



**MOTOROLA**  
**Semiconductors**

NPN PNP

**2N3773 2N6609**

### COMPLEMENTARY SILICON POWER TRANSISTORS

The 2N3773 and 2N6609 are EPI-BASE▲ 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 to dc converters or inverters.

- 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 A, 4 V  
 $V_{CE(sat)} = 1.4$  V (Max) @  $I_C = 8$  A,  $I_B = 0.8$  A
- For Low Distortion Complementary Designs

#### \* MAXIMUM RATINGS

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 (1)	$I_C$	16 30	Adc
Base Current — Continuous Peak (1)	$I_B$	4 15	Adc
Total Power 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	$^\circ\text{C}$

#### THERMAL CHARACTERISTICS

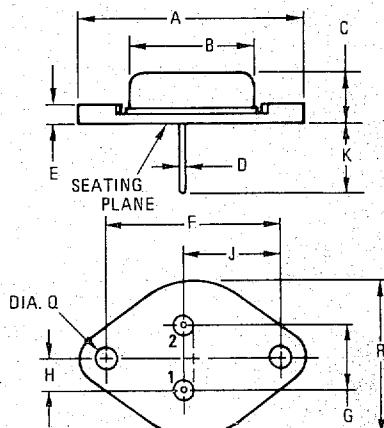
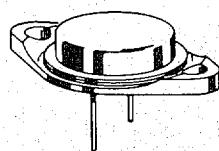
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.17	$^\circ\text{C}/\text{W}$

\*Indicates JEDEC Registered Data

(1) Pulse Test: Pulse Width = 5 ms, Duty Cycle  $\leq 10\%$ .

### 16 AMPERE COMPLEMENTARY POWER TRANSISTORS

140 VOLTS  
150 WATTS



STYLE 1:  
PIN 1. BASE  
2. Emitter  
CASE: COLLECTOR

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	—	39.37	—	1.550
B	—	22.23	—	0.875
C	6.35	11.43	0.250	0.450
D	0.97	1.09	0.038	0.043
E	—	3.43	—	0.135
F	29.90	30.40	1.177	1.197
G	10.67	11.18	0.420	0.440
H	5.21	5.72	0.205	0.225
J	16.64	17.15	0.655	0.675
K	11.18	12.19	0.440	0.480
Q	3.84	4.09	0.151	0.161
R	—	26.67	—	1.050

CASE 11-03  
TO-3

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

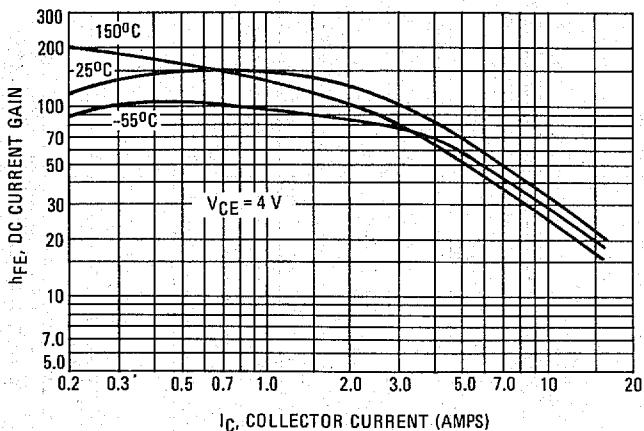
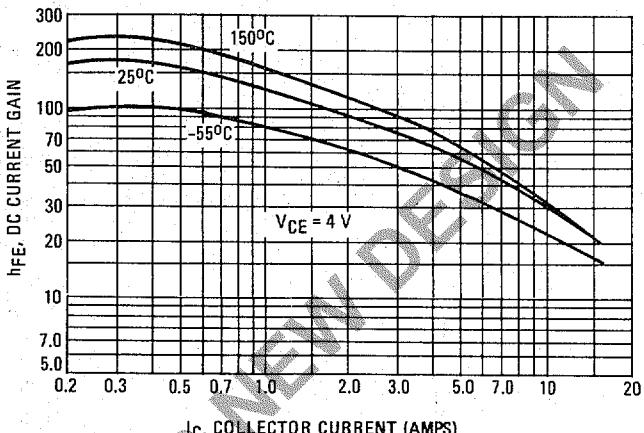
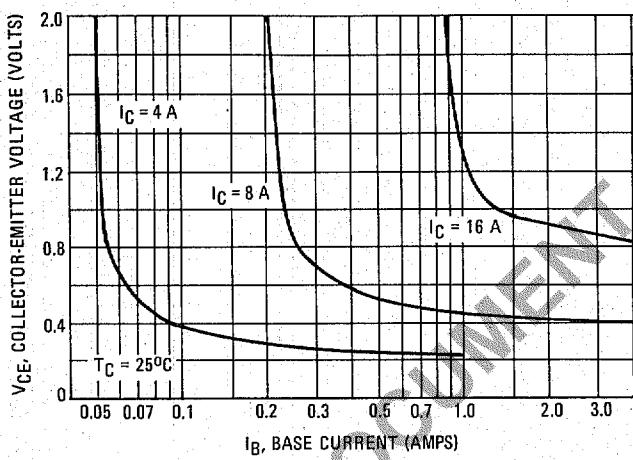
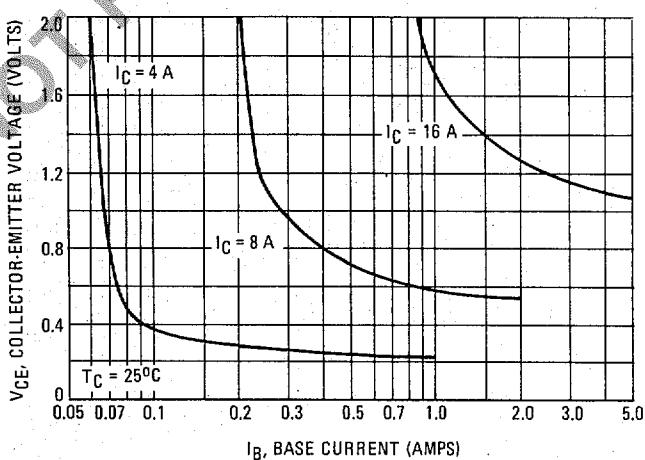
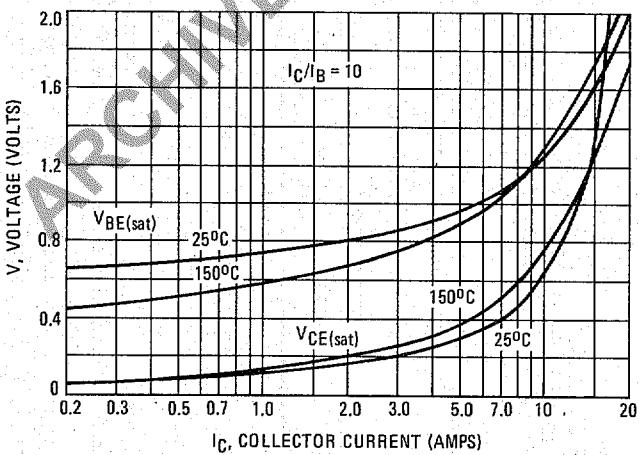
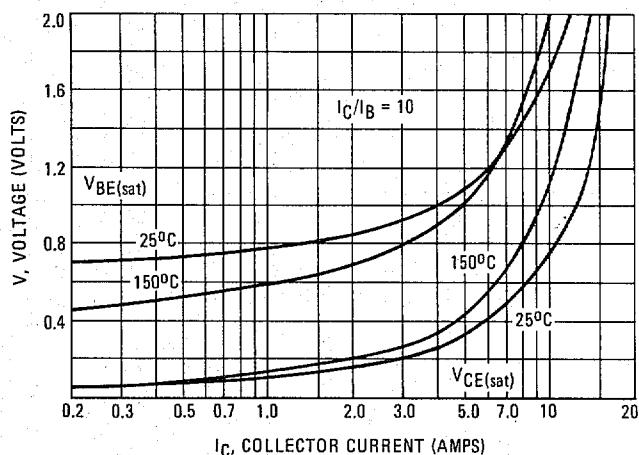
Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS (1)</b>				
*Collector-Emitter Breakdown Voltage ( $I_C = 0.2 \text{ Adc}, I_B = 0$ )	$V_{CEO(\text{sus})}$	140	—	Vdc
*Collector-Emitter Sustaining Voltage ( $I_C = 0.1 \text{ Adc}, V_{BE(\text{off})} = 1.5 \text{ Vdc}, R_{BE} = 100 \text{ Ohms}$ )	$V_{CEX(\text{sus})}$	160	—	Vdc
Collector-Emitter Sustaining Voltage ( $I_C = 0.2 \text{ Adc}, R_{BE} = 100 \text{ Ohms}$ )	$V_{CER(\text{sus})}$	150	—	Vdc
*Collector Cutoff Current ( $V_{CE} = 120 \text{ Vdc}, I_B = 0$ )	$I_{CEO}$	—	10	mAdc
*Collector Cutoff Current ( $V_{CE} = 140 \text{ Vdc}, V_{BE(\text{off})} = 1.5 \text{ Vdc}$ $(V_{CE} = 140 \text{ Vdc}, V_{BE(\text{off})} = 1.5 \text{ Vdc}, T_C = 150^\circ\text{C})$ )	$I_{CEX}$	—	2 10	mAdc
Collector Cutoff Current ( $V_{CB} = 140 \text{ Vdc}, I_E = 0$ )	$I_{CBO}$	—	2	mAdc
*Emitter Cutoff Current ( $V_{BE} = 7 \text{ Vdc}, I_C = 0$ )	$I_{EBO}$	—	5	mAdc
<b>ON CHARACTERISTICS (1)</b>				
DC Current Gain *( $I_C = 8 \text{ Adc}, V_{CE} = 4 \text{ Vdc}$ $(I_C = 16 \text{ Adc}, V_{CE} = 4 \text{ Vdc})$ )	$h_{FE}$	15 5	60	—
Collector-Emitter Saturation Voltage *( $I_C = 8 \text{ Adc}, I_B = 800 \text{ mAdc}$ $(I_C = 16 \text{ Adc}, I_B = 3.2 \text{ Adc})$ )	$V_{CE(\text{sat})}$	— —	1.4 4	Vdc
*Base-Emitter On Voltage ( $I_C = 8 \text{ Adc}, V_{CE} = 4 \text{ Vdc}$ )	$V_{BE(\text{on})}$	—	2.2	Vdc
<b>DYNAMIC CHARACTERISTICS</b>				
Magnitude of Common-Emitter Small-Signal, Short-Circuit, Forward Current Transfer Ratio ( $I_C = 1 \text{ A}, f = 50 \text{ kHz}$ )	$ h_{f\text{el}}$	4	—	—
*Small-Signal Current Gain ( $I_C = 1 \text{ Adc}, V_{CE} = 4 \text{ Vdc}, f = 1 \text{ kHz}$ )	$h_{fe}$	40	—	—
<b>SWITCHING CHARACTERISTICS</b>				
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

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

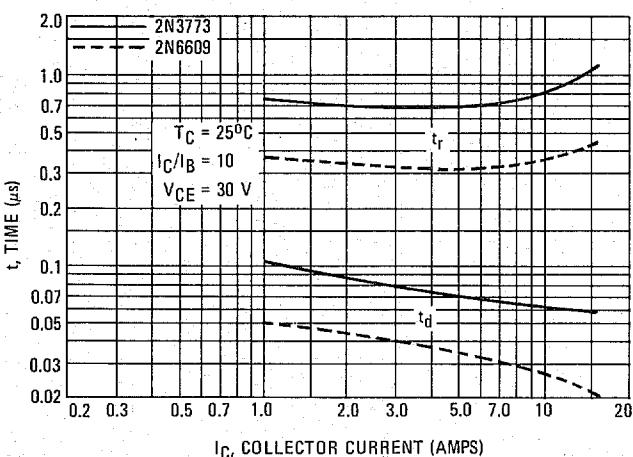
\* Indicates JEDEC Registered Data.



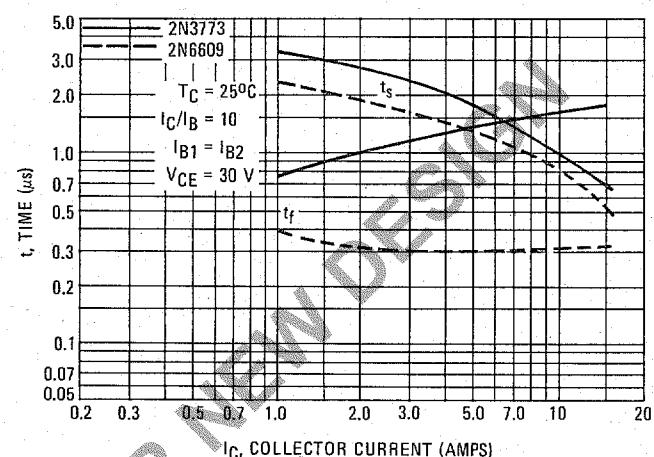
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**NPN****FIGURE 1 – DC CURRENT GAIN****PNP****FIGURE 2 – DC CURRENT GAIN****FIGURE 3 – COLLECTOR SATURATION REGION****FIGURE 4 – COLLECTOR SATURATION REGION****FIGURE 5 – “ON” VOLTAGE****FIGURE 6 – “ON” VOLTAGE**

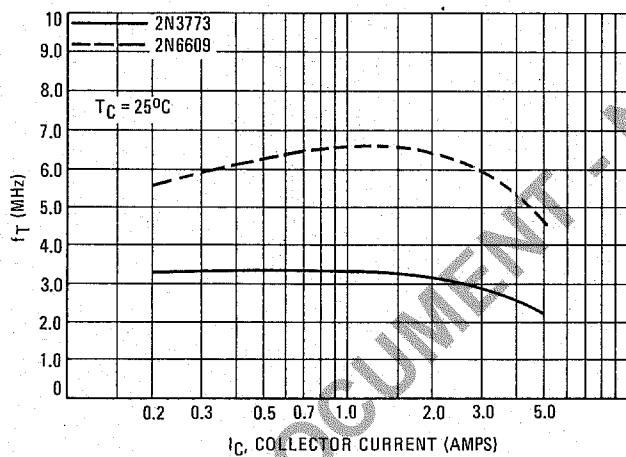
**FIGURE 7 – TURN-ON SWITCHING  
TIMES – 2N3773, 2N6609**



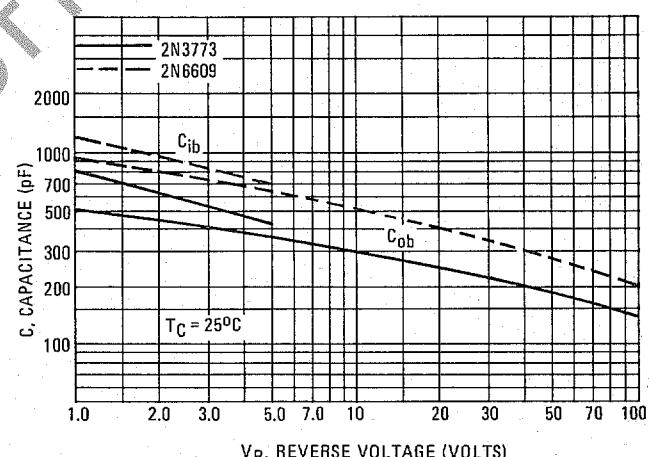
**FIGURE 8 – TURN-OFF SWITCHING  
TIMES – 2N3773, 2N6609**



**FIGURE 9 – CURRENT-GAIN – BANDWIDTH  
PRODUCT – 2N3773, 2N6609**



**FIGURE 10 – CAPACITANCES – 2N3773, 2N6609**



**FIGURE 11 – THERMAL RESPONSE – 2N3773, 2N6609**

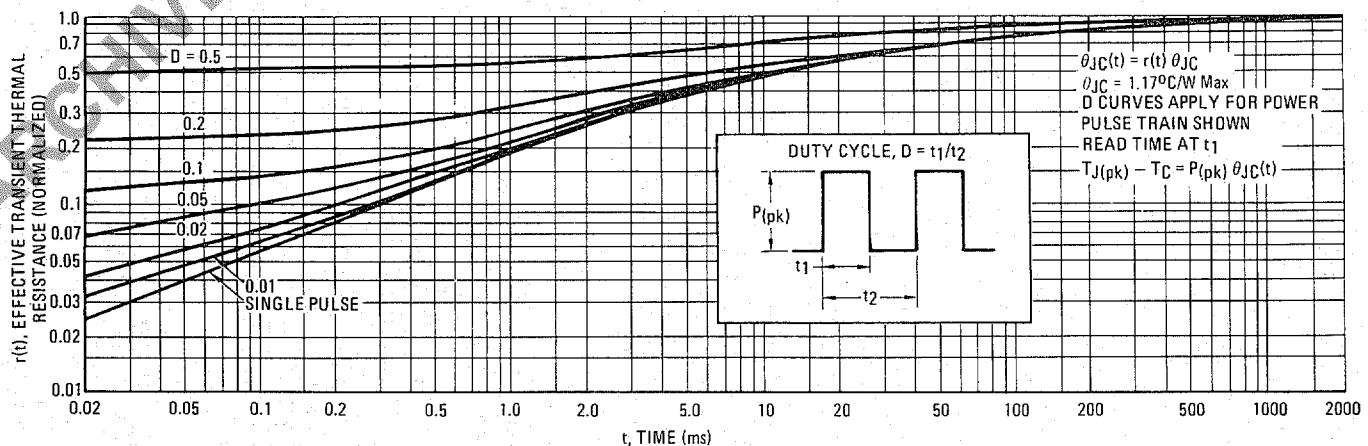
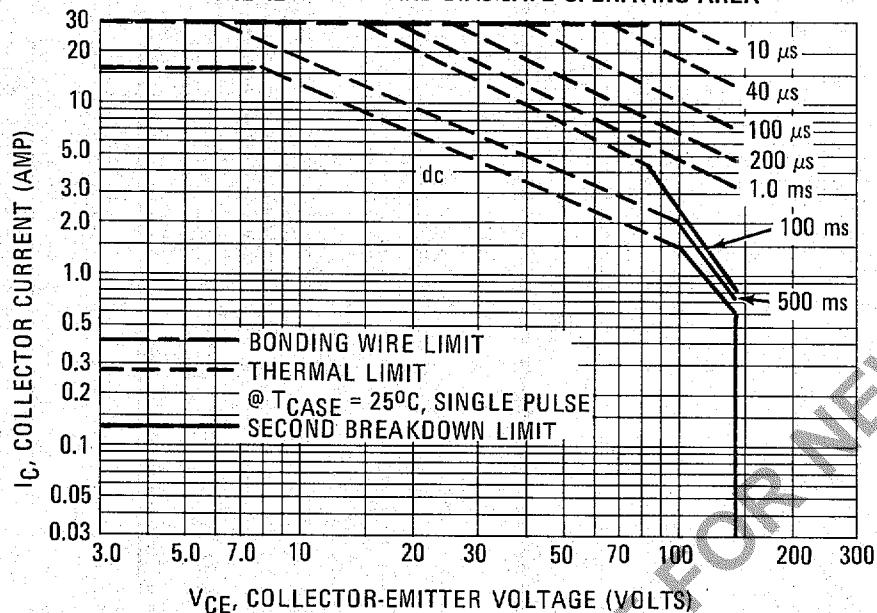


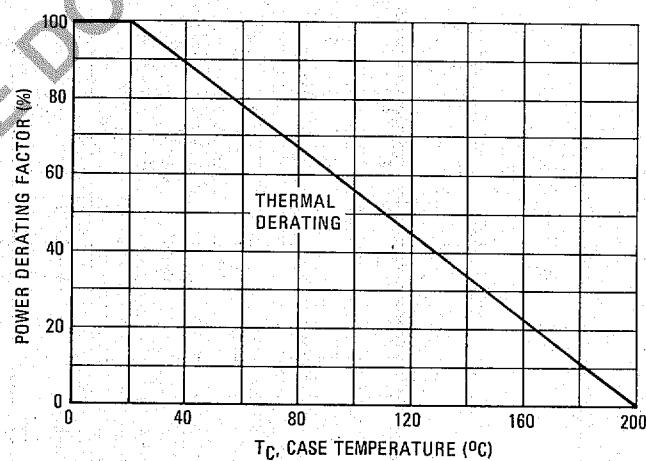
FIGURE 12 – FORWARD BIAS SAFE OPERATING AREA



There are two limitations on the powerhandling 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 12 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 (see AN-415A).

FIGURE 13 – POWER DERATING



ARCHIVE DOCUMENT - NOT FOR NEW DESIGN



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