ST®

74VHC245

OCTAL BUS
TRANSCEIVER (3-STATE)

- HIGH SPEED: t_{PD} = 4.0 ns (TYP.) at V_{CC} = 5V
- LOW POWER DISSIPATION:
  I_{CC} = 4 μA (MAX.) at T_A = 25 ^{o}C
- HIGH NOISE IMMUNITY:
  V_{NIH} = V_{NIL} = 28% V_{CC} (MIN.)
- POWER DOWN PROTECTION ON CONTROL INPUTS
- SYMMETRICAL OUTPUT IMPEDANCE:
  $|I_{OH}|$ = I_{OL} = 8 mA (MIN)
- BALANCED PROPAGATION DELAYS:
  $t_{PLH} \cong t_{PHL}$
- OPERATING VOLTAGE RANGE:
  V_{CC} (OPR) = 2V to 5.5V
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 245
- IMPROVED LATCH-UP IMMUNITY
- LOW NOISE V_{OLP} = 0.9V (Max.)

DESCRIPTION
The 74VHC245 is an advanced high-speed CMOS OCTAL BUS TRANSCEIVER (3-STATE) fabricated with sub-micron silicon gate and double-layer metal wiring C^{2}MOS technology.

This IC is intended for two-way asynchronous communication between data busses; the direction of data trasmission is determined by the level of the DIR input. The enable input $\overline{G}$ can be

M
(Micro Package)

T
(TSSOP Package)

ORDER CODES :

74VHC245M   74VHC245T

used to disable the device so that the busses are effectively isolated.

All inputs and outputs are equipped with protection circuits against static discharge, giving them 2kV ESD immunity and transient excess voltage.
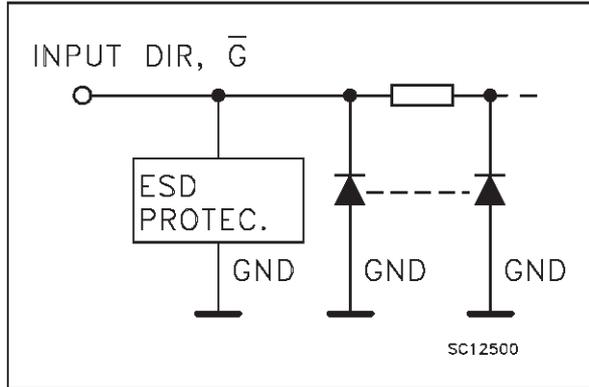
IT IS PROHIBITED TO APPLY A SIGNAL TO A TERMINAL WHEN IT IS IN OUTPUT MODE AND WHEN A BUS TERMINAL IS FLOATING (HIGH IMPEDANCE STATE) IT IS REQUESTED TO FIX THE INPUT LEVEL BY MEANS OF EXTERNAL PULL DOWN OR PULL UP RESISTOR.

PIN CONNECTION AND IEC LOGIC SYMBOLS
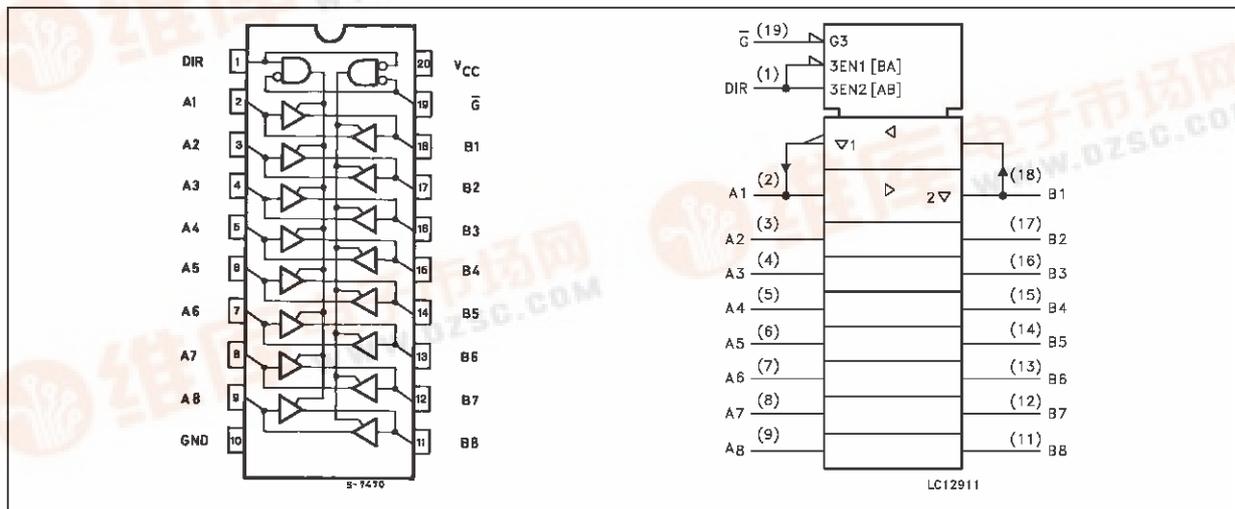
INPUT EQUIVALENT CIRCUIT

INPUT DIR, $\overline{G}$

ESD PROTEC.

GND   GND   GND

SC12500

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	$\overline{G}$	Output Enable Input
10	GND	Ground (0V)
20	V_{CC}	Positive Supply Voltage

TRUTH TABLE

INPUT		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: "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 (DIR, $\overline{G}$)	-0.5 to +7.0	V
$V_{I/O}$	Bus I/O 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	± 25	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current	± 75	mA
T_{stg}	Storage Temperature	-65 to +150	^oC
T_L	Lead Temperature (10 sec)	300	^oC

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	2.0 to 5.5	V
V_I	Input Voltage (DIR, $\overline{G}$)	0 to 5.5	V
$V_{I/O}$	Bus I/O Voltage	0 to V_{CC}	V
V_O	Output Voltage	0 to V_{CC}	V
T_{op}	Operating Temperature	-40 to +85	^oC
dt/dv	Input Rise and Fall Time (see note 1) (V_{CC} = 3.3 ± 0.3V) (V_{CC} = 5.0 ± 0.5V)	0 to 100 0 to 20	ns/V ns/V

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

DC SPECIFICATIONS

Symbol	Parameter	Test Conditions		Value					Unit
		V_{CC} (V)		$T_A = 25\ ^{\circ}C$			-40 to 85 $^{\circ}C$		
				Min.	Typ.	Max.	Min.	Max.	
V_{IH}	High Level Input Voltage	2.0		1.5			1.5		V
		3.0 to 5.5		$0.7V_{CC}$			$0.7V_{CC}$		
V_{IL}	Low Level Input Voltage	2.0				0.5		0.5	V
		3.0 to 5.5				$0.3V_{CC}$		$0.3V_{CC}$	
V_{OH}	High Level Output Voltage	2.0	$I_O=-50\ \mu A$	1.9	2.0		1.9		V
		3.0	$I_O=-50\ \mu A$	2.9	3.0		2.9		
		4.5	$I_O=-50\ \mu A$	4.4	4.5		4.4		
		3.0	$I_O=-4$ mA	2.58			2.48		
		4.5	$I_O=-8$ mA	3.94			3.8		
V_{OL}	Low Level Output Voltage	2.0	$I_O=50\ \mu A$		0.0	0.1		0.1	V
		3.0	$I_O=50\ \mu A$		0.0	0.1		0.1	
		4.5	$I_O=50\ \mu A$		0.0	0.1		0.1	
		3.0	$I_O=4$ mA			0.36		0.44	
		4.5	$I_O=8$ mA			0.36		0.44	
I_{OZ}	High Impedance Output Leakage Current	5.5	$V_I = V_{IH}$ or V_{IL} $V_O = V_{CC}$ or GND			±0.25		±2.5	μA
I_I	Input Leakage Current	0 to 5.5	$V_I = 5.5V$ or GND			±0.1		±1.0	μA
I_{CC}	Quiescent Supply Current	5.5	$V_I = V_{CC}$ or GND			4		40	μA

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

Symbol	Parameter	Test Condition			Value					Unit
		V_{CC} (V)	C_L (pF)		$T_A = 25\ ^{\circ}C$			-40 to 85 $^{\circ}C$		
					Min.	Typ.	Max.	Min.	Max.	
t_{PLH} t_{PHL}	Propagation Delay Time	3.3[*]	15			5.8	8.4	1.0	10.0	ns
		3.3[*]	50			8.3	11.9	1.0	13.5	
		5.0[**]	15			4.0	5.5	1.0	6.5	
		5.0[**]	50			5.5	7.5	1.0	8.5	
t_{PLZ} t_{PHZ}	Output Disable Time	3.3[*]	15	$R_L = 1K\Omega$		8.5	13.2	1.0	15.5	ns
		3.3[*]	50	$R_L = 1K\Omega$		11.0	16.7	1.0	19.0	
		5.0[**]	15	$R_L = 1K\Omega$		5.8	8.5	1.0	10.0	
		5.0[**]	50	$R_L = 1K\Omega$		7.3	10.6	1.0	12.0	
t_{PZL} t_{PZH}	Output Enable Time	3.3[*]	50	$R_L = 1K\Omega$		11.5	15.8	1.0	18.0	ns
		5.0[**]	50	$R_L = 1K\Omega$		7.0	9.7	1.0	11.0	
t_{OSLH} t_{OSHL}	Output to Output Skew Time (note 1)	3.3[*]	50				1.5		1.5	ns
		5.0[**]	50				1.0		1.0	

(*) Voltage range is 3.3V ± 0.3V

(**) Voltage range is 5V ± 0.5V

Note 1: Parameter guaranteed by design. $t_{soLH} = |t_{pLHm} - t_{pLHn}|$, $t_{soHL} = |t_{pHLm} - t_{pHLn}|$

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Conditions	Value					Unit
			$T_A = 25\ ^oC$			-40 to 85 ^oC		
			Min.	Typ.	Max.	Min.	Max.	
C_{IN}	Input Capacitance			4	10		10	pF
$C_{I/O}$	Bus Input Capacitance			8				pF
C_{PD}	Power Dissipation Capacitance (note 1)			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 operting current can be obtained by the following equation. $I_{CC}(opr) = C_{PD} \bullet V_{CC} \bullet f_{IN} + I_{CO}/8$ (per circuit)

DYNAMIC SWITCHING CHARACTERISTICS

Symbol	Parameter	Test Conditions		Value					Unit
		V_{CC} (V)		$T_A = 25\ ^oC$			-40 to 85 ^oC		
				Min.	Typ.	Max.	Min.	Max.	
V_{OLP}	Dynamic Low Voltage Quiet Output (note 1, 2)	5.0			0.6	0.9			
V_{OLV}			$C_L = 50$ pF	-0.9	-0.6				V
V_{IHD}	Dynamic High Voltage Input (note 1, 3)	5.0		3.5					
V_{ILD}	Dynamic Low Voltage Input (note 1, 3)	5.0				1.5			

1) Worst case package.

2) Max number of outputs defined as (n). Data inputs are driven 0V to 5.0V, (n -1) outputs switching and one output at GND.

3) Max number of data inputs (n) switching. (n-1) switching 0V to 5.0V. Inputs under test switching: 5.0V to threshold (V_{ILD}), 0V to threshold (V_{IHD}), f=1MHz.
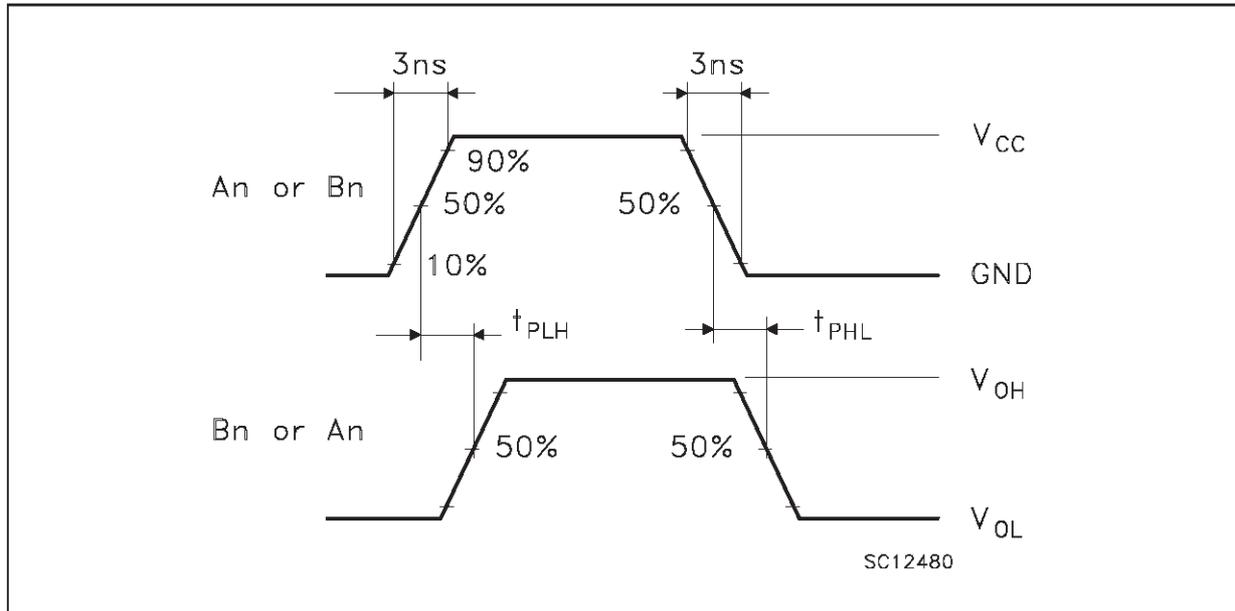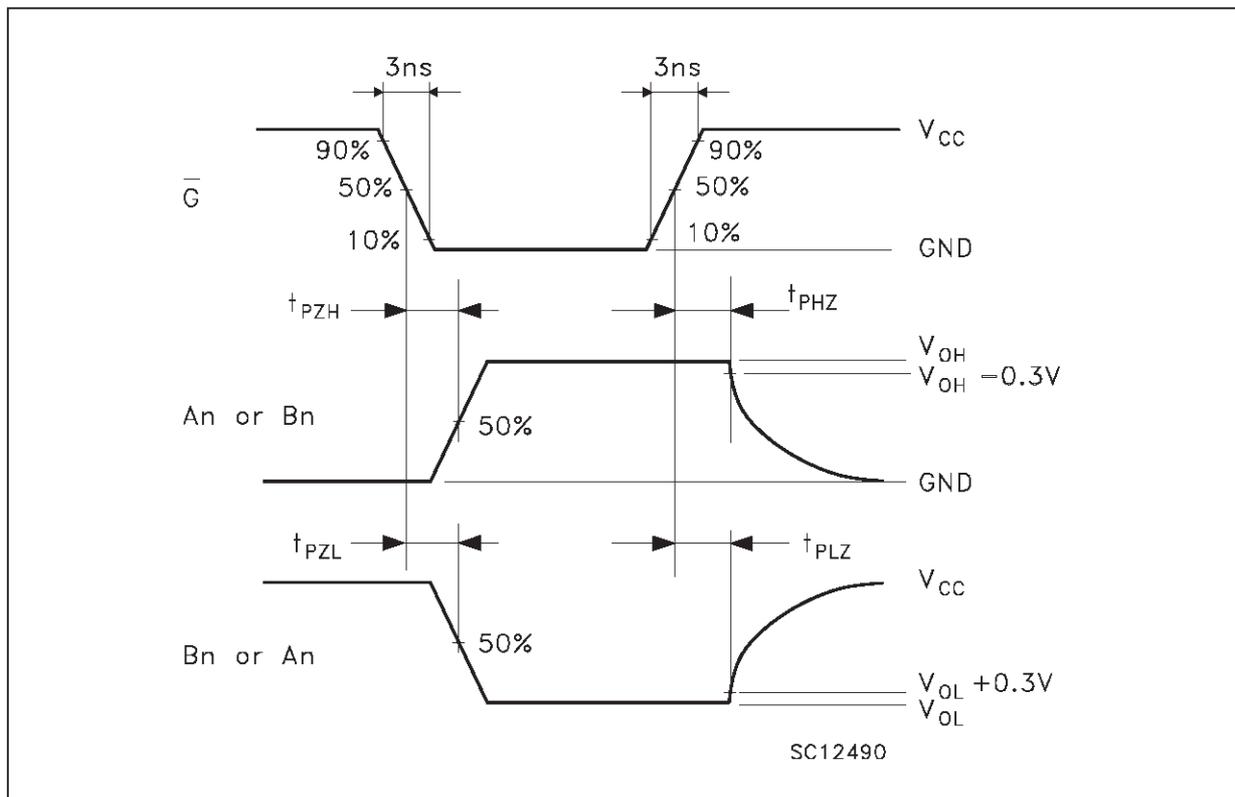
TEST CIRCUIT

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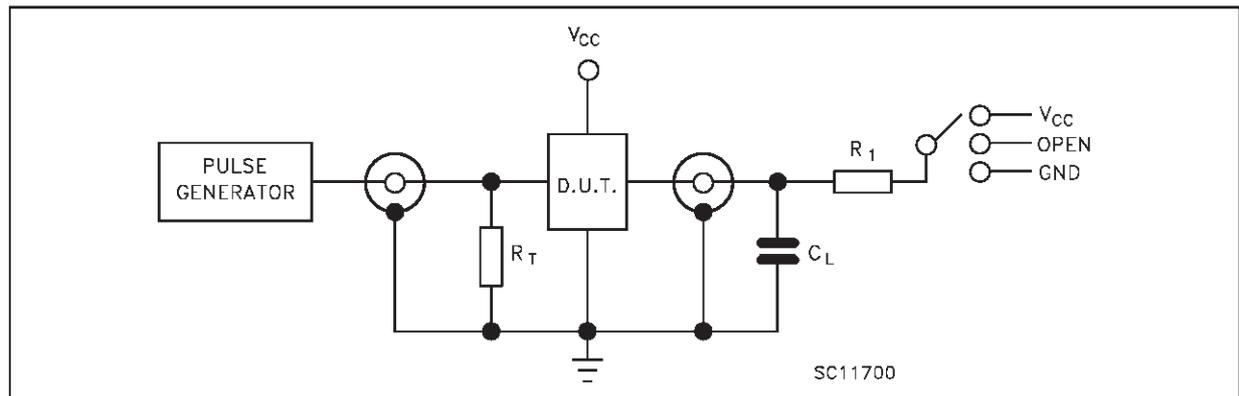
TEST	SWITCH
t_{PLH}, t_{PHL}	Open
t_{PZL}, t_{PLZ}	V_{CC}
t_{PZH}, t_{PHZ}	GND

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

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

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

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

SC12480

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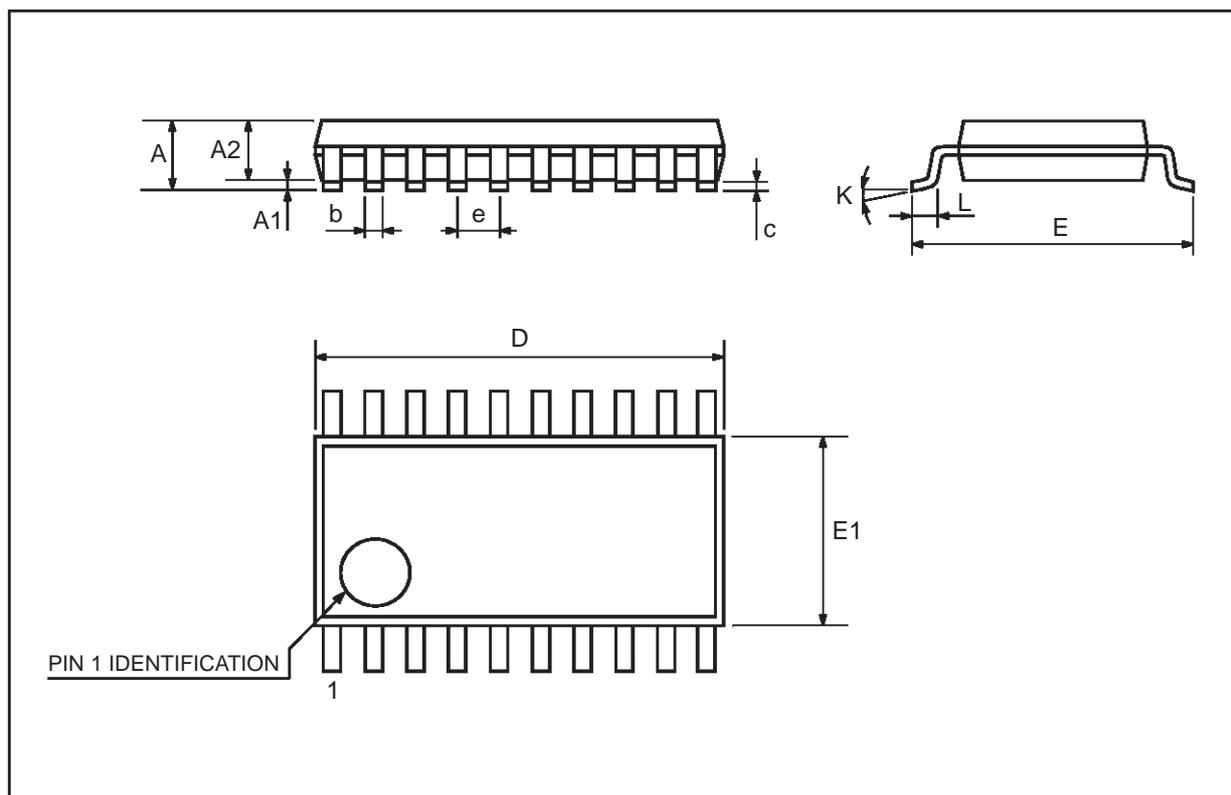

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SO-20 MECHANICAL DATA

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.)					
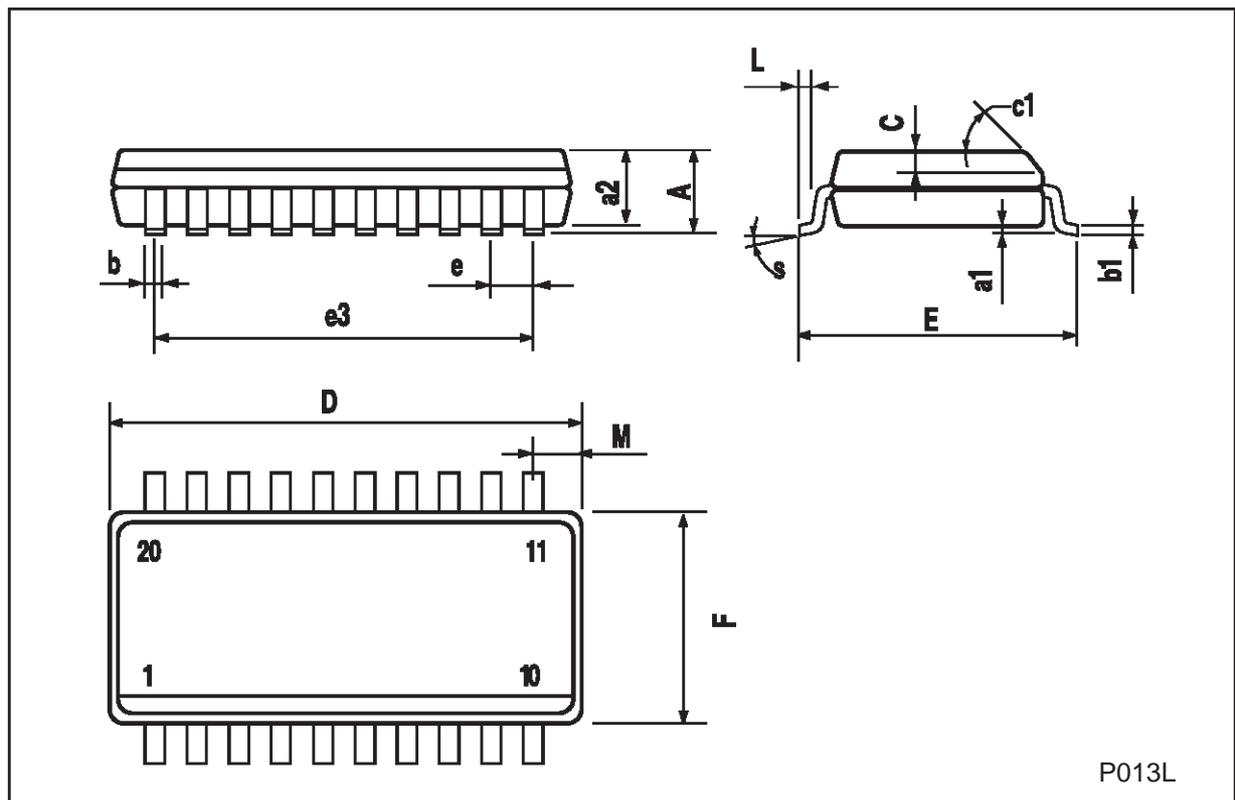
P013L

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

PIN 1 IDENTIFICATION