Features

- High Speed Smooth Switching Device for Hard and Soft Switching
- Positive Temperature Coefficient
- High Ruggedness, Good Thermal Stability
- Moisture Sensitivity Level 1
- 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 15A

Applications

- Soft Switching Applications
- Air Conditioning
- Motor Drive Inverter

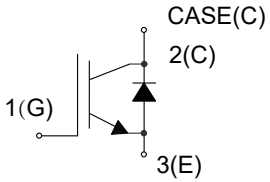
Maximum Ratings

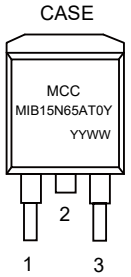
Parameter		Symbol	Rating	Unit
Collector-Emitter Voltage		V_{CE}	650	V
DC Collector Current(3)	T_C=25°C	I_C	30	A
	T_C=100°C		15	
Pulsed Collector Current,V_{GE}=15V(4)		$I_{C,pluse}$	45	A
Diode Forward Current (3)	T_C=25°C	I_F	30	A
	T_C=100°C		15	
Diode Pulsed Current (4)		$I_{F,pluse}$	45	A
Continuous Gate-Emitter Voltage		V_{GE}	±20	V
Transient Gate-Emitter Voltage(5)			±30	
Turn off Safe Operation Area, VCE≤ 600V,Tj≤ 150°C			45	A
Short Circuit Withstand Time(6)		T_{SC}	5	μs
Power Dissipation, T_C=25°C, T_j=175°C		P_D	110	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≤10us, Duty Cycle<1%
6. V_{GE}=15V, V_{CE}≤400V

Internal Structure

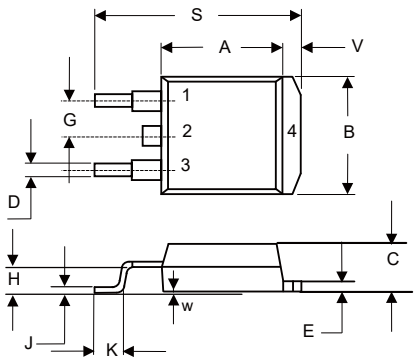




Device Code: MIB15N65AT0Y

Date Code: YYWW: (Year & Week)

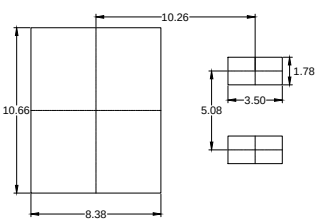
D²-PAK



DIMENSIONS					
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	0.10		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

Unit:mm



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=15A, T_j=25°C		1.4	1.70	V
		V_{GE}=15V, I_C=15A, T_j=125°C		1.55		
		V_{GE}=15V, I_C=15A, T_j=150°C		1.6		
G-E Threshold Voltage	$V_{GE(th)}$	I_C=1mA, V_{CE}=V_{GE}	5.0	5.8	6.5	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			1	
G-E Leakage Current	I_{GES}	V_{CE}=0V, V_{GE}=±20V			±200	nA
Dynamic Characteristics						
Input Capacitance	C_{ies}	V_{CE}=25V,V_{GE}=0V,f=1MHz		0.88		nF
Output Capacitance	C_{oes}			0.04		
Reverse Transfer Capacitance	C_{res}			0.01		
Gate Charge	Q_G	V_{CC}=300V,I_C=15A,V_{GE}=15V		0.069		μC
IGBT Switching Characteristics						
Turn-On Delay Time	$td_{(on)}$	V_{CC}=300V, I_C=15A, V_{GE}=-5V~15V, R_G=51Ω,T_j=25°C		10		ns
Rise Time	t_r			28		
Turn-Off Delay Time	$td_{(off)}$			68		
Fall Time	t_f			138		
Turn-On Energy	E_{on}			0.33		mJ
Turn-Off Energy	E_{off}			0.16		
Turn-On Delay Time	$td_{(on)}$	V_{CC}=300V, I_C=15A V_{GE}=-5V~15V, R_G=51Ω,T_j=125°C		14		ns
Rise Time	t_r			36		
Turn-Off Delay Time	$td_{(off)}$			69		
Fall Time	t_f			161		
Turn-On Energy	E_{on}			0.38		mJ
Turn-Off Energy	E_{off}			0.27		
Turn-On Delay Time	$td_{(on)}$	V_{CC}=300V, I_C=15A V_{GE}=-5V~15V, R_G=51Ω,T_j=150°C		16		ns
Rise Time	t_r			43		
Turn-Off Delay Time	$td_{(off)}$			69		
Fall Time	t_f			182		
Turn-On Energy	E_{on}			0.43		mJ
Turn-Off Energy	E_{off}			0.32		
Short Circuit Collector Current	$I_{C(SC)}$	V_{GE}=15V,t_{SC}≤5us V_{CC}=400V,$T_{j,start}$=25°C		110		A

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=15A, T_j=25°C		1.9	2.4	V
		V_{GE}=0V, I_F=15A, T_j=125°C		1.7		
		V_{GE}=0V, I_F=15A, T_j=150°C		1.6		
Reverse Recovery Current	I_{rr}	V_R=300V, I_F=15A, di_F/dt=-380A/μs, T_j=25°C		6		A
Diode Reverse Recovery Time	t_{rr}			197		ns
Reverse Recovery Charge	Q_{rr}			0.24		μC
Reverse Recovery Energy	E_{rec}			0.06		mJ
Reverse Recovery Current	I_{rr}	V_R=300V, I_F=15A, di_F/dt=-380A/μs, T_j=125°C		7		A
Diode Reverse Recovery Time	t_{rr}			213		ns
Reverse Recovery Charge	Q_{rr}			0.58		μC
Reverse Recovery Energy	E_{rec}			0.11		mJ
Reverse Recovery Current	I_{rr}	V_R=300V, I_F=15A, di_F/dt=-380A/μs, T_j=150°C		8		A
Diode Reverse Recovery Time	t_{rr}			221		ns
Reverse Recovery Charge	Q_{rr}			0.71		μC
Reverse Recovery Energy	E_{rec}			0.14		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}			1.35	°C/W
Thermal Resistance from Junction to Case (Diode)	Rth_{J-C}			1.5	°C/W
Thermal Resistance from Junction to Ambient	Rth_{J-A}			60	°C/W

Curve Characteristics

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

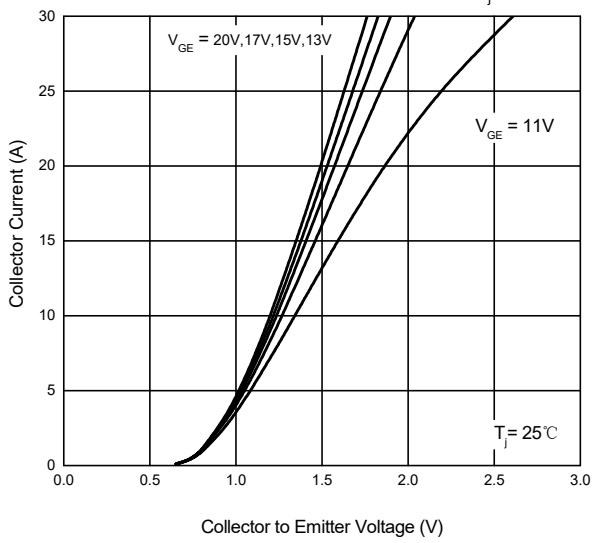


Fig. 2 - Typical Output Characteristic (T_j=150°C)

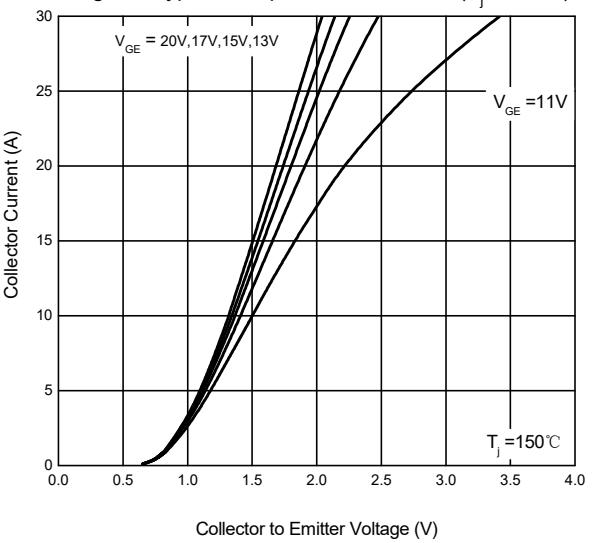


Fig. 3 - IGBT Typical Transfer Characteristic

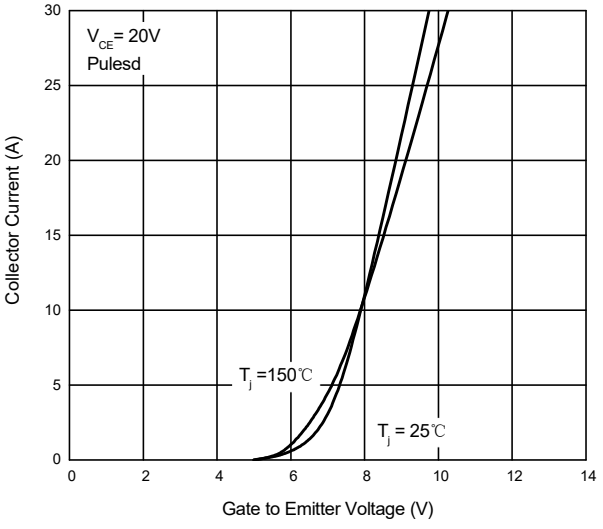


Fig. 4 - Diode Forward Current vs V_F

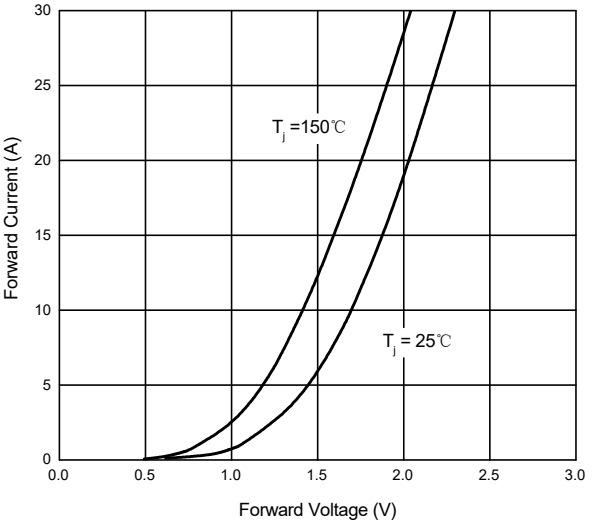


Fig. 5 - IGBT Switching Loss vs. I_C

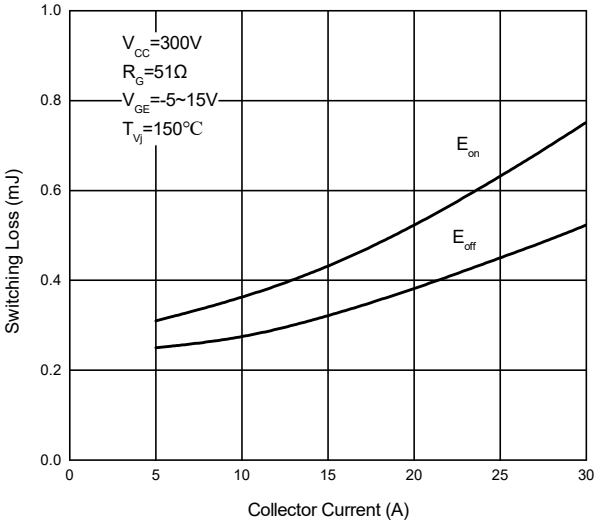
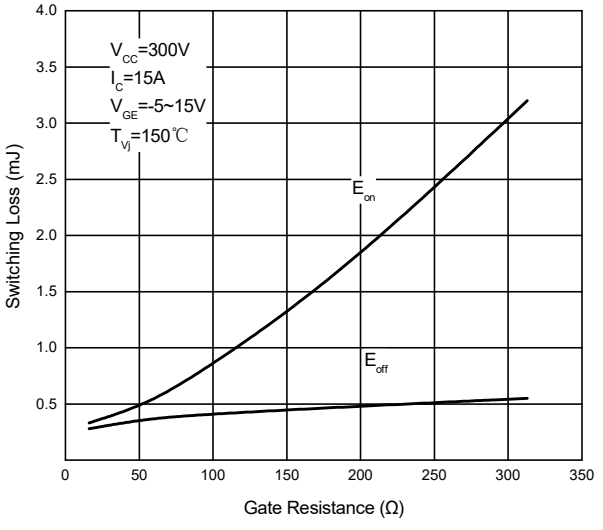


Fig. 6 - IGBT Switch Loss $_{VS.}R_G$



Curve Characteristics

Fig. 7 - Diode Switching Loss vs I_F

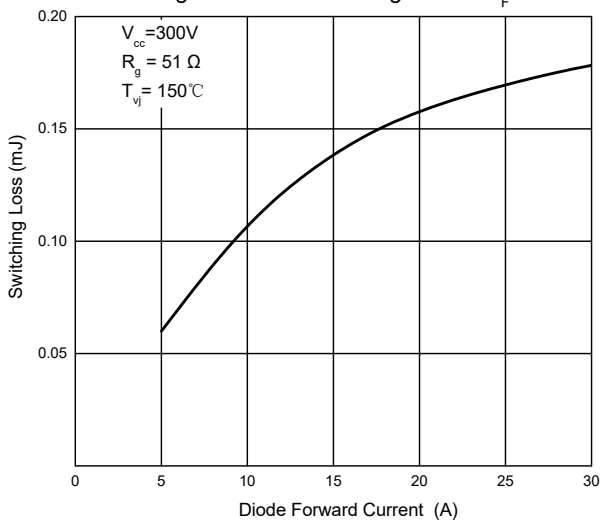


Fig. 8 - Diode Switching Loss vs R_G

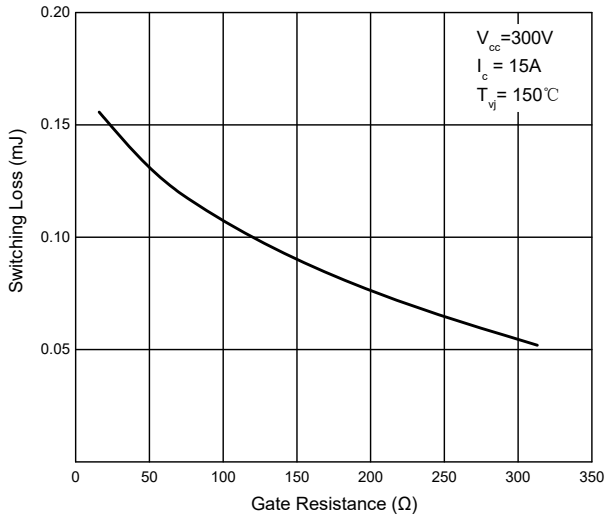


Fig. 9 - IGBT Transient Thermal Impedance

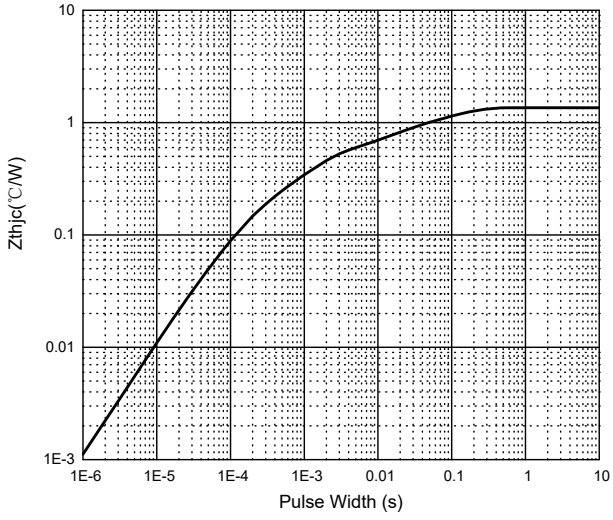


Fig. 10 - Diode Transient Thermal Impedance

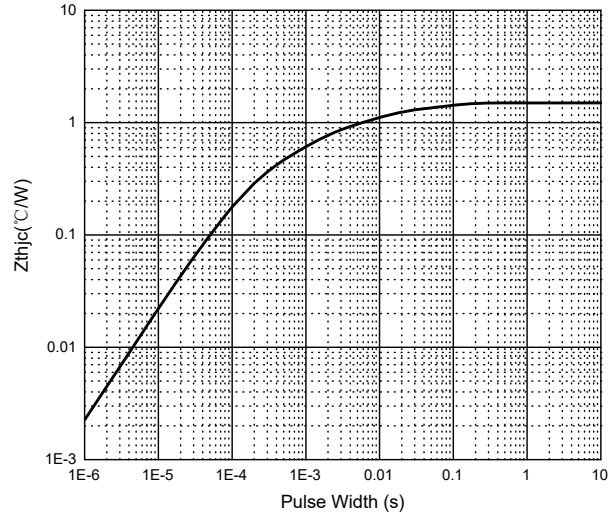


Fig. 11 - Collector Current vs Case Temperature

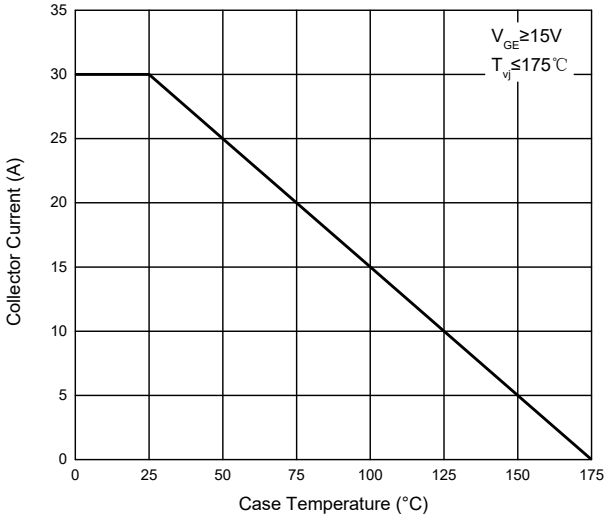
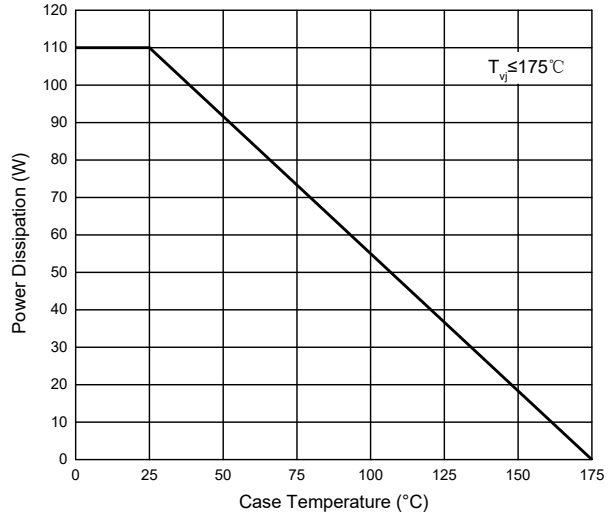


Fig. 12 - Power Derating



Ordering Information

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