NPN 2N3773*, PNP 2N6609

Preferred Device

Complementary Silicon Power Transistors

The 2N3773 and 2N6609 are PowerBase™ power transistors designed for high power audio, disk head positioners and other linear applications. These devices can also be used in power switching circuits such as relay or solenoid drivers, DC−DC converters or inverters.

Features

- Pb−Free Packages are Available**
- 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

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

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

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

THERMAL CHARACTERISTICS

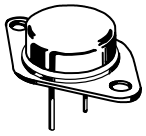
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	1.17	°C/W

**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®

http://onsemi.com

16 A COMPLEMENTARY POWER TRANSISTORS 140 V, 150 W



TO−204
CASE 1−07

MARKING DIAGRAM

xxxx = 3773 or 6609
A = Assembly Location
YY = Year
WW = Work Week

ORDERING INFORMATION

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

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

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July, 2004 − Rev. 10

Publication Order Number:
2N3773/D

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS (Note 3)				
Collector−Emitter Breakdown Voltage (Note 4) (I_C = 0.2 Adc, I_B = 0)	$V_{CEO(sus)}$	140	−	Vdc
Collector−Emitter Sustaining Voltage (Note 4) (I_C = 0.1 Adc, $V_{BE(off)}$ = 1.5 Vdc, R_{BE} = 100 Ohms)	$V_{CEX(sus)}$	160	−	Vdc
Collector−Emitter Sustaining Voltage (I_C = 0.2 Adc, R_{BE} = 100 Ohms)	$V_{CER(sus)}$	150	−	Vdc
Collector Cutoff Current (Note 4) (V_{CE} = 120 Vdc, I_B = 0)	I_{CEO}	−	10	mAdc
Collector Cutoff Current (Note 4) (V_{CE} = 140 Vdc, $V_{BE(off)}$ = 1.5 Vdc) (V_{CE} = 140 Vdc, $V_{BE(off)}$ = 1.5 Vdc, T_C = 150°C)	I_{CEX}	 − −	 2 10	mAdc
Collector Cutoff Current (V_{CB} = 140 Vdc, I_E = 0)	I_{CBO}	−	2	mAdc
Emitter Cutoff Current (Note 4) (V_{BE} = 7 Vdc, I_C = 0)	I_{EBO}	−	5	mAdc
ON CHARACTERISTICS (Note 3)				
DC Current Gain (I_C = 8 Adc, V_{CE} = 4 Vdc) (Note 4) (I_C = 16 Adc, V_{CE} = 4 Vdc)	h_{FE}	 15 5	 60 −	−
Collector−Emitter Saturation Voltage (I_C = 8 Adc, I_B = 800 mAdc) (Note 4) (I_C = 16 Adc, I_B = 3.2 Adc)	$V_{CE(sat)}$	 − −	 1.4 4	Vdc
Base−Emitter On Voltage (Note 4) (I_C = 8 Adc, V_{CE} = 4 Vdc)	$V_{BE(on)}$	—	2.2	Vdc
DYNAMIC CHARACTERISTICS				
Magnitude of Common−Emitter Small−Signal, Short−Circuit, Forward Current Transfer Ratio (I_C = 1 A, f = 50 kHz)	$\|h_{fe}\|$	4	−	−
Small−Signal Current Gain (Note 4) (I_C = 1 Adc, V_{CE} = 4 Vdc, f = 1 kHz)	h_{fe}	40	−	−
SECOND BREAKDOWN CHARACTERISTICS				
Second Breakdown Collector Current with Base Forward Biased t = 1 s (non−repetitive), V_{CE} = 100 V, See Figure 12	$I_{S/b}$	1.5	−	Adc

3. Pulse Test: Pulse Width = 300 μs, Duty Cycle ≤ 2%.
4. Indicates JEDEC Registered Data.

ORDERING INFORMATION

Device	Package	Shipping†
2N3773	TO−204	100 Unit / Tray
2N3773G	TO−204 (Pb−Free)	100 Unit / Tray
2N6609	TO−204	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

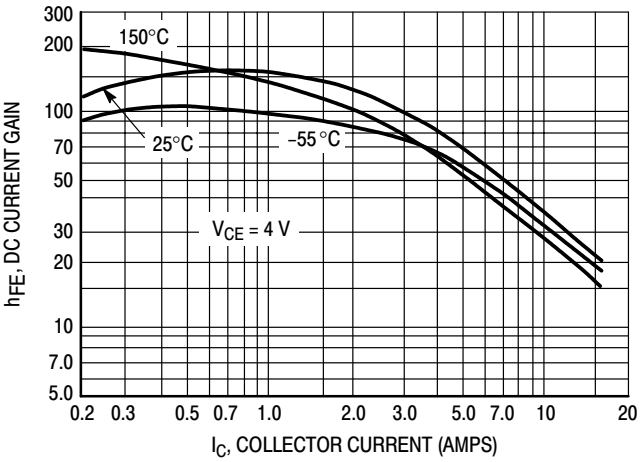


Figure 1. DC Current Gain

PNP

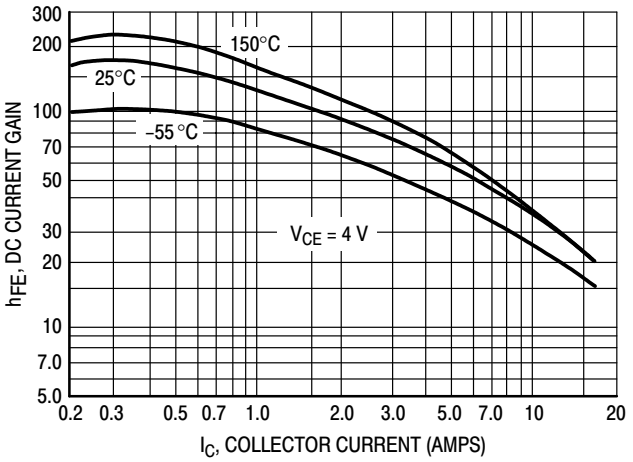


Figure 2. DC Current Gain

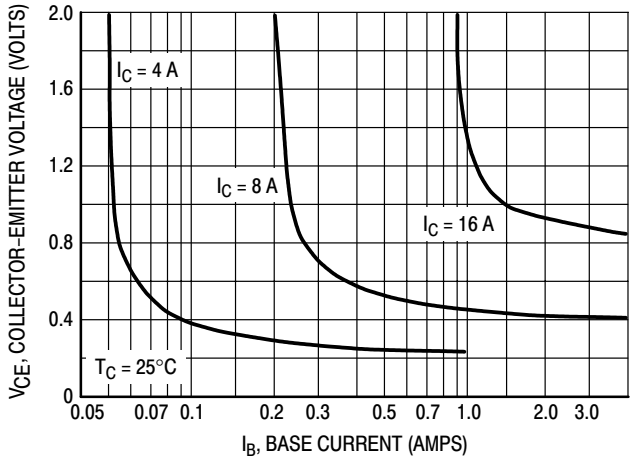


Figure 3. Collector Saturation Region

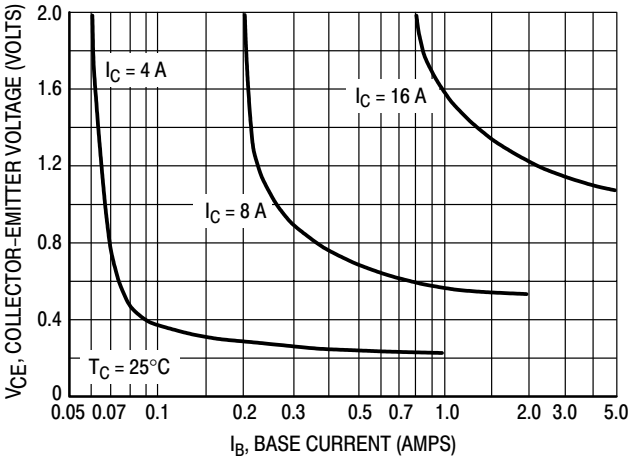


Figure 4. Collector Saturation Region

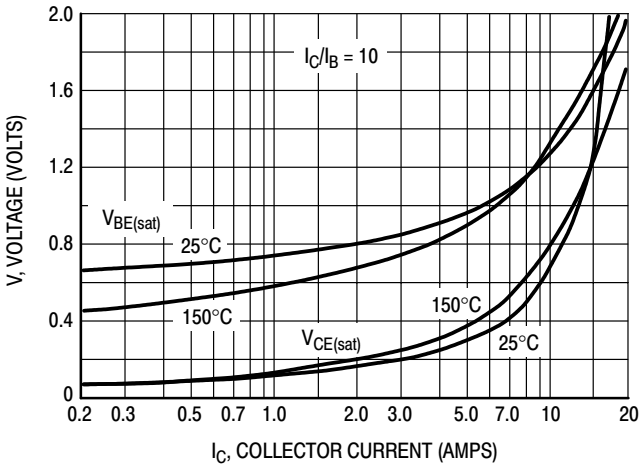


Figure 5. “On” Voltage

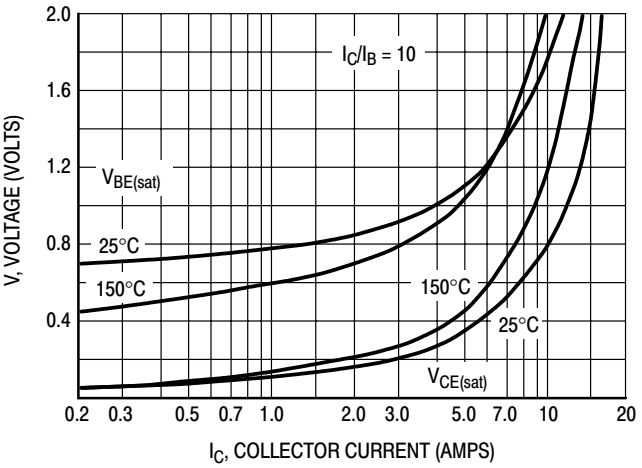


Figure 6. “On” Voltage

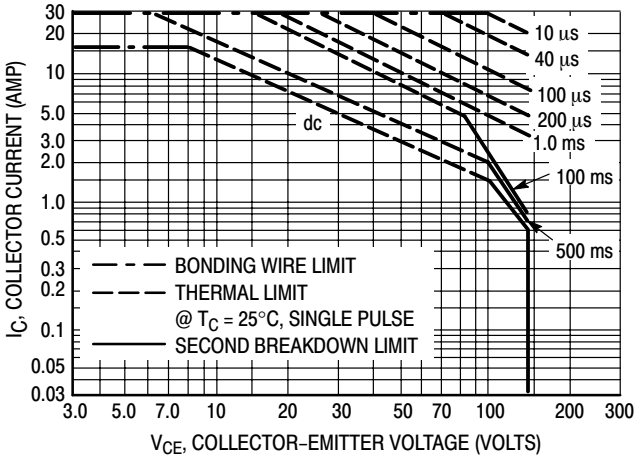


Figure 7. Forward Bias Safe Operating Area

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

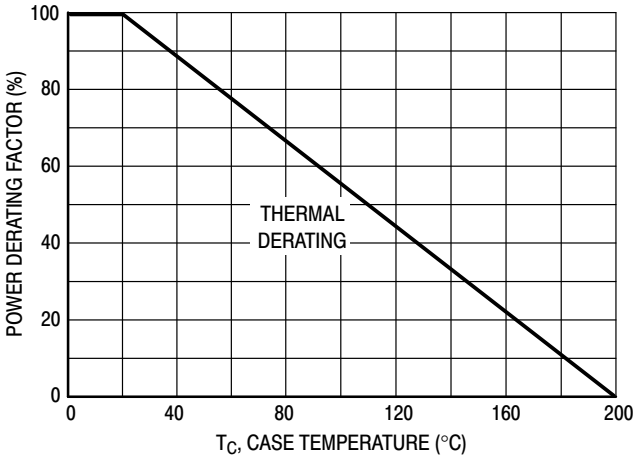
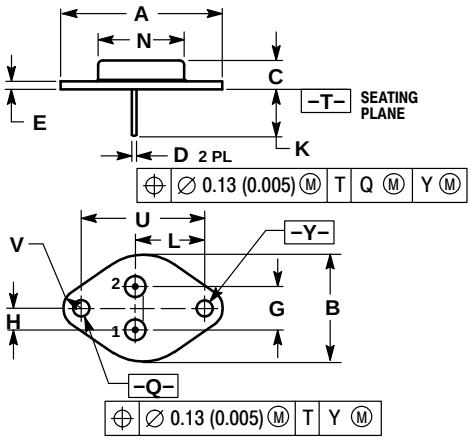


Figure 8. Power Derating

PACKAGE DIMENSIONS

TO−204 (TO−3)
CASE 1−07
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

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