

# 3.3 V/5 V ECL Quad D Flip-Flop with Set, Reset, and Differential Clock

## MC10EP131, MC100EP131

### Description

The MC10/100EP131 is a Quad Master-slaved D flip-flop with common set and separate resets. The device is an expansion of the E131 with differential common clock and individual clock enables. With AC performance faster than the E131 device, the EP131 is ideal for applications requiring the fastest AC performance available.

Each flip-flop may be clocked separately by holding Common Clock ( $C_C$ ) LOW and  $\overline{C_C}$  HIGH, then using the differential Clock Enable inputs for clocking ( $C_{0-3}$ ,  $\overline{C_{0-3}}$ ).

Common clocking is achieved by holding the differential inputs  $C_{0-3}$  LOW and  $\overline{C_{0-3}}$  HIGH while using the differential Common Clock ( $C_C$ ) to clock all four flip-flops. When left floating open, any differential input will disable operation due to input pulldown resistors forcing an output default state.

Individual asynchronous resets ( $R_{0-3}$ ) and an asynchronous set (SET) are provided.

Data enters the master when both  $C_C$  and  $C_{0-3}$  are LOW, and transfers to the slave when either  $C_C$  or  $C_{0-3}$  (or both) go HIGH.

The 100 Series contains temperature compensation.

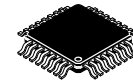
### Features

- 460 ps Typical Propagation Delay
- Maximum Frequency > 3 GHz Typical
- Differential Individual and Common Clocks
- Individual Asynchronous Resets
- Asynchronous Set
- PECL Mode Operating Range:  $V_{CC} = 3.0\text{ V to }5.5\text{ V}$  with  $V_{EE} = 0\text{ V}$
- NECL Mode Operating Range:  $V_{CC} = 0\text{ V}$  with  $V_{EE} = -3.0\text{ V to }-5.5\text{ V}$
- Open Input Default State
- Safety Clamp on Inputs
- Q Output Will Default LOW with Inputs Open or at  $V_{EE}$
- Pb-Free Packages are Available



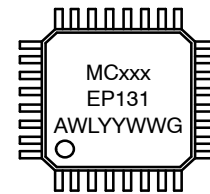
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LQFP-32  
FA SUFFIX  
CASE 561AB

### MARKING DIAGRAM\*



xxx = 10 or 100  
A = Assembly Location  
WL = Wafer Lot  
YY = Year  
WW = Work Week  
G = Pb-Free Package

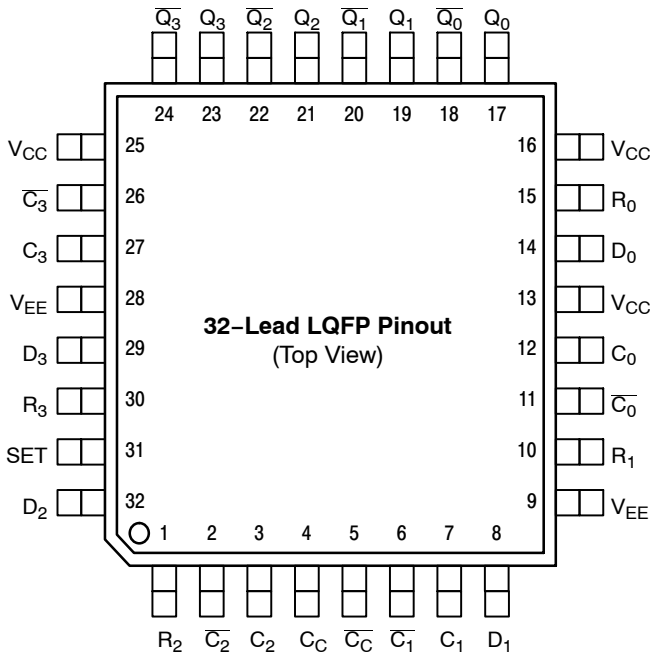
(Note: Microdot may be in either location)  
\*For additional marking information, refer to Application Note [AND8002/D](#).

### ORDERING INFORMATION

| Device          | Package              | Shipping†          |
|-----------------|----------------------|--------------------|
| MC10EP131FAG    | LQFP-32<br>(Pb-Free) | 250 Units / Tray   |
| MC100EP131FAG   | LQFP-32<br>(Pb-Free) | 250 Units / Tray   |
| MC100EP131FAR2G | LQFP-32<br>(Pb-Free) | 2000 / 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](#).

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Warning: All V<sub>CC</sub> and V<sub>EE</sub> pins must be externally connected to Power Supply to guarantee proper operation.

Figure 1. 32-Lead LQFP Pinout (Top View)

Table 1. PIN DESCRIPTION

| PIN  | FUNCTION                  |
|--|---------------------------|
| D <sub>0-3</sub> *                         | ECL Data Inputs           |
| C <sub>0-3</sub> *, $\overline{C}_{0-3}$ * | ECL Separate Clock Inputs |
| C <sub>C</sub> *, $\overline{C}_C$ *       | ECL Common Clock Inputs   |
| R <sub>0-3</sub> *                         | ECL Asynchronous Reset    |
| SET*                                       | ECL Asynchronous Set      |
| Q <sub>0-3</sub> , $\overline{Q}_{0-3}$    | ECL Data Outputs          |
| V <sub>CC</sub>                            | Positive Supply           |
| V <sub>EE</sub>                            | Negative Supply           |

\* Pins will default LOW when left open.

Table 2. TRUTH TABLE

| D | S* | R* | CLK | Q     |
|---|----|----|-----|-------|
| L | L  | L  | Z   | L     |
| H | L  | L  | Z   | H     |
| X | H  | L  | X   | H     |
| X | L  | H  | X   | L     |
| X | H  | H  | X   | Undef |

Z = LOW to HIGH Transition

\* Pins will default low when left open.

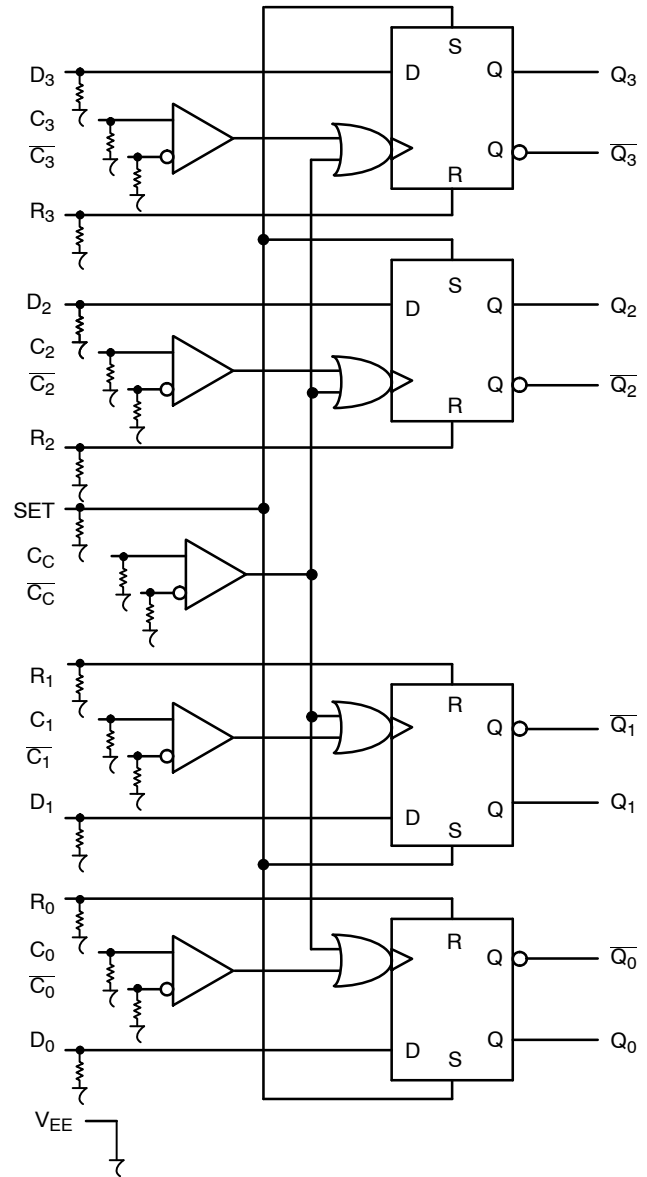


Figure 2. Logic Diagram

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**Table 3. ATTRIBUTES**

| Characteristics   | Value                       |
|---|-----------------------------|
| Internal Input Pulldown Resistor  | 75 kΩ                       |
| Internal Input Pullup Resistor  | N/A                         |
| ESD Protection<br>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)               | Pb-Free Pkg                 |
| LQFP-32   | Level 2                     |
| Flammability Rating<br>Oxygen Index: 28 to 34                               | UL 94 V-0 @ 0.125 in        |
| Transistor Count  | 935 Devices                 |
| Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test                      |                             |

1. For additional information, see Application Note [AND8003/D](#).

**Table 4. MAXIMUM RATINGS**

| Symbol           | Parameter  | Condition 1                                    | Condition 2  | Rating      | Unit         |
|------------------|--|--|--|-------------|--------------|
| V <sub>CC</sub>  | PECL Mode Power Supply                             | V <sub>EE</sub> = 0 V                          |  | 6           | V            |
| V <sub>EE</sub>  | NECL Mode Power Supply                             | V <sub>CC</sub> = 0 V                          |  | -6          | 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<br>-6     | 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                             | 32 LQFP<br>32 LQFP   | 80<br>55    | °C/W<br>°C/W |
| θ <sub>JC</sub>  | Thermal Resistance (Junction-to-Case)              | Standard Board                                 | 32 LQFP  | 12 to 17    | °C/W         |
| T <sub>sol</sub> | Wave Solder (Pb-Free)                              |  |  | 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.

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**Table 5. 10EP DC CHARACTERISTICS, PECL  $V_{CC} = 3.3\text{ V}$ ,  $V_{EE} = 0\text{ V}$  (Note 2)**

| Symbol      | Characteristic   | -40°C |      |      | 25°C |      |      | 85°C |      |      | Unit          |
|-------------|--|-------|------|------|------|------|------|------|------|------|---------------|
|             |  | Min   | Typ  | Max  | Min  | Typ  | Max  | Min  | Typ  | Max  |               |
| $I_{EE}$    | Power Supply Current   | 70    | 95   | 120  | 70   | 95   | 120  | 70   | 95   | 120  | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 3)   | 2165  | 2290 | 2415 | 2230 | 2355 | 2480 | 2290 | 2415 | 2540 | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 3)  | 1365  | 1490 | 1615 | 1430 | 1555 | 1680 | 1490 | 1615 | 1740 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)  | 2090  |      | 2415 | 2155 |      | 2480 | 2215 |      | 2540 | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)   | 1365  |      | 1690 | 1460 |      | 1755 | 1490 |      | 1815 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 4) | 2.0   |      | 3.3  | 2.0  |      | 3.3  | 2.0  |      | 3.3  | V             |
| $I_{IH}$    | Input HIGH Current   |       |      | 150  |      |      | 150  |      |      | 150  | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current  | 0.5   |      |      | 0.5  |      |      | 0.5  |      |      | $\mu\text{A}$ |

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.

2. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary +0.3 V to -2.2 V.
3. All loading with 50  $\Omega$  to  $V_{CC} - 2.0\text{ V}$ .
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 6. 10EP DC CHARACTERISTICS, PECL  $V_{CC} = 5.0\text{ V}$ ,  $V_{EE} = 0\text{ V}$  (Note 5)**

| Symbol      | Characteristic   | -40°C |      |      | 25°C |      |      | 85°C |      |      | Unit          |
|-------------|--|-------|------|------|------|------|------|------|------|------|---------------|
|             |  | Min   | Typ  | Max  | Min  | Typ  | Max  | Min  | Typ  | Max  |               |
| $I_{EE}$    | Power Supply Current   | 70    | 95   | 120  | 70   | 95   | 120  | 70   | 95   | 120  | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 6)   | 3865  | 3990 | 4115 | 3930 | 4055 | 4180 | 3990 | 4115 | 4240 | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 6)  | 3065  | 3190 | 3315 | 3130 | 3255 | 3380 | 3190 | 3315 | 3440 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)  | 3790  |      | 4115 | 3855 |      | 4180 | 3915 |      | 4240 | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)   | 3065  |      | 3390 | 3130 |      | 3455 | 3190 |      | 3515 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 7) | 2.0   |      | 5.0  | 2.0  |      | 5.0  | 2.0  |      | 5.0  | V             |
| $I_{IH}$    | Input HIGH Current   |       |      | 150  |      |      | 150  |      |      | 150  | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current  | 0.5   |      |      | 0.5  |      |      | 0.5  |      |      | $\mu\text{A}$ |

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.

5. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary +2.0 V to -0.5 V.
6. All loading with 50  $\Omega$  to  $V_{CC} - 2.0\text{ V}$ .
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.

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**Table 7. 10EP DC CHARACTERISTICS, NECL**  $V_{CC} = 0\text{ V}$ ,  $V_{EE} = -5.5\text{ V}$  to  $-3.0\text{ V}$  (Note 8)

| Symbol      | Characteristic  | -40°C        |       |       | 25°C         |       |       | 85°C         |       |       | Unit          |
|-------------|---|--------------|-------|-------|--------------|-------|-------|--------------|-------|-------|---------------|
|             |   | Min          | Typ   | Max   | Min          | Typ   | Max   | Min          | Typ   | Max   |               |
| $I_{EE}$    | Power Supply Current  | 70           | 95    | 120   | 70           | 95    | 120   | 70           | 95    | 120   | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 9)  | -1135        | -1010 | -885  | -1070        | -945  | -820  | -1010        | -885  | -760  | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 9)   | -1935        | -1810 | -1685 | -1870        | -1745 | -1620 | -1810        | -1685 | -1560 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)   | -1210        |       | -885  | -1145        |       | -820  | -1085        |       | -760  | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)  | -1935        |       | -1610 | -1870        |       | -1545 | -1810        |       | -1485 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 10) | $V_{EE}+2.0$ |       | 0.0   | $V_{EE}+2.0$ |       | 0.0   | $V_{EE}+2.0$ |       | 0.0   | V             |
| $I_{IH}$    | Input HIGH Current  |              |       | 150   |              |       | 150   |              |       | 150   | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current   | 0.5          |       |       | 0.5          |       |       | 0.5          |       |       | $\mu\text{A}$ |

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 lpm.

8. Input and output parameters vary 1:1 with  $V_{CC}$ .

9. All loading with  $50\ \Omega$  to  $V_{CC} - 2.0\text{ V}$ .

10.  $V_{IHCMR}$  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 8. 100EP DC CHARACTERISTICS, PECL**  $V_{CC} = 3.3\text{ V}$ ,  $V_{EE} = 0\text{ V}$  (Note 11)

| Symbol      | Characteristic  | -40°C |      |      | 25°C |      |      | 85°C |      |      | Unit          |
|-------------|---|-------|------|------|------|------|------|------|------|------|---------------|
|             |   | Min   | Typ  | Max  | Min  | Typ  | Max  | Min  | Typ  | Max  |               |
| $I_{EE}$    | Power Supply Current  | 70    | 95   | 120  | 75   | 97   | 120  | 80   | 105  | 130  | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 12)   | 2155  | 2280 | 2405 | 2155 | 2280 | 2405 | 2155 | 2280 | 2405 | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 12)  | 1355  | 1480 | 1605 | 1355 | 1480 | 1605 | 1355 | 1480 | 1605 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)   | 2075  |      | 2420 | 2075 |      | 2420 | 2075 |      | 2420 | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)  | 1355  |      | 1675 | 1355 |      | 1675 | 1355 |      | 1675 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 13) | 2.0   |      | 3.3  | 2.0  |      | 3.3  | 2.0  |      | 3.3  | V             |
| $I_{IH}$    | Input HIGH Current  |       |      | 150  |      |      | 150  |      |      | 150  | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current   | 0.5   |      |      | 0.5  |      |      | 0.5  |      |      | $\mu\text{A}$ |

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 lpm.

11. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary  $+0.3\text{ V}$  to  $-2.2\text{ V}$ .

12. All loading with  $50\ \Omega$  to  $V_{CC} - 2.0\text{ V}$ .

13.  $V_{IHCMR}$  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.

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**Table 9. 100EP DC CHARACTERISTICS, PECL**  $V_{CC} = 5.0\text{ V}$ ,  $V_{EE} = 0\text{ V}$  (Note 14)

| Symbol      | Characteristic  | -40°C |      |      | 25°C |      |      | 85°C |      |      | Unit          |
|-------------|---|-------|------|------|------|------|------|------|------|------|---------------|
|             |   | Min   | Typ  | Max  | Min  | Typ  | Max  | Min  | Typ  | Max  |               |
| $I_{EE}$    | Power Supply Current  | 70    | 95   | 120  | 75   | 97   | 120  | 80   | 105  | 130  | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 15)   | 3855  | 3980 | 4105 | 3855 | 3980 | 4105 | 3855 | 3980 | 4105 | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 15)  | 3055  | 3180 | 3305 | 3055 | 3180 | 3305 | 3055 | 3180 | 3305 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)   | 3775  |      | 4120 | 3775 |      | 4120 | 3775 |      | 4120 | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)  | 3055  |      | 3375 | 3055 |      | 3375 | 3055 |      | 3375 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 16) | 2.0   |      | 5.0  | 2.0  |      | 5.0  | 2.0  |      | 5.0  | V             |
| $I_{IH}$    | Input HIGH Current  |       |      | 150  |      |      | 150  |      |      | 150  | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current   | 0.5   |      |      | 0.5  |      |      | 0.5  |      |      | $\mu\text{A}$ |

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.

14. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary +2.0 V to -0.5 V.

15. All loading with 50  $\Omega$  to  $V_{CC} - 2.0\text{ V}$ .

16.  $V_{IHCMR}$  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 10. 100EP DC CHARACTERISTICS, NECL**  $V_{CC} = 0\text{ V}$ ,  $V_{EE} = -5.5\text{ V}$  to  $-3.0\text{ V}$  (Note 17)

| Symbol      | Characteristic  | -40°C        |       |       | 25°C         |       |       | 85°C         |       |       | Unit          |
|-------------|---|--------------|-------|-------|--------------|-------|-------|--------------|-------|-------|---------------|
|             |   | Min          | Typ   | Max   | Min          | Typ   | Max   | Min          | Typ   | Max   |               |
| $I_{EE}$    | Power Supply Current  | 70           | 95    | 120   | 75           | 97    | 120   | 80           | 105   | 130   | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 18)   | -1145        | -1020 | -895  | -1145        | -1020 | -895  | -1145        | -1020 | -895  | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 18)  | -1945        | -1820 | -1695 | -1945        | -1820 | -1695 | -1945        | -1820 | -1695 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)   | -1225        |       | -880  | -1225        |       | -880  | -1225        |       | -880  | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)  | -1945        |       | -1625 | -1945        |       | -1625 | -1945        |       | -1625 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 19) | $V_{EE}+2.0$ |       | 0.0   | $V_{EE}+2.0$ |       | 0.0   | $V_{EE}+2.0$ |       | 0.0   | V             |
| $I_{IH}$    | Input HIGH Current  |              |       | 150   |              |       | 150   |              |       | 150   | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current   | 0.5          |       |       | 0.5          |       |       | 0.5          |       |       | $\mu\text{A}$ |

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.

17. Input and output parameters vary 1:1 with  $V_{CC}$ .

18. All loading with 50  $\Omega$  to  $V_{CC} - 2.0\text{ V}$ .

19.  $V_{IHCMR}$  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.

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**Table 11. AC CHARACTERISTICS**  $V_{CC} = 0\text{ V}$ ;  $V_{EE} = -3.0\text{ V}$  to  $-5.5\text{ V}$  or  $V_{CC} = 3.0\text{ V}$  to  $5.5\text{ V}$ ;  $V_{EE} = 0\text{ V}$  (Note 20)

| Symbol                   | Characteristic   | -40°C                    |                          |                          | 25°C                     |                          |                          | 85°C                     |                          |                          | Unit |
|--------------------------|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|------|
|                          |  | Min                      | Typ                      | Max                      | Min                      | Typ                      | Max                      | Min                      | Typ                      | Max                      |      |
| $f_{\max}$               | Maximum Frequency<br>(See Figure 3. Frequency vs. $V_{OUTpp}$<br>and JITTER)     |                          | > 3                      |                          |                          | > 3                      |                          |                          | > 3                      |                          | GHz  |
| $t_{PLH}$ ,<br>$t_{PHL}$ | Propagation Delay to<br>Output Differential $C_C$<br>$R_{0-3}$<br>SET            | 320<br>320<br>320<br>300 | 450<br>450<br>430<br>430 | 520<br>520<br>520<br>550 | 380<br>400<br>380<br>380 | 460<br>500<br>480<br>460 | 580<br>600<br>580<br>580 | 450<br>450<br>450<br>400 | 560<br>560<br>560<br>530 | 650<br>650<br>700<br>650 | ps   |
| $t_{RR}$                 | Set/R0-3 Recovery  | 290                      | 210                      |                          | 290                      | 210                      |                          | 350                      | 280                      |                          | ps   |
| $t_S$<br>$t_H$           | Setup Time<br>Hold Time  | 120                      | 80                       |                          | 120                      | 80                       |                          | 120                      | 80                       |                          | ps   |
| $t_{PW}$                 | Minimum Pulse Rate<br>$R_{0-3}$  | 550                      | 400                      |                          | 550                      | 400                      |                          | 550                      | 400                      |                          |      |
| $t_{JITTER}$             | Cycle-to-Cycle Jitter<br>(See Figure 3. Frequency vs. $V_{OUTpp}$<br>and JITTER) |                          | 0.2                      | < 1                      |                          | 0.2                      | < 1                      |                          | 0.2                      | < 1                      | ps   |
| $t_r$<br>$t_f$           | Output Rise/Fall Times<br>(20% – 80%)  | 110                      | 180                      | 250                      | 125                      | 200                      | 275                      | 150                      | 230                      | 300                      | 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.

20. Measured using a 750 mV source, 50% duty cycle clock source. All loading with  $50\ \Omega$  to  $V_{CC} - 2.0\text{ V}$ .

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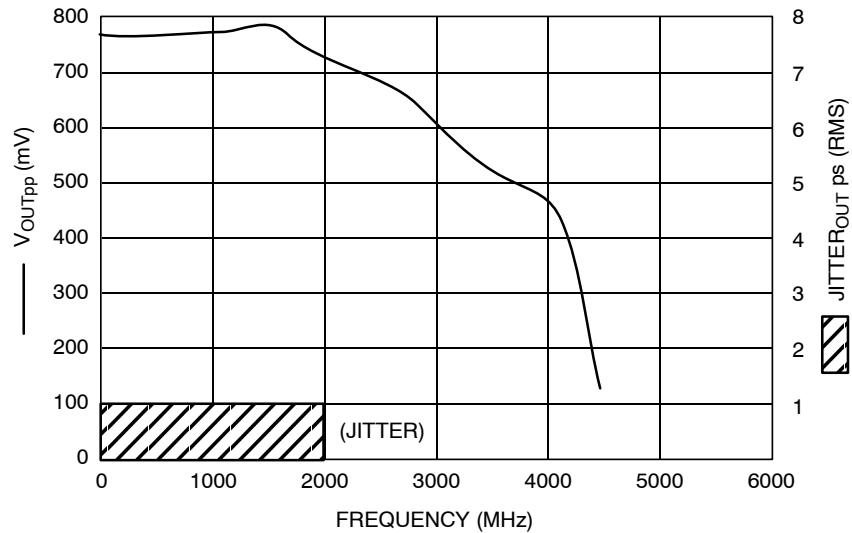


Figure 3. Frequency vs.  $V_{OUTpp}$  and JITTER

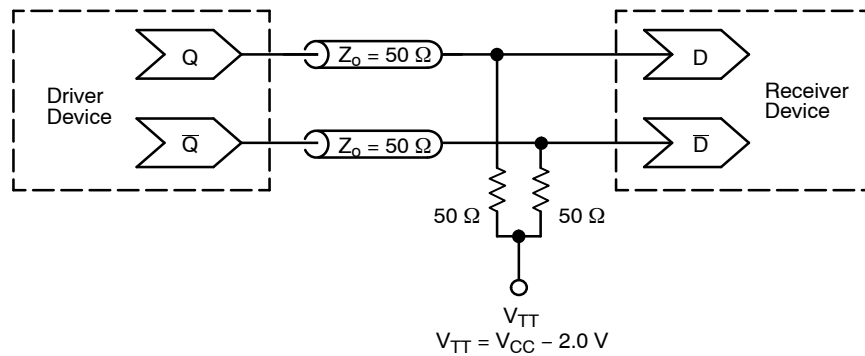


Figure 4. Typical Termination for Output Driver and Device Evaluation  
(See Application Note [AND8020/D](#) – Termination of ECL Logic Devices.)

### 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



**MECHANICAL CASE OUTLINE**  
**PACKAGE DIMENSIONS**

ON Semiconductor®



**LQFP-32, 7x7**  
**CASE 561AB-01**  
**ISSUE O**

DATE 19 JUN 2008



| SYMBOL         | MIN      | NOM  | MAX  |
|----------------|----------|------|------|
| A              | —        | —    | 1.60 |
| A1             | 0.05     | —    | 0.15 |
| A2             | 1.35     | 1.40 | 1.45 |
| B              | 0.30     | 0.37 | 0.45 |
| B1             | 0.30     | 0.35 | 0.40 |
| C              | 0.09     | —    | 0.20 |
| C1             | 0.09     | —    | 0.16 |
| D              | 9.00 BSC |      |      |
| D1             | 7.00 BSC |      |      |
| E              | 9.00 BSC |      |      |
| E1             | 7.00 BSC |      |      |
| e              | 0.80 BSC |      |      |
| L              | 0.45     | 0.60 | 0.75 |
| L1             | 1.00     |      |      |
| R1             | 0.08     | —    | 0.20 |
| $\alpha^\circ$ | 11       | —    | 13   |
| $\beta^\circ$  | 0        | —    | 7    |
| $\gamma^\circ$ | 0        | —    | —    |



ALL DIMENSIONS IN MM

|                         |                          |  |
|-------------------------|--------------------------|--|
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