

MC100LVEL37

3.3V ECL 1:4 ÷1/÷2 Clock Fanout Buffer

Description

The MC100LVEL37 is a fully differential 1:4 fanout buffer. The device offers two outputs at $\div 1$ of the input frequency, and two outputs at $\div 2$ of the input frequency. The Low Output–Output Skew of the device makes it ideal for distributing 1x and 1/2x 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 CLK_n input will pull down to V_{EE} . The $\overline{\text{CLK}}_n$ input will bias around $V_{CC}/2$ and the Q_n output will go LOW.

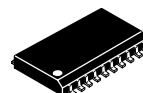
Features

- 700 ps Typical Propagation Delays
- 50 ps Maximum Output–Output Skews
- ESD Protection: >2 kV Human Body Model, >200 V Machine Model
- The 100 Series Contains Temperature Compensation
- PECL Mode Operating Range: $V_{CC} = 3.0 \text{ V}$ to 3.8 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 V
- Internal Input Pulldown Resistors
- Q_n Output will Default LOW with Inputs Open or at V_{EE}
- Meets or Exceeds JEDEC Spec EIA/JESD78 IC Latchup Test
- Moisture Sensitivity Level 1
For Additional Information, see Application Note AND8003/D
- Flammability Rating: UL 94 V-0 @ 0.125 in, Oxygen Index 28 to 34
- Transistor Count = 256 devices
- Pb–Free Packages are Available*



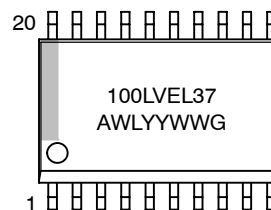
ON Semiconductor®

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SO–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

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

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

MC100LEVEL37

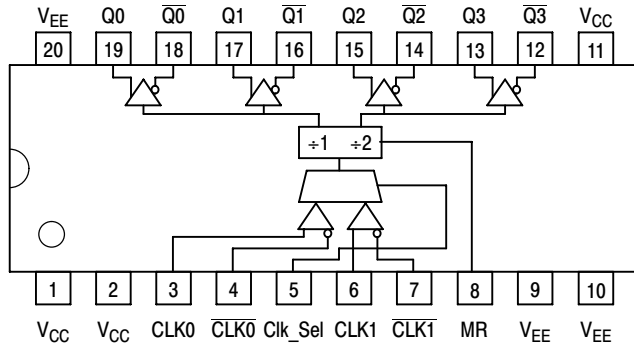


Figure 1. 20-Lead Pinout (Top View)

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

Table 1. TRUTH TABLE

| Clk_Sel | MR | Q0, 1 | Q2, 3 |
|---------|----|---------|---------|
| L | L | CLK0/+1 | CLK0/+2 |
| H | L | CLK1/+1 | CLK1/+2 |
| X | H | L | L |

X = Don't Care

Table 2. PIN DESCRIPTION

| PIN | FUNCTION |
|---|-----------------------------------|
| Q0, $\overline{Q0}$; Q1, $\overline{Q1}$ | ECL Differential Clock +1 Outputs |
| Q2, $\overline{Q2}$; Q3, $\overline{Q3}$ | ECL Differential Clock +2 Outputs |
| CLKn, \overline{CLKn} | ECL Differential Clock Inputs |
| Clk_Sel | ECL Input Clock Selection |
| MR | ECL Asynchronous Master Reset |
| V_{CC} | Positive Supply |
| V_{EE} | Negative Supply |

Table 3. 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 NECL Mode Input Voltage | $V_{EE} = 0\text{ V}$ $V_{CC} = 0\text{ V}$ | $V_I \leq V_{CC}$ $V_I \geq V_{EE}$ | 6 to 0 -6 to 0 | V |
| I_{out} | Output Current | Continuous Surge | | 50 100 | mA mA |
| T_A | Operating Temperature Range | | | -40 to +85 | $^{\circ}\text{C}$ |
| T_{stg} | Storage Temperature Range | | | -65 to +150 | $^{\circ}\text{C}$ |
| θ_{JA} | Thermal Resistance (Junction to Ambient) | 0 lfp 500 lfp | 20 SOIC 20 SOIC | 90 60 | $^{\circ}\text{C}/\text{W}$ $^{\circ}\text{C}/\text{W}$ |
| θ_{JC} | Thermal Resistance (Junction to Case) | Standard Board | 20 SOIC | 30 to 35 | $^{\circ}\text{C}/\text{W}$ |
| T_{sol} | Wave Solder | Pb Pb-Free | <2 to 3 sec @ 248 $^{\circ}\text{C}$ <2 to 3 sec @ 260 $^{\circ}\text{C}$ | 265 265 | $^{\circ}\text{C}$ |

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.

MC100LEVEL37

Table 4. 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 | | 38 | 50 | | 38 | 55 | | 38 | 55 | 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 6) | | | | | | | | | | |
| | | $V_{PP} < 500\text{ mV}$ | 1.3 | 2.9 | 1.2 | 2.9 | 1.2 | 2.9 | 1.4 | 2.9 | V |
| | | $V_{PP} \geq 500\text{ mV}$ | 1.5 | 2.9 | 1.4 | 2.9 | 1.4 | 2.9 | 1.4 | 2.9 | V |
| I_{IH} | Input HIGH Current | | | 150 | | | 150 | | | 150 | μA |
| I_{IL} | Input LOW Current | \overline{CLKn} | 0.5 | | 0.5 | | | 0.5 | | | μA |
| | | \overline{CLKn} | -300 | | -300 | | | -300 | | | 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 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 V .

Table 5. LVNECL DC CHARACTERISTICS $V_{CC} = 0.0\text{ V}$; $V_{EE} = -3.3\text{ V}$ (Note 4)

| Symbol | Characteristic | -40°C | | | 25°C | | | 85°C | | | Unit |
|-------------|--|-----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|---------------|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | |
| I_{EE} | Power Supply Current | | 38 | 50 | | 38 | 55 | | 38 | 55 | mA |
| V_{OH} | Output HIGH Voltage (Note 5) | -1085 | -1005 | -880 | -1025 | -955 | -880 | -1025 | -955 | -880 | mV |
| V_{OL} | Output LOW Voltage (Note 5) | -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 6) | | | | | | | | | | |
| | | $V_{PP} < 500\text{ mV}$ | -2.0 | -0.4 | -2.1 | -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 | -1.9 | -0.4 | V |
| I_{IH} | Input HIGH Current | | | 150 | | | 150 | | | 150 | μA |
| I_{IL} | Input LOW Current | \overline{CLKn} | 0.5 | | 0.5 | | | 0.5 | | | μA |
| | | \overline{CLKn} | -300 | | -300 | | | -300 | | | 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 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. Input and output parameters vary 1:1 with V_{CC} . V_{EE} can vary $\pm 0.3\text{ V}$.
5. Outputs are terminated through a $50\ \Omega$ resistor to $V_{CC} - 2.0\text{ V}$.
6. 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 .

MC100LVEL37

Table 6. 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 7)

| 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} t _{PHL} | Propagation Delay CLK to Q/ \bar{Q} (Diff) CLK to Q/ \bar{Q} MR to Q | 640 | | 940 | 680 | 700 | 920 | 720 | | 980 | ps |
| t _{SKEW} | Within-Device Skew (Note 8) Duty Cycle Skew (Differential Configuration) (Note 9) | | | 50 50 | | | 50 50 | | | 50 50 | ps |
| t _{JITTER} | Cycle-to-Cycle Jitter | | TBD | | | TBD | | | TBD | | ps |
| V _{PP} | Input Swing (Note 10) | 150 | | 1000 | 150 | | 1000 | 150 | | 1000 | mV |
| t _r t _f | Output Rise/Fall Times Q (20% – 80%) | 280 | | 550 | 280 | | 550 | 280 | | 550 | 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.

7. V_{EE} can vary $\pm 0.3\text{ V}$.
8. Within-device skew defined as identical transitions on similar paths through a device.
9. Duty cycle skew is the difference between a TPLH and TPHL propagation delay through a device.
10. $V_{PP}(\text{min})$ is minimum input swing for which AC parameters guaranteed. The device has a DC gain of ≈ 40 .

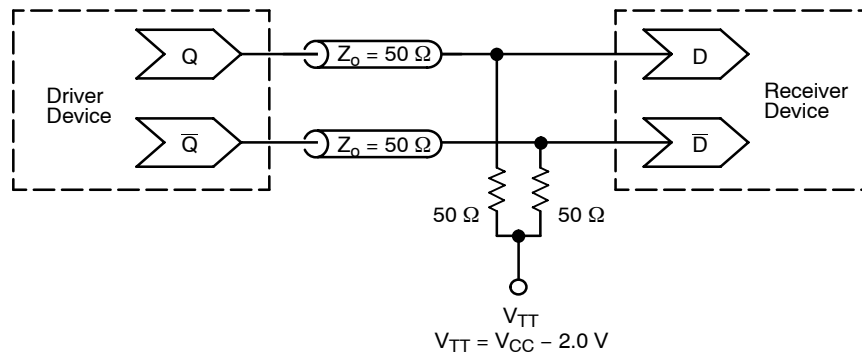


Figure 2. Typical Termination for Output Driver and Device Evaluation
(See Application Note AND8020/D – Termination of ECL Logic Devices.)

MC100LVEL37

ORDERING INFORMATION

| Device | Package | Shipping† |
|------------------|-----------------------|--------------------|
| MC100LVEL37DW | SO-20 WB | 38 Units / Rail |
| MC100LVEL37DWG | SO-20 WB (Pb-Free) | 38 Units / Rail |
| MC100LVEL37DWR2 | SO-20 WB | 1000 / Tape & Reel |
| MC100LVEL37DWR2G | 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.

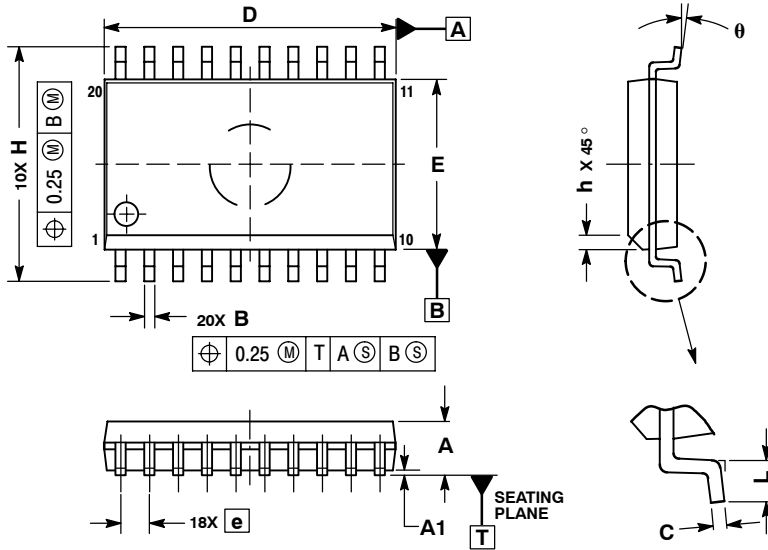
Resource Reference of Application Notes

- 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

MC100LVEL37

PACKAGE DIMENSIONS

SO-20 WB
DW SUFFIX
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.

| 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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