



# THE DATASHEET OF M74HCT540RM13TR

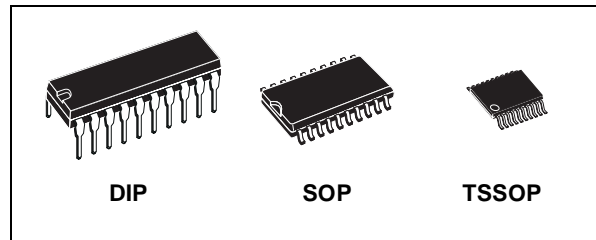




# M74HCT540

## OCTAL BUS BUFFER WITH 3 STATE OUTPUTS (INVERTED)

- HIGH SPEED:  
 $t_{PD} = 12\text{ns}$  (TYP.) at  $V_{CC} = 4.5\text{V}$
- LOW POWER DISSIPATION:  
 $I_{CC} = 4\mu\text{A}$ (MAX.) at  $T_A = 25^\circ\text{C}$
- COMPATIBLE WITH TTL OUTPUTS :  
 $V_{IH} = 2\text{V}$  (MIN.)  $V_{IL} = 0.8\text{V}$  (MAX)
- BALANCED PROPAGATION DELAYS:  
 $t_{PLH} \cong t_{PHL}$
- SYMMETRICAL OUTPUT IMPEDANCE:  
 $|I_{OH}| = I_{OL} = 6\text{mA}$  (MIN)
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 540



### ORDER CODES

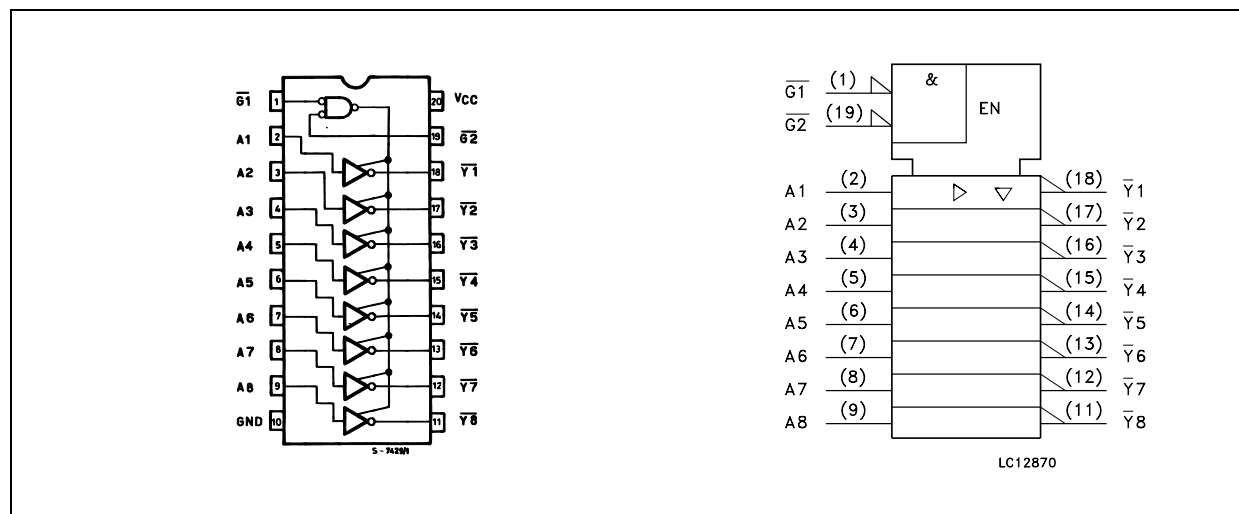
PACKAGE	TUBE	T & R
DIP	M74HCT540B1R	
SOP	M74HCT540M1R	M74HCT540RM13TR
TSSOP		M74HCT540TTR

### DESCRIPTION

The 74HCT540 is an advanced high-speed CMOS OCTAL BUS BUFFER (3-STATE) fabricated with silicon gate C<sup>2</sup>MOS technology. The M74HCT540 is an inverting buffer. The 3-STATE control gate operates as a two input AND such that if either G1 and G2 are high, all eight output are in the high impedance state. In order to enhance PC board layout the M74HCT540 offer a pinout having inputs and outputs on opposite sides of the package.

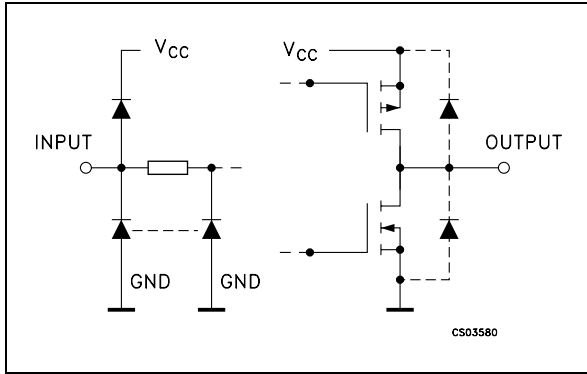
The M74HCT540 is designed to directly interface HSC<sup>2</sup>MOS systems with TTL and NMOS components. All inputs are equipped with protection circuits against static discharge and transient excess voltage.

### PIN CONNECTION AND IEC LOGIC SYMBOLS



# M74HCT541

## INPUT AND OUTPUT EQUIVALENT CIRCUIT



## PIN DESCRIPTION

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

## TRUTH TABLE

INPUT			OUTPUT
$\overline{G1}$	$\overline{G2}$	A <sub>n</sub>	$\overline{Yn}$
H	X	X	Z
X	H	X	Z
L	L	H	L
L	L	L	H

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 Input Voltage	-0.5 to V <sub>CC</sub> + 0.5	V
V <sub>O</sub>	DC Output 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	± 35	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC V <sub>CC</sub> or Ground Current	± 70	mA
P <sub>D</sub>	Power Dissipation	500(*)	mW
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  
(\*) 500mW at 65 °C; derate to 300mW by 10mW/°C from 65°C to 85°C

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage	4.5 to 5.5	V
V <sub>I</sub>	Input Voltage	0 to V <sub>CC</sub>	V
V <sub>O</sub>	Output Voltage	0 to V <sub>CC</sub>	V
T <sub>op</sub>	Operating Temperature	-55 to 125	°C
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time (V <sub>CC</sub> = 4.5 to 5.5V)	0 to 500	ns

## 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	4.5 to 5.5		2.0			2.0		2.0		V
V <sub>IL</sub>	Low Level Input Voltage	4.5 to 5.5				0.8		0.8		0.8	V
V <sub>OH</sub>	High Level Output Voltage	4.5	I <sub>O</sub> = -20 μA	4.4	4.5		4.4		4.4		V
			I <sub>O</sub> = -6.0 mA	4.18	4.31		4.13		4.10		
V <sub>OL</sub>	Low Level Output Voltage	4.5	I <sub>O</sub> = 20 μA		0.0	0.1		0.1		0.1	V
			I <sub>O</sub> = 6.0 mA		0.17	0.26		0.33		0.40	
I <sub>I</sub>	Input Leakage Current	5.5	V <sub>I</sub> = V <sub>CC</sub> or GND			± 0.1		± 1		± 1	μA
I <sub>OZ</sub>	High Impedance Output Leakage Current	5.5	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> V <sub>O</sub> = V <sub>CC</sub> or GND			± 0.5		± 5		± 10	μA
I <sub>CC</sub>	Quiescent Supply Current	5.5	V <sub>I</sub> = V <sub>CC</sub> or GND			4		40		80	μA
Δ I <sub>CC</sub>	Additional Worst Case Supply Current	5.5	Per Input pin V <sub>I</sub> = 0.5V or V <sub>I</sub> = 2.4V Other Inputs at V <sub>CC</sub> or GND			2.0		2.9		3.0	mA

AC ELECTRICAL CHARACTERISTICS (C<sub>L</sub> = 50 pF, Input t<sub>r</sub> = t<sub>f</sub> = 6ns)

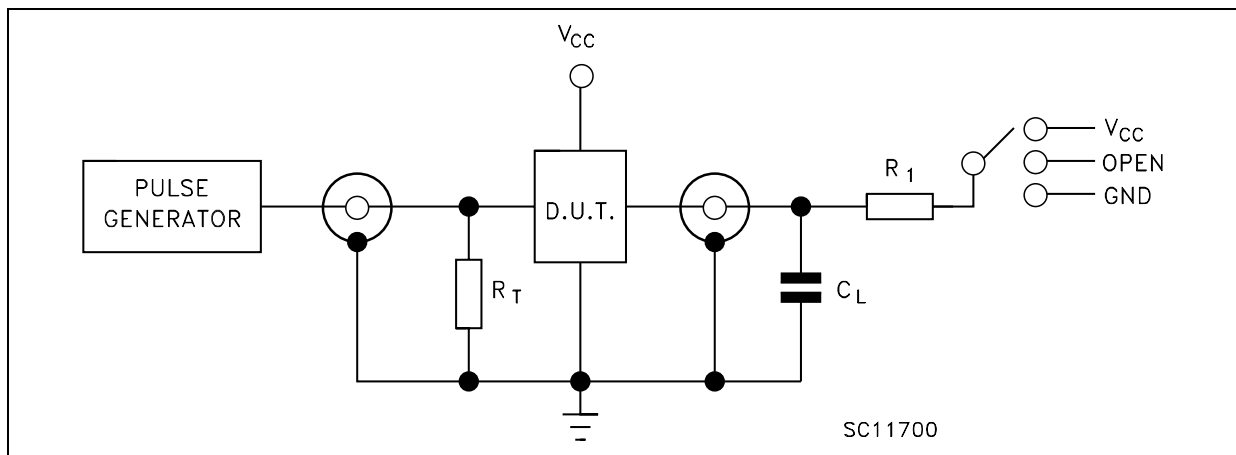
Symbol	Parameter	Test Condition			Value						Unit	
		V <sub>CC</sub> (V)	C <sub>L</sub> (pF)		T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C		
					Min.	Typ.	Max.	Min.	Max.	Min.		Max.
t <sub>TLH</sub> t <sub>THL</sub>	Output Transition Time	4.5	50			6	12		15		18	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time	4.5	50			12	20		25		30	ns
		4.5	150			16	25		31		38	
t <sub>PZL</sub> t <sub>PZH</sub>	Output Enable Time	4.5	50	R <sub>L</sub> = 1 KΩ		18	30		38		45	ns
		4.5	150			22	34		43		51	
t <sub>PLZ</sub> t <sub>PHZ</sub>	Output Disable Time	4.5	50	R <sub>L</sub> = 1 KΩ		19	27		34		41	ns

**CAPACITIVE 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.
C <sub>IN</sub>	Input Capacitance	5.0			5	10		10		10	pF
C <sub>PD</sub>	Power Dissipation Capacitance (note 1)	5.0			34						pF

1) C<sub>PD</sub> 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<sub>CC(OPR)</sub> = C<sub>PD</sub> × V<sub>CC</sub> × f<sub>IN</sub> + I<sub>CC</sub>/8 (per circuit)

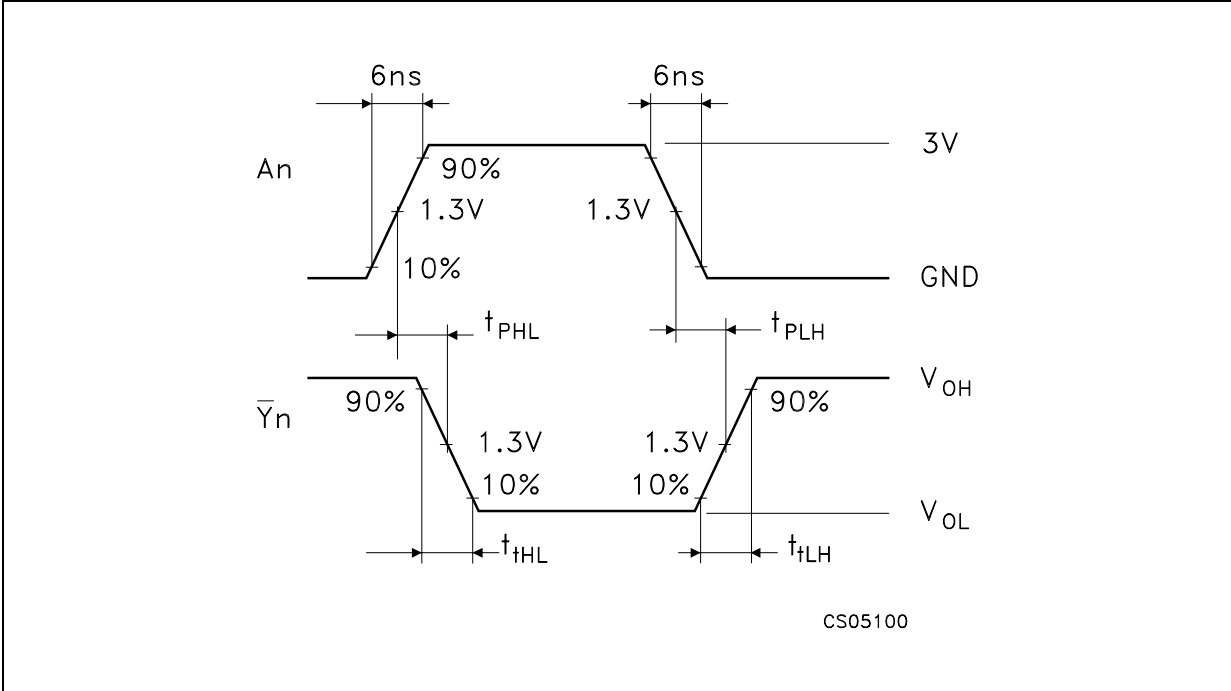
**TEST CIRCUIT**



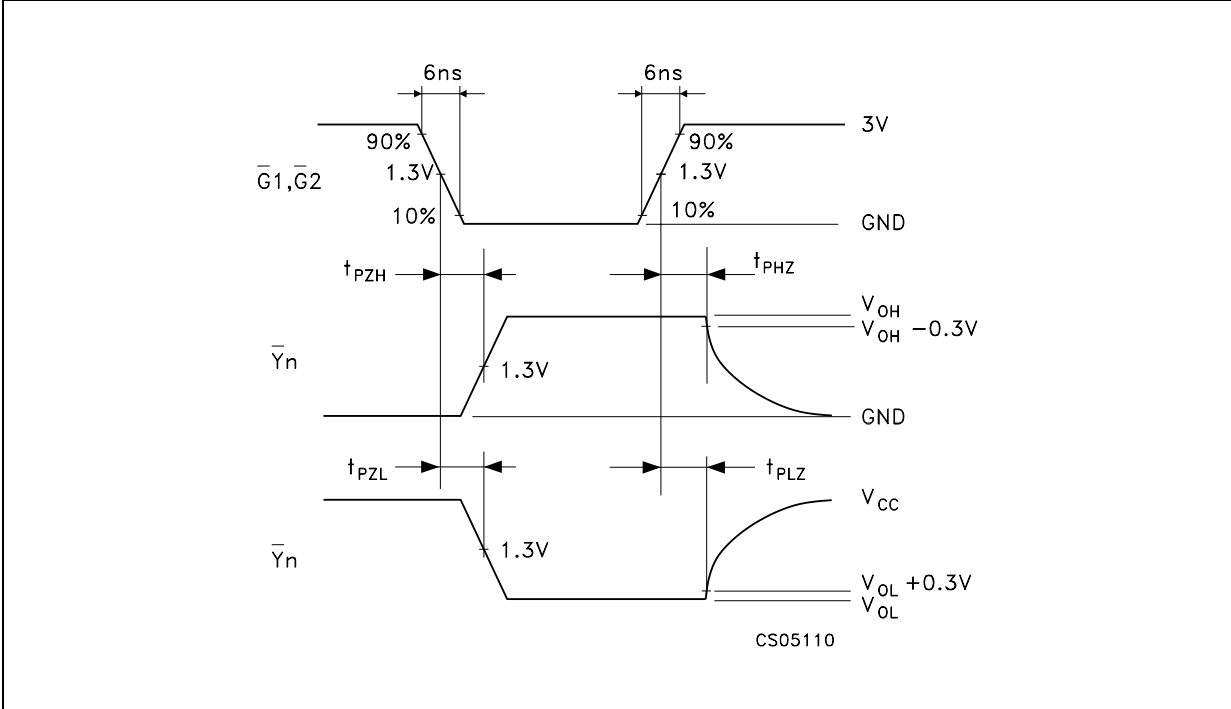
TEST	SWITCH
t <sub>PLH</sub> , t <sub>PHL</sub>	Open
t <sub>PZL</sub> , t <sub>PLZ</sub>	V <sub>CC</sub>
t <sub>PZH</sub> , t <sub>PHZ</sub>	GND

C<sub>L</sub> = 50pF/150pF or equivalent (includes jig and probe capacitance)  
 R<sub>1</sub> = 1KΩ or equivalent  
 R<sub>T</sub> = Z<sub>OUT</sub> of pulse generator (typically 50Ω)

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

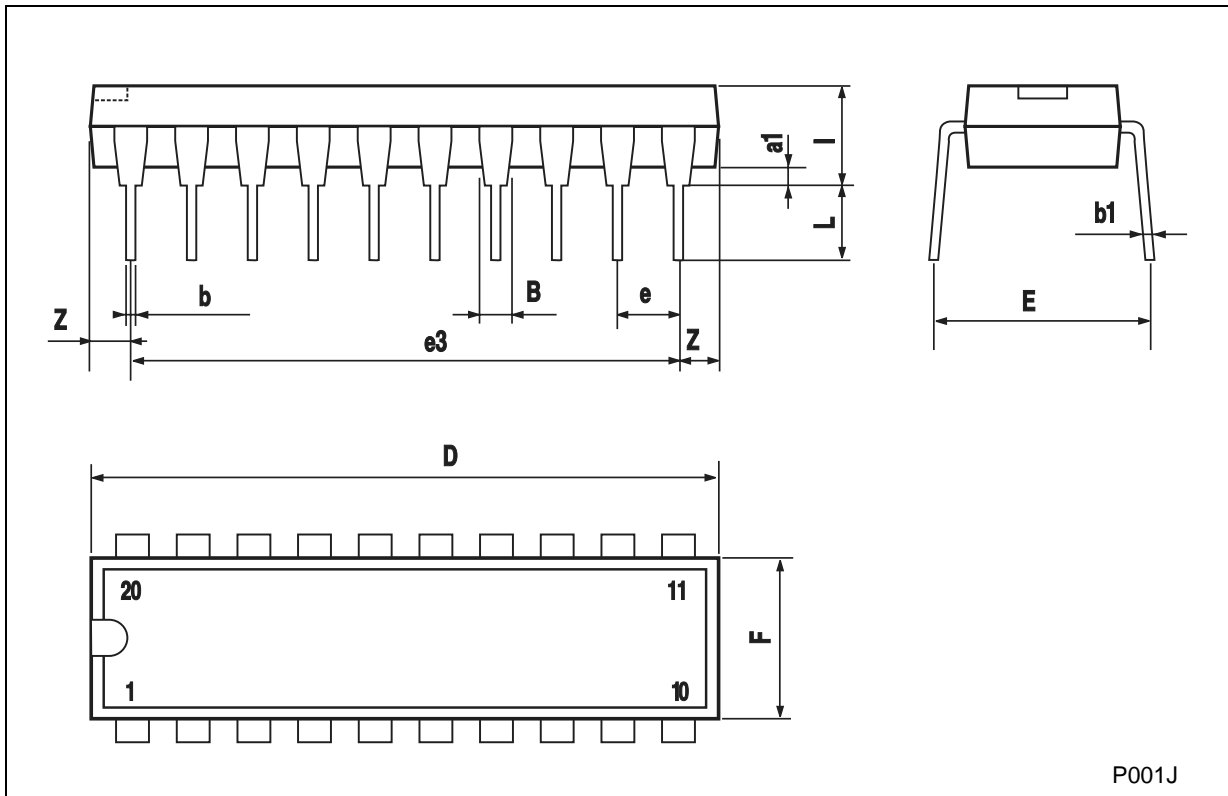


WAVEFORM 2 : OUTPUT ENABLE AND DISABLE TIMES (f=1MHz; 50% duty cycle)



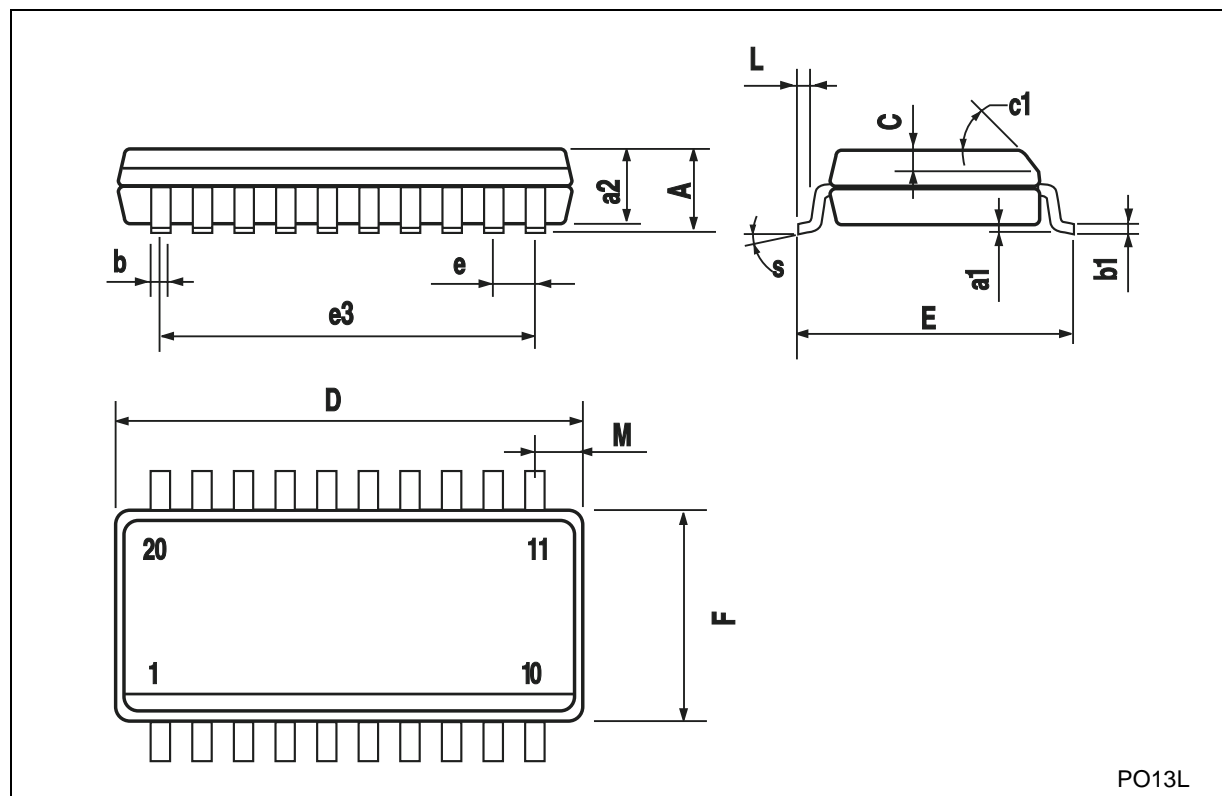
**Plastic DIP-20 (0.25) MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
a1	0.254			0.010		
B	1.39		1.65	0.055		0.065
b		0.45			0.018	
b1		0.25			0.010	
D			25.4			1.000
E		8.5			0.335	
e		2.54			0.100	
e3		22.86			0.900	
F			7.1			0.280
I			3.93			0.155
L		3.3			0.130	
Z			1.34			0.053



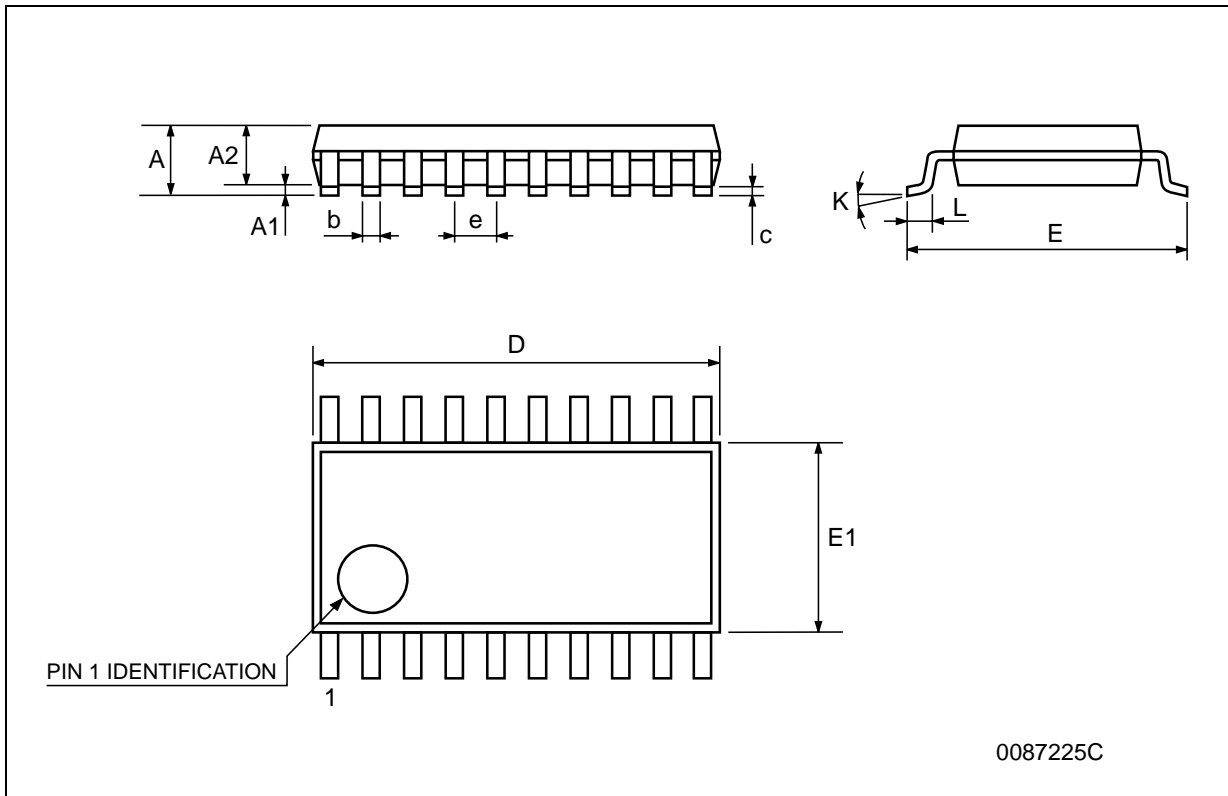
## SO-20 MECHANICAL DATA

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.)					



**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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