

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.

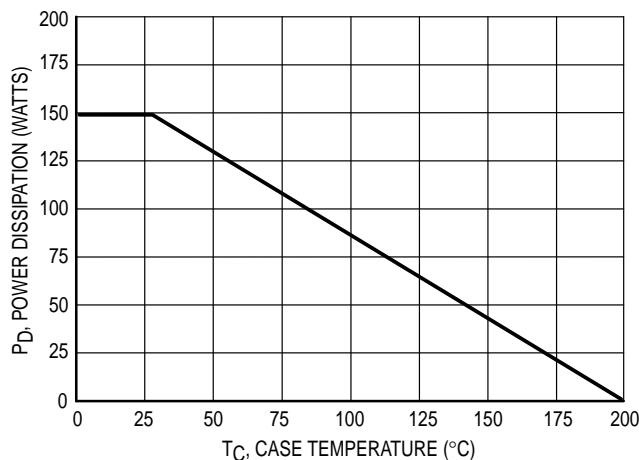


Figure 1. Power Derating

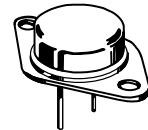
Preferred devices are Motorola recommended choices for future use and best overall value.

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

Characteristic	Symbol	Min	Max	Unit	
OFF CHARACTERISTICS					
*Collector–Emitter Sustaining Voltage (1) ($I_C = 0.2\text{ A dc}$, $I_B = 0$)	2N3771 2N3772	$V_{CEO(sus)}$	40 60	— —	Vdc
Collector–Emitter Sustaining Voltage ($I_C = 0.2\text{ A dc}$, $V_{EB(off)} = 1.5\text{ Vdc}$, $R_{BE} = 100\text{ Ohms}$)	2N3771 2N3772	$V_{CEX(sus)}$	50 80	— —	Vdc
Collector–Emitter Sustaining Voltage ($I_C = 0.2\text{ A dc}$, $R_{BE} = 100\text{ Ohms}$)	2N3771 2N3772	$V_{CER(sus)}$	45 70	— —	Vdc
*Collector Cutoff Current ($V_{CE} = 30\text{ Vdc}$, $I_B = 0$) ($V_{CE} = 50\text{ Vdc}$, $I_B = 0$) ($V_{CE} = 25\text{ Vdc}$, $I_B = 0$)	2N3771 2N3772	I_{CEO}	— —	10 10	mAdc
*Collector Cutoff Current ($V_{CE} = 50\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$) ($V_{CE} = 100\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$) ($V_{CE} = 45\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$) ($V_{CE} = 30\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$, $T_C = 150^\circ\text{C}$) ($V_{CE} = 45\text{ Vdc}$, $V_{EB(off)} = 1.5\text{ Vdc}$, $T_C = 150^\circ\text{C}$)	2N3771 2N3772 2N6257 2N3771 2N3772	I_{CEV}	— — — — —	2.0 5.0 4.0 10 10	mAdc
*Collector Cutoff Current ($V_{CB} = 50\text{ Vdc}$, $I_E = 0$) ($V_{CB} = 100\text{ Vdc}$, $I_E = 0$)	2N3771 2N3772	I_{CBO}	— —	2.0 5.0	mAdc
*Emitter Cutoff Current ($V_{BE} = 5.0\text{ Vdc}$, $I_C = 0$) ($V_{BE} = 7.0\text{ Vdc}$, $I_C = 0$)	2N3771 2N3772	I_{EBO}	— —	5.0 5.0	mAdc
*ON CHARACTERISTICS					
DC Current Gain (1) ($I_C = 15\text{ A dc}$, $V_{CE} = 4.0\text{ Vdc}$) ($I_C = 10\text{ A dc}$, $V_{CE} = 4.0\text{ Vdc}$) ($I_C = 8.0\text{ A dc}$, $V_{CE} = 4.0\text{ Vdc}$) ($I_C = 30\text{ A dc}$, $V_{CE} = 4.0\text{ Vdc}$) ($I_C = 20\text{ A dc}$, $V_{CE} = 4.0\text{ Vdc}$)	2N3771 2N3772 2N3771 2N3772	h_{FE}	15 15 5.0 5.0	60 60 — —	—
Collector–Emitter Saturation Voltage ($I_C = 15\text{ A dc}$, $I_B = 1.5\text{ A dc}$) ($I_C = 10\text{ A dc}$, $I_B = 1.0\text{ A dc}$) ($I_C = 30\text{ A dc}$, $I_B = 6.0\text{ A dc}$) ($I_C = 20\text{ A dc}$, $I_B = 4.0\text{ A dc}$)	2N3771 2N3772 2N3771 2N3772	$V_{CE(sat)}$	— — — —	2.0 1.4 4.0 4.0	Vdc
Base–Emitter On Voltage ($I_C = 15\text{ A dc}$, $V_{CE} = 4.0\text{ Vdc}$) ($I_C = 10\text{ A dc}$, $V_{CE} = 4.0\text{ Vdc}$) ($I_C = 8.0\text{ A dc}$, $V_{CE} = 4.0\text{ Vdc}$)	2N3771 2N3772	$V_{BE(on)}$	— —	2.7 2.2	Vdc
*DYNAMIC CHARACTERISTICS					
Current–Gain — Bandwidth Product ($I_C = 1.0\text{ A dc}$, $V_{CE} = 4.0\text{ Vdc}$, $f_{test} = 50\text{ kHz}$)		f_T	0.2	—	MHz
Small–Signal Current Gain ($I_C = 1.0\text{ A dc}$, $V_{CE} = 4.0\text{ Vdc}$, $f = 1.0\text{ kHz}$)		h_{fe}	40	—	—
SECOND BREAKDOWN					
Second Breakdown Energy with Base Forward Biased, $t = 1.0\text{ s}$ (non–repetitive) ($V_{CE} = 40\text{ Vdc}$) ($V_{CE} = 60\text{ Vdc}$)	2N3771 2N3772	$I_{S/b}$	3.75 2.5	— —	Adc

* Indicates JEDEC Registered Data.

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

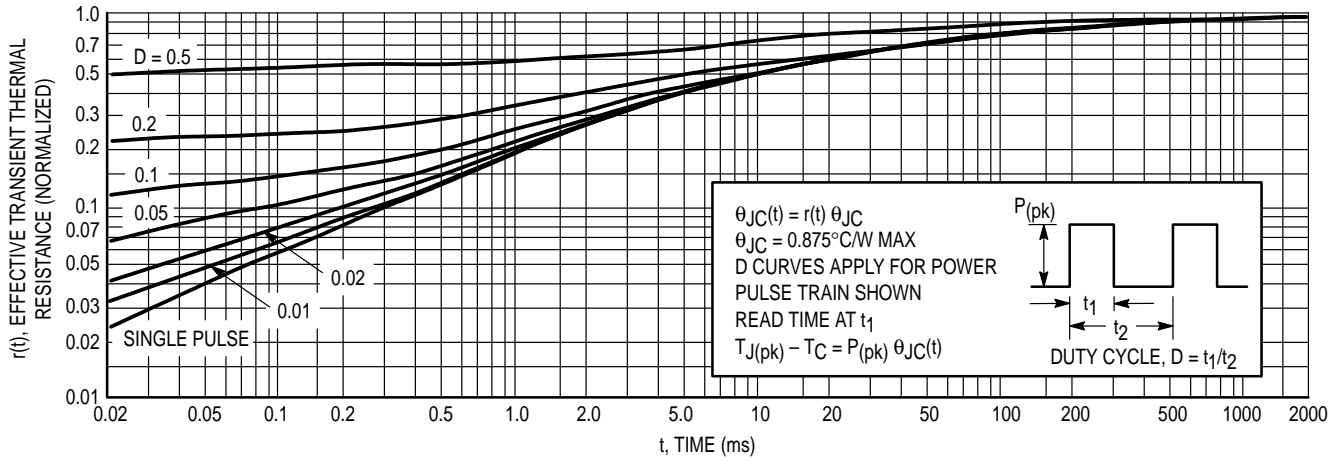


Figure 2. Thermal Response — 2N3771, 2N3772

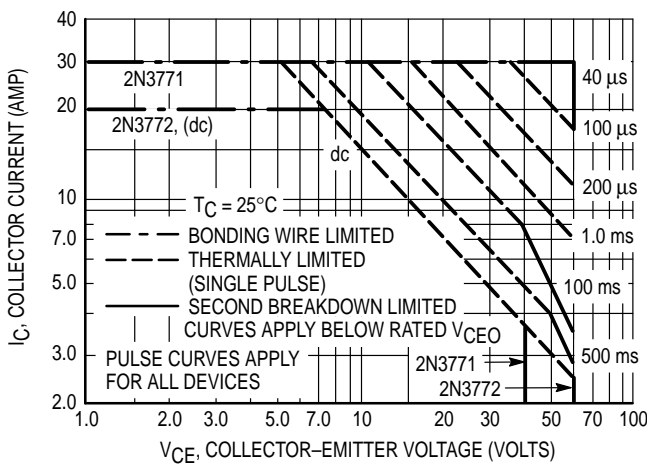


Figure 3. Active-Region Safe Operating Area — 2N3771, 2N3772

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 $T_{J(max)}$.

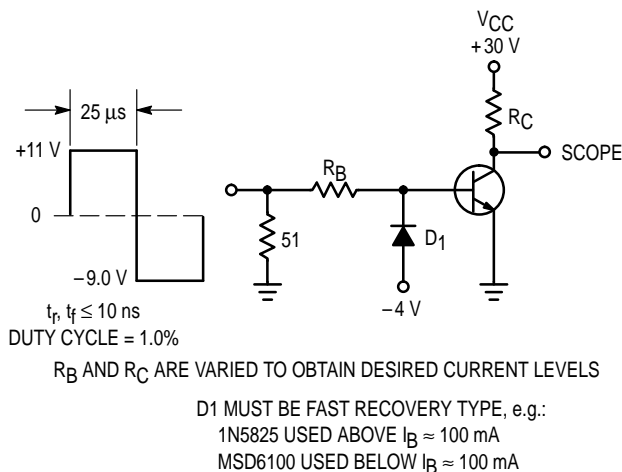


Figure 4. Switching Time Test Circuit

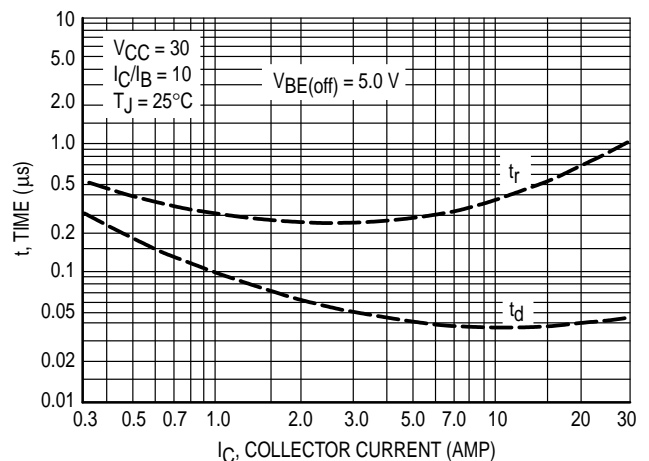


Figure 5. Turn-On Time

2N3771 2N3772

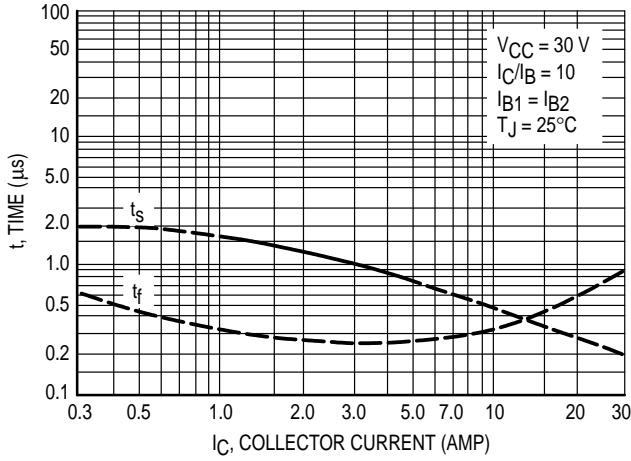


Figure 6. Turn-Off Time

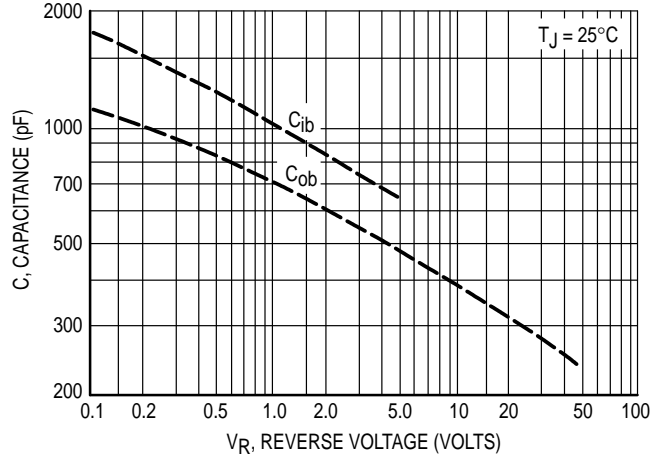


Figure 7. Capacitance

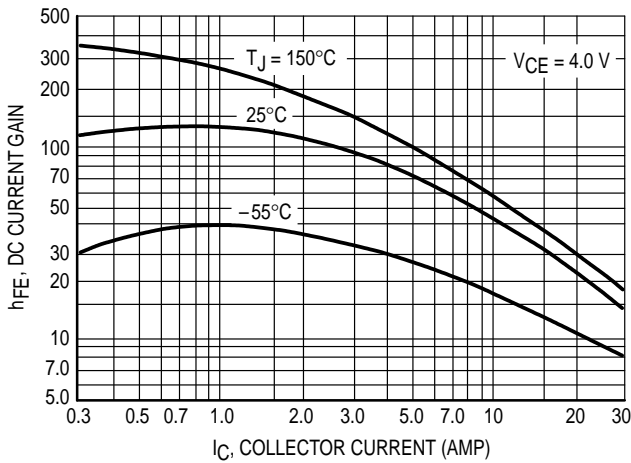


Figure 8. DC Current Gain

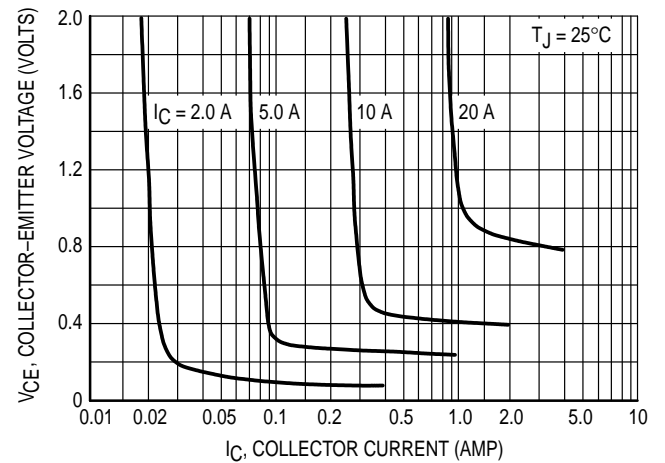
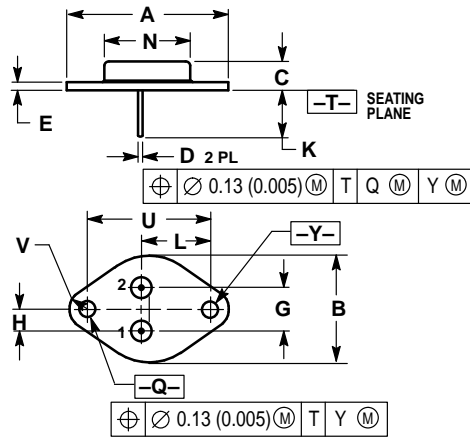


Figure 9. Collector Saturation Region

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

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