

# 2N3771, 2N3772

## High Power NPN Silicon Power Transistors

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

### Features

- Forward Biased Second Breakdown Current Capability  
 $I_{S/b} = 3.75 \text{ Adc @ } V_{CE} = 40 \text{ Vdc} - 2N3771$   
 $= 2.5 \text{ Adc @ } V_{CE} = 60 \text{ Vdc} - 2N3772$
- These Devices are Pb-Free and are RoHS Compliant

### MAXIMUM RATINGS (Note 1)

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	Adc
Base Current – Continuous Peak	$I_B$	7.5 15	5.0 15	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	150 0.855		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	$\theta_{JC}$	1.17	$^\circ\text{C/W}$

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Indicates JEDEC registered data.

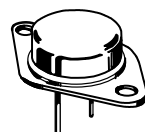


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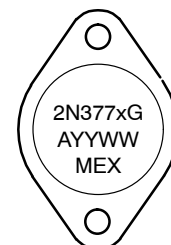
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**20 and 30 AMPERE  
POWER TRANSISTORS  
NPN SILICON  
40 and 60 VOLTS, 150 WATTS**

### MARKING DIAGRAM



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



2N377x = Device Code  
x = 1 or 2  
G = Pb-Free Package  
A = Assembly Location  
YY = Year  
WW = Work Week  
MEX = Country of Origin

### ORDERING INFORMATION

Device	Package	Shipping
2N3771G	TO-204 (Pb-Free)	100 Units / Tray
2N3772G	TO-204 (Pb-Free)	100 Units / Tray

## 2N3771, 2N3772

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

Characteristic		Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector–Emitter Sustaining Voltage (Note 2 and 3) ( $I_C = 0.2\text{ Adc}$ , $I_B = 0$ )	2N3771 2N3772	$V_{CEO(sus)}$	40 60	– –	Vdc
Collector–Emitter Sustaining Voltage ( $I_C = 0.2\text{ Adc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ , $R_{BE} = 100\ \Omega$ )	2N3771 2N3772	$V_{CEX(sus)}$	50 80	– –	Vdc
Collector–Emitter Sustaining Voltage ( $I_C = 0.2\text{ Adc}$ , $R_{BE} = 100\ \Omega$ )	2N3771 2N3772	$V_{CER(sus)}$	45 70	– –	Vdc
Collector Cutoff Current (Note 2) ( $V_{CE} = 30\text{ Vdc}$ , $I_B = 0$ ) ( $V_{CE} = 50\text{ Vdc}$ , $I_B = 0$ ) ( $V_{CE} = 25\text{ Vdc}$ , $I_B = 0$ )	2N3771 2N3772	$I_{CEO}$	– –	10 10	mAdc
Collector Cutoff Current (Note 2) ( $V_{CE} = 50\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ ) ( $V_{CE} = 100\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ ) ( $V_{CE} = 45\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ ) ( $V_{CE} = 30\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ , $T_C = 150^\circ\text{C}$ )  ( $V_{CE} = 45\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ , $T_C = 150^\circ\text{C}$ )	2N3771 2N3772 2N6257 2N3771 2N3772	$I_{CEV}$	– – – – –	2.0 5.0 4.0 10 10	mAdc
Collector Cutoff Current (Note 2) ( $V_{CB} = 50\text{ Vdc}$ , $I_E = 0$ ) ( $V_{CB} = 100\text{ Vdc}$ , $I_E = 0$ )	2N3771 2N3772	$I_{CBO}$	– –	2.0 5.0	mAdc
Emitter Cutoff Current (Note 2) ( $V_{BE} = 5.0\text{ Vdc}$ , $I_C = 0$ ) ( $V_{BE} = 7.0\text{ Vdc}$ , $I_C = 0$ )	2N3771 2N3772	$I_{EBO}$	– –	5.0 5.0	mAdc
<b>ON CHARACTERISTICS</b> (Note 2)					
DC Current Gain (Note 3) ( $I_C = 15\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ ) ( $I_C = 10\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ ) ( $I_C = 8.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ ) ( $I_C = 30\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ ) ( $I_C = 20\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ )	2N3771 2N3772 2N3771 2N3772	$h_{FE}$	15 15 5.0 5.0	60 60 – –	–
Collector–Emitter Saturation Voltage ( $I_C = 15\text{ Adc}$ , $I_B = 1.5\text{ Adc}$ ) ( $I_C = 10\text{ Adc}$ , $I_B = 1.0\text{ Adc}$ ) ( $I_C = 30\text{ Adc}$ , $I_B = 6.0\text{ Adc}$ ) ( $I_C = 20\text{ Adc}$ , $I_B = 4.0\text{ Adc}$ )	2N3771 2N3772 2N3771 2N3772	$V_{CE(sat)}$	– – – –	2.0 1.4 4.0 4.0	Vdc
Base–Emitter On Voltage ( $I_C = 15\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ ) ( $I_C = 10\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ ) ( $I_C = 8.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ )	2N3771 2N3772	$V_{BE(on)}$	– –	2.7 2.2	Vdc
<b>*DYNAMIC CHARACTERISTICS</b> (Note 2)					
Current–Gain — Bandwidth Product ( $I_C = 1.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ , $f_{test} = 50\text{ kHz}$ )		$f_T$	0.2	–	MHz
Small–Signal Current Gain ( $I_C = 1.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )		$h_{fe}$	40	–	–
<b>SECOND BREAKDOWN</b>					
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

2. Indicates JEDEC registered data.

3. Pulse Test: 300  $\mu\text{s}$ , Rep. Rate 60 cps.

## 2N3771, 2N3772

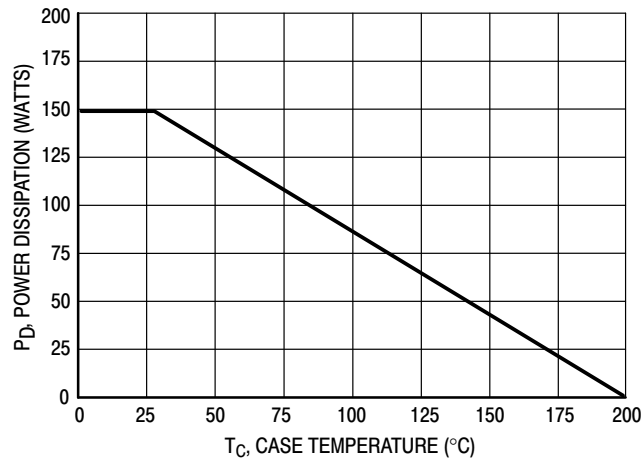


Figure 1. Power Derating

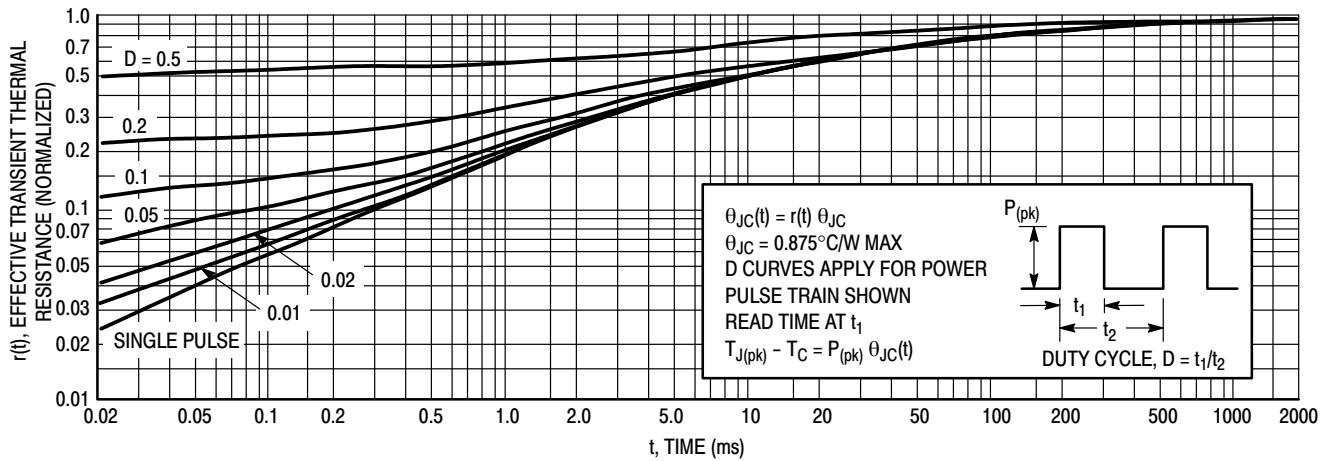


Figure 2. Thermal Response — 2N3771, 2N3772

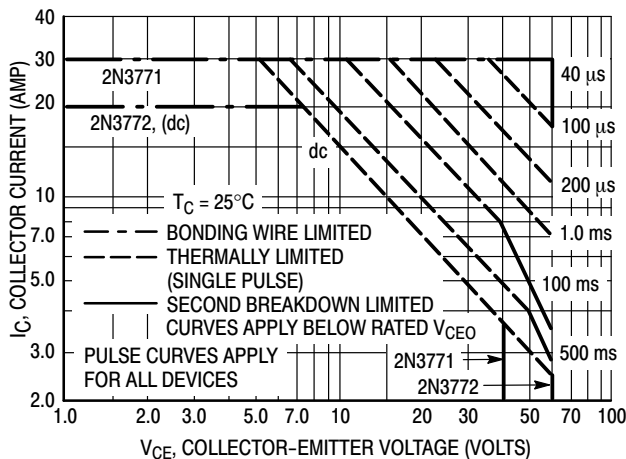


Figure 3. Active-Region Safe Operating Area — 2N3771, 2N3772

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  $T_{J(max)}$ .

# 2N3771, 2N3772

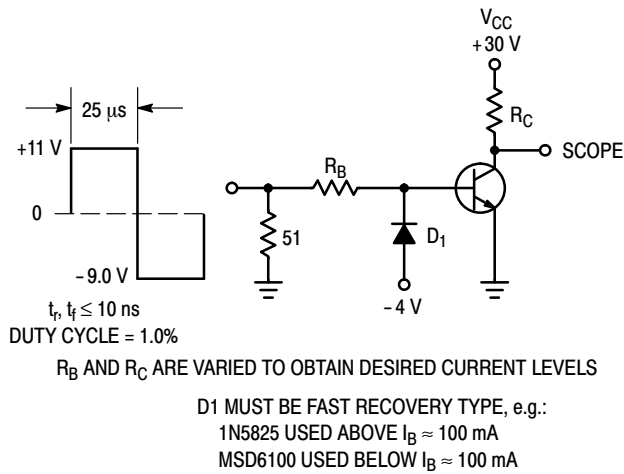


Figure 4. Switching Time Test Circuit

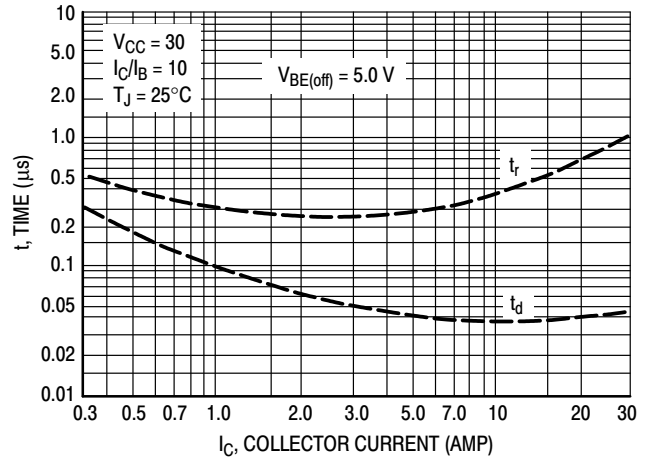


Figure 5. Turn-On Time

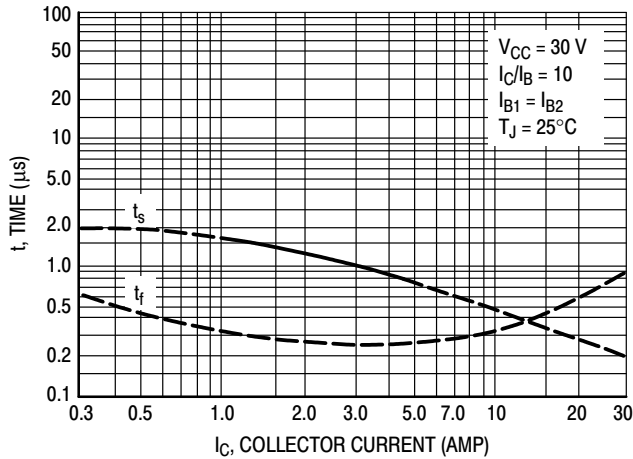


Figure 6. Turn-Off Time

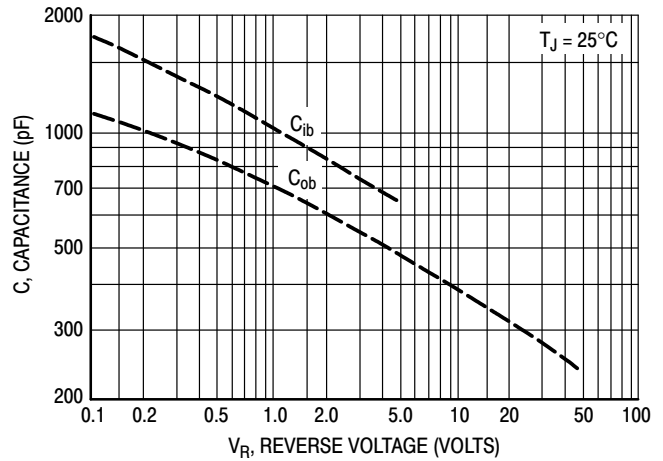


Figure 7. Capacitance

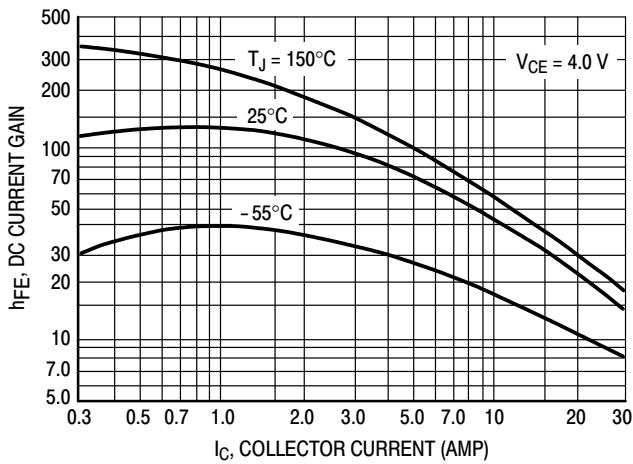


Figure 8. DC Current Gain

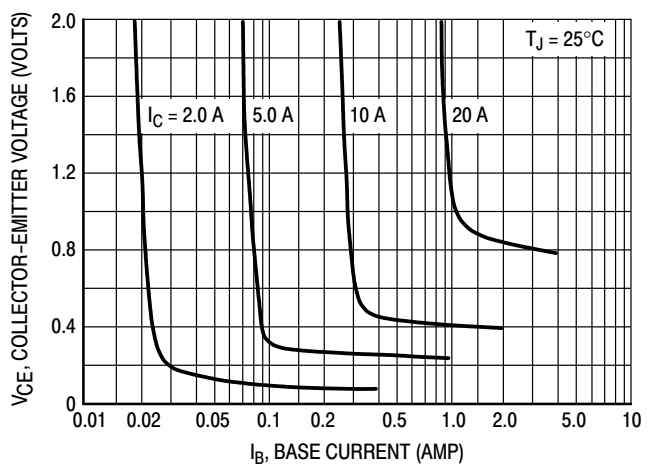
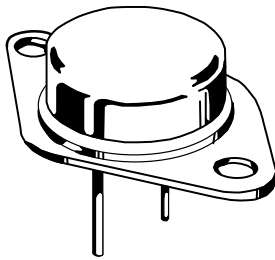


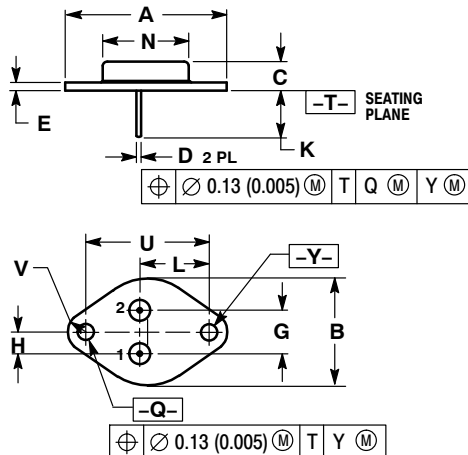
Figure 9. Collector Saturation Region



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

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

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

STYLE 3:  
PIN 1. GATE  
2. SOURCE  
CASE: DRAIN

STYLE 4:  
PIN 1. GROUND  
2. INPUT  
CASE: OUTPUT

STYLE 5:  
PIN 1. CATHODE  
2. EXTERNAL TRIP/DELAY  
CASE: ANODE

STYLE 6:  
PIN 1. GATE  
2. EMITTER  
CASE: COLLECTOR

STYLE 7:  
PIN 1. ANODE  
2. OPEN  
CASE: CATHODE

STYLE 8:  
PIN 1. CATHODE #1  
2. CATHODE #2  
CASE: ANODE

STYLE 9:  
PIN 1. ANODE #1  
2. ANODE #2  
CASE: CATHODE

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