# MC100LVELT23

# 3.3 V Dual Differential LVPECL/LVDS to LVTTL Translator

**ON Semiconductor®**

**http://onsemi.com**

### Description

The MC100LVELT23 is a dual differential LVPECL/LVDS to LVTTL translator. Because LVPECL (Positive ECL) or LVDS levels are used only +3.3 V and ground are required. The small outline 8-lead package and the dual gate design of the LVELT23 makes it ideal for applications which require the translation of a clock and a data signal.

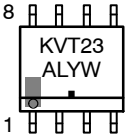
The LVELT23 is available in only the ECL 100K standard. Since there are no LVPECL outputs or an external $V_{BB}$ reference, the LVELT23 does not require both ECL standard versions. The LVPECL inputs are differential. Therefore, the MC100LVELT23 can accept any standard differential LVPECL input referenced from a $V_{CC}$ of +3.3 V.

### Features

- 2.0 ns Typical Propagation Delay
- Maximum Frequency > 180 MHz
- Differential LVPECL Inputs
- PECL Mode Operating Range: $V_{CC}$ = 3.0 V to 3.8 V with GND = 0 V
- 24 mA LVTTL Outputs
- Flow Through Pinouts
- Internal Pulldown and Pullup Resistors
- Pb−Free Packages are Available

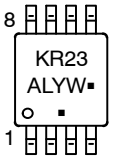
**MARKING DIAGRAMS***

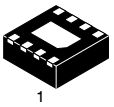

**SOIC−8**
**D SUFFIX**
**CASE 751**



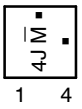


**TSSOP−8**
**DT SUFFIX**
**CASE 948R**




**DFN8**
**MN SUFFIX**
**CASE 506AA**




A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week
$\overline{M}$ = 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.

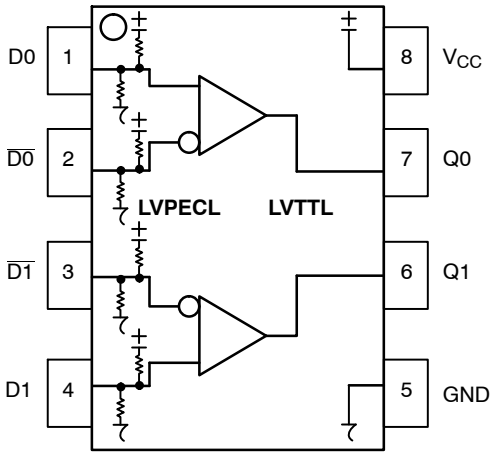



**Figure 1. 8−Lead Pinout** (Top View) **and Logic Diagram**

**Table 1. PIN DESCRIPTION**

| Pin | Function |
|---|---|
| Q0, Q1<br>D0*, D1*<br>$\overline{D0}$*, $\overline{D1}$*<br>$V_{CC}$<br>GND<br>EP | LVTTL Outputs<br>Differential LVPECL Inputs<br><br>Positive Supply<br>Ground<br>(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 to $V_{CC}/2$ when left open.

**Table 2. ATTRIBUTES**

| Characteristics | | Value |
|---|---|---|
| Internal Input Pulldown Resistor | | 50 kΩ |
| Internal Input Pullup Resistor | | 50 kΩ |
| ESD Protection | Human Body Model<br>Machine Model<br>CDM | > 1500 V<br>> 100 V<br>> 2000 V |
| Moisture Sensitivity, Indefinite Time Out of Drypack (Note 1) | | Level 1 |
| Flammability Rating | Oxygen Index: 28 to 34 | UL 94 V−0 @ 0.125 in |
| Transistor Count | | 91 |
| Meets or Exceeds JEDEC Spec EIA/JESD78 IC Latchup Test | | |

1. Refer to Application Note AND8003/D for additional information.

**Table 3. MAXIMUM RATINGS**

| Symbol | Parameter | Condition 1 | Condition 2 | Rating | Unit |
|---|---|---|---|---|---|
| $V_{CC}$ | PECL Power Supply | GND = 0 V | | 3.8 | V |
| $V_I$ | Input Voltage | GND = 0 V,<br>$V_I$ not more positive than $V_{CC}$ | | 3.8 | V |
| $I_{out}$ | Output Current | Continuous<br>Surge | | 50<br>100 | mA |
| $T_A$ | Operating Temperature Range | | | −40 to +85 | °C |
| $T_{stg}$ | Storage Temperature | | | −65 to +150 | °C |
| $\theta_{JA}$ | Thermal Resistance (Junction−to−Ambient) | 0 lfpm<br>500 lfpm | SOIC−8<br>SOIC−8 | 190<br>130 | °C/W<br>°C/W |
| $\theta_{JC}$ | Thermal Resistance (Junction−to−Case) | Standard Board | SOIC−8 | 41 to 44 ± 5% | °C/W |
| $\theta_{JA}$ | Thermal Resistance (Junction−to−Ambient) | 0 lfpm<br>500 lfpm | TSSOP−8<br>TSSOP−8 | 185<br>140 | °C/W<br>°C/W |
| $\theta_{JC}$ | Thermal Resistance (Junction−to−Case) | Standard Board | TSSOP−8 | 41 to 44 ± 5% | °C/W |
| $\theta_{JA}$ | Thermal Resistance (Junction−to−Ambient) | 0 lfpm<br>500 lfpm | DFN8<br>DFN8 | 129<br>84 | °C/W<br>°C/W |
| $T_{sol}$ | Wave Solder Pb<br>Pb−Free | <2 to 3 sec @ 248°C<br><2 to 3 sec @ 260°C | | 265<br>265 | °C |
| $\theta_{JC}$ | 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. LVPECL INPUT DC CHARACTERISTICS** $V_{CC}$ = 3.3 V; GND = 0 V (Note 3)

| | | −40°C | | | 25°C | | | 85°C | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Symbol | Characteristic | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | Unit |
| $I_{CCH}$ | Power Supply Current (Outputs set to HIGH) | 10 | 20 | 35 | 10 | 20 | 35 | 10 | 20 | 35 | mA |
| $I_{CCL}$ | Power Supply Current (Outputs set to LOW) | 15 | 27 | 40 | 15 | 27 | 40 | 15 | 27 | 40 | mA |
| $V_{IH}$ | Input HIGH Voltage (Note 5) | 2135 | | 2420 | 2135 | | 2420 | 2135 | | 2420 | mV |
| $V_{IL}$ | Input LOW Voltage (Note 5) | 1490 | | 1825 | 1490 | | 1825 | 1490 | | 1825 | mV |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Notes 4 and 5) | 1.2 | | $V_{CC}$ | 1.2 | | $V_{CC}$ | 1.2 | | $V_{CC}$ | V |
| $I_{IH}$ | Input HIGH Current | | | 150 | | | 150 | | | 150 | μA |
| $I_{IL}$ | Input LOW Current $\overline{D}$ | −150 | | | −150 | | | −150 | | | 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. All values vary 1:1 with $V_{CC}$. $V_{CC}$ can vary ±0.3 V.
4. $V_{IHCMR}$ min varies 1:1 with GND, max varies 1:1 with $V_{CC}$.
5. LVTTL output $R_L$ = 500 Ω to GND.

**Table 5. LVTTL OUTPUT DC CHARACTERISTICS** $V_{CC}$ = 3.3 V; GND = 0V (Note 6)

| Symbol | Characteristic | −40°C | | | 25°C | | | 85°C | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | |
| $V_{OH}$ | Output HIGH Voltage ($I_{OH}$ = −3.0 mA) (Note 7) | 2.4 | | | 2.4 | | | 2.4 | | | V |
| $V_{OL}$ | Output LOW Voltage ($I_{OL}$ = 24 mA) (Note 7) | | | 0.5 | | | 0.5 | | | 0.5 | V |
| $I_{OS}$ | Output Short Circuit Current | −180 | | −50 | −180 | | −50 | −180 | | −50 | 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 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.

6. All values vary 1:1 with $V_{CC}$. $V_{CC}$ can vary ±0.3 V.
7. LVTTL output $R_L$ = 500 Ω to GND.

**Table 6. AC CHARACTERISTICS** $V_{CC}$ = 3.3 V; GND = 0 V (Notes 8, 9)

| Symbol | Characteristic | −40°C | | | 25°C | | | 85°C | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | |
| $F_{max}$ | Maximum Toggle Frequency (Note 10) | 180 | | | 180 | | | 180 | | | MHz |
| $t_{PLH}$, $t_{PHL}$ | Propagation Delay to Output Differential | 1.0 | 1.5 | 2.5 | 1.0 | 1.7 | 2.5 | 1.0 | 1.7 | 2.5 | ns |
| $t_{SK++}$<br>$t_{SK--}$<br>$t_{SKPP}$ | Output−to−Output Skew++<br>Output−to−Output Skew− −<br>Part−to−Part Skew (Note 11) | | 15<br>35<br>70 | 60<br>80<br>500 | | 15<br>40<br>70 | 70<br>80<br>500 | | 30<br>40<br>140 | 125<br>80<br>500 | ps |
| $t_{JITTER}$ | Random Clock Jitter (RMS) | | 4.0 | 10 | | 4.0 | 10 | | 4.0 | 10 | ps |
| $V_{PP}$ | Input Voltage Swing (Differential Configuration) (Note 12) | 200 | 800 | 1000 | 200 | 800 | 1000 | 200 | 800 | 1000 | mV |
| $t_r$<br>$t_f$ | Output Rise/Fall Times<br>(0.8 V − 2.0 V) Q, $\overline{Q}$ | 330 | 600 | 900 | 330 | 600 | 900 | 330 | 650 | 900 | 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.

8. All values vary 1:1 with $V_{CC}$. $V_{CC}$ can vary ±0.3 V.
9. LVTTL output $R_L$ = 500 Ω to GND and $C_L$ = 20 pF to GND. Refer to Figure 2.
10. $F_{max}$ guaranteed for functionality only. $V_{OL}$ and $V_{OH}$ levels are guaranteed at DC only.
11. Skews are measured between outputs under identical conditions.
12. 200 mV input guarantees full logic swing at the output.

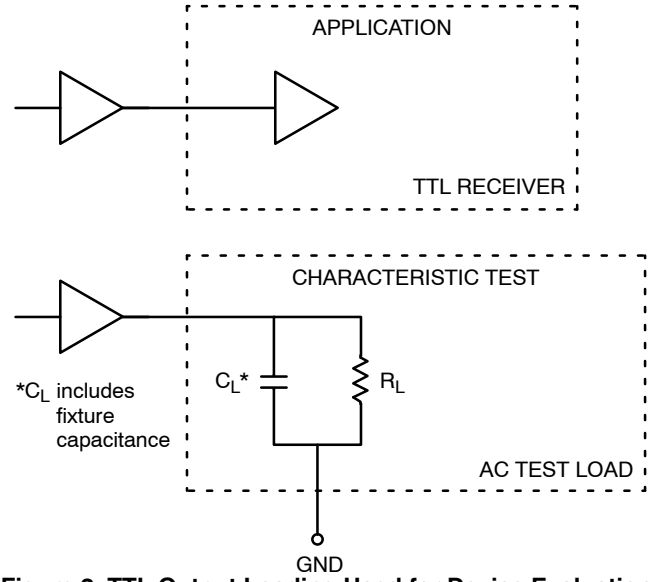



**Figure 2. TTL Output Loading Used for Device Evaluation**

## ORDERING INFORMATION

| Device | Package | Shipping† |
|---|---|---|
| MC100LVELT23D | SOIC−8 | 98 Units / Rail |
| MC100LVELT23DG | SOIC−8 (Pb−Free) | 98 Units / Rail |
| MC100LVELT23DR2 | SOIC−8 | 2500 / Tape & Reel |
| MC100LVELT23DR2G | SOIC−8 (Pb−Free) | 2500 / Tape & Reel |
| MC100LVELT23DT | TSSOP−8 | 100 Units / Rail |
| MC100LVELT23DTG | TSSOP−8 (Pb−Free) | 100 Units / Rail |
| MC100LVELT23DTR2 | TSSOP−8 | 2500 / Tape & Reel |
| MC100LVELT23DTRG | TSSOP−8 (Pb−Free) | 2500 / Tape & Reel |
| MC100LVELT23MNRG | DFN8 (Pb−Free) | 1000 / 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

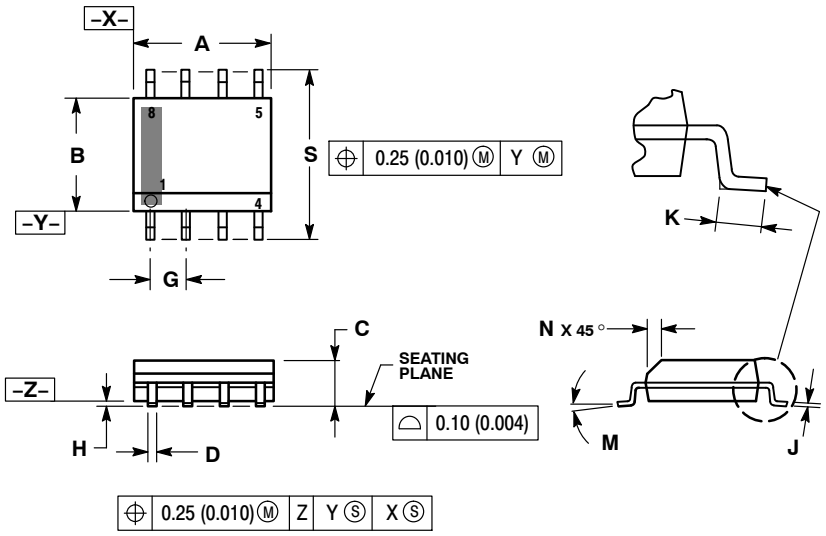
**AND8020/D** – Termination of ECL Logic Devices

**AND8066/D** – Interfacing with ECLinPS

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

## PACKAGE DIMENSIONS

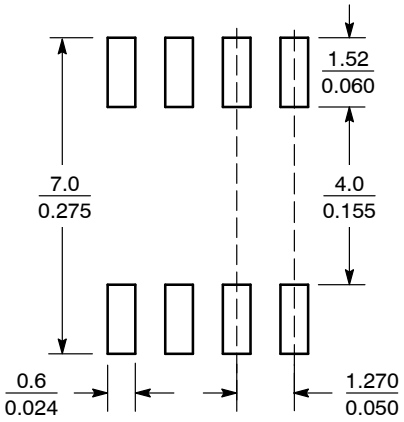
**SOIC−8 NB**
CASE 751−07
ISSUE AJ




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.

| | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| DIM | 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*

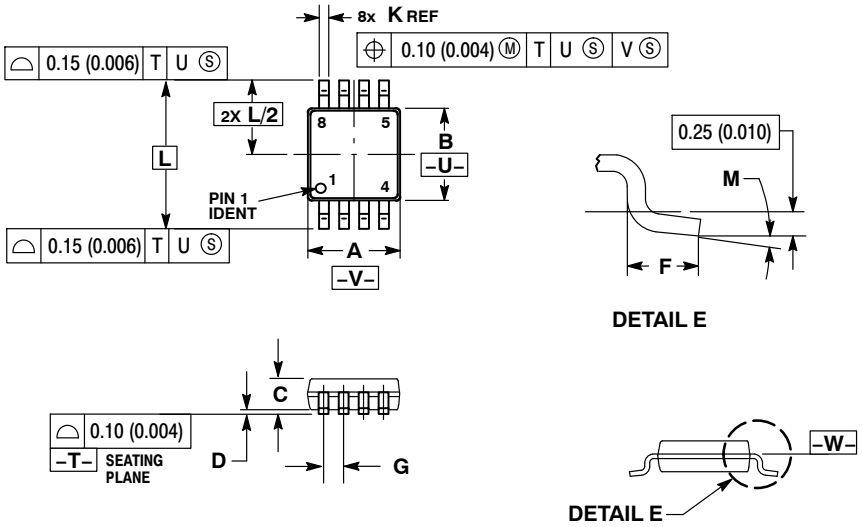



SCALE 6:1 (mm / inches)

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

## PACKAGE DIMENSIONS

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

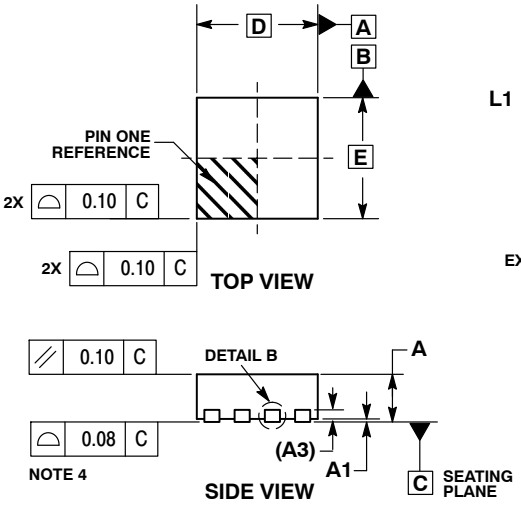


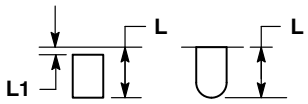

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH. PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD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

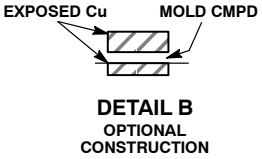
| | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 2.90 | 3.10 | 0.114 | 0.122 |
| B | 2.90 | 3.10 | 0.114 | 0.122 |
| C | 0.80 | 1.10 | 0.031 | 0.043 |
| D | 0.05 | 0.15 | 0.002 | 0.006 |
| F | 0.40 | 0.70 | 0.016 | 0.028 |
| G | 0.65 BSC | | 0.026 BSC | |
| K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

## PACKAGE DIMENSIONS

**DFN8 2x2, 0.5P**
CASE 506AA−01
ISSUE E

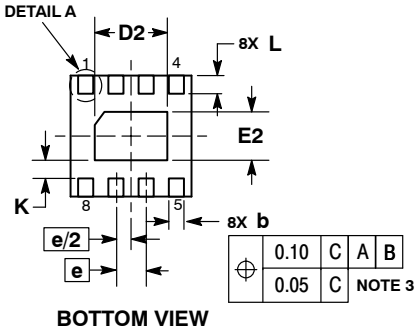


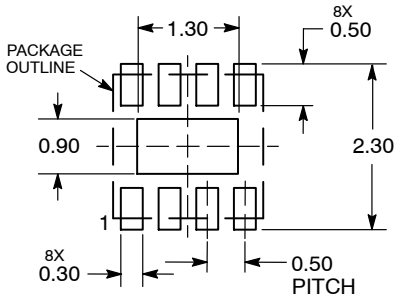




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994 .
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.20 MM FROM TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

| | MILLIMETERS | |
|---|---|---|
| DIM | 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 | 0.30 REF | |
| L | 0.25 | 0.35 |
| L1 | −−− | 0.10 |




### RECOMMENDED SOLDERING FOOTPRINT*




DIMENSIONS: MILLIMETERS

*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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