



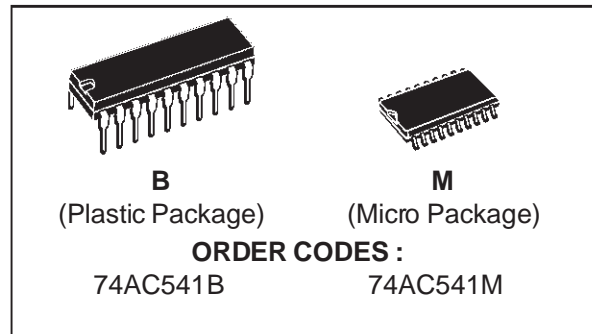
74AC541

OCTAL BUS BUFFER WITH 3 STATE OUTPUTS (NON INVERTED)

- HIGH SPEED: $t_{PD} = 4 \text{ ns}$ (TYP.) at $V_{CC} = 5V$
- LOW POWER DISSIPATION:
 $I_{CC} = 8 \mu A$ (MAX.) at $T_A = 25^\circ C$
- HIGH NOISE IMMUNITY:
 $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (MIN.)
- 50Ω TRANSMISSION LINE DRIVING CAPABILITY
- SYMMETRICAL OUTPUT IMPEDANCE:
 $|I_{OH}| = I_{OL} = 24 \text{ mA}$ (MIN)
- BALANCED PROPAGATION DELAYS:
 $t_{PLH} \cong t_{PHL}$
- OPERATING VOLTAGE RANGE:
 V_{CC} (OPR) = 2V to 6V
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 541
- IMPROVED LATCH-UP IMMUNITY

DESCRIPTION

The AC541 is an advanced CMOS OCTAL BUS BUFFER (3-STATE) fabricated with sub-micron silicon gate and double-layer metal wiring C²MOS technology. It is ideal for low power applications maintaining high speed operation similar to

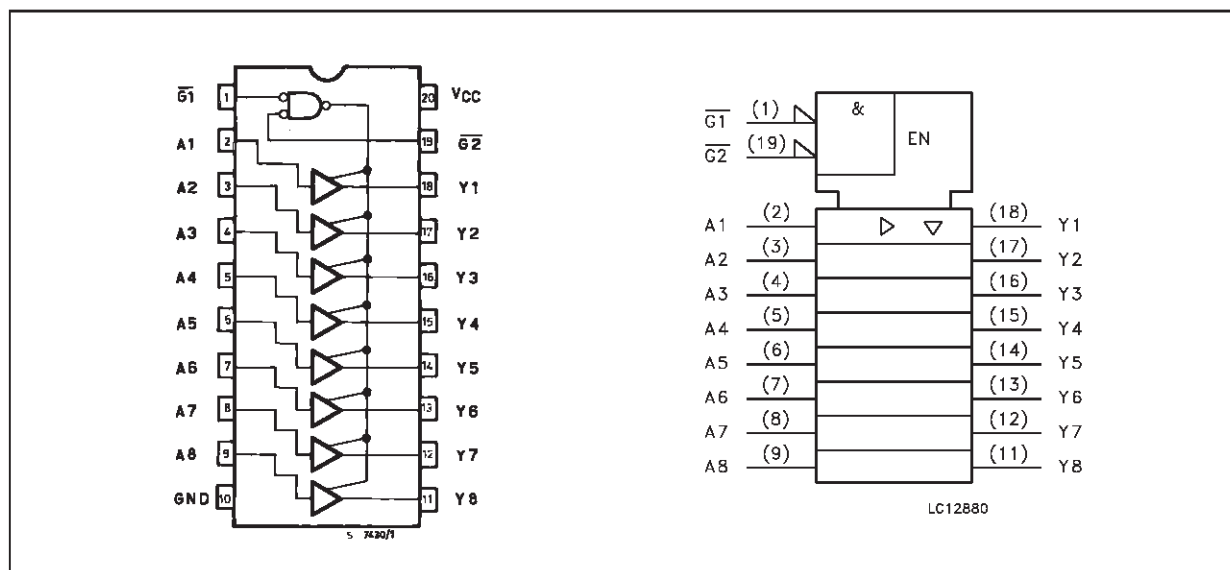


equivalent Bipolar Schottky TTL.

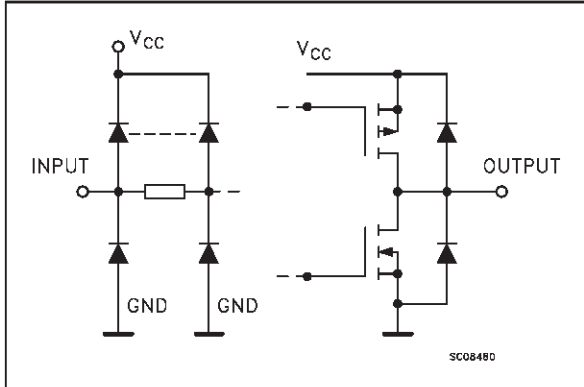
The 3 STATE control gate operates as a two input AND such that if either G1 and G2 are high, all eight outputs are in the high impedance state. In order to enhance PC board layout, the AC541 offers a pinout having inputs and outputs on opposite sides of the package.

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	V
V _I	DC Input Voltage	-0.5 to V _{CC} + 0.5	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	±50	mA
I _{CC} or I _{GND}	DC V _{CC} or Ground Current	±400	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	2 to 6	V
V _I	Input Voltage	0 to V _{CC}	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} = 3.0, 4.5 or 5.5 V(note 1)	8	ns/V

1) V_{IN} from 30% to 70% of V_{CC}

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	3.0	V _O = 0.1 V or V _{CC} - 0.1 V	2.1	1.5		2.1		V	
		4.5		3.15	2.25		3.15			
		5.5		3.85	2.75		3.85			
V _{IL}	Low Level Input Voltage	3.0	V _O = 0.1 V or V _{CC} - 0.1 V		1.5	0.9		0.9	V	
		4.5			2.25	1.35		1.35		
		5.5			2.75	1.65		1.65		
V _{OH}	High Level Output Voltage	3.0	V _I ^(*) = V _{IH} or V _{IL}	I _O = -50 μA	2.9	2.99		2.9	V	
		4.5		I _O = -50 μA	4.4	4.49		4.4		
		5.5		I _O = -50 μA	5.4	5.49		5.4		
		3.0		I _O = -12 mA	2.56			2.46		
		4.5		I _O = -24 mA	3.86			3.76		
		5.5		I _O = -24 mA	4.86			4.76		
V _{OL}	Low Level Output Voltage	3.0	V _I ^(*) = V _{IH} or V _{IL}	I _O = 50 μA		0.002	0.1		0.1	V
		4.5		I _O = 50 μA		0.001	0.1		0.1	
		5.5		I _O = 50 μA		0.001	0.1		0.1	
		3.0		I _O = 12 mA			0.36		0.44	
		4.5		I _O = 24 mA			0.36		0.44	
		5.5		I _O = 24 mA			0.36		0.44	
I _I	Input Leakage Current	5.5	V _I = V _{CC} or GND			±0.1		±1	μA	
I _{OZ}	3 State Output Leakage Current	5.5	V _I = V _{IH} or V _{IL} V _O = V _{CC} or GND			±0.5		±5	μA	
I _{CC}	Quiescent Supply Current	5.5	V _I = V _{CC} or GND			8		80	μA	
I _{OLD}	Dynamic Output Current (note 1, 2)	5.5	V _{OLD} = 1.65 V max					75	mA	
I _{OHD}			V _{OHD} = 3.85 V min					-75	mA	

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

2) Incident wave switching is guaranteed on transmission lines with impedances as low as 50 Ω.

(*) All outputs loaded.

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

Symbol	Parameter	Test Condition		Value					Unit	
				V _{CC} (V)	T _A = 25 °C			-40 to 85 °C		
					Min.	Typ.	Max.	Min.		Max.
t _{PLH} t _{PHL}	Propagation Delay Time	3.3 ^(*)		1.5	5	8	1.5	9	ns	
		5.0 ^(**)		1.5	4	6.5	1.5	7		
t _{PZL} t _{PZH}	Output Enable Time	3.3 ^(*)		1.5	7	10.5	1.5	11.5	ns	
		5.0 ^(**)		1.5	5	8	1.5	8.5		
t _{PLZ} t _{PHZ}	Output Disable Time	3.3 ^(*)		1.5	7	10.5	1.5	11.5	ns	
		5.0 ^(**)		1.5	6	9	1.5	9.5		

(*) Voltage range is 3.3V ± 0.3V

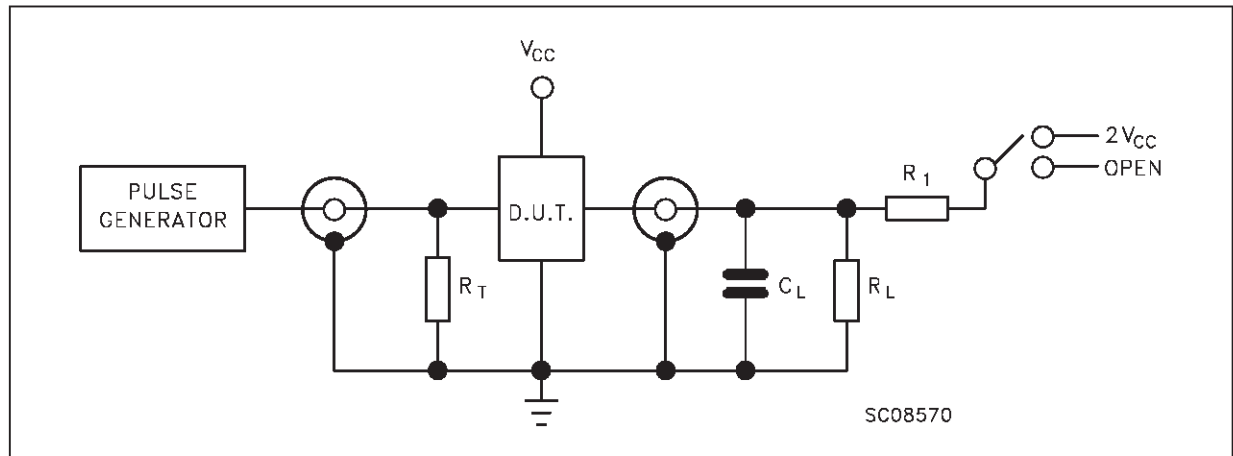
(**) Voltage range is 5V ± 0.5V

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	5.0			4				pF	
C _{OUT}	Output Capacitance	5.0			8				pF	
C _{PD}	Power Dissipation Capacitance (note 1)	5.0			21				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. $I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/8$ (per circuit)

TEST CIRCUIT

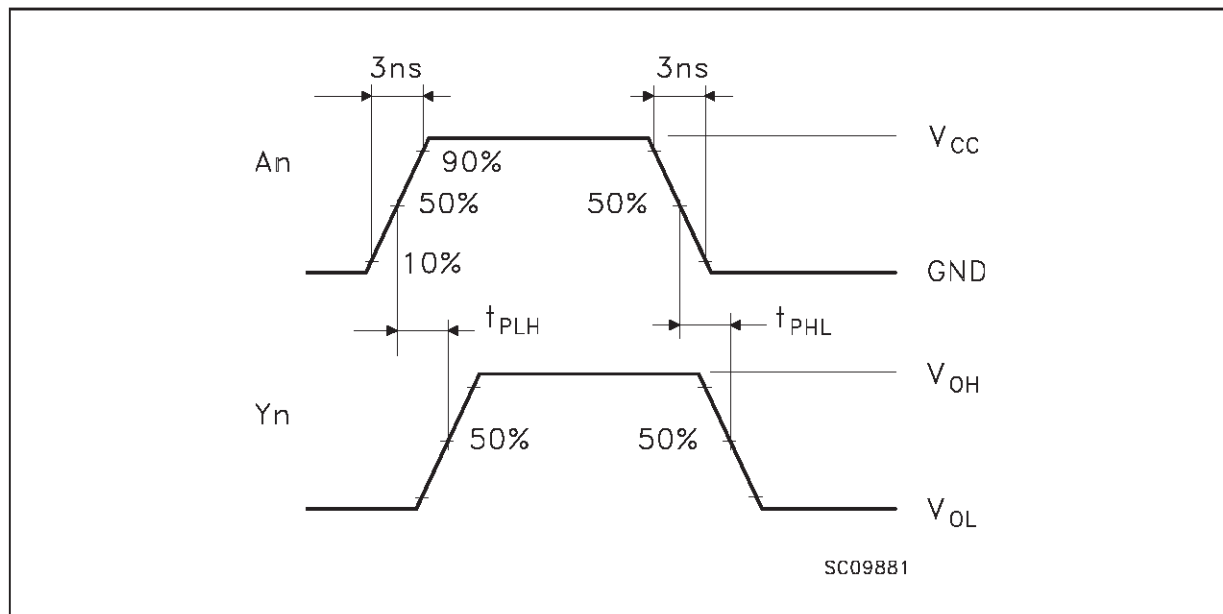
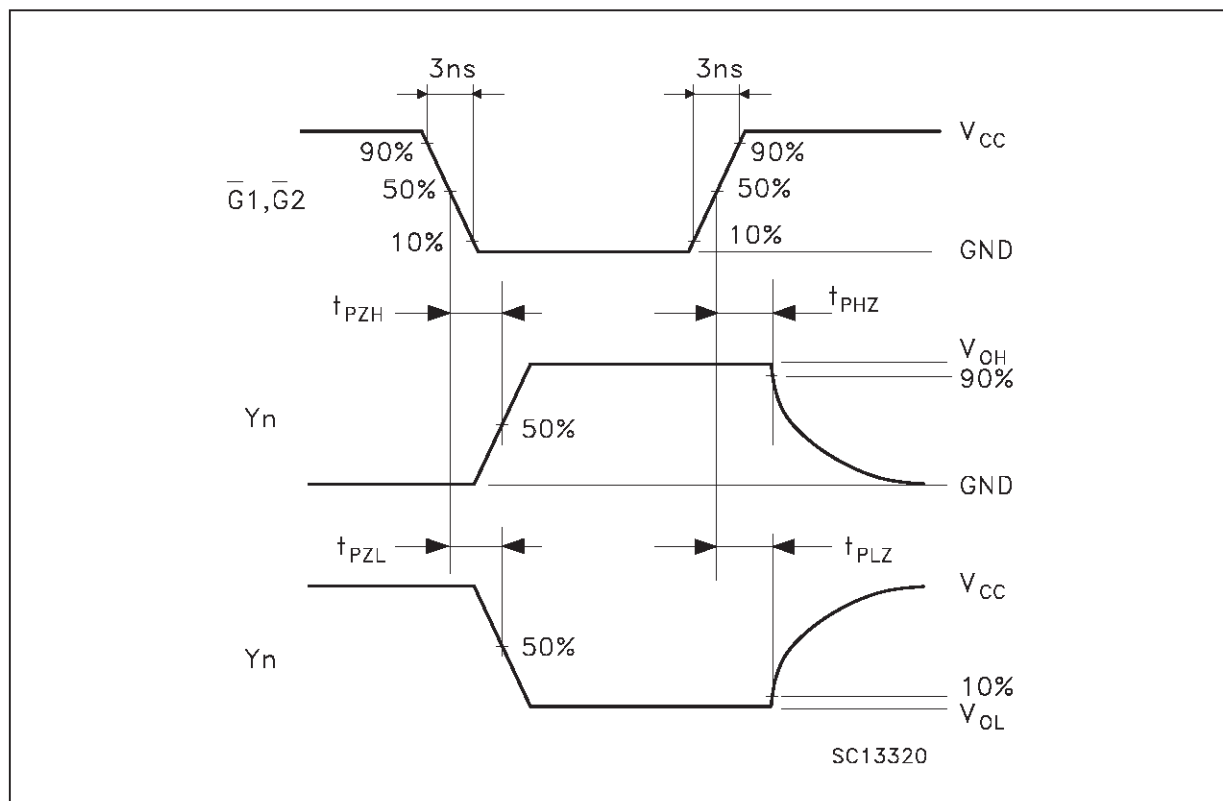


TEST	SWITCH
t _{PLH} , t _{PHL}	Open
t _{PZL} , t _{PLZ}	2V _{CC}
t _{PZH} , t _{PHZ}	Open

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

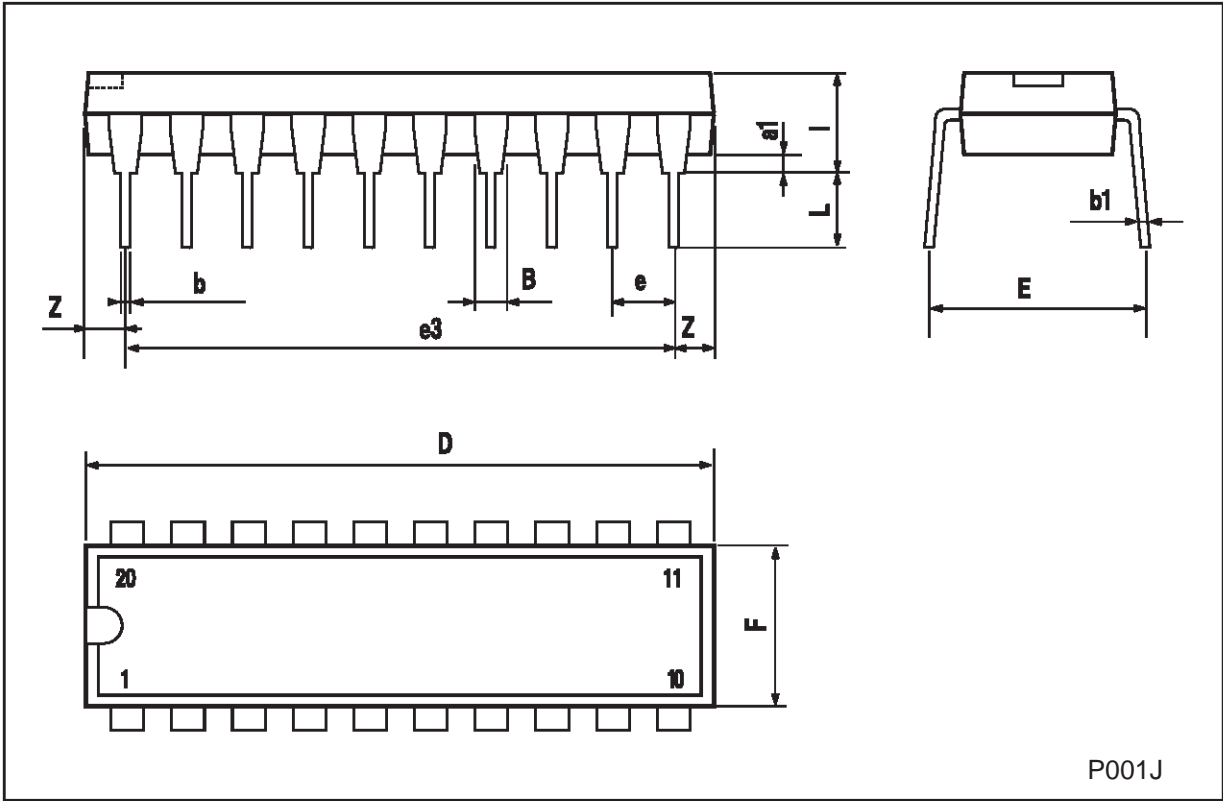
R_L = R₁ = 500Ω or equivalent

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

WAVEFORM 1: PROPAGATION DELAYS (f=1MHz; 50% duty cycle)**WAVEFORM 2: OUTPUT ENABLE AND DISABLE TIME** (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
l			3.93			0.155
L		3.3			0.130	
Z			1.34			0.053

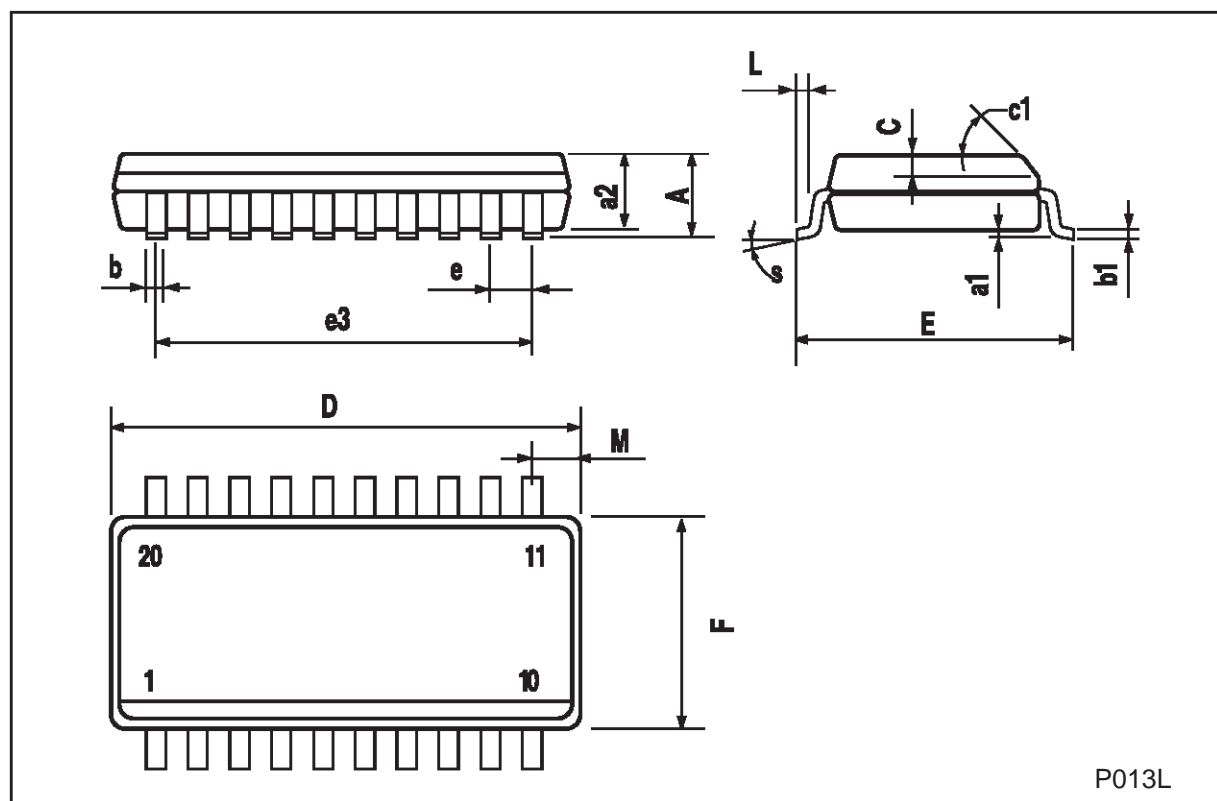


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SO-20 MECHANICAL DATA

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.)					



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