

High Power NPN Silicon Power Transistors

... designed for linear amplifiers, series pass regulators, and inductive switching applications.

- Forward Biased Second Breakdown Current Capability
 $I_{S/b} = 3.75 \text{ Adc @ } V_{CE} = 40 \text{ Vdc} \text{ — } 2N3771$
 $= 2.5 \text{ Adc @ } V_{CE} = 60 \text{ Vdc} \text{ — } 2N3772$

*MAXIMUM RATINGS

| Rating | Symbol | 2N3771 | 2N3772 | Unit |
|--|----------------|--------------|-----------|------------------------------|
| Collector-Emitter Voltage | V_{CEO} | 40 | 60 | Vdc |
| Collector-Emitter Voltage | V_{CEX} | 50 | 80 | Vdc |
| Collector-Base Voltage | V_{CB} | 50 | 100 | Vdc |
| Emitter-Base Voltage | V_{EB} | 5.0 | 7.0 | Vdc |
| Collector Current — Continuous Peak | I_C | 30 30 | 20 30 | A dc |
| Base Current — Continuous Peak | I_B | 7.5 15 | 5.0 15 | A dc |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 150 0.855 | | Watts W/ $^\circ\text{C}$ |
| Operating and Storage Junction Temperature Range | T_J, T_{stg} | -65 to +200 | | $^\circ\text{C}$ |

THERMAL CHARACTERISTICS

| Characteristics | Symbol | 2N3771, 2N3772 | Unit |
|--------------------------------------|---------------|----------------|--------------------|
| Thermal Resistance, Junction to Case | θ_{JC} | 1.17 | $^\circ\text{C/W}$ |

* Indicates JEDEC Registered Data.

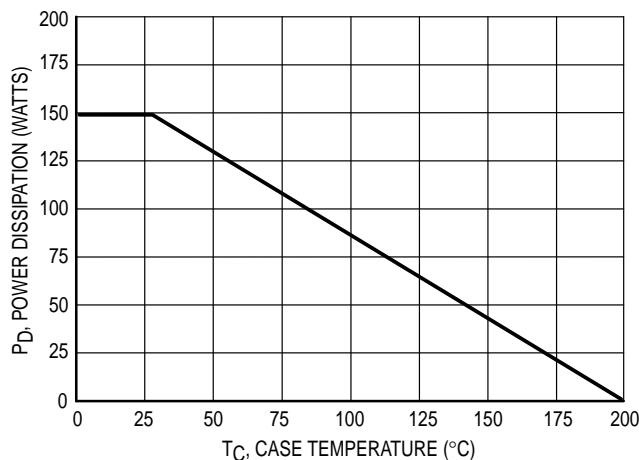


Figure 1. Power Derating

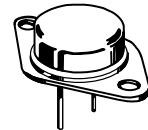
Preferred devices are Motorola recommended choices for future use and best overall value.

REV 7

2N3771*
2N3772

*Motorola Preferred Device

**20 and 30 AMPERE
POWER TRANSISTORS
NPN SILICON
40 and 60 VOLTS
150 WATTS**



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

2N3771 2N3772

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

| Characteristic | Symbol | Min | Max | Unit | |
|--|--|-----------------------|------------------------|-------------------------------|------|
| OFF CHARACTERISTICS | | | | | |
| *Collector–Emitter Sustaining Voltage (1) (I _C = 0.2 Adc, I _B = 0) | 2N3771 2N3772 | V _{CEO(sus)} | 40 60 | — — | Vdc |
| Collector–Emitter Sustaining Voltage (I _C = 0.2 Adc, V _{EB(off)} = 1.5 Vdc, R _{BE} = 100 Ohms) | 2N3771 2N3772 | V _{CEx(sus)} | 50 80 | — — | Vdc |
| Collector–Emitter Sustaining Voltage (I _C = 0.2 Adc, R _{BE} = 100 Ohms) | 2N3771 2N3772 | V _{CER(sus)} | 45 70 | — — | Vdc |
| *Collector Cutoff Current (V _{CE} = 30 Vdc, I _B = 0) (V _{CE} = 50 Vdc, I _B = 0) (V _{CE} = 25 Vdc, I _B = 0) | 2N3771 2N3772 | I _{CEO} | — — | 10 10 | mAdc |
| *Collector Cutoff Current (V _{CE} = 50 Vdc, V _{EB(off)} = 1.5 Vdc) (V _{CE} = 100 Vdc, V _{EB(off)} = 1.5 Vdc) (V _{CE} = 45 Vdc, V _{EB(off)} = 1.5 Vdc) (V _{CE} = 30 Vdc, V _{EB(off)} = 1.5 Vdc, T _C = 150°C) (V _{CE} = 45 Vdc, V _{EB(off)} = 1.5 Vdc, T _C = 150°C) | 2N3771 2N3772 2N6257 2N3771 2N3772 | I _{CEV} | — — — — — | 2.0 5.0 4.0 10 10 | mAdc |
| *Collector Cutoff Current (V _{CB} = 50 Vdc, I _E = 0) (V _{CB} = 100 Vdc, I _E = 0) | 2N3771 2N3772 | I _{CBO} | — — | 2.0 5.0 | mAdc |
| *Emitter Cutoff Current (V _{BE} = 5.0 Vdc, I _C = 0) (V _{BE} = 7.0 Vdc, I _C = 0) | 2N3771 2N3772 | I _{EBO} | — — | 5.0 5.0 | mAdc |
| *ON CHARACTERISTICS | | | | | |
| DC Current Gain (1) (I _C = 15 Adc, V _{CE} = 4.0 Vdc) (I _C = 10 Adc, V _{CE} = 4.0 Vdc) (I _C = 8.0 Adc, V _{CE} = 4.0 Vdc) (I _C = 30 Adc, V _{CE} = 4.0 Vdc) (I _C = 20 Adc, V _{CE} = 4.0 Vdc) | 2N3771 2N3772 2N3771 2N3772 | h _{FE} | 15 15 5.0 5.0 | 60 60 — — | — |
| Collector–Emitter Saturation Voltage (I _C = 15 Adc, I _B = 1.5 Adc) (I _C = 10 Adc, I _B = 1.0 Adc) (I _C = 30 Adc, I _B = 6.0 Adc) (I _C = 20 Adc, I _B = 4.0 Adc) | 2N3771 2N3772 2N3771 2N3772 | V _{CE(sat)} | — — — — | 2.0 1.4 4.0 4.0 | Vdc |
| Base–Emitter On Voltage (I _C = 15 Adc, V _{CE} = 4.0 Vdc) (I _C = 10 Adc, V _{CE} = 4.0 Vdc) (I _C = 8.0 Adc, V _{CE} = 4.0 Vdc) | 2N3771 2N3772 | V _{BE(on)} | — — | 2.7 2.2 | Vdc |
| *DYNAMIC CHARACTERISTICS | | | | | |
| Current–Gain — Bandwidth Product (I _C = 1.0 Adc, V _{CE} = 4.0 Vdc, f _{test} = 50 kHz) | | f _T | 0.2 | — | MHz |
| Small–Signal Current Gain (I _C = 1.0 Adc, V _{CE} = 4.0 Vdc, f = 1.0 kHz) | | h _{fe} | 40 | — | — |
| SECOND BREAKDOWN | | | | | |
| Second Breakdown Energy with Base Forward Biased, t = 1.0 s (non–repetitive) (V _{CE} = 40 Vdc) (V _{CE} = 60 Vdc) | 2N3771 2N3772 | I _{S/b} | 3.75 2.5 | — — | Adc |

* Indicates JEDEC Registered Data.

(1) Pulse Test: 300 μs, Rep. Rate 60 cps.

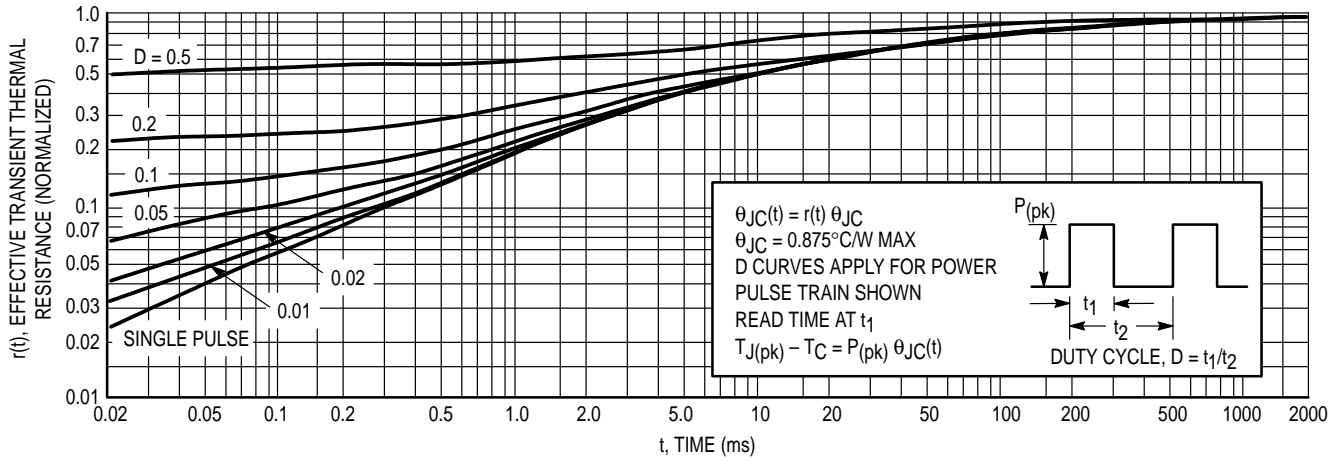


Figure 2. Thermal Response — 2N3771, 2N3772

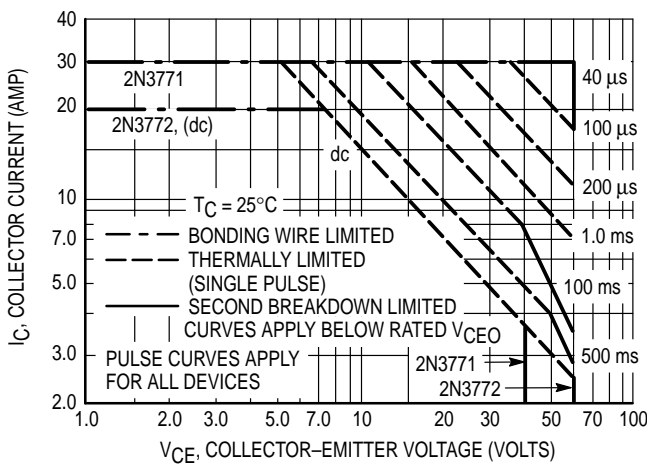


Figure 3. Active-Region Safe Operating Area — 2N3771, 2N3772

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.

Figure 3 is based on JEDEC registered Data. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} < 200^{\circ}\text{C}$. $T_{J(pk)}$ may be calculated from the data of Figure 2. Using data of Figure 2 and the pulse power limits of Figure 3, $T_{J(pk)}$ will be found to be less than $T_{J(max)}$ for pulse widths of 1 ms and less. When using Motorola transistors, it is permissible to increase the pulse power limits until limited by $T_{J(max)}$.

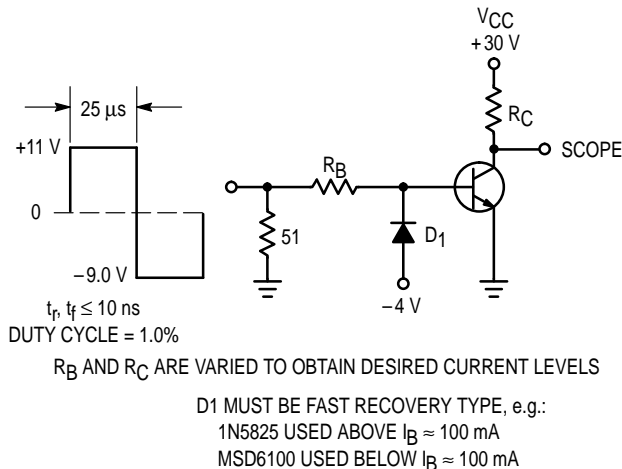


Figure 4. Switching Time Test Circuit

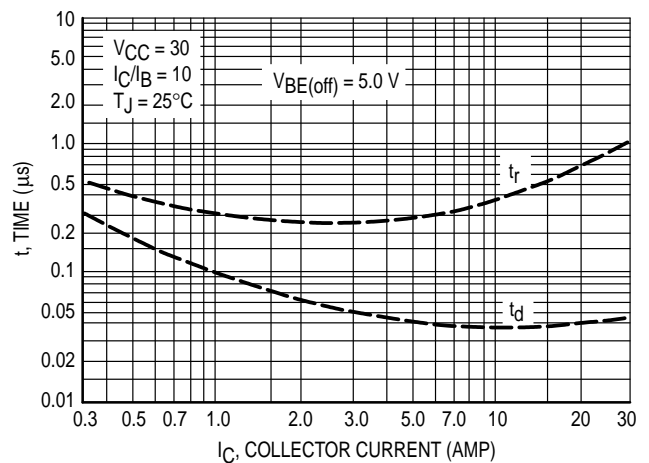


Figure 5. Turn-On Time

2N3771 2N3772

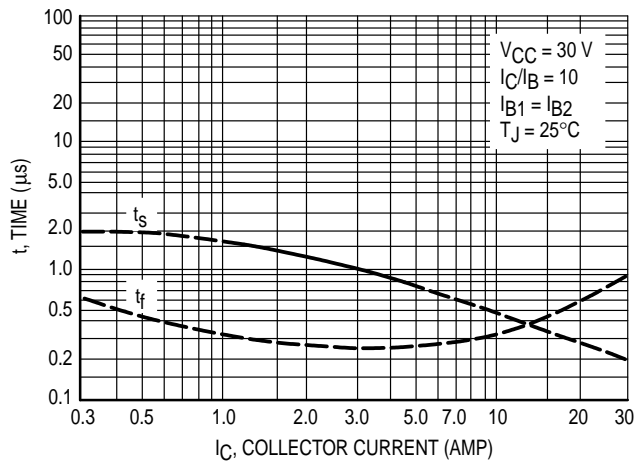


Figure 6. Turn-Off Time

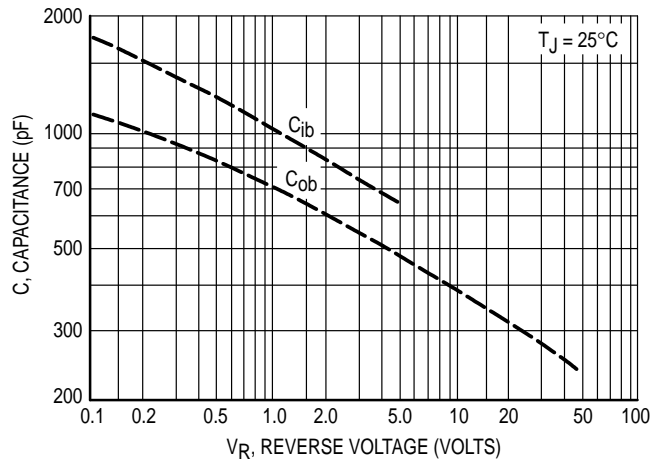


Figure 7. Capacitance

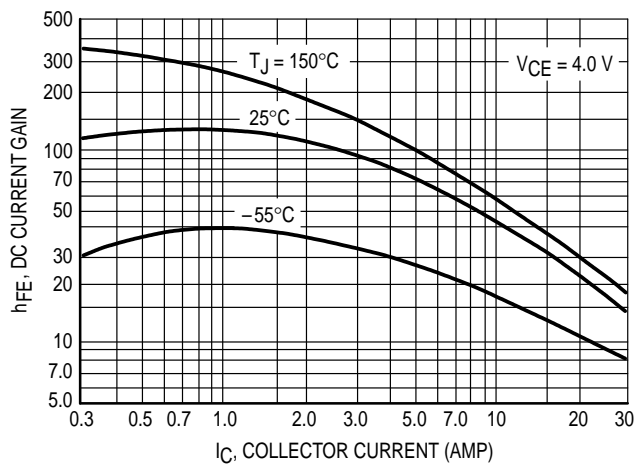


Figure 8. DC Current Gain

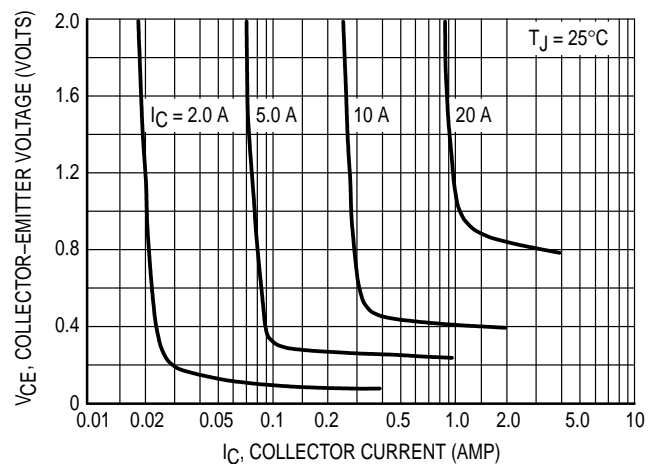
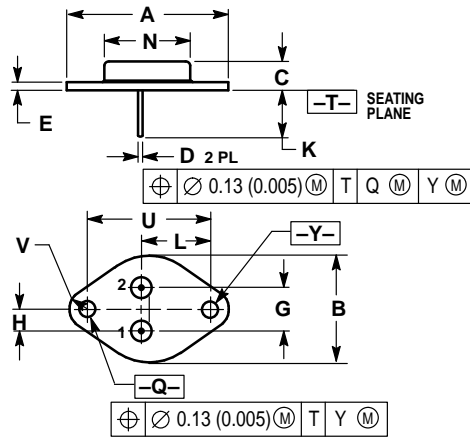


Figure 9. Collector Saturation Region

PACKAGE DIMENSIONS




- 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 |

STYLE 1:
 PIN 1. BASE
 2. EMITTER
 CASE: COLLECTOR

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

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

How to reach us:

USA / EUROPE: Motorola Literature Distribution;
P.O. Box 20912; Phoenix, Arizona 85036. 1-800-441-2447

JAPAN: Nippon Motorola Ltd.; Tatsumi-SPD-JLDC, Toshikatsu Otsuki,
6F Seibu-Butsuryu-Center, 3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 03-3521-8315

MFAX: RMFAX0@email.sps.mot.com - TOUCHTONE (602) 244-6609
INTERNET: <http://Design-NET.com>

HONG KONG: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298

