HIGH SPEED DUAL COMPARATORS

- TWO INDEPENDENT COMPARATORS
- OPERATES FROM A SINGLE +5V SUPPLY
- TYPICALLY 80ns RESPONSE TIME AT ±15V
- MINIMUM FAN-OUT OF 2 EACH SIDE
- MAXIMUM INPUT CURRENT OF 1µA OVER OPERATING TEMPERATURE RANGE
- INPUTS AND OUTPUTS CAN BE ISOLATED FROM SYSTEM GROUND
- HIGH COMMON-MODE SLEW RATE

DESCRIPTION
These products are precision high speed dual comparators designed to operate over a wide range of supply voltages down to a single 5V logic supply and ground and have low input currents and high gains.
The open collector of the output stage makes compatible with TTL as well as capable of driving lamps and relays at currents up to 25mA.
Although designed primarily for applications requiring operation from digital logic supplies, are fully specified for power supplies up to ±15V.
They feature faster response than the LM111 at the expense of higher power dissipation. However, the high speed, wide operating voltage range and low package count make the much more versatile.

ORDER CODES

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Temperature Range</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>LM119</td>
<td>−55, +125°C</td>
<td>•</td>
</tr>
<tr>
<td>LM219</td>
<td>−40, +105°C</td>
<td>•</td>
</tr>
<tr>
<td>LM319</td>
<td>0, +70°C</td>
<td>•</td>
</tr>
</tbody>
</table>

Example: LM219N

PIN CONNECTIONS (top view)

1 - N.C.  2 - N.C.  3 - Ground 1  4 - Non-inverting input 1  5 - Inverting input 1  6 - Vcc  7 - Output 2  8 - Ground 2  9 - Non-inverting input 2  10 - Inverting input 2  11 - Vcc  12 - Output 1  13 - N.C.  14 - N.C.
# ABSOLUTE MAXIMUM RATINGS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>LM119</th>
<th>LM219</th>
<th>LM319</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_O - V_{CC} )</td>
<td>Output to Negative Supply Voltage</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>V</td>
</tr>
<tr>
<td>( V_{CC} )</td>
<td>Negative Supply Voltage</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>V</td>
</tr>
<tr>
<td>( V_{CC}^+ )</td>
<td>Positive Supply Voltage</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>V</td>
</tr>
<tr>
<td>( V_{id} )</td>
<td>Differential Input Voltage</td>
<td>±5</td>
<td>±5</td>
<td>±5</td>
<td>V</td>
</tr>
<tr>
<td>( V_i )</td>
<td>Input Voltage – (note 1)</td>
<td>±15</td>
<td>±15</td>
<td>±15</td>
<td>V</td>
</tr>
<tr>
<td>( P_{tot} )</td>
<td>Power Dissipation</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>mW</td>
</tr>
<tr>
<td>( T_{oper} )</td>
<td>Operating Free-air Temperature Range</td>
<td>−55 to +125</td>
<td>−40 to +105</td>
<td>0 to +70</td>
<td>°C</td>
</tr>
<tr>
<td>( T_{stg} )</td>
<td>Storage Temperature Range</td>
<td>−65 to +150</td>
<td>−65 to +150</td>
<td>−65 to +150</td>
<td>°C</td>
</tr>
</tbody>
</table>
ELECTRICAL CHARACTERISTICS

$V_{CC} = \pm 15V$, $T_{amb} = 25^\circ C$(unless otherwise specified)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>LM119 - LM219</th>
<th>LM319</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_i$</td>
<td>Input Offset Voltage ($R_S \leq 5k\Omega$) – (note 2)</td>
<td>Min.</td>
<td>Typ.</td>
<td>Max.</td>
</tr>
<tr>
<td></td>
<td>$T_{amb} = +25^\circ C$</td>
<td>0.7</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>$I_i$</td>
<td>Input Offset Current – (note 2)</td>
<td>30</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>$I_b$</td>
<td>Input Bias Current – (note 2)</td>
<td>150</td>
<td>500</td>
<td>1000</td>
</tr>
<tr>
<td>$A_{vd}$</td>
<td>Large Signal Voltage Gain</td>
<td>10</td>
<td>40</td>
<td>8</td>
</tr>
<tr>
<td>$I_{CC^+}$</td>
<td>Positive Supply Current</td>
<td>8</td>
<td>4.3</td>
<td>11.5</td>
</tr>
<tr>
<td>$I_{CC^-}$</td>
<td>Negative Supply Current</td>
<td>3</td>
<td>4.5</td>
<td>3</td>
</tr>
<tr>
<td>$V_{icm}$</td>
<td>Input Common Mode Voltage Range</td>
<td>±12</td>
<td>1</td>
<td>±12</td>
</tr>
<tr>
<td>$V_{id}$</td>
<td>Differential Input Voltage</td>
<td>±5</td>
<td>±5</td>
<td>±5</td>
</tr>
<tr>
<td>$V_{OL}$</td>
<td>Low Level Output Voltage</td>
<td>0.75</td>
<td>1.5</td>
<td>0.75</td>
</tr>
<tr>
<td></td>
<td>$T_{amb} = +25^\circ C, I_O = 25mA$</td>
<td>$V_i \leq -5mV$</td>
<td>$V_i \leq -10mV$</td>
<td>$V_{CC^+} \geq +4.5V, V_{CC^-} = 0V, I_{O(sink)} &lt; 3.2mA$</td>
</tr>
<tr>
<td>$I_{OH}$</td>
<td>High Level Output Current ($V_O = +35V$)</td>
<td>0.2</td>
<td>2</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>$T_{amb} = +25^\circ C$</td>
<td>$V_i \geq 5mV$</td>
<td>$V_i \geq 10mV$</td>
<td>$V_i \geq 5mV$</td>
</tr>
<tr>
<td>$t_{re}$</td>
<td>Response Time – (note 3)</td>
<td>80</td>
<td>80</td>
<td>ns</td>
</tr>
</tbody>
</table>

Notes:
1. For supply voltages less than ±15V the absolute maximum input voltage is equal to the supply voltage.
2. These specifications apply for $V_{CC} = \pm 15V$, unless otherwise stated. The offset voltage, offset current and bias current specifications apply for any supply voltage from a single +5V supply up to ±15V supplies. The offset voltages and offset current given are the maximum values required to drive the output down to 1V or up to ±14V with a 1mA load current. Thus, these parameters define an error band and take into account the worst case effects of voltage gain and input impedance.
3. The response time specified is for a 100mV input step with 5mV overdrive.
LM119 - LM219 - LM319

INPUT BIAS CURRENTS

COMMON MODE LIMITS

OUTPUT SATURATION VOLTAGE

SUPPLY CURRENT

SUPPLY CURRENT

OUTPUT LIMITING CHARACTERISTICS

OUTPUT VOLTAGE (V)

TEMPERATURE (°C)

INPUT BIAS CURRENT (μA)

OFFSET

VCC = +15V

TEMPERATURE (°C)

COMMON MODE LIMITS (V)

VCC = +5V, VCC = 0

VCC = ±15V, VCC = 5V, VCC = 0

SUPPLY CURRENT (mA)

Tamb = +25°C

Tamb = +125°C

Tamb = -55°C

VCC = ±15V

POWER DISSIPATION (W)

SUPPLY VOLTAGE (±V)

SUPPLY CURRENT (mA)

POSITIVE SUPPLY

NEGATIVE SUPPLY

SHORT CIRCUIT CURRENT

Power dissipation

OUTPUT VOLTAGE (V)

SUPPLY VOLTAGE (±V)
LM319

INPUT BIAS CURRENTS

![Graph showing input bias currents vs. temperature (°C)]

COMMON MODE LIMITS

![Graph showing common mode limits vs. temperature (°C)]

OUTPUT SATURATION VOLTAGE

![Graph showing output saturation voltage vs. output current (mA)]

SUPPLY CURRENT

![Graph showing supply current vs. temperature (°C)]
TYPICAL APPLICATION DIAGRAMS

RELAY DRIVER

![Diagram of a relay driver circuit](image1)

WINDOW DETECTOR

![Diagram of a window detector circuit](image2)

VO = +5V for VLT < V1 < VUT

VO = 0 for V1 < VLT or V1 > VUT
## PACKAGE MECHANICAL DATA
14 PINS – PLASTIC DIP OR CERDIP

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Millimeters</th>
<th>Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>a1</td>
<td>0.51</td>
<td>0.020</td>
</tr>
<tr>
<td>B</td>
<td>1.39</td>
<td>0.055</td>
</tr>
<tr>
<td>b</td>
<td>0.5</td>
<td>0.020</td>
</tr>
<tr>
<td>b1</td>
<td>0.25</td>
<td>0.010</td>
</tr>
<tr>
<td>D</td>
<td>20</td>
<td>0.787</td>
</tr>
<tr>
<td>E</td>
<td>8.5</td>
<td>0.335</td>
</tr>
<tr>
<td>e</td>
<td>2.54</td>
<td>0.100</td>
</tr>
<tr>
<td>e3</td>
<td>15.24</td>
<td>0.600</td>
</tr>
<tr>
<td>F</td>
<td>7.1</td>
<td>0.280</td>
</tr>
<tr>
<td>i</td>
<td>5.1</td>
<td>0.201</td>
</tr>
<tr>
<td>L</td>
<td>3.3</td>
<td>0.130</td>
</tr>
<tr>
<td>Z</td>
<td>1.27</td>
<td>0.050</td>
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</tbody>
</table>

REFERENCES:
- LM119 - LM219 - LM319
- 8/9
### PACKAGE MECHANICAL DATA
14 PINS – PLASTIC MICROPACKAGE (SO)

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Millimeters</th>
<th>Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1.75</td>
<td>1.75</td>
</tr>
<tr>
<td>a1</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td>a2</td>
<td>1.6</td>
<td>1.6</td>
</tr>
<tr>
<td>b</td>
<td>0.35</td>
<td>0.46</td>
</tr>
<tr>
<td>b1</td>
<td>0.19</td>
<td>0.25</td>
</tr>
<tr>
<td>C</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>c1</td>
<td>45°</td>
<td>45°</td>
</tr>
<tr>
<td>D</td>
<td>8.55</td>
<td>8.75</td>
</tr>
<tr>
<td>E</td>
<td>5.8</td>
<td>6.2</td>
</tr>
<tr>
<td>e</td>
<td>1.27</td>
<td>1.27</td>
</tr>
<tr>
<td>e3</td>
<td>7.62</td>
<td>7.62</td>
</tr>
<tr>
<td>F</td>
<td>3.8</td>
<td>4.0</td>
</tr>
<tr>
<td>G</td>
<td>4.6</td>
<td>5.3</td>
</tr>
<tr>
<td>L</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>M</td>
<td>0.68</td>
<td>0.68</td>
</tr>
<tr>
<td>S</td>
<td>8°</td>
<td>8°</td>
</tr>
</tbody>
</table>

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