

MC74VHC139

Dual 2-to-4 Decoder/ Demultiplexer

The MC74VHC139 is an advanced high speed CMOS 2-to-4 decoder/ demultiplexer fabricated with silicon gate CMOS technology. It achieves high speed operation similar to equivalent Bipolar Schottky TTL while maintaining CMOS low power dissipation.

When the device is enabled ($\bar{E} = \text{low}$), it can be used for gating or as a data input for demultiplexing operations. When the enable input is held high, all four outputs are fixed high, independent of other inputs.

The internal circuit is composed of three stages, including a buffer output which provides high noise immunity and stable output. The inputs tolerate voltages up to 7 V, allowing the interface of 5 V systems to 3 V systems.

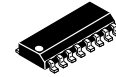
- High Speed: $t_{PD} = 5.0 \text{ ns (Typ)}$ at $V_{CC} = 5 \text{ V}$
- Low Power Dissipation: $I_{CC} = 4 \mu\text{A (Max)}$ at $T_A = 25^\circ\text{C}$
- High Noise Immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC}$
- Power Down Protection Provided on Inputs
- Balanced Propagation Delays
- Designed for 2 V to 5.5 V Operating Range
- Low Noise: $V_{OLP} = 0.8 \text{ V (Max)}$
- Pin and Function Compatible with Other Standard Logic Families
- Latchup Performance Exceeds 300 mA
- ESD Performance: Human Body Model > 2000 V;
Machine Model > 200 V
- Chip Complexity: 100 FETs or 25 Equivalent Gates
- These Devices are Pb-Free and are RoHS Compliant



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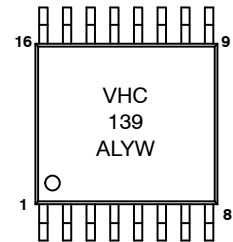
MARKING DIAGRAMS



**SOIC-16
D SUFFIX
CASE 751B**

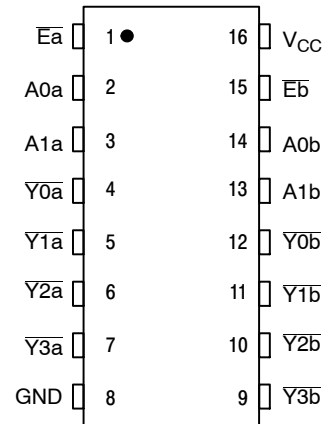


**TSSOP-16
DT SUFFIX
CASE 948F**



A = Assembly Location
WL, L = Wafer Lot
YY, Y = Year
WW, W = Work Week

PIN ASSIGNMENT



ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

MC74VHC139

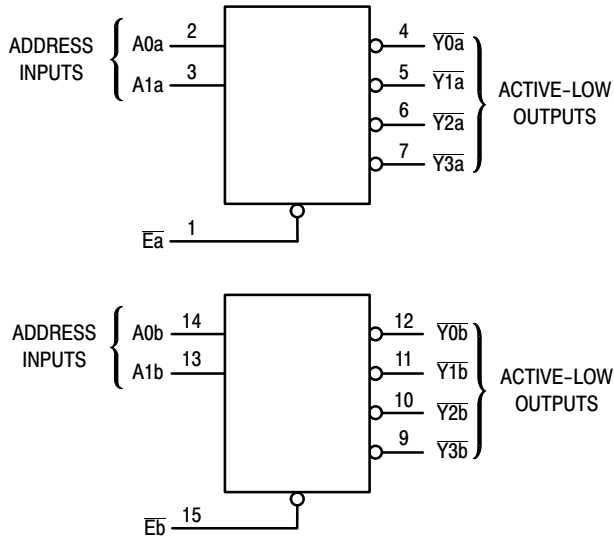


Figure 1. Logic Diagram

Table 1. FUNCTION TABLE

| Inputs | | | Outputs | | | |
|--------|----|----|-----------------|-----------------|-----------------|-----------------|
| E | A1 | A0 | $\overline{Y0}$ | $\overline{Y1}$ | $\overline{Y2}$ | $\overline{Y3}$ |
| H | X | X | H | H | H | H |
| L | L | L | L | H | H | H |
| L | L | H | H | L | H | H |
| L | H | L | H | H | L | H |
| L | H | H | H | H | H | L |

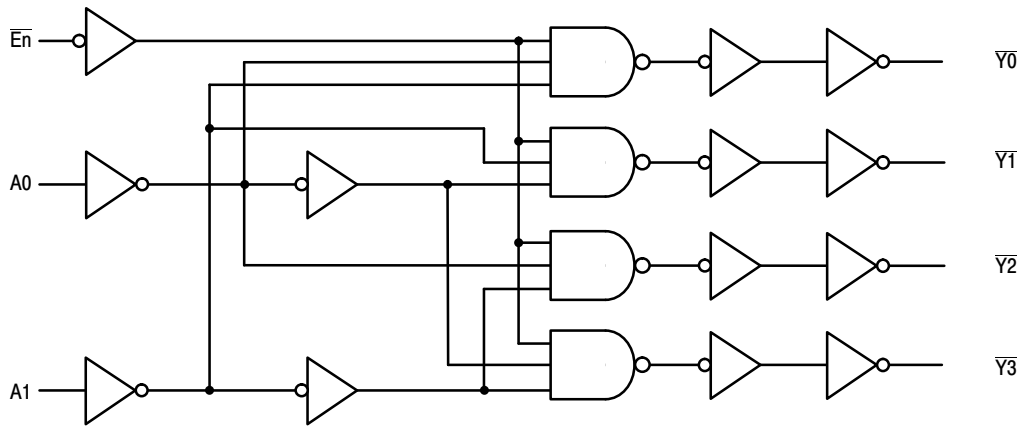


Figure 2. Expanded Logic Diagram
(1/2 of Device)

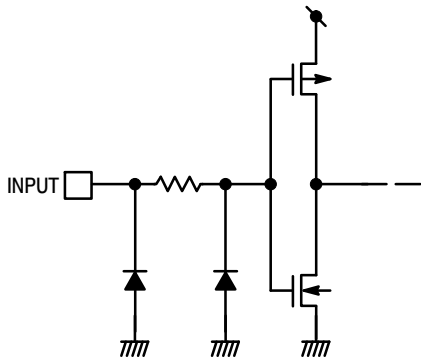


Figure 3. Input Equivalent Circuit

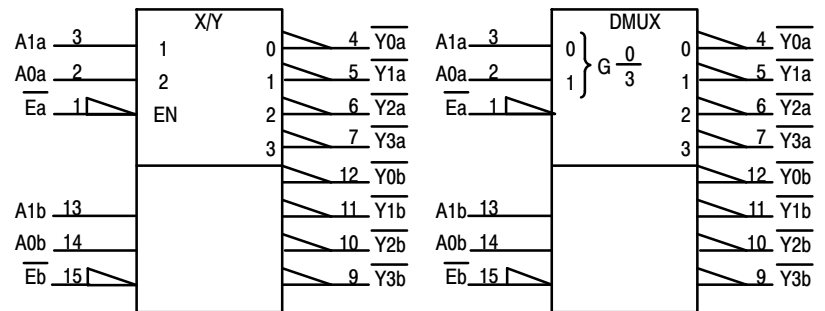


Figure 4. IEC Logic Diagram

MC74VHC139

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} | Input Diode Current | -20 | mA |
| I _{OK} | Output Diode Current | ±20 | mA |
| I _{out} | DC Output Current, per Pin | ±25 | mA |
| I _{CC} | DC Supply Current, V _{CC} and GND Pins | ±75 | mA |
| P _D | Power Dissipation in Still Air, SOIC Packages† TSSOP Package† | 500 450 | mW |
| T _{stg} | Storage Temperature | -65 to +150 | °C |

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V_{in} and V_{out} should be constrained to the range GND ≤ (V_{in} or V_{out}) ≤ V_{CC}. Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V_{CC}). Unused outputs must be left open.

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

†Derating – SOIC Packages: - 7 mW/°C from 65° to 125°C
TSSOP Package: - 6.1 mW/°C from 65° to 125°C

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Min | Max | Unit |
|---------------------------------|--|--|-----------------|------------|
| V _{CC} | DC Supply Voltage | 2.0 | 5.5 | V |
| V _{in} | DC Input Voltage | 0 | 5.5 | V |
| V _{out} | DC Output Voltage | 0 | V _{CC} | V |
| T _A | Operating Temperature | -55 | +125 | °C |
| t _r , t _f | Input Rise and Fall Time (Figure 3) | V _{CC} = 3.3 V ±0.3V V _{CC} = 5.0 V ±0.5V | 0 100 | ns/V 20 |

The θ_{JA} of the package is equal to 1/Derating. Higher junction temperatures may affect the expected lifetime of the device per the table and figure below.

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 |

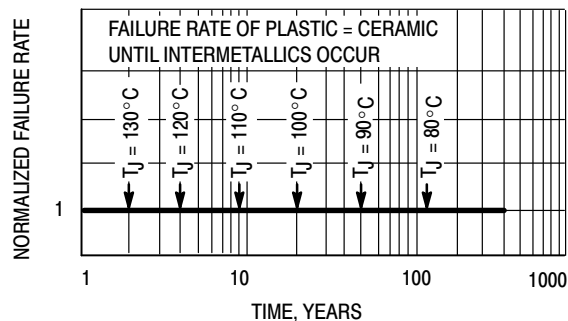


Figure 5. Failure Rate vs. Time Junction Temperature

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DC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Test Conditions | V _{CC} (V) | T _A = 25°C | | | T _A = ≤ 85°C | | T _A = ≤ 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 | | μA |
| I _{CC} | Maximum Quiescent Supply Current | V _{IN} = V _{CC} or GND | 5.5 | | | 4.0 | | 40.0 | | 40.0 | μA |

AC ELECTRICAL CHARACTERISTICS (Input t_r = t_f = 3.0ns)

| Symbol | Parameter | Test Conditions | T _A = 25°C | | | T _A = -40 to 85°C | | T _A = -55 to 125°C | | Unit |
|--|--------------------------------------|---|-----------------------|------------|--------------|------------------------------|--------------|-------------------------------|--------------|------|
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| t _{PLH} , t _{PHL} | Maximum Propagation Delay, A to Y | V _{CC} = 3.3 ± 0.3 V C _L = 15 pF C _L = 50 pF | | 7.2 9.7 | 11.0 14.5 | 1.0 1.0 | 13.0 16.5 | 1.0 1.0 | 13.0 16.5 | ns |
| | | V _{CC} = 5.0 ± 0.5 V C _L = 15 pF C _L = 50 pF | | 5.0 6.5 | 7.2 9.2 | 1.0 1.0 | 8.5 10.5 | 1.0 1.0 | 8.5 10.5 | |
| t _{PLH} , t _{PHL} | Maximum Propagation Delay, E to Y | V _{CC} = 3.3 ± 0.3 V C _L = 15 pF C _L = 50 pF | | 6.4 8.9 | 9.2 12.7 | 1.0 1.0 | 11.0 14.5 | 1.0 1.0 | 11.0 14.5 | ns |
| | | V _{CC} = 5.0 ± 0.5 V C _L = 15 pF C _L = 50 pF | | 4.4 5.9 | 6.3 8.3 | 1.0 1.0 | 7.5 9.5 | 1.0 1.0 | 7.5 9.5 | |
| C _{IN} | Maximum Input Capacitance | | | 4 | 10 | | 10 | | 10 | pF |

| | | | |
|-----------------|-----------------------------------|---|----|
| C _{PD} | Power Dissipation Capacitance (1) | Typical @ 25°C, V _{CC} = 5.0 V | pF |
| | | 26 | |

1. 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}/2 (per decoder). 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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SWITCHING WAVEFORMS

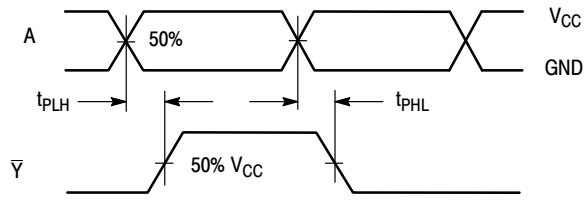


Figure 6.

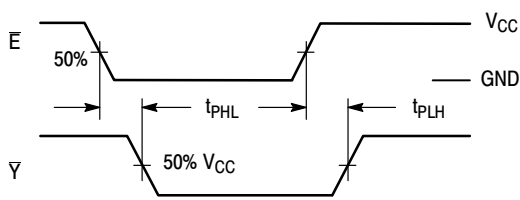
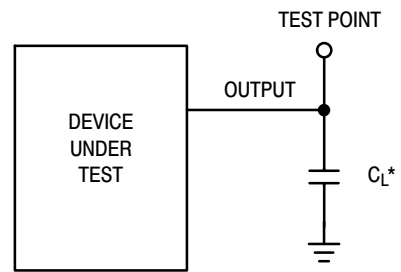


Figure 7.



*Includes all probe and jig capacitance

Figure 8. Test Circuit

MC74VHC139

ORDERING INFORMATION

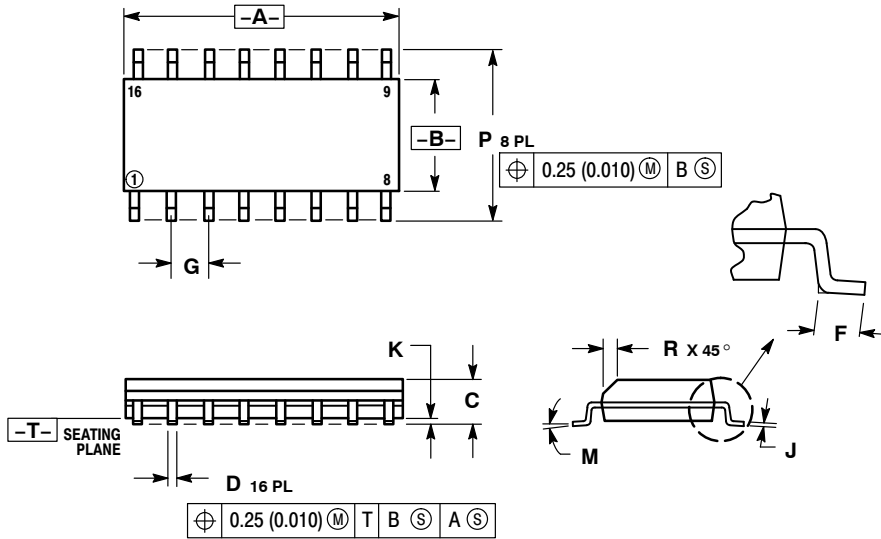
| Device | Package | Shipping† |
|-----------------|-----------------------|--------------------|
| MC74VHC139DR2G | SOIC-16 (Pb-Free) | 2500 / Tape & Reel |
| MC74VHC139DTR2G | TSSOP-16 (Pb-Free) | 2500 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

MC74VHC139

PACKAGE DIMENSIONS

SOIC-16
CASE 751B-05
ISSUE K

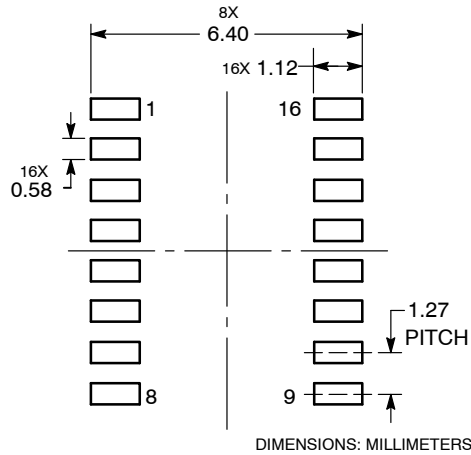


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | 9.80 | 10.00 | 0.386 | 0.393 |
| B | 3.80 | 4.00 | 0.150 | 0.157 |
| C | 1.35 | 1.75 | 0.054 | 0.068 |
| D | 0.35 | 0.49 | 0.014 | 0.019 |
| F | 0.40 | 1.25 | 0.016 | 0.049 |
| G | 1.27 BSC | | 0.050 BSC | |
| J | 0.19 | 0.25 | 0.008 | 0.009 |
| K | 0.10 | 0.25 | 0.004 | 0.009 |
| M | 0° | 7° | 0° | 7° |
| P | 5.80 | 6.20 | 0.229 | 0.244 |
| R | 0.25 | 0.50 | 0.010 | 0.019 |

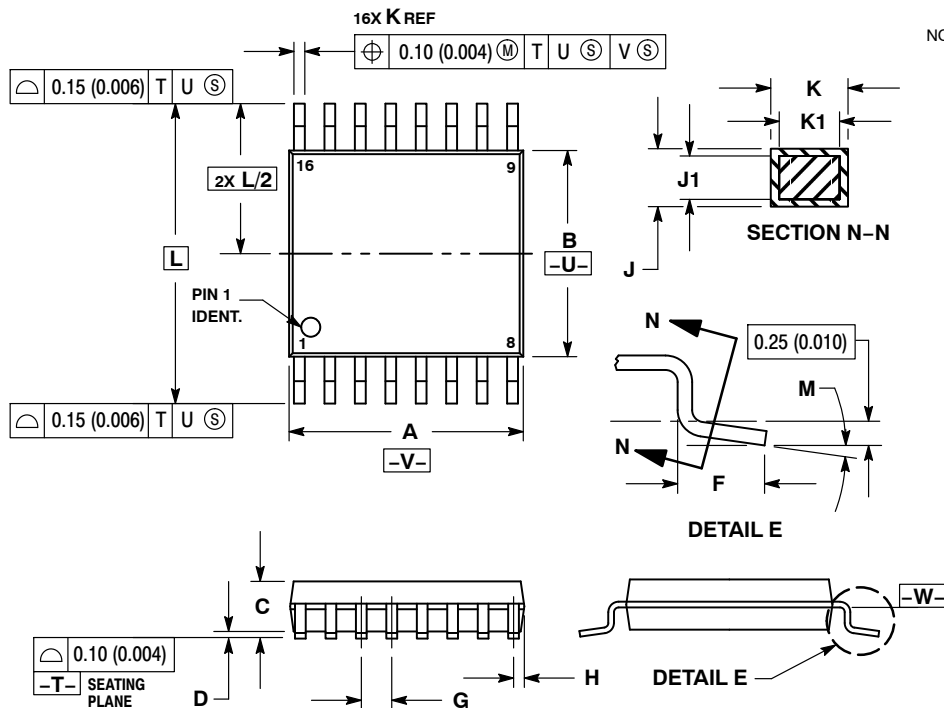
SOLDERING FOOTPRINT



MC74VHC139

PACKAGE DIMENSIONS

TSSOP-16
CASE 948F-01
ISSUE B

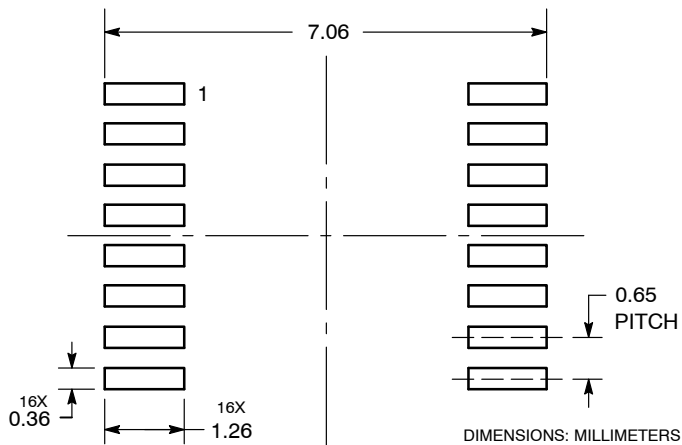


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH. PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | 4.90 | 5.10 | 0.193 | 0.200 |
| B | 4.30 | 4.50 | 0.169 | 0.177 |
| C | --- | 1.20 | --- | 0.047 |
| D | 0.05 | 0.15 | 0.002 | 0.006 |
| F | 0.50 | 0.75 | 0.020 | 0.030 |
| G | 0.65 BSC | | 0.026 BSC | |
| H | 0.18 | 0.28 | 0.007 | 0.011 |
| J | 0.09 | 0.20 | 0.004 | 0.008 |
| J1 | 0.09 | 0.16 | 0.004 | 0.006 |
| K | 0.19 | 0.30 | 0.007 | 0.012 |
| K1 | 0.19 | 0.25 | 0.007 | 0.010 |
| L | 6.40 BSC | | 0.252 BSC | |
| M | 0° | 8° | 0° | 8° |

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С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

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- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

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Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



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