

## Features

- Low  $V_{ce(sat)}$ , Fast Switching
- $V_{ce(sat)}$  with Positive Temperature Coefficient
- High Ruggedness, Good Thermal Stability
- Very Tight Parameter Distribution
- Halogen Free
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant ("P" Suffix Designates RoHS Compliant. See Ordering Information)

## Maximum Ratings

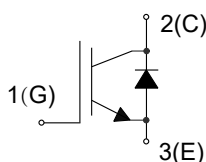
- Operating Junction Temperature Range : -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C
- IGBT Thermal Resistance: 0.45°C/W Junction to Case
- Diode Thermal Resistance: 0.8°C/W Junction to Case
- Thermal Resistance: 40°C/W Junction to Ambient

Parameter	Symbol	Rating	Unit
Collector-Emitter Voltage	$V_{CE}$	1200	V
DC Collector Current <sup>(1)</sup>	$I_C$	$T_C=25^\circ\text{C}$	80
		$T_C=100^\circ\text{C}$	40
Pulsed Collector Current <sup>(2)</sup>	$I_{C,pluse}$	160	A
Diode Forward Current <sup>(1)</sup>	$I_F$	$T_C=25^\circ\text{C}$	40
		$T_C=100^\circ\text{C}$	20
Diode Pulsed Current <sup>(2)</sup>	$I_{F,pluse}$	160	A
Gate-Emitter Voltage	$V_{GE}$	$\pm 20$	V
Short Circuit Withstand Time <sup>(3)</sup> $V_{GE}=15\text{V}, V_{CC}=600\text{V}, T_J \leq 150^\circ\text{C}$	$t_{SC}$	10	$\mu\text{s}$
Power Dissipation	$P_D$	$T_C=25^\circ\text{C}$	277
		$T_C=100^\circ\text{C}$	111

Note:

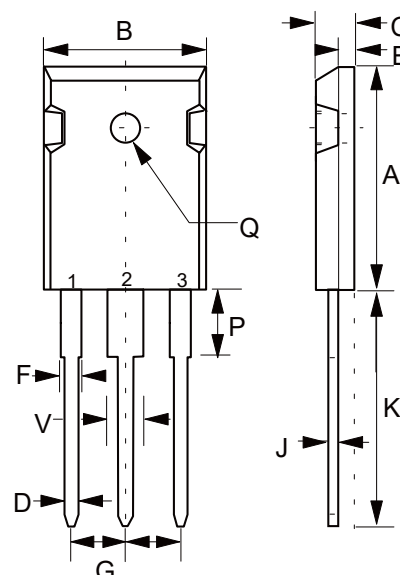
1. Limited by  $T_{Jmax}$ .
2.  $T_p$  limited by  $T_{Jmax}$ .
3. Allowed number of short circuits: <1000; time between short circuits: >1s.

## Internal Structure



# Trench and Field Stop IGBT 1200V 40A

## TO-247



DIM	DIMENSIONS				NOTE
	INCHES		MM		
	MIN	MAX	MIN	MAX	
A	0.787	0.866	20.00	22.00	
B	0.598	0.638	15.20	16.20	
C	0.185	0.208	4.70	5.30	
D	0.035	0.059	0.90	1.50	
E	0.059	0.094	1.50	2.40	
F	0.067	0.091	1.70	2.30	
J	0.019	0.031	0.48	0.80	
K	0.748	0.833	19.00	21.15	
P	0.122	0.189	3.10	4.80	
Q	0.118	0.150	3.00	3.80	$\Phi$
V	0.106	0.134	2.70	3.40	
G	0.197	0.224	5.00	5.70	

**Electrical Characteristics @ 25°C (Unless Otherwise Specified)**

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Static Characteristics</b>						
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	$V_{GE}=0V, I_C=0.25mA$	1200			V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=40A$		1.9	2.4	V
		$V_{GE}=15V, I_C=40A, T_J=150^\circ C$		2.3		
Diode Forward Voltage	$V_F$	$V_{GE}=0V, I_F=20A$		2.45		V
		$V_{GE}=0V, I_F=20A, T_J=150^\circ C$		1.9		
G-E Threshold Voltage	$V_{GE(th)}$	$I_C=1mA, V_{CE}=V_{GE}$	5.5	6	6.5	V
C-E Leakage Current	$I_{CES}$	$V_{CE}=1200V, V_{GE}=0V$			0.1	mA
		$V_{CE}=1200V, V_{GE}=0V, T_J=150^\circ C$			4	
G-E Leakage Current	$I_{GES}$	$V_{CE}=0V, V_{GE}=20V$			250	nA
Transconductance	$g_{FS}$	$V_{CE}=20V, I_C=40A$		26.5		S
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{ies}$	$V_{CE}=25V, V_{GE}=0V, f=1MHz$		3823		pF
Output Capacitance	$C_{oes}$			170		
Reverse Transfer Capacitance	$C_{res}$			94		
Gate Charge	$Q_g$	$V_{CC}=600V, I_C=40A, V_{GE}=15V$		239		nC
<b>IGBT Switching Characteristics</b>						
Turn-On Delay Time	$t_{d(on)}$	$V_{CC}=600V, I_C=40A, V_{GE}=0/15V, R_G=10\Omega, \text{ Inductive load}$		62		ns
Rise Time	$t_r$			54		
Turn-Off Delay Time	$t_{d(off)}$			265		
Fall Time	$t_f$			30		
Turn-On Energy	$E_{on}$			3.3		mJ
Turn-Off Energy	$E_{off}$			1.4		
Total Switching Energy	$E_{ts}$			4.7		
Turn-On Delay Time	$t_{d(on)}$	$V_{CC}=600V, I_C=40A, V_{GE}=0/15V, R_G=10\Omega, T_J=150^\circ C, \text{ Inductive load}$		55		ns
Rise Time	$t_r$			55		
Turn-Off Delay Time	$t_{d(off)}$			306		
Fall Time	$t_f$			38		
Turn-On Energy	$E_{on}$			3.49		mJ
Turn-Off Energy	$E_{off}$			1.85		
Total Switching Energy	$E_{ts}$			5.34		

**Electrical Characteristics @ 25°C (Unless Otherwise Specified)**

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Diode Characteristics</b>						
Reverse Recovery Time	$t_{rr}$	$V_R=600V, I_F=20A,$ $di_F/dt=100A/\mu s$		80		ns
Reverse Recovery Charge	$Q_{rr}$			0.15		$\mu C$
Peak Reverse Recovery Current	$I_{rrm}$			5.4		A

**Curve Characteristics**

Fig. 1 - FBSOA

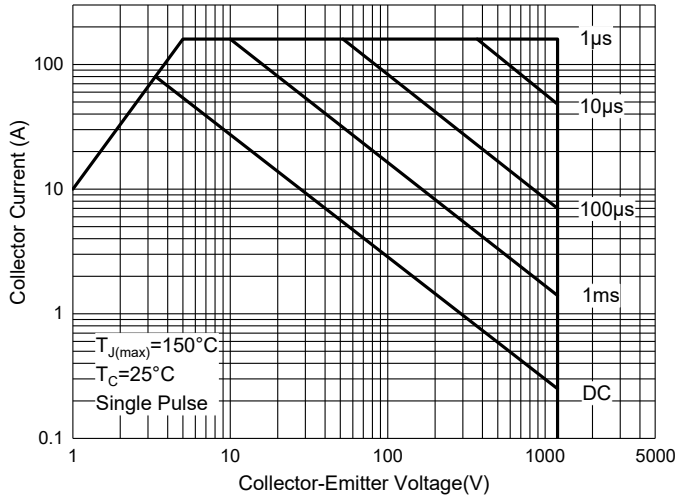


Fig. 2 - RBSOA

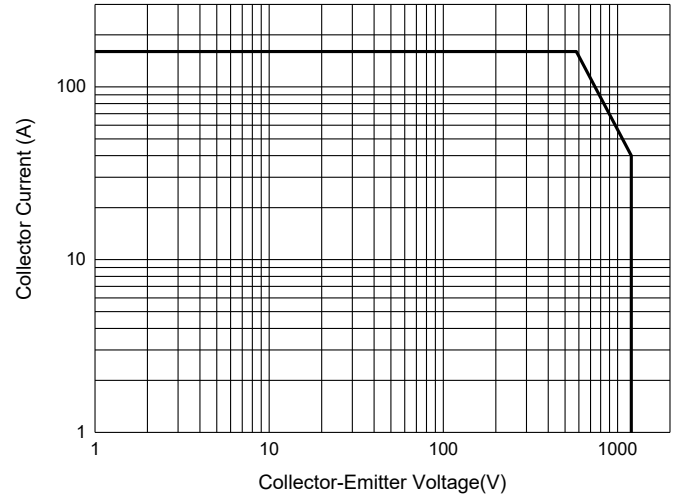


Fig. 3 - Typical Output Characteristics

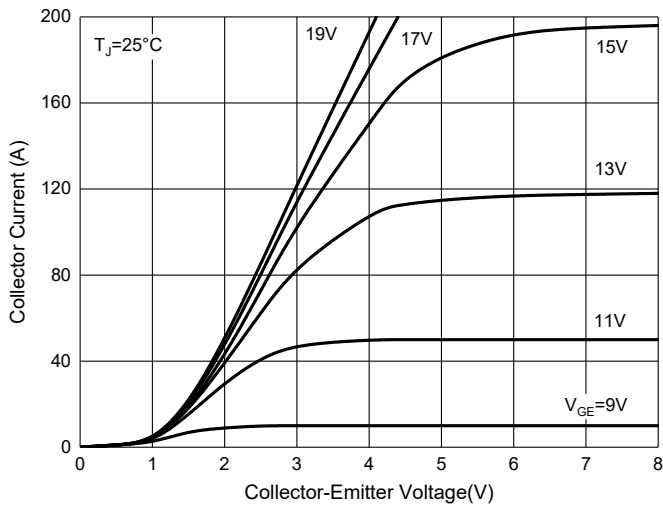


Fig. 4 - Typical Output Characteristics

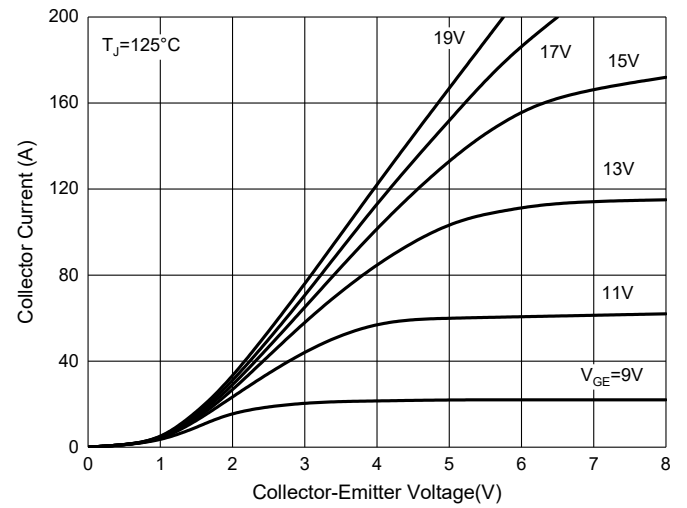


Fig. 5 -  $V_{CE(sat)} - I_C$

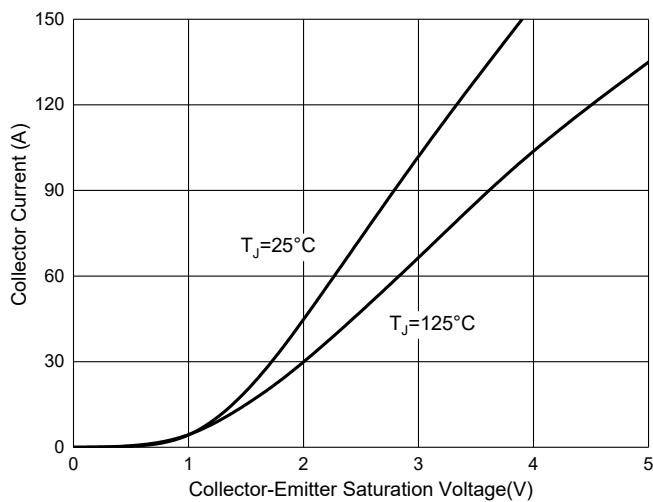
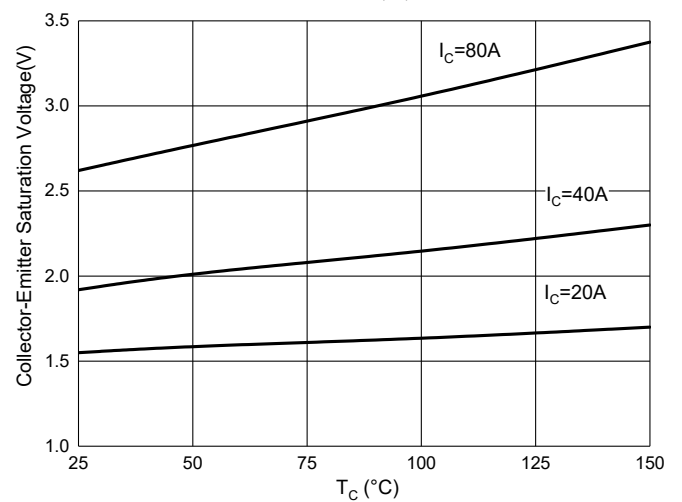


Fig. 6 -  $V_{CE(sat)} - T_C$



**Curve Characteristics**

Fig. 7 - Gate Charge

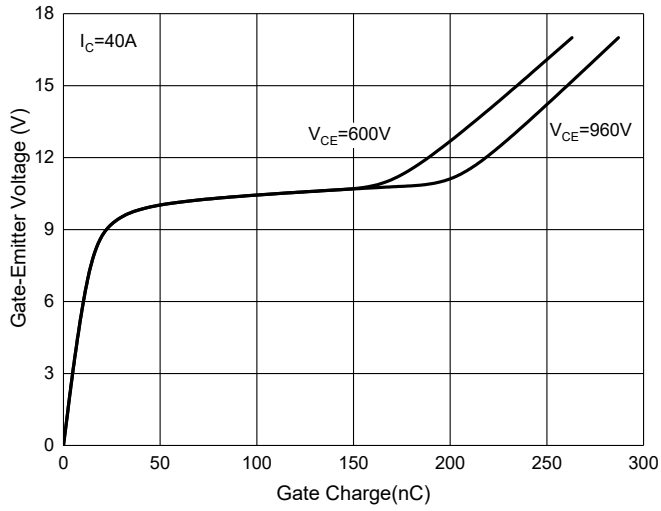


Fig. 8 - Capacitance Characteristics

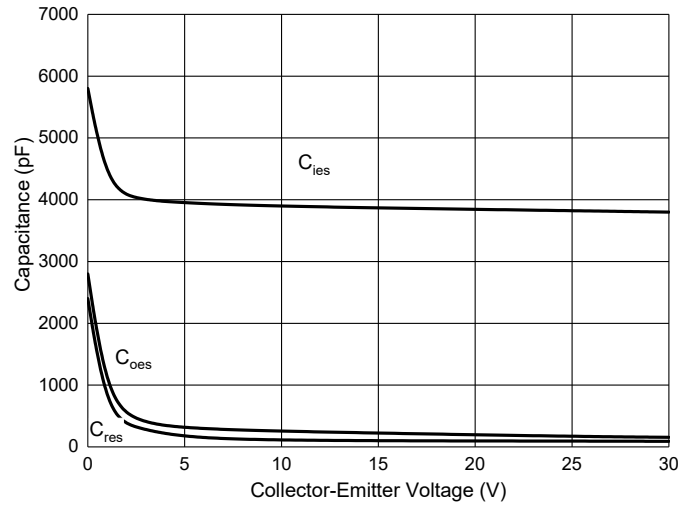


Fig. 9 - Power Derating Curve

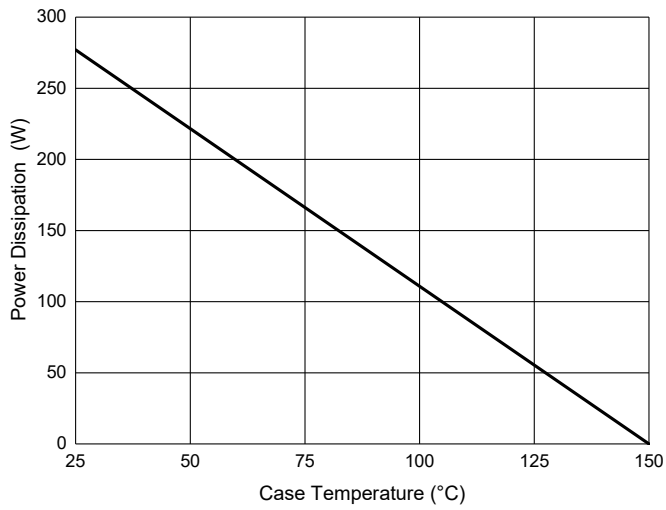
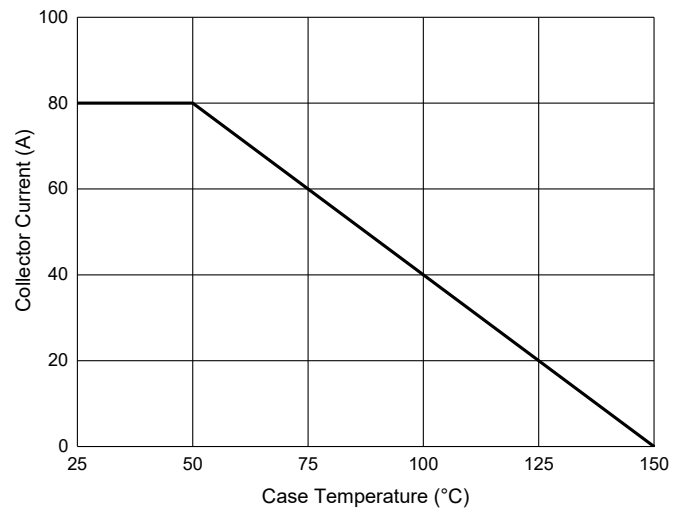


Fig. 10 - Collector Current Derating Curve



## Ordering Information

Device	Packing
Part Number-BP	Tube:30pcs/Tube, 360pcs/Box,1.8K/Ctn;

Note : Adding "-HF" Suffix For Halogen Free, eg. Part Number-BP-HF

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