



High-Speed CMOS 64Kx4 SRAM with Common I/O

QS86440

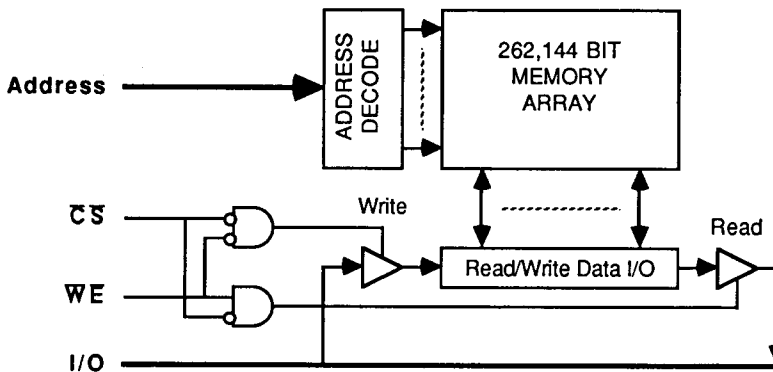
FEATURES/BENEFITS

- High Speed Access and Cycle times
- 12 ns/15 ns Commercial
- 15 ns/20 ns Military
- TTL compatible I/O
- Low power, high-speed QCMOS™ technology
- Military product compliant to MIL-STD-883, Class B
- 6-Transistor cell for high reliability
- Ideal for reliable, dense memory systems
- Available in 24-pin DIP, 28-pin LCC
24-pin 300 mil SOJ
- Low Standby current
- JEDEC standard pinout

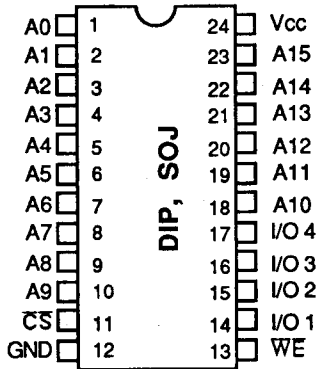
DESCRIPTION

The QS86440 is a high-speed 256K SRAM organized as 64K words of 4 bits. It is manufactured in a high-performance CMOS process, and it based on a 6-transistor cell design for high reliability of data retention. The high-speed access times of the QS86440 make it useful in cache data RAM, cache tag RAMs, high-speed scratchpad memories, look-up tables, pipelined DSP and bit-slice systems. Low operating power and excellent latch-up and ESD protection are provided.

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATIONS



ALL PINS TOP VIEW

* For LCC pinout contact factory

PIN DESCRIPTION

| Pin Name | I/O | Function |
|-------------|-----|--------------|
| A | I | Address |
| I/O1 - I/O4 | I/O | Data |
| CS | I | Chip Select |
| WE | I | Write Enable |

FUNCTION TABLE

| CS | WE | I/O | Power | Function |
|----|----|----------|---------|----------|
| H | X | High Z | Standby | Deselect |
| L | H | Data Out | Active | Read |
| L | L | Data In | Active | Write |

ABSOLUTE MAXIMUM RATINGS

Supply Voltage to Ground..... -0.5V to +7.0V
 DC Output Voltage V_O -0.5V to $V_{CC} + 0.5V$
 DC Input Voltage V_I -0.5V to $V_{CC} + 0.5V$
 AC Input Voltage (for a pulse width ≤ 20 ns)..... -3.0V
 DC Output Current Max. sink current/pin..... 50 mA
 DC Output Current Max. source current/pin..... 30 mA
 TBIAS Temperature Under Bias, COM..... -65° to +125°C
 TSTG Storage Temperature, COM..... -65° to +125°C
 TBIAS Temperature Under Bias, MIL..... -65° to +135°C
 TSTG Storage Temperature, MIL..... -65° to +155°C

Note: Stresses above those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent device failure. Functionality at or above these limits is not implied. Exposure to the maximum ratings for extended periods may affect reliability.

CAPACITANCE

Ta=+25°C, f=1 MHz

| Name | Description | Conditions | Typ | Max | Unit |
|------|--------------------|----------------------|-----|-----|------|
| Cin | Input Capacitance | Vin = 0 V PDIP Pkg. | 3 | 6 | pF |
| Cin | Input Capacitance | Vin = 0 V SOJ Pkg. | 2.5 | 5 | pF |
| Cout | Output Capacitance | Vout = 0 V PDIP Pkg. | | 7 | pF |
| Cout | Output Capacitance | Vout = 0 V SOJ Pkg. | | 7 | pF |

Note: Capacitance is measured at characterization but not tested at final production.

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Commercial TA = 0° C to 70°C, Vcc = 5.0V±10% Military TA = -55°C to 125° C, Vcc = 5.0V±10%

| Symbol | Parameter | Test Conditions | Commercial | | Military | | Unit |
|--------|-----------------------|---------------------------------|------------|-----|----------|-----|-------|
| | | | Min | Max | Min | Max | |
| Vih | Input HIGH Voltage | Logic High for All Inputs | 2.2 | 6.0 | 2.2 | 6.0 | Volts |
| Vil | Input LOW Voltage (1) | Logic Low for All Inputs | | 0.8 | | 0.8 | |
| Voh | Output HIGH Voltage | Ioh = -4 mA, Vcc = MIN | 2.4 | | 2.4 | | |
| Vol | Output LOW Voltage | Iol = 8 mA, Vcc = MIN | | 0.4 | | 0.4 | |
| Ii | Input Leakage | Vcc = MAX, Vin = GND to Vcc | | 5 | | 10 | µA |
| Io | Output Leakage | Vcc = MAX, Vout = GND to Vcc | | 5 | | 10 | |

Notes:

1. Transient inputs with Vil not more negative than -3.0 volts are permitted for pulse widths < 20 ns.

POWER SUPPLY CHARACTERISTICS

Commercial TA = 0° C to 70°C, Vcc = 5.0V±10% Military TA = -55°C to 125° C, Vcc = 5.0V±10%
 Vlc = 0.2 V, Vhc = Vcc - 0.2V At f = 0, no input lines switch; At f = f MAX, RAM is cycling at 1 / t RC

| Symbol | Parameter | -12 | -15 | | -20 | | Unit |
|------------------|--|-----|-----|-----|-----|--|------|
| | | C | C | M | M | | |
| Icc | Dynamic Operating Current, Vcc = MAX Outputs open CS ≤ Vil, f = f MAX | 170 | 165 | 175 | 165 | | mA |
| I _{sb} | TTL Standby Current, Vcc = MAX Outputs open CS ≥ Vih, f = f MAX | 90 | 90 | 100 | 100 | | |
| I _{sb1} | Full Standby Current, Vcc = MAX Outputs open CS ≥ Vhc, f = 0 Vin ≤ Vlc or Vin ≥ Vhc | 15 | 15 | 20 | 20 | | |

SWITCHING CHARACTERISTICS OVER OPERATING RANGE

Commercial TA = 0° C to 70°C, Vcc = 5.0V±10% Military TA = -55°C to 125° C, Vcc = 5.0V±10%
 See Read Timing Diagrams. All values in nanoseconds

| Symbol | Parameter | -12(3) | | -15(3) | | -20 | |
|-------------------|-------------------------------------|--------|-----|--------|-----|-----|-----|
| | | Min | Max | Min | Max | Min | Max |
| READ CYCLE | | | | | | | |
| t RC | Read Cycle Time (1) | 12 | - | 15 | - | 19 | - |
| t AA | Address Access Time | - | 12 | - | 15 | - | 19 |
| t ACS | Chip Select Access Time | - | 12 | - | 15 | - | 19 |
| t OH | Output Hold from Address Change | 2 | - | 2 | - | 3 | - |
| t LZ | Chip Select to Output in Low Z (2) | 2 | - | 2 | - | 2 | - |
| t HZ | Chip Select to Output in High Z (2) | - | 5 | - | 7 | - | 8 |
| t PU | Chip Select to Power Up Time (2) | 0 | - | 0 | - | 0 | - |
| t PD | Chip Select to Power Down Time (2) | - | 12 | - | 15 | - | 19 |

Notes:

- 1) See Test Circuit and Waveforms. Minimums guaranteed but not tested.
- 2) This parameter is guaranteed by design but not tested.
- 3) For Vcc±5%. Commercial Only

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QS86440

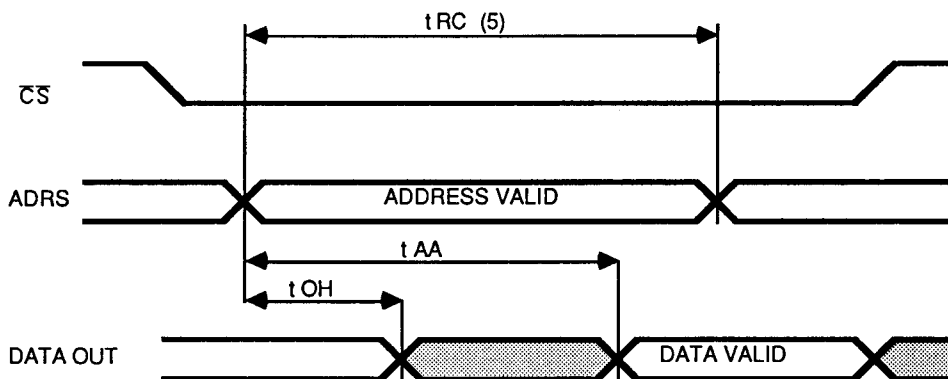
Commercial TA = 0° C to 70° C, Vcc = 5.0V±10% Military TA = -55° C to 125° C, Vcc = 5.0V±10%
See Write Timing Diagrams. All values in nanoseconds.

| Symbol | Parameter | -12(3) | | -15(3) | | -20 | |
|--------------------|---|--------|-----|--------|-----|-----|-----|
| | | Min | Max | Min | Max | Min | Max |
| WRITE CYCLE | | | | | | | |
| t _{WC} | Write Cycle Time (1) | 12 | - | 15 | - | 19 | - |
| t _{CW} | Chip Select Valid to End of Write | 10 | - | 13 | - | 17 | - |
| t _{AW} | Address Valid to End of Write | 10 | - | 13 | - | 17 | - |
| t _{AS} | Address Setup Time | 0 | - | 0 | - | 0 | - |
| t _{WP} | Write Pulse width | 10 | - | 12 | - | 16 | - |
| t _{WR} | Write Recovery Time | 0 | - | 0 | - | 0 | - |
| t _{DW} | Data Valid to End of Write | 6 | - | 8 | - | 10 | - |
| t _{DH} | Data Hold Time | 0 | - | 0 | - | 0 | - |
| t _{WZ} | Write Enable to Output in High Z (2) | - | 5 | - | 6 | - | 7 |
| t _{OW} | Output Active from End of Write(2) | 2 | - | 2 | - | 2 | - |

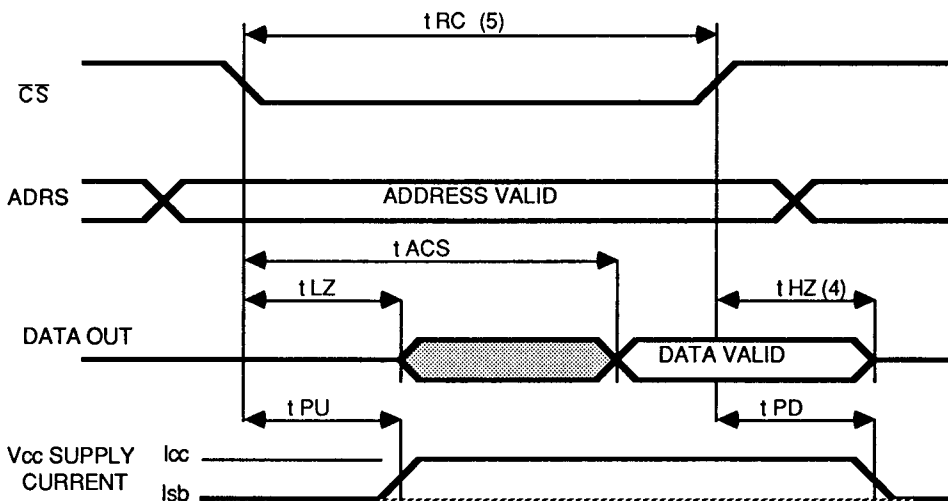
Notes:

- 1) See Test Circuit and Waveforms. Minimums guaranteed but not tested.
- 2) This parameter is guaranteed by design but not tested.
- 3) For Vcc±5% Commercial Only

TIMING WAVEFORMS - READ CYCLE NO. 1 (1,2)



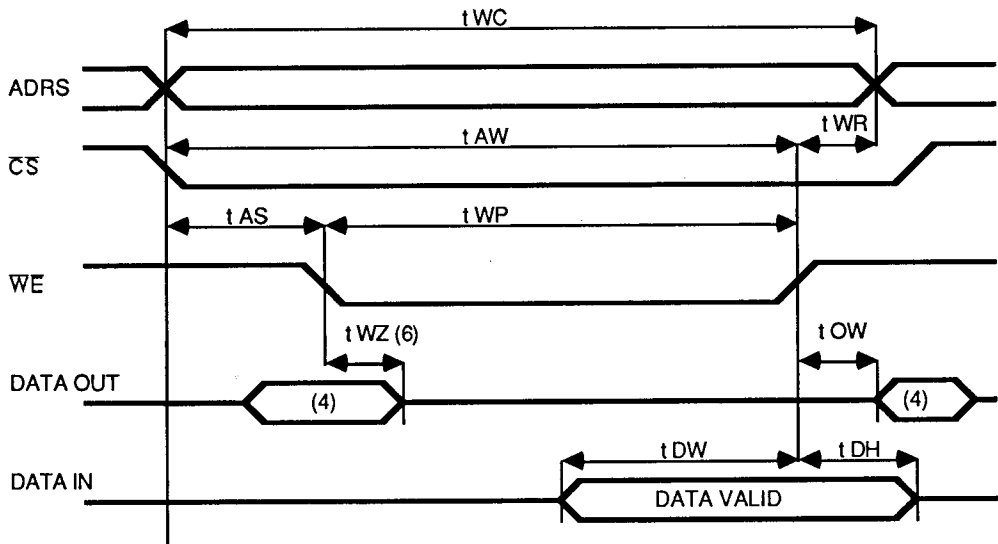
TIMING WAVEFORMS - READ CYCLE NO. 2 (1,3)



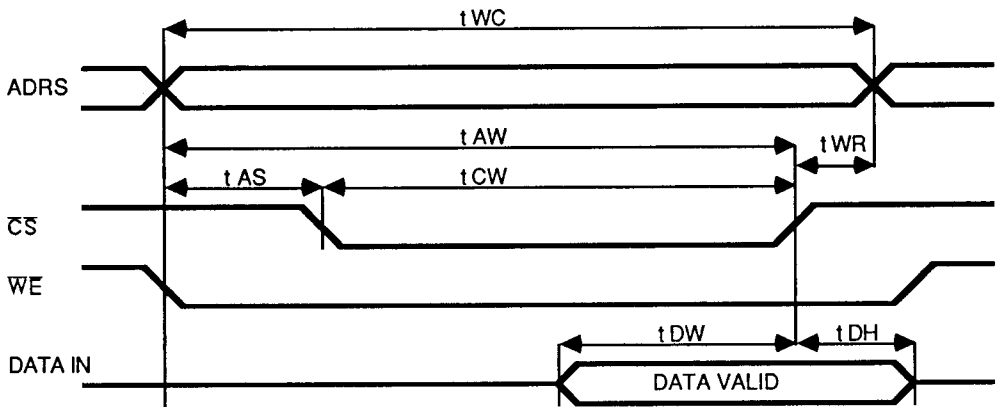
Notes:

1. \overline{WE} is high for Read cycle.
2. \overline{CS} is low for Read cycle #1.
3. Address is valid to or coincident with \overline{CS} transition time for Read Cycle #2.
4. Transition to Hi-Z is measured ± 200 mV change from the prior steady state voltage.
5. All read timings are referenced from the last valid address to the first transitioning address.

TIMING WAVEFORMS-WRITE CYCLE No. 1 (1,2,3 WE controlled timing)



TIMING WAVEFORMS-WRITE CYCLE No. 2 (1,2,3,5 CS controlled timing)



Notes:

1. WE or CS must be high during address transitions.
2. A write occurs during the overlap of a low CS and a low WE.
3. tWR is measured from the earlier of CS and WE going high to end of the write cycle.
4. During this period the I/O pins are in the output state and input signals must not be applied.
5. If the CS low transition occurs simultaneously with or after the WE low transition, the output remains in the high impedance state.
6. Transition to Hi-Z is measured ± 200 mV change from the previous steady state voltage.