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 ("P" Suffix Designates RoHS Compliant. See Ordering Information)

Trench and Field Stop IGBT 650V 50A

Applications

- Frequency Converters
- AC and DC servo drive amplifier
- Uninterruptible power supply

Maximum Ratings

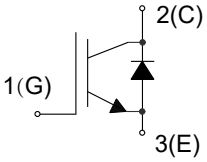
- Operating Junction Temperature Range : -40°C to +175°C
- Storage Temperature Range: -55°C to +150°C
- IGBT Thermal Resistance: 0.49°C/W Junction to Case
- Diode Thermal Resistance: 1.05°C/W Junction to Case
- Thermal Resistance: 40°C/W Junction to Ambient

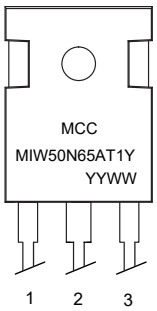
Parameter		Symbol	Rating	Unit
Collector-Emitter Voltage		V_{CE}	650	V
DC Collector Current(2)	T_C=25°C(3)	I_C	80	A
	T_C=100°C		50	
Pulsed Collector Current (4) V_{GE}=15V		I_{CM}	150	A
Diode Forward Current (2)	T_C=25°C(3)	I_F	80	A
	T_C=100°C		50	
Diode Pulsed Current (4)		$I_{F,puls}$	150	A
Gate-Emitter Voltage		V_{GE}	±20	V
Transient Gate-Emitter Voltage(5)			±30	
Short Circuit Withstand Time V_{GE}=15V, V_{CC}=300V, V_{CEM}≤650V		t_{SC}	5	μs
Turn off Safe Operating Area V_{CE}≤ 650V,T_j=150℃			150	A
Power Dissipation,T_j=175℃,Tc=25℃		P_D	306	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. Limited by T_{Jmax}.
3. Limited by bondwire
4. T_p limited by T_{Jmax}.
5. tp≤10us，D≤0.01

Internal Structure

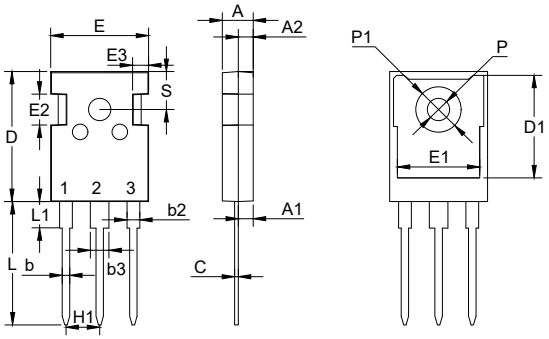




Device Code: MIW50N65AT1Y

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 @ 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℃	1.2	1.5	1.8	V
		V_{GE}=15V, I_C=50A, T_J=125℃		1.7		
		V_{GE}=15V, I_C=50A, T_J=150℃		1.8		
G-E Threshold Voltage	$V_{GE(th)}$	I_C=1mA, V_{GE}=V_{CE}	4.7	5.5	6.2	V
C-E Leakage Current	I_{CES}	V_{CE}=650V, V_{GE}=0V, TJ=25℃			0.25	mA
		V_{CE}=650V, V_{GE}=0V, T_J=150℃			3.0	
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		3.19		nF
Reverse Transfer Capacitance	C_{res}			0.05		
Gate Charge	Q_g	V_{CC}=520V,I_C=50A,V_{GE}=15V		0.15		μC
Short Circuit Collector Current	I_{sc}	V_{GE}=15V, tsc≤5us, V_{cc}=300V		272		A
IGBT Switching Characteristics						
Turn-On Delay Time	$td_{(on)}$	V_{CC}=400V, I_C=50A, V_{GE}=-15~15V, R_G=10Ω Inductive Load		20		ns
Rise Time	t_r			59		
Turn-Off Delay Time	$td_{(off)}$			103		
Fall Time	t_f			112		
Turn-On Energy	E_{on}			3.18		mJ
Turn-Off Energy	E_{off}			1.25		
Total switching energy	E_{ts}			4.43		
Turn-On Delay Time	$td_{(on)}$	V_{CC}=400V, I_C=50A, V_{GE}=-15~15V, R_G=10Ω, T_J=125℃ Inductive Load		21		ns
Rise Time	t_r			60		
Turn-Off Delay Time	$td_{(off)}$			112		
Fall Time	t_f			153		
Turn-On Energy	E_{on}			3.36		mJ
Turn-Off Energy	E_{off}			1.62		
Total switching energy	E_{ts}			4.98		
Turn-On Delay Time	$td_{(on)}$	V_{CC}=400V, I_C=50A, V_{GE}=-15~15V, R_G=10Ω, T_J=150℃ Inductive Load		22		ns
Rise Time	t_r			62		
Turn-Off Delay Time	$td_{(off)}$			116		
Fall Time	t_f			171		
Turn-On Energy	E_{on}			3.44		mJ
Turn-Off Energy	E_{off}			1.78		
Total switching energy	E_{ts}			5.22		

Electrical Characteristics @ 25°C (Unless Otherwise Specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Static Characteristics						
Diode Forward Voltage	V_F	I_F=50A, T_J=25℃		1.6	2.0	V
		I_F=50A, T_J=125℃		1.5		
		I_F=50A, T_J=150℃		1.4		
Diode Dynamic Characteristics						
Reverse Recovery Current	I_{rr}	V_R=400V, I_F=50A, -di_F/dt=450A/μs, T_J=25℃		15		A
Reverse Recovery Charge	Q_{rr}			1.58		uC
Diode reverse recovery time	t_{rr}			148		ns
Reverse Recovery Energy	E_{rec}			0.29		mJ
Reverse Recovery Current	I_{rr}	V_R=400V, I_F=50A, -di_F/dt=450A/μs, T_J=125℃		21		A
Reverse Recovery Charge	Q_{rr}			2.54		μC
Diode reverse recovery time	t_{rr}			183		ns
Reverse Recovery Energy	E_{rec}			0.65		mJ
Reverse Recovery Current	I_{rr}	V_R=400V, I_F=50A, -di_F/dt=450A/μs, T_J=150℃		24		A
Reverse Recovery Charge	Q_{rr}			3.59		μC
Diode reverse recovery time	t_{rr}			218		ns
Reverse Recovery Energy	E_{rec}			0.79		mJ

Curve Characteristics

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

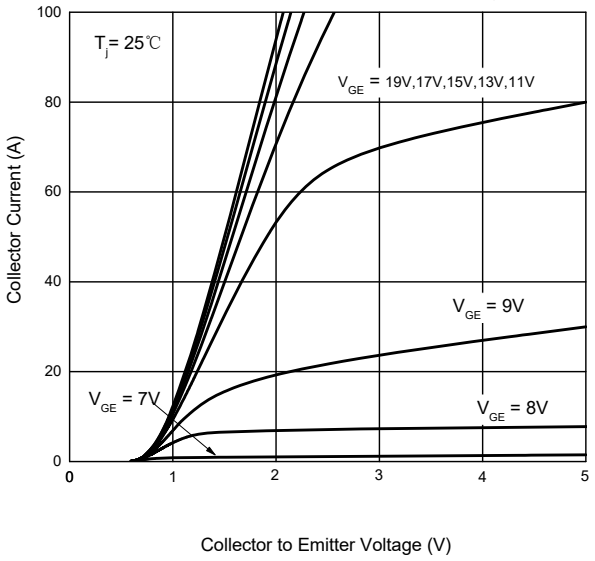


Fig. 2 - Typical Output Characteristic (T_j=150°C)

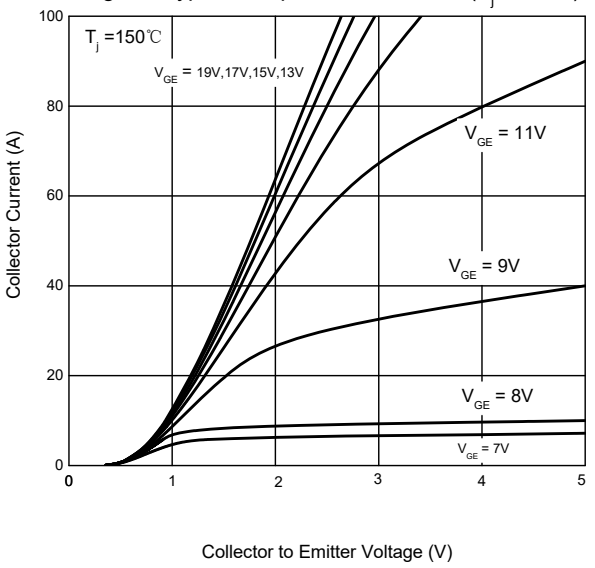


Fig. 3 - Typical Transfer Characteristic

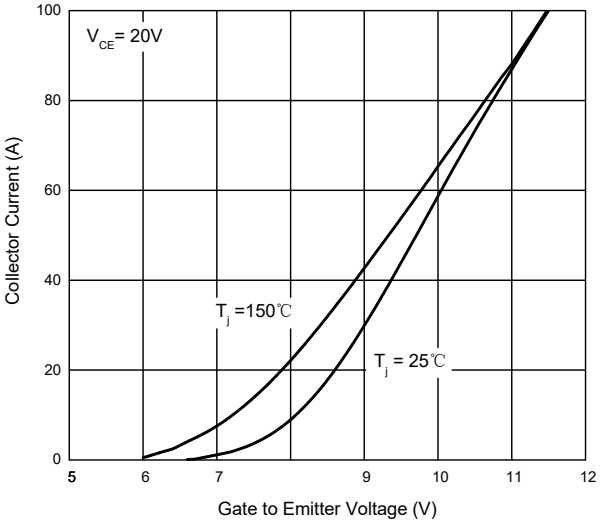


Fig. 4 - Diode Forward Current vs. Forward Voltage

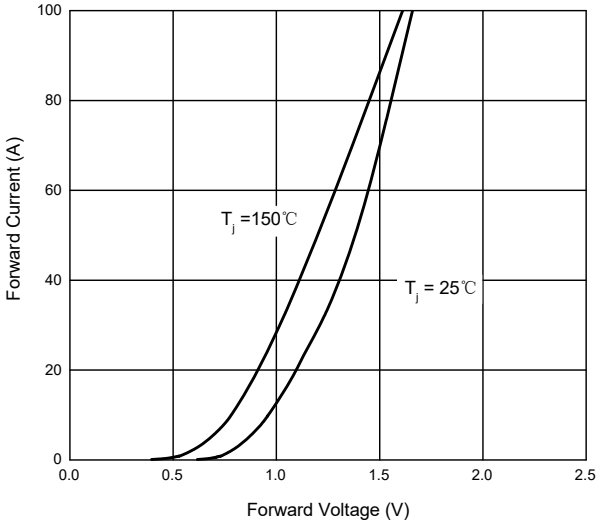


Fig. 5 - Diode VF vs. Junction Temperature

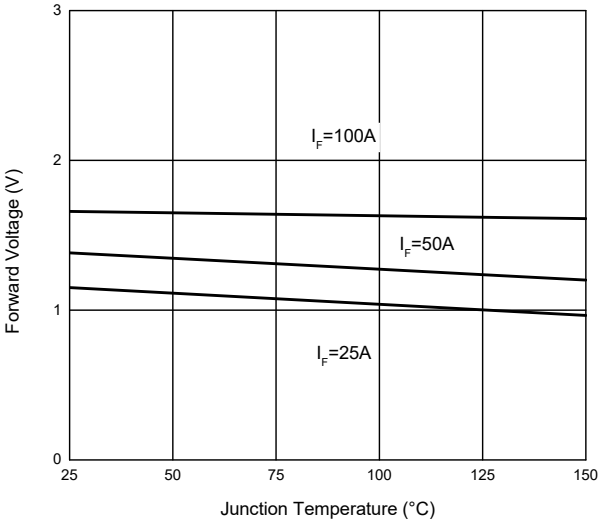
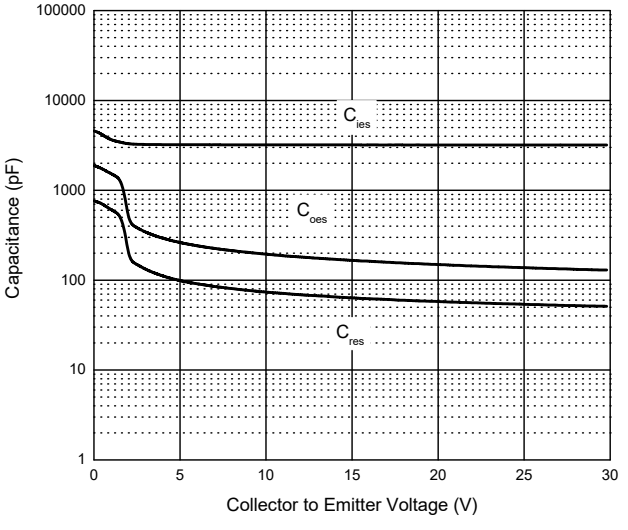


Fig. 6 - Capacitance Characteristics



Curve Characteristics

Fig. 7 - IGBT Switching Loss vs. IC

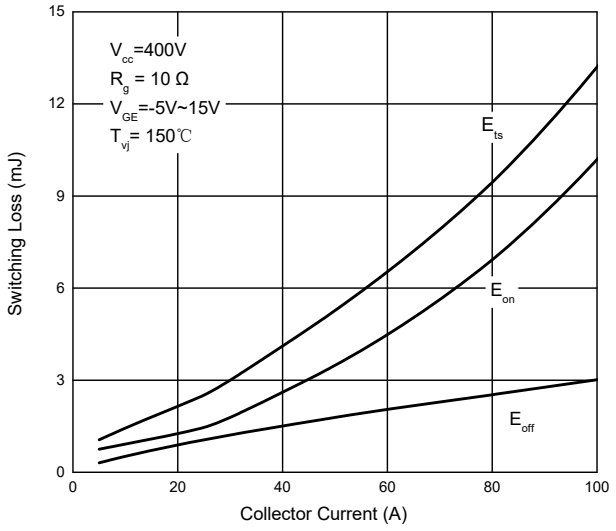


Fig. 8- IGBT Switching Loss vs. R_g

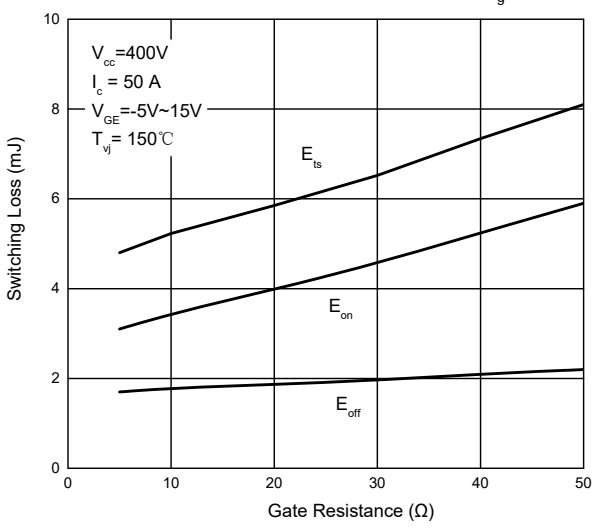


Fig. 9 -IGBT Switching Loss vs. Junction Temperature

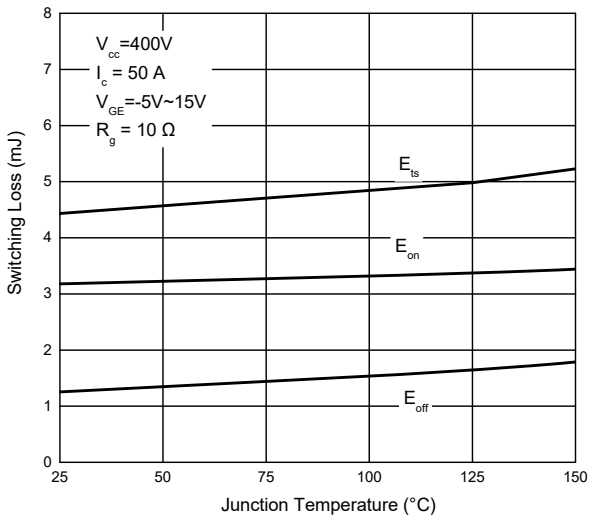


Fig. 10 - Switching Loss vs. VCE

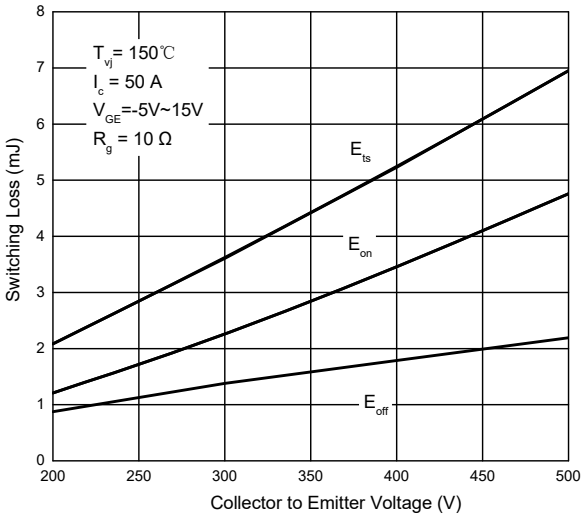


Fig. 11 - $V_{CE(sat)}$ vs. Junction Temperature

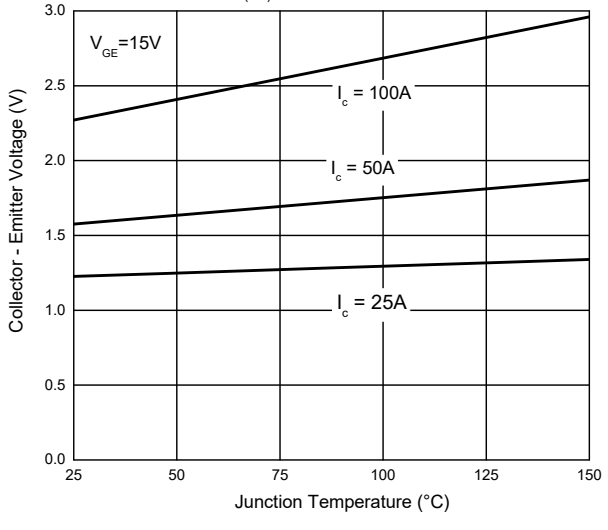
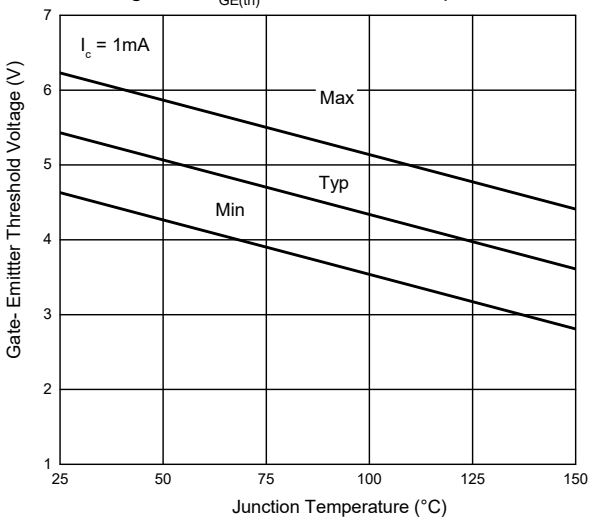


Fig. 12 $V_{GE(th)}$ vs. Junction Temperature



Curve Characteristics

Fig. 13 - Switching Time vs. Collect Current

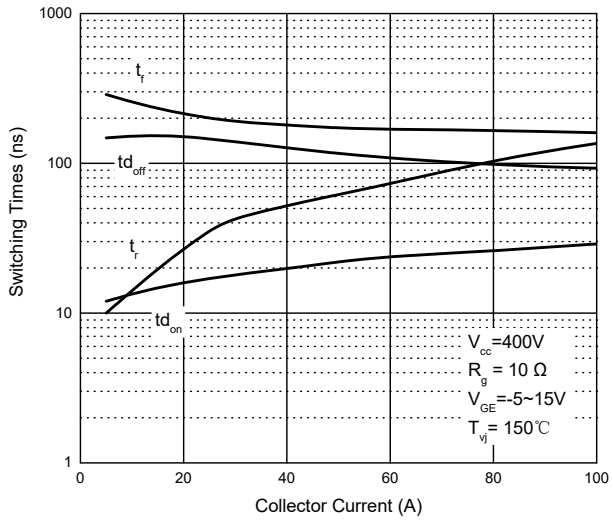


Fig. 14 - Switching Time vs. Gate Resistance

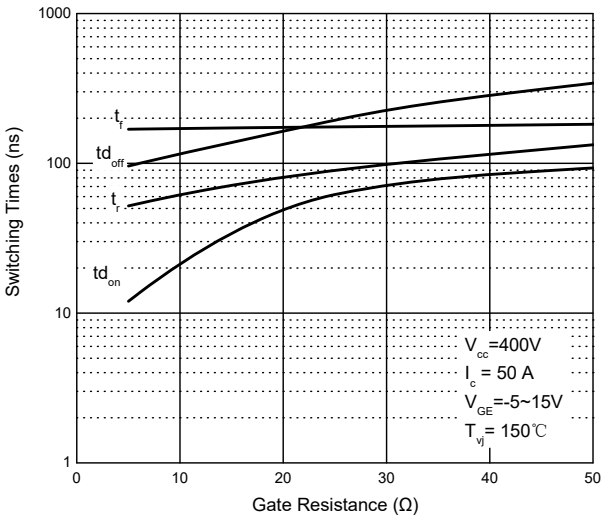


Fig. 15 - IGBT Transient Thermal Impedance

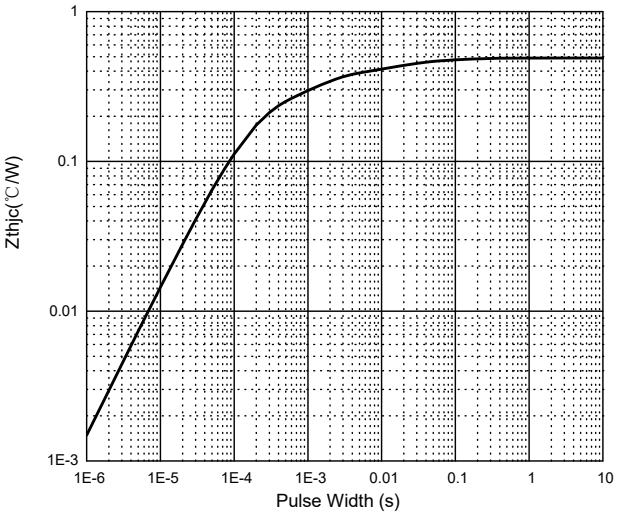


Fig. 16 - Diode Transient Thermal Impedance

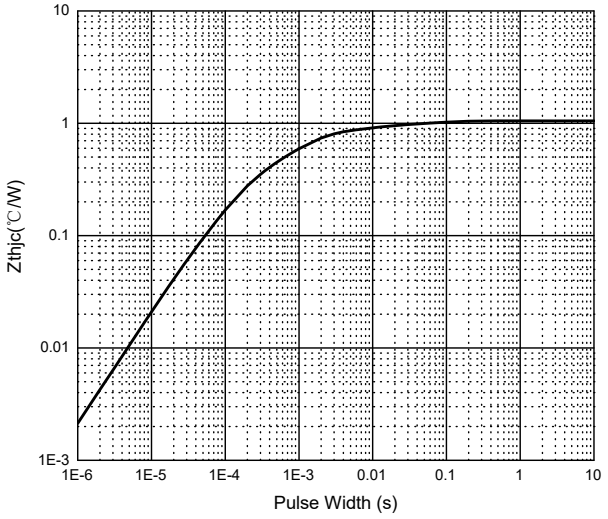


Fig. 17 - Collector Current vs. Case Temperature

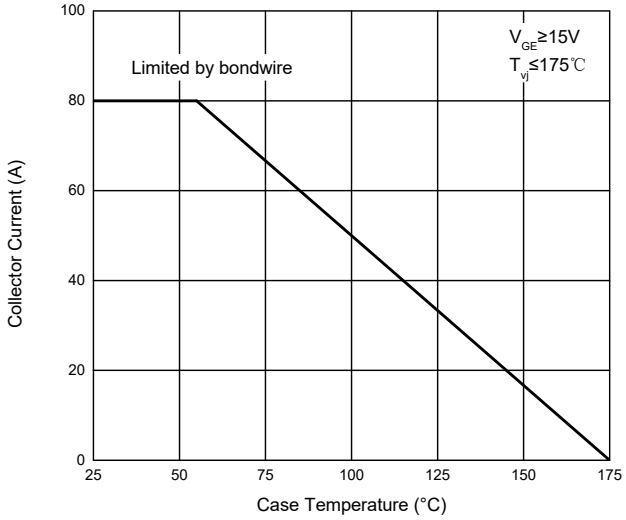
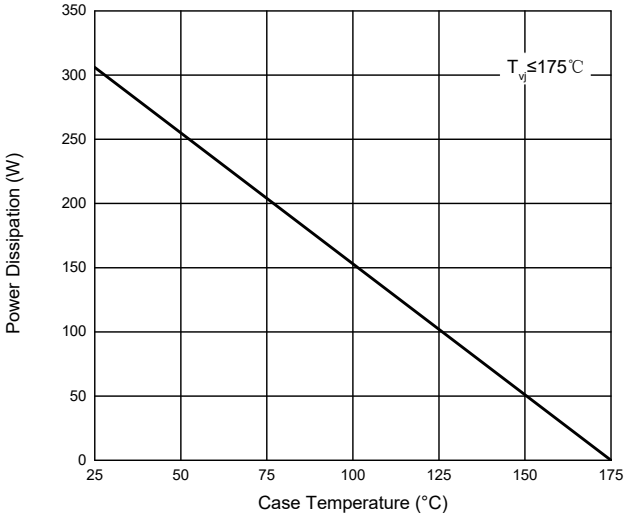


Fig. 18 - Power Derating



Ordering Information

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