

**512K x 8 SRAM**  
**SRAM MEMORY ARRAY**  
**AVAILABLE AS MILITARY**  
**SPECIFICATION**

- SMD 5962-95600
- SMD 5962-95613
- MIL STD-883

**FEATURES**

- High Speed: 12, 15, 17, 20, 25, 35 and 45ns
- High-performance, low power military grade device
- Single +5V  $\pm 10\%$  power supply
- Easy memory expansion with CE\ and OE\ options
- All inputs and outputs are TTL-compatible
- Ease of upgradability from 1 Meg using the 32 pin evolutionary version.

**OPTIONS**

- Timing
  - 12ns access
  - 15ns access
  - 17ns access
  - 20ns access
  - 25ns access
  - 35ns access
  - 45ns access
- Operating Temperature Range
  - Military: -55°C to +125°C
  - Industrial: -40°C to +85°C
- Packages
  - Ceramic Dip (600 mil)
  - Ceramic Flatpack
  - Ceramic LCC
  - Ceramic SOJ
- Options
  - 2V data retention/ low power

**MARKING**

-12		
-15		
-17		
-20		
-25		
-35		
-45		
XT		
IT		
CW	No. 112	
F	No. 304	
EC	No. 209	
ECJ	No. 502	
L		

**NOTE:** Not all combinations of operating temperature, speed, data retention and low power are necessarily available. Please contact factory for availability of specific part number combinations.

**GENERAL DESCRIPTION**

The AS5C4008 is a 4 megabit monolithic CMOS SRAM, organized as a 512K x 8.

The evolutionary 32 pin device allows for easy upgrades from the 1 meg SRAM.

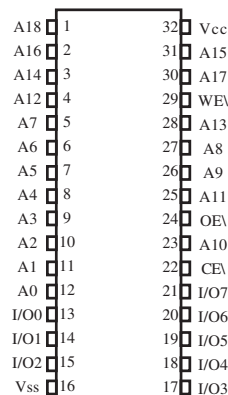
For flexibility in high-speed memory applications, ASI offers chip enable (CE\ ) and output enable (OE\ ) capabilities. These enhancements can place the outputs in High-Z for additional flexibility in system design.

Writing to these devices is accomplished when write enable (WE\ ) and CE\ inputs are both LOW. Reading is accomplished when WE\ remains HIGH and CE\ and OE\ go LOW. This allows systems designers to meet low standby power requirements.

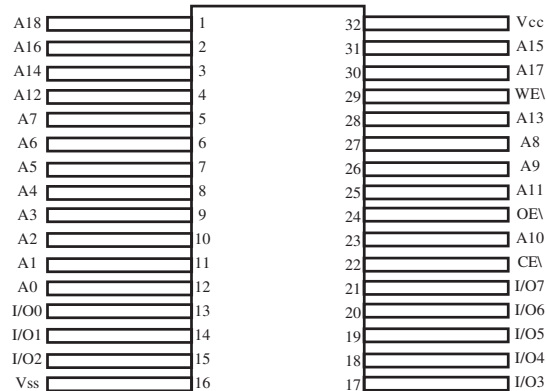
All devices operate from a single +5V power supply and all inputs are fully TTL-Compatible.

**PIN ASSIGNMENT**  
(Top View)

32-Pin DIP (CW), 32-Pin LCC (EC)  
32-Pin SOJ (ECJ)

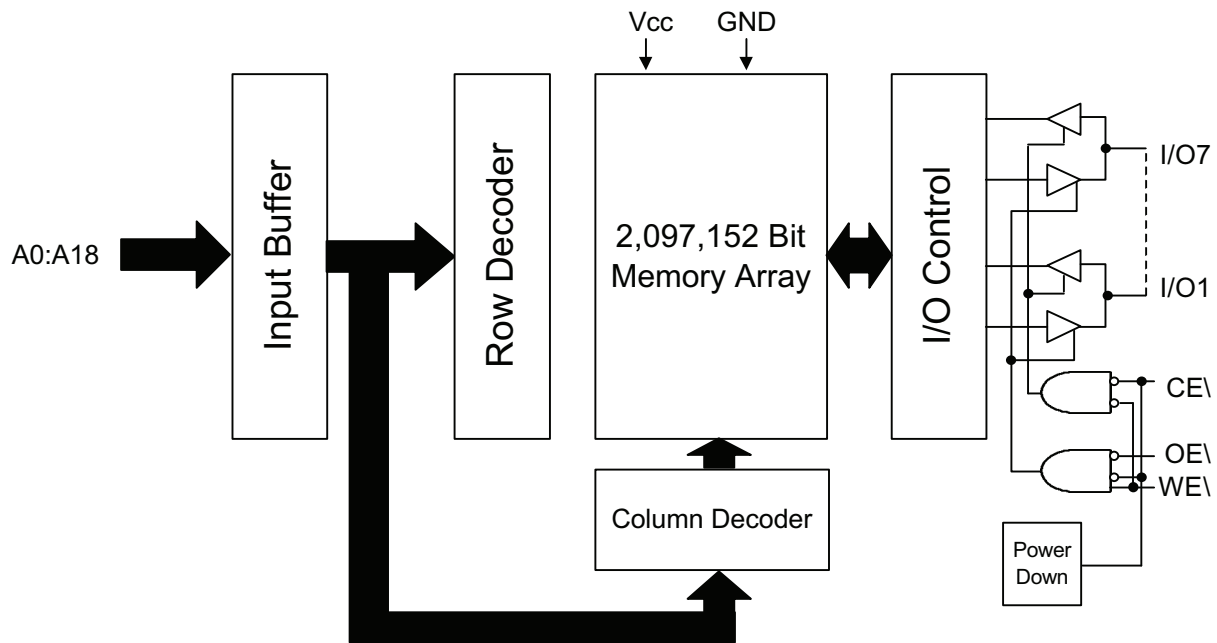


**32-Pin Flat Pack (F)**



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[www.austinsemiconductor.com](http://www.austinsemiconductor.com)

**FUNCTIONAL BLOCK DIAGRAM**



**TRUTH TABLE**

MODE	OE\ $\backslash$	CE\ $\backslash$	WE\ $\backslash$	DQ	POWER
STANDBY	X	H	X	High-Z	STANDBY
READ	L	L	H	Q	ACTIVE
NOT SELECTED	H	L	H	High-Z	ACTIVE
WRITE	X	L	L	D	ACTIVE



**ABSOLUTE MAXIMUM RATINGS\***

Voltage on V<sub>cc</sub> Supply Relative to V<sub>ss</sub>.....-5V to +7.0V  
 Storage Temperature .....-65°C to +150°C  
 Short Circuit Output Current (per I/O).....20mA  
 Voltage on any Pin Relative to V<sub>ss</sub>.....-5V to V<sub>cc</sub>+1V  
 Maximum Junction Temperature\*\* .....+150°C

\*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.

\*\* Junction temperature depends upon package type, cycle time, loading, ambient temperature and airflow.

**ELECTRICAL CHARACTERISTICS AND RECOMMENDED DC OPERATING CONDITIONS**

(-55°C ≤ T<sub>A</sub> ≤ 125°C or -40°C to +85°C; V<sub>cc</sub> = 5V ±10%)

PARAMETER	CONDITION	SYMBOL	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, 2
Input Leakage Current	0V ≤ V <sub>IN</sub> ≤ V <sub>CC</sub>	I <sub>L1</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> = -4.0 mA	V <sub>OH</sub>	2.4	--	V	1
Output Low Voltage	I <sub>OL</sub> = 8.0 mA	V <sub>OL</sub>	---	0.4	V	1
Supply Voltage		V <sub>CC</sub>	4.5	5.5	V	1

PARAMETER	CONDITIONS	SYM	MAX							UNITS	NOTES	
			-12	-15	-17	-20	-25	-35	-45			
Power Supply Current: Operating	CE\ ≤ V <sub>IL</sub> ; V <sub>CC</sub> = MAX f = MAX = 1/t <sub>RC</sub> Outputs Open	I <sub>CCSP</sub>	225	225	225	225	225	225	225	225	mA	3
	L Version Only	I <sub>CCLP</sub>	180	180	180	180	180	180	180	180	mA	
Power Supply Current: Standby	CE\ ≥ V <sub>IH</sub> ; V <sub>CC</sub> = MAX f = 0, Outputs Open	I <sub>SBTSP</sub>	60	60	60	60	60	60	60	60	mA	
	L Version Only	I <sub>SBTLP</sub>	30	30	30	30	30	30	30	30	mA	
	CE\ ≤ V <sub>CC</sub> -0.2V; V <sub>CC</sub> = MAX V <sub>IN</sub> ≤ V <sub>SS</sub> +0.2V or V <sub>IN</sub> ≥ V <sub>CC</sub> -0.2V; f = 0	I <sub>SBCSP</sub>	25	25	25	25	25	25	25	25	mA	
	L Version Only	I <sub>SBCLP</sub>	10	10	10	10	10	10	10	10	mA	

**CAPACITANCE**

PARAMETER	CONDITIONS	SYMBOL	MAX	UNITS	NOTES
Input Capacitance	T <sub>A</sub> = 25°C, f = 1MHz V <sub>IN</sub> = 0	C <sub>I</sub>	12	pF	4
Output Capacitance		C <sub>O</sub>	14	pF	4



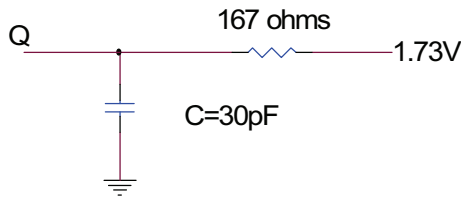
**ELECTRICAL CHARACTERISTICS AND RECOMMENDED AC OPERATING CONDITIONS**

( $-55^{\circ}\text{C} \leq T_A \leq 125^{\circ}\text{C}$  or  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ ;  $V_{CC} = 5\text{V} \pm 10\%$ )

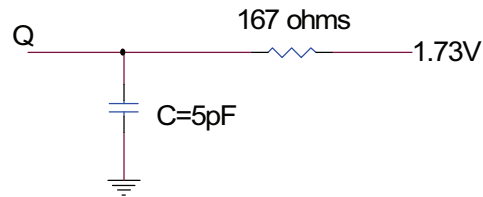
DESCRIPTION	SYM	-12		-15		-17		-20		-25		-35		-45		UNITS	NOTES
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX		
<b>READ CYCLE</b>																	
Read Cycle Time	$t_{RC}$	12		15		17		20		25		35		45		ns	
Address Access Time	$t_{AA}$		12		15		17		20		25		35		45	ns	
Chip Enable Access Time	$t_{ACE}$		12		15		17		20		25		35		45	ns	
Output Hold From Address Change	$t_{OH}$	2		2		2		2		2		2		2		ns	
Chip Enable to Output in Low-Z	$t_{LZCE}$	2		2		2		2		2		2		2		ns	4, 6, 7
Chip Disable to Output in High-Z	$t_{HZCE}$	0	6.5	0	7	0	8	0	8	0	10	0	15	0	20	ns	4, 6, 7
Output Enable Access Time	$t_{AOE}$		7		8		8		10		12		15		25	ns	
Output Enable to Output in Low-Z	$t_{LZOE}$	0		0		0		0		0		0		0		ns	4, 6, 7
Output Disable to Output in High-Z	$t_{HZOE}$	0	6.5	0	7	0	8	0	8	0	10	0	15	0	20	ns	4, 6, 7
<b>WRITE CYCLE</b>																	
WRITE Cycle Time	$t_{WC}$	12		15		17		20		25		35		45		ns	
Chip Enable to End of Write	$t_{CW}$	12		15		16		17		20		30		35		ns	
Address Valid to End of Write	$t_{AW}$	12		15		16		17		20		30		35		ns	
Address Setup Time	$t_{AS}$	0		0		0		0		0		0		0		ns	
Address Hold From End of Write	$t_{AH}$	1		0		1		1		1		1		1		ns	
WRITE Pulse Width	$t_{WP}$	12		15		16		17		20		30		35		ns	
Data Setup Time	$t_{DS}$	6.5		7		9		10		12		20		25		ns	
Data Hold Time	$t_{DH}$	0		0		0		0		0		0		0		ns	
Write Disable to Output in Low-Z	$t_{LZWE}$	0		0		0		0		0		0		0		ns	4, 6, 7
Write Enable to Output in High-Z	$t_{HZWE}$	0	6.5	0	7	0	8	0	8	0	10	0	25	0	30	ns	4, 6, 7

**AC TEST CONDITIONS**

Input pulse levels .....	V <sub>ss</sub> to 3.0V
Input rise and fall times .....	3ns
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**

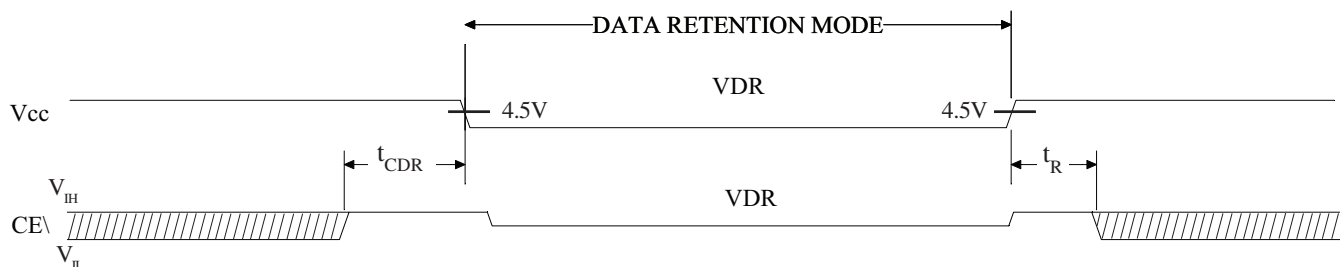
**NOTES**

1. All voltages referenced to V<sub>ss</sub> (GND).
2. -2V for pulse width < 20ns
3. I<sub>CC</sub> is dependent on output loading and cycle rates.
4. This parameter is guaranteed but not tested.
5. Test conditions as specified with the output loading as shown in Fig. 1 unless otherwise noted.
6. 'LZCE, 'LZWE, 'LZOE, 'HZCE, 'HZOE and 'HZWE are specified with CL = 5pF as in Fig. 2. Transition is measured ±200mV from steady state voltage.
7. At any given temperature and voltage condition, 'HZCE is less than 'LZCE, and 'HZWE is less than 'LZWE.
8. WE\ is HIGH for READ cycle.
9. Device is continuously selected. Chip enables and output enables are held in their active state.
10. Address valid prior to, or coincident with, latest occurring chip enable.
11. 'RC = Read Cycle Time.
12. Chip enable and write enable can initiate and terminate a WRITE cycle.
13. Output enable (OE\ ) is inactive (HIGH).
14. Output enable (OE\ ) is active (LOW).
15. ASI does not warrant functionality nor reliability of any product in which the junction temperature exceeds 150°C. Care should be taken to limit power to acceptable levels.

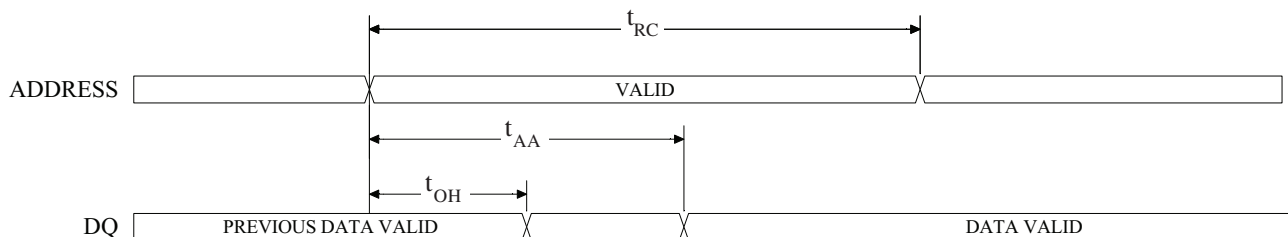
**DATA RETENTION ELECTRICAL CHARACTERISTICS (L Version Only)**

DESCRIPTION	CONDITIONS	SYMBOL	MIN	MAX	UNITS	NOTES
V <sub>CC</sub> for Retention Data	CE\ > (V <sub>CC</sub> -0.2V) VIN > (V <sub>CC</sub> -0.2V) or < 0.2V	V <sub>DR</sub>	2		V	
Data Retention Current (L Version Only)	V <sub>CC</sub> = 2V	I <sub>CCDR</sub>		4.5	mA	
Chip Deselect to Data Retention Time		t <sub>CDR</sub>	0		ns	4
Operation Recovery Time		t <sub>R</sub>	10		ms	4, 11

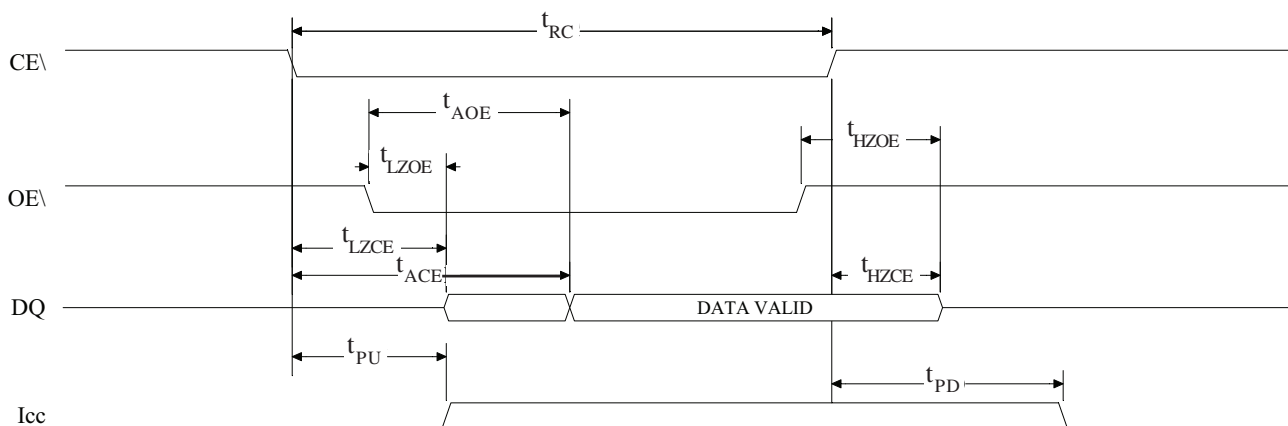
**LOW  $V_{CC}$  DATA RETENTION WAVEFORM**



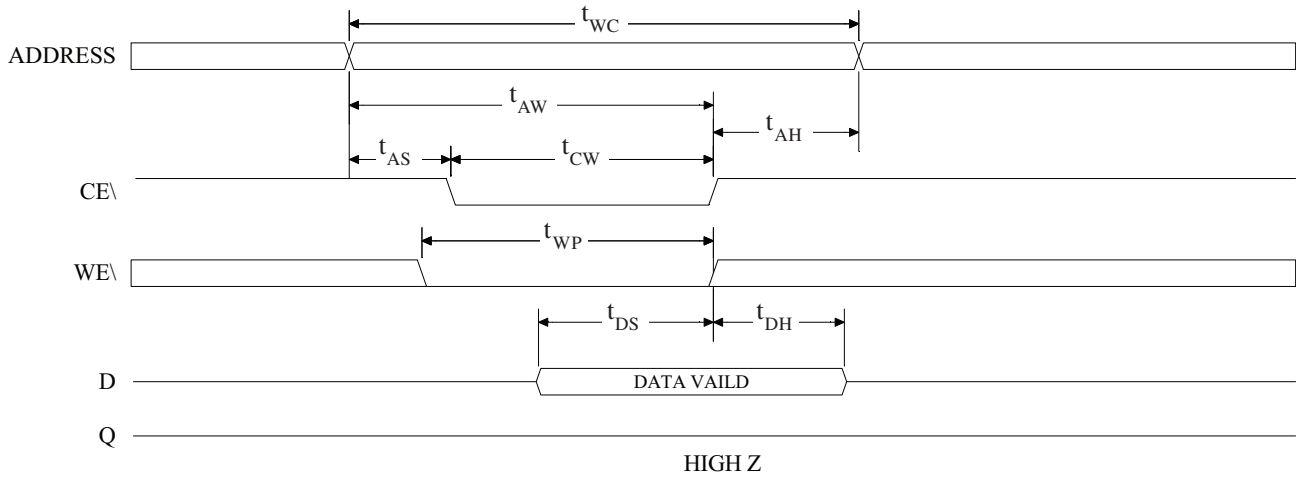
**READ CYCLE NO. 1 <sup>8,9</sup>**  
(Write Enabled Controlled)



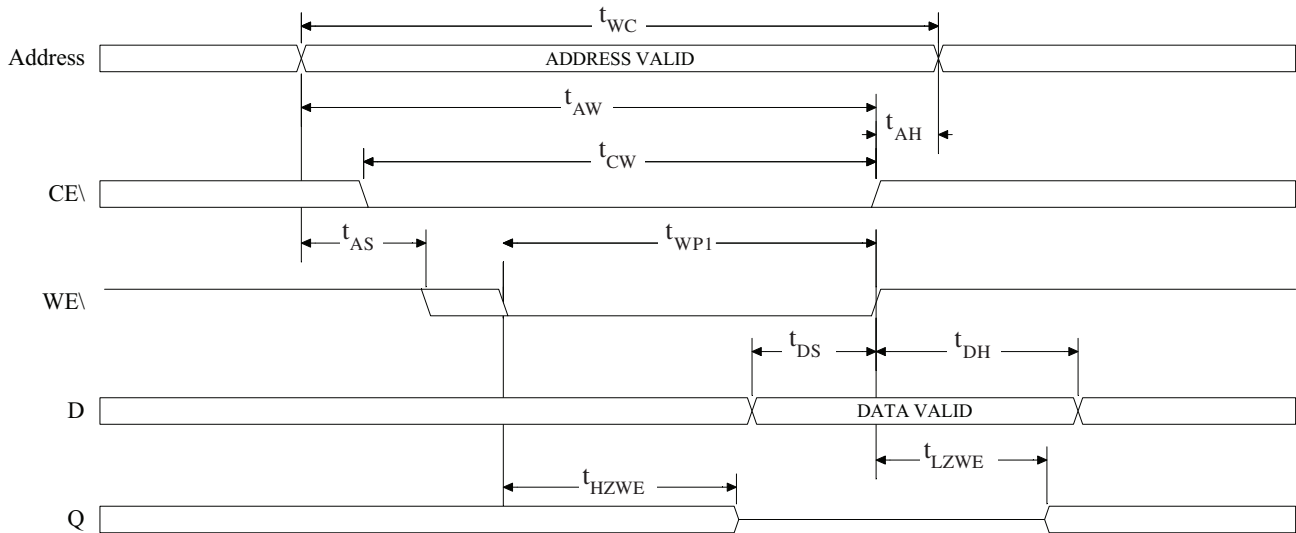
**READ CYCLE NO. 2 <sup>7,8,10</sup>**  
(Write Enabled Controlled)



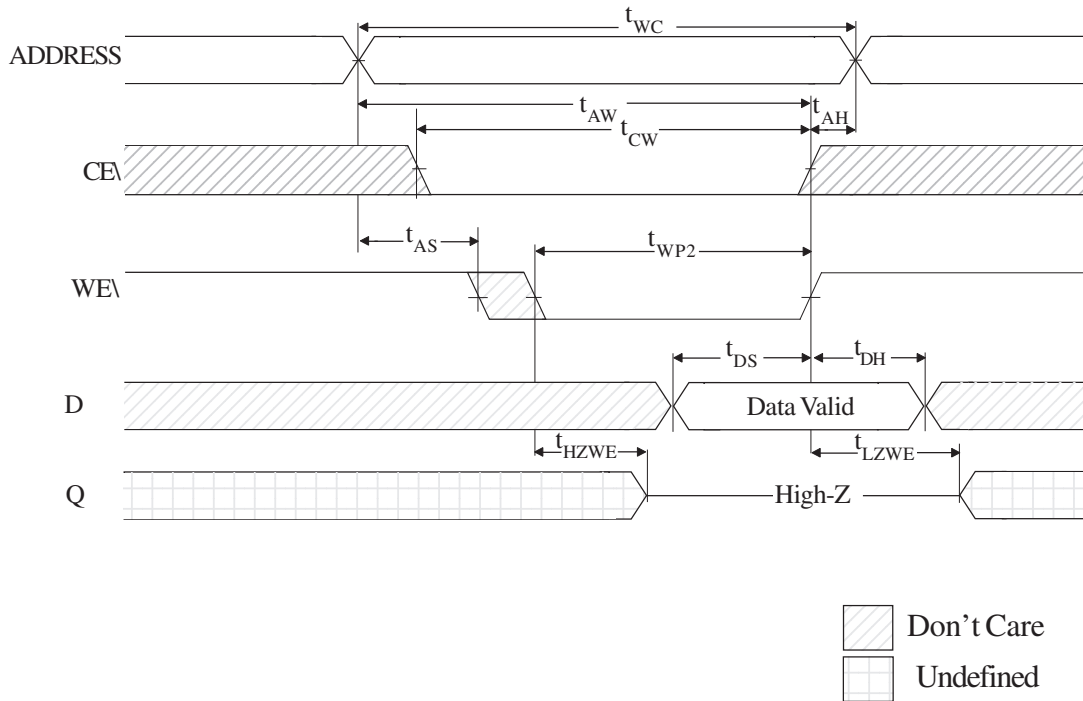
**WRITE CYCLE NO. 1** <sup>12</sup>  
(Chip Enabled Controlled)



**WRITE CYCLE NO. 2** <sup>12, 13</sup>  
(Write Enabled Controlled)

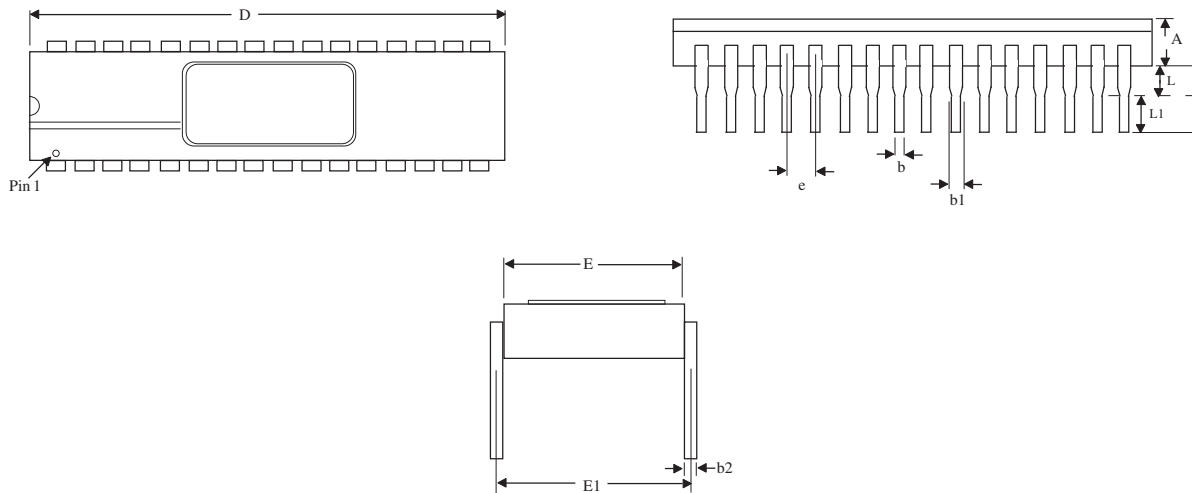


**WRITE CYCLE NO. 37, 12, 14**  
(Write Enable Controlled)



**MECHANICAL DEFINITION\***

**ASI Case #112 (Package Designator CW)  
SMD 5962-95600, Case Outline X**



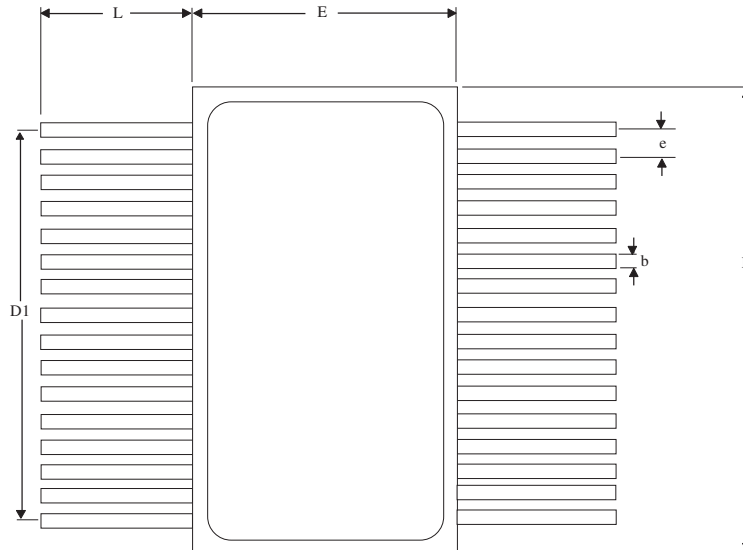
SYMBOL	SMD Specifications	
	MIN	MAX
A	---	0.225
b	0.014	0.026
b1	0.045	0.065
b2	0.008	0.018
D	---	1.680
E	0.510	0.620
e	0.100 BSC	
E1	0.600 BSC	
L1	0.125	0.200
L	0.015	0.070

**NOTE:** These dimensions are per the SMD. ASI's package dimensional limits may differ, but they will be within the SMD limits.

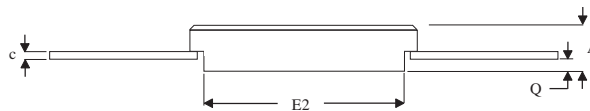
\*All measurements are in inches.

**MECHANICAL DEFINITION\***

**ASI Case #304 (Package Designator F)**  
**SMD 5962-95600, Case Outline 9**



**Top View**



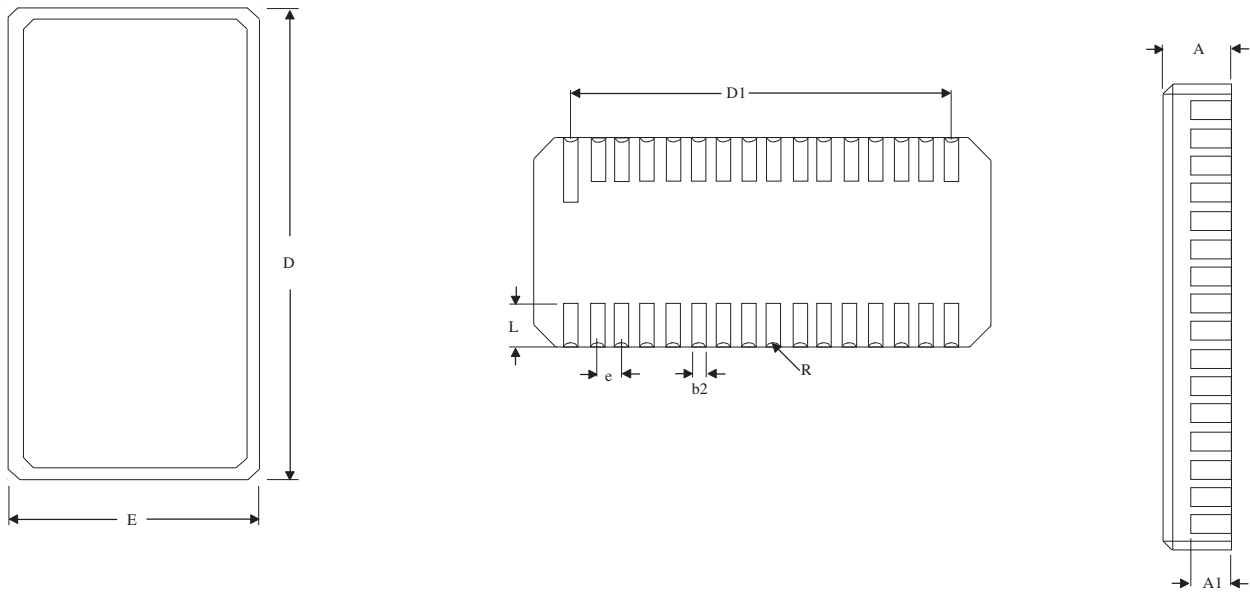
SYMBOL	SMD SPECIFICATIONS	
	MIN	MAX
A	0.096	0.114
b	0.008	0.019
c	0.003	0.008
D	0.816	0.838
D1	0.742	0.758
E	0.419	0.460
E2	0.345	0.427
e	0.050 BSC	
L	0.290	0.310
Q	0.024	0.038

**NOTE:** *These dimensions are per the SMD. ASI's package dimensional limits may differ, but they will be within the SMD limits.*

\*All measurements are in inches.

**MECHANICAL DEFINITION\***

ASI Case #209 (Package Designator EC)  
SMD 5962-95600, Case Outline Z



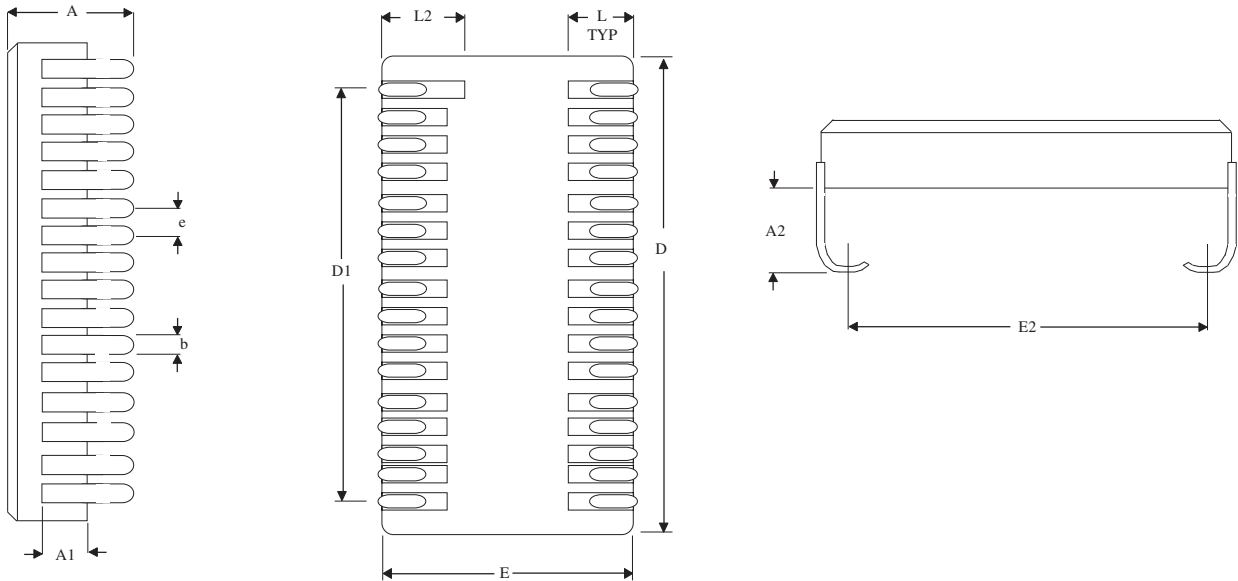
SYMBOL	SMD SPECIFICATIONS	
	MIN	MAX
A	0.080	0.100
A1	0.006	0.054
b2	0.022	0.028
D	0.815	0.835
D1	0.740	0.760
E	0.440	0.460
e	0.050 BSC	
L	0.100 REF	
R	0.009 REF	

**NOTE:** These dimensions are per the SMD. ASI's package dimensional limits may differ, but they will be within the SMD limits.

\*All measurements are in inches.

**MECHANICAL DEFINITION\***

**ASI Case #502 (Package Designator ECJ)**



SYMBOL	MICROSS SPECIFICATIONS	
	MIN	MAX
A	0.115	0.160
A1	0.054	0.075
A2	0.025	0.063
b	0.012	0.028
D	0.815	0.835
D1	0.740	0.760
E	0.418	0.460
E2	0.460	0.440
e	0.050 BSC	
L	0.050	0.070
L2	0.115	0.135

**NOTE:** This package meets SMD 5962-95600, Case Outline U dimensions in every aspect, except dimension E2.

\*All measurements are in inches.



**ORDERING INFORMATION**

**EXAMPLE:** AS5C4008EC-20/883C

Device Number	Package Type	Speed ns	Options**	Process
AS5C4008	EC	-15	L	/*
AS5C4008	ECJ	-15	L	/*
AS5C4008	EC	-17	L	/*
AS5C4008	ECJ	-17	L	/*
AS5C4008	EC	-20	L	/*
AS5C4008	ECJ	-20	L	/*
AS5C4008	EC	-25	L	/*
AS5C4008	ECJ	-25	L	/*
AS5C4008	EC	-35	L	/*
AS5C4008	ECJ	-35	L	/*
AS5C4008	EC	-45	L	/*
AS5C4008	ECJ	-45	L	/*

**EXAMPLE:** AS5C4008FN-45E/883C

Device Number	Package Type	Speed ns	Options**	Process
AS5C4008	F	-15	L	/*
AS5C4008	FN	-15	L	/*
AS5C4008	FN	-15	E	/*
AS5C4008	F	-17	L	/*
AS5C4008	FN	-17	L	/*
AS5C4008	FN	-17	E	/*
AS5C4008	F	-20	L	/*
AS5C4008	FN	-20	L	/*
AS5C4008	FN	-20	E	/*
AS5C4008	F	-25	L	/*
AS5C4008	FN	-25	L	/*
AS5C4008	FN	-25	E	/*
AS5C4008	F	-35	L	/*
AS5C4008	FN	-35	L	/*
AS5C4008	FN	-35	E	/*
AS5C4008	F	-45	L	/*
AS5C4008	FN	-45	L	/*
AS5C4008	FN	-45	E	/*

**EXAMPLE:** AS5C4008CW-25L/883C

Device Number	Package Type	Speed ns	Options**	Process
AS5C4008	CW	-15	L	/*
AS5C4008	CW	-17	L	/*
AS5C4008	CW	-20	L	/*
AS5C4008	CW	-25	L	/*
AS5C4008	CW	-35	L	/*
AS5C4008	CW	-45	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

**\*\*DEFINITION OF OPTIONS**

2V Data Retention/Low Power

L



ASI TO DSCC PART NUMBER
CROSS REFERENCE
FOR 5962-95600\*

ASI Package Designator CW

Table with 2 columns: ASI Part #, SMD Part #. Lists various CW package designators and their corresponding SMD part numbers.

ASI Package Designator F

Table with 2 columns: ASI Part #, SMD Part #. Lists various F package designators and their corresponding SMD part numbers.

ASI Package Designator EC

Table with 2 columns: ASI Part #, SMD Part #. Lists various EC package designators and their corresponding SMD part numbers.

ASI Package Designator ECJ

Table with 2 columns: ASI Part #, SMD Part #. Lists various ECJ package designators and their corresponding SMD part numbers.

\* ASI part number is for reference only. Orders received referencing the SMD part number will be processed per the SMD.

**ASI TO DSCC PART NUMBER CROSS REFERENCE  
FOR 5962-95613\***

**ASI Package Designator CW**

<b>ASI Part #</b>	<b>SMD Part #</b>
AS5C4008CW-12/H	5962-9561329HYA
AS5C4008CW-12/LH	5962-9561328HYA
AS5C4008CW-15/H	5962-9561314HYA
AS5C4008CW-17/H	5962-9561310HYA
AS5C4008CW-17/LH	5962-9561324HYA
AS5C4008CW-20/H	5962-9561309HYA
AS5C4008CW-20/LH	5962-9561323HYA
AS5C4008CW-25/H	5962-9561308HYA
AS5C4008CW-25/H	5962-9561313HYA
AS5C4008CW-25/LH	5962-9561322HYA
AS5C4008CW-25/LH	5962-9561327HYA
AS5C4008CW-35/H	5962-9561307HYA
AS5C4008CW-35/H	5962-9561312HYA
AS5C4008CW-35/LH	5962-9561321HYA
AS5C4008CW-35/LH	5962-9561326HYA
AS5C4008CW-45/H	5962-9561306HYA
AS5C4008CW-45/H	5962-9561311HYA
AS5C4008CW-45/LH	5962-9561320HYA
AS5C4008CW-45/LH	5962-9561325HYA
AS5C4008CW-55/H	5962-9561305HYA
AS5C4008CW-55/LH	5962-9561319HYA

AS5C4008CW-12/H	5962-9561329HYC
AS5C4008CW-12/LH	5962-9561328HYC
AS5C4008CW-15/H	5962-9561314HYC
AS5C4008CW-17/H	5962-9561310HYC
AS5C4008CW-17/LH	5962-9561324HYC
AS5C4008CW-20/H	5962-9561309HYC
AS5C4008CW-20/LH	5962-9561323HYC
AS5C4008CW-25/H	5962-9561308HYC
AS5C4008CW-25/H	5962-9561313HYC
AS5C4008CW-25/LH	5962-9561322HYC
AS5C4008CW-25/LH	5962-9561327HYC
AS5C4008CW-35/H	5962-9561307HYC
AS5C4008CW-35/H	5962-9561312HYC
AS5C4008CW-35/LH	5962-9561321HYC
AS5C4008CW-35/LH	5962-9561326HYC
AS5C4008CW-45/H	5962-9561306HYC
AS5C4008CW-45/H	5962-9561311HYC
AS5C4008CW-45/LH	5962-9561320HYC
AS5C4008CW-45/LH	5962-9561325HYC
AS5C4008CW-55/H	5962-9561305HYC
AS5C4008CW-55/LH	5962-9561319HYC

**ASI Package Designator F**

<b>ASI Part #</b>	<b>SMD Part #</b>
AS5C4008F-12/H	5962-9561329H9A
AS5C4008F-12/LH	5962-9561328H9A
AS5C4008F-15/H	5962-9561314H9A
AS5C4008F-17/H	5962-9561310H9A
AS5C4008F-17/LH	5962-9561324H9A
AS5C4008F-20/H	5962-9561309H9A
AS5C4008F-20/LH	5962-9561323H9A
AS5C4008F-25/H	5962-9561308H9A
AS5C4008F-25/H	5962-9561313H9A
AS5C4008F-25/LH	5962-9561322H9A
AS5C4008F-25/LH	5962-9561327H9A
AS5C4008F-35/H	5962-9561307H9A
AS5C4008F-35/H	5962-9561312H9A
AS5C4008F-35/LH	5962-9561321H9A
AS5C4008F-35/LH	5962-9561326H9A
AS5C4008F-45/H	5962-9561306H9A
AS5C4008F-45/H	5962-9561311H9A
AS5C4008F-45/LH	5962-9561320H9A
AS5C4008F-45/LH	5962-9561325H9A
AS5C4008F-55/H	5962-9561305H9A
AS5C4008F-55/LH	5962-9561319H9A

AS5C4008F-12/H	5962-9561329H9C
AS5C4008F-12/LH	5962-9561328H9C
AS5C4008F-15/H	5962-9561314H9C
AS5C4008F-17/H	5962-9561310H9C
AS5C4008F-17/LH	5962-9561324H9C
AS5C4008F-20/H	5962-9561309H9C
AS5C4008F-20/LH	5962-9561323H9C
AS5C4008F-25/H	5962-9561308H9C
AS5C4008F-25/H	5962-9561313H9C
AS5C4008F-25/LH	5962-9561322H9C
AS5C4008F-25/LH	5962-9561327H9C
AS5C4008F-35/H	5962-9561307H9C
AS5C4008F-35/H	5962-9561312H9C
AS5C4008F-35/LH	5962-9561321H9C
AS5C4008F-35/LH	5962-9561326H9C
AS5C4008F-45/H	5962-9561306H9C
AS5C4008F-45/H	5962-9561311H9C
AS5C4008F-45/LH	5962-9561320H9C
AS5C4008F-45/LH	5962-9561325H9C
AS5C4008F-55/H	5962-9561305H9C
AS5C4008F-55/LH	5962-9561319H9C

\* ASI part number is for reference only. Orders received referencing the SMD part number will be processed per the SMD.



ASI TO DSCC PART NUMBER CROSS REFERENCE
FOR 5962-95613\*

ASI Package Designator EC

Table with 2 columns: ASI Part # and SMD Part #. Lists various EC package part numbers and their corresponding SMD part numbers.

Table with 2 columns: ASI Part # and SMD Part #. Lists various EC package part numbers and their corresponding SMD part numbers.

ASI Package Designator ECJ

Table with 2 columns: ASI Part # and SMD Part #. Lists various ECJ package part numbers and their corresponding SMD part numbers.

Table with 2 columns: ASI Part # and SMD Part #. Lists various ECJ package part numbers and their corresponding SMD part numbers.

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Austin Semiconductor, Inc.

**SRAM**  
**AS5C4008**

**DOCUMENT TITLE**

512K x 8 SRAM SRAM MEMORY ARRAY

**REVISION HISTORY**

<u>Rev #</u>	<u>History</u>	<u>Release Date</u>	<u>Status</u>
6.3	Corrected A2 Measurement from base to the bottom of the lead Removed ECA Package	November 2009	Release