

Features

- Low switching losses, High ruggedness, temperature stable
- Maximum Junction Temperature 175 °C
- Positive Temperature Coefficient
- Moisture Sensitivity Level 1
- High short circuit capability(5us)
- 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

- Soft Switching Applications
- Air Conditioning
- Motor Drive Inverter

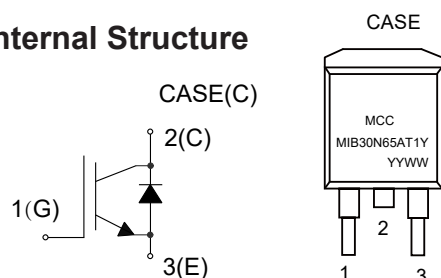
Maximum Ratings

Parameter	Symbol	Rating	Unit
Collector-Emitter Voltage	V_{CE}	650	V
DC Collector Current ⁽³⁾	I_C	$T_C=25^{\circ}C$ 40	A
		$T_C=100^{\circ}C$ 30	
Pulsed Collector Current ⁽⁴⁾ , $V_{GE}=15V$	$I_{C,pluse}$	60	A
Diode Forward Current ⁽³⁾	I_F	$T_C=25^{\circ}C$ 40	A
		$T_C=100^{\circ}C$ 30	
Diode Pulsed Current ⁽⁴⁾	$I_{F,pluse}$	60	A
Continuous Gate-Emitter Voltage	V_{GE}	±20	V
Transient Gate-Emitter Voltage ⁽⁵⁾		±30	
Turn off Safe Operation Area, $T_J \leq 150^{\circ}C$ $V_{CE} \leq 650V$		60	A
Short Circuit Withstand Time ⁽⁶⁾	T_{SC}	5	µs
Power Dissipation, $T_C=25^{\circ}C$, $T_J=175^{\circ}C$	P_D	136	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. High Temperature Solder Exemptions Applied, see EU Directive Annex 7a.
3. Limited by T_{Jmax} .
4. t_p limited by T_{Jmax} .
5. $t_p \leq 10\mu s$, Duty Cycle < 1%
6. $V_{GE}=15V$, $V_{CEM} \leq 650V$, $V_{cc}=400V$

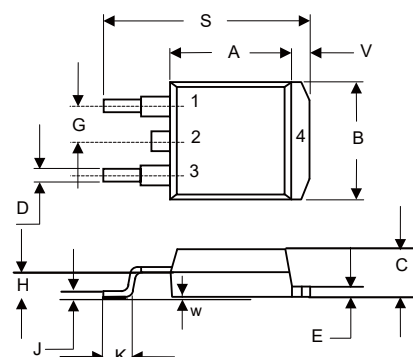
Internal Structure



Device Code: MIB30N65AT1Y
Date Code: YYWW (Year & Week)

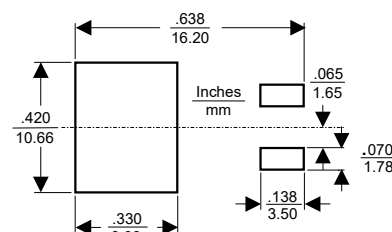
Trench and Field Stop IGBT 650V 30A

D2-PAK



DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	0.331	0.370	8.40	9.40	
B	0.378	0.417	9.60	10.60	
C	0.165	0.189	4.20	4.80	
D	0.027	0.037	0.68	0.94	
E	0.045	0.055	1.14	1.40	
G	0.010		2.54		TYP.
H	0.096	0.134	2.43	3.40	
J	0.011	0.025	0.28	0.64	
K	0.071	0.131	1.80	3.32	
S	0.575	0.625	14.60	15.87	
V	0.042	0.058	1.07	1.47	
W	0.000	0.010	0.00	0.25	

Suggested Solder Pad Layout



Electrical Characteristics @ 25°C (Unless Otherwise Specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
IGBT Static Characteristics						
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	$V_{GE}=0V, I_C=250\mu A$	650			V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=30A, T_J=25^\circ C$		1.65	1.95	V
		$V_{GE}=15V, I_C=30A, T_J=125^\circ C$		2.00		
		$V_{GE}=15V, I_C=30A, T_J=150^\circ C$		2.1		
G-E Threshold Voltage	$V_{GE(th)}$	$I_C=1mA, V_{CE}=V_{GE}$	4.7	5.5	6.2	V
C-E Leakage Current	I_{CES}	$V_{CE}=650V, V_{GE}=0V, T_J=25^\circ C$			0.25	mA
		$V_{CE}=650V, V_{GE}=0V, T_J=150^\circ C$			4	
G-E Leakage Current	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V$			100	nA
Dynamic Characteristics						
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V, f=1MHz$		1.53		nF
Reverse Transfer Capacitance	C_{res}			0.04		
Gate Charge	Q_G	$V_{CC}=480V, I_C=30A, V_{GE}=15V$		0.16		μC
Short Circuit Collector Current	I_{SC}	$V_{GE}=15V, t_{sc}\leq 5\mu s, V_{CC}=400V, T_J\leq 150^\circ C$		130		A
IGBT Switching Characteristics						
Turn-On Delay Time	$t_{d(on)}$	$V_{CC}=400V, I_C=30A, V_{GE}=-5V\sim 15V, R_G=20\Omega, T_J=25^\circ C$		58		ns
Rise Time	t_r			76		
Turn-Off Delay Time	$t_{d(off)}$			93		
Fall Time	t_f			88		
Turn-On Energy	E_{on}	$V_{CC}=400V, I_C=30A, V_{GE}=-5V\sim 15V, R_G=20\Omega, T_J=25^\circ C$		1.37		mJ
Turn-Off Energy	E_{off}			0.63		
Turn-On Delay Time	$t_{d(on)}$	$V_{CC}=400V, I_C=30A, V_{GE}=-5V\sim 15V, R_G=20\Omega, T_J=125^\circ C$		56		ns
Rise Time	t_r			77		
Turn-Off Delay Time	$t_{d(off)}$			99		
Fall Time	t_f			116		
Turn-On Energy	E_{on}	$V_{CC}=400V, I_C=30A, V_{GE}=-5V\sim 15V, R_G=20\Omega, T_J=125^\circ C$		1.42		mJ
Turn-Off Energy	E_{off}			0.79		
Turn-On Delay Time	$t_{d(on)}$	$V_{CC}=400V, I_C=30A, V_{GE}=-5V\sim 15V, R_G=20\Omega, T_J=150^\circ C$		54		ns
Rise Time	t_r			77		
Turn-Off Delay Time	$t_{d(off)}$			102		
Fall Time	t_f			128		
Turn-On Energy	E_{on}			1.45		mJ
Turn-Off Energy	E_{off}			0.85		

Electrical Characteristics @ 25°C (Unless Otherwise Specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Characteristics						
Diode Forward Voltage	V_F	$V_{GE}=0V, I_F=30A, T_j=25^{\circ}C$		1.6	2.0	V
		$V_{GE}=0V, I_F=30A, T_j=125^{\circ}C$		1.55		
		$V_{GE}=0V, I_F=30A, T_j=150^{\circ}C$		1.5		
Reverse Recovery Current	I_{rr}	$V_R=400V, I_F=30A,$ $di_F/dt=-320A/\mu s, T_j=25^{\circ}C$		11		A
Diode Reverse Recovery Time	t_{rr}			114		ns
Reverse Recovery Charge	Q_{rr}			0.75		μC
Reverse Recovery Energy	E_{rec}			0.14		mJ
Reverse Recovery Current	I_{rr}	$V_R=400V, I_F=30A,$ $di_F/dt=-320A/\mu s, T_j=125^{\circ}C$		14		A
Diode Reverse Recovery Time	t_{rr}			156		ns
Reverse Recovery Charge	Q_{rr}			1.14		μC
Reverse Recovery Energy	E_{rec}			0.27		mJ
Reverse Recovery Current	I_{rr}	$V_R=400V, I_F=30A,$ $di_F/dt=-320A/\mu s, T_j=150^{\circ}C$		16		A
Diode Reverse Recovery Time	t_{rr}			177		ns
Reverse Recovery Charge	Q_{rr}			1.59		μC
Reverse Recovery Energy	E_{rec}			0.34		mJ

Thermal characteristics

Parameter	Symbol	Min	Typ	Max	Units
Operating Junction Temperature Range	T_j	-40		175	$^{\circ}C$
Storage Temperature Range	T_{stg}	-55		150	$^{\circ}C$
Thermal Resistance from Junction to Case (IGBT)	$R_{th_{J-C}}$			1.1	$^{\circ}C/W$
Thermal Resistance from Junction to Case (Diode)	$R_{th_{J-C}}$			1.8	$^{\circ}C/W$
Thermal Resistance from Junction to Ambient	$R_{th_{J-A}}$			40	$^{\circ}C/W$

Curve Characteristics

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

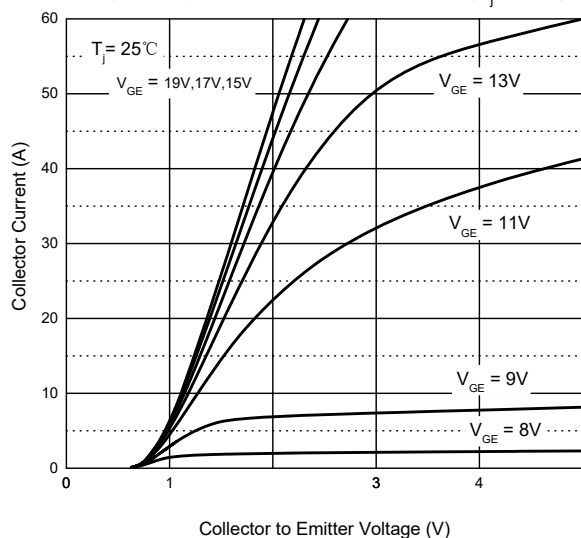


Fig. 2 - Typical Output Characteristic ($T_j=150^\circ\text{C}$)

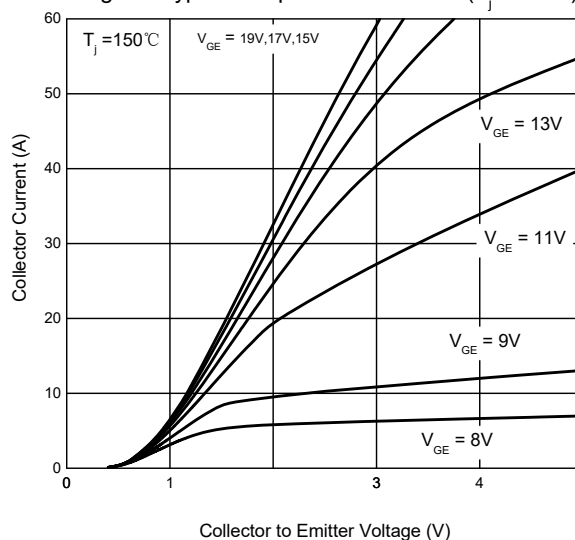


Fig. 3 - Typical Transfer Characteristic

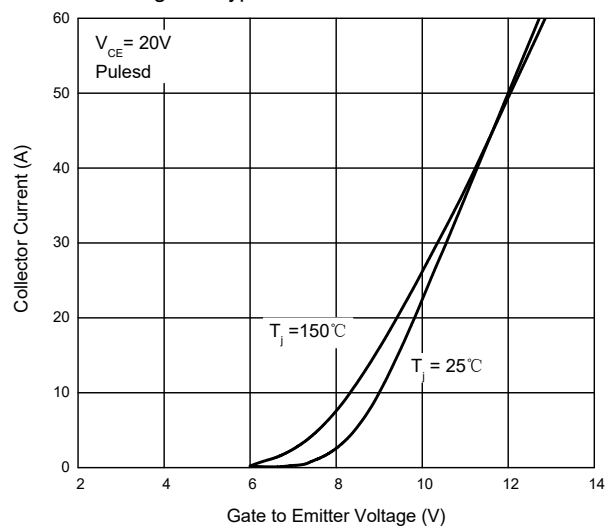


Fig. 4 - Diode Forward Current vs. Forward Voltage

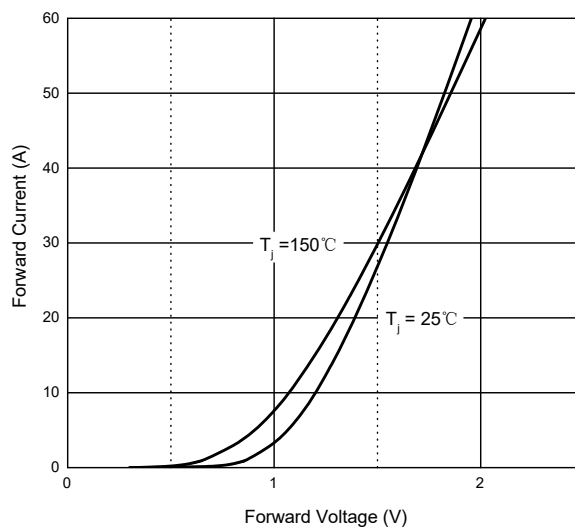


Fig. 5 - Diode VF vs. Junction Temperature

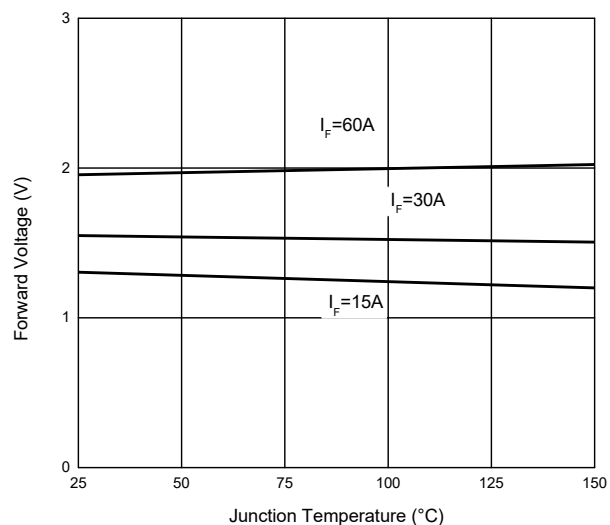
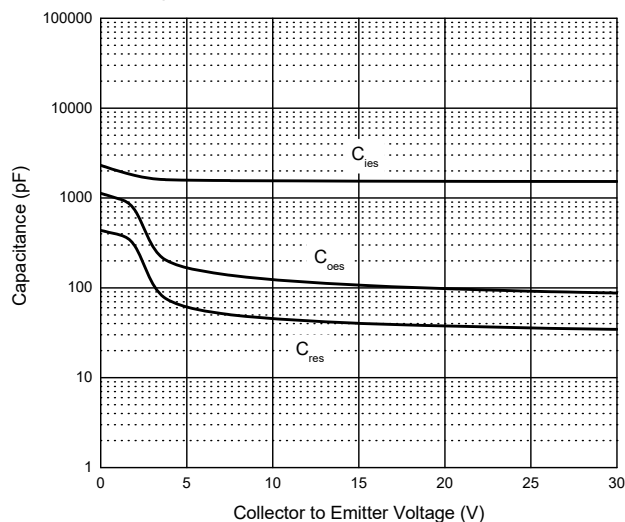


Fig. 6 - Capacitance Characteristics



Curve Characteristics

Fig. 7 - IGBT Switching Loss vs. I_C

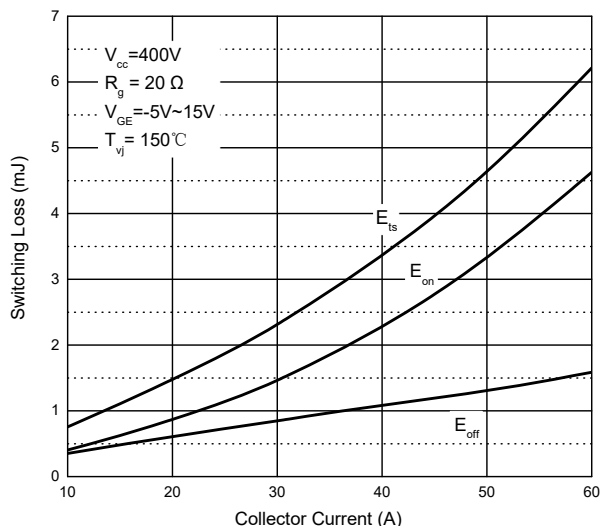


Fig. 8- IGBT Switching Loss vs. R_g

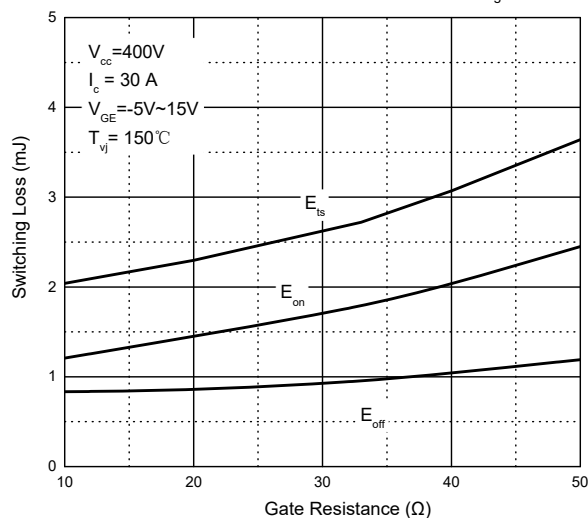


Fig. 9 -IGBT Switching Loss vs. Junction Temperature

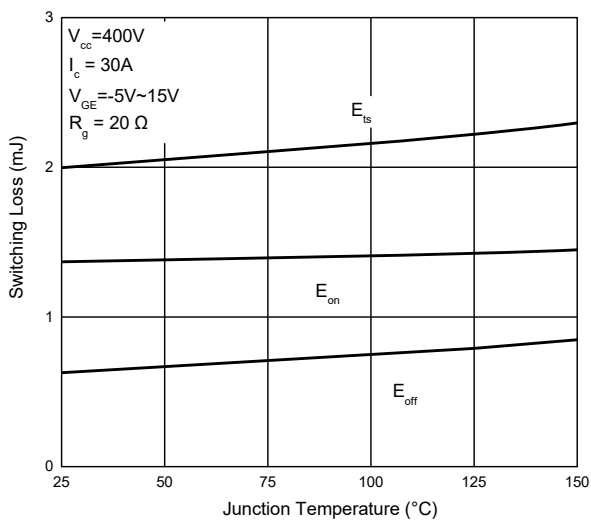


Fig. 10 - Switching Loss vs. VCE

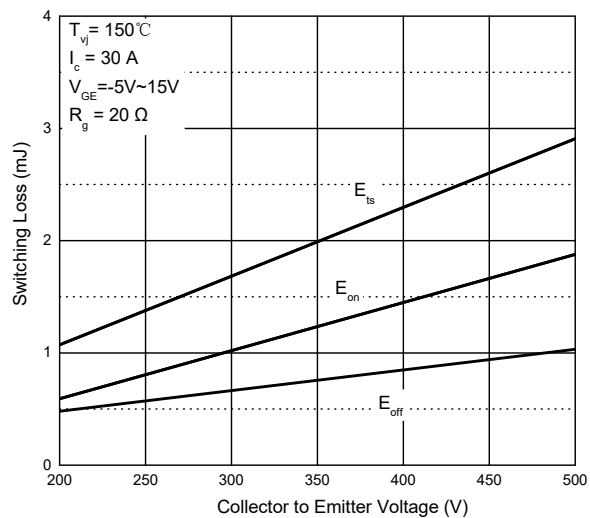


Fig. 11 - $V_{CE(sat)}$ vs. Junction Temperature

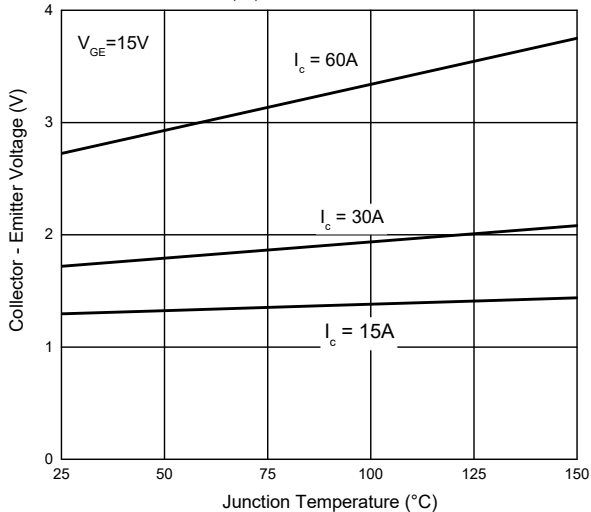
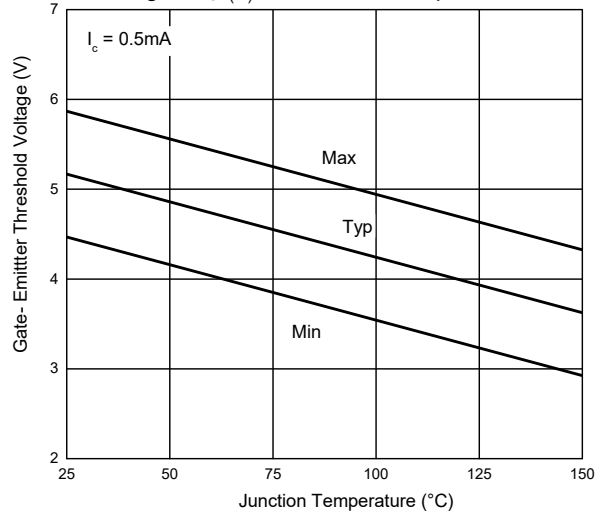


Fig.12 $V_{GE(th)}$ vs. Junction Temperature



Curve Characteristics

Fig. 13 - Switching Time vs. Collect Current

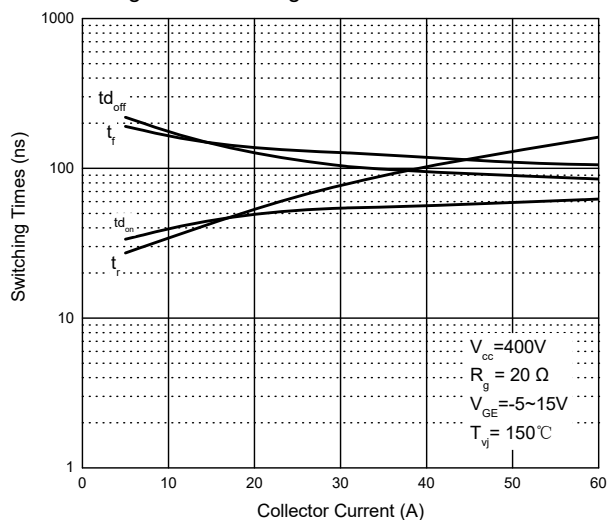


Fig. 14 - Switching Time vs. Gate Resistance

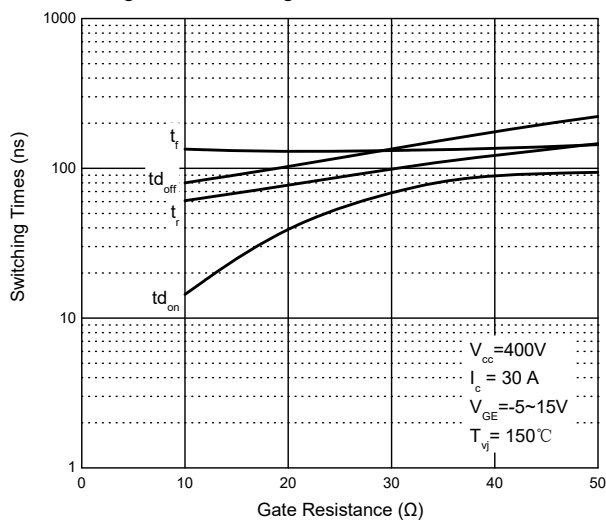


Fig. 15 - Switching Time vs. Junction Temperature

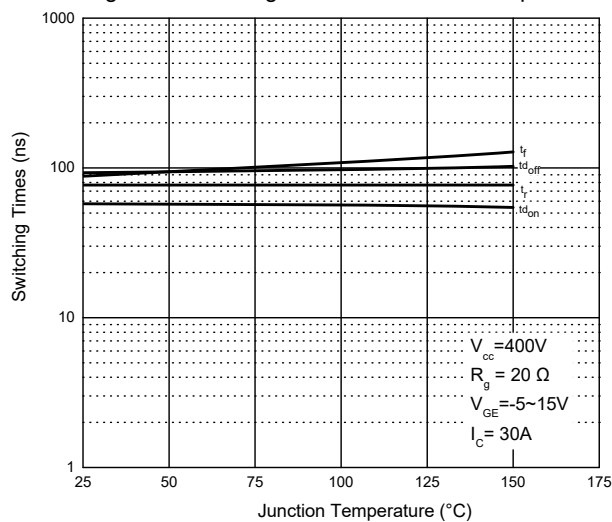


Fig. 16 - IGBT Transient Thermal Impedance

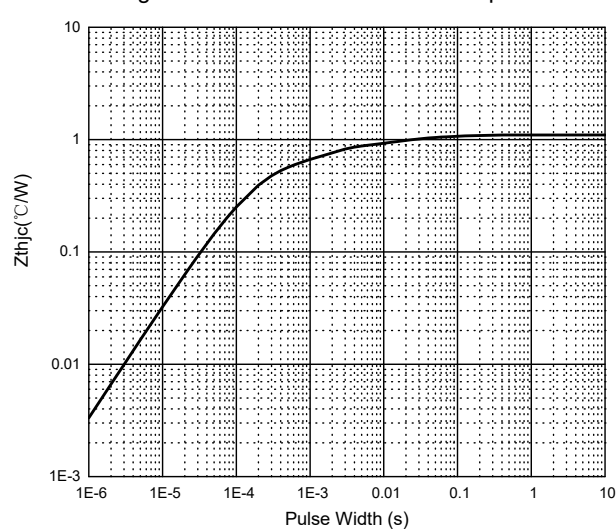


Fig. 17 - Diode Transient Thermal Impedance

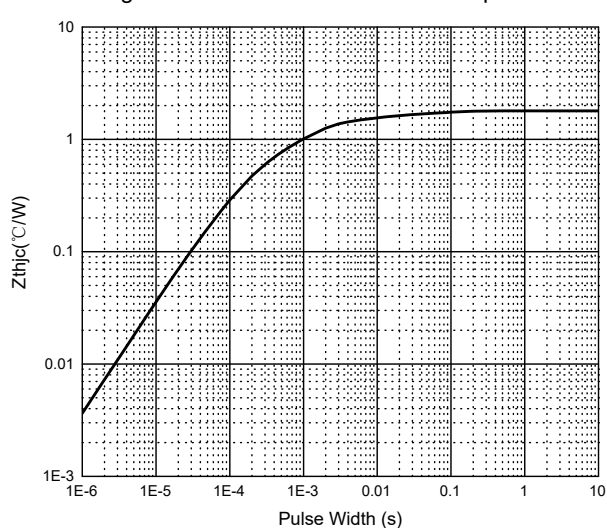
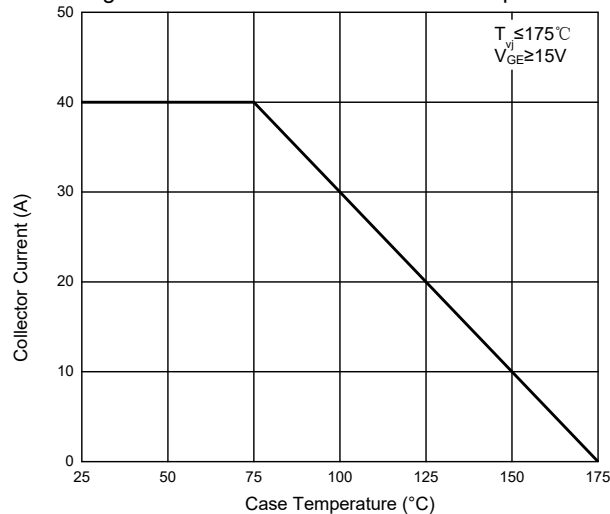
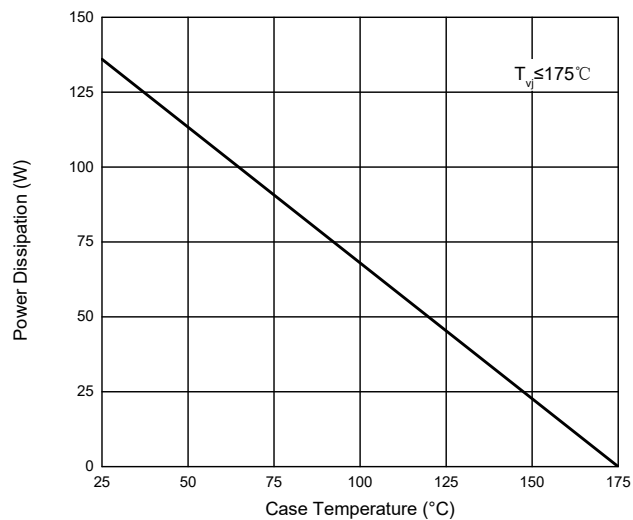


Fig. 18 - Collector Current vs. Case Temperature



Curve Characteristics

Fig. 19 - Power Derating



Ordering Information

Device	Packing
Part Number-TP	Tape&Reel: 800pcs/Reel

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