BSI

Very Low Power CMOS SRAM
128K X 8 bit

Green package materials are compliant to RoHS

Automotive Grade

BS62LV1027

n FEATURES

Ÿ Wide V_{CC} operation voltage : 2.4V ~ 5.5V
Ÿ Very low power consumption :
  V_{CC} = 3.0V   Operation current : 15mA (Max.) at 70ns
                                    2mA (Max.) at 1MHz
                Standby current : 0.02uA (Typ.) at 25°C
  V_{CC} = 5.0V   Operation current : 39mA (Max.) at 70ns
                                    10mA (Max.) at 1MHz
                Standby current : 0.4uA (Typ.) at 25°C
Ÿ High speed access time :
  -70   70ns (Max.) at V_{CC} : 2.7~5.5V
Ÿ Automatic power down when chip is deselected
Ÿ Easy expansion with CE2, $\overline{CE1}$ and $\overline{OE}$ options
Ÿ Three state outputs and TTL compatible
Ÿ Fully static operation
Ÿ Data retention supply voltage as low as 1.5V

n DESCRIPTION

The BS62LV1027 is a high performance, very low power CMOS Static Random Access Memory organized as 131,072 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 0.02uA at 3.0V/25°C and maximum access time of 70ns at 2.7V/125°C.

Easy memory expansion is provided by an active LOW chip enable ($\overline{CE1}$), an active HIGH chip enable (CE2), and active LOW output enable ($\overline{OE}$) and three-state output drivers.
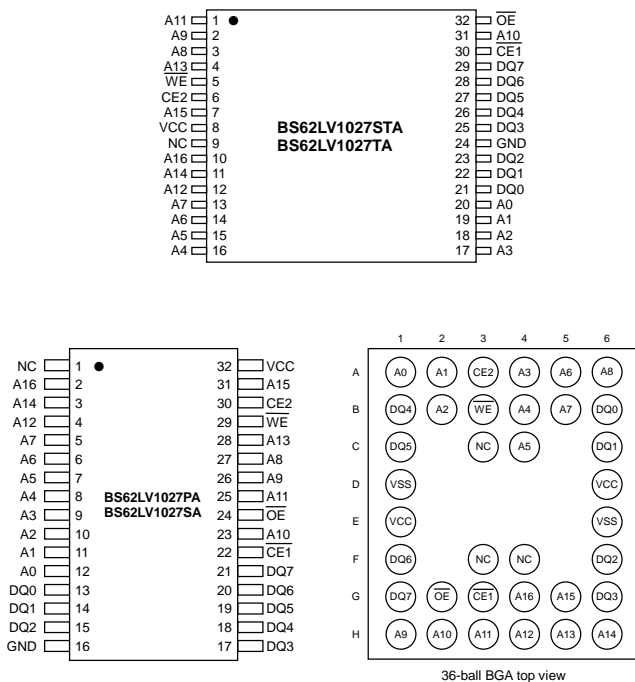
The BS62LV1027 has an automatic power down feature, reducing the power consumption significantly when chip is deselected.

The BS62LV1027 is available in DICE form, JEDEC standard 32 pin 450mil Plastic SOP, 600mil Plastic DIP, 8mmx13.4mm STSOP, 8mmx20mm TSOP and 36-ball BGA package.
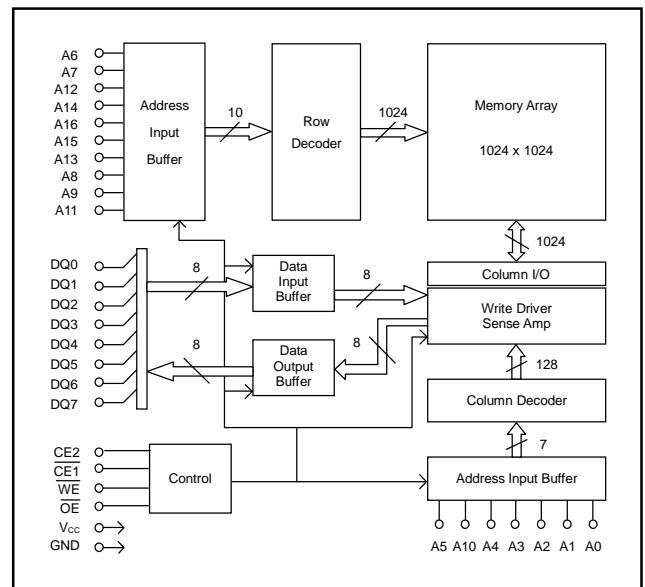
n POWER CONSUMPTION

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	$f_{Max.}$	
BS62LV1027HA	Automotive Grade -40°C to +125°C	0.4uA	0.02uA	15uA	8.0uA	10mA	39mA	2mA	15mA	BGA-36-0608
BS62LV1027PA										PDIP-32
BS62LV1027SA										SOP-32
BS62LV1027STA										STSOP-32
BS62LV1027TA										TSOP-32

n PIN CONFIGURATIONS

BS62LV1027STA
BS62LV1027TA

BS62LV1027PA
BS62LV1027SA

36-ball BGA top view

n BLOCK DIAGRAM

Brilliance Semiconductor, Inc. reserves the right to change products and specifications without notice.

n PIN DESCRIPTIONS

Name	Function
A0-A16 Address Input	These 17 address inputs select one of the 131,072 x 8-bit in the RAM
$\overline{CE1}$ Chip Enable 1 Input CE2 Chip Enable 2 Input	$\overline{CE1}$ is active LOW and CE2 is active HIGH. Both chip enables must be active when data read form or write to the device. If either 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	$\overline{CE1}$	CE2	$\overline{WE}$	$\overline{OE}$	I/O OPERATION	V_{CC} CURRENT
Not selected (Power Down)	H	X	X	X	High Z	I_{CCSB}, I_{CCSB1}
	X	L	X	X		
Output Disabled	L	H	H	H	High Z	I_{CC}
Read	L	H	H	L	D_{OUT}	I_{CC}
Write	L	H	L	X	D_{IN}	I_{CC}

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°C to + 125°C	2.4V ~ 5.5V

n CAPACITANCE [1] (T_A = 25°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_{CC} = Max, V_{IN} = 0V to V_{CC}		--	--	1	UA
I_{Lo}	Output Leakage Current	V_{CC} = Max, $\overline{CE1}$= V_{IH}, CE2= V_{IL}, or $\overline{OE}$ = V_{IH}, $V_{I/O}$ = 0V to V_{CC}		--	--	1	UA
V_{OL}	Output Low Voltage	V_{CC} = Max, I_{OL} = 2.0mA	V_{CC}=3.0V	--	--	0.4	V
			V_{CC}=5.0V				
V_{OH}	Output High Voltage	V_{CC} = Min, I_{OH} = -1.0mA	V_{CC}=3.0V	2.4	--	--	V
			V_{CC}=5.0V				
I_{CC}	Operating Power Supply Current	$\overline{CE1}$ = V_{IL}, CE2 = V_{IH}, I_{DQ} = 0mA, f = f_{Max}[4]	V_{CC}=3.0V	--	--	15	mA
			V_{CC}=5.0V	--	--	39	
I_{CC1}	Operating Power Supply Current	CE1 = V_{IL}, CE2 = V_{IH}, I_{DQ} = 0mA, f = 1MHz	V_{CC}=3.0V			2	MA
			V_{CC}=5.0V			10	
I_{CCSB}	Standby Current – TTL	$\overline{CE1}$ = V_{IH}, or CE2 = V_{IL}, I_{DQ} = 0mA	V_{CC}=3.0V	--	--	0.5	mA
			V_{CC}=5.0V	--	--	1.0	
I_{CCSB1}	Standby Current – CMOS	$\overline{CE1}$≧V_{CC}-0.2V or CE2≦0.2V, V_{IN}≧V_{CC}-0.2V or V_{IN}≦0.2V	V_{CC}=3.0V	--	0.02	8.0	uA
			V_{CC}=5.0V	--	0.4	15	

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	$\overline{CE1}$≧V_{CC}-0.2V or CE2≦0.2V, V_{IN}≧V_{CC}-0.2V or V_{IN}≦0.2V	1.5	--	--	V
I_{CCDR}	Data Retention Current	$\overline{CE1}$≧V_{CC}-0.2V or CE2≦0.2V, V_{IN}≧V_{CC}-0.2V or V_{IN}≦0.2V	--	0.02	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.
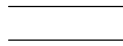
n LOW V_{CC} DATA RETENTION WAVEFORM (1) ($\overline{CE1}$ Controlled)
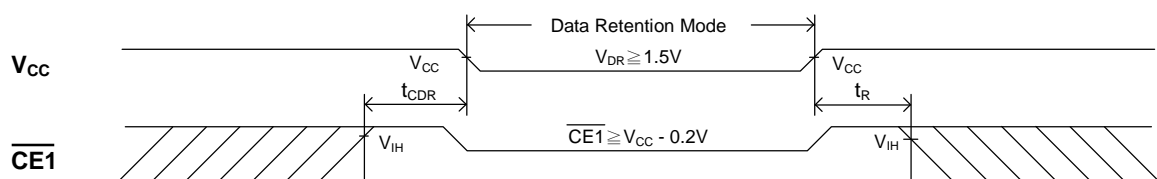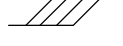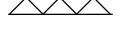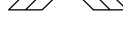
n LOW V_{CC} DATA RETENTION WAVEFORM (2) (CE2 Controlled)
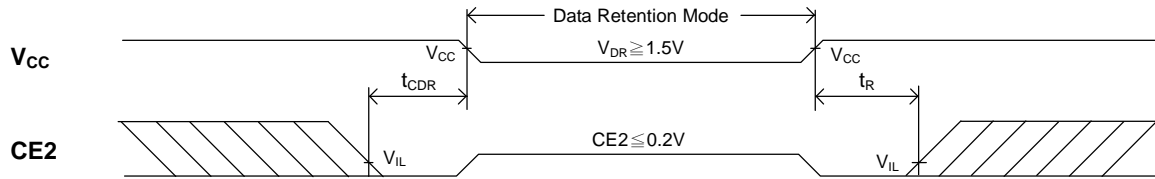
n AC TEST CONDITIONS
(Test Load and Input/Output Reference)

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 = 30pF+1TTL

ALL INPUT PULSES
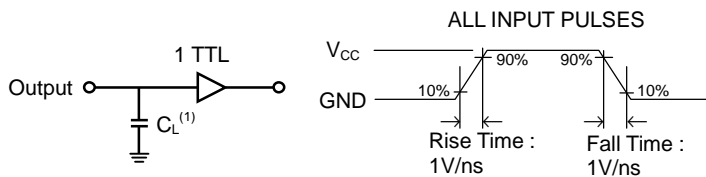
1. Including jig and scope capacitance.

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} = 2.7~5.5V)			UNITS
				MIN.	TYP.	MAX.	
t_{AVAX}	t_{RC}	Read Cycle Time		70	--	--	ns
t_{AVQX}	t_{AA}	Address Access Time		--	--	70	ns
t_{E1LQV}	t_{ACS1}	Chip Select Access Time	($\overline{CE1}$)	--	--	70	ns
t_{E2HQV}	t_{ACS2}	Chip Select Access Time	(CE2)	--	--	70	ns
t_{GLQV}	t_{OE}	Output Enable to Output Valid		--	--	35	ns
t_{E1LQX}	t_{CLZ1}	Chip Select to Output Low Z	($\overline{CE1}$)	10	--	--	ns
t_{E2HQX}	t_{CLZ2}	Chip Select to Output Low Z	(CE2)	10	--	--	ns
t_{GLQX}	t_{OLZ}	Output Enable to Output Low Z		5	--	--	ns
t_{E1HQZ}	t_{CHZ1}	Chip Select to Output High Z	($\overline{CE1}$)	--	--	35	ns
t_{E2LQZ}	t_{CHZ2}	Chip Select to Output High Z	(CE2)	--	--	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]

ADDRESS

t_{RC}

t_{AA}

t_{OH}

t_{OH}

D_{OUT}

READ CYCLE 2 [1,3,4]

$\overline{CE1}$

t_{ACS1}

CE2

t_{ACS2}

t_{CHZ1}, t_{CHZ2} [5]

t_{CLZ} [5]

D_{OUT}

READ CYCLE 3 [1, 4]

ADDRESS

t_{RC}

t_{AA}

$\overline{OE}$

t_{OE}

t_{OH}

$\overline{CE1}$

t_{OLZ}

t_{ACS1}

t_{OHZ} [5]

t_{CLZ1} [5]

t_{CHZ1} [1,5]

CE2

t_{ACS2}

t_{CHZ2} [2,5]

t_{CLZ2} [5]

D_{OUT}
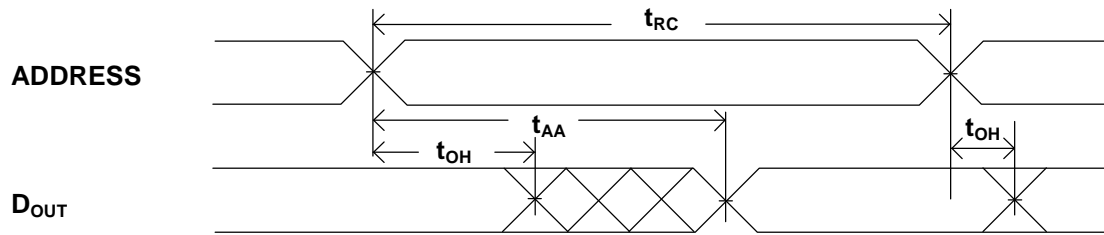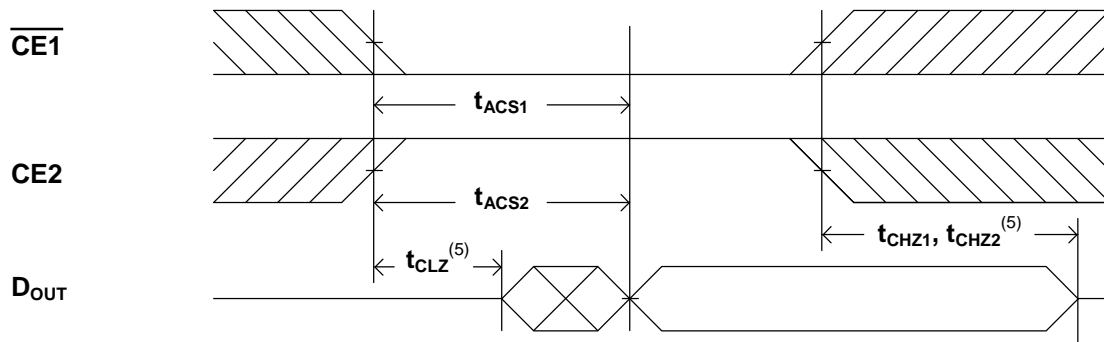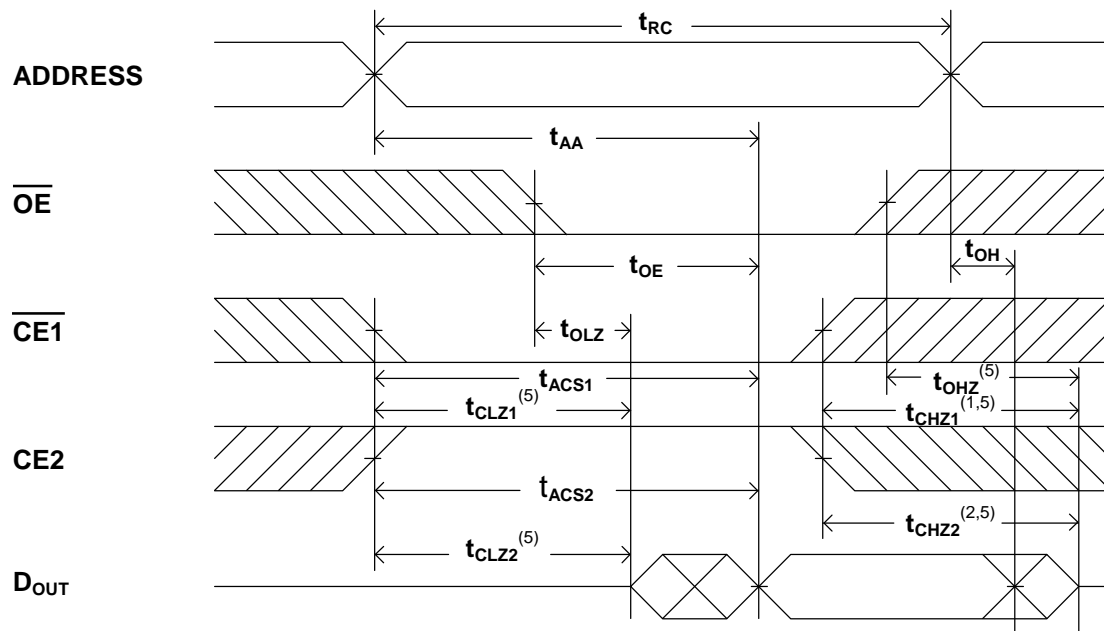
NOTES:
1. $\overline{WE}$ is high in read Cycle.
2. Device is continuously selected when $\overline{CE1} = V_{IL}$ and CE2= V_{IH}.
3. Address valid prior to or coincident with $\overline{CE1}$ transition low and/or CE2 transition high.
4. $\overline{OE} = V_{IL}$.
5. Transition is measured $\pm$ 500mV 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)
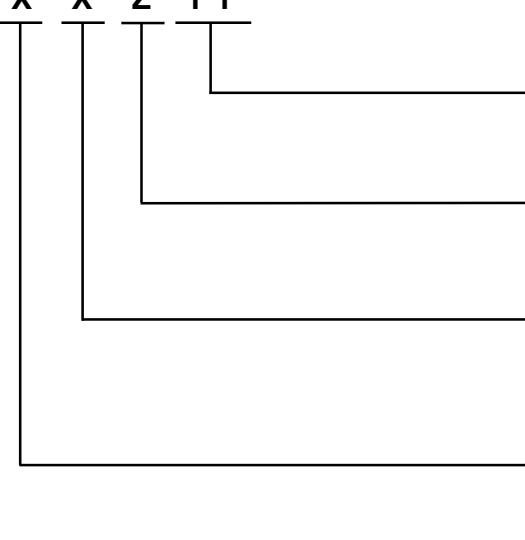
WRITE CYCLE

JEDEC PARAMETER NAME	PARANETER NAME	DESCRIPTION	CYCLE TIME : 70ns (V$_{CC}$ = 2.7~5.5V)			UNITS
			MIN.	TYP.	MAX.	
t$_{AVAX}$	t$_{WC}$	Write Cycle Time	70	--	--	ns
t$_{E1LWH}$	t$_{CW}$	Chip Select to End of Write	70	--	--	ns
t$_{AVWL}$	t$_{AS}$	Address Set up Time	0	--	--	ns
t$_{AVWH}$	t$_{AW}$	Address Valid to End of Write	70	--	--	ns
t$_{WLWH}$	t$_{WP}$	Write Pulse Width	35	--	--	ns
t$_{WHAX}$	t$_{WR1}$	Write Recovery Time (CE1, WE)	0	--	--	ns
t$_{E2LAX}$	t$_{WR2}$	Write Recovery Time (CE2)	0	--	--	ns
t$_{WLQZ}$	t$_{WHZ}$	Write to Output High Z	--	--	30	ns
t$_{DVWH}$	t$_{DW}$	Data to Write Time Overlap	30	--	--	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)]
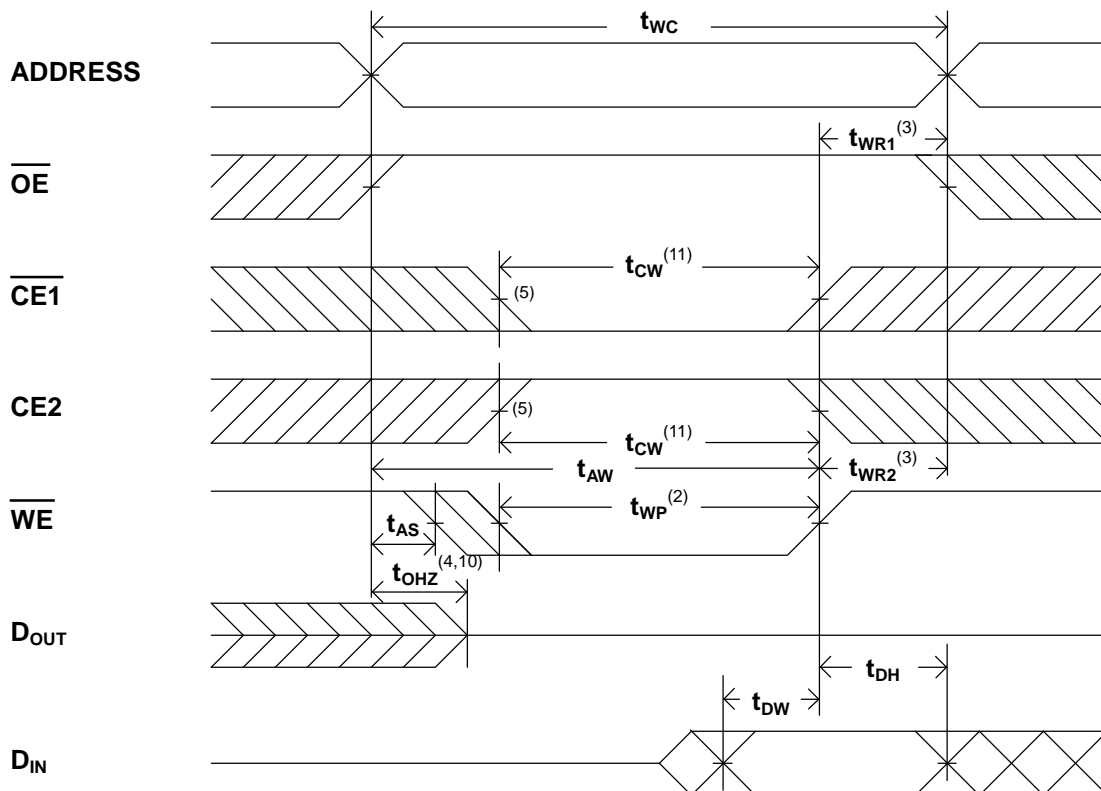
WRITE CYCLE 2 [1,6]
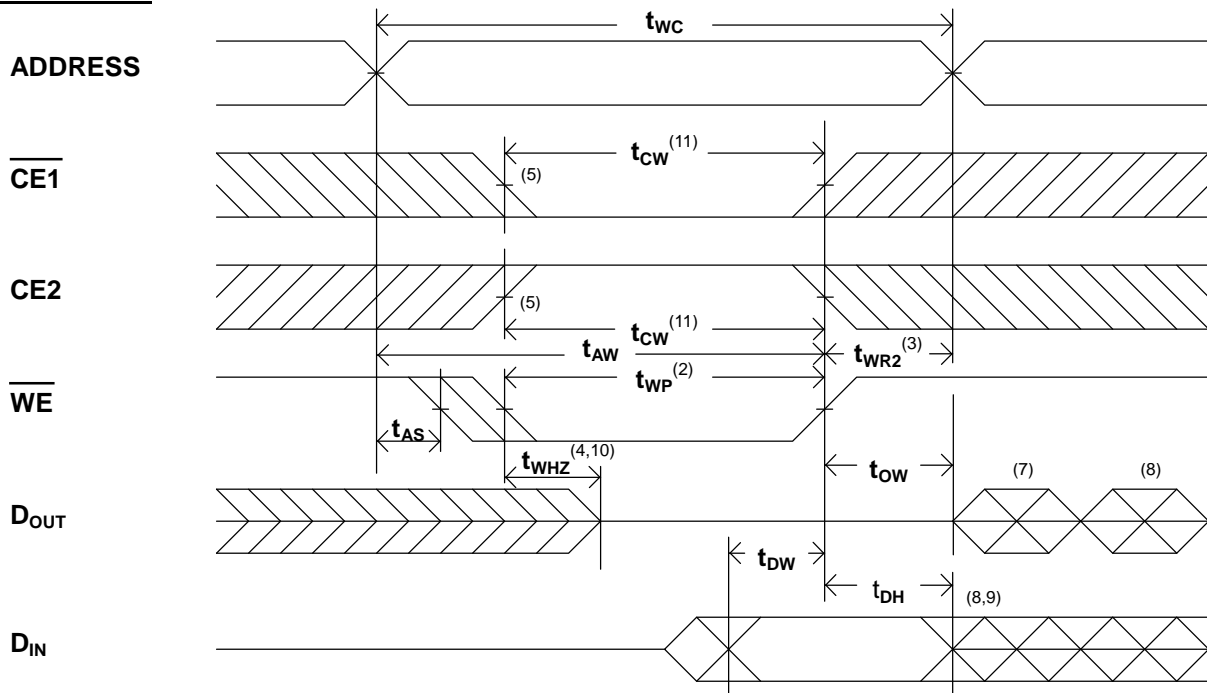
NOTES:

1. $\overline{WE}$ must be high during address transitions.
2. The internal write time of the memory is defined by the overlap of $\overline{CE1}$ and CE2 active and $\overline{WE}$ 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 $\overline{CE1}$ or $\overline{WE}$ going high or CE2 going low 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 $\overline{CE1}$ low transition or the CE2 high transition occurs simultaneously with the $\overline{WE}$ low transitions or after the $\overline{WE}$ transition, output remain in a high impedance state.
6. $\overline{OE}$ is continuously low ($\overline{OE} = V_{IL}$).
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 $\overline{CE1}$ is low and CE2 is high 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 $\pm$ 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 $\overline{CE1}$ going low or CE2 going high to the end of write.

n ORDERING INFORMATION

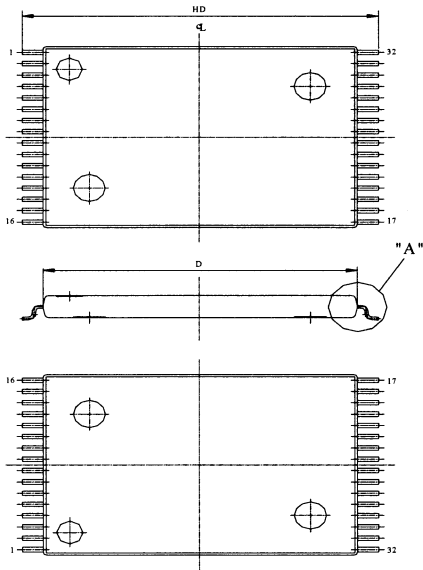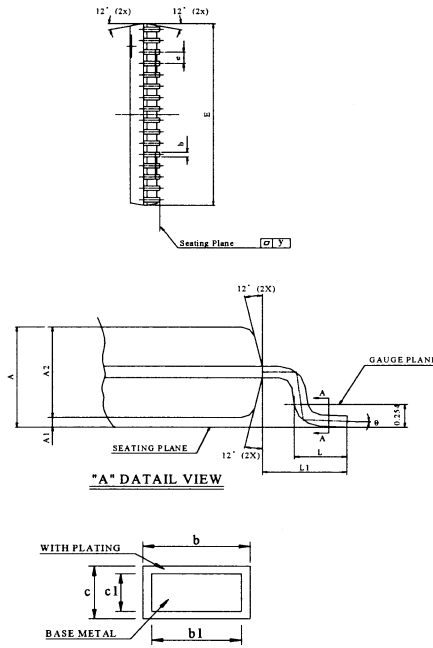BS62LV1027   X   X   Z   Y Y

SPEED
70: 70ns

PKG MATERIAL
-: Normal
G: Green, RoHS Compliant

GRADE
A: -40°C to +125°C
(Automotive Grade)

PACKAGE
H: BGA-36-0608
P: PDIP
S: SOP
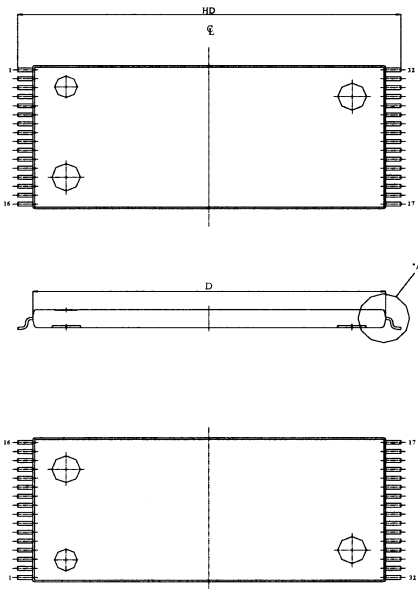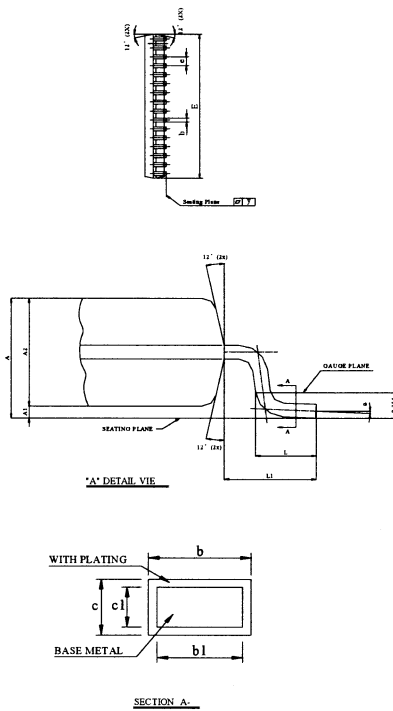T: TSOP (8mm x 20mm)
ST: Small TSOP (8mm x 13.4mm)

Note:
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n PACKAGE DIMENSIONS
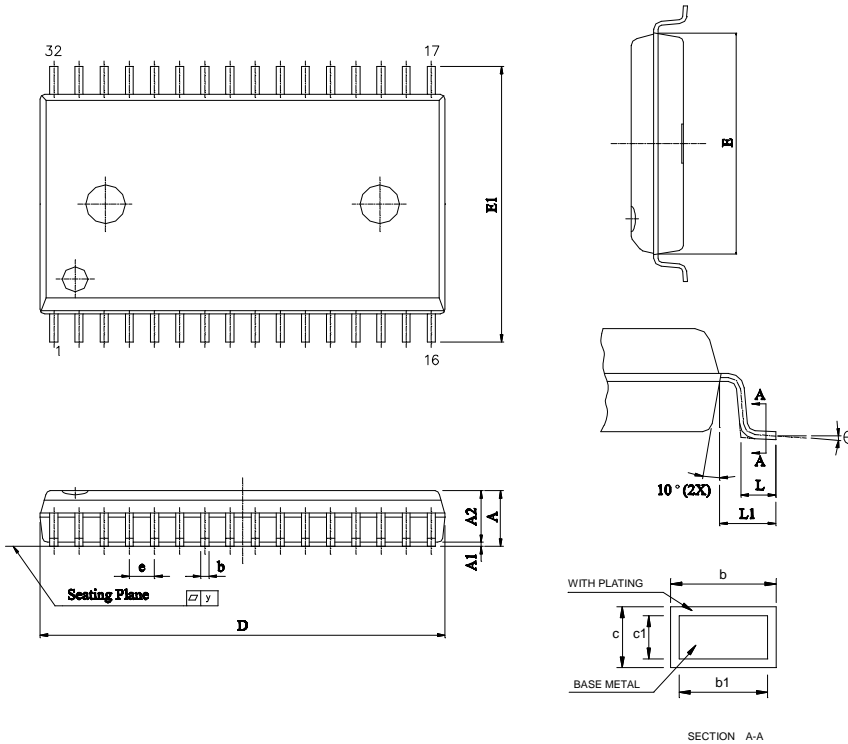
SYMBOL UNIT	INCH	MM
A	0.111±0.007	2.821±0.176
A1	0.009±0.005	0.229±0.127
A2	0.1055±0.0055	2.680±0.140
b	0.014 ~ 0.020	0.35 ~ 0.50
b1	0.014 ~ 0.018	0.35 ~ 0.46
c	0.006 ~ 0.012	0.15 ~ 0.32
c1	0.006 ~ 0.011	0.15 ~ 0.28
D	0.805±0.005	20.447±0.127
E	0.445±0.005	11.303±0.127
E1	0.555±0.012	14.097±0.305
e	0.050±0.006	1.270±0.152
L	0.033±0.010	0.834±0.25
L1	0.055±0.008	1.397±0.203
y	0.004 Max.	0.1 Max.
Θ	0° ~ 10°	0° ~ 10°

10 ° (2X)

WITH PLATING

BASE METAL

SECTION A-A

SOP -32

n PACKAGE DIMENSIONS (continued)

STSOP - 32

UNIT SYMBOL	INCH	MM
A	0.0433± 0.004	1.10± 0.10
A1	0.004± 0.002	0.10± 0.05
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	0.020± 0.004	0.50± 0.10
HD	0.528± 0.008	13.40± 0.20
L	0.0197 +0.008 -0.004	0.50 +0.2 -0.1
L1	0.0315± 0.004	0.80± 0.10
y	0.004 Max.	0.1 Max.
θ	0° ~ 8°	0° ~ 8°

TSOP - 32

UNIT SYMBOL	INCH	MM
A	0.0433± 0.004	1.10± 0.10
A1	0.004± 0.002	0.10± 0.05
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	0.724± 0.004	18.40± 0.10
E	0.315± 0.004	8.00± 0.10
e	0.020± 0.004	0.50± 0.10
HD	0.787± 0.008	20.00± 0.20
L	0.0197 +0.008 -0.004	0.50 +0.2 -0.1
L1	0.0315± 0.004	0.80± 0.10
y	0.004 Max.	0.1 Max.
θ	0° ~ 8°	0° ~ 8°

PACKAGE DIMENSIONS (continued)

UNIT SYMBOL	INCH(BASE)	MM(REF)
A1	0.010(MIN)	0.254(MIN)
A2	0.154±0.005	3.912±0.127
B	0.018±0.005	0.457±0.127
B1	0.050±0.005	1.270±0.127
c	0.010±0.004	0.254±0.102
D	1.650±0.005	41.910±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	0.650±0.020	16.510±0.508
L	0.130±0.010	3.302±0.254
S	0.075±0.010	1.905±0.254
Q1	0.070±0.005	1.778±0.127
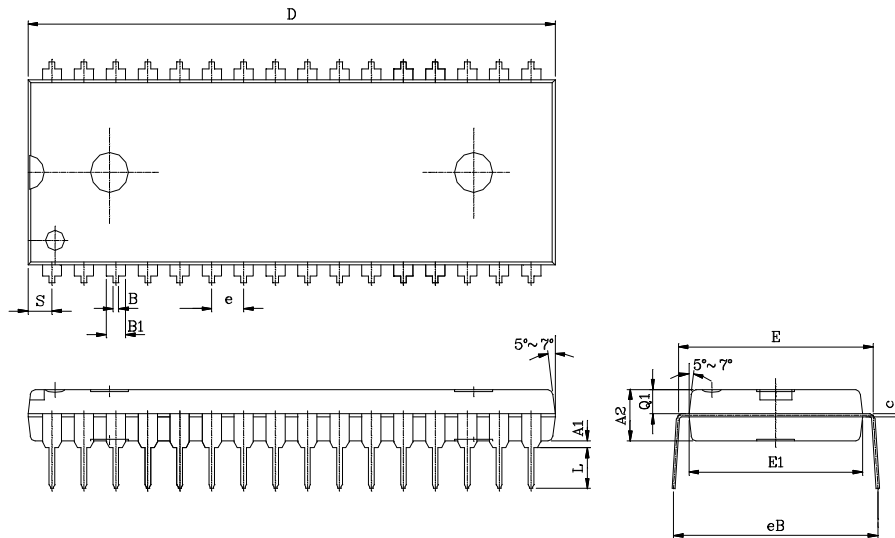
PDIP - 32
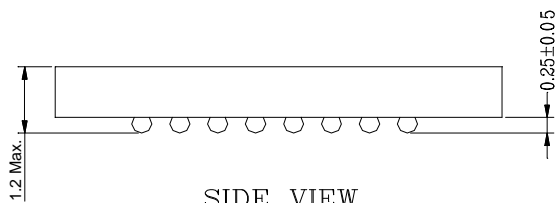
NOTES
1: CONTROLLING DIMENSIONS ARE IN MILLIMETERS.
2: PIN#1 DOT MARKING BY LASER OR PAD PRINT.
3: SYMBOL "N" IS THE NUMBER OF SOLDER BALLS.

SIDE VIEW

BALL PITCH e = 0.75				
D	E	N	D1	E1
8.0	6.0	48	5.25	3.75

SOLDER BALL ∅0.35±0.05
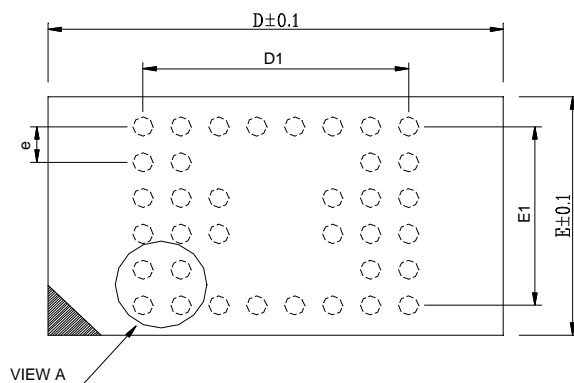
VIEW A

TOP VIEW

36 mini-BGA (6 x 8mm)
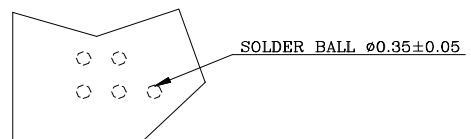
n Revision History

Revision No.	History	Draft Date	Remark
2.2.A	Add Automotive	Mar. 27,2006	