

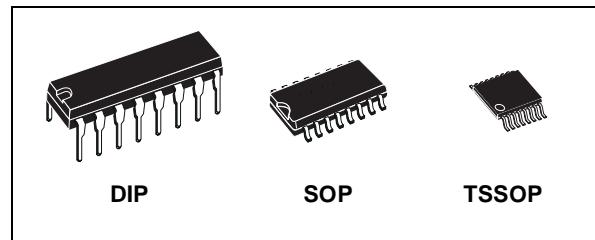
## QUAD D TYPE LATCH

- HIGH SPEED:  
 $t_{PD} = 12\text{ns}$  (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:  
 $|I_{OHI}| = I_{OL} = 4\text{mA}$  (MIN)
- BALANCED PROPAGATION DELAYS:  
 $t_{PLH} \approx t_{PHL}$
- WIDE OPERATING VOLTAGE RANGE:  
 $V_{CC}$  (OPR) = 2V to 6V
- PIN AND FUNCTION COMPATIBLE WITH  
74 SERIES 375

### DESCRIPTION

The M74HC375 is an high speed CMOS QUAD D-TYPE LATCH fabricated with silicon gate C<sup>2</sup>MOS 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  $\bar{Q}$  outputs (1Q - 4Q and 1Q - 4Q). The data applied to the data input is transferred to the Q and  $\bar{Q}$  outputs when the enable input is taken



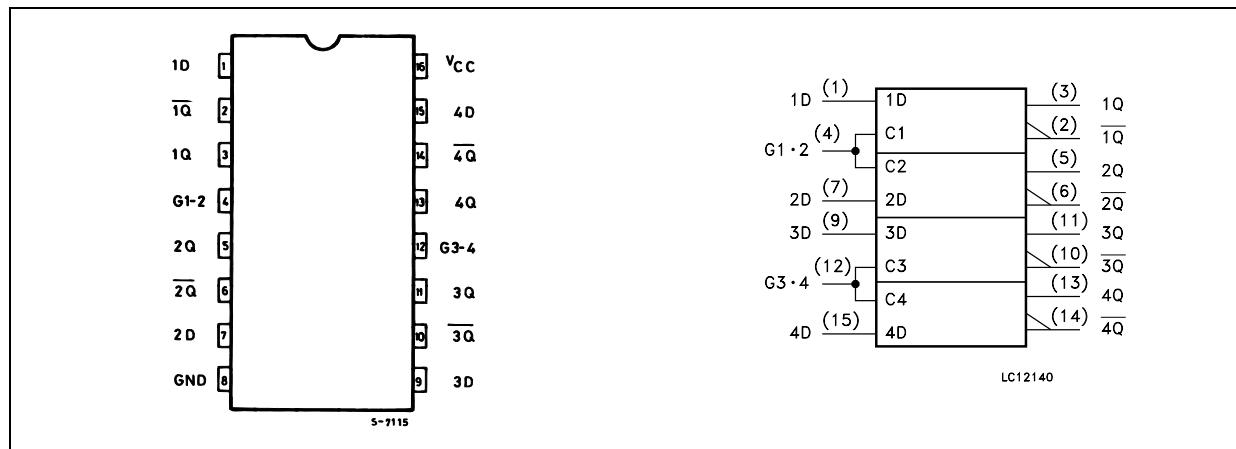
### ORDER CODES

PACKAGE	TUBE	T & R
DIP	M74HC375B1R	
SOP	M74HC75M1R	M74HC375RM13TR
TSSOP		M74HC375TTR

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 at that time is retained at the outputs.

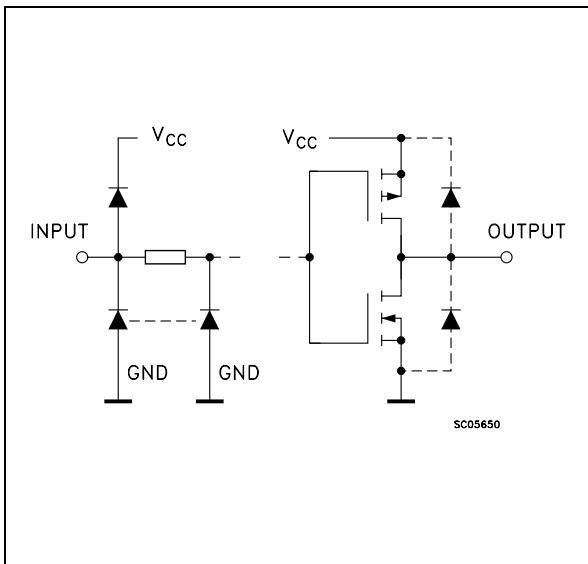
All inputs are equipped with protection circuits against static discharge and transient excess voltage.

### PIN CONNECTION AND IEC LOGIC SYMBOLS



## M74HC375

### I INPUT AND OUTPUT EQUIVALENT CIRCUIT



### PIN DESCRIPTION

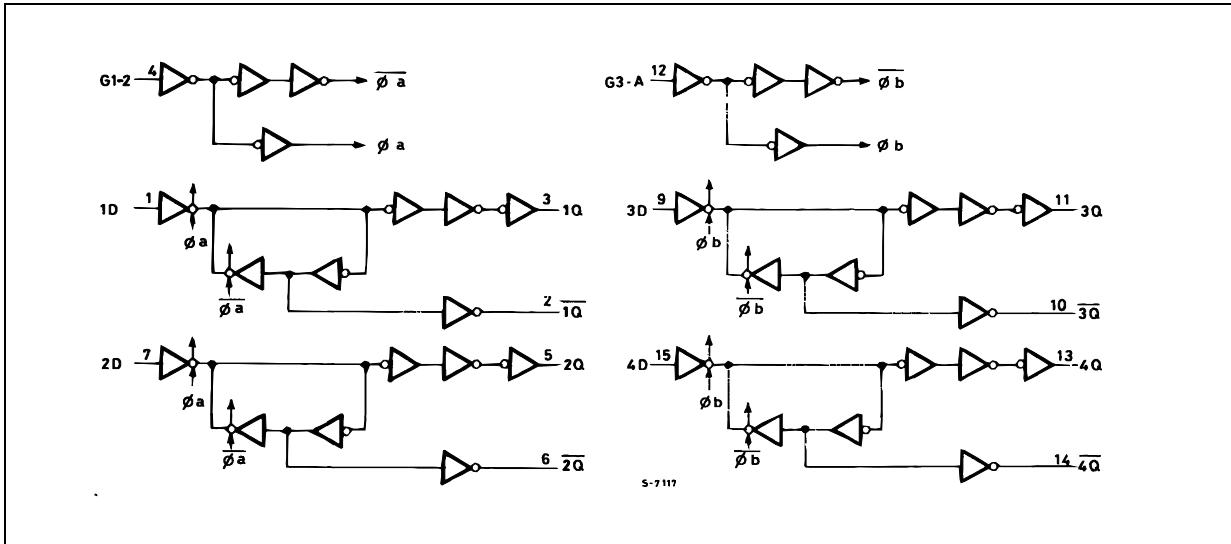
PIN No	SYMBOL	NAME AND FUNCTION
1, 7, 9, 15	1D to 4D	Data Inputs
3, 5, 11, 13, 2, 6, 10, 14	1Q to 4Q 1Q to 4Q	Outputs
12	G3 • 4	Enable Input
4	G1 • 2	Enable Input
8	GND	Ground (0V)
16	V <sub>CC</sub>	Positive Supply Voltage

### TRUTH TABLE

INPUTS		OUTPUTS		FUNCTION
D	G	Q	$\bar{Q}$	
L	H	L	H	
H	H	H	L	
X	L	Q <sub>n</sub>	$\bar{Q}_n$	LATCH

X : Don't Care

### LOGIC DIAGRAM



This logic diagram has not be used to estimate propagation delays

**ABSOLUTE MAXIMUM RATINGS**

<b>Symbol</b>	<b>Parameter</b>	<b>Value</b>	<b>Unit</b>
$V_{CC}$	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	500(*)	mW
$T_{stg}$	Storage Temperature	-65 to +150	°C
$T_L$	Lead Temperature (10 sec)	300	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied

(\*) 500mW at 65 °C; derate to 300mW by 10mW/°C from 65°C to 85°C

**RECOMMENDED OPERATING CONDITIONS**

<b>Symbol</b>	<b>Parameter</b>	<b>Value</b>	<b>Unit</b>
$V_{CC}$	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
		$V_{CC} = 4.5V$	0 to 500
		$V_{CC} = 6.0V$	0 to 400

## 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	$I_O=-4.0 mA$	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	$I_O=20 \mu A$		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	$I_O=4.0 mA$		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	$V_I = V_{CC} \text{ or GND}$			$\pm 0.1$		$\pm 1$		$\pm 1$	$\mu A$
$I_{CC}$	Quiescent Supply Current	6.0	$V_I = V_{CC} \text{ or GND}$			2		20		40	$\mu A$

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

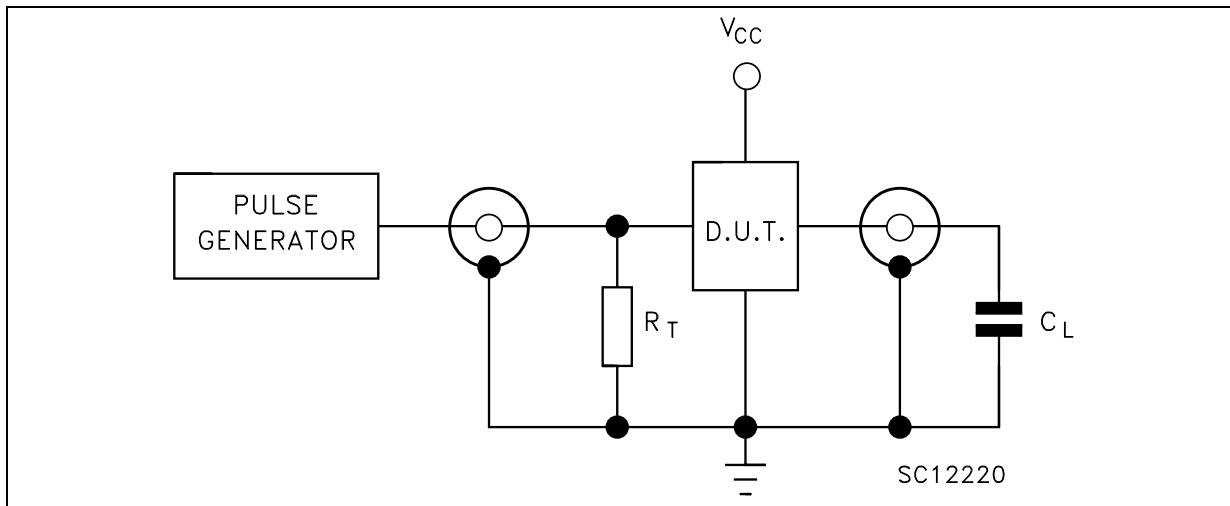
Symbol	Parameter	Test Condition		Value						Unit	
		$V_{CC}$ (V)		$T_A = 25^\circ\text{C}$			$-40 \text{ to } 85^\circ\text{C}$		$-55 \text{ to } 125^\circ\text{C}$		
				Min.	Typ.	Max.	Min.	Max.	Min.		
$t_{TLH}$ $t_{THL}$	Output Transition Time	2.0			30	75		95		110	ns
		4.5			8	15		19		22	
		6.0			7	13		16		19	
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time (DATA - Q, Q)	2.0			56	115		145		175	ns
		4.5			14	23		29		35	
		6.0			12	20		25		30	
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time (G - Q, Q)	2.0			52	105		130		160	ns
		4.5			13	21		26		32	
		6.0			11	18		22		27	
$t_{W(H)}$	Minimum Enable Pulse Width (G)	2.0			12	75		95		115	ns
		4.5			3	15		19		23	
		6.0			3	13		16		20	
$t_s$	Minimum Set-up Time (DATA - G)	2.0			20	75		95		115	ns
		4.5			5	15		19		23	
		6.0			4	13		16		20	
$t_h$	Minimum Hold Time (DATA - G)	2.0				0		0		0	ns
		4.5				0		0		0	
		6.0				0		0		0	

## 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.		
$C_{IN}$	Input Capacitance	5.0			5	10		10		10	pF
$C_{PD}$	Power Dissipation Capacitance (note 1)	5.0			52						pF

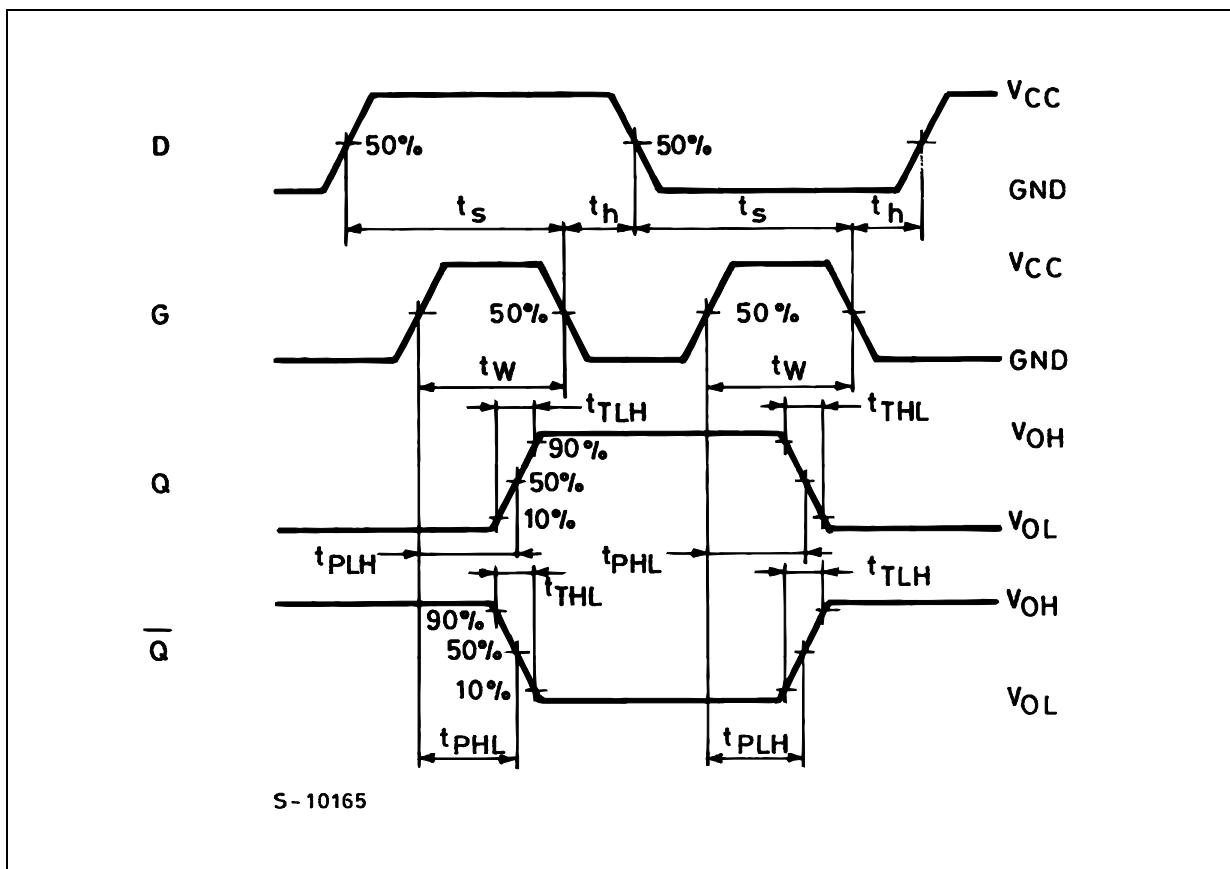
1)  $C_{PD}$  is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation.  $I_{CC(\text{opr})} = C_{PD} \times V_{CC} \times f_{IN}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

TEST CIRCUIT

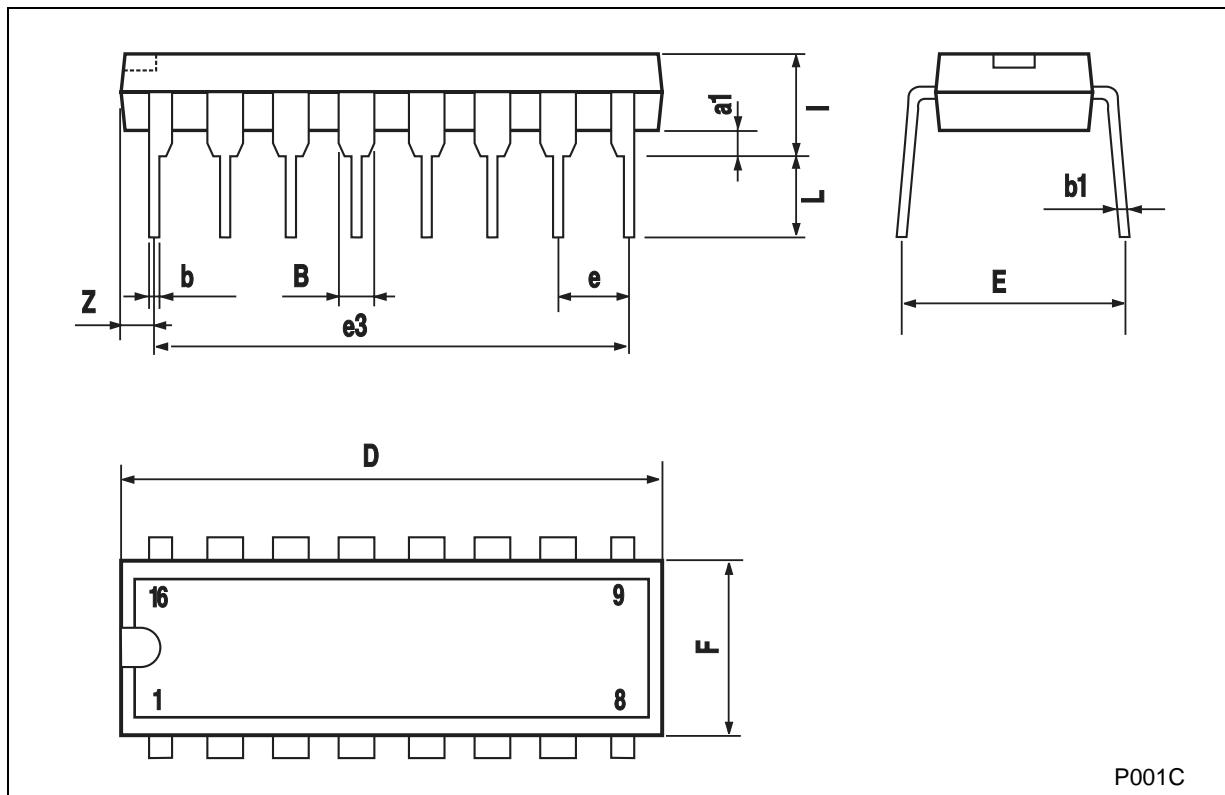


$C_L = 50\text{pF}$  or equivalent (includes jig and probe capacitance)  
 $R_T = Z_{OUT}$  of pulse generator (typically  $50\Omega$ )

**WAVEFORM 1: PROPAGATION DELAY TIMES, MINIMUM ENABLE PULSE WIDTH, SETUP AND HOLD TIMES (f=1MHz; 50% duty cycle)**



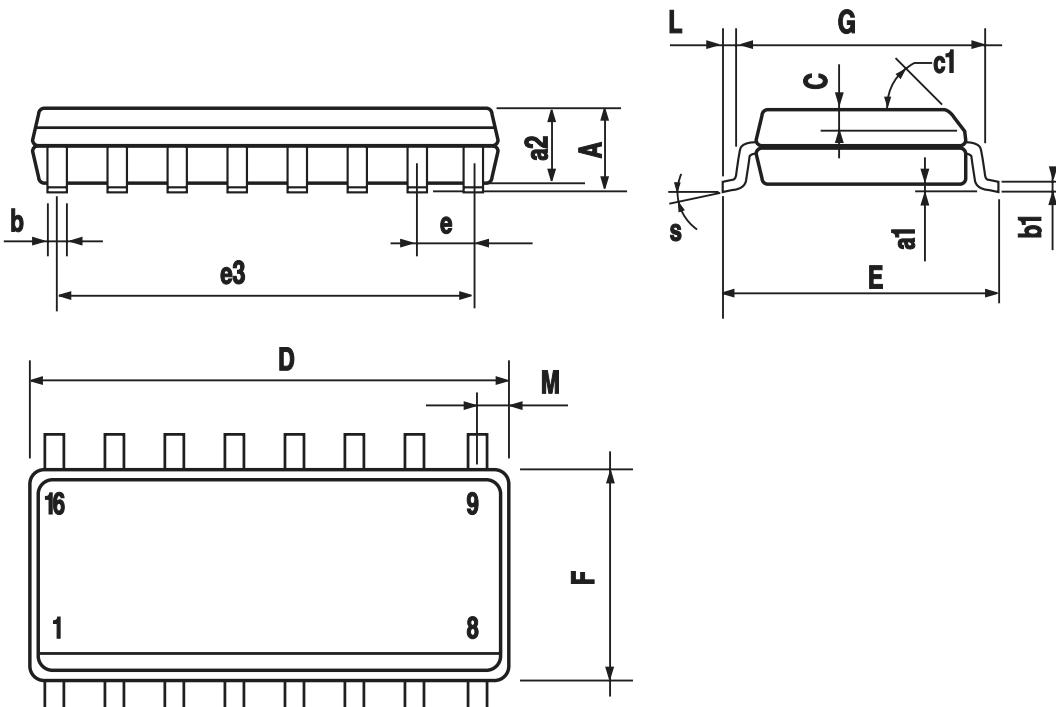
Plastic DIP-16 (0.25) MECHANICAL DATA						
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



P001C

## SO-16 MECHANICAL DATA

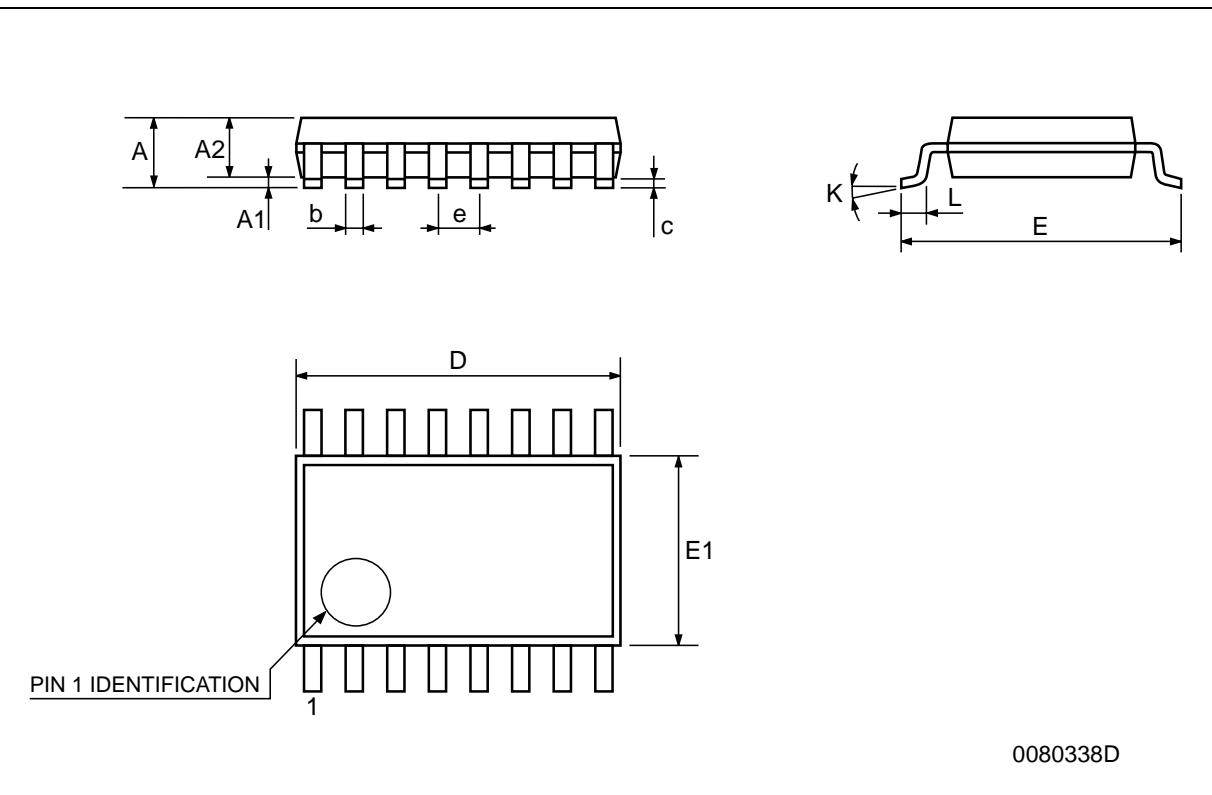
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1		45° (typ.)				
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157
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.)				



PO13H

## TSSOP16 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.2			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.8	1	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.0089
D	4.9	5	5.1	0.193	0.197	0.201
E	6.2	6.4	6.6	0.244	0.252	0.260
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°		8°	0°		8°
L	0.45	0.60	0.75	0.018	0.024	0.030



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