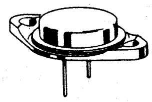
HIGH VOLTAGE NPN SILICON TRANSISTOR

. . . designed for use in high-voltage switching regulators, inverters, converters and line operated amplifiers.

- High Collector-Emitter Voltage — 400 Volts
- DC Current Gain —
  h_{FE} = 10 (Min) @ I_C = 3.5 Adc
- Low Collector-Emitter Saturation Voltage —
  $V_{CE(sat)}$ = 0.7 Vdc (Max) @ I_C = 2.5 Adc
- Switching Times — @ I_C = 2.5 Adc
  t_{on} = 0.8 μs (Max)
  t_{off} = 1.7 μs (Max)

5.0 AMPERE
POWER TRANSISTOR
NPN SILICON

400 VOLTS
125 WATTS



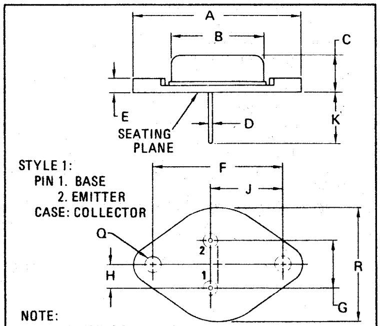
*MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	400	Vdc
Collector-Base Voltage	V_{CB}	400	Vdc
Emitter-Base Voltage	V_{EB}	5.0	Vdc
Collector Current — Continuous	I_C	5.0	Adc
Base Current	I_B	2.0	Adc
Total Device Dissipation @ T_C = 62.5°C Derate above 62.5°C	P_D	125 1.43	Watts W/°C
Operating Junction Temperature Range	T_J	-65 to +150	°C
Storage Temperature Range	T_{stg}	-65 to +200	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	θ_{JC}	0.7	°C/W

*Indicates JEDEC Registered Data



NOTE:
1. DIM "Q" IS DIA.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	–	39.37	–	1.550
B	–	22.23	–	0.875
C	6.35	11.43	0.250	0.450
D	0.97	1.09	0.038	0.043
E	–	3.43	–	0.135
F	29.90	30.40	1.177	1.197
G	10.67	11.18	0.420	0.440
H	5.21	5.72	0.205	0.225
J	16.64	17.15	0.655	0.675
K	11.18	12.19	0.440	0.480
Q	3.84	4.09	0.151	0.161
R	–	26.67	–	1.050

CASE 11-03

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Sustaining Voltage (I_C = 100 mAdc, I_B = 0)	$BV_{CEO(sus)}$	325	–	Vdc
Collector Cutoff Current (V_{CE} = 400 Vdc, I_B = 0)	I_{CEO}	–	2.5	mAdc
Collector Cutoff Current	I_{CEX}			mAdc
(V_{CE} = 400 Vdc, $V_{EB(off)}$ = 1.5 Vdc)		–	0.5	
(V_{CE} = 400 Vdc, $V_{EB(off)}$ = 1.5 Vdc, T_C = 125°C)		–	5.0	
Emitter Cutoff Current (V_{BE} = 5.0 Vdc, I_C = 0)	I_{EBO}	–	2.0	mAdc
ON CHARACTERISTICS				
DC Current Gain	h_{FE}			–
(I_C = 2.5 Adc, V_{CE} = 5.0 Vdc)		15	35	
(I_C = 3.5 Adc, V_{CE} = 5.0 Vdc)		10	–	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			Vdc
(I_C = 2.5 Adc, I_B = 0.5 Adc)		–	0.7	
(I_C = 5.0 Adc, I_B = 1.0 Adc)		–	2.5	
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			Vdc
(I_C = 2.5 Adc, I_B = 0.5 Adc)		–	1.5	
(I_C = 5.0 Adc, I_B = 1.0 Adc)		–	2.0	
DYNAMIC CHARACTERISTICS				
Current-Gain—Bandwidth Product (I_C = 0.2 Adc, V_{CE} = 12 Vdc, f = 1.0 MHz)	f_T	2.5	–	MHz
SWITCHING CHARACTERISTICS				
Turn-On Time (V_{CC} = 125 Vdc, I_C = 2.5 Adc, I_{B1} = 0.25 Adc)	t_{on}	–	0.8	μs
Turn-Off Time (V_{CC} = 125 Vdc, I_C = 2.5 Adc, I_{B1} = 0.25 Adc, I_{B2} = 0.5 Adc)	t_{off}	–	1.7	μs
Pulse Energy Test (V_{CC} = 200 Vdc, I_C = 0.3 Adc, t_p = 5.0 ms, Duty Cycle = 1.0%)	–	300	–	mJ

FIGURE 1 — COLLECTOR-EMITTER SUSTAINING VOLTAGE TEST CIRCUIT AND WAVEFORM

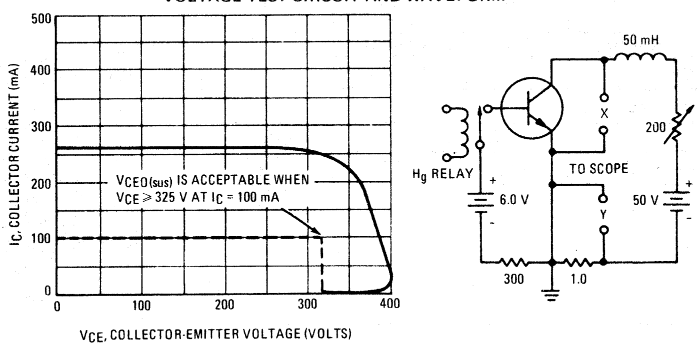
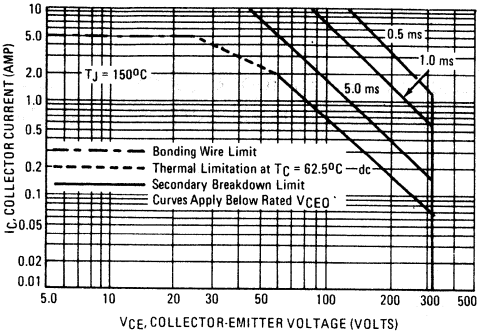


FIGURE 2 – ACTIVE-REGION SAFE OPERATING AREA



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.

The data of Figure 1 is based on $T_{J(pk)}$ = 150°C; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)}$ 150°C. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown. (See AN-415)

FIGURE 3 – DC CURRENT GAIN

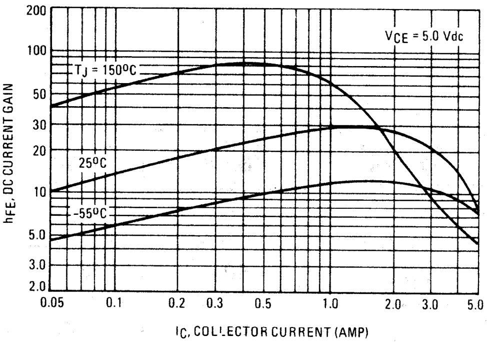


FIGURE 4 – "ON" VOLTAGES

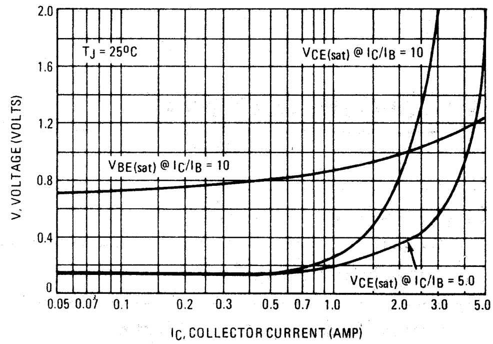


FIGURE 5 – SWITCHING CIRCUIT