

# MC100LVEL13

## 3.3 V ECL Dual 1:3 Fanout Buffer

### Description

The MC100LVEL13 is a dual, fully differential 1:3 fanout buffer. The Low Output-Output Skew of the device makes it ideal for distributing two different frequency synchronous signals.

The differential inputs have special circuitry which ensures device stability under open input conditions. When both differential inputs are left open the D input will pull down to  $V_{EE}$ , The  $\bar{D}$  input will bias around  $V_{CC}/2$  and the Q output will go LOW.

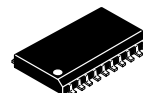
### Features

- 500 ps Typical Propagation Delays
- 50 ps Output-Output Skews
- ESD Protection: > 2 kV Human Body Model
- The 100 Series Contains Temperature Compensation
- PECL Mode Operating Range:  $V_{CC} = 3.0\text{ V}$  to  $3.8\text{ V}$  with  $V_{EE} = 0\text{ V}$
- NECL Mode Operating Range:  $V_{CC} = 0\text{ V}$  with  $V_{EE} = -3.0\text{ V}$  to  $-3.8\text{ V}$
- Internal Input Pulldown Resistors
- Q Output will Default LOW with Inputs Open or at  $V_{EE}$
- Meets or Exceeds JEDEC Spec EIA/JESD78 IC Latchup Test
- Moisture Sensitivity: Level 3 (Pb-Free)
- Flammability Rating: UL 94 V-0 @ 0.125 in, Oxygen Index: 28 to 34
- Transistor Count = 143 Devices
- These Devices are Pb-Free, Halogen Free and are RoHS Compliant



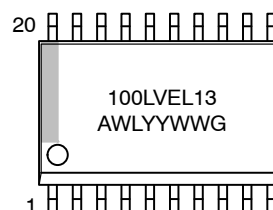
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**SOIC-20 WB  
DW SUFFIX  
CASE 751D**

### MARKING DIAGRAM\*



A = Assembly Location  
WL = Wafer Lot  
YY = Year  
WW = Work Week  
G = Pb-Free Package

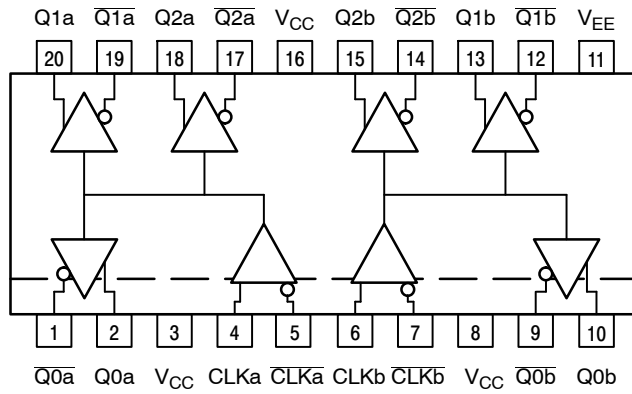
\*For additional marking information, refer to Application Note [AND8002/D](#).

### ORDERING INFORMATION

| Device           | Package              | Shipping†        |
|------------------|----------------------|------------------|
| MC100LVEL13DWG   | SOIC-20 WB (Pb-Free) | 38 Units / Tube  |
| MC100LVEL13DWR2G | SOIC-20 WB (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](#).

# MC100LVEL13



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: 20-Lead SOIC**  
(Top View)

**Table 1. PIN DESCRIPTION**

| PIN                         | FUNCTION                       |
|-----------------------------|--------------------------------|
| $Q_{na}, \overline{Q_{na}}$ | ECL Differential Clock Outputs |
| $Q_{nb}, \overline{Q_{nb}}$ | ECL Differential Clock Outputs |
| $CLK_n, \overline{CLK_n}$   | ECL Differential Clock Inputs  |
| $V_{CC}$                    | Positive Supply                |
| $V_{EE}$                    | Negative Supply                |

**Table 2. MAXIMUM RATINGS**

| Symbol        | Parameter                                          | Condition 1                                      | Condition 2                            | Rating            | Unit   |
|---------------|----------------------------------------------------|--------------------------------------------------|----------------------------------------|-------------------|--------|
| $V_{CC}$      | PECL Mode Power Supply                             | $V_{EE} = 0 \text{ V}$                           |                                        | 8 to 0            | V      |
| $V_{EE}$      | NECL Mode Power Supply                             | $V_{CC} = 0 \text{ V}$                           |                                        | -8 to 0           | V      |
| $V_I$         | PECL Mode Input Voltage<br>NECL Mode Input Voltage | $V_{EE} = 0 \text{ V}$<br>$V_{CC} = 0 \text{ V}$ | $V_I \leq V_{CC}$<br>$V_I \geq V_{EE}$ | 6 to 0<br>-6 to 0 | V<br>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 Range                          |                                                  |                                        | -65 to +150       | °C     |
| $\theta_{JA}$ | Thermal Resistance (Junction-to-Ambient)           | 0 lfpm<br>500 lfpm                               | SOIC-20 WB<br>SOIC-20 WB               | 90<br>60          | °C/W   |
| $\theta_{JC}$ | Thermal Resistance (Junction-to-Case)              | Standard Board                                   | SOIC-20 WB                             | 30 to 35          | °C/W   |
| $T_{sol}$     | Wave Solder (Pb-Free)                              | < 2 to 3 sec @ 260°C                             |                                        | 265               | °C     |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

**Table 3. LVPECL DC CHARACTERISTICS** ( $V_{CC} = 3.3\text{ V}$ ;  $V_{EE} = 0.0\text{ V}$  (Note 1))

| Symbol      | Characteristic                                                                                                          | -40°C |      |      | 25°C |      |      | 85°C |      |      | Unit          |
|-------------|-------------------------------------------------------------------------------------------------------------------------|-------|------|------|------|------|------|------|------|------|---------------|
|             |                                                                                                                         | Min   | Typ  | Max  | Min  | Typ  | Max  | Min  | Typ  | Max  |               |
| $I_{EE}$    | Power Supply Current                                                                                                    |       | 30   | 38   |      | 30   | 38   |      | 32   | 40   | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 2)                                                                                            | 2215  | 2295 | 2420 | 2275 | 2345 | 2420 | 2275 | 2345 | 2420 | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 2)                                                                                             | 1470  | 1605 | 1745 | 1490 | 1595 | 1680 | 1490 | 1595 | 1680 | mV            |
| $V_{IH}$    | 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            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential) (Note 3)<br>$V_{PP} < 500\text{ mV}$<br>$V_{PP} \geq 500\text{ mV}$ |       |      |      |      |      |      |      |      |      | V             |
|             |                                                                                                                         | 1.3   |      | 2.9  | 1.2  |      | 2.9  | 1.2  |      | 2.9  |               |
|             |                                                                                                                         | 1.5   |      | 2.9  | 1.4  |      | 2.9  | 1.4  |      | 2.9  |               |
| $I_{IH}$    | Input HIGH Current                                                                                                      |       |      | 150  |      |      | 150  |      |      | 150  | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current<br>CLKn<br>$\overline{\text{CLKn}}$                                                                   | 0.5   |      |      | 0.5  |      |      | 0.5  |      |      | $\mu\text{A}$ |
|             |                                                                                                                         | -300  |      |      | -300 |      |      | -300 |      |      |               |

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.

1. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary  $\pm 0.3\text{ V}$ .
2. Outputs are terminated through a  $50\ \Omega$  resistor to  $V_{CC} - 2.0\text{ V}$ .
3.  $V_{IHCMR}$  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  $1\text{ V}$ .

**Table 4. LVNECL DC CHARACTERISTICS** ( $V_{CC} = 0.0\text{ V}$ ;  $V_{EE} = -3.3\text{ V}$  (Note 1))

| Symbol      | Characteristic                                                                                                          | -40°C |       |       | 25°C  |       |       | 85°C  |       |       | Unit          |
|-------------|-------------------------------------------------------------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------------|
|             |                                                                                                                         | Min   | Typ   | Max   | Min   | Typ   | Max   | Min   | Typ   | Max   |               |
| $I_{EE}$    | Power Supply Current                                                                                                    |       | 30    | 38    |       | 30    | 38    |       | 32    | 40    | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 2)                                                                                            | -1085 | -1005 | -880  | -1025 | -955  | -880  | -1025 | -955  | -880  | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 2)                                                                                             | -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            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential) (Note 3)<br>$V_{PP} < 500\text{ mV}$<br>$V_{PP} \geq 500\text{ mV}$ |       |       |       |       |       |       |       |       |       | V             |
|             |                                                                                                                         | -2.0  |       | -0.4  | -2.1  |       | -0.4  | -2.1  |       | -0.4  |               |
|             |                                                                                                                         | -1.8  |       | -0.4  | -1.9  |       | -0.4  | -1.9  |       | -0.4  |               |
| $I_{IH}$    | Input HIGH Current                                                                                                      |       |       | 150   |       |       | 150   |       |       | 150   | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current<br>CLKn<br>$\overline{\text{CLKn}}$                                                                   | 0.5   |       |       | 0.5   |       |       | 0.5   |       |       | $\mu\text{A}$ |
|             |                                                                                                                         | -300  |       |       | -300  |       |       | -300  |       |       |               |

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.

1. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary  $\pm 0.3\text{ V}$ .
2. Outputs are terminated through a  $50\ \Omega$  resistor to  $V_{CC} - 2.0\text{ V}$ .
3.  $V_{IHCMR}$  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  $1\text{ V}$ .

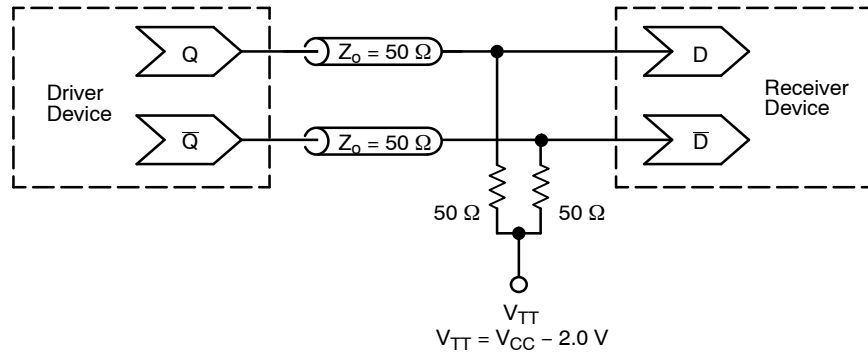
# MC100LEVEL13

**Table 5. 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 1))

| Symbol                 | Characteristic                                                       | -40°C |     |          | 25°C |     |          | 85°C |     |          | Unit |
|------------------------|----------------------------------------------------------------------|-------|-----|----------|------|-----|----------|------|-----|----------|------|
|                        |                                                                      | Min   | Typ | Max      | Min  | Typ | Max      | Min  | Typ | Max      |      |
| $f_{\max}$             | Maximum Toggle Frequency                                             |       | TBD |          |      | TBD |          |      | TBD |          | GHz  |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay CLK to Q/ $\bar{Q}$                                | 410   |     | 600      | 430  | 500 | 620      | 450  |     | 640      | ps   |
| $t_{sk(O)}$            | Output-Output Skew<br>Any Qa to Qa, Any Qb to Qb<br>Any Qa to Any Qb |       |     | 50<br>75 |      |     | 50<br>75 |      |     | 50<br>75 | ps   |
| $t_{skew}$             | Duty Cycle Skew $ t_{PLH} - t_{PHL} $                                |       |     | 50       |      |     | 50       |      |     | 50       | ps   |
| $t_{JITTER}$           | Cycle-to-Cycle Jitter                                                |       | TBD |          |      | TBD |          |      | TBD |          | ps   |
| $V_{PP}$               | Input Swing (Note 2)                                                 | 150   |     | 1000     | 150  |     | 1000     | 150  |     | 1000     | mV   |
| $t_r$<br>$t_f$         | Output Rise/Fall Times Q (20%–80%)                                   | 230   |     | 500      | 230  |     | 500      | 230  |     | 500      | 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.

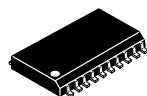
- $V_{EE}$  can vary  $\pm 0.3\text{ V}$ .
- $V_{PP}(\min)$  is minimum input swing for which AC parameters guaranteed. The device has a DC gain of  $\approx 40$ .



**Figure 2. Typical Termination for Output Driver and Device Evaluation**  
(See Application Note [AND8020/D](#) – Termination of ECL Logic Devices)

## Resource Reference of Application Notes

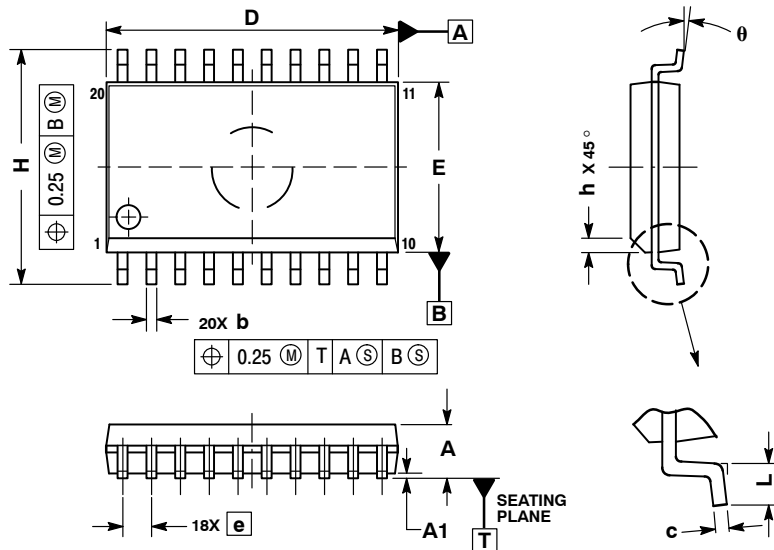
- AN1405/D** – ECL Clock Distribution Techniques
- AN1406/D** – Designing with PECL (ECL at +5.0 V)
- AN1503/D** – ECLinPS™ I/O SPICE Modeling Kit
- AN1504/D** – Metastability and the ECLinPS Family
- AN1568/D** – Interfacing Between LVDS and ECL
- AN1672/D** – The ECL Translator Guide
- AND8001/D** – 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



SCALE 1:1

### SOIC-20 WB CASE 751D-05 ISSUE H

DATE 22 APR 2015

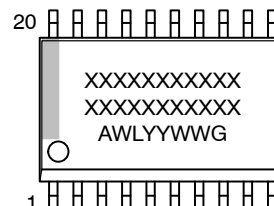


#### NOTES:

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.

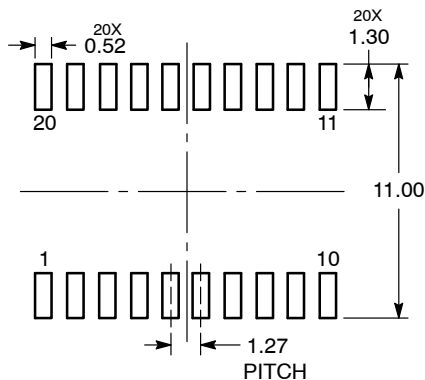
| DIM | MILLIMETERS |       |
|-----|-------------|-------|
|     | MIN         | MAX   |
| A   | 2.35        | 2.65  |
| A1  | 0.10        | 0.25  |
| b   | 0.35        | 0.49  |
| c   | 0.23        | 0.32  |
| D   | 12.65       | 12.95 |
| E   | 7.40        | 7.60  |
| e   | 1.27 BSC    |       |
|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

### GENERIC MARKING DIAGRAM\*



XXXXXX = Specific Device Code  
A = Assembly Location  
WL = Wafer Lot  
YY = Year  
WW = Work Week  
G = Pb-Free Package

### 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.

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present.

|                  |             |                                                                                                                                                                                  |
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| DESCRIPTION:     | SOIC-20 WB  | PAGE 1 OF 1                                                                                                                                                                      |

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