New Jersey Semi-Conductor Products, Inc.

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MJ8504
MJ8505

Designers Data Sheet

SWITCHMODE SERIES
NPN SILICON POWER TRANSISTORS

The MJ8504 and MJ8505 transistors are designed for high-voltage, high-speed, power switching in inductive circuits where fall time is critical. They are particularly suited for line operated switch-mode applications such as:

- Switching Regulators
- Inverters
- Solenoid and Relay Drivers
- Motor Controls
- Deflection Circuits

Fast Turn-Off Times
  75 ns Inductive Fall Time –25°C (typ)
  150 ns Inductive Crossover Time –25°C (typ)
  1.25 μs Inductive Storage Time –25°C (typ)

Operating Temperature Range –65 to + 200°C

100°C Performance Specified for:
  Reverse-Biased SOA with Inductive Loads
  Switching Times with Inductive Loads
  Saturation Voltages
  Leakage Currents

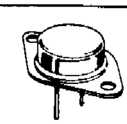
10 AMPERE

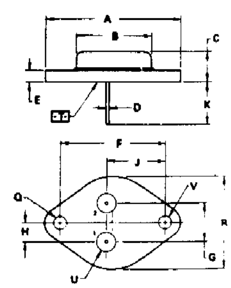
NPN SILICON POWER TRANSISTORS

700 and 800 VOLTS
175 WATTS

Designer's Data for "Worst Case" Conditions

The Designers Data Sheet permits the design of most circuits entirely from the information presented. Limit data – representing device characteristics boundaries are given to facilitate "worst case" design.





NOTES
1. DIMENSIONS Q AND V ARE DATUMS.
2. [T] IS SEATING PLANE AND DATUM
3. POSITIONAL TOLERANCE FOR MOUNTING HOLE Q:
   ⌖ | ∅ 0.13 (0.005) Ⓜ | T | V Ⓜ
   FOR LEADS:
   ⌖ | ∅ 0.13 (0.005) Ⓜ T | V Ⓜ | Q Ⓜ
4. DIMENSIONS AND TOLERANCES PER ANSI Y14.5, 1973.

STYLE 1
PIN 1. BASE
2. EMITTER
CASE COLLECTOR

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	–	39.37	–	1.550
B	–	21.08	–	0.830
C	6.35	7.62	0.250	0.300
D	0.97	1.09	0.038	0.043
E	–	3.43	–	0.135
F	30.15 BSC		1.187 BSC	
G	10.92 BSC		0.430 BSC	
H	5.46 BSC		0.215 BSC	
J	16.89 BSC		0.665 BSC	
K	11.18	12.19	0.440	0.480
Q	3.81	4.19	0.150	0.165
R	–	26.67	–	1.050
U	4.83	5.33	0.190	0.210
V	3.81	4.19	0.150	0.165

TO-3

MAXIMUM RATINGS

Rating	Symbol	MJ8504	MJ8505	Unit
Collector-Emitter Voltage	$V_{CEO(sus)}$	700	800	Vdc
Collector-Emitter Voltage	V_{CEV}	1200	1400	Vdc
Emitter Base Voltage	V_{EB}	8.0	8.0	Vdc
Collector Current – Continuous Peak (1)	I_C I_{CM}	10 15	10 15	Adc
Base Current – Continuous Peak (1)	I_B I_{BM}	8 12	8 12	Adc
Total Power Dissipation @ $T_C = 25°C$ @ $T_C = 100°C$ Derate above 25°C	P_D	175 100 1.0	175 100 1.0	Watts 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	$R_{\theta JC}$	1.0	°C/W
Maximum Lead Temperature for Soldering Purposes: 1/8" from Case for 5 Seconds	T_L	275	°C

(1) Pulse Test: Pulse Width = 5 ms, Duty Cycle ≤ 10%.

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Sustaining Voltage (Table 1) (I_C = 100 mA, I_B = 0) MJ8504	$V_{CEO(sus)}$	700	–	–	Vdc
MJ8505		800	–	–	
Collector Cutoff Current (V_{CEV} = Rated Value, $V_{BE(off)}$ = 1.5 Vdc)	I_{CEV}	–	–	0.25	mAdc
(V_{CEV} = Rated Value, $V_{BE(off)}$ = 1.5 Vdc, T_C = 150°C)		–	–	5.0	
Collector Cutoff Current (V_{CE} = Rated V_{CEV}, R_{BE} = 50 Ω, T_C = 100°C)	I_{CER}	–	–	5.0	mAdc
Emitter Cutoff Current (V_{EB} = 7.0 Vdc, I_C = 0)	I_{EBO}	–	–	1.0	mAdc
SECOND BREAKDOWN					
Second Breakdown Collector Current with base forward biased	$I_{S/b}$	See Figure 12			
Clamped Inductive SOA with Base Reverse Biased	RBSOA	See Figure 13			
ON CHARACTERISTICS (1)					
DC Current Gain (I_C = 1.5 Adc, V_{CE} = 5.0 Vdc)	h_{FE}	7.5	–	–	–
Collector-Emitter Saturation Voltage (I_C = 5.0 Adc, I_B = 2.0 Adc)	$V_{CE(sat)}$	–	–	2.0	Vdc
(I_C = 10 Adc, I_B = 4.0 Adc)		–	–	5.0	
(I_C = 5.0 Adc, I_B = 2.0 Adc, T_C = 100°C)		–	–	3.0	
Base-Emitter Saturation Voltage (I_C = 5.0 Adc, I_B = 2.0 Adc)	$V_{BE(sat)}$	–	–	1.5	Vdc
(I_C = 5.0 Adc, I_B = 2.0 Adc, T_C = 100°C)		–	–	1.5	
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f_{test} = 1.0 kHz)	C_{ob}	90	–	450	pF
SWITCHING CHARACTERISTICS					
Resistive Load (Table 1)					
Delay Time (V_{CC} = 500 Vdc, I_C = 5.0 A, I_{B1} = 2.0 A, $V_{BE(off)}$ = 5.0 Vdc, t_p = 50 μs, Duty Cycle ≤ 2.0%)	t_d	–	0.050	0.20	μs
Rise Time	t_r	–	0.175	2.0	μs
Storage Time	t_s	–	1.25	4.0	μs
Fall Time	t_f	–	0.60	2.0	μs
Inductive Load, Clamped (Table 1)					
Storage Time (I_C = 5.0 A(pk), V_{clamp} = 500 Vdc, I_{B1} = 2.0 A, $V_{BE(off)}$ = 5 Vdc, T_C = 100°C)	t_{sv}	–	1.75	5.5	μs
Crossover Time	t_c	–	0.400	2.0	μs
Storage Time (I_C = 5.0 A(pk), V_{clamp} = 500 Vdc, I_{B1} = 2.0 A, $V_{BE(off)}$ = 5 Vdc, T_C = 25°C)	t_{sv}	–	1.25	–	μs
Crossover Time	t_c	–	0.150	–	μs
Fall Time	t_{fi}	–	0.075	–	μs

(1) Pulse Test: PW · 300 μs, Duty Cycle ≤ 2%.

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