

## SWITCHMODE SERIES NPN SILICON POWER TRANSISTORS

These devices are designed for high-voltage, high-speed, power switching inductive circuits where fall time is critical. They are particularly suited for 115 and 220 volt line operated SWITCHMODE applications such as:

- \* Switching Regulators
- \* PWM inverters and Motor Controls
- \* Solenoid and Relay Drivers
- \* Deflection Circuits

### Specification Features-

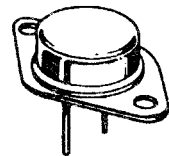
High Temperature Performance Specified for: Reversed Biased SOA with inductive loads  
Switching Times with inductive Loads  
Saturation Voltages, Leakage Currents.

**NPN**  
**2N6542**  
**2N6543**

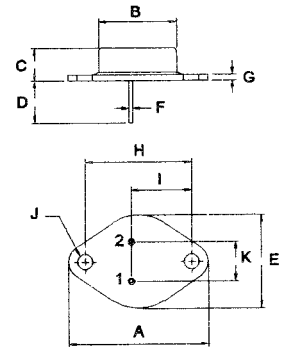
**5 AMPERE**  
**NPN SILICON**  
**POWER TRANSISTORS**  
**300 - 400 VOLTS**  
**100 WATTS**

### MAXIMUM RATINGS

Characteristic	Symbol	2N6542	2N6543	Unit
Collector-Emitter Voltage	$V_{CEO(sus)}$	300	400	V
Collector-Emitter Voltage	$V_{CEV}$	650	850	V
Collector-Base Voltage	$V_{EBO}$	8.0		V
Collector current - Continuous - Peak	$I_C$	5.0		A
	$I_{CM}$	10		
Base current - Continuous	$I_B$	5		A
Emitter current - Continuous - Peak	$I_E$	10		A
	$I_{EM}$	20		
Total Power Dissipation @ $T_C = 25^\circ C$ Derate above $25^\circ C$	$P_D$	100		W
		0.57		
Operating and Storage Junction Temperature Range	$T_J, T_{STG}$	- 65 to +200		$^\circ C$



**TO-3**



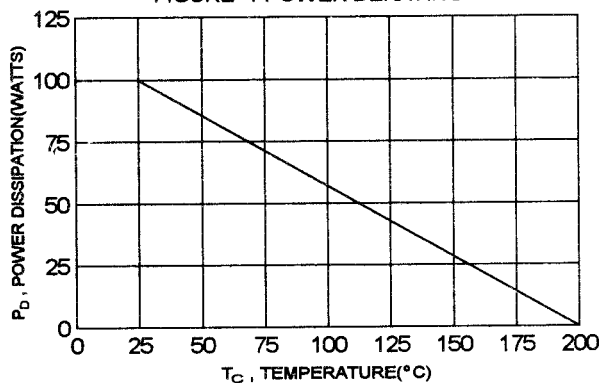
PIN 1. BASE  
2. EMITTER  
COLLECTOR (CASE)

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

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance Junction to Case	$R_{\theta jc}$	1.75	$^\circ C/W$

FIGURE -1 POWER DERATING



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) ( $I_C = 100\text{ mA}$ , $I_B = 0$ )	$V_{CEO(sus)}$	300 400		V
Collector Cutoff Current ( $V_{CEV} = 650\text{ V}$ , $V_{BE(off)} = 1.5\text{ V}$ ) ( $V_{CEV} = 850\text{ V}$ , $V_{BE(off)} = 1.5\text{ V}$ ) ( $V_{CEV} = 650\text{ V}$ , $V_{BE(off)} = 1.5\text{ V}$ , $T_C = 100^\circ\text{C}$ ) ( $V_{CEV} = 850\text{ V}$ , $V_{BE(off)} = 1.5\text{ V}$ , $T_C = 100^\circ\text{C}$ )	$I_{CEV}$		0.5 0.5 3.0 3.0	mA
Emitter Cutoff Current ( $V_{EB} = 8.0\text{ V}$ , $I_C = 0$ )	$I_{EBO}$		1.0	mA

## ON CHARACTERISTICS(1)

DC Current Gain ( $I_C = 1.5\text{ A}$ , $V_{CE} = 2.0\text{ V}$ ) ( $I_C = 3.0\text{ A}$ , $V_{CE} = 2.0\text{ V}$ )	hFE	12 7.0	60 35	
Collector-Emitter Saturation Voltage ( $I_C = 3.0\text{ A}$ , $I_B = 0.6\text{ A}$ ) ( $I_C = 5.0\text{ A}$ , $I_B = 1.0\text{ A}$ )	$V_{CE(sat)}$		1.0 5.0	V
Base-Emitter Saturation Voltage ( $I_C = 3.0\text{ A}$ , $I_B = 0.6\text{ A}$ )	$V_{BE(sat)}$		1.4	V

## DYNAMIC CHARACTERISTICS

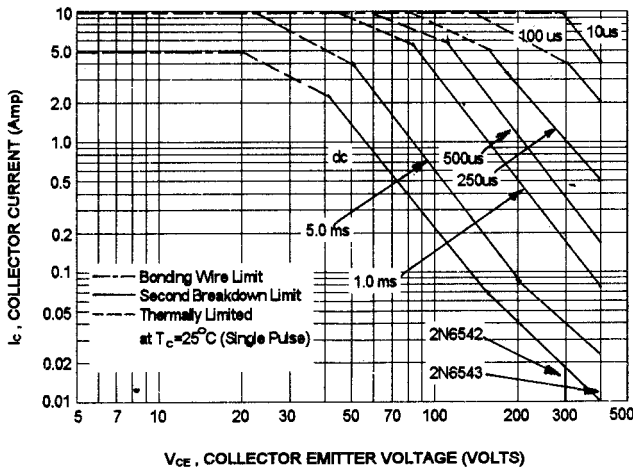
Current Gain Bandwidth (2) ( $I_C = 200\text{ mA}$ , $V_{CE} = 10\text{ V}$ , $f = 1.0\text{ MHz}$ )	$f_T$	6.0	35	MHz
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## SWITCHING CHARACTERISTICS

Delay Time	$V_{CC} = 250\text{ V}$ $I_C = 3.0\text{ A}$ $I_{B1} = -I_{B2} = 0.6\text{ A}$ $t_p = 0.1\text{ ms}$ Duty Cycle $\leq 2.0\%$	$t_d$		0.05	us
Rise Time		$t_r$		0.7	us
Storage Time		$t_s$		4.0	us
Fall Time		$t_f$		0.8	us

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

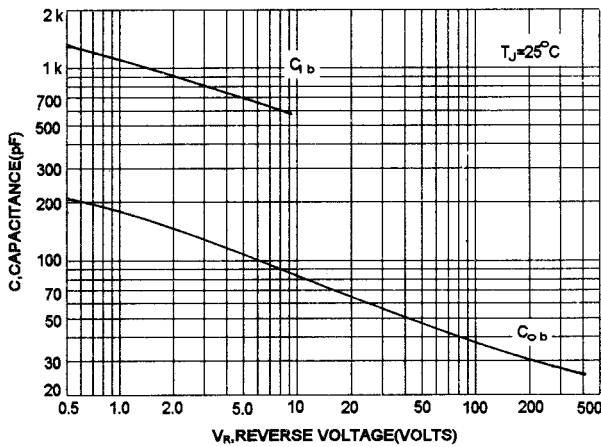
ACTIVE-REGION SAFE OPERATING AREA (SOA)



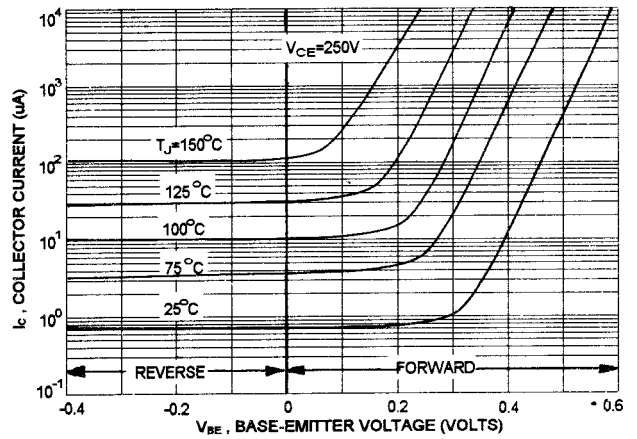
There are two limitation on the power handling ability of a transistor: average junction temperature and second breakdown safe operating area curves indicate  $I_C$ - $V_{CE}$  limits of the transistor that must be observed for reliable operation i.e., the transistor must not be subjected to greater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

The data of SOA curve is base on  $T_{J(PK)} = 200^\circ\text{C}$ ;  $T_c$  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.

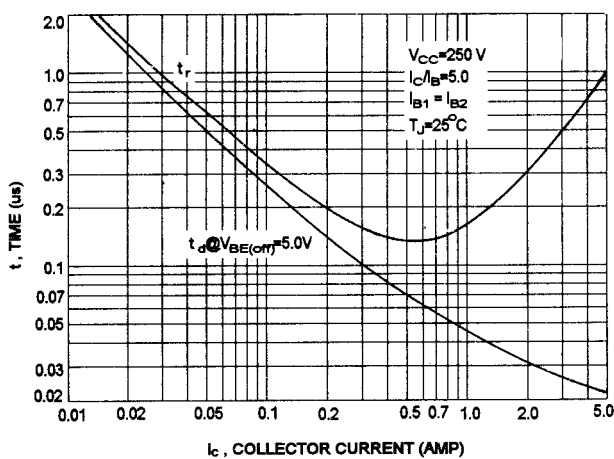
CAPACITANCES



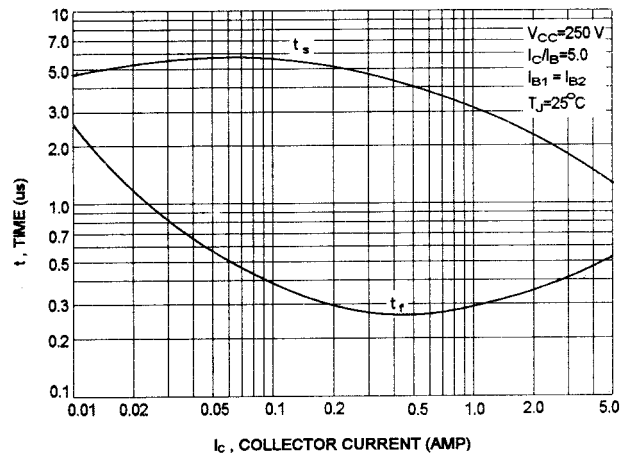
COLLECTOR CUT-OFF REGION



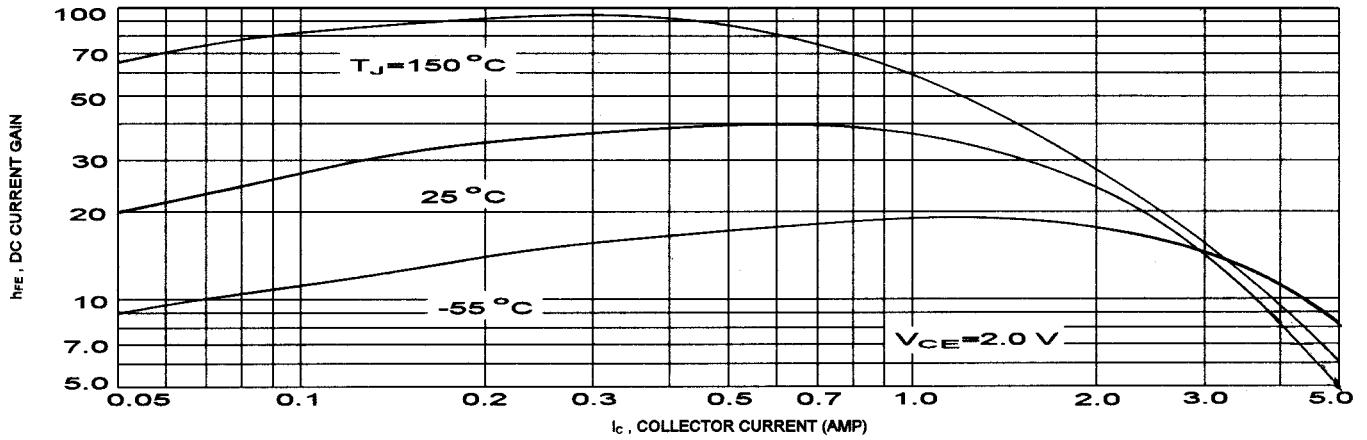
TURN-ON TIME



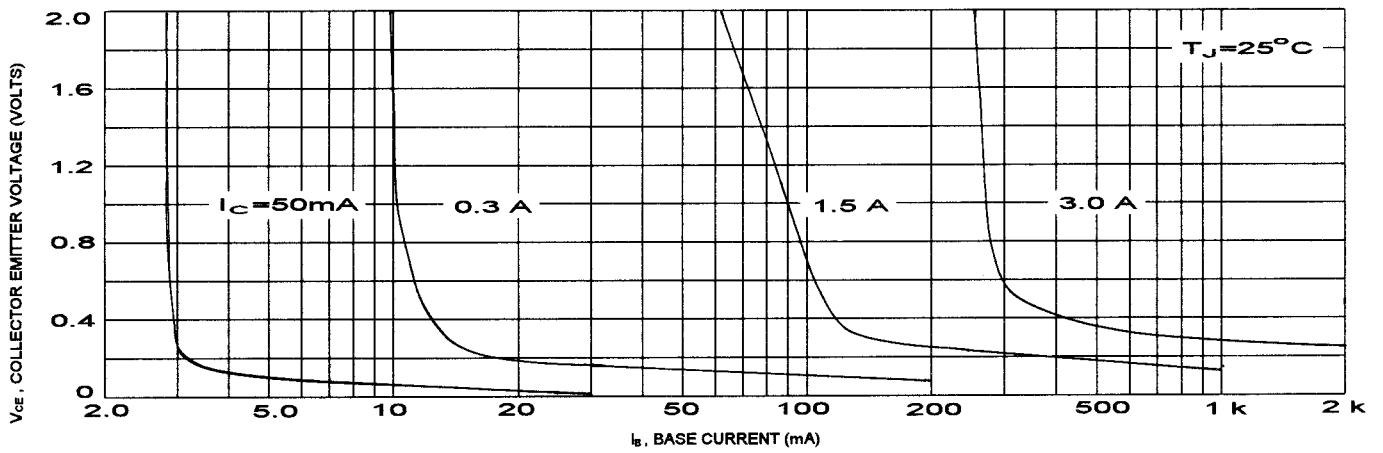
TURN-OFF TIME



DC CURRENT GAIN



COLLECTOR SATURATION REGION



"ON" VOLTAGES

