

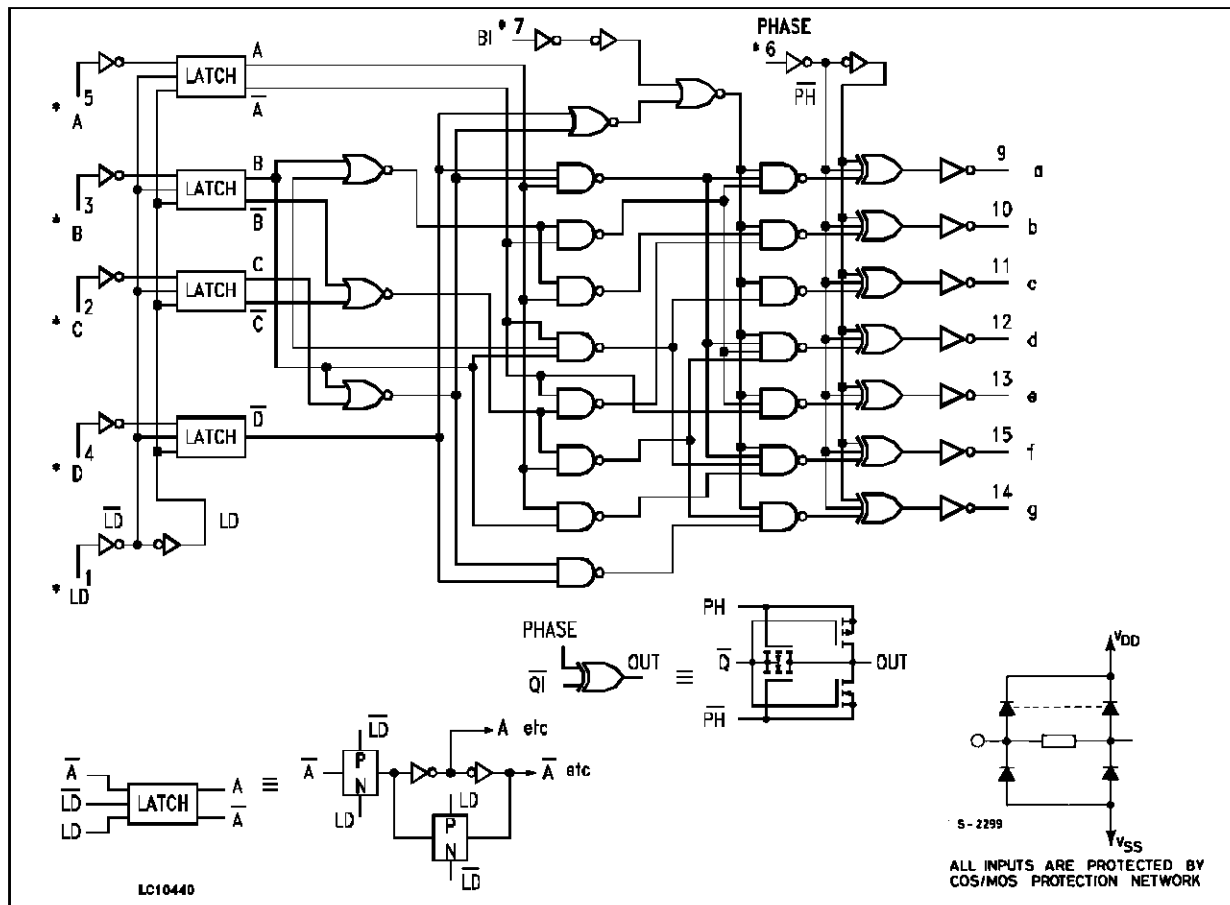
HCC/HCF4543B

ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|------------|---|-------------------------------|----------------------------|
| V_{DD}^* | Supply voltage : HCC Types HCF Types | - 0.5 to + 20 - 0.5 to 18 | V V |
| V_i | Input Voltage | - 0.5 to $V_{DD} + 0.5$ | V |
| I_i | DC Input Current (any one input) | ± 10 | mA |
| P_{tot} | Total Power Dissipation (per package) Dissipation per Output Transistor for T_{op} = Full Package-temperature Range | 200 100 | mW mW |
| T_{op} | Operating Temperature : HCC Types HCF Types | - 55 to + 125 - 40 to + 85 | $^{\circ}C$ $^{\circ}C$ |
| T_{stg} | Storage Temperature | - 65 to + 150 | $^{\circ}C$ |

* All Voltage Values are referred to V_{SS} pin voltage.

LOGIC DIAGRAM (1/2 of device shown)



RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Value | Unit |
|----------|--|-------------------------------|----------------------------|
| V_{DD} | Supply Voltage : HCC Types HCF Types | 3 to + 18 3 to + 15 | V V |
| V_i | Input Voltage | 0 to V_{DD} | V |
| T_{op} | Operating Temperature : HCC Types HCF Types | - 55 to + 125 - 40 to + 85 | $^{\circ}C$ $^{\circ}C$ |

TRUTH TABLE

| INPUT CODE | | | | | | | OUTPUT STATE | | | | | | | DISPLAY CHARACTER |
|------------|----|-----|---|---|---|---|--------------------------------------|---|---|---|---|---|---|-------------------|
| LD | BI | Ph* | D | C | B | A | a | b | c | d | e | f | g | |
| X | 1 | 0 | X | X | X | X | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 |
| 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 |
| 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 4 |
| 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 5 |
| 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 6 |
| 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 7 |
| 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 |
| 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 9 |
| 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Blank |
| 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Blank |
| 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Blank |
| 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Blank |
| 0 | 0 | 0 | X | X | X | X | ** | | | | | | | ** |
| • | • | • | • | | | | Inverse of Output Combinations Above | | | | | | | Display as above |

X = Don't care.

• = Above combinations

* = For liquid-crystal readouts, apply a square wave to Ph.

For common cathode LED readouts, select Ph = 0.

For common anode LED readouts, select Ph = 1.

** = Depends upon the BCD code previously applied when LD = 1.

STATIC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | | Test Conditions | | | | Value | | | | | | Unit | |
|-----------------------------------|-----------------------|-----------|-----------------------|-----------------------|------------------------------|------------------------|------------------|-----------|-------|---------------|-----------|-------------------|---------|---------|
| | | | V _I (V) | V _O (V) | I _O (μ A) | V _{DD} (V) | T _{Low} | | 25°C | | | T _{High} | | |
| | | | | | | | Min. | Max. | Min. | Typ. | Max. | Min. | | Max. |
| I _L | Quiescent Current | HCC Types | 0/5 | | | 5 | | 5 | | 0.04 | 5 | | 150 | μ A |
| | | | 0/10 | | | 10 | | 10 | | 0.04 | 10 | | 300 | |
| | | | 0/15 | | | 15 | | 20 | | 0.04 | 20 | | 600 | |
| | | | 0/20 | | | 20 | | 100 | | 0.08 | 100 | | 3000 | |
| | | HCF Types | 0/5 | | | 5 | | 5 | | 0.04 | 5 | | 150 | |
| | | | 0/10 | | | 10 | | 10 | | 0.04 | 10 | | 300 | |
| | | | 0/15 | | | 15 | | 20 | | 0.04 | 20 | | 600 | |
| V _{OH} | Output High 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 _{OL} | Output Low 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 _{IH} | Input High 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 _{IL} | Input Low 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 _{OH} | Output Drive Current | HCC Types | 0/5 | 2.5 | | 5 | -1.6 | | -1.3 | -2.6 | | -0.9 | mA | |
| | | | 0/5 | 4.6 | | 5 | -0.46 | | -0.37 | -0.75 | | -0.26 | | |
| | | | 0/10 | 9.5 | | 10 | -0.98 | | -0.8 | -1.6 | | -0.55 | | |
| | | | 0/15 | 13.5 | | 15 | -3.33 | | -2.7 | -5.4 | | -1.9 | | |
| | | HCF Types | 0/5 | 2.5 | | 5 | 1.3 | | -1.1 | -2.6 | | -0.9 | | |
| | | | 0/5 | 4.6 | | 5 | 0.36 | | -0.31 | -0.75 | | -0.25 | | |
| | | | 0/10 | 9.5 | | 10 | 0.81 | | -0.68 | -1.6 | | -0.54 | | |
| 0/15 | 13.5 | | 15 | 2.7 | | -2.3 | -5.4 | | -1.84 | | | | | |
| I _{OL} | Output Sink Current | HCC Types | 0/5 | 0.4 | | 5 | 0.64 | | 0.51 | 1 | | 0.36 | mA | |
| | | | 0/10 | 0.5 | | 10 | 1.6 | | 1.3 | 2.6 | | 0.9 | | |
| | | | 0/15 | 1.5 | | 15 | 4.2 | | 3.4 | 6.8 | | 2.4 | | |
| | | HCF Types | 0/5 | 0.4 | | 5 | 0.52 | | 0.44 | 1 | | 0.36 | | |
| | | | 0/10 | 0.5 | | 10 | 1.3 | | 1.1 | 2.6 | | 0.9 | | |
| | | | 0/15 | 1.5 | | 15 | 3.6 | | 3.0 | 6.8 | | 2.4 | | |
| I _{IH} , I _{IL} | Input Leakage Current | HCC types | 0/18 | Any Input | | 18 | | ± 0.1 | | $\pm 10^{-5}$ | ± 0.1 | | ± 1 | μ A |
| | | HCF types | 0/15 | | | 15 | | ± 0.3 | | $\pm 10^{-5}$ | ± 0.3 | | ± 1 | |

* T_{Low} = -55°C for HCC device : -40°C for HCF device.

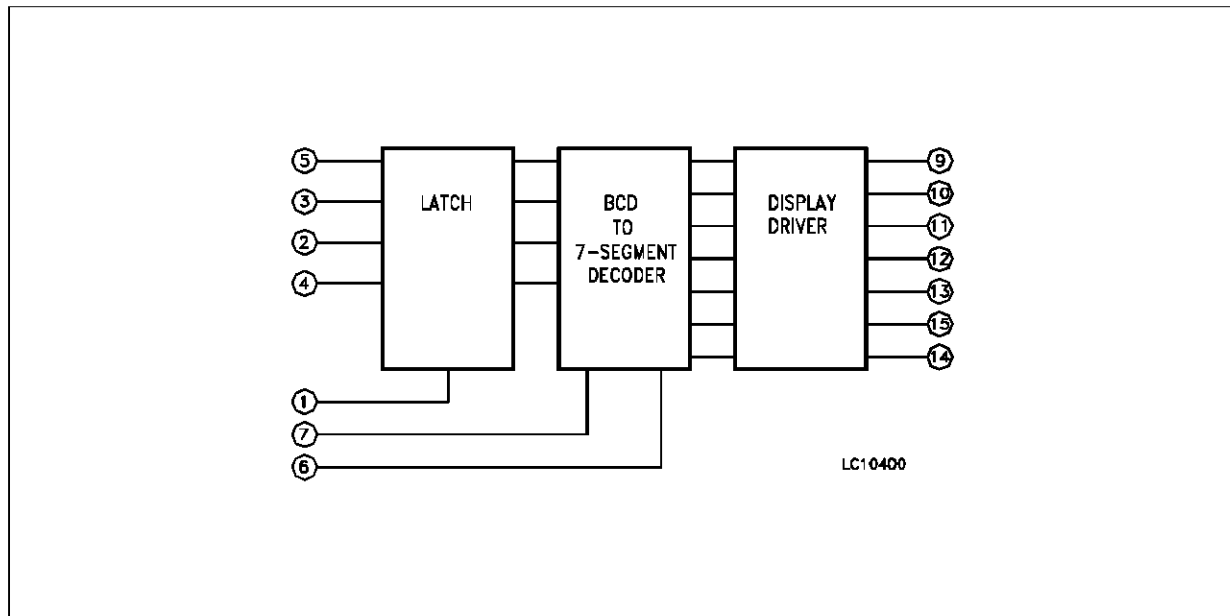
* T_{High} = +125°C for HCC device : +85°C for HCF device.

The Noise Margin for both "1" and "0" level is : 1V min. with V_{DD} = 5V, 2V min. with V_{DD} = 10V, 2.5V min. with V_{DD} = 15V.

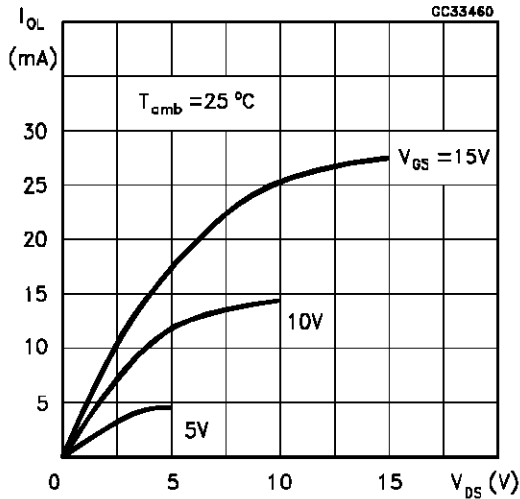
DYNAMIC ELECTRICAL CHARACTERISTICS ($T_{amb} = 25^{\circ}C$, $C_L = 50pF$, $R_L = 200k\Omega$, typical temperature coefficient for all V_{DD} values is $0.3\%/^{\circ}C$, all input rise and fall time = 20ns)

| Symbol | Parameter | Test Conditions V_{DD} (V) | Limits All packages | | | Unit |
|-----------|---------------------------|---------------------------------|------------------------|------|------|------|
| | | | Min. | Typ. | Max. | |
| t_{PHL} | Propagation Delay Time | 5 | | 600 | 1200 | ns |
| | | 10 | | 200 | 400 | |
| | | 15 | | 150 | 300 | |
| t_{PLH} | | 5 | | 500 | 1000 | |
| | | 10 | | 200 | 400 | |
| | | 15 | | 150 | 300 | |
| t_{rHL} | Transition Time | 5 | | 180 | 360 | |
| | | 10 | | 90 | 180 | |
| | | 15 | | 65 | 130 | |
| t_{rLH} | | 5 | | 180 | 360 | |
| | | 10 | | 90 | 180 | |
| | | 15 | | 65 | 130 | |
| t_{WH} | Latch Disable Pulse Width | 5 | 250 | 125 | | |
| | | 10 | 100 | 50 | | |
| | | 15 | 80 | 40 | | |
| t_{SU} | Address Setup Time | 5 | 60 | 15 | | |
| | | 10 | 20 | - 5 | | |
| | | 15 | 10 | - 5 | | |
| t_H | Address Hold Time | 5 | 25 | -5 | | |
| | | 10 | 20 | 10 | | |
| | | 15 | 20 | 0 | | |
| C_{IN} | Input Capacitance | Any Input | | 5 | 7.5 | pF |

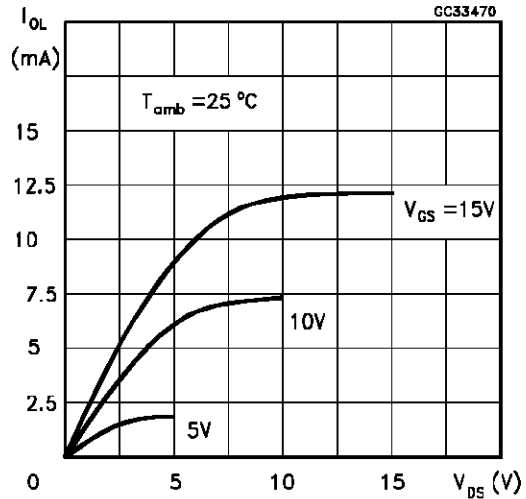
BCD-to-seven-segment latch/decoder/driver functional diagram



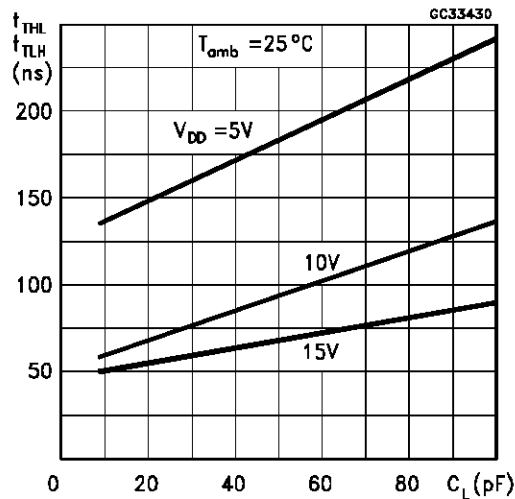
Typical Output Low (sink) Current Characteristics.



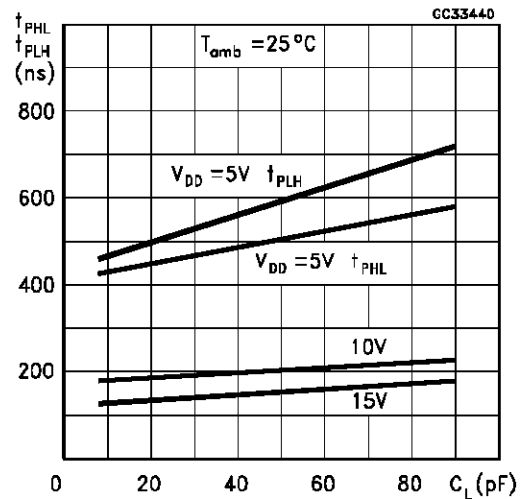
Minimum Output Low (sink) Current Characteristics.



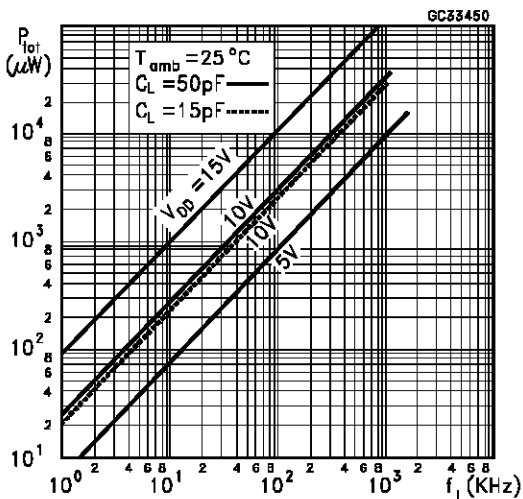
Typical Transition Time as a Function of Load Capacitance



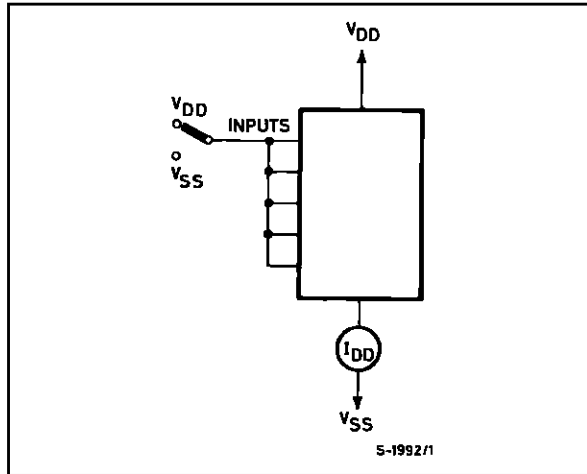
Typical Propagation Delay Time as a Function of Load Capacitance



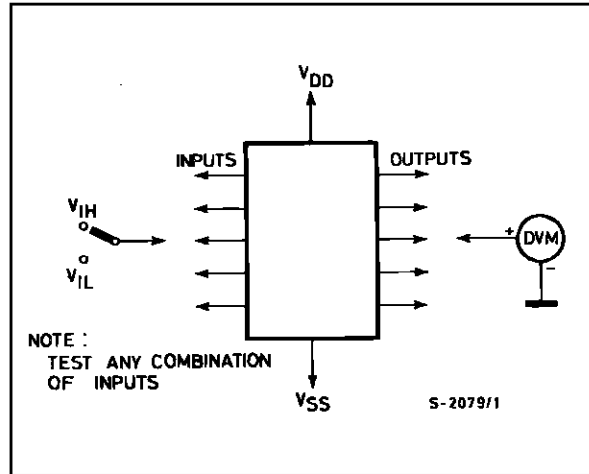
Typical Dynamic Power Dissipation as a Function of Frequency



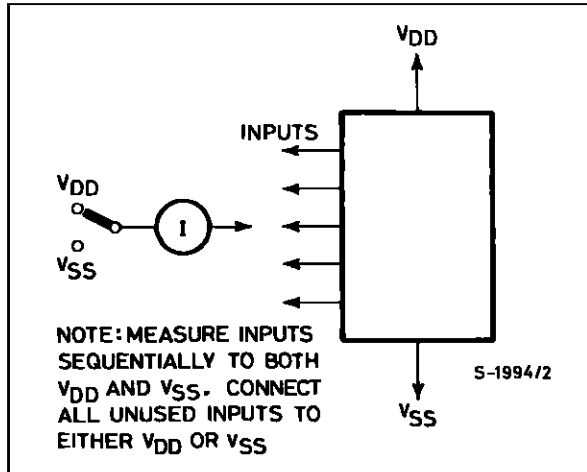
Input Voltage Test Circuit.



Quiescent Device Current Test Circuit.



Input-leakage -current Test Circuit.



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 |
| I | | | 5.1 | | | 0.201 |
| L | | 3.3 | | | 0.130 | |
| Z | | | 1.27 | | | 0.050 |



Ceramic DIP16/1 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|------|-------|------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 20 | | | 0.787 |
| B | | | 7 | | | 0.276 |
| D | | 3.3 | | | 0.130 | |
| E | 0.38 | | | 0.015 | | |
| e3 | | 17.78 | | | 0.700 | |
| 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 | 0.51 | | 1.27 | 0.020 | | 0.050 |
| N | | | 10.3 | | | 0.406 |
| P | 7.8 | | 8.05 | 0.307 | | 0.317 |
| Q | | | 5.08 | | | 0.200 |



SO16 (Narrow) 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.) | | | | | |



P013H

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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