



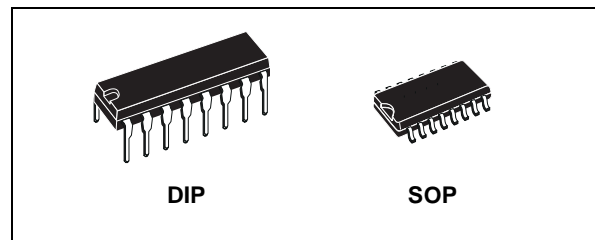
# HCF40147B

## 10 TO 4 LINE BCD PRIORITY ENCODER

- ENCODES 10 LINE TO 4 LINE BCD
- ACTIVE LOW INPUTS AND OUTPUTS
- STANDARDIZED, SYMMETRICAL OUTPUT CHARACTERIZATION
- QUIESCENT CURRENT SPECIFIED UP TO 20V
- 5V, 10V AND 15V PARAMETRIC RATINGS
- MAXIMUM INPUT CURRENT OF 1  $\mu$ A AT 18V OVER FULL PACKAGE TEMPERATURE RANGE; 100 nA AT 18 V AND 25°C
- NOISE MARGIN (FULL PACKAGE TEMPERATURE RANGE): 1V AT  $V_{DD} = 5V$ , 2V AT  $V_{DD} = 10V$ , 2.5V AT  $V_{DD} = 15V$
- INPUT LEAKAGE CURRENT  
 $I_l = 100nA$  (MAX) AT  $V_{DD} = 18V$   $T_A = 25^\circ C$
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC JESD13B "STANDARD SPECIFICATIONS FOR DESCRIPTION OF B SERIES CMOS DEVICES"

### DESCRIPTION

HCF40147B is a monolithic integrated circuit fabricated in Metal Oxide Semiconductor technology available in DIP and SOP packages. HCF40147B, encoder CMOS, features priority encoding of the inputs to ensure that only the

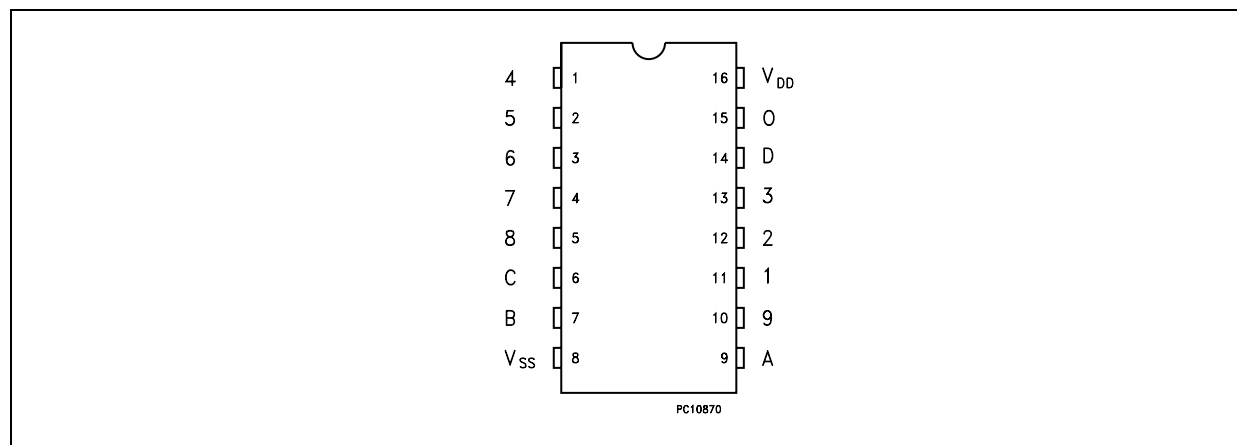


### ORDER CODES

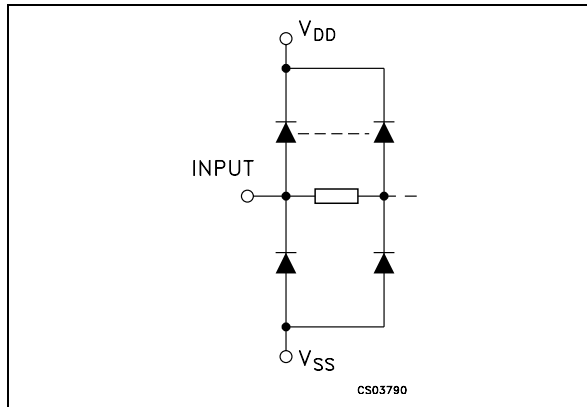
PACKAGE	TUBE	T & R
DIP	HCF40147BEY	
SOP	HCF40147BM1	HCF40147M013TR

highest order data line is encoded. Ten data input lines (0-9) are encoded to four line (8, 4, 2, 1) BCDs. The highest priority line is line 9. All four output lines are logic "1" ( $V_{SS}$ ) when all input lines are logic "0". All inputs and outputs are buffered, and each output can drive one TTL Low Power Schottky load. HCF40147B is functionally similar to the T54/T74LS147 if pin 15 is tied low. HCF40147B is supplied in 16-lead plastic or ceramic and plastic micropackages.

### PIN CONNECTION



INPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

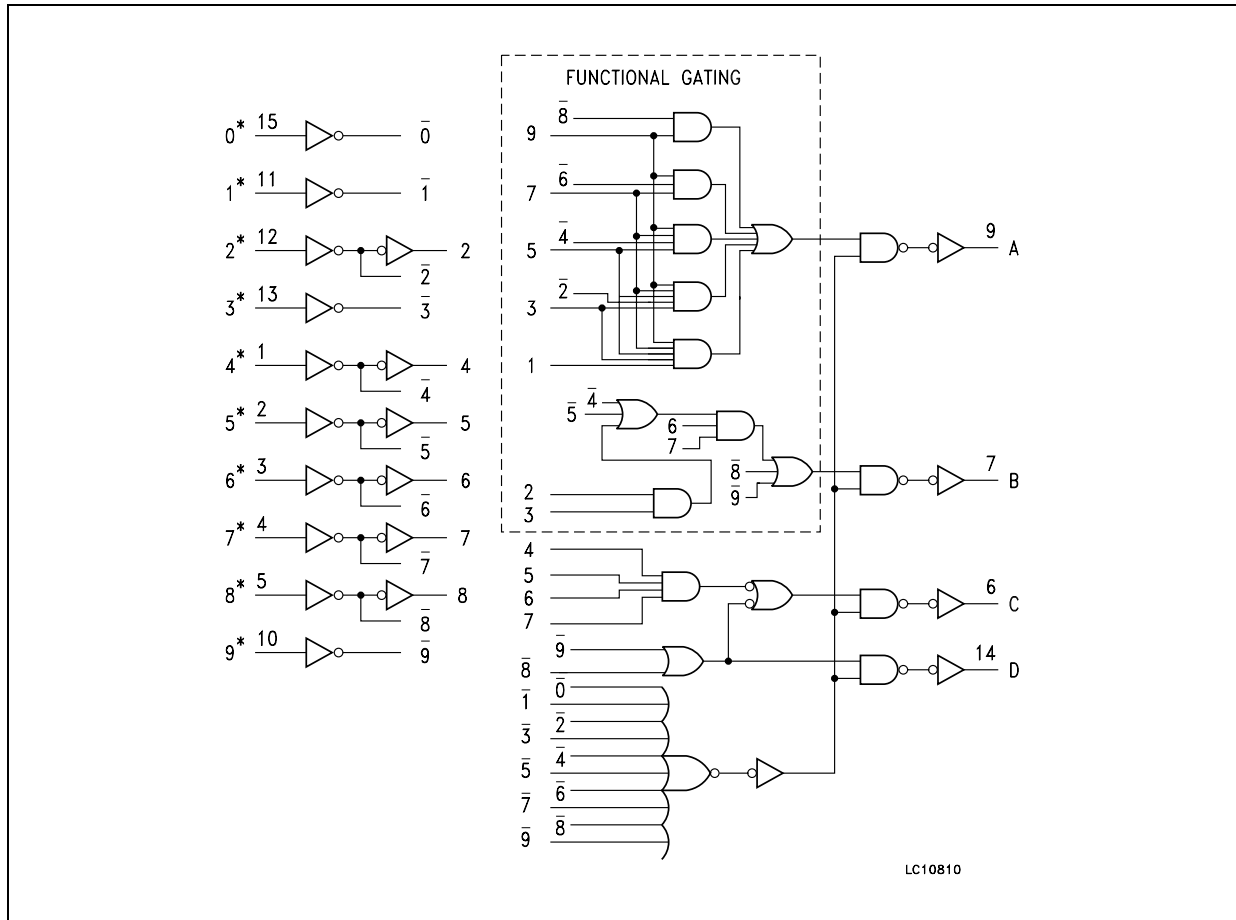
PIN No	SYMBOL	NAME AND FUNCTION
9, 7, 6, 14	A to D	BCD Address Outputs (Active LOW)
11, 12, 13, 1, 2, 3, 4, 5, 10	1 to 9	Decimal data Inputs (Active LOW)
15	0	Not Connected
8	V <sub>SS</sub>	Negative Supply Voltage
16	V <sub>DD</sub>	Positive Supply Voltage

TRUTH TABLE

INPUT										OUTPUTS			
0	1	2	3	4	5	6	7	8	9	D	C	B	A
L	L	L	L	L	L	L	L	L	L	H	H	H	H
H	L	L	L	L	L	L	L	L	L	L	L	L	L
X	H	L	L	L	L	L	L	L	L	L	L	L	H
X	X	H	L	L	L	L	L	L	L	L	L	H	L
X	X	X	H	L	L	L	L	L	L	L	L	H	H
X	X	X	X	H	L	L	L	L	L	L	H	L	L
X	X	X	X	X	H	L	L	L	L	L	H	L	H
X	X	X	X	X	X	H	L	L	L	L	H	H	L
X	X	X	X	X	X	X	H	L	L	L	H	H	H
X	X	X	X	X	X	X	X	H	L	H	L	L	L
X	X	X	X	X	X	X	X	X	H	H	L	L	H

X : Don't Care

LOGIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{DD}$	Supply Voltage	-0.5 to +22	V
$V_I$	DC Input Voltage	-0.5 to $V_{DD} + 0.5$	V
$I_I$	DC Input Current	$\pm 10$	mA
$P_D$	Power Dissipation per Package	200	mW
	Power Dissipation per Output Transistor	100	mW
$T_{op}$	Operating Temperature	-55 to +125	$^{\circ}C$
$T_{stg}$	Storage Temperature	-65 to +150	$^{\circ}C$

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

All voltage values are referred to  $V_{SS}$  pin voltage.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
$V_{DD}$	Supply Voltage	3 to 20	V
$V_I$	Input Voltage	0 to $V_{DD}$	V
$T_{op}$	Operating Temperature	-55 to 125	$^{\circ}C$

DC SPECIFICATIONS

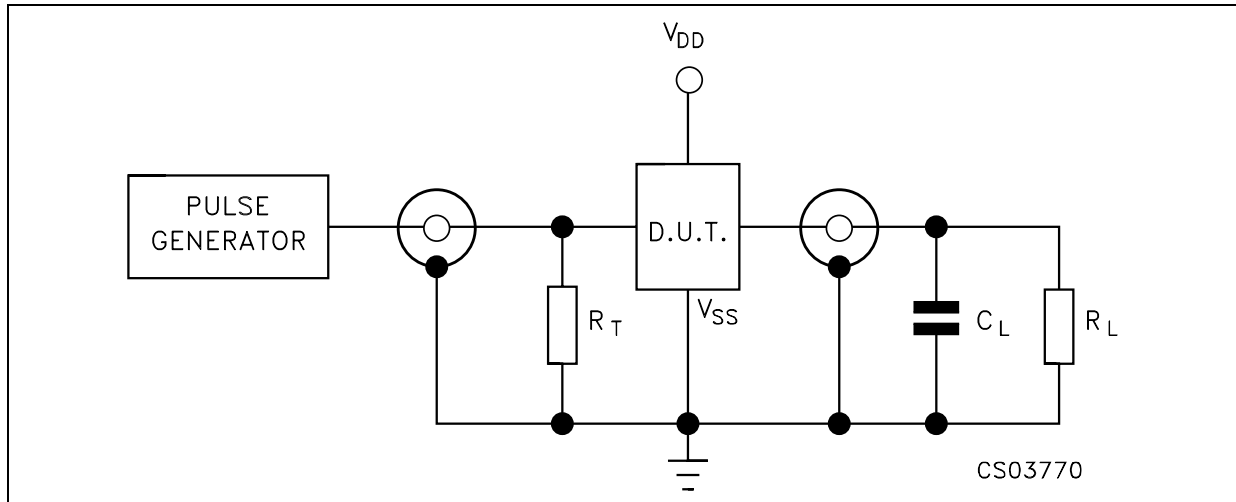
Symbol	Parameter	Test Condition				Value						Unit	
		V <sub>I</sub> (V)	V <sub>O</sub> (V)	I <sub>ol</sub>   ( $\mu$ A)	V <sub>DD</sub> (V)	T <sub>A</sub> = 25°C			-40 to 85°C		-55 to 125°C		
						Min.	Typ.	Max.	Min.	Max.	Min.		Max.
I <sub>L</sub>	Quiescent Current	0/5			5		0.04	5		150		150	$\mu$ A
		0/10			10		0.04	10		300		300	
		0/15			15		0.04	20		600		600	
		0/20			20		0.08	100		3000		3000	
V <sub>OH</sub>	High Level Output Voltage	0/5		<1	5	4.95			4.95		4.95		V
		0/10		<1	10	9.95			9.95		9.95		
		0/15		<1	15	14.95			14.95		14.95		
V <sub>OL</sub>	Low Level Output Voltage	5/0		<1	5		0.05			0.05		0.05	V
		10/0		<1	10		0.05			0.05		0.05	
		15/0		<1	15		0.05			0.05		0.05	
V <sub>IH</sub>	High Level Input Voltage		0.5/4.5	<1	5	3.5			3.5		3.5		V
			1/9	<1	10	7			7		7		
			1.5/13.5	<1	15	11			11		11		
V <sub>IL</sub>	Low Level Input Voltage		4.5/0.5	<1	5			1.5		1.5		1.5	V
			9/1	<1	10			3		3		3	
			13.5/1.5	<1	15			4		4		4	
I <sub>OH</sub>	Output Drive Current	0/5	2.5	<1	5	-1.36	-3.2		-1.1		-1.1		mA
		0/5	4.6	<1	5	-0.44	-1		-0.36		-0.36		
		0/10	9.5	<1	10	-1.1	-2.6		-0.9		-0.9		
		0/15	13.5	<1	15	-3.0	-6.8		-2.4		-2.4		
I <sub>OL</sub>	Output Sink Current	0/5	0.4	<1	5	0.44	1		0.36		0.36		mA
		0/10	0.5	<1	10	1.1	2.6		0.9		0.9		
		0/15	1.5	<1	15	3.0	6.8		2.4		2.4		
I <sub>I</sub>	Input Leakage Current	0/18	Any Input		18		$\pm 10^{-5}$	$\pm 0.1$		$\pm 1$		$\pm 1$	$\mu$ A
C <sub>I</sub>	Input Capacitance		Any Input				5	7.5					pF

The Noise Margin for both "1" and "0" level is: 1V min. with V<sub>DD</sub>=5V, 2V min. with V<sub>DD</sub>=10V, 2.5V min. with V<sub>DD</sub>=15V

DYNAMIC ELECTRICAL CHARACTERISTICS (T<sub>amb</sub> = 25°C, C<sub>L</sub> = 50pF, R<sub>L</sub> = 200K $\Omega$ , t<sub>r</sub> = t<sub>f</sub> = 20 ns)

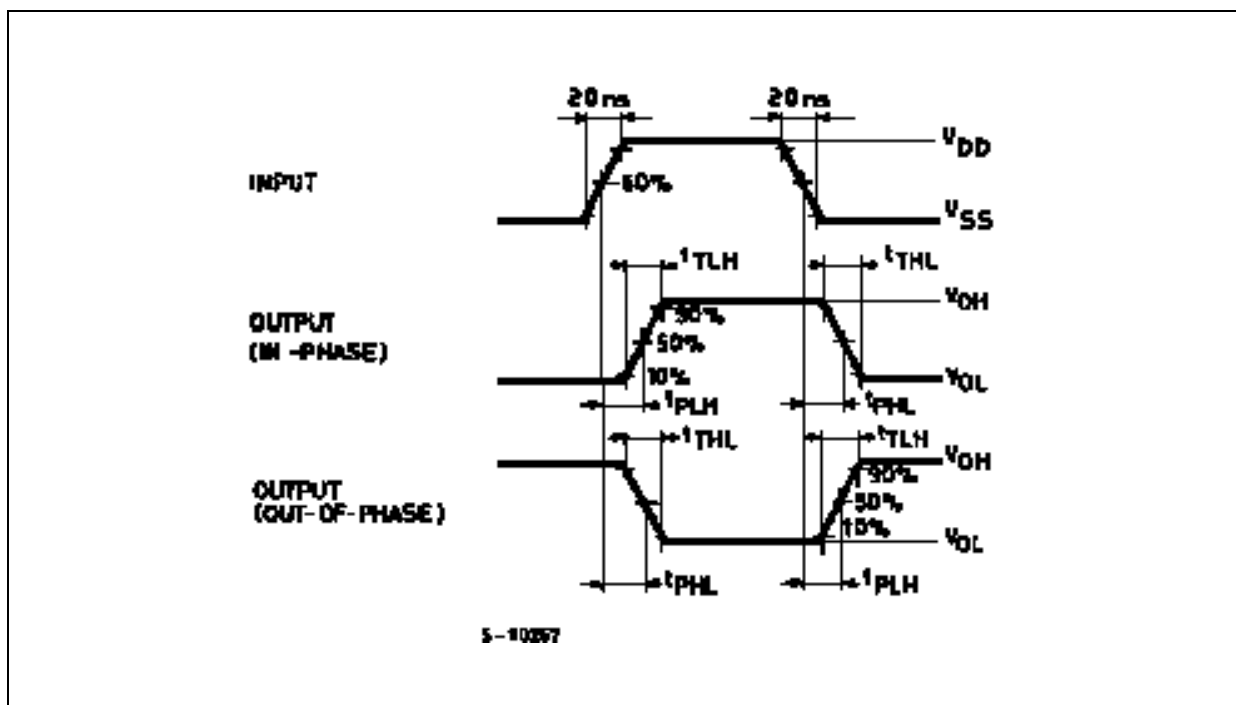
Symbol	Parameter	Test Condition		Value (*)			Unit
		V <sub>DD</sub> (V)		Min.	Typ.	Max.	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time In Phase Output	5			450	900	ns
		10			200	400	
		15			150	300	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time Out Phase Output	5			425	850	ns
		10			175	350	
		15			125	250	
t <sub>TLH</sub> t <sub>THL</sub>	Transition Time	5			100	200	ns
		10			50	100	
		15			40	80	
C <sub>I</sub>	Input Capacitance				5	7.5	pF

TEST CIRCUIT



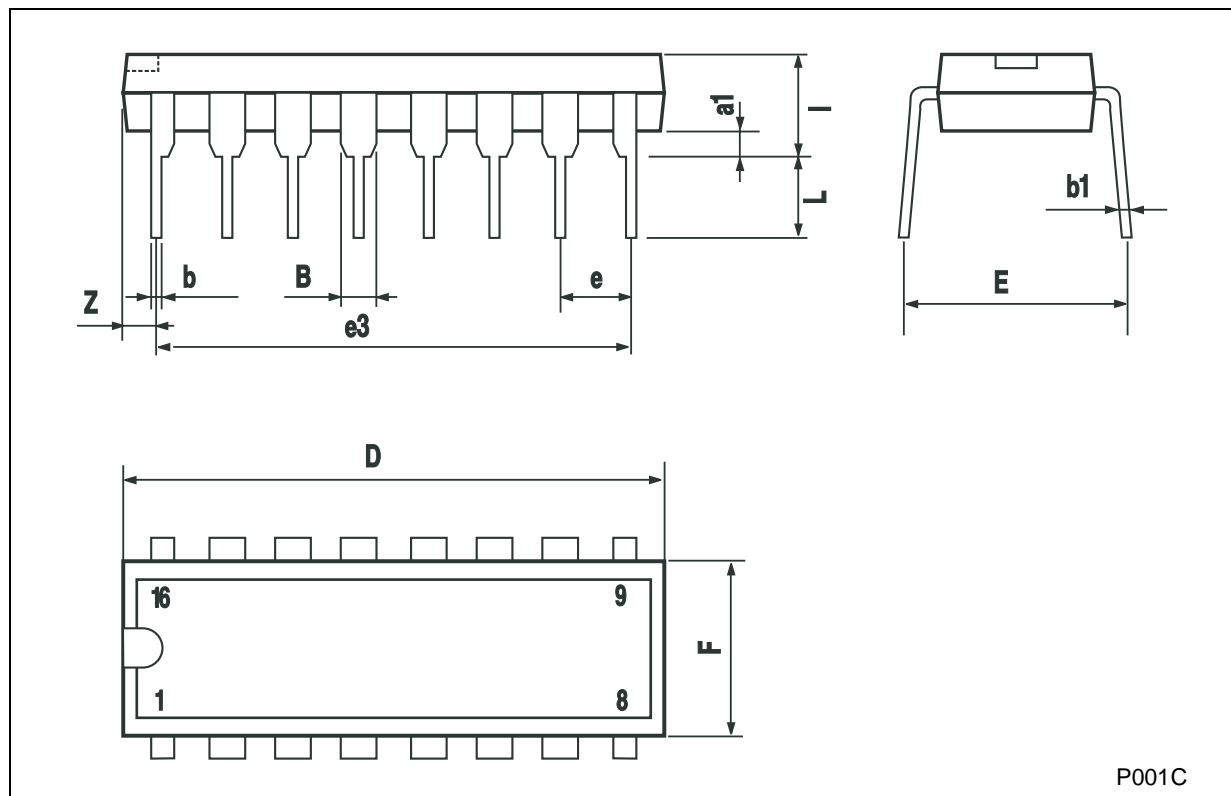
$C_L = 50\text{pF}$  or equivalent (includes jig and probe capacitance)  
 $R_L = 200\text{K}\Omega$   
 $R_T = Z_{OUT}$  of pulse generator (typically  $50\Omega$ )

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



**Plastic DIP-16 (0.25) MECHANICAL DATA**

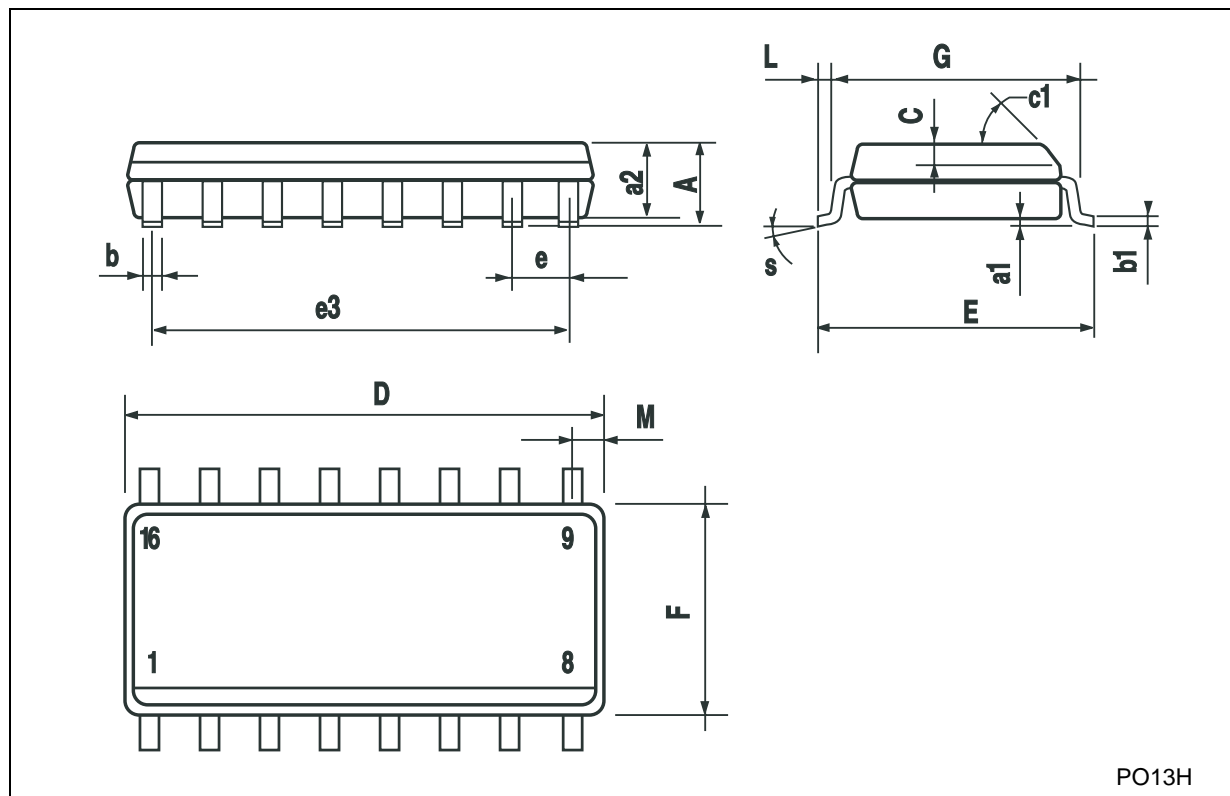
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



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.)					



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