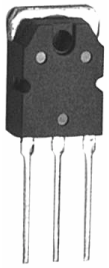
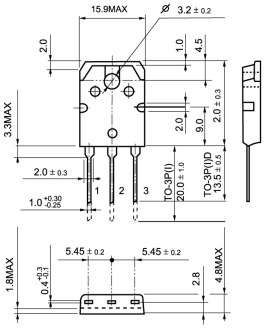
2SD717 Silicon Epitaxial Planar Transistor

GENERAL DESCRIPTION

Silicon NPN high frequency, high power transistors in
a plastic envelope, primarily for use in audio and general purpose



TO-3P(I)D



QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP	MAX	UNIT
V_{CBO}	Collector-emitter voltage peak value	V_{BE} = 0V	-	70	V
V_{CEO}	Collector-emitter voltage (open base)		-	70	V
I_C	Collector current (DC)		-	10	A
I_{CM}	Collector current peak value		-		A
P_{tot}	Total power dissipation	T_{mb}≤25℃	-	80	W
V_{CEsat}	Collector-emitter saturation voltage	I_C = 4.0A; I_B=0.4A	-	2	V
V_F	Diode forward voltage	I_F = 3.5A	1.5	2.0	V
t_f	Fall time	I_C=4A,I_{B1}=-I_{B2}=0.4A,V_{CC}=30V	0.4	1.0-	μs

LIMITING VALUES

SYMBOL	PARAMETER	CONDITIONS	MIN	MAX	UNIT
V_{CESM}	Collector-emitter voltage peak value	V_{BE} = 0V	-	70	V
V_{CEO}	Collector-emitter voltage (open base)		-	70	V
V_{EBO}	Emitter-base oltage (open colloctor)			5	V
I_C	Collector current (DC)		-	10	A
I_B	Base current (DC)		-	2.5	A
P_{tot}	Total power dissipation	Tmb≤25℃	-	80	W
T_{stg}	Storage temperature		-55	150	℃
T_j	Junction temperature		-	150	℃

ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	TYP	MAX	UNIT
I_{CBO}	Collector-base cut-off current	V_{CB}=70V	-	0.2	mA
I_{EBO}	Emitter-base cut-off current	V_{EB}=5V	-	0.2	mA
$V_{(BR)CEO}$	Collector-emitter breakdown voltage	I_C=1mA	70		V
V_{CEsat}	Collector-emitter saturation voltages	I_C = 4.0A; I_B = 0.4A	-	3	V
h_{FE}	DC current gain	I_C = 1A; V_{CE} = 5V	50	240	
f_T	Transition frequency at f = 5MHz	I_C = 1A; V_{CE} = 12V	10	-	MHz
C_c	Collector capacitance at f = 1MHz	V_{CB} = 10V	350	-	pF
t_{on}	On times	I_C=4A,I_{B1}=-I_{B2}=0.4A,V_{CC}=30V	0.3		us
t_s	Tum-off storage time	I_C=4A,I_{B1}=-I_{B2}=0.4A,V_{CC}=30V	2.5		us
t_f	Fall time	I_C=4A,I_{B1}=-I_{B2}=0.4A,V_{CC}=30V	0.4		us

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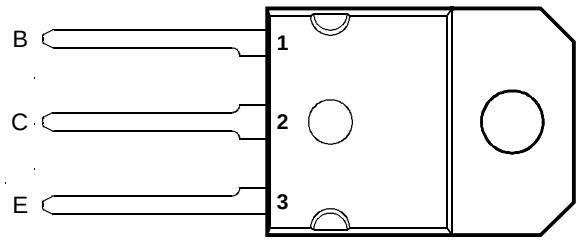
BD249, BD249A, BD249B, BD249C
NPN SILICON POWER TRANSISTORS

 JUNE 1973 - REVISED MARCH 1997

- **Designed for Complementary Use with the BD250 Series**
- **125 W at 25°C Case Temperature**
- **25 A Continuous Collector Current**
- **40 A Peak Collector Current**
- **Customer-Specified Selections Available**

SOT-93 PACKAGE
(TOP VIEW)



Pin 2 is in electrical contact with the mounting base.

MDTRAA

absolute maximum ratings at 25°C case temperature (unless otherwise noted)

RATING		SYMBOL	VALUE	UNIT
Collector-emitter voltage (R_{BE} = 100 Ω)	BD249	V_{CER}	55	V
	BD249A		70	
	BD249B		90	
	BD249C		115	
Collector-emitter voltage (I_C = 30 mA)	BD249	V_{CEO}	45	V
	BD249A		60	
	BD249B		80	
	BD249C		100	
Emitter-base voltage		V_{EBO}	5	V
Continuous collector current		I_C	25	A
Peak collector current (see Note 1)		I_{CM}	40	A
Continuous base current		I_B	5	A
Continuous device dissipation at (or below) 25°C case temperature (see Note 2)		P_{tot}	125	W
Continuous device dissipation at (or below) 25°C free air temperature (see Note 3)		P_{tot}	3	W
Unclamped inductive load energy (see Note 4)		$½LI_C^2$	90	mJ
Operating junction temperature range		T_j	-65 to +150	°C
Storage temperature range		T_{stg}	-65 to +150	°C
Lead temperature 3.2 mm from case for 10 seconds		T_L	250	°C

NOTES: 1. This value applies for $t_p \leq 0.3$ ms, duty cycle ≤ 10%.
2. Derate linearly to 150°C case temperature at the rate of 1 W/°C.
3. Derate linearly to 150°C free air temperature at the rate of 24 mW/°C.
4. This rating is based on the capability of the transistor to operate safely in a circuit of: L = 20 mH, $I_{B(on)}$ = 0.4 A, R_{BE} = 100 Ω, $V_{BE(off)}$ = 0, R_S = 0.1 Ω, V_{CC} = 20 V.

PRODUCT INFORMATION

electrical characteristics at 25°C case temperature

PARAMETER		TEST CONDITIONS			MIN	TYP	MAX	UNIT
$V_{(BR)CEO}$	Collector-emitter breakdown voltage	I_C = 30 mA (see Note 5)	I_B = 0	BD249	45			V
				BD249A	60			
				BD249B	80			
				BD249C	100			
I_{CES}	Collector-emitter cut-off current	V_{CE} = 55 V	V_{BE} = 0	BD249			0.7	mA
		V_{CE} = 70 V	V_{BE} = 0	BD249A			0.7	
		V_{CE} = 90 V	V_{BE} = 0	BD249B			0.7	
		V_{CE} = 115 V	V_{BE} = 0	BD249C			0.7	
I_{CEO}	Collector cut-off current	V_{CE} = 30 V	I_B = 0	BD249/249A			1	mA
		V_{CE} = 60 V	I_B = 0	BD249B/249C			1	
I_{EBO}	Emitter cut-off current	V_{EB} = 5 V	I_C = 0				1	mA
h_{FE}	Forward current transfer ratio	V_{CE} = 4 V	I_C = 1.5 A	(see Notes 5 and 6)	25			
		V_{CE} = 4 V	I_C = 15 A		10			
		V_{CE} = 4 V	I_C = 25 A		5			
$V_{CE(sat)}$	Collector-emitter saturation voltage	I_B = 1.5 A	I_C = 15 A	(see Notes 5 and 6)			1.8	V
		I_B = 5 A	I_C = 25 A				4	
V_{BE}	Base-emitter voltage	V_{CE} = 4 V	I_C = 15 A	(see Notes 5 and 6)			2	V
		V_{CE} = 4 V	I_C = 25 A				4	
h_{fe}	Small signal forward current transfer ratio	V_{CE} = 10 V	I_C = 1 A	f = 1 kHz	25			
$\|h_{fe}\|$	Small signal forward current transfer ratio	V_{CE} = 10 V	I_C = 1 A	f = 1 MHz	3			

NOTES: 5. These parameters must be measured using pulse techniques, t_p = 300 µs, duty cycle ≤ 2%.
6. These parameters must be measured using voltage-sensing contacts, separate from the current carrying contacts.

thermal characteristics

PARAMETER		MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to case thermal resistance			1	°C/W
$R_{\theta JA}$	Junction to free air thermal resistance			42	°C/W

resistive-load-switching characteristics at 25°C case temperature

PARAMETER		TEST CONDITIONS †			MIN	TYP	MAX	UNIT
t_{on}	Turn-on time	I_C = 5 A	$I_{B(on)}$ = 0.5 A	$I_{B(off)}$ = -0.5 A		0.3		µs
t_{off}	Turn-off time	$V_{BE(off)}$ = -5 V	R_L = 5 Ω	t_p = 20 µs, dc ≤ 2%		0.9		µs

† Voltage and current values shown are nominal; exact values vary slightly with transistor parameters.

TYPICAL CHARACTERISTICS

TYPICAL DC CURRENT GAIN
vs
COLLECTOR CURRENT

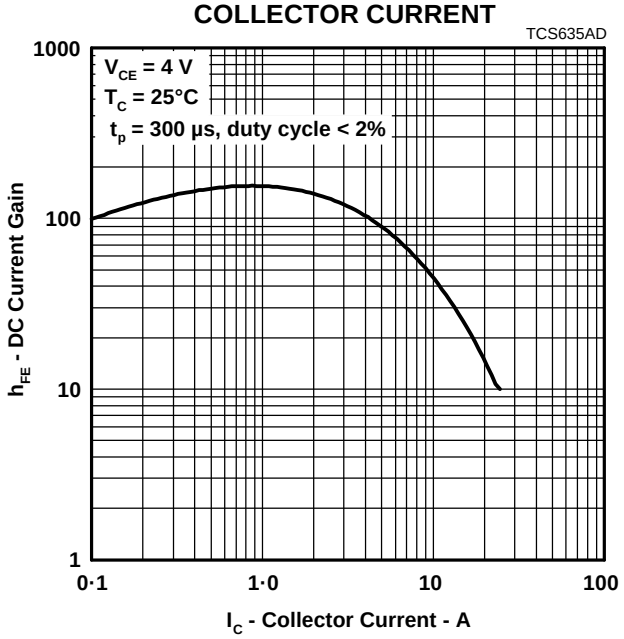


Figure 1.

COLLECTOR-EMITTER SATURATION VOLTAGE
vs
BASE CURRENT

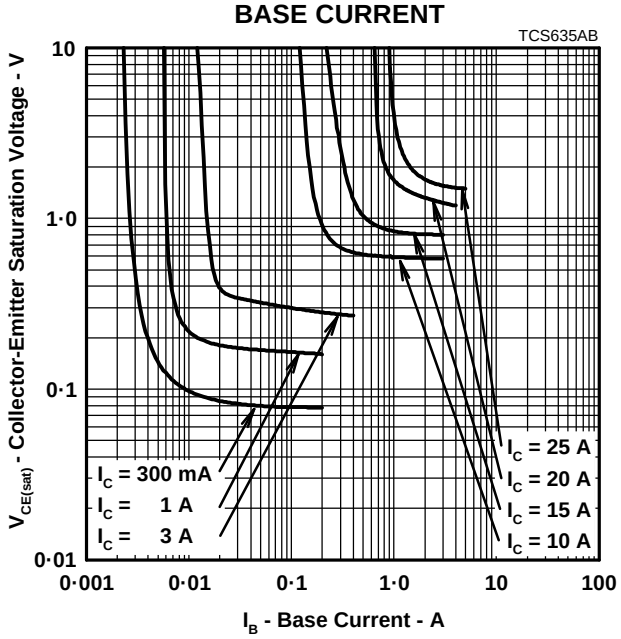


Figure 2.

BASE-EMITTER VOLTAGE
vs
COLLECTOR CURRENT

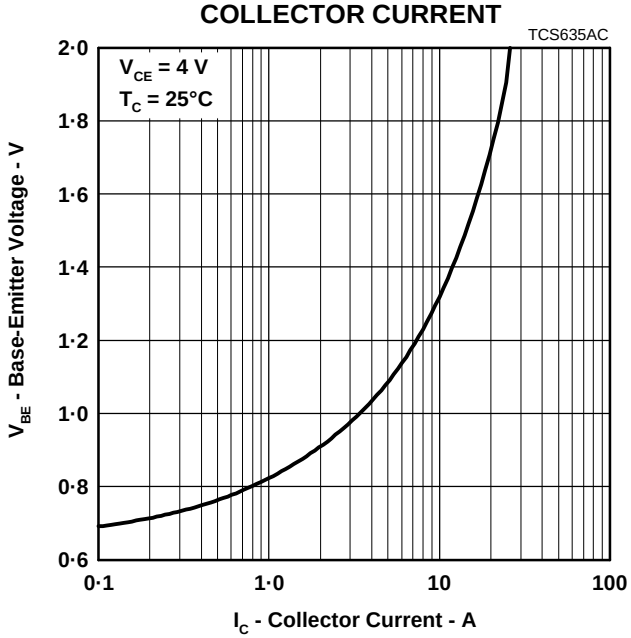


Figure 3.

MAXIMUM SAFE OPERATING REGIONS

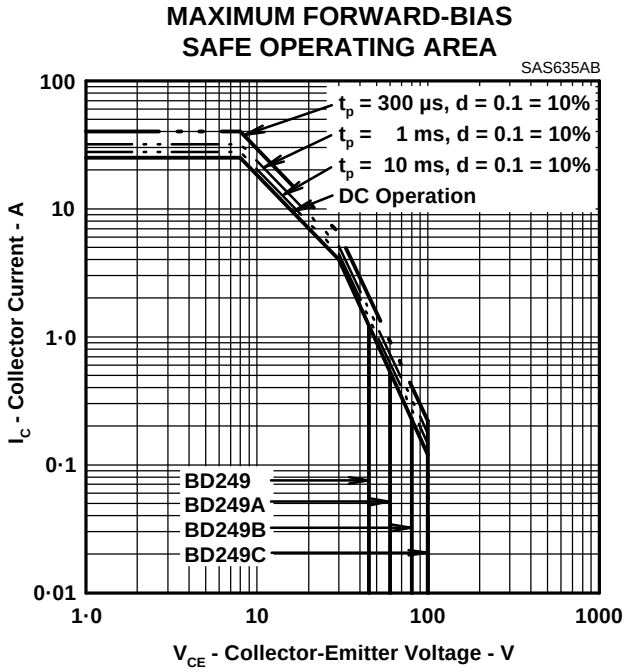


Figure 4.

THERMAL INFORMATION

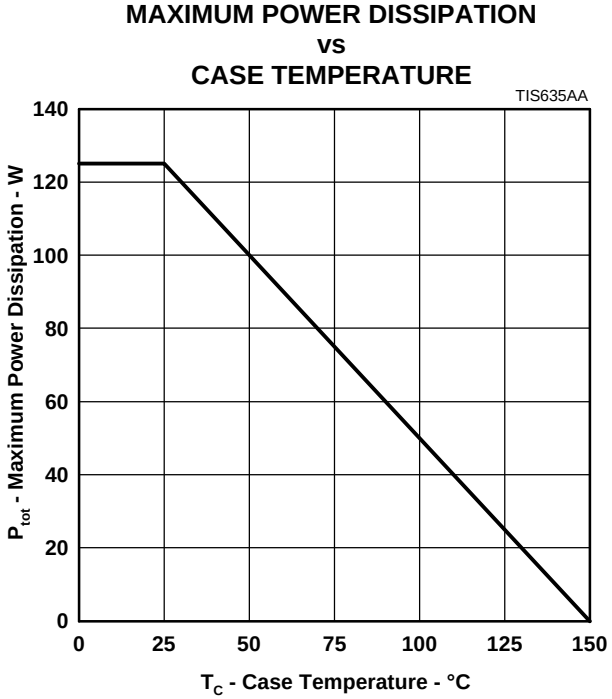


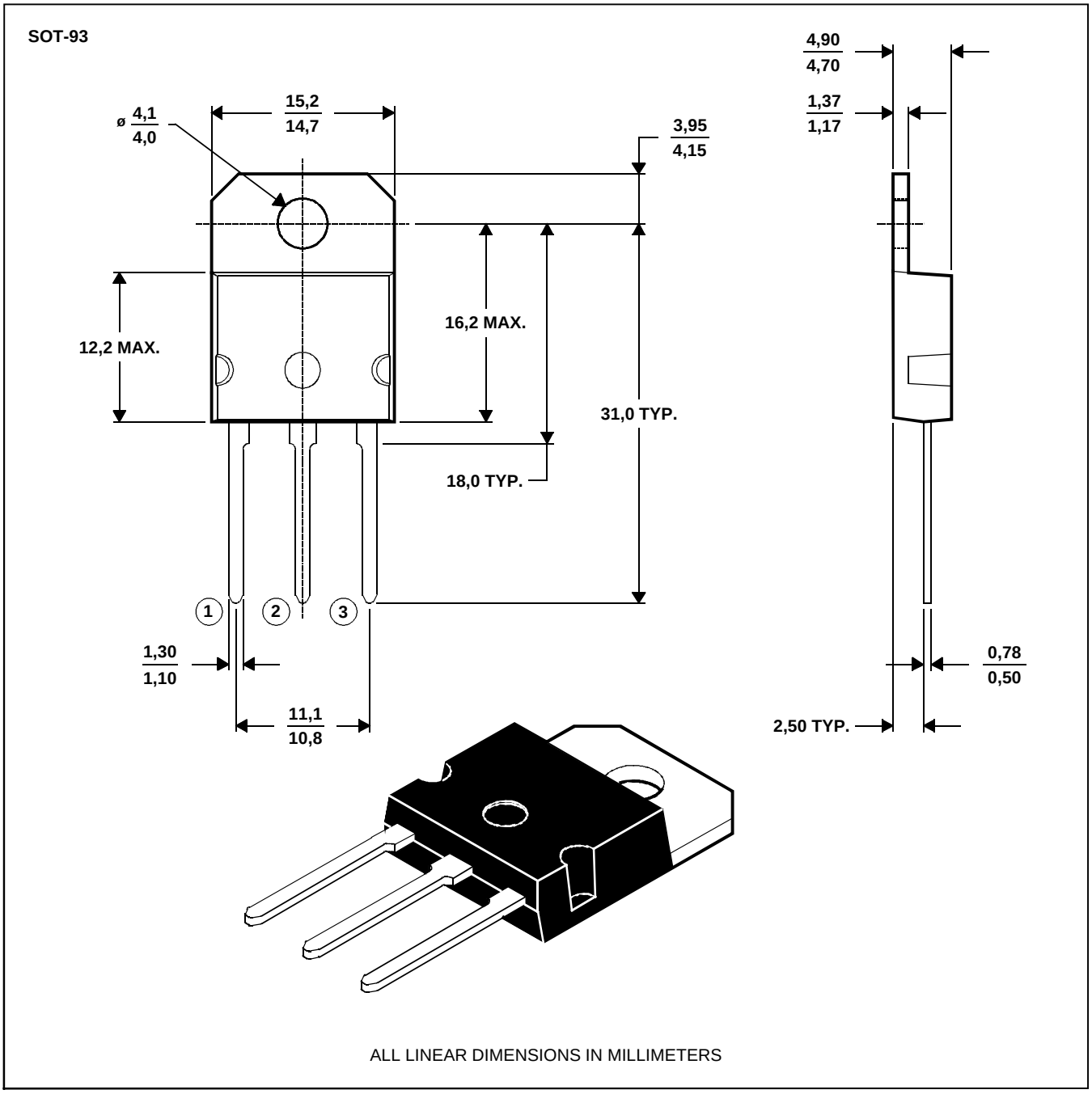
Figure 5.

PRODUCT INFORMATION

MECHANICAL DATA

SOT-93
3-pin plastic flange-mount package

This single-in-line package consists of a circuit mounted on a lead frame and encapsulated within a plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high humidity conditions. Leads require no additional cleaning or processing when used in soldered assembly.



NOTE A: The centre pin is in electrical contact with the mounting tab.

MDXXAW

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MOSPEC

COMPLEMENTARY SILICON POWER TRANSISTORS

The 2N3773 and 2N6609 are power base power transistors designed for high power audio, disk head positioners,linear amplifiers,switching regulators,solenoid drivers,and dc to dc converters or inverters.

NPN 2N3773 **PNP 2N6609**

16 AMPERE
COMPLEMENTARY SILICON
POWER TRANSISTORS
140 VOLTS
150 WATTS

FEATURES:

* High Power Dissipation
  P_D = 150 W (T_C = 25°C)
* High DC Current Gain and Low Saturation Voltage
  hFE = 15-60 @ I_C = 8 A , V_{CE} = 4 V
  $V_{CE(SAT)}$ = 1.4 V (Max.) @ I_C = 8 A, I_B = 0.8 A

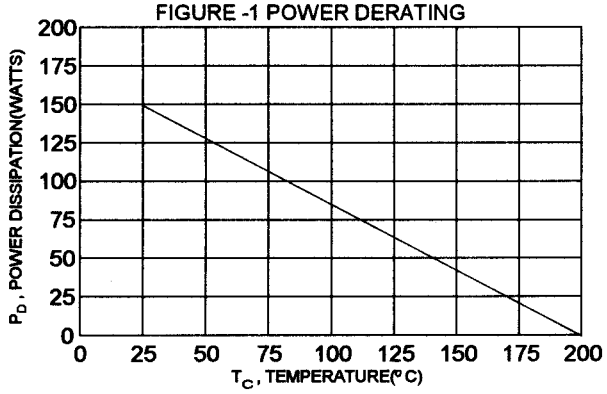
MAXIMUM RATINGS

Characteristic	Symbol	Rating	Unit
Collector-Emitter Voltage	$V_{CEO(SUS)}$	140	V
Collector-Emitter Voltage	V_{CEX}	160	V
Collector-Base Voltage	V_{CBO}	160	V
Emitter-Base Voltage	V_{EBO}	7	V
Collector Current-Continuous Peak (1)	I_C I_{CM}	16 30	A
Base Current-Continuous Peak (1)	I_B I_{BM}	4.0 15	A
Total Power Dissipation @T_C=25°C Derate above 25°C	P_D	150 0.857	W W/°C
Operating and Storage Junction Temperature Range	T_J , T_{STG}	-65 to +200	°C

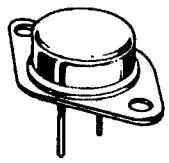
THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance Junction to Case	Rθjc	1.17	°C/W

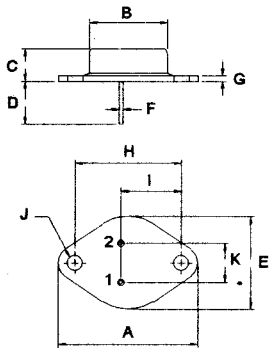
FIGURE -1 POWER DERATING



(1) Pulse Test: Pulse width = 5 ms , Duty Cycle < 10%



TO-3



PIN 1.BASE
2.EMITTER
COLLECTOR(CASE)

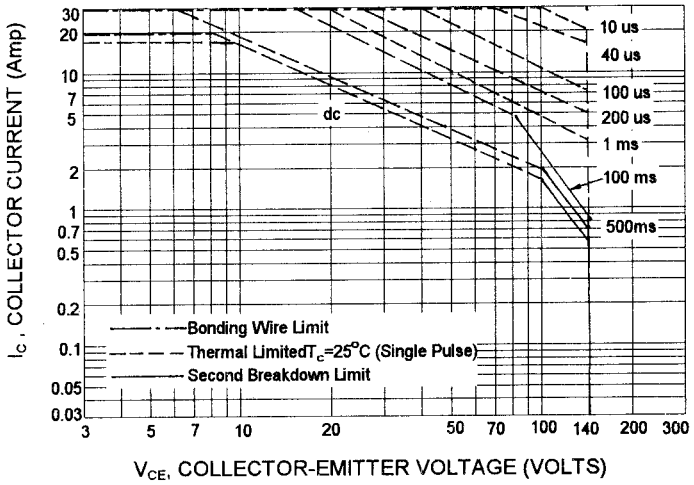
DIM	MILLIMETERS	
	MIN	MAX
A	38.75	39.96
B	19.28	22.23
C	7.96	9.28
D	11.18	12.19
E	25.20	26.67
F	0.92	1.09
G	1.38	1.62
H	29.90	30.40
I	16.64	17.30
J	3.88	4.36
K	10.67	11.18

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector - Emitter Sustaining Voltage (1) (I_C = 200 mA, I_B = 0)	$V_{CEO(SUS)}$	140		V
Collector Cutoff Current (V_{CE} = 120 V, I_B = 0)	I_{CEO}		10	mA
Collector Cutoff Current (V_{CE} = 140 V, $V_{BE(OFF)}$ = 1.5 V)	I_{CEX}		2.0	mA
Collector Cutoff Current (V_{CB} = 140 V, I_E = 0)	I_{CBO}		2.0	mA
Emitter Cutoff Current (V_{EB} = 7.0 V, I_C = 0)	I_{EBO}		5.0	mA
ON CHARACTERISTICS (1)				
DC Current Gain (I_C = 8.0 A , V_{CE} = 4.0 V) (I_C = 16 A, V_{CE} = 4.0 V	hFE	15 5.0	60	
Collector - Emitter Saturation Voltage (I_C = 8.0 A , I_B = 800 mA) (I_C = 16 A, I_B = 3.2 A)	$V_{CE(sat)}$		1.4 4.0	V
Base - Emitter On Voltage (I_C = 8.0 A, V_{CE} = 4.0 V)	$V_{BE(ON)}$		2.2	V

* Pulse Test: Pulse width = 300 us , Duty Cycle = 2.0%

ACTIVE-REGION SAFE OPERATING AREA (SOA)

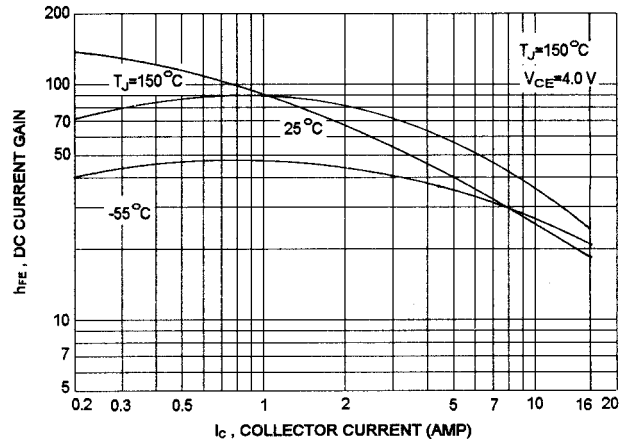


There are two limitation on the power handling ability of a transistor:average junction temperature and second breakdown safe operating area curves indicate I_C-V_{CE} limits of the transistor that must be observed for reliable operation i.e., the transistor must not be subjected to greater dissipation than curves indicate.

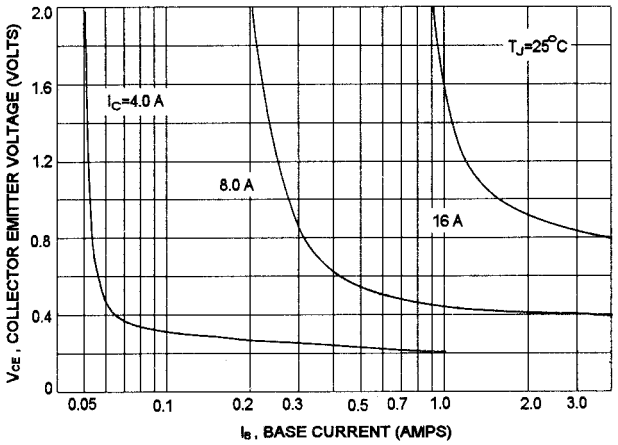
The data of SOA curve is base on $T_{J(PK)}$=200 °C;T_C is variable depending on conditions. second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(PK)}$≤200°C,At high case temperatures, thermal limita - tion will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

NPN 2N3773

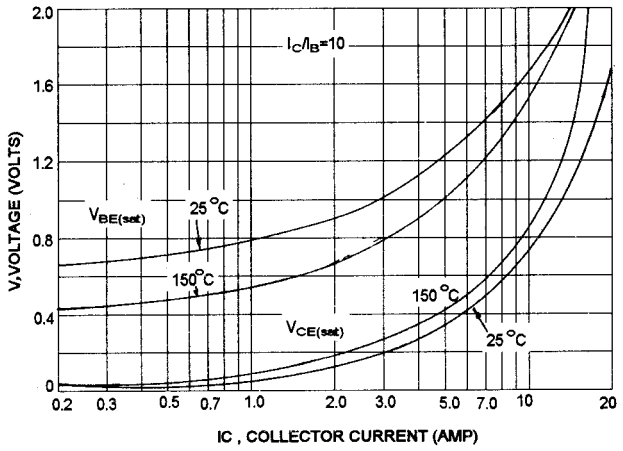
DC CURRENT GAIN



COLLECTOR SATURATION REGION

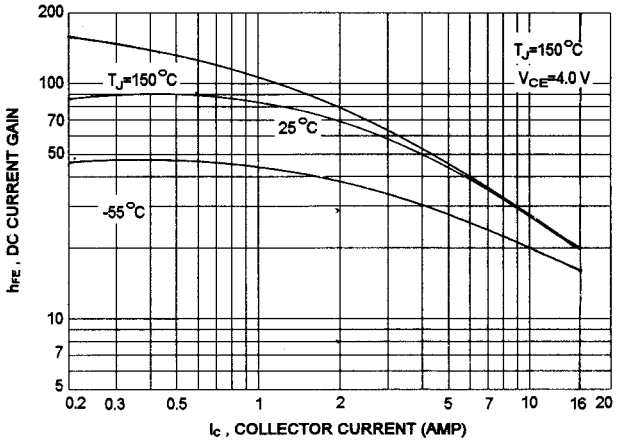


"ON" VOLTAGES

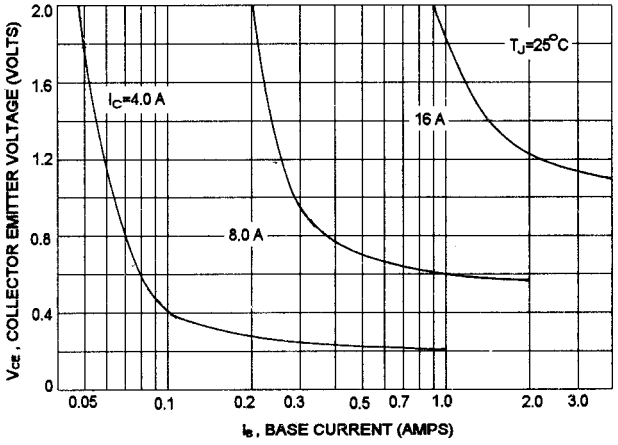


PNP MJ6609

DC CURRENT GAIN



COLLECTOR SATURATION REGION



"ON" VOLTAGES