

6367254 MOTOROLA SC (XSTRS/R F)

96D 80587

DT-33-13

T-33-23

MOTOROLA **SEMICONDUCTOR** **TECHNICAL DATA**

NPN
BD311
PNP
BD312

COMPLEMENTARY SILICON **HIGH-POWER TRANSISTORS**

... designed for high quality amplifiers operating up to 60 Watts into 4 ohm load.

- High DC Current Gain
- Excellent Safe Operating Area
- High Current Gain – Bandwidth Product – Typical
 $f_T = 4.0 \text{ MHz @ } I_C = 0.5 \text{ A}$

10 AMPERE **COMPLEMENTARY SILICON** **POWER TRANSISTORS**

60 VOLTS
115 WATTS

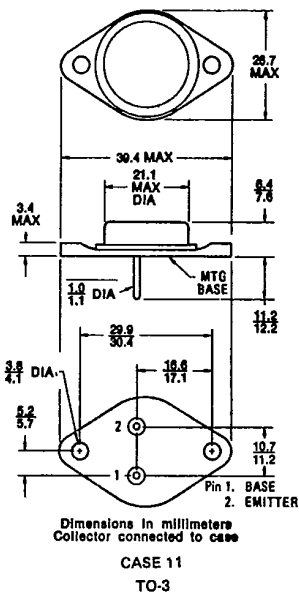
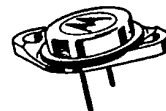
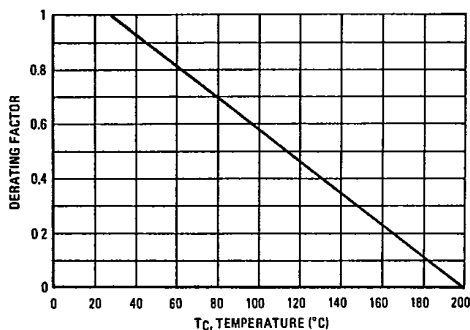
MAXIMUM RATINGS

Rating	Symbol	BD311/312	Unit
Collector-Emitter Voltage	V_{CEO}	60	Vdc
Collector-Base Voltage	V_{CB}	60	Vdc
Emitter-Base Voltage	V_{EB}	5.0	Vdc
Collector Current – Continuous	I_C	10	Adc
Peak		20	
Base Current	I_B	4.0	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$	P_D	115	Watts
Derate above 25°C		0.658	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	θ_{JC}	1.52	$^\circ\text{C/W}$

FIGURE 1 – POWER DERATING



6367254 MOTOROLA SC (XSTRS/R F)

96D 80588 D

BD311 NPN, BD312 PNP

T-33-13

T-33-23

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

Characteristic	Symbol	Min.	Max.	Unit.
----------------	--------	------	------	-------

OFF CHARACTERISTICS

Collector-Emitter Sustaining Voltage ¹ ($I_C = 200\text{ mA}$, $I_B = 0$)	$V_{CE(sus)}$	60		Vdc
Collector-Base Cutoff Current ($V_{CB} = \text{Rated } V_{CB}$, $I_E = 0$)	I_{CBO}		1.0	mA
Emitter-Base Cutoff Current ($V_{BE} = 7.0\text{ Vdc}$, $I_C = 0$)	I_{EBO}		1.0	mA

ON CHARACTERISTICS¹

DC Current Gain ($I_C = 5.0\text{ Vdc}$, $V_{CE} = 4.0\text{ Vdc}$) ($I_C = 10\text{ A}$, $V_{CE} = 4.0\text{ Vdc}$)	h_{FE}	25 5		—
Collector-Emitter Saturation Voltage ($I_C = 5.0\text{ A}$, $I_B = 0.5\text{ A}$)	$V_{CE(sat)}$		1.0	Vdc
Base-Emitter Saturation Voltage ($I_C = 5.0\text{ A}$, $I_B = 0.5\text{ A}$)	$V_{BE(sat)}$		1.8	Vdc
Base-Emitter On Voltage ($I_C = 5.0\text{ A}$, $V_{CE} = 4.0\text{ Vdc}$)	$V_{BE(on)}$		1.5	Vdc

DYNAMIC CHARACTERISTICS¹

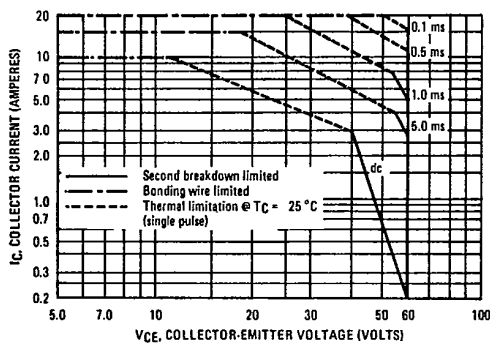
Current-Gain — Bandwidth Product ² ($I_C = 0.5\text{ A}$, $V_{CE} = 10\text{ Vdc}$, $f_{test} = 1.0\text{ MHz}$)	f_T	4.0		MHz
--	-------	-----	--	-----

SECOND BREAKDOWN

Second Breakdown Collector Current ($V_{CE} = 39\text{ Vdc}$, $t = 0.5\text{ sec.}$) ($V_{CE} = 50\text{ Vdc}$, $t = 0.5\text{ sec.}$)	$I_{S/B}$	2.95 0.60		A
--	-----------	--------------	--	---

¹ Pulse test: Pulse width $< 300\text{ }\mu\text{s}$, Duty Cycle $> 2\%$ ² $f_T = |h_{fe}| \cdot f_{test}$ 

FIGURE 2 — ACTIVE REGION 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.

Second breakdown pulse limits are valid for duty cycles to 10%.

At high case temperatures, thermal limitation may reduce the power that can be handled to values less than the limitations imposed by second breakdown.

6367254 MOTOROLA SC (XSTRS/R F)
BD311 NPN, BD312 PNP

96D 80589 D

T-33-13

T-33-23

PNP DEVICE
BD312

NPN DEVICE
BD311

FIGURE 3 - DC CURRENT GAIN

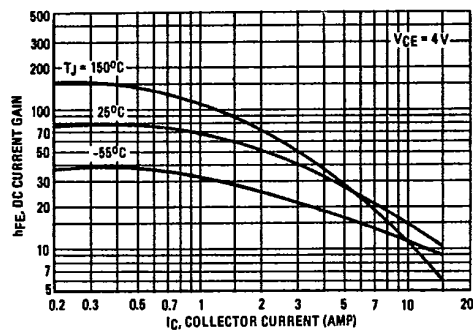
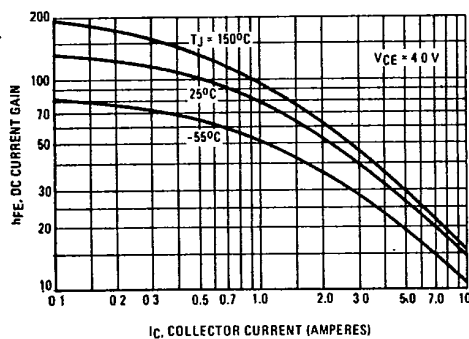
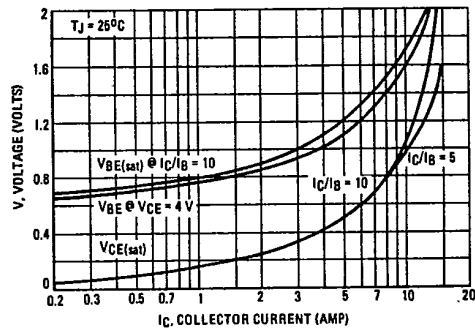
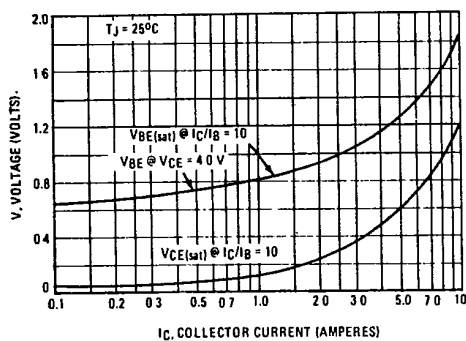


FIGURE 4 - "ON" VOLTAGES



3