Features

- Low Switching Losses
- 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 50A

Applications

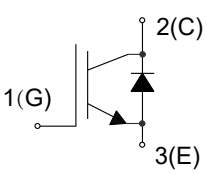
- Solar converters
- Uninterruptible power supplies
- Welding converters

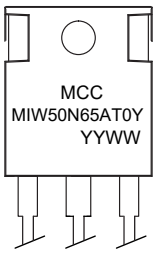
Parameter		Symbol	Rating	Unit
Collector-Emitter Voltage		V_{CE}	650	V
DC Collector Current(3)	T_C=25°C	I_C	70	A
	T_C=100°C		50	
Pulsed Collector Current (4) ,V_{GE}=15V		$I_{C,pluse}$	200	A
Diode Forward Current (3)	T_C=25°C	I_F	70	A
	T_C=100°C		50	
Diode Pulsed Current (4)		$I_{F,pluse}$	200	A
Continuous Gate-Emitter Voltage		V_{GE}	±20	V
Transient Gate-Emitter Voltage(5)			±30	
Turn off Safe Operating Area V_{CE}≤ 650V T_j≤ 150°C			200	A
Power Dissipation	T_C=25°C	P_D	214	W
	T_j=175°C			

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%

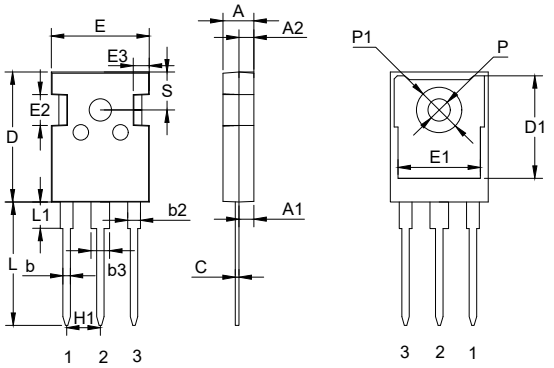
Internal Structure





Device Code:MIW50N65AT0Y
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
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=50A, T_j=25°C		1.7	2.1	V
		V_{GE}=15V, I_C=50A, T_j=125°C		1.9		
		V_{GE}=15V, I_C=50A, T_j=150°C		2.0		
G-E Threshold Voltage	$V_{GE(th)}$	I_C=1mA, V_{CE}=V_{GE}	4.7	5.5	6.3	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			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		2.18		nF
Reverse Transfer Capacitance	C_{res}			0.03		
Gate Charge	Q_G	V_{CC}=300V,I_C=50A,V_{GE}=15V		0.25		μC
IGBT Switching Characteristics						
Turn-On Delay Time	$td_{(on)}$	V_{CC}=300V, I_C=50A V_{GE}=-5V~15V, R_G=20Ω,T_j=25°C		20		ns
Rise Time	t_r			67		
Turn-Off Delay Time	$td_{(off)}$			131		
Fall Time	t_f			49		
Turn-On Energy	E_{on}			1.57		mJ
Turn-Off Energy	E_{off}			0.58		
Turn-On Delay Time	$td_{(on)}$	V_{CC}=300V, I_C=50A V_{GE}=-5V~15V, R_G=20Ω,T_j=125°C		19		ns
Rise Time	t_r			65		
Turn-Off Delay Time	$td_{(off)}$			139		
Fall Time	t_f			81		
Turn-On Energy	E_{on}			1.59		mJ
Turn-Off Energy	E_{off}			0.67		
Turn-On Delay Time	$td_{(on)}$	V_{CC}=300V, I_C=50A V_{GE}=-5V~15V, R_G=20Ω,T_j=150°C		19		ns
Rise Time	t_r			63		
Turn-Off Delay Time	$td_{(off)}$			142		
Fall Time	t_f			93		
Turn-On Energy	E_{on}			1.61		mJ
Turn-Off Energy	E_{off}			0.72		

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=50A, T_j=25°C		1.6	2.0	V
		V_{GE}=0V, I_F=50A, T_j=125°C		1.5		
		V_{GE}=0V, I_F=50A, T_j=150°C		1.4		
Reverse Recovery Current	I_{rr}	V_R=400V, I_F=50A, di_F/dt=-450A/μs, T_j=25°C		15		A
Diode Reverse Recovery Time	t_{rr}			148		ns
Reverse Recovery Charge	Q_{rr}			1.58		μC
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°C		21		A
Diode Reverse Recovery Time	t_{rr}			183		ns
Reverse Recovery Charge	Q_{rr}			2.54		μC
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°C		24		A
Diode Reverse Recovery Time	t_{rr}			218		ns
Reverse Recovery Charge	Q_{rr}			3.59		μC
Reverse Recovery Energy	E_{rec}			0.79		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}			0.7	°C/W
Thermal Resistance from Junction to Case (Diode)	Rth_{J-C}			1.05	°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)

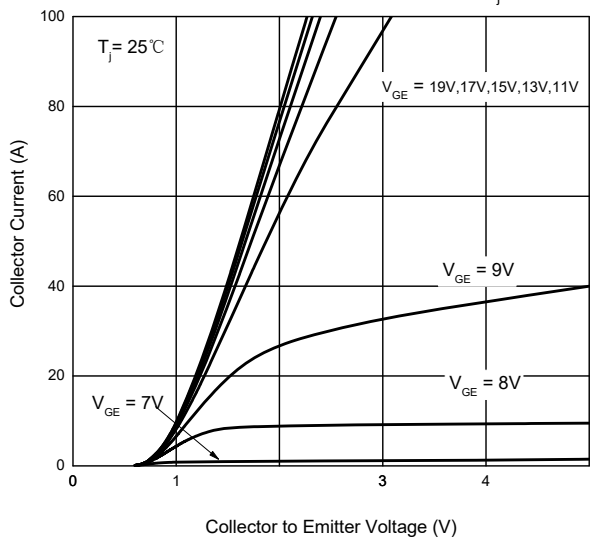


Fig. 2 - Typical Output Characteristic (T_j=150°C)

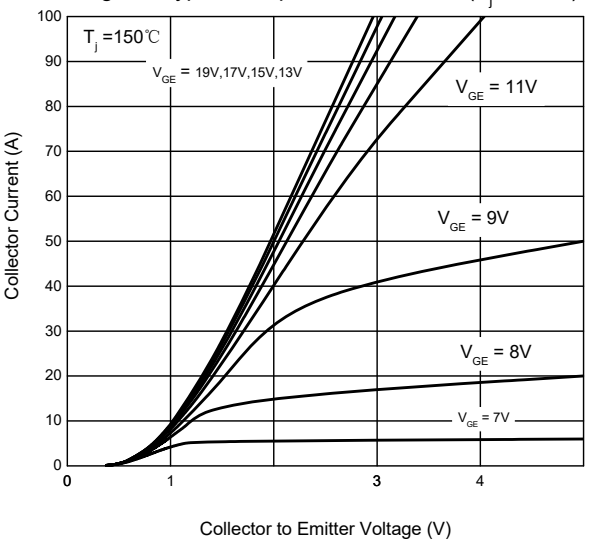


Fig. 3 - Typical Transfer Characteristic

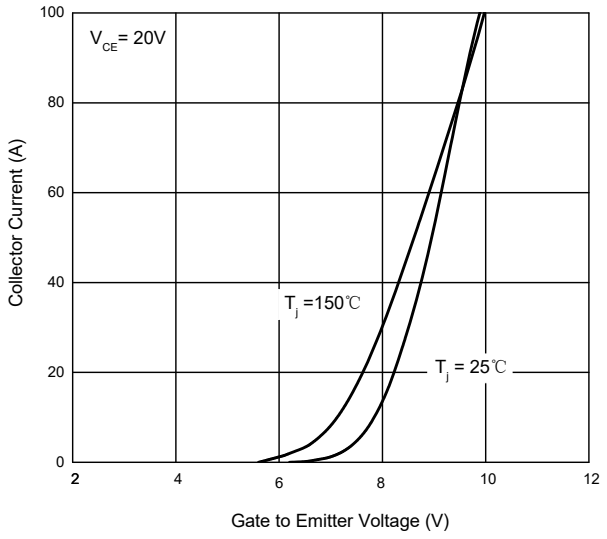


Fig. 4 - Diode Forward Current vs. Forward Voltage

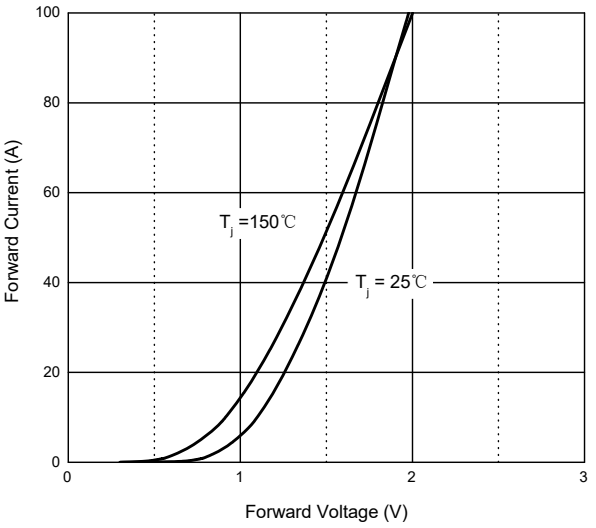


Fig. 5 - Capacitance Characteristics

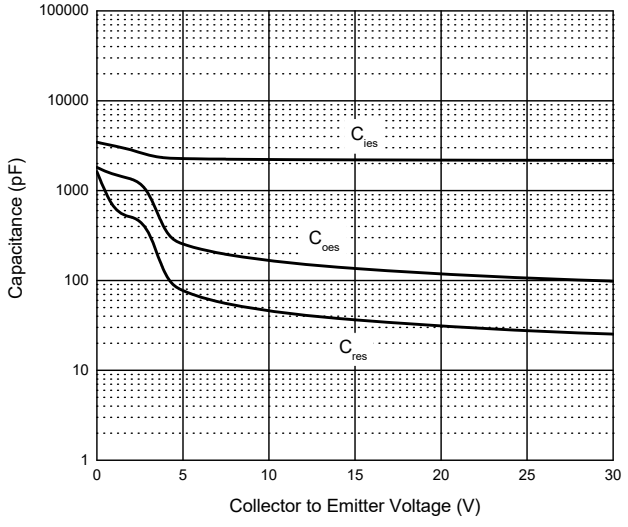
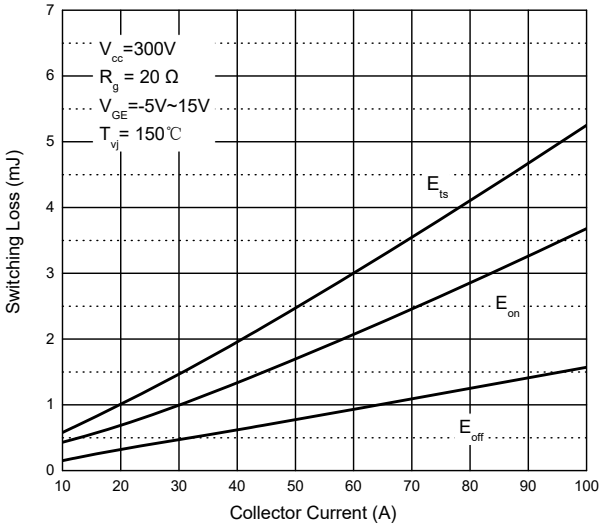


Fig. 6 - IGBT Switching Loss vs. IC



Curve Characteristics

Fig. 7- IGBT Switching Loss vs. R_g

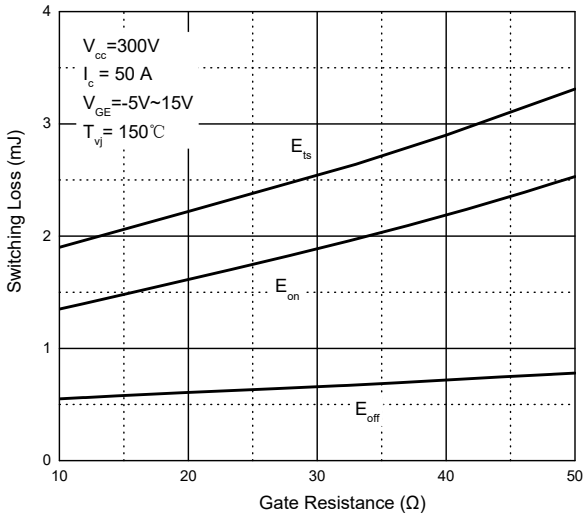


Fig. 8 -IGBT Switching Loss vs. Junction Temperature

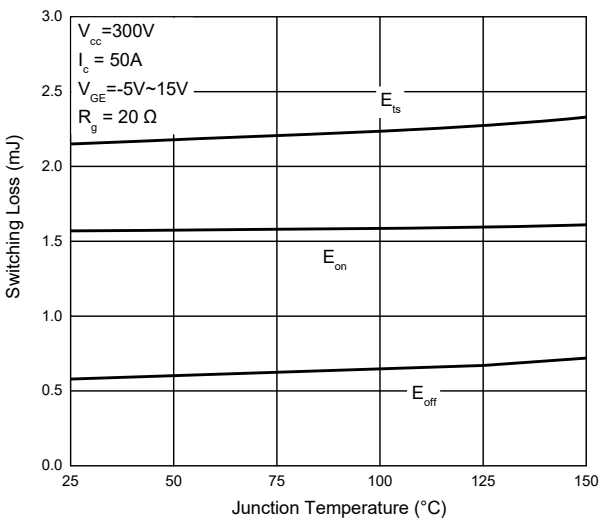


Fig. 9 - Switching Loss vs. V_{CE}

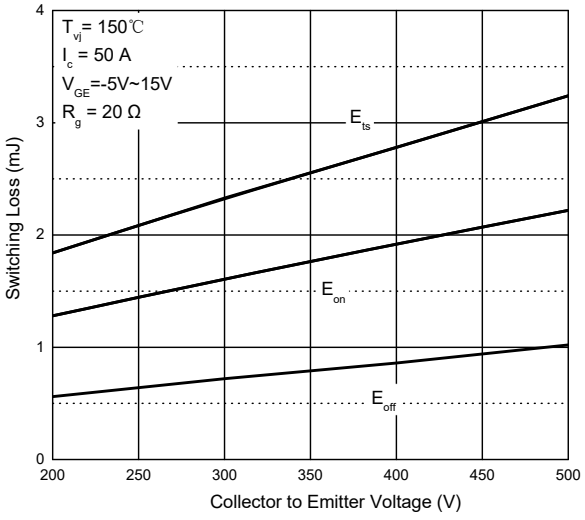


Fig. 10 - $V_{CE(sat)}$ vs. Junction Temperature

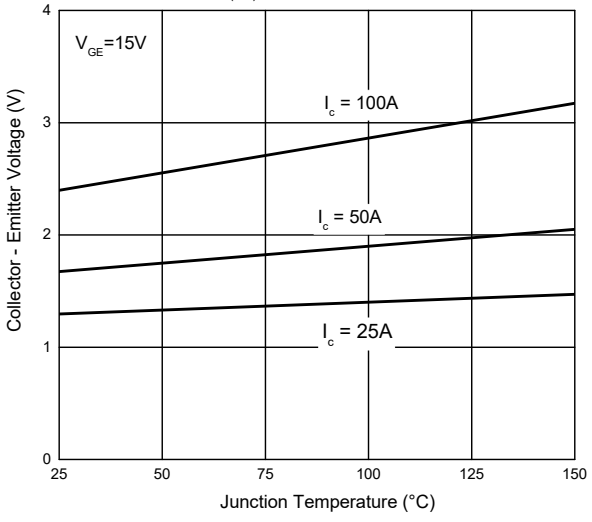


Fig. 11- $V_{GE(th)}$ vs. Junction Temperature

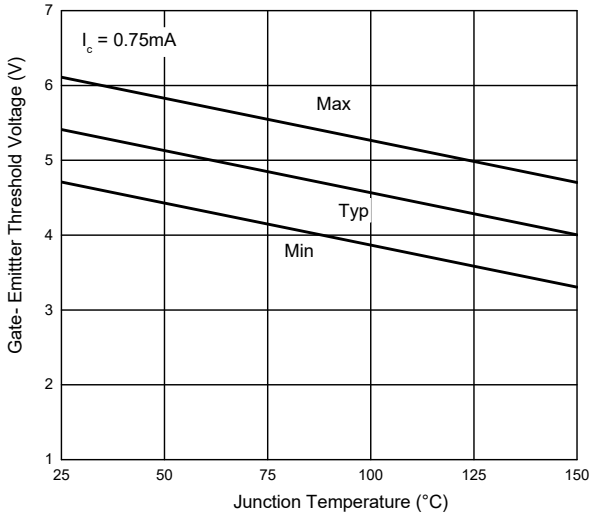
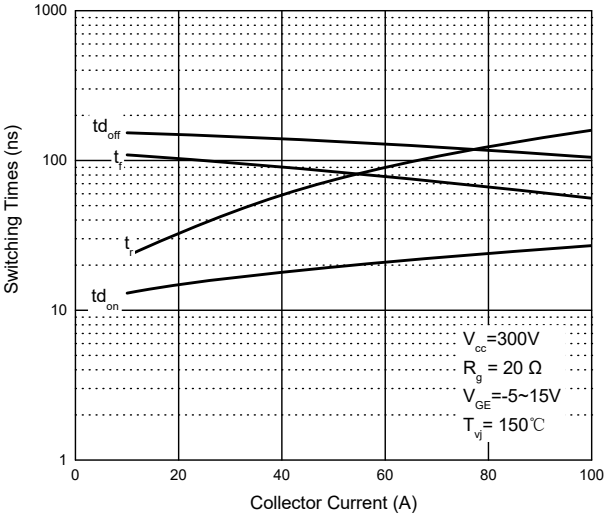


Fig. 12 - Switching Time vs. Collect Current



Curve Characteristics

Fig. 13 - Switching Time vs. Gate Resistance

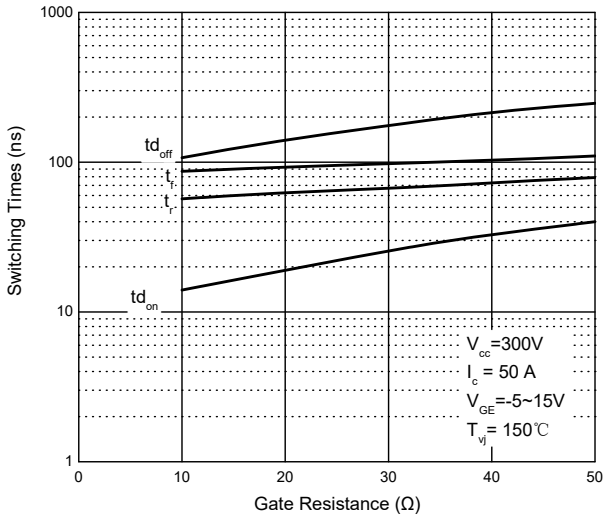


Fig. 14 - Switching Time vs. Junction Temperature

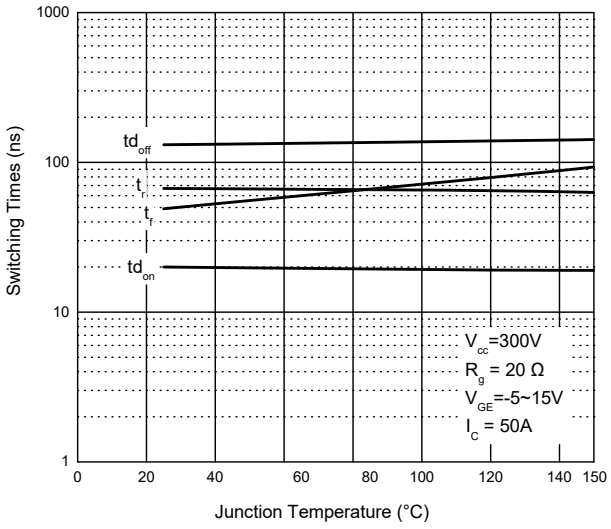


Fig. 15 - IGBT Transient Thermal Impedance

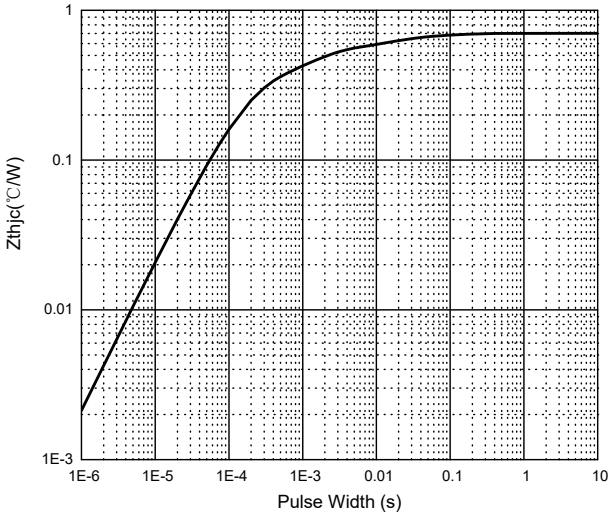


Fig. 16 - Diode Transient Thermal Impedance

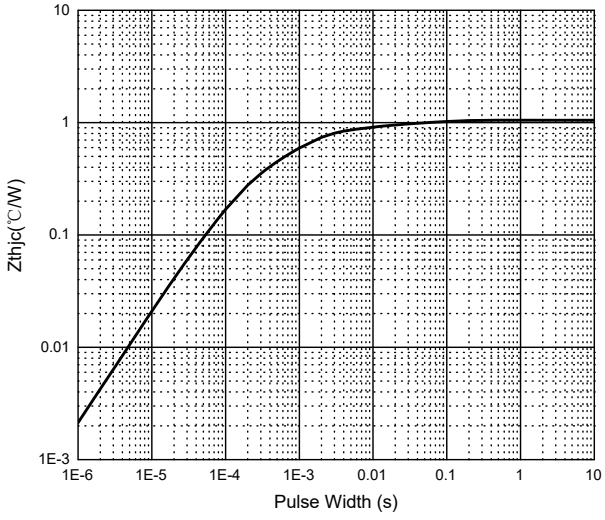


Fig. 17 - Collector Current vs. Case Temperature

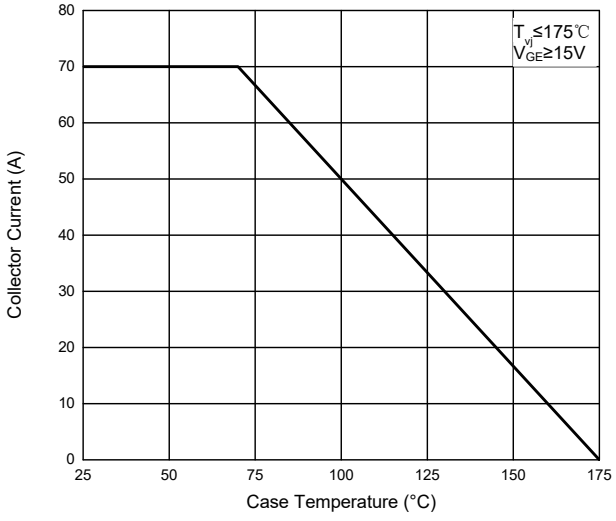
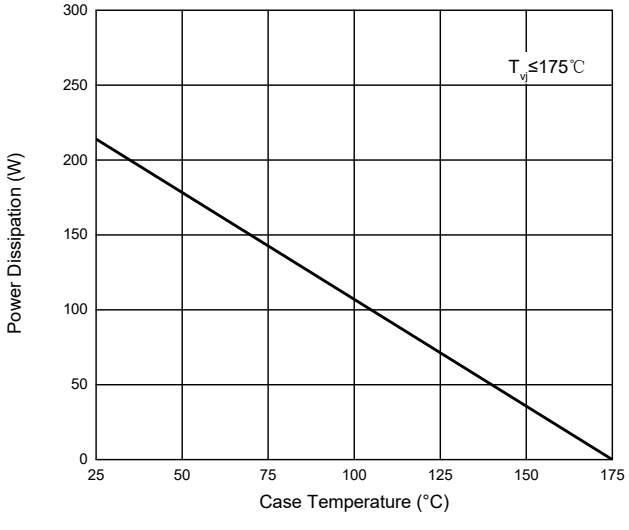


Fig. 18 - Power Derating



Ordering Information

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