

HIGH-CURRENT COMPLEMENTARY SILICON POWER TRANSISTORS

... designed for use in high-power amplifier and switching circuit applications

FEATURES:

- * Continuous Collector Current - $I_C = 50$ A
- * Power Dissipation - $P_D = 300$ W @ $T_C = 25^\circ\text{C}$
- * DC Current Gain - $h_{FE} = 15 \sim 60$ @ $I_C = 25$ A

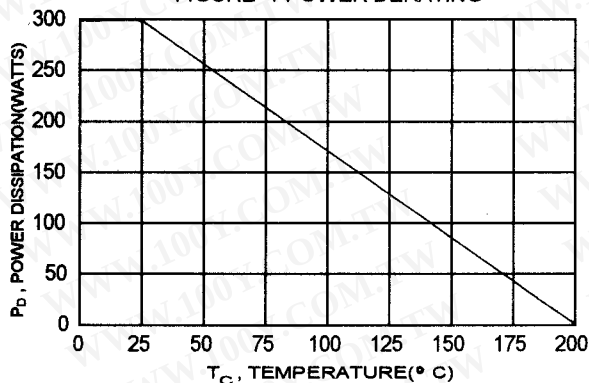
MAXIMUM RATINGS

Characteristic	Symbol	2N5683 2N5685	2N5684 2N5686	Unit
Collector-Emitter Voltage	V_{CEO}	60	80	V
Collector-Base Voltage	V_{CBO}	60	80	V
Emitter-Base Voltage	V_{EBO}	5		V
Collector Current-Continuous	I_C	50		A
Base Current	I_B	15		A
Total Power Dissipation@ $T_C=25^\circ\text{C}$ Derate above 25°C	P_D	300 1.715		W 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	$R_{\theta jc}$	0.584	$^\circ\text{C/W}$

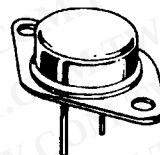
FIGURE -1 POWER DERATING



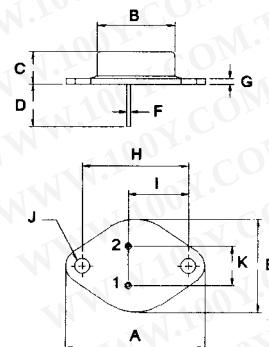
PNP
2N5683
2N5684

NPN
2N5685
2N5686

**50 AMPERE
COMPLEMENTARY SILICON
POWER TRANSISTORS**
 60 - 80 Volts
 300 Watts



TO-3



PIN 1.BASE
 2.EMITTER
 3.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 ($T_c = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
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OFF CHARACTERISTICS

Collector - Emitter Sustaining Voltage (1) ($I_C = 200\text{ mA}$, $I_B = 0$) 2N5683, 2N5685 2N5684, 2N5686	$V_{CE(sus)}$	60 80		V
Collector Cutoff Current ($V_{CE} = 30\text{ V}$, $I_B = 0$) ($V_{CE} = 40\text{ V}$, $I_B = 0$) 2N5683, 2N5685 2N5684, 2N5686	I_{CEO}		1.0 1.0	mA
Collector Cutoff Current ($V_{CE} = 60\text{ V}$, $V_{BE(off)} = 1.5\text{ V}$) ($V_{CE} = 80\text{ V}$, $V_{BE(off)} = 1.5\text{ V}$) ($V_{CE} = 60\text{ V}$, $V_{BE(off)} = 1.5\text{ V}$, $T_c = 150^\circ\text{C}$) ($V_{CE} = 80\text{ V}$, $V_{BE(off)} = 1.5\text{ V}$, $T_c = 150^\circ\text{C}$) 2N5683, 2N5685 2N5684, 2N5686 2N5683, 2N5685 2N5684, 2N5686	I_{CEX}		2.0 2.0 10 10	mA
Collector Cutoff Current ($V_{CB} = 60\text{ V}$, $I_E = 0$) ($V_{CB} = 80\text{ V}$, $I_E = 0$) 2N5683, 2N5685 2N5684, 2N5686	I_{CBO}		2.0 2.0	mA
Emitter Cutoff Current ($V_{EB} = 5.0\text{ V}$, $I_C = 0$)	I_{EBO}		5.0	mA

ON CHARACTERISTICS (1)

DC Current Gain ($I_C = 25\text{ A}$, $V_{CE} = 2.0\text{ V}$) ($I_C = 50\text{ A}$, $V_{CE} = 5.0\text{ V}$)	h_{FE}	15 5.0	60	
Collector-Emitter Saturation Voltage ($I_C = 25\text{ A}$, $I_B = 2.5\text{ A}$) ($I_C = 50\text{ A}$, $I_B = 10\text{ A}$)	$V_{CE(sat)}$		1.0 5.0	V
Base-Emitter Saturation Voltage ($I_C = 25\text{ A}$, $I_B = 2.5\text{ A}$)	$V_{BE(sat)}$		2.0	V
Base-Emitter On Voltage ($I_C = 25\text{ A}$, $V_{CE} = 2.0\text{ V}$)	$V_{BE(on)}$		2.0	V

DYNAMIC CHARACTERISTICS

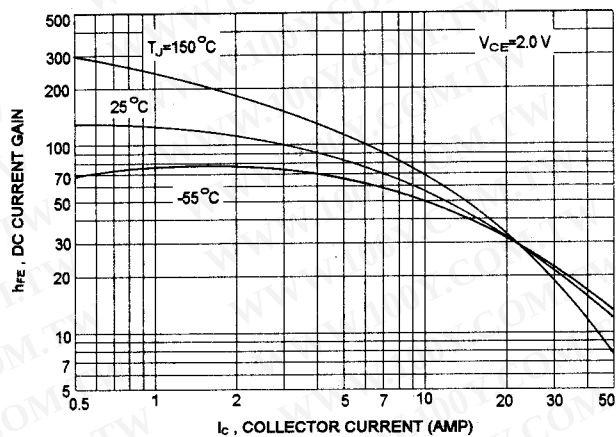
Current-Gain-Bandwidth Product (2) ($I_C = 5\text{ A}$, $V_{CE} = 10\text{ V}$, $f = 1.0\text{ MHz}$)	f_T	2.0		MHz
Small-Signal Current Gain ($I_C = 10\text{ A}$, $V_{CE} = 5\text{ V}$, $f = 1\text{ KHz}$)	h_{fe}	15		

(1) Pulse Test: Pulse width = 300 us , Duty Cycle $\leq 2.0\%$

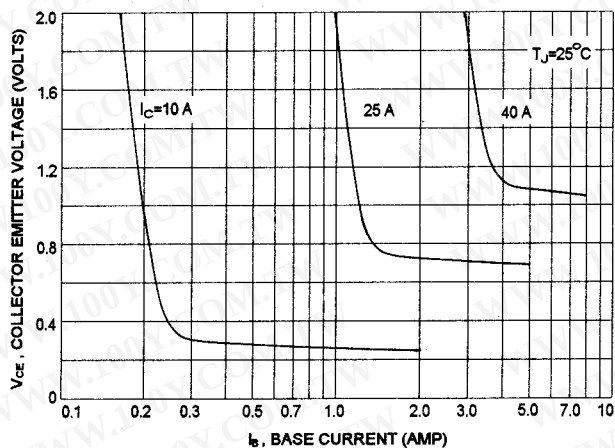
(2) $f_T = |h_{fe}| \cdot f_{test}$

PNP 2N5683,2N5684

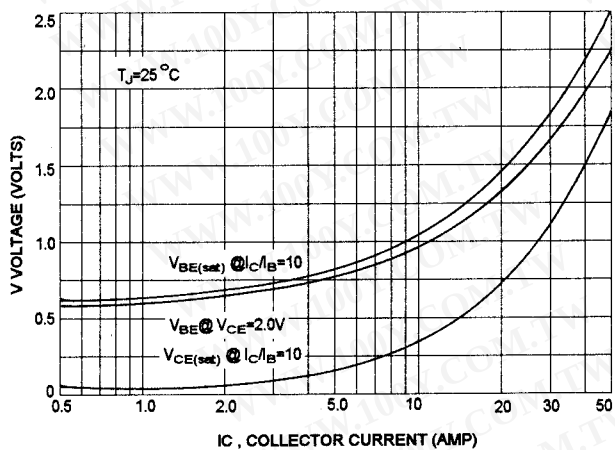
DC CURRENT GAIN



COLLECTOR SATURATION REGION

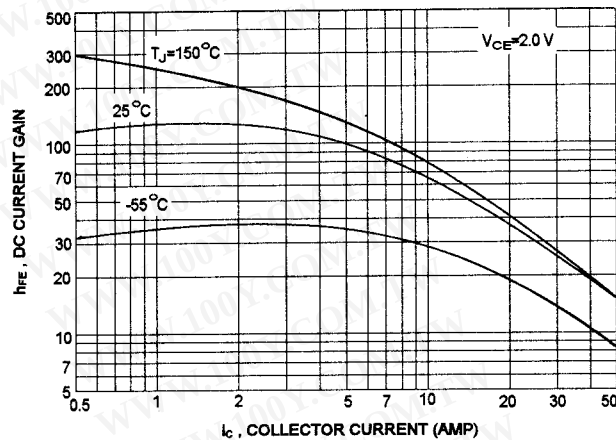


"ON" VOLTAGES

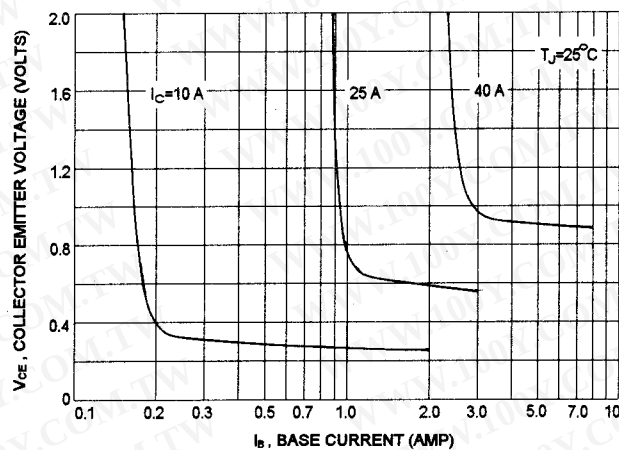


NPN 2N5685,2N5686

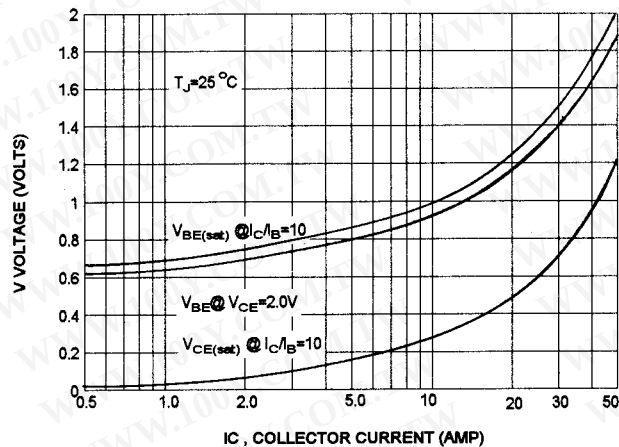
DC CURRENT GAIN



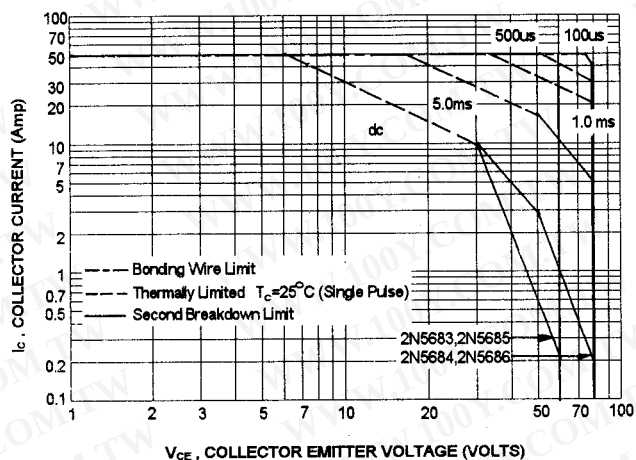
COLLECTOR SATURATION REGION



"ON" VOLTAGES



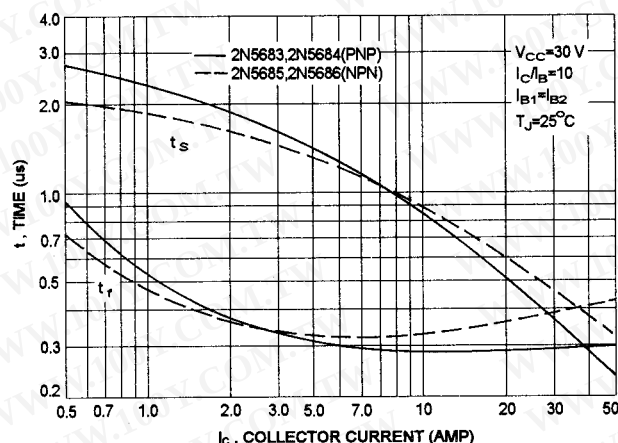
ACTIVE-REGION SAFE OPERATING AREA (SOA)



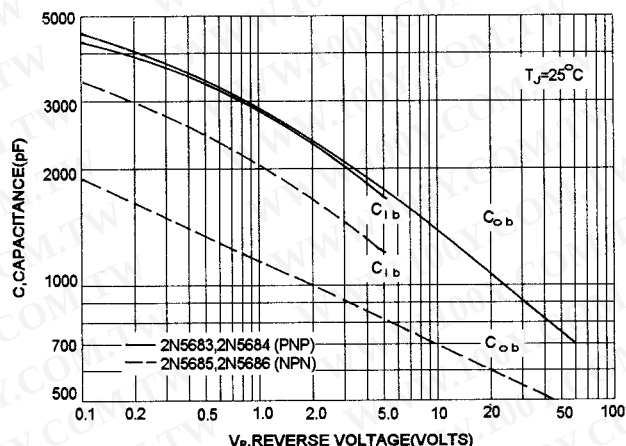
There are two limitation on the power handling ability of a transistor: average junction temperature and second breakdown safe operating area curves indicate I_C - V_{CE} limits of the transistor that must be observed for reliable operation i.e., the transistor must not be subjected to greater dissipation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

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

TURN-OFF TIME



CAPACITANCES



TURN-ON TIME

