MBM500E33E2-R

Silicon N-channel IGBT 3300V E2 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=25ºC)

Item		Symbol	Unit	MBM500E33E2-R
Collector Emitter Voltage		V_{CES}	V	3,300
Gate Emitter Voltage		V_{GES}	V	±20
Collector Current	DC	I_C	A	500 (Tc=95 ºC)
	1ms	I_{Cp}		1,000
Forward Current	DC	I_F	A	500
	1ms	I_{FM}		1,000
Operating Junction Temperature		$T_{vj,op}$	°C	-50 ~ +150
Maximum Junction Temperature		$T_{vj,max}$	°C	175 (1)
Storage Temperature		T_{stg}	°C	-55 ~ +125
Isolation Voltage		V_{ISO}	V_{RMS}	6,000(AC 1 minute)
Screw Torque	Terminals (M4/M8)	-	N·m	2/15 (2)
	Mounting (M6)	-		6 (3)

Notes: (1) Only static operation is applicable. Please refer to LD-ES-130737.
(2) Recommended Value $1.8\pm0.2/15^{+0}_{-3}$N·m (3) 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	-	-	4	V_{CE}=3,300V, V_{GE}=0V, Tj=25ºC
				-	7	20	V_{CE}=3,300V, V_{GE}=0V, Tj=125ºC
Gate Emitter Leakage Current		I_{GES}	nA	-500	-	+500	V_{GE}=±20V, V_{CE}=0V, Tj=25ºC
Collector Emitter Saturation Voltage		$V_{CE(sat)}$	V	2.5	2.95	3.5	I_C=500A, V_{GE}=15V, Tj=125ºC
				-	3.1	-	I_C=500A, V_{GE}=15V, Tj=150ºC
Gate Emitter Threshold Voltage		$V_{GE(TO)}$	V	5.5	6.5	7.5	V_{CE}=10V, I_C=500mA, Tj=25ºC
Input Capacitance		C_{ies}	nF	-	65	-	V_{CE}=10V, V_{GE}=0V, f=100kHz, Tj=25ºC
Internal Gate Resistance		Rge	Ω	-	2.1	-	V_{CE}=10V, V_{GE}=0V, f=100kHz, Tj=25ºC
Switching Times	Rise Time	t_r	µs	0.8	1.3	1.8	V_{CC}=1,650V, I_C=500A
	Turn On Time	t_{on}		0.7	1.7	2.1	Ls=150nH
	Fall Time	t_f		0.9	1.7	2.6	R_G(on/off)=5.6Ω/8.2Ω (4)
	Turn Off Time	t_{off}		2.1	3.8	4.9	V_{GE}=±15V, Tj=125ºC
Peak Forward Voltage Drop		V_{FM}	V	2.2	2.5	3.0	IF=500A, V_{GE}=0V, Tj=125ºC
				-	2.5	-	IF=500A, V_{GE}=0V, Tj=150ºC
Reverse Recovery Time		t_{rr}	µs	-	0.60	0.87	V_{CC} =1,650V, IF=500A, Ls=150nH Tj=125ºC, R_G(on)=5.6Ω, V_{GE}=±15V
Short Circuit Pulse Width		t_{SC}	µs	10	-	-	V_{CC}=2200V,Ls=130nH R_G(on/off)=5.6/82Ω,V_{GE}=±15V,Tj=150ºC
Turn On Loss		$E_{on(10\%)}$	J/P	-	0.65	0.95	Tj=125ºC
		$E_{on(full)}$		-	0.70	-	
				-	0.75	-	Tj=150ºC
Turn Off Loss		$E_{off(10\%)}$	J/P	-	0.72	0.86	Tj=125ºC
		$E_{off(full)}$		-	0.79	-	
				-	0.82	-	Tj=150ºC
Reverse Recovery Loss		$E_{rr(10\%)}$	J/P	-	0.66	0.80	Tj=125ºC
		$E_{rr(full)}$		-	0.78	-	
				-	0.93	-	Tj=150ºC

V_{CC}=1,650V, I_C=500A, Ls=150nH, R_G(on/off)=5.6Ω/8.2Ω (4) V_{GE}=±15V

Notes:(4) R_G 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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THERMAL CHARACTERISTICS

Item		Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Thermal Impedance	IGBT	Rth(j-c)	K/W	-	-	0.024	Junction to case
	FWD	Rth(j-c)		-	-	0.049	
Contact Thermal Impedance		Rth(c-f)	K/W	-	0.008	-	Case to fin (λgrease=1W/(m･K), heat-sink flatness ≤50um)

MODULE MECHANICAL CHARACTERISTICS

Item		Unit	Characteristics	Conditions
Weight		g	900	
Creepage Distance	Between terminal	mm	>34	E2aux-C2aux
	Terminal-Base	mm	>32	Base-E1aux
Clearance Distance	Between terminal	mm	>19	C1main-E1aux
	Terminal-Base	mm	>28	Base-E1aux
Stray inductance in module		nH	36	Collector-main to Emitter-main
Comparative Tracking Index (CTI)			600	
Module base plate Material			Al-SiC	
Baseplate Thickness		mm	5	
Insulation plate Material			Al N	
Terminal Surface treatment			Ni plating	
Case Material			Poly-Phenilene Sulfide	
Fire and Smoke Category			I2 / F3	NFF 16-102

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DEFINITION OF TEST CIRCUIT

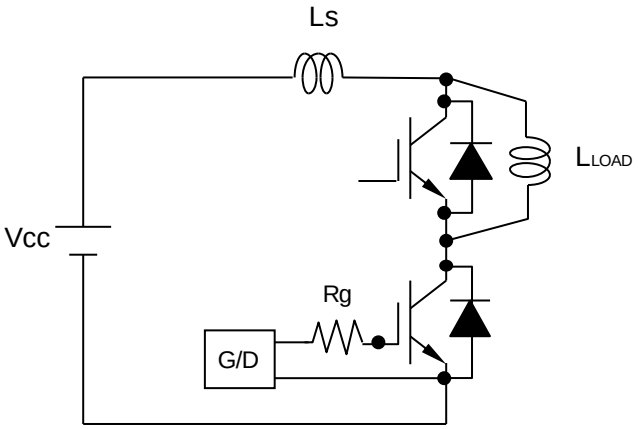
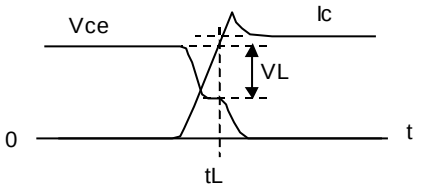
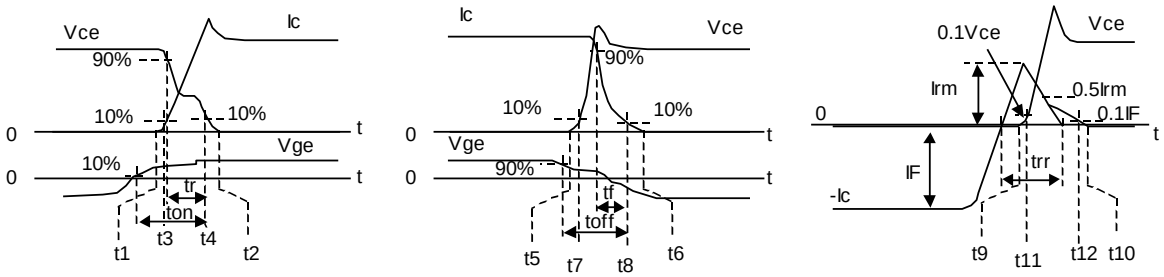


Fig.1 Switching test circuit



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

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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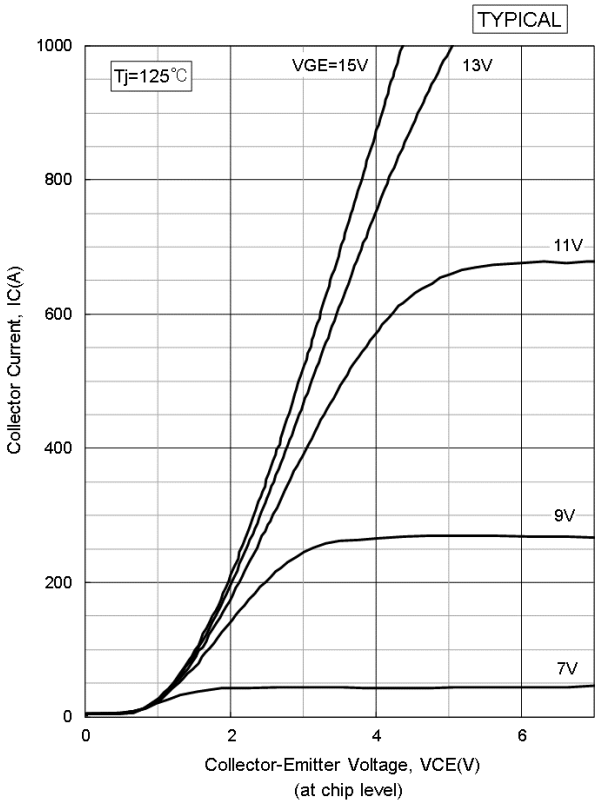
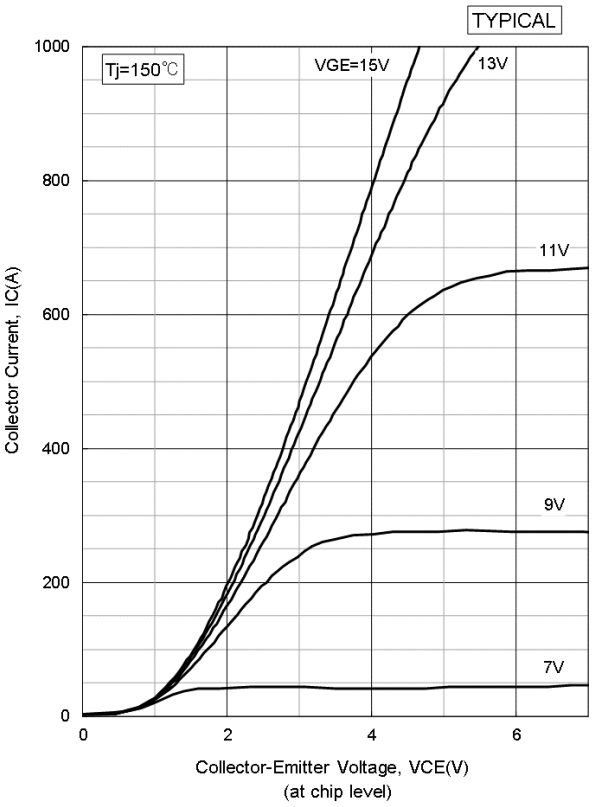
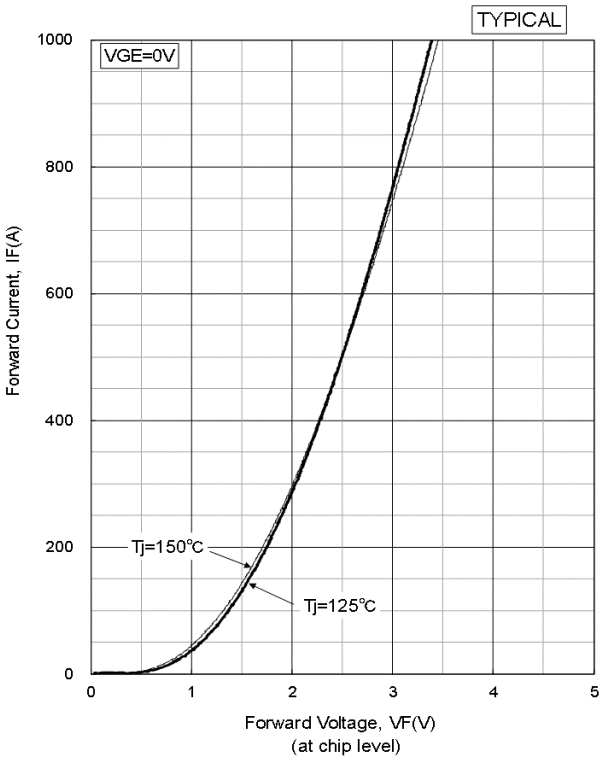
STATIC CHARACTERISTICS



IC vs. VCE



IC vs. VCE



IF vs. VF

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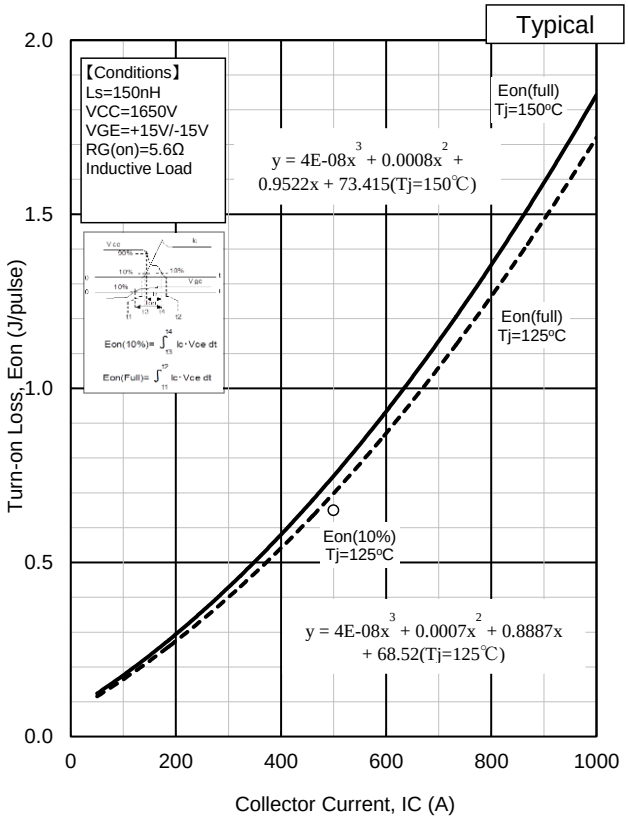
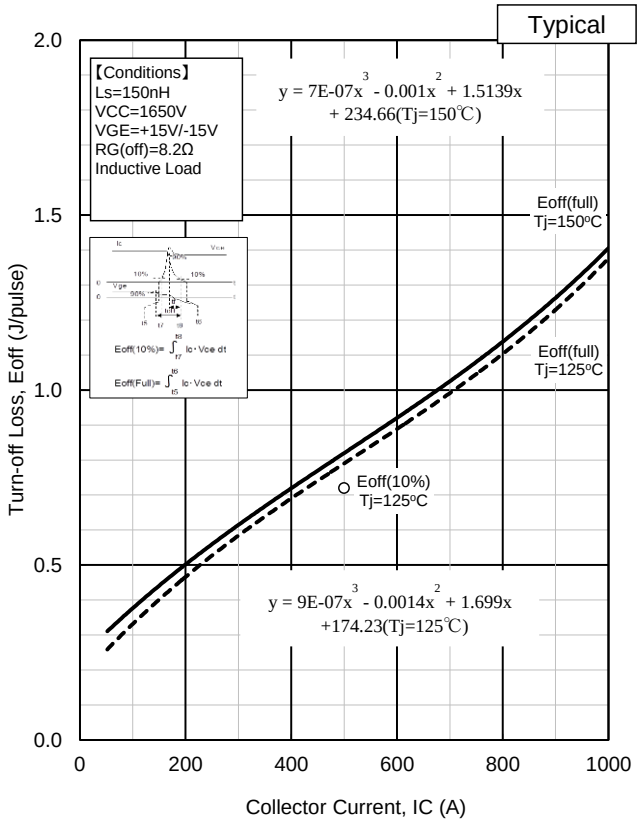
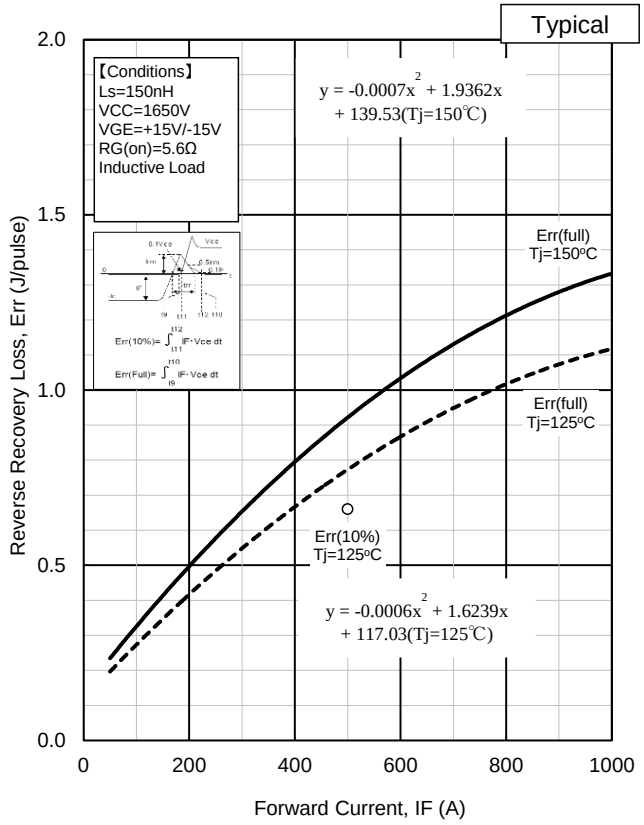
DYNAMIC CHARACTERISTICS



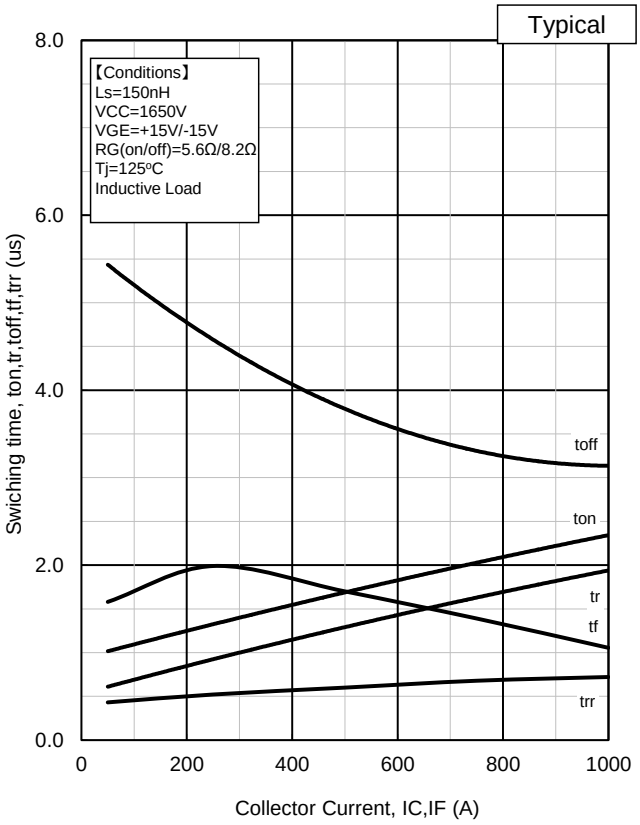
Turn-on loss vs. Collector current



Turn-off loss vs. Collector current



Recovery loss vs. Forward current



Switching time vs. Collector current

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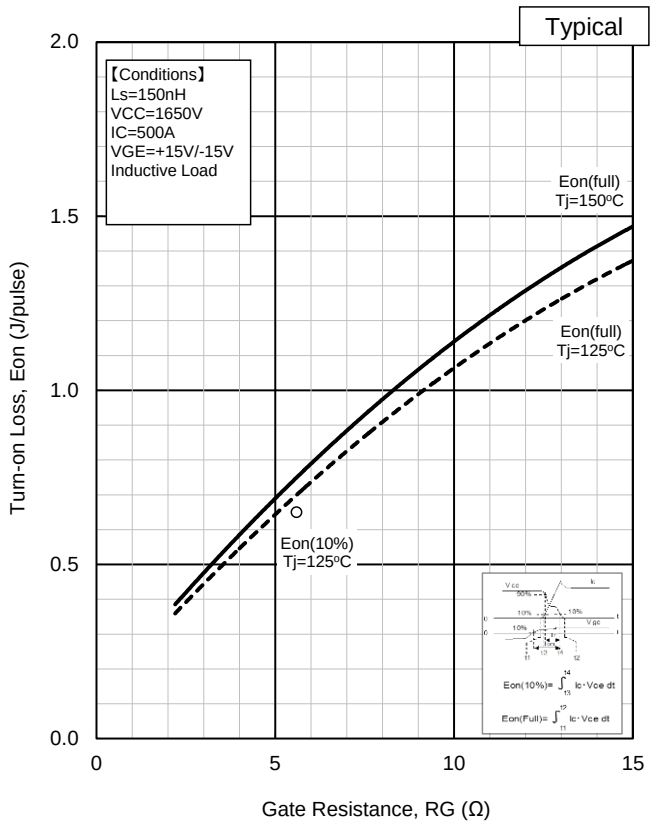
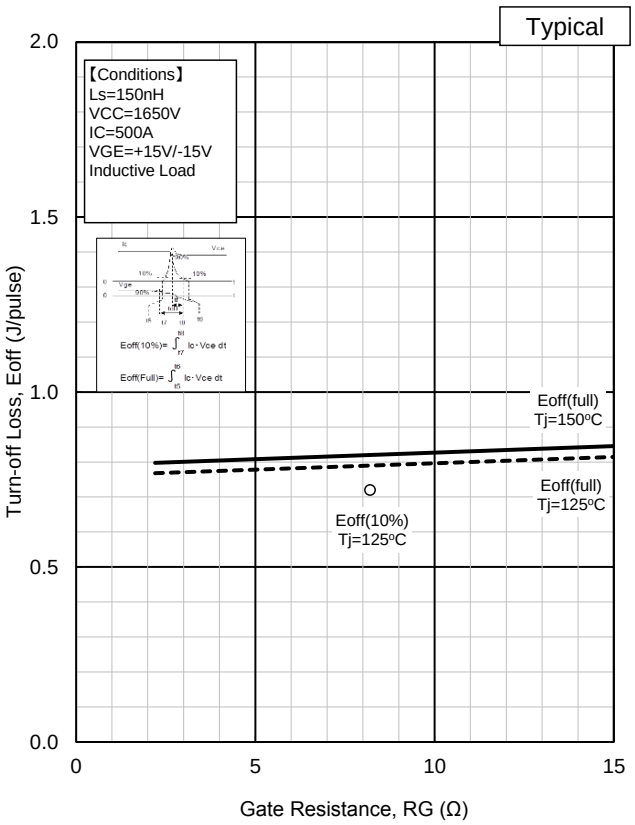
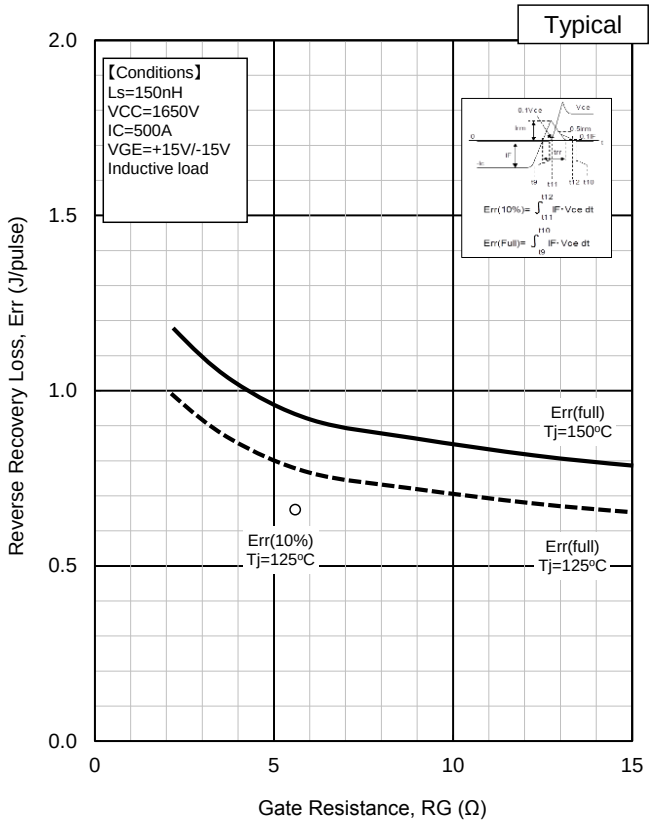


Turn-on loss vs. Gate Resistance



Turn-off loss vs. Gate Resistance



Recovery loss vs. Gate Resistance

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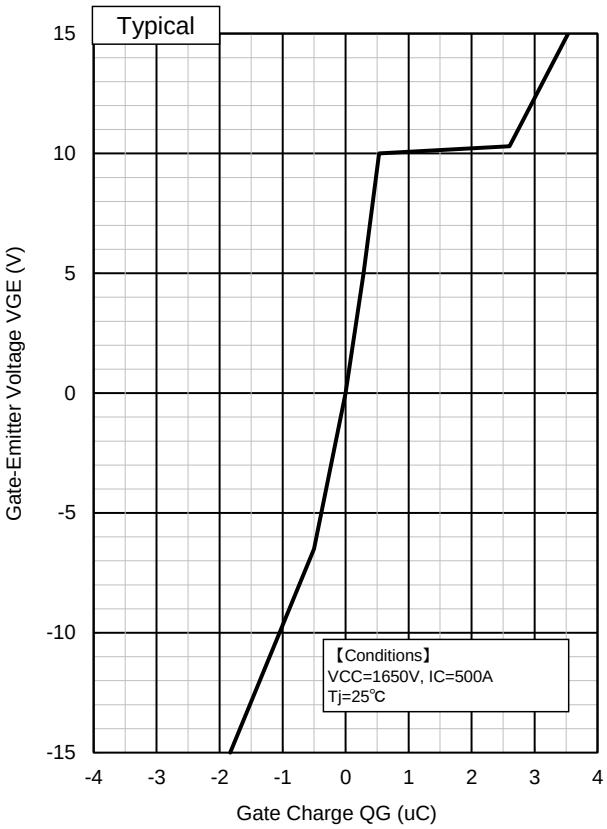
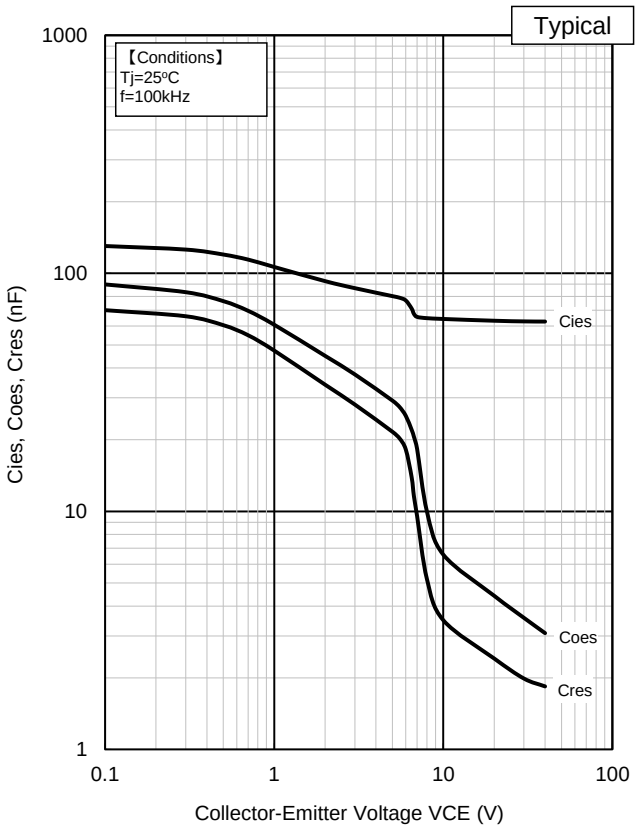
QG-VG Curve



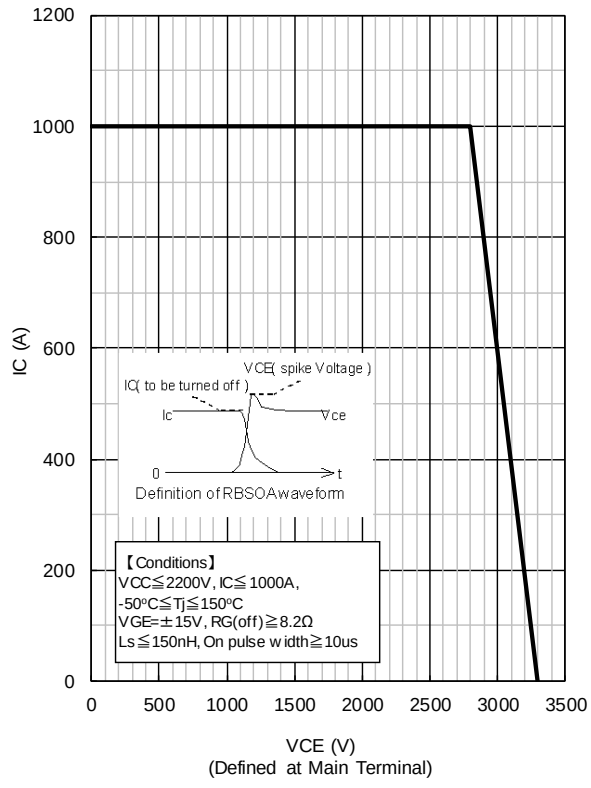
QG vs. VGE

Cies, Coes, Cres curve

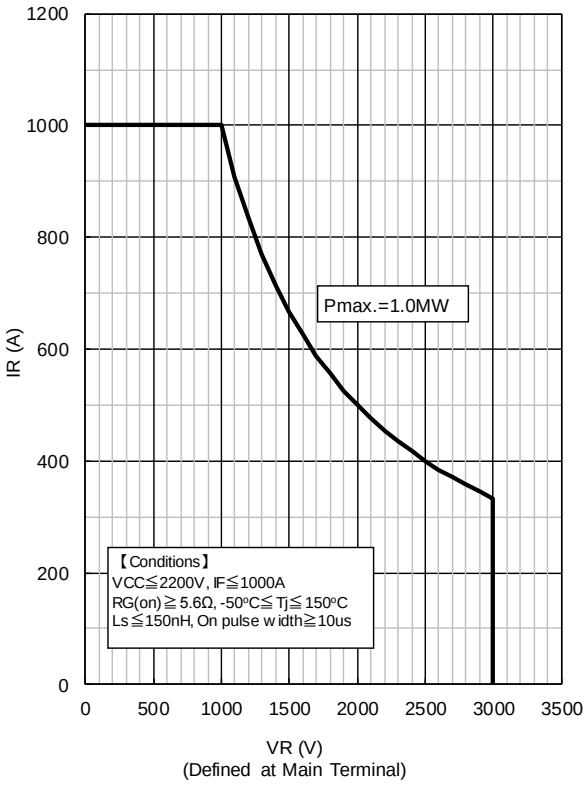


Cies, Coes, Cres vs. VCE

Safe Operation Area



RBSOA



RecSOA

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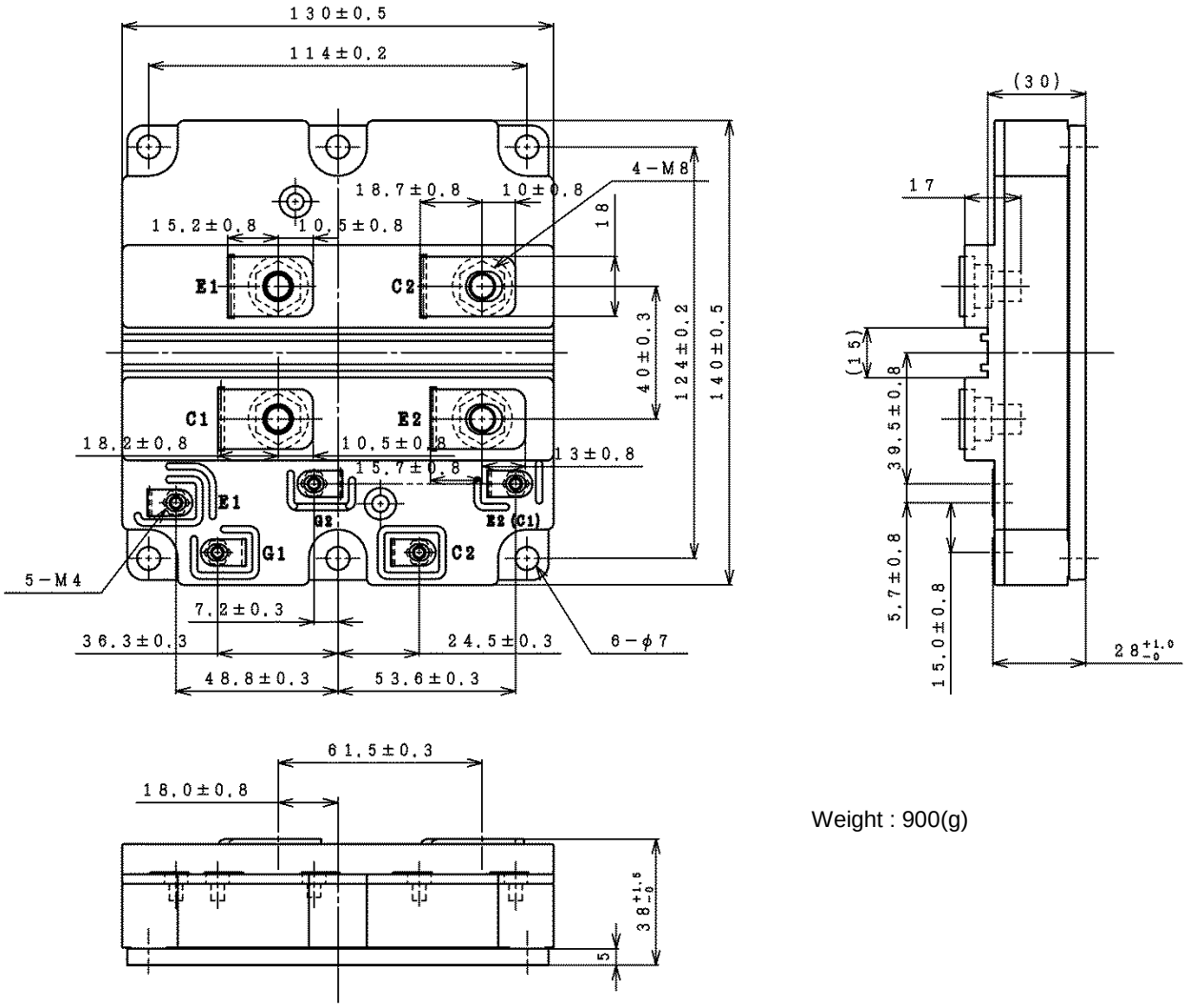
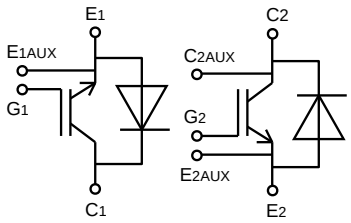
OUTLINE DRAWINGS

Unit in mm



Weight : 900(g)

CIRCUIT DIAGRAM



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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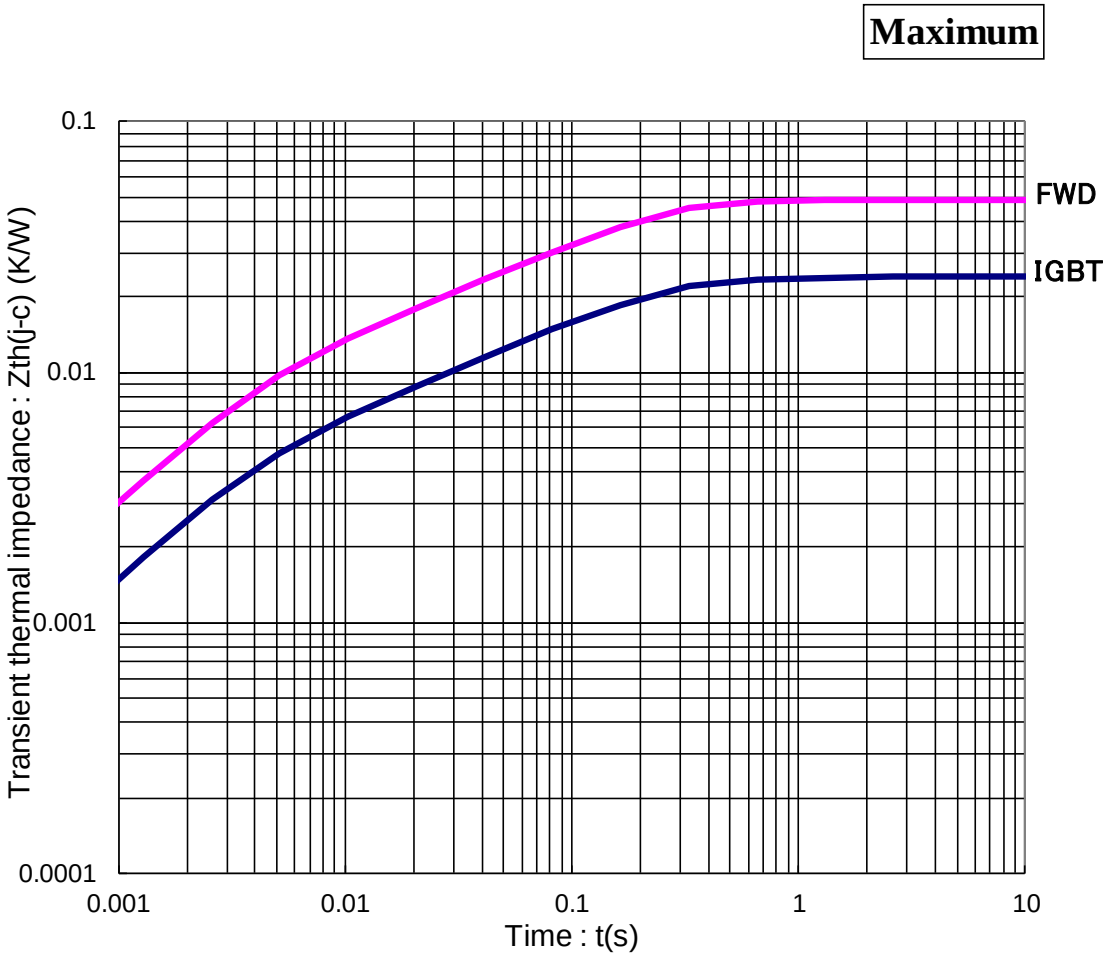
TRANSIENT THERMAL IMPEDANCE



Transient Thermal Impedance Curve

Curve approximation model

(ΣRth[n]*(1-exp(-t/τth[n])))

n	1	2	3	4	Unit
τ th[n]	1.60E-01	2.77E-02	4.10E-03	8.07E-04	sec
Rth[n,IGBT]	1.49E-02	4.33E-03	4.28E-03	5.03E-04	K/W
Rth[n,Diode]	3.02E-02	9.24E-03	8.50E-03	1.06E-03	K/W

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HITACHI POWER SEMICONDUCTORS

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