

## HC352: DUAL 4 CHANNEL MULTIPLEXER(INV.)

## HC353: DUAL 4 CHANNEL MULTIPLEXER 3 STATE OUTPUT(INV.)

- HIGH SPEED  
 $t_{PD} = 12 \text{ ns (TYP.) AT } V_{CC} = 5 \text{ V}$
- LOW POWER DISSIPATION  
 $I_{CC} = 4 \mu\text{A (MAX.) AT } T_A = 25 \text{ }^\circ\text{C}$
- OUTPUT DRIVE CAPABILITY  
 10 LSTTL LOADS
- BALANCED PROPAGATION DELAYS  
 $t_{PLH} = t_{PHL}$
- SYMMETRICAL OUTPUT IMPEDANCE  
 $I_{OL} = |I_{OH}| = 4 \text{ mA (MIN.)}$
- HIGH NOISE IMMUNITY  
 $V_{NIH} = V_{NIL} = 28 \% V_{CC} \text{ (MIN.)}$
- WIDE OPERATING VOLTAGE RANGE  
 $V_{CC} \text{ (OPR)} = 2 \text{ V TO } 6 \text{ V}$
- PIN AND FUNCTION COMPATIBLE  
 WITH 54/74LS352/353



### DESCRIPTION

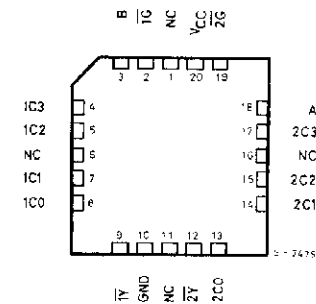
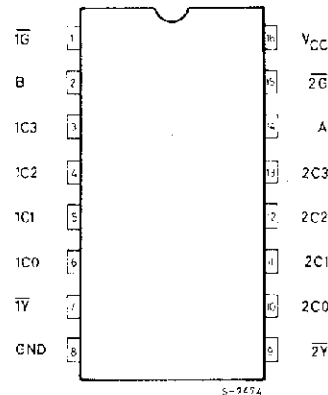
The M54/74HC352 and M54/74HC353 are high speed CMOS DUAL 4 CHANNEL MULTIPLEXERS INVERTING fabricated with silicon gate C<sup>2</sup>MOS technology.

Both achieve high speed operation, similar to equivalent LSTTL while maintaining the CMOS low power dissipation. The designer has a choice of complementary output (HC352) and 3 state output (HC353). Each of these data (1C0-1C3, 2C0-2C3) is selected by the two address inputs A and B.

Separate strobe inputs ( $1\bar{G}$ ,  $2\bar{G}$ ) are provided for each of the two four line sections. Taking the strobe input ( $1\bar{G}$ ,  $2\bar{G}$ ) high inhibits the outputs. The output of HC352 is fixed at logic low level and the output of HC353 has a high impedance, unconditionally.

All inputs are equipped with protection circuits against static discharge and transient excess voltage.

### PIN CONNECTIONS (top view)



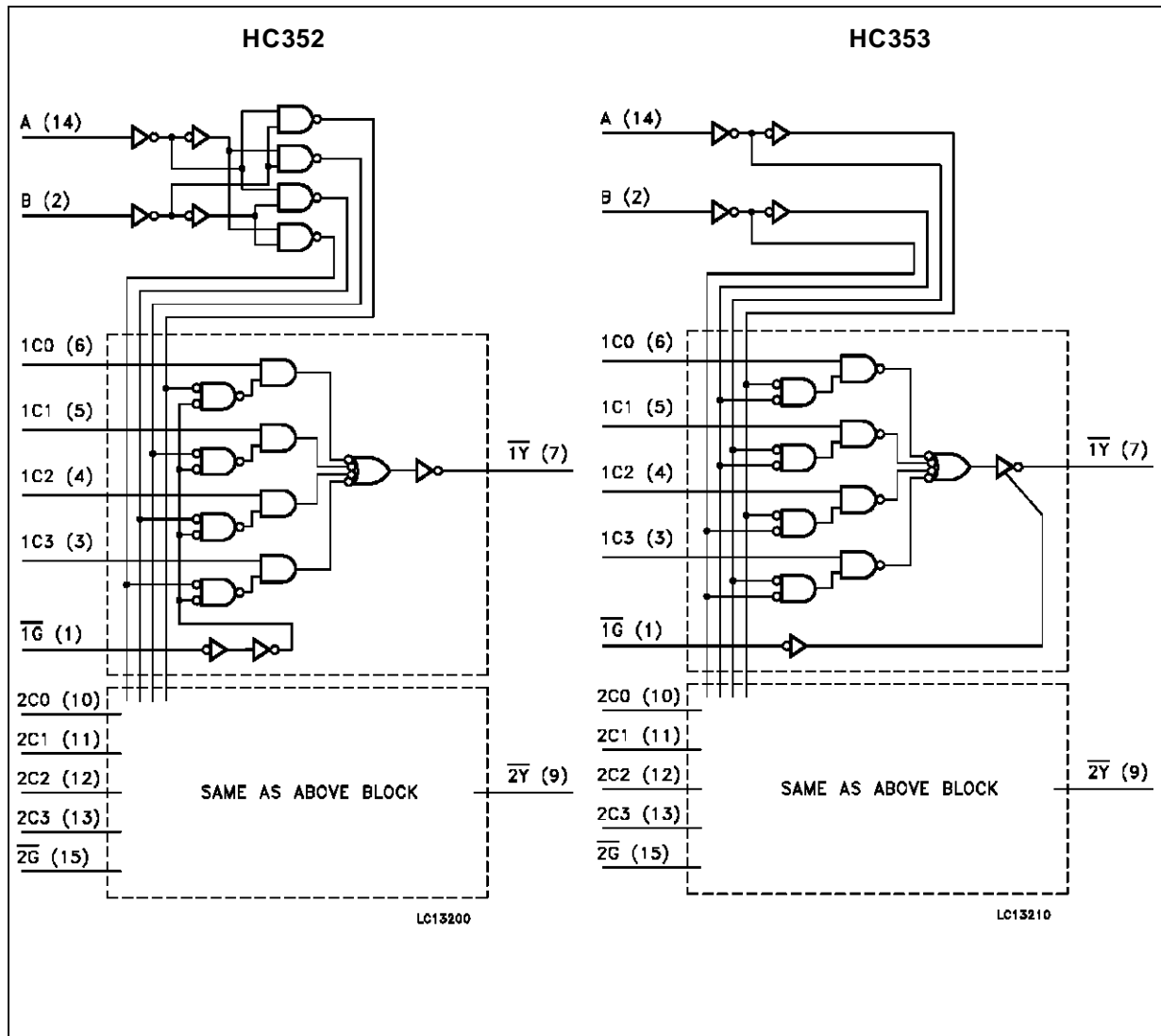
# M54/M74HC352/353

## TRUTH TABLE

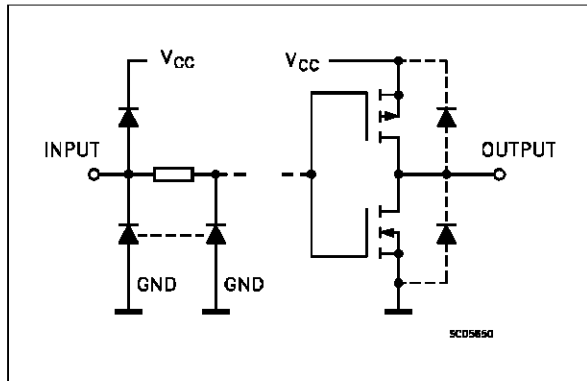
SELECT INPUTS		DATA INPUTS				STROBE	OUTPUT $\bar{Y}$	
B	A	C <sub>0</sub>	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	G	HC352	HC353
X	X	X	X	X	X	H	H	Z
L	L	L	X	X	X	L	H	H
L	L	H	X	X	X	L	L	L
L	H	X	L	X	X	L	H	H
L	H	X	H	X	X	L	L	L
H	L	X	X	L	X	L	H	H
H	L	X	X	H	X	L	L	L
H	H	X	X	X	L	L	H	H
H	H	X	X	X	H	L	L	L

X: Don't Care  
Z: High Impedance

## LOGIC DIAGRAM



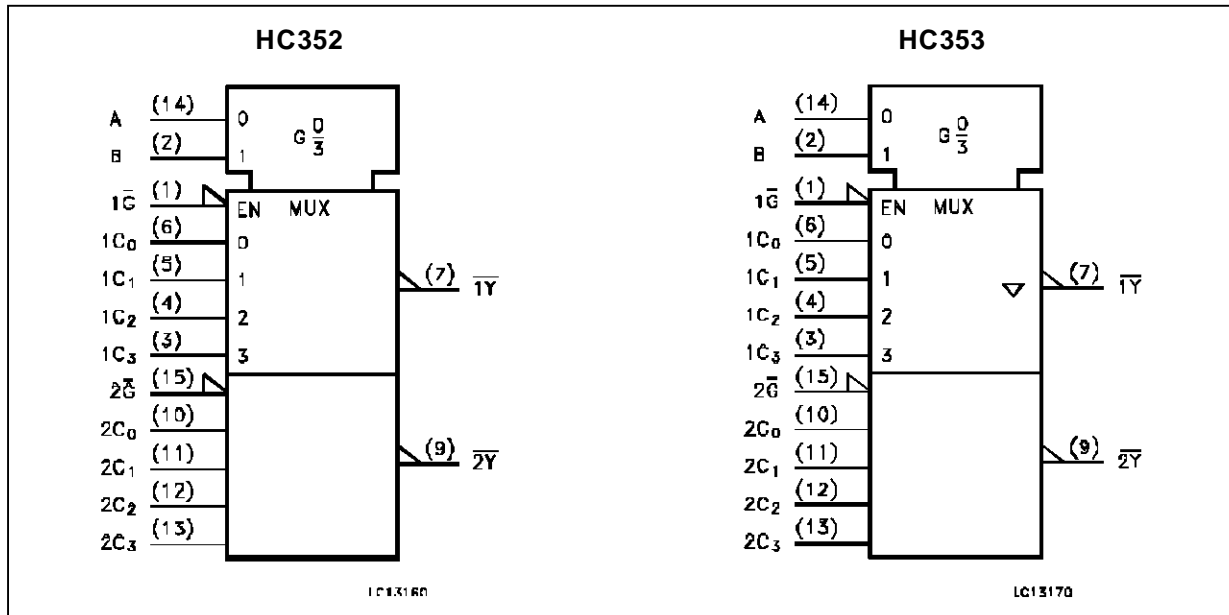
INPUT AND OUTPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1, 15	1G, 2G	Output Enable Inputs
6, 5, 4, 3	1C <sub>0</sub> to 1C <sub>3</sub>	Data Input from Source 1
7	1Y	Data Outputs from Source 1
9	2Y	Data Outputs from Source 2
10, 11, 12, 13	2C <sub>0</sub> to 2C <sub>3</sub>	Data Input from Source 2
14, 2	A, B	Common Data Select Inputs
8	GND	Ground (0V)
16	V <sub>CC</sub>	Positive Supply Voltage

IEC LOGIC SYMBOL



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 Source Sink Current Per Output Pin	± 25	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC V <sub>CC</sub> or Ground Current	± 50	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 condition is not implied.  
 (\*) 500 mW: ≡ 65 °C derate to 300 mW by 10mW/°C: 65 °C to 85 °C

## M54/M74HC352/353

### 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: <b>M54HC Series</b> <b>M74HC Series</b>	-55 to +125 -40 to +85	°C °C	
$t_r, t_f$	Input Rise and Fall Time	$V_{CC} = 2\text{ V}$	0 to 1000	ns
		$V_{CC} = 4.5\text{ V}$	0 to 500	
		$V_{CC} = 6\text{ V}$	0 to 400	

### DC SPECIFICATIONS

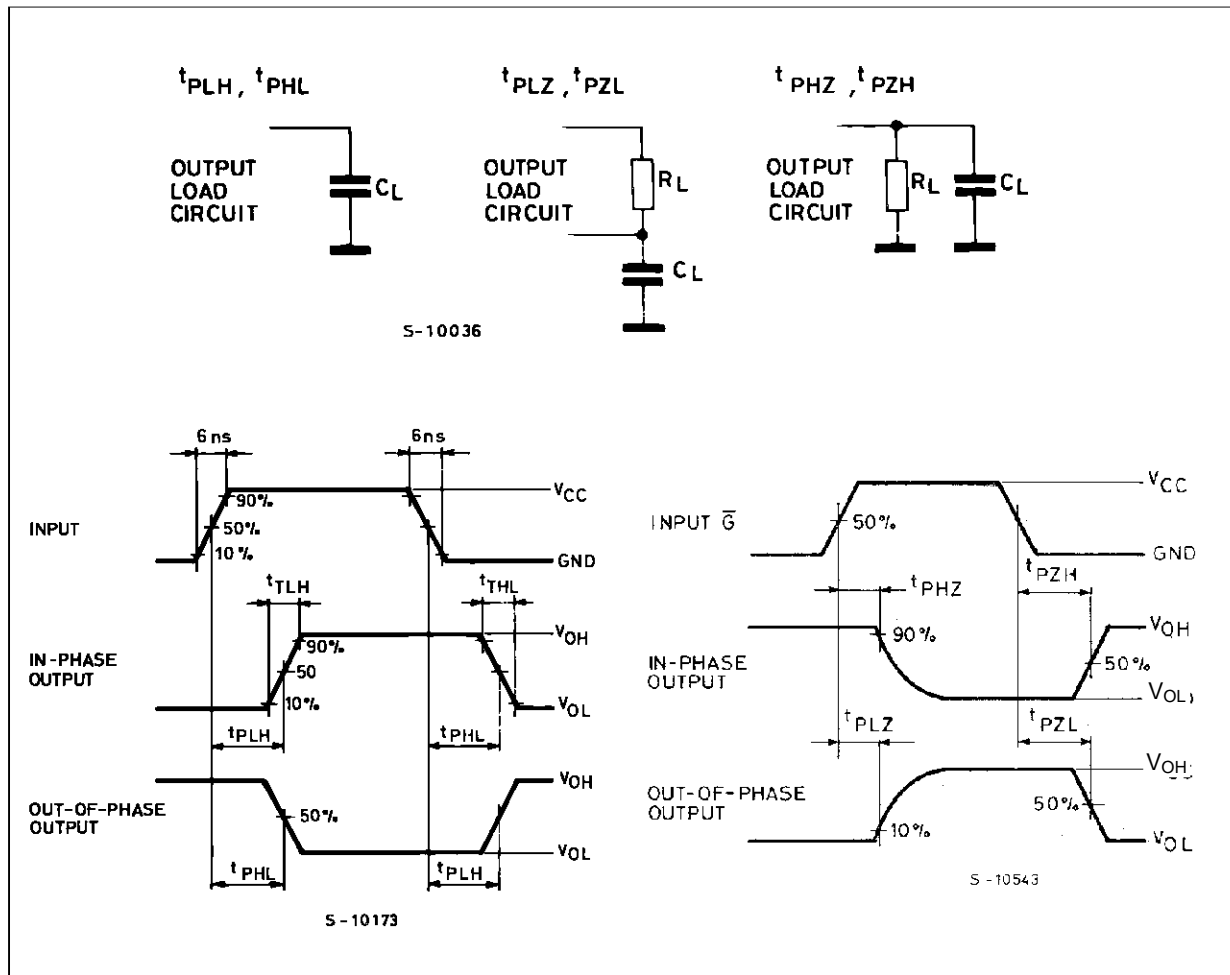
Symbol	Parameter	Test Conditions		Value						Unit	
				$T_A = 25\text{ °C}$ 54HC and 74HC			$-40\text{ to }85\text{ °C}$ 74HC		$-55\text{ to }125\text{ °C}$ 54HC		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
$V_{IH}$	High Level Input Voltage	$V_{CC}$ (V)								V	
		2.0			1.5			1.5			
		4.5			3.15			3.15			
$V_{IL}$	Low Level Input Voltage	2.0								V	
		4.5				0.5		0.5			
		6.0				1.35		1.35			
$V_{OH}$	High Level Output Voltage	$V_I = V_{IH}$ or $V_{IL}$	$I_O = -20\text{ }\mu\text{A}$	2.0	1.9	2.0		1.9		1.9	V
				4.5	4.4	4.5		4.4		4.4	
				6.0	5.9	6.0		5.9		5.9	
			4.5	4.18	4.31		4.13		4.10		
			6.0	5.68	5.8		5.63		5.60		
$V_{OL}$	Low Level Output Voltage	$V_I = V_{IH}$ or $V_{IL}$	$I_O = 20\text{ }\mu\text{A}$	2.0		0.0	0.1		0.1		V
				4.5		0.0	0.1		0.1		
				6.0		0.0	0.1		0.1		
			4.5		0.17	0.26		0.33		0.40	
			6.0		0.18	0.26		0.33		0.40	
$I_I$	Input Leakage Current	6.0	$V_I = V_{CC}$ or GND			$\pm 0.1$		$\pm 1$		$\pm 1$	$\mu\text{A}$
$I_{OZ}$	3 State Output Off State Current (for HC353)	6.0	$V_I = V_{IH}$ or $V_{IL}$ $V_O = V_{CC}$ or GND			$\pm 0.5$		$\pm 5$		$\pm 10$	$\mu\text{A}$
$I_{CC}$	Quiescent Supply Current	6.0	$V_I = V_{CC}$ or GND			4		40		80	$\mu\text{A}$

AC ELECTRICAL CHARACTERISTICS ( $C_L = 50$  pF, Input  $t_r = t_f = 6$  ns)

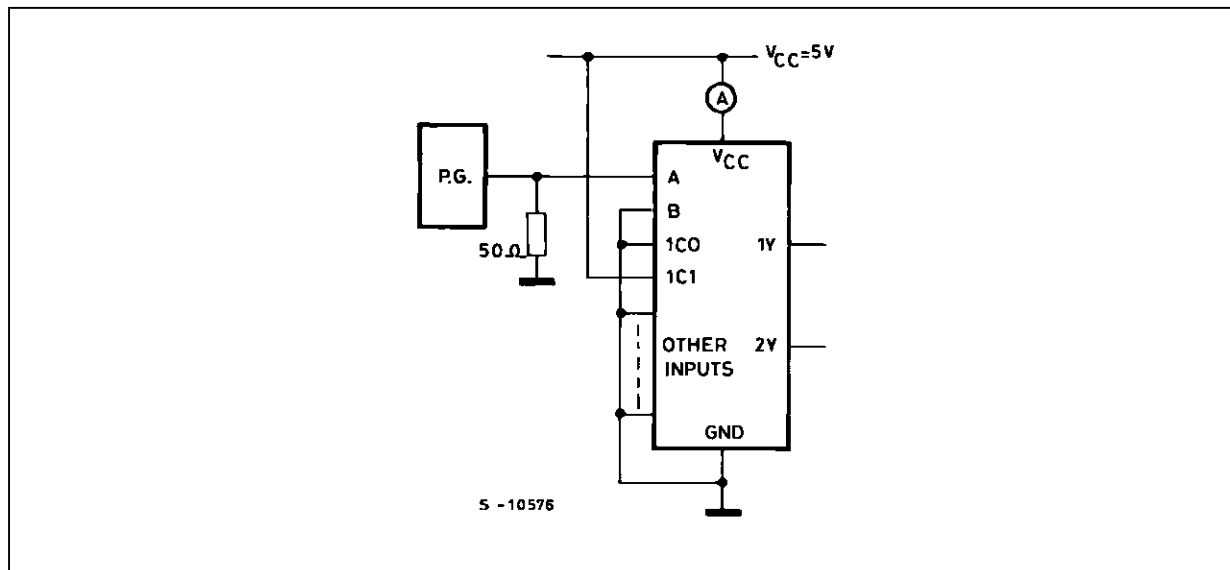
Symbol	Parameter	Test Conditions		Value						Unit	
		$V_{CC}$ (V)		$T_A = 25\text{ }^\circ\text{C}$ 54HC and 74HC			$-40$ to $85\text{ }^\circ\text{C}$ 74HC		$-55$ to $125\text{ }^\circ\text{C}$ 54HC		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
$t_{TLH}$ $t_{THL}$	Output Transition Time	2.0			30	75		95		110	ns
		4.5			8	15		19		22	
		6.0			7	13		16		19	
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time ( $C_n - \bar{Y}$ ) for HC352	2.0			56	115		145		175	ns
		4.5			14	23		29		35	
		6.0			12	20		25		30	
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time ( $A, B - \bar{Y}$ ) for HC352	2.0			80	150		190		225	ns
		4.5			20	30		38		45	
		6.0			17	26		33		38	
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time ( $\bar{G} - Y$ ) for HC352	2.0			40	85		105		130	ns
		4.5			10	17		21		26	
		6.0			9	14		18		22	
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time ( $C_n - \bar{Y}$ ) for HC353	2.0			64	125		155		95	ns
		4.5			16	25		31		38	
		6.0			14	21		26		32	
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time ( $A, B - \bar{Y}$ ) for HC353	2.0			84	150		190		225	ns
		4.5			21	30		38		45	
		6.0			18	26		33		38	
$t_{PZL}$ $t_{PZH}$	Output Enable Time ( $\bar{G} - \bar{Y}$ ) for HC353	2.0	$R_L = 1\text{ K}\Omega$		64	115		145		175	ns
		4.5			16	23		29		35	
		6.0			14	20		25		30	
$t_{PLZ}$ $t_{PHZ}$	Output Disable Time ( $\bar{G} - \bar{Y}$ ) for HC353	2.0	$R_L = 1\text{ K}\Omega$		44	100		125		150	ns
		4.5			11	20		25		30	
		6.0			9	17		21		26	
$C_{IN}$	Input Capacitance				5	10		10		10	pF
$C_{PD}$ (*)	Power Dissipation Capacitance		for HC352 for HC353		63 61						pF

(\*)  $C_{PD}$  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.  $I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$

SWITCHING CHARACTERISTICS TEST WAVEFORMS

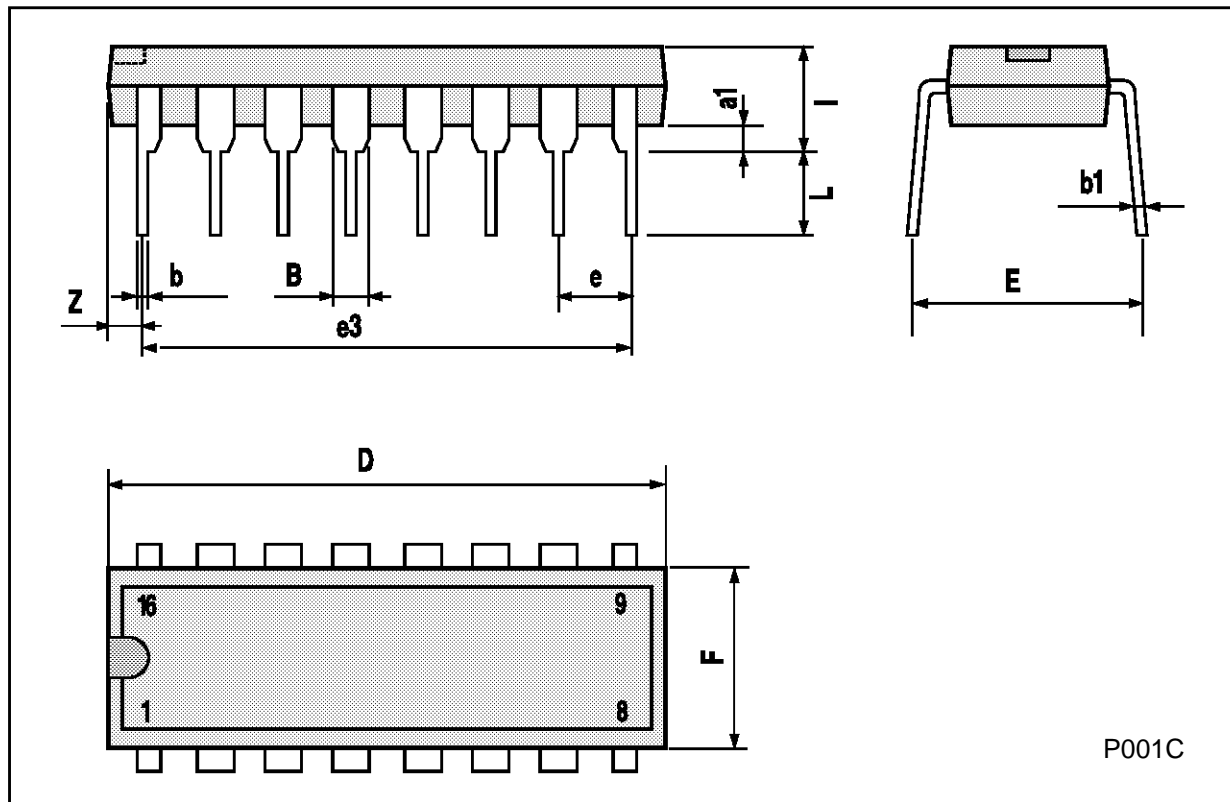


TEST CIRCUIT  $I_{CC}$  (Opr.)



## Plastic DIP16 (0.25) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



**Ceramic DIP16/1 MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			20			0.787
B			7			0.276
D		3.3			0.130	
E	0.38			0.015		
e3		17.78			0.700	
F	2.29		2.79	0.090		0.110
G	0.4		0.55	0.016		0.022
H	1.17		1.52	0.046		0.060
L	0.22		0.31	0.009		0.012
M	0.51		1.27	0.020		0.050
N			10.3			0.406
P	7.8		8.05	0.307		0.317
Q			5.08			0.200





## SO16 (Narrow) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.004		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.62			0.024
S	8° (max.)					



P013H

**PLCC20 MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	9.78		10.03	0.385		0.395
B	8.89		9.04	0.350		0.356
D	4.2		4.57	0.165		0.180
d1		2.54			0.100	
d2		0.56			0.022	
E	7.37		8.38	0.290		0.330
e		1.27			0.050	
e3		5.08			0.200	
F		0.38			0.015	
G			0.101			0.004
M		1.27			0.050	
M1		1.14			0.045	



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