MBM1000FS17G2-C

Silicon N-channel Side-gate HiGT 1700V G2 version with SiC Diode.

FEATURES

* Low power dissipation by side-gate HiGT.
* Ultra low recovery loss with SiC-SBD.
* Low noise & easy drive through low Cies and Cres
* High current density & half-bridge nHPD[2] module with low stray inductance.
* Scalable large current easily handled by paralleling.
* Built in temperature sensor.
* Equipped with current sensing terminals.

HiGT : High-conductivity IGBT
nHPD[2] : next High Power Density Dual

ABSOLUTE MAXIMUM RATINGS (T_C=25°C)

Item		Symbol	Unit	MBM1000FS17G2-C
Collector Emitter Voltage		V_{CES}	V	1,700
Gate Emitter Voltage		V_{GES}	V	±20
Collector Current	DC	I_C	A	1,000
	1ms	I_{CRM}		2,000
Forward Current	DC	I_F	A	1,000
	1ms	I_{FRM}		2,000
Junction Temperature		$T_{vj\ op}$	°C	-40 ~ +150
Storage Temperature		T_{stg}	°C	-40 ~ +150
Isolation Voltage		V_{ISO}	V_{RMS}	4,000(AC 1 minute)
Screw Torque	Terminals (M3/M8)	-	N·m	0.8/15
	Mounting (M6)	-		6.0 (1)

Notes: (1) Recommended Value 5.5±0.5N·m

ELECTRICAL CHARACTERISTICS

Item		Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Collector Emitter Cut-Off Current		I_{CES}	mA	-	1	20	V_{CE}=1,700V, V_{GE}=0V, T_{vj}=25°C
				-	10	-	V_{CE}=1,700V, V_{GE}=0V, T_{vj}=150°C
Gate Emitter Leakage Current		I_{GES}	nA	-500	-	+500	V_{GE}=±20V, V_{CE}=0V, T_{vj}=25°C
Collector Emitter Saturation Voltage		V_{CEsat}	V	-	1.85	-	I_C=1,000A, V_{GE}=15V, T_{vj}=25°C
				-	2.15	2.6	I_C=1,000A, V_{GE}=15V, T_{vj}=150°C
Gate Emitter Threshold Voltage		$V_{GE(th)}$	V	6.0	7.0	8.0	V_{CE}=10V, I_C=1,000mA, T_{vj}=25°C
Input Capacitance		C_{ies}	nF	-	46	-	V_{CE}=10V, V_{GE}=0V, f=100kHz, T_{vj}=25°C
Internal Gate Resistance		$R_{G(int)}$	Ω	-	6.8	-	V_{CE}=10V, V_{GE}=0V, f=100kHz, T_{vj}=25°C
Turn On Delay Time		$t_{d(on)}$	μs	-	0.68	-	V_{CC}=900V, I_C=1,000A
Rise Time		t_r		-	0.15	-	L_S=40nH
Turn Off Delay Time		$t_{d(off)}$		-	0.88	-	R_G(on/off)=1.8Ω/6.8Ω (2)
Fall Time		t_f		-	0.60	-	V_{GE}=±15V, T_{vj}=150°C
Peak Forward Voltage Drop		V_F	V	-	1.8	-	I_F=1,000A, V_{GE}=0V, T_{vj}=25°C
				-	2.7	3.6	I_F=1,000A, V_{GE}=0V, T_{vj}=150°C
Reverse Recovery Time		t_{rr}	μs	-	0.06	-	V_{CC}=900V, I_F=1,000A, L_S=40nH T_{vj}=150°C
Turn On Loss		E_{on}	J/P	-	0.16	0.25	V_{CC}=900V, I_C=1,000A, L_S=40nH
Turn Off Loss		E_{off}	J/P	-	0.34	0.45	R_G(on/off)=1.8Ω/6.8Ω (2)
Reverse Recovery Loss		E_{rr}	J/P	-	0.01	-	V_{GE}=±15V, T_{vj}=150°C
Short Circuit Pulse Width		t_{sc}	μs	10	-	-	V_{CC}=1,000V, Ls=40nH, R_G(on/off)=1.8Ω/82Ω, V_{GE}=±15V, T_{vj}=150°C
Stray inductance module		L_{SCE}	nH	-	9	-	Between C1(main) and E2(main)
NTC-Thermistor	Resistance	R_{25}	kΩ	-	5	-	Tc=25°C
	Deviation	ΔR/R	%	-5	-	5	Tc=25°C
	B-constant	$B_{(25/50)}$	K	-	3375	-	Between 25°C and 50°C
Thermal Impedance	IGBT	$R_{th(j-c)}$	K/W	-	-	0.027	Junction to case
	FWD	$R_{th(j-c)}$		-	-	0.047	
Contact Thermal Impedance		$R_{th(c-f)}$	K/W	-	0.02	-	Case to fin (per 1 arm)

Notes: (2) R_G value is a test condition value for evaluation, not recommended value.
Please, determine the suitable R_G value by measuring switching behaviors.

* Please contact our representatives at order.
* For improvement, specifications are subject to change without notice.
* For actual application, please confirm this spec sheet is the newest revision.
* ELECTRICAL CHARACTERISTIC items shown in above table are according to IEC 60747–2 and IEC 60747–9.

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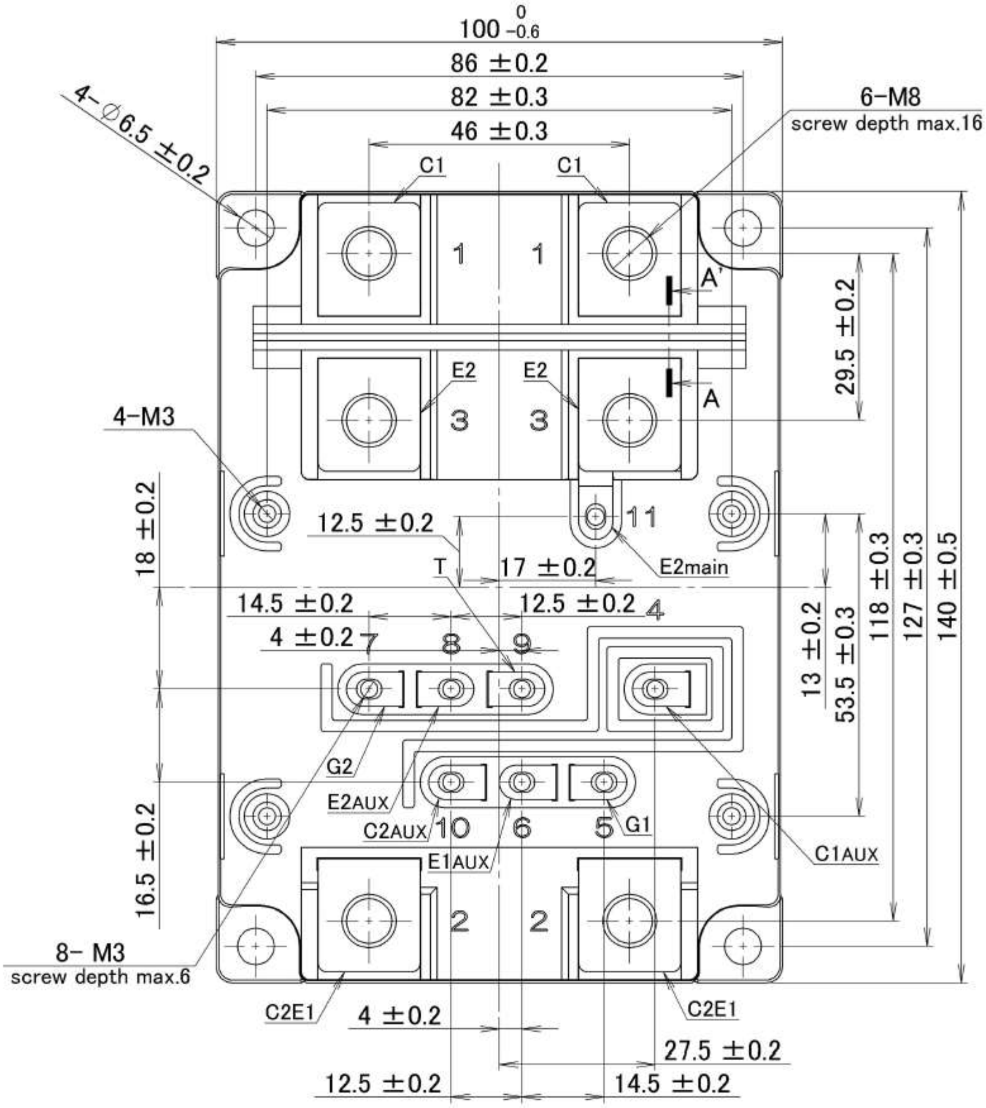
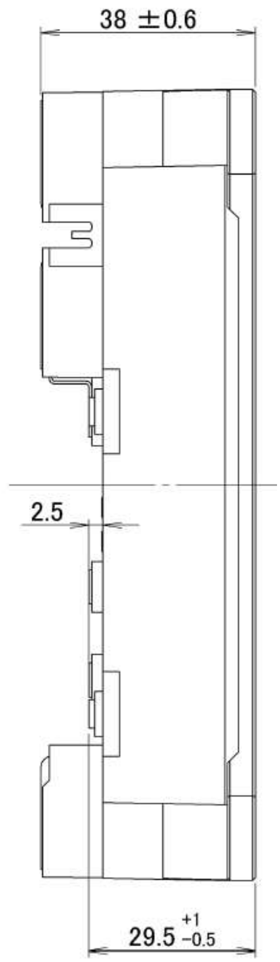
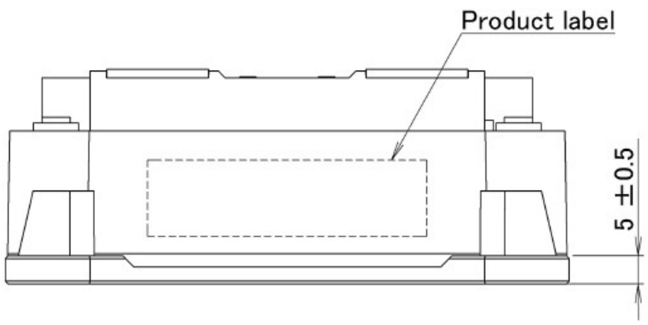
OUTLINE DRAWING

Unit in mm

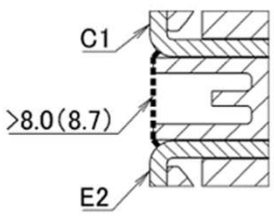






Weight: 770g

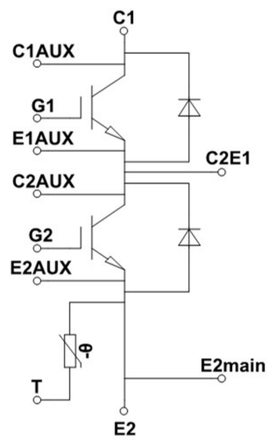
Clearance between
C1 and E2 terminal



<A-A' cross section>

1 : C1
2 : C2E1
3 : E2
4 : C1AUX
5 : G1
6 : E1AUX
7 : G2
8 : E2AUX
9 : T
10 : C2AUX
11 : E2main

Terminal Number



Circuit Diagram

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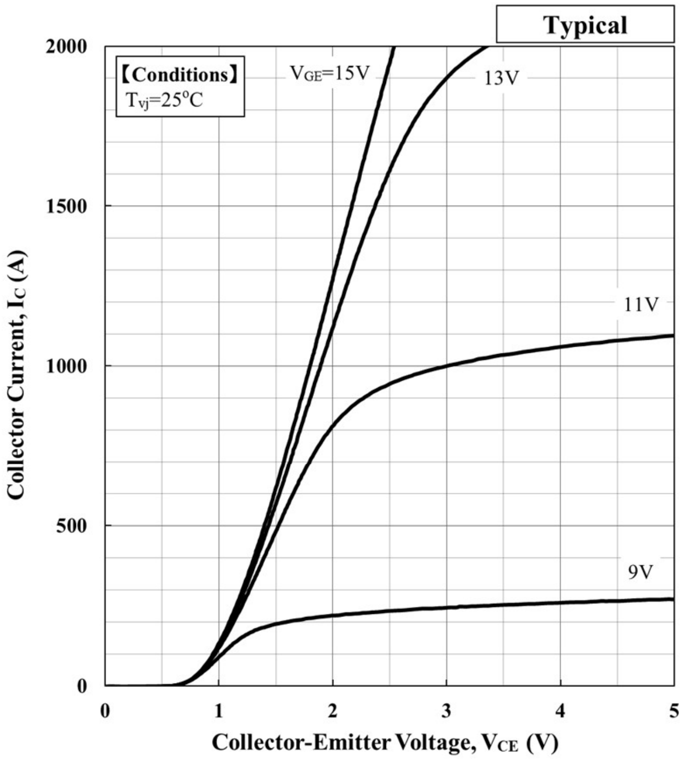
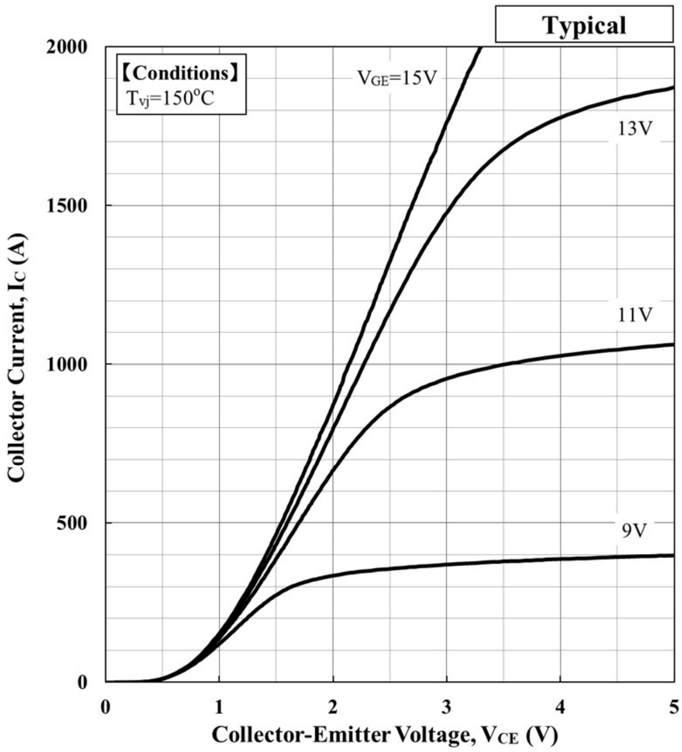


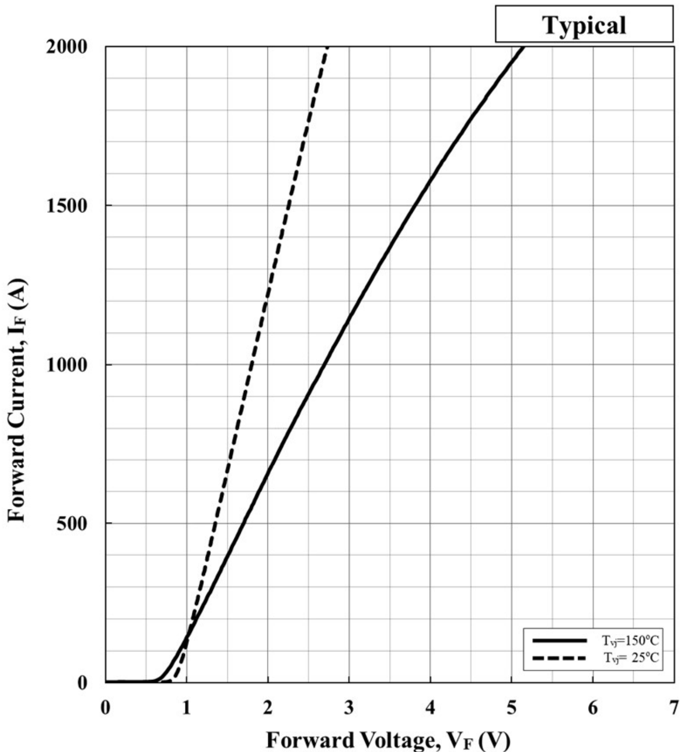
$V_{CE}(sat)[V] = a_3 \cdot \lvert I_c \rvert^3 + a_2 \cdot \lvert I_c \rvert^2 + a_1 \cdot \lvert I_c \rvert + a_0$					
Temp.[°C]	V_{GE}[V]	a_3	a_2	a_1	a_0
25	15	1.35E-10	-5.28E-07	1.38E-03	8.21E-01

Collector Current vs. Collector Emitter Voltage



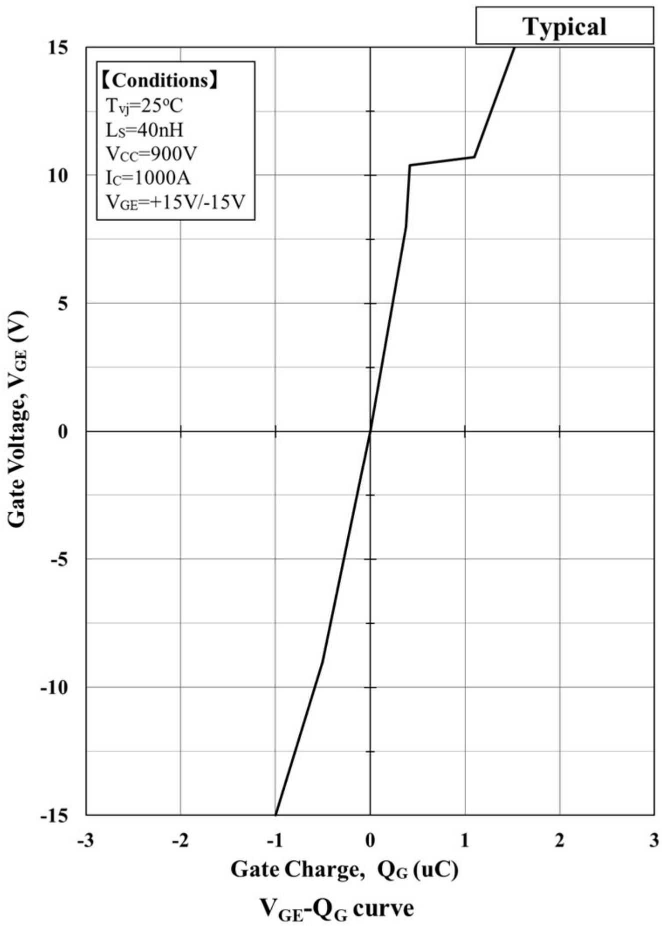
$V_{CE}(sat)[V] = a_3 \cdot \lvert I_c \rvert^3 + a_2 \cdot \lvert I_c \rvert^2 + a_1 \cdot \lvert I_c \rvert + a_0$					
Temp.[°C]	V_{GE}[V]	a_3	a_2	a_1	a_0
150	15	2.20E-10	-8.10E-07	2.05E-03	6.93E-01

Collector Current vs. Collector Emitter Voltage



$V_F[V] = a_3 \cdot \lvert I_F \rvert^3 + a_2 \cdot \lvert I_F \rvert^2 + a_1 \cdot \lvert I_F \rvert + a_0$				
Temp.[°C]	a_3	a_2	a_1	a_0
25	4.24E-11	-1.26E-07	1.01E-03	8.71E-01
150	1.39E-10	-1.79E-07	2.02E-03	7.15E-01

Forward Voltage of free-wheeling diode



V_{GE}-Q_G curve

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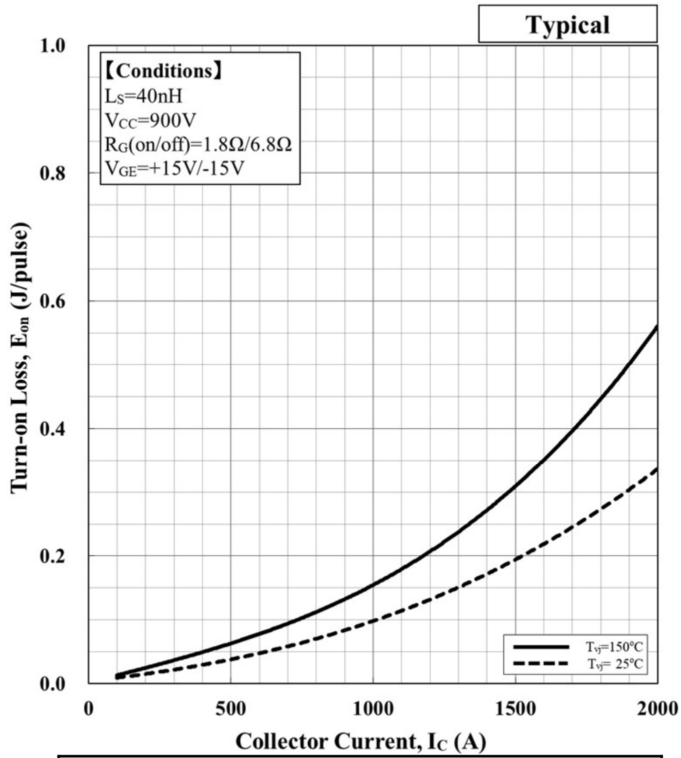
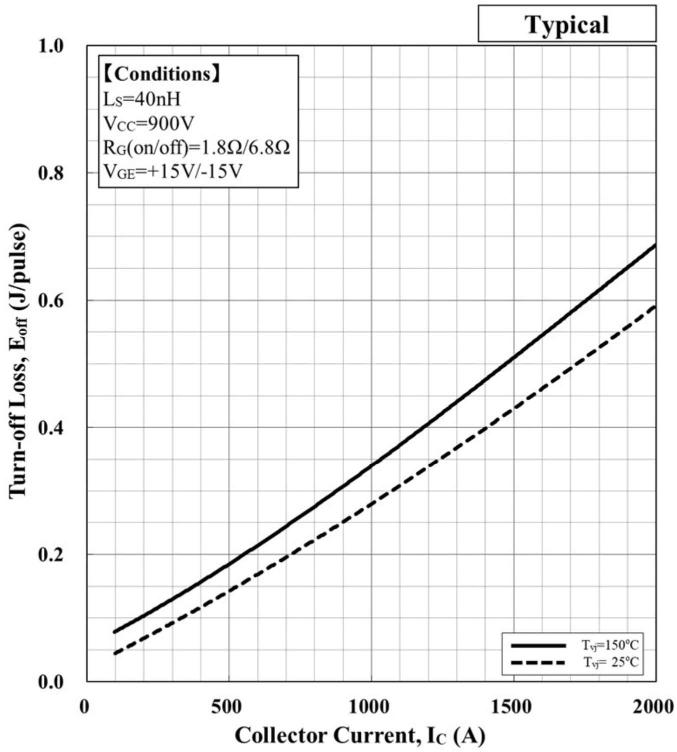


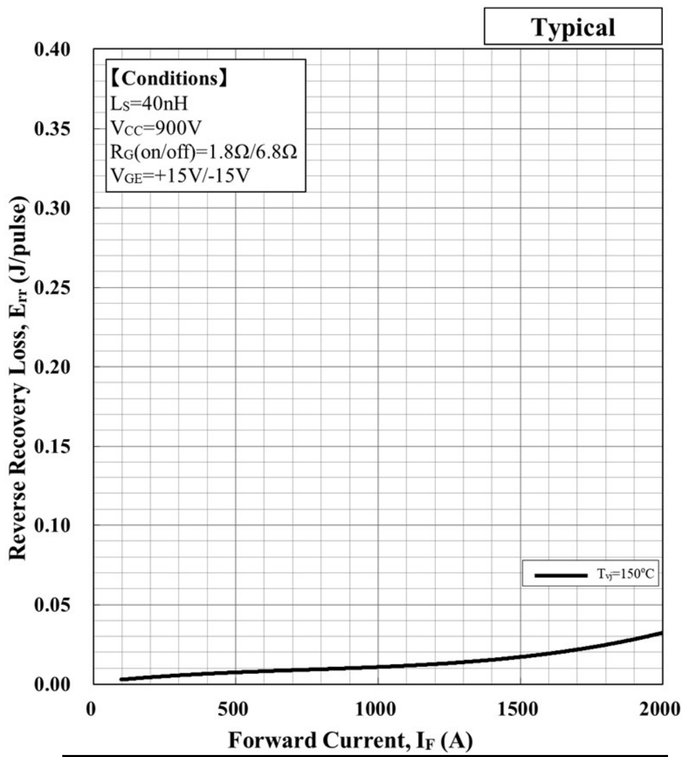
$E\,[J] = a_3 \cdot \lvert I_c \rvert^3 + a_2 \cdot \lvert I_c \rvert^2 + a_1 \cdot \lvert I_c \rvert + a_0$				
Temp.[°C]	a_3	a_2	a_1	a_0
25	1.30E-11	3.33E-08	4.77E-05	4.28E-03
150	4.41E-11	-5.53E-09	1.14E-04	1.79E-03

Turn-on loss vs. Collector current



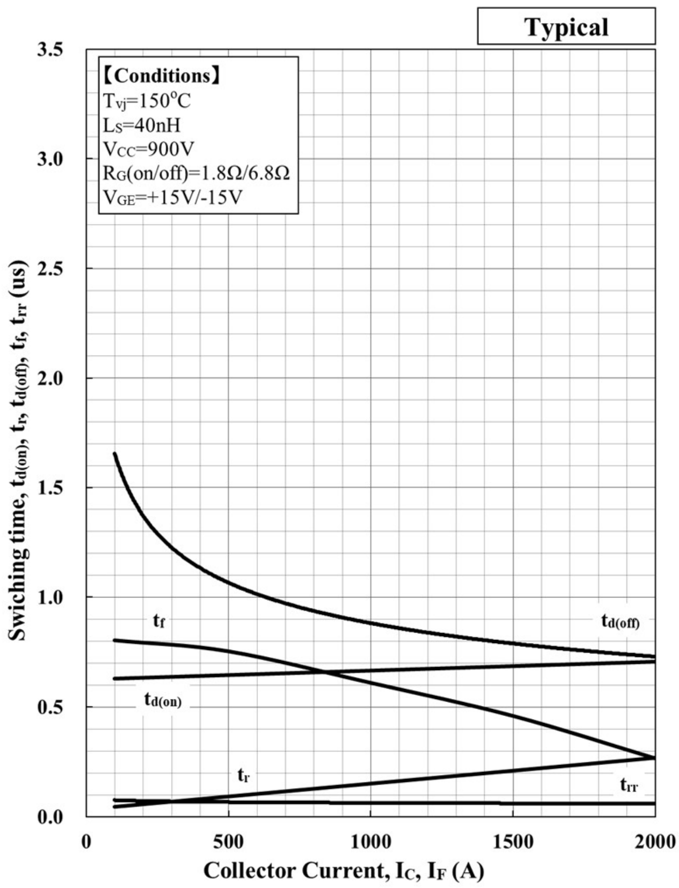
$E\,[J] = a_3 \cdot \lvert I_c \rvert^3 + a_2 \cdot \lvert I_c \rvert^2 + a_1 \cdot \lvert I_c \rvert + a_0$				
Temp.[°C]	a_3	a_2	a_1	a_0
25	-3.46E-12	3.77E-08	2.23E-04	2.22E-02
150	-1.24E-11	6.91E-08	2.27E-04	5.57E-02

Turn-off loss vs. Collector current



$E\,[J] = a_3 \cdot \lvert I_F \rvert^3 + a_2 \cdot \lvert I_F \rvert^2 + a_1 \cdot \lvert I_F \rvert + a_0$				
Temp.[°C]	a_3	a_2	a_1	a_0
25	-	-	-	-
150	7.87E-12	-1.77E-08	1.95E-05	1.06E-03

Recovery loss vs. Forward current



Switching time vs. Collector Current

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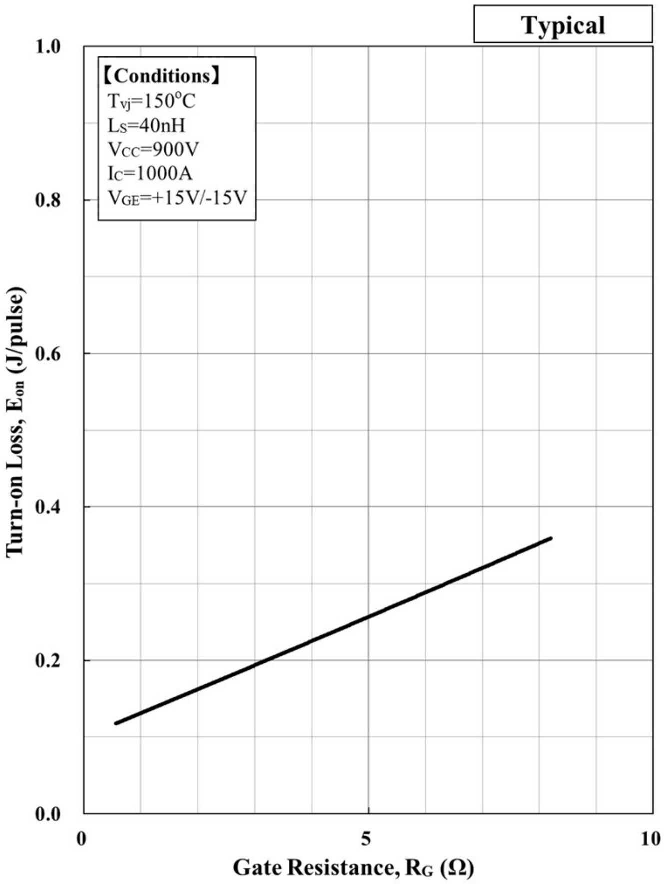
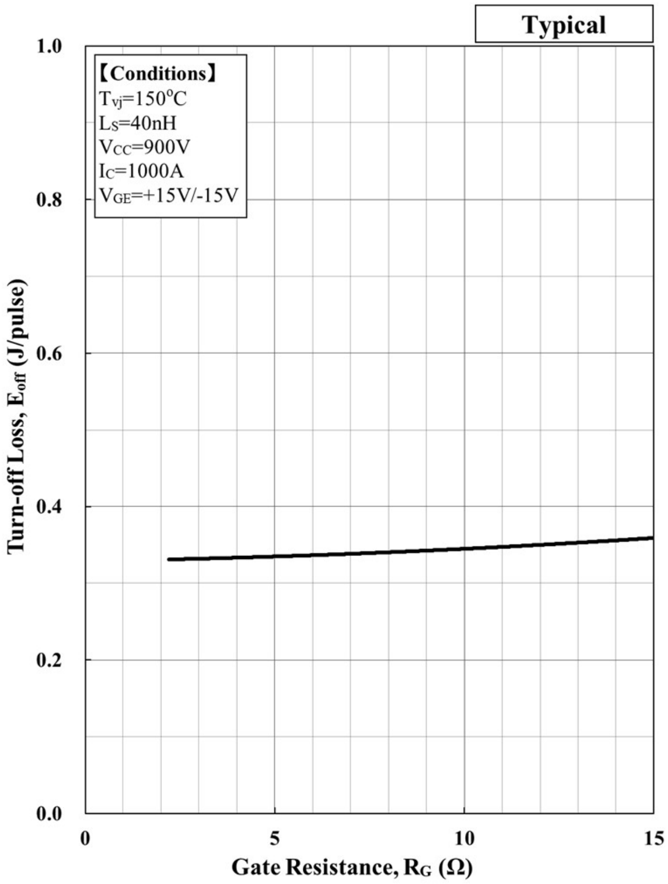
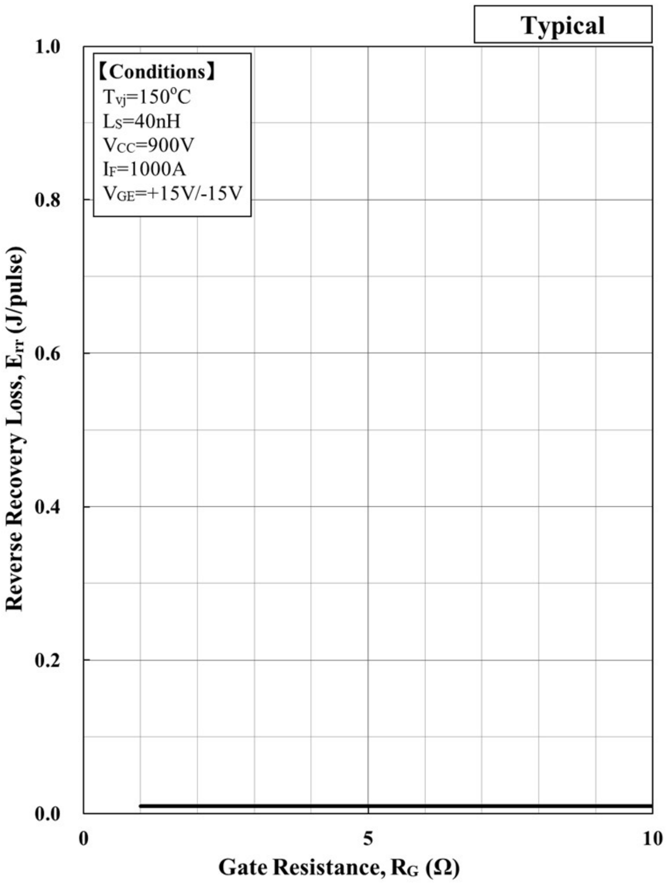


Turn-on loss vs. Gate Resistance



Turn-off loss vs. Gate Resistance



Reverse Recovery loss vs. Gate Resistance

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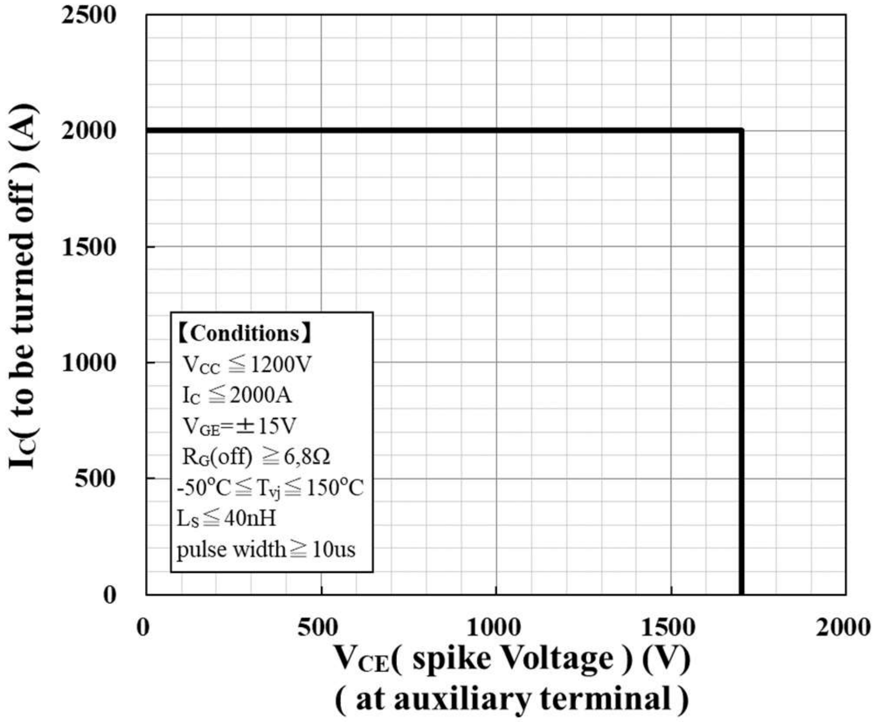

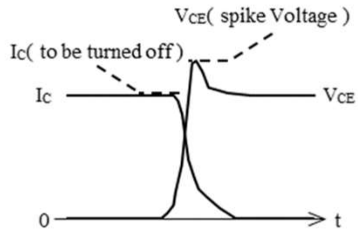

Definition of RBSOA waveform

Reverse Bias Safe Operation Area (RBSOA)

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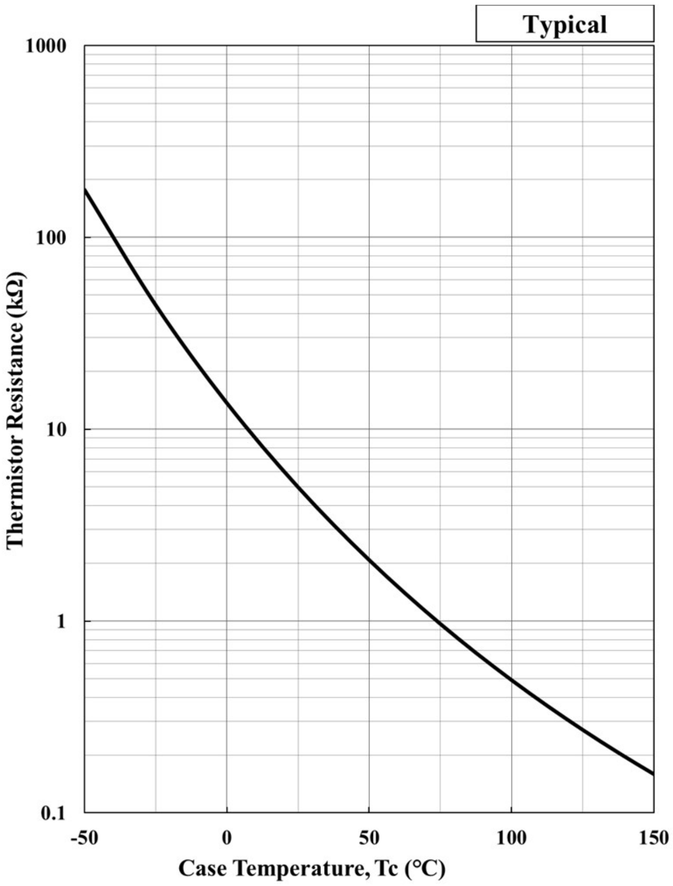
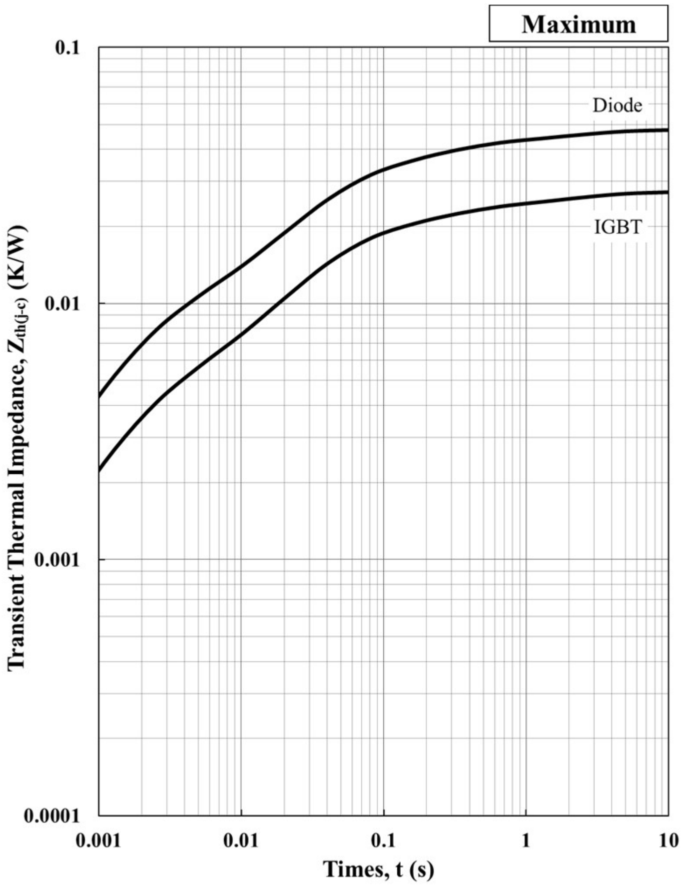


Thermistor Resistance vs. Temperature



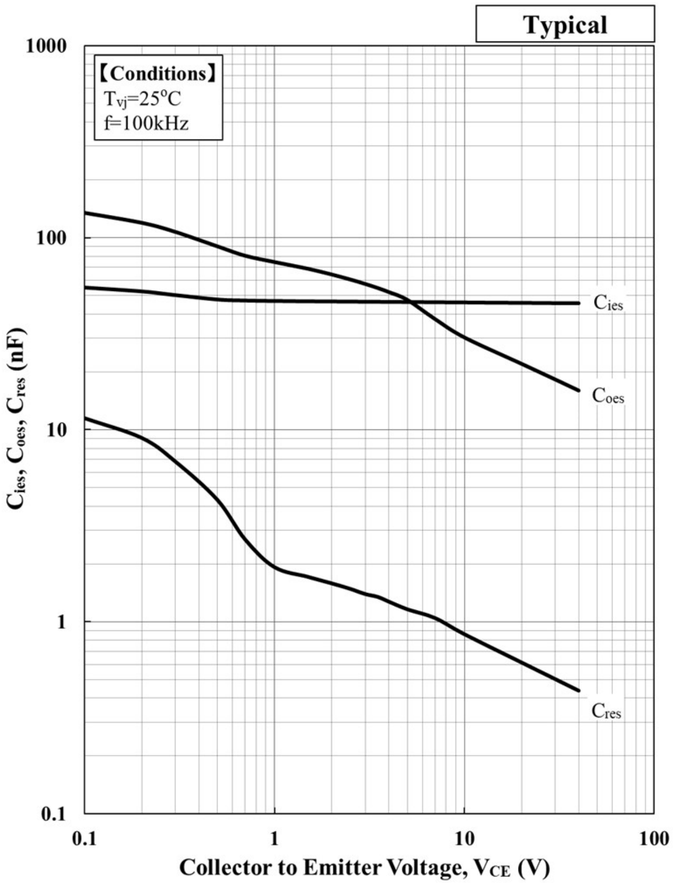
Transient Thermal Ipedance Curve

Foster model lumped circuit constant

n	1	2	3	4	Unit
R th, IGBT [n}	4.22E-03	6.22E-03	1.30E-02	3.70E-03	[K/W]
C th, IGBT [n}	4.93E+02	3.20E+01	2.43E+00	4.06E-01	[J/K]
R th, Diode [n}	6.48E-03	1.19E-02	2.18E-02	7.43E-03	[K/W]
C th, Diode [n}	3.21E+02	1.68E+01	1.45E+00	2.02E-01	[J/K]

Cauer model lumped circuit constant

n	1	2	3	4	Unit
R th, IGBT [n}	5.11E-03	1.37E-02	5.05E-03	3.32E-03	[K/W]
C th, IGBT [n}	3.44E-01	2.12E+00	3.97E+01	5.80E+02	[J/K]
R th, Diode [n}	9.79E-03	2.33E-02	9.32E-03	5.09E-03	[K/W]
C th, Diode [n}	1.75E-01	1.28E+00	2.10E+01	3.83E+02	[J/K]



Capacitance vs. Collector to Emitter Voltage

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Notices

1. Since mishandling of semiconductor devices may cause malfunctions, please be sure to read "Precautions for Safe Use and Notices" in the individual brochure before use.
2. When designing an electronic circuit using semiconductor devices, please do not exceed the absolute maximum rating specified for the device under any external fluctuations. And for pulse applications, please also do not exceed the "Safe Operating Area (SOA)".
3. Semiconductor devices may sometimes break down by accidental or unexpected surge voltage, so please be careful about the safety design such as redundant design and malfunction prevention design which don't cause the damage expand even if they break down.
4. In cases where extremely high reliability is required (such as use in nuclear power control, aerospace and aviation, traffic equipment, life-support-related medical equipment, fuel control equipment and various kinds of safety equipment), safety should be ensured by using semiconductor devices that feature assured safety or by means of users' fail-safe precautions or other arrangement. Or consult with Hitachi's sales department staff. (When semiconductor devices fail, as a result the semiconductor devices or wiring, wiring pattern may smoke, ignite, or the semiconductor devices themselves may burst.)
5. A semi-processed article is done now using solder which contains lead inside the semiconductor devices. There is possibility of the regulation substance depend on the applied models, so please check before using.
6. This specification is a material for component selection, which describes specifications of power semiconductor devices (hereinafter referred to as products), characteristic charts, and external dimension drawings.
7. The information given herein, including the specifications and dimensions, is subject to change without prior notice to improve product characteristics. Before ordering, purchasers are advised to contact with Hitachi power semiconductor sales department for the latest version of this data sheets.
8. For handling other than described in this manual, follow the handling instructions (IGBT-HI-00002).
9. In this module, the maximum depth of the screw holes on the main terminals is 16mm. Using screws longer than 16mm will break the case.

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