



**THE DATASHEET OF
MC10E164FNR2G**



MC10E164, MC100E164

5V ECL 16:1 Multiplexer

Description

The MC10E/100E164 is a 16:1 multiplexer with a differential output. The select inputs (SEL0, 1, 2, 3) control which one of the sixteen data inputs (A0 – A15) is propagated to the output.

Special attention to the design layout results in a typical skew between the 16 inputs of only 50 ps.

The 100 Series contains temperature compensation.

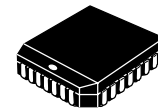
Features

- 850 ps Data Input to Output
 - Differential Output
 - PECL Mode Operating Range: $V_{CC} = 4.2\text{ V}$ to 5.7 V with $V_{EE} = 0\text{ V}$
 - NECL Mode Operating Range: $V_{CC} = 0\text{ V}$ with $V_{EE} = -4.2\text{ V}$ to -5.7 V
 - Internal Input $50\text{ k}\Omega$ Pulldown Resistors
 - ESD Protection: Human Body Model; $> 2\text{ kV}$, Machine Model; $> 200\text{ V}$
 - Meets or Exceeds JEDEC Standard EIA/JESD78 IC Latchup Test
 - Moisture Sensitivity Level:
Pb = 1
Pb-Free = 3
- For Additional Information, see Application Note AND8003/D
- Flammability Rating: UL 94 V-0 @ 0.125 in, Oxygen Index: 28 to 34
 - Transistor Count = 213 devices
 - Pb-Free Packages are Available*



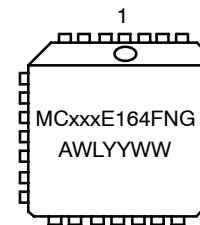
ON Semiconductor®

<http://onsemi.com>



**PLCC-28
FN SUFFIX
CASE 776**

MARKING DIAGRAM*



xxx = 10 or 100
A = Assembly Location
WL = Wafer Lot
YY = Year
WW = Work Week
G = Pb-Free Package

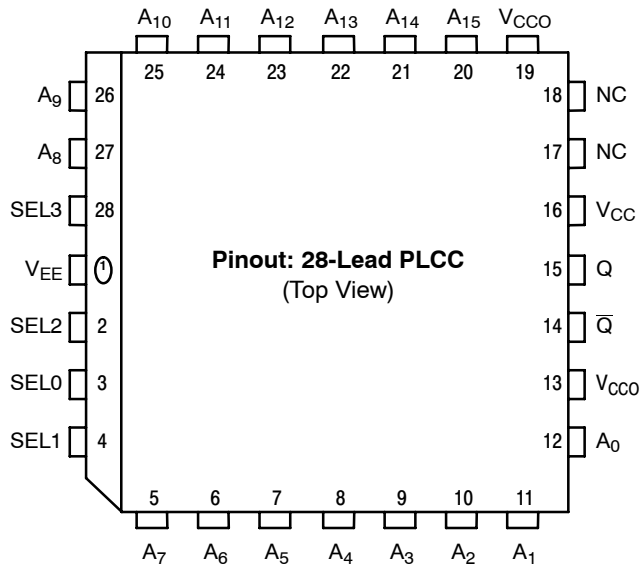
*For additional marking information, refer to Application Note AND8002/D.

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 7 of this data sheet.

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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* All V_{CC} and V_{CCO} pins are tied together on the die.
 Warning: All V_{CC}, V_{CCO}, and V_{EE} pins must be externally connected to Power Supply to guarantee proper operation.

Figure 1. 28-Lead Pinout Assignment

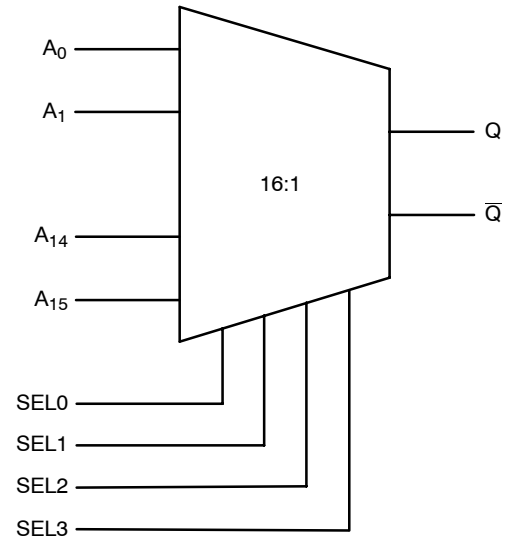


Figure 2. Logic Diagram

Table 1. PIN DESCRIPTION

| PIN | FUNCTION |
|------------------------------------|-------------------|
| A ₀ – A ₁₅ | ECL Data Inputs |
| SEL[0:3] | ECL Select Inputs |
| Q, \bar{Q} | ECL Output |
| V _{CC} , V _{CCO} | Positive Supply |
| V _{EE} | Negative Supply |
| NC | No Connect |

Table 2. FUNCTION TABLE

| SEL3 | SEL2 | SEL1 | SEL0 | Data |
|------|------|------|------|------|
| L | L | L | L | A0 |
| L | L | L | H | A1 |
| L | L | H | L | A2 |
| L | L | H | H | A3 |
| L | H | L | L | A4 |
| L | H | L | H | A5 |
| L | H | H | L | A6 |
| L | H | H | H | A7 |
| H | L | L | L | A8 |
| H | L | L | H | A9 |
| H | L | H | L | A10 |
| H | L | H | H | A11 |
| H | H | L | L | A12 |
| H | H | L | H | A13 |
| H | H | H | L | A14 |
| H | H | H | H | A15 |

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Table 3. MAXIMUM RATINGS

| Symbol | Parameter | Condition 1 | Condition 2 | Rating | Unit |
|---------------|--|--|--|--------------|--------------|
| V_{CC} | PECL Mode Power Supply | $V_{EE} = 0\text{ V}$ | | 8 | V |
| V_I | PECL Mode Input Voltage NECL Mode Input Voltage | $V_{EE} = 0\text{ V}$ $V_{CC} = 0\text{ V}$ | $V_I \leq V_{CC}$ $V_I \geq V_{EE}$ | 6 -6 | V V |
| I_{out} | Output Current | Continuous Surge | | 50 100 | mA mA |
| T_A | Operating Temperature Range | | | 0 to +85 | °C |
| T_{stg} | Storage Temperature Range | | | -65 to +150 | °C |
| θ_{JA} | Thermal Resistance (Junction-to-Ambient) | 0 lfpm 500 lfpm | PLCC-28 PLCC-28 | 63.5 43.5 | °C/W °C/W |
| θ_{JC} | Thermal Resistance (Junction-to-Case) | Standard Board | PLCC-28 | 22 to 26 | °C/W |
| T_{sol} | Wave Solder Pb Pb-Free | | | 265 265 | °C |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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Table 4. 10E SERIES PECL DC CHARACTERISTICS $V_{CCx} = 5.0\text{ V}$, $V_{EE} = 0.0\text{ V}$ (Note 1)

| Symbol | Characteristic | 0°C | | | 25°C | | | 85°C | | | Unit |
|----------|------------------------------|------|------|------|------|------|------|------|------|------|---------------|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | |
| I_{EE} | Power Supply Current | | 33 | 40 | | 33 | 40 | | 33 | 40 | mA |
| I_{EE} | Power Supply Current | | 59 | 71 | | 59 | 71 | | 59 | 71 | mA |
| V_{OH} | Output HIGH Voltage (Note 2) | 3980 | 4070 | 4160 | 4020 | 4105 | 4190 | 4090 | 4185 | 4280 | mV |
| V_{OL} | Output LOW Voltage (Note 2) | 3050 | 3210 | 3370 | 3050 | 3210 | 3370 | 3050 | 3227 | 3405 | mV |
| V_{IH} | Input HIGH Voltage | 3830 | 3995 | 4160 | 3870 | 4030 | 4190 | 3940 | 4110 | 4280 | mV |
| V_{IL} | Input LOW Voltage | 3050 | 3285 | 3520 | 3050 | 3285 | 3520 | 3050 | 3302 | 3555 | mV |
| I_{IH} | Input HIGH Current | | | 150 | | | 150 | | | 150 | μA |
| I_{IL} | Input LOW Current | 0.5 | 0.3 | | 0.5 | 0.25 | | 0.3 | 0.2 | | μA |

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

1. Input and output parameters vary 1:1 with V_{CC} . V_{EE} can vary $-0.46\text{ V} / +0.06\text{ V}$.
2. Outputs are terminated through a $50\ \Omega$ resistor to $V_{CC} - 2.0\text{ V}$.

Table 5. 10E SERIES NECL DC CHARACTERISTICS $V_{CCx} = 0.0\text{ V}$; $V_{EE} = -5.0\text{ V}$ (Note 3)

| Symbol | Characteristic | 0°C | | | 25°C | | | 85°C | | | Unit |
|----------|------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------------|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | |
| I_{EE} | Power Supply Current | | 59 | 71 | | 59 | 71 | | 59 | 71 | mA |
| V_{OH} | Output HIGH Voltage (Note 4) | -1020 | -930 | -840 | -980 | -895 | -810 | -910 | -815 | -720 | mV |
| V_{OL} | Output LOW Voltage (Note 4) | -1950 | -1790 | -1630 | -1950 | -1790 | -1630 | -1950 | -1773 | -1595 | mV |
| V_{IH} | Input HIGH Voltage | -1170 | -1005 | -840 | -1130 | -970 | -810 | -1060 | -890 | -720 | mV |
| V_{IL} | Input LOW Voltage | -1950 | -1715 | -1480 | -1950 | -1715 | -1480 | -1950 | -1698 | -1445 | mV |
| I_{IH} | Input HIGH Current | | | 150 | | | 150 | | | 150 | μA |
| I_{IL} | Input LOW Current | 0.5 | 0.3 | | 0.5 | 0.065 | | 0.3 | 0.2 | | μA |

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

3. Input and output parameters vary 1:1 with V_{CC} . V_{EE} can vary $-0.46\text{ V} / +0.06\text{ V}$.
4. Outputs are terminated through a $50\ \Omega$ resistor to $V_{CC} - 2.0\text{ V}$.

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Table 6. 100E SERIES PECL DC CHARACTERISTICS $V_{CCx} = 5.0\text{ V}$; $V_{EE} = 0.0\text{ V}$ (Note 5)

| Symbol | Characteristic | 0°C | | | 25°C | | | 85°C | | | Unit |
|----------|------------------------------|------|------|------|------|------|------|------|------|------|---------------|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | |
| I_{EE} | Power Supply Current | | 59 | 71 | | 59 | 71 | | 68 | 81 | mA |
| V_{OH} | Output HIGH Voltage (Note 6) | 3975 | 4050 | 4120 | 3975 | 4050 | 4120 | 3975 | 4050 | 4120 | mV |
| V_{OL} | Output LOW Voltage (Note 6) | 3190 | 3295 | 3380 | 3190 | 3255 | 3380 | 3190 | 3260 | 3380 | mV |
| V_{IH} | Input HIGH Voltage | 3835 | 3975 | 4120 | 3835 | 3975 | 4120 | 3835 | 3975 | 4120 | mV |
| V_{IL} | Input LOW Voltage | 3190 | 3355 | 3525 | 3190 | 3355 | 3525 | 3190 | 3355 | 3525 | mV |
| I_{IH} | Input HIGH Current | | | 150 | | | 150 | | | 150 | μA |
| I_{IL} | Input LOW Current | 0.5 | 0.3 | | 0.5 | 0.25 | | 0.5 | 0.2 | | μA |

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

5. Input and output parameters vary 1:1 with V_{CC} . V_{EE} can vary $-0.46\text{ V} / +0.8\text{ V}$.

6. Outputs are terminated through a $50\ \Omega$ resistor to $V_{CC} - 2.0\text{ V}$.

Table 7. 100E SERIES NECL DC CHARACTERISTICS $V_{CCx} = 0.0\text{ V}$; $V_{EE} = -5.0\text{ V}$ (Note 7)

| Symbol | Characteristic | 0°C | | | 25°C | | | 85°C | | | Unit |
|----------|------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------------|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | |
| I_{EE} | Power Supply Current | | 59 | 71 | | 59 | 71 | | 68 | 81 | mA |
| V_{OH} | Output HIGH Voltage (Note 8) | -1025 | -950 | -880 | -1025 | -950 | -880 | -1025 | -950 | -880 | mV |
| V_{OL} | Output LOW Voltage (Note 8) | -1810 | -1705 | -1620 | -1810 | -1745 | -1620 | -1810 | -1740 | -1620 | mV |
| V_{IH} | Input HIGH Voltage | -1165 | -1025 | -880 | -1165 | -1025 | -880 | -1165 | -1025 | -880 | mV |
| V_{IL} | Input LOW Voltage | -1810 | -1645 | -1475 | -1810 | -1645 | -1475 | -1810 | -1645 | -1475 | mV |
| I_{IH} | Input HIGH Current | | | 150 | | | 150 | | | 150 | μA |
| I_{IL} | Input LOW Current | 0.5 | 0.3 | | 0.5 | 0.25 | | 0.5 | 0.2 | | μA |

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

7. Input and output parameters vary 1:1 with V_{CC} . V_{EE} can vary $-0.46\text{ V} / +0.8\text{ V}$.

8. Outputs are terminated through a $50\ \Omega$ resistor to $V_{CC} - 2.0\text{ V}$.

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Table 8. AC CHARACTERISTICS $V_{CCx} = 5.0\text{ V}$; $V_{EE} = 0.0\text{ V}$ or $V_{CCx} = 0.0\text{ V}$; $V_{EE} = -5.0\text{ V}$ (Note 9)

| Symbol | Characteristic | 0°C | | | 25°C | | | 85°C | | | Unit |
|------------------------|--|-----|------|------|------|------|------|------|------|------|------|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | |
| f_{MAX} | Maximum Toggle Frequency | 700 | 1100 | | 700 | 1100 | | 700 | 1100 | | MHz |
| t_{PLH} t_{PHL} | Propagation Delay to Output A to Q/Q, SELx to Q/Q | 600 | 850 | 1100 | 600 | 850 | 1100 | 600 | 850 | 1100 | ps |
| t_{SKEW} | Within Device Skew (Note 10) | | 50 | | | 50 | | | 50 | | ps |
| t_{JITTER} | Random Clock Jitter (RMS) | | < 1 | | | < 1 | | | < 1 | | ps |
| t_r t_f | Rise/Fall Times (20 - 80%) | 275 | 400 | 550 | 275 | 400 | 550 | 275 | 400 | 550 | ps |

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

9. 10 Series: V_{EE} can vary $-0.46\text{ V} / +0.06\text{ V}$.

100 Series: V_{EE} can vary $-0.46\text{ V} / +0.8\text{ V}$.

10. Within Device skew is defined as the difference in the A to Q delay between the 16 different A inputs.

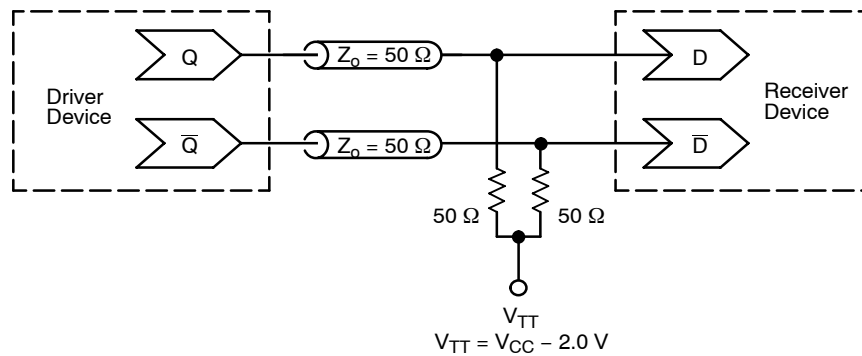


Figure 3. Typical Termination for Output Driver and Device Evaluation
(See Application Note AND8020/D – Termination of ECL Logic Devices.)

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ORDERING INFORMATION

| Device | Package | Shipping† |
|----------------|----------------------|-------------------|
| MC10E164FN | PLCC-28 | 37 Units / Rail |
| MC10E164FNG | PLCC-28 (Pb-Free) | 37 Units / Rail |
| MC10E164FNR2 | PLCC-28 | 500 / Tape & Reel |
| MC10E164FNR2G | PLCC-28 (Pb-Free) | 500 / Tape & Reel |
| MC100E164FN | PLCC-28 | 37 Units / Rail |
| MC100E164FNG | PLCC-28 (Pb-Free) | 37 Units / Rail |
| MC100E164FNR2 | PLCC-28 | 500 / Tape & Reel |
| MC100E164FNR2G | PLCC-28 (Pb-Free) | 500 / 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.

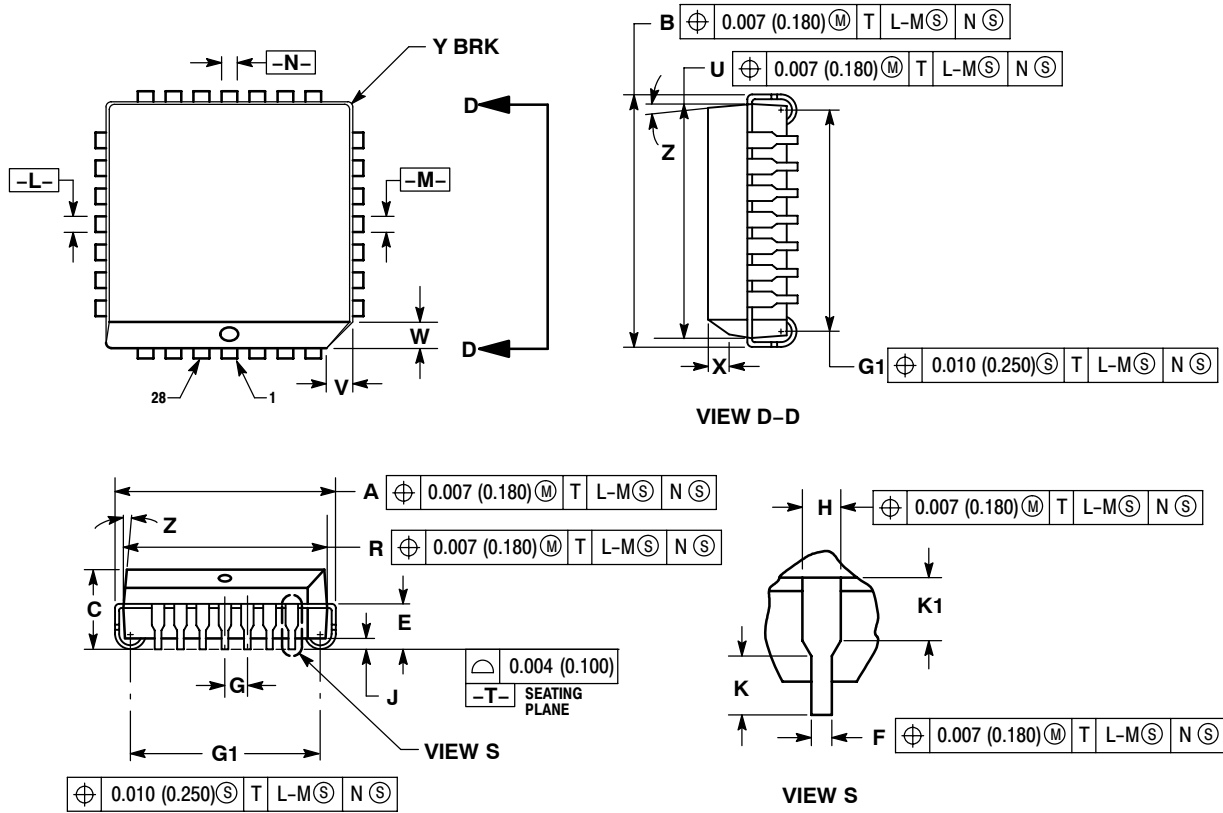
Resource Reference of Application Notes

- AN1405/D** – ECL Clock Distribution Techniques
- AN1406/D** – Designing with PECL (ECL at +5.0 V)
- AN1503/D** – ECLinPS™ I/O SPICE Modeling Kit
- AN1504/D** – Metastability and the ECLinPS Family
- AN1568/D** – Interfacing Between LVDS and ECL
- AN1672/D** – The ECL Translator Guide
- AND8001/D** – Odd Number Counters Design
- AND8002/D** – Marking and Date Codes
- AND8020/D** – Termination of ECL Logic Devices
- AND8066/D** – Interfacing with ECLinPS
- AND8090/D** – AC Characteristics of ECL Devices

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PACKAGE DIMENSIONS

PLCC-28
FN SUFFIX
PLASTIC PLCC PACKAGE
CASE 776-02
ISSUE E



NOTES:

- DATUMS -L-, -M-, AND -N- DETERMINED WHERE TOP OF LEAD SHOULDER EXITS PLASTIC BODY AT MOLD PARTING LINE.
- DIMENSION G1, TRUE POSITION TO BE MEASURED AT DATUM -T-, SEATING PLANE.
- DIMENSIONS R AND U DO NOT INCLUDE MOLD FLASH. ALLOWABLE MOLD FLASH IS 0.010 (0.250) PER SIDE.
- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: INCH.
- THE PACKAGE BOTTOM MAY BE SMALLER THAN THE PACKAGE TOP BY UP TO 0.012 (0.300). DIMENSIONS R AND U ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY EXCLUSIVE OF MOLD FLASH, TIE BAR BURRS, GATE BURRS AND INTERLEAD FLASH, BUT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF THE PLASTIC BODY.
- DIMENSION H DOES NOT INCLUDE DAMBAR PROTRUSION OR INTRUSION. THE DAMBAR PROTRUSION(S) SHALL NOT CAUSE THE H DIMENSION TO BE GREATER THAN 0.037 (0.940). THE DAMBAR INTRUSION(S) SHALL NOT CAUSE THE H DIMENSION TO BE SMALLER THAN 0.025 (0.635).

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.485 | 0.495 | 12.32 | 12.57 |
| B | 0.485 | 0.495 | 12.32 | 12.57 |
| C | 0.165 | 0.180 | 4.20 | 4.57 |
| E | 0.090 | 0.110 | 2.29 | 2.79 |
| F | 0.013 | 0.019 | 0.33 | 0.48 |
| G | 0.050 BSC | | 1.27 BSC | |
| H | 0.026 | 0.032 | 0.66 | 0.81 |
| J | 0.020 | --- | 0.51 | --- |
| K | 0.025 | --- | 0.64 | --- |
| R | 0.450 | 0.456 | 11.43 | 11.58 |
| U | 0.450 | 0.456 | 11.43 | 11.58 |
| V | 0.042 | 0.048 | 1.07 | 1.21 |
| W | 0.042 | 0.048 | 1.07 | 1.21 |
| X | 0.042 | 0.056 | 1.07 | 1.42 |
| Y | --- | 0.020 | --- | 0.50 |
| Z | 2° 10° | | 2° 10° | |
| G1 | 0.410 | 0.430 | 10.42 | 10.92 |
| K1 | 0.040 | --- | 1.02 | --- |

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