

# MC100EPT25

## -3.3V / -5V Differential ECL to +3.3V LVTTTL Translator

### Description

The MC100EPT25 is a Differential ECL to LVTTTL translator. This device requires +3.3 V, -3.3 V to -5.2 V, and ground. The small outline 8-lead package and the single gate of the EPT25 make it ideal for applications which require the translation of a clock or data signal.

The  $V_{BB}$  output allows the EPT25 to also be used in a single-ended input mode. In this mode the  $V_{BB}$  output is tied to the D input for a inverting buffer or the  $\bar{D}$  input for a non-inverting buffer. If used, the  $V_{BB}$  pin should be bypassed to ground with at least a 0.01  $\mu\text{F}$  capacitor.

### Features

- 1.1 ns Typical Propagation Delay
- Maximum Frequency > 275 MHz Typical
- Operating Range:  $V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$ ;  
 $V_{EE} = -5.5 \text{ V to } -3.0 \text{ V}$ ;  $GND = 0 \text{ V}$
- 24 mA TTL Outputs
- Q Output Will Default LOW with Inputs Open or at  $V_{EE}$
- $V_{BB}$  Output
- Open Input Default State
- Safety Clamp on Inputs
- Pb-Free Packages are Available



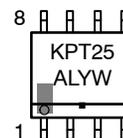
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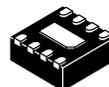
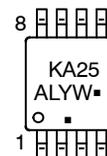
### MARKING DIAGRAMS\*



SOIC-8  
D SUFFIX  
CASE 751



TSSOP-8  
DT SUFFIX  
CASE 948R



DFN8  
MN SUFFIX  
CASE 506AA



- A = Assembly Location
- L = Wafer Lot
- Y = Year
- W = Work Week
- M = Date Code
- = Pb-Free Package

(Note: Microdot may be in either location)

\*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 5 of this data sheet.

# MC100EPT25

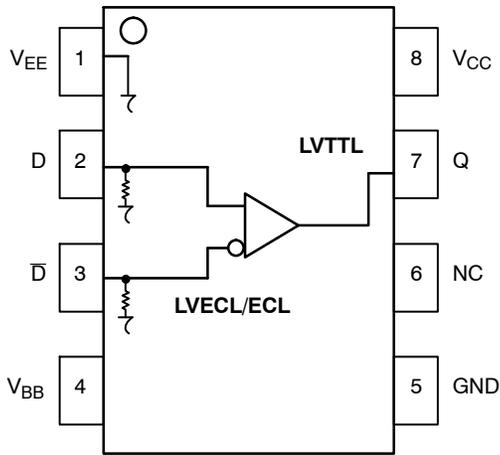


Figure 1. 8-Lead Pinout (Top View) and Logic Diagram

Table 1. PIN DESCRIPTION

| PIN             | FUNCTION   |
|-----------------|--|
| Q               | LVTTTL Output  |
| D*, $\bar{D}$ * | Differential ECL Input Pair  |
| V <sub>CC</sub> | Positive Supply  |
| V <sub>BB</sub> | Output Reference Voltage   |
| GND             | Ground   |
| V <sub>EE</sub> | Negative Supply  |
| NC              | No Connect   |
| EP              | (DFN8 only) Thermal exposed pad must be connected to a sufficient thermal conduit. Electrically connect to the most negative supply (GND) or leave unconnected, floating open. |

\* Pins will default LOW when left open.

Table 2. ATTRIBUTES

| Characteristics   | Value                  |                      |
|---|------------------------|----------------------|
| Internal Input Pulldown Resistor                              | 75 k $\Omega$          |                      |
| Internal Input Pullup Resistor                                | N/A                    |                      |
| ESD Protection  | Human Body Model       | > 4 kV               |
|   | Machine Model          | > 200 V              |
|   | Charged Device Model   | > 2 kV               |
| Moisture Sensitivity, Indefinite Time Out of Drypack (Note 1) | Pb Pkg                 | Pb-Free Pkg          |
|   | SOIC-8                 | Level 1              |
|   | TSSOP-8                | Level 1              |
|   | DFN8                   | Level 1              |
| Flammability Rating   | Oxygen Index: 28 to 34 | UL-94 V-0 @ 0.125 in |
| Transistor Count  | 111 Devices            |                      |
| Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test        |                        |                      |

1. For additional information, see Application Note AND8003/D.

# MC100EPT25

**Table 3. MAXIMUM RATINGS**

| Symbol           | Parameter                                | Condition 1                                | Condition 2              | Rating               | Unit         |
|------------------|--|--|--------------------------|----------------------|--------------|
| V <sub>CC</sub>  | Positive Power Supply                    | GND = 0 V                                  | V <sub>EE</sub> = -5.0 V | 3.8                  | V            |
| V <sub>EE</sub>  | Negative Power Supply                    | GND = 0 V                                  | V <sub>CC</sub> = +3.3 V | -6                   | V            |
| V <sub>IN</sub>  | Input Voltage                            | GND = 0 V                                  |                          | 0 to V <sub>EE</sub> | V            |
| I <sub>BB</sub>  | V <sub>BB</sub> Sink/Source              |  |                          | ± 0.5                | mA           |
| T <sub>A</sub>   | Operating Temperature Range              |  |                          | -40 to +85           | °C           |
| T <sub>stg</sub> | Storage Temperature Range                |  |                          | -65 to +150          | °C           |
| θ <sub>JA</sub>  | Thermal Resistance (Junction-to-Ambient) | 0 lfpm<br>500 lfpm                         | 8 SOIC<br>8 SOIC         | 190<br>130           | °C/W<br>°C/W |
| θ <sub>JC</sub>  | Thermal Resistance (Junction-to-Case)    | Standard Board                             | 8 SOIC                   | 41 to 44             | °C/W         |
| θ <sub>JA</sub>  | Thermal Resistance (Junction-to-Ambient) | 0 lfpm<br>500 lfpm                         | 8 TSSOP<br>8 TSSOP       | 185<br>140           | °C/W<br>°C/W |
| θ <sub>JC</sub>  | Thermal Resistance (Junction-to-Case)    | Standard Board                             | 8 TSSOP                  | 41 to 44             | °C/W         |
| θ <sub>JA</sub>  | Thermal Resistance (Junction-to-Ambient) | 0 lfpm<br>500 lfpm                         | DFN8<br>DFN8             | 129<br>84            | °C/W<br>°C/W |
| T <sub>sol</sub> | Wave Solder<br>Pb<br>Pb-Free             | <2 to 3 sec @ 248°C<br><2 to 3 sec @ 260°C |                          | 265<br>265           | °C           |
| θ <sub>JC</sub>  | Thermal Resistance (Junction-to-Case)    | (Note 2)                                   | DFN8                     | 35 to 40             | °C/W         |

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.

2. JEDEC standard multilayer board – 2S2P (2 signal, 2 power)

**Table 4. NECL DC CHARACTERISTICS** V<sub>CC</sub> = 3.3 V; V<sub>EE</sub> = -5.5 V to -3.0 V; GND = 0.0 V (Note 3)

| Symbol             | Characteristic                                | -40°C                 |       |       | 25°C                  |       |       | 85°C                  |       |       | Unit |
|--------------------|---|-----------------------|-------|-------|-----------------------|-------|-------|-----------------------|-------|-------|------|
|                    |   | Min                   | Typ   | Max   | Min                   | Typ   | Max   | Min                   | Typ   | Max   |      |
| I <sub>EE</sub>    | Power Supply Current                          | 8.0                   | 16    | 25    | 8.0                   | 16    | 25    | 8.0                   | 16    | 25    | mA   |
| V <sub>IH</sub>    | Input HIGH Voltage Single-Ended               | -1225                 |       | -880  | -1225                 |       | -880  | -1225                 |       | -880  | mV   |
| V <sub>IL</sub>    | Input LOW Voltage Single-Ended                | -1945                 |       | -1625 | -1945                 |       | -1625 | -1945                 |       | -1625 | mV   |
| V <sub>BB</sub>    | Output Voltage Reference                      | -1525                 | -1425 | -1325 | -1525                 | -1425 | -1325 | -1525                 | -1425 | -1325 | mV   |
| V <sub>IHCMR</sub> | Input HIGH Voltage Common Mode Range (Note 4) | V <sub>EE</sub> + 2.0 |       | 0.0   | V <sub>EE</sub> + 2.0 |       | 0.0   | V <sub>EE</sub> + 2.0 |       | 0.0   | V    |
| I <sub>IH</sub>    | Input HIGH Current                            |                       |       | 150   |                       |       | 150   |                       |       | 150   | μA   |
| I <sub>IL</sub>    | Input LOW Current                             | 0.5                   |       |       | 0.5                   |       |       | 0.5                   |       |       | 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 parameters vary 1:1 with GND.

4. V<sub>IHCMR</sub> min varies 1:1 with V<sub>EE</sub>; V<sub>IHCMR</sub> max varies 1:1 with V<sub>CC</sub>. The V<sub>IHCMR</sub> range is referenced to the most positive side of the differential input signal.

# MC100EPT25

**Table 5. TTL OUTPUT DC CHARACTERISTICS**  $V_{CC} = 3.3\text{ V}$ ;  $V_{EE} = -5.5\text{ V}$  to  $-3.0\text{ V}$ ;  $GND = 0.0\text{ V}$ ;  $T_A = -40^\circ\text{C}$  to  $85^\circ\text{C}$

| Symbol    | Characteristic       | Condition                 | Min | Typ | Max | Unit |
|-----------|----------------------|---------------------------|-----|-----|-----|------|
| $V_{OH}$  | Output HIGH Voltage  | $I_{OH} = -3.0\text{ mA}$ | 2.2 |     |     | V    |
| $V_{OL}$  | Output LOW Voltage   | $I_{OL} = 24\text{ mA}$   |     |     | 0.5 | V    |
| $I_{CCH}$ | Power Supply Current |                           | 6   | 10  | 14  | mA   |
| $I_{CCL}$ | Power Supply Current |                           | 7   | 12  | 17  | mA   |

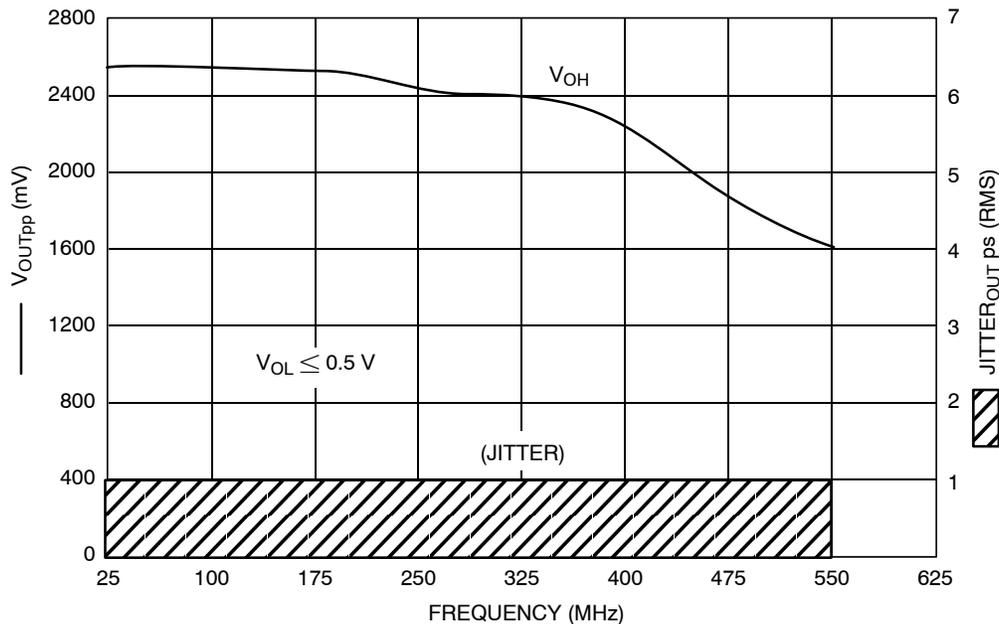
NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional 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.

**Table 6. AC CHARACTERISTICS**  $V_{CC} = 3.0\text{ V}$  to  $3.6\text{ V}$ ;  $V_{EE} = -5.5\text{ V}$  to  $-3.0\text{ V}$ ;  $GND = 0.0\text{ V}$  (Note 5)

| Symbol             | Characteristic   | $-40^\circ\text{C}$        |             |             | $25^\circ\text{C}$ |             |             | $85^\circ\text{C}$ |             |             | Unit |
|--------------------|--|----------------------------|-------------|-------------|--------------------|-------------|-------------|--------------------|-------------|-------------|------|
|                    |  | Min                        | Typ         | Max         | Min                | Typ         | Max         | Min                | Typ         | Max         |      |
| $f_{max}$          | Maximum Frequency<br>(See Figure 2 $F_{max}/JITTER$ )              | 275                        |             |             | 275                |             |             | 275                |             |             | MHz  |
| $t_{PLH}, t_{PHL}$ | Propagation Delay to Output Differential<br>(Cross-Point to 1.5 V) | 500                        | 950         | 1300        | 800                | 950         | 1600        | 800                | 960         | 1600        | ps   |
| $t_{SKPP}$         | Device-to-Device Skew (Note 6)                                     |                            |             | 500         |                    |             | 500         |                    |             | 500         | ps   |
| $t_{JITTER}$       | Random Clock Jitter (RMS)<br>(See Figure 2 $F_{max}/JITTER$ )      |                            | 0.2         | < 1         |                    | 0.2         | < 1         |                    | 0.2         | < 1         | ps   |
| $V_{PP}$           | Input Voltage Swing (Differential)                                 | 150                        | 800         | 1200        | 150                | 800         | 1200        | 150                | 800         | 1200        | mV   |
| $t_r$<br>$t_f$     | Output Rise/Fall Times<br>(0.8 V – 2.0 V)                          | Q, $\bar{Q}$<br>300<br>900 | 474<br>1160 | 600<br>1400 | 300<br>900         | 459<br>1100 | 600<br>1400 | 300<br>900         | 457<br>1100 | 600<br>1400 | 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.

5. Measured with a 750 mV 50% duty-cycle clock source.  $R_L = 500\ \Omega$  to GND and  $C_L = 20\text{ pF}$  to GND. Refer to Figure 3.
6. Skews are measured between outputs under identical conditions.



**Figure 2.  $F_{max}/Jitter$**

# MC100EPT25

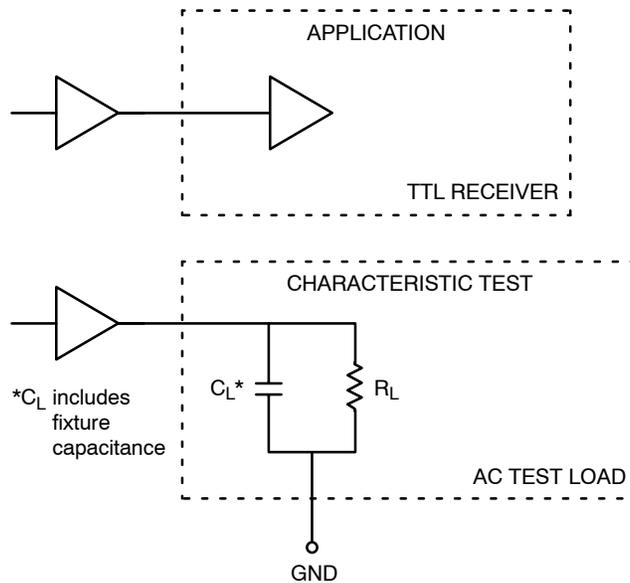


Figure 3. TTL Output Loading Used for Device Evaluation

## ORDERING INFORMATION

| Device          | Package              | Shipping <sup>†</sup> |
|-----------------|----------------------|-----------------------|
| MC100EPT25D     | SOIC-8               | 98 Units / Rail       |
| MC100EPT25DG    | SOIC-8<br>(Pb-Free)  | 98 Units / Rail       |
| MC100EPT25DR2   | SOIC-8               | 2500 / Tape & Reel    |
| MC100EPT25DR2G  | SOIC-8<br>(Pb-Free)  | 2500 / Tape & Reel    |
| MC100EPT25DT    | TSSOP-8              | 100 Units / Rail      |
| MC100EPT25DTG   | TSSOP-8<br>(Pb-Free) | 100 Units / Rail      |
| MC100EPT25DTR2  | TSSOP-8              | 2500 / Tape & Reel    |
| MC100EPT25DTR2G | TSSOP-8<br>(Pb-Free) | 2500 / Tape & Reel    |
| MC100EPT25MNR4  | DFN8                 | 1000 / Tape & Reel    |
| MC100EPT25MNR4G | DFN8<br>(Pb-Free)    | 1000 / Tape & Reel    |

<sup>†</sup>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.

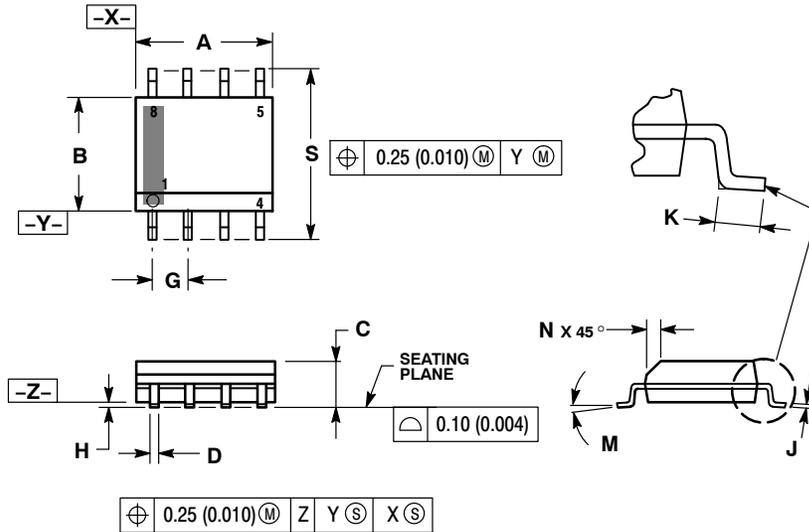
## Resource Reference of Application Notes

- 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

# MC100EPT25

## PACKAGE DIMENSIONS

SOIC-8 NB  
CASE 751-07  
ISSUE AJ

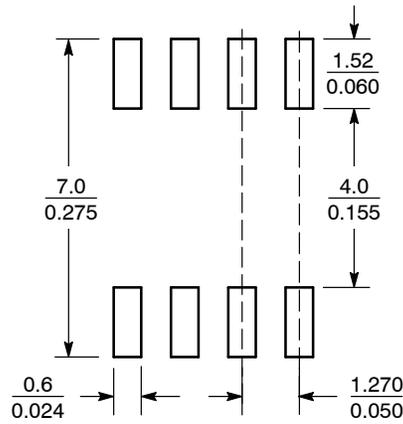


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION 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.
6. 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | MIN         | MAX  | MIN       | MAX   |
| A   | 4.80        | 5.00 | 0.189     | 0.197 |
| B   | 3.80        | 4.00 | 0.150     | 0.157 |
| C   | 1.35        | 1.75 | 0.053     | 0.069 |
| D   | 0.33        | 0.51 | 0.013     | 0.020 |
| G   | 1.27 BSC    |      | 0.050 BSC |       |
| H   | 0.10        | 0.25 | 0.004     | 0.010 |
| J   | 0.19        | 0.25 | 0.007     | 0.010 |
| K   | 0.40        | 1.27 | 0.016     | 0.050 |
| M   | 0°          | 8°   | 0°        | 8°    |
| N   | 0.25        | 0.50 | 0.010     | 0.020 |
| S   | 5.80        | 6.20 | 0.228     | 0.244 |

### SOLDERING FOOTPRINT\*



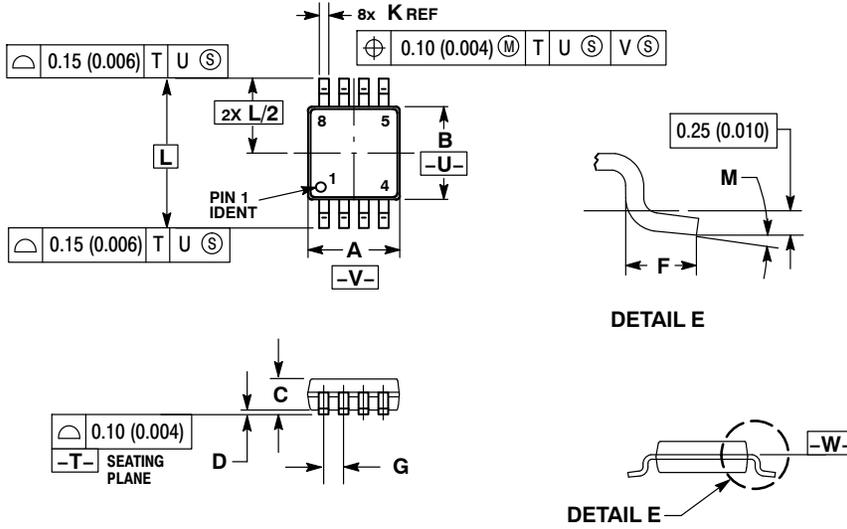
SCALE 6:1 (mm/inches)

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

# MC100EPT25

## PACKAGE DIMENSIONS

TSSOP-8  
DT SUFFIX  
PLASTIC TSSOP PACKAGE  
CASE 948R-02  
ISSUE A



NOTES:

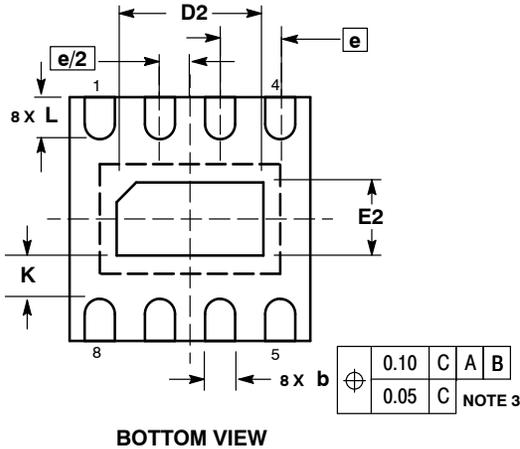
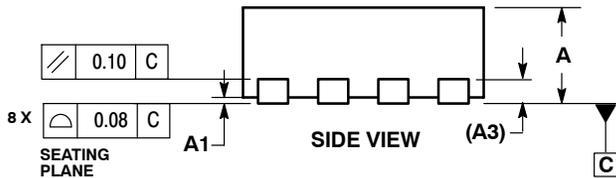
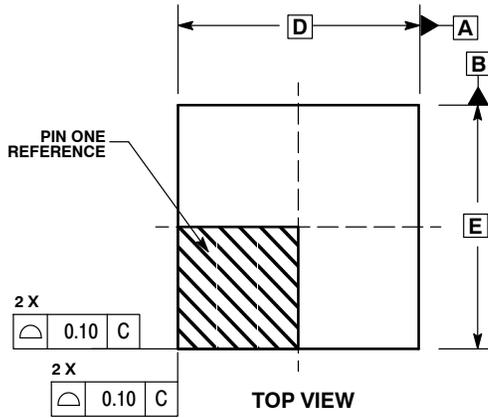
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH. PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL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

| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | MIN         | MAX  | MIN       | MAX   |
| A   | 2.90        | 3.10 | 0.114     | 0.122 |
| B   | 2.90        | 3.10 | 0.114     | 0.122 |
| C   | 0.80        | 1.10 | 0.031     | 0.043 |
| D   | 0.05        | 0.15 | 0.002     | 0.006 |
| F   | 0.40        | 0.70 | 0.016     | 0.028 |
| G   | 0.65 BSC    |      | 0.026 BSC |       |
| K   | 0.25        | 0.40 | 0.010     | 0.016 |
| L   | 4.90 BSC    |      | 0.193 BSC |       |
| M   | 0°          | 6°   | 0°        | 6°    |

# MC100EPT25

## PACKAGE DIMENSIONS

DFN8  
CASE 506AA-01  
ISSUE D



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.25 AND 0.30 MM FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

| DIM | MILLIMETERS |      |
|-----|-------------|------|
|     | MIN         | MAX  |
| A   | 0.80        | 1.00 |
| A1  | 0.00        | 0.05 |
| A3  | 0.20        | REF  |
| b   | 0.20        | 0.30 |
| D   | 2.00        | BSC  |
| D2  | 1.10        | 1.30 |
| E   | 2.00        | BSC  |
| E2  | 0.70        | 0.90 |
| e   | 0.50        | BSC  |
| K   | 0.20        | ---  |
| L   | 0.25        | 0.35 |

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