

2N5883, 2N5884 (PNP) 2N5885, 2N5886 (NPN)

2N5884 and 2N5886 are Preferred Devices

Complementary Silicon High-Power Transistors

Complementary silicon high-power transistors are designed for general-purpose power amplifier and switching applications.

Features

- Low Collector–Emitter Saturation Voltage –
 $V_{CE(sat)} = 1.0 \text{ Vdc}$, (max) at $I_C = 15 \text{ Adc}$
- Low Leakage Current
 $I_{CEX} = 1.0 \text{ mAdc}$ (max) at Rated Voltage
- Excellent DC Current Gain –
 $h_{FE} = 20$ (min) at $I_C = 10 \text{ Adc}$
- High Current Gain Bandwidth Product –
 $f_T = 4.0 \text{ MHz}$ (min) at $I_C = 1.0 \text{ Adc}$
- Pb–Free Packages are Available*

MAXIMUM RATINGS (Note 1)

| Rating | Symbol | Value | Unit |
|--|----------------|-------------|--------------------------|
| Collector–Emitter Voltage 2N5883, 2N5885 2N5884, 2N5886 | V_{CEO} | 60 80 | Vdc |
| Collector–Base Voltage 2N5883, 2N5885 2N5884, 2N5886 | V_{CB} | 60 80 | Vdc |
| Emitter–Base Voltage | V_{EB} | 5.0 | Vdc |
| Collector Current – Continuous Peak | I_C | 25 50 | Adc |
| Base Current | I_B | 7.5 | Adc |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 200 1.15 | 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 | $^\circ\text{C}/\text{W}$ |

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.

1. Indicates JEDEC registered data. Units and conditions differ on some parameters and re–registration reflecting these changes has been requested. All above values most or exceed present JEDEC registered data.

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



ON Semiconductor®

<http://onsemi.com>

25 AMPERE COMPLEMENTARY SILICON POWER TRANSISTORS 60 – 80 VOLTS, 200 WATTS



TO–204AA (TO–3)
CASE 1–07
STYLE 1

MARKING DIAGRAM



2N588x = Device Code
x = 3, 4, 5, or 6
G = Pb–Free Package
A = Assembly Location
YY = Year
WW = Work Week
MEX = Country of Origin

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

Preferred devices are recommended choices for future use and best overall value.

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ELECTRICAL CHARACTERISTICS (Note 2) ($T_C = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic | | Symbol | Min | Max | Unit |
|--|--|---------------|------------------|------------------------|------|
| Collector-Emitter Sustaining Voltage (Note 3) ($I_C = 200\text{ mA}$, $I_B = 0$) | 2N5883, 2N5885 2N5884, 2N5886 | $V_{CE(sus)}$ | 60 80 | – – | Vdc |
| Collector Cutoff Current ($V_{CE} = 30\text{ Vdc}$, $I_B = 0$) ($V_{CE} = 40\text{ Vdc}$, $I_B = 0$) | 2N5883, 2N5885 2N5884, 2N5886 | I_{CEO} | – – | 2.0 2.0 | mA |
| Collector Cutoff Current ($V_{CE} = 60\text{ Vdc}$, $V_{BE(off)} = 1.5\text{ Vdc}$) ($V_{CE} = 80\text{ Vdc}$, $V_{BE(off)} = 1.5\text{ Vdc}$) ($V_{CE} = 60\text{ Vdc}$, $V_{BE(off)} = 1.5\text{ Vdc}$, $T_C = 150^\circ\text{C}$) ($V_{CE} = 80\text{ Vdc}$, $V_{BE(off)} = 1.5\text{ Vdc}$, $T_C = 150^\circ\text{C}$) | 2N5883, 2N5885 2N5884, 2N5886 2N5883, 2N5885 2N5884, 2N5886 | I_{CEX} | – – – – | 1.0 1.0 10 10 | mA |
| Collector Cutoff Current ($V_{CB} = 60\text{ Vdc}$, $I_E = 0$) ($V_{CB} = 80\text{ Vdc}$, $I_E = 0$) | 2N5883, 2N5885 2N5884, 2N5886 | I_{CBO} | – – | 1.0 1.0 | mA |
| Emitter Cutoff Current ($V_{EB} = 5.0\text{ Vdc}$, $I_C = 0$) | | I_{EBO} | – | 1.0 | mA |

ON CHARACTERISTICS

| | | | | |
|--|---------------|-----------------|------------|-----|
| DC Current Gain (Note 3) ($I_C = 3.0\text{ A}$, $V_{CE} = 4.0\text{ Vdc}$) ($I_C = 10\text{ A}$, $V_{CE} = 4.0\text{ Vdc}$) ($I_C = 25\text{ A}$, $V_{CE} = 4.0\text{ Vdc}$) | h_{FE} | 35 20 4.0 | – 100 | – |
| Collector-Emitter Saturation Voltage (Note 3) ($I_C = 15\text{ A}$, $I_B = 1.5\text{ A}$) ($I_C = 25\text{ A}$, $I_B = 6.25\text{ A}$) | $V_{CE(sat)}$ | – – | 1.0 4.0 | Vdc |
| Base-Emitter Saturation Voltage (Note 3) ($I_C = 25\text{ A}$, $I_B = 6.25\text{ A}$) | $V_{BE(sat)}$ | – | 2.5 | Vdc |
| Base-Emitter On Voltage (Note 3) ($I_C = 10\text{ A}$, $V_{CE} = 4.0\text{ Vdc}$) | $V_{BE(on)}$ | – | 1.5 | Vdc |

DYNAMIC CHARACTERISTICS

| | | | | |
|---|----------|--------|-------------|-----|
| Current-Gain - Bandwidth Product (Note 4) ($I_C = 1.0\text{ A}$, $V_{CE} = 10\text{ Vdc}$, $f_{test} = 1.0\text{ MHz}$) | f_T | 4.0 | – | MHz |
| Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$) | C_{ob} | – – | 1000 500 | pF |
| Small-Signal Current Gain ($I_C = 3.0\text{ A}$, $V_{CE} = 4.0\text{ Vdc}$, $f_{test} = 1.0\text{ kHz}$) | h_{fe} | 20 | – | – |

SWITCHING CHARACTERISTICS

| | | | | | |
|--------------|---|-------|---|-----|---------------|
| Rise Time | $(V_{CC} = 30\text{ Vdc}, I_C = 10\text{ A}, I_{B1} = I_{B2} = 1.0\text{ A})$ | t_r | – | 0.7 | μs |
| Storage Time | | t_s | – | 1.0 | μs |
| Fall Time | | t_f | – | 0.8 | μs |

2. Indicates JEDEC Registered Data.

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

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



Figure 1. Power Derating

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FOR CURVES OF FIGURES 3 & 6, R_B & R_L ARE VARIED.
 INPUT LEVELS ARE APPROXIMATELY AS SHOWN.
 FOR NPN, REVERSE ALL POLARITIES.

Figure 2. Switching Time Equivalent Test Circuits



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

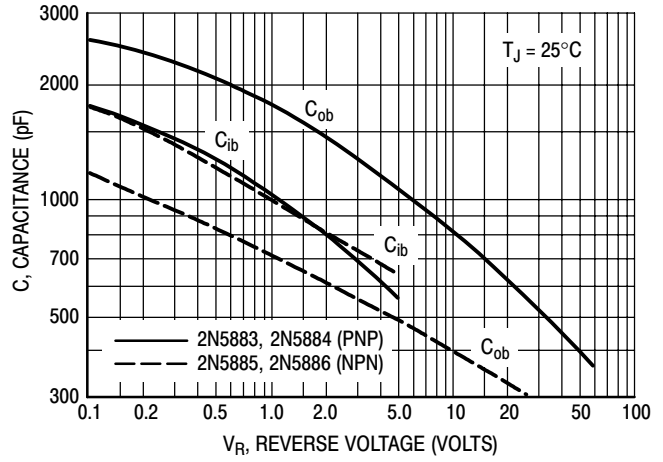


Figure 7. Capacitance

PNP DEVICES
2N5883 and 2N5884



Figure 8. DC Current Gain

NPN DEVICES
2N5885 and 2N5886



Figure 9. DC Current Gain

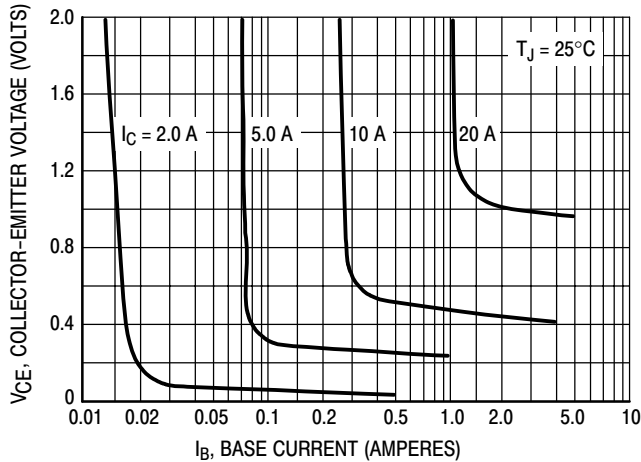


Figure 10. Collector Saturation Region

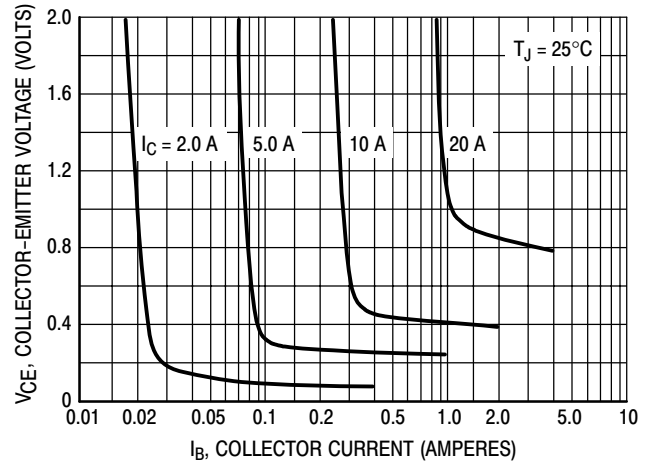


Figure 11. Collector Saturation Region

2N5883, 2N5884 (PNP) 2N5885, 2N5886 (NPN)



Figure 12. "On" Voltages

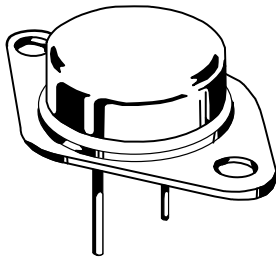


Figure 13. "On" Voltages

ORDERING INFORMATION

| Device | Package | Shipping |
|---------|---------------------|------------------|
| 2N5883 | TO-204 | 100 Units / Tray |
| 2N5883G | TO-204 (Pb-Free) | |
| 2N5884 | TO-204 | |
| 2N5884G | TO-204 (Pb-Free) | |
| 2N5885 | TO-204 | |
| 2N5885G | TO-204 (Pb-Free) | |
| 2N5886 | TO-204 | |
| 2N5886G | TO-204 (Pb-Free) | |

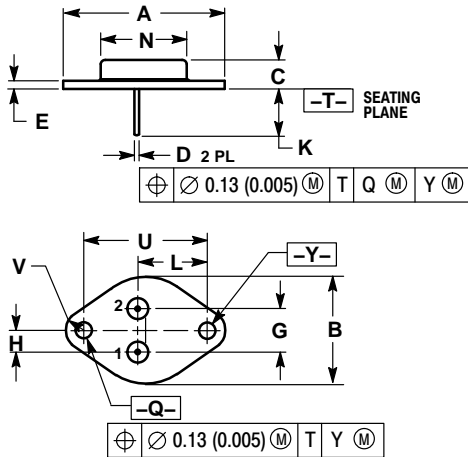
MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



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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