



Austin Semiconductor, Inc.

# SRAM MT5C1005

## 256K x 4 SRAM SRAM MEMORY ARRAY

### AVAILABLE AS MILITARY SPECIFICATIONS

•MIL-STD-883

### FEATURES

- High Speed: 20, 25, 35, and 45
- Battery Backup: 2V data retention
- Low power standby
- High-performance, low-power CMOS double-metal process
- Single +5V ( $\pm 10\%$ ) Power Supply
- Easy memory expansion with CE\ and OE\ options.
- All inputs and outputs are TTL compatible

### OPTIONS

- **Timing**
- 20ns access
- 25ns access
- 35ns access
- 45ns access
- 55ns access
- 70ns access

### MARKING

- 20
- 25
- 35
- 45
- 55\*
- 70\*

### Package(s)

Ceramic DIP (400 mil)	C	No. 109
Ceramic Quad LCC (contact factory)	ECW	No. 206
Ceramic LCC	EC	No. 207
Ceramic Flatpack	F	No. 303
Ceramic SOJ	DCJ	No. 501

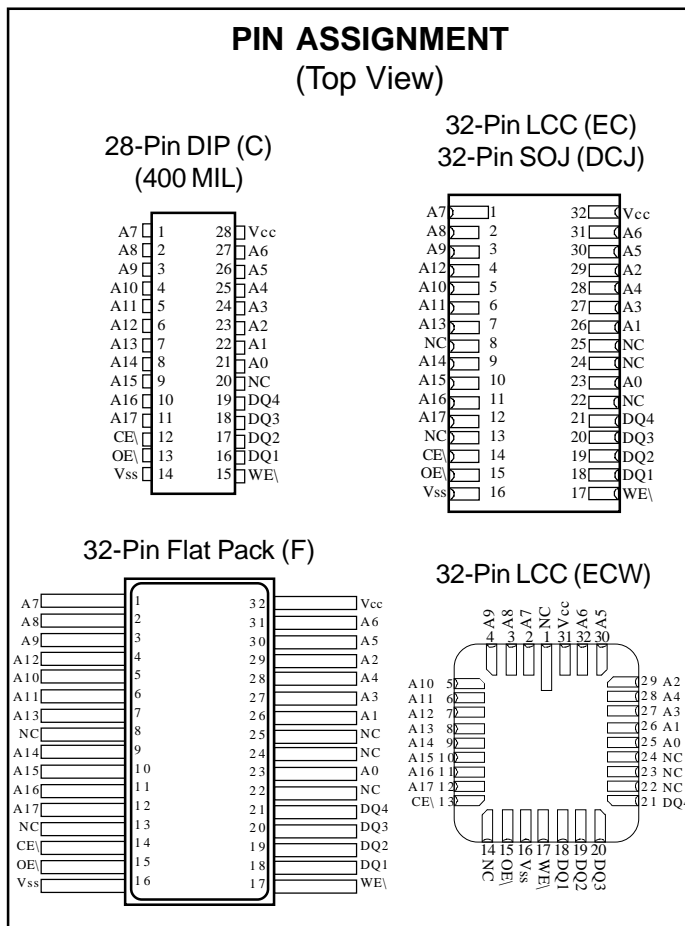
### Operating Temperature Ranges

Industrial (-40°C to +85°C)	IT
Military (-55°C to +125°C)	XT

- 2V data retention/low power L

\*Electrical characteristics identical to those provided for the 45ns access devices.

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## GENERAL DESCRIPTION

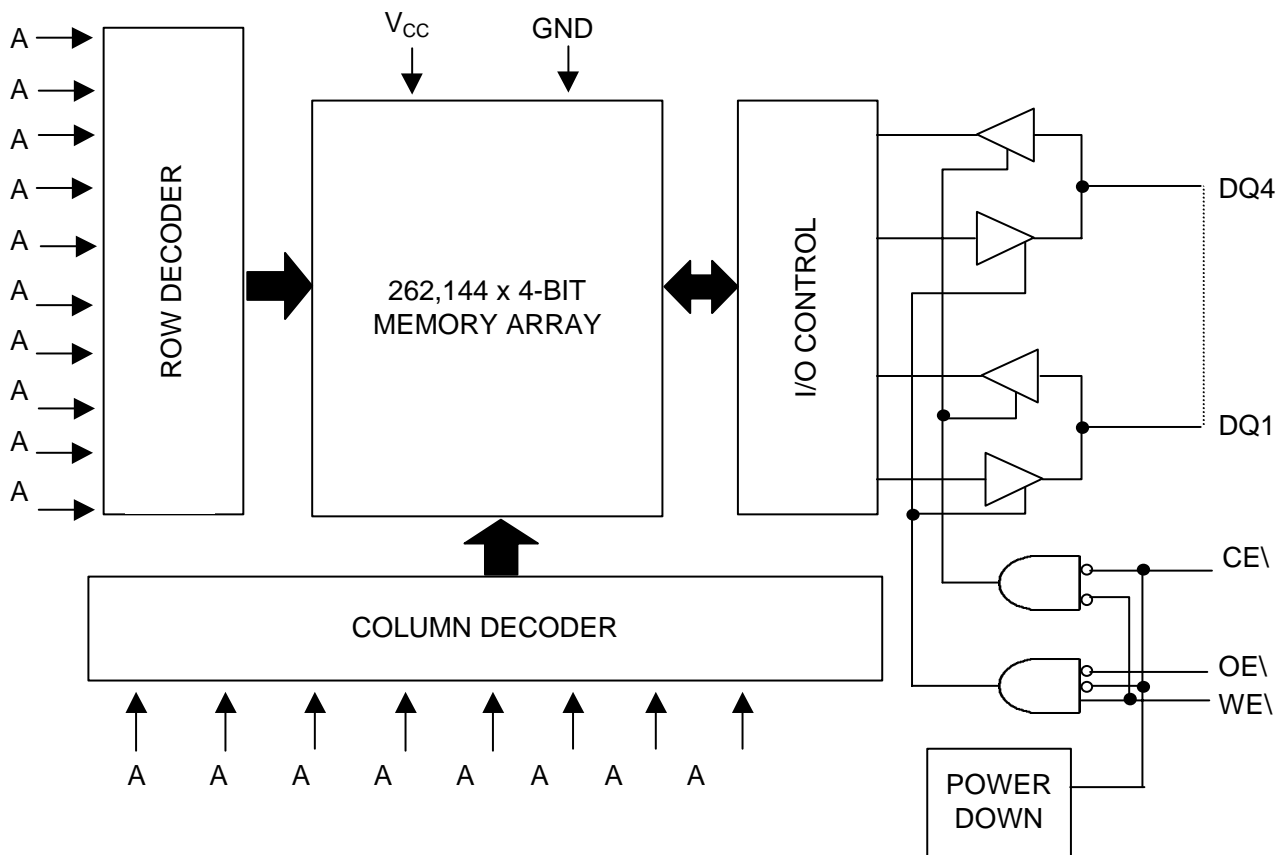
The Austin Semiconductor SRAM family employs high-speed, low power CMOS designs fabricated using double-layer metal, double-layer polysilicon technology.

For flexibility in high-speed memory applications, ASI offers chip enable (CE\ ) and output enable (OE\ ) capability. These enhancements can place the outputs in High-Z for additional flexibility in system design. Writing to these devices is accomplished when write enable (WE\ ) and CE\ inputs are both LOW. Reading is accomplished when WE\ remains HIGH while CE\ and OE\ go LOW. The devices offer a reduced power standby mode when disabled. This allows system designs to achieve low standby power requirements.

All devices operation from a single +5V power supply and all inputs and outputs are fully TTL compatible.



**FUNCTIONAL BLOCK DIAGRAM**



**TRUTHTABLE**

MODE	OE\	CE\	WE\	DQ	POWER
STANDBY	X	H	X	HIGH-Z	STANDBY
READ	L	L	H	Q	ACTIVE
READ	H	L	H	HIGH-Z	ACTIVE
WRITE	X	L	L	D	ACTIVE



**ABSOLUTE MAXIMUM RATINGS\***

Supply Voltage Range (V <sub>CC</sub> ).....	-5V to +7.0V
Storage Temperature.....	-65°C to +150°C
Voltage on any Pin Relative to V <sub>SS</sub> .....	-5V to V <sub>CC</sub> +5V
Max Junction Temperature.....	+175°C
Lead Temperature (soldering 10 seconds).....	+260°C
Power Dissipation .....	1 W

\*Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

**ELECTRICAL CHARACTERISTICS AND RECOMMENDED DC OPERATING CONDITIONS**

(-55°C ≤ T<sub>C</sub> ≤ 125°C; V<sub>CC</sub> = 5V ±10%)

DESCRIPTION	CONDITIONS	SYM	MIN	MAX	UNITS	NOTES
Input High (Logic 1) Voltage		V <sub>IH</sub>	2.2	V <sub>CC</sub> +0.5	V	1
Input Low (Logic 0) Voltage		V <sub>IL</sub>	-0.5	0.8	V	1
Input Leakage Current	0V ≤ V <sub>IN</sub> ≤ V <sub>CC</sub>	I <sub>LI</sub>	-10	10	μA	
Output Leakage Current	Output(s) disabled 0V ≤ V <sub>OUT</sub> ≤ V <sub>CC</sub>	I <sub>LO</sub>	-10	10	μA	
Output High Voltage	I <sub>OH</sub> = -4.0mA	V <sub>OH</sub>	2.4		V	1
Output Low Voltage	I <sub>OL</sub> = 8.0mA	V <sub>OL</sub>		0.4	V	1

PARAMETER	CONDITIONS	SYM	MAX				UNITS	NOTES
			-20	-25	-35	-45		
Power Supply Current: Operating	WE\, CE\ ≤ V <sub>IL</sub> ; V <sub>CC</sub> = MAX Output Open	I <sub>CC</sub>	180	180	180	180	mA	3
Power Supply Current: Standby	CE\ ≥ V <sub>IH</sub> ; All Other Inputs ≤ V <sub>IL</sub> or ≥ V <sub>IH</sub> , V <sub>CC</sub> = MAX	I <sub>SBT2</sub>	25	25	25	25	mA	
	CE\ ≥ V <sub>CC</sub> - 0.2V; V <sub>CC</sub> = MAX V <sub>IL</sub> ≤ V <sub>SS</sub> + 0.2V V <sub>IH</sub> ≥ V <sub>CC</sub> - 0.2V; f = 0 Hz*	I <sub>SBC</sub>	16	16	16	16	mA	

\* "L" version only.

**CAPACITANCE**

PARAMETER	CONDITIONS	SYM	MAX	UNITS	NOTES
Input Capacitance	V <sub>IN</sub> = 0V, T <sub>A</sub> = 25°C, f = 1MHz	C <sub>I</sub>	12	pF	4
Output Capacitance (DQ1-DQ4)	V <sub>CC</sub> = 5V	C <sub>O</sub>	14	pF	4



**ELECTRICAL CHARACTERISTICS AND RECOMMENDED AC OPERATING CONDITIONS**

(Note 5) ( $-55^{\circ}\text{C} \leq T_c \leq 125^{\circ}\text{C}$ ;  $V_{cc} = 5\text{V} \pm 10\%$ )

DESCRIPTION	SYMBOL	-20		-25		-35		-45		UNITS	NOTES
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX		
<b>READ CYCLE</b>											
READ cycle time	$t_{RC}$	20		25		35		45		ns	
Address access time	$t_{AA}$		20		25		35		45	ns	
Chip Enable access time	$t_{ACE}$		20		25		35		45	ns	
Output hold from address change	$t_{OH}$	3		3		3		3		ns	
Chip Enable to output in Low-Z	$t_{LZCE}$	3		3		3		3		ns	4, 6, 7
Chip disable to output in High-Z	$t_{HZCE}$		10		12		20		25	ns	4, 6, 7
Chip Enable to power-up time	$t_{PU}$	0		0		0		0		ns	4
Chip disable to power-down time	$t_{PD}$		20		25		35		45	ns	4
Output Enable access time	$t_{AOE}$		8		10		20		25	ns	
Output Enable to output in Low-Z	$t_{LZOE}$	0		0		0		0		ns	4, 6, 7
Output disable to output in High-Z	$t_{HZOE}$		8		10		20		25	ns	4, 6, 7
<b>WRITE CYCLE</b>											
WRITE cycle time	$t_{WC}$	20		25		35		45		ns	
Chip Enable to end of write	$t_{CW}$	15		20		30		35		ns	
Address valid to end of write	$t_{AW}$	15		20		30		35		ns	
Address setup time	$t_{AS}$	0		0		0		0		ns	
Address hold from end of write	$t_{AH}$	0		0		0		0		ns	
WRITE pulse width	$t_{WP}$	15		20		30		35		ns	
Data setup time	$t_{DS}$	12		15		20		25		ns	
Data hold time	$t_{DH}$	0		0		0		0		ns	
Write disable to output in Low-Z	$t_{LZWE}$	3		3		3		3		ns	4, 6, 7
Write Enable to output in High-Z	$t_{HZWE}$	0	8	0	10	0	15	0	20	ns	4, 6, 7



**ACTEST CONDITIONS**

Input pulse levels .....	V <sub>ss</sub> to 3.0V
Input rise and fall times .....	5ns
Input timing reference levels .....	1.5V
Output reference levels .....	1.5V
Output load .....	See Figures 1 and 2

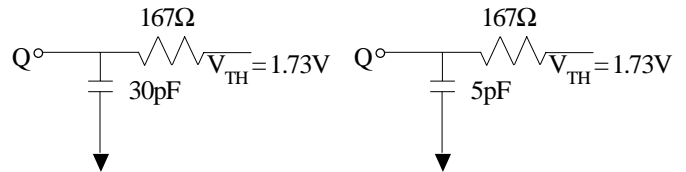


Fig. 1 Output Load Equivalent

Fig. 2 Output Load Equivalent

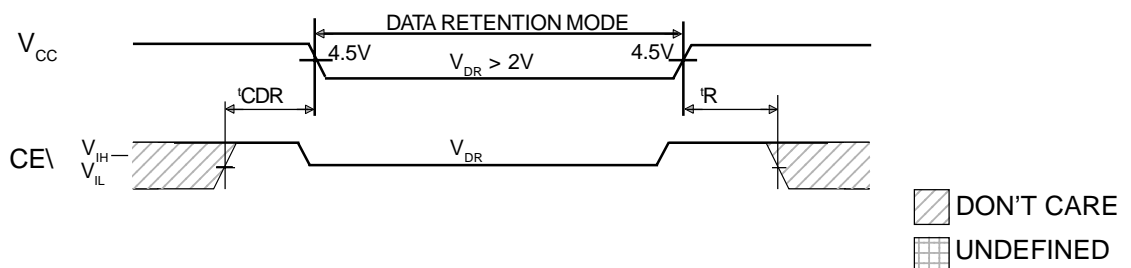
**NOTES**

- All voltages referenced to V<sub>ss</sub> (GND).
- 3V for pulse width < 20ns
- I<sub>CC</sub> is dependent on output loading and cycle rates. The specified value applies with the outputs unloaded, and  $f = \frac{1}{RC (MIN)}$  Hz.
- This parameter is guaranteed but not tested.
- Test conditions as specified with the output loading as shown in Fig. 1 unless otherwise noted.
- Minimum of 5pF for t<sub>EHQZ</sub>, t<sub>OHQZ</sub>, t<sub>ELQX</sub>, t<sub>OLQX</sub>, and t<sub>WHQX</sub>.
- At any given temperature and voltage condition, 'HZCE is less than 'LZCE, and 'HZWE is less than 'LZWE and 'HZOE is less than 'LZOE.
- WE\ is HIGH for READ cycle.
- Device is continuously selected. Chip enables and output enables are held in their active state.
- Address valid prior to, or coincident with, latest occurring chip enable.
- 'RC = Read Cycle Time.
- Chip enable (CE\ ) and write enable (WE\ ) can initiate and terminate a WRITE cycle.

**DATA RETENTION ELECTRICAL CHARACTERISTICS (L Version Only)**

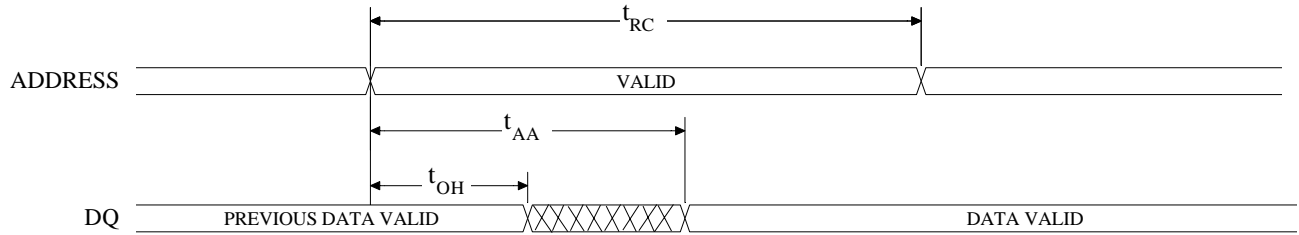
DESCRIPTION	CONDITIONS		SYM	MIN	MAX	UNITS	NOTES
V <sub>CC</sub> for Retention Data			V <sub>DR</sub>	2		V	
Data Retention Current	CE\ ≥ (V <sub>CC</sub> -0.2V) and V <sub>IN</sub> ≥ (V <sub>CC</sub> -0.2V) or ≤ 0.2V	V <sub>CC</sub> = 2V	I <sub>CCDR</sub>		5	mA	
Chip Deselect to Data Retention Time			t <sub>CDR</sub>	0	--	ns	4
Operation Recovery Time			t <sub>R</sub>	t <sub>RC</sub>		ns	4, 11

**LOW V<sub>CC</sub> DATA RETENTION WAVEFORM**

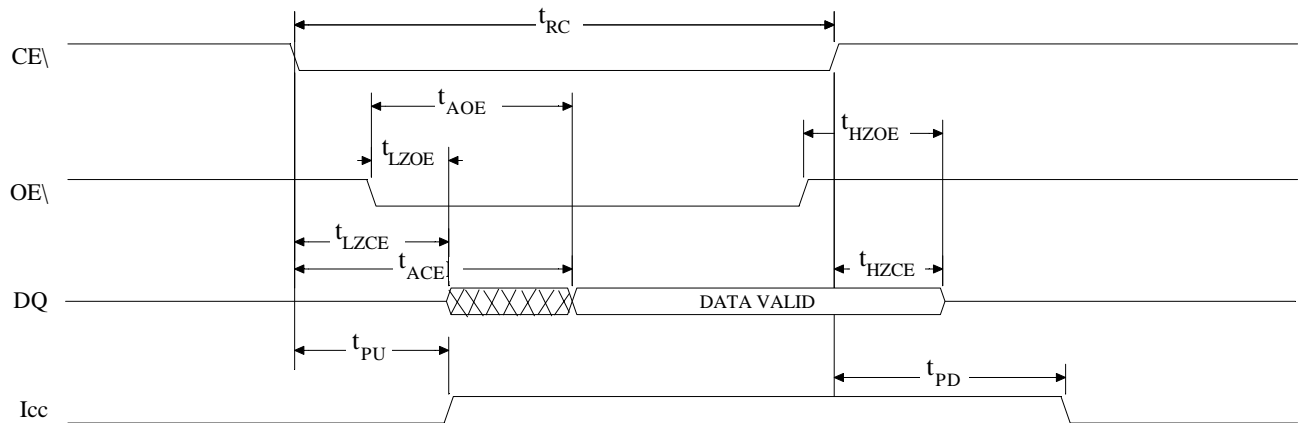






**READ CYCLE NO. 1** <sup>8,9</sup>



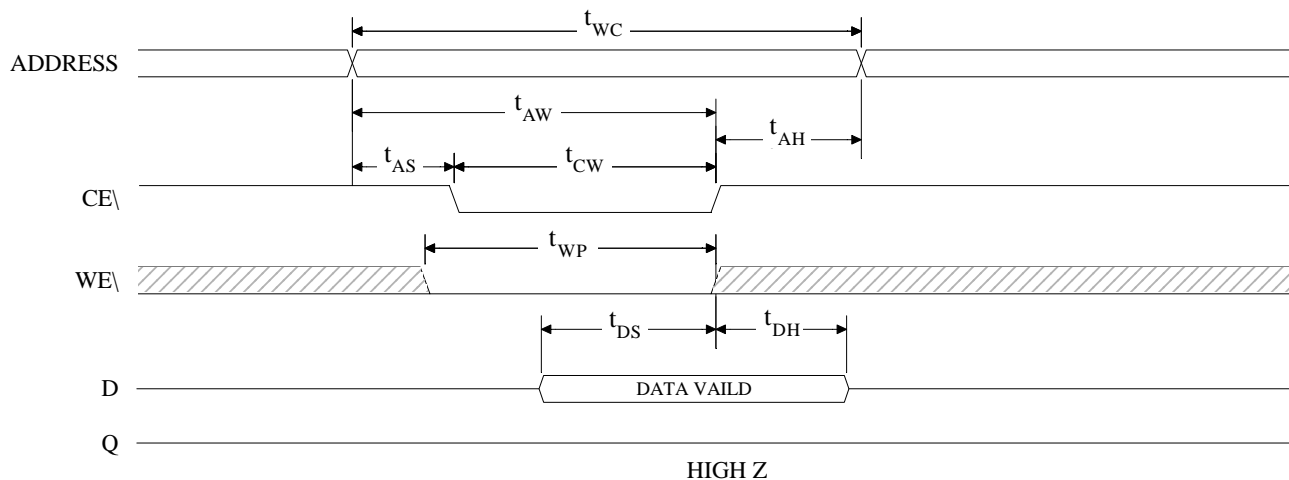
**READ CYCLE NO. 2** <sup>7, 8, 10</sup>



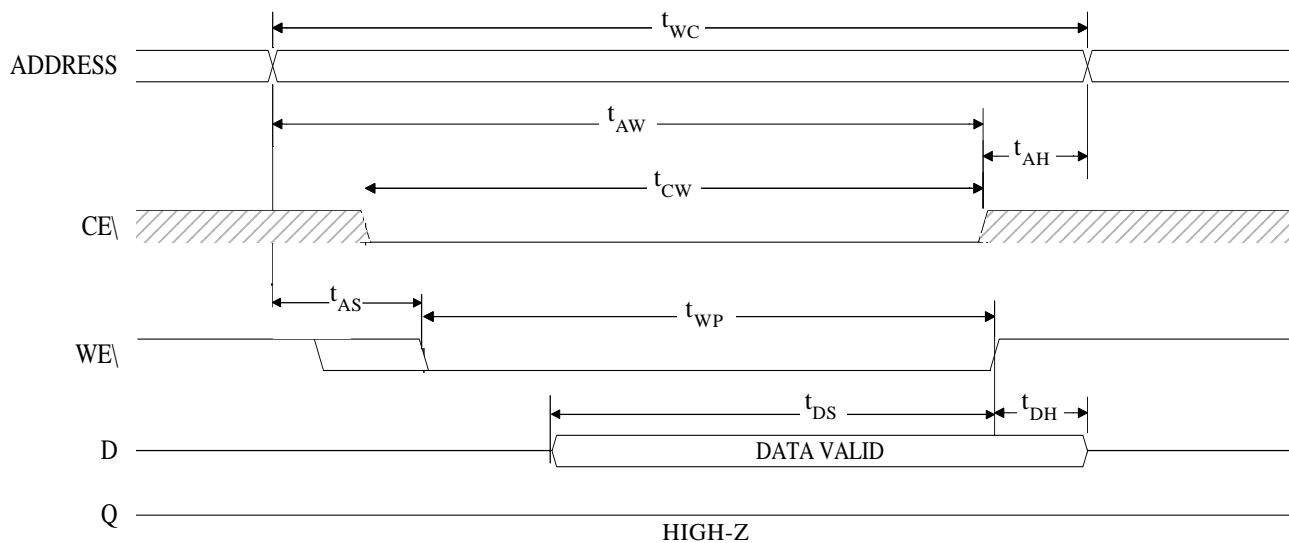
 DON'T CARE  
 UNDEFINED





**WRITE CYCLE NO. 1 <sup>12</sup>**  
**(Chip Enabled Controlled)**



**WRITE CYCLE NO. 2 <sup>7,12</sup>**  
**(Write Enabled Controlled)**



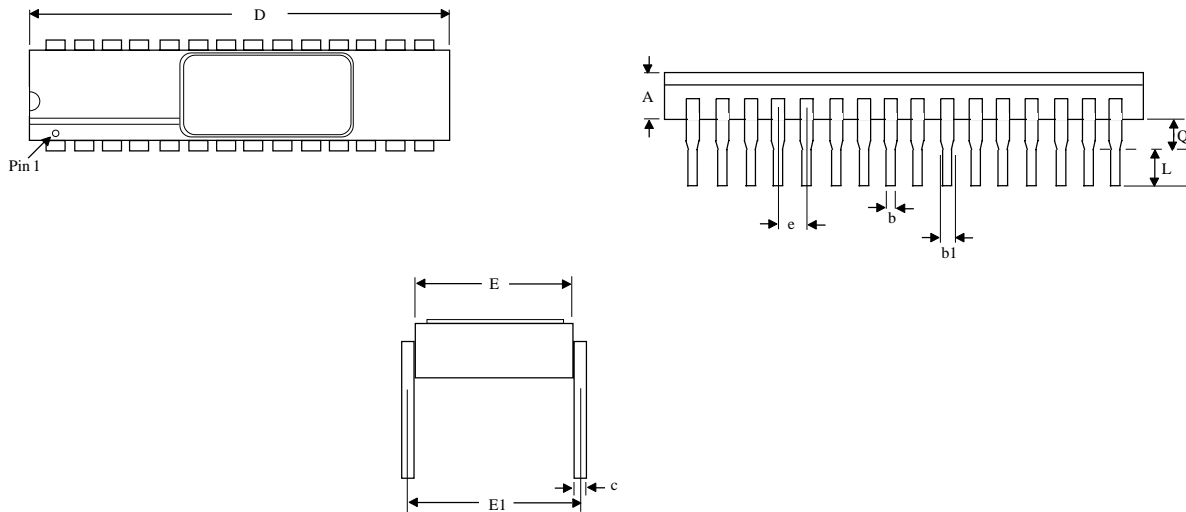
 DON'T CARE  
 UNDEFINED

**NOTE:** Output enable (OE\) is inactive (HIGH).



**MECHANICAL DEFINITIONS\***

**ASI Case #109 (Package Designator C)**



SYMBOL	ASI PACKAGE SPECIFICATIONS	
	MIN	MAX
A	0.090	0.110
b	0.016	0.020
b1	0.040	0.060
c	0.008	0.012
D	1.386	1.414
E	0.385	0.405
E1	0.390	0.410
e	0.090	0.110
L	0.125	0.175
Q	0.040	0.060

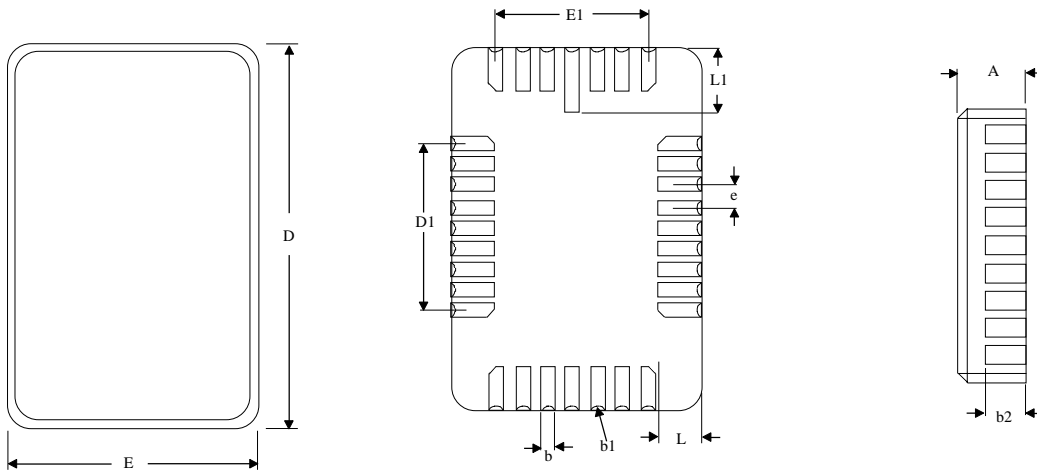
\*All measurements are in inches.





**MECHANICAL DEFINITIONS\***

**ASI Case #206 (Package Designator ECW)**



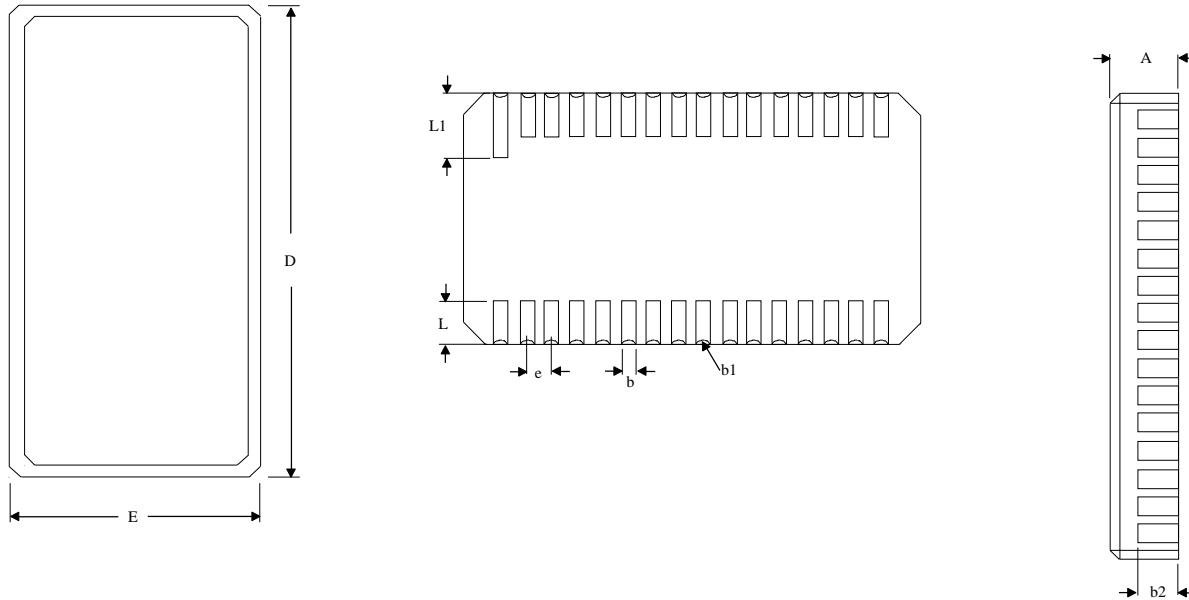
SYMBOL	ASI PACKAGE SPECIFICATIONS	
	MIN	MAX
A	0.077	0.093
b	0.022	0.028
b1	0.004	0.014
b2	0.054	0.066
D	0.742	0.758
D1	0.395	0.405
E	0.442	0.458
E1	0.295	0.305
e	0.045	0.055
L	0.045	0.055
L1	0.077	0.093

\*All measurements are in inches.



**MECHANICAL DEFINITIONS\***

ASI Case #207 (Package Designator EC)



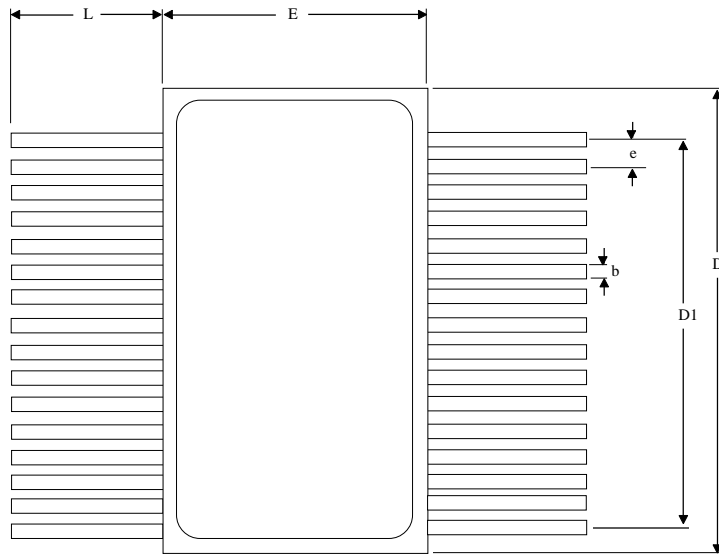
SYMBOL	ASI PACKAGE SPECIFICATIONS	
	MIN	MAX
A	0.080	0.100
b	0.022	0.028
b1	0.004	0.014
b2	0.054	0.066
D	0.815	0.835
E	0.392	0.408
e	0.045	0.055
L	0.070	0.080
L1	0.090	0.110

\*All measurements are in inches.

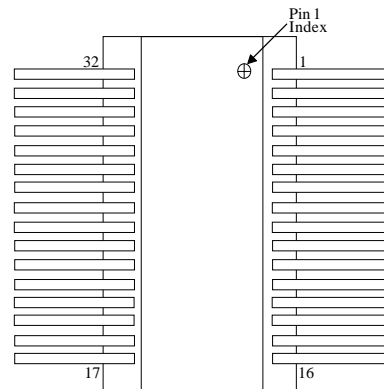


**MECHANICAL DEFINITIONS\***

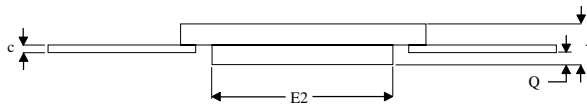
**ASI Case #303 (Package Designator F)**



**Top View**



**Bottom View**



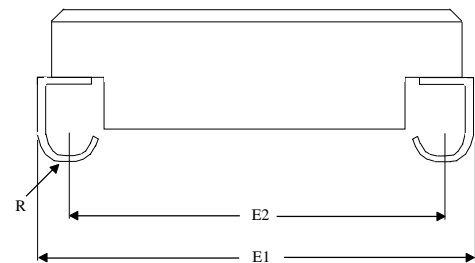
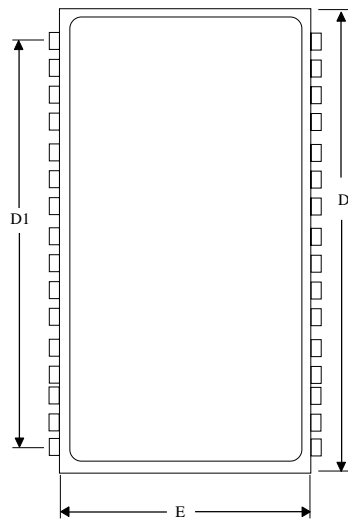
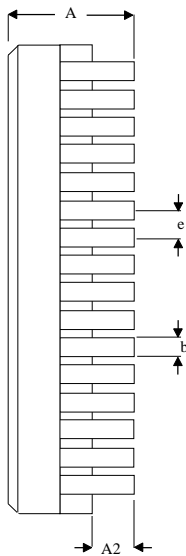
SYMBOL	ASI PACKAGE SPECIFICATIONS	
	MIN	MAX
A	---	0.125
b	0.015	0.019
c	0.004	0.006
D	0.812	0.828
D1	0.745	0.755
E	0.405	0.415
E2	0.324	0.336
e	0.045	0.055
L	0.290	0.310
Q	0.027	0.033

*\*All measurements are in inches.*



**MECHANICAL DEFINITIONS\***

**ASI Case #501 (Package Designator DCJ)**



SYMBOL	ASI PACKAGE SPECIFICATIONS	
	MIN	MAX
A	0.135	0.153
A2	0.026	0.036
b	0.015	0.019
D	0.812	0.828
D1	0.740	0.755
E	0.405	0.415
e	0.045	0.055
E1	0.435	0.445
E2	0.360	0.380
R	0.030	0.040

\*All measurements are in inches.



### ORDERING INFORMATION

EXAMPLE : MT5C1005C-20L/IT

Device Number	Package Type	Speed ns	Options**	Process
MT5C1005	C	-20	L	/*
MT5C1005	C	-25	L	/*
MT5C1005	C	-35	L	/*
MT5C1005	C	-40	L	/*
MT5C1005	C	-55	L	/*
MT5C1005	C	-70	L	/*

EXAMPLE : MT5C1005EC-45/XT

Device Number	Package Type	Speed ns	Options**	Process
MT5C1005	EC ECW	-20	L	/*
MT5C1005	EC ECW	-25	L	/*
MT5C1005	EC ECW	-35	L	/*
MT5C1005	EC ECW	-40	L	/*
MT5C1005	EC ECW	-55	L	/*
MT5C1005	EC ECW	-70	L	/*

EXAMPLE : MT5C1005F-25L/883C

Device Number	Package Type	Speed ns	Options**	Process
MT5C1005	F	-20	L	/*
MT5C1005	F	-25	L	/*
MT5C1005	F	-35	L	/*
MT5C1005	F	-40	L	/*
MT5C1005	F	-55	L	/*
MT5C1005	F	-70	L	/*

EXAMPLE : MT5C1005DCJ-70/XT

Device Number	Package Type	Speed ns	Options**	Process
MT5C1005	DCJ	-20	L	/*
MT5C1005	DCJ	-25	L	/*
MT5C1005	DCJ	-35	L	/*
MT5C1005	DCJ	-40	L	/*
MT5C1005	DCJ	-55	L	/*
MT5C1005	DCJ	-70	L	/*

**\*AVAILABLE PROCESSES**

IT = Industrial Temperature Range  
XT = Extended Temperature Range  
883C = Full Military Processing

-40°C to +85°C  
-55°C to +125°C  
-55°C to +125°C

**\*\* OPTIONS**

L = 2V Data Retention/Low Power