

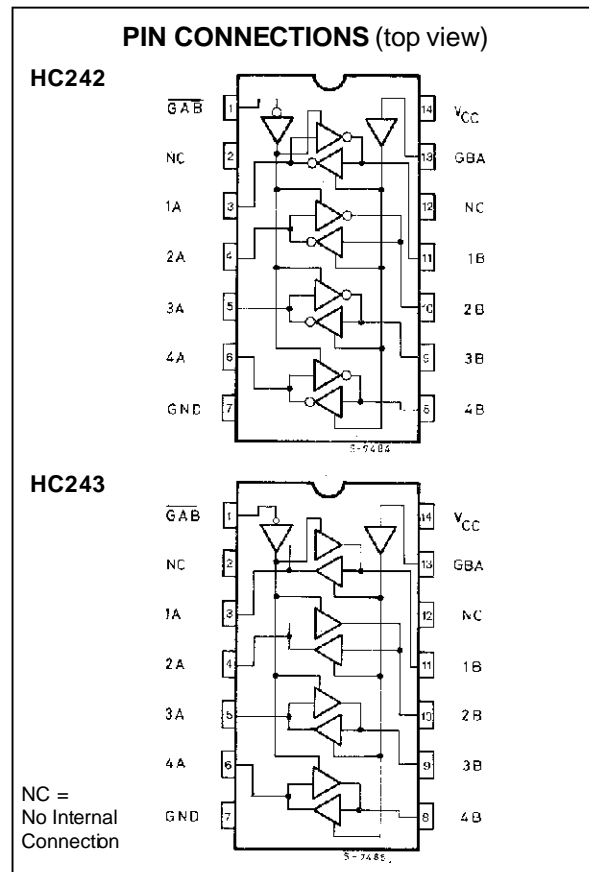
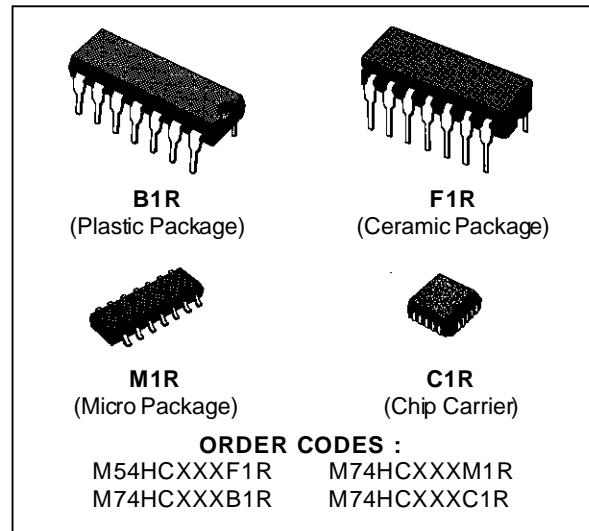
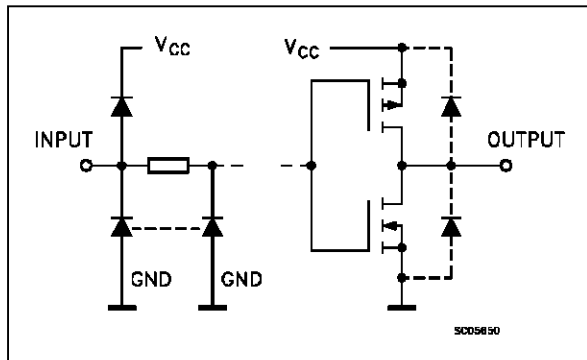
QUAD BUS TRANSCEIVER (3-STATE)

- 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°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

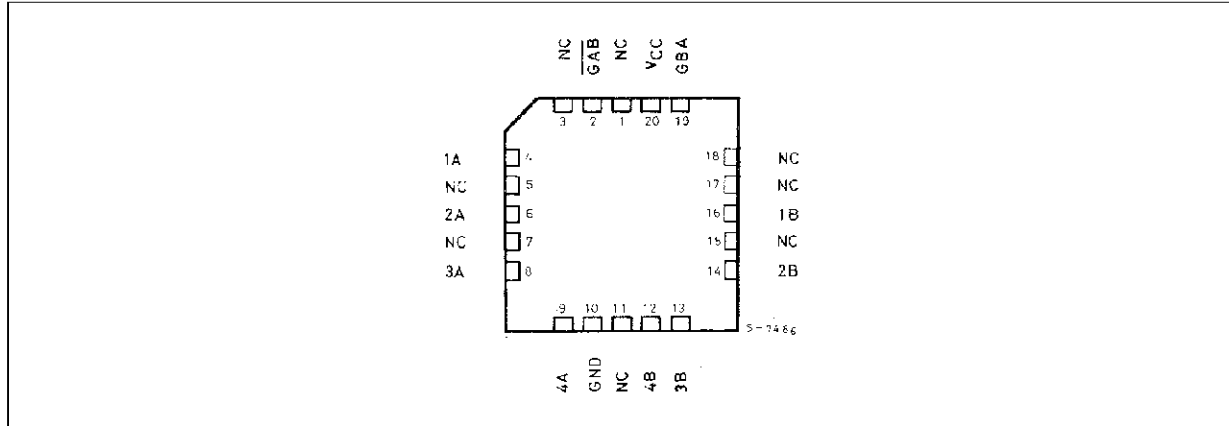
The M54/74HC242/243 are high speed CMOS QUAD BUS TRANSCEIVER (3-STATE) FABRICATED IN SILICON GATE C²MOS technology. They have the same high speed performance of LSTTL combined with true CMOS low power consumption. The HC242/243 are 3 STATE bi-directional inverting and non-inverting buffers and are intended 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



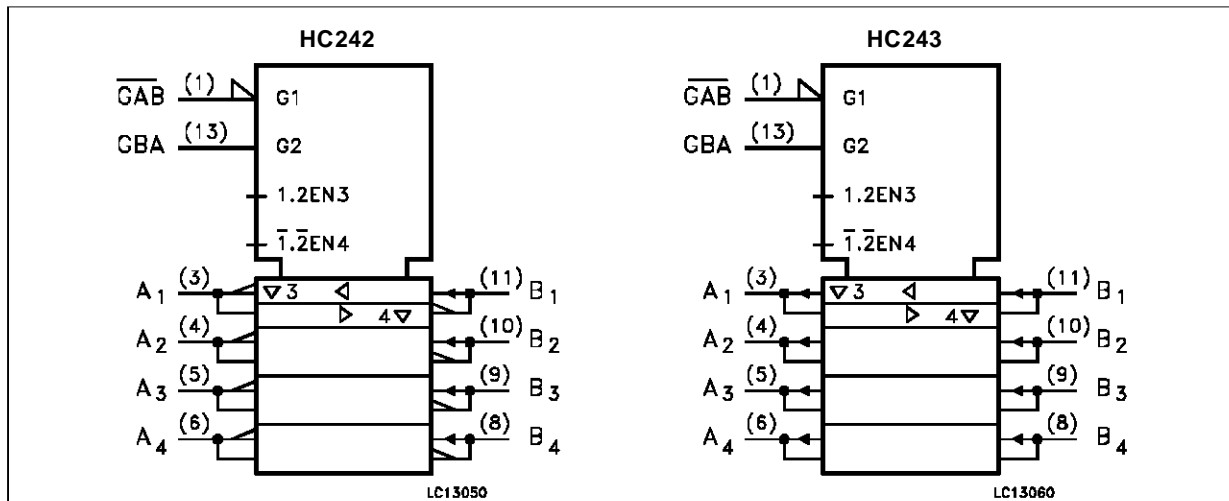
TRUTH TABLE

| 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 |

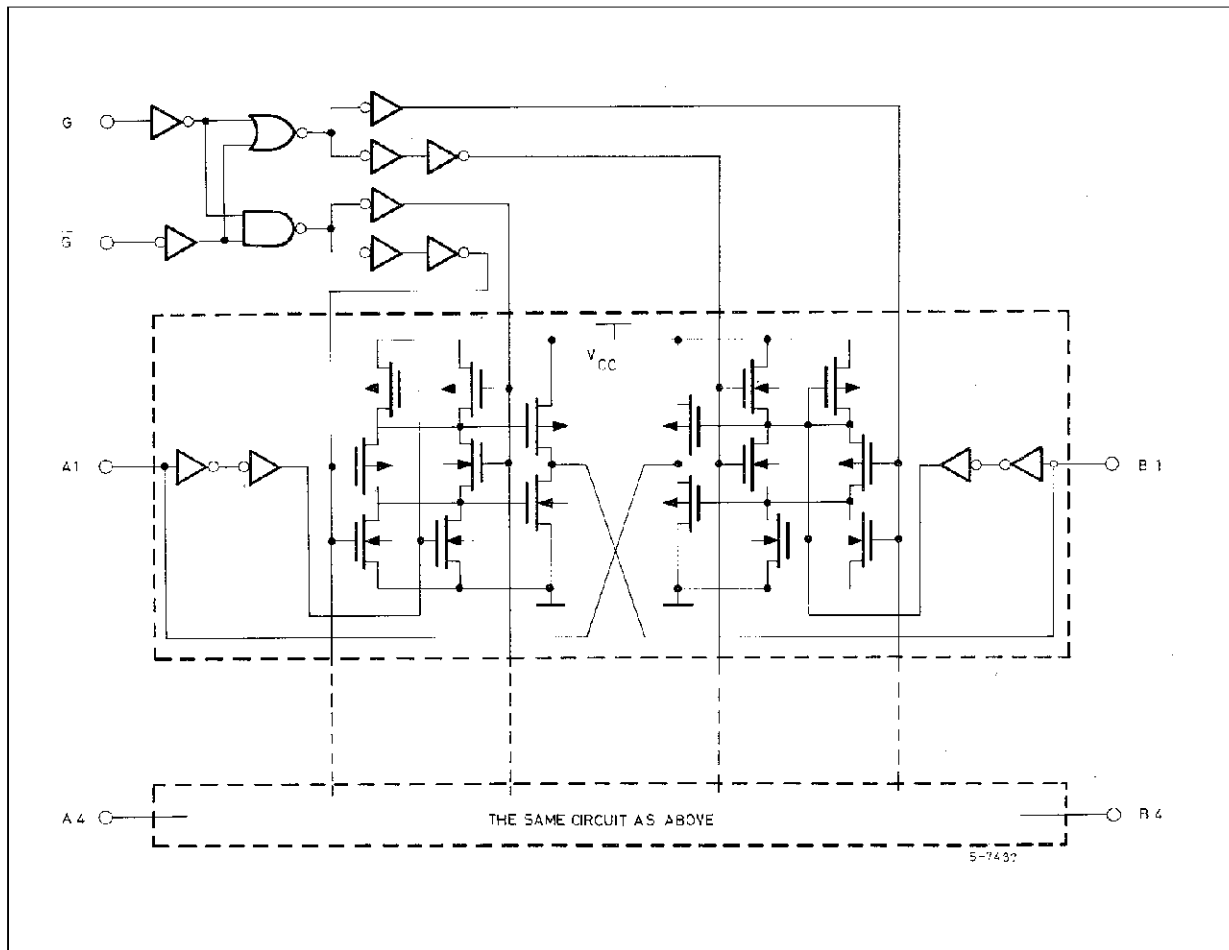
PIN DESCRIPTION

| 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 _{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 | °C °C | |
| 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

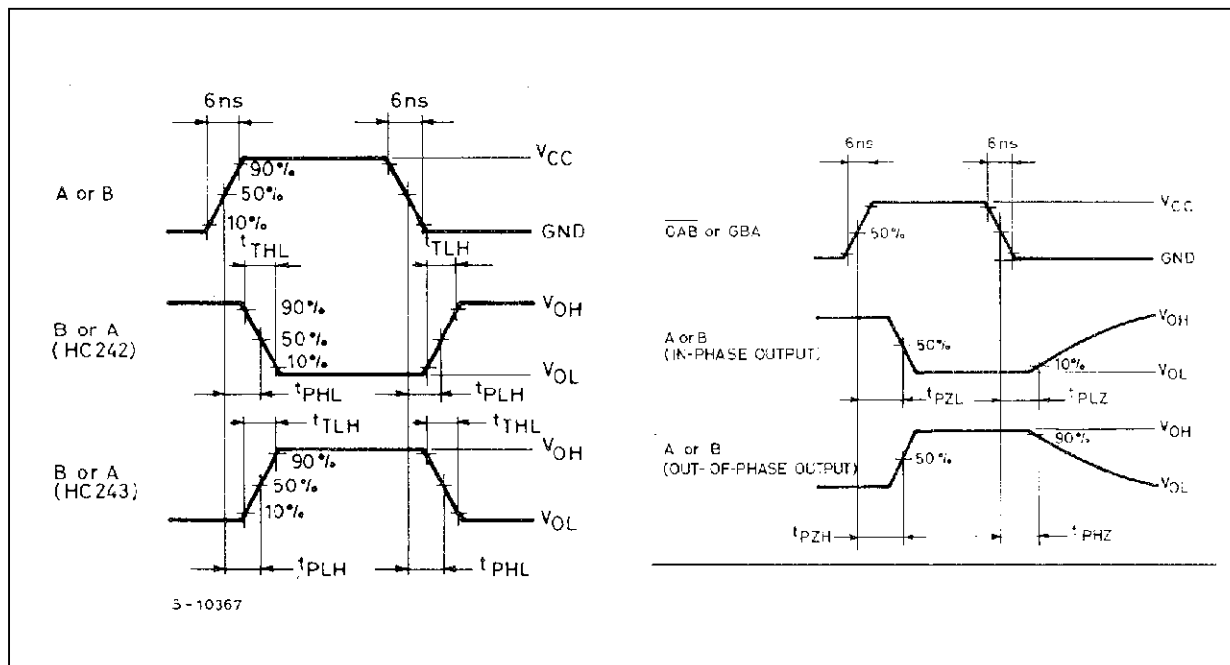
| Symbol | Parameter | Test Conditions | | Value | | | | | | Unit | | |
|-----------------|----------------------------------|---------------------------------|--|---|--------------------------|------|----------------------|------|-----------------------|------|------|------|
| | | | | T _A = 25 °C 54HC 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 4.5 6.0 | | 1.5 | | | 1.5 | | 1.5 | | V | |
| | | | | 3.15 | | | 3.15 | | 3.15 | | | |
| | | | | 4.2 | | | 4.2 | | 4.2 | | | |
| V _{IL} | Low Level Input Voltage | 2.0 4.5 6.0 | | | | 0.5 | | 0.5 | | 0.5 | V | |
| | | | | | | 1.35 | | 1.35 | | 1.35 | | |
| | | | | | | 1.8 | | 1.8 | | 1.8 | | |
| V _{OH} | High Level Output Voltage | 2.0 4.5 6.0 4.5 6.0 | V _I = V _{IH} or V _{IL} | I _O = -20 μA | 1.9 | 2.0 | | 1.9 | | 1.9 | V | |
| | | | | | 4.4 | 4.5 | | 4.4 | | 4.4 | | |
| | | | | | 5.9 | 6.0 | | 5.9 | | 5.9 | | |
| | | | | I _O = -6.0 mA | 4.18 | 4.31 | | 4.13 | | 4.10 | | |
| | | | | | I _O = -7.8 mA | 5.68 | 5.8 | | 5.63 | | | 5.60 |
| V _{OL} | Low Level Output Voltage | 2.0 4.5 6.0 4.5 6.0 | V _I = V _{IH} or V _{IL} | I _O = 20 μA | | | 0.0 | 0.1 | | 0.1 | | 0.1 |
| | | | | | | 0.0 | 0.1 | | 0.1 | | 0.1 | |
| | | | | | | 0.0 | 0.1 | | 0.1 | | 0.1 | |
| | | | | I _O = 6.0 mA | | 0.17 | 0.26 | | 0.33 | | 0.40 | |
| | | | | | 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)

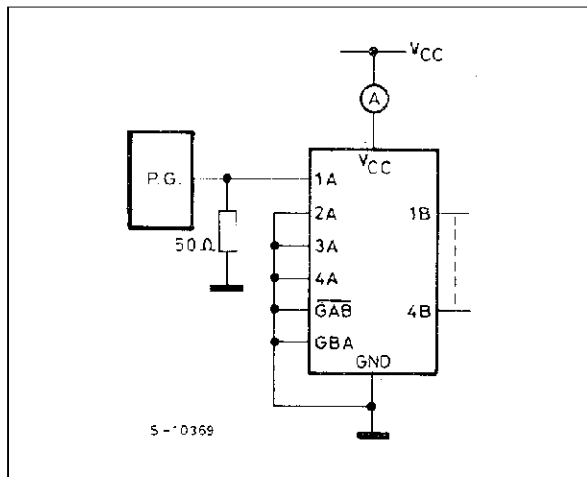
| Symbol | Parameter | Test Conditions | | Value | | | | | | Unit | | |
|------------------------|-------------------------------|----------------------------|-----------------------------|---|--------------------------|--------------------------|--|-----------------|---|-----------------|-----------------|----|
| | | V_{CC} (V) | C_L (pF) | $T_A = 25\text{ }^\circ\text{C}$ 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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