

2MSI400VE-170-53

Hybrid Modules

Power Module (Vseries IGBT&SiC SBD Hybrid type)
1700V / 400A / 2-in-1 package

■ Features

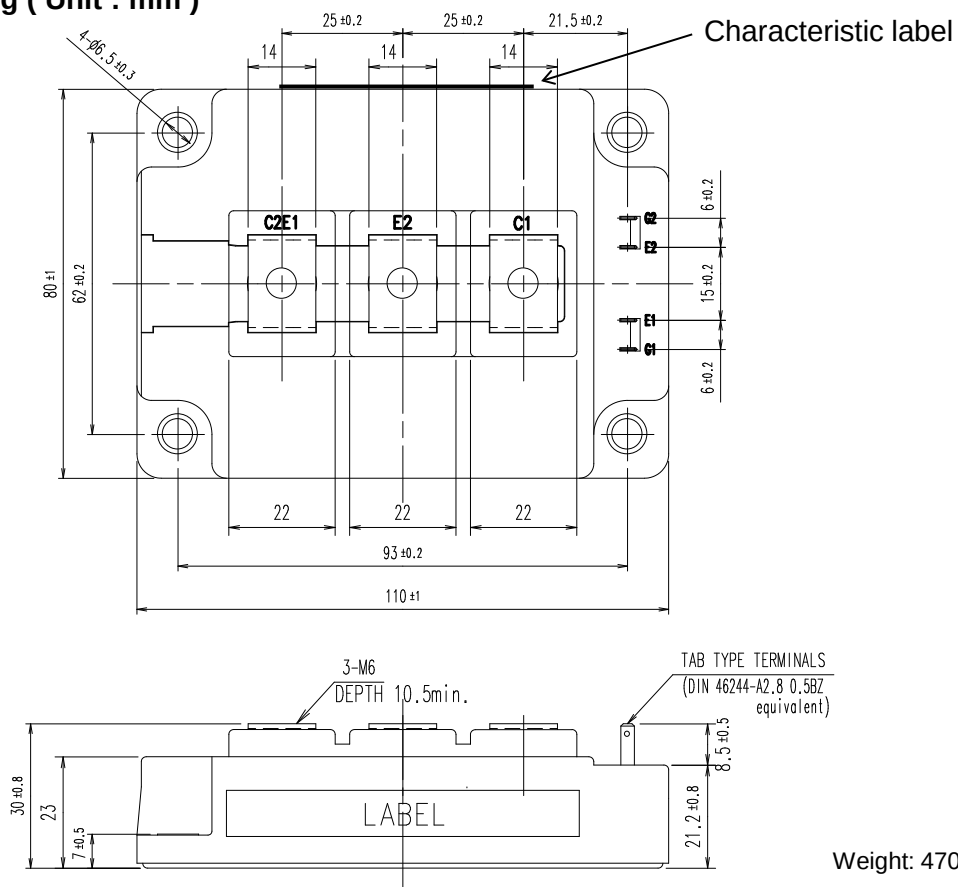
- High speed switching
- Voltage drive
- Low switching loss
- Low Inductance module structure

■ Applications

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

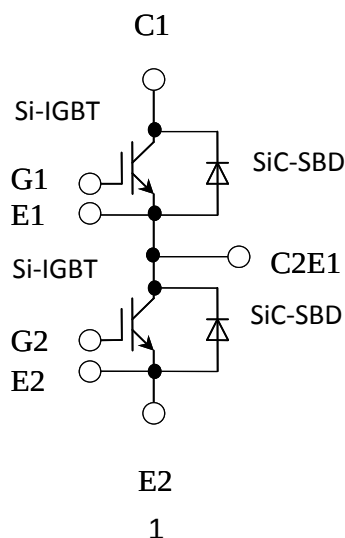


■ Outline drawing (Unit : mm)



Weight: 470g (typ.)

■ Equivalent Circuit



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■ Absolute Maximum Ratings (at Tc= 25°C unless otherwise specified)

Items		Symbols	Conditions		Maximum Ratings	Units
Collector-Emitter voltage		VCES			1,700	V
Gate-Emitter voltage		VGES			±20	V
Collector current		Ic	Continuous	Tc=100°C	400	A
				Tc=25°C	520	
		Ic pulse	1ms		800	
		-Ic			400	
		-Ic pulse	1ms		800	
Collector power dissipation		Pc	1 device		4,540	W
I²t (*1)		I²t	1 device VCE=0V,tw=10ms	Tj=125°C	14,240	A²s
				Tj=150°C	11,760	
Junction temperature		Tj			175	°C
Operating junction temperature (under switching conditions)		Tjop			150	
Case temperature		Tc			125	
Storage temperature		Tstg			-40 ~ 125	
Isolation	between terminal and copper base (*2)	Viso	AC: 1min.		4,000	VAC
Screw Torqu	Mounting (*3)	-			6.0	N m
	Terminals (*4)	-			5.0	

(* Non-repetitive)

(* All terminals should be connected together during the test.

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

(* Recommendable Value : 2.5-5.0 Nm (M6)

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

NOTICE:

The external gate resistance (Rg_on, Rg_off) shown in below is one of our recommend value for the purpose of minimum switching loss. However the optimum Rg depends on circuit configuration and/or environment. We recommend that the Rg 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. Especially, we recommend to choose Rg_on value shown in below or more.

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Zero gate voltage Collector current	ICES	VGE=0V, VCE=1700V	-	-	10.0	mA
Gate-Emitter leakage current	IGES	VCE=0V, VGE=±20V	-	-	800	nA
Gate-Emitter threshold voltage	VGE(th)	VCE=20V, Ic=400mA	6.0	6.5	7.0	V
Collector-Emitter saturation voltage	VCE(sat) (terminal)	VGE=15V, Ic=400A	Tj=25°C	-	2.15	V
			Tj=125°C	-	2.55	
			Tj=150°C	-	2.60	
	VCE(sat) (chip)	VGE=15V, Ic=400A	Tj=25°C	-	2.00	
			Tj=125°C	-	2.40	
Internal gate resistance	Rg(int)	-	-	5.6	-	Ω
Input capacitance	Cies	VCE=10V, VGE=0V, f=1MHz	-	38	-	nF
Turn-on time	ton	Vcc=900V, Ic=400A, VGE=±15V, Rg_on=1Ω, Rg_off=0.5Ω, Tj=125°C, Ls=30nH	-	1050	-	nsec
	tr		-	450	-	
	tr(i)		-	-	-	
Turn-off time	toff		-	1950	-	
	tf		-	90	-	
Forward on voltage	VF (terminal)	VGE=0V, IF=400A	Tj=25°C	-	1.70	V
			Tj=125°C	-	2.25	
			Tj=150°C	-	2.45	
	VF (chip)	VGE=0V, IF=400A	Tj=25°C	-	1.60	
			Tj=125°C	-	2.15	
			Tj=150°C	-	2.35	

5. Thermal resistance characteristics

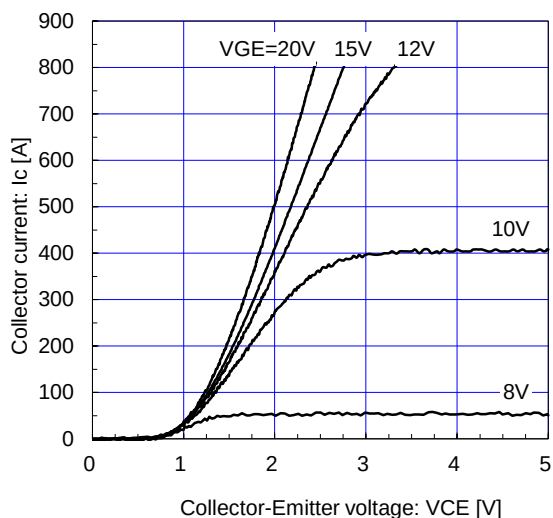
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance(1device)	Rth(j-c)	IGBT	-	-	0.033	°C/W
		FWD(SiC-SBD)	-	-	0.070	
Contact thermal resistance (1device) (*1)	Rth(c-f)	with Thermal Compound	-	0.0125	-	

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

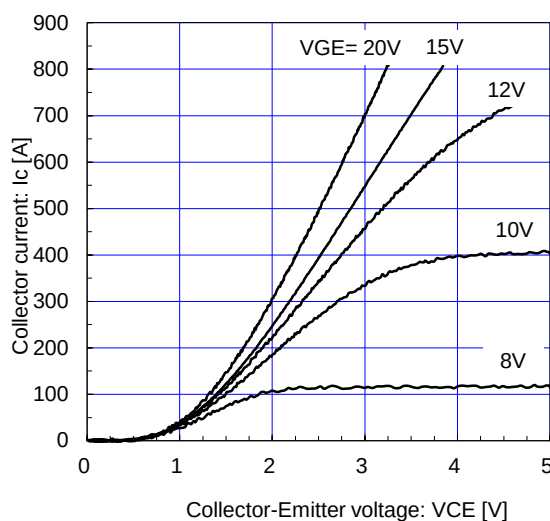
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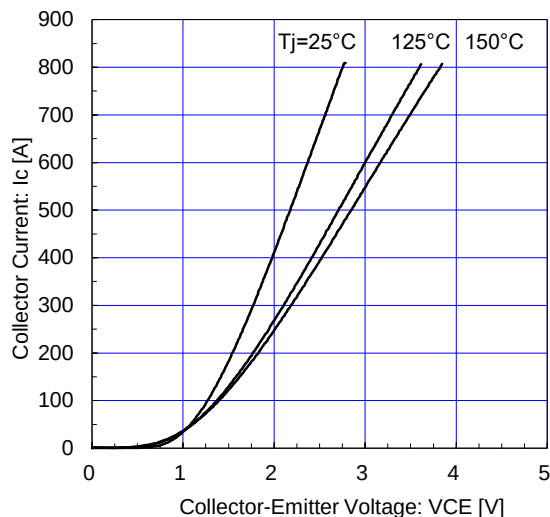
Collector current vs. Collector-Emitter voltage
Tj= 25°C / chip



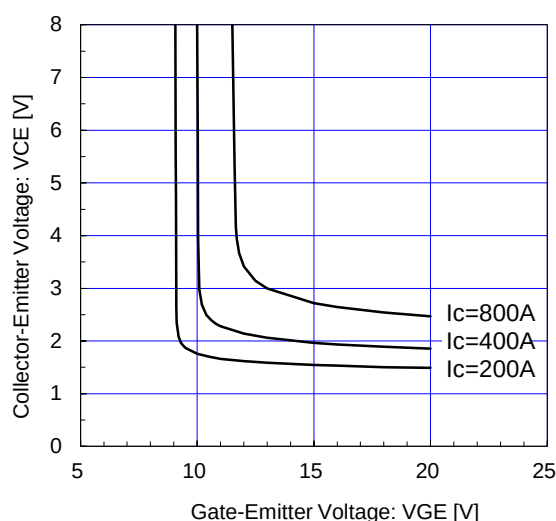
Collector current vs. Collector-Emitter voltage (typ.)
Tj= 150°C / chip



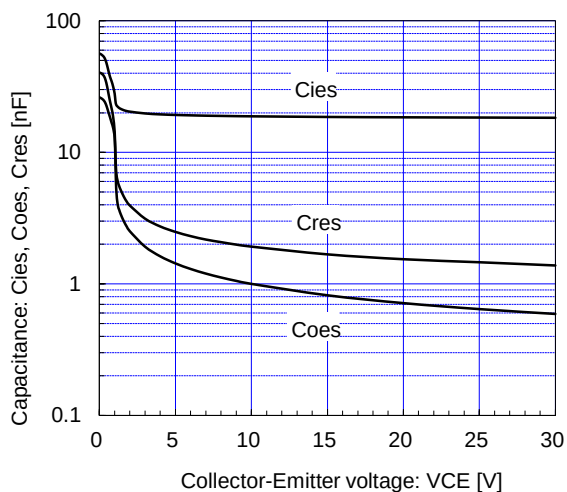
Collector current vs. Collector-Emitter voltage
VGE= 15V / chip



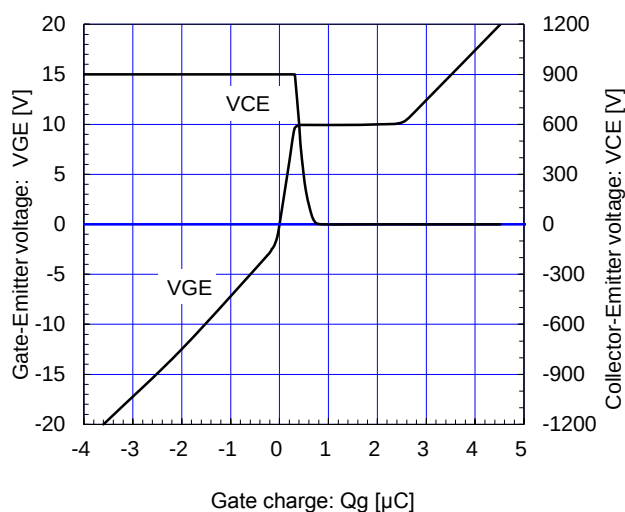
Collector-Emitter voltage vs. Gate-Emitter voltage
Tj= 25°C / chip



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



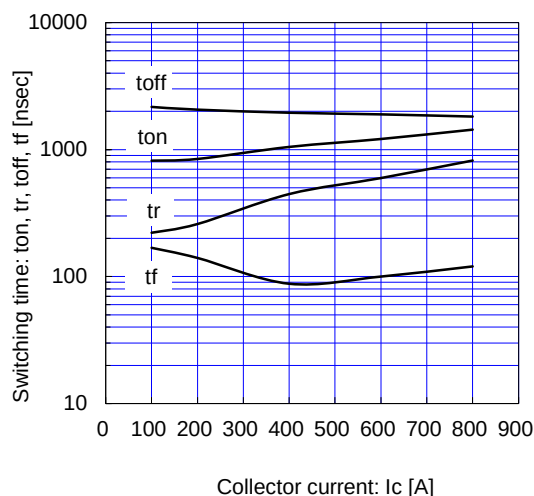
Dynamic Gate Charge (typ.)
Vcc=900V, Ic=400A, Tj= 25°C



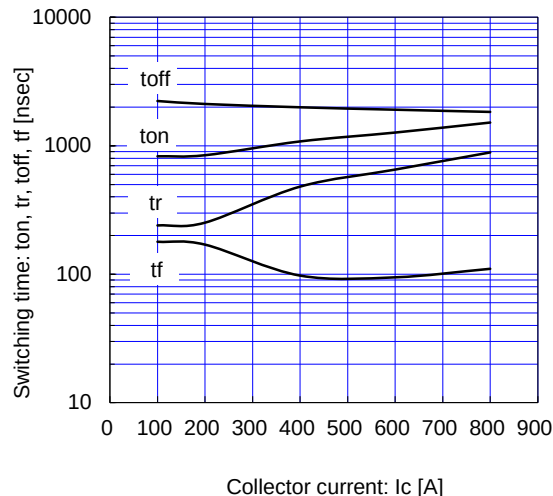
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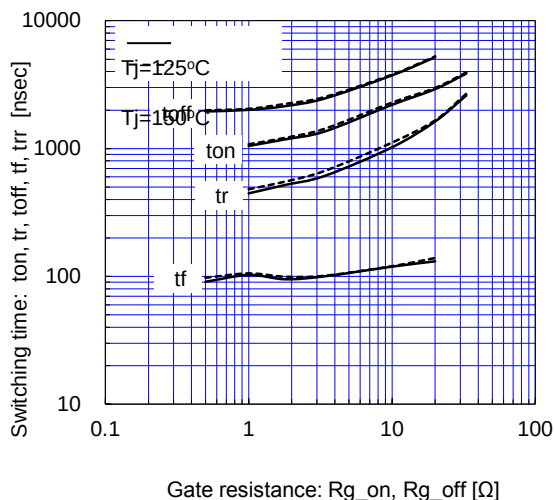
Switching time vs. Collector current (typ.)
Vcc=900V, VGE=±15V, Rg_on=1Ω, Rg_off=0.5Ω, Tj=125°C



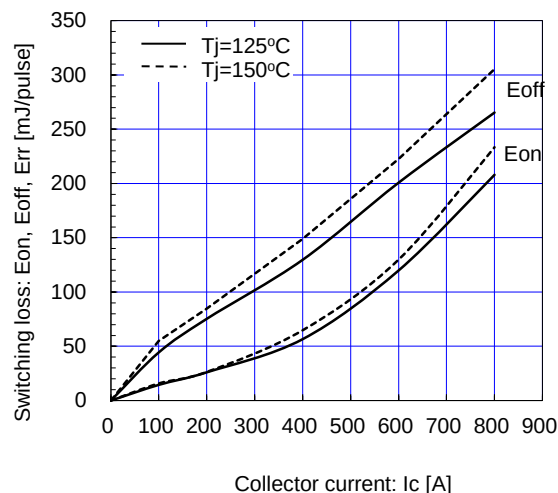
Switching time vs. Collector current (typ.)
Vcc=900V, VGE=±15V, Rg_on=1Ω, Rg_off=0.5Ω, Tj=150°C



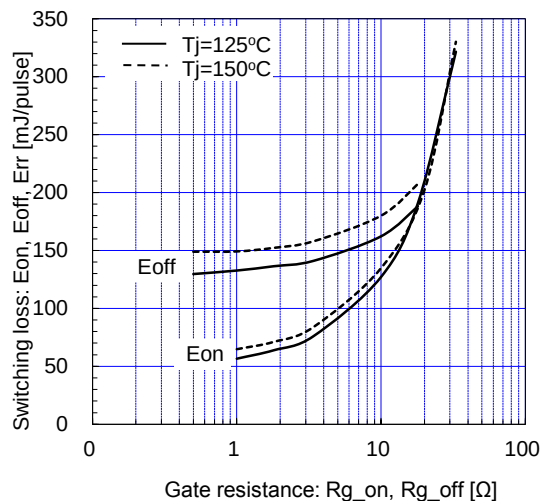
Switching time vs. Gate resistance (typ.)
Vcc=900V, Ic=IF=400A, VGE=±15V



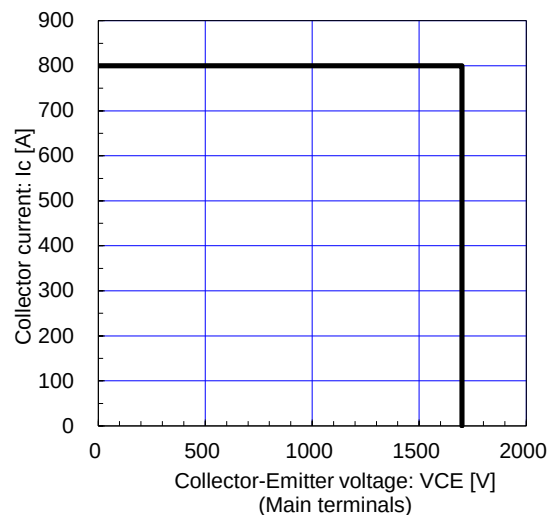
Switching loss vs. Collector current (typ.)
Vcc=900V, VGE=±15V, Rg_on=1Ω, Rg_off=0.5Ω



Switching loss vs. Gate resistance (typ.)
Vcc=900V, Ic=IF=400A, VGE=±15V

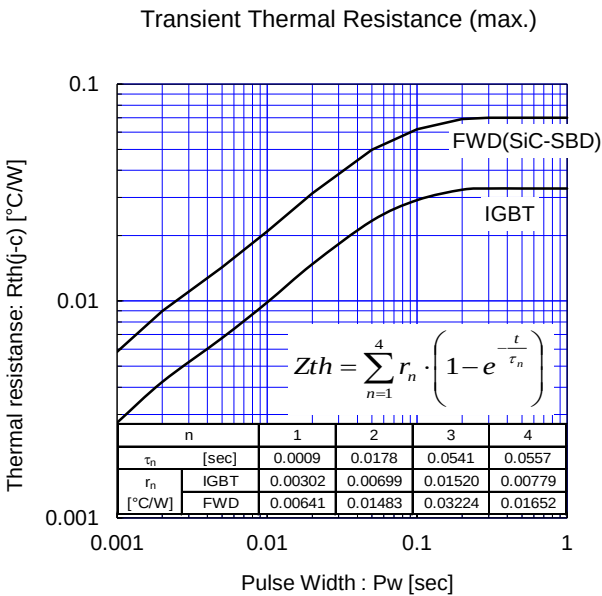
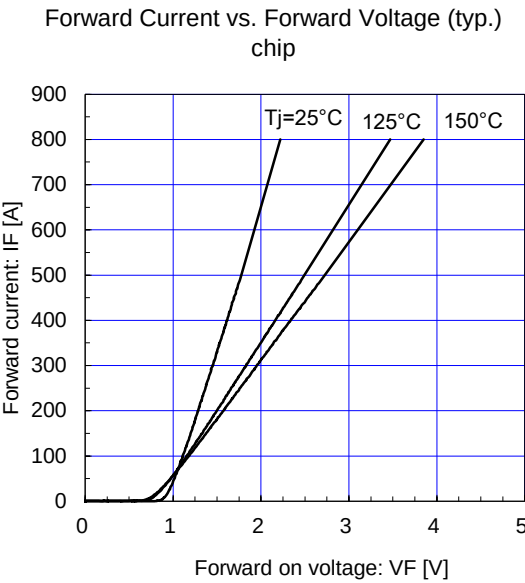


Reverse bias safe operating area (max.)
+VGE=15V, -VGE=15V, Rg_off=0.5Ω, Tj=150°C



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