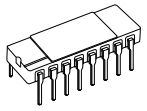
M54HC75

RAD HARD 4 BIT D TYPE LATCH

- HIGH SPEED:
  t_{PD} = 11ns (TYP.) at V_{CC} = 6V
- LOW POWER DISSIPATION:
  I_{CC} =2µA(MAX.) at T_A=25° C
- HIGH NOISE IMMUNITY:
  V_{NIH} = V_{NIL} = 28% V_{CC} (MIN.)
- SYMMETRICAL OUTPUT IMPEDANCE:
  $|I_{OH}|$ = I_{OL} = 4mA (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 75
- 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-9203-065



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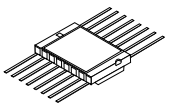


FPC-16

ORDER CODES

PACKAGE	FM	EM
DILC	M54HC75D	M54HC75D1
FPC	M54HC75K	M54HC75K1

DESCRIPTION

The M54HC75 is an high speed CMOS 4 BIT D TYPE LATCH fabricated with silicon gate C^2MOS technology.

It contains two groups of 2 bit latches controlled by an enable input (G1•2 or G3•4). These two latch groups can be used in different circuits. Each latch has Q and $\overline{Q}$ outputs (1Q - 4$\overline{Q}$ and 1Q - 4$\overline{Q}$). The data applied to the data input is transferred to the Q and $\overline{Q}$ outputs when the enable input is taken high and the outputs will follow the data input as long as the enable input is kept high. When the enable input is taken low, the information data applied to the data input is retained at the outputs. All inputs are equipped with protection circuits against static discharge and transient excess voltage.

PIN CONNECTION

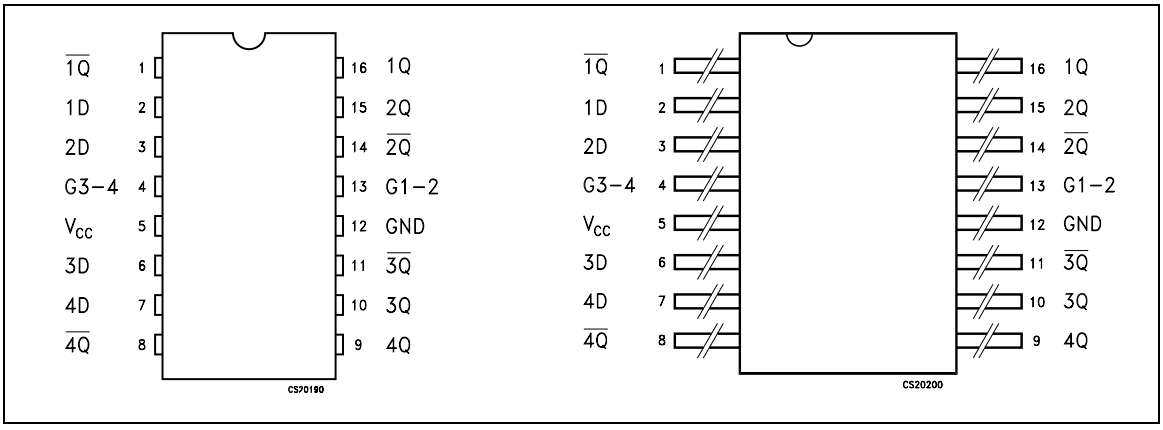


Figure 1: IEC Logic Symbols

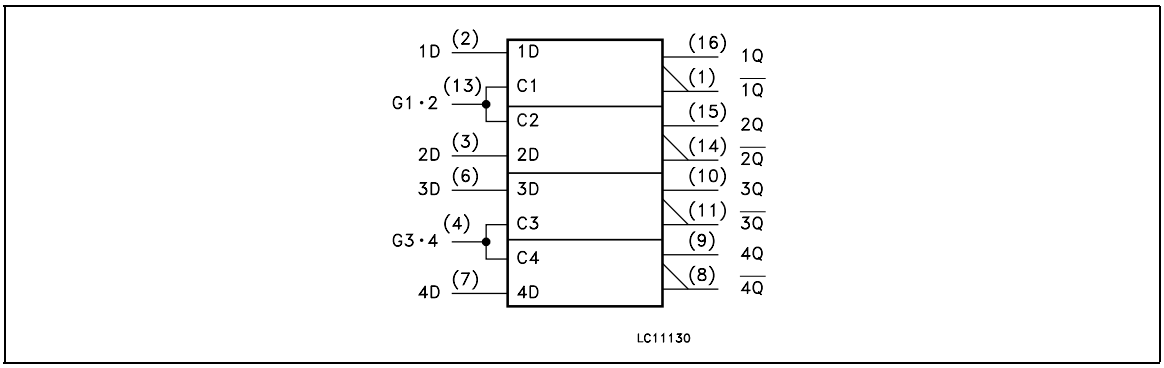


Figure 2: Input And Output Equivalent Circuit

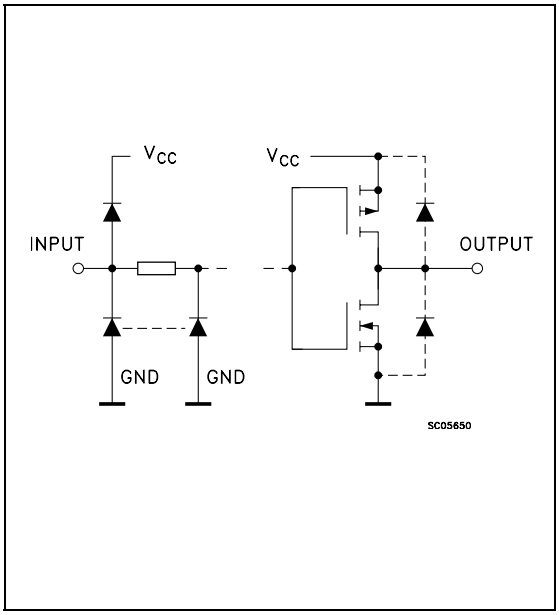


Table 1: Pin Description

PIN N°	SYMBOL	NAME AND FUNCTION
1, 14, 11, 8	$1\overline{Q}$ to $4\overline{Q}$	Complementary Latch Outputs
2, 3, 6, 7	1D to 4D	Data Inputs
4	G3 • 4	Latch Enable Input, latches 3 and 4
13	G1 • 2	Latch Enable Input, latches 1 and 2
16, 15, 10, 9	1Q to 4Q	Latch Outputs
12	GND	Ground (0V)
5	V_{CC}	Positive Supply Voltage

Table 2: Truth Table

INPUTS		OUTPUTS		FUNCTION
D	G	Q	$\overline{Q}$	
L	H	L	H	
H	H	H	L	
X	L	Qn	$\overline{Q}$n	LATCH

Figure 3: Logic Diagram

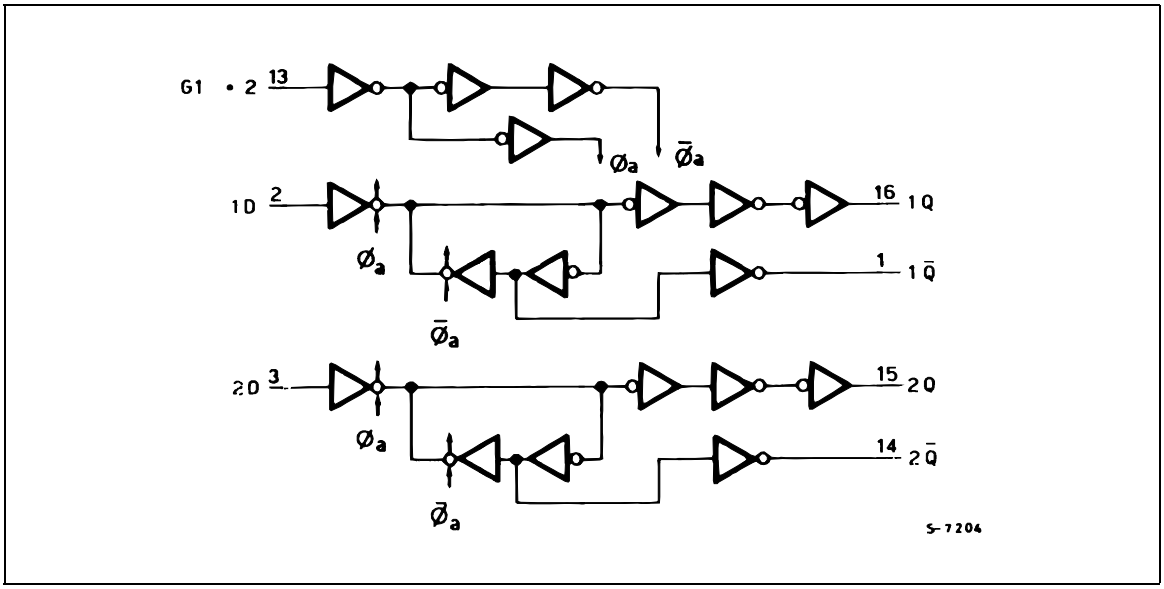


Table 3: Absolute Maximum Ratings

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	± 25	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current	± 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

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=-4.0 mA	4.18	4.31		4.13		4.10		
		6.0	I_O=-5.2 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=4.0 mA		0.17	0.26		0.33		0.40	
		6.0	I_O=5.2 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_{CC}	Quiescent Supply Current	6.0	V_I = V_{CC} or GND			2		20		40	µA

Table 6: AC Electrical Characteristics (C_L = 50 pF, Input t_r = t_f = 6ns)

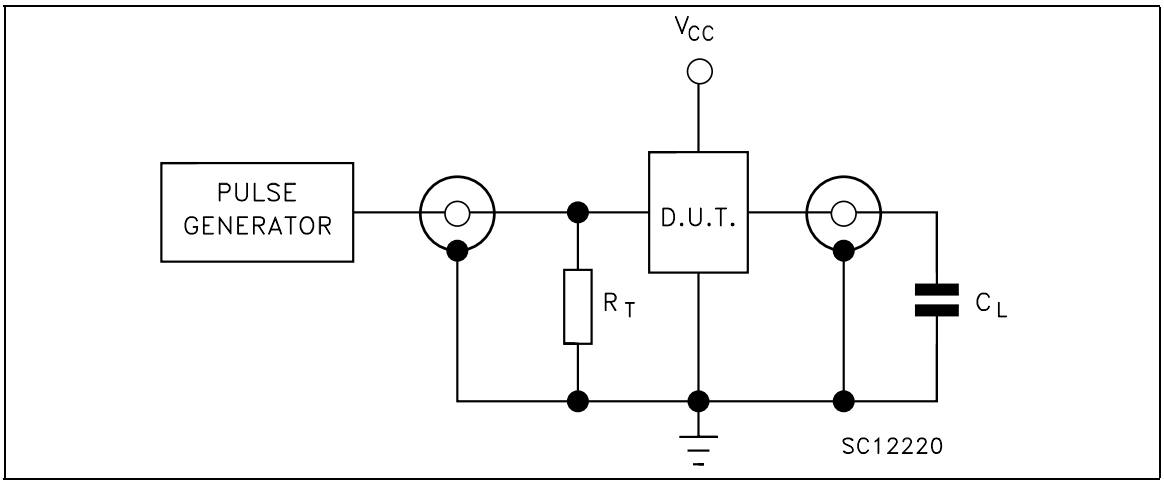
Symbol	Parameter	Test Condition		Value							Unit
		V_{CC} (V)		T_A = 25° C			-40 to 85° C		-55 to 125° C		
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
t_{TLH} t_{THL}	Output Transition Time	2.0			25	75		95		110	ns
		4.5			7	15		19		22	
		6.0			6	13		16		19	
t_{PLH} t_{PHL}	Propagation Delay Time (DATA - Q)	2.0			36	110		140		165	ns
		4.5			12	22		28		33	
		6.0			10	19		24		28	
t_{PLH} t_{PHL}	Propagation Delay Time (G-Q)	2.0			40	125		155		190	ns
		4.5			13	25		31		38	
		6.0			11	21		26		32	
$t_{W(H)}$	Minimum Pulse Width (G)	2.0			18	75		95		110	ns
		4.5			6	15		19		22	
		6.0			6	13		16		19	
t_s	Minimum Set-up Time	2.0				50		65		75	ns
		4.5				10		13		15	
		6.0				9		11		13	
t_h	Minimum Hold Time	2.0				25		30		40	ns
		4.5				5		6		8	
		6.0				4		5		7	

Table 7: Capacitive Characteristics

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.	
C_{IN}	Input Capacitance	5.0			5	10		10		10	pF
C_{PD}	Power Dissipation Capacitance (note 1)	5.0			30						pF

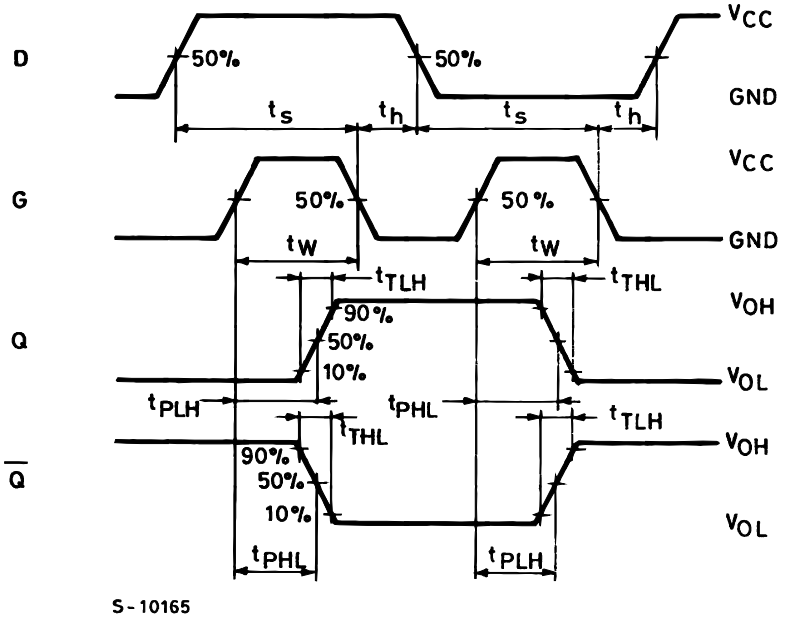
1) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation. $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$

Figure 4: Test Circuit



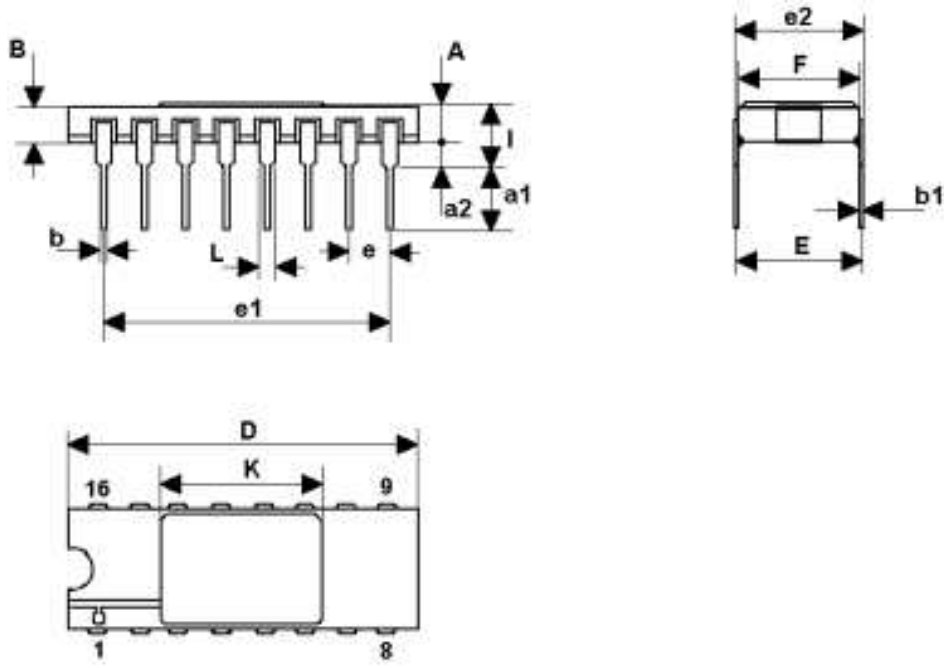
C_L = 50pF or equivalent (includes jig and probe capacitance)
$R_T = Z_{OUT}$ of pulse generator (typically 50Ω)

Figure 5: Switching Characteristics Test Waveform (f=1MHz; 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
e		2.54			0.100	
e1	17.65	17.78	17.90	0.695	0.700	0.705
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
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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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	

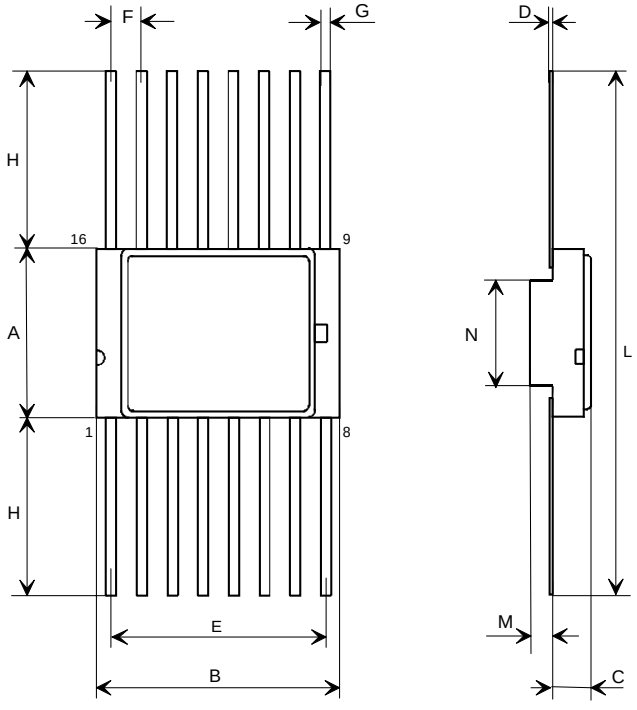

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Table 8: Revision History

Date	Revision	Description of Changes
01-Jun-2004	1	First Release