

MBB800TV7A

Silicon N-channel IGBT

1. FEATURES

- * High speed, low loss IGBT module.
- * Low thermal impedance due to direct liquid cooling.
- * High reliability, high durability module.

2. ABSOLUTE MAXIMUM RATINGS (Tc=25°C)

Item	Symbol	Unit	Specification
Collector Emitter Voltage	V _{CES}	V	700 (4)
Gate Emitter Voltage	V _{GES}	V	±20
Collector Current	DC	I _C	800
	1ms	I _{Cp}	1600
Forward Current	DC	I _F	800
	1ms	I _{FM}	1600
Maximum Junction Temperature	T _{jmax}	°C	175
Temperature under switching conditions	T _{jop}	°C	-40 ~ +150
Storage Temperature	T _{stg}	°C	-40 ~ +125
Isolation Voltage	V _{ISO}	V _{RMS}	2,500 (AC 1 minute)
Screw Torque	Terminals (M6)	-	6.0 (1)
	Mounting (M5)	-	4.0 (2)
	PCB Mounting (M3)	-	0.8 (3)

Notes: Recommended Value (1)5.5±0.5N·m, (2)3.5±0.5N·m, (3)0.65±0.15N·m.

(4)Please refer to figure of V_{CES} vs. T_c on the page of 6.

3. ELECTRICAL CHARACTERISTICS

Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions	
Collector Emitter Cut-Off Current	I _{CES}	mA	-	-	1.0	V _{ce} =700V, V _{ge} =0V, T _j =25°C	
Gate Emitter Leakage Current	I _{GES}	nA	-	-	±500	V _{ge} =±20V, V _{ce} =0V, T _j =25°C	
Collector Emitter Saturation Voltage	V _{CE(sat)}	V	-	1.55	2.0	I _c =800A, V _{ge} =15V, T _j =25°C	
			-	1.80	-	I _c =800A, V _{ge} =15V, T _j =150°C	
Gate Emitter Threshold Voltage	V _{GE(TH)}	V	6.0	6.7	7.5	V _{ce} =5V, I _c =800mA, T _j =25°C	
Input Capacitance	C _{ies}	nF	-	70	-	V _{ce} =10V, V _{ge} =0V, f=100kHz, T _j =25°C	
Switching Times	Rise Time	t _r	-	0.2	0.5	V _{cc} =300V, I _c =800A	
	Turn On Time	t _{on}	-	0.6	1.1	L _s =30nH, R _{g(ext)} =4.7Ω, C _{ge} =56nF	
	Fall Time	t _f	-	0.3	1.15	V _{ge} =+15V/0V, T _j =150°C	
	Turn Off Time	t _{off}	-	1.3	2.2	Inductive load	
Peak Forward Voltage Drop	V _F	V	-	1.35	1.7	I _f =800A, V _{GE} =0V, T _j =25°C	
			-	1.35	-	I _f =800A, V _{GE} =0V, T _j =150°C	
Reverse Recovery Time	t _{rr}	μs	-	0.4	0.85	V _{cc} =300V, I _c =800A,	
Turn On Loss	E _{on(full)}	mJ/P	-	20	50	L _s =30nH, R _{g(ext)} =4.7Ω, C _{ge} =56nF	
Turn Off Loss	E _{off(full)}	mJ/P	-	66	95	V _{ge} =+15V/0V, T _j =150°C	
Reverse Recovery Loss	E _{rr(full)}	mJ/P	-	22	42	Inductive load	
Thermistor Resistance	R	kΩ	-	5	-	T _c =25°C	
			-	0.16	-	T _c =150°C	
Leakage Current between Thermistor and Other Terminals		mA	-	-	0.1	V=600Vp	
Thermal Resistance	IGBT	R _{th(j-w)}	K/W	-	-	0.135	Junction to water/fin, 10l/min, 50%LLC
	FWD	R _{th(j-w)}	K/W	-	-	0.165	(per 1 arm)

* 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.

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4. PACKAGE OUTLINE DRAWING

Unit in mm

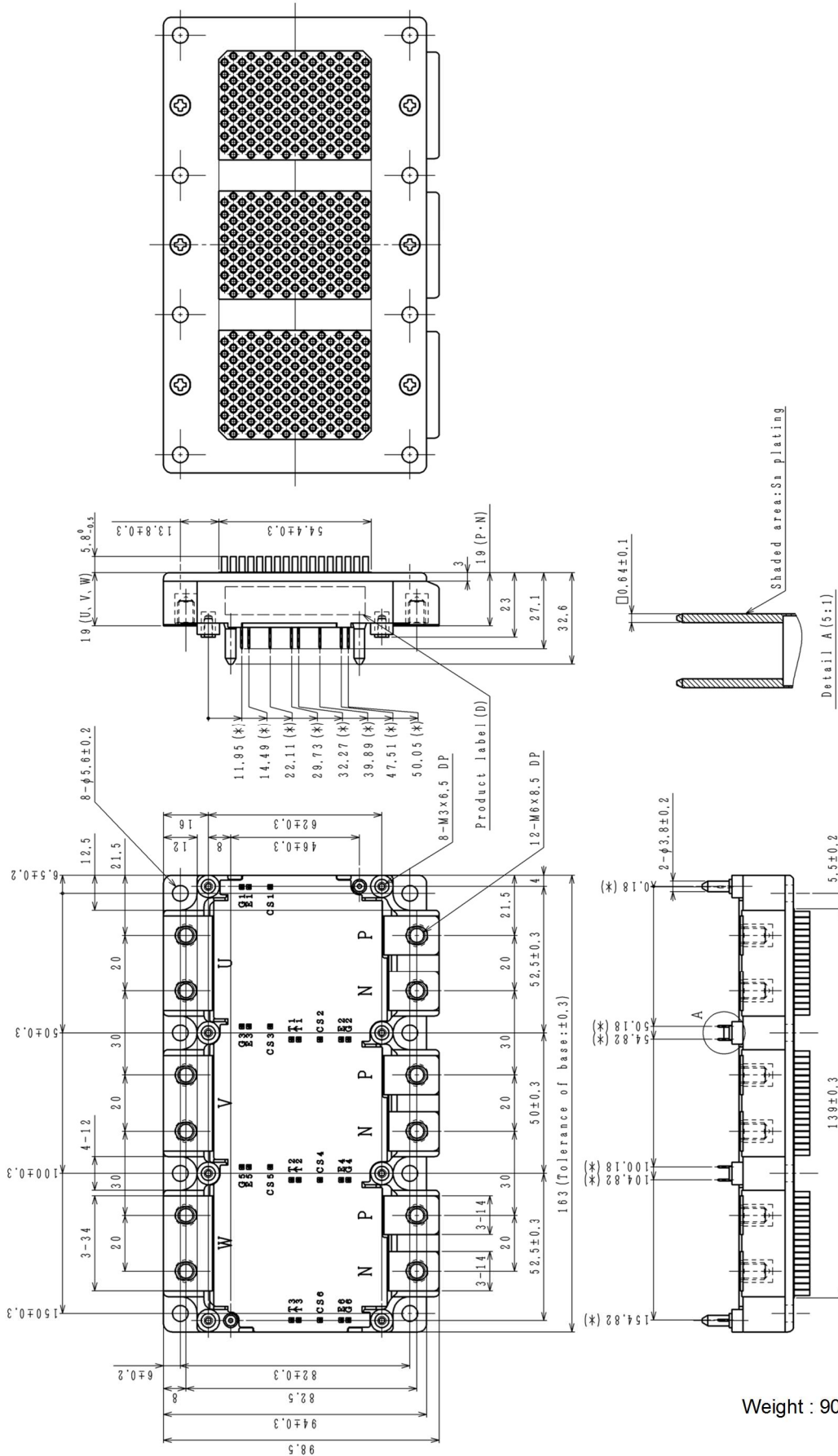


Table. Classification of basic dimension

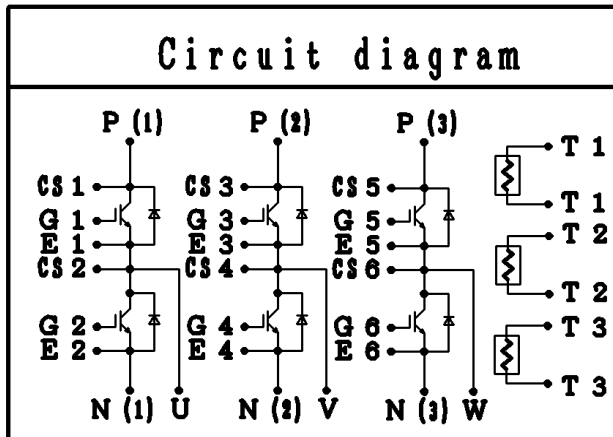
Classification of basic dimension (x)	Unit:mm
0.55 (x) ≤ 3	±0.2
3 < (x) ≤ 6	±0.3
6 < (x) ≤ 30	±0.5
30 < (x) ≤ 120	±0.8
120 < (x) ≤ 400	±1.2

(Note 1) Dimension of (*) is that of the root portion of terminal. (Tolerance:±0.5)
 (Note 2) Dimensional tolerance follows the right table, if not described.

Weight : 900g

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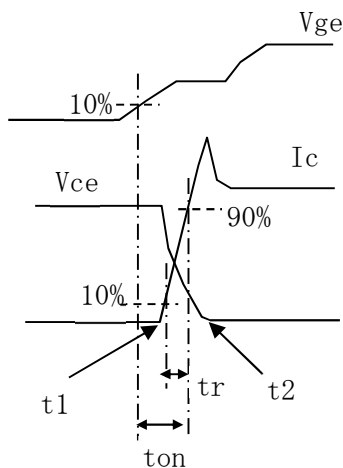
5. CIRCUIT DIAGRAM



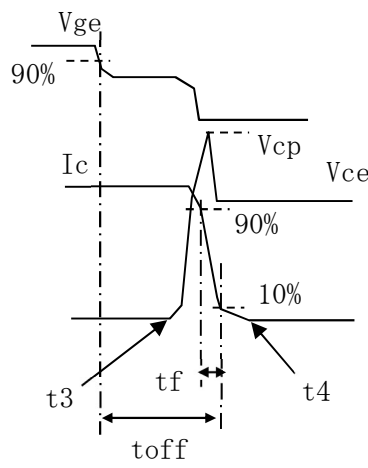
Thermistor T1, T2 and T3 are located on the same ceramic substrate with the IGBT and diode chips of phase U, V and W, respectively.

Note: This temperature measurement is not suitable for the short circuit or short term overload detection and should be used only for the module protection against long term overload or malfunction of the cooling system.

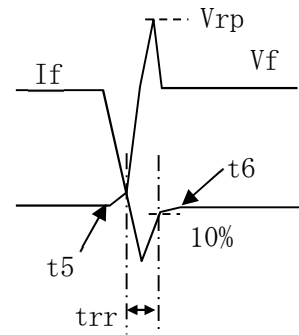
6. DEFINITION OF THE SYMBOLS



$$E_{on} = \int_{t1}^{t2} I_c \cdot V_{ce} dt$$



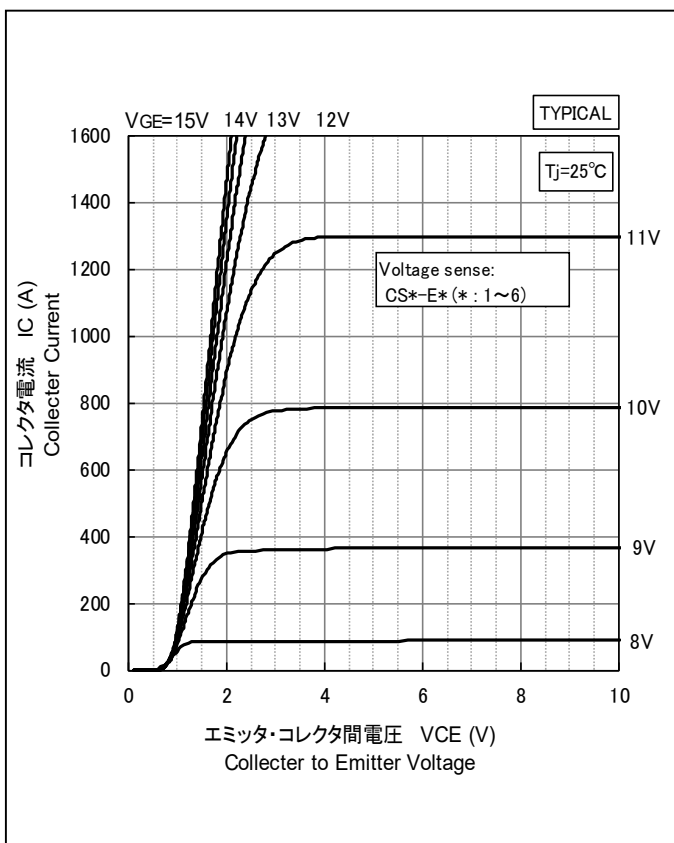
$$E_{off} = \int_{t3}^{t4} I_c \cdot V_{ce} dt$$



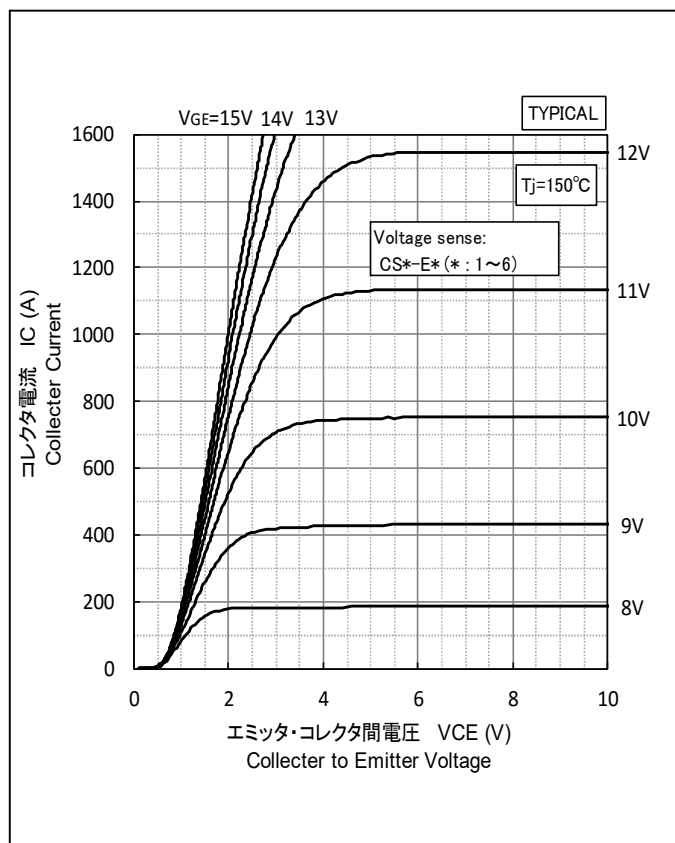
$$Err = - \int_{t5}^{t6} I_f \cdot V_f dt$$

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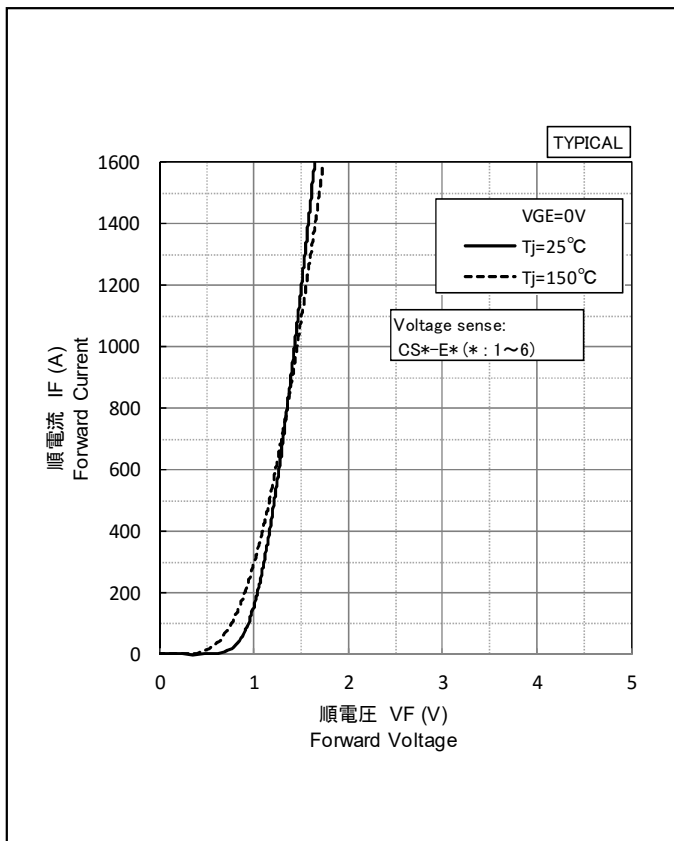
7. STATIC CHARACTERISTICS



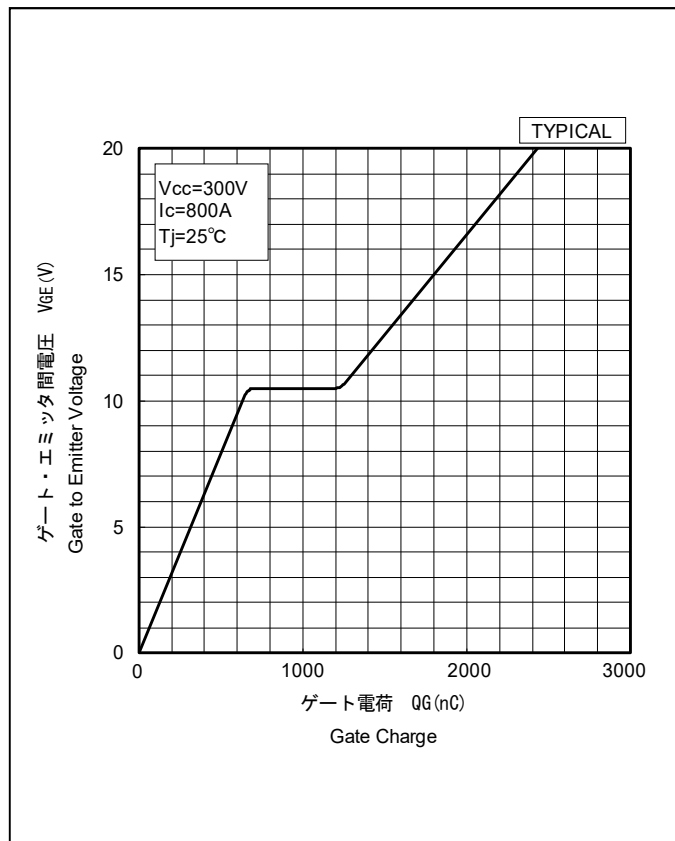
Collector Current vs. Collector to Emitter Voltage



Collector Current vs. Collector to Emitter Voltage



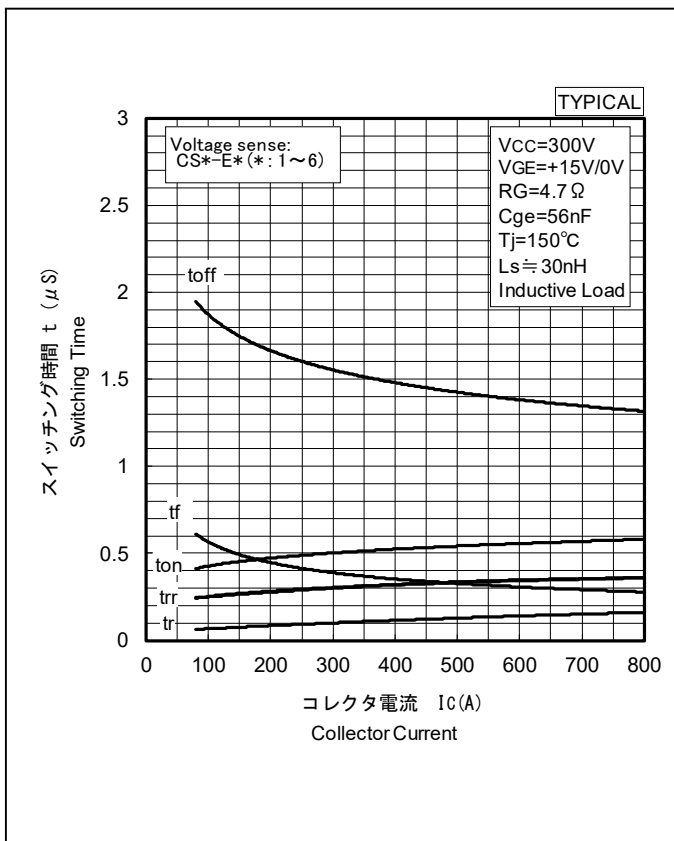
Forward Current vs. Forward Voltage



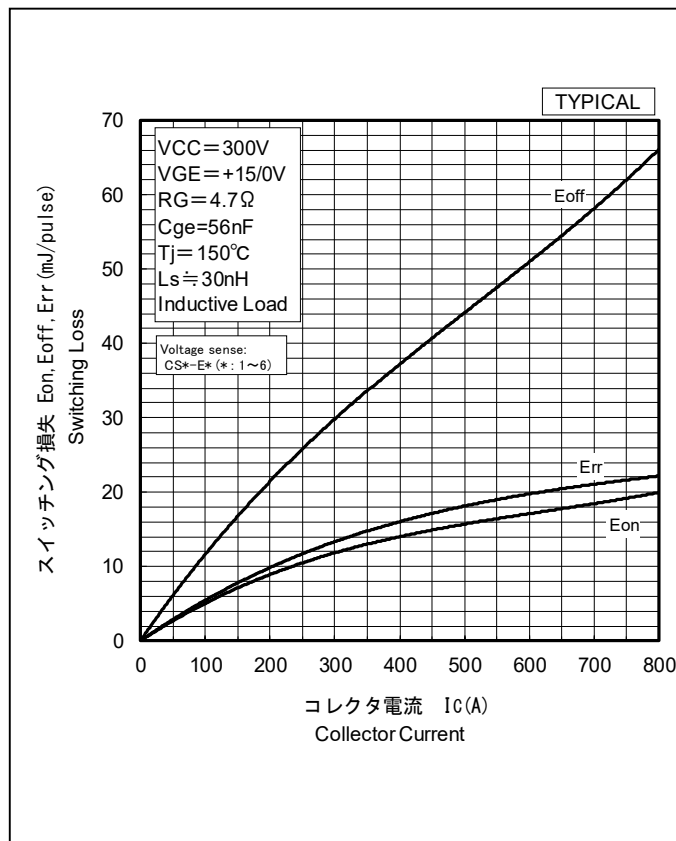
Gate to Emitter Voltage vs. Gate Charge

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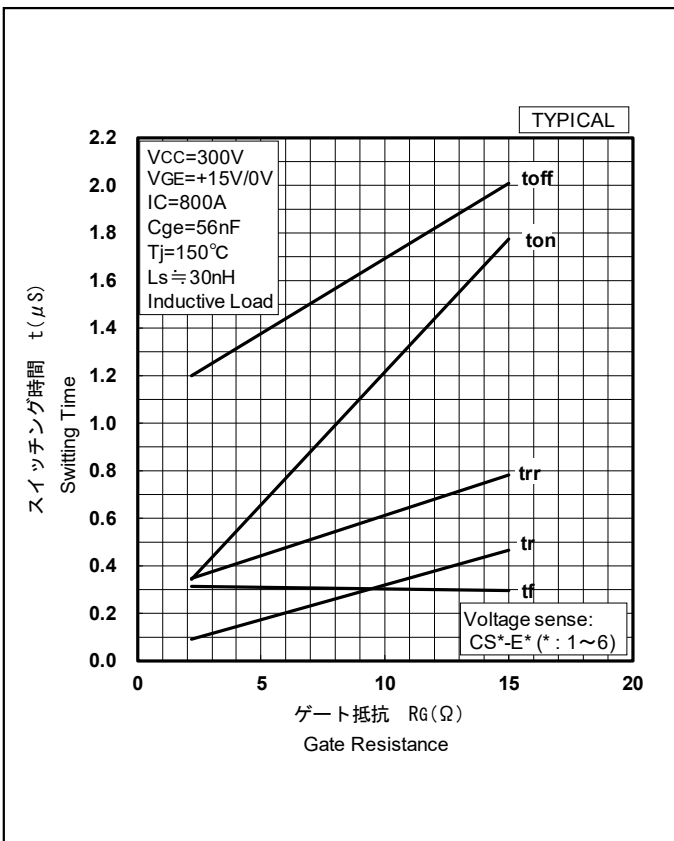
8. DYNAMIC CHARACTERISTICS



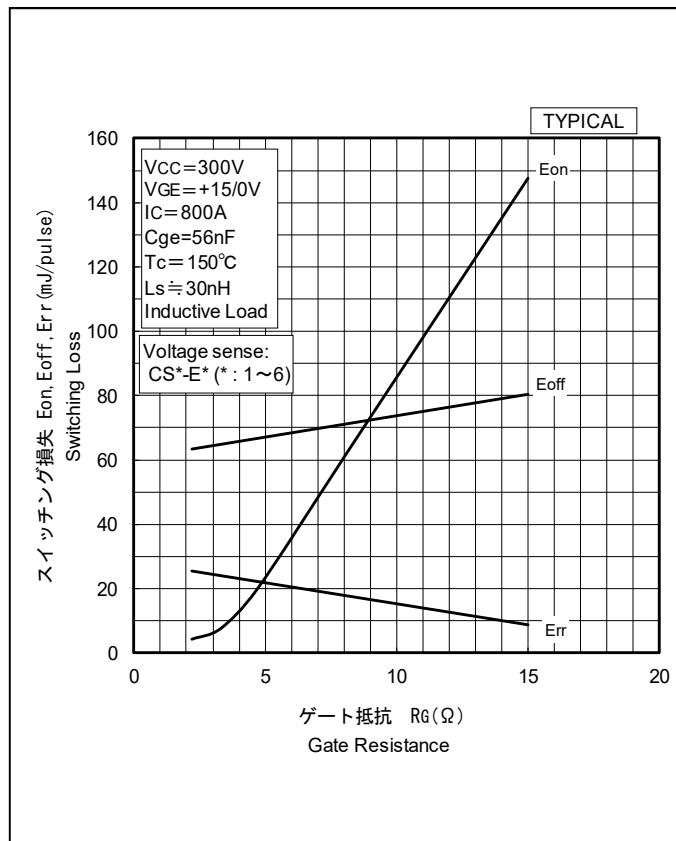
Switching Time vs. Collector Current



Switching Loss vs. Collector Current

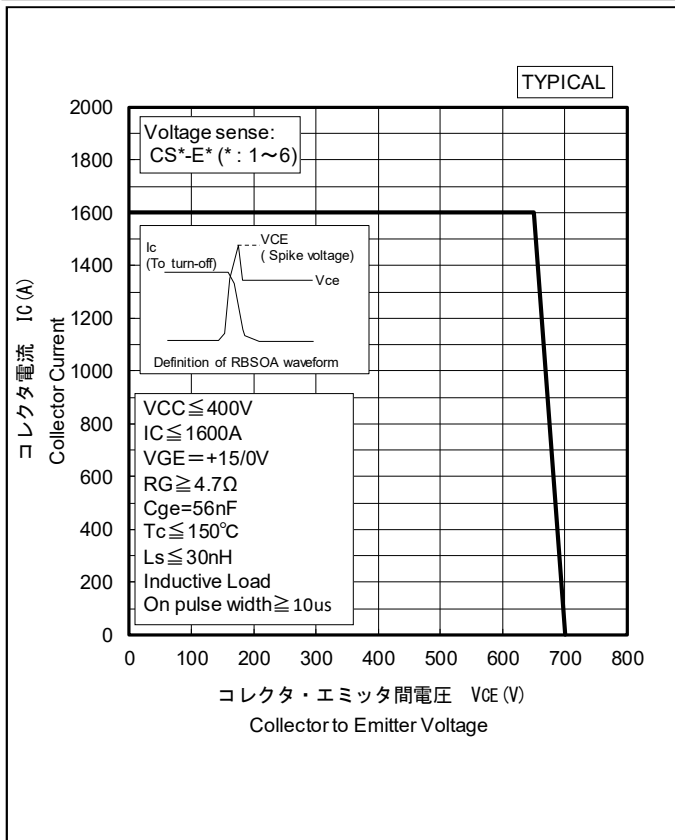


Switching Time vs. Gate Resistance

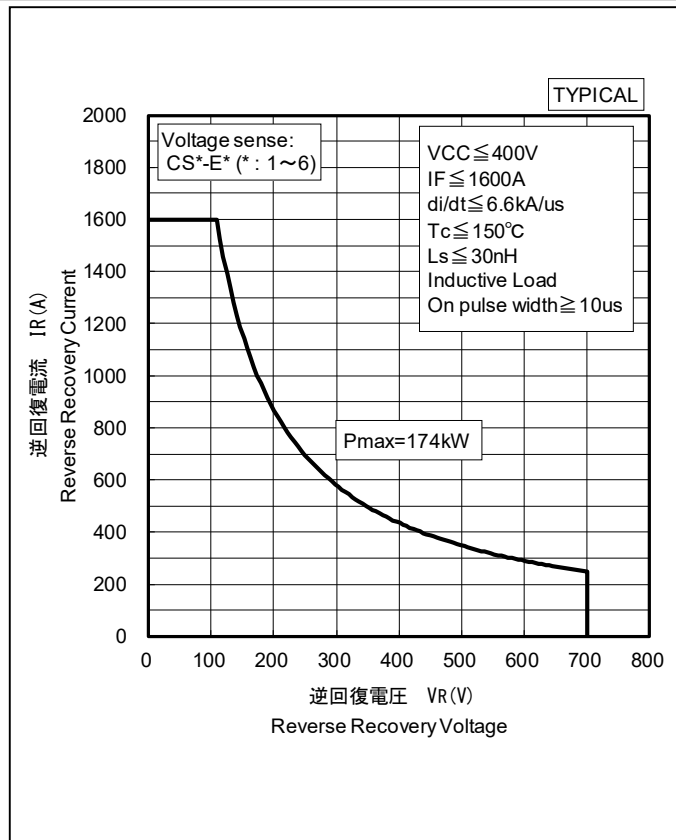


Switching Loss vs. Gate Resistance

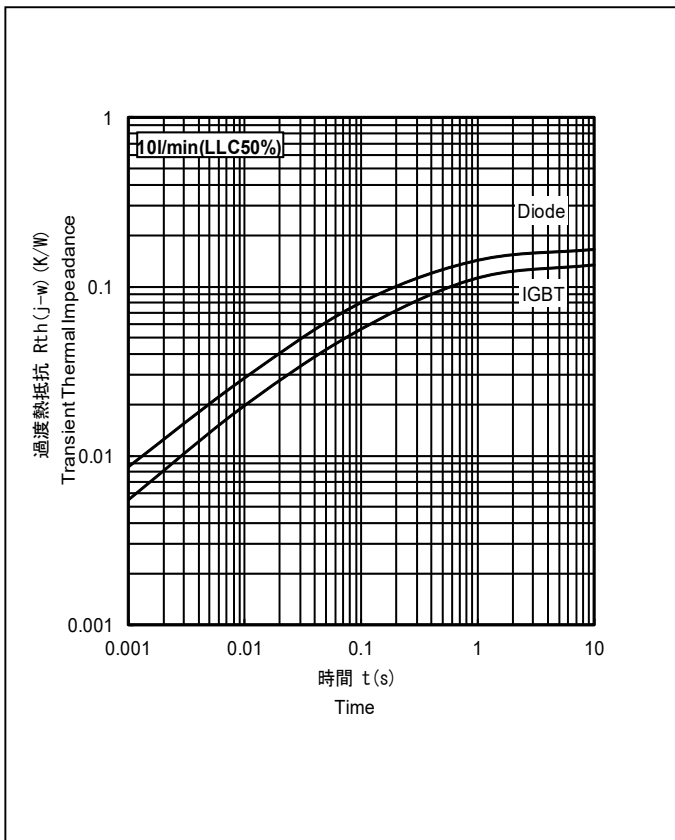
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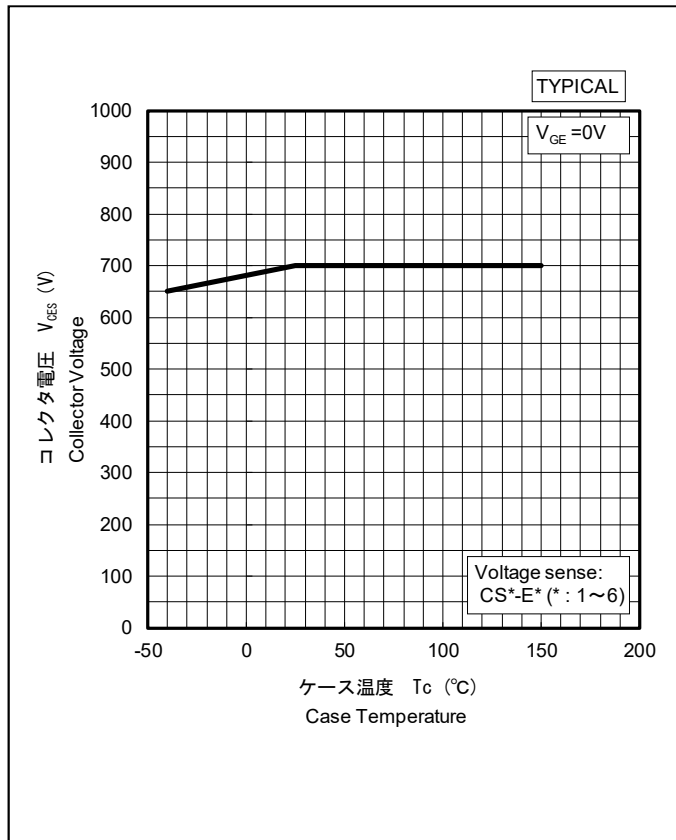
RBSOA



RRSOA



Transient Thermal Impedance Characteristics



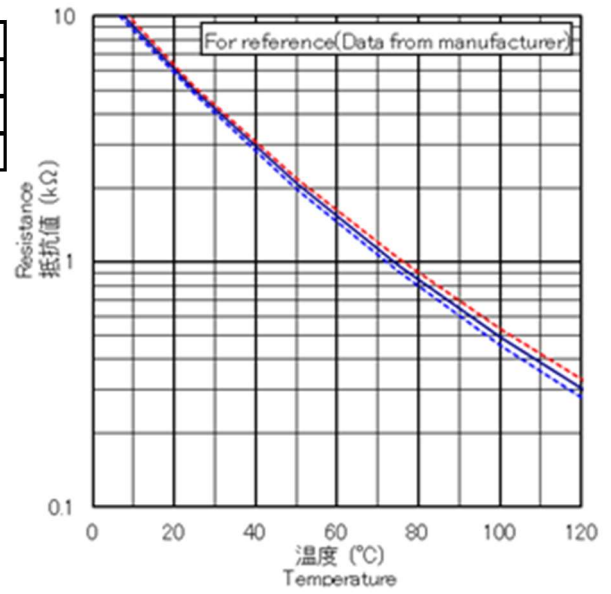
V_{CES} vs. T_c

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9. THERMISTOR

Table1 Specifications of Thermistor(For reference)

Nominal zero-power resistance	5k Ω \pm 3% (25°C)
B value	3375K \pm 2% (25~50°C)
Operating temperature range	-50~150°C
Thermal time constant(in still air)	Approx. 10 sec.



Resistance vs. Temperature

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10. PRECAUTIONS

10-1. Storage and Shipping Precautions

Important Notices

(1) IGBT modules should always be stored under the following conditions.

- Temperature : 40 degrees Celsius, maximum.
- Humidity : 60% Relative Humidity, maximum.
- Dust : Avoid storing the module in locations subject to dust.
- Harmful substances : The installation location should be free of corrosive gases such as sulfur dioxide and chlorine gas.
- Other : Do not remove the conductive sponges or tapes attached to the signal gate and emitter gate.

(2) Shipping Method

- To prevent the case cracking and/or the electrode bending, appropriate consideration should be given to properly insulate the shipping container from mechanical shock or sever vibration situation.
- Do not throw or drop the case while shipping. Treat them with care. The devices may break if they are not handled with care. Please do not use the IGBT modules that were dropped or damaged.
- Appropriate labeling on the outside of the shipping container should always be present.
- The shipping container itself should always be properly protected from both rain and water.

10-2. Precautions against Electrostatic Failure

Important Notices

Because the IGBT has a MOS gate structure and temperature sensing diode, you should always take the following precautions as measures to avoid generating static electricity.

- Before starting operation, do not remove the conductive sponge mounted between terminals of gate, emitter, collector, temperature sensing anode and cathode.
- When handling the IGBT module, ground our body via a high-value resistor (between 100kΩ and 1MΩ), hold the package body, and do not touch the terminals of gate, temperature sensing anode and cathode.
- Be sure to ground any parts which the IGBT module may touch, such as the work table or soldering iron.
- Before testing or inspection, be sure to check that any residual electric charge in measuring instruments has been removed. Apply voltage to each terminal starting at 0V and return to 0V when finishing.

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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.
2. When designing an electronic circuit using semiconductor devices, please do not exceed the absolute maximum rating specified for the device under any external fluctuations. And for pulse applications, please also do not exceed the "Safe Operating Area (SOA)".
3. Semiconductor devices may sometimes break down by accidental or unexpected surge voltage, so please be careful about the safety design such as redundant design and malfunction prevention design which don't cause the damage expand even if they break down.
4. In cases where extremely high reliability is required (such as use in nuclear power control, aerospace and aviation, traffic equipment, life-support-related medical equipment, fuel control equipment and various kinds of safety equipment), safety should be ensured by using semiconductor devices that feature assured safety or by means of users' fail-safe precautions or other arrangement. Or consult with Hitachi's sales department staff. (When semiconductor devices fail, as a result the semiconductor devices or wiring, wiring pattern may smoke, ignite, or the semiconductor devices themselves may burst.)
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.
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HITACHI POWER SEMICONDUCTORS

Usage

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