

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 @ $I_C = 10 \text{ Adc}$
 $t_r = 0.3 \text{ ms (Max)}$
 $t_s = 1.0 \text{ ms (Max)}$
 $t_f = 0.25 \text{ ms (Max)}$
- Pb–Free Packages are Available

*MAXIMUM RATINGS

| Rating | Symbol | 2N6338 | 2N6341 | Unit |
|---|----------------|-------------|--------|--------------------------|
| Collector–Base Voltage | V_{CB} | 120 | 180 | Vdc |
| Collector–Emitter Voltage | V_{CEO} | 100 | 150 | Vdc |
| Emitter–Base Voltage | V_{EB} | 6.0 | | Vdc |
| Collector Current Continuous Peak | I_C | 25 50 | | Adc |
| Base Current | I_B | 10 | | Adc |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 200 1.14 | | W W/ $^\circ\text{C}$ |
| Operating and Storage Junction Temperature Range | T_J, T_{stg} | –65 to +200 | | $^\circ\text{C}$ |

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|--------------------------------------|---------------|-------|--------------------|
| Thermal Resistance, Junction to Case | θ_{JC} | 0.875 | $^\circ\text{C/W}$ |

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.

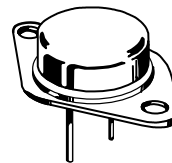
*Indicates JEDEC Registered Data.



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25 AMPERE POWER TRANSISTORS NPN SILICON



TO–204AA
CASE 1–07

ORDERING INFORMATION

| Device | Package | Shipping |
|---------|-----------------------|------------------|
| 2N6338 | TO–204AA | 100 Units / Tray |
| 2N6338G | TO–204AA (Pb–Free) | 100 Units / Tray |
| 2N6341 | TO–204AA | 100 Units / Tray |
| 2N6341G | TO–204AA (Pb–Free) | 100 Units / Tray |

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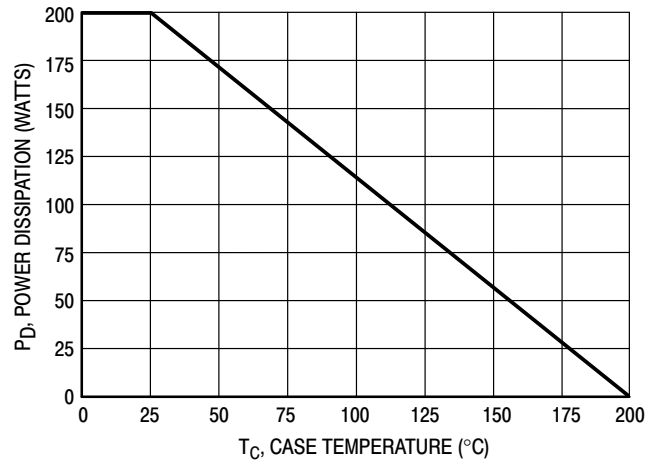


Figure 1. Power Derating

***ELECTRICAL CHARACTERISTICS** (T_C = 25°C unless otherwise noted)

| Characteristic | Symbol | Min | Max | Unit | |
|--|------------------|-----------------------|------------|-----------|--------------|
| OFF CHARACTERISTICS | | | | | |
| Collector-Emitter Sustaining Voltage (1) (I _C = 50 mAdc, I _B = 0) | 2N6338 2N6341 | V _{CEO(sus)} | 100 150 | – – | Vdc |
| Collector Cutoff Current (V _{CE} = 50 Vdc, I _B = 0) (V _{CE} = 75 Vdc, I _B = 0) | 2N6338 2N6341 | I _{CEO} | – – | 50 50 | μAdc |
| Collector Cutoff Current (V _{CE} = Rated V _{CEO} , V _{EB(off)} = 1.5 Vdc) (V _{CE} = Rated V _{CEO} , V _{EB(off)} = 1.5 Vdc, T _C = 150°C) | | I _{CEx} | – – | 10 1.0 | μAdc mAdc |
| Collector Cutoff Current (V _{CB} = Rated V _{CB} , I _E = 0) | | I _{CBO} | – | 10 | μAdc |
| Emitter Cutoff Current (V _{BE} = 6.0 Vdc, I _C = 0) | | I _{EBO} | – | 100 | μAdc |

ON CHARACTERISTICS (1)

| | | | | |
|--|----------------------|----------------|---------------|-----|
| DC Current Gain (I _C = 0.5 Adc, V _{CE} = 2.0 Vdc) (I _C = 10 Adc, V _{CE} = 2.0 Vdc) (I _C = 25 Adc, V _{CE} = 2.0 Vdc) | h _{FE} | 50 30 12 | – 120 – | – |
| Collector Emitter Saturation Voltage (I _C = 10 Adc, I _B = 1.0 Adc) (I _C = 25 Adc, I _B = 2.5 Adc) | V _{CE(sat)} | – – | 1.0 1.8 | Vdc |
| Base-Emitter Saturation Voltage (I _C = 10 Adc, I _B = 1.0 Adc) (I _C = 25 Adc, I _B = 2.5 Adc) | V _{BE(sat)} | – – | 1.8 2.5 | Vdc |
| Base-Emitter On Voltage (I _C = 10 Adc, V _{CE} = 2.0 Vdc) | V _{BE(on)} | – | 1.8 | Vdc |

DYNAMIC CHARACTERISTICS

| | | | | |
|---|-----------------|----|-----|-----|
| Current-Gain – Bandwidth Product (2) (I _C = 1.0 Adc, V _{CE} = 10 Vdc, f _{test} = 10 MHz) | f _T | 40 | – | MHz |
| Output Capacitance (V _{CB} = 10 Vdc, I _E = 0, f = 0.1 MHz) | C _{ob} | – | 300 | pF |

SWITCHING CHARACTERISTICS

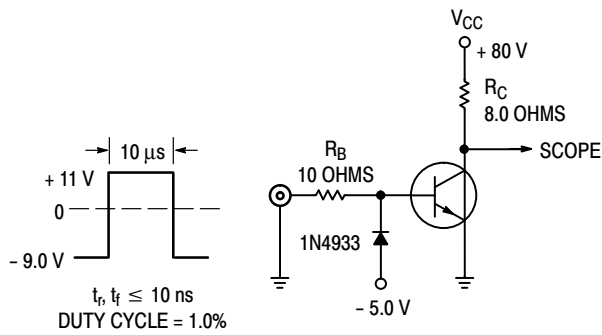
| | | | | |
|---|----------------|---|------|----|
| Rise Time (V _{CC} ≈ 80 Vdc, I _C = 10Adc, I _{B1} = 1.0 Adc, V _{BE(off)} = 6.0 Vdc) | t _r | – | 0.3 | μs |
| Storage Time (V _{CC} ≈ 80 Vdc, I _C = 10 Adc, I _{B1} = I _{B2} = 1.0 Adc) | t _s | – | 1.0 | μs |
| Fall Time (V _{CC} ≈ 80 Vdc, I _C = 10 Adc, I _{B1} = I _{B2} = 1.0 Adc) | t _f | – | 0.25 | μs |

*Indicates JEDEC Registered Data.

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

(2) f_T = |h_{fe}| • f_{test}.

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NOTE: For information on Figures 3 and 6, R_B and R_C were varied to obtain desired test conditions.

Figure 2. Switching Time Test Circuit

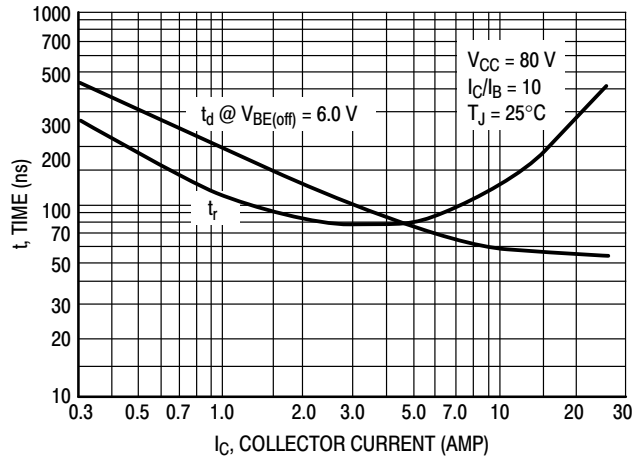


Figure 3. Turn-On Time

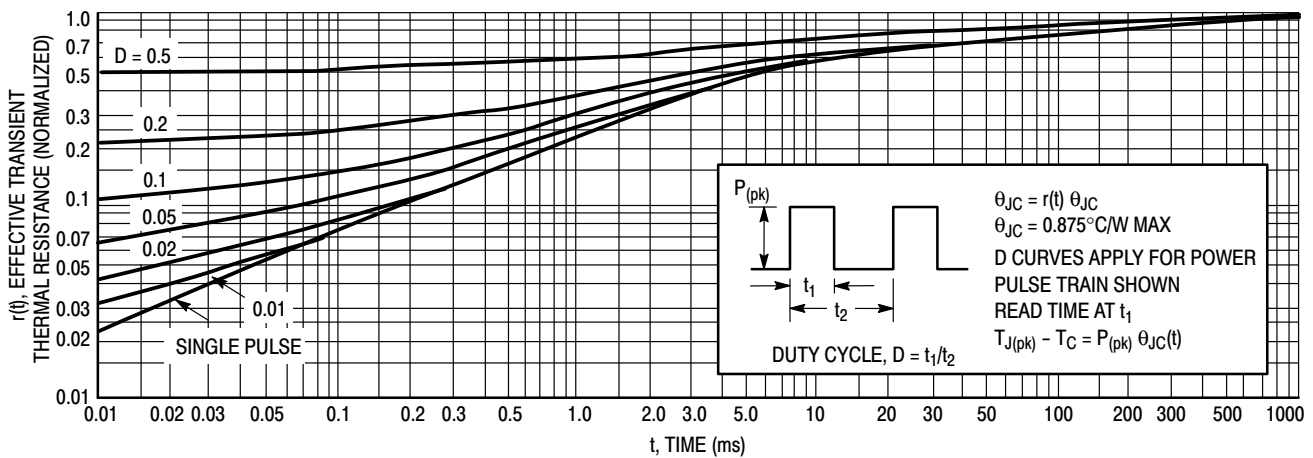


Figure 4. Thermal Response

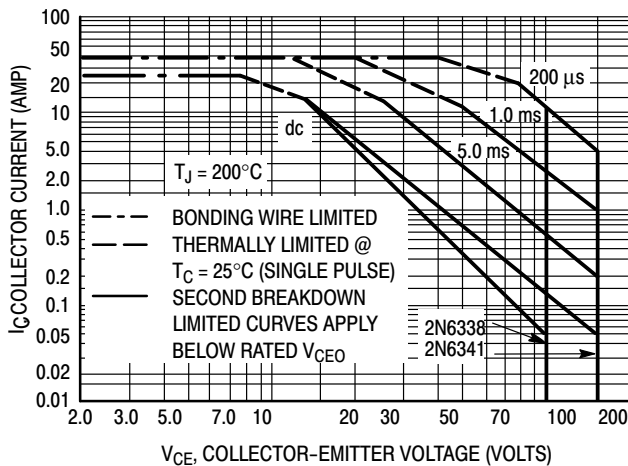


Figure 5. Active Region Safe Operating Area

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate I_C - V_{CE} 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 $T_{J(pk)} = 200^\circ\text{C}$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \leq 200^\circ\text{C}$. $T_{J(pk)}$ 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.

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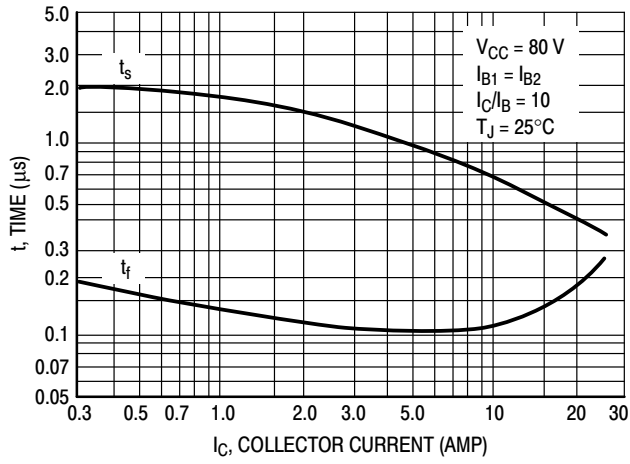


Figure 6. Turn-Off Time

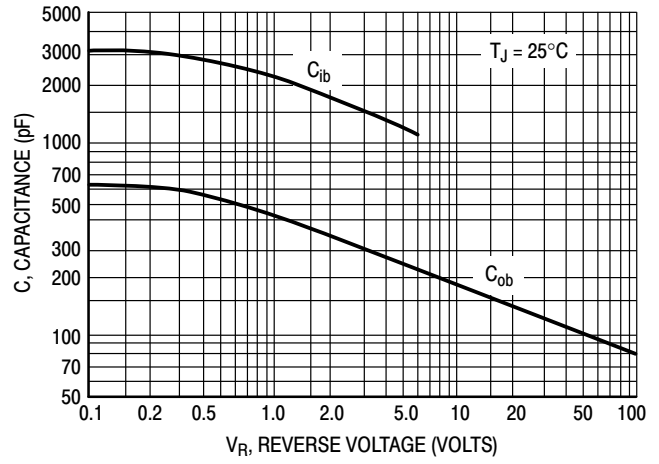


Figure 7. Capacitance

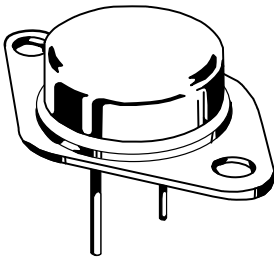
MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

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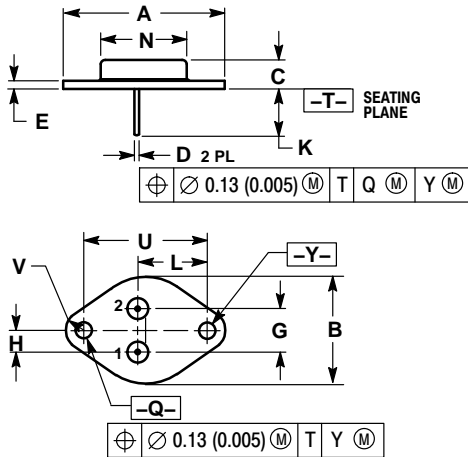


TO-204 (TO-3)
CASE 1-07
ISSUE Z

DATE 05/18/1988



SCALE 1:1



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. ALL RULES AND NOTES ASSOCIATED WITH REFERENCED TO-204AA OUTLINE SHALL APPLY.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 1.550 REF | --- | 39.37 REF | --- |
| B | --- | 1.050 | --- | 26.67 |
| 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 |

- | | | | | |
|--|--|---|---|---|
| <p>STYLE 1: PIN 1. BASE 2. EMITTER CASE: COLLECTOR</p> | <p>STYLE 2: PIN 1. BASE 2. COLLECTOR CASE: EMITTER</p> | <p>STYLE 3: PIN 1. GATE 2. SOURCE CASE: DRAIN</p> | <p>STYLE 4: PIN 1. GROUND 2. INPUT CASE: OUTPUT</p> | <p>STYLE 5: PIN 1. CATHODE 2. EXTERNAL TRIP/DELAY CASE: ANODE</p> |
| <p>STYLE 6: PIN 1. GATE 2. EMITTER CASE: COLLECTOR</p> | <p>STYLE 7: PIN 1. ANODE 2. OPEN CASE: CATHODE</p> | <p>STYLE 8: PIN 1. CATHODE #1 2. CATHODE #2 CASE: ANODE</p> | <p>STYLE 9: PIN 1. ANODE #1 2. ANODE #2 CASE: CATHODE</p> | |

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