MOSPEC

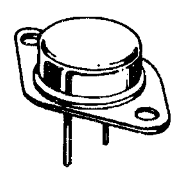
COMPLEMENTARY SILICON POWER DARLINGTON TRANSISTORS

..designed for use as general purpose amplifiers,low frequency switching and motor control applications.

FEATURES:
* High Gain Darlington Performance
* High DC Current Gain hFE = 400(Min) @ I_C = 10 A
* Monolithic Construction

PNP	NPN
MJ11017	MJ11018
MJ11019	MJ11020
MJ11021	MJ11022

15 AMPERE
COMPLEMENTARY
SILICON POWER
DARLINGTON TRANSISTOR
150-250 VOLTS
175 WATTS



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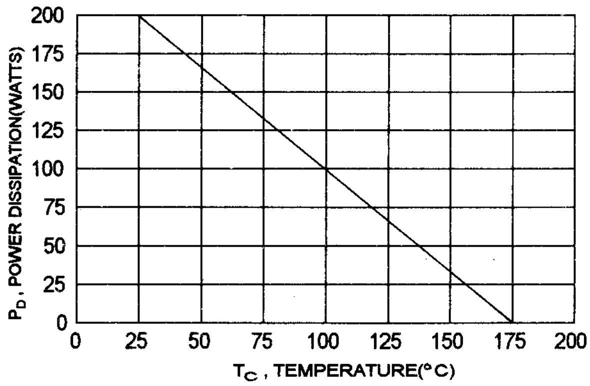
MAXIMUM RATINGS

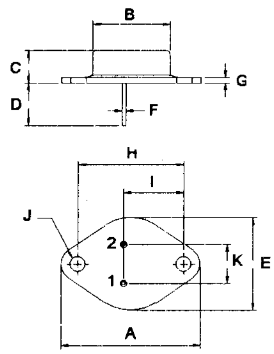
Characteristic	Symbol	MJ11017 MJ11018	MJ11019 MJ11020	MJ11021 MJ11022	Unit
Collector-Emitter Voltage	V_{CEO}	150	200	250	V
COllector-Base Voltage	V_{CBO}	150	200	250	V
Emitter-Base Voltage	V_{EBO}	5.0			V
Collector Current-Continuous -Peak	I_C I_{CM}	15 30			A
Base Current	I_B	0.5			A
Total Power Dissipation @T_C= 25°C Derate above 25°C	P_D	175 1.16			W W/°C
Operating and Storage Junction Temperature Range	T_J ,T_{STG}	- 65 to +175			°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance Junction to Case	Rθjc	0.86	°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	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°C unless otherwise noted)

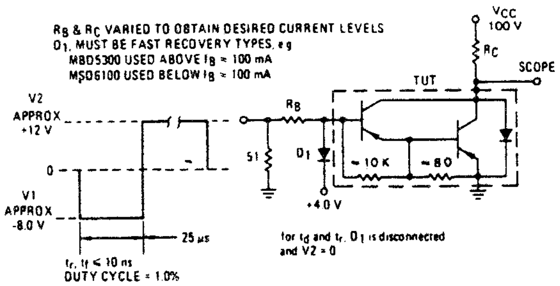
Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector - Emitter Sustaining Voltage (1) (I_C = 100 mA, I_B = 0)	MJ11017,MJ11018 MJ11019,MJ11020 MJ11021,MJ11022	$V_{CEO(sus)}$	150 200 250		V
Collector Cutoff Current (V_{CE} = 75 V, I_B = 0) (V_{CE} = 100 V, I_B = 0) (V_{CE} = 125 V, I_B = 0)		I_{CEO}		1.0 1.0 1.0	mA
Collector Cutoff Current (V_{CE} = Rated V_{CB} ,$V_{BE(off)}$= 1.5V) (V_{CE} = Rated V_{CB} ,$V_{BE(off)}$= 1.5V ,T_J=150 °C)		I_{CEV}		0.5 5.0	mA
Emitter Cutoff Current (V_{EB} = 5.0 V,I_C= 0)		I_{EBO}		2.0	mA
ON CHARACTERISTICS (1)					
DC Current Gain (I_C = 10 A, V_{CE} = 5.0 V) (I_C = 15 A, V_{CE} = 5.0 V)		hFE	400 100	15000	
Collector-Emitter Saturation Voltage (I_C = 10 A, I_B = 100 mA) (I_C = 15 A, I_B = 150 mA)		$V_{CE(sat)}$		2.0 3.4	V
Base-Emitter Saturation Voltage (I_C = 15 A, I_B = 150 mA))		$V_{BE(sat)}$		3.8	V
Base-Emitter On Voltage (I_C = 10 A,V_{CE} = 5.0 V)		$V_{BE(on)}$		2.8	V
DYNAMIC CHARACTERISTICS					
Small-Signal Current Gain (I_C = 10 A, V_{CE} = 3.0 V, f = 1.0 MHz)		$\|h_{fe}\|$	3.0		

SWITCHING CHARACTERISTICS

Characteristic		Symbol	Typical		Unit
			NPN	PNP	
Delay Time	V_{CC} = 100 V, I_C = 10 A I_{B1} = 100mA,$V_{BE(off)}$=5.0V tp = 25us,Duty Cycle ≦ 10%	t_d	0.2	0.1	us
Rise Time		t_r	1.3	0.6	us
Storage Time		t_s	4.5	2.7	us
Fall Time		t_f	10	2.6	us

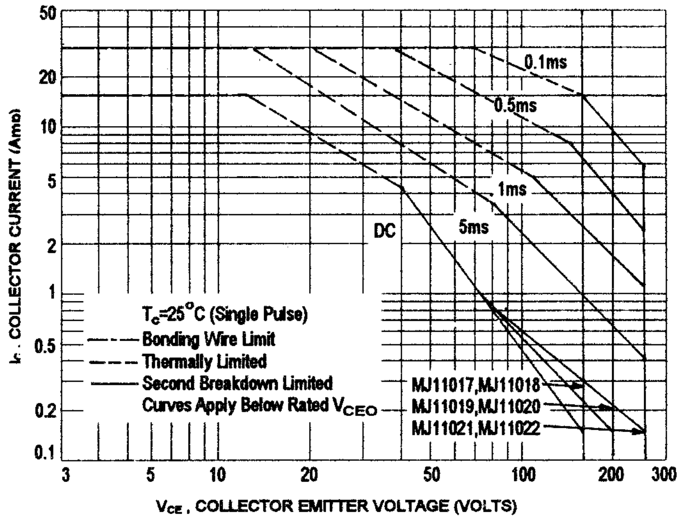
(1) Pulse Test: Pulse width = 300 us , Duty Cycle ≦ 2.0%
(2) $f_T = |h_{fe}| \circ f_{test}$

FIGURE 2 — SWITCHING TIMES TEST CIRCUIT



For NPN test circuit reverse diode and voltage polarities.

FIG-3 FORWARD BIAS SAFE OPERATING AREA

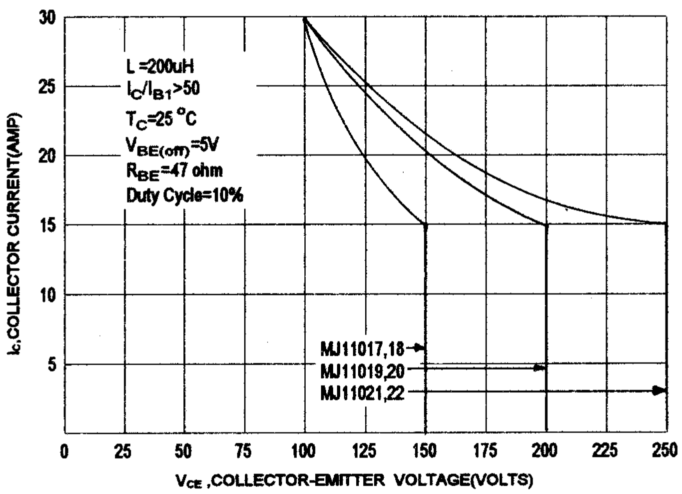


FORWARD BIAS

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-3 is base on $T_{J(PK)}$=200 °C;T_C is variable depending on conditions.At high case temperatures , thermal limitation will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

FIG-4 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-4 gives the RBSOA characteristics.

FIG-5 DC CURRENT GAIN

PNP NPN

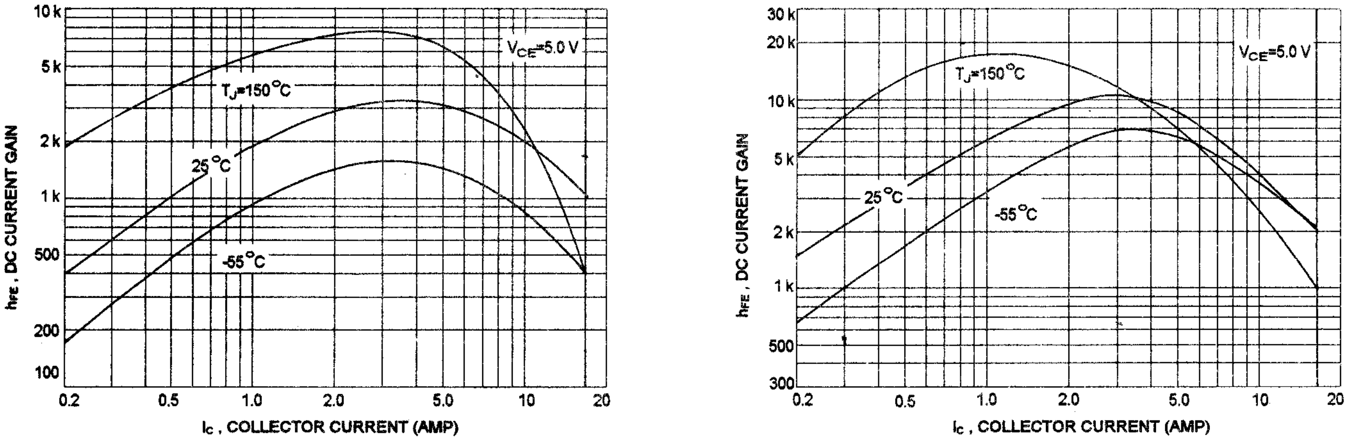


FIG-6 COLLECTOR SATURATION

PNP NPN

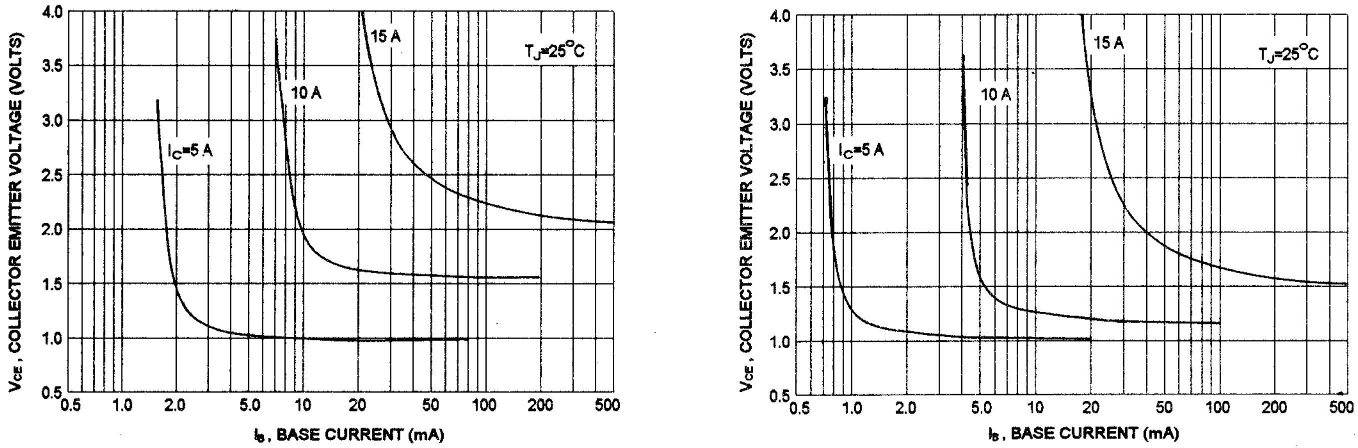


FIG-7 "ON" VOLTAGE

PNP NPN