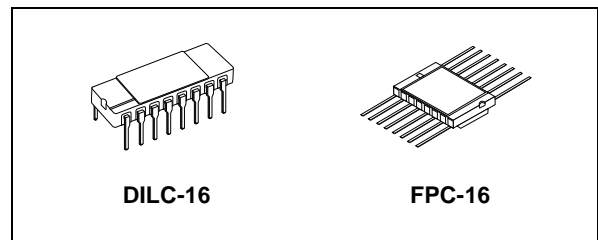


## RAD-HARD 3 TO 8 LINE DECODER/LATCH (INVERTING)

- **HIGH SPEED:**  
 $t_{PD} = 18\text{ns}$  (TYP.) at  $V_{CC} = 6\text{V}$
- **LOW POWER DISSIPATION:**  
 $I_{CC} = 2\mu\text{A}$  (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:**  
 $t_{PLH} \approx t_{PHL}$
- **WIDE OPERATING VOLTAGE RANGE:**  
 $V_{CC}$  (OPR) = 2V to 6V
- **PIN AND FUNCTION COMPATIBLE WITH 54 SERIES 137**
- **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-9205-013**

### DESCRIPTION

The M54HC137 is an high speed CMOS 3 TO 8 LINE DECODER/LATCH (INVERTING) fabricated with silicon gate C<sup>2</sup>MOS technology. This device is a 3 to 8 line decoder with latches on the three address inputs. When  $\overline{GL}$  goes from low

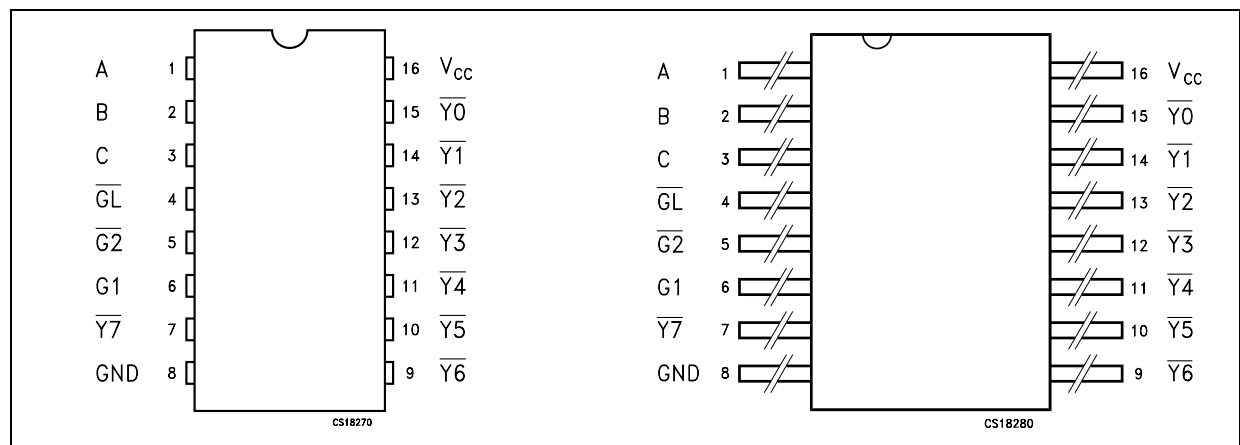


### ORDER CODES

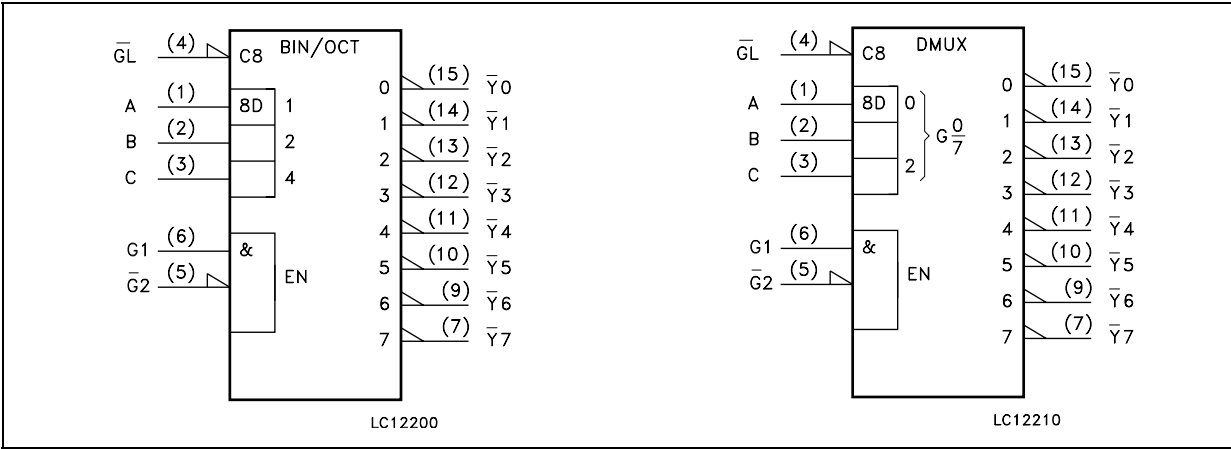
PACKAGE	FM	EM
DILC	M54HC137D	M54HC137D1
FPC	M54HC137K	M54HC137K1

to high, the addresses present at the select inputs ( $\overline{A}$ ,  $\overline{B}$ , and  $\overline{C}$ ) is stored in the latches. As long as  $\overline{GL}$  remains high no address changes will be recognized. Output enable pins  $\overline{G1}$  and  $\overline{G2}$ , control the state of the outputs independently of the select or latch-enable inputs. All the outputs are high unless  $\overline{G1}$  is high and  $\overline{G2}$  is low. The 54HC137 is ideally suited for the implementation of glitch-free decoders in stored-address application in bus oriented systems. All inputs are equipped with protection circuits against static discharge and transient excess voltage.

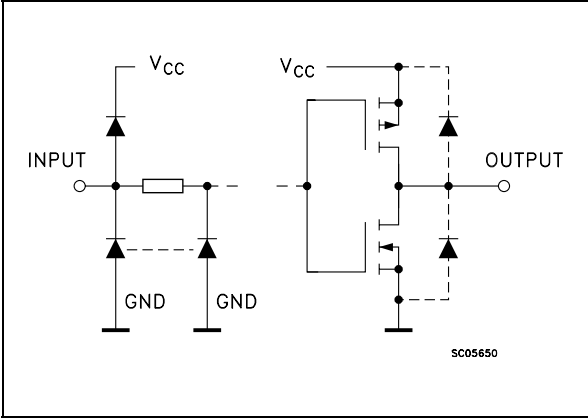
### PIN CONNECTION



IEC LOGIC SYMBOLS



INPUT AND OUTPUT EQUIVALENT CIRCUIT



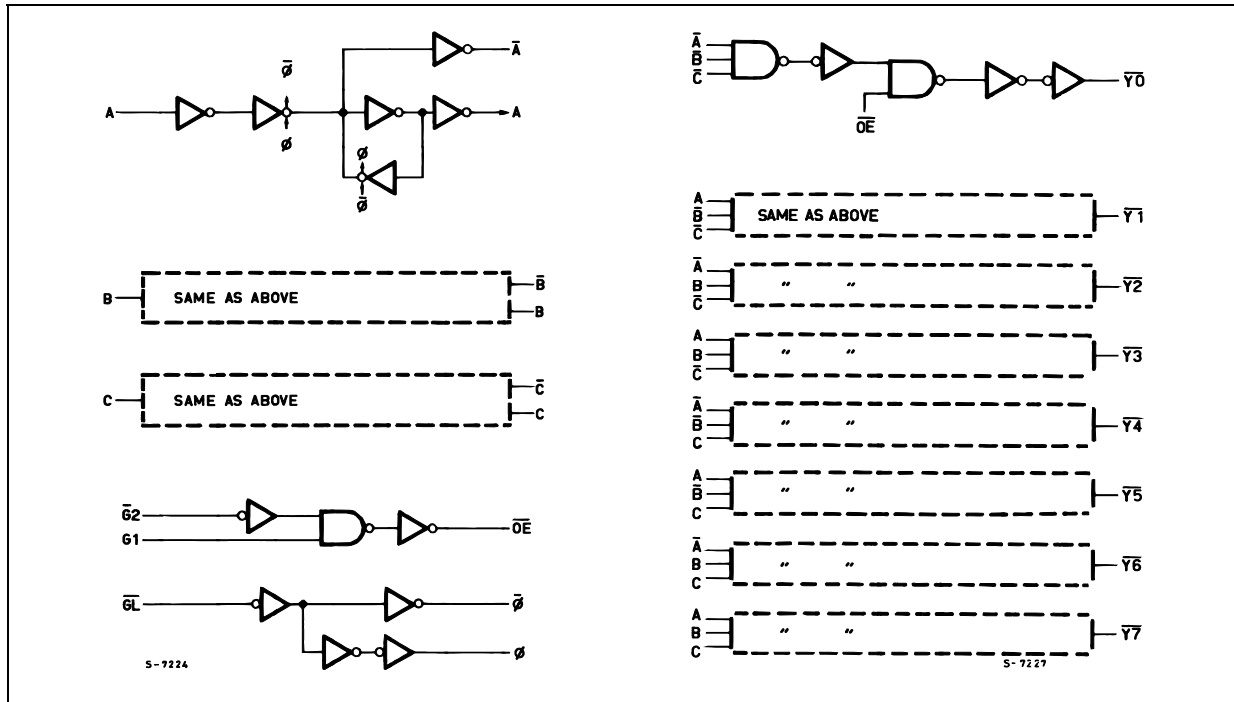
PIN DESCRIPTION

PIN N°	SYMBOL	NAME AND FUNCTION
1, 2, 3	A to C	Data Inputs
4	GL	Latch Enable Input (Active LOW)
5	G2	Data Enable Input (Active LOW)
6	G1	Data Enable Input (Active HIGH)
9, 10, 11, 12, 13, 14, 15, 7	Y0 to Y7	Multiplexer Outputs
8	GND	Ground (0V)
16	V <sub>CC</sub>	Positive Supply Voltage

TRUTH TABLE

INPUTS						OUTPUTS							
ENABLE			SELECT										
GL	G1	G2	C	B	A	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
X	X	H	X	X	X	H	H	H	H	H	H	H	H
X	L	X	X	X	X	H	H	H	H	H	H	H	H
L	H	L	L	L	L	L	H	H	H	H	H	H	H
L	H	L	L	L	H	H	L	H	H	H	H	H	H
L	H	L	L	H	L	H	H	L	H	H	H	H	H
L	H	L	L	H	H	H	H	H	L	H	H	H	H
L	H	L	H	L	L	H	H	H	H	L	H	H	H
L	H	L	H	L	H	H	H	H	H	H	L	H	H
L	H	L	H	H	L	H	H	H	H	H	H	L	H
L	H	L	H	H	H	H	H	H	H	H	H	H	L
H	H	L	X	X	X	Outputs corresponding to stored address L: all others H							

## 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	°C
$T_L$	Lead Temperature (10 sec)	265	°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 <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		-55 to 125	°C
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time	V <sub>CC</sub> = 2.0V	0 to 1000	ns
		V <sub>CC</sub> = 4.5V	0 to 500	ns
		V <sub>CC</sub> = 6.0V	0 to 400	ns

## DC SPECIFICATIONS

Symbol	Parameter	Test Condition		Value								Unit
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C			
				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	I <sub>O</sub> =-20 μA	1.9	2.0		1.9		1.9		V	
		4.5	I <sub>O</sub> =-20 μA	4.4	4.5		4.4		4.4			
		6.0	I <sub>O</sub> =-20 μA	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	I <sub>O</sub> =20 μA		0.0	0.1		0.1		0.1	V	
		4.5	I <sub>O</sub> =20 μA		0.0	0.1		0.1		0.1		
		6.0	I <sub>O</sub> =20 μA		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>CC</sub>	Quiescent Supply Current	6.0	V <sub>I</sub> = V <sub>CC</sub> or GND			2		20		40	μA	

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

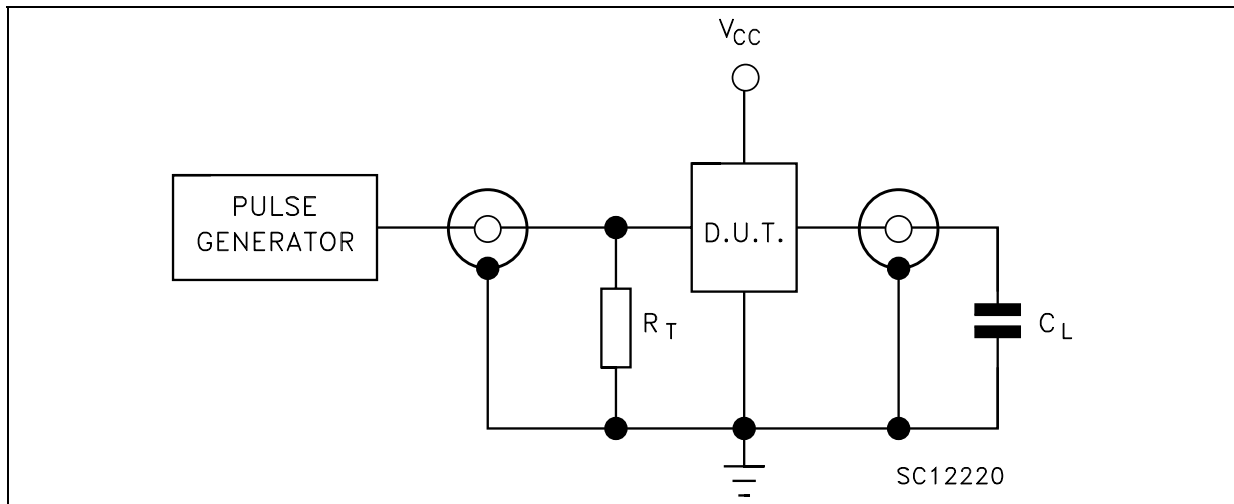
Symbol	Parameter	Test Condition		Value						Unit	
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
t <sub>TLH</sub> t <sub>THL</sub>	Output Transition Time	2.0			30	75		95		110	ns
		4.5			8	15		19		22	
		6.0			7	13		16		19	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time (G1 - Yn)	2.0			45	115		145		175	ns
		4.5			14	23		29		35	
		6.0			12	20		25		30	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time (G2 - Yn)	2.0			50	115		145		175	ns
		4.5			15	23		29		35	
		6.0			13	20		25		30	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time (GL - Yn)	2.0			70	170		215		250	ns
		4.5			22	34		43		50	
		6.0			19	29		37		43	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time (A, B, C - Y)	2.0			70	165		205		110	ns
		4.5			21	33		41		22	
		6.0			18	28		35		19	
t <sub>W(H)</sub> t <sub>W(L)</sub>	Minimum Pulse Width (GL)	2.0			12	50		65		75	ns
		4.5			3	10		13		15	
		6.0			3	9		11		13	
t <sub>s</sub>	Minimum Set-up Time (A, B, C - GL)	2.0			8	50		60		75	ns
		4.5			2	10		12		15	
		6.0			2	9		10		13	
t <sub>h</sub>	Minimum Hold Time (A, B, C - GL)	2.0				5		5		5	ns
		4.5				5		5		5	
		6.0				5		5		5	

**CAPACITIVE CHARACTERISTICS**

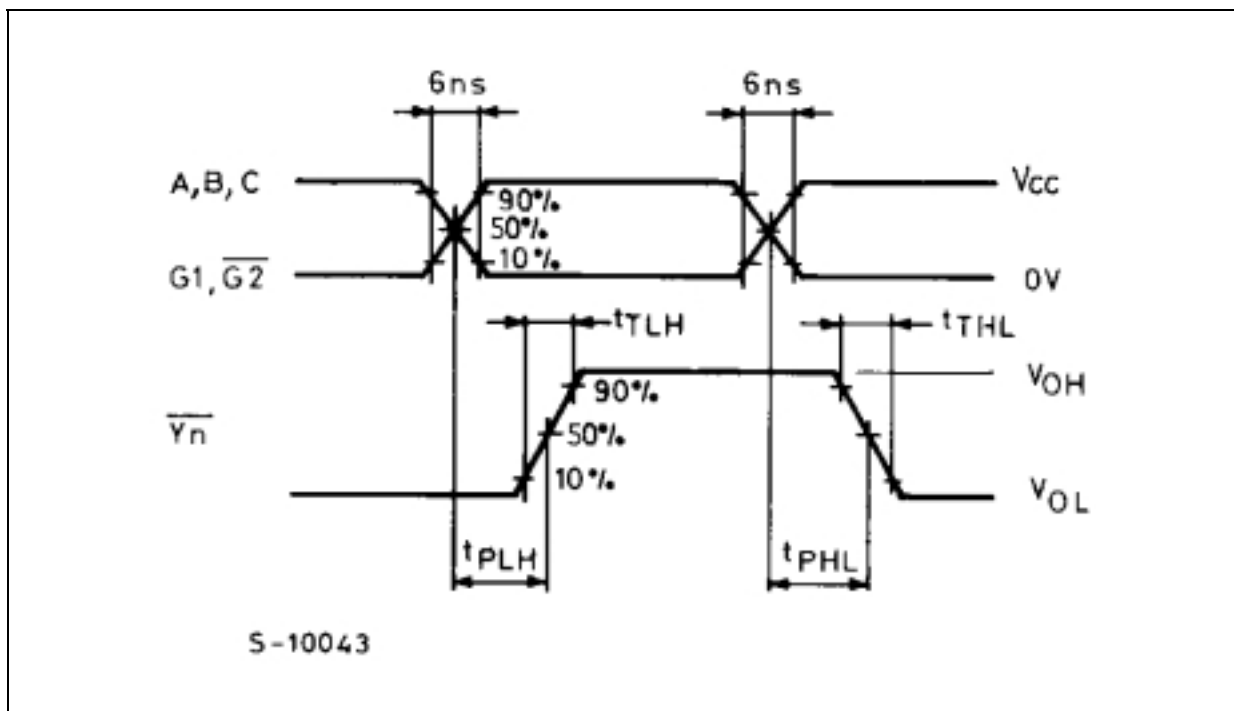
Symbol	Parameter	Test Condition		Value						Unit	
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
C <sub>IN</sub>	Input Capacitance	5.0			5	10		10		10	pF
C <sub>PD</sub>	Power Dissipation Capacitance (note 1)	5.0			55						pF

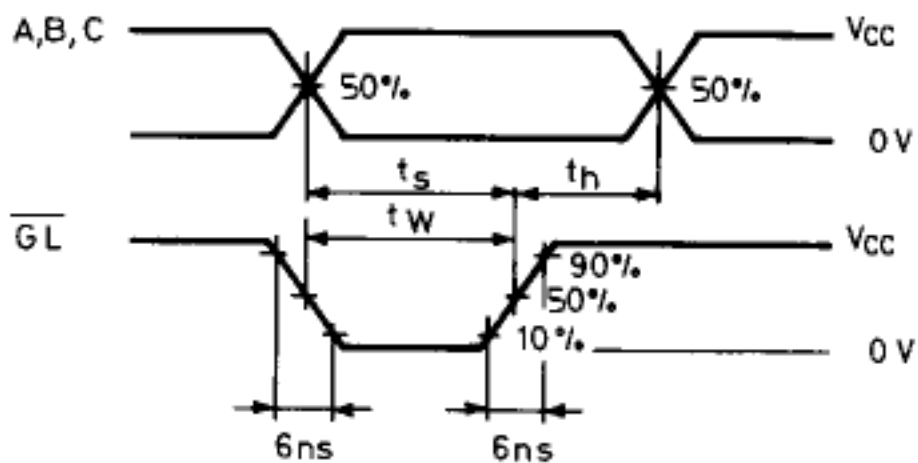
1)  $C_{PD}$  is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation.  $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} +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

## TEST CIRCUIT



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

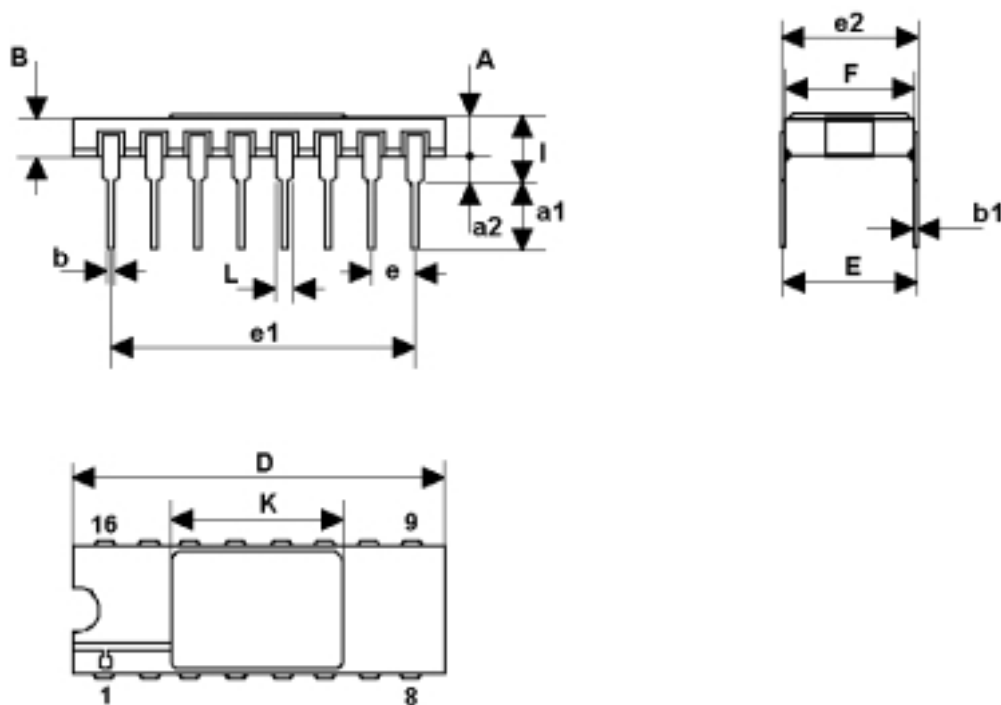
WAVEFORM 1: PROPAGATION DELAY TIME ( $f=1\text{MHz}$ ; 50% duty cycle)

**WAVEFORM 2: MINIMUM PULSE WIDTH, SETUP AND HOLD TIME** ( $f=1\text{MHz}$ ; 50% duty cycle)

S-10044

## DILC-16 MECHANICAL DATA

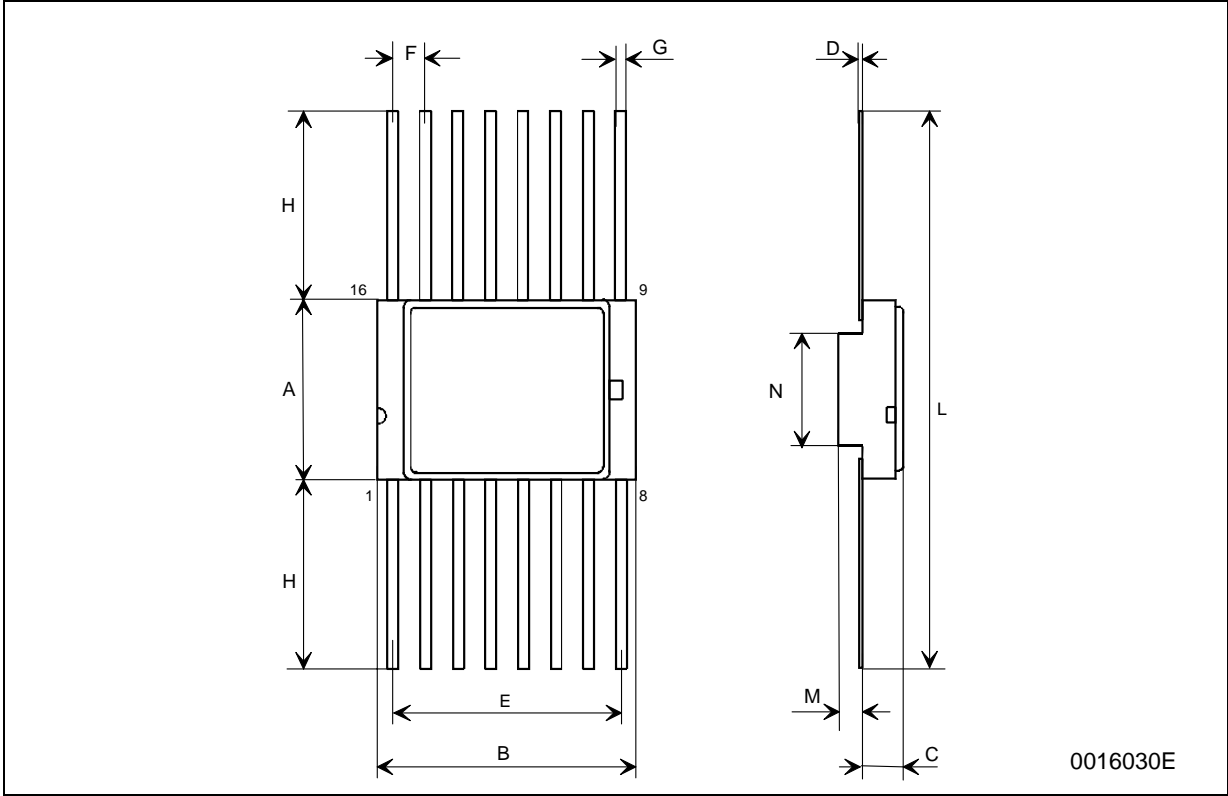
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	2.1		2.71	0.083		0.107
a1	3.00		3.70	0.118		0.146
a2	0.63	0.88	1.14	0.025	0.035	0.045
B	1.82		2.39	0.072		0.094
b	0.40	0.45	0.50	0.016	0.018	0.020
b1	0.20	0.254	0.30	0.008	0.010	0.012
D	20.06	20.32	20.58	0.790	0.800	0.810
e	7.36	7.62	7.87	0.290	0.300	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



0056437F

FPC-16 MECHANICAL DATA

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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