# VERSATILITY + PERFORMANCE

## LPDRAM for mobile and embedded

## Micron® LPDRAM

Consumers want more features and functionality from their ultrathin computing devices, mobile phones and automotive infotainment systems — and you're expected to design it in with less power, less time and less space. We understand these design challenges and offer a wide range of low-power DRAM (LPDRAM) devices to address them.

## What You Get With Micron's LPDRAM Portfolio

Micron offers one of the industry's broadest LPDRAM portfolios, featuring our industry-leading LPDDR4 and cutting-edge LPDDR5. Our wide array of options helps you choose the best balance of features for your design. You'll get the right mix of low-power, high-performance devices coupled with world-class technical support that features simulation models, in-house qualifications and lab analysis.

## Ideal Applications

- **Mobile** – Handsets and tablets
- **Consumer** – DTV, digital cameras, wearables, PMP/MP3 players, portable games, personal navigation devices
- **Networking** – Machine-to-machine (M2M) devices, USB dongles
- **Security** – Fingerprint detectors, digital surveillance
- **Automotive** – Infotainment, ADAS, communications, clusters
- **Industrial/Medical** – Patient monitors, defibrillators, portable ultrasound machines
- **Client** – Notebooks, ultrathins, convertibles and detachables
- **Graphics** – Portable games

See our entire line of LPDRAM devices and get specific part detail information at micron.com/lpdram.

## Advantages of Designing-in Micron LPDRAM

### 1. Low Power

Extend battery life with ultra-low power supply voltages and standby currents.

### 2. High Performance

Deliver data transfer rates of 4266 GT/s with the industry's fastest mobile LPDDR4 and up to 6400 GT/s with our latest LPDDR5.

### 3. Temperature Ranges

Maintain high performance in extreme environments with extended temperatures.

### 4. Product Portfolio Breadth

Enhance design flexibility and provide a migration path with a wide range of densities and packages.

### 5. Testing and Reliability

Provide greater reliability with parts that undergo stringent quality and reliability testing — including Micron's automotive product lines that meet the stringent requirements of ISO9001 and TS16949 and feature the industry's first ASIL D-certified DRAM.

### 6. Regional Technical Support

Receive assistance with your unique design challenges from our expert design engineers and local FAEs.

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# Micron® LPDRAM

| Features | | Benefits |
|---|---|---|
| Densities | 512Mb (LPSDR)<br>512Mb to 2Gb (LPDDR)<br>512Mb to 2Gb (LPDDR2)<br>8Gb to 32Gb (LPDDR3)<br>4Gb to 128Gb (LPDDR4)<br>16Gb to 128Gb (LPDDR5) | Provides flexibility for a variety of application designs. |
| Configurations | x16, x32 (LPSDR, LPDDR)<br>x16, x32, x64 (LPDDR4)<br>x32, x64 (LPDDR3)<br>x32, (2 channels, x16) (LPDDR2)<br>x64 (4 channels, x16) (LPDDR4, LPDDR5) | Enables the use of fewer components to support wide bus architectures. |
| Core Voltages | 1.8V (LPSDR, LPDDR)<br>1.2V (LPDDR2, LPDDR3)<br>0.6V, 1.1V (LPDDR4)<br>0.5V, 1.05V (LPDDR5) | Helps reduce power consumption—a key advantage over standard DRAM. |
| Clock Frequencies | Up to 166 MHz (LPSDR)<br>Up to 208 MHz (LPDDR)<br>Up to 533 MHz (LPDDR2)<br>Up to 933 MHz (LPDDR3)<br>Up to 2133 MHz (LPDDR4)<br>Up to 3200 MHz (LPDDR5)<br>Up to 4250 MHz (LPDDR5x) | Provides high performance, high bandwidth, and low power consumption. |
| Power Consumption | Refer to specific data sheet | Delivers low power consumption in standby and active modes, plus special mobile features to reduce power for a more efficient design. |
| Special Features | Temperature-compensated self refresh (TCSR) | Adjusts refresh timing to minimize power consumption at lower, ambient temperatures. |
| | Partial-array self refresh (PASR) | Reduces power by refreshing only critical data. |
| | Deep power-down (DPD)[1] | Provides an ultra-low power state when data retention is not required. |
| | Programmable drive strength (DS) | Enables adjustment for operation in point-to-point and point-to-2-point applications. |
| | Programmable $V_{OH}$ signal level (LPDDR4 only) | Enables adjustment for operation in point-to-point and point-to-2-point applications. |
| Temperature Ranges | –30°C to +85°C (WT LPDDR2/3/4/5)<br>–30°C to +105°C (XT LPDDR3/4)<br>–40°C to +85°C (IT)<br>–40°C to +95°C (IT LPDDR4, LPDDR5)<br>–40°C to +105°C (AT LPSDR, LPDDR, LPDDR2/4/5)<br>–40°C to +125°C (Ultra[2] LPDDR2/4/5) | Enables high performance in extreme environments. |
| Packages | PoP | Saves board space by enabling a Mobile LPDRAM to be stacked on top of a processor so that the two components require only one foot-print on the board. |
| | Wafer | Supports bare die with edge bond pads for easy stacking in SIP and MCP solutions. |
| | FBGA | Supports JEDEC-standard FBGA ballout. |
| | Near memory package | High density, smaller footprint. Excellent board-level reliability. Wide IO for high bandwidth. Improved signal integrity with shorter distance between processor and memory. |

1. LPDDR4 does not support DPD.
2. Only available for select automotive products.

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