

# High Power NPN Silicon Power Transistors

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

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

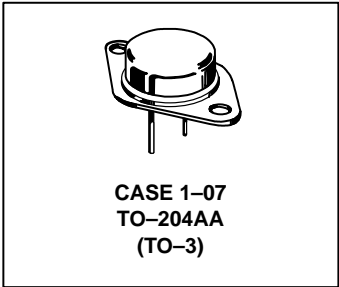
**\*MAXIMUM RATINGS**

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

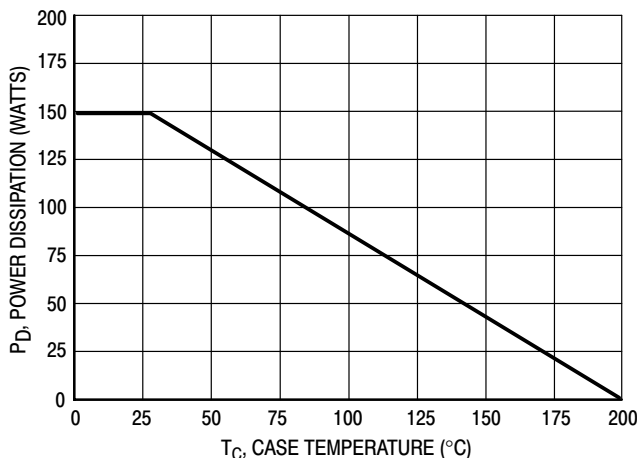
**20 and 30 AMPERE  
POWER TRANSISTORS  
NPN SILICON  
40 and 60 VOLTS  
150 WATTS**



**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

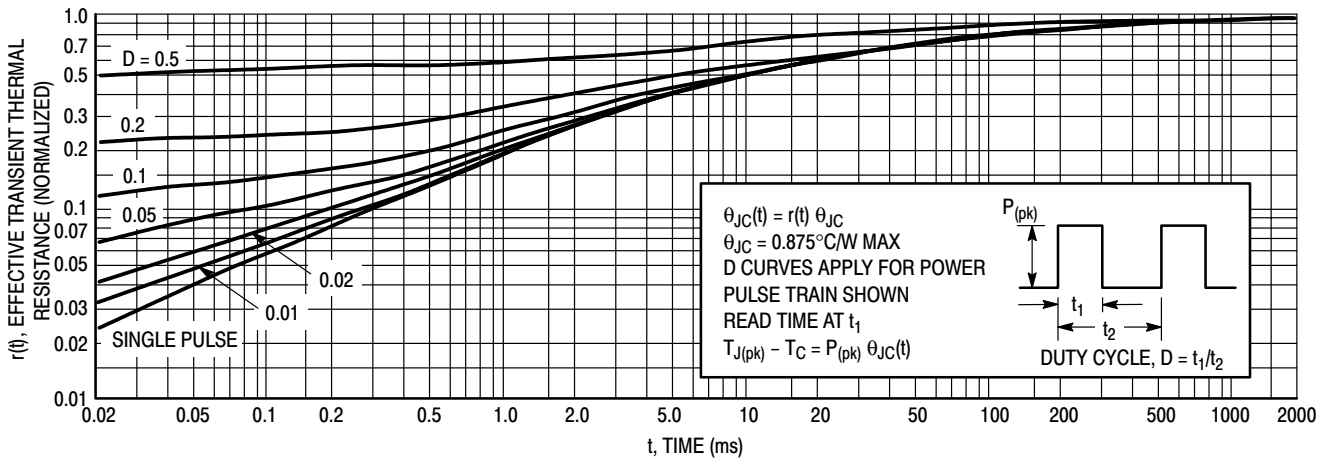
### ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

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

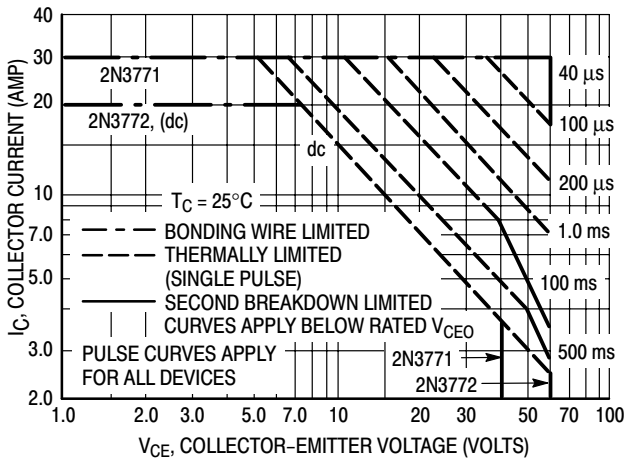
\*Indicates JEDEC Registered Data.

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

## 2N3771 2N3772



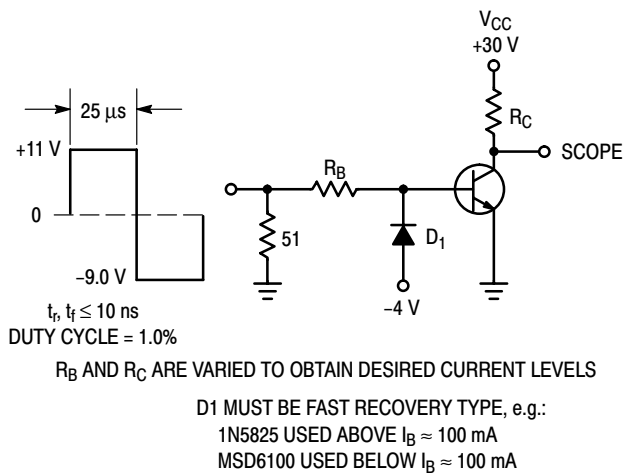
**Figure 2. Thermal Response — 2N3771, 2N3772**



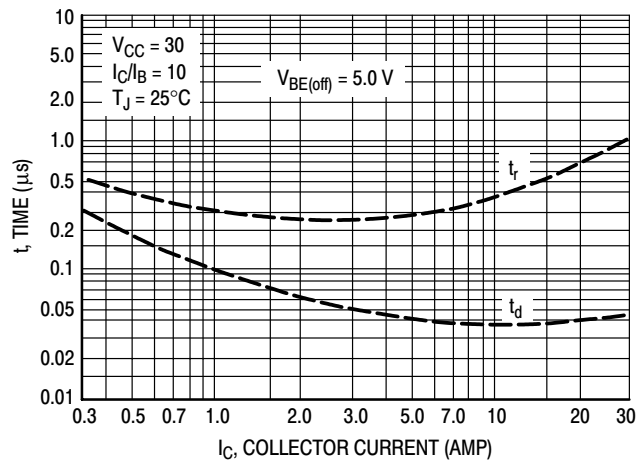
**Figure 3. Active-Region Safe Operating Area — 2N3771, 2N3772**

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**

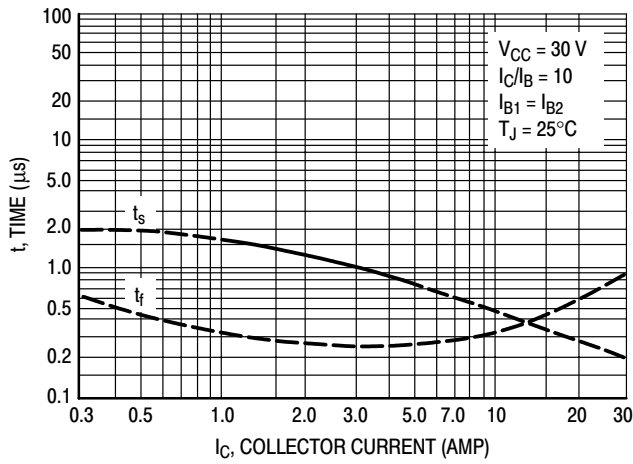


Figure 6. Turn-Off Time

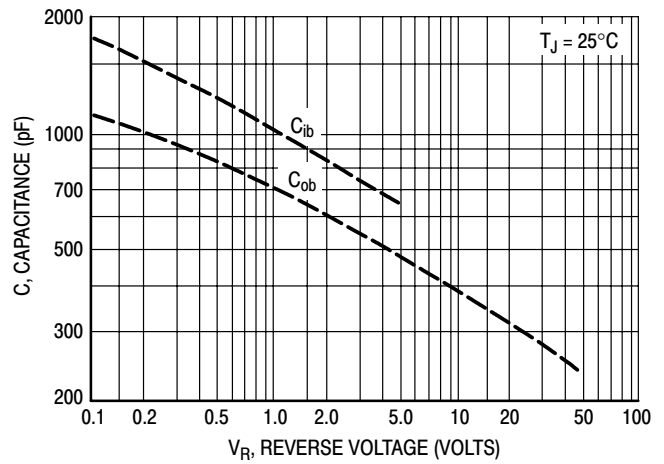


Figure 7. Capacitance

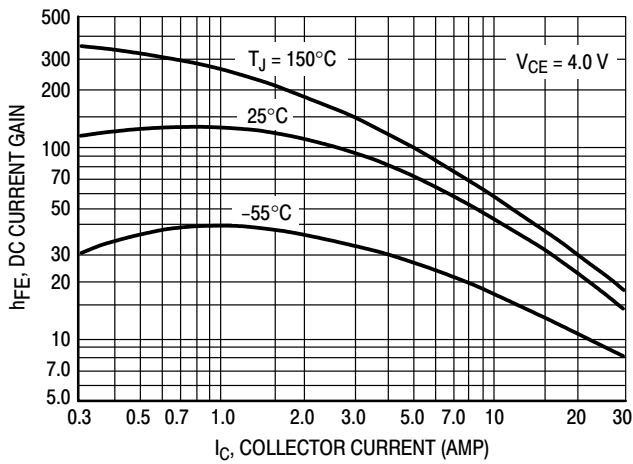


Figure 8. DC Current Gain

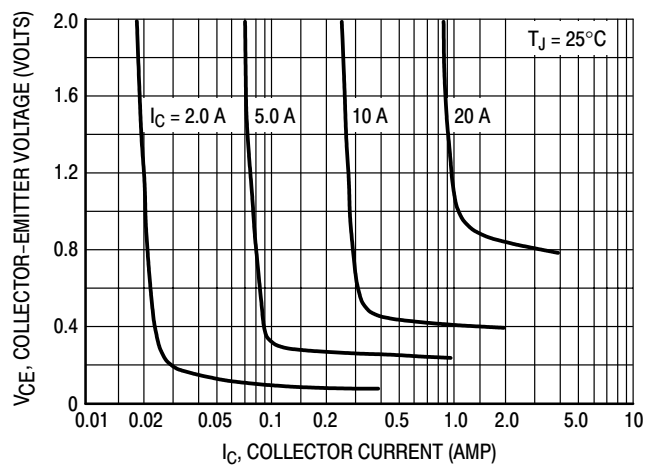
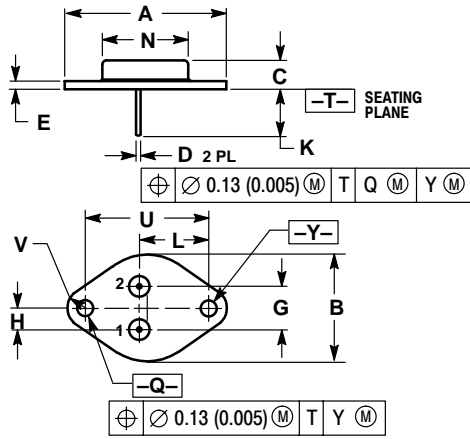


Figure 9. Collector Saturation Region

# 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

**ON Semiconductor** and  are trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer.

## 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.