Features

- Low switching losses,High ruggedness, temperature stable
- Maximum Junction Temperature 175℃
- Positive Temperature Coefficient
- Moisture Sensitivity Level 1
- High short circuit capability(5us)
- 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)

Trench and Field Stop IGBT 650V 10A

Applications

- Soft Switching Applications
- Air Conditioning
- Motor Drive Inverter

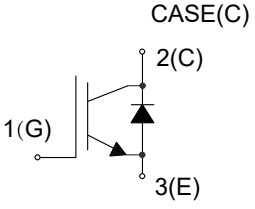
Maximum Ratings

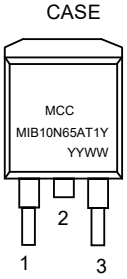
Parameter		Symbol	Rating	Unit
Collector-Emitter Voltage		V_{CE}	650	V
DC Collector Current(3)	T_C=25°C	I_C	20	A
	T_C=100°C		10	
Pulsed Collector Current (4) ,V_{GE}=15V		$I_{C,pluse}$	30	A
Diode Forward Current (3)	T_C=25°C	I_F	20	A
	T_C=100°C		10	
Diode Pulsed Current (4)		$I_{F,pluse}$	30	A
Continuous Gate-Emitter Voltage		V_{GE}	±20	V
Transient Gate-Emitter Voltage(5)			±30	
Turn off Safe Operation Area,T_j≤ 150°C V_{CE}≤650V			30	A
Short Circuit Withstand Time(6)		T_{SC}	5	μs
Power Dissipation, T_C=25°C, T_j=175°C		P_D	115	W

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. 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≤10us, Duty Cycle<1%
6. V_{GE}=15V, V_{CEM}≤650V,V_{cc}=400V

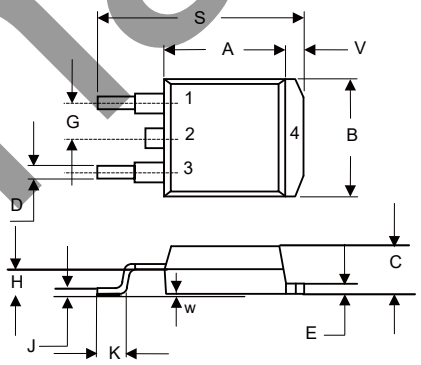
Internal Structure





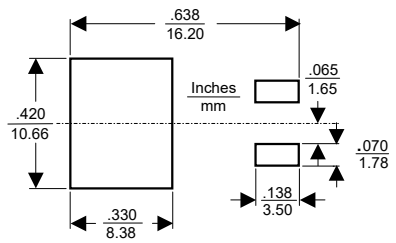
Device Code: MIB10N65AT1Y
Date Code: YYWW (Year & Week)

D2-PAK



DIMENSIONS					
DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	0.331	0.370	8.40	9.40	
B	0.378	0.417	9.60	10.60	
C	0.165	0.189	4.20	4.80	
D	0.027	0.037	0.68	0.94	
E	0.045	0.055	1.14	1.40	
G	0.010		2.54		TYP.
H	0.096	0.134	2.43	3.40	
J	0.011	0.025	0.28	0.64	
K	0.071	0.131	1.80	3.32	
S	0.575	0.625	14.60	15.87	
V	0.042	0.058	1.07	1.47	
W	0.000	0.010	0.00	0.25	

Suggested Solder Pad Layout



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=1mA	650			V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE}=15V, I_C=10A, T_j=25°C		1.65	2.15	V
		V_{GE}=15V, I_C=10A, T_j=125°C		1.80		
		V_{GE}=15V, I_C=10A, T_j=150°C		1.85		
G-E Threshold Voltage	$V_{GE(th)}$	I_C=250uA, V_{CE}=V_{GE}	4.0	5.5	6.5	V
C-E Leakage Current	I_{CES}	V_{CE}=650V, V_{GE}=0V, T_j=25°C			0.25	mA
		V_{CE}=650V, V_{GE}=0V, T_j=150°C			5	
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		0.56		nF
Reverse Transfer Capacitance	C_{res}			0.01		
Gate Charge	Q_G	V_{CC}=400V,I_C=10A,V_{GE}=15V		0.06		μC
IGBT Switching Characteristics						
Turn-On Delay Time	$td_{(on)}$	V_{CC}=400V, I_C=10A, V_{GE}=-5V~15V, R_G=10Ω,T_j=25°C		7		ns
Rise Time	t_r			17		
Turn-Off Delay Time	$td_{(off)}$			23		
Fall Time	t_f			106		
Turn-On Energy	E_{on}			0.19		mJ
Turn-Off Energy	E_{off}			0.17		
Turn-On Delay Time	$td_{(on)}$	V_{CC}=400V, I_C=10A V_{GE}=-5V~15V, R_G=10Ω,T_j=125°C		6		ns
Rise Time	t_r			18		
Turn-Off Delay Time	$td_{(off)}$			28		
Fall Time	t_f			161		
Turn-On Energy	E_{on}			0.21		mJ
Turn-Off Energy	E_{off}			0.25		
Turn-On Delay Time	$td_{(on)}$	V_{CC}=400V, I_C=10A V_{GE}=-5V~15V, R_G=10Ω,T_j=150°C		6		ns
Rise Time	t_r			18		
Turn-Off Delay Time	$td_{(off)}$			31		
Fall Time	t_f			189		
Turn-On Energy	E_{on}			0.23		mJ
Turn-Off Energy	E_{off}			0.3		

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°C		1.50	2.00	V
		V_{GE}=0V, I_F=30A, T_j=125°C		1.40		
		V_{GE}=0V, I_F=30A, T_j=150°C		1.35		
Reverse Recovery Current	I_{rr}	V_R=400V, I_F=10A, di_F/dt=-320A/μs, T_j=25°C		9		A
Diode Reverse Recovery Time	t_{rr}			81		ns
Reverse Recovery Charge	Q_{rr}			0.33		μC
Reverse Recovery Energy	E_{rec}			0.06		mJ
Reverse Recovery Current	I_{rr}	V_R=400V, I_F=10A, di_F/dt=-320A/μs, T_j=125°C		11		A
Diode Reverse Recovery Time	t_{rr}			99		ns
Reverse Recovery Charge	Q_{rr}			0.52		μC
Reverse Recovery Energy	E_{rec}			0.14		mJ
Reverse Recovery Current	I_{rr}	V_R=400V, I_F=10A, di_F/dt=-320A/μs, T_j=150°C		12		A
Diode Reverse Recovery Time	t_{rr}			106		ns
Reverse Recovery Charge	Q_{rr}			0.77		μC
Reverse Recovery Energy	E_{rec}			0.17		mJ

Thermal characteristics

Parameter	Symbol	Min	Typ	Max	Units
Operating Junction Temperature Range	T_J	-40		175	°C
Storage Temperature Range	T_{stg}	-55		150	°C
Thermal Resistance from Junction to Case (IGBT)	Rth_{J-C}			1.3	°C/W
Thermal Resistance from Junction to Case (Diode)	Rth_{J-C}			1.5	°C/W
Thermal Resistance from Junction to Ambient	Rth_{J-A}			40	°C/W

Curve Characteristics

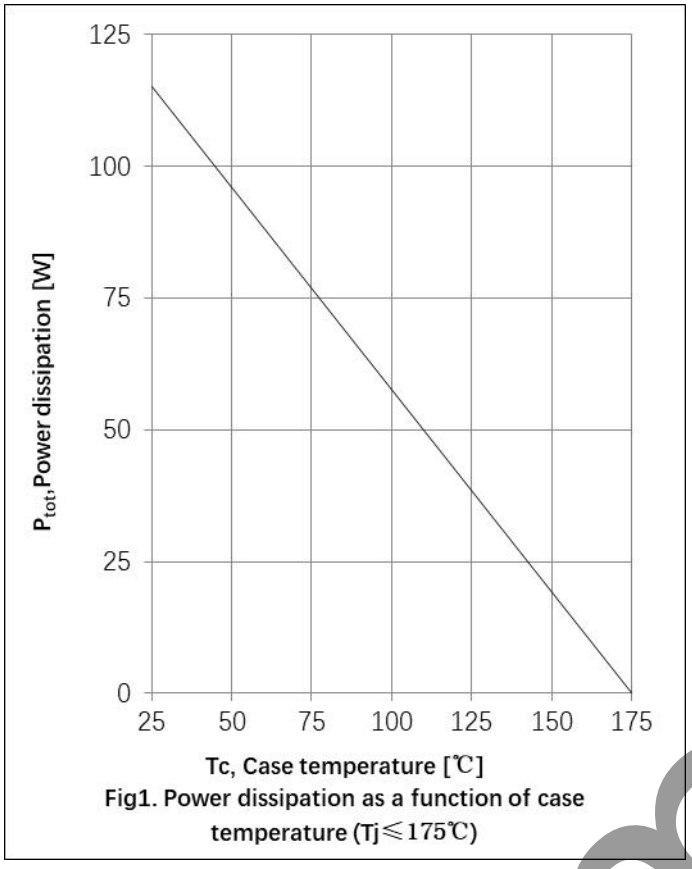


Fig1. Power dissipation as a function of case temperature (Tj≤175℃)

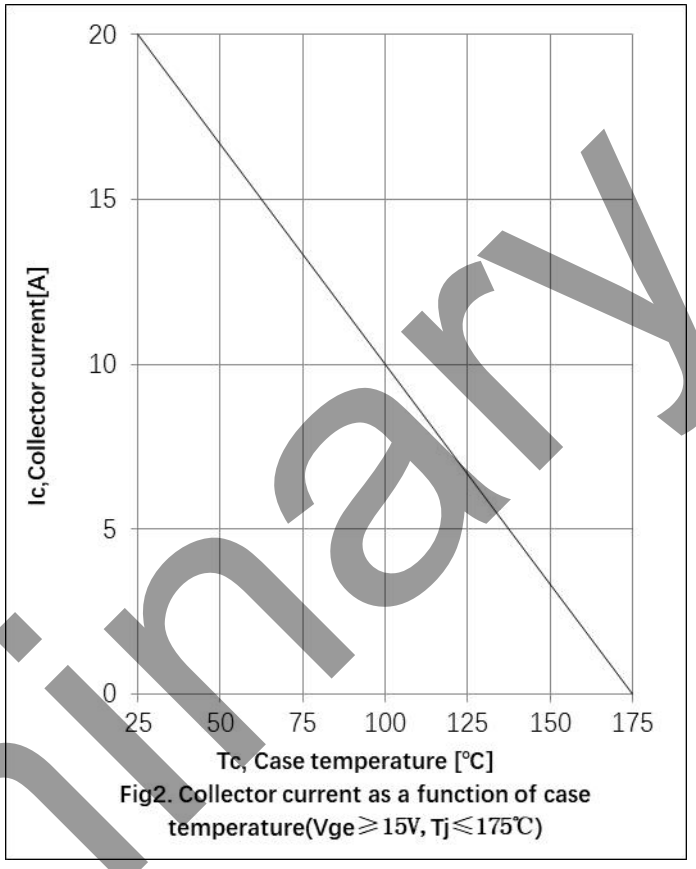


Fig2. Collector current as a function of case temperature(Vge≥15V, Tj≤175℃)

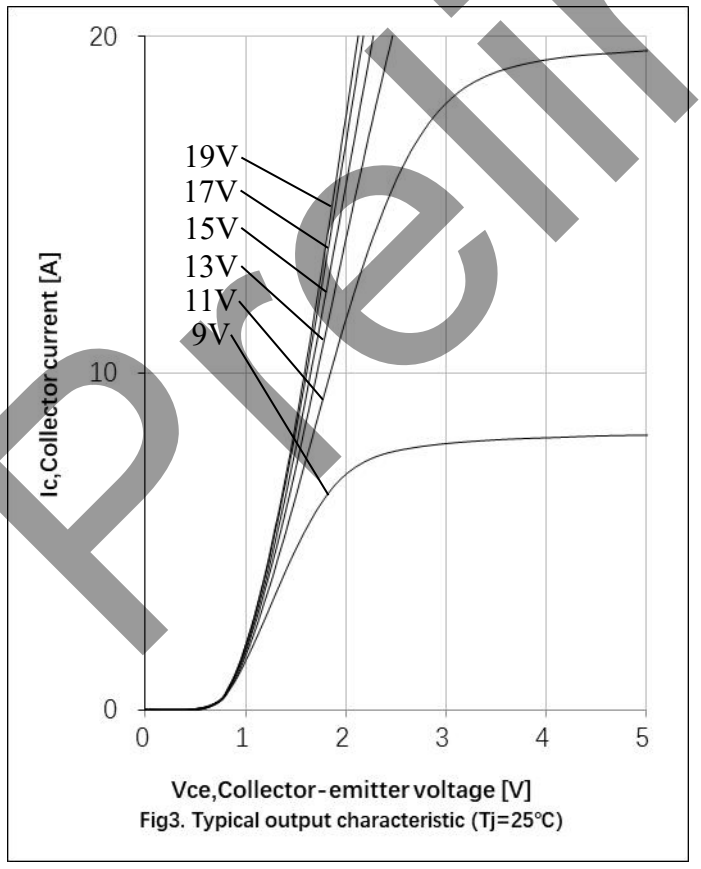


Fig3. Typical output characteristic (Tj=25℃)

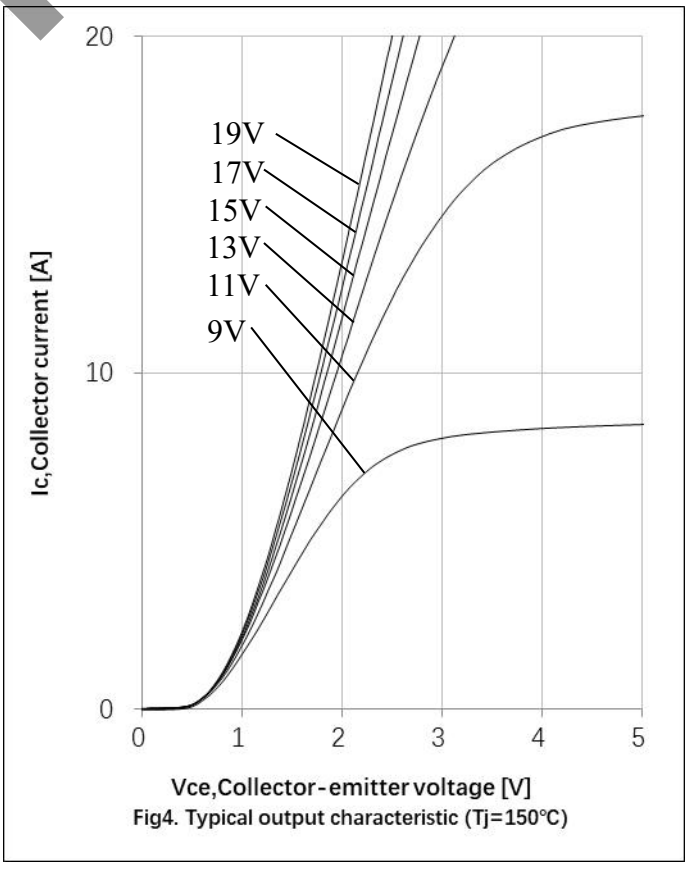


Fig4. Typical output characteristic (Tj=150℃)

Curve Characteristics

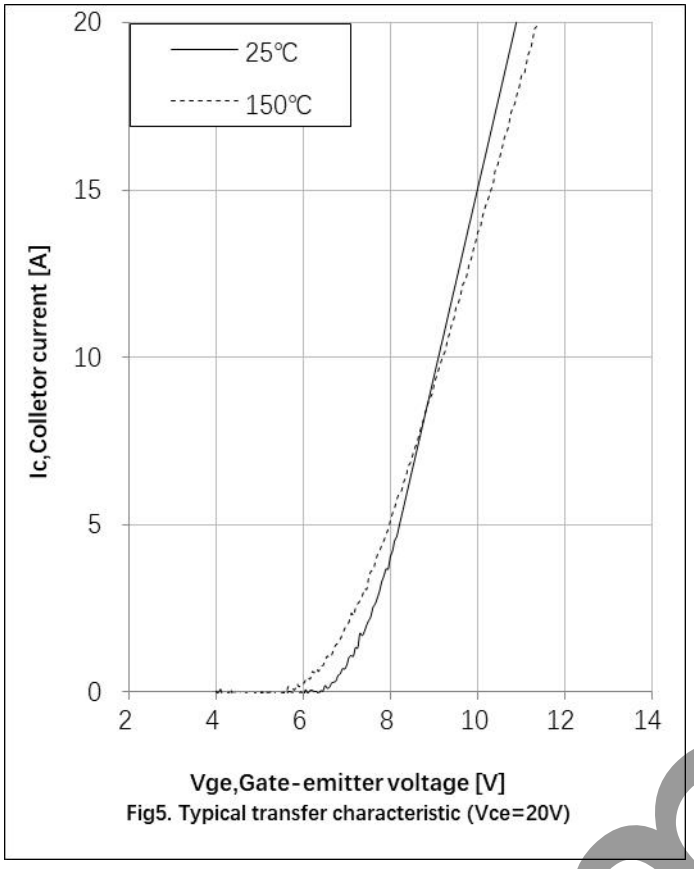


Fig5. Typical transfer characteristic (Vce=20V)

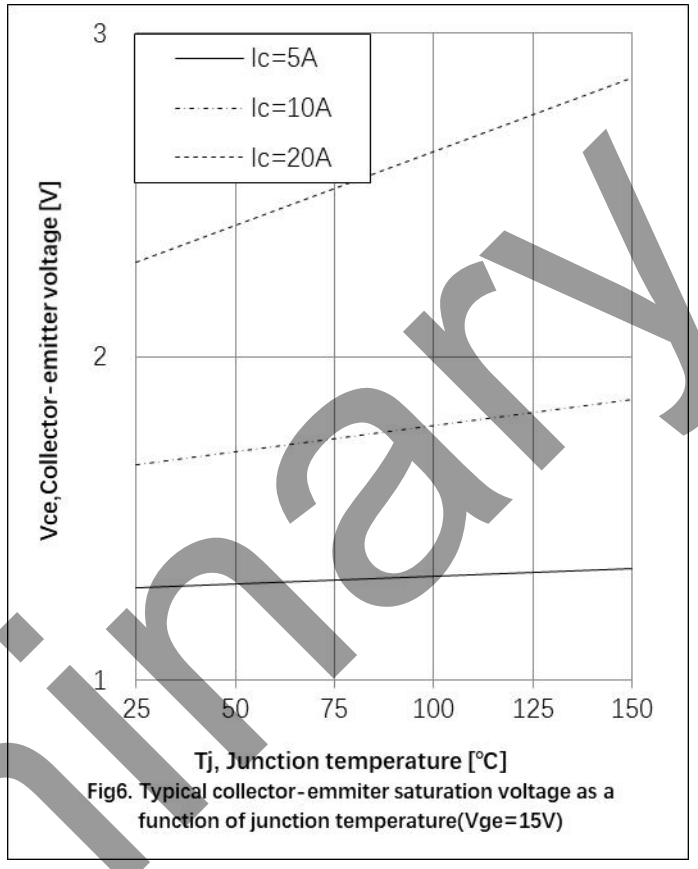


Fig6. Typical collector-emmiter saturation voltage as a function of junction temperature(Vge=15V)

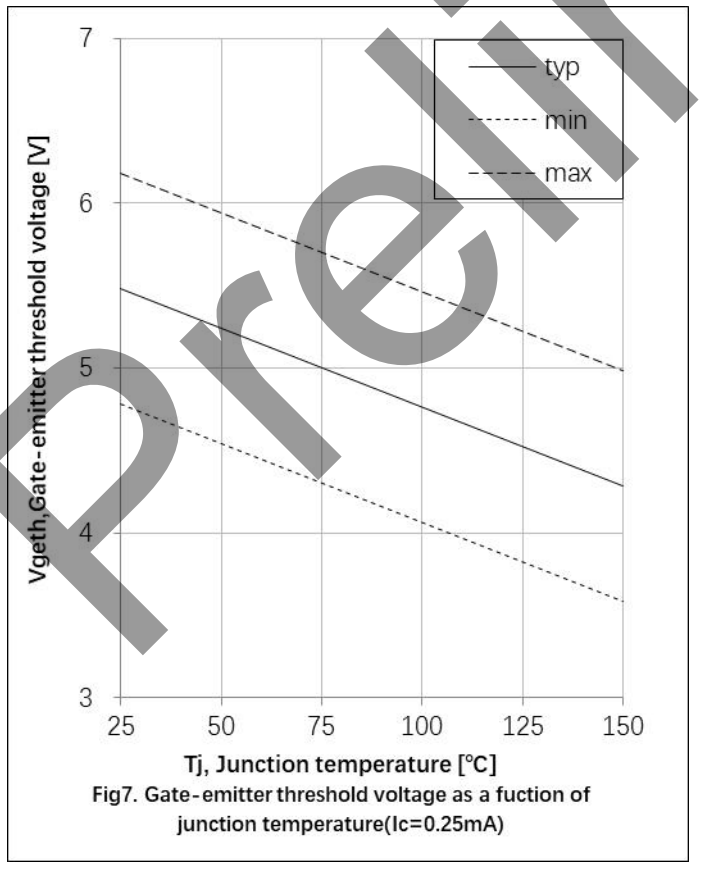


Fig7. Gate-emitter threshold voltage as a fuction of junction temperature(Ic=0.25mA)

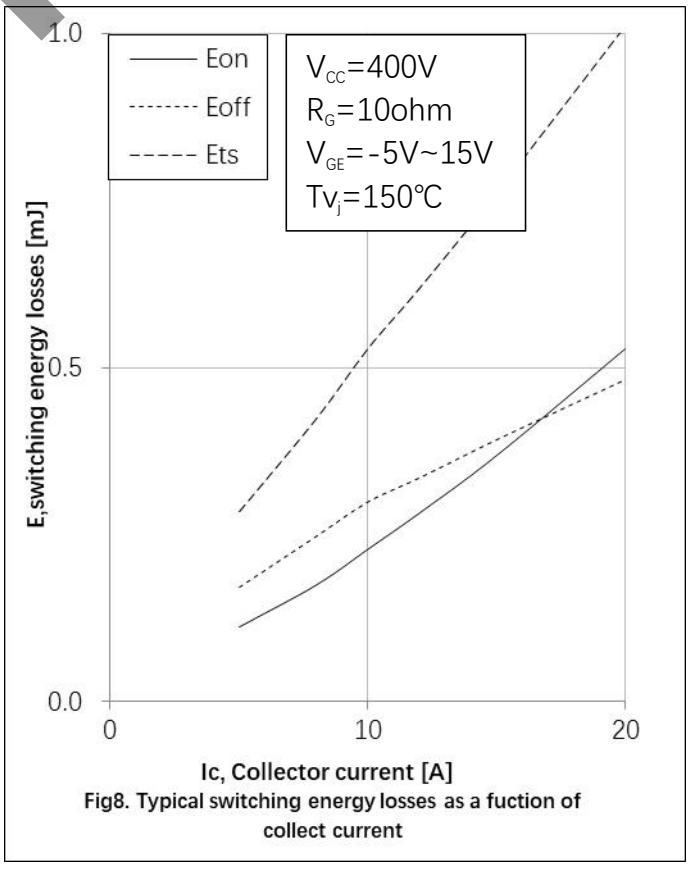


Fig8. Typical switching energy losses as a fuction of collect current

Curve Characteristics

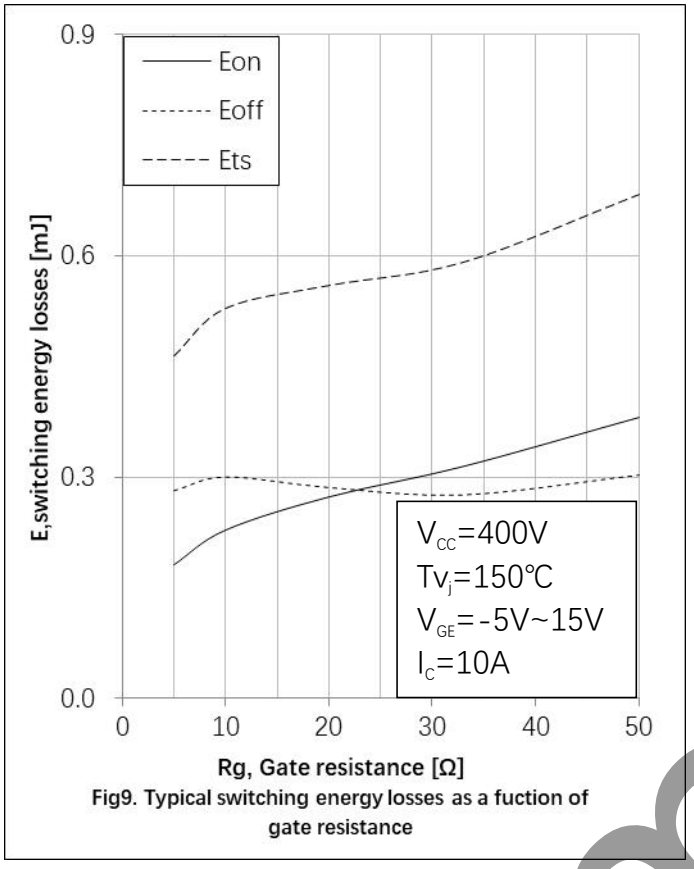


Fig9. Typical switching energy losses as a fuction of gate resistance

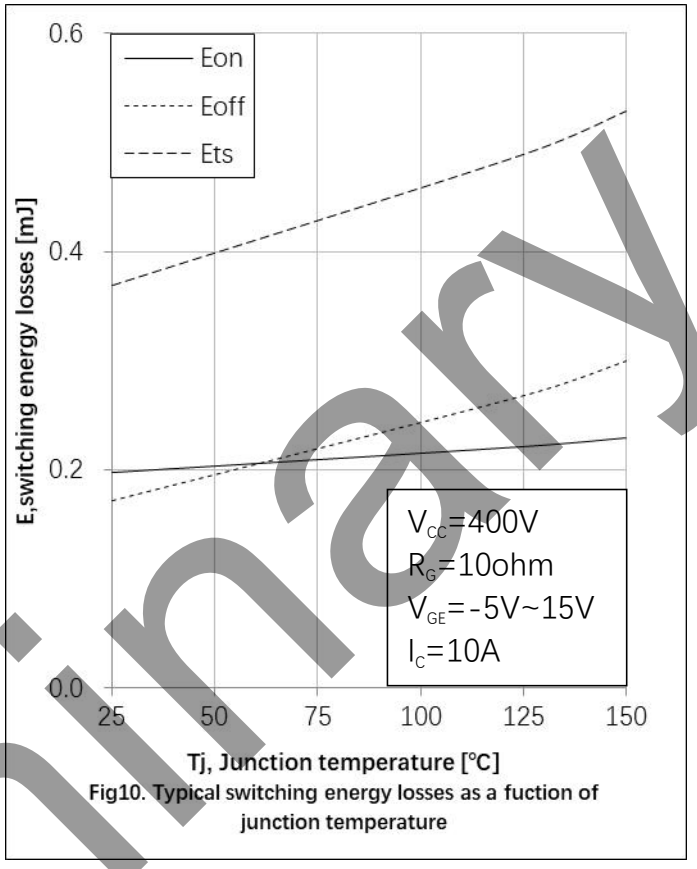


Fig10. Typical switching energy losses as a fuction of junction temperature

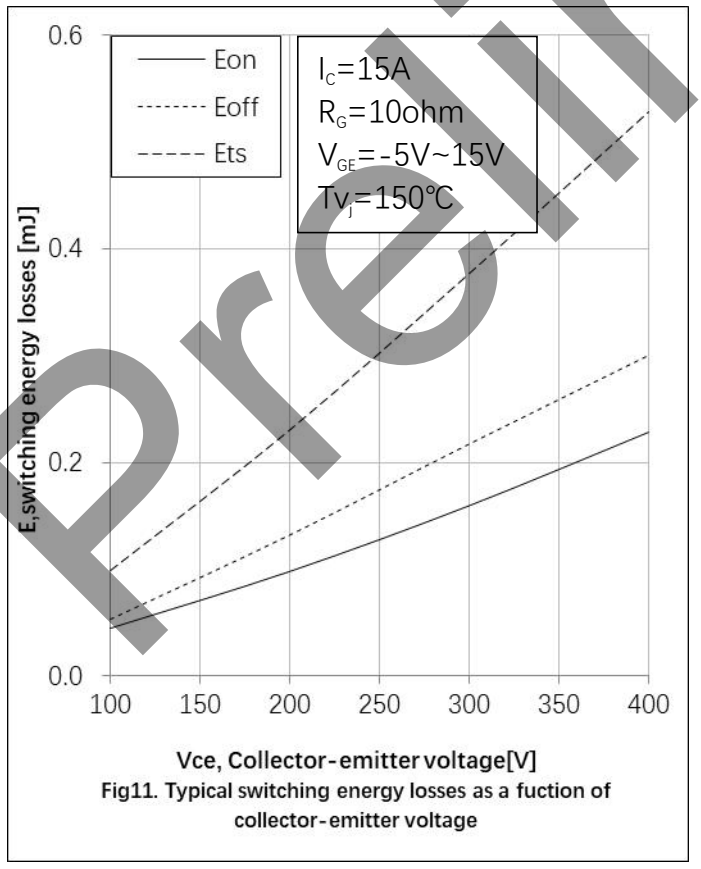


Fig11. Typical switching energy losses as a fuction of collector-emitter voltage

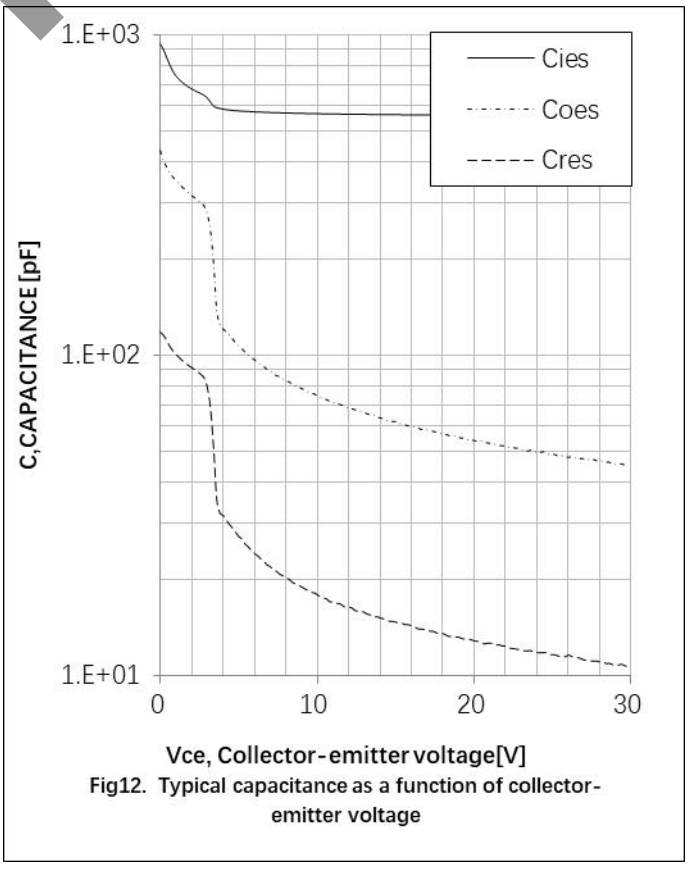


Fig12. Typical capacitance as a function of collector-emitter voltage

Curve Characteristics

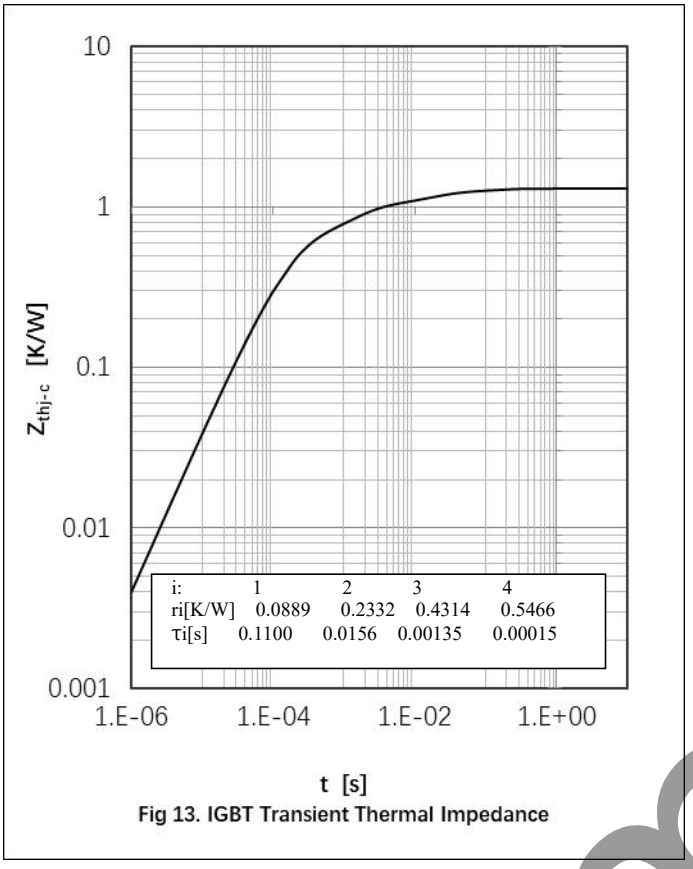


Fig 13. IGBT Transient Thermal Impedance

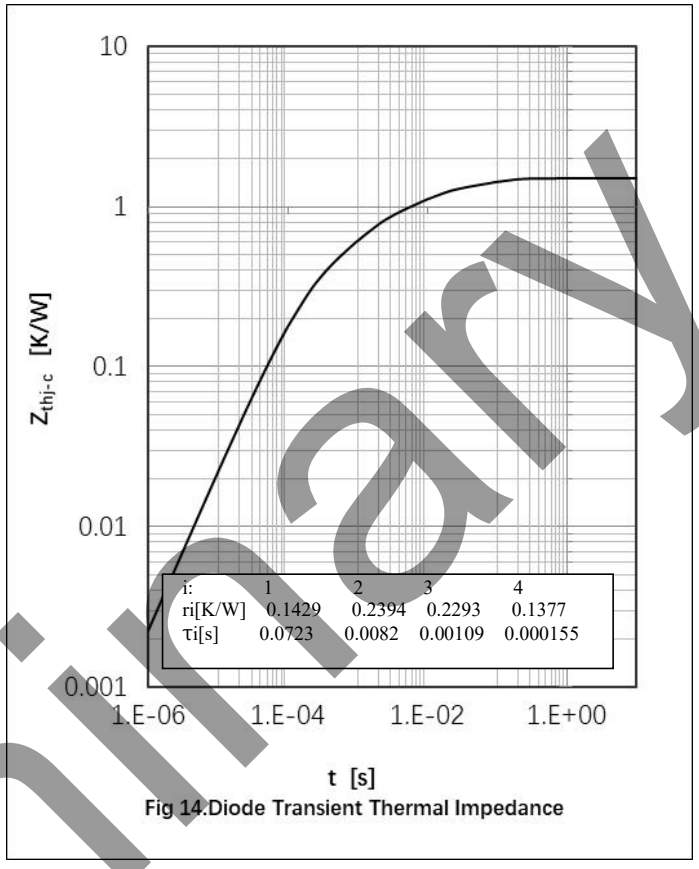


Fig 14.Diode Transient Thermal Impedance

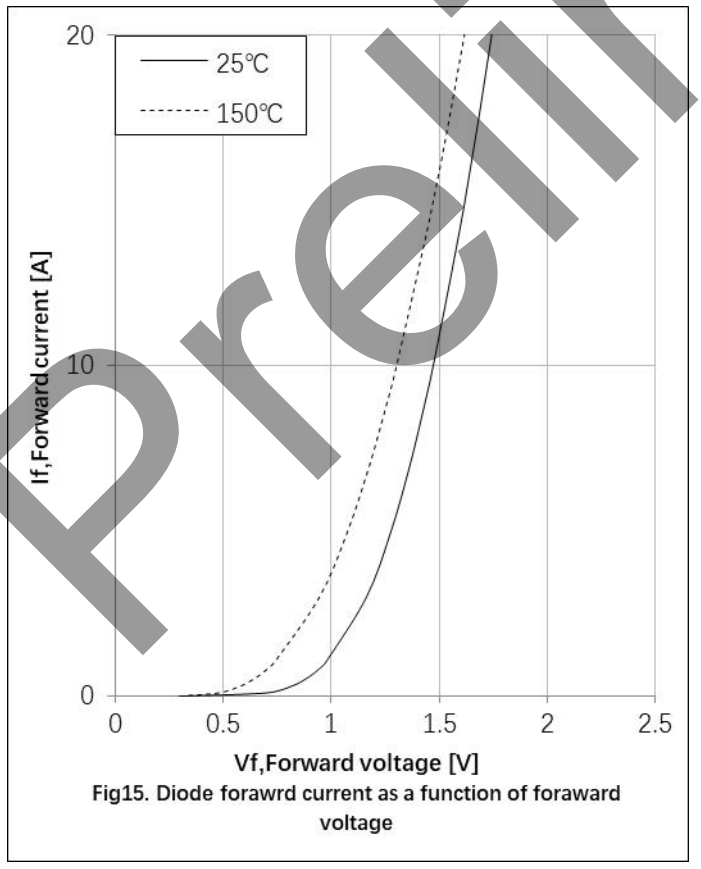


Fig15. Diode forawrd current as a function of foraward voltage

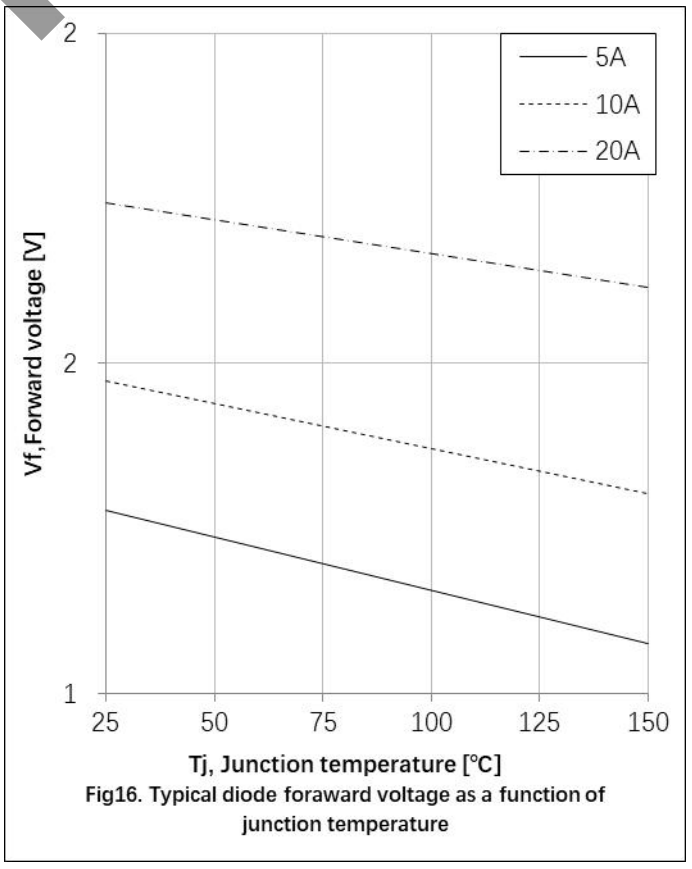


Fig16. Typical diode foraward voltage as a function of junction temperature

Ordering Information

Device	Packing
Part Number-TP	Tape&Reel: 800pcs/Reel