# 3538
# 256 × 4 STATIC RANDOM ACCESS MEMORY

**GENERAL DESCRIPTION** – The 3538 is a 256-word by 4-bit Static Random Access Memory. It requires a single 5 V power supply, is fully TTL compatible on the inputs and outputs and requires no clocking or refresh. The Chip Select ($\overline{CS}$) controls a 3-state output which allows the outputs to be wired-OR.

The 3538 is manufactured with the n-channel Isoplanar process. It is available in the 22-pin ceramic Dual In-line Package in commercial, limited military or military temperature ranges.

- **FAST ACCESS TIME (350 ns and 450 ns)**
- **SINGLE 5 V POWER SUPPLY**
- **TTL COMPATIBLE ON INPUTS AND OUTPUTS**
- **TOTALLY STATIC – NO CLOCKS OR REFRESH**
- **3-STATE OUTPUTS**
- **FULLY EXPANDABLE**
- **FULLY DECODED**
- **22-PIN CERAMIC DUAL IN-LINE PACKAGE**

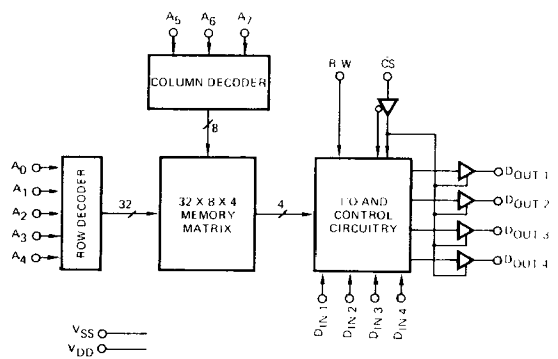
**PIN NAMES**

| | |
|---|---|
| $A_n$ | Address Inputs |
| $D_{OUTX}$ | Data Outputs |
| $D_{INX}$ | Data Inputs |
| $R/\overline{W}$ | Read/Write Control Input |
| $\overline{CS}$ | Chip Select |

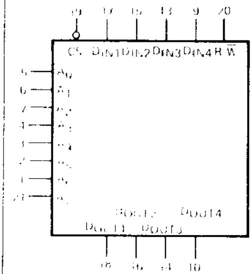
**ABSOLUTE MAXIMUM RATINGS**

| | | |
|---|---|---|
| Any Pin with Respect to $V_{SS}$ | | −0.5 V to +7.0 V |
| Storage Temperature | | −55°C to +150°C |
| Operating Temperature: | DC | 0°C to +70°C |
| | DL | −55°C to +85°C |
| | DM | −55°C to +125°C |

**BLOCK DIAGRAM**

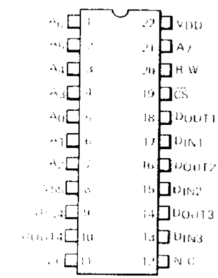



**LOGIC SYMBOL**



$V_{SS}$ = Pin 8
$V_{DD}$ = Pin 22

**CONNECTION DIAGRAM**
**DIP (TOP VIEW)**



N/C = No Connection

**TRUTH TABLE**

| $\overline{CS}$ | R/$\overline{W}$ | $D_{INX}$ | $D_{OUTX}$ | Comments |
|---|---|---|---|---|
| H | X | X | • | Chip Deselected |
| L | L | H | H | Write "1"† |
| L | L | L | L | Write "0"† |
| L | H | X | $D_n$ | Read † |

X Don't Care
• Output HIGH Impedance State
$D_n$ Data at Addressed Location
† Chip Selected

**FUNCTIONAL DESCRIPTION** – The 3538 is a 256 x 4 static RAM. When the Chip Select ($\overline{CS}$) goes HIGH, the Read/Write (R/$\overline{W}$) input is disabled and the Data Outputs ($D_{OUT}$) are forced into a high impedance state. When Chip Select goes LOW, the Read/Write is enabled.

When R/$\overline{W}$ goes LOW, data from the Data Inputs ($D_{IN}$) is written at the location specified by the Address Inputs ($A_n$). The Data Outputs will be identical to the Data Inputs during a write command. When R/$\overline{W}$ goes HIGH, the contents of the addressed location will appear at $D_{OUT}$. $D_{OUT}$ is not inverted from $D_{IN}$ in the 3538.

**DC REQUIREMENTS:** DC: $T_A$ = 0°C to +70°C; DL: $T_A$ = –55°C to +85°C; DM: $T_A$ = –55°C to +125°C

| SYMBOL | PARAMETER | DC | | DL | | DM | | UNITS | CONDITIONS |
|---|---|---|---|---|---|---|---|---|---|
| | | MIN | MAX | MIN | MAX | MIN | MAX | | |
| $V_{IH}$ | Input HIGH Voltage | 2.2 | $V_{DD}$ | 2.0 | $V_{DD}$ | 2.0 | $V_{DD}$ | V | $V_{SS}$ = 0 V |
| $V_{IL}$ | Input LOW Voltage | –0.5 | 0.65 | –0.5 | 0.8 | –0.5 | 0.8 | V | |
| $V_{DD}$ | Power Supply Voltage | 4.75 | 5.25 | 4.50 | 5.50 | 4.50 | 5.50 | V | |

**DC CHARACTERISTICS:** DC: $T_A$ = 0°C to +70°C; DL: $T_A$ = –55°C to +85°C; DM: $T_A$ = –55°C to +125°C
$V_{SS}$ = 0 V, $V_{DD(Min)} \leq V_{DD} \leq V_{DD(Max)}$ (Note 1)

| SYMBOL | PARAMETER | DC | | DL | | DM | | UNITS | CONDITIONS |
|---|---|---|---|---|---|---|---|---|---|
| | | MIN | MAX | MIN | MAX | MIN | MAX | | |
| $V_{OH}$ | Output HIGH Voltage | 2.2 | | 2.2 | | 2.2 | | V | $I_{OH}$ = –100 μA |
| $V_{OL}$ | Output LOW Voltage | | 0.45 | | 0.45 | | 0.45 | V | $I_{OL}$ = 1.9 mA |
| $I_{IN}$ | Input Leakage Current | | 10 | | 10 | | 10 | μA | $V_{IN} = V_{DD(Max)}$ |
| $I_{OUT}$ | Output Leakage Current | –10 | 10 | –10 | 10 | –10 | 10 | μA | $V_{OUT}$ = 0 V to $V_{DD(Max)}$ |
| $I_{DD}$ | Power Supply Current | | 60 | | 70 | | 70 | mA | $V_{IN} = V_{DD(Max)}$ |

**AC REQUIREMENTS:** DC: $T_A$ = 0°C to +70°C; DL: $T_A$ = –55°C to +85°C; DM: $T_A$ = –55°C to +125°C

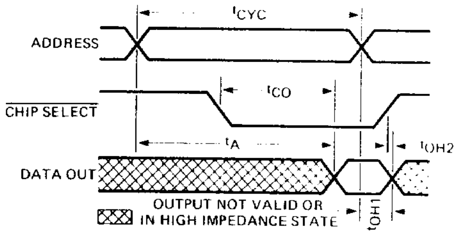
| SYMBOL | PARAMETER | 3538F DC/DL/DM | | 3538-1 DC/DL/DM | | 3538 DC/DL/DM | | UNITS | CONDITIONS |
|---|---|---|---|---|---|---|---|---|---|
| | | MIN | MAX | MIN | MAX | MIN | MAX | | |
| $t_{CYC}$ | Read or Write Cycle Time | 350 | | 450 | | 650 | | ns | $V_{DD(Min)} \leq V_{DD} \leq V_{DD(Max)}$ (See Note 1) $V_{SS}$ = 0 V |
| $t_{AW}$ | Address to Write Time | 100 | | 170 | | 200 | | ns | |
| $t_{WP}$ | Write Pulse Width | 170 | | 200 | | 350 | | ns | |
| $t_{WR}$ | Write Recovery Time | 50 | | 50 | | 50 | | ns | |
| $t_{DS}$ | Data Set-up Time | 170 | | 200 | | 350 | | ns | |
| $t_{DH}$ | Data Hold Time | 50 | | 50 | | 50 | | ns | |
| $t_{CW}$ | Chip Select to Write Time | 200 | | 250 | | 400 | | ns | |
| $t_{WC}$ | Write to Chip Select Time | 50 | | 50 | | 50 | | ns | |

**AC CHARACTERISTICS:** DC: $T_A$ = 0°C to +70°C; DL: $T_A$ = –55°C to +85°C; DM: $T_A$ = –55°C to +125°C

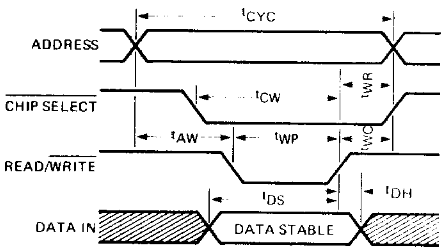
| SYMBOL | PARAMETER | 3538F DC/DL/DM | | 3538-1 DC/DL/DM | | 3538 DC/DL/DM | | UNITS | CONDITIONS |
|---|---|---|---|---|---|---|---|---|---|
| | | MIN | MAX | MIN | MAX | MIN | MAX | | |
| $t_A$ | Read Access Time | | 350 | | 450 | | 650 | ns | |
| $t_{CO}$ | Chip Select to Output Time | | 180 | | 200 | | 400 | ns | $V_{DD(Min)} \leq V_{DD} \leq V_{DD(Max)}$ (See note 1) $V_{SS}$= 0 V |
| $t_{OH1}$ | Data Valid After Address | 50 | | 50 | | 50 | | ns | |
| $t_{OH2}$ | Previous Data Valid After Chip Deselect | 0 | | 0 | | 0 | | ns | |
| $C_{IN}$ | Input Capacitance | | 5 | | 5 | | 5 | pF | $V_{IN}$ = 0 V, f = 1 MHz, |
| $C_{OUT}$ | Output Capacitance | | 10 | | 10 | | 10 | pF | $T_A$ = 25°C, $V_{SS}$ = 0 V |

NOTE 1: See DC Requirements.

READ CYCLE TIMING




WRITE CYCLE TIMING




AC CONDITIONS:

Input Levels: $V_{IL(Max)}$ to $V_{IH(Max)}$
Input Rise and Fall Times: 10 ns
Timing Measurement Reference Level: 1.5 V
Output Load: 1 TTL Gate + 100 pF