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 50A

Maximum Ratings

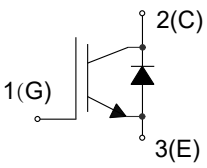
- Operating Junction Temperature Range : -40°C to +175°C
- Storage Temperature Range: -55°C to +150°C
- IGBT Thermal Resistance: 0.46°C/W Junction to Case
- Diode Thermal Resistance: 0.51°C/W Junction to Case
- Thermal Resistance: 40°C/W Junction to Ambient

Parameter		Symbol	Rating	Unit
Collector-Emitter Voltage		V_{CE}	650	V
DC Collector Current(2)	T_C=25°C	I_C	85	A
	T_C=100°C		60	
Pulsed Collector Current (3)		$I_{C,pluse}$	200	A
Diode Forward Current (2)	T_C=25°C	I_F	85	A
	T_C=100°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	T_C=25°C	P_D	326	W
	T_C=100°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≤10us, Duty Cycle<1%
5. Allowed number of short circuits: <1000; time between short circuits: >1s.

Internal Structure



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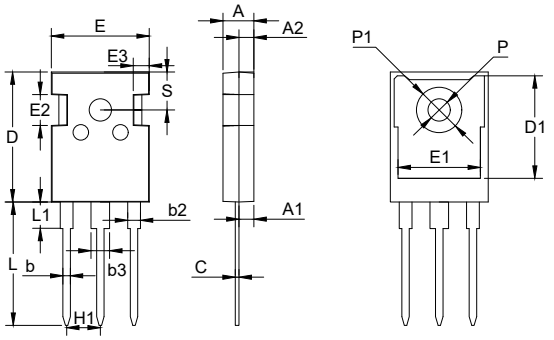

DIMENSIONS					
DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	0.189	0.205	4.80	5.20	
A1	0.087	0.103	2.21	2.61	
A2	0.073	0.085	1.85	2.15	
b	0.039	0.055	1.00	1.40	
b2	0.075	0.087	1.91	2.21	
C	0.020	0.028	0.50	0.70	
D	0.815	0.839	20.70	21.30	
D1	0.640	0.663	16.25	16.85	
E	0.610	0.634	15.50	16.10	
E1	0.512	0.535	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=50A, T_J=25℃		1.60	1.95	V
		V_{GE}=15V, I_C=50A, T_J=125℃		1.95		
		V_{GE}=15V, I_C=50A, T_J=150℃		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}=±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=10Ω,L_S=60nH, T_J=25℃		55		ns
Rise Time	t_r			56		
Turn-Off Delay Time	$td_{(off)}$			319		
Fall Time	t_f			24		
Turn-On Energy	E_{on}			1.27		mJ
Turn-Off Energy	E_{off}			0.65		
Turn-On Delay Time	$td_{(on)}$	V_{CC}=300V, I_C=50A, V_{GE}=0/15V, R_G=10Ω,L_S=60nH, T_J=125℃		53		ns
Rise Time	t_r			61		
Turn-Off Delay Time	$td_{(off)}$			351		
Fall Time	t_f			59		
Turn-On Energy	E_{on}			1.51		mJ
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=10Ω,L_S=60nH, T_J=150℃		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℃		1.45	1.80	V
		V_{GE}=0V, I_F=50A, T_J=125℃		1.29		
		V_{GE}=0V, I_F=50A, T_J=150℃		1.23		
Reverse Recovery Current	I_{rr}	V_R=300V, I_F=50A, di_F/dt=-610A/μs, T_J=25℃		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/μs, T_J=125℃		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/μs, T_J=150℃		40		A
Reverse Recovery Charge	Q_{rr}			3.22		μC
Reverse Recovery Energy	E_{rec}			0.43		mJ

Curve Characteristics

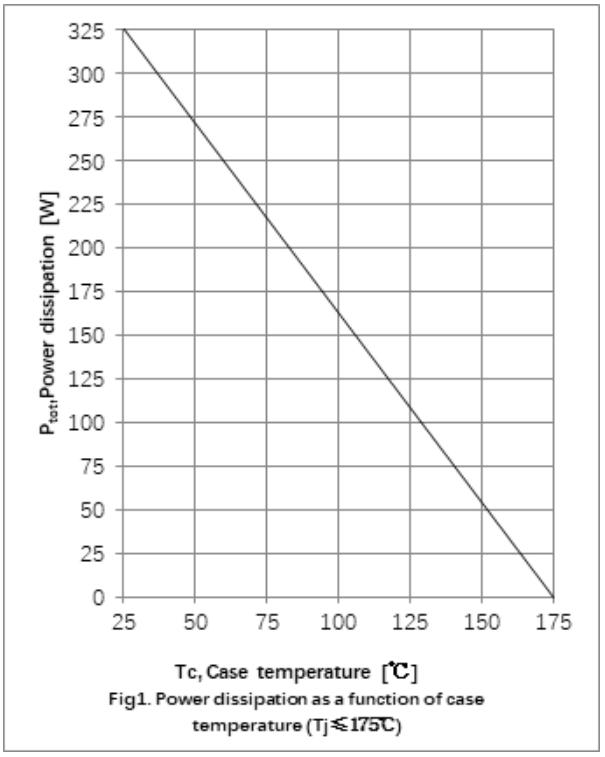

Fig1. Power dissipation as a function of case temperature (Tj≤175℃)

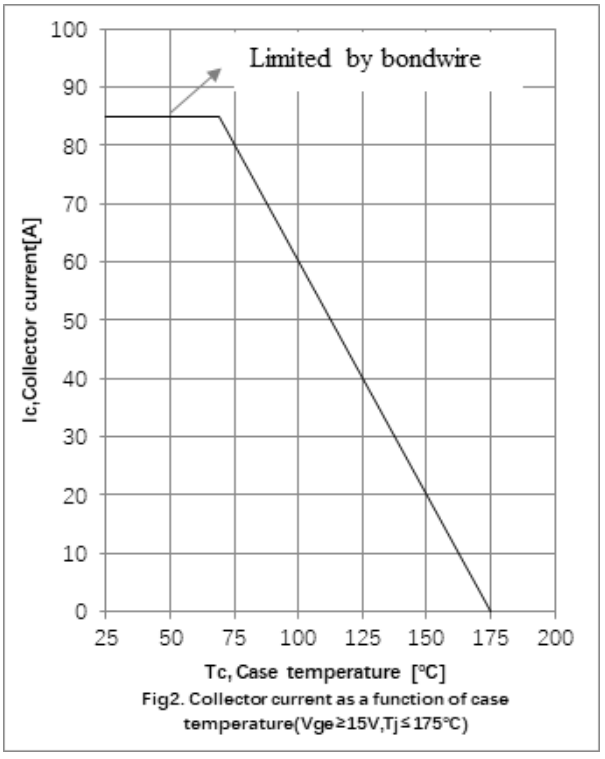

Fig2. Collector current as a function of case temperature(Vge≥15V,Tj≤175°C)

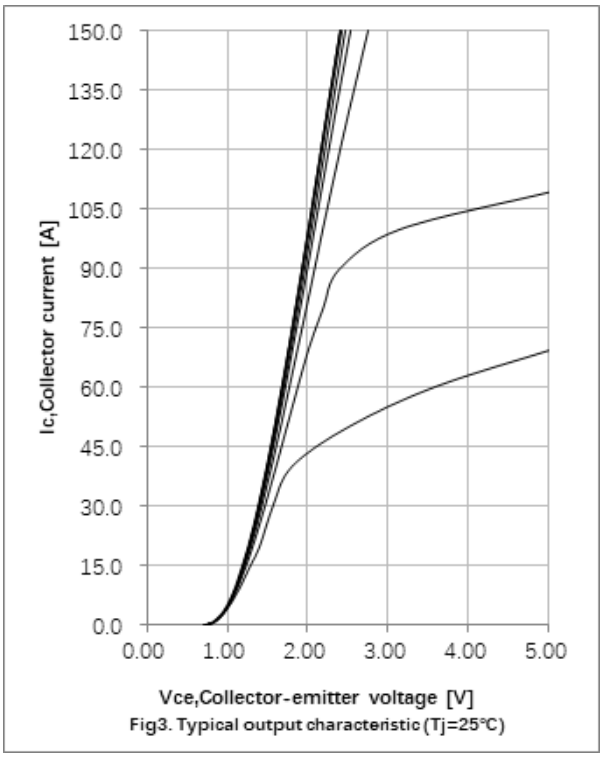

Fig3. Typical output characteristic (Tj=25°C)

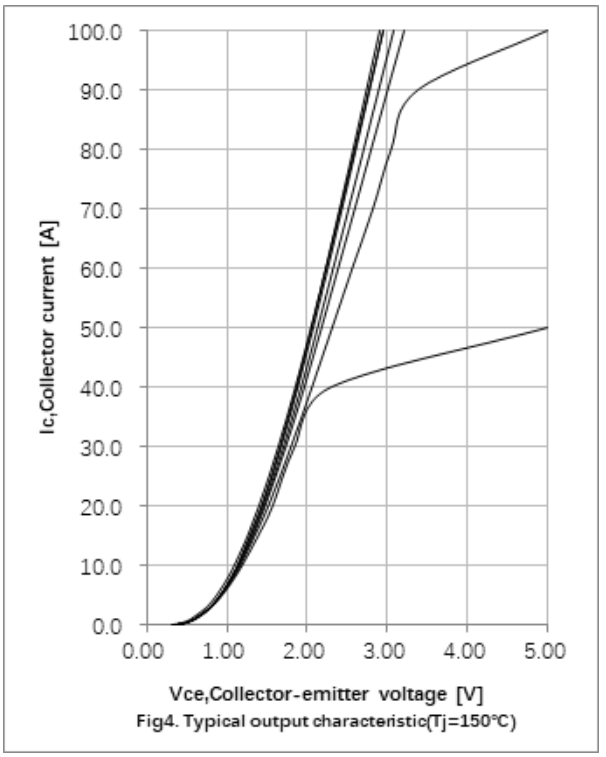

Fig4. Typical output characteristic(Tj=150°C)

Curve Characteristics

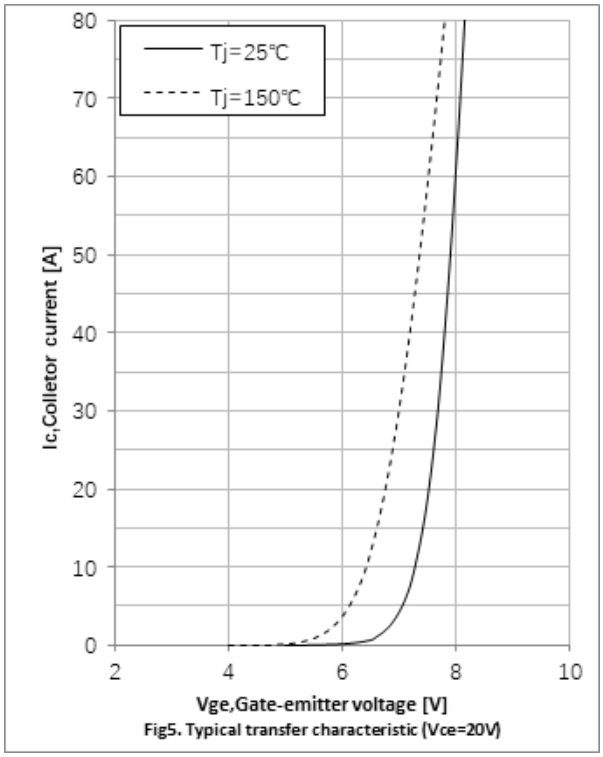

Fig5. Typical transfer characteristic (Vce=20V)

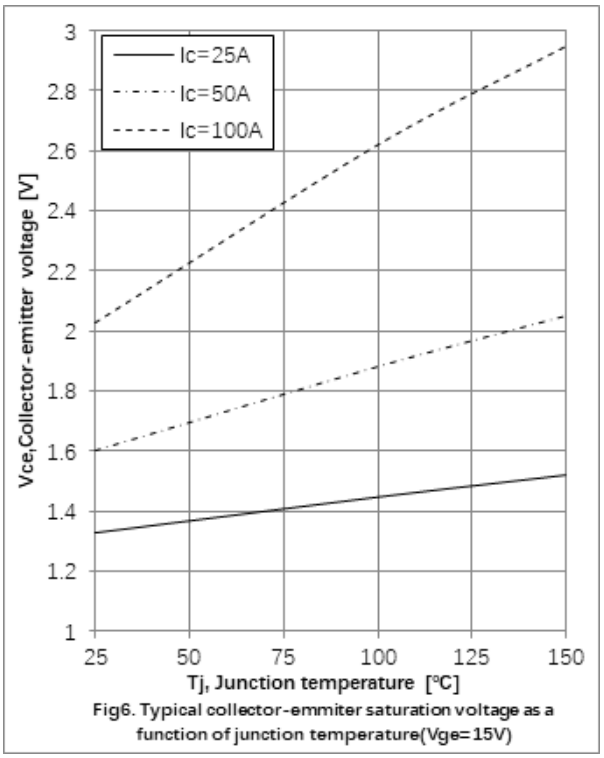

Fig6. Typical collector-emmiter saturation voltage as a function of junction temperature(Vge=15V)

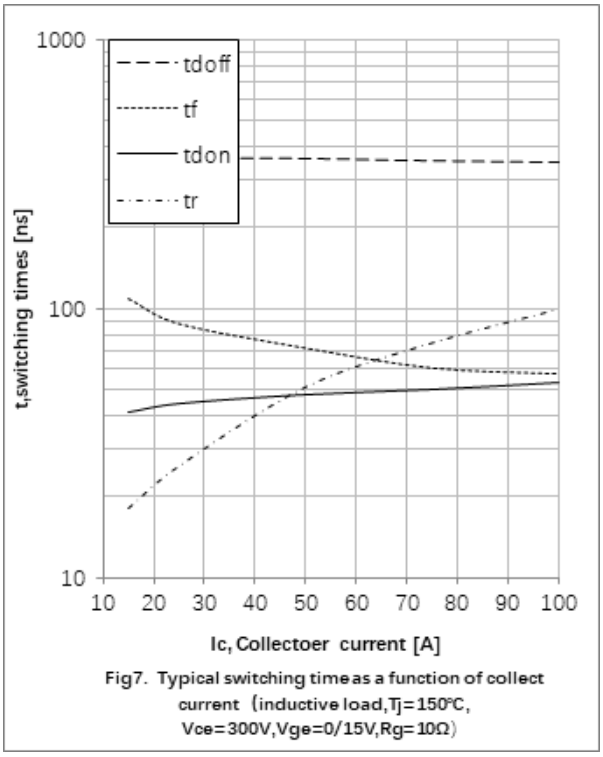

Fig7. Typical switching time as a function of collect current (inductive load,Tj=150℃, Vce=300V,Vge=0/15V,Rg=10Ω)

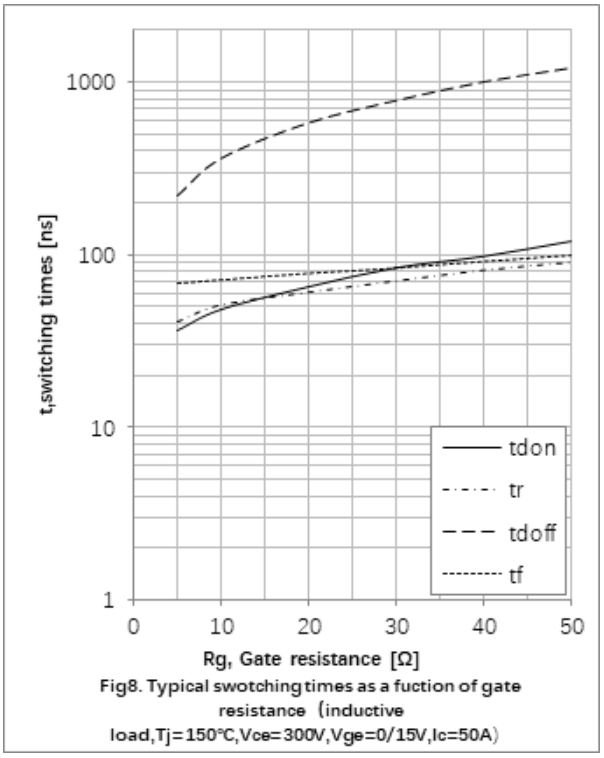

Fig8. Typical swotching times as a fuction of gate resistance (inductive load,Tj=150℃,Vce=300V,Vge=0/15V,Ic=50A)

Curve Characteristics

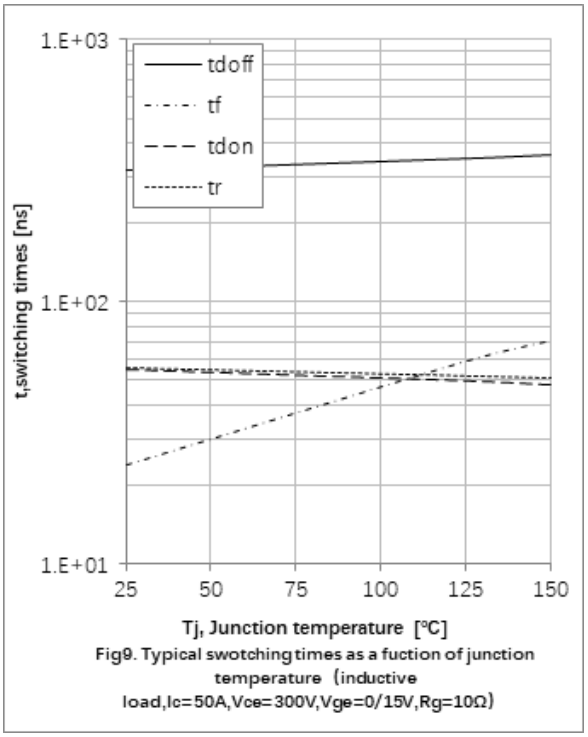

Fig9. Typical swotching times as a fuction of junction temperature (inductive load,Ic=50A,Vce=300V,Vge=0/15V,Rg=10Ω)

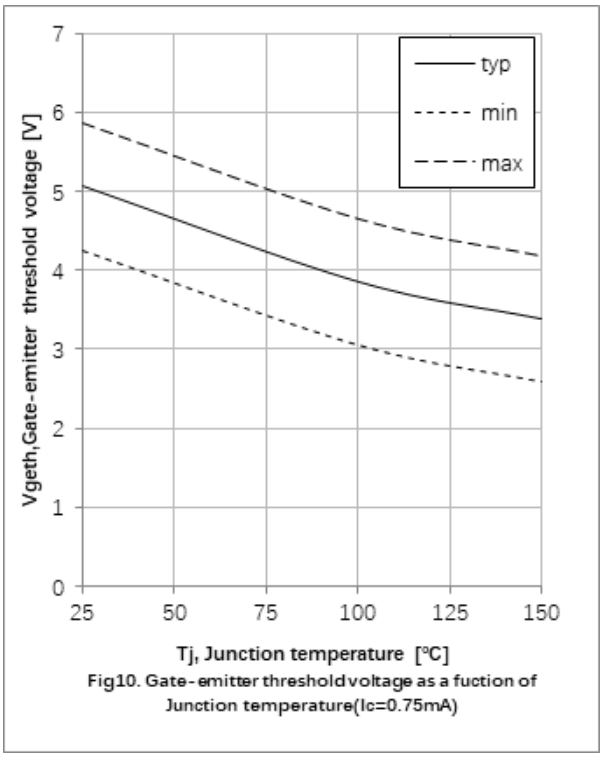

Fig10. Gate-emitter threshold voltage as a fuction of Junction temperature(Ic=0.75mA)

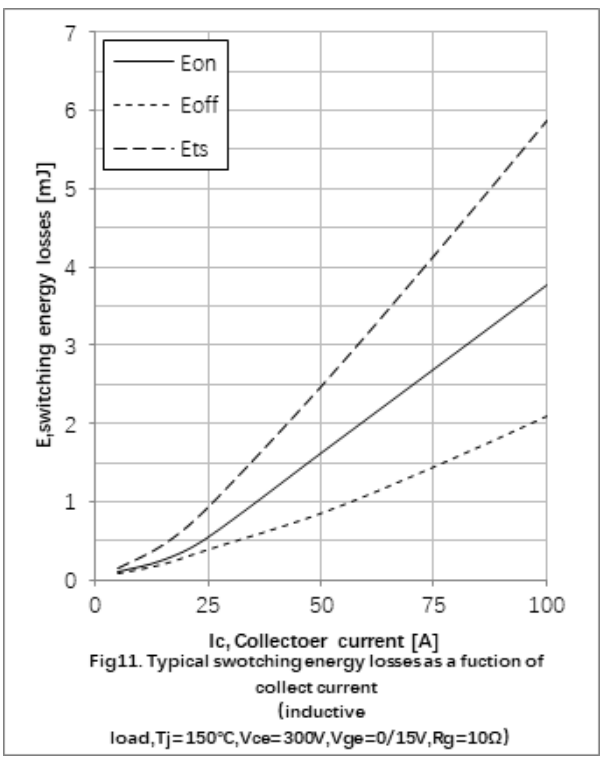

Fig11. Typical swotching energy losses as a fuction of collect current (inductive load,Tj=150℃,Vce=300V,Vge=0/15V,Rg=10Ω)

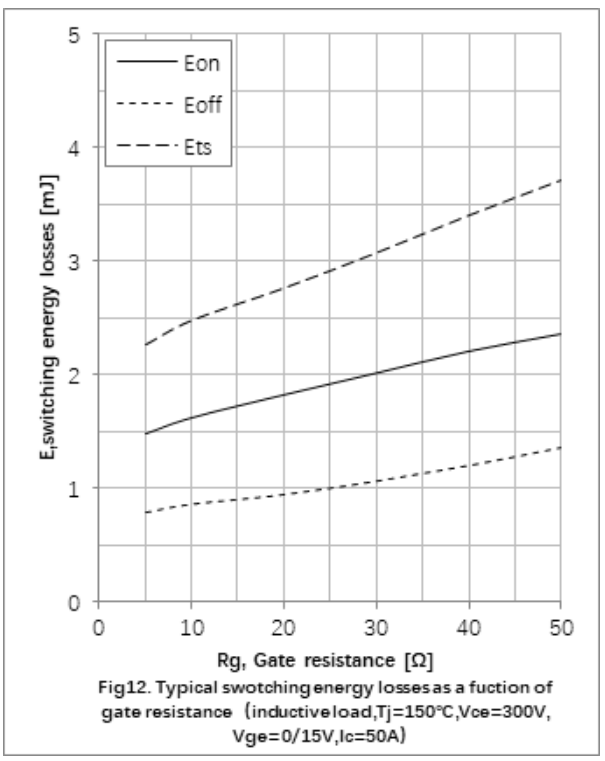

Fig12. Typical swotching energy losses as a fuction of gate resistance (inductive load,Tj=150℃,Vce=300V, Vge=0/15V,Ic=50A)

Curve Characteristics

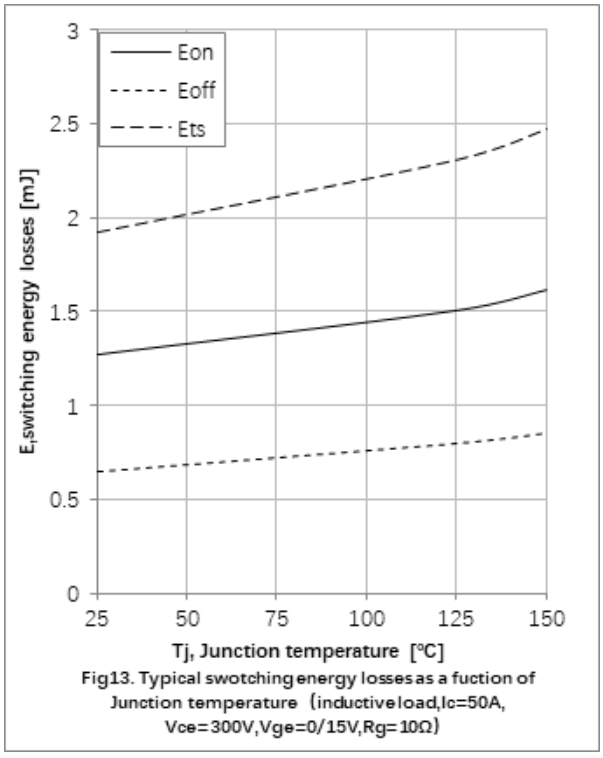

Fig13. Typical swotching energy losses as a fuction of Junction temperature (inductive load,Ic=50A, Vce=300V,Vge=0/15V,Rg=10Ω)

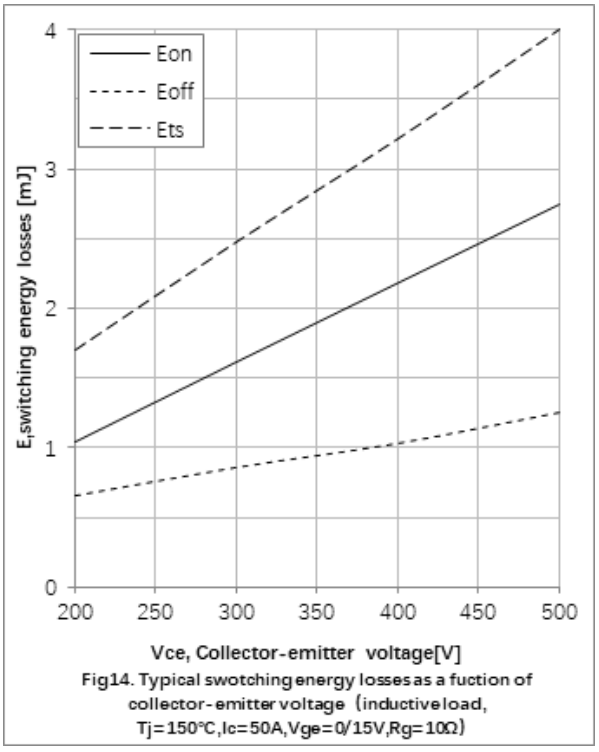

Fig14. Typical swotching energy losses as a fuction of collector-emitter voltage (inductive load, Tj=150℃,Ic=50A,Vge=0/15V,Rg=10Ω)

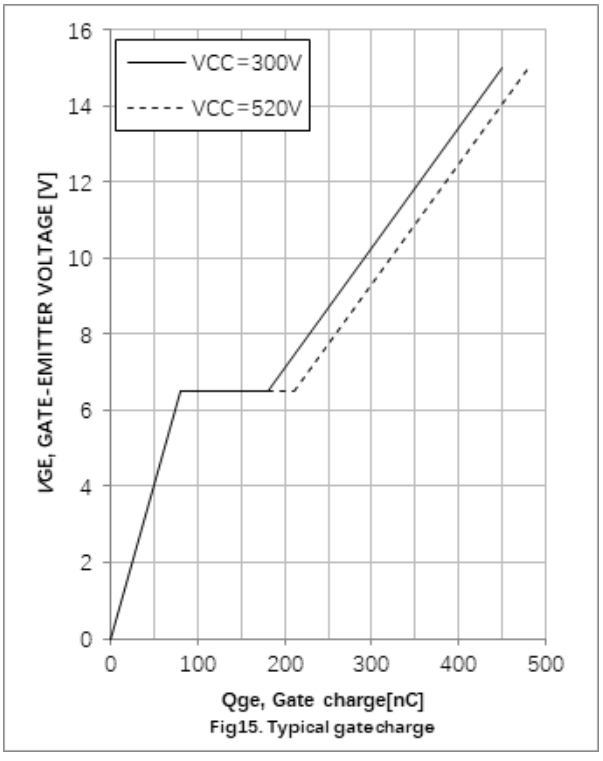

Fig15. Typical gate charge

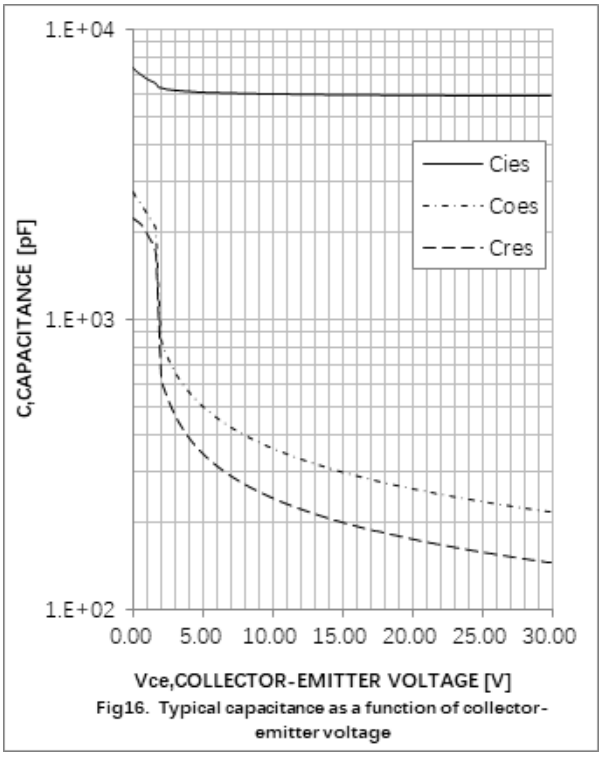

Fig16. Typical capacitance as a function of collector-emitter voltage

Curve Characteristics

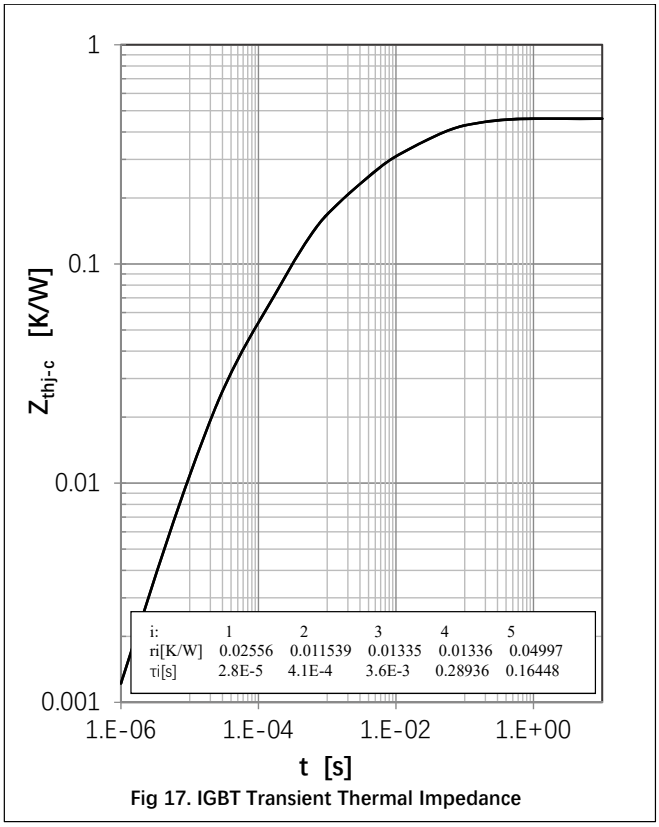

Fig 17. IGBT Transient Thermal Impedance

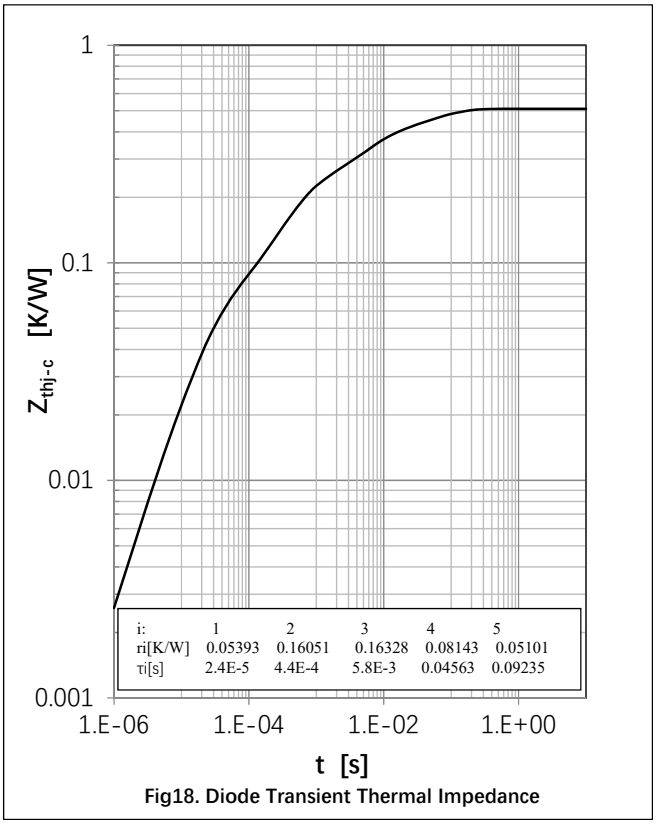

Fig18. Diode Transient Thermal Impedance

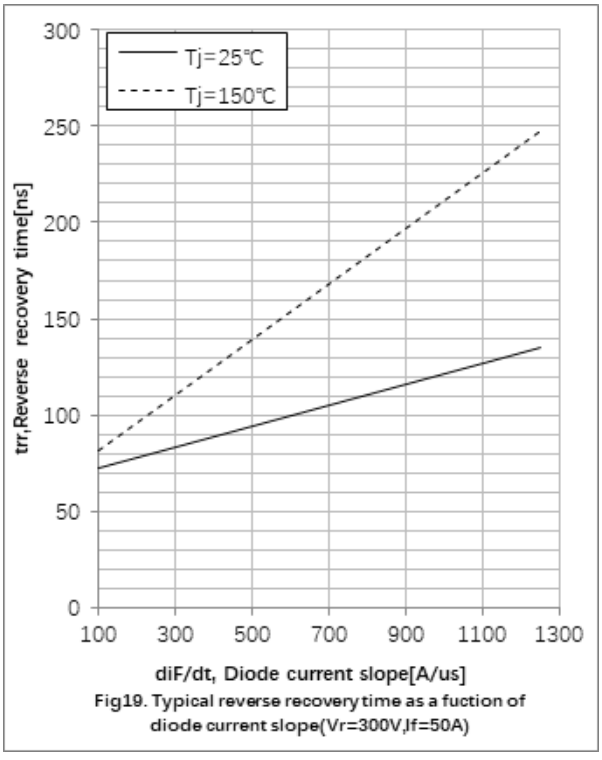

Fig19. Typical reverse recovery time as a fuction of diode current slope(Vr=300V,If=50A)

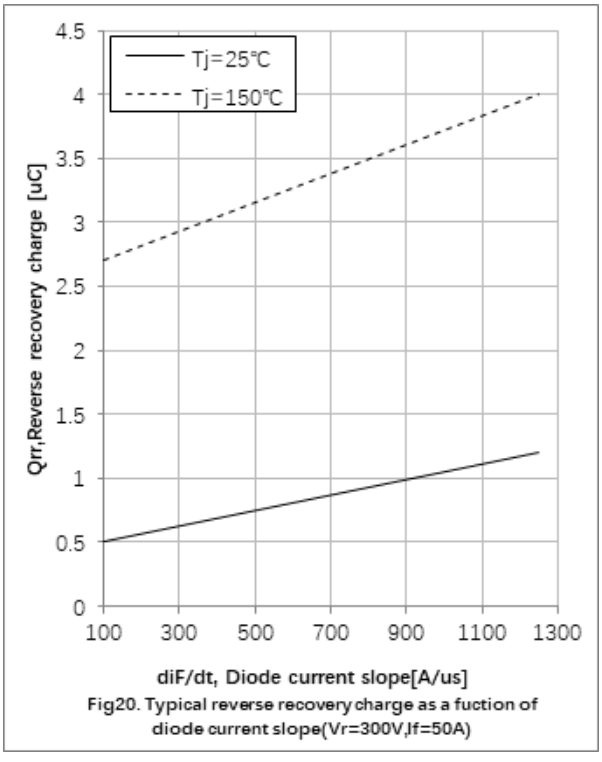

Fig20. Typical reverse recovery charge as a fuction of diode current slope(Vr=300V,If=50A)

Curve Characteristics

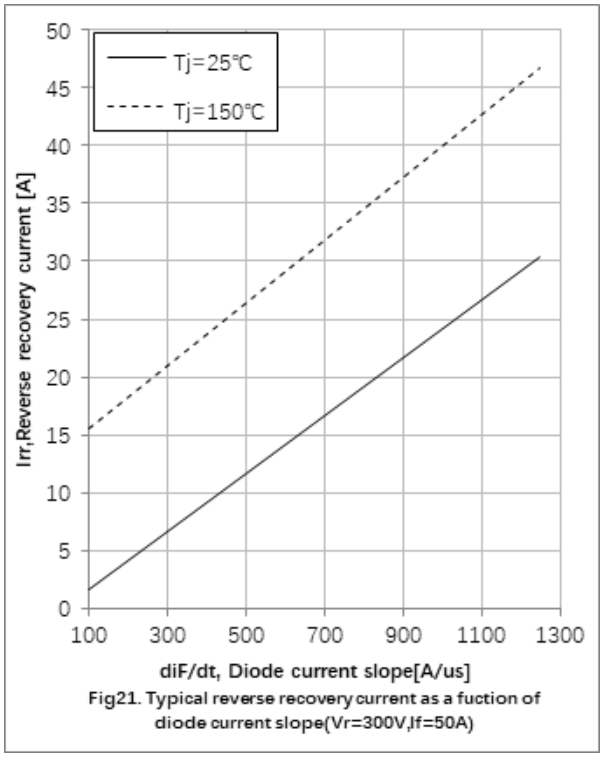

Fig21. Typical reverse recovery current as a fuction of diode current slope(Vr=300V,If=50A)

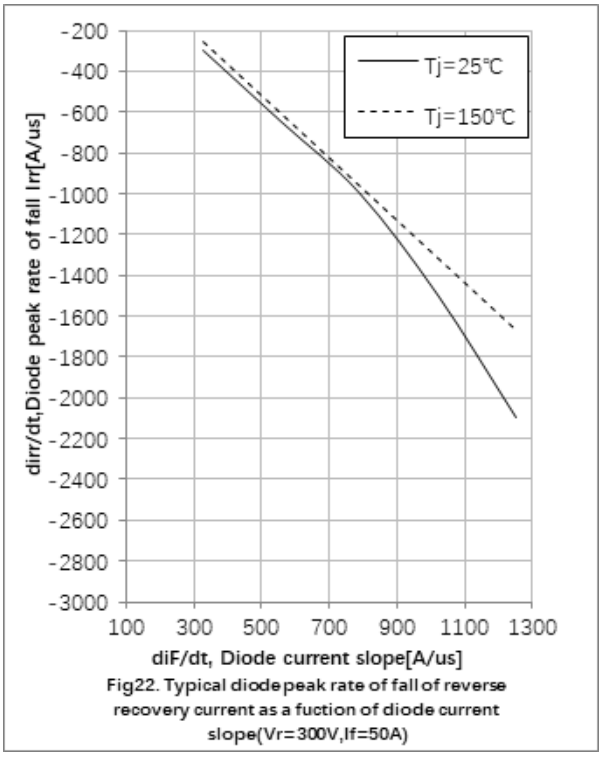

Fig22. Typical diode peak rate of fall of reverse recovery current as a fuction of diode current slope(Vr=300V,If=50A)

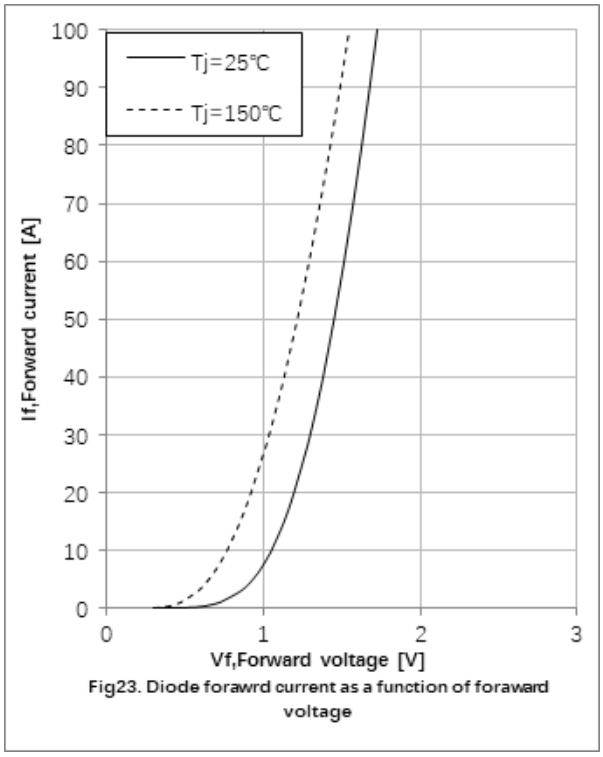

Fig23. Diode forawrd current as a function of foraward voltage

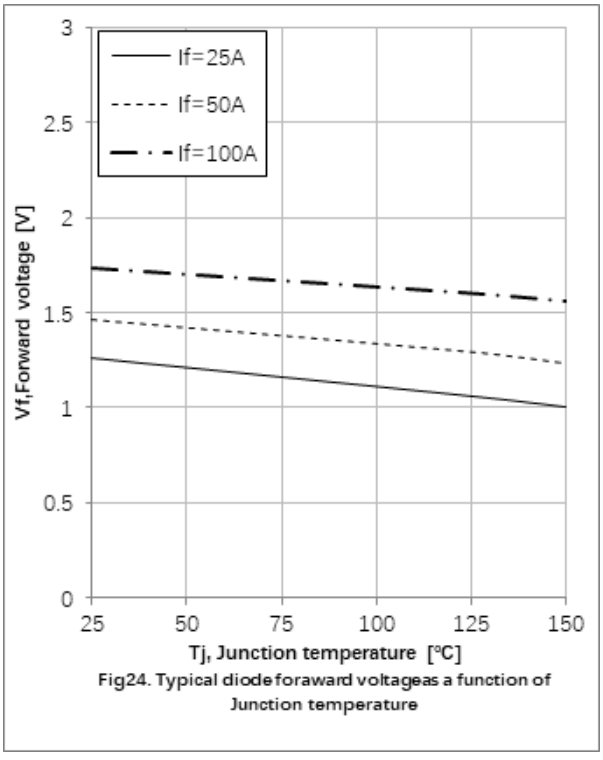

Fig24. Typical diode foraward voltageas a function of Junction temperature

Ordering Information

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