

NPN Power Transistors

2N3773

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 – Continuous – Peak (Note 2)	I_C	16 30	Adc
Base Current – Continuous – Peak (Note 2)	I_B	4 15	Adc
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°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 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.

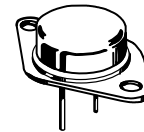
1. Indicates JEDEC Registered Data.
2. Pulse Test: Pulse Width = 5 ms, Duty Cycle $\leq 10\%$.

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 **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

16 A NPN POWER TRANSISTORS 140 V, 150 W



TO–204
CASE 1–07

MARKING DIAGRAM



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

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS (Note 3)				
Collector–Emitter Breakdown Voltage (Note 4) ($I_C = 0.2\text{ A dc}$, $I_B = 0$)	$V_{CEO(sus)}$	140	–	Vdc
Collector–Emitter Sustaining Voltage (Note 4) ($I_C = 0.1\text{ A dc}$, $V_{BE(off)} = 1.5\text{ Vdc}$, $R_{BE} = 100\ \Omega$)	$V_{CEX(sus)}$	160	–	Vdc
Collector–Emitter Sustaining Voltage ($I_C = 0.2\text{ A dc}$, $R_{BE} = 100\ \Omega$)	$V_{CER(sus)}$	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 ($I_C = 8\text{ A dc}$, $V_{CE} = 4\text{ Vdc}$) (Note 4) ($I_C = 16\text{ A dc}$, $V_{CE} = 4\text{ Vdc}$)	h_{FE}	15 5	60 –	–
Collector–Emitter Saturation Voltage ($I_C = 8\text{ A dc}$, $I_B = 800\text{ mAdc}$) (Note 4) ($I_C = 16\text{ A dc}$, $I_B = 3.2\text{ A dc}$)	$V_{CE(sat)}$	– –	1.4 4	Vdc
Base–Emitter On Voltage (Note 4) ($I_C = 8\text{ A dc}$, $V_{CE} = 4\text{ Vdc}$)	$V_{BE(on)}$	–	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) ($I_C = 1\text{ A dc}$, $V_{CE} = 4\text{ Vdc}$, $f = 1\text{ kHz}$)	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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Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

3. Pulse Test: Pulse Width = $300\ \mu\text{s}$, Duty Cycle $\leq 2\%$.

4. Indicates JEDEC Registered Data.

ORDERING INFORMATION

Device	Package	Shipping [†]
2N3773G	TO–204 (Pb–Free)	100 Unit / Tray

[†]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

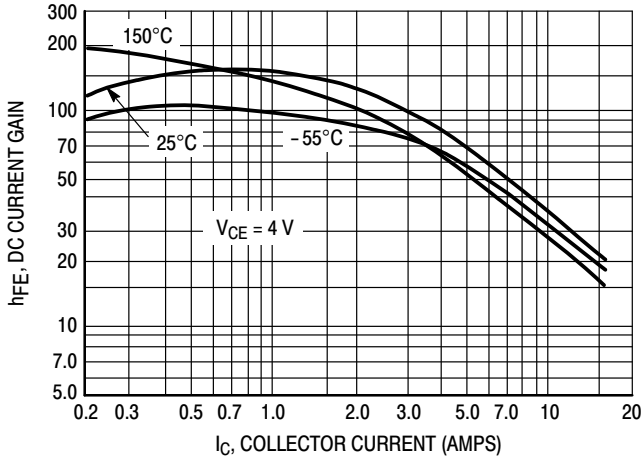


Figure 1. DC Current Gain

PNP

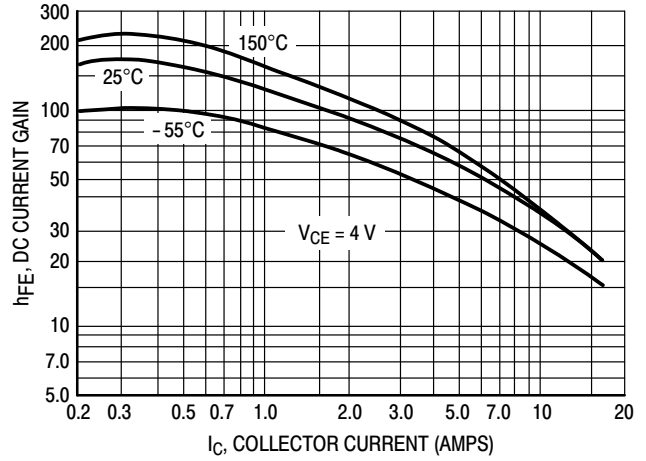


Figure 2. DC Current Gain

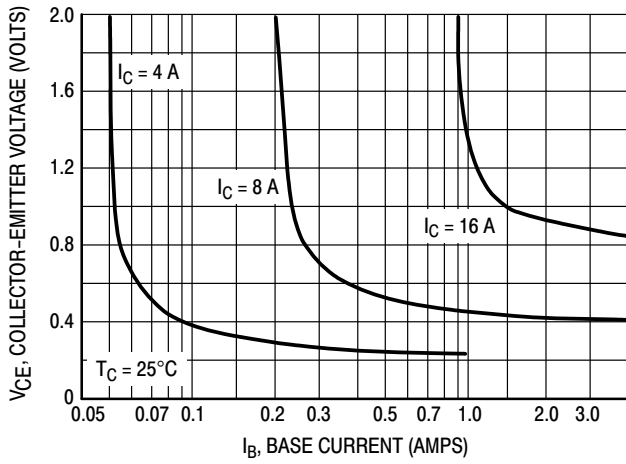


Figure 3. Collector Saturation Region

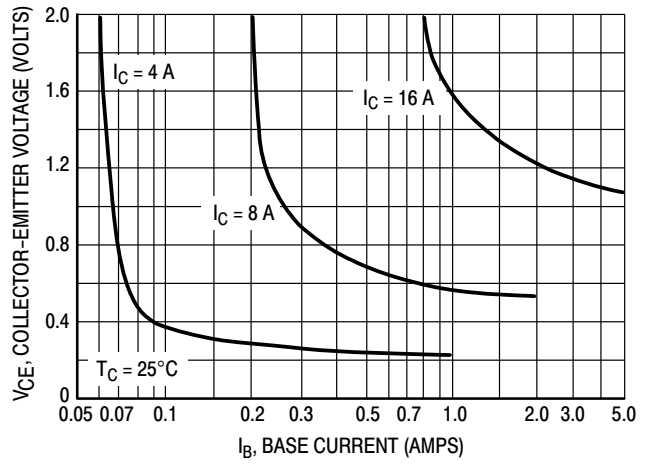


Figure 4. Collector Saturation Region

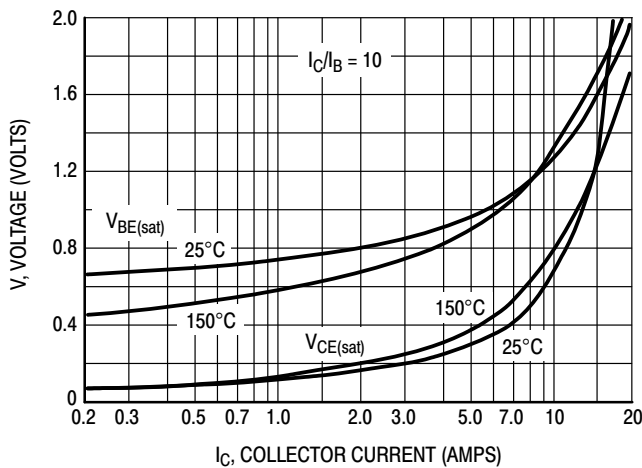


Figure 5. "On" Voltage

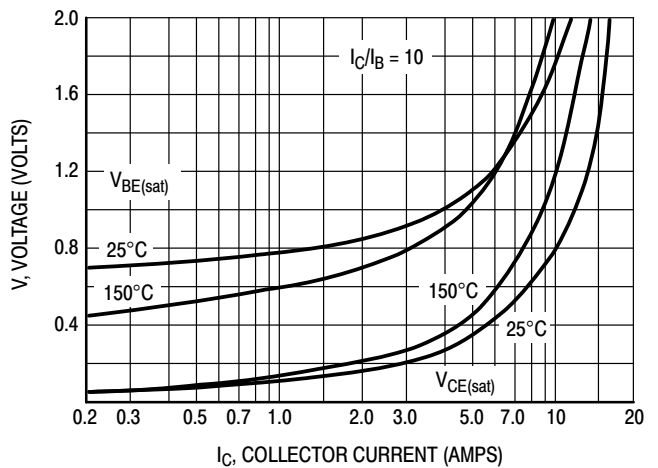


Figure 6. "On" Voltage

TYPICAL CHARACTERISTICS

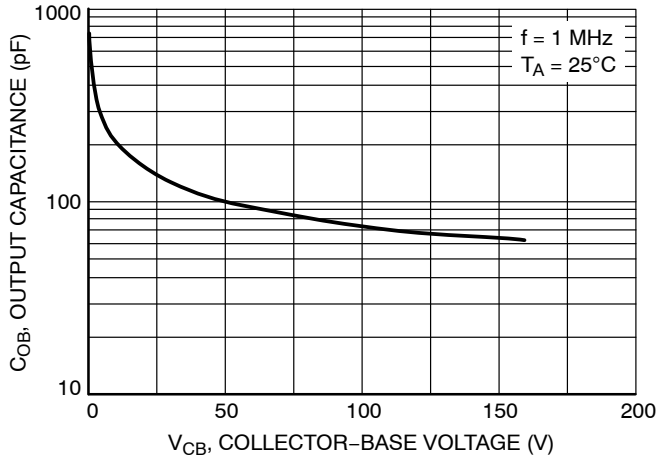


Figure 7. Output Capacitance

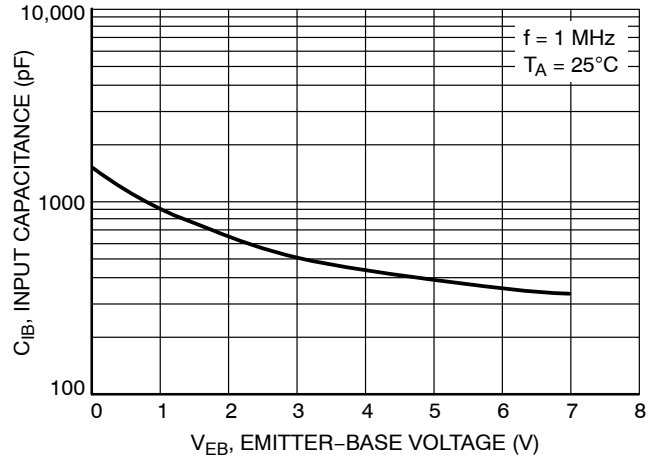


Figure 8. Input Capacitance

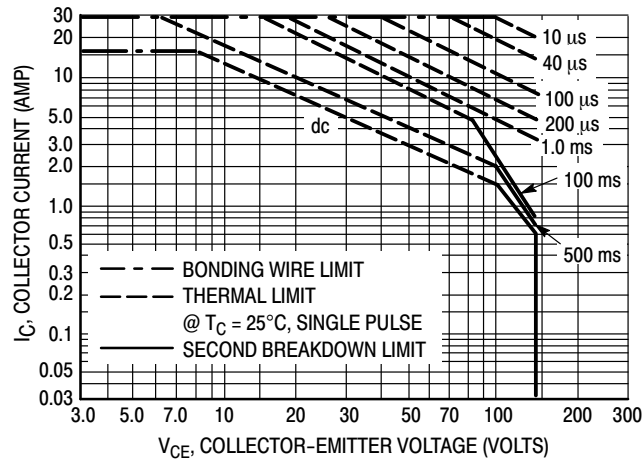


Figure 9. Forward Bias Safe Operating Area

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.

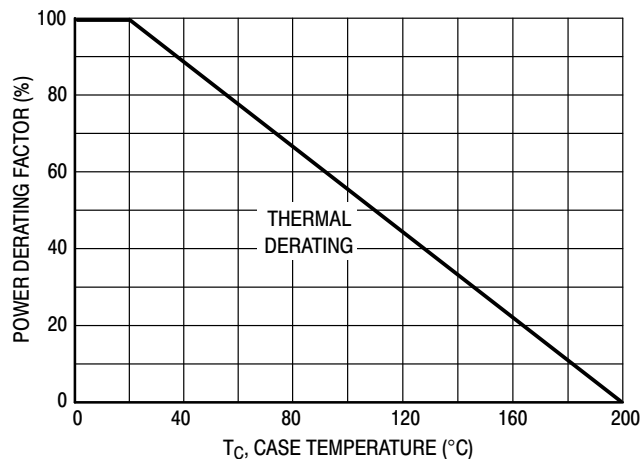
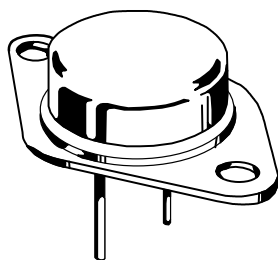


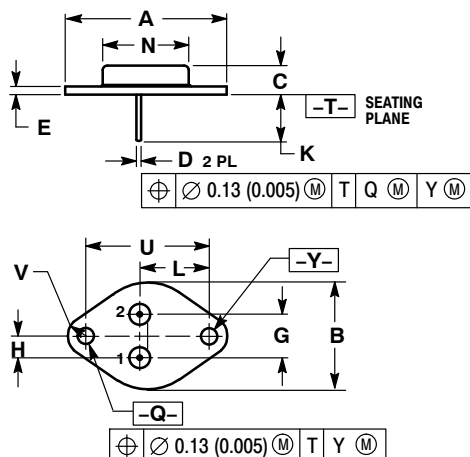
Figure 10. Power Derating



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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DESCRIPTION:	TO-204 (TO-3)	PAGE 1 OF 1

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