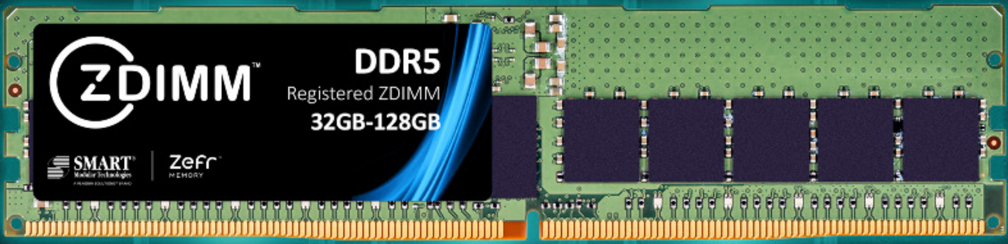
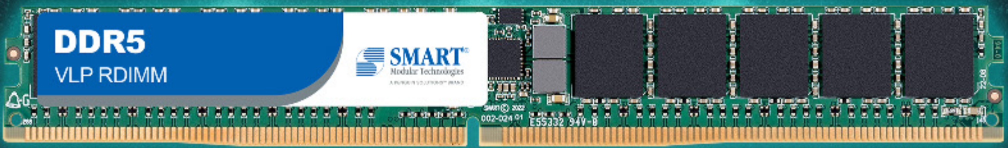
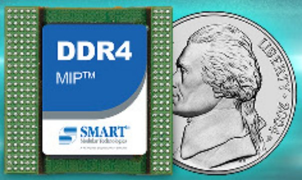
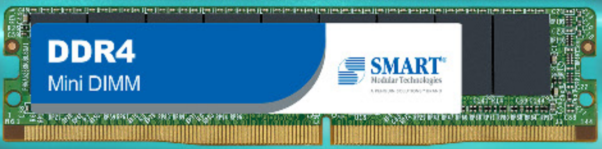
SMART®
Modular Technologies

A PENGUIN SOLUTIONS™ BRAND









Special DIMM Type
Product Line

Introduction

SMART Modular has a long history of successfully partnering with customers to satisfy their specific design needs. With extensive industry and design expertise and global manufacturing capabilities, SMART Modular offers a unique combination of advantages that can support customers' designs from conception to manufacturing through final testing and logistics. This blend of abilities allows SMART Modular to efficiently and reliably customize products to meet particular customer needs.

SMART Modular delivers solutions to a broad customer base, including OEMs in computing, networking, communications, storage, mobile and industrial markets. Available in registered, unbuffered, and ECC configurations, SMART Modular's DRAM memory modules are available in various form factors that include standard height and special DIMM types, including Very Low Profile (VLP), Ultra Low Profile (ULP), mini-DIMM, Module-in-a-Package (MIP), LRDIMM and Zefr ZDIMM.

Among these special DIMM types,

- Small form factor DIMMs are particularly designed and manufactured for space-constrained applications, such as 1U blade servers and blade enclosure systems, to improves airflow inside the system and reduces thermal impact.
- LRDIMMs, with specific configurations intended for servers, workstations and data center applications, allow adding more DIMMs per channel to maximize capacity and performance.
- ZDIMMs (Zefr Memory Module) utilize SMART's Zefr™ proprietary screening process, ensuring the industry's highest levels of uptime and reliability.

Special DIMM Type Memory Products

VLP + VLP Mini

ULP + ULP Mini

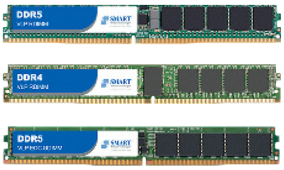
Mini DIMM

MIP

LRDIMM

ZDIMM

VLP DIMM



Features & Benefits

- DIMM Height of 18.75mm for Vertical Placement in 1U Blades
- Maximize System Density and Performance - up to 384GB in 1U Blade Systems with 12 DIMM Sockets
- Maximize Air Flow in Dense Systems
- Zefr™ High Reliability

Applications

- Blade Servers – Compute & Storage
- Telecom and Networking ATCA Blades
- Embedded & Edge Computing

Use Case

DIMM Type	VLP RDIMM		VLP ECC UDIMM
Module Type	DDR5	DDR4	DDR5
Density	32GB	4GB - 64GB	16GB - 64GB
Height	18.75 mm	18.75 mm	18.75 mm
Configuration	80bit	72bit	72bit
Speed (MT/s)	4800-5600	2666-3200	4800-5600
Voltage	1.1V	1.2V	1.1V
Operating Temperature*	C Temp	C Temp	C/I Temp

*C Temp (0 °C to +70 °C); I Temp (-40 °C to +85 ° C)

VLP Mini DIMM

Features & Benefits

- DIMM Height of 18.75mm for Vertical Placement in 1U Blades
- Maximize System Density and Performance - up to 384GB in 1U Blade Systems with 12 DIMM Sockets
- Maximize Air Flow in Dense Systems
- Zefr™ High Reliability

Applications

- Blade Servers – Compute & Storage
- Telecom and Networking ATCA Blades
- Embedded & Edge Computing

Use Case

DIMM Type	VLP Mini UDIMM	VLP Mini RDIMM
Module Type	DDR4	DDR4
Density	4GB	8GB - 16GB
Height	18.75 mm	18.75 mm
Configuration	72bit	72bit
Speed (MT/s)	3200	3200
Voltage	1.2V	1.2V
Operating Temperature*	C Temp	C Temp

*C Temp (0 °C to +70 °C); I Temp (-40 °C to +85 ° C)

ULP DIMM

Features & Benefits

- Suitable for Space-constrained Blade Applications
- For Vertical Placement in 1U Blades
- Maximize System Density and Performance
- Built-in ECC to Detect and Correct Memory Errors

Applications

- Blade Servers – Compute & Storage
- Telecom and Networking ATCA Blades
- Embedded & Edge Computing

Use Case

DIMM Type	ULP ECC UDIMM
Module Type	DDR4
Density	16GB – 32GB
Height	17.78 mm
Configuration	72bit
Speed (MT/s)	3200
Voltage	1.2V
Operating Temperature*	C/I Temp

*C Temp (0 °C to +70 °C)

ULP Mini DIMM

Features & Benefits

- Suitable for Space-constrained Blade Applications
- For Vertical Placement in 1U Blades
- Maximize System Density and Performance
- Built-in ECC to Detect and Correct Memory Errors

Applications

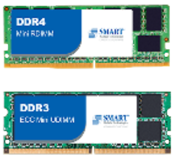
- Blade Servers – Compute & Storage
- Telecom and Networking ATCA Blades
- Embedded & Edge Computing

Use Case

DIMM Type	ULP Mini RDIMM
Module Type	DDR4
Density	16GB - 32GB
Height	17.78 mm
Configuration	72bit
Speed (MT/s)	3200
Voltage	1.2V
Operating Temperature*	C Temp

*C Temp (0 °C to +70 °C)

Mini DIMM



Features & Benefits

- Command/Address and Control bus is Double Data Rate
- Generates CRC Checksum in READ Data Frames
- Default Burst Length Increased to BL16 – Single Burst = 64B of Data
- Integrated Temperature Sensor (MR4)
- DDR5 DRAM Contains 256 Mode Registers

Applications

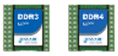
- Networking
- Telecom
- Industrial SBC Blades

Use Case

DIMM Type	Mini RDIMM	ECC Mini UDIMM
Module Type	DDR4	DDR3
Density	8GB - 16GB	8GB
Height	30.00 mm	30.00 mm
Configuration	72bit	72bit
Speed (MT/s)	2666	1600
Voltage	1.2V	1.35V
Operating Temperature*	C Temp	C Temp

*C Temp (0 °C to +70 °C)

Module-In-A-Package™ (MIP™)



Features & Benefits

- Occupies Only 1/5th the Space of an SODIMM
- Up to 42% Power Savings Comparing to SODIMMs
- Superior Ruggedness – Soldered Down; No Sockets or Clips
- Leverages SMART's Proven Stacking Technology

Applications

- Video Broadcast
- Video/Graphics Cards
- Embedded Computing
- Telecom
- Defense/Aerospace
- Automotive

Use Case

DIMM Type	Module-In-A-Package (MIP)	
Module Type	DDR4	DDR3
Density	4GB - 16GB	2GB
Height	22.25 x 22.25 x 3.85 mm	22.25 x 22.25 x 3.85 mm
Configuration	64bit	64bit
Speed (MT/s)	3200	1866
Voltage	1.2V	1.35V
Operating Temperature*	C/I Temp	C Temp

*C Temp (0 °C to +70 °C); I Temp (-40 °C to +85 ° C)

LRDIMM

Features & Benefits

- Load-Reduced Dual In-Line Memory Modular (LRDIMM)
- JEDEC Standard
- Three DIMM per Channel Server Configurations
- High Speed Data Rates
- Minimize Supply Chain Disruptions by Self-Qualifying New Die Revs and Providing Multi-sourced DRAM Options

Applications

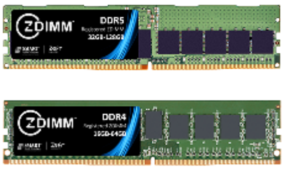
- Data Centers Requiring Large Amounts of Server Memory
- Enterprise Grade LRDIMMs Available for Mission Critical Applications

Use Case

DIMM Type	LRDIMM
Module Type	DDR4
Density	32GB
Height	31.25 mm
Configuration	72bit
Speed (MT/s)	2666
Voltage	1.2V
Operating Temperature*	C Temp

*C Temp (0 °C to +70 °C)

Zefr ZDIMM



Features & Benefits

- Five Testing Process: Temperature, Speed, Load, System & Time
- Zefr Testing Emulates the Most Strenuous Use Cases Producing
- Proven Long-Term Reliability with 200 or Less DPPM (vs. Industry Standard of 3,000-5,000 DPPM)
- Available in DDR4 and DDR5

Applications

- Natural Language Processing (LLMs)
- Image Recognition, 3D Rendering, Security Camera Data Processing
- DNA Sequencing, High Resolution Medical Image Processing
- Algorithmic Trading, Real Time High-Speed Analytics

Use Case

DIMM Type	Zefr ZDIMM	
Module Type	DDR5	DDR4
Density	32GB - 128GB	16GB - 64GB
Height	31.25 mm	31.25 mm
Configuration	80bit	72bit
Speed (MT/s)	5600	3200
Voltage	1.1V	1.2V
Operating Temperature*	C Temp	C Temp

*C Temp (0 °C to +70 °C)

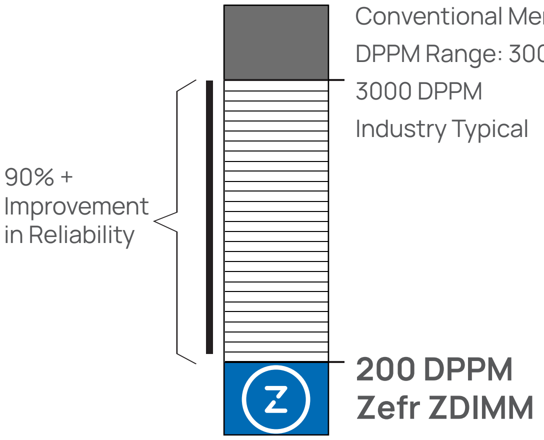
SMART® Modular Technologies
A PENGUIN SOLUTIONS™ BRAND

Zefr™ MEMORY

Ultra-High Reliability
Zefr™ ZDIMM Memory

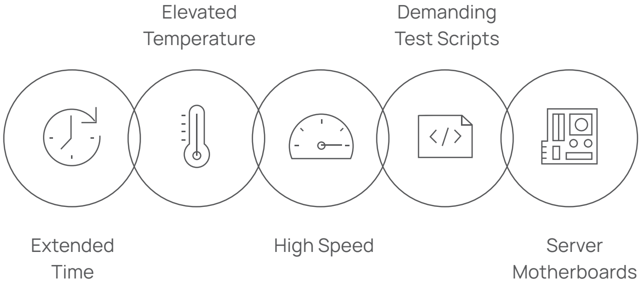
Eliminate over **90%** of Memory Reliability Failures

Industry Standard Memory Reliability isn't Sufficient



Zefr Screens Memory to Real-World Conditions

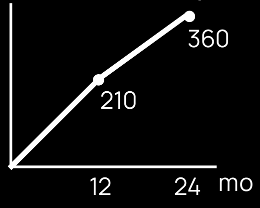
Zefr ZDIMM has been intensely processed to filter out weak memory modules. The Zefr Process combines five key testing ingredients.



Case Study

An HPC System Integrator built identical systems with standard and Zefr memory.

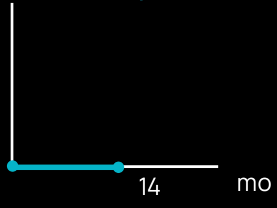
Standard Memory



Purchase 18,384 Standard RDIMMs
Build Cluster A:
- 1,532 Nodes
- Twelve 16GB RDIMMs per Node

Field Failures since Platform Bring up:
360 Failures

Zefr Memory



1Purchase 18,384 Standard RDIMMs
Build Cluster B:
- 1,532 Nodes
- Twelve 16GB RDIMMs per Node

Field Failures since Platform Bring up:
0 Failures

For more information, please visit **https://www.smartm.com/product/list/zefr-zdimm**

SMART®
Modular Technologies
A PENGUIN SOLUTIONS™ BRAND

Think Memory.
Think SMART.

For more product details, please contact the SMART sales team or visit our website.

**Product images are for promotional purposes only.*
Labels may not be representative of the actual product.

Headquarters - Newark, CA
39870 Eureka Dr. Newark CA 94560
☎: (+1) 510-623-1231
🖷: (+1) 510-623-1434
✉: info@smartm.com

Branch Office - Taiwan
6F, Unit A, No. 1, Yuan Dong Rd.,
Banqiao District, New Taipei City 220, Taiwan, R.O.C.
☎: (+886) 2-7705-2700
🖷: (+886) 2-7705-2701
✉: sales.asia@smartm.com

www.smartm.com

Follow us on Linkedin