



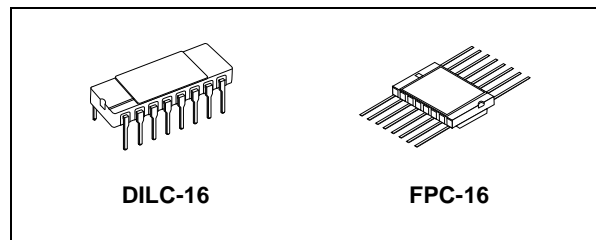
# M54HC253

## RAD-HARD DUAL 4 CHANNEL MULTIPLEXER 3 STATE OUTPUT

- HIGH SPEED:  
 $t_{PD} = 16\text{ns}$  (TYP.) at  $V_{CC} = 6\text{V}$
- LOW POWER DISSIPATION:  
 $I_{CC} = 4\mu\text{A}$ (MAX.) at  $T_A=25^\circ\text{C}$
- HIGH NOISE IMMUNITY:  
 $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (MIN.)
- SYMMETRICAL OUTPUT IMPEDANCE:  
 $|I_{OH}| = I_{OL} = 4\text{mA}$  (MIN)
- BALANCED PROPAGATION DELAYS:  
 $t_{PLH} \cong t_{PHL}$
- WIDE OPERATING VOLTAGE RANGE:  
 $V_{CC}$  (OPR) = 2V to 6V
- PIN AND FUNCTION COMPATIBLE WITH 54 SERIES 253
- SPACE GRADE-1: ESA SCC QUALIFIED
- 50 krad QUALIFIED, 100 krad AVAILABLE ON REQUEST
- NO SEL UNDER HIGH LET HEAVY IONS IRRADIATION
- DEVICE FULLY COMPLIANT WITH SCC-9408-058

### DESCRIPTION

The M54HC253 is an high speed CMOS DUAL 4 CHANNEL MULTIPLEXER fabricated with silicon gate C<sup>2</sup>MOS technology.



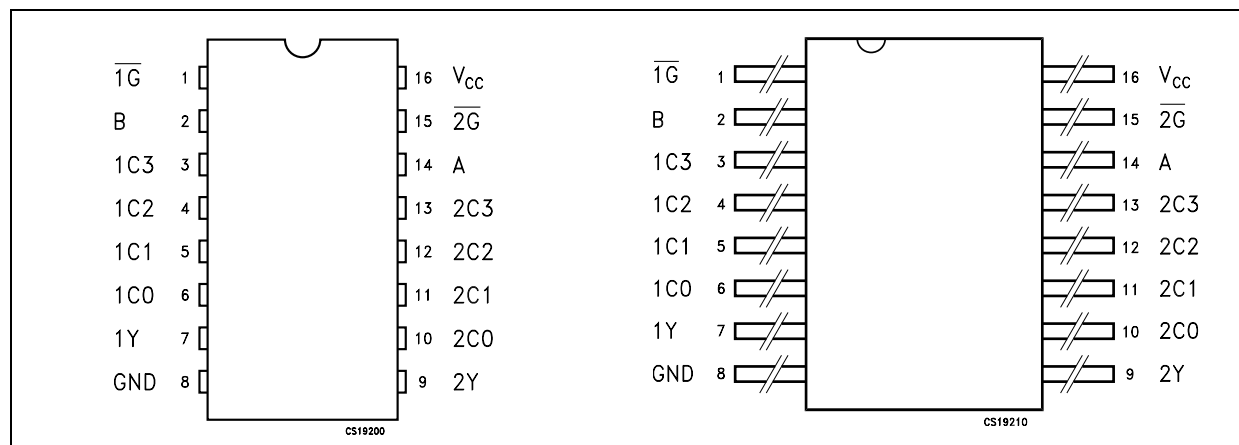
### ORDER CODES

PACKAGE	FM	EM
DILC	M54HC253D	M54HC253D1
FPC	M54HC253K	M54HC253K1

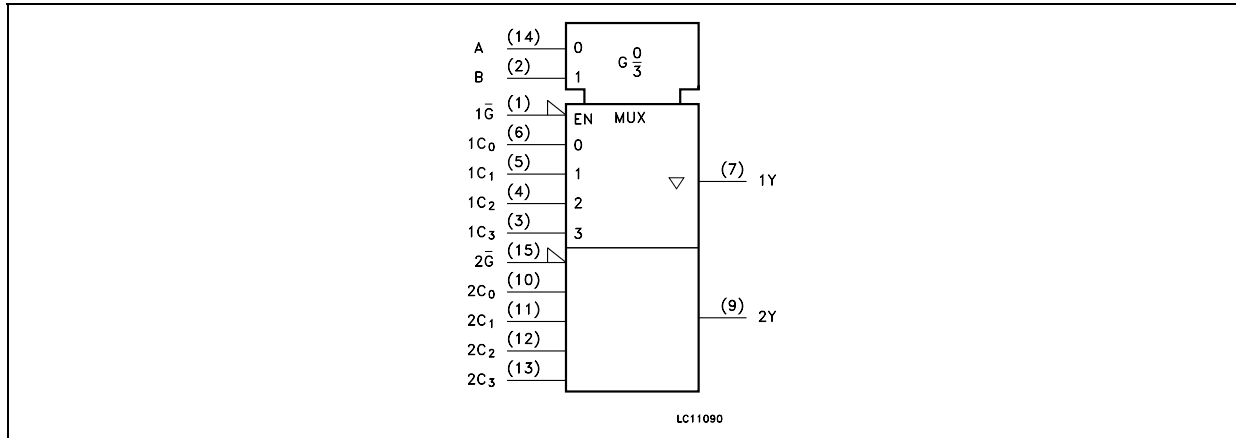
Each of these data (1C0-1C3, 2C0-2C3) is selected by the two address inputs A and B. Separate strobe inputs ( $\overline{1G}$ ,  $\overline{2G}$ ) are provided for each of the two four-line sections. The strobe input ( $\overline{nG}$ ) can be used to inhibit the data output; the output of M54HC253 is a high impedance while the strobe input is held high.

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

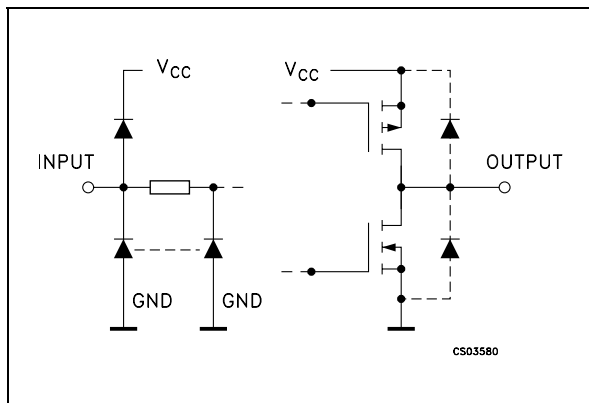
### PIN CONNECTION



IEC LOGIC SYMBOLS



INPUT AND OUTPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

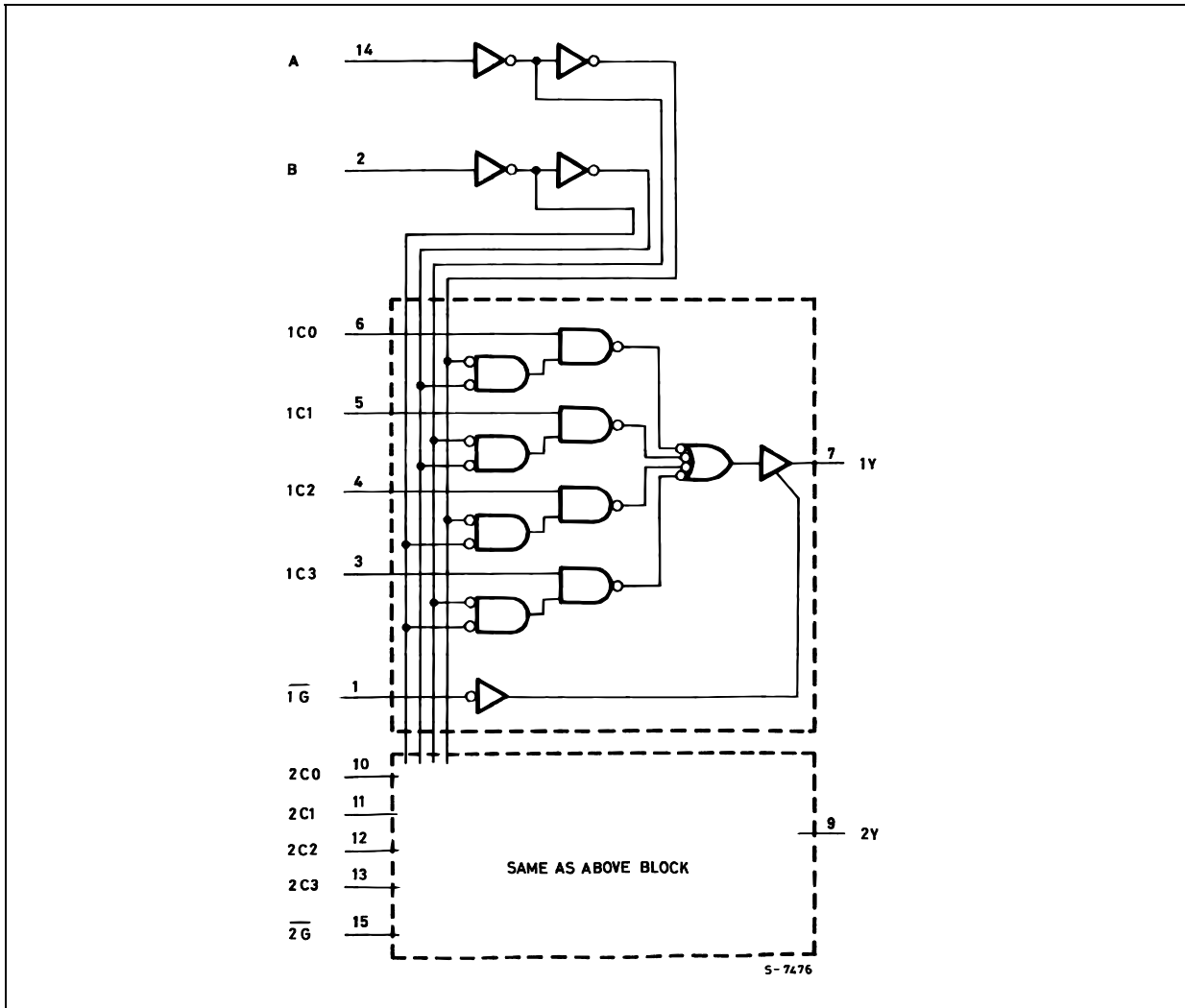
PIN N°	SYMBOL	NAME AND FUNCTION
1, 15	1G, 2G	Output Enable Inputs
14, 2	A, B	Common Data Select Inputs
6, 5, 4, 3	1C0 to 1C3	Data Inputs From Source 1
7, 9	1Y, 2Y	3 State Multiplexer Outputs
10, 11, 12, 13	2C0 to 2C3	Data Inputs From Source 2
8	GND	Ground (0V)
16	V <sub>CC</sub>	Positive Supply Voltage

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>	$\overline{G}$	
X	X	X	X	X	X	H	Z
L	L	L	X	X	X	L	L
L	L	H	X	X	X	L	H
L	H	X	L	X	X	L	L
L	H	X	H	X	X	L	H
H	L	X	X	L	X	L	L
H	L	X	X	H	X	L	H
H	H	X	X	X	L	L	L
H	H	X	X	X	H	L	H

X : Don't Care  
Z : High Impedance

LOGIC DIAGRAM



This logic diagram has not be used to estimate propagation delays

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	$\pm 20$	mA
$I_{OK}$	DC Output Diode Current	$\pm 20$	mA
$I_O$	DC Output Current	$\pm 25$	mA
$I_{CC}$ or $I_{GND}$	DC $V_{CC}$ or Ground Current	$\pm 50$	mA
$P_D$	Power Dissipation	300	mW
$T_{stg}$	Storage Temperature	-65 to +150	$^{\circ}C$
$T_L$	Lead Temperature (10 sec)	265	$^{\circ}C$

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions 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	-55 to 125	°C	
$t_r, t_f$	Input Rise and Fall Time	$V_{CC} = 2.0V$	0 to 1000	ns
		$V_{CC} = 4.5V$	0 to 500	ns
		$V_{CC} = 6.0V$	0 to 400	ns

## DC SPECIFICATIONS

Symbol	Parameter	Test Condition		Value						Unit	
		$V_{CC}$ (V)		$T_A = 25^\circ C$			$-40 \text{ to } 85^\circ C$		$-55 \text{ to } 125^\circ C$		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
$V_{IH}$	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		
$V_{IL}$	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	
$V_{OH}$	High Level Output Voltage	2.0	$I_O = -20 \mu A$	1.9	2.0		1.9		1.9		V
		4.5	$I_O = -20 \mu A$	4.4	4.5		4.4		4.4		
		6.0	$I_O = -20 \mu A$	5.9	6.0		5.9		5.9		
		4.5	$I_O = -4.0 \text{ mA}$	4.18	4.31		4.13		4.10		
		6.0	$I_O = -5.2 \text{ mA}$	5.68	5.8		5.63		5.60		
$V_{OL}$	Low Level Output Voltage	2.0	$I_O = 20 \mu A$		0.0	0.1		0.1		0.1	V
		4.5	$I_O = 20 \mu A$		0.0	0.1		0.1		0.1	
		6.0	$I_O = 20 \mu A$		0.0	0.1		0.1		0.1	
		4.5	$I_O = 4.0 \text{ mA}$		0.17	0.26		0.33		0.40	
		6.0	$I_O = 5.2 \text{ mA}$		0.18	0.26		0.33		0.40	
$I_I$	Input Leakage Current	6.0	$V_I = V_{CC} \text{ or GND}$			$\pm 0.1$		$\pm 1$		$\pm 1$	$\mu A$
$I_{OZ}$	High Impedance Output Leakage Current	6.0	$V_I = V_{IH} \text{ or } V_{IL}$ $V_O = V_{CC} \text{ or GND}$			$\pm 0.5$		$\pm 5$		$\pm 5$	$\mu A$
$I_{CC}$	Quiescent Supply Current	6.0	$V_I = V_{CC} \text{ or GND}$			4		40		80	$\mu A$

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

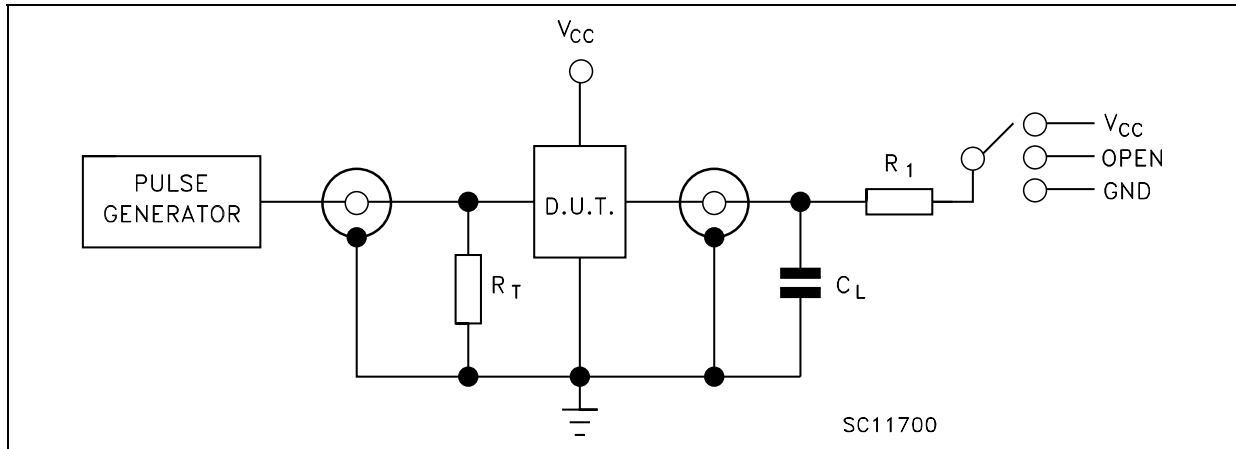
Symbol	Parameter	Test Condition		Value						Unit	
		$V_{CC}$ (V)		$T_A = 25^\circ\text{C}$			$-40$ to $85^\circ\text{C}$		$-55$ to $125^\circ\text{C}$		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
$t_{TLH}$ $t_{THL}$	Output Transition Time	2.0			30	75		95		110	ns
		4.5			8	15		19		22	
		6.0			7	13		16		19	
$t_{PLH}$ $t_{PHL}$	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	
$t_{PZL}$ $t_{PZH}$	High Impedance Output Enable Time ( $\bar{G}$ - Y)	2.0	$R_1 = 1\text{K}\Omega$		36	100		125		150	ns
		4.5			12	20		25		30	
		6.0			9	17		21		26	
$t_{PLZ}$ $t_{PHZ}$	High Impedance Output Disable Time ( $\bar{G}$ - Y)	2.0	$R_1 = 1\text{K}\Omega$		22	100		125		150	ns
		4.5			11	20		25		30	
		6.0			9	17		21		26	

## CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Condition		Value						Unit	
		$V_{CC}$ (V)		$T_A = 25^\circ\text{C}$			$-40$ to $85^\circ\text{C}$		$-55$ to $125^\circ\text{C}$		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
$C_{IN}$	Input Capacitance	5.0			5	10		10		10	pF
$C_{PD}$	Power Dissipation Capacitance (note 1)	5.0			58						pF

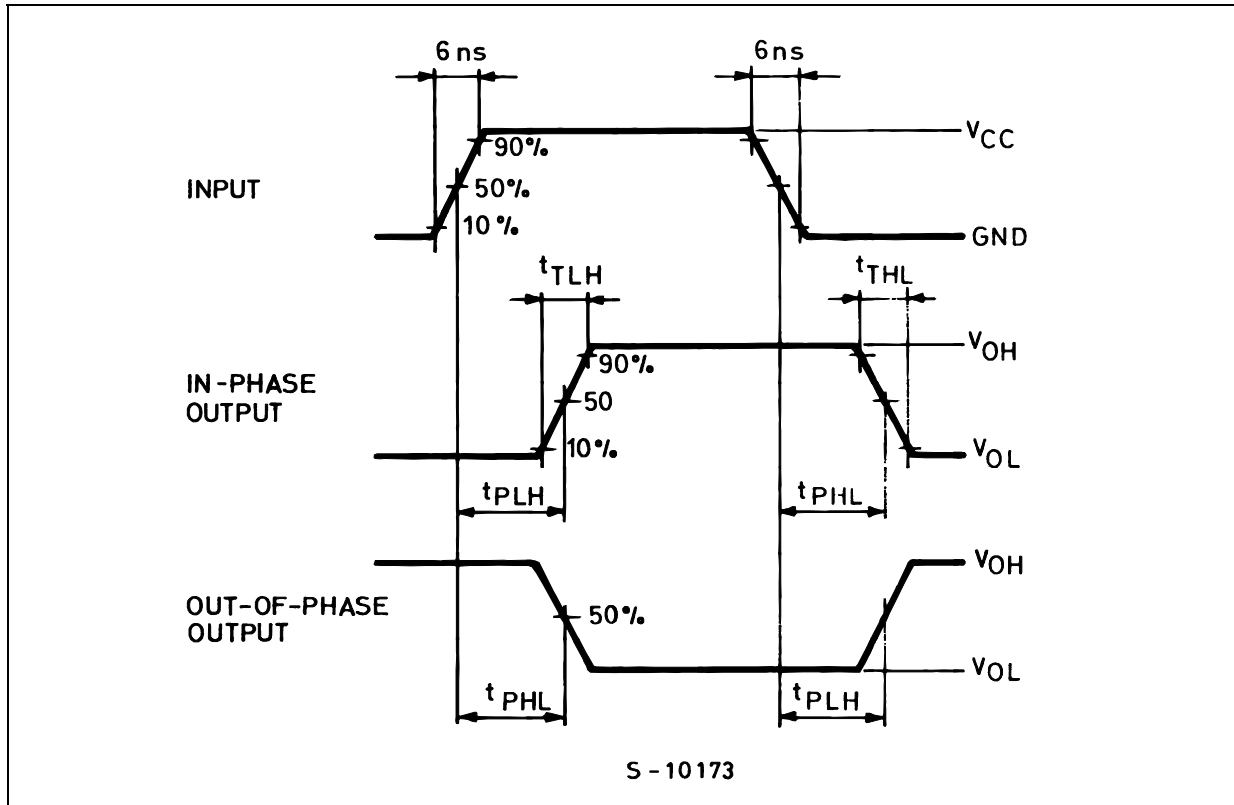
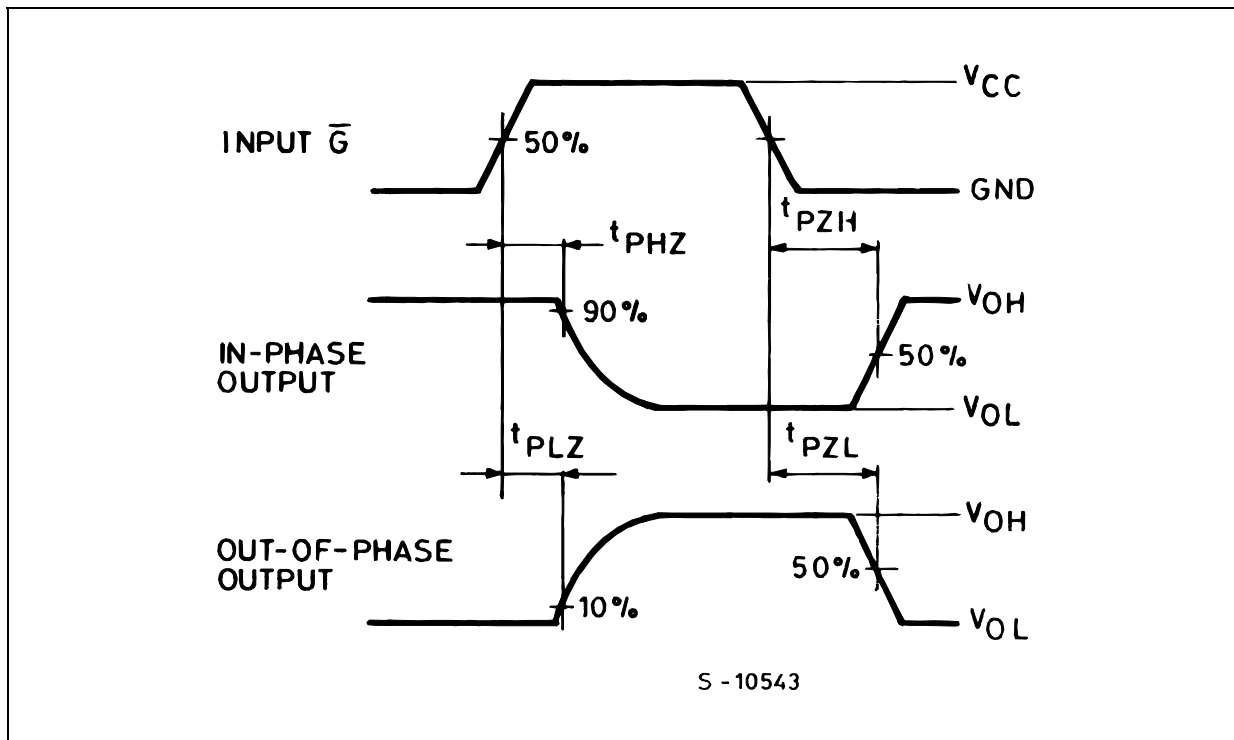
1)  $C_{PD}$  is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation.  $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/4$  (per circuit)

TEST CIRCUIT



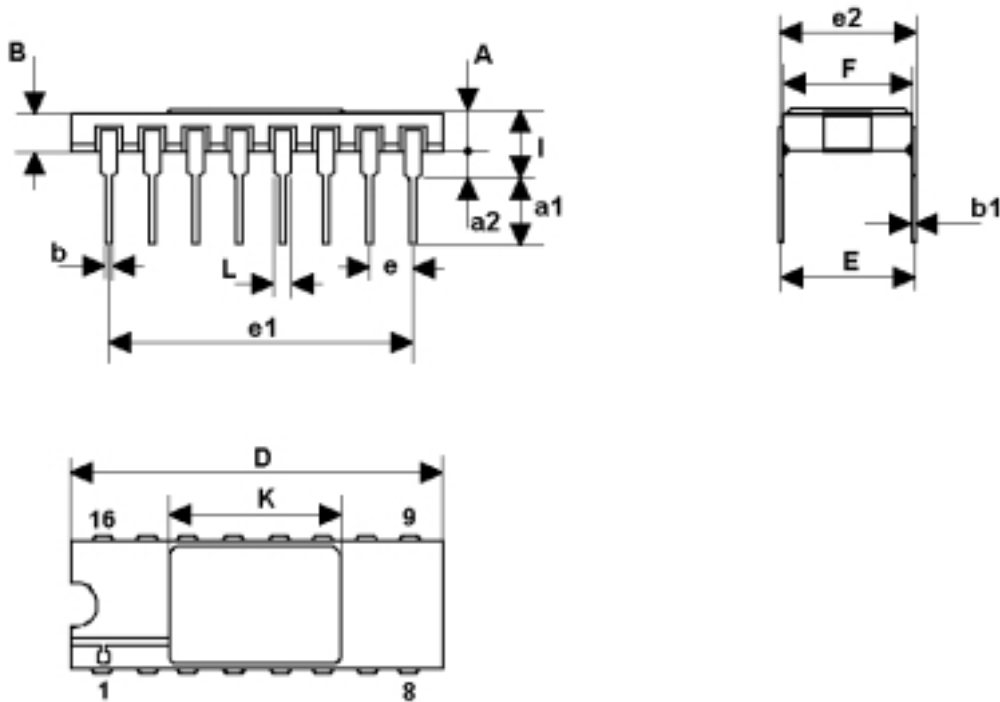
TEST	SWITCH
$t_{PLH}$ , $t_{PHL}$	Open
$t_{PZL}$ , $t_{PLZ}$	$V_{CC}$
$t_{PZH}$ , $t_{PHZ}$	GND

$C_L$  = 50pF/150pF or equivalent (includes jig and probe capacitance)  
 $R_1$  = 1K $\Omega$  or equivalent  
 $R_T$  =  $Z_{OUT}$  of pulse generator (typically 50 $\Omega$ )

WAVEFORM 1: PROPAGATION DELAY TIMES ( $f=1\text{MHz}$ ; 50% duty cycle)WAVEFORM 2: OUTPUT ENABLE AND DISABLE TIME ( $f=1\text{MHz}$ ; 50% duty cycle)

**DILC-16 MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	2.1		2.71	0.083		0.107
a1	3.00		3.70	0.118		0.146
a2	0.63	0.88	1.14	0.025	0.035	0.045
B	1.82		2.39	0.072		0.094
b	0.40	0.45	0.50	0.016	0.018	0.020
b1	0.20	0.254	0.30	0.008	0.010	0.012
D	20.06	20.32	20.58	0.790	0.800	0.810
e	7.36	7.62	7.87	0.290	0.300	0.310
e1		2.54			0.100	
e2	17.65	17.78	17.90	0.695	0.700	0.705
e3	7.62	7.87	8.12	0.300	0.310	0.320
F	7.29	7.49	7.70	0.287	0.295	0.303
I			3.83			0.151
K	10.90		12.1	0.429		0.476
L	1.14		1.5	0.045		0.059

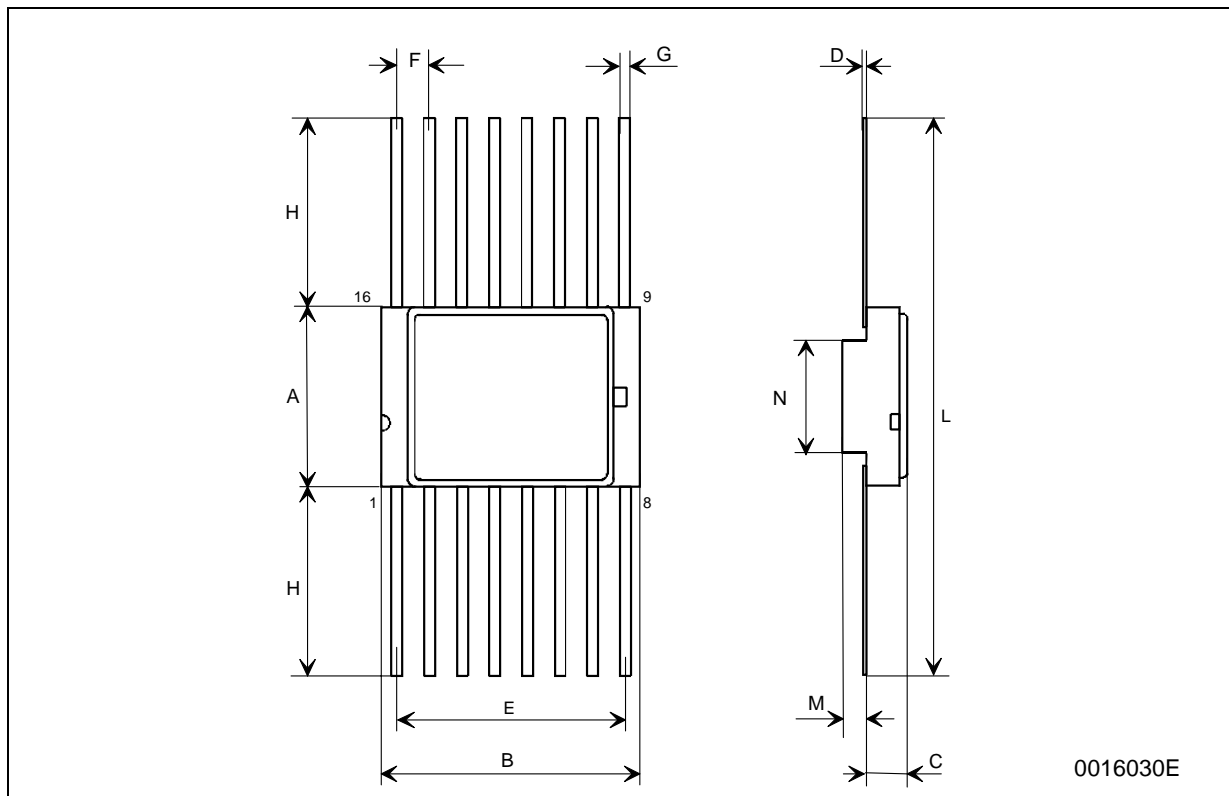


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<b>FPC-16 MECHANICAL DATA</b>
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DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	6.75	6.91	7.06	0.266	0.272	0.278
B	9.76	9.94	10.14	0.384	0.392	0.399
C	1.49		1.95	0.059		0.077
D	0.102	0.127	0.152	0.004	0.005	0.006
E	8.76	8.89	9.01	0.345	0.350	0.355
F		1.27			0.050	
G	0.38	0.43	0.48	0.015	0.017	0.019
H	6.0			0.237		
L	18.75		22.0	0.738		0.867
M	0.33	0.38	0.43	0.013	0.015	0.017
N		4.31			0.170	



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