MBM200H45E2-H

Preliminary Specification

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 (Tc=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	A	200 (Tc=80°C)
	1ms	I_{Cp}		400
Forward Current	DC	I_F	A	200
	1ms	I_{FM}		400
Peak Forward Surge Current		IFSM	Ap	1500 (Tj=125℃, 50Hz, 10ms Half-sinewave)
Total Power Dissipation		Ptot	W	1,960 (Tc=25℃ per IGBT)
Junction Temperature		T_j	°C	-40 ~ +125
Junction Operating Temperature		Tjop	°C	-40 ~ +125
Case Temperature		Tc	°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)	-	N·m	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	Tj=25°C	V_{CE}=4,500V, V_{GE}=0V
				-	4	16	Tj=125°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	-	3.2	4.5	Tj=25°C	I_C=200A, V_{GE}=15V
				3.5	4.2	4.7	Tj=125°C	
Gate Emitter Threshold Voltage		$V_{GE(TO)}$	V	5.4	6.4	7.4	V_{CE}=10V, I_C=200mA, Tj=25°C	
Gate Charge		Qg	μC	-	2.1	-	V_{CC}=2800V, Ic=200A, V_{GE}=+/-15V	
Input Capacitance		C_{ies}	nF	-	28	-	V_{CE}=10V,V_{GE}=0V, f=100kHz, Tj=25°C	
Output Capacitance		C_{oes}	nF	-	2.3	-		
Reverse transfer capacitance		C_{res}	nF	-	1.1	-		
Internal Gate Resistance		Rge	Ω	-	4.8	-	V_{CE}=10V,V_{GE}=0V, f=100kHz, Tj=25°C	
Switching Times	Rise Time	t_r	μs	-	1.9	-	Tj=25°C	V_{CC}=2,800V, Ic=200A, Ls=400nH, R_G=20Ω (2), V_{GE}=+/-15V
				-	2.1	4.2	Tj=125°C	
	Turn On Time	t_{on}		-	2.4	-	Tj=25°C	
				-	2.7	5.4	Tj=125°C	
	Fall Time	t_f		-	1.8	-	Tj=25°C	
				-	2.4	3.6	Tj=125°C	
	Turn Off Time	t_{off}		-	3.6	-	Tj=25°C	
				-	4.3	6.7	Tj=125°C	
Turn On Loss		$E_{on(full)}$	J/p	-	0.73	-	Tj=25°C	V_{CC}=2800V, Ic=200A, Ls=400nH R_G= 20Ω (2) V_{GE}=+/-15V
		$E_{on(10\%)}$		-	0.85	1.30	Tj=125°C	
		$E_{on(full)}$		-	0.92	-	Tj=125°C	
Turn Off Loss		$E_{off(full)}$	J/ p	-	0.60	-	Tj=25°C	
		$E_{off(10\%)}$			0.65	1.00	Tj=125°C	
		$E_{off(full)}$		-	0.73	-	Tj=125°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.

* 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

Preliminary Specification

ELECTRICAL CHARACTERISTICS (DIODE)

Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions	
Peak Forward Voltage Drop	V_{FM}	V	-	3.6	4.15	Tj=25°C	IF=200A, V_{GE}=0V
			3.2	3.9	4.7	Tj=125°C	
Reverse Recovery Time	t_{rr}	μs	-	0.5	-	Tj=25°C	Vcc=2800V, IF=200A, Ls=400nH R_G= 20Ω
			-	0.7	1.4	Tj=125°C	
Reverse Recovery Current	I_{rr}	A	-	230	-	Tj=25°C	
			-	250	-	Tj=125°C	
Recovery charge	Qrr	μC	-	100	-	Tj=25°C	
			-	170	-	Tj=125°C	
Reverse Recovery Loss	$E_{rr(full)}$	J/ p	-	0.16	-	Tj=25°C	V_{CC}=2800V,IF=200A, Ls=400nH, R_G= 20Ω (3)
	$E_{rr(10\%)}$		-	0.26	0.50	Tj=125°C	
	$E_{rr(full)}$		-	0.29	-	Tj=125°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	Rth(j-c)	K/W	-	-	0.052	Junction to case
	FWD	Rth(j-c)		-	-	0.104	
Contact Thermal Impedance		Rth(c-f)	K/W	-	0.032	-	Case to fin (λgrease=1W/(m·K), heat-sink flatness ≤50um)

MODULE MECHANICAL CHARACTERISTICS

Item		Unit	Characteristics	Conditions
Weight		g	840	
Creepage Distance	Between terminal	mm	54	Collector-sense to Emitter-main
	Terminal-Base	mm	64	
Clearance Distance	Between terminal	mm	19	Collector-sense to Emitter-main
	Terminal-Base	mm	35	
Stray inductance in module	LS(CM-EM)	nH	140	Between C1- E2
Resistance, Terminal-chip	$R_{CC'+EE'}$	mΩ	1.5	Terminal to chip
Comparative Tracking Index (CTI)			600	
Module base plate Material			Cu	
Baseplate Thickness		mm	5	
Insulation plate Material			Al N	
Terminal Surface treatment			Ni plating	
Case Material			Poly-Phenilene Sulfide	

MBM200H45E2-H

Preliminary Specification

DEFINITION OF TEST CIRCUIT

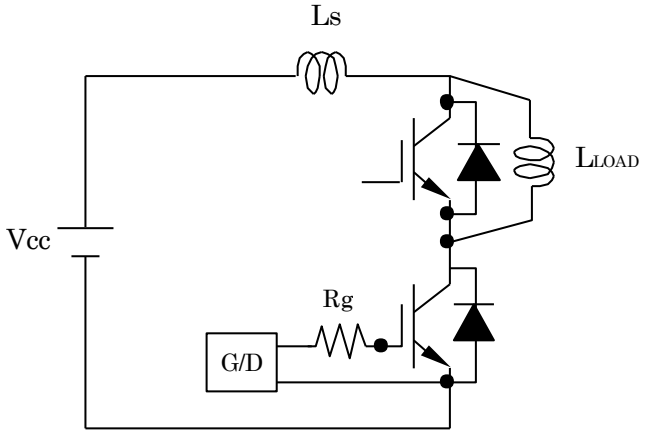
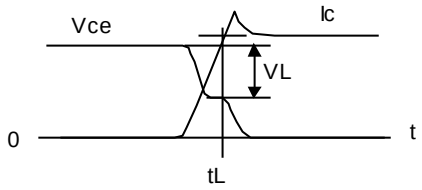
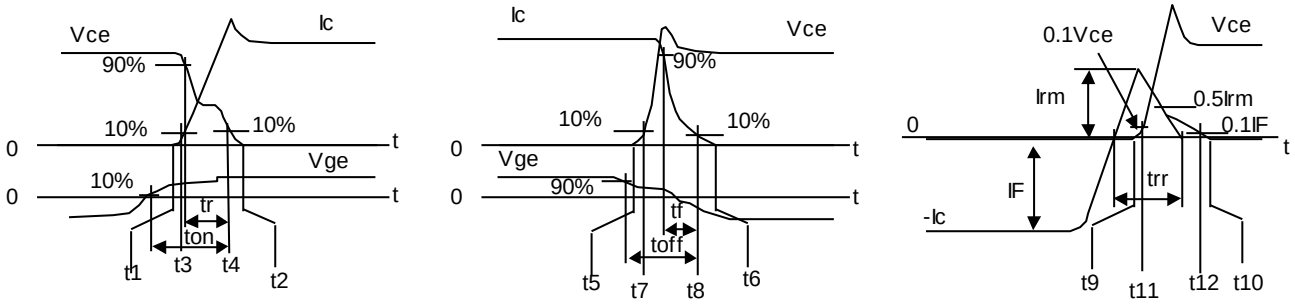


Fig.1 Switching test circuit



$$Ls = \frac{VL}{\left(\frac{dIc}{dt}\right)_{t=tL}}$$

Fig.2 Definition of Ls



$$Eon(10\%) = \int_{t3}^{t4} Ic \cdot Vce \, dt \qquad Eoff(10\%) = \int_{t7}^{t8} Ic \cdot Vce \, dt \qquad Err(10\%) = \int_{t11}^{t12} IF \cdot Vce \, dt$$

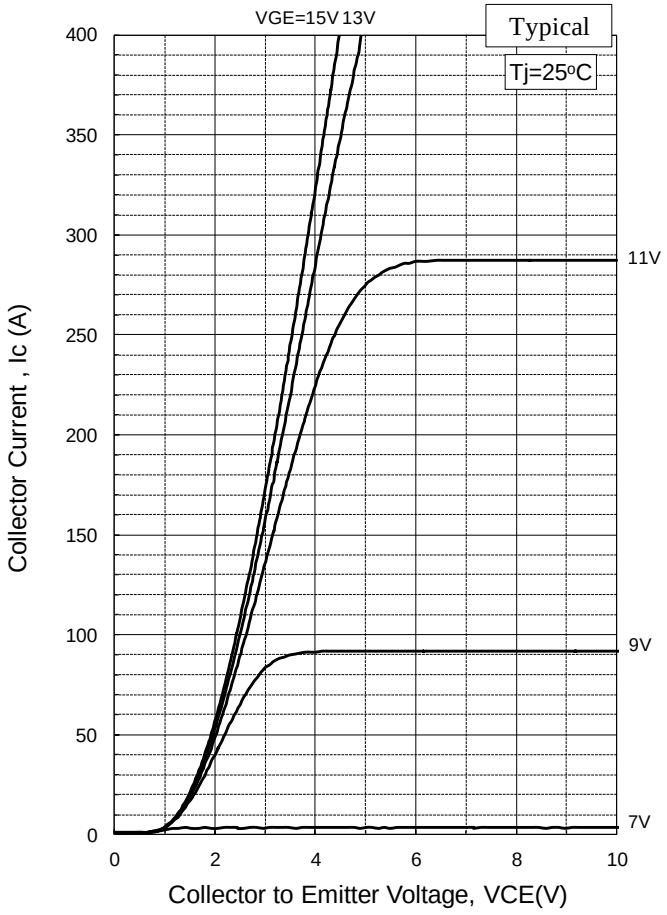
$$Eon(Full) = \int_{t1}^{t2} Ic \cdot Vce \, dt \qquad Eoff(Full) = \int_{t5}^{t6} Ic \cdot Vce \, dt \qquad Err(Full) = \int_{t9}^{t10} IF \cdot Vce \, dt$$

Fig.3 Definition of switching loss

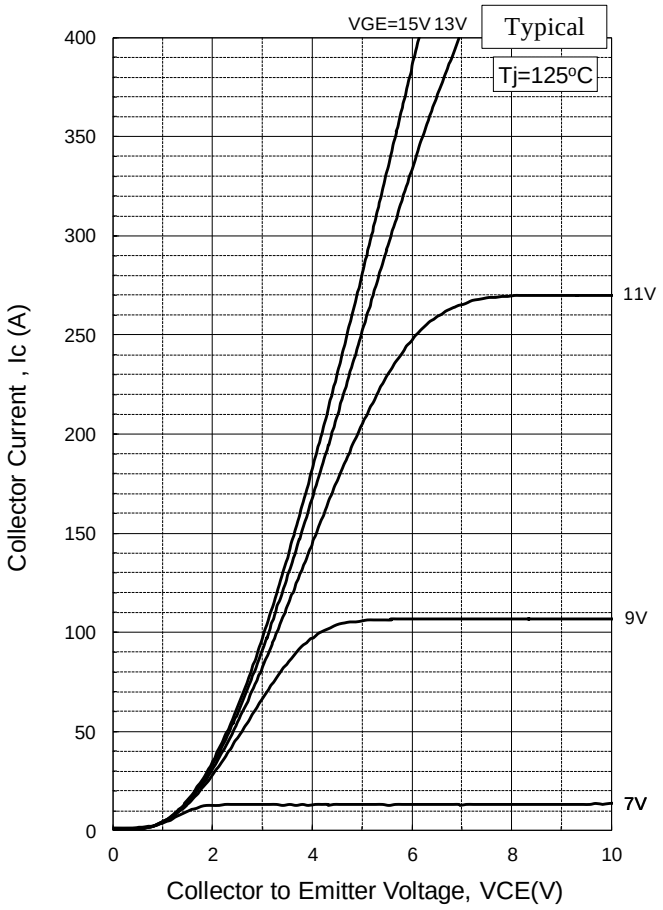
MBM200H45E2-H

Preliminary Specification

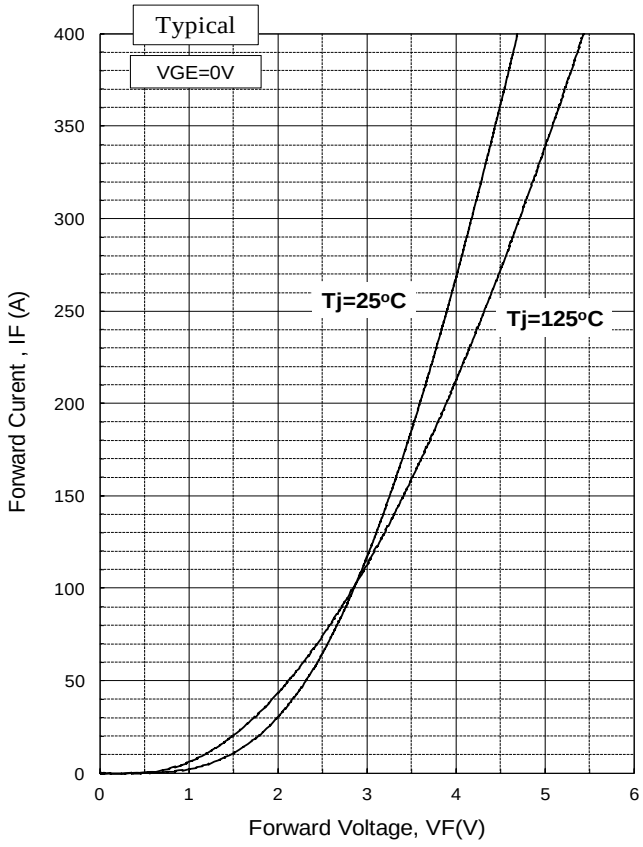
STATIC CHARACTERISTICS



Ic vs. VCE(Tj=25°C)



Ic vs. VCE(Tj=125°C)

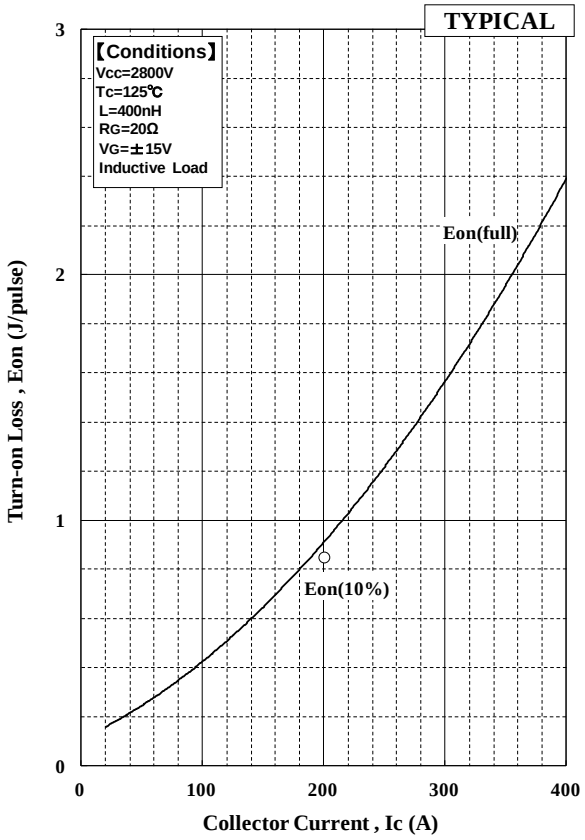


IF vs. VF

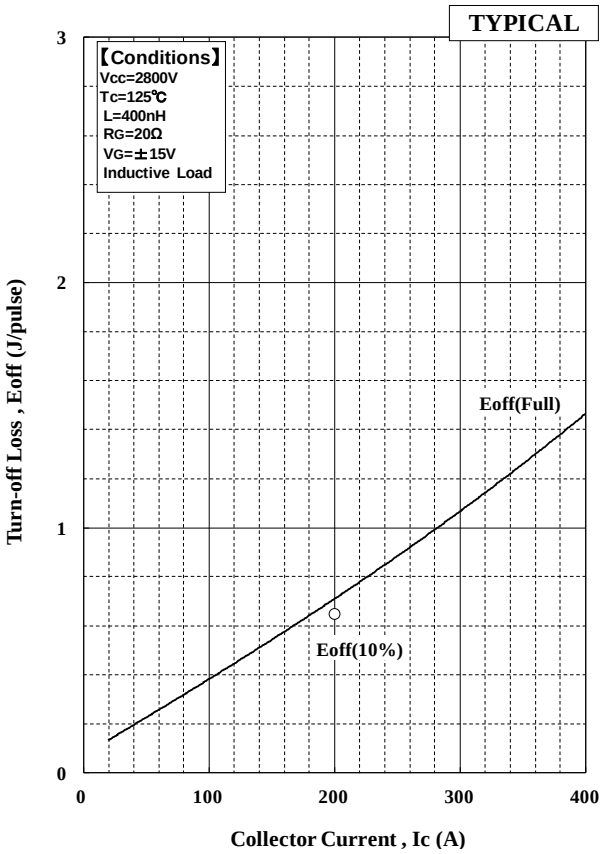
MBM200H45E2-H

Preliminary Specification

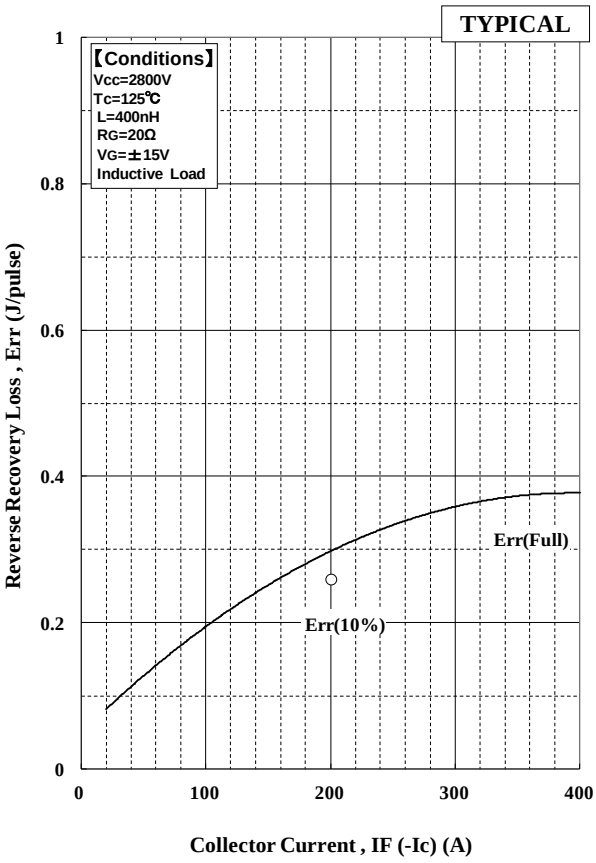
DYNAMIC CHARACTERISTICS



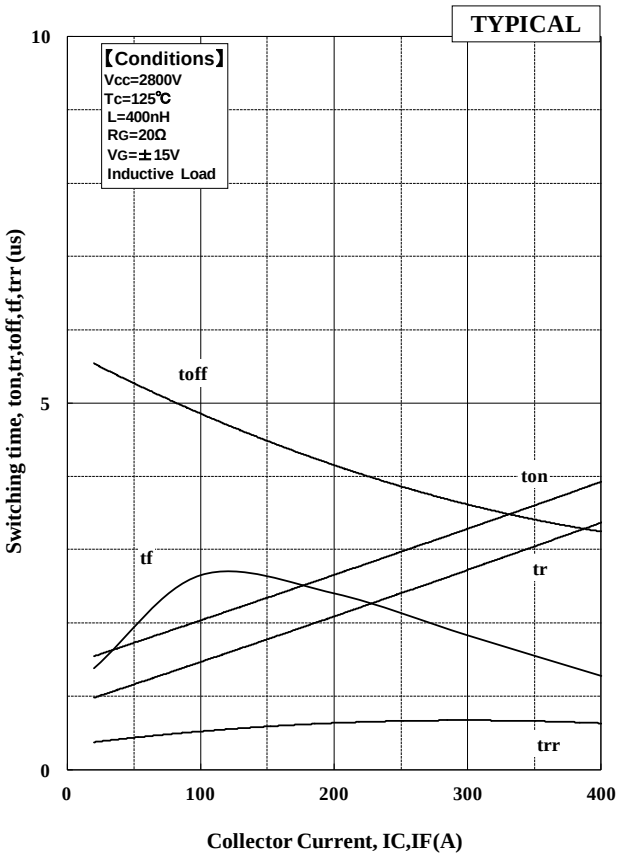
Turn-on loss vs. Collector current



Turn-off loss vs. Collector current



Recovery loss vs. Forward current

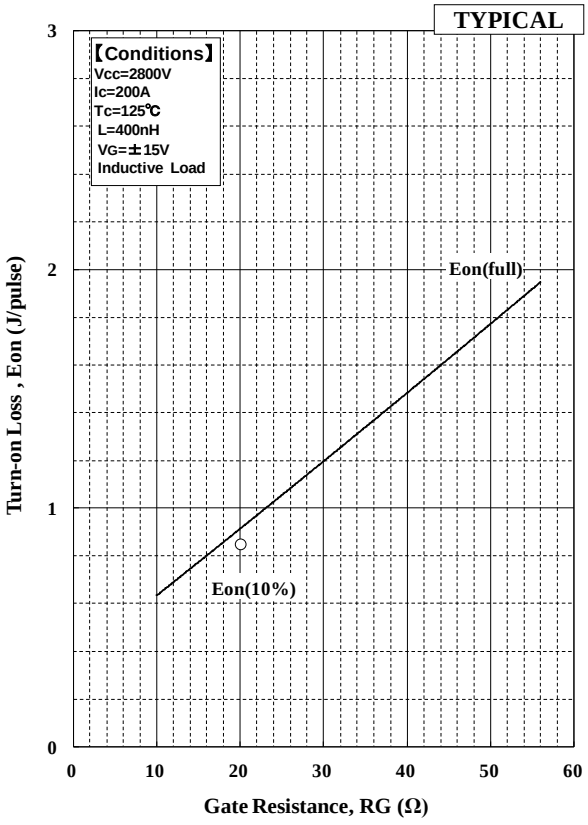


Switching time vs. Collector current

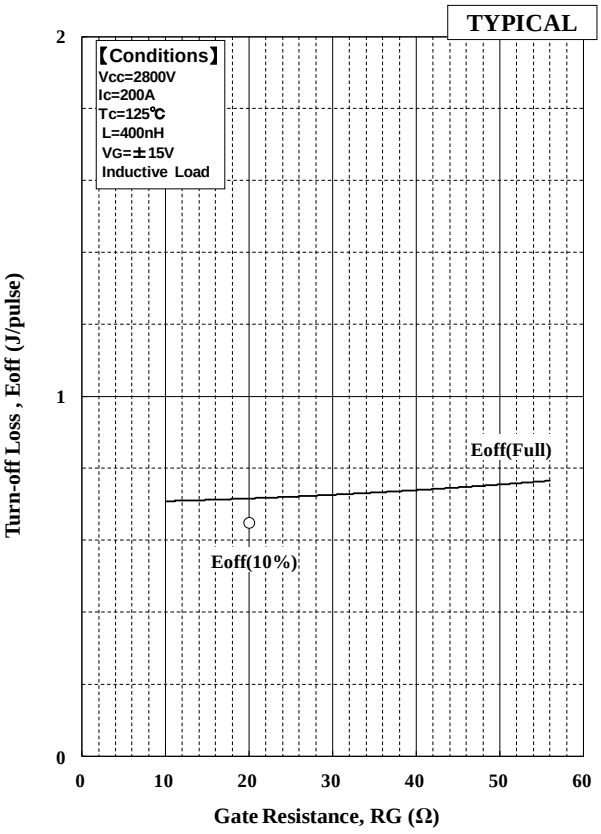
MBM200H45E2-H

Preliminary Specification

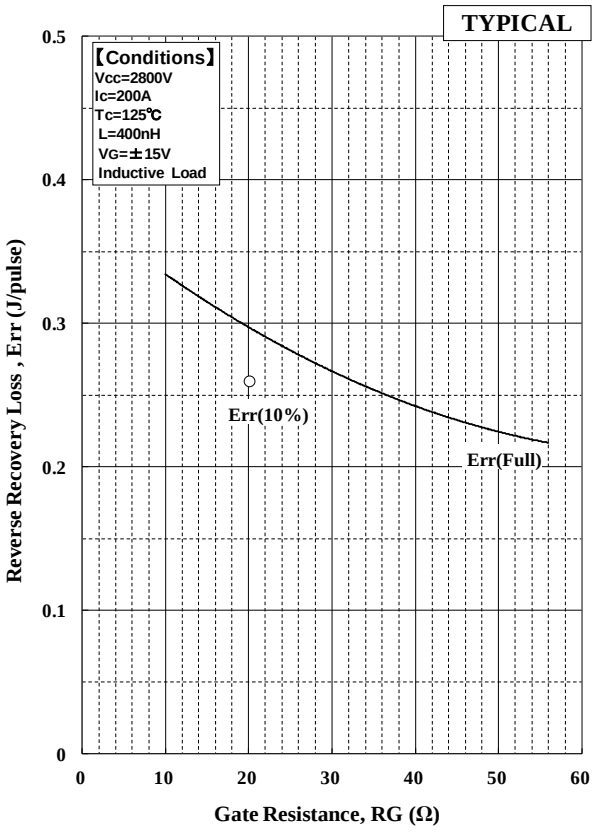
DYNAMIC CHARACTERISTICS



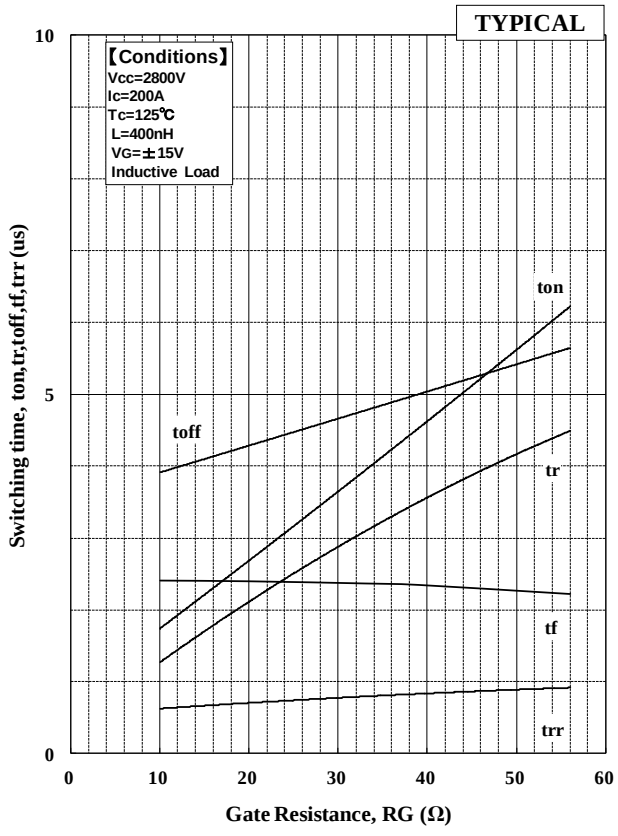
Turn-on loss vs. Gate Resistance



Turn-off loss vs. Gate Resistance



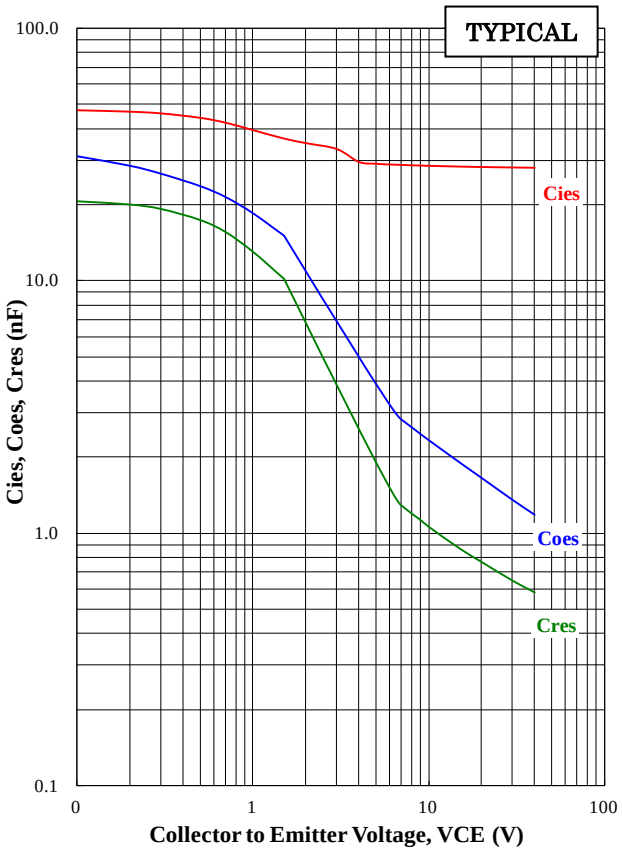
Recovery loss vs. Gate Resistance



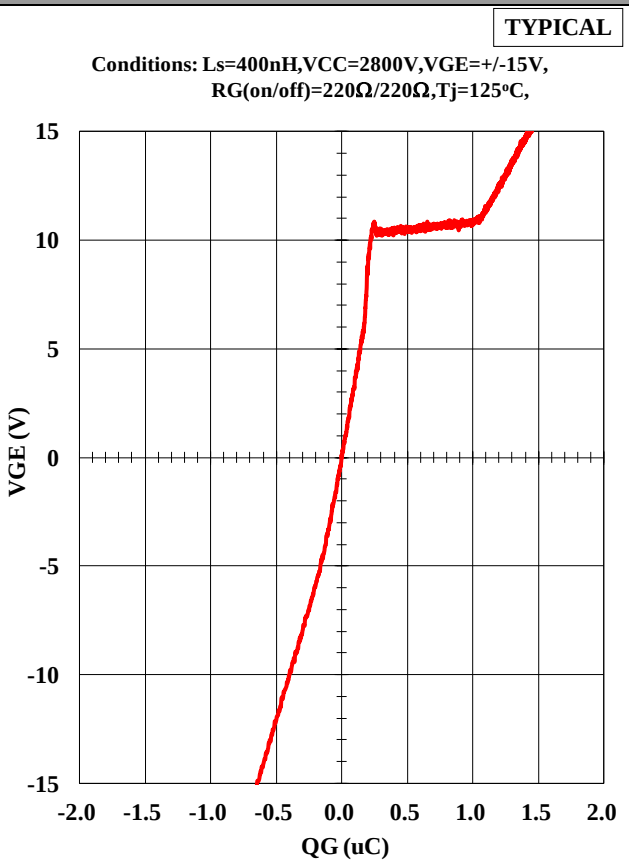
Switching time vs. Gate Resistance

MBM200H45E2-H

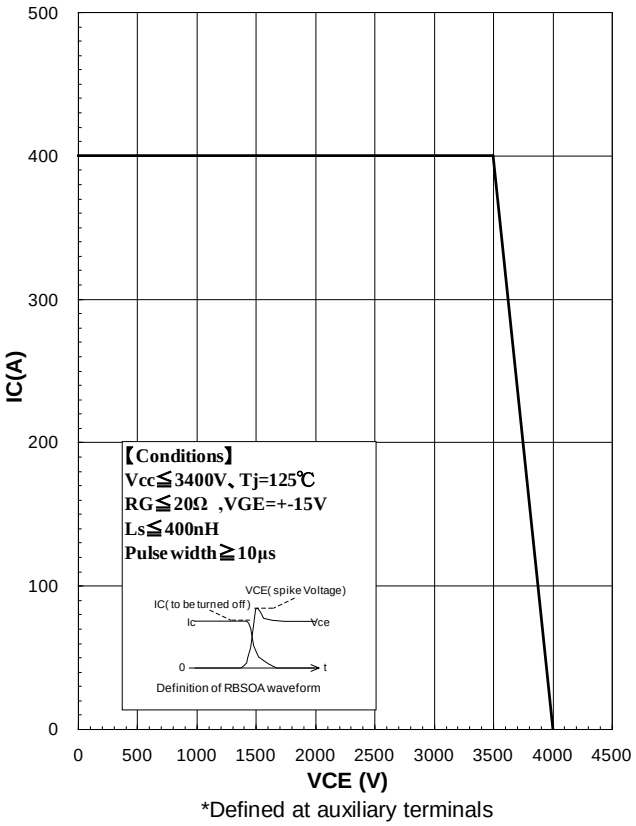
Preliminary Specification



Cies, Coes, Cres – VCE

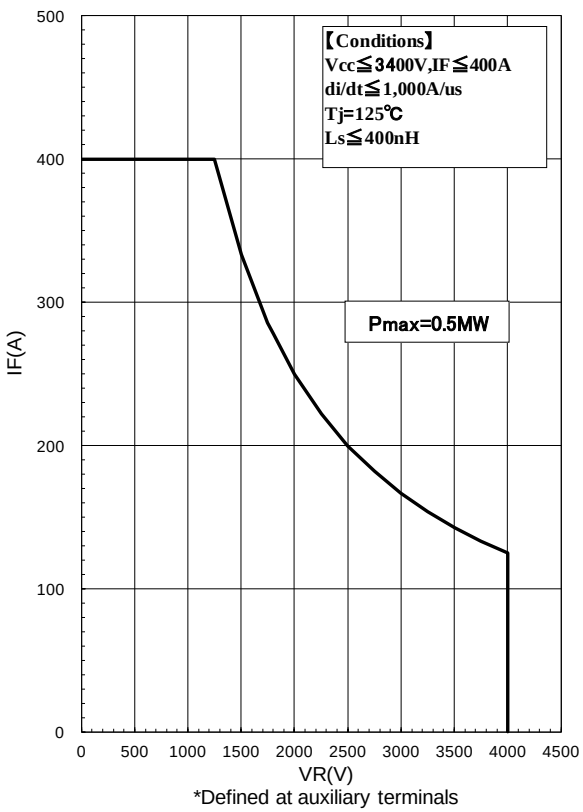


QG-VGE Curve



*Defined at auxiliary terminals

RBSOA



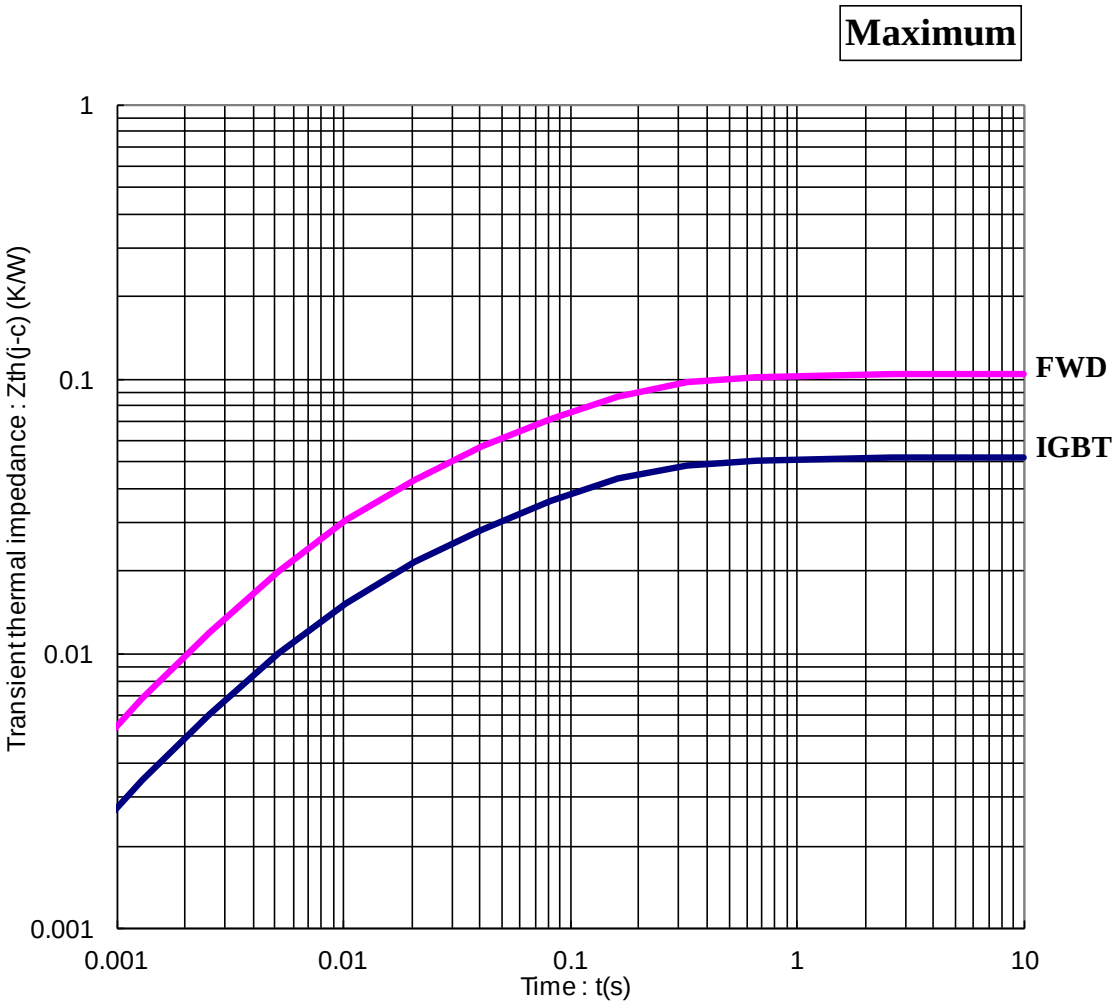
*Defined at auxiliary terminals

ReCSOA

MBM200H45E2-H

Preliminary Specification

TRANSIENT THERMAL IMPEDANCE



Transient Thermal Impedance Curve

Material Declaration

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

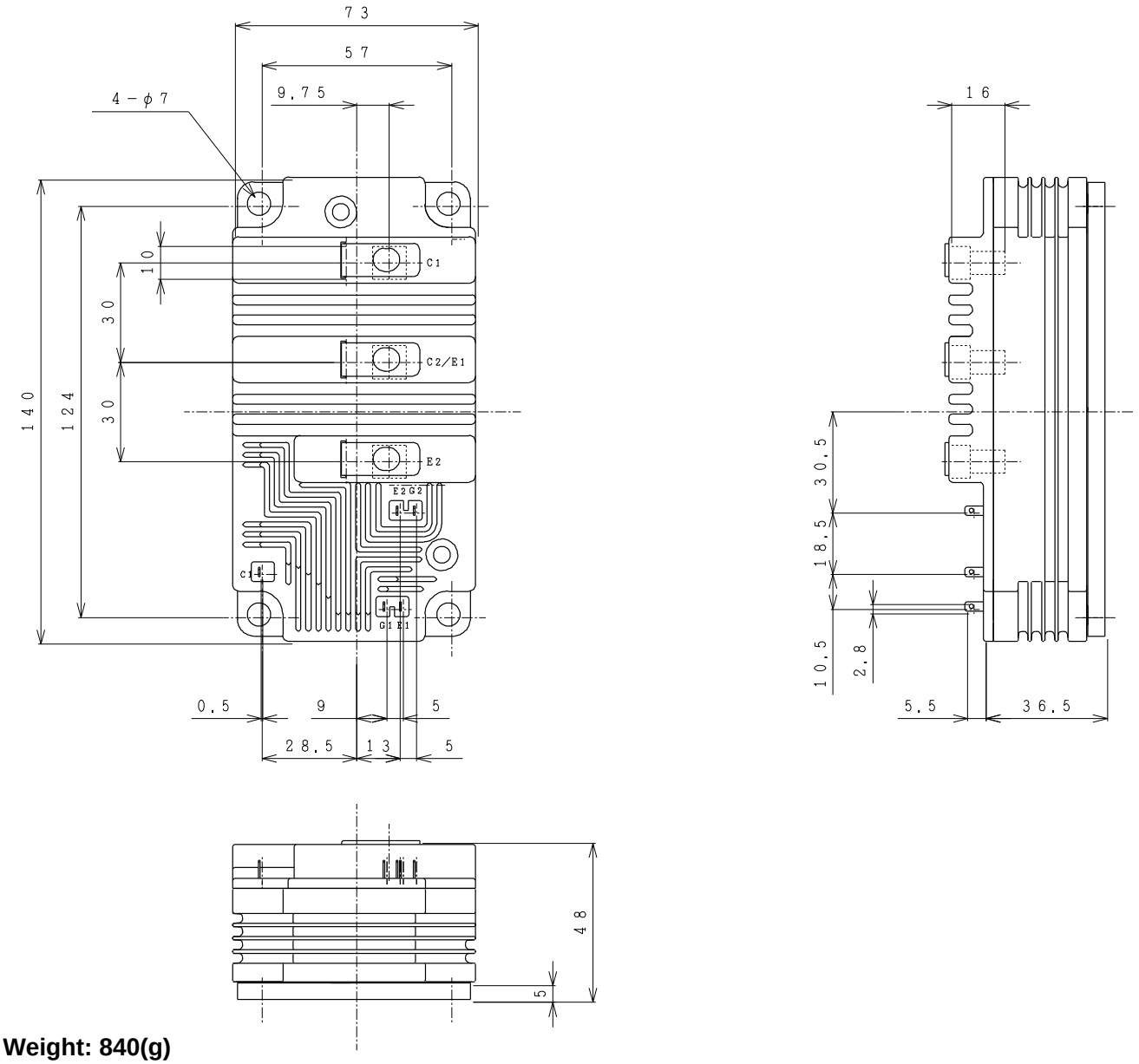
Material	Contained part
Lead (Pb) and its compounds	Solder

MBM200H45E2-H

Preliminary Specification

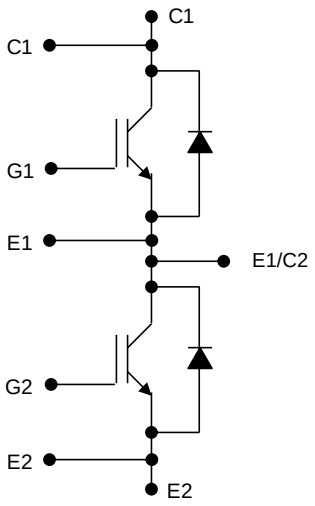
Module Outline Drawing

Unit: mm



Weight: 840(g)

CIRCUIT DIAGRAM



MBM200H45E2-H

Preliminary Specification

HITACHI POWER SEMICONDUCTORS

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