

## Features

- High Breakdown Voltage to 1200V for Improved Reliability
- Maximum Junction Temperature 175°C
- Positive Temperature Coefficient
- Including SiC FWD
- 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)

## Applications

- PV Inverter
- Switch Mode Power Supplies
- Welding Machine

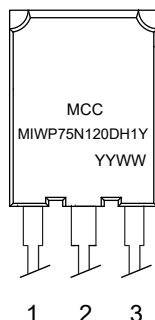
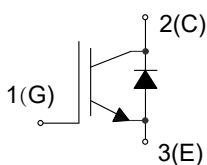
## Maximum Ratings

Parameter	Symbol	Rating	Unit
Collector-Emitter Voltage	$V_{CE}$	1200	V
DC Collector Current <sup>(3)</sup>	$I_C$	$T_C=25^\circ\text{C}$	150
		$T_C=100^\circ\text{C}$	75
Pulsed Collector Current <sup>(4)</sup> , $V_{GE}=15\text{V}$	$I_{C,pluse}$	300	A
Diode Forward Current <sup>(3)</sup>	$I_F$	$T_C=25^\circ\text{C}$	90
		$T_C=150^\circ\text{C}$	30
Diode Pulsed Current <sup>(4)</sup>	$I_{F,pluse}$	225	A
Continuous Gate-Emitter Voltage	$V_{GE}$	$\pm 20$	V
Transient Gate-Emitter Voltage <sup>(5)</sup>		$\pm 30$	
Turn off Safe Operation Area $V_{CE} \leq 1200\text{V}$ , $T_j = 175^\circ\text{C}$		300	A
Power Dissipation	$P_D$	$T_C=25^\circ\text{C}$	600
		$T_j=175^\circ\text{C}$	

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.  $t_p \leq 10\mu\text{s}$ , Duty Cycle <1%

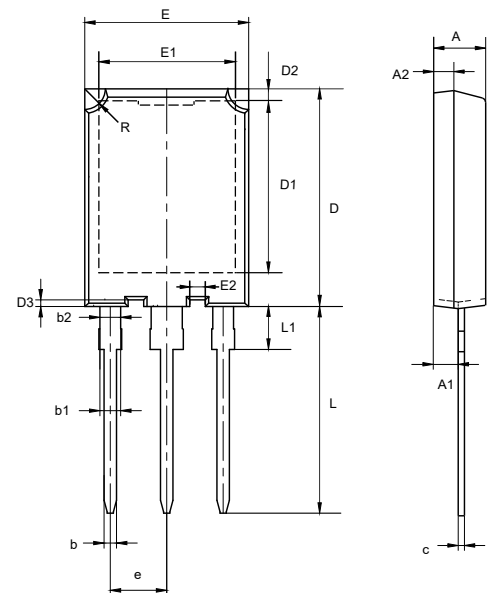
## Internal Structure



Device Code: MIWP75N120DH1Y  
Date Code: YYWW (Year & Week)

# Trench and Field Stop IGBT 1200V 75A

## 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
<b>IGBT Static Characteristics</b>						
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	$V_{GE}=0V, I_C=250\mu A$	1200			V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=75A, T_j=25^\circ C$	1.8	2.1	2.5	V
		$V_{GE}=15V, I_C=75A, T_j=125^\circ C$		2.5		
		$V_{GE}=15V, I_C=75A, T_j=150^\circ C$		2.6		
G-E Threshold Voltage	$V_{GE(th)}$	$I_C=2.6mA, V_{CE}=V_{GE}$	5.2	5.8	6.5	V
C-E Leakage Current	$I_{CES}$	$V_{CE}=1200V, V_{GE}=0V, T_j=25^\circ C$			0.25	mA
		$V_{CE}=1200V, V_{GE}=0V, T_j=150^\circ C$			5	
G-E Leakage Current	$I_{GES}$	$V_{CE}=0V, V_{GE}=\pm 20V$			$\pm 100$	nA
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{ies}$	$V_{CE}=25V, V_{GE}=0V, f=1MHz$		8.43		nF
Reverse Transfer Capacitance	$C_{res}$			0.19		
Gate Charge	$Q_G$	$V_{CC}=960V, I_C=75A, V_{GE}=15V$		0.65		$\mu C$
<b>IGBT Switching Characteristics</b>						
Turn-On Delay Time	$t_{d(on)}$	$V_{CC}=600V, I_C=75A, V_{GE}=-5V\sim 15V, R_G=10\Omega, T_j=25^\circ C$		23		ns
Rise Time	$t_r$			108		
Turn-Off Delay Time	$t_{d(off)}$			227		
Fall Time	$t_f$			91		mJ
Turn-On Energy	$E_{on}$			7.3		
Turn-Off Energy	$E_{off}$			2.2		
Turn-On Delay Time	$t_{d(on)}$	$V_{CC}=600V, I_C=75A, V_{GE}=-5V\sim 15V, R_G=10\Omega, T_j=125^\circ C$		26		ns
Rise Time	$t_r$			101		
Turn-Off Delay Time	$t_{d(off)}$			243		
Fall Time	$t_f$			108		mJ
Turn-On Energy	$E_{on}$			7.5		
Turn-Off Energy	$E_{off}$			3.0		
Turn-On Delay Time	$t_{d(on)}$	$V_{CC}=600V, I_C=75A, V_{GE}=-5V\sim 15V, R_G=10\Omega, T_j=150^\circ C$		27		ns
Rise Time	$t_r$			95		
Turn-Off Delay Time	$t_{d(off)}$			252		
Fall Time	$t_f$			116		mJ
Turn-On Energy	$E_{on}$			7.6		
Turn-Off Energy	$E_{off}$			3.5		

**Electrical Characteristics @ 25°C (Unless Otherwise Specified)**

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Diode Characteristics</b>						
Diode Forward Voltage	$V_F$	$V_{GE}=0V, I_F=30A, T_j=25^\circ C$		1.4	1.6	V
		$V_{GE}=0V, I_F=30A, T_j=175^\circ C$		2.0		
Diode Capacitive Charge	$Q_c$	$V_R=800V$		162		nC
Diode Capacitance	C	$V_R=0V, f=1MHz$		2179		pF
		$V_R=400V, f=1MHz$		152		
		$V_R=800V, f=1MHz$		118		

**Thermal characteristics**

Parameter	Symbol	Min	Typ	Max	Units
Operating Junction Temperature Range	$T_J$	-40		175	°C
Storage Temperature Range	$T_{stg}$	-55		175	°C
Thermal Resistance from Junction to Case (IGBT)	$R_{th_{J-C}}$		0.25		°C/W
Thermal Resistance from Junction to Case (Diode)	$R_{th_{J-C}}$		0.53		°C/W
Thermal Resistance from Junction to Ambient	$R_{th_{J-A}}$			40	°C/W

## Curve Characteristics

Fig. 1 - Typical Output Characteristic ( $T_J=25^\circ\text{C}$ )

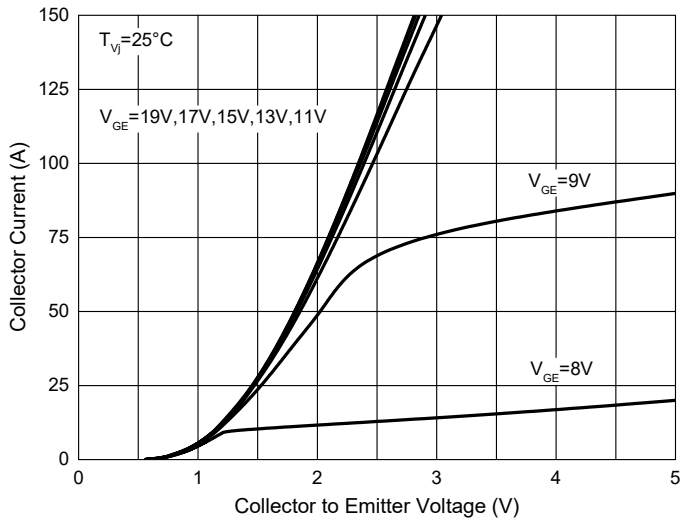


Fig. 2 - Typical Output Characteristic ( $T_J=150^\circ\text{C}$ )

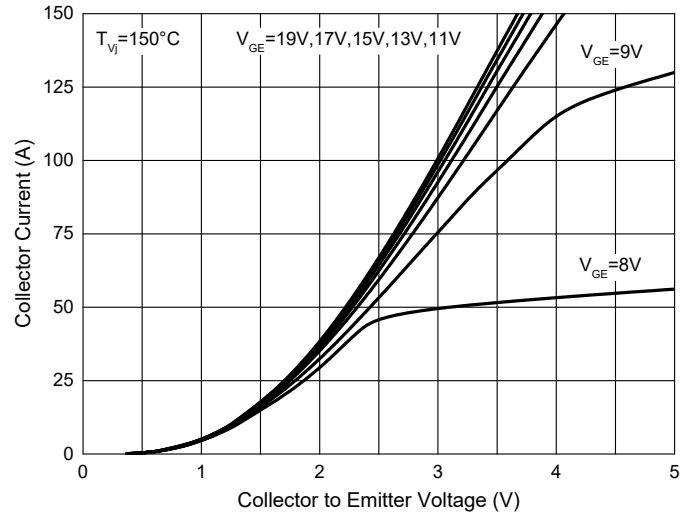


Fig. 3 - Typical Transfer Characteristic

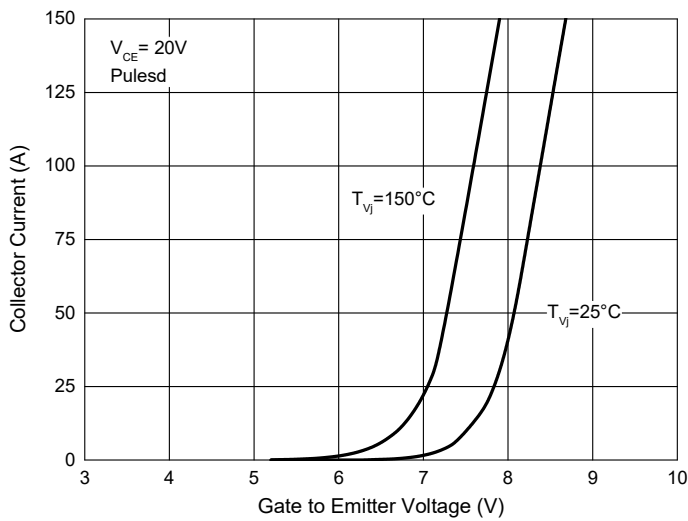


Fig. 4 - Typical Instantaneous Forward Characteristics

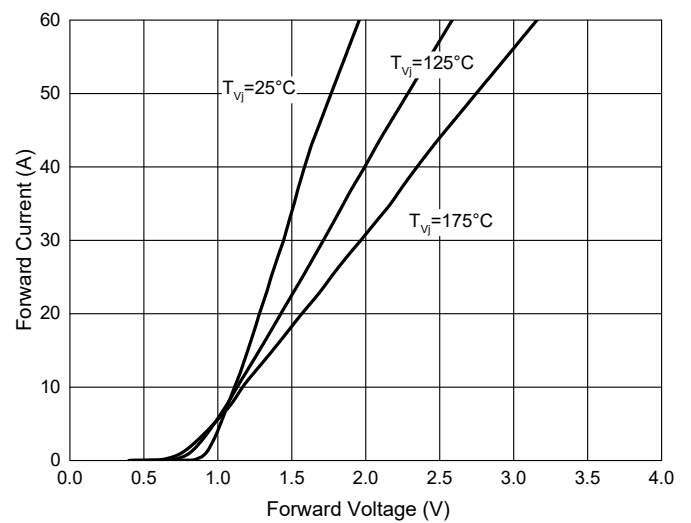


Fig. 5 -  $V_{GE(th)}$  vs Junction Temperature

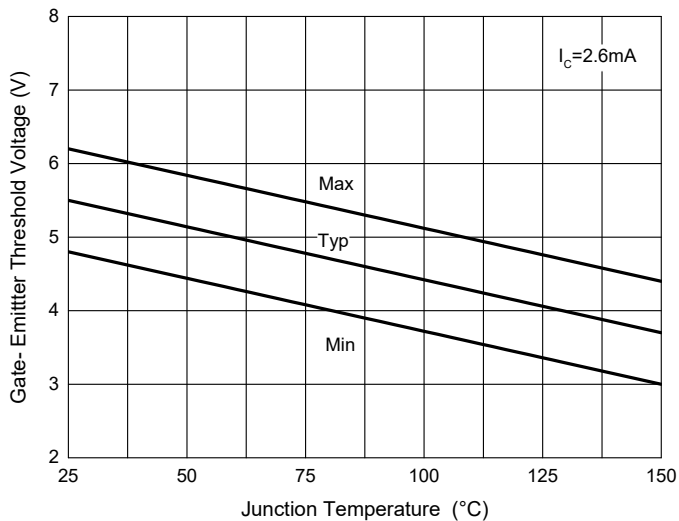
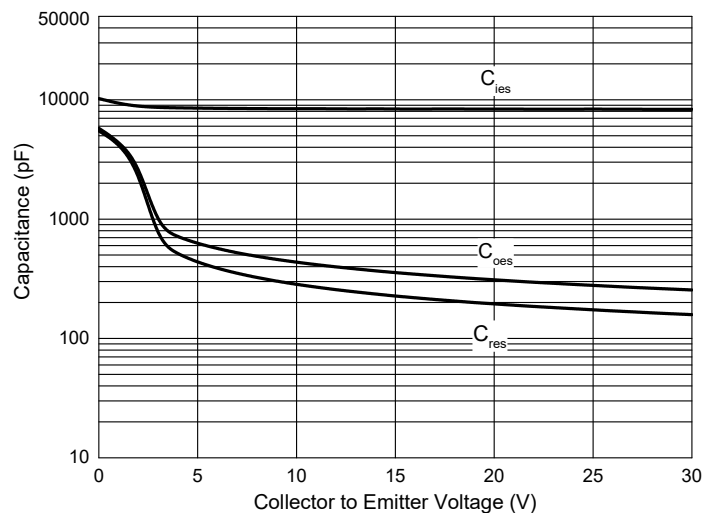


Fig. 6 - Capacitance Characteristics



**Curve Characteristics**

Fig. 7 - IGBT Switching Loss vs  $I_c$

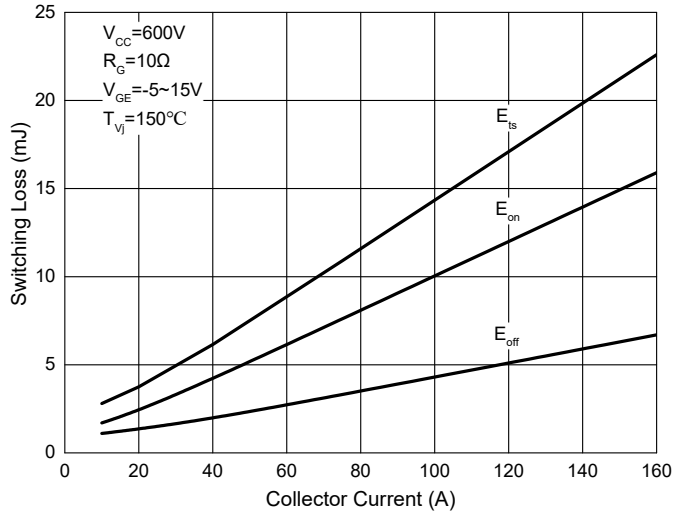


Fig. 8- IGBT Switching Loss vs  $R_g$

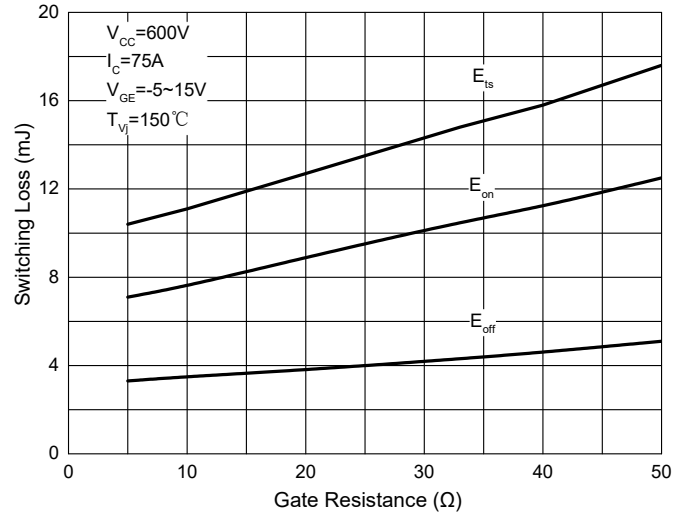


Fig. 9 - Switching Loss vs Junction Temperature

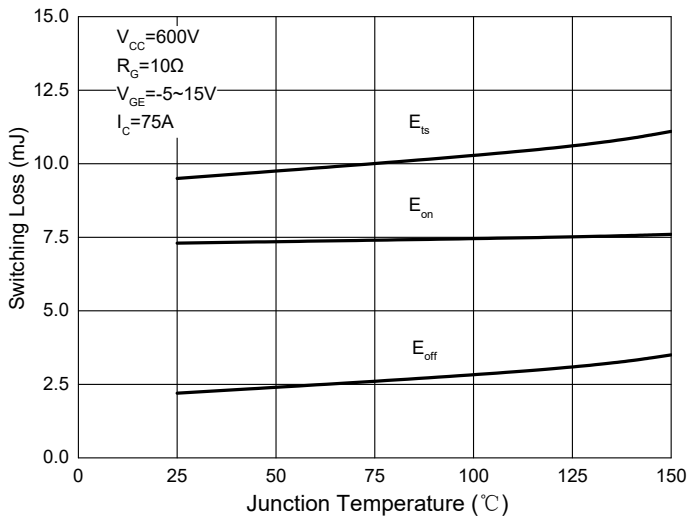


Fig. 10 - Switching Time vs Collect Current

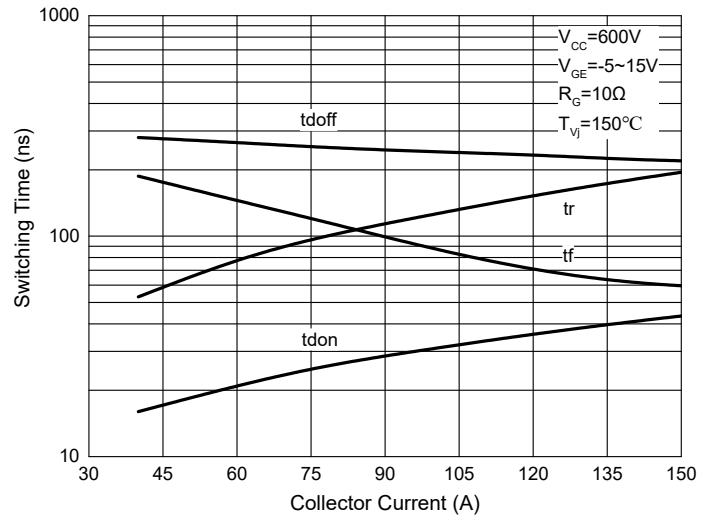


Fig. 11 - Switching Time vs Gate Resistance

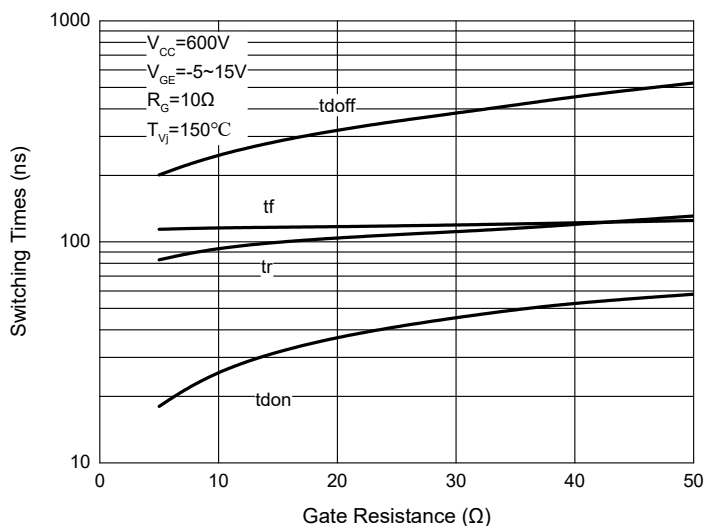
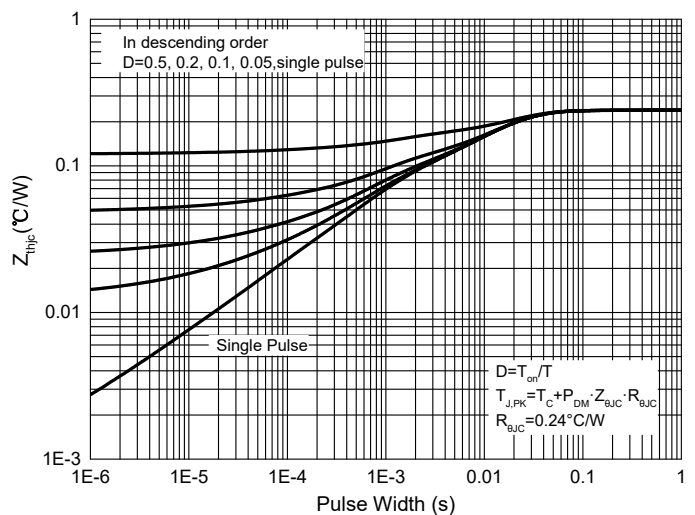
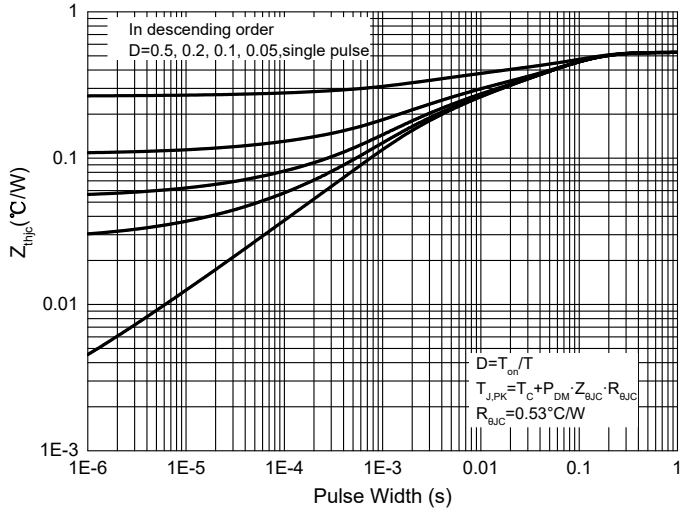


Fig. 12 - IGBT Transient Thermal Impedance

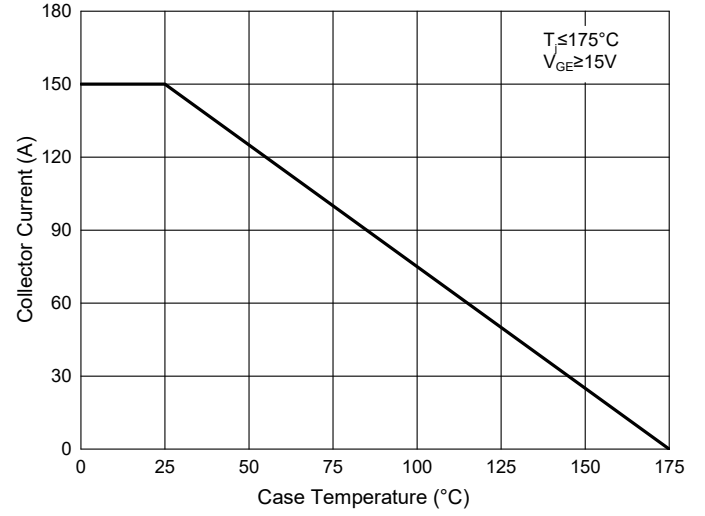


**Curve Characteristics**

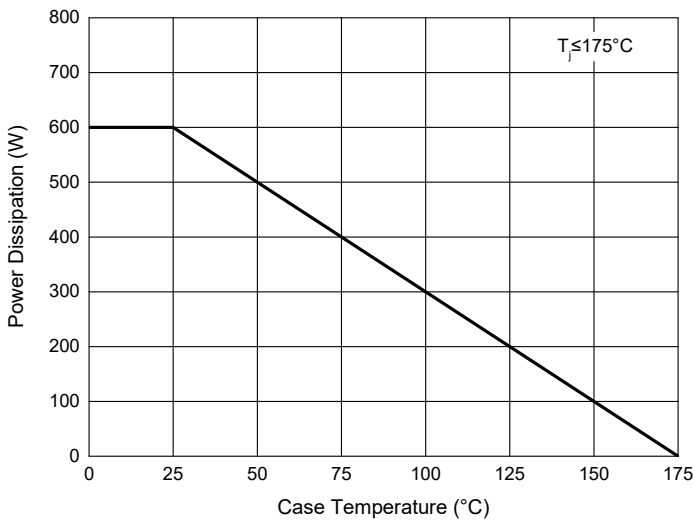
**Fig. 13 - Diode Transient Thermal Impedance**



**Fig. 14 - Collector Current vs Case Temperature**



**Fig. 15 - Power Derating**



## Ordering Information

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

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