

# 2MBI600VD-060-50

IGBT Modules

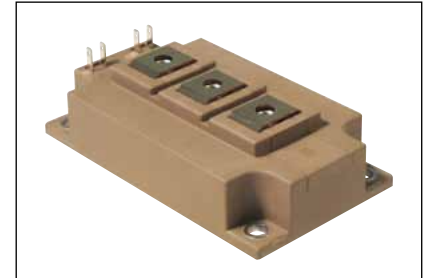
## IGBT MODULE (V series) 600V / 600A / 2 in one package

### ■ 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 Tc=25°C unless otherwise specified)

Items	Symbols	Conditions	Maximum ratings	Units	
Inverter	Collector-Emitter voltage	V <sub>CEs</sub>	600	V	
	Gate-Emitter voltage	V <sub>GES</sub>	±20	V	
	Collector current	I <sub>c</sub>	Continuous Tc=80°C	600	
		I <sub>c</sub> pulse	1ms Tc=80°C	1200	
		-I <sub>c</sub>		600	
		-I <sub>c</sub> pulse	1ms	1200	
Collector power dissipation	P <sub>c</sub>	1 device	2940	W	
Junction temperature	T <sub>j</sub>		175	°C	
Operating junction temperature (under switching conditions)	T <sub>top</sub>		150		
Case temperature	T <sub>c</sub>		125		
Storage temperature	T <sub>stg</sub>		-40 ~ +125		
Isolation voltage	between terminal and copper base (*1) V <sub>iso</sub>	AC : 1min.	2500	VAC	
Screw torque	Mounting (*2)		6.0	N m	
	Terminals (*3)		5.0		

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

Note \*2: Recommendable Value : 3.0-6.0 Nm (M5 or M6)

Note \*3: Recommendable Value : 2.5-5.0 Nm (M6)

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

Items	Symbols	Conditions	Characteristics			Units	
			min.	typ.	max.		
Zero gate voltage collector current	I <sub>CEs</sub>	V <sub>GE</sub> = 0V, V <sub>CE</sub> = 600V	-	-	2.0	mA	
Gate-Emitter leakage current	I <sub>GES</sub>	V <sub>CE</sub> = 0V, V <sub>GE</sub> = ±20V	-	-	800	nA	
Gate-Emitter threshold voltage	V <sub>GE(th)</sub>	V <sub>CE</sub> = 20V, I <sub>c</sub> = 600mA	6.2	6.7	7.2	V	
Collector-Emitter saturation voltage	V <sub>CE(sat)</sub> (terminal)	V <sub>GE</sub> = 15V I <sub>c</sub> = 600A	Tj=25°C	-	1.85	2.30	V
			Tj=125°C	-	2.15	-	
			Tj=150°C	-	2.35	-	
	V <sub>CE(sat)</sub> (chip)		Tj=25°C	-	1.60	2.05	
			Tj=125°C	-	1.90	-	
			Tj=150°C	-	2.00	-	
Inverter	Input capacitance	Cies	V <sub>CE</sub> = 10V, V <sub>GE</sub> = 0V, f = 1MHz	-	38.9	-	nF
	Turn-on time	ton	V <sub>CC</sub> = 300V	-	0.65	-	μs
		tr	I <sub>c</sub> = 600A	-	0.26	-	
		tr (i)	V <sub>GE</sub> = ±15V	-	0.12	-	
Turn-off time	toff	R <sub>G</sub> = 2.2Ω	-	0.80	-	μs	
	tf	Tj = 150°C	-	0.07	-		
Forward on voltage	V <sub>F</sub> (terminal)	V <sub>GE</sub> = 0V I <sub>F</sub> = 600A	Tj=25°C	-	1.70	2.25	V
			Tj=125°C	-	1.60	-	
			Tj=150°C	-	1.57	-	
	V <sub>F</sub> (chip)		Tj=25°C	-	1.60	1.85	
			Tj=125°C	-	1.50	-	
			Tj=150°C	-	1.47	-	
Reverse recovery time	trr	I <sub>F</sub> = 600A	-	0.30	-	μs	

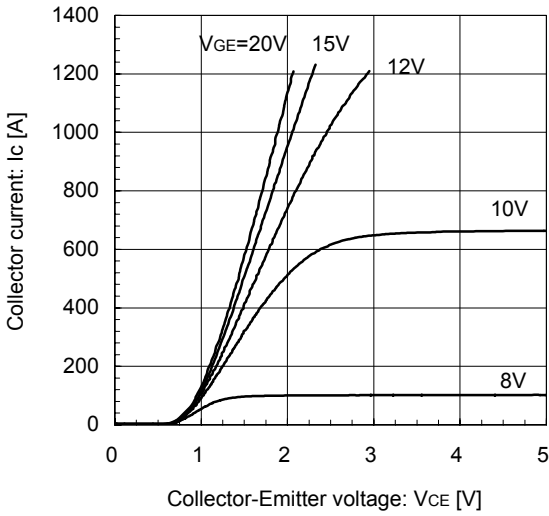
#### ● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	R <sub>th(j-c)</sub>	IGBT	-	-	0.051	°C/W
		FWD	-	-	0.088	
Contact thermal resistance (1device) (*4)	R <sub>th(c-f)</sub>	with Thermal Compound	-	0.0125	-	

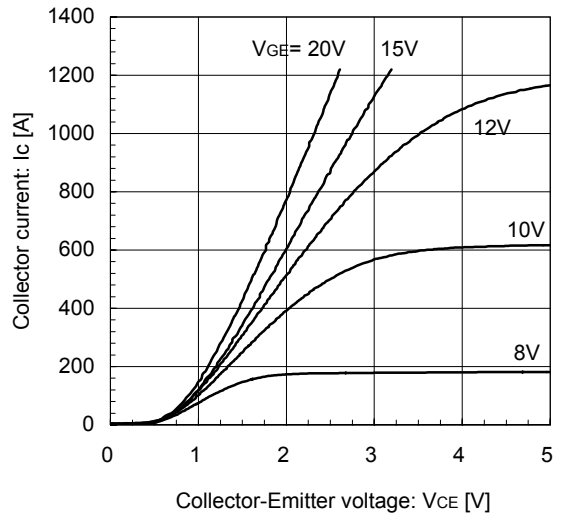
Note \*4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

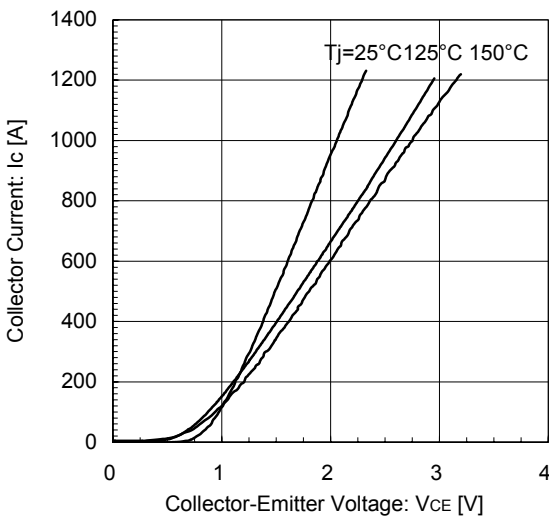
Collector current vs. Collector-Emittter voltage (typ.)  
Tj= 25°C / chip



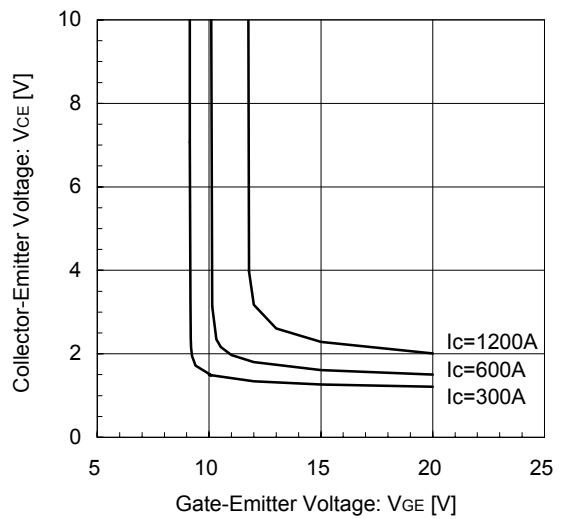
Collector current vs. Collector-Emittter voltage (typ.)  
Tj= 150°C / chip



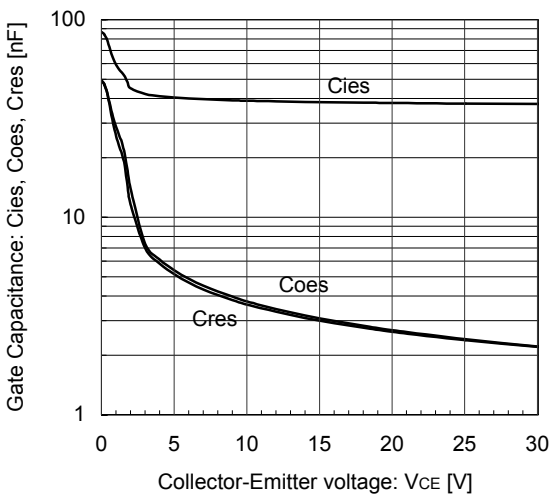
Collector current vs. Collector-Emittter voltage (typ.)  
VGE= 15V / chip



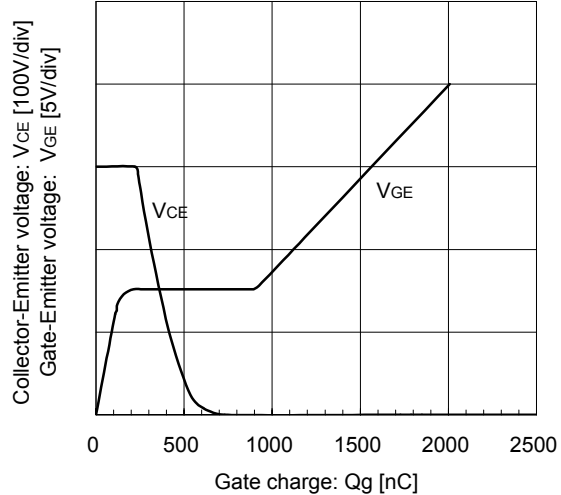
Collector-Emittter voltage vs. Gate-Emittter voltage  
Tj= 25°C / chip



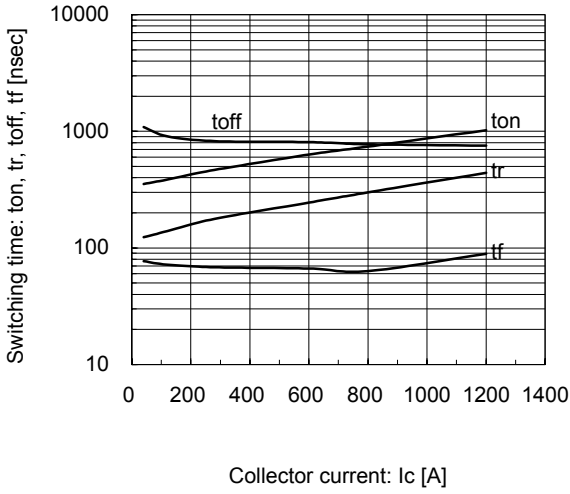
Gate Capacitance vs. Collector-Emittter Voltage  
VGE= 0V, f= 1MHz, Tj= 25°C



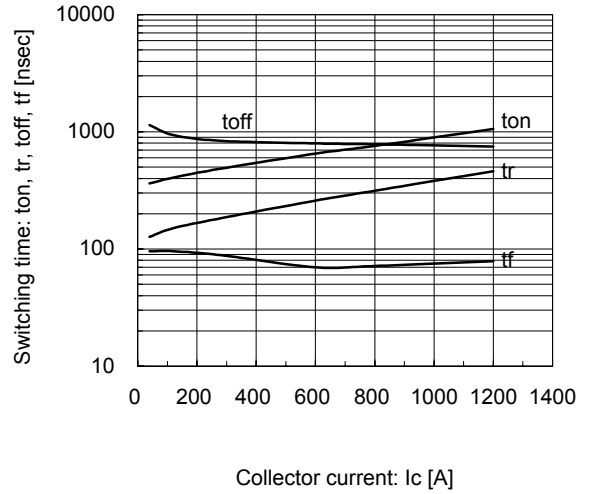
Dynamic Gate Charge (typ.)  
Vcc=300V, Ic=600A, Tj= 25°C



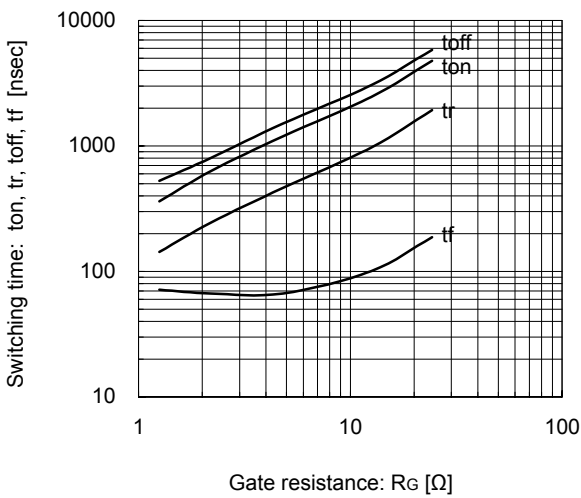
Switching time vs. Collector current (typ.)  
 $V_{CC}=300V, V_{GE}=\pm 15V, R_G=2.2\Omega, T_j=125^\circ C$



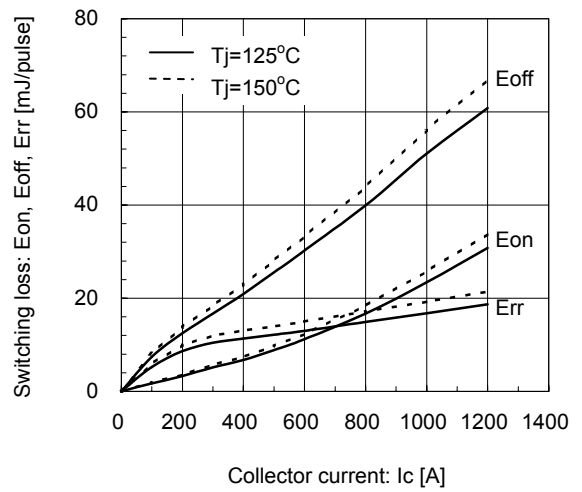
Switching time vs. Collector current (typ.)  
 $V_{CC}=300V, V_{GE}=\pm 15V, R_G=2.2\Omega, T_j=150^\circ C$



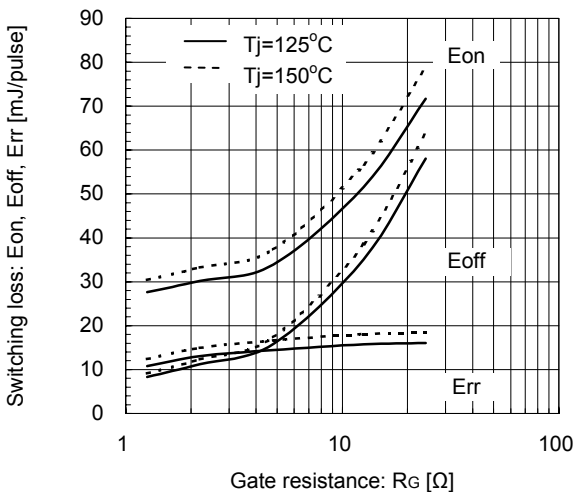
Switching time vs. Gate resistance (typ.)  
 $V_{CC}=300V, I_c=600A, V_{GE}=\pm 15V, T_j=125^\circ C$



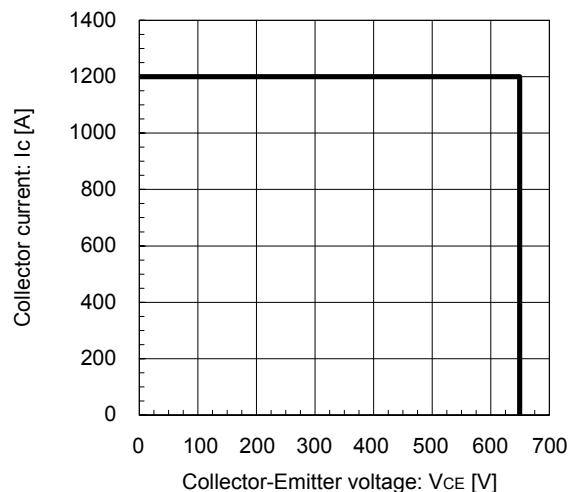
Switching loss vs. Collector current (typ.)  
 $V_{CC}=300V, V_{GE}=\pm 15V, R_G=2.2\Omega, T_j=125^\circ C, 150^\circ C$



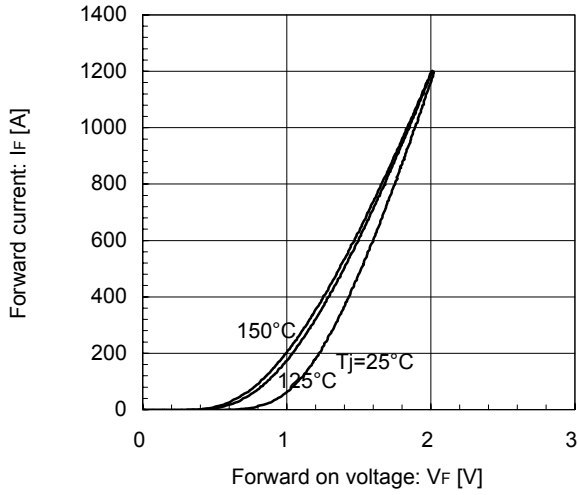
Switching loss vs. Gate resistance (typ.)  
 $V_{CC}=300V, I_c=600A, V_{GE}=\pm 15V, T_j=125^\circ C, 150^\circ C$



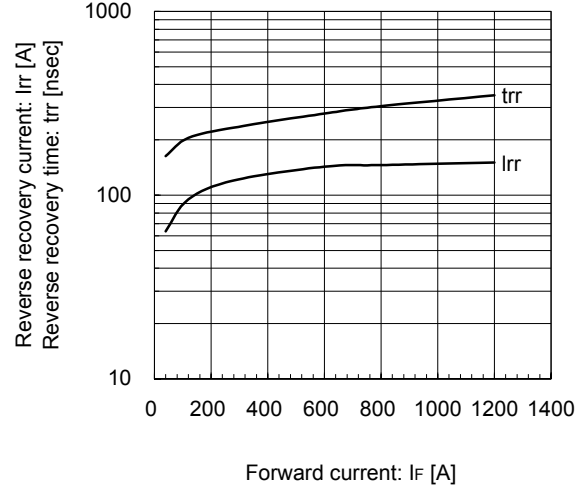
Reverse bias safe operating area (max.)  
 $+V_{GE}=15V, -V_{GE}=15V, R_G=2.2\Omega, T_j=150^\circ C$



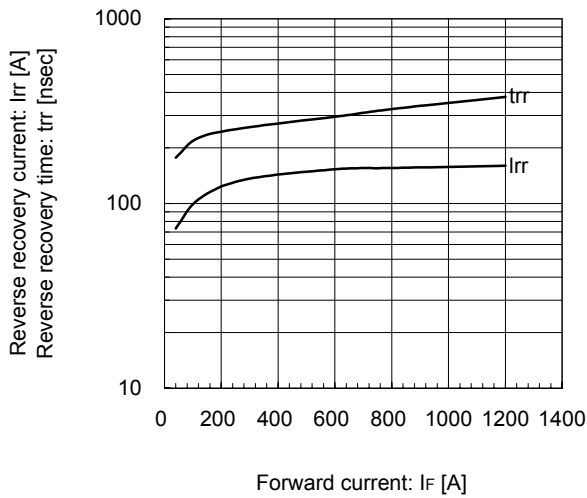
Forward Current vs. Forward Voltage (typ.)  
chip



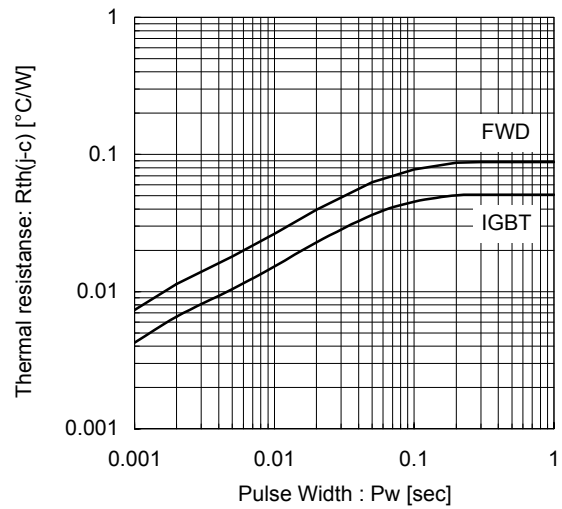
Reverse Recovery Characteristics (typ.)  
Vcc=300V, VGE=±15V, RG=2.2Ω, Tj=125°C



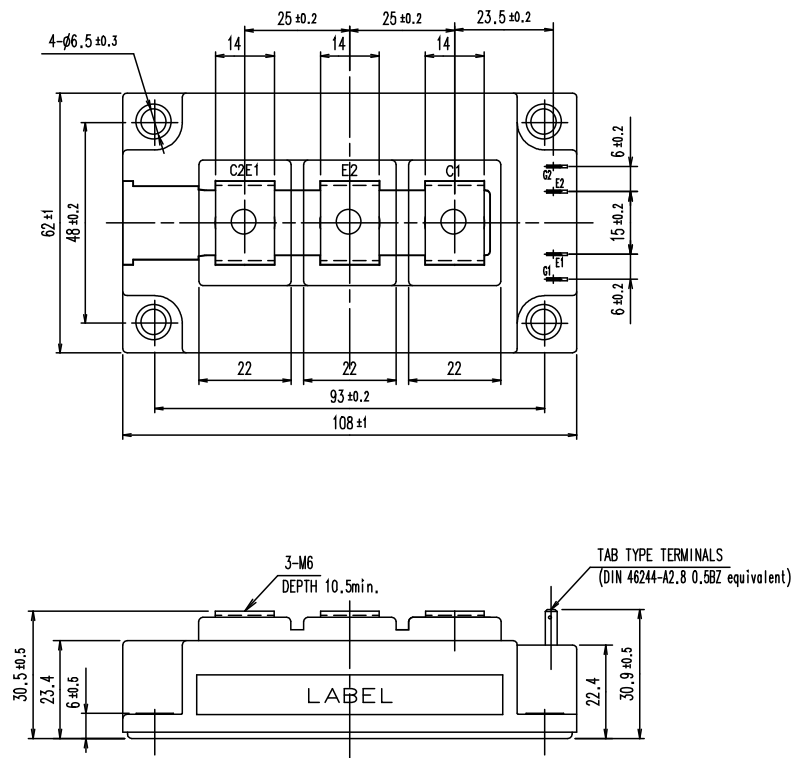
Reverse Recovery Characteristics (typ.)  
Vcc=300V, VGE=±15V, RG=2.2Ω, Tj=150°C



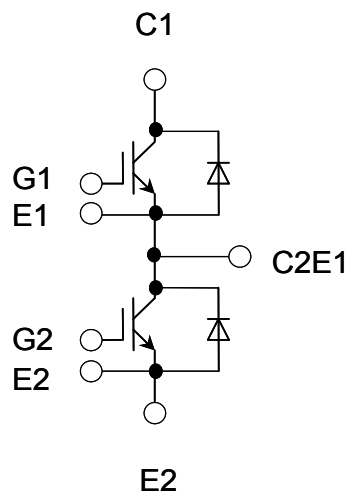
Transient Thermal Resistance (max.)



■ Outline Drawings, mm



■ Equivalent Circuit Schematic



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