

# MBM1200E17F

Silicon N-channel IGBT 1700V F version

## 1. FEATURES

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

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

Item	Symbol	Unit	MBM1200E17F
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>	1,200
	1ms	I <sub>Cp</sub>	2,400
Forward Current	DC	I <sub>F</sub>	1,200
	1ms	I <sub>FM</sub>	2,400
Junction Temperature	T <sub>j 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>-0.3</sub>N·m (2) Recommended Value 5.5±0.5N·m

## 3.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>j</sub> =25°C
			-	23	-	V <sub>CE</sub> =1,700V, V <sub>GE</sub> =0V, T <sub>j</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>j</sub> =25°C
Collector Emitter Saturation Voltage	V <sub>CE(sat)</sub>	V	-	2.0	-	I <sub>C</sub> =1,200A, V <sub>GE</sub> =15V, T <sub>j</sub> =25°C
			-	2.4	-	I <sub>C</sub> =1,200A, V <sub>GE</sub> =15V, T <sub>j</sub> =150°C
Gate Emitter Threshold Voltage	V <sub>GE(TO)</sub>	V	4.1	5.5	7.1	V <sub>CE</sub> =10V, I <sub>C</sub> =120mA, T <sub>j</sub> =25°C
Input Capacitance	C <sub>ies</sub>	nF	-	63	-	V <sub>CE</sub> =10V, V <sub>GE</sub> =0V, f=100kHz, T <sub>j</sub> =25°C
Internal Gate Resistance	R <sub>ge</sub>	Ω	-	4	-	V <sub>CE</sub> =10V, V <sub>GE</sub> =0V, f=100kHz, T <sub>j</sub> =25°C
Switching Times	Rise Time	t <sub>r</sub>	-	0.26	0.8	V <sub>CC</sub> =900V, I <sub>C</sub> =1,200A
	Turn On Time	t <sub>on</sub>	-	1.0	2.5	L <sub>s</sub> =100nH (3)
	Fall Time	t <sub>f</sub>	-	1.6	3.0	R <sub>G(on/off)</sub> =2.7/4.7Ω (3)
	Turn Off Time	t <sub>off</sub>	-	3.5	6.0	V <sub>GE</sub> =±15V, T <sub>j</sub> =150°C
Peak Forward Voltage Drop	V <sub>FM</sub>	V	-	2.0	-	I <sub>F</sub> =1,200A, V <sub>GE</sub> =0V, T <sub>j</sub> =25°C
			-	2.3	-	I <sub>F</sub> =1,200A, V <sub>GE</sub> =0V, T <sub>j</sub> =150°C
Reverse Recovery Time	t <sub>rr</sub>	μs	-	0.65	1.5	V <sub>CC</sub> =900V, I <sub>C</sub> =1,200A
Turn On Loss	E <sub>on</sub>	J/P	-	0.31	-	L <sub>s</sub> =100nH (3)
Turn Off Loss	E <sub>off</sub>	J/P	-	0.93	-	R <sub>G(on/off)</sub> = 2.7/4.7Ω (3)
Reverse Recovery Loss	E <sub>rr</sub>	J/P	-	0.44	-	V <sub>GE</sub> =±15V, T <sub>j</sub> =150°C
Stray inductance in module	L <sub>SCE</sub>	nH	-	21	-	Per 1 arm
Thermal Impedance	IGBT	R <sub>th(j-c)</sub>	-	-	0.022	Junction to case
	FWD	R <sub>th(j-c)</sub>	-	-	0.033	
Contact Thermal Impedance	R <sub>th(c-f)</sub>	K/W	-	0.016	-	Case to fin (λgrease=1W/(m·K), heat-sink flatness ≤50μm), per 1 arm

Notes:(3) L<sub>s</sub> and R<sub>G</sub> are the test condition's values for evaluation of the switching times, not recommended value.

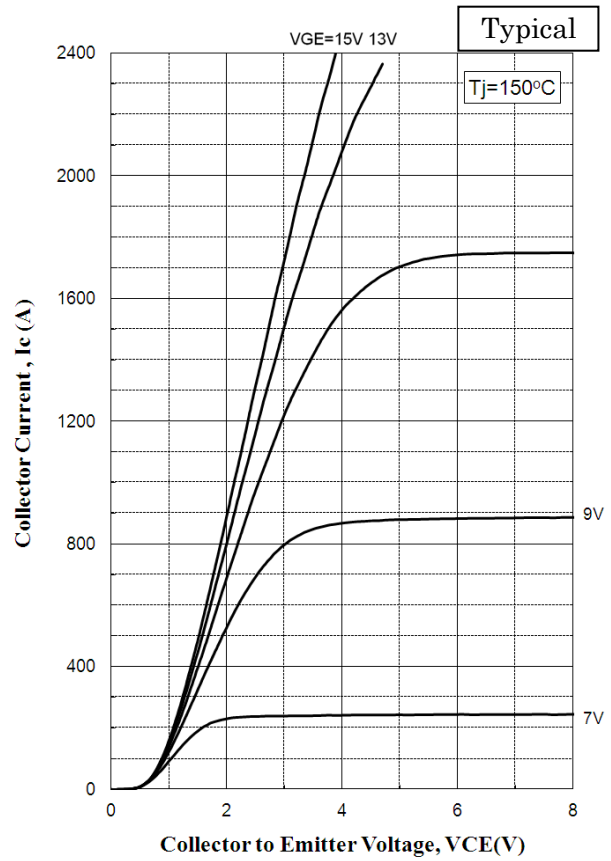
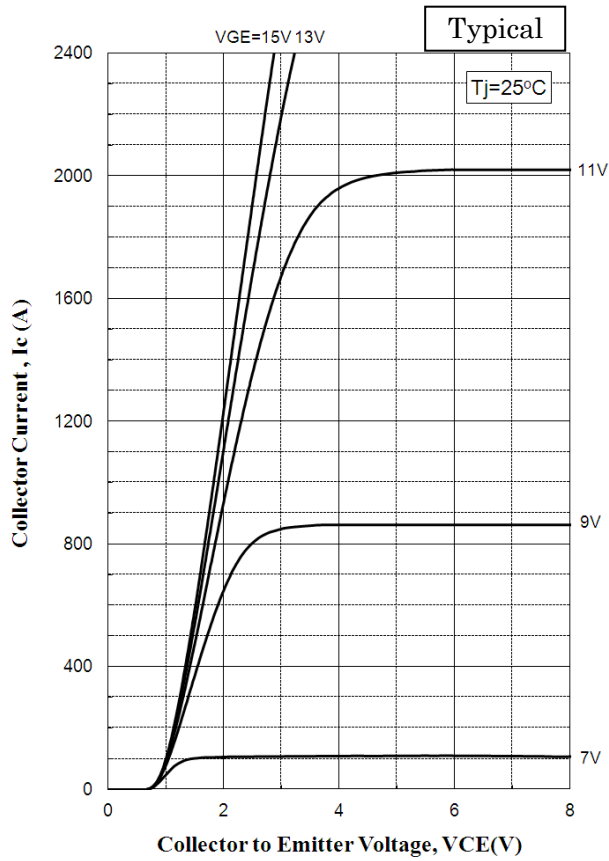
Please, determine the suitable R<sub>G</sub> value after the measurement of switching waveforms (overshoot voltage, etc.) with appliance mounted.

- \* 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 values according to IEC 60747-2 IEC 60747-9

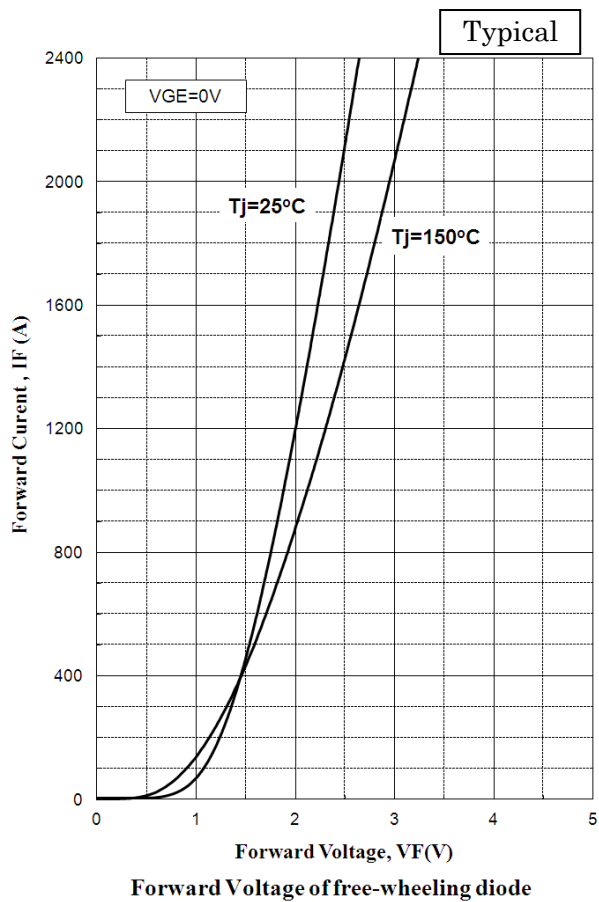
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## 4.CHARACTERISTICS CURVE

### 4.1 STATIC CHARACTERISTICS

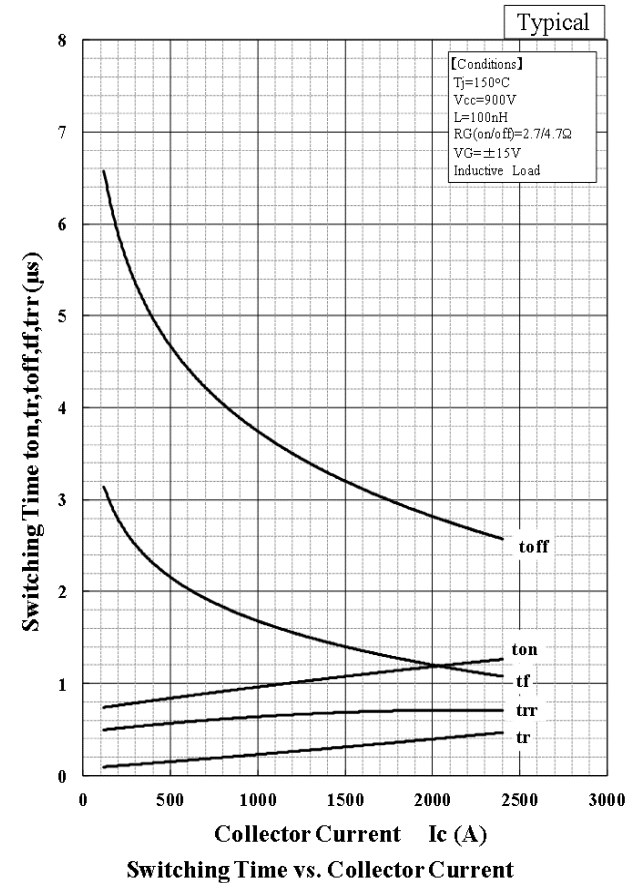
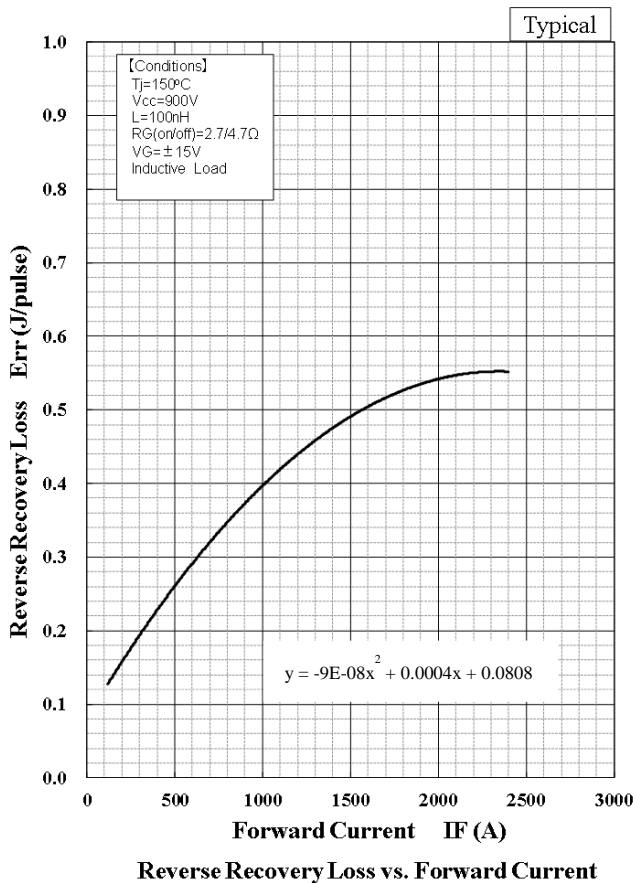
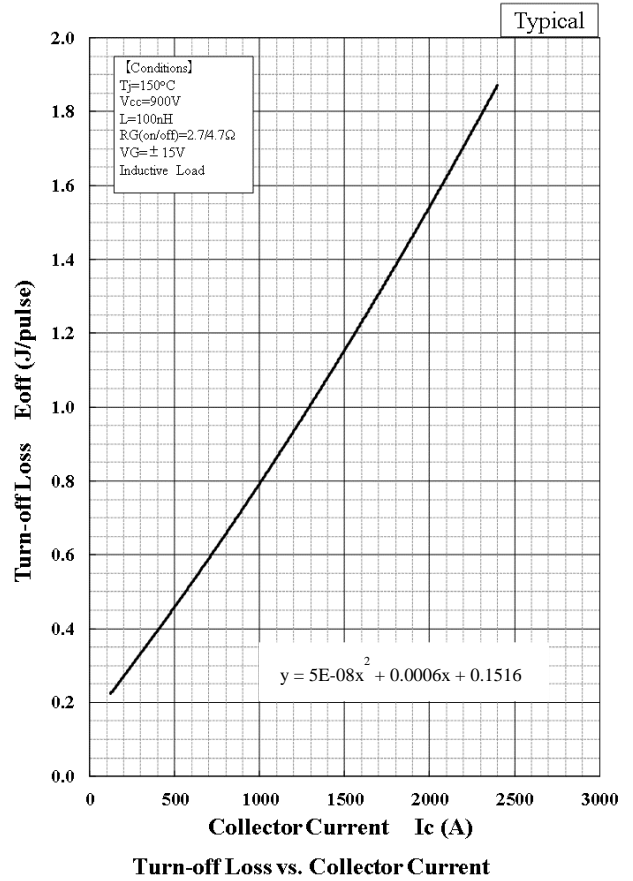
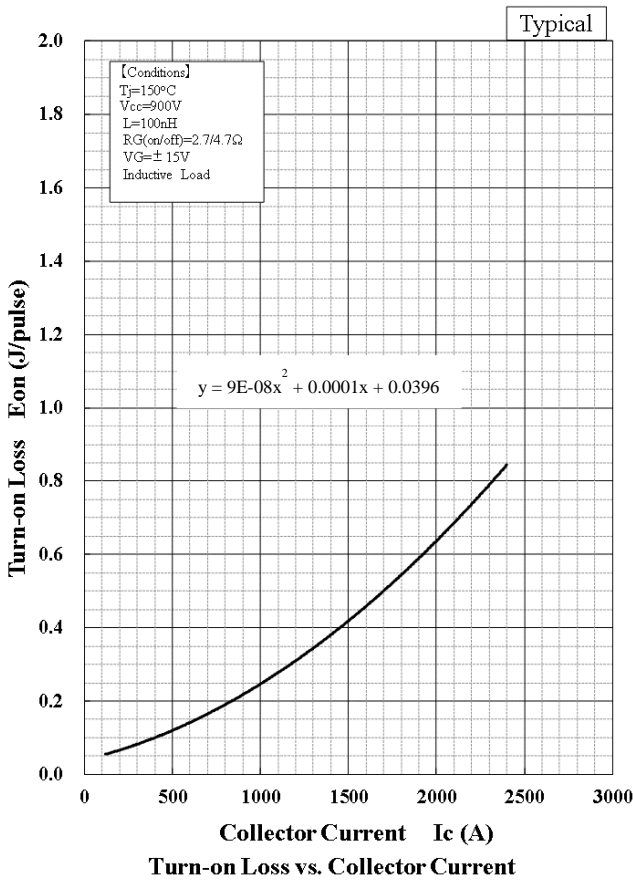


Collector Current vs. Collector to Emitter Voltage

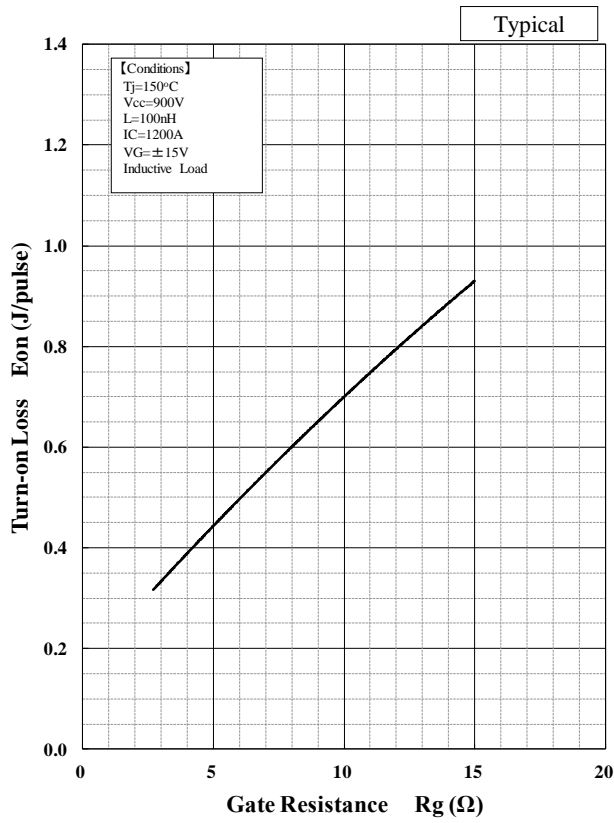


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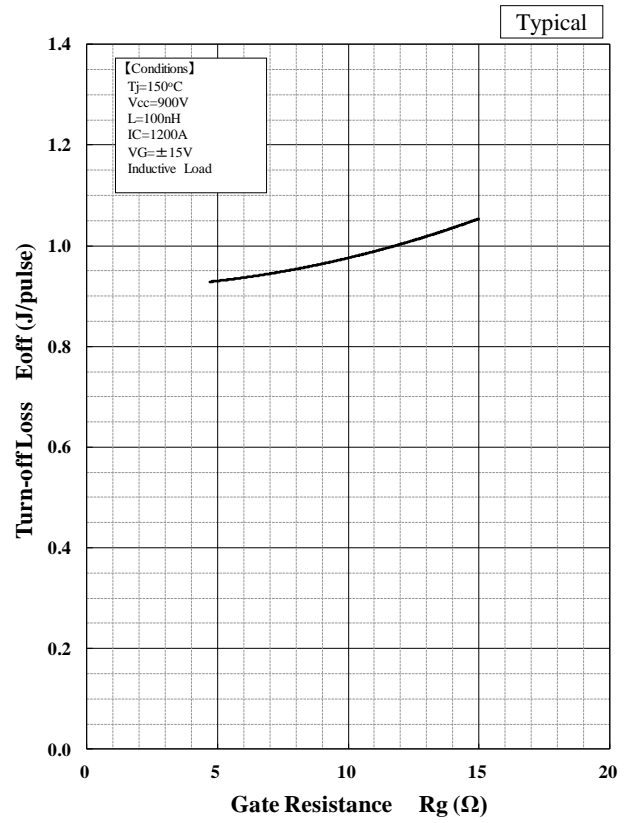
## 4.2 DYNAMIC CHARACTERISTICS



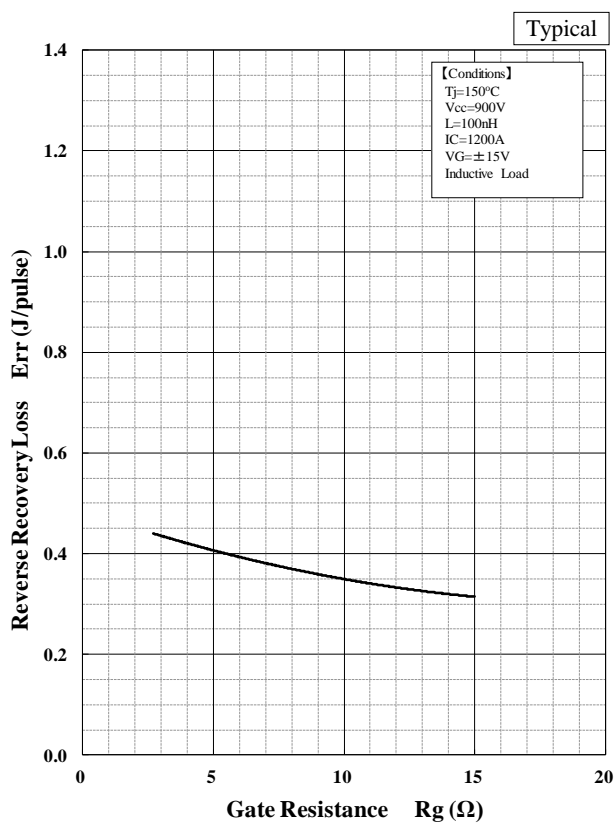
# MBM1200E17F



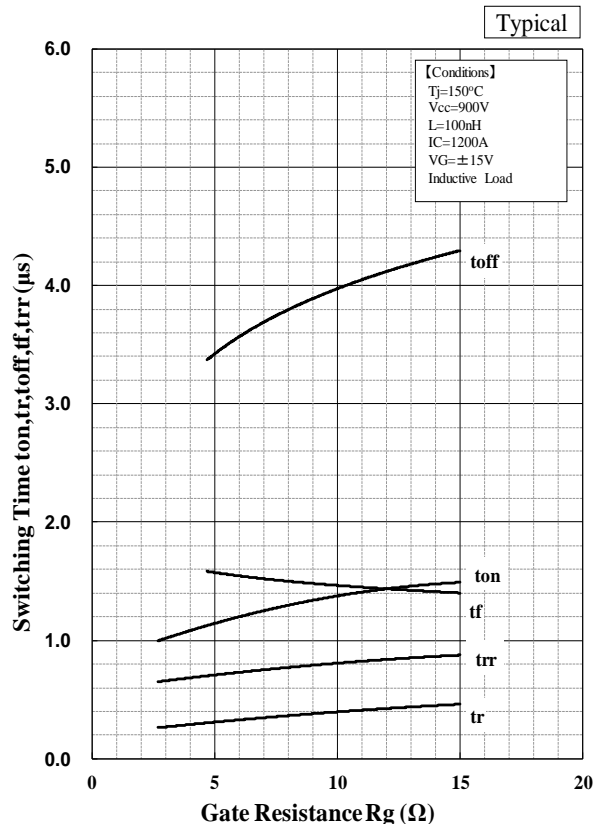
Turn-on Loss vs. Gate Resistance



Turn-off Loss vs. Gate Resistance



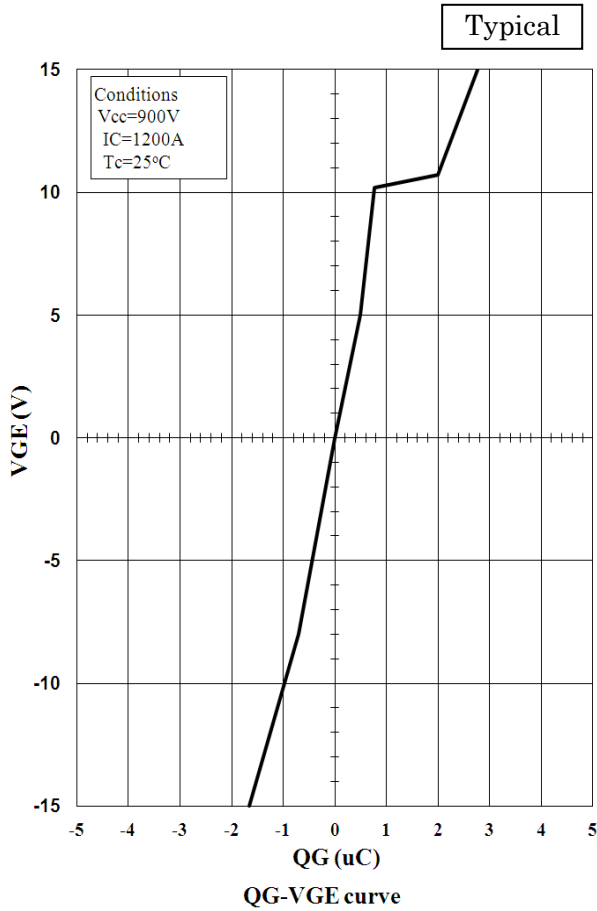
Reverse Recovery Loss vs. Gate Resistance



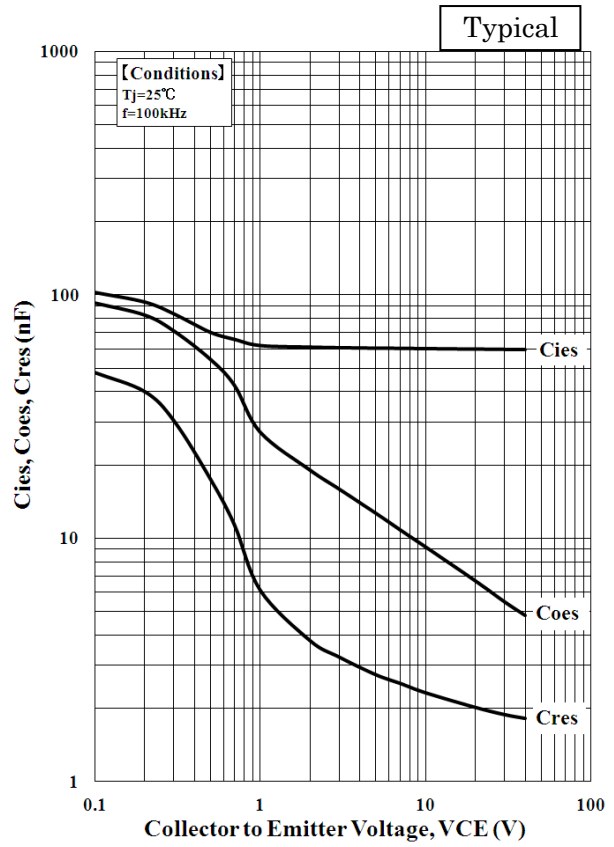
Switching Time vs. Gate Resistance

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### 4.3 QG-VG CURVE

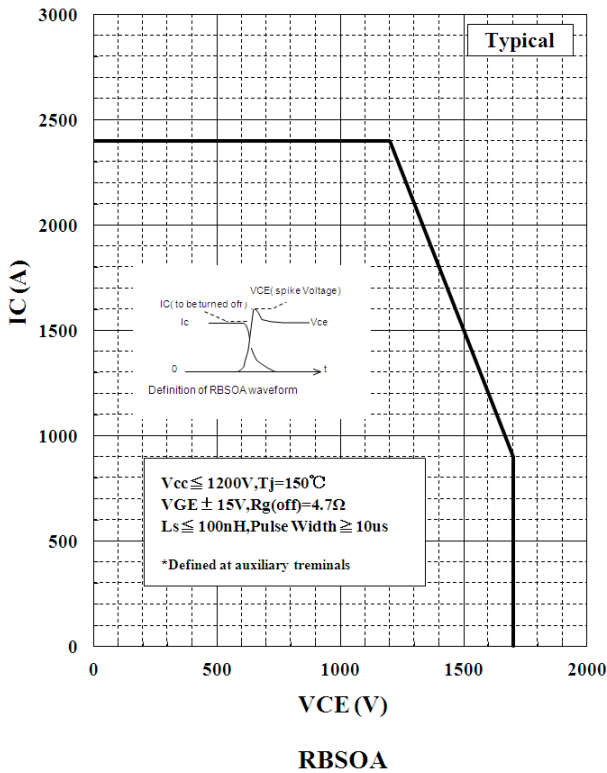


### 4.4 Cies, Coes, Cres CURVE

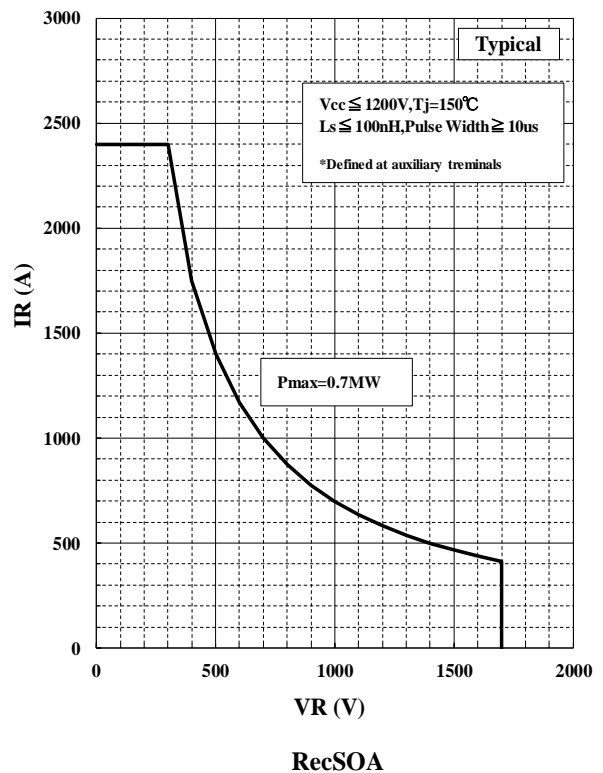


Capacitance vs. Collector to Emitter Voltage

### 4.5 RBSOA

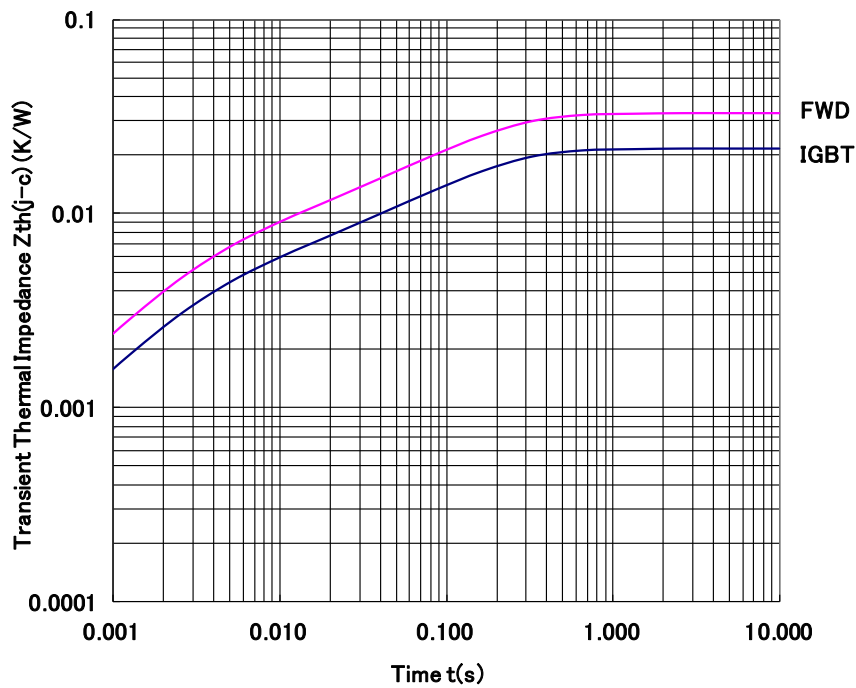


### 4.6 RecSOA



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## 5. TRANSIENT THERMAL IMPEDANCE



Transient Thermal Impedance Curve

### Curve approximation model

$$(\sum Z_{th[n]} * (1 - \exp(-t/\tau_{th[n]})))$$

n	1	2	3	4	Unit
$\tau_{th[n]}$	1.62E-01	2.45E-02	3.11E-03	5.44E-04	sec
$r_{th[n,IGBT]}$	1.39E-02	3.60E-03	3.61E-03	4.97E-04	K/W
$r_{th[n,Diode]}$	2.11E-02	5.79E-03	5.34E-03	7.82E-04	K/W

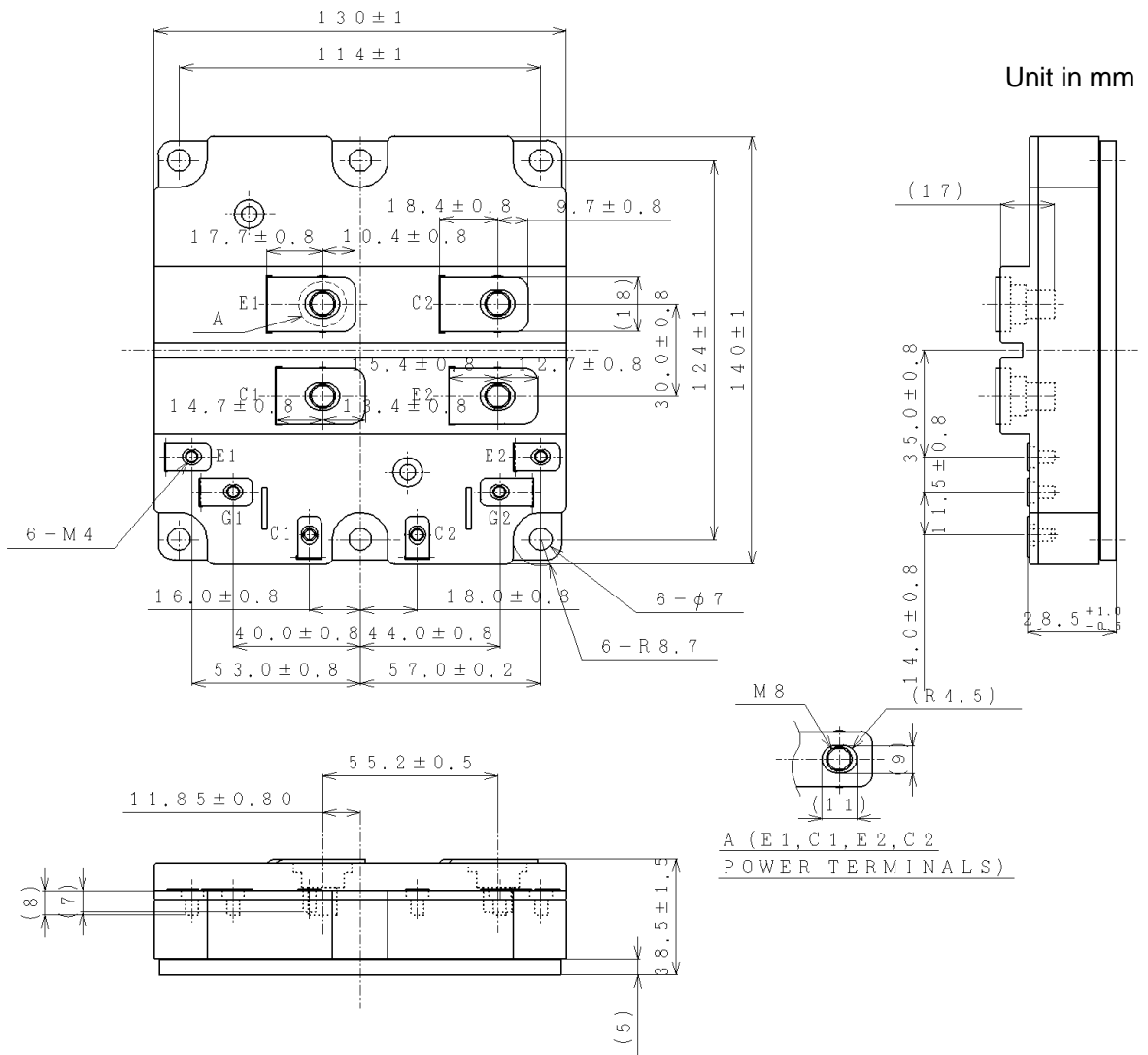
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## 6. Material declaration

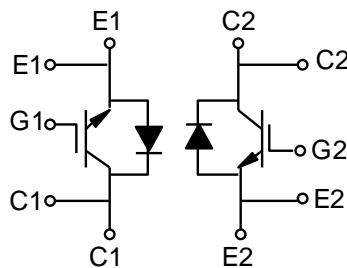
Please note the following materials are contained in the product, in order to keep characteristic and reliability level.

Material	Contained part
Lead (Pb) and its compounds	Solder

## 7. Outline Drawing



Weight: 900g



Circuit Diagram

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## HITACHI POWER SEMICONDUCTORS

### Notices

1. 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 Hitachi sales department for the latest version of this data sheets.
2. Please be sure to read "Precautions for Safe Use and Notices" in the individual brochure before use.
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