

## HC153 DUAL 4 CHANNEL MULTIPLEXER HC253 DUAL 4 CHANNEL MULTIPLEXER 3 STATE OUTPUT

- HIGH SPEED  
 $t_{PD} = 12 \text{ ns (TYP.) at } V_{CC} = 5 \text{ V}$
- LOW POWER DISSIPATION  
 $I_{CC} = 4 \mu\text{A (MAX.) at } T_A = 25^\circ\text{C}$
- HIGH NOISE IMMUNITY  
 $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (MIN.)}$
- OUTPUT DRIVE CAPABILITY  
 10 LSTTL LOADS
- SYMMETRICAL OUTPUT IMPEDANCE  
 $|I_{OH}| = I_{OL} = 4 \text{ mA (MIN.)}$
- BALANCED PROPAGATION DELAYS  
 $t_{PLH} = t_{PHL}$
- WIDE OPERATING VOLTAGE RANGE  
 $V_{CC} \text{ (OPR)} = 2 \text{ V to } 6 \text{ V}$
- PIN AND FUNCTION COMPATIBLE WITH  
 54/74LS153/253



### DESCRIPTION

The M54/74HC153 and M54/74HC253 are high speed CMOS DUAL 4-CHANNEL MULTIPLEXERS fabricated with silicon gate CMOS technology. Both achieve high speed operation, similar to equivalent LSTTL, while maintaining the CMOS low power dissipation.

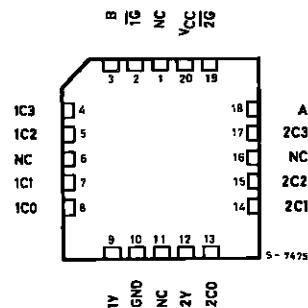
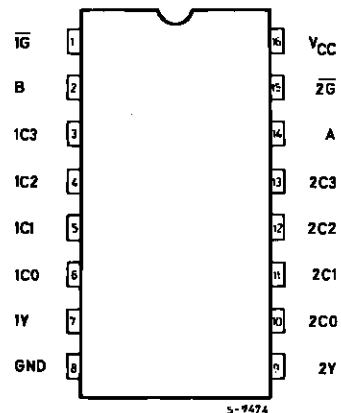
The designer has a choice of complementary output (HC153) and 3-state output (HC253).

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. The strobe input ( $\bar{G}$ ) can be used to inhibit the data output ; the output of HC 153 is fixed at a low level and the output of HC253 is a high impedance, while the strobe input is held low.

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

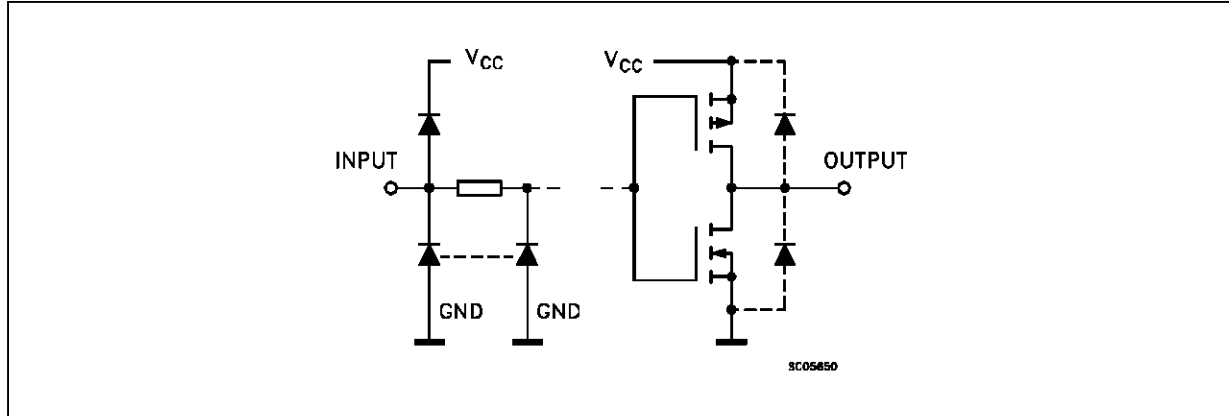
### PIN CONNECTIONS (top view)



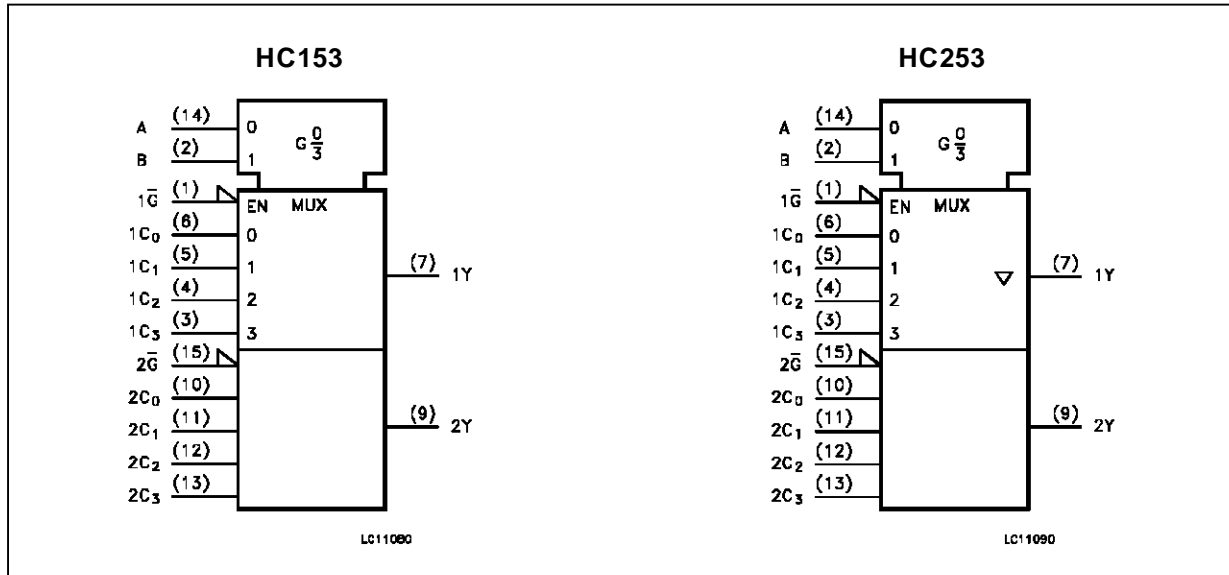
NC =  
No Internal  
Connection

## M54/M74HC153 M54/M74HC253

### INPUT AND OUTPUT EQUIVALENT CIRCUIT



### IEC LOGIC SYMBOLS



### PIN DESCRIPTION (for HC153)

PIN No	SYMBOL	NAME AND FUNCTION
1, 15	$1\bar{G}, 2\bar{G}$	Output Enable Inputs
14, 2	A, B	Common Data Select Inputs
6, 5, 4, 3	1C0 to 1C3	Data Inputs From Source 1
7	1Y	Multiplexer Output From Source 1
9	2Y	Multiplexer Output From Source 2
10, 11, 12, 13	2C0 to 2C3	Data Inputs From Source 2
8	GND	Ground (0V)
16	V <sub>CC</sub>	Positive Supply Voltage

### PIN DESCRIPTION (for HC253)

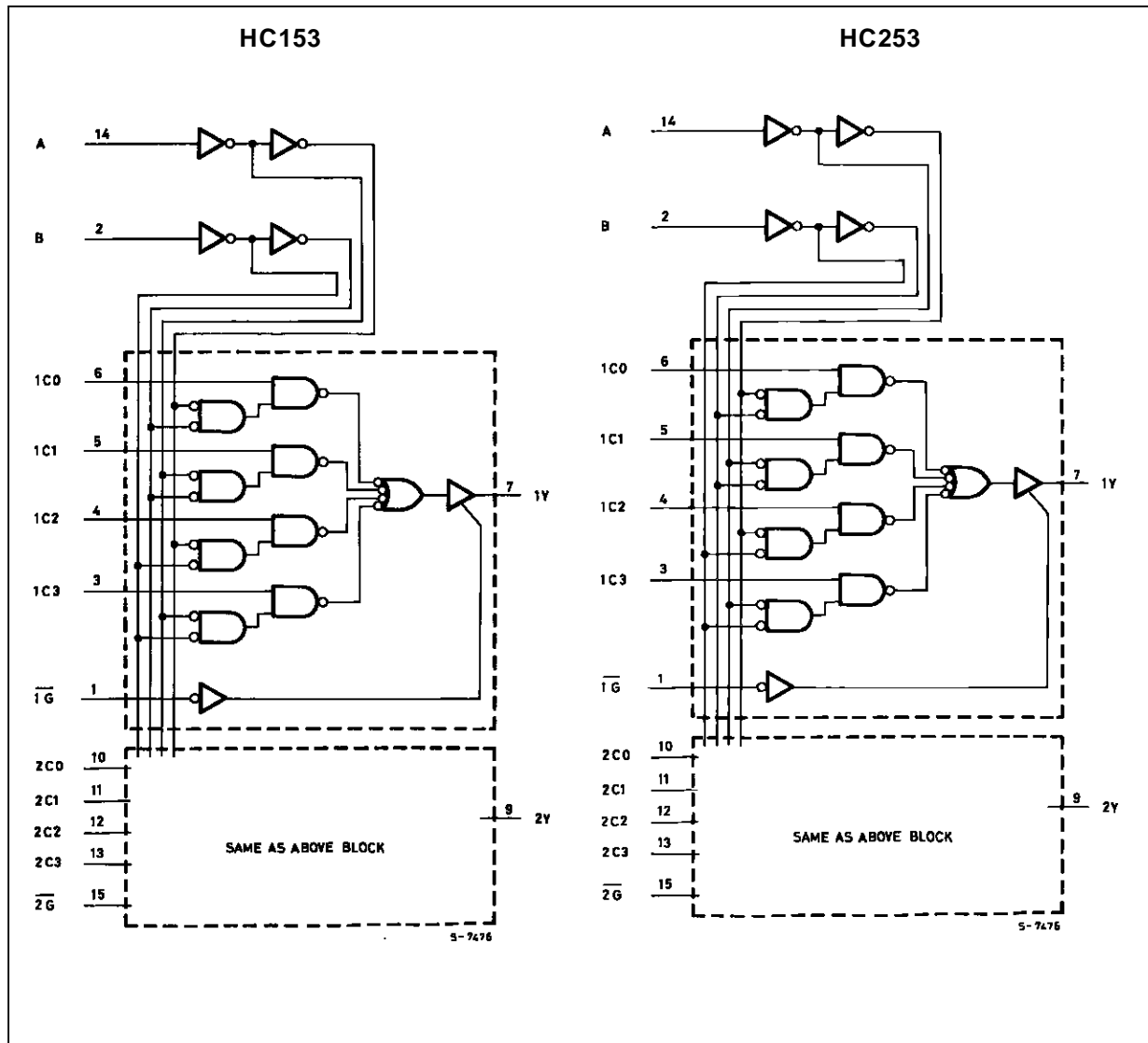
PIN No	SYMBOL	NAME AND FUNCTION
1, 15	$1\bar{G}, 2\bar{G}$	Output Enable Inputs
14, 2	A, B	Common Data Select Inputs
6, 5, 4, 3	1C0 to 1C3	Data Inputs From Source 1
7, 9	1Y, 2Y	3 State Multiplexer Outputs
10, 11, 12, 13	2C0 to 2C3	Data Inputs From Source 2
8	GND	Ground (0V)
16	V <sub>CC</sub>	Positive Supply Voltage

TRUTH TABLE

SELECT INPUTS		DATA INPUTS				STROBE	OUTPUT Y	
B	A	C <sub>0</sub>	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	G	HC153	HC253
X	X	X	X	X	X	H	L	Z
L	L	L	X	X	X	L	L	L
L	L	H	X	X	X	L	H	H
L	H	X	L	X	X	L	L	L
L	H	X	H	X	X	L	H	H
H	L	X	X	L	X	L	L	L
H	L	X	X	H	X	L	H	H
H	H	X	X	X	L	L	L	L
H	H	X	X	X	H	L	H	H

X: DON'T CARE - Z: HIGH IMPEDANCE

LOGIC DIAGRAM



## M54/M74HC153 M54/M74HC253

### 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

### RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit	
V <sub>CC</sub>	Supply Voltage	2 to 6	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: <b>M54HC Series</b> <b>M74HC Series</b>	-55 to +125 -40 to +85	°C °C	
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time	V <sub>CC</sub> = 2 V V <sub>CC</sub> = 4.5 V V <sub>CC</sub> = 6 V	0 to 1000 0 to 500 0 to 400	ns

## DC SPECIFICATIONS

Symbol	Parameter	Test Conditions		Value						Unit		
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25 °C 54HC and 74HC			-40 to 85 °C 74HC		-55 to 125 °C 54HC			
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.	
V <sub>IH</sub>	High Level Input Voltage	2.0		1.5			1.5		1.5		V	
		4.5		3.15			3.15		3.15			
		6.0		4.2			4.2		4.2			
V <sub>IL</sub>	Low Level Input Voltage	2.0				0.5		0.5		0.5	V	
		4.5				1.35		1.35		1.35		
		6.0				1.8		1.8		1.8		
V <sub>OH</sub>	High Level Output Voltage	2.0	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>O</sub> = -20 μA	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	I <sub>O</sub> = -4.0 mA	4.18	4.31		4.13		4.10			
		6.0		I <sub>O</sub> = -5.2 mA	5.68	5.8		5.63		5.60		
V <sub>OL</sub>	Low Level Output Voltage	2.0	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>O</sub> = 20 μA		0.0	0.1		0.1		V	
		4.5				0.0	0.1		0.1			0.1
		6.0				0.0	0.1		0.1			0.1
		4.5	I <sub>O</sub> = 4.0 mA		0.17	0.26		0.33		0.40		
		6.0		I <sub>O</sub> = 5.2 mA		0.18	0.26		0.33			0.40
I <sub>I</sub>	Input Leakage Current	6.0	V <sub>I</sub> = V <sub>CC</sub> or GND			±0.1		±1		±1	μA	
I <sub>OZ</sub> (1)	3 State Output Off State Current	6.0	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	6.0	V <sub>I</sub> = V <sub>CC</sub> or GND			4		40		80	mA	

Note: 1. Applied only for M54/M74HC253

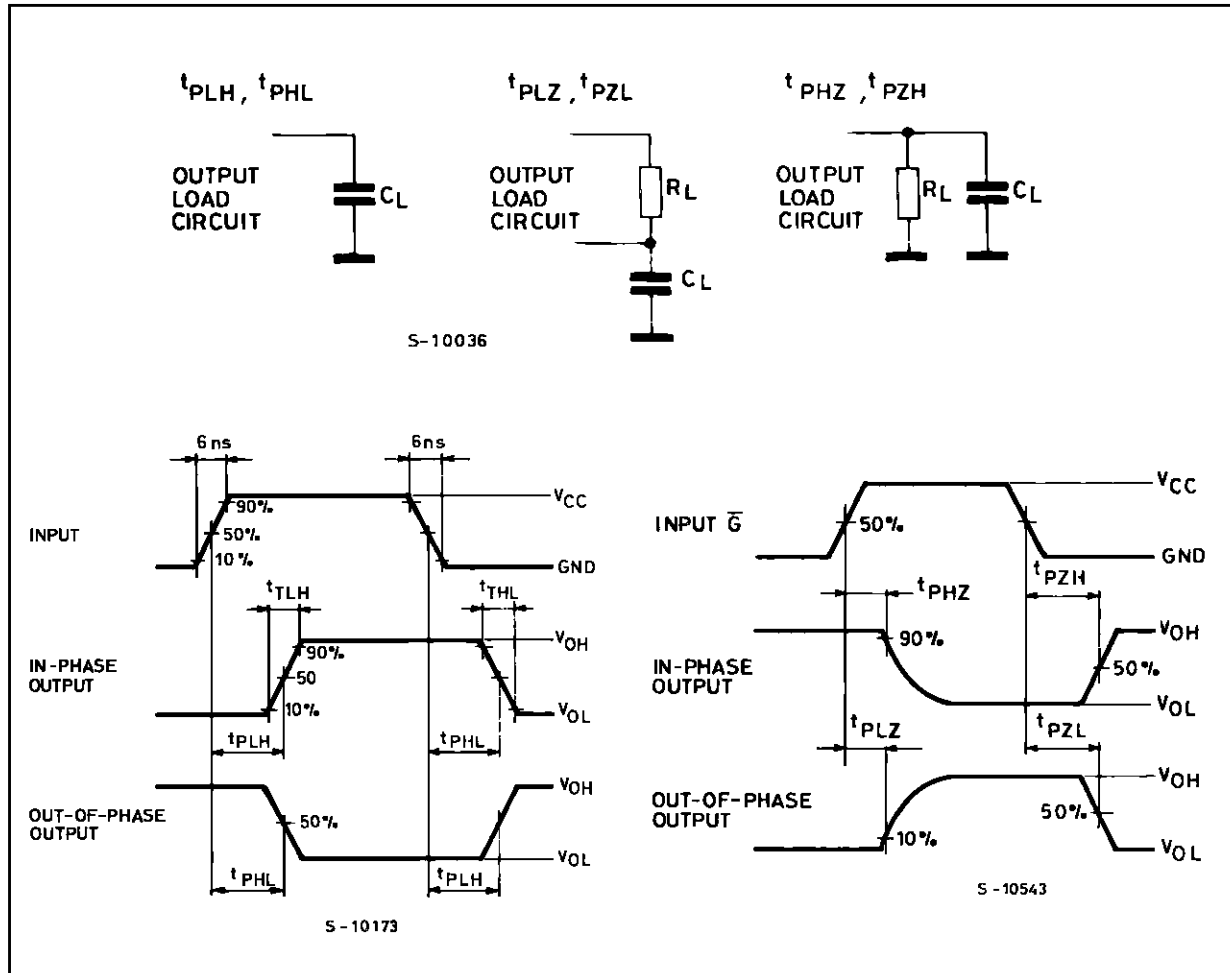
## M54/M74HC153 M54/M74HC253

### AC ELECTRICAL CHARACTERISTICS ( $C_L = 50 \text{ pF}$ , Input $t_r = t_f = 6 \text{ ns}$ )

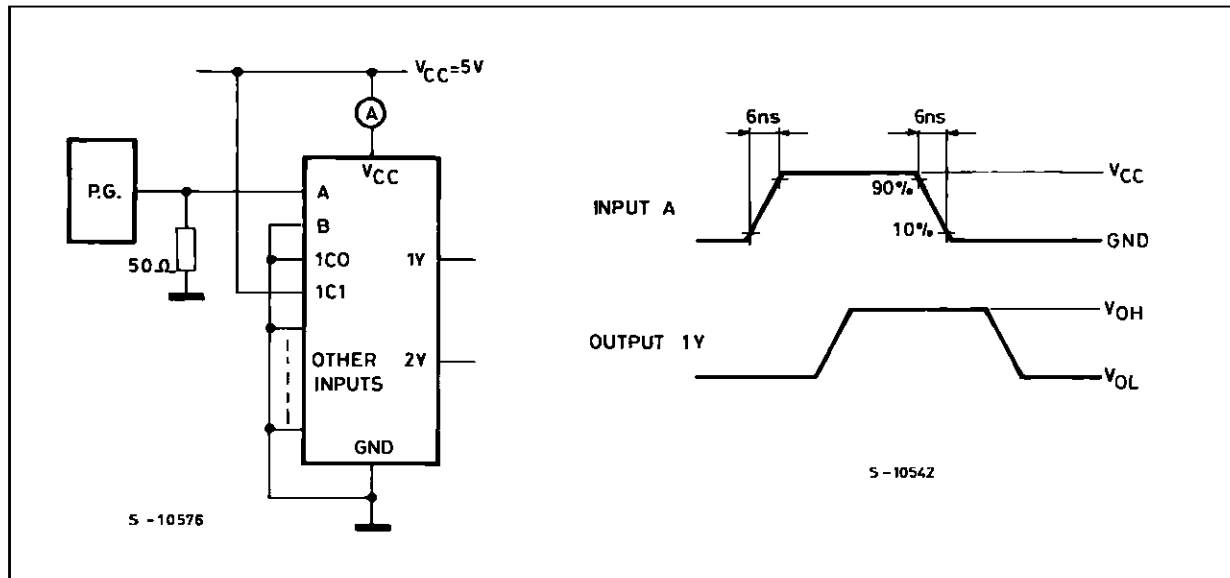
Symbol	Parameter	Test Conditions		Value						Unit	
		$V_{CC}$ (V)		$T_A = 25 \text{ }^\circ\text{C}$ 54HC and 74HC			$-40 \text{ to } 85 \text{ }^\circ\text{C}$ 74HC		$-55 \text{ to } 125 \text{ }^\circ\text{C}$ 54HC		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
$t_{TLH}$ $t_{THL}$	Output Transition Time	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 (Cn - Y)	2.0			48	115		145		175	ns
		4.5			15	23		29		35	
		6.0			12	20		25		30	
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time (A, B - Y)	2.0			68	150		190		225	ns
		4.5			20	30		38		45	
		6.0			16	26		32		38	
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time (G - Y)	2.0			30	85		105		130	ns
		4.5			10	17		21		26	
		6.0			9	14		18		22	
$t_{PZL}$ $t_{PZH}$	Propagation Delay Time (for HC253) (G - Y)	2.0	$R_L = 1\text{K}\Omega$		36	100		125		150	ns
		4.5			12	20		25		30	
		6.0			9	17		21		26	
$t_{PLZ}$ $t_{PHZ}$	Propagation Delay Time (for HC253) (G - Y)	2.0	$R_L = 1\text{K}\Omega$		22	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				58						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.  $I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/4$  (per circuit)

SWITCHING CHARACTERISTICS TEST WAVEFORM



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



P001C



**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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