Features

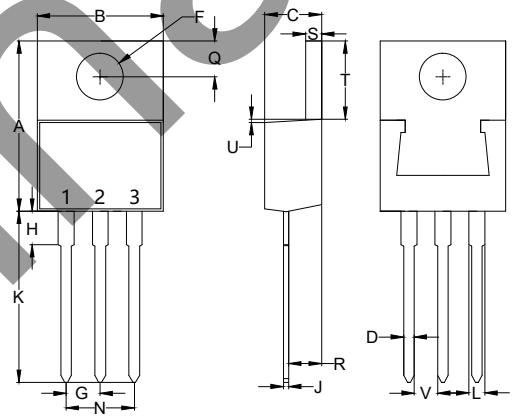
- High Speed Smooth Switching Device for Hard and Soft Switching
- Positive Temperature Coefficient
- High Ruggedness, Good Thermal Stability
- Halogen Free. “Green” Device (Note 1)
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant (Note 2)("P" Suffix Designates RoHS Compliant. See Ordering Information)

Applications

- Soft Switching Applications
- Air Conditioning
- Motor Drive Inverter

Trench and Field Stop IGBT 650V 15A

TO-220AB



DIMENSIONS					
DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	0.560	0.625	14.22	15.88	
B	0.380	0.429	9.65	10.90	
C	0.140	0.201	3.56	5.10	
D	0.020	0.045	0.51	1.14	
F	0.131	0.170	3.34	4.31	Φ
G	0.079	0.121	2.01	3.07	
H	-----	0.250	-----	6.35	
J	0.011	0.025	0.28	0.64	
K	0.500	0.580	12.70	14.73	
L	0.045	0.060	1.14	1.52	
N	0.158	0.242	4.02	6.14	
Q	0.087	0.135	2.22	3.43	
R	0.080	0.126	2.04	3.19	
S	0.045	0.055	1.14	1.39	
T	0.230	0.270	5.84	6.86	
U	-----	0.050	-----	1.27	
V	0.045	-----	1.15	-----	

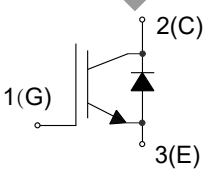
Maximum Ratings

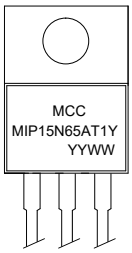
Parameter		Symbol	Rating	Unit
Collector-Emitter Voltage		V_{CE}	650	V
DC Collector Current(3)	T_C=25°C	I_C	30	A
	T_C=100°C		15	
Pulsed Collector Current (4) ,V_{GE}=15V		$I_{C,pluse}$	45	A
Diode Forward Current (3)	T_C=25°C	I_F	30	A
	T_C=100°C		15	
Diode Pulsed Current (4)		$I_{F,pluse}$	45	A
Continuous Gate-Emitter Voltage		V_{GE}	±20	V
Transient Gate-Emitter Voltage(5)			±30	
Turn off Safe Operation Area V_{CE}≤650V, T_j≤150°C			45	A
Short Circuit Withstand Time, V_{GE}= 15V, V_{CC}=400V, V_{CEM}≤650V		T_{SC}	5	us
Power Dissipation	T_C=25°C	P_D	150	W
	T_j=175°C			

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≤10us, Duty Cycle<1%

Internal Structure





Device Code: MIP15N65AT1Y
Date Code: YYWW: (Year & Week)

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=15A, T_J=25°C		1.65	2.15	V
		V_{GE}=15V, I_C=15A, T_J=125°C		1.80		
		V_{GE}=15V, I_C=15A, 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		0.74		nF
Reverse Transfer Capacitance	C_{res}			0.02		
Gate Charge	Q_g	V_{CC}=400V,I_C=15A,V_{GE}=15V		0.08		µC
IGBT Switching Characteristics						
Turn-On Delay Time	$td_{(on)}$	V_{CC}=400V, I_C=15A, V_{GE}=-5~15V,R_G=10Ω, T_j=25°C		10		ns
Rise Time	t_r			27		
Turn-Off Delay Time	$td_{(off)}$			58		
Fall Time	t_f			64		
Turn-On Energy	E_{on}			0.33		mJ
Turn-Off Energy	E_{off}			0.22		
Turn-On Delay Time	$td_{(on)}$	V_{CC}=400V, I_C=15A, V_{GE}=-5~15V,R_G=10Ω, T_J=125°C		10		ns
Rise Time	t_r			27		
Turn-Off Delay Time	$td_{(off)}$			74		
Fall Time	t_f			105		
Turn-On Energy	E_{on}			0.35		mJ
Turn-Off Energy	E_{off}			0.35		
Turn-On Delay Time	$td_{(on)}$	V_{CC}=400V, I_C=15A, V_{GE}=-5~15V,R_G=10Ω, T_J=150°C		9		ns
Rise Time	t_r			27		
Turn-Off Delay Time	$td_{(off)}$			81		
Fall Time	t_f			122		
Turn-On Energy	E_{on}			0.36		mJ
Turn-Off Energy	E_{off}			0.41		

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=15A, T_J=25°C		1.60	2.10	V
		V_{GE}=0V, I_F=15A, T_J=125°C		1.50		
		V_{GE}=0V, I_F=15A, T_J=150°C		1.45		
Reverse Recovery Current	I_{rr}	V_R=400V, I_F=15A, di_F/dt=-450A/μs, T_J=25°C		8		A
Diode Recovery Current	t_{rr}			78		ns
Reverse Recovery Charge	Q_{rr}			0.36		μC
Reverse Recovery Energy	E_{rec}			0.08		mJ
Reverse Recovery Current	I_{rr}	V_R=400V, I_F=15A, di_F/dt=-450A/μs, T_J=125°C		12		A
Diode Recovery Current	t_{rr}			126		ns
Reverse Recovery Charge	Q_{rr}			0.77		μC
Reverse Recovery Energy	E_{rec}			0.20		mJ
Reverse Recovery Current	I_{rr}	V_R=400V, I_F=15A, di_F/dt=-450A/μs, T_J=150°C		14		A
Diode Recovery Current	t_{rr}			146		ns
Reverse Recovery Charge	Q_{rr}			0.94		μC
Reverse Recovery Energy	E_{rec}			0.25		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}			1.0	°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

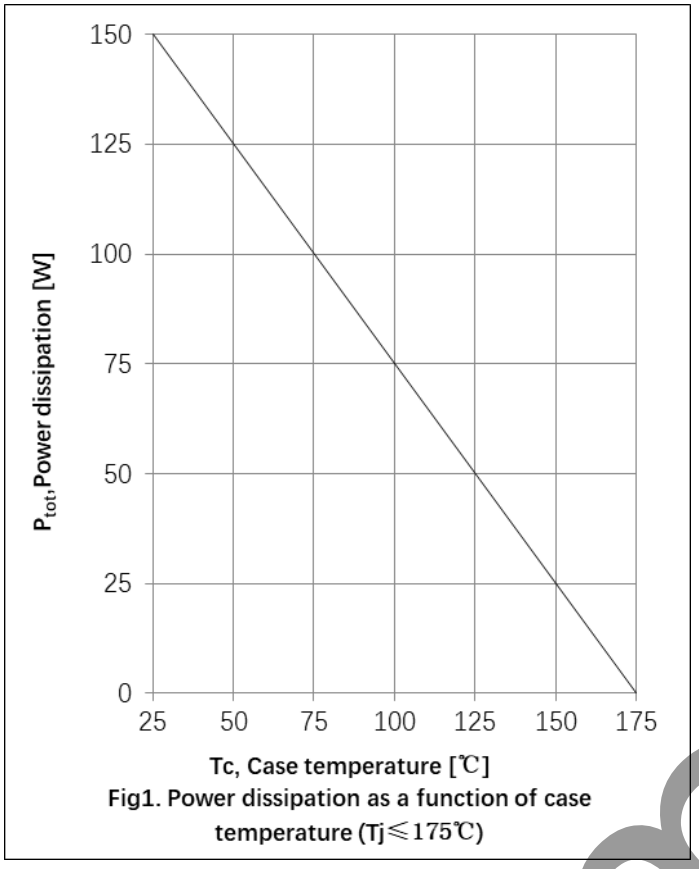


Fig1. Power dissipation as a function of case temperature (Tj≤175℃)

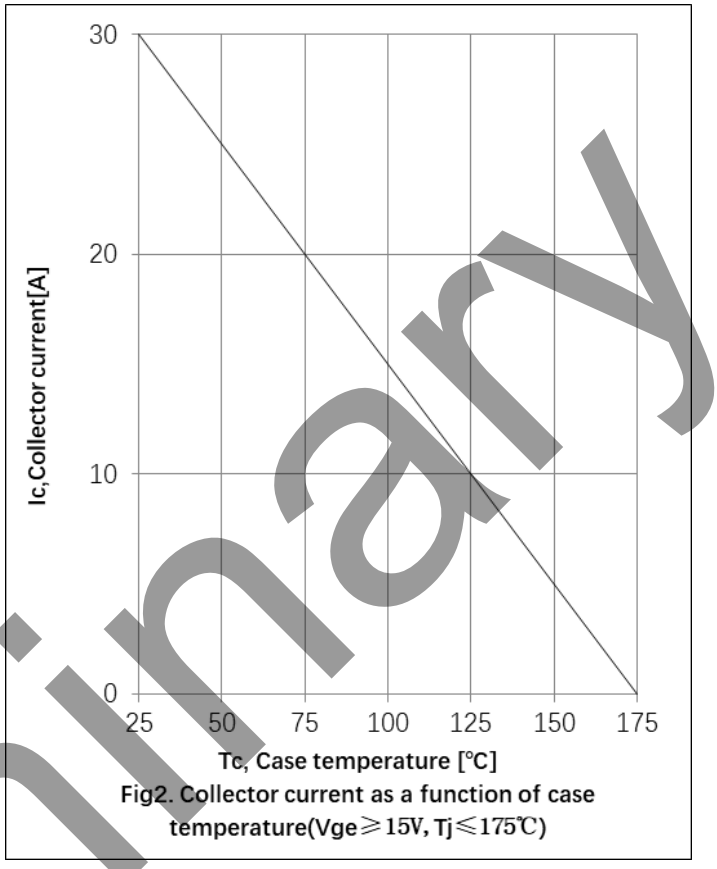


Fig2. Collector current as a function of case temperature(Vge≥15V, Tj≤175℃)

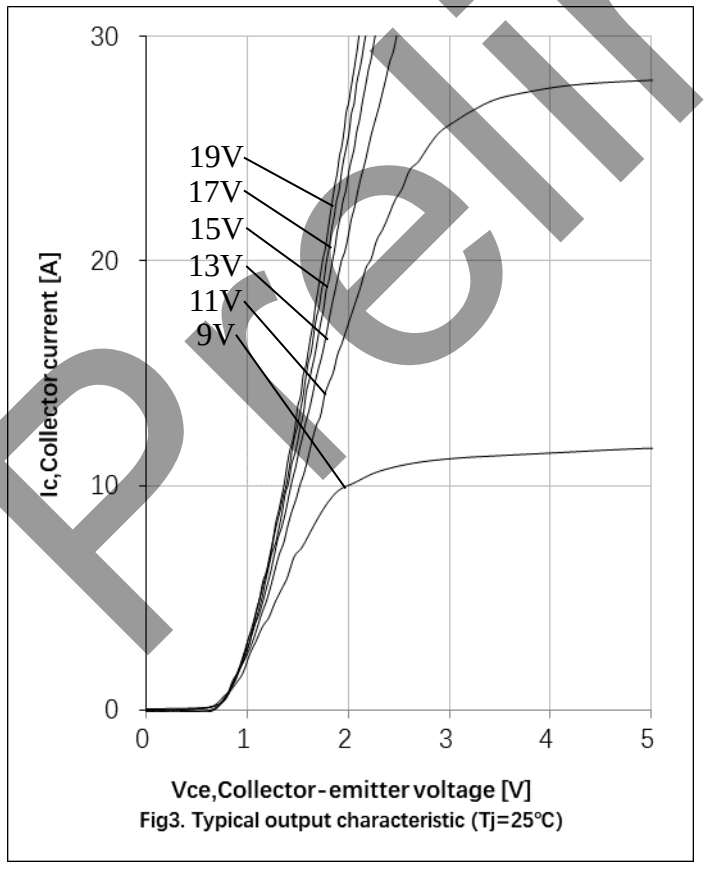


Fig3. Typical output characteristic (Tj=25℃)

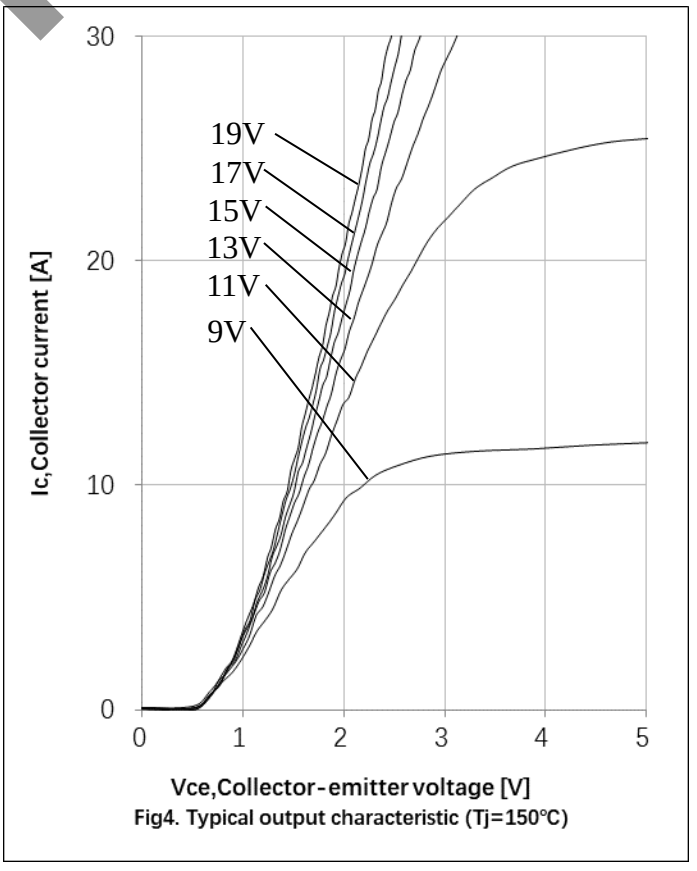


Fig4. Typical output characteristic (Tj=150℃)

Curve Characteristics

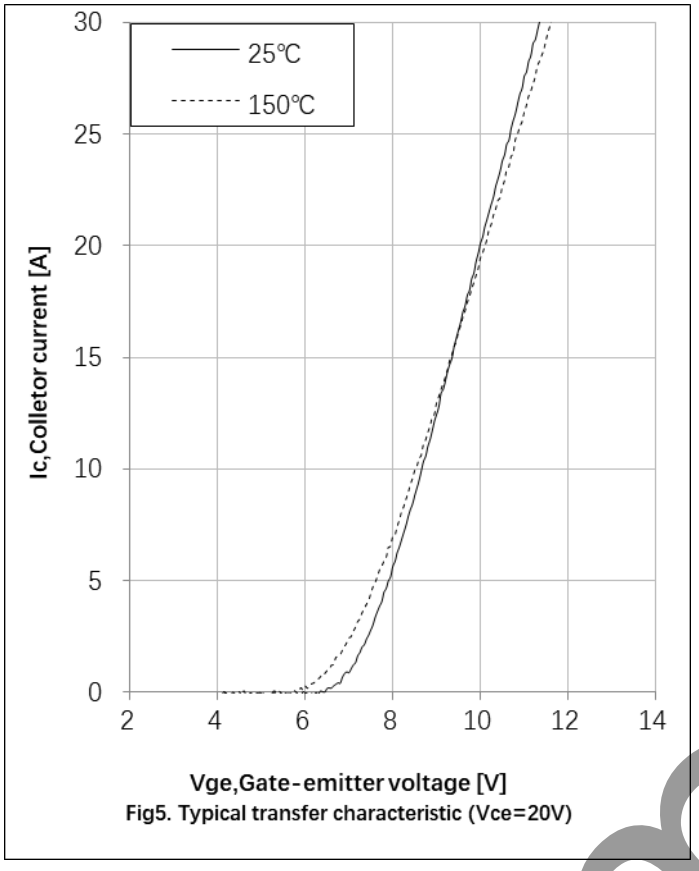


Fig5. Typical transfer characteristic (Vce=20V)

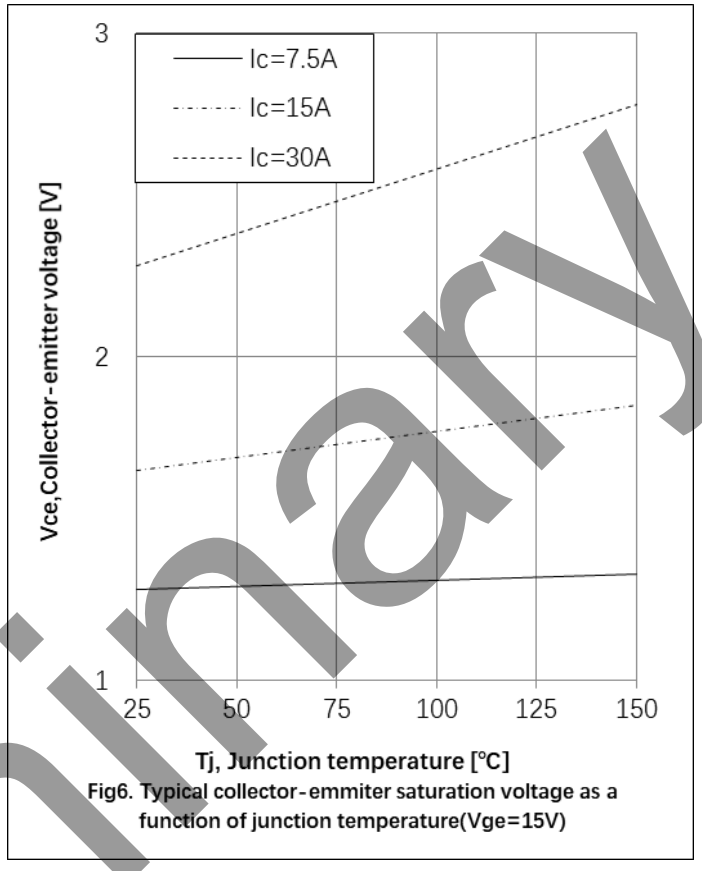


Fig6. Typical collector-emmiter saturation voltage as a function of junction temperature(Vge=15V)

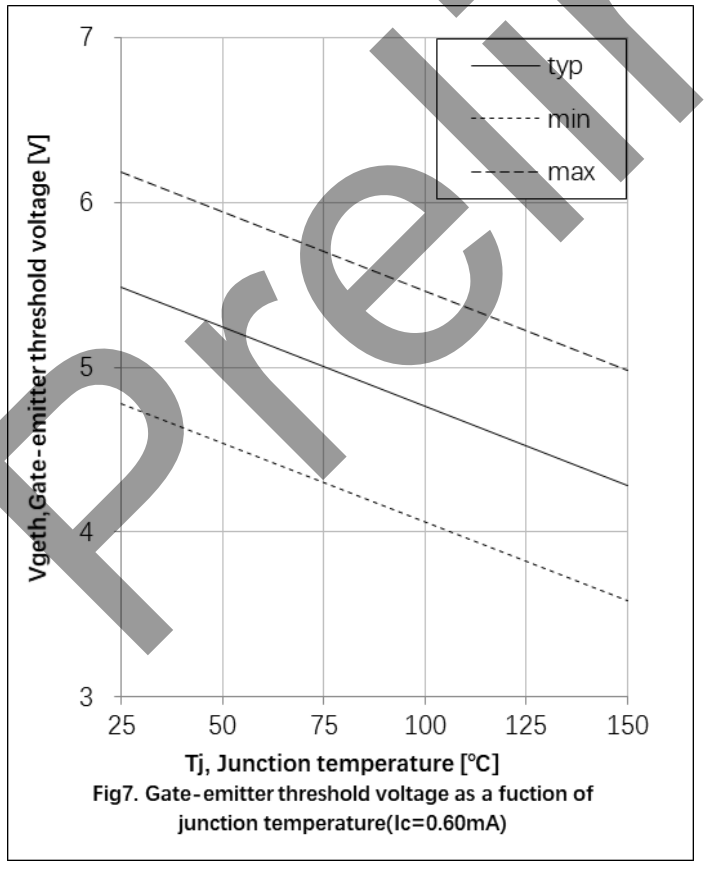


Fig7. Gate-emitter threshold voltage as a fuction of junction temperature(Ic=0.60mA)

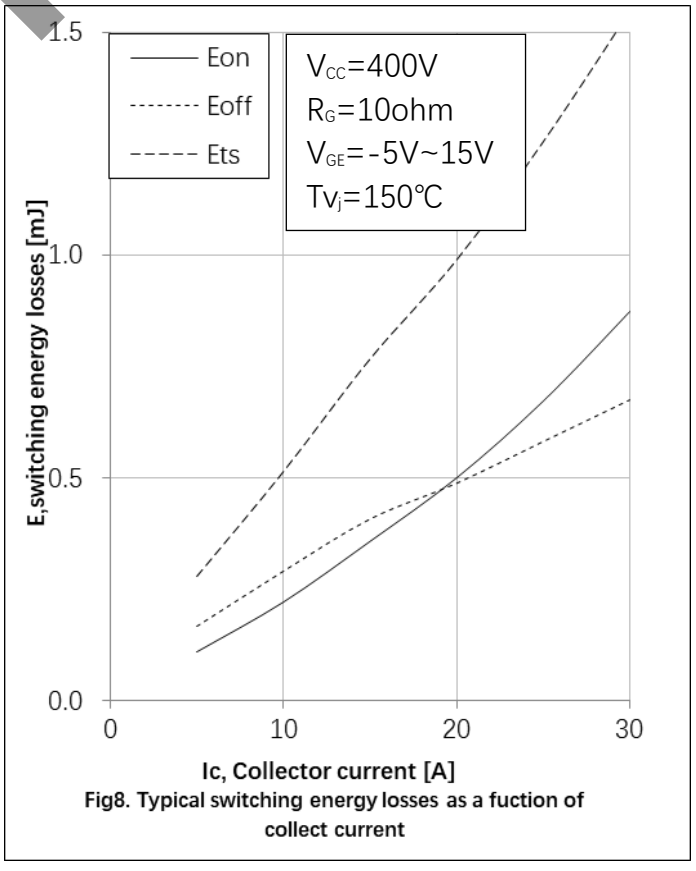


Fig8. Typical switching energy losses as a fuction of collect current

Curve Characteristics

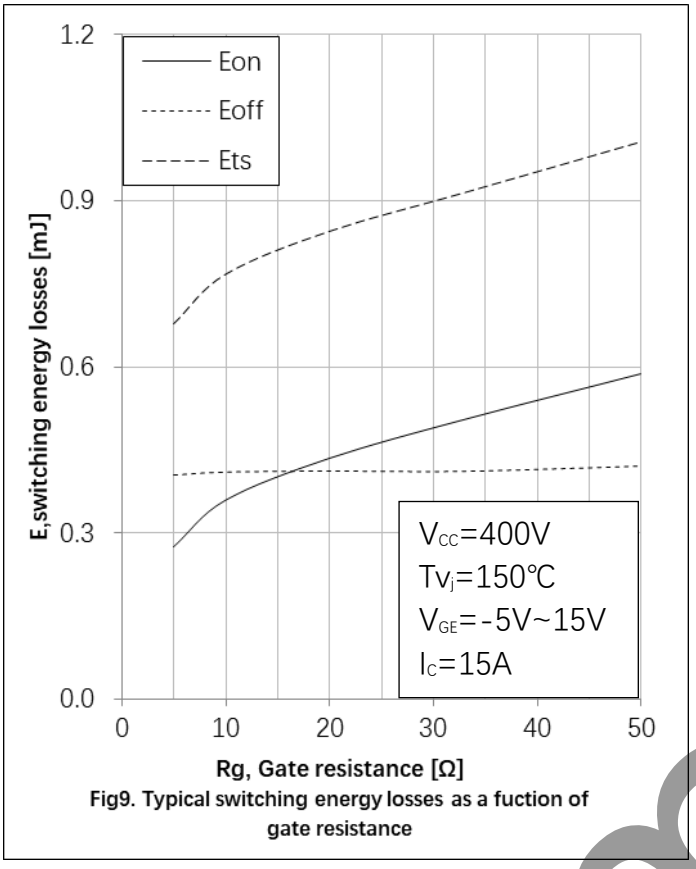


Fig9. Typical switching energy losses as a fuction of gate resistance

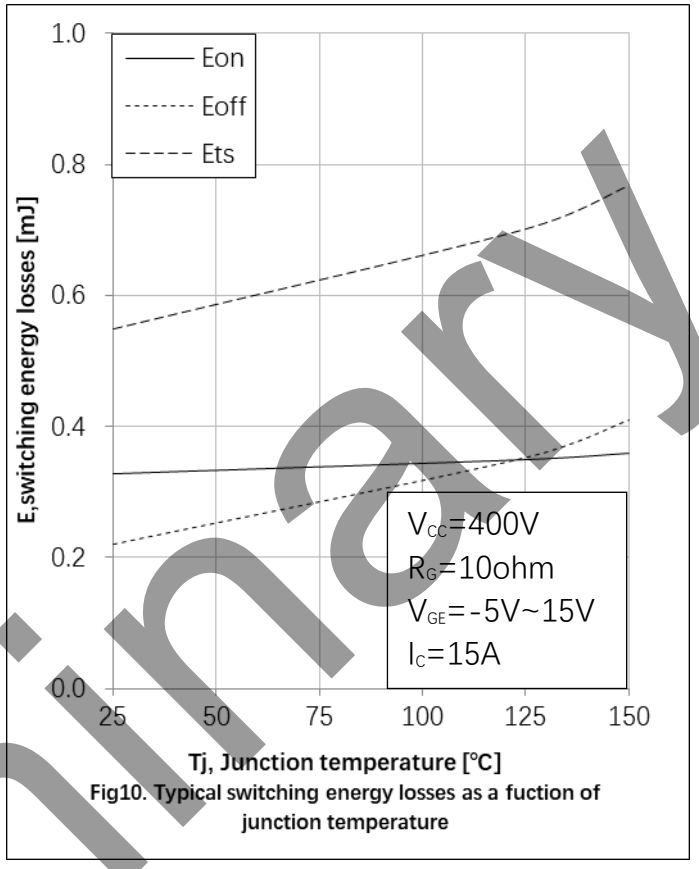


Fig10. Typical switching energy losses as a fuction of junction temperature

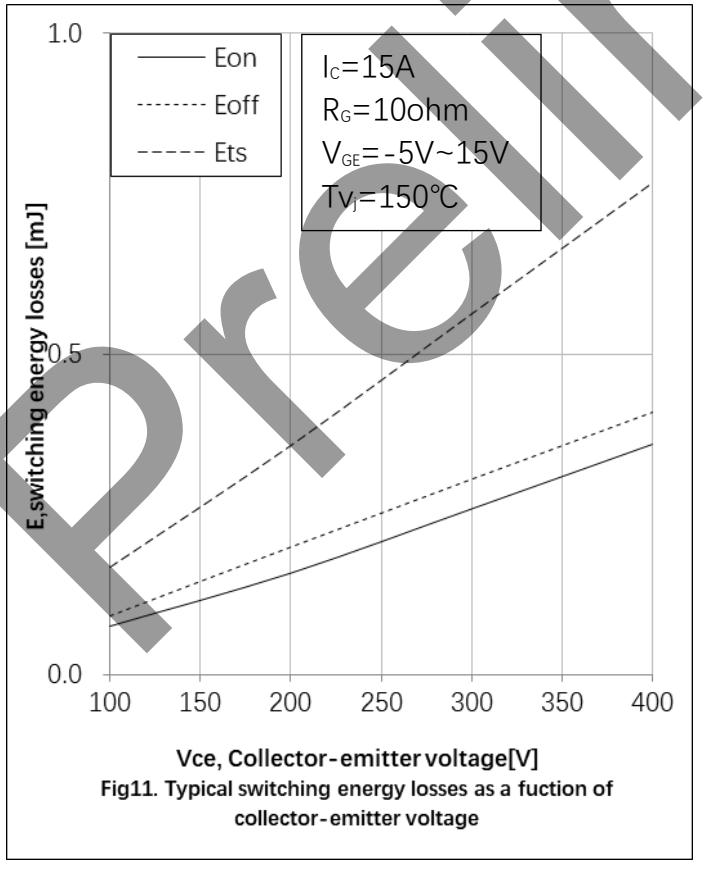


Fig11. Typical switching energy losses as a fuction of collector-emitter voltage

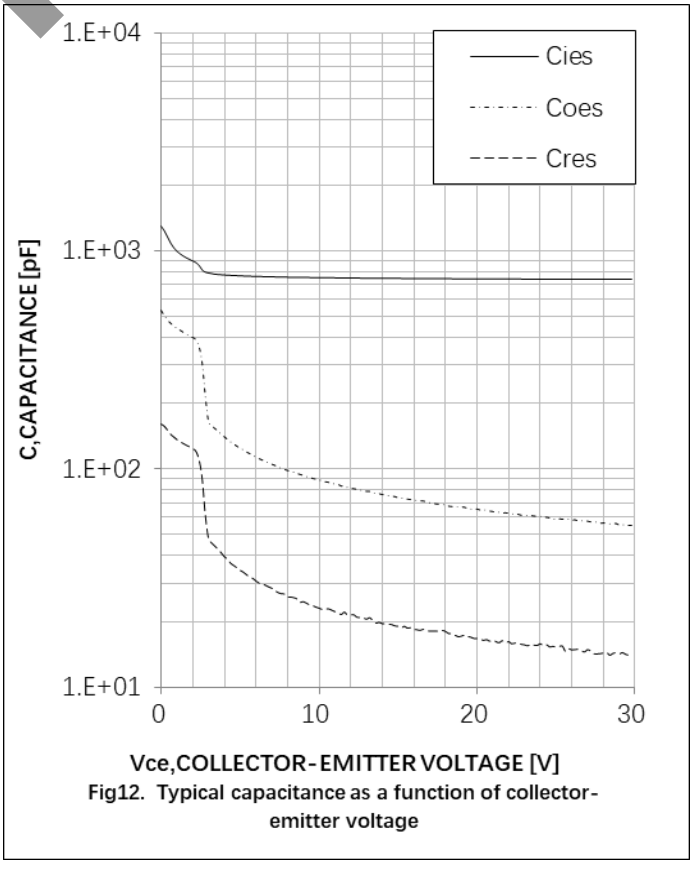


Fig12. Typical capacitance as a function of collector-emitter voltage

Curve Characteristics

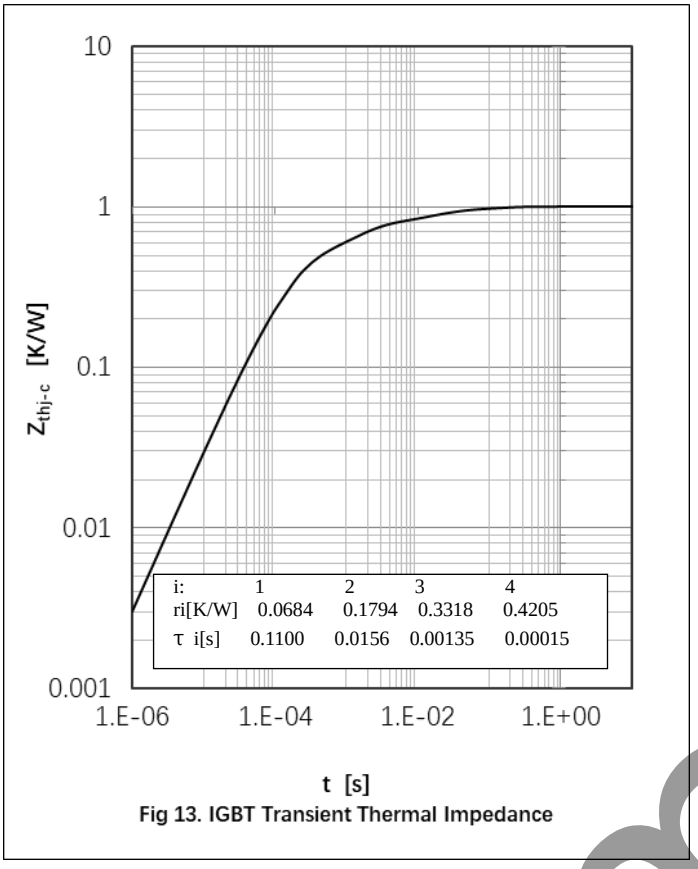


Fig 13. IGBT Transient Thermal Impedance

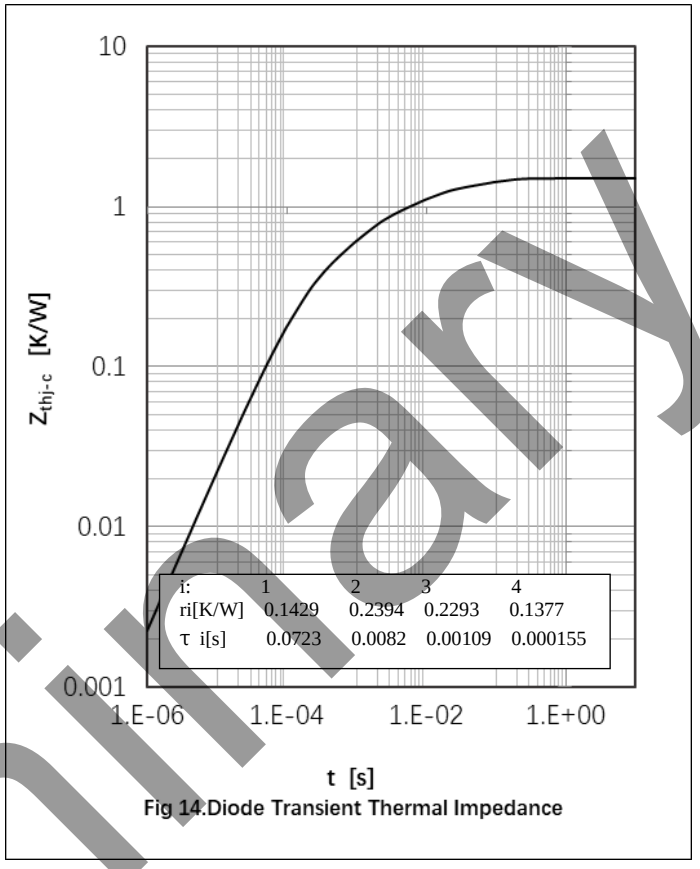


Fig 14.Diode Transient Thermal Impedance

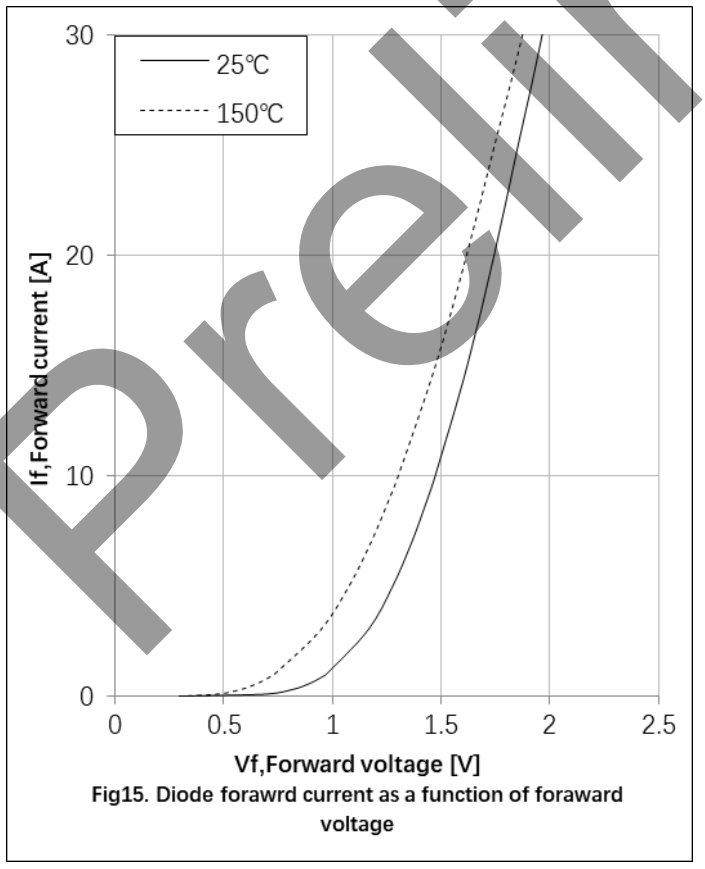


Fig15. Diode forawrd current as a function of foraward voltage

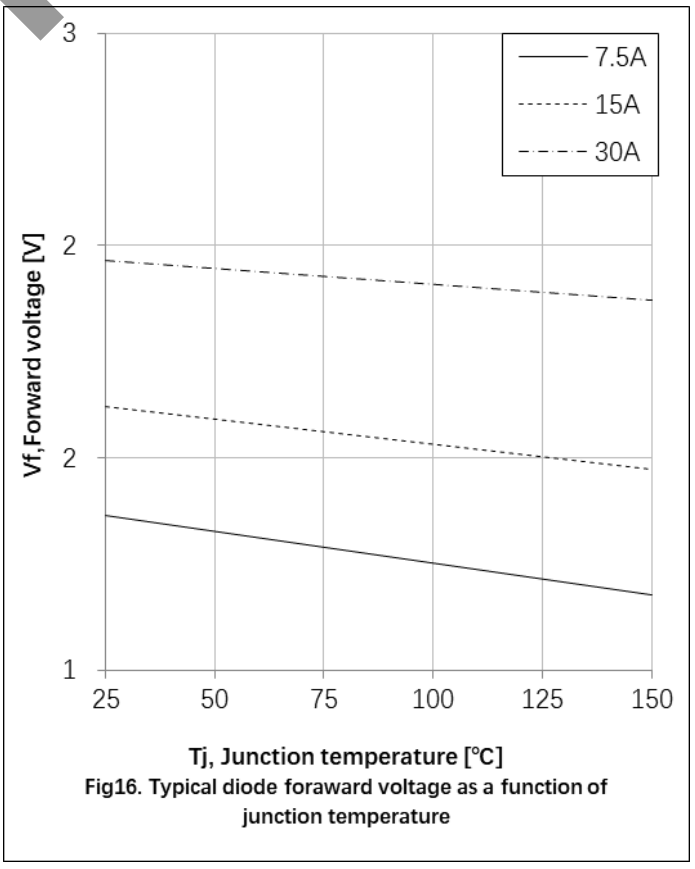


Fig16. Typical diode foraward voltage as a function of junction temperature

Ordering Information

Device	Packing
Part Number-BP	Bulk:50pcs/Tube,1Kpcs/Box,5Kpcs/Carton