

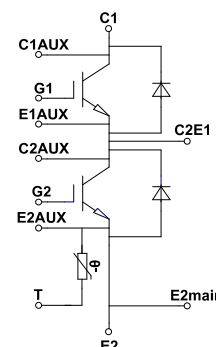
# MBM800GS33G2

Silicon N-channel IGBT 3300V G2 version

## FEATURES

- \* Low power dissipation by side-gate HiGT
- \* Low noise & easy drive through low Cies and Cres
- \* High current density & half-bridge nHPD<sup>2</sup> module
- \* Low stray inductance & low Rth(j-c)
- \* Built in temperature sensor
- \* Scalable large current easily handled by paralleling
- \* Equipped with current sensing terminals

HiGT : High-conductivity IGBT  
nHPD<sup>2</sup> : next High Power Density Dual



Circuit diagram

## ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub>=25°C)

Item	Symbol	Unit	MBM800GS33G2
Collector Emitter Voltage	V <sub>CEs</sub>	V	3,300
Gate Emitter Voltage	V <sub>GES</sub>	V	±20
Collector Current	DC	I <sub>C</sub>	800
	1ms	I <sub>CRM</sub>	1,600
Forward Current	DC	I <sub>F</sub>	800
	1ms	I <sub>FRM</sub>	1,600
Junction Temperature	T <sub>vj op</sub>	°C	-50 ~ +175
Storage Temperature	T <sub>stg</sub>	°C	-40 ~ +125
Isolation Voltage	V <sub>ISO</sub>	V <sub>RMS</sub>	6,000(AC 1 minute)
Screw Torque	Terminals (M3/M8)	-	0.8/15
	Mounting (M6)	-	6.0 (1)

Notes: (1) Recommended Value 5.5±0.5N·m

## ELECTRICAL CHARACTERISTICS

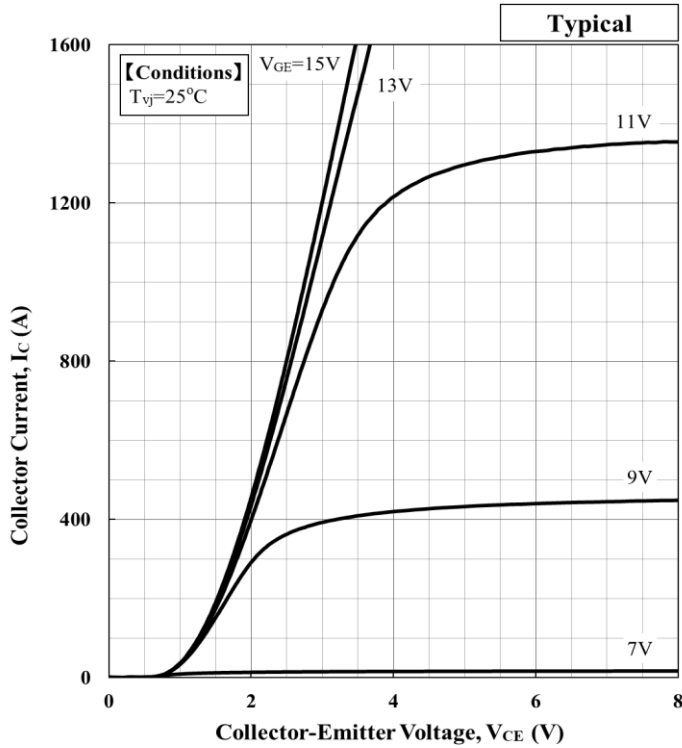
Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Collector Emitter Cut-Off Current	I <sub>CEs</sub>	mA	-	-	0.40	V <sub>CE</sub> =3,300V, V <sub>GE</sub> =0V, T <sub>vj</sub> =25°C
Gate Emitter Leakage Current	I <sub>GES</sub>	nA	-500	-	+500	V <sub>CE</sub> =±20V, V <sub>GE</sub> =0V, T <sub>vj</sub> =25°C
Collector Emitter Saturation Voltage	V <sub>CE(sat)</sub>	V	-	2.5	-	I <sub>C</sub> =800A, V <sub>GE</sub> =15V, T <sub>vj</sub> =25°C
			2.8	3.3	3.8	I <sub>C</sub> =800A, V <sub>GE</sub> =15V, T <sub>vj</sub> =150°C
			-	3.5	-	I <sub>C</sub> =800A, V <sub>GE</sub> =15V, T <sub>vj</sub> =175°C (3)
Gate Emitter Threshold Voltage	V <sub>GE(th)</sub>	V	5.5	6.5	7.5	V <sub>CE</sub> =10V, I <sub>C</sub> =800mA, T <sub>vj</sub> =25°C
Input Capacitance	C <sub>ies</sub>	nF	-	46	-	V <sub>CE</sub> =10V, V <sub>GE</sub> =0V, f=100kHz, T <sub>vj</sub> =25°C
Internal Gate Resistance	R <sub>G(int)</sub>	Ω	-	11.0	-	V <sub>CE</sub> =10V, V <sub>GE</sub> =0V, f=100kHz, T <sub>vj</sub> =25°C
Turn On Delay Time	t <sub>d(on)</sub>	μs	-	0.9	-	V <sub>CC</sub> =1,800V, I <sub>C</sub> =800A
Rise Time	t <sub>r</sub>		-	0.2	-	L <sub>S</sub> =40nH (2)
Turn Off Delay Time	t <sub>d(off)</sub>		-	1.7	-	R <sub>G(on/off)</sub> =1.8/18Ω (2)
Fall Time	t <sub>f</sub>		-	1.0	-	V <sub>GE</sub> =±15V, T <sub>vj</sub> =150°C
Forward Voltage Drop	V <sub>F</sub>	V	-	2.9	-	I <sub>F</sub> =800A, V <sub>GE</sub> =0V, T <sub>vj</sub> =25°C
			2.7	3.2	3.7	I <sub>F</sub> =800A, V <sub>GE</sub> =0V, T <sub>vj</sub> =150°C
Reverse Recovery Time	t <sub>rr</sub>	μs	-	1.3	-	T <sub>vj</sub> =150°C
			-	1.1	-	T <sub>vj</sub> =175°C (3)
Turn On Loss	E <sub>on</sub>	J/P	-	1.06	-	T <sub>vj</sub> =150°C
			-	1.1	-	T <sub>vj</sub> =175°C (3)
Turn Off Loss	E <sub>off</sub>	J/P	-	0.7	-	T <sub>vj</sub> =150°C
			-	0.8	-	T <sub>vj</sub> =175°C (3)
Reverse Recovery Loss	E <sub>rr</sub>	J/P	-	0.7	-	T <sub>vj</sub> =150°C
			-	0.8	-	T <sub>vj</sub> =175°C (3)
Short Circuit Pulse Width	t <sub>sc</sub>	μs	10	-	-	V <sub>CC</sub> =2,200V, L <sub>S</sub> =40nH, V <sub>GE</sub> =±15V R <sub>G(on/off)</sub> =1.8/56Ω, T <sub>vjmax</sub> =175°C (3)
Stray inductance module	L <sub>SCE</sub>	nH	-	9	-	Collector Main to Emitter Main
	R <sub>25</sub>	kΩ	-	5	-	T <sub>C</sub> =25°C
NTC-Thermistor	B-constant	K	-	3375	-	Between 25°C and 50°C
	Resistance	R <sub>25</sub>	-	-	-	-
di/dt detecting terminal inductance	Upper	L <sub>E1AUX-C2AUX</sub>	nH	-	2.5	-
	Lower	L <sub>E2AUX-E2main</sub>	nH	-	2.5	-
Thermal Impedance	IGBT	R <sub>th(j-c)</sub>	K/W	-	-	0.028
	FWD	R <sub>th(j-c)</sub>	K/W	-	-	0.036
Contact Thermal Impedance	R <sub>th(c-f)</sub>	K/W	-	0.02	-	Case to fin (per 1 arm)

Notes:(2) L<sub>S</sub> and R<sub>G</sub> are the test condition's values for evaluation of the switching times, not recommended value. Please, determine the suitable R<sub>G</sub> value after the measurement of switching waveforms (overshoot voltage, etc.) with appliance mounted.  
(3) The electrical characteristics at T<sub>vj</sub>=175°C are based on type testing and are not verified during shipping inspection.

- \* 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.
- \* ELECTRICAL CHARACTERISTIC items shown in above table are according to IEC 60747-2 and IEC 60747-9.



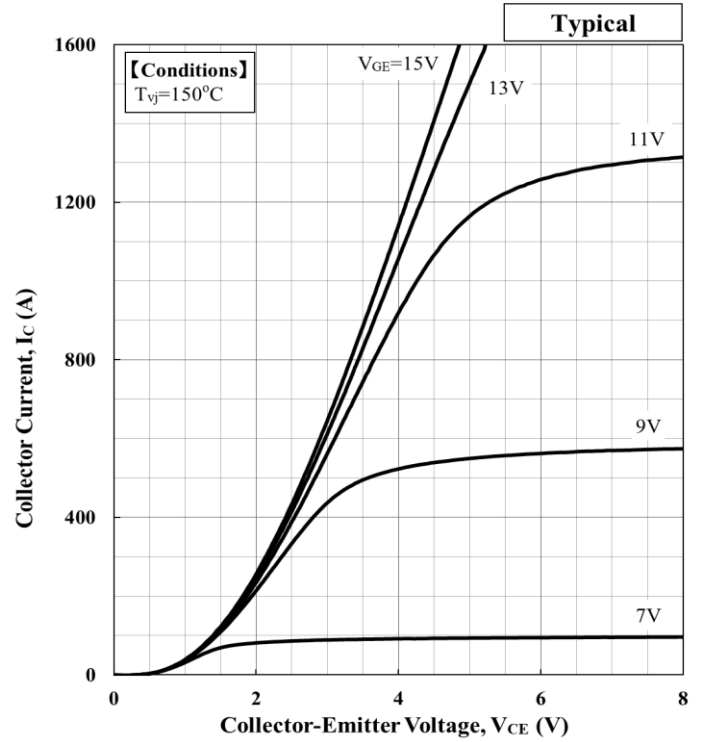
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$$V_{CE}(sat)[V] = a_3 \cdot |I_c|^3 + a_2 \cdot |I_c|^2 + a_1 \cdot |I_c| + a_0$$

Temp.[°C]	V <sub>GE</sub> [V]	a <sub>3</sub>	a <sub>2</sub>	a <sub>1</sub>	a <sub>0</sub>
25	15	6.59E-10	-2.04E-06	3.22E-03	9.09E-01

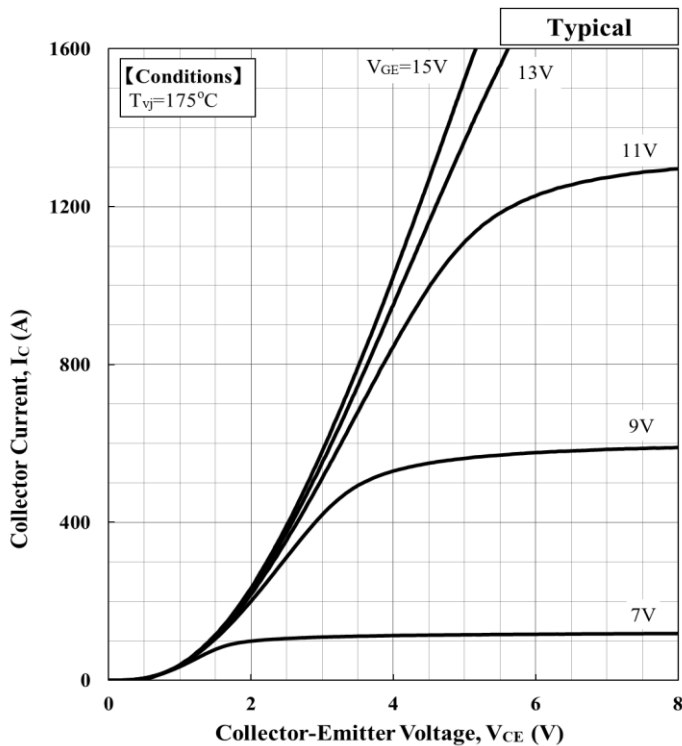
Collector Current vs. Collector Emittor Voltage



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

Temp.[°C]	V <sub>GE</sub> [V]	a <sub>3</sub>	a <sub>2</sub>	a <sub>1</sub>	a <sub>0</sub>
150	15	9.78E-10	-3.08E-06	4.97E-03	8.51E-01

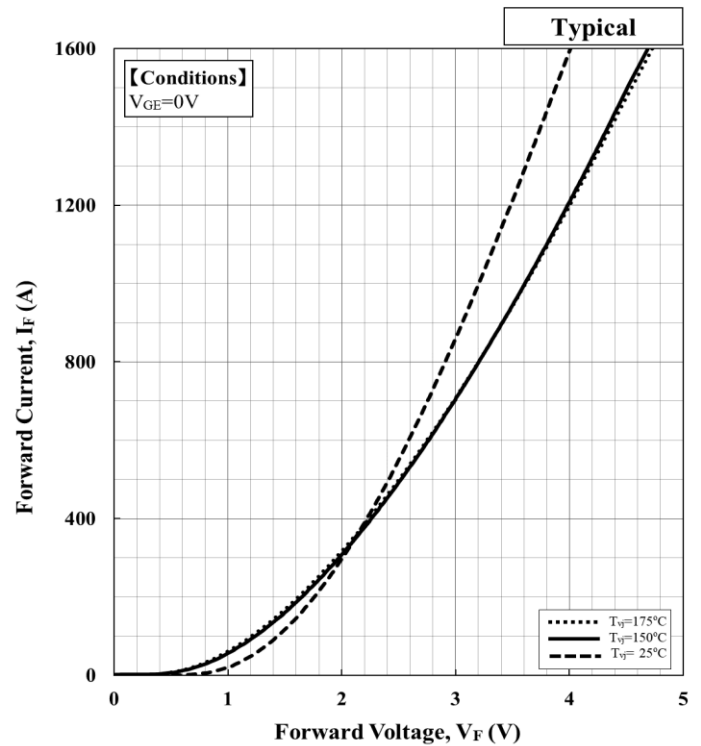
Collector Current vs. Collector Emittor Voltage



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

Temp.[°C]	V <sub>GE</sub> [V]	a <sub>3</sub>	a <sub>2</sub>	a <sub>1</sub>	a <sub>0</sub>
175	15	1.14E-09	-3.57E-06	5.57E-03	8.00E-01

Collector Current vs. Collector Emittor Voltage

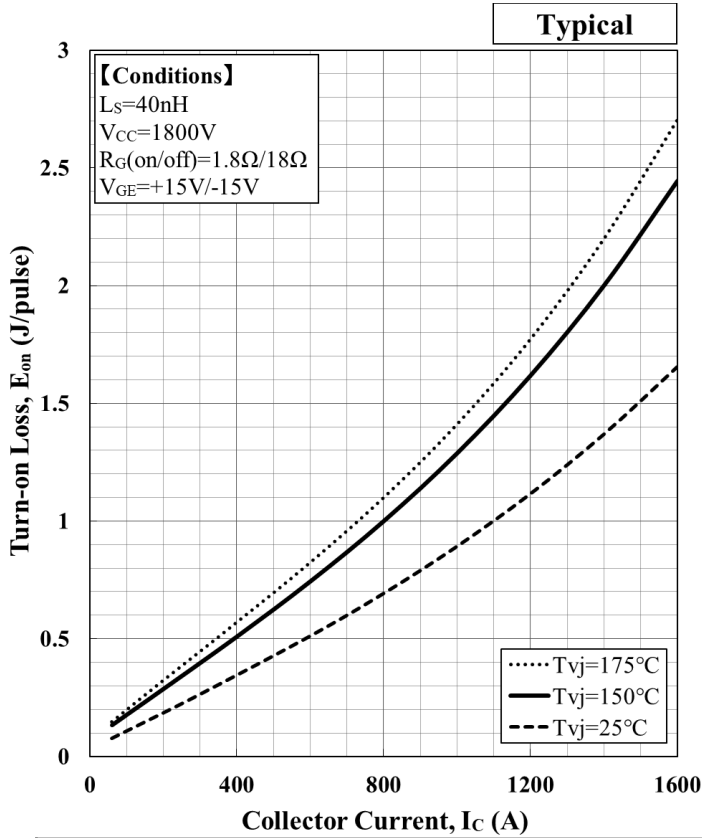


$$V_F[V] = a_3 \cdot |I_F|^3 + a_2 \cdot |I_F|^2 + a_1 \cdot |I_F| + a_0$$

Temp.[°C]	a <sub>3</sub>	a <sub>2</sub>	a <sub>1</sub>	a <sub>0</sub>
25	9.63E-10	-2.85E-06	4.09E-03	9.90E-01
150	8.84E-10	-2.83E-06	4.80E-03	7.42E-01
175	9.83E-10	-3.25E-06	5.32E-03	5.69E-01

Forward Voltage of free-wheeling diode

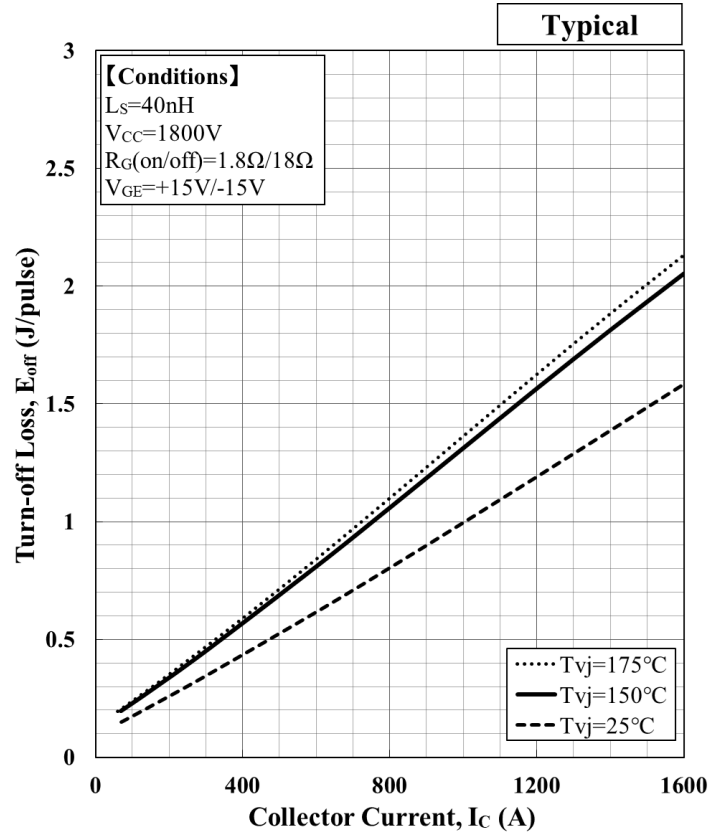
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$$E [J] = a_3 \cdot |I_c|^3 + a_2 \cdot |I_c|^2 + a_1 \cdot |I_c| + a_0$$

Temp.[°C]	$a_3$	$a_2$	$a_1$	$a_0$
25	1.05E-10	-1.78E-08	7.74E-04	3.05E-02
150	2.08E-10	-9.89E-08	1.11E-03	6.78E-02
175	2.97E-10	-2.64E-07	1.31E-03	7.05E-02

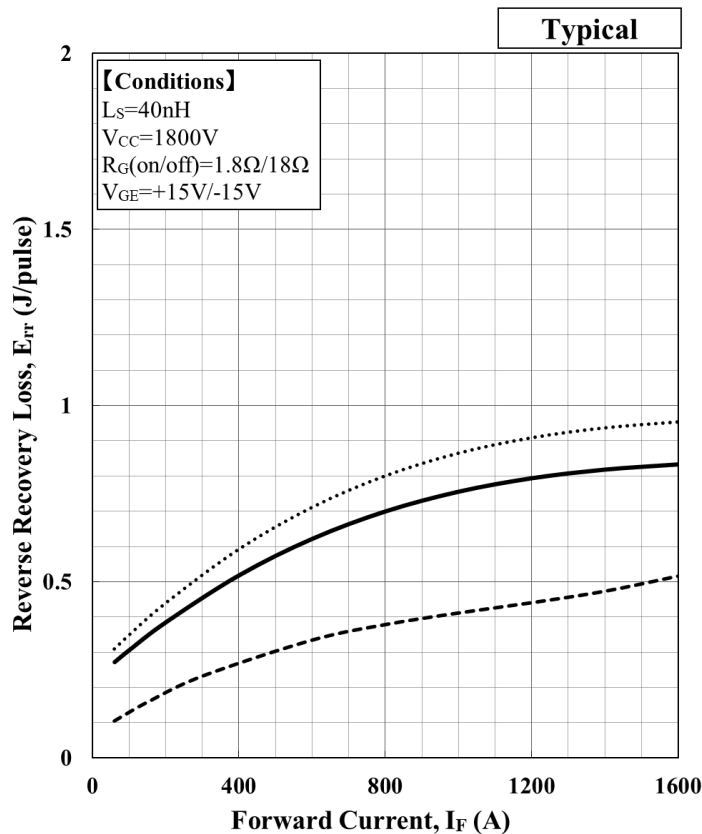
Turn-on loss vs. Collector current



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

Temp.[°C]	$a_3$	$a_2$	$a_1$	$a_0$
25	-2.65E-11	1.15E-07	7.89E-04	9.01E-02
150	-9.10E-11	2.67E-07	1.05E-03	1.29E-01
175	-9.15E-11	2.68E-07	1.06E-03	1.30E-01

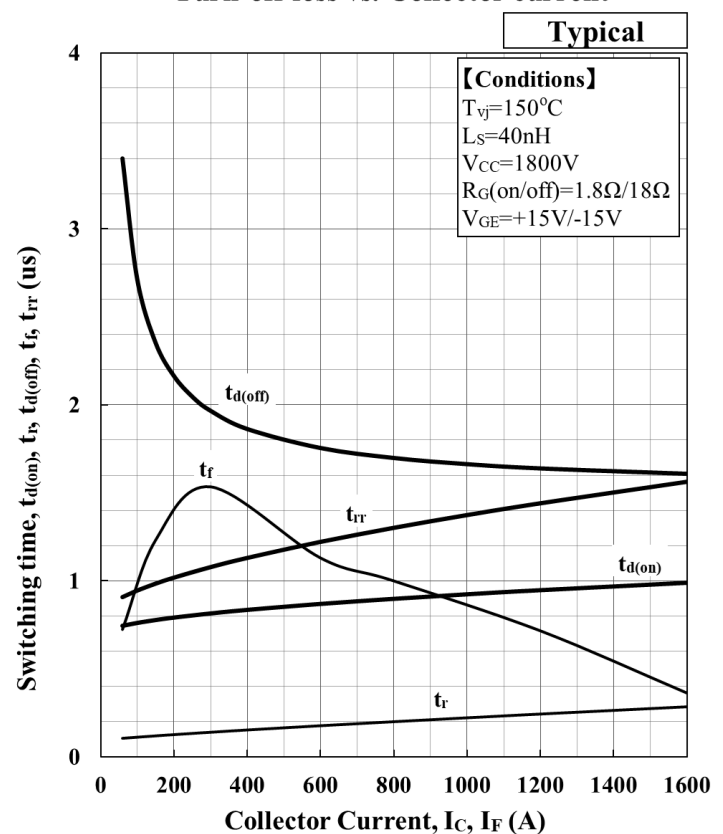
Turn-off loss vs. Collector current



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

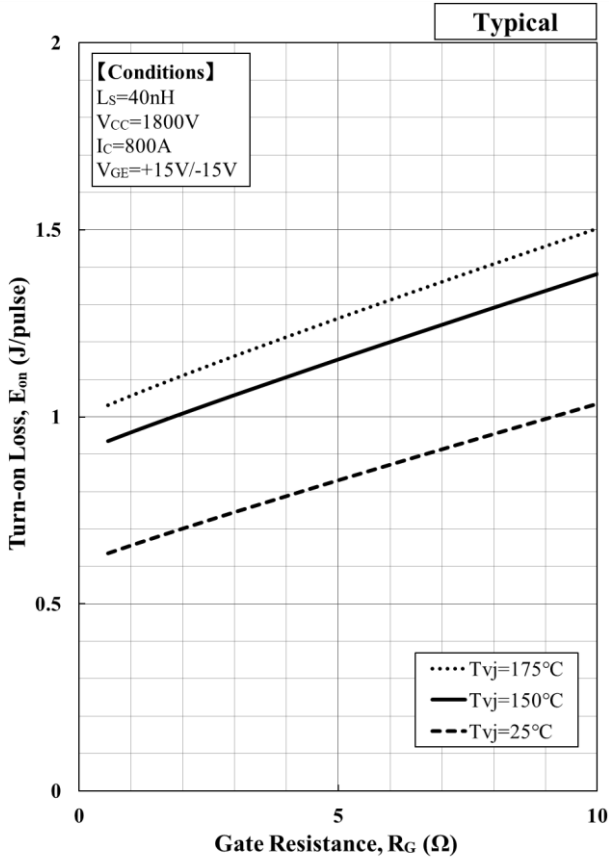
Temp.[°C]	$a_3$	$a_2$	$a_1$	$a_0$
25	1.48E-10	-4.92E-07	6.89E-04	6.59E-02
150	8.35E-11	-4.73E-07	9.29E-04	2.17E-01
175	9.54E-11	-5.41E-07	1.06E-03	2.48E-01

Reverse Recovery loss vs. Forward current

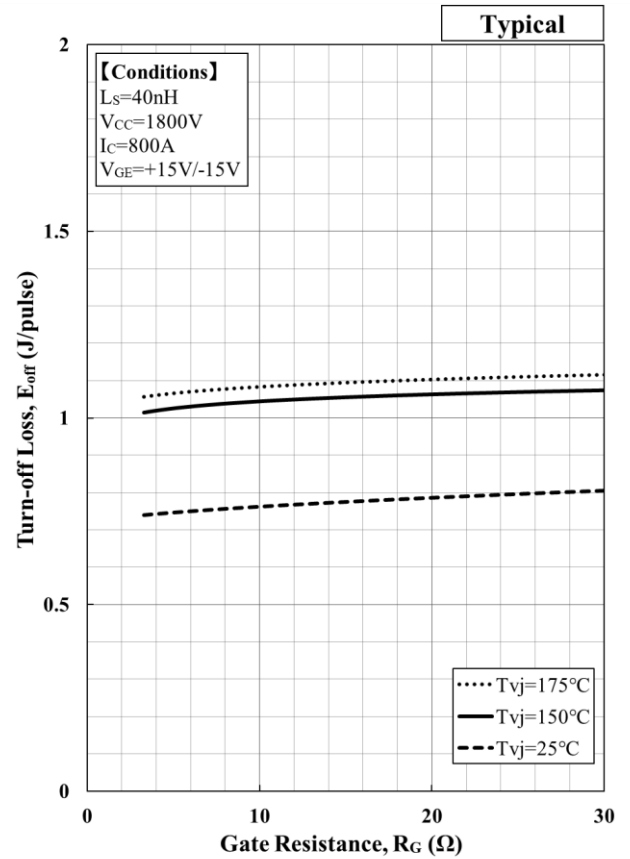


Switching time vs. Collector Current

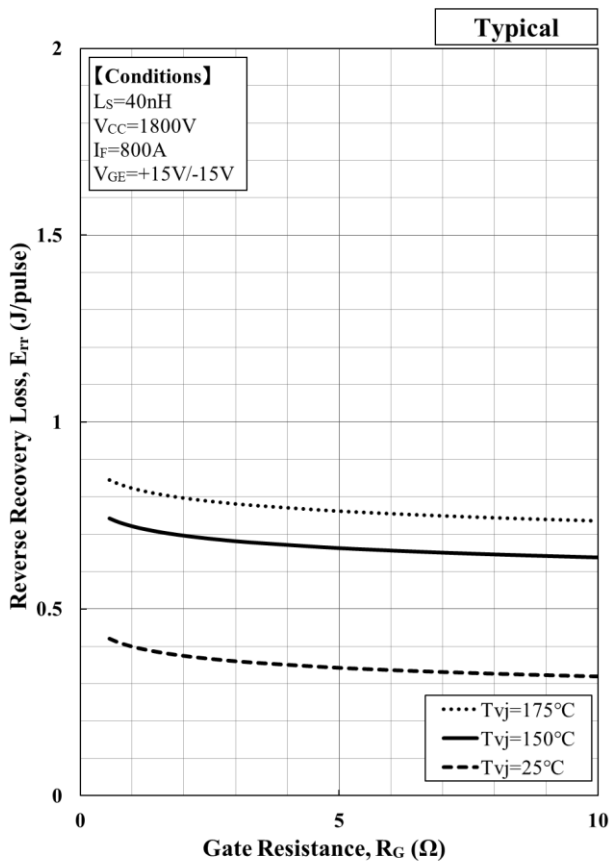
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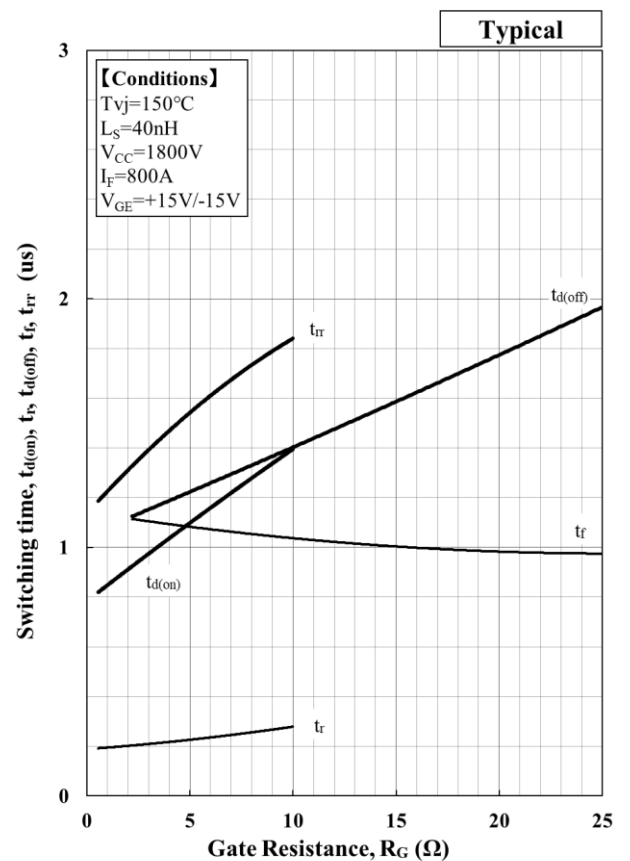
Turn-on loss vs. Gate Resistance



Turn-off loss vs. Gate Resistance

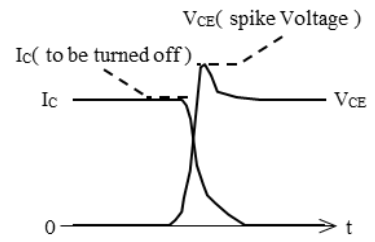
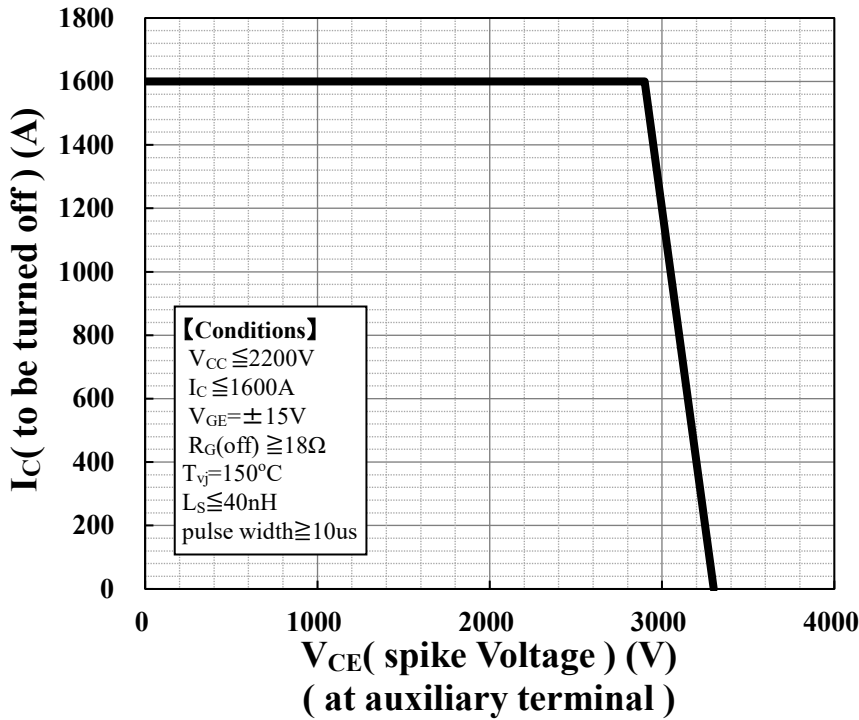


Reverse Recovery loss vs. Gate Resistance



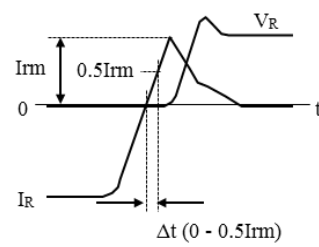
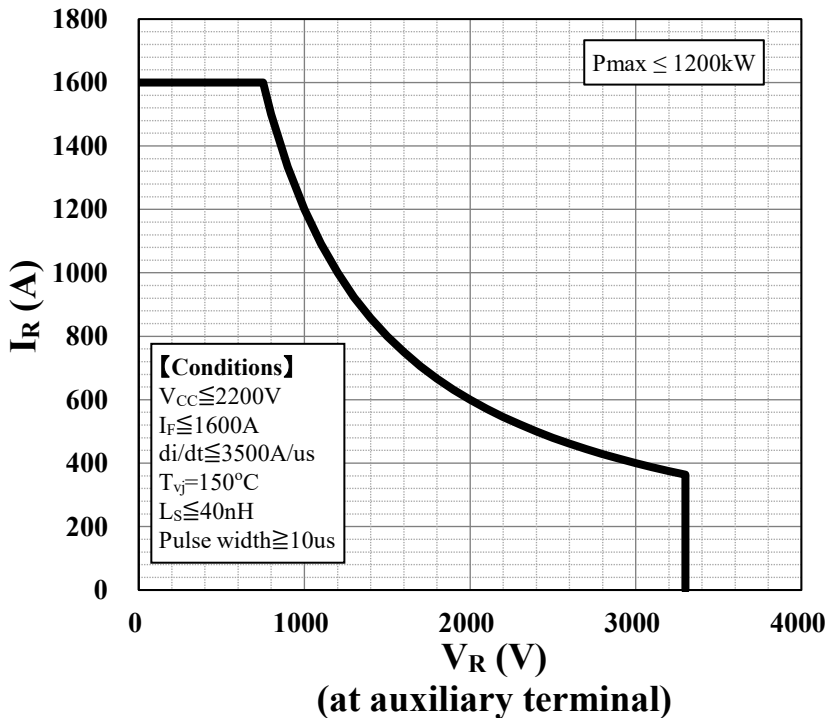
Switching time vs. Gate Resistance

# MBM800GS33G2



Definition of RBSOA waveform

## Reverse Bias Safe Operation Area ( RBSOA )

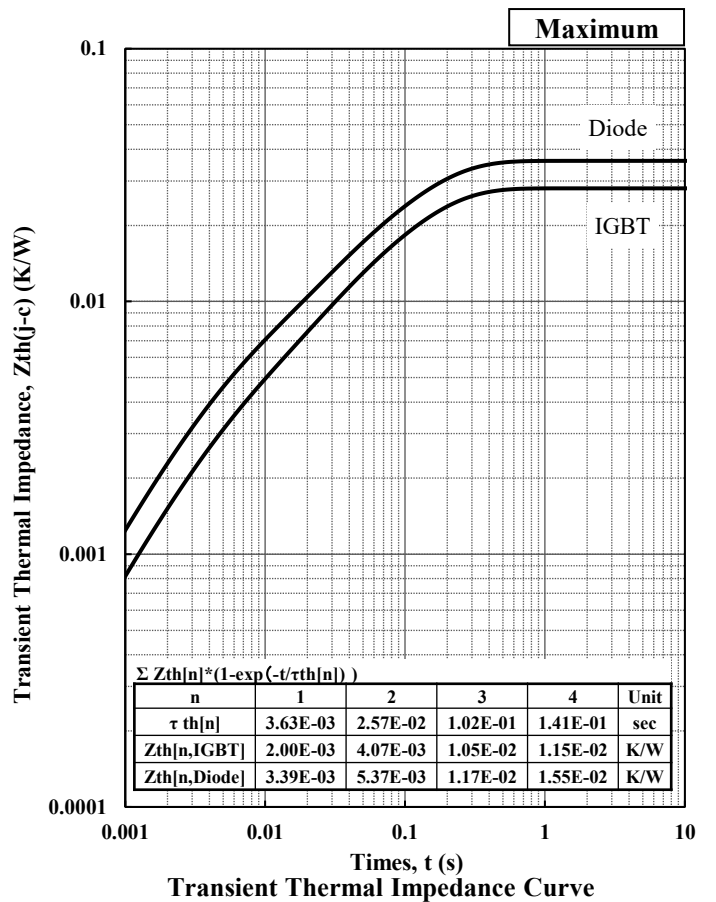
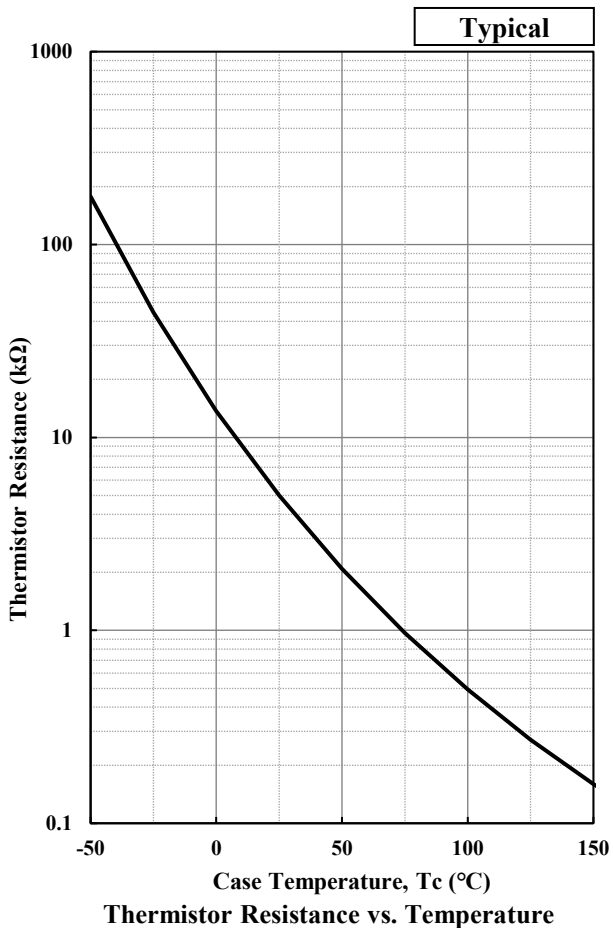
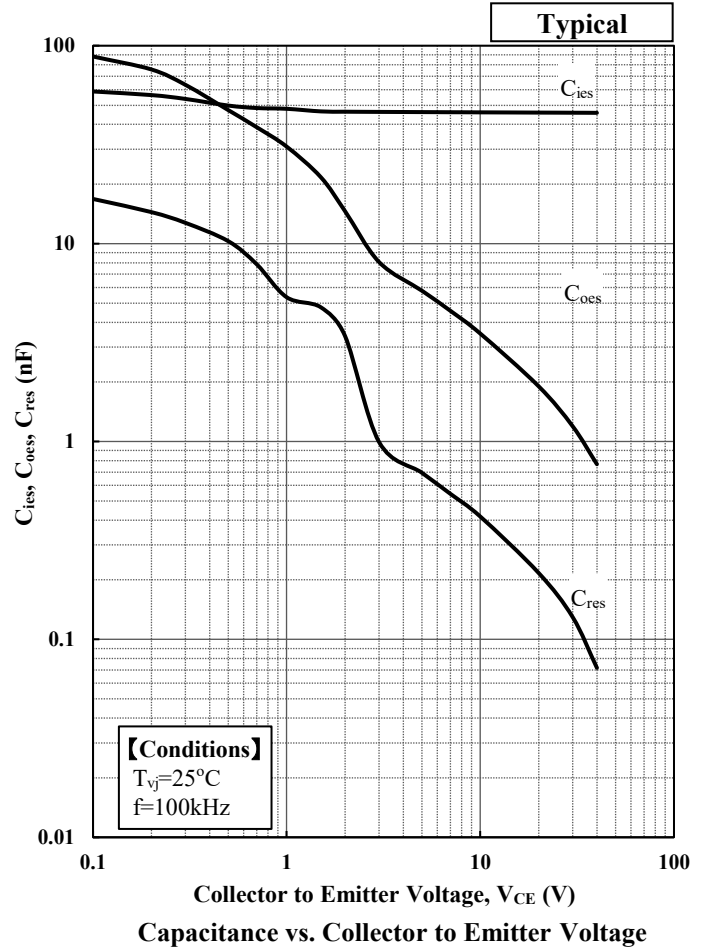
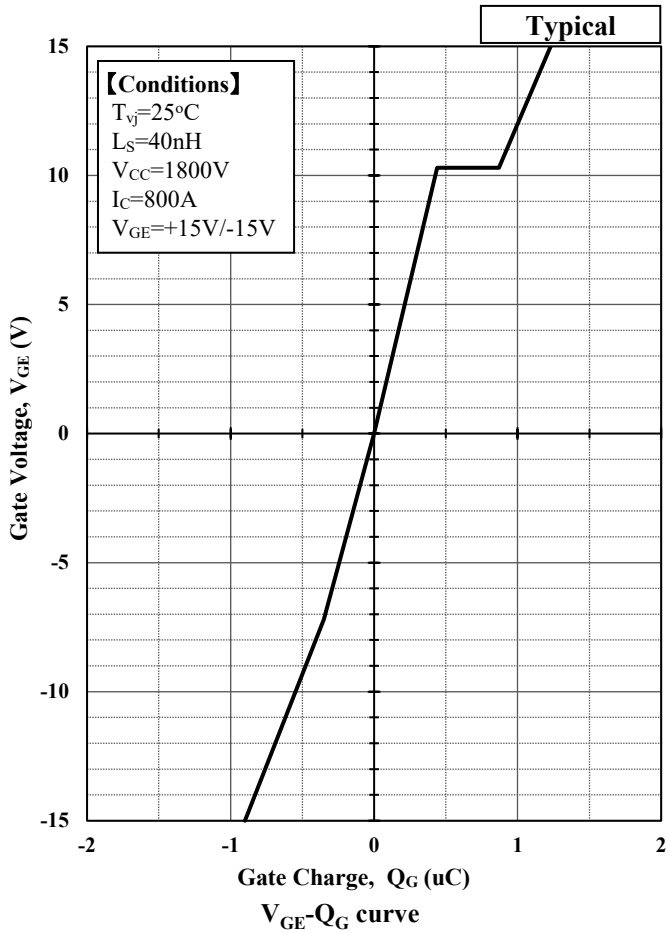


$$di/dt = \frac{0.5I_{rms}}{\Delta t}$$

Definition of Recovery di/dt

## Reverse Recovery Safe Operation Area ( RRSOA )

# MBM800GS33G2



# MBM800GS33G2

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