MBN1000FH45F

Silicon N-channel IGBT 4500V F version

FEATURES

* Soft switching behavior, low switching loss & low conduction loss :
  Soft low-injection punch-through
  Advanced Trench High conductivity IGBT.
* Low driving power due to low input capacitance with trench MOS gate.
* Low noise recovery: Ultra soft fast recovery diode.
* High Current rate Package.
* Low Rth(j-c) & low stray inductance.
* RoHS

ABSOLUTE MAXIMUM RATINGS (Tc=25°C)

Item		Symbol	Unit	MBN1000FH45F
Collector Emitter Voltage		V_{CES}	V	4,500
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_j	°C	-50 ~ +150
Storage Temperature		T_{stg}	°C	-50 ~ +150
Isolation Voltage		V_{ISO}	V_{RMS}	10,200(AC 1 minute)
Screw Torque	Terminals (M4/M8)	-	N·m	2/10 (1)
	Mounting (M6)	-		6 (2)

Notes: (1) Recommended Value 1.8±0.2/9±1N·m (2) Recommended Value 5.5±0.5N·m

ELECTRICAL CHARACTERISTICS

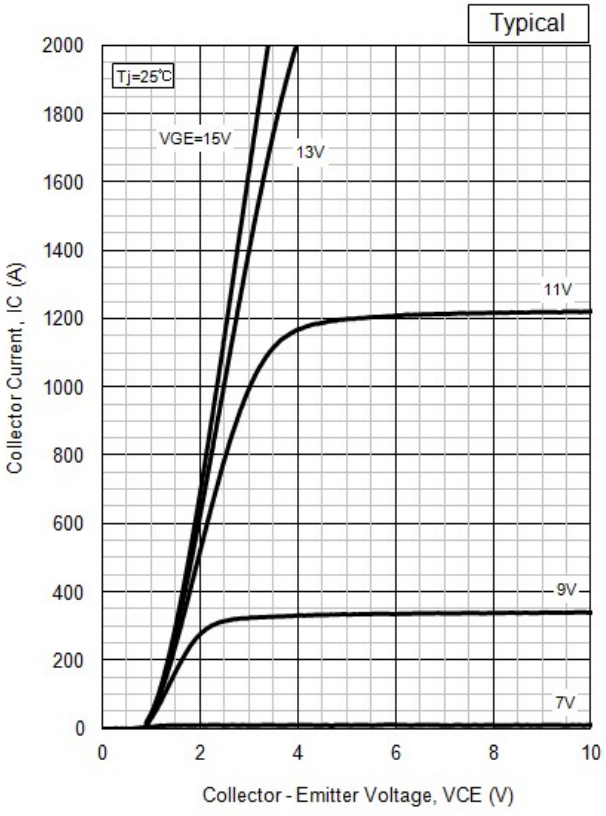
Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Collector Emitter Cut-Off Current	I_{CES}	mA	-	-	4	V_{CE}=4,500V, V_{GE}=0V, Tj=25°C
			-	40	120	V_{CE}=4,500V, V_{GE}=0V, Tj=150°C
Gate Emitter Leakage Current	I_{GES}	nA	-500	-	+500	V_{GE}=±20V, V_{CE}=0V, Tj=25°C
Collector Emitter Saturation Voltage	$V_{CE(sat)}$	V	-	3.0	3.4	I_C=1000A, V_{GE}=15V, Tj=150°C
Gate Emitter Threshold Voltage	$V_{GE(th)}$	V	6.0	6.5	7.0	V_{CE}=10V, I_C=1000mA, Tj=25°C
Input Capacitance	C_{ies}	nF	-	55	-	V_{CE}=10V, V_{GE}=0V, f=100kHz, Tj=25°C
Internal Gate Resistance	rg	Ω	-	3.9	-	V_{CE}=10V, V_{GE}=0V, f=100kHz, Tj=25°C
Turn On Delay Time	$t_{d(on)}$	μs	-	0.5	-	V_{CC}=2,800V, Ic=1000A
Rise Time	t_r		-	0.25	-	Ls=180nH
Turn Off Delay Time	$t_{d(off)}$		-	2.8	-	R_G=4.7Ω (3)
Fall Time	t_f		-	2.1	-	V_{GE}=±15V, Tj=150°C
Peak Forward Voltage Drop	V_F	V	-	2.8	3.2	IF=1000A, V_{GE}=0V, Tj=150°C
Reverse Recovery Time	t_{rr}	μs	-	1.3	-	V_{CC}=2,800V, IF=1000A, Ls=180nH Tj=150°C
Turn On Loss	E_{on}	J/P	-	3.6	-	V_{CC}=2,800V, Ic=1000A, Ls=180nH
Turn Off Loss	E_{off}	J/P	-	5.3	-	R_G=4.7Ω (3)
Reverse Recovery Loss	E_{rr}	J/P	-	3.6	-	V_{GE}=±15V, Tj=150°C
Short Circuit Pulse Width	t_{sc}	μs	10	-	-	V_{CC}=3000V,Ls=180nH R_G(on/off)=4.7/47Ω, V_{GE}=±15V,Tj=150°C
Partial discharge extinction voltage	V_e	V_{RMS}	3,500	-	-	f=50Hz, Q_{PD}≤10pC(acc. to IEC 61287)
Stray inductance module	L_{SCE}	nH	-	15	-	Collector Main to Emitter Main
Thermal Impedance IGBT	Rth(j-c)	K/W	-	-	0.013	Junction to case
Thermal Impedance FWD	Rth(j-c)		-	-	0.017	Junction to case
Contact Thermal Impedance	Rth(c-f)	K/W	-	0.007	-	Case to heatsink

Notes: (3) R_G value is a test condition value for evaluation, not recommended value.
Please determine the suitable R_G value by measuring switching behaviors.

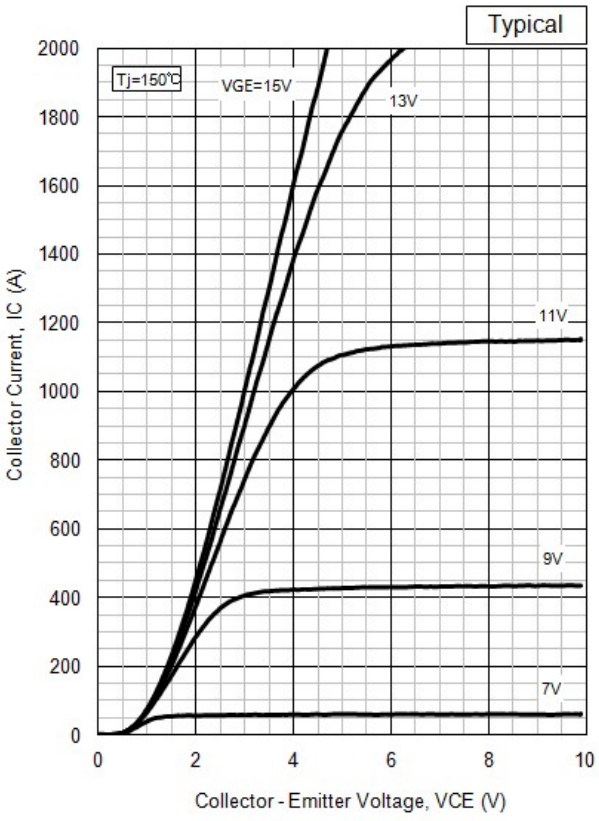
* Please contact our representatives at order.
* For improvement, specifications are subject to change without notice.
* For actual application, please confirm this spec sheet is the newest revision.
* ELECTRICAL CHARACTERISTIC items shown in above table are according to IEC 60747–2 and IEC 60747–9.

MBN1000FH45F

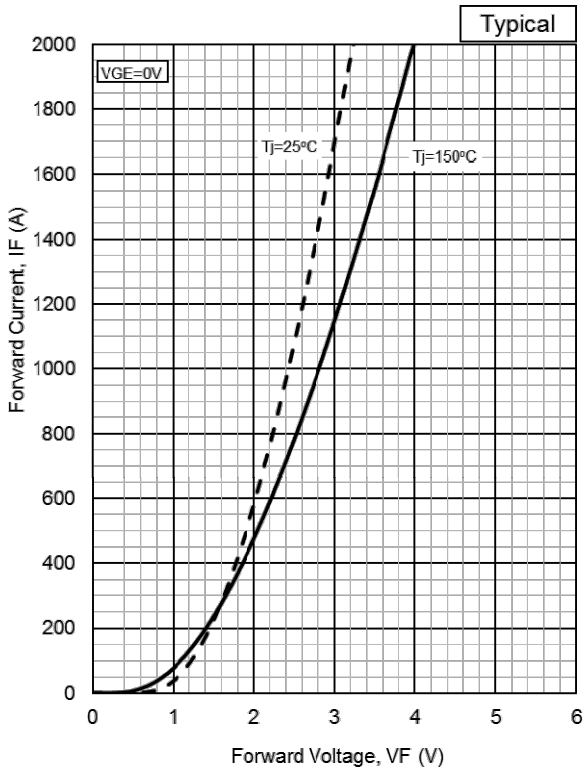
STATIC CHARACTERISTICS



IC vs. VCE (Tj=25°C)



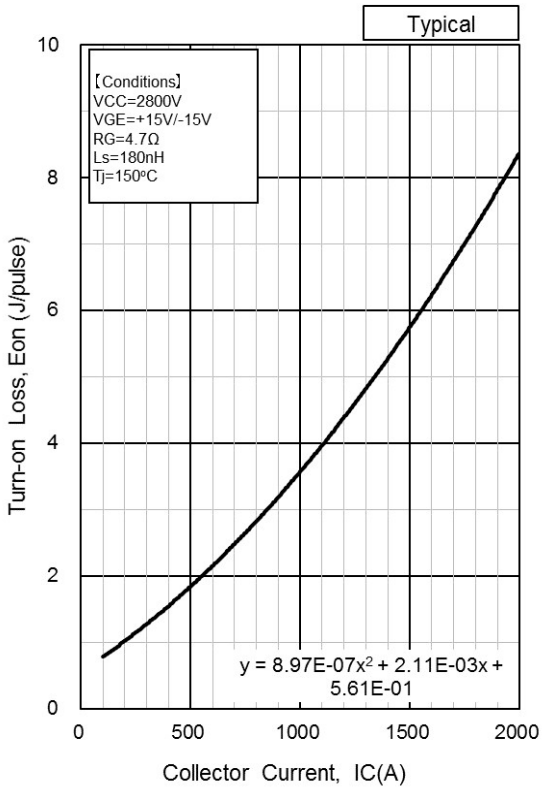
IC vs. VCE(Tj=150°C)



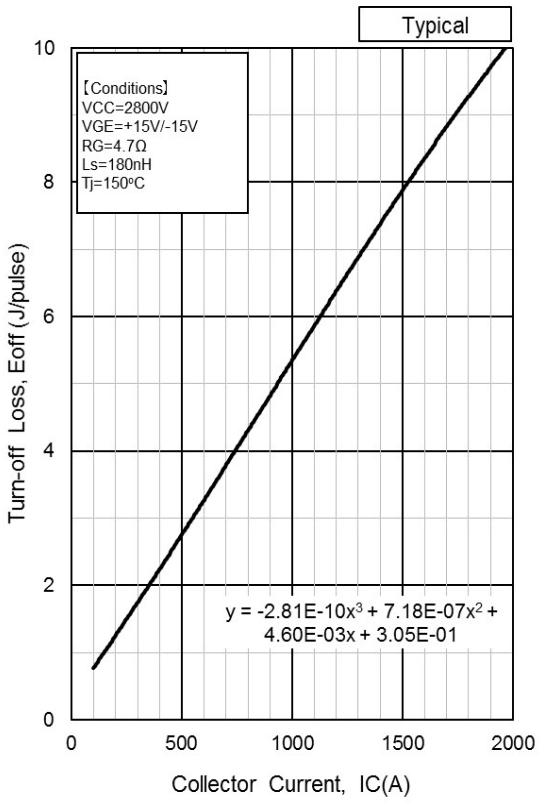
IF vs. VF

MBN1000FH45F

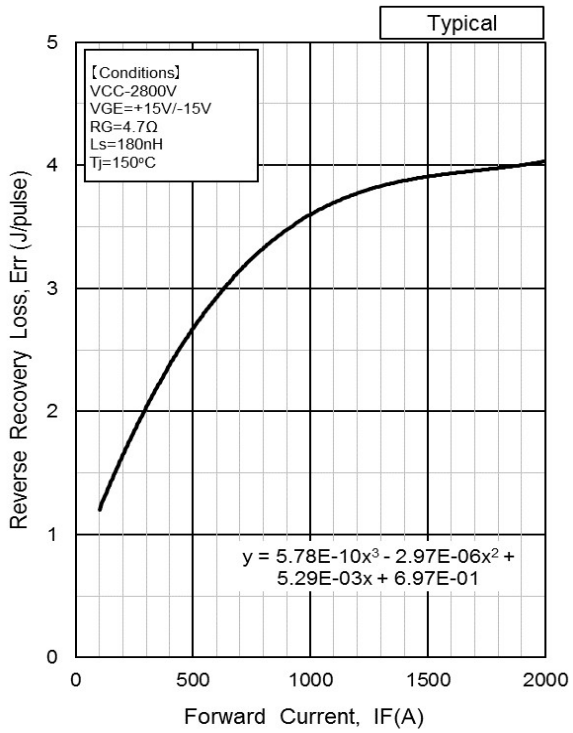
DYNAMIC CHARACTERISTICS



Turn-on loss vs. Collector Current

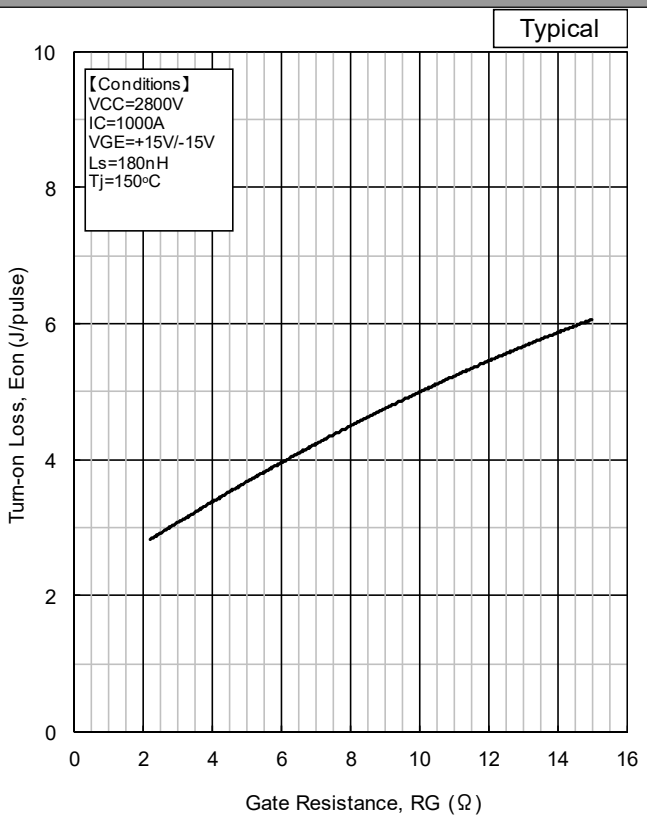


Turn-off loss vs. Collector Current

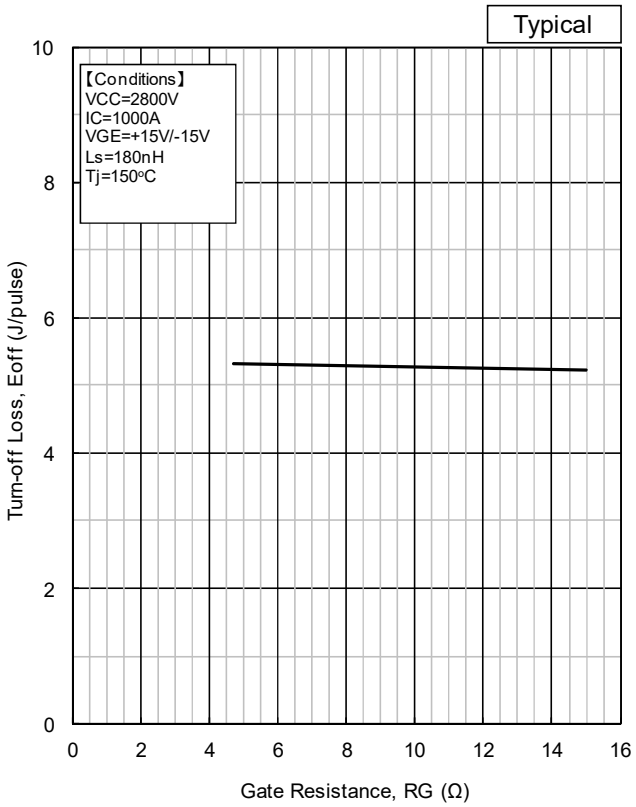


Recovery loss vs. Forward Current

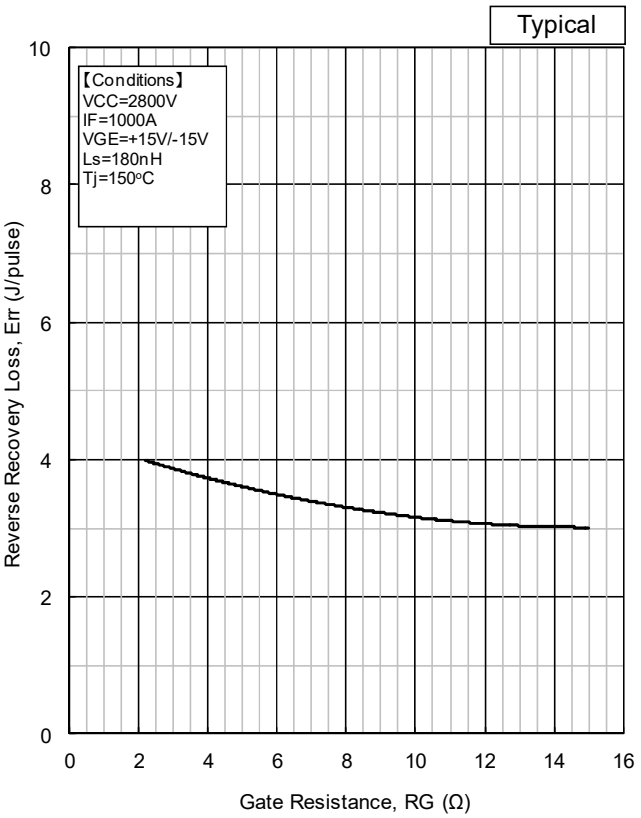
MBN1000FH45F



Turn-on loss vs. Gate Resistance

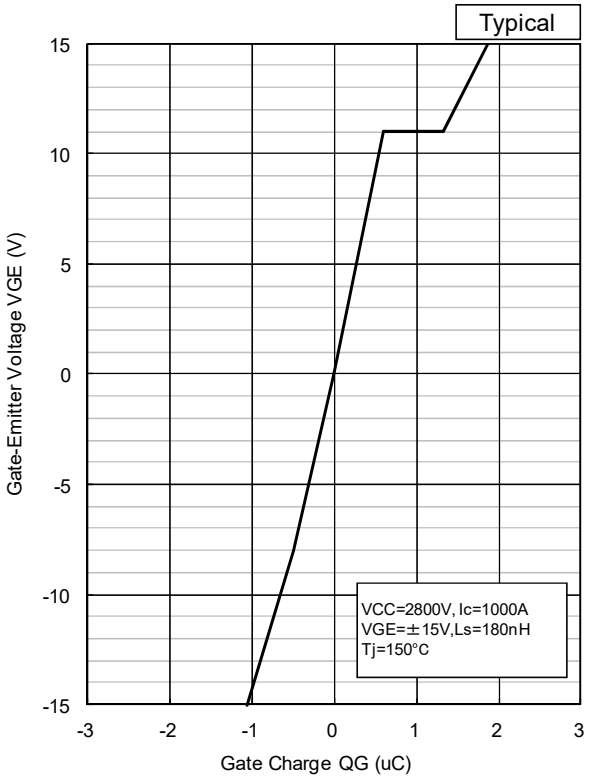


Turn-off loss vs. Gate Resistance

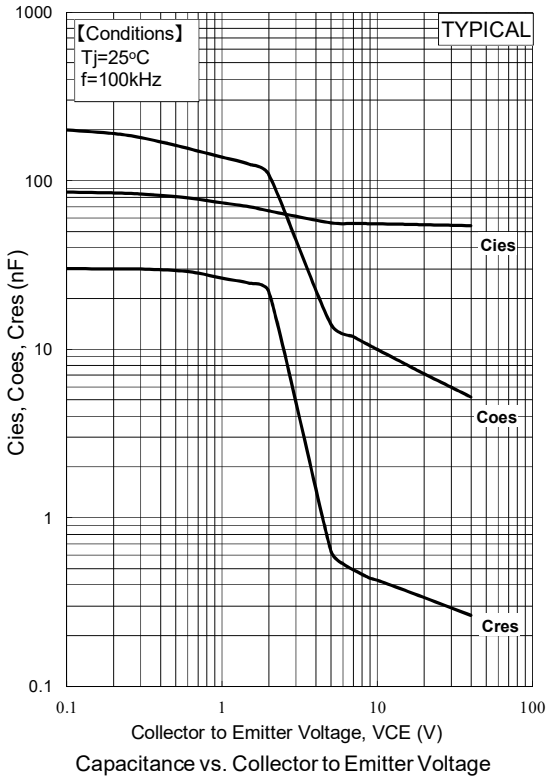


Recovery loss vs. Gate Resistance

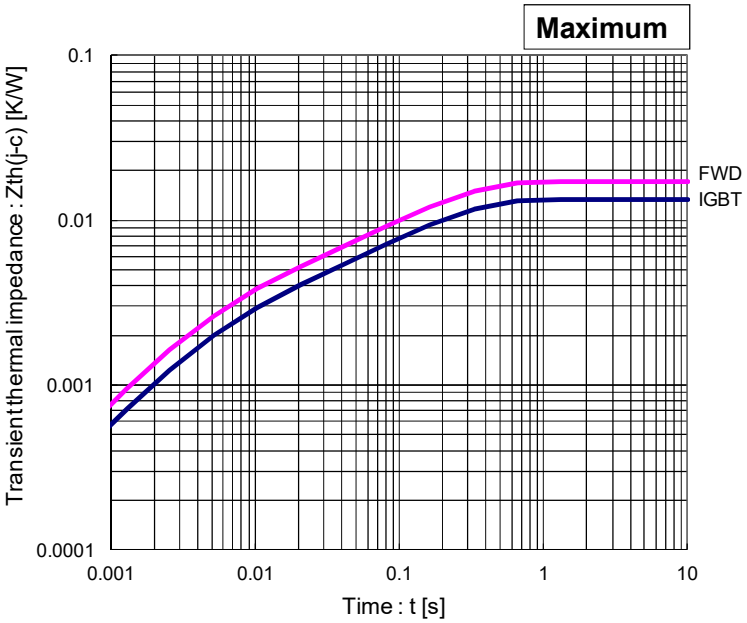
MBN1000FH45F



QG - VGE



Capacitance vs. Collector to Emitter Voltage



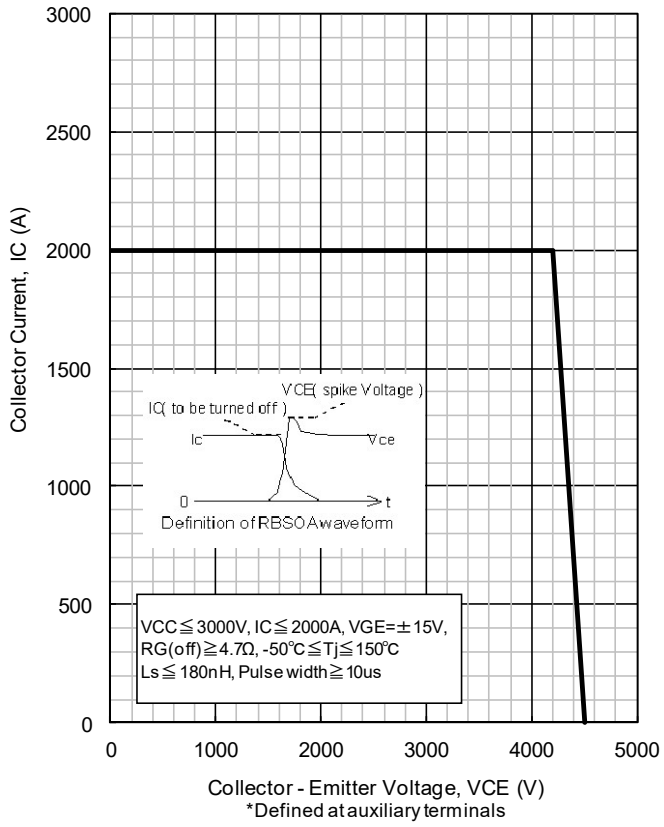
Transient Thermal Impedance Curve

Curve Approximation Model
Σ rth[n]*(1-exp(-t/τth[n]))

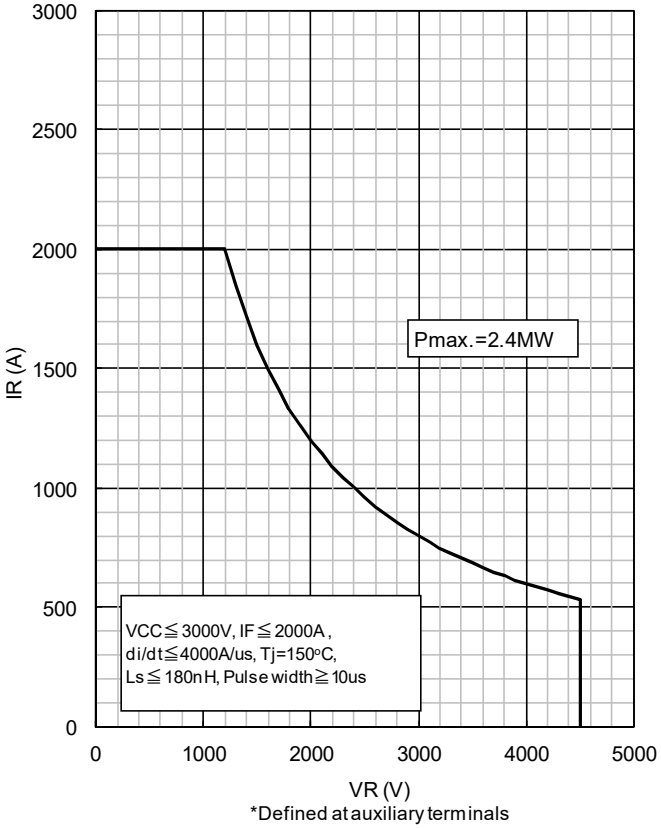
n	1	2	3	4	Unit
τ th[n]	1.89E-01	2.34E-02	9.34E-04	4.65E-03	sec
rth[n,IGBT]	9.33E-03	2.02E-03	1.55E-04	1.79E-03	K/W
rth[n,Diode]	1.23E-02	2.24E-03	1.99E-04	2.46E-03	K/W

MBN1000FH45F

Safe Operating Area



Reverse bias safe operation area(RBSOA)

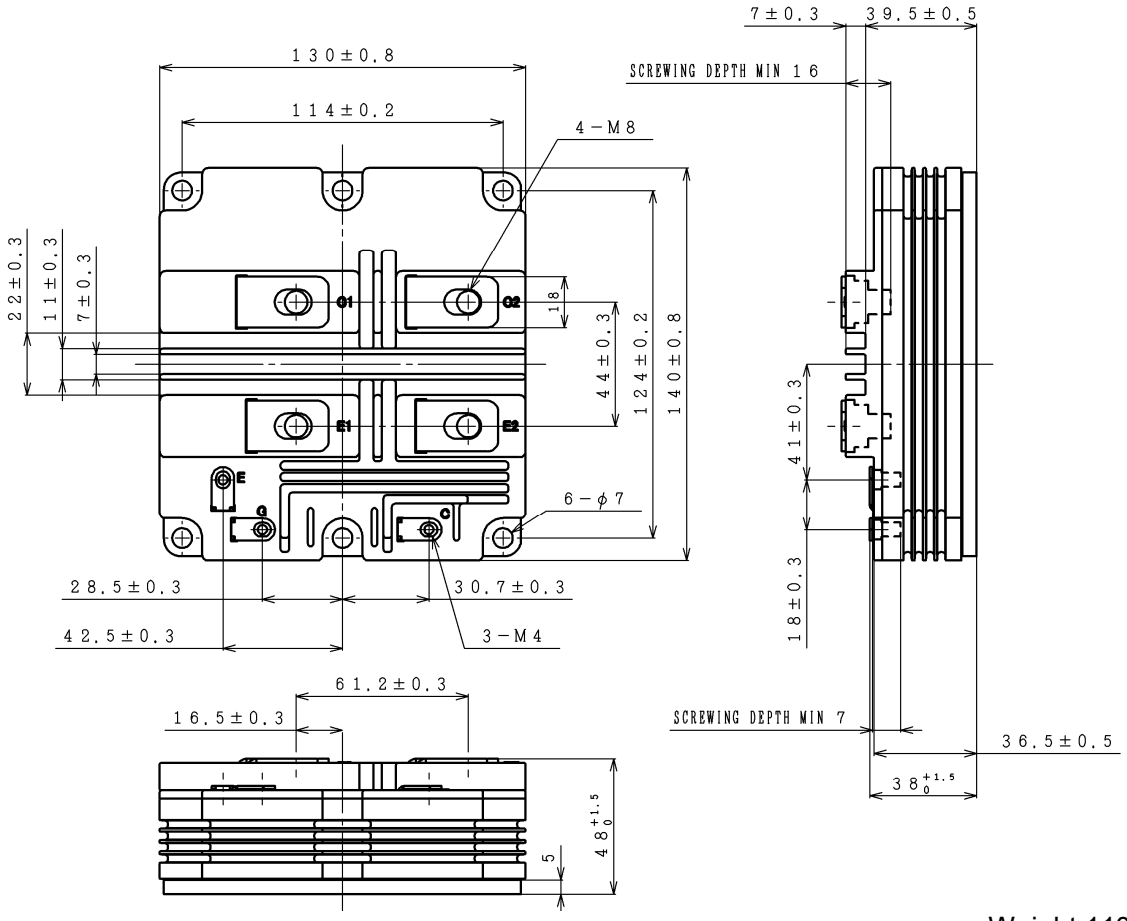


Reverse recovery safe operation area(RRSOA)

MBN1000FH45F

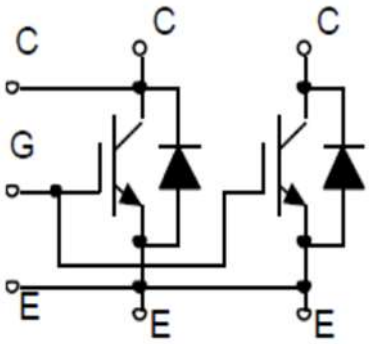
PACKAGE OUTLINE DRAWING

Unit in mm



Weight:1100g

CIRCUIT DIAGRAM



MBN1000FH45F

HITACHI POWER SEMICONDUCTORS

Notices

1. 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 Hitachi sales department for the latest version of this data sheets.
2. Please be sure to read "Precautions for Safe Use and Notices" in the individual brochure before use.
3. 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 Hitachi's sales department staff.
4. In no event shall Hitachi be liable for any damages that may result from an accident or any other cause during operation of the user's units according to this data sheets. Hitachi assumes no responsibility for any intellectual property claims or any other problems that may result from applications of information, products or circuits described in this data sheets.
5. In no event shall Hitachi be liable for any failure in a semiconductor device or any secondary damage resulting from use at a value exceeding the absolute maximum rating.
6. No license is granted by this data sheets under any patents or other rights of any third party or Hitachi Power Semiconductor Device, Ltd.
7. This data sheets may not be reproduced or duplicated, in any form, in whole or in part , without the expressed written permission of Hitachi Power Semiconductor Device, Ltd.
8. The products (technologies) described in this data sheets are not to be provided to any party whose purpose in their application will hinder maintenance of international peace and safety not are they to be applied to that purpose by their direct purchasers or any third party. When exporting these products (technologies), the necessary procedures are to be taken in accordance with related laws and regulations.

■ For inquiries relating to the products, please contact nearest overseas representatives which 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/en/

HITACHI
Inspire the Next