NB2304A

Zero Delay Buffer, 3.3 V, Quad Output

The NB2304A is a versatile, 3.3 V zero delay buffer designed to distribute high-speed clocks in PC, workstation, datacom, telecom and other high-performance applications. It is available in an 8 pin package. The part has an on-chip PLL which locks to an input clock presented on the REF pin. The PLL feedback is required to be driven to FBK pin, and can be obtained from one of the outputs. The input-to-output propagation delay is guaranteed to be less than 250 ps, and the output-to-output skew is guaranteed to be less than 200 ps.

The NB2304A has two Banks of two outputs each. Multiple NB2304A devices can accept the same input clock and distribute it. In this case, the skew between the outputs of the two devices is guaranteed to be less than 500 ps.

The NB2304A is available in two different configurations (Refer to NB2304A Configurations Table). The NB2304AI1 is the base part, where the output frequencies equal the reference if there is no counter in the feedback path. The NB2304AI1H is the high-drive version of the -1 and the rise and fall times on this device are much faster.

The NB2304AI2 allows the user to obtain REF, 1/2 X and 2X frequencies on each output Bank. The exact configuration and output frequencies depend on which output drives the feedback pin.

Features
- Zero Input - Output Propagation Delay, Adjustable by Capacitive Load on FBK Input
- Multiple Configurations - Refer to NB2304A Configurations Table
- Input Frequency Range: 15 MHz to 133 MHz
- Multiple Low-Skew Outputs
- Output-Output Skew < 200 ps
- Device-Device Skew < 500 ps
- Two Banks of Four Outputs
- Less than 200 ps Cycle-to-Cycle Jitter (-1, -1H, -5H)
- Available in Space Saving, 8 pin 150 mil SOIC Package
- 3.3 V Operation
- Advanced 0.35 µ CMOS Technology
- Guaranteed Across Commercial and Industrial Temperature Ranges
- These are Pb-Free Devices
Table 1. CONFIGURATIONS

<table>
<thead>
<tr>
<th>Device</th>
<th>Feedback From</th>
<th>Bank A Frequency</th>
<th>Bank B Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>NB2304AI1</td>
<td>Bank A or Bank B</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>NB2304AI1H</td>
<td>Bank A or Bank B</td>
<td>Reference</td>
<td>Reference</td>
</tr>
<tr>
<td>NB2304AI2</td>
<td>Bank A</td>
<td>Reference</td>
<td>Reference ÷ 2</td>
</tr>
<tr>
<td>NB2304AI2</td>
<td>Bank B</td>
<td>2 X Reference</td>
<td>Reference</td>
</tr>
</tbody>
</table>

Table 2. PIN DESCRIPTION

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Pin Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>REF (Note 1)</td>
<td>Input reference frequency, 5 V tolerant input.</td>
</tr>
<tr>
<td>2</td>
<td>CLKA1 (Note 2)</td>
<td>Buffered clock output, Bank A.</td>
</tr>
<tr>
<td>3</td>
<td>CLKA2 (Note 2)</td>
<td>Buffered clock output, Bank A.</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>Ground.</td>
</tr>
<tr>
<td>5</td>
<td>CLKB1 (Note 2)</td>
<td>Buffered clock output, Bank B.</td>
</tr>
<tr>
<td>6</td>
<td>CLKB2 (Note 2)</td>
<td>Buffered clock output, Bank B.</td>
</tr>
<tr>
<td>7</td>
<td>VDD</td>
<td>3.3 V supply.</td>
</tr>
<tr>
<td>8</td>
<td>FBK</td>
<td>PLL feedback input.</td>
</tr>
</tbody>
</table>

1. Weak pulldown.
2. Weak pulldown on all outputs.
### Table 3. MAXIMUM RATINGS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage to Ground Potential</td>
<td>-0.5</td>
<td>+7.0</td>
<td>V</td>
</tr>
<tr>
<td>DC Input Voltage (Except REF)</td>
<td>-0.5</td>
<td>$V_{DD} + 0.5$</td>
<td>V</td>
</tr>
<tr>
<td>DC Input Voltage (REF)</td>
<td>-0.5</td>
<td>7</td>
<td>V</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-65</td>
<td>+150</td>
<td>°C</td>
</tr>
<tr>
<td>Maximum Soldering Temperature (10 sec)</td>
<td>260</td>
<td></td>
<td>°C</td>
</tr>
<tr>
<td>Junction Temperature</td>
<td>150</td>
<td></td>
<td>°C</td>
</tr>
<tr>
<td>Static Discharge Voltage (per MIL-STD-883, Method 3015)</td>
<td>&gt; 2000</td>
<td></td>
<td>V</td>
</tr>
</tbody>
</table>

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. OPERATING CONDITIONS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{DD}$</td>
<td>Supply Voltage</td>
<td>3.0</td>
<td>3.6</td>
<td>V</td>
</tr>
<tr>
<td>$T_A$</td>
<td>Operating Temperature (Ambient Temperature)</td>
<td>-40</td>
<td>85</td>
<td>°C</td>
</tr>
<tr>
<td>CL</td>
<td>Load Capacitance, 15 MHz to 100 MHz</td>
<td>30</td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>CL</td>
<td>Load Capacitance, from 100 MHz to 133 MHz</td>
<td>15</td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>$C_{IN}$</td>
<td>Input Capacitance (Note 3)</td>
<td>7</td>
<td></td>
<td>pF</td>
</tr>
</tbody>
</table>

3. Applies to both REF Clock and FBK.

### Table 5. ELECTRICAL CHARACTERISTICS $V_{CC} = 3.0$ V to $3.6$ V, $GND = 0$ V, $T_A = -40°C$ to $+85°C$

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{IL}$</td>
<td>Input LOW Voltage</td>
<td></td>
<td>0.8</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>$V_{IH}$</td>
<td>Input HIGH Voltage</td>
<td></td>
<td>2.0</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>$I_{IL}$</td>
<td>Input LOW Current</td>
<td>$V_{IN} = 0$ V</td>
<td>50.0</td>
<td>µA</td>
<td></td>
</tr>
<tr>
<td>$I_{IH}$</td>
<td>Input HIGH Current</td>
<td>$V_{IN} = V_{DD}$</td>
<td>100.0</td>
<td>µA</td>
<td></td>
</tr>
<tr>
<td>$V_{OL}$</td>
<td>Output LOW Voltage</td>
<td>$I_{OL} = 8$ mA (-1, -2)</td>
<td>0.4</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_{OL} = 12$ mA (-1H)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V_{OH}$</td>
<td>Output HIGH Voltage</td>
<td>$I_{OH} = -8$ mA (-1, -2)</td>
<td>2.4</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_{OH} = -12$ mA (-1H)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_{DD}$</td>
<td>Supply Current</td>
<td>Unloaded outputs 100 MHz REF</td>
<td>45</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Select inputs at $V_{DD}$ or $GND$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unloaded outputs, 66 MHz REF (-1, -2)</td>
<td>35</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unloaded outputs, 33 MHz REF (-1, -2)</td>
<td>20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 6. SWITCHING CHARACTERISTICS \( V_{CC} = 3.0 \) V to 3.6 V, GND = 0 V, \( T_A = -40^\circ \)C to +85°C  
(All parameters are specified with loaded outputs)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>( t_1 )</td>
<td>Output Frequency</td>
<td>30 pF load (all devices)</td>
<td>15</td>
<td>15</td>
<td>100</td>
<td>MHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 pF load (-1, -2)</td>
<td></td>
<td></td>
<td>133.3</td>
<td></td>
</tr>
<tr>
<td>( t_1 )</td>
<td>Duty Cycle = ((t_2 / t_1) \times 100) (all devices)</td>
<td>Measured at 1.4 V, ( F_{OUT} \leq 66.66 ) MHz 30 pF load</td>
<td>40.0</td>
<td>50.0</td>
<td>60.0</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measured at 1.4 V, ( F_{OUT} \leq 50 ) MHz 15 pF load</td>
<td>45.0</td>
<td>50.0</td>
<td>55.0</td>
<td></td>
</tr>
<tr>
<td>( t_3 )</td>
<td>Output Rise Time (-1, -2)</td>
<td>Measured between 0.8 V and 2.0 V 30 pF load</td>
<td>2.50</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measured between 0.8 V and 2.0 V 15 pF load</td>
<td>1.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Output Rise Time (-1H)</td>
<td>Measured between 0.8 V and 2.0 V 30 pF load</td>
<td>1.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( t_4 )</td>
<td>Output Fall Time (-1, -2)</td>
<td>Measured between 2.0 V and 0.8 V 30 pF load</td>
<td>2.50</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measured between 2.0 V and 0.8 V 15 pF load</td>
<td>1.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Output Fall Time (-1H)</td>
<td>Measured between 2.0 V and 0.8 V 30 pF load</td>
<td>1.25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( t_5 )</td>
<td>Output-to-Output Skew on same Bank (-1, -2)</td>
<td>All outputs equally loaded</td>
<td>200</td>
<td></td>
<td></td>
<td>ps</td>
</tr>
<tr>
<td></td>
<td>Output-to-Output Skew (-1H)</td>
<td>All outputs equally loaded</td>
<td>200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Output Bank A-Output Bank B skew (-1)</td>
<td>All outputs equally loaded</td>
<td>200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Output Bank A-Output Bank B skew (-2)</td>
<td>All outputs equally loaded</td>
<td>400</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( t_6 )</td>
<td>Delay, REF Rising Edge to FBK Rising Edge</td>
<td>Measured at ( V_{DD}/2 )</td>
<td>0</td>
<td></td>
<td>+250</td>
<td>ps</td>
</tr>
<tr>
<td>( t_7 )</td>
<td>Device-to-Device Skew</td>
<td>Measured at ( V_{DD}/2 ) on the FBK pins of the device</td>
<td>0</td>
<td></td>
<td>500</td>
<td>ps</td>
</tr>
<tr>
<td>( t_8 )</td>
<td>Output Slew Rate</td>
<td>Measured between 0.8 V and 2.0 V using Test Circuit #2</td>
<td>1</td>
<td></td>
<td></td>
<td>V/ns</td>
</tr>
<tr>
<td>( t_9 )</td>
<td>Cycle-to-Cycle Jitter (-1, -1H)</td>
<td>Measured at 66.67 MHz, loaded outputs, 15 pF load</td>
<td>180</td>
<td></td>
<td></td>
<td>ps</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measured at 66.67 MHz, loaded outputs, 30 pF load</td>
<td>200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measured at 133.3 MHz, loaded outputs, 15 pF load</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cycle-to-Cycle Jitter (-2)</td>
<td>Measured at 66.67 MHz, loaded outputs, 30 pF load</td>
<td>400</td>
<td></td>
<td></td>
<td>ps</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measured at 66.67 MHz, loaded outputs, 15 pF load</td>
<td>380</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( t_{LOCK} )</td>
<td>PLL Lock Time</td>
<td>Stable power supply, valid clock presented on REF and FBK pins</td>
<td>1.0</td>
<td></td>
<td></td>
<td>ms</td>
</tr>
</tbody>
</table>
Zero Delay and Skew Control

For applications requiring zero input-output delay, all outputs must be equally loaded.

To close the feedback loop of the NB2304A, the FBK pin can be driven from any of the four available output pins. The output driving the FBK pin will be driving a total load of 7 pF plus any additional load that it drives. The relative loading of this output (with respect to the remaining outputs) can adjust the input output delay. This is shown in Figure 3.

For applications requiring zero input-output delay, all outputs including the one providing feedback should be equally loaded. If input-output delay adjustments are required, use Figure 3 to calculate loading differences between the feedback output and remaining outputs. For zero output-output skew, be sure to load outputs equally.

**SWITCHING WAVEFORMS**

![Duty Cycle Timing](image1)

**Figure 4. Duty Cycle Timing**

![All Outputs Rise/Fall Time](image2)

**Figure 5. All Outputs Rise/Fall Time**

![Output - Output Skew](image3)

**Figure 6. Output - Output Skew**

![Input - Output Propagation Delay](image4)

**Figure 7. Input - Output Propagation Delay**

![Device - Device Skew](image5)

**Figure 8. Device - Device Skew**
Figure 9. Test Circuit #1

Figure 10. Test Circuit #2
For parameter $t_8$ (output slew rate) on -1H devices

Figure 11. NB2304AI1 and NB2304AI1H

Figure 12. NB2304AI2

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>Device</th>
<th>Marking</th>
<th>Operating Range</th>
<th>Package</th>
<th>Shipping†</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>NB2304AI1DG</td>
<td>4I1</td>
<td>Industrial &amp; Commercial</td>
<td>SOIC-8 (Pb-Free)</td>
<td>98 Units / Rail</td>
<td>Now</td>
</tr>
<tr>
<td>NB2304AI1DR2G</td>
<td>4I1</td>
<td>Industrial &amp; Commercial</td>
<td>SOIC-8 (Pb-Free)</td>
<td>2500 Tape &amp; Reel</td>
<td>Now</td>
</tr>
<tr>
<td>NB2304AI1HDG</td>
<td>4I1H</td>
<td>Industrial &amp; Commercial</td>
<td>SOIC-8 (Pb-Free)</td>
<td>98 Units / Rail</td>
<td>Now</td>
</tr>
<tr>
<td>NB2304AI1HDR2G</td>
<td>4I1H</td>
<td>Industrial &amp; Commercial</td>
<td>SOIC-8 (Pb-Free)</td>
<td>2500 Tape &amp; Reel</td>
<td>Now</td>
</tr>
<tr>
<td>NB2304AI2DG</td>
<td>4I2</td>
<td>Industrial &amp; Commercial</td>
<td>SOIC-8 (Pb-Free)</td>
<td>98 Units / Rail</td>
<td>Now</td>
</tr>
<tr>
<td>NB2304AI2DR2G</td>
<td>4I2</td>
<td>Industrial &amp; Commercial</td>
<td>SOIC-8 (Pb-Free)</td>
<td>2500 Tape &amp; Reel</td>
<td>Now</td>
</tr>
</tbody>
</table>

†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.

http://onsemi.com
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.
6. 751−01 THRU 751−06 ARE OBSOLETE. NEW STANDARD IS 751−07.

SCALE 6:1

SOLDERING FOOTPRINT*

*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. Some products may not follow the Generic Marking.

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

STYLES ON PAGE 2
### Description

**STYLE 1:**

- **PIN 1:** Emitter
- **PIN 2:** Collector
- **PIN 3:** Collector
- **PIN 4:** Emitter
- **PIN 5:** Base
- **PIN 6:** Emitter, #2
- **PIN 7:** Base, #1
- **PIN 8:** Emitter, #1

**STYLE 2:**

- **PIN 1:** Collector, Die, #1
- **PIN 2:** Collector, #1
- **PIN 3:** Collector, #2
- **PIN 4:** Base, #2
- **PIN 5:** Emitter, #2
- **PIN 6:** Base, #1
- **PIN 7:** Emitter, #1
- **PIN 8:** Collector, #1

**STYLE 3:**

- **PIN 1:** Drain, Die #1
- **PIN 2:** Drain
- **PIN 3:** Drain
- **PIN 4:** Base
- **PIN 5:** Emitter, #2
- **PIN 6:** Source, #2
- **PIN 7:** Gate, #1
- **PIN 8:** Source, #1

**STYLE 4:**

- **PIN 1:** Anode
- **PIN 2:** Drain, #1
- **PIN 3:** Drain
- **PIN 4:** Base
- **PIN 5:** Emitter, #2
- **PIN 6:** Source, #2
- **PIN 7:** Gate, #1
- **PIN 8:** Anode

**STYLE 5:**

- **PIN 1:** Drain
- **PIN 2:** Drain
- **PIN 3:** Drain
- **PIN 4:** Source
- **PIN 5:** Source
- **PIN 6:** Gate
- **PIN 7:** Source
- **PIN 8:** Source

**STYLE 6:**

- **PIN 1:** Source
- **PIN 2:** Drain
- **PIN 3:** Drain
- **PIN 4:** Source
- **PIN 5:** Source
- **PIN 6:** Gate
- **PIN 7:** Gate
- **PIN 8:** Source

**STYLE 7:**

- **PIN 1:** Input
- **PIN 2:** Source
- **PIN 3:** Drain
- **PIN 4:** Drain
- **PIN 5:** Source
- **PIN 6:** Gate
- **PIN 7:** Gate
- **PIN 8:** Source

**STYLE 8:**

- **PIN 1:** Collector, Die #1
- **PIN 2:** Collector, #1
- **PIN 3:** Collector, #2
- **PIN 4:** Collector, Common
- **PIN 5:** Collector, Common
- **PIN 6:** Collector, #2
- **PIN 7:** Collector, #1
- **PIN 8:** Collector, #1

**STYLE 9:**

- **PIN 1:** Emitter, Common
- **PIN 2:** Collector, Die #1
- **PIN 3:** Collector, #2
- **PIN 4:** Collector, Common
- **PIN 5:** Emitter, Common
- **PIN 6:** Base, #2
- **PIN 7:** Base, Die #1
- **PIN 8:** Emitter, Common

**STYLE 10:**

- **PIN 1:** Source
- **PIN 2:** Drain
- **PIN 3:** Drain
- **PIN 4:** Source
- **PIN 5:** Source
- **PIN 6:** Gate
- **PIN 7:** Gate
- **PIN 8:** Source

**STYLE 11:**

- **PIN 1:** Source
- **PIN 2:** Gate 1
- **PIN 3:** Source
- **PIN 4:** Gate 2
- **PIN 5:** Drain 2
- **PIN 6:** Drain 2
- **PIN 7:** Drain 1
- **PIN 8:** Drain 1

**STYLE 12:**

- **PIN 1:** Sink
- **PIN 2:** Sink
- **PIN 3:** Sink
- **PIN 4:** Source
- **PIN 5:** Source
- **PIN 6:** Gate
- **PIN 7:** Gate
- **PIN 8:** Source

**STYLE 13:**

- **PIN 1:** N.C.
- **PIN 2:** Source
- **PIN 3:** Source
- **PIN 4:** Gate
- **PIN 5:** Drain
- **PIN 6:** Drain
- **PIN 7:** Drain
- **PIN 8:** Drain

**STYLE 14:**

- **PIN 1:** Source
- **PIN 2:** Drain
- **PIN 3:** Drain
- **PIN 4:** Source
- **PIN 5:** Gate 1
- **PIN 6:** Gate 2
- **PIN 7:** Drain 1
- **PIN 8:** Drain 1

**STYLE 15:**

- **PIN 1:** Sink
- **PIN 2:** Sink
- **PIN 3:** Sink
- **PIN 4:** Source
- **PIN 5:** Source
- **PIN 6:** Gate 2
- **PIN 7:** Gate 2
- **PIN 8:** Gate 2

**STYLE 16:**

- **PIN 1:** Source
- **PIN 2:** Gate 1
- **PIN 3:** Source
- **PIN 4:** Gate 2
- **PIN 5:** Drain 2
- **PIN 6:** Drain 2
- **PIN 7:** Drain 1
- **PIN 8:** Drain 1

**STYLE 17:**

- **PIN 1:** VCC
- **PIN 2:** D2 OUT
- **PIN 3:** VOUT
- **PIN 4:** TXE
- **PIN 5:** RXE
- **PIN 6:** VEE
- **PIN 7:** GND
- **PIN 8:** ACC

**STYLE 18:**

- **PIN 1:** Collector
- **PIN 2:** Anode
- **PIN 3:** Source
- **PIN 4:** Gate
- **PIN 5:** Drain
- **PIN 6:** Cathode
- **PIN 7:** Cathode
- **PIN 8:** Cathode

**STYLE 19:**

- **PIN 1:** Line 1 IN
- **PIN 2:** Line 1
- **PIN 3:** Line 1
- **PIN 4:** Line 1
- **PIN 5:** Line 1
- **PIN 6:** Line 1
- **PIN 7:** Line 1
- **PIN 8:** Line 1

**STYLE 20:**

- **PIN 1:** Source
- **PIN 2:** Gate 1
- **PIN 3:** Source
- **PIN 4:** Gate 2
- **PIN 5:** Drain 2
- **PIN 6:** Drain 2
- **PIN 7:** Drain 1
- **PIN 8:** Drain 1

**STYLE 21:**

- **PIN 1:** Cathode 1
- **PIN 2:** Cathode 2
- **PIN 3:** Cathode 3
- **PIN 4:** Cathode 4
- **PIN 5:** Cathode 5
- **PIN 6:** Cathode
- **PIN 7:** Cathode
- **PIN 8:** Cathode

**STYLE 22:**

- **PIN 1:** I/O Line 1
- **PIN 2:** Common Cathode/VCC
- **PIN 3:** Common Cathode/VCC
- **PIN 4:** I/O Line 3
- **PIN 5:** Common Anode/GND
- **PIN 6:** I/O Line 4
- **PIN 7:** Common Anode/GND
- **PIN 8:** Common Anode/GND

**STYLE 23:**

- **PIN 1:** Line 1
- **PIN 2:** Common Anode/GND
- **PIN 3:** Common Anode/GND
- **PIN 4:** Line 2
- **PIN 5:** Line 2
- **PIN 6:** Common Anode/GND
- **PIN 7:** Common Anode/GND
- **PIN 8:** Common Anode/GND

**STYLE 24:**

- **PIN 1:** Source
- **PIN 2:** Gate 1
- **PIN 3:** Source
- **PIN 4:** Gate 2
- **PIN 5:** Drain 2
- **PIN 6:** Drain 2
- **PIN 7:** Drain 1
- **PIN 8:** Drain 1

**STYLE 25:**

- **PIN 1:** VIN
- **PIN 2:** N/C
- **PIN 3:** REXT
- **PIN 4:** GND
- **PIN 5:** IOUT
- **PIN 6:** IOUT
- **PIN 7:** IOUT
- **PIN 8:** IOUT

**STYLE 26:**

- **PIN 1:** GND
- **PIN 2:** GND
- **PIN 3:** GND
- **PIN 4:** SOURCE
- **PIN 5:** SOURCE
- **PIN 6:** SOURCE
- **PIN 7:** SOURCE
- **PIN 8:** SOURCE

**STYLE 27:**

- **PIN 1:** ILIMIT
- **PIN 2:** ILIMIT
- **PIN 3:** ILIMIT
- **PIN 4:** ILIMIT
- **PIN 5:** ILIMIT
- **PIN 6:** ILIMIT
- **PIN 7:** ILIMIT
- **PIN 8:** ILIMIT

**STYLE 28:**

- **PIN 1:** SW_TO_GND
- **PIN 2:** SW_TO_GND
- **PIN 3:** SW_TO_GND
- **PIN 4:** SW_TO_GND
- **PIN 5:** SW_TO_GND
- **PIN 6:** SW_TO_GND
- **PIN 7:** SW_TO_GND
- **PIN 8:** SW_TO_GND

**STYLE 29:**

- **PIN 1:** Base, Die #1
- **PIN 2:** Emitter, #1
- **PIN 3:** Base, #2
- **PIN 4:** Emitter, #2
- **PIN 5:** Collector, #2
- **PIN 6:** Collector, #2
- **PIN 7:** Collector, #1
- **PIN 8:** Collector, #1

**STYLE 30:**

- **PIN 1:** Drain
- **PIN 2:** Drain
- **PIN 3:** Drain
- **PIN 4:** Source
- **PIN 5:** Source
- **PIN 6:** Source
- **PIN 7:** Source
- **PIN 8:** Source