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)

Trench and Field Stop IGBT 650V 40A

Maximum Ratings

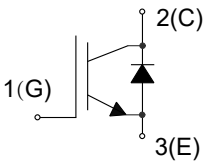
- Operating Junction Temperature Range : -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C
- IGBT Thermal Resistance: 0.45°C/W Junction to Case
- Diode Thermal Resistance: 1.25°C/W Junction to Case
- Thermal Resistance: 40°C/W Junction to Ambient

Parameter		Symbol	Rating	Unit
Collector-Emitter Voltage		V_{CE}	650	V
DC Collector Current(1)	T_C=25°C	I_C	80	A
	T_C=100°C		40	
Pulsed Collector Current (2)		$I_{C,pluse}$	120	A
Diode Forward Current (1)	T_C=25°C	I_F	40	A
	T_C=100°C		20	
Diode Pulsed Current (2)		$I_{F,pluse}$	120	A
Gate-Emitter Voltage		V_{GE}	±20	V
Short Circuit Withstand Time (3) V_{GE}=15V, V_{CC}=400V, T_J≤150°C		t_{SC}	10	μs
Power Dissipation	T_C=25°C	P_D	280	W
	T_C=100°C		110	

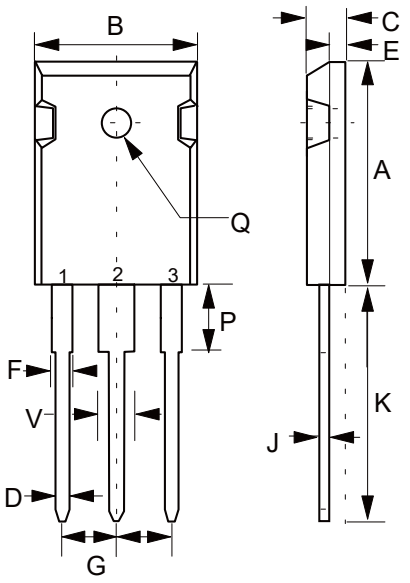
Note:

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



TO-247



DIMENSIONS					
DIM	INCHES		MM		NOTE
	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	Φ
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
Static Characteristics						
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	V_{GE}=0V, I_C=0.25mA	650			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°C		2.4		
Diode Forward Voltage	V_F	V_{GE}=0V, I_F=20A		1.8		V
		V_{GE}=0V, I_F=20A, T_J=150°C		1.6		
G-E Threshold Voltage	$V_{GE(th)}$	I_C=1mA, V_{CE}=V_{GE}	4	5.7	7	V
C-E Leakage Current	I_{CES}	V_{CE}=650V, V_{GE}=0V			0.1	mA
		V_{CE}=650V, V_{GE}=0V, T_J=150°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		24		S
Dynamic Characteristics						
Input Capacitance	C_{ies}	V_{CE}=30V,V_{GE}=0V,f=1MHz		3155		pF
Output Capacitance	C_{oes}			175		
Reverse Transfer Capacitance	C_{res}			81.5		
Gate Charge	Q_g	V_{CC}=400V,I_C=40A,V_{GE}=15V		165		nC
IGBT Switching Characteristics						
Turn-On Delay Time	$t_{d(on)}$	V_{CC}=600V, I_C=40A, V_{GE}=0/15V, R_G=10Ω, 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		
Diode Characteristics						
Reverse Recovery Time	t_{rr}	V_R=400V, I_F=20A, di_F/dt=200A/μs		41		ns
Reverse Recovery Charge	Q_{rr}			0.31		μC
Peak Reverse Recovery Current	I_{rrm}			13.3		A

Curve Characteristics

Fig. 1 - FBSOA

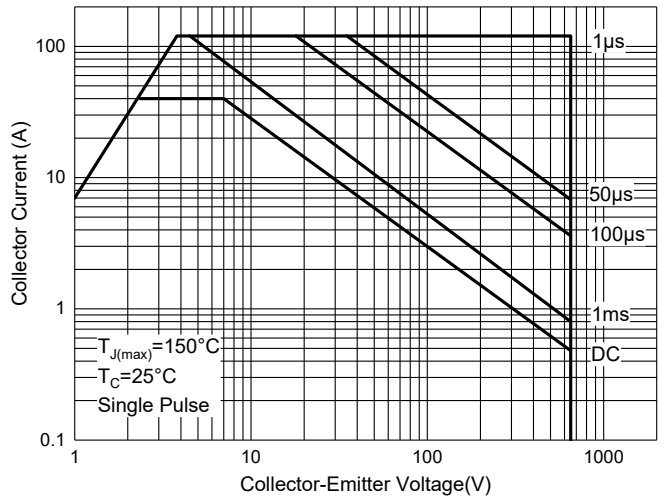


Fig. 2 - RBSOA

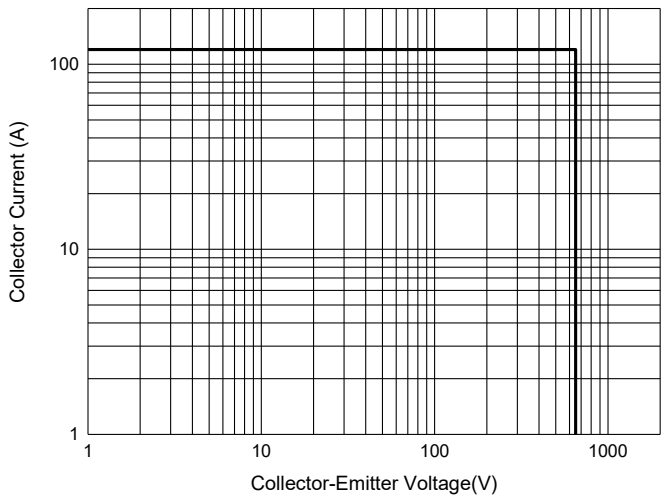


Fig. 3 - Typical Output Characteristics

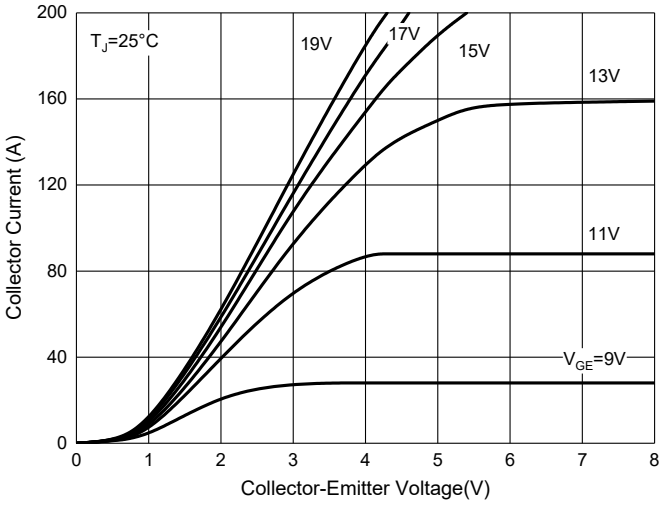


Fig. 4 - Typical Output Characteristics

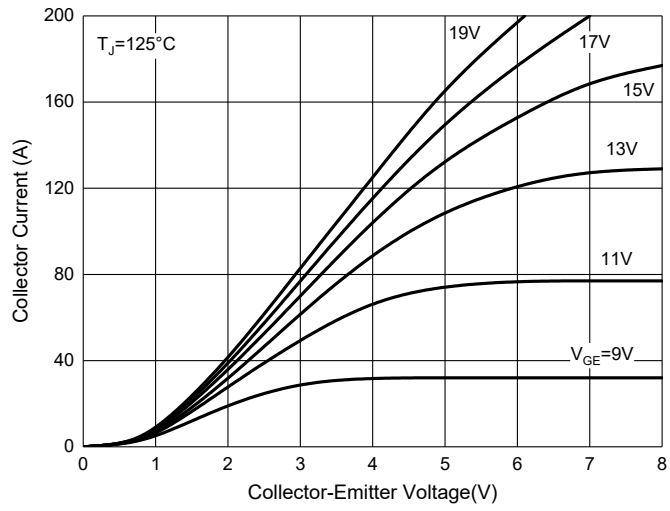


Fig. 5 - $V_{CE(sat)}$—I_C

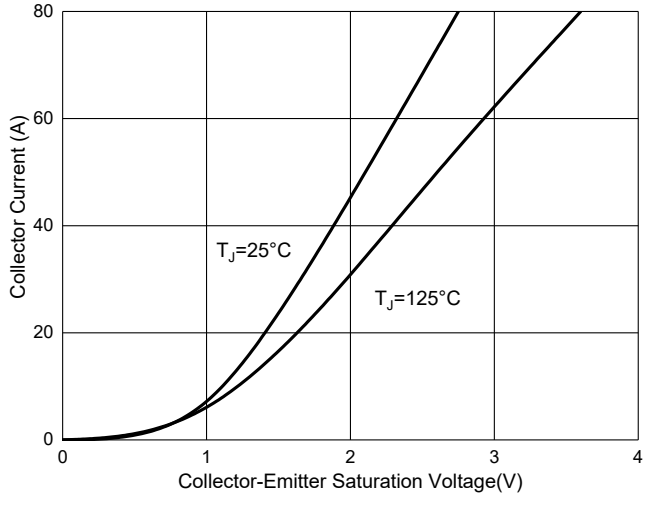
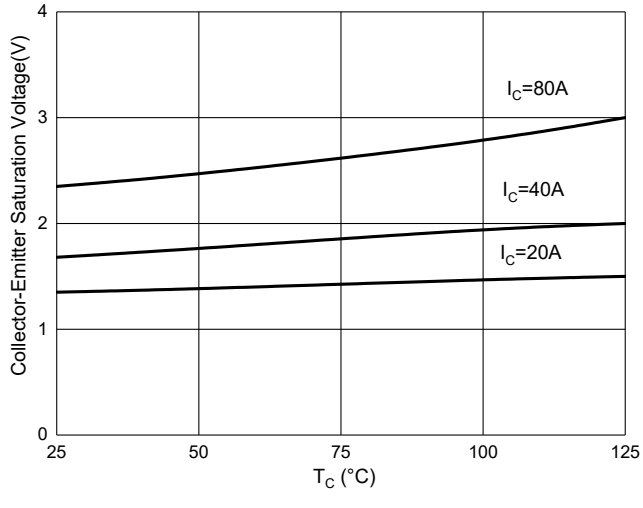


Fig. 6 - $V_{CE(sat)}$—T_C



Curve Characteristics

Fig. 7 - V_{CE}—V_{GE}

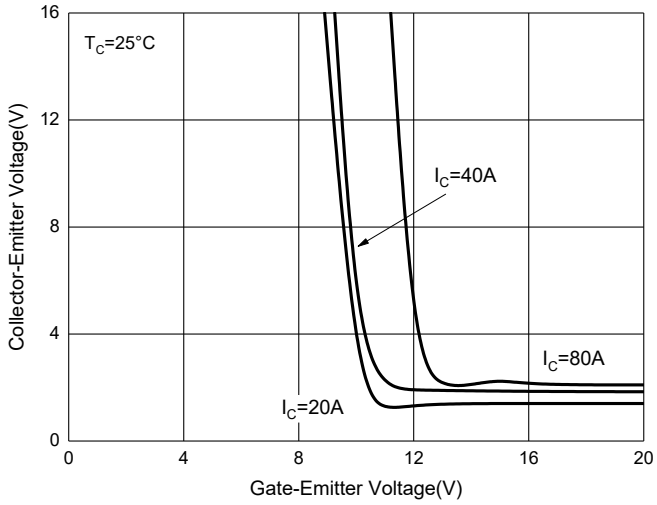


Fig. 8 - V_{CE}—V_{GE}

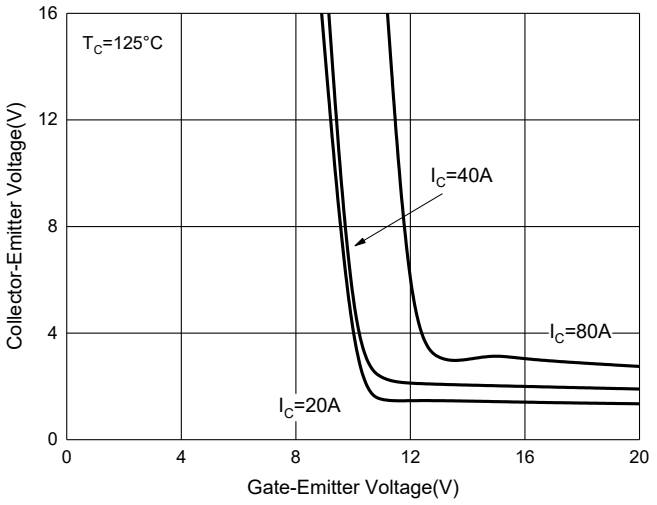


Fig. 9 - Capacitance Characteristics

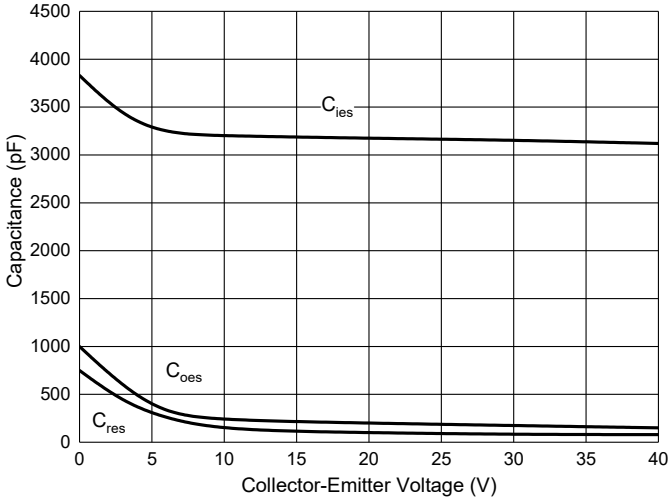


Fig. 10 - Gate Charge

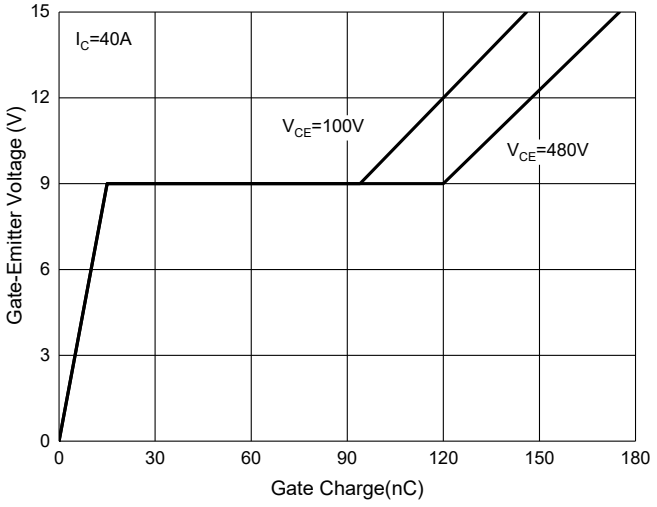


Fig. 11 - Power Derating Curve

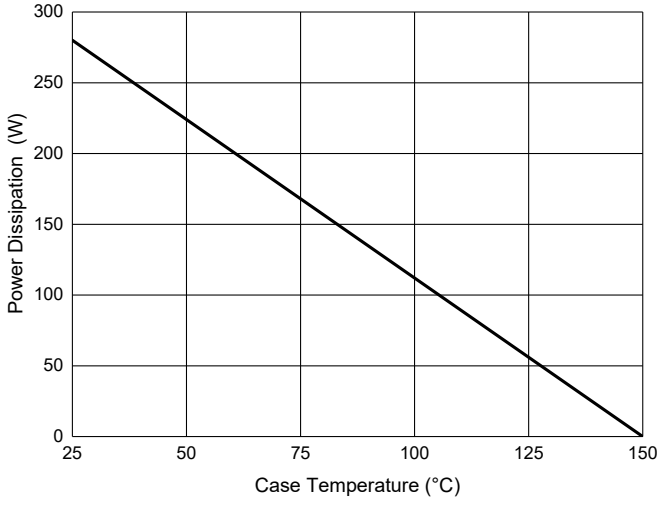
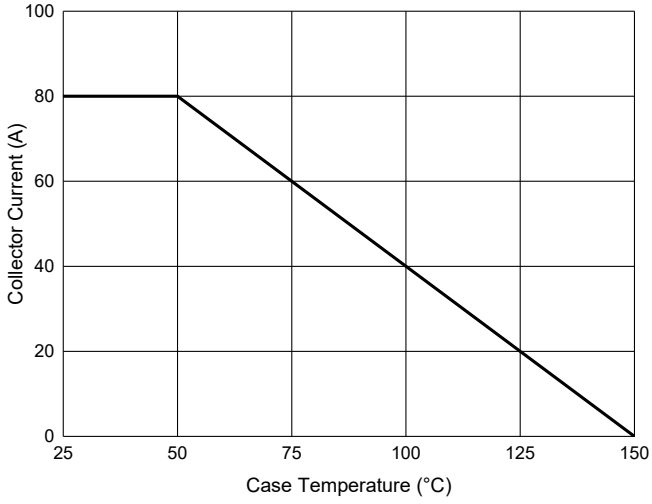


Fig. 12 - Collector Current Derating Curve



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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