# MC100EL13

# 5V ECL Dual 1:3 Fanout Buffer

The MC100EL13 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 $\overline{D}$ 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
- The 100 Series Contains Temperature Compensation
- PECL Mode Operating Range: $V_{CC}$ = 4.2 V to 5.7 V with $V_{EE}$ = 0 V
- NECL Mode Operating Range: $V_{CC}$ = 0 V with $V_{EE}$ = −4.2 V to −5.7 V
- Internal Input Pulldown Resistors
- Q Output will Default LOW with Inputs Open or at $V_{EE}$
- Internal Input Pulldown Resistors on All Inputs, Pullup Resistors on Inverted Inputs
- Pb−Free Packages are Available*

*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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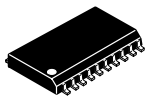
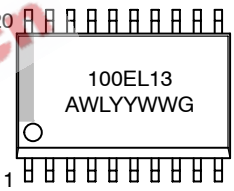


**SO−20L**
**DW SUFFIX**
**CASE 751D**

**MARKING DIAGRAM***

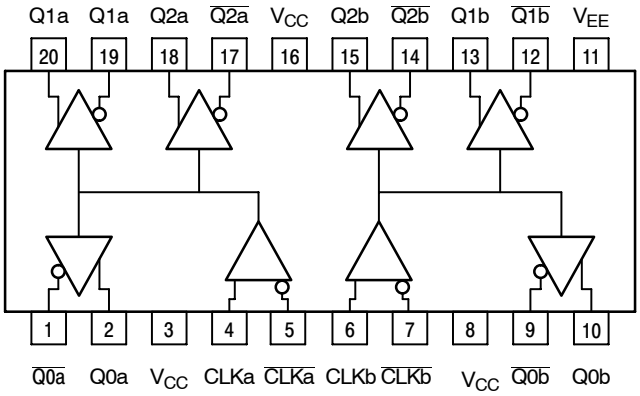



| | |
|---|---|
| A | = Assembly Location |
| WL | = Wafer Lot |
| YY | = Year |
| WW | = Work Week |
| G | = Pb−Free Package |

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

**ORDERING INFORMATION**

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.




* 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: Assignment**

**Table 1. PIN DESCRIPTION**

| PIN | FUNCTION |
|---|---|
| Qna, $\overline{Qna}$ | ECL Differential Clock Outputs |
| Qnb, $\overline{Qnb}$ | ECL Differential Clock Outputs |
| CLKn, $\overline{CLKn}$ | ECL Differential Clock Inputs |
| $V_{CC}$ | Positive Supply |
| VEE | Negative Supply |

**Table 2. ATTRIBUTES**

| Characteristics | | Value |
|---|---|---|
| Internal Input Pulldown Resistor | | 75 kΩ |
| Internal Input Pullup Resistor | | 75 kΩ |
| ESD Protection | Human Body Model<br>Machine Model<br>Charge Device Model | > 2 kV<br>> 200 V<br>> 4 kV |
| Moisture Sensitivity (Note 1) | | Level 1 |
| Flammability Rating | Oxygen Index: 28 to 34 | UL 94 V−0 @ 0.125 in |
| Transistor Count | | 143 Devices |
| Meets or Exceeds JEDEC Spec EIA/JESD78 IC Latchup Test | | |

1. For additional Moisture Sensitivity information, refer to Application Note AND8003/D.

**Table 3. MAXIMUM RATINGS**

| Symbol | Parameter | Condition 1 | Condition 2 | Rating | Unit |
|---|---|---|---|---|---|
| $V_{CC}$ | PECL Mode Power Supply | $V_{EE}$ = 0 V | | 8 | V |
| $V_{EE}$ | NECL Mode Power Supply | $V_{CC}$ = 0 V | | −8 | V |
| $V_I$ | PECL Mode Input Voltage<br>NECL Mode Input Voltage | $V_{EE}$ = 0 V<br>$V_{CC}$ = 0 V | $V_I \le V_{CC}$<br>$V_I \ge V_{EE}$ | 6<br>−6 | V<br>V |
| $I_{out}$ | Output Current | Continuous<br>Surge | | 50<br>100 | mA<br>mA |
| $I_{BB}$ | $V_{BB}$ Sink/Source | | | ± 0.5 | 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 | SO−20L<br>SO−20L | 90<br>60 | °C/W<br>°C/W |
| $\theta_{JC}$ | Thermal Resistance (Junction−to−Case) | Standard Board | SO−20L | 30 to 35 | °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 |

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.

**Table 4. 100EL SERIES PECL DC CHARACTERISTICS** $V_{CC}$ = 5.0 V; $V_{EE}$ = 0.0 V (Note 2)

| | | −40°C | | | 25°C | | | 85°C | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Symbol** | **Characteristic** | **Min** | **Typ** | **Max** | **Min** | **Typ** | **Max** | **Min** | **Typ** | **Max** | **Unit** |
| $I_{EE}$ | Power Supply Current | | 30 | 38 | | 30 | 38 | | 32 | 40 | mA |
| $V_{OH}$ | Output HIGH Voltage (Note 3) | 3915 | 3995 | 4120 | 3975 | 4045 | 4120 | 3975 | 4050 | 4120 | mV |
| $V_{OL}$ | Output LOW Voltage (Note 3) | 3170 | 3305 | 3445 | 3190 | 3295 | 3380 | 3190 | 3295 | 3380 | mV |
| $V_{IH}$ | 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 |
| $V_{BB}$ | Output Voltage Reference | 3.62 | | 3.74 | 3.62 | | 3.74 | 3.62 | | 3.74 | V |
| $V_{IHCMR}$ | Common Mode Range (Differential Configuration) (Note 4)<br>$V_{PP}$ < 500 mV<br>$V_{PP}$ ≥ 500 mV | <br>1.3<br>1.5 | | <br>4.6<br>4.6 | <br>1.2<br>1.4 | | <br>4.6<br>4.6 | <br>1.2<br>1.4 | | <br>4.6<br>4.6 | V |
| $I_{IH}$ | Input HIGH Current | | | 150 | | | 150 | | | 150 | μA |
| $I_{IL}$ | Input LOW Current | 0.5 | | | 0.5 | | | 0.5 | | | 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.

2. Input and output parameters vary 1:1 with $V_{CC}$. $V_{EE}$ can vary +0.8 V / −0.5 V.
3. Outputs are terminated through a 50 Ω resistor to $V_{CC}$ − 2.0 V.
4. $V_{IHCMR}$ 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. 100EL SERIES NECL DC CHARACTERISTICS** $V_{CC}$ = 0.0 V; $V_{EE}$ = −5.0 V (Note 5)

| | | −40°C | | | 25°C | | | 85°C | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Symbol** | **Characteristic** | **Min** | **Typ** | **Max** | **Min** | **Typ** | **Max** | **Min** | **Typ** | **Max** | **Unit** |
| $I_{EE}$ | Power Supply Current | | 30 | 38 | | 30 | 38 | | 32 | 40 | mA |
| $V_{OH}$ | Output HIGH Voltage (Note 6) | −1085 | −1005 | −880 | −1025 | −955 | −880 | −1025 | −955 | −880 | mV |
| $V_{OL}$ | Output LOW Voltage (Note 6) | −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 |
| $V_{IHCMR}$ | Common Mode Range (Differential Configuration) (Note 7)<br>$V_{PP}$ < 500 mV<br>$V_{PP}$ ≥ 500 mV | <br>−3.7<br>−3.5 | | <br>−0.4<br>−0.4 | <br>−3.8<br>−3.6 | | <br>−0.4<br>−0.4 | <br>−3.8<br>−3.6 | | <br>−0.4<br>−0.4 | V |
| $I_{IH}$ | Input HIGH Current | | | 150 | | | 150 | | | 150 | μA |
| $I_{IL}$ | Input LOW Current | 0.5 | | | 0.5 | | | 0.5 | | | 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.

5. Input and output parameters vary 1:1 with $V_{CC}$. $V_{EE}$ can vary +0.8 V / −0.5 V.
6. Outputs are terminated through a 50 Ω resistor to $V_{CC}$ − 2.0 V.
7. $V_{IHCMR}$ 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 6. AC CHARACTERISTICS** $V_{CC}$ = 5.0 V; $V_{EE}$ = 0.0 V or $V_{CC}$ = 0.0 V; $V_{EE}$ = −5.0 V (Note 8)

| 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<br>CLK→Q/$\overline{Q}$ | 410 | | 600 | 430 | | 620 | 450 | | 640 | ps |
| $t_{sk(O)}$ | Output−Output Skew<br>Any Qa→Qa, Any Qb→Qb<br>Any Qa→Any Qb | | | <br>50<br>75 | | | <br>50<br>75 | | | <br>50<br>75 | ps |
| $t_{sk(DC)}$ | Duty Cycle Skew<br>$\lvert t_{PLH} - t_{PHL} \rvert$ | | | 50 | | | 50 | | | 50 | ps |
| $t_{JITTER}$ | Cycle−to−Cycle Jitter | | TBD | | | TBD | | | TBD | | ps |
| $V_{PP}$ | Input Swing (Note 9) | 150 | | 1000 | 150 | | 1000 | 150 | | 1000 | mV |
| $t_r$<br>$t_f$ | Output Rise/Fall Times Q<br>(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 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. $V_{EE}$ can vary +0.8 V / −0.5 V.
9. $V_{PP}$min is minimum input swing for which AC parameters guaranteed. The device has a DC gain of ≈40.

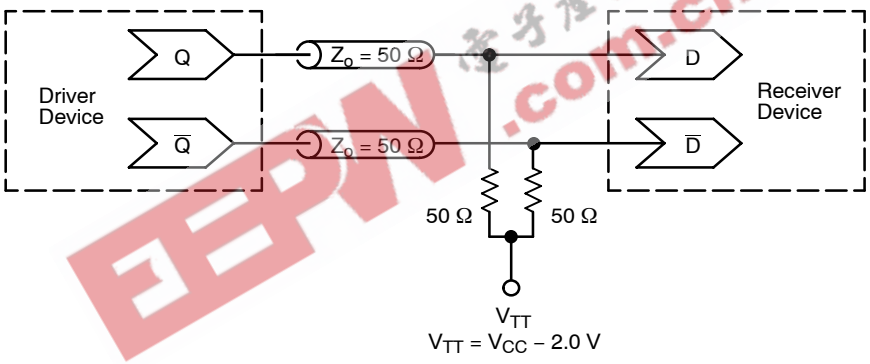



**Figure 2. Typical Termination for Output Driver and Device Evaluation (See Application Note AND8020/D − Termination of ECL Logic Devices.)**

## ORDERING INFORMATION

| Device | Package | Shipping† |
|---|---|---|
| MC100EL13DW | SO−20 WB | 38 Units / Rail |
| MC100EL13DWG | SO−20 WB (Pb−Free) | 38 Units / Rail |
| MC100EL13DWR2 | SO−20 WB | 1000 / Tape & Reel |
| MC100EL13DWR2G | SO−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.

### 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

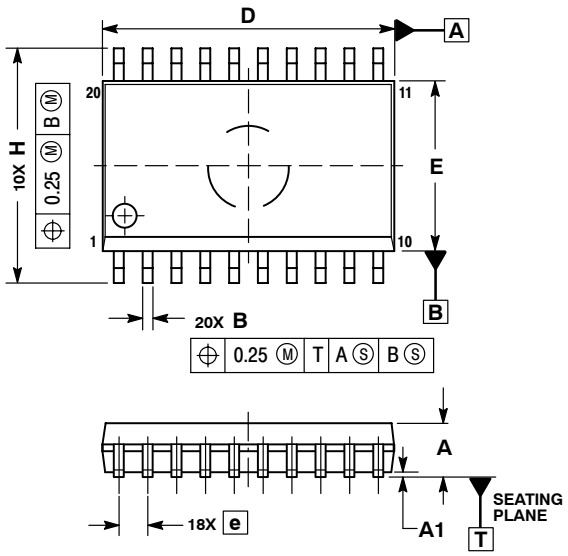
**AND8066/D** – Interfacing with ECLinPS

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

# MC100EL13

## PACKAGE DIMENSIONS

**SO−20 WB**
CASE 751D−05
ISSUE G




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.

| | MILLIMETERS | |
|---|---|---|
| DIM | 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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