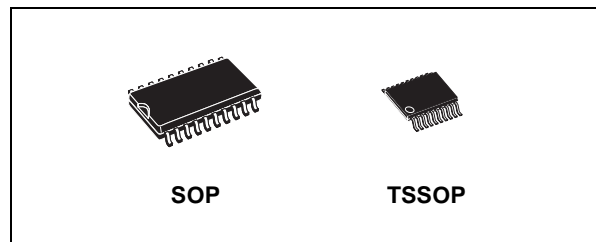




# 74LVQ245

## LOW VOLTAGE CMOS OCTAL BUS TRANSCEIVER WITH (3-STATE)

- HIGH SPEED:  
 $t_{PD} = 5.7 \text{ ns (TYP.) at } V_{CC} = 3.3 \text{ V}$
- COMPATIBLE WITH TTL OUTPUTS
- LOW POWER DISSIPATION:  
 $I_{CC} = 5 \mu\text{A (MAX.) at } T_A = 25^\circ\text{C}$
- LOW NOISE:  
 $V_{OLP} = 0.5\text{V (TYP.) at } V_{CC} = 3.3\text{V}$
- $75\Omega$  TRANSMISSION LINE DRIVING CAPABILITY
- SYMMETRICAL OUTPUT IMPEDANCE:  
 $|I_{OH}| = I_{OL} = 12\text{mA (MIN) at } V_{CC} = 3.0 \text{ V}$
- PCI BUS LEVELS GUARANTEED AT 24 mA
- BALANCED PROPAGATION DELAYS:  
 $t_{PLH} \approx t_{PHL}$
- OPERATING VOLTAGE RANGE:  
 $V_{CC(OPR)} = 2\text{V to } 3.6\text{V (1.2V Data Retention)}$
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 245
- IMPROVED LATCH-UP IMMUNITY



### ORDER CODES

PACKAGE	TUBE	T & R
SOP	74LVQ245M	74LVQ245MTR
TSSOP		74LVQ245TTR

### DESCRIPTION

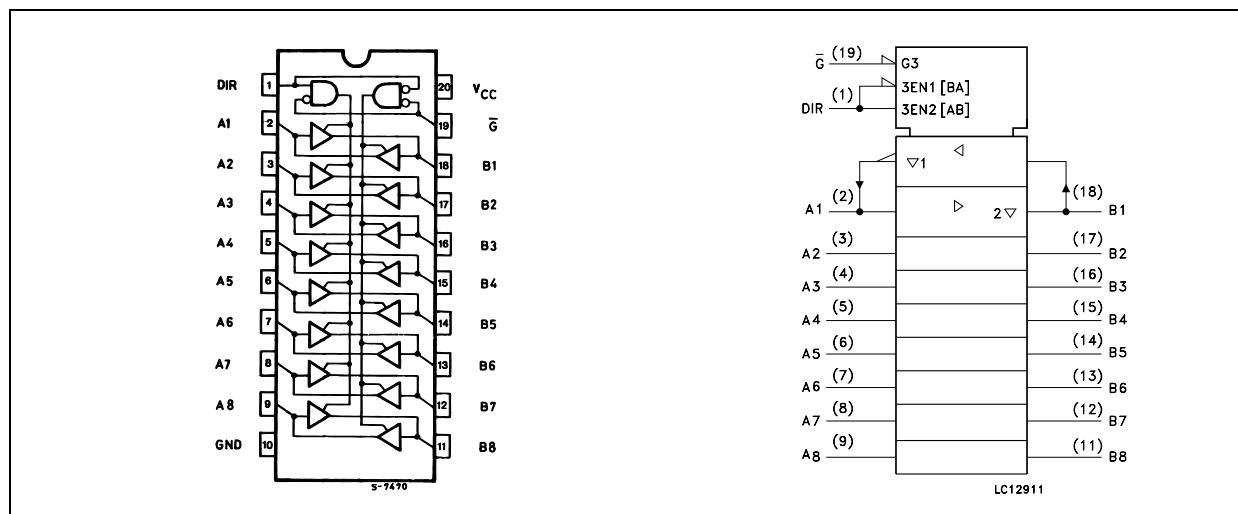
The 74LVQ245 is a low voltage CMOS OCTAL BUS TRANSCEIVER (3-STATE) fabricated with sub-micron silicon gate and double-layer metal wiring C<sup>2</sup>MOS technology. It is ideal for low power and low noise 3.3V applications.

This IC is intended for two-way asynchronous communication between data buses and the direction of data transmission is determined by DIR input. The enable input  $\bar{G}$  can be used to disable the device so that the buses are effectively isolated.

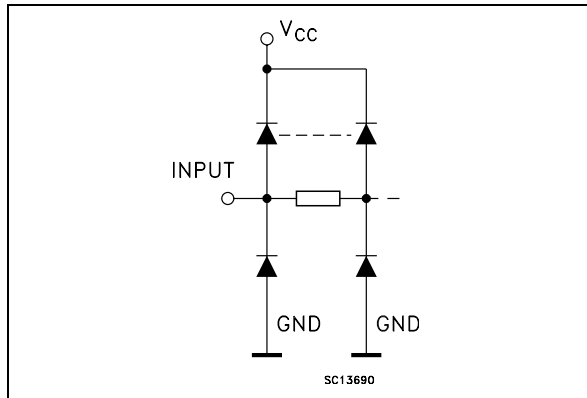
All inputs and outputs are equipped with protection circuits against static discharge, giving them 2KV ESD immunity and transient excess voltage.

All floating bus terminals during High Impedance State must be held HIGH or LOW.

### PIN CONNECTION AND IEC LOGIC SYMBOLS



## INPUT EQUIVALENT CIRCUIT



## PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1	DIR	Directional Control
2, 3, 4, 5, 6, 7, 8, 9	A1 to A8	Data Inputs/Outputs
18, 17, 16, 15, 14, 13, 12, 11	B1 to B8	Data Inputs/Outputs
19	G	Output Enable Input
10	GND	Ground (0V)
20	V <sub>CC</sub>	Positive Supply Voltage

## TRUTH TABLE

INPUTS		FUNCTION		OUTPUT
$\overline{G}$	DIR	A BUS	B BUS	
L	L	OUTPUT	INPUT	A = B
L	H	INPUT	OUTPUT	B = A
H	X	Z	Z	Z

X : Don't Care  
Z : High Impedance

## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage	-0.5 to +7	V
V <sub>I</sub>	DC Bus I/O Voltage (DIR, $\overline{G}$ )	-0.5 to V <sub>CC</sub> + 0.5	V
V <sub>I/O</sub>	DC Bus I/O Voltage	-0.5 to V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	DC Input Diode Current	± 20	mA
I <sub>OK</sub>	DC Output Diode Current	± 20	mA
I <sub>O</sub>	DC Output Current	± 50	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC V <sub>CC</sub> or Ground Current	± 400	mA
T <sub>stg</sub>	Storage Temperature	-65 to +150	°C
T <sub>L</sub>	Lead Temperature (10 sec)	300	°C

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

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage (note 1)	2 to 3.6	V
V <sub>I</sub>	Input Voltage (DIR, $\overline{G}$ )	0 to V <sub>CC</sub>	V
V <sub>O</sub>	DC Bus I/O Voltage	0 to V <sub>CC</sub>	V
T <sub>op</sub>	Operating Temperature	-55 to 125	°C
dt/dv	Input Rise and Fall Time V <sub>CC</sub> = 3.0V (note 2)	0 to 10	ns/V

1) Truth Table guaranteed: 1.2V to 3.6V

2) V<sub>IN</sub> from 0.8V to 2V

## DC SPECIFICATIONS

Symbol	Parameter	Test Condition		Value						Unit	
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
V <sub>IH</sub>	High Level Input Voltage	3.0 to 3.6		2.0			2.0		2.0		V
V <sub>IL</sub>	Low Level Input Voltage					0.8		0.8		0.8	V
V <sub>OH</sub>	High Level Output Voltage	3.0	I <sub>O</sub> =-50 μA	2.9	2.99		2.9		2.9		V
			I <sub>O</sub> =-12 mA	2.58			2.48		2.48		
			I <sub>O</sub> =-24 mA				2.2		2.2		
V <sub>OL</sub>	Low Level Output Voltage	3.0	I <sub>O</sub> =50 μA		0.002	0.1		0.1		0.1	V
			I <sub>O</sub> =12 mA		0	0.36		0.44		0.44	
			I <sub>O</sub> =24 mA					0.55		0.55	
I <sub>I</sub>	Input Leakage Current	3.6	V <sub>I</sub> = V <sub>CC</sub> or GND			± 0.1		± 1		± 1	μA
I <sub>oz</sub>	High Impedance Output Leakage Current	3.6	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> V <sub>O</sub> = V <sub>CC</sub> or GND			± 0.3		± 3		± 10	μA
I <sub>CC</sub>	Quiescent Supply Current	3.6	V <sub>I</sub> = V <sub>CC</sub> or GND			4		40		40	μA
I <sub>OLD</sub>	Dynamic Output Current (note 1, 2)	3.6	V <sub>OLD</sub> = 0.8 V max				36		25		mA
I <sub>OHD</sub>			V <sub>OHD</sub> = 2 V min				-25		-25		mA

1) Maximum test duration 2ms, one output loaded at a time

2) Incident wave switching is guaranteed on transmission lines with impedances as low as 75Ω

## DYNAMIC SWITCHING CHARACTERISTICS

Symbol	Parameter	Test Condition		Value						Unit	
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
V <sub>OLP</sub>	Dynamic Low Voltage Quiet Output (note 1, 2)	3.3	C <sub>L</sub> = 50 pF		0.5	0.8					V
V <sub>OLV</sub>				-0.8	-0.5						
V <sub>IHD</sub>	Dynamic High Voltage Input (note 1, 3)	3.3		2							V
V <sub>ILD</sub>	Dynamic Low Voltage Input (note 1, 3)	3.3					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<sub>ILD</sub>), 0V to threshold (V<sub>IHD</sub>), f=1MHz.

## 74LVQ245

### AC ELECTRICAL CHARACTERISTICS ( $C_L = 50 \text{ pF}$ , $R_L = 500 \Omega$ , Input $t_r = t_f = 3\text{ns}$ )

Symbol	Parameter	Test Condition		Value						Unit	
		$V_{CC}$ (V)		$T_A = 25^\circ\text{C}$			$-40 \text{ to } 85^\circ\text{C}$		$-55 \text{ to } 125^\circ\text{C}$		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time	2.7			6.7	11.0		13.0		15.0	ns
		3.3(*)			5.7	9.0		10.5		12.0	
$t_{PZL}$ $t_{PZH}$	Output Enable Time	2.7			9.3	15.0		17.5		20.0	ns
		3.3(*)			7.5	12.0		14.0		16.0	
$t_{PLZ}$ $t_{PHZ}$	Output Disable Time	2.7			7.5	12.0		14.0		16.0	ns
		3.3(*)			6.6	10.0		11.5		13.0	
$t_{OSLH}$ $t_{OSHL}$	Output To Output Skew Time (note1, 2)	2.7			0.5	1.0		1.0		1.0	ns
		3.3(*)			0.5	1.0		1.0		1.0	

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 ( $t_{OSLH} = |t_{PLHm} - t_{PLHn}|$ ,  $t_{OSHL} = |t_{PHLm} - t_{PHLn}|$ )

2) Parameter guaranteed by design

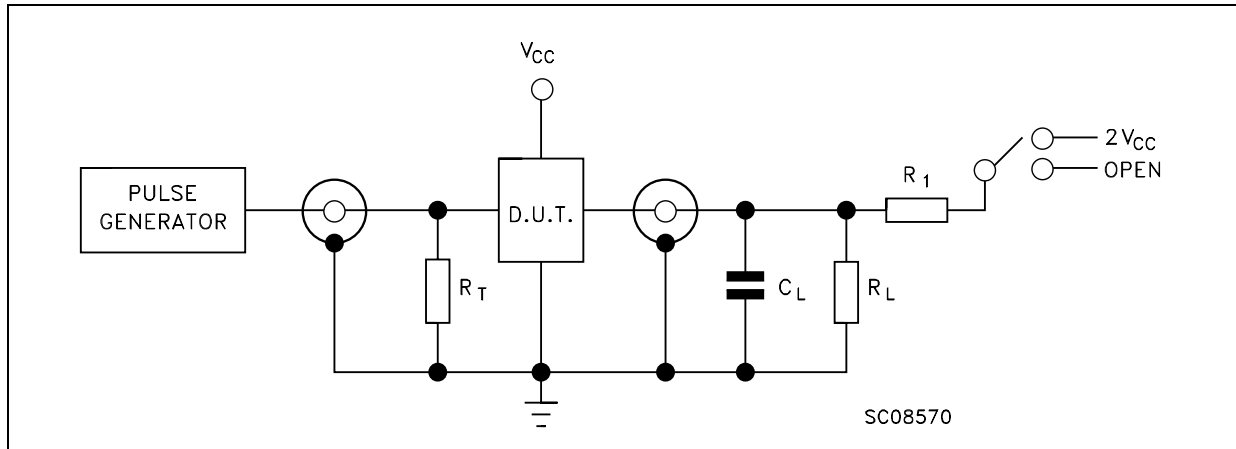
(\*) Voltage range is  $3.3\text{V} \pm 0.3\text{V}$

### CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Condition		Value						Unit	
		$V_{CC}$ (V)		$T_A = 25^\circ\text{C}$			$-40 \text{ to } 85^\circ\text{C}$		$-55 \text{ to } 125^\circ\text{C}$		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
$C_{IN}$	Input Capacitance	3.3			5						pF
$C_{I/O}$	I/O Capacitance	3.3			10						pF
$C_{PD}$	Power Dissipation Capacitance (note 1)	3.3	$f_{IN} = 10\text{MHz}$		20						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.  $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/8$  (per circuit)

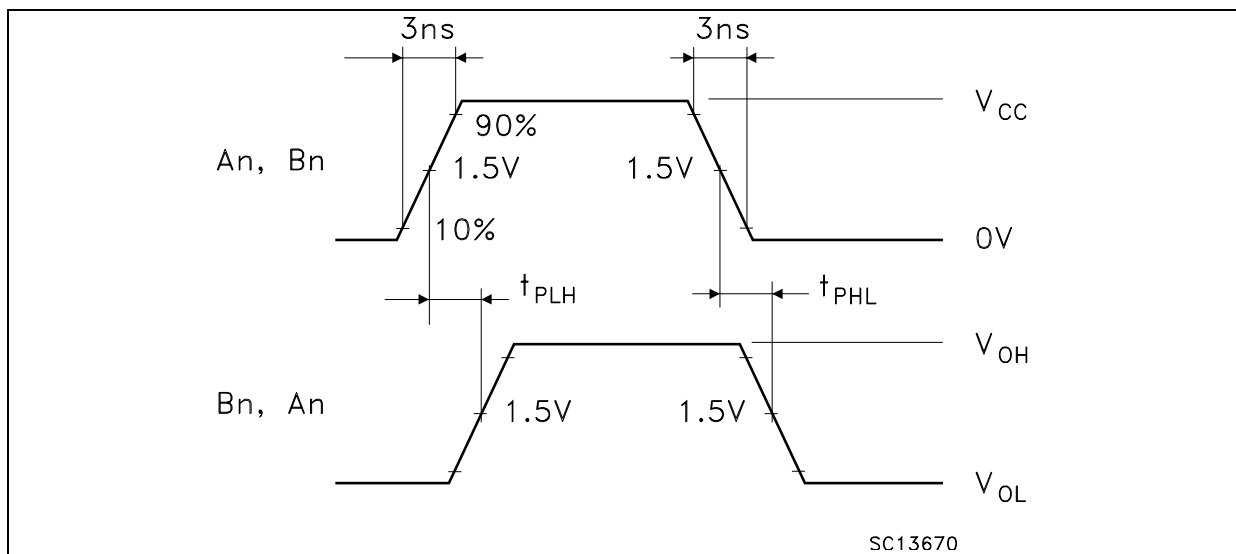
TEST CIRCUIT



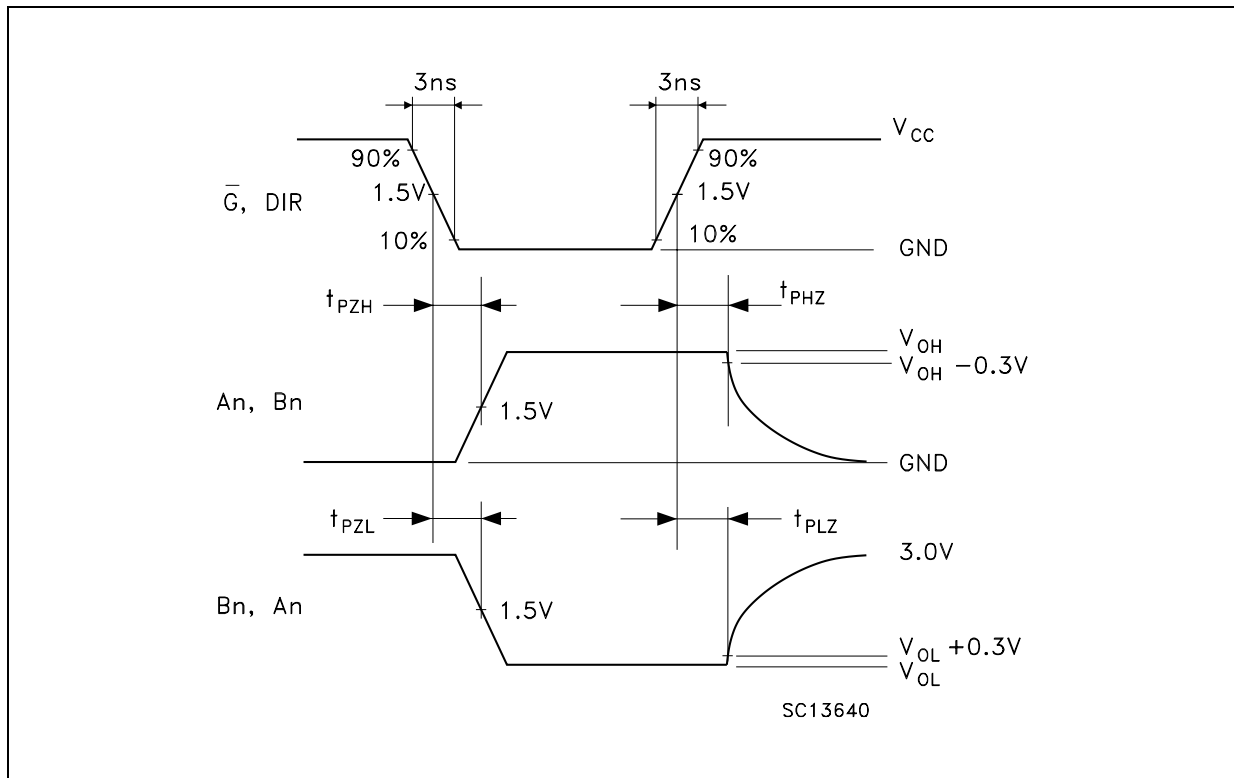
TEST	SWITCH
$t_{PLH}$ , $t_{PHL}$	Open
$t_{PZL}$ , $t_{PLZ}$	$2V_{CC}$
$t_{PZH}$ , $t_{PHZ}$	Open

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

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

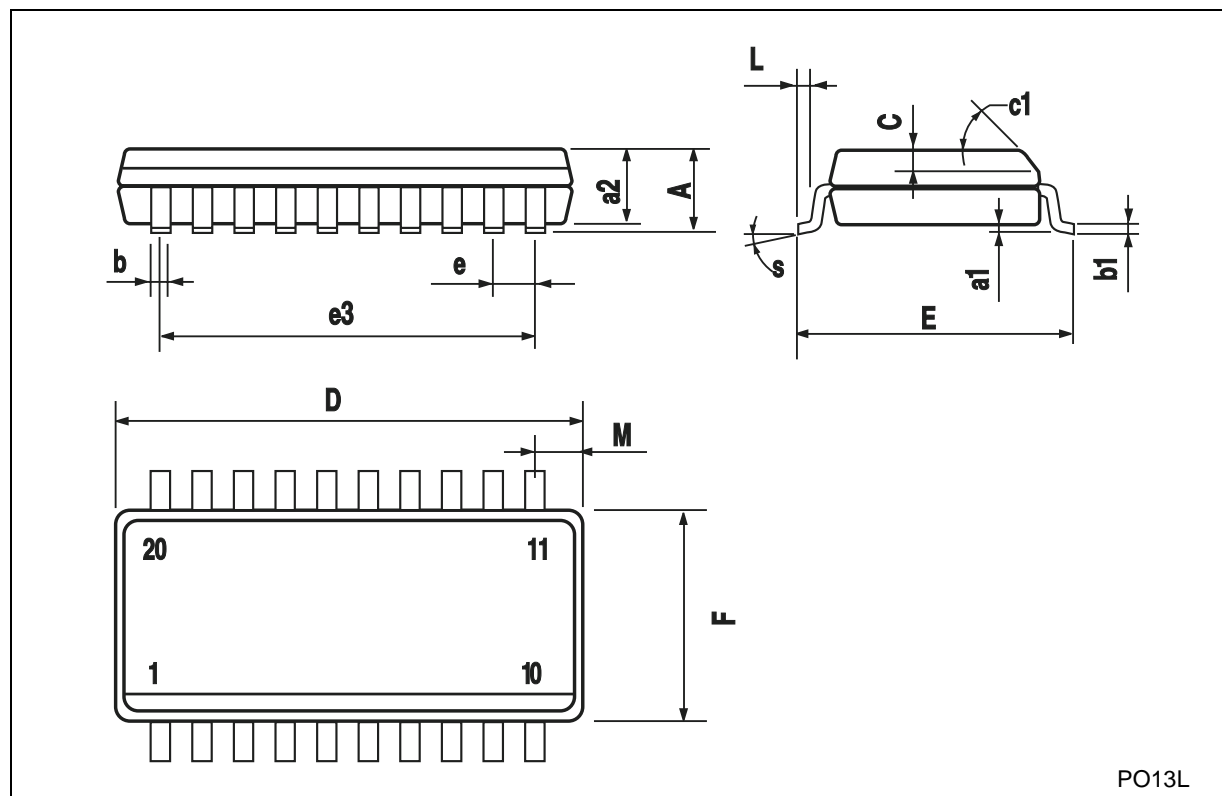


WAVEFORM 2: OUTPUT ENABLE AND DISABLE TIME (f=1MHz; 50% duty cycle)



## SO-20 MECHANICAL DATA

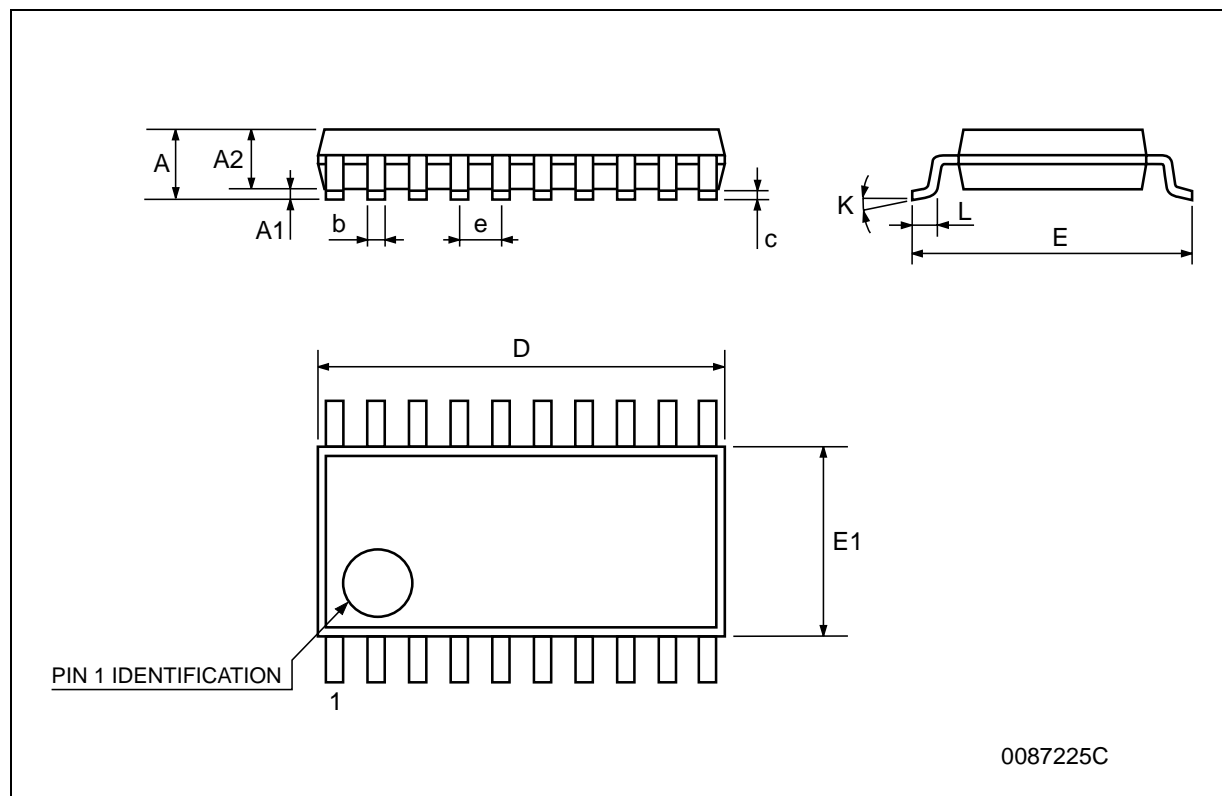
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.1		0.2	0.004		0.008
a2			2.45			0.096
b	0.35		0.49	0.014		0.019
b1	0.23		0.32	0.009		0.012
C		0.5			0.020	
c1	45° (typ.)					
D	12.60		13.00	0.496		0.512
E	10.00		10.65	0.393		0.419
e		1.27			0.050	
e3		11.43			0.450	
F	7.40		7.60	0.291		0.300
L	0.50		1.27	0.020		0.050
M			0.75			0.029
S	8° (max.)					



PO13L

## TSSOP20 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.2			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.8	1	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.0089
D	6.4	6.5	6.6	0.252	0.256	0.260
E	6.2	6.4	6.6	0.244	0.252	0.260
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°		8°	0°		8°
L	0.45	0.60	0.75	0.018	0.024	0.030





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