

## 3 TO 8 LINE DECODER (INVERTING)

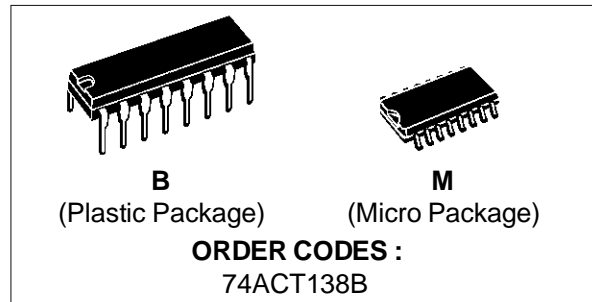
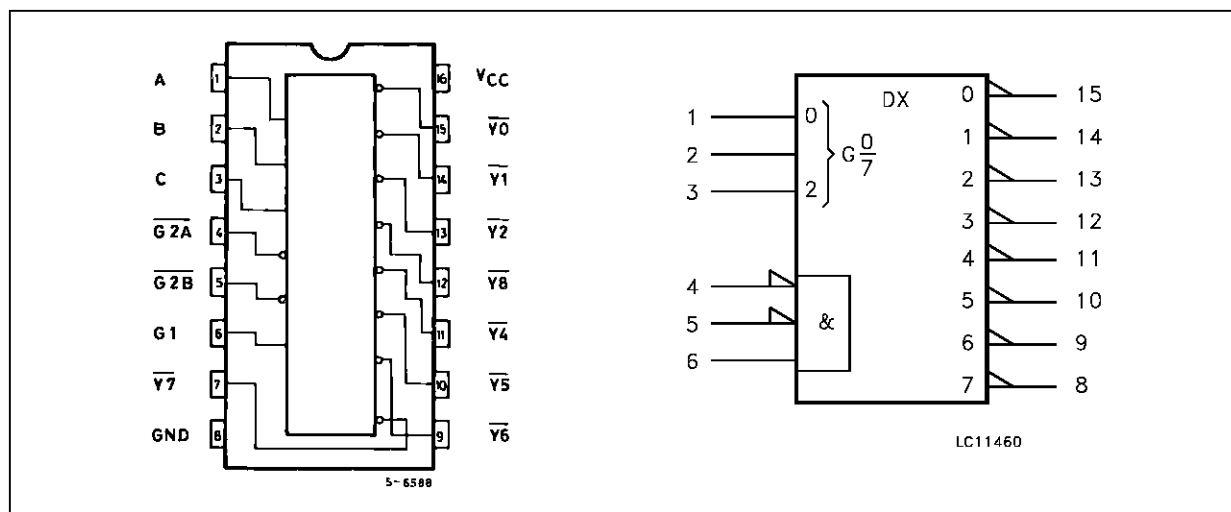
- HIGH SPEED:  $t_{PD} = 5 \text{ ns}$  (TYP.) at  $V_{CC} = 5V$
- LOW POWER DISSIPATION:  
 $I_{CC} = 8 \mu A$  (MAX.) at  $T_A = 25^\circ C$
- COMPATIBLE WITH TTL OUTPUTS  
 $V_{IH} = 2V$  (MIN),  $V_{IL} = 0.8V$  (MAX)
- $50\Omega$  TRANSMISSION LINE DRIVING CAPABILITY
- SYMMETRICAL OUTPUT IMPEDANCE:  
 $|I_{OH}| = I_{OL} = 24 \text{ mA}$  (MIN)
- BALANCED PROPAGATION DELAYS:  
 $t_{PLH} \cong t_{PHL}$
- OPERATING VOLTAGE RANGE:  
 $V_{CC}$  (OPR) = 4.5V to 5.5V
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 138
- IMPROVED LATCH-UP IMMUNITY

### DESCRIPTION

The ACT138 is an advanced high-speed CMOS 3 TO 8 LINE DECODER (INVERTING) fabricated with sub-micron silicon gate and double-layer metal wiring C<sup>2</sup>MOS technology.

If the device is enabled, 3 binary select inputs (A, B and C) determine which one of the outputs will go low. If enable input G1 is held low or either G2A or G2B is held high, the decoding function is inhibited and all the 8 outputs go to high.

### PIN CONNECTION AND IEC LOGIC SYMBOLS



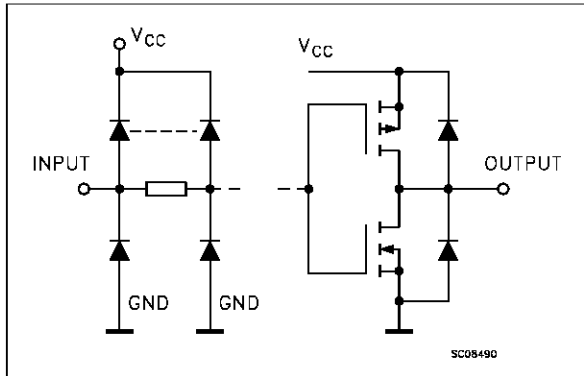
Three enable inputs are provided to ease cascade connection and application of address decoders for memory systems.

It is ideal for low power applications maintaining high speed operation similar to equivalent Bipolar Schottky TTL.

The device is designed to interface directly High Speed CMOS systems with TTL, NMOS and CMOS output voltage levels.

All inputs and outputs are equipped with protection circuits against static discharge, giving them 2KV ESD immunity and transient excess voltage.

INPUT AND OUTPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

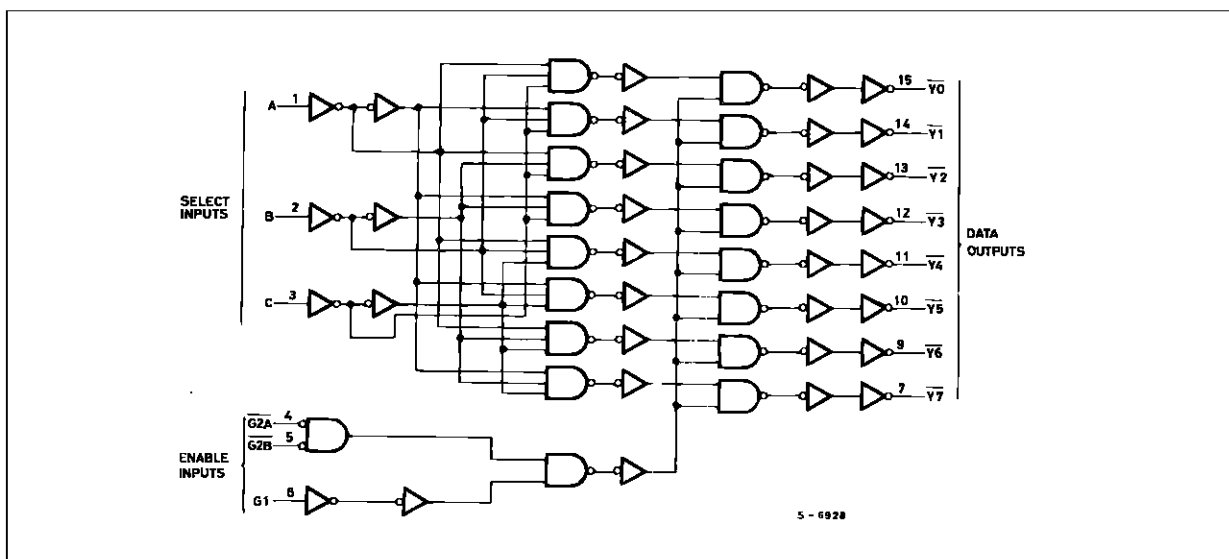
PIN No	SYMBOL	NAME AND FUNCTION
1, 2, 3	A, B, C	Address Inputs
4, 5	$\overline{G2A}$ , $\overline{G2B}$	Enable Inputs
6	$\overline{G1}$	Enable Input
15, 14, 13, 12, 11, 10, 9, 7	$\overline{Y0}$ to $\overline{Y7}$	Outputs
8	GND	Ground (0V)
16	V <sub>CC</sub>	Positive Supply Voltage

TRUTH TABLE

INPUTS						OUTPUTS							
ENABLE			SELECT			$\overline{Y0}$	$\overline{Y1}$	$\overline{Y2}$	$\overline{Y3}$	$\overline{Y4}$	$\overline{Y5}$	$\overline{Y6}$	$\overline{Y7}$
$\overline{G2B}$	$\overline{G2A}$	G1	C	B	A								
X	X	L	X	X	X	H	H	H	H	H	H	H	H
X	H	X	X	X	X	H	H	H	H	H	H	H	H
H	X	X	X	X	X	H	H	H	H	H	H	H	H
L	L	H	L	L	L	L	H	H	H	H	H	H	H
L	L	H	L	L	H	H	L	H	H	H	H	H	H
L	L	H	L	H	L	H	H	L	H	H	H	H	H
L	L	H	L	H	H	H	H	H	L	H	H	H	H
L	L	H	H	L	L	H	H	H	H	L	H	H	H
L	L	H	H	L	H	H	H	H	H	H	L	H	H
L	L	H	H	H	L	H	H	H	H	H	H	L	H
L	L	H	H	H	H	H	H	H	H	H	H	H	L

X: Dont Care

LOGIC DIAGRAMS



This logic diagram has not been used to estimate propagation delays

**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage	-0.5 to +7	V
V <sub>I</sub>	DC Input Voltage	-0.5 to V <sub>CC</sub> + 0.5	V
V <sub>O</sub>	DC Output Voltage	-0.5 to V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	DC Input Diode Current	± 20	mA
I <sub>OK</sub>	DC Output Diode Current	± 20	mA
I <sub>O</sub>	DC Output Current	± 50	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC V <sub>CC</sub> or Ground Current	± 400	mA
T <sub>stg</sub>	Storage Temperature	-65 to +150	°C
T <sub>L</sub>	Lead Temperature (10 sec)	300	°C

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

**RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage	4.5 to 5.5	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:	-40 to +85	°C
dt/dv	Input Rise and Fall Time V <sub>CC</sub> = 4.5 to 5.5V (note 1)	8	ns/V

1) V<sub>IN</sub> from 0.8 V to 2.0 V

DC SPECIFICATIONS

Symbol	Parameter	Test Conditions		Value					Unit	
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25 °C			-40 to 85 °C			
				Min.	Typ.	Max.	Min.	Max.		
V <sub>IH</sub>	High Level Input Voltage	4.5	V <sub>O</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V	2.0	1.5		2.0		V	
		5.5		2.0	1.5		2.0			
V <sub>IL</sub>	Low Level Input Voltage	4.5	V <sub>O</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V		1.5	0.8		0.8	V	
		5.5			1.5	0.8		0.8		
V <sub>OH</sub>	High Level Output Voltage	4.5	V <sub>I</sub> <sup>(*)</sup> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>O</sub> = -50 μA	4.4	4.49		4.4	V	
		5.5			5.4	5.49		5.4		
		4.5		I <sub>O</sub> = -24 mA	3.86			3.76		
		5.5			4.86			4.76		
V <sub>OL</sub>	Low Level Output Voltage	4.5	V <sub>I</sub> <sup>(*)</sup> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>O</sub> = 50 μA		0.001	0.1		0.1	V
		5.5				0.001	0.1		0.1	
		4.5		I <sub>O</sub> = 24 mA			0.36		0.44	
		5.5					0.36		0.44	
I <sub>I</sub>	Input Leakage Current	5.5	V <sub>I</sub> = V <sub>CC</sub> or GND			±0.1		±1	μA	
I <sub>CCT</sub>	Max I <sub>CC</sub> /Input	5.5	V <sub>I</sub> = V <sub>CC</sub> -2.1 V		0.6			1.5	mA	
I <sub>CC</sub>	Quiescent Supply Current	5.5	V <sub>I</sub> = V <sub>CC</sub> or GND			8		80	μA	
I <sub>OLD</sub>	Dynamic Output Current (note 1, 2)	5.5	V <sub>OLD</sub> = 1.65 V max					75	mA	
I <sub>OHD</sub>			V <sub>OHD</sub> = 3.85 V min					-75	mA	

- 1) Maximum test duration 2ms, one output loaded at time
- 2) Incident wave switching is guaranteed on transmission lines with impedances as low as 50 Ω.
- (\*) All outputs loaded.

AC ELECTRICAL CHARACTERISTICS (C<sub>L</sub> = 50 pF, R<sub>L</sub> = 500 Ω, Input t<sub>r</sub> = t<sub>f</sub> = 3 ns)

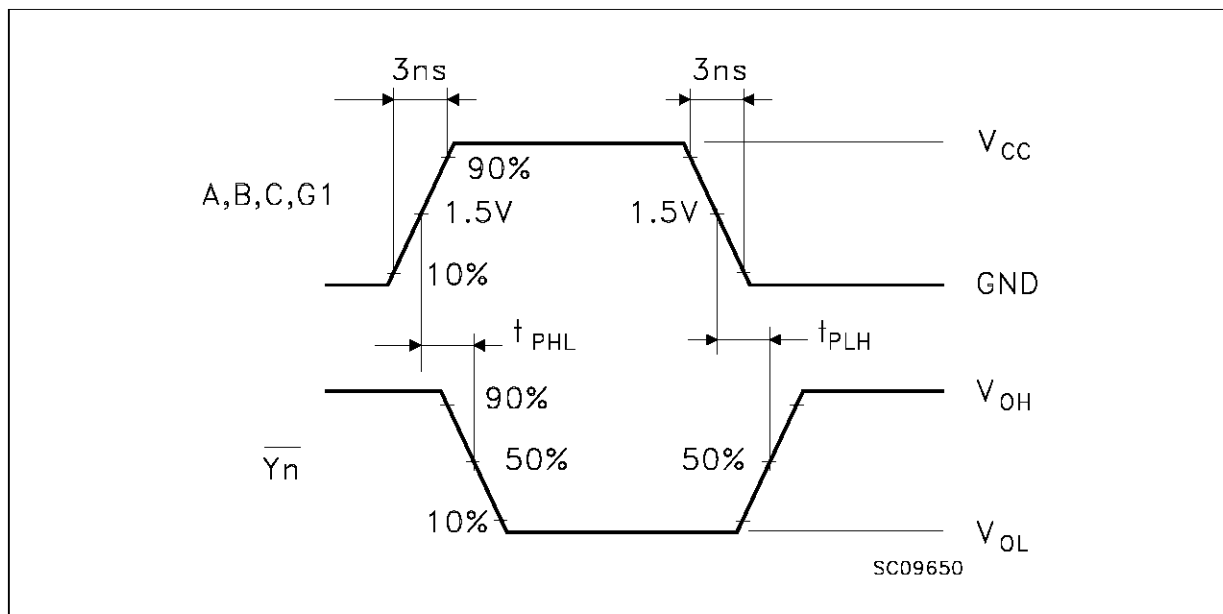
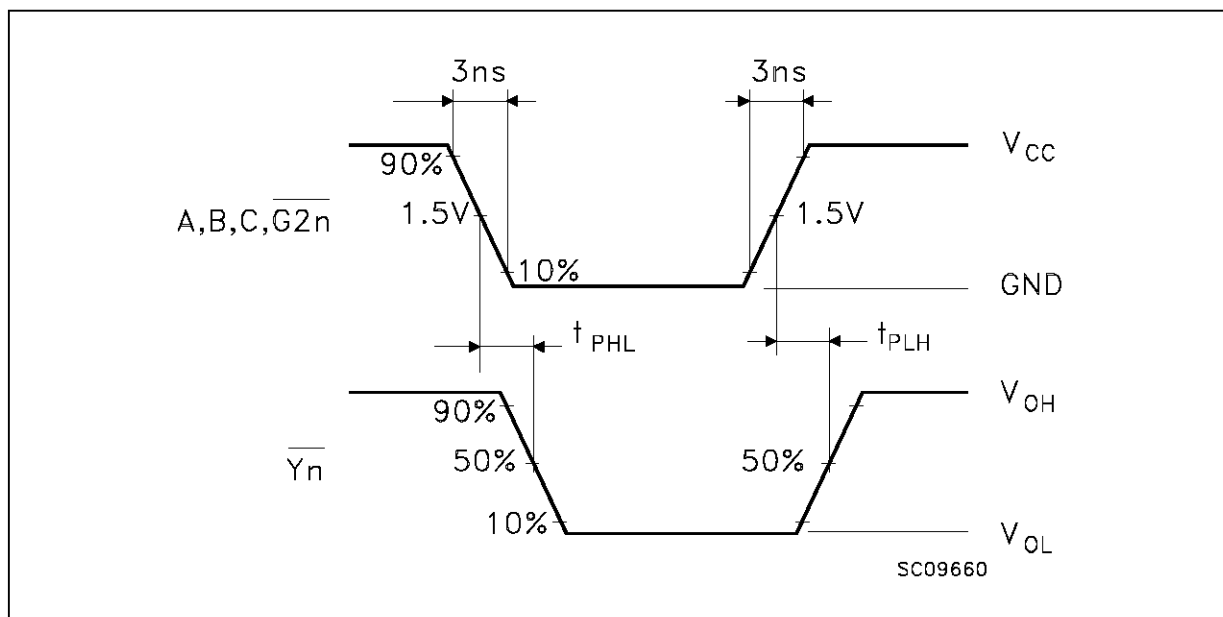
Symbol	Parameter	Test Condition		Value					Unit
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25 °C			-40 to 85 °C		
				Min.	Typ.	Max.	Min.	Max.	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time A, B, C to Y	5.0 <sup>(*)</sup>			5.0	10.0		11.0	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time G1 to Y	5.0 <sup>(*)</sup>			5.0	10.0		11.0	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time G2A or G2B to Y	5.0 <sup>(*)</sup>			5.5	10.0		11.0	ns

(\*) Voltage range is 5V ± 0.5V

CAPACITIVE CHARACTERISTICS

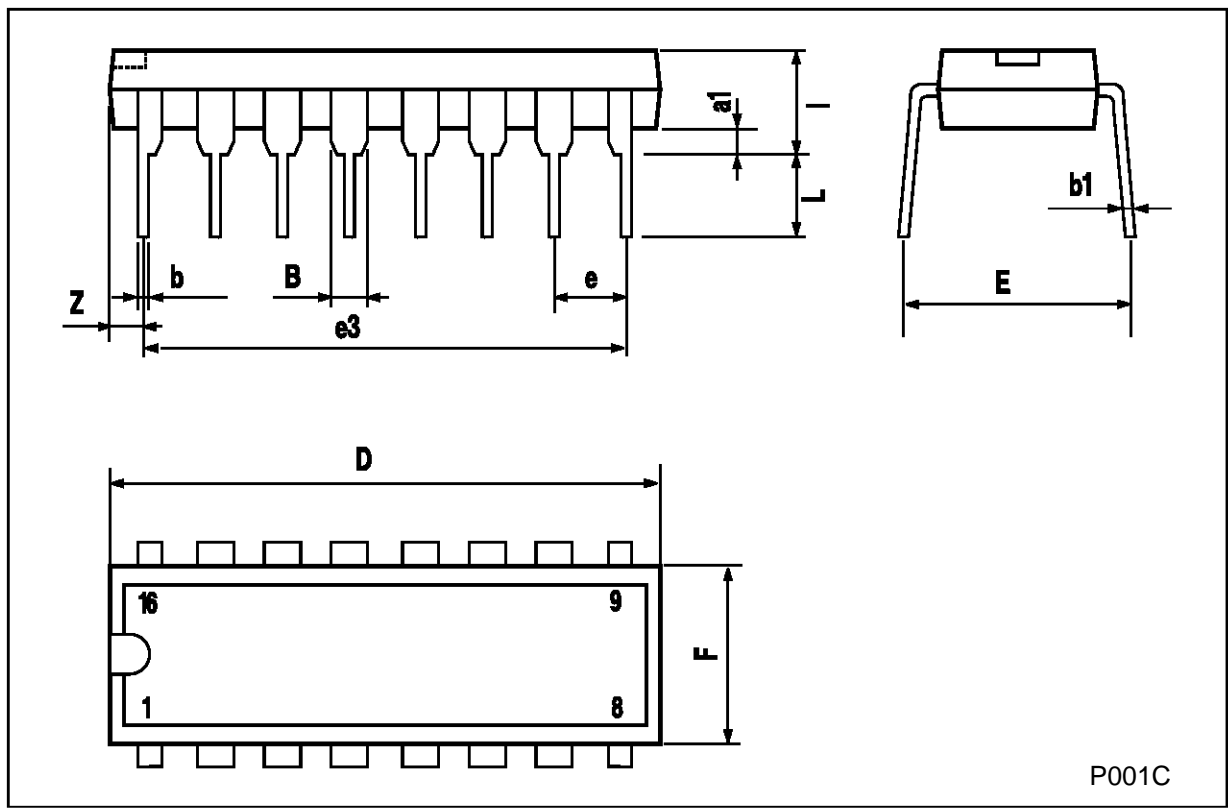
Symbol	Parameter	Test Conditions		Value					Unit
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25 °C			-40 to 85 °C		
				Min.	Typ.	Max.	Min.	Max.	
C <sub>IN</sub>	Input Capacitance	5.0			4				pF
C <sub>PD</sub>	Power Dissipation Capacitance (note 1)	5.0			25				pF

1) C<sub>PD</sub> 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<sub>CC(oper)</sub> = C<sub>PD</sub> • V<sub>CC</sub> • f<sub>IN</sub> + I<sub>CC</sub>/n (per circuit)

**WAVEFORM 1: PROPAGATION DELAYS FOR INVERTING OUTPUTS** ( $f=1\text{MHz}$ ; 50% duty cycle)**WAVEFORM 2: PROPAGATION DELAYS FOR NON-INVERTING OUTPUTS** ( $f=1\text{MHz}$ ; 50% duty cycle)

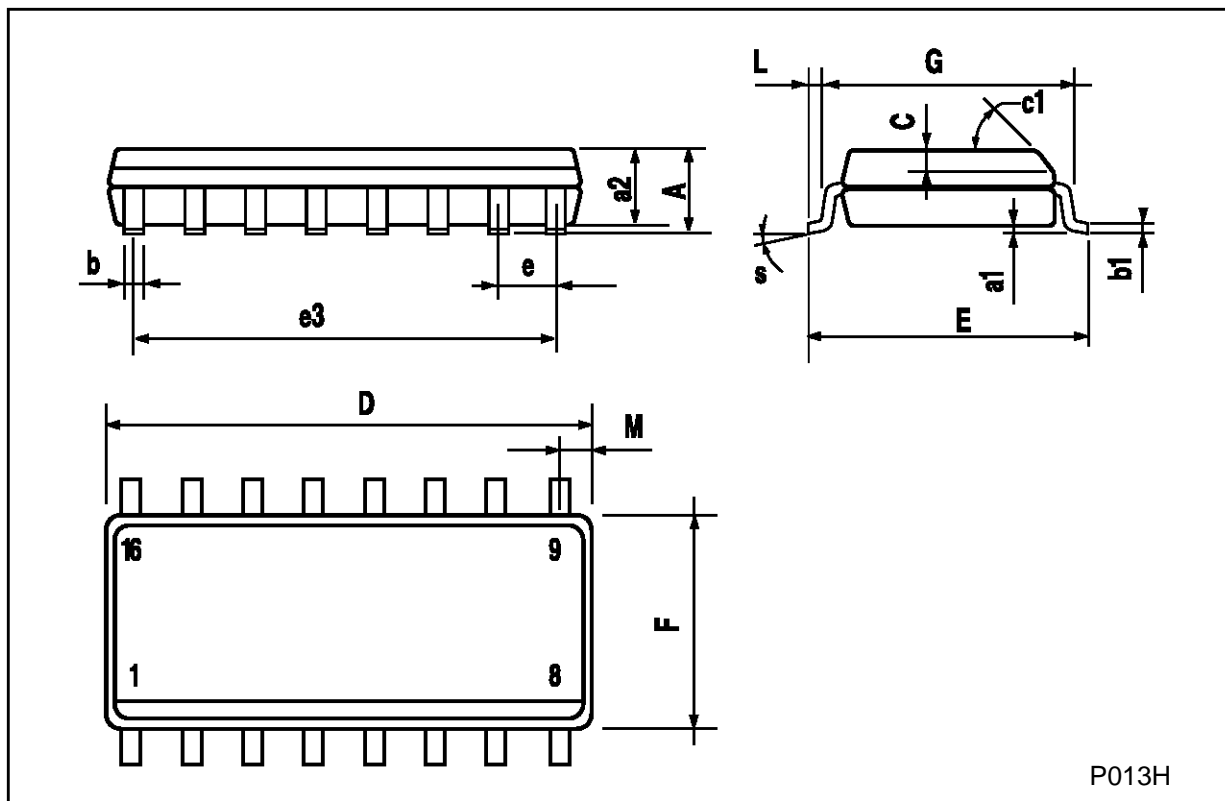
**Plastic DIP16 (0.25) MECHANICAL DATA**

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
l			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



## SO16 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.004		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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