

MC74VHC1G32

Single 2-Input OR Gate

The MC74VHC1G32 is an advanced high speed CMOS 2-input OR gate fabricated with silicon gate CMOS technology.

The internal circuit is composed of multiple stages, including a buffer output which provides high noise immunity and stable output.

The MC74VHC1G32 input structure provides protection when voltages up to 7.0 V are applied, regardless of the supply voltage. This allows the MC74VHC1G32 to be used to interface 5.0 V circuits to 3.0 V circuits.

- High Speed: $t_{PD} = 3.7$ ns (Typ) at $V_{CC} = 5$ V
- Low Power Dissipation: $I_{CC} = 1$ μ A (Max) at $T_A = 25^\circ\text{C}$
- Power Down Protection Provided on Inputs
- Balanced Propagation Delays
- Pin and Function Compatible with Other Standard Logic Families
- Chip Complexity: FETs = 60

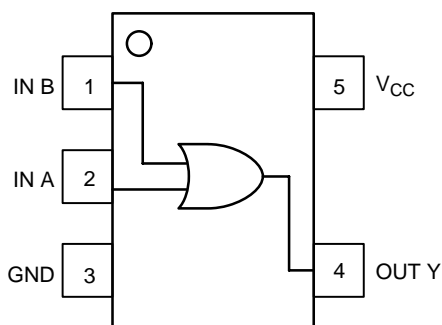


Figure 1. Pinout (Top View)

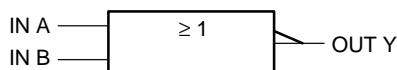


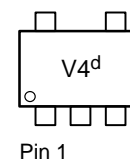
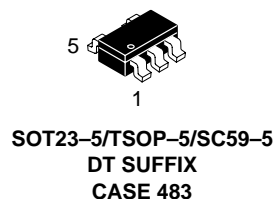
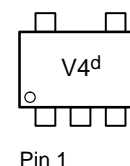
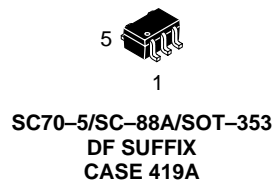
Figure 2. Logic Symbol



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MARKING DIAGRAMS



d = Date Code

PIN ASSIGNMENT

| 1 | IN B |
|---|----------|
| 2 | IN A |
| 3 | GND |
| 4 | OUT Y |
| 5 | V_{CC} |

FUNCTION TABLE

| Inputs | | Output |
|--------|---|--------|
| A | B | Y |
| L | L | L |
| L | H | H |
| H | L | H |
| H | H | H |

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

MC74VHC1G32

MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|-----------------------|---|--|------|
| V _{CC} | DC Supply Voltage | −0.5 to +7.0 | V |
| V _{IN} | DC Input Voltage | −0.5 to +7.0 | V |
| V _{OUT} | 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 _{OUT} | DC Output Sink Current | ±12.5 | mA |
| I _{CC} | DC Supply Current per Supply Pin | ±25 | mA |
| T _{STG} | Storage Temperature Range | −65 to +150 | °C |
| T _L | Lead Temperature, 1 mm from Case for 10 Seconds | 260 | °C |
| T _J | Junction Temperature Under Bias | +150 | °C |
| θ _{JA} | Thermal Resistance | SC70-5/SC-88A (Note 1) TSOP-5 350 230 | °C/W |
| P _D | Power Dissipation in Still Air at 85°C | SC70-5/SC-88A TSOP-5 150 200 | mW |
| MSL | Moisture Sensitivity | Level 1 | |
| F _R | Flammability Rating | Oxygen Index: 28 to 34 UL 94 V-0 @ 0.125 in | |
| V _{ESD} | ESD Withstand Voltage | Human Body Model (Note 2) Machine Model (Note 3) Charged Device Model (Note 4) >2000 >200 N/A | V |
| I _{LATCH-UP} | Latch-Up Performance | Above V _{CC} and Below GND at 125°C (Note 5) ±500 | mA |

Maximum Ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute-maximum-rated conditions is not implied. Functional operation should be restricted to the Recommended Operating Conditions.

1. Measured with minimum pad spacing on an FR4 board, using 10 mm-by-1 inch, 2-ounce copper trace with no air flow.
2. Tested to EIA/JESD22-A114-A.
3. Tested to EIA/JESD22-A115-A.
4. Tested to JESD22-C101-A.
5. Tested to EIA/JESD78.

RECOMMENDED OPERATING CONDITIONS

| Symbol | Characteristics | Min | Max | Unit |
|---------------------------------|-----------------------------|--|-----------------|------|
| V _{CC} | DC Supply Voltage | 2.0 | 5.5 | V |
| V _{IN} | DC Input Voltage | 0.0 | 5.5 | V |
| V _{OUT} | DC Output Voltage | 0.0 | V _{CC} | V |
| T _A | Operating Temperature Range | −55 | +125 | °C |
| t _r , t _f | Input Rise and Fall Time | V _{CC} = 3.3 V ± 0.3 V V _{CC} = 5.0 V ± 0.5 V 0 0 | 100 20 | ns/V |

DEVICE JUNCTION TEMPERATURE VERSUS TIME TO 0.1% BOND FAILURES

| Junction Temperature °C | Time, Hours | Time, Years |
|-------------------------|-------------|-------------|
| 80 | 1,032,200 | 117.8 |
| 90 | 419,300 | 47.9 |
| 100 | 178,700 | 20.4 |
| 110 | 79,600 | 9.4 |
| 120 | 37,000 | 4.2 |
| 130 | 17,800 | 2.0 |
| 140 | 8,900 | 1.0 |

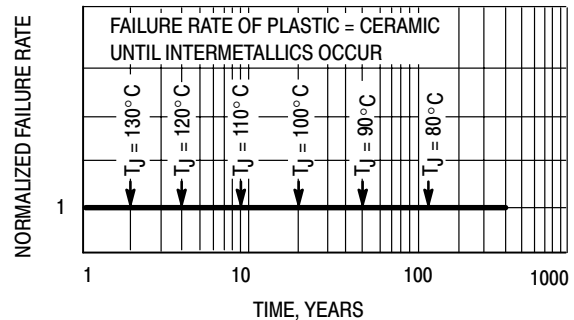


Figure 3. Failure Rate vs. Time Junction Temperature

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DC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Test Conditions | V _{CC} (V) | T _A = 25°C | | | T _A ≤ 85°C | | –55°C to 125°C | | Unit |
|-----------------|---|--|--------------------------|----------------------------|-------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|------|
| | | | | Min | Typ | Max | Min | Max | Min | Max | |
| V _{IH} | Minimum High-Level Input Voltage | | 2.0 3.0 4.5 5.5 | 1.5 2.1 3.15 3.85 | | | 1.5 2.1 3.15 3.85 | | 1.5 2.1 3.15 3.85 | | V |
| V _{IL} | Maximum Low-Level Input Voltage | | 2.0 3.0 4.5 5.5 | | | 0.5 0.9 1.35 1.65 | | 0.5 0.9 1.35 1.65 | | 0.5 0.9 1.35 1.65 | V |
| V _{OH} | Minimum High-Level Output Voltage V _{IN} = V _{IH} or V _{IL} | V _{IN} = V _{IH} or V _{IL} I _{OH} = –50 μA | 2.0 3.0 4.5 | 1.9 2.9 4.4 | 2.0 3.0 4.5 | | 1.9 2.9 4.4 | | 1.9 2.9 4.4 | | V |
| | | V _{IN} = V _{IH} or V _{IL} I _{OH} = –4 mA I _{OH} = –8 mA | 3.0 4.5 | 2.58 3.94 | | | 2.48 3.80 | | 2.34 3.66 | | |
| V _{OL} | Maximum Low-Level Output Voltage V _{IN} = V _{IH} or V _{IL} | V _{IN} = V _{IH} or V _{IL} I _{OL} = 50 μA | 2.0 3.0 4.5 | | 0.0 0.0 0.0 | 0.1 0.1 0.1 | | 0.1 0.1 0.1 | | 0.1 0.1 0.1 | V |
| | | V _{IN} = V _{IH} or V _{IL} I _{OL} = 4 mA I _{OL} = 8 mA | 3.0 4.5 | | | 0.36 0.36 | | 0.44 0.44 | | 0.52 0.52 | |
| I _{IN} | Maximum Input Leakage Current | V _{IN} = 5.5 V or GND | 0 to 5.5 | | | ±0.1 | | ±1.0 | | ±1.0 | μA |
| I _{CC} | Maximum Quiescent Supply Current | V _{IN} = V _{CC} or GND | 5.5 | | | 1.0 | | 10 | | 40 | μA |

AC ELECTRICAL CHARACTERISTICS C_{load} = 50 pF, Input t_r = t_f = 3.0 ns

| Symbol | Parameter | Test Conditions | T _A = 25°C | | | T _A ≤ 85°C | | –55 ≤ T _A ≤ 125°C | | Unit |
|--|--|--|-----------------------|------------|-------------|-----------------------|-------------|------------------------------|--------------|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| t _{PLH} , t _{PHL} | Maximum Propagation Delay, Input A or B to Y | V _{CC} = 3.3 ± 0.3 V C _L = 15 pF C _L = 50 pF | | 4.8 6.1 | 7.9 11.4 | | 9.5 13.0 | | 11.5 15.5 | ns |
| | | V _{CC} = 5.0 ± 0.5 V C _L = 15 pF C _L = 50 pF | | 3.7 4.4 | 5.5 7.5 | | 6.5 8.5 | | 8.0 10.0 | |
| C _{IN} | Maximum Input Capacitance | | | 5.5 | 10 | | 10 | | 10 | pF |

| | | | |
|-----------------|--|---|----|
| C _{PD} | Power Dissipation Capacitance (Note 6) | Typical @ 25°C, V _{CC} = 5.0 V | pF |
| | | 11 | |

6. C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: I_{CC(OPR)} = C_{PD} • V_{CC} • f_{in} + I_{CC}. C_{PD} is used to determine the no-load dynamic power consumption; P_D = C_{PD} • V_{CC}² • f_{in} + I_{CC} • V_{CC}.

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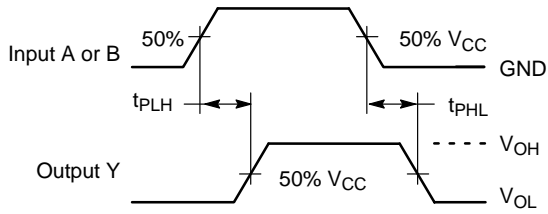
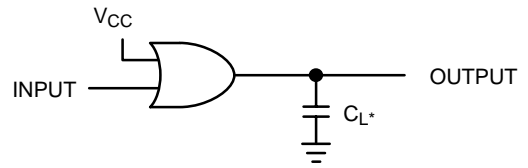


Figure 4. Switching Waveforms



*Includes all probe and jig capacitance.
A 1-MHz square input wave is recommended
for propagation delay tests.

Figure 5. Test Circuit

DEVICE ORDERING INFORMATION

| Device Order Number | Device Nomenclature | | | | | | Package Type (Name/SOT#/Common Name) | Tape and Reel Size |
|---------------------|-------------------------|-----------------------|------------|-----------------|----------------|----------------------|---|-------------------------|
| | Logic Circuit Indicator | Temp Range Identifier | Technology | Device Function | Package Suffix | Tape and Reel Suffix | | |
| MC74VHC1G32DFT1 | MC | 74 | VHC1G | 00 | DF | T1 | SC70-5/SC-88A/SOT-353 | 178 mm (7 in) 3000 Unit |
| MC74VHC1G32DFT2 | MC | 74 | VHC1G | 00 | DF | T2 | SC70-5/SC-88A/SOT-353 | 178 mm (7 in) 3000 Unit |
| MC74VHC1G32DTT1 | MC | 74 | VHC1G | 00 | DT | T1 | SOT23-5/TSOP-5/SC59-5 | 178 mm (7 in) 3000 Unit |

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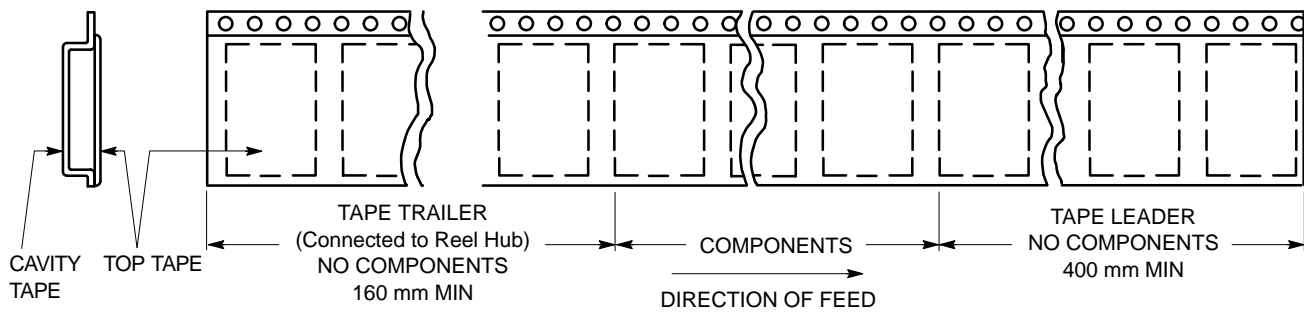


Figure 6. Tape Ends for Finished Goods

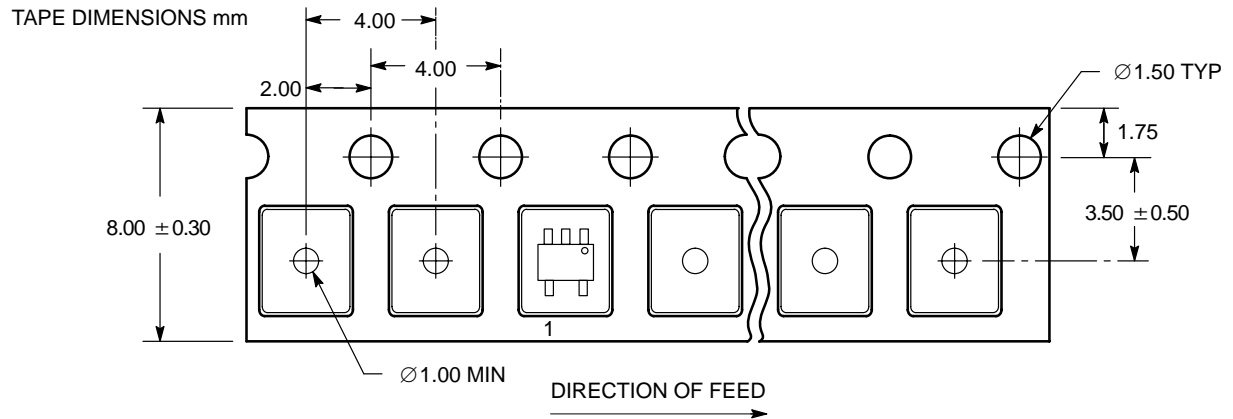


Figure 7. SC-70-5/SC-88A/SOT-353 DFT1 Reel Configuration/Orientation

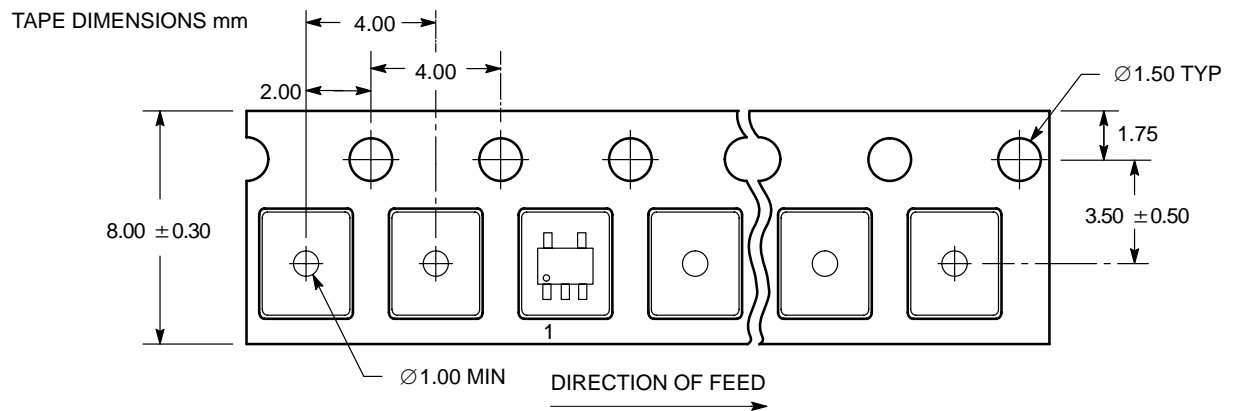


Figure 8. SC-70/SC-88A/SOT-353 DFT2 and SOT23-5/TSOP-5/SC59-5 DTT1 Reel Configuration/Orientation

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Figure 9. Reel Dimensions

REEL DIMENSIONS

| Tape Size | T and R Suffix | A Max | G | t Max |
|-----------|----------------|------------------|---|----------------------|
| 8 mm | T1, T2 | 178 mm (7 in) | 8.4 mm, + 1.5 mm, -0.0 (0.33 in + 0.059 in, -0.00) | 14.4 mm (0.56 in) |

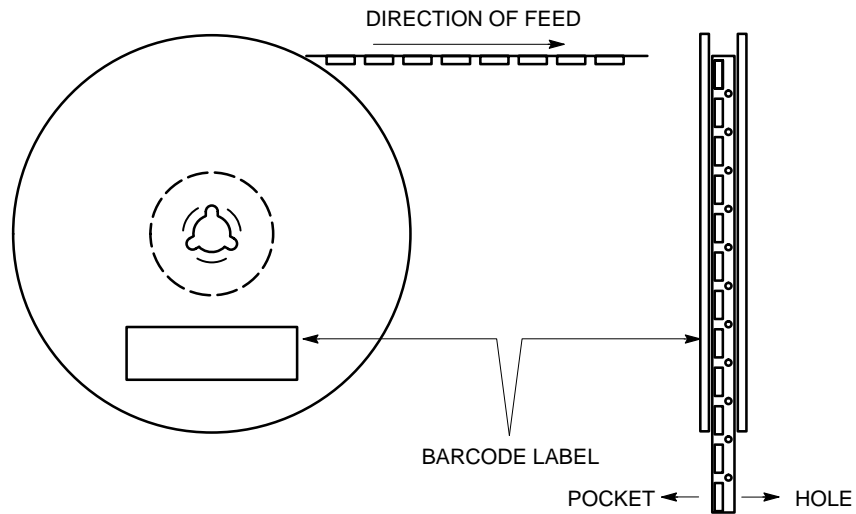


Figure 10. Reel Winding Direction

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PACKAGE DIMENSIONS

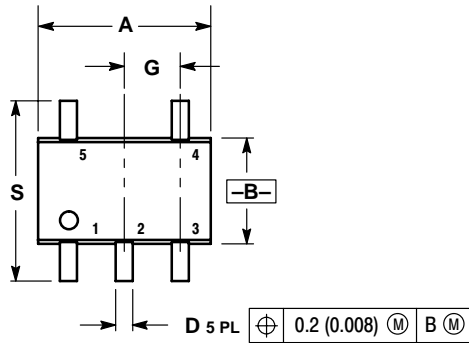
SC70-5/SC-88A/SOT-353

DF SUFFIX

5-LEAD PACKAGE

CASE 419A-02

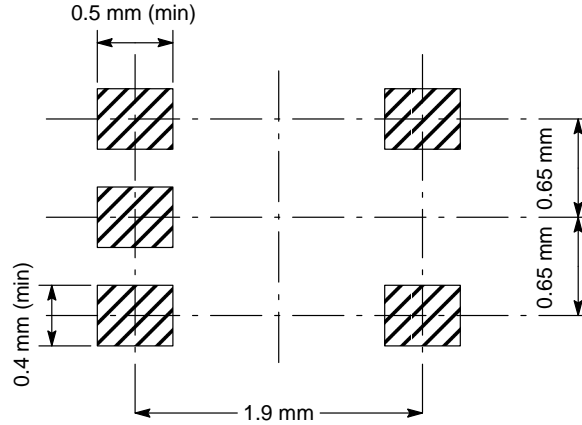
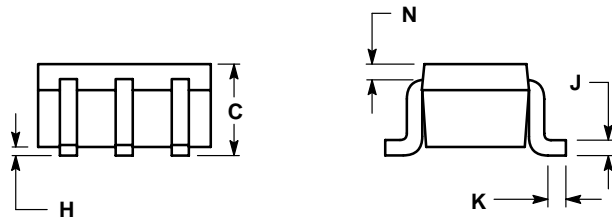
ISSUE F



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419A-01 OBSOLETE. NEW STANDARD 419A-02.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| A | 0.071 | 0.087 | 1.80 | 2.20 |
| B | 0.045 | 0.053 | 1.15 | 1.35 |
| C | 0.031 | 0.043 | 0.80 | 1.10 |
| D | 0.004 | 0.012 | 0.10 | 0.30 |
| G | 0.026 BSC | | 0.65 BSC | |
| H | --- | 0.004 | --- | 0.10 |
| J | 0.004 | 0.010 | 0.10 | 0.25 |
| K | 0.004 | 0.012 | 0.10 | 0.30 |
| N | 0.008 REF | | 0.20 REF | |
| S | 0.079 | 0.087 | 2.00 | 2.20 |



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PACKAGE DIMENSIONS

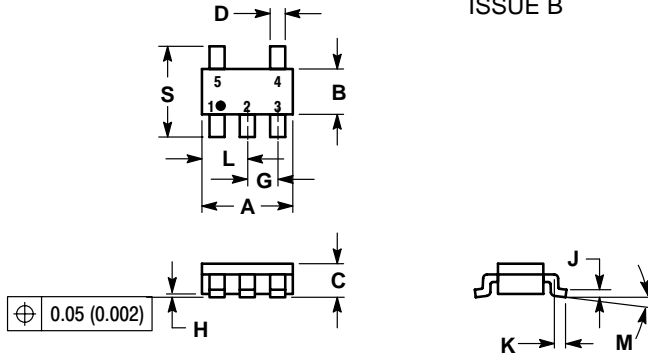
SOT23-5/TSOP-5/SC59-5

DT SUFFIX

5-LEAD PACKAGE

CASE 483-01

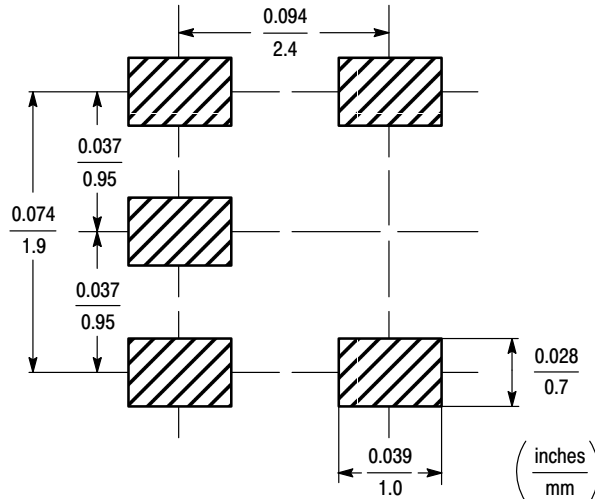
ISSUE B




NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|--------|--------|
| | MIN | MAX | MIN | MAX |
| A | 2.90 | 3.10 | 0.1142 | 0.1220 |
| B | 1.30 | 1.70 | 0.0512 | 0.0669 |
| C | 0.90 | 1.10 | 0.0354 | 0.0433 |
| D | 0.25 | 0.50 | 0.0098 | 0.0197 |
| G | 0.85 | 1.05 | 0.0335 | 0.0413 |
| H | 0.013 | 0.100 | 0.0005 | 0.0040 |
| J | 0.10 | 0.26 | 0.0040 | 0.0102 |
| K | 0.20 | 0.60 | 0.0079 | 0.0236 |
| L | 1.25 | 1.55 | 0.0493 | 0.0610 |
| M | 0° | 10° | 0° | 10° |
| S | 2.50 | 3.00 | 0.0985 | 0.1181 |



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