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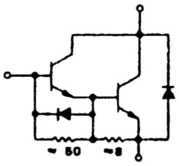
SWITCHMODE SERIES
NPN SILICON POWER DARLINGTON TRANSISTORS WITH BASE-EMITTER SPEEDUP DIODE

NPN
MJ10015
MJ10016

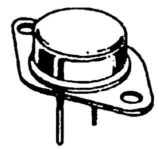
The MJ10015 and MJ10016 darlington transistors are designed for high-voltage, high-speed, power switching in inductive circuits where fall time is critical. They are particularly suited for line oper -ated switch-mode applications such as:

FEATURES:

- *Continuous Collector Current - I_C = 50 A
- *Switching Regulators
- *Inverters
- *Solenoid and Relay Drivers
- *Motor Controls



50 AMPERE
POWER DARLINGTON
TRANSISTORS
400-500 VOLTS
250 WATTS



TO-3

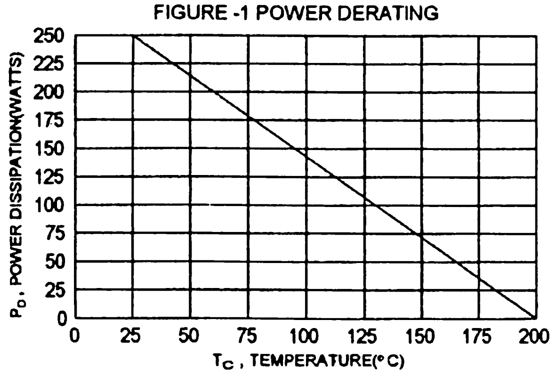
MAXIMUM RATINGS

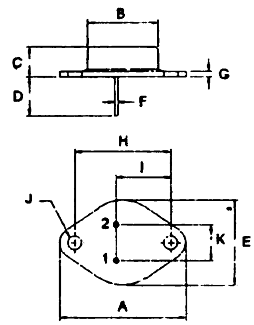
Characteristic	Symbol	MJ10015	MJ10016	Unit
Collector-Emitter Voltage	V_{CEV}	600	700	V
Collector-Emitter Voltage	$V_{CEO(SUS)}$	400	500	V
Emitter-Base Voltage	V_{EBO}	8.0		V
Collector Current-Continuous -Peak	I_C I_{CM}	50 75		A
Base current	I_B	10		A
Total Power Dissipation @T_C=25°C @T_C= 100°C Derate above 25°C	P_D	250 143 1.43		W 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	$R\theta jc$	0.7	°C/W

FIGURE -1 POWER DERATING





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	1.45	1.60
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°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit

OFF CHARACTERISTICS

Characteristic		Symbol	Min	Max	Unit
Collector - Emitter Sustaining Voltage (I_C = 100 mA, I_B = 0, V_{clamp}=Rate V_{CEO})	MJ10015 MJ10016	$V_{CEO(SUS)}$	400 500		V
Collector Cutoff Current (V_{CEV}= Rated Value, $V_{BE(OFF)}$=1.5 V)		I_{CEV}		0.25	mA
Emitter Cutoff Current (V_{EB} = 2.0 V , I_C = 0)		I_{EBO}		350	mA

ON CHARACTERISTICS (1)

Characteristic	Symbol	Min	Max	Unit
DC Current Gain (I_C = 20 A , V_{CE} = 5.0 V) (I_C = 40 A, V_{CE} = 5.0 V)	hFE	25 10		
Collector - Emitter Saturation Voltage (I_C = 20 A , I_B = 1.0 A) (I_C = 50 A, I_B = 10 A)	$V_{CE(sat)}$		2.2 5.0	V
Base - Emitter Saturation Voltage (I_C = 20 A, I_B = 1.0 A)	$V_{BE(sat)}$		2.75	V
Diode Forward Voltage (I_F = 20 A)	V_F		5.0	V

DYNAMIC CHARACTERISTICS

Characteristic	Symbol	Min	Max	Unit
Output Capacitance (V_{CB}=10 V, I_E=0, f =100 kHz)	C_{ob}		750	pF

SWITCHING CHARACTERISTICS

Characteristic	Conditions	Symbol	Min	Max	Unit
Delay Time	V_{CC} = 250 V, I_C = 20 A I_{B1} = 1.0A, $V_{BE(off)}$=5.0V tp = 25us, Duty Cycle ≤ 2%	t_d		0.3	us
Rise Time		t_r		1.0	us
Storage Time		t_s		2.5	us
Fall Time		t_f		1.0	us

(1) Pulse Test: Pulse width = 300 μs , Duty Cycle ≤ 2.0%

FIG-2 DC CURRENT GAIN

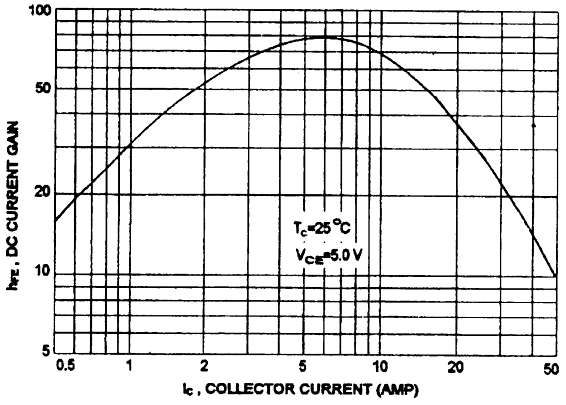


FIG-3 COLLECTOR EMITTER SATURATION VOLTAGE

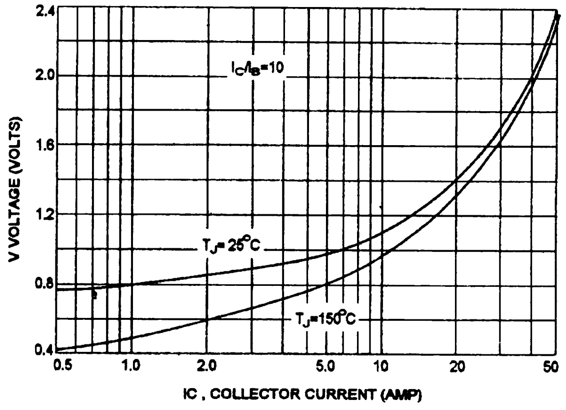


FIG-4 OUTPUT CAPACITANCES

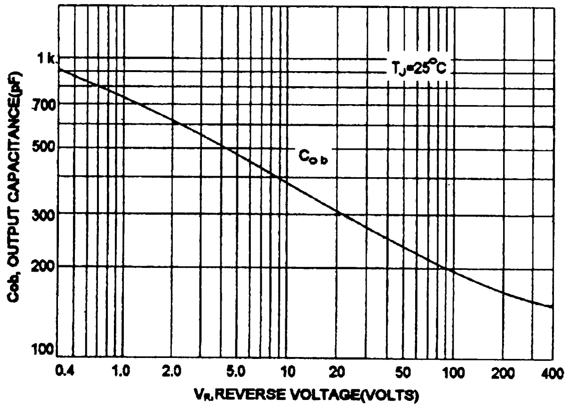


FIG-5 BASE- EMITTER SATURATION VOLTAGE

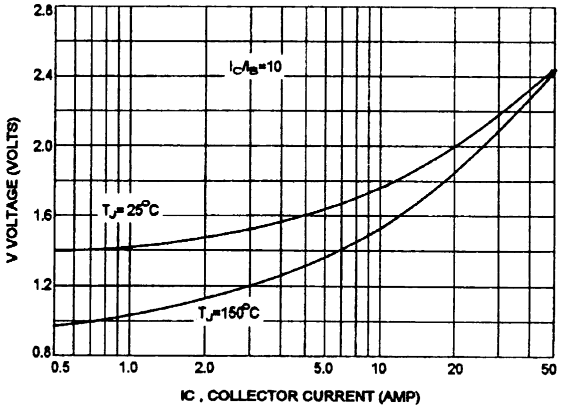


FIG-6 COLLECTOR CUT-OFF REGION

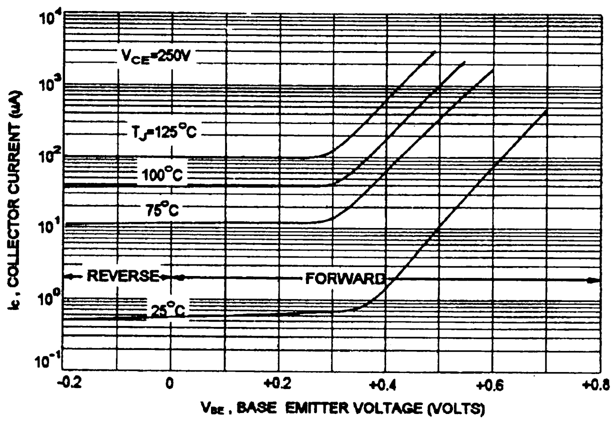
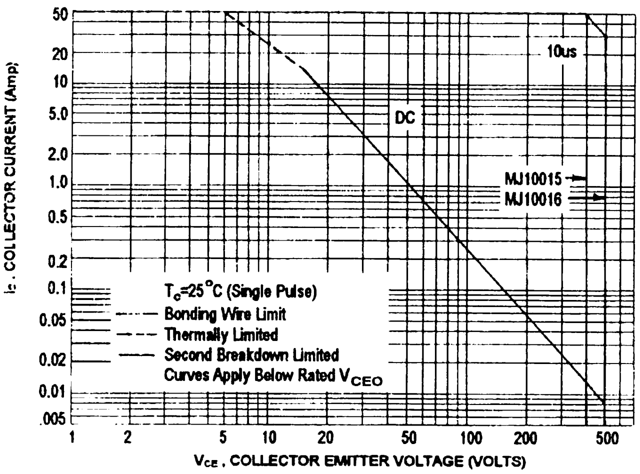


FIG-7 FORWARD BIAS SAFE OPERATING AREA

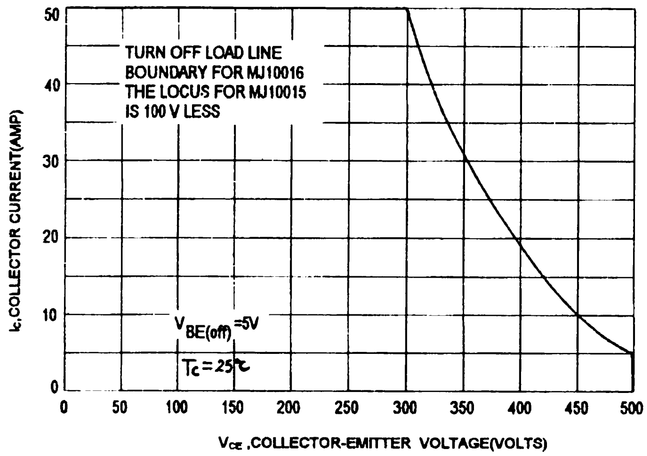


FORWARD BIAS

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 FIG-7 is base on T_C=25 °C;$T_{J(PK)}$ isvariable depending on power level. second breakdown pulse limits are valid for duty cycles to 10% must be derate when $T_C \geq 25$°C, Second breakdown limitations do not derate the same as thermal limitations.

FIG-8 REVERSE BIAS SAFE OPERATING AREA



REVERSE BIAS

For inductive loads, high voltage and high current must be sustained simultaneously during turn-off, in most cases, with the base-to-emitter junction reverse biased Under these conditions the collector voltage must be held to a safe level at or below a specfic value of collector current.This can be accomplished by several mean such as active clamping, RC snubbing, load line shaping, etc. the safe level for these devices is specified as Reverse Bias Safe Operating Area and represents the voltage-current condition allowable during reverse biased turn-off. This rating is verified under clamped conditions so that the device is never subjected to an avalanche mode. FIG-8 gives the RBSOA haracteristics.