

MBN1200E33E

Silicon N-channel IGBT 3300V E version

FEATURES

- * Soft switching behavior & low conduction loss:
 - Soft low-injection punch-through
 - High conductivity IGBT.
- * Low driving power due to low input capacitance MOS gate.
- * Low noise recovery: Ultra soft fast recovery diode.
- * High thermal fatigue durability:
 - ($\Delta T_c=70K$, $N>30,000$ cycles)
 - AlSiC base-plate/AlN substrate

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

Item	Symbol	Unit	MBN1200E33E
Collector Emitter Voltage	V_{CES}	V	3,300
Gate Emitter Voltage	V_{GES}	V	± 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}	$^\circ\text{C}$	-50 ~ +125
Isolation Voltage	V_{ISO}	V_{RMS}	6,000(AC 1 minute)
Screw Torque	Terminals (M4/M8)	-	2/15 (1)
	Mounting (M6)	-	6 (2)

Notes: (1) Recommended Value $1.8 \pm 0.2/15^{+0}_{-3} \text{N}\cdot\text{m}$ (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	$V_{CE}=3,300\text{V}$, $V_{GE}=0\text{V}$, $T_j=25^\circ\text{C}$
Gate Emitter Leakage Current	I_{GES}	nA	-500	-	+500	$V_{CE}=3,300\text{V}$, $V_{GE}=0\text{V}$, $T_j=125^\circ\text{C}$
Collector Emitter Saturation Voltage	$V_{CE(sat)}$	V	3.0	3.5	4.2	$I_C=1,200\text{A}$, $V_{GE}=15\text{V}$, $T_j=125^\circ\text{C}$
Gate Emitter Threshold Voltage	$V_{GE(TH)}$	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}	Ω	-	1.3	-	$V_{CE}=10\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$, $T_j=25^\circ\text{C}$
Switching Times	Rise Time	t_r	1.1	2.1	3.1	$V_{CC}=1,650\text{V}$, $I_C=1,200\text{A}$
	Turn On Time	t_{on}	1.7	2.5	3.3	$L=100\text{nH}$
	Fall Time	t_f	1.3	2.2	3.1	$R_G=3.9/3.9\Omega$ (3)
	Turn Off Time	t_{off}	2.7	4.2	5.7	$V_{GE}=\pm 15\text{V}$, $T_j=125^\circ\text{C}$
Peak Forward Voltage Drop	V_{FM}	V	2.0	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}	μs	0.2	0.7	1.2	$V_{CC}=1,650\text{V}$, $I_F=1,200\text{A}$, $L=100\text{nH}$ $T_j=125^\circ\text{C}$
Turn On Loss	$E_{on(10\%)}$	J/P	-	1.7	2.2	$V_{CC}=1,650\text{V}$, $I_C=1,200\text{A}$, $L=100\text{nH}$
Turn Off Loss	$E_{off(10\%)}$	J/P	-	1.9	2.4	$R_G=3.9/3.9\Omega$ (3)
Reverse Recovery Loss	$E_{rr(10\%)}$	J/P	-	1.6	2.1	$V_{GE}=\pm 15\text{V}$, $T_j=125^\circ\text{C}$
Stray inductance module	L_{SCE}	nH	-	12	-	
Thermal Impedance	IGBT	$R_{th(j-c)}$	-	-	0.0085	Junction to case
	FWD	$R_{th(j-c)}$	-	-	0.017	
Contact Thermal Impedance	$R_{th(c-f)}$	K/W	-	0.006	-	Case to fin ($\lambda_{grease}=1\text{W}/(\text{m}\cdot\text{K})$, heat-sink flatness $\leq 50\mu\text{m}$)

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

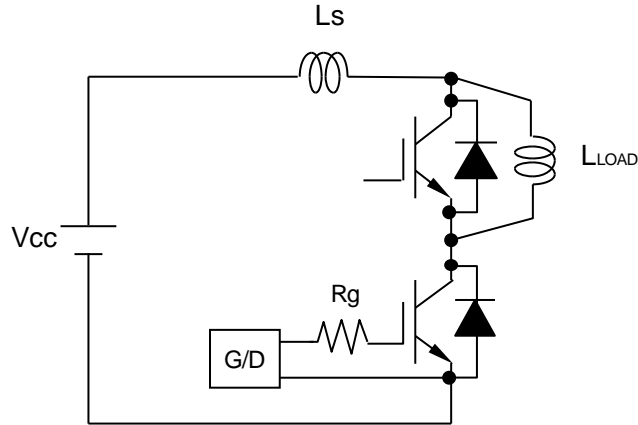


Fig.1 Switching test circuit

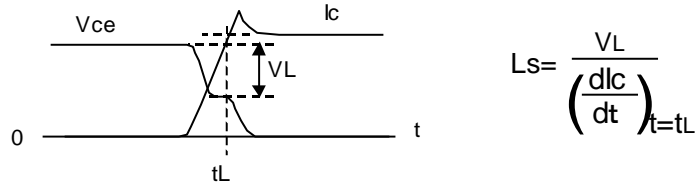


Fig.2 Definition of stray inductance

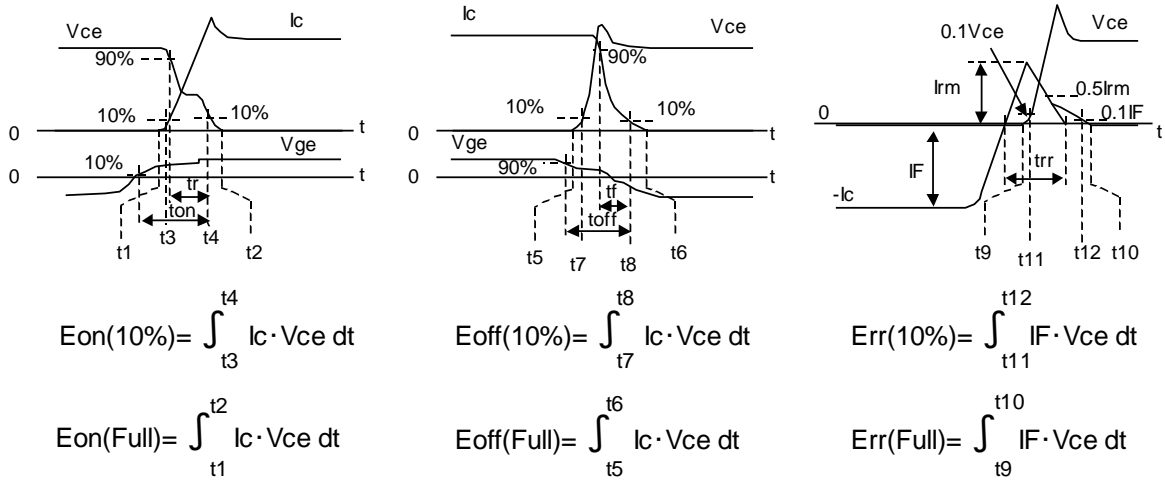
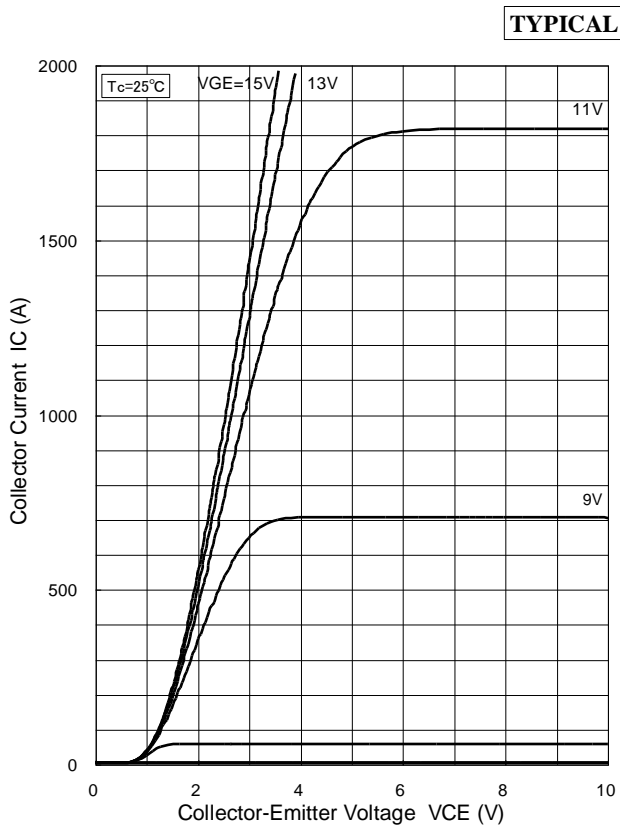


Fig.3 Definition of switching loss

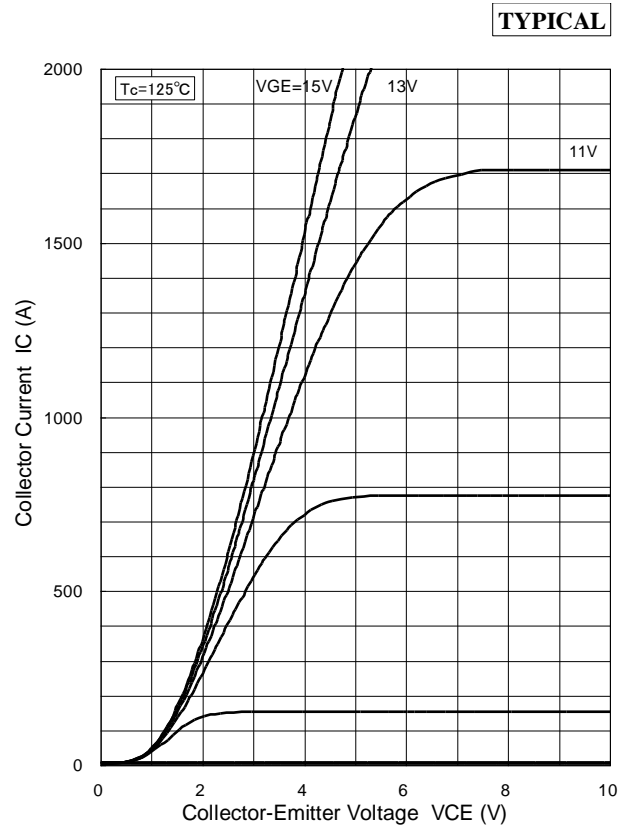
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CHARACTERISTICS CURVE

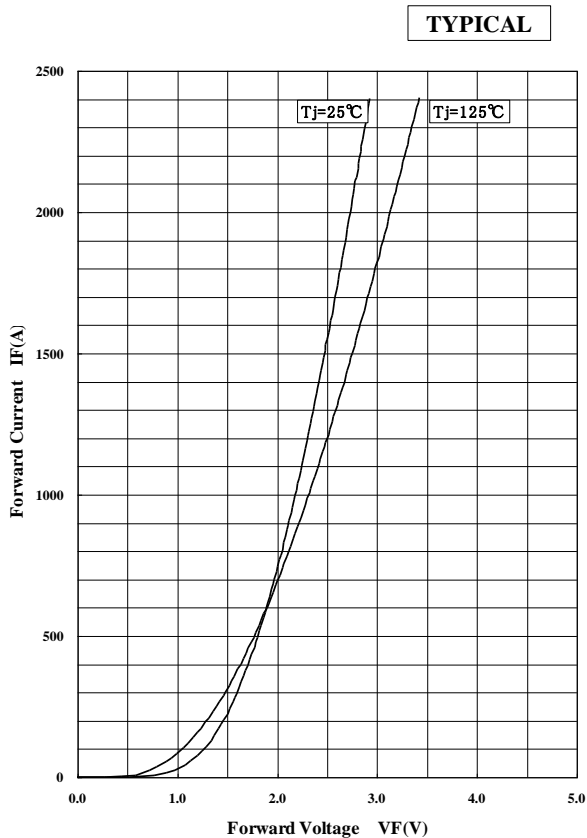
STATIC CHARACTERISTICS



Collector Current vs. Collector to Emmitter Voltage



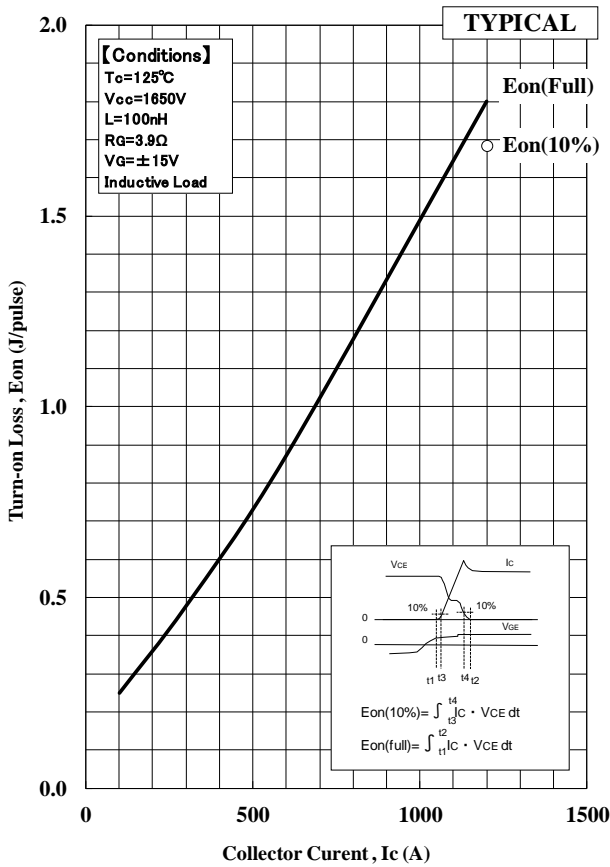
Collector Current vs. Collector to Emmitter Voltage



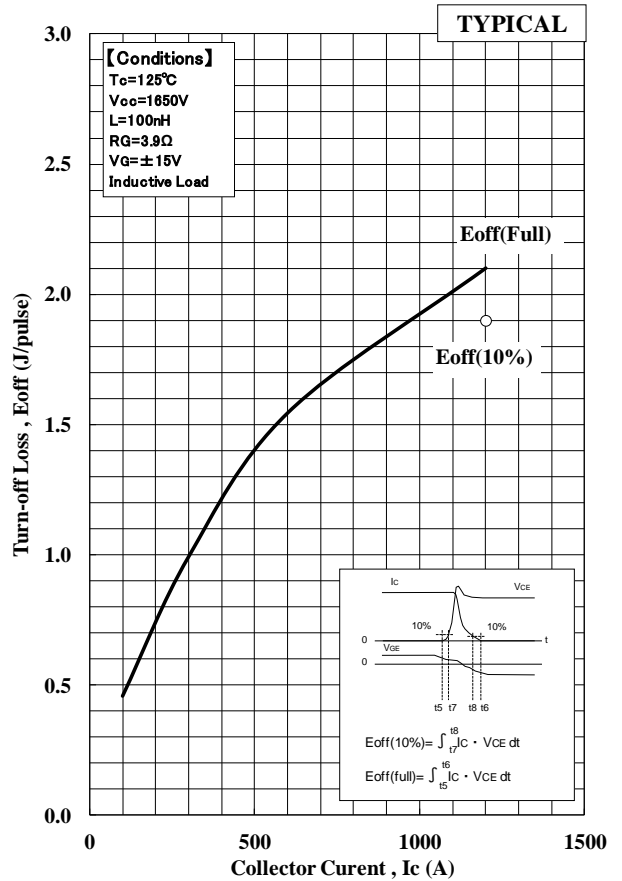
Forward Voltage of free-wheeling diode

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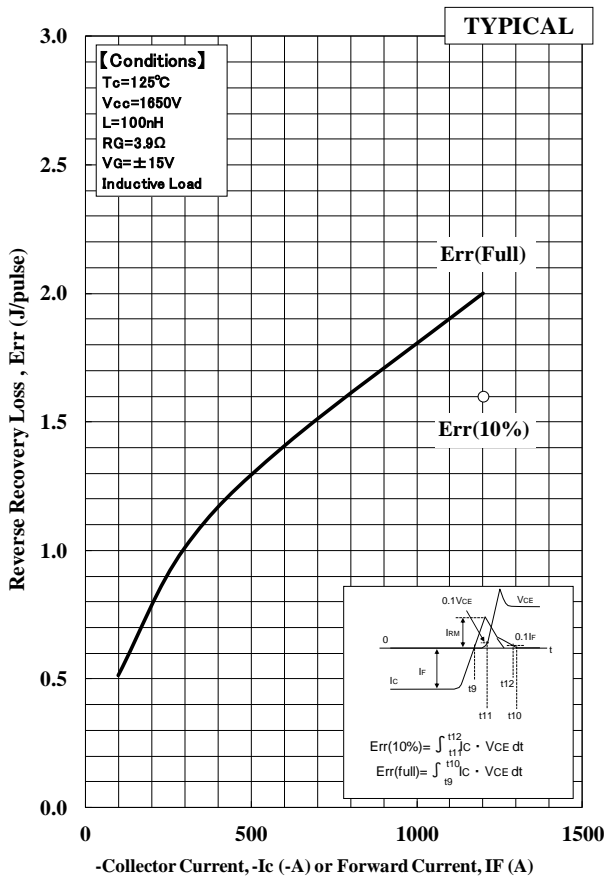
DYNAMIC CHARACTERISTICS



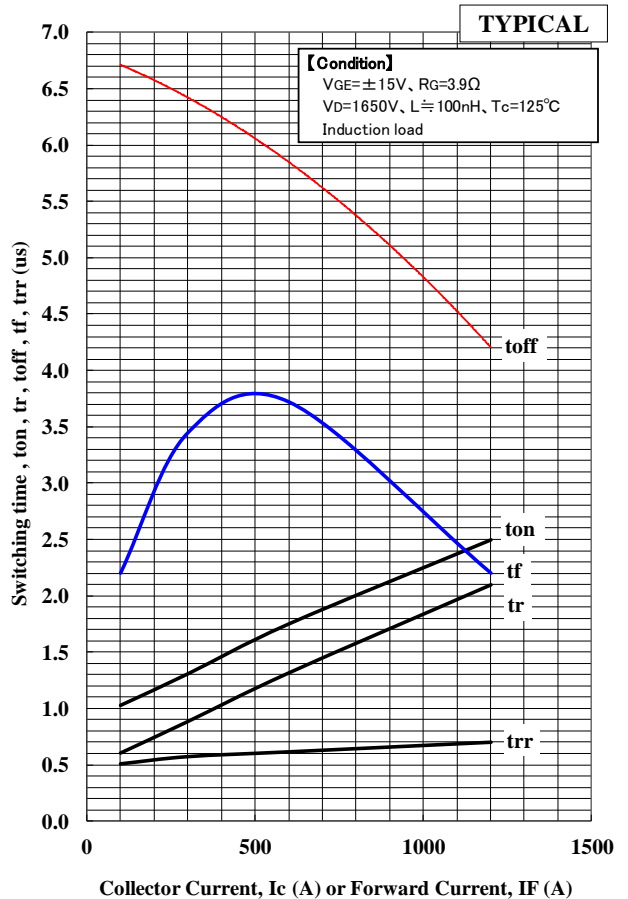
Turn-on Loss vs. Collector Current



Turn-off Loss vs. Collector Current

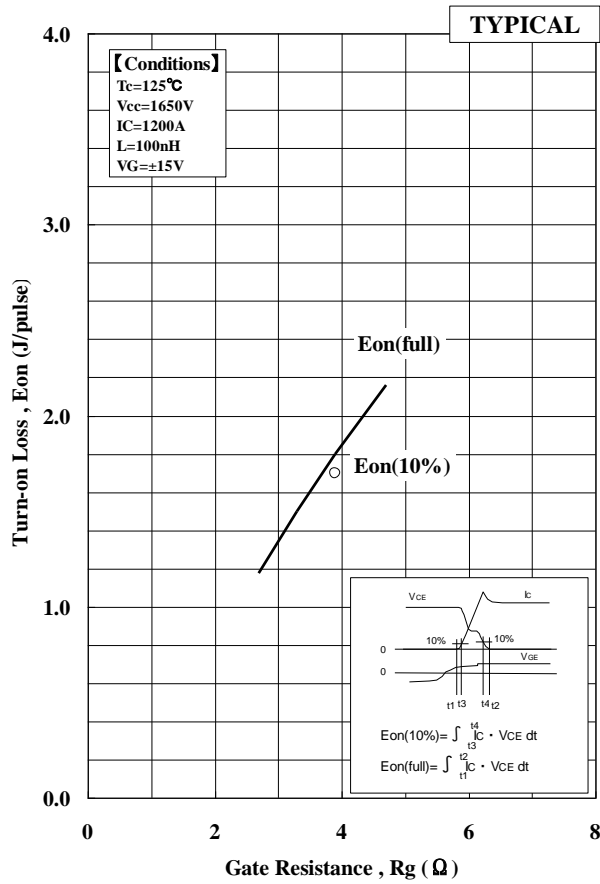


Recovery Loss vs. Collector Current

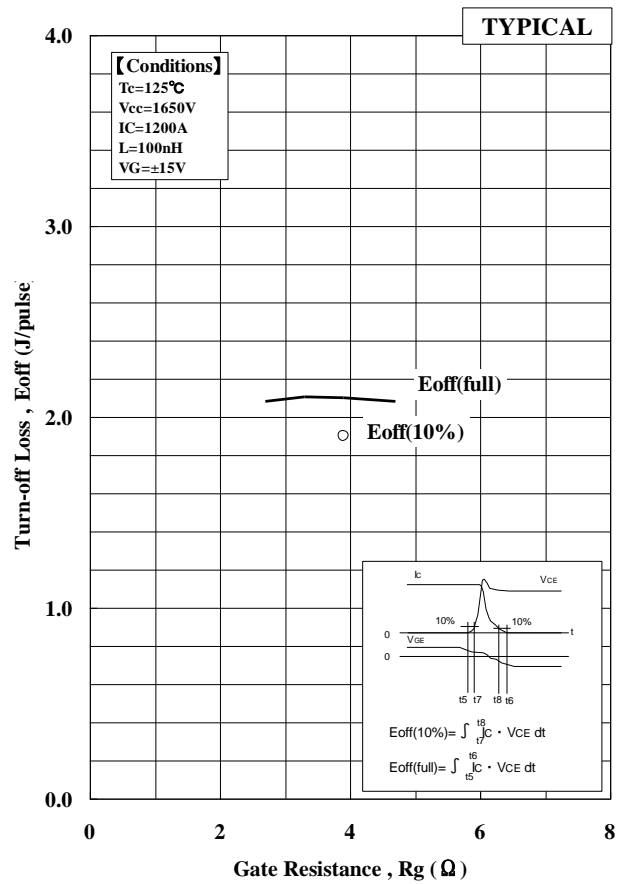


Switching time vs. Collector current

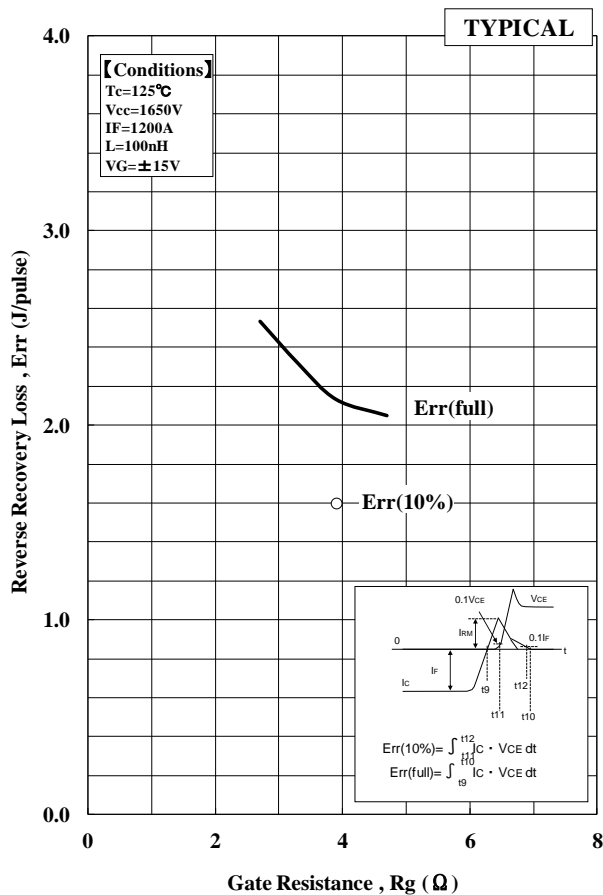
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Turn-on Loss vs. Gate Resistance



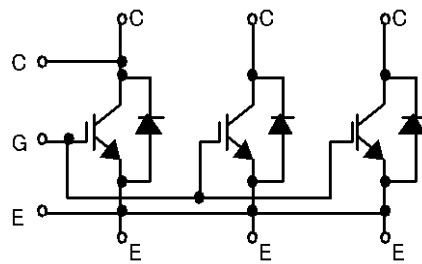
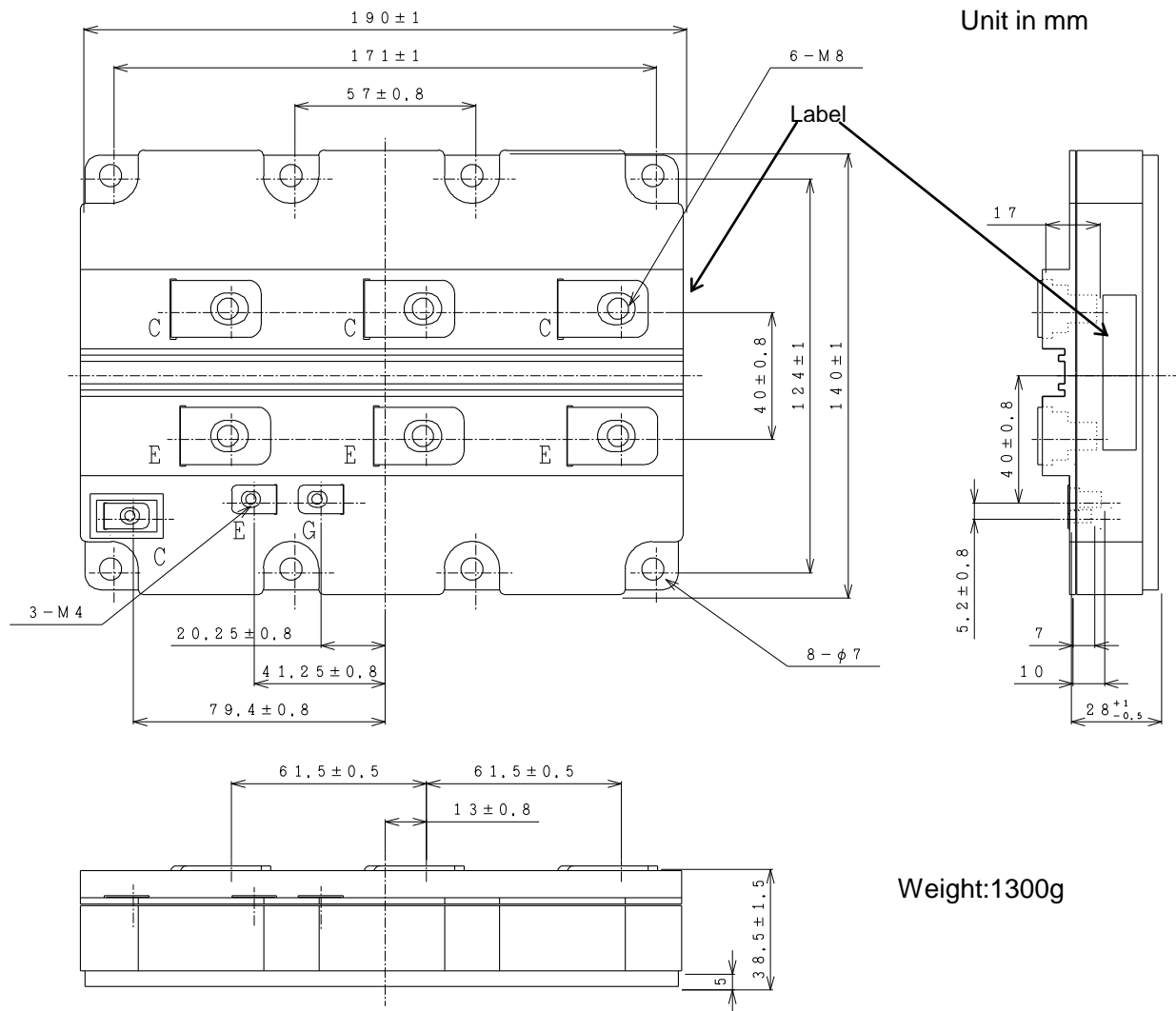
Turn-off Loss vs. Gate Resistance



Recovery Loss vs. Gate Resistance

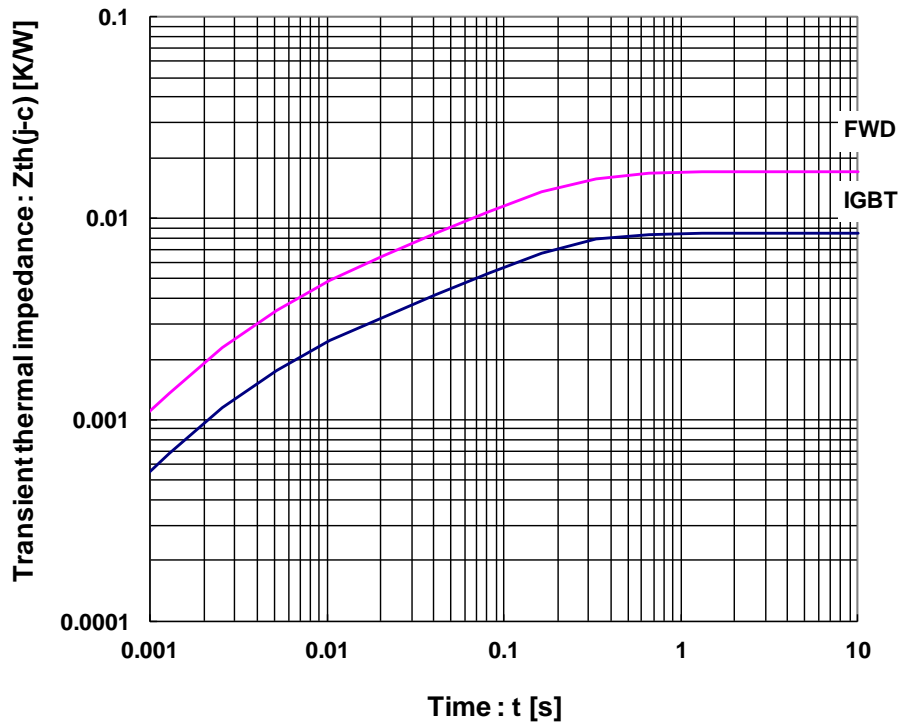
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PACKAGE OUTLINE DRAWING



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TRANSIENT THERMAL IMPEDANCE



Transient Thermal Impedance Curve (Maximum Value)

Curve Approximation Model

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

n	1	2	3	4	Unit
$\tau_{th}[n]$	1.51E-01	2.49E-02	3.86E-03	6.61E-04	sec
$r_{th}[n,IGBT]$	5.24E-03	1.54E-03	1.57E-03	1.45E-04	K/W
$r_{th}[n,Diode]$	1.04E-02	3.19E-03	3.08E-03	2.99E-04	K/W

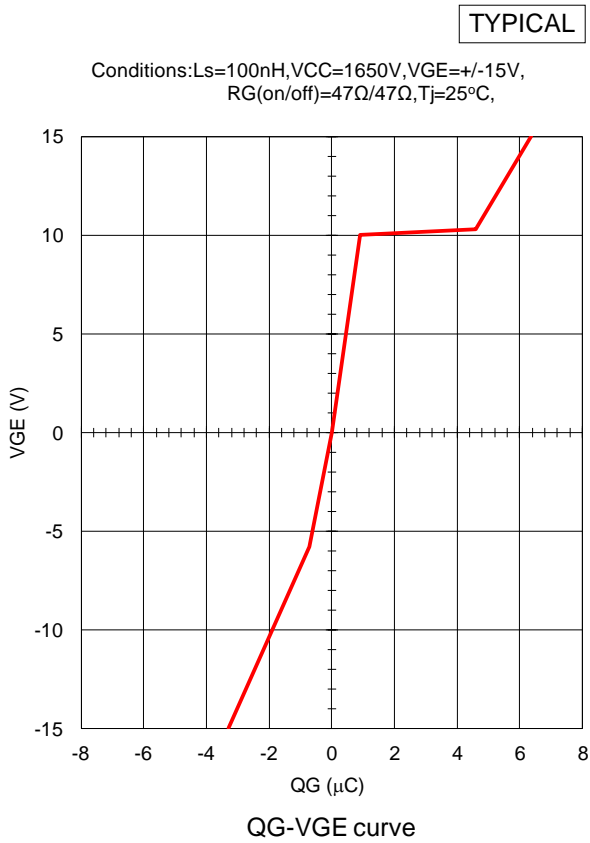
Material declaration

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

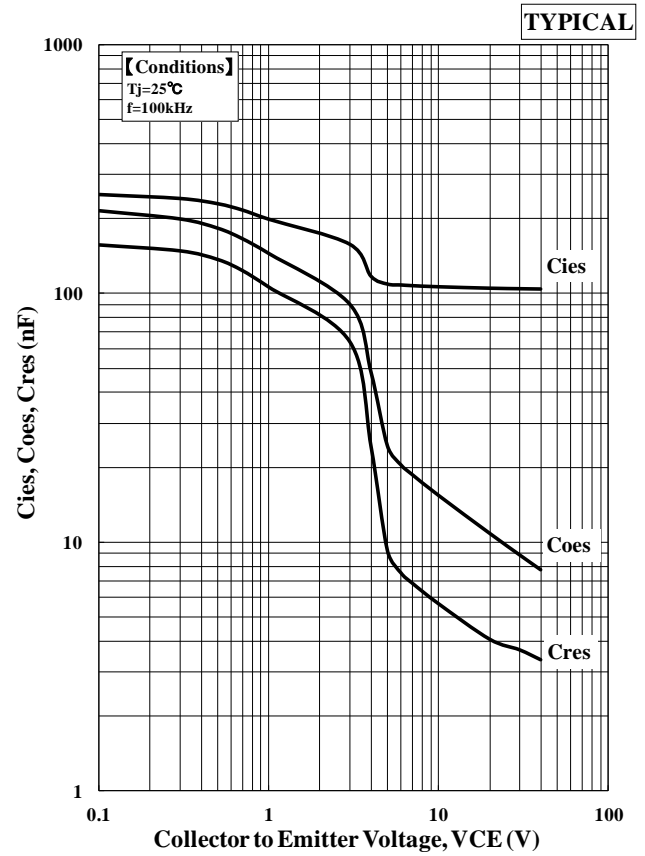
Material	Contained part
Lead (Pb) and its compounds	Solder

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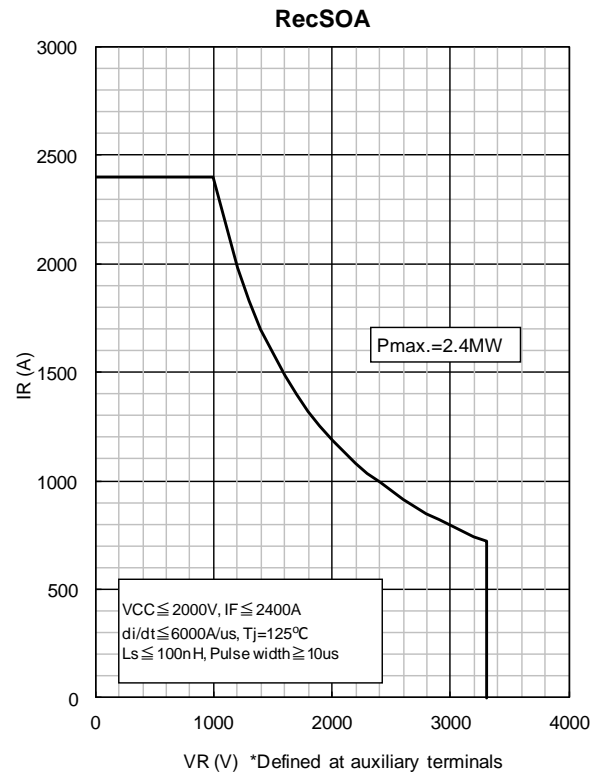
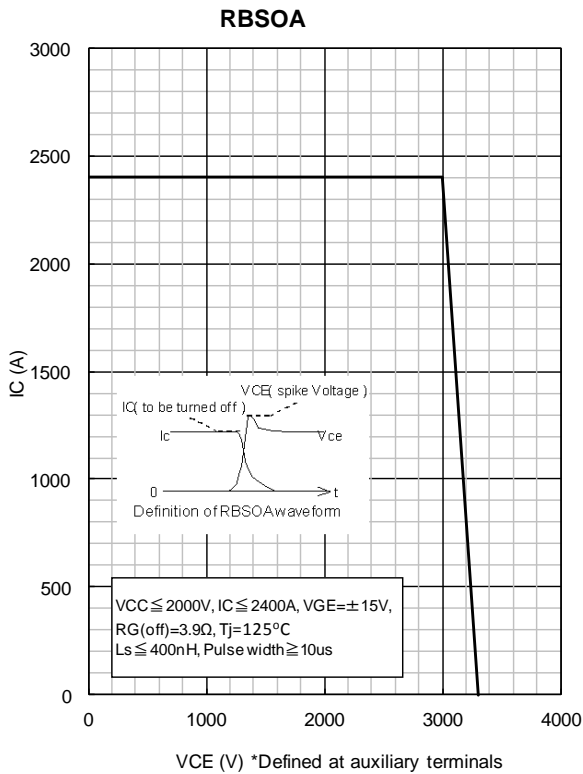
QG-VGE curve



Cies, Coes, Cres curve



Capacitance vs. Collector to Emitter Voltage



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HITACHI POWER SEMICONDUCTORS

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2. Please be sure to read "Precautions for Safe Use and Notices" in the individual brochure before use.
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