

# MC100EPT23

## 3.3V Dual Differential LVPECL/LVDS to LVTTTL Translator

The MC100EPT23 is a dual differential LVPECL/LVDS to LVTTTL 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 EPT23 makes it ideal for applications which require the translation of a clock and a data signal.

The EPT23 is available in only the ECL 100K standard. Since there are no LVPECL outputs or an external  $V_{BB}$  reference, the EPT23 does not require both ECL standard versions. The LVPECL/LVDS inputs are differential. Therefore, the MC100EPT23 can accept any standard differential LVPECL/LVDS input referenced from a  $V_{CC}$  of +3.3 V.

- 1.5 ns Typical Propagation Delay
- Maximum Operating Frequency > 275 MHz
- 24 mA LVTTTL Outputs
- Operating Range:  $V_{CC}$  = 3.0 V to 3.6 V with GND = 0 V
- Pb-Free Packages are Available



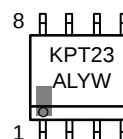
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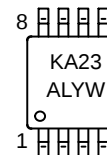
### MARKING DIAGRAMS\*



**SOIC-8  
D SUFFIX  
CASE 751**



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



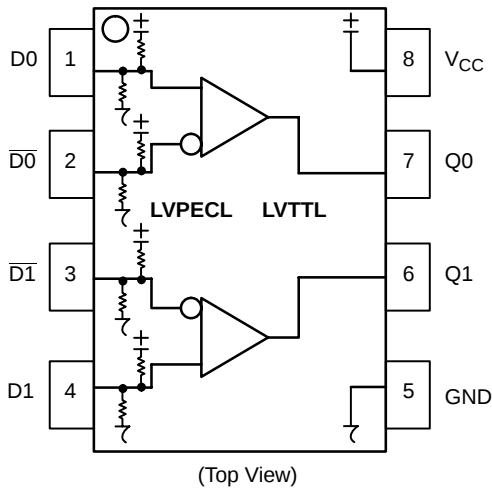
A = Assembly Location  
L = Wafer Lot  
Y = Year  
W = Work Week

\*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.

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**Figure 1. 8-Lead Pinout and Logic Diagram**

**Table 1. PIN DESCRIPTION**

| Pin                      | Function                   |
|--------------------------|----------------------------|
| Q0, Q1                   | LVTTL Outputs              |
| D0**, D1**<br>D0**, D1** | Differential LVPECL Inputs |
| V <sub>CC</sub>          | Positive Supply            |
| GND                      | Ground                     |

\*\* Pins will default to V<sub>CC</sub>/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>Charged Device Model |
|                                                               | > 1500 V<br>> 100 V<br>> 2 kV                             |
| 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 Devices                                                |
| Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test        |                                                           |

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

**Table 3. MAXIMUM RATINGS**

| Symbol           | Parameter                                | Condition 1          | Condition 2                      | Rating      | Unit         |
|------------------|------------------------------------------|----------------------|----------------------------------|-------------|--------------|
| V <sub>CC</sub>  | Power Supply                             | GND = 0 V            |                                  | 3.8         | V            |
| V <sub>I</sub>   | Input Voltage                            | GND = 0 V            | V <sub>I</sub> ≤ V <sub>CC</sub> | 3.8         | V            |
| I <sub>out</sub> | Output Current                           | Continuous<br>Surge  |                                  | 50<br>100   | mA<br>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   | SOIC-8<br>SOIC-8                 | 190<br>130  | °C/W<br>°C/W |
| θ <sub>JC</sub>  | Thermal Resistance (Junction-to-Case)    | Standard Board       | SOIC-8                           | 41 to 44    | °C/W         |
| θ <sub>JA</sub>  | Thermal Resistance (Junction-to-Ambient) | 0 lfpm<br>500 lfpm   | TSSOP-8<br>TSSOP-8               | 185<br>140  | °C/W<br>°C/W |
| θ <sub>JC</sub>  | Thermal Resistance (Junction-to-Case)    | Standard Board       | TSSOP-8                          | 41 to 44    | °C/W         |
| T <sub>sol</sub> | Wave Solder                              | < 2 to 3 sec @ 248°C |                                  | 265         | °C           |

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

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**Table 4. PECL DC CHARACTERISTICS**  $V_{CC} = 3.3 \text{ V}$ ,  $GND = 0 \text{ V}$  (Note 2)

| Symbol      | Characteristic                                | -40°C          |     |      | 25°C         |     |      | 85°C         |     |      | Unit          |
|-------------|-----------------------------------------------|----------------|-----|------|--------------|-----|------|--------------|-----|------|---------------|
|             |                                               | Min            | Typ | Max  | Min          | Typ | Max  | Min          | Typ | Max  |               |
| $I_{CCH}$   | Power Supply Current (Outputs set to HIGH)    | 10             | 18  | 25   | 10           | 18  | 25   | 10           | 18  | 25   | mA            |
| $I_{CCL}$   | Power Supply Current (Outputs set to LOW)     | 15             | 26  | 36   | 15           | 26  | 36   | 15           | 26  | 36   | mA            |
| $V_{IH}$    | Input HIGH Voltage                            | 2075           |     | 2420 | 2075         |     | 2420 | 2075         |     | 2420 | mV            |
| $V_{IL}$    | Input LOW Voltage                             | 1355           |     | 1675 | 1355         |     | 1675 | 1355         |     | 1675 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Note 3) | 1.2            |     | 3.3  | 1.2          |     | 3.3  | 1.2          |     | 3.3  | V             |
| $I_{IH}$    | Input HIGH Current                            |                |     | 150  |              |     | 150  |              |     | 150  | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current                             | D<br>-150<br>D |     |      | -150<br>-150 |     |      | -150<br>-150 |     | 0.5  | $\mu\text{A}$ |

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.

2. All values vary 1:1 with  $V_{CC}$ .

3.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ ,  $V_{IHCMR}$  max varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

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

| Symbol   | Characteristic               | Condition                  | Min  | Typ | Max | Unit |
|----------|------------------------------|----------------------------|------|-----|-----|------|
| $V_{OH}$ | Output HIGH Voltage          | $I_{OH} = -3.0 \text{ mA}$ | 2.4  |     |     | V    |
| $V_{OL}$ | Output LOW Voltage           | $I_{OL} = 24 \text{ mA}$   |      |     | 0.5 | V    |
| $I_{OS}$ | Output Short Circuit Current |                            | -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 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.

**Table 6. AC CHARACTERISTICS**  $V_{CC} = 3.0 \text{ V}$  to  $3.6 \text{ V}$ ,  $GND = 0.0 \text{ V}$  (Note 4)

| Symbol                                     | Characteristic                                                                   | -40°C      |                |                 | 25°C       |                |                 | 85°C       |                 |                  | Unit |
|--------------------------------------------|----------------------------------------------------------------------------------|------------|----------------|-----------------|------------|----------------|-----------------|------------|-----------------|------------------|------|
|                                            |                                                                                  | Min        | Typ            | Max             | Min        | Typ            | Max             | Min        | Typ             | Max              |      |
| $f_{max}$                                  | Maximum Frequency (Figure 2)                                                     | 275        | 350            |                 | 275        | 350            |                 | 275        | 350             |                  | MHz  |
| $t_{PLH}$ ,<br>$t_{PHL}$                   | Propagation Delay to Output Differential (Note 5)                                | 1.2<br>1.2 | 1.5<br>1.5     | 1.8<br>1.8      | 1.2<br>1.1 | 1.5<br>1.5     | 1.8<br>1.8      | 1.3<br>1.1 | 1.7<br>1.5      | 2.4<br>1.8       | ns   |
| $t_{SK++}$ ,<br>$t_{SK--}$ ,<br>$t_{SKPP}$ | Output-to-Output Skew++<br>Output-to-Output Skew--<br>Part-to-Part Skew (Note 6) |            | 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) (Figure 2)                                             |            | 5              | 10              |            | 5              | 10              |            | 5               | 10               | ps   |
| $V_{PP}$                                   | Input Voltage Swing (Differential Configuration)                                 | 150        | 800            | 1200            | 150        | 800            | 1200            | 150        | 800             | 1200             | mV   |
| $t_r$ , $t_f$                              | Output Rise/Fall Times (0.8 V – 2.0 V) $Q, \bar{Q}$                              | 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 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.

4. 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.

5. Reference ( $V_{CC} = 3.3 \text{ V} \pm 5\%$ ;  $GND = 0 \text{ V}$ )

6. Skews are measured between outputs under identical conditions.

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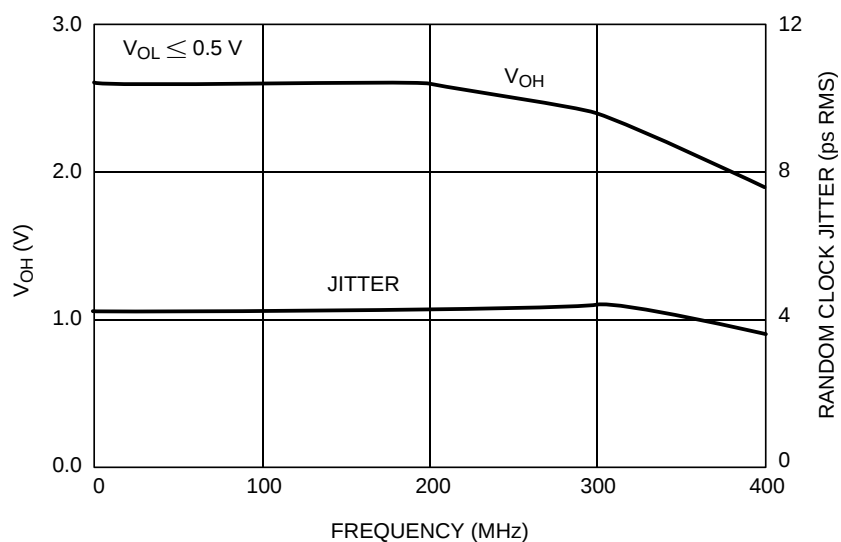


Figure 2. Typical  $V_{OH}$  / Jitter versus Frequency (25°C)

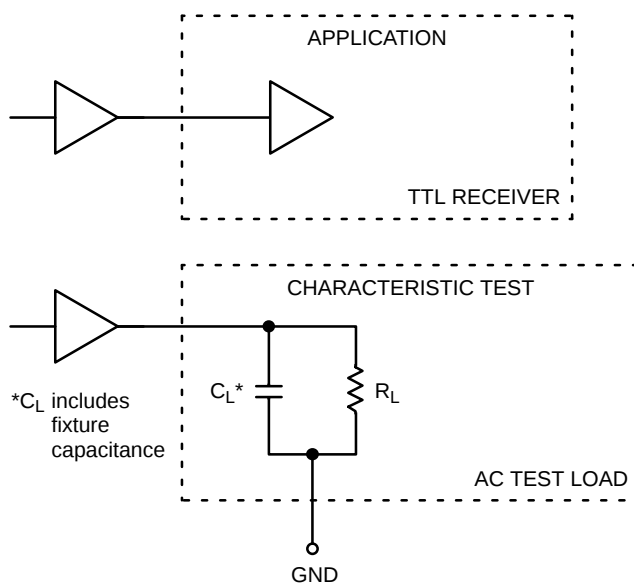


Figure 3. TTL Output Loading Used for Device Evaluation

## MC100EPT23

### ORDERING INFORMATION

| Device          | Package              | Shipping <sup>†</sup> |
|-----------------|----------------------|-----------------------|
| MC100EPT23D     | SOIC-8               | 98 Units / Rail       |
| MC100EPT23DG    | SOIC-8<br>(Pb-Free)  | 98 Units / Rail       |
| MC100EPT23DR2   | SOIC-8               | 2500 / Tape & Reel    |
| MC100EPT23DR2G  | SOIC-8<br>(Pb-Free)  | 2500 / Tape & Reel    |
| MC100EPT23DT    | TSSOP-8              | 100 Units / Rail      |
| MC100EPT23DTG   | TSSOP-8<br>(Pb-Free) | 100 Units / Rail      |
| MC100EPT23DTR2  | TSSOP-8              | 2500 / Tape & Reel    |
| MC100EPT23DTR2G | TSSOP-8<br>(Pb-Free) | 2500 / 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.

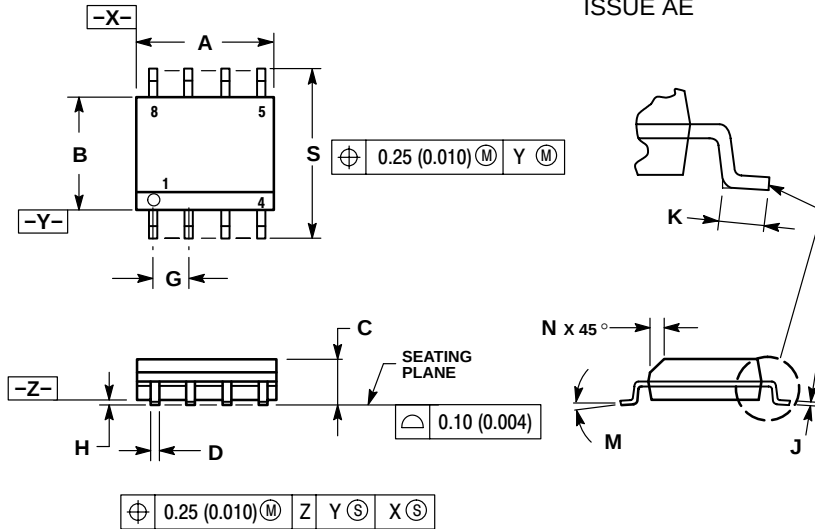
### Resource Reference of Application Notes

- 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
- AN1642/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

# MC100EPT23

## PACKAGE DIMENSIONS

SOIC-8 NB  
D SUFFIX  
PLASTIC SOIC PACKAGE  
CASE 751-07  
ISSUE AE

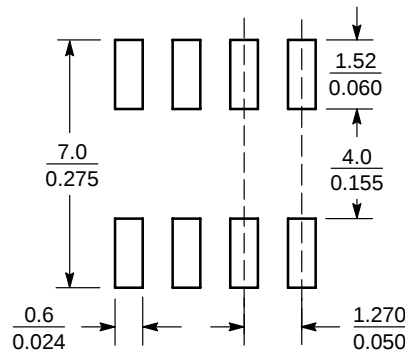


### NOTES:

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\*



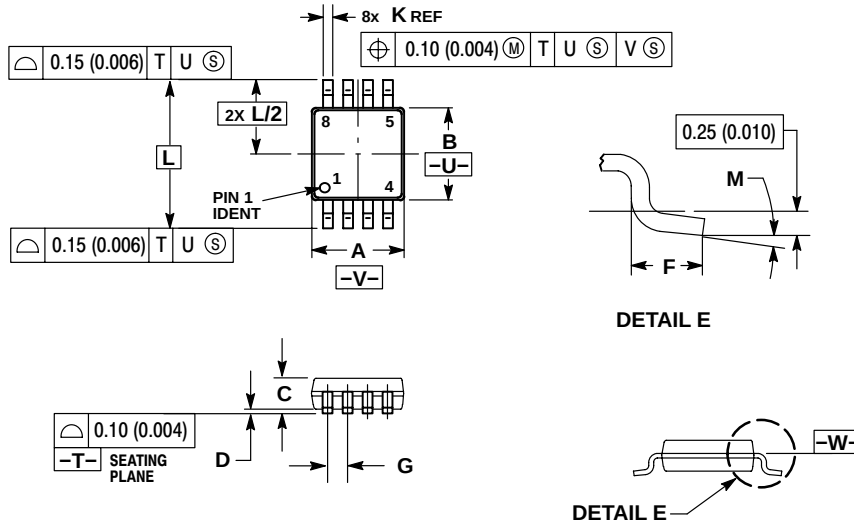
SCALE 6:1 (mm/inches)

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

# MC100EPT23

## 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-.

| 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°    |

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