

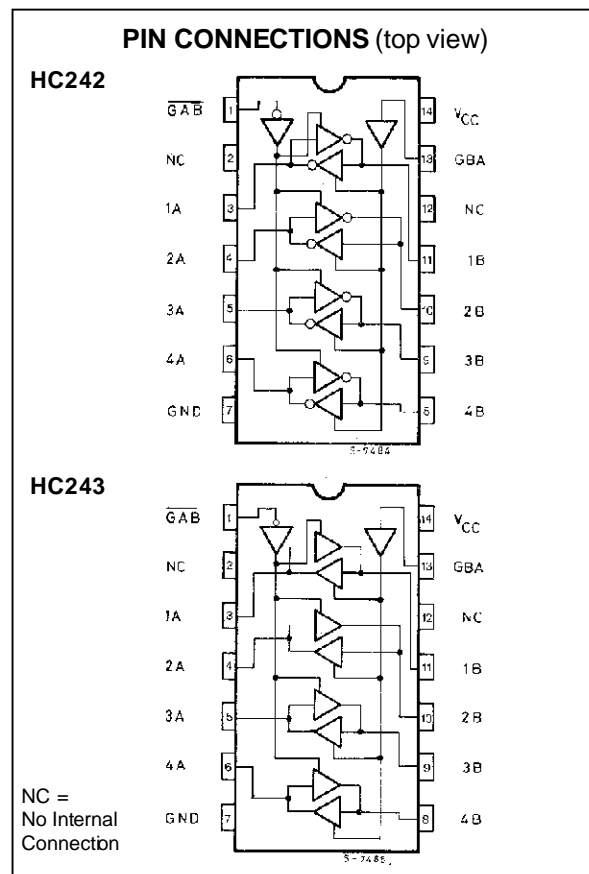
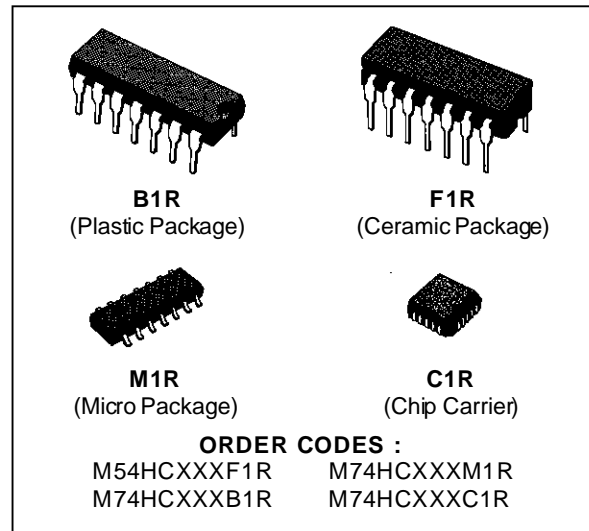
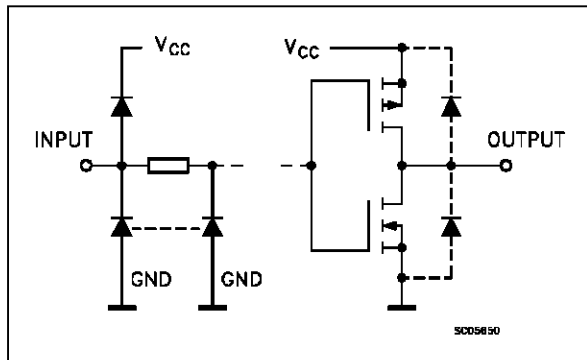
## QUAD BUS TRANSCEIVER (3-STATE)

- HIGH SPEED  
 $t_{PD} = 9 \text{ ns}$  (TYP.) AT  $V_{CC} = 5 \text{ V}$
- LOW POWER DISSIPATION  
 $I_{CC} = 4 \mu\text{A}$  (MAX.) AT  $25^\circ\text{C}$
- OUTPUT DRIVE CAPABILITY  
 15 LSTTL LOADS
- BALANCED PROPAGATION DELAYS  
 $t_{PLH} = t_{PHL}$
- SYMMETRICAL OUTPUT IMPEDANCE  
 $I_{OL} = |I_{OH}| = 6 \text{ mA}$  (MIN.)
- HIGH NOISE IMMUNITY  
 $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (MIN.)
- WIDE OPERATING VOLTAGE RANGE  
 $V_{CC}$  (OPR) = 2 V TO 6 V
- PIN AND FUNCTION COMPATIBLE  
 WITH 54/74LS242/243

### DESCRIPTION

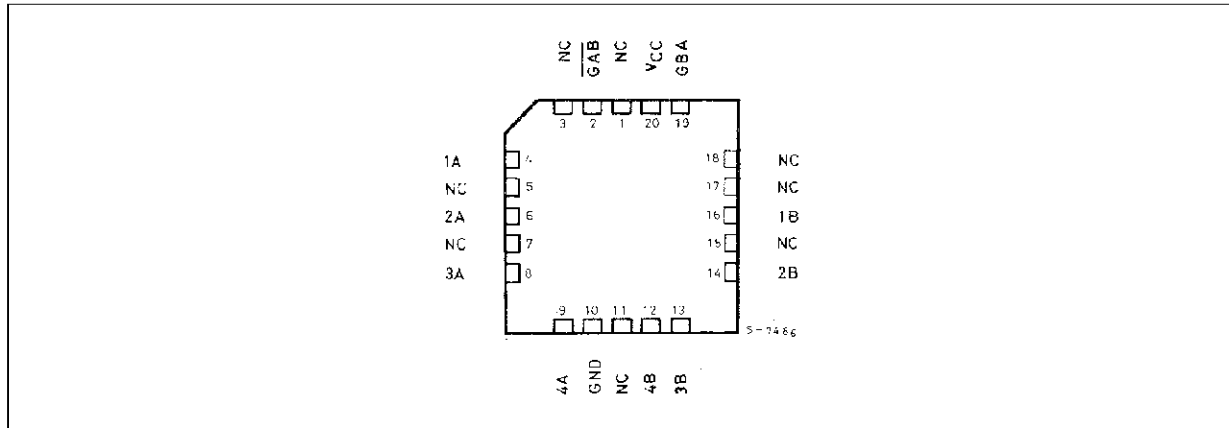
The M54/74HC242/243 are high speed CMOS QUAD BUS TRANSCEIVER (3-STATE) FABRICATED IN SILICON GATE C<sup>2</sup>MOS technology. They have the same high speed performance of LSTTL combined with true CMOS low power consumption. The HC242/243 are 3 STATE bi-directional inverting and non-inverting buffers and are intended for two-way asynchronous communication between data buses. They are high drive current outputs which enable high speed operation when driving large bus capacitances. Each device has one active high enable (GBA), and one active low enable ( $\overline{\text{GAB}}$ ). GBA enables the A outputs and  $\overline{\text{GAB}}$  enables the B outputs. All inputs are equipped with protection circuits against static discharge and transient excess voltage.

### INPUT AND OUTPUT EQUIVALENT CIRCUIT



# M54/M74HC242/243

## CHIP CARRIER



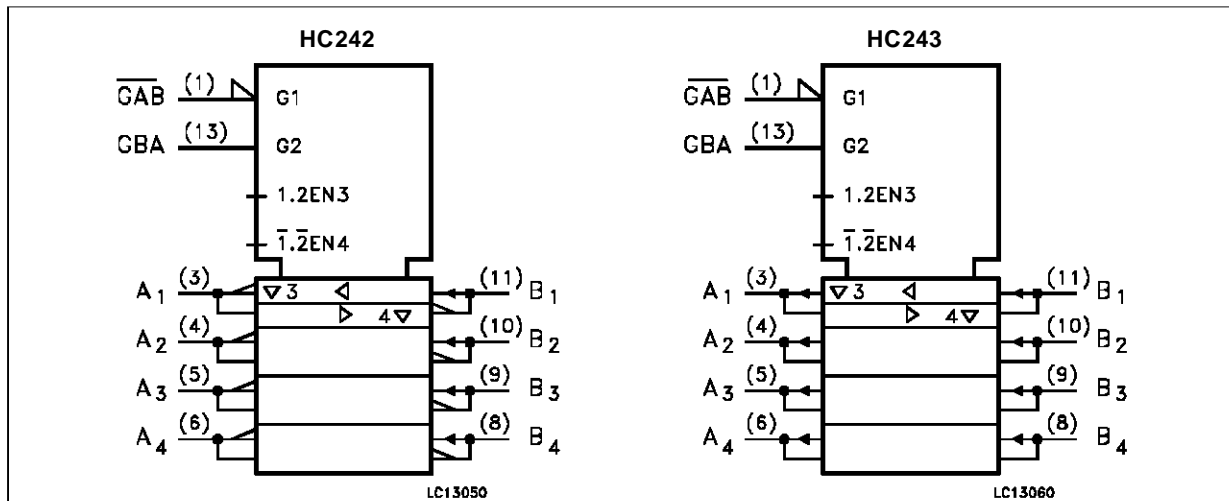
## TRUTH TABLE

INPUTS		FUNCTION		OUTPUTS	
$\overline{\text{GAB}}$	GBA	A BUS	B BUS	HC242	HC243
H	H	OUTPUT	INPUT	$A = \overline{B}$	$A = B$
L	L	INPUT	OUTPUT	$B = \overline{A}$	$B = A$
H	L	HIGH IMPEDANCE		Z	Z
L	H	HIGH IMPEDANCE		Z	Z

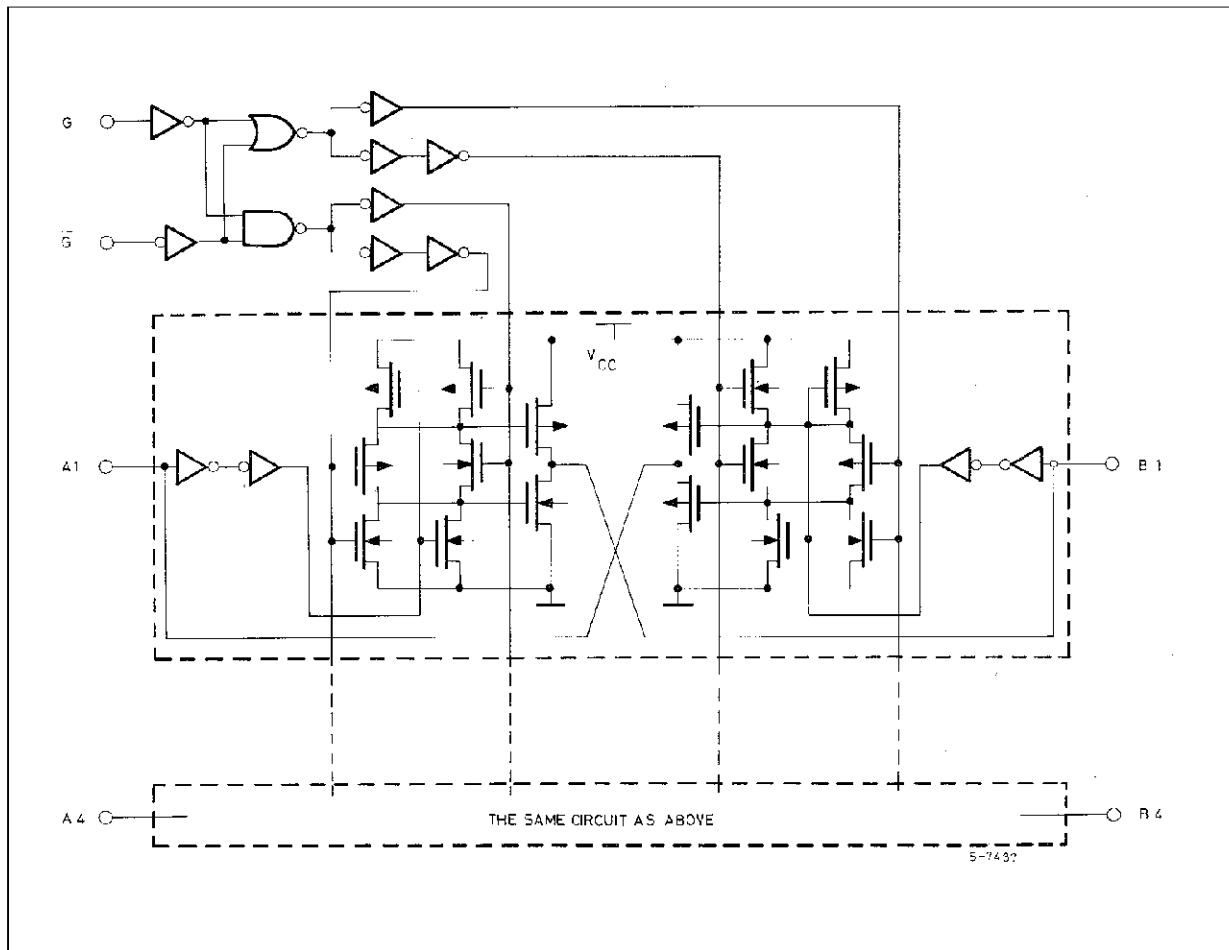
## PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1	$\overline{\text{GAB}}$	Output Enable Input (active LOW)
2, 12	NC	Not connected
3, 4, 5, 6	1A to 4A	Data Inputs/Outputs
11, 10, 9, 8	1B to 4B	Data Inputs/Outputs
13	GBA	Output Enable Input
7	GND	Ground (0V)
14	VCC	Positive Supply Voltage

## IEC LOGIC SYMBOLS



**CIRCUIT DIAGRAM**



**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 Source Sink Current Per Output Pin	± 35	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC V <sub>CC</sub> or Ground Current	± 70	mA
P <sub>D</sub>	Power Dissipation	500 (*)	mW
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.  
 (\*) 500 mW: ≡ 65 °C derate to 300 mW by 10mW/°C: 65 °C to 85 °C

**RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Value	Unit	
V <sub>CC</sub>	Supply Voltage	2 to 6	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: <b>M54HC Series</b> <b>M74HC Series</b>	-55 to +125 -40 to +85	°C °C	
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time	V <sub>CC</sub> = 2 V	0 to 1000	ns
		V <sub>CC</sub> = 4.5 V	0 to 500	
		V <sub>CC</sub> = 6 V	0 to 400	

**DC SPECIFICATIONS**

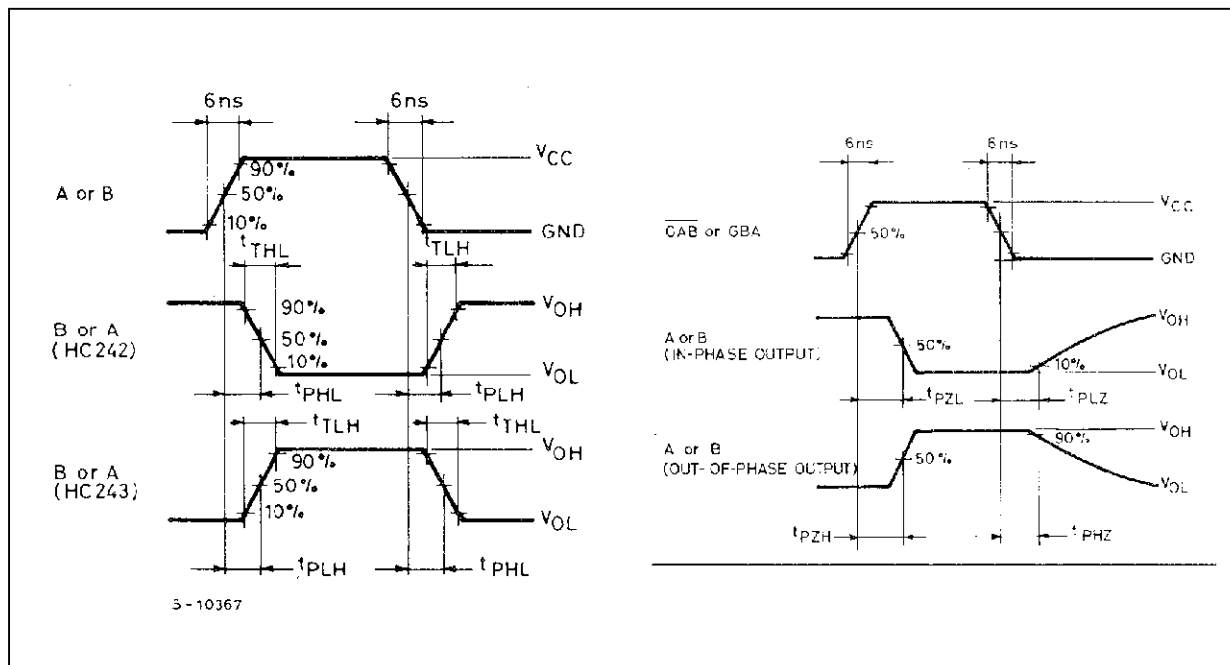
Symbol	Parameter	Test Conditions		Value						Unit		
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25 °C 54HC and 74HC			-40 to 85 °C 74HC		-55 to 125 °C 54HC			
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.	
V <sub>IH</sub>	High Level Input Voltage	2.0		1.5			1.5		1.5		V	
		4.5		3.15			3.15		3.15			
		6.0		4.2			4.2		4.2			
V <sub>IL</sub>	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 <sub>OH</sub>	High Level Output Voltage	2.0	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>O</sub> = -20 μA	1.9	2.0		1.9		1.9	V	
		4.5			4.4	4.5		4.4		4.4		
		6.0			5.9	6.0		5.9		5.9		
		4.5	I <sub>O</sub> = -6.0 mA	4.18	4.31		4.13		4.10			
		6.0		I <sub>O</sub> = -7.8 mA	5.68	5.8		5.63		5.60		
V <sub>OL</sub>	Low Level Output Voltage	2.0	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>O</sub> = 20 μA		0.0	0.1		0.1		0.1	V
		4.5				0.0	0.1		0.1		0.1	
		6.0				0.0	0.1		0.1		0.1	
		4.5		I <sub>O</sub> = 6.0 mA		0.17	0.26		0.33		0.40	
		6.0			I <sub>O</sub> = 7.8 mA		0.18	0.26		0.33		
I <sub>I</sub>	Input Leakage Current	6.0	V <sub>I</sub> = V <sub>CC</sub> or GND			±0.1		±1		±1	μA	
I <sub>OZ</sub>	3 State Output Off-state Current	6.0	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> V <sub>O</sub> = V <sub>CC</sub> or GND			±0.5		±5		±10	μA	
I <sub>CC</sub>	Quiescent Supply Current	6.0	V <sub>I</sub> = V <sub>CC</sub> or GND			4		40		80	μA	

AC ELECTRICAL CHARACTERISTICS (Input  $t_r = t_f = 6$  ns)

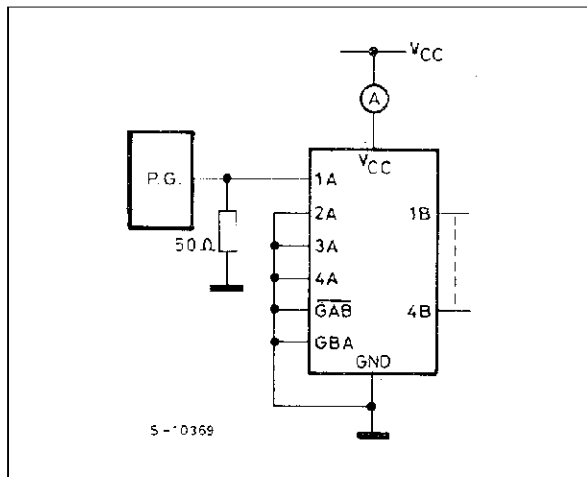
Symbol	Parameter	Test Conditions		Value						Unit		
		$V_{CC}$ (V)	$C_L$ (pF)	$T_A = 25\text{ }^\circ\text{C}$ 54HC and 74HC			$-40\text{ to }85\text{ }^\circ\text{C}$ 74HC		$-55\text{ to }125\text{ }^\circ\text{C}$ 54HC			
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.	
$t_{TLH}$ $t_{THL}$	Output Transition Time	2.0 4.5 6.0	50		25 7 6	60 12 10		75 15 13	90 18 15	ns		
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time	2.0 4.5 6.0	50		39 13 11	90 18 15		115 23 20	135 27 23	ns		
		2.0 4.5 6.0	150		51 17 14	145 29 25		180 36 31	220 44 37	ns		
$t_{PZL}$ $t_{PZH}$		3 State Output Enable Time	2.0 4.5 6.0	50	$R_L = 1\text{ K}\Omega$	57 18 15	145 29 25		180 36 31	220 44 37	ns	
			2.0 4.5 6.0	150	$R_L = 1\text{ K}\Omega$	70 22 19	175 35 30		220 44 37	265 53 45	ns	
$t_{PLZ}$ $t_{PHZ}$			3 State Output Disable Time	2.0 4.5 6.0	50	$R_L = 1\text{ K}\Omega$	45 20 17	150 30 26		190 38 32	225 45 38	ns
$C_{IN}$				Input Capacitance			5	10		10	10	pF
$C_{PD} (*)$	Power Dissipation Capacitance					for HC242 for HC243		30 35				pF

(\*)  $C_{PD}$  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.  $I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$

SWITCHING CHARACTERISTICS TEST WAVEFORM



TEST CIRCUIT  $I_{CC}$  (Opr.)



$C_{PD}$  CALCULATION

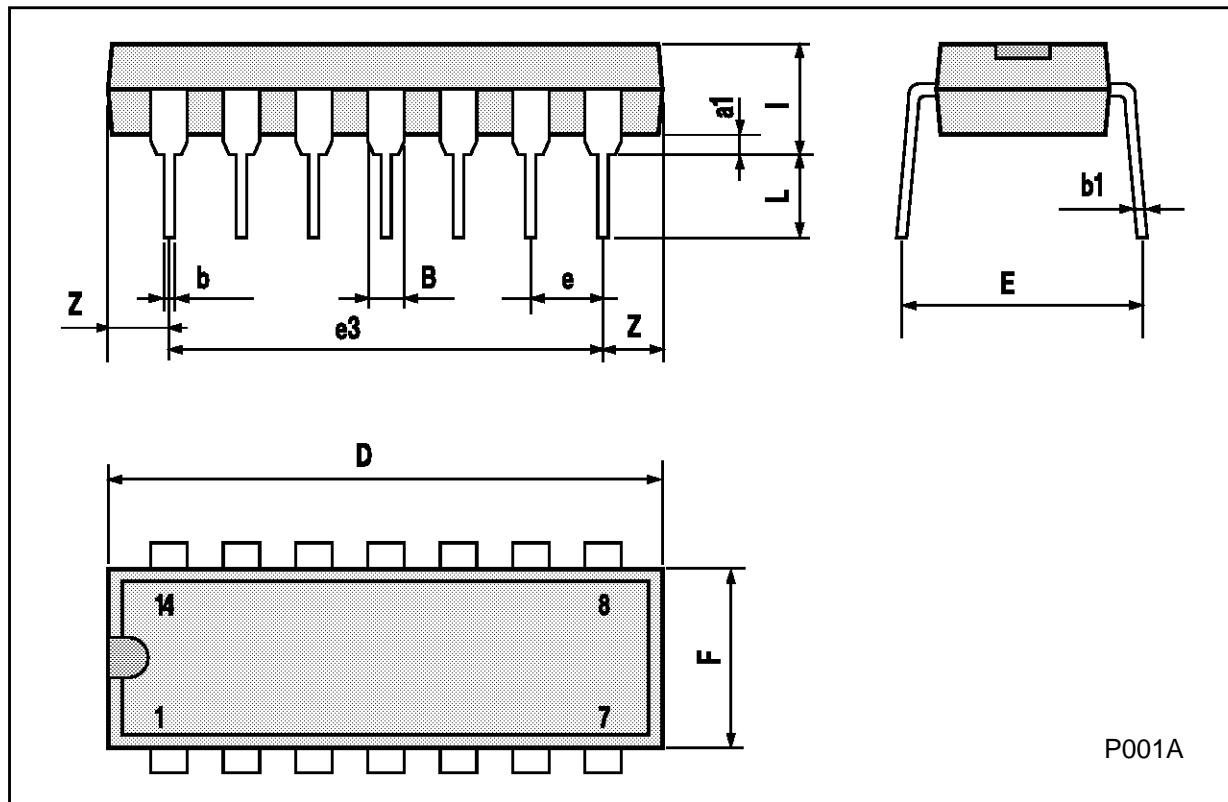
$C_{PD}$  is to be calculated with the following formula by using the measured value of  $I_{CC}$  (Opr.) in the test circuit opposite

$$C_{PD} = \frac{I_{CC} (Opr.)}{f_{IN} \times V_{CC}}$$

In determining the typical value of  $C_{PD}$ , a relatively high frequency of 1MHz was applied to  $f_{IN}$ , in order to eliminate any error caused by the quiescent supply current.

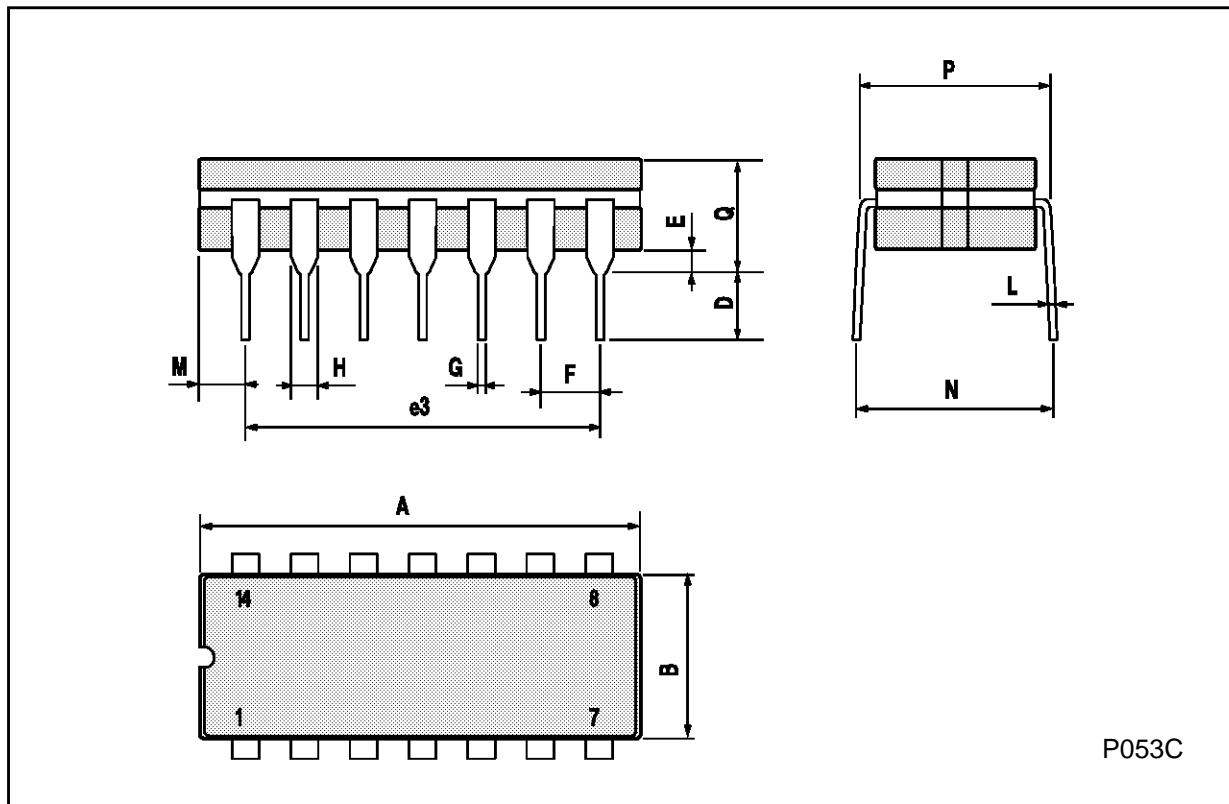
## Plastic DIP14 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	1.39		1.65	0.055		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		15.24			0.600	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100



**Ceramic DIP14/1 MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			20			0.787
B			7.0			0.276
D		3.3			0.130	
E	0.38			0.015		
e3		15.24			0.600	
F	2.29		2.79	0.090		0.110
G	0.4		0.55	0.016		0.022
H	1.17		1.52	0.046		0.060
L	0.22		0.31	0.009		0.012
M	1.52		2.54	0.060		0.100
N			10.3			0.406
P	7.8		8.05	0.307		0.317
Q			5.08			0.200

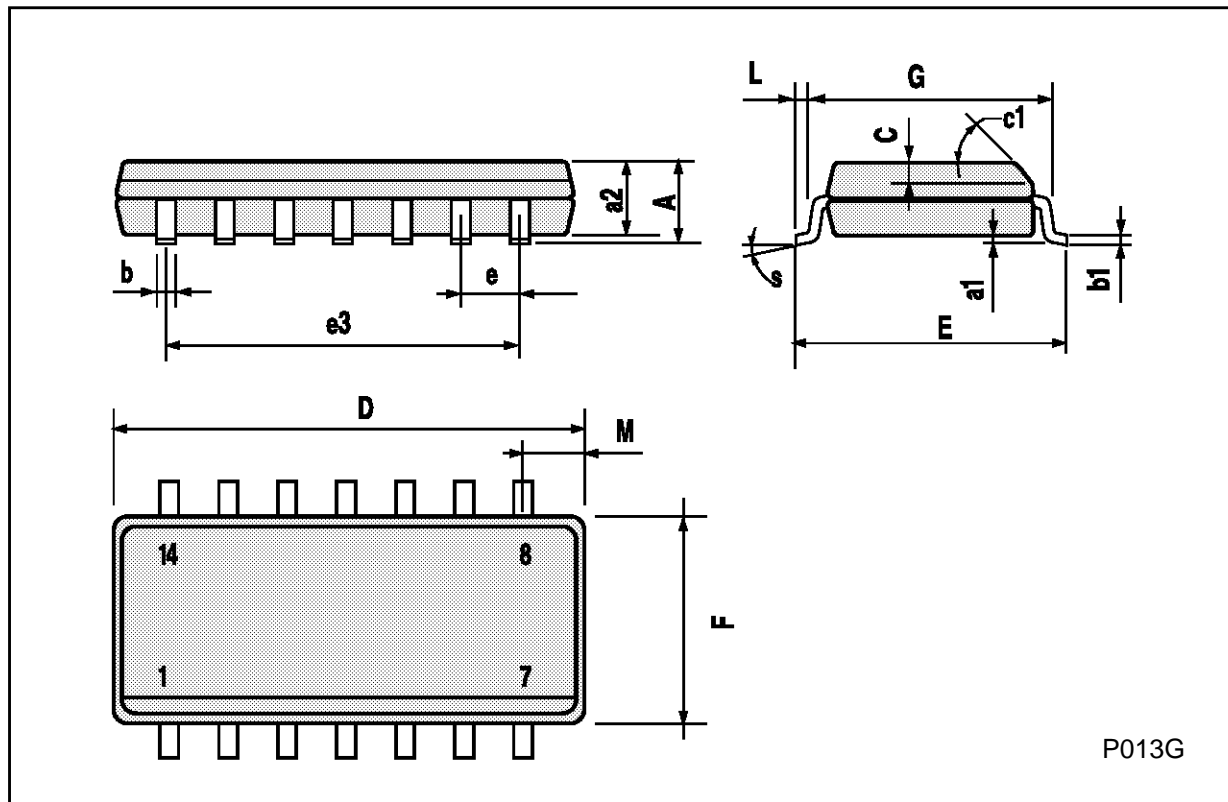


P053C



## SO14 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	8.55		8.75	0.336		0.344
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
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			0.68			0.026
S	8° (max.)					



**PLCC20 MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	9.78		10.03	0.385		0.395
B	8.89		9.04	0.350		0.356
D	4.2		4.57	0.165		0.180
d1		2.54			0.100	
d2		0.56			0.022	
E	7.37		8.38	0.290		0.330
e		1.27			0.050	
e3		5.08			0.200	
F		0.38			0.015	
G			0.101			0.004
M		1.27			0.050	
M1		1.14			0.045	



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