

# 6MBI450V-120-50

IGBT Modules

## IGBT MODULE (V series) 1200V / 450A / 6 in one package

### ■ Features

- Compact Package
- P.C.Board Mount
- Low  $V_{CE(sat)}$

### ■ 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 $T_c=25^\circ\text{C}$ unless otherwise specified)

Items		Symbols	Conditions		Maximum ratings	Units
Inverter	Collector-Emitter voltage	$V_{CES}$			1200	V
	Gate-Emitter voltage	$V_{GES}$			$\pm 20$	V
	Collector current	$I_c$	Continuous	$T_c=80^\circ\text{C}$	450	A
		$I_{cp}$	1ms	$T_c=80^\circ\text{C}$	900	
		$-I_c$			450	
		$-I_c$ pulse	1ms		900	
Collector power dissipation	$P_c$	1 device		2250	W	
Junction temperature		$T_j$			175	$^\circ\text{C}$
Operation temperature		$T_{op}$			150	
Storage temperature		$T_{stg}$			-40 to +125	
Isolation voltage	between terminal and copper base (*1) between thermistor and others (*2)	$V_{iso}$	AC : 1min.		2500	VAC
Screw torque	Mounting (*3)	-			3.5	N m
	Terminals (*4)	-			4.5	

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

Note \*2: Two thermistor terminals should be connected together, other terminals should be connected together and shorted to base plate during the test.

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

Note \*4: Recommendable value : 3.5-4.5 Nm (M6)

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

Items	Symbols	Conditions	Characteristics			Units	
			min.	typ.	max.		
Zero gate voltage collector current	ICES	V <sub>GE</sub> = 0V, V <sub>CE</sub> = 1200V	-	-	3.0	mA	
Gate-Emitter leakage current	IGES	V <sub>GE</sub> = 0V, V <sub>CE</sub> = ±20V	-	-	600	nA	
Gate-Emitter threshold voltage	V <sub>GE(th)</sub>	V <sub>CE</sub> = 20V, I <sub>c</sub> = 450mA	6.0	6.5	7.0	V	
Collector-Emitter saturation voltage	V <sub>CE(sat)</sub> (terminal)	V <sub>GE</sub> = 15V I <sub>c</sub> = 450A	Tj=25°C	-	2.30	2.75	V
			Tj=125°C	-	2.60	-	
			Tj=150°C	-	2.65	-	
	V <sub>CE(sat)</sub> (chip)	V <sub>GE</sub> = 15V I <sub>c</sub> = 450A	Tj=25°C	-	1.75	2.20	
			Tj=125°C	-	2.05	-	
			Tj=150°C	-	2.10	-	
Input capacitance	Cies	V <sub>CE</sub> = 10V, V <sub>GE</sub> = 0V, f = 1MHz	-	41	-	nF	
Turn-on time	ton	V <sub>CC</sub> = 600V I <sub>c</sub> = 450A V <sub>GE</sub> = +15V R <sub>G</sub> = 0.52Ω	-	550	1200	μs	
	tr		-	180	600		
	tr(i)		-	120	-		
Turn-off time	toff	R <sub>G</sub> = 0.52Ω	-	1050	2000	μs	
	tf		-	110	350		
Forward on voltage	V <sub>F</sub> (terminal)	V <sub>GE</sub> = 0V I <sub>F</sub> = 450A	Tj=25°C	-	2.25	2.70	V
			Tj=125°C	-	2.40	-	
			Tj=150°C	-	2.35	-	
	V <sub>F</sub> (chip)	V <sub>GE</sub> = 0V I <sub>F</sub> = 450A	Tj=25°C	-	1.70	2.15	
			Tj=125°C	-	1.85	-	
			Tj=150°C	-	1.80	-	
Reverse recovery time	trr	I <sub>F</sub> = 450A	-	200	600	μs	
Resistance	R	T = 25°C	-	5000	-	Ω	
		T = 100°C	465	495	520		
B value	B	T = 25 / 50°C	3305	3375	3450	K	

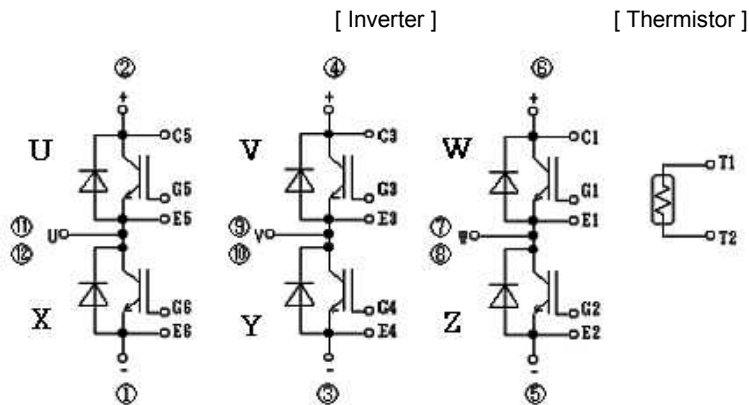
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)(*5)	Rth(j-c)	Inverter IGBT	-	-	0.066	°C/W
		Inverter FWD	-	-	0.100	
Contact thermal resistance (1device) (*6)	Rth(c-f)	with Thermal Compound	-	0.0167	-	

Note \*5: This value is including margins. This will be revised in future.

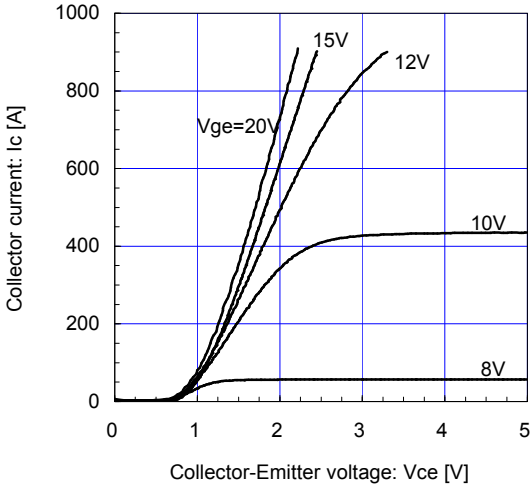
Note \*6: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Equivalent Circuit Schematic

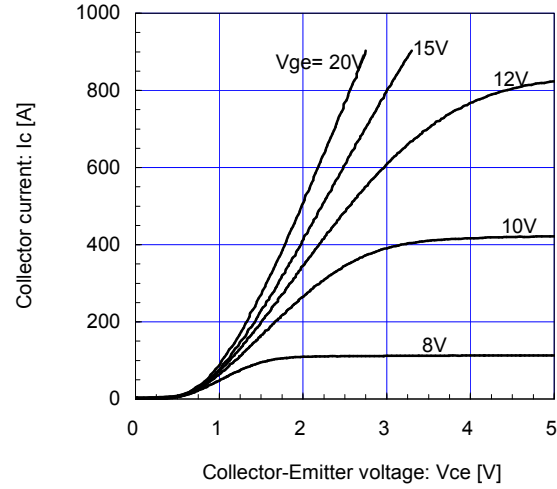


■ Characteristics (Representative)

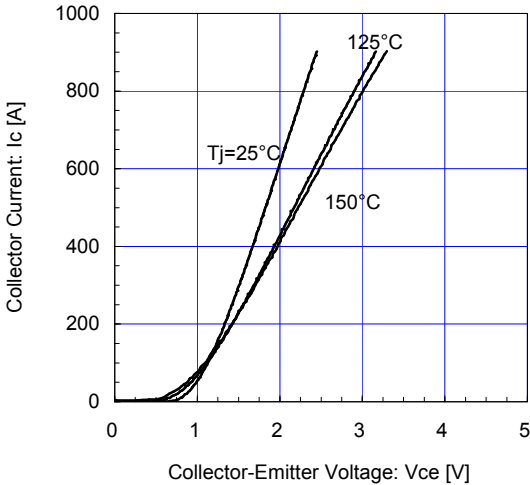
[INVERTER]  
Collector current vs. Collector-Emittter voltage (typ.)  
T<sub>j</sub> = 25°C / chip



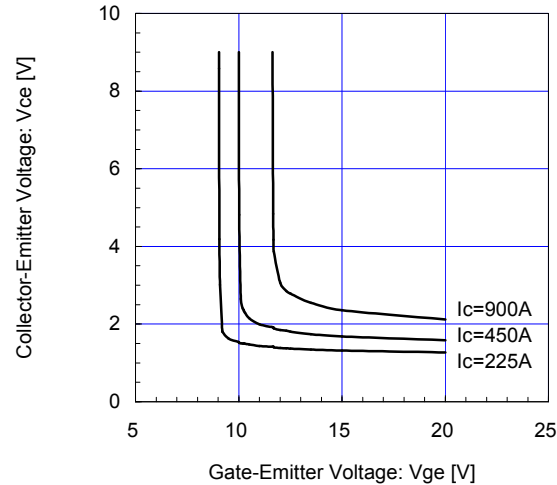
[INVERTER]  
Collector current vs. Collector-Emittter voltage (typ.)  
T<sub>j</sub> = 150°C / chip



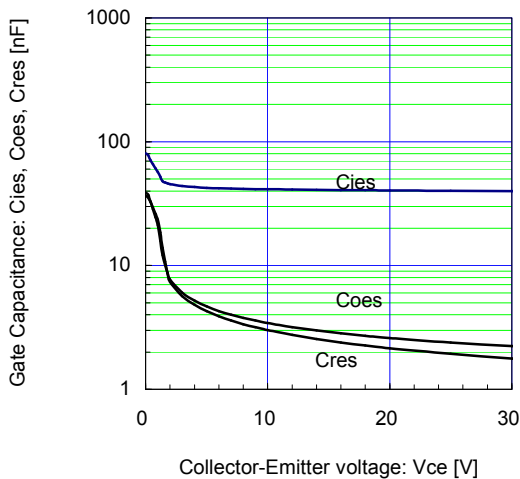
[INVERTER]  
Collector current vs. Collector-Emittter voltage (typ.)  
Vge = 15V / chip



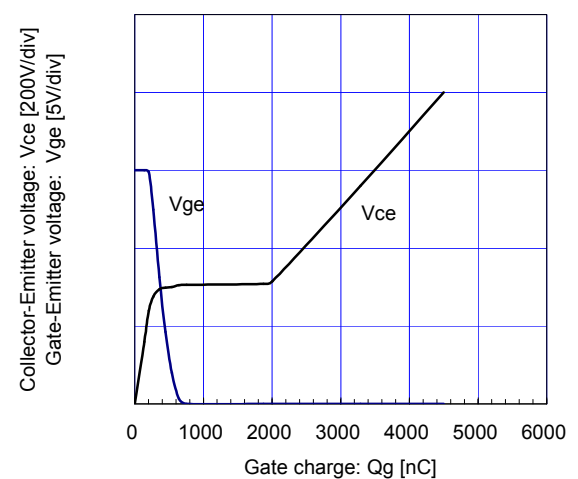
[INVERTER]  
Collector-Emittter voltage vs. Gate-Emittter voltage (typ.)  
T<sub>j</sub> = 25°C / chip



[INVERTER]  
Gate Capacitance vs. Collector-Emittter Voltage (typ.)  
Vge = 0V, f = 1MHz, Tj = 25°C

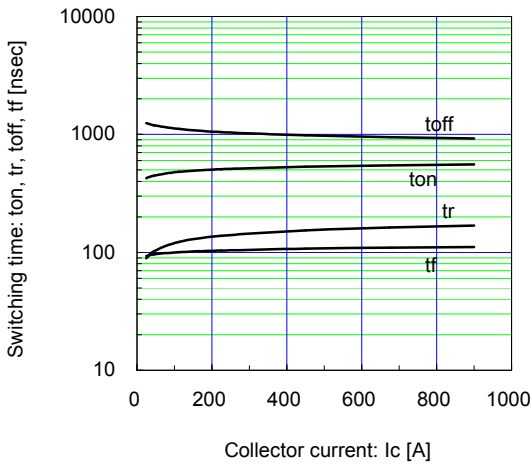


[INVERTER]  
Dynamic Gate Charge (typ.)  
Vcc = 600V, Ic = 450A, Tj = 25°C



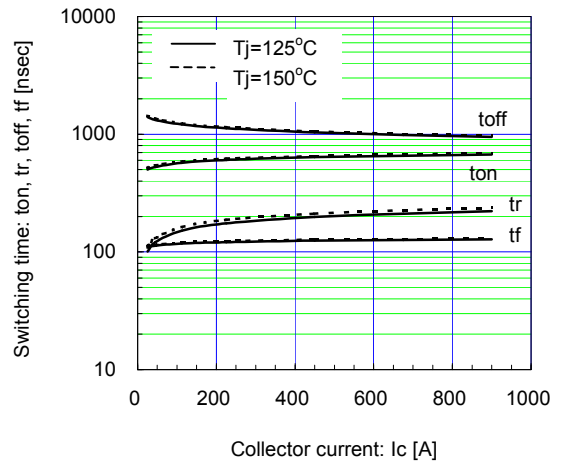
[INVERTER]

Switching time vs. Collector current (typ.)  
 $V_{cc}=600V, V_{ge}=\pm 15V, R_g=0.52\Omega, T_j=25^\circ C$



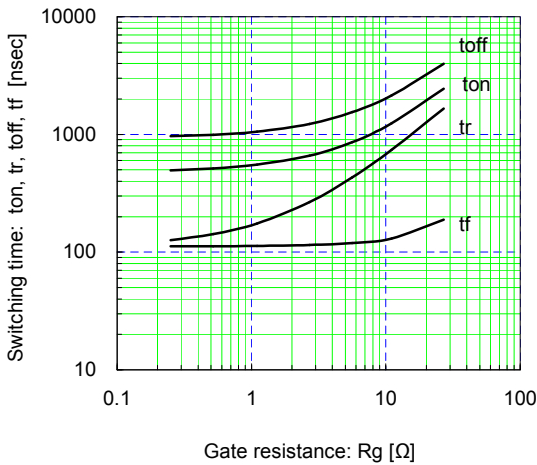
[INVERTER]

Switching time vs. Collector current (typ.)  
 $V_{cc}=600V, V_{ge}=\pm 15V, R_g=0.52\Omega, T_j=125^\circ C, 150^\circ C$



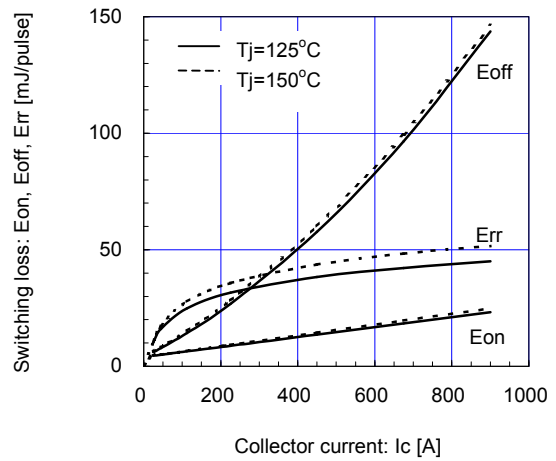
[INVERTER]

Switching time vs. Gate resistance (typ.)  
 $V_{cc}=600V, I_c=450A, V_{ge}=\pm 15V, T_j=25^\circ C$



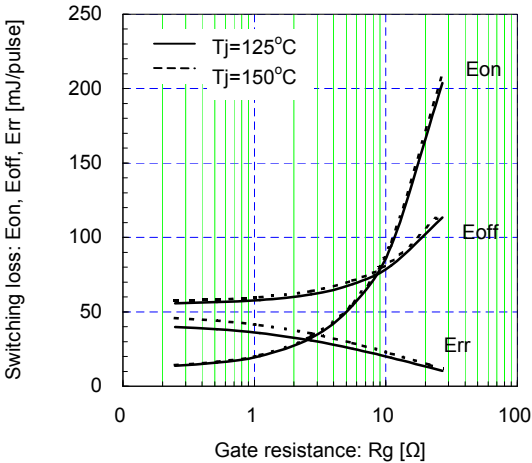
[INVERTER]

Switching loss vs. Collector current (typ.)  
 $V_{cc}=600, V_{ge}=\pm 15V, R_g=0.52\Omega, T_j=125^\circ C, 150^\circ C$



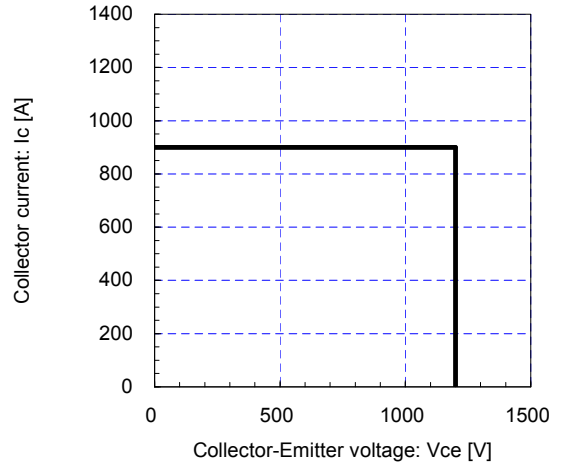
[INVERTER]

Switching loss vs. Gate resistance (typ.)  
 $V_{cc}=600V, I_c=450A, V_{ge}=\pm 15V, T_j=125^\circ C, 150^\circ C$



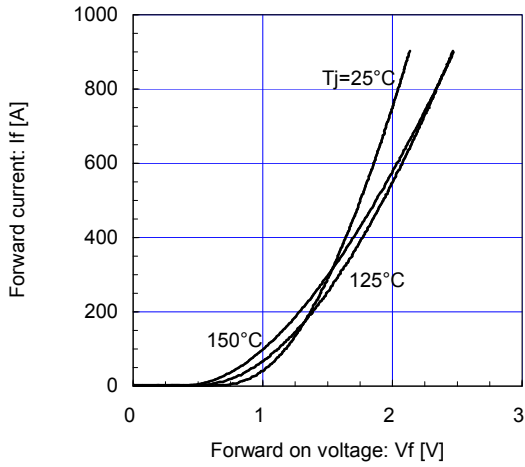
[INVERTER]

Reverse bias safe operating area (max.)  
 $+V_{ge}=15V, -V_{ge}\le 15V, R_g\ge 0.52\Omega, T_j=150^\circ C$



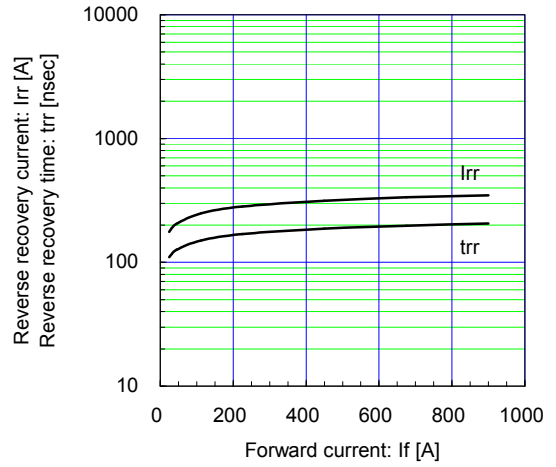
[INVERTER]

Forward Current vs. Forward Voltage (typ.)  
 chip



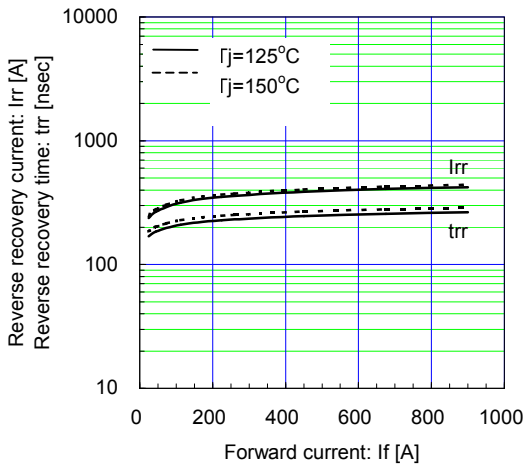
[INVERTER]

Reverse Recovery Characteristics (typ.)  
 $V_{cc}=600V, V_{ge}=\pm 15V, R_g=0.52\Omega, T_j=25^\circ C$

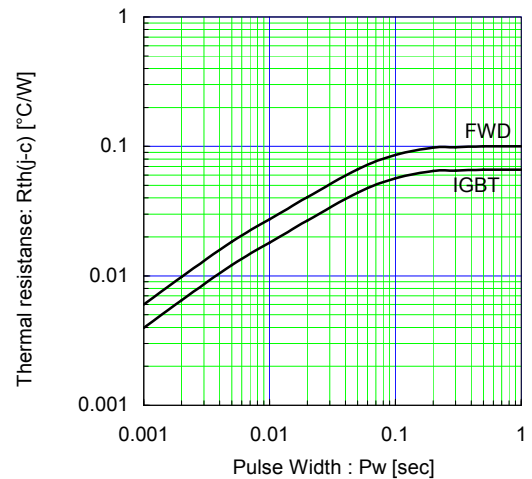


[INVERTER]

Reverse Recovery Characteristics (typ.)  
 $V_{cc}=600V, V_{ge}=\pm 15V, R_g=0.52\Omega, T_j=125^\circ C, 150^\circ C$

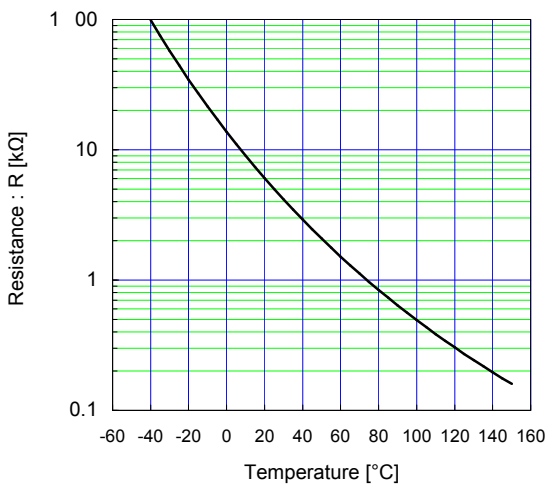


Transient Thermal Resistance (max.)

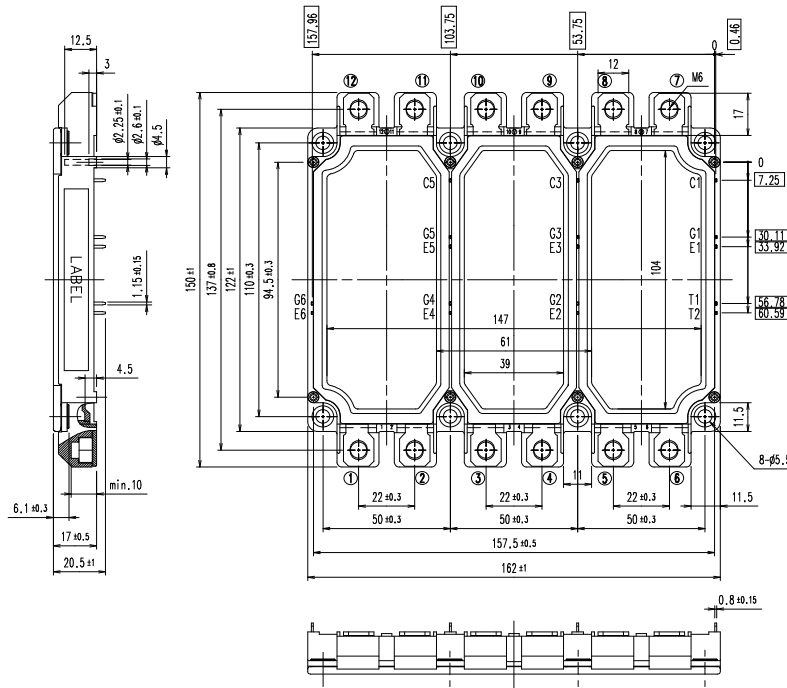


[THERMISTOR]

Temperature characteristic (typ.)



■ Outline Drawings, mm



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