Features

- High Speed Smooth Switching Device for Hard & Soft Switching
- Positive Temperature Coefficient
- High Ruggedness ,Temperature Stable
- Maximum junction temperature 175℃
- 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 60A

Applications

- Solar converters
- Uninterruptible power supplies
- Mid to high range switching frequency converters
- Welding Converters

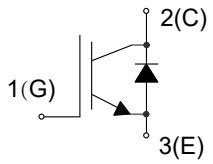
Maximum Ratings

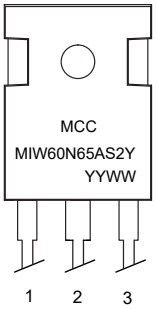
Parameter		Symbol	Rating	Unit
Collector-Emitter Voltage		V_{CE}	650	V
DC Collector Current (Note 3)	T_C=25°C	I_C	80 (Note 4)	A
	T_C=100°C		60	
Pulsed Collector Current, V_{GE}=15V (Note 5)		$I_{C,pluse}$	240	A
Diode Forward Current (Note 3)	T_C=25°C	I_F	80 (Note 4)	A
	T_C=100°C		60	
Diode Pulsed Current (Note 5)		$I_{F,pluse}$	240	A
Gate-Emitter Voltage		V_{GE}	±20	V
Transient Gate-Emitter Voltage (Note 6)			±30	
Power Dissipation	T_C=25°C	P_D	283	W
	T_C=100°C		141.5	

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. Value limited by bondwire.
5. T_p limited by T_{jmax}.
6. T_p≤10us, Duty Cycle<1%

Internal Structure

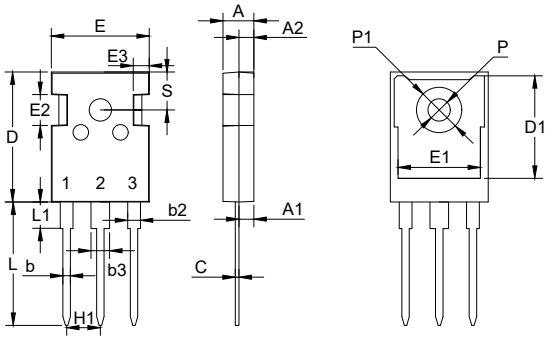




Device Code: MIW60N65AS2Y

Date Code: YYWW (Year & Week)

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 of the IGBT @ T_j=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=60A, T_j=25℃	1.20	1.50	1.80	V
		V_{GE}=15V, I_C=60A, T_j=125℃		1.70		
		V_{GE}=15V, I_C=60A, T_j=150℃		1.80		
G-E Threshold Voltage	$V_{GE(th)}$	I_C=0.50mA, V_{CE}=V_{GE}	3.0	4.0	5.0	V
C-E Leakage Current	I_{CES}	V_{CE}=650V, V_{GE}=0V, T_j=25℃			0.25	mA
		V_{CE}=650V, V_{GE}=0V, T_j=150℃			3	
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		2.86		nF
Reverse Transfer Capacitance	C_{res}			0.02		
Gate Charge	Q_g	V_{CC}=520V,I_C=60A,V_{GE}=15V		0.18		μC
IGBT Switching Characteristics						
Turn-On Delay Time	$td_{(on)}$	V_{CC}=400V, I_C=60A, V_{GE}=-5V~15V, R_G=10Ω,T_j=25℃ Inductive Load		27		ns
Rise Time	t_r			41		
Turn-Off Delay Time	$td_{(off)}$			81		
Fall Time	t_f			45		
Turn-On Energy	E_{on}			2.47		mJ
Turn-Off Energy	E_{off}			0.67		
Turn-On Delay Time	$td_{(on)}$	V_{CC}=400V, I_C=60A, V_{GE}=-5V~15V, R_G=10Ω,T_j=125℃ Inductive Load		28		ns
Rise Time	t_r			49		
Turn-Off Delay Time	$td_{(off)}$			88		
Fall Time	t_f			57		
Turn-On Energy	E_{on}			2.53		mJ
Turn-Off Energy	E_{off}			0.89		
Turn-On Delay Time	$td_{(on)}$	V_{CC}=400V, I_C=60A, V_{GE}=-5V~15V, R_G=10Ω,T_j=150℃ Inductive Load		29		ns
Rise Time	t_r			52		
Turn-Off Delay Time	$td_{(off)}$			93		
Fall Time	t_f			66		
Turn-On Energy	E_{on}			2.57		mJ
Turn-Off Energy	E_{off}			0.93		

Electrical Characteristics of the Diode @ T_j=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=60A, T_j=25℃		1.70	2.10	V
		V_{GE}=0V, I_F=60A, T_j=125℃		1.60		
		V_{GE}=0V, I_F=60A, T_j=150℃		1.50		
Reverse Recovery Current	I_{rr}	V_R=400V, I_F=60A, di_F/dt=-460A/μs, T_j=25℃		16		A
Diode Reverse Recovery Time	t_{rr}			155		ns
Reverse Recovery Charge	Q_{rr}			1.76		μC
Reverse Recovery Energy	E_{rec}			0.34		mJ
Reverse Recovery Current	I_{rr}	V_R=400V, I_F=60A, di_F/dt=-460A/μs, T_j=125℃		22		A
Diode Reverse Recovery Time	t_{rr}			196		ns
Reverse Recovery Charge	Q_{rr}			2.83		μC
Reverse Recovery Energy	E_{rec}			0.71		mJ
Reverse Recovery Current	I_{rr}	V_R=400V, I_F=60A, di_F/dt=-460A/μs, T_j=150℃		25		A
Diode Reverse Recovery Time	t_{rr}			227		ns
Reverse Recovery Charge	Q_{rr}			3.66		μC
Reverse Recovery Energy	E_{rec}			0.85		mJ

Thermal characteristics

Parameter	Symbol	Min	Typ	Max	Units
Operating Junction Temperature Range	T_j	-40		175	℃
Storage Temperature Range	T_{stg}	-55		150	℃
Thermal Resistance from Junction to Case (IGBT)	Rth_{J-C}			0.53	℃/W
Thermal Resistance from Junction to Case (Diode)	Rth_{J-C}			1.05	℃/W
Thermal Resistance from Junction to Ambient	Rth_{J-A}			40	℃/W

Curve Characteristics

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

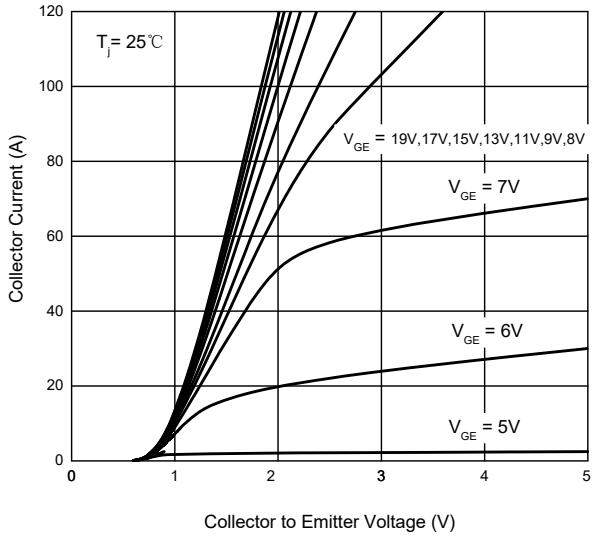


Fig. 2 - Typical Output Characteristic (T_j=150°C)

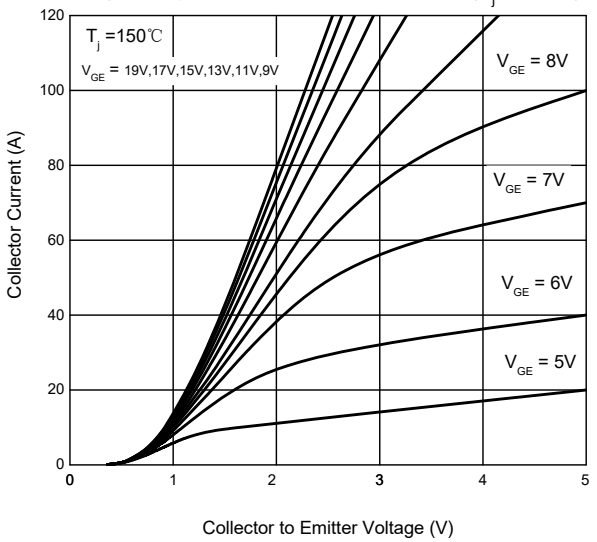


Fig. 3 - Typical Transfer Characteristic

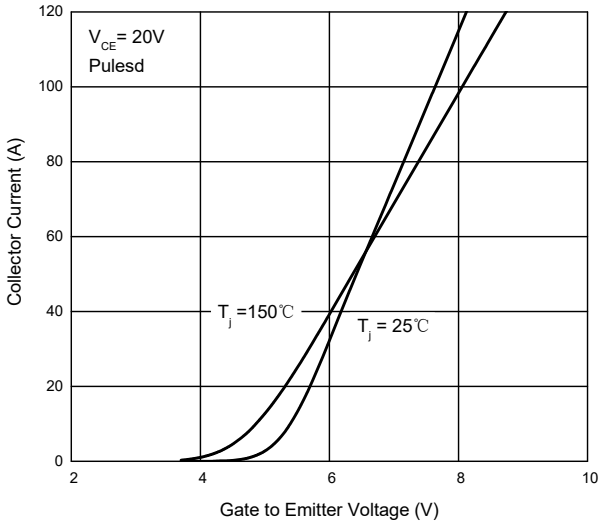


Fig. 4 - Diode Forward Current vs. Forward Voltage

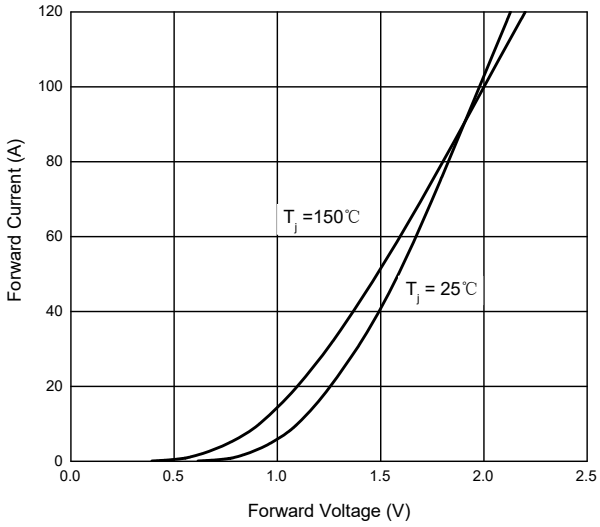


Fig. 5 - Diode VF vs. Junction Temperature

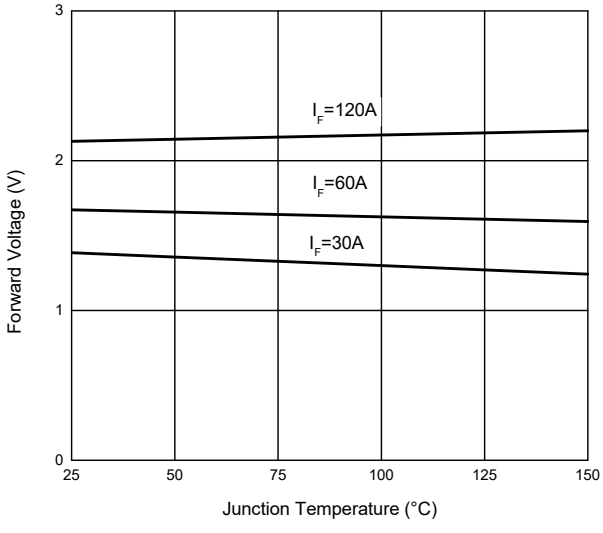
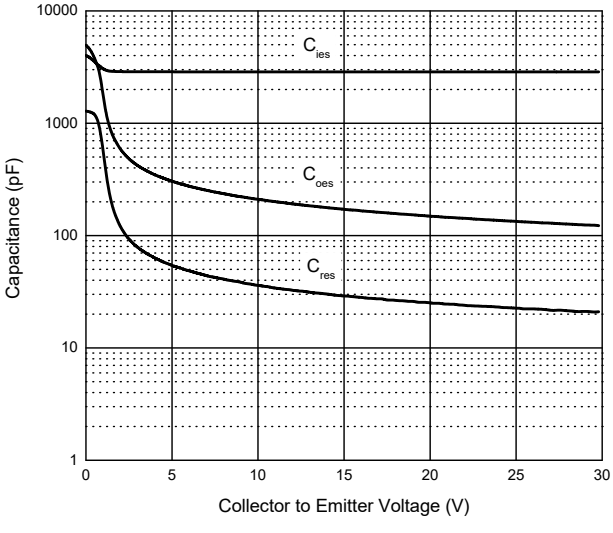


Fig. 6 - Capacitance Characteristics



Curve Characteristics

Fig. 7 - IGBT Switching Loss vs. I_C

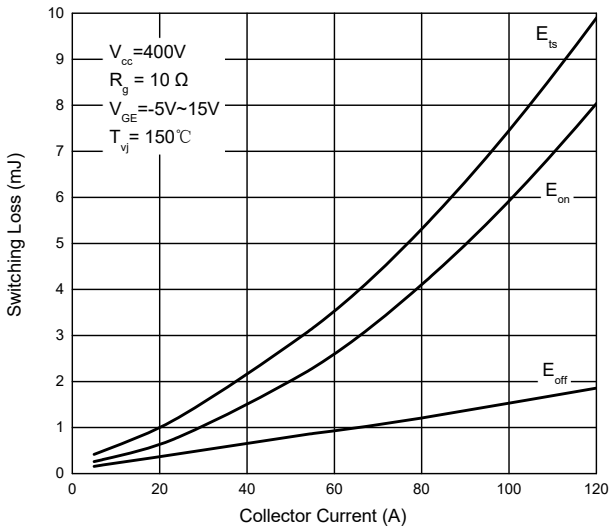


Fig. 8- IGBT Switching Loss vs. R_g

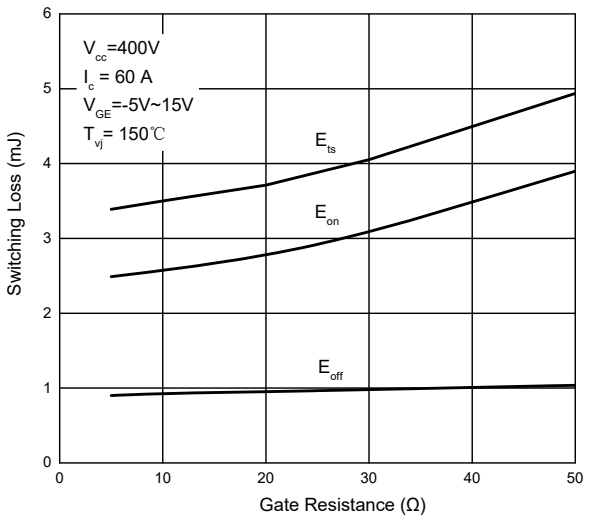


Fig. 9 -IGBT Switching Loss vs. Junction Temperature

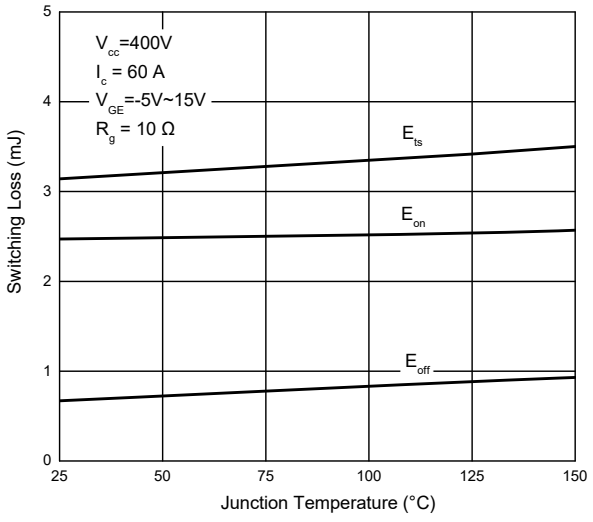


Fig. 10 - Switching Loss vs. V_{CE}

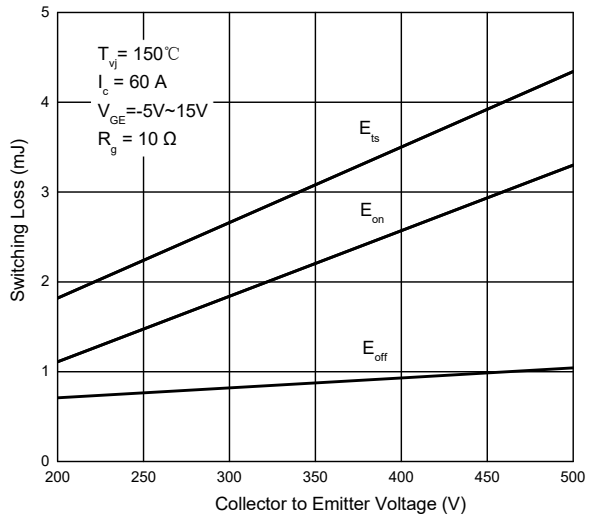


Fig. 11 - $V_{CE(sat)}$ vs. Junction Temperature

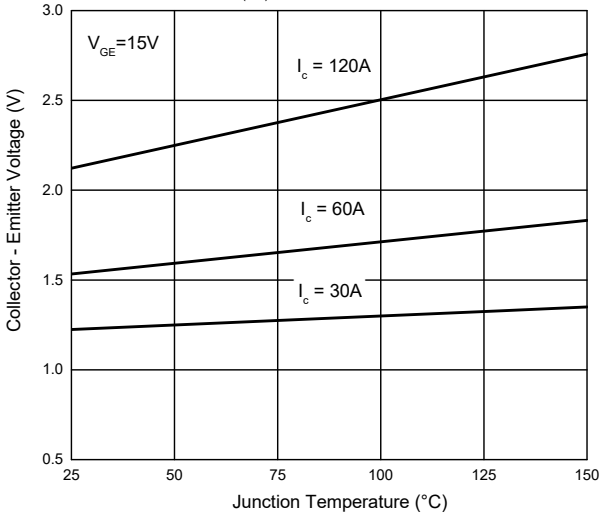
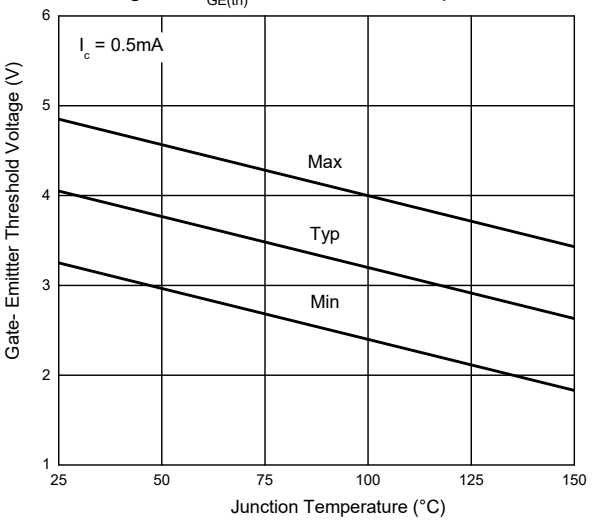


Fig. 12-$V_{GE(th)}$ vs. Junction Temperature



Curve Characteristics

Fig. 13 - Switching Times vs. Collect Current

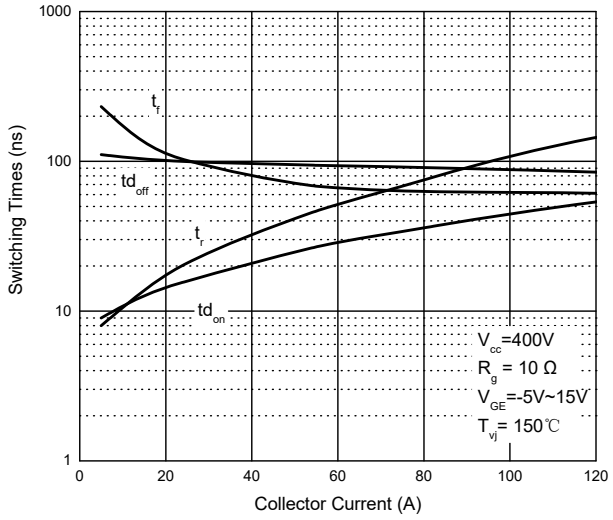


Fig. 14 - Switching Times vs. Gate Resistance

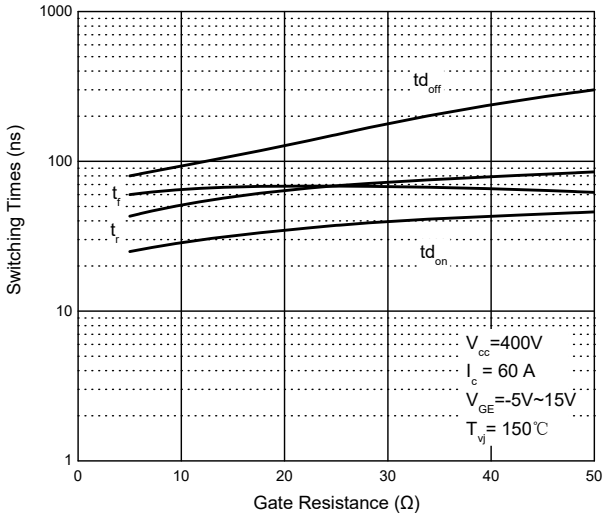


Fig. 15 - IGBT Transient Thermal Impedance

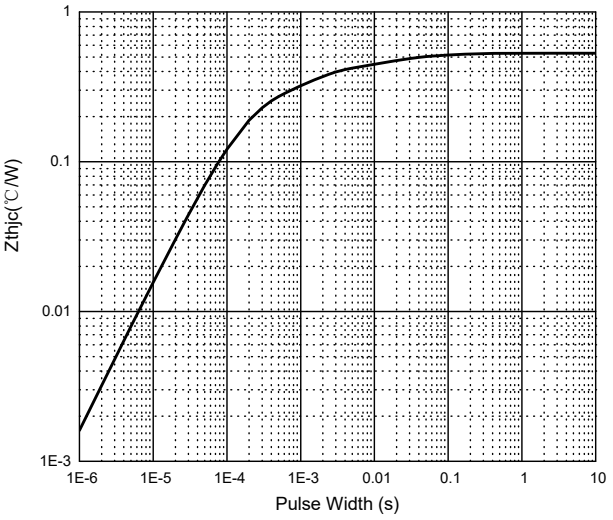


Fig. 16 - Diode Transient Thermal Impedance

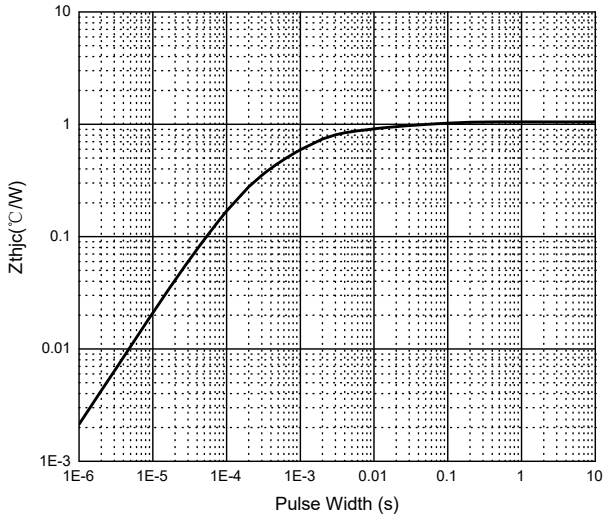


Fig. 17 - Collector Current vs. Case Temperature

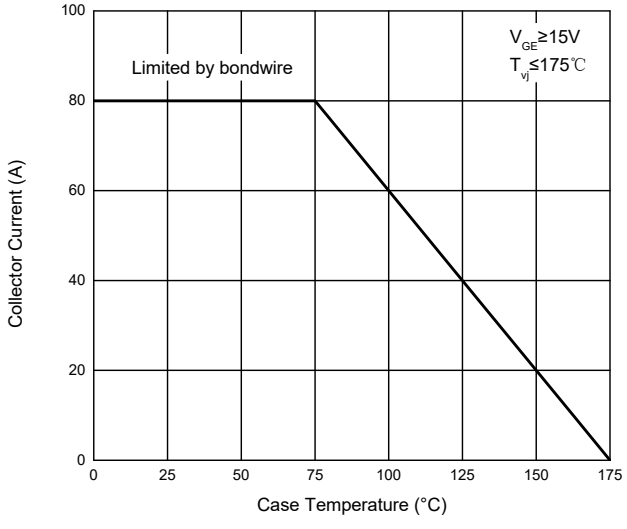
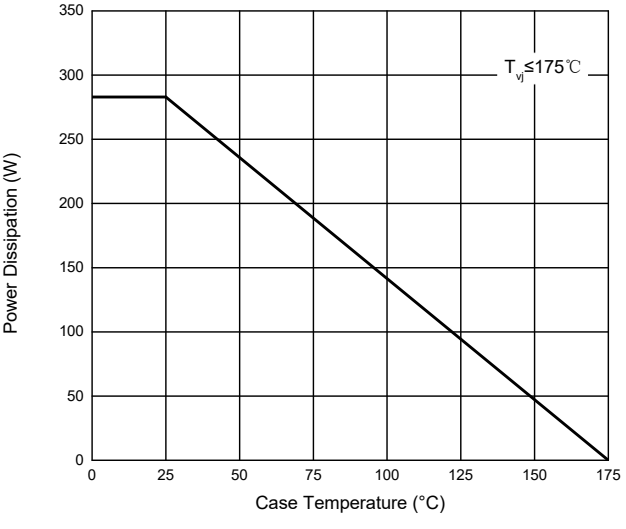
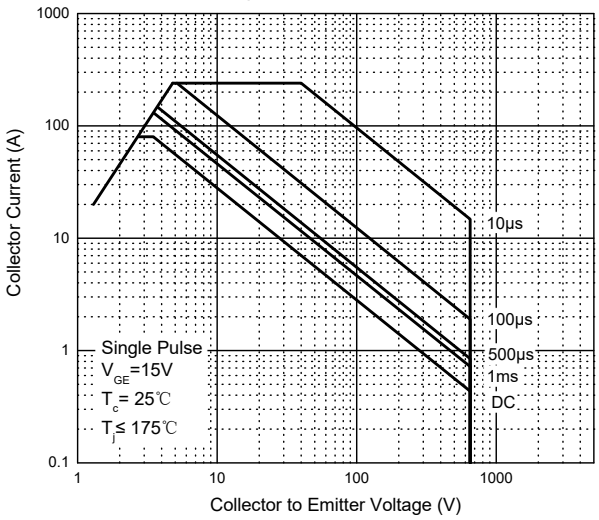


Fig. 18 - Power Derating



Curve Characteristics

Fig. 19 -FBSOA



Ordering Information

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