

1MBI1600VC-120P

IGBT Modules

IGBT MODULE (V series) 1200V / 1600A / 1 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	
Collector-Emitter voltage	V_{CES}		1200	V	
Gate-Emitter voltage	V_{GES}		±20	V	
Collector current	I_c	Continuous	$T_c=25^\circ\text{C}$	2400	A
			$T_c=100^\circ\text{C}$	1600	
	I_{cp}	1ms	3200		
	$-I_c$		1600		
	$-I_{c\ pulse}$	1ms	3200		
Collector power dissipation	P_c	1 device	10340	W	
Junction temperature	T_j		175	°C	
Operating junction temperature (under switching conditions)	T_{jop}		150		
Storage temperature	T_{stg}		-40 ~ +150		
Isolation voltage	Between terminal and copper base *1	V_{iso}	AC : 1min.	4000	VAC
Screw torque *2	Mounting	M6	5.75	Nm	
	Main Terminals	M8	10		
	Sense Terminals	M4	2.5		

(*1) All terminals should be connected together when isolation test will be done.

(*2) Recommendable Value :Mounting 4.25~5.75 Nm (M6) , Main Terminals 8~10 Nm (M8) , Sense Terminals 1.7~2.5 Nm (M4)

● Electrical characteristics (at $T_j = 25^\circ\text{C}$ unless otherwise specified)

Items	Symbols	Conditions	Characteristics			Units	
			min.	typ.	max.		
Zero gate voltage collector current	I_{CES}	$V_{GE} = 0V, V_{CE} = 1200V$	-	-	1.0	mA	
Gate-Emitter leakage current	I_{GES}	$V_{CE} = 0V, V_{GE} = \pm 20V$	-	-	3200	nA	
Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V, I_c = 1600mA$	6.0	6.5	7.0	V	
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (main terminal)	$V_{GE} = 15V$ $I_c = 1600A$	$T_j = 25^\circ\text{C}$	-	1.91	2.19	V
			$T_j = 125^\circ\text{C}$	-	2.21	-	
			$T_j = 150^\circ\text{C}$	-	2.31	-	
	$V_{CE(sat)}$ (chip)		$T_j = 25^\circ\text{C}$	-	1.70	1.95	
			$T_j = 125^\circ\text{C}$	-	2.00	-	
			$T_j = 150^\circ\text{C}$	-	2.10	-	
Internal gate resistance	$Int R_g$		-	1.09	-	Ω	
Input capacitance	C_{ies}	$V_{CE} = 10V, V_{GE} = 0V, f = 1MHz$	-	141	-	nF	
Turn-on	t_{on}	$V_{CC} = 600V, I_c = 1600A$	-	2.22	-	μs	
	t_r	$L_m = 56nH, V_{GE} = \pm 15V, T_j = 125^\circ\text{C}$	-	0.77	-		
Turn-off	t_{off}	$R_{gon} = 1.8 \Omega$	-	1.47	-		
	t_f	$R_{goff} = 0.22 \Omega$	-	0.19	-		
Forward on voltage	V_F (main terminal)	$V_{GE} = 0V$ $I_F = 1600A$	$T_j = 25^\circ\text{C}$	-	1.91	2.19	V
			$T_j = 125^\circ\text{C}$	-	2.06	-	
			$T_j = 150^\circ\text{C}$	-	2.01	-	
	V_F (chip)		$T_j = 25^\circ\text{C}$	-	1.70	1.95	
			$T_j = 125^\circ\text{C}$	-	1.85	-	
			$T_j = 150^\circ\text{C}$	-	1.80	-	
Reverse recovery time	t_{rr}	$I_F = 1600A, T_j = 125^\circ\text{C}$	-	0.36	-	μs	
Lead resistance, terminal-chip	R_{lead}		-	0.134	-	m Ω	

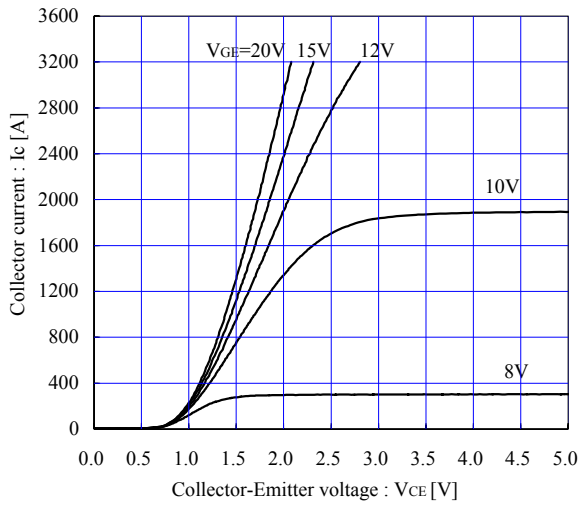
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance	$R_{th(j-c)}$	IGBT	-	-	0.0145	$^\circ\text{C/W}$
		FWD	-	-	0.0230	
Contact Thermal resistance	$R_{th(c-f)}$	with Thermal Compound(*)	-	0.0060	-	

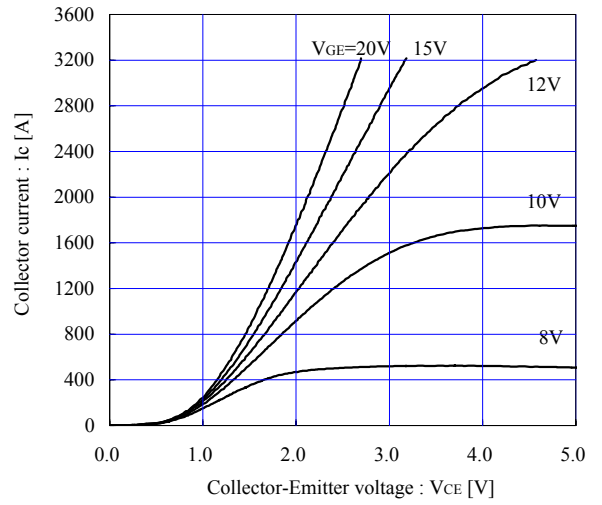
* This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

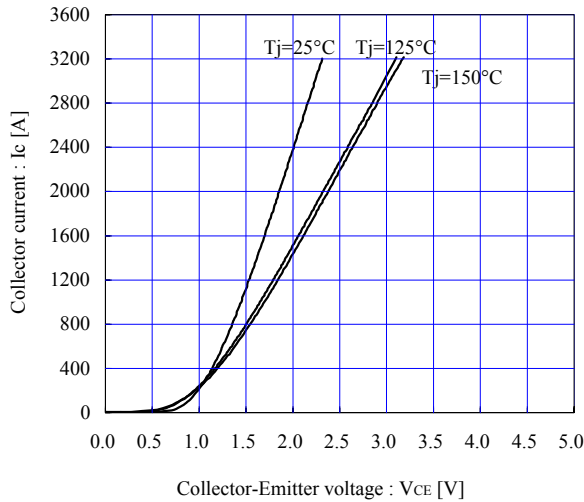
Collector current vs. Collector-Emittor voltage (typ.)
Tj=25°C, chip



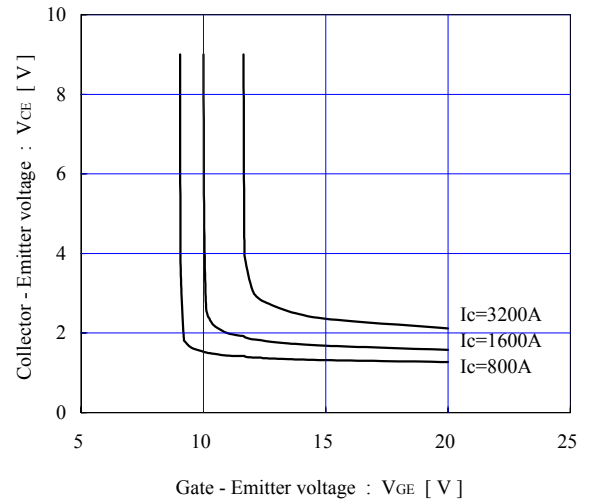
Collector current vs. Collector-Emittor voltage (typ.)
Tj= 150°C, chip



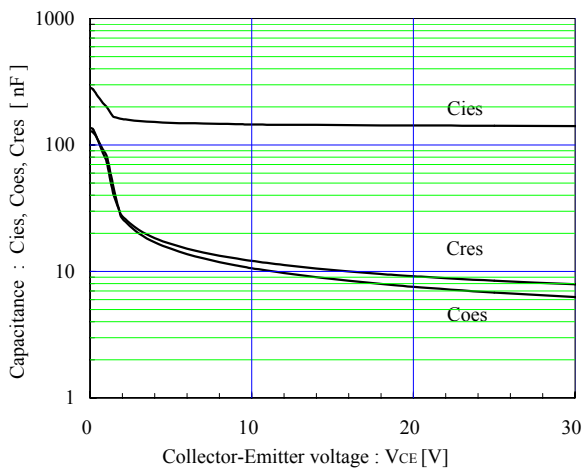
Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)
VGE=+15V, chip



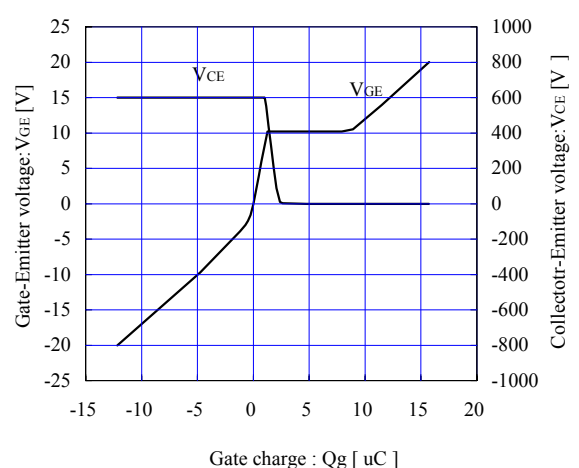
Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)
Tj=25°C, chip



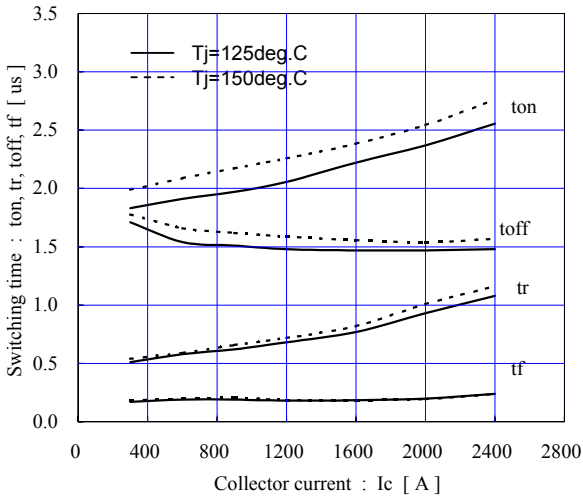
Capacitance vs. Collector-Emittor voltage (typ.)
VGE=0V, f= 1MHz, Tj= 25°C



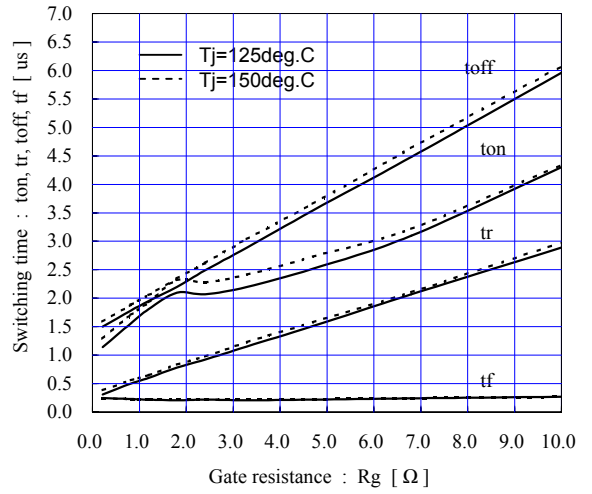
Dynamic Gate charge (typ.)
Tj= 25°C



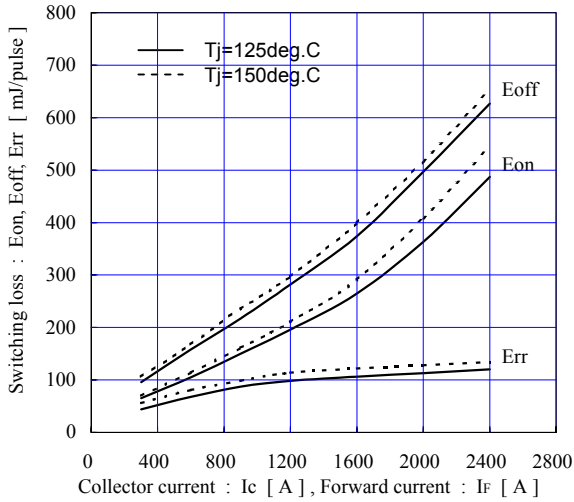
Switching time vs. Collector current (typ.)
 $V_{cc}=600V, V_{GE}=\pm 15V, R_{gon}=1.8\ \Omega, R_{goff}=0.22\ \Omega$



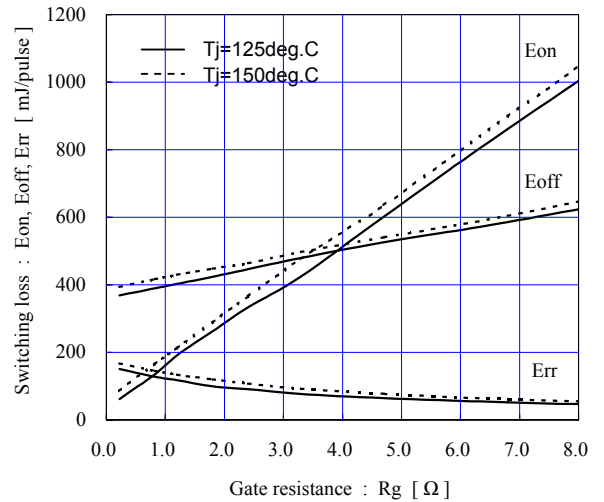
Switching time vs. Gate resistance (typ.)
 $V_{cc}=600V, I_c=1600A, V_{GE}=\pm 15V$



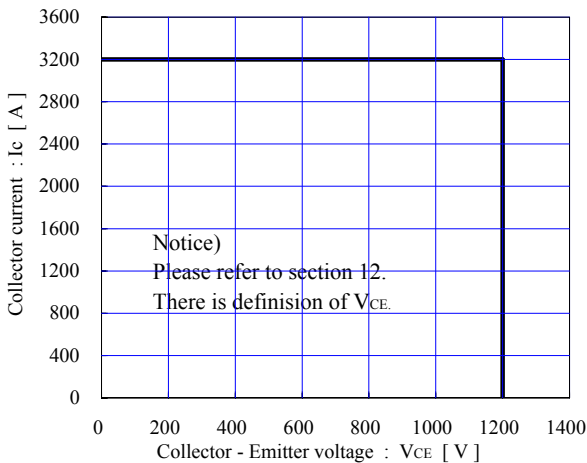
Switching loss vs. Collector current (typ.)
 $V_{cc}=600V, V_{GE}=\pm 15V, R_{gon}=1.8\ \Omega, R_{goff}=0.22\ \Omega$



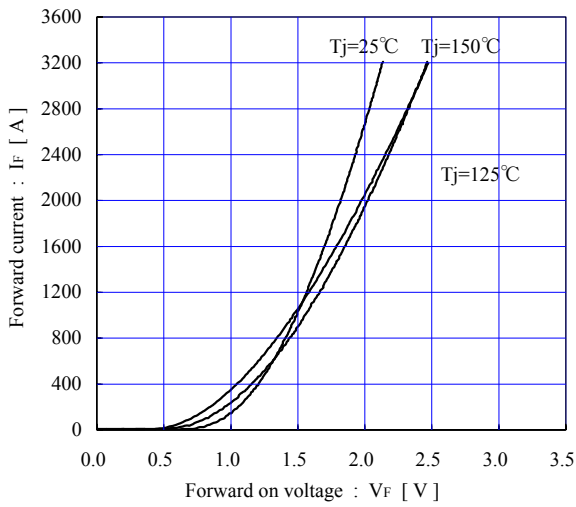
Switching loss vs. Gate resistance (typ.)
 $V_{cc}=600V, I_c=1600A, V_{GE}=\pm 15V$



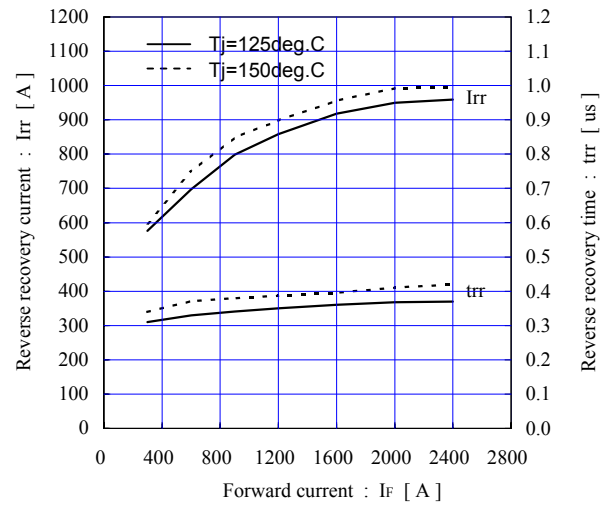
Reverse bias safe operating area (max.)
 $\pm V_{GE}=15V, T_j = 150^\circ\text{C}$



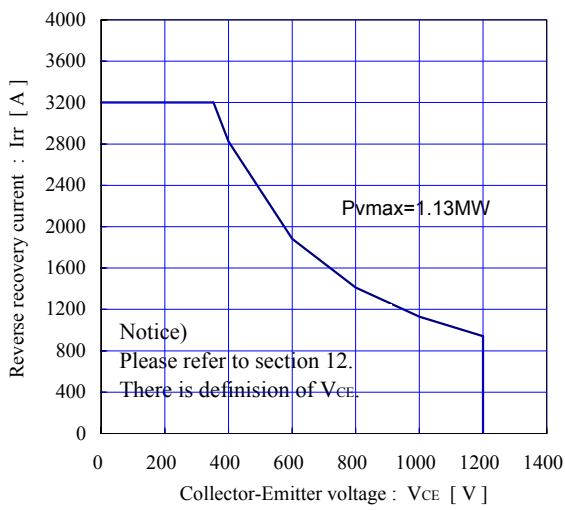
Forward current vs. Forward on voltage (typ.)
chip



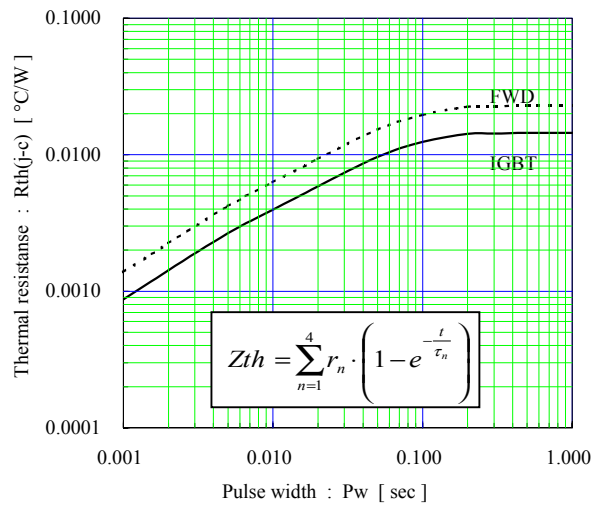
Reverse recovery characteristics (typ.)
V_{CE}=600V, V_{GE}=±15V, R_{gon}=1.8 Ω



FWD safe operating area (max.)
T_j=150°C

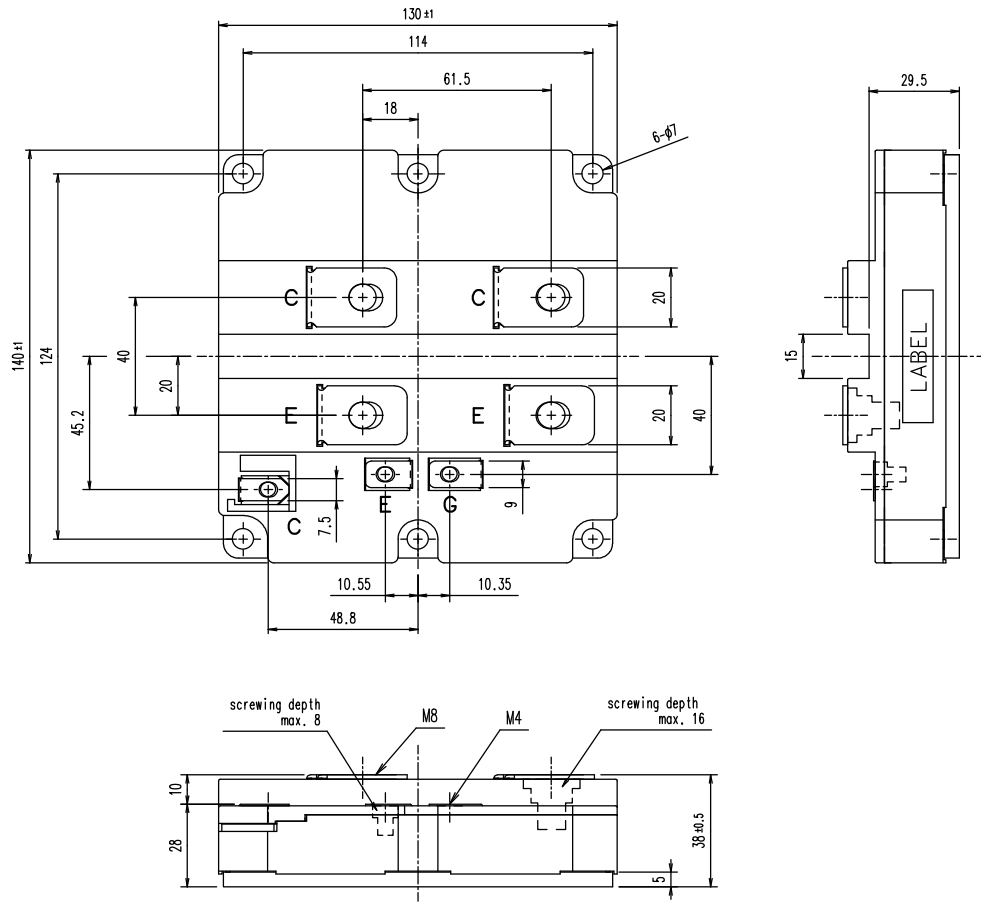


Transient thermal resistance (max.)

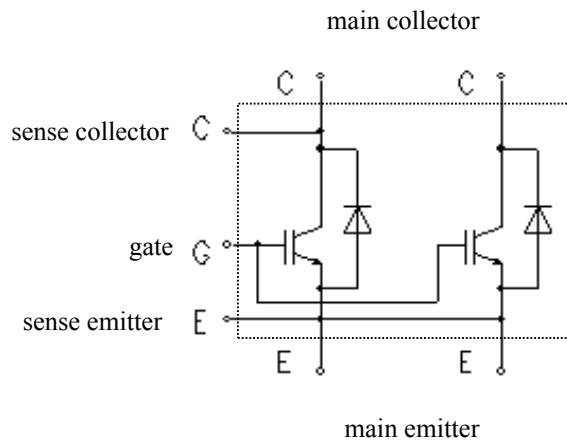


	IGBT	FWD
r1	0.00162	0.00255
r2	0.00560	0.00888
r3	0.00401	0.00636
r4	0.00327	0.00521
τ1	0.0024	0.0024
τ2	0.0357	0.0354
τ3	0.0633	0.0642
τ4	0.0738	0.0728

■ Outline Drawings, mm



■ Equivalent Circuit Schematic



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