Features

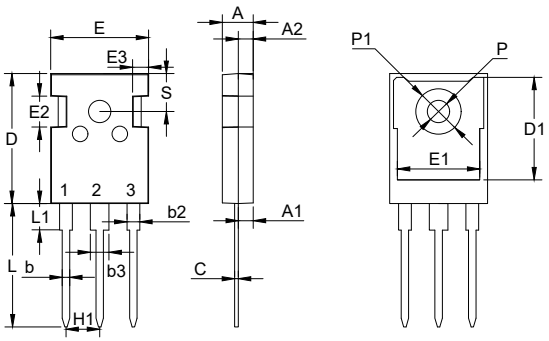
- Low switching losses
- Maximum junction temperature 175℃
- Positive temperature coefficient
- High ruggedness, temperature stable
- High short circuit capability(5us)
- Halogen Free. “Green” Device (Note 1)
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant ("P" Suffix Designates RoHS Compliant. See Ordering Information)

Trench and Field Stop IGBT 650V 40A

Applications

- AC and DC servo drive amplifier
- Uninterruptible power supply
- Motion/servo control

TO-247AB



Maximum Ratings

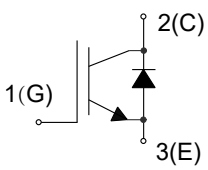
Parameter		Symbol	Rating	Unit
Collector-Emitter Voltage		V_{CE}	650	V
DC Collector Current (2)	T_C=25°C	I_C	80	A
	T_C=100°C		40	
Pulsed Collector Current (3) V_{GE}=15V		I_{CM}	120	A
Diode Forward Current (2)	T_C=25°C	I_F	80	A
	T_C=100°C		40	
Diode Pulsed Current (3)		$I_{F,puls}$	120	A
Gate-Emitter Voltage		V_{GE}	±20	V
Transient Gate-Emitter Voltage(4)			±30	
Short Circuit Withstand Time V_{GE}=15V, V_{CC}=400V, V_{CEM}≤650V		t_{SC}	5	μs
Turn off Safe Operating Area V_{CE}≤ 650V,T_j=150℃			120	A
Power Dissipation,T_j=175℃,Tc=25℃		P_D	187	W

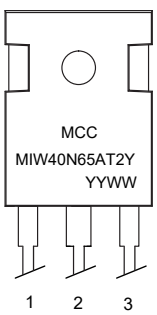
DIMENSIONS					
DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	0.189	0.205	4.80	5.20	
A1	0.087	0.103	2.21	2.61	
A2	0.073	0.085	1.85	2.15	
b	0.039	0.055	1.00	1.40	
b2	0.075	0.087	1.91	2.21	
C	0.020	0.028	0.50	0.70	
D	0.815	0.839	20.70	21.30	
D1	0.640	0.663	16.25	16.85	
E	0.610	0.634	15.50	16.10	
E1	0.512	0.535	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	

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. Limited by T_{Jmax}.
3. Tp limited by T_{Jmax}.
4. tp≤10us，D≤0.01

Internal Structure





Device Code: MIW40N65AT2Y

Date Code: YYWW (Year & Week)

Electrical Characteristics @ 25°C (Unless Otherwise Specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
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=40A, T_J=25℃		1.60	1.90	V
		V_{GE}=15V, I_C=40A, T_J=125℃		1.85		
		V_{GE}=15V, I_C=40A, T_J=150℃		2.00		
G-E Threshold Voltage	$V_{GE(th)}$	I_C=1mA, V_{GE}=V_{CE}	4.1	5.1	6.1	V
C-E Leakage Current	I_{CES}	V_{CE}=650V, V_{GE}=0V, TJ=25℃			0.25	mA
		V_{CE}=650V, V_{GE}=0V, T_J=150℃			4.0	
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		2.03		nF
Reverse Transfer Capacitance	C_{res}			0.02		
Gate Charge	Q_g	V_{CC}=400V,I_C=40A,V_{GE}=15V		0.14		μC
Short Circuit Collector Current	I_{sc}	V_{GE}=15V, tsc≤5us, V_{cc}=400V		185		A
IGBT Switching Characteristics						
Turn-On Delay Time	$td_{(on)}$	V_{CC}=400V, I_C=40A, V_{GE}=-5~15V, R_G=20Ω T_j=25℃		55		ns
Rise Time	t_r			72		
Turn-Off Delay Time	$td_{(off)}$			129		
Fall Time	t_f			116		
Turn-On Energy	E_{on}			1.34		mJ
Turn-Off Energy	E_{off}			0.91		
Turn-On Delay Time	$td_{(on)}$	V_{CC}=400V, I_C=40A, V_{GE}=-5~15V, R_G=20Ω, T_J=125℃		52		ns
Rise Time	t_r			74		
Turn-Off Delay Time	$td_{(off)}$			140		
Fall Time	t_f			159		
Turn-On Energy	E_{on}			1.47		mJ
Turn-Off Energy	E_{off}			1.14		
Turn-On Delay Time	$td_{(on)}$	V_{CC}=400V, I_C=40A, V_{GE}=-5~15V, R_G=20Ω, T_J=150℃Inductive Load		50		ns
Rise Time	t_r			75		
Turn-Off Delay Time	$td_{(off)}$			144		
Fall Time	t_f			178		
Turn-On Energy	E_{on}			1.53		mJ
Turn-Off Energy	E_{off}			1.24		

Electrical Characteristics @ 25°C (Unless Otherwise Specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Static Characteristics						
Diode Forward Voltage	V_F	I_F=40A, T_J=25℃		1.60	2.10	V
		I_F=40A, T_J=125℃		1.40		
		I_F=40A, T_J=150℃		1.45		
Diode Dynamic Characteristics						
Reverse Recovery Current	I_{rr}	V_R=400V, I_F=40A, -di_F/dt=470A/μs, T_J=25℃		14		A
Reverse Recovery Charge	Q_{rr}			0.60		uC
Diode reverse recovery time	t_{rr}			79		ns
Reverse Recovery Energy	E_{rec}			0.10		mJ
Reverse Recovery Current	I_{rr}	V_R=400V, I_F=40A, -di_F/dt=470A/μs, T_J=125℃		20		A
Reverse Recovery Charge	Q_{rr}			1.31		μC
Diode reverse recovery time	t_{rr}			125		ns
Reverse Recovery Energy	E_{rec}			0.25		mJ
Reverse Recovery Current	I_{rr}	V_R=400V, I_F=40A, -di_F/dt=470A/μs, T_J=150℃		22		A
Reverse Recovery Charge	Q_{rr}			1.62		μC
Diode reverse recovery time	t_{rr}			144		ns
Reverse Recovery Energy	E_{rec}			0.32		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}			0.8	°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)

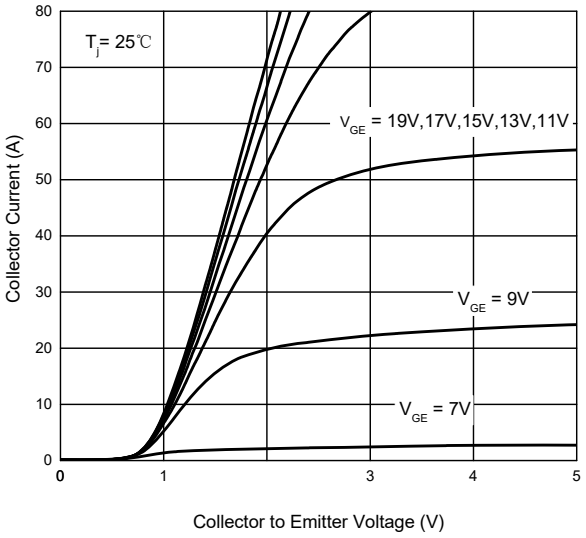


Fig. 2 - Typical Output Characteristic (T_j=150°C)

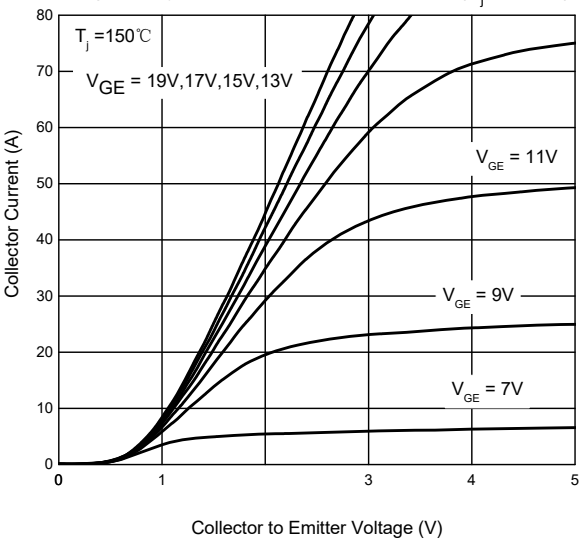


Fig. 3 - Typical Transfer Characteristic

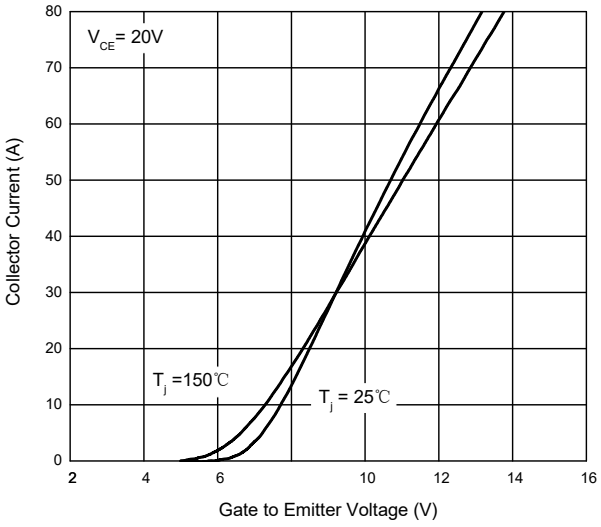


Fig. 4 - Diode Forward Current vs. Forward Voltage

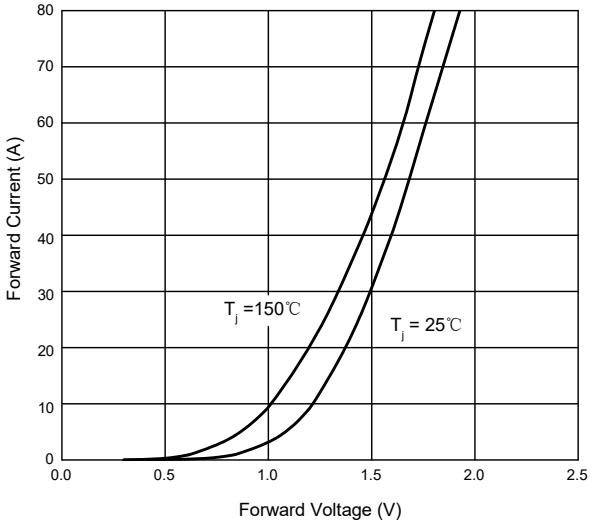


Fig. 5 - Capacitance Characteristics

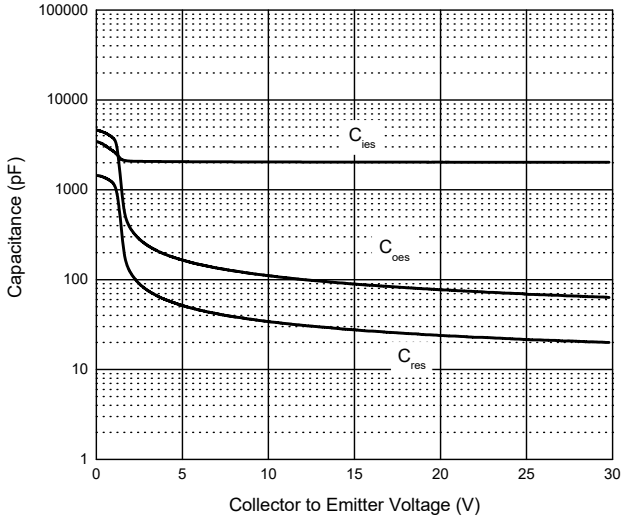
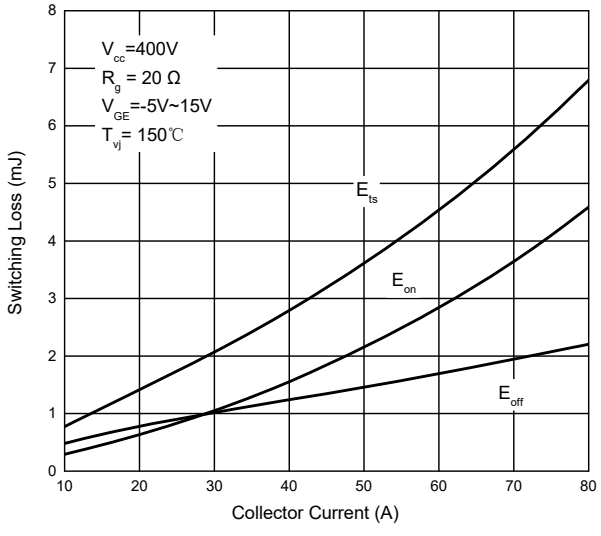


Fig. 6 - IGBT Switching Loss vs. IC



Curve Characteristics

Fig. 7 -IGBT Switching Loss vs. Junction Temperature

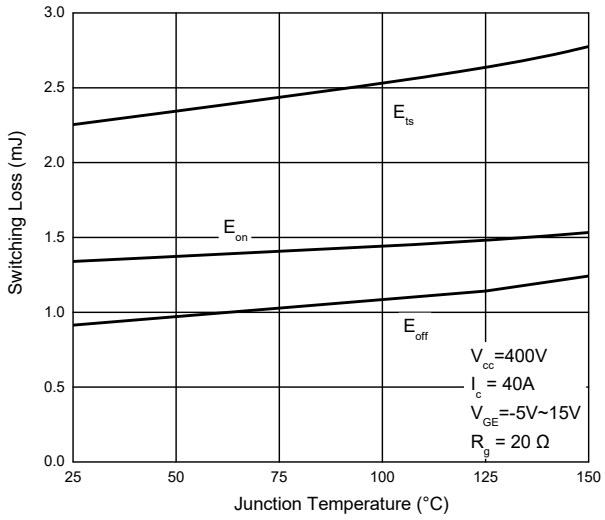


Fig. 8 - Switching Loss vs. V_{CE}

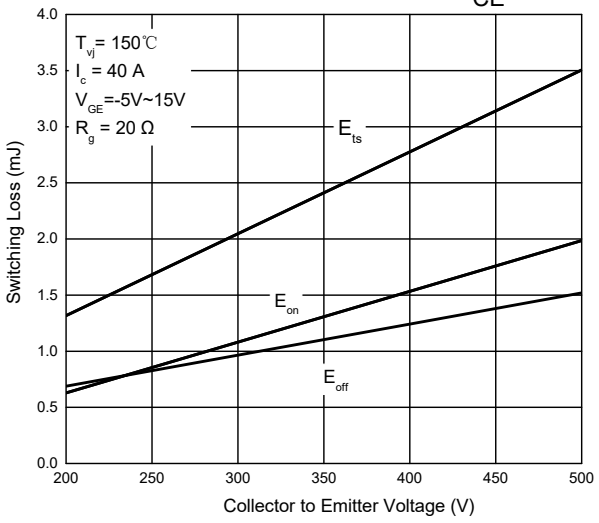


Fig. 9 - $V_{GE(th)}$ vs. Junction Temperature

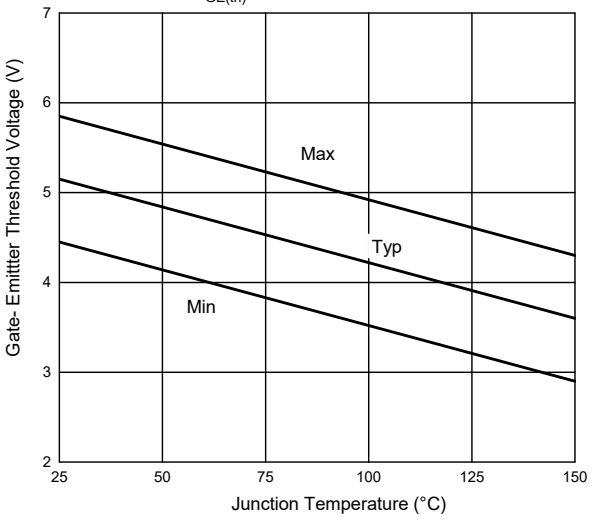


Fig. 10 - Switching Time vs. Collect Current

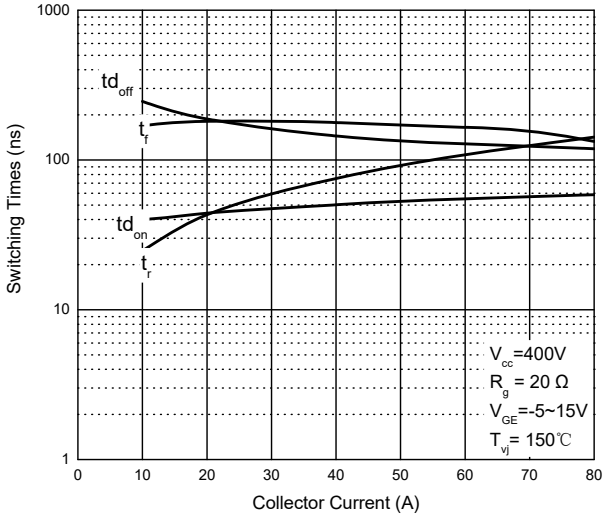


Fig. 11 - IGBT Transient Thermal Impedance

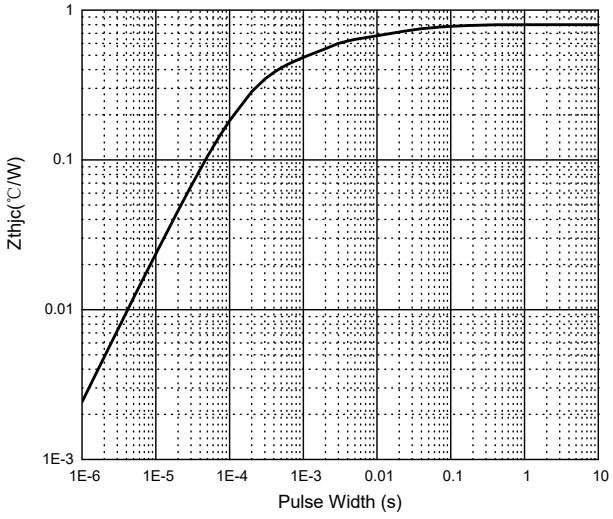
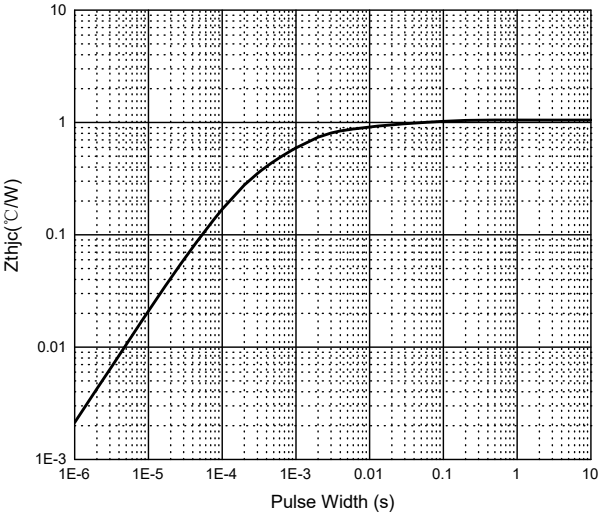


Fig. 12 - Diode Transient Thermal Impedance



Curve Characteristics

Fig. 13 - Collector Current vs. Case Temperature

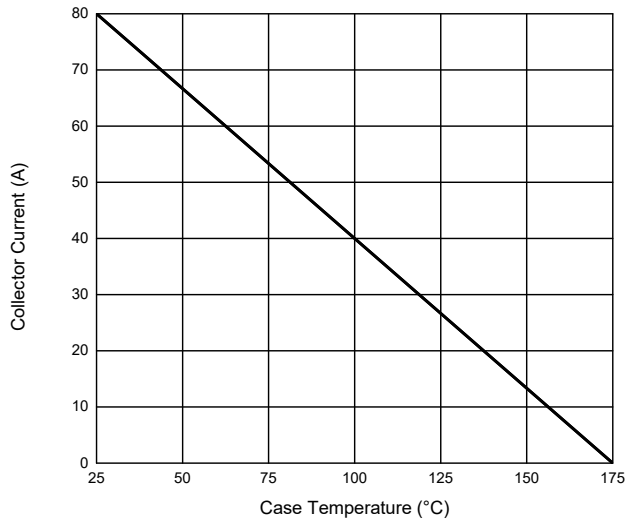
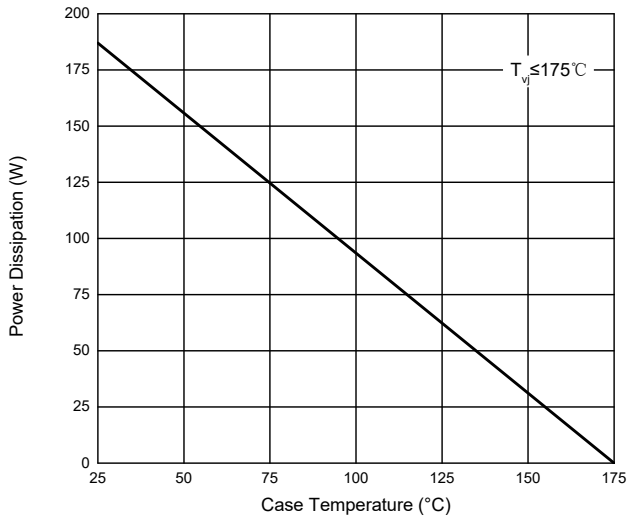


Fig. 14 - Power Derating



Ordering Information

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