

# 2MBI400VD-060-50

**IGBT Modules**

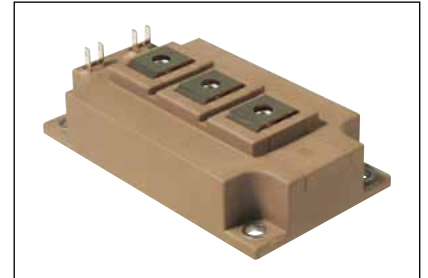
## IGBT MODULE (V series) 600V / 400A / 2 in one package

### ■ 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 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 T <sub>c</sub> =80°C	400	
		I <sub>c</sub> pulse	1ms T <sub>c</sub> =80°C	800	
		-I <sub>c</sub>		400	
		-I <sub>c</sub> pulse	1ms	800	
Collector power dissipation	P <sub>c</sub>	1 device	1970	W	
Junction temperature	T <sub>j</sub>		175	°C	
Operating junction temperature (under switching conditions)	T <sub>jop</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> = 400mA	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> = 400A	T <sub>j</sub> =25°C	-	1.80	2.25	V
			T <sub>j</sub> =125°C	-	2.10	-	
			T <sub>j</sub> =150°C	-	2.30	-	
	V <sub>CE(sat)</sub> (chip)		T <sub>j</sub> =25°C	-	1.60	2.05	
			T <sub>j</sub> =125°C	-	1.90	-	
			T <sub>j</sub> =150°C	-	2.00	-	
Internal gate resistance	R <sub>g(int)</sub>	-	-	2.3	-	Ω	
Input capacitance	C <sub>ies</sub>	V <sub>CE</sub> = 10V, V <sub>GE</sub> = 0V, f = 1MHz	-	25.6	-	nF	
Turn-on time	ton	V <sub>CC</sub> = 300V, I <sub>c</sub> = 400A V <sub>GE</sub> = ±15V, R <sub>g</sub> = 3.3Ω T <sub>j</sub> = 150°C, L <sub>s</sub> = 30nH	-	0.65	-	μsec	
	tr		-	0.30	-		
	tr(i)		-	0.10	-		
	toff		-	0.60	-		
Turn-off time	tf	-	-	0.07	-	μsec	
Forward on voltage	V <sub>F</sub> (terminal)	V <sub>GE</sub> = 0V I <sub>F</sub> = 400A	T <sub>j</sub> =25°C	-	1.75	2.20	V
			T <sub>j</sub> =125°C	-	1.65	-	
			T <sub>j</sub> =150°C	-	1.62	-	
	V <sub>F</sub> (chip)		T <sub>j</sub> =25°C	-	1.60	2.05	
			T <sub>j</sub> =125°C	-	1.50	-	
			T <sub>j</sub> =150°C	-	1.47	-	
Reverse recovery time	trr	I <sub>F</sub> = 400A	-	0.20	-	μsec	

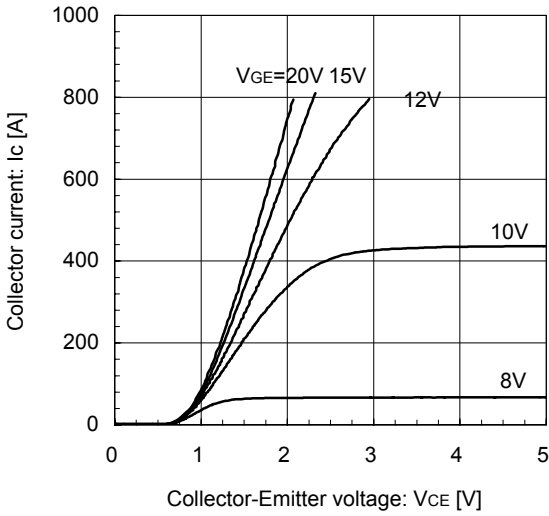
#### ● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	R <sub>th(j-c)</sub>	IGBT FWD	-	-	0.076	°C/W
Contact thermal resistance (1device) (*4)	R <sub>th(c-f)</sub>	with Thermal Compound	-	0.0125	-	

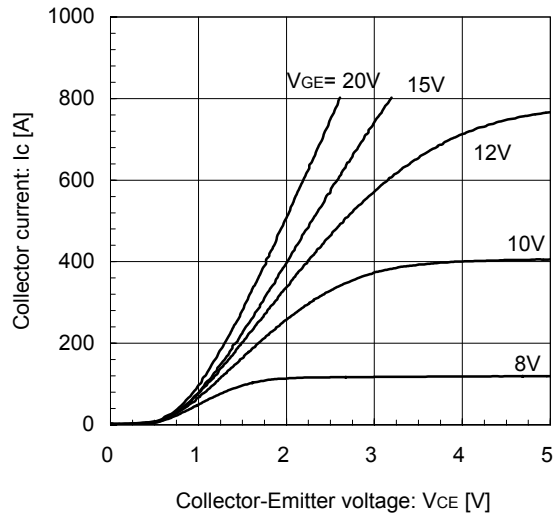
Note \*4: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

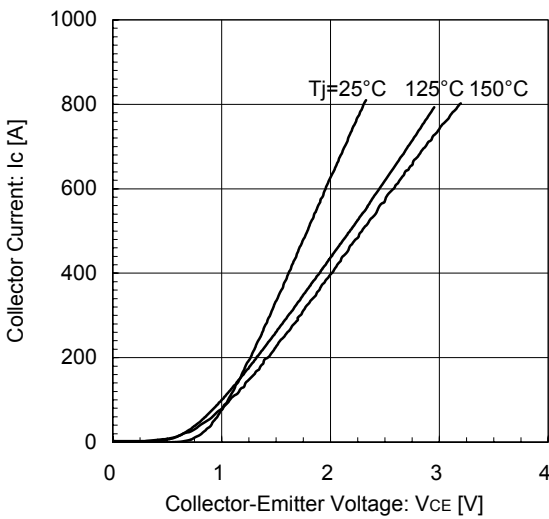
Collector current vs. Collector-Emmitter voltage (typ.)  
T<sub>j</sub> = 25°C / chip



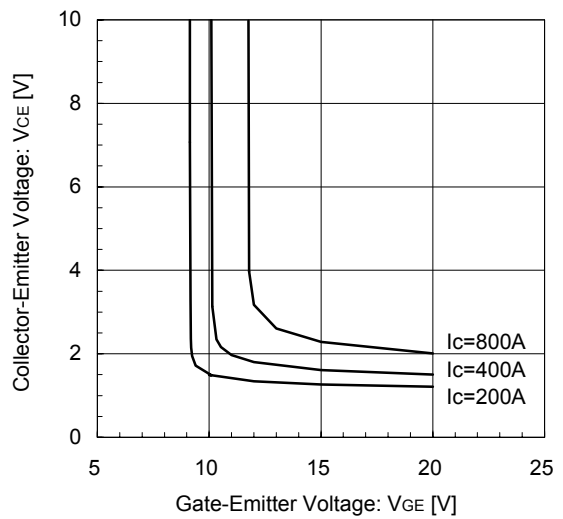
Collector current vs. Collector-Emmitter voltage (typ.)  
T<sub>j</sub> = 150°C / chip



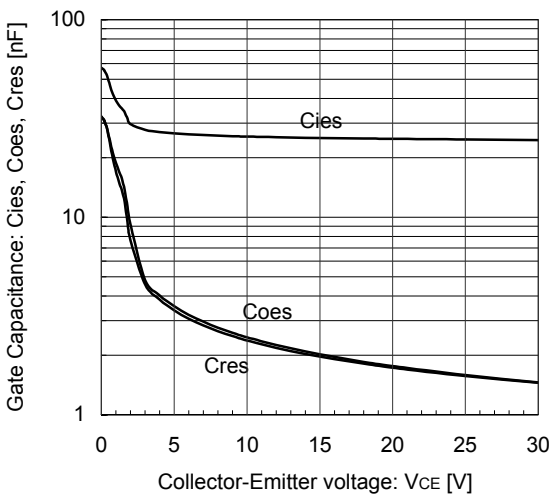
Collector current vs. Collector-Emmitter voltage (typ.)  
V<sub>GE</sub> = 15V / chip



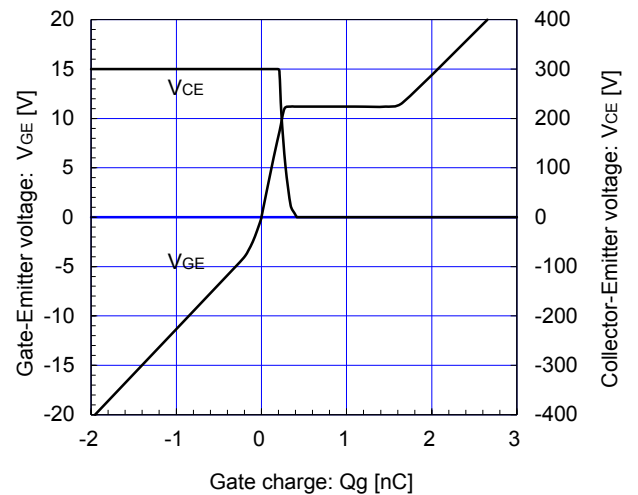
Collector-Emmitter voltage vs. Gate-Emmitter voltage  
T<sub>j</sub> = 25°C / chip



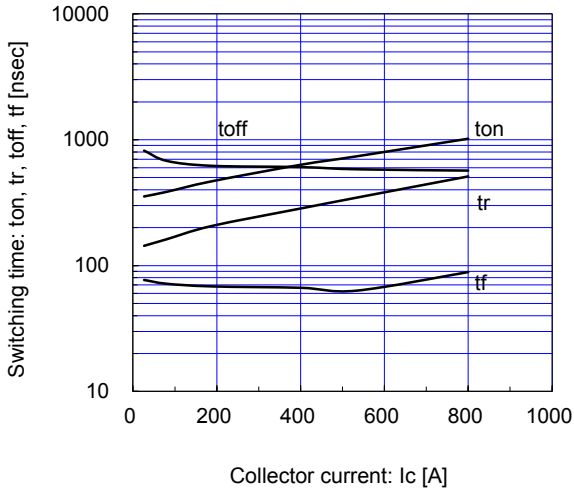
Gate Capacitance vs. Collector-Emmitter Voltage  
V<sub>GE</sub> = 0V, f = 1MHz, T<sub>j</sub> = 25°C



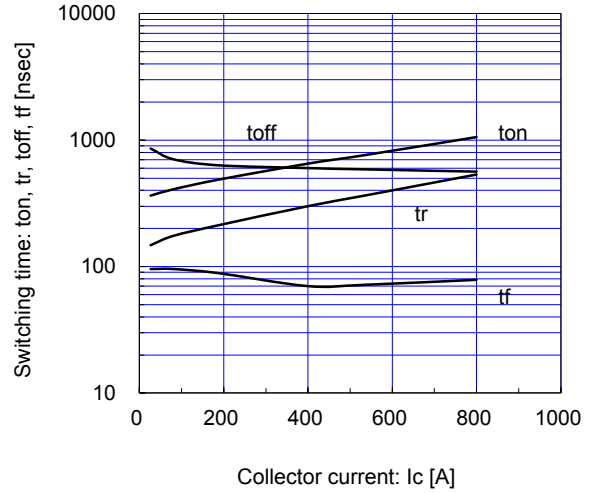
Dynamic Gate Charge (typ.)  
V<sub>CC</sub> = 300V, I<sub>c</sub> = 400A, T<sub>j</sub> = 25°C



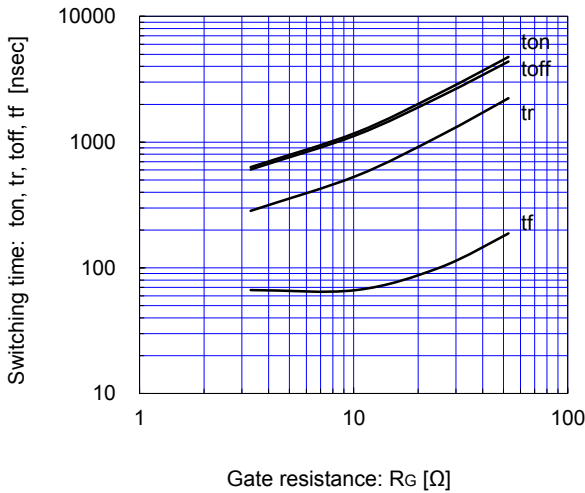
Switching time vs. Collector current (typ.)  
 $V_{CC}=300V, V_{GE}=\pm 15V, R_G=3.3\Omega, T_J=125^\circ C$



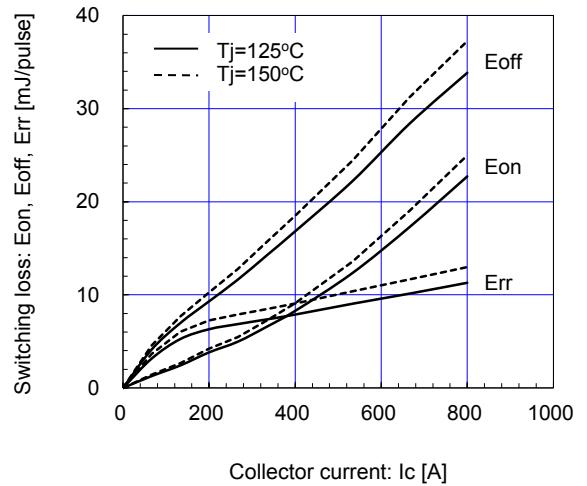
Switching time vs. Collector current (typ.)  
 $V_{CC}=300V, V_{GE}=\pm 15V, R_G=3.3\Omega, T_J=150^\circ C$



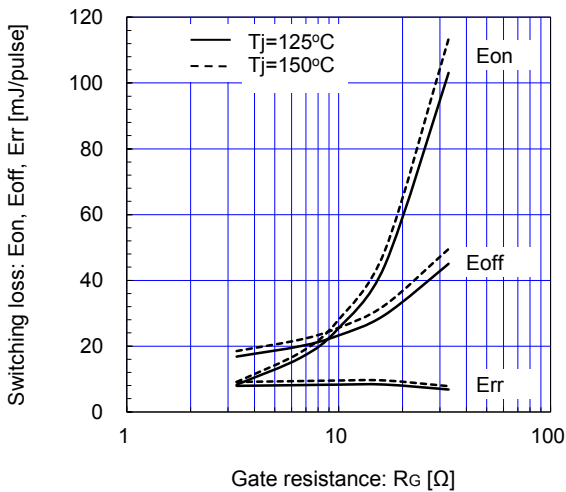
Switching time vs. Gate resistance (typ.)  
 $V_{CC}=300V, I_c=400A, V_{GE}=\pm 15V, T_J=125^\circ C$



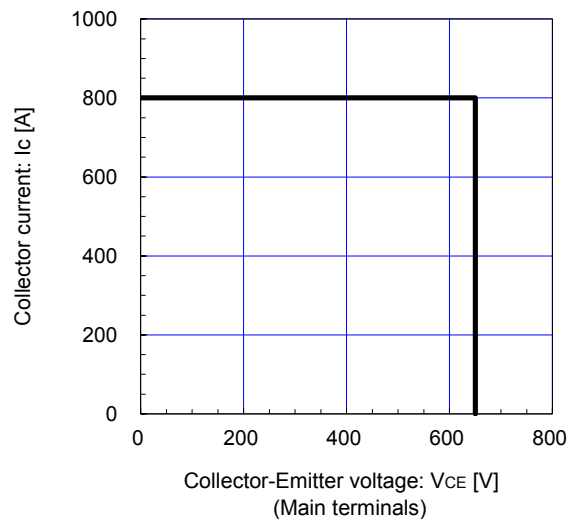
Switching loss vs. Collector current (typ.)  
 $V_{CC}=300V, V_{GE}=\pm 15V, R_G=3.3\Omega, T_J=125^\circ C, 150^\circ C$



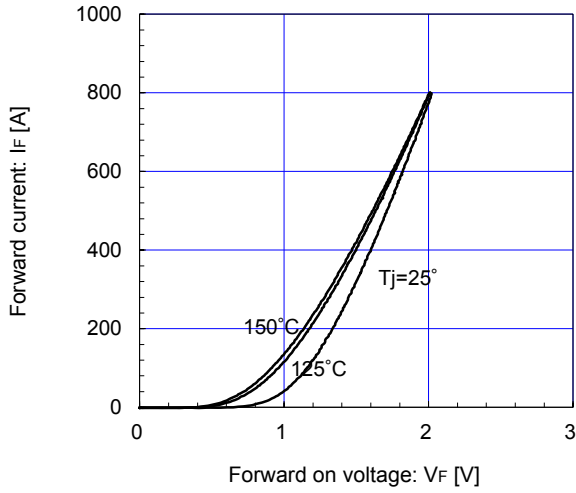
Switching loss vs. Gate resistance (typ.)  
 $V_{CC}=300V, I_c=400A, V_{GE}=\pm 15V, T_J=125^\circ C, 150^\circ C$



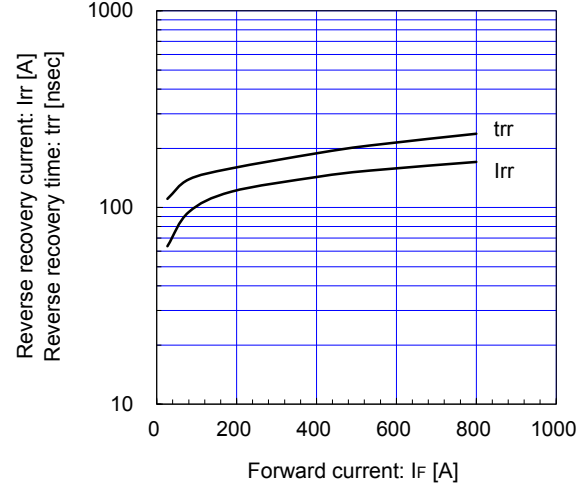
Reverse bias safe operating area (max.)  
 $+V_{GE}=15V, -V_{GE}=15V, R_G=3.3\Omega, T_J=150^\circ C$



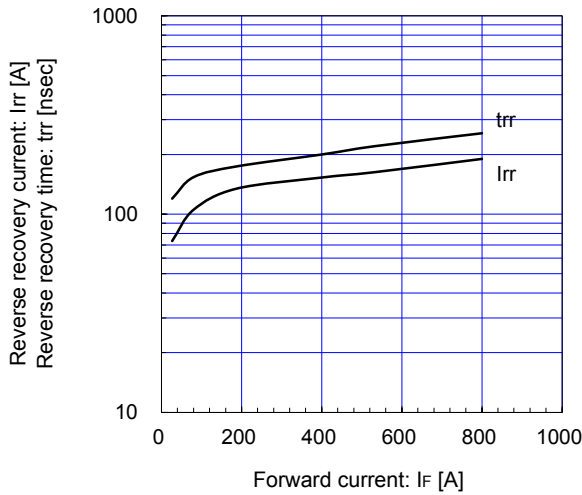
Forward Current vs. Forward Voltage (typ.)  
chip



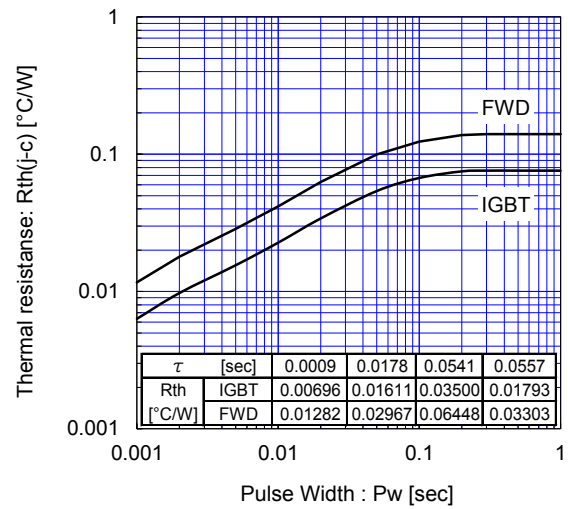
Reverse Recovery Characteristics (typ.)  
V<sub>CC</sub>=300V, V<sub>GE</sub>=±15V, R<sub>G</sub>=3.3Ω, T<sub>J</sub>=125°C



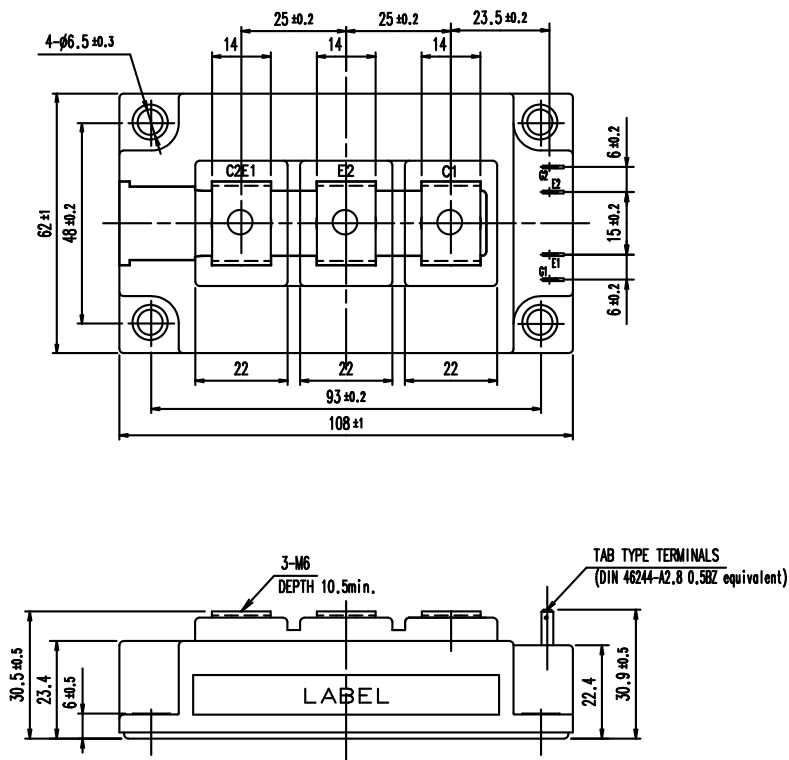
Reverse Recovery Characteristics (typ.)  
V<sub>CC</sub>=300V, V<sub>GE</sub>=±15V, R<sub>G</sub>=3.3Ω, T<sub>J</sub>=150°C



Transient Thermal Resistance (max.)

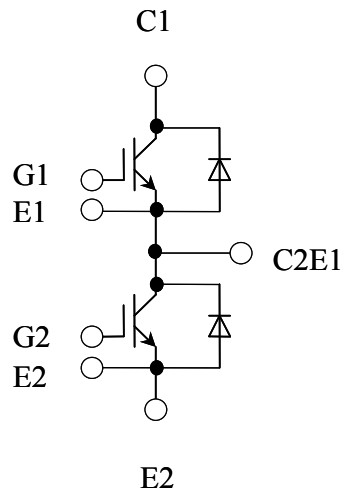


■ Outline Drawings (Unit: mm)



Weight: 370g (typ.)

■ Equivalent Circuit



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