivity to SEU, single event upset

Latch-up free:
No parasitic thyristor (PNPN structure) in the silicon substrate
Eliminating the occurrence of SEL, single event latch-up

Low standby current:
By optimizing leak current of transistors

Renesas' Advanced LPSRAM Technology: 3D Image of Memory Cell

Product Differentiation

Renesas supports soft error free products for entire lineup of 256Kbit to 64Mbit

✓ Production Soft error countermeasure: Yes No

Vendor	Process	256Kb	1Mb	2Mb	4Mb	8Mb	16Mb	32Mb	64Mb
Renesas	0.15µm Advanced	✓	✓	✓	✓ (5V)	Change to 0.11µm Advanced			
	0.11µm Advanced				✓ (3V)	✓	✓	✓	✓
Competitor	90nm CMOS no ECC	✓	✓	✓	✓	✓	✓	✓	✓
	65nm CMOS ECC embedded				✓	✓	✓	✓	✓

Product Benchmark

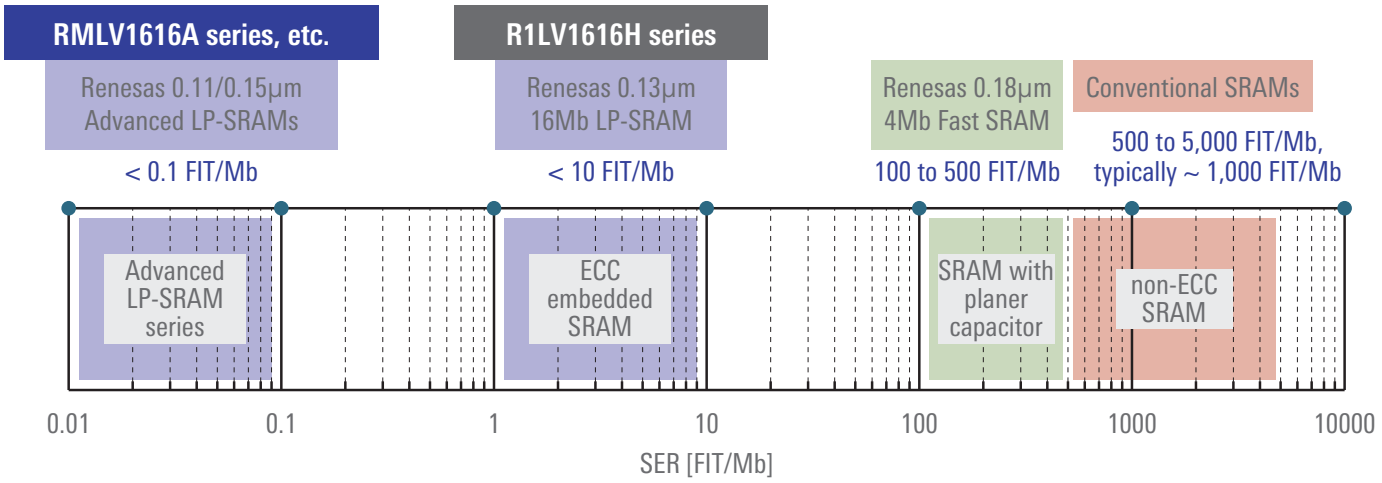
Only Renesas supports unique products that realize both lowest standby current and soft error free

vs.	Renesas 0.11µm Advanced LPSRAM	Competitor's 65nm LPSRAM (with ECC)
Standby current	**0.3µA (4Mb, typ.)**	3.5µA (4Mb, typ.)
vs.	**Renesas 0.11µm Advanced LPSRAM**	**Competitor's 90nm LPSRAM (no ECC)**
Soft error rate	**< 0.04 FIT / Mbit**	500 to 5,000 FIT / Mbit

Soft Error Rate Comparison

Advanced LPSRAM has superior Soft Error Immunity to ECC-embedded SRAMs

Product Family	Countermeasure against soft error?	By what?	Soft error rate (Measured)
Advanced LPSRAM series (0.11µm / 0.15µm)	YES	Increasing Critical Charge (Qcrit) by the proprietary technology	< 0.04 FIT/Mb [0.11µm] < 0.06 FIT/Mb [0.15µm]
R1LV1616H series <EOL> (0.13µm CMOS 16Mb)	YES	Embedded ECC	< 5.5 FIT/Mb



Logarithmic (order of $\times 10^n$) Comparison of SRAM Soft Error Rate

Package Lineup for Low Power SRAM

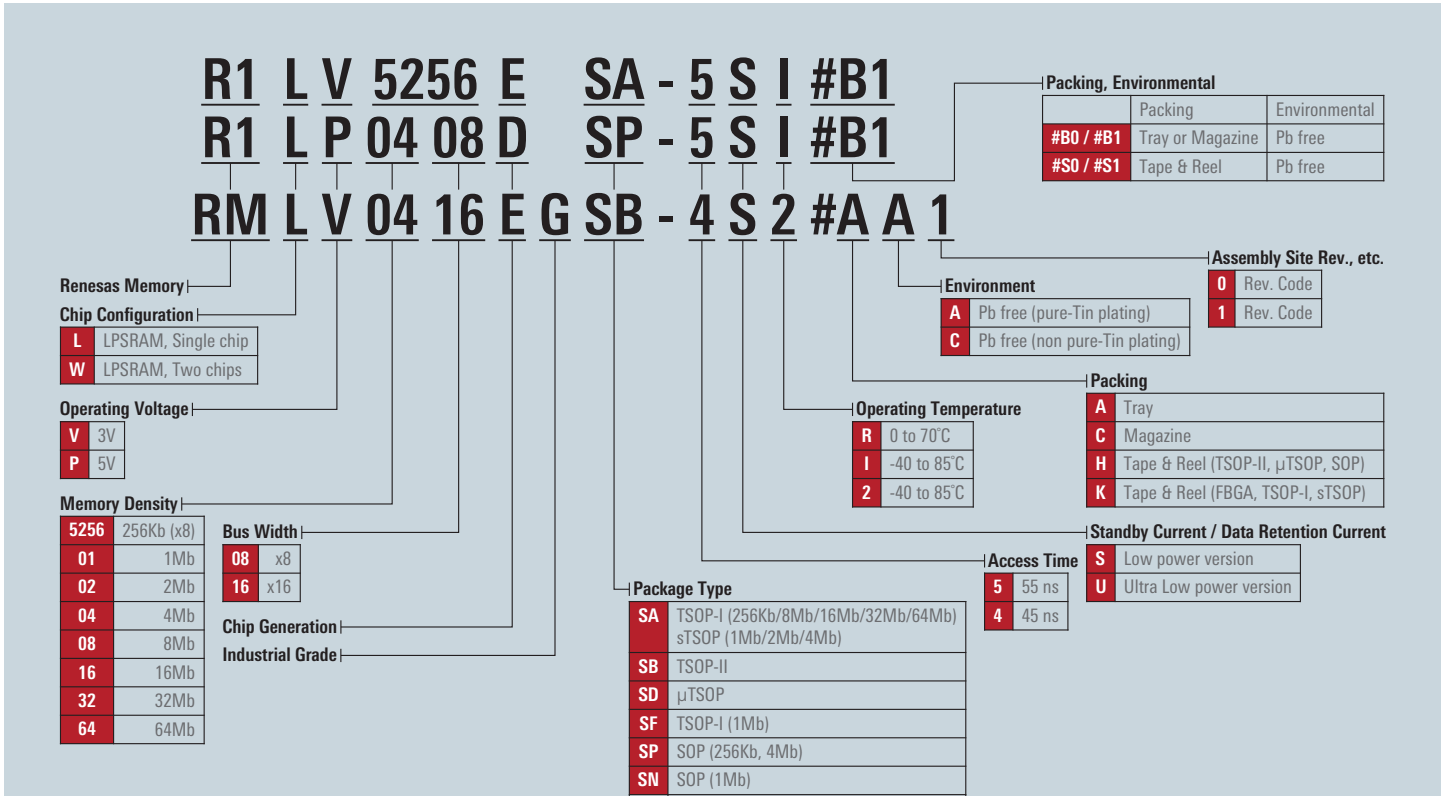
	SOP	TSOP-I	sTSOP	TSOP-II	µTSOP	FBGA
28-pin	256 Kb (11.93 × 17.5, 1.27)	256 Kb (8.0 × 13.4, 0.55)				
32-pin	1/4 Mb (14.1 × 20.75, 1.27)	1 Mb (8.0 × 20.0, 0.5)	1/2/4 Mb (8.0 × 13.4, 0.5)	4 Mb (11.76 × 20.95, 1.27)		x8 config.
44-pin				2/4/8 Mb (11.76 × 18.41, 0.8)		x8 / x16 config.
48-pin (48-ball)		8/16/32 64 Mb (12.0 × 20.0, 0.5)				4/8/16/32 64 Mb (0.11µm) (8.5 × 7.5)
52-pin					8/16/32 64 Mb (10.49 × 10.79, 0.4)	

■ Renesas provides 6 kinds of common packages, which are upward compatible, making it easy to expand density without changing the PCB.

Product List

Product Series	Density	Org.	Supply Voltage (V)	Access Time (ns)	Standby Current (typ.)	Temp. Range	TSOP	SOP	FBGA	µTSOP
R1LP5256E	256 Kb	x8	4.5 - 5.5	55	0.6 µA	-40°C to 85°C	✓	✓		
R1LP0108E	1 Mb	x8	4.5 - 5.5	55	0.6 µA	-40°C to 85°C	✓	✓		
R1LP0408D	4 Mb	x8	4.5 - 5.5	55	0.8 µA	-40°C to 85°C	✓	✓		
R1LV5256E	256 Kb	x8	2.7 - 3.6	55	0.6 µA	-40°C to 85°C	✓	✓		
R1LV0108E	1 Mb	x8	2.7 - 3.6	55	0.6 µA	-40°C to 85°C	✓	✓		
R1LV0208BSA	2 Mb	x8	2.7 - 3.6	55	1 µA	-40°C to 85°C	✓			
R1LV0216BSB	2 Mb	x16	2.7 - 3.6	55	1 µA	-40°C to 85°C	✓			
RMLV0408E	4 Mb	x8	2.7 - 3.6	45	0.3 µA	-40°C to 85°C	✓	✓		
RMLV0414E	4 Mb	x16	2.7 - 3.6	45	0.3 µA	-40°C to 85°C	✓			
RMLV0416E	4 Mb	x16	2.7 - 3.6	45	0.3 µA	-40°C to 85°C	✓		✓	
RMLV0808BGSB	8 Mb	x8	2.4 - 3.6	45	0.45 µA	-40°C to 85°C	✓			
RMLV0816BGBG	8 Mb	x16	2.4 - 3.6	45	0.45 µA	-40°C to 85°C			✓	
RMLV0816BGSA	8 Mb	x16	2.4 - 3.6	45	0.45 µA	-40°C to 85°C	✓			
RMLV0816BGSB	8 Mb	x16	2.4 - 3.6	45	0.45 µA	-40°C to 85°C	✓			
RMLV0816BGSD	8 Mb	x16	2.4 - 3.6	45	0.45 µA	-40°C to 85°C				✓
RMLV1616A-S	16 Mb	x16	2.7 - 3.6	55	0.5 µA	-40°C to 85°C	✓		✓	✓
RMLV1616A-U	16 Mb	x16	2.7 - 3.6	45, 55	0.4 µA	-40°C to 85°C	✓		✓	
RMLV3216A	32 Mb	x16	2.7 - 3.6	55	0.6 µA	-40°C to 85°C	✓		✓	✓
RMWV6416A	64 Mb	x16	2.7 - 3.6	55	1.2 µA	-40°C to 85°C	✓		✓	✓

Low Power SRAM Part Name Decoder



MEMO

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