

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)

Maximum Ratings

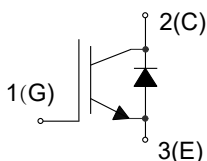
- Operating Junction Temperature Range : -40°C to $+175^{\circ}\text{C}$
- Storage Temperature Range: -55°C to $+150^{\circ}\text{C}$
- IGBT Thermal Resistance: 0.46°C/W Junction to Case
- Diode Thermal Resistance: 0.51°C/W Junction to Case
- Thermal Resistance: 40°C/W Junction to Ambient

Parameter	Symbol	Rating	Unit
Collector-Emitter Voltage	V_{CE}	650	V
DC Collector Current ⁽²⁾	I_C	$T_C=25^{\circ}\text{C}$	85
		$T_C=100^{\circ}\text{C}$	60
Pulsed Collector Current ⁽³⁾	$I_{C,pluse}$	200	A
Diode Forward Current ⁽²⁾	I_F	$T_C=25^{\circ}\text{C}$	85
		$T_C=100^{\circ}\text{C}$	60
Diode Pulsed Current ⁽³⁾	$I_{F,pluse}$	200	A
Gate-Emitter Voltage	V_{GE}	± 20	V
Transient Gate-Emitter Voltage ⁽⁴⁾		± 30	
Power Dissipation	P_D	$T_C=25^{\circ}\text{C}$	326
		$T_C=100^{\circ}\text{C}$	163

Note:

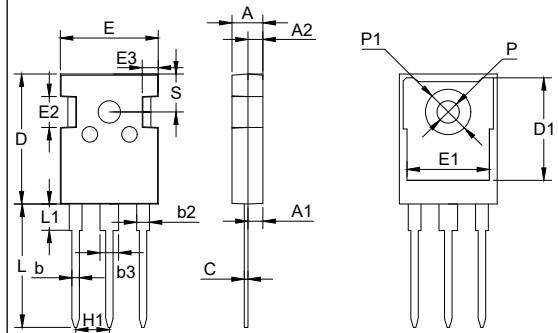
1. Halogen free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
2. Limited by T_{Jmax} .
3. T_p limited by T_{Jmax} .
4. $T_p \leq 10\mu\text{s}$, Duty Cycle < 1%
5. Allowed number of short circuits: < 1000;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

Internal Structure



Trench and Field Stop IGBT 650V 50A

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	

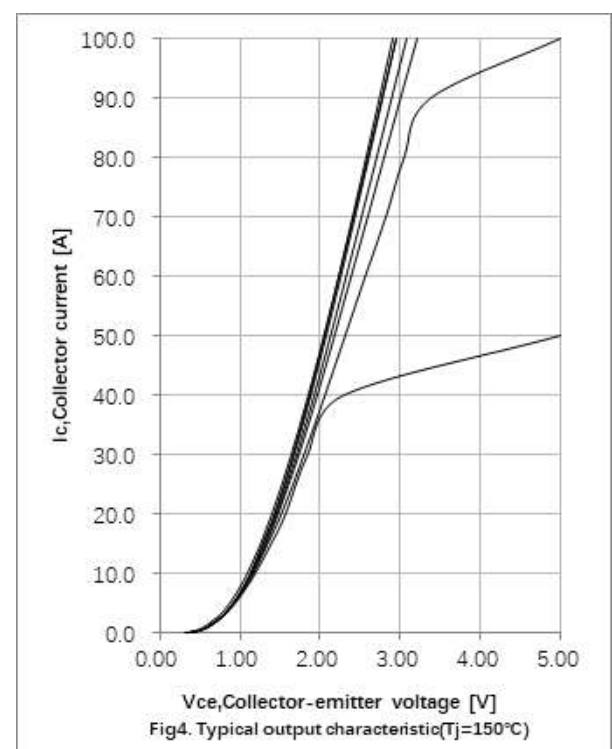
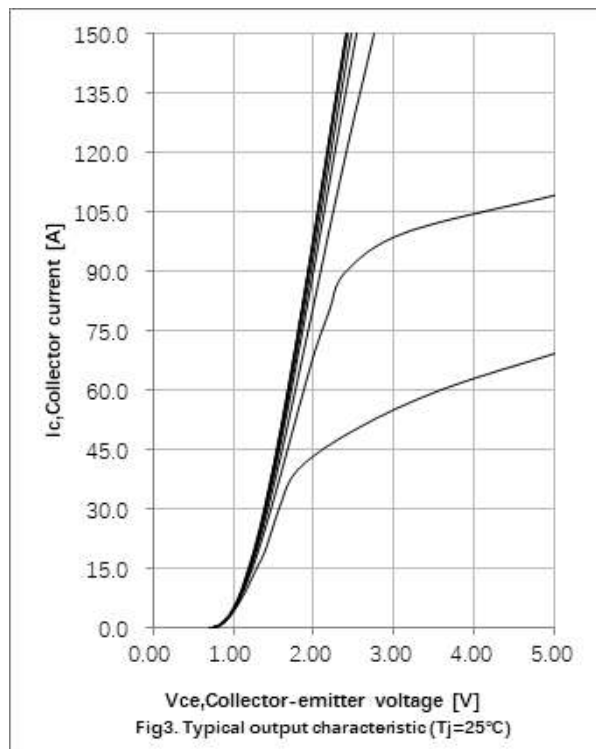
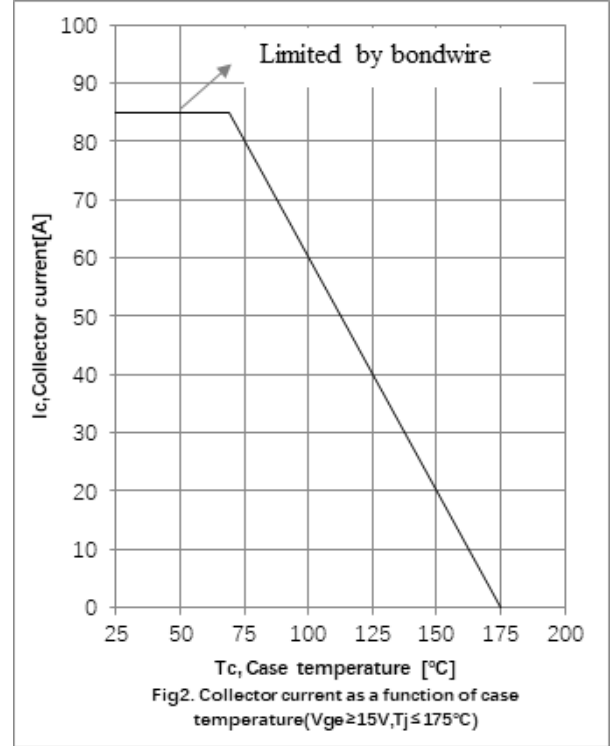
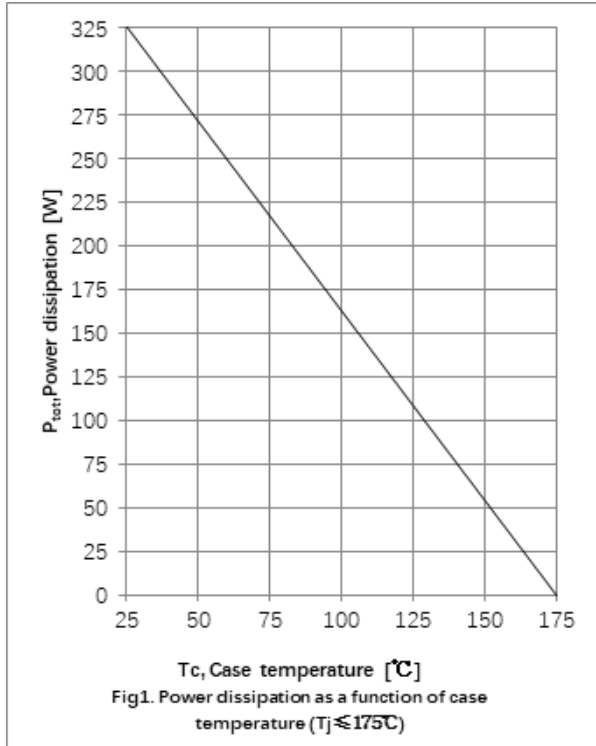
Electrical Characteristics @ 25°C (Unless Otherwise Specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Static Characteristics						
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	$V_{GE}=0V, I_C=250\mu A$	650			V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=50A, T_J=25^\circ C$		1.60	1.95	V
		$V_{GE}=15V, I_C=50A, T_J=125^\circ C$		1.95		
		$V_{GE}=15V, I_C=50A, T_J=150^\circ C$		2.05		
G-E Threshold Voltage	$V_{GE(th)}$	$I_C=0.75mA, V_{CE}=V_{GE}$	4.25	5.05	5.85	V
C-E Leakage Current	I_{CES}	$V_{CE}=650V, V_{GE}=0V$			0.25	mA
G-E Leakage Current	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V$			200	nA
Dynamic Characteristics						
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V, f=1MHz$		5.92		nF
Reverse Transfer Capacitance	C_{res}			0.23		
Gate Charge	Q_g	$V_{CC}=300V, I_C=50A, V_{GE}=15V$		0.45		uC
IGBT Switching Characteristics						
Turn-On Delay Time	$td_{(on)}$	$V_{CC}=300V, I_C=50A, V_{GE}=0/15V, R_G=10\Omega, L_S=60nH, T_J=25^\circ C$		55		ns
Rise Time	t_r			56		
Turn-Off Delay Time	$td_{(off)}$			319		
Fall Time	t_f			24		
Turn-On Energy	E_{on}	$V_{CC}=300V, I_C=50A, V_{GE}=0/15V, R_G=10\Omega, L_S=60nH, T_J=25^\circ C$		1.27		mJ
Turn-Off Energy	E_{off}			0.65		
Turn-On Delay Time	$td_{(on)}$			53		
Rise Time	t_r			61		
Turn-Off Delay Time	$td_{(off)}$	$V_{CC}=300V, I_C=50A, V_{GE}=0/15V, R_G=10\Omega, L_S=60nH, T_J=125^\circ C$		351		ns
Fall Time	t_f			59		
Turn-On Energy	E_{on}			1.51		
Turn-Off Energy	E_{off}			0.8		
Turn-On Delay Time	$td_{(on)}$	$V_{CC}=300V, I_C=50A, V_{GE}=0/15V, R_G=10\Omega, L_S=60nH, T_J=150^\circ C$		52		ns
Rise Time	t_r			60		
Turn-Off Delay Time	$td_{(off)}$			361		
Fall Time	t_f			71		
Turn-On Energy	E_{on}			1.62		mJ
Turn-Off Energy	E_{off}			0.85		

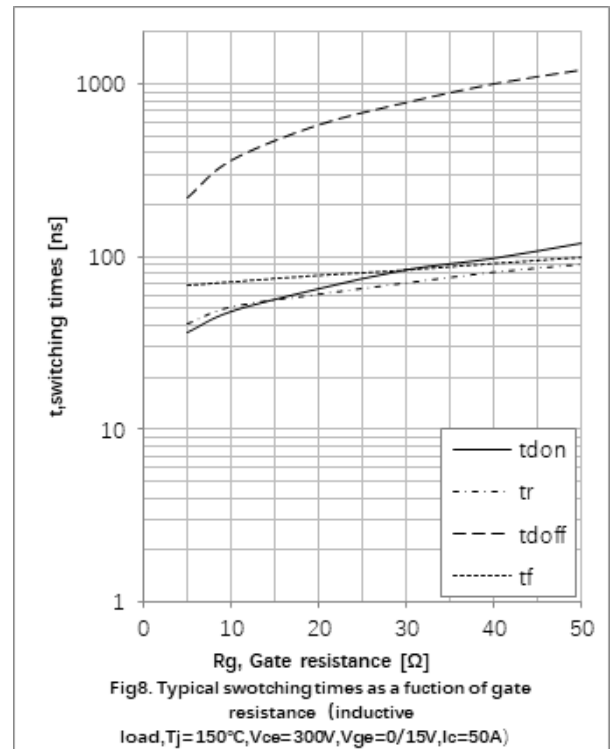
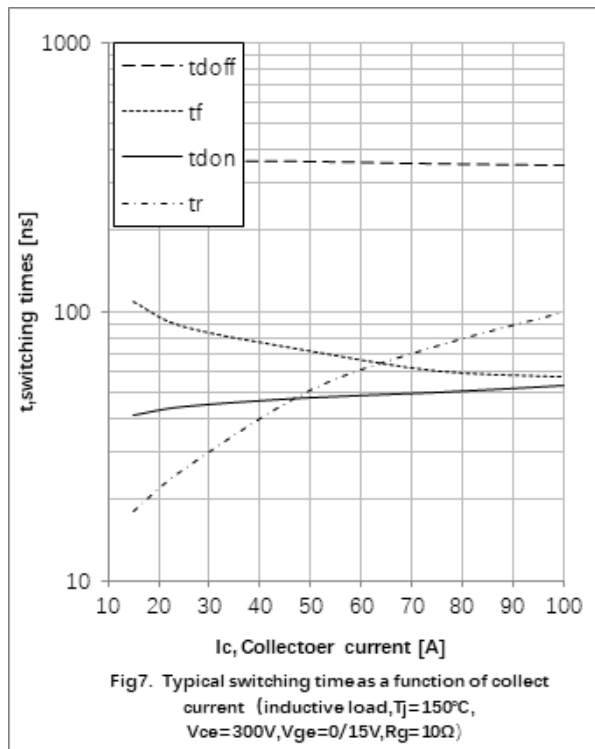
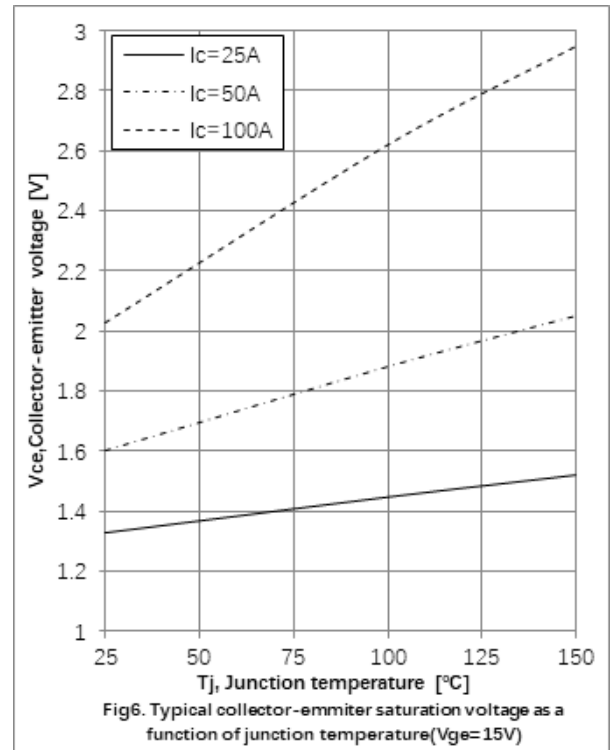
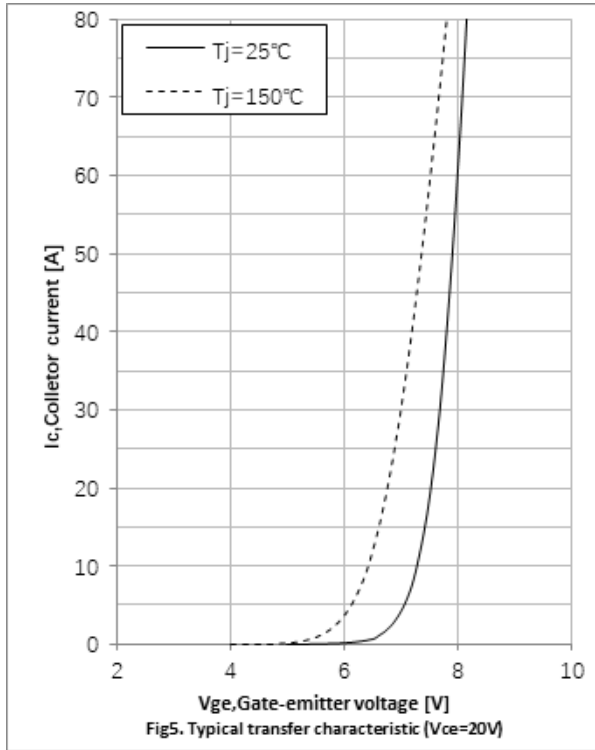
Electrical Characteristics @ 25°C (Unless Otherwise Specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Characteristics						
Diode Forward Voltage	V_F	$V_{GE}=0V, I_F=50A, T_J=25^\circ C$		1.45	1.80	V
		$V_{GE}=0V, I_F=50A, T_J=125^\circ C$		1.29		
		$V_{GE}=0V, I_F=50A, T_J=150^\circ C$		1.23		
Reverse Recovery Current	I_{rr}	$V_R=300V, I_F=50A,$ $di_F/dt=-610A/\mu s, T_J=25^\circ C$		13		A
Reverse Recovery Charge	Q_{rr}			0.78		μC
Reverse Recovery Energy	E_{rec}			0.1		mJ
Reverse Recovery Current	I_{rr}	$V_R=300V, I_F=50A,$ $di_F/dt=-610A/\mu s, T_J=125^\circ C$		35		A
Reverse Recovery Charge	Q_{rr}			2.8		μC
Reverse Recovery Energy	E_{rec}			0.38		mJ
Reverse Recovery Current	I_{rr}	$V_R=300V, I_F=50A,$ $di_F/dt=-610A/\mu s, T_J=150^\circ C$		40		A
Reverse Recovery Charge	Q_{rr}			3.22		μC
Reverse Recovery Energy	E_{rec}			0.43		mJ

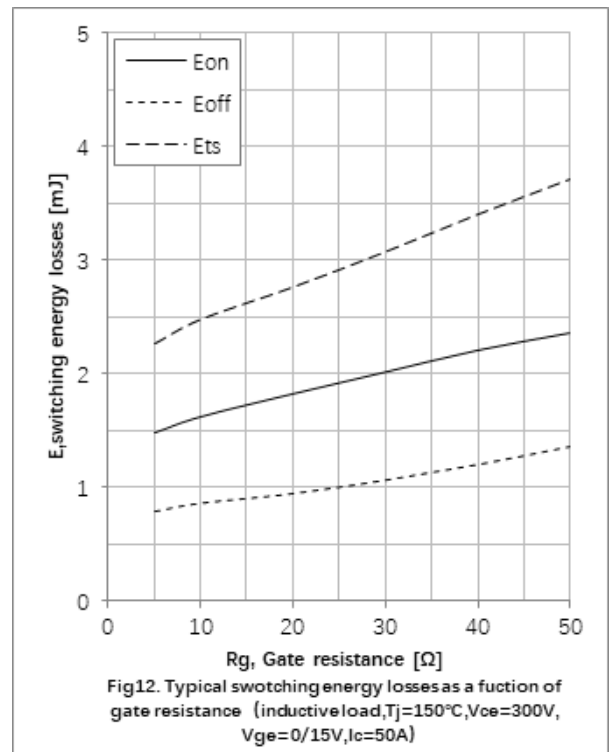
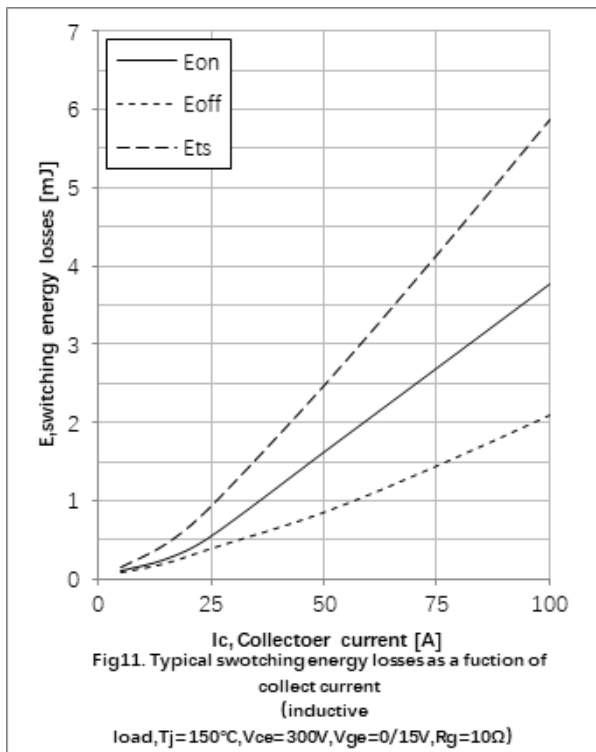
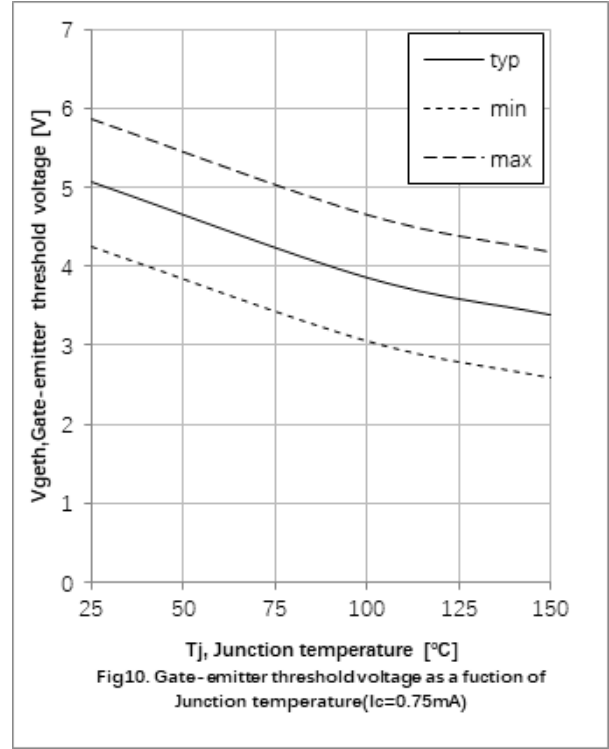
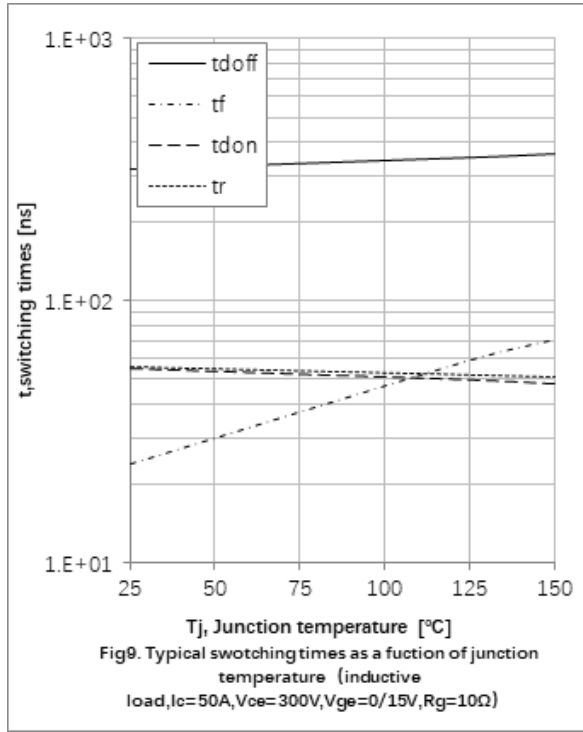
Curve Characteristics



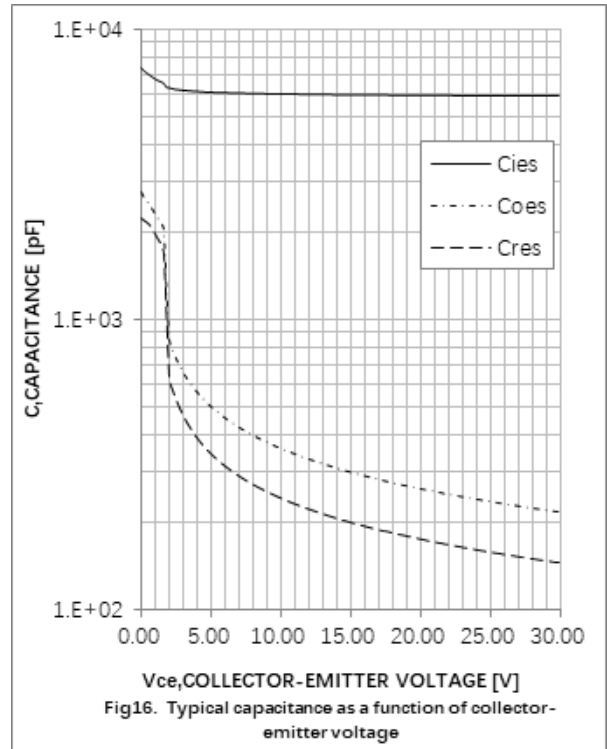
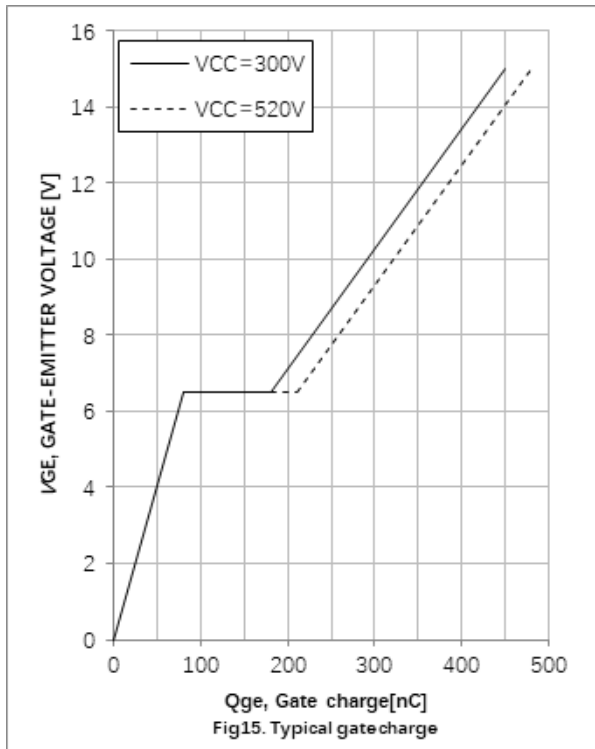
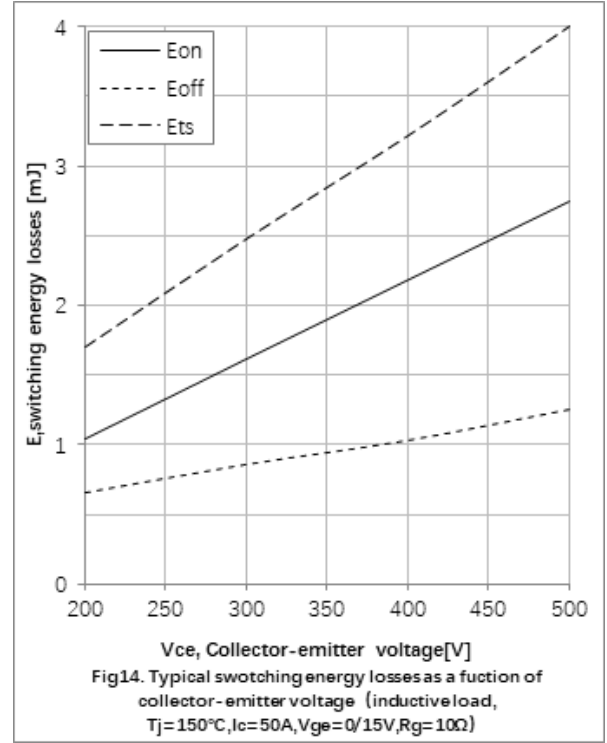
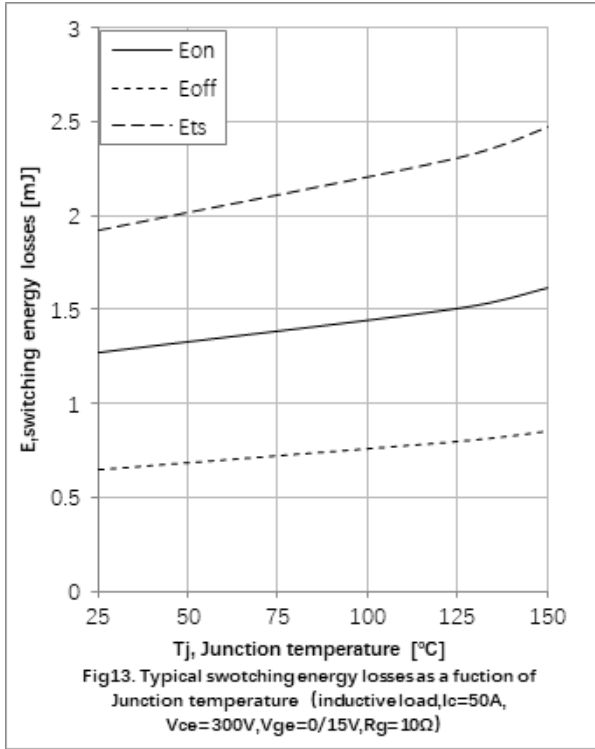
Curve Characteristics



Curve Characteristics



Curve Characteristics



Curve Characteristics

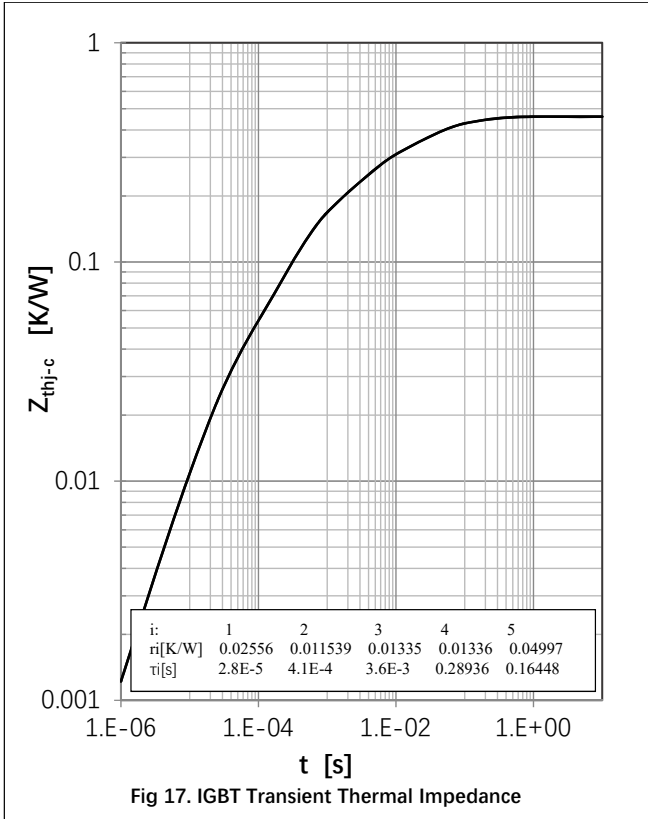


Fig 17. IGBT Transient Thermal Impedance

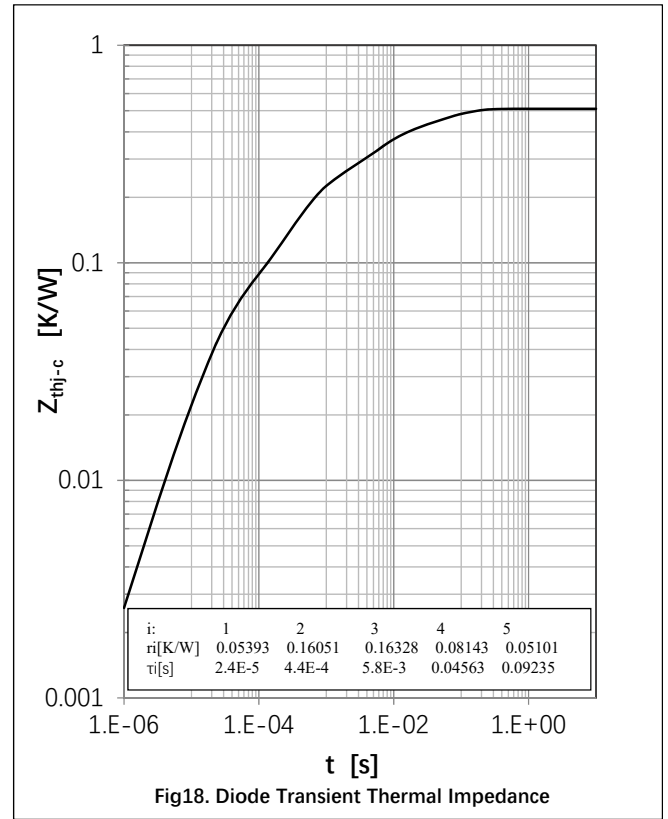


Fig 18. Diode Transient Thermal Impedance

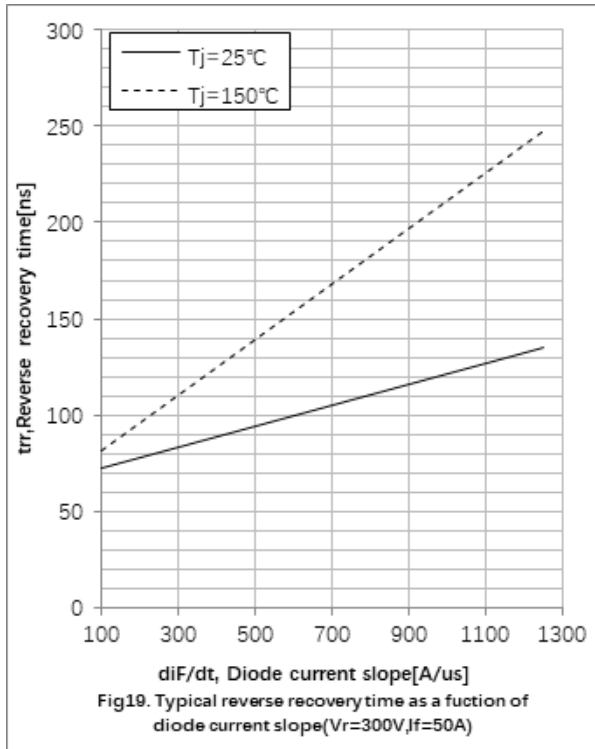


Fig 19. Typical reverse recovery time as a function of diode current slope (Vr=300V, If=50A)

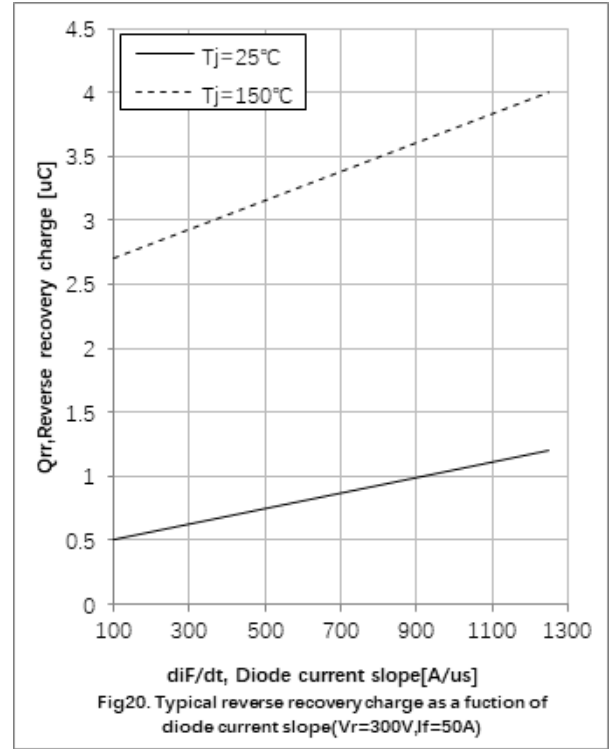
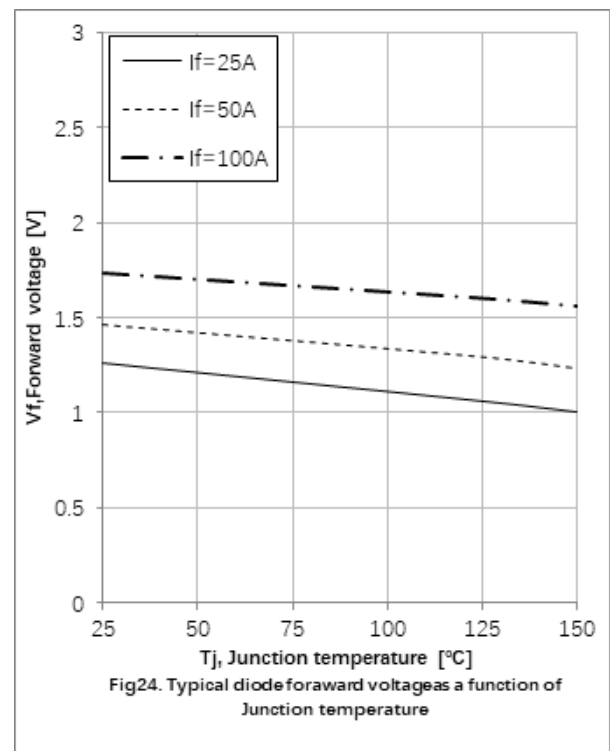
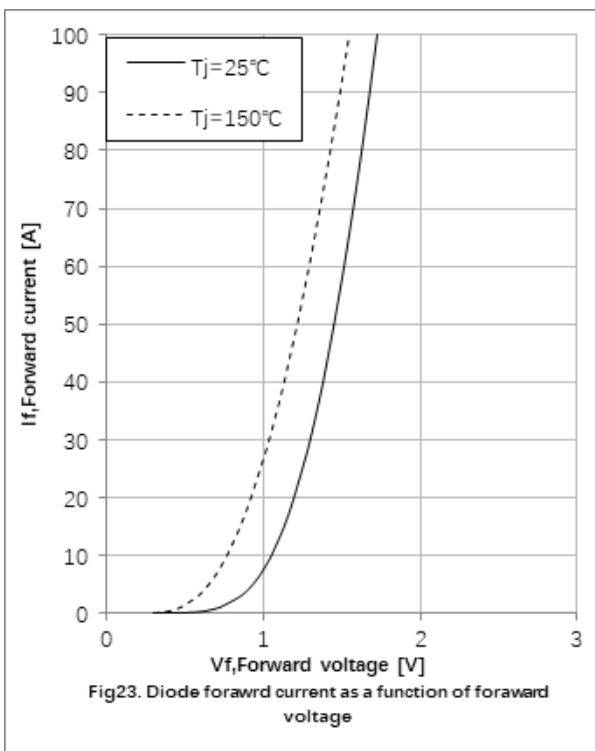
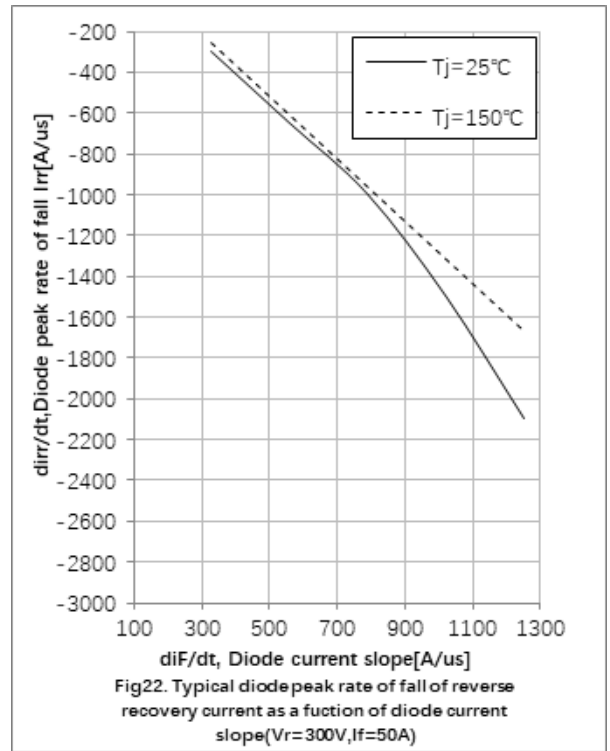
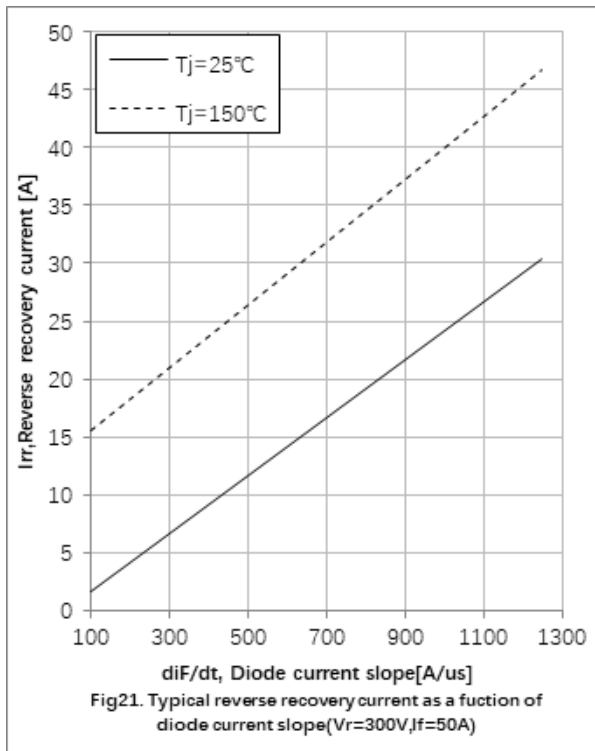


Fig 20. Typical reverse recovery charge as a function of diode current slope (Vr=300V, If=50A)

Curve Characteristics



Ordering Information

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

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