

2MSI300VAH-120-53

SiC Hybrid Modules

Power Module (V-series IGBT & SiC SBD Hybrid type)
1200V / 300A / 2-in-1 package

■ **Features**

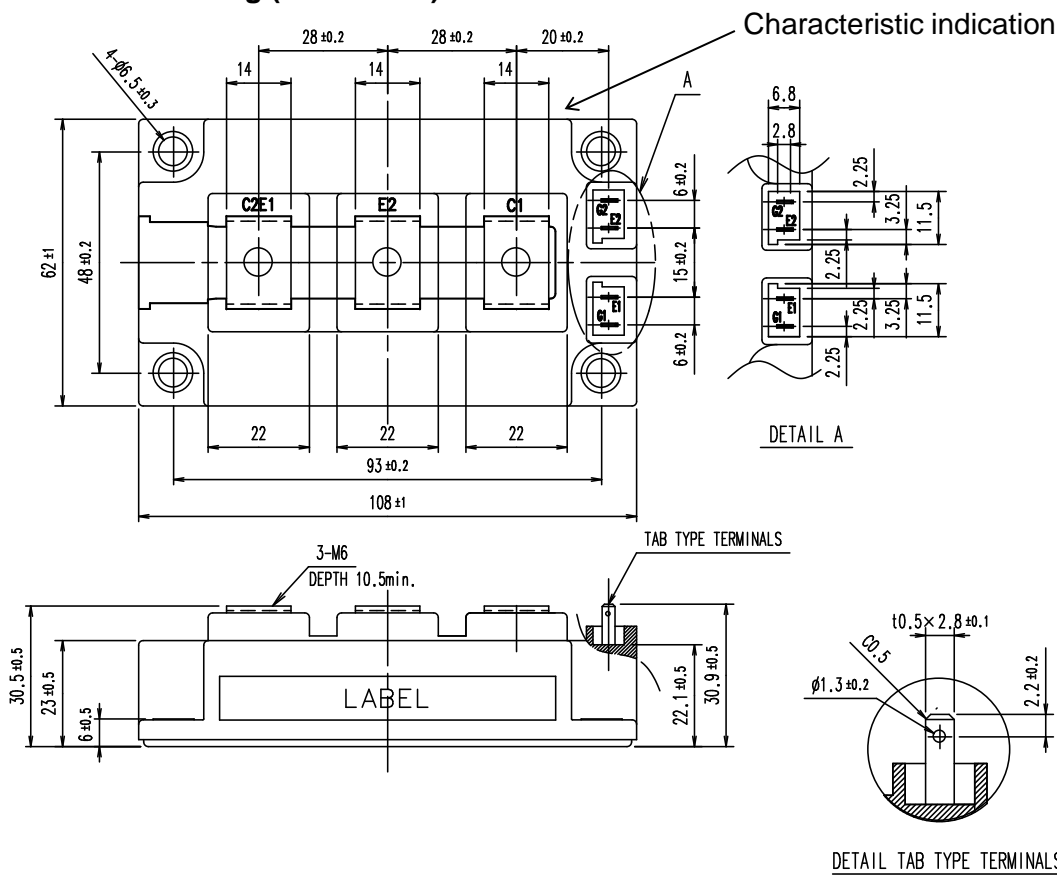
- High speed switching
- Voltage drive
- Low switching loss
- Low inductance module structure

■ **Applications**

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

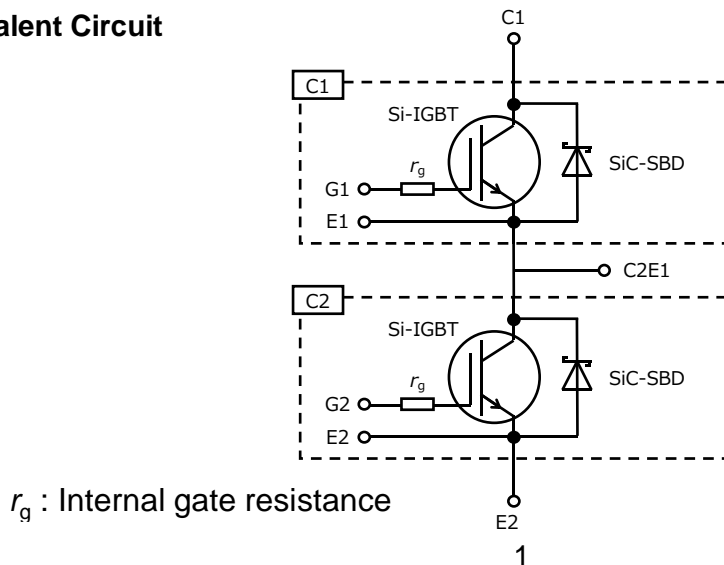


■ **Outline drawing (Unit : mm)**



Weight: 370g (typ.)

■ **Equivalent Circuit**



2MSI300VWAH-120-53

SiC Hybrid Modules

■ Absolute maximum ratings (at $T_C = 25^\circ\text{C}$ 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 $T_C = 100^\circ\text{C}$	300	A
		I_{CRM}	1 ms	600	
		$-I_C$		300	
		$-I_{CRM}$	1 ms	600	
Collector power dissipation		P_C	1 device	1610	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)

2MSI300VWAH-120-53

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■ Electrical characteristics (at $T_{vj}=25^{\circ}\text{C}$ 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 if IGBT module matches environment. We recommend that the R_G has to be carefully chosen based on consideration design criteria, for example, switching loss, EMC/EMI, spike voltage, surge current and no unexpected oscillation and so on.

Items	Symbols	Conditions	Characteristics			Units	
			min.	typ.	max.		
Zero gate voltage collector current	I_{CES}	$V_{GE} = 0 \text{ V}, V_{CE} = 1200 \text{ V}$	-	-	2.5	mA	
Gate-Emitter leakage current	I_{GES}	$V_{CE} = 0 \text{ V}, V_{GE} = \pm 20 \text{ V}$	-	-	400	nA	
Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20 \text{ V}, I_C = 300 \text{ mA}$	6.0	6.5	7.0	V	
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15 \text{ V}, I_C = 300 \text{ A}$	$T_{vj}=25^{\circ}\text{C}$	-	2.50	2.95	V
			$T_{vj}=125^{\circ}\text{C}$	-	3.00	-	
			$T_{vj}=150^{\circ}\text{C}$	-	3.10	-	
	$V_{CE(sat)}$ (chip)	$V_{GE} = 15 \text{ V}, I_C = 300 \text{ A}$	$T_{vj}=25^{\circ}\text{C}$	-	2.30	2.70	
			$T_{vj}=125^{\circ}\text{C}$	-	2.70	-	
			$T_{vj}=150^{\circ}\text{C}$	-	2.80	-	
Internal gate	$r_{g(int)}$	-	-	5	-	Ω	
Input capacitance	C_{ies}	$V_{CE}=10 \text{ V}, V_{GE}=0 \text{ V}, f=100 \text{ kHz}$	-	24.5	-	nF	
Turn-on time	t_{on}	$V_{CC} = 600 \text{ V}, I_C = 300 \text{ A}, V_{GE} = \pm 15 \text{ V}, R_G = 1.0\Omega, T_{vj} = 150^{\circ}\text{C}, L_s = 60\text{nH}$	-	325	-	nsec	
	t_r		-	55	-		
Turn-off time	t_{off}		-	316	-		
	t_f		-	62	-		
Forward voltage	V_F (terminal)	$V_{GE} = 0 \text{ V}, I_F = 300 \text{ A}$	$T_{vj}=25^{\circ}\text{C}$	-	1.85	2.30	V
			$T_{vj}=125^{\circ}\text{C}$	-	2.40	-	
			$T_{vj}=150^{\circ}\text{C}$	-	2.65	-	
	V_F (chip)	$V_{GE} = 0 \text{ V}, I_F = 300 \text{ A}$	$T_{vj}=25^{\circ}\text{C}$	-	1.75	2.15	
			$T_{vj}=125^{\circ}\text{C}$	-	2.25	-	
			$T_{vj}=150^{\circ}\text{C}$	-	2.50	-	
Reverse recovery time	t_{rr}	$I_F = 300\text{A}$	-	64	-	nsec	

5. Thermal resistance characteristics

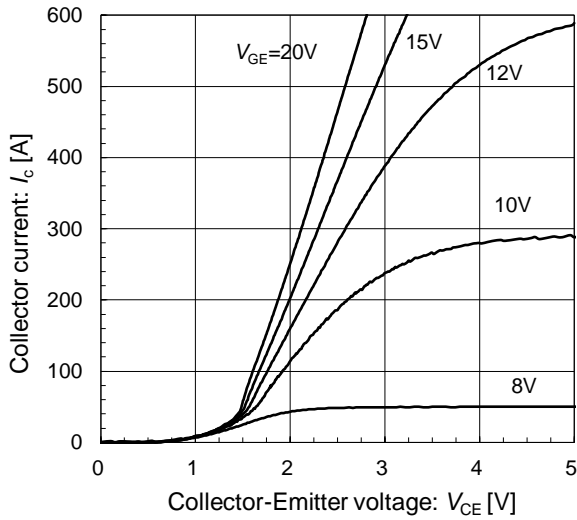
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	$R_{th(j-c)}$	IGBT	-	-	0.082	$^{\circ}\text{C/W}$
		FWD	-	-	0.106	
Contact thermal resistance (1device) (*1)	$R_{th(c-f)}$	with thermal compound	-	0.025	-	

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

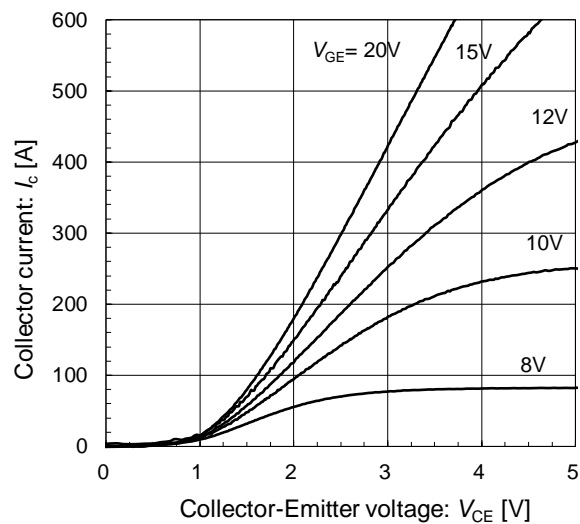
2MSI300VAH-120-53

SiC Hybrid Modules

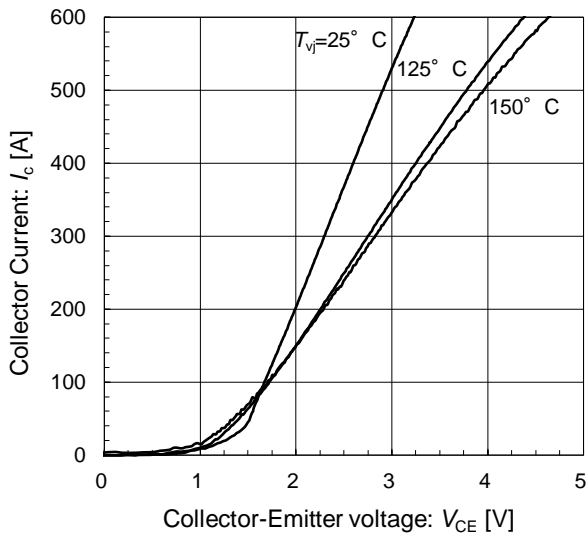
Collector current vs. Collector-Emitter voltage
 $T_{vj} = 25^{\circ}\text{C} / \text{chip}$



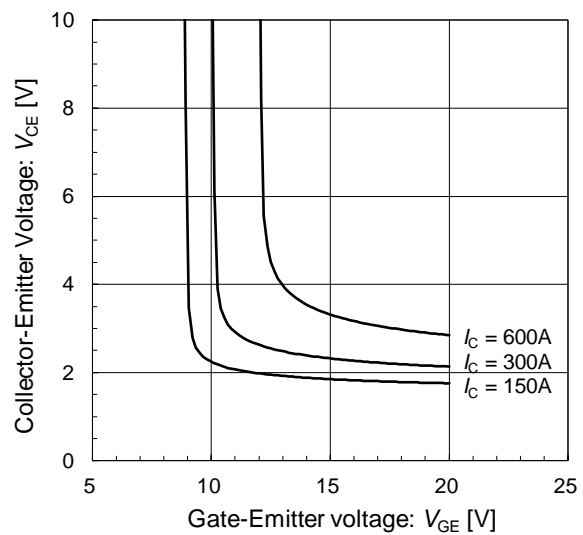
Collector current vs. Collector-Emitter voltage (typ.)
 $T_{vj} = 150^{\circ}\text{C} / \text{chip}$



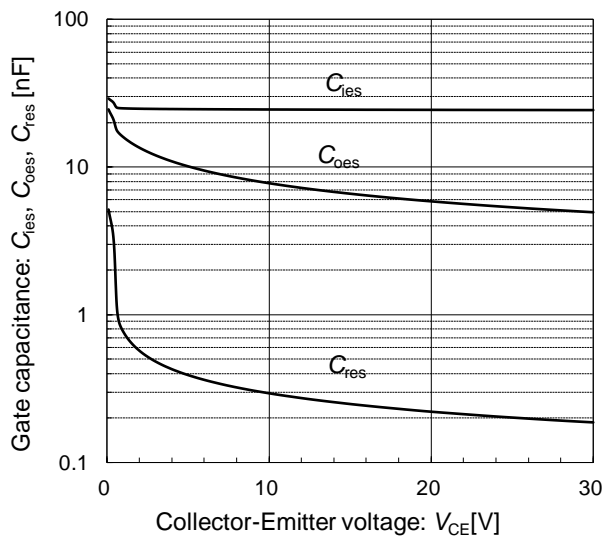
Collector current vs. Collector-Emitter voltage
 $V_{GE} = 15\text{V} / \text{chip}$



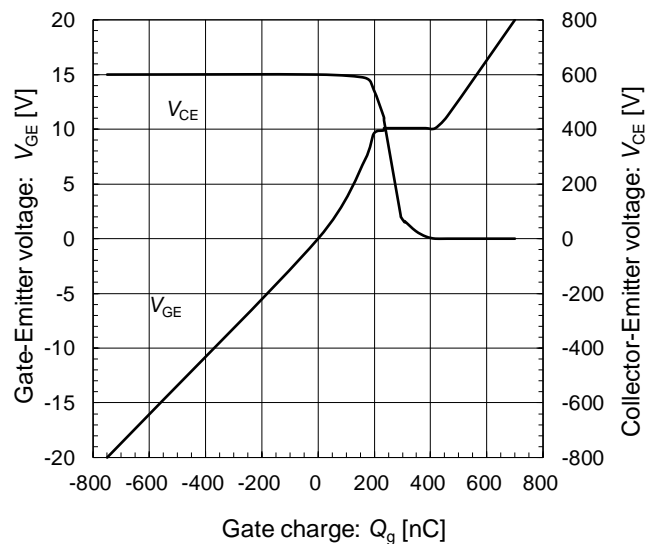
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
 $T_{vj} = 25^{\circ}\text{C} / \text{chip}$



Gate capacitance vs. Collector-Emitter voltage
 $V_{GE} = 0\text{V}, f = 100\text{kHz}, T_{vj} = 25^{\circ}\text{C}$



Dynamic gate charge (typ.)
 $V_{CC} = 600\text{V}, I_C = 300\text{A}, T_{vj} = 25^{\circ}\text{C}$

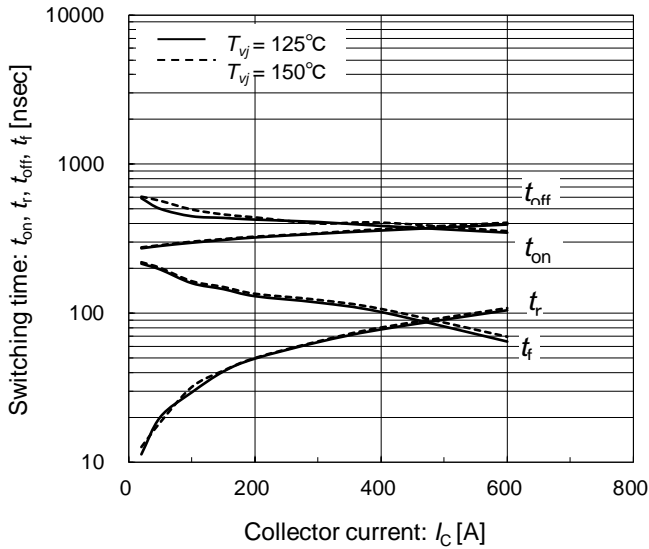


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SiC Hybrid Modules

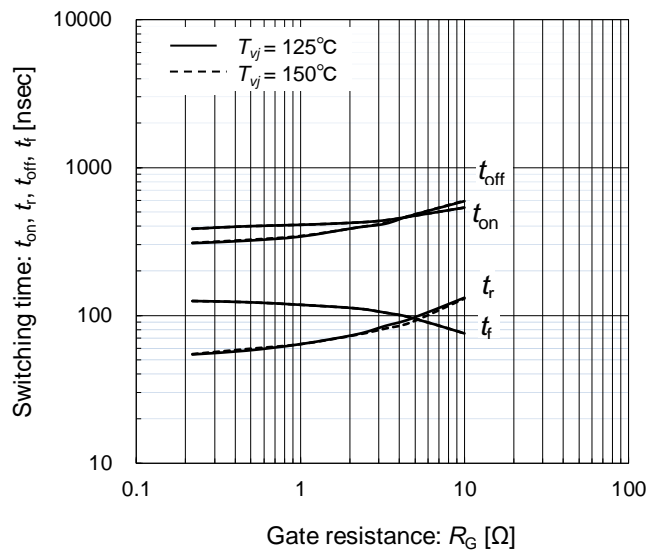
Switching time vs. Collector current (typ.)

$V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_G = \pm 1.0\ \Omega$, $T_{vj} = 125^\circ\text{C}, 150^\circ\text{C}$



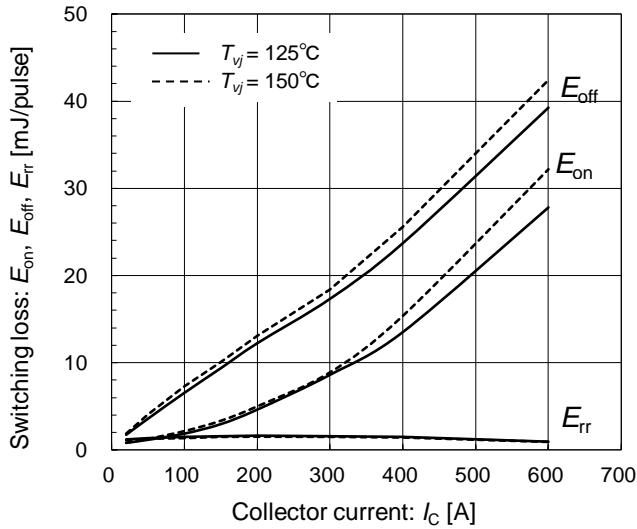
Switching time vs. Gate resistance (typ.)

$V_{CC} = 600\text{ V}$, $I_C = 300\text{ A}$, $V_{GE} = \pm 15\text{ V}$, $T_{vj} = 125^\circ\text{C}, 150^\circ\text{C}$



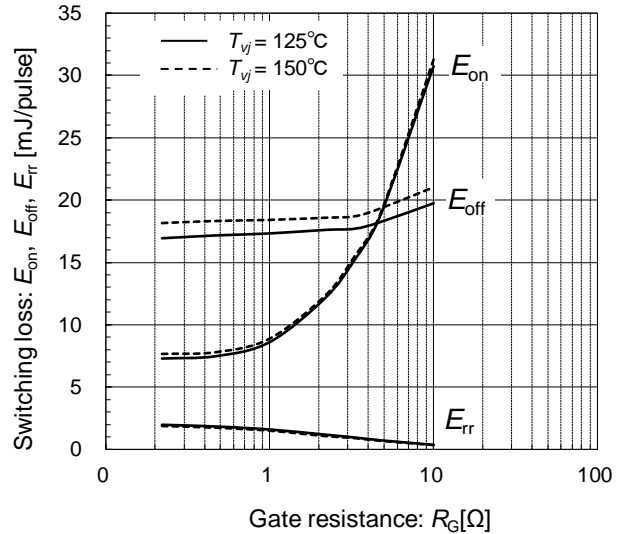
Switching loss vs. Collector current (typ.)

$V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_G = \pm 1.0\ \Omega$, $T_{vj} = 125^\circ\text{C}, 150^\circ\text{C}$



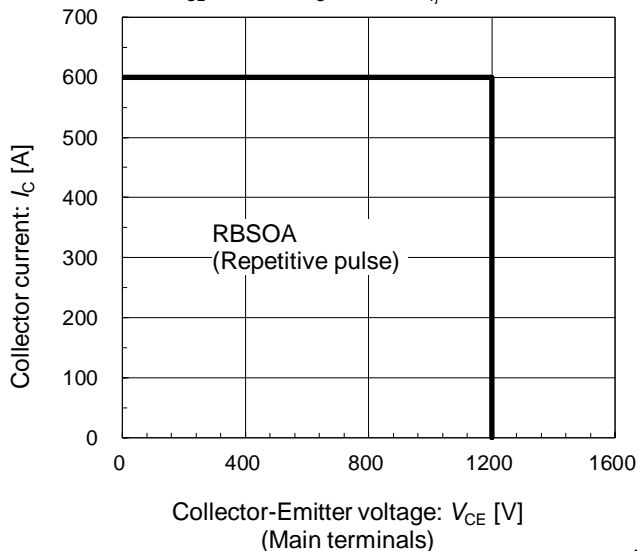
Switching loss vs. Gate resistance (typ.)

$V_{CC} = 600\text{ V}$, $I_C = 300\text{ A}$, $V_{GE} = \pm 15\text{ V}$, $T_{vj} = 125^\circ\text{C}, 150^\circ\text{C}$



Reverse bias safe operating area (max.)

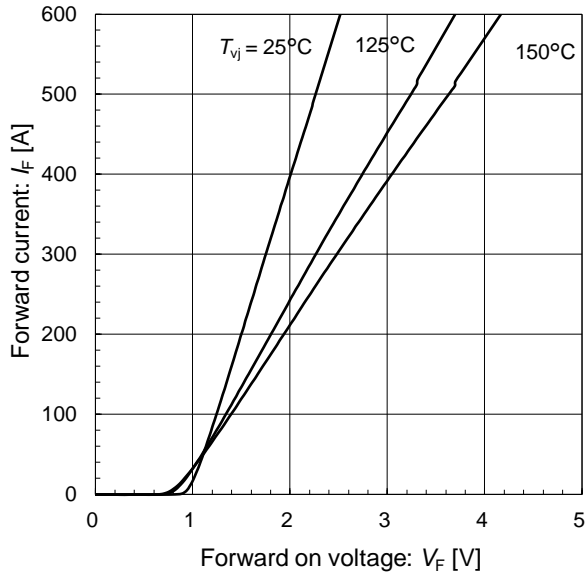
$V_{GE} = \pm 15\text{ V}$, $R_G = 1.0\ \Omega$, $T_{vj} = 150^\circ\text{C}$



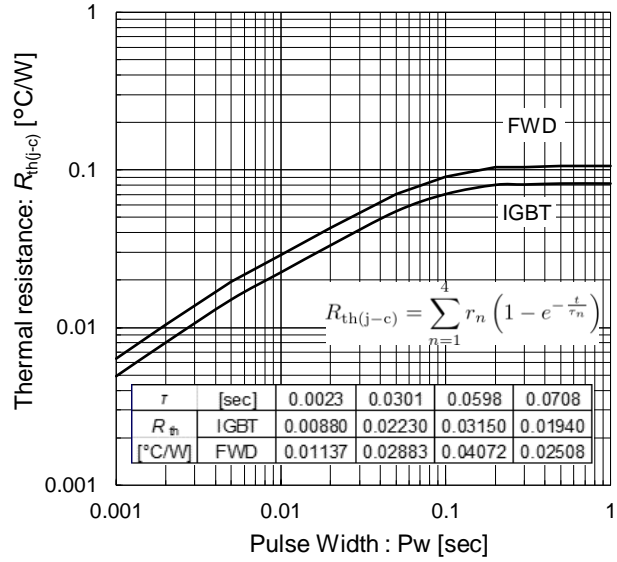
2MSI300VWAH-120-53

SiC Hybrid Modules

Forward current vs. Forward voltage (typ.)
chip



Transient thermal resistance (max.)



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