

2N3442

High-Power Industrial Transistors

NPN silicon power transistor designed for applications in industrial and commercial equipment including high fidelity audio amplifiers, series and shunt regulators and power switches.

Features

- Collector–Emitter Sustaining Voltage – $V_{CEO(sus)} = 140$ Vdc (Min)
- Excellent Second Breakdown Capability
- Pb–Free Package is Available*

MAXIMUM RATINGS (Note 1)

| Rating | Symbol | Value | Unit |
|---|----------------|-------------|--------------------------|
| Collector–Emitter Voltage | V_{CEO} | 140 | Vdc |
| Collector–Base Voltage | V_{CB} | 160 | Vdc |
| Emitter–Base Voltage | V_{EB} | 7.0 | Vdc |
| Collector Current – Continuous – Peak | I_C | 10 15 | Adc |
| Base Current – Continuous – Peak | I_B | 7.0 – | Adc |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C (Note 2) | P_D | 117 0.67 | W W/ $^\circ\text{C}$ |
| Operating and Storage Junction Temperature Range | T_J, T_{stg} | –65 to +200 | $^\circ\text{C}$ |

THERMAL CHARACTERISTICS

| Characteristics | Symbol | Max | Unit |
|--------------------------------------|-----------------|------|--------------------|
| Thermal Resistance, Junction–to–Case | $R_{\theta JC}$ | 1.17 | $^\circ\text{C/W}$ |

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

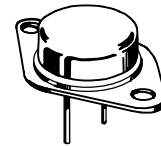
1. Indicates JEDEC Registered Data.
2. This data guaranteed in addition to JEDEC registered data.



ON Semiconductor®

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**10 AMPERE
POWER TRANSISTOR
NPN SILICON
140 VOLTS – 117 WATTS**



TO-204AA (TO-3)
CASE 1-07
STYLE 1

MARKING DIAGRAM



2N3442 = Device Code
G = Pb–Free Package
A = Assembly Location
Y = Year
WW = Work Week
MEX = Country of Origin

ORDERING INFORMATION

| Device | Package | Shipping |
|---------|---------------------|------------------|
| 2N3442 | TO-204 | 100 Units / Tray |
| 2N3442G | TO-204 (Pb–Free) | 100 Units / Tray |

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

2N3442

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic | Symbol | Min | Max | Unit |
|--|---------------|-----|-----------|------|
| OFF CHARACTERISTICS | | | | |
| Collector-Emitter Sustaining Voltage ($I_C = 200\text{ mA}$, $I_B = 0$) | $V_{CE(sus)}$ | 140 | – | Vdc |
| Collector Cutoff Current ($V_{CE} = 140\text{ Vdc}$, $I_B = 0$) | I_{CEO} | – | 200 | mA |
| Collector Cutoff Current ($V_{CE} = 140\text{ Vdc}$, $V_{BE(off)} = 1.5\text{ Vdc}$) ($V_{CE} = 140\text{ Vdc}$, $V_{BE(off)} = 1.5\text{ Vdc}$, $T_C = 150^\circ\text{C}$) | I_{CEX} | – | 5.0 30 | mA |
| Emitter Cutoff Current ($V_{BE} = 7.0\text{ Vdc}$, $I_C = 0$) | I_{EBO} | – | 5.0 | mA |

ON CHARACTERISTICS (Note 3)

| | | | | |
|--|---------------|-----------|---------|-----|
| DC Current Gain ($I_C = 3.0\text{ A}$, $V_{CE} = 4.0\text{ Vdc}$) ($I_C = 10\text{ A}$, $V_{CE} = 4.0\text{ Vdc}$) | h_{FE} | 20 7.5 | 70 – | – |
| Collector-Emitter Saturation Voltage ($I_C = 10\text{ A}$, $I_B = 2.0\text{ A}$) | $V_{CE(sat)}$ | – | 5.0 | Vdc |
| Base-Emitter On Voltage ($I_C = 10\text{ A}$, $V_{CE} = 4.0\text{ Vdc}$) | $V_{BE(on)}$ | – | 5.7 | Vdc |

DYNAMIC CHARACTERISTICS

| | | | | |
|--|----------|----|----|-----|
| Current-Gain – Bandwidth Product (Note 4) ($I_C = 2.0\text{ A}$, $V_{CE} = 4.0\text{ Vdc}$, $f_{test} = 40\text{ kHz}$) | f_T | 80 | – | kHz |
| Small-Signal Current Gain ($I_C = 2.0\text{ A}$, $V_{CE} = 4.0\text{ Vdc}$, $f = 1.0\text{ kHz}$) | h_{fe} | 12 | 72 | – |

3. Pulse Test: Pulse Width = $300\ \mu\text{s}$, Duty Cycle $\leq 2.0\%$.

4. $f_T = |h_{fe}| \cdot f_{test}$

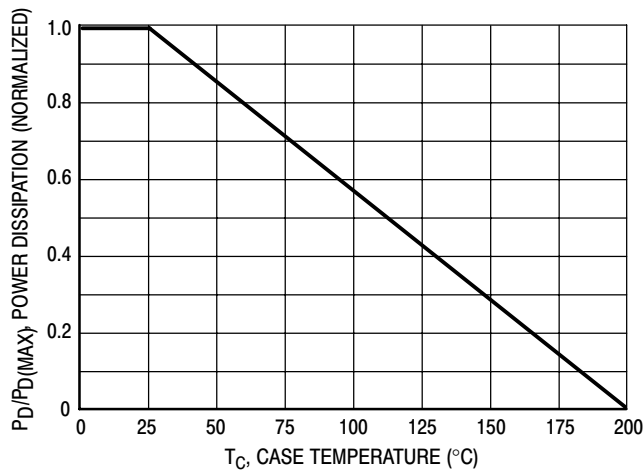


Figure 1. Power Derating

ACTIVE REGION SAFE OPERATING AREA INFORMATION

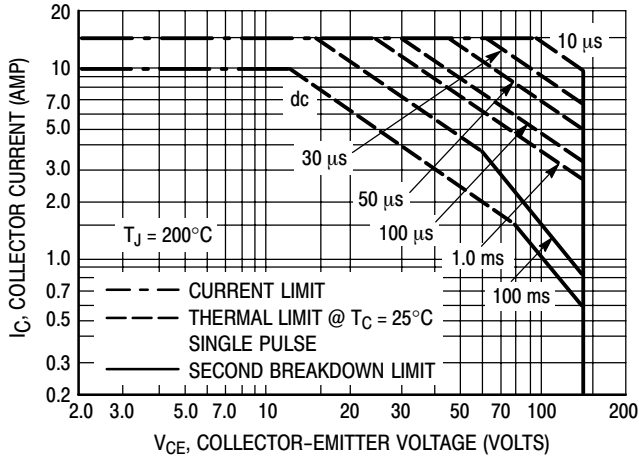


Figure 2. 2N3442

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 2 is based on $T_{J(pk)} = 200^\circ\text{C}$; T_C is variable depending on conditions. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

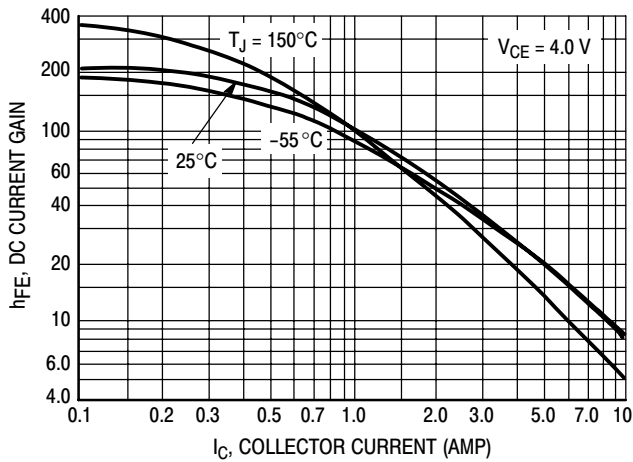


Figure 3. DC Current Gain

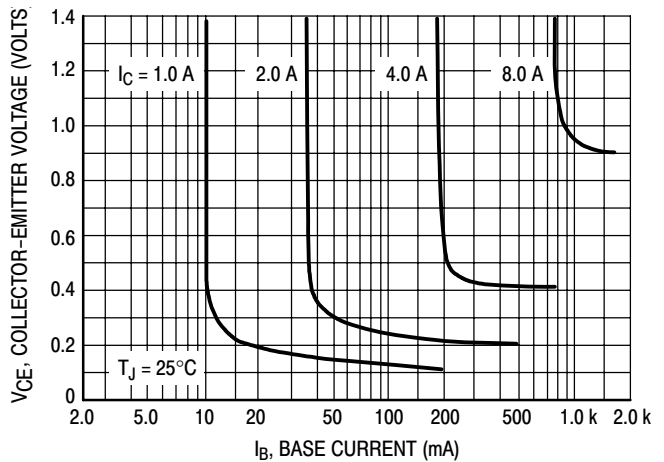
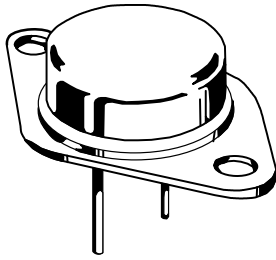


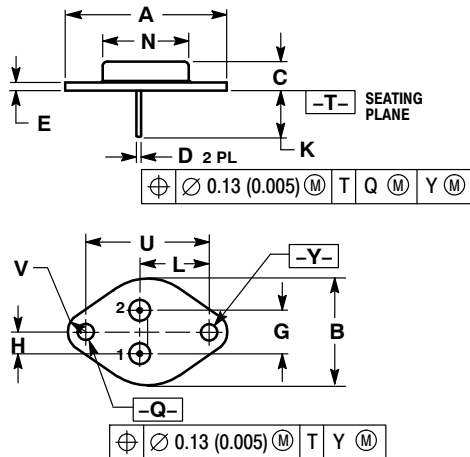
Figure 4. Collector-Saturation Region



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

DATE 10 MAR 2000

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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