

2MBI400VB-060-50

IGBT Modules

IGBT MODULE (V series) 600V / 400A / 2 in one package

■ Features

- High speed switching
- Voltage drive
- Low Inductance module structure

■ Applications

- Inverter for Motor Drive
- AC and DC Servo Drive Amplifier
- Uninterruptible Power Supply
- Industrial machines, such as Welding machines



■ Maximum Ratings and Characteristics

● Absolute Maximum Ratings (at T_c=25°C unless otherwise specified)

Items	Symbols	Conditions	Maximum ratings	Units
Collector-Emitter voltage	V _{CEs}		600	V
Gate-Emitter voltage	V _{GES}		±20	V
Collector current	I _C	Continuous T _c =80°C	400	
	I _{C pulse}	1ms	800	
	-I _C		400	
	-I _{C pulse}	1ms	800	
Collector power dissipation	P _C	1 device	1970	W
Junction temperature	T _J		175	°C
Operating junction temperature (under switching conditions)	T _{Jop}		150	
Case temperature	T _C		125	
Storage temperature	T _{stg}		-40 ~ 125	
Isolation voltage	between terminal and copper base (*1) V _{iso}	AC : 1min.	2500	VAC
Screw torque	Mounting (*2)		3.5	N m
	Terminals (*3)		3.5	

Note *1: All terminals should be connected together during the test.

Note *2: Recommendable Value : 2.5-3.5 Nm (M5 or M6)

Note *3: Recommendable Value : 2.5-3.5 Nm (M5)

● Electrical characteristics (at T_J= 25°C unless otherwise specified)

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Zero gate voltage collector current	I _{CEs}	V _{GE} = 0V, V _{CE} = 600V	-	-	2.0	mA
Gate-Emitter leakage current	I _{GES}	V _{CE} = 0V, V _{GE} = ±20V	-	-	400	nA
Gate-Emitter threshold voltage	V _{GE(th)}	V _{CE} = 20V, I _C = 400mA	6.2	6.7	7.2	V
Collector-Emitter saturation voltage	V _{CE(sat)} (terminal)	V _{GE} = 15V I _C = 400A	T _J =25°C	1.90	2.35	V
			T _J =125°C	2.20	-	
			T _J =150°C	2.30	-	
	V _{CE(sat)} (chip)	V _{GE} = 15V I _C = 400A	T _J =25°C	1.60	2.05	
			T _J =125°C	1.90	-	
			T _J =150°C	2.00	-	
Internal gate resistance	R _{G(int)}	-	-	2.0	-	Ω
Input capacitance	C _{ies}	V _{CE} = 10V, V _{GE} = 0V, f = 1MHz	-	25.6	-	nF
Turn-on time	t _{on}	V _{CC} = 300V L _S = 30nH I _C = 400A V _{GE} = ±15V	-	650	-	nsec
	t _r		-	300	-	
Turn-off time	t _f	R _G = 3.3Ω T _J = 150°C	-	100	-	
	t _{rr}		-	600	-	
Forward on voltage	V _F (terminal)	V _{GE} = 0V I _F = 400A	T _J =25°C	1.75	2.20	V
			T _J =125°C	1.65	-	
			T _J =150°C	1.62	-	
	V _F (chip)	V _{GE} = 0V I _F = 400A	T _J =25°C	1.60	2.05	
			T _J =125°C	1.50	-	
			T _J =150°C	1.47	-	
Reverse recovery time	t _{rr}	I _F = 400A	-	200	-	nsec

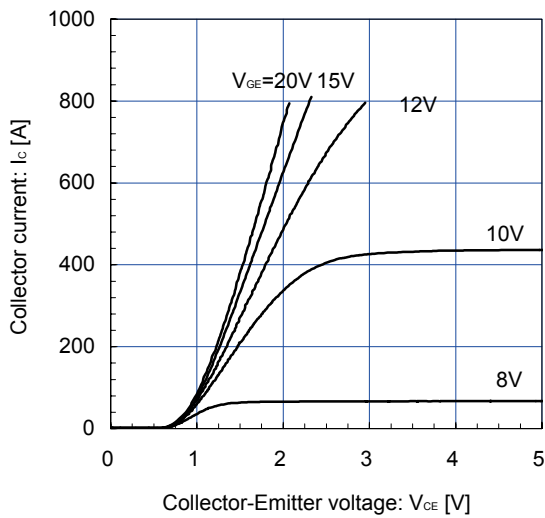
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	R _{th(j-c)}	IGBT	-	-	0.076	°C/W
		FWD	-	-	0.140	
Contact thermal resistance (1device) (*4)	R _{th(c-f)}	with Thermal Compound	-	0.025	-	

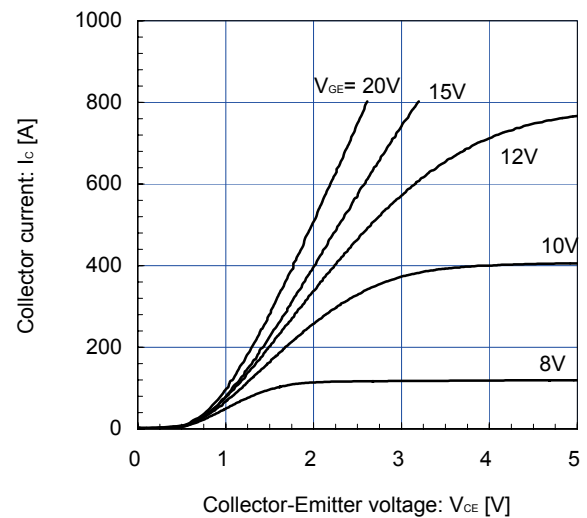
Note *4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

Characteristics (Representative)

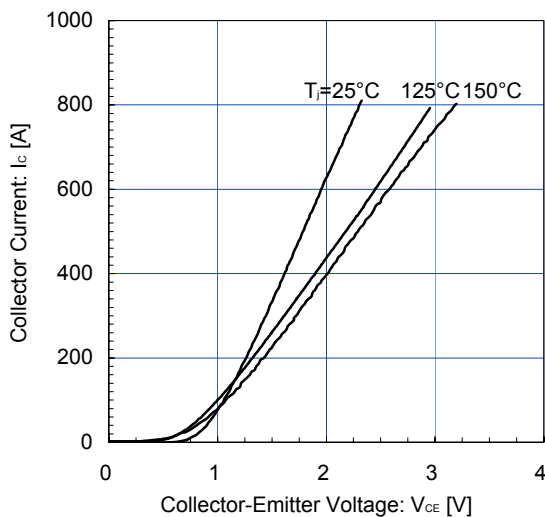
Collector current vs. Collector-Emitter voltage (typ.)
 $T_J = 25^\circ\text{C}$ / chip



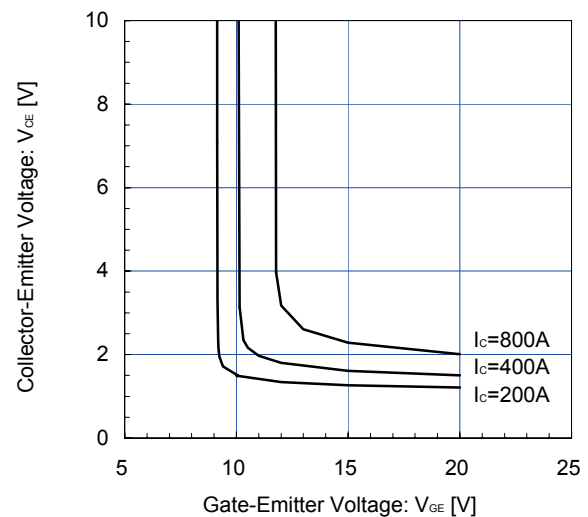
Collector current vs. Collector-Emitter voltage (typ.)
 $T_J = 150^\circ\text{C}$ / chip



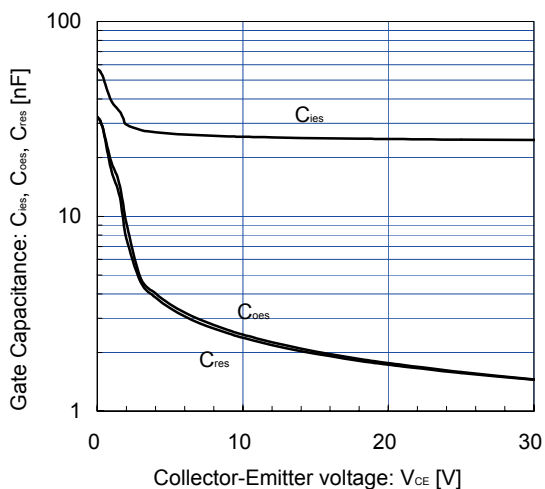
Collector current vs. Collector-Emitter voltage (typ.)
 $V_{GE} = 15\text{V}$ / chip



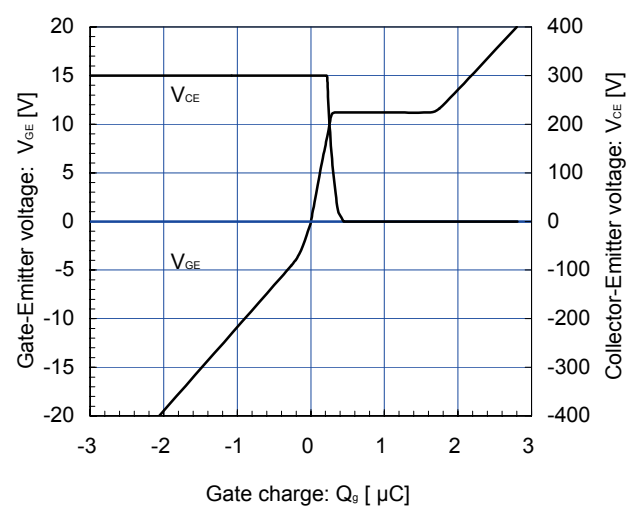
Collector-Emitter voltage vs. Gate-Emitter voltage
 $T_J = 25^\circ\text{C}$ / chip



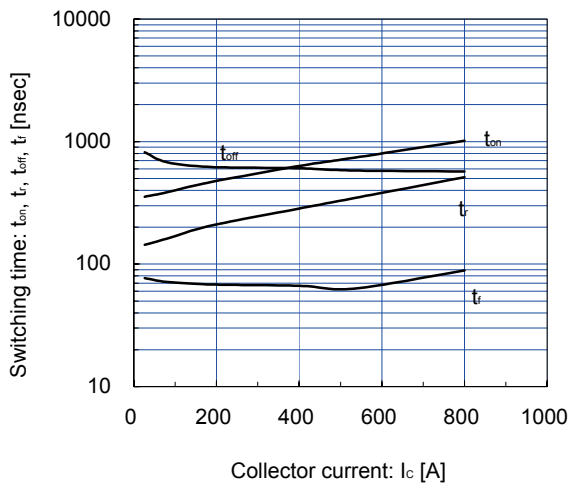
Gate Capacitance vs. Collector-Emitter Voltage
 $V_{GE} = 0\text{V}$, $f = 1\text{MHz}$, $T_J = 25^\circ\text{C}$



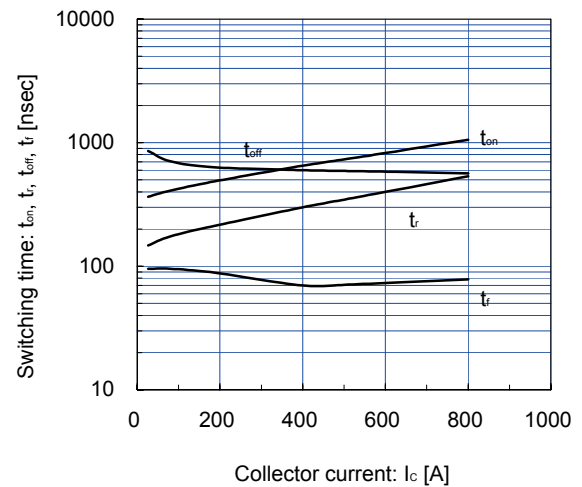
Dynamic Gate Charge (typ.)
 $V_{CC} = 300\text{V}$, $I_C = 400\text{A}$, $T_J = 25^\circ\text{C}$



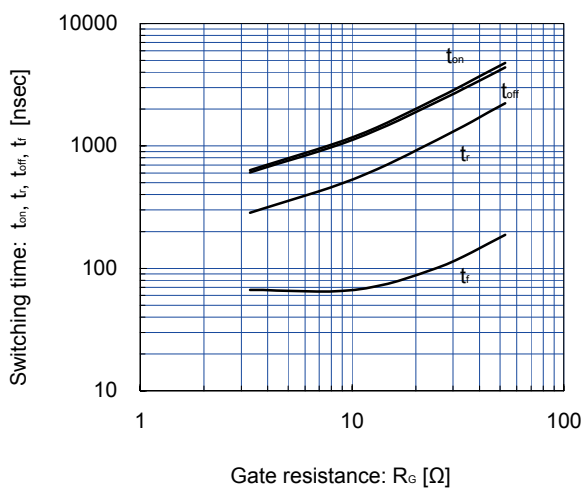
Switching time vs. Collector current (typ.)
 $V_{CC}=300V$, $V_{GE}=\pm 15V$, $R_G=3.3\Omega$, $T_J=125^\circ C$



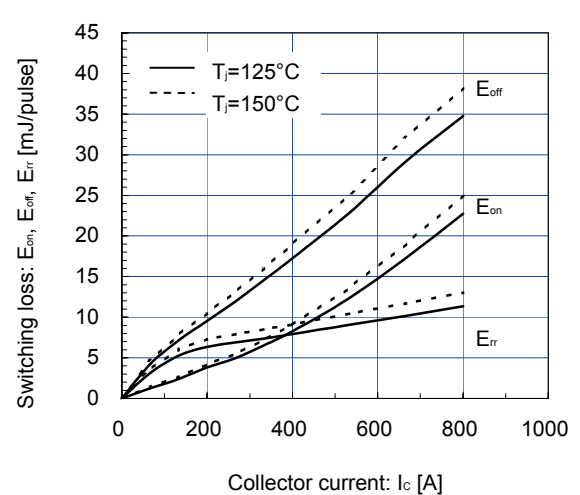
Switching time vs. Collector current (typ.)
 $V_{CC}=300V$, $V_{GE}=\pm 15V$, $R_G=3.3\Omega$, $T_J=150^\circ C$



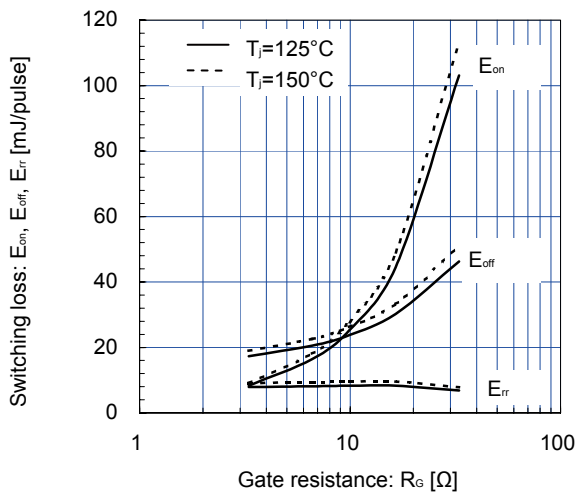
Switching time vs. Gate resistance (typ.)
 $V_{CC}=300V$, $I_C=400A$, $V_{GE}=\pm 15V$, $T_J=125^\circ C$



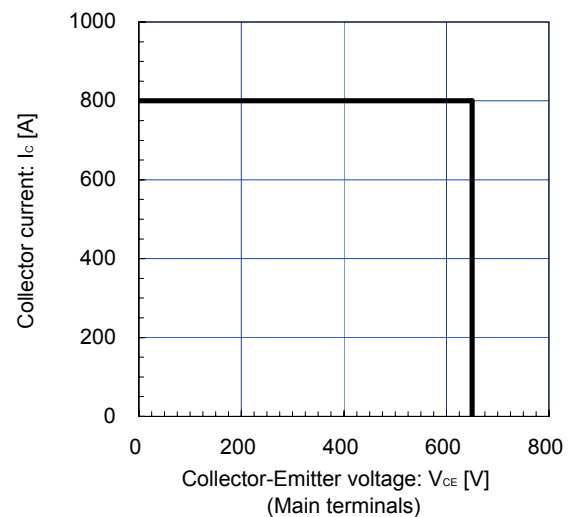
Switching loss vs. Collector current (typ.)
 $V_{CC}=300V$, $V_{GE}=\pm 15V$, $R_G=3.3\Omega$, $T_J=125, 150^\circ C$



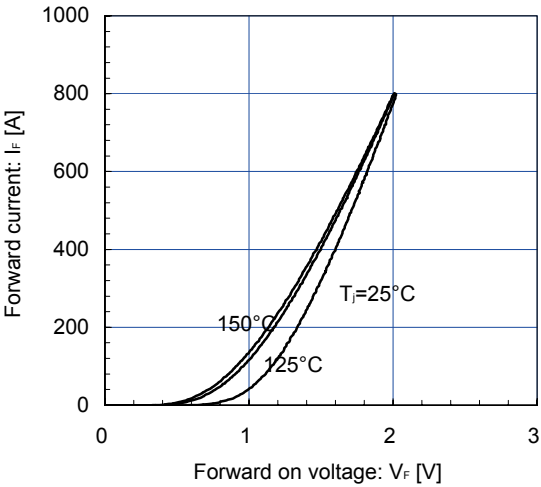
Switching loss vs. Gate resistance (typ.)
 $V_{CC}=300V$, $I_C=400A$, $V_{GE}=\pm 15V$, $T_J=125, 150^\circ C$



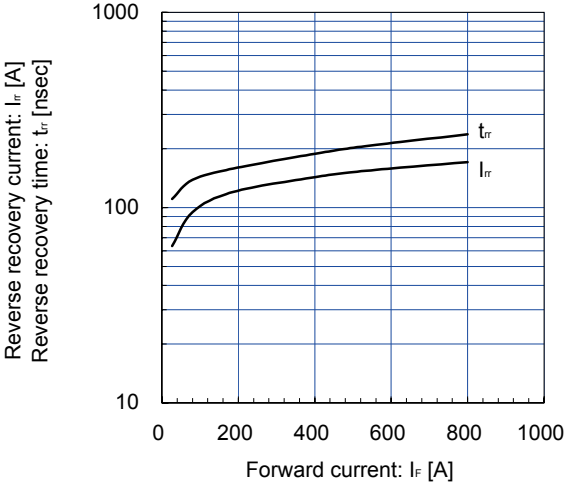
Reverse bias safe operating area (max.)
 $+V_{GE}=15V$, $-V_{GE}=15V$, $R_G=3.3\Omega$, $T_J=150^\circ C$



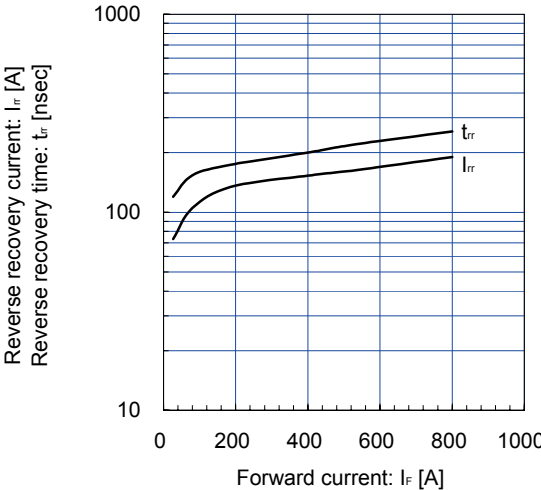
Forward Current vs. Forward Voltage (typ.)
chip



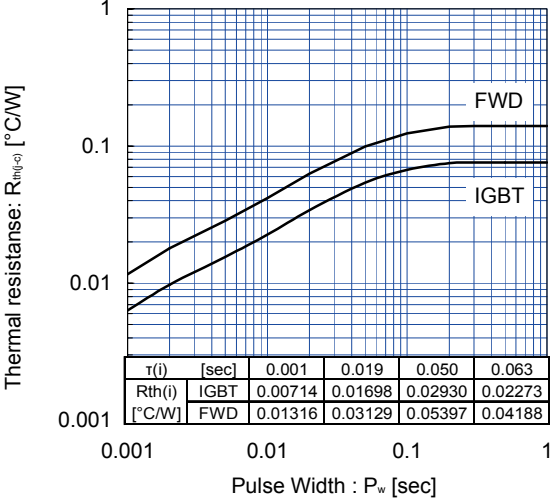
Reverse Recovery Characteristics (typ.)
V_{CC}=300V, V_{GE}=±15V, R_G=3.3Ω, T_J=125°C



Reverse Recovery Characteristics (typ.)
V_{CC}=300V, V_{GE}=±15V, R_G=3.3Ω, T_J=150°C

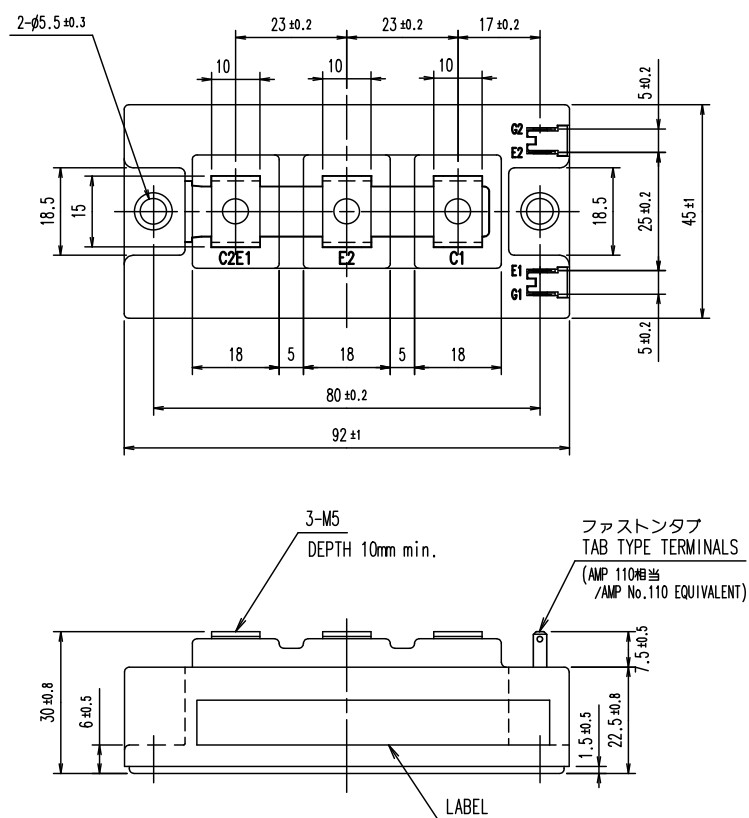


Transient Thermal Resistance (max.)

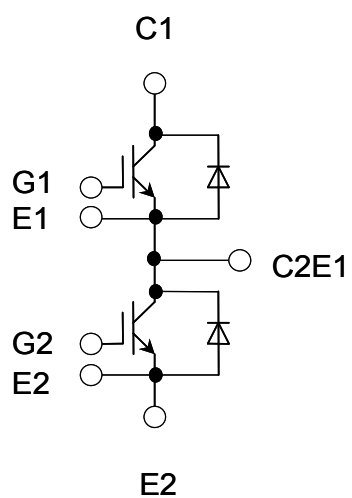


$t(t)$	[sec]	0.001	0.019	0.050	0.063
$R_{th}(t)$	IGBT	0.00714	0.01698	0.02930	0.02273
	FWD	0.01316	0.03129	0.05397	0.04188

■ Outline Drawings, mm



■ Equivalent Circuit Schematic



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