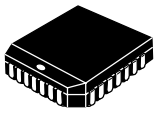
# MC10E157, MC100E157

# 5 V ECL Quad 2:1 Multiplexer



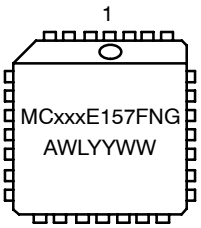
**ON Semiconductor®**

**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 6 of this data sheet.

### Description

The MC10E/100E157 contains four 2:1 multiplexers with differential outputs. The output data are controlled by the individual Select (SEL) inputs. The individual select control makes the devices well suited for random logic designs.

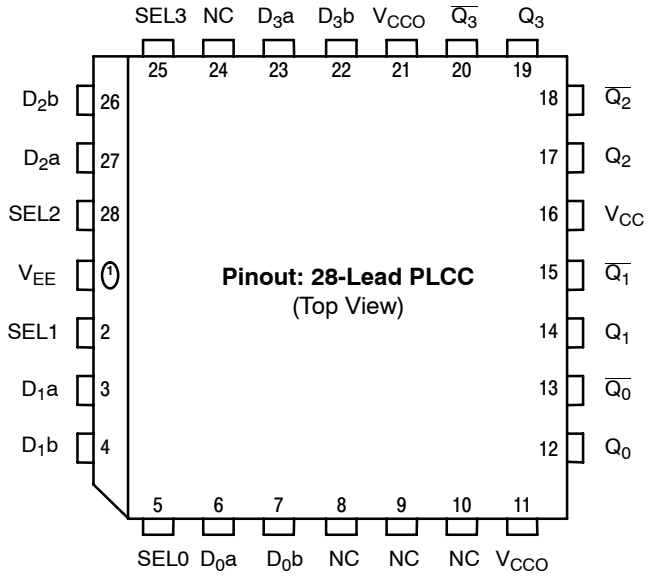
The 100 Series contains temperature compensation.

### Features

- Individual Select Controls
- 550 ps Max. D to Output
- 800 ps Max. SEL to Output
- PECL Mode Operating Range: $V_{CC}$ = 4.2 V to 5.7 V with $V_{EE}$ = 0 V
- NECL Mode Operating Range: $V_{CC}$= 0 V with $V_{EE}$ = −4.2 V to −5.7 V
- Internal Input 50 kΩ Pulldown Resistors
- ESD Protection: Human Body Model; > 2 kV,
  Machine Model; > 200 V
  Charged Device Model; > 2 kV
- 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
- Meets or Exceeds JEDEC Spec EIA/JESD78 IC Latchup Test
- Transistor Count = 137 devices
- Pb−Free Packages are Available*

*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**

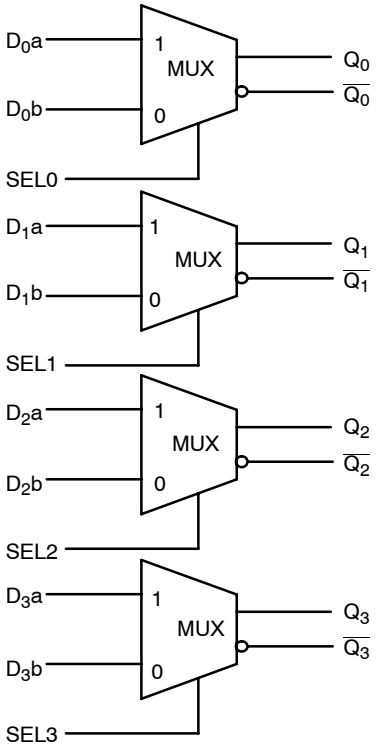



**Figure 2. Logic Diagram**

**Table 1. PIN DESCRIPTION**

| PIN | FUNCTION |
|---|---|
| $D_0a$ – $D_3a$ | ECL Input Data a |
| $D_0b$ – $D_3b$ | ECL Input Data b |
| SEL0 – SEL3 | ECL Select Inputs |
| $Q_0$ – $Q_3$, $\overline{Q_0}$ – $\overline{Q_3}$ | ECL Differential Outputs |
| $V_{CC}$, $V_{CCO}$ | Positive Supply |
| $V_{EE}$ | Negative Supply |
| NC | No Connect |

**Table 2. Logic Diagram**

| SEL | Data |
|---|---|
| H<br>L | a<br>b |

**Table 3. MAXIMUM RATINGS**

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

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

| | | 0°C | | | 25°C | | | 85°C | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Symbol | Characteristic | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | Unit |
| $I_{EE}$ | Power Supply Current | | 32 | 38 | | 32 | 38 | | 32 | 38 | 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<br>D<br>SEL | | | <br>200<br>150 | | | <br>200<br>150 | | | <br>200<br>150 | <br>μA<br>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 lfpm. 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 V / +0.06 V.
2. Outputs are terminated through a 50 Ω resistor to $V_{CC}$ − 2.0 V.

**Table 5. 10E SERIES PECL DC CHARACTERISTICS** $V_{CC}$ = 5.0 V, $V_{EE}$ = 0.0 V (Note 3)

| | | 0°C | | | 25°C | | | 85°C | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Symbol** | **Characteristic** | **Min** | **Typ** | **Max** | **Min** | **Typ** | **Max** | **Min** | **Typ** | **Max** | **Unit** |
| $I_{EE}$ | Power Supply Current | | 32 | 38 | | 32 | 38 | | 32 | 38 | 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<br>D<br>SEL | | | <br>200<br>150 | | | <br>200<br>150 | | | <br>200<br>150 | <br>μA<br>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 lfpm. 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 V / +0.06 V.
4. Outputs are terminated through a 50 Ω resistor to $V_{CC}$ − 2.0 V.

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

| | | 0°C | | | 25°C | | | 85°C | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Symbol** | **Characteristic** | **Min** | **Typ** | **Max** | **Min** | **Typ** | **Max** | **Min** | **Typ** | **Max** | **Unit** |
| $I_{EE}$ | Power Supply Current | | 32 | 38 | | 32 | 38 | | 37 | 44 | 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 |
| $V_{BB}$ | Output Voltage Reference | 3.62 | | 3.74 | 3.62 | | 3.74 | 3.62 | | 3.74 | V |
| $I_{IH}$ | Input HIGH Current<br>D<br>SEL | | | <br>200<br>150 | | | <br>200<br>150 | | | <br>200<br>150 | <br>μA<br>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 lfpm. 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 V / +0.8 V.
6. Outputs are terminated through a 50 Ω resistor to $V_{CC}$ − 2.0 V.

**Table 7. 100E SERIES NECL DC CHARACTERISTICS** $V_{CCx}$ = 0 V; $V_{EE}$ = −5.0 V (Note 7)

| | | 0°C | | | 25°C | | | 85°C | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Symbol** | **Characteristic** | **Min** | **Typ** | **Max** | **Min** | **Typ** | **Max** | **Min** | **Typ** | **Max** | **Unit** |
| $I_{EE}$ | Power Supply Current | | 32 | 38 | | 32 | 38 | | 37 | 44 | 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 |
| $V_{BB}$ | Output Voltage Reference | −1.38 | | −1.26 | −1.38 | | −1.26 | −1.38 | | −1.26 | V |
| $I_{IH}$ | Input HIGH Current<br>D<br>SEL | | | <br>200<br>150 | | | <br>200<br>150 | | | <br>200<br>150 | <br>μA<br>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 lfpm. 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 V / +0.8 V.
8. Outputs are terminated through a 50 Ω resistor to $V_{CC}$ − 2.0 V.

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

| | | 0°C | | | 25°C | | | 85°C | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Symbol** | **Characteristic** | **Min** | **Typ** | **Max** | **Min** | **Typ** | **Max** | **Min** | **Typ** | **Max** | **Unit** |
| $f_{MAX}$ | Maximum Toggle Frequency | 700 | 1100 | | 700 | 1100 | | 700 | 1100 | | MHz |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay to Output<br>D<br>SEL | <br>220<br>425 | <br>380<br>600 | <br>550<br>800 | <br>220<br>425 | <br>380<br>600 | <br>550<br>800 | <br>220<br>425 | <br>380<br>600 | <br>550<br>800 | ps |
| $t_{SKEW}$ | Within-Device Skew (Note 10) | | 70 | | | 70 | | | 70 | | ps |
| $t_{JITTER}$ | Random Clock Jitter (RMS) | | < 1 | | | < 1 | | | < 1 | | ps |
| $t_r$<br>$t_f$ | Rise/Fall Time<br>(20 - 80%) | 275 | 400 | 650 | 275 | 400 | 650 | 275 | 400 | 650 | 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 lfpm. 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 V / +0.06 V.
   100 Series: $V_{EE}$ can vary −0.46 V / +0.8 V.
10. Within-device skew is defined as identical transitions on similar paths through a device.

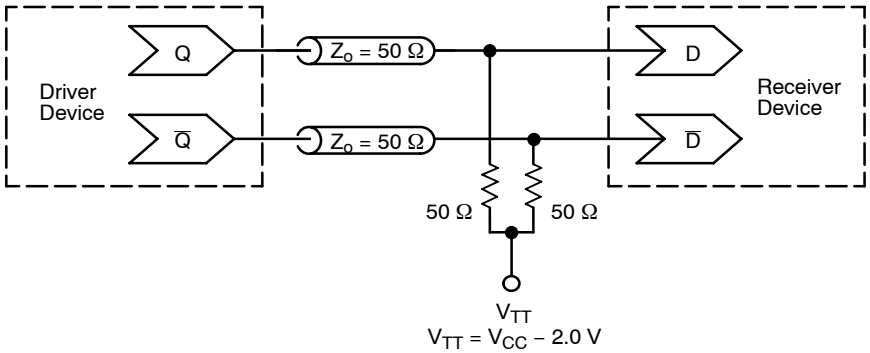



**Figure 3. Typical Termination for Output Driver and Device Evaluation (See Application Note AND8020/D – Termination of ECL Logic Devices.)**

## ORDERING INFORMATION

| Device | Package | Shipping† |
|---|---|---|
| MC10E157FN | PLCC–28 | 37 Units / Rail |
| MC10E157FNG | PLCC–28 (Pb–Free) | 37 Units / Rail |
| MC10E157FNR2 | PLCC–28 | 500 / Tape & Reel |
| MC10E157FNR2G | PLCC–28 (Pb–Free) | 500 / Tape & Reel |
| MC100E157FN | PLCC–28 | 37 Units / Rail |
| MC100E157FNG | PLCC–28 (Pb–Free) | 37 Units / Rail |
| MC100E157FNR2 | PLCC–28 | 500 / Tape & Reel |
| MC100E157FNR2G | 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

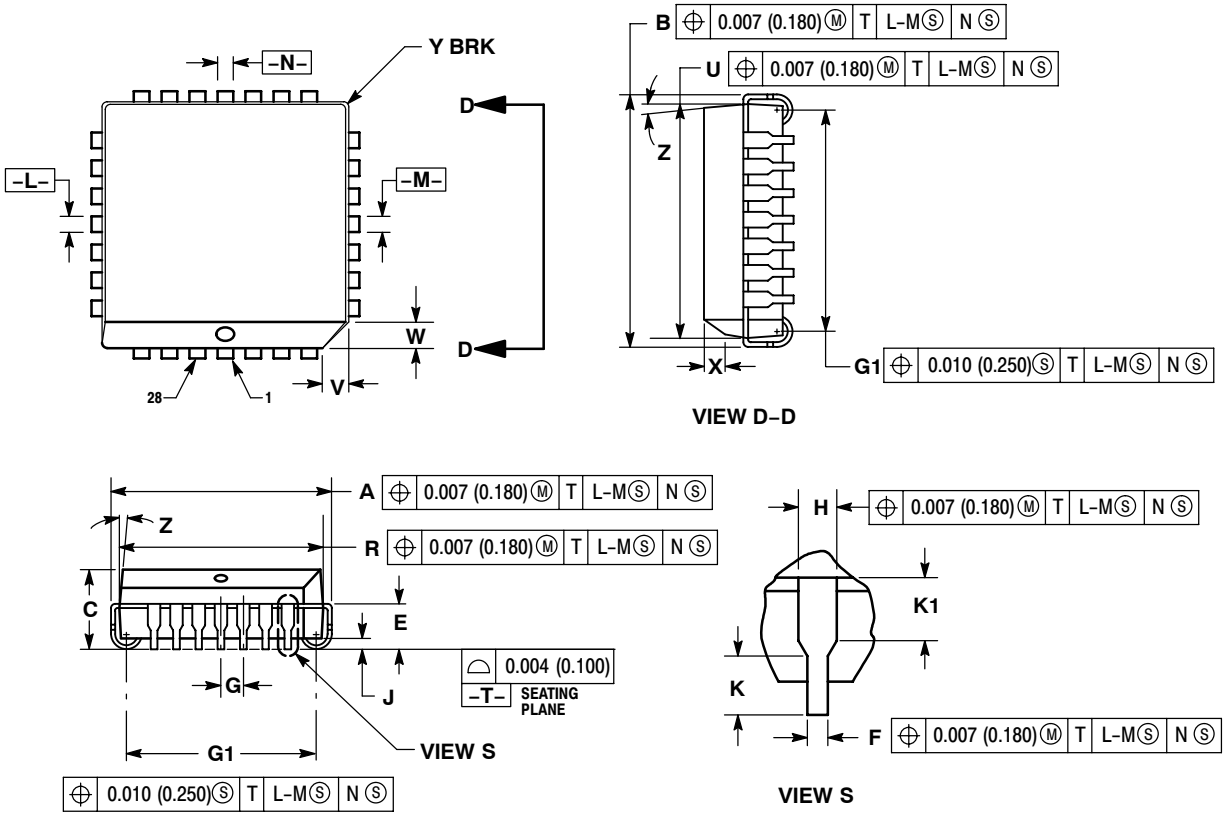
**AND8020/D** – Termination of ECL Logic Devices

**AND8066/D** – Interfacing with ECLinPS

**AND8090/D** – AC Characteristics of ECL Devices

## PACKAGE DIMENSIONS

**PLCC−28**
**FN SUFFIX**
PLASTIC PLCC PACKAGE
CASE 776−02
ISSUE E




NOTES:
1. DATUMS –L–, –M–, AND –N– DETERMINED WHERE TOP OF LEAD SHOULDER EXITS PLASTIC BODY AT MOLD PARTING LINE.
2. DIMENSION G1, TRUE POSITION TO BE MEASURED AT DATUM –T–, SEATING PLANE.
3. DIMENSIONS R AND U DO NOT INCLUDE MOLD FLASH. ALLOWABLE MOLD FLASH IS 0.010 (0.250) PER SIDE.
4. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
5. CONTROLLING DIMENSION: INCH.
6. THE PACKAGE TOP MAY BE SMALLER THAN THE PACKAGE BOTTOM 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.
7. 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).

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | 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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**MC10E157/D**