

# MBM500E33E2

## Target Specification

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:  
( $\Delta T_c=70K$ ,  $N>30,000$ cycles)  
AlSiC base-plate/AlN substrate

### ABSOLUTE MAXIMUM RATINGS ( $T_c=25^\circ C$ )

Item	Symbol	Unit	MBM500E33E2
Collector Emitter Voltage	$V_{CES}$	V	3,300
Gate Emitter Voltage	$V_{GES}$	V	$\pm 20$
Collector Current	DC	$I_C$	500 ( $T_c=95^\circ C$ )
	1ms	$I_{cp}$	1,000
Forward Current	DC	$I_F$	500
	1ms	$I_{FM}$	1,000
Junction Temperature	$T_j$	$^\circ C$	-40 ~ +150
Storage Temperature	$T_{stg}$	$^\circ C$	-50 ~ +125
Isolation Voltage	$V_{ISO}$	$V_{RMS}$	6,000(AC 1 minute)
Screw Torque	Terminals (M4/M8)	-	2/15 (1)
	Mounting (M6)	-	6 (2)

Notes: (1) Recommended Value  $1.8 \pm 0.2 / 15^{+0}_{-3} N \cdot m$

(2) Recommended Value  $5.5 \pm 0.5 N \cdot m$

### ELECTRIC CHARACTERISTICS

Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Collector Emitter Cut-Off Current	$I_{CES}$	mA	-	-	4	$V_{CE}=3,300V, V_{GE}=0V, T_j=25^\circ C$
Gate Emitter Leakage Current	$I_{GES}$	nA	-500	-	+500	$V_{GE}=\pm 20V, V_{CE}=0V, T_j=25^\circ C$
Collector Emitter Saturation Voltage	$V_{CE(sat)}$	V	tbd	2.95	tbd	$I_C=500A, V_{GE}=15V, T_j=125^\circ C$
			-	3.10	-	$I_C=500A, V_{GE}=15V, T_j=150^\circ C$
Gate Emitter Threshold Voltage	$V_{GE(TH)}$	V	5.5	6.5	7.5	$V_{CE}=10V, I_C=500mA, T_j=25^\circ C$
Input Capacitance	$C_{ies}$	nF	-	65	-	$V_{CE}=10V, V_{GE}=0V, f=100kHz, T_j=25^\circ C$
Internal Gate Resistance	$R_{ge}$	$\Omega$	-	3.2	-	$V_{CE}=10V, V_{GE}=0V, f=100kHz, T_j=25^\circ C$
Switching Times	Rise Time	$t_r$	tbd	1.6	tbd	$V_{CC}=1,650V, I_C=500A$
	Turn On Time	$t_{on}$	tbd	2.2	tbd	$L=150nH$
	Fall Time	$t_f$	tbd	1.7	tbd	$R_G=8.2 \Omega / 8.2 \Omega$
	Turn Off Time	$t_{off}$	tbd	3.8	tbd	$V_{GE}=\pm 15V, T_j=125^\circ C$
Peak Forward Voltage Drop	$V_{FM}$	V	tbd	2.5	tbd	$I_F=500A, V_{GE}=0V, T_j=125^\circ C$
			-	2.5	-	$I_F=500A, V_{GE}=0V, T_j=150^\circ C$
Reverse Recovery Time	$t_{rr}$	$\mu s$	-	0.55	tbd	$V_{CC}=1,650V, I_F=500A, L=150nH$ $T_j=125^\circ C$
Turn On Loss	$E_{on(10\%)}$	J/P	-	0.80	tbd	$T_j=125^\circ C$
	$E_{on(full)}$		-	0.86	-	$T_j=150^\circ C$
Turn Off Loss	$E_{off(10\%)}$	J/P	-	0.72	tbd	$T_j=125^\circ C$
	$E_{off(full)}$		-	0.79	-	$T_j=150^\circ C$
Reverse Recovery Loss	$E_{rr(10\%)}$	J/P	-	0.66	tbd	$T_j=125^\circ C$
	$E_{rr(full)}$		-	0.78	-	$T_j=150^\circ C$

Notes:(3)  $R_G$  and  $C_{GE}$  value are 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, per arm
	FWD	Rth(j-c)	K/W	-	-	0.049	
Contact Thermal Impedance		Rth(c-f)	K/W	-	0.008	-	Case to fin, per module

### PACKAGE CHARACTERISTICS

Item	Unit	Characteristics	Test Conditions	
Stray inductance module	L <sub>SCE</sub>	nH	36	Collector-main to Emitter-main
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
Comparative Tracking Index	CTI	V	600	

### DEFINITION OF TEST CIRCUIT

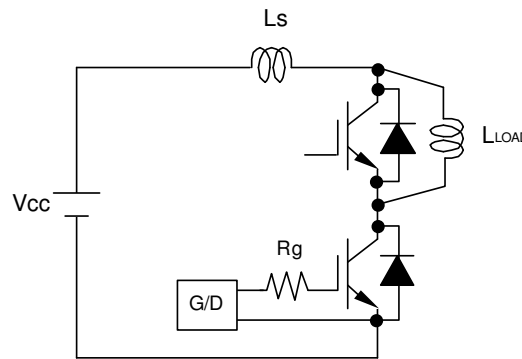


Fig.1 Switching test circuit

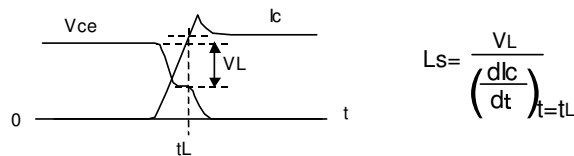


Fig.2 Definition of Ls

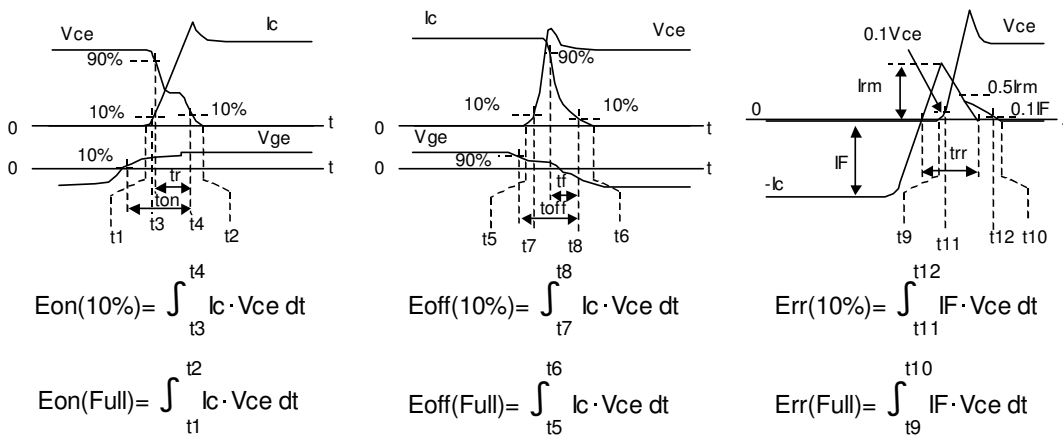
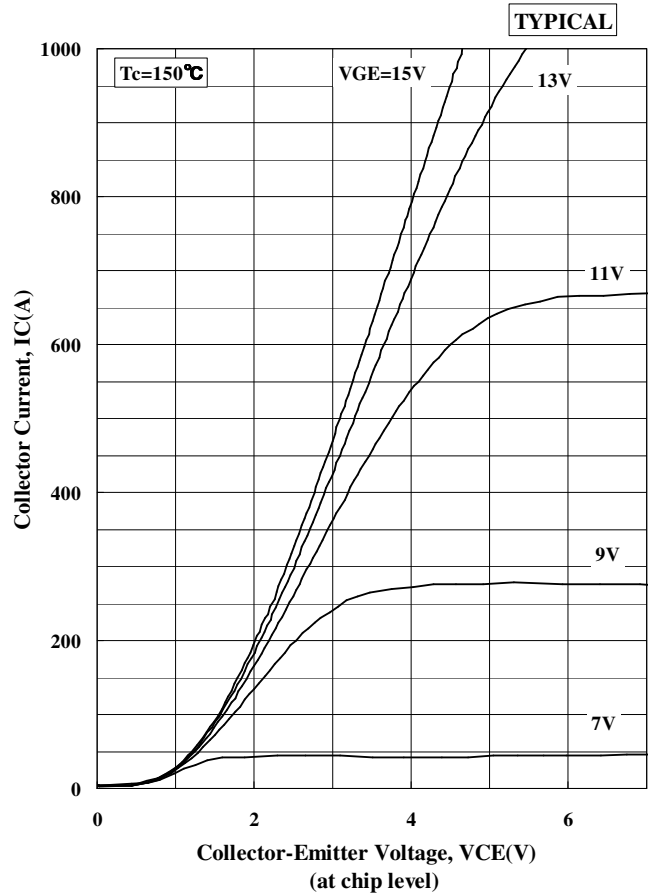
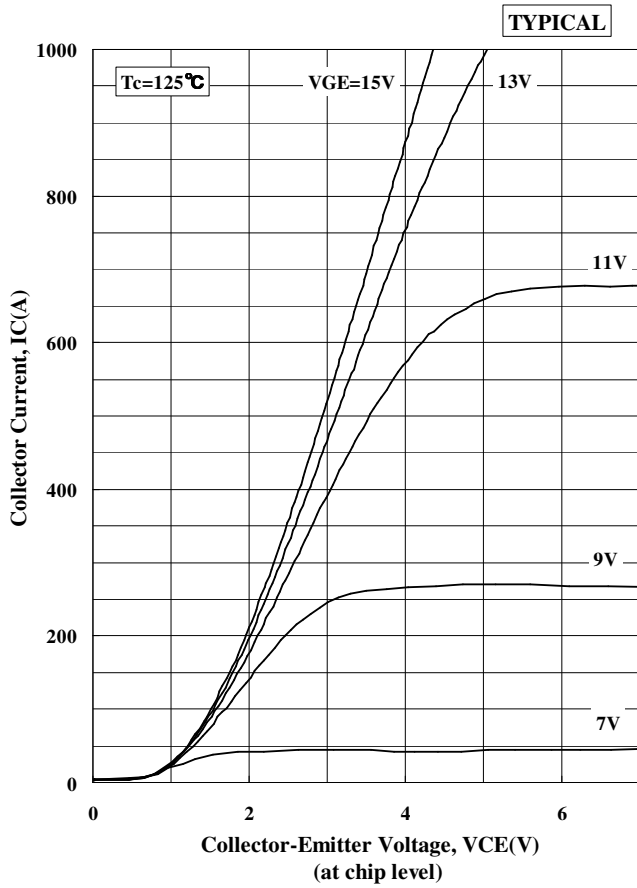


Fig.3 Definition of switching loss

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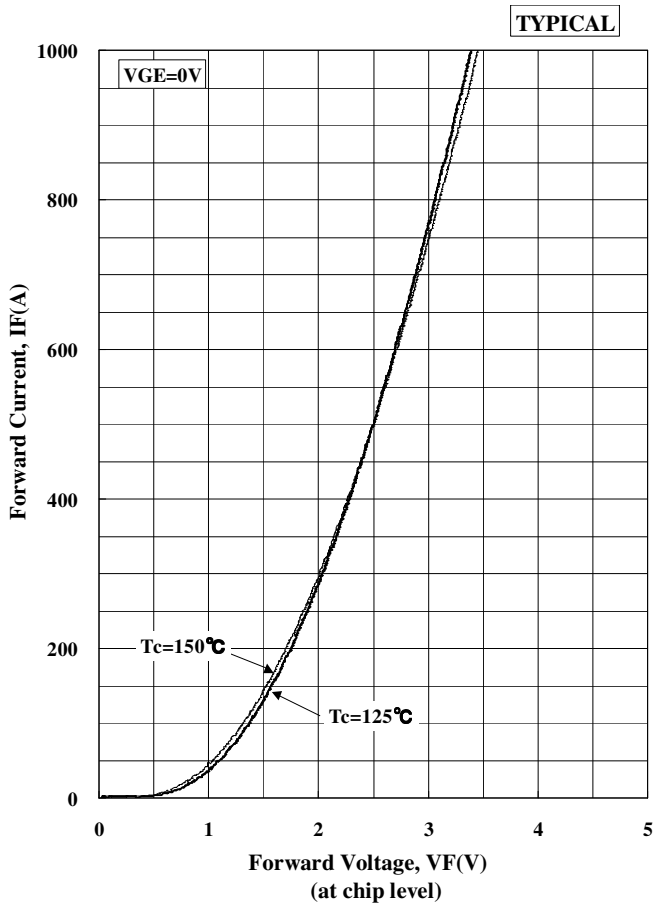
## Target Specification

### STATIC CHARACTERISTICS



Collector Current vs. Collector to Emitter Voltage

Collector Current vs. Collector to Emitter Voltage

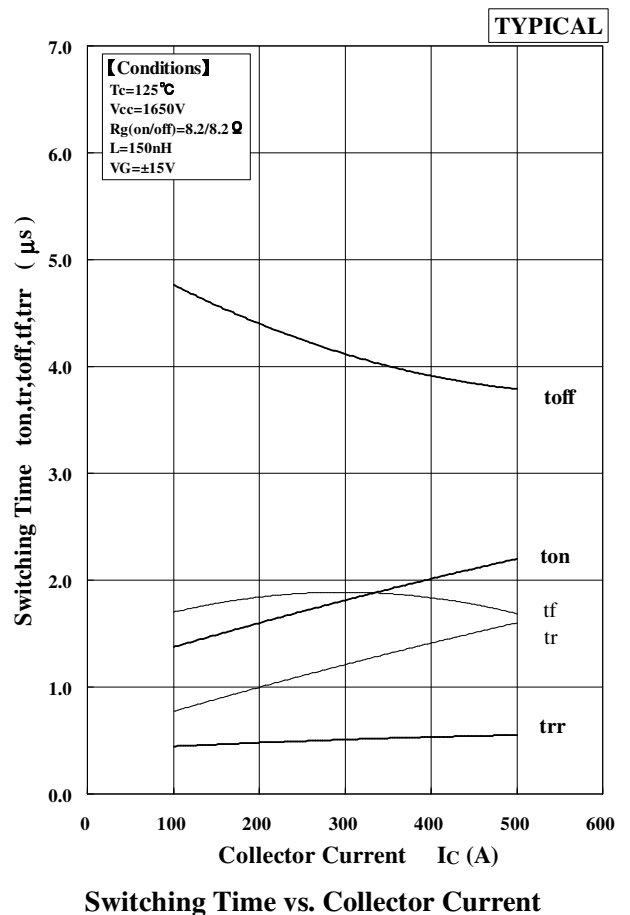
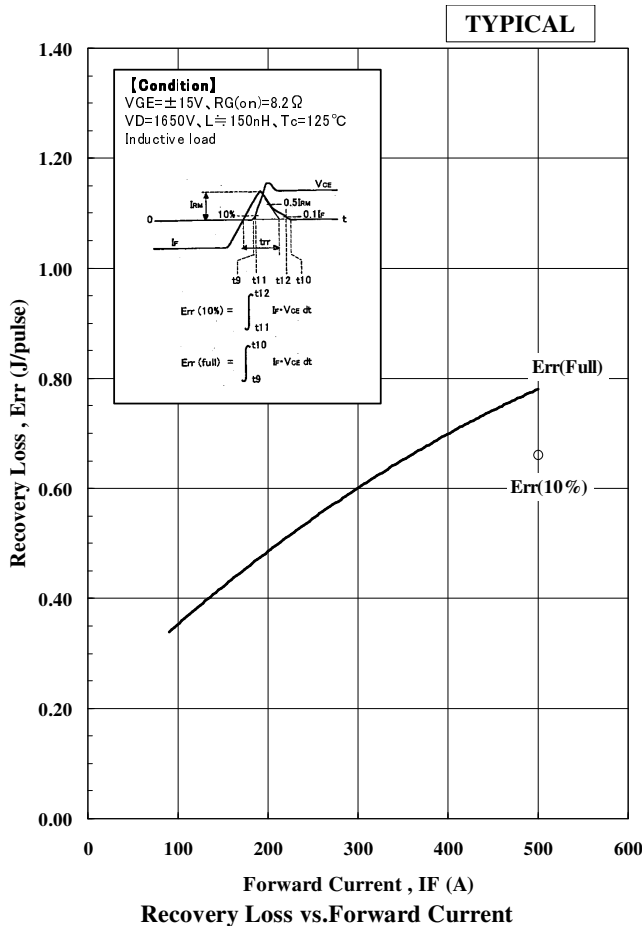
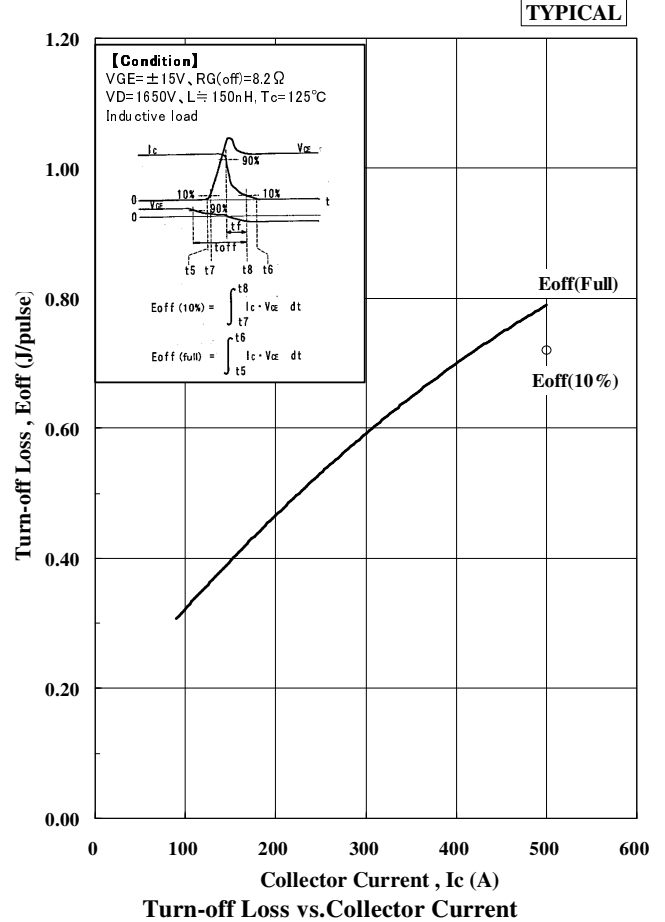
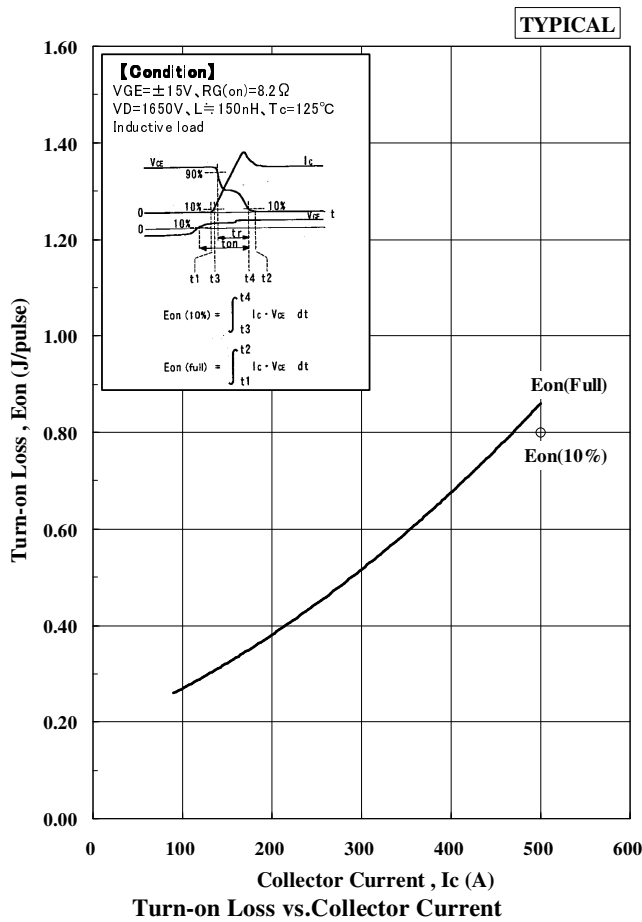


Forward Voltage of free-wheeling diode

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### DYNAMIC CHARACTERISTICS

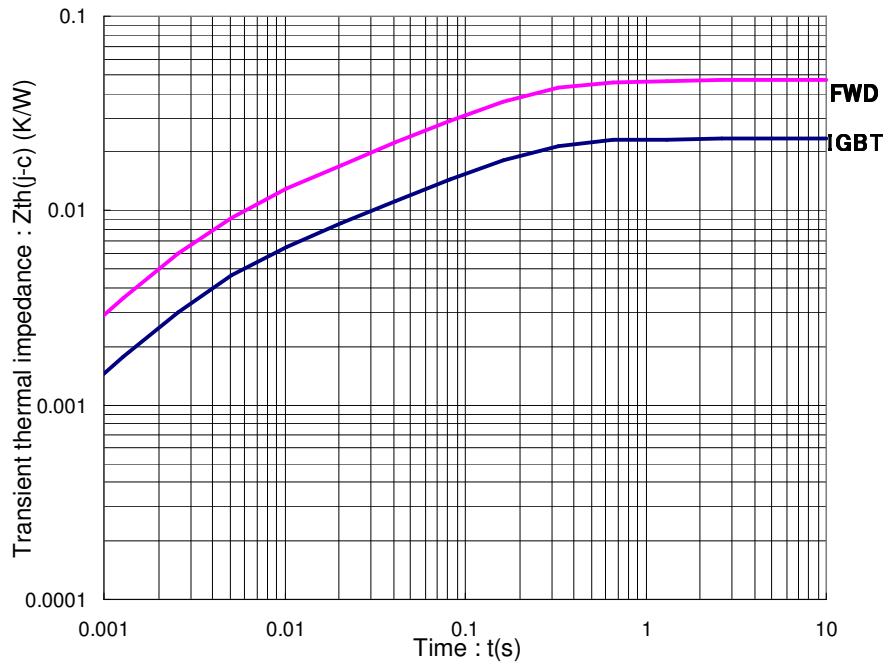


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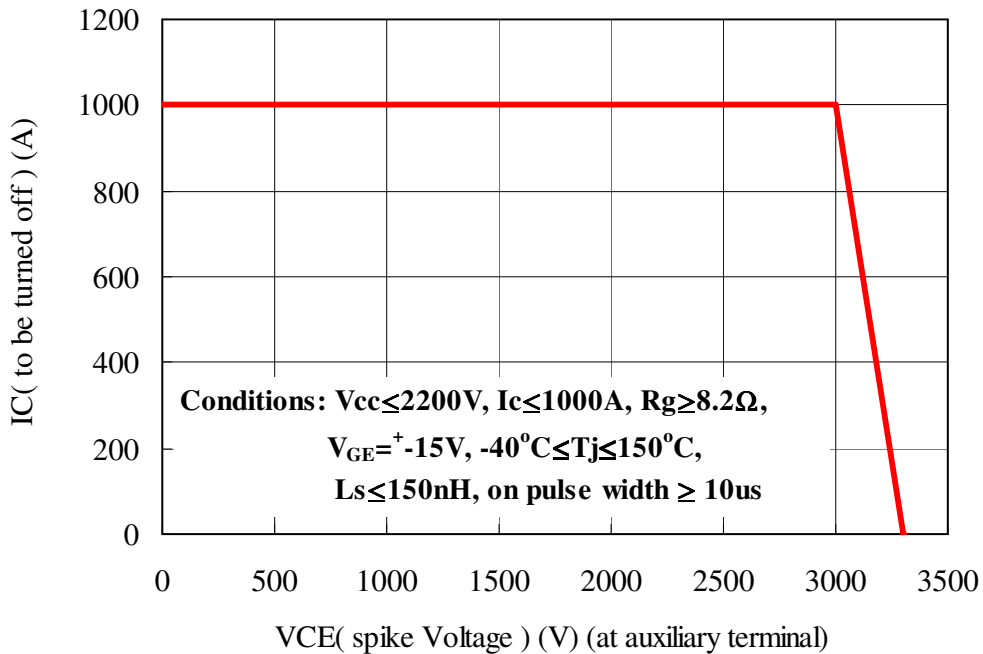
## TRANSIENT THERMAL IMPEDANCE

Maximum



Transient Thermal Impedance Curve

## RBSOA

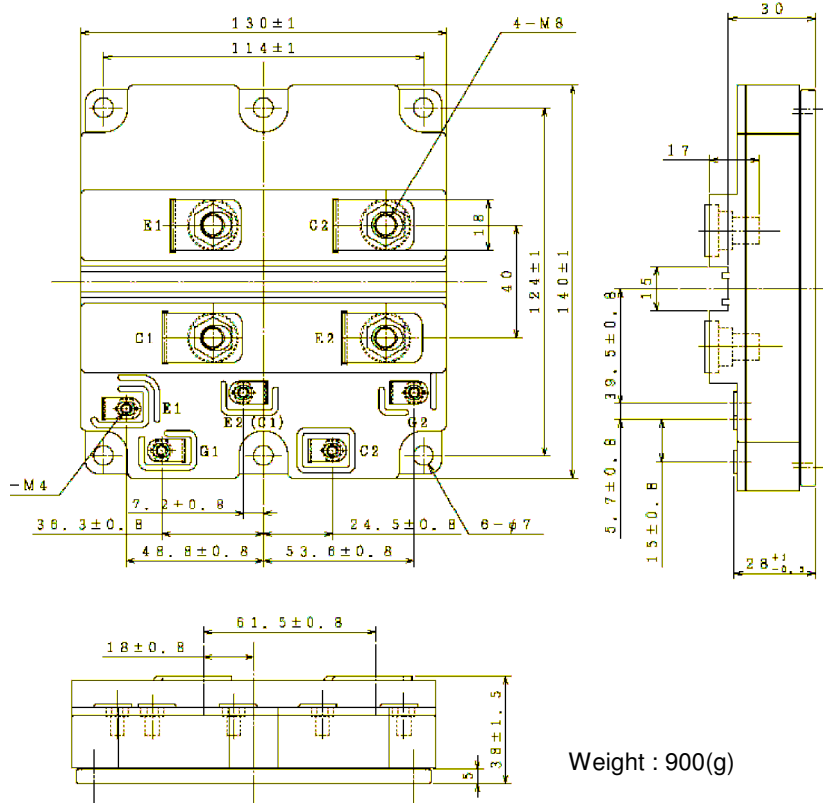


Reverse bias safe operation area ( RBSOA )

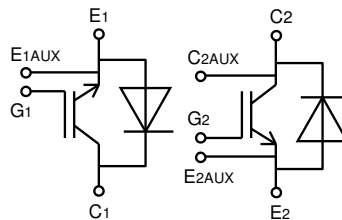
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## PACKAGE OUTLINE DRAWING



## CIRCUIT DIAGRAM



## Negative environmental impact material

Please note the following negative environmental impact materials are contained in the product in order to keep product characteristic and reliability level.

Material	Contained part
Lead (Pb) and its compounds	Solder
Arsenic and its compounds	Si chip

# HITACHI POWER SEMICONDUCTORS

## Notices

1. 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 Hitachi sales department for the latest version of this data sheets.
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