



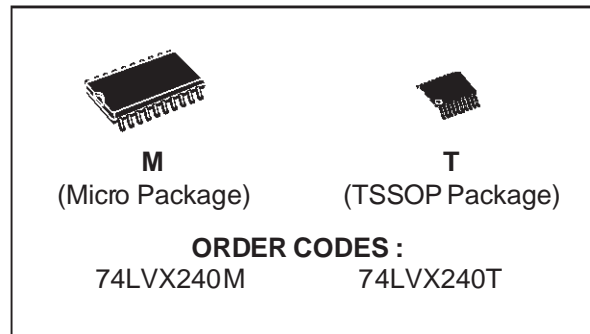
74LVX240

LOW VOLTAGE OCTAL BUS BUFFER (3-STATE INV.) WITH 5V TOLERANT INPUTS

- HIGH SPEED:
 $t_{PD} = 4.7 \text{ ns (TYP.) at } V_{CC} = 3.3\text{V}$
- 5V TOLERANT INPUTS
- POWER-DOWN PROTECTION ON INPUTS
 INPUT VOLTAGE LEVEL:
 $V_{IL} = 0.8\text{V}, V_{IH} = 2\text{V at } V_{CC} = 3\text{V}$
- LOW POWER DISSIPATION:
 $I_{CC} = 4 \mu\text{A (MAX.) at } T_A = 25 \text{ }^\circ\text{C}$
- LOW NOISE:
 $V_{OLP} = 0.3 \text{ V (TYP.) at } V_{CC} = 3.3\text{V}$
- SYMMETRICAL OUTPUT IMPEDANCE:
 $|I_{OH}| = I_{OL} = 4 \text{ mA (MIN)}$
- BALANCED PROPAGATION DELAYS:
 $t_{PLH} \cong t_{PHL}$
- OPERATING VOLTAGE RANGE:
 $V_{CC} \text{ (OPR)} = 2\text{V to } 3.6\text{V}$
- PIN AND FUNCTION COMPATIBLE WITH
 74 SERIES 240
- IMPROVED LATCH-UP IMMUNITY

DESCRIPTION

The LVX240 is a low voltage CMOS OCTAL BUS BUFFER fabricated with sub-micron silicon gate and double-layer metal wiring C²MOS technology. It is ideal for low power and low noise 3.3V applications.



It has better speed performance at 3.3V than 5V LSTTL family combined with the true CMOS low power consumption.

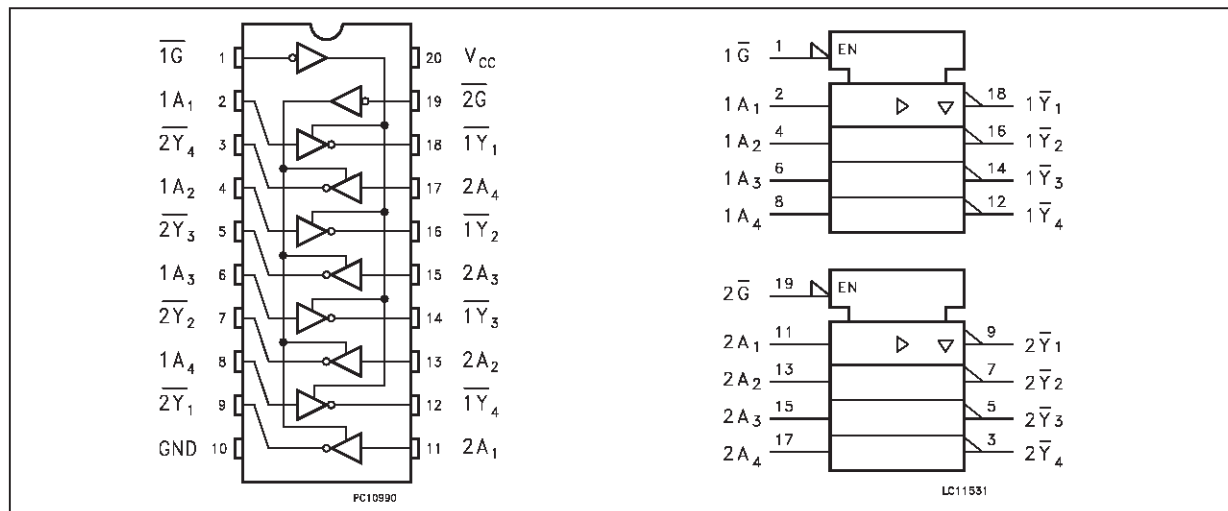
\overline{G} output control governs four BUS BUFFERs.

This device is designed to be used with 3 state memory address drivers, etc.

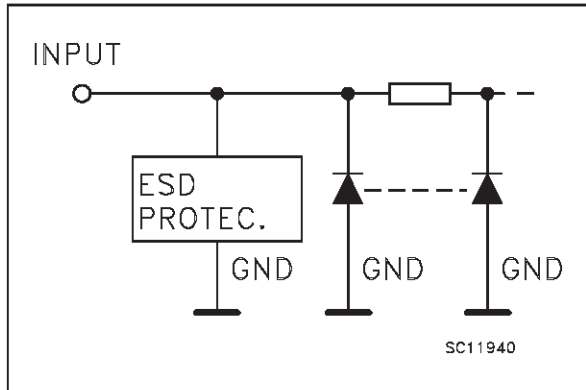
Power down protection is provided on all inputs and 0 to 7V can be accepted on inputs with no regard to the supply voltage. This device can be used to interface 5V to 3V.

All inputs and outputs are equipped with protection circuits against static discharge, giving them 2KV ESD immunity and transient excess voltage.

PIN CONNECTION AND IEC LOGIC SYMBOLS



INPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1	$\overline{1G}$	Output Enable Input
2, 4, 6, 8	1A1 to 1A4	Data Inputs
9, 7, 5, 3	$\overline{2Y1}$ to $\overline{2Y4}$	Data Outputs
11, 13, 15, 17	2A1 to 2A4	Data Inputs
18, 16, 14, 12	$\overline{1Y1}$ to $\overline{1Y4}$	Data Outputs
19	$\overline{2G}$	Output Enable Input
10	GND	Ground (0V)
20	V _{CC}	Positive Supply Voltage

TRUTH TABLE

INPUT		OUTPUT
\overline{G}	A _n	$\overline{Y_n}$
L	L	H
L	H	L
H	X	Z

X: "H" or "L"
Z: High impedance

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CC}	Supply Voltage	-0.5 to +7.0	V
V _I	DC Input Voltage	-0.5 to 7.0	V
V _O	DC Output Voltage	-0.5 to V _{CC} + 0.5	V
I _{IK}	DC Input Diode Current	-20	mA
I _{OK}	DC Output Diode Current	±20	mA
I _O	DC Output Current	±25	mA
I _{CC} or I _{GND}	DC V _{CC} or Ground Current	±50	mA
T _{stg}	Storage Temperature	-65 to +150	°C
T _L	Lead Temperature (10 sec)	300	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V _{CC}	Supply Voltage (note 1)	2 to 3.6	V
V _I	Input Voltage	0 to 5.5	V
V _O	Output Voltage	0 to V _{CC}	V
T _{op}	Operating Temperature:	-40 to +85	°C
dt/dv	Input Rise and Fall Time (V _{CC} = 3V) (note 2)	0 to 100	ns/V

1) Truth Table guaranteed: 1.2V to 3.6V
2) V_{IN} from 0.8V to 2V

DC SPECIFICATIONS

Symbol	Parameter	Test Conditions		Value					Unit	
				V _{CC} (V)	T _A = 25 °C			-40 to 85 °C		
					Min.	Typ.	Max.	Min.		Max.
V _{IH}	High Level Input Voltage	2.0		1.5			1.5		V	
		3.0		2.0			2.0			
		3.6		2.4			2.4			
V _{IL}	Low Level Input Voltage	2.0				0.5		0.5	V	
		3.0				0.8		0.8		
		3.6				0.8		0.8		
V _{OH}	High Level Output Voltage	2.0	V _I ^(*) = V _{IH} or V _{IL}	I _O = -50 μA	1.9	2.0		1.9		V
		3.0		I _O = -50 μA	2.9	3.0		2.9		
		3.0		I _O = -4 mA	2.58			2.48		
V _{OL}	Low Level Output Voltage	2.0	V _I ^(*) = V _{IH} or V _{IL}	I _O = 50 μA		0.0	0.1		0.1	V
		3.0		I _O = 50 μA		0.0	0.1		0.1	
		3.0		I _O = 4 mA			0.36		0.44	
I _I	Input Leakage Current	3.6	V _I = 5.5V or GND				±0.1		±1	μA
I _{OZ}	3 State Output Leakage Current	3.6	V _I = V _{IH} or V _{IL} V _O = V _{CC} or GND				±0.25		±2.5	μA
I _{CC}	Quiescent Supply Current	3.6	V _I = V _{CC} or GND				4		40	μA

(*) All outputs loaded.

DYNAMIC SWITCHING CHARACTERISTICS

Symbol	Parameter	Test Conditions		Value					Unit	
				V _{CC} (V)	T _A = 25 °C			-40 to 85 °C		
					Min.	Typ.	Max.	Min.		Max.
V _{OLP}	Dynamic Low Voltage	3.3	C _L = 50 pF		0.3	0.5			V	
V _{OLV}	Quiet Output (note 1, 2)			-0.5	-0.3					
V _{IHD}	Dynamic High Voltage Input (note 1, 3)					2				
V _{ILD}	Dynamic Low Voltage Input (note 1, 3)			0.8						

1) Worst case package

2) Max number of outputs defined as (n). Data inputs are driven 0V to 3.3V, (n-1) outputs switching and one output at GND

3) max number of data inputs (n) switching, (n-1) switching 0V to 3.3V. Inputs under test switching: 3.3V to threshold (V_{ILD}), 0V to threshold (V_{IHD}). f=1MHz

AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3$ ns)

Symbol	Parameter	Test Condition			Value					Unit
		V _{CC} (V)	C _L (pF)		T _A = 25 °C			-40 to 85 °C		
					Min.	Typ.	Max.	Min.	Max.	
t _{PLH} t _{PHL}	Propagation Delay Time	2.7	15		5.7	10.1	1.0	12.5	ns	
		2.7	50		8.2	13.6	1.0	16.0		
		3.3 ^(*)	15		4.3	6.2	1.0	7.5		
		3.3 ^(*)	50		6.8	9.7	1.0	11.0		
t _{PZL} t _{PZH}	Output Enable Time	2.7	15	R _L = 1 KΩ	7.1	13.8	1.0	16.5	ns	
		2.7	50		9.6	17.3	1.0	20.0		
		3.3 ^(*)	15		5.5	8.8	1.0	10.5		
		3.3 ^(*)	50		8.0	12.3	1.0	14.0		
t _{PLZ} t _{PHZ}	Output Disable Time	2.7	50	R _L = 1 KΩ	11.6	16.0	1.0	19.0	ns	
		3.3 ^(*)	50		9.7	11.4	1.0	13.0		
t _{OSLH} t _{OSHL}	Output to Output Skew Time (note 1, 2)	2.7	50			1.5		1.5	ns	
		3.3 ^(*)	50			1.5		1.5		

1) Skew is defined as the absolute value of the difference between the actual propagation delay for any two outputs of the same device switching in the same direction, either HIGH or LOW

2) Parameter guaranteed by design

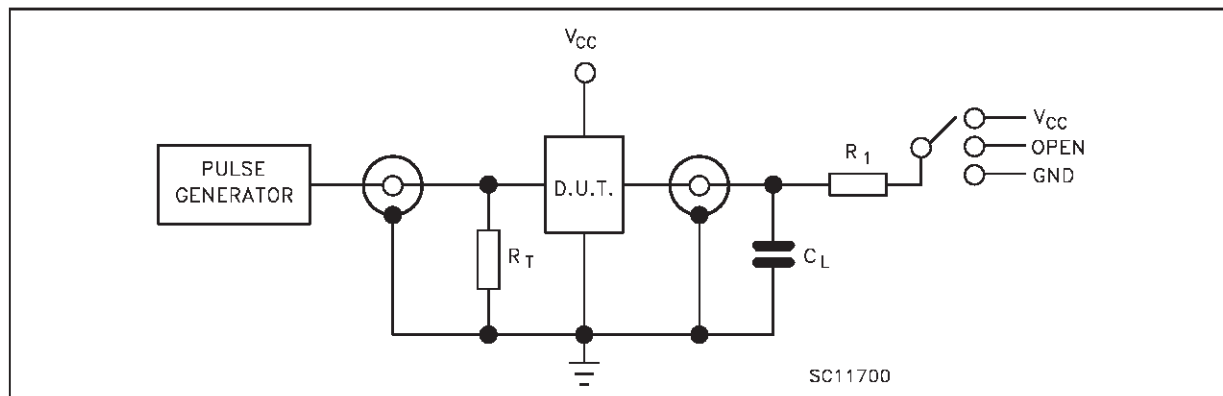
(*) Voltage range is 3.3V ± 0.3V

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Conditions		Value					Unit
		V _{CC} (V)		T _A = 25 °C			-40 to 85 °C		
				Min.	Typ.	Max.	Min.	Max.	
C _{IN}	Input Capacitance	3.3			4	10		10	pF
C _{OUT}	Output Capacitance	3.3			6				pF
C _{PD}	Power Dissipation Capacitance (note 1)	3.3	f _{IN} = 10 MHz		17				pF

1) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation. I_{CC(opr)} = C_{PD} • V_{CC} • f_{IN} + I_{CC}/n (per circuit)

TEST CIRCUIT

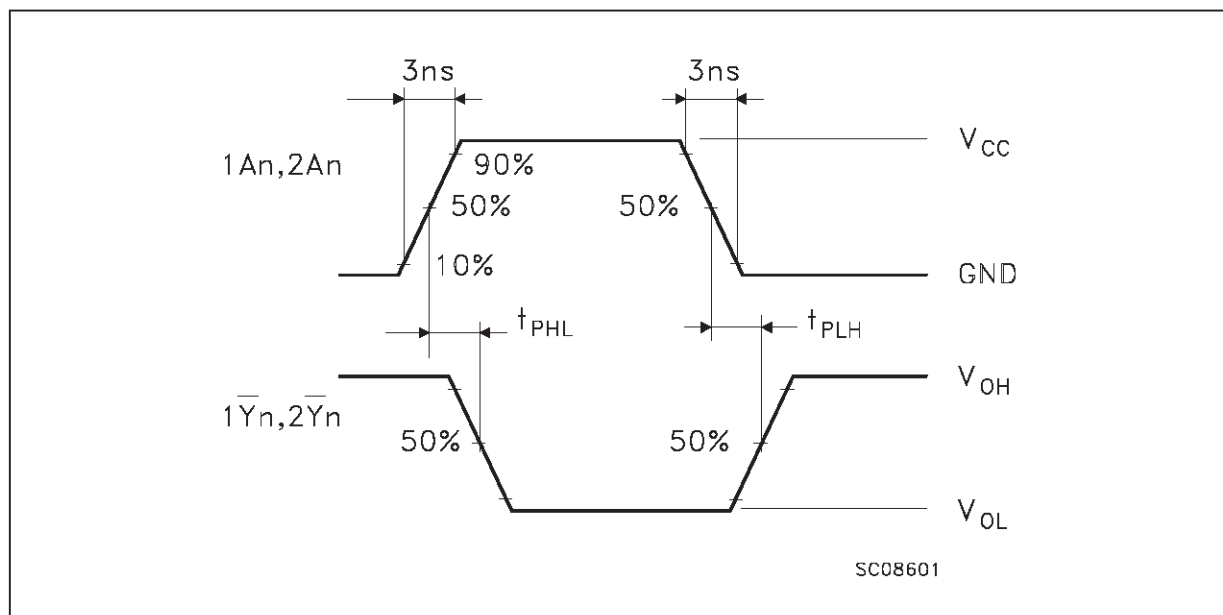


TEST	SWITCH
t_{PLH} , t_{PHL}	Open
t_{PZL} , t_{PLZ}	V_{CC}
t_{PZH} , t_{PHZ}	GND

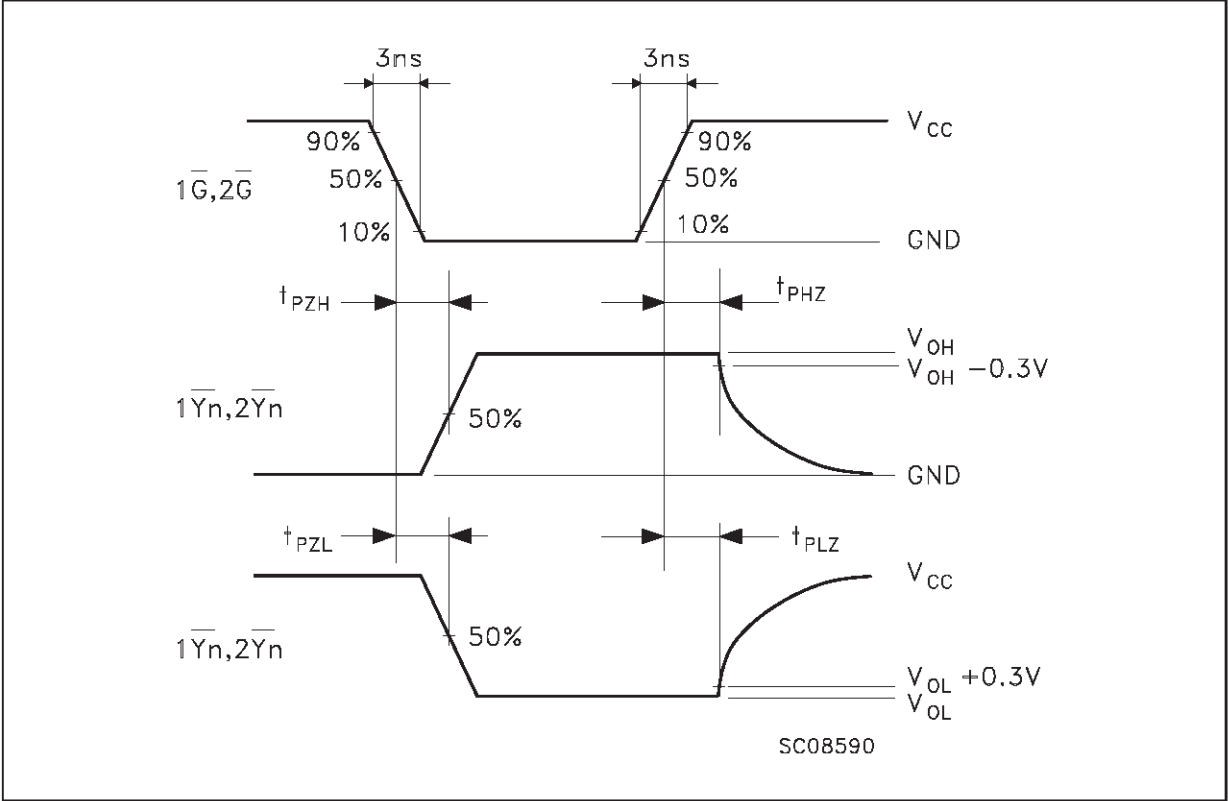
$C_L = 15/50$ pF or equivalent (includes jig and probe capacitance)

$R_L = R_1 = 1K\Omega$ or equivalent

$R_T = Z_{OUT}$ of pulse generator (typically 50Ω)

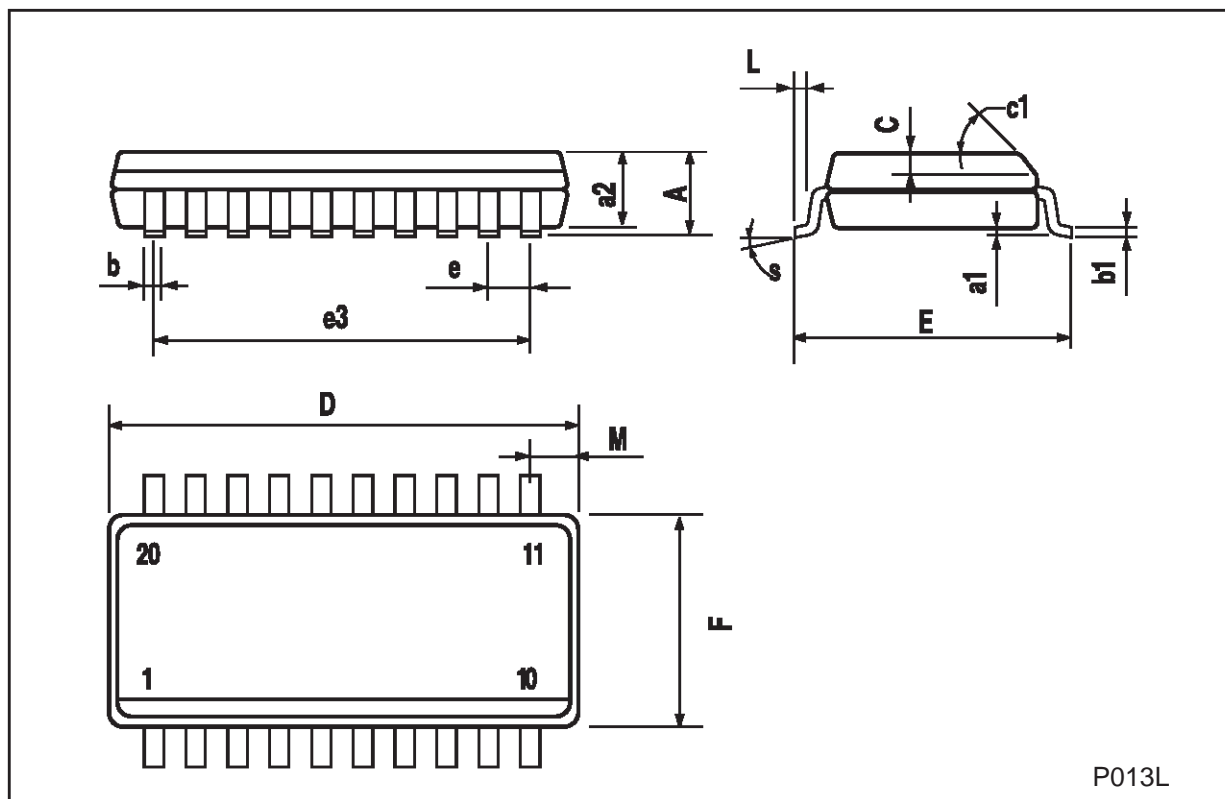
WAVEFORM 1: PROPAGATION DELAYS ($f=1\text{MHz}$; 50% duty cycle)

WAVEFORM 2: OUTPUT ENABLE AND DISABLE TIME (f=1MHz; 50% duty cycle)



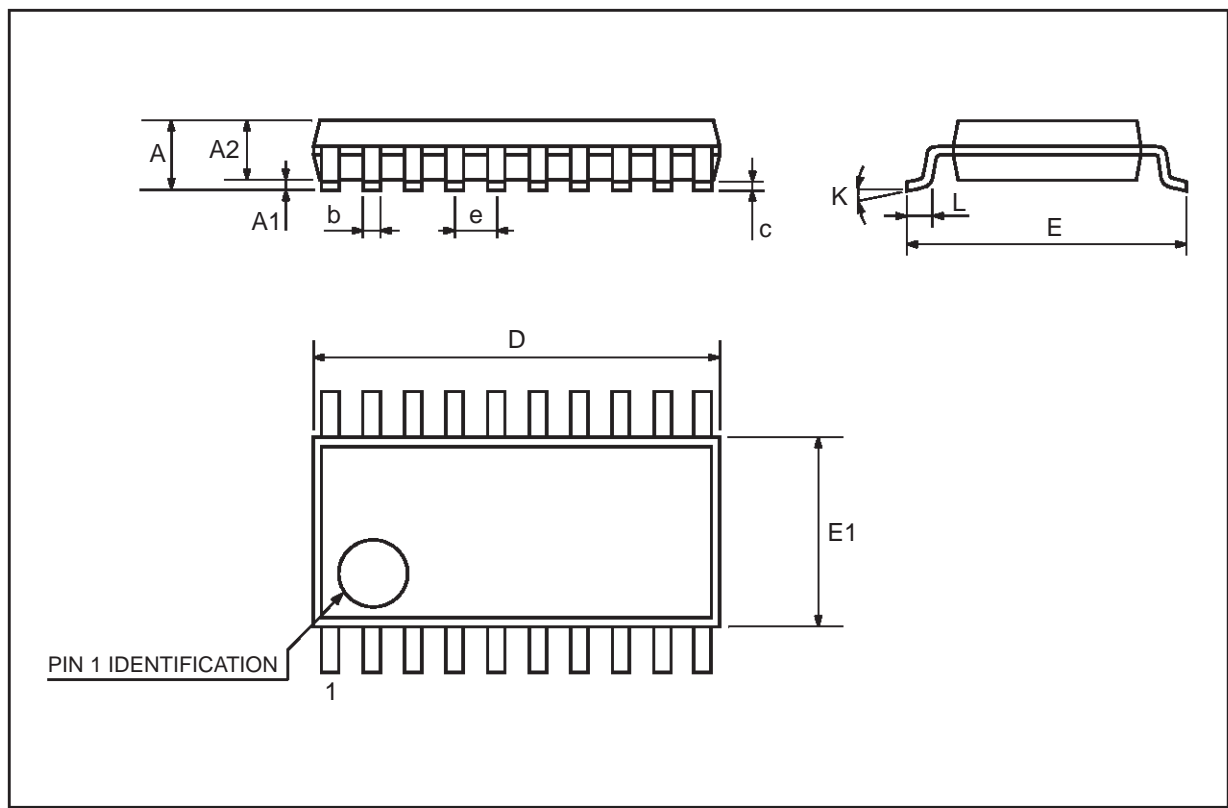
SO-20 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.10		0.20	0.004		0.007
a2			2.45			0.096
b	0.35		0.49	0.013		0.019
b1	0.23		0.32	0.009		0.012
C		0.50			0.020	
c1	45 (typ.)					
D	12.60		13.00	0.496		0.512
E	10.00		10.65	0.393		0.419
e		1.27			0.050	
e3		11.43			0.450	
F	7.40		7.60	0.291		0.299
L	0.50		1.27	0.19		0.050
M			0.75			0.029
S	8 (max.)					



TSSOP20 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.1			0.433
A1	0.05	0.10	0.15	0.002	0.004	0.006
A2	0.85	0.9	0.95	0.335	0.354	0.374
b	0.19		0.30	0.0075		0.0118
c	0.09		0.2	0.0035		0.0079
D	6.4	6.5	6.6	0.252	0.256	0.260
E	6.25	6.4	6.5	0.246	0.252	0.256
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°	4°	8°	0°	4°	8°
L	0.50	0.60	0.70	0.020	0.024	0.028



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