High Power NPN Silicon Power Transistors

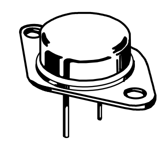
2N3771*
2N3772

*ON Semiconductor Preferred Device

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

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

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



CASE 1–07 TO–204AA (TO–3)

***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°C Derate above 25°C	P_D	150 0.855		Watts W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	–65 to +200		°C

THERMAL CHARACTERISTICS

Characteristics	Symbol	2N3771, 2N3772	Unit
Thermal Resistance, Junction to Case	θ_{JC}	1.17	°C/W

*Indicates JEDEC Registered Data.

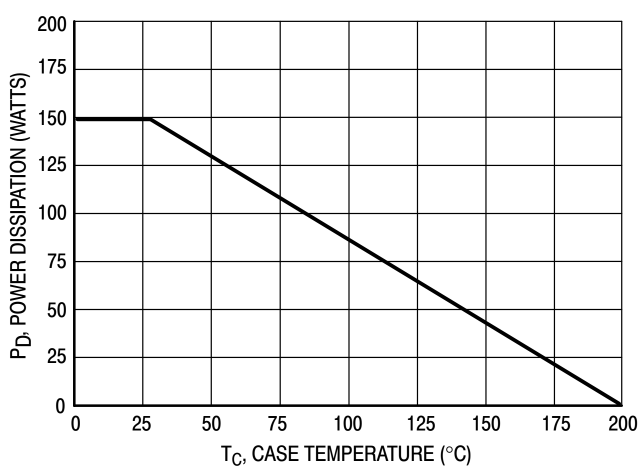


Figure 1. Power Derating

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

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.

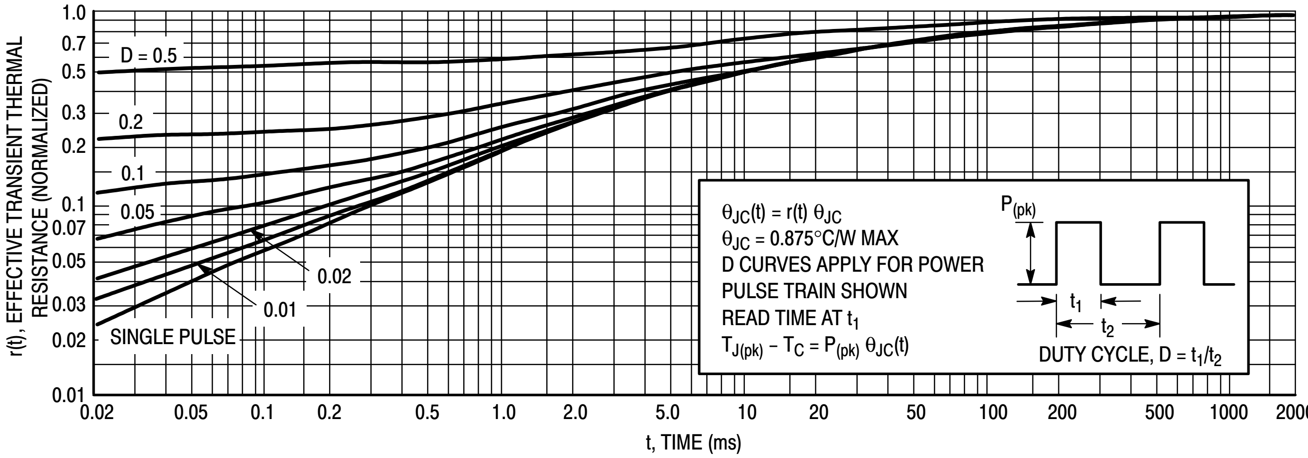


Figure 2. Thermal Response — 2N3771, 2N3772

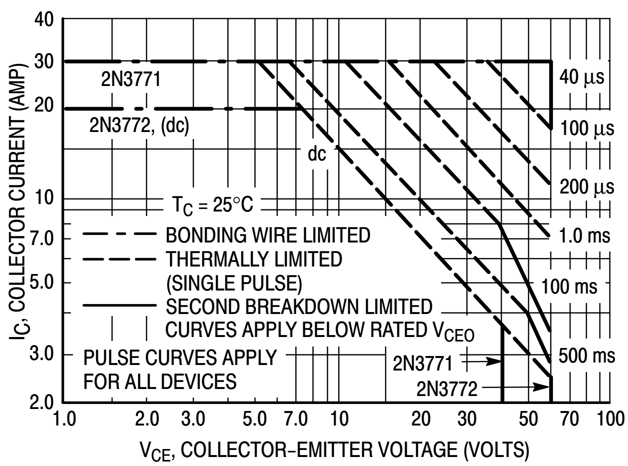


Figure 3. Active–Region Safe Operating Area — 2N3771, 2N3772

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 $T_{J(pk)} < 200°C$. $T_{J(pk)}$ 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 $T_{J(max)}$.

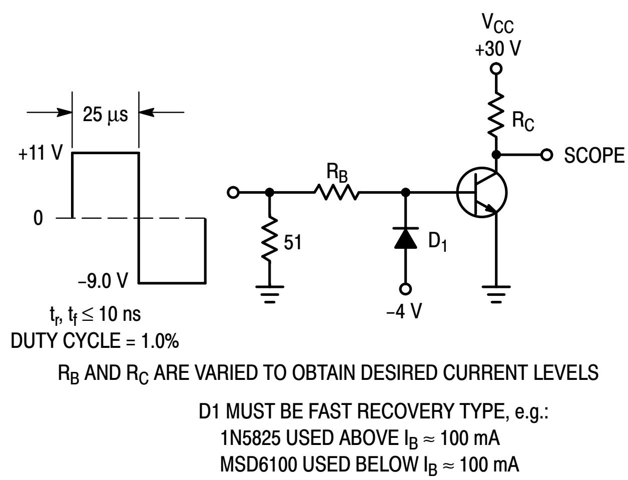


Figure 4. Switching Time Test Circuit

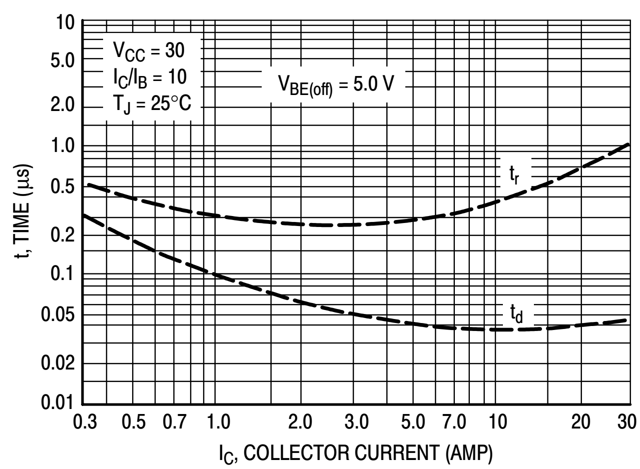


Figure 5. Turn–On Time

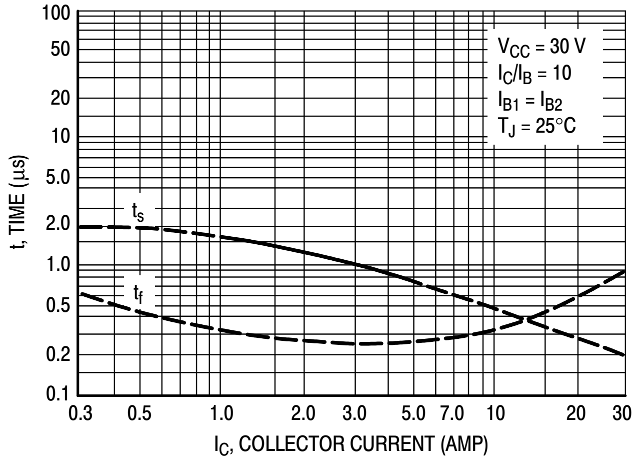


Figure 6. Turn−Off Time

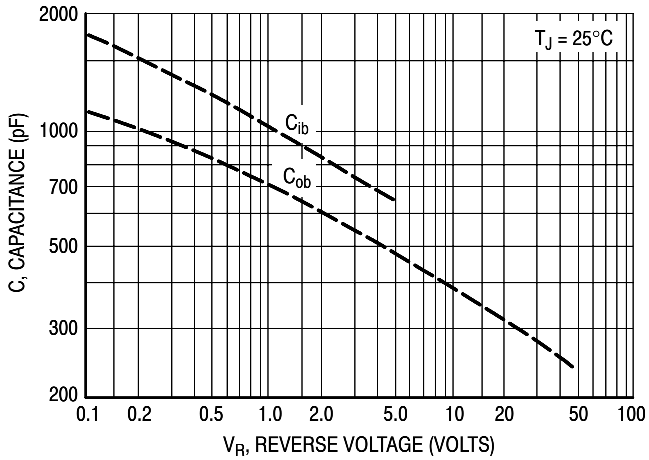


Figure 7. Capacitance

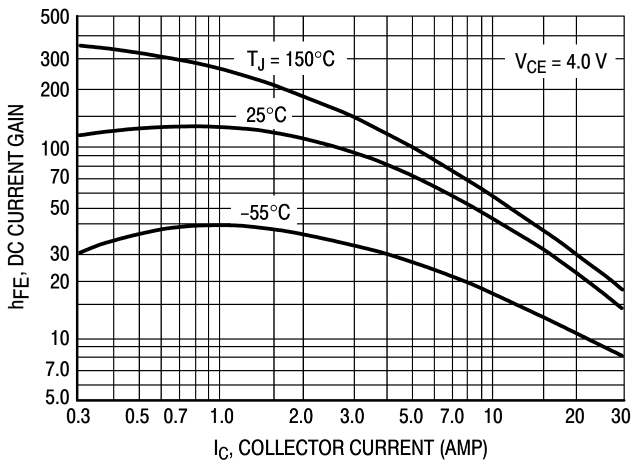


Figure 8. DC Current Gain

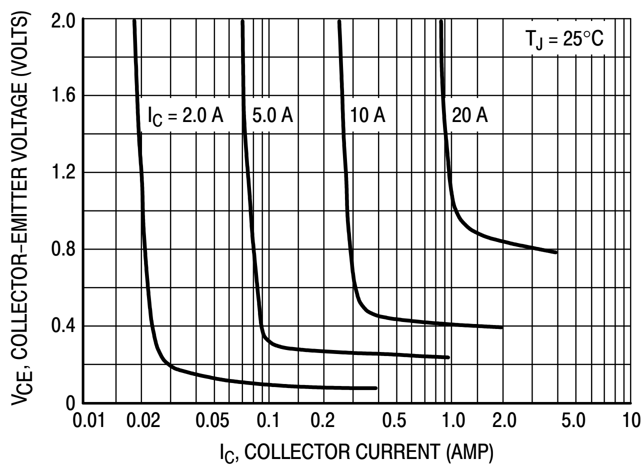
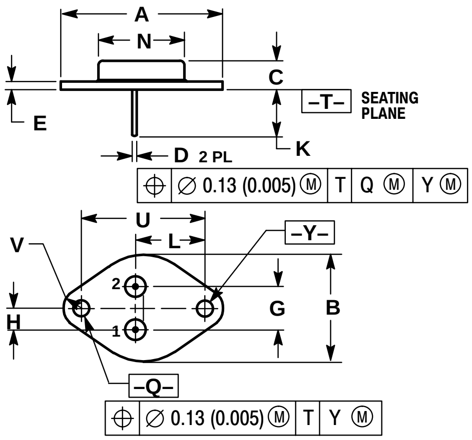


Figure 9. Collector Saturation Region

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.

	INCHES		MILLIMETERS	
DIM	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

PUBLICATION ORDERING INFORMATION

NORTH AMERICA Literature Fulfillment:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303–675–2175 or 800–344–3860 Toll Free USA/Canada
Fax: 303–675–2176 or 800–344–3867 Toll Free USA/Canada
Email: ONlit@hibbertco.com
Fax Response Line: 303–675–2167 or 800–344–3810 Toll Free USA/Canada

N. American Technical Support: 800–282–9855 Toll Free USA/Canada

EUROPE: LDC for ON Semiconductor – European Support
German Phone: (+1) 303–308–7140 (Mon–Fri 2:30pm to 7:00pm CET)
Email: ONlit–german@hibbertco.com
French Phone: (+1) 303–308–7141 (Mon–Fri 2:00pm to 7:00pm CET)
Email: ONlit–french@hibbertco.com
English Phone: (+1) 303–308–7142 (Mon–Fri 12:00pm to 5:00pm GMT)
Email: ONlit@hibbertco.com

EUROPEAN TOLL–FREE ACCESS*: 00–800–4422–3781
*Available from Germany, France, Italy, UK, Ireland

CENTRAL/SOUTH AMERICA:
Spanish Phone: 303–308–7143 (Mon–Fri 8:00am to 5:00pm MST)
Email: ONlit–spanish@hibbertco.com
Toll–Free from Mexico: Dial 01–800–288–2872 for Access – then Dial 866–297–9322

ASIA/PACIFIC: LDC for ON Semiconductor – Asia Support
Phone: 1–303–675–2121 (Tue–Fri 9:00am to 1:00pm, Hong Kong Time)
Toll Free from Hong Kong & Singapore:
001–800–4422–3781
Email: ONlit–asia@hibbertco.com

JAPAN: ON Semiconductor, Japan Customer Focus Center
4–32–1 Nishi–Gotanda, Shinagawa–ku, Tokyo, Japan 141–0031
Phone: 81–3–5740–2700
Email: r14525@onsemi.com

ON Semiconductor Website: http://onsemi.com

For additional information, please contact your local Sales Representative.