



MOTOROLA
Semiconductors

NPN PNP
2N3773 2N6609

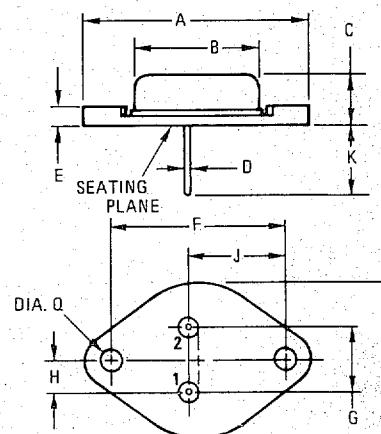
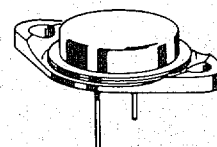
COMPLEMENTARY SILICON POWER TRANSISTORS

The 2N3773 and 2N6609 are EPI-BASE Δ 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

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

* 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	I_C	16	Adc
— Peak (1)		30	
Base Current — Continuous	I_B	4	Adc
— Peak (1)		15	
Total Power Dissipation @ $T_C = 25^\circ\text{C}$	P_D	150	Watts
Derate above 25°C		0.855	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 $\leq 10\%$.

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS (1)				
*Collector-Emitter Breakdown Voltage ($I_C = 0.2 \text{ A dc}$, $I_B = 0$)	$V_{CEO(sus)}$	140	—	Vdc
*Collector-Emitter Sustaining Voltage ($I_C = 0.1 \text{ A dc}$, $V_{BE(off)} = 1.5 \text{ Vdc}$, $R_{BE} = 100 \text{ Ohms}$)	$V_{CEX(sus)}$	160	—	Vdc
Collector-Emitter Sustaining Voltage ($I_C = 0.2 \text{ A dc}$, $R_{BE} = 100 \text{ Ohms}$)	$V_{CER(sus)}$	150	—	Vdc
*Collector Cutoff Current ($V_{CE} = 120 \text{ Vdc}$, $I_B = 0$)	I_{CEO}	—	10	mA dc
*Collector Cutoff Current ($V_{CE} = 140 \text{ Vdc}$, $V_{BE(off)} = 1.5 \text{ Vdc}$ ($V_{CE} = 140 \text{ Vdc}$, $V_{BE(off)} = 1.5 \text{ Vdc}$, $T_C = 150^\circ\text{C}$)	I_{CEX}	—	2 10	mA dc
Collector Cutoff Current ($V_{CB} = 140 \text{ Vdc}$, $I_E = 0$)	I_{CBO}	—	2	mA dc
*Emitter Cutoff Current ($V_{BE} = 7 \text{ Vdc}$, $I_C = 0$)	I_{EBO}	—	5	mA dc
ON CHARACTERISTICS (1)				
DC Current Gain *($I_C = 8 \text{ A dc}$, $V_{CE} = 4 \text{ Vdc}$) ($I_C = 16 \text{ A dc}$, $V_{CE} = 4 \text{ Vdc}$)	h_{FE}	15 5	60	—
Collector-Emitter Saturation Voltage *($I_C = 8 \text{ A dc}$, $I_B = 800 \text{ mA dc}$) ($I_C = 16 \text{ A dc}$, $I_B = 3.2 \text{ A dc}$)	$V_{CE(sat)}$	— —	1.4 4	Vdc
*Base-Emitter On Voltage ($I_C = 8 \text{ A dc}$, $V_{CE} = 4 \text{ Vdc}$)	$V_{BE(on)}$	—	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 ($I_C = 1 \text{ A dc}$, $V_{CE} = 4 \text{ Vdc}$, $f = 1 \text{ kHz}$)	h_{fe}	40	—	—
SWITCHING 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	—	A dc

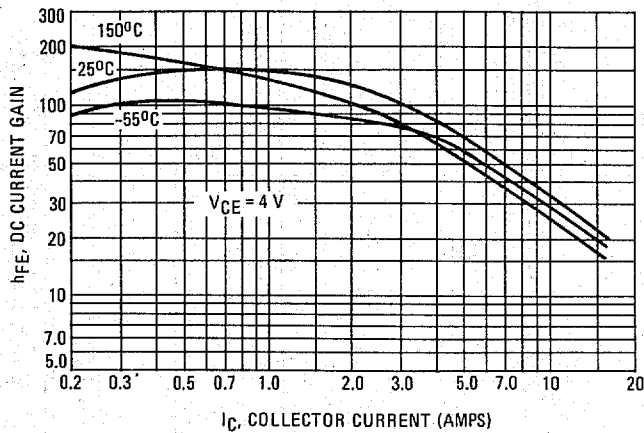
(1) Pulse Test: Pulse Width = $300 \mu\text{s}$, Duty Cycle $\leq 2\%$.

* Indicates JEDEC Registered Data



NPN

FIGURE 1 — DC CURRENT GAIN



PNP

FIGURE 2 — DC CURRENT GAIN

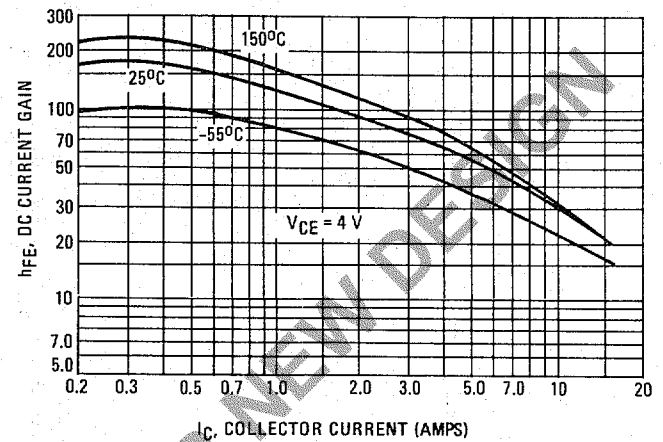


FIGURE 3 — COLLECTOR SATURATION REGION

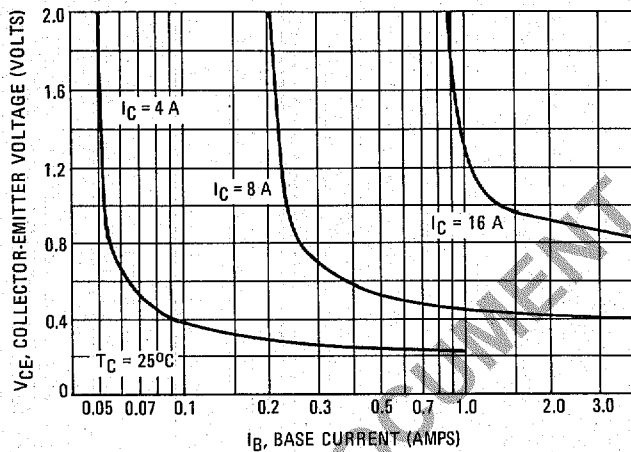


FIGURE 4 — COLLECTOR SATURATION REGION

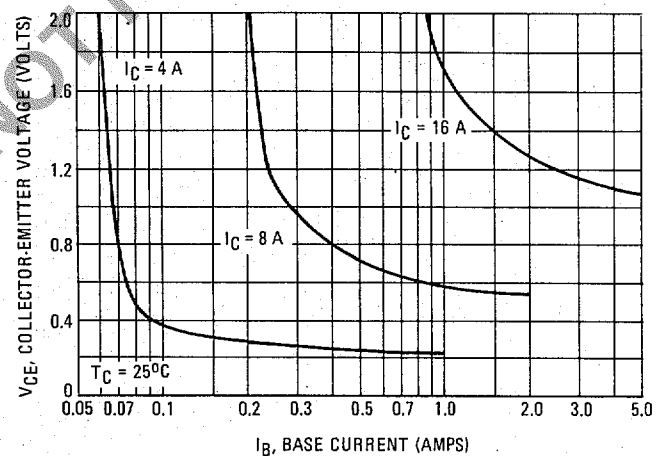


FIGURE 5 — "ON" VOLTAGE

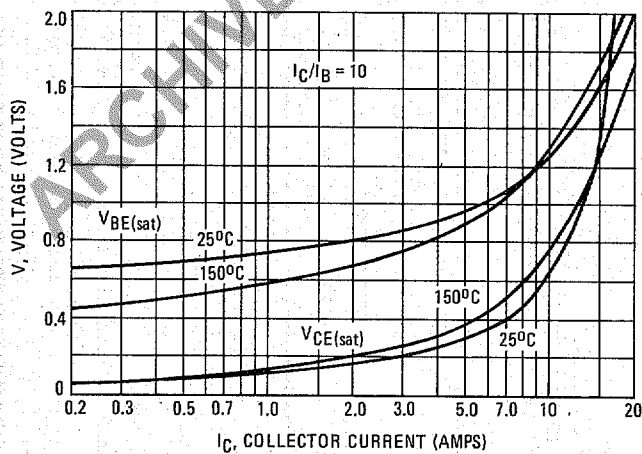


FIGURE 6 — "ON" VOLTAGE

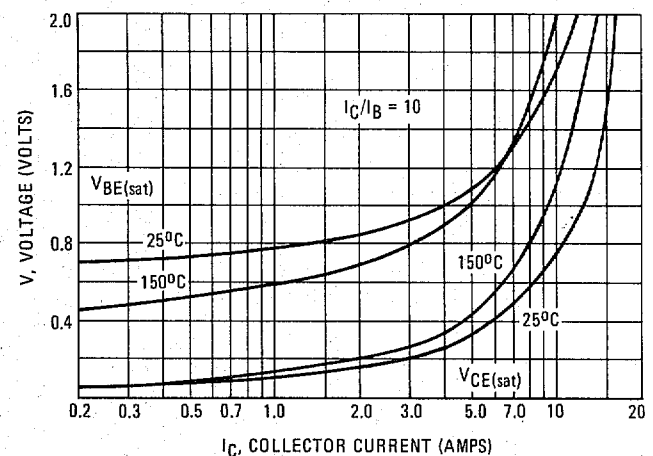


FIGURE 7 – TURN-ON SWITCHING TIMES – 2N3773, 2N6609

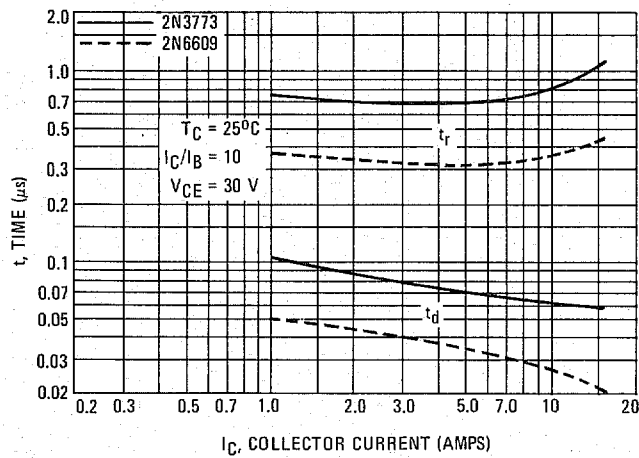


FIGURE 8 – TURN-OFF SWITCHING TIMES – 2N3773, 2N6609

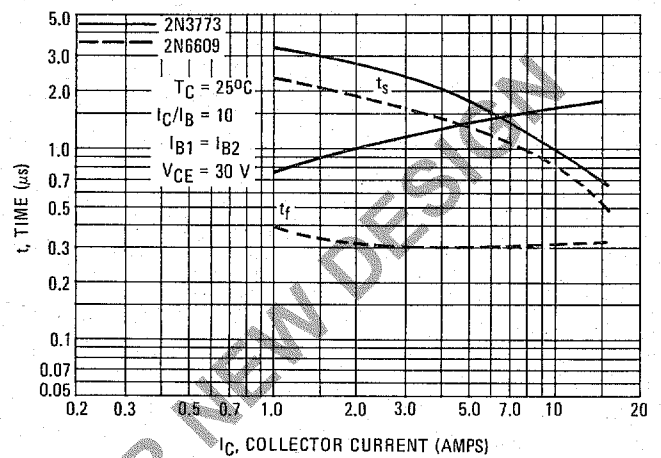


FIGURE 9 – CURRENT-GAIN – BANDWIDTH PRODUCT – 2N3773, 2N6609

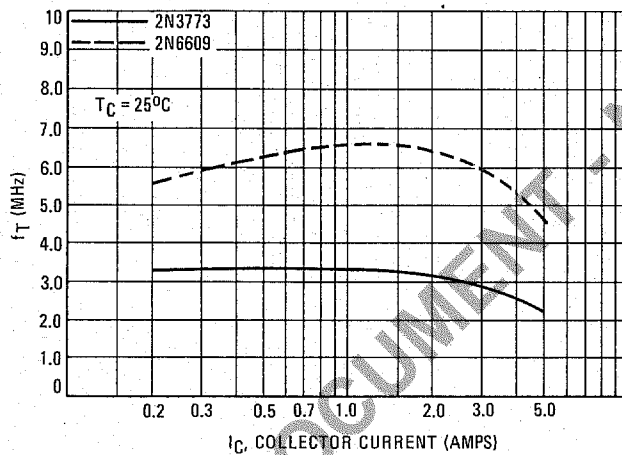


FIGURE 10 – CAPACITANCES – 2N3773, 2N6609

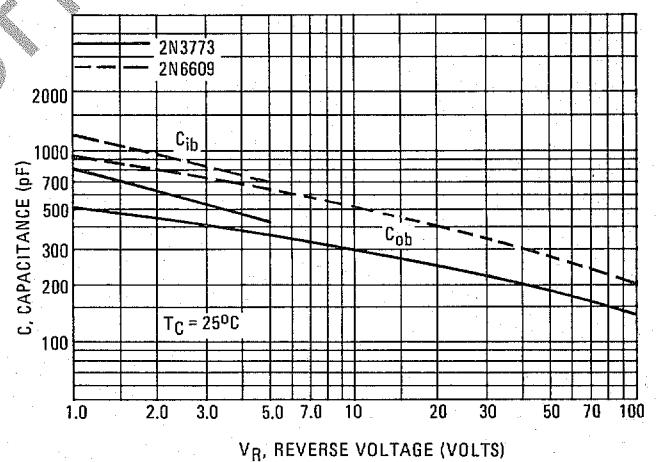


FIGURE 11 – THERMAL RESPONSE – 2N3773, 2N6609

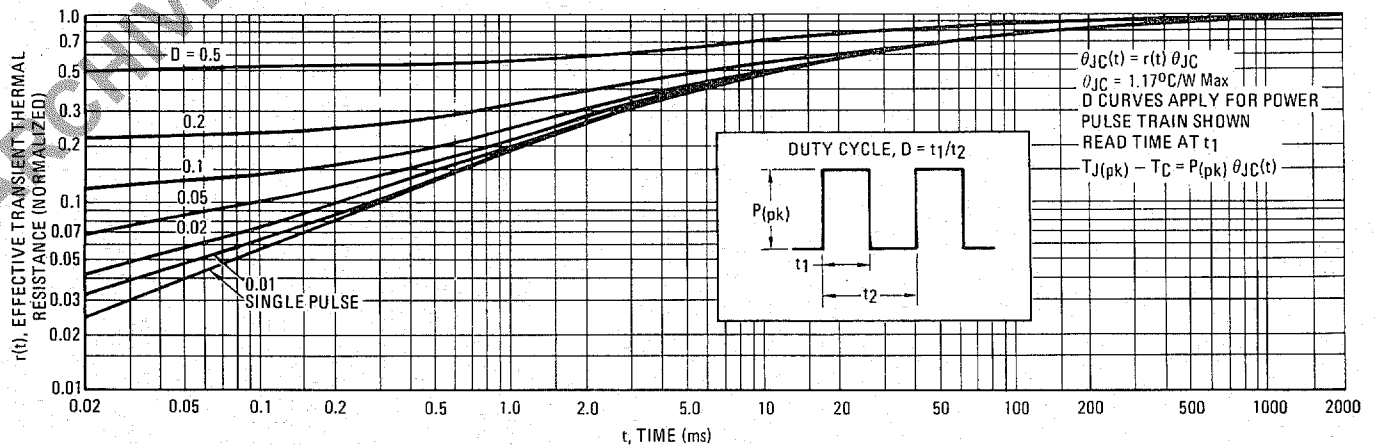
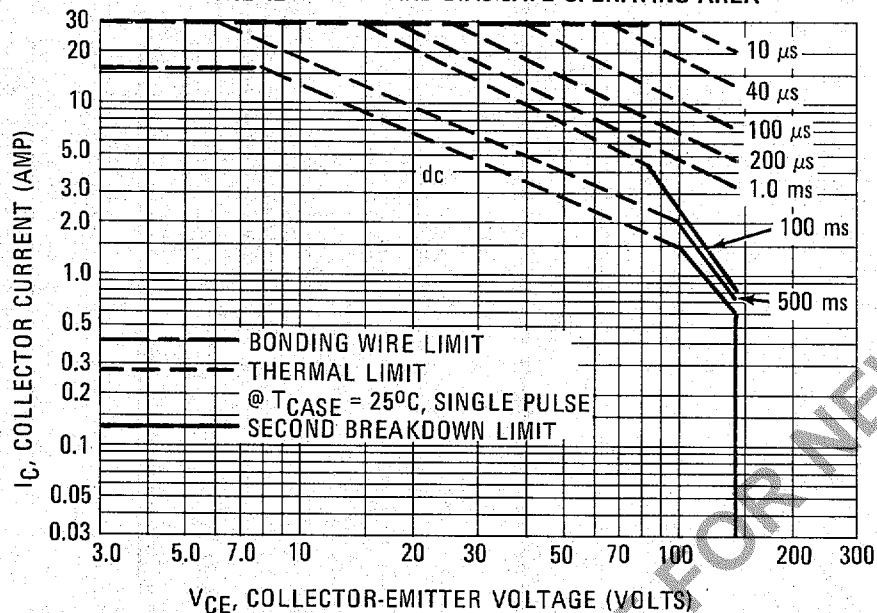


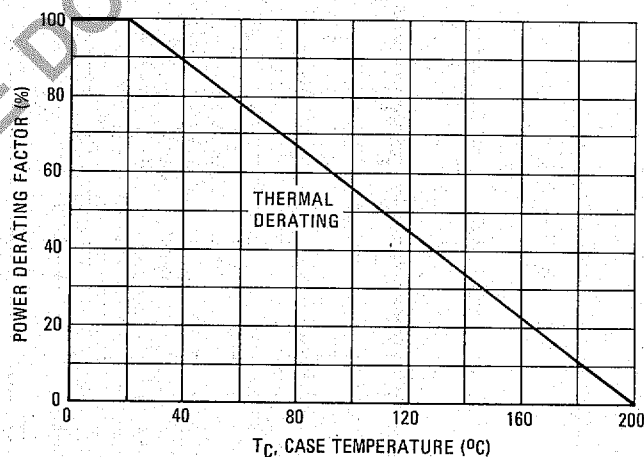
FIGURE 12 — FORWARD BIAS SAFE OPERATING AREA



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



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