

MBN800H45E2-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	MBN800H45E2-H
Collector Emitter Voltage	V_{CES}	V	4,500
Gate Emitter Voltage	V_{GES}	V	± 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
Maximum Junction Temperature(1)	$T_{vj\max}$	$^\circ\text{C}$	150
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 condition 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	-	-	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	3.5	4.2	4.7	$I_C=800\text{A}$, $V_{GE}=15\text{V}$, $T_j=125^\circ\text{C}$	
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}	Ω	-	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	1.0	2.1	4.2	$V_{CC}=2,600\text{V}$, $I_C=800\text{A}$	
	Turn On Time	t_{on}	1.3	2.7	5.4	$L_s=165\text{nH}$	
	Fall Time	t_f	1.2	2.4	3.6	$R_g=4.7\Omega$ (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	$I_F=800\text{A}$, $V_{GE}=0\text{V}$, $T_j=125^\circ\text{C}$	
Reverse Recovery Time	t_{rr}	μs	0.3	0.7	1.4	$V_{CC}=2,600\text{V}$, $I_F=800\text{A}$, $L_s=165\text{nH}$ $T_j=125^\circ\text{C}$	
Turn On Loss	$E_{on(10\%)}$	J/p	-	2.1	3.2	$V_{CC}=2,600\text{V}$, $I_C=I_F=800\text{A}$, $L_s=165\text{nH}$	
	$E_{on(full)}$	J/p	-	2.5	-		
Turn Off Loss	$E_{off(10\%)}$	J/p	-	2.1	3.2	$R_g=4.7\Omega$ (5) $V_{GE}=\pm 15\text{V}$, $T_j=125^\circ\text{C}$	
	$E_{off(full)}$	J/p	-	2.5	-		
Reverse Recovery Loss	$E_{rr(10\%)}$	J/p	-	1.7	2.5	$V_{GE}=\pm 15\text{V}$, $T_j=125^\circ\text{C}$	
	$E_{rr(full)}$	J/p	-	1.9	-		
Thermal Impedance	IGBT	$R_{th(j-c)}$	K/W	-	-	0.013	Junction to case
	FWD	$R_{th(j-c)}$	K/W	-	-	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:(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

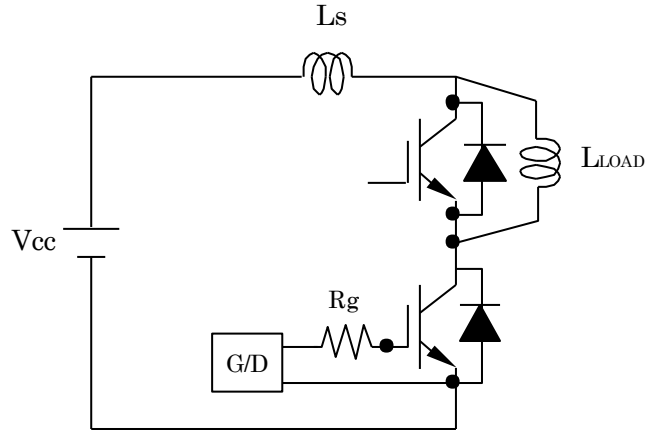


Fig.1 Switching test circuit

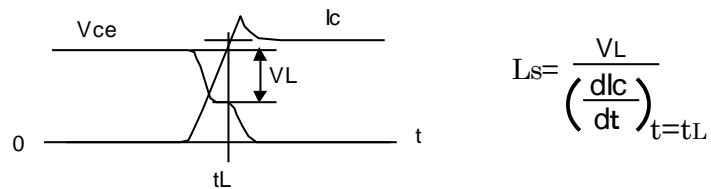


Fig.2 Definition of Ls

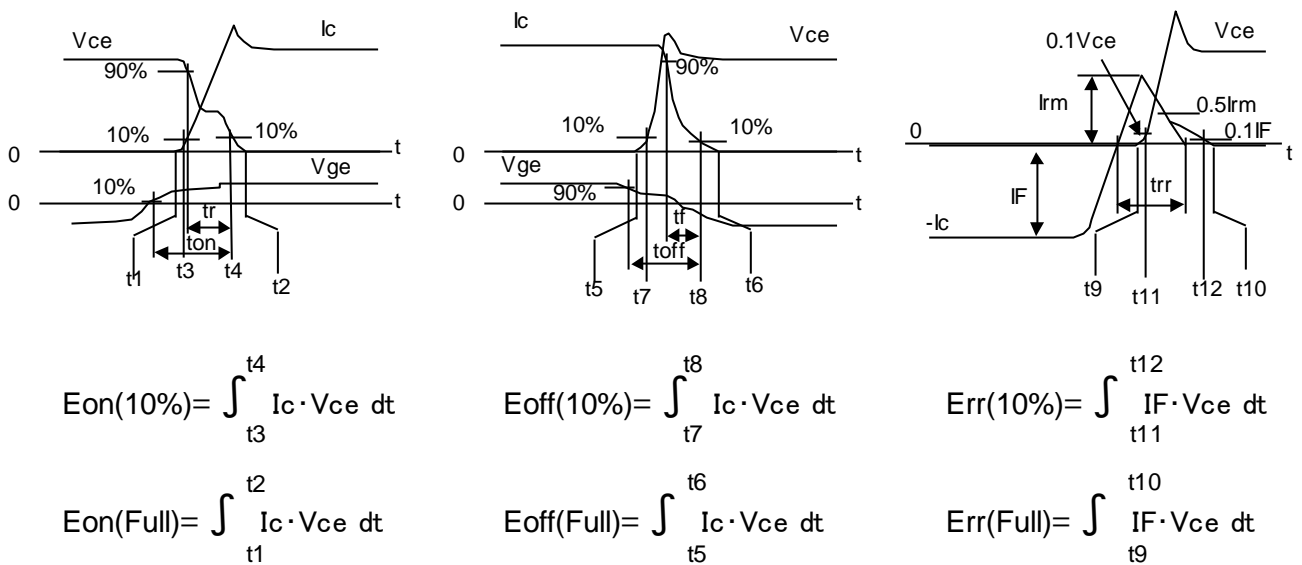
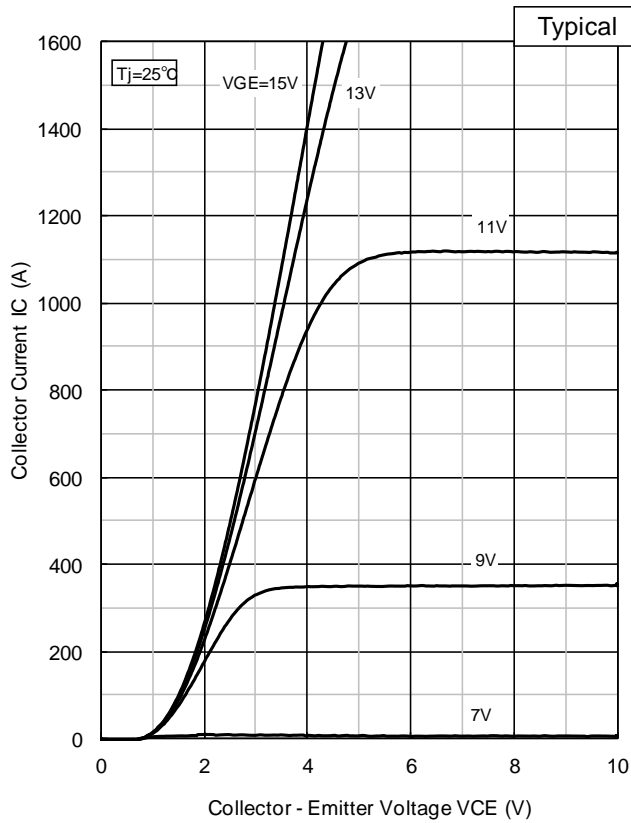


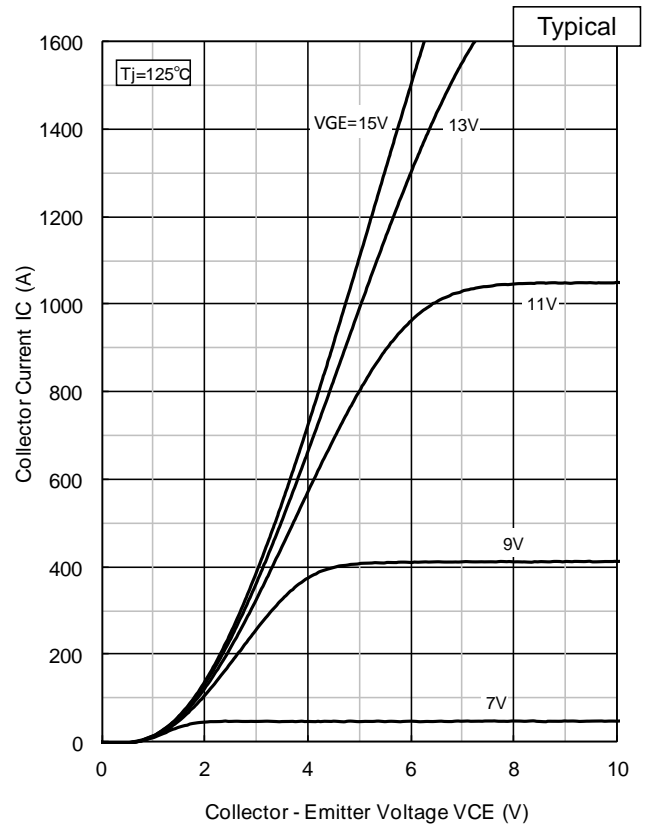
Fig.3 Definition of switching loss

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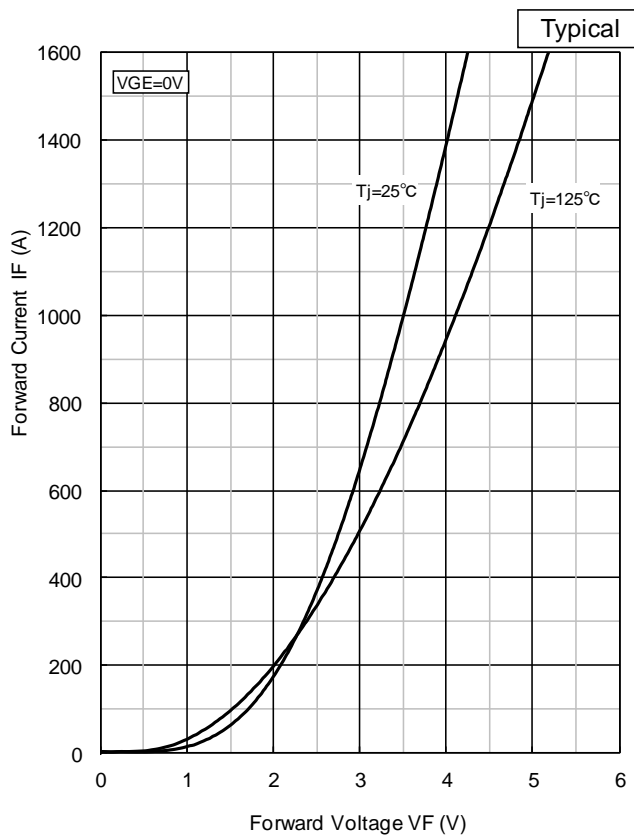
STATIC CHARACTERISTICS



IC vs. VCE ($T_j=25^\circ\text{C}$)



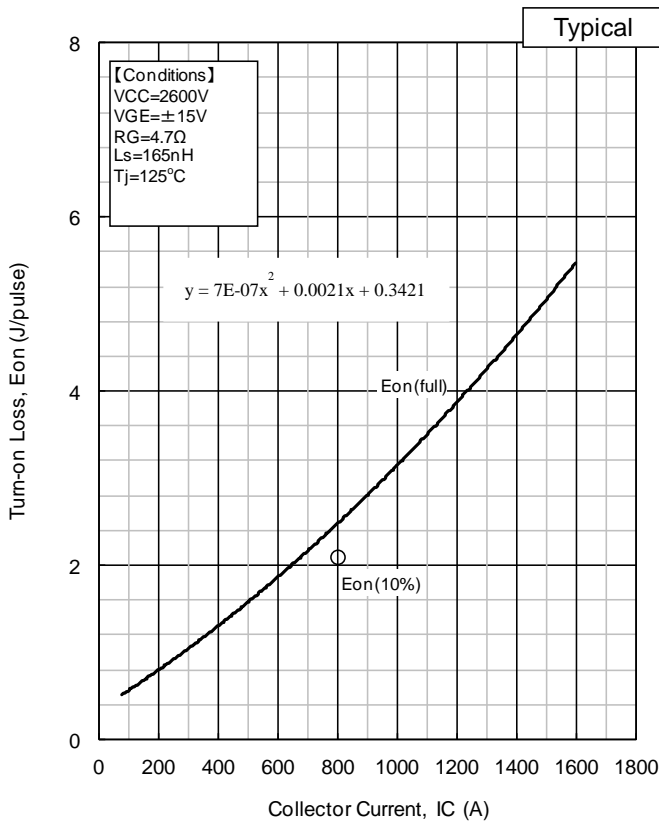
IC vs. VCE ($T_j=125^\circ\text{C}$)



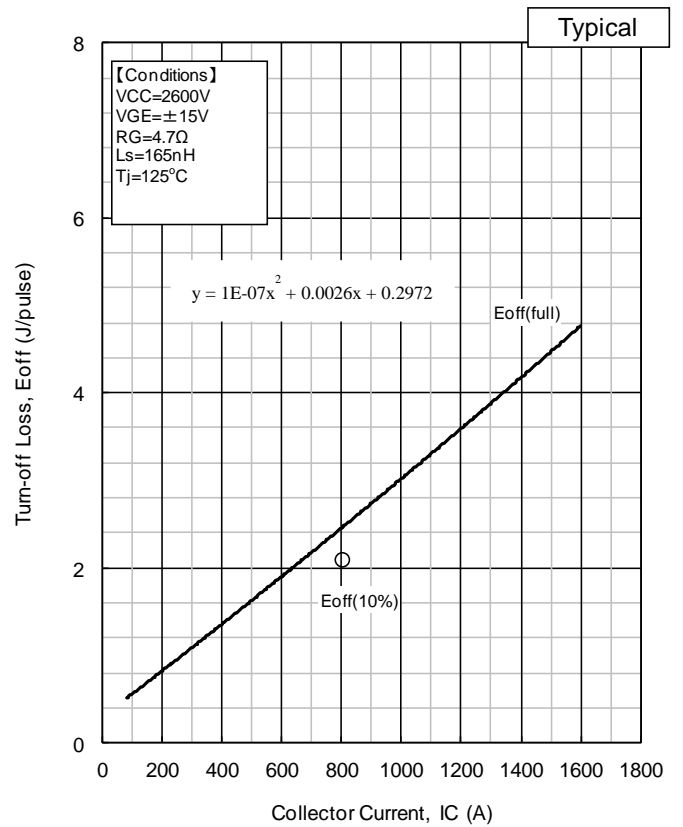
IF vs. VF

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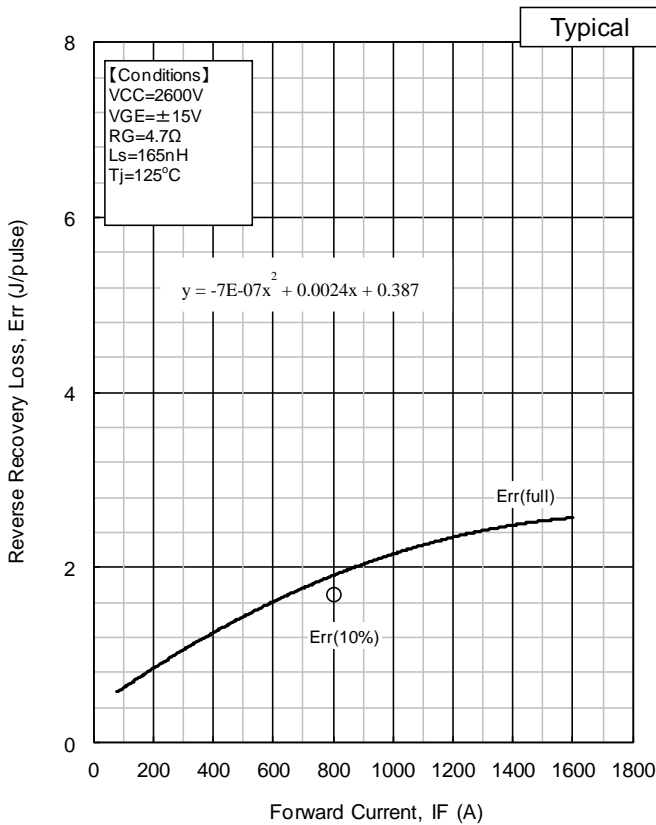
DYNAMIC CHARACTERISTICS



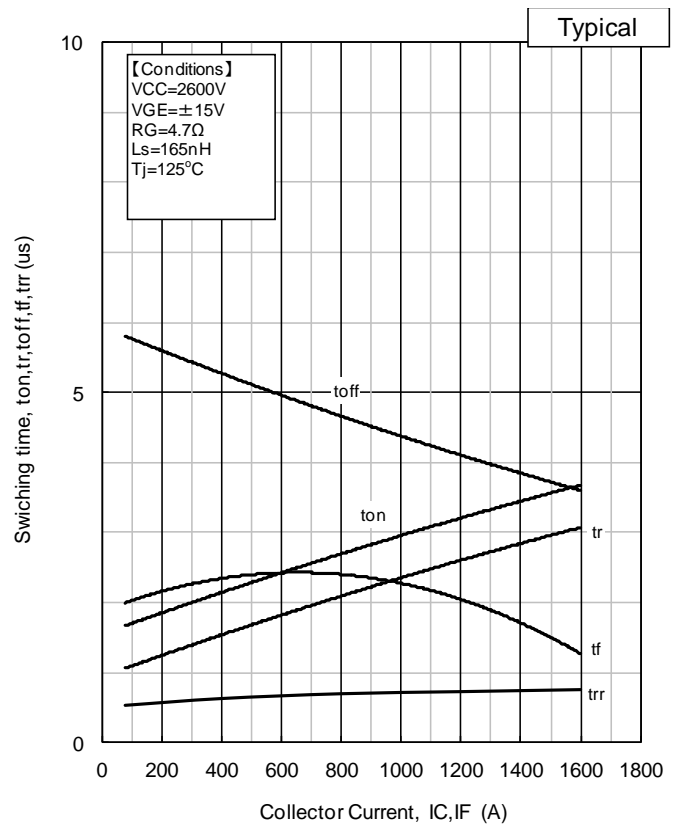
Turn-on loss vs. Collector current



Turn-off loss vs. Collector current

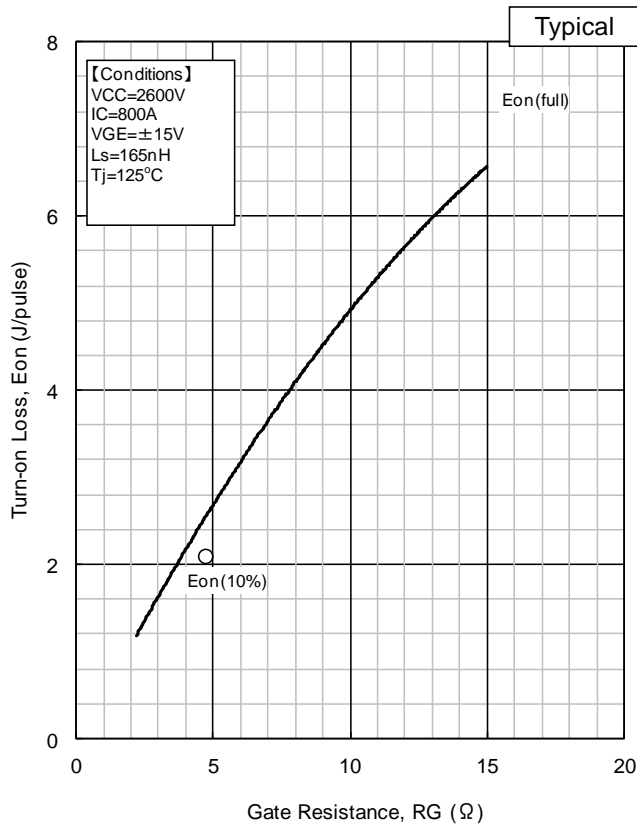


Recovery loss vs. Forward current

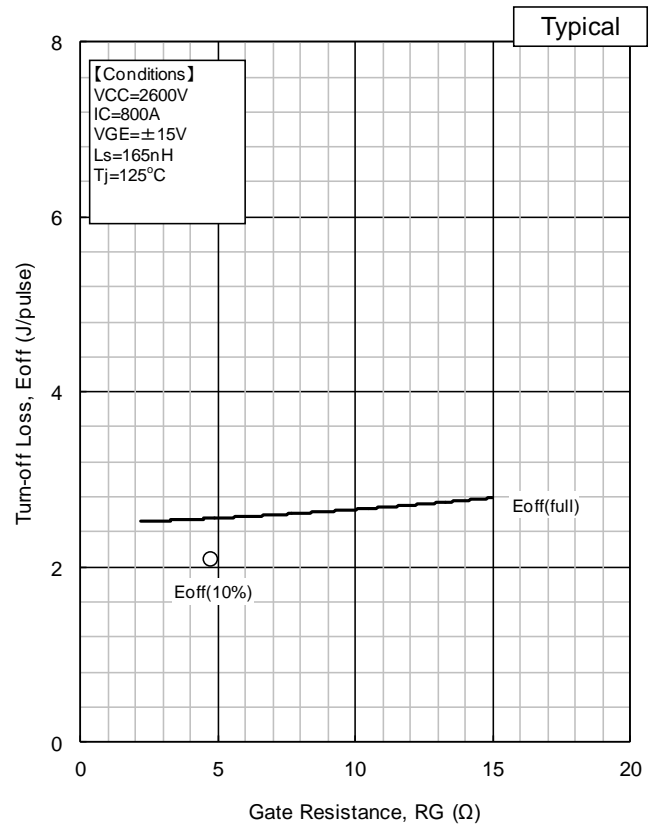


Switching time vs. Collector current

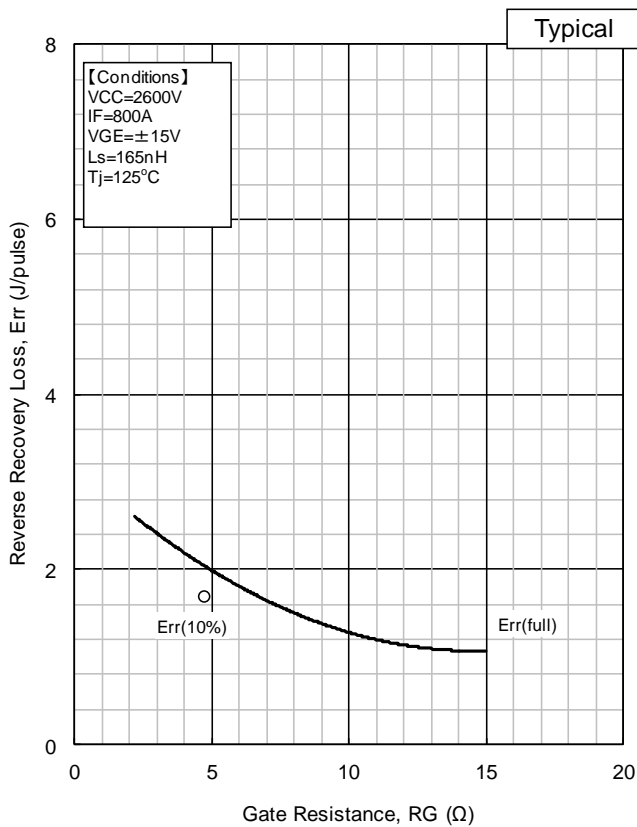
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Turn-on loss vs. Gate Resistance



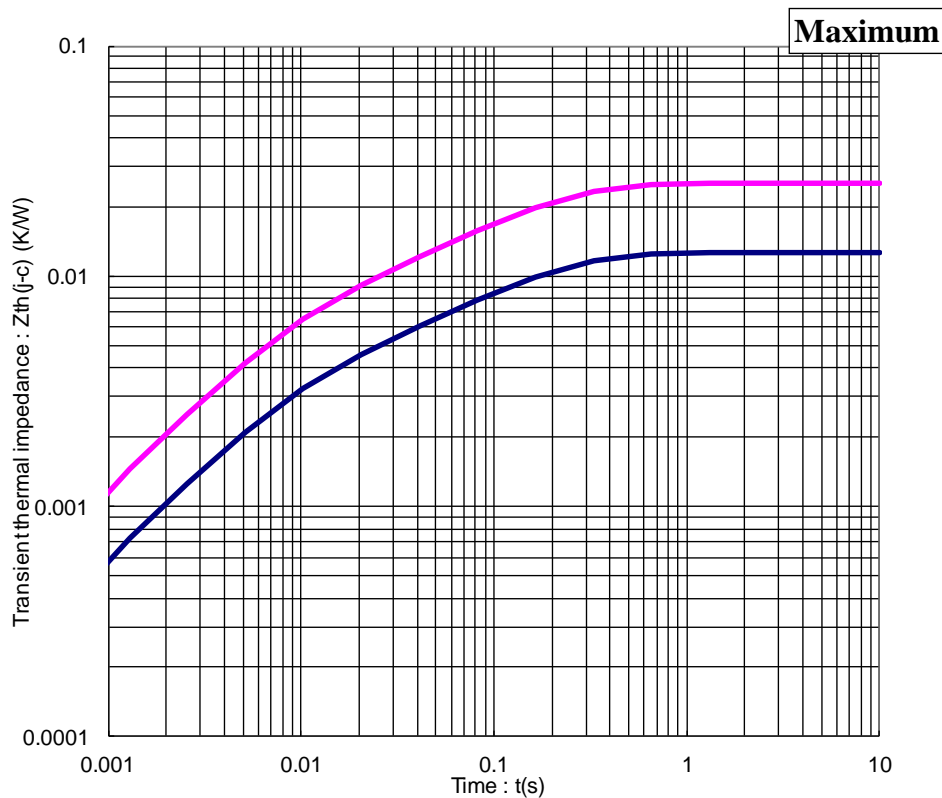
Turn-off loss vs. Gate Resistance



Recovery loss vs. Gate Resistance

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TRANSIENT THERMAL IMPEDANCE



Transient Thermal Impedance Curve (Maximum Value)

Curve approximation model
 $(\sum r_{th}[n] \cdot (1 - \exp(-t/\tau_{th}[n])))$

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

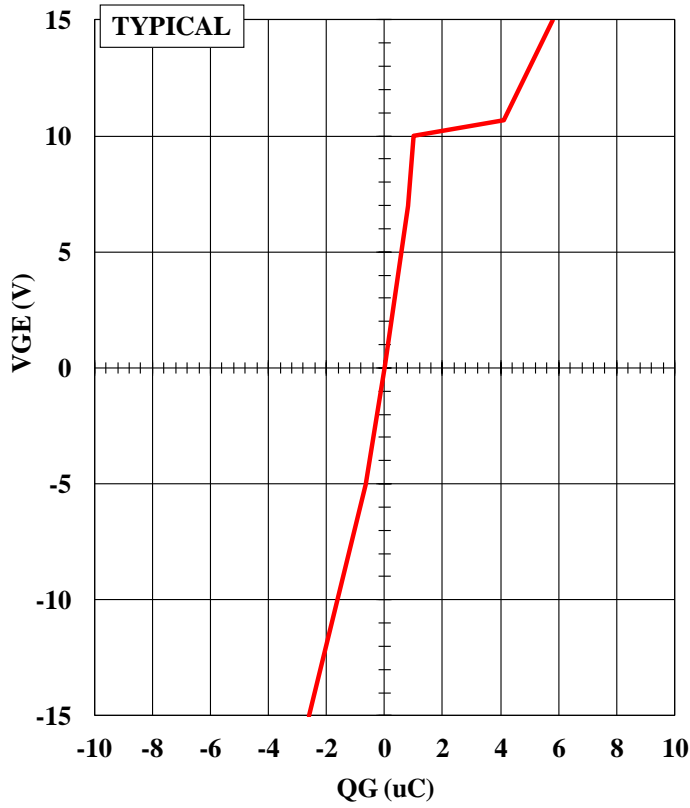
Please note that following materials are contained in the product
 In order to keep characteristics and reliability level.

Material	Contained part
Lead (Pb) and its compounds	Solder

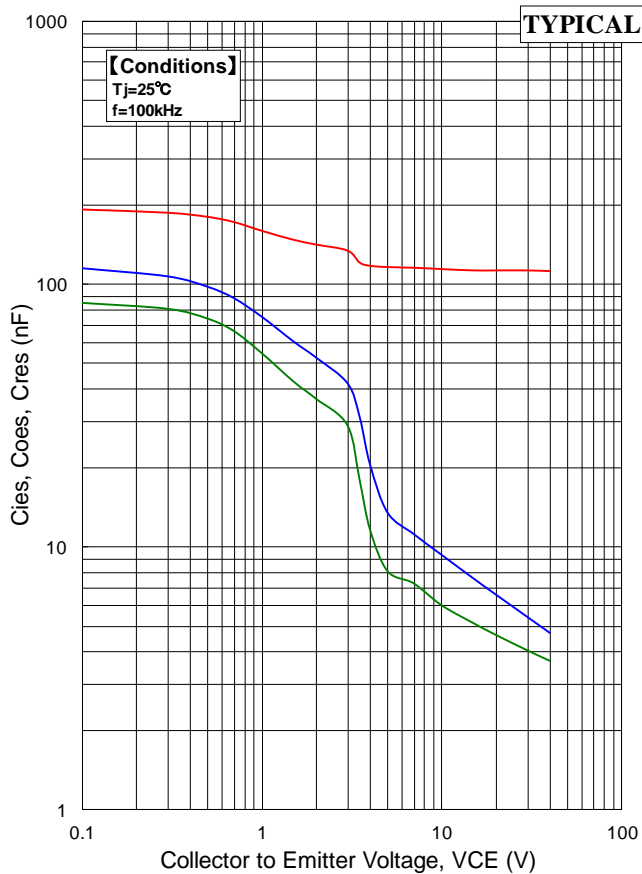
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QG-VGE Curve

Conditions: $L_s=165\text{nH}$, $V_{CC}=2600\text{V}$, $V_{GE}=\pm 15\text{V}$, $T_j=25^\circ\text{C}$



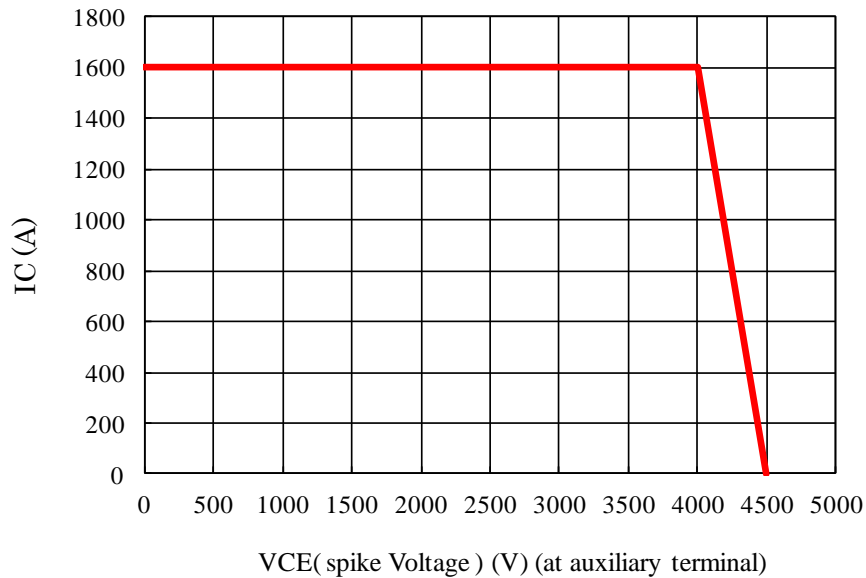
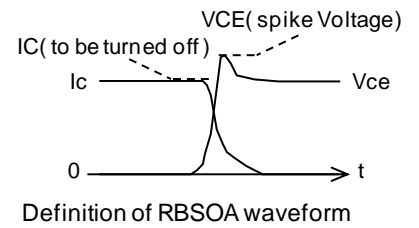
Cies, Coes, Cres Curve



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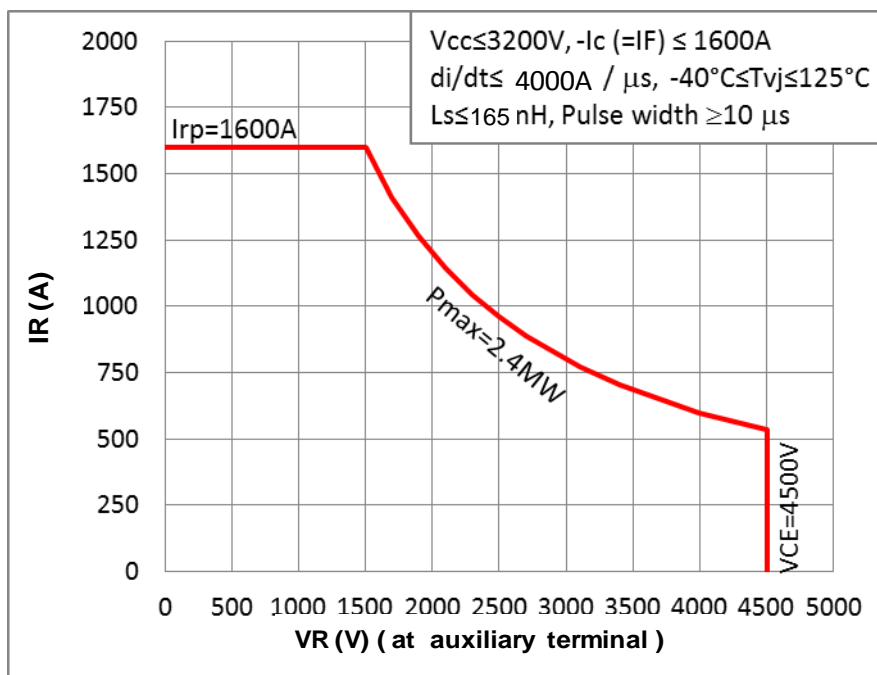
RBSOA

Conditions: $V_{cc} \leq 3000V$, $I_c \leq 1600A$,
 $R_g \geq 4.7\Omega$,
 $V_{GE} = \pm 15V$, $-40^\circ C \leq T_j \leq 125^\circ C$,
 $L_s \leq 165nH$, on pulse width $\geq 10\mu s$
 (V_{ce} spike voltage and L_s are defined at auxiliary terminal)



Reverse bias safe operation area (RBSOA)

Reverse Recovery SOA



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HITACHI POWER SEMICONDUCTORS

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