

2K × 8 High Speed CMOS SRAM

Description

The HM 65728B is a high speed CMOS static RAM organized as 2048 × 8 bits. It is manufactured using MHS's high performance CMOS technology.

Access times as fast as 25 ns are available with maximum power consumption of only 600 mW.

The HM 65728B features fully static operation requiring no external clocks or timing strobes. The automatic power-down feature reduces the power consumption by 80 % when the circuit is deselected.

Easy memory expansion is provided by an active low chip select (\overline{CS}) and active low output enable (\overline{OE}) and three state drivers.

All inputs and outputs of the HM 65728 are TTL compatible and operate from single 5V supply thus simplifying system design.

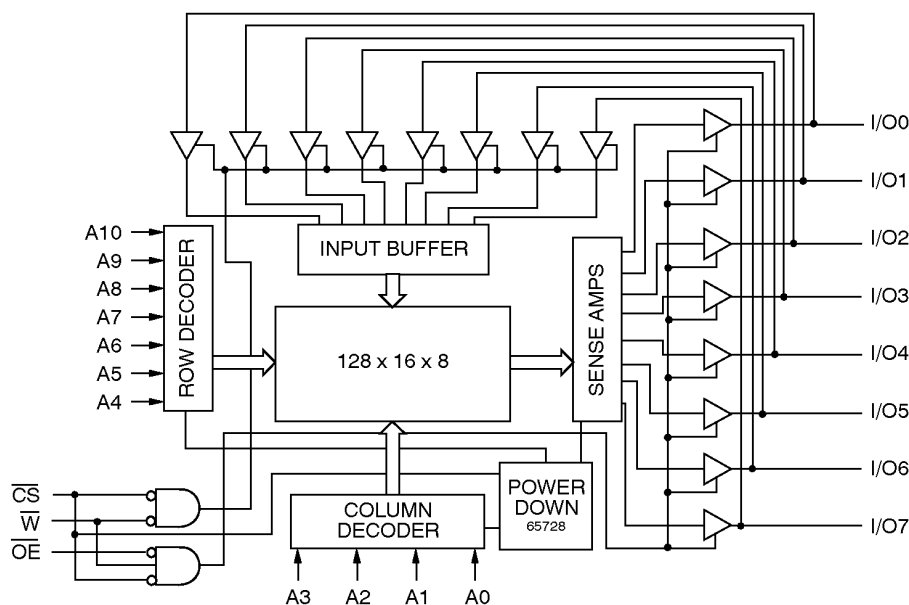
The HM 65728B is 100 % processed following the test methods of MIL STD 883 and/or ESA/SCC 9000 making it ideally suitable for military/space applications that demand superior levels of performance and reliability.

Features

- Fast Access Time
Commercial : 25/35/45/55 ns (max)
Military : 25/35/45/55 ns (max)
- Low Power Consumption Active :
550 mW (max)
Standby : 110 mW (max)
- Wide Temperature Range :
-55°C to + 125°C
- 300 and 600 Mils Width Package
- TTL Compatible Inputs and Outputs
- Asynchronous
- Capable of Withstanding Greater than 2000 V Electrostatic Discharge
- Single 5 Volt Supply

Interface

Block Diagram

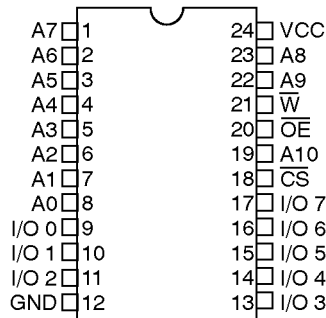


HM 65728B

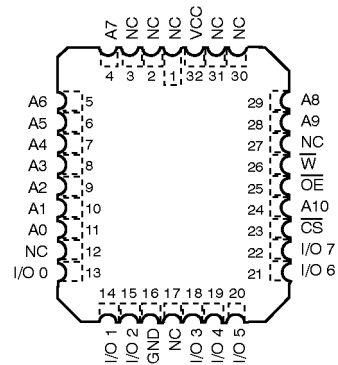
Pin Configuration

Ceramic 300 mils, 24 pins, DIL
 Plastic 300 & 600 mils, 24 pins, DIL
 SOIC 300 mils, 24 pins

LCC, 32 pins

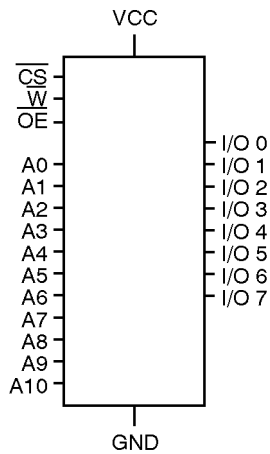


Pinout DIL/SOIC 24 pins (top view)



Pinout LCC 32 pins (top view)

Logic Symbol



Pin Names

| | | |
|--------------------------|-----------------|-----------------|
| A0–A10: Address inputs | \overline{CS} | : Chip Select |
| I/O0–I/O7 : Input/Output | \overline{OE} | : Output Enable |
| Vcc : Power | \overline{W} | : Write enable |
| Gnd : Ground | | |

Truth Table

| \overline{CS} | \overline{OE} | \overline{W} | DATA-IN | DATA-OUT | MODE |
|-----------------|-----------------|----------------|---------|----------|----------|
| H | X | X | Z | Z | Deselect |
| L | L | H | Z | Valid | Read |
| L | H | L | Valid | Z | Write |
| L | L | L | Valid | Z | Write |

Electrical Characteristics

Supply voltage to GND potential : -0.5 V to +7.0 V Storage temperature : -65°C to +150°C
 DC input voltage : -3.0 V to +7.0 V Output current into outputs (low) : 20 mA
 DC output voltage in high Z state : -0.5 V to +7.0 V Electro Static Discharge Voltage > 2000 V
 (MIL STD 883 METHOD 3015.2)

Operating Range

| | | OPERATING VOLTAGE | OPERATING TEMPERATURE |
|------------|-------|-------------------|-----------------------|
| Military | (- 2) | 5 V ± 10 % | - 55°C to + 125°C |
| Automotive | - A | 5 V ± 10 % | - 40°C to + 125°C |
| Industrial | (- 9) | 5 V ± 10 % | - 40°C to + 85°C |
| Commercial | (- 5) | 5 V ± 10 % | 0°C to + 70°C |

Recommended DC Operating Conditions

| PARAMETER | DESCRIPTION | MINIMUM | TYPICAL | MAXIMUM | UNIT |
|-----------|--------------------|---------|---------|---------|------|
| Vcc | Supply Voltage | 4.5 | 5.0 | 5.5 | V |
| Gnd | Ground | 0.0 | 0.0 | 0.0 | V |
| VIL | Input low voltage | - 0.3 | 0.0 | 0.8 | V |
| VIH | Input high voltage | 2.2 | - | 5.5 | V |

Capacitance

| PARAMETER | DESCRIPTION | MINIMUM | TYPICAL | MAXIMUM | UNIT |
|-----------|--------------------|---------|---------|---------|------|
| Cin (1) | Input capacitance | - | - | 5 | pF |
| Cout (1) | Output capacitance | - | - | 7 | pF |

Note : 1. TA = 25°C, f = 1 MHz, Vcc = 5.0 V, these parameters are not tested.

DC Parameters

| PARAMETER | DESCRIPTION | MINIMUM | TYPICAL | MAXIMUM | UNIT |
|-----------|------------------------------|---------|---------|---------|------|
| IIX (2) | Input leakage current | - 10.0 | - | 10.0 | µA |
| IOZ (3) | Output leakage current | - 10.0 | - | 10.0 | µA |
| IOS (3) | Output short circuit current | - | - | - 300.0 | mA |
| VOL (4) | Output low voltage | - | - | 0.4 | V |
| VOH (5) | Output high voltage | 2.4 | - | - | V |

- Note :**
2. Gnd < Vin < Vcc, Gnd < Vout < Vcc Output disabled.
 3. Vcc = max, Vout = Gnd, duration of the short circuit should not exceed 30 seconds. Not more than 1 output should be shorted at one time.
 4. Vcc min, IOL = 8.0 mA.
 5. Vcc min, IOH = -4.0 mA.

Consumption for Commercial (-5) Specification

| SYMBOL | PARAMETER | 65728B H-5 | 65728B K-5 | 65728B M-5 | 65728B N-5 | UNIT | VALUE |
|-----------|---------------------------|---------------|---------------|---------------|---------------|------|-------|
| ICCSB (6) | Standby supply current | 20 | 20 | 20 | 30 | mA | max |
| ICCOP (7) | Dynamic operating current | 100 | 100 | 100 | 100 | mA | max |

Consumption for Military (-2) Automotive (-A), Industrial (-9) Specification

| SYMBOL | PARAMETER | 65728B H-2/A/9 | 65728B K-2/A/9 | 65728B M-2/A/9 | 65728B N-2/A/9 | UNIT | VALUE |
|-----------|---------------------------|-------------------|-------------------|-------------------|-------------------|------|-------|
| ICCSB (6) | Standby supply current | 40 | 30 | 30 | 30 | mA | max |
| ICCOP (7) | Dynamic operating current | 120 | 120 | 120 | 120 | mA | max |

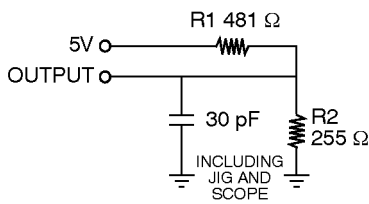
- Note :**
- $\overline{CS} \geq V_{IH}$, a pull-up resistor to Vcc on the CS input is required to keep the device deselected during Vcc power-up otherwise ICCSB will exceed values above.
 - Vcc max, Output current = 0 mA, f = max, Vin = Vcc or Gnd.

AC Parameters

AC Conditions

Input pulse levels : Gnd to 3.0 V Input timing reference levels : 1.5 V
 Input rise : 5 ns Output loading IOL/IOH (see figure 1a and 1b) : +30 pF

AC Test Loads and Waveforms



**Figure 1
a**

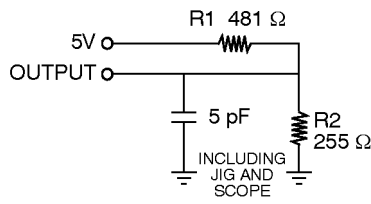


Figure 1 b

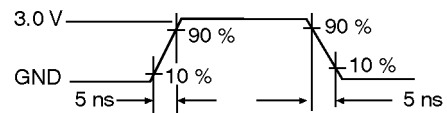
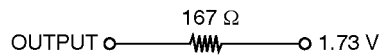


Figure 2

Equivalent to : THEVENIN EQUIVALENT



Write Cycle : Commercial (-5) Specification

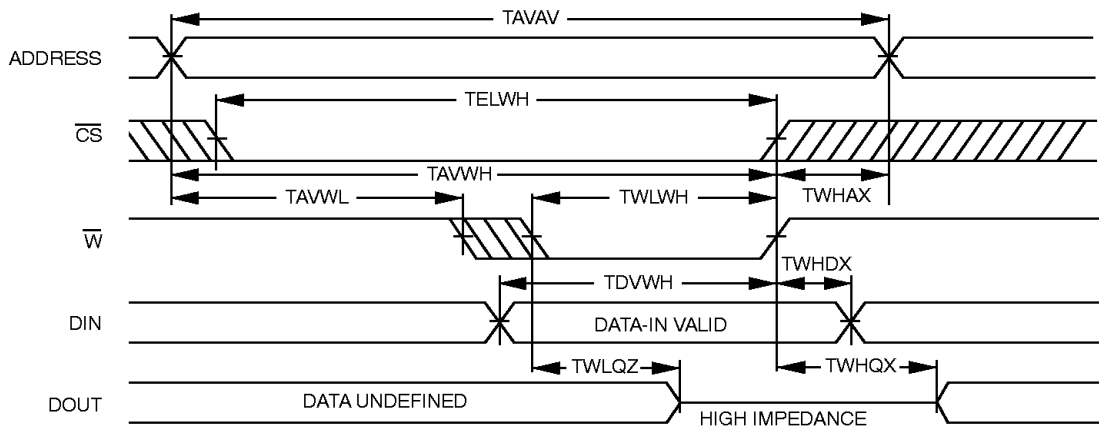
| SYMBOL | PARAMETER | 65728B H-5 | 65728B K-5 | 65728B M-5 | 65728B N-5 | UNIT | VALUE |
|--------------|----------------------------------|---------------|---------------|---------------|---------------|------|-------|
| TAVAV | Write cycle time | 25 | 35 | 45 | 55 | ns | min |
| TAVWL | Address set-up time | 0 | 0 | 0 | 0 | ns | min |
| TAVWH | Address valid to end of write | 20 | 30 | 40 | 50 | ns | min |
| TDVWH | Data set-up time | 15 | 15 | 20 | 25 | ns | min |
| TELWH | \overline{CS} low to write end | 20 | 30 | 40 | 50 | ns | min |
| TWLQZ(8) | Write low to high Z | 10 | 15 | 15 | 20 | ns | max |
| TWLWH | Write pulse width | 20 | 20 | 20 | 30 | ns | min |
| TWHAX | Address hold to end of write | 2 | 2 | 2 | 2 | ns | min |
| TWHDX | Data hold time | 0 | 0 | 0 | 5 | ns | min |
| TWHQX (8, 9) | Write high to low Z | 3 | 0 | 0 | 0 | ns | min |
| TEHAX | Address hold end \overline{CS} | 3 | 3 | 3 | 3 | ns | min |

- Notes :**
8. The data input set up and hold timing should be referenced to the rising edge of the signal that terminates the write.
 9. At any given temperature and voltage condition, TWHQX is less than TWLQZ for all devices. These parameters are sampled and not 100 % tested.

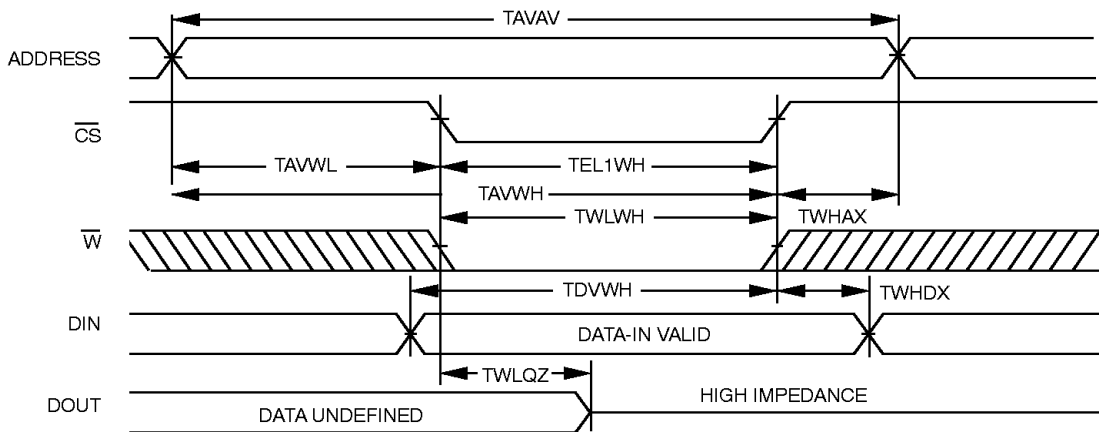
Write Cycle : Military (-2) Automotive (-A) Industrial (-9) Specification

| SYMBOL | PARAMETER | 65728B H-2 | 65728B K-2 | 65728B M-2 | 65728B N-2 | UNIT | VALUE |
|----------|----------------------------------|---------------|---------------|---------------|---------------|------|-------|
| TAVAV | Write Cycle time | 25 | 35 | 45 | 55 | ns | min |
| TAVWL | Address set-up time | 0 | 0 | 0 | 0 | ns | min |
| TAVWH | Address valid to end of write | 20 | 30 | 40 | 50 | ns | min |
| TDVWH | Data set-up time | 15 | 15 | 20 | 25 | ns | min |
| TELWH | \overline{CS} low to write end | 20 | 30 | 40 | 50 | ns | min |
| TWLQZ(8) | Write low to high Z | 10 | 15 | 15 | 20 | ns | max |
| TWLWH | Write pulse width | 20 | 20 | 25 | 30 | ns | min |
| TWHAX | Address hold to end of write | 2 | 2 | 2 | 2 | ns | min |
| TWHDX | Data hold time | 5 | 5 | 5 | 5 | ns | min |
| TEHAX | Address hold end \overline{CS} | 3 | 3 | 3 | 3 | ns | min |

Write Cycle 1 (\overline{W} Controlled)



Write Cycle 2 (\overline{CS} controlled)



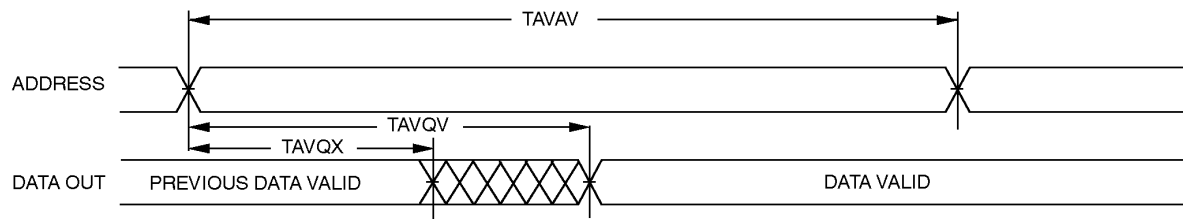
Read Cycle : Commercial (-5) Specification

| SYMBOL | PARAMETER | 65728B H-5 | 65728B K-5 | 65728B M-5 | 65728B N-5 | UNIT | VALUE |
|--------|------------------------------------|---------------|---------------|---------------|---------------|------|-------|
| TAVAV | Read cycle time | 25 | 35 | 45 | 55 | ns | min |
| TAVQV | Address access time | 25 | 35 | 45 | 55 | ns | max |
| TAVQX | Address valid to low Z | 5 | 5 | 5 | 5 | ns | min |
| TELQV | Chip-select access time | 25 | 35 | 45 | 55 | ns | max |
| TELQX | \overline{CS} low to low Z | 5 | 5 | 5 | 5 | ns | min |
| TEHQZ | \overline{CS} high to high Z | 12 | 15 | 20 | 20 | ns | max |
| TELIC | \overline{CS} low to power up | 0 | 0 | 0 | 0 | ns | min |
| TEHICL | \overline{CS} high to power down | 15 | 20 | 25 | 25 | ns | max |
| TGLQV | Output enable access time | 15 | 15 | 20 | 25 | ns | max |
| TGLQX | \overline{OE} low to low Z | 2 | 0 | 0 | 0 | ns | min |
| TGHQZ | \overline{OE} high to high Z | 10 | 15 | 15 | 20 | ns | max |

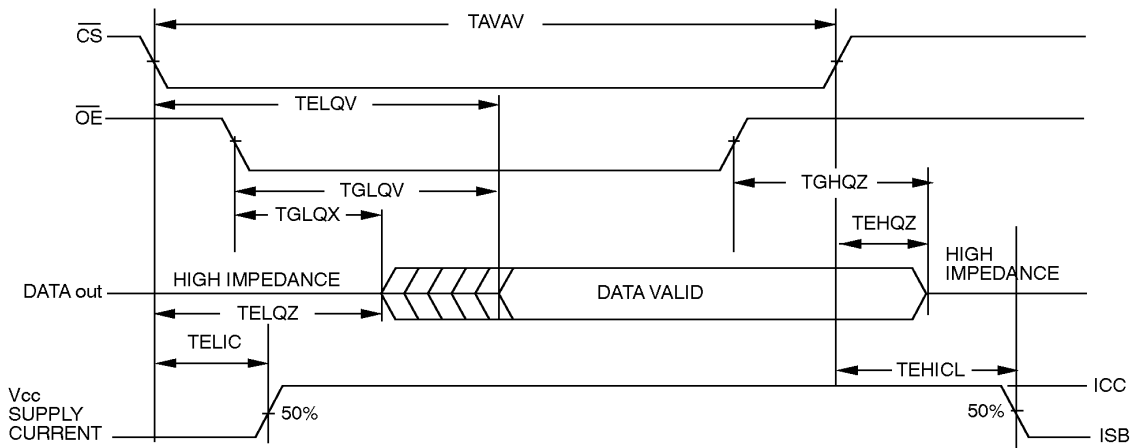
Read Cycle : Military (-2) Automotive (-A) Industrial (-9) Specification

| SYMBOL | PARAMETER | 65728B H-2 | 65728B K-2 | 65728B M-2 | 65728B N-2 | UNIT | VALUE |
|--------|------------------------------------|---------------|---------------|---------------|---------------|------|-------|
| TAVAV | Read cycle time | 25 | 35 | 45 | 55 | ns | min |
| TAVQV | Address access time | 25 | 35 | 45 | 55 | ns | max |
| TAVQX | Address valid to low Z | 5 | 5 | 5 | 5 | ns | min |
| TELQV | Chip-select access time | 25 | 35 | 45 | 55 | ns | max |
| TELQX | \overline{CS} low to low Z | 5 | 5 | 5 | 5 | ns | min |
| TEHQZ | \overline{CS} high to high Z | 12 | 15 | 20 | 20 | ns | max |
| TELIC | \overline{CS} low to power up | 0 | 0 | 0 | 0 | ns | min |
| TEHICL | \overline{CS} high to power down | 20 | 20 | 25 | 25 | ns | max |
| TGLQV | Output enable access time | 15 | 15 | 20 | 25 | ns | max |
| TGLQX | \overline{OE} low to low Z | 0 | 0 | 0 | 0 | ns | min |
| TGHQZ | \overline{OE} high to high Z | 12 | 15 | 15 | 20 | ns | max |

Read Cycle nb 1



Read Cycle nb 2



Ordering Information

| PACKAGE | | DEVICE TYPE | GRADE | LEVEL |
|----------------------------------|----------|-------------------------------|-----------|----------------------------------|
| HM | 3 | 65728B | H | -5 : R |
| 0 – Chip form | | 8 k × 8 high speed static RAM | | -2 : Military |
| 1 – Ceramic 24 pins | | | | -5 : Commercial |
| 3 – Plastic 24 pins 300 mils | | | | -6 : 100% 25°C Probe |
| 3E – Plastic 24 pins 600 mils | | | | -9 : Industrial |
| 4 – LCC 32 pins | | | | -A : Automotive |
| T – SOIC 24 pins 300 mils | | | | /883 : MIL STD 883 Class B or S |
| | | | H = 25 ns | DB : Dice Military program |
| | | | K = 35 ns | R : Tape & Reel option |
| | | | M = 45 ns | RD : Tape & Reel/Dry pack option |
| | | | N = 55 ns | D : Dry pack option |

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