

PRODUCT CHARACTERISTICS

BVCBO	700V
BVCEO	400V
HFE@5V2A	8-40
IC	4A

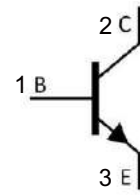
FEATURES

- * $V_{CEO(SUS)} = 400\text{ V}$
- * Reverse bias SOA with inductive loads @ $T_C = 100^\circ\text{C}$
- * Inductive switching matrix 2 to 4 Amp, 25 and 100°C
 t_C @ 3A, 100°C is 180 ns (Typ)
- * 700V blocking capability
- * SOA and switching applications information

APPLICATIONS

- * Switching regulator's, inverters
- * Motor controls
- * Solenoid/Relay drivers
- * Deflection circuits

Symbol



ORDER INFORMATION

Order codes		Package	Packing
Halogen-Free	Halogen		
N/A	MOT13005DF	TO-220F	50 pieces/Tube
N/A	MOT13005DA	TO-220	50 pieces/Tube

ABSOLUTE MAXIMUM RATINGS

PARAMETER		SYMBOL	RATINGS	UNIT
Collector-Emitter Voltage		$V_{CEO(SUS)}$	400	V
Collector-Emitter Voltage ($V_{BE}=0$)		V_{CES}	700	V
Collector-Base Voltage		V_{CBO}	700	V
Emitter Base Voltage		V_{EBO}	9	V
Collector Current	Continuous	I_C	4	A
	Peak (1)	I_{CM}	8	A
Base Current	Continuous	I_B	2	A
	Peak (1)	I_{BM}	4	A
Emitter Current	Continuous	I_E	6	A
	Peak (1)	I_{EM}	12	A
Power Dissipation at $T_C=25^\circ\text{C}$	TO-220F	P_D	40	W
	TO-220		75	
Derate above 25°C	TO-220F		320	mW/ $^\circ\text{C}$
	TO-220		600	
Operating and Storage Junction Temperature		T_J, T_{STG}	-65 ~ +150	$^\circ\text{C}$

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F	θ_{JA}	62.5	$^\circ\text{C/W}$
Junction to Case	TO-220/TO-220F	θ_{JC}	1.67	$^\circ\text{C/W}$

■ ELECTRICAL CHARACTERISTICS ($T_C=25^{\circ}\text{C}$, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS (Note 1)						
Collector-Emitter Sustaining Voltage	V _{CEO(SUS)}	I _C =10mA , I _B =0	400			V
Collector Cutoff Current	I _{CBO}	V _{CBO} =Rated Value, V _{BE(OFF)} =1.5V			1	mA
		V _{CBO} =Rated Value, V _{BE(OFF)} =1.5V, T _C =100°C			5	
Emitter Cutoff Current	I _{EBO}	V _{EB} =9V, I _C =0			1	mA
SECOND BREAKDOWN						
Second Breakdown Collector Current with bass forward biased	I _{S/B}				See Fig. 11	
Clamped Inductive SOA with Base Reverse Biased	RBSOA				See Fig. 12	
ON CHARACTERISTICS (Note 1)						
DC Current Gain	h _{FE1}	I _C =0.5A, V _{CE} =5V	20		40	
	h _{FE2}	I _C =1A, V _{CE} =5V	10		60	
	h _{FE3}	I _C =2A, V _{CE} =5V	8		40	
Collector-Emitter Saturation Voltage	V _{CE(SAT)}	I _C =1A, I _B =0.2A			0.5	V
		I _C =2A, I _B =0.5A			0.6	V
		I _C =4A, I _B =1A			1	V
		I _C =2A, I _B =0.5A, T _a =100°C			1	V
Base-Emitter Saturation Voltage	V _{BE (SAT)}	I _C =1A, I _B =0.2A			1.2	V
		I _C =2A, I _B =0.5A			1.6	V
		I _C =2A, I _B =0.5A, T _C =100°C			1.5	V
DYNAMIC CHARACTERISTICS						
Current-Gain-Bandwidth Product	f _T	I _C =500mA, V _{CE} =10V, f=1MHz	4			MHz
Output Capacitance	C _{OB}	V _{CB} =10V, I _E =0, f=0.1MHz		65		pF
SWITCHING CHARACTERISTICS						
Resistive Load (Table 1)						
Delay Time	t _D	V _{CC} =125V, I _C =2A, I _{B1} =I _{B2} =0.4A, t _p =25μs, Duty Cycle≤1%		0.025	0.1	μs
Rise Time	t _R			0.3	0.7	μs
Storage Time	t _S			1.7	4	μs
Fall Time	t _F			0.4	0.9	μs

Note: 1. Pulse Test: Pulse Width=5ms, Duty Cycles $\leq 10\%$

2. Pulse Test: $P_W=300\mu\text{s}$, Duty Cycles $\leq 2\%$

■ RESISTIVE SWITCHING PERFORMANCE

Fig. 1 Turn-On Time

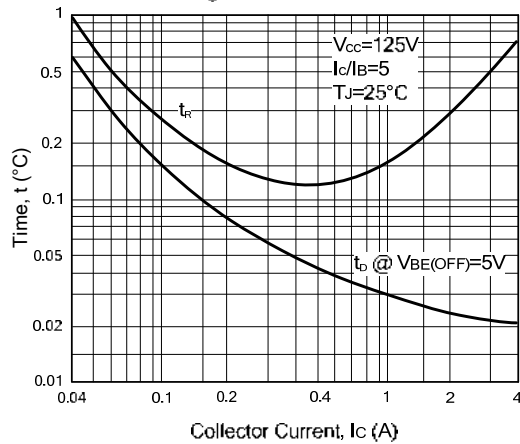


Fig. 2 Turn-Off Time

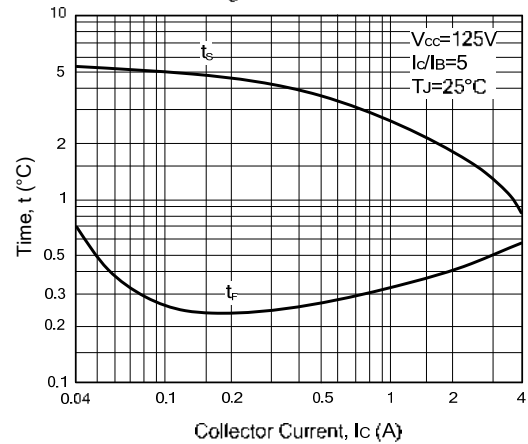


Fig. 3 Typical Thermal Response [$Z_{\theta JC}(t)$]

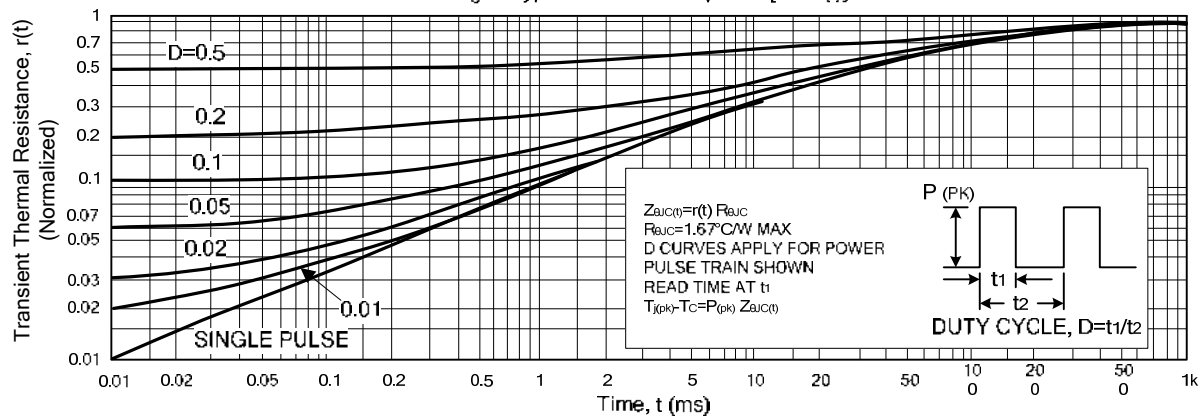


Fig. 4 Forward Bias Safe Operating Area

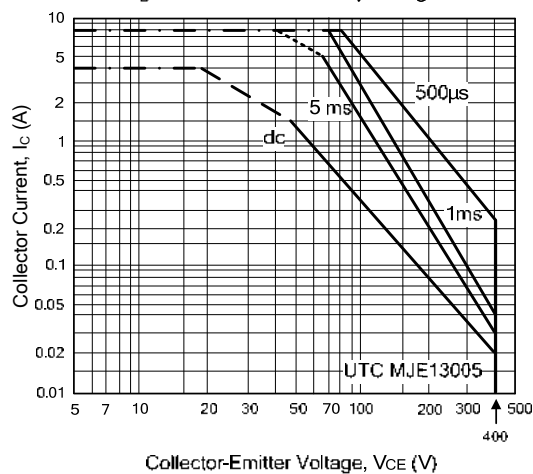
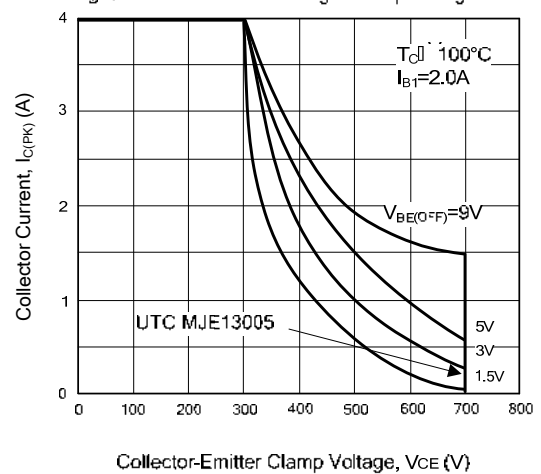
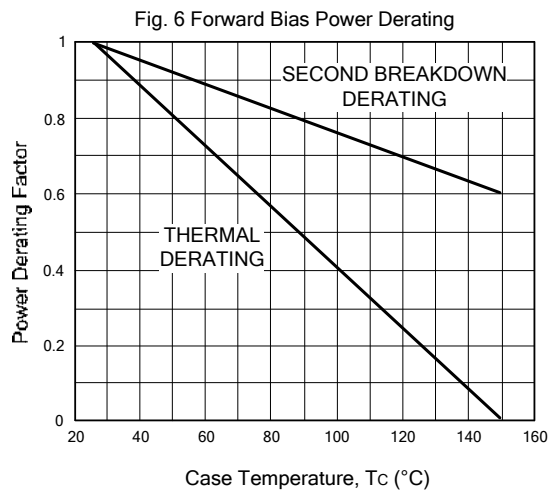


Fig. 5 Reverse Bias Switching Safe Operating Area



■ RESISTIVE SWITCHING PERFORMANCE(Cont.)



Technical drawing of a mechanical part, showing front, top, and side views with dimensions.

Front View Dimensions:

- Overall width: 10.06 ± 0.15
- Overall height: 15.87 ± 0.15
- Top flange width: 7.00 ± 0.15
- Top flange thickness: 3.30
- Central hole diameter: $3 - \phi 1.50 \pm 0.15$
- Central hole position from top edge: 1.80
- Central hole position from side edge: 1.80 ± 0.1
- Bottom flange width: 8.0
- Bottom flange thickness: 4.90
- Bottom flange radius: $R0.5$
- Bottom flange position from top edge: 6.10 ± 0.1
- Bottom flange position from side edge: 1.80 ± 0.1
- Bottom flange position from bottom edge: 6.47
- Bottom flange position from side edge: 3.18
- Bottom flange position from bottom edge: 12.93 ± 0.3
- Bottom flange position from side edge: 0.80
- Bottom flange position from bottom edge: 2.54
- Bottom flange position from side edge: 2.54

Top View Dimensions:

- Overall width: 10.06 ± 0.15
- Overall height: 15.87 ± 0.15
- Top flange width: 7.00 ± 0.15
- Top flange thickness: 3.30
- Central hole diameter: $3 - \phi 1.50 \pm 0.15$
- Central hole position from top edge: 1.80
- Central hole position from side edge: 1.80 ± 0.1
- Bottom flange width: 8.0
- Bottom flange thickness: 4.90
- Bottom flange radius: $R0.5$
- Bottom flange position from top edge: 6.10 ± 0.1
- Bottom flange position from side edge: 1.80 ± 0.1
- Bottom flange position from bottom edge: 6.47
- Bottom flange position from side edge: 3.18
- Bottom flange position from bottom edge: 12.93 ± 0.3
- Bottom flange position from side edge: 0.80
- Bottom flange position from bottom edge: 2.54
- Bottom flange position from side edge: 2.54

Side View Dimensions:

- Overall width: 4.70 ± 0.1
- Overall height: 6.68 ± 0.1
- Top flange width: 2.54 ± 0.15
- Top flange thickness: 3.30
- Central hole diameter: $3 - \phi 1.50 \pm 0.15$
- Central hole position from top edge: 1.80
- Central hole position from side edge: 1.80 ± 0.1
- Bottom flange width: 8.0
- Bottom flange thickness: 4.90
- Bottom flange radius: $R0.5$
- Bottom flange position from top edge: 6.10 ± 0.1
- Bottom flange position from side edge: 1.80 ± 0.1
- Bottom flange position from bottom edge: 6.47
- Bottom flange position from side edge: 3.18
- Bottom flange position from bottom edge: 12.93 ± 0.3
- Bottom flange position from side edge: 0.80
- Bottom flange position from bottom edge: 2.54
- Bottom flange position from side edge: 2.54

■ TO-220-3L PACKAGE OUTLINE DIMENSIONS

