2N6338, 2N6341

High-Power NPN Silicon Transistors

... designed for use in industrial–military power amplifier and switching circuit applications.
- High Collector–Emitter Sustaining Voltage –
  \[ V_{CEO(sus)} = 100 \text{ Vdc (Min)} - 2N6338 \]
  \[ = 150 \text{ Vdc (Min)} - 2N6341 \]
- High DC Current Gain –
  \[ h_{FE} = 30 - 120 @ I_C = 10 \text{ Adc} \]
  \[ = 12 \text{ (Min)} @ I_C = 25 \text{ Adc} \]
- Low Collector–Emitter Saturation Voltage –
  \[ V_{CE(sat)} = 1.0 \text{ Vdc (Max)} @ I_C = 10 \text{ Adc} \]
- Fast Switching Times @ I_C = 10 Adc
  \[ t_r = 0.3 \text{ ms (Max)} \]
  \[ t_f = 1.0 \text{ ms (Max)} \]
  \[ t_f = 0.25 \text{ ms (Max)} \]
- Pb–Free Packages are Available

*MAXIMUM RATINGS*

<table>
<thead>
<tr>
<th>Rating</th>
<th>Symbol</th>
<th>2N6338</th>
<th>2N6341</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector–Base Voltage</td>
<td>V_CB</td>
<td>120</td>
<td>180</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector–Emitter Voltage</td>
<td>V_CE</td>
<td>100</td>
<td>150</td>
<td>Vdc</td>
</tr>
<tr>
<td>Emitter–Base Voltage</td>
<td>V_EB</td>
<td>6.0</td>
<td></td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector Current</td>
<td>I_C</td>
<td>25</td>
<td></td>
<td>Adc</td>
</tr>
<tr>
<td>Continuous</td>
<td></td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base Current</td>
<td>I_B</td>
<td>10</td>
<td></td>
<td>Adc</td>
</tr>
<tr>
<td>Total Device Dissipation</td>
<td>P_D</td>
<td>200</td>
<td>1.14</td>
<td>W</td>
</tr>
<tr>
<td>@ T_C = 25°C Derate</td>
<td></td>
<td></td>
<td></td>
<td>W/°C</td>
</tr>
<tr>
<td>above 25°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating and Storage</td>
<td></td>
<td>–65 to 200</td>
<td>–65 to 200</td>
<td>°C</td>
</tr>
<tr>
<td>Junction Temperature</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**THERMAL CHARACTERISTICS**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Symbol</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal Resistance,</td>
<td>( \theta_{JC} )</td>
<td>0.875</td>
<td>°C/W</td>
</tr>
<tr>
<td>Junction to Case</td>
<td></td>
<td></td>
<td></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.

*Indicates JEDEC Registered Data.
**ELECTRICAL CHARACTERISTICS** (T<sub>C</sub> = 25°C unless otherwise noted)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Symbol</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF CHARACTERISTICS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector–Emitter Sustaining Voltage (1)</td>
<td>V&lt;sub&gt;CE(sus)&lt;/sub&gt;</td>
<td>100</td>
<td>150</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector Cutoff Current</td>
<td>I&lt;sub&gt;CES&lt;/sub&gt;</td>
<td>10</td>
<td>50</td>
<td>μAdc</td>
</tr>
<tr>
<td>Collector Cutoff Current (V&lt;sub&gt;CE&lt;/sub&gt; = Rated V&lt;sub&gt;CEO&lt;/sub&gt;, V&lt;sub&gt;BE(off)&lt;/sub&gt; = 1.5 Vdc)</td>
<td>I&lt;sub&gt;CBO&lt;/sub&gt;</td>
<td>10</td>
<td>10</td>
<td>μAdc</td>
</tr>
<tr>
<td>Collector Cutoff Current (V&lt;sub&gt;CE&lt;/sub&gt; = 150°C)</td>
<td>I&lt;sub&gt;EBO&lt;/sub&gt;</td>
<td>100</td>
<td></td>
<td>μAdc</td>
</tr>
<tr>
<td>ON CHARACTERISTICS (1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Current Gain</td>
<td>h&lt;sub&gt;FE&lt;/sub&gt;</td>
<td>50</td>
<td>120</td>
<td>–</td>
</tr>
<tr>
<td>Collector Emitter Saturation Voltage</td>
<td>V&lt;sub&gt;CE(sat)&lt;/sub&gt;</td>
<td>1.0</td>
<td>1.8</td>
<td>Vdc</td>
</tr>
<tr>
<td>Base–Emitter Saturation Voltage</td>
<td>V&lt;sub&gt;BE(sat)&lt;/sub&gt;</td>
<td>1.8</td>
<td>2.5</td>
<td>Vdc</td>
</tr>
<tr>
<td>Base–Emitter On Voltage (I&lt;sub&gt;C&lt;/sub&gt; = 10 Adc, V&lt;sub&gt;CE&lt;/sub&gt; = 2.0 Vdc)</td>
<td>V&lt;sub&gt;BE(on)&lt;/sub&gt;</td>
<td>1.8</td>
<td></td>
<td>Vdc</td>
</tr>
<tr>
<td>DYNAMIC CHARACTERISTICS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current–Gain – Bandwidth Product (2)</td>
<td>f&lt;sub&gt;T&lt;/sub&gt;</td>
<td>40</td>
<td></td>
<td>MHz</td>
</tr>
<tr>
<td>Output Capacitance (V&lt;sub&gt;CE&lt;/sub&gt; = 10 Vdc, I&lt;sub&gt;E&lt;/sub&gt; = 0, f = 0.1 MHz)</td>
<td>C&lt;sub&gt;ob&lt;/sub&gt;</td>
<td>300</td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>SWITCHING CHARACTERISTICS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rise Time (V&lt;sub&gt;CC&lt;/sub&gt; = 80 Vdc, I&lt;sub&gt;C&lt;/sub&gt; = 10Adc, I&lt;sub&gt;B1&lt;/sub&gt; = 1.0 Adc, V&lt;sub&gt;BE(off)&lt;/sub&gt; = 6.0 Vdc)</td>
<td>t&lt;sub&gt;r&lt;/sub&gt;</td>
<td>0.3</td>
<td></td>
<td>μs</td>
</tr>
<tr>
<td>Storage Time (V&lt;sub&gt;CC&lt;/sub&gt; = 80 Vdc, I&lt;sub&gt;C&lt;/sub&gt; = 10 Adc, I&lt;sub&gt;B1&lt;/sub&gt; = I&lt;sub&gt;B2&lt;/sub&gt; = 1.0 Adc)</td>
<td>t&lt;sub&gt;s&lt;/sub&gt;</td>
<td>1.0</td>
<td></td>
<td>μs</td>
</tr>
<tr>
<td>Fall Time (V&lt;sub&gt;CC&lt;/sub&gt; = 80 Vdc, I&lt;sub&gt;C&lt;/sub&gt; = 10 Adc, I&lt;sub&gt;B1&lt;/sub&gt; = I&lt;sub&gt;B2&lt;/sub&gt; = 1.0 Adc)</td>
<td>t&lt;sub&gt;f&lt;/sub&gt;</td>
<td>0.25</td>
<td></td>
<td>μs</td>
</tr>
</tbody>
</table>

*Indicates JEDEC Registered Data.

1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

2) f<sub>T</sub> = |h<sub>FE</sub>| • f<sub>test</sub>

http://onsemi.com
There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate IC−VCE limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 5 is based on TJ(pk) = 200°C; TC is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided TJ(pk) ≤ 200°C. TJ(pk) may be calculated from the data in Figure 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.
Figure 6. Turn-Off Time

Figure 7. Capacitance
### MECHANICAL CASE OUTLINE

**PACKAGE DIMENSIONS**

**TO-204 (TO-3)**  
CASE 1-07  
ISSUE Z  
DATE 05/18/1988

**NOTES:**  
2. CONTROLLING DIMENSION: INCH.  
3. ALL RULES AND NOTES ASSOCIATED WITH REFERENCED TO-204AA OUTLINE SHALL APPLY.

#### SCALE 1:1

- **A**: 1.550 REF 39.37 REF  
- **B**: 1.050 3.67  
- **C**: 0.250 0.335 6.35 8.51  
- **D**: 0.038 0.043 0.97 1.09  
- **E**: 0.055 0.070 1.40 1.77  
- **G**: 0.430 BSC 10.92 BSC  
- **H**: 0.215 BSC 5.46 BSC  
- **K**: 0.440 0.480 11.18 12.19  
- **L**: 0.665 BSC 16.89 BSC  
- **N**: 0.830 21.08  
- **Q**: 0.151 0.165 3.84 4.19  
- **U**: 1.187 BSC 30.15 BSC  
- **V**: 0.131 0.188 3.33 4.77

#### STYLE 1:
- PIN 1. BASE
- PIN 2. Emitter
- CASE: Collector

#### STYLE 2:
- PIN 1. BASE
- PIN 2. Collector
- CASE: Emitter

#### STYLE 3:
- PIN 1. GATE
- PIN 2. Source
- CASE: Drain

#### STYLE 4:
- PIN 1. GROUND
- PIN 2. INPUT
- CASE: OUTPUT

#### STYLE 5:
- PIN 1. CATHODE
- PIN 2. EXTERNAL TRIP/Delay
- CASE: ANODE

#### STYLE 6:
- PIN 1. GATE
- PIN 2. CATHODE
- CASE: Collector

#### STYLE 7:
- PIN 1. ANODE
- PIN 2. OPEN
- CASE: CATHODE

#### STYLE 8:
- PIN 1. CATHODE #1
- PIN 2. CATHODE #2
- CASE: ANODE

#### STYLE 9:
- PIN 1. ANODE #1
- PIN 2. ANODE #2
- CASE: CATHODE

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