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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	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°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.

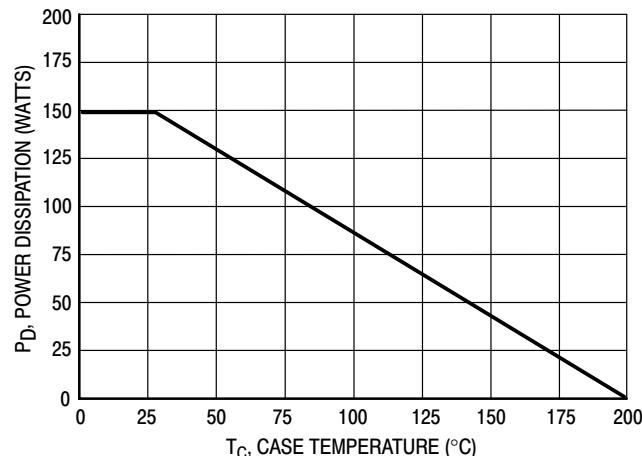


Figure 1. Power Derating

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

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) ($I_C = 0.2 \text{ Adc}$, $I_B = 0$)	2N3771 2N3772	$V_{CEO(\text{sus})}$	40 60	— —
Collector-Emitter Sustaining Voltage ($I_C = 0.2 \text{ Adc}$, $V_{EB(\text{off})} = 1.5 \text{ Vdc}$, $R_{BE} = 100 \text{ Ohms}$)	2N3771 2N3772	$V_{CE(\text{sus})}$	50 80	— —
Collector-Emitter Sustaining Voltage ($I_C = 0.2 \text{ Adc}$, $R_{BE} = 100 \text{ Ohms}$)	2N3771 2N3772	$V_{CE(\text{sus})}$	45 70	— —
*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
*Collector Cutoff Current ($V_{CE} = 50 \text{ Vdc}$, $V_{EB(\text{off})} = 1.5 \text{ Vdc}$) ($V_{CE} = 100 \text{ Vdc}$, $V_{EB(\text{off})} = 1.5 \text{ Vdc}$) ($V_{CE} = 45 \text{ Vdc}$, $V_{EB(\text{off})} = 1.5 \text{ Vdc}$) ($V_{CE} = 30 \text{ Vdc}$, $V_{EB(\text{off})} = 1.5 \text{ Vdc}$, $T_C = 150^\circ\text{C}$) ($V_{CE} = 45 \text{ Vdc}$, $V_{EB(\text{off})} = 1.5 \text{ Vdc}$, $T_C = 150^\circ\text{C}$)	2N3771 2N3772 2N6257 2N3771 2N3772	I_{CEV}	— — — — —	2.0 5.0 4.0 10 10
*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
*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
*ON CHARACTERISTICS				
DC Current Gain (1) ($I_C = 15 \text{ Adc}$, $V_{CE} = 4.0 \text{ Vdc}$) ($I_C = 10 \text{ Adc}$, $V_{CE} = 4.0 \text{ Vdc}$) ($I_C = 8.0 \text{ Adc}$, $V_{CE} = 4.0 \text{ Vdc}$) ($I_C = 30 \text{ Adc}$, $V_{CE} = 4.0 \text{ Vdc}$) ($I_C = 20 \text{ Adc}$, $V_{CE} = 4.0 \text{ Vdc}$)	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	$V_{CE(\text{sat})}$	— — — —	2.0 1.4 4.0 4.0
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	$V_{BE(\text{on})}$	— —	2.7 2.2
*DYNAMIC CHARACTERISTICS				
Current-Gain — Bandwidth Product ($I_C = 1.0 \text{ Adc}$, $V_{CE} = 4.0 \text{ Vdc}$, $f_{\text{test}} = 50 \text{ kHz}$)		f_T	0.2	—
Small-Signal Current Gain ($I_C = 1.0 \text{ Adc}$, $V_{CE} = 4.0 \text{ Vdc}$, $f = 1.0 \text{ kHz}$)		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	— —

*Indicates JEDEC Registered Data.

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

2N3771 2N3772

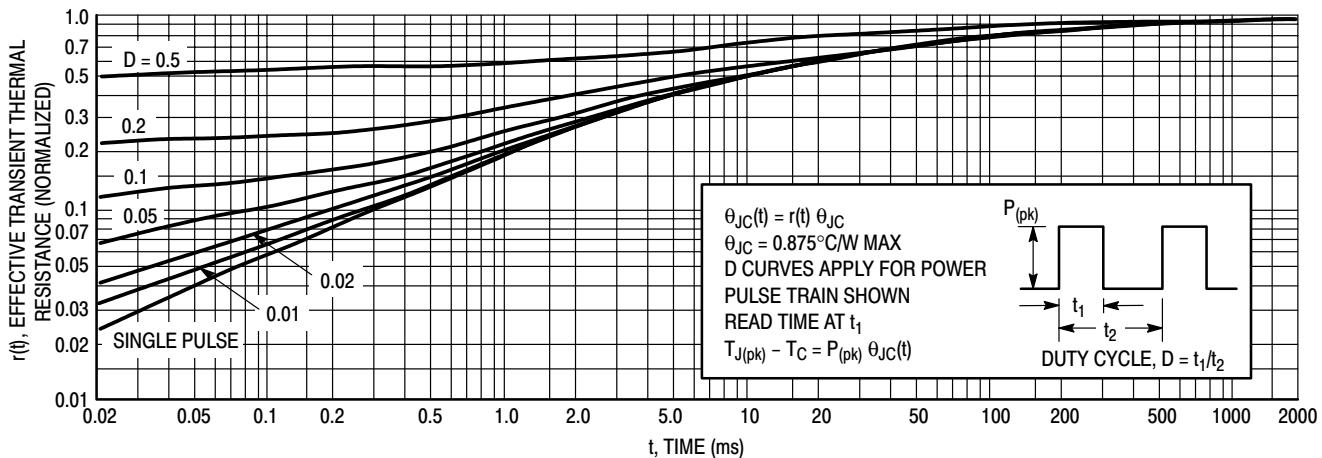


Figure 2. Thermal Response — 2N3771, 2N3772

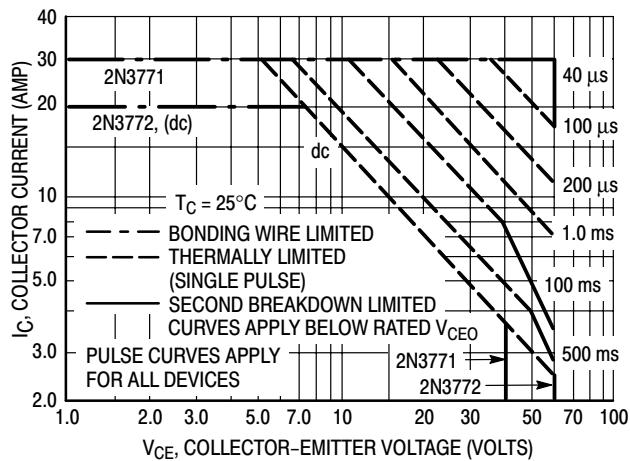


Figure 3. Active-Region Safe Operating Area — 2N3771, 2N3772

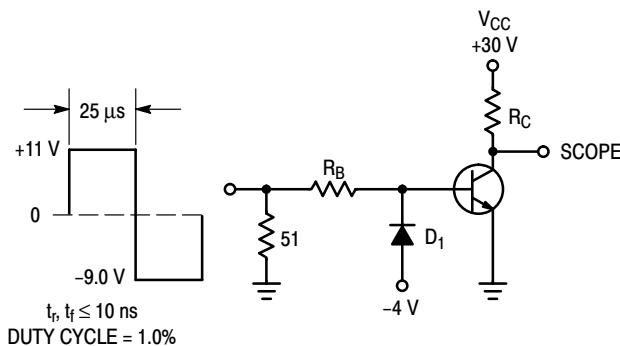


Figure 4. Switching Time Test Circuit

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 $T_{J(\max)}$.

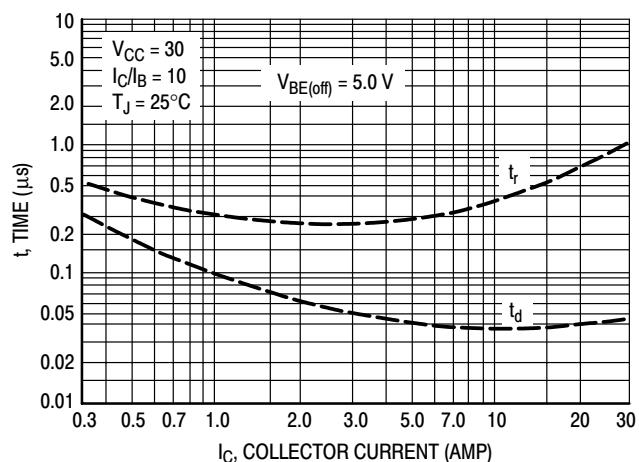


Figure 5. Turn-On Time

2N3771 2N3772

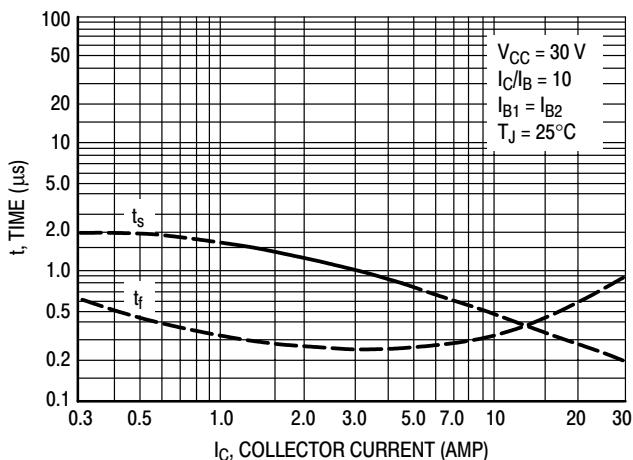


Figure 6. Turn-Off Time

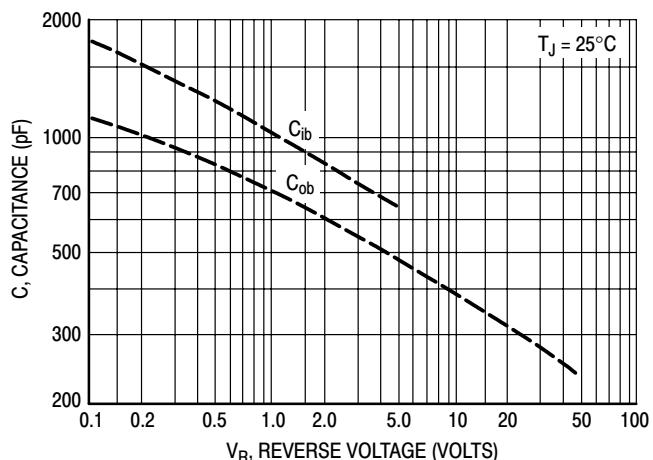


Figure 7. Capacitance

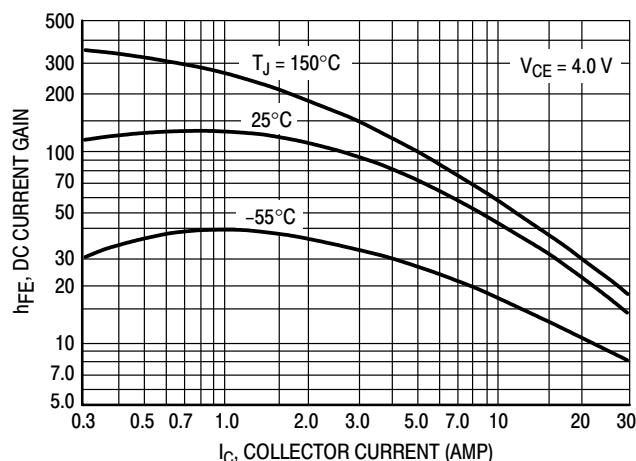


Figure 8. DC Current Gain

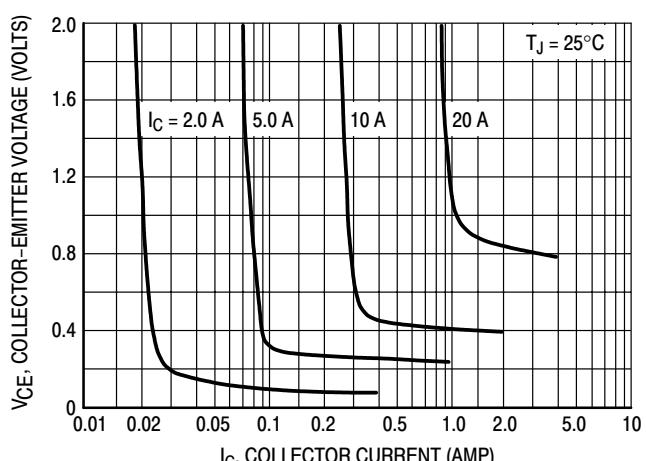
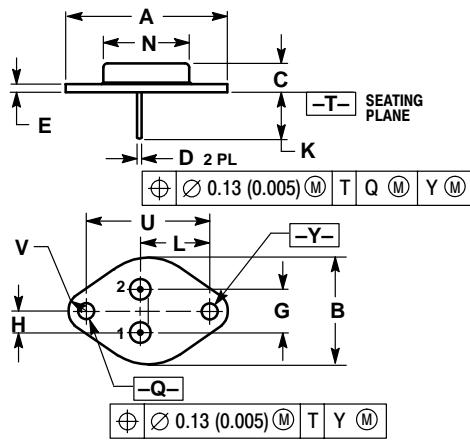


Figure 9. Collector Saturation Region

PACKAGE DIMENSIONS

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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