Features

- High speed smooth switching device for hard & soft switching
- Maximum Junction Temperature 175℃
- Positive Temperature Coefficient
- High ruggedness, temperature stable
- 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 160A

Applications

- Energy storage inverter
- Uninterruptible power supplies
- Solar inverters

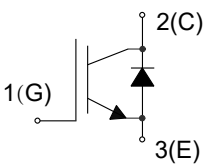
Maximum Ratings

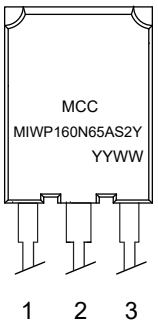
Parameter		Symbol	Rating	Unit
Collector-Emitter Voltage		V_{CE}	650	V
DC Collector Current(3)	T_C=25°C(6)	I_C	180	A
	T_C=100°C		160	
Pulsed Collector Current (4) ,V_{GE}=15V		$I_{C,pluse}$	320	A
Diode Forward Current (3)	T_C=25°C(6)	I_F	180	A
	T_C=100°C		160	
Diode Pulsed Current (4)		$I_{F,pluse}$	320	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			320	A
Power Dissipation,T_C=25℃,T_j=175℃		P_D	714	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. Value limited by bondwire

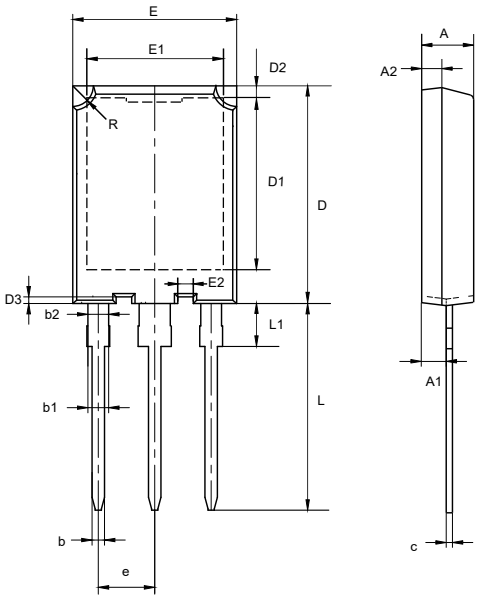
Internal Structure





Device Code: MIWP160N65AS2Y
Date Code: YYWW (Year & Week)

TO-247Plus



DIMENSIONS					
DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	0.192	0.201	4.90	5.10	
A1	0.090	0.099	2.31	2.51	
A2	0.074	0.083	1.90	2.10	
b	0.044	0.050	1.14	1.26	
b1	0.073	0.085	1.86	2.16	
b2	0.077	0.081	1.96	2.06	
c	0.022	0.026	0.58	0.64	
D	0.822	0.831	20.90	21.10	
D1	0.639	0.664	16.25	16.85	
D2	0.041	0.054	1.05	1.35	
D3	0.022	0.031	0.58	0.78	
E	0.618	0.626	15.70	15.90	
E1	0.515	0.532	13.10	13.50	
E2	0.053	0.061	1.35	1.55	
e	0.214(BSC)		5.44(BSC)		
L	0.778	0.791	19.78	20.08	
L1	0.158	0.167	4.03	4.23	
R	0.074	0.083	1.90	2.10	

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=250μA	650			V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE}=15V, I_C=160A, T_j=25°C		1.55	1.85	V
		V_{GE}=15V, I_C=160A, T_j=125°C		1.75		
		V_{GE}=15V, I_C=160A, T_j=150°C		1.85		
G-E Threshold Voltage	$V_{GE(th)}$	I_C=1mA, V_{CE}=V_{GE}	3.2	4.0	4.8	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			3.00	
G-E Leakage Current	I_{GES}	V_{CE}=0V, V_{GE}=±20V			100	nA
Dynamic Characteristics						
Input Capacitance	C_{ies}	V_{CE}=25V,V_{GE}=0V,f=1MHz		6.93		nF
Reverse Transfer Capacitance	C_{res}			0.07		
Gate Charge	Q_G	V_{CC}=400V,I_C=160A,V_{GE}=-5~15V		0.35		μC
IGBT Switching Characteristics						
Turn-On Delay Time	$td_{(on)}$	V_{CC}=400V, I_C=160A, V_{GE}=-5V~15V, R_G=10Ω,Inductive Load T_j=25°C		47		ns
Rise Time	t_r			103		
Turn-Off Delay Time	$td_{(off)}$			210		
Fall Time	t_f			74		
Turn-On Energy	E_{on}			5.75		mJ
Turn-Off Energy	E_{off}			3.69		
Turn-On Delay Time	$td_{(on)}$	V_{CC}=400V, I_C=160A ,V_{GE}=-5V~15V, R_G=10Ω,Inductiv Load T_j=125°C		42		ns
Rise Time	t_r			109		
Turn-Off Delay Time	$td_{(off)}$			214		
Fall Time	t_f			75		
Turn-On Energy	E_{on}			8.36		mJ
Turn-Off Energy	E_{off}			4.42		
Turn-On Delay Time	$td_{(on)}$	V_{CC}=400V, I_C=160A ,V_{GE}=-5V~15V, R_G=10Ω,Inductive Load T_j=150°C		41		ns
Rise Time	t_r			113		
Turn-Off Delay Time	$td_{(off)}$			217		
Fall Time	t_f			76		
Turn-On Energy	E_{on}			9.08		mJ
Total switching energy	E_{off}			4.67		

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=160A, T_j=25°C		2.10	2.60	V
		V_{GE}=0V, I_F=160A, T_j=125°C		1.95		
		V_{GE}=0V, I_F=160A, T_j=150°C		1.90		
Reverse Recovery Current	I_{rr}	V_R=400V, I_F=160A, di/dt=-1200A/μs, T_J=25°C		30		A
Diode Reverse Recovery Time	t_{rr}			55		ns
Reverse Recovery Charge	Q_{rr}			1.05		μC
Reverse Recovery Energy	E_{rec}			0.15		mJ
Reverse Recovery Current	I_{rr}	V_R=400V, I_F=160A, di/dt=-1200A/μs, T_J=125°C		69		A
Diode Reverse Recovery Time	t_{rr}			104		ns
Reverse Recovery Charge	Q_{rr}			4.97		μC
Reverse Recovery Energy	E_{rec}			0.88		mJ
Reverse Recovery Current	I_{rr}	V_R=400V, I_F=160A, di/dt=-1200A/μs, T_J=150°C		89		A
Diode Reverse Recovery Time	t_{rr}			131		ns
Reverse Recovery Charge	Q_{rr}			6.93		μC
Reverse Recovery Energy	E_{rec}			1.27		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}			0.21	°C/W
Thermal Resistance from Junction to Case (Diode)	Rth_{J-C}			0.25	°C/W
Thermal Resistance from Junction to Ambient	Rth_{J-A}			40	°C/W

Curve Characteristics

Fig. 1 - Typical Output Characteristic(T_j=25°C)

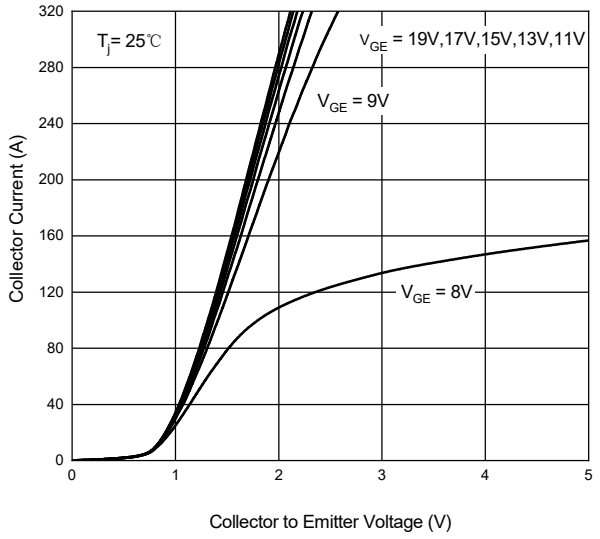


Fig. 2 - Typical Output Characteristic (T_j=150°C)

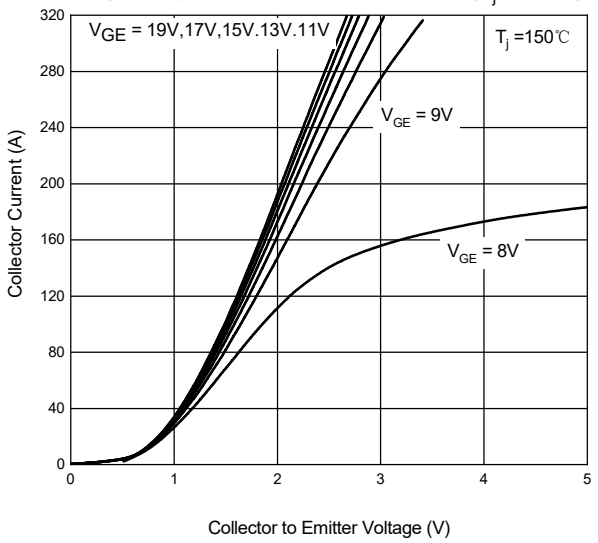


Fig. 3 - Typical Transfer Characteristic

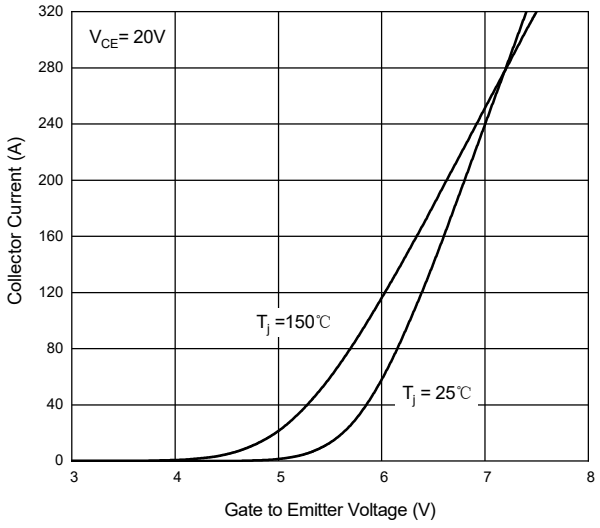


Fig. 4 - Diode Forward Current vs. Forward Voltage

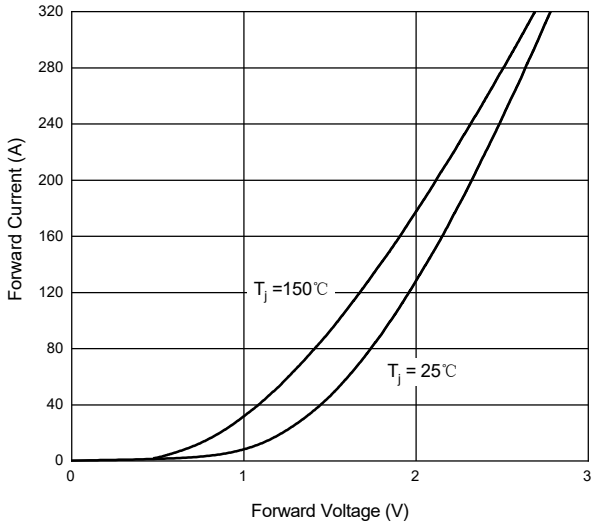


Fig. 5 - Diode V_F vs. Junction Temperature

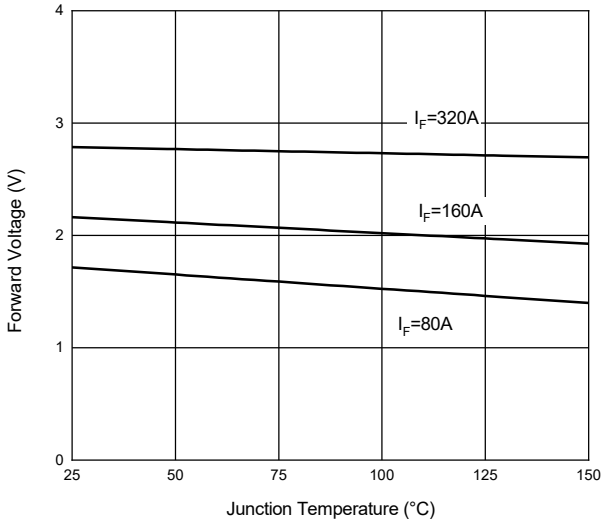
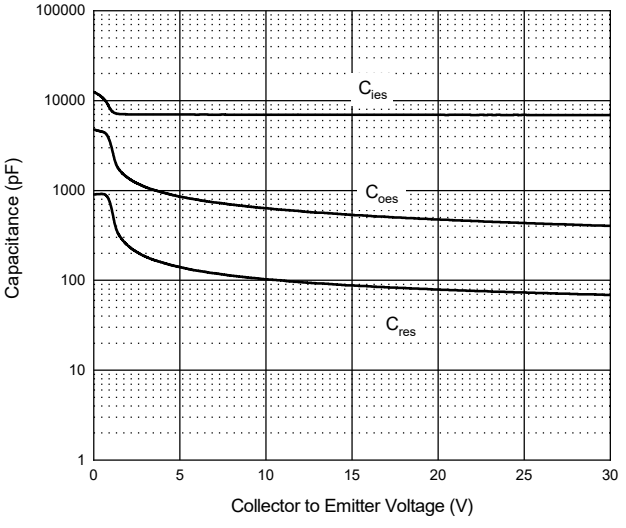


Fig. 6 - Capacitance Characteristics



Curve Characteristics

Fig. 7 - IGBT Switching Loss vs. I_C

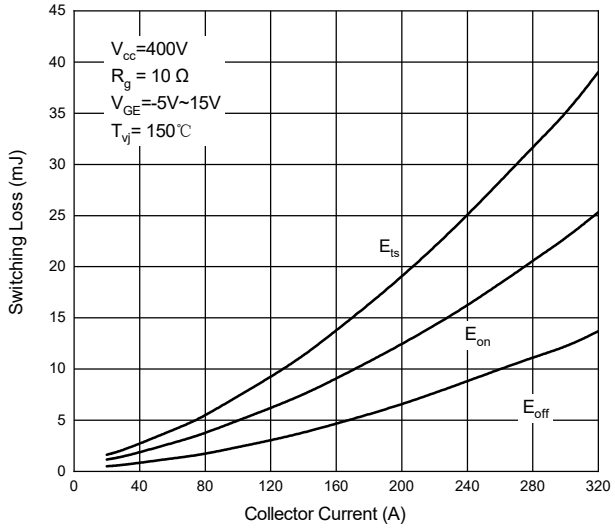


Fig. 8- IGBT Switching Loss vs. R_g

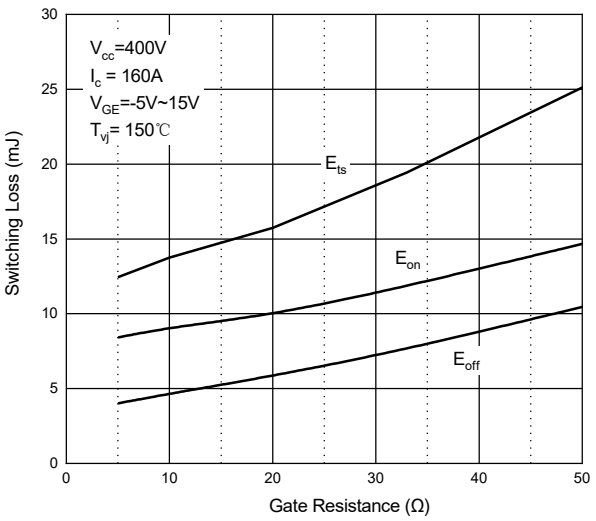


Fig. 9 -IGBT Switching Loss vs. Junction Temperature

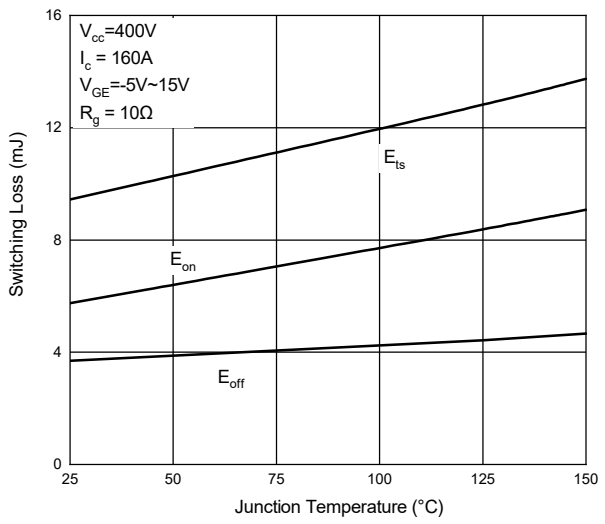


Fig. 10 - Switching Loss vs.V_{CE}

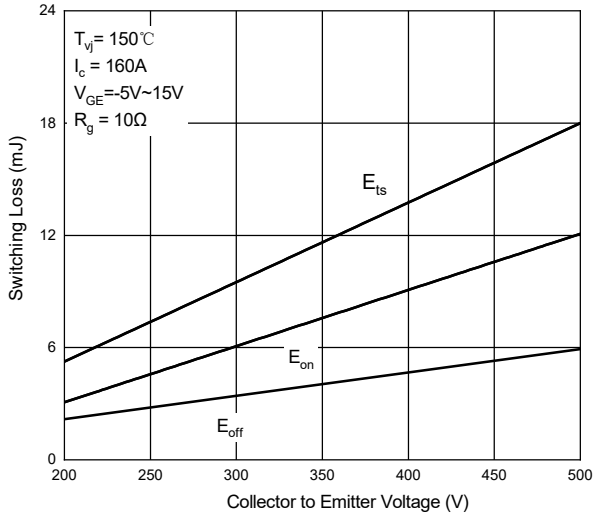


Fig. 11 - $V_{CE(sat)}$ vs. Junction Temperature

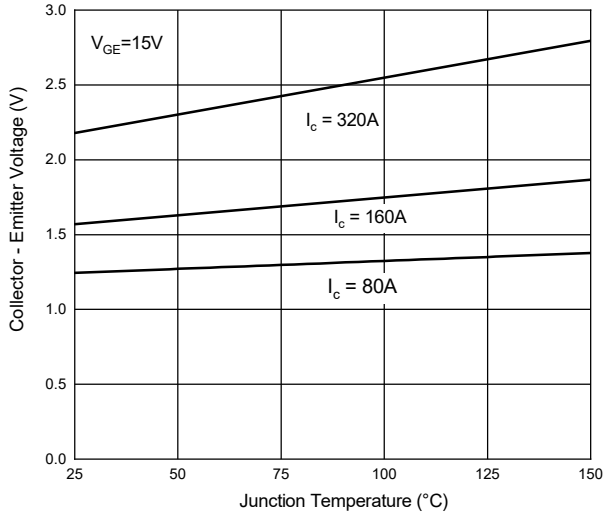
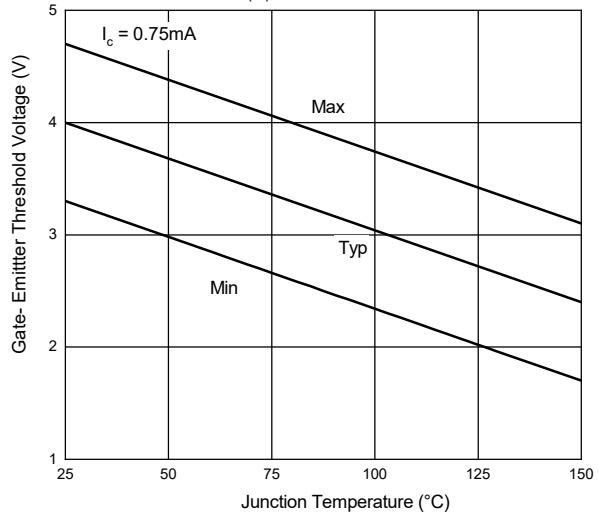


Fig. 12 - $V_{GE(th)}$ vs. Junction Temperature



Curve Characteristics

Fig. 13 - Switching Time vs. Collect Current

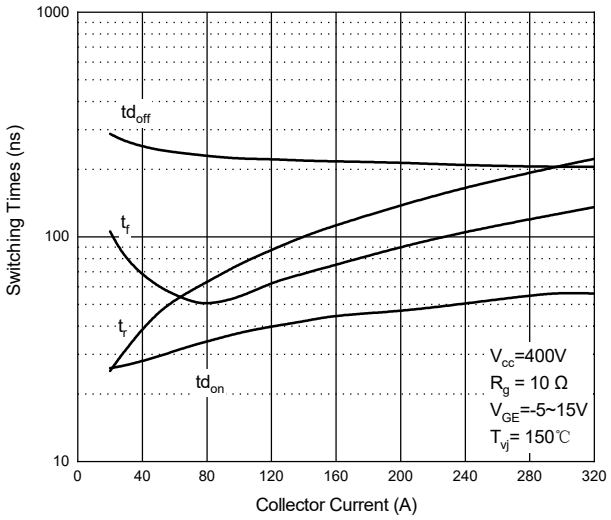


Fig. 14 - Switching Time vs. Gate Resistance

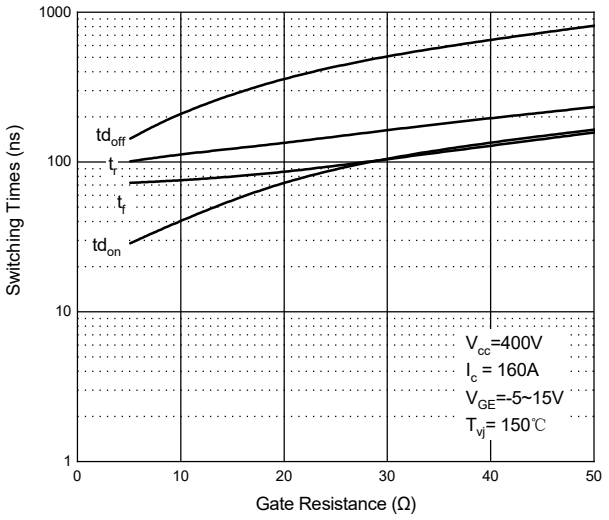


Fig. 15 - Switching Time vs. Juction temperature

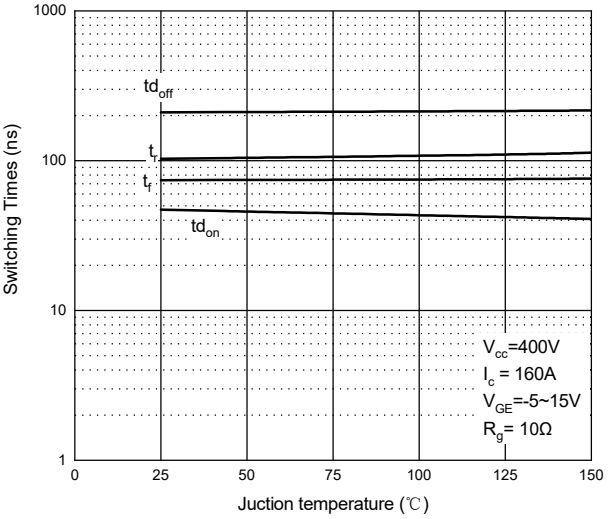


Fig. 16 - IGBT Transient Thermal Impedance

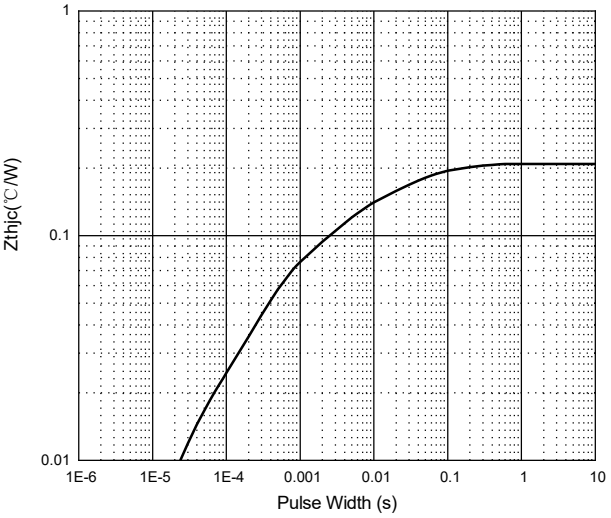


Fig. 17- Diode Transient Thermal Impedance

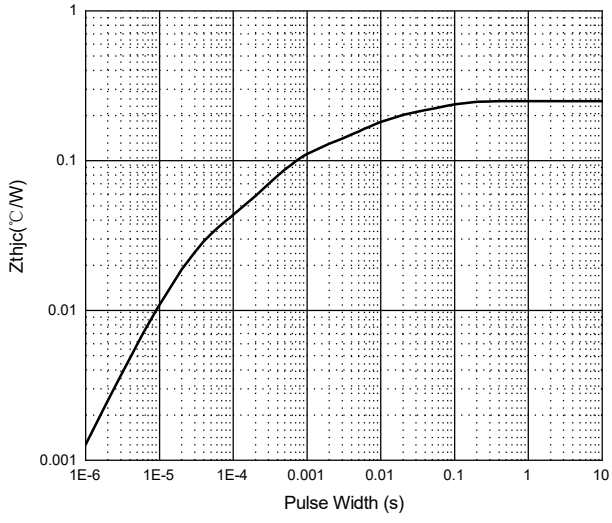
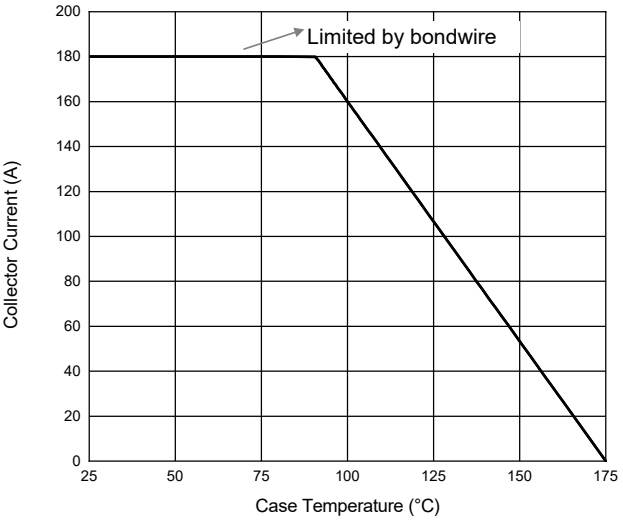


Fig. 18 - Collector Current vs. Case Temperature



Curve Characteristics

Fig. 19 - Power Derating

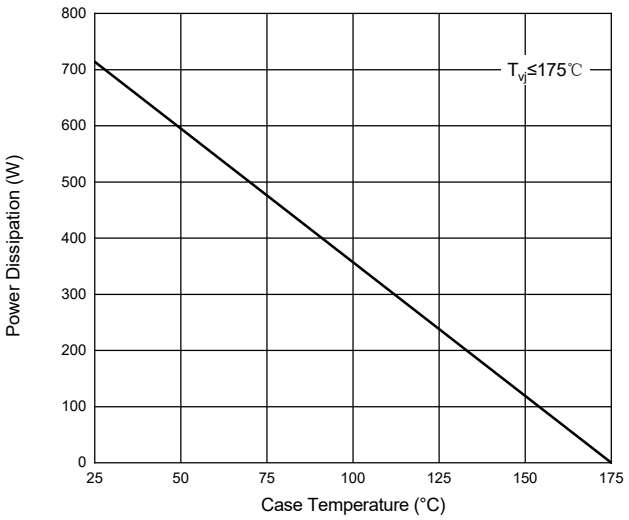
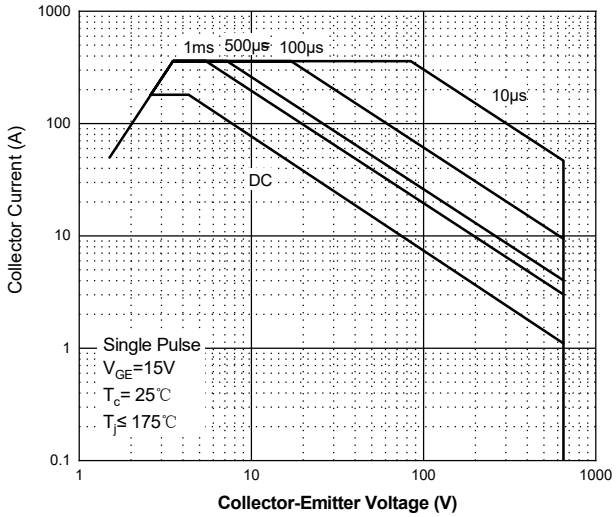


Fig. 20 -FBSOA



Ordering Information

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