

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 (Note 2)("P" Suffix Designates RoHS Compliant. See Ordering Information)

Maximum Ratings

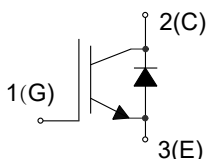
- Operating Junction Temperature Range : -40°C to $+175^{\circ}\text{C}$
- Storage Temperature Range: -55°C to $+150^{\circ}\text{C}$
- IGBT Thermal Resistance: 0.38°C/W Junction to Case
- Diode Thermal Resistance: 0.45°C/W Junction to Case
- Thermal Resistance: 40°C/W Junction to Ambient

Parameter	Symbol	Rating	Unit
Collector-Emitter Voltage	V_{CE}	650	V
DC Collector Current ^(Note 3)	I_C	$T_C=25^{\circ}\text{C}$	85
		$T_C=100^{\circ}\text{C}$	80
Pulsed Collector Current ^(Note 4)	$I_{C,pluse}$	300	A
Diode Forward Current ^(Note3)	I_F	$T_C=25^{\circ}\text{C}$	85
		$T_C=100^{\circ}\text{C}$	80
Diode Pulsed Current ^(Note 4)	$I_{F,pluse}$	300	A
Gate-Emitter Voltage	V_{GE}	± 20	V
Transient Gate-Emitter Voltage ^(Note 5)		± 30	V
Power Dissipation	P_D	$T_C=25^{\circ}\text{C}$	395
		$T_C=100^{\circ}\text{C}$	195

Notes:

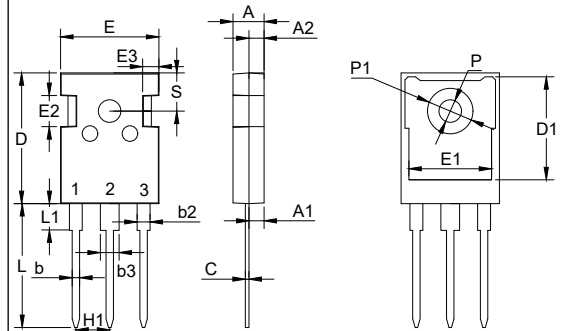
1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
2. High Temperature Solder Exemptions Applied, see EU Directive Annex 7a.
3. Limited by T_{Jmax} .
4. T_p limited by T_{Jmax} .
5. $T_p \leq 10\mu\text{s}$, Duty Cycle <1%
6. Allowed number of short circuits: <1000; time between short circuits: >1s.

Internal Structure



Trench and Field Stop IGBT 650V 75A

TO-247AB



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
IGBT Static Characteristics						
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	$V_{GE}=0V, I_C=250\mu A$	650			V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=75A, T_J=25^\circ C$		1.65	1.95	V
		$V_{GE}=15V, I_C=75A, T_J=125^\circ C$		2.05		
		$V_{GE}=15V, I_C=75A, T_J=150^\circ C$		2.15		
G-E Threshold Voltage	$V_{GE(th)}$	$I_C=0.75mA, V_{CE}=V_{GE}$	4.25	5.05	5.9	V
C-E Leakage Current	I_{CES}	$V_{CE}=650V, V_{GE}=0V, T_J=25^\circ C$			0.25	mA
		$V_{CE}=650V, V_{GE}=0V, T_J=150^\circ C$			3	
G-E Leakage Current	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V$			200	nA
Dynamic Characteristics						
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V, f=1MHz$		8.15		nF
Reverse Transfer Capacitance	C_{res}				0.17	
Gate Charge	Q_g	$V_{CC}=300V, I_C=75A, V_{GE}=-5V\sim 15V$		0.58		μC
IGBT Switching Characteristics						
Turn-On Delay Time	$t_{d(on)}$	$V_{CC}=300V, I_C=75A, V_{GE}=0\sim 15V, R_G=10\Omega, L_s=60nH, T_J=25^\circ C$		75		ns
Rise Time	t_r			91		
Turn-Off Delay Time	$t_{d(off)}$			468		
Fall Time	t_f			41		
Turn-On Energy	E_{on}			2.5		mJ
Turn-Off Energy	E_{off}			1.3		
Total switching energy Energy	E_{ts}			3.8		
Turn-On Delay Time	$t_{d(on)}$	$V_{CC}=300V, I_C=75A, V_{GE}=0\sim 15V, R_G=10\Omega, L_s=60nH, T_J=125^\circ C$		70		ns
Rise Time	t_r			79		
Turn-Off Delay Time	$t_{d(off)}$			508		
Fall Time	t_f			48		
Turn-On Energy	E_{on}			3.5		mJ
Turn-Off Energy	E_{off}			1.6		
Total switching energy Energy	E_{ts}			5.1		
Turn-On Delay Time	$t_{d(on)}$	$V_{CC}=300V, I_C=75A, V_{GE}=0\sim 15V, R_G=10\Omega, L_s=60nH, T_J=150^\circ C$		68		ns
Rise Time	t_r			76		
Turn-Off Delay Time	$t_{d(off)}$			519		
Fall Time	t_f			52		
Turn-On Energy	E_{on}			3.7		mJ
Turn-Off Energy	E_{off}			1.7		
Total switching energy Energy	E_{ts}			5.4		

Electrical Characteristics @ 25°C (Unless Otherwise Specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Characteristics						
Diode Forward Voltage	V_F	$V_{GE}=0V, I_F=75A, T_J=25^\circ C$	1.35	1.61	1.95	V
		$V_{GE}=0V, I_F=75A, T_J=125^\circ C$		1.45		
		$V_{GE}=0V, I_F=75A, T_J=150^\circ C$		1.41		
Reverse Recovery Current	I_{rr}	$V_R=300V, I_F=75A,$ $di_F/dt=-550A/\mu s, T_J=25^\circ C$		13		A
Diode Reverse Recovery Time	t_{rr}			100		ns
Reverse Recovery Charge	Q_{rr}			0.73		μC
Reverse Recovery Energy	E_{rec}			0.12		mJ
Reverse Recovery Current	I_{rr}	$V_R=300V, I_F=75A,$ $di_F/dt=-550A/\mu s, T_J=125^\circ C$		32		A
Diode Reverse Recovery Time	t_{rr}			140		ns
Reverse Recovery Charge	Q_{rr}			3.4		μC
Reverse Recovery Energy	E_{rec}			0.4		mJ
Reverse Recovery Current	I_{rr}	$V_R=300V, I_F=75A,$ $di_F/dt=-550A/\mu s, T_J=150^\circ C$		38		A
Diode Reverse Recovery Time	t_{rr}			160		ns
Reverse Recovery Charge	Q_{rr}			3.58		μC
Reverse Recovery Energy	E_{rec}			0.49		mJ

Curve Characteristics

Fig. 1 - Typical Output Characteristic($T_J=25^\circ\text{C}$)

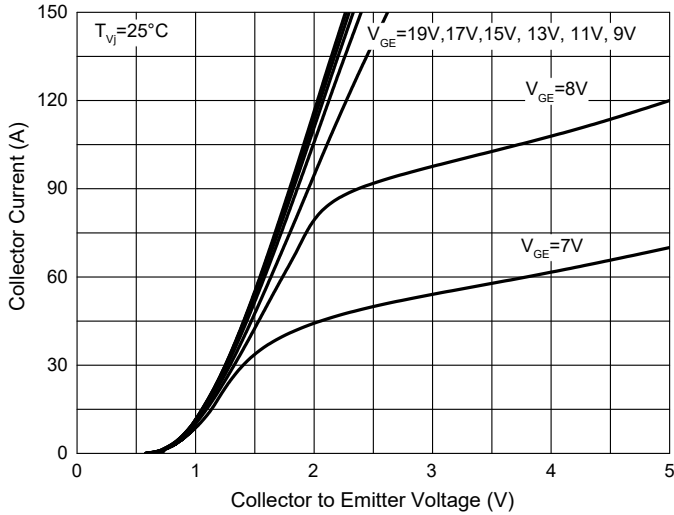


Fig. 2 - Typical Output Characteristic ($T_J=150^\circ\text{C}$)

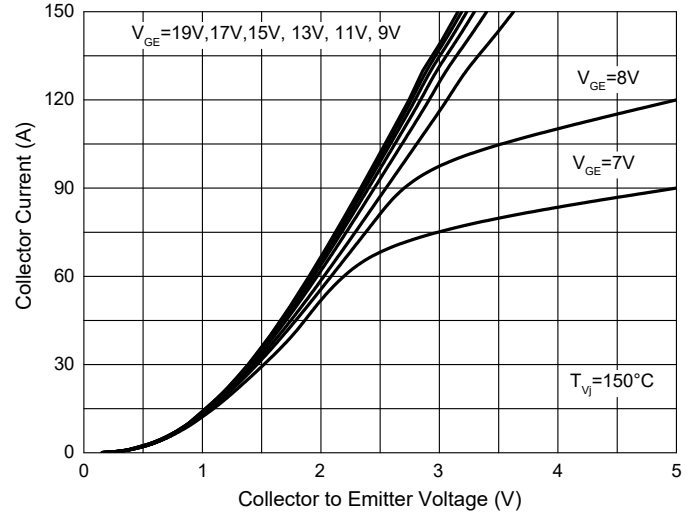


Fig. 3 - Typical Transfer Characteristic

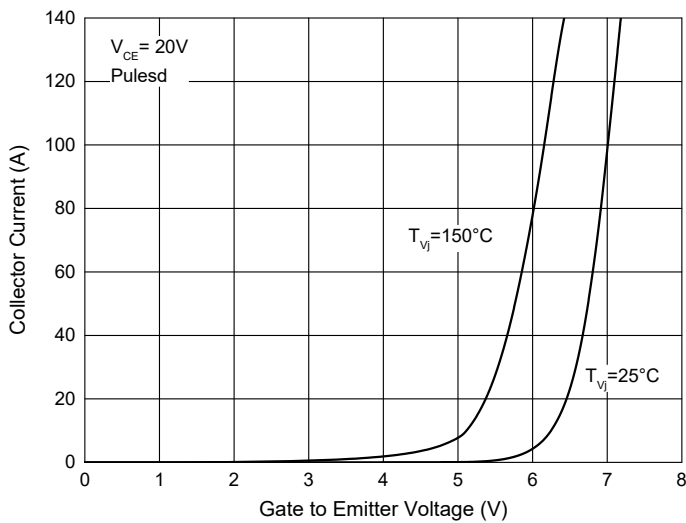


Fig. 4 - Diode Forward Current as a function of Forward Voltage

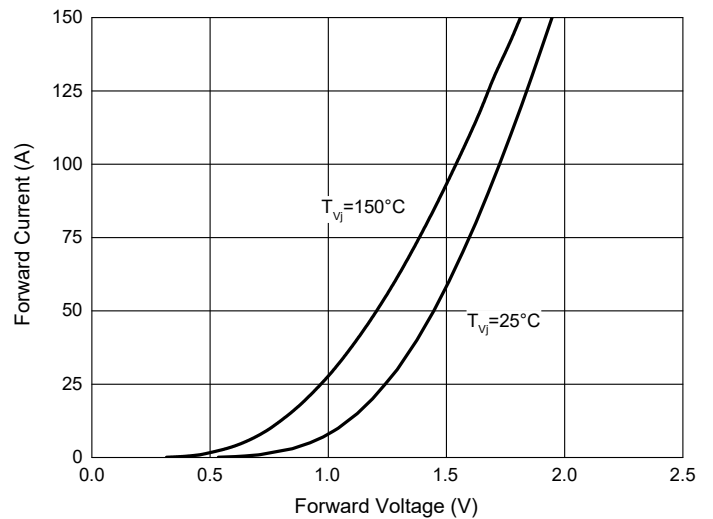


Fig. 5 - Typical Gate Charge

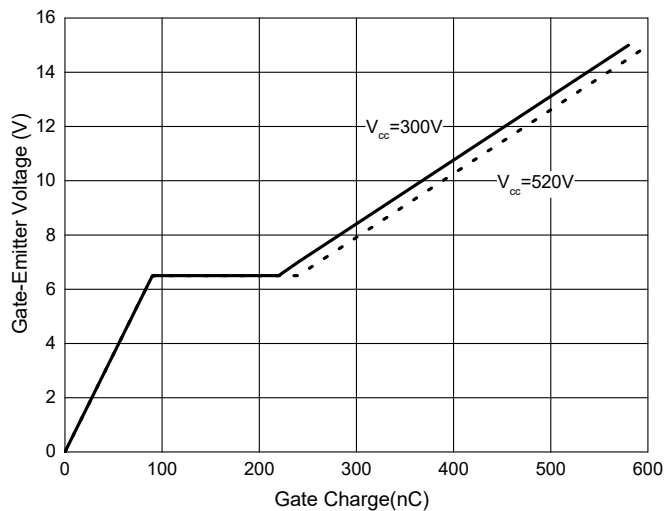
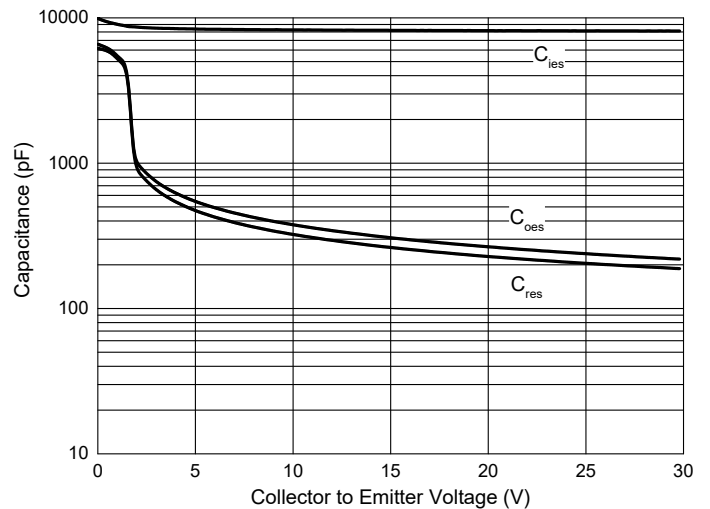


Fig. 6 - Capacitance Characteristics



Curve Characteristics

Fig. 7 - IGBT Switching Loss vs I_C

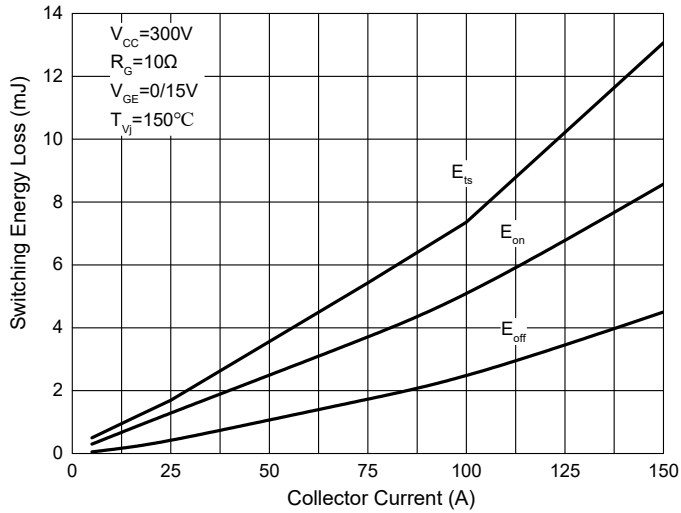


Fig. 8- IGBT Switching Loss vs R_g

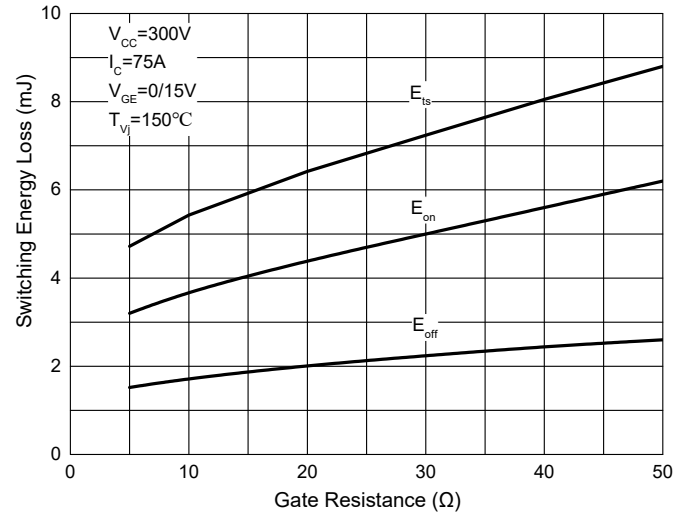


Fig. 9 - Switching Loss vs Junction Temperature

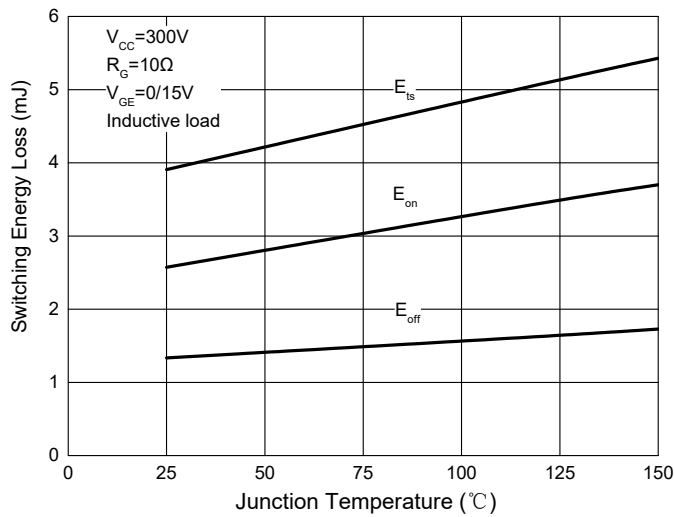


Fig. 10 - Switching Loss vs V_{CE}

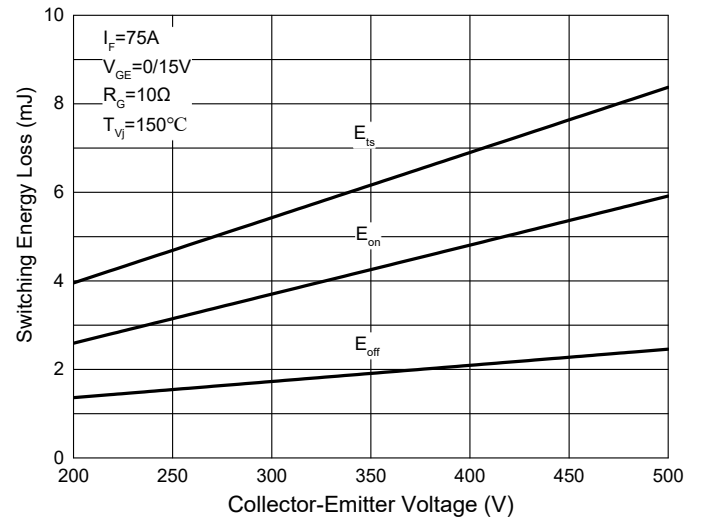


Fig. 11 - V_{CE} vs Junction Temperature

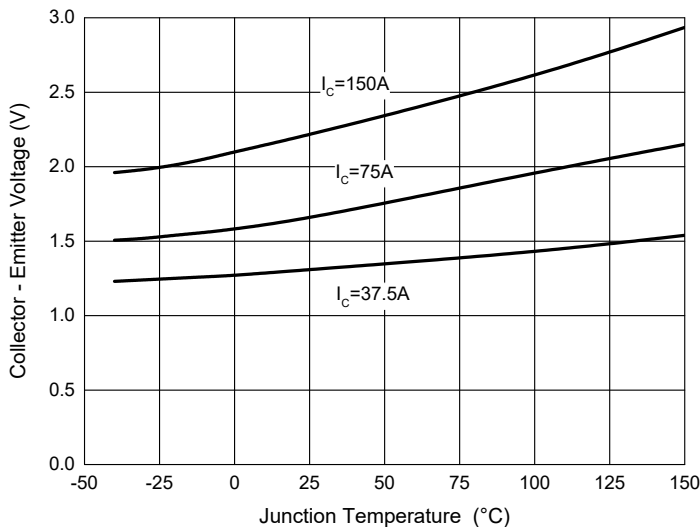
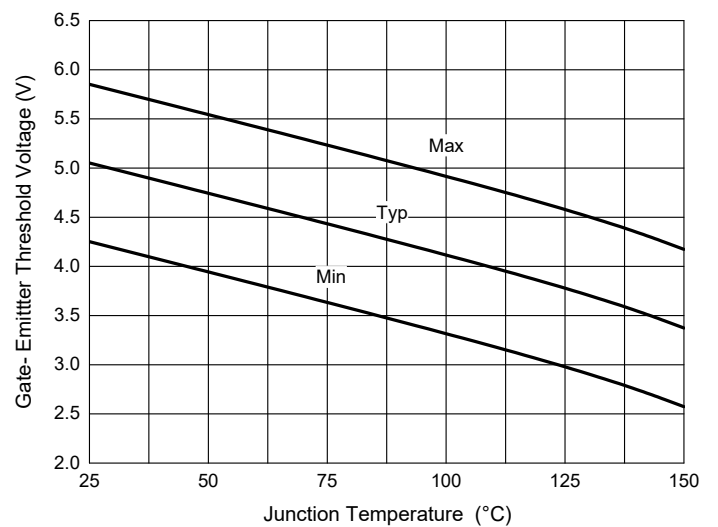


Fig. 12 - $V_{GE(th)}$ vs Junction Temperature



Curve Characteristics

Fig. 13 - Switching Times vs V_{CE}

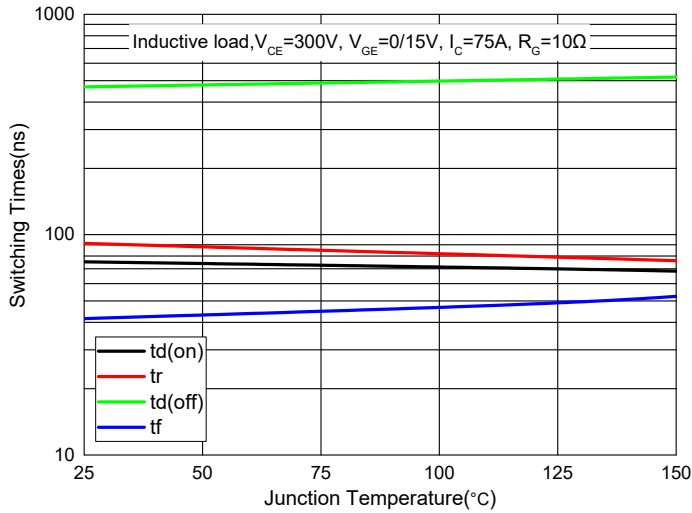


Fig. 14 - Switching Times vs Gate Resistance

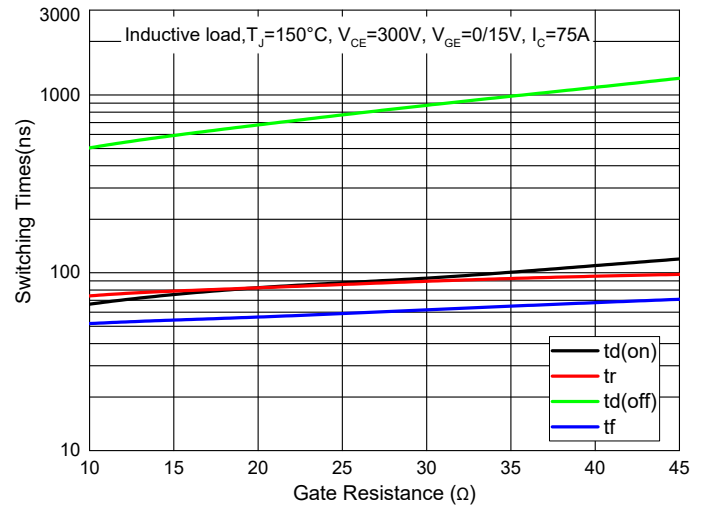


Fig. 15 - Typical Switching Time vs Collector Current

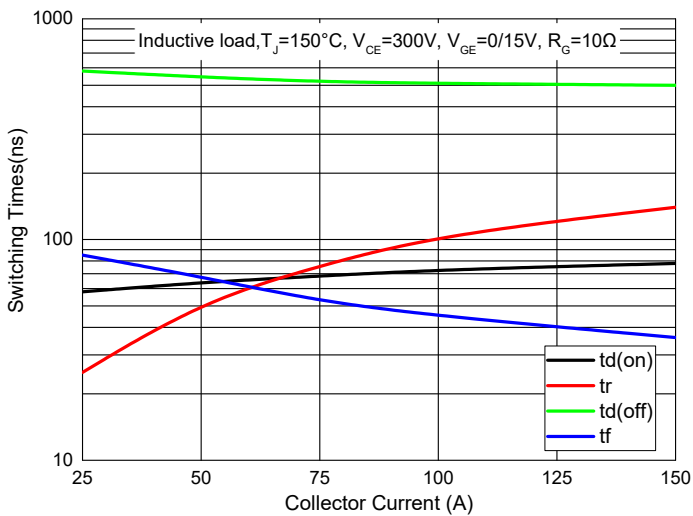


Fig. 16 - Typical di_{rr}/dt vs Diode Current Slope

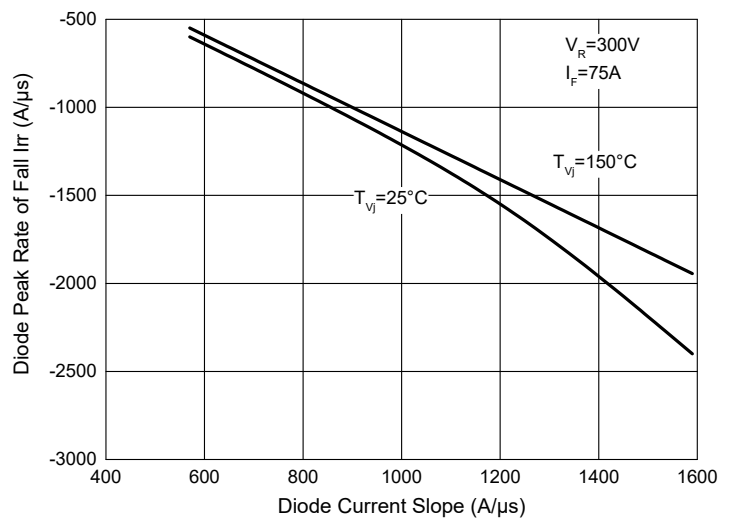


Fig. 17 - Typical I_{rr} vs Diode Current Slope

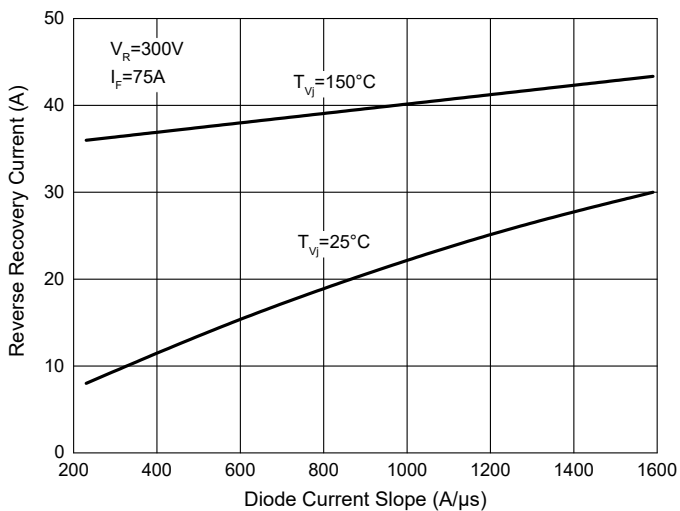
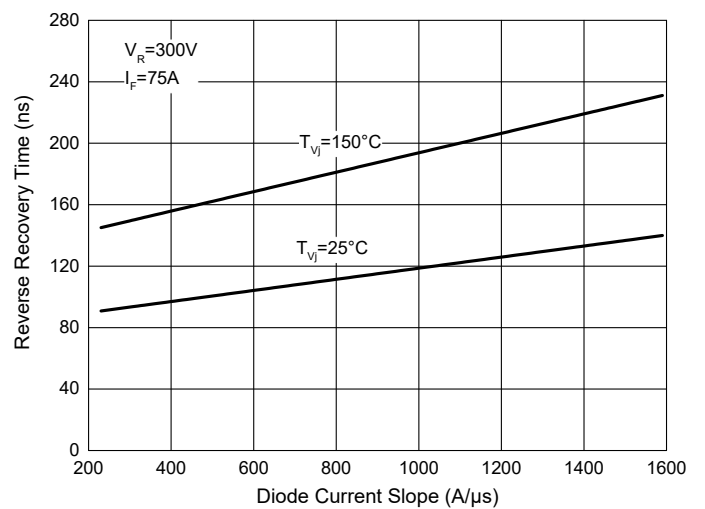


Fig. 18 - Typical T_{rr} vs Diode Current Slope



Curve Characteristics

Fig. 19 - Typical Q_{rr} vs Diode Current Slope

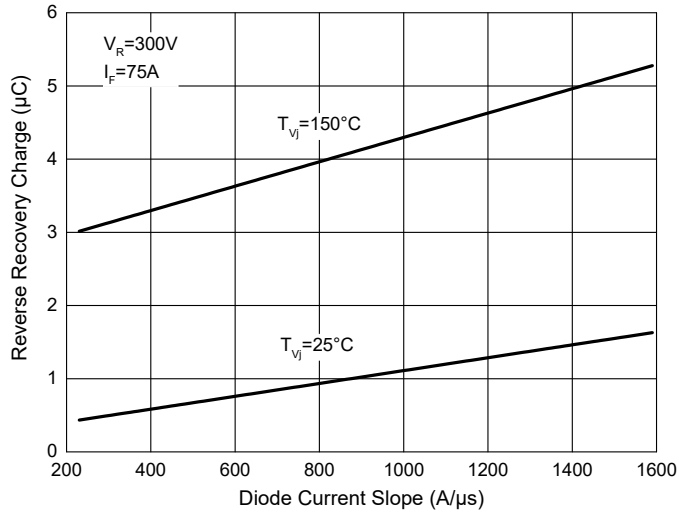


Fig. 20 - V_F vs Junction Temperature

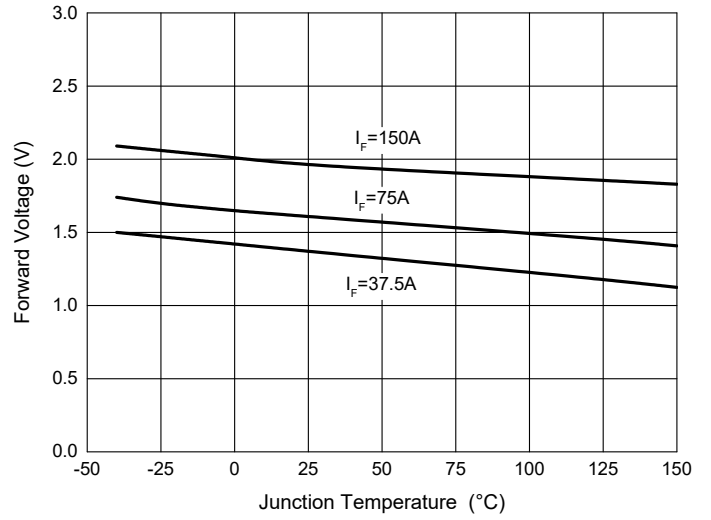


Fig. 21 - IGBT Transient Thermal Impedance

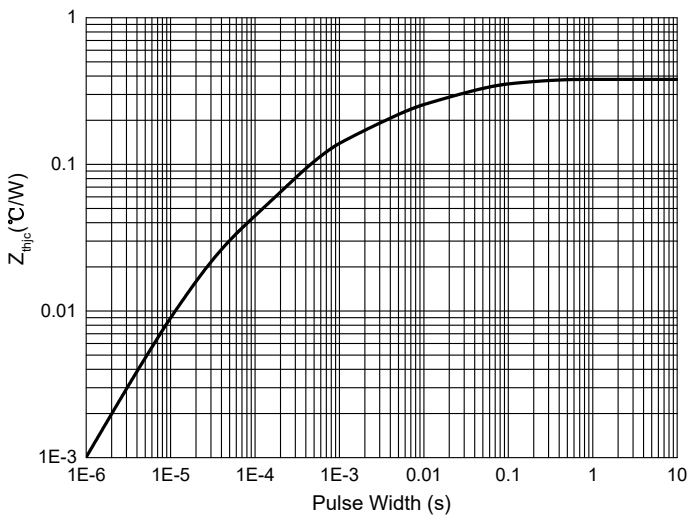


Fig. 22 - Diode Transient Thermal Impedance

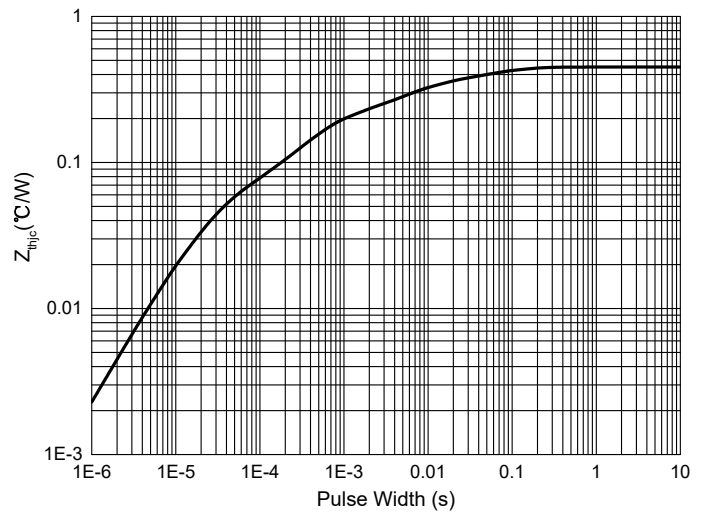


Fig. 23 - Collector Current vs Case Temperature

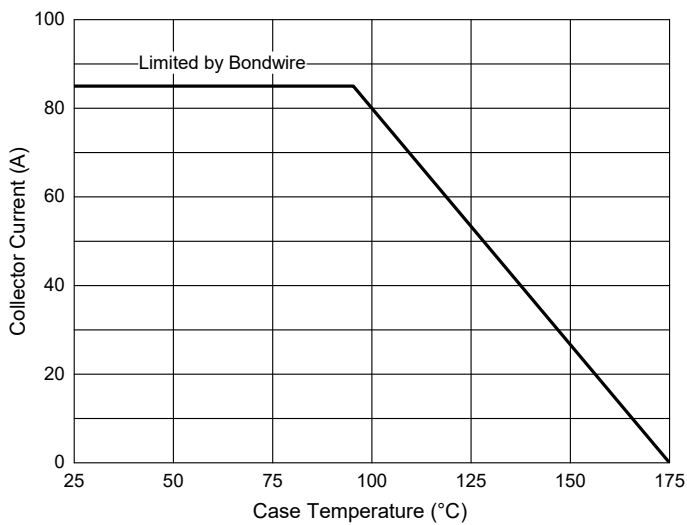
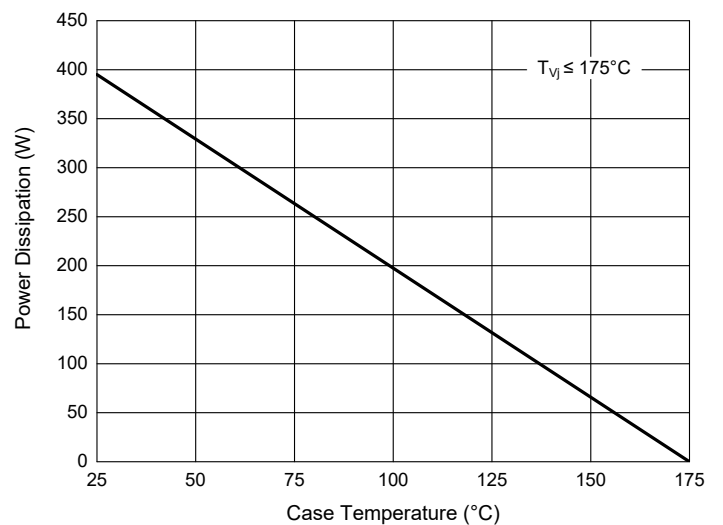


Fig. 24 - Power Derating



Ordering Information

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

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