

# MC10E158, MC100E158

## 5 V ECL 5-Bit 2:1 Multiplexer

### Description

The MC10E/100E158 contains five 2:1 multiplexers with differential outputs. The output data are controlled by the Select input (SEL).

The 100 Series contains temperature compensation.

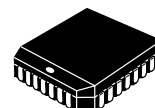
### Features

- 600 ps Max. D to Output
- 800 ps Max. SEL to Output
- Differential Outputs
- One  $V_{CCO}$  Pin Per Output Pair
- PECL Mode Operating Range:
  - ♦  $V_{CC} = 4.2\text{ V to } 5.7\text{ V}$  with  $V_{EE} = 0\text{ V}$
- NECL Mode Operating Range:
  - ♦  $V_{CC} = 0\text{ V}$  with  $V_{EE} = -4.2\text{ V to } -5.7\text{ V}$
- Internal Input 50 k $\Omega$  Pulldown Resistors
- ESD Protection:
  - ♦ Human Body Model; > 2 kV
  - ♦ Machine Model; > 200 V
- Meets or Exceeds JEDEC Standard EIA/JESD78 IC Latchup Test
- Moisture Sensitivity Level: 3 (Pb-Free)
  - ♦ For Additional Information, see Application Note [AND8003/D](#)
- Flammability Rating:
  - ♦ UL 94 V-0 @ 0.125 in, Oxygen Index: 28 to 34
- Transistor Count = 126 devices
- These Devices are Pb-Free, Halogen Free and are RoHS Compliant



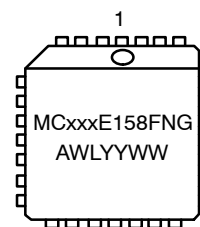
**ON Semiconductor®**

[www.onsemi.com](http://www.onsemi.com)



PLCC-28  
FN SUFFIX  
CASE 776-02

### MARKING DIAGRAM\*



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

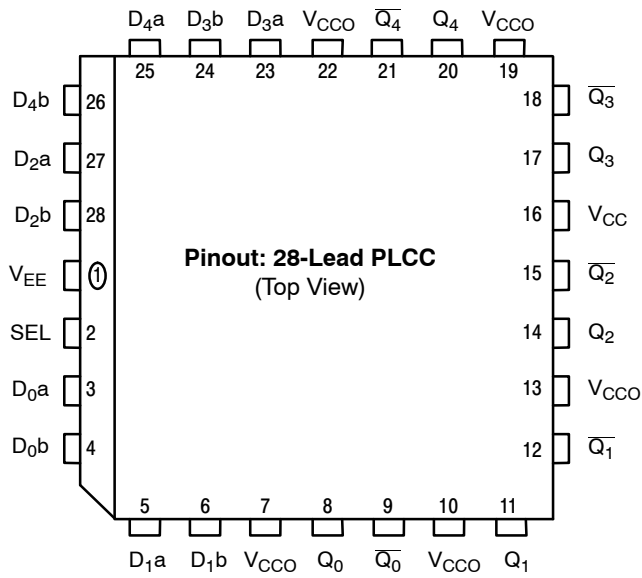
\*For additional marking information, refer to Application Note [AND8002/D](#).

### ORDERING INFORMATION

| Device        | Package              | Shipping†       |
|---------------|----------------------|-----------------|
| MC10E158FNG   | PLCC-28<br>(Pb-Free) | 37 Units/Tube   |
| MC10E158FNR2G | PLCC-28<br>(Pb-Free) | 500/Tape & Reel |
| MC100E158FNG  | PLCC-28<br>(Pb-Free) | 37 Units/Tube   |

†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](#).

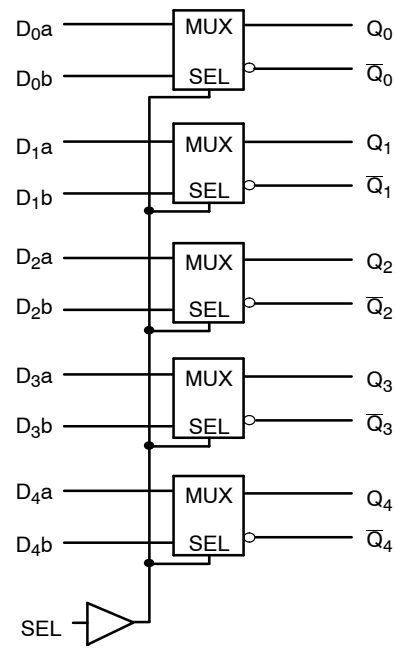
# MC10E158, MC100E158



\* All V<sub>CC</sub> and V<sub>CCO</sub> pins are tied together on the die.

Warning: All V<sub>CC</sub>, V<sub>CCO</sub>, and V<sub>EE</sub> 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 <sub>0a</sub> – D <sub>4a</sub>  | ECL Input Data a     |
| D <sub>0b</sub> – D <sub>4b</sub>  | ECL Input Data b     |
| Q <sub>0</sub> – Q <sub>4</sub>    | ECL True Outputs     |
| Q <sub>0</sub> – Q <sub>4</sub>    | ECL Inverted Outputs |
| SEL                                | ECL Select Input     |
| V <sub>CC</sub> , V <sub>CCO</sub> | Positive Supply      |
| V <sub>EE</sub>                    | Negative Supply      |

**Table 2. Logic Diagram**

| SEL | Data |
|-----|------|
| H   | a    |
| L   | b    |

# MC10E158, MC100E158

**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<br>NECL Mode Input Voltage | $V_{EE} = 0\text{ V}$<br>$V_{CC} = 0\text{ V}$ | $V_I \leq V_{CC}$<br>$V_I \geq V_{EE}$ | 6<br>-6      | V    |
| $I_{out}$     | Output Current                                     | Continuous<br>Surge                            |                                        | 50<br>100    | 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                                | 63.5<br>43.5 | °C/W |
| $\theta_{JC}$ | Thermal Resistance (Junction-to-Case)              | Standard Board                                 | PLCC-28                                | 22 to 26     | °C/W |
| $T_{sol}$     | Wave Solder (Pb-Free)                              |                                                |                                        | 265          | °C   |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

**Table 4. 10E SERIES PECL DC CHARACTERISTICS** ( $V_{CC} = 5.0\text{ V}$ ,  $V_{EE} = 0.0\text{ V}$  (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   |
| $V_{OH}$ | 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 |      |      | 200<br>150 |      |      | 200<br>150 |      |      | 200<br>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 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  $\Omega$  resistor to  $V_{CC} - 2.0\text{ V}$ .

# MC10E158, MC100E158

**Table 5. 10E SERIES NECL DC CHARACTERISTICS** ( $V_{CCx} = 0.0\text{ V}$ ;  $V_{EE} = -5.0\text{ V}$  (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            |
| $V_{OH}$ | Output HIGH Voltage (Note 2)   | -1020 | -930  | -840       | -980  | -895  | -810       | -910  | -815  | -720       | mV            |
| $V_{OL}$ | Output LOW Voltage (Note 2)    | -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 |       |       | 200<br>150 |       |       | 200<br>150 |       |       | 200<br>150 | $\mu\text{A}$ |
| $I_{IL}$ | Input LOW Current              | 0.5   | 0.3   |            | 0.5   | 0.065 |            | 0.3   | 0.2   |            | $\mu\text{A}$ |

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 6. 100E 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         |      | 38   | 46         | mA            |
| $V_{OH}$ | Output HIGH Voltage (Note 2)   | 3975 | 4050 | 4120       | 3975 | 4050 | 4120       | 3975 | 4050 | 4120       | mV            |
| $V_{OL}$ | Output LOW Voltage (Note 2)    | 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<br>D<br>SEL |      |      | 200<br>150 |      |      | 200<br>150 |      |      | 200<br>150 | $\mu\text{A}$ |
| $I_{IL}$ | Input LOW Current              | 0.5  | 0.3  |            | 0.5  | 0.25 |            | 0.5  | 0.2  |            | $\mu\text{A}$ |

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  $-0.46\text{ V}$  /  $+0.8\text{ V}$ .
2. Outputs are terminated through a  $50\ \Omega$  resistor to  $V_{CC} - 2.0\text{ V}$ .

# MC10E158, MC100E158

**Table 7. 100E SERIES NECL DC CHARACTERISTICS** ( $V_{CCx} = 0\text{ V}$ ;  $V_{EE} = -5.0\text{ V}$  (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         |       | 38    | 46         | mA            |
| $V_{OH}$ | Output HIGH Voltage (Note 2)   | -1025 | -950  | -880       | -1025 | -950  | -880       | -1025 | -950  | -880       | mV            |
| $V_{OL}$ | Output LOW Voltage (Note 2)    | -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<br>D<br>SEL |       |       | 200<br>150 |       |       | 200<br>150 |       |       | 200<br>150 | $\mu\text{A}$ |
| $I_{IL}$ | Input LOW Current              | 0.5   | 0.3   |            | 0.5   | 0.25  |            | 0.5   | 0.2   |            | $\mu\text{A}$ |

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  $-0.46\text{ V} / +0.8\text{ V}$ .
2. Outputs are terminated through a  $50\ \Omega$  resistor to  $V_{CC} - 2.0\text{ V}$ .

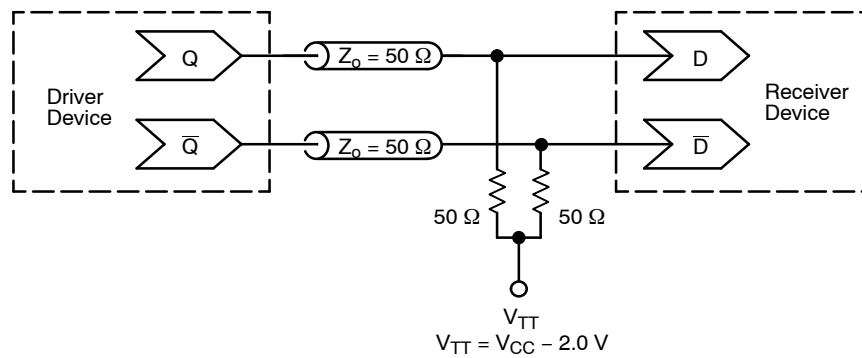
**Table 8. AC CHARACTERISTICS** ( $V_{CCx} = 5.0\text{ V}$ ;  $V_{EE} = 0.0\text{ V}$  or  $V_{CCx} = 0.0\text{ V}$ ;  $V_{EE} = -5.0\text{ V}$  (Note 1))

| 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  |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay to Output<br>D<br>SEL | 250<br>450 | 500<br>700 | 650<br>825 | 250<br>450 | 500<br>700 | 650<br>825 | 250<br>450 | 500<br>700 | 650<br>825 | ps   |
| $t_{SKEW}$             | Within-Device Skew (Note 2)             |            | 60         |            |            | 60         |            |            | 60         |            | ps   |
| $t_{JITTER}$           | Random Clock Jitter (RMS)               |            | < 1        |            |            | < 1        |            |            | < 1        |            | ps   |
| $t_r$<br>$t_f$         | Rise/Fall Time<br>(20 - 80%)            | 275        | 425        | 650        | 275        | 425        | 650        | 275        | 425        | 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 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. 10 Series:  $V_{EE}$  can vary  $-0.46\text{ V} / +0.06\text{ V}$ .  
100 Series:  $V_{EE}$  can vary  $-0.46\text{ V} / +0.8\text{ V}$ .
2. Within-device skew is defined as identical transitions on similar paths through a device.

## MC10E158, MC100E158



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

### 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

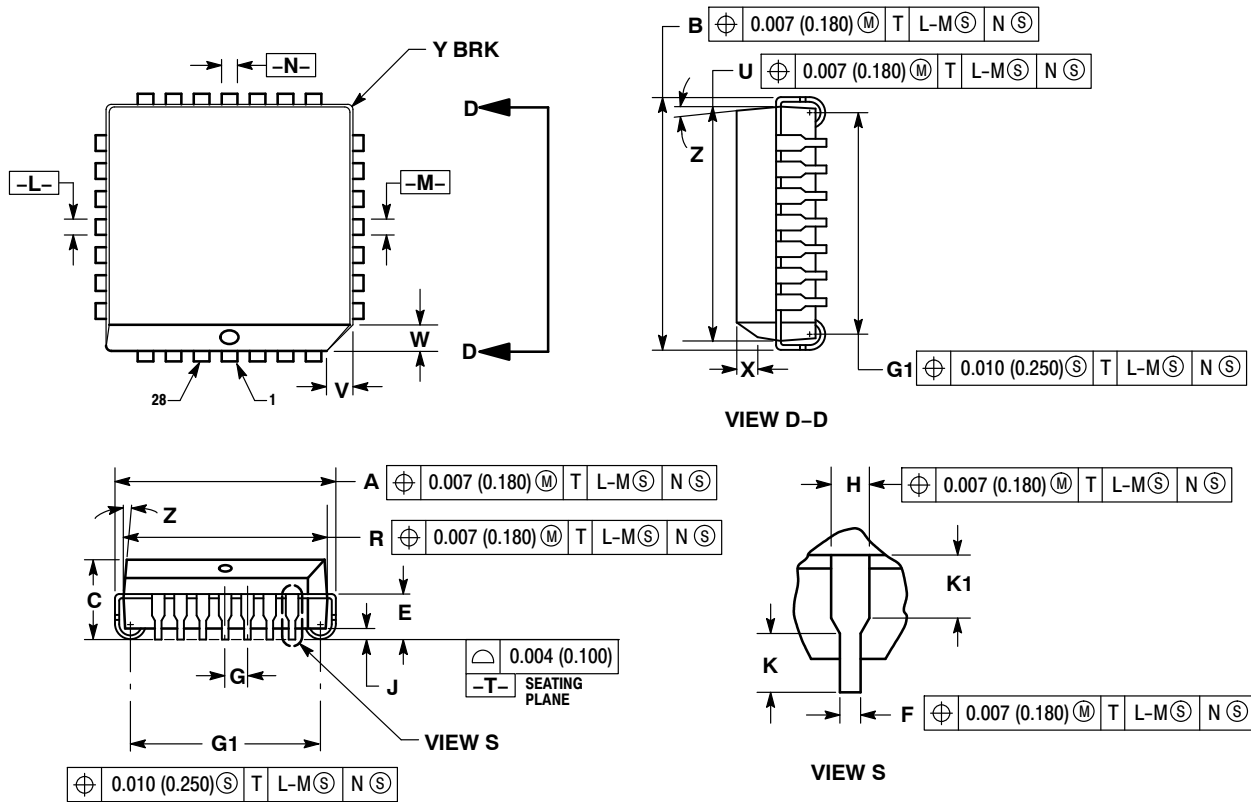
# MC10E158, MC100E158

## PACKAGE DIMENSIONS

### 28 LEAD PLLC

CASE 776-02

ISSUE F



#### 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).

| 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     | 0.021 | 0.33        | 0.53  |
| 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        | ---   |

# MC10E158, MC100E158

ECLinPS is a registered trademark of Semiconductor Components Industries, LLC (SCILLC) or its subsidiaries in the United States and/or other countries.

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor  
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA  
**Phone:** 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
**Fax:** 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
**Email:** [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

**N. American Technical Support:** 800-282-9855 Toll Free  
USA/Canada

**Europe, Middle East and Africa Technical Support:**  
Phone: 421 33 790 2910

**Japan Customer Focus Center**  
Phone: 81-3-5817-1050

**ON Semiconductor Website:** [www.onsemi.com](http://www.onsemi.com)

**Order Literature:** <http://www.onsemi.com/orderlit>

For additional information, please contact your local  
Sales Representative