MBL400E33D

Silicon N-channel IGBT

FEATURES

* High thermal fatigue durability.(delta Tc=70°C, N>30,000cycles)
* High speed, low loss IGBT module.
* Low noise due to built-in free-wheeling diode
  – ultra soft fast recovery diode(USFD).
* Low driving power due to low input capacitance MOS gate.
* High reliability, high durability module.
* Isolated heat sink (terminal to base).

ABSOLUTE MAXIMUM RATINGS (Tc=25°C)

Item		Symbol	Unit	MBL400E33D
Collector Emitter Voltage		VCES	V	3,300
Gate Emitter Voltage		VGES	V	±20
Collector Current	DC	IC	A	400
	1ms	ICp		800
Forward Current	DC	IF	A	400
	1ms	IFM		800
Junction Temperature		Tj	°C	-40 ~ +125
Storage Temperature		Tstg	°C	-40 ~ +125
Isolation Voltage		VISO	VRMS	6,000(AC 1 minute)
Screw Torque	Terminals (M4/M8)	-	N·m	2/22 (1)
	Mounting (M6)	-		6 (2)

Notes: (1) Recommended Value 1.8±0.2/22±1N·m (2) Recommended Value 5.5±0.5N·m

ELECTRICAL CHARECTERISTICS

1) IGBT + FWD

Item		Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Collector Emitter Cut-Off Current		ICES	mA	-	-	12.0	VCE=3,300V, VGE=0V, Tj=25°C
Gate Emitter Leakage Current		IGES	nA	-	-	±500	VGE=±20V, VCE=0V, Tj=25°C
Collector Emitter Saturation Voltage		VCE(sat)	V	3.5	4.2	5.0	IC=400A, VGE=15V, Tj=125°C
Gate Emitter Threshold Voltage		VGE(TO)	V	4.5	6.0	7.0	VCE=10V, IC=400mA, Tj=25°C
Input Capacitance		Cies	nF	-	35	-	VCE=10V, VGE=0V,f=100kHz, Tj=25°C
Internal Gate Resistance		Rge	Ω	-	3.6	-	
Switching Times	Rise Time	tr	µs	1.0	1.9	3.1	VCC=1,650V, IC=400A L=150nH RG=10Ω (3) VGE=±15V, Tj=125°C
	Turn On Time	ton		1.5	2.4	3.3	
	Fall Time	tf		0.5	1.0	2.5	
	Turn Off Time	toff		2.0	3.0	5.1	
Peak Forward Voltage Drop		VFM	V	2.0	2.5	3.0	-IC=400A, VGE=0V, Tj=125°C
Reverse Recovery Time		trr	µs	-	0.6	-	VCC=1,650V, IF=400A (4) L=150nH, Tj=125°C
Thermal Impedance	IGBT	Rth(j-c)	K/W	-	-	0.026	Junction to case
	FWD	Rth(j-c)		-	-	0.052	

2) DIODE

Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Collector Emitter Cut-Off Current	IAKS	mA	-	-	12.0	VAK=3,300V, Tj=25°C
Peak Forward Voltage Drop	VF	V	2.2	2.7	3.2	IF=400A, Tj=125°C At Main terminal (Terminal resistance:0.5mΩ typical)
Reverse Recovery Time	trr	µs	0.2	0.6	1.1	IF =400A, VCC=1,650V (4) L=150nH, Tj=125°C
Thermal Impedance	Rth(j-c)	K/W			0.052	Junction to case

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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DEFINITION OF TEST CIRCUIT

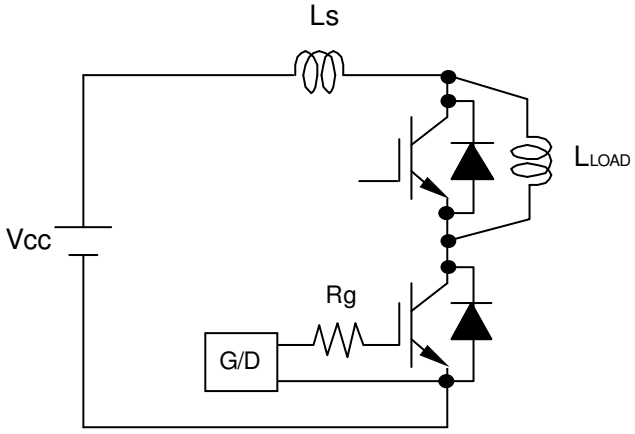
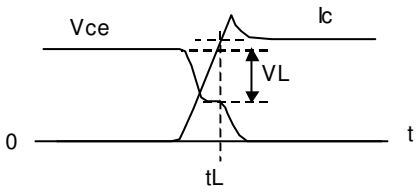
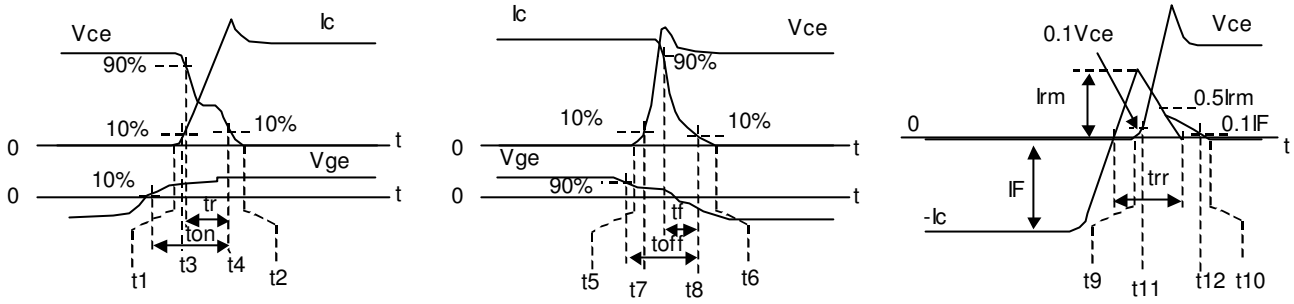


Fig.1 Switching test circuit



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

Fig.2 Definition of Ls



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

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

Fig.3 Definition of switching loss

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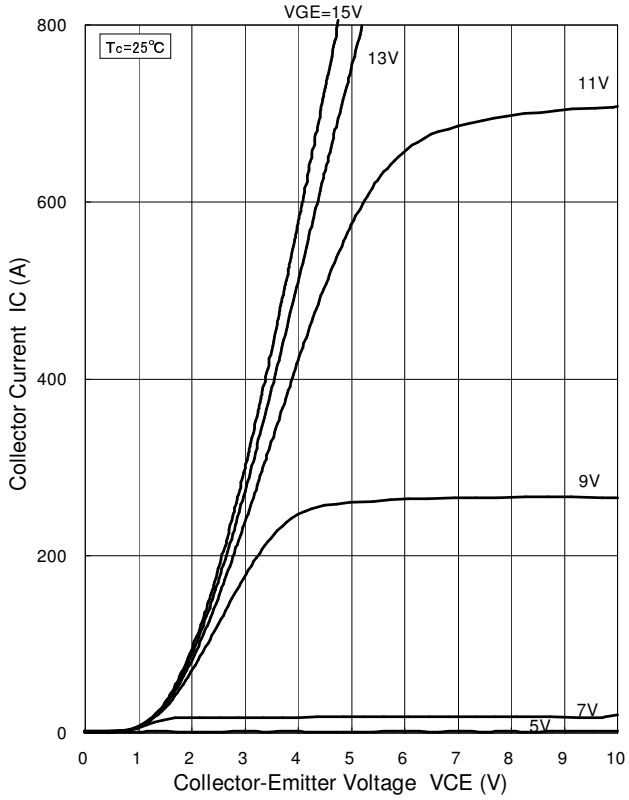
CHARACTERISTICS CURVE

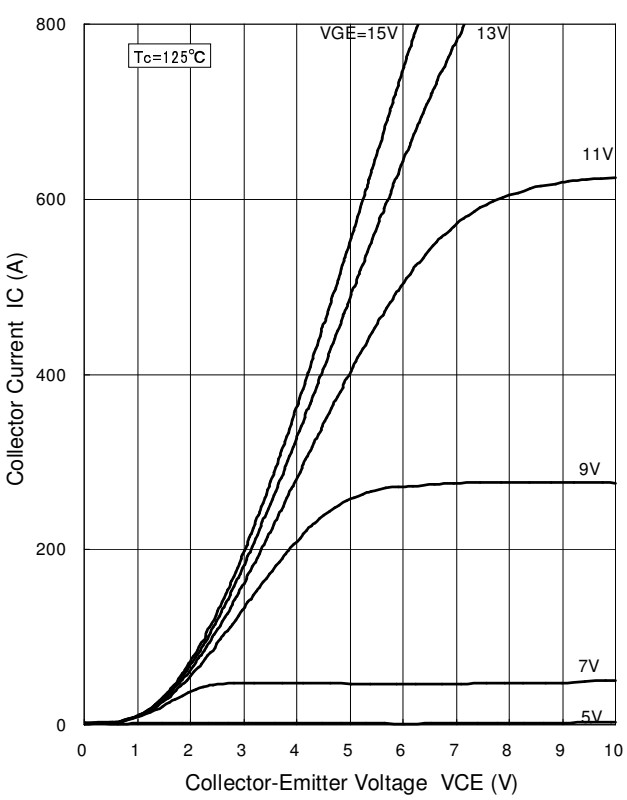
STATIC CHARACTERISTICS

TYPICAL



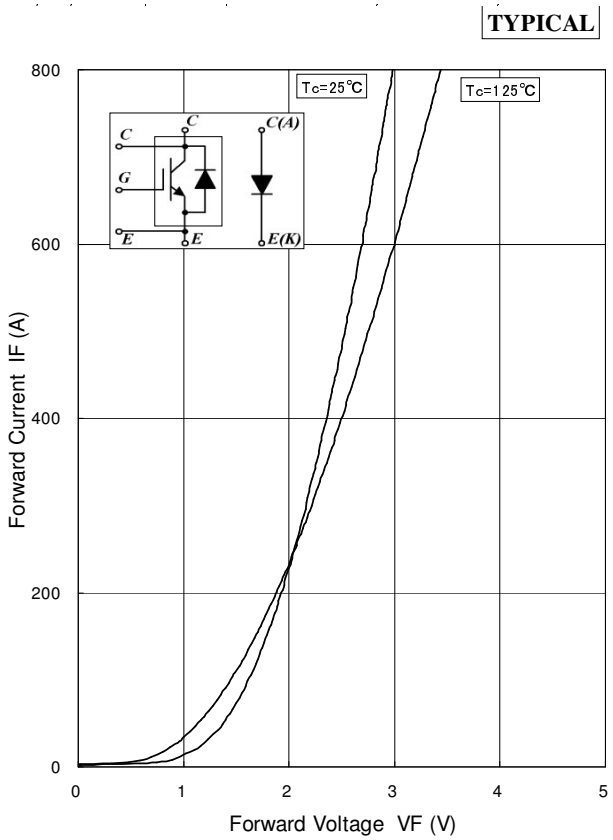
Collector Current vs.Collector to Emitter Voltage

TYPICAL



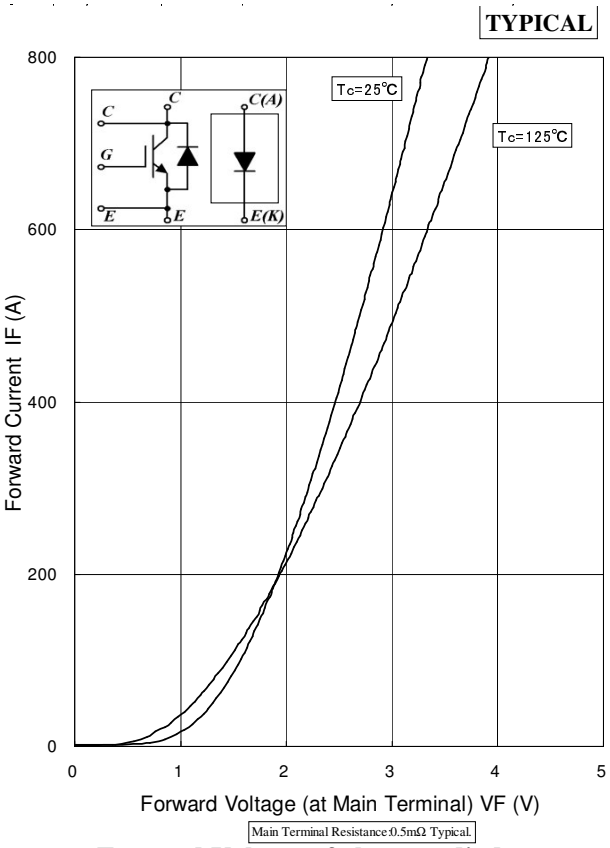
Collector Current vs.Collector to Emitter Voltage

TYPICAL



Forward Voltage of free-wheeling diode

TYPICAL



Forward Voltage of chopper diode

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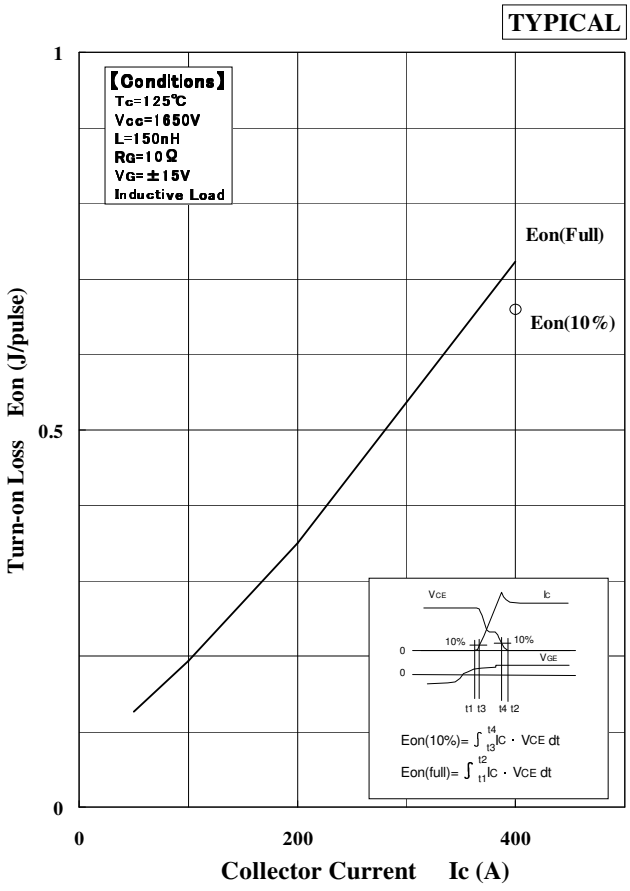
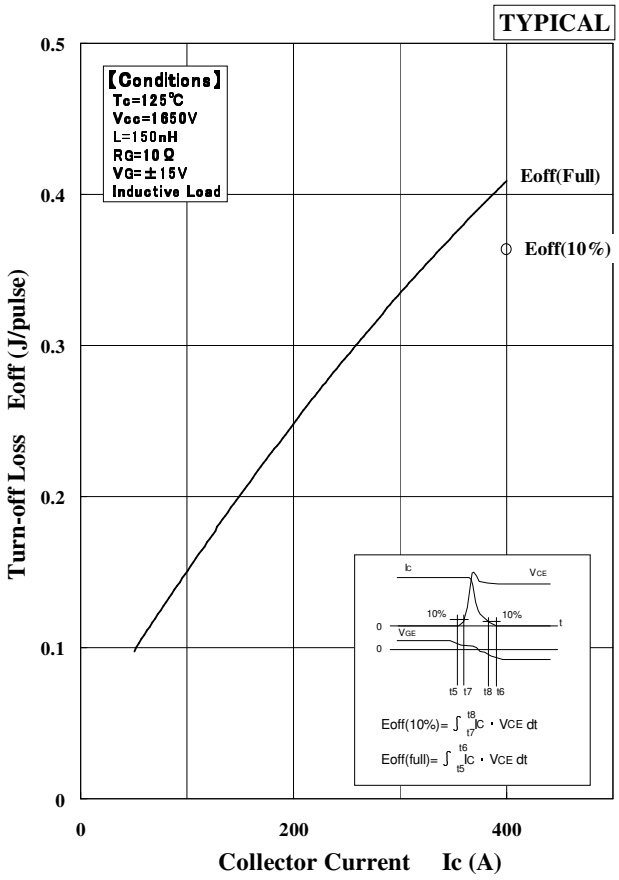
DYNAMIC CHARACTERISTICS

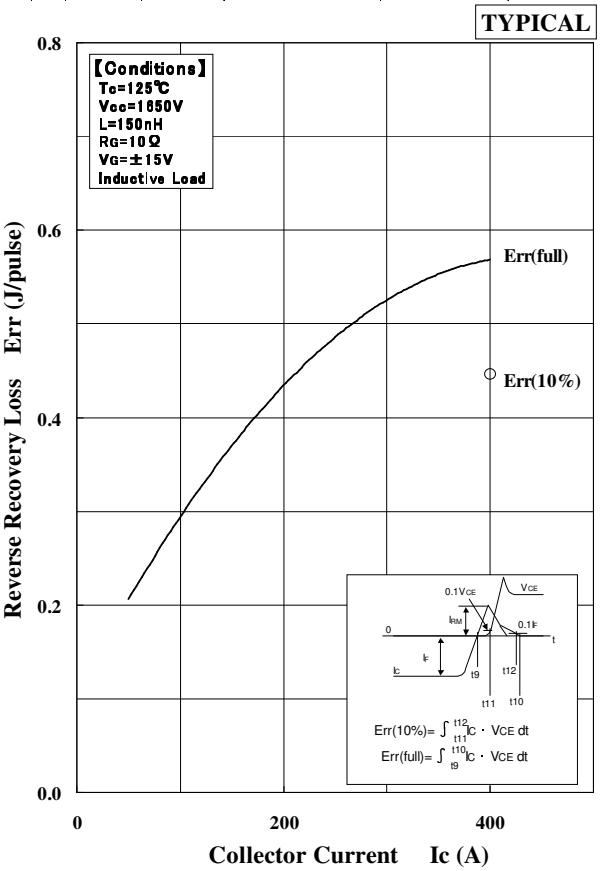
DEPENDENCE OF CURRENT



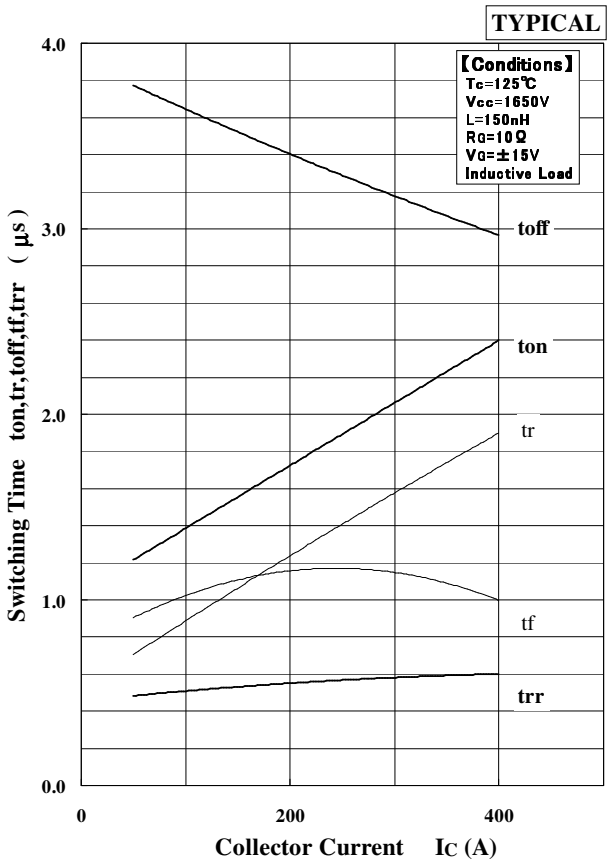
Turn-on Loss vs. Collector Current



Turn-off Loss vs. Collector Current



Recovery Loss vs. Collector Current



Switching Time vs. Collector Current

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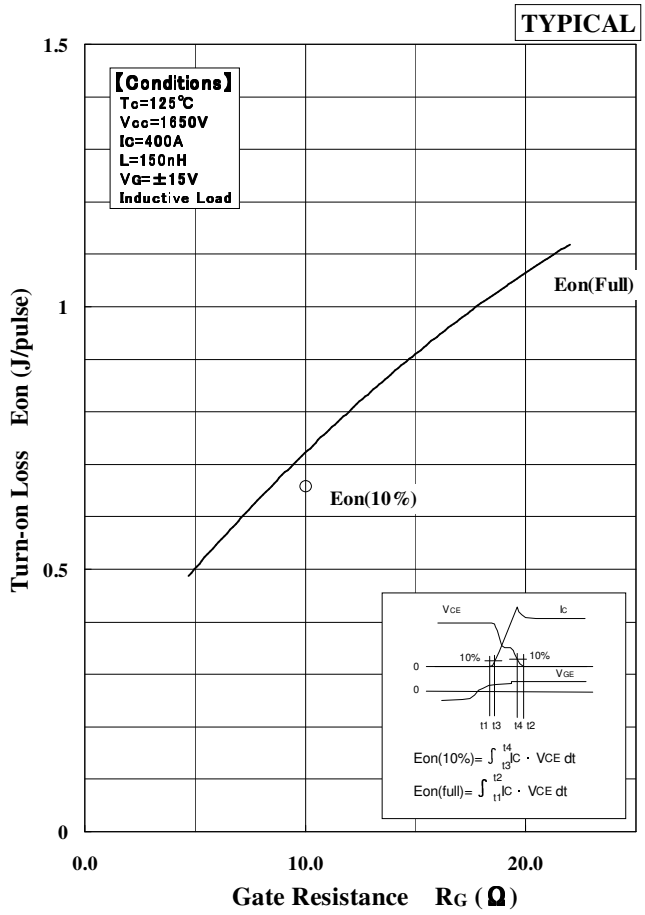
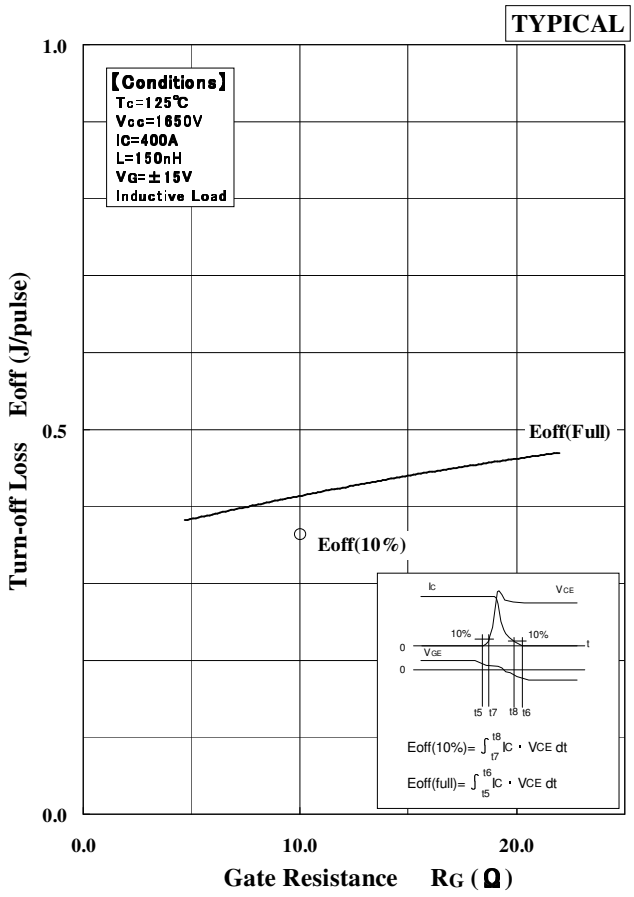
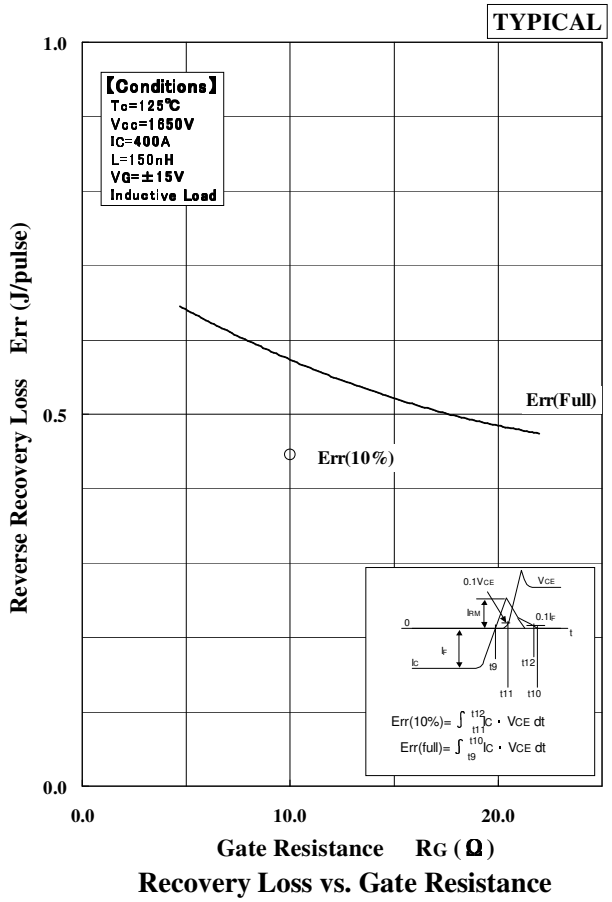
DEPENDENCE OF RG



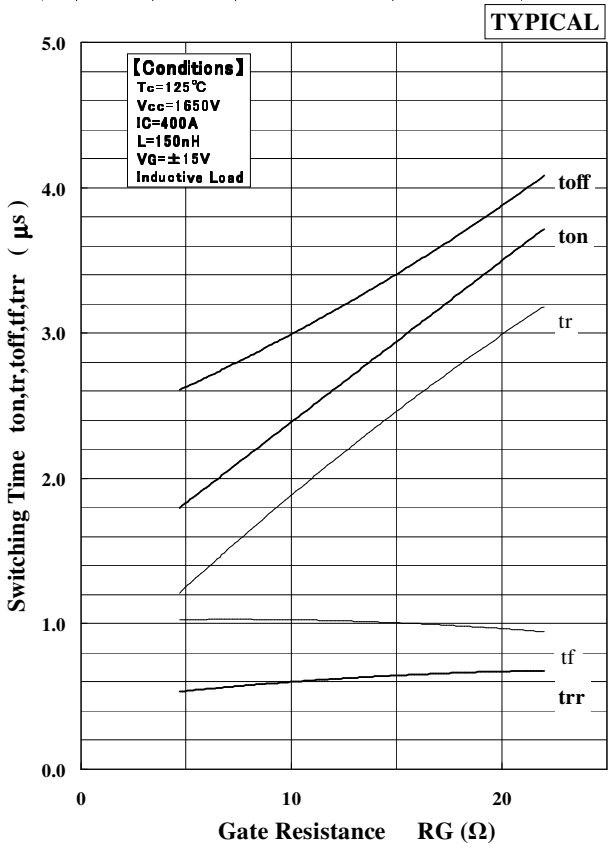
Turn-on Loss vs. Gate Resistance



Turn-off Loss vs. Gate Resistance



Recovery Loss vs. Gate Resistance



Switching Time vs. Gate Resistance

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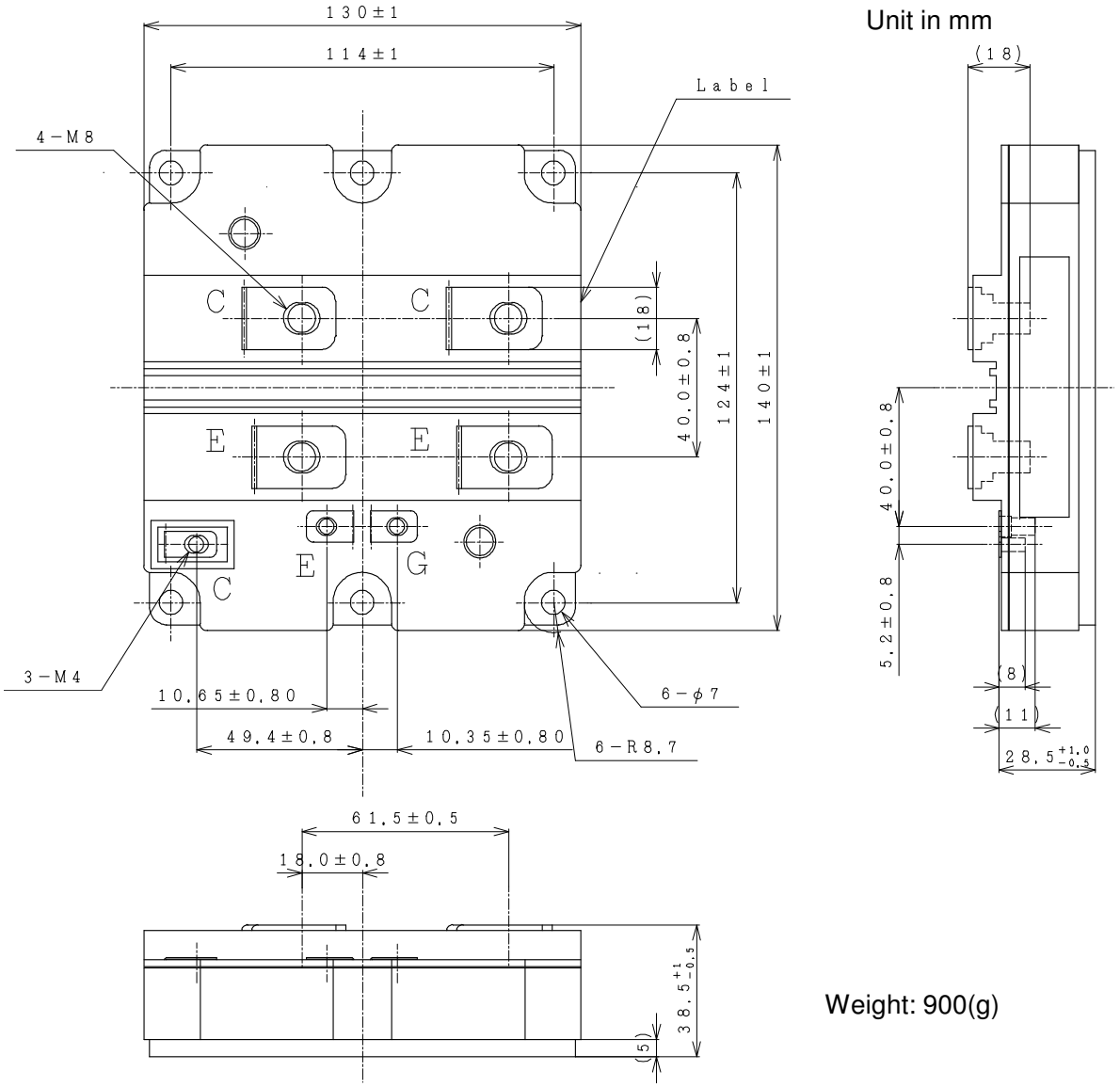
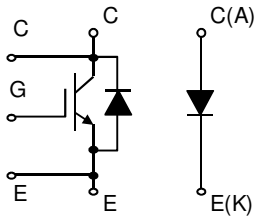
PACKAGE OUTLINE DRAWING

Unit in mm



Weight: 900(g)



Circuit diagram

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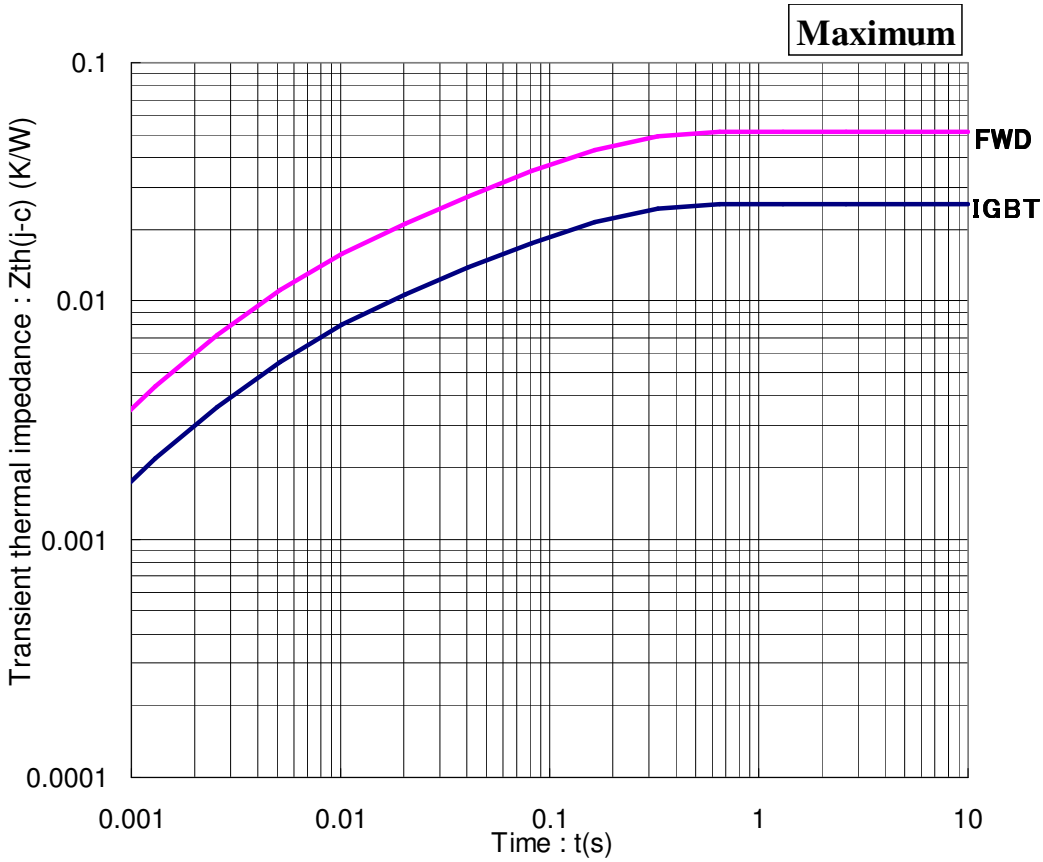
TRANSIENT THERMAL IMPEDANCE



Transient Thermal Impedance 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

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