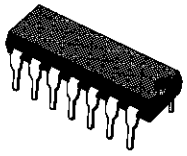
SGS-THOMSON MICROELECTRONICS

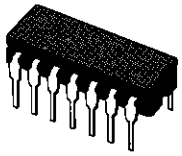
M54/74HC242
M54/74HC243

QUAD BUS TRANSCEIVER (3-STATE)

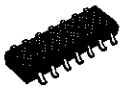
- HIGH SPEED
  t_{PD} = 9 ns (TYP.) AT V_{CC} = 5 V
- LOW POWER DISSIPATION
  I_{CC} = 4 µA (MAX.) AT 25 °C
- OUTPUT DRIVE CAPABILITY
  15 LSTTL LOADS
- BALANCED PROPAGATION DELAYS
  $t_{PLH} = t_{PHL}$
- SYMMETRICAL OUTPUT IMPEDANCE
  $I_{OL} = |I_{OH}| = 6$ mA (MIN.)
- HIGH NOISE IMMUNITY
  $V_{NIH}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



B1R
(Plastic Package)



F1R
(Ceramic Package)



M1R
(Micro Package)

C1R
(Chip Carrier)

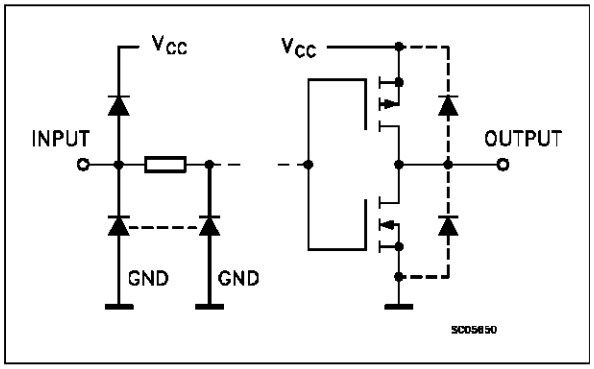
ORDER CODES :

M54HCXXXF1R	M74HCXXXM1R
M74HCXXXB1R	M74HCXXXC1R

DESCRIPTION

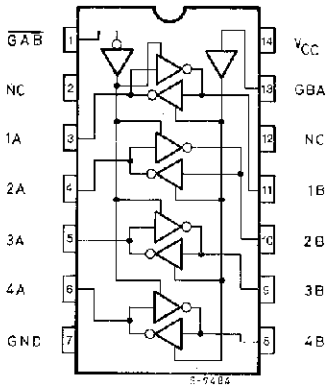
The M54/74HC242/243 are high speed CMOS QUAD BUS TRANSCEIVER (3-STATE) FABRICATED IN SILICON GATE C^2MOS technology. They have the same high speed performance of LSTTL combined with true CMOS low power consumption. The HC242/243 are 3 STATE bi-directional inverting and non-inverting buffers and are intended 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 ($\overline{GAB}$). GBA enables the A outputs and $\overline{GAB}$ enables the B outputs. All inputs are equipped with protection circuits against static discharge and transient excess voltage.

INPUT AND OUTPUT EQUIVALENT CIRCUIT

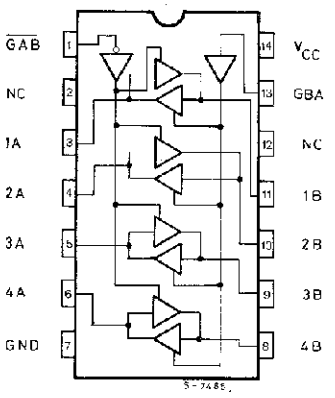


PIN CONNECTIONS (top view)

HC242

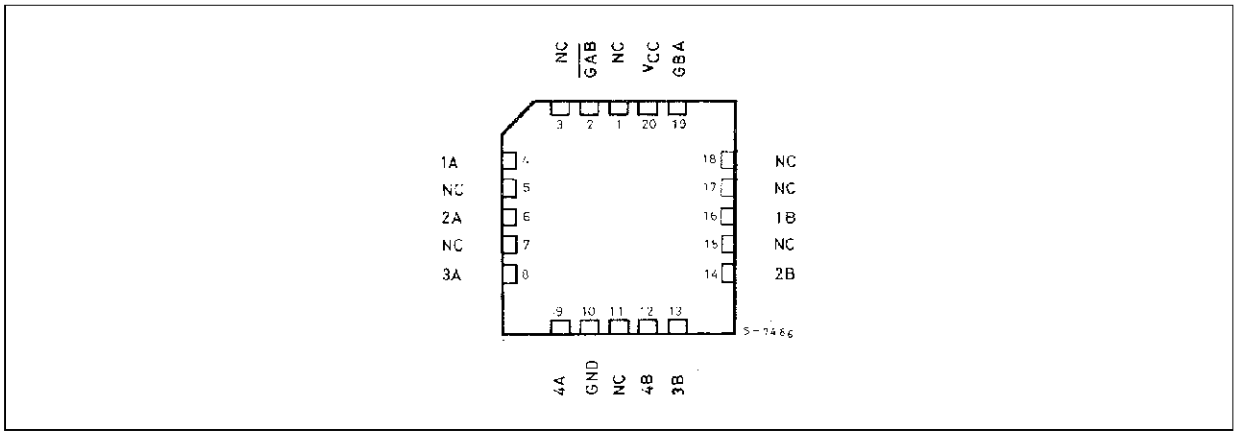


HC243



NC =
No Internal
Connection

CHIP CARRIER



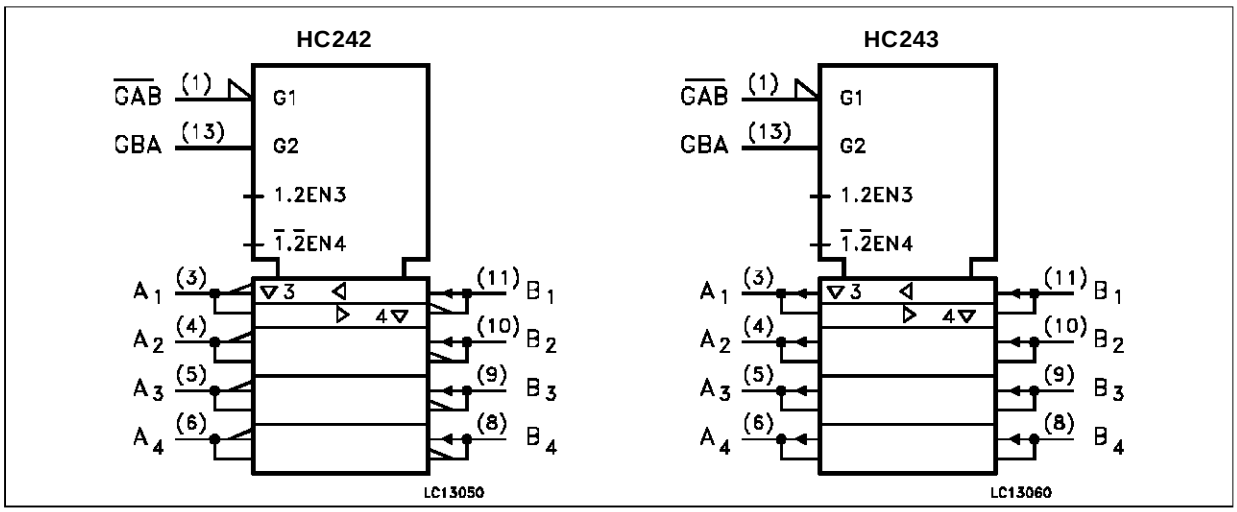
TRUTH TABLE

INPUTS		FUNCTION		OUTPUTS	
$\overline{GAB}$	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

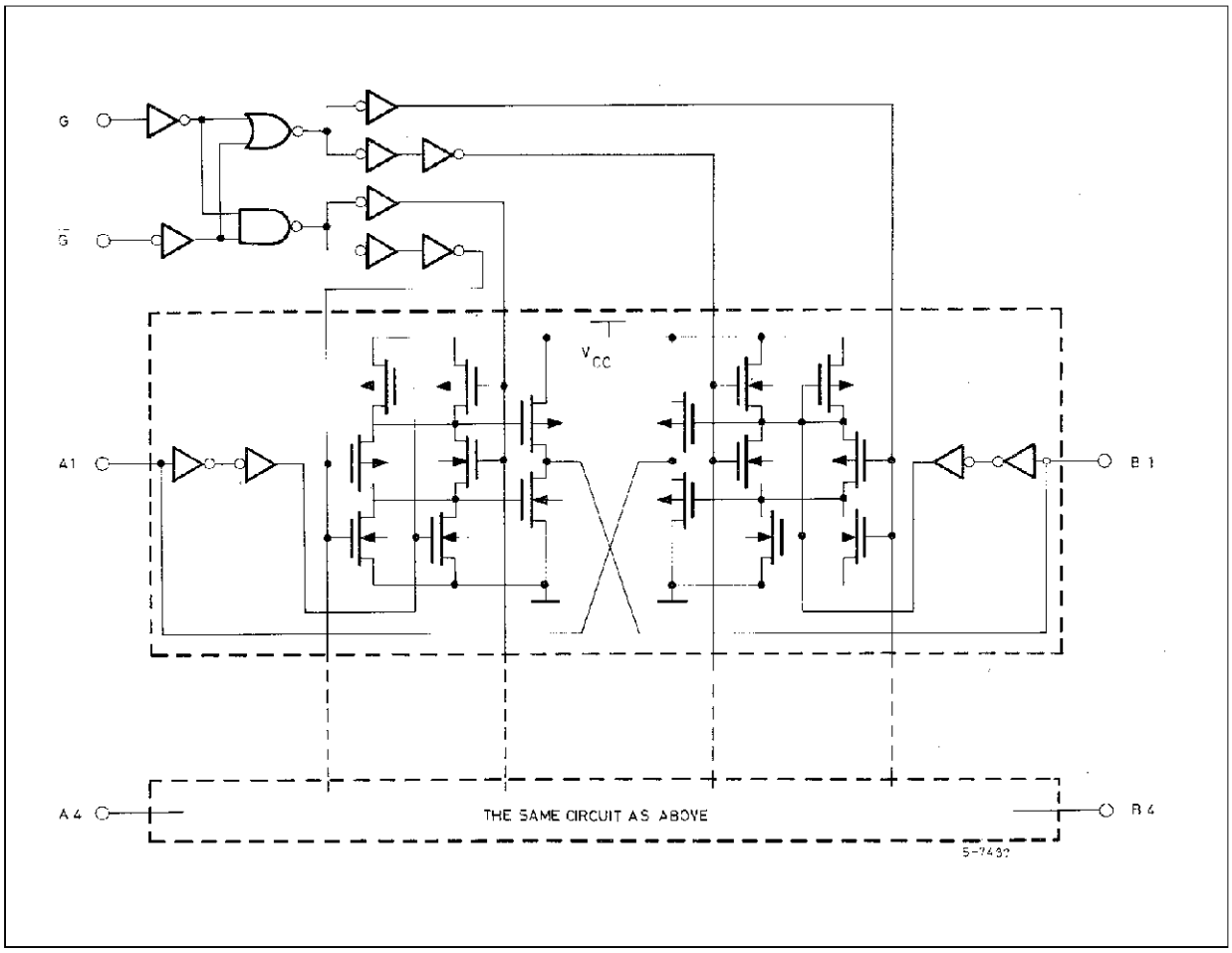
PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1	$\overline{GAB}$	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	V_{CC}	Positive Supply Voltage

IEC LOGIC SYMBOLS



CIRCUIT DIAGRAM



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 Source Sink Current Per Output Pin	± 35	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current	± 70	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 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_{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: **M54HC** Series **M74HC** Series		-55 to +125 -40 to +85	^oC ^oC
t_r, t_f	Input Rise and Fall Time	V_{CC} = 2 V	0 to 1000	ns
		V_{CC} = 4.5 V	0 to 500	
		V_{CC} = 6 V	0 to 400	

DC SPECIFICATIONS

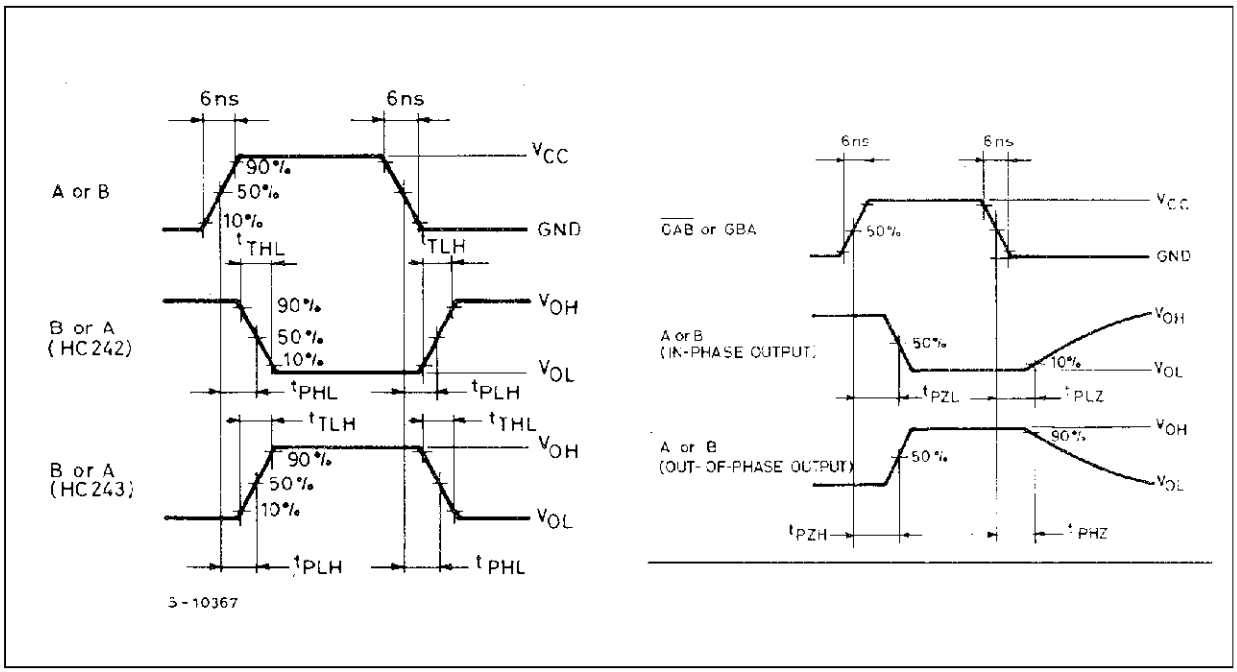
Symbol	Parameter	Test Conditions			Value							Unit
		V_{CC} (V)			T_A = 25 °C 54HC and 74HC			-40 to 85 °C 74HC		-55 to 125 °C 54HC		
					Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
V_{IH}	High Level Input Voltage	2.0			1.5			1.5		1.5		V
		4.5			3.15			3.15		3.15		
		6.0			4.2			4.2		4.2		
V_{IL}	Low Level 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	V_I = V_{IH} or V_{IL}	I_O=-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_O=-6.0 mA	4.18	4.31		4.13		4.10		
		6.0		I_O=-7.8 mA	5.68	5.8		5.63		5.60		
V_{OL}	Low Level Output Voltage	2.0	V_I = V_{IH} or V_{IL}	I_O= 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_O= 6.0 mA		0.17	0.26		0.33		0.40	
		6.0		I_O= 7.8 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_{OZ}	3 State Output Off-state Current	6.0	V_I = V_{IH} or V_{IL} V_O = V_{CC} or GND				±0.5		±5		±10	µA
I_{CC}	Quiescent Supply Current	6.0	V_I = V_{CC} or GND				4		40		80	µA

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

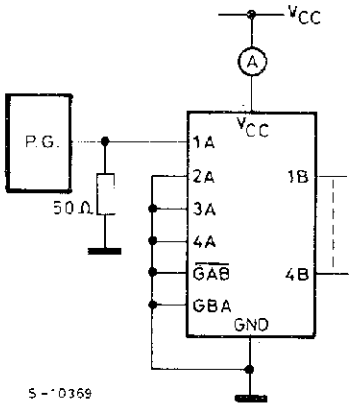
Symbol	Parameter	Test Conditions			Value							Unit
		V_{CC} (V)	C_L (pF)		T_A = 25 °C 54HC and 74HC			-40 to 85 °C 74HC		-55 to 125 °C 54HC		
					Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
t_{TLH} t_{THL}	Output Transition Time	2.0	50			25	60		75		90	ns
		4.5				7	12		15		18	
		6.0				6	10		13		15	
t_{PLH} t_{PHL}	Propagation Delay Time	2.0	50			39	90		115		135	ns
		4.5				13	18		23		27	
		6.0				11	15		20		23	
		2.0	150			51	145		180		220	ns
		4.5				17	29		36		44	
		6.0				14	25		31		37	
t_{PZL} t_{PZH}	3 State Output Enable Time	2.0	50	R_L = 1 KΩ		57	145		180		220	ns
		4.5				18	29		36		44	
		6.0				15	25		31		37	
		2.0	150	R_L = 1 KΩ		70	175		220		265	ns
		4.5				22	35		44		53	
		6.0				19	30		37		45	
t_{PLZ} t_{PHZ}	3 State Output Disable Time	2.0	50	R_L = 1 KΩ		45	150		190		225	ns
		4.5				20	30		38		45	
		6.0				17	26		32		38	
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 operting current can be obtained by the following equation. $I_{CC}(opr) = C_{PD} \bullet V_{CC} \bullet f_{IN} + I_{CC}$

SWITCHING CHARACTERISTICS TEST WAVEFORM



TEST CIRCUIT I_{CC} (Opr.)



C_{CP} CALCULATION

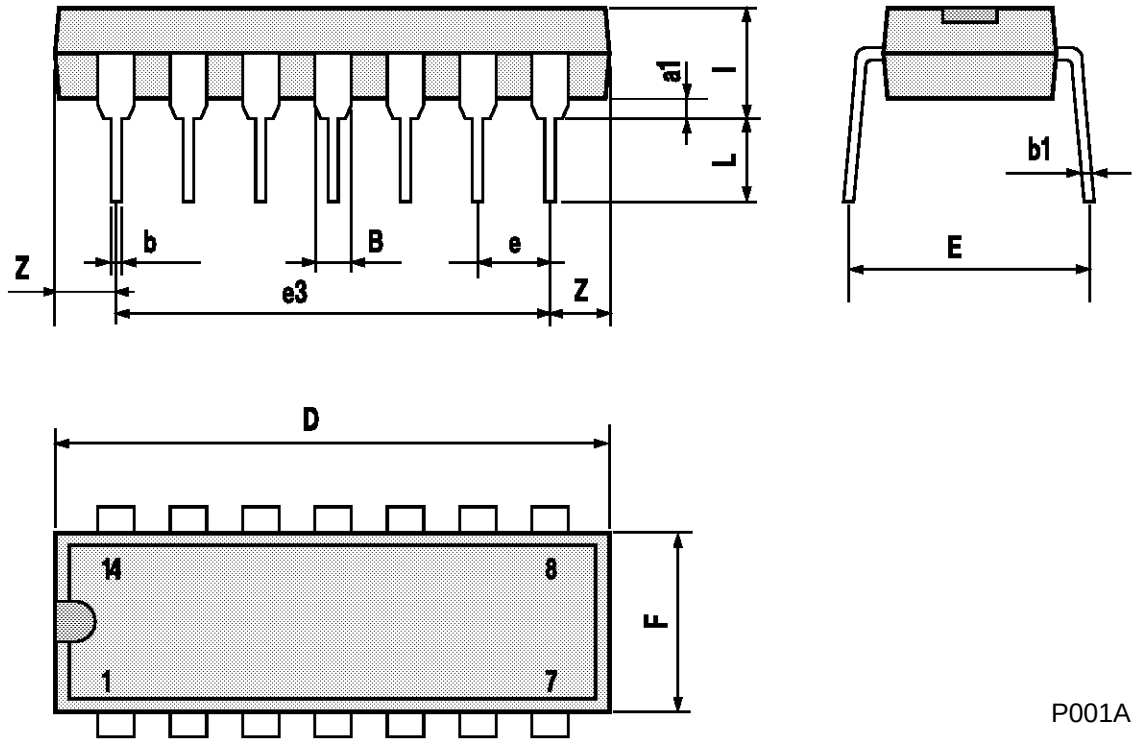
C_{PD} is to be calculated with the following formula by using the measured value of ICC (Opr.) in the test circuit opposite

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

In determining the typical value of CPD, a relatively high frequency of 1MHz was applied to fIN, in order to eliminate any error caused by the quiescent supply current.

Plastic DIP14 MECHANICAL DATA

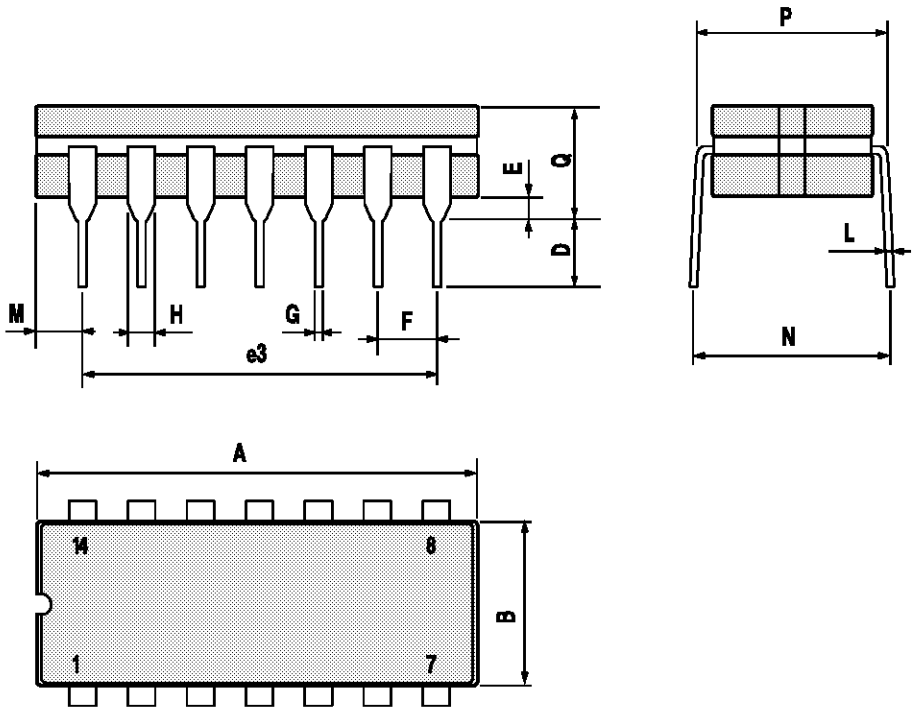
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	1.39		1.65	0.055		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		15.24			0.600	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100



P001A

Ceramic DIP14/1 MECHANICAL DATA

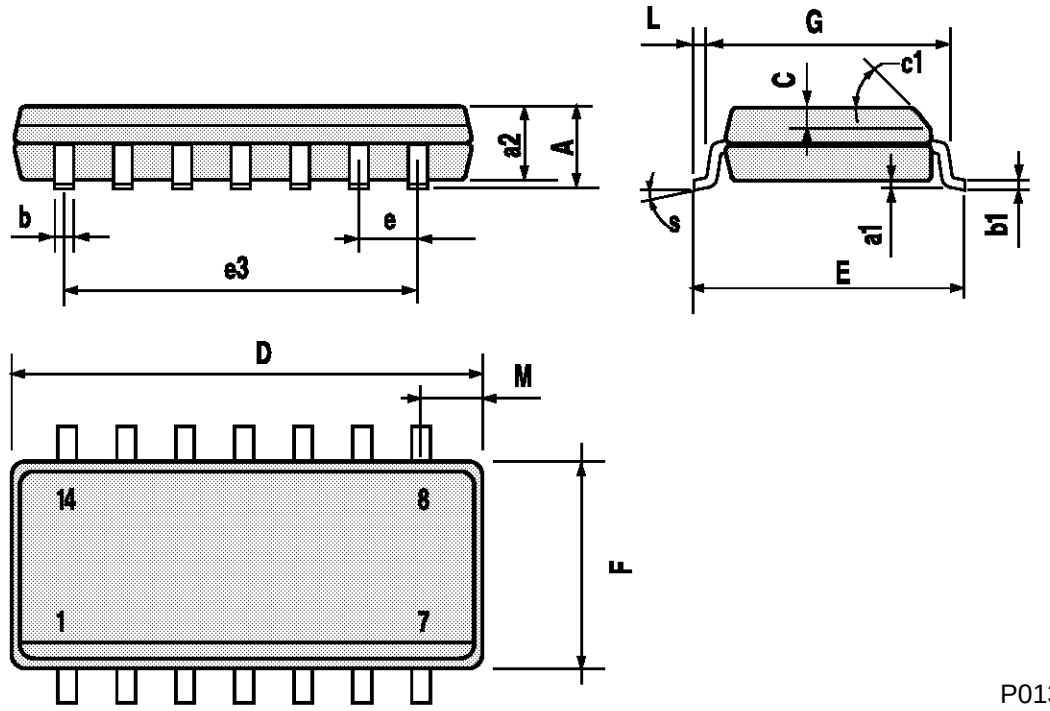
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			20			0.787
B			7.0			0.276
D		3.3			0.130	
E	0.38			0.015		
e3		15.24			0.600	
F	2.29		2.79	0.090		0.110
G	0.4		0.55	0.016		0.022
H	1.17		1.52	0.046		0.060
L	0.22		0.31	0.009		0.012
M	1.52		2.54	0.060		0.100
N			10.3			0.406
P	7.8		8.05	0.307		0.317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



P013G

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