Features

- Including Fast & Soft Recovery anti-Parallel FWD
- Positive Temperature Coefficient
- Maximum junction temperature 175℃
- High breakdown voltage to 1200V for improved reliability
- 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 1200V 50A

Applications

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

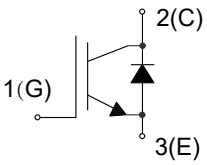
Maximum Ratings

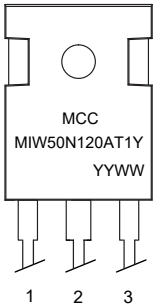
Parameter		Symbol	Rating	Unit
Collector-Emitter Voltage		V_{CE}	1200	V
DC Collector Current (Note 3)	T_C=25°C	I_C	80	A
	T_C=100°C		50	
Pulsed Collector Current, V_{GE}=15V (Note 4)		$I_{C,pluse}$	150	A
Diode Forward Current (Note 3)	T_C=25°C	I_F	80	A
	T_C=100°C		50	
Diode Pulsed Current (Note 4)		$I_{F,pluse}$	150	A
Gate-Emitter Voltage		V_{GE}	±20	V
Transient Gate-Emitter Voltage (Note 5)			±30	
Turn off Safe Operating Area V_{CEM}≤1200V ,T_j≤150℃			150	A
Short Circuit Withstand Time V_{GE}=15V,V_{CC}=600V,V_{CEM}≤1200V		T_{SC}	10	us
Power Dissipation	T_C=25°C	P_D	468	W
	T_C=100°C		234	

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%

Internal Structure

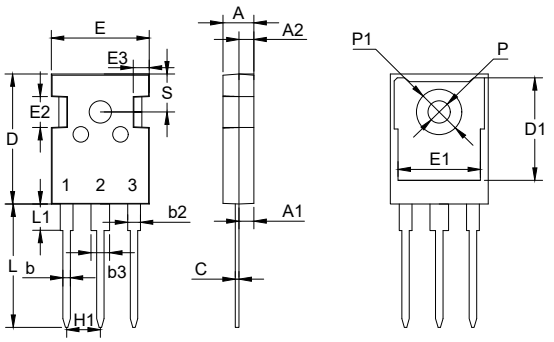




Device Code: MIW50N120AT1Y

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 @ 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	1200			V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE}=15V, I_C=50A, T_J=25℃		1.55	1.85	V
		V_{GE}=15V, I_C=50A, T_J=125℃		1.85		
		V_{GE}=15V, I_C=50A, T_J=150℃		1.95		
G-E Threshold Voltage	$V_{GE(th)}$	I_C=1mA, V_{CE}=V_{GE}	5.0	5.6	6.2	V
C-E Leakage Current	I_{CES}	V_{CE}=1200V, V_{GE}=0V, T_J=25℃			0.25	mA
		V_{CE}=1200V, V_{GE}=0V, T_J=150°C			4	
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		6.73		nF
Reverse Transfer Capacitance	C_{res}			0.09		
Gate Charge	Q_g	V_{CC}=600V,I_C=50A,V_{GE}=15V		0.34		μC
IGBT Switching Characteristics						
Turn-On Delay Time	$td_{(on)}$	V_{CC}=600V, I_C=50A, V_{GE}=-5V~15V, R_G=10Ω,T_J=25°C		53		ns
Rise Time	t_r			74		
Turn-Off Delay Time	$td_{(off)}$			221		
Fall Time	t_f			178		
Turn-On Energy	E_{on}			4.02		mJ
Turn-Off Energy	E_{off}			2.66		
Turn-On Delay Time	$td_{(on)}$	V_{CC}=600V, I_C=50A, V_{GE}=-5V~15V, R_G=10Ω,T_J=125°C		51		ns
Rise Time	t_r			75		
Turn-Off Delay Time	$td_{(off)}$			212		
Fall Time	t_f			231		
Turn-On Energy	E_{on}			4.43		mJ
Turn-Off Energy	E_{off}			2.99		
Turn-On Delay Time	$td_{(on)}$	V_{CC}=600V, I_C=50A, V_{GE}=-5V~15V, R_G=10Ω,T_J=150°C		50		ns
Rise Time	t_r			76		
Turn-Off Delay Time	$td_{(off)}$			194		
Fall Time	t_f			256		
Turn-On Energy	E_{on}			4.64		mJ
Turn-Off Energy	E_{off}			3.14		

Electrical Characteristics of the Diode @ 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=50A, T_J=25℃		2.00	2.60	V
		V_{GE}=0V, I_F=50A, T_J=125℃		1.85		
		V_{GE}=0V, I_F=50A, T_J=150℃		1.75		
Reverse Recovery Current	I_{rr}	V_R=600V, I_F=50A, di_F/dt=-500A/μs, T_J=25°C		15		A
Diode Reverse Recovery Time	t_{rr}			255		ns
Reverse Recovery Charge	Q_{rr}			1.48		μC
Reverse Recovery Energy	E_{rec}			0.42		mJ
Reverse Recovery Current	I_{rr}	V_R=600V, I_F=50A, di_F/dt=-500A/μs, T_J=125°C		17		A
Diode Reverse Recovery Time	t_{rr}			323		ns
Reverse Recovery Charge	Q_{rr}			3.74		μC
Reverse Recovery Energy	E_{rec}			1.09		mJ
Reverse Recovery Current	I_{rr}	V_R=600V, I_F=50A, di_F/dt=-500A/μs, T_J=150°C		18		A
Diode Reverse Recovery Time	t_{rr}			367		ns
Reverse Recovery Charge	Q_{rr}			4.51		μC
Reverse Recovery Energy	E_{rec}			1.45		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}			0.32	°C/W
Thermal Resistance from Junction to Case (Diode)	Rth_{J-C}			0.65	°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)

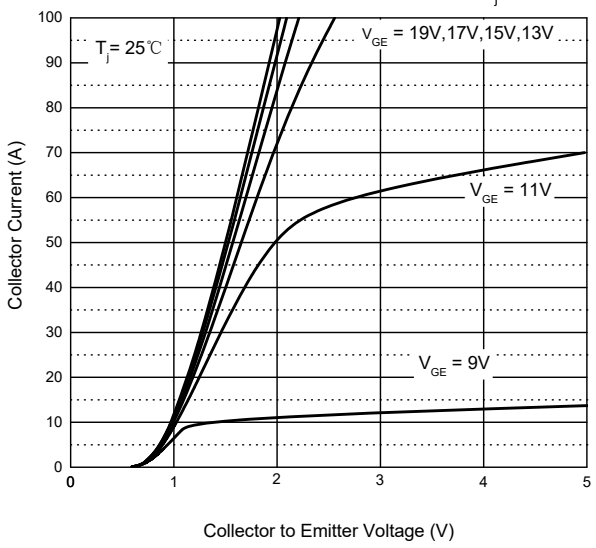


Fig. 2 - Typical Output Characteristic (T_j=150°C)

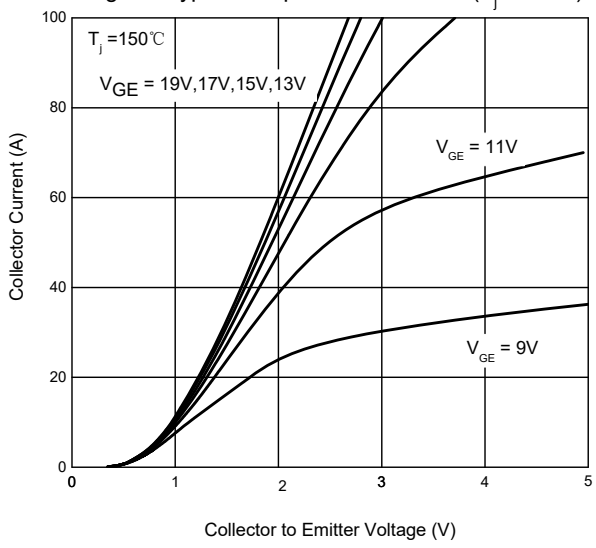


Fig. 3 - Typical Transfer Characteristic

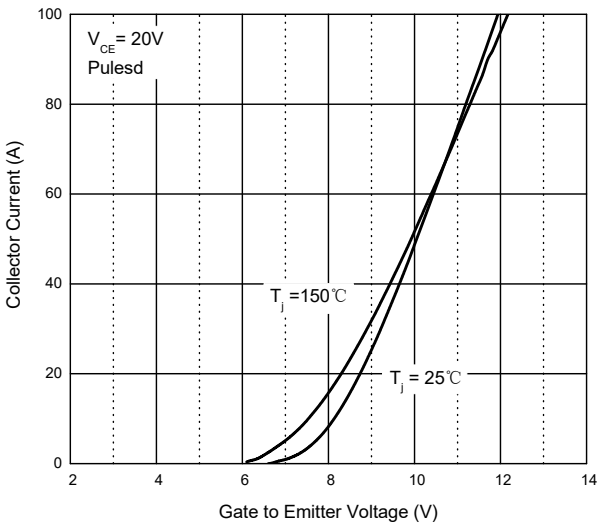


Fig. 4 - Diode Forward Current vs. Forward Voltage

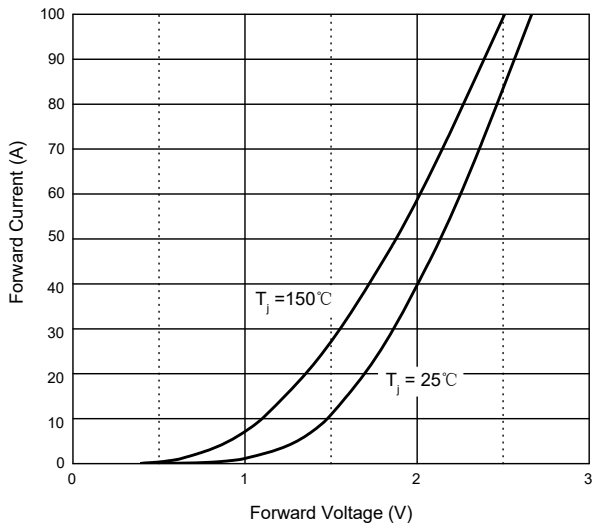


Fig. 5 - Diode VF vs. Junction Temperature

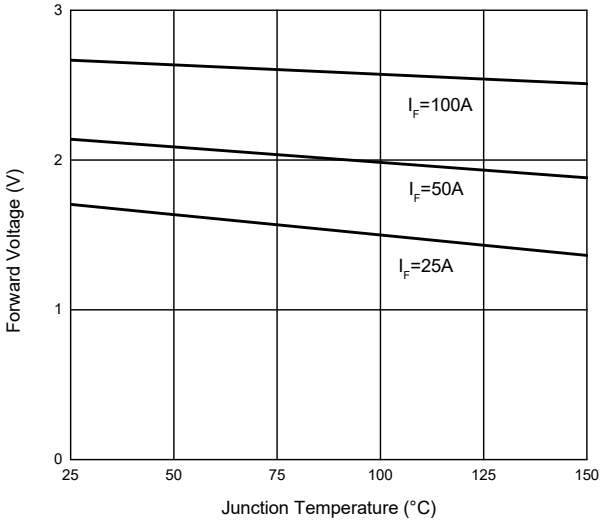
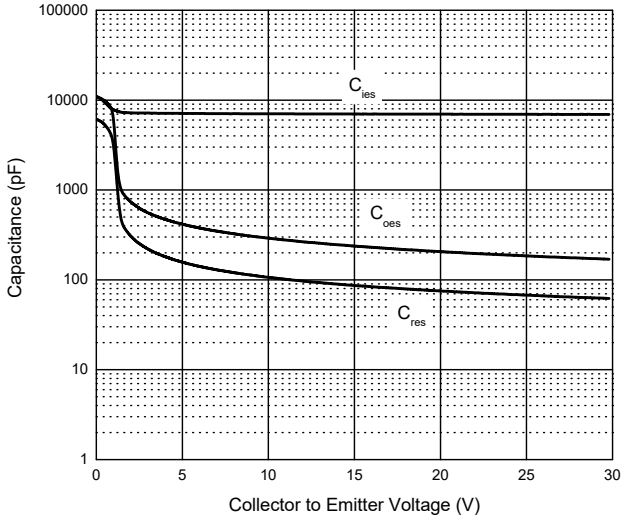


Fig. 6 - Capacitance Characteristics



Curve Characteristics

Fig. 7 - IGBT Switching Loss vs. IC

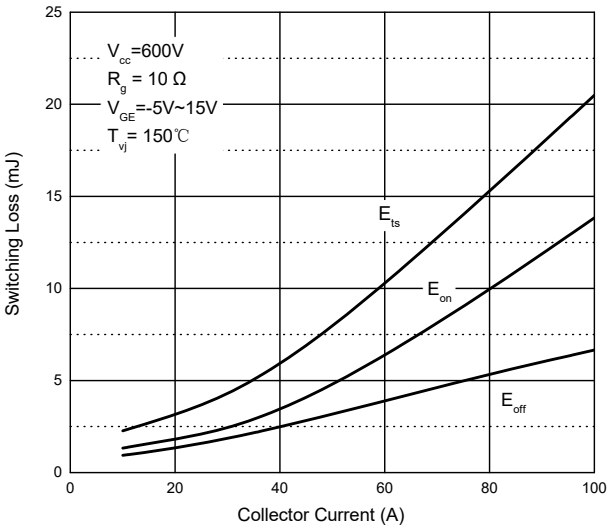


Fig. 8- IGBT Switching Loss vs. R_g

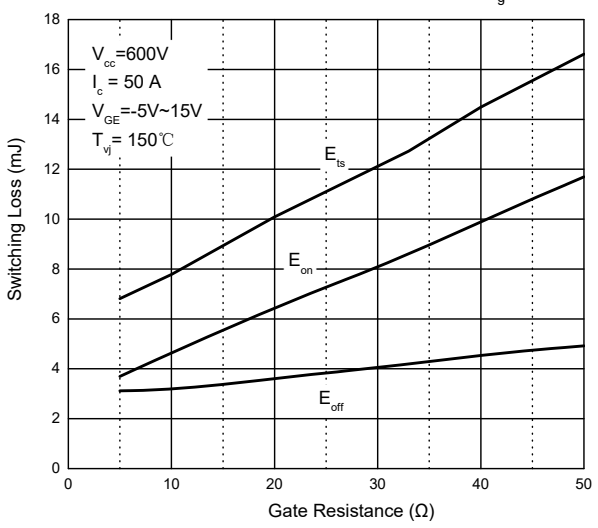


Fig. 9 -IGBT Switching Loss vs. Junction Temperature

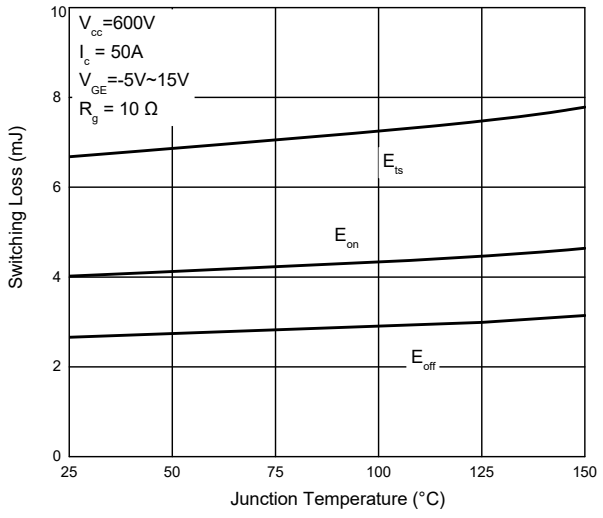


Fig. 10 - Switching Loss vs. V_{CE}

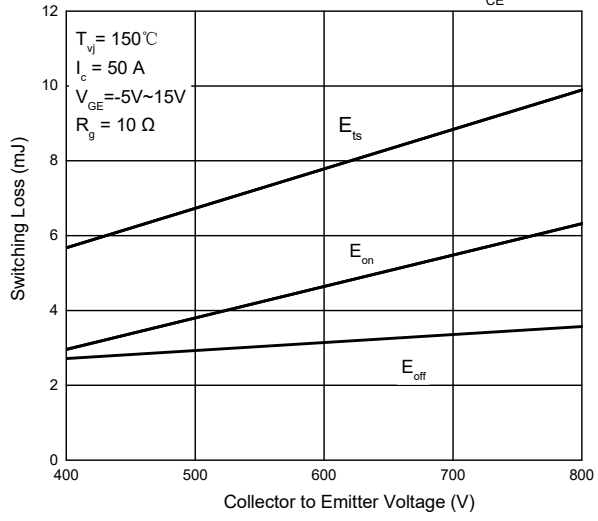


Fig. 11 - $V_{CE(sat)}$ vs. Junction Temperature

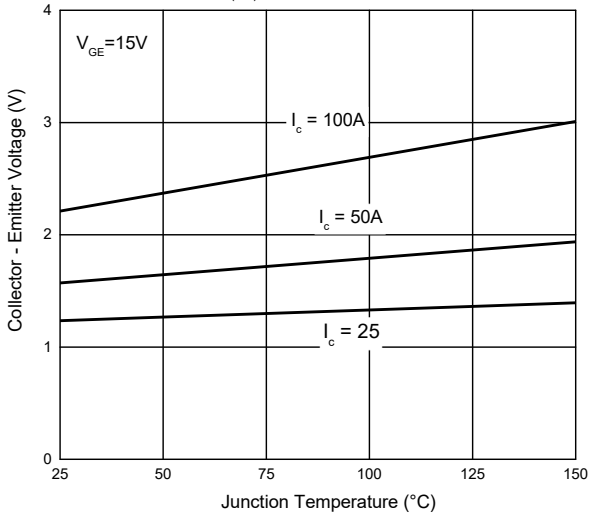
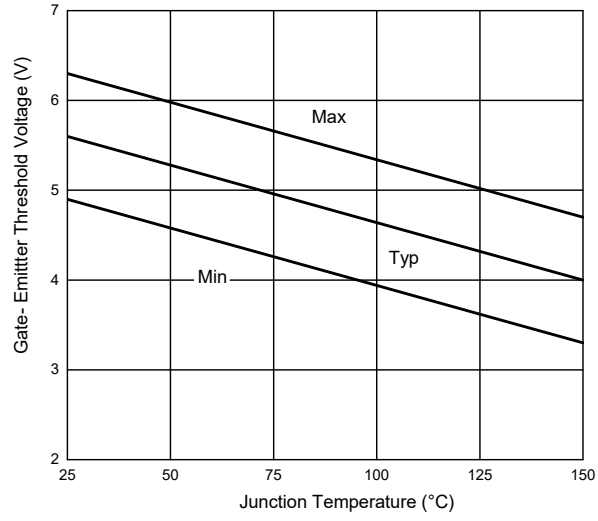


Fig. 12 $V_{GE(th)}$ vs. Junction Temperature



Curve Characteristics

Fig. 13 - Switching Time vs. Juction temperature

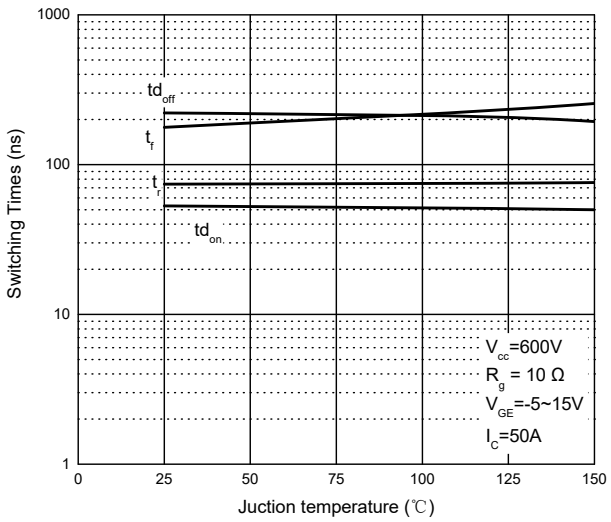


Fig. 14 - Switching Time vs. Collect Current

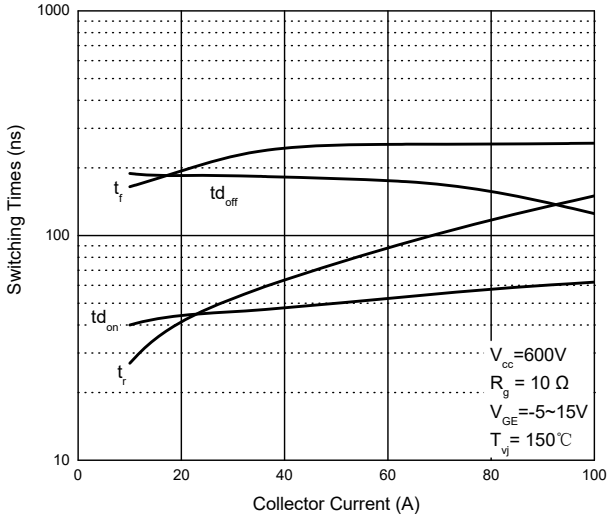


Fig. 15 - Switching Time vs. Gate Resistance

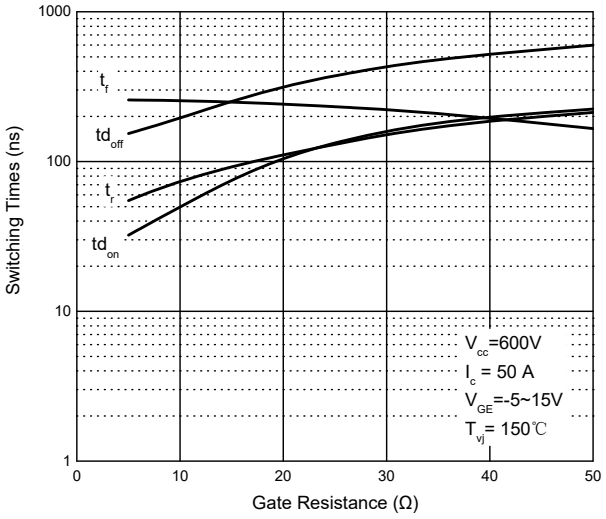


Fig. 16- IGBT Transient Thermal Impedance

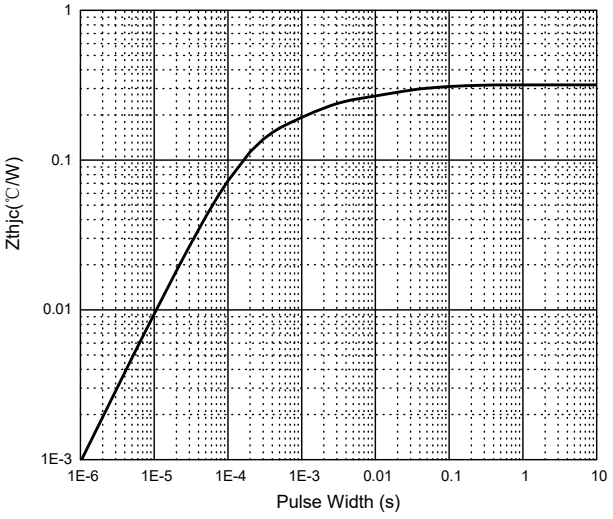


Fig. 17 - Diode Transient Thermal Impedance

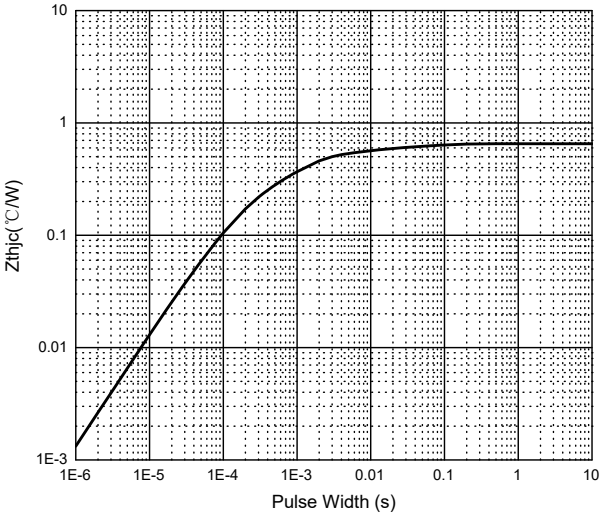
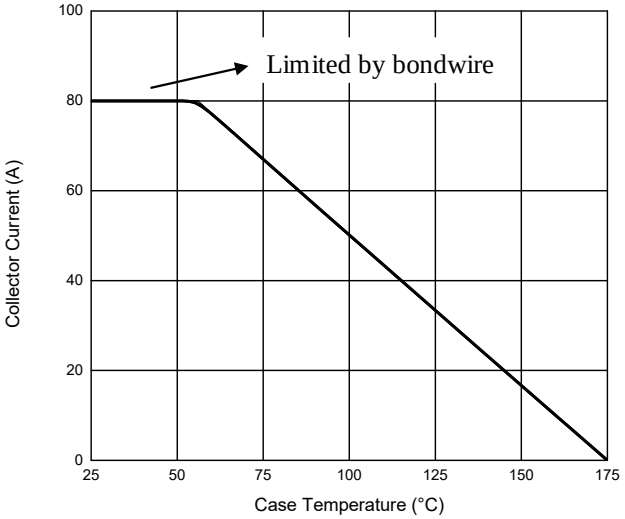
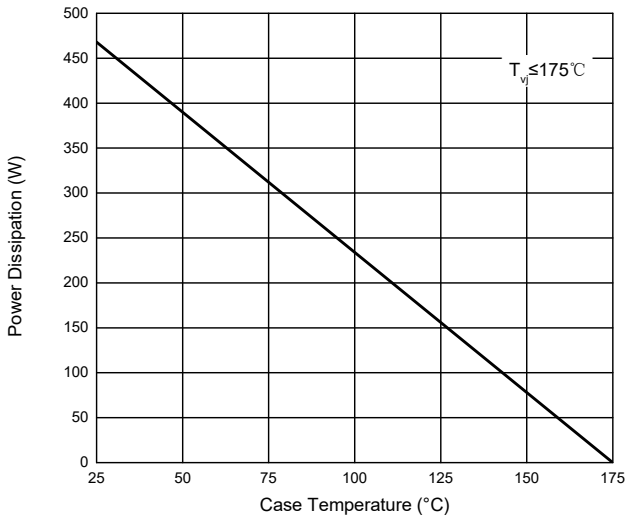


Fig. 18 - Collector Current vs. Case Temperature



Curve Characteristics

Fig. 19 - Power Derating



Ordering Information

Device	Packing
Part Number-BP	Tube: 30pcs/Tube, 360pcs/Box, 1800pcs/Ctn

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