

MBN1500FH45F

Preliminary Specification

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	MBN1500FH45F
Collector Emitter Voltage	V _{CES}	V	4,500
Gate Emitter Voltage	V _{GES}	V	±20
Collector Current	DC	I _C	1,500
	1ms	I _{CRM}	3,000
Forward Current	DC	I _F	1,500
	1ms	I _{FRM}	3,000
Junction Temperature	T _j	°C	-40 ~ +150
Storage Temperature	T _{stg}	°C	-50 ~ +150
Isolation Voltage	V _{ISO}	V _{RMS}	10,200(AC 1 minute)
Screw Torque	Terminals (M4/M8)	-	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	-	-	6	V _{CE} =4,500V, V _{GE} =0V, T _j =25°C
			-	60	180	V _{CE} =4,500V, V _{GE} =0V, T _j =150°C
Gate Emitter Leakage Current	I _{GES}	nA	-500	-	+500	V _{GE} =±20V, V _{CE} =0V, T _j =25°C
Collector Emitter Saturation Voltage	V _{CESat}	V	-	3.0	3.4	I _C =1500A, V _{GE} =15V, T _j =150°C
Gate Emitter Threshold Voltage	V _{GE(th)}	V	6.0	6.5	7.0	V _{CE} =10V, I _C =1500mA, T _j =25°C
Input Capacitance	C _{ies}	nF	-	83	-	V _{CE} =10V, V _{GE} =0V, f=100kHz, T _j =25°C
Internal Gate Resistance	r _g	Ω	-	2.6	-	V _{CE} =10V, V _{GE} =0V, f=100kHz, T _j =25°C
Switching Times	Rise Time	t _r	-	0.25	-	V _{CC} =2,800V, I _C =1500A
	Turn On Time	t _{on}	-	0.75	-	L _S =165nH
	Fall Time	t _f	-	2.1	-	R _G =3.3Ω (3)
	Turn Off Time	t _{off}	-	4.9	-	V _{GE} =±15V, T _j =150°C
Peak Forward Voltage Drop	V _F	V	-	2.8	3.2	I _F =1500A, V _{GE} =0V, T _j =150°C
Reverse Recovery Time	t _{rr}	μs	-	1.3	-	V _{CC} =2,800V, I _F =1500A, L _S =165nH T _j =150°C
Turn On Loss	E _{on}	J/P	-	4.8	-	V _{CC} =2,800V, I _C =1500A, L _S =165nH
Turn Off Loss	E _{off}	J/P	-	8.0	-	R _G =3.3Ω (3)
Reverse Recovery Loss	E _{rr}	J/P	-	6.3	-	V _{GE} =±15V, T _j =150°C
Stray inductance module	L _{SCE}	nH	-	10	-	
Thermal Impedance	IGBT	Rth(j-c)	-	-	0.0085	Junction to case
	FWD	Rth(j-c)	-	-	0.0115	
Contact Thermal Impedance	Rth(c-f)	K/W	-	0.005	-	Case to fin

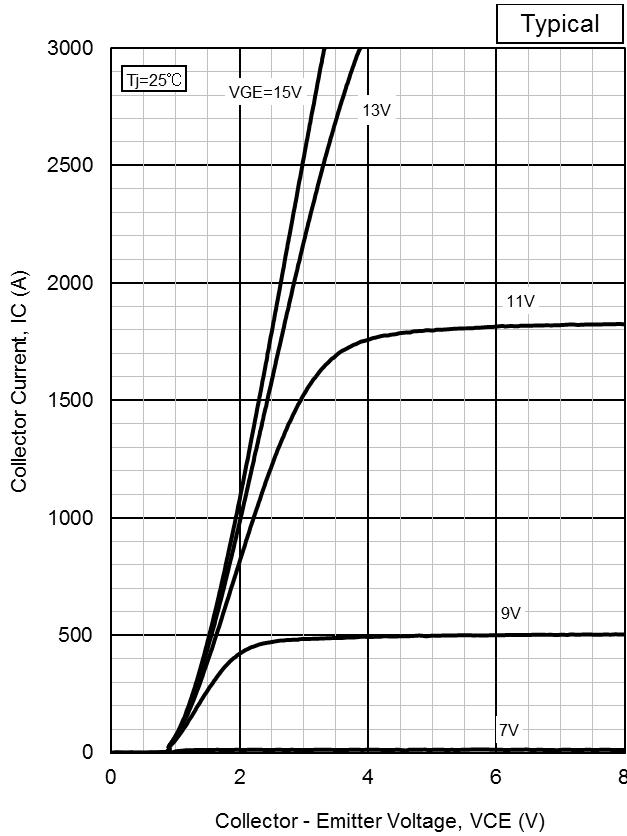
Notes: (3) R_G value is a test condition value for evaluation, not recommended value.Please determine the suitable R_G value by measuring switching behaviors.

- * 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 values according to IEC 60747-2 IEC 60747-9

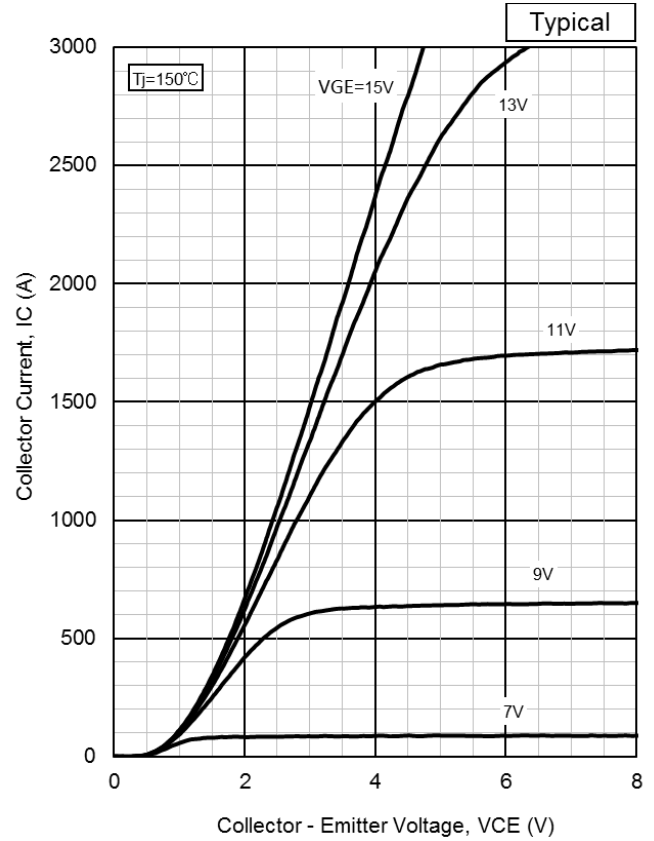
MBN1500FH45F

Preliminary Specification

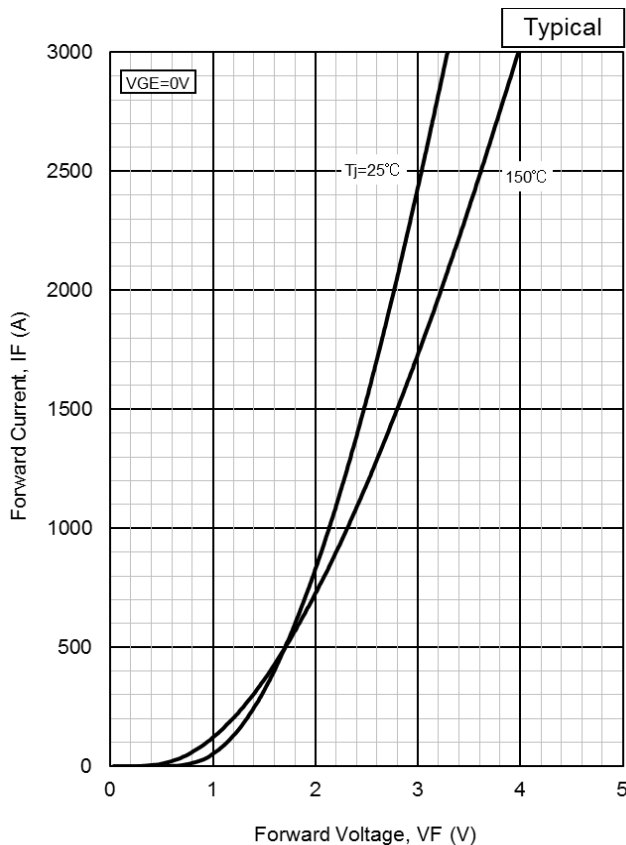
STATIC CHARACTERISTICS



I_C vs. V_{CE} ($T_j=25^\circ\text{C}$)



I_C vs. V_{CE} ($T_j=150^\circ\text{C}$)

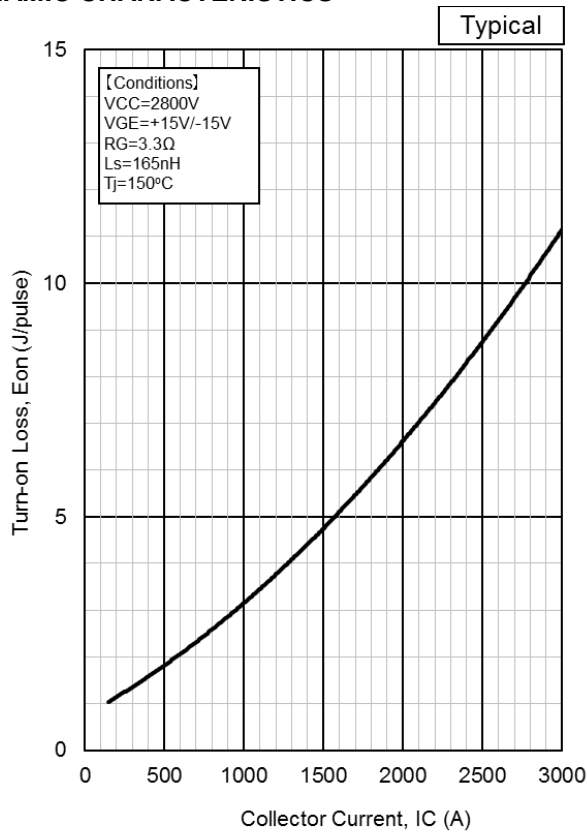


I_F vs. V_F

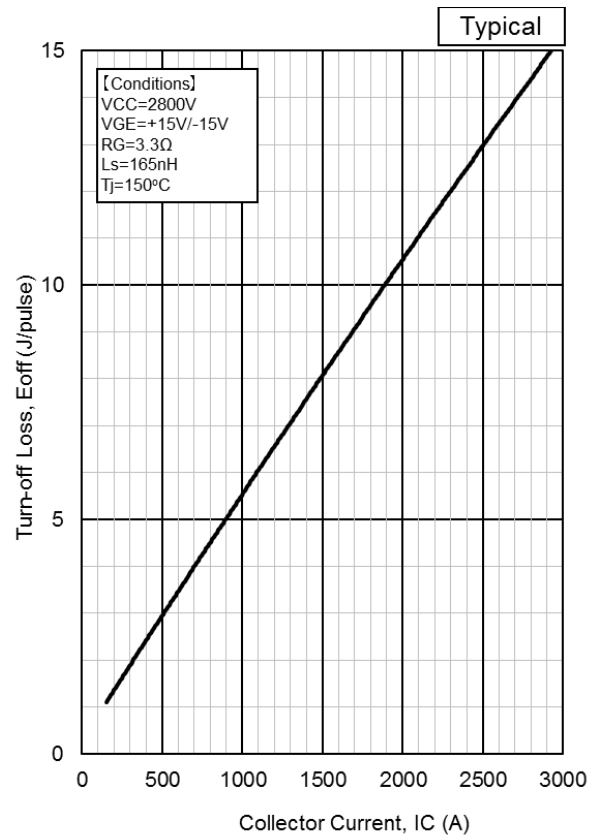
MBN1500FH45F

Preliminary Specification

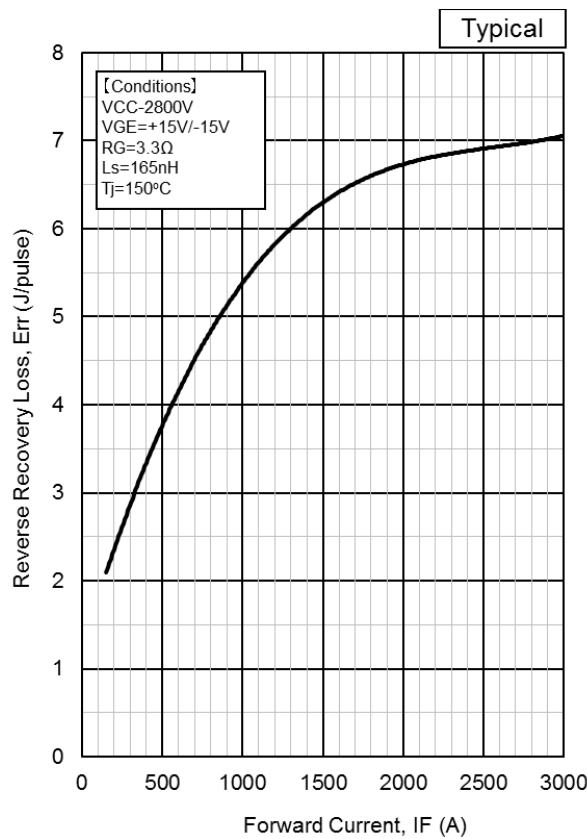
DYNAMIC CHARACTERISTICS



Turn-on loss vs. Collector current



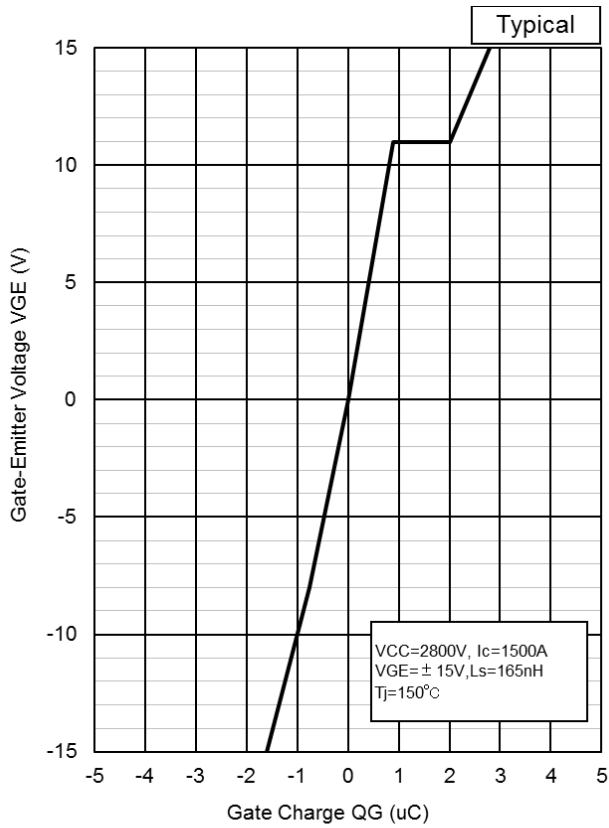
Turn-off loss vs. Collector current



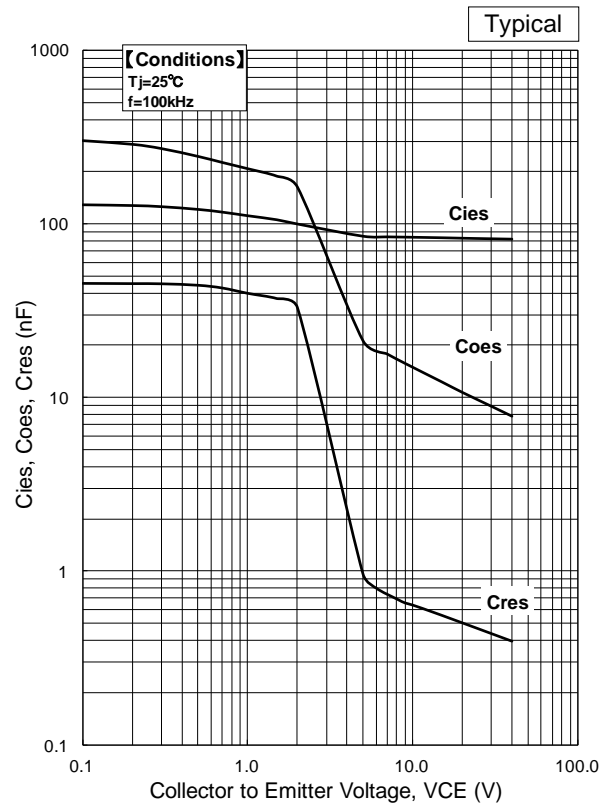
Recovery loss vs. Forward current

MBN1500FH45F

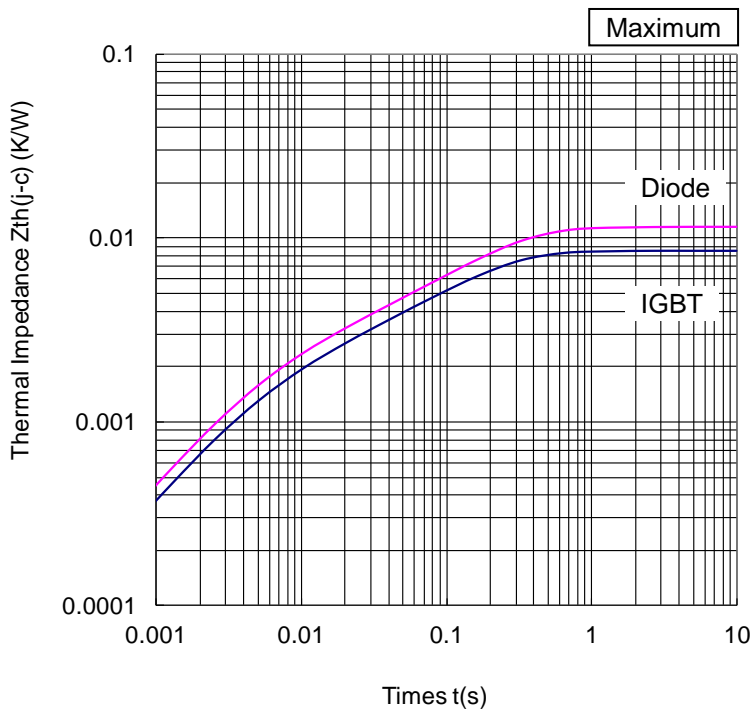
Preliminary Specification



QG - VGE



Capacitance vs. Collector to Emmitter Voltage



Transient Thermal Impedance Curve

Curve Approximation Model

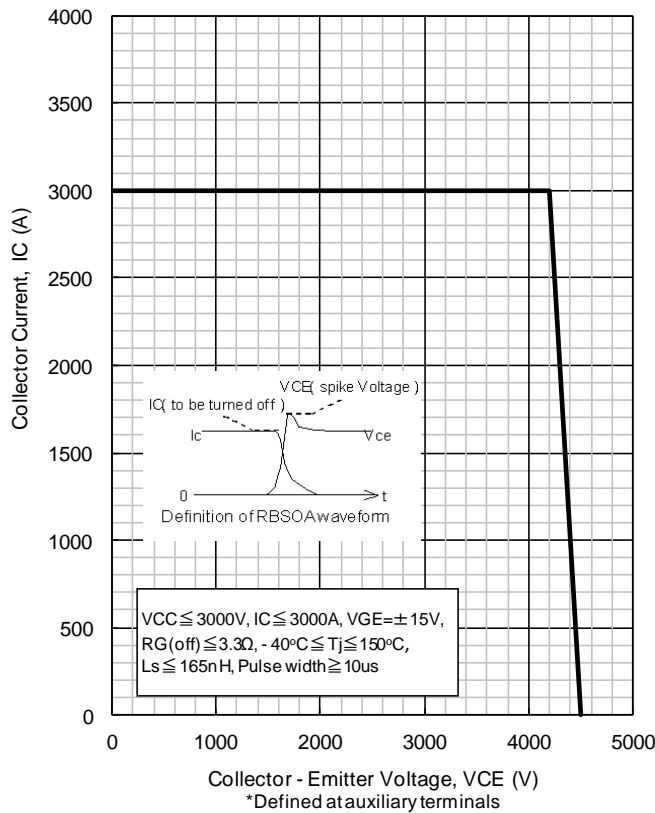
$$\sum r_{th}[n] * (1 - \exp(-t/r_{th}[n]))$$

n	1	2	3	4	Unit
$\tau_{th}[n]$	1.83E-01	3.34E-02	6.04E-03	1.67E-03	sec
rth[n,IGBT]	5.59E-03	1.38E-03	1.28E-03	2.45E-04	K/W
rth[n,Diode]	8.66E-03	7.55E-04	1.84E-03	2.46E-04	K/W

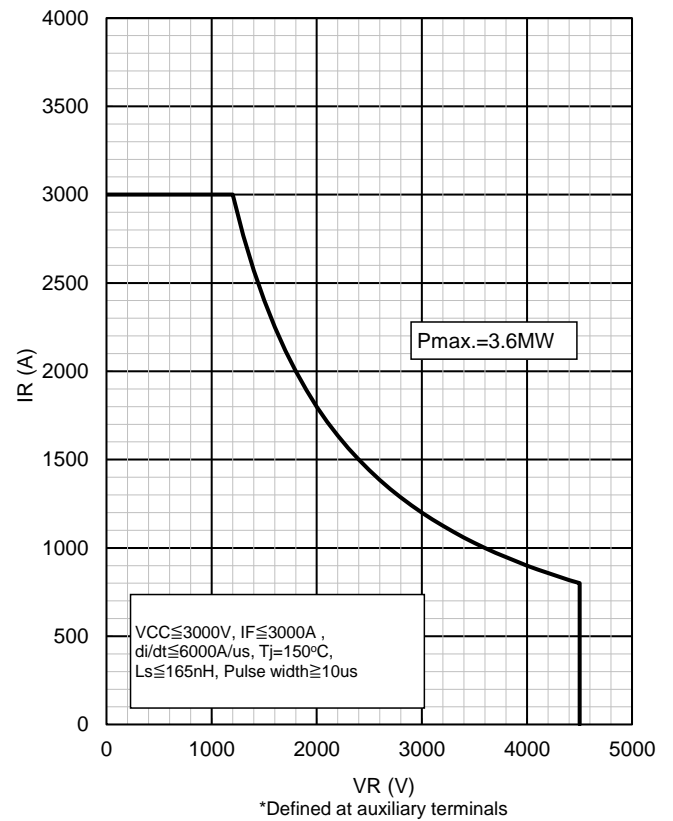
MBN1500FH45F

Preliminary Specification

Safe Operating Area



Reverse bias safe operation area(RBSOA)



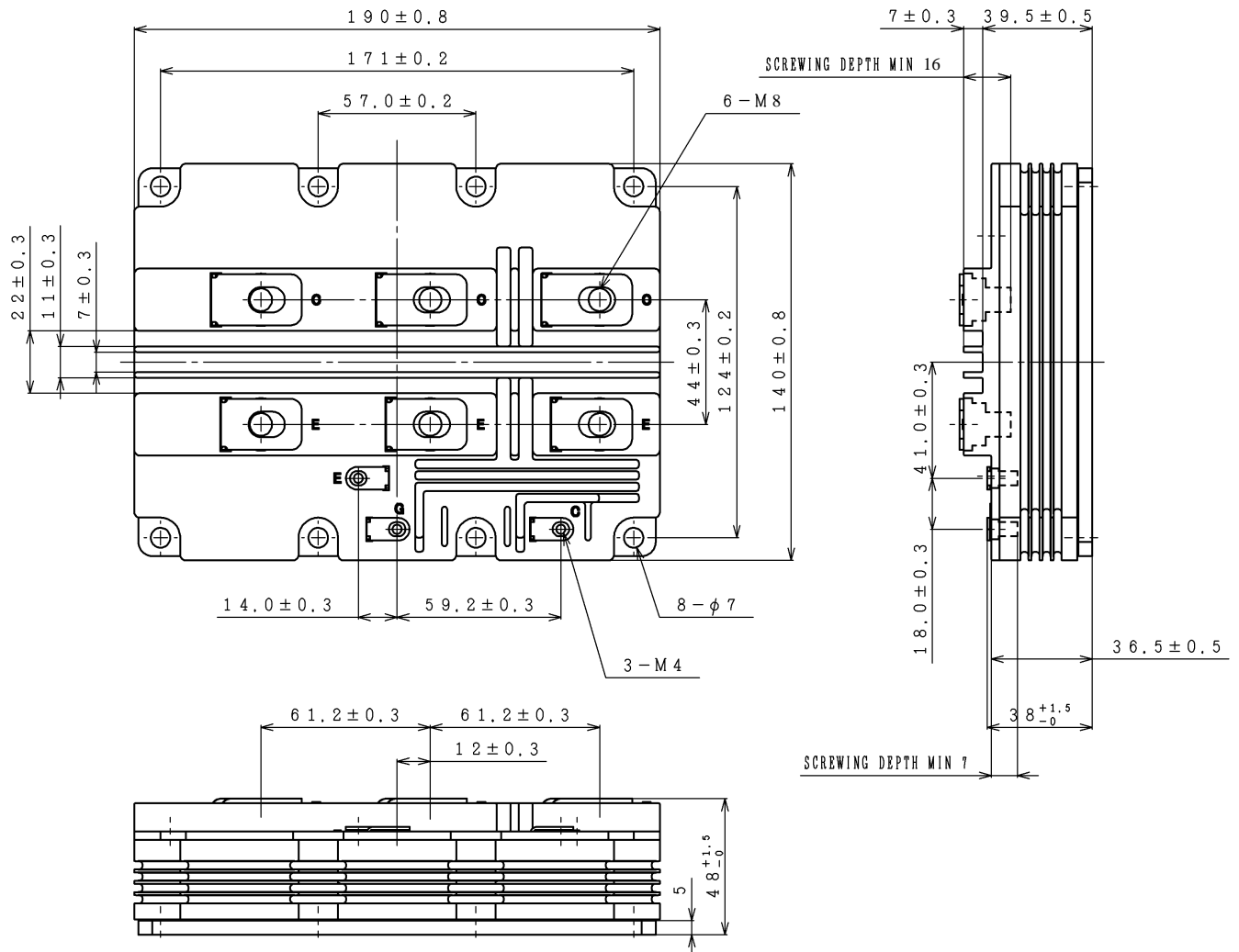
Reverse recovery safe operation area(RRSOA)

MBN1500FH45F

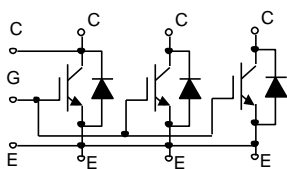
Preliminary Specification

PACKAGE OUTLINE DRAWING

Unit in mm



CIRCUIT DIAGRAM



MBN1500FH45F

Preliminary Specification

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/>