MBN1200E33E

Silicon N-channel IGBT 3300V E 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.
- High thermal fatigue durability:
  (delta Tc=70K, N>30,000cycles)
  AlSiC base-plate/AlN substrate

ABSOLUTE MAXIMUM RATINGS (Tc=25°C)

Item		Symbol	Unit	MBN1200E33E
Collector Emitter Voltage		V_{CES}	V	3,300
Gate Emitter Voltage		V_{GES}	V	±20
Collector Current	DC	I_C	A	1,200
	1ms	I_{Cp}		2,400
Forward Current	DC	I_F	A	1,200
	1ms	I_{FM}		2,400
Junction Temperature		T_j	°C	-40 ~ +125
Storage Temperature		T_{stg}	°C	-50 ~ +125
Isolation Voltage		V_{ISO}	V_{RMS}	6,000(AC 1 minute)
Screw Torque	Terminals (M4/M8)	-	N·m	2/15 (1)
	Mounting (M6)	-		6 (2)

Notes: (1) Recommended Value 1.8±0.2/15$^{+0}_{-3}$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_{CES}	mA	-	-	12	V_{CE}=3,300V, V_{GE}=0V, Tj=25°C
				-	20	60	V_{CE}=3,300V, V_{GE}=0V, Tj=125°C
Gate Emitter Leakage Current		I_{GES}	nA	-500	-	+500	V_{GE}=±20V, V_{CE}=0V, Tj=25°C
Collector Emitter Saturation Voltage		$V_{CE(sat)}$	V	3.0	3.5	4.2	I_C=1,200A, V_{GE}=15V, Tj=125°C
Gate Emitter Threshold Voltage		$V_{GE(TO)}$	V	4.5	6.0	7.0	V_{CE}=10V, I_C=1,200mA, Tj=25°C
Input Capacitance		C_{ies}	nF	-	110	-	V_{CE}=10V, V_{GE}=0V, f=100kHz, Tj=25°C
Internal Gate Resistance		Rge	Ω	-	1.3	-	V_{CE}=10V, V_{GE}=0V, f=100kHz, Tj=25°C
Switching Times	Rise Time	t_r	μs	1.1	2.1	3.1	V_{CC}=1,650V, Ic=1,200A
	Turn On Time	t_{on}		1.7	2.5	3.3	L=100nH
	Fall Time	t_f		1.3	2.2	3.1	R_G=3.9/3.9Ω (3)
	Turn Off Time	t_{off}		2.7	4.2	5.7	V_{GE}=±15V, Tj=125°C
Peak Forward Voltage Drop		V_{FM}	V	2.0	2.5	3.0	IF=1,200A, V_{GE}=0V, Tj=125°C
Reverse Recovery Time		t_{rr}	μs	0.2	0.7	1.2	Vcc=1,650V, IF=1,200A, L=100nH Tj=125°C
Turn On Loss		$E_{on(10\%)}$	J/P	-	1.7	2.2	V_{CC}=1,650V, Ic=1,200A, L=100nH
Turn Off Loss		$E_{off(10\%)}$	J/P	-	1.9	2.4	R_G= 3.9/3.9Ω (3)
Reverse Recovery Loss		$E_{rr(10\%)}$	J/P	-	1.6	2.1	V_{GE}=±15V, Tj=125°C
Stray inductance module		L_{SCE}	nH	-	12	-	
Thermal Impedance	IGBT	Rth(j-c)	K/W	-	-	0.0085	Junction to case
	FWD	Rth(j-c)		-	-	0.017	
Contact Thermal Impedance		Rth(c-f)	K/W	-	0.006	-	Case to fin (λgrease=1W/(m·K), heat-sink flatness ≤ 50um)

Notes:(3) R_G value is the test condition's value 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.

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DEFINITION OF TEST CIRCUIT

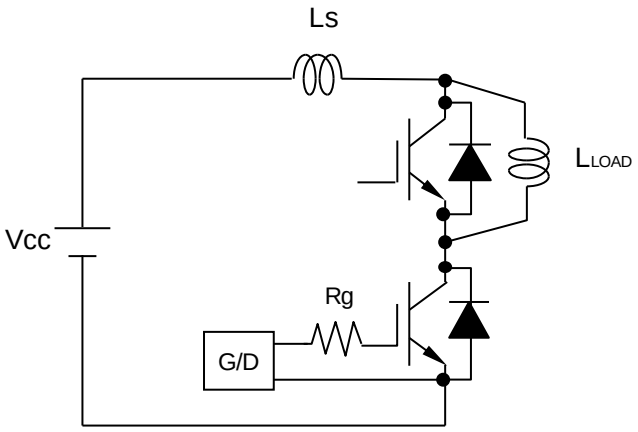
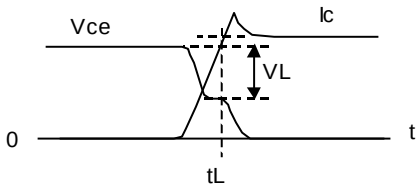
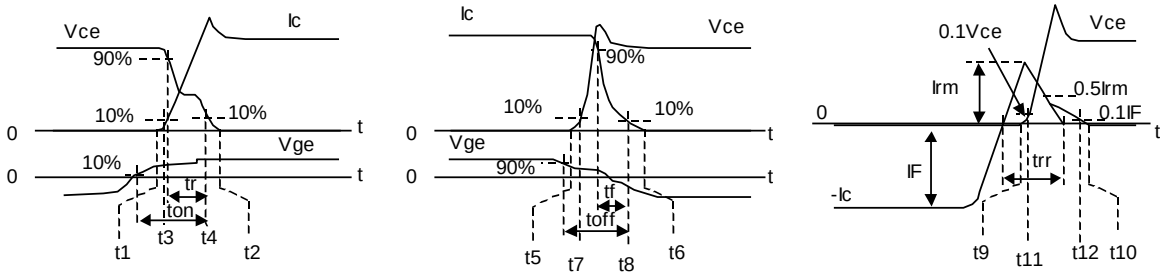


Fig.1 Switching test circuit



$$Ls = \frac{VL}{\left(\frac{dIc}{dt}\right)_{t=tL}}$$

Fig.2 Definition of stray inductance



$$Eon(10\%) = \int_{t3}^{t4} Ic \cdot Vce\, dt \qquad Eoff(10\%) = \int_{t7}^{t8} Ic \cdot Vce\, dt \qquad Err(10\%) = \int_{t11}^{t12} IF \cdot Vce\, dt$$

$$Eon(Full) = \int_{t1}^{t2} Ic \cdot Vce\, dt \qquad Eoff(Full) = \int_{t5}^{t6} Ic \cdot Vce\, dt \qquad Err(Full) = \int_{t9}^{t10} IF \cdot Vce\, dt$$

Fig.3 Definition of switching loss

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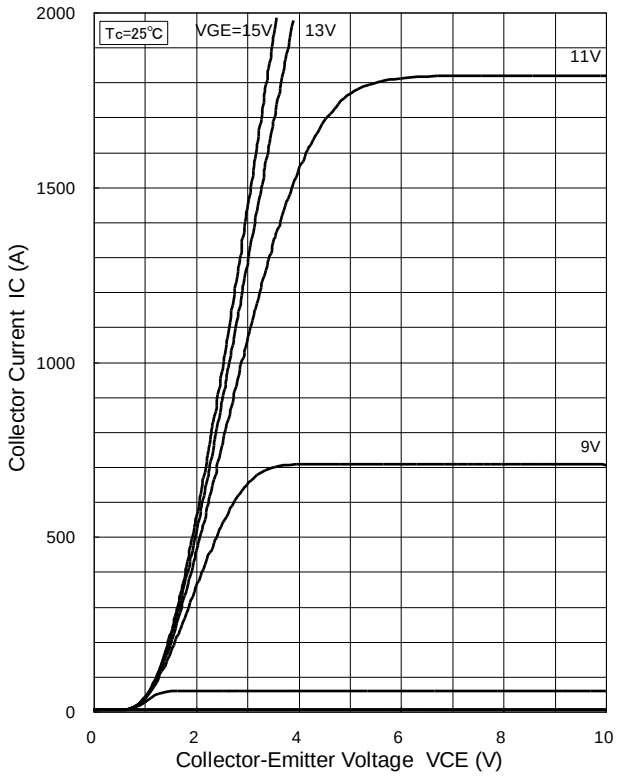
CHARACTERISTICS CURVE

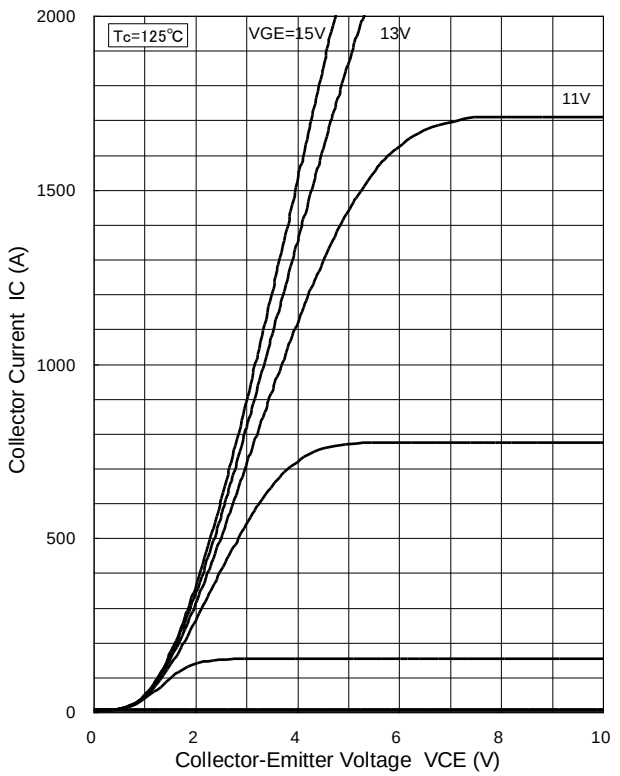
STATIC CHARACTERISTICS

TYPICAL



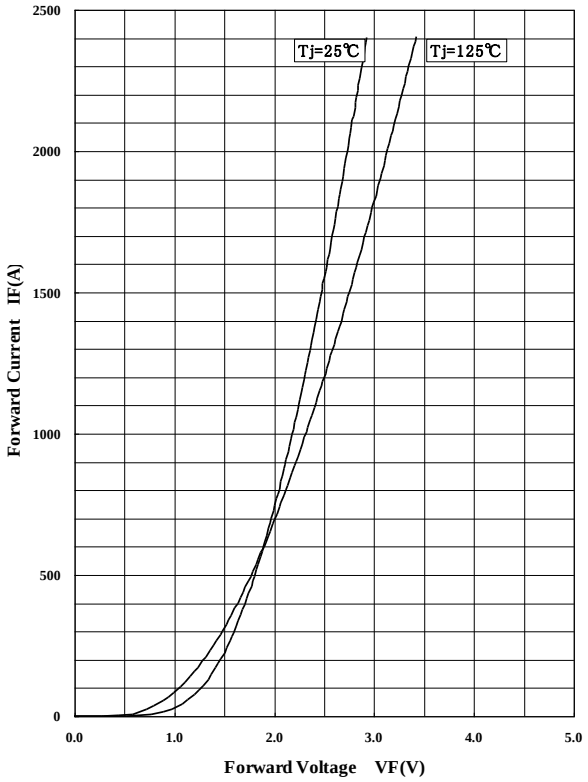
Collector Current vs. Collector to Emitter Voltage

TYPICAL



Collector Current vs. Collector to Emitter Voltage

TYPICAL



Forward Voltage of free-wheeling diode

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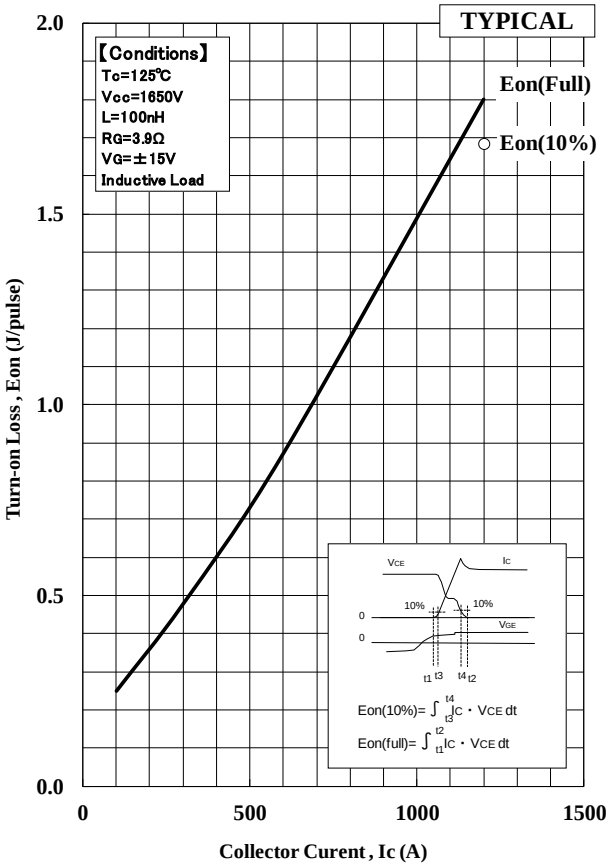
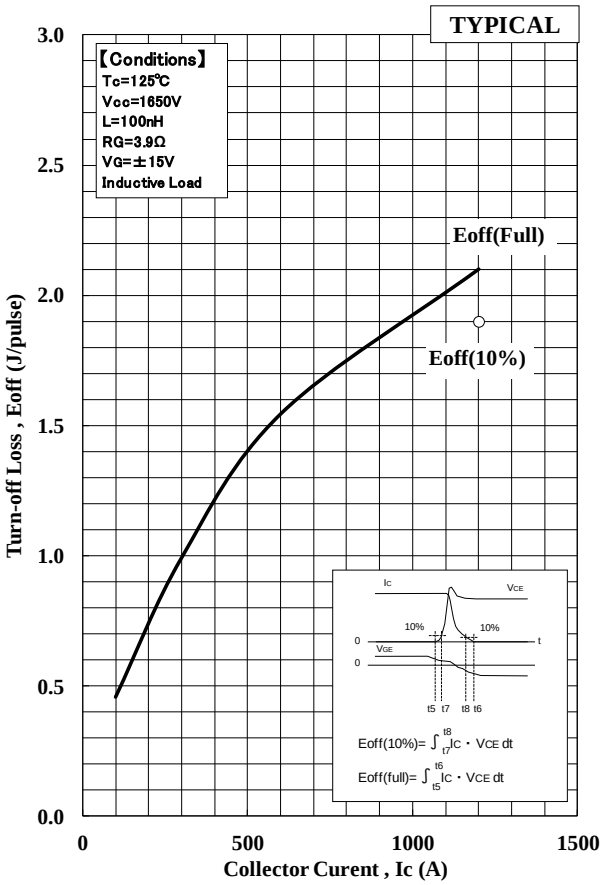
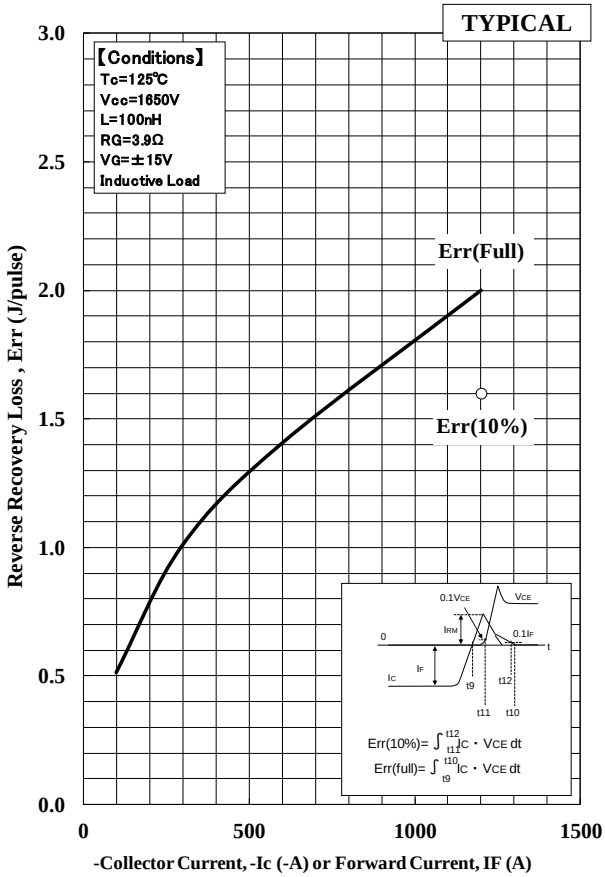
DYNAMIC CHARACTERISTICS



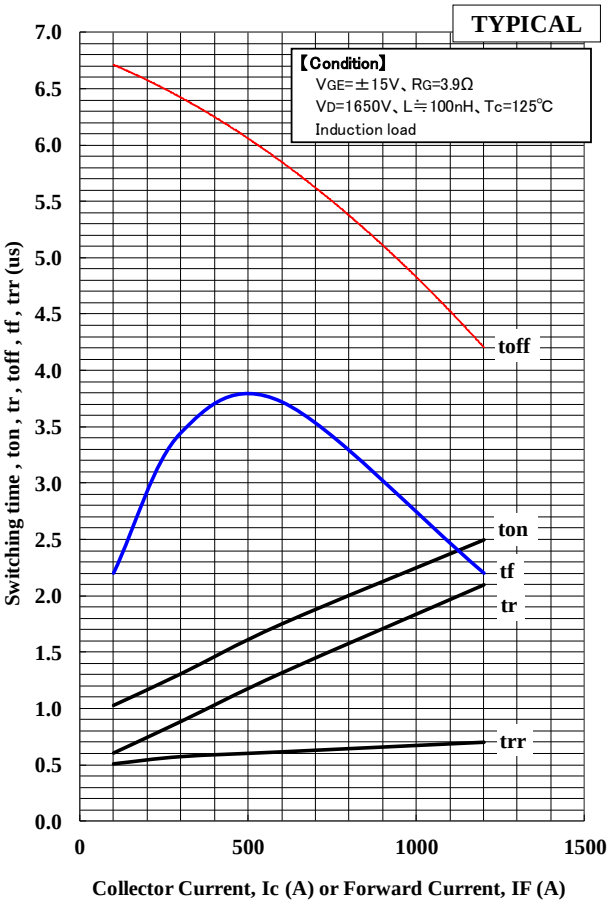
Turn-on Loss vs.Collector Current



Turn-off Loss vs.Collector Current



Recovery Loss vs.Collector Current



Switching time vs. Collector current

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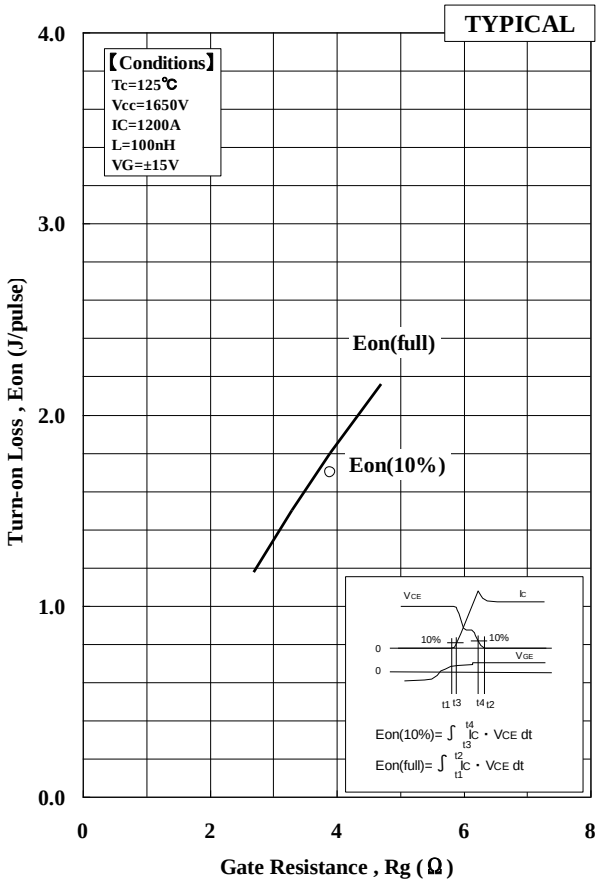
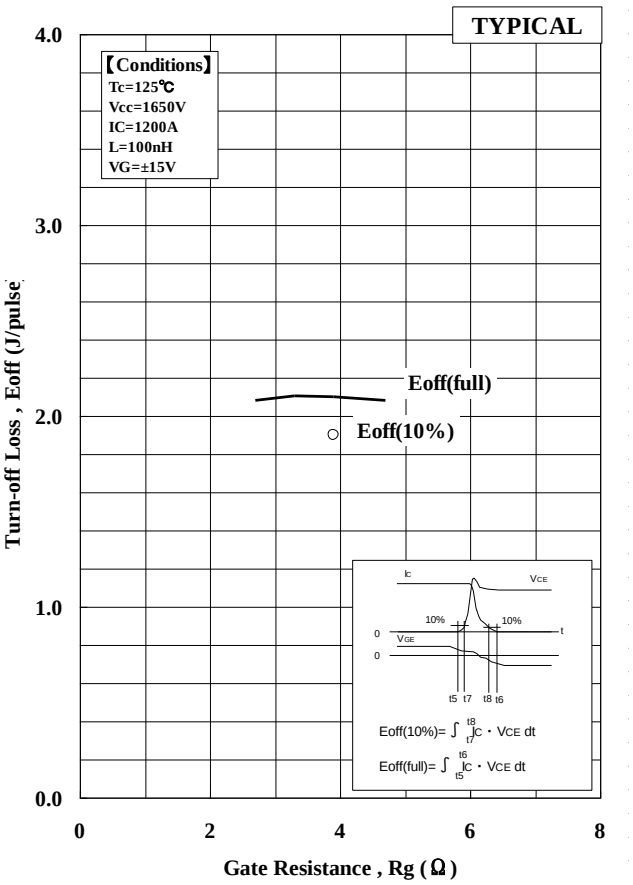
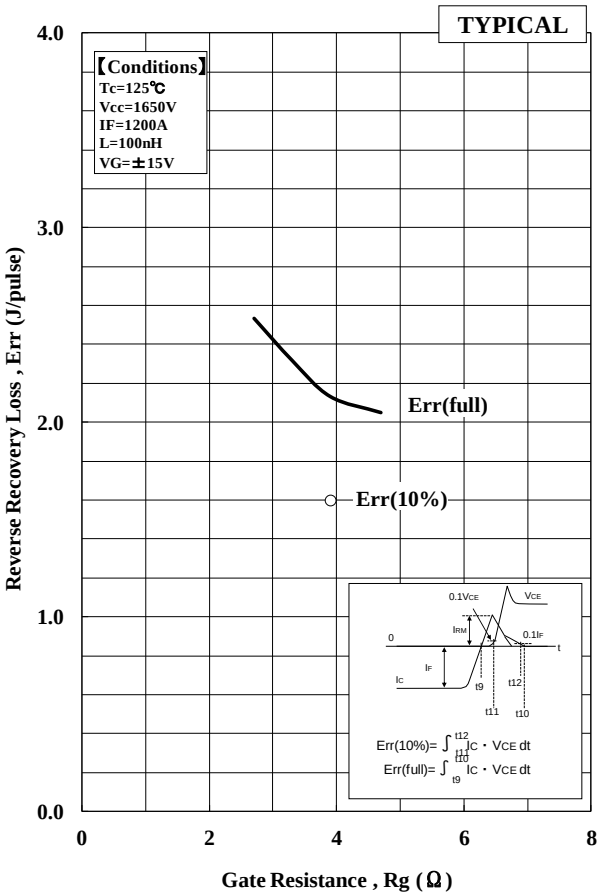


Turn-on Loss vs. Gate Resistance



Turn-off Loss vs. Gate Resistance



Recovery Loss vs. Gate Resistance

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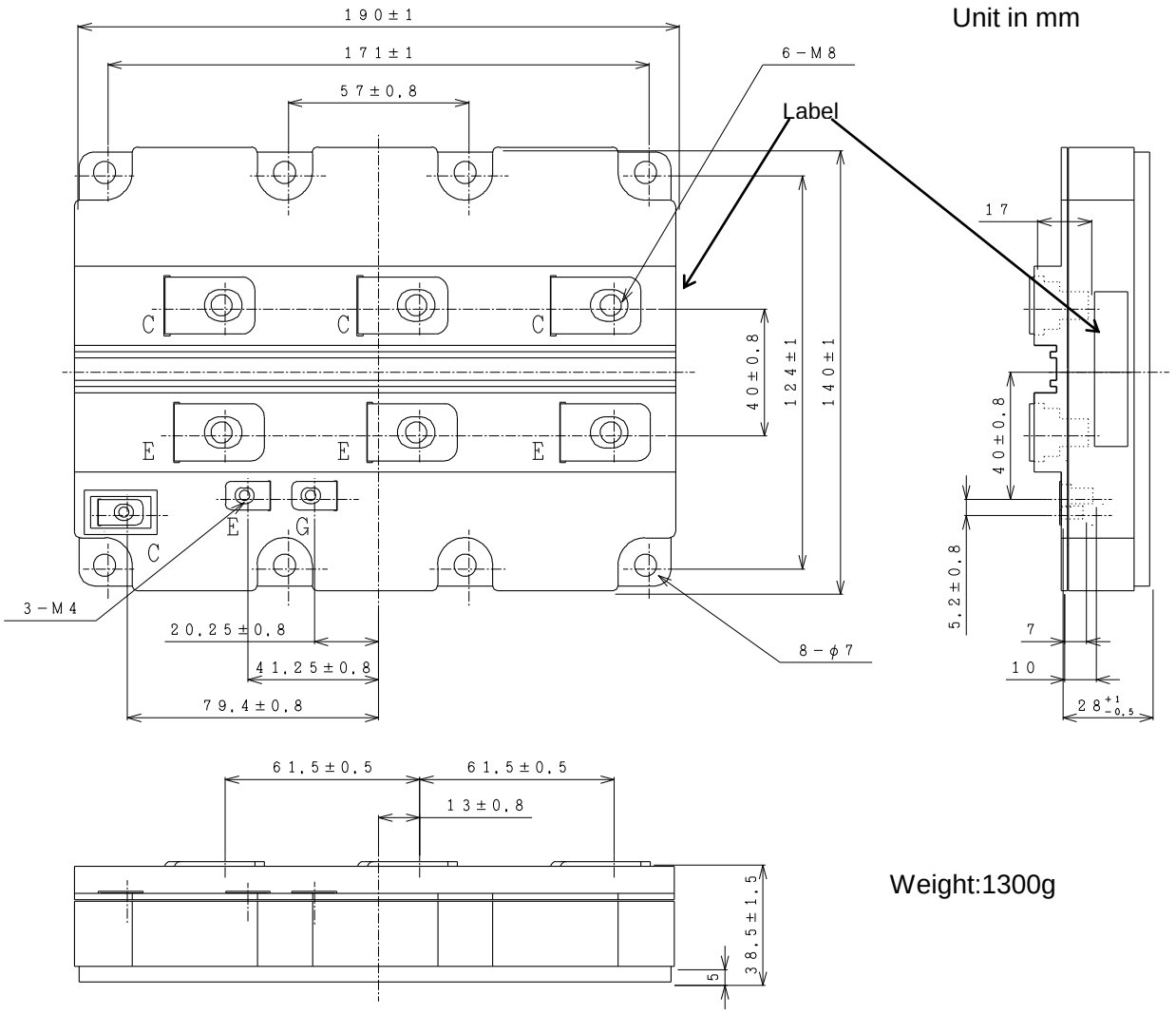
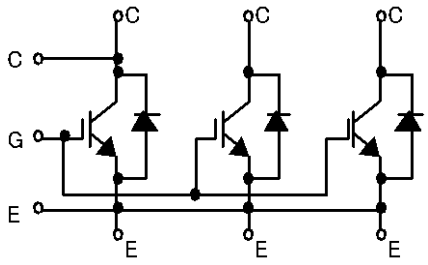
PACKAGE OUTLINE DRAWING

Unit in mm



Weight:1300g



Circuit diagram

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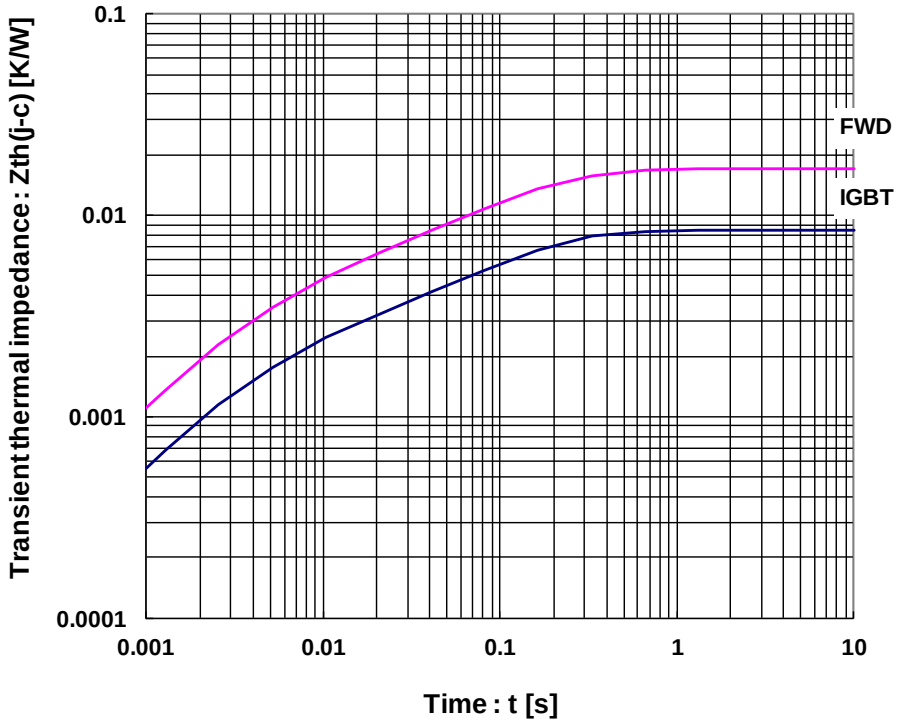
TRANSIENT THERMAL IMPEDANCE



Transient Thermal Impedance Curve (Maximum Value)

Curve Approximation Model
Σ rth[n]*(1-exp(-t/τth[n]))

n	1	2	3	4	Unit
τ th[n]	1.51E-01	2.49E-02	3.86E-03	6.61E-04	sec
rth[n,IGBT]	5.24E-03	1.54E-03	1.57E-03	1.45E-04	K/W
rth[n,Diode]	1.04E-02	3.19E-03	3.08E-03	2.99E-04	K/W

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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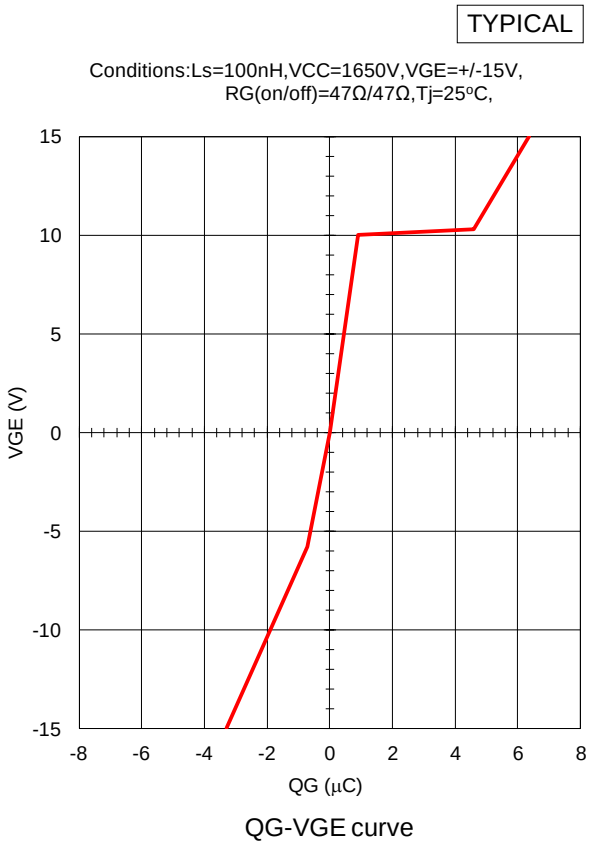
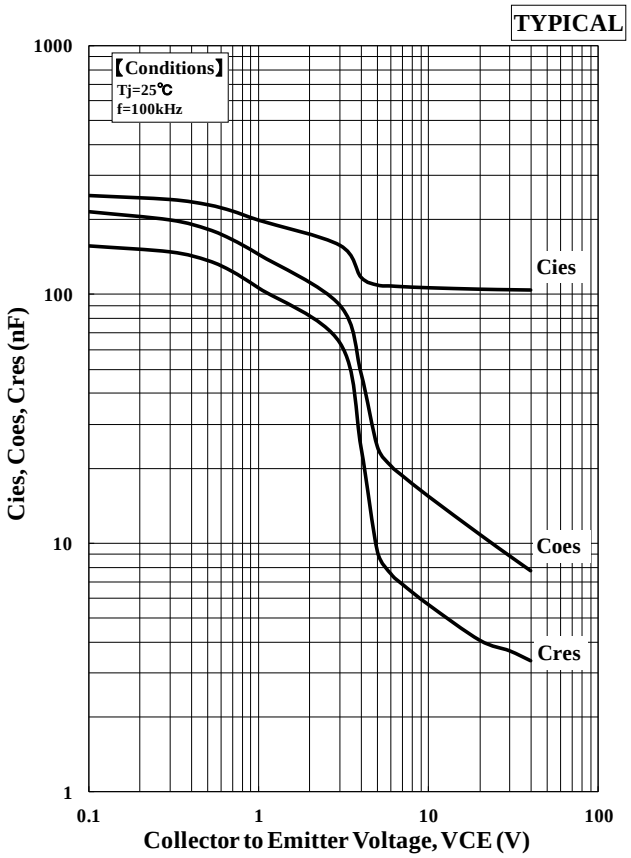
QG-VGE curve



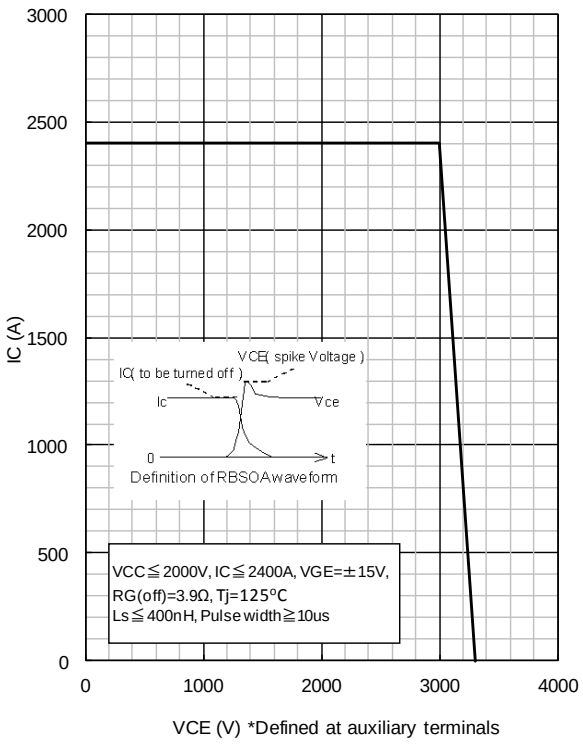
QG-VGE curve

Cies, Coes, Cres curve



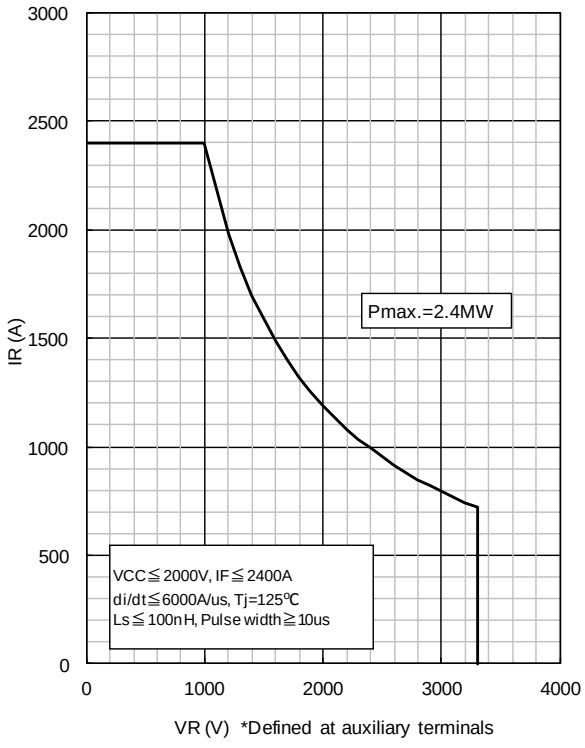
Capacitance vs. Collector to Emitter Voltage

RBSOA



RBSOA

RecSOA



RecSOA

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HITACHI POWER SEMICONDUCTORS

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