

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	I _{FSM}	A _p	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	
Turn On Loss	E _{on} (full)	J/p	-	0.73	-	T _j =25°C
			-	0.85	1.30	T _j =125°C
			-	0.92	-	T _j =125°C
Turn Off Loss	E _{off} (full)	J/p	-	0.60	-	T _j =25°C
			-	0.65	1.00	T _j =125°C
			-	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.

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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	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	$LS(\text{CM-EM})$	nH	140	Between C1- E2
Resistance, Terminal-chip	$R_{CC'+EE'}$	$\text{m}\Omega$	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	

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DEFINITION OF TEST CIRCUIT

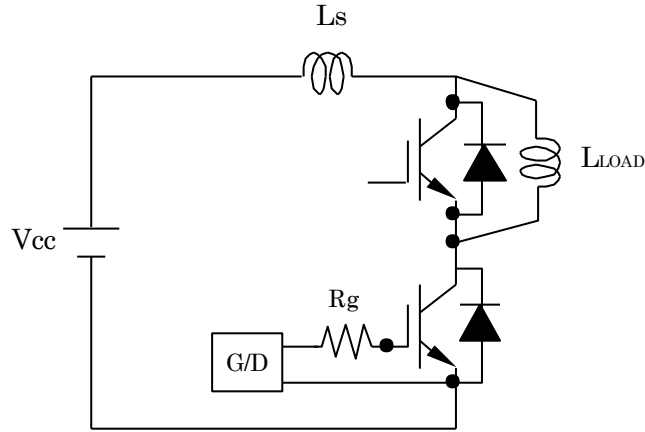


Fig.1 Switching test circuit

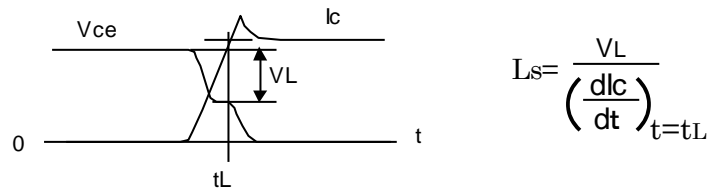


Fig.2 Definition of Ls

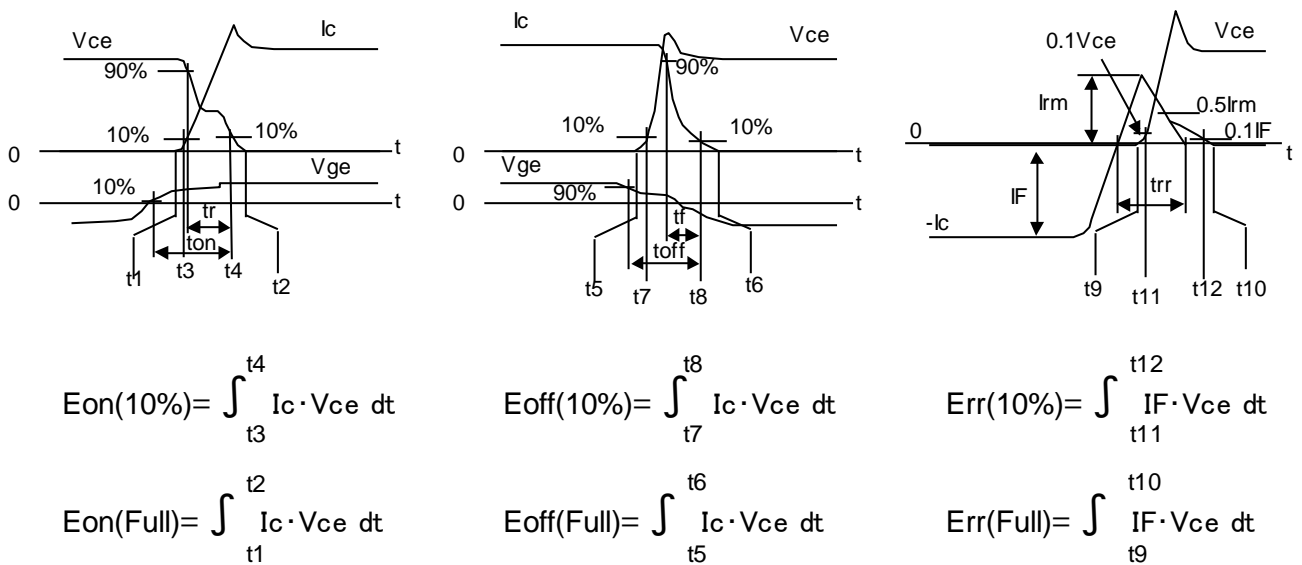
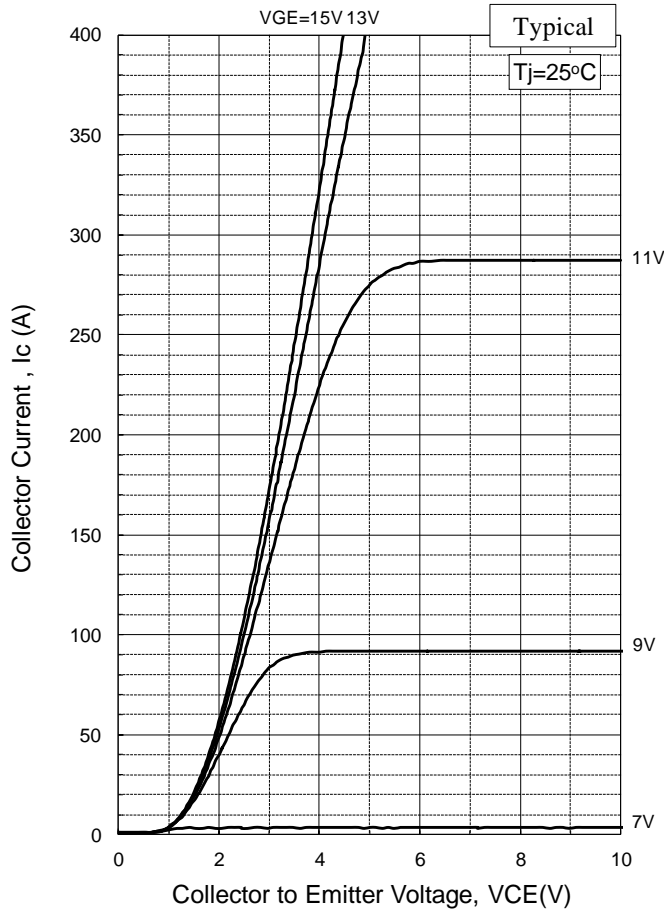


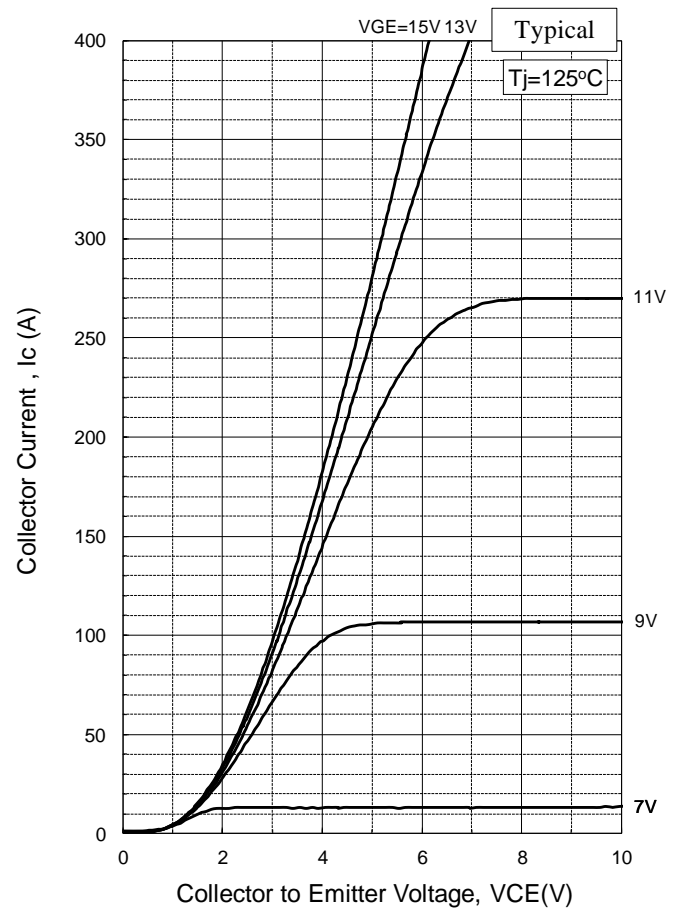
Fig.3 Definition of switching loss

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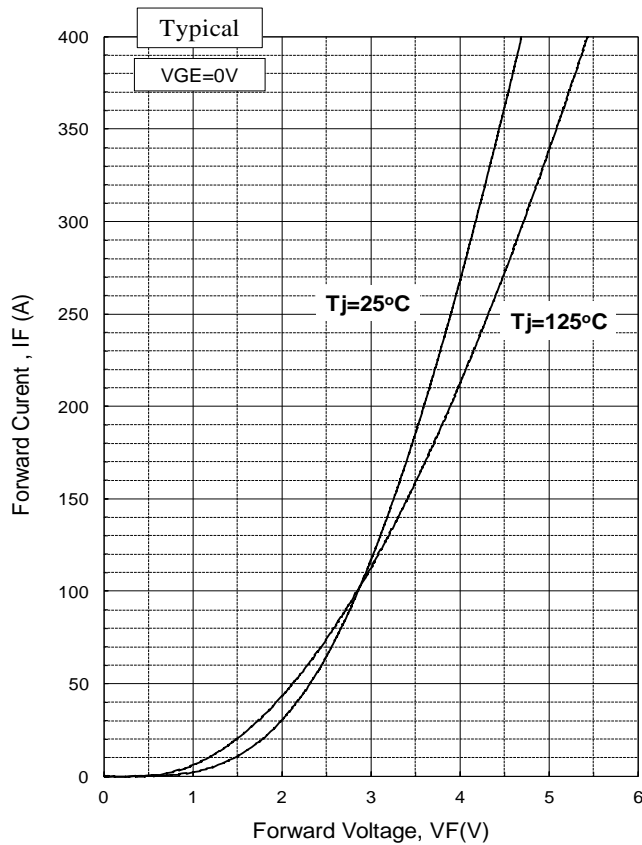
STATIC CHARACTERISTICS



Ic vs. VCE(Tj=25°C)



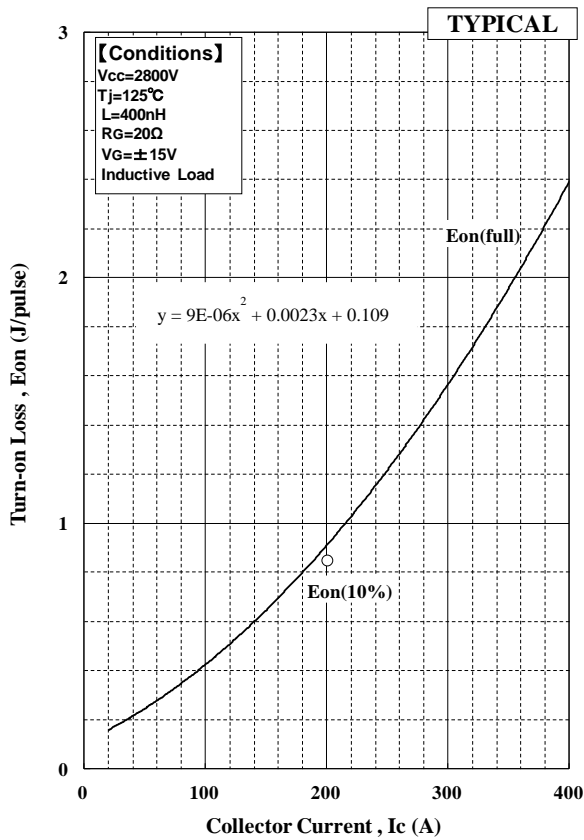
Ic vs. VCE(Tj=125°C)



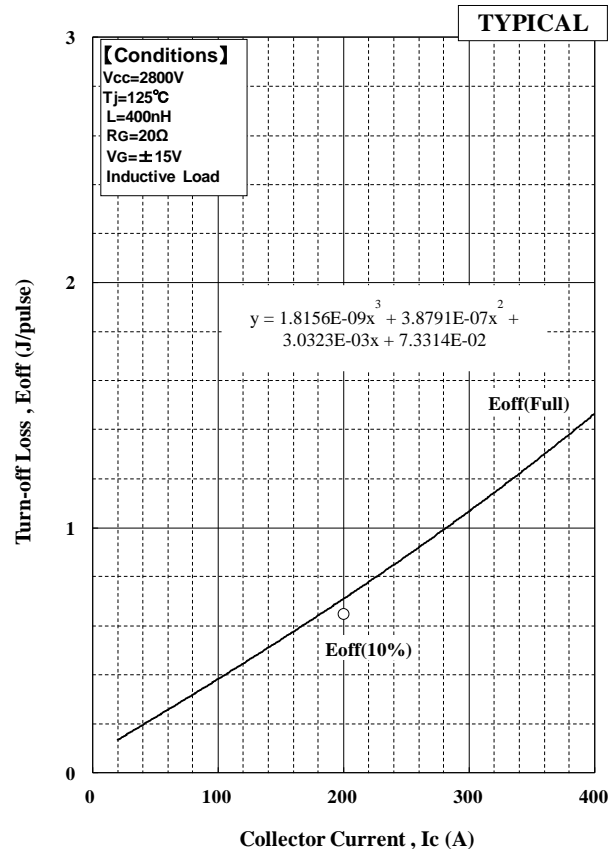
IF vs. VF

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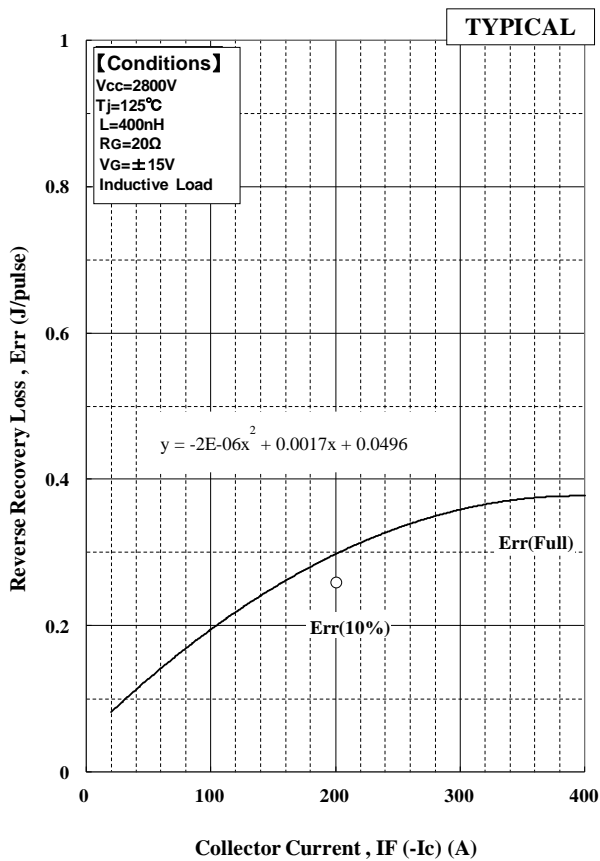
DYNAMIC CHARACTERISTICS



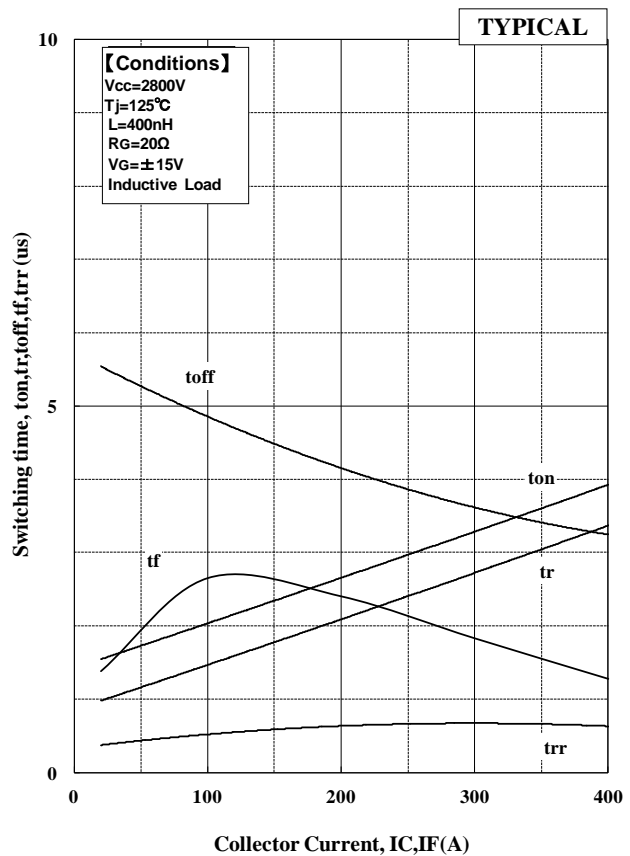
Turn-on loss vs. Collector current



Turn-off loss vs. Collector current



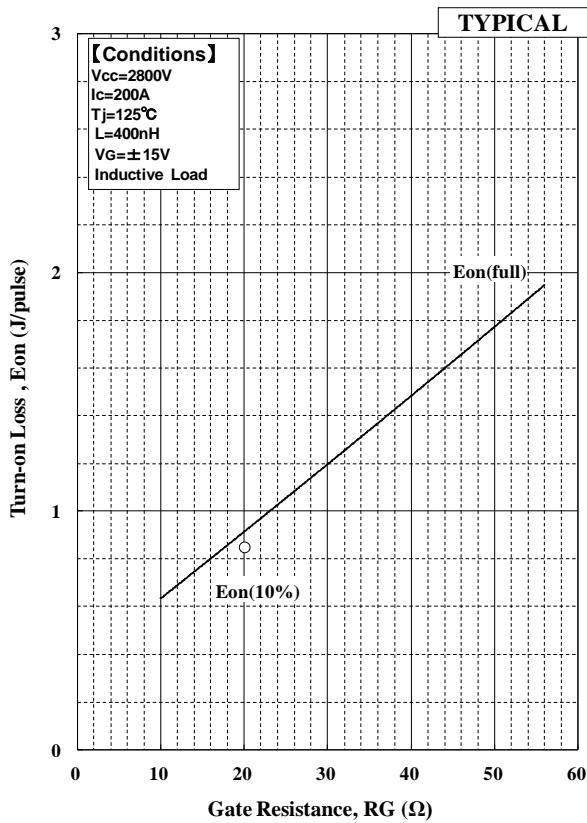
Recovery loss vs. Forward current



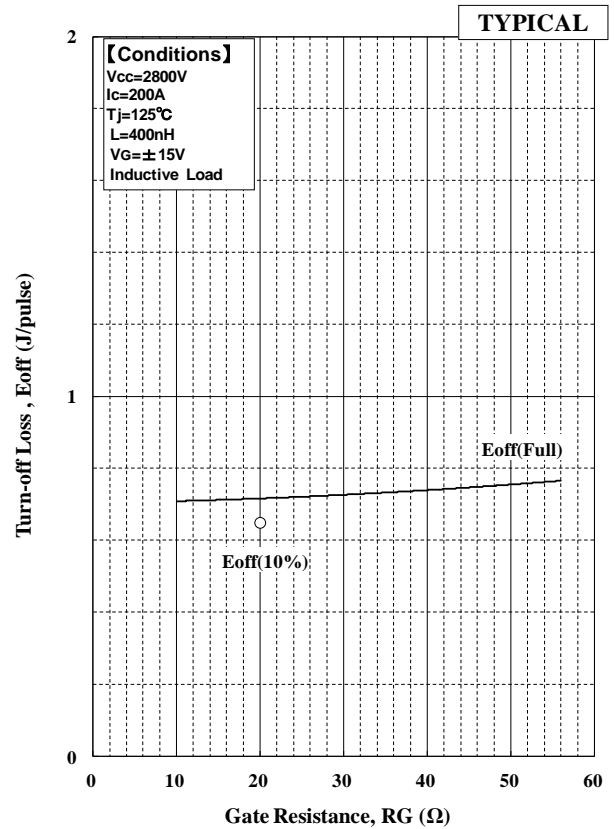
Switching time vs. Collector current

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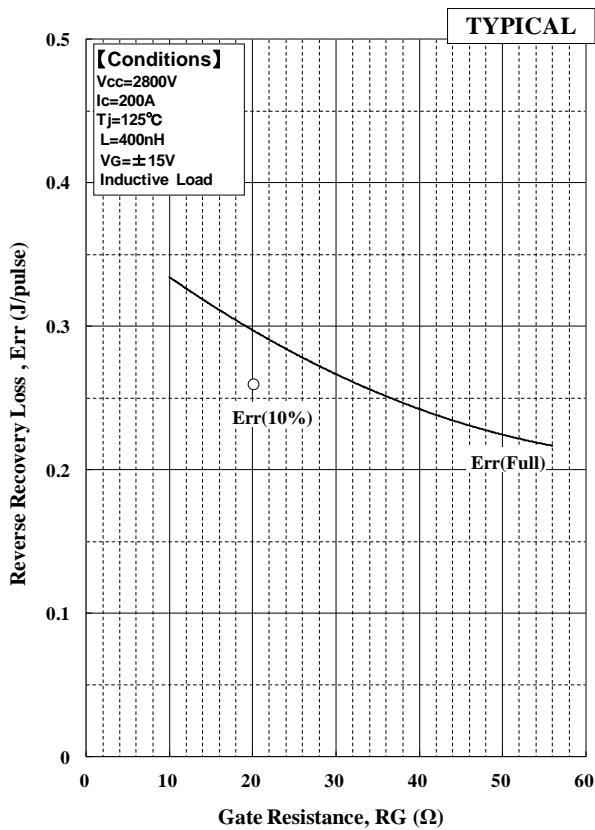
DYNAMIC CHARACTERISTICS



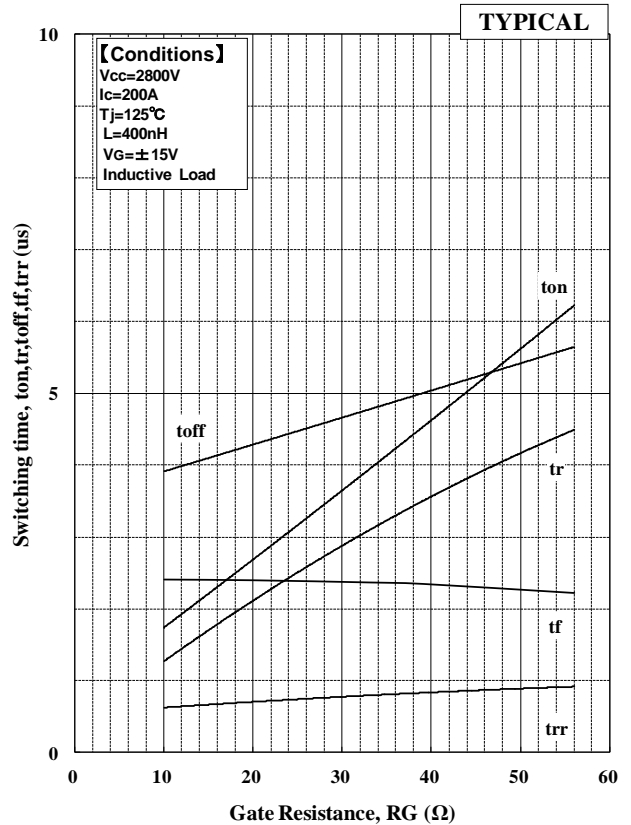
Turn-on loss vs. Gate Resistance



Turn-off loss vs. Gate Resistance

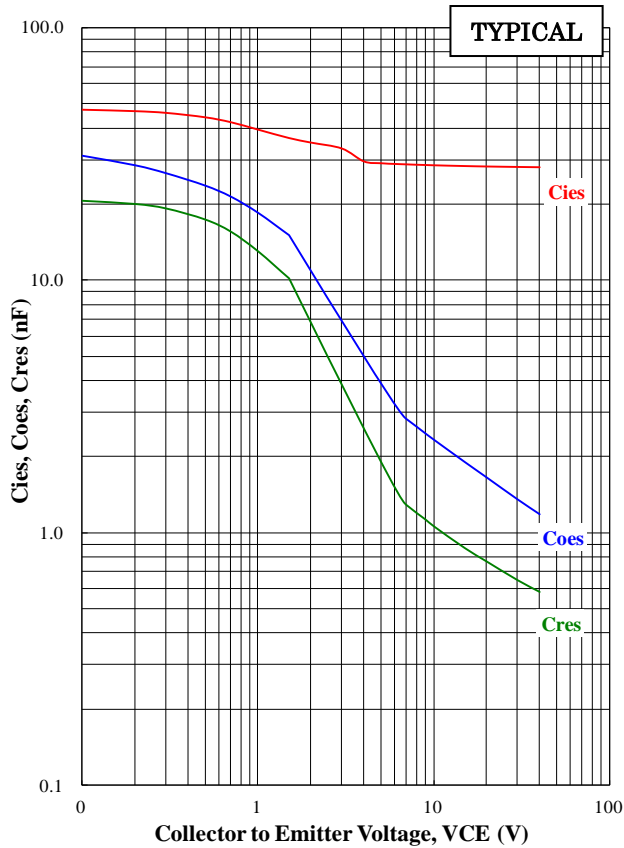


Recovery loss vs. Gate Resistance

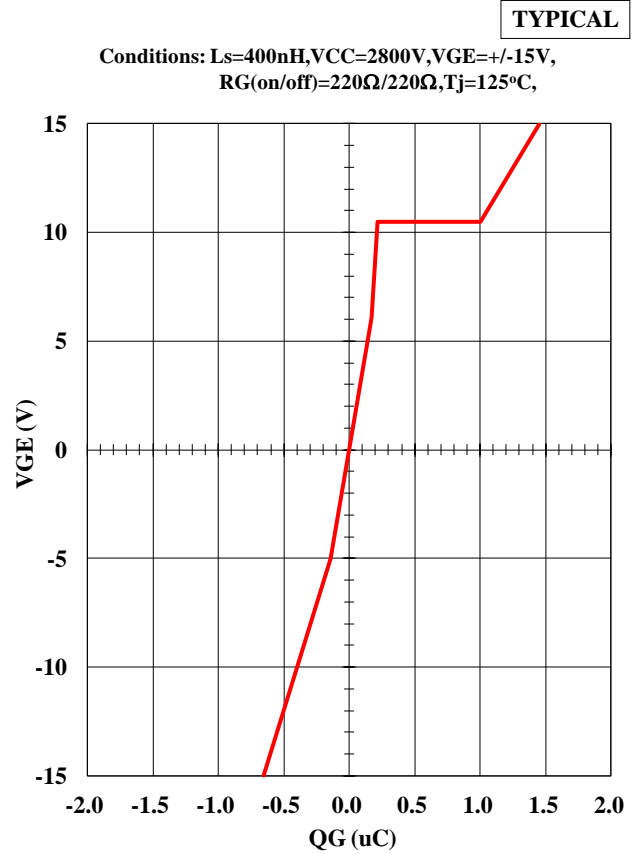


Switching time vs. Gate Resistance

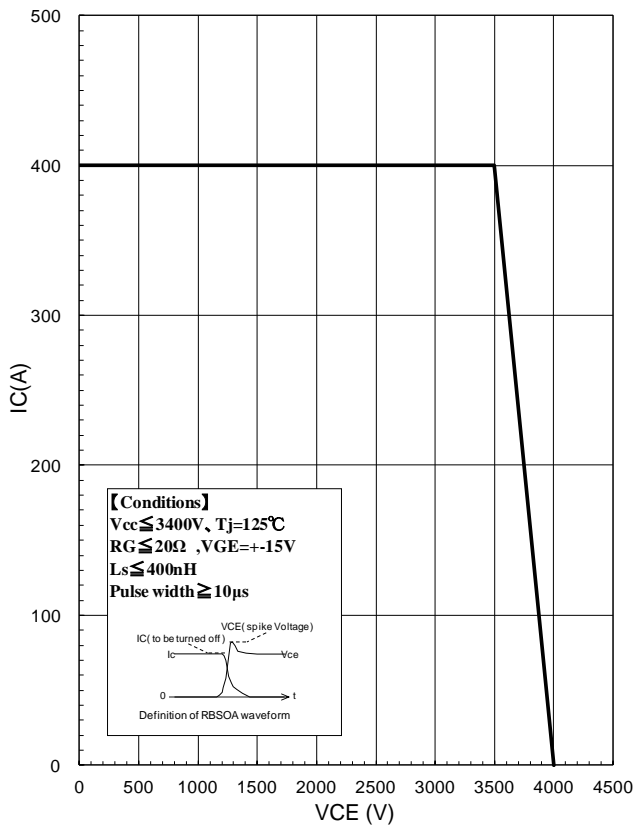
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Cies, Coes, Cres – VCE

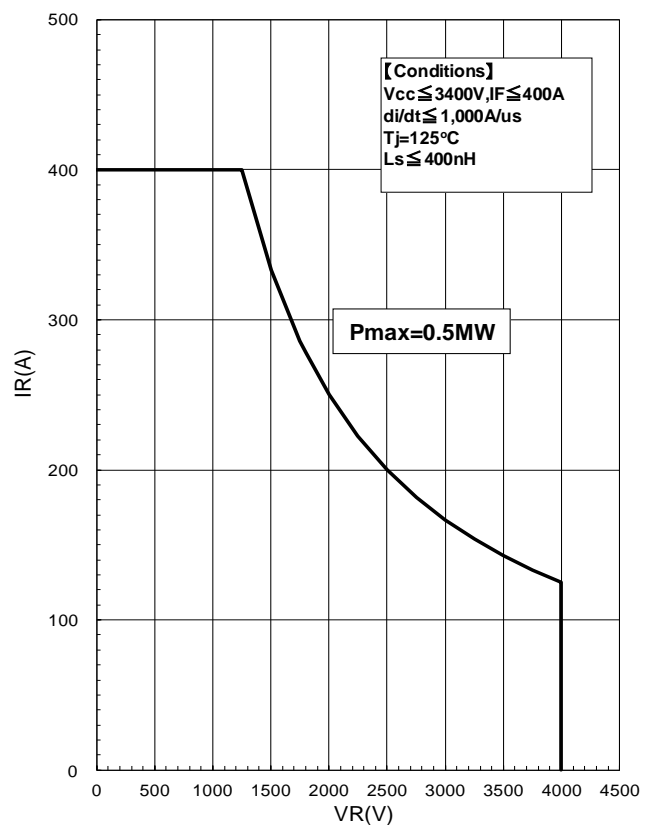


QG-VGE Curve



*Defined at auxiliary terminals

RBSOA



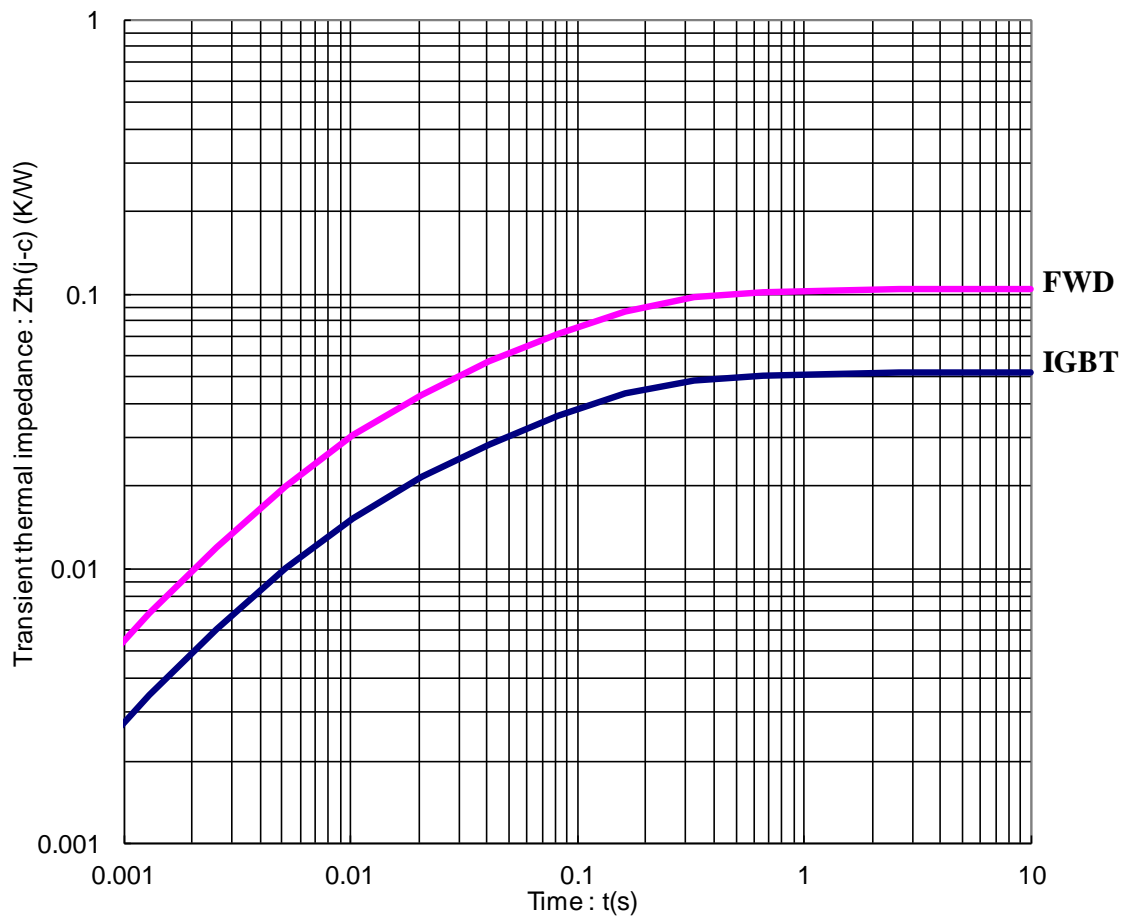
*Defined at auxiliary terminals

RecSOA

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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

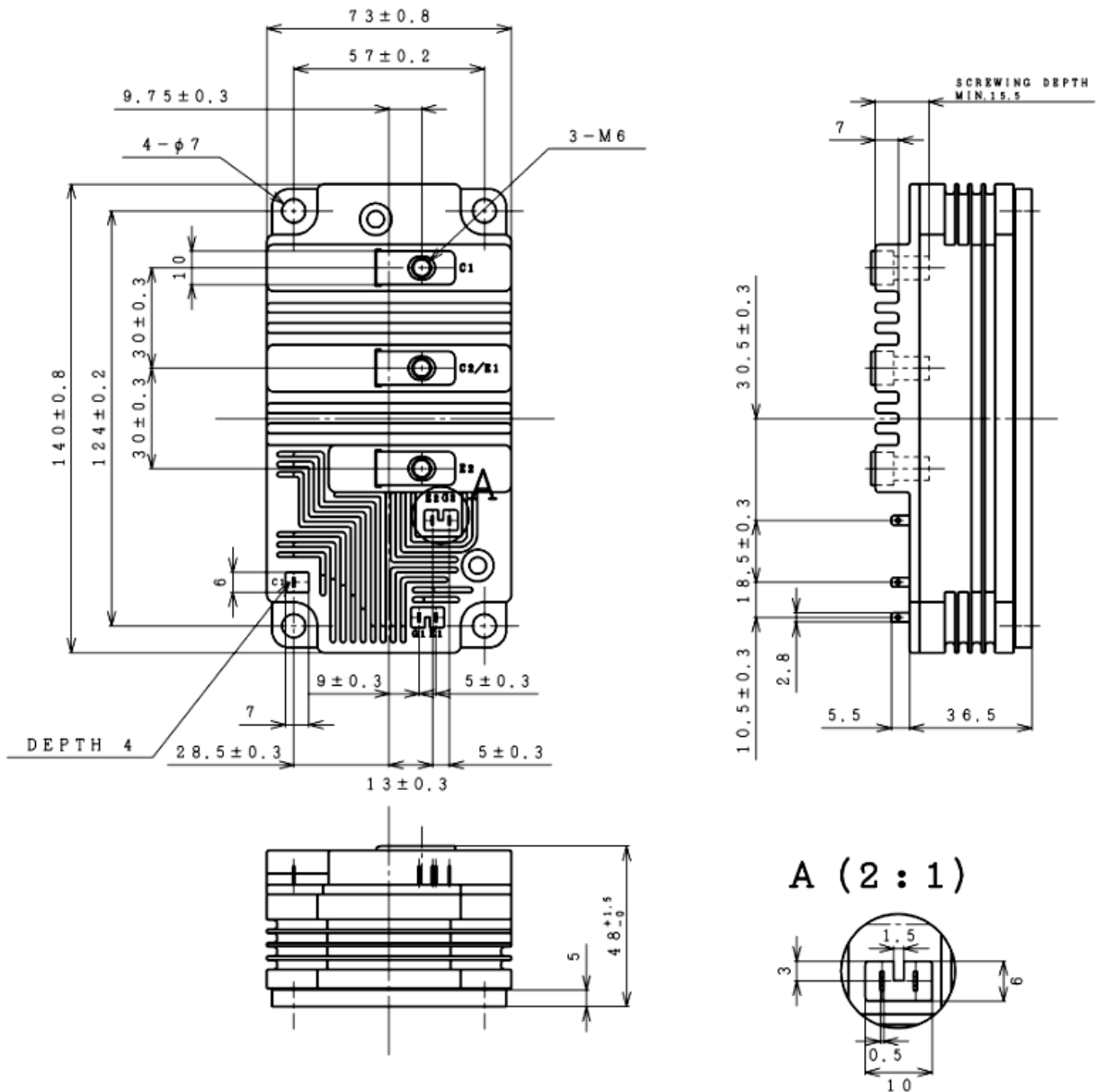
Please note the following material is contained in the product in order to keep product characteristic and reliability level.

Material	Contained part
Lead (Pb) and its compounds	Solder

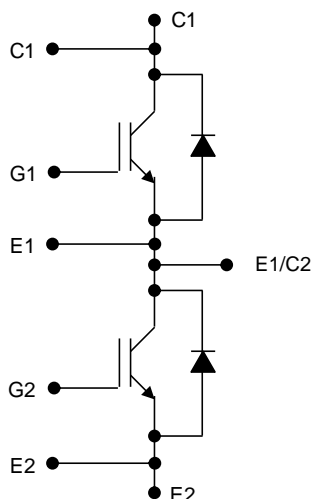
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Module Outline Drawing

Unit: mm



CIRCUIT DIAGRAM



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HITACHI POWER SEMICONDUCTORS

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