

# High Power NPN Silicon Power Transistors

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

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

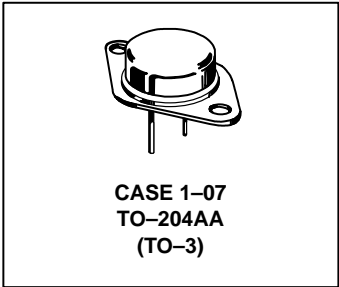
**\*MAXIMUM RATINGS**

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 <sub>dc</sub>
Base Current — Continuous Peak	$I_B$	7.5 15	5.0 15	A <sub>dc</sub>
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	150 0.855		Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	–65 to +200		$^\circ\text{C}$

**2N3771\***  
**2N3772**

\*ON Semiconductor Preferred Device

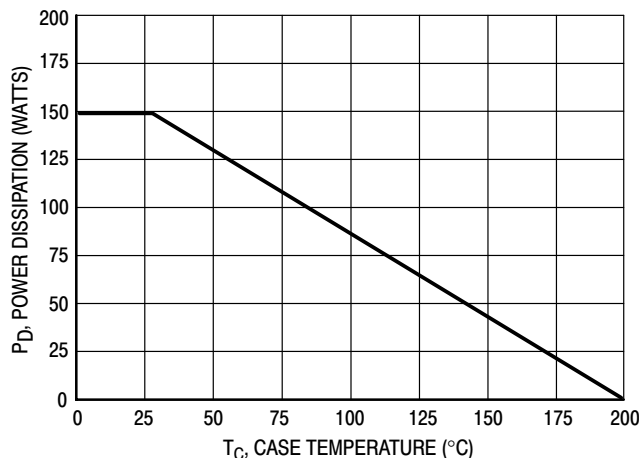
**20 and 30 AMPERE  
POWER TRANSISTORS  
NPN SILICON  
40 and 60 VOLTS  
150 WATTS**



**THERMAL CHARACTERISTICS**

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

\*Indicates JEDEC Registered Data.



**Figure 1. Power Derating**

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

## 2N3771 2N3772

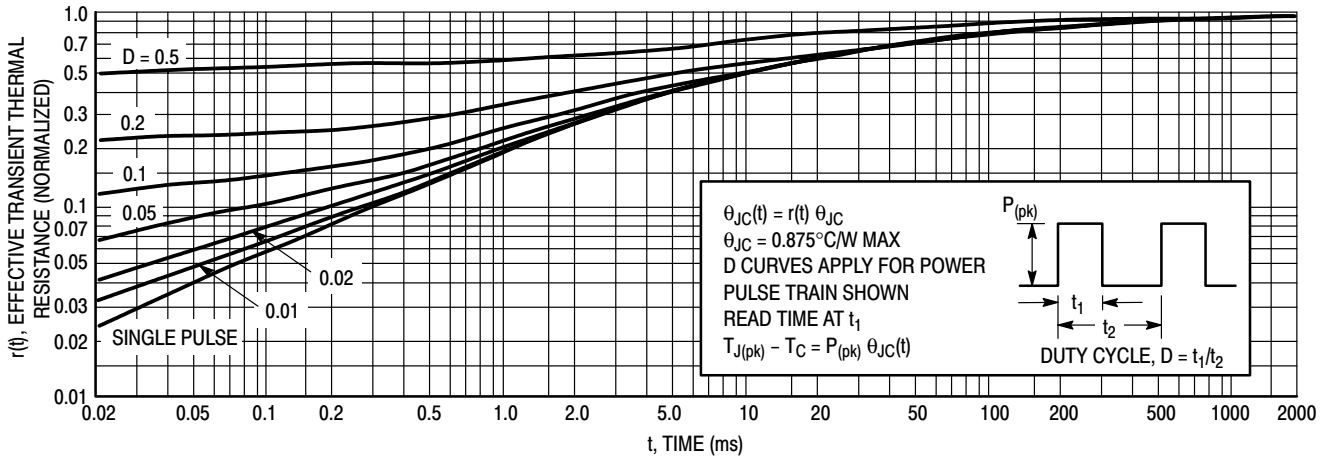
### ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

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

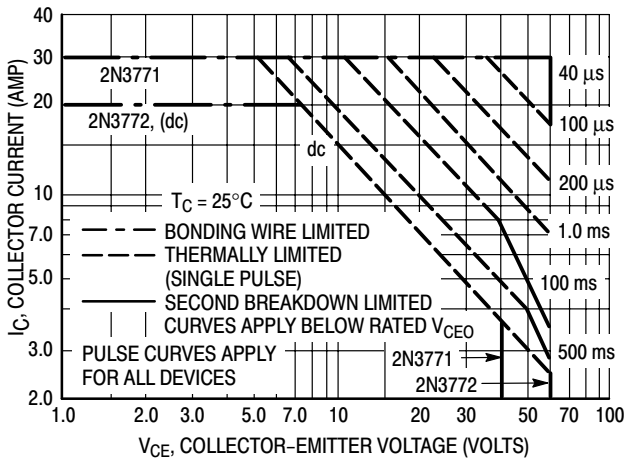
\*Indicates JEDEC Registered Data.

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

## 2N3771 2N3772



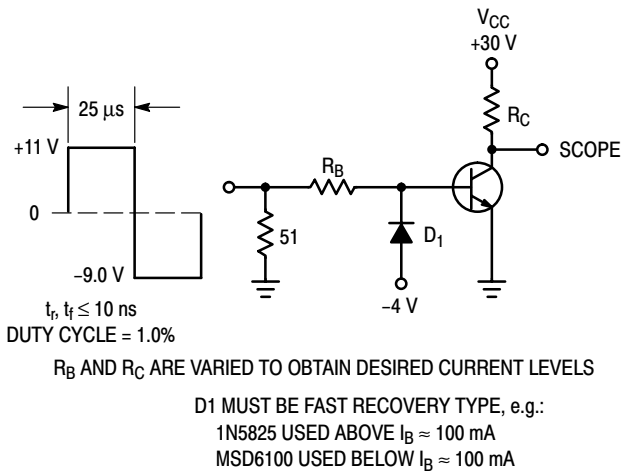
**Figure 2. Thermal Response — 2N3771, 2N3772**



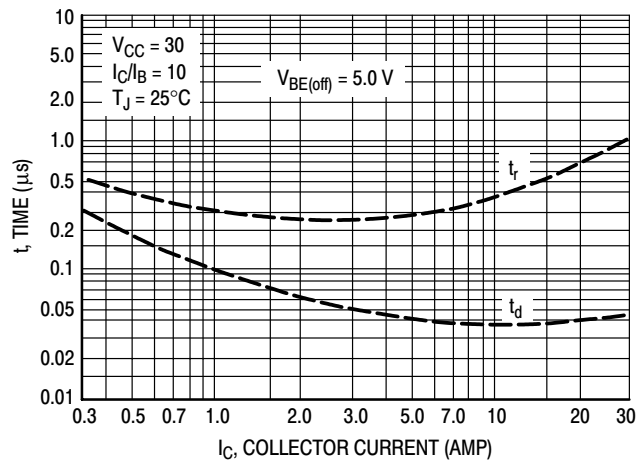
**Figure 3. Active-Region Safe Operating Area — 2N3771, 2N3772**

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 ON Semiconductor 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

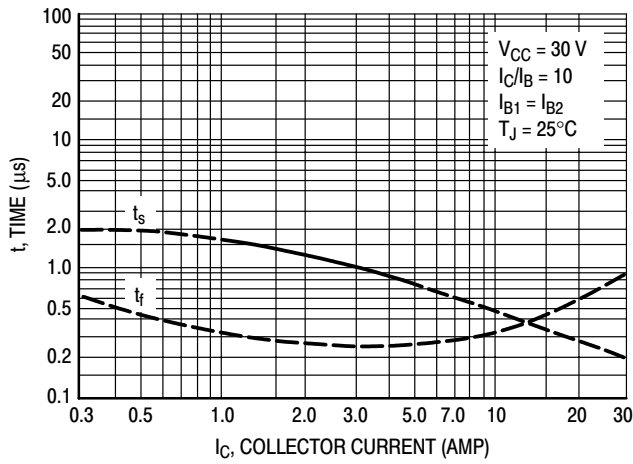


Figure 6. Turn-Off Time

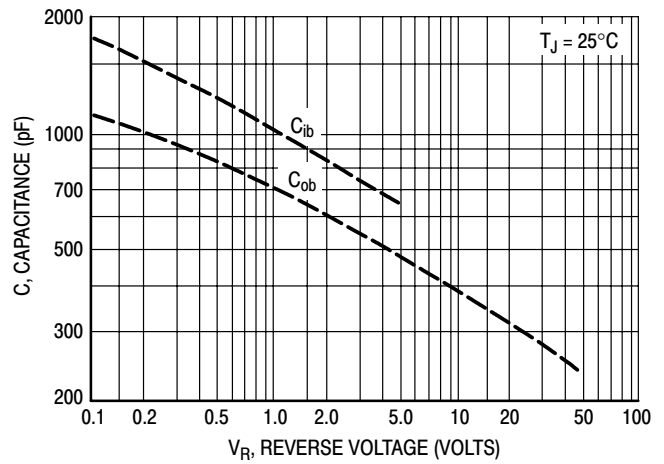


Figure 7. Capacitance

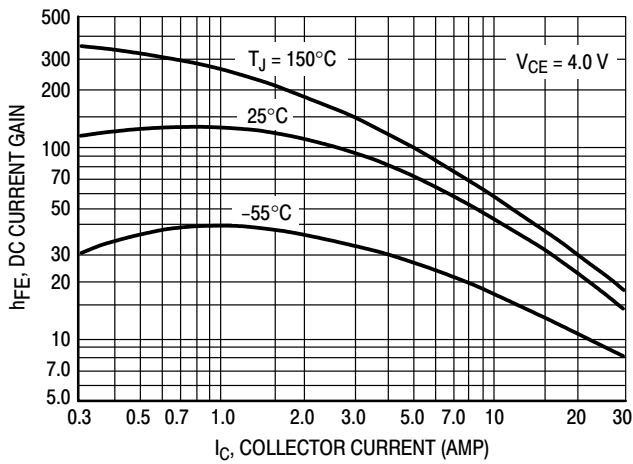


Figure 8. DC Current Gain

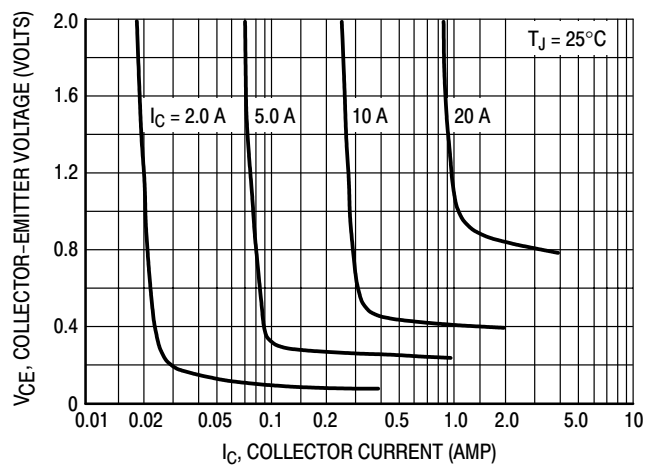
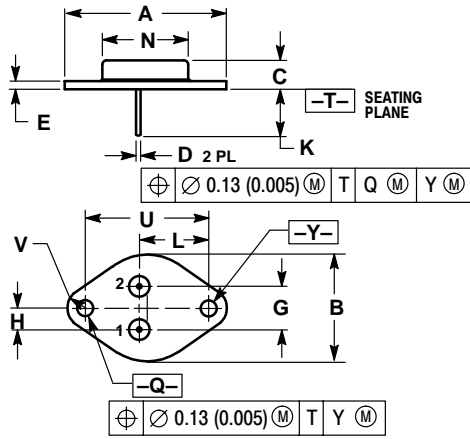


Figure 9. Collector Saturation Region

# 2N3771 2N3772

## PACKAGE DIMENSIONS

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



- 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

## Notes

## Notes

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