Revision History

Rev. No.	History	Issue Date
2.0	Initial issue with new naming rule	Jan.26, 2005
2.1	Add a new 32L WSON –8x8mm package	Aug.12, 2005

■ GENERAL DESCRIPTION

The CS18LV40963 is a high performance, high speed, and super low power CMOS Static Random Access Memory organized as 524,288 words by 8 bits and operates from a wide range of 2.7 to 3.6V supply voltage. Advanced CMOS technology and circuit techniques provide both high speed and low power features with a typical CMOS standby current of 0.50uA and maximum access time of 55/70ns in 3.0V operation. Easy memory expansion is provided by an active LOW chip enable (/CE) and active LOW output enable (/OE) and three-state output drivers.

The CS18LV40963 has an automatic power down feature, reducing the power consumption significantly when chip is deselected. The CS18LV40963 is available in JEDEC standard 32-pin sTSOP 1 -8x13.4 mm, TSOP 1 -8x20mm, TSOP 2 -400mil, SOP -450 mil and WSON –8x8mm packages.

.

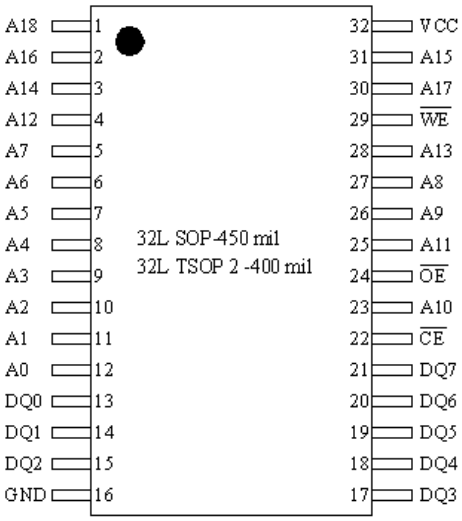
■ FEATURES

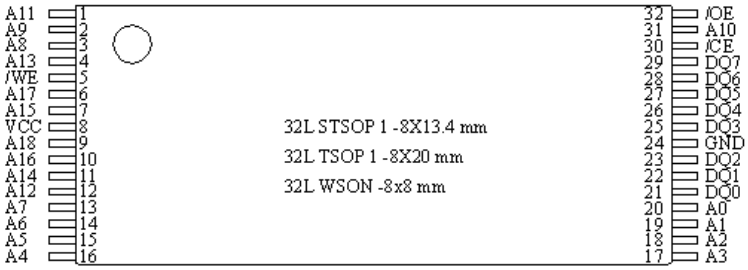
- Low operation voltage : 2.7 ~ 3.6V
  Ultra low power consumption : 3mA@1MHz (Max.) operating current
  0.50 uA (Typ.) CMOS standby current
- High speed access time : 55/70ns (Max.) at Vcc = 3.0V.
- Automatic power down when chip is deselected.
- Three state outputs and TTL compatible
- Data retention supply voltage as low as 1.5V.
- Easy expansion with /CE and /OE options.

■ Product Family

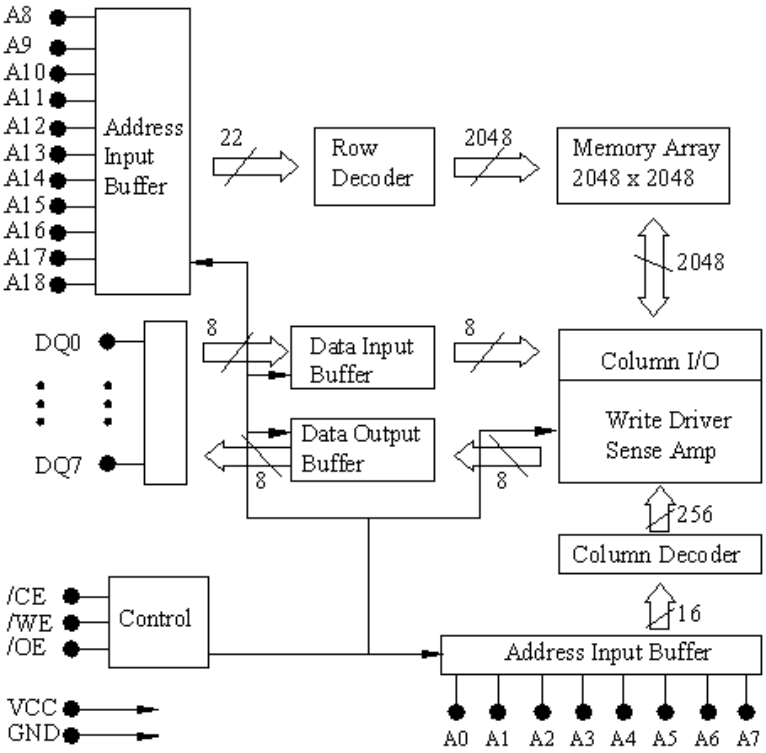
Product Family	Operating Temp	Standby (Typ.) (Vcc = 3.0V)	Vcc. Range	Speed (ns)	Package Type
CS18LV40963	0~70°C	0.50 uA	2.7~3.6	55/70	32L SOP
					32L STSOP 1
					32L TSOP 1
	-40~85°C	1.0 uA			32L TSOP 2
					32L WSON
					Dice

■ PIN CONFIGURATIONS





■ FUNCTIONAL BLOCK DIAGRAM



■ PIN DESCRIPTIONS

Name	Type	Function
A0 – A18	Input	Address inputs for selecting one of the 524,288 x 8 bit words in the RAM
/CE	Input	/CE is active LOW. Chip enables must be active when data read from or write to the device. If either chip enable is not active, the device is deselected and in a standby power down mode. The DQ pins will be in high impedance state when the device is deselected.
/WE	Input	The Write enable input is active LOW. It controls read and write operations. With the chip selected, when /WE is HIGH and /OE is LOW, output data will be present on the DQ pins, when /WE is LOW, the data present on the DQ pins will be written into the selected memory location.
/OE	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 impedance state when /OE is inactive.
DQ0~DQ7	I/O	These 8 bi-directional ports are used to read data from or write data into the RAM.
Vcc	Power	Power Supply
Gnd	Power	Ground
NC		No connection

■ TRUTH TABLE

MODE	/CE	/WE	/OE	DQ0~7	Vcc Current
Standby	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}

■ ABSOLUTE MAXIMUM RATINGS (1)

Symbol	Parameter	Rating	Unit
V_{TERM}	Terminal Voltage with Respect to GND	-0.5 to Vcc+0.5	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	30	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.

■ OPERATING RANGE

Range	Ambient Temperature	Vcc
Commercial	0~70^{o}C	2.7V ~ 3.6V
Industrial	-40~85^{o}C	2.7V ~ 3.6V

1. Overshoot : Vcc +2.0V in case of pulse width ≦20ns.
2. Undershoot : - 2.0V in case of pulse width ≦20ns.
3. Overshoot and undershoot are sampled, not 100% tested.

■ CAPACITANCE (1) (TA = 25^{o}C, f =1.0 MHz)

Symbol	Parameter	Conditions	MAX.	Unit
C_{IN}	Input Capacitance	V_{IN}=0V	6	pF
C_{DQ}	Input/Output Capacitance	$V_{I/O}$=0V	8	pF

1. This parameter is guaranteed and not tested.

■ DC ELECTRICAL CHARACTERISTICS (TA = 0 to + 70°C , Vcc = 3.0V)

Parameter Name	Parameter	Test Conduction	MIN	TYP(1)	MAX	Unit
V_{IL}	Guaranteed Input Low Voltage (2)		-0.5		0.8	V
V_{IH}	Guaranteed Input High Voltage (2)		2.0		Vcc+0.2	V
I_{IL}	Input Leakage Current	V_{CC}=MAX, V_{IN}=0 to V_{CC}	-1		1	uA
I_{OL}	Output Leakage Current	V_{CC}=MAX, /CE=V_{IN}, or /OE=V_{IN} , V_{IO}=0V to V_{CC}	-1		1	uA
V_{OL}	Output Low Voltage	V_{CC}=MAX, I_{OL} = 2mA			0.4	V
V_{OH}	Output High Voltage	V_{CC}=MIN, I_{OH} = -1mA	2.4			V
I_{CC}	Operating Power Supply Current	/CE=V_{IL}, I_{DQ}=0mA, F=F_{MAX}(3)			30	mA
I_{CCSB}	Standby Supply - TTL	/CE=V_{IH}, I_{DQ}=0mA,			1	mA
I_{CCSB1}	Standby Current -CMOS	/CE≧V_{CC}-0.2V, V_{IN}≧ V_{CC}-0.2V or V_{IN}≦0.2V		0.5	5	uA

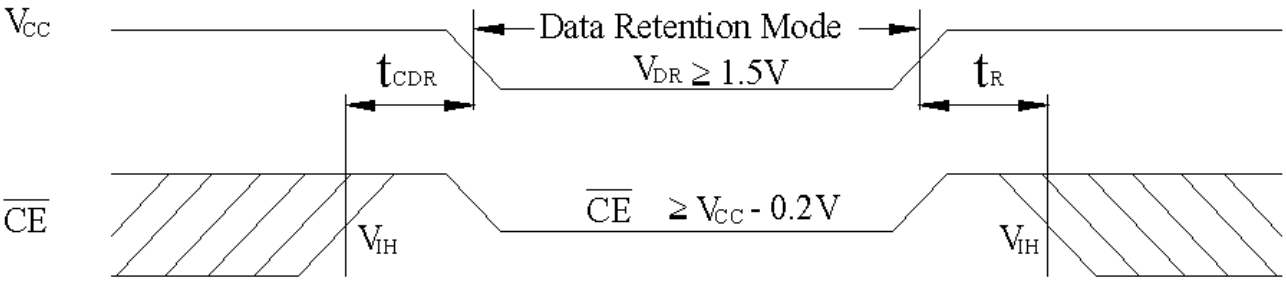
1. Typical characteristics are at TA = 25°C.
2. These are absolute values with respect to device ground and all overshoots due to system or tester notice are included.
3. Fmax = 1/t_{RC}.

■ DATA RETENTION CHARACTERISTICS (TA = 0 to + 70°C)

Parameter Name	Parameter	Test Conduction	MIN	TYP	MAX	Unit
V_{DR}	V_{CC} for Data Retention	/CE≧V_{CC}-0.2V, V_{IN}≧V_{CC}-0.2V or V_{IN}≦0.2V	1.5			V
I_{CCDR}	Data Retention Current	/CE≧V_{CC}-0.2V, V_{CC}=1.5V V_{IN}≧V_{CC}-0.2V or V_{IN}≦0.2V		0.3	2	uA
T_{CDR}	Chip Deselect to Data Retention Time	See Retention Waveform	0			ns
t_R	Operation Recovery Time		t_{RC} (1)			ns

1. Read Cycle Time.

■ LOW Vcc DATA RETENTION WAVEFORM (/CE Controlled)



■ AC TEST CONDITIONS

Input Pulse Levels	Vcc/0V
Input Rise and Fall Times	5ns
Input and Output Timing Reference Level	0.5Vcc
Output Load	See FIGURE 1A and 1B

■ KEY TO SWITCHING WAVEFORMS

WAVEFORMS	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 UNKNOWN
	DOES NOT APPLY	CENTER LINE IS HIGH IMPEDANCE OFF STATE

■ AC TEST LOADS AND WAVEFORMS

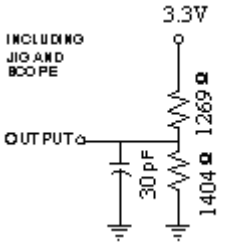


FIGURE 1A

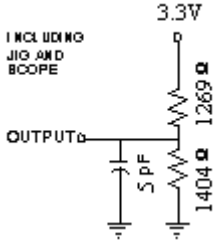


FIGURE 1B

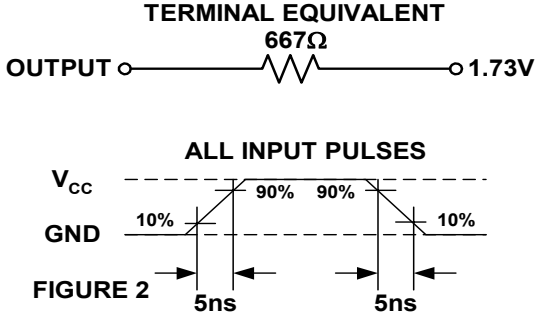


FIGURE 2

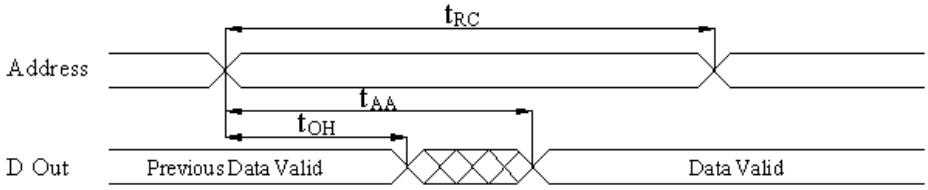
■ AC ELECTRICAL CHARACTERISTICS (TA = 0 to + 70°C , Vcc = 3.3V)

< READ CYCLE >

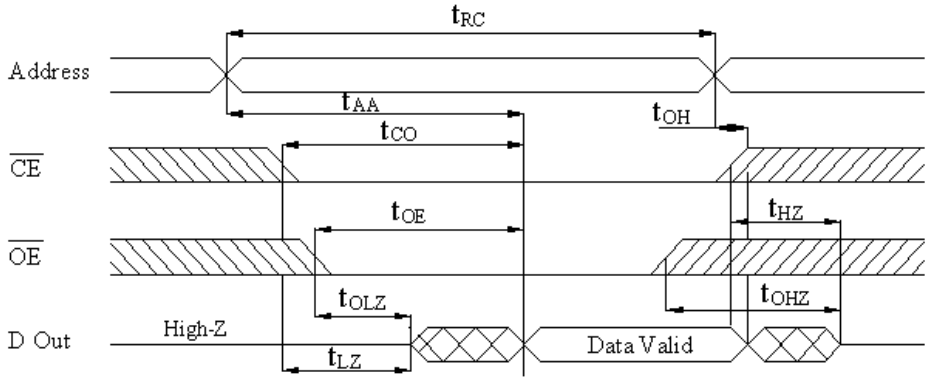
JEDEC Parameter Name	Parameter Name	Description	55		-70		Unit
			MIN	MAX	MIN	MAX	
t_{AVAX}	t_{RC}	Read Cycle Time	55		70		ns
t_{AVQV}	t_{AA}	Address Access Time		55		70	ns
t_{ELQV}	t_{CO}	Chip Select Access Time (/CE)		55		70	ns
t_{GLQV}	t_{OE}	Output Enable to Output Valid		25		35	ns
t_{ELQX}	t_{LZ}	Chip Select to Output Low Z (/CE)	10		10		ns
t_{GLQX}	t_{OLZ}	Output Enable to Output in Low Z	5		5		ns
t_{EHQZ}	t_{CHZ}	Chip Deselect to Output in High Z (/CE)	0	20	0	25	ns
t_{GHQZ}	t_{OHZ}	Output Disable to Output in High Z	0	20	0	25	ns
t_{AXOX}	t_{OH}	Out Disable to Address Change	10		10		ns

■ SWITCHING WAVEFORMS (READ CYCLE)

READ CYCLE 1.



READ CYCLE 2.



NOTES:

1. t_{HZ} and t_{OHZ} are defined as the outputs achieve the open circuit conditions and are not referenced to output voltage levels.
2. At any given temperature and voltage condition, t_{HZ}(Max.) is less than t_{LZ}(Min.) both for a given device and from device to device interconnection.

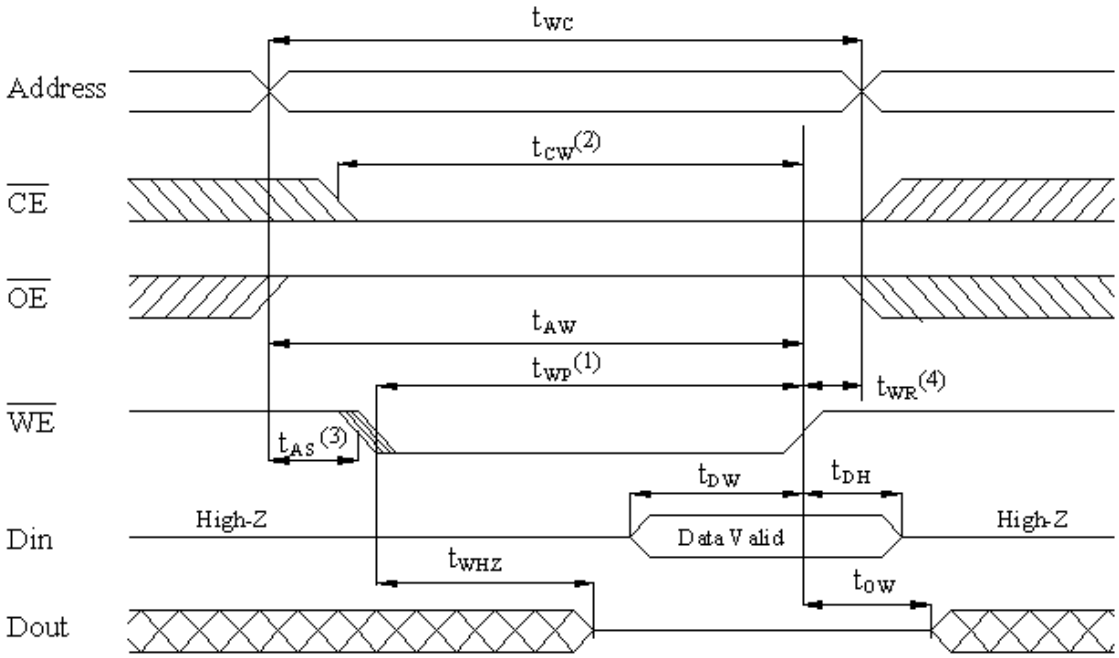
■ AC ELECTRICAL CHARACTERISTICS (TA = 0 to + 70°C , Vcc = 3.3V)

< WRITE CYCLE >

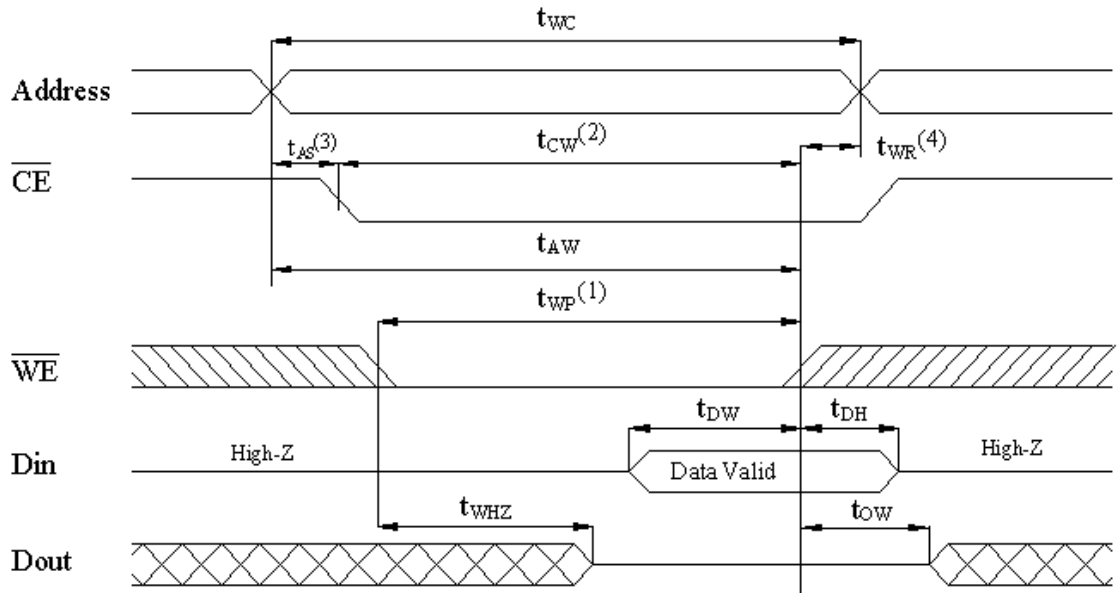
JEDEC Parameter Name	Parameter Name	Description	55		-70		Unit
			MIN	MAX	MIN	MAX	
t_{AVAX}	t_{WC}	Write Cycle Time	55		70		ns
t_{E1LWH}	t_{CW}	Chip Select to End of Write	45		60		ns
t_{AVWL}	t_{AS}	Address Setup Time	0		0		ns
t_{AVWH}	t_{AW}	Address Valid to End of Write	45		60		ns
t_{WLWH}	t_{WP}	Write Pulse Width	40		50		ns
t_{WHAX}	t_{WR}	Write Recovery Time (/CE, /WE)	0		0		ns
t_{WLQZ}	t_{WHZ}	Write to Output in High Z		20		20	ns
t_{DVWH}	t_{DW}	Data to Write Time Overlap	25		30		ns
t_{WHDX}	t_{DH}	Data Hold from Write Time	0		0		ns
t_{WHOX}	t_{OW}	End of Write to Output Active	5		5		ns

■ SWITCHING WAVEFORMS (WRITE CYCLE)

WRITE CYCLE 1. (/WE controlled)



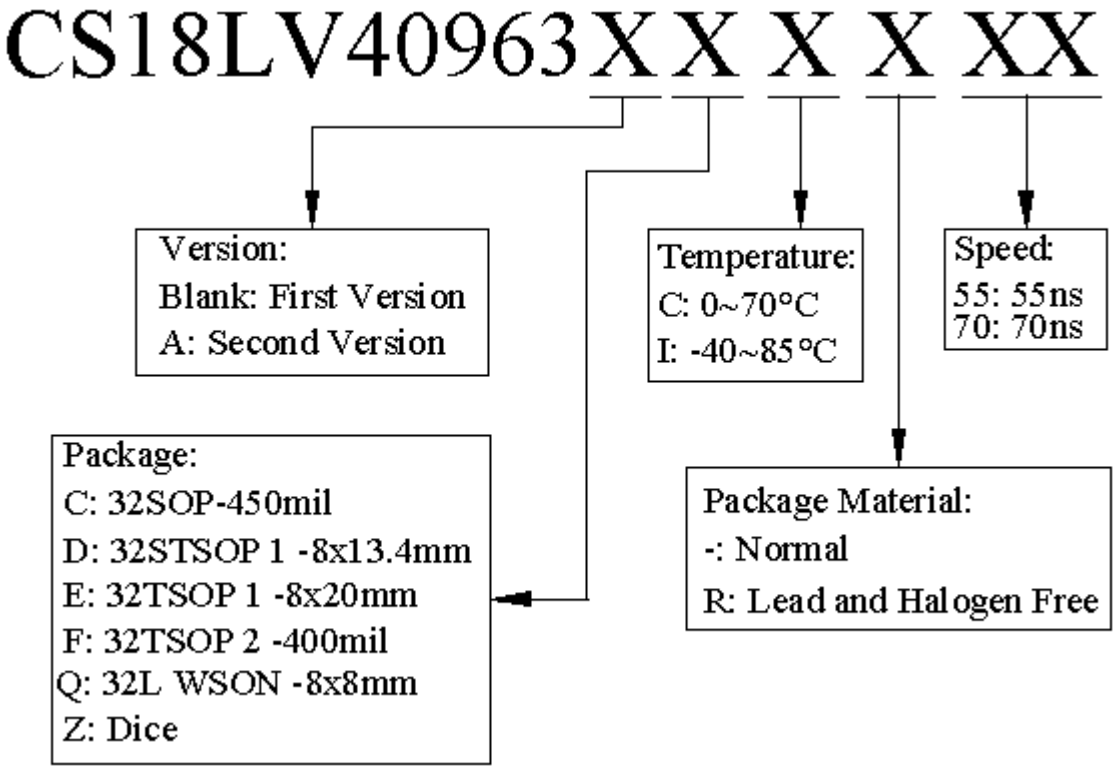
WRITE CYCLE 2. (/CE Controlled)



NOTES:

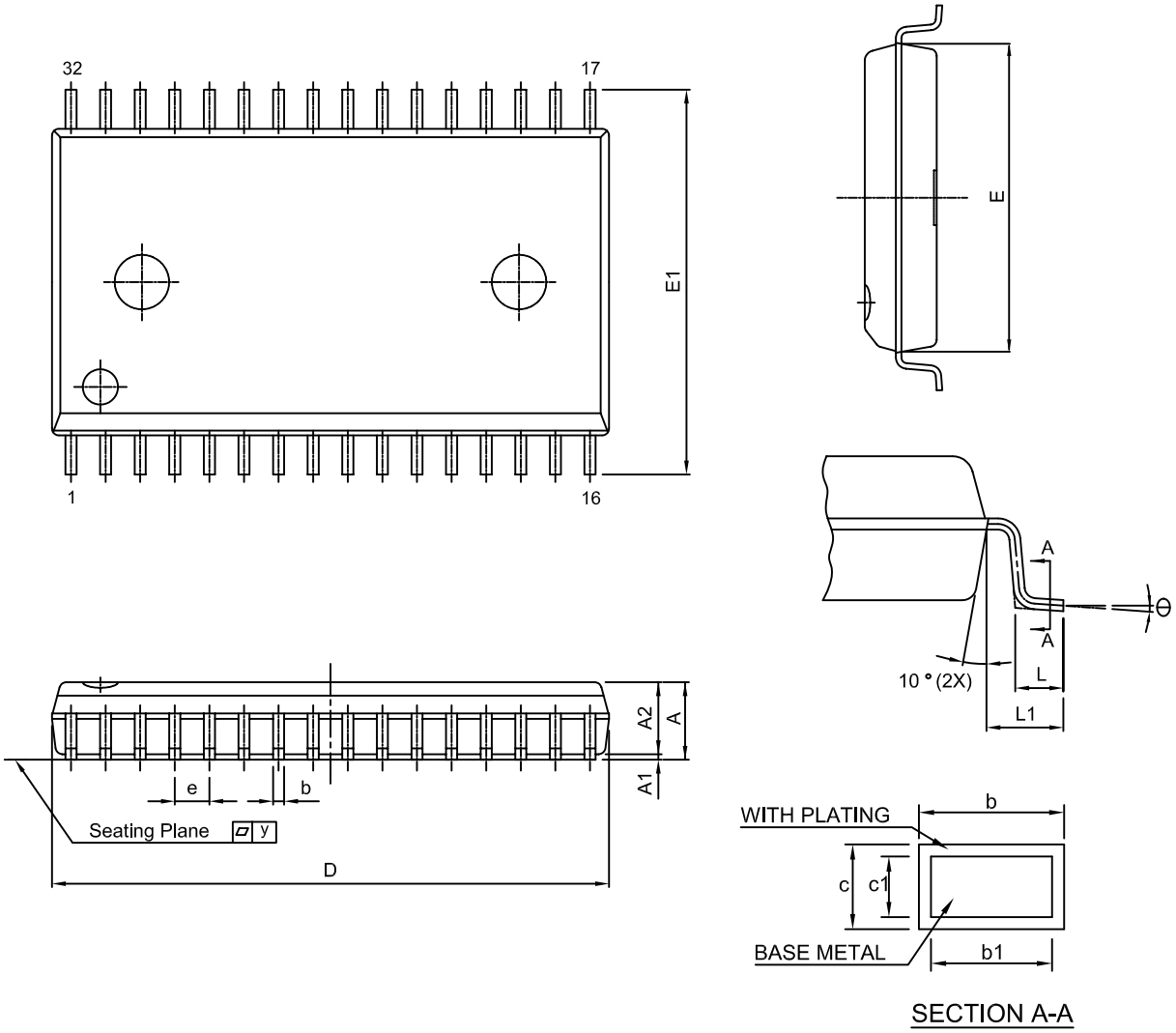
1. A write occurs during the overlap(t_{WP}) of low /CE and low /WE. A write begins at the latest transition among /CE goes low. A write ends at the earliest transition when /CE goes high and /WE goes high. The t_{WP} is measured from the beginning of the write to the end of write.
2. t_{CW} is measured from the /CE going low to end of write.
3. t_{AS} is measured from the address valid to the beginning of write.
4. t_{WR} is measured from the end or write to the address change. T_{WR} applied in case a write ends as /CE or /WE going high.

■ ORDER INFORMATION



Note: Package material code “R” meets ROHS

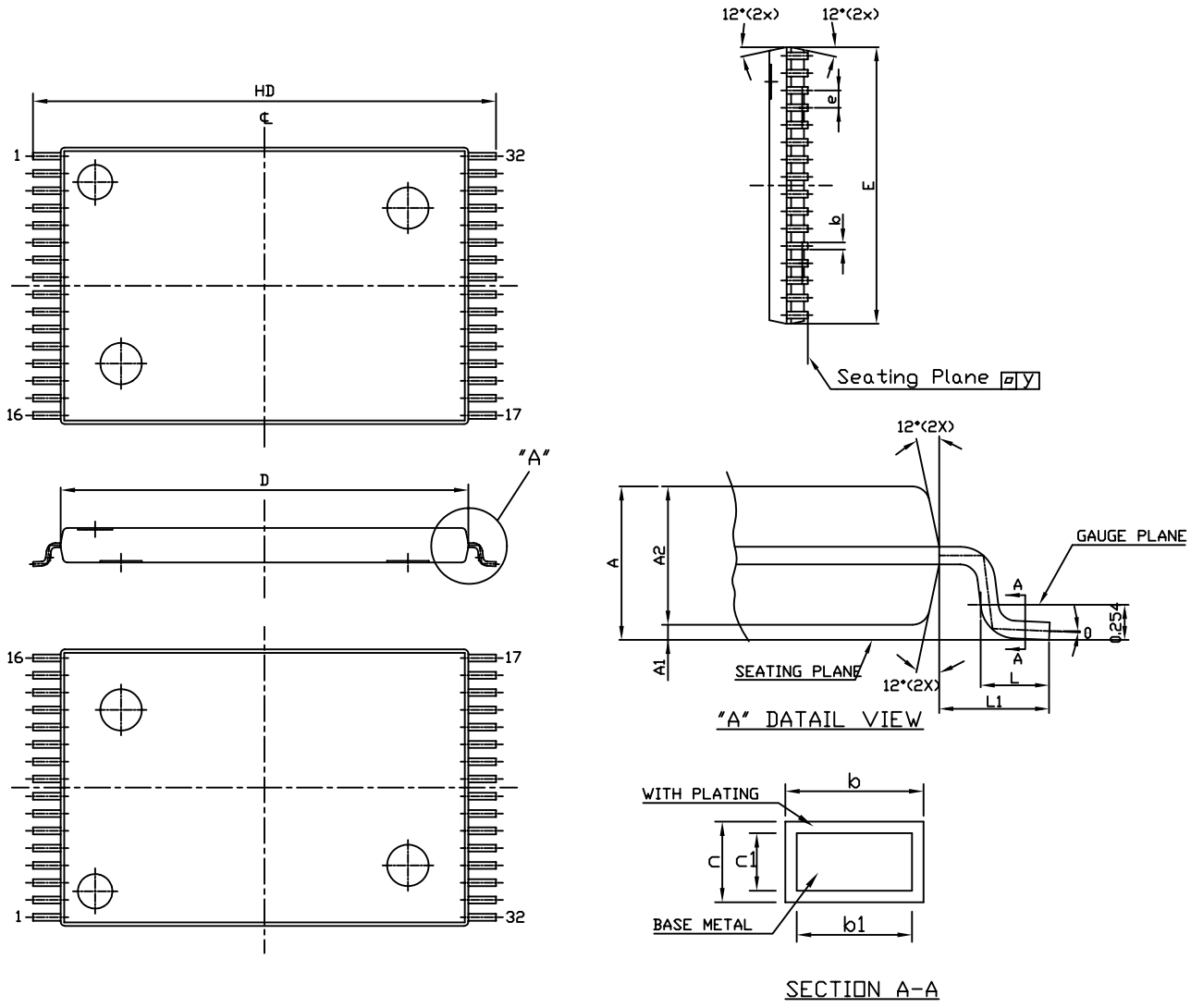
■ PACKAGE DIMENSIONS - 32L SOP 450 mil



SECTION A-A

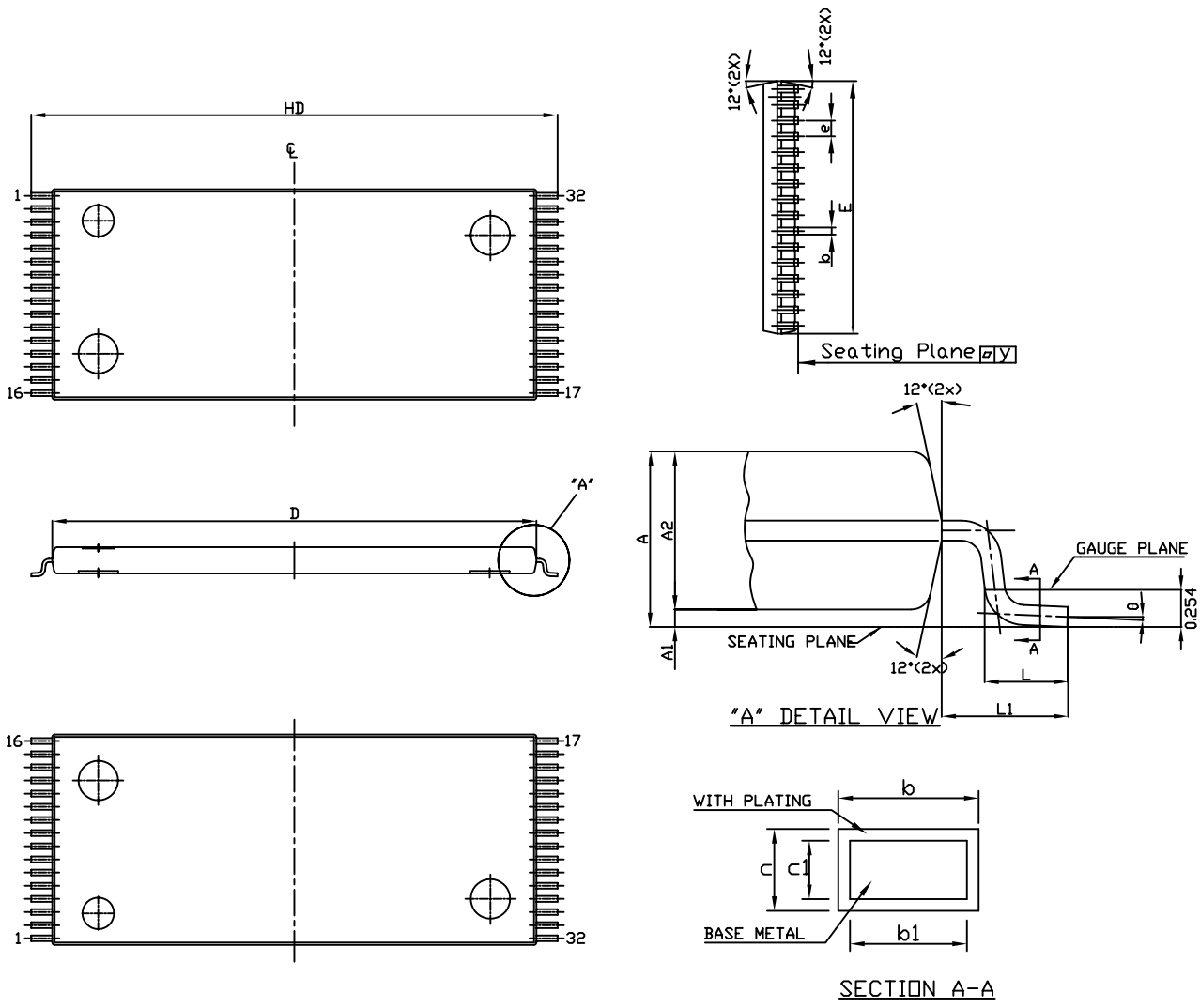
SYMBOL / UNIT		A	A1	A2	b	b1	c	c1	D	E	E1	e	L	L1	y	Θ
mm	Min.	2.645	0.102	2.540	0.35	0.35	0.15	0.15	20.320	11.176	13.792	1.118	0.584	1.194	–	0°
	Nom.	2.821	0.229	2.680	–	–	–	–	20.447	11.303	14.097	1.270	0.834	1.397	–	–
	Max.	2.997	0.356	2.820	0.50	0.46	0.32	0.28	20.574	11.430	14.402	1.422	1.084	1.600	0.1	10°
inch	Min.	0.104	0.004	0.1000	0.014	0.014	0.006	0.006	0.800	0.440	0.543	0.044	0.023	0.047	–	0°
	Nom.	0.111	0.009	0.1055	–	–	–	–	0.805	0.445	0.555	0.050	0.033	0.055	–	–
	Max.	0.118	0.014	0.1110	0.020	0.018	0.012	0.011	0.810	0.450	0.567	0.056	0.043	0.063	0.004	10°

■ PACKAGE DIMENSIONS: 32L STSOP 1-8x13.4mm



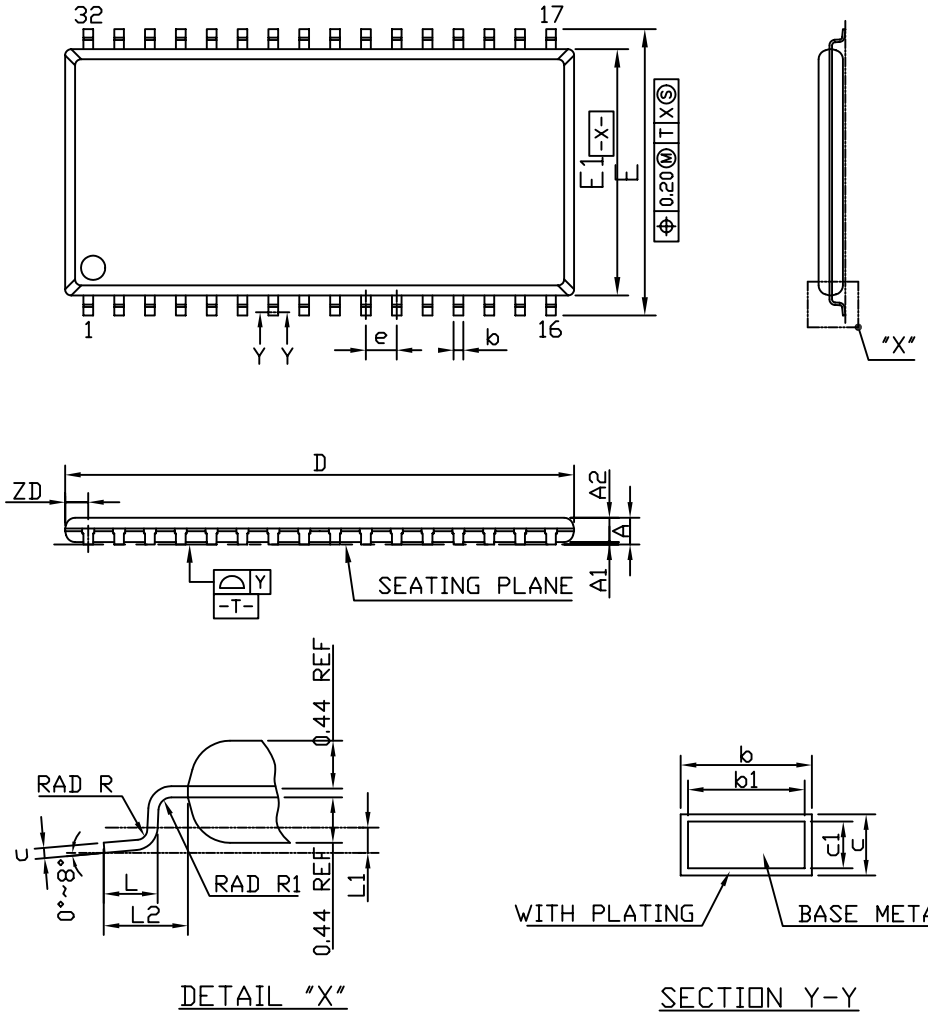
SYMBOL / UNIT		A	A1	A2	b	b1	c	c1	D	E	e	HD	L	L1	y	θ
mm	Min.	1.00	0.05	0.95	0.17	0.17	0.10	0.10	11.70	7.90	0.40	13.20	0.40	0.70	–	0°
	Nom.	1.10	0.10	1.00	0.22	0.20	–	–	11.80	8.00	0.50	13.40	0.50	0.80	–	–
	Max.	1.20	0.15	1.05	0.27	0.23	0.21	0.16	11.90	8.10	0.60	13.60	0.70	0.90	0.1	8°
inch	Min.	0.0393	0.002	0.037	0.007	0.007	0.004	0.004	0.461	0.311	0.016	0.520	0.0157	0.0275	–	0°
	Nom.	0.0433	0.004	0.039	0.009	0.008	–	–	0.465	0.315	0.020	0.528	0.0197	0.0315	–	–
	Max.	0.0473	0.006	0.041	0.011	0.009	0.008	0.006	0.469	0.319	0.024	0.536	0.0277	0.0355	0.004	8°

■ PACKAGE DIMENSIONS: 32L TSOP 1-8x20mm



SYMBOL / UNIT		A	A1	A2	b	b1	c	c1	D	E	e	HD	L	L1	y	θ
mm	Min.	1.00	0.05	0.95	0.17	0.17	0.10	0.10	18.30	7.90	0.40	19.80	0.40	0.70	–	0°
	Nom.	1.10	0.10	1.00	0.22	0.20	–	–	18.40	8.00	0.50	20.00	0.50	0.80	–	–
	Max.	1.20	0.15	1.05	0.27	0.23	0.21	0.16	18.50	8.10	0.60	20.20	0.70	0.90	0.1	8°
inch	Min.	0.0393	0.002	0.037	0.007	0.007	0.004	0.004	0.720	0.311	0.016	0.779	0.0157	0.0275	–	0°
	Nom.	0.0433	0.004	0.039	0.009	0.008	–	–	0.724	0.315	0.020	0.787	0.0197	0.0315	–	–
	Max.	0.0473	0.006	0.041	0.011	0.009	0.008	0.006	0.728	0.319	0.024	0.795	0.0277	0.0355	0.004	8°

■ PACKAGE DIMENSIONS: 32L TSOP 2-400mil

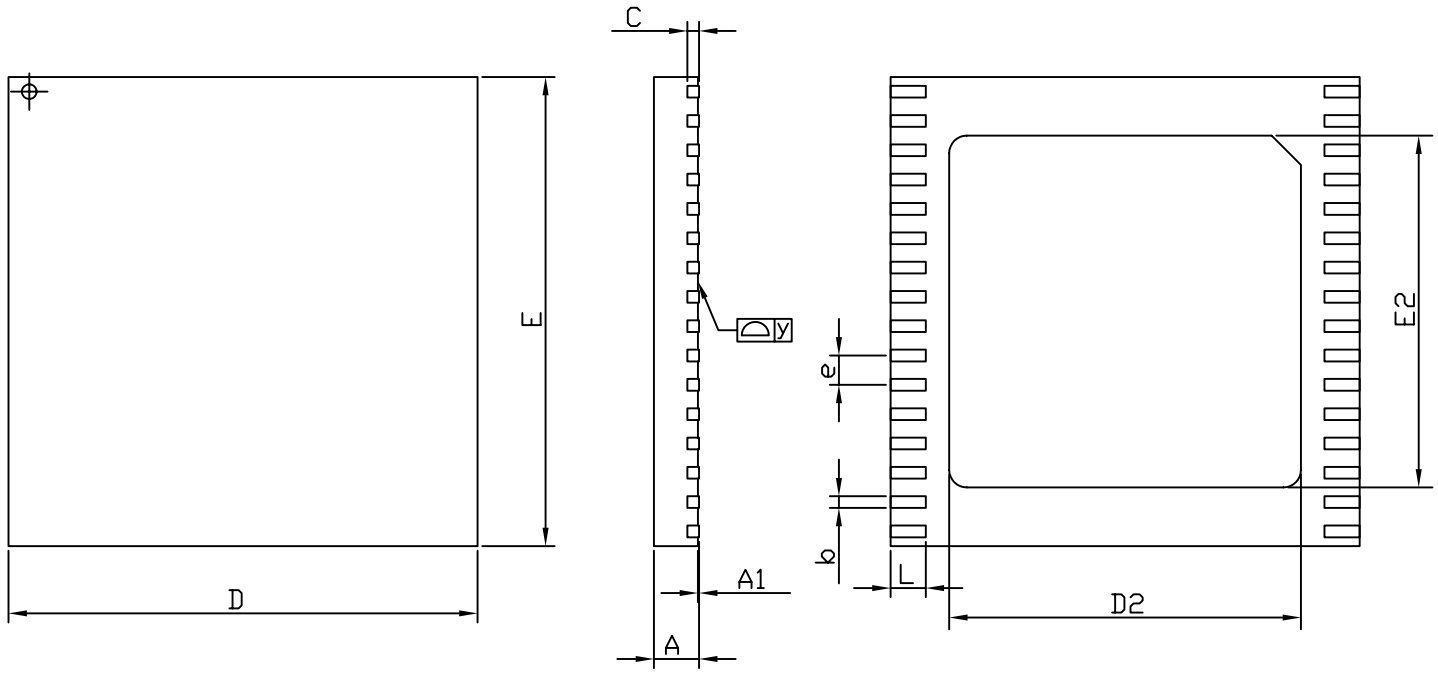


DETAIL "X"

SECTION Y-Y

SYMBOL / UNIT		A	A1	A2	b	b1	c	c1	D	E	E1	e	L	L1	L2	R	R1	ZD	Y
mm	Min.	–	0.05	0.95	0.30	0.30	0.12	0.10	20.82	11.56	10.03	1.27 bsc	0.40	0.25 bsc	0.8 ref	0.12	0.12	0.95 ref	–
	Nom.	–	0.10	1.00	–	0.40	–	0.127	20.95	11.76	10.16		0.50			–	–		–
	Max.	1.20	0.15	1.05	0.52	0.45	0.21	0.16	21.08	11.96	10.29		0.60			0.25	–		0.10
inch	Min.	–	0.002	0.037	0.012	0.012	0.005	0.004	0.820	0.455	0.394	0.050 bsc	0.016	0.010 bsc	0.031 ref	0.005	0.005	0.037 ref	–
	Nom.	–	0.004	0.039	–	0.016	–	0.005	0.825	0.463	0.400		0.020			–	–		–
	Max.	0.047	0.006	0.042	0.020	0.018	0.008	0.006	0.830	0.471	0.405		0.024			0.010	–		0.004

■ PACKAGE DIMENSIONS: 32L WSON-8x8mm



SYMBOL / UNIT		A	A1	b	C	D	D2	E	E2	e	L	y
mm	Min.	0.70	0.00	0.15	0.19	7.90	5.95	7.90	5.95	–	0.55	0.00
	Nom.	0.75	0.02	0.20	0.20	8.00	6.00	8.00	6.00	0.50	0.60	–
	Max.	0.80	0.05	0.25	0.25	8.10	6.05	8.10	6.05	–	0.65	0.075