

MBN1200H45E2-H

Silicon N-channel IGBT 4500V E2 version

FEATURES

- * Low switching loss IGBT module.
- * Low noise due to ultra soft fast recovery diode.
- * High reliability, high durability module.
- * High thermal fatigue durability.
($\Delta T_c=70^\circ\text{C}$, $N>30,000$ cycles)
- * Isolated heat sink (terminal to base).

ABSOLUTE MAXIMUM RATINGS ($T_c=25^\circ\text{C}$)

Item	Symbol	Unit	MBN1200H45E2-H
Collector Emitter Voltage	V_{CES}	V	4,500
Gate Emitter Voltage	V_{GES}	V	± 20
Collector Current	DC	I_C	1,200 ($T_c=80^\circ\text{C}$)
	1ms	I_{Cp}	2,400
Forward Current	DC	I_F	1,200
	1ms	I_{FM}	2,400
Junction Temperature	T_j	$^\circ\text{C}$	-40 ~ +125
Maximum Junction Temperature	$T_{vj\max}$	$^\circ\text{C}$	150 (1)
Storage Temperature	T_{stg}	$^\circ\text{C}$	-50 ~ +125 (2)
Isolation Voltage	V_{ISO}	V_{RMS}	10,200 (AC 1 minute)
Screw Torque	Terminals (M4/M8)	-	2/10 (3)
	Mounting (M6)	-	6 (4)

Notes: (1) Regarding the definition of $T_{vj\max}$ for each operation mode, please refer to LD-ES-130737.

(2) Terminal temperature shall not exceed the specified temperature in any operation.

(3) Recommended Value $1.8\pm 0.2/9\pm 1\text{N}\cdot\text{m}$ (4) Recommended Value $5.5\pm 0.5\text{N}\cdot\text{m}$

ELECTRICAL CHARACTERISTICS

Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions	
Collector Emitter Cut-Off Current	I_{CES}	mA	-	-	5	$V_{CE}=4,500\text{V}$, $V_{GE}=0\text{V}$, $T_j=25^\circ\text{C}$	
			-	25	100	$V_{CE}=4,500\text{V}$, $V_{GE}=0\text{V}$, $T_j=125^\circ\text{C}$	
Gate Emitter Leakage Current	I_{GES}	nA	-500	-	+500	$V_{GE}=\pm 20\text{V}$, $V_{CE}=0\text{V}$, $T_j=25^\circ\text{C}$	
Collector Emitter Saturation Voltage	$V_{CE(sat)}$	V	3.5	4.2	4.7	$I_C=1200\text{A}$, $V_{GE}=15\text{V}$, $T_j=125^\circ\text{C}$	
Gate Emitter Threshold Voltage	$V_{GE(TO)}$	V	5.4	6.4	7.4	$V_{CE}=10\text{V}$, $I_C=1200\text{mA}$, $T_j=25^\circ\text{C}$	
Input Capacitance	C_{ies}	nF	-	165	-	$V_{CE}=10\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$, $T_j=25^\circ\text{C}$	
Internal Gate Resistance	R_{ge}	Ω	-	0.8	-	$V_{CE}=10\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$, $T_j=25^\circ\text{C}$	
Switching Times	Rise Time	t_r	1.0	2.1	4.2	$V_{CC}=2,600\text{V}$, $I_C=1200\text{A}$	
	Turn On Time	t_{on}	1.3	2.7	5.4	$L_s=150\text{nH}$	
	Fall Time	t_f	1.2	2.4	3.6	$R_g=3.3\Omega$ (5)	
	Turn Off Time	t_{off}	2.4	4.8	7.2	$V_{GE}=\pm 15\text{V}$, $T_j=125^\circ\text{C}$	
Peak Forward Voltage Drop	V_{FM}	V	3.0	3.7	4.2	$I_F=1200\text{A}$, $V_{GE}=0\text{V}$, $T_j=125^\circ\text{C}$	
Reverse Recovery Time	t_{rr}	μs	0.3	0.7	1.4	$V_{CC}=2600\text{V}$, $I_F=1200\text{A}$, $L_s=150\text{nH}$ $T_j=125^\circ\text{C}$	
Turn On Loss	$E_{on(10\%)}$	J/p	-	3.2	4.8	$V_{CC}=2600\text{V}$, $I_C=I_F=1200\text{A}$, $L_s=150\text{nH}$ $R_g=3.3\Omega$ (5) $V_{GE}=\pm 15\text{V}$, $T_j=125^\circ\text{C}$	
	$E_{on(full)}$		-	3.8	-		
Turn Off Loss	$E_{off(10\%)}$	J/p	-	3.2	4.8		
	$E_{off(full)}$		-	3.8	-		
Reverse Recovery Loss	$E_{rr(10\%)}$	J/p	-	2.5	3.7		
	$E_{rr(full)}$		-	2.8	-		
Thermal Impedance	IGBT	$R_{th(j-c)}$	K/W	-	-	0.0085	
	FWD	$R_{th(j-c)}$		-	-		0.017
Contact Thermal Impedance		$R_{th(c-f)}$	K/W	-	0.005	-	Case to fin ($\lambda_{grease}=1\text{W}/(\text{m}\cdot\text{K})$, Heat-sink flatness $\leq 50\mu\text{m}$)

Notes:(5) 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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DEFINITION OF TEST CIRCUIT

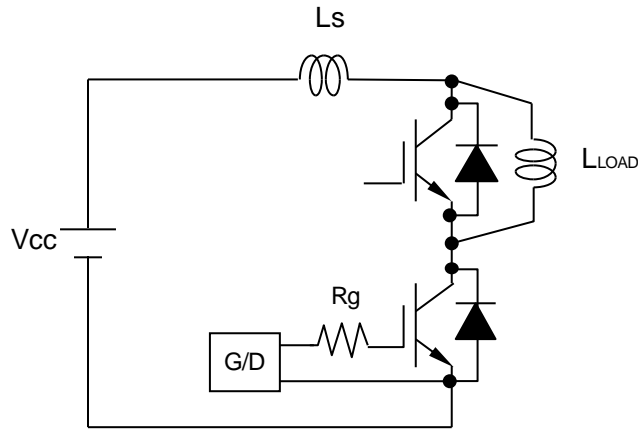


Fig.1 Switching test circuit

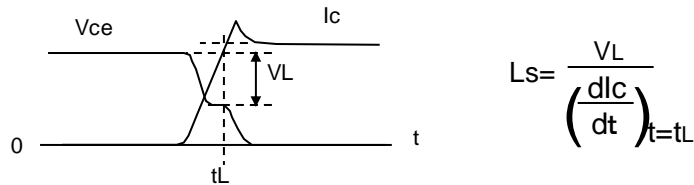


Fig.2 Definition of Ls

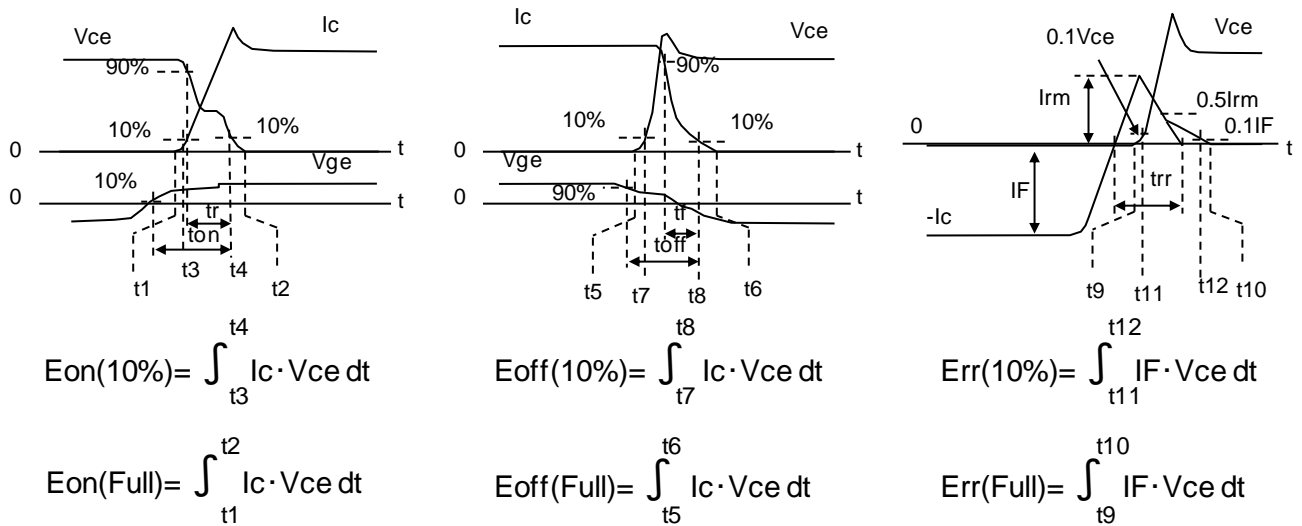
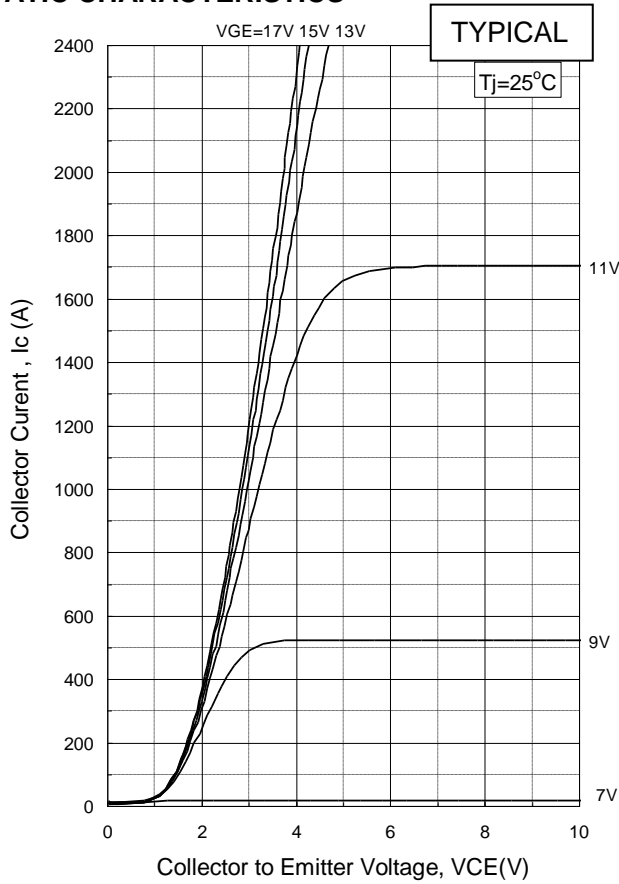


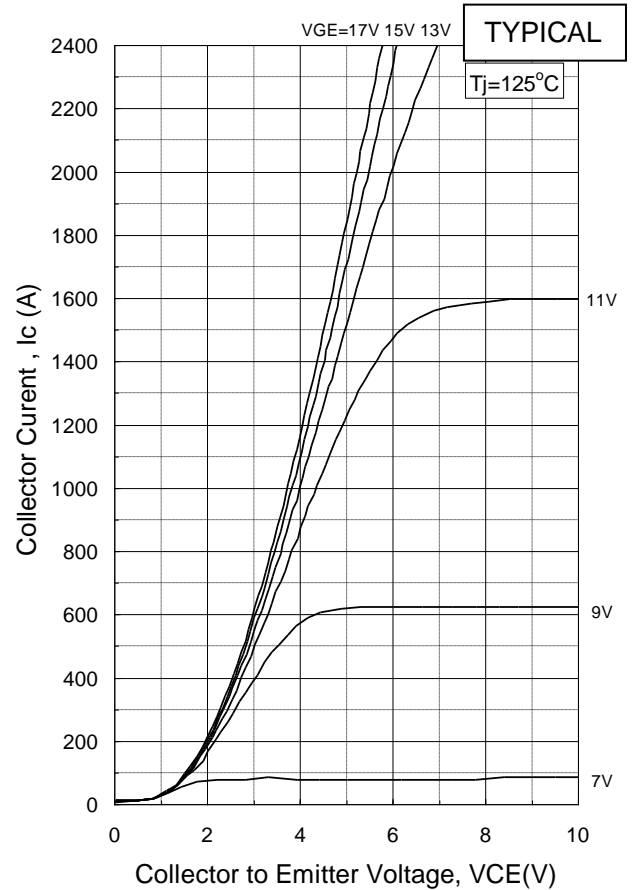
Fig.3 Definition of switching loss

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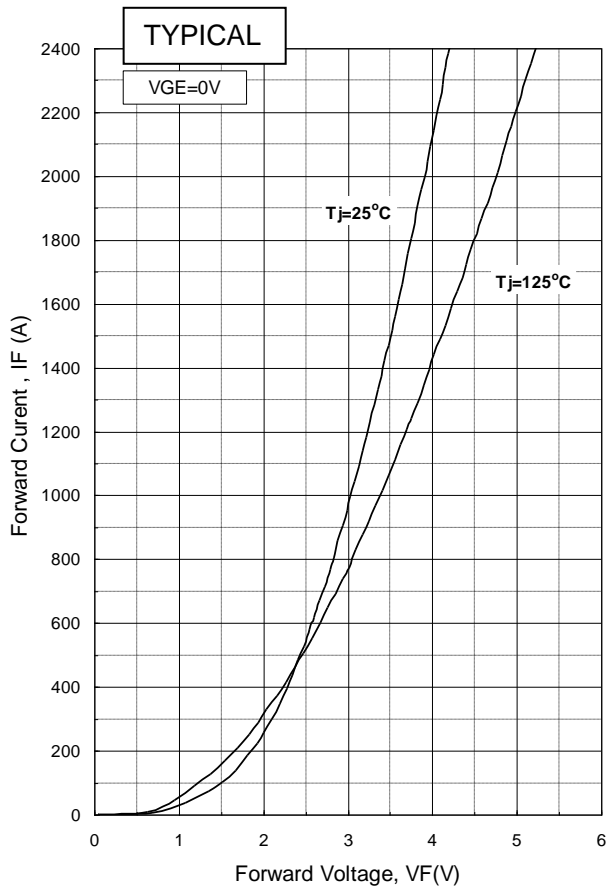
STATIC CHARACTERISTICS



Ic vs. VCE(Tj=25°C)



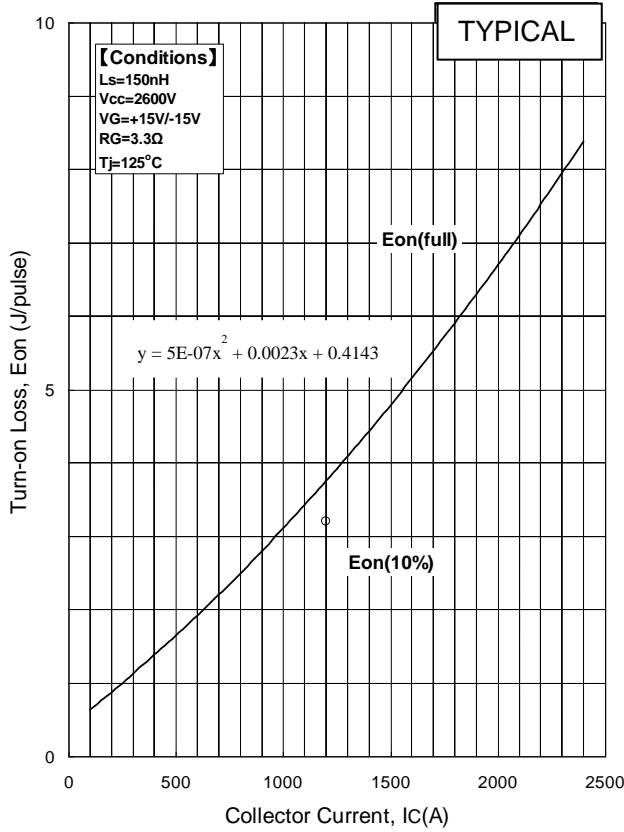
Ic vs. VCE(Tj=125°C)



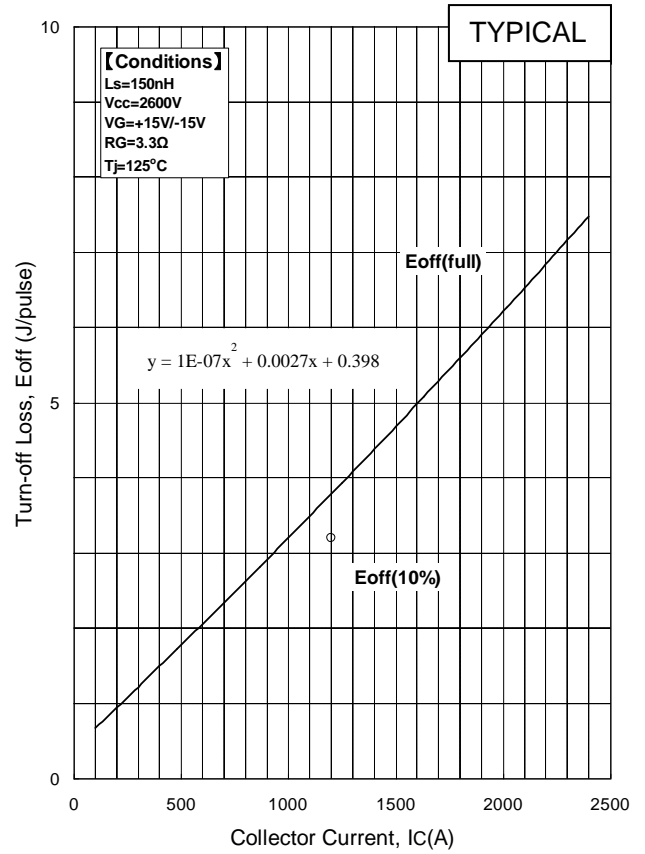
IF vs. VF

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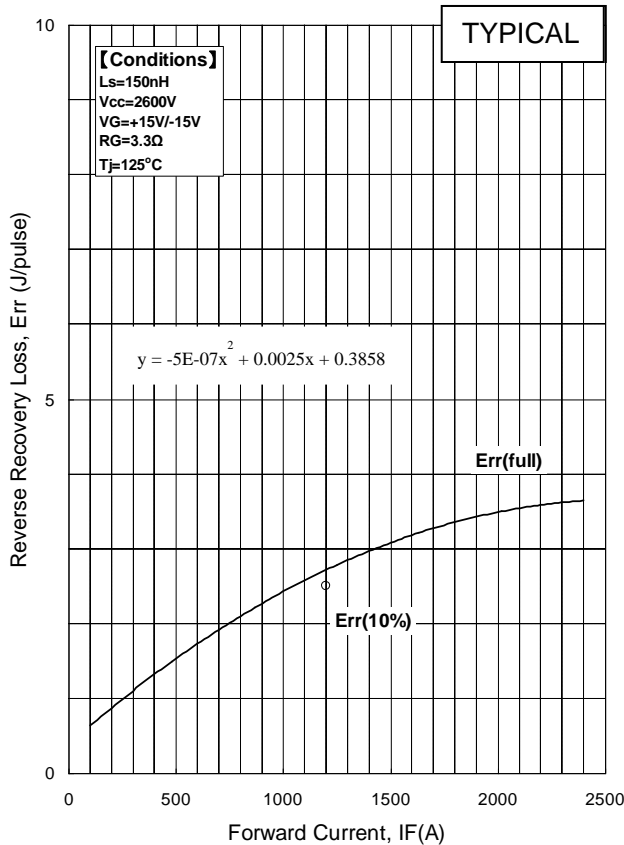
DYNAMIC CHARACTERISTICS



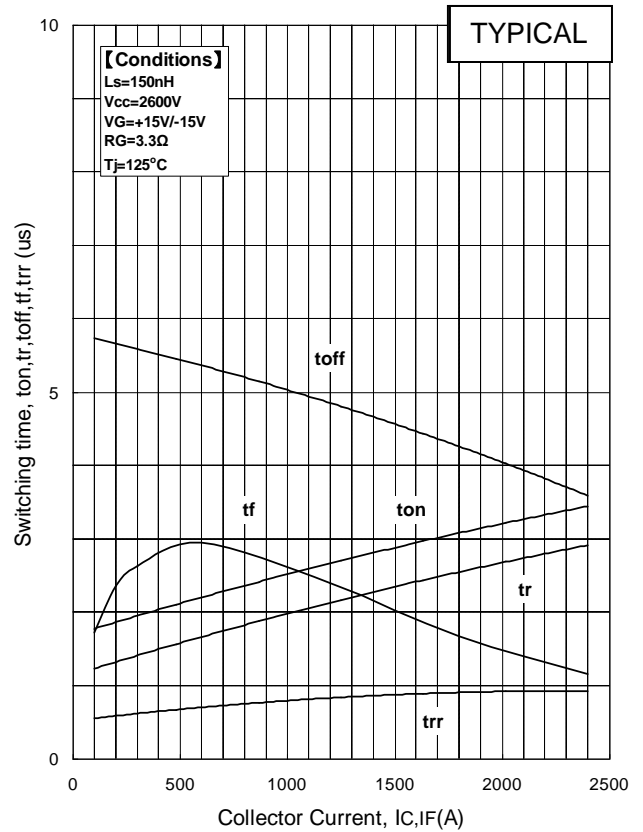
Turn-on loss vs. Collector current



Turn-off loss vs. Collector current



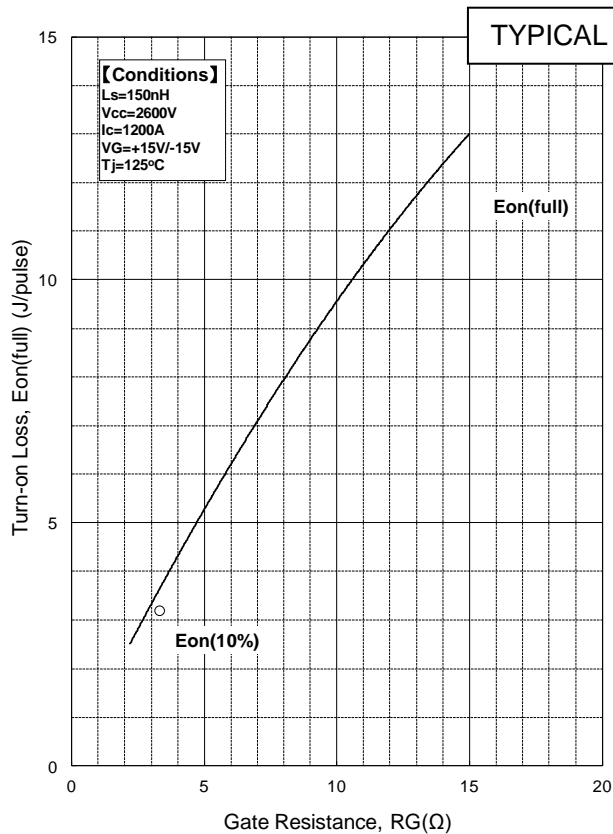
Recovery loss vs. Forward current



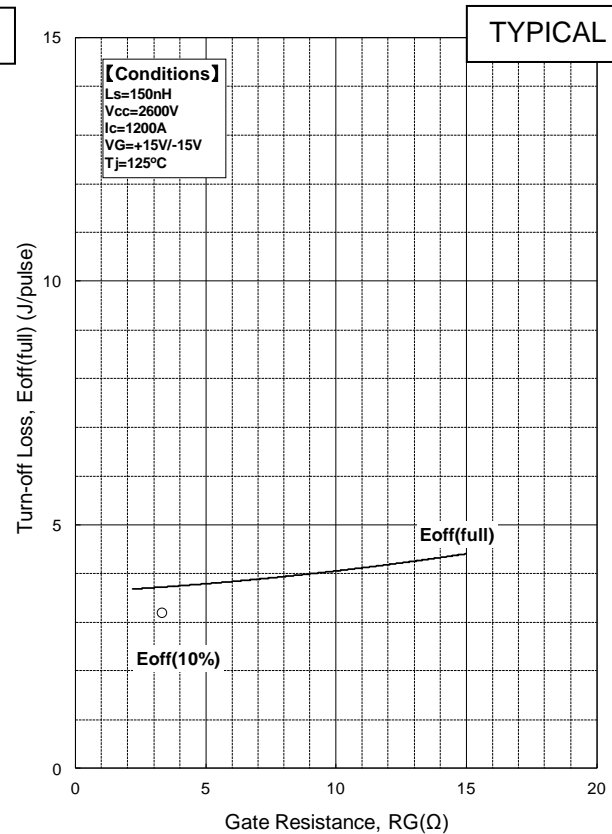
Switching time vs. Collector current

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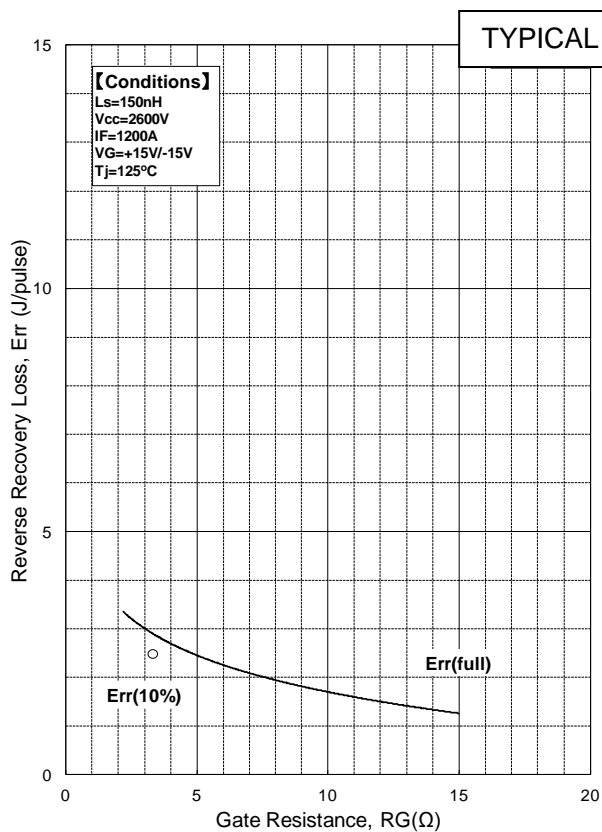
DYNAMIC CHARACTERISTICS



Turn-on loss vs. Gate Resistance

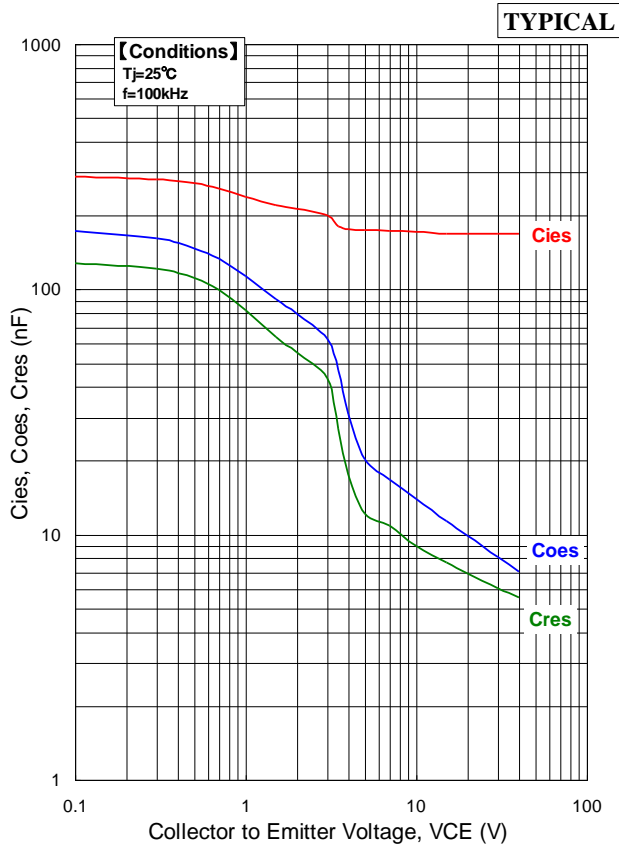


Turn-off loss vs. Gate Resistance

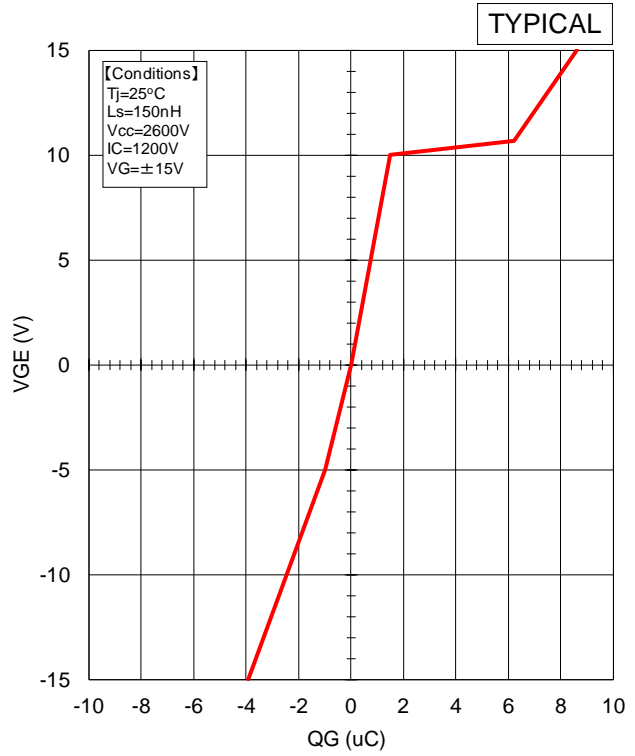


Recovery loss vs. Gate Resistance

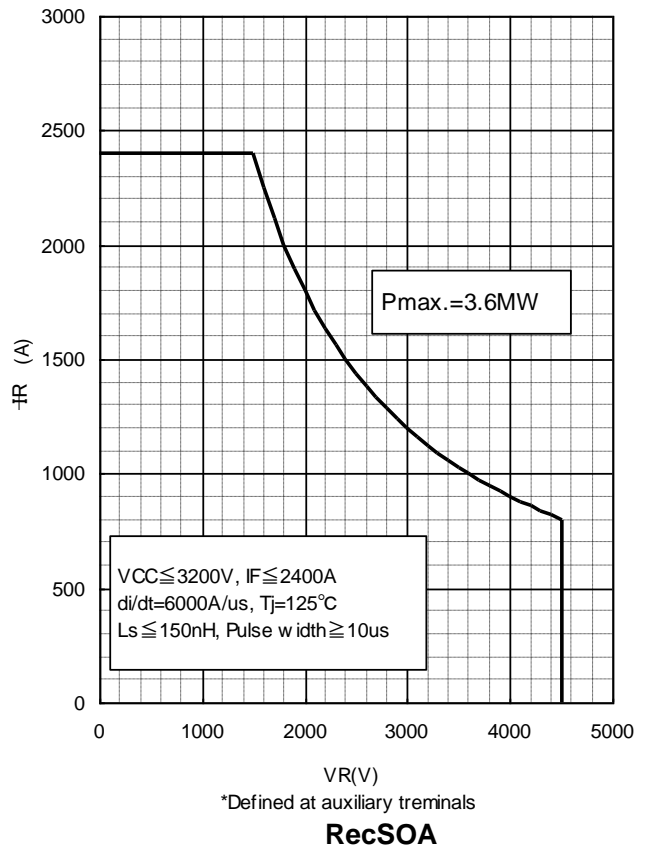
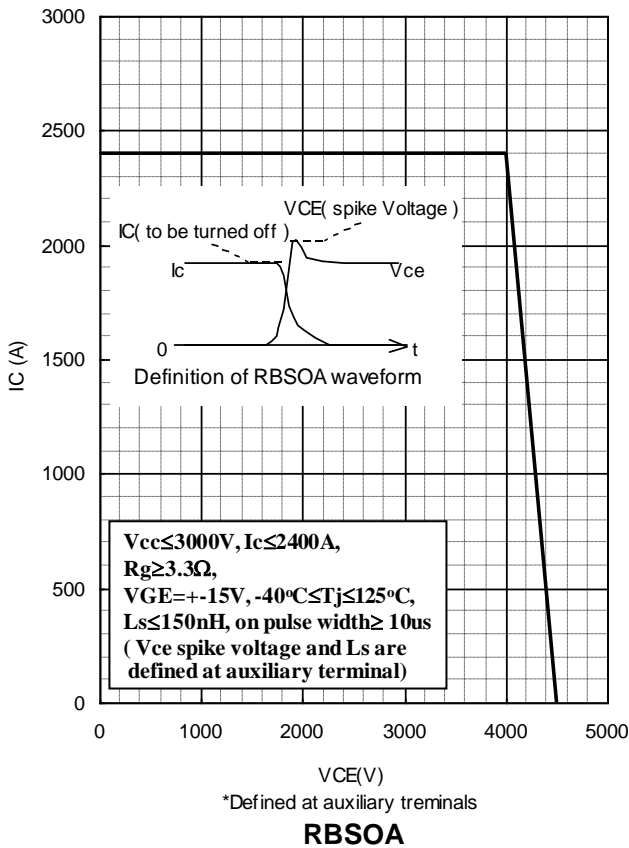
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Cies, Coes, Cres - VCE

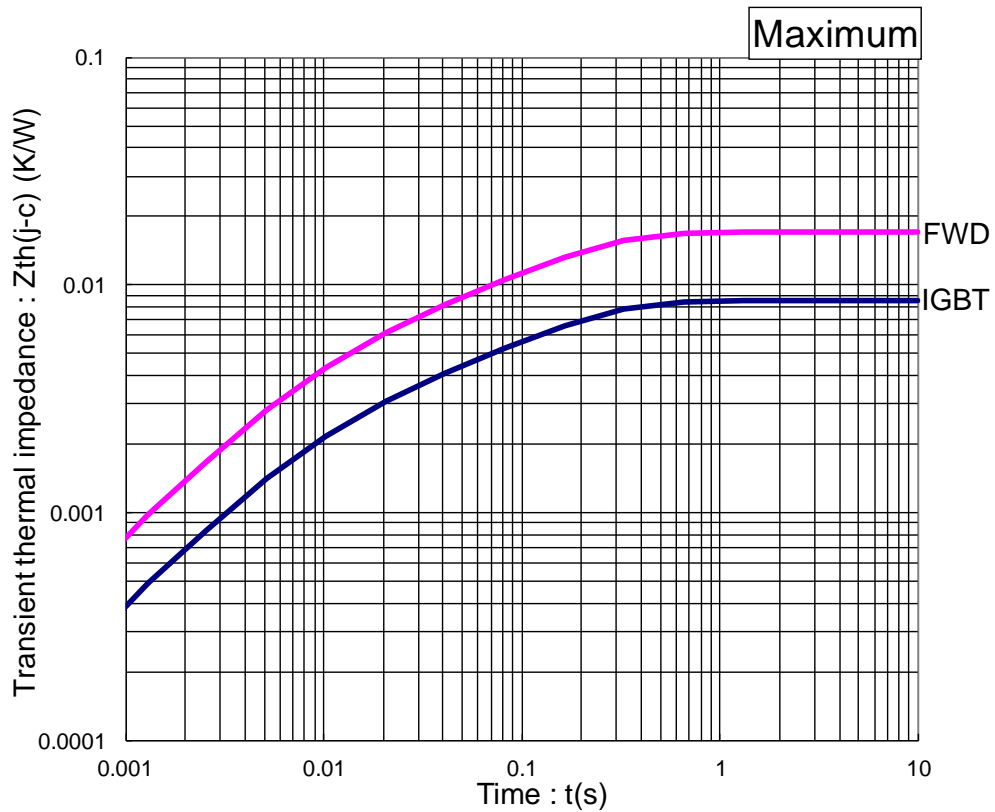


QG - VGE



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TRANSIENT THERMAL IMPEDANCE



Transient Thermal Impedance Curve

Curve Approximation Model

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

n	1	2	3	4	Unit
$\tau_{th}[n]$	1.63E-01	2.71E-02	6.12E-03	8.66E-04	sec
$r_{th}[n,IGBT]$	5.24E-03	1.61E-03	1.56E-03	8.64E-05	K/W
$r_{th}[n,Diode]$	1.05E-02	3.18E-03	3.13E-03	1.71E-04	K/W

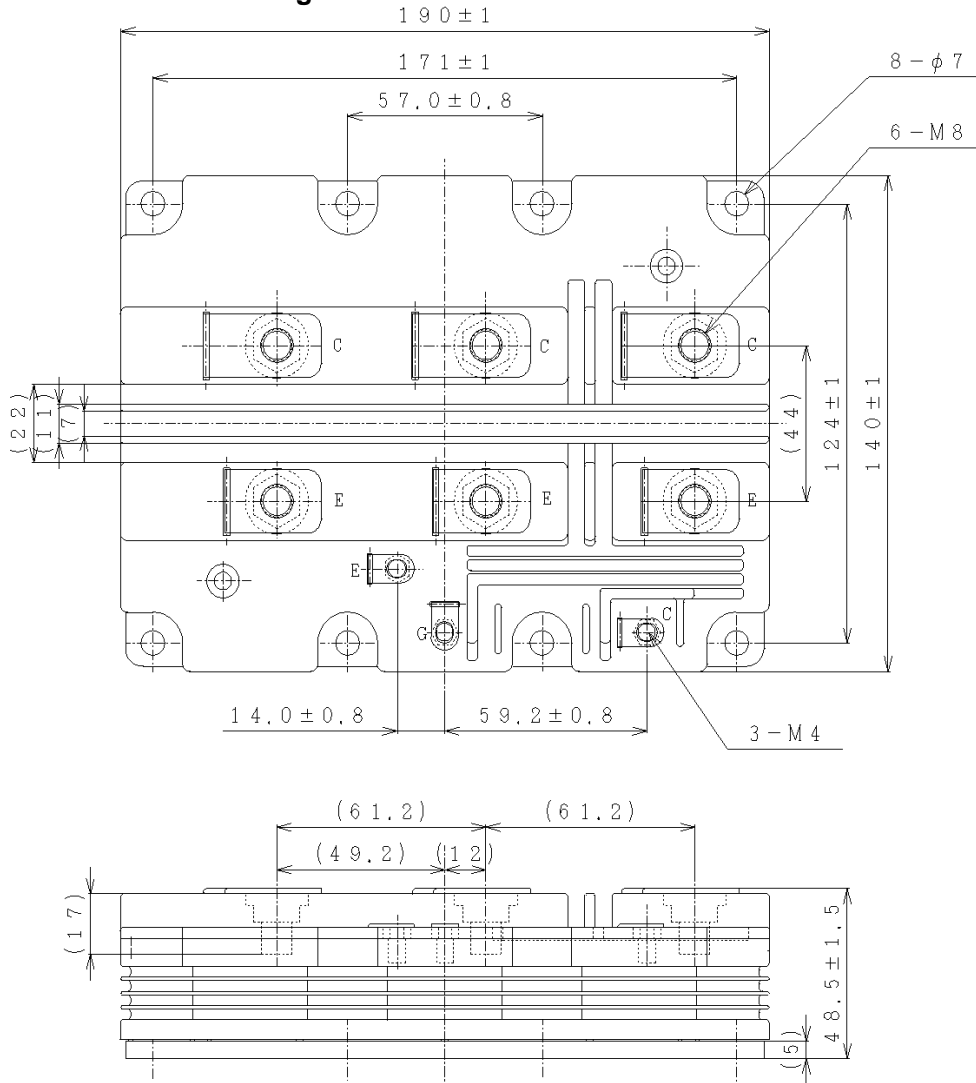
Material declaration

Please note that following materials are contained in the product In order to keep characteristics and reliability level.

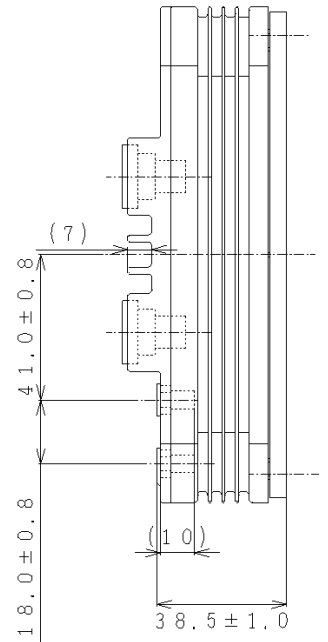
Material	Contained part
Lead (Pb) and its compounds	Solder

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Module Outline Drawing

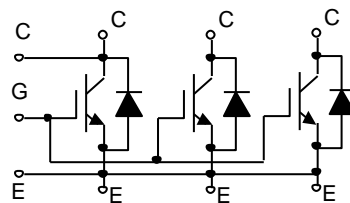


Unit: mm



Weight: 1550(g)

CIRCUIT DIAGRAM



TERMINALS

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HITACHI POWER SEMICONDUCTORS

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