

# MBN3600E17F

Silicon N-channel IGBT 1700V F version

## FEATURES

- \* Soft switching behavior & low conduction loss :
  - Soft low-injection punch-through with
  - Advanced trench HiGT\* (\*High conductivity IGBT)
- \* Low driving power:
  - Low input capacitance advanced trench gate.
- \* Low noise recovery: Ultra soft fast recovery diode.

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

Item	Symbol	Unit	MBN3600E17F
Collector Emitter Voltage	V <sub>CES</sub>	V	1,700
Gate Emitter Voltage	V <sub>GES</sub>	V	±20
Collector Current	DC	I <sub>C</sub>	3,600
	1ms	I <sub>CRM</sub>	7,200
Forward Current	DC	I <sub>F</sub>	3,600
	1ms	I <sub>FRM</sub>	7,200
Junction Temperature	T <sub>vj op</sub>	°C	-50 ~ +150
Storage Temperature	T <sub>stg</sub>	°C	-55 ~ +125
Isolation Voltage	V <sub>ISO</sub>	V <sub>RMS</sub>	4,000(AC 1 minute)
Screw Torque	Terminals (M4/M8)	-	2/15 (1)
	Mounting (M6)	-	6 (2)

Notes: (1) Recommended Value 1.8±0.2/15<sup>+0</sup><sub>-3</sub>N·m (2) 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	-	-	10	V <sub>CE</sub> =1,700V, V <sub>GE</sub> =0V, T <sub>vj</sub> =25°C
			-	35	150	V <sub>CE</sub> =1,700V, V <sub>GE</sub> =0V, T <sub>vj</sub> =150°C
Gate Emitter Leakage Current	I <sub>GES</sub>	nA	-500	-	+500	V <sub>GE</sub> =±20V, V <sub>CE</sub> =0V, T <sub>vj</sub> =25°C
Collector Emitter Saturation Voltage	V <sub>CEsat</sub>	V	-	2.4	2.8	I <sub>C</sub> =3,600A, V <sub>GE</sub> =15V, T <sub>vj</sub> =150°C
Gate Emitter Threshold Voltage	V <sub>GE(th)</sub>	V	4.1	5.5	7.1	V <sub>CE</sub> =10V, I <sub>C</sub> =360mA, T <sub>vj</sub> =25°C
Input Capacitance	C <sub>ies</sub>	nF	-	177	-	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	-	1.3	-	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	-	1.05	2.0	V <sub>CC</sub> =900V, I <sub>C</sub> =3,600A
Rise Time	t <sub>r</sub>		-	0.35	0.8	L <sub>S</sub> =55nH
Turn Off Delay Time	t <sub>d(off)</sub>		-	1.7	3.4	R <sub>G(on/off)</sub> =3.3/3.3Ω (3)
Fall Time	t <sub>f</sub>		-	1.6	3.2	V <sub>GE</sub> =±15V, T <sub>vj</sub> =150°C
Peak Forward Voltage Drop	V <sub>F</sub>	V	-	2.25	2.7	I <sub>F</sub> =3,600A, V <sub>GE</sub> =0V, T <sub>vj</sub> =150°C
Reverse Recovery Time	t <sub>rr</sub>	μs	-	0.8	1.6	V <sub>CC</sub> =900V, I <sub>F</sub> =3,600A, L <sub>S</sub> =55nH T <sub>vj</sub> =150°C
Turn On Loss	E <sub>on</sub>	J/P	-	1.4	-	V <sub>CC</sub> =900V, I <sub>C</sub> =3,600A, L <sub>S</sub> =55nH
Turn Off Loss	E <sub>off</sub>	J/P	-	3.0	-	R <sub>G(on/off)</sub> =3.3/3.3Ω (3)
Reverse Recovery Loss	E <sub>rr</sub>	J/P	-	1.15	-	V <sub>GE</sub> =±15V, T <sub>vj</sub> =150°C
Short Circuit Pulse Width	t <sub>sc</sub>	μs	10	-	-	V <sub>CC</sub> =1,100V, L <sub>S</sub> =55nH R <sub>G(on/off)</sub> =3.3/15Ω, V <sub>GE</sub> =±15V, T <sub>vj</sub> =150°C
Stray inductance module	L <sub>SCE</sub>	nH	-	8	-	
Thermal Impedance	IGBT	R <sub>th(f-c)</sub>	-	-	0.0072	Junction to case
	FWD	R <sub>th(f-c)</sub>	-	-	0.011	
Contact Thermal Impedance		R <sub>th(c-f)</sub>	-	0.005	-	Case to fin

Notes: (3) R<sub>G</sub> value is a test condition value for evaluation, not recommended value.

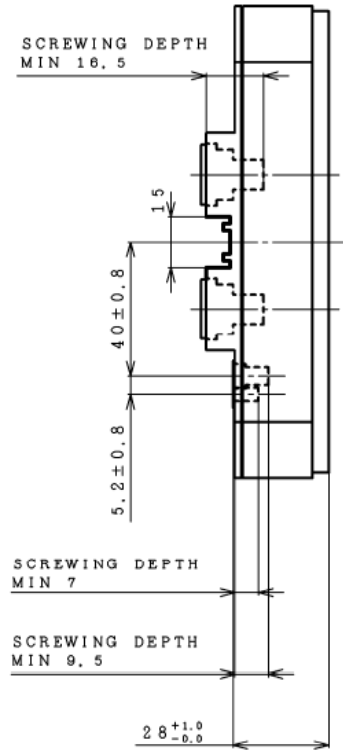
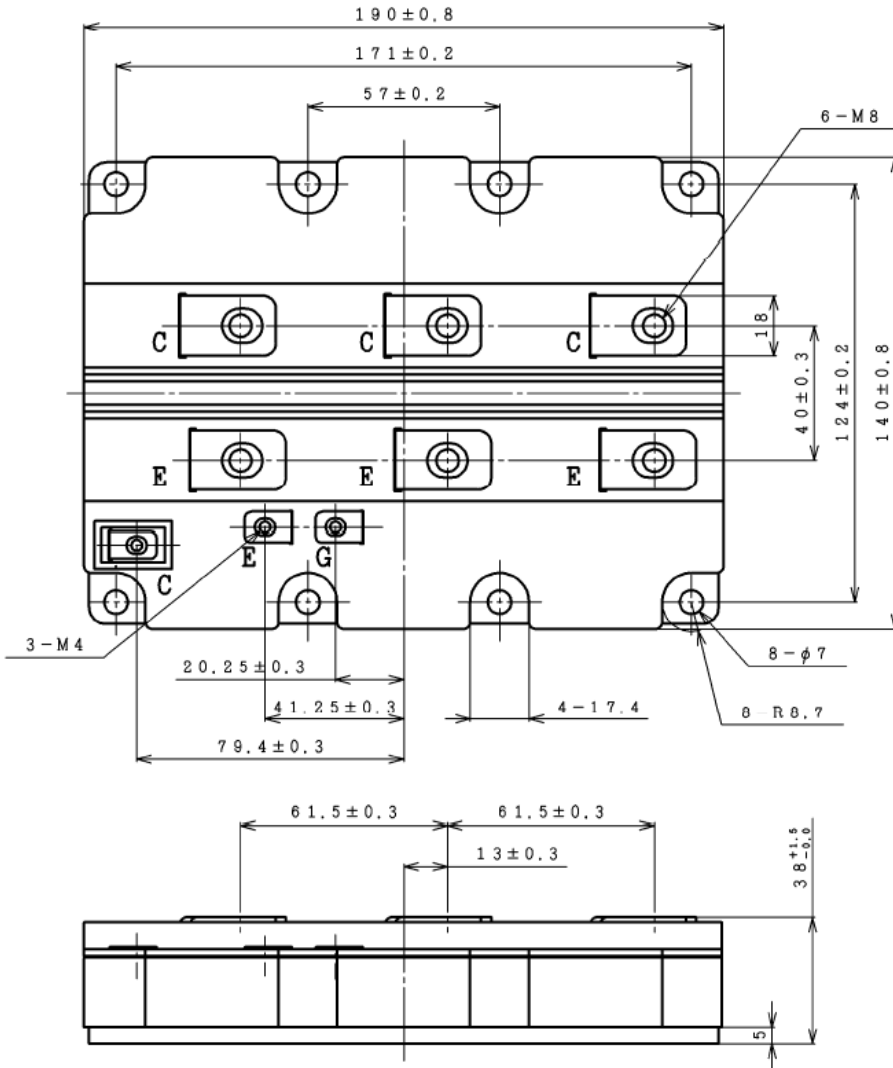
Please, determine the suitable R<sub>G</sub> value by measuring switching behaviors.

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

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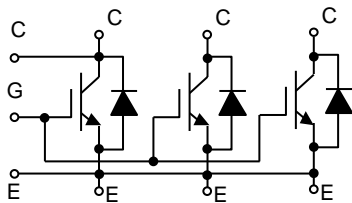
OUTLINE DRAWING

Unit in mm

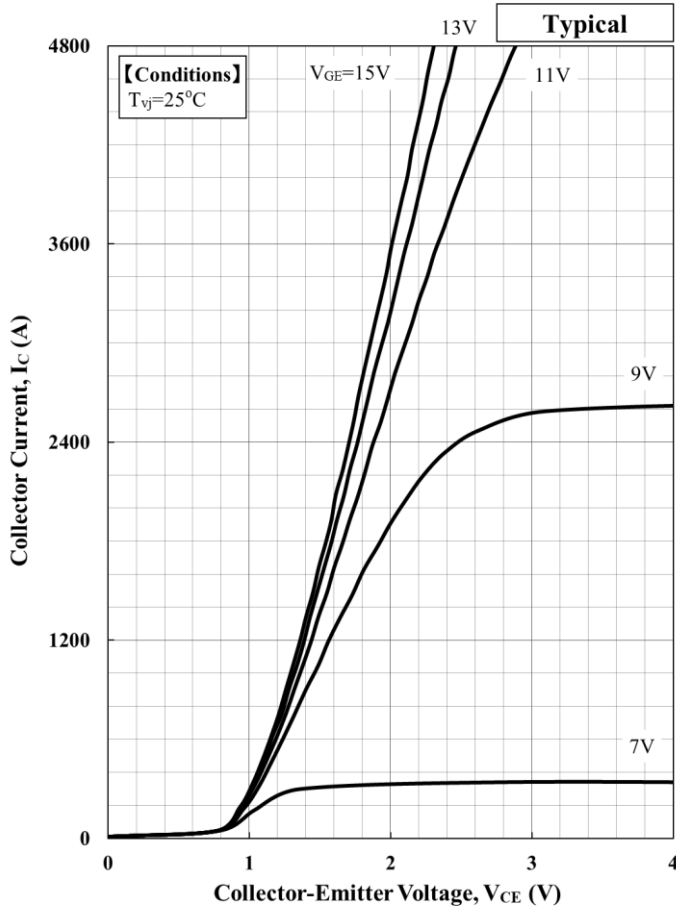


Weight: 1300g

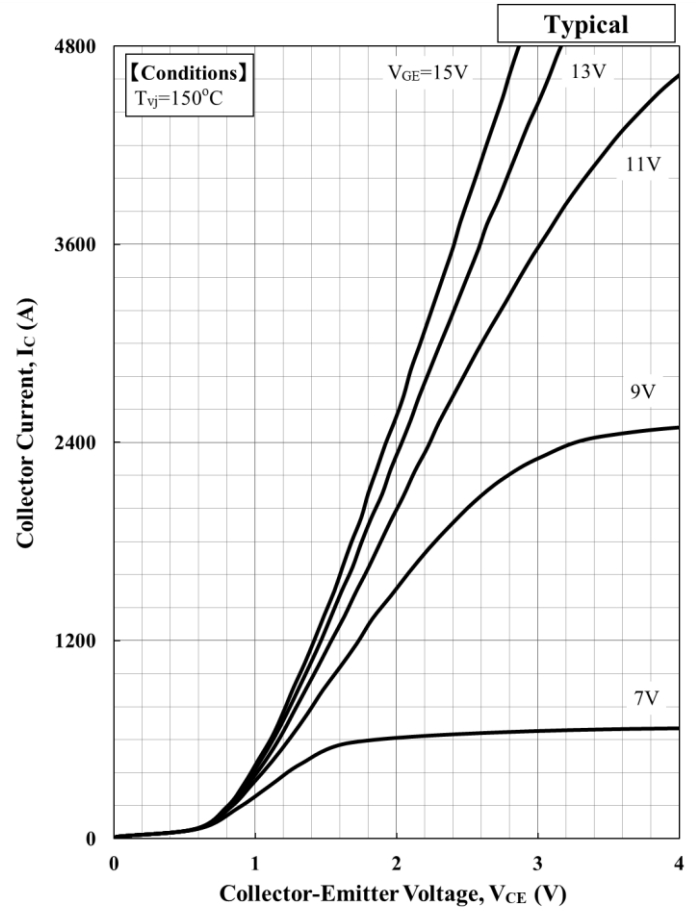
CIRCUIT DIAGRAM



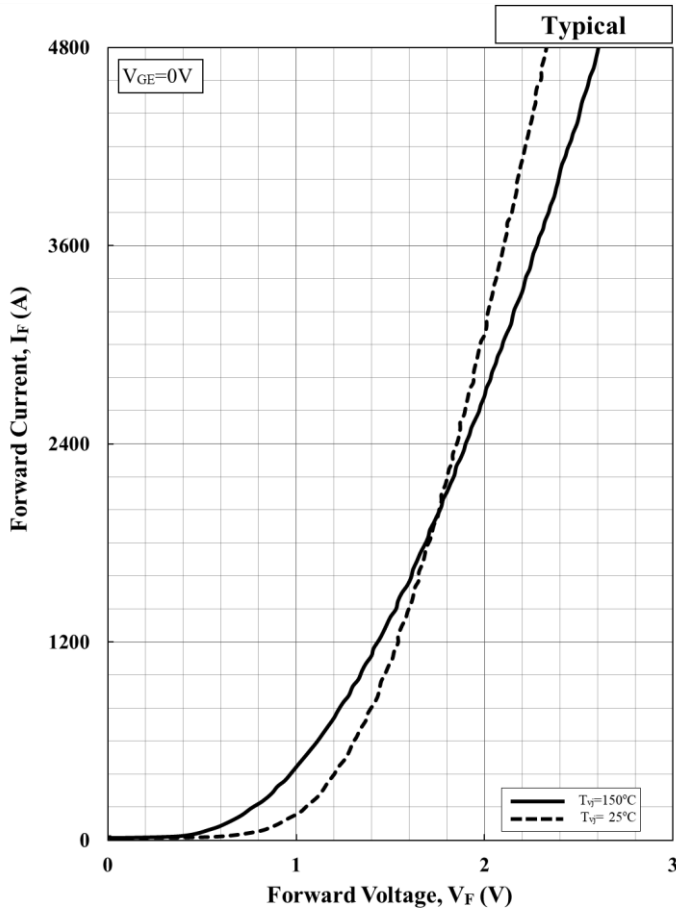
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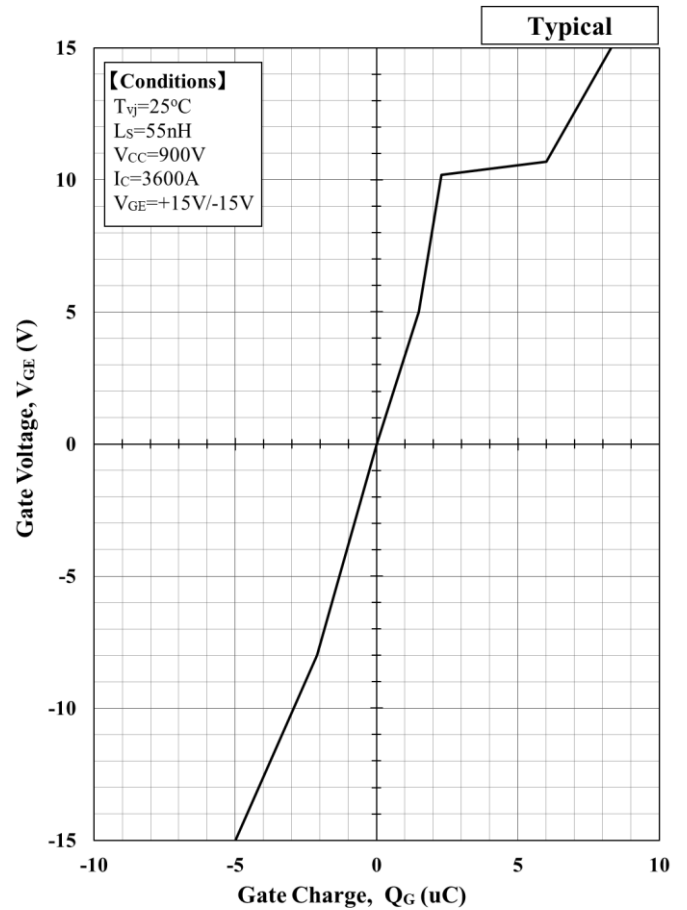
Collector Current vs. Collector Emitter Voltage



Collector Current vs. Collector Emitter Voltage

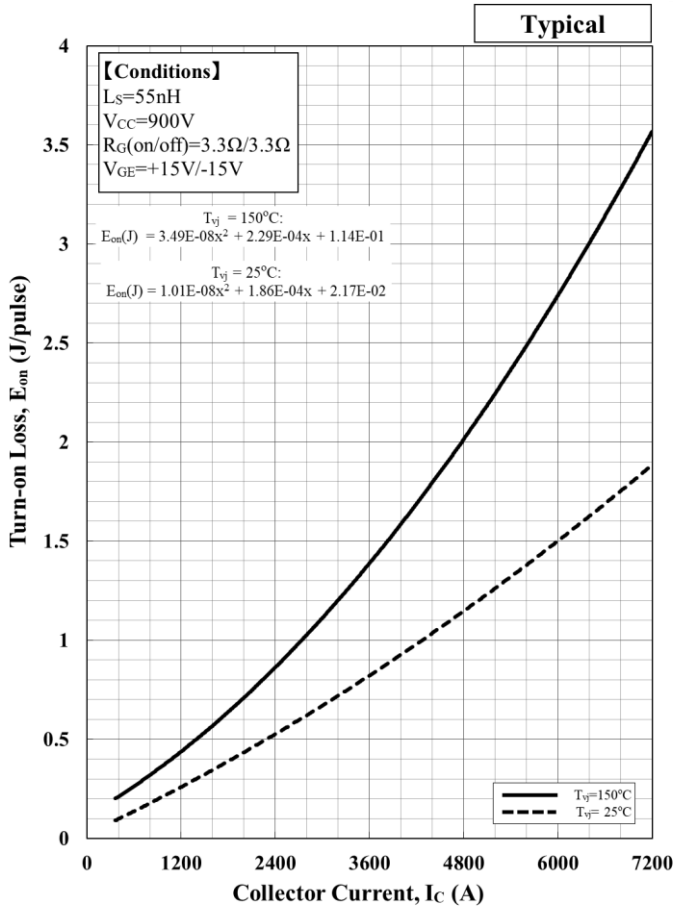


Forward Voltage of free-wheeling diode

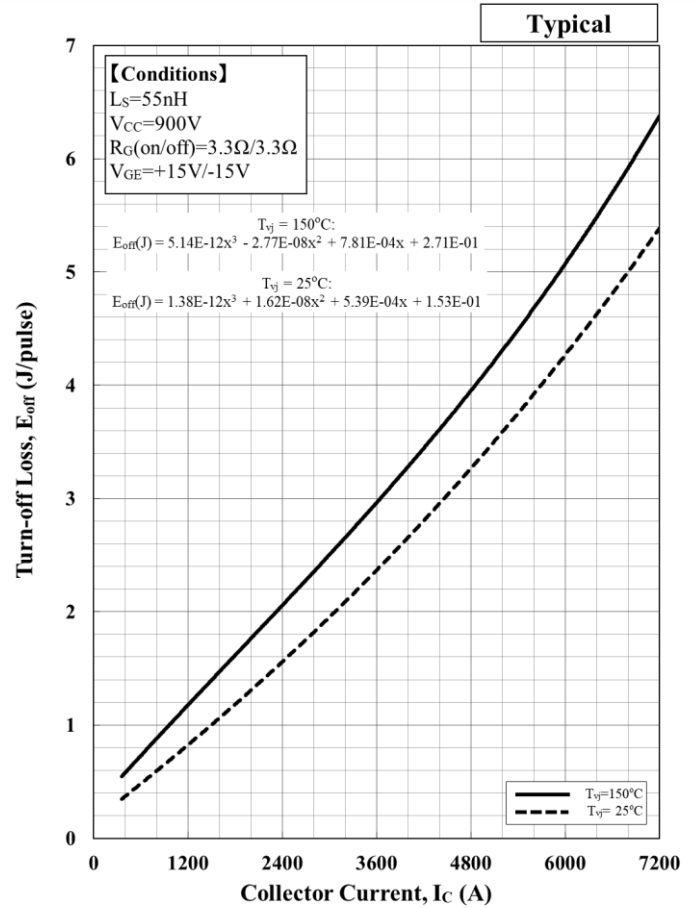


$V_{GE}$ - $Q_G$  curve

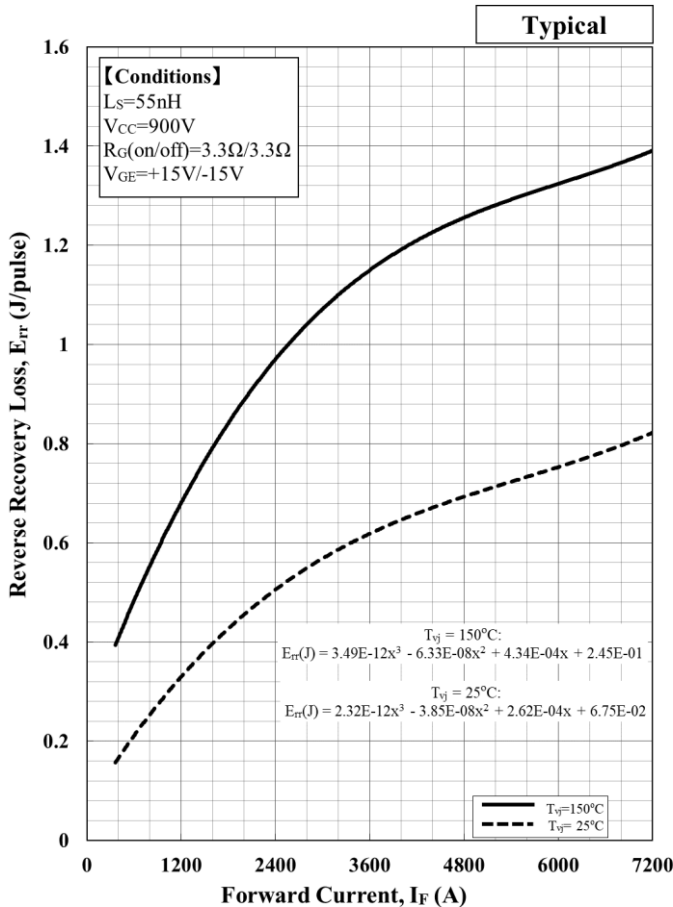
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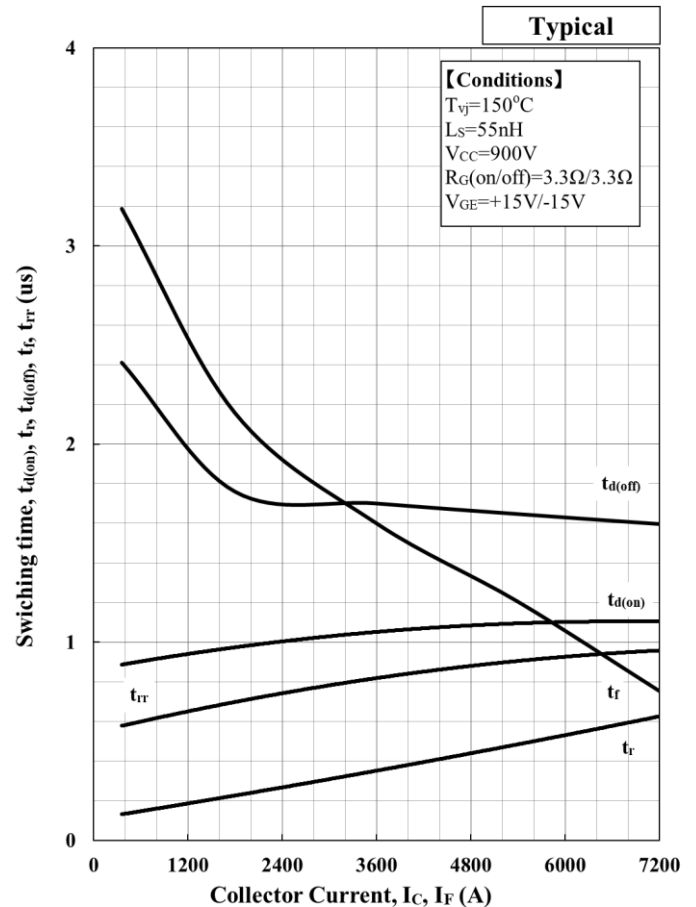
Turn-on loss vs. Collector current



Turn-off loss vs. Collector current

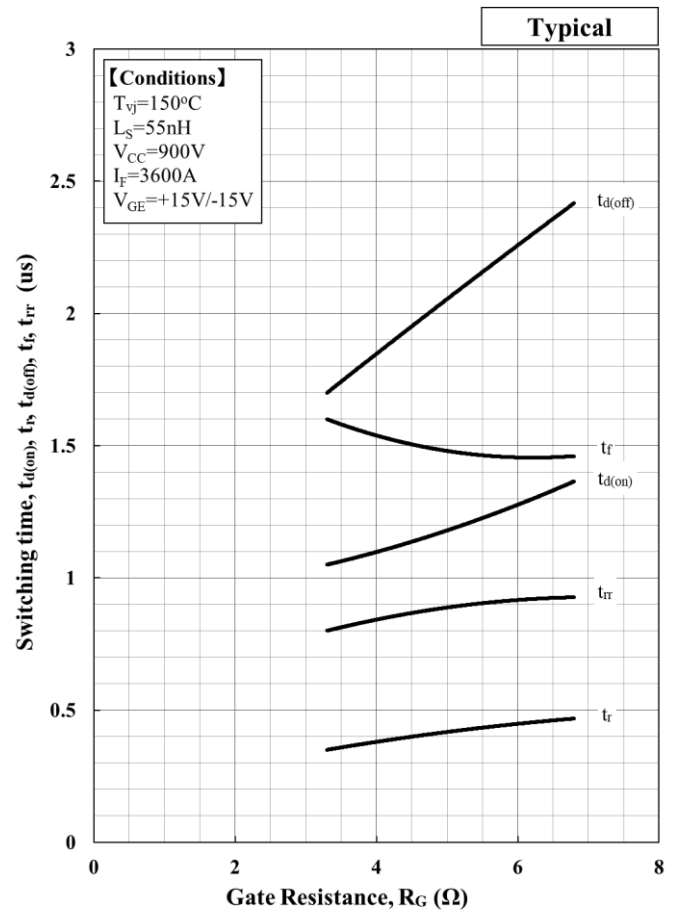
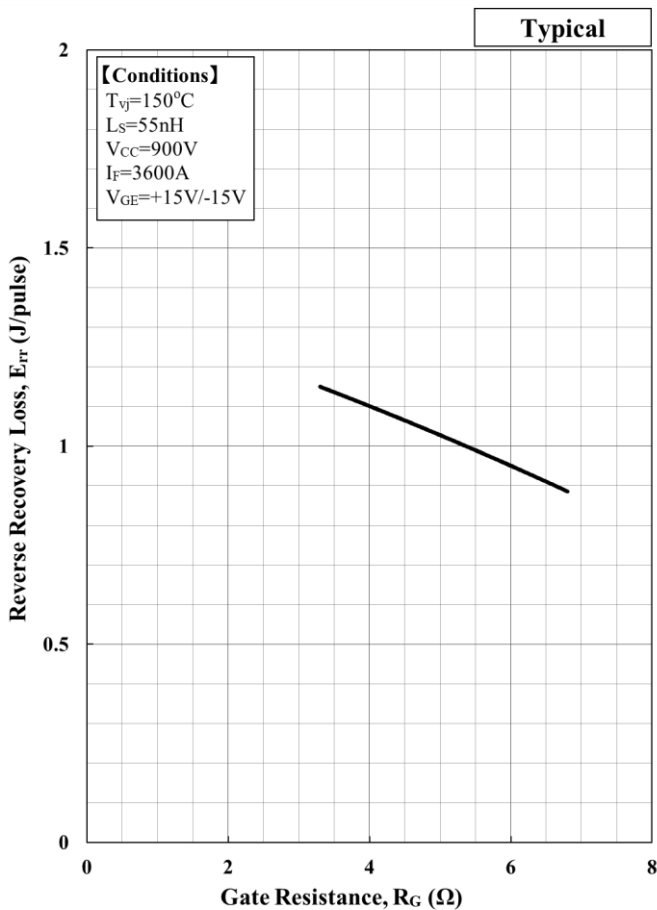
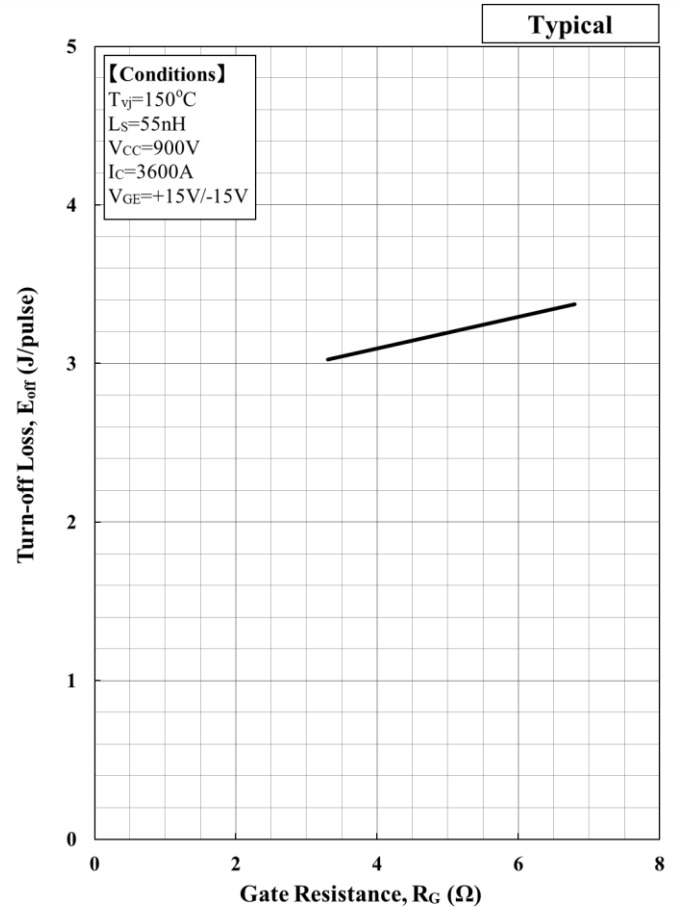
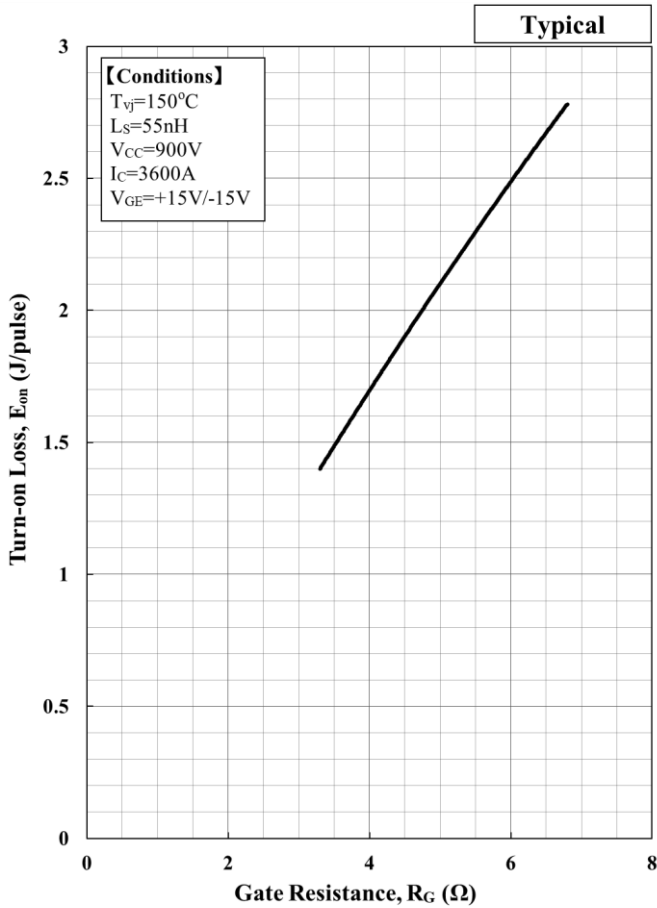


Recovery loss vs. Forward current

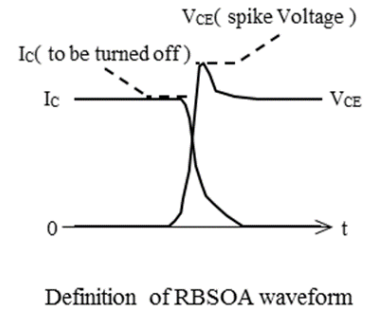
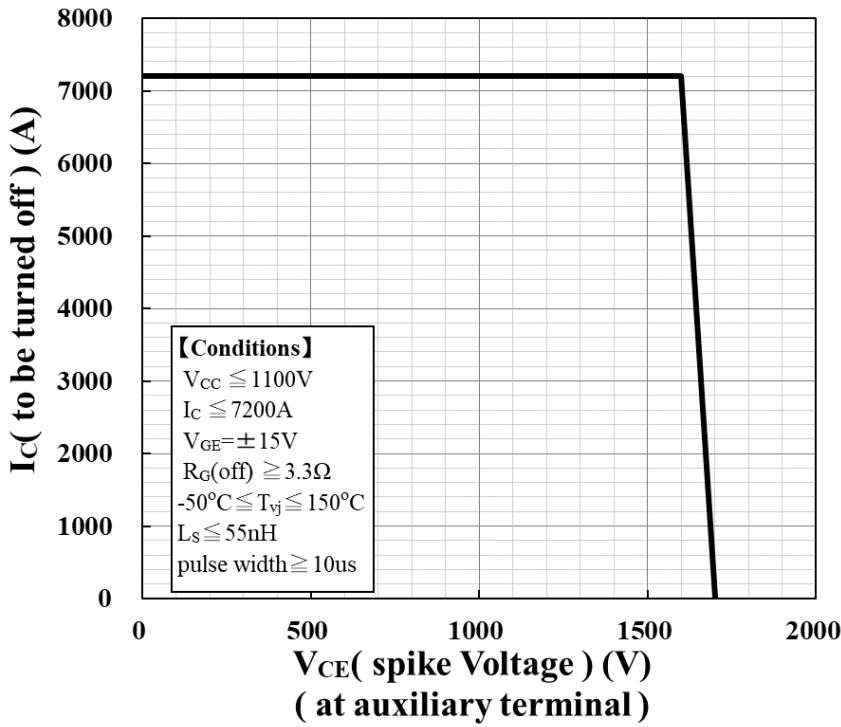


Switching time vs. Collector Current

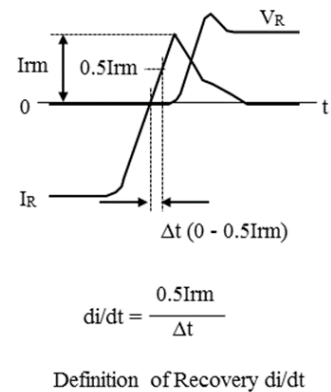
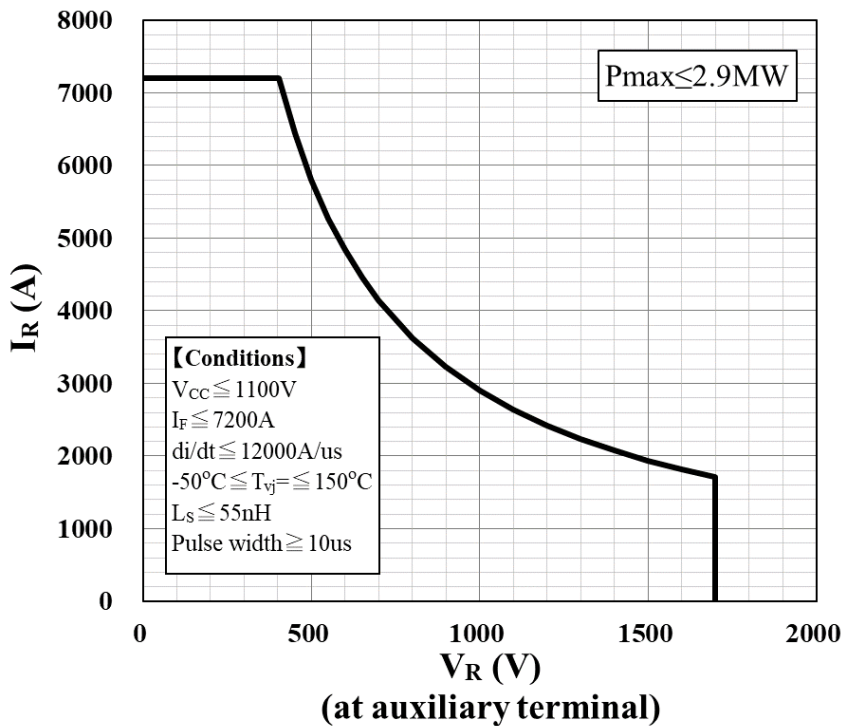
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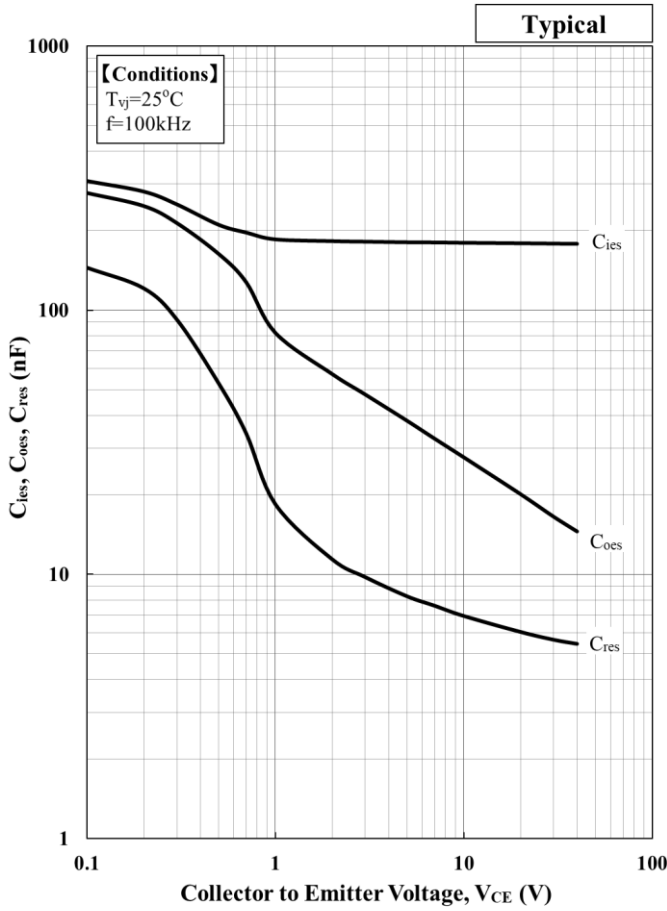


**Reverse Bias Safe Operation Area ( RBSOA )**

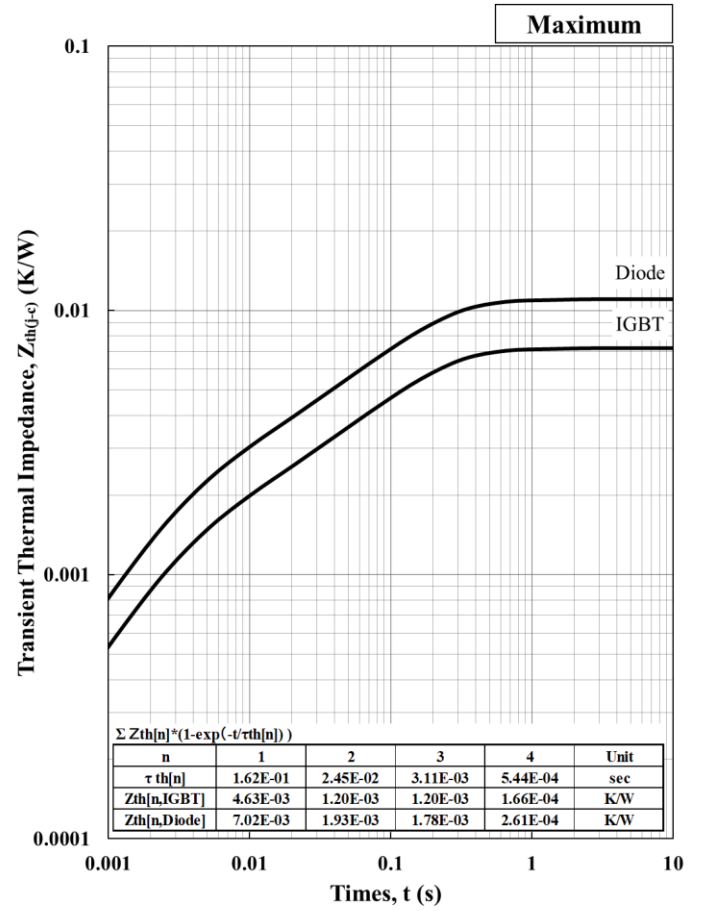


**Reverse Recovery Safe Operation Area ( RRSOA )**

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Capacitance vs. Collector to Emitter Voltage



Transient Thermal Impedance Curve

**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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## HITACHI POWER SEMICONDUCTORS

### Notices

1. Since mishandling of semiconductor devices may cause malfunctions, please be sure to read "Precautions for Safe Use and Notices" in the individual brochure before use.
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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.
7. The information given herein, including the specifications and dimensions, is subject to change without prior notice to improve product characteristics. Before ordering, purchasers are advised to contact with Hitachi power semiconductor sales department for the latest version of this data sheets.
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- For inquiries relating to the products, please contact nearest representatives that is located "Inquiry" portion on the top page of a home page.
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## HITACHI POWER SEMICONDUCTORS

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