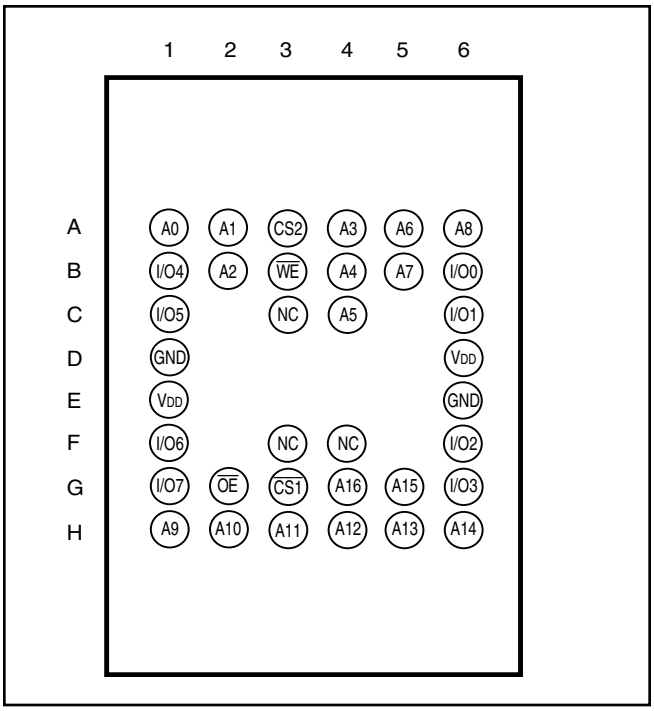
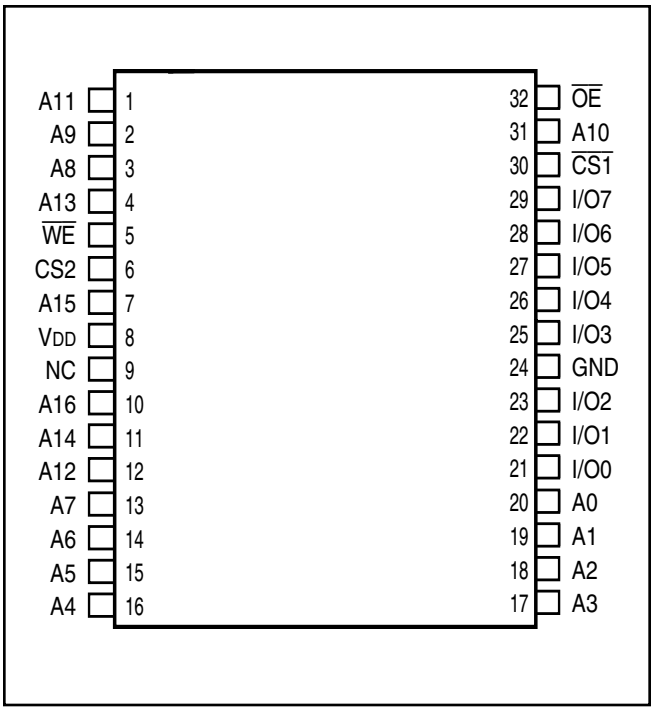
PIN CONFIGURATION

36-pin mini BGA (B) (6mm x 8mm)



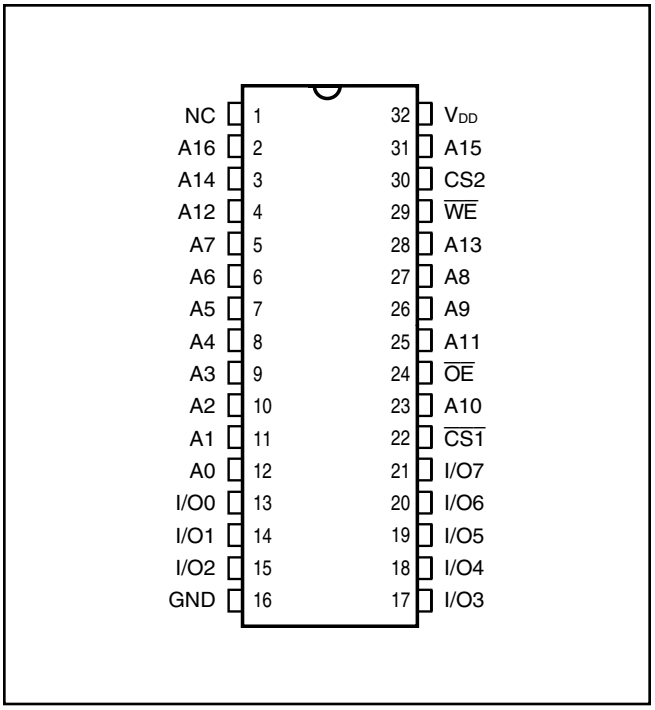
32-pin TSOP (TYPE I) (T), 32-pin sTSOP (TYPE I) (H)



PIN DESCRIPTIONS

A0-A16	Address Inputs
$\overline{CS1}$	Chip Enable 1 Input
CS2	Chip Enable 2 Input
$\overline{OE}$	Output Enable Input
$\overline{WE}$	Write Enable Input
I/O0-I/O7	Input/Output
NC	No Connection
VDD	Power
GND	Ground

32-pin SOP (Q)



ABSOLUTE MAXIMUM RATINGS[1]

Symbol	Parameter	Value	Unit
V_{TERM}	Terminal Voltage with Respect to GND	–0.2 to V_{DD}+0.3	V
V_{DD}	V_{DD} Related to GND	–0.2 to +3.8	V
T_{STG}	Storage Temperature	–65 to +150	°C
P_T	Power Dissipation	1.0	W

Note:
1. Stress 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.

OPERATING RANGE (V_{DD})

Range	Ambient Temperature	IS62WV1288ALL	IS62/65WV1288BLL
Commercial	0°C to +70°C	1.65V - 2.2V	2.5V - 3.6V
Industrial/A1	–40°C to +85°C	1.65V - 2.2V	2.5V - 3.6V
Automotive	–40°C to +125°C		2.5V - 3.6V

DC ELECTRICAL CHARACTERISTICS (Over Operating Range)

Symbol	Parameter	Test Conditions	V_{DD}	Min.	Max.	Unit
V_{OH}	Output HIGH Voltage	I_{OH} = -0.1 mA	1.65-2.2V	1.4	—	V
		I_{OH} = -1 mA	2.5-3.6V	2.2	—	V
V_{OL}	Output LOW Voltage	I_{OL} = 0.1 mA	1.65-2.2V	—	0.2	V
		I_{OL} = 2.1 mA	2.5-3.6V	—	0.4	V
V_{IH}[2]	Input HIGH Voltage		1.65-2.2V	1.4	V_{DD} + 0.2	V
			2.5-3.6V	2.2	V_{DD} + 0.3	V
V_{IL}[1]	Input LOW Voltage		1.65-2.2V	–0.2	0.4	V
			2.5-3.6V	–0.2	0.6	V
I_{LI}	Input Leakage	GND ≤ V_{IN} ≤ V_{DD}		–1	1	µA
I_{LO}	Output Leakage	GND ≤ V_{OUT} ≤ V_{DD}, Outputs Disabled		–1	1	µA

Notes:
1. Undershoot: –1.0V for pulse width less than 10 ns. Not 100% tested.
2. Overshoot: V_{DD} + 1.0V for pulse width less than 10 ns. Not 100% tested.

TRUTH TABLE

Mode	$\overline{WE}$	$\overline{CS1}$	CS2	$\overline{OE}$	I/O Operation	V_{DD} Current
Not Selected	X	H	X	X	High-Z	I_{SB1}, I_{SB2}
(Power-down)	X	X	L	X	High-Z	I_{SB1}, I_{SB2}
Output Disabled	H	L	H	H	High-Z	I_{CC}
Read	H	L	H	L	D_{OUT}	I_{CC}
Write	L	L	H	X	D_{IN}	I_{CC}

CAPACITANCE[1]

Symbol	Parameter	Conditions	Max.	Unit
C_{IN}	Input Capacitance	V_{IN} = 0V	8	pF
C_{OUT}	Input/Output Capacitance	V_{OUT} = 0V	10	pF

Note:
1. Tested initially and after any design or process changes that may affect these parameters.

AC TEST CONDITIONS

Parameter	62WV1288ALL (Unit)	62/65WV1288BLL (Unit)
Input Pulse Level	0.4V to V_{DD}-0.2V	0.4V to V_{DD}-0.3V
Input Rise and Fall Times	5 ns	5ns
Input and Output Timing and Reference Level	V_{REF}	V_{REF}
Output Load	See Figures 1 and 2	See Figures 1 and 2

	1.65V - 2.2V	2.5V - 3.6V
R1(Ω)	3070	3070
R2(Ω)	3150	3150
V_{REF}	0.9V	1.5V
V_{TM}	1.8V	2.8V

AC TEST LOADS

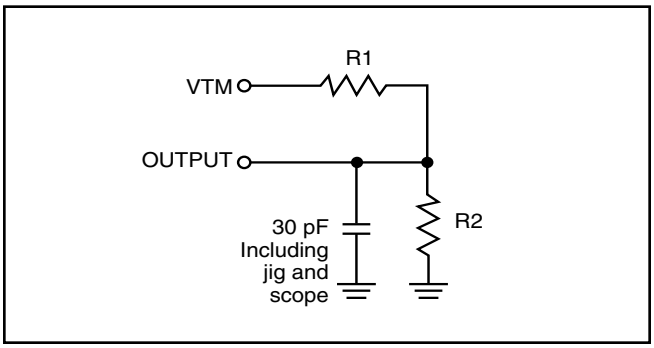


Figure 1

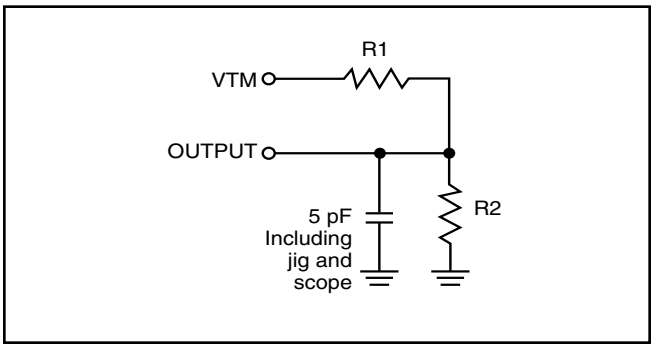


Figure 2

POWER SUPPLY CHARACTERISTICS[1] (Over Operating Range)

1.65V - 2.2V

Symbol	Parameter	Test Conditions		Max. 70 ns	Unit
I_{CC}	V_{DD} Dynamic Operating Supply Current	V_{DD} = Max., I_{OUT} = 0 mA, f = f_{MAX}	Com. Ind. typ.[2]	8 8 5	mA
I_{CC1}	Operating Supply Current	V_{DD} = Max., I_{OUT} = 0 mA, f = 0	Com. Ind.	5 5	mA
I_{SB1}	TTL Standby Current (TTL Inputs)	V_{DD} = Max., V_{IN} = V_{IH} or V_{IL} $\overline{CS1}$ = V_{IH} , CS2 = V_{IL}, f = 1 MHz	Com. Ind.	0.8 0.8	mA
I_{SB2}	CMOS Standby Current (CMOS Inputs)	V_{DD} = Max., $\overline{CS1} \geq V_{DD} - 0.2V$, CS2 ≤ 0.2V, $V_{IN} \geq V_{DD} - 0.2V$, or $V_{IN} \leq 0.2V$, f = 0	Com. Ind. typ.[2]	10 10 5	µA

Note:
1. At f = f_{MAX}, address and data inputs are cycling at the maximum frequency, f = 0 means no input lines change.
2. Typical values are measured at V_{DD}=1.8V, T_A=25°C. Not 100% tested.

POWER SUPPLY CHARACTERISTICS[1] (Over Operating Range)

2.5V - 3.6V

Symbol	Parameter	Test Conditions		Max. 45ns	Max. 55 ns	Unit
I_{CC}	V_{DD} Dynamic Operating Supply Current	V_{DD} = Max., I_{OUT} = 0 mA, f = f_{MAX}	Com. Ind./A1 A3 typ.[2]	17 17 12	15 15 35 10	mA
I_{CC1}	Operating Supply Current	V_{DD} = Max., I_{OUT} = 0 mA, f = 0	Com. Ind./A1 A3	5 5	5 5 7	mA
I_{SB1}	TTL Standby Current (TTL Inputs)	V_{DD} = Max., V_{IN} = V_{IH} or V_{IL} $\overline{CS1}$ = V_{IH} , CS2 = V_{IL}, f = 1 MHz	Com. Ind./A1 A3	0.8 0.8	0.8 0.8 3	mA
I_{SB2}	CMOS Standby Current (CMOS Inputs)	V_{DD} = Max., $\overline{CS1} \geq V_{DD} - 0.2V$, CS2 ≤ 0.2V, $V_{IN} \geq V_{DD} - 0.2V$, or $V_{IN} \leq 0.2V$, f = 0	Com. Ind./A1 A3 typ.[2]	10 10 5	10 10 75 5	µA

Note:
1. At f = f_{MAX}, address and data inputs are cycling at the maximum frequency, f = 0 means no input lines change.
2. Typical values are measured at V_{DD}=3.0V, T_A=25°C. Not 100% tested.

READ CYCLE SWITCHING CHARACTERISTICS[1] (Over Operating Range)

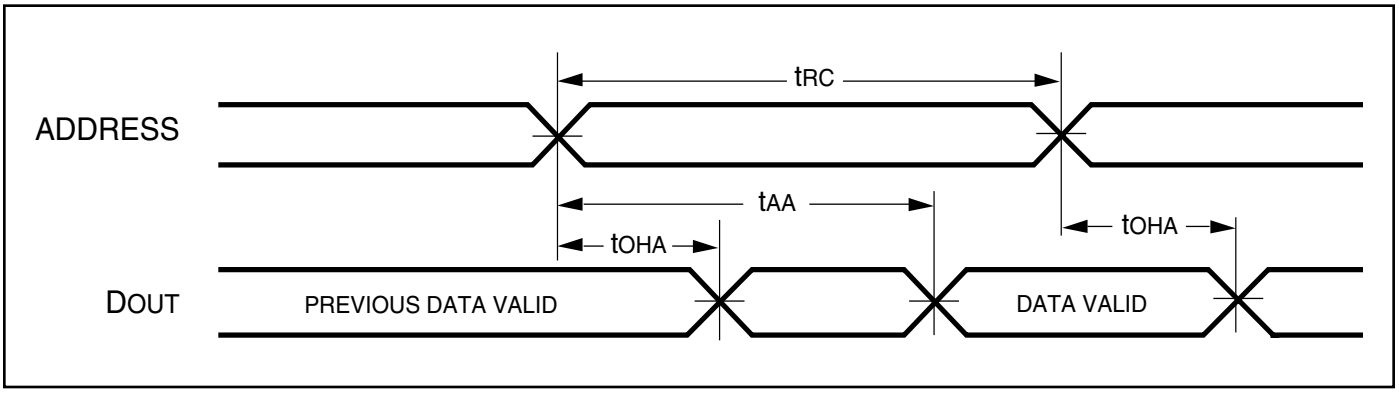
Symbol	Parameter	45 ns		55 ns		70 ns		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
t_{RC}	Read Cycle Time	45	—	55	—	70	—	ns
t_{AA}	Address Access Time	—	45	—	55	—	70	ns
t_{OHA}	Output Hold Time	10	—	10	—	10	—	ns
t_{ACS1}/t_{ACS2}	$\overline{CS1}$/CS2 Access Time	—	45	—	55	—	70	ns
t_{DOE}	$\overline{OE}$ Access Time	—	20	—	25	—	35	ns
t_{HZOE}[2]	$\overline{OE}$ to High-Z Output	0	15	0	20	0	25	ns
t_{LZOE}[2]	$\overline{OE}$ to Low-Z Output	5	—	5	—	5	—	ns
t_{HZCS1}/t_{HZCS2}[2]	$\overline{CS1}$/CS2 to High-Z Output	0	15	0	20	0	25	ns
t_{LZCS1}/t_{LZCS2}[2]	$\overline{CS1}$/CS2 to Low-Z Output	5	—	10	—	10	—	ns

Notes:

1. Test conditions assume signal transition times of 5 ns or less, timing reference levels of 0.9V/1.5V, input pulse levels of 0.4 to V_{DD}-0.2V/V_{DD}-0.3V and output loading specified in Figure 1.
2. Tested with the load in Figure 2. Transition is measured ±500 mV from steady-state voltage. Not 100% tested.

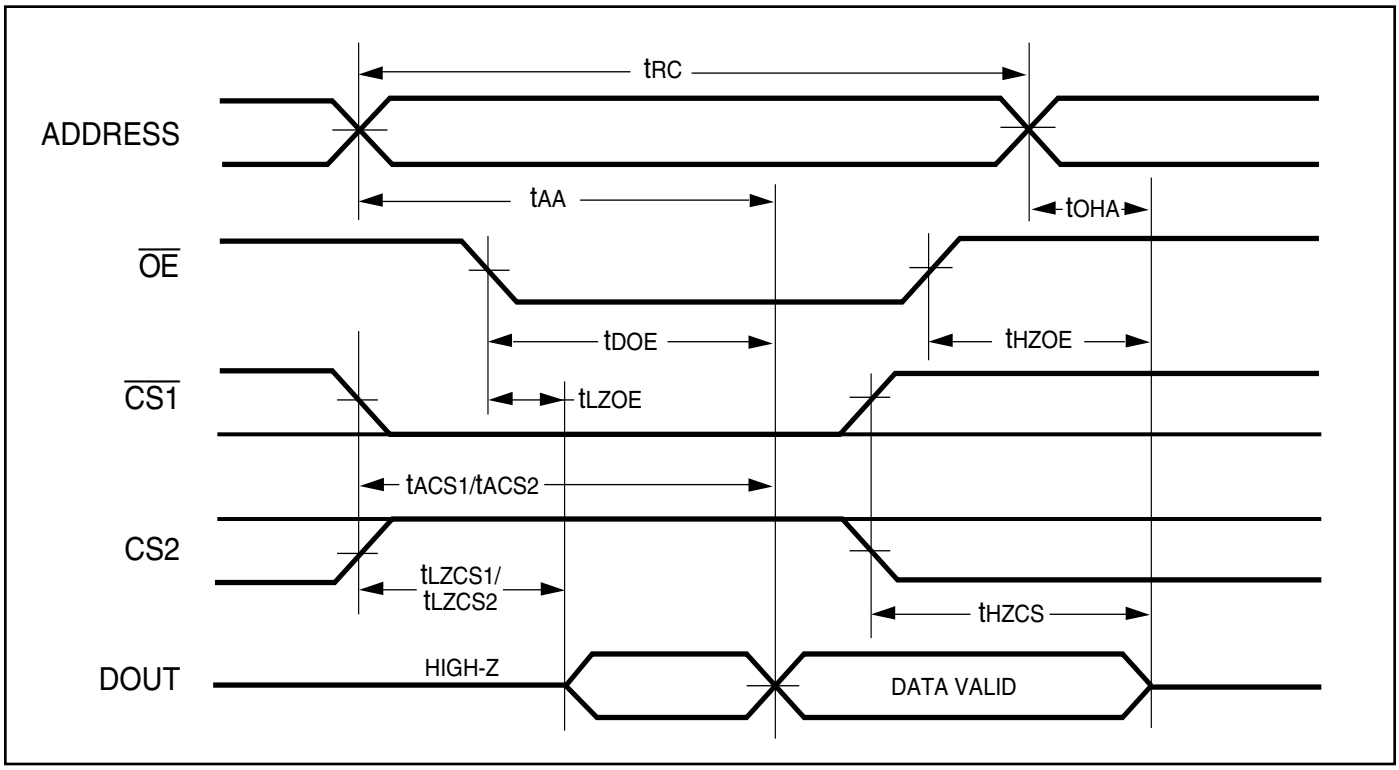
AC WAVEFORMS

READ CYCLE NO. 1[1,2] (Address Controlled) ($\overline{CS1}$ = $\overline{OE}$ = V_{IL}, CS2 = $\overline{WE}$ = V_{IH})



AC WAVEFORMS

READ CYCLE NO. 2[1,3] ($\overline{CS1}$, CS2, $\overline{OE}$ Controlled)



Notes:
1. $\overline{WE}$ is HIGH for a Read Cycle.
2. The device is continuously selected. $\overline{OE}$, $\overline{CS1}$= V_{IL}. CS2=$\overline{WE}$=V_{IH}.
3. Address is valid prior to or coincident with $\overline{CS1}$ LOW and CS2 HIGH transition.

WRITE CYCLE SWITCHING CHARACTERISTICS[1,2] (Over Operating Range)

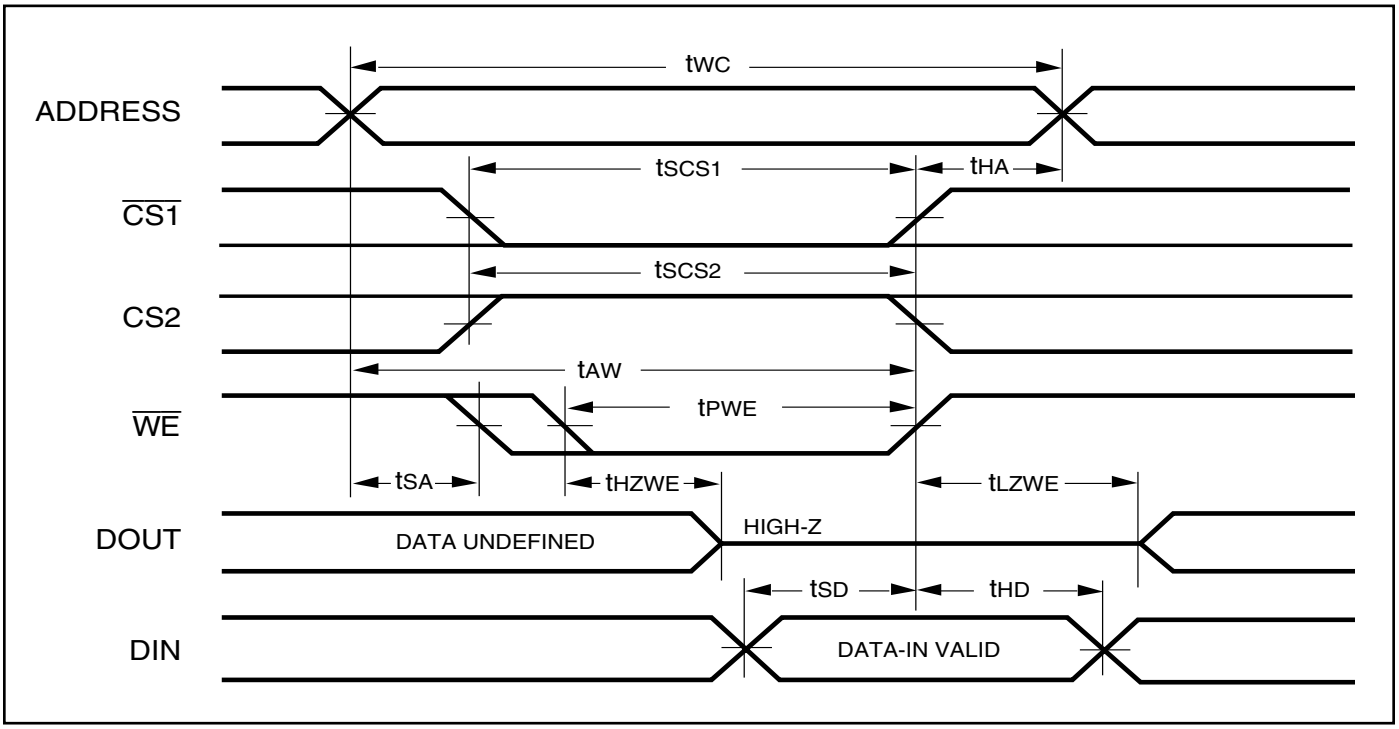
Symbol	Parameter	45 ns Min.	45 ns Max.	55 ns Min.	55 ns Max.	70 ns Min.	70 ns Max.	Unit
t_{WC}	Write Cycle Time	45	—	55	—	70	—	ns
t_{SCS1}/t_{SCS2}	CS1/CS2 to Write End	35	—	45	—	60	—	ns
t_{AW}	Address Setup Time to Write End	35	—	45	—	60	—	ns
t_{HA}	Address Hold from Write End	0	—	0	—	0	—	ns
t_{SA}	Address Setup Time	0	—	0	—	0	—	ns
t_{PWE}	$\overline{WE}$ Pulse Width	35	—	40	—	50	—	ns
t_{SD}	Data Setup to Write End	20	—	25	—	30	—	ns
t_{HD}	Data Hold from Write End	0	—	0	—	0	—	ns
t_{HZWE}[3]	$\overline{WE}$ LOW to High-Z Output	—	20	—	20	—	20	ns
t_{LZWE}[3]	$\overline{WE}$ HIGH to Low-Z Output	5	—	5	—	5	—	ns

Notes:

1. Test conditions assume signal transition times of 5 ns or less, timing reference levels of 0.9V/1.5V, input pulse levels of 0.4V to V_{DD}-0.2V/V_{DD}-0.3V and output loading specified in Figure 1.
2. The internal write time is defined by the overlap of $\overline{CS1}$ LOW, CS2 HIGH, and $\overline{WE}$ LOW. All signals must be in valid states to initiate a Write, but any one can go inactive to terminate the Write. The Data Input Setup and Hold timing are referenced to the rising or falling edge of the signal that terminates the write.
3. Tested with the load in Figure 2. Transition is measured ±500 mV from steady-state voltage. Not 100% tested.

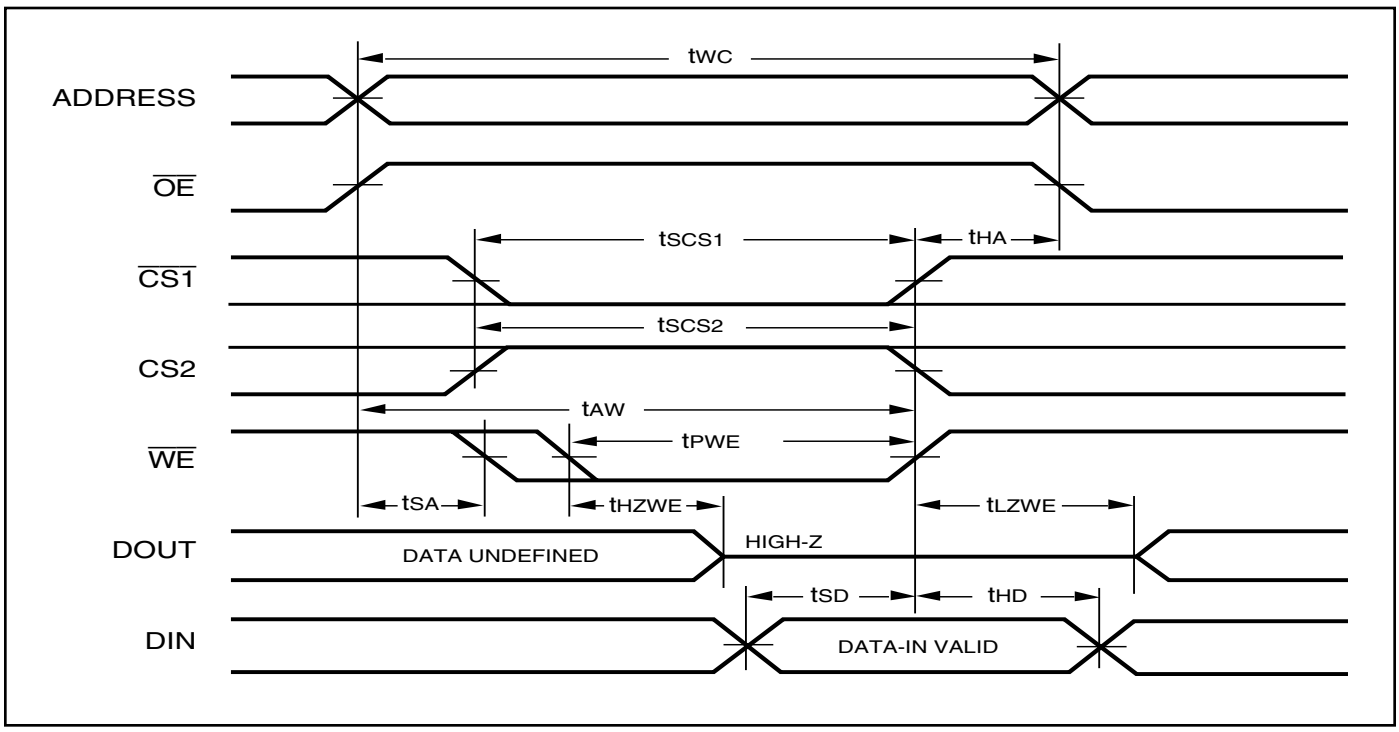
AC WAVEFORMS

WRITE CYCLE NO. 1 ($\overline{CS1}$/CS2 Controlled, $\overline{OE}$ = HIGH or LOW)

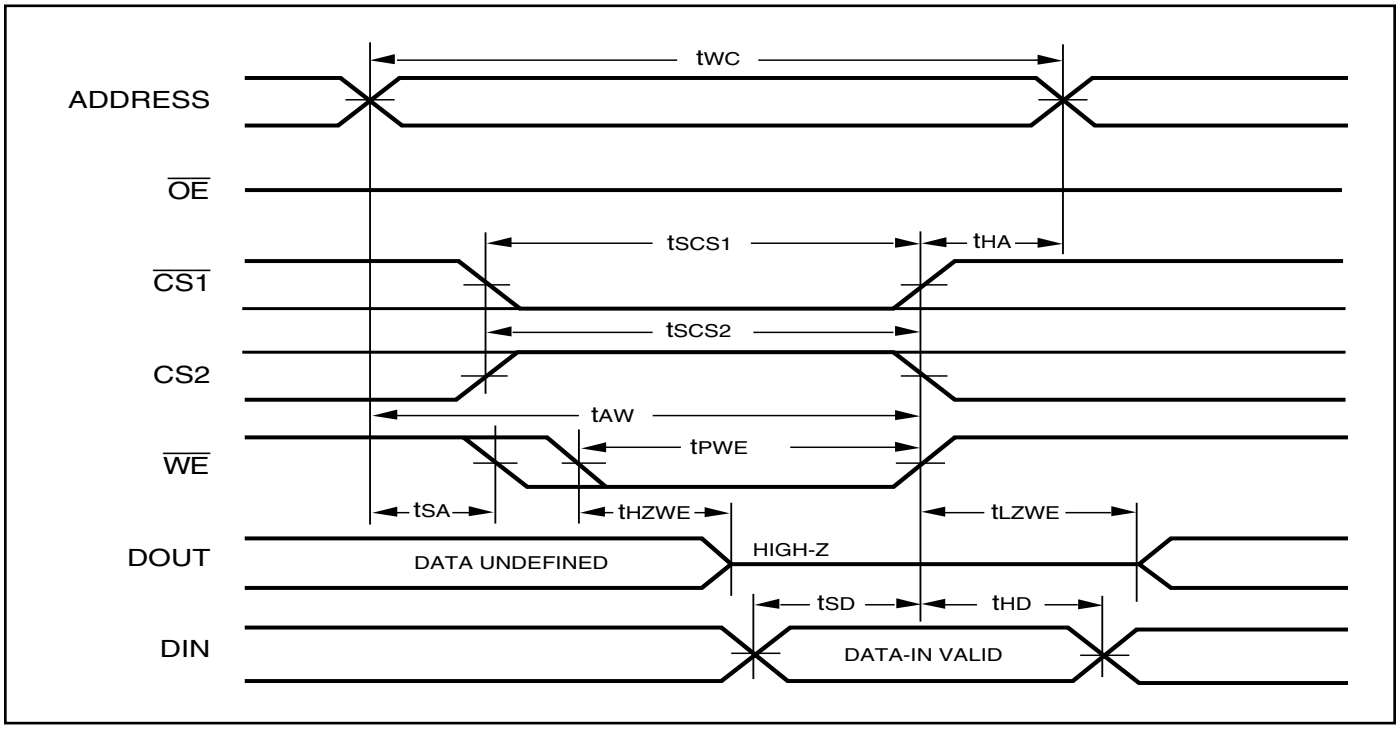


AC WAVEFORMS

WRITE CYCLE NO. 2 ($\overline{WE}$ Controlled: $\overline{OE}$ is HIGH During Write Cycle)



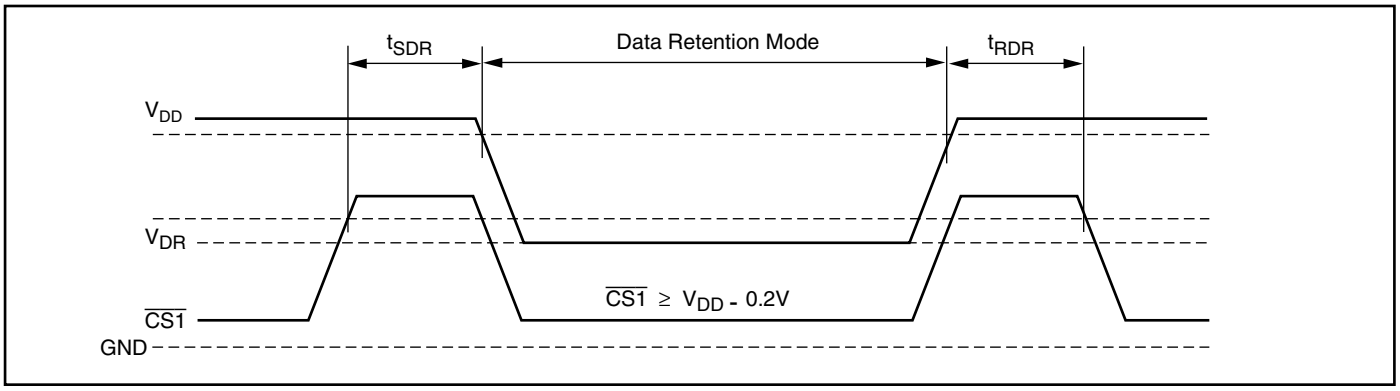
WRITE CYCLE NO. 3 ($\overline{WE}$ Controlled: $\overline{OE}$ is LOW During Write Cycle)



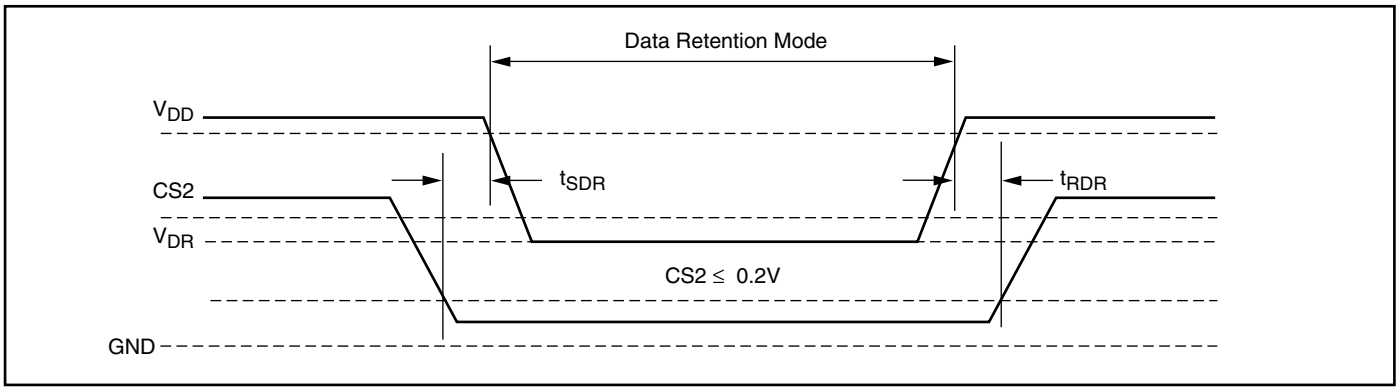
DATA RETENTION SWITCHING CHARACTERISTICS

Symbol	Parameter	Test Condition		Min.	Max.	Unit
V_{DR}	V_{DD} for Data Retention	See Data Retention Waveform		1.2	3.6	V
I_{DR}	Data Retention Current	V_{DD} = 1.2V, $\overline{CS1} \geq V_{DD} - 0.2V$	Com.	—	5	µA
			Ind./A1	—	10	
			A3	—	75	
t_{SDR}	Data Retention Setup Time	See Data Retention Waveform		0	—	ns
t_{RDR}	Recovery Time	See Data Retention Waveform		t_{RC}	—	ns

DATA RETENTION WAVEFORM ($\overline{CS1}$ Controlled)



DATA RETENTION WAVEFORM (CS2 Controlled)



ORDERING INFORMATION

IS62WV1288ALL (1.65V - 2.2V)

Industrial Range: -40°C to +85°C

Speed (ns)	Order Part No.	Package
70	IS62WV1288ALL-70BI	mini BGA (6mm x 8mm)
	IS62WV1288ALL-70HI	sTSOP, TYPE I

IS62WV1288BLL (2.5V-3.6V)

Industrial Range: -40°C to +85°C

Speed (ns)	Order Part No.	Package
45	IS62WV1288BLL-45TI	TSOP, TYPE I
	IS62WV1288BLL-45BI	mini BGA (6mm x 8mm)
	IS62WV1288BLL-45HI	sTSOP, TYPE I
	IS62WV1288BLL-45HLI	sTSOP, TYPE I, Lead-free
	IS62WV1288BLL-45QI	SOP
55	IS62WV1288BLL-55TI	TSOP, TYPE I
	IS62WV1288BLL-55TLI	TSOP, TYPE I, Lead-free
	IS62WV1288BLL-55BI	mini BGA (6mm x 8mm)
	IS62WV1288BLL-55HI	sTSOP, TYPE I
	IS62WV1288BLL-55HLI	sTSOP, TYPE I, Lead-free
	IS62WV1288BLL-55QI	SOP
	IS62WV1288BLL-55QLI	SOP, Lead-free

IS65WV1288BLL (2.5V-3.6V)

A1 Range: -40°C to +85°C

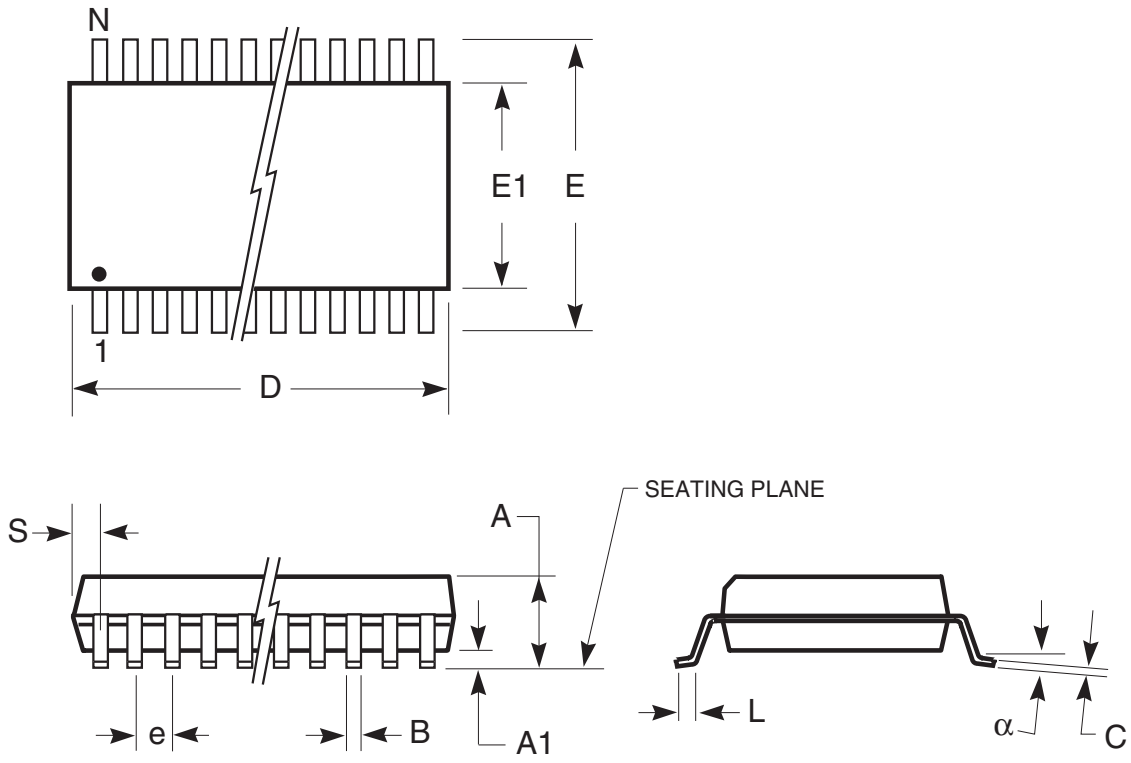
Speed (ns)	Order Part No.	Package
55	IS65WV1288BLL-55HLA1	sTSOP, TYPE I, Lead-free
	IS65WV1288BLL-55TLA1	TSOP, TYPE I, Lead-free

A3 Range: -40°C to +125°C

Speed (ns)	Order Part No.	Package
55	IS65WV1288BLL-55HLA3	sTSOP, TYPE I, Lead-free

PACKAGING INFORMATION

450-mil Plastic SOP
Package Code: Q (32-pin)

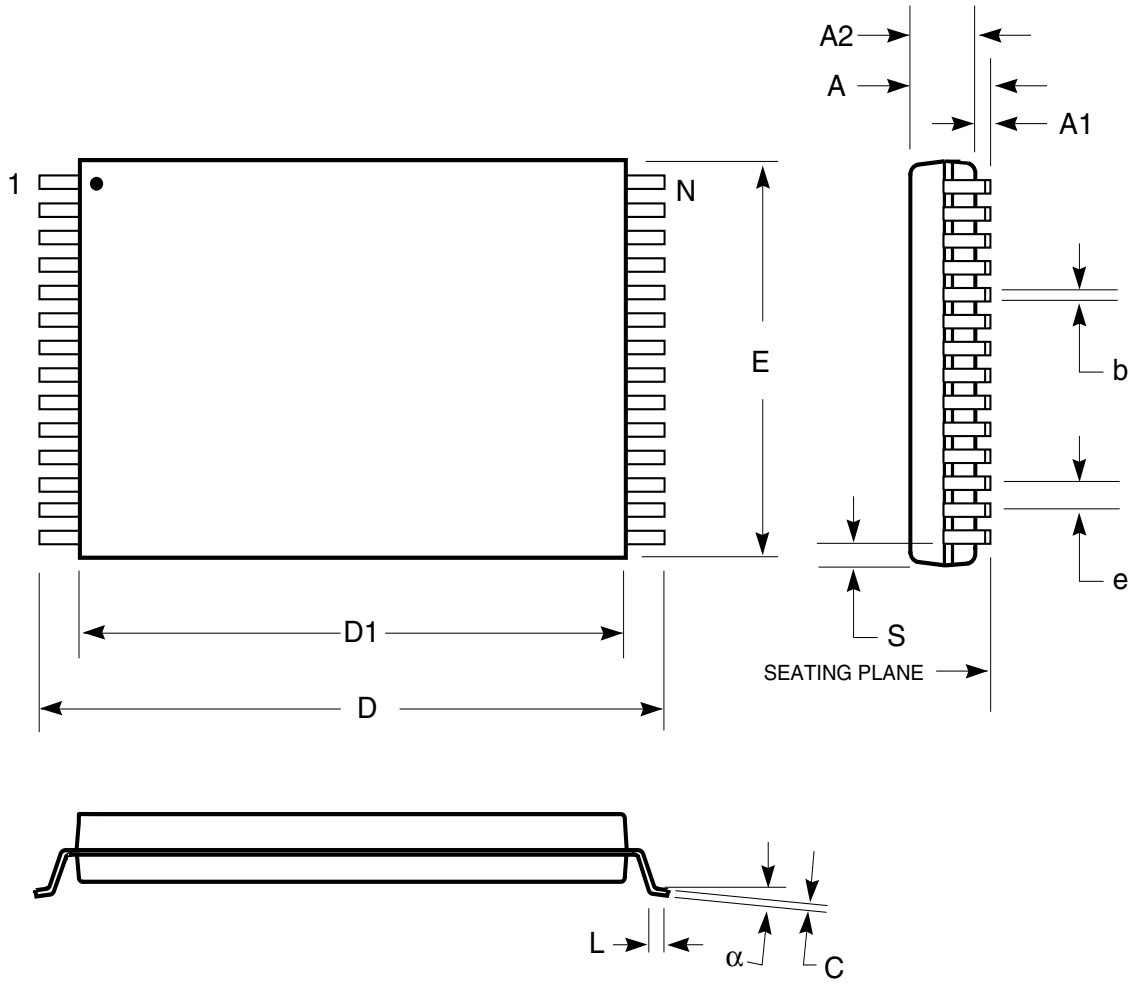


	MILLIMETERS		INCHES	
Symbol	**Min.**	**Max.**	**Min.**	**Max.**
No. Leads		**32**		
A	—	3.00	—	0.118
A1	0.10	—	0.004	—
B	0.36	0.51	0.014	0.020
C	0.15	0.30	0.006	0.012
D	20.14	20.75	0.793	0.817
E	13.87	14.38	0.546	0.566
E1	11.18	11.43	0.440	0.450
e	1.27 BSC		0.050 BSC	
L	0.58	0.99	0.023	0.039
α	0°	10°	0°	10°
S	—	0.86	—	0.034

Notes:
1. Controlling dimension: inches, unless otherwise specified.
2. BSC = Basic lead spacing between centers.
3. Dimensions D and E1 do not include mold flash protrusions and should be measured from the bottom of the package.
4. Formed leads shall be planar with respect to one another within 0.004 inches at the seating plane.

PACKAGING INFORMATION

Plastic STSOP - 32 pins
Package Code: H (Type I)

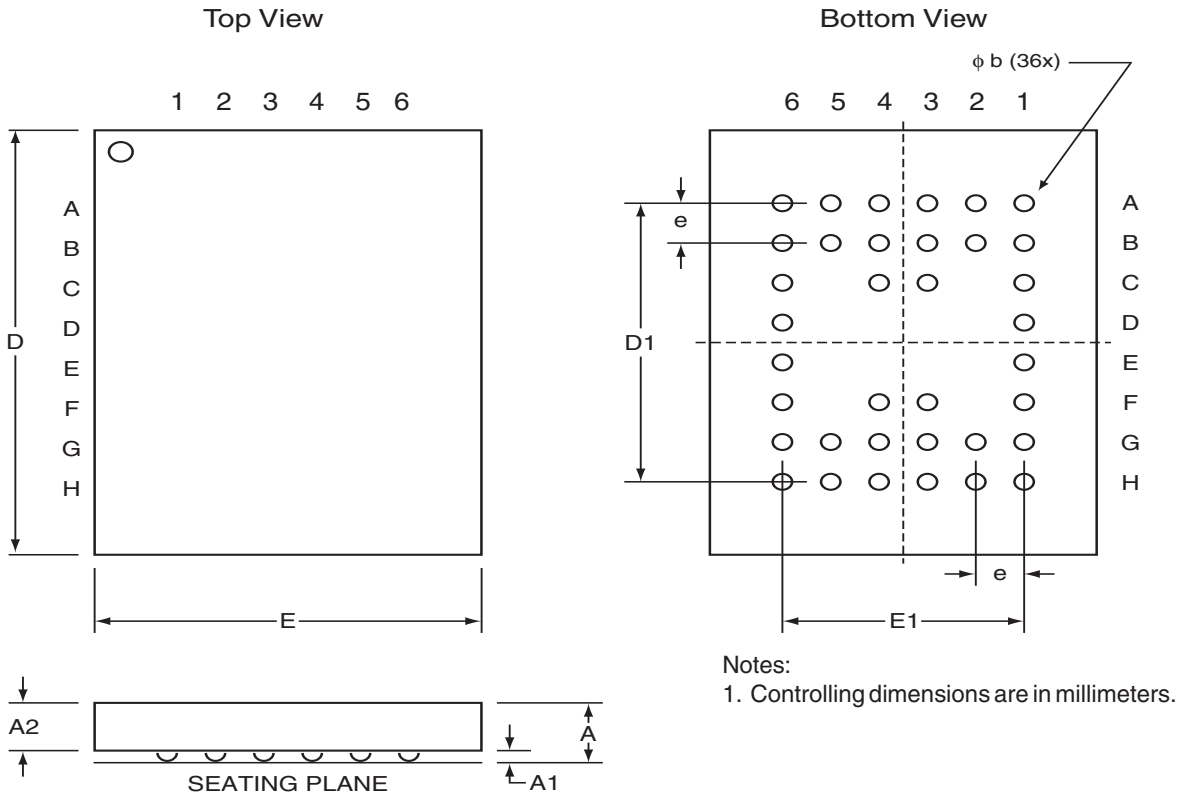


Plastic STSOP (H - Type I)				
	Millimeters		Inches	
Symbol	Min	Max	Min	Max
Ref. Std.				
N		32		
A	—	1.25	—	0.049
A1	0.05	—	0.002	—
A2	0.95	1.05	0.037	0.041
b	0.17	0.23	0.007	0.009
C	0.14	0.16	0.0055	0.0063
D	13.20	13.60	0.520	0.535
D1	11.70	11.90	0.461	0.469
E	7.90	8.10	0.311	0.319
e	0.50 BSC		0.020 BSC	
L	0.30	0.70	0.012	0.028
S	0.28 Typ.		0.011 Typ.	
α	0°	5°	0°	5°

Notes:
1. Controlling dimension: millimeters, unless otherwise specified.
2. BSC = Basic lead spacing between centers.
3. Dimensions D1 and E do not include mold flash protrusions and should be measured from the bottom of the package.
4. Formed leads shall be planar with respect to one another within 0.004 inches at the seating plane.

PACKAGING INFORMATION

Mini Ball Grid Array
Package Code: B (36-pin)



Notes:
1. Controlling dimensions are in millimeters.

mBGA - 6mm x 8mm

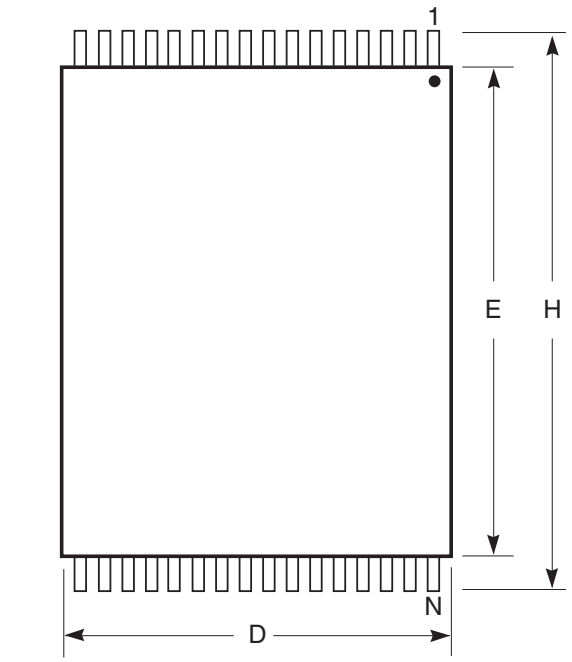
	MILLIMETERS			INCHES		
Sym.	Min.	Typ.	Max.	Min.	Typ.	Max.
N0. Leads		36			36	
A	—	—	1.20	—	—	0.047
A1	0.24	—	0.30	0.009	—	0.012
A2	0.60	—	—	0.024	—	—
D	7.90	8.00	8.10	0.311	0.315	0.319
D1		5.25BSC			0.207BSC	
E	5.90	6.00	6.10	0.232	0.236	0.240
E1		3.75BSC			0.148BSC	
e		0.75BSC			0.030BSC	
b	0.30	0.35	0.40	0.012	0.014	0.016

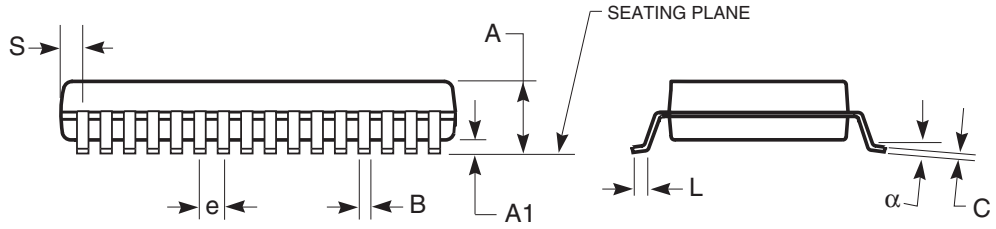
mBGA - 8mm x 10mm

	MILLIMETER			INCHES		
Sym.	Min.	Typ.	Max.	Min.	Typ.	Max.
N0. Leads		36			36	
A	—	—	1.20	—	—	0.047
A1	0.24	—	0.30	0.009	—	0.012
A2	0.60	—	—	0.024	—	—
D	9.90	10.00	10.10	0.390	0.394	0.398
D1		5.25BSC			.207BSC	
E	7.90	8.00	8.10	0.311	0.315	0.319
E1		3.75BSC			0.148BSC	
e		0.75BSC			0.030BSC	
b	0.30	0.35	0.40	0.012	0.014	0.016

PACKAGING INFORMATION

Plastic TSOP-Type I
Package Code: T (32-pin)





	MILLIMETERS		INCHES	
Symbol	**Min.**	**Max.**	**Min.**	**Max.**
No. Leads		**32**		
A	—	1.20	—	0.047
A1	0.05	0.25	0.002	0.010
B	0.17	0.23	0.007	0.009
C	0.12	0.17	0.005	0.007
D	7.90	8.10	0.311	0.319
E	18.30	18.50	0.720	0.728
H	19.80	20.20	0.780	0.795
e	0.50 BSC		0.020 BSC	
L	0.40	0.60	0.016	0.024
α	0°	8°	0°	8°
S	0.25 REF		0.010 REF	

Notes:
1. Controlling dimension: millimeters, unless otherwise specified.
2. BSC = Basic lead spacing between centers.
3. Dimensions D and E do not include mold flash protrusions and should be measured from the bottom of the package.
4. Formed leads shall be planar with respect to one another within 0.004 inches at the seating plane.