

# MBN1200H33D

Silicon N-channel IGBT

## FEATURES

- \* High speed, low loss IGBT module.
- \* Low driving power due to low input capacitance MOS gate.
- \* Low noise due to ultra soft fast recovery diode.
- \* High reliability, high durability module.
- \* High thermal fatigue durability.  
( $\Delta T_c=70K$ ,  $N>30,000$ cycles)
- \* High isolation package

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

Item	Symbol	Unit	MBN1200H33D
Collector Emitter Voltage	$V_{CES}$	V	3,300
Gate Emitter Voltage	$V_{GES}$	V	$\pm 20$
Collector Current	DC	$I_C$	1,200
	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
Storage Temperature	$T_{stg}$	$^\circ\text{C}$	-40 ~ +125
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  $1.8\pm 0.2/9\pm 1\text{N}\cdot\text{m}$  (2) 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	-	-	12	$V_{CE}=3,300\text{V}$ , $V_{GE}=0\text{V}$ , $T_j=25^\circ\text{C}$	
			-	20	60	$V_{CE}=3,300\text{V}$ , $V_{GE}=0\text{V}$ , $T_j=125^\circ\text{C}$	
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	3.4	4.2	5.2	$I_C=1,200\text{A}$ , $V_{GE}=15\text{V}$ , $T_j=125^\circ\text{C}$	
Gate Emitter Threshold Voltage	$V_{GE(TO)}$	V	4.5	6.0	7.0	$V_{CE}=10\text{V}$ , $I_C=1,200\text{mA}$ , $T_j=25^\circ\text{C}$	
Input Capacitance	$C_{ies}$	nF	-	110	-	$V_{CE}=10\text{V}$ , $V_{GE}=0\text{V}$ , $f=100\text{kHz}$ , $T_j=25^\circ\text{C}$	
Internal Gate Resistance	$R_{ge}$	$\Omega$	-	1.2	-	$V_{CE}=10\text{V}$ , $V_{GE}=0\text{V}$ , $f=100\text{kHz}$ , $T_j=25^\circ\text{C}$	
Switching Times	Rise Time	$t_r$	0.6	1.9	3.1	$V_{CC}=1,650\text{V}$ , $I_C=1,200\text{A}$	
	Turn On Time	$t_{on}$	1.1	2.4	3.3	$L=100\text{nH}$	
	Fall Time	$t_f$	0.1	1.0	2.5	$R_G=3.3/3.3\Omega$ (3)	
	Turn Off Time	$t_{off}$	0.9	3.0	5.1	$V_{GE}=\pm 15\text{V}$ , $T_j=125^\circ\text{C}$	
Peak Forward Voltage Drop	$V_{FM}$	V	1.9	2.5	3.0	$I_F=1,200\text{A}$ , $V_{GE}=0\text{V}$ , $T_j=125^\circ\text{C}$	
Reverse Recovery Time	$t_{rr}$	$\mu\text{s}$	0.1	0.6	1.1	$V_{CC}=1,650\text{V}$ , $I_C=1,200\text{A}$ , $L=100\text{nH}$	
Turn On Loss	$E_{on(10\%)}$	J/P	-	1.6	2.1	$R_G=3.3/3.3\Omega$ (3)	
Turn Off Loss	$E_{off(10\%)}$	J/P	-	1.3	1.7	$V_{GE}=\pm 15\text{V}$ , $T_j=125^\circ\text{C}$	
Reverse Recovery Loss	$E_{rr(10\%)}$	J/P	-	1.2	1.9		
Stray inductance module	$L_{SCE}$	nH	-	14	-		
Thermal Impedance	IGBT	$R_{th(j-c)}$	K/W	-	-	0.009	Junction to case
	FWD	$R_{th(j-c)}$	K/W	-	-	0.018	
Contact Thermal Impedance	$R_{th(c-f)}$	K/W	-	0.006	-	Case to fin	

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.

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## DEFINITION OF TEST CIRCUIT

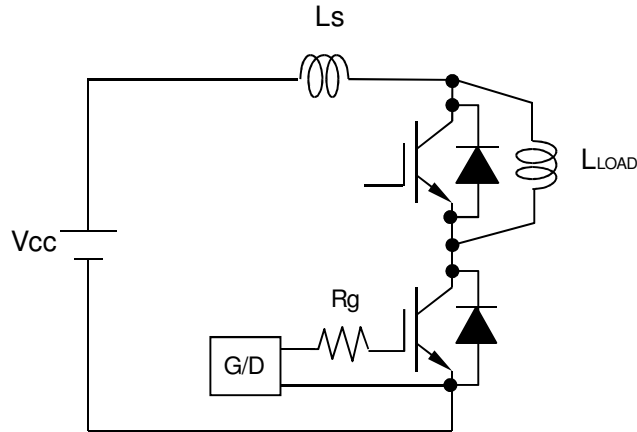


Fig.1 Switching test circuit

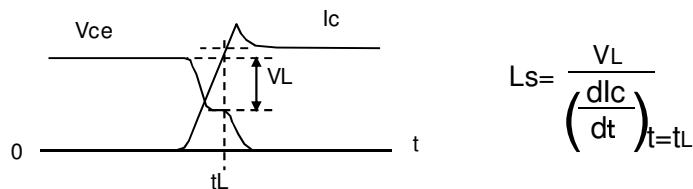


Fig.2 Definition of Ls

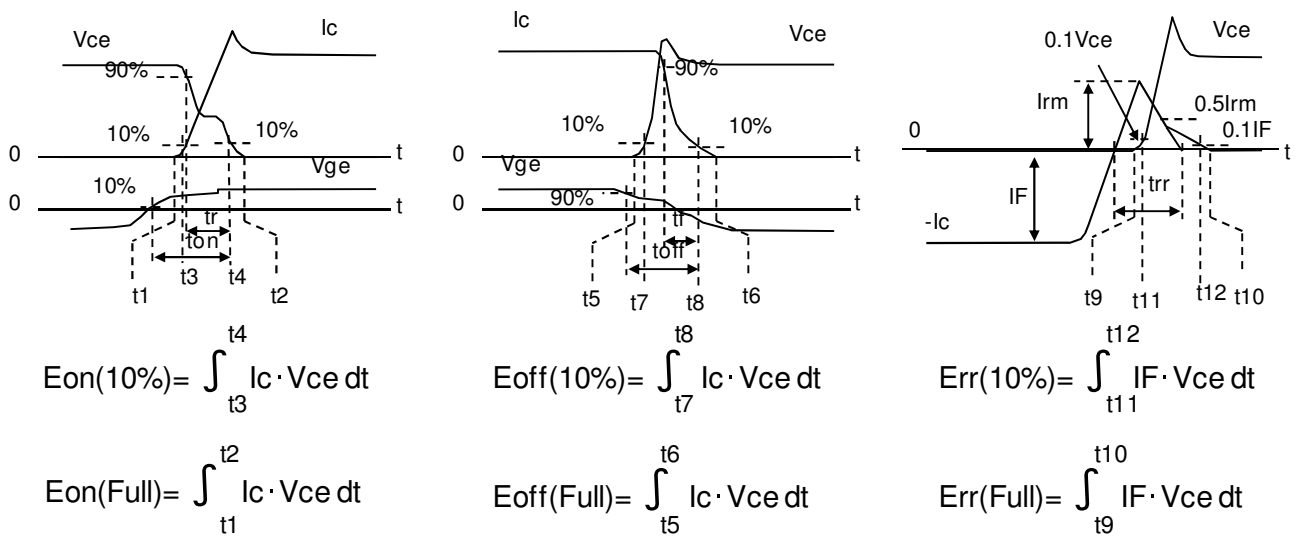
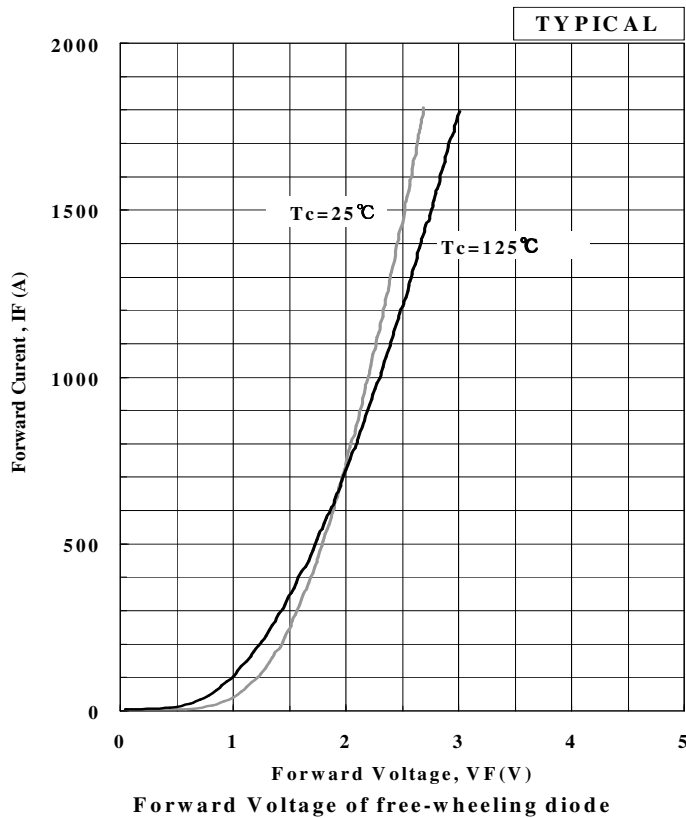
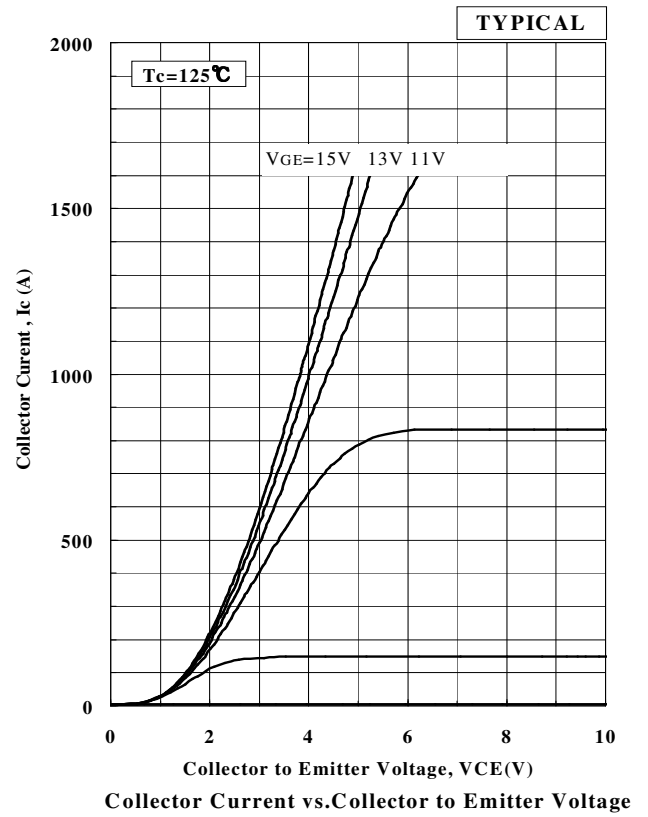
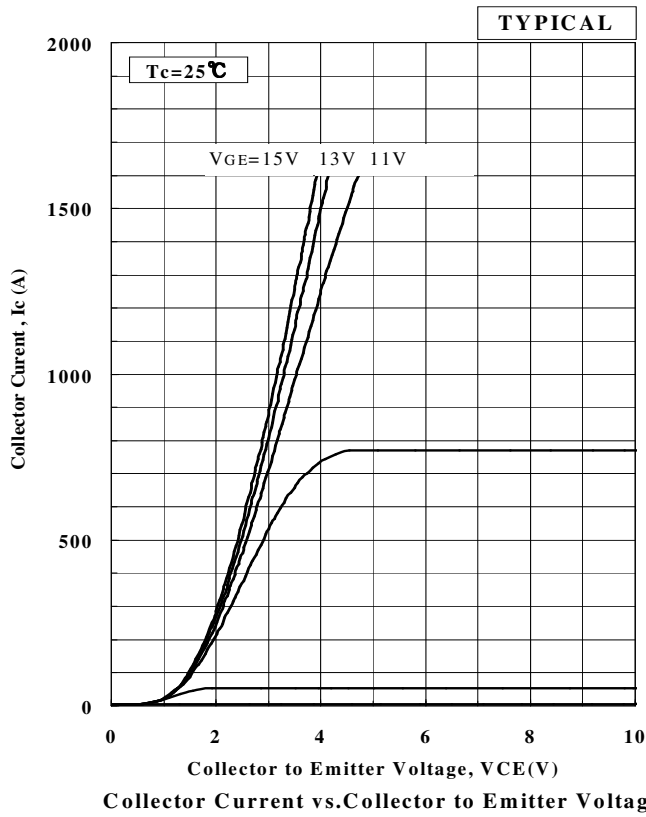


Fig.3 Definition of switching loss

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## CHARACTERISTICS CURVE

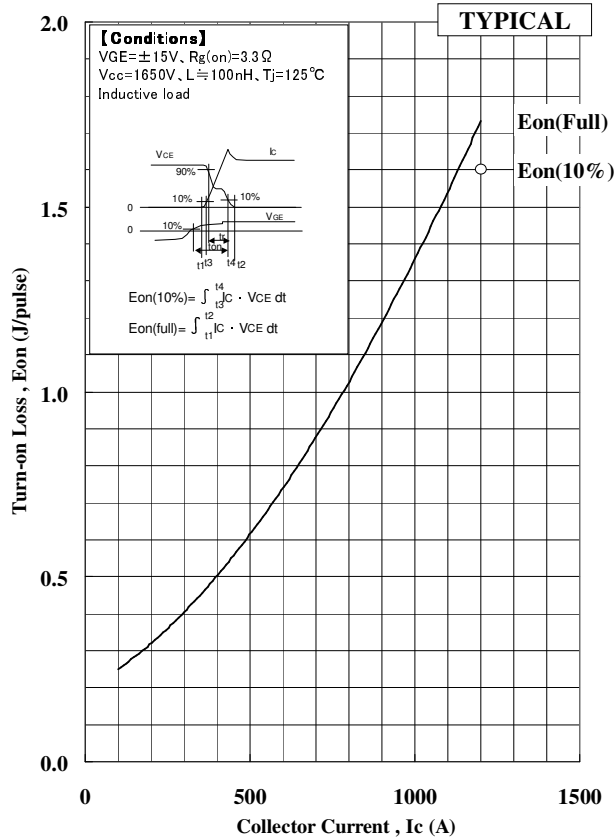
### STATIC CHARACTERISTICS



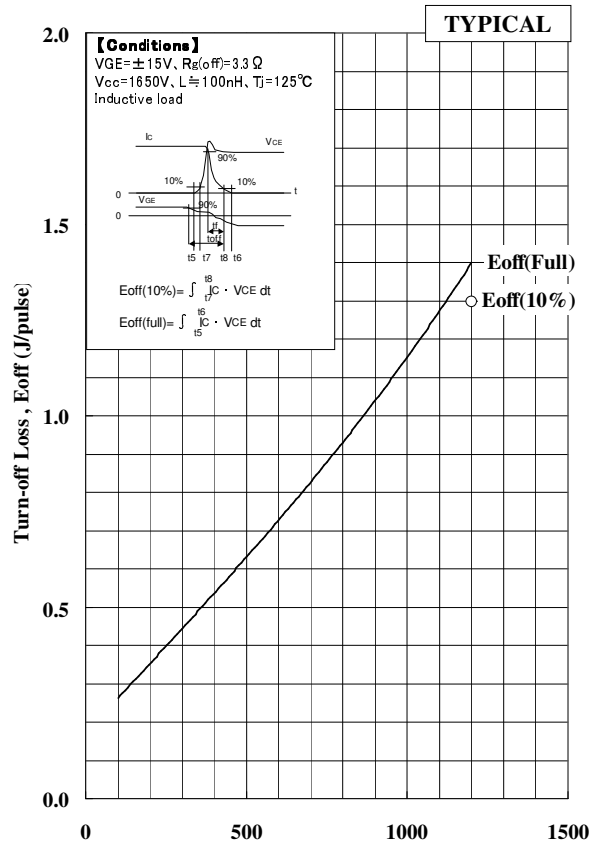
# MBN1200H33D

## DYNAMIC CHARACTERISTICS

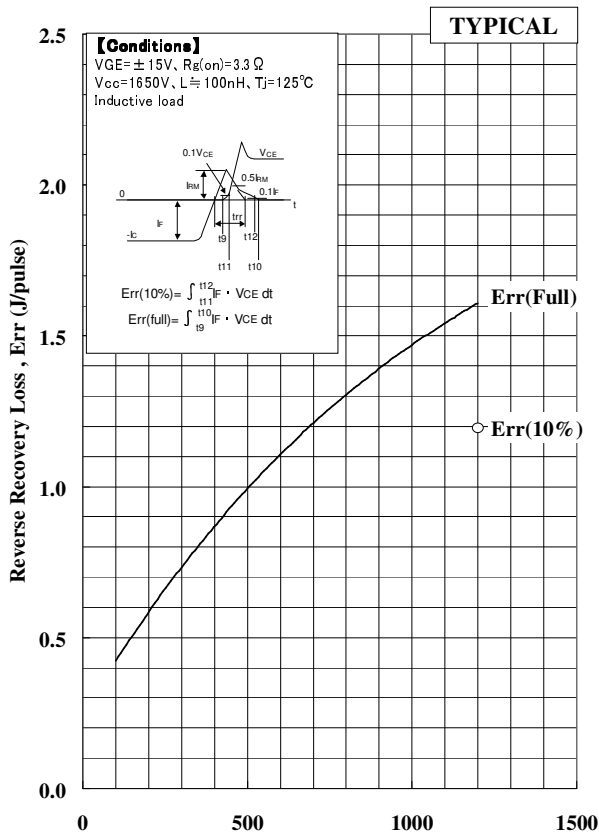
### DEPENDENCE OF CURRENT



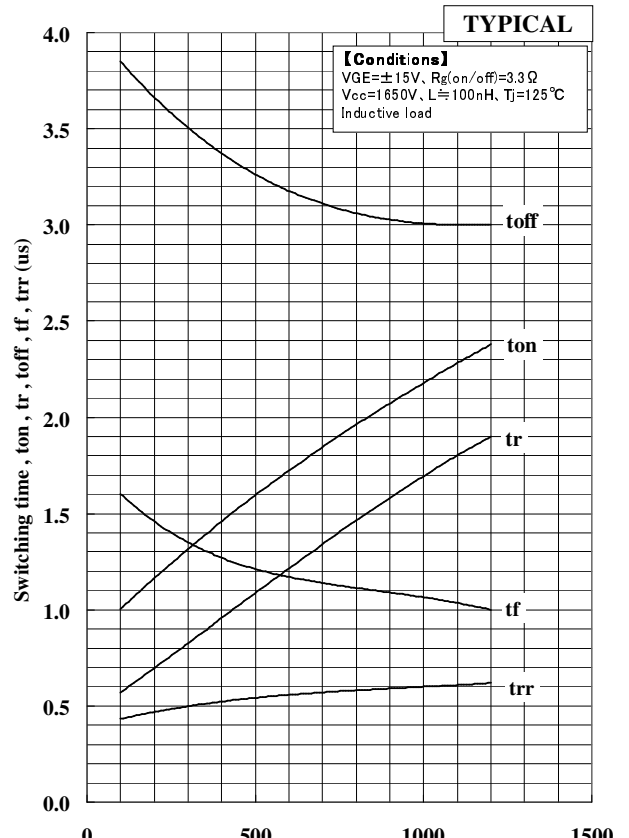
Turn-on Loss vs. Collector Current



Turn-off Loss vs. Collector Current



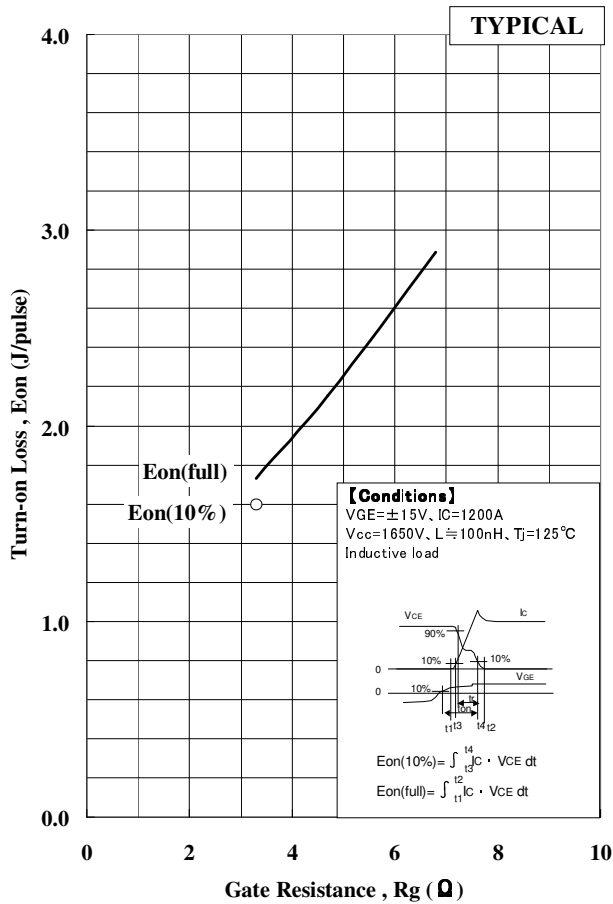
Recovery Loss vs. Forward Current



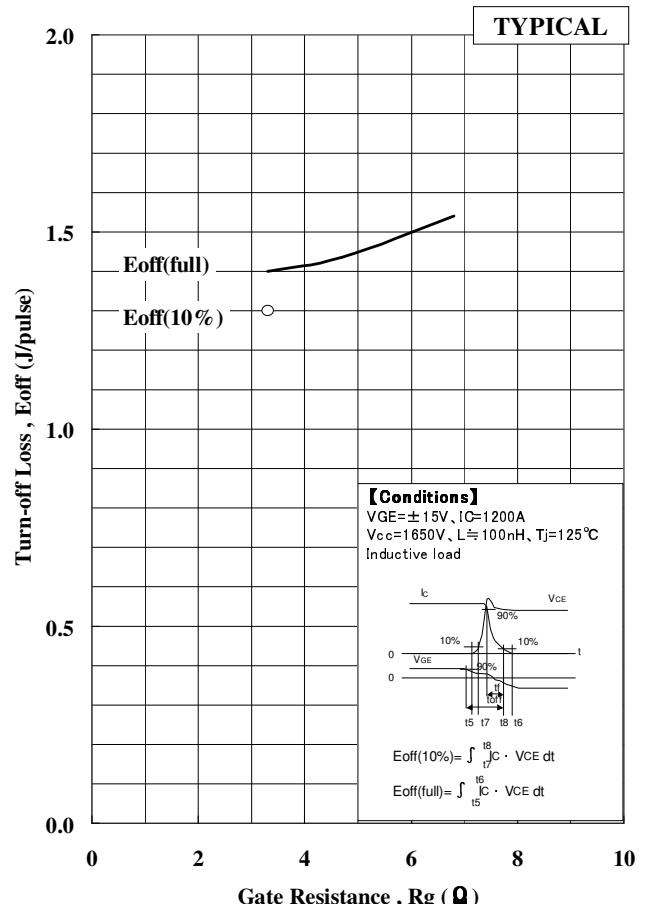
Switching time vs. Collector current

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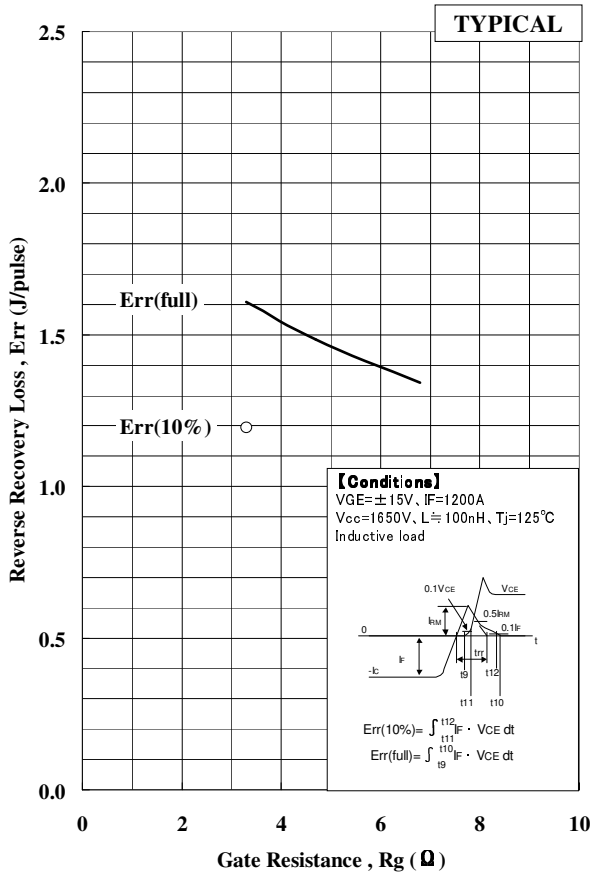
## DEPENDENCE OF RG



Turn-on Loss vs. Gate Resistance



Turn-off Loss vs. Gate Resistance

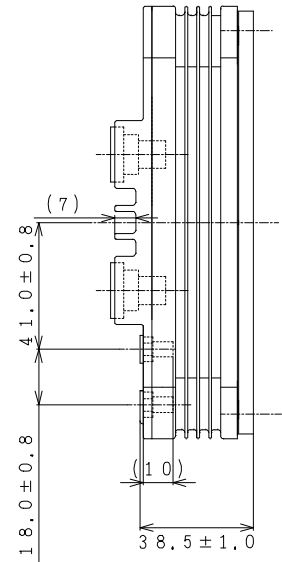
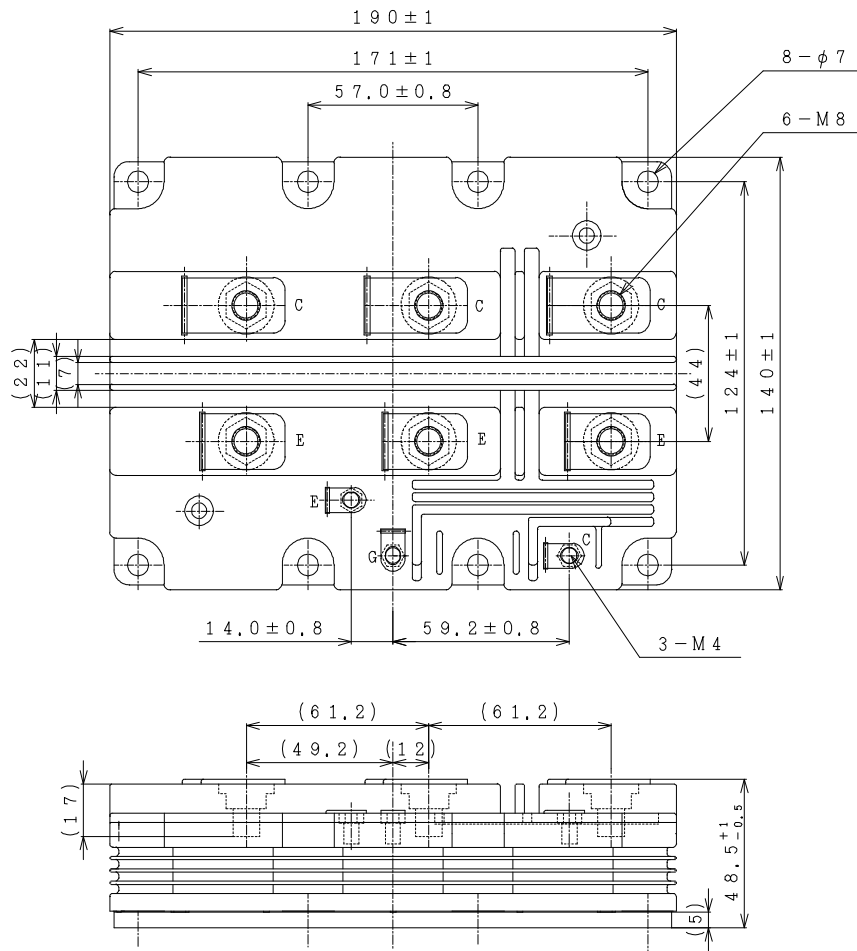


Recovery Loss vs. Gate Resistance

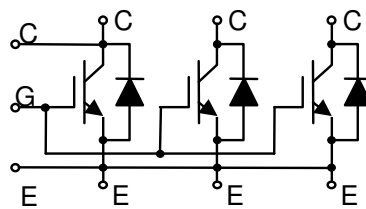
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## PACKAGE OUTLINE DRAWING

Unit in mm



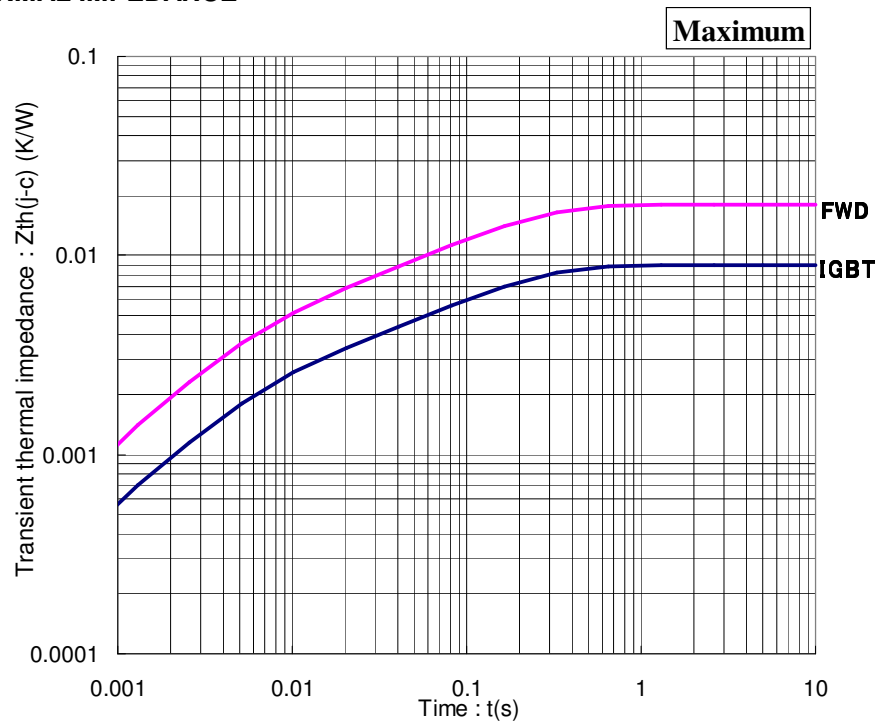
Weight: 1,550(g)



Circuit diagram

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## TRANSIENT THERMAL IMPEDANCE



**Transient Thermal Impedance Curve**

n	1	2	3	4	5	6	7	Unit
$\tau_{th}[n]$	0.30	0.1	0.03	0.01	0.003	0.001	0.0003	sec
$Z_{th}[n,IGBT]$	1.79E-03	4.55E-03	1.59E-05	1.44E-03	1.15E-03	3.47E-06	4.25E-05	K/W
$Z_{th}[n,Diode]$	3.58E-03	9.13E-03	1.01E-05	2.89E-03	2.31E-03	1.16E-06	8.63E-05	K/W

### Material declaration

Please note the following materials are contained in the product, in order to keep characteristic and reliability level.

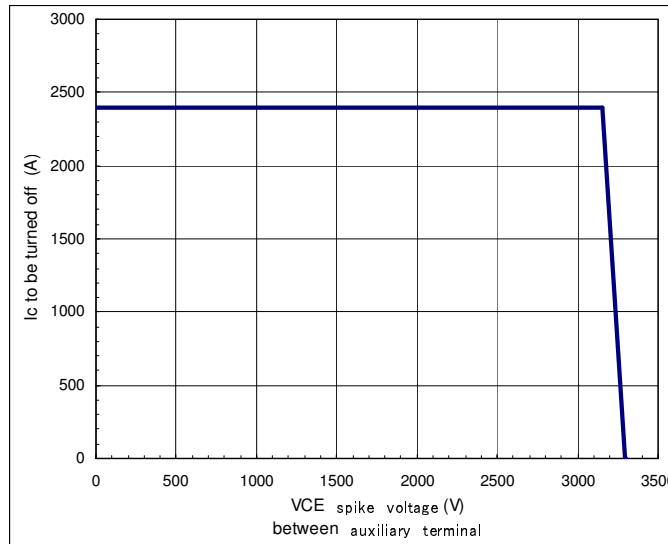
Material	Contained part
Lead (Pb) and its compounds	Solder

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## RBSOA / Recovery SOA

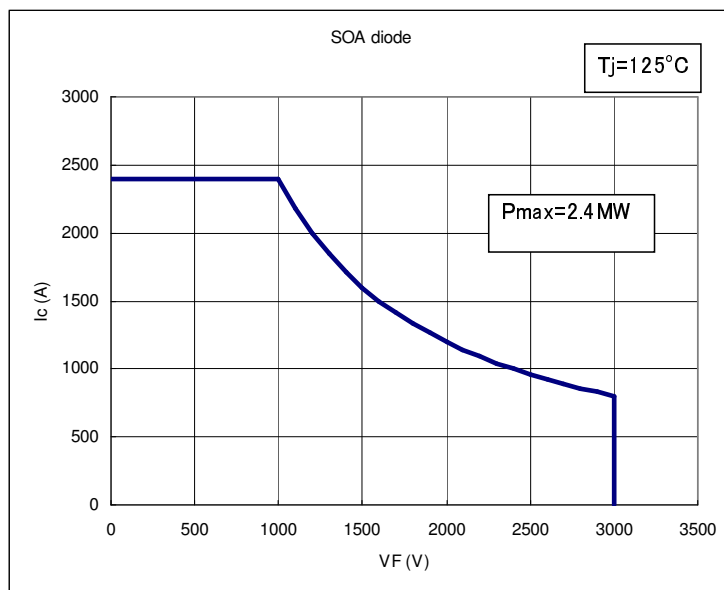
### RBSOA

$V_{cc}=2300V$ ,  $I_c=2400A$ ,  $R_g(\text{on/off})=3.3/3.3\Omega$   
 ,  $V_{GE}=\pm 15V$ ,  $L_s=100nH$ ,  $T_c=125^\circ C$   
 (Measured at auxiliary terminal)



### Recovery SOA

$V_{cc}=2000V$ ,  $I_c=-I_F=2400A$ ,  $R_g(\text{on/off})=3.3/3.3\Omega$   
 ,  $V_{GE}=\pm 15V$ ,  $L_s=100nH$ ,  $T_c=125^\circ C$   
 (Measured at auxiliary terminal)





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## HITACHI POWER SEMICONDUCTORS

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