MOSPEC

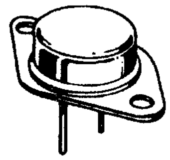
NPN SILICON HIGH-POWER TRANSISTORS

General Purpose use in power amplifier and switching circuit applications.

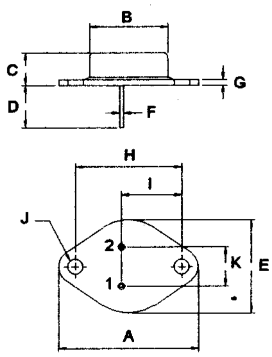
FEATURES:
* DC Current Gain Specified- 1.0 to 30 A
* Low Collector-Emitter Saturation Voltage -
  $V_{CE(sat)}$ = 0.75 V (Max.) @ I_C = 10 A - 2N5301, 2N5302
  $V_{CE(sat)}$ = 1.0 V (Max.) @ I_C = 10 A - 2N5303.
* Complements to PNP 2N4398,2N4399 and 2N5745

NPN
2N5301
2N5302
2N5303

20 AND 30 AMPERE
NPN SILICON
POWER TRANSISTORS
40-80 Volts
200 Watts



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

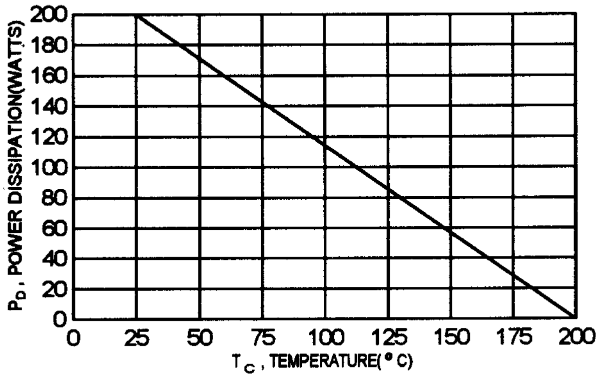
MAXIMUM RATINGS

Characteristic	Symbol	2N5301	2N5302	2N5303	Unit
Collector-Emitter Voltage	V_{CBO}	40	60	80	V
Collector-Emitter Voltage	V_{CEO}	40	60	80	V
Emitter-Base Voltage	V_{EB}		5.0		V
Collector Current-Continuous	I_C	30	30	20	A
Base current - Continuous	I_B		7.5		A
Total Power Dissipation @T_C=25°C Derate above 25°C	P_D		200 1.14		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	0.875	°C/W

FIGURE -1 POWER DERATING



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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector - Emitter Sustaining Voltage (1)		$V_{CEO(SUS)}$			V
(I_C = 200 mA, I_B = 0)	2N5301		40		
	2N5302		60		
	2N5303		80		
Collector Cutoff Current		I_{CEO}			mA
(V_{CE} = 40 V, I_B = 0)	2N5301			5.0	
(V_{CE} = 60 V, I_B = 0)	2N5302			5.0	
(V_{CE} = 80 V, I_B = 0)	2N5303			5.0	
Collector Cutoff Current		I_{CEX}			
(V_{CE} = 40 V, $V_{BE(off)}$ = 1.5 V)	2N5301			1.0	mA
(V_{CE} = 60 V, $V_{BE(off)}$ = 1.5 V)	2N5302			1.0	
(V_{CE} = 80 V, $V_{BE(off)}$ = 1.5 V)	2N5303			1.0	
(V_{CE} = 40 V, $V_{BE(off)}$ = 1.5 V, T_C = 150°C)	2N5301			10	mA
(V_{CE} = 60 V, $V_{BE(off)}$ = 1.5 V, T_C = 150°C)	2N5302			10	
(V_{CE} = 80 V, $V_{BE(off)}$ = 1.5 V, T_C = 150°C)	2N5303				
Collector Cutoff Current		I_{CBO}			mA
(V_{CB} = 40 V, I_E = 0)	2N5301			1.0	
(V_{CB} = 60 V, I_E = 0)	2N5302			1.0	
(V_{CB} = 80 V, I_E = 0)	2N5303			1.0	
Emitter Cutoff Current		I_{EBO}		5.0	mA
(V_{EB} = 5.0 V , I_C = 0)	All Types				
ON CHARACTERISTICS (1)					
DC Current Gain		h_{FE}			
(I_C = 1.0 A, V_{CE} = 2.0 V)	All Types		40		
(I_C = 10 A, V_{CE} = 2.0 V)	2N5303		15	60	
(I_C = 15 A, V_{CE} = 2.0 V)	2N5301,2N5302		15	60	
(I_C = 20 A, V_{CE} = 4.0 V)	2N5303		5.0		
(I_C = 30 A, V_{CE} = 4.0 V)	2N5301,2N5302		5.0		
Collector-Emitter Saturation Voltage		$V_{CE(sat)}$			V
(I_C = 10 A, I_B = 1.0 A)	2N5301,2N5302			0.75	
	2N5303			1.0	
(I_C = 15 A, I_B = 1.5 A)	2N5303			1.5	
(I_C = 20 A, I_B = 2.0 A)	2N5301,2N5302			2.0	
(I_C = 20 A, I_B = 4.0 A)	2N5303			2.0	
(I_C = 30 A, I_B = 6.0 A)	2N5301,2N5302			3.0	
Base-Emitter Saturation Voltage		$V_{BE(sat)}$			
(I_C = 10 A, I_B = 1.0 A)	All Types			1.7	V
(I_C = 15 A, I_B = 1.5 A)	2N5301,2N5302			1.8	
	2N5303			2.0	
(I_C = 20 A, I_B = 2.0 A)	2N5301,2N5302			2.5	
(I_C = 20 A, I_B = 4.0 A)	2N5303			2.5	
Base-Emitter On Voltage		$V_{BE(on)}$			V
(I_C = 10 A, V_{CE} = 2.0 V)	2N5303			1.5	
(I_C = 15 A, V_{CE} = 2.0 V)	2N5301,2N5302			1.7	
(I_C = 20 A, V_{CE} = 4.0 V)	2N5303			2.5	
(I_C = 30 A, V_{CE} = 4.0 V)	2N5301,2N5302			3.0	

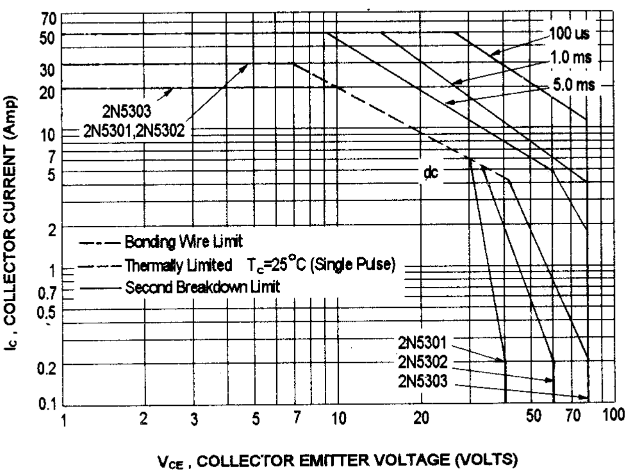
(1) Pulse Test: Pulse width = 300 us , Duty Cycle ≦ 2.0%

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

Characteristic		Symbol	Min	Max	Unit
DYNAMIC CHARACTERISTICS					
Current - Gain -Bandwidth Product (2) (I_C = 1.0 A, V_{CE} = 10 V, f = 1.0 MHz)		f_T	2.0		MHz
Small-Signal Current Gain (I_C = 1.0 A, V_{CE} = 10 V, f = 1.0 KHz)		h_{fe}	40		
SWITCHING CHARACTERISTICS					
Rise Time	V_{CC} = 30 V, I_C = 10.0 A I_{B1} =- I_{B2} = 1.0 A t_p = 0.1 ms Duty Cycle ≦2.0%	t_r		1.0	us
Storage Time		t_s		2.0	us
Fall Time		t_f		1.0	us

(1) Pulse Test: Pulse width = 300 us , Duty Cycle ≦ 2.0%
(2) f_T = $|h_{fe}| \circ f_{test}$

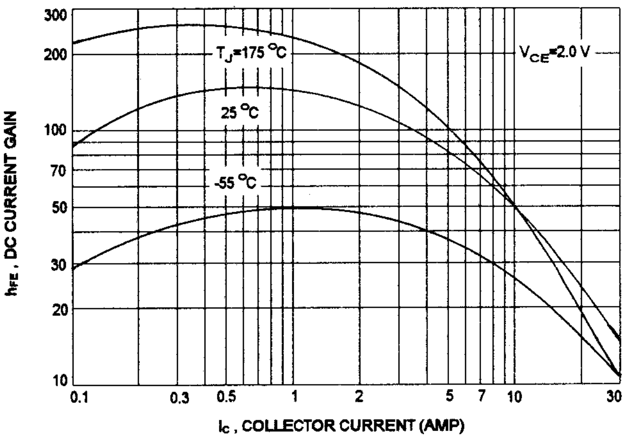
ACTIVE REGION SAFE OPERATING AREA (SOA)



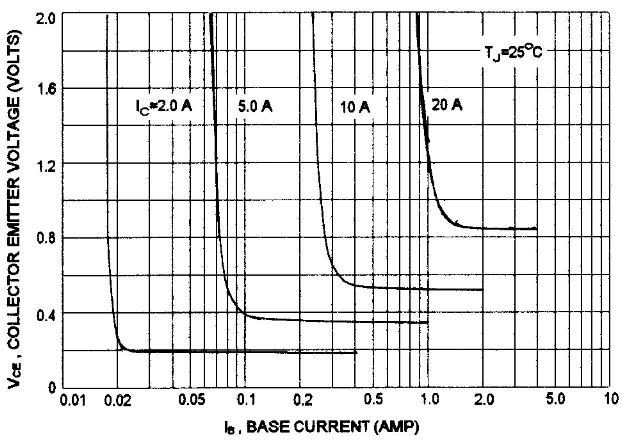
There are two limitation on the power handling ability of a transistor:average junction temperature and second breakdown safe operating area curves indicate I_C-V_{CE} limits of the transistor that must be observed for reliable operation i.e., the transistor must not be subjected to greater dissipation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

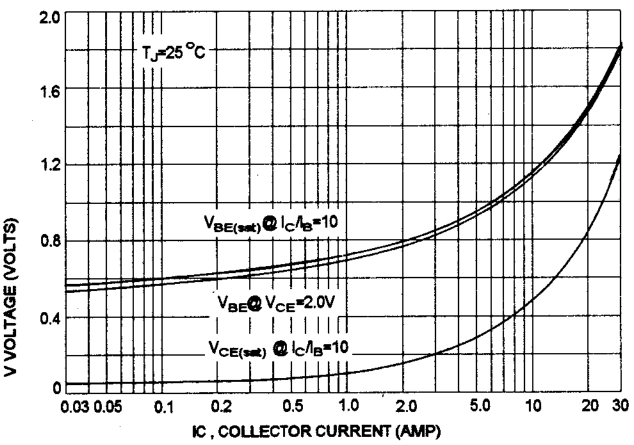
DC CURRENT GAIN



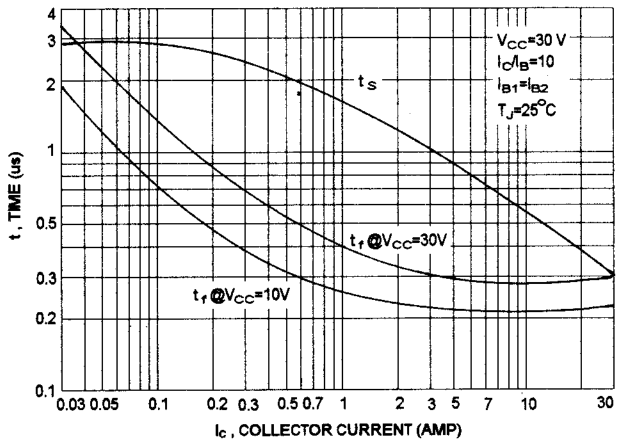
COLLECTOR SATURATION REGION



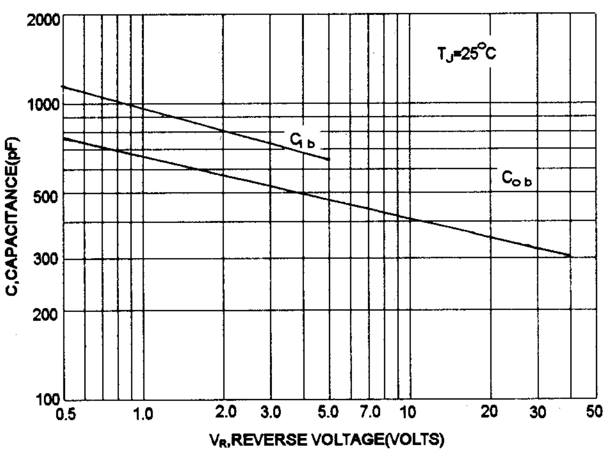
"ON"VOLTAGES



TURN-OFF TIME



CAPACITANCES



COLLECTOR CUT-OFF REGION