



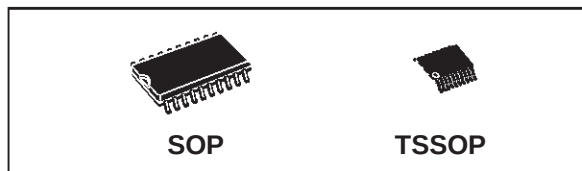
74LCX541

OCTAL BUS BUFFER (3-STATE NON INV.) WITH 5V TOLERANT INPUTS AND OUTPUTS

- 5V TOLERANT INPUTS AND OUTPUTS
- HIGH SPEED: $t_{PD} = 6.3 \text{ ns (MAX.)}$ at $V_{CC} = 3V$
- POWER DOWN PROTECTION ON INPUTS AND OUTPUTS
- SYMMETRICAL OUTPUT IMPEDANCE:
 $|I_{OH}| = I_{OL} = 24 \text{ mA (MIN)}$
- PCI BUS LEVELS GUARANTEED AT 24mA
- BALANCED PROPAGATION DELAYS:
 $t_{PLH} \cong t_{PHL}$
- OPERATING VOLTAGE RANGE:
 $V_{CC} \text{ (OPR)} = 2.0V \text{ to } 3.6V \text{ (1.5V Data Retention)}$
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 541
- LATCH-UP PERFORMANCE EXCEEDS 500mA
- ESD PERFORMANCE:
 $HBM > 2000V$; $MM > 200V$

DESCRIPTION

The LCX541 is a low voltage CMOS OCTAL BUS BUFFER (3-STATE) fabricated with sub-micron silicon gate and double-layer metal wiring C^2MOS technology. It is ideal for low power and high speed 3.3V applications. It can be interfaced to 5V signal environment for inputs. The 3 STATE control gate operates as a two



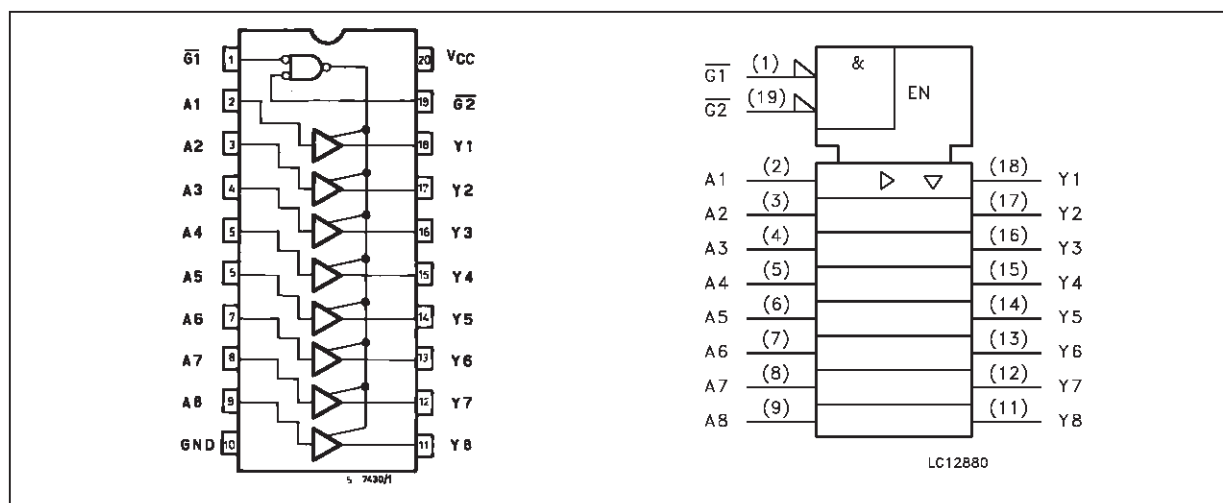
ORDER CODES		
PACKAGE	TUBE	T & R
SOP	74LCX541AM	74LCX541AMTR
TSSOP		74LCX541ATTR

input AND such that if either $\overline{G1}$ and $\overline{G2}$ are high, all eight outputs are in the high impedance state. In order to enhance PC board layout, the LCX541 offers a pinout having inputs and outputs on opposite sides of the package.

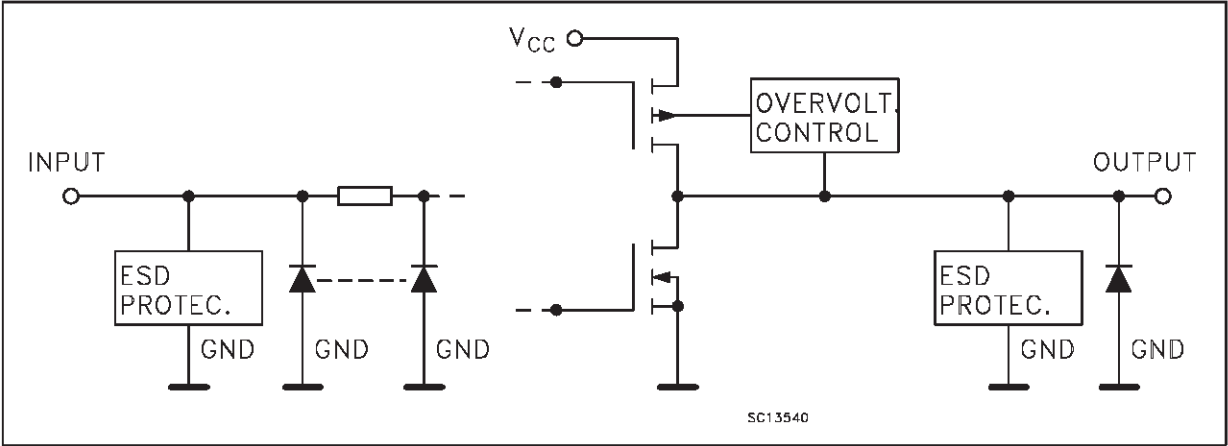
It has same speed performance at 3.3V than 5V, AC/ACT family, combined with a lower power consumption.

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 AND OUTPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1, 19	$\overline{G1}, \overline{G2}$	Output Enable Input
2, 3, 4, 5, 6, 7, 8, 9	A1 to A8	Data Inputs
18, 17, 16, 15, 14, 13, 12, 11	Y1 to Y8	Data Outputs
10	GND	Ground (0V)
20	V _{CC}	Positive Supply Voltage

TRUTH TABLE

INPUT			OUTPUT
$\overline{G1}$	$\overline{G2}$	A _n	Y _n
H	X	X	Z
X	H	X	Z
L	L	H	H
L	L	L	L

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 (OFF state)	-0.5 to + 7.0	V
V _O	DC Output Voltage (High or Low State) (note1)	-0.5 to V _{CC} + 0.5	V
I _{IK}	DC Input Diode Current	- 50	mA
I _{OK}	DC Output Diode Current (note2)	± 50	mA
I _O	DC Output Source/Sink Current	± 50	mA
I _{CC}	DC Supply Current per Supply Pin	± 100	mA
I _{GND}	DC Ground Current per Supply Pin	± 100	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.

1) I_O absolute maximum rating must be observed

2) V_O < GND, V_O > V_{CC}

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage (note 1)	2.0 to 3.6	V
V_I	Input Voltage	0 to 5.5	V
V_O	Output Voltage (OFF state)	0 to 5.5	V
V_O	Output Voltage (High or Low State)	0 to V_{CC}	V
I_{OH}, I_{OL}	High or Low Level Output Current ($V_{CC} = 3.0$ to $3.6V$)	± 24	mA
I_{OH}, I_{OL}	High or Low Level Output Current ($V_{CC} = 2.7$ to $3.0V$)	± 12	mA
T_{op}	Operating Temperature:	-40 to +85	°C
dt/dv	Input Transition Rise or Fall Rate ($V_{CC} = 3.0V$) (note 2)	0 to 10	ns/V

1) Truth Table guaranteed: 1.5V to 3.6V

2) V_{IN} from 0.8V to 2.0V

DC SPECIFICATIONS

Symbol	Parameter	Test Conditions			Value		Unit
		V _{CC} (V)		-40 to 85 °C			
				Min.	Max.		
V _{IH}	High Level Input Voltage	2.7 to 3.6		2.0		V	
V _{IL}	Low Level Input Voltage				0.8	V	
V _{OH}	High Level Output Voltage	2.7 to 3.6	V _I = V _{IH} or V _{IL}	I _O =-100 μA	V _{CC} -0.2	V	
		2.7		I _O =-12 mA	2.2		
		3.0		I _O =-18 mA	2.4		
				I _O =-24 mA	2.2		
V _{OL}	Low Level Output Voltage	2.7 to 3.6	V _I = V _{IH} or V _{IL}	I _O =100 μA		0.2	V
		2.7		I _O =12 mA		0.4	
		3.0		I _O =16 mA		0.4	
		3.0		I _O =24 mA		0.55	
I _I	Input Leakage Current	2.7 to 3.6	V _I = 0 to 5.5 V			±5	μA
I _{OZ}	3 State Output Leakage Current	2.7 to 3.6	V _I = V _{IH} or V _{IL} V _O = 0 to 5.5V			±5	μA
I _{off}	Power Off Leakage Current	0	V _I or V _O = 5.5V			100	μA
I _{CC}	Quiescent Supply Current	2.7 to 3.6	V _I = V _{CC} or GND			10	μA
			V _I or V _O = 3.6 to 5.5V			±10	
ΔI _{CC}	ICC incr. per input	2.7 to 3.6	V _{IH} = V _{CC} -0.6V			500	μA

DYNAMIC SWITCHING CHARACTERISTICS

Symbol	Parameter	Test Conditions		Value			Unit
		V _{CC} (V)		T _A = 25 °C			
				Min.	Typ.	Max.	
V _{OLP}	Dynamic Low Voltage Quiet Output (note 1)	3.3	C _L = 50pF V _{IL} = 0 V V _{IH} = 3.3V		0.8		V
V _{OLV}					-0.8		

1) Number of outputs defined as "n". Measured with "n-1" outputs switching from HIGH to LOW or LOW to HIGH. The remaining output is measured in the LOW state.

AC ELECTRICAL CHARACTERISTICS ($C_L = 50 \text{ pF}$, $R_L = 500 \Omega$, Input $t_r = t_f = 2.5 \text{ ns}$)

Symbol	Parameter	Test Condition		Value		Unit
		V _{CC} (V)		-40 to 85 °C		
				Min.	Max.	
t _{PLH} t _{PHL}	Propagation Delay Time	2.7		1.5	9.0	ns
		3.0 to 3.6		1.5	8.0	
t _{PZL} t _{PZH}	Output Enable Time	2.7		1.5	9.5	ns
		3.0 to 3.6		1.5	8.5	
t _{PLZ} t _{PHZ}	Output Disable Time	2.7		1.5	8.5	ns
		3.0 to 3.6		1.5	7.5	
t _{OSLH} t _{OSHL}	Output to Output Skew Time (note 1, 2)	3.0 to 3.6			1.0	ns

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 ($t_{OSLH} = |t_{PLHm} - t_{PLHl}|$, $t_{OSHL} = |t_{PHLm} - t_{PHLl}|$)

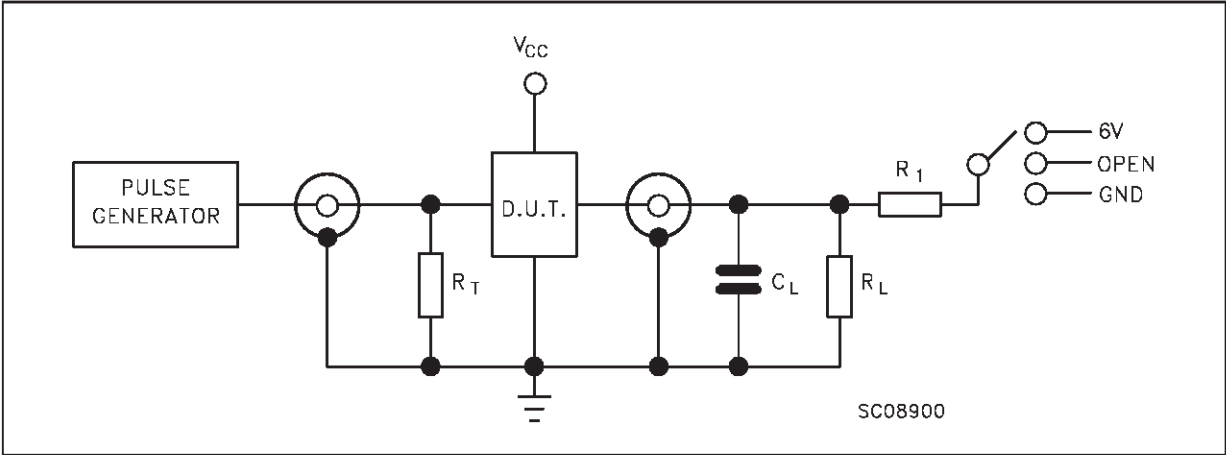
2) Parameter guaranteed by design

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Conditions		Value			Unit
		V _{CC} (V)		T _A = 25 °C			
				Min.	Typ.	Max.	
C _{IN}	Input Capacitance	3.3	V _{IN} = 0 to V _{CC}		6		pF
C _{OUT}	Output Capacitance	3.3	V _{IN} = 0 to V _{CC}		12		pF
C _{PD}	Power Dissipation Capacitance (note 1)	3.3	f _{IN} = 10MHz V _{IN} = 0 or V _{CC}		25		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. Average operating current can be obtained by the following equation. $I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{cd}/8$ (per Buffer)

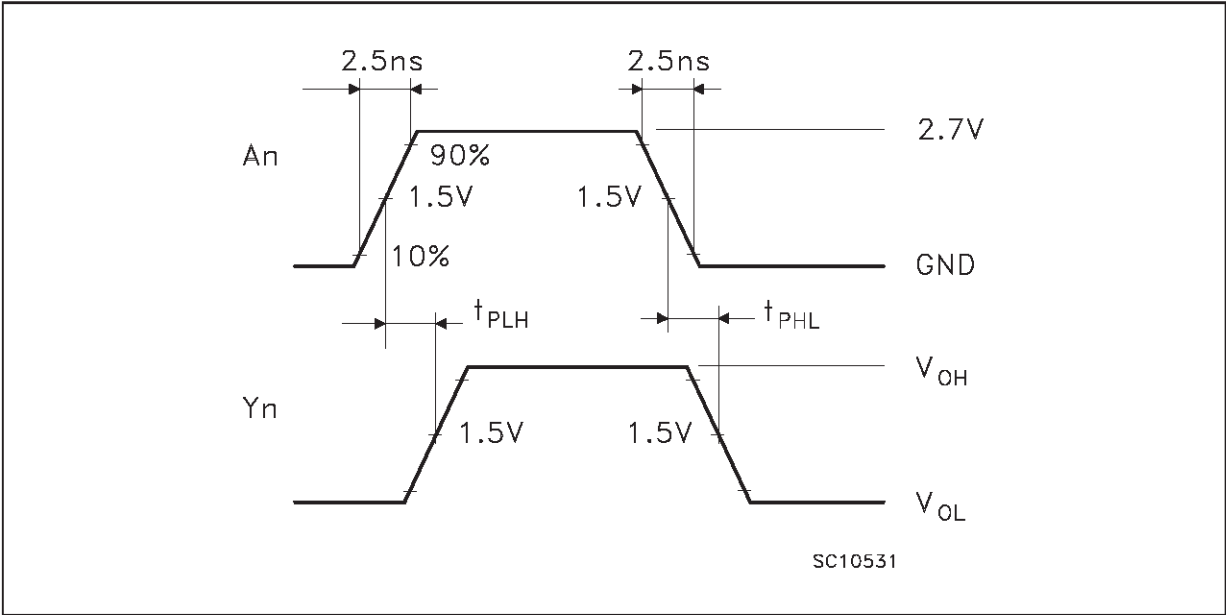
TEST CIRCUIT



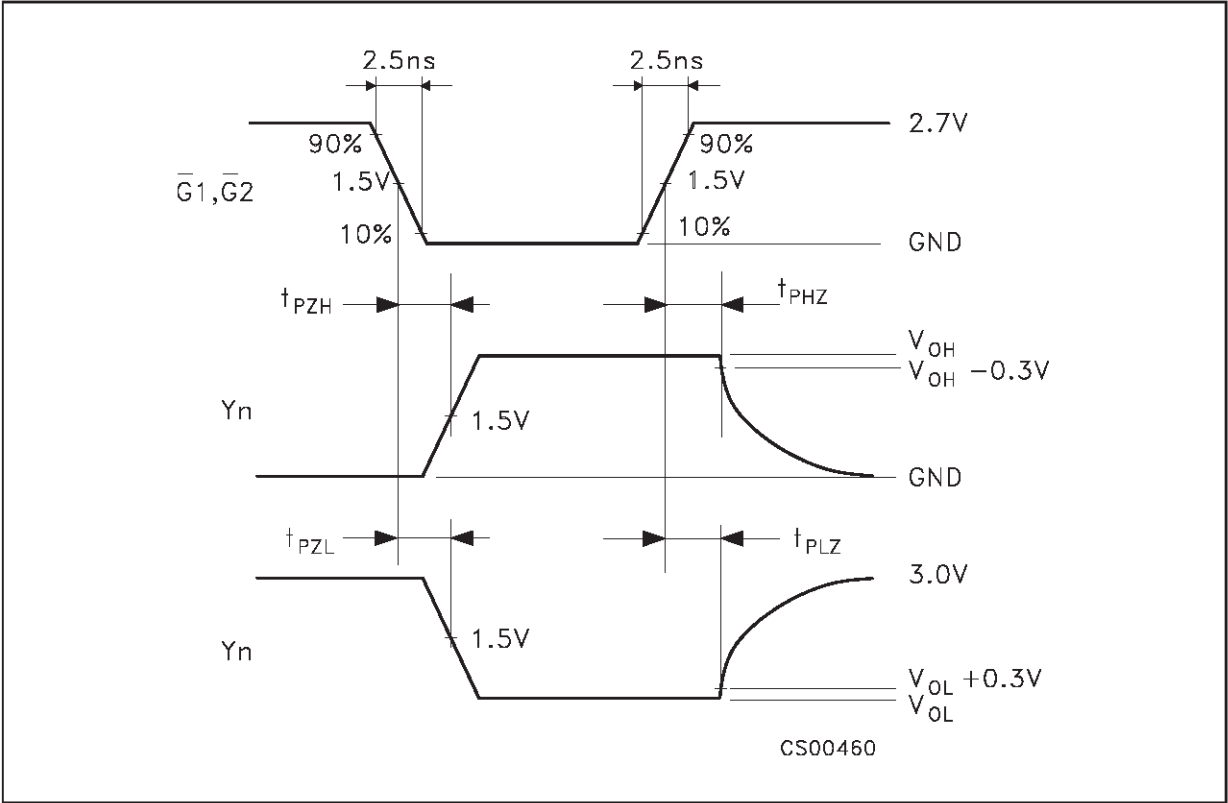
TEST	SWITCH
t_{PLH} , t_{PHL}	Open
t_{PZL} , t_{PLZ}	6V
t_{PZH} , t_{PHZ}	GND

C_L = 50 pF or equivalent (includes jig and probe capacitance)
 R_L = R_1 = 500 Ω or equivalent
 R_T = Z_{OUT} of pulse generator (typically 50 Ω)

WAVEFORM 1: PROPAGATION DELAYS (f=1MHz; 50% duty cycle)

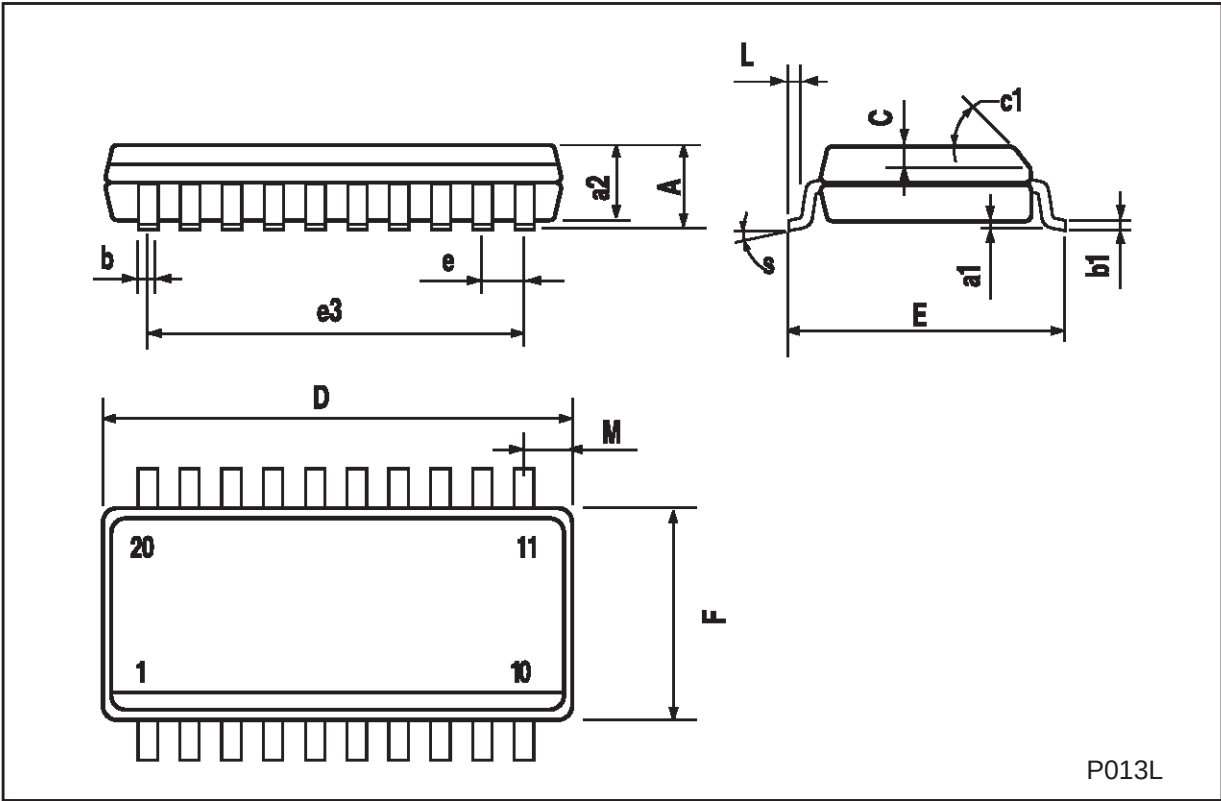


WAVEFORM 2: OUTPUT ENABLE AND DISABLE TIME (f=1MHz; 50% duty cycle)



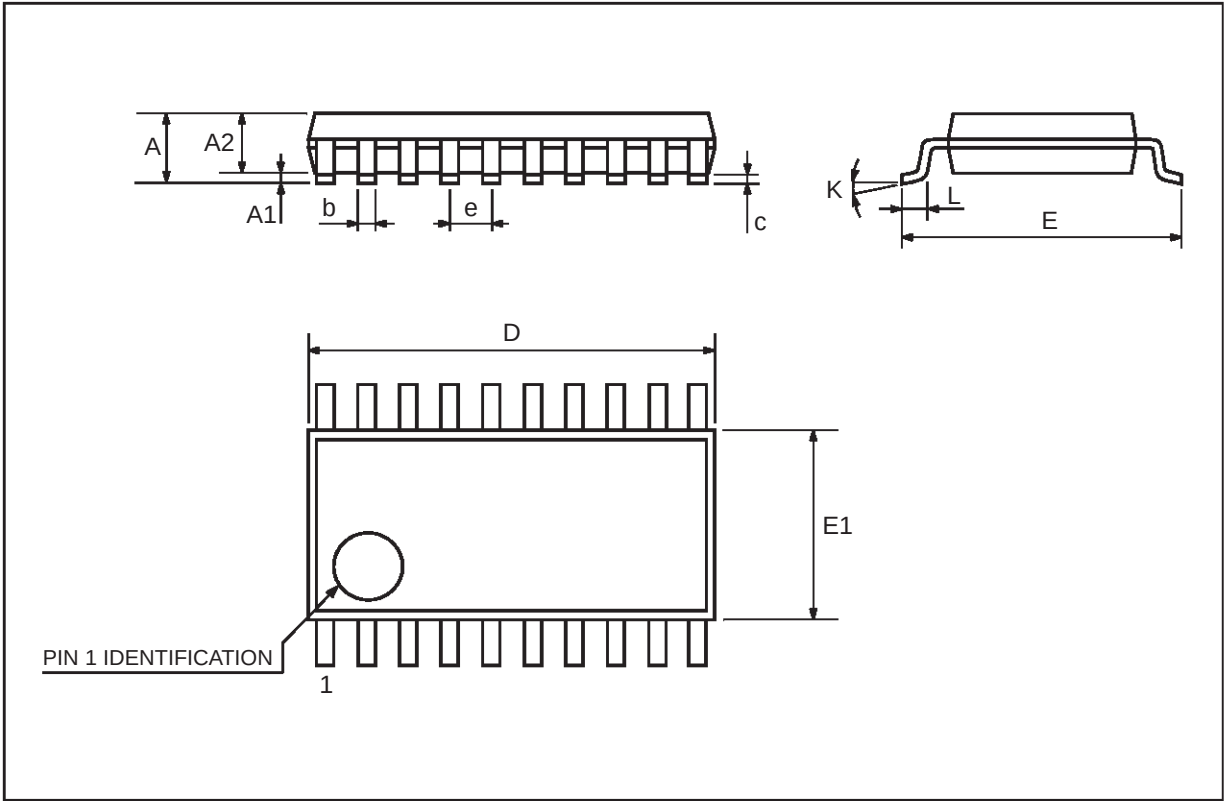
SO-20 MECHANICAL DATA

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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