MBM250H33E3

Silicon N-channel IGBT 3300V E3 version

FEATURES

- Soft switching behavior & low conduction loss:
  Soft low-injection punch-through
  High conductivity IGBT.
- Low driving power due to low input
  capacitance MOS gate.
- Low noise recovery: Ultra soft fast recovery diode.

ABSOLUTE MAXIMUM RATINGS (T_C=25°C)

Item		Symbol	Unit	MBM250H33E3
Collector Emitter Voltage		V_{CES}	V	3,300
Gate Emitter Voltage		V_{GES}	V	±20
Collector Current	DC	I_C	A	250(Tc=95℃)
	1ms	I_{CRM}		500
Forward Current	DC	I_F	A	250
	1ms	I_{FRM}		500
Peak Forward Surge Current		IFSM	Ap	2,000
Junction Temperature		T_{vj}	°C	-40 ~ +150
Junction Temperature		$T_{vj\ op}$	°C	-40 ~ +125
Case Temperature		T_C	°C	-40 ~ +125
Storage Temperature		T_{stg}	°C	-50 ~ +125
Isolation Voltage		V_{ISO}	V_{RMS}	7,700(AC 1 minute)
Screw Torque	Mounting (M6)	-	N·m	6 (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_{CES}	mA	-	-	2	V_{CE}=3,300V, V_{GE}=0V, T_{vj}=25°C
			-	4	10	V_{CE}=3,300V, V_{GE}=0V, T_{vj}=125°C
Gate Emitter Leakage Current	I_{GES}	nA	-500	-	+500	V_{GE}=±20V, V_{CE}=0V, T_{vj}=25°C
Collector Emitter Saturation Voltage	V_{CEsat}	V	-	2.65	-	T_{vj}=25°C | I_C=250A, V_{GE}=15V,
			2.70	3.40	3.90	T_{vj}=125°C
Gate Emitter Threshold Voltage	$V_{GE(th)}$	V	5.5	6.3	7.5	V_{CE}=10V, I_C=250mA, T_{vj}=25°C
Gate Charge	Qg	uC	-	2.8	-	V_{CC}=1,800V, I_C=250A, V_{GE}=±15V
Input Capacitance	C_{ies}	nF	-	33	-	V_{CE}=10V, V_{GE}=0V, f=100kHz, T_{vj}=25°C
Output Capacitance	C_{oes}	nF	-	3.3	-	
Reverse transfer capacitance	C_{res}	nF	-	2.3	-	
Internal Gate Resistance	$R_{G(int)}$	Ω	-	5.4	-	V_{CE}=10V, V_{GE}=0V, f=100kHz, T_{vj}=25°C
Turn On Delay Time	$t_{d(on)}$	μs	-	0.7	-	V_{CC}=1,800V, I_C=250A
Rise Time	t_r		-	1.8	2.5	L_S=400nH
Turn Off Delay Time	$t_{d(off)}$		-	2.1	-	R_G=15/15Ω (2)
Fall Time	t_f		-	1.9	3.2	V_{GE}=±15V, T_{vj}=125°C
Forward Voltage Drop	V_F	V	2.3	2.9	3.3	I_F=250A, V_{GE}=0V, T_{vj}=125°C
Reverse Recovery Time	t_{rr}	μs	-	0.7	1.2	V_{CC}=1,800V, I_F=250A, L_S=100nH T_{vj}=125°C
Turn On Loss	$E_{on(10\%)}$	J/P	-	0.43	0.58	V_{CC}=1,800V, I_C=250A, L_S=400nH
Turn Off Loss	$E_{off(10\%)}$	J/P	-	0.37	0.50	R_G=15/15Ω (2)
Reverse Recovery Loss	$E_{rr(10\%)}$	J/P	-	0.31	0.41	V_{GE}=±15V, T_{vj}=125°C
Partial discharge extinction voltage	V_e	V_{RMS}	3,500	-	-	f=50Hz, Q_{PD}≤10pC(acc. to IEC 61287)
Stray inductance module	L_{SCE}	nH	-	140	-	Between C1- E2
Thermal Impedance IGBT	$R_{th(j-c)}$	K/W	-	-	0.050	Junction to case
Thermal Impedance FWD	$R_{th(j-c)}$		-	-	0.100	
Contact Thermal Impedance	$R_{th(c-f)}$	K/W	-	0.032	-	Case to fin

Notes: (2) RG value is the test condition's value for evaluation of the switching times, not recommended value.
Please, determine the suitable RG 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.

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MODULE MECHANICAL CHARACTERISTICS

Item		Unit	Characteristics	Conditions
Weight		g	840	
Creepage Distance	Between terminal	mm	54	Collector-sense to Emitter-main
	Terminal-Base	mm	64	
Clearance Distance	Between terminal	mm	19	Collector-sense to Emitter-main
	Terminal-Base	mm	35	
Resistance, Terminal-chip	$R_{CC'+EE'}$	mΩ	1.5	Terminal to chip
Comparative Tracking Index	(CTI)		600	
Module base plate Material			Cu	
Baseplate Thickness		mm	5	
Insulation plate Material			AlN	
Terminal Surface treatment			Ni plating	
Case Material			Poly-Phenilene Sulfide	

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DEFINITION OF TEST CIRCUIT

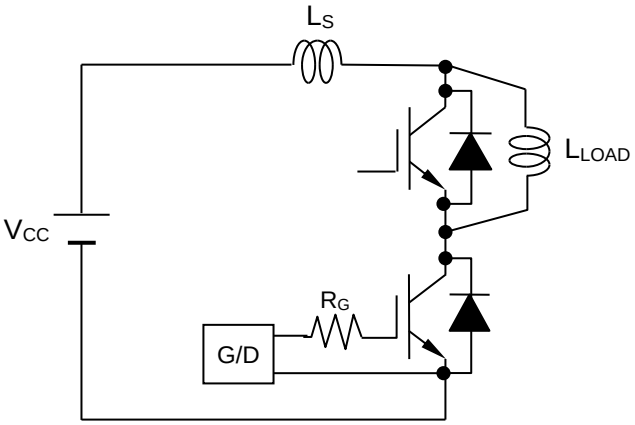
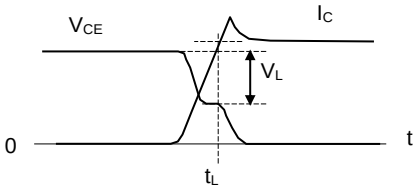
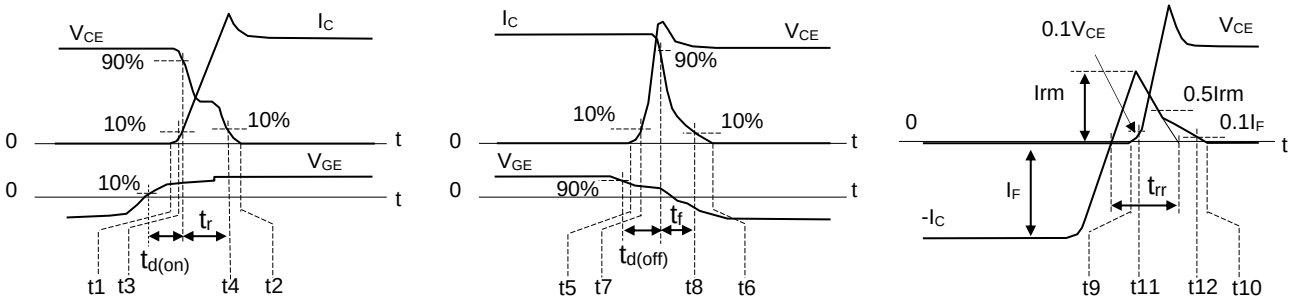


Fig.1 Switching test circuit



$$L_S = \frac{V_L}{\left(\frac{dI_C}{dt}\right)_{t=t_L}}$$

Fig.2 Definition of stray inductance



$$E_{on(10\%)} = \int_{t3}^{t4} I_C \cdot V_{CE}\, dt \qquad E_{off(10\%)} = \int_{t7}^{t8} I_C \cdot V_{CE}\, dt \qquad E_{rr(10\%)} = \int_{t11}^{t12} I_F \cdot V_{CE}\, dt$$

$$E_{on(Full)} = \int_{t1}^{t2} I_C \cdot V_{CE}\, dt \qquad E_{off(Full)} = \int_{t5}^{t6} I_C \cdot V_{CE}\, dt \qquad E_{rr(Full)} = \int_{t9}^{t10} I_F \cdot V_{CE}\, dt$$

Fig.3 Definition of switching loss

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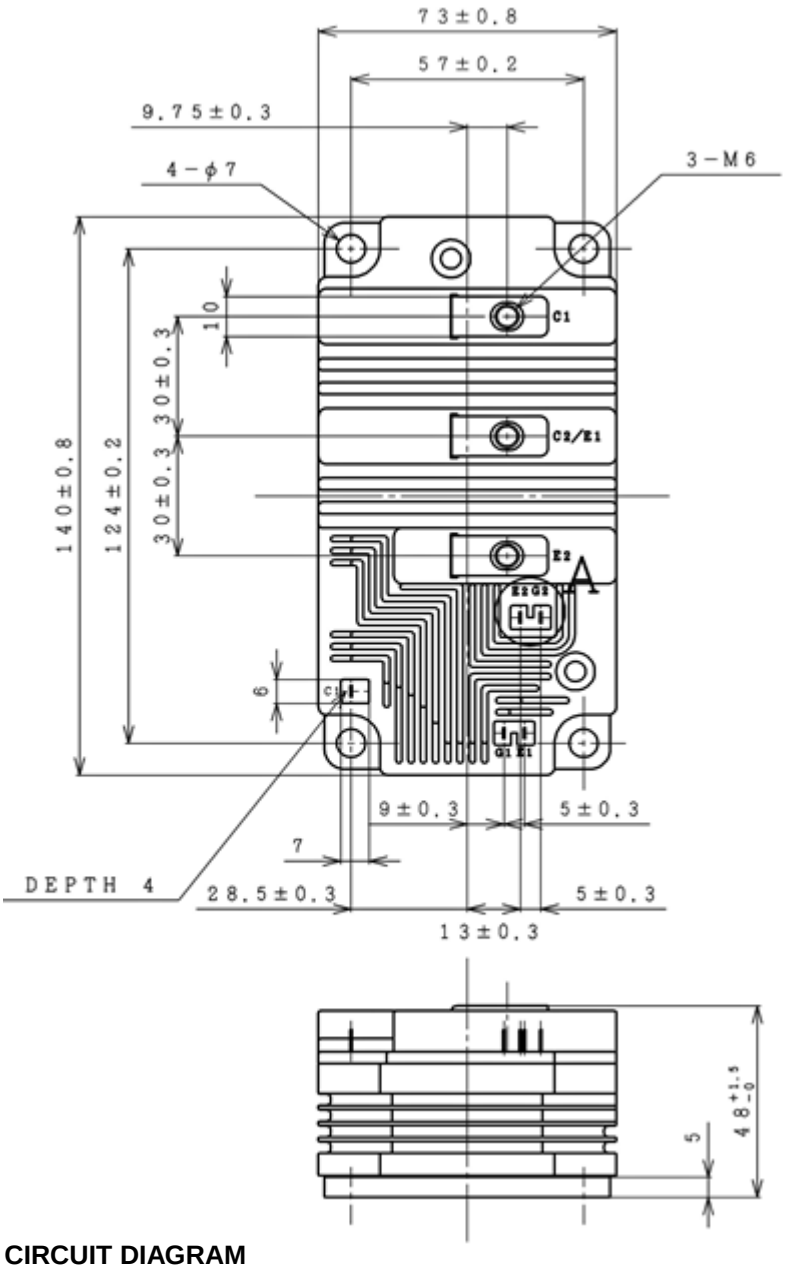
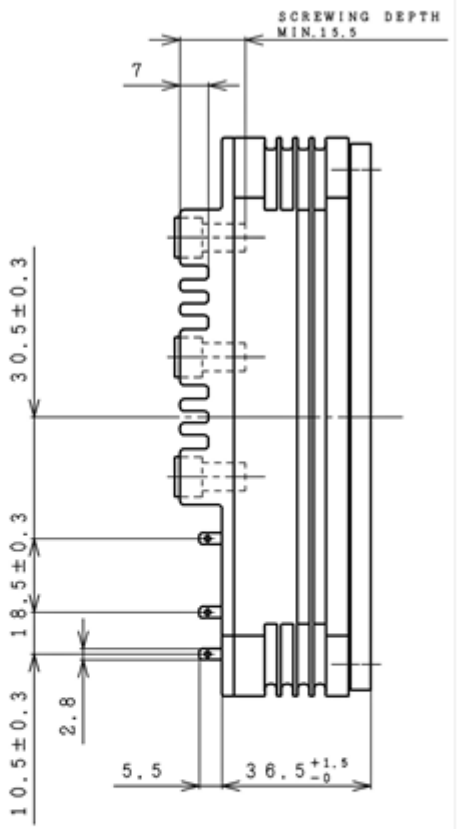
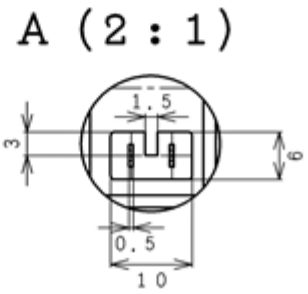
OUTLINE DRAWING

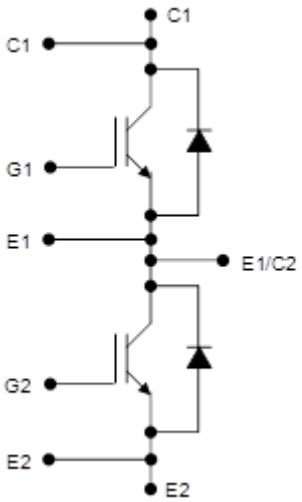
Unit in mm







CIRCUIT DIAGRAM



Weight: 840g

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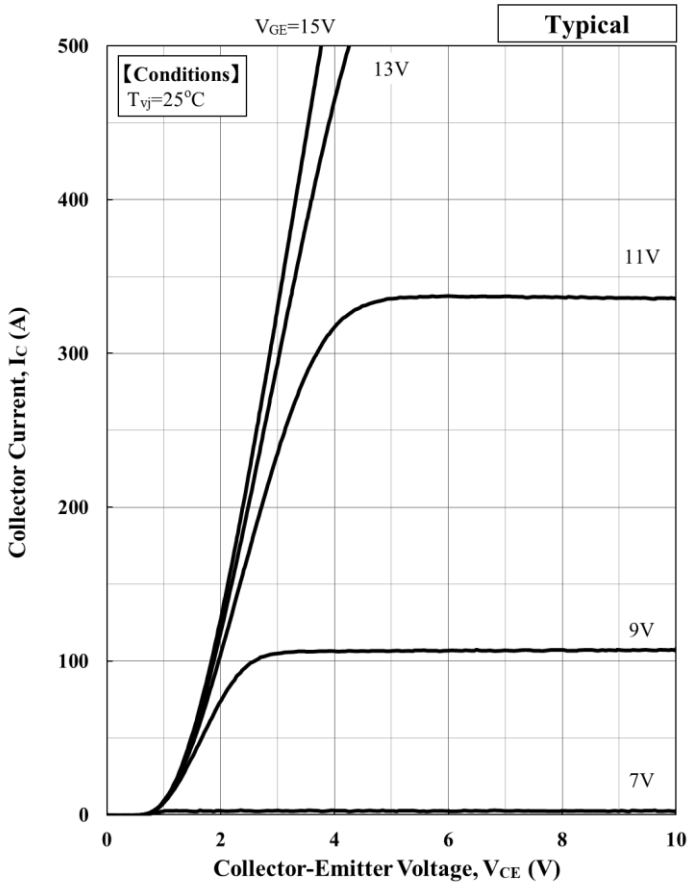
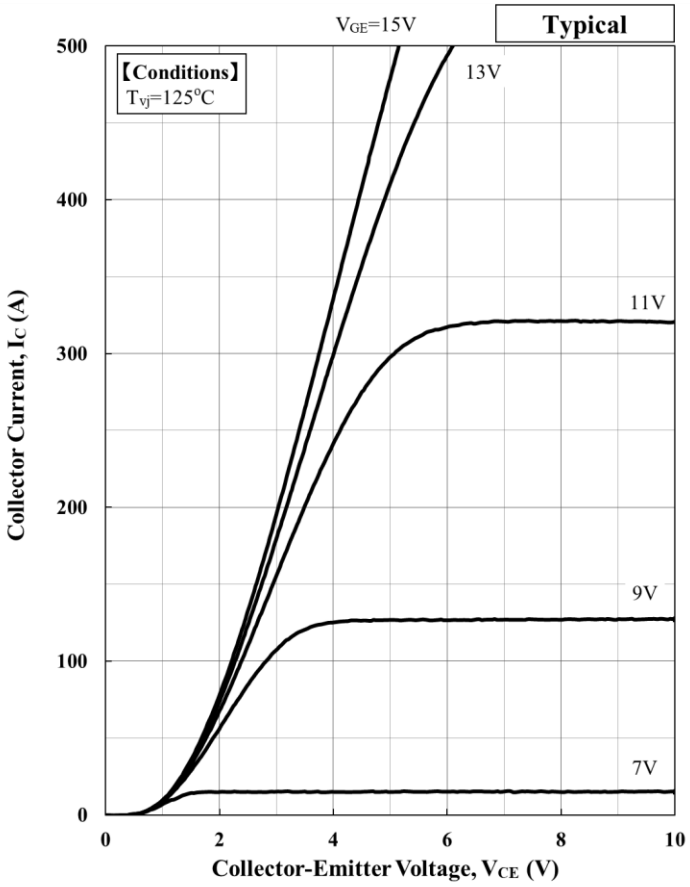
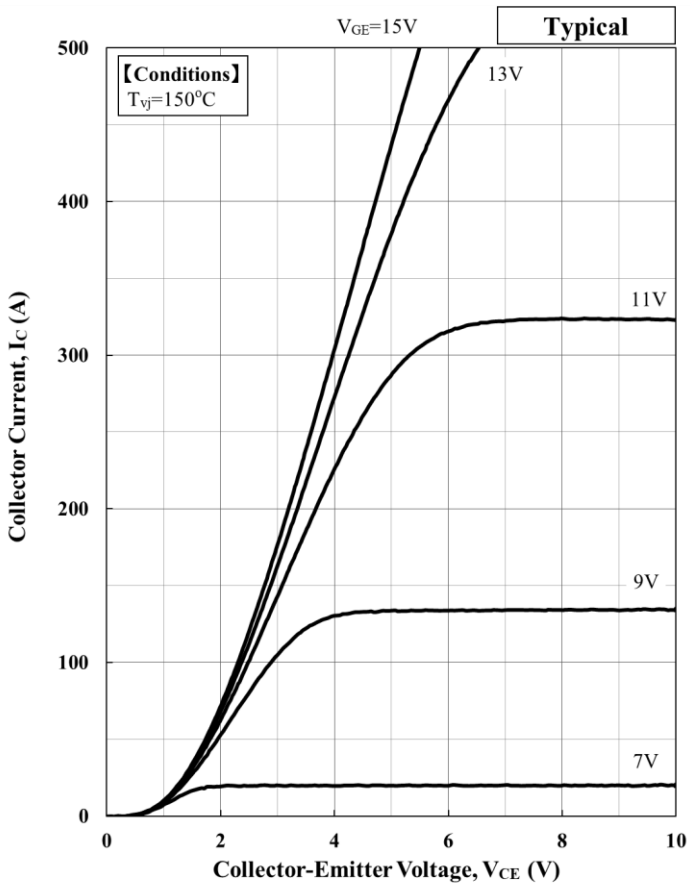


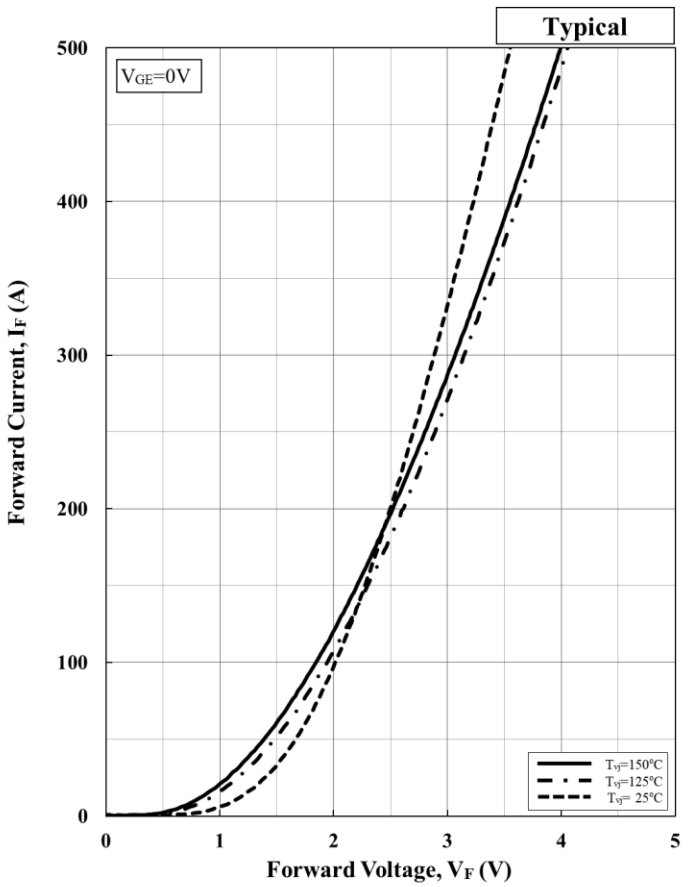
Collector Current vs. Collector Emitter Voltage



Collector Current vs. Collector Emitter Voltage



Collector Current vs. Collector Emitter Voltage



Forward Voltage of free-wheeling diode

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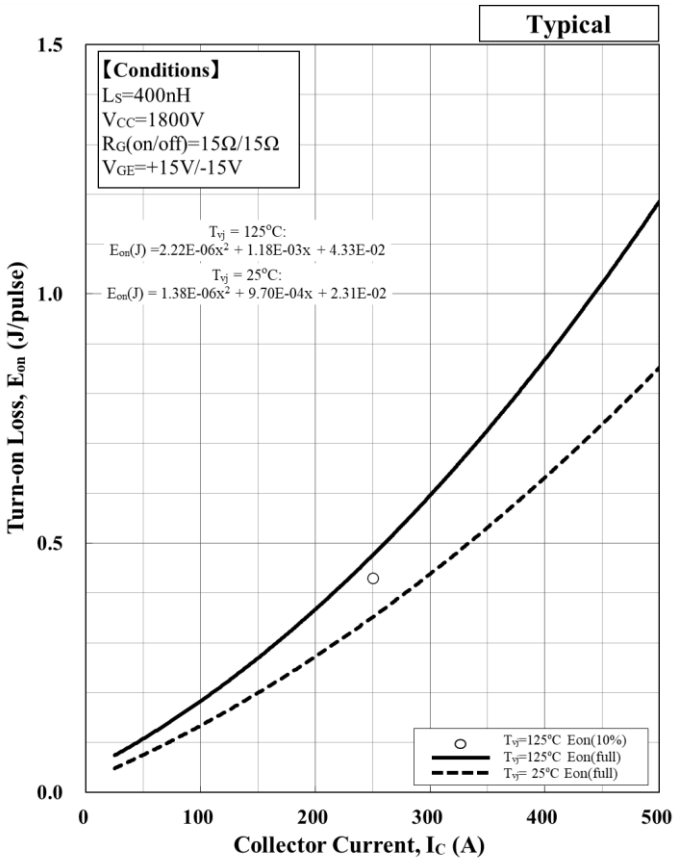
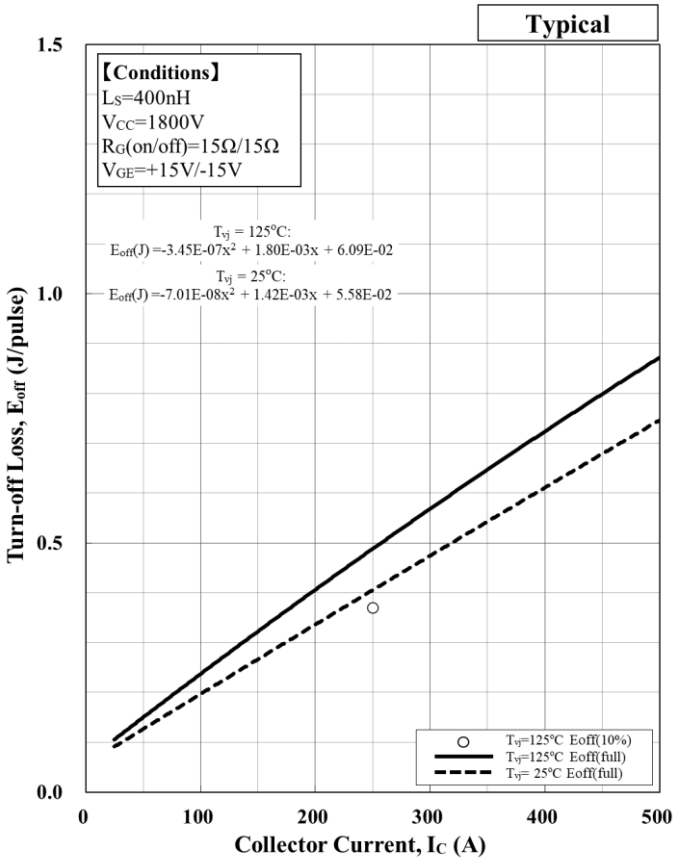
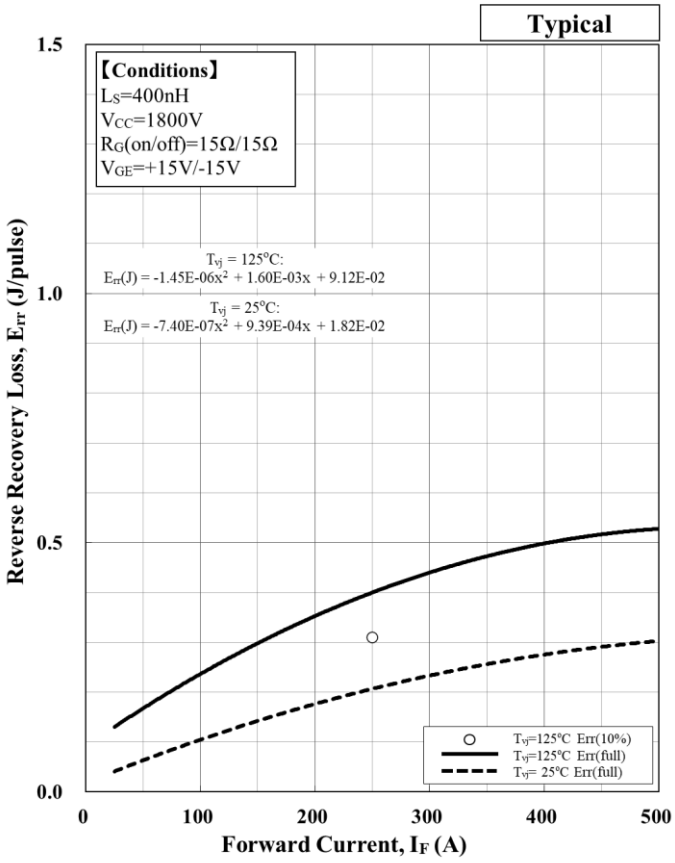


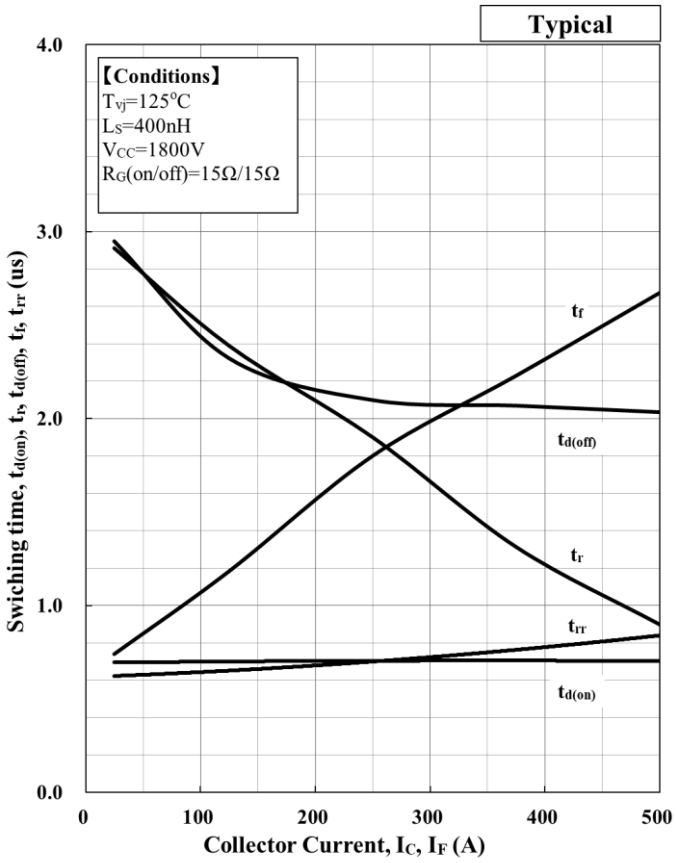
Turn-on loss vs. Collector current



Turn-off loss vs. Collector current



Reverse Recovery loss vs. Forward current



Switching time vs. Collector Current

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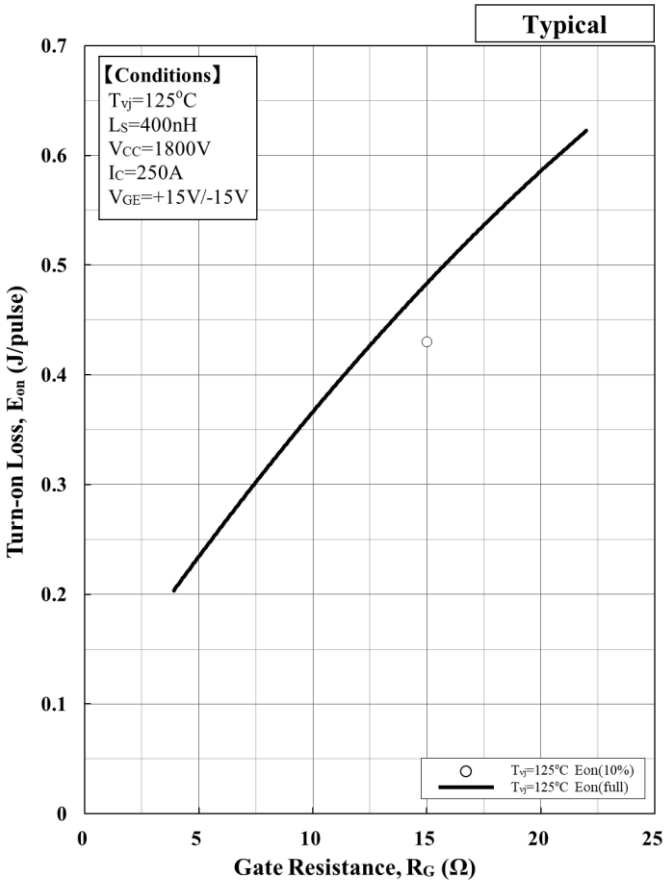
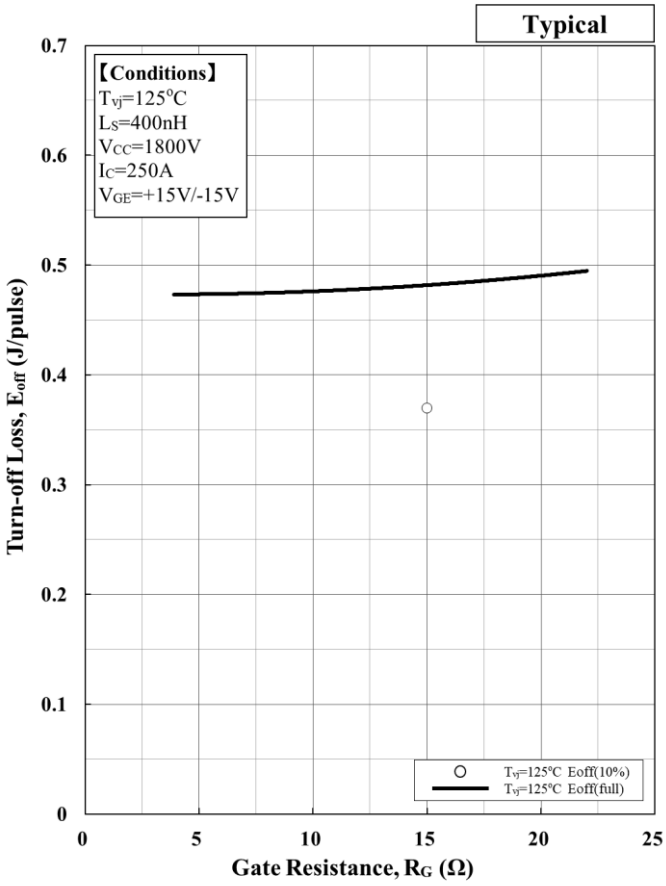
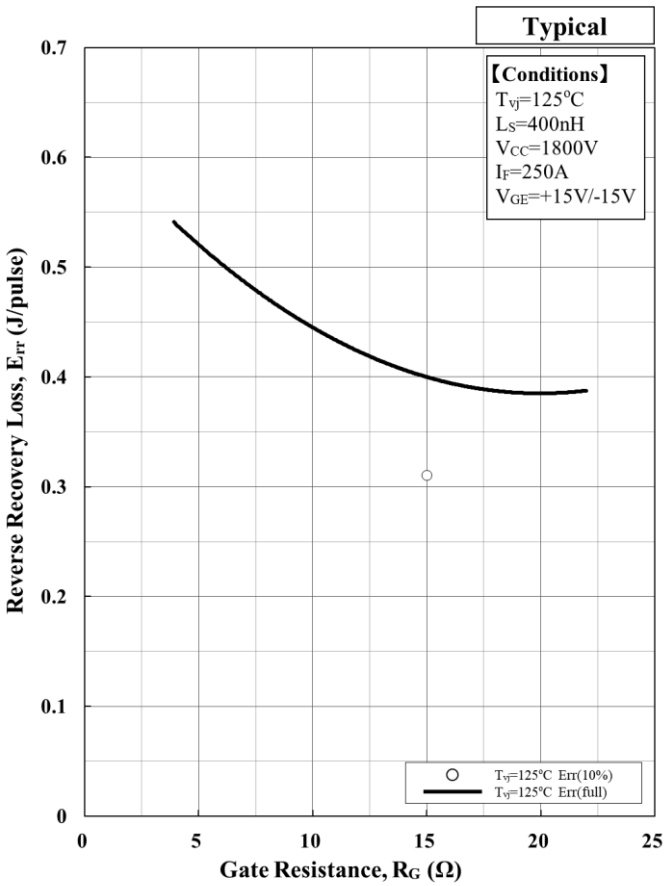


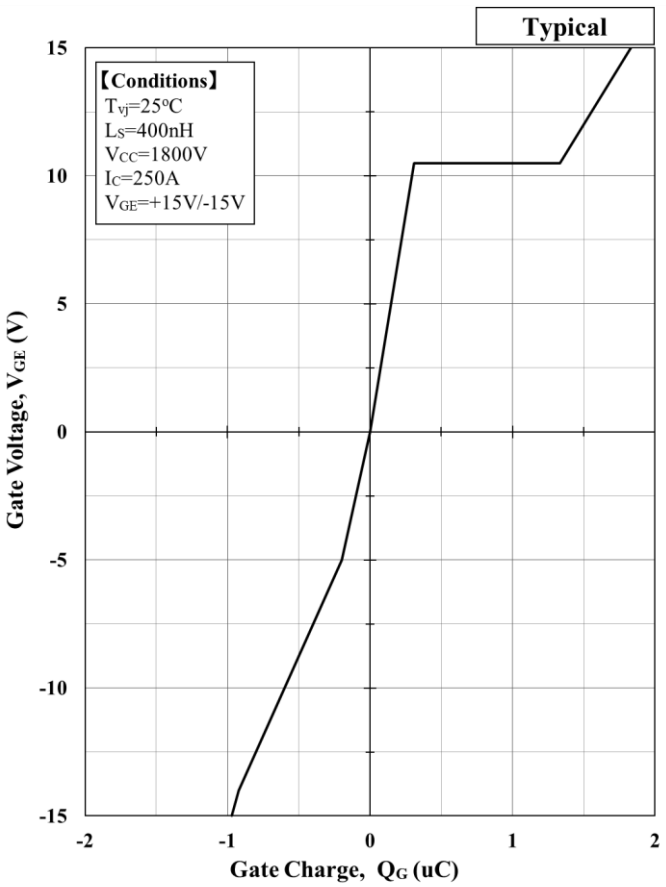
Turn-on loss vs. Gate Resistance



Turn-off loss vs. Gate Resistance



Reverse Recovery loss vs. Gate Resistance



VGE-QG curve

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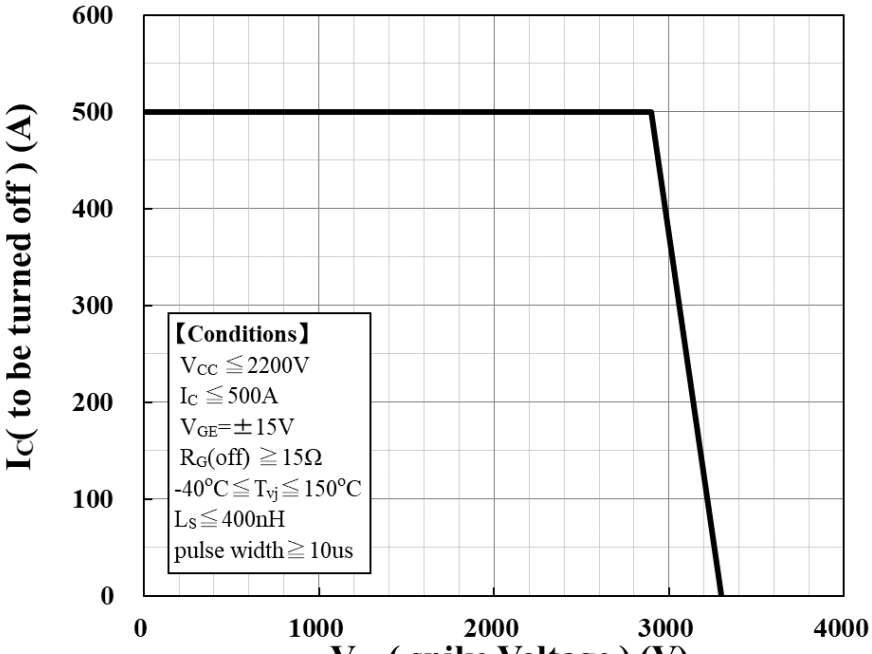
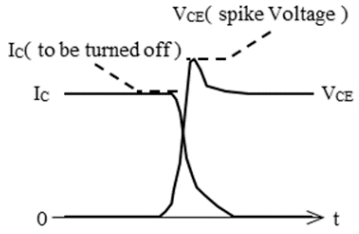
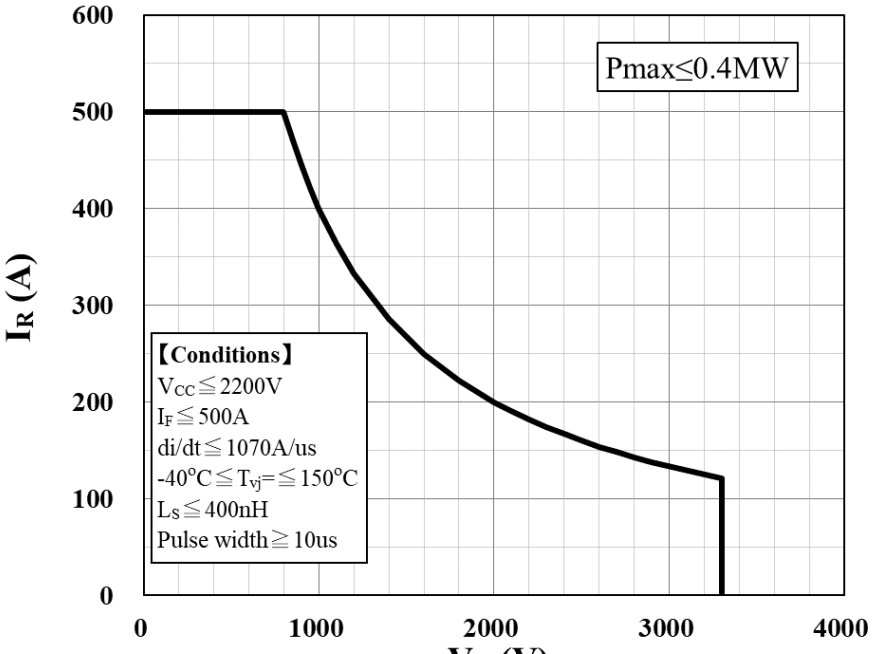


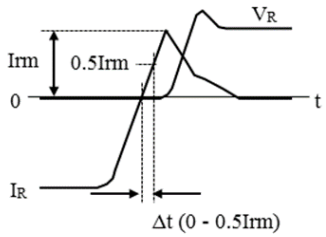
Reverse Bias Safe Operation Area (RBSOA)



Definition of RBSOA waveform



Reverse Recovery Safe Operation Area (RRSOA)



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

Definition of Recovery di/dt

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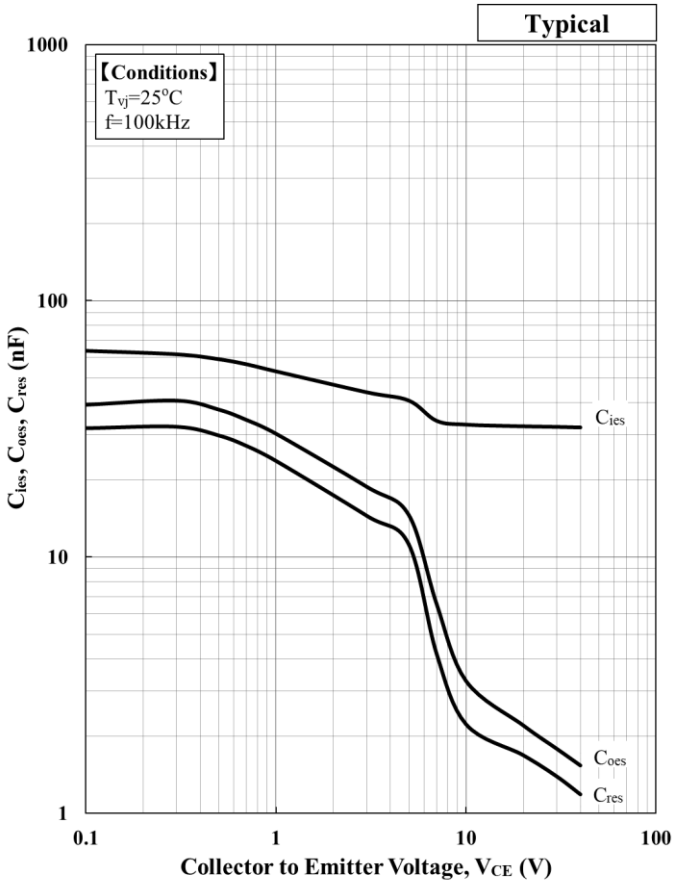
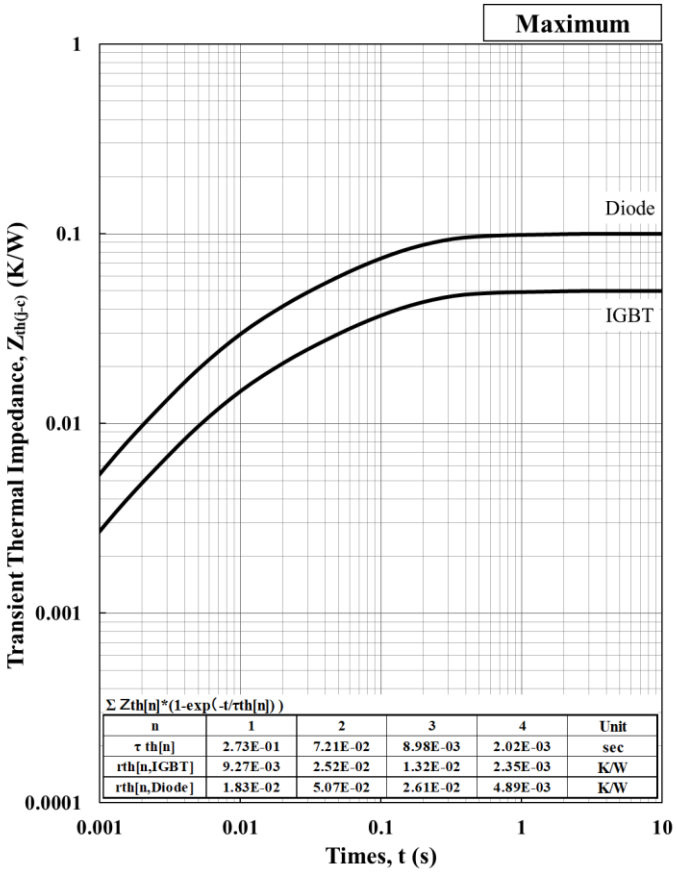


Capacitance vs. Collector to Emitter Voltage



n	1	2	3	4	Unit
τ th[n]	2.73E-01	7.21E-02	8.98E-03	2.02E-03	sec
rth[n,IGBT]	9.27E-03	2.52E-02	1.32E-02	2.35E-03	K/W
rth[n,Diode]	1.83E-02	5.07E-02	2.61E-02	4.89E-03	K/W

Transient Thermal Ipedance 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.
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)".
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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.
8. For handling other than described in this manual, follow the handling instructions (IGBT-HI-00002).

■ 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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Usage

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