

# MBN800H45E2

Silicon N-channel IGBT 4500V E2 version

## FEATURES

- \* Low conduction 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	MBN800H45E2
Collector Emitter Voltage	$V_{CES}$	V	4,500
Gate Emitter Voltage	$V_{GES}$	V	$\pm 20$
Collector Current	DC	$I_c$	800 ( $T_c=80^\circ\text{C}$ )
	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	$T_{stg}$	$^\circ\text{C}$	-50 ~ +125 (1)
Isolation Voltage	$V_{ISO}$	$V_{RMS}$	10,200 (AC 1 minute)
Screw Torque	Terminals (M4/M8)	-	2/10 (2)
	Mounting (M6)	-	6 (3)

Notes: (1) Terminal temperature shall not exceed the specified temperature in any operation.

(2) Recommended Value  $1.8\pm 0.2/9\pm 1\text{N}\cdot\text{m}$ (3) 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	-	-	17	$V_{CE}=4,500\text{V}$ , $V_{GE}=0\text{V}$ , $T_j=25^\circ\text{C}$	
			-	17	67	$V_{CE}=4,500\text{V}$ , $V_{GE}=0\text{V}$ , $T_j=125^\circ\text{C}$	
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	3.1	3.7	4.2	$I_c=800\text{A}$ , $V_{GE}=15\text{V}$ , $T_j=125^\circ\text{C}$	
Gate Emitter Threshold Voltage	$V_{GE(TO)}$	V	5.4	6.4	7.4	$V_{CE}=10\text{V}$ , $I_c=800\text{mA}$ , $T_j=25^\circ\text{C}$	
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	$R_{ge}$	$\Omega$	-	2.4	-	$V_{CE}=10\text{V}$ , $V_{GE}=0\text{V}$ , $f=100\text{kHz}$ , $T_j=25^\circ\text{C}$	
Switching Times	Rise Time	$t_r$	1.0	2.2	3.3	$V_{CC}=2,600\text{V}$ , $I_c=800\text{A}$	
	Turn On Time	$t_{on}$	1.4	3.1	4.7	$L_s=165\text{nH}$	
	Fall Time	$t_f$	1.5	3.0	4.5	$R_g=4.7\Omega$ (4)	
	Turn Off Time	$t_{off}$	3.6	5.5	8.0	$V_{GE}=\pm 15\text{V}$ , $T_j=125^\circ\text{C}$	
Peak Forward Voltage Drop	$V_{FM}$	V	2.3	2.9	3.4	$I_F=800\text{A}$ , $V_{GE}=0\text{V}$ , $T_j=125^\circ\text{C}$	
Reverse Recovery Time	$t_{rr}$	$\mu\text{s}$	-	0.8	1.6	$V_{CC}=2,600\text{V}$ , $I_F=800\text{A}$ , $L_s=165\text{nH}$ $T_j=125^\circ\text{C}$	
Turn On Loss	$E_{on(10\%)}$	J/p	-	2.6	3.9	$V_{CC}=2,600\text{V}$ , $I_c=800\text{A}$ , $L_s=165\text{nH}$ $R_g=4.7\Omega$ (4) $V_{GE}=\pm 15\text{V}$ , $T_j=125^\circ\text{C}$	
	$E_{on(full)}$		-	2.9	-		
Turn Off Loss	$E_{off(10\%)}$	J/p	-	2.8	4.2		
	$E_{off(full)}$		-	3.2	-		
Reverse Recovery Loss	$E_{rr(10\%)}$	J/p	-	2.1	3.2		
	$E_{rr(full)}$		-	2.3	-		
Thermal Impedance	IGBT	$R_{th(j-c)}$	K/W	-	-	Junction to case	
	FWD	$R_{th(j-c)}$		-	-		0.026
Contact Thermal Impedance		$R_{th(c-f)}$	K/W	-	0.007	-	Case to fin ( $\lambda_{grease}=1\text{W}/(\text{m}\cdot\text{K})$ , Heat-sink flatness $\leq 50\mu\text{m}$ )

Notes:(4)  $R_g$  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.

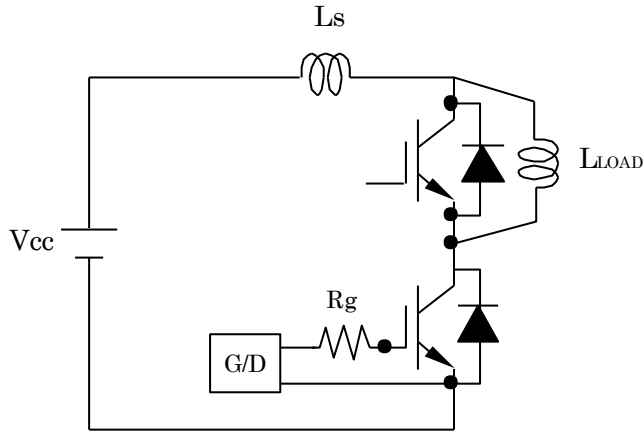
\* Please contact our representatives at order.

\* For improvement, specifications are subject to change without notice.

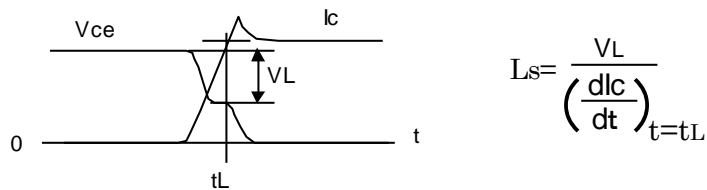
\* For actual application, please confirm this spec sheet is the newest revision.

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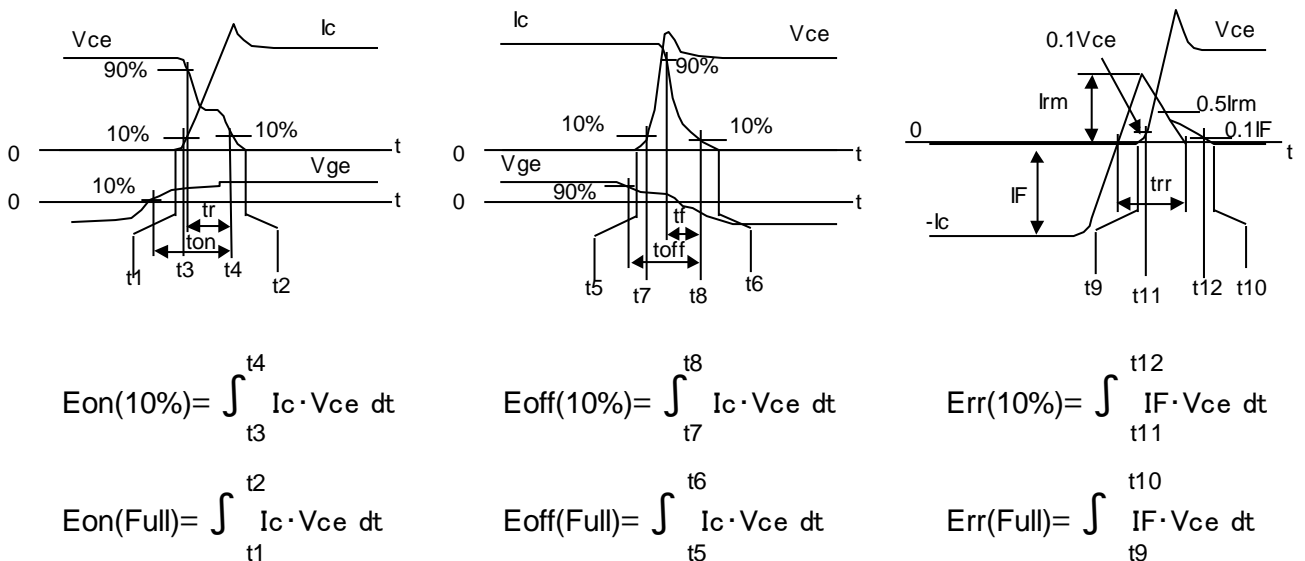
## DEFINITION OF TEST CIRCUIT



**Fig.1 Switching test circuit**



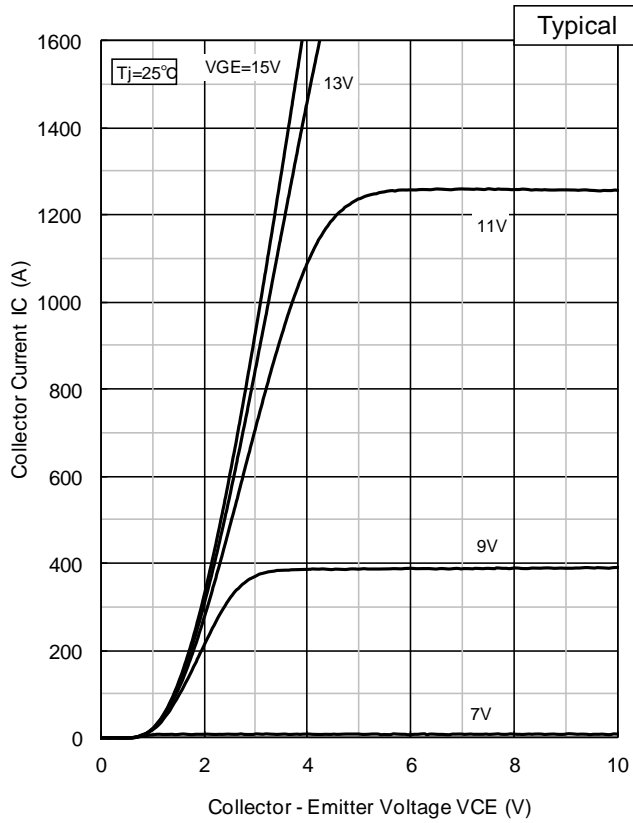
**Fig.2 Definition of Ls**



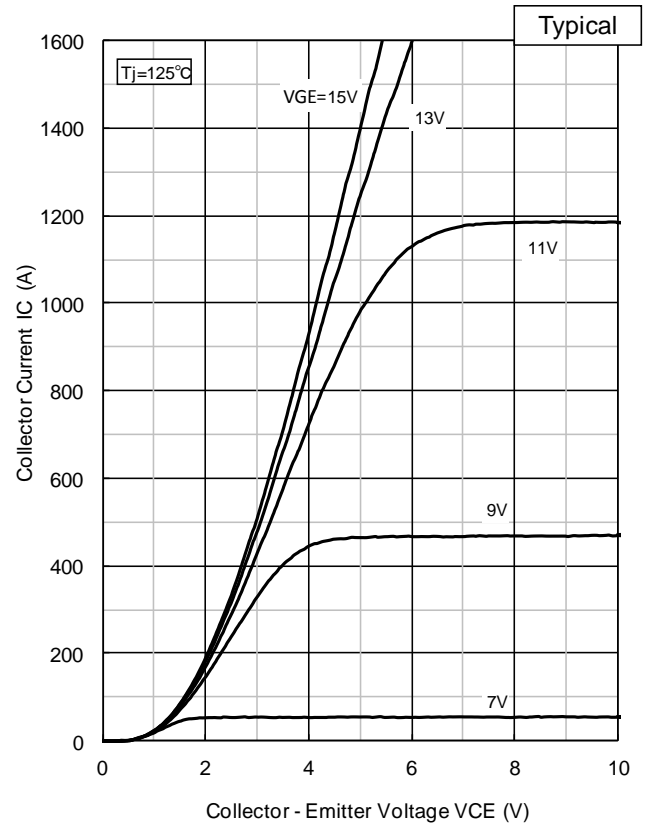
**Fig.3 Definition of switching loss**

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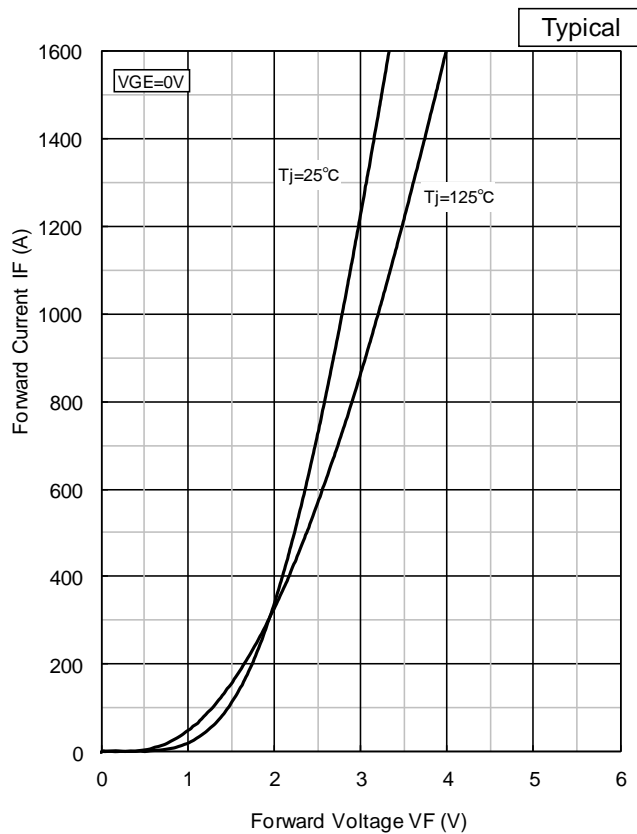
## STATIC CHARACTERISTICS



**$I_C$  vs.  $V_{CE}$  ( $T_j=25^\circ\text{C}$ )**



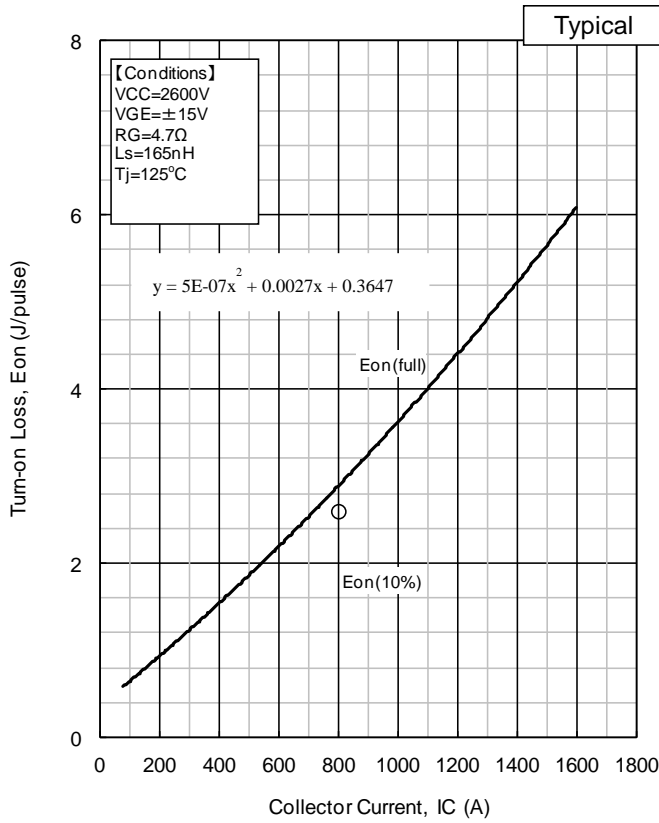
**$I_C$  vs.  $V_{CE}$  ( $T_j=125^\circ\text{C}$ )**



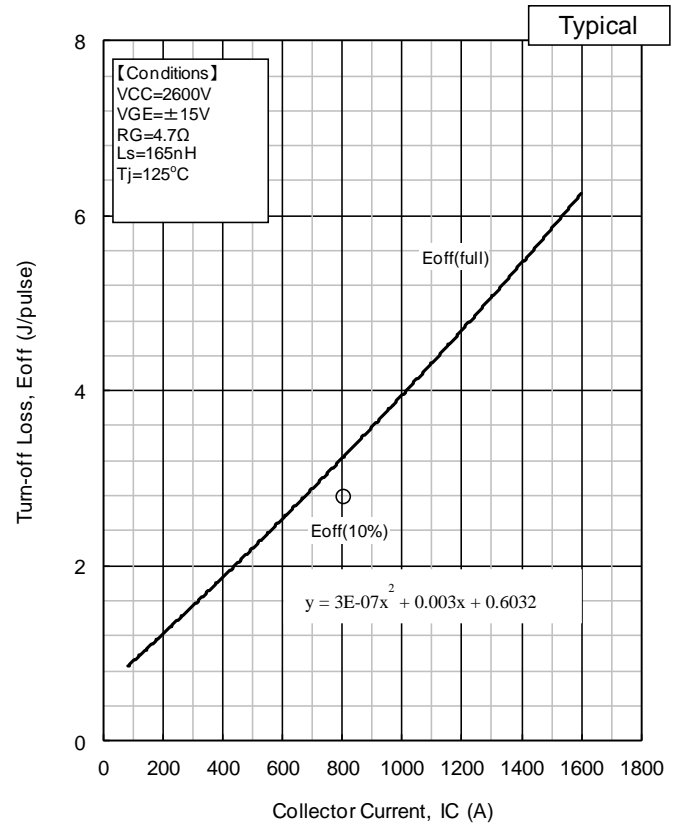
**$I_F$  vs.  $V_F$**

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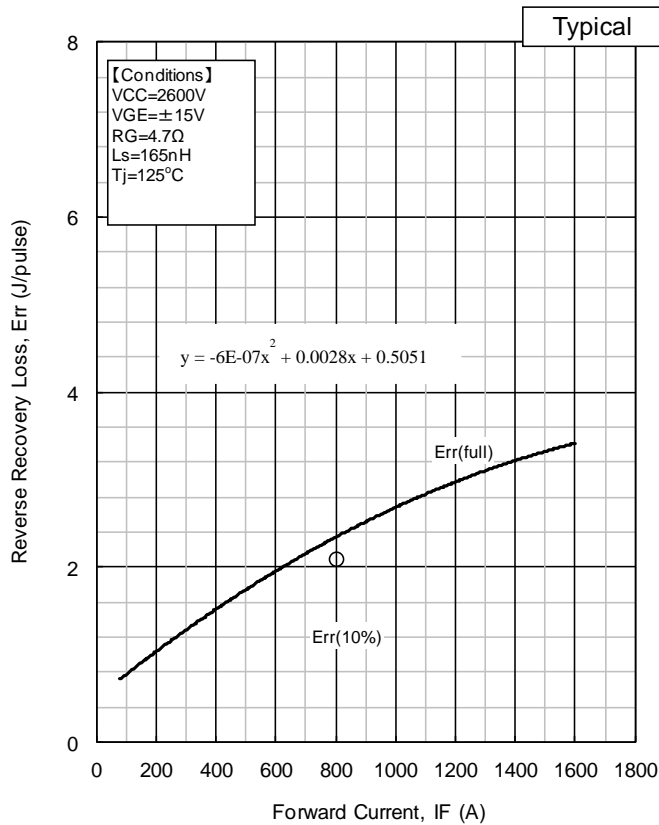
## DYNAMIC CHARACTERISTICS



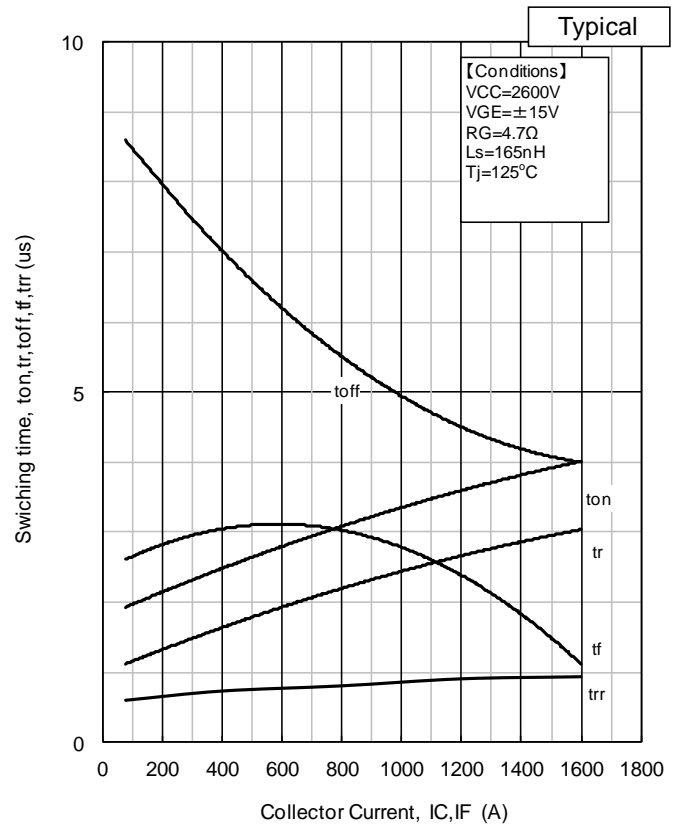
Turn-on loss vs. Collector current



Turn-off loss vs. Collector current

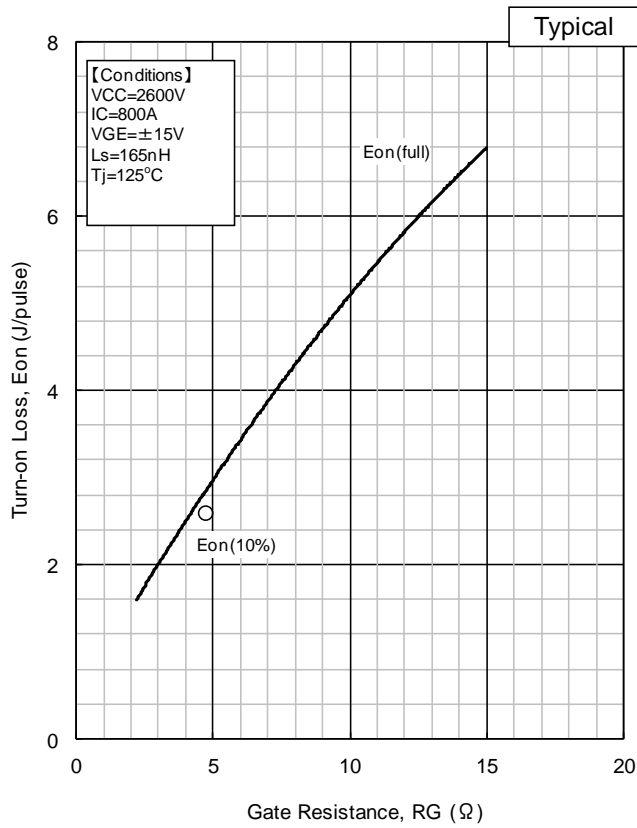


Recovery loss vs. Forward current

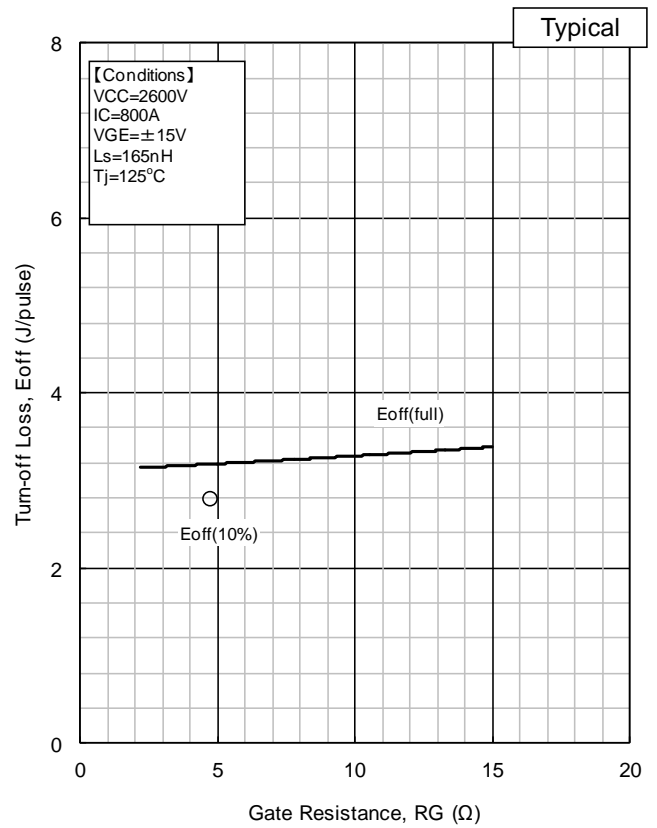


Switching time vs. Collector current

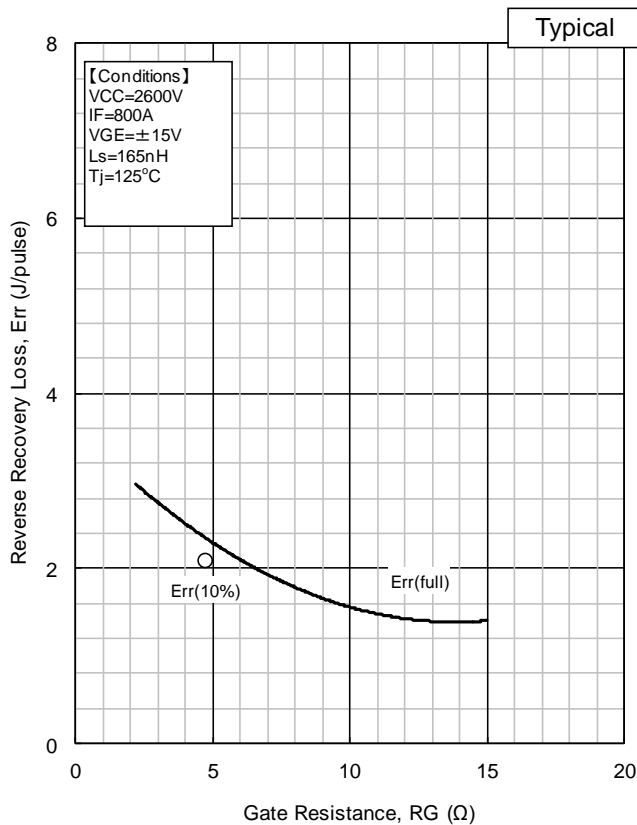
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Turn-on loss vs. Gate Resistance



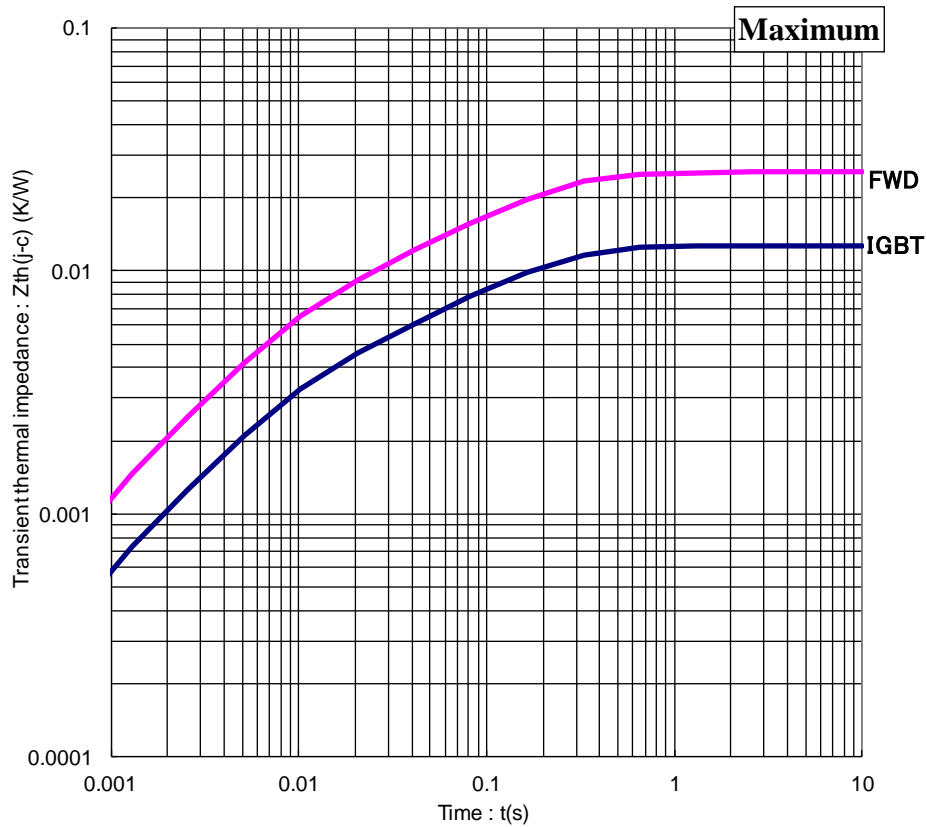
Turn-off loss vs. Gate Resistance



Recovery loss vs. Gate Resistance

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## TRANSIENT THERMAL IMPEDANCE



**Transient Thermal Impedance Curve**

### Curve approximation model

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

n	1	2	3	4	Unit
$\tau_{th}[n]$	1.63E-01	2.71E-02	6.11E-03	8.61E-04	sec
$r_{th}[n,IGBT]$	8.05E-03	2.47E-03	2.39E-03	1.31E-04	K/W
$r_{th}[n,Diode]$	1.61E-02	4.91E-03	4.76E-03	2.61E-04	K/W

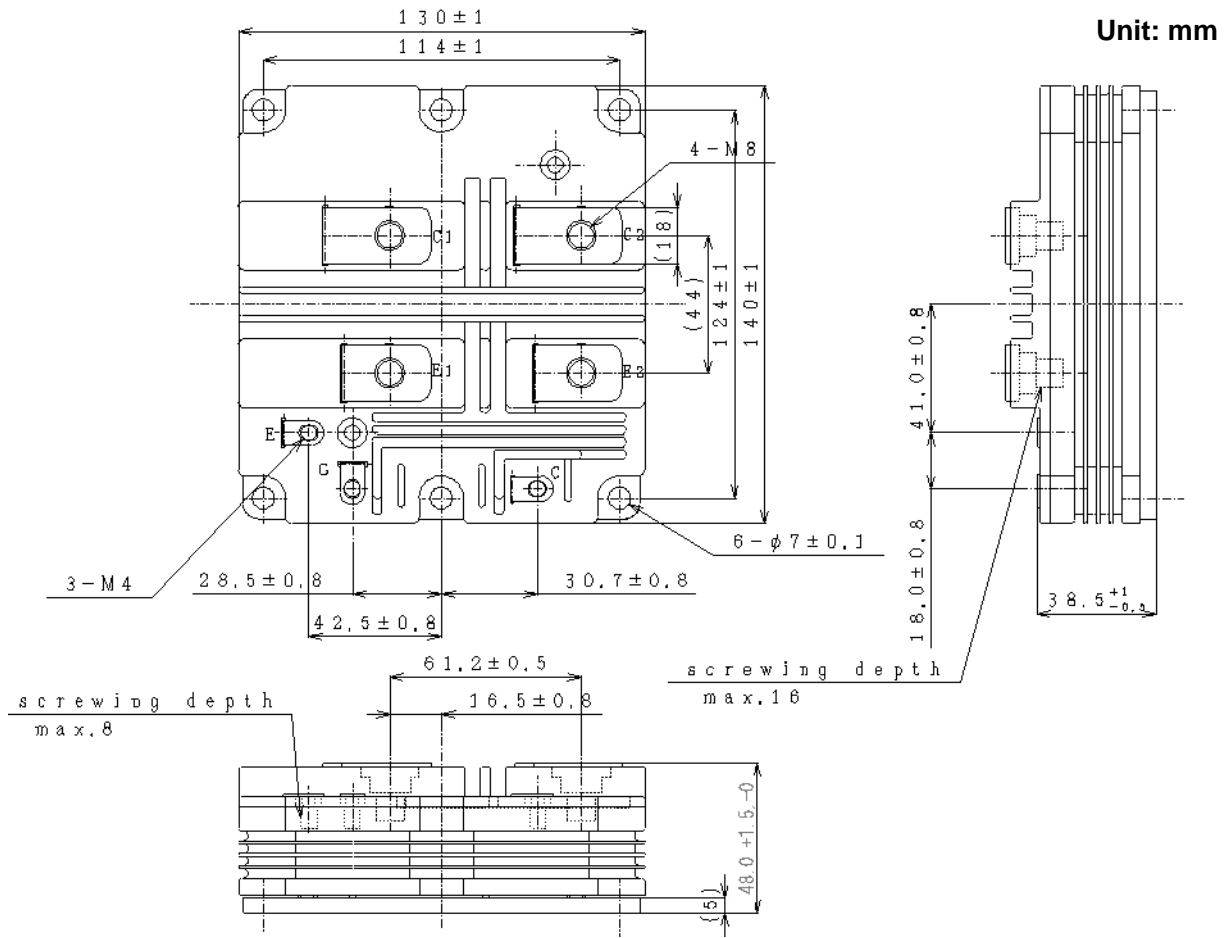
### Material declaration

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

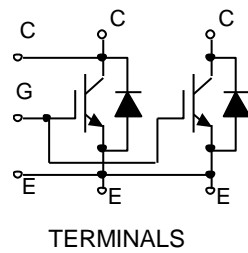
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## Module Outline Drawing



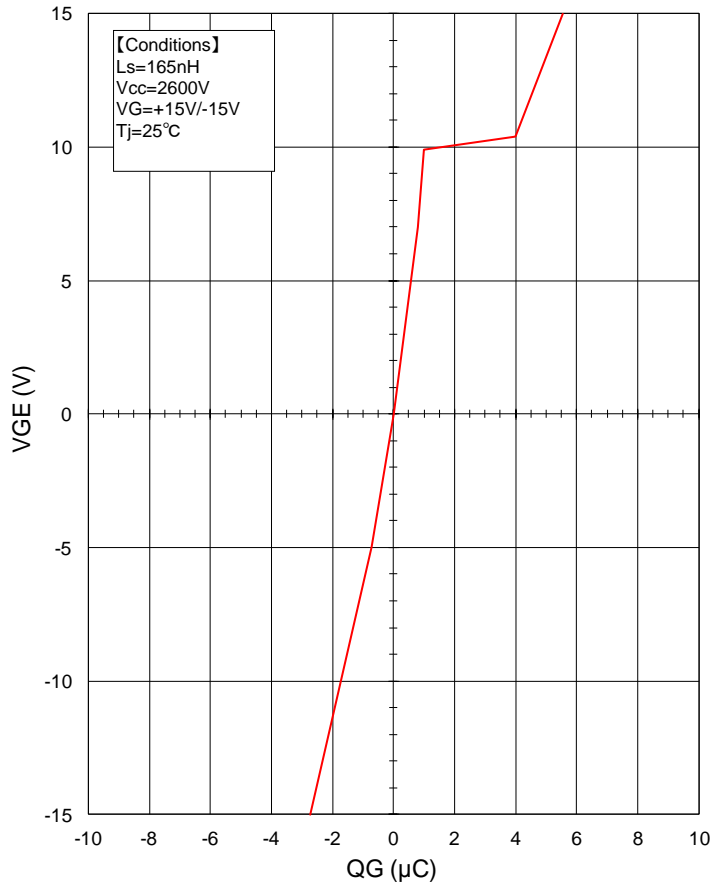
**Weight: 1050(g)**

## Circuit diagram

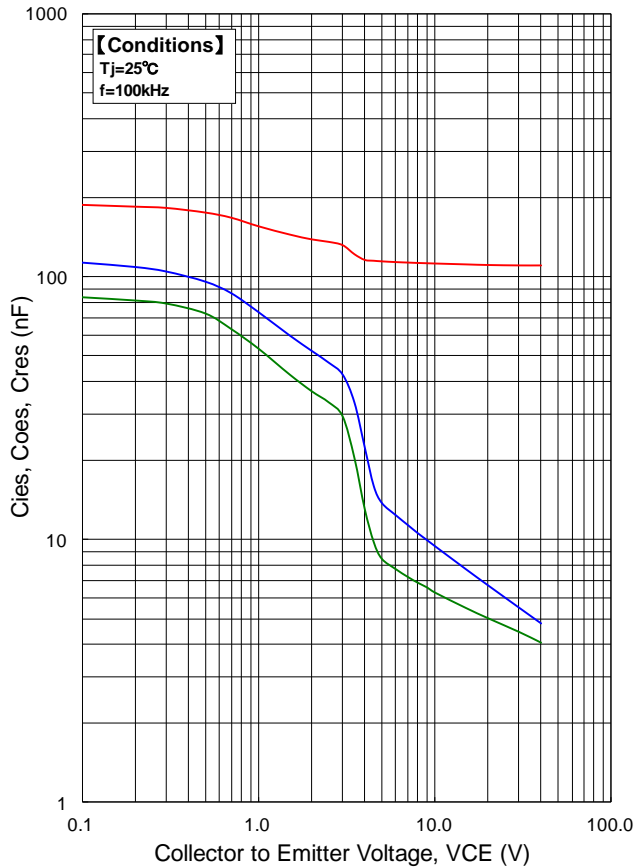


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## QG-VGE Curve



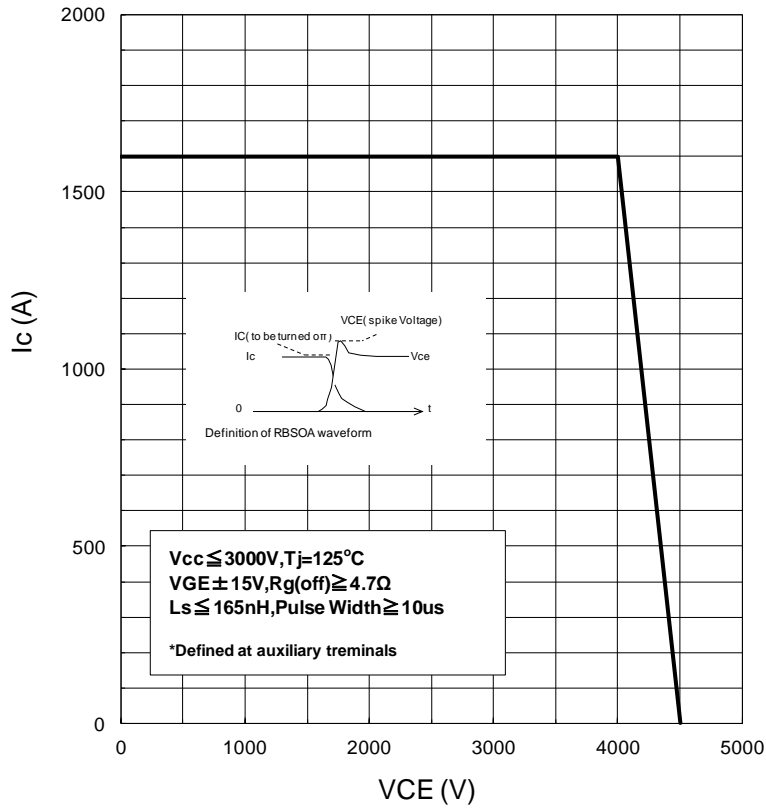
## Cies, Coes, Cres Curve



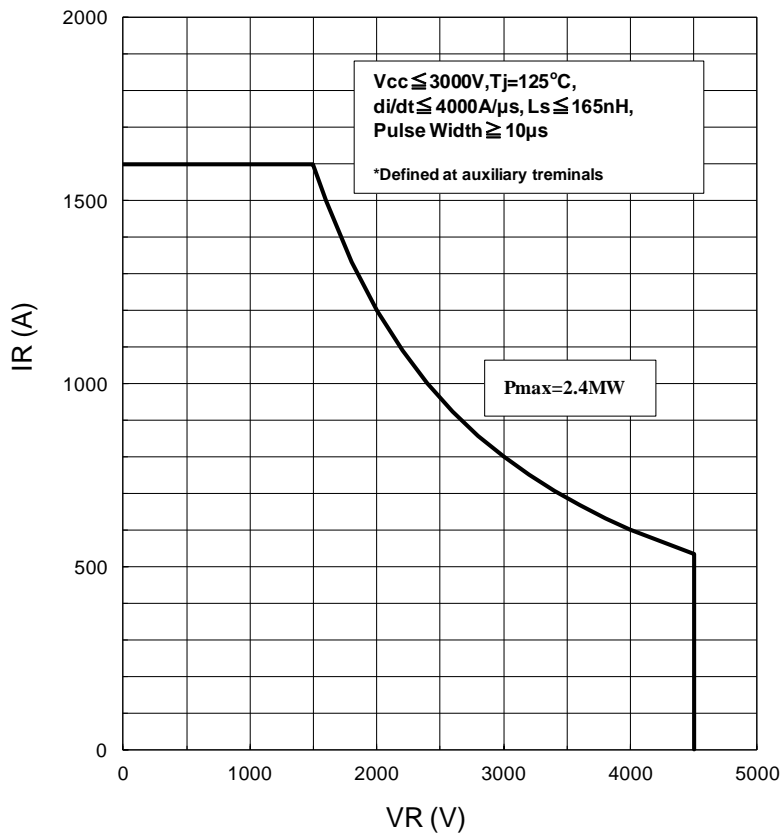


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## RBSOA



## RRSOA



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## HITACHI POWER SEMICONDUCTORS

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