Features

- High Speed Smooth Switching Device for Hard and Soft Switching
- $V_{ce(sat)}$ with Positive Temperature Coefficient
- High Ruggedness, Good Thermal Stability
- Very Tight Parameter Distribution
- Halogen Free. “Green” Device (Note 1)
- 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 30A

Maximum Ratings

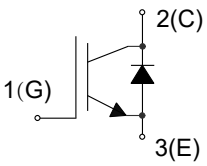
- Operating Junction Temperature Range : -40°C to +175°C
- Storage Temperature Range: -55°C to +150°C
- IGBT Thermal Resistance: 0.8°C/W Junction to Case
- Diode Thermal Resistance: 1.4°C/W Junction to Case
- Thermal Resistance: 40°C/W Junction to Ambient

Parameter		Symbol	Rating	Unit
Collector-Emitter Voltage		V_{CE}	650	V
DC Collector Current(2)	T_C=25°C	I_C	60	A
	T_C=100°C		30	
Pulsed Collector Current (3)		$I_{C,pluse}$	120	A
Diode Forward Current (2)	T_C=25°C	I_F	60	A
	T_C=100°C		30	
Diode Pulsed Current (3)		$I_{F,pluse}$	120	A
Gate-Emitter Voltage		V_{GE}	±20	V
Transient Gate-Emitter Voltage(4)			±30	
Short Circuit Withstand Time (5) V_{GE}=15V, V_{CC}=400V, V_{CEM}≤650V		t_{SC}	5	μs
Power Dissipation	T_C=25°C	P_D	187	W
	T_C=100°C		93	

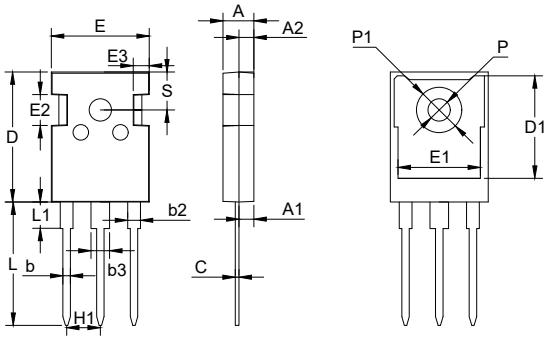
Note:

1. Halogen free "Green” products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
2. Limited by T_{Jmax}.
3. T_p limited by T_{Jmax}.
4. T_p≤10us, Duty Cycle<1%
5. Allowed number of short circuits: <1000; time between short circuits: >1s.

Internal Structure



TO-247AB



DIMENSIONS					
DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	0.189	0.205	4.80	5.20	
A1	0.087	0.103	2.21	2.61	
A2	0.073	0.085	1.85	2.15	
b	0.039	0.055	1.00	1.40	
b2	0.075	0.087	1.91	2.21	
C	0.020	0.028	0.50	0.70	
D	0.815	0.839	20.70	21.30	
D1	0.640	0.663	16.25	16.85	
E	0.610	0.634	15.50	16.10	
E1	0.512	0.535	13.00	13.60	
E2	0.189	0.205	4.80	5.20	
E3	0.091	0.106	2.30	2.70	
L	0.772	0.796	19.62	20.22	
L1	-	0.169	-	4.30	
P	0.134	0.150	3.40	3.80	Φ
P1		0.287	-	7.30	Φ
S	0.242		6.15		TYP
H1	0.214		5.44		TYP
b3	0.110	0.126	2.80	3.20	

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=250μA	650			V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE}=15V, I_C=30A, T_J=25℃		1.95	2.4	V
		V_{GE}=15V, I_C=30A, T_J=125℃		2.3		
		V_{GE}=15V, I_C=30A, T_J=150℃		2.4		
G-E Threshold Voltage	$V_{GE(th)}$	I_C=0.5mA, V_{CE}=V_{GE}	4.5	5.0	5.5	V
C-E Leakage Current	I_{CES}	V_{CE}=650V, V_{GE}=0V			0.25	mA
G-E Leakage Current	I_{GES}	V_{CE}=0V, V_{GE}=±20V			100	nA
Dynamic Characteristics						
Input Capacitance	C_{ies}	V_{CE}=25V,V_{GE}=0V,f=1MHz		1.6		nF
Reverse Transfer Capacitance	C_{res}			0.09		
Gate Charge	Q_g	V_{CC}=300V,I_C=30A,V_{GE}=15V		0.15		uC
IGBT Switching Characteristics						
Turn-On Delay Time	$td_{(on)}$	V_{CC}=300V, I_C=30A,V_{GE}=-15/15V, R_G=33Ω,L_S=60nH, T_J=25℃		37		ns
Rise Time	t_r			67		
Turn-Off Delay Time	$td_{(off)}$			113		
Fall Time	t_f			16		
Turn-On Energy	E_{on}			0.87		mJ
Turn-Off Energy	E_{off}			0.26		
Turn-On Delay Time	$td_{(on)}$	V_{CC}=300V, I_C=30A, V_{GE}=-15/15V, R_G=33Ω,L_S=60nH, T_J=125℃		40		ns
Rise Time	t_r			69		
Turn-Off Delay Time	$td_{(off)}$			155		
Fall Time	t_f			18		
Turn-On Energy	E_{on}			1.22		mJ
Turn-Off Energy	E_{off}			0.38		
Turn-On Delay Time	$td_{(on)}$	V_{CC}=300V, I_C=30A, V_{GE}=-15/15V, R_G=33Ω,L_S=60nH, T_J=150℃		41		ns
Rise Time	t_r			70		
Turn-Off Delay Time	$td_{(off)}$			165		
Fall Time	t_f			20		
Turn-On Energy	E_{on}			1.35		mJ
Turn-Off Energy	E_{off}			0.45		

Electrical Characteristics @ 25°C (Unless Otherwise Specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Characteristics						
Diode Forward Voltage	V_F	V_{GE}=0V, I_F=30A, T_J=25℃		1.9	2.4	V
		V_{GE}=0V, I_F=30A, T_J=125℃		1.95		
		V_{GE}=0V, I_F=30A, T_J=150℃		1.95		
Reverse Recovery Current	I_{rr}	V_R=300V, I_F=30A, di_F/dt=-300A/μs, T_J=25℃		6		A
Reverse Recovery Charge	Q_{rr}			0.1		uC
Reverse Recovery Energy	E_{rec}			0.06		mJ
Reverse Recovery Current	I_{rr}	V_R=300V, I_F=30A, di_F/dt=-300A/μs, T_J=125℃		10		A
Reverse Recovery Charge	Q_{rr}			0.22		uC
Reverse Recovery Energy	E_{rec}			0.13		mJ
Reverse Recovery Current	I_{rr}	V_R=300V, I_F=30A, di_F/dt=-300A/μs, T_J=150℃		12		A
Reverse Recovery Charge	Q_{rr}			0.26		uC
Reverse Recovery Energy	E_{rec}			0.17		mJ

Curve Characteristics

Fig. 1 - $V_{CE(sat)}$ —I_C

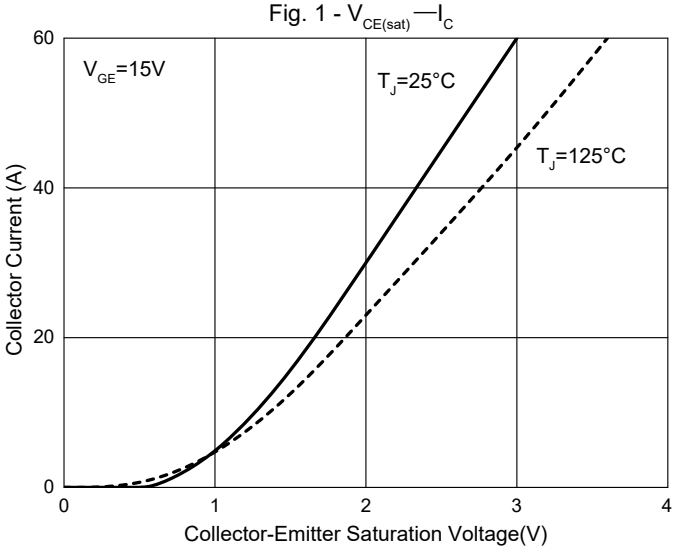


Fig. 2 - IGBT Transfer Characteristics

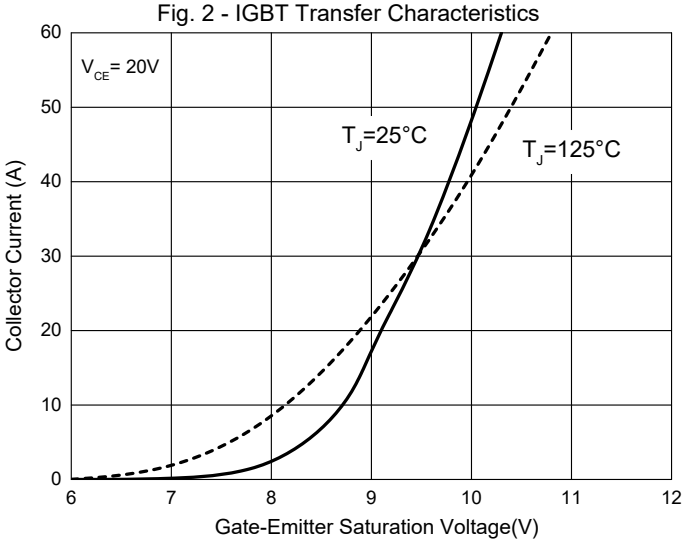


Fig.3 - Switching Energy Losses —I_C

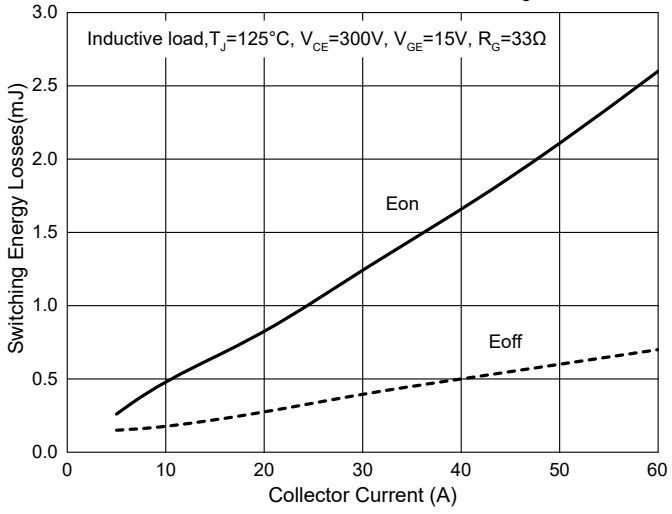


Fig.4 - Switching Energy Losses —R_G

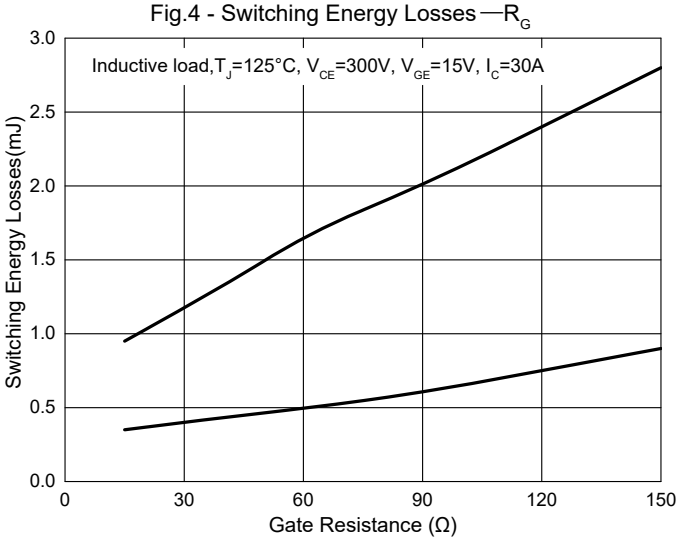


Fig.5 - RBSOA

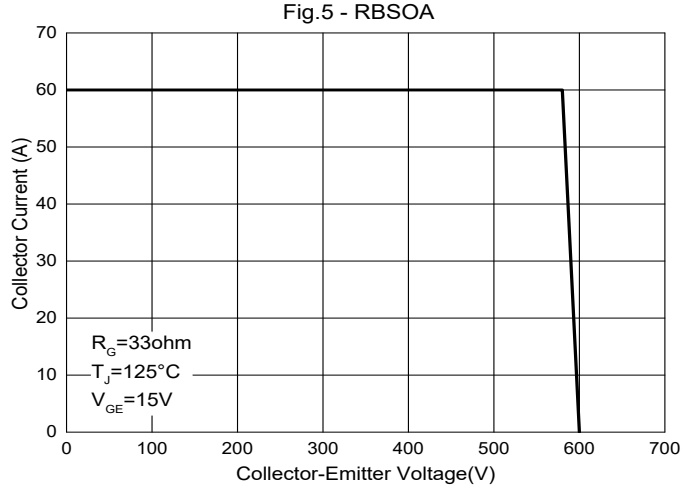
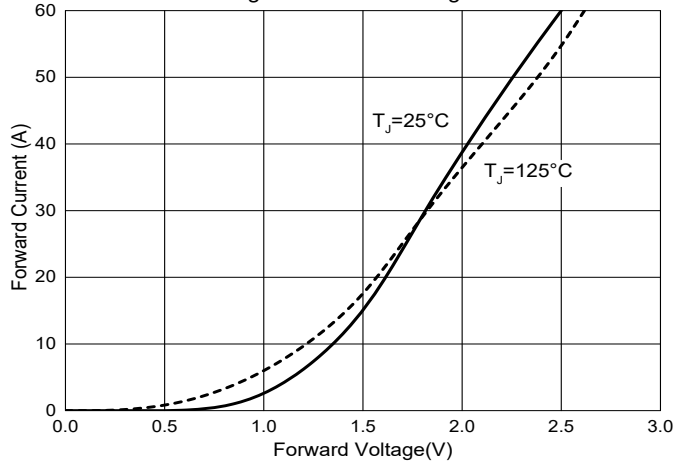


Fig. 6 - Forward Voltage



Curve Characteristics

Fig.7 - Switching Energy Losses —I_F

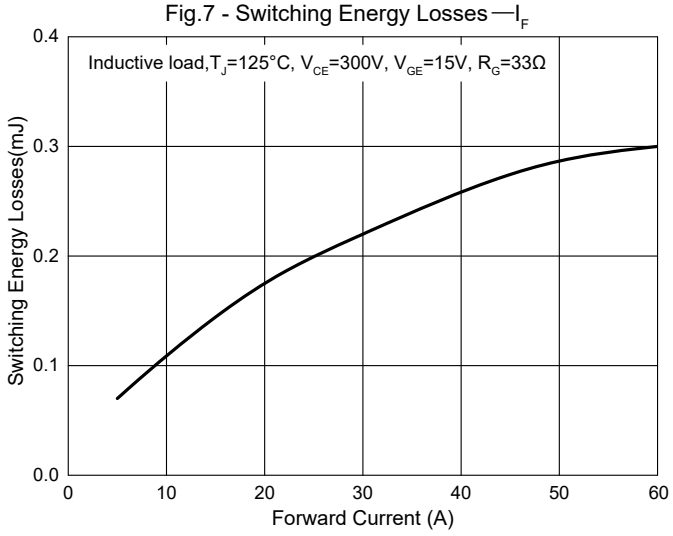


Fig.8 - Switching Energy Losses —R_G

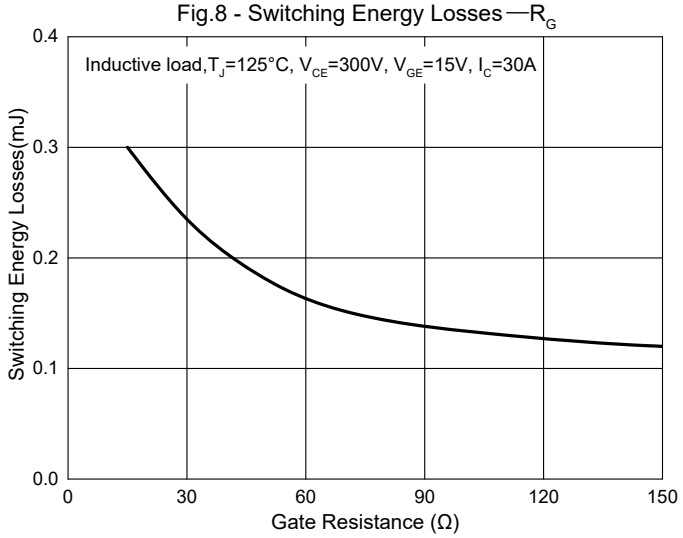


Fig. 9 - Diode Transient Thermal Impedance

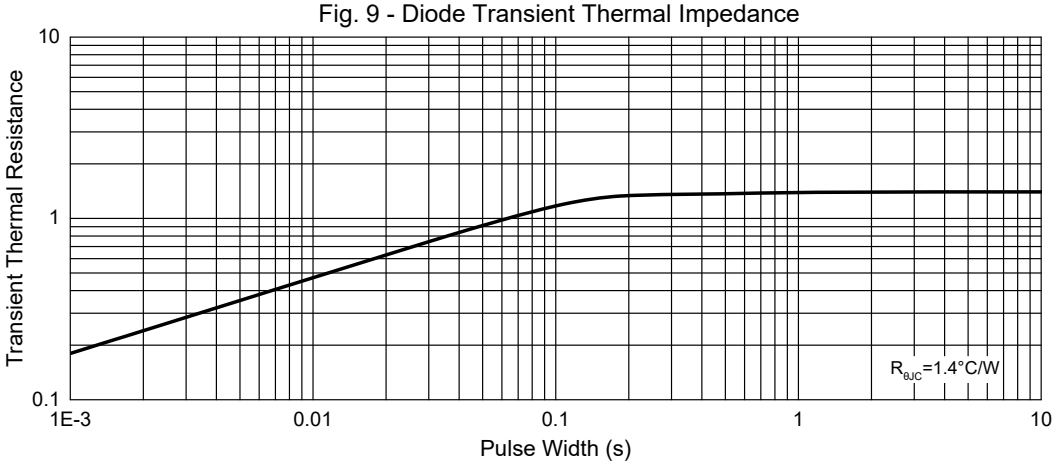
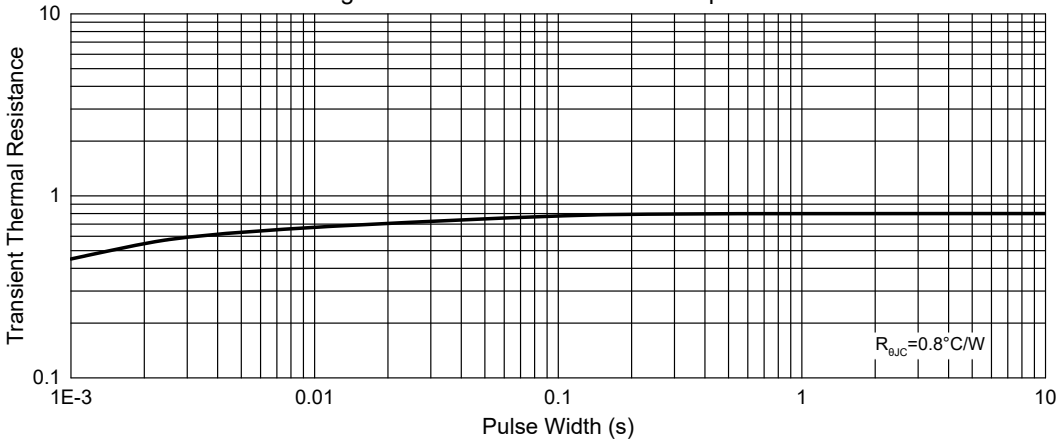


Fig.10 - IGBT Transient Thermal Impedance



Ordering Information

Device	Packing
Part Number-BP	Tube: 30pcs/Tube, 1800pcs/Ctn

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