

# MBN2400F17F

Silicon N-channel IGBT 1700V F version

## FEATURES

- \* Soft switching behavior, low switching loss & low conduction loss :  
Soft low-injection punch-through with trench gate IGBT
- \* Low driving power due to low input capacitance advanced trench MOS gate.
- \* Ultra soft fast recovery diode.
- \* High current rate package.
- \* Low  $R_{th(j-c)}$  & low stray inductance.
- \* RoHS
- \* High thermal fatigue durability

## ABSOLUTE MAXIMUM RATINGS ( $T_C=25^\circ\text{C}$ )

Item	Symbol	Unit	MBN2400F17F
Collector Emitter Voltage	$V_{CES}$	V	1,700
Gate Emitter Voltage	$V_{GES}$	V	$\pm 20$
Collector Current	DC	$I_C$	2,400
	1ms	$I_{CRM}$	4,800
Forward Current	DC	$I_F$	2,400
	1ms	$I_{FRM}$	4,800
Junction Temperature	$T_{vj\text{ op}}$	$^\circ\text{C}$	-50 ~ +150
Storage Temperature	$T_{stg}$	$^\circ\text{C}$	-50 ~ +150
Isolation Voltage	$V_{ISO}$	$V_{RMS}$	4,000(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	-	-	7	$V_{CE}=1,700\text{V}, V_{GE}=0\text{V}, T_{vj}=25^\circ\text{C}$
			-	30	100	$V_{CE}=1,700\text{V}, V_{GE}=0\text{V}, T_{vj}=150^\circ\text{C}$
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	$V_{CE(sat)}$	V	-	2.0	-	$I_C=2,400\text{A}, V_{GE}=15\text{V}, T_{vj}=25^\circ\text{C}$
			-	2.3	-	$I_C=2,400\text{A}, V_{GE}=15\text{V}, T_{vj}=125^\circ\text{C}$
			-	2.4	2.6	$I_C=2,400\text{A}, V_{GE}=15\text{V}, T_{vj}=150^\circ\text{C}$
Gate Emitter Threshold Voltage	$V_{GE(th)}$	V	4.1	5.5	7.1	$V_{CE}=10\text{V}, I_C=240\text{mA}, T_{vj}=25^\circ\text{C}$
Input Capacitance	$C_{ies}$	nF	-	131	-	$V_{CE}=10\text{V}, V_{GE}=0\text{V}, f=100\text{kHz}, T_{vj}=25^\circ\text{C}$
Internal Gate Resistance	$R_{G(int)}$	$\Omega$	-	1.5	-	$V_{CE}=10\text{V}, V_{GE}=0\text{V}, f=100\text{kHz}, T_{vj}=25^\circ\text{C}$
Turn On Delay Time	$t_{d(on)}$	$\mu\text{s}$	-	0.8	-	$V_{CC}=900\text{V}, I_C=2,400\text{A}$
Rise Time	$t_r$		-	0.2	-	$L_S=55\text{nH}$ (3)
Turn Off Delay Time	$t_{d(off)}$		-	1.7	-	$R_G(\text{on/off})=3.3/3.3\Omega$ (3)
Fall Time	$t_f$		-	1.5	-	$V_{GE}=\pm 15\text{V}, T_{vj}=150^\circ\text{C}$
Peak Forward Voltage Drop	$V_F$	V	-	2.0	-	$I_F=2,400\text{A}, V_{GE}=0\text{V}, T_{vj}=25^\circ\text{C}$
			-	2.2	-	$I_F=2,400\text{A}, V_{GE}=0\text{V}, T_{vj}=125^\circ\text{C}$
			-	2.25	2.7	$I_F=2,400\text{A}, V_{GE}=0\text{V}, T_{vj}=150^\circ\text{C}$
Reverse Recovery Time	$t_{rr}$	$\mu\text{s}$	-	0.85	-	$V_{CC}=900\text{V}, I_C=2,400\text{A}$
Turn On Loss	$E_{on}$	J/P	-	0.7	-	$L_S=55\text{nH}$ (3)
Turn Off Loss	$E_{off}$	J/P	-	2.0	-	$R_G(\text{on/off})=3.3/3.3\Omega$ (3)
Reverse Recovery Loss	$E_{rr}$	J/P	-	0.8	-	$V_{GE}=\pm 15\text{V}, T_{vj}=150^\circ\text{C}$
Stray inductance module	$L_{SCE}$	nH	-	7	-	Collector Main to Emitter Main
Thermal Impedance	IGBT	$R_{th(j-c)}$	-	-	0.011	Junction to case
	FWD	$R_{th(j-c)}$	-	-	0.017	
Contact Thermal Impedance		$R_{th(c-f)}$	-	0.005	-	Case to fin

Notes:(3)  $L_S$  and  $R_G$  are the test condition's values for evaluation of the switching times, not recommended value.

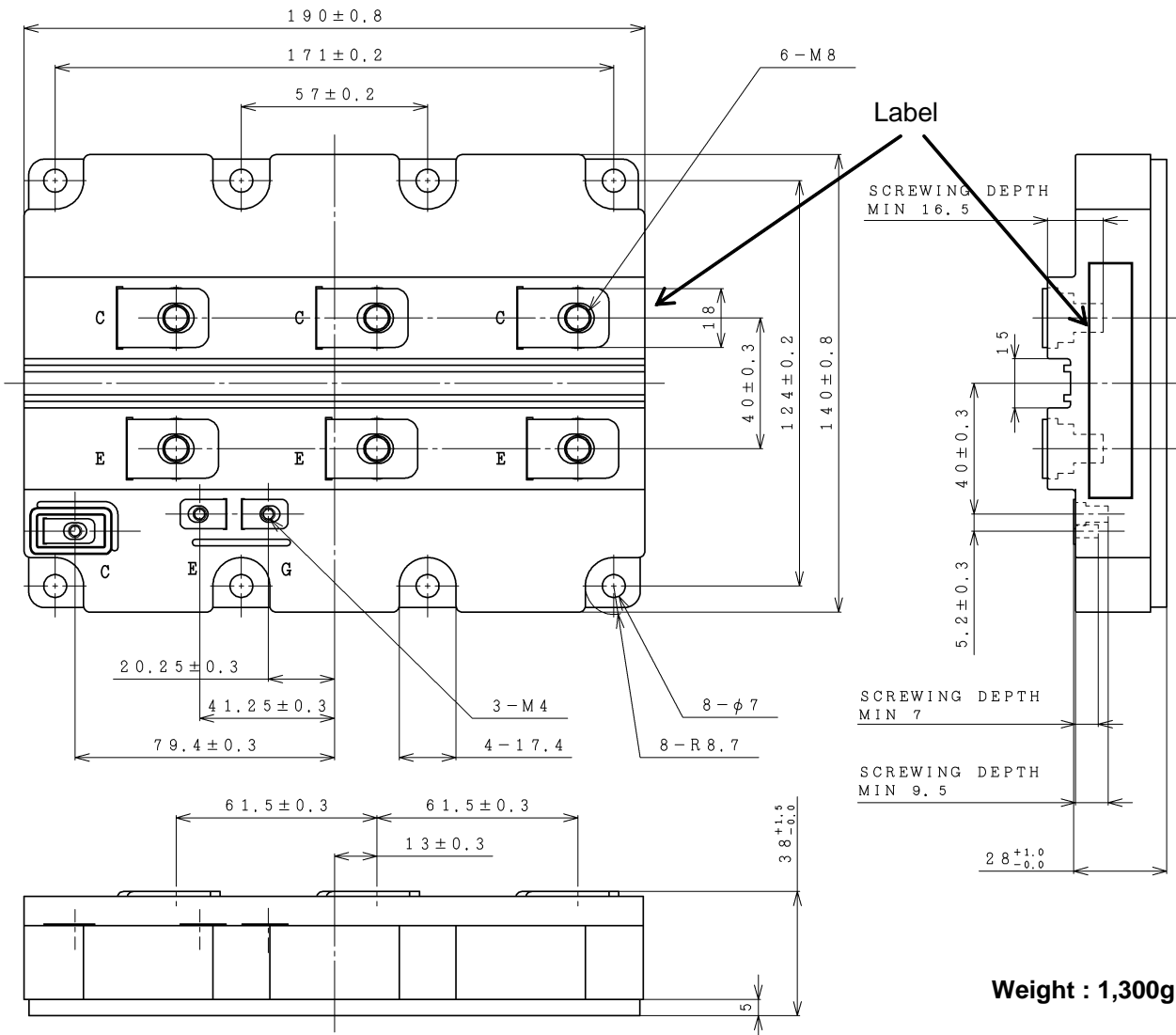
Please, determine the suitable  $R_G$  value after the measurement of switching waveforms (overshoot voltage, etc.) with appliance mounted.

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

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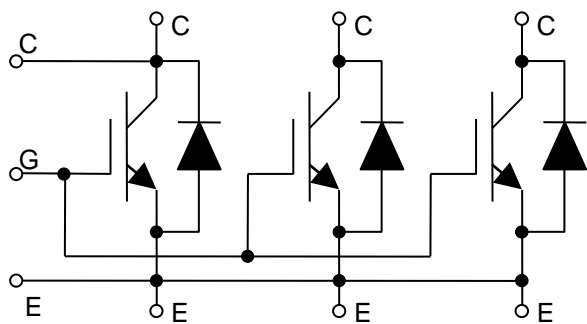
## OUTLINE DRAWING

Unit in mm

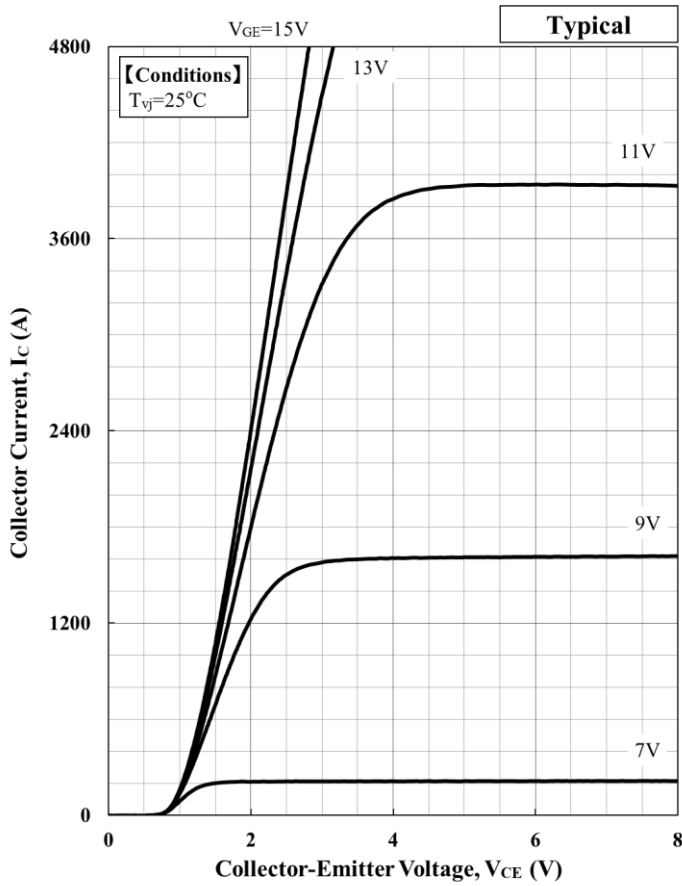


Weight : 1,300g

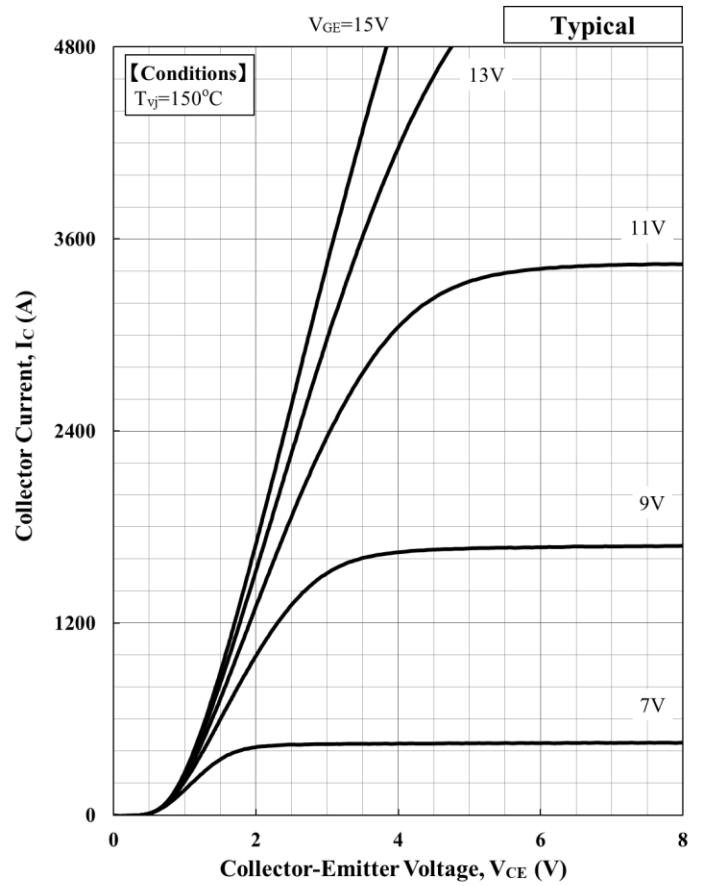
## CIRCUIT DIAGRAM



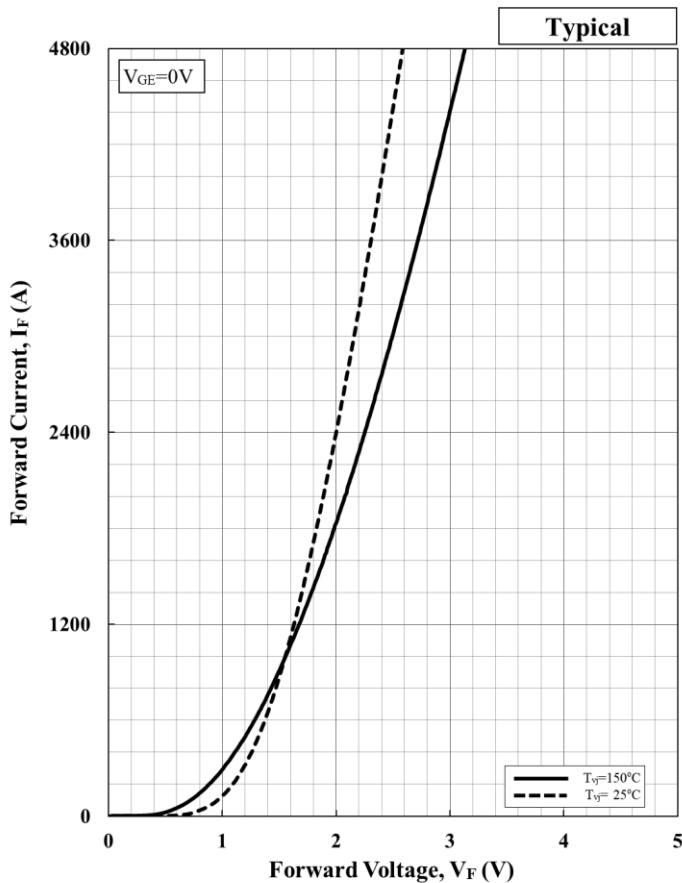
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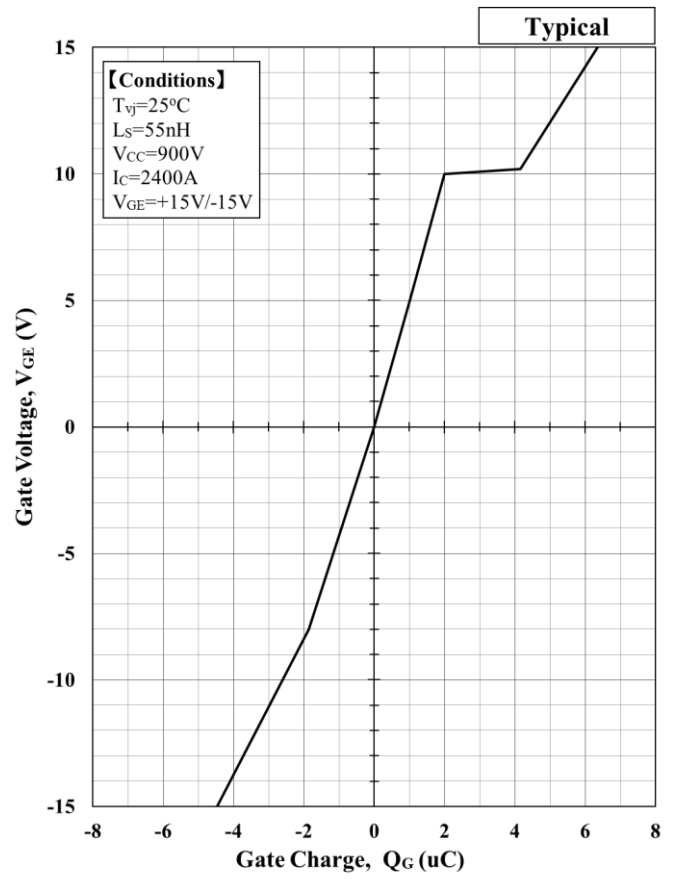
Collector Current vs. Collector Emitter Voltage



Collector Current vs. Collector Emitter Voltage

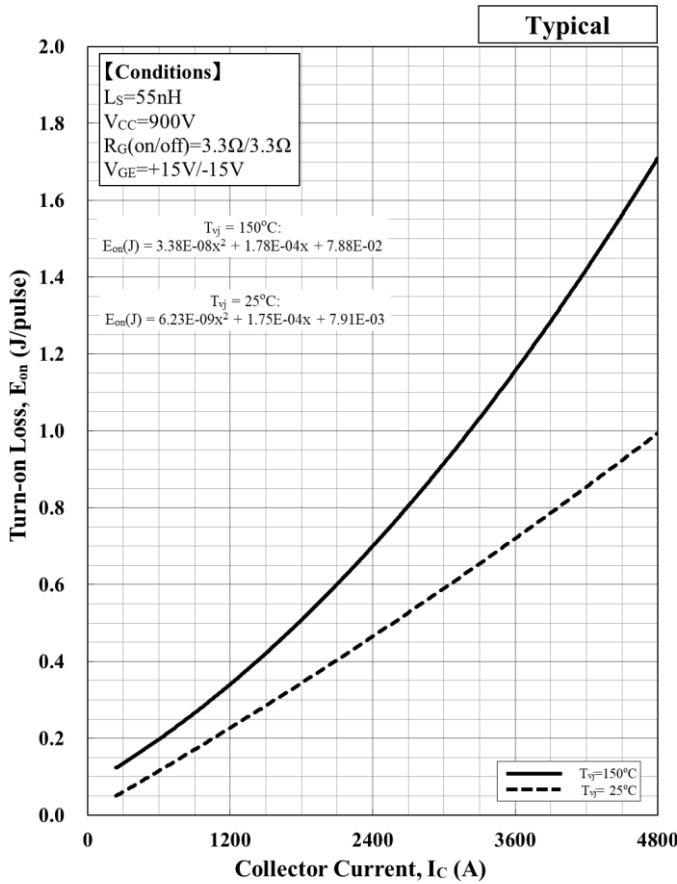


Forward Voltage of free-wheeling diode

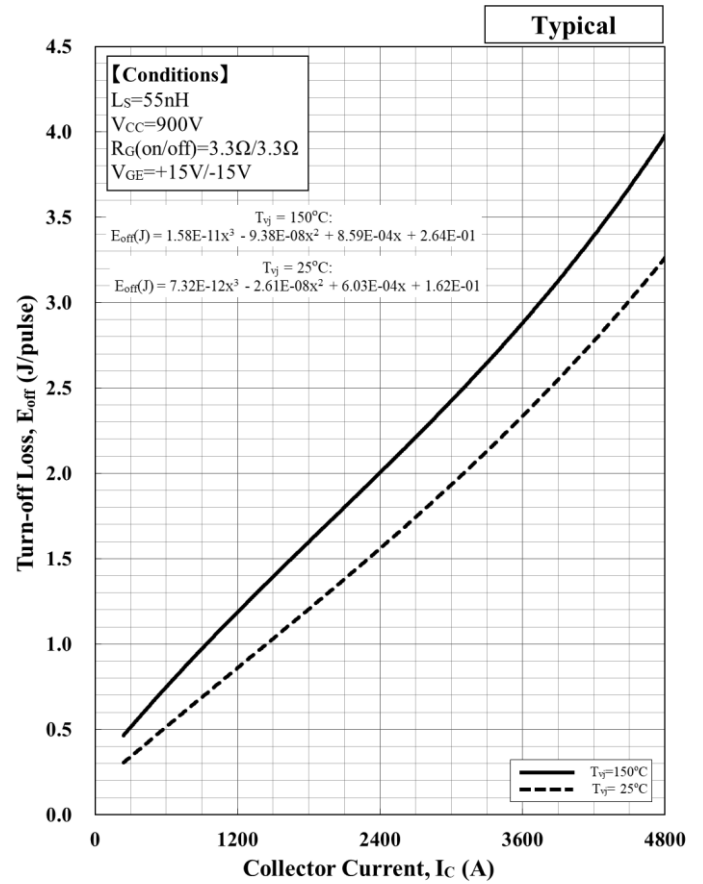


$V_{GE}-Q_G$  curve

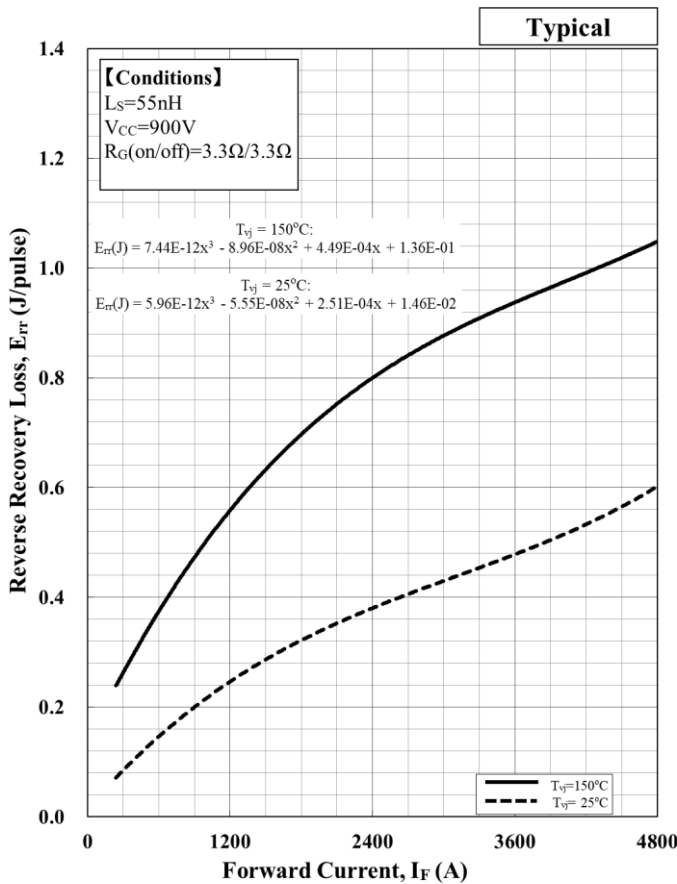
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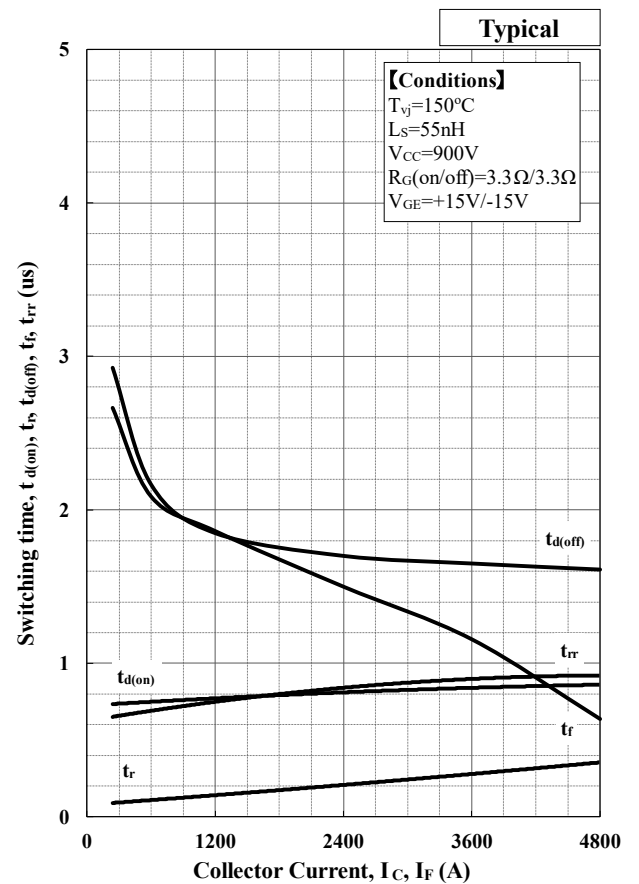
Turn-on loss vs. Collector current



Turn-off loss vs. Collector current

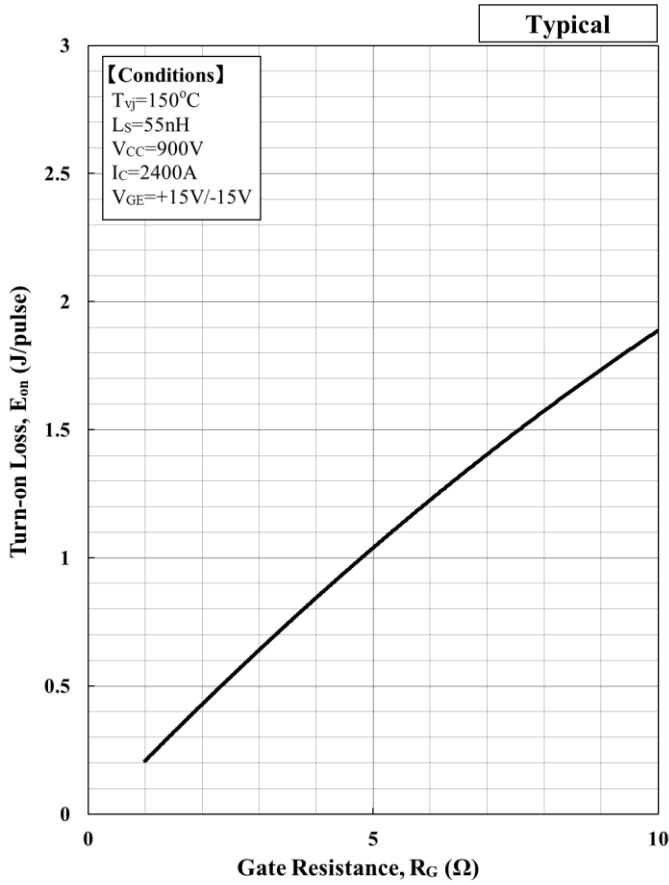


Recovery loss vs. Forward current

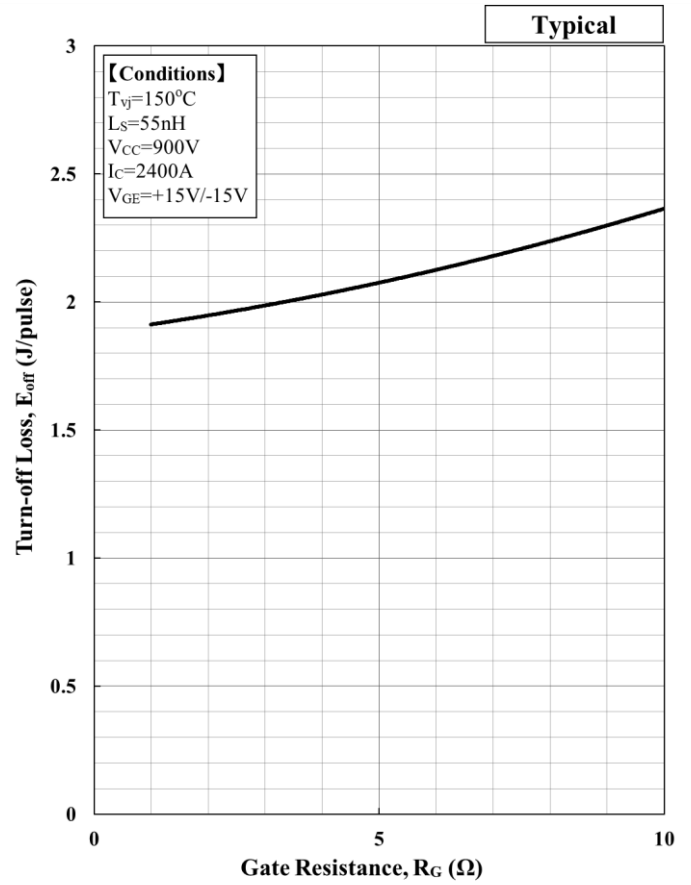


Switching time vs. Collector Current

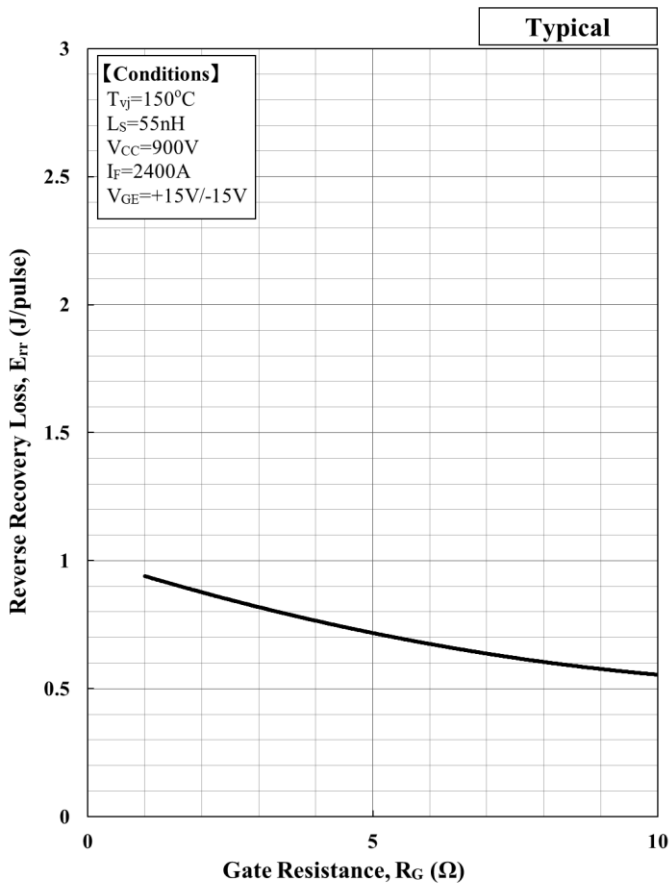
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Turn-on loss vs. Gate Resistance

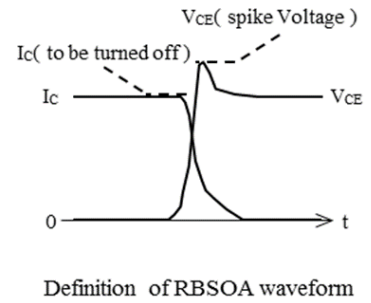
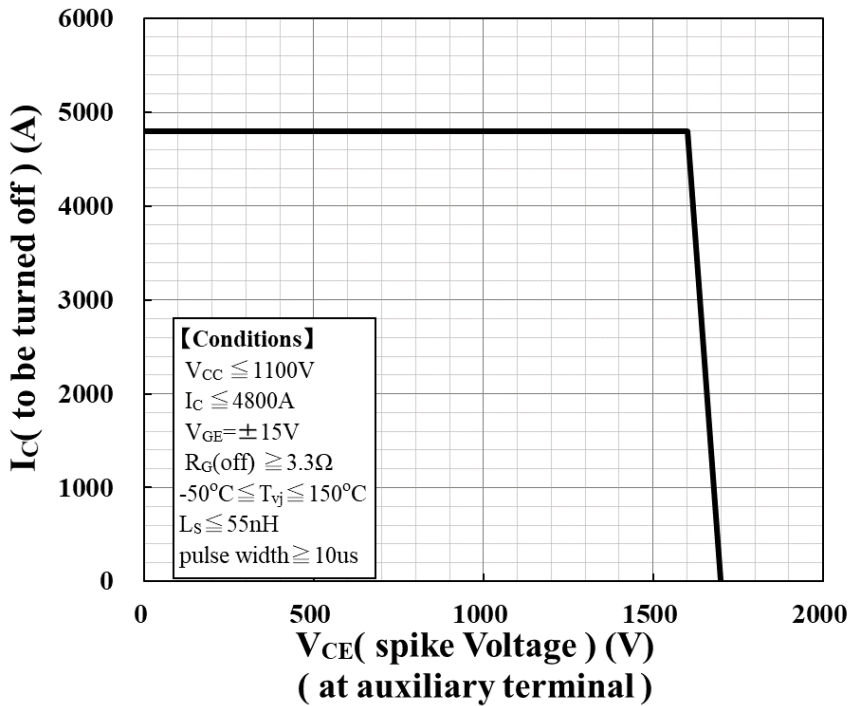


Turn-off loss vs. Gate Resistance

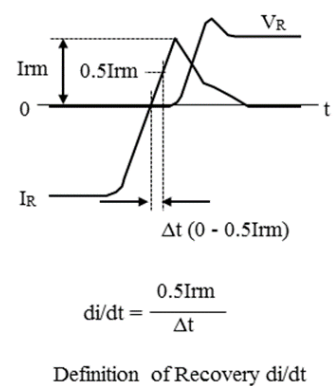
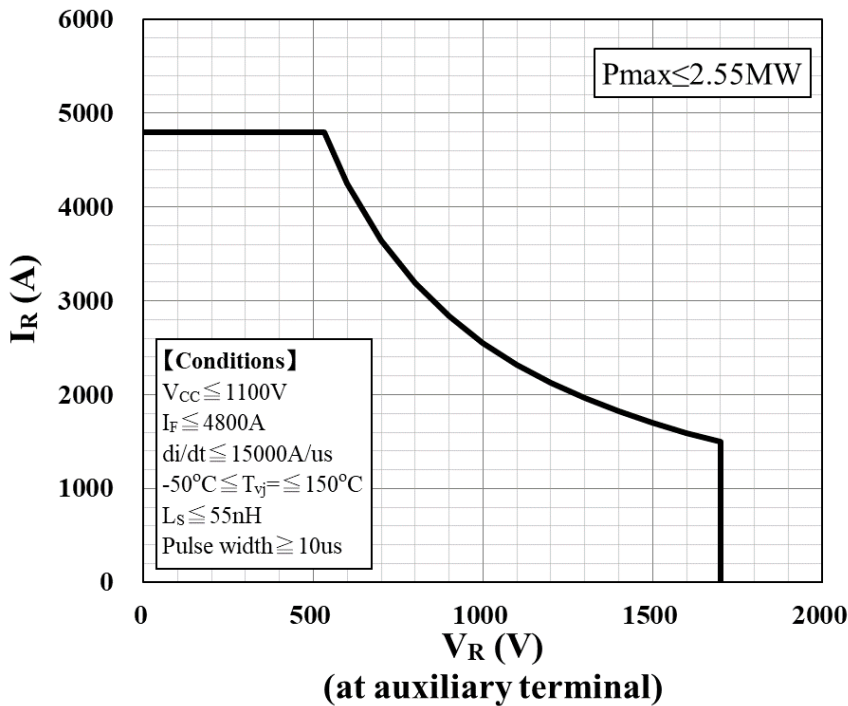


Recovery loss vs. Gate Resistance

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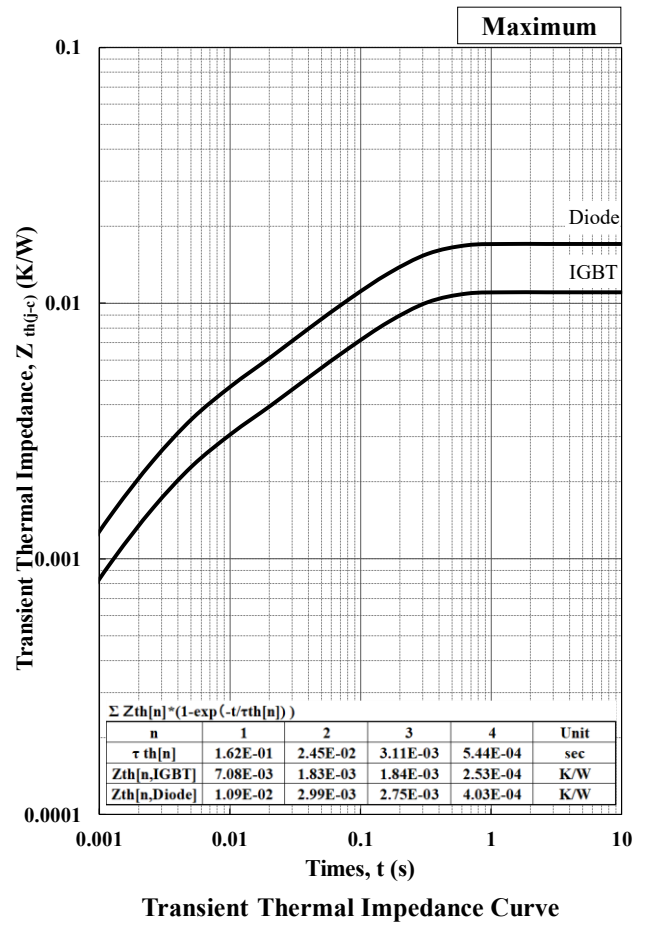
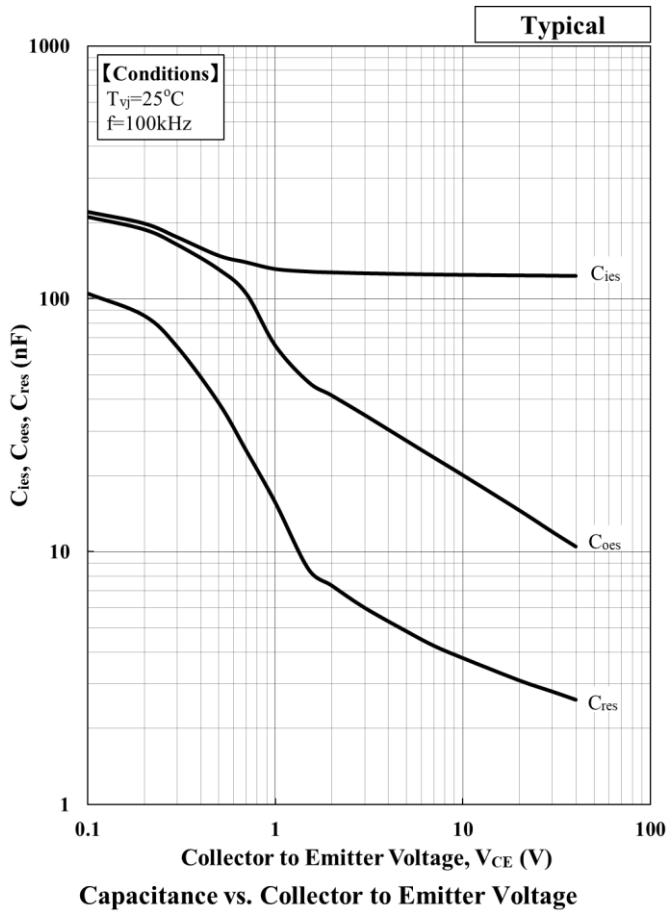


**Reverse Bias Safe Operation Area ( RBSOA )**



**Reverse Recovery Safe Operation Area ( RRSOA )**

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## Minebea POWER SEMICONDUCTORS

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5. A semi-processed article is done now using solder which contains lead inside the semiconductor devices. There is possibility of the regulation substance depend on the applied models, so please check before using.
6. This specification is a material for component selection, which describes specifications of power semiconductor devices (hereinafter referred to as products), characteristic charts, and external dimension drawings.
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