

# 2N3773

## NPN Power Transistors

The 2N3773 is a PowerBase™ power transistor designed for high power audio, disk head positioners and other linear applications. This device can also be used in power switching circuits such as relay or solenoid drivers, DC-DC converters or inverters.

### Features

- High Safe Operating Area (100% Tested) 150 W @ 100 V
- Completely Characterized for Linear Operation
- High DC Current Gain and Low Saturation Voltage  
 $h_{FE} = 15$  (Min) @ 8.0 A, 4.0 V  
 $V_{CE(sat)} = 1.4$  V (Max) @  $I_C = 8.0$  A,  $I_B = 0.8$  A
- For Low Distortion Complementary Designs
- This is a Pb-Free Device

### MAXIMUM RATINGS (Note 1)

Rating	Symbol	Value	Unit
Collector - Emitter Voltage	$V_{CEO}$	140	Vdc
Collector - Emitter Voltage	$V_{CEX}$	160	Vdc
Collector - Base Voltage	$V_{CBO}$	160	Vdc
Emitter - Base Voltage	$V_{EBO}$	7	Vdc
Collector Current	$I_C$		Adc
- Continuous		16	
- Peak (Note 2)		30	
Base Current	$I_B$		Adc
- Continuous		4	
- Peak (Note 2)		15	
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ 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	$^\circ\text{C}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Indicates JEDEC Registered Data.
2. Pulse Test: Pulse Width = 5 ms, Duty Cycle  $\leq 10\%$ .

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.17	$^\circ\text{C}/\text{W}$

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

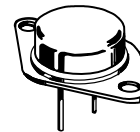


ON Semiconductor®

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## 16 A NPN POWER TRANSISTORS 140 V, 150 W

### MARKING DIAGRAM



TO-204  
CASE 1-07



A = Assembly Location  
YY = Year  
WW = Work Week  
G = Pb-Free Package

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

## 2N3773

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

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b> (Note 3)				
Collector–Emitter Breakdown Voltage (Note 4) ( $I_C = 0.2\text{ Adc}$ , $I_B = 0$ )	$V_{CEO(sus)}$	140	–	Vdc
Collector–Emitter Sustaining Voltage (Note 4) ( $I_C = 0.1\text{ Adc}$ , $V_{BE(off)} = 1.5\text{ Vdc}$ , $R_{BE} = 100\text{ Ohms}$ )	$V_{CEX(sus)}$	160	–	Vdc
Collector–Emitter Sustaining Voltage ( $I_C = 0.2\text{ Adc}$ , $R_{BE} = 100\text{ Ohms}$ )	$V_{CER(sus)}$	150	–	Vdc
Collector Cutoff Current (Note 4) ( $V_{CE} = 120\text{ Vdc}$ , $I_B = 0$ )	$I_{CEO}$	–	10	mAdc
Collector Cutoff Current (Note 4) ( $V_{CE} = 140\text{ Vdc}$ , $V_{BE(off)} = 1.5\text{ Vdc}$ ) ( $V_{CE} = 140\text{ Vdc}$ , $V_{BE(off)} = 1.5\text{ Vdc}$ , $T_C = 150^\circ\text{C}$ )	$I_{CEX}$	– –	2 10	mAdc
Collector Cutoff Current ( $V_{CB} = 140\text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	–	2	mAdc
Emitter Cutoff Current (Note 4) ( $V_{BE} = 7\text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	–	5	mAdc

### ON CHARACTERISTICS (Note 3)

DC Current Gain ( $I_C = 8\text{ Adc}$ , $V_{CE} = 4\text{ Vdc}$ ) (Note 4) ( $I_C = 16\text{ Adc}$ , $V_{CE} = 4\text{ Vdc}$ )	$h_{FE}$	15 5	60 –	–
Collector–Emitter Saturation Voltage ( $I_C = 8\text{ Adc}$ , $I_B = 800\text{ mAdc}$ ) (Note 4) ( $I_C = 16\text{ Adc}$ , $I_B = 3.2\text{ Adc}$ )	$V_{CE(sat)}$	– –	1.4 4	Vdc
Base–Emitter On Voltage (Note 4) ( $I_C = 8\text{ Adc}$ , $V_{CE} = 4\text{ Vdc}$ )	$V_{BE(on)}$	–	2.2	Vdc

### DYNAMIC CHARACTERISTICS

Magnitude of Common–Emitter Small–Signal, Short–Circuit, Forward Current Transfer Ratio ( $I_C = 1\text{ A}$ , $f = 50\text{ kHz}$ )	$ h_{fe} $	4	–	–
Small–Signal Current Gain (Note 4) ( $I_C = 1\text{ Adc}$ , $V_{CE} = 4\text{ Vdc}$ , $f = 1\text{ kHz}$ )	$h_{fe}$	40	–	–

### SECOND BREAKDOWN CHARACTERISTICS

Second Breakdown Collector Current with Base Forward Biased $t = 1\text{ s}$ (non–repetitive), $V_{CE} = 100\text{ V}$ , See Figure 12	$I_{S/b}$	1.5	–	Adc
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3. Pulse Test: Pulse Width = 300  $\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

4. Indicates JEDEC Registered Data.

### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
2N3773G	TO–204 (Pb–Free)	100 Unit / Tray

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

NPN

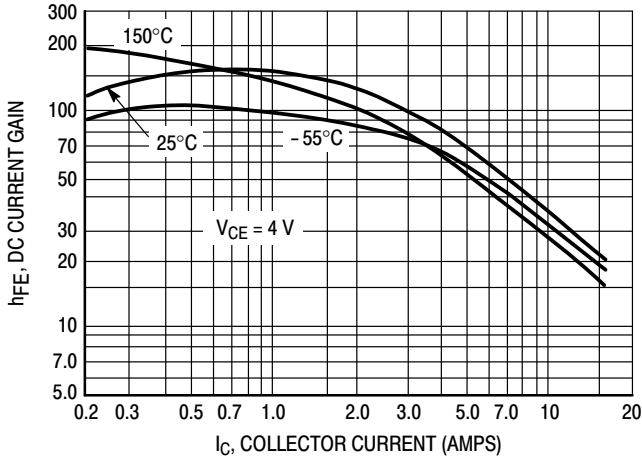


Figure 1. DC Current Gain

PNP

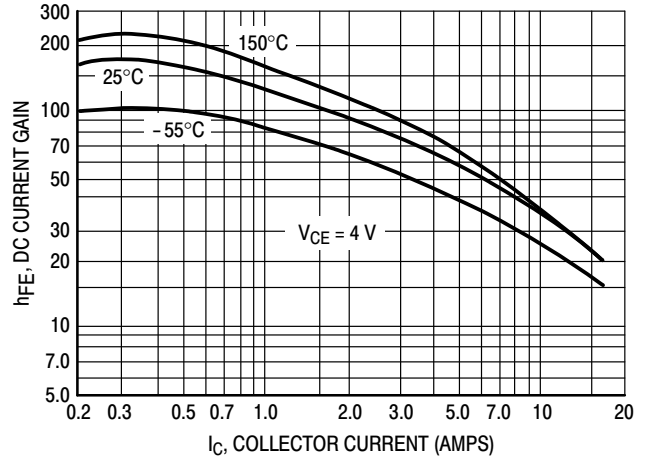


Figure 2. DC Current Gain

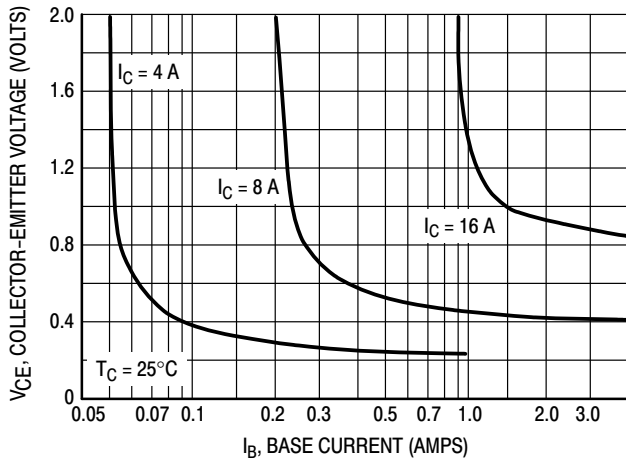


Figure 3. Collector Saturation Region

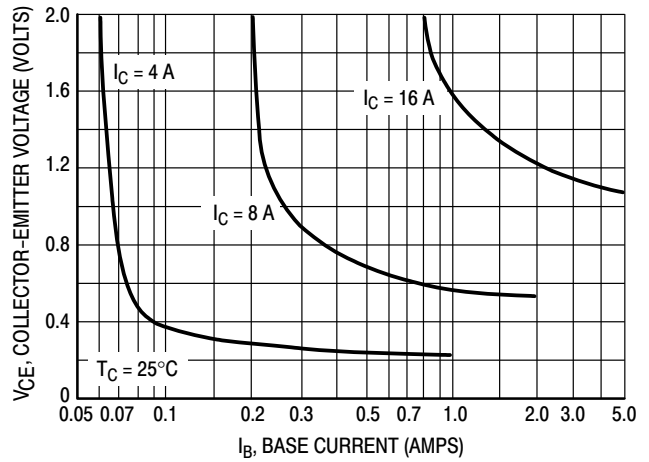


Figure 4. Collector Saturation Region

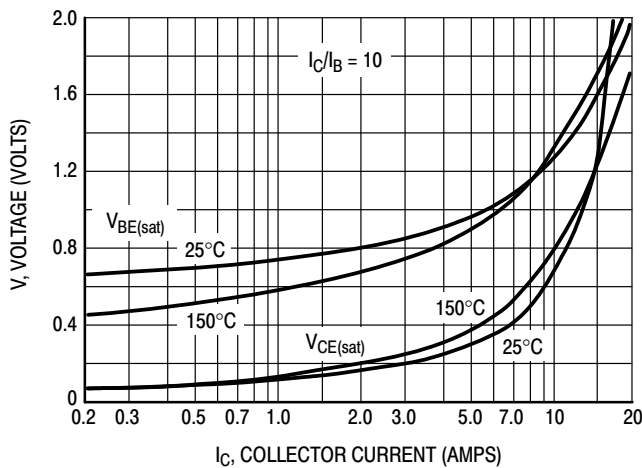


Figure 5. "On" Voltage

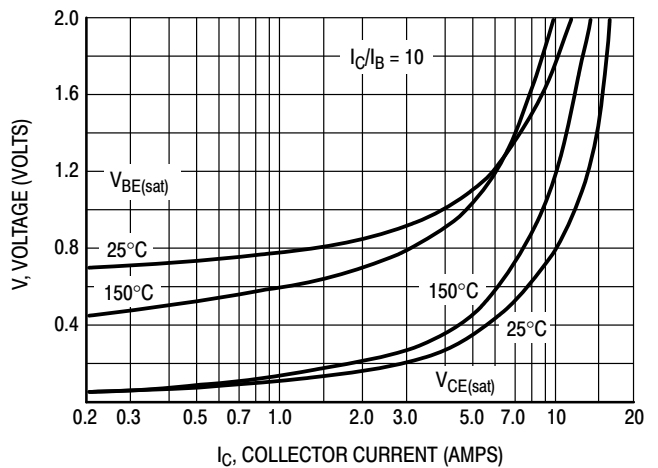


Figure 6. "On" Voltage

TYPICAL CHARACTERISTICS

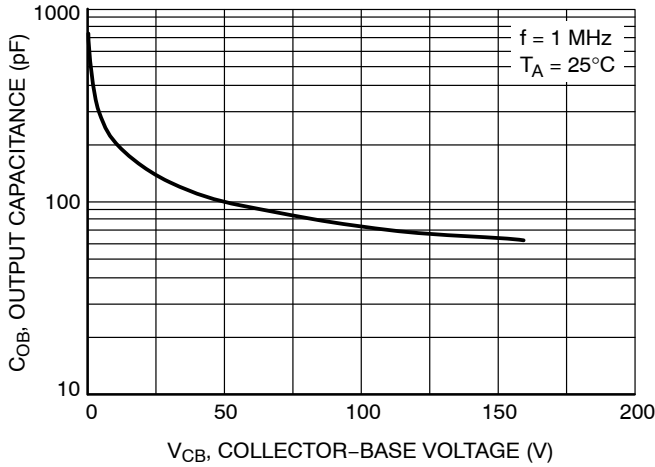


Figure 7. Output Capacitance

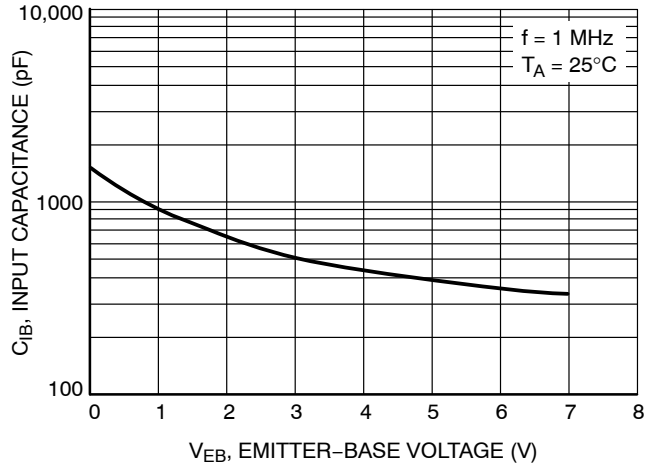


Figure 8. Input Capacitance

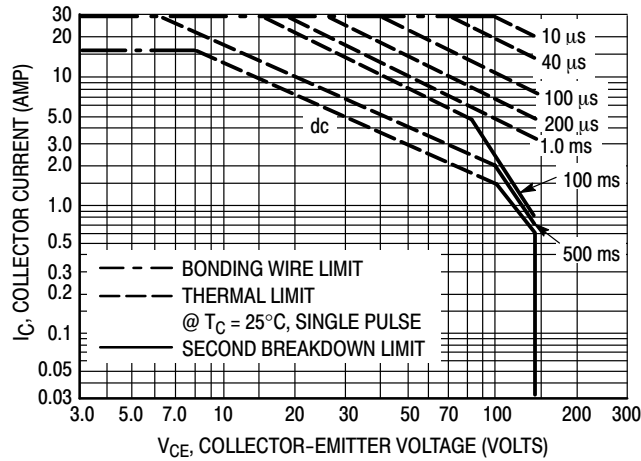
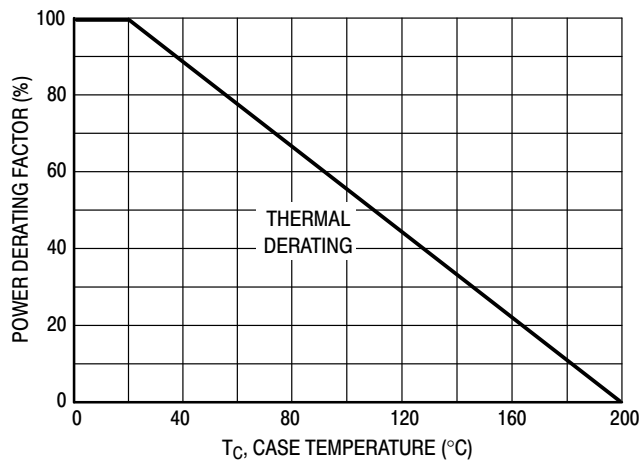


Figure 9. Forward Bias Safe Operating Area

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.

The data of Figure 9 is based on  $T_{J(pk)} = 200^\circ\text{C}$ ;  $T_C$  is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(pk)} < 200^\circ\text{C}$ . At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

# 2N3773



**Figure 10. Power Derating**

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



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

DATE 05/18/1988



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

- |  |  |   |   |   |
|--|--|---|---|---|
| <p>STYLE 1:<br/>PIN 1. BASE<br/>2. EMITTER<br/>CASE: COLLECTOR</p> | <p>STYLE 2:<br/>PIN 1. BASE<br/>2. COLLECTOR<br/>CASE: EMITTER</p> | <p>STYLE 3:<br/>PIN 1. GATE<br/>2. SOURCE<br/>CASE: DRAIN</p>           | <p>STYLE 4:<br/>PIN 1. GROUND<br/>2. INPUT<br/>CASE: OUTPUT</p>       | <p>STYLE 5:<br/>PIN 1. CATHODE<br/>2. EXTERNAL TRIP/DELAY<br/>CASE: ANODE</p> |
| <p>STYLE 6:<br/>PIN 1. GATE<br/>2. EMITTER<br/>CASE: COLLECTOR</p> | <p>STYLE 7:<br/>PIN 1. ANODE<br/>2. OPEN<br/>CASE: CATHODE</p>     | <p>STYLE 8:<br/>PIN 1. CATHODE #1<br/>2. CATHODE #2<br/>CASE: ANODE</p> | <p>STYLE 9:<br/>PIN 1. ANODE #1<br/>2. ANODE #2<br/>CASE: CATHODE</p> |   |

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