

# MC100LVEL17

## 3.3V ECL Quad Differential Receiver

The MC100LVEL17 is a 3.3 V ECL, quad differential receiver. The device is functionally equivalent to the E116 device with the capability of operation from either a -3.3 V or +3.3 V supply voltage.

Under open input conditions, the  $\overline{D}$  input will be biased at  $V_{CC}/2$  and the D input will be pulled down to  $V_{EE}$ . This operation will force the Q output LOW and ensure 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.

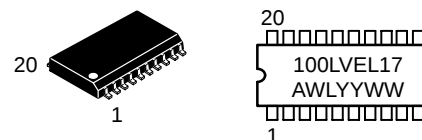
- 325 ps Propagation Delay
- High Bandwidth Output Transitions
- The 100 Series Contains Temperature Compensation
- PECL Mode Operating Range:  $V_{CC} = 3.0$  V to 3.8 V with  $V_{EE} = 0$  V
- NECL Mode Operating Range:  $V_{CC} = 0$  V with  $V_{EE} = -3.0$  V to -3.8 V
- Internal Input Pulldown Resistors D Inputs; Pullup and Pulldown on  $\overline{D}$  Inputs
- Q Output will Default LOW with Inputs Open or at  $V_{EE}$



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### MARKING DIAGRAM\*



**SO-20L  
DW SUFFIX  
CASE 751D**

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

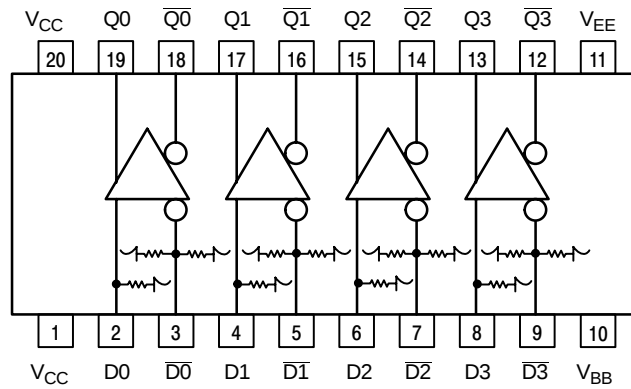
\*For additional marking information, refer to Application Note AND8002/D.

### ORDERING INFORMATION

| Device          | Package | Shipping <sup>†</sup> |
|-----------------|---------|-----------------------|
| MC100LVEL17DW   | SO-20L  | 38 Units/Rail         |
| MC100LVEL17DWR2 | SO-20L  | 1000 Tape & Reel      |

<sup>†</sup>For additional tape and reel information, refer to Brochure BRD8011/D.

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

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

**Figure 1. Logic Diagram and Pinout: (Top View)**

## PIN DESCRIPTION

| PIN              | FUNCTION                      |
|------------------|-------------------------------|
| $D_n, \bar{D}_n$ | ECL Differential Data Inputs  |
| $Q_n, \bar{Q}_n$ | ECL Differential Data Outputs |
| $V_{BB}$         | Reference Voltage Output      |
| $V_{CC}$         | Positive Supply               |
| $V_{EE}$         | Negative Supply               |

## 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>> 200 V<br>> 4 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                                              | 141                                                       |
| Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test        |                                                           |

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

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## MAXIMUM RATINGS (Note 2)

| Symbol           | Parameter                                          | Condition 1                                    | Condition 2                                                          | Rating            | Units        |
|------------------|----------------------------------------------------|------------------------------------------------|----------------------------------------------------------------------|-------------------|--------------|
| V <sub>CC</sub>  | PECL Mode Power Supply                             | V <sub>EE</sub> = 0 V                          |                                                                      | 8 to 0            | V            |
| V <sub>EE</sub>  | NECL Mode Power Supply                             | V <sub>CC</sub> = 0 V                          |                                                                      | -8 to 0           | V            |
| V <sub>I</sub>   | PECL Mode Input Voltage<br>NECL Mode Input Voltage | V <sub>EE</sub> = 0 V<br>V <sub>CC</sub> = 0 V | V <sub>I</sub> ≤ V <sub>CC</sub><br>V <sub>I</sub> ≥ V <sub>EE</sub> | 6 to 0<br>-6 to 0 | V<br>V       |
| I <sub>out</sub> | Output Current                                     | Continuous<br>Surge                            |                                                                      | 50<br>100         | mA<br>mA     |
| 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                             | SO-20L<br>SO-20L                                                     | 90<br>60          | °C/W<br>°C/W |
| θ <sub>JC</sub>  | Thermal Resistance (Junction-to-Case)              | Standard Board                                 | SO-20L                                                               | 30 to 35          | °C/W         |
| T <sub>sol</sub> | Wave Solder                                        | <2 to 3 sec @ 248°C                            |                                                                      | 265               | °C           |

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

## LVPECL DC CHARACTERISTICS V<sub>CC</sub> = 3.3 V; V<sub>EE</sub> = 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                                         |              | 26   | 31   |              | 26   | 31   |              | 27   | 33   | mA       |
| V <sub>OH</sub>    | Output HIGH Voltage (Note 4)                                 | 2215         | 2295 | 2420 | 2275         | 2345 | 2420 | 2275         | 2345 | 2420 | mV       |
| V <sub>OL</sub>    | Output LOW Voltage (Note 4)                                  | 1470         | 1605 | 1745 | 1490         | 1595 | 1680 | 1490         | 1595 | 1680 | mV       |
| V <sub>IH</sub>    | Input HIGH Voltage (Single-Ended)                            | 2135         |      | 2420 | 2135         |      | 2420 | 2135         |      | 2420 | mV       |
| V <sub>IL</sub>    | Input LOW Voltage (Single-Ended)                             | 1490         |      | 1825 | 1490         |      | 1825 | 1490         |      | 1825 | mV       |
| V <sub>BB</sub>    | Output Voltage Reference                                     | 1.92         |      | 2.04 | 1.92         |      | 2.04 | 1.92         |      | 2.04 | V        |
| V <sub>IHCMR</sub> | Input HIGH Voltage Common Mode Range (Differential) (Note 5) |              |      |      |              |      |      |              |      |      |          |
|                    | V <sub>pp</sub> < 500 mV                                     | 1.3          |      | 2.9  | 1.2          |      | 2.9  | 1.2          |      | 2.9  | V        |
|                    | V <sub>pp</sub> ≥ 500 mV                                     | 1.5          |      | 2.9  | 1.4          |      | 2.9  | 1.4          |      | 2.9  | V        |
| I <sub>IH</sub>    | Input HIGH Current                                           |              |      | 150  |              |      | 150  |              |      | 150  | μA       |
| I <sub>IL</sub>    | Input LOW Current                                            |              |      |      |              |      |      |              |      |      |          |
|                    | Dn<br>Dn                                                     | 0.5<br>- 300 |      |      | 0.5<br>- 300 |      |      | 0.5<br>- 300 |      |      | μA<br>μA |

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 lfpm is maintained.

3. Input and output parameters vary 1:1 with V<sub>CC</sub>. V<sub>EE</sub> can vary ±0.3 V.

4. Outputs are terminated through a 50 ohm resistor to V<sub>CC</sub>-2 volts.

5. V<sub>IHCMR</sub> min varies 1:1 with V<sub>EE</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. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between V<sub>ppmin</sub> and 1 V.

# MC100LEVEL17

## LVNECL DC CHARACTERISTICS $V_{CC} = 0.0\text{ V}$ ; $V_{EE} = -3.3\text{ V}$ (Note 6)

| Symbol      | Characteristic                                               | -40 °C           |       |       | 25 °C |       |       | 85 °C |       |       | Unit          |
|-------------|--------------------------------------------------------------|------------------|-------|-------|-------|-------|-------|-------|-------|-------|---------------|
|             |                                                              | Min              | Typ   | Max   | Min   | Typ   | Max   | Min   | Typ   | Max   |               |
| $I_{EE}$    | Power Supply Current                                         |                  | 26    | 31    |       | 26    | 31    |       | 27    | 33    | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 7)                                 | -1085            | -1005 | -880  | -1025 | -955  | -880  | -1025 | -955  | -880  | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 7)                                  | -1830            | -1695 | -1555 | -1810 | -1705 | -1620 | -1810 | -1705 | -1620 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)                            | -1165            |       | -880  | -1165 |       | -880  | -1165 |       | -880  | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)                             | -1810            |       | -1475 | -1810 |       | -1475 | -1810 |       | -1475 | mV            |
| $V_{BB}$    | Output Voltage Reference                                     | -1.38            |       | -1.26 | -1.38 |       | -1.26 | -1.38 |       | -1.26 | V             |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential) (Note 8) |                  |       |       |       |       |       |       |       |       |               |
|             | $V_{pp} < 500\text{ mV}$                                     | -2.0             |       | -0.4  | -2.1  |       | -0.4  | -2.1  |       | -0.4  | V             |
|             | $V_{pp} \geq 500\text{ mV}$                                  | -1.8             |       | -0.4  | -1.9  |       | -0.4  | -1.9  |       | -0.4  | V             |
| $I_{IH}$    | Input HIGH Current                                           |                  |       | 150   |       |       | 150   |       |       | 150   | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current                                            | $D_n$            | 0.5   |       | 0.5   |       |       | 0.5   |       |       | $\mu\text{A}$ |
|             |                                                              | $\overline{D_n}$ | -300  |       | -300  |       |       | -300  |       |       | $\mu\text{A}$ |

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.

6. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary  $\pm 0.3\text{ V}$ .

7. Outputs are terminated through a 50 ohm resistor to  $V_{CC}-2\text{ volts}$ .

8.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ , max varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between  $V_{ppmin}$  and 1 V.

## AC CHARACTERISTICS $V_{CC} = 3.3\text{ V}$ ; $V_{EE} = 0.0\text{ V}$ or $V_{CC} = 0.0\text{ V}$ ; $V_{EE} = -3.3\text{ V}$ (Note 9)

| Symbol                 | Characteristic                                                                                     | -40 °C     |     |                 | 25 °C      |      |                 | 85 °C      |     |                 | Unit |
|------------------------|----------------------------------------------------------------------------------------------------|------------|-----|-----------------|------------|------|-----------------|------------|-----|-----------------|------|
|                        |                                                                                                    | Min        | Typ | Max             | Min        | Typ  | Max             | Min        | Typ | Max             |      |
| $f_{max}$              | Maximum Toggle Frequency                                                                           |            |     |                 |            | 1.75 |                 |            |     |                 | GHz  |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay<br>D to Q<br>Diff<br>S.E.                                                        | 330<br>280 |     | 530<br>580      | 350<br>300 |      | 550<br>600      | 360<br>310 |     | 560<br>610      | ps   |
| $t_{SKEW}$             | Skew<br>Output-to-Output (Note 10)<br>Part-to-Part (Diff) (Note 10)<br>Duty Cycle (Diff) (Note 11) |            |     | 75<br>200<br>25 |            |      | 75<br>200<br>25 |            |     | 75<br>200<br>25 | ps   |
| $t_{JITTER}$           | Random Clock Jitter (RMS)                                                                          |            |     |                 |            | 0.7  |                 |            |     |                 | ps   |
| $V_{PP}$               | Input Swing (Note 12)                                                                              | 150        |     | 1000            | 150        |      | 1000            | 150        |     | 1000            | mV   |
| $t_r$<br>$t_f$         | Output Rise/Fall Times Q<br>(20% - 80%)                                                            | 280        |     | 550             | 280        |      | 550             | 280        |     | 550             | ps   |

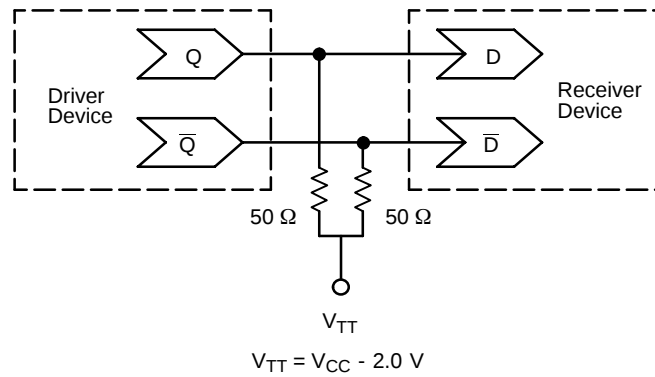
9.  $V_{EE}$  can vary  $\pm 0.3\text{ V}$ .

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

11. Duty cycle skew is the difference between a  $t_{PLH}$  and  $t_{PHL}$  propagation delay through a device.

12.  $V_{pp(min)}$  is minimum input swing for which AC parameters guaranteed. The device has a DC gain of  $\approx 40$ .

## MC100LVEL17



**Figure 2. Typical Termination for Output Driver and Device Evaluation**  
(See Application Note AND8020 - Termination of ECL Logic Devices.)

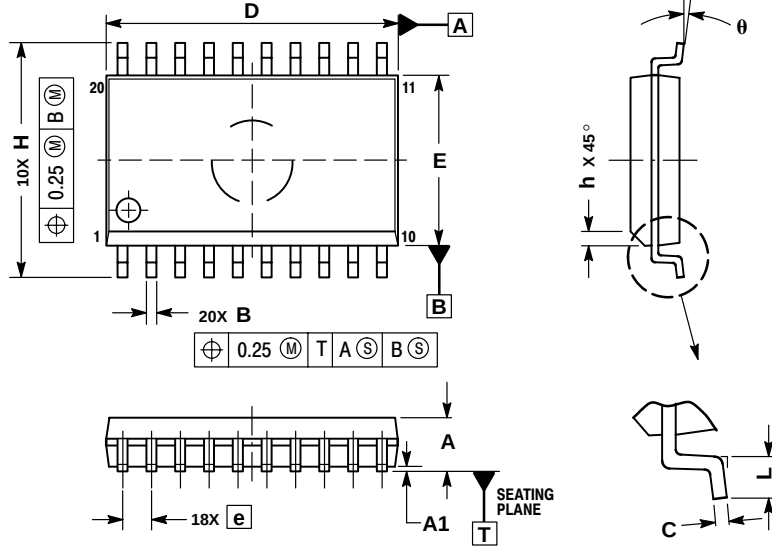
### Resource Reference of Application Notes

|                |                                                               |
|----------------|---------------------------------------------------------------|
| <b>AN1404</b>  | - ECLinPS Circuit Performance at Non-Standard $V_{IH}$ Levels |
| <b>AN1405</b>  | - ECL Clock Distribution Techniques                           |
| <b>AN1406</b>  | - Designing with PECL (ECL at +5.0 V)                         |
| <b>AN1503</b>  | - ECLinPS I/O SPICE Modeling Kit                              |
| <b>AN1504</b>  | - Metastability and the ECLinPS Family                        |
| <b>AN1560</b>  | - Low Voltage ECLinPS SPICE Modeling Kit                      |
| <b>AN1568</b>  | - Interfacing Between LVDS and ECL                            |
| <b>AN1596</b>  | - ECLinPS Lite Translator ELT Family SPICE I/O Model Kit      |
| <b>AN1650</b>  | - Using Wire-OR Ties in ECLinPS Designs                       |
| <b>AN1672</b>  | - The ECL Translator Guide                                    |
| <b>AND8001</b> | - Odd Number Counters Design                                  |
| <b>AND8002</b> | - Marking and Date Codes                                      |
| <b>AND8020</b> | - Termination of ECL Logic Devices                            |
| <b>AND8090</b> | - AC Characteristics of ECL Devices                           |

# MC100LVEL17

## PACKAGE DIMENSIONS

SO-20L  
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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