2MSI200VWAH-120-53

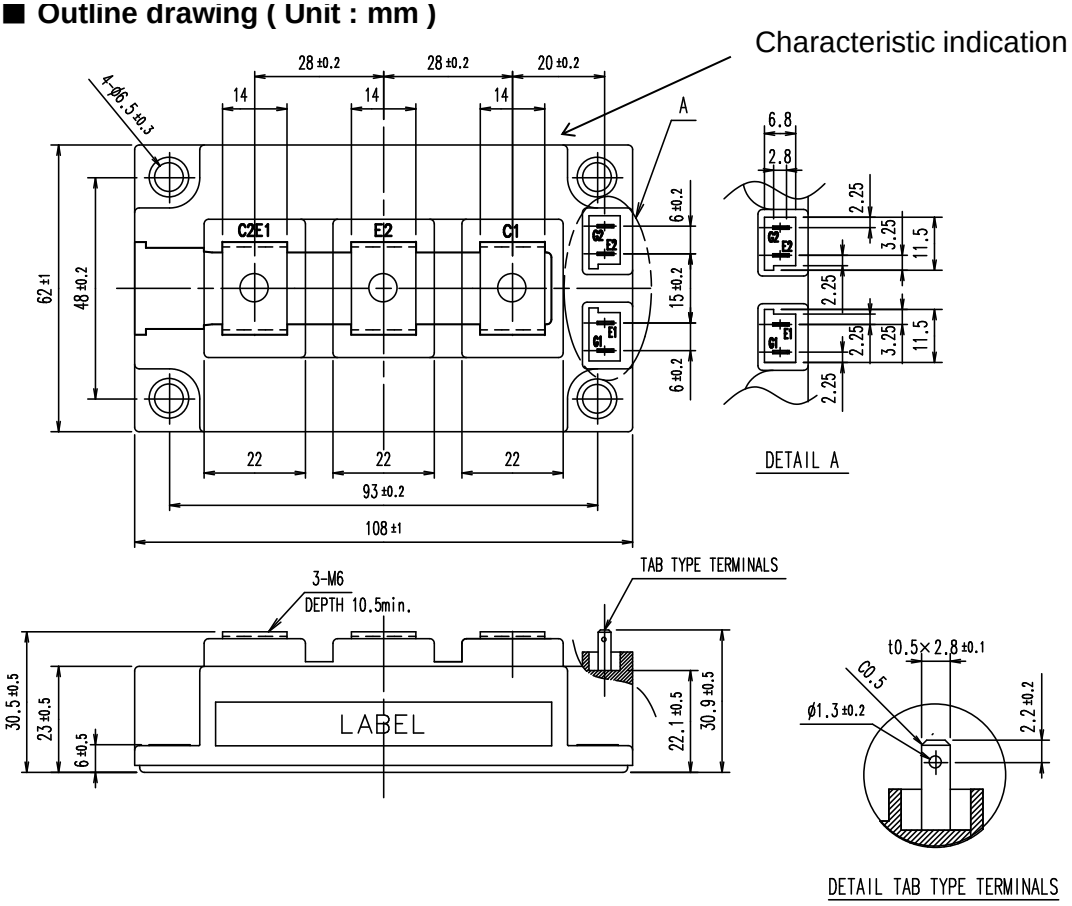
SiC Hybrid Modules

Power Module (V-series IGBT & SiC SBD Hybrid type)
1200V / 200A / 2-in-1 package

■ Features
High speed switching
Voltage drive
Low switching loss
Low inductance module structure

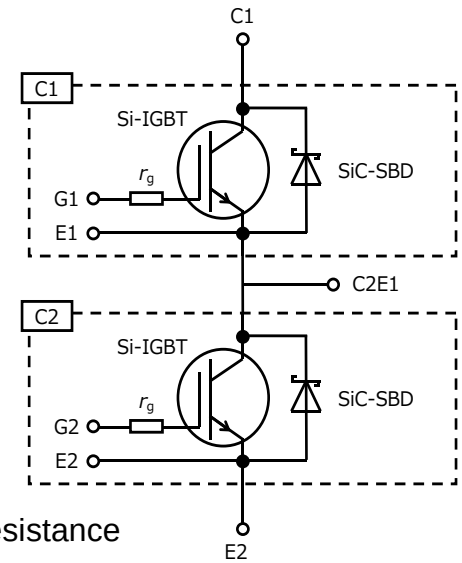
■ Applications
Inverter for Motor Drive
AC and DC Servo Drive Amplifier
Uninterruptible Power Supply
Active Front End

■ Outline drawing (Unit : mm)



Weight: 370g (typ.)

■ Equivalent Circuit



r_g : Internal gate resistance

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■ **Absolute maximum ratings (at T_C= 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 = 100°C	200	A
		$I_{C\,RM}$	1 ms	400	
		$-I_C$		200	
		$-I_{C\,RM}$	1 ms	400	
Collector power dissipation		P_C	1 device	1245	W
Junction temperature		T_{vj}		175	°C
Operating junction temperature (under switching conditions)		T_{vjop}		150	
Case temperature		T_C		125	
Storage temperature		T_{stg}		-40 ~ 125	
Isolation voltage	between terminal and copper base (*1)	V_{iso}	AC: 1 min.	4000	VAC
Screw torque	Mounting (*2)	-		6.0	N m
	Terminals (*3)	-		5.0	

(*1) All terminals should be connected together during the test.
(*2) Recommendable value : 3.0 - 6.0 Nm (M5 or M6)
(*3) Recommendable value : 2.5 - 5-0 Nm (M6)

■ Electrical characteristics (at T_{vj}= 25°C unless otherwise specified)

NOTICE:
The external gate resistance (R_G) shown in below is one of our recommend value for the purpose of minimum switching loss. However the optimum R_G depends on circuit configuration and/or environment. We recommend that the R_G has to be carefully chosen based on consideration if IGBT module matches design criteria, for example, switching loss, EMC/EMI, spike voltage, surge current and no unexpected oscillation and so on.

Items	Symbols	Conditions		Characteristics min.	Characteristics typ.	Characteristics max.	Units
Zero gate voltage collector current	I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V		-	-	2.5	mA
Gate-Emitter leakage current	I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V		-	-	400	nA
Gate-Emitter threshold voltage	$V_{GE(th)}$	V_{CE} = 20 V, I_C = 200 mA		6.0	6.5	7.0	V
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	V_{GE} = 15 V, I_C = 200 A	T_{vj}=25°C	-	2.45	2.90	V
			T_{vj}=125°C	-	2.95	-	
			T_{vj}=150°C	-	3.05	-	
	$V_{CE(sat)}$ (chip)	V_{GE} = 15 V, I_C = 200 A	T_{vj}=25°C	-	2.25	2.65	
			T_{vj}=125°C	-	2.65	-	
			T_{vj}=150°C	-	2.75	-	
Internal gate resistance	$r_{g(int)}$	-		-	2.5	-	Ω
Input capacitance	C_{ies}	V_{CE}= 10 V, V_{GE}= 0 V, f=100 kHz		-	17.5	-	nF
Turn-on time	t_{on}	V_{CC} = 600 V, I_C = 200 A, V_{GE} = ±15 V, R_G = 4.7Ω, T_{vj} = 150°C, L_s = 60nH		-	215	-	nsec
	t_r			-	59	-	
Turn-off time	t_{off}			-	299	-	
	t_f			-	55	-	
Forward voltage	V_F (terminal)	V_{GE} = 0 V, I_F = 200 A	T_{vj}=25°C	-	1.90	2.35	V
			T_{vj}=125°C	-	2.45	-	
			T_{vj}=150°C	-	2.70	-	
	V_F (chip)	V_{GE} = 0 V, I_F = 200 A	T_{vj}=25°C	-	1.75	2.15	
			T_{vj}=125°C	-	2.25	-	
			T_{vj}=150°C	-	2.50	-	
Reverse recovery time	t_{rr}	I_F = 200A		-	37	-	nsec

5. Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics min.	Characteristics typ.	Characteristics max.	Units
Thermal resistance(1device)	$R_{th(j-c)}$	IGBT	-	-	0.097	°C/W
		FWD	-	-	0.164	
Contact thermal resistance (1device) (*1)	$R_{th(c-f)}$	with thermal compound	-	0.045	-	

(*1) This is the value which is defined mounting on the additional heat sink with thermal compound.

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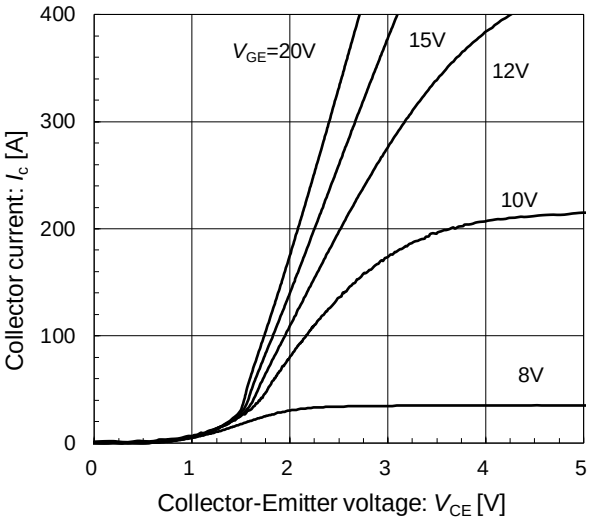
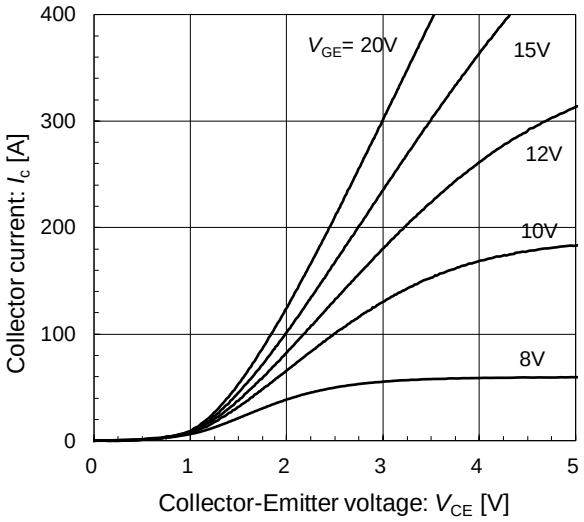
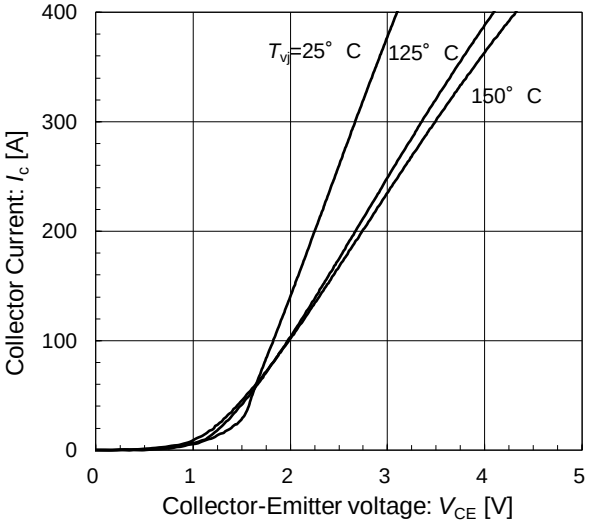
Collector current vs. Collector-Emitter voltage (typ.)
T_{vj} = 25°C / chip



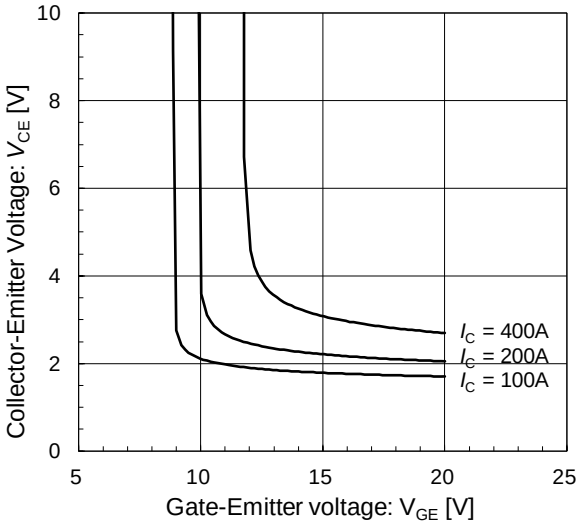
Collector current vs. Collector-Emitter voltage (typ.)
T_{vj} = 150°C / chip



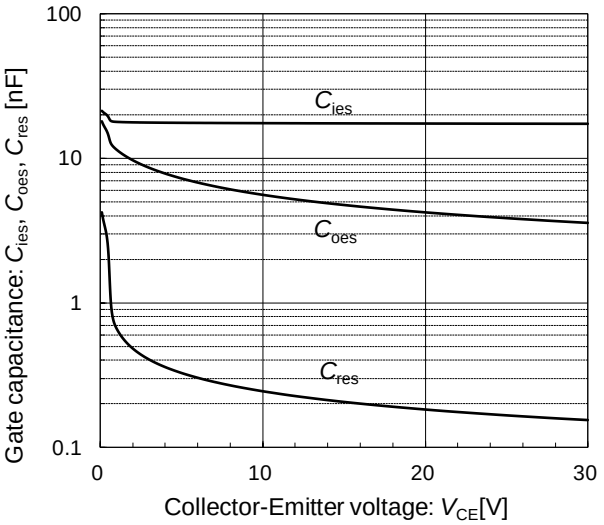
Collector current vs. Collector-Emitter voltage (typ.)
V_{GE} = 15V / chip



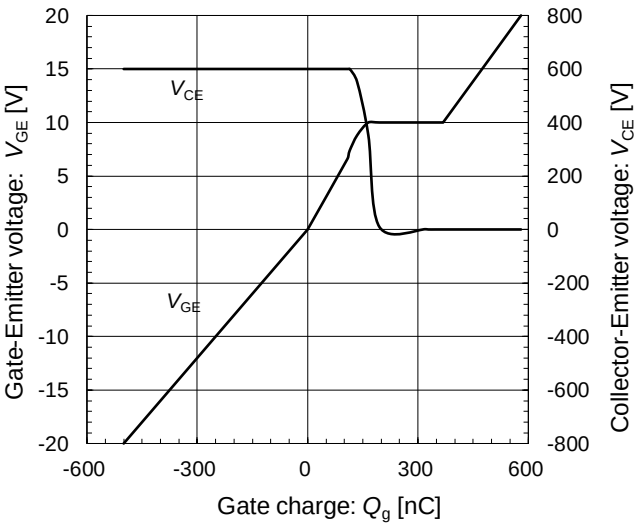
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
T_{vj}= 25°C / chip



Gate capacitance vs. Collector-Emitter voltage (typ.)
V_{GE} = 0 V, f = 100kHz, T_{vj} = 25°C



Dynamic gate charge (typ.)
V_{CC} = 600 V, I_C = 200 A, T_{vj} = 25°C



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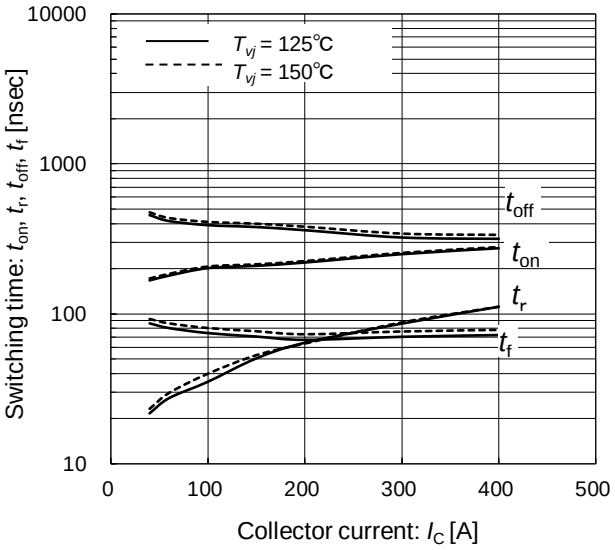
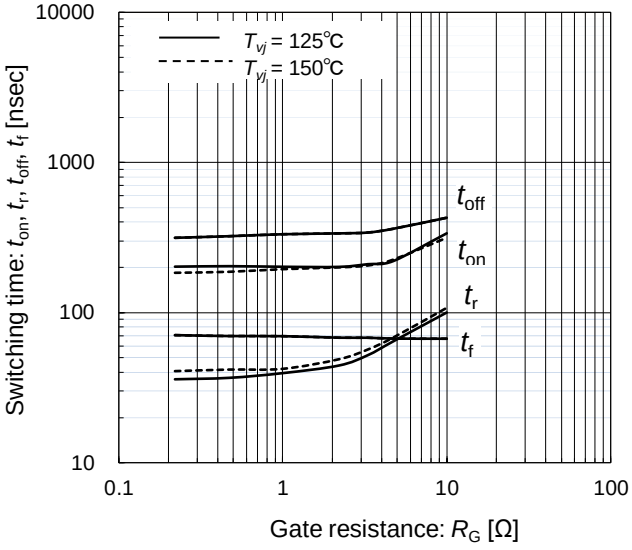
Switching time vs. Collector current (typ.)

V_{CC} = 600 V, V_{GE} = ±15 V, R_G = ±4.7 Ω, T_{vj} = 125℃,150℃



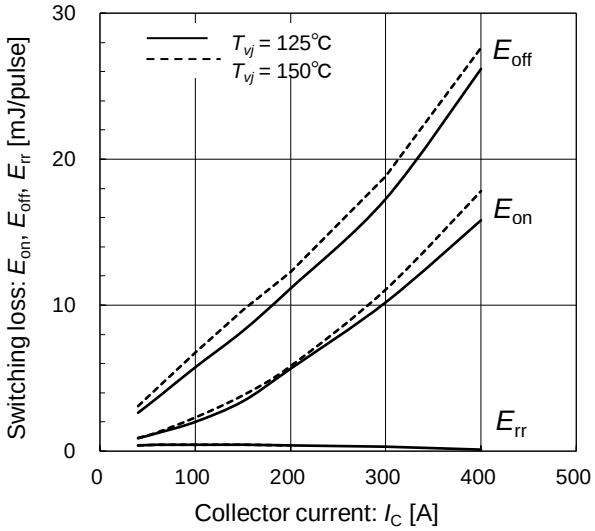
Switching time vs. Gate resistance (typ.)

V_{CC} = 600 V, I_C = 200 A, V_{GE} = ±15 V, T_{vj} = 125℃,150℃



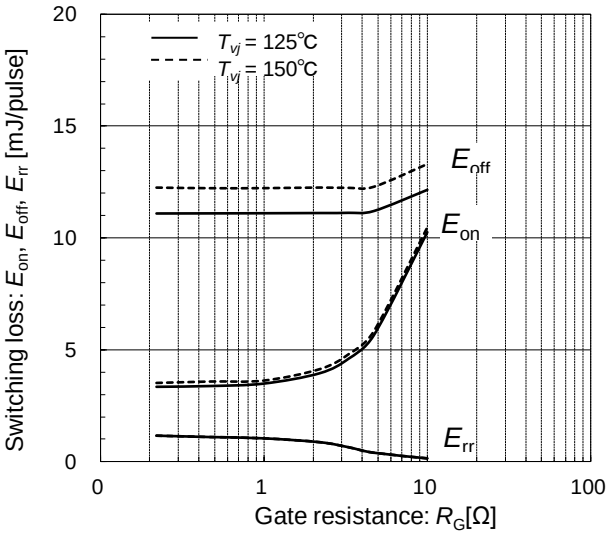
Switching loss vs. Collector current (typ.)

V_{CC} = 600 V, V_{GE} = ±15 V, R_G = ±4.7 Ω, T_{vj} = 125℃,150℃



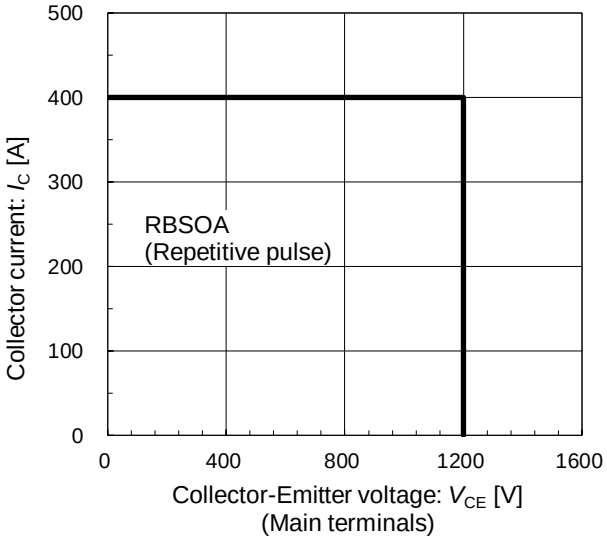
Switching loss vs. Gate resistance (typ.)

V_{CC} = 600 V, I_C = 200 A, V_{GE} = ±15 V, T_{vj} = 125℃,150℃



Reverse bias safe operating area (max.)

V_{GE} = ±15 V, R_G = 4.7 Ω, T_{vj} = 150°C



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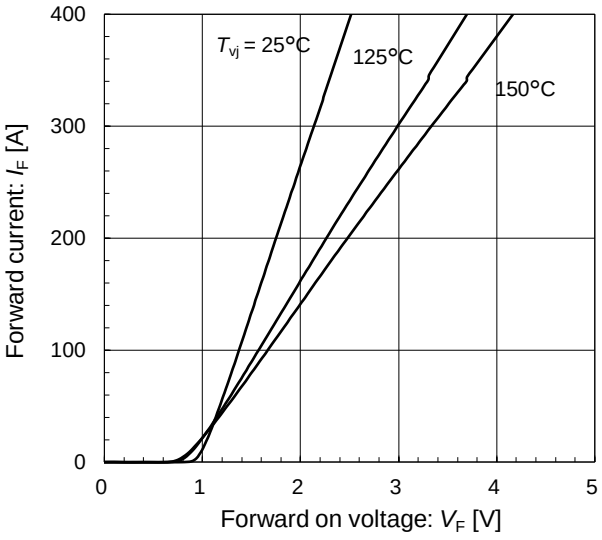
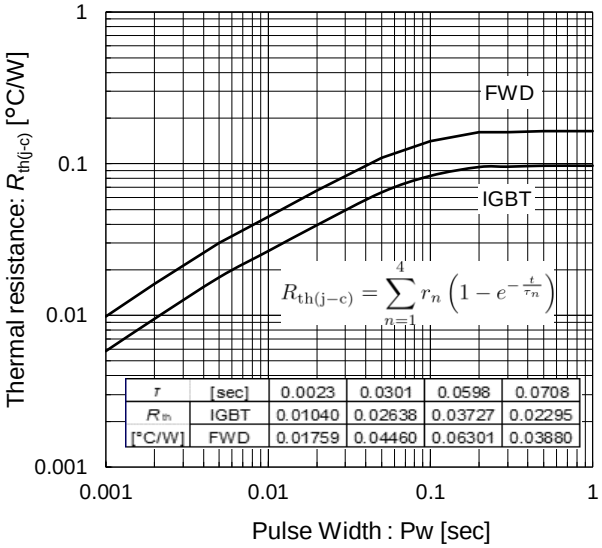
Forward current vs. Forward voltage (typ.)
chip



Transient thermal resistance (max.)



τ	[sec]	0.0023	0.0301	0.0598	0.0708
R_{th}	IGBT	0.01040	0.02638	0.03727	0.02295
[°C/W]	FWD	0.01759	0.04460	0.06301	0.03880

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