

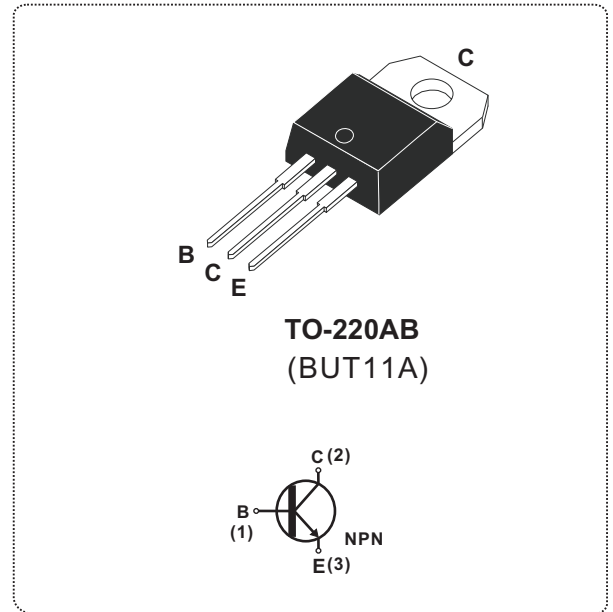
High Voltage Fast-switching NPN Power Transistor 5A/450V

FEATURES

- High voltage capability
- Fast switching speed
- TO-220AB package which can be installed to the heat sink with one screw

APPLICATIONS

- Flyback and forward single transistor low power converters
- Inverters
- Converters
- Switching regulators
- Motor control systems



ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ unless otherwise specified)				
SYMBOL	PARAMETER	TEST CONDITIONS	VALUE	UNIT
V_{CES}	Collector to emitter voltage	$V_{BE}=0$	1000	V
V_{CEO}	Collector to emitter voltage	$I_B=0$	450	
V_{EBO}	Emitter to base voltage	$I_C=0$	9	
I_C	Collector current-continuous		5	A
I_{CM}	Peak collector current	$t_p < 5 \text{ ms}$	10	
I_B	Base Current		2	
I_{BM}	Peak base current	$t_p < 5 \text{ ms}$	4	
P_D	Collector power dissipation	$T_a=25^\circ\text{C}$	100	W
T_J	Junction temperature		150	$^\circ\text{C}$
T_{STG}	Storage temperature		-65 to 150	

THERMAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$)			
SYMBOL	PARAMETER	VALUE	UNIT
$R_{th(j-c)}$	Thermal resistance, junction to case	1.5	$^\circ\text{C/W}$

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise specified)							
SYMBOL	PARAMETER	TEST CONDITIONS	Min.	Typ.	Max.	UNIT	
I_{CES}	Collector to emitter cutoff current	$V_{CE}=1000\text{V}, V_{BE}=0$	$T_C=25^\circ\text{C}$			1.0	mA
			$T_C=125^\circ\text{C}$			2.0	
I_{EBO}	Emitter to base cutoff current	$V_{EBO}=9\text{V}, I_C=0$			10		
V_{CEO}	Collector to emitter voltage	$I_B=0$	450			V	
$V_{CEO(SUS)}^*$	Collector to emitter sustaining voltage	$I_C=100\text{mA}, I_B=0, L=25\text{mH}$	450				
h_{FE}^*	Forward current transfer ratio (DC current gain)	$I_C=5\text{mA}, V_{CE}=5\text{V}$ $I_C=0.5\text{A}, V_{CE}=5\text{V}$	10	18	35		
			10	20	35		
$V_{CE(sat)}^*$	Collector to emitter saturation voltage	$I_C=2.5\text{A}, I_B=0.5\text{A}$			1.5	V	
$V_{BE(sat)}^*$	Base to emitter saturation voltage	$I_C=2.5\text{A}, I_B=0.5\text{A}$			1.3		
© SWITCHING TIMES RESISTIVE LOAD							
t_{on}	Turn-on time	$I_C=2.5\text{A}, I_{B(on)}=-I_{B(off)}=0.5\text{A}, V_{CC}=250\text{V}$			1	μS	
t_{stg}	Storage time				4		
t_f	Fall time				0.8		
© SWITCHING TIMES INDUCTIVE LOAD							
t_{stg}	Storage time	$I_C=2.5\text{A}, I_{B(on)}=0.5\text{A}, V_{CC}=300\text{V}, V_{EB}=5\text{V}, L_B=1\mu\text{H}$	$T_C=25^\circ\text{C}$		1.1	1.4	μS
			$T_C=100^\circ\text{C}$		1.2	1.5	
t_f	Fall time		$T_C=25^\circ\text{C}$		80	150	nS
			$T_C=100^\circ\text{C}$		140	300	

*Pulsed: Pulse duration= 300 μs , duty cycle= 1.5%.

Fig.1 Reverse bias SOA

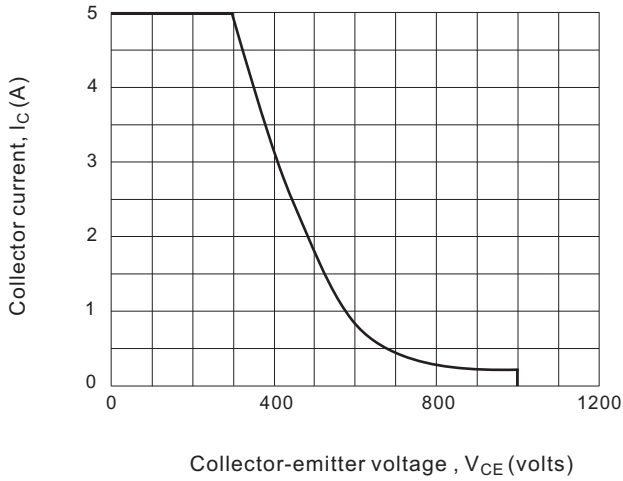


Fig.2 Power derating curve

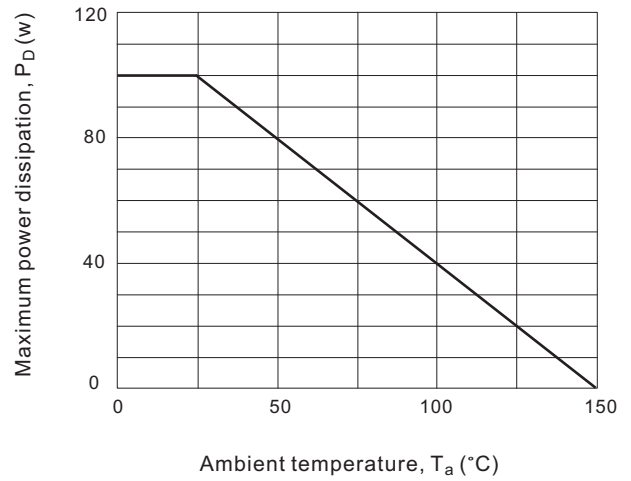
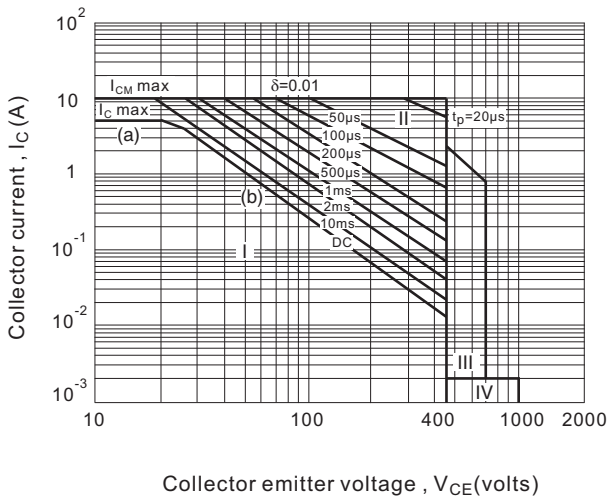


Fig.3 Forward bias SOA



$T_a \leq 25^\circ\text{C}$

- I - Region permissible DC operation
 - II - Permissible extension for repetitive pulse operation
 - III - Area of permissible operation during turn-on in single transistor converters, provided $R_{BE} \leq 100\Omega$ and $t_p \leq 0.6\mu\text{s}$
 - IV - Repetitive pulse operation in this region is permissible provided $V_{BE} \leq 0$ and $t_p \leq 5\text{ms}$.
- (a) P_D max and P_D peak max lines.
 (b) Second breakdown limits.

Fig.4 Test circuit for $V_{CE(sus)}$

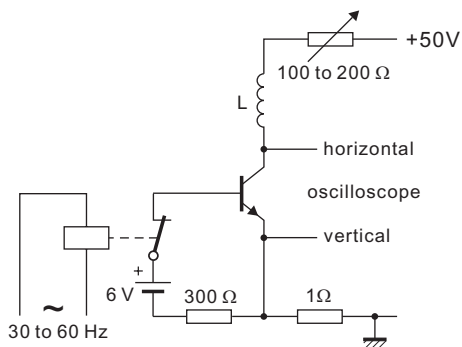


Fig.5 Oscilloscope display for $V_{CE(sus)}$

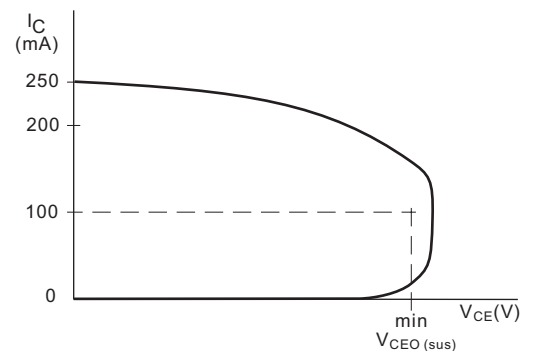


Fig.6 $V_{BE(sat)}$ - $V_{CE(sat)}$ - I_C Temperature characteristics (Typical)

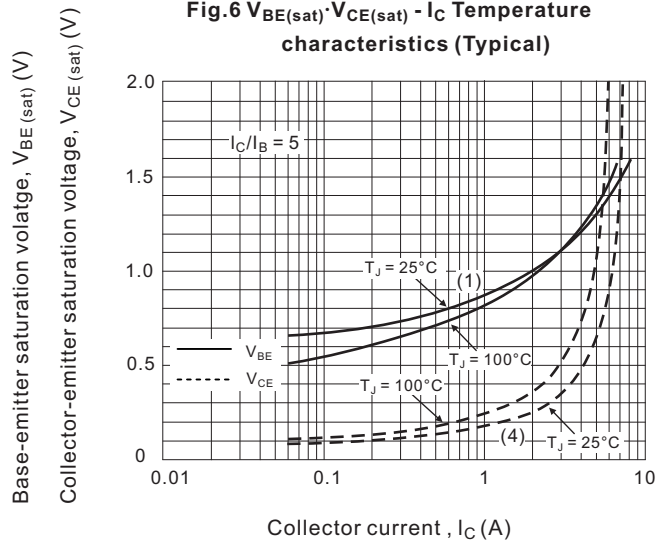


Fig.7 V_{BE} - I_B Characteristics

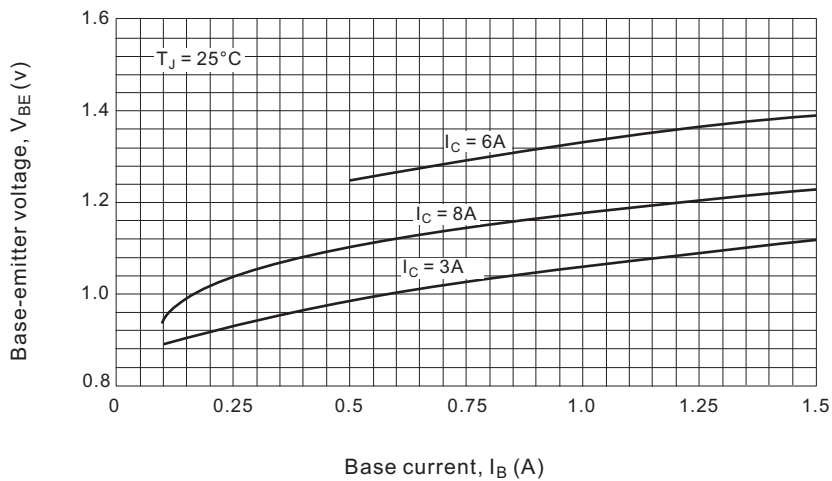


Fig.8 $V_{CE(sat)}$ - I_B Characteristics (Typical)

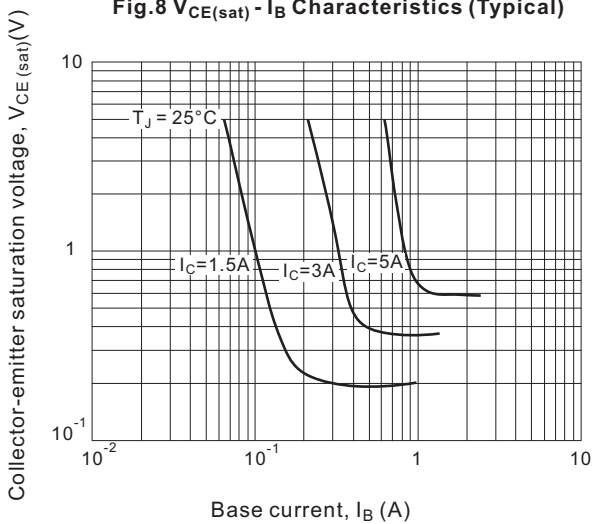


Fig.9 DC current gain

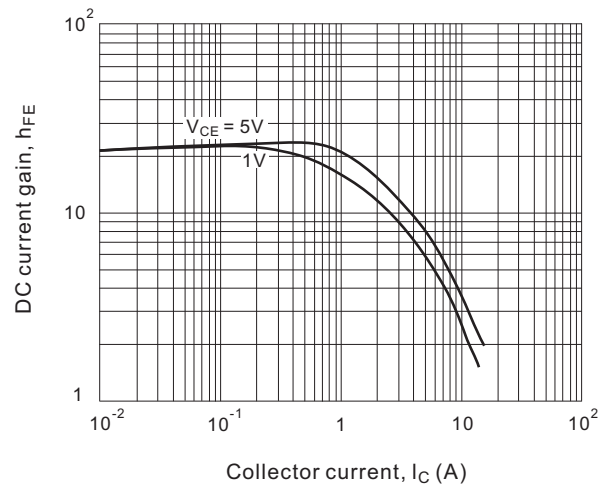
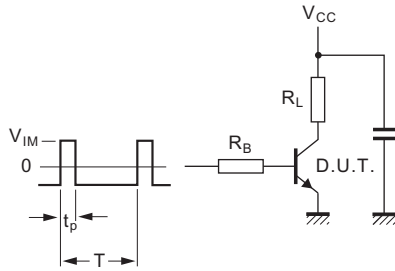


Fig.10 Test circuit resistive load



$V_{CC} = 250V$; $t_p = 20\mu s$; $V_{IM} = -6$ to $+8V$; $t_p/T = 0.01$.
The values of R_B and R_L are selected in accordance with $I_{C(ON)}$ and $I_{B(ON)}$ requirements

Fig.11 Switching time waveforms with resistive load

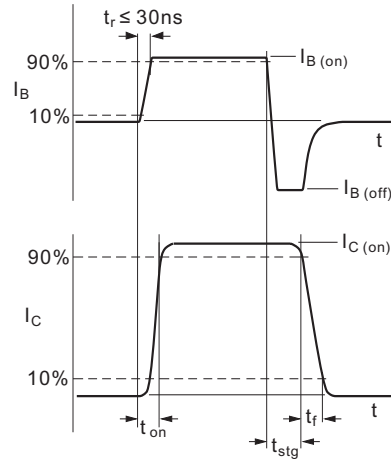
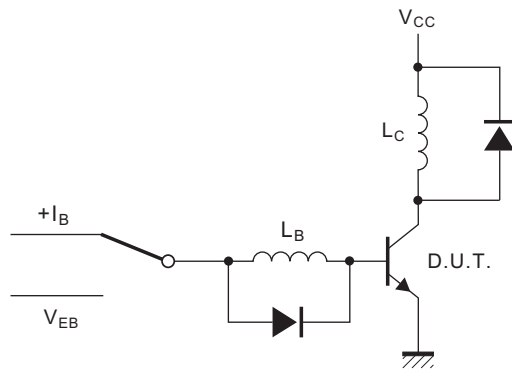
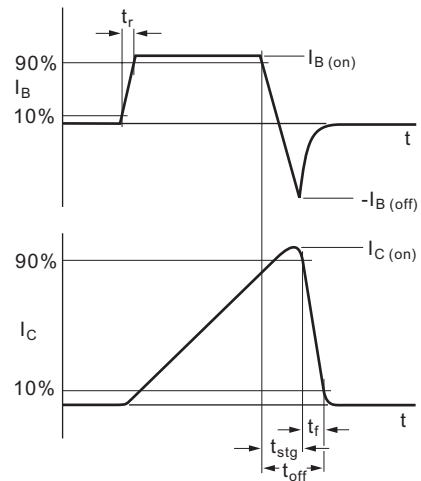


Fig.12 Test circuit inductive load



$V_{CC} = 300V$; $V_{EB} = 5V$; $L_B = 1\mu H$

Fig.13 Switching time waveforms with inductive load



Case Style

