

# MBN800E33E

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	MBN800E33E
Collector Emitter Voltage	$V_{CES}$	V	3,300
Gate Emitter Voltage	$V_{GES}$	V	$\pm 20$
Collector Current	DC	$I_C$	800
	1ms	$I_{Cp}$	1,600
Forward Current	DC	$I_F$	800
	1ms	$I_{FM}$	1,600
Junction Temperature	$T_j$	$^\circ\text{C}$	-40 ~ +125
Storage Temperature	$T_{stg}$	$^\circ\text{C}$	-40 ~ +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	-	-	12.0	$V_{CE}=3,300\text{V}$ , $V_{GE}=0\text{V}$ , $T_j=25^\circ\text{C}$
			-	14	40	$V_{CE}=3,300\text{V}$ , $V_{GE}=0\text{V}$ , $T_j=125^\circ\text{C}$
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	3.0	3.5	4.2	$I_C=800\text{A}$ , $V_{GE}=15\text{V}$ , $T_j=125^\circ\text{C}$
Gate Emitter Threshold Voltage	$V_{GE(TH)}$	V	4.5	6.0	7.0	$V_{CE}=10\text{V}$ , $I_C=800\text{mA}$ , $T_j=25^\circ\text{C}$
Input Capacitance	$C_{ies}$	nF	-	70	-	$V_{CE}=10\text{V}$ , $V_{GE}=0\text{V}$ , $f=100\text{kHz}$ , $T_j=25^\circ\text{C}$
Internal Gate Resistance	$R_{g(int)}$	$\Omega$	-	2.0	-	$V_{CE}=10\text{V}$ , $V_{GE}=0\text{V}$ , $f=100\text{kHz}$ , $T_j=25^\circ\text{C}$
Switching Times	Rise Time	$t_r$	1.1	2.1	3.1	$V_{CC}=1,650\text{V}$ , $I_C=800\text{A}$ $L=120\text{nH}$ $R_G=5.6\Omega$ (3) $V_{GE}=\pm 15\text{V}$ , $T_j=125^\circ\text{C}$
	Turn On Time	$t_{on}$	1.7	2.5	3.3	
	Fall Time	$t_f$	1.3	2.2	3.1	
	Turn Off Time	$t_{off}$	2.7	4.2	5.7	
Peak Forward Voltage Drop	$V_{FM}$	V	2.0	2.5	3.0	$I_F=800\text{A}$ , $V_{GE}=0\text{V}$ , $T_j=125^\circ\text{C}$
Reverse Recovery Time	$t_{rr}$	$\mu\text{s}$	0.2	0.7	1.2	$V_{CC}=1,650\text{V}$ , $I_F=800\text{A}$ , $L=120\text{nH}$ $T_j=125^\circ\text{C}$
Turn On Loss	$E_{on(10\%)}$	J/P	-	1.2	1.6	$V_{CC}=1,650\text{V}$ , $I_C=800\text{A}$ , $L=120\text{nH}$
Turn Off Loss	$E_{off(10\%)}$	J/P	-	1.3	1.7	$R_G=5.6\Omega$ (3)
Reverse Recovery Loss	$E_{rr(10\%)}$	J/P	-	1.0	1.5	$V_{GE}=\pm 15\text{V}$ , $T_j=125^\circ\text{C}$
Stray inductance in module	$L_{SCE}$	nH	-	18	-	Collector-main to Emitter-main
Thermal Impedance	IGBT	$R_{th(j-c)}$	-	-	0.013	Junction to case
	FWD	$R_{th(j-c)}$	-	-	0.026	
Contact Thermal Impedance	$R_{th(c-f)}$	K/W	-	0.008	-	Case to fin

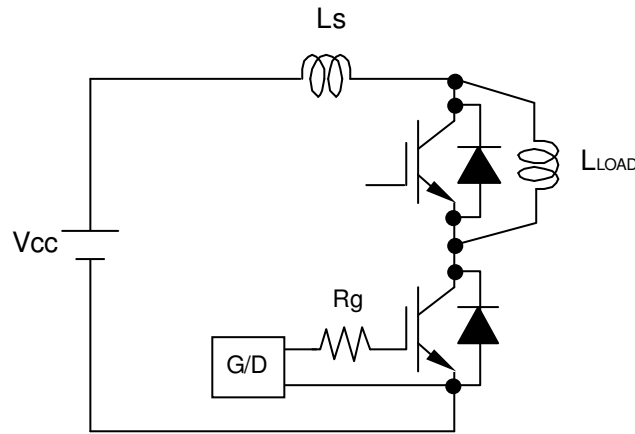
Notes:(3)  $R_G$  value is a test condition value for evaluation, not recommended value.

Please, determine the suitable  $R_G$  value by measuring switching behaviors.

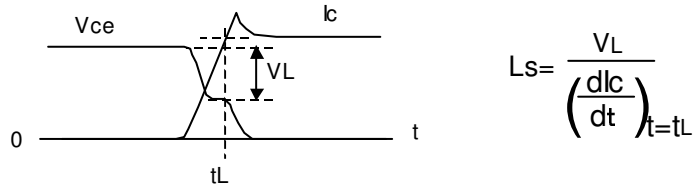
- \* Please contact our representatives at order.
- \* For improvement, specifications are subject to change without notice.
- \* For actual application, please confirm this spec sheet is the newest revision.

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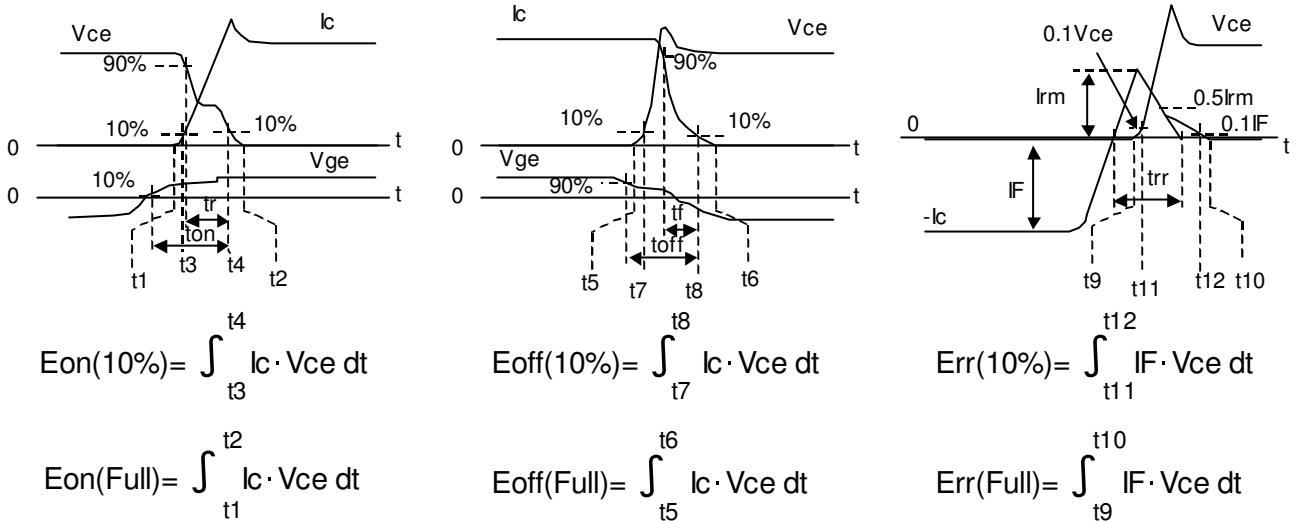
## DEFINITION OF TEST CIRCUIT



**Fig.1 Switching test circuit**



**Fig.2 Definition of Ls**

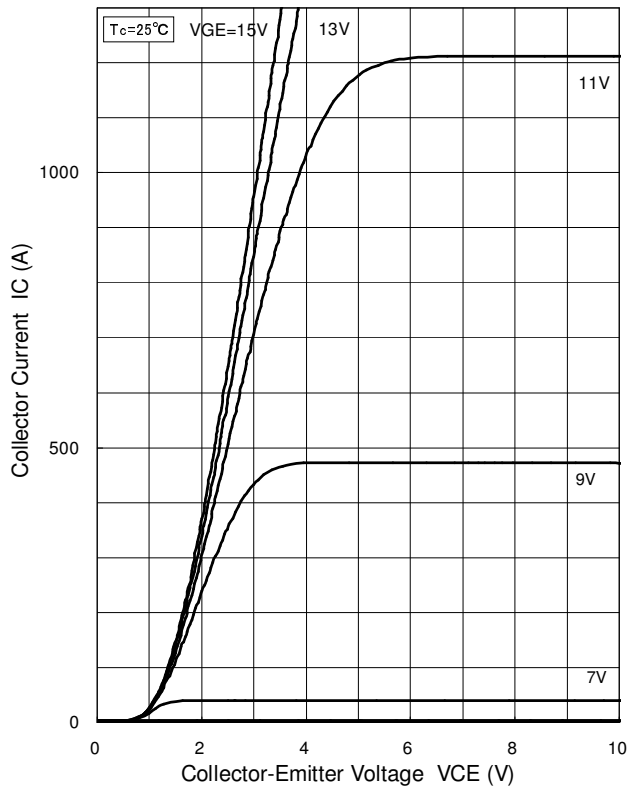


**Fig.3 Definition of switching loss**

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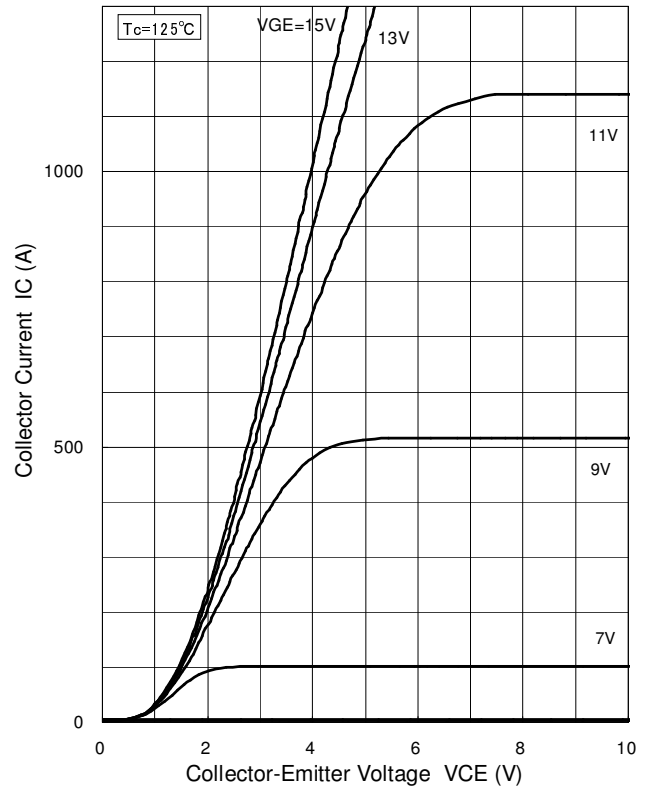
## STATIC CHARACTERISTICS

TYPICAL



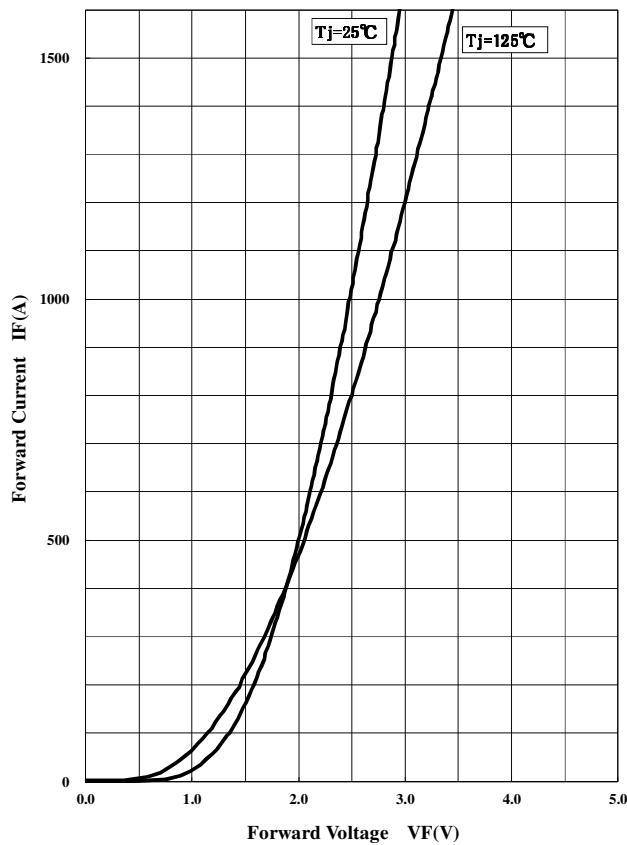
Collector Current vs. Collector to Emitter Voltage

TYPICAL



Collector Current vs. Collector to Emitter Voltage

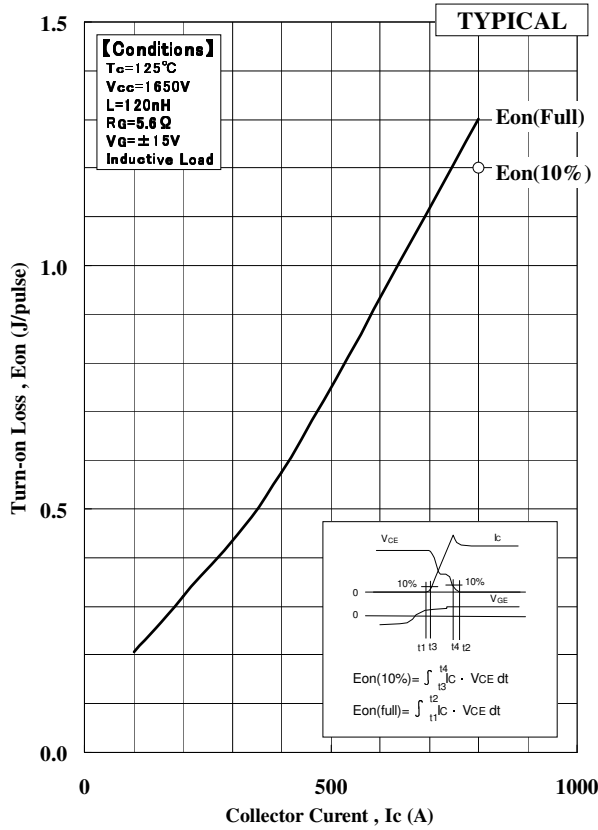
TYPICAL



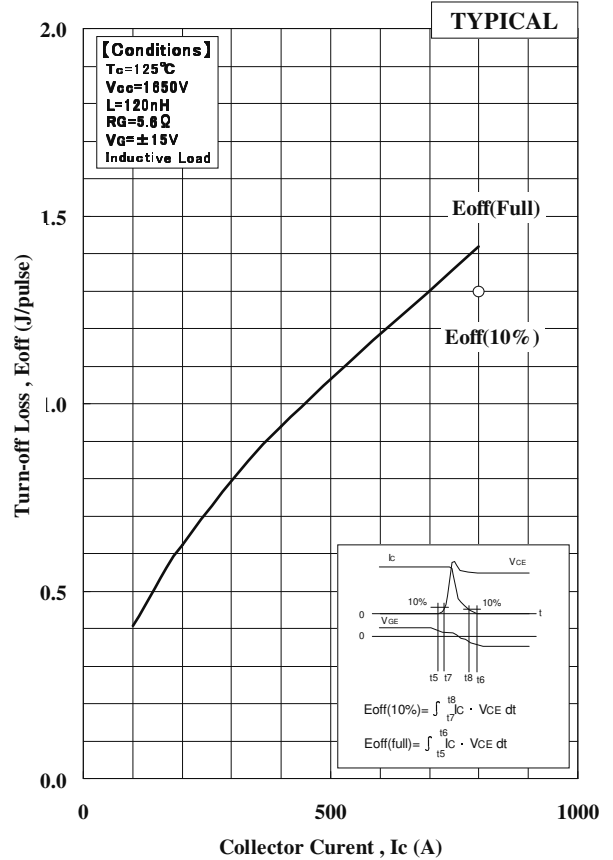
Forward Voltage of free-wheeling diode

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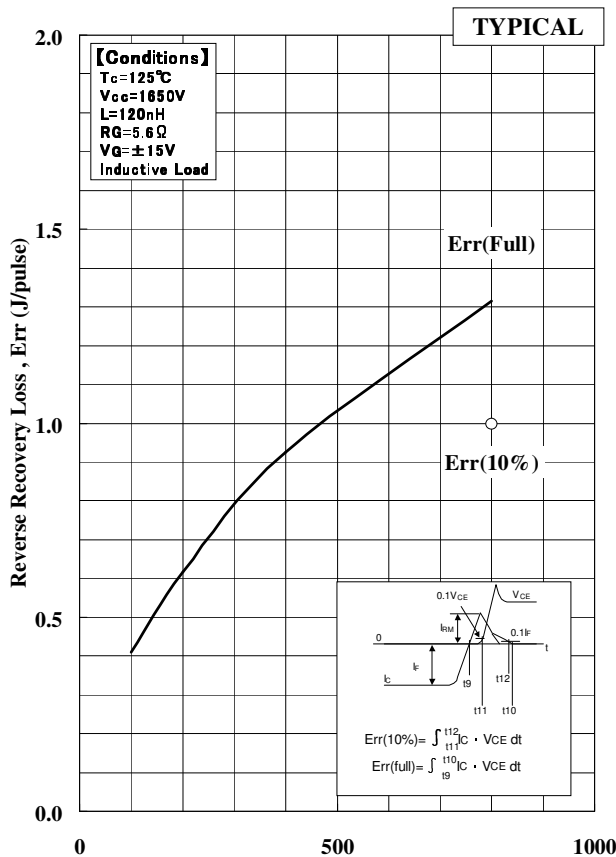
## DYNAMIC CHARACTERISTICS



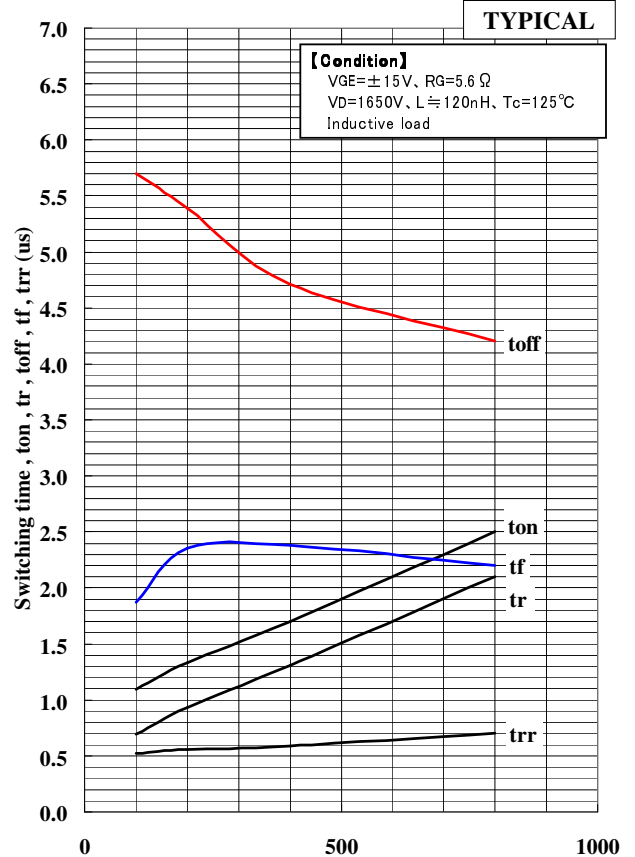
Turn-on Loss vs. Collector Current



Turn-off Loss vs. Collector Current

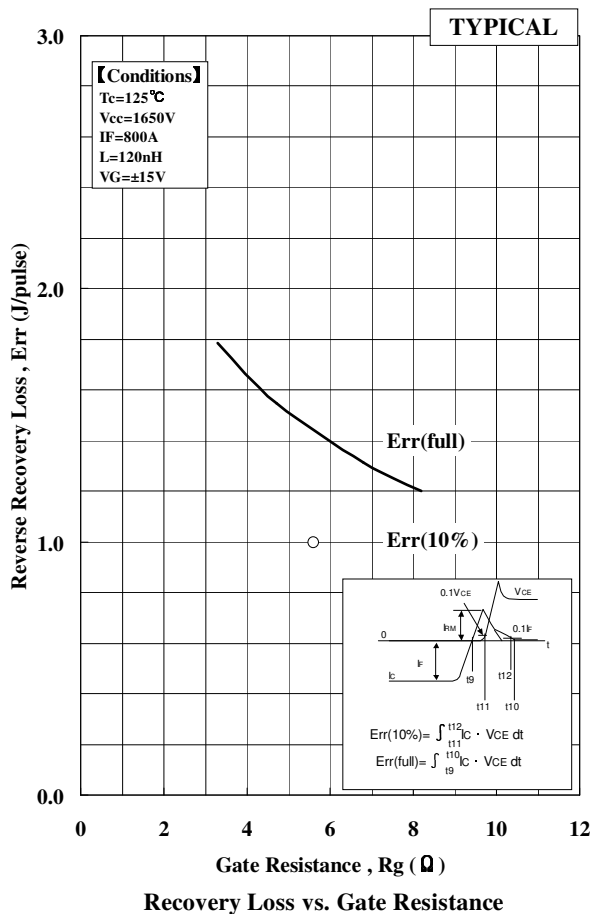
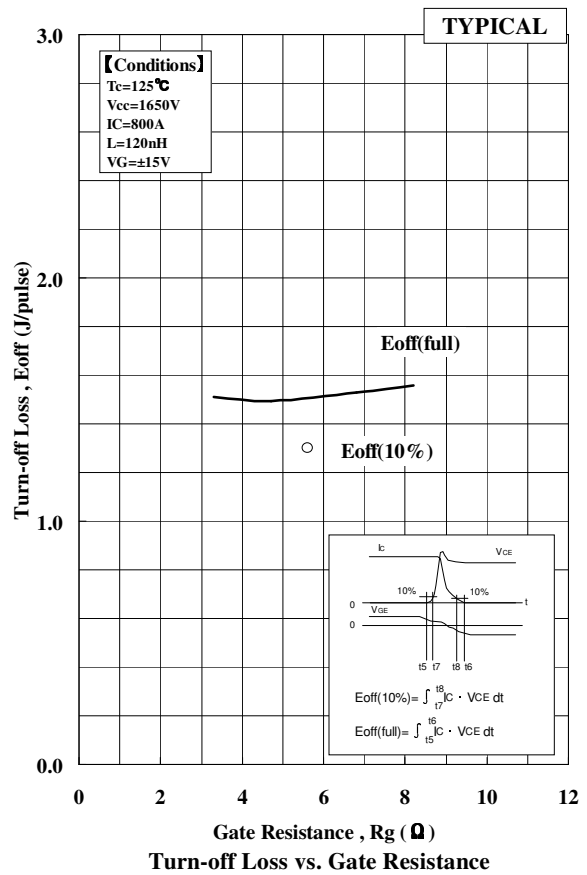
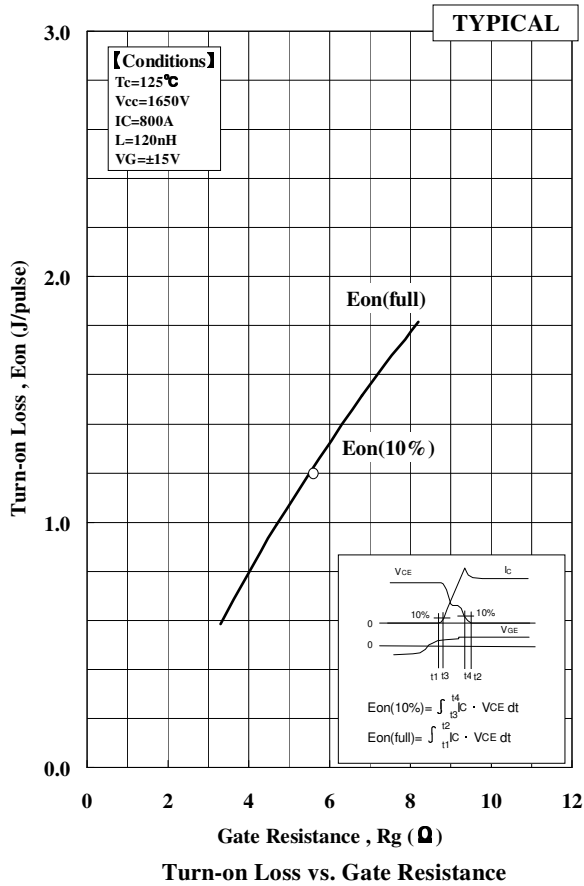


Recovery Loss vs. Collector Current



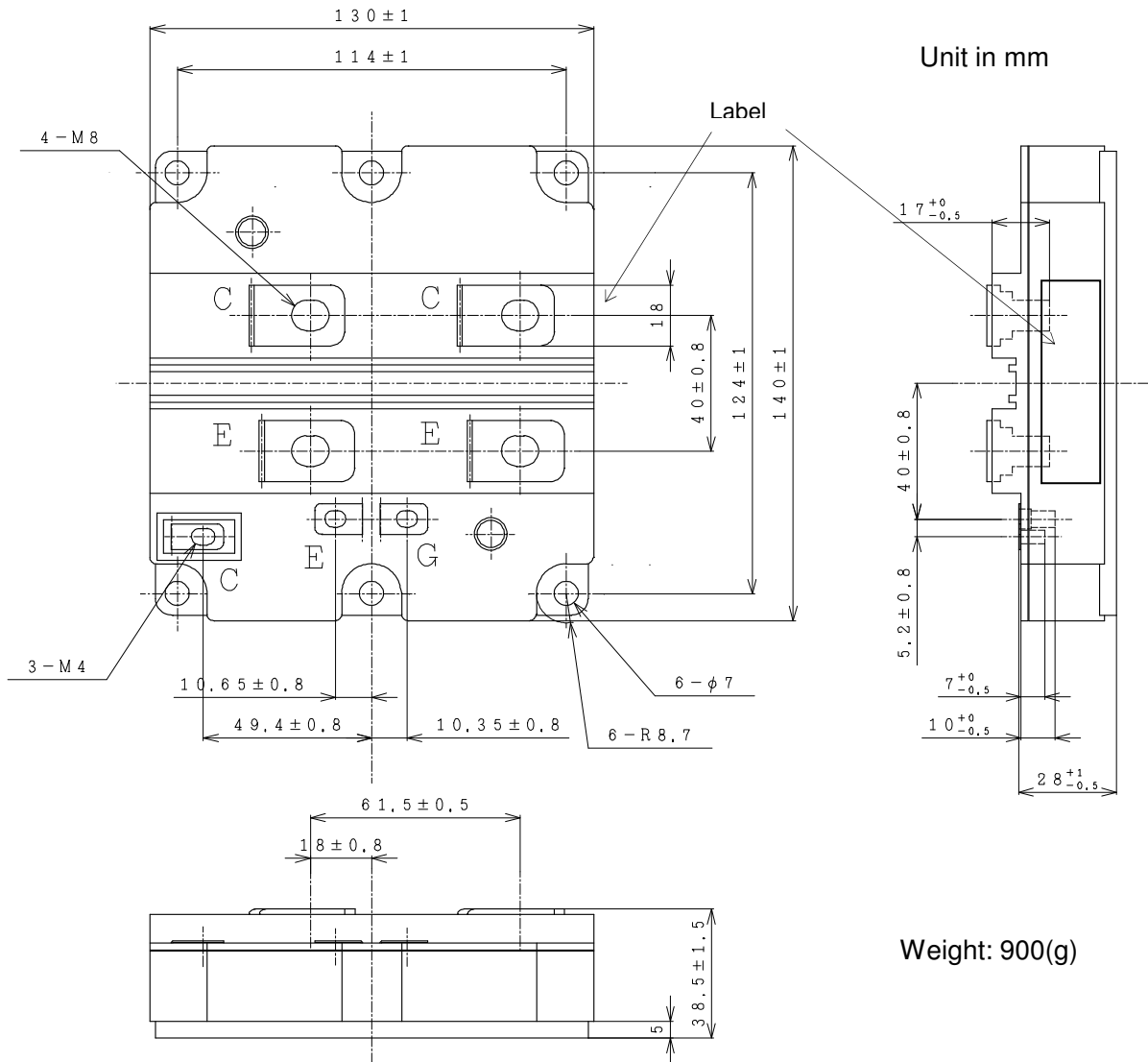
Switching time vs. Collector current

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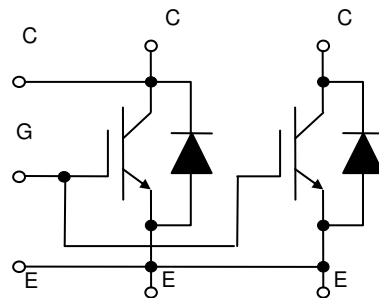


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## OUTLINE DRAWINGS

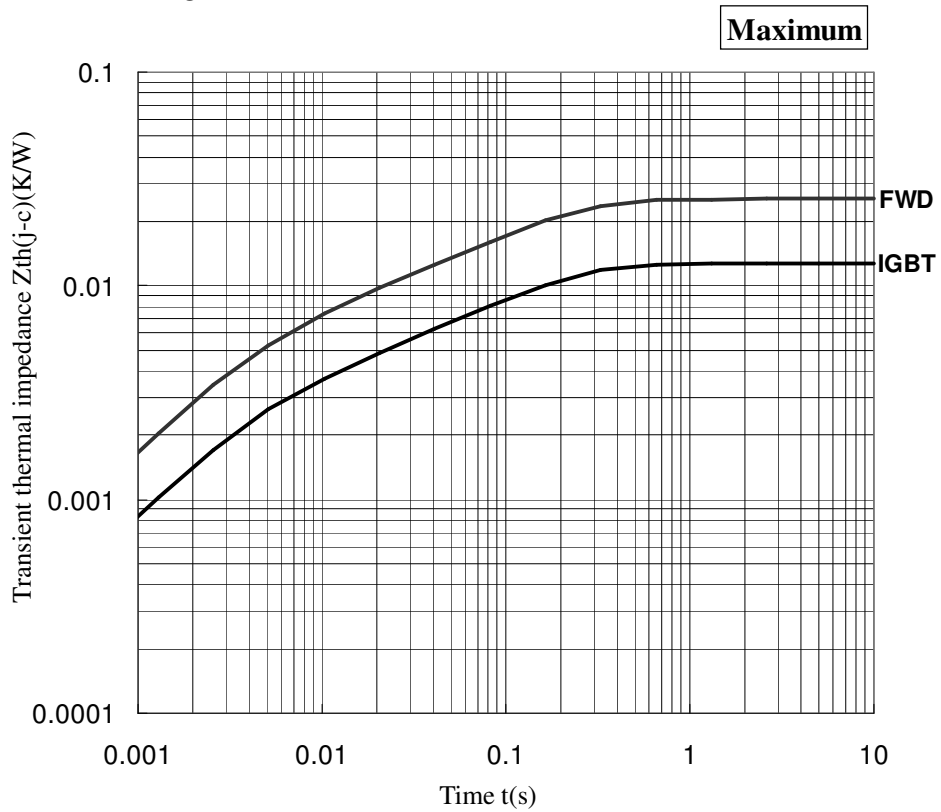


## CIRCUIT DIAGRAM



# MBN800E33E

## TRANSIENT THERMAL IMPEDANCE



**Transient Thermal Impedance Curve**

### Material declaration

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

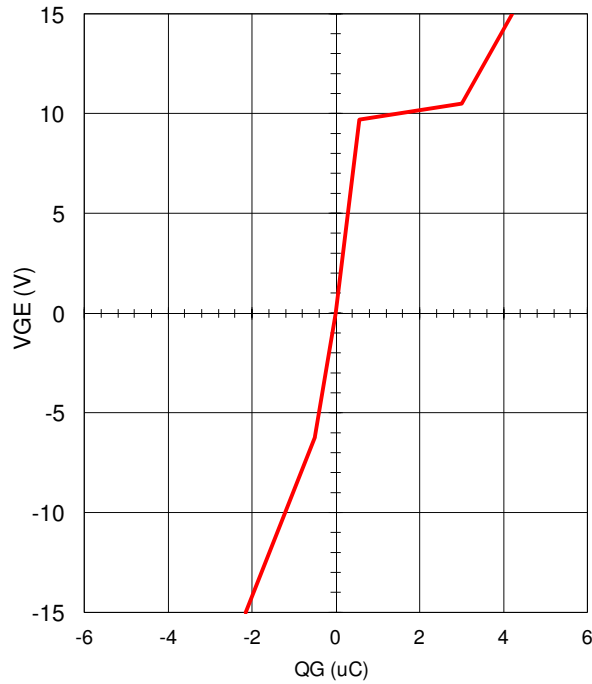
Material	Contained part
Lead (Pb) and its compounds	Solder

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## QG-VG CURVE

TYPICAL

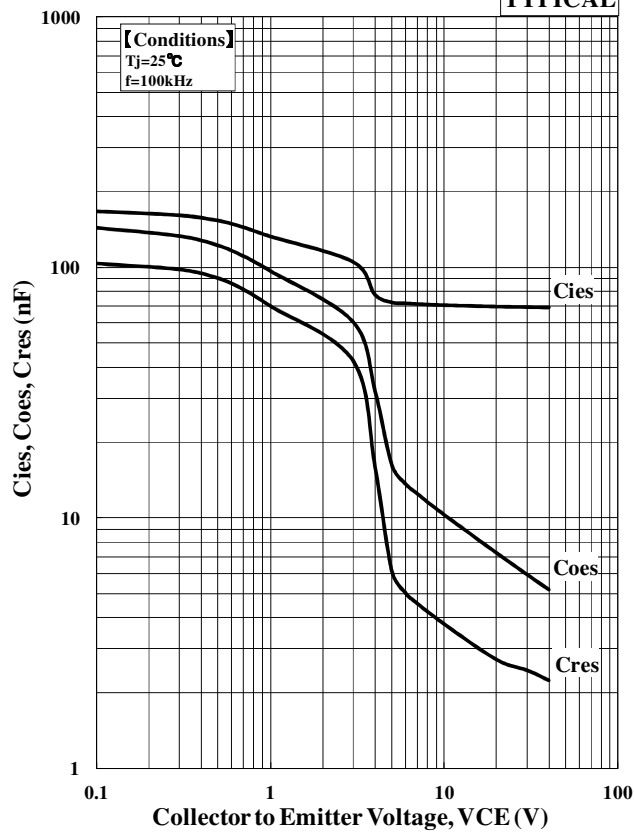
Conditions:  $L_s=120\text{nH}$ ,  $V_{CC}=1650\text{V}$ ,  $V_{GE}=\pm 15\text{V}$ ,  
 $R_{G(\text{on/off})}=68\Omega/68\Omega$ ,  $T_j=25^\circ\text{C}$ ,



QG-VGE curve

## Cies, Coes, Cres curve

TYPICAL



Capacitance vs. Collector to Emitter Voltage



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## HITACHI POWER SEMICONDUCTORS

### Notices

1. The information given herein, including the specifications and dimensions, is subject to change without prior notice to improve product characteristics. Before ordering, purchasers are advised to contact Hitachi sales department for the latest version of this data sheets.
2. Please be sure to read "Precautions for Safe Use and Notices" in the individual brochure before use.
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