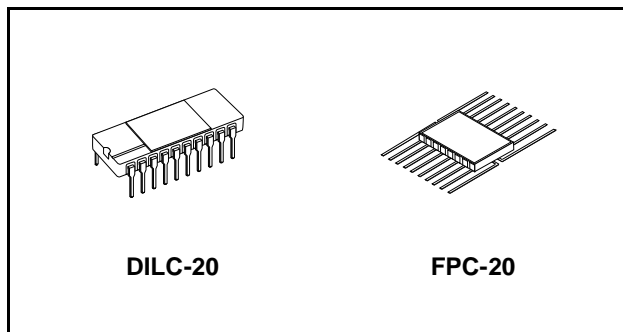




M54HC541

RAD-HARD OCTAL BUS BUFFER WITH 3 STATE OUTPUTS (NON INVERTED)

- HIGH SPEED:
 $t_{PD} = 9ns$ (TYP.) at $V_{CC} = 6V$
- LOW POWER DISSIPATION:
 $I_{CC} = 4\mu A$ (MAX.) at $T_A=25^\circ C$
- HIGH NOISE IMMUNITY:
 $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (MIN.)
- SYMMETRICAL OUTPUT IMPEDANCE:
 $|I_{OH}| = |I_{OL}| = 6mA$ (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 541
- 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-9401-047



ORDER CODES

PACKAGE	FM	EM
DILC	M54HC541D	M54HC541D1
FPC	M54HC541K	M54HC541K1

The 3-STATE control gate operates as a two input AND such that if either G1 and G2 are high, all eight output are in the high impedance state. In order to enhance PC board layout the M54HC541 offer a pinout having inputs and outputs on opposite sides of the package.

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

DESCRIPTION

The 54HC541 is an advanced high-speed CMOS OCTAL BUS BUFFER (3-STATE) fabricated with silicon gate C²MOS technology. The M54HC541 is a non inverting buffer.

PIN CONNECTION

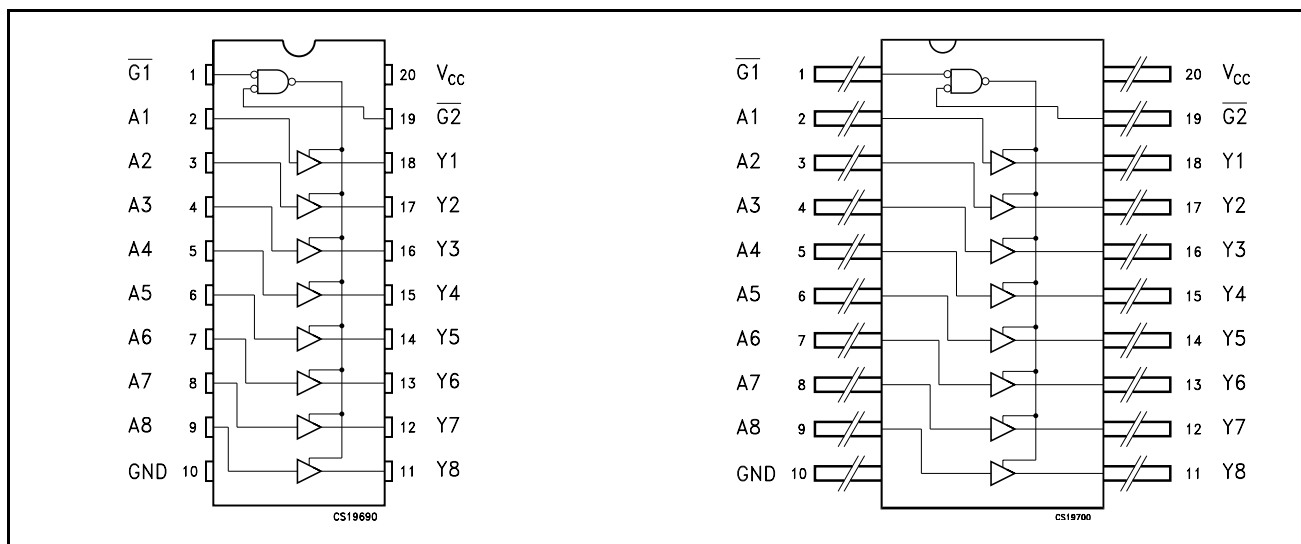


Figure 1: IEC Logic Symbols

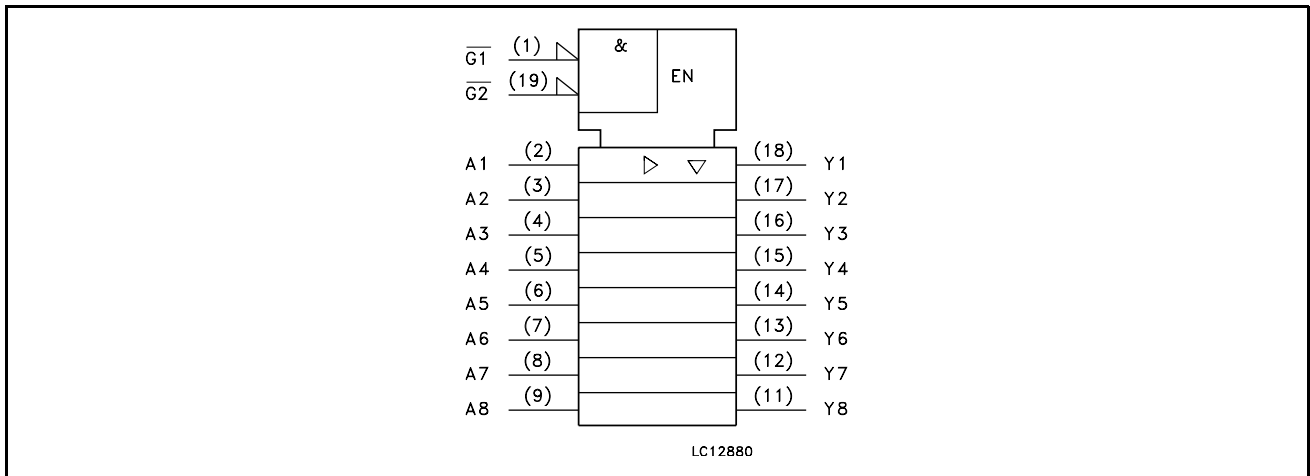


Figure 2: Input And Output Equivalent Circuit

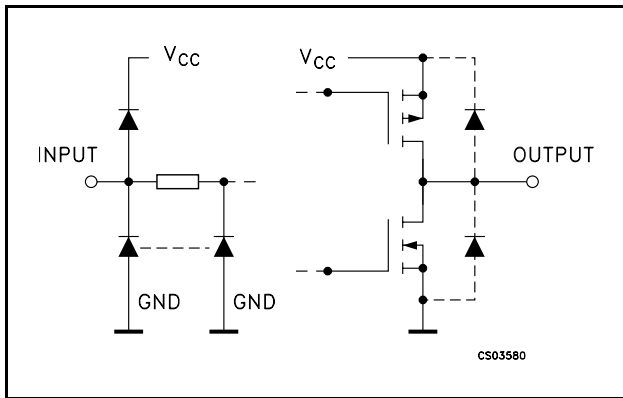


Table 1: Pin Description

PIN N°	SYMBOL	NAME AND FUNCTION
1, 19	$\overline{G1}, \overline{G2}$	Output Enable Inputs
2, 3, 4, 5, 6, 7, 8, 9	A1 to A8	Data Inputs
18, 17, 16, 15, 14, 13, 12, 11	Y1 to Y8	Bus Outputs
10	GND	Ground (0V)
20	V _{CC}	Positive Supply Voltage

Table 2: Truth Table

INPUT			OUTPUT
$\overline{G1}$	$\overline{G2}$	A _n	Y _n
H	X	X	Z
X	H	X	Z
L	L	H	H
L	L	L	L

X : Don't Care
Z : High Impedance

Table 3: 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	± 20	mA
I_{OK}	DC Output Diode Current	± 20	mA
I_O	DC Output Current	± 35	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current	± 70	mA
P_D	Power Dissipation	420	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

Table 4: 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

Table 5: DC Specifications

Symbol	Parameter	Test Condition		Value						Unit	
		V _{CC} (V)		T _A = 25°C			-40 to 85°C		-55 to 125°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 μA	1.9	2.0		1.9		1.9		V
		4.5	I _O =-20 μA	4.4	4.5		4.4		4.4		
		6.0	I _O =-20 μA	5.9	6.0		5.9		5.9		
		4.5	I _O =-6.0 mA	4.18	4.31		4.13		4.10		
		6.0	I _O =-7.8 mA	5.68	5.8		5.63		5.60		
V _{OL}	Low Level Output Voltage	2.0	I _O =20 μA		0.0	0.1		0.1		0.1	V
		4.5	I _O =20 μA		0.0	0.1		0.1		0.1	
		6.0	I _O =20 μA		0.0	0.1		0.1		0.1	
		4.5	I _O =6.0 mA		0.17	0.26		0.33		0.40	
		6.0	I _O =7.8 mA		0.18	0.26		0.33		0.40	
I _I	Input Leakage Current	6.0	V _I = V _{CC} or GND			± 0.1		± 1		± 1	μA
I _{OZ}	High Impedance Output Leakage Current	6.0	V _I = V _{IH} or V _{IL} V _O = V _{CC} or GND			± 0.5		± 5		± 10	μA
I _{CC}	Quiescent Supply Current	6.0	V _I = V _{CC} or GND			4		40		80	μA

Table 6: AC Electrical Characteristics ($C_L = 50 \text{ pF}$, Input $t_r = t_f = 6 \text{ ns}$)

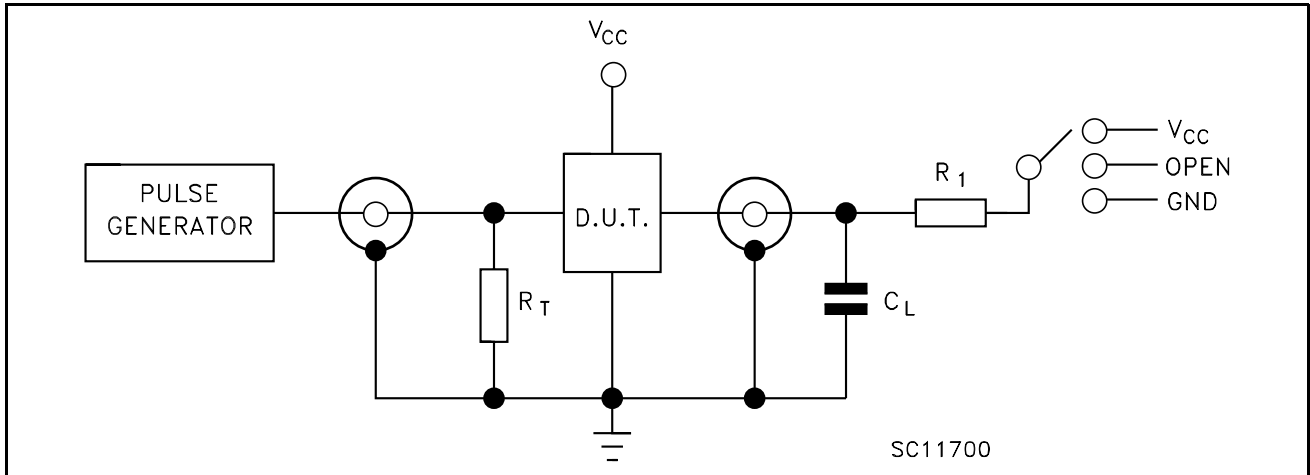
Symbol	Parameter	Test Condition			Value						Unit	
		V_{CC} (V)	C_L (pF)		$T_A = 25^\circ\text{C}$			$-40 \text{ to } 85^\circ\text{C}$		$-55 \text{ to } 125^\circ\text{C}$		
					Min.	Typ.	Max.	Min.	Max.	Min.		Max.
t_{TLH} t_{THL}	Output Transition Time	2.0	50			25	60		75		90	ns
		4.5				7	12		19		18	
		6.0				6	10		13		15	
t_{PLH} t_{PHL}	Propagation Delay Time	2.0	50			40	85		105		130	ns
		4.5				10	17		21		26	
		6.0				9	14		18		22	
		2.0	150			56	115		145		175	ns
		4.5				14	23		29		35	
		6.0				12	20		25		30	
t_{PZL} t_{PZH}	High Impedance Output Enable Time	2.0	50	$R_L = 1 \text{ K}\Omega$		47	110		140		165	ns
		4.5				13	22		28		33	
		6.0				11	19		24		28	
		2.0	150	$R_L = 1 \text{ K}\Omega$		61	135		170		205	ns
		4.5				17	27		34		41	
		6.0				14	23		29		35	
t_{PLZ} t_{PHZ}	High Impedance Output Disable Time	2.0	50	$R_L = 1 \text{ K}\Omega$		52	110		140		165	ns
		4.5				15	22		28		33	
		6.0				13	19		24		28	

Table 7: Capacitive Characteristics

Symbol	Parameter	Test Condition			Value						Unit	
		V_{CC} (V)			$T_A = 25^\circ\text{C}$			$-40 \text{ to } 85^\circ\text{C}$		$-55 \text{ to } 125^\circ\text{C}$		
					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				31						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. $I_{CC(oper)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/8$ (per circuit)

Figure 3: 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 50Ω)

Figure 4: Waveform - Propagation Delay Times ($f=1MHz$; 50% duty cycle)

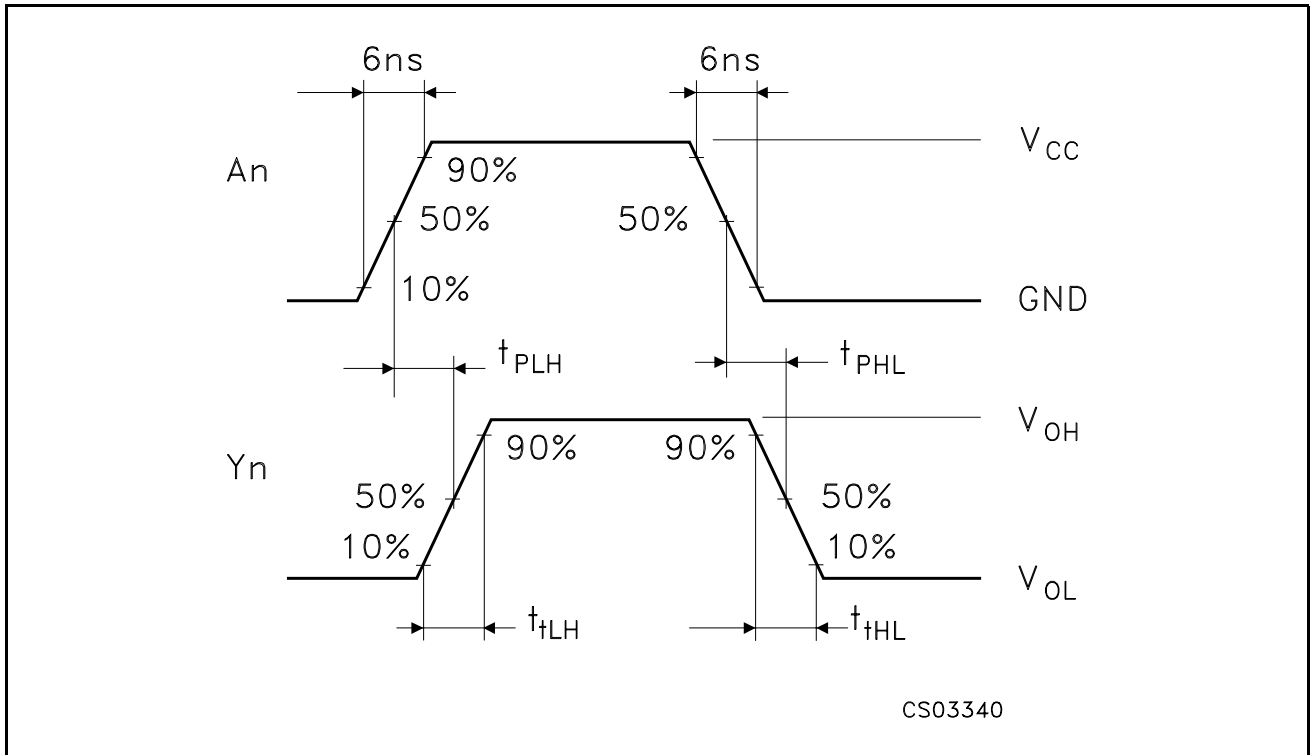
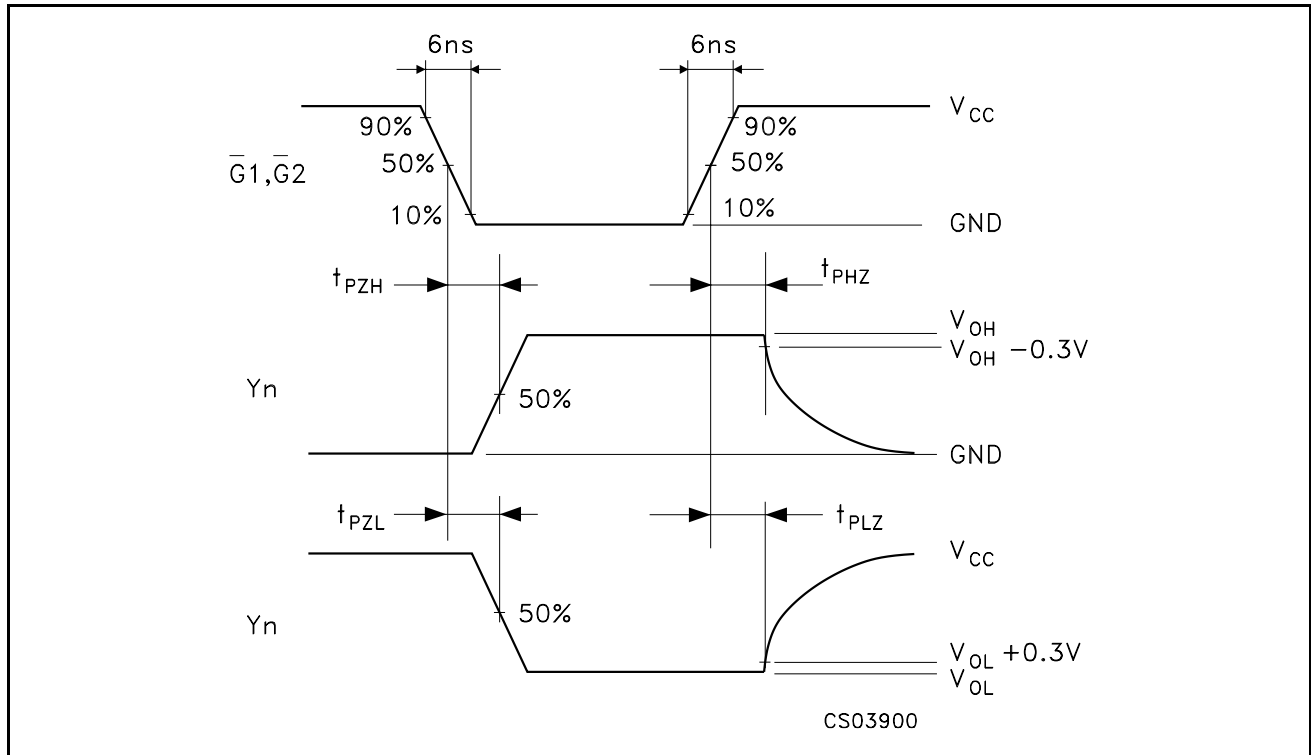
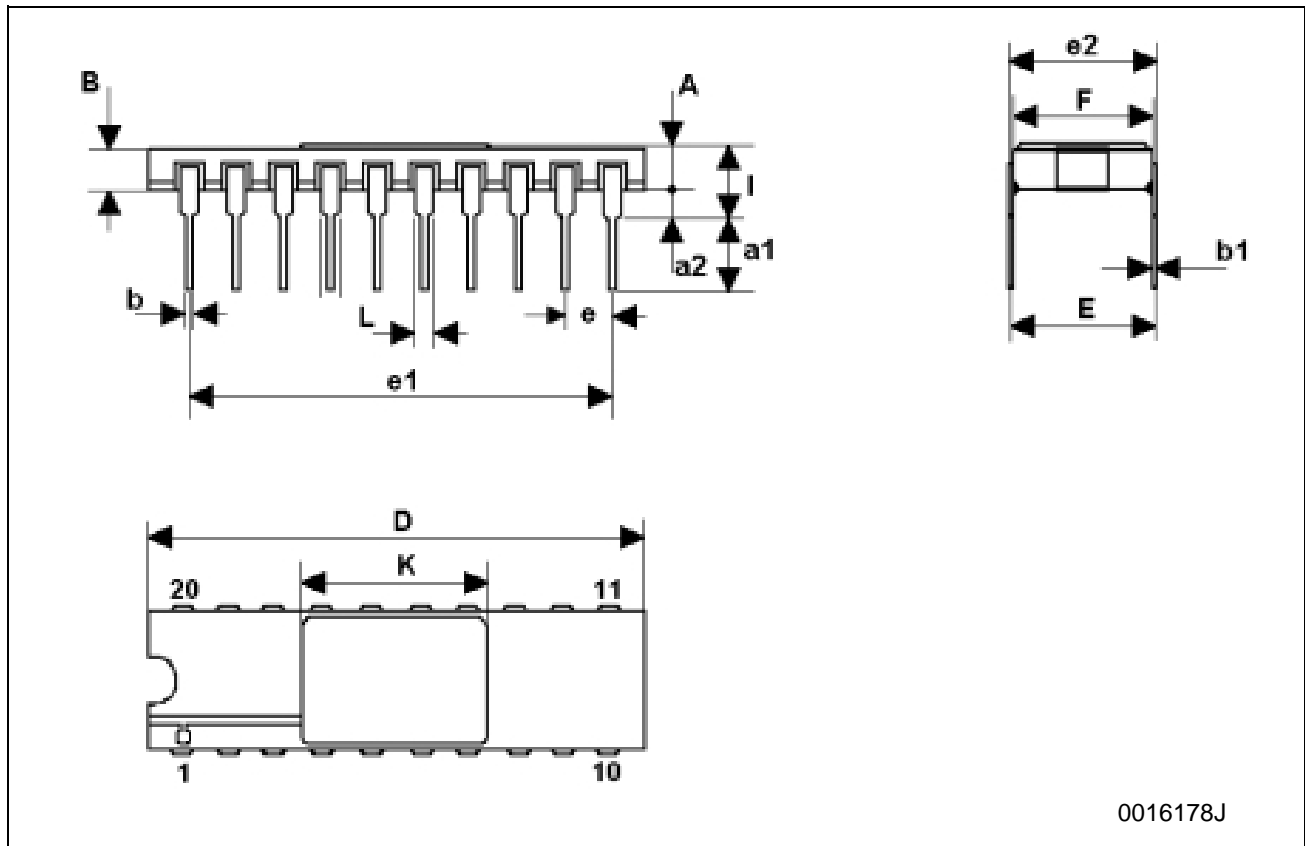


Figure 5: Waveform - Output Enable And Disable Times ($f=1\text{MHz}$; 50% duty cycle)

DILC-20 MECHANICAL DATA

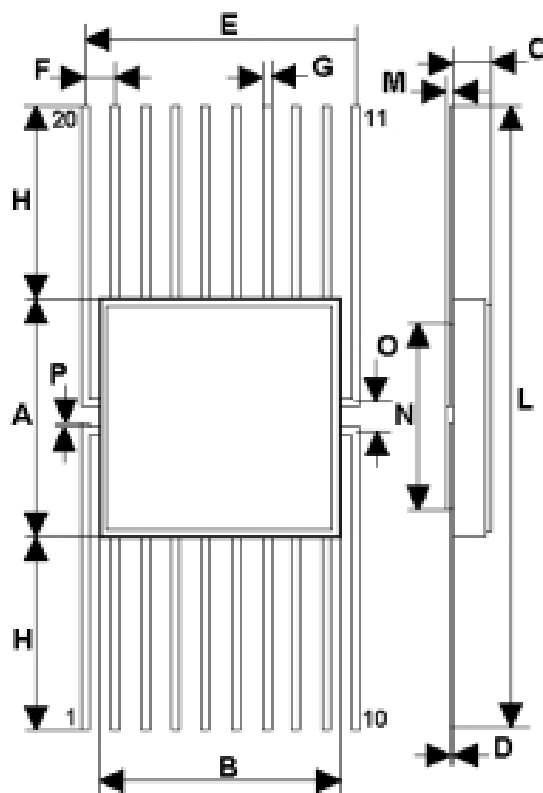
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	2.1		2.71	0.083		0.107
a1	3.00		3.70	0.118		0.146
a2	0.63	0.88	1.14	0.025	0.035	0.045
B	1.93	2.03	2.23	0.076	0.080	0.088
b	0.40	0.45	0.50	0.016	0.018	0.020
b1	0.20	0.254	0.30	0.008	0.010	0.012
D	25.14	25.40	25.65	0.990	1.000	1.010
E	7.36	7.62	7.87	0.290	0.300	0.310
e		2.54			0.100	
e1	22.73	22.86	22.99	0.895	0.900	0.905
e2	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
l			3.86			0.152
K	11.30		11.56	0.445		0.455
L	1.14	1.27	1.40	0.045	0.050	0.055



0016178J

FPC-20 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	9.98	10.16	10.34	0.393	0.400	0.407
B	9.98	10.16	10.34	0.393	0.400	0.407
C	1.45	1.61	1.78	0.57	0.63	0.070
D	0.10	0.127	0.18	0.004	0.005	0.007
E	11.30	11.43	11.56	0.445	0.450	0.455
F		1.27			0.050	
G	0.38	0.43	0.48	0.015	0.017	0.019
H	7.24		8.16	0.285		0.320
L	24.46		26.67	0.960		1.050
M	0.45	0.50	0.55	0.018	0.020	0.022
N		7.87			0.310	
O	1.14	1.27	1.40	0.045	0.050	0.055
P	0.10	0.18	0.25	0.004	0.007	0.010



016032F

Table 8: Revision History

Date	Revision	Description of Changes
14-May-2004	1	First Release

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