MC10EP31, MC100EP31

3.3 V / 5 V ECL D Flip-Flop with Set and Reset

Description
The MC10/100EP31 is a D flip-flop with set and reset. The device is pin and functionally equivalent to the EL31 and LVEL31 devices. With AC performance much faster than the EL31 and LVEL31 devices, the EP31 is ideal for applications requiring the fastest AC performance available. Both set and reset inputs are asynchronous, level triggered signals. Data enters the master portion of the flip-flop when CLK is low and is transferred to the slave, and thus the outputs, upon a positive transition of the CLK.
The 100 Series contains temperature compensation.

Features
- 340 ps Typical Propagation Delay
- Maximum Frequency = > 3 GHz Typical
- 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
- Q Output Will Default LOW with Inputs Open or at \( V_{EE} \)
- These Devices are Pb-Free, Halogen Free and are RoHS Compliant

MARKING DIAGRAMS*

SOIC–8 NB
D SUFFIX
CASE 751–07

TSSOP–8
DT SUFFIX
CASE 948R–02

DFN8
MN SUFFIX
CASE 506AA

H = MC10
K = MC100
5O = MC10
3J = MC100
M = Date Code

A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week

(Note: Microdot may be in either location)
*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 8 of this data sheet.
Figure 1. 8-Lead Pinout (Top View) and Logic Diagram

Table 1. PIN DESCRIPTION

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
</tr>
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<tbody>
<tr>
<td>CLK*</td>
<td>ECL Clock Inputs</td>
</tr>
<tr>
<td>Reset*</td>
<td>ECL Asynchronous Reset</td>
</tr>
<tr>
<td>Set*</td>
<td>ECL Asynchronous Set</td>
</tr>
<tr>
<td>D*</td>
<td>ECL Data Input</td>
</tr>
<tr>
<td>Q, Q</td>
<td>ECL Data Outputs</td>
</tr>
<tr>
<td>VCC</td>
<td>Positive Supply</td>
</tr>
<tr>
<td>VEE</td>
<td>Negative Supply</td>
</tr>
<tr>
<td>EP (DFN8 only)</td>
<td>Thermal exposed pad must be connected to a sufficient thermal conduit. Electrically connect to the most negative supply (GND) or leave unconnected, floating open.</td>
</tr>
</tbody>
</table>

*Pins will default LOW when left open.

Table 2. TRUTH TABLE

<table>
<thead>
<tr>
<th>D</th>
<th>SET</th>
<th>RESET</th>
<th>CLK</th>
<th>Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>L</td>
<td>L</td>
<td>Z</td>
<td>L</td>
</tr>
<tr>
<td>H</td>
<td>L</td>
<td>L</td>
<td>Z</td>
<td>H</td>
</tr>
<tr>
<td>X</td>
<td>H</td>
<td>L</td>
<td>X</td>
<td>H</td>
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<td>L</td>
<td>H</td>
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<td>L</td>
</tr>
<tr>
<td>X</td>
<td>H</td>
<td>H</td>
<td>X</td>
<td>UNDEF</td>
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</tbody>
</table>

Z = LOW to HIGH Transition

Table 3. ATTRIBUTES

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Input Pulldown Resistor</td>
<td>75 kΩ</td>
</tr>
<tr>
<td>Internal Input Pullup Resistor</td>
<td>N/A</td>
</tr>
<tr>
<td>ESD Protection</td>
<td></td>
</tr>
<tr>
<td>Human Body Model</td>
<td>&gt; 4 kV</td>
</tr>
<tr>
<td>Machine Model</td>
<td>&gt; 200 V</td>
</tr>
<tr>
<td>Charged Device Model</td>
<td>&gt; 2 kV</td>
</tr>
<tr>
<td>Moisture Sensitivity, Indefinite Time Out of Drypack (Note 1)</td>
<td>Pb-Free Pkg</td>
</tr>
<tr>
<td>SOIC–8 NB</td>
<td>Level 1</td>
</tr>
<tr>
<td>TSSOP–8</td>
<td>Level 3</td>
</tr>
<tr>
<td>DFN8</td>
<td>Level 1</td>
</tr>
<tr>
<td>Flammability Rating</td>
<td>Oxygen Index: 28 to 34</td>
</tr>
<tr>
<td></td>
<td>UL 94 V–0 @ 0.125 in</td>
</tr>
<tr>
<td>Transistor Count</td>
<td>75 Devices</td>
</tr>
<tr>
<td>Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test</td>
<td></td>
</tr>
</tbody>
</table>

1. For additional information, see Application Note [AND8003/D](https://www.onsemi.com).
Table 4. MAXIMUM RATINGS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Condition 1</th>
<th>Condition 2</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCC</td>
<td>PECL Mode Power Supply</td>
<td>VEE = 0 V</td>
<td></td>
<td>6</td>
<td>V</td>
</tr>
<tr>
<td>VEE</td>
<td>NECL Mode Power Supply</td>
<td>VCC = 0 V</td>
<td></td>
<td>–6</td>
<td>V</td>
</tr>
<tr>
<td>Vt</td>
<td>PECL Mode Input Voltage</td>
<td>VEE = 0 V</td>
<td>VCC ≥ VEE</td>
<td>6</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>NECL Mode Input Voltage</td>
<td>VEE ≥ VCC</td>
<td></td>
<td>–6</td>
<td>V</td>
</tr>
<tr>
<td>Iout</td>
<td>Output Current</td>
<td>Continuous</td>
<td>Surge</td>
<td>50</td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
<td>mA</td>
</tr>
<tr>
<td>TA</td>
<td>Operating Temperature Range</td>
<td></td>
<td></td>
<td>–40 to +85</td>
<td>°C</td>
</tr>
<tr>
<td>Tstg</td>
<td>Storage Temperature Range</td>
<td></td>
<td></td>
<td>–65 to +150</td>
<td>°C</td>
</tr>
<tr>
<td>θJA</td>
<td>Thermal Resistance (Junction-to-Ambient)</td>
<td>0 lfpm</td>
<td></td>
<td>190</td>
<td>°C/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500 lfpm</td>
<td></td>
<td>130</td>
<td>°C/W</td>
</tr>
<tr>
<td>θJC</td>
<td>Thermal Resistance (Junction-to-Case)</td>
<td>Standard Board</td>
<td></td>
<td>41 to 44</td>
<td>°C/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SOIC–8 NB</td>
<td></td>
<td>41</td>
<td>°C/W</td>
</tr>
<tr>
<td>θJA</td>
<td>Thermal Resistance (Junction-to-Ambient)</td>
<td>0 lfpm</td>
<td></td>
<td>185</td>
<td>°C/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500 lfpm</td>
<td></td>
<td>140</td>
<td>°C/W</td>
</tr>
<tr>
<td>θJC</td>
<td>Thermal Resistance (Junction-to-Case)</td>
<td>Standard Board</td>
<td></td>
<td>41 to 44</td>
<td>°C/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TSSOP–8</td>
<td></td>
<td>41</td>
<td>°C/W</td>
</tr>
<tr>
<td>θJA</td>
<td>Thermal Resistance (Junction-to-Ambient)</td>
<td>0 lfpm</td>
<td></td>
<td>129</td>
<td>°C/W</td>
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<tr>
<td></td>
<td></td>
<td>500 lfpm</td>
<td></td>
<td>84</td>
<td>°C/W</td>
</tr>
<tr>
<td>θJC</td>
<td>Thermal Resistance (Junction-to-Case)</td>
<td>(Note 2)</td>
<td></td>
<td>265</td>
<td>°C/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DFN8</td>
<td></td>
<td>35 to 40</td>
<td>°C/W</td>
</tr>
</tbody>
</table>

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.

2. JEDEC standard multilayer board – 2S2P (2 signal, 2 power)
### Table 5. 10EP DC CHARACTERISTICS, PECL (V<sub>CC</sub> = 3.3 V, V<sub>EE</sub> = 0 V (Note 1))

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Characteristic</th>
<th>40°C</th>
<th>25°C</th>
<th>85°C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Min</td>
<td>Typ</td>
<td>Max</td>
</tr>
<tr>
<td>I&lt;sub&gt;EE&lt;/sub&gt;</td>
<td>Power Supply Current</td>
<td>26</td>
<td>34</td>
<td>44</td>
</tr>
<tr>
<td>V&lt;sub&gt;OH&lt;/sub&gt;</td>
<td>Output HIGH Voltage (Note 2)</td>
<td>2165</td>
<td>2290</td>
<td>2415</td>
</tr>
<tr>
<td>V&lt;sub&gt;OL&lt;/sub&gt;</td>
<td>Output LOW Voltage (Note 2)</td>
<td>1365</td>
<td>1490</td>
<td>1615</td>
</tr>
<tr>
<td>V&lt;sub&gt;IH&lt;/sub&gt;</td>
<td>Input HIGH Voltage (Single-Ended)</td>
<td>2090</td>
<td>2415</td>
<td>2155</td>
</tr>
<tr>
<td>V&lt;sub&gt;IL&lt;/sub&gt;</td>
<td>Input LOW Voltage (Single-Ended)</td>
<td>1365</td>
<td>1690</td>
<td>1925</td>
</tr>
<tr>
<td>I&lt;sub&gt;IH&lt;/sub&gt;</td>
<td>Input HIGH Current</td>
<td>150</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>I&lt;sub&gt;IL&lt;/sub&gt;</td>
<td>Input LOW Current</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
</tbody>
</table>

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<sub>CC</sub>. V<sub>EE</sub> can vary +0.3 V to −2.2 V.
2. All loading with 50 Ω to V<sub>CC</sub> − 2.0 V.

### Table 6. 10EP DC CHARACTERISTICS, PECL (V<sub>CC</sub> = 5.0 V, V<sub>EE</sub> = 0 V (Note 1))

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Characteristic</th>
<th>40°C</th>
<th>25°C</th>
<th>85°C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Min</td>
<td>Typ</td>
<td>Max</td>
</tr>
<tr>
<td>I&lt;sub&gt;EE&lt;/sub&gt;</td>
<td>Power Supply Current</td>
<td>26</td>
<td>34</td>
<td>44</td>
</tr>
<tr>
<td>V&lt;sub&gt;OH&lt;/sub&gt;</td>
<td>Output HIGH Voltage (Note 2)</td>
<td>3865</td>
<td>3990</td>
<td>4115</td>
</tr>
<tr>
<td>V&lt;sub&gt;OL&lt;/sub&gt;</td>
<td>Output LOW Voltage (Note 2)</td>
<td>3065</td>
<td>3190</td>
<td>3315</td>
</tr>
<tr>
<td>V&lt;sub&gt;IH&lt;/sub&gt;</td>
<td>Input HIGH Voltage (Single-Ended)</td>
<td>3790</td>
<td>4115</td>
<td>3855</td>
</tr>
<tr>
<td>V&lt;sub&gt;IL&lt;/sub&gt;</td>
<td>Input LOW Voltage (Single-Ended)</td>
<td>3065</td>
<td>3390</td>
<td>3625</td>
</tr>
<tr>
<td>I&lt;sub&gt;IH&lt;/sub&gt;</td>
<td>Input HIGH Current</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>I&lt;sub&gt;IL&lt;/sub&gt;</td>
<td>Input LOW Current</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
</tbody>
</table>

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<sub>CC</sub>. V<sub>EE</sub> can vary +2.0 V to −0.5 V.
2. All loading with 50 Ω to V<sub>CC</sub> − 2.0 V.

### Table 7. 10EP DC CHARACTERISTICS, NECL (V<sub>CC</sub> = 0 V; V<sub>EE</sub> = −5.5 V to −3.0 V (Note 1))

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Characteristic</th>
<th>−40°C</th>
<th>25°C</th>
<th>85°C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Min</td>
<td>Typ</td>
<td>Max</td>
</tr>
<tr>
<td>I&lt;sub&gt;EE&lt;/sub&gt;</td>
<td>Power Supply Current</td>
<td>26</td>
<td>34</td>
<td>44</td>
</tr>
<tr>
<td>V&lt;sub&gt;OH&lt;/sub&gt;</td>
<td>Output HIGH Voltage (Note 2)</td>
<td>−1135</td>
<td>−1010</td>
<td>−885</td>
</tr>
<tr>
<td>V&lt;sub&gt;OL&lt;/sub&gt;</td>
<td>Output LOW Voltage (Note 2)</td>
<td>−1935</td>
<td>−1810</td>
<td>−1685</td>
</tr>
<tr>
<td>V&lt;sub&gt;IH&lt;/sub&gt;</td>
<td>Input HIGH Voltage (Single-Ended)</td>
<td>−1210</td>
<td>−1085</td>
<td>−960</td>
</tr>
<tr>
<td>V&lt;sub&gt;IL&lt;/sub&gt;</td>
<td>Input LOW Voltage (Single-Ended)</td>
<td>−1935</td>
<td>−1610</td>
<td>−1385</td>
</tr>
<tr>
<td>I&lt;sub&gt;IH&lt;/sub&gt;</td>
<td>Input HIGH Current</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>I&lt;sub&gt;IL&lt;/sub&gt;</td>
<td>Input LOW Current</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
</tbody>
</table>

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<sub>CC</sub>.
2. All loading with 50 Ω to V<sub>CC</sub> − 2.0 V.
Table 8. 100EP DC CHARACTERISTICS, PECL ($V_{CC} = 3.3\, \text{V}, V_{EE} = 0\, \text{V}$ (Note 1))

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Characteristic</th>
<th>$-40^\circ\text{C}$</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>$25^\circ\text{C}$</th>
<th></th>
<th></th>
<th></th>
<th>$85^\circ\text{C}$</th>
<th></th>
<th></th>
<th></th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Min</td>
<td>Typ</td>
<td>Max</td>
<td>Min</td>
<td>Typ</td>
<td>Max</td>
<td>Min</td>
<td>Typ</td>
<td>Max</td>
<td>Min</td>
<td>Typ</td>
<td>Max</td>
<td>Min</td>
<td>Typ</td>
<td>Max</td>
<td>mA</td>
</tr>
<tr>
<td>$I_{EE}$</td>
<td>Power Supply Current</td>
<td>26</td>
<td>34</td>
<td>44</td>
<td>26</td>
<td>35</td>
<td>45</td>
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<td>47</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V_{OH}$</td>
<td>Output HIGH Voltage (Note 2)</td>
<td>2155</td>
<td>2280</td>
<td>2405</td>
<td>2155</td>
<td>2280</td>
<td>2405</td>
<td>2155</td>
<td>2280</td>
<td>2405</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V_{OL}$</td>
<td>Output LOW Voltage (Note 2)</td>
<td>1355</td>
<td>1480</td>
<td>1605</td>
<td>1355</td>
<td>1480</td>
<td>1605</td>
<td>1355</td>
<td>1480</td>
<td>1605</td>
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<tr>
<td>$I_{HI}$</td>
<td>Input HIGH Voltage (Single-Ended)</td>
<td>2075</td>
<td>2420</td>
<td></td>
<td>2075</td>
<td>2420</td>
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<td>2075</td>
<td>2420</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_{IL}$</td>
<td>Input LOW Voltage (Single-Ended)</td>
<td>1355</td>
<td>1675</td>
<td></td>
<td>1355</td>
<td>1675</td>
<td></td>
<td>1355</td>
<td>1675</td>
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<td></td>
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<tr>
<td>$I_{HI}$</td>
<td>Input HIGH Current</td>
<td>150</td>
<td></td>
<td></td>
<td>150</td>
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<td>150</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>$I_{IL}$</td>
<td>Input LOW Current</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

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. 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 $+0.3\, \text{V}$ to $-2.2\, \text{V}$.
2. All loading with $50\, \text{Ω}$ to $V_{CC} - 2.0\, \text{V}$.

Table 9. 100EP DC CHARACTERISTICS, PECL ($V_{CC} = 5.0\, \text{V}, V_{EE} = 0\, \text{V}$ (Note 1))

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Characteristic</th>
<th>$-40^\circ\text{C}$</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>$25^\circ\text{C}$</th>
<th></th>
<th></th>
<th></th>
<th>$85^\circ\text{C}$</th>
<th></th>
<th></th>
<th></th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Min</td>
<td>Typ</td>
<td>Max</td>
<td>Min</td>
<td>Typ</td>
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<td>Min</td>
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<td>44</td>
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<td>$V_{OH}$</td>
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<td>3855</td>
<td>3980</td>
<td>4105</td>
<td>3855</td>
<td>3980</td>
<td>4105</td>
<td>3855</td>
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<td>3180</td>
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<td>3055</td>
<td>3180</td>
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<td>$V_{HI}$</td>
<td>Input HIGH Voltage (Single-Ended)</td>
<td>3775</td>
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<td>3775</td>
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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. 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 $+2.0\, \text{V}$ to $-0.5\, \text{V}$.
2. All loading with $50\, \text{Ω}$ to $V_{CC} - 2.0\, \text{V}$.

Table 10. 100EP DC CHARACTERISTICS, NECL ($V_{CC} = 0\, \text{V}, V_{EE} = -5.5\, \text{V}$ to $-3.0\, \text{V}$ (Note 1))

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Characteristic</th>
<th>$-40^\circ\text{C}$</th>
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<th></th>
<th></th>
<th>$25^\circ\text{C}$</th>
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<th>$85^\circ\text{C}$</th>
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<td>Max</td>
<td>Min</td>
<td>Typ</td>
<td>Max</td>
<td>mA</td>
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<tr>
<td>$I_{EE}$</td>
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<td>34</td>
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<tr>
<td>$V_{OH}$</td>
<td>Output HIGH Voltage (Note 2)</td>
<td>-1145</td>
<td>-1020</td>
<td>-895</td>
<td>-1145</td>
<td>-1020</td>
<td>-895</td>
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<td>-1820</td>
<td>-1695</td>
<td>-1945</td>
<td>-1820</td>
<td>-1695</td>
<td>-1945</td>
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<td>$V_{HI}$</td>
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<td>-880</td>
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<td>-1225</td>
<td>-880</td>
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<td>-1225</td>
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<td>-1625</td>
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<td>-1945</td>
<td>-1625</td>
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<td>-1945</td>
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<td>$I_{HI}$</td>
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</table>

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. 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 $V_{CC}$.
2. All loading with $50\, \text{Ω}$ to $V_{CC} - 2.0\, \text{V}$.

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Table 11. AC CHARACTERISTICS (V\text{CC} = 0 \text{ V}; V\text{EE} = −3.0 \text{ V} to −5.5 \text{ V or } V\text{CC} = 3.0 \text{ V} to 5.5 \text{ V}; V\text{EE} = 0 \text{ V} (Note 1))

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Characteristic</th>
<th>−40°C</th>
<th>25°C</th>
<th>85°C</th>
<th>Unit</th>
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<tbody>
<tr>
<td></td>
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<td>Min</td>
<td>Typ</td>
<td>Max</td>
<td>Min</td>
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<tr>
<td>f\text{max}</td>
<td>Maximum Frequency (Figure 2)</td>
<td>&gt; 3</td>
<td>&gt; 3</td>
<td>&gt; 3</td>
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<tr>
<td>t\text{PLH}, t\text{PHL}</td>
<td>Propagation Delay to Output Differential CLK to Q, Q̅</td>
<td>250</td>
<td>330</td>
<td>400</td>
<td>270</td>
</tr>
<tr>
<td></td>
<td>S, R to Q, Q̅</td>
<td>300</td>
<td>380</td>
<td>450</td>
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<tr>
<td>t\text{RR}</td>
<td>Set/Reset Recovery</td>
<td>225</td>
<td>225</td>
<td>225</td>
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<tr>
<td>t\text{S}, t\text{H}</td>
<td>Setup Time Hold Time</td>
<td>100</td>
<td>150</td>
<td>250</td>
<td>100</td>
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<tr>
<td>t\text{PW}</td>
<td>Minimum Pulse width SET, RESET</td>
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<td>450</td>
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<td>t\text{JITTER}</td>
<td>Cycle-to-Cycle Jitter (Figure 2)</td>
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<td>&lt; 1</td>
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<td>&lt; 1</td>
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<td>t_r, t_f</td>
<td>Output Rise/Fall Times Q, Q̅ (20% − 80%)</td>
<td>50</td>
<td>120</td>
<td>180</td>
<td>60</td>
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</tbody>
</table>

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.

1. Measured using a 750 mV source, 50% duty cycle clock source. All loading with 50 Ω to V\text{CC}−2.0 V.

Figure 2. F\text{max}/Jitter
Figure 3. Typical Termination for Output Driver and Device Evaluation (See Application Note AND8020/D – Termination of ECL Logic Devices)
## ORDERING INFORMATION

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<tr>
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<th>Package</th>
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<td>SOIC−8 NB (Pb-Free)</td>
<td>98 Units / Rail</td>
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<tr>
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<td>SOIC−8 NB (Pb-Free)</td>
<td>2500 / Tape &amp; Reel</td>
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<td>MC10EP31DTG</td>
<td>TSSOP−8 (Pb-Free)</td>
<td>100 Units / Rail</td>
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<tr>
<td>MC10EP31DTR2G</td>
<td>TSSOP−8 (Pb-Free)</td>
<td>2500 / Tape &amp; Reel</td>
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†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
MC10EP31, MC100EP31

PACKAGE DIMENSIONS

SOIC-8 NB
D SUFFIX
CASE 751–07
ISSUE AK

NOTES:
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

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*SOLDERING FOOTPRINT*

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.*
MC10EP31, MC100EP31

PACKAGE DIMENSIONS

TSSOP-8
DT SUFFIX
CASE 948R-02
ISSUE A

NOTES:
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH. PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
6. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

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LEFT SIDE