

MBM200H45E2-H

Silicon N-channel IGBT 4500V E2 version

FEATURES

- * Low switching loss IGBT module.
- * Low noise due to ultra soft fast recovery diode.
- * Isolated heat sink (terminal to base).

ABSOLUTE MAXIMUM RATINGS (T_c=25°C)

Item	Symbol	Unit	MBM200H45E2-H
Collector Emitter Voltage	V _{CES}	V	4,500
Gate Emitter Voltage	V _{GES}	V	±20
Collector Current	DC	I _c	200 (T _c =80°C)
	1ms	I _{cp}	400
Forward Current	DC	I _F	200
	1ms	I _{FM}	400
Peak Forward Surge Current	IFSM	Ap	1500 (T _j =125°C, 50Hz, 10ms Half-sinewave)
Total Power Dissipation	P _{tot}	W	1,960 (T _c =25°C per IGBT)
Junction Temperature	T _j	°C	-40 ~ +125
Junction Operating Temperature	T _{jop}	°C	-40 ~ +125
Case Temperature	T _c	°C	-40 ~ +125
Storage Temperature	T _{stg}	°C	-40 ~ +125
Isolation Voltage	V _{ISO}	V _{RMS}	9,000 (AC 1 minute)
Screw Torque	Terminals (M6)	-	6 (1)
	Mounting (M6)	-	6 (1)

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

ELECTRICAL CHARACTERISTICS (IGBT)

Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Collector Emitter Cut-Off Current	I _{CES}	mA	-	-	7	T _j =25°C
			-	4	16	T _j =125°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 _{CE(sat)}	V	-	3.2	4.5	T _j =25°C
			3.5	4.2	4.7	T _j =125°C
Gate Emitter Threshold Voltage	V _{GE(TO)}	V	5.4	6.4	7.4	V _{CE} =10V, I _c =200mA, T _j =25°C
Gate Charge	Q _g	μC	-	2.1	-	V _{CC} =2800V, I _c =200A, V _{GE} =+/-15V
Input Capacitance	C _{ies}	nF	-	28	-	V _{CE} =10V, V _{GE} =0V, f=100kHz, T _j =25°C
Output Capacitance	C _{oes}	nF	-	2.3	-	
Reverse transfer capacitance	C _{res}	nF	-	1.1	-	
Internal Gate Resistance	R _{ge}	Ω	-	4.8	-	V _{CE} =10V, V _{GE} =0V, f=100kHz, T _j =25°C
Switching Times	Rise Time	t _r	-	1.9	-	T _j =25°C
			-	2.1	4.2	T _j =125°C
	Turn On Time	t _{on}	-	2.4	-	T _j =25°C
			-	2.7	5.4	T _j =125°C
	Fall Time	t _f	-	1.8	-	T _j =25°C
			-	2.4	3.6	T _j =125°C
Turn Off Time	t _{off}	-	3.6	-	T _j =25°C	
-	-	-	4.3	6.7	T _j =125°C	
Turn On Loss	E _{on(full)}	J/p	-	0.73	-	T _j =25°C
	E _{on(10%)}		-	0.85	1.30	T _j =125°C
	E _{on(full)}		-	0.92	-	T _j =125°C
Turn Off Loss	E _{off(full)}	J/p	-	0.60	-	T _j =25°C
	E _{off(10%)}		-	0.65	1.00	T _j =125°C
	E _{off(full)}		-	0.73	-	T _j =125°C
	E _{off(full)}		-	0.73	-	T _j =125°C

Notes:(2) R_G value is the test condition's value 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.

MBM200H45E2-H

ELECTRICAL CHARACTERISTICS (DIODE)

Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions	
Peak Forward Voltage Drop	V_{FM}	V	-	3.6	4.15	$T_j=25^{\circ}\text{C}$	$I_F=200\text{A}$, $V_{GE}=0\text{V}$
			3.2	3.9	4.7	$T_j=125^{\circ}\text{C}$	
Reverse Recovery Time	t_{rr}	μs	-	0.5	-	$T_j=25^{\circ}\text{C}$	$V_{CC}=2800\text{V}$, $I_F=200\text{A}$, $L_s=400\text{nH}$ $R_G=20\Omega$
			-	0.7	1.4	$T_j=125^{\circ}\text{C}$	
Reverse Recovery Current	I_{rr}	A	-	230	-	$T_j=25^{\circ}\text{C}$	
			-	250	-	$T_j=125^{\circ}\text{C}$	
Recovery charge	Q_{rr}	μC	-	100	-	$T_j=25^{\circ}\text{C}$	
			-	170	-	$T_j=125^{\circ}\text{C}$	
Reverse Recovery Loss	$E_{rr(\text{full})}$	J/ p	-	0.16	-	$T_j=25^{\circ}\text{C}$	$V_{CC}=2800\text{V}$, $I_F=200\text{A}$, $L_s=400\text{nH}$, $R_G=20\Omega$ (3)
	$E_{rr(10\%)}$		-	0.26	0.50	$T_j=125^{\circ}\text{C}$	
	$E_{rr(\text{full})}$		-	0.29	-	$T_j=125^{\circ}\text{C}$	

Notes:(3) R_G value is the test condition's value 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.

THERMAL CHARACTERISTICS

Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions	
Thermal Impedance	IGBT	$R_{th(j-c)}$	K/W	-	-	0.052	Junction to case
	FWD	$R_{th(j-c)}$		-	-	0.104	
Contact Thermal Impedance	$R_{th(c-f)}$	K/W	-	0.032	-	Case to fin ($\lambda_{grease}=1\text{W}/(\text{m}\cdot\text{K})$, heat-sink flatness $\leq 50\mu\text{m}$)	

MODULE MECHANICAL CHARACTERISTICS

Item	Unit	Characteristics	Conditions
Weight	g	840	
Creepage Distance	Between terminal	mm	54
	Terminal-Base	mm	64
Clearance Distance	Between terminal	mm	19
	Terminal-Base	mm	35
Stray inductance in module	$LS(\text{CM-EM})$	nH	140
Resistance, Terminal-chip	R_{CC+EE}	$\text{m}\Omega$	1.5
Comparative Tracking Index (CTI)			600
Module base plate Material			Cu
Baseplate Thickness	mm		5
Insulation plate Material			AlN
Terminal Surface treatment			Ni plating
Case Material			Poly-Phenilene Sulfide

MBM200H45E2-H

DEFINITION OF TEST CIRCUIT

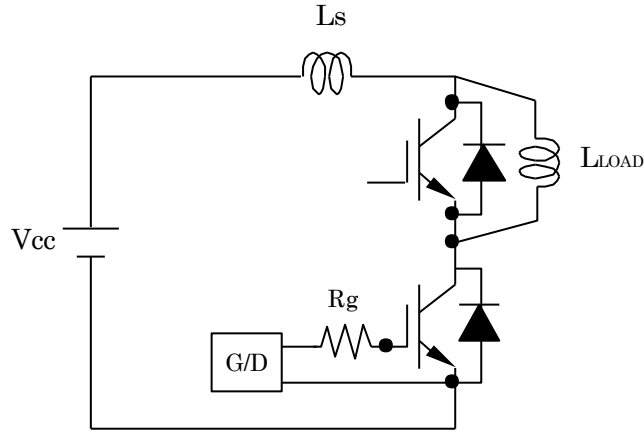


Fig.1 Switching test circuit

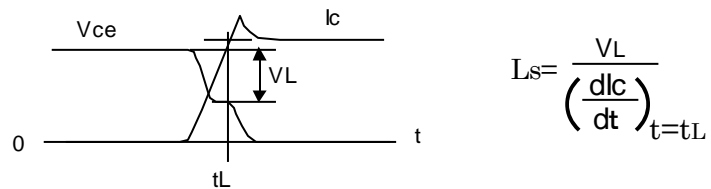


Fig.2 Definition of Ls

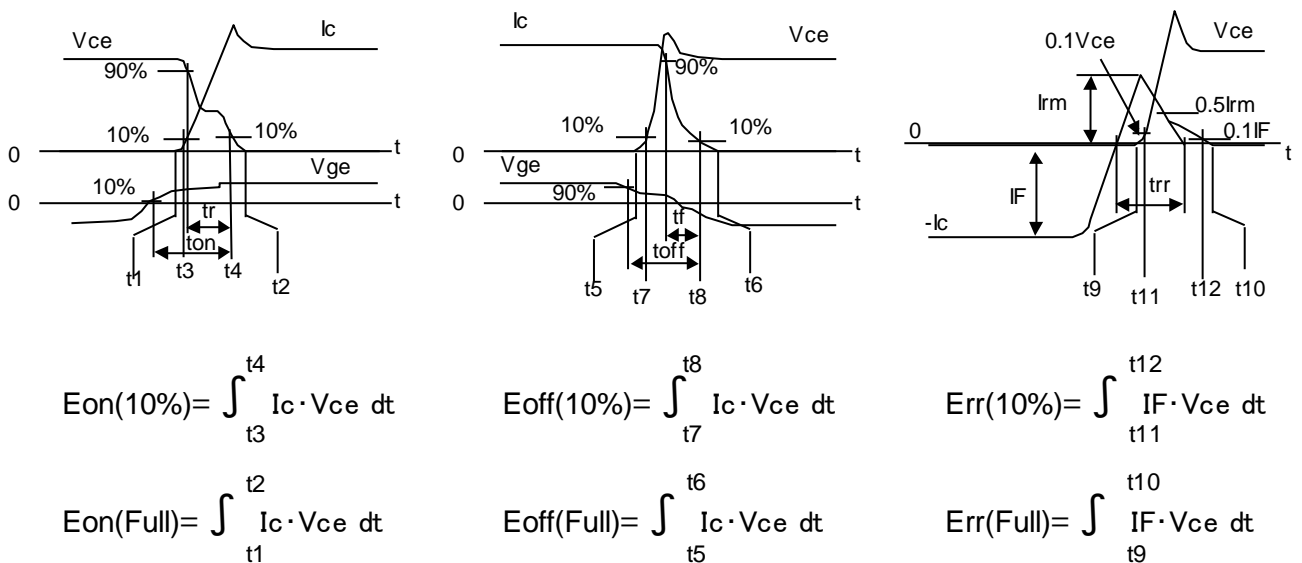
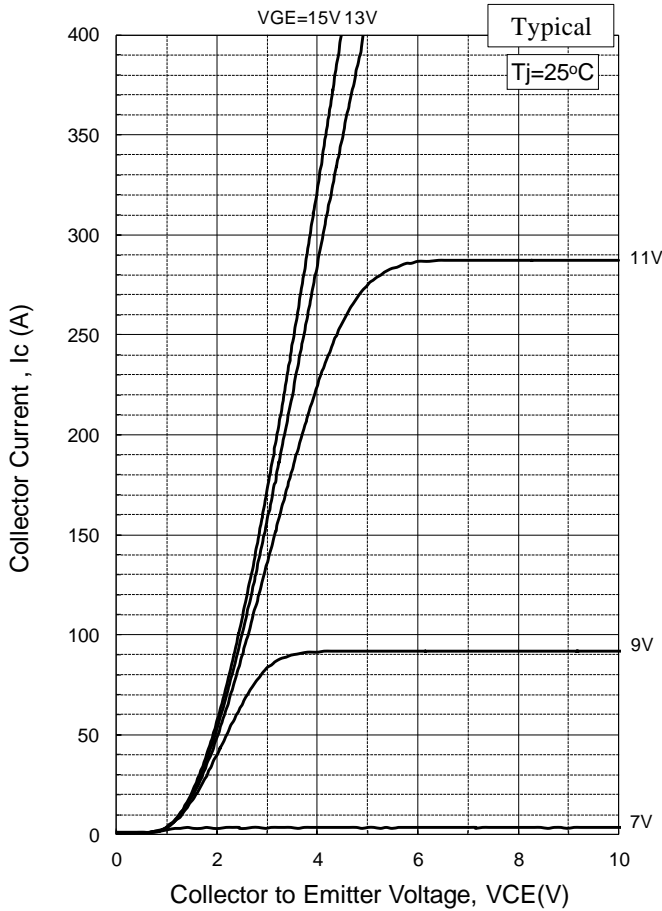


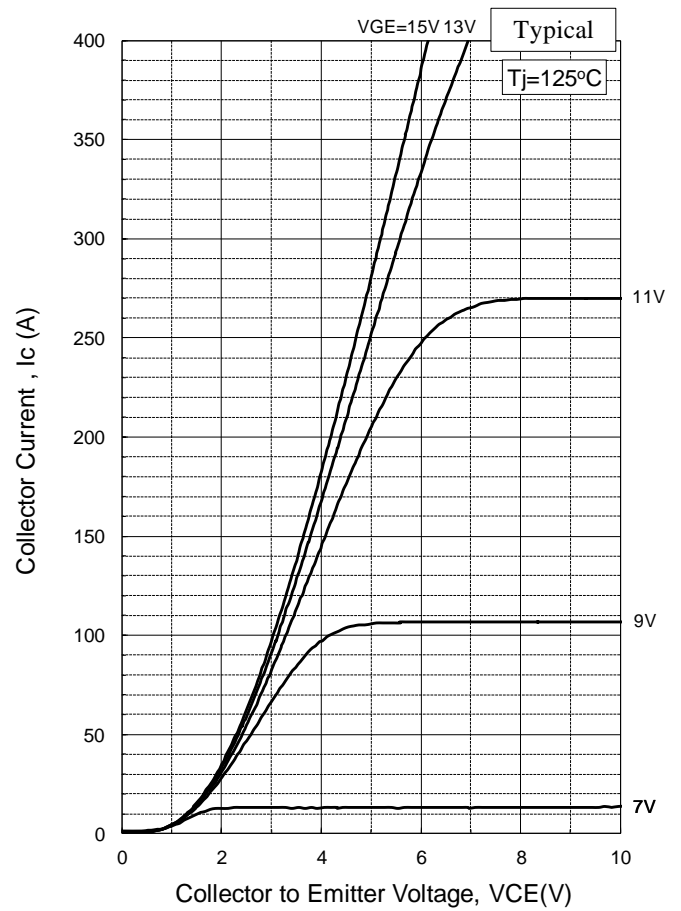
Fig.3 Definition of switching loss

MBM200H45E2-H

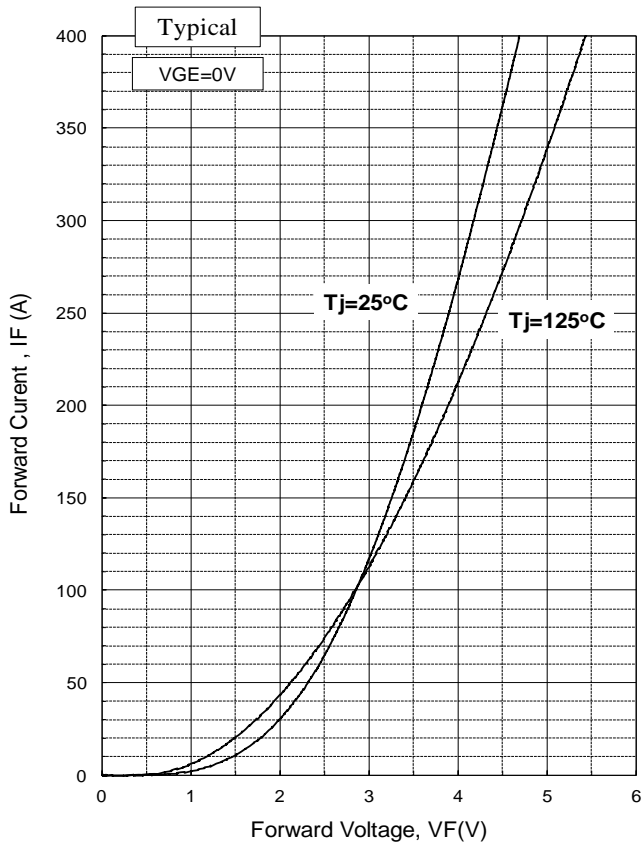
STATIC CHARACTERISTICS



Ic vs. VCE(Tj=25°C)



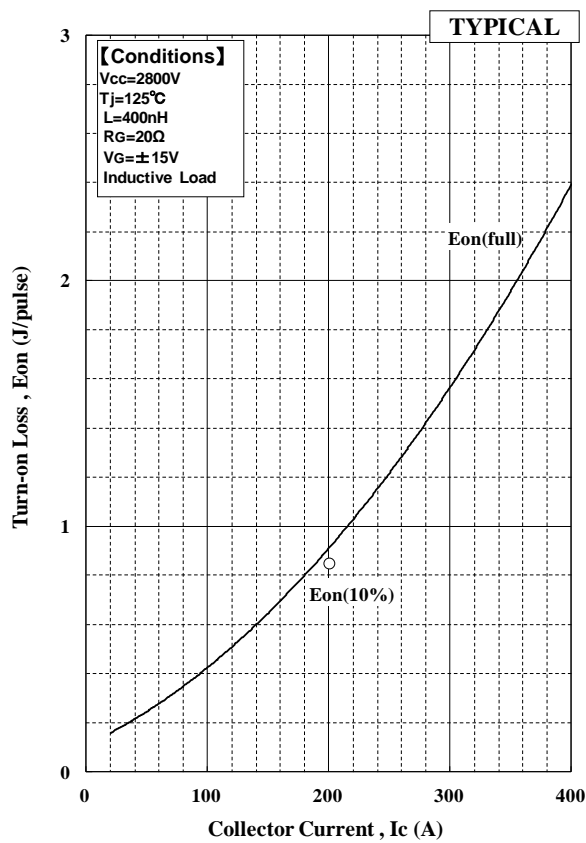
Ic vs. VCE(Tj=125°C)



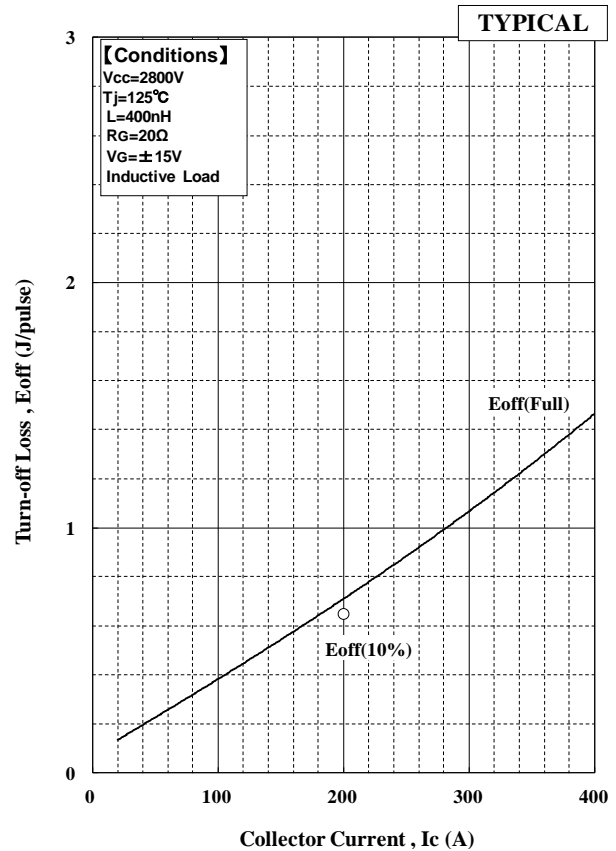
IF vs. VF

MBM200H45E2-H

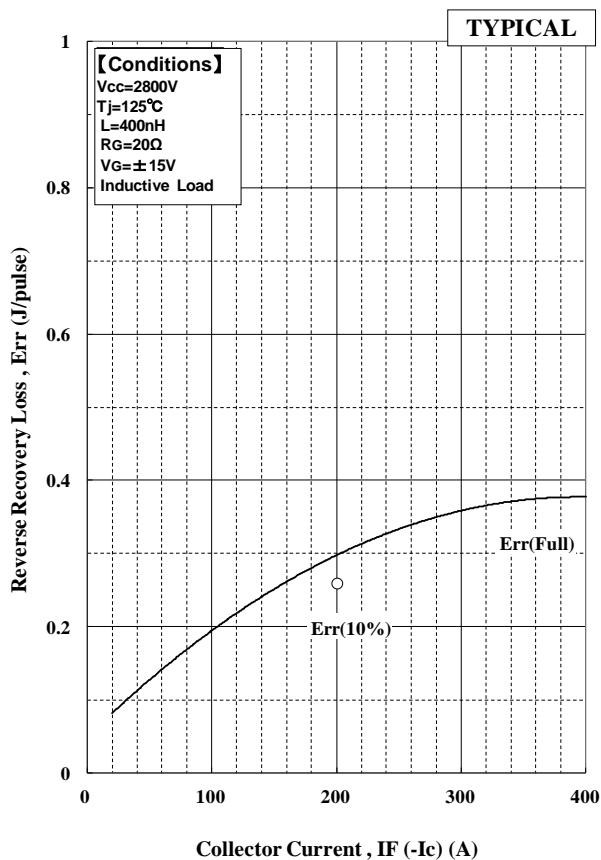
DYNAMIC CHARACTERISTICS



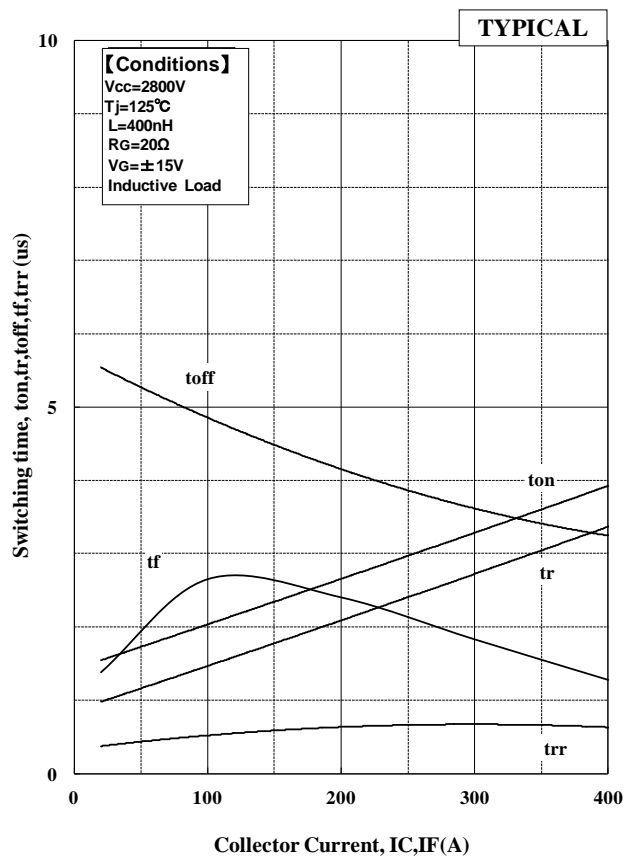
Turn-on loss vs. Collector current



Turn-off loss vs. Collector current



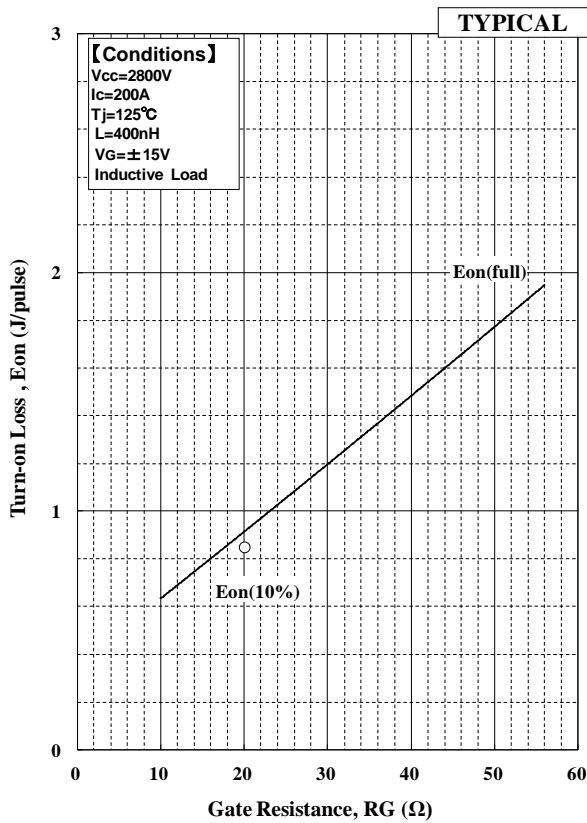
Recovery loss vs. Forward current



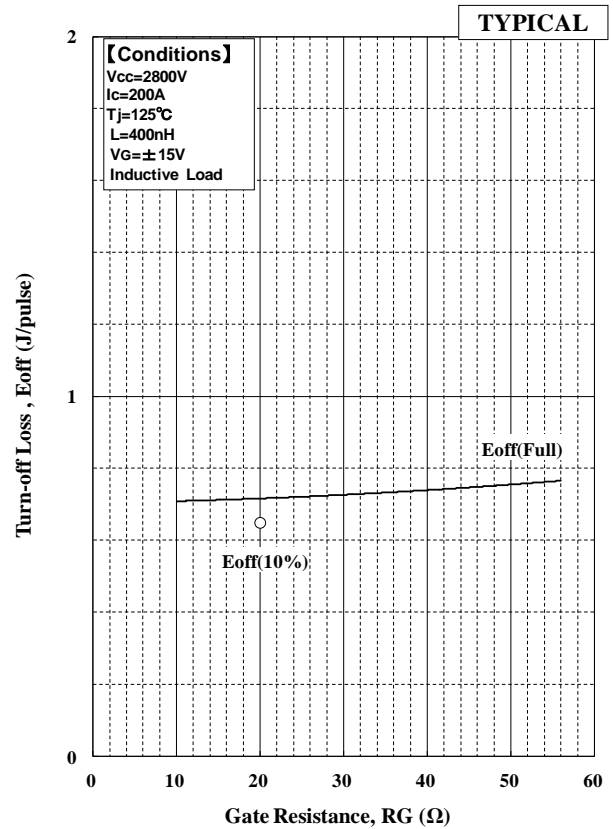
Switching time vs. Collector current

MBM200H45E2-H

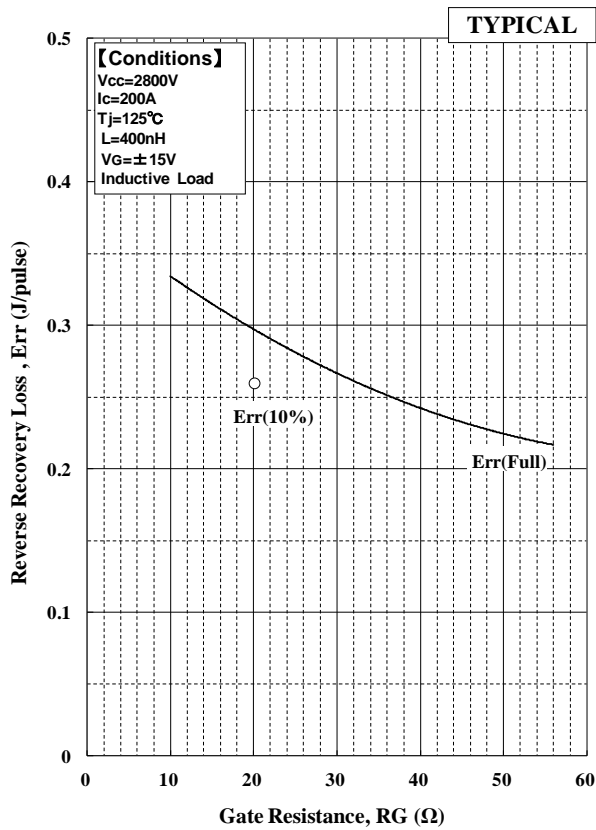
DYNAMIC CHARACTERISTICS



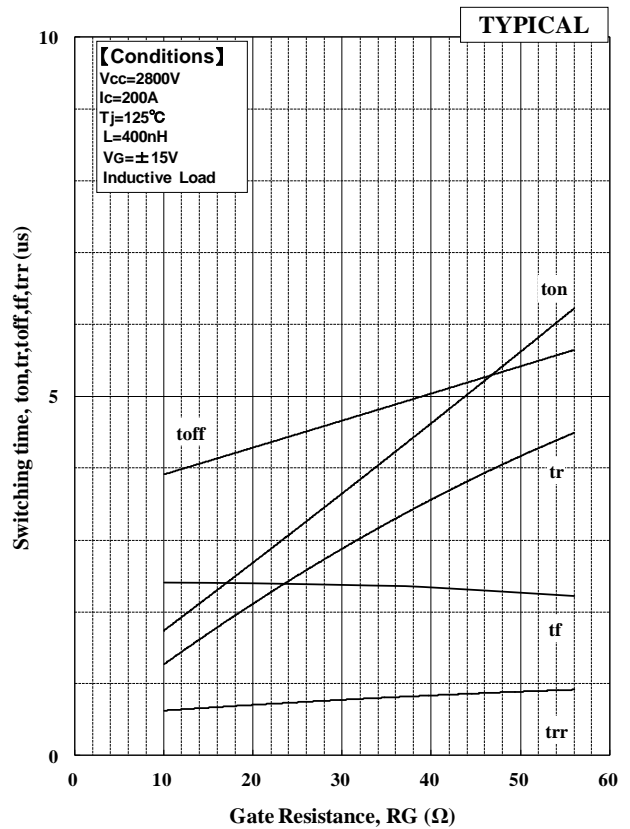
Turn-on loss vs. Gate Resistance



Turn-off loss vs. Gate Resistance

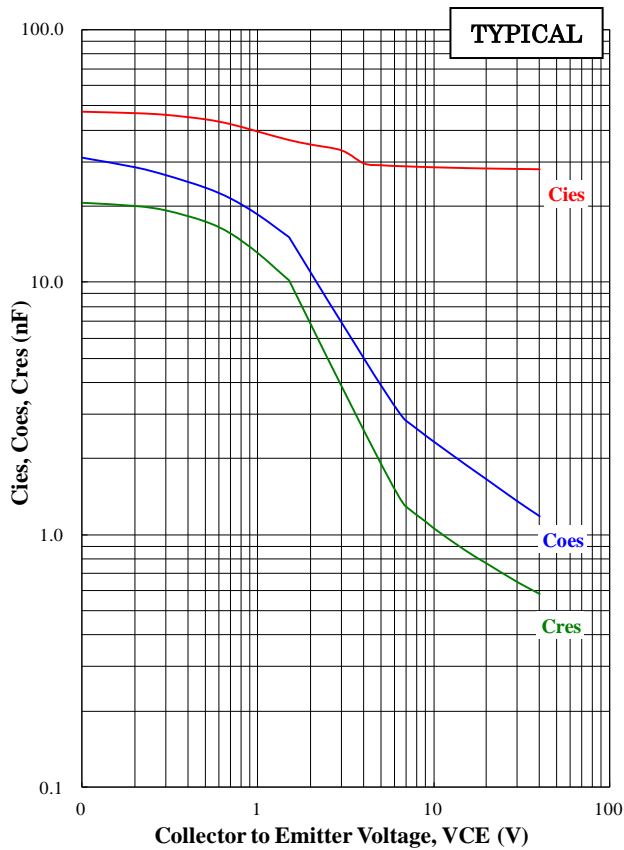


Recovery loss vs. Gate Resistance

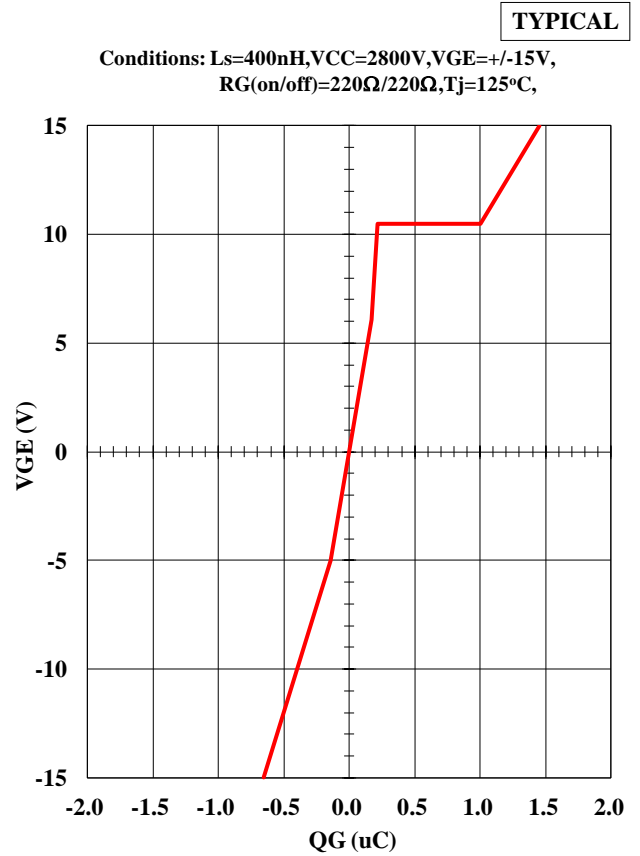


Switching time vs. Gate Resistance

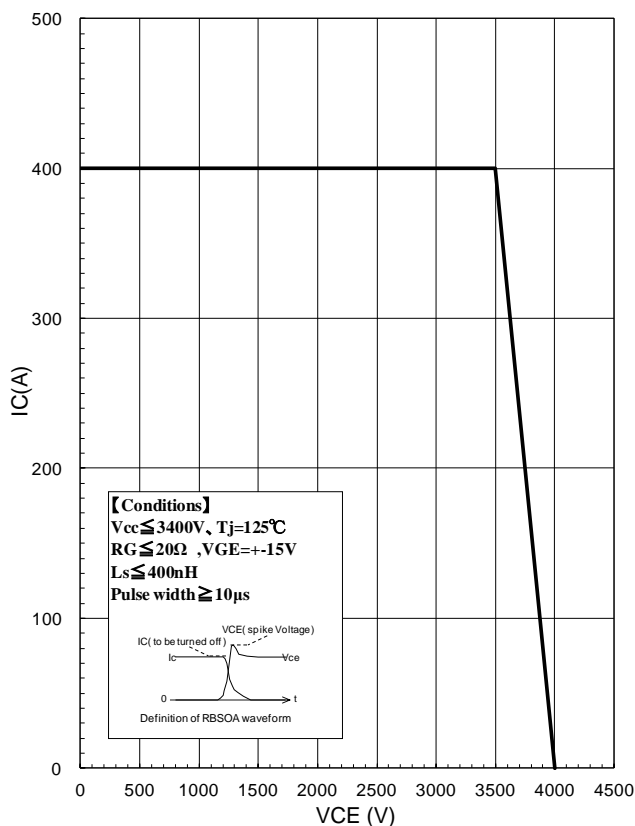
MBM200H45E2-H



Cies, Coes, Cres – VCE

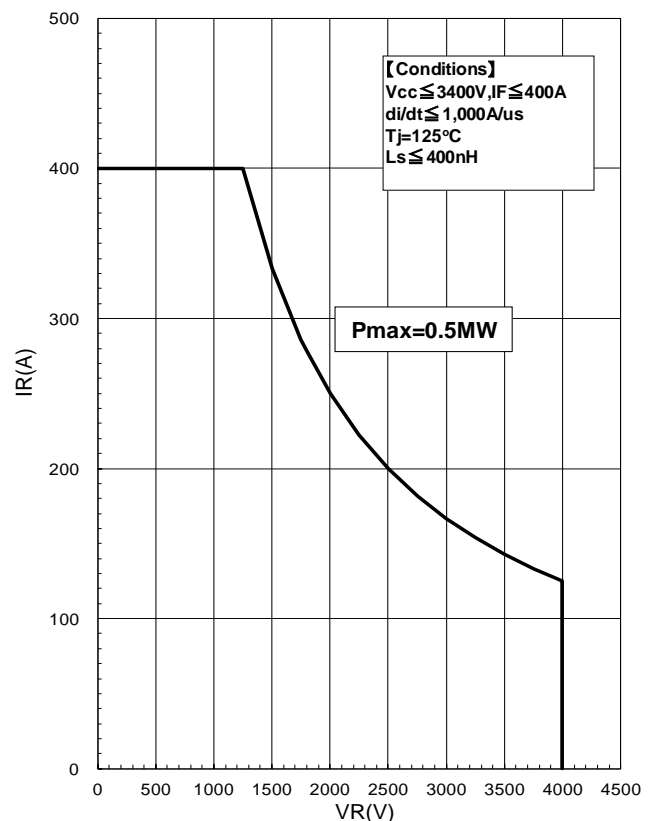


QG-VGE Curve



*Defined at auxiliary terminals

RBSOA



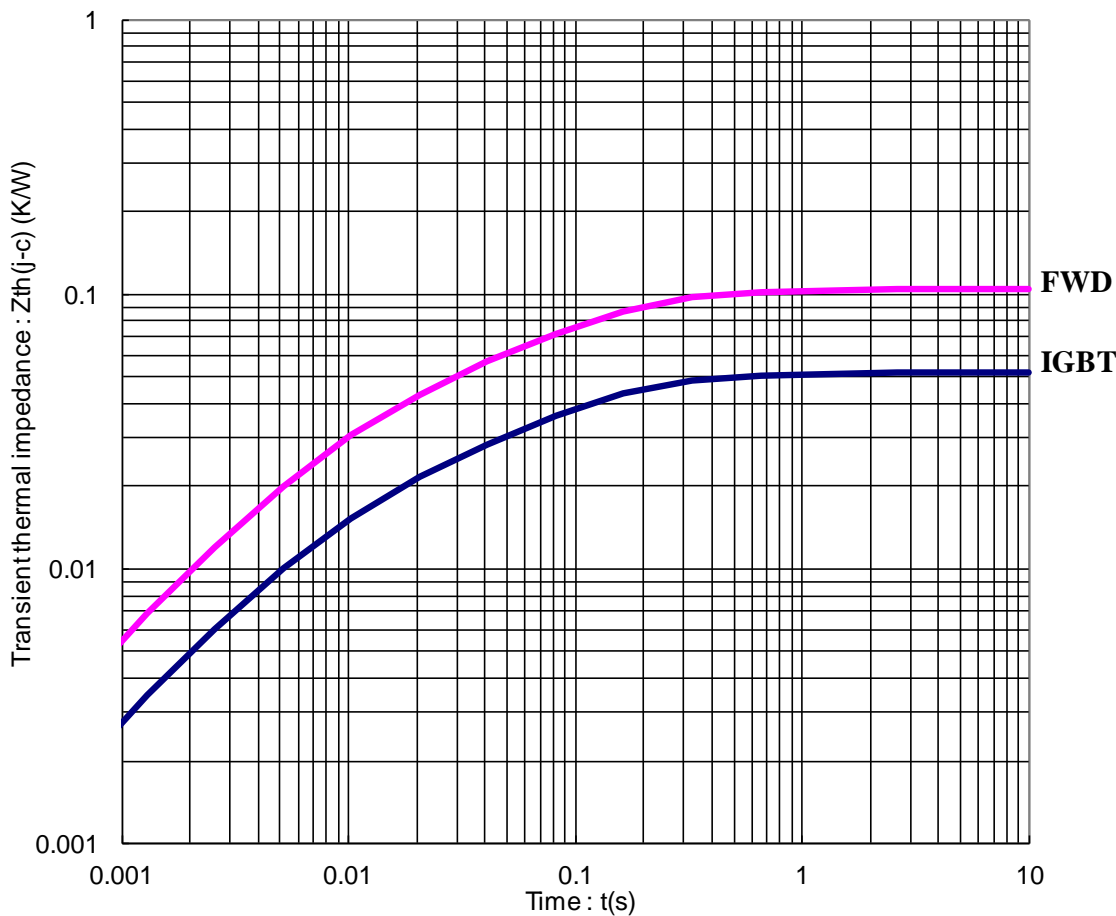
*Defined at auxiliary terminals

RecSOA

MBM200H45E2-H

TRANSIENT THERMAL IMPEDANCE

Maximum



Transient Thermal Impedance Curve

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

n	1	2	3	4	Unit
$\tau_{th}[n]$	1.85E-01	4.11E-02	2.80E-03	1.54E-03	sec
$r_{th}[n,IGBT]$	2.83E-02	1.64E-02	7.28E-03	8.58E-10	K/W
$r_{th}[n,Diode]$	5.55E-02	3.41E-02	1.40E-02	1.00E-04	K/W

Material Declaration

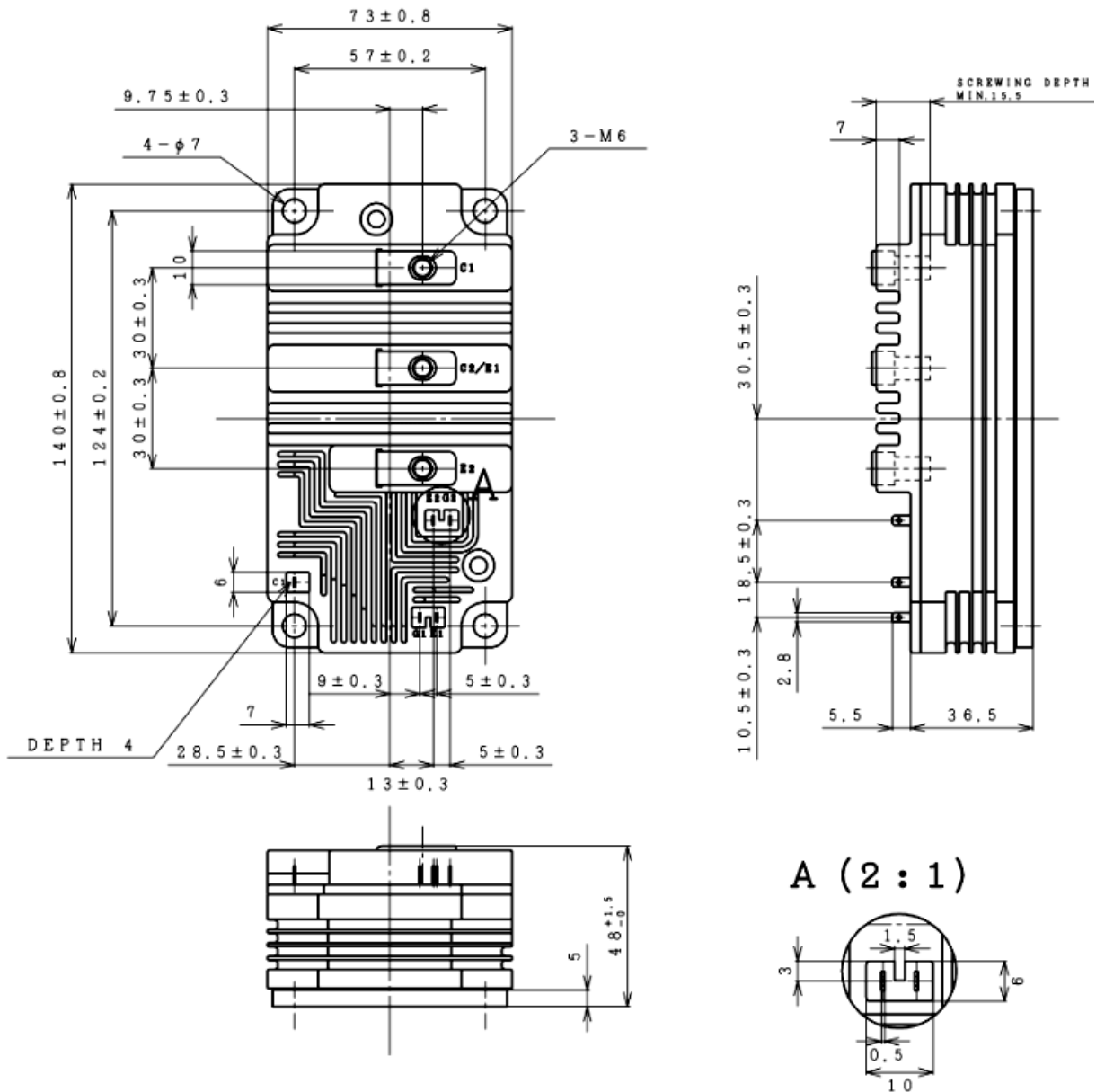
Please note the following material is contained in the product in order to keep product characteristic and reliability level.

Material	Contained part
Lead (Pb) and its compounds	Solder

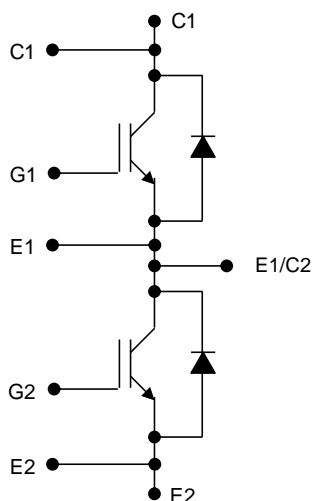
MBM200H45E2-H

Module Outline Drawing

Unit: mm



CIRCUIT DIAGRAM



MBM200H45E2-H

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 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/en/>