

# MC100LVEL91

## 3.3V / 5V Triple LVPECL / PECL Input to -3.3V ECL Output Translator

The MC100LVEL91 is a triple LVPECL / PECL input to ECL output translator. The device receives standard or low voltage differential PECL signals, determined by the  $V_{CC}$  supply level, and translates them to differential -3.3 V ECL output signals. (For translation to -5 V ECL output, see MC100EL91.)

To accomplish the level translation the LVEL91 requires three power rails. The  $V_{CC}$  supply should be connected to the positive supply, and the  $V_{EE}$  pin should be connected to the negative power supply. The GND pins are connected to the system ground plane. Both  $V_{EE}$  and  $V_{CC}$  should be bypassed to ground via 0.01  $\mu$ F capacitors.

Under open input conditions, the  $\overline{D}$  input will be biased at  $V_{CC}/2$  and the D input will be pulled to GND. This condition will force the Q output to a low, ensuring stability.

The  $V_{BB}$  pin, an internally generated voltage supply, is available to this device only. For single-ended input conditions, the unused differential input is connected to  $V_{BB}$  as a switching reference voltage.  $V_{BB}$  may also rebias AC coupled inputs. When used, decouple  $V_{BB}$  and  $V_{CC}$  via a 0.01  $\mu$ F capacitor and limit current sourcing or sinking to 0.5 mA. When not used,  $V_{BB}$  should be left open.

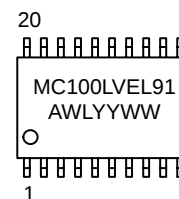
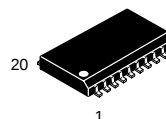
- 620 ps Typical Propagation Delay
- The 100 Series Contains Temperature Compensation
- Operating Range:  $V_{CC}$  = 3.0 V to 5.25 V;  
 $V_{EE}$  = -3.0 V to -3.8 V; GND = 0 V
- Q Output will Default LOW with Inputs Open or at GND



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### MARKING DIAGRAM\*



### SO-20 DW SUFFIX CASE 751D

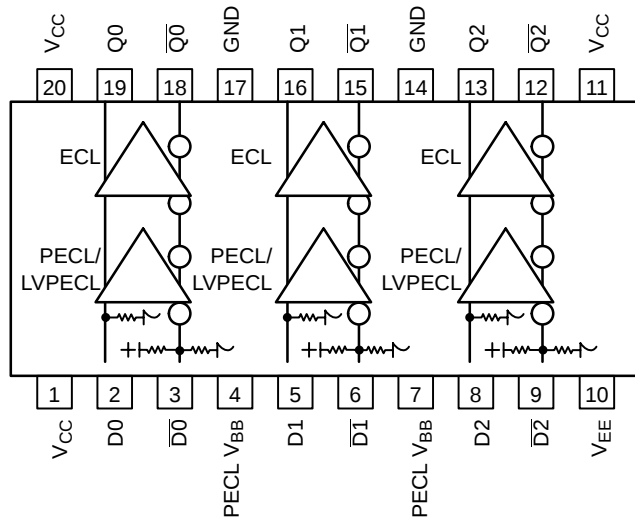
A = Assembly Location  
WL = Wafer Lot  
YY = Year  
WW = Work Week

\*For additional information, see Application Note  
AND8002/D

### ORDERING INFORMATION

| Device          | Package | Shipping        |
|-----------------|---------|-----------------|
| MC100LVEL91DW   | SO-20   | 38 Units/Rail   |
| MC100LVEL91DWR2 | SO-20   | 1000 Units/Reel |

# MC100LEVEL91



## PIN DESCRIPTION

| PIN                 | FUNCTION                      |
|---------------------|-------------------------------|
| Dn, $\overline{Dn}$ | PECL/LVPECL Inputs            |
| Qn, $\overline{Qn}$ | ECL Outputs                   |
| PECL $V_{BB}$       | PECL Reference Voltage Output |
| $V_{CC}$            | Positive Supply               |
| $V_{EE}$            | Negative Supply               |
| GND                 | Ground                        |

**Figure 1. 20-Lead Pinout (Top View) and Logic Diagram**

\* All  $V_{CC}$  pins are tied together on the die.

Warning: All  $V_{CC}$ ,  $V_{EE}$ , and GND pins must be externally connected to Power Supply to guarantee proper operation.

## ATTRIBUTES

| Characteristics                                               | Value                                                     |
|---------------------------------------------------------------|-----------------------------------------------------------|
| Internal Input Pulldown Resistor                              | 75 k $\Omega$                                             |
| Internal Input Pullup Resistor                                | 75 k $\Omega$                                             |
| ESD Protection                                                | Human Body Model<br>Machine Model<br>Charged Device Model |
|                                                               | > 2 kV<br>> 100 V<br>> 2 kV                               |
| Moisture Sensitivity, Indefinite Time Out of Drypack (Note 1) | Level 1                                                   |
| Flammability Rating                                           | Oxygen Index: 28 to 34<br>UL 94 V-0 @ 0.125 in            |
| Transistor Count                                              | 282 Devices                                               |
| Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test        |                                                           |

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

## MAXIMUM RATINGS (Note 2)

| Symbol        | Parameter                                | Condition 1                          | Condition 2        | Rating      | Units                                        |
|---------------|------------------------------------------|--------------------------------------|--------------------|-------------|----------------------------------------------|
| $V_{CC}$      | PECL Power Supply                        | GND = 0 V                            |                    | 8 to 0      | V                                            |
| $V_{EE}$      | NECL Power Supply                        | GND = 0 V                            |                    | -8 to 0     | V                                            |
| $V_I$         | PECL Input Voltage                       | GND = 0 V                            | $V_I \leq V_{CC}$  | 6 to 0      | V                                            |
| $I_{out}$     | Output Current                           | Continuous<br>Surge                  |                    | 50<br>100   | mA<br>mA                                     |
| $I_{BB}$      | PECL $V_{BB}$ Sink/Source                |                                      |                    | $\pm 0.5$   | mA                                           |
| $T_A$         | Operating Temperature Range              |                                      |                    | -40 to +85  | $^{\circ}\text{C}$                           |
| $T_{stg}$     | Storage Temperature Range                |                                      |                    | -65 to +150 | $^{\circ}\text{C}$                           |
| $\theta_{JA}$ | Thermal Resistance (Junction to Ambient) | 0 LFPM<br>500 LFPM                   | 20 SOIC<br>20 SOIC | 90<br>60    | $^{\circ}\text{C/W}$<br>$^{\circ}\text{C/W}$ |
| $\theta_{JC}$ | Thermal Resistance (Junction to Case)    | std bd                               | 20 SOIC            | 30 to 35    | $^{\circ}\text{C/W}$                         |
| $T_{sol}$     | Wave Solder                              | <2 to 3 sec @ 248 $^{\circ}\text{C}$ |                    | 265         | $^{\circ}\text{C}$                           |

2. Maximum Ratings are those values beyond which device damage may occur.

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## LVPECL INPUT DC CHARACTERISTICS $V_{CC} = 3.3\text{ V}$ ; $V_{EE} = -3.3\text{ V}$ ; GND = 0 V (Note 3)

| Symbol          | Characteristic                                                                                                          | -40°C     |      |      | 25°C |     |      | 85°C |     |      | Unit          |
|-----------------|-------------------------------------------------------------------------------------------------------------------------|-----------|------|------|------|-----|------|------|-----|------|---------------|
|                 |                                                                                                                         | Min       | Typ  | Max  | Min  | Typ | Max  | Min  | Typ | Max  |               |
| $I_{CC}$        | $V_{CC}$ Power Supply Current                                                                                           |           |      | 11   |      | 6   | 11   |      |     | 11   | mA            |
| $V_{IH}$        | Input HIGH Voltage (Single-Ended)                                                                                       | 2135      |      | 2420 | 2135 |     | 2420 | 2135 |     | 2420 | mV            |
| $V_{IL}$        | Input LOW Voltage (Single-Ended)                                                                                        | 1490      |      | 1825 | 1490 |     | 1825 | 1490 |     | 1825 | mV            |
| LVPECL $V_{BB}$ | Output Voltage Reference                                                                                                | 1.92      |      | 2.04 | 1.92 |     | 2.04 | 1.92 |     | 2.04 | V             |
| $V_{IHCMR}$     | Input HIGH Voltage Common Mode Range (Differential) (Note 4)<br>$V_{pp} < 500\text{ mV}$<br>$V_{pp} \geq 500\text{ mV}$ |           |      |      |      |     |      |      |     |      |               |
|                 |                                                                                                                         | 1.0       |      | 2.9  | 0.9  |     | 2.9  | 0.9  |     | 2.9  | V             |
|                 |                                                                                                                         | 1.2       |      | 2.9  | 1.1  |     | 2.9  | 1.1  |     | 2.9  | V             |
| $I_{IH}$        | Input HIGH Current                                                                                                      |           |      | 150  |      |     | 150  |      |     | 150  | $\mu\text{A}$ |
| $I_{IL}$        | Input LOW Current                                                                                                       | D         | 0.5  |      | 0.5  |     |      | 0.5  |     |      | $\mu\text{A}$ |
|                 |                                                                                                                         | $\bar{D}$ | -600 |      | -600 |     |      | -600 |     |      | $\mu\text{A}$ |

NOTE: Devices are designed to meet the DC specifications shown in the above table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 lfm is maintained.

3. Input parameters vary 1:1 with  $V_{CC}$ .  $V_{CC}$  can vary +0.5 / -0.3 V.

4.  $V_{IHCMR}$  min varies 1:1 with GND.  $V_{IHCMR}$  max varies 1:1 with  $V_{CC}$ .

## PECL INPUT DC CHARACTERISTICS $V_{CC} = 5.0\text{ V}$ ; $V_{EE} = -3.3\text{ V}$ ; GND = 0 V (Note 5)

| Symbol        | Characteristic                                                                                                          | -40°C     |      |      | 25°C |     |      | 85°C |     |      | Unit          |
|---------------|-------------------------------------------------------------------------------------------------------------------------|-----------|------|------|------|-----|------|------|-----|------|---------------|
|               |                                                                                                                         | Min       | Typ  | Max  | Min  | Typ | Max  | Min  | Typ | Max  |               |
| $I_{CC}$      | $V_{CC}$ Power Supply Current                                                                                           |           |      | 11   |      | 6   | 11   |      |     | 11   | mA            |
| $V_{IH}$      | Input HIGH Voltage (Single-Ended)                                                                                       | 3835      |      | 4120 | 3835 |     | 4120 | 3835 |     | 4120 | mV            |
| $V_{IL}$      | Input LOW Voltage (Single-Ended)                                                                                        | 3190      |      | 3525 | 3190 |     | 3525 | 3190 |     | 3525 | mV            |
| PECL $V_{BB}$ | Output Voltage Reference                                                                                                | 3.62      |      | 3.74 | 3.62 |     | 3.74 | 3.62 |     | 3.74 | V             |
| $V_{IHCMR}$   | Input HIGH Voltage Common Mode Range (Differential) (Note 6)<br>$V_{pp} < 500\text{ mV}$<br>$V_{pp} \geq 500\text{ mV}$ |           |      |      |      |     |      |      |     |      | V             |
|               |                                                                                                                         | 1.0       |      | 4.6  | 0.9  |     | 4.6  | 0.9  |     | 4.6  |               |
|               |                                                                                                                         | 1.2       |      | 4.6  | 1.1  |     | 4.6  | 1.1  |     | 4.6  |               |
| $I_{IH}$      | Input HIGH Current                                                                                                      |           |      | 150  |      |     | 150  |      |     | 150  | $\mu\text{A}$ |
| $I_{IL}$      | Input LOW Current                                                                                                       | D         | 0.5  |      | 0.5  |     |      | 0.5  |     |      | $\mu\text{A}$ |
|               |                                                                                                                         | $\bar{D}$ | -600 |      | -600 |     |      | -600 |     |      | $\mu\text{A}$ |

NOTE: Devices are designed to meet the DC specifications shown in the above table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 lfm is maintained.

5. Input parameters vary 1:1 with  $V_{CC}$ .  $V_{CC}$  can vary  $\pm 0.25\text{ V}$ .

6.  $V_{IHCMR}$  min varies 1:1 with GND.  $V_{IHCMR}$  max varies 1:1 with  $V_{CC}$ .

## NECL OUTPUT DC CHARACTERISTICS $V_{CC} = 3.3\text{ V to }5.0\text{ V}$ ; $V_{EE} = -3.3\text{ V}$ ; GND = 0 V (Note 7)

| Symbol   | Characteristic                | -40°C |       |       | 25°C  |       |       | 85°C  |       |       | Unit |
|----------|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
|          |                               | Min   | Typ   | Max   | Min   | Typ   | Max   | Min   | Typ   | Max   |      |
| $I_{EE}$ | $V_{EE}$ Power Supply Current |       |       | 27    |       | 21    | 27    |       |       | 29    | mA   |
| $V_{OH}$ | Output HIGH Voltage (Note 8)  | -1085 | -1005 | -880  | -1025 | -955  | -880  | -1025 | -955  | -880  | mV   |
| $V_{OL}$ | Output LOW Voltage (Note 8)   | -1830 | -1695 | -1555 | -1810 | -1705 | -1620 | -1810 | -1705 | -1620 | mV   |

NOTE: Devices are designed to meet the DC specifications shown in the above table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 lfm is maintained.

7. Output parameters vary 1:1 with GND.  $V_{EE}$  can vary +0.3 V / -0.5 V.

8. All loading with 50 ohm resistor to GND-2 volts.

# MC100LVEL91

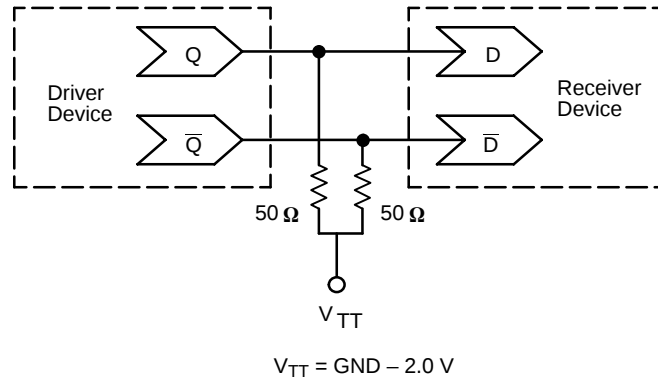
**AC CHARACTERISTICS**  $V_{CC} = 3.0\text{ V to } 5.5\text{ V}$ ;  $V_{EE} = -3.0\text{ V to } -3.8\text{ V}$ ;  $GND = 0\text{ V}$

| Symbol                               | Characteristic                                                                                                   | -40°C      |            |            | 25°C       |            |            | 85°C       |            |            | Unit |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------|
|                                      |                                                                                                                  | Min        | Typ        | Max        | Min        | Typ        | Max        | Min        | Typ        | Max        |      |
| F <sub>max</sub>                     | Maximum Toggle Frequency                                                                                         |            | 600        |            |            | 600        |            |            | 600        |            | MHz  |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay<br>D to Q<br>Differential<br>Select-Ended                                                      | 490<br>440 | 590<br>590 | 690<br>740 | 520<br>470 | 620<br>620 | 720<br>770 | 560<br>510 | 660<br>660 | 760<br>810 | ps   |
| t <sub>SKEW</sub>                    | Skew<br>Output-to-Output (Note 9)<br>Part-to-Part (Differential) (Note 9)<br>Duty Cycle (Differential) (Note 10) |            | 40<br>25   | 100<br>200 |            | 40<br>25   | 100<br>200 |            | 40<br>25   | 100<br>200 | ps   |
| V <sub>PP</sub>                      | Input Swing (Note 11)                                                                                            | 200        |            | 1000       | 200        |            | 1000       | 200        |            | 1000       | mV   |
| t <sub>r</sub><br>t <sub>f</sub>     | Output Rise/Fall Times Q<br>(20% – 80%)                                                                          | 320        | 400        | 580        | 320        | 400        | 580        | 320        | 400        | 580        | ps   |

9. Skews are valid across specified voltage range, part-to-part skew is for a given temperature.

10. Duty cycle skew is the difference between a T<sub>PLH</sub> and T<sub>PHL</sub> propagation delay through a device.

11. V<sub>PP</sub>(min) is the minimum input swing for which AC parameters are guaranteed. The device has a DC gain of ≈ 40.



**Figure 1. Typical Termination for Output Driver and Device Evaluation**  
(See Application Note AND8020 – Termination of ECL Logic Devices.)

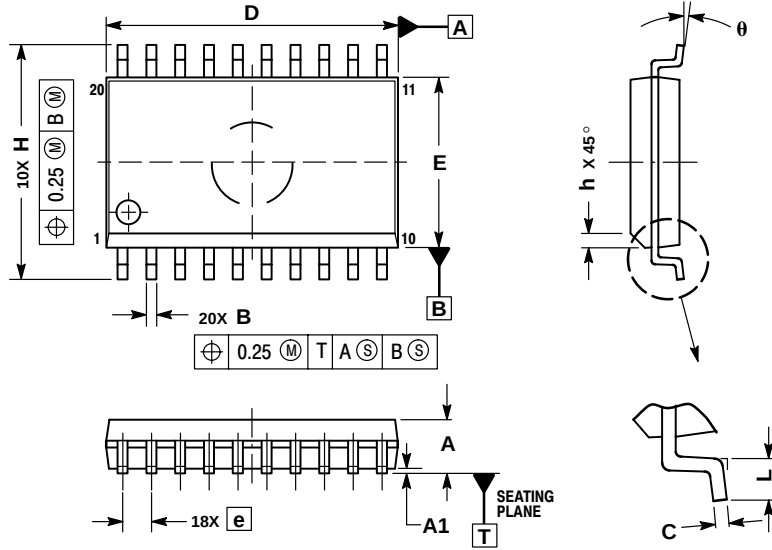
## Resource Reference of Application Notes

- AN1404** – ECLinPS Circuit Performance at Non-Standard  $V_{IH}$  Levels
- AN1405** – ECL Clock Distribution Techniques
- AN1406** – Designing with PECL (ECL at +5.0 V)
- AN1503** – ECLinPS I/O SPICE Modeling Kit
- AN1504** – Metastability and the ECLinPS Family
- AN1560** – Low Voltage ECLinPS SPICE Modeling Kit
- AN1568** – Interfacing Between LVDS and ECL
- AN1596** – ECLinPS Lite Translator ELT Family SPICE I/O Model Kit
- AN1650** – Using Wire-OR Ties in ECLinPS Designs
- AN1672** – The ECL Translator Guide
- AND8001** – Odd Number Counters Design
- AND8002** – Marking and Date Codes
- AND8020** – Termination of ECL Logic Devices

# MC100LVEL91

## PACKAGE DIMENSIONS

SO-20  
DW SUFFIX  
PLASTIC SOIC PACKAGE  
CASE 751D-05  
ISSUE F



### NOTES:

1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF B DIMENSION AT MAXIMUM MATERIAL CONDITION.

| DIM | MILLIMETERS |       |
|-----|-------------|-------|
|     | MIN         | MAX   |
| A   | 2.35        | 2.65  |
| A1  | 0.10        | 0.25  |
| B   | 0.35        | 0.49  |
| C   | 0.23        | 0.32  |
| D   | 12.65       | 12.95 |
| E   | 7.40        | 7.60  |
| e   | 1.27 BSC    |       |
| H   | 10.05       | 10.55 |
| h   | 0.25        | 0.75  |
| L   | 0.50        | 0.90  |
| θ   | 0°          | 7°    |

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