

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	MBN800H45H
Collector Emitter Voltage	V_{CES}	V	4,500
Gate Emitter Voltage	V_{GES}	V	± 20
Collector Current	DC	A	800 ($T_c=80^\circ\text{C}$)
	1ms		1,600
Forward Current	DC	A	800
	1ms		1,600
Operating Junction Temperature	$T_{vj\text{ op}}$	$^\circ\text{C}$	-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	$V_{CE}=4,500\text{V}$, $V_{GE}=0\text{V}$, $T_{vj}=25^\circ\text{C}$
			-	17	67	$V_{CE}=4,500\text{V}$, $V_{GE}=0\text{V}$, $T_{vj}=125^\circ\text{C}$
Gate Emitter Leakage Current	I_{GES}	nA	-500	-	+500	$V_{GE}=\pm 20\text{V}$, $V_{CE}=0\text{V}$, $T_{vj}=25^\circ\text{C}$
Collector Emitter Saturation Voltage	V_{CESat}	V	3.1	3.7	4.2	$I_C=800\text{A}$, $V_{GE}=15\text{V}$, $T_{vj}=125^\circ\text{C}$
Gate Emitter Threshold Voltage	$V_{GE(th)}$	V	5.4	6.4	7.4	$V_{CE}=10\text{V}$, $I_C=800\text{mA}$, $T_{vj}=25^\circ\text{C}$
Input Capacitance	C_{ies}	nF	-	110	-	$V_{CE}=10\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$, $T_{vj}=25^\circ\text{C}$
Internal Gate Resistance	$R_{G(int)}$	Ω	-	2.4	-	$V_{CE}=10\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$, $T_{vj}=25^\circ\text{C}$
Turn On Delay Time	$t_{d(on)}$	μs	-	0.9	-	$V_{CC}=2,600\text{V}$, $I_C=800\text{A}$
Rise Time	t_r		1.0	2.2	3.3	$L_S=165\text{nH}$
Turn Off Delay Time	$t_{d(off)}$		-	2.5	-	$R_G=4.7\Omega$ (4)
Fall Time	t_f		1.5	3.0	4.5	$V_{GE}=\pm 15\text{V}$, $T_{vj}=125^\circ\text{C}$
Forward Voltage Drop	V_F	V	2.3	2.9	3.4	$I_F=800\text{A}$, $V_{GE}=0\text{V}$, $T_{vj}=125^\circ\text{C}$
Reverse Recovery Time	t_{rr}	μs	-	0.8	1.6	$V_{CC}=2,600\text{V}$, $I_F=800\text{A}$, $L_S=165\text{nH}$ $T_{vj}=125^\circ\text{C}$
Turn On Loss	$E_{on(10\%)}$	J/P	-	2.6	3.9	$V_{CC}=2,600\text{V}$, $I_C=I_F=800\text{A}$, $L_S=165\text{nH}$ $R_G=4.7\Omega$ (4) $V_{GE}=\pm 15\text{V}$, $T_{vj}=125^\circ\text{C}$
	$E_{on(full)}$		-	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	-	
Partial discharge extinction voltage	V_e	V_{RMS}	3,500	-	-	$f=50\text{Hz}$, $Q_{PD}\leq 10\text{pC}$ (acc. to IEC 61287)
Stray inductance module	L_{SCE}	nH	-	21	-	
Thermal Impedance	IGBT	K/W	-	-	0.013	Junction to case
	FWD		-	-	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 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..

MBN800H45E2

DEFINITION OF TEST CIRCUIT

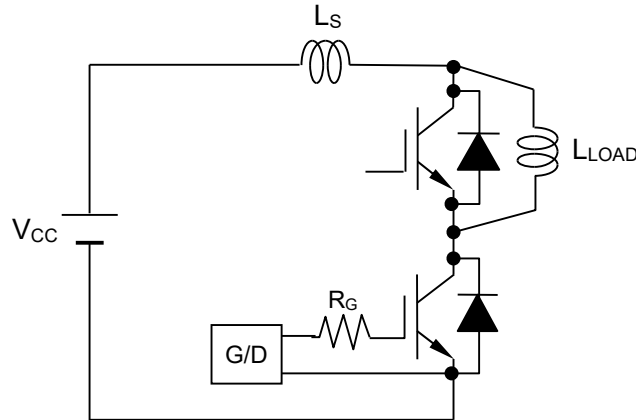


Fig.1 Switching test circuit

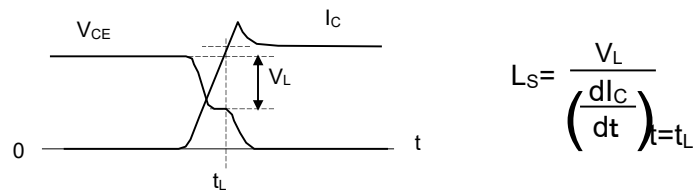


Fig.2 Definition of stray inductance

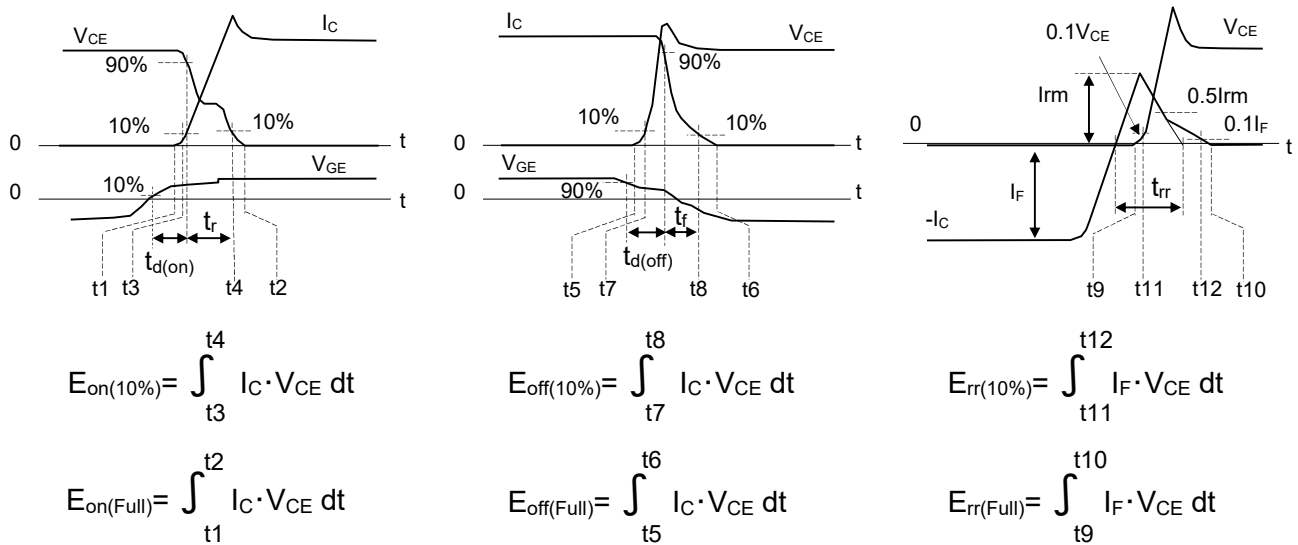
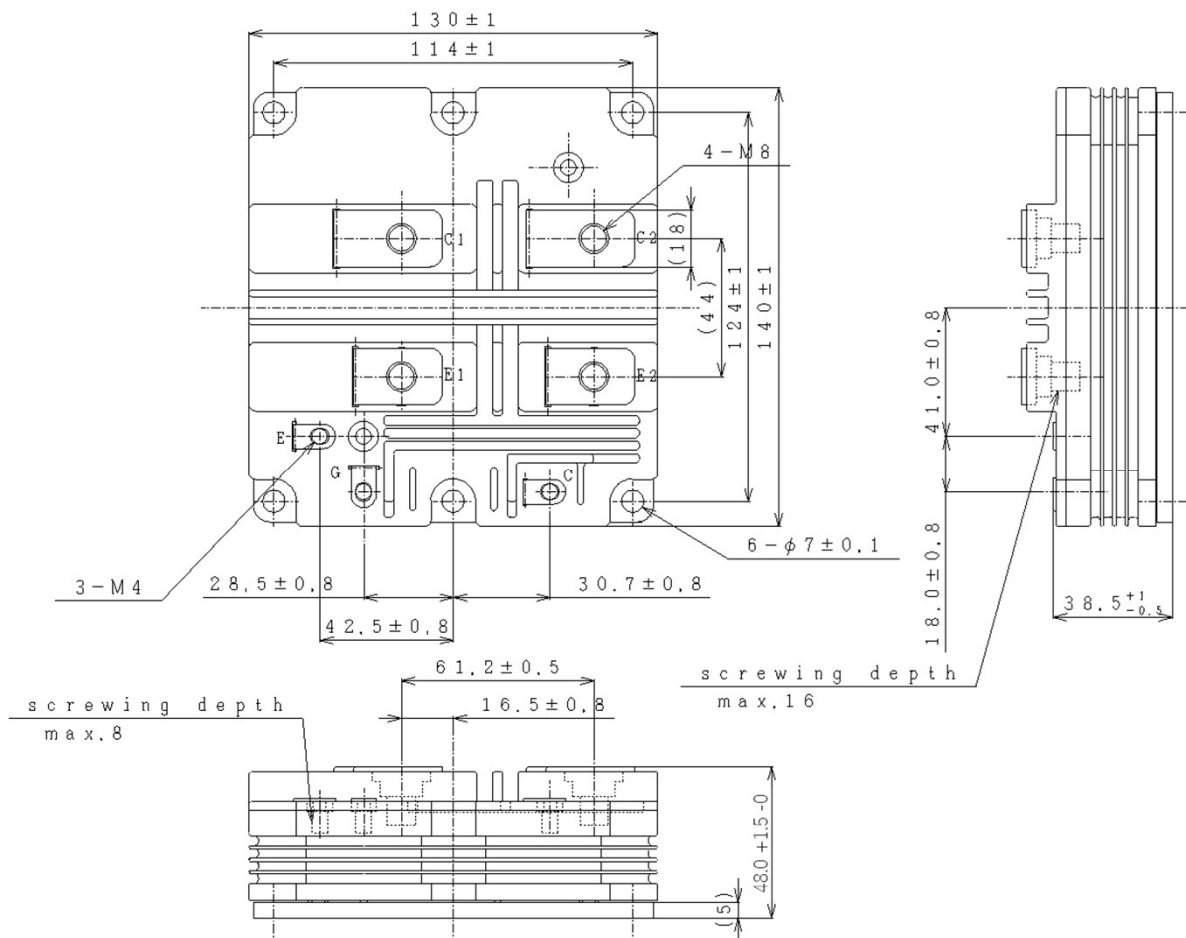


Fig.3 Definition of switching loss

MBN800H45E2

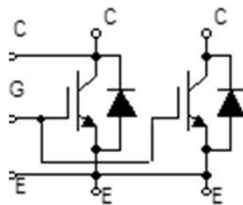
OUTLINE DRAWING

Unit in mm

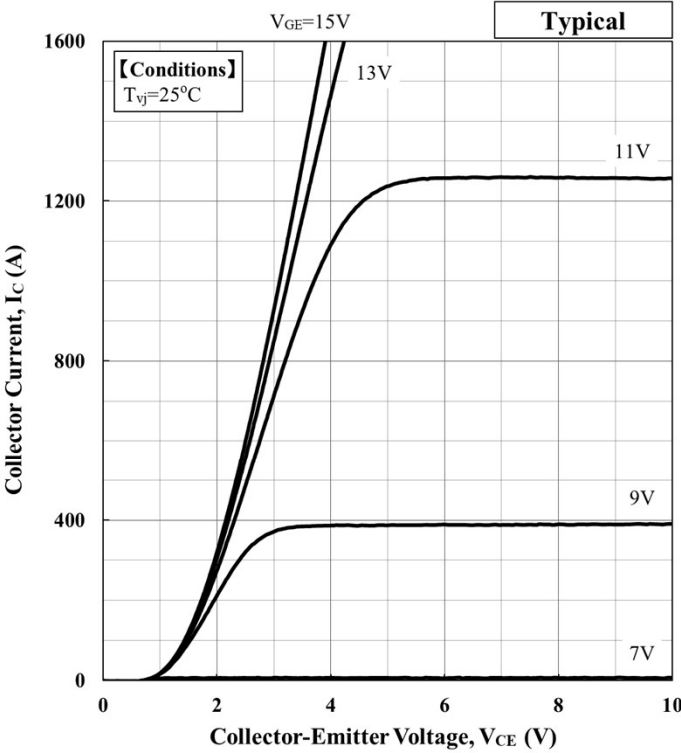


Weight: 1,050g

CIRCUIT DIAGRAM



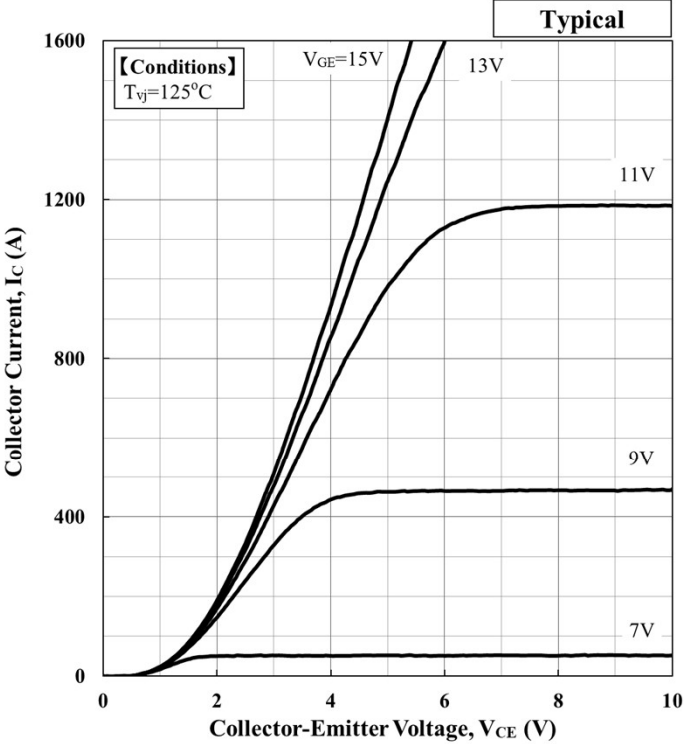
MBN800H45E2



$$V_{ce}(sat)[V] = a_3 \cdot |I_c|^3 + a_2 \cdot |I_c|^2 + a_1 \cdot |I_c| + a_0$$

Temp.[$^{\circ}\text{C}$]	$V_{ge}[V]$	a_3	a_2	a_1	a_0
25	15	2.21E-10	-9.40E-07	2.60E-03	1.23E+00

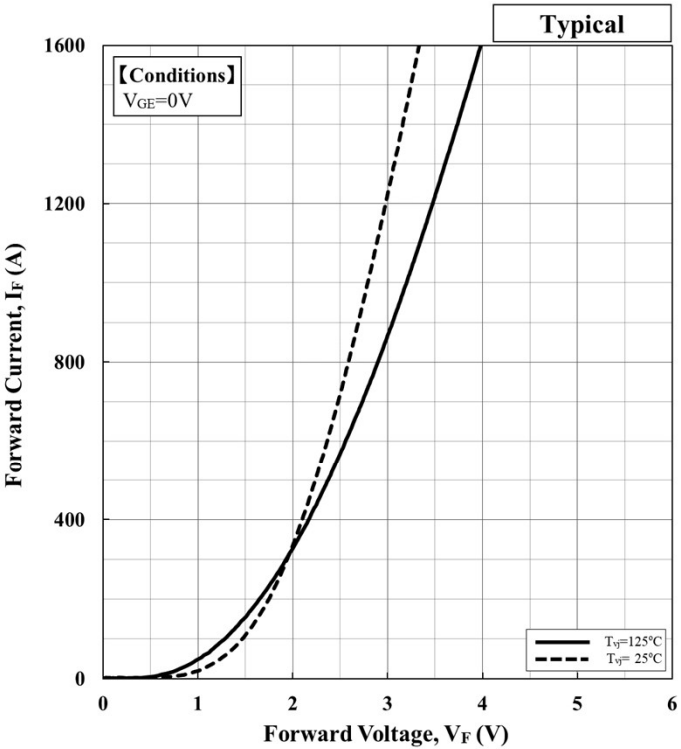
Collector Current vs. Collector Emitter Voltage



$$V_{ce}(sat)[V] = a_3 \cdot |I_c|^3 + a_2 \cdot |I_c|^2 + a_1 \cdot |I_c| + a_0$$

Temp.[$^{\circ}\text{C}$]	$V_{ge}[V]$	a_3	a_2	a_1	a_0
125	15	4.49E-10	-1.69E-06	4.15E-03	1.25E+00

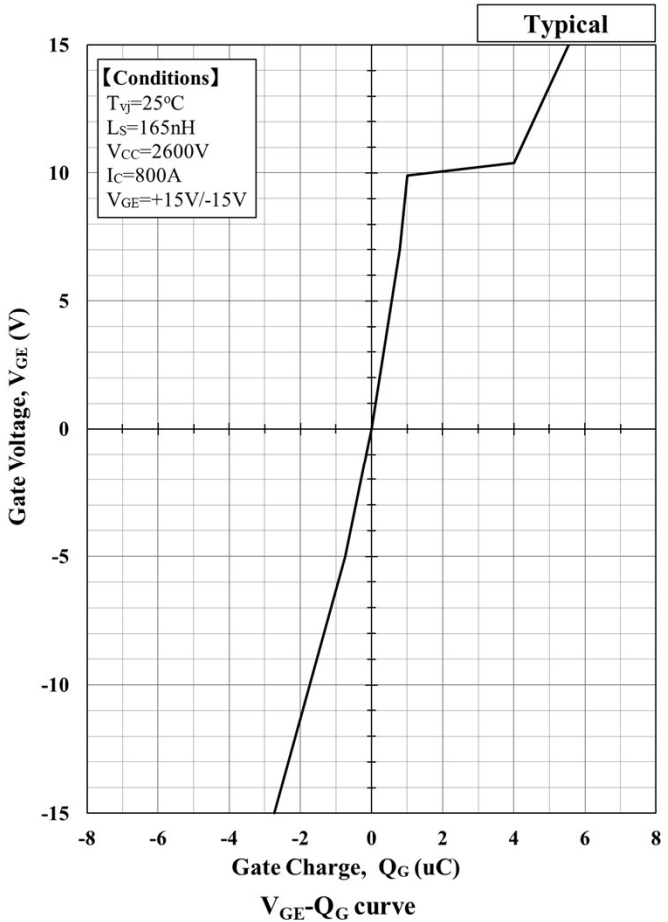
Collector Current vs. Collector Emitter Voltage



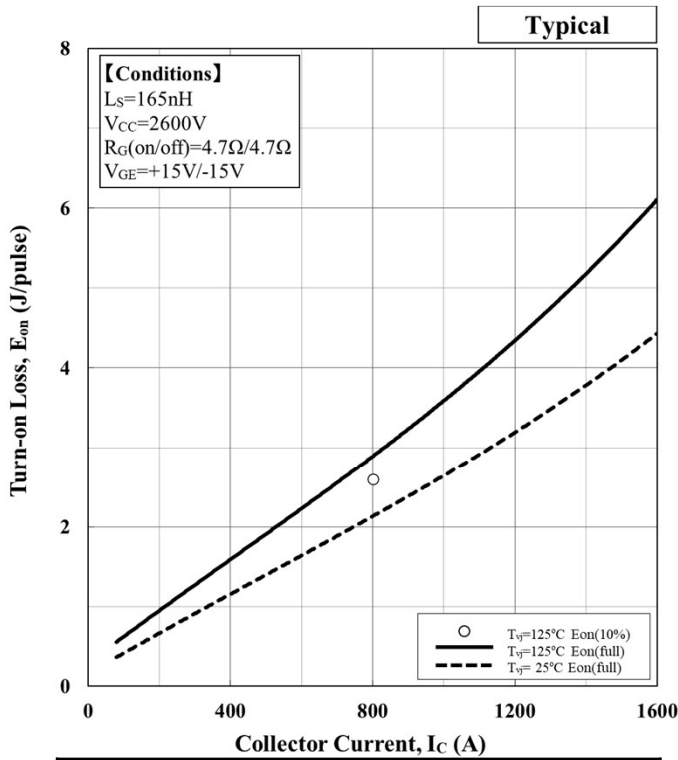
$$V_f[V] = a_3 \cdot |I_f|^3 + a_2 \cdot |I_f|^2 + a_1 \cdot |I_f| + a_0$$

Temp.[$^{\circ}\text{C}$]	a_3	a_2	a_1	a_0
25	4.19E-10	-1.47E-06	2.58E-03	1.26E+00
125	5.28E-10	-1.93E-06	3.62E-03	9.74E-01

Forward Voltage of free-wheeling diode



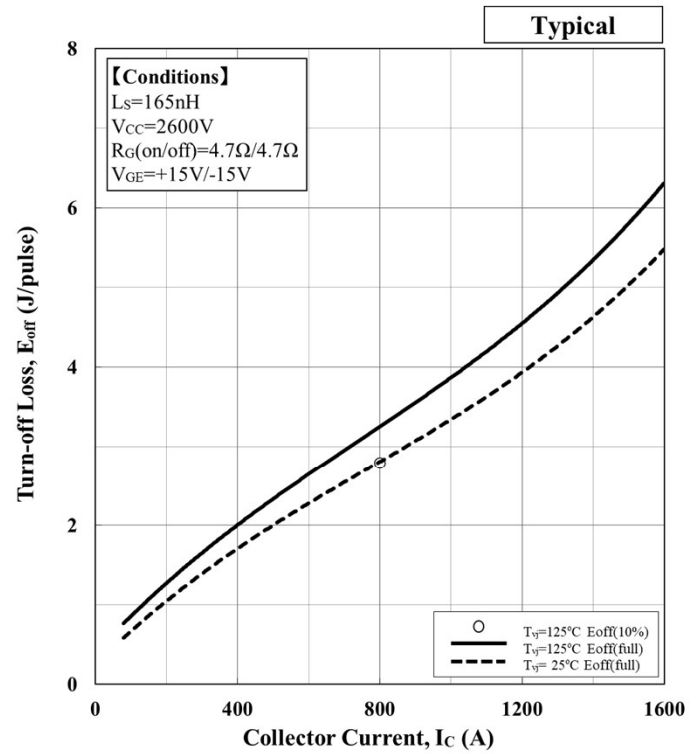
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$$E [J] = a_3 \cdot |I_c|^3 + a_2 \cdot |I_c|^2 + a_1 \cdot |I_c| + a_0$$

Temp.[°C]	a_3	a_2	a_1	a_0
25	2.61E-10	-3.74E-07	2.60E-03	1.58E-01
125	4.07E-10	-4.95E-07	3.39E-03	2.87E-01

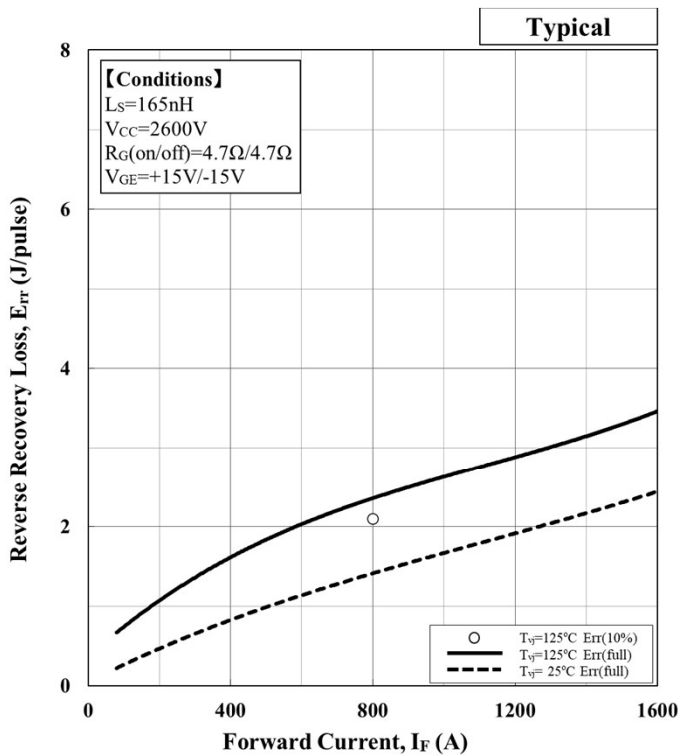
Turn-on loss vs. Collector current



$$E [J] = a_3 \cdot |I_c|^3 + a_2 \cdot |I_c|^2 + a_1 \cdot |I_c| + a_0$$

Temp.[°C]	a_3	a_2	a_1	a_0
25	1.02E-09	-2.37E-06	4.44E-03	2.46E-01
125	1.08E-09	-2.42E-06	4.81E-03	3.98E-01

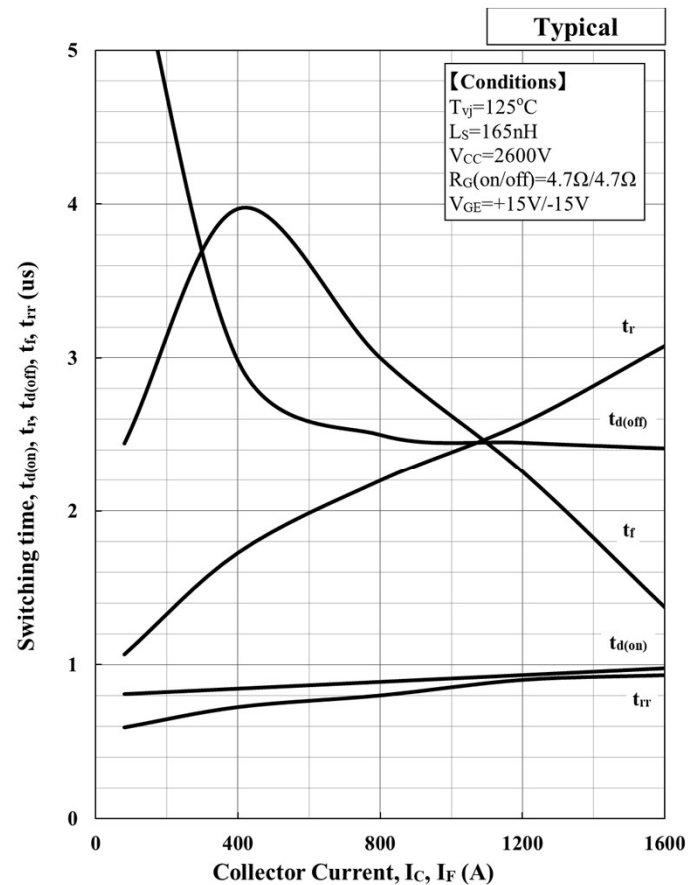
Turn-off loss vs. Collector current



$$E [J] = a_3 \cdot |I_F|^3 + a_2 \cdot |I_F|^2 + a_1 \cdot |I_F| + a_0$$

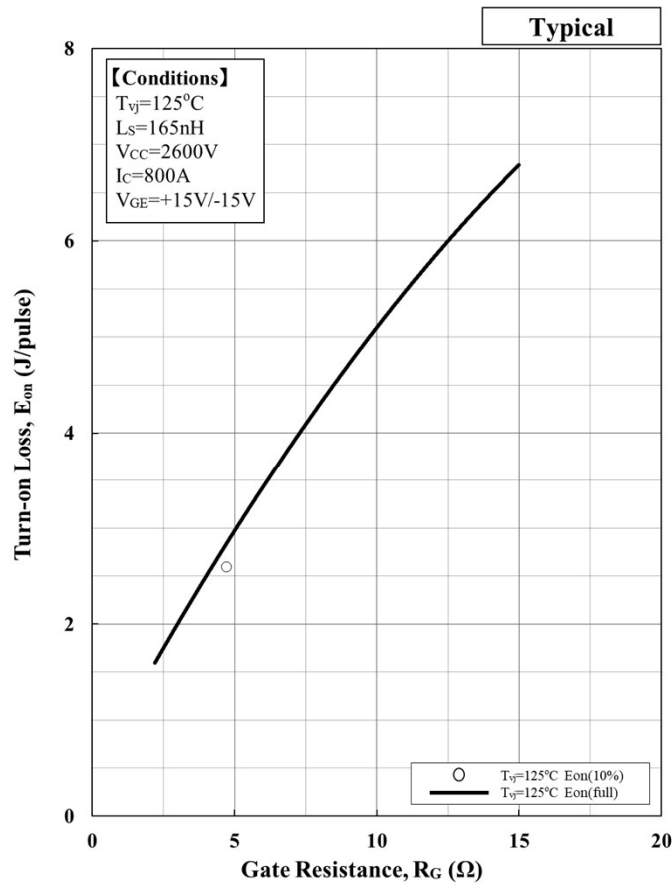
Temp.[°C]	a_3	a_2	a_1	a_0
25	2.86E-10	-9.51E-07	2.29E-03	4.40E-02
125	7.30E-10	-2.45E-06	3.98E-03	3.66E-01

Recovery loss vs. Forward current

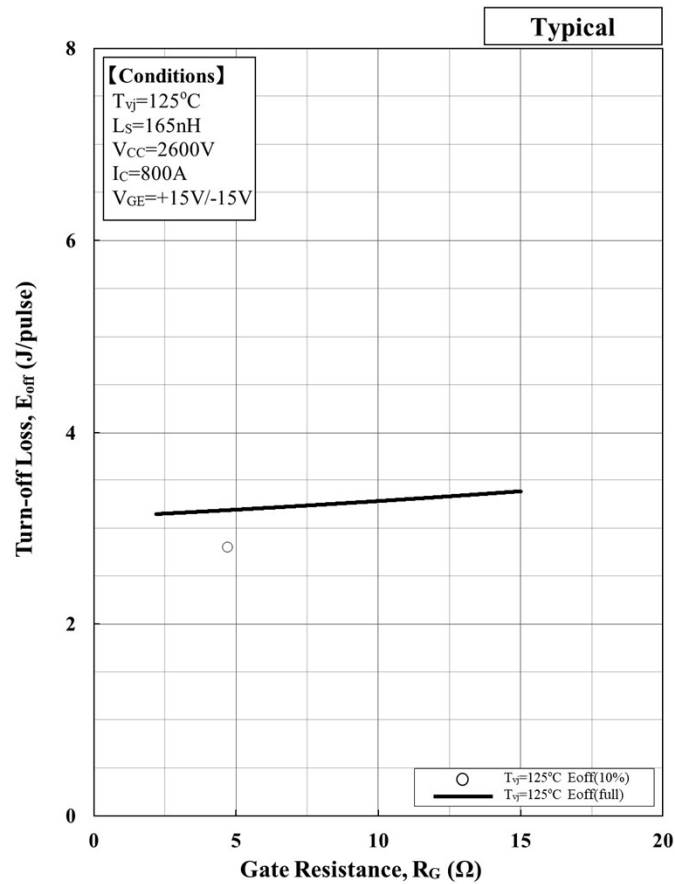


Switching time vs. Collector Current

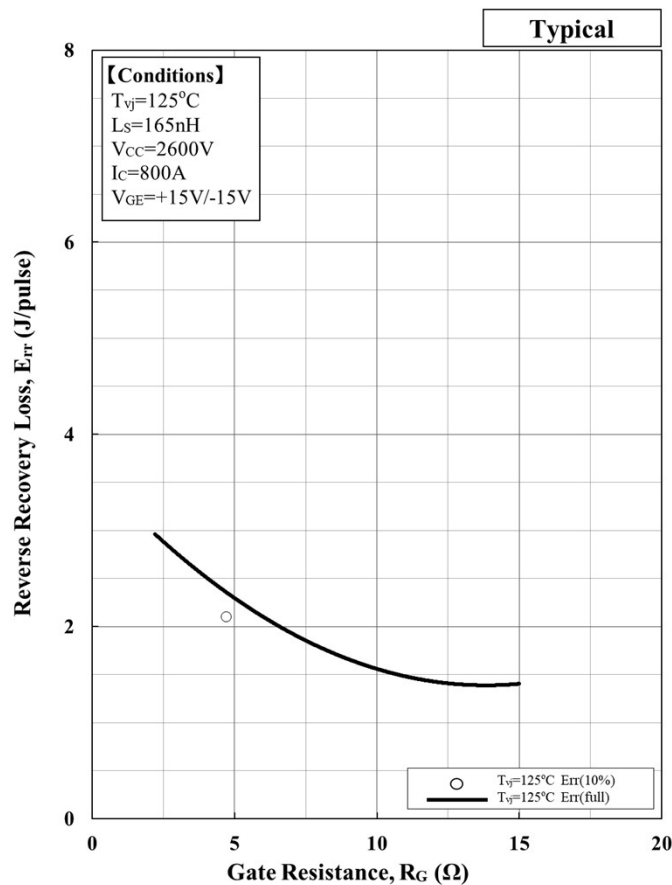
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Turn-on loss vs. Gate Resistance

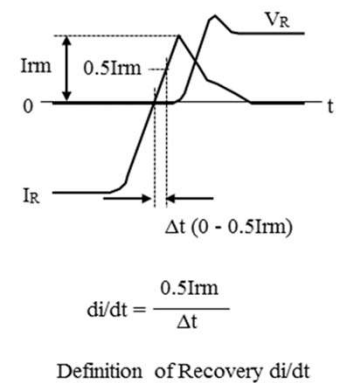
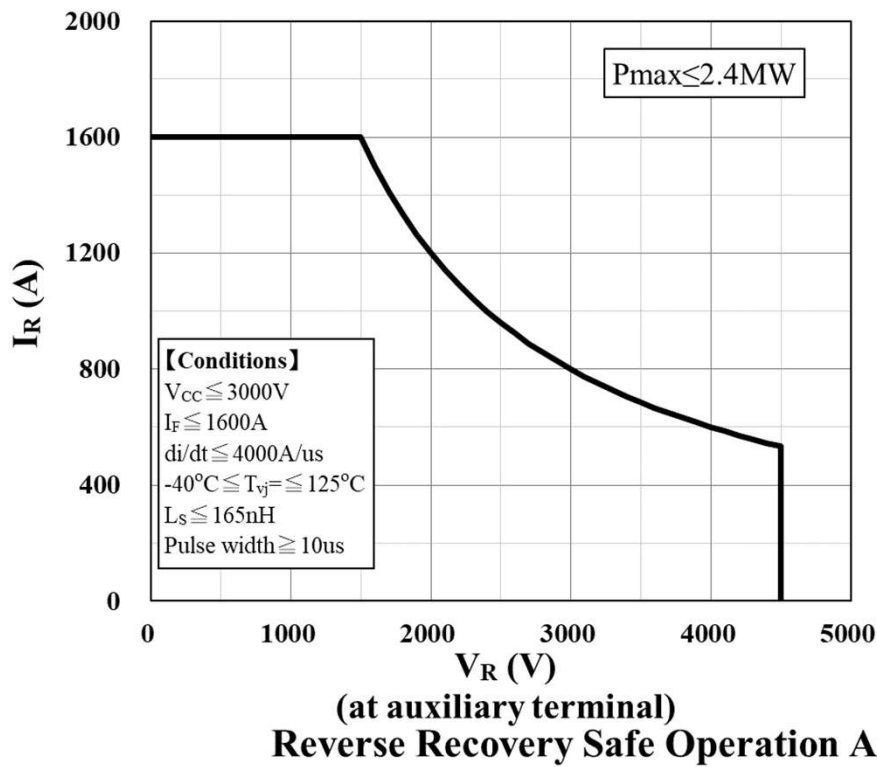
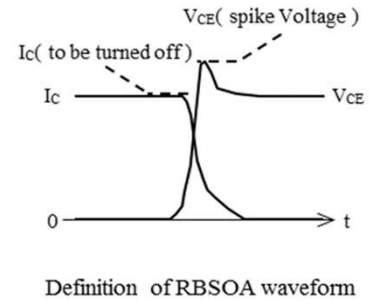
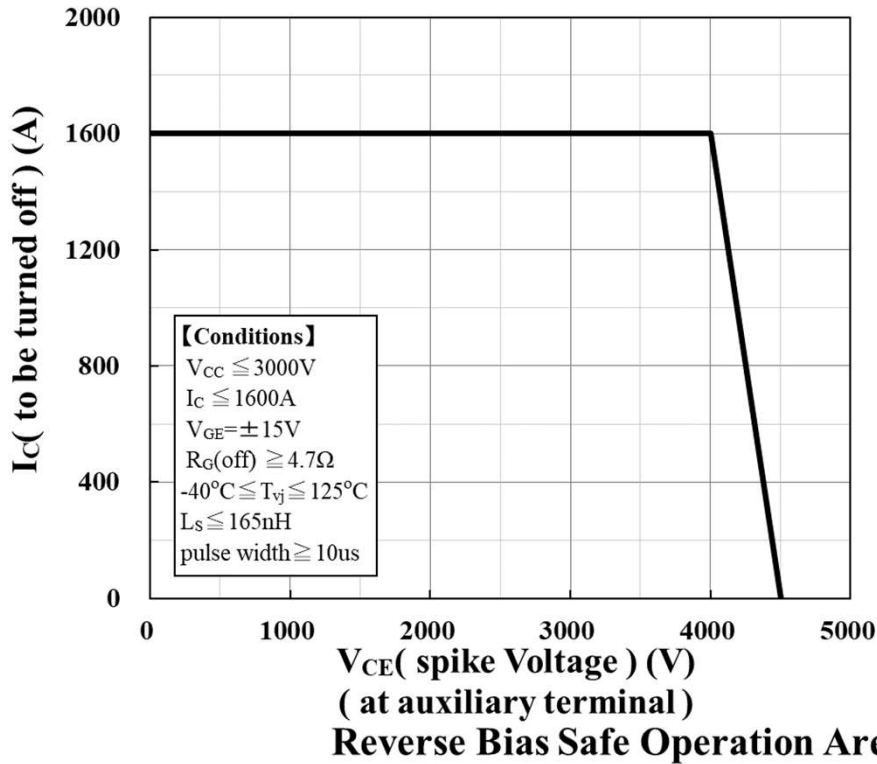


Turn-off loss vs. Gate Resistance

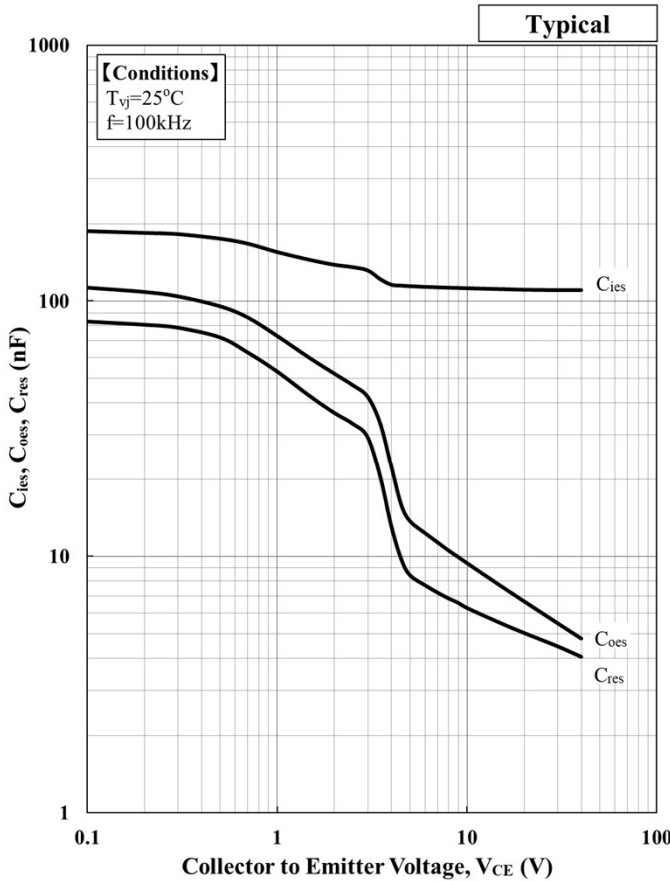


Reverse Recovery loss vs. Gate Resistance

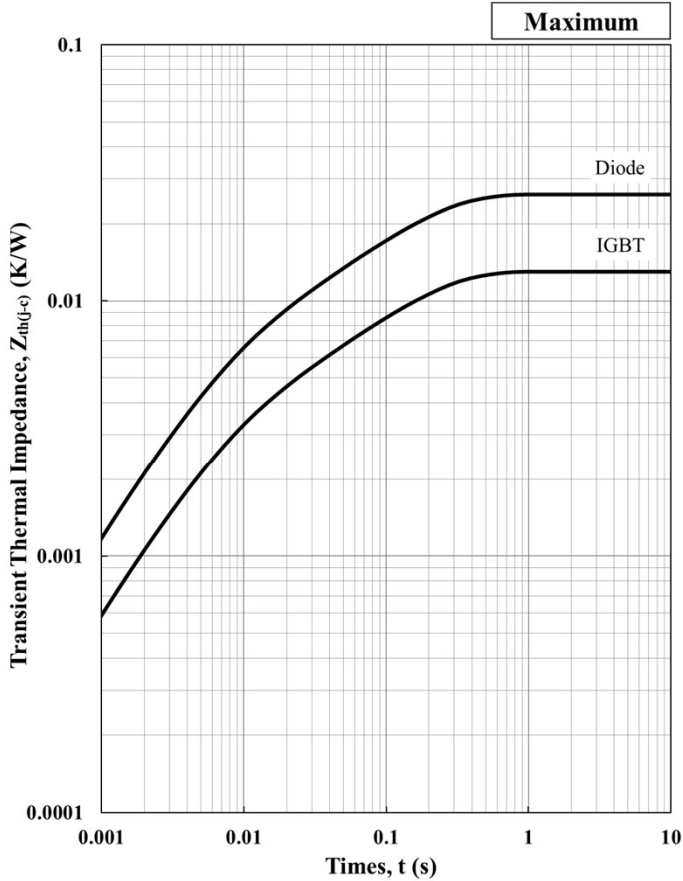
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MBN800H45E2



Capacitance vs. Collector to Emitter Voltage



Transient Thermal Impedance Curve

Foster model lumped circuit constant

n	1	2	3	4	Unit
R th, IGBT [n]	8.05E-03	2.47E-03	2.39E-03	1.31E-04	[K/W]
C th, IGBT [n]	2.03E+01	1.09E+01	2.56E+00	6.55E+00	[J/K]
R th, Diode [n]	1.61E-02	4.91E-03	4.76E-03	2.61E-04	[K/W]
C th, Diode [n]	1.02E+01	5.51E+00	1.28E+00	3.29E+00	[J/K]

Cauer model lumped circuit constant

n	1	2	3	4	Unit
R th, IGBT [n]	1.91E-03	2.61E-03	4.04E-03	4.48E-03	[K/W]
C th, IGBT [n]	1.46E+00	9.96E-01	8.00E+00	2.21E+01	[J/K]
R th, Diode [n]	3.81E-03	5.20E-03	8.04E-03	8.93E-03	[K/W]
C th, Diode [n]	7.34E-01	5.00E-01	4.02E+00	1.11E+01	[J/K]

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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