Very Low Power CMOS SRAM
32K X 8 bit

Green package materials are compliant to RoHS

BS62LV256

n FEATURES

- Wide V_{CC} operation voltage : 2.4V ~ 5.5V
- Very low power consumption :
  - V_{CC} = 3.0V Operation current : 25mA (Max.) at 70ns
    1mA (Max.) at 1MHz
    Standby current : 0.01uA(Typ.) at 25^{O}C
  - V_{CC} = 5.0V Operation current : 40mA (Max.) at 70ns
    2mA (Max.) at 1MHz
    Standby current : 0.4uA (Typ.) at 25^{O}C
- High speed access time :
  - -70 70ns(Max.) at V_{CC} : 3.0~5.5V
- Automatic power down when chip is deselected
- Easy expansion with $\overline{CE}$ and $\overline{OE}$ options
- Three state outputs and TTL compatible
- Fully static operation
- Data retention supply voltage as low as 1.5V

n DESCRIPTION

The BS62LV256 is a high performance, very low power CMOS Static Random Access Memory organized as 32,768 by 8 bits and operates form a wide range of 2.4V to 5.5V supply voltage.

Advanced CMOS technology and circuit techniques provide both high speed and low power features with typical CMOS standby current of 0.01uA and maximum access time of 70ns in 3.0V operation.

Easy memory expansion is provided by an active LOW chip enable ($\overline{CE}$), and active LOW output enable ($\overline{OE}$) and three-state output drivers.

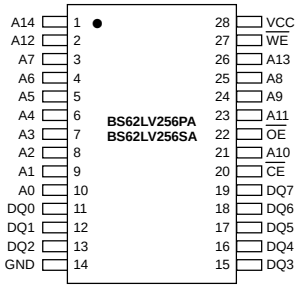
The BS62LV256 has an automatic power down feature, reducing the power consumption significantly when chip is deselected.

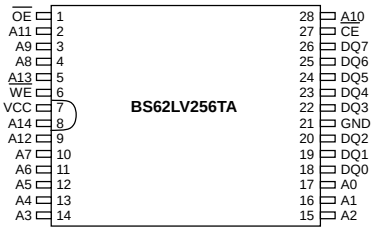
The BS62LV256 is available in DICE form, JEDEC standard 28 pin 330mil Plastic SOP, 600mil Plastic DIP, 8mmx13.4mm TSOP (normal type).

n POWER CONSUMPTION

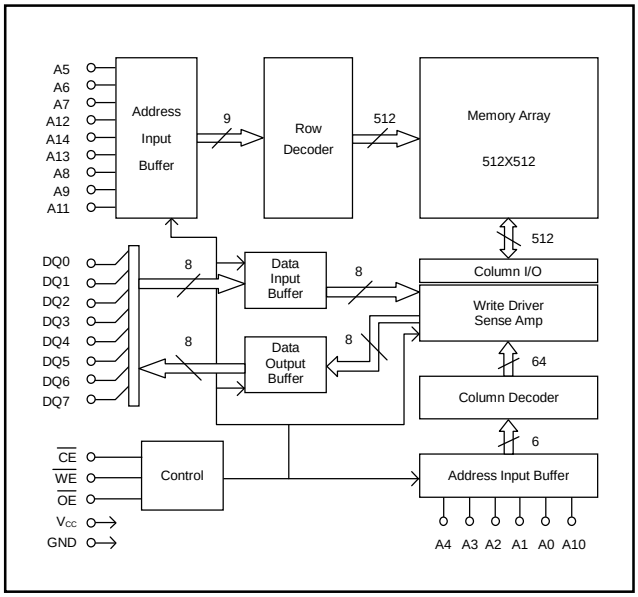
PRODUCT FAMILY	OPERATING TEMPERATURE	POWER DISSIPATION								PKG TYPE
		STANDBY				Operating (I_{CC}, Max)				
		(I_{CCSB1}, Typ.)		(I_{CCSB1}, Max)		V_{CC}=5.0V		V_{CC}=3.0V		
		V_{CC}=5.0V	V_{CC}=3.0V	V_{CC}=5.0V	V_{CC}=3.0V	1MHz	$f_{Max.}$	1MHz	$f_{Max.}$	
BS62LV256PA	Automotive Grade -40^{O}C to +125^{O}C	0.4uA	0.01uA	25uA	10uA	2mA	40mA	1mA	25mA	PDIP-28
BS62LV256SA										SOP-28
BS62LV256TA										TSOP-28

n PIN CONFIGURATIONS





n BLOCK DIAGRAM



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n PIN DESCRIPTIONS

Name	Function
A0-A14 Address Input	These 15 address inputs select one of the 32,768 x 8-bit in the RAM
$\overline{CE}$ Chip Enable Input	$\overline{CE}$ is active LOW. Chip enable must be active when data read form or write to the device. If chip enable is not active, the device is deselected and is in standby power mode. The DQ pins will be in the high impedance state when the device is deselected.
$\overline{WE}$ Write Enable Input	The write enable input is active LOW and controls read and write operations. With the chip selected, when $\overline{WE}$ is HIGH and $\overline{OE}$ is LOW, output data will be present on the DQ pins; when $\overline{WE}$ is LOW, the data present on the DQ pins will be written into the selected memory location.
$\overline{OE}$ Output Enable Input	The output enable input is active LOW. If the output enable is active while the chip is selected and the write enable is inactive, data will be present on the DQ pins and they will be enabled. The DQ pins will be in the high impendence state when $\overline{OE}$ is inactive.
DQ0-DQ7 Data Input/Output Ports	There 8 bi-directional ports are used to read data from or write data into the RAM.
V_{CC}	Power Supply
GND	Ground

n TRUTH TABLE

MODE	$\overline{CE}$	$\overline{WE}$	$\overline{OE}$	I/O OPERATION	V_{CC} CURRENT
Not selected (Power Down)	H	X	X	High Z	I_{CCSB}, I_{CCSB1}
Output Disabled	L	H	H	High Z	I_{CC}
Read	L	H	L	D_{OUT}	I_{CC}
Write	L	L	X	D_{IN}	I_{CC}

NOTES: H means V_{IH}; L means V_{IL}; X means don't care (Must be V_{IH} or V_{IL} state)

n ABSOLUTE MAXIMUM RATINGS (1)

SYMBOL	PARAMETER	RATING	UNITS
V_{TERM}	Terminal Voltage with Respect to GND	-0.5(2) to 7.0	V
T_{BIAS}	Temperature Under Bias	-40 to +125	^{O}C
T_{STG}	Storage Temperature	-60 to +150	^{O}C
P_T	Power Dissipation	1.0	W
I_{OUT}	DC Output Current	20	mA

1. 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 operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.
2. –2.0V in case of AC pulse width less than 30 ns.

n OPERATING RANGE

RANG	AMBIENT TEMPERATURE	V_{CC}
Automotive	-40^{O}C to + 125^{O}C	2.4V ~ 5.5V

n CAPACITANCE (1) (T_A = 25^{O}C, f = 1.0MHz)

SYMBOL	PAMAMETER	CONDITIONS	MAX.	UNITS
C_{IN}	Input Capacitance	V_{IN} = 0V	6	pF
C_{IO}	Input/Output Capacitance	$V_{I/O}$ = 0V	8	pF

1. This parameter is guaranteed and not 100% tested.

n DC ELECTRICAL CHARACTERISTICS (T_A = -40°C to +125°C)

PARAMETER NAME	PARAMETER	TEST CONDITIONS		MIN.	TYP.(1)	MAX.	UNITS
V_{CC}	Power Supply			2.4	--	5.5	V
V_{IL}	Input Low Voltage			-0.5(2)	--	0.8	V
V_{IH}	Input High Voltage			2.2	--	V_{CC}+0.3(3)	V
I_{IL}	Input Leakage Current	V_{IN} = 0V to V_{CC}		--	--	1	uA
I_{LO}	Output Leakage Current	$\overline{CE}$= V_{IH}, or $\overline{OE}$ = V_{IH}, $V_{I/O}$ = 0V to V_{CC}		--	--	1	uA
V_{OL}	Output Low Voltage	V_{CC} = Max, I_{OL} = 0.5mA		--	--	0.4	V
V_{OH}	Output High Voltage	V_{CC} = Min, I_{OH} = -0.5mA		2.4	--	--	V
I_{CC}	Operating Power Supply Current	$\overline{CE}$ = V_{IL}, I_{DQ} = 0mA, f = F_{MAX}(4)	V_{CC}=3.0V	--	--	25	mA
			V_{CC}=5.0V	--	--	40	
I_{CC1}	Operating Power Supply Current	$\overline{CE}$ = V_{IL}, I_{DQ} = 0mA, f = 1MHz	V_{CC}=3.0V	--	--	1	mA
			V_{CC}=5.0V	--	--	2	
I_{CCSB}	Standby Current – TTL	$\overline{CE}$ = V_{IH}, I_{DQ} = 0mA	V_{CC}=3.0V	--	--	1.0	mA
			V_{CC}=5.0V	--	--	2.0	
I_{CCSB1}	Standby Current – CMOS	$\overline{CE}$≧V_{CC}-0.2V, V_{IN}≧V_{CC}-0.2V or V_{IN}≦0.2V	V_{CC}=3.0V	--	0.01	10	uA
			V_{CC}=5.0V	--	0.4	25	

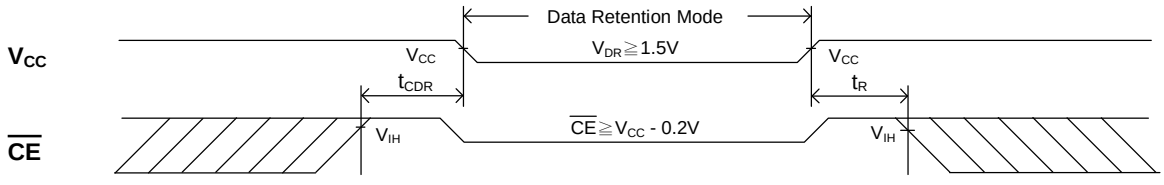
1. Typical characteristics are at T_A=25°C and not 100% tested.
2. Undershoot: -1.0V in case of pulse width less than 20 ns.
3. Overshoot: V_{CC}+1.0V in case of pulse width less than 20 ns.
4. F_{MAX}=1/t_{RC}.

n DATA RETENTION CHARACTERISTICS (T_A = -40°C to +125°C)

SYMBOL	PARAMETER	TEST CONDITIONS	MIN.	TYP. (1)	MAX.	UNITS
V_{DR}	V_{CC} for Data Retention	$\overline{CE}$≧V_{CC}-0.2V, V_{IN}≧V_{CC}-0.2V or V_{IN}≦0.2V	1.5	--	--	V
I_{CCDR}	Data Retention Current	$\overline{CE}$≧V_{CC}-0.2V, V_{IN}≧V_{CC}-0.2V or V_{IN}≦0.2V	--	0.01	5.0	uA
t_{CDR}	Chip Deselect to Data Retention Time	See Retention Waveform	0	--	--	ns
t_R	Operation Recovery Time		t_{RC} (2)	--	--	ns

1. V_{CC}=1.5V, T_A=25°C and not 100% tested.
2. t_{RC} = Read Cycle Time.

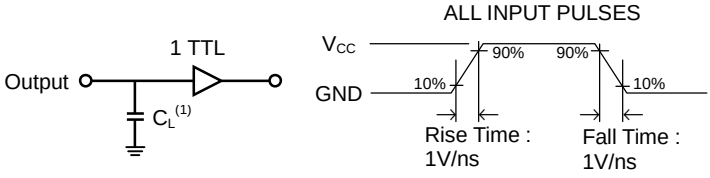
n LOW V_{CC} DATA RETENTION WAVEFORM ($\overline{CE}$ Controlled)



n AC TEST CONDITIONS

(Test Load and Input/Output Reference)

Input Pulse Levels		Vcc / 0V
Input Rise and Fall Times		1V/ns
Input and Output Timing Reference Level		0.5Vcc
Output Load	t_{CLZ}, t_{OLZ}, t_{CHZ}, t_{OHZ}, t_{WHZ}	C_L = 5pF+1TTL
	Others	C_L = 100pF+1TTL



1. Including jig and scope capacitance.

n KEY TO SWITCHING WAVEFORMS

WAVEFORM	INPUTS	OUTPUTS
	MUST BE STEADY	MUST BE STEADY
	MAY CHANGE FROM "H" TO "L"	WILL BE CHANGE FROM "H" TO "L"
	MAY CHANGE FROM "L" TO "H"	WILL BE CHANGE FROM "L" TO "H"
	DON'T CARE ANY CHANGE PERMITTED	CHANGE : STATE UNKNOW
	DOES NOT APPLY	CENTER LINE IS HIGH INPEDANCE "OFF" STATE

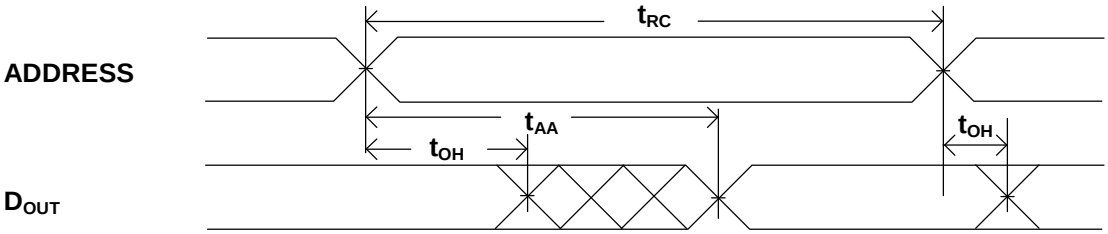
n AC ELECTRICAL CHARACTERISTICS (T_A = -40°C to +125°C)

READ CYCLE

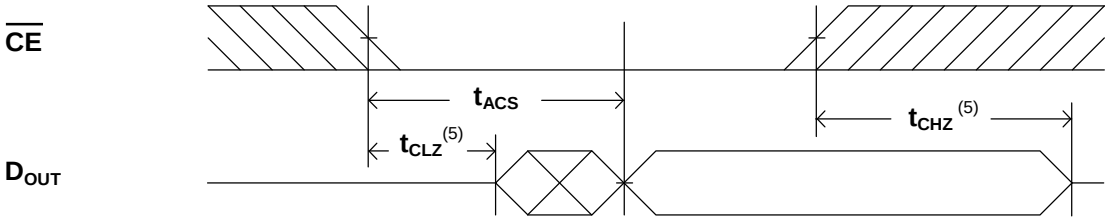
JEDEC PARAMETER NAME	PARANETER NAME	DESCRIPTION	CYCLE TIME : 70ns (V_{CC} = 3.0~5.5V) MIN.	TYP.	MAX.	UNITS
t_{AVAX}	t_{RC}	Read Cycle Time	70	--	--	ns
t_{AVQX}	t_{AA}	Address Access Time	--	--	70	ns
t_{E1LQV}	t_{ACS}	Chip Select Access Time	--	--	70	ns
t_{GLQV}	t_{OE}	Output Enable to Output Valid	--	--	35	ns
t_{E1LQX}	t_{CLZ}	Chip Select to Output Low Z	10	--	--	ns
t_{GLQX}	t_{OLZ}	Output Enable to Output Low Z	10	--	--	ns
t_{E1HQZ}	t_{CHZ}	Chip Select to Output High Z	--	--	35	ns
t_{GHQZ}	t_{OHZ}	Output Enable to Output High Z	--	--	30	ns
t_{AVQX}	t_{OH}	Data Hold from Address Change	10	--	--	ns

n SWITCHING WAVEFORMS (READ CYCLE)

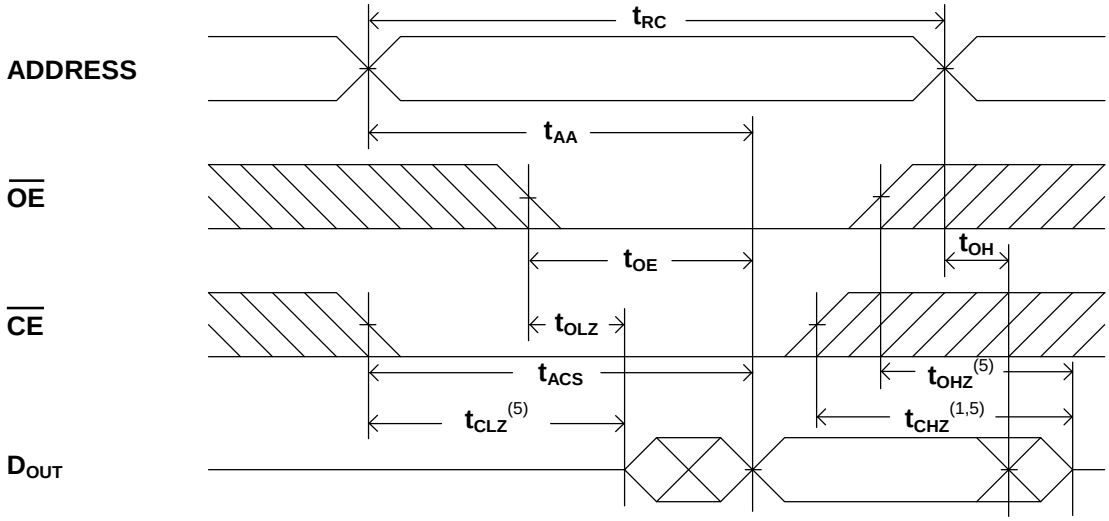
READ CYCLE 1 (1,2,4)



READ CYCLE 2 (1,3,4)



READ CYCLE 3 (1, 4)



NOTES:
1. WE is high in read Cycle.
2. Device is continuously selected when CE = V_{IL}.
3. Address valid prior to or coincident with CE transition low.
4. OE = V_{IL}.
5. Transition is measured ± 500mV from steady state with C_L = 5pF.
   The parameter is guaranteed but not 100% tested.

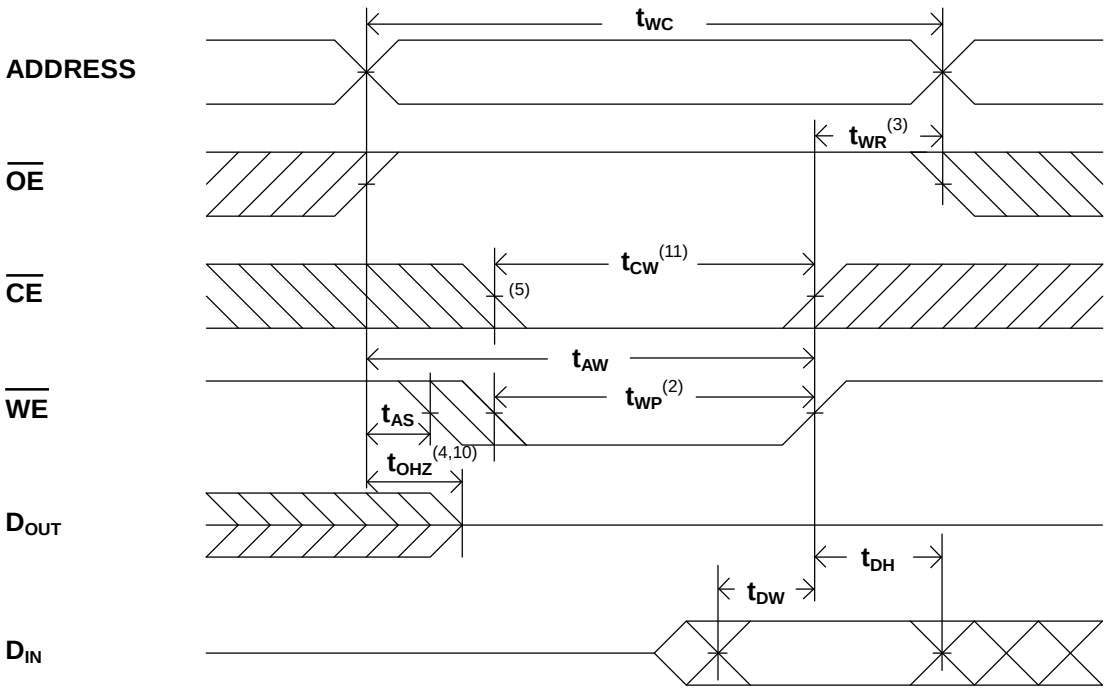
n AC ELECTRICAL CHARACTERISTICS (T_A = -40°C to +125°C)

WRITE CYCLE

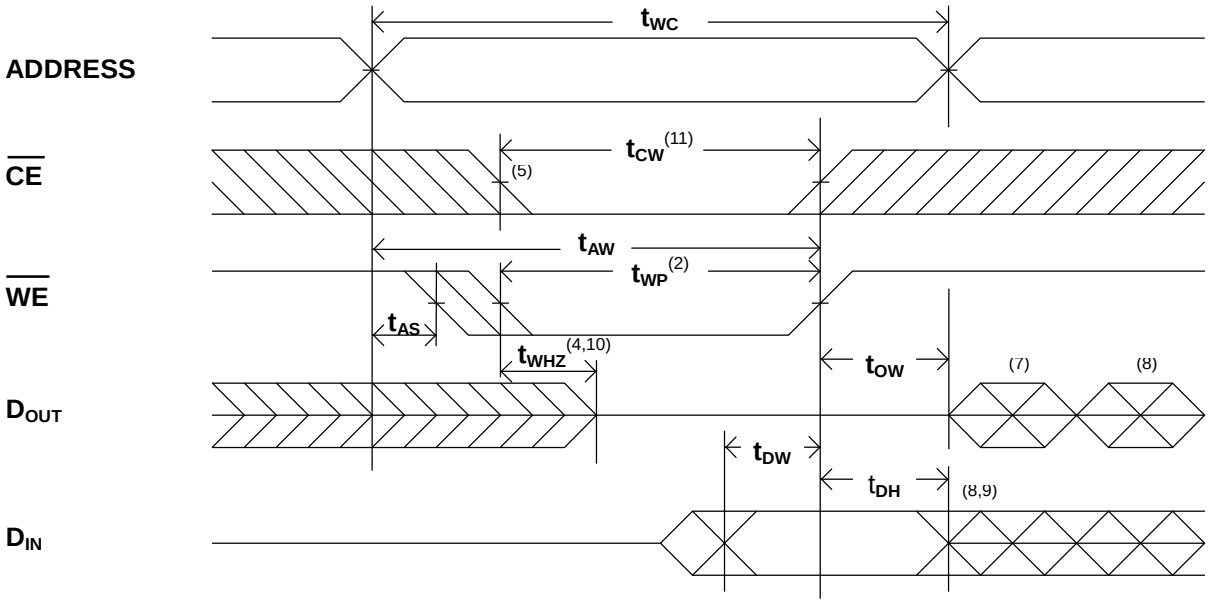
JEDEC PARAMETER NAME	PARANETER NAME	DESCRIPTION	CYCLE TIME : 70ns (V_{CC} = 3.0~5.5V) MIN.	TYP.	MAX.	UNITS
t_{AVAX}	t_{WC}	Write Cycle Time	70	--	--	ns
t_{AVWH}	t_{AW}	Address Valid to End of Write	70	--	--	ns
t_{E1LWH}	t_{CW}	Chip Select to End of Write	70	--	--	ns
t_{WLWH}	t_{WP}	Write Pulse Width	40	--	--	ns
t_{AVWL}	t_{AS}	Address Set up Time	0	--	--	ns
t_{WHAX}	t_{WR}	Write Recovery Time ($\overline{CE}$, $\overline{WE}$)	0	--	--	ns
t_{WLQZ}	t_{WHZ}	Write to Output High Z	--	--	30	ns
t_{DVWH}	t_{DW}	Data to Write Time Overlap	40	--	--	ns
t_{WHDX}	t_{DH}	Data Hold from Write Time	0	--	--	ns
t_{GHQZ}	t_{OHZ}	Output Disable to Output in High Z	--	--	30	ns
t_{WHQX}	t_{OW}	End of Write to Output Active	5	--	--	ns

n SWITCHING WAVEFORMS (WRITE CYCLE)

WRITE CYCLE 1 (1)

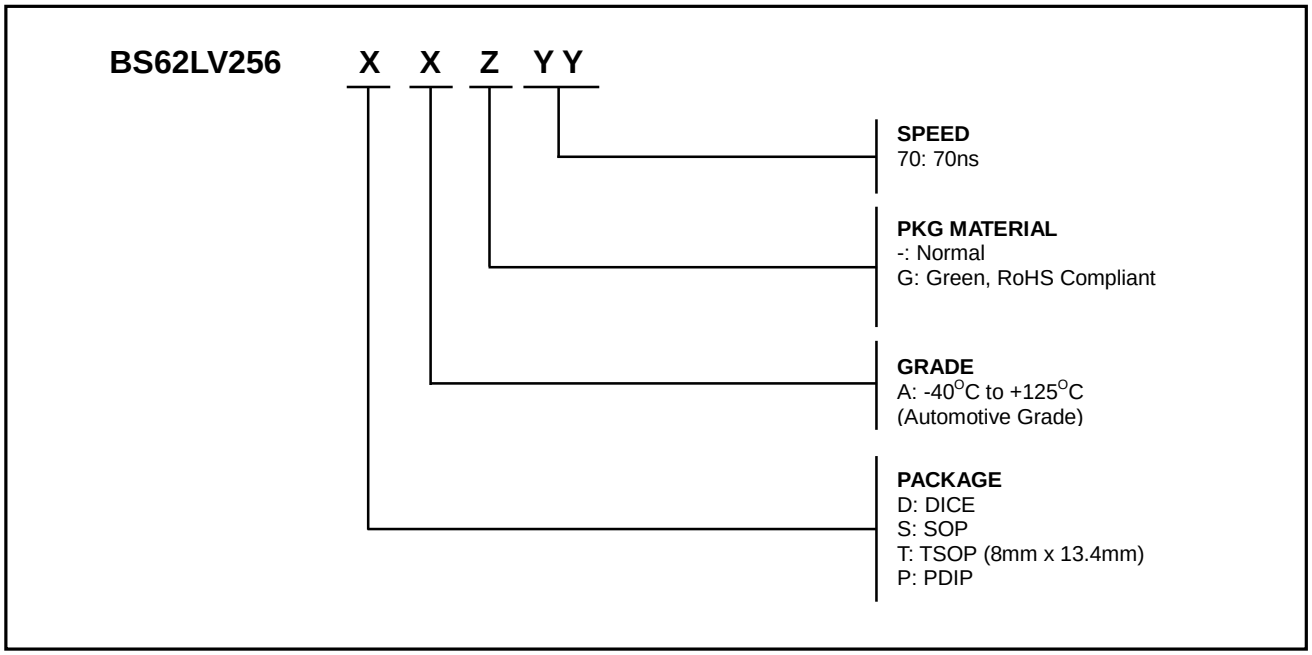


WRITE CYCLE 2 (1,6)



NOTES:
1. WE must be high during address transitions.
2. The internal write time of the memory is defined by the overlap of CE and WE low. All signals must be active to initiate a write and any one signal can terminate a write by going inactive. The data input setup and hold timing should be referenced to the second transition edge of the signal that terminates the write.
3. t_{WR} is measured from the earlier of CE or WE going high at the end of write cycle.
4. During this period, DQ pins are in the output state so that the input signals of opposite phase to the outputs must not be applied.
5. If the CE low transition occurs simultaneously with the WE low transitions or after the WE transition, output remain in a high impedance state.
6. OE is continuously low (OE = V_{IL}).
7. D_{OUT} is the same phase of write data of this write cycle.
8. D_{OUT} is the read data of next address.
9. If CE is low during this period, DQ pins are in the output state. Then the data input signals of opposite phase to the outputs must not be applied to them.
10. Transition is measured ± 500mV from steady state with C_L = 5pF. The parameter is guaranteed but not 100% tested.
11. t_{CW} is measured from the later of CE going low to the end of write.

n ORDERING INFORMATION



Note:
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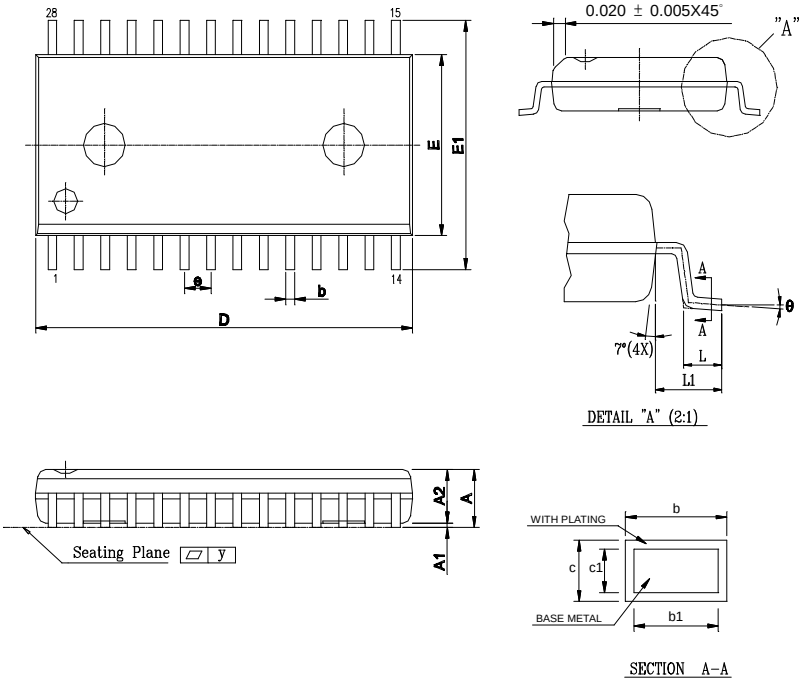
n PACKAGE DIMENSIONS



SYMBOL \ UNIT	INCH	MM
A	0.106±0.006	2.692±0.152
A1	0.009±0.005	0.226±0.124
A2	0.098±0.005	2.489±0.127
b	0.014 ~ 0.020	0.35 ~ 0.50
b1	0.014 ~ 0.018	0.35 ~ 0.45
c	0.008 ~ 0.012	0.20 ~ 0.32
c1	0.008 ~ 0.011	0.20 ~ 0.28
D	0.713±0.005	18.110±0.127
E	0.331±0.005	8.407±0.127
E1	0.465±0.012	11.811±0.305
e	0.050±0.006	1.270±0.152
L	0.0380±0.0104	0.964±0.264
L1	0.0677±0.0079	1.72±0.2
y	0.004 Max.	0.1 Max.
θ	0° ~ 10°	0° ~ 10°

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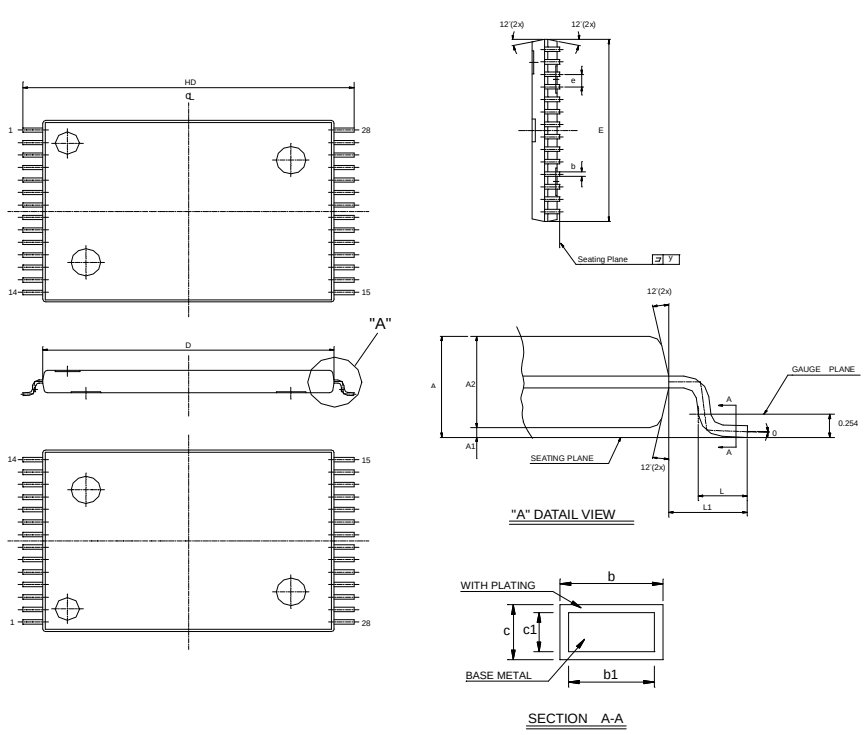
n PACKAGE DIMENSIONS (continued)



UNIT / SYMBOL	INCH	MM
A	0.0433±0.004	1.10±0.10
A1	0.0045±0.0026	0.115±0.065
A2	0.039±0.002	1.00±0.05
b	0.009±0.002	0.22±0.05
b1	0.008±0.001	0.20±0.03
c	0.004 ~ 0.008	0.10 ~ 0.21
c1	0.004 ~ 0.006	0.10 ~ 0.16
D	0.465±0.004	11.80±0.10
E	0.315±0.004	8.00±0.10
e	0.022±0.004	0.55±0.10
HD	0.528±0.008	13.40±0.20
L	0.0197 +0.008 -0.004	0.50 +0.20 -0.10
L1	0.0315±0.004	0.80±0.10
y	0.004 Max.	0.1 Max.
θ	0°~ 8°	0°~ 8°

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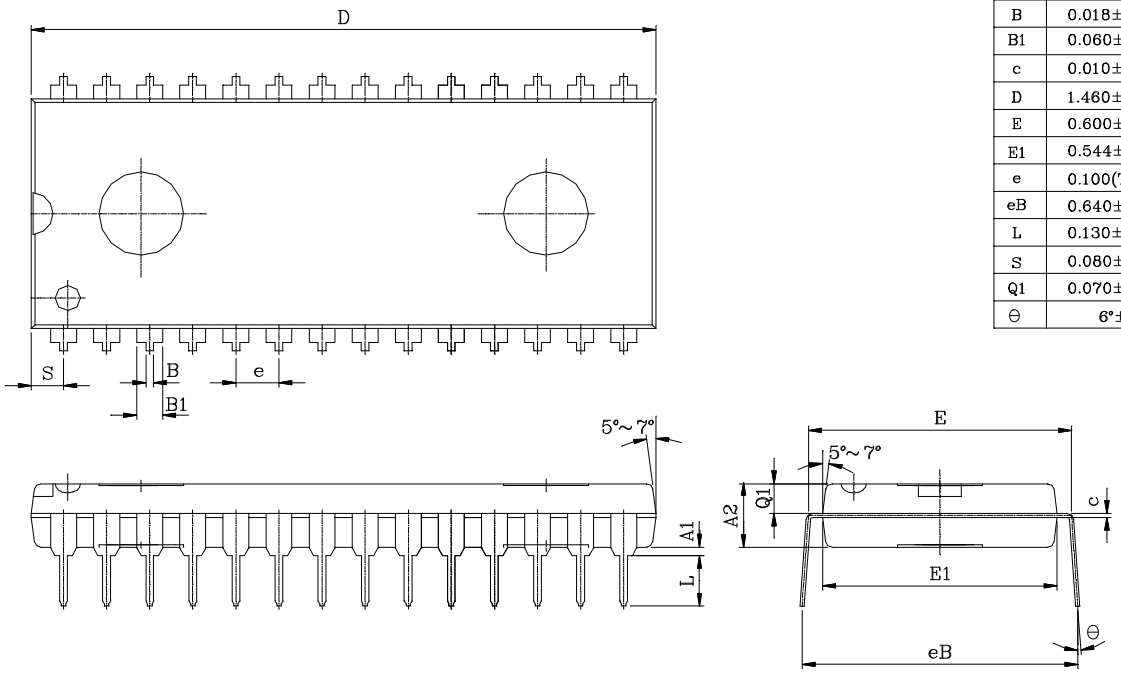

UNIT / SYMBOL	INCH(BASE)	MM(REF)
A1	0.010(MIN)	0.254(MIN)
A2	0.150±0.005	3.810±0.127
B	0.018±0.005	0.457±0.127
B1	0.060±0.010	1.524±0.254
c	0.010±0.004	0.254±0.102
D	1.460±0.005	37.084±0.127
E	0.600±0.010	15.240±0.254
E1	0.544±0.004	13.818±0.102
e	0.100(TYP)	2.540(TYP)
eB	0.640±0.020	16.256±0.508
L	0.130±0.010	3.302±0.254
S	0.080±0.010	2.032±0.254
Q1	0.070±0.005	1.778±0.127
θ	6°±3°	6°±3°

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n Revision History

Revision No.	History	Draft Date	Remark
2.4.A	Add Automotive grade	Mar. 27,2006	
2.5A	Revised I_{CCSB1} sepc. - from 15uA to 25uA for 5V - from 6.0uA to 10uA for 3V Revised I_{CCDR} sepc. - from 4.0uA to 5.0uA	Sep. 05, 2006	