2MSI600VAN-120-53

SiC Hybrid Modules

Power Module (V-series IGBT&SiC SBD Hybrid type)
1200V / 600A / 2-in-1 package

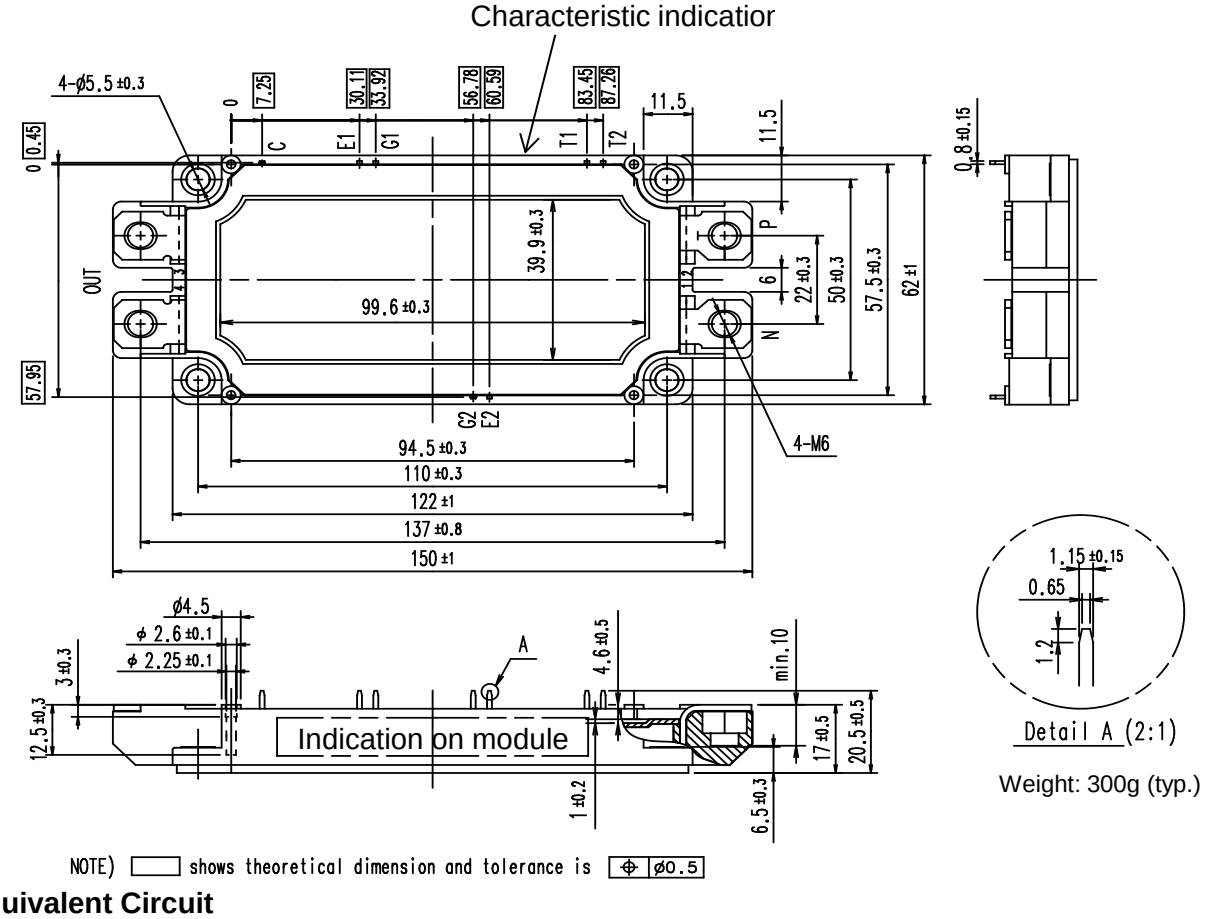
■ Features

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

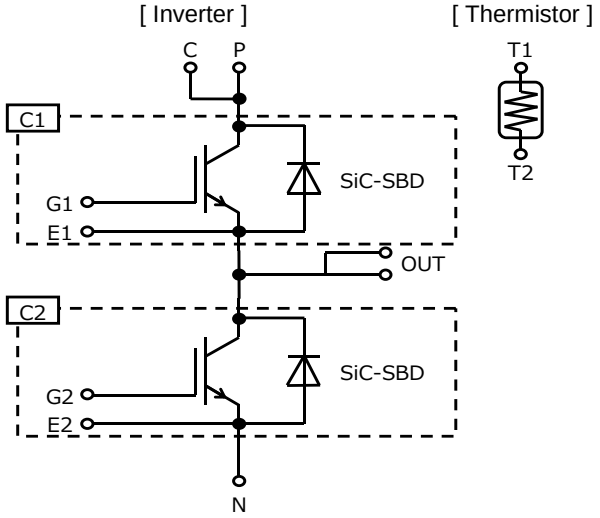
■ Outline drawing (Unit : mm)



Weight: 300g (typ.)

NOTE) ▭ shows theoretical dimension and tolerance is ⊕ ø0.5

■ Equivalent Circuit



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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 = 25°C	750	A
				T_c = 100°C	600	
		I_C pulse	1ms		1200	
		$-I_C$			600	
		$-I_C$ pulse	1ms		1200	
Collector power dissipation		P_C	1 device		3720	W
Junction temperature		T_{vj}	1 device		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_{isol}	AC: 1min.		2500	VAC
	between thermistor and others (*2)					
Screw Torque	Mounting (*3)	-			3.5	N m
	Terminals (*4)	-			4.5	

(*1) All terminals should be connected together during the test.
(*2) Two thermistor terminals should be connected together, other terminals should be connected together and shorted to base plate during the test.
(*3) Recommendable Value : 2.5-3.5 Nm (M5)
(*4) Recommendable Value : 3.5-4.5 Nm (M6)

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■ 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		Characteristlcs min.	typ.	max.	Units
Inverter	Zero gate voltage Collector current	I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V		-	-	5.0	mA
	Gate-Emitter leakage current	I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V		-	-	600	nA
	Gate-Emitter threshold voltage	$V_{GE(th)}$	V_{CE} = 20 V, I_C = 600 mA		6.0	6.5	7.0	V
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	V_{GE} = 15 V, I_C = 600 A	T_{vj} = 25°C	-	2.65	3.10	V
				T_{vj} = 125°C	-	3.15	-	
				T_{vj} = 150°C	-	3.30	-	
		$V_{CE(sat)}$ (chip)		T_{vj} = 25°C	-	1.85	2.30	
				T_{vj} = 125°C	-	2.20	-	
				T_{vj} = 150°C	-	2.25	-	
	Internal gate resistance	$r_{g(int)}$	-		-	1.25	-	Ω
	Input capacitance	C_{ies}	V_{CE} = 10 V, V_{GE} = 0 V, f = 100kHz		-	41	-	nF
	Turn-on time	t_{on}	V_{CC} = 600V, I_C = 600A, V_{GE} = ±15V, R_G = 0.62Ω, L_s = 40nH		-	470	-	nsec
		t_r			-	90	-	
		$t_{r(i)}$			-	80	-	
	Turn-off time	t_{off}			-	790	-	
		t_f			-	100	-	
	Forward voltage	V_F (terminal)	V_{GE} = 0 V, I_F = 600 A	T_{vj} = 25°C	-	2.55	2.90	V
				T_{vj} = 125°C	-	3.20	-	
				T_{vj} = 150°C	-	3.45	-	
		V_F (chip)		T_{vj} = 25°C	-	1.80	2.10	
				T_{vj} = 125°C	-	2.25	-	
				T_{vj} = 150°C		2.45	-	
	Reverse recovery time	t_{rr}	I_F = 600A		-	60	-	nsec
Thermister	Resistannce	R	T = 25°C		-	5000	-	Ω
			T = 100°C		465	495	520	
	B value	B	T = 25/50°C		-	3375	3450	K

5. Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics min.	typ.	max.	Units
Thermal resistance(1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.040	°C/W
		Inverter FWD	-	-	0.070	
Contact thermal resistance (1device) (*1)	$R_{th(c-f)}$	with Thermal Compound	-	0.0167	-	

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

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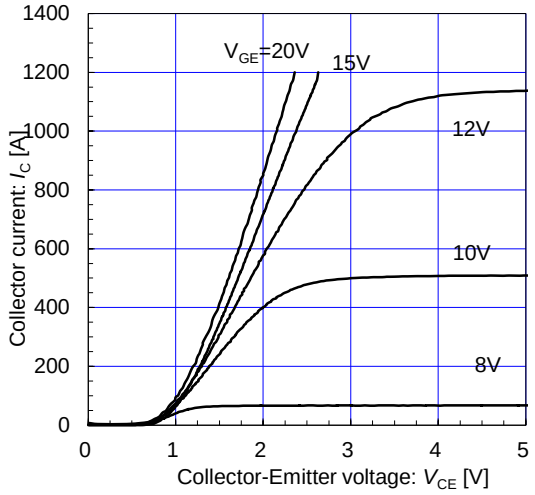
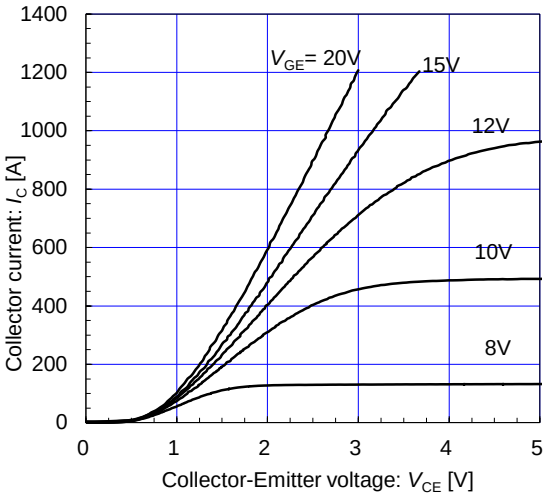
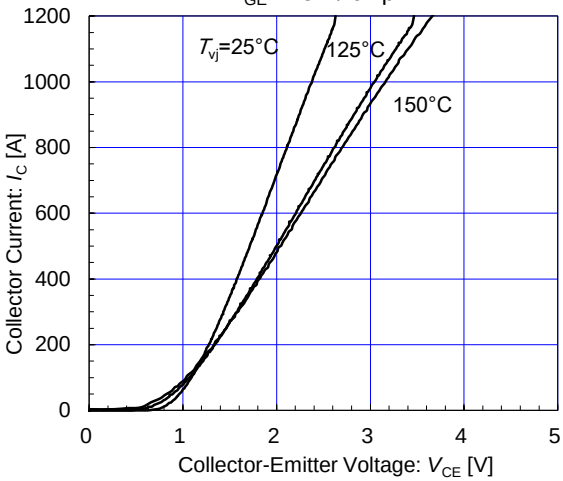
[INVERTER]
Collector current vs. Collector-Emitter voltage (typ.)
T_{vj}= 25°C / chip



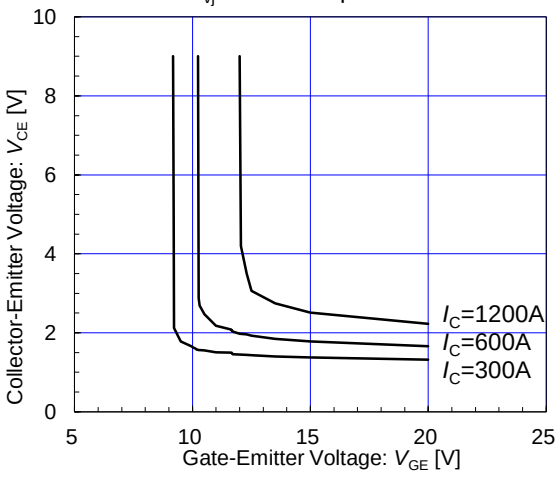
[INVERTER]
Collector current vs. Collector-Emitter voltage (typ.)
T_{vj}= 150°C / chip



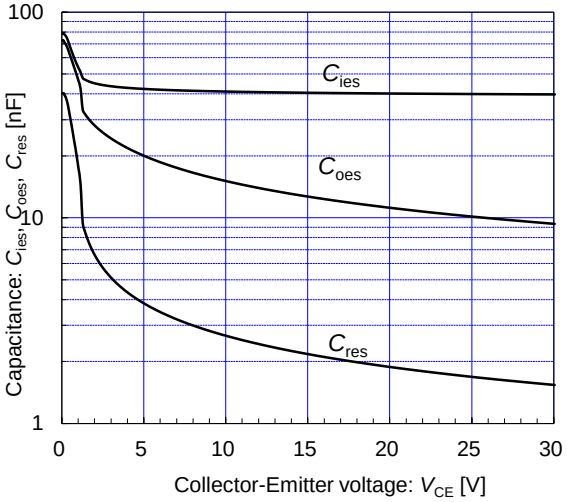
[INVERTER]
Collector current vs. Collector-Emitter voltage (typ.)
V_{GE}= 15V / chip



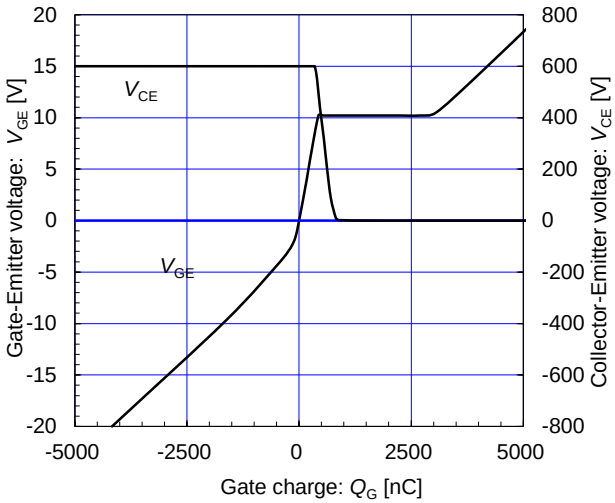
[INVERTER]
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
T_{vj}= 25°C / chip



[INVERTER]
Gate Capacitance vs. Collector-Emitter Voltage (typ.)
V_{GE} = 0 V, f = 100kHz, T_{vj} = 25°C



[INVERTER]
Dynamic Gate Charge (typ.)
V_{CC} = 600 V, I_C = 600 A, T_{vj} = 25°C



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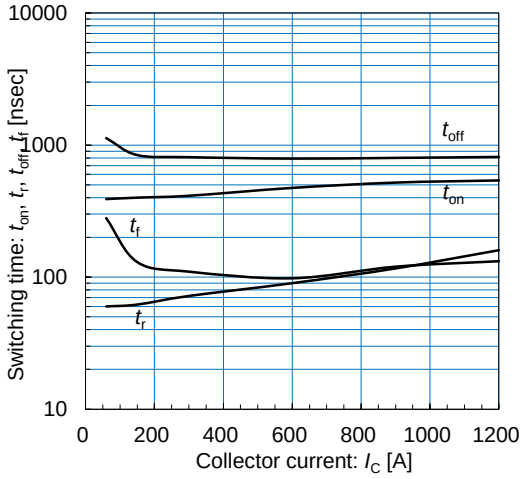
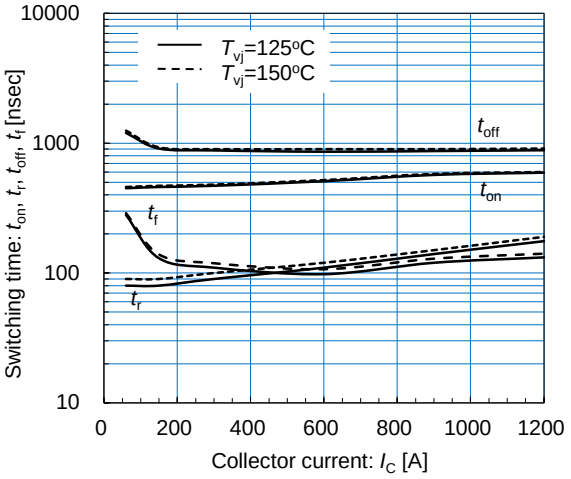
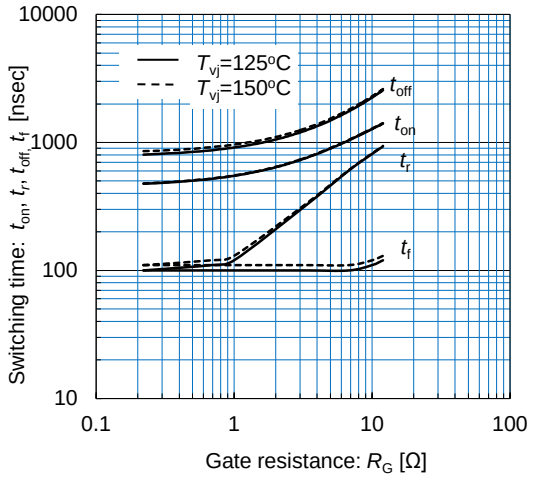
[INVERTER]
Switching time vs. Collector current (typ.)
V_{CC} = 600 V, V_{GE} = ±15 V, R_G= 0.62 Ω, T_{vj} = 25°C



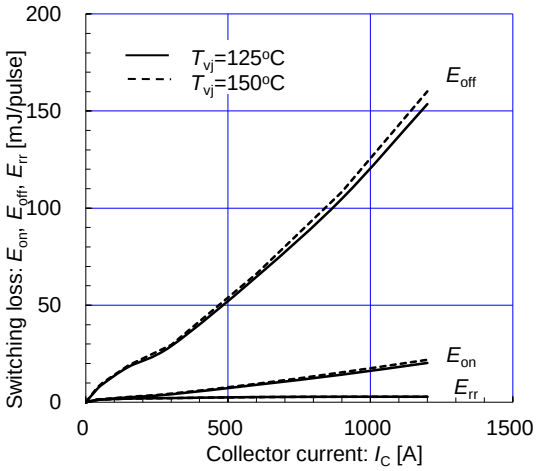
[INVERTER]
Switching time vs. Collector current (typ.)
V_{CC} = 600 V, V_{GE} = ±15 V, R_G = 0.62Ω, T_{vj} = 125°C,150°C



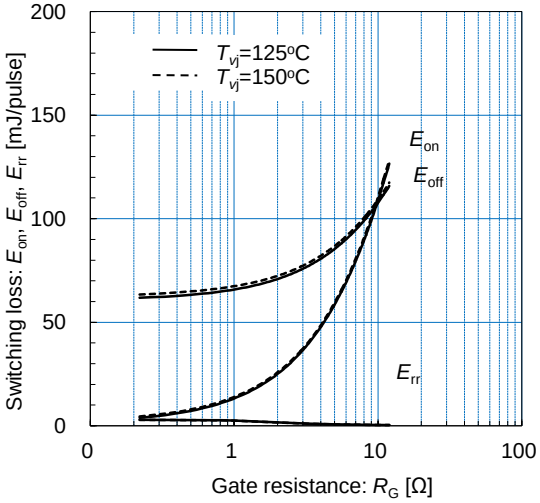
[INVERTER]
Switching time vs. Gate resistance (typ.)
V_{CC} = 600 V, I_C = 600 A, V_{GE} = ±15 V, T_{vj} = 125°C,150°C



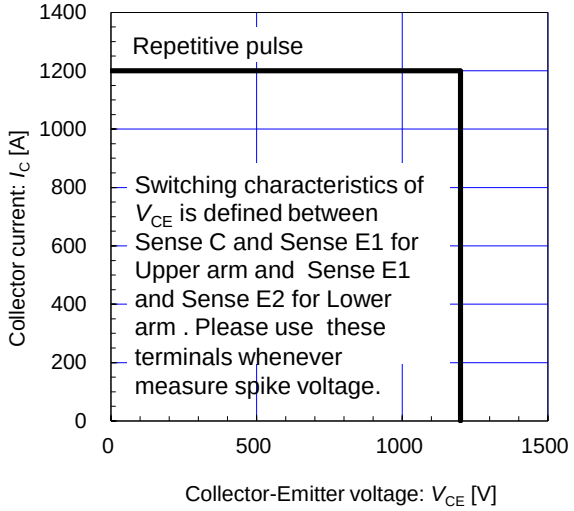
[INVERTER]
Switching loss vs. Collector current (typ.)
V_{CC} = 600V, V_{GE} = ±15V, R_G = 0.62Ω, T_{vj} = 125°C,150°C



[INVERTER]
Switching loss vs. Gate resistance (typ.)
V_{CC} = 600 V, I_C = 600 A, V_{GE} = ±15 V, T_{vj} = 125°C,150°C



[INVERTER]
Reverse bias safe operating area (max.)
+V_{GE} = 15V, -V_{GE} = 15V, R_G = 0.62Ω, T_{vj} = 150°C



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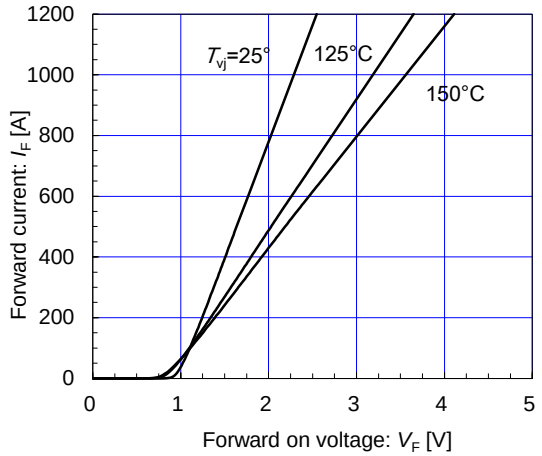
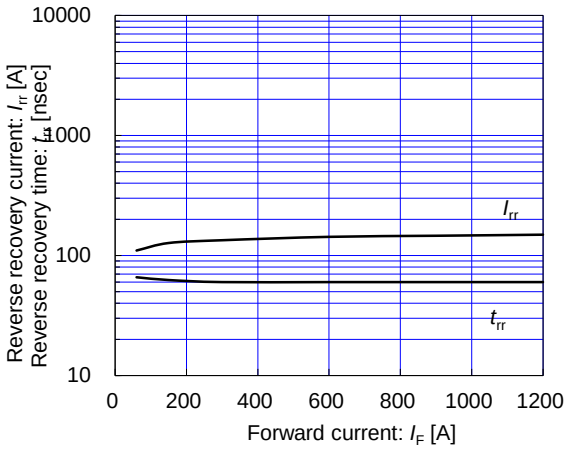
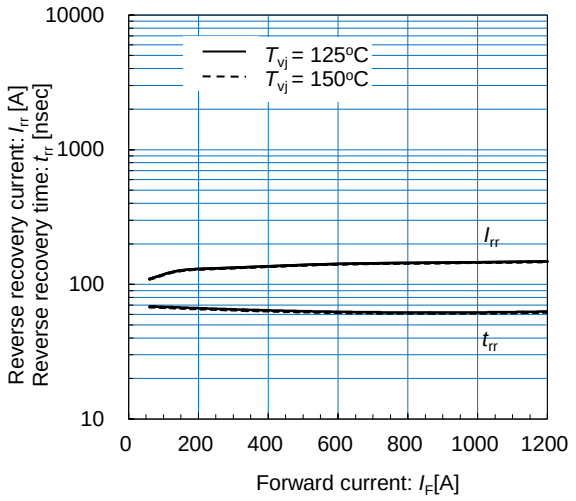
[INVERTER]
Forward Current vs. Forward Voltage (typ.)
chip



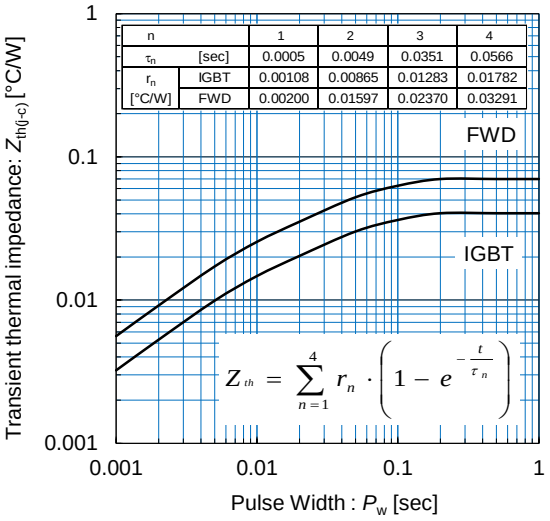
[INVERTER]
Reverse Recovery Characteristics (typ.)
V_{CC} = 600V, V_{GE} = ±15V, R_G = 0.62Ω, T_{vj} = 25°C



[INVERTER]
Reverse Recovery Characteristics (typ.)
V_{CC} = 600V, V_{GE} = ±15V, R_G = 0.62Ω, T_{vj} = 125°C,150°C

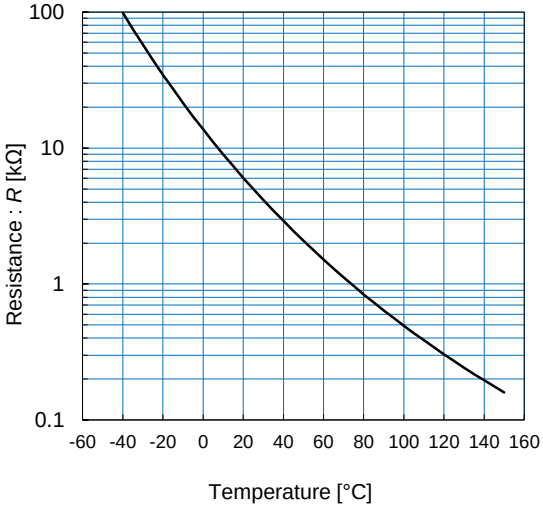


Transient Thermal Resistance (max.)



n		1	2	3	4
τ_n	[sec]	0.0005	0.0049	0.0351	0.0566
r_n [°C/W]	IGBT	0.00108	0.00865	0.01283	0.01782
	FWD	0.00200	0.01597	0.02370	0.03291

[THERMISTOR]
Temperature characteristic (typ.)



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   ・Machine tools ・Audiovisual equipment ・Electrical home appliances ・Personal equipment ・Industrial robots etc.

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7.

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