MBL1200F17F

Preliminary Specification

Silicon N-channel IGBT 1700V F version

FEATURES

- Soft switching behavior & low conduction loss :
  Soft low-injection punch-through with trench gate IGBT
- Low driving power due to low input capacitance advanced trench gate.
- Low noise due to ultra soft fast recovery diode.
- High Current rate Package.
- Low $R_{th(j-c)}$ & low stray inductance.
- RoHS

ABSOLUTE MAXIMUM RATINGS (T_C=25°C)

Item		Symbol	Unit	MBL1200F17F
Collector Emitter Voltage		V_{CES}	V	1,700
Gate Emitter Voltage		V_{GES}	V	±20
Collector Current	DC	I_C	A	1,200
	1ms	I_{CRM}		2,400
Forward Current (Free wheel Diode) (1)	DC	$I_{F(FWD)}$	A	150
	1ms	$I_{FRM(FWD)}$		300
Forward Current (Chopper Diode)	DC	$I_{F(chopper)}$	A	1,200
	1ms	$I_{FRM(chopper)}$		2,400
Junction Temperature		$T_{vj\ op}$	°C	-50 ~ +150
Storage Temperature		T_{stg}	°C	-50 ~ +150
Isolation Voltage		V_{ISO}	V_{RMS}	4,000(AC 1 minute)
Screw Torque	Terminals (M4/M8)	-	N·m	2/15 (2)
	Mounting (M6)	-		6 (3)

Notes: (1) For reverse voltage protection (2) Recommended Value 1.8±0.2/ 15^{+0}_{-3}N·m (3) Recommended Value 5.5±0.5N·m

ELECTRICAL CHARACTERISTICS

1)IGBT+FWD

Item		Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Collector Emitter Cut-Off Current		I_{CES}	mA	-	-	4	V_{CE}=1,700V, V_{GE}=0V, T_{vj}=25°C
				-	15	50	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		$V_{CE(sat)}$	V	-	1.9	-	I_C=1,200A, V_{GE}=15V, T_{vj}=25°C
				-	2.3	TBD	I_C=1,200A, V_{GE}=15V, T_{vj}=150°C
Gate Emitter Threshold Voltage		$V_{GE(th)}$	V	4.1	5.5	7.1	V_{CE}=10V, I_C=120mA, T_{vj}=25°C
Input Capacitance		C_{ies}	nF	-	63	-	V_{CE}=10V, V_{GE}=0V, f=100kHz, T_{vj}=25°C
Internal Gate Resistance		$R_{G(int)}$	Ω	-	2.9	-	V_{CE}=10V, V_{GE}=0V, f=100kHz, T_{vj}=25°C
Turn On Delay Time		$t_{d(on)}$	μs	-	0.78	TBD	V_{CC}=900V, I_C=1,200A
Rise Time		t_r		-	0.25	TBD	L_S=115nH (4)
Turn Off Delay Time		$t_{d(off)}$		-	1.7	TBD	R_G(on/off)=6.8/6.8Ω (4)
Fall Time		t_f		-	1.3	TBD	V_{GE}=±15V, T_{vj}=150°C
Peak Forward Voltage Drop		V_F	V	-	1.5	-	I_F=150A, V_{GE}=0V, T_{vj}=25°C
				-	1.6	-	I_F=150A, V_{GE}=0V, T_{vj}=150°C
Turn On Loss		E_{on}	J/P	-	0.58	-	V_{CC}=900V, I_C=1,200A L_S=115nH (4)
Turn Off Loss		E_{off}	J/P	-	0.9	-	R_G(on/off)=6.8/6.8Ω (4) V_{GE}=±15V, T_{vj}=150°C
Stray inductance module		L_{SCE}	nH	-	20	-	Collector Main to Emitter Main
Thermal Impedance	IGBT	$R_{th(j-c)}$	K/W	-	-	0.02	Junction to case
	FWD	$R_{th(j-c)}$		-	-	0.13	
Contact Thermal Impedance		$R_{th(c-f)}$	K/W	-	0.016	-	Case to fin (grease=1W/(m·K), (at IGBT+FWD part)

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2) Chopper Diode

Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Repetitive Reverse Current	I_{RRM}	mA	-	-	2	V_{CE}=1,700V, T_{vj}=25°C
			-	8	-	V_{CE}=1,700V, T_{vj}=150°C
Peak Forward Voltage Drop (Between main terminals)	V_F	V	-	2.1	-	I_F=1,200A,T_{vj}=25°C Measured at main terminals
			-	2.3	-	I_F=1,200A,T_{vj}=150°C Measured at main terminals
Reverse Recovery Time	t_{rr}	μs	-	1.6	TBD	V_{CC}=900V, I_C=1,200A L_S=115nH (4) R_G(on/off)=6.8/6.8Ω (4) V_{GE}=±15V, T_{vj}=150°C
Reverse Recovery Loss	E_{rr}	J/P	-	0.35	-	
Thermal Impedance	$R_{th(j-c)}$	K/W	-	-	0.03	Junction to case
Contact Thermal Impedance	$R_{th(c-f)}$	K/W	-	0.016	-	Case to fin(at Chopper Diode part)

Notes:(4) Ls and R_G are the test condition's values for evaluation of the switching times, not recommended value. Please, determine the suitable R_G value after the measurement of switching waveforms (overshoot voltage, etc.) with appliance mounted.

* 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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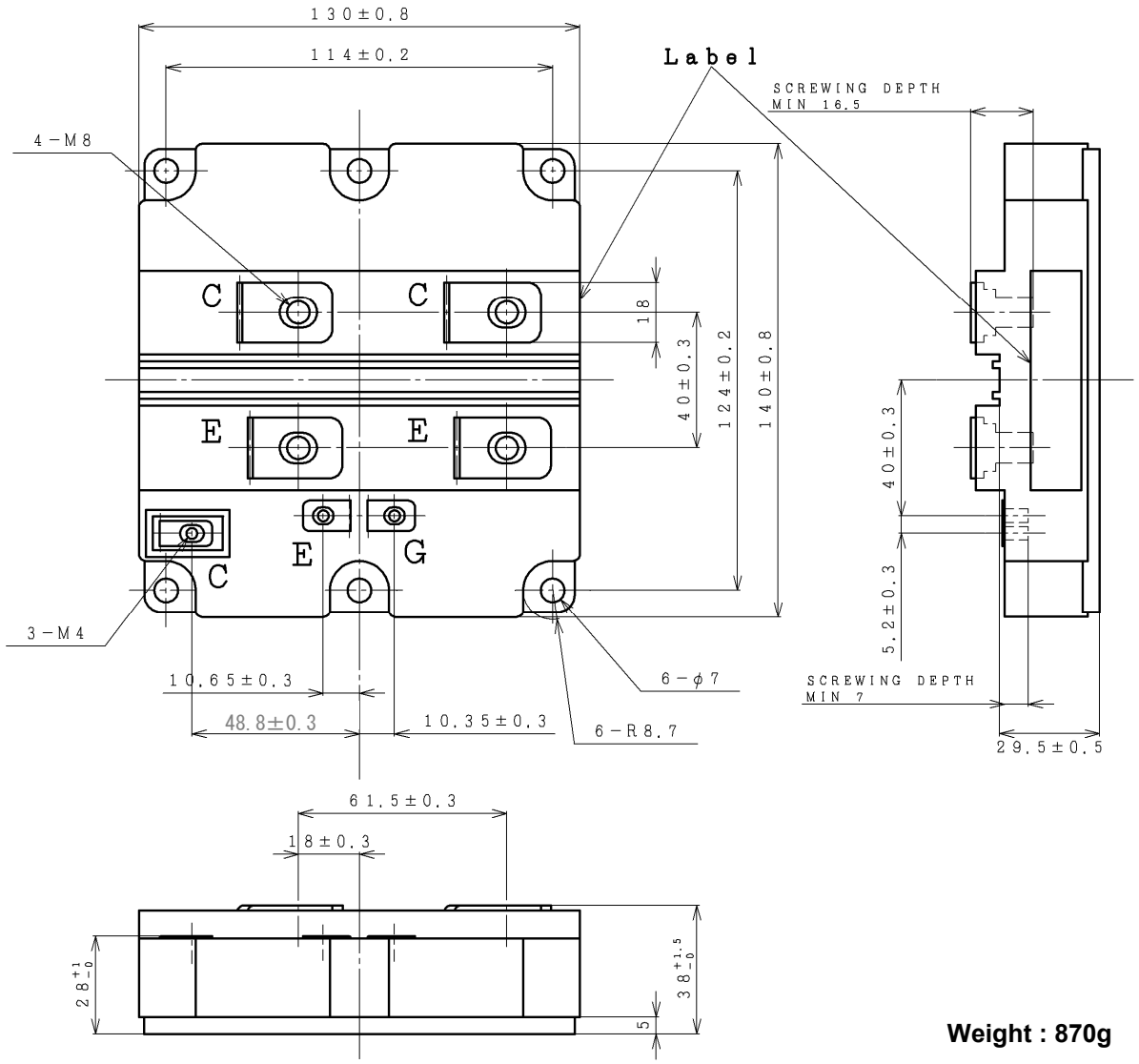
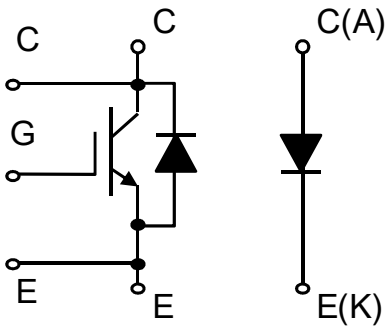
OUTLINE DRAWING

Unit in mm



Weight : 870g

CIRCUIT DIAGRAM



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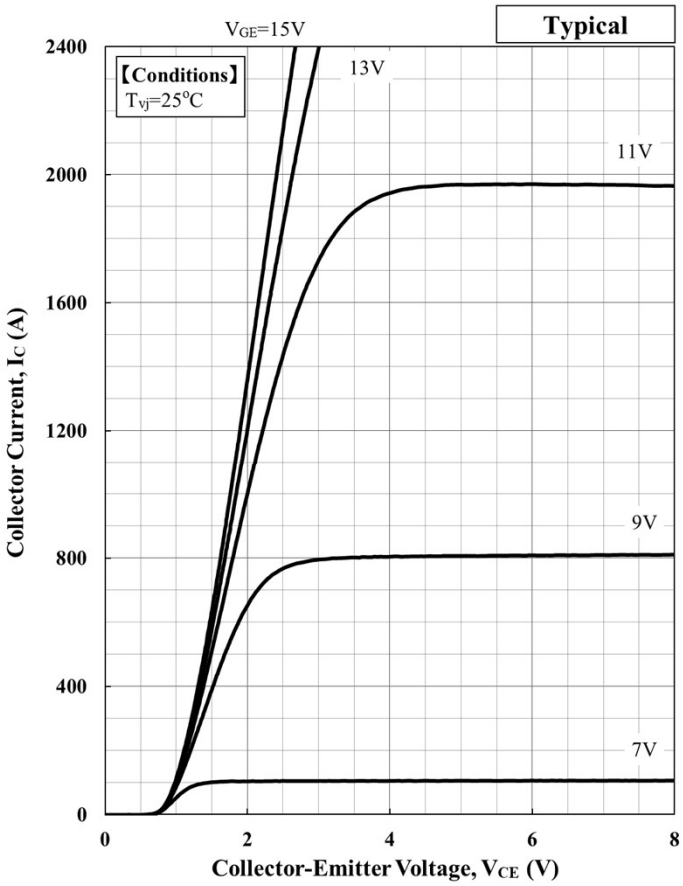
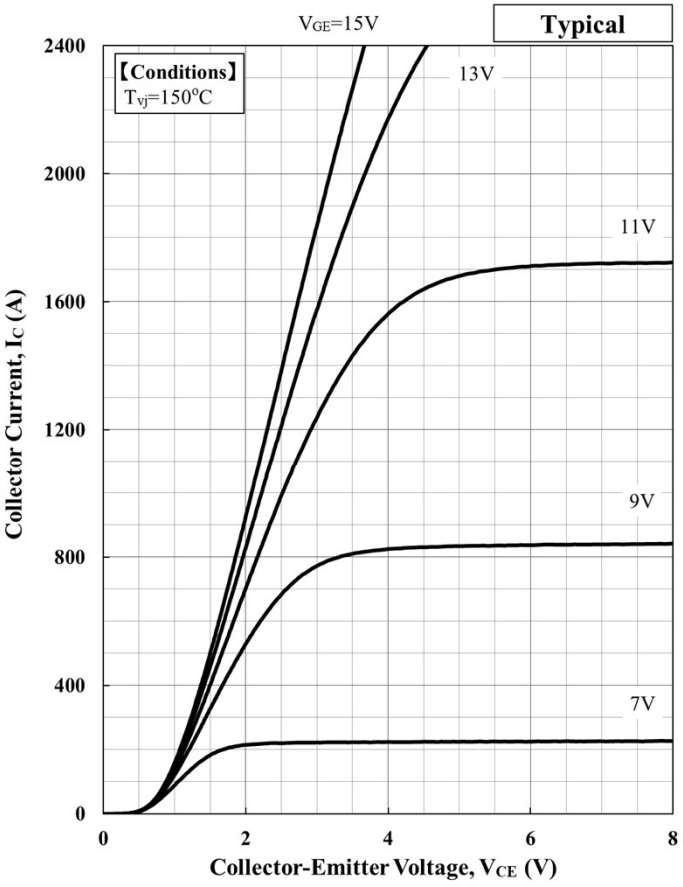
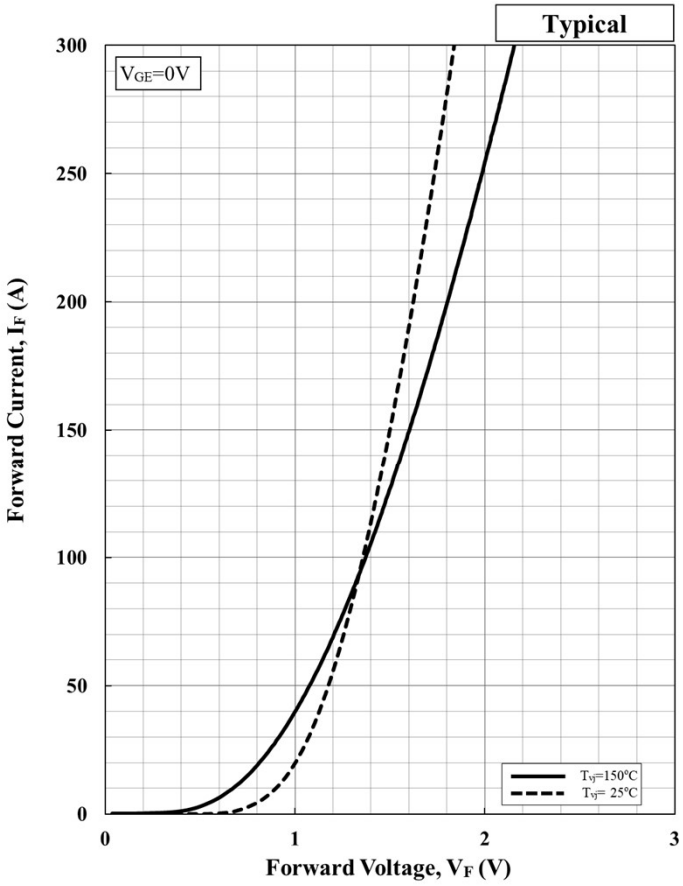


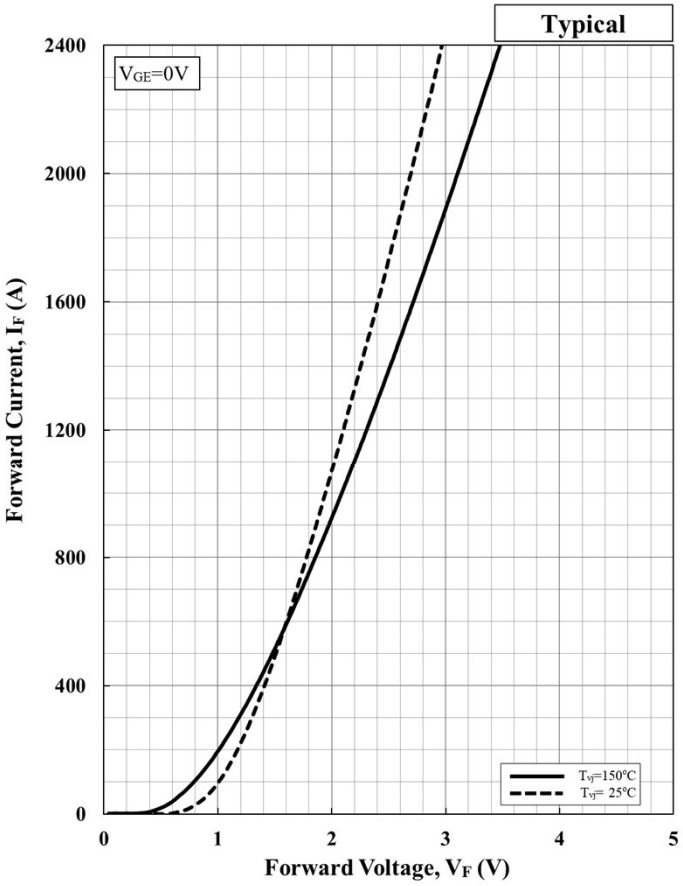
Collector Current vs. Collector Emitter Voltage



Collector Current vs. Collector Emitter Voltage



Forward Voltage of free-wheeling diode



Forward Voltage of Chopper diode

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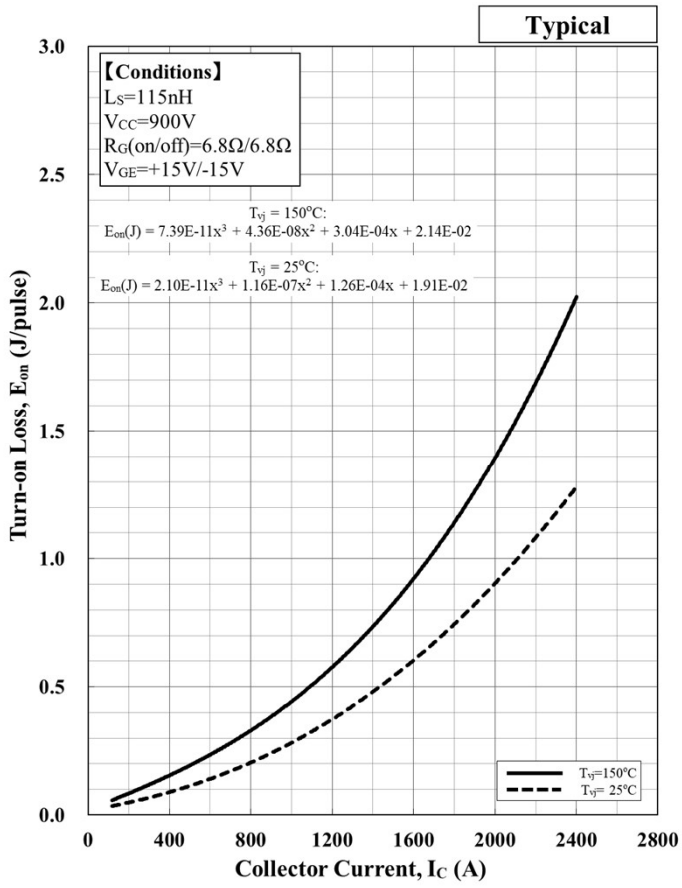
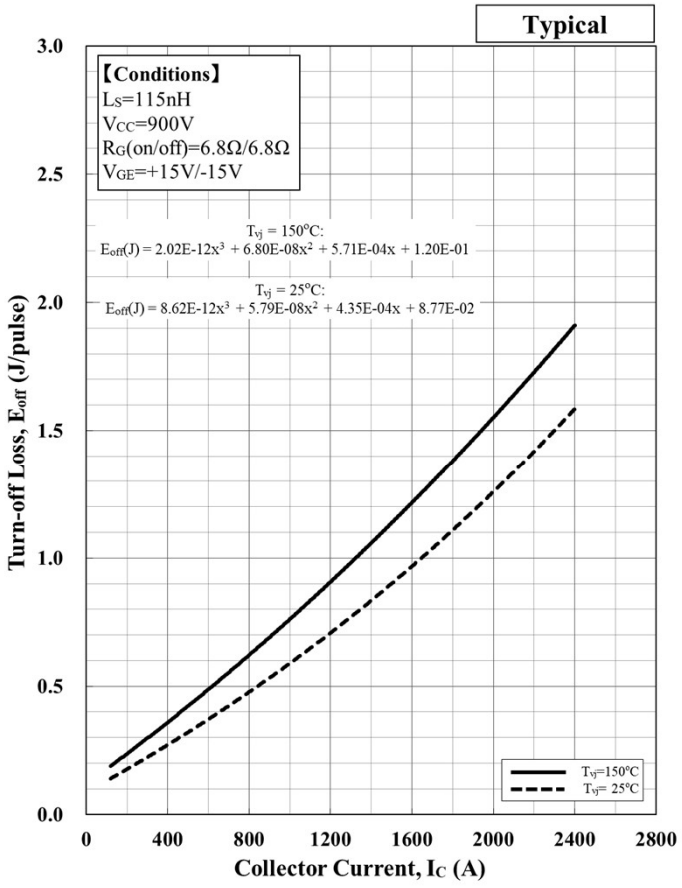
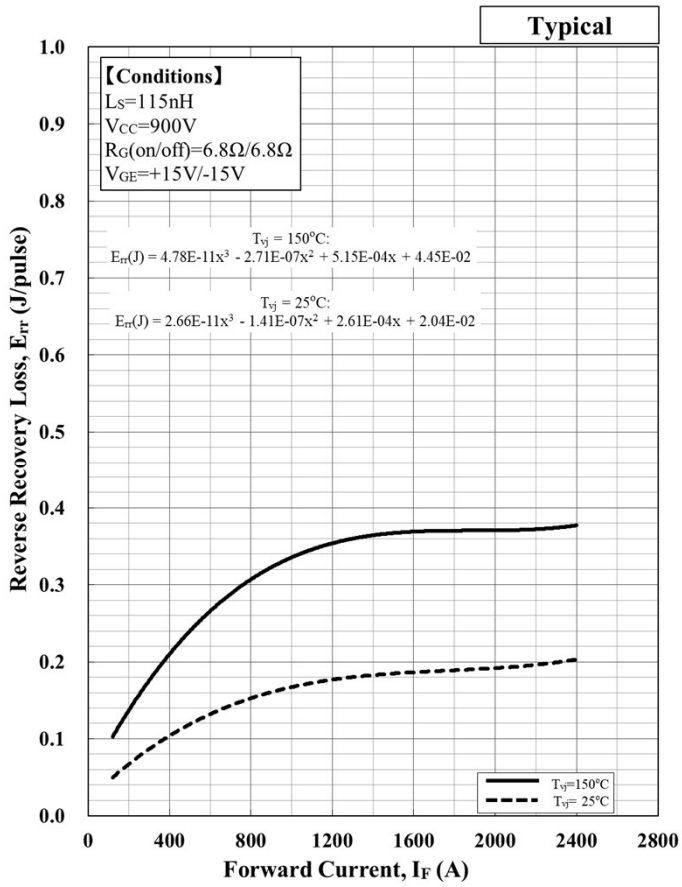


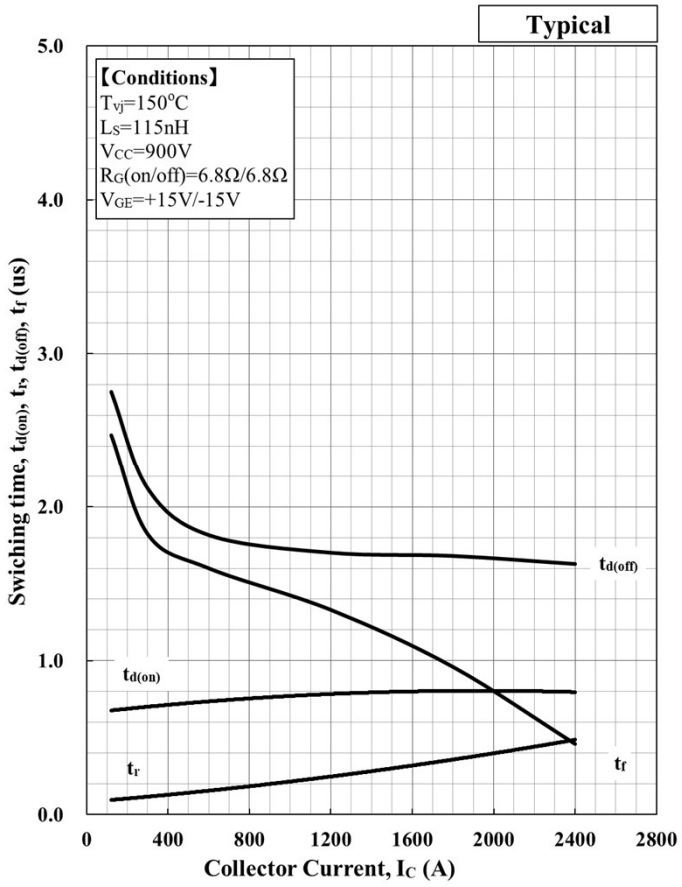
Turn-on loss vs. Collector current



Turn-off loss vs. Collector current



Recovery loss vs. Forward current



Switching time vs. Collector Current

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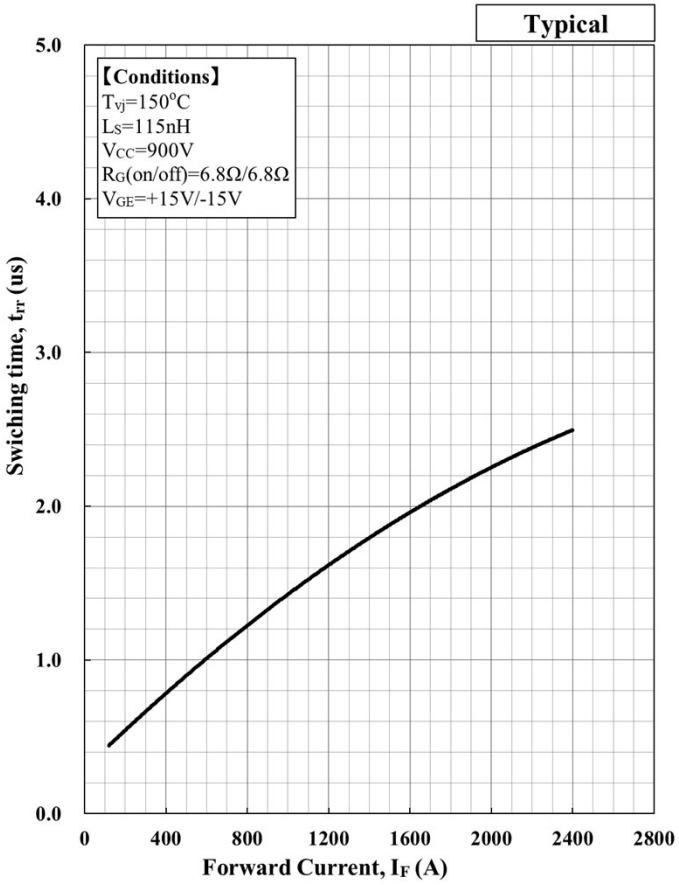

Switching time vs. Forward Current of chopper diode

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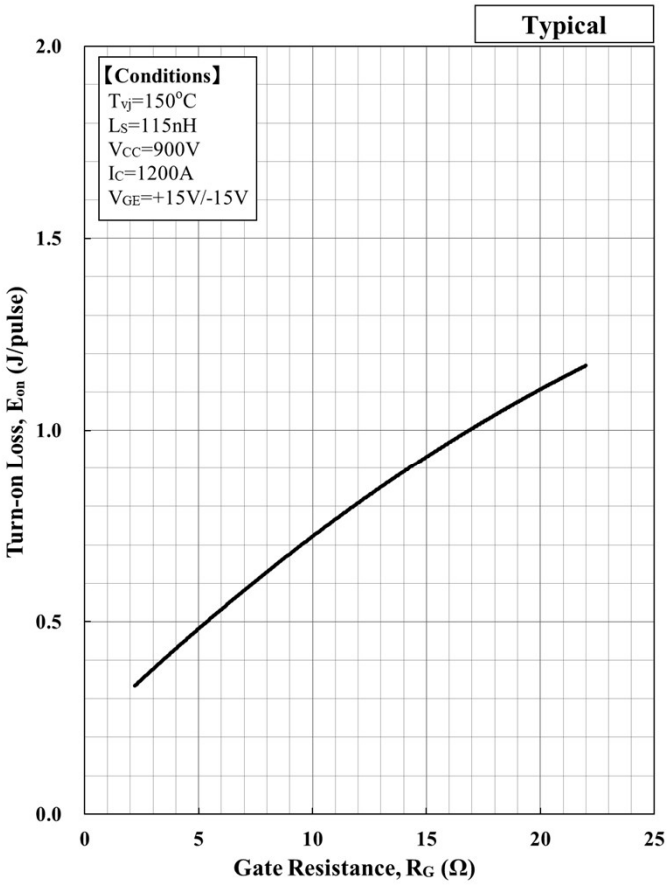
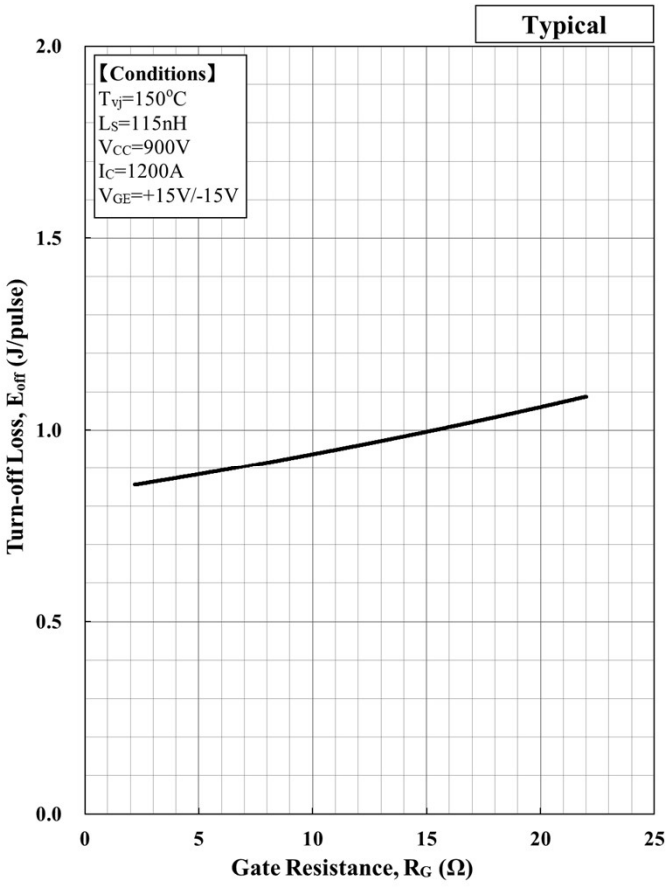
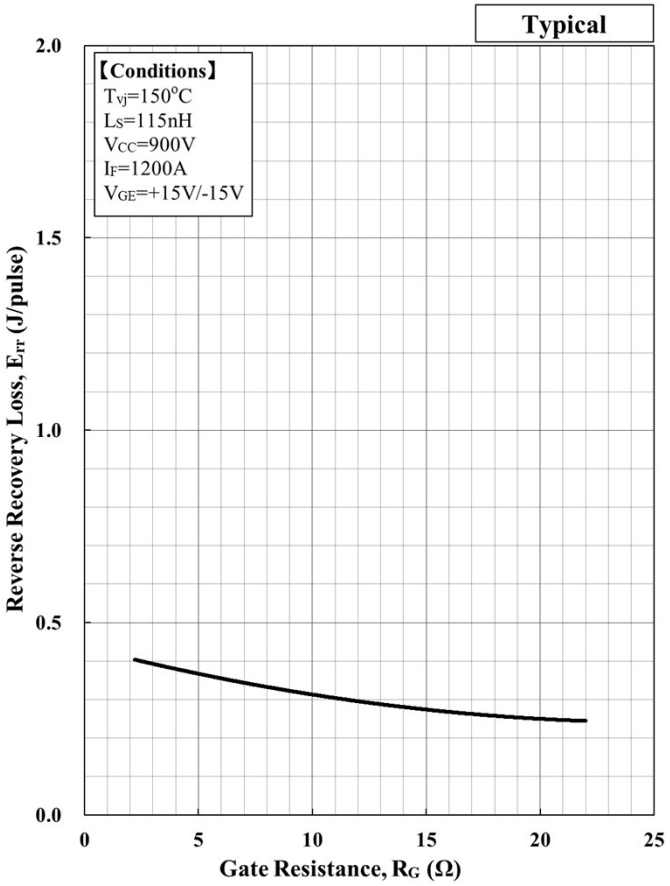


Turn-on loss vs. Gate Resistance



Turn-off loss vs. Gate Resistance



Recovery loss vs. Gate Resistance

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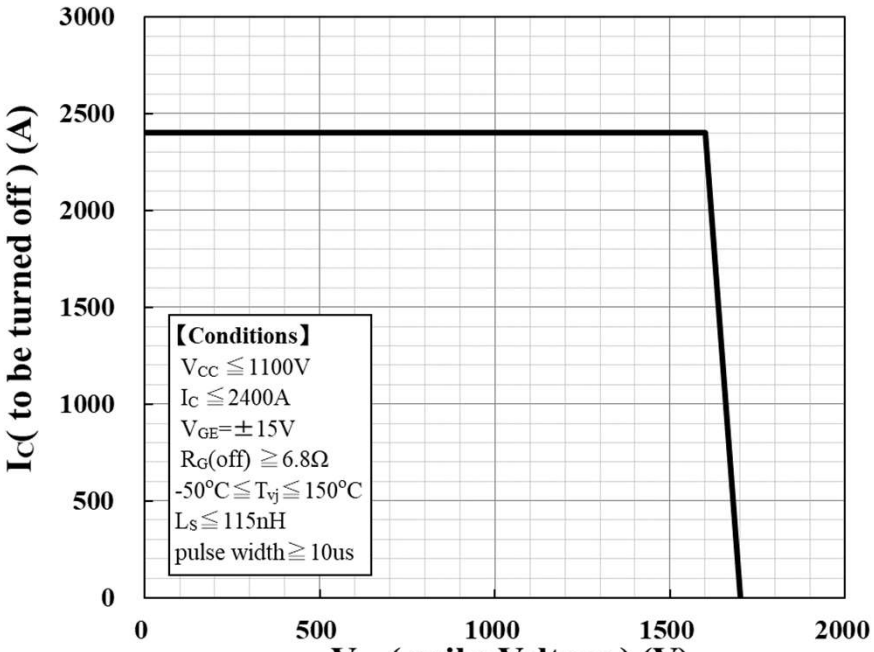
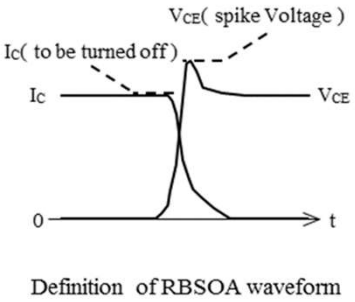
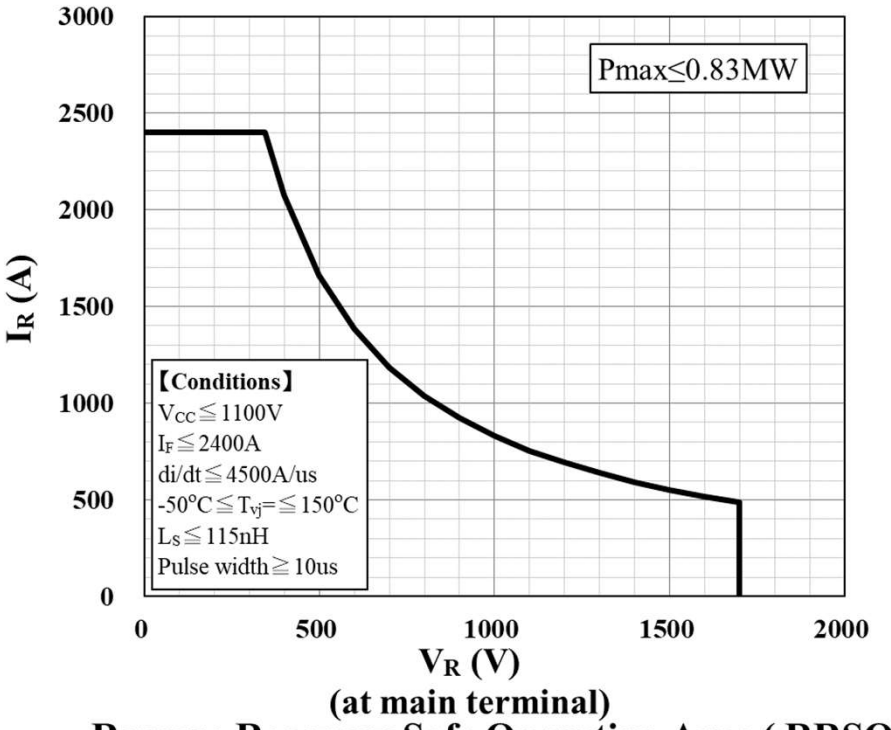


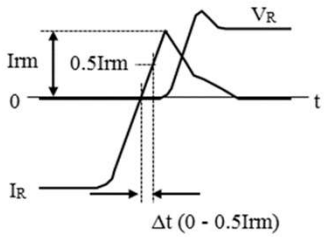
Reverse Bias Safe Operation Area (RBSOA)



Definition of RBSOA waveform



Reverse Recovery Safe Operation Area (RRSOA) of Chopper diode



$$di/dt = \frac{0.5Irm}{\Delta t}$$

Definition of Recovery di/dt

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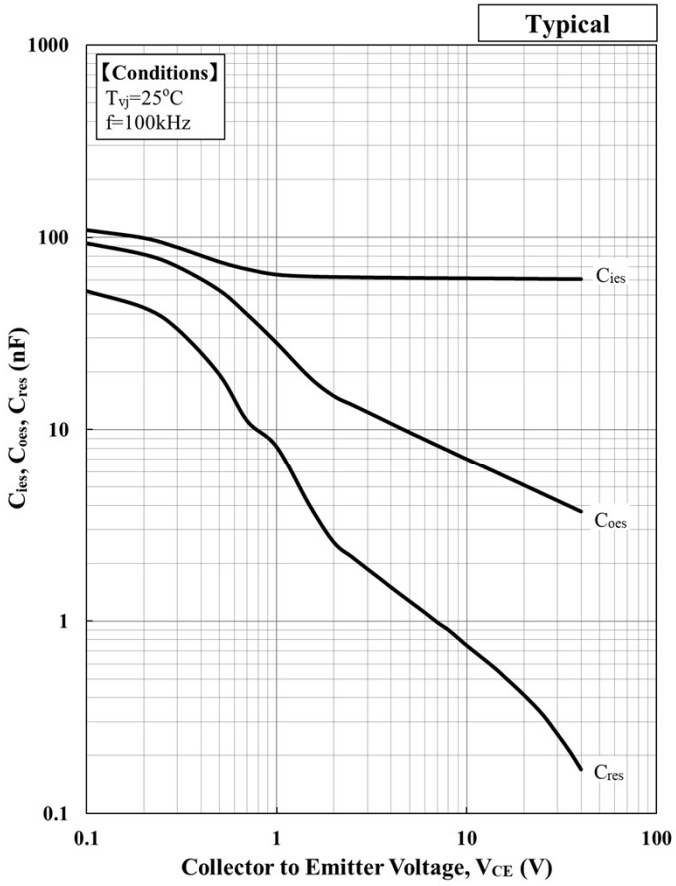
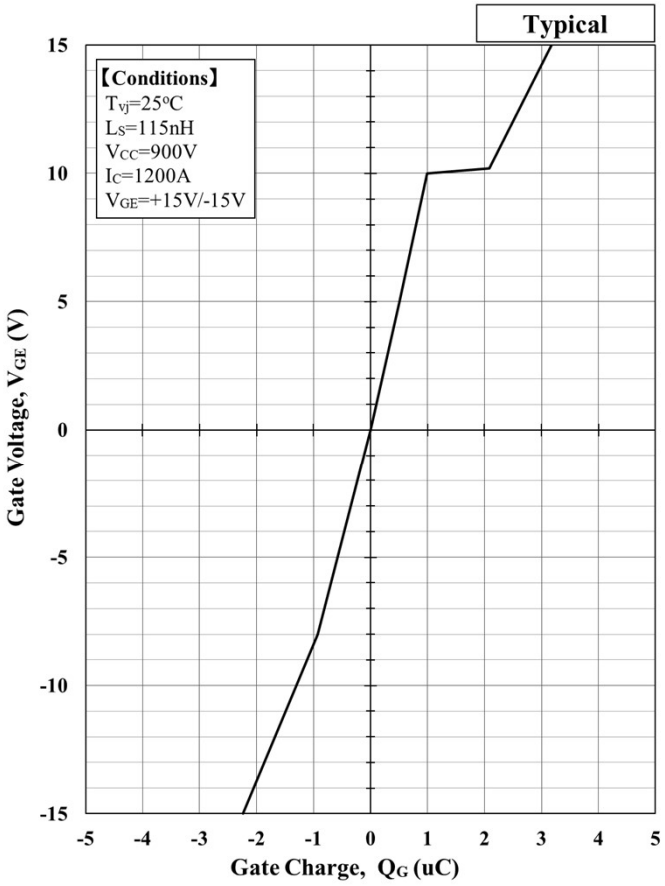
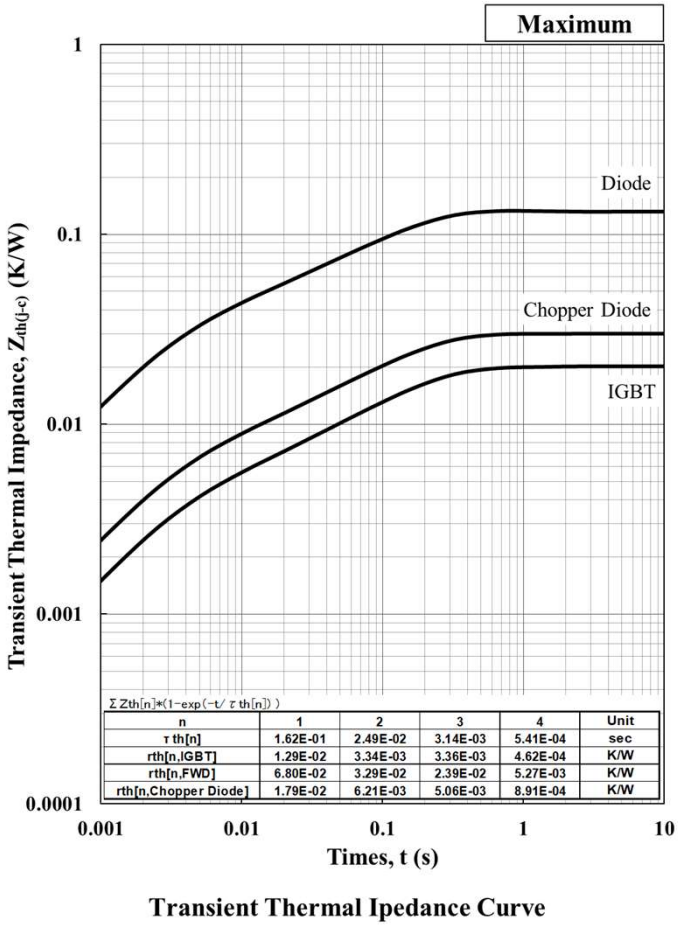


Capacitance vs. Collector to Emitter Voltage



V_{GE}-Q_G curve



Σ Zth[n]*(1-exp(-t/ τ th[n]))

n	1	2	3	4	Unit
τ th[n]	1.62E-01	2.49E-02	3.14E-03	5.41E-04	sec
rth[n,IGBT]	1.29E-02	3.34E-03	3.36E-03	4.62E-04	K/W
rth[n,FWD]	6.80E-02	3.29E-02	2.39E-02	5.27E-03	K/W
rth[n,Chopper Diode]	1.79E-02	6.21E-03	5.06E-03	8.91E-04	K/W

Transient Thermal Ipedance Curve

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HITACHI POWER SEMICONDUCTORS

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).

■ For inquiries relating to the products, please contact nearest representatives that is located "Inquiry" portion on the top page of a home page.

Hitachi power semiconductor home page address
http://www.hitachi-power-semiconductor-device.co.jp/
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HITACHI POWER SEMICONDUCTORS

Usage

1. HPSD warrants that the HPSD products have the specified performance according to the respective specifications at the time of its sale. Testing and other quality control techniques of the HPSD products by HPSD are utilized to the extent HPSD needs to meet the specifications described in this document. Not every device of the HPSD products is specifically tested on all parameters, except those mandated by relevant laws and/or regulations.
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