MBL800E33E

Silicon N-channel IGBT 3300V E version

1. 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

2. ABSOLUTE MAXIMUM RATINGS (TC=25℃)

Item		Symbol	Unit	MBL800E33E
Collector Emitter Voltage		V_{CES}	V	3,300
Gate Emitter Voltage		V_{GES}	V	±20
Collector Current	DC	I_C	A	800
	1ms	I_{Cp}		1,600
Forward Current	DC	I_F	A	800
	1ms	I_{FM}		1,600
Junction Temperature		T_j	℃	-40 ～ +125
Storage Temperature		T_{stg}	℃	-40 ～ +125
Isolation Voltage		V_{ISO}	V_{RMS}	6,000(AC 1 minute)
Screw Torque	Terminals (M4/M8)	-	N·m	2/10 (1)
	Mounting (M6)	-		6 (2)

Notes: (1) Recommended Value 1.8±0.2/9±1N·m (2) Recommended Value 5.5±0.5N·m

3. ELECTRICAL CHARECTERISTICS

1) IGBT + FWD

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℃
Gate Emitter Leakage Current		I_{GES}	nA	-	-	±500	V_{GE}=±20V, V_{CE}=0V, Tj=25℃
Collector Emitter Saturation Voltage		$V_{CE(sat)}$	V	3.0	3.5	4.2	I_C=800A, V_{GE}=15V, Tj=125℃
Gate Emitter Threshold Voltage		$V_{GE(TO)}$	V	4.5	6.0	7.0	V_{CE}=10V, I_C=800mA, Tj=25℃
Input Capacitance		Cies	nF	-	70	-	V_{CE}=10V, V_{GE}=0V,f=100kHz, Tj=25℃
Internal Gate Resistance		Rg(int)	Ω	-	1.8	-	
Switching Times	Rise Time	t_r	μs	1.1	2.1	3.1	V_{CC}=1,650V, I_C=800A
	Turn On Time	t_{on}		1.7	2.5	3.3	L=120nH
	Fall Time	t_f		1.3	2.2	3.1	R_G=5.6Ω (3)
	Turn Off Time	t_{off}		2.7	4.2	5.7	V_{GE}=±15V, Tj=125℃
Peak Forward Voltage Drop		V_{FM}	V	2.0	2.5	3.0	-I_C=800A, V_{GE}=0V, Tj=125℃
Reverse Recovery Time		t_{rr}	μs	0.2	0.7	1.2	V_{CC}=1,650V, I_F=800A (4)
Peak Reverse Current		I_{RM}	A	-	1300	-	L=120nH, Tj=125℃
Turn On Loss		Eon(10%)	J/P	-	1.2	1.6	V_{CC}=1,650V, I_C=800A
Turn Off Loss		Eoff(10%)		-	1.3	1.7	L=120nH, R_G=5.6Ω (3)
Reverse Recovery Loss		Err(10%)		-	1.0	1.5	V_{GE}=±15V, Tj=125℃

Notes: (3) R_G value is the test condition's value for decision 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.
(4)Counter arm IGBT VGE=±15V

* 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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CHKD.	Y.Koike	'08.12.23
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2) DIODE

Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Collector Emitter Cut-Off Current	I_{AKS}	mA	-	-	12	V_{AK}=3,300V, T_j=25℃
Peak Forward Voltage Drop	V_F	V	2.2	2.7	3.2	I_F=800A, T_j=125℃ At Main terminal
Reverse Recovery Time	trr	μs	0.2-	0.7	1.2	I_F =800A, V_{CC}=1,650V (5) L=120nH, T_j=125°C
Peak Reverse Current	I_{RM}	A	-	1300	-	
Reverse Recovery Loss	Err(10%)	J/P	-	1.0	1.5	

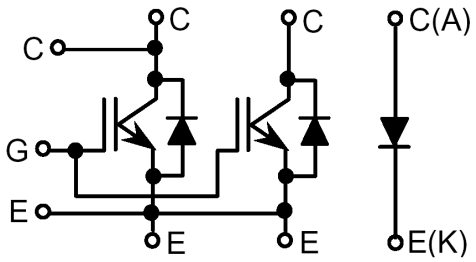
Notes: (5)Counter arm IGBT VGE=±15V

4. THERMAL CHARECTERISTICS

Item		Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Thermal Impedance	IGBT	Rth(j-c)	K/W	-	-	0.013	Junction to case
	FWD	Rth(j-c)		-	-	0.026	
Contact Thermal Impedance		Rth(c-f)		-	0.008	-	Case to fin with thermal grease (6)

Notes: (6) Thermal grease thickness is 100μm using G747(Shin-Etsu Chemical Co.,Ltd)

5. CIRCUIT DIAGRAM



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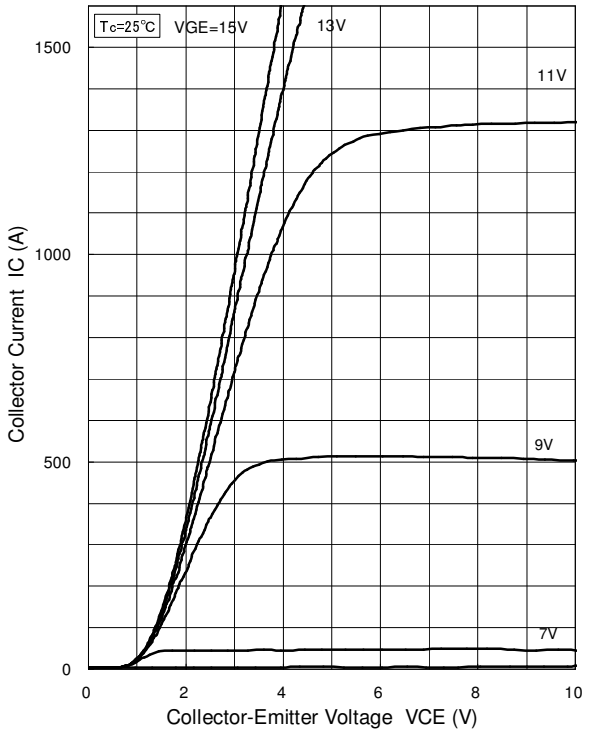
6. CHARACTERISTICS CURVE

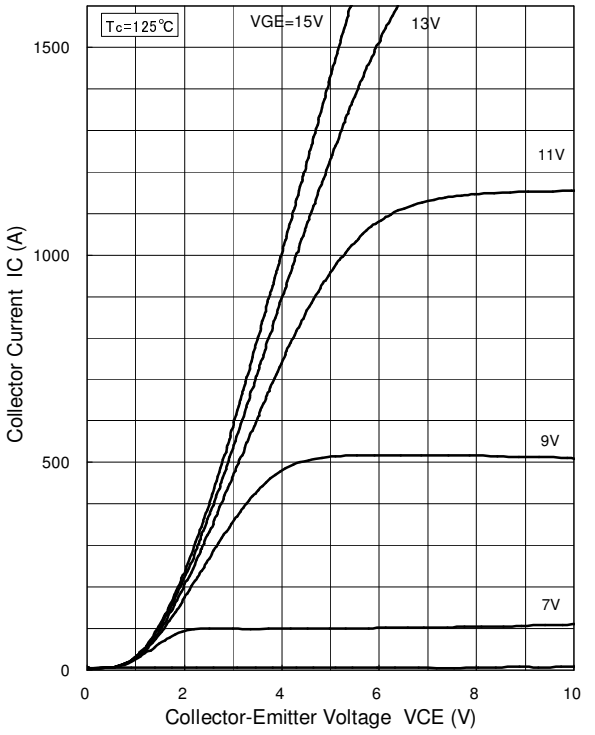
6.1 STATIC CHARACTERISTICS

TYPICAL



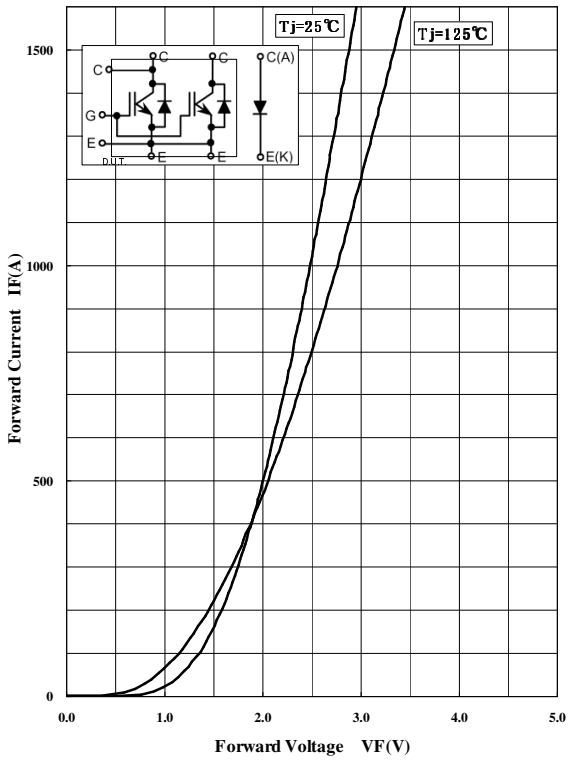
Collector Current vs. Collector to Emitter Voltage

TYPICAL



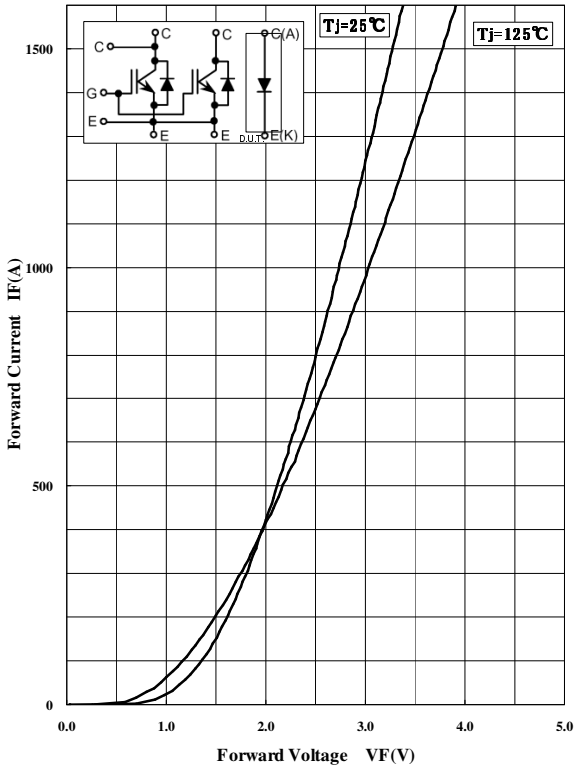
Collector Current vs. Collector to Emitter Voltage

TYPICAL



Forward Voltage of free-wheeling diode

TYPICAL



Forward Voltage of Chopper diode

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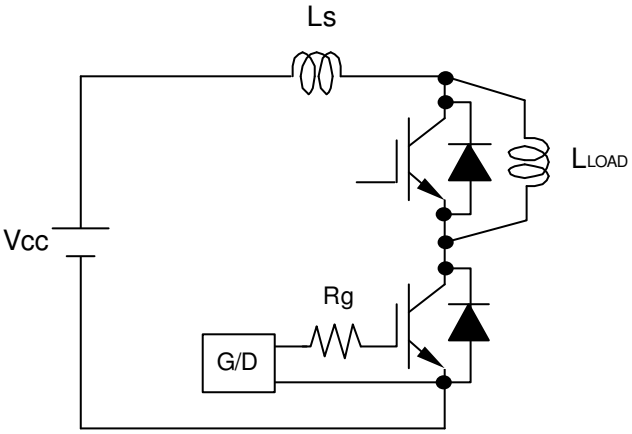
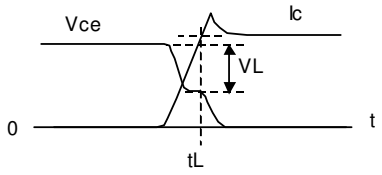
6.2 DYNAMIC CHARACTERISTICS

6.2.1 TEST CIRCUIT



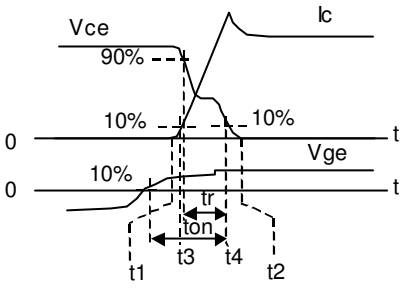
Switching test circuit



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

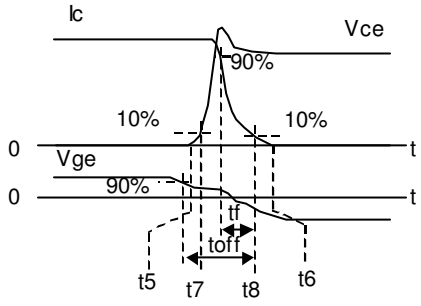
Definition of Ls

6.2.2 WAVEFORM DEFINITION



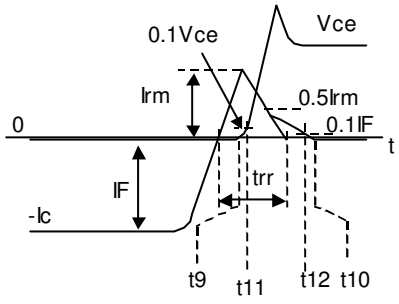
$$Eon(10\%) = \int_{t3}^{t4} Ic \cdot Vce\, dt$$

$$Eon(Full) = \int_{t1}^{t2} Ic \cdot Vce$$



$$Eoff(10\%) = \int_{t7}^{t8} Ic \cdot Vce\, dt$$

$$Eoff(Full) = \int_{t5}^{t6} Ic \cdot Vce\, dt$$



$$Err(10\%) = \int_{t11}^{t12} IF \cdot Vce\, dt$$

$$Err(Full) = \int_{t9}^{t10} IF \cdot Vce\, dt$$

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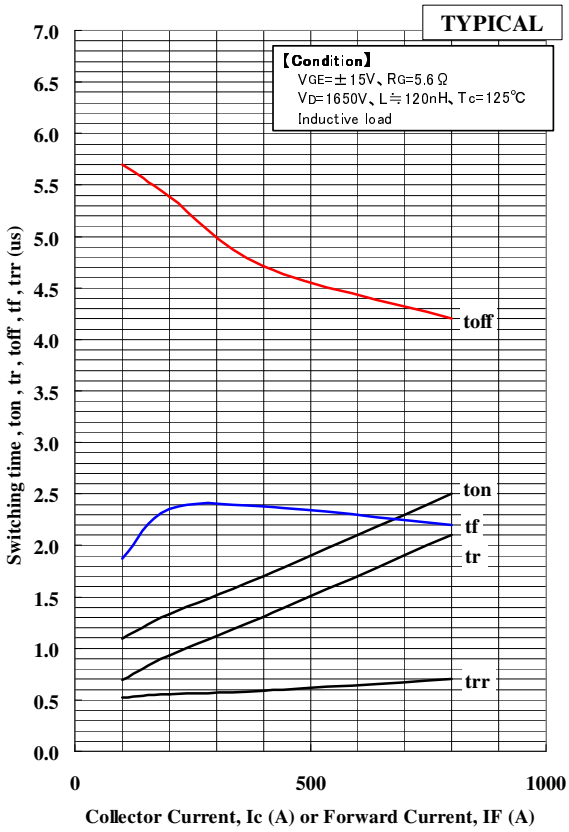
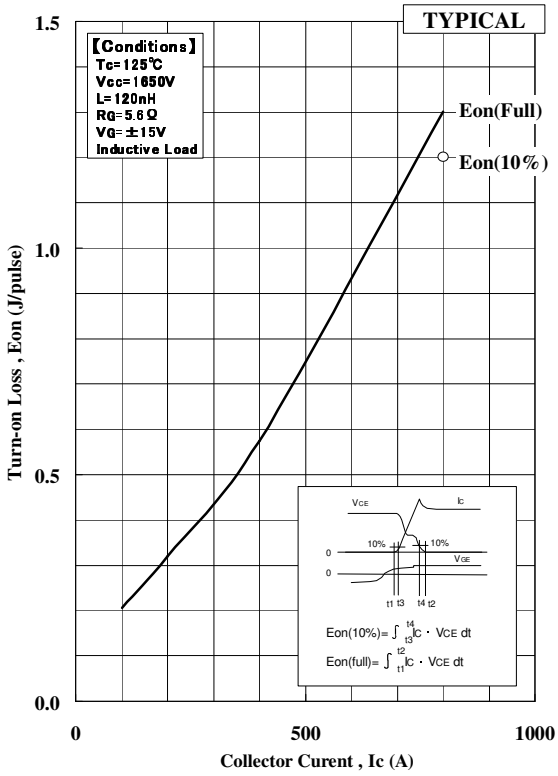
6.2.3 DEPENDENCE OF CURRENT

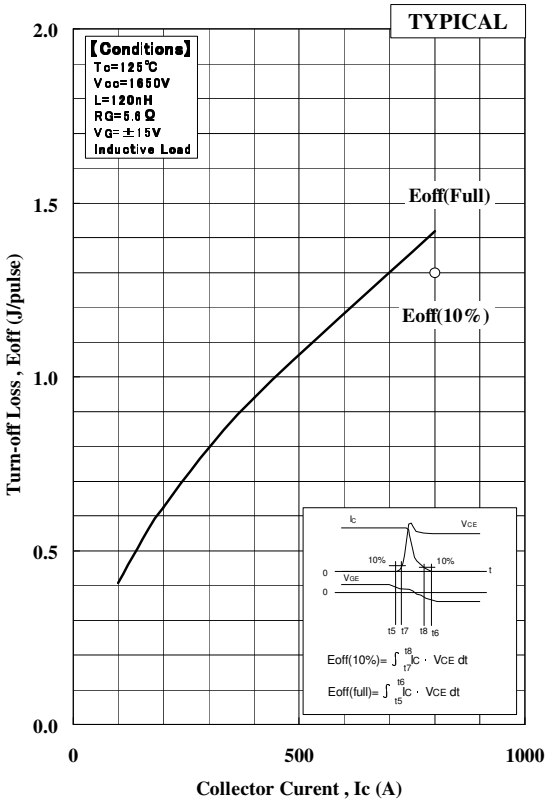


Switching time vs. Collector current

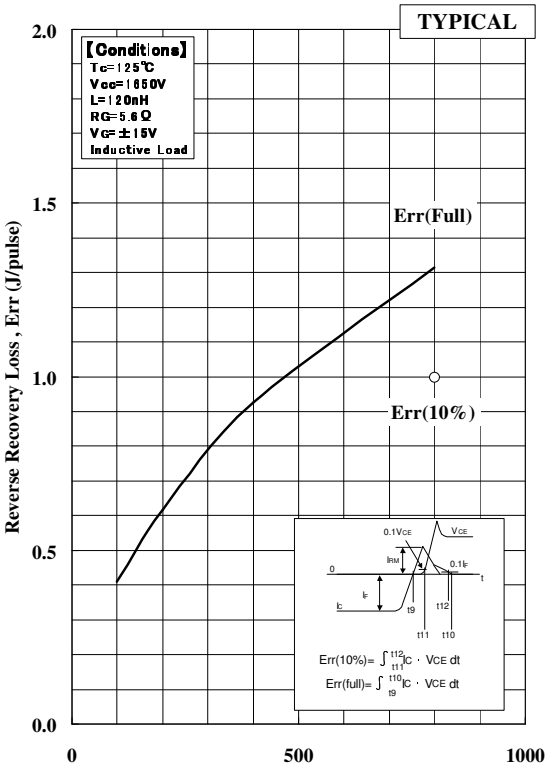


Turn-on Loss vs.Collector Current

Tc=125°C



Turn-off Loss vs.Collector Current



Recovery Loss vs.Collector Current

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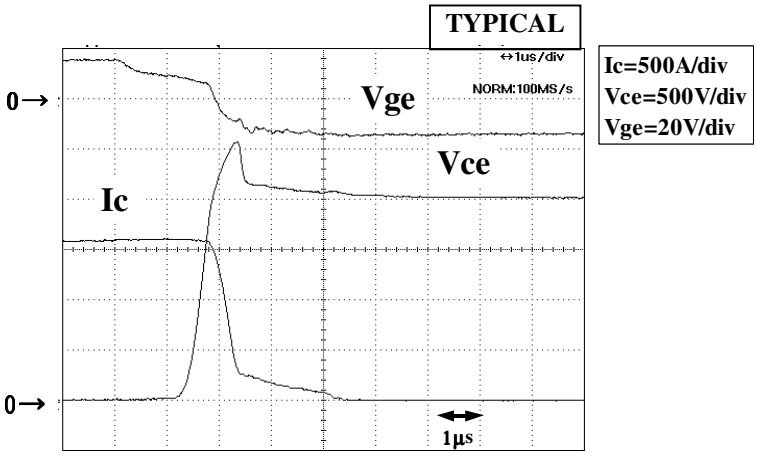
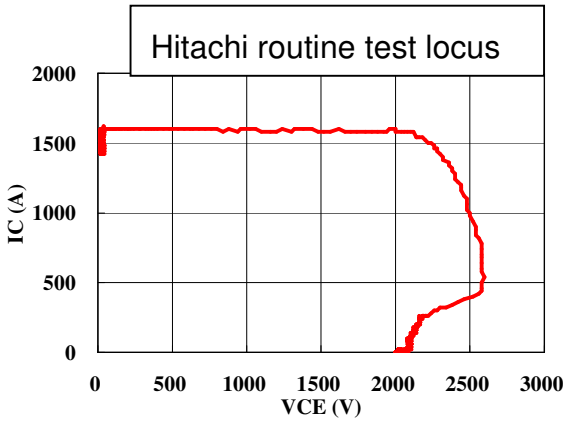
6.2.4 RBSOA/RecSOA/SCSOA

RBSOA

Ls=120nH, Vcc=200V, Ic=1600A, VGE=±15V,
Rg(on/off)=5.6/5.6Ω, Tc=125℃
(Measured at auxiliary terminal)



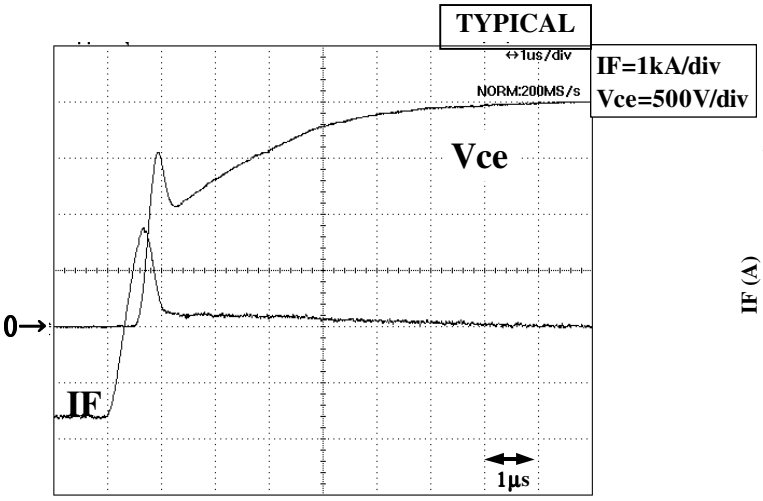
RBSOA Waveform of Hitachi routine test



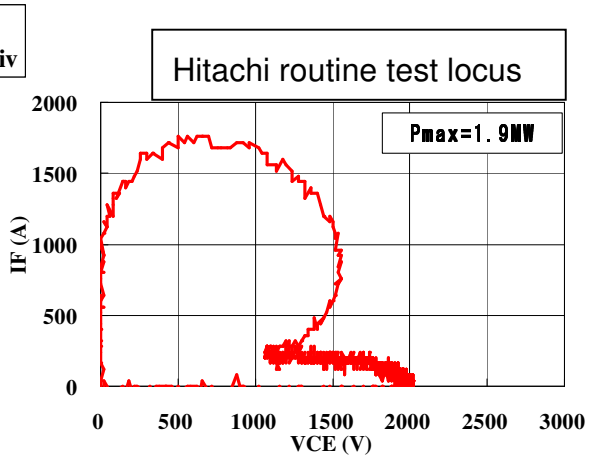
RBSOA Vce-Ic locus of Hitachi routine test.

Recovery SOA

Ls=120nH, Vcc=2000V, Ic=-IF=1600A, VGE=±15V,
Rg(on/off)=5.6/5.6Ω, Tc=125℃
(Measured at auxiliary terminal)



RecSOA Waveform of Hitachi routine test



RecSOA Vce-Ic locus of Hitachi routine test.

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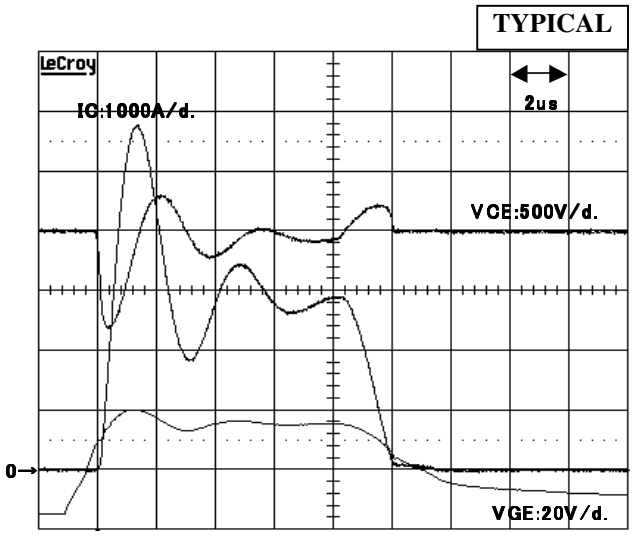
SCSOA

Ls=120nH, Vcc=200V, VGE=±15V,
Rg(on/off)=5.6/56Ω, Tc=125℃
Vge Clamped at +/-15V
(Measured at auxiliary terminal)



SCSOA Waveform of Hitachi type test

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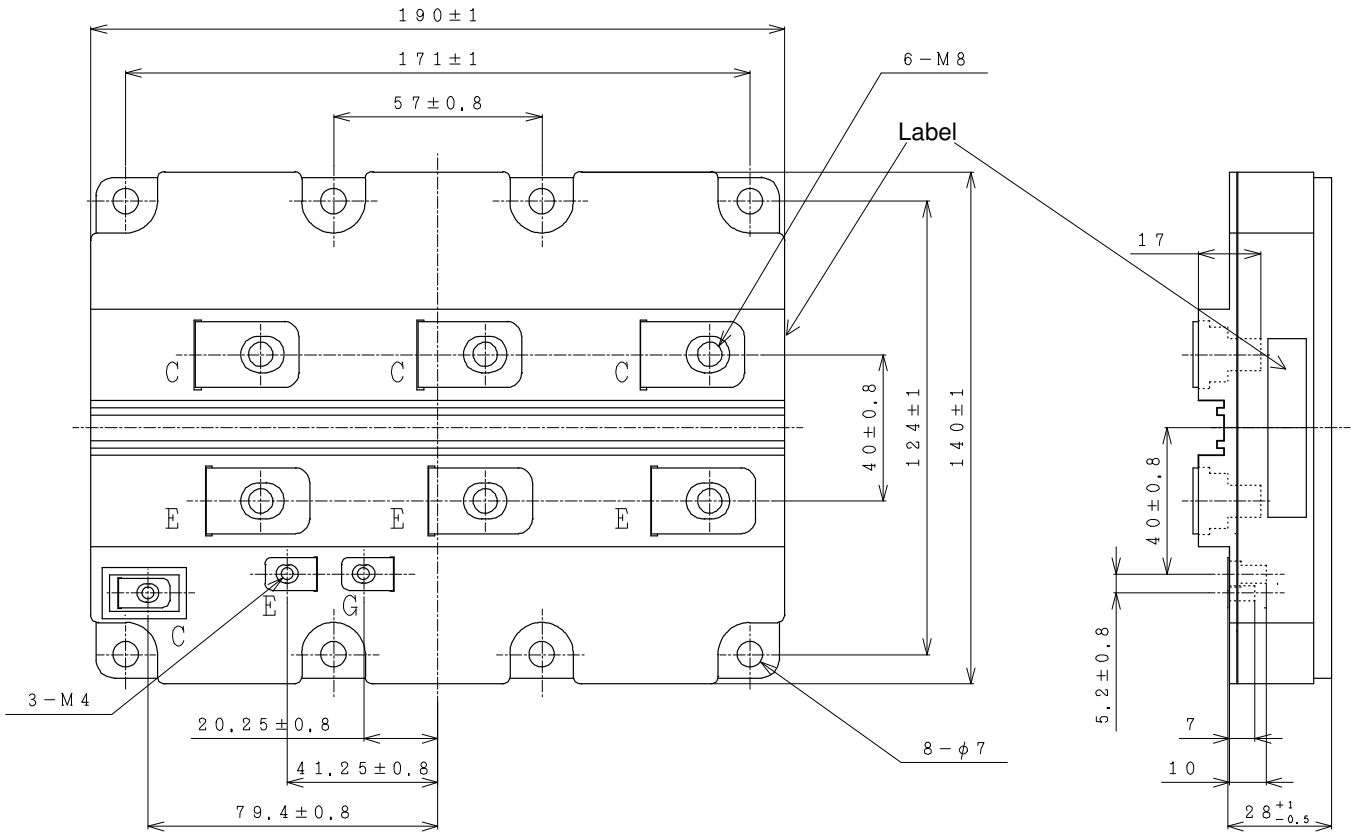
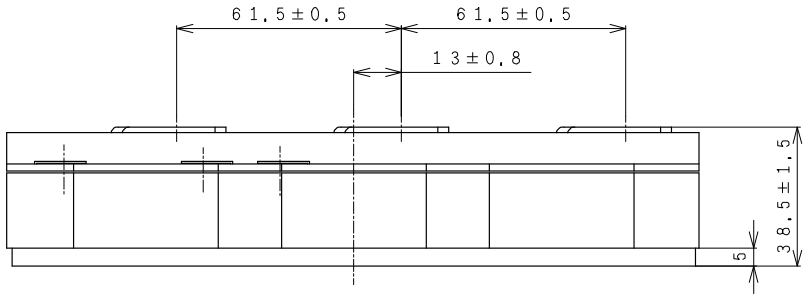
7. PACKAGE OUTLINE DRAWING





Weght : 1300g

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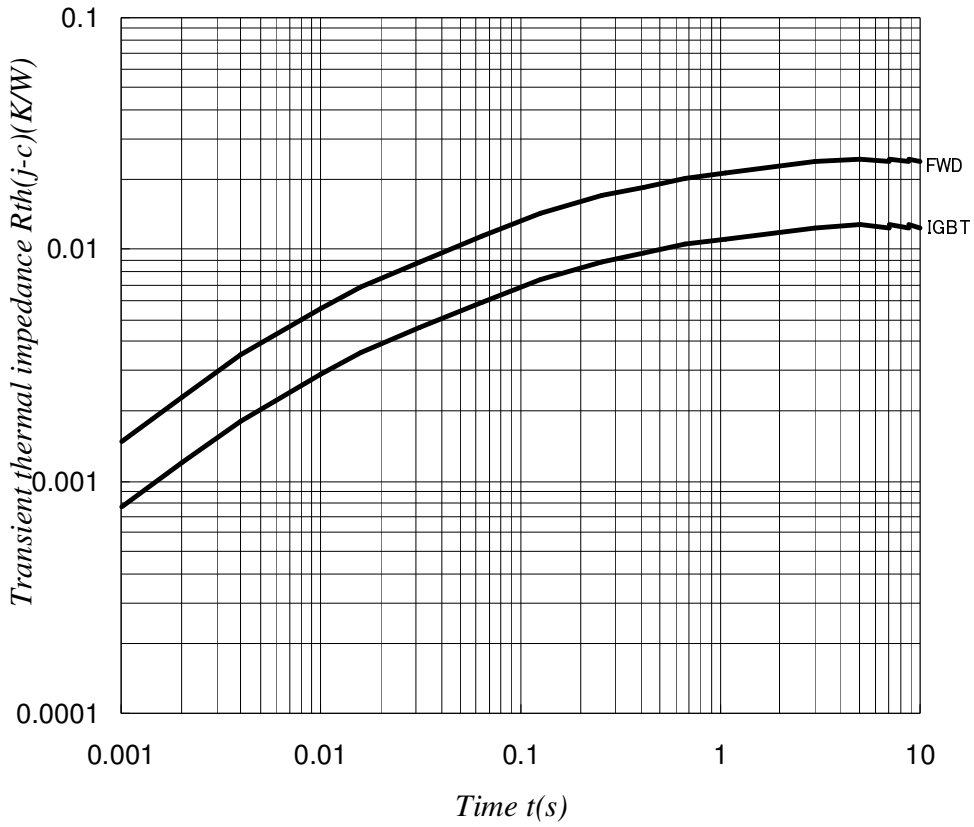
8. Thermal Impedance

8.1 TRANSIENT THERMAL IMPEDANCE



Transient thermal impedance curve (Max value)

9. Negative environmental impact material

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
Arsenic and its compounds	Si chip

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HITACHI POWER SEMICONDUCTORS

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