

# MBL1000E33E2-B

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.

## ABSOLUTE MAXIMUM RATINGS (T<sub>c</sub>=25 °C)

Item	Symbol	Unit	MBL1000E33E2-B
Collector Emitter Voltage	V <sub>CES</sub>	V	3,300
Gate Emitter Voltage	V <sub>GES</sub>	V	±20
Collector Current	DC	I <sub>c</sub>	1,000
	1ms	I <sub>Cp</sub>	2,000
Forward Current	DC	I <sub>F</sub>	800
	1ms	I <sub>FM</sub>	1,600
Junction Temperature	T <sub>j</sub>	°C	-40 ~ +125
Storage Temperature	T <sub>stg</sub>	°C	-50 ~ +125
Isolation Voltage	V <sub>ISO</sub>	V <sub>RMS</sub>	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·m (2) Recommended Value  $5.5 \pm 0.5$  N·m

## ELECTRICAL CHARACTERISTICS

### 1) IGBT + FWD

Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Collector Emitter Cut-Off Current	I <sub>CES</sub>	mA	-	-	12.0	V <sub>CE</sub> =3,300V, V <sub>GE</sub> =0V, T <sub>j</sub> =25 °C
Gate Emitter Leakage Current	I <sub>GES</sub>	nA	-	-	±500	V <sub>GE</sub> =±20V, V <sub>CE</sub> =0V, T <sub>j</sub> =25 °C
Collector Emitter Saturation Voltage	V <sub>CE(sat)</sub>	V	2.5	2.95	3.5	I <sub>c</sub> =1,000A, V <sub>GE</sub> =15V, T <sub>j</sub> =125 °C
Gate Emitter Threshold Voltage	V <sub>GE(TO)</sub>	V	5.5	6.3	7.7	V <sub>CE</sub> =10V, I <sub>c</sub> =1,000mA, T <sub>j</sub> =25 °C
Input Capacitance	C <sub>ies</sub>	nF	-	130	-	V <sub>CE</sub> =10V, V <sub>GE</sub> =0V, f=100kHz, T <sub>j</sub> =25 °C
Internal Gate Resistance	R <sub>ge</sub>	Ω	-	1.3	-	
Switching Times	Rise Time	t <sub>r</sub>	1.0	1.6	2.2	V <sub>CC</sub> =1,650V, I <sub>c</sub> =1,000A
	Turn On Time	t <sub>on</sub>	1.3	2.3	3.3	L <sub>s</sub> =200nH
	Fall Time	t <sub>f</sub>	1.0	1.8	2.7	R <sub>G</sub> =3.9Ω/3.9Ω, C <sub>GE</sub> =100nF (3)
	Turn Off Time	t <sub>off</sub>	2.8	3.9	5.0	V <sub>GE</sub> =±15V, T <sub>j</sub> =125 °C
Peak Forward Voltage Drop	V <sub>FM</sub>	V	-	2.5	-	-I <sub>c</sub> =1,000A, V <sub>GE</sub> =0V, T <sub>j</sub> =125 °C
Reverse Recovery Time	t <sub>rr</sub>	μs	-	0.8	-	V <sub>CC</sub> =1,650V, I <sub>F</sub> =1,000A (4) L <sub>s</sub> =200nH, T <sub>j</sub> =125 °C

### 2) DIODE

Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Collector Emitter Cut-Off Current	I <sub>AKS</sub>	mA	-	-	12.0	V <sub>AK</sub> =3,300V, T <sub>j</sub> =25 °C
Peak Forward Voltage Drop	V <sub>F</sub>	V	2.4	2.9	3.4	I <sub>F</sub> =800A, T <sub>j</sub> =125 °C At Main terminal (Terminal resistance:0.5mΩ typical)
Reverse Recovery Time	t <sub>rr</sub>	μs	0.4	1.0	1.7	V <sub>CC</sub> =1,650V, I <sub>F</sub> =800A, (4) L <sub>s</sub> =200nH, T <sub>j</sub> =125 °C, R <sub>G</sub> =3.9Ω/3.9Ω, C <sub>GE</sub> =100nF

Notes: (3) R<sub>G</sub> and C<sub>GE</sub> value are the test condition's value for decision of the switching times, not recommended value. Please, determine the suitable R<sub>G</sub> value after the measurement of switching waveforms(overshoot voltage, etc.)with appliance mounted.  
(4)Counter arm IGBT V<sub>GE</sub>=±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.

# MBL1000E33E2-B

## THERMAL CHARACTERISTICS

Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Thermal Impedance	IGBT	Rth(j-c)	-	-	0.012	Junction to case
	FWD	Rth(j-c)	-	-	0.024	
	Chopper Diode	Rth(j-c)	-	-	0.026	
Contact Thermal Impedance	Rth(c-f)	K/W	-	0.005	-	Case to f fin (λgrease=1W/(m·K), heat-sink flatness ≤50um)

## DEFINITION OF TEST CIRCUIT

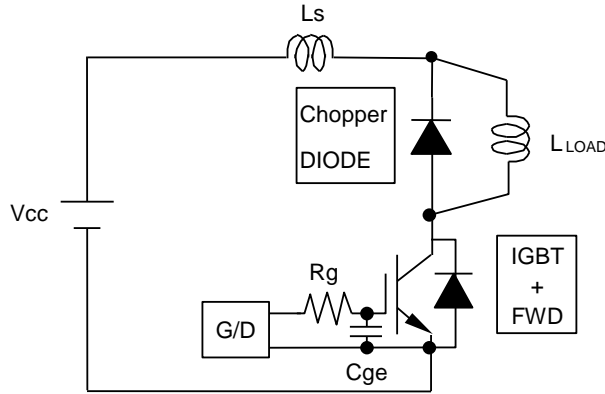


Fig.1 Switching test circuit

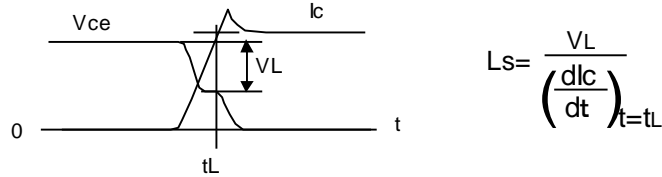


Fig.2 Definition of Ls

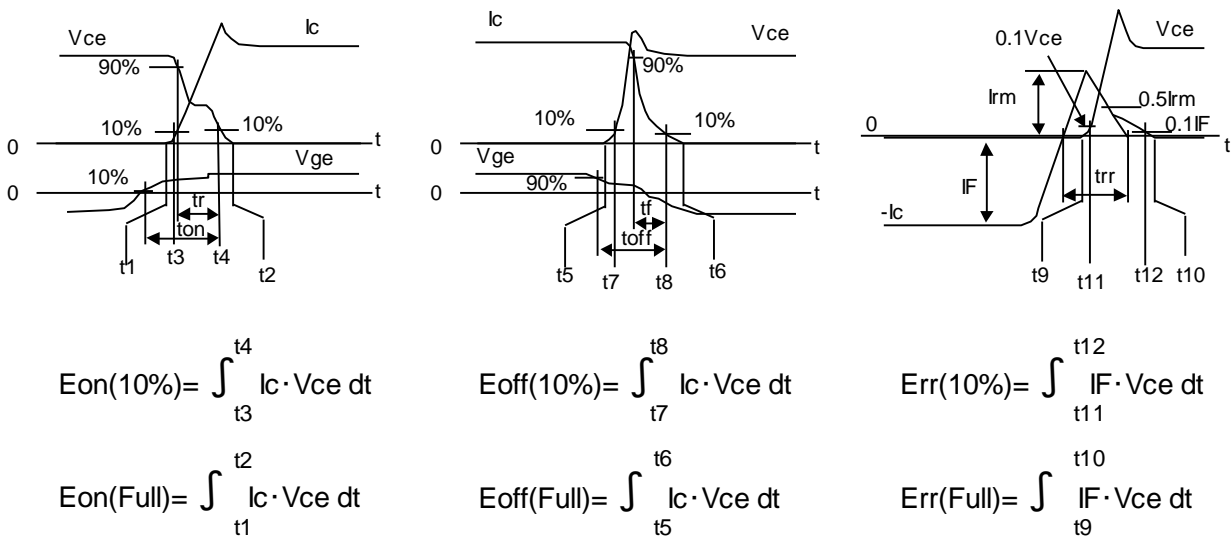
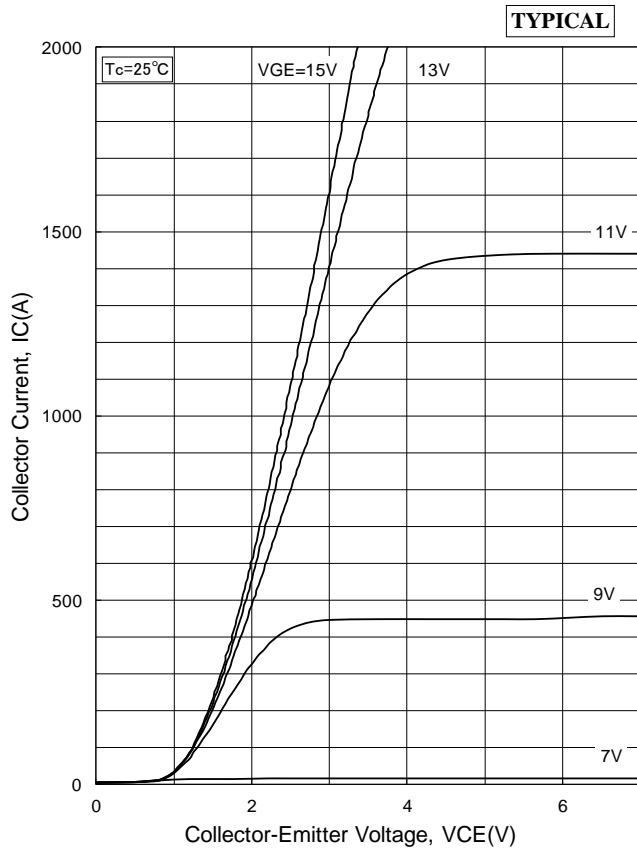


Fig.3 Definition of switching loss

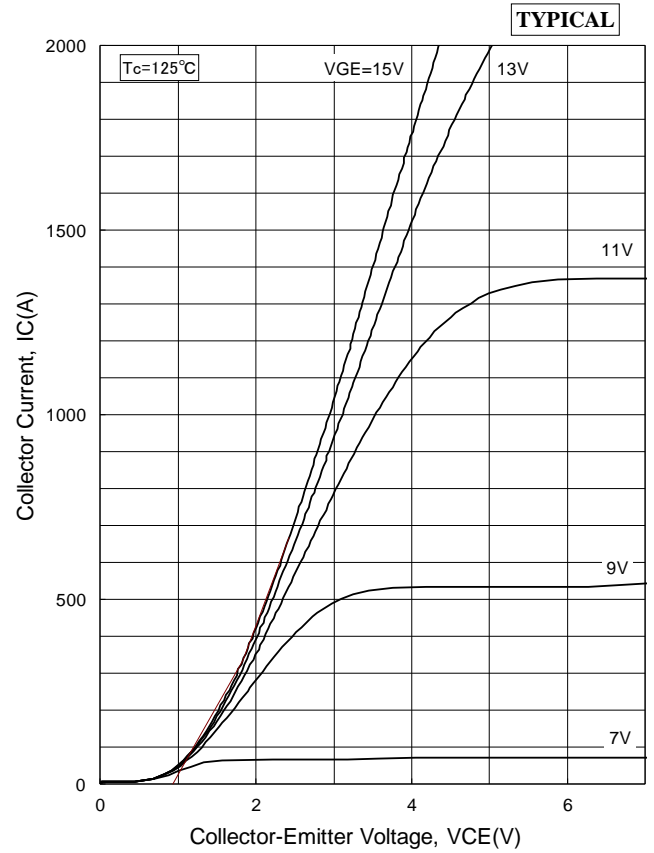
# MBL1000E33E2-B

## CHARACTERISTICS CURVE

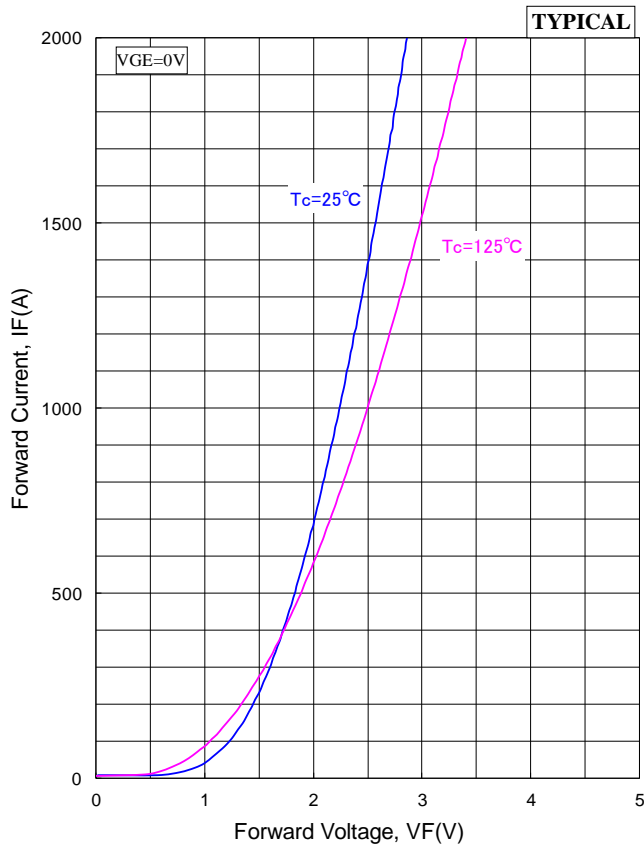
### STATIC CHARACTERISTICS



Collector Current vs. Collector to Emitter Voltage



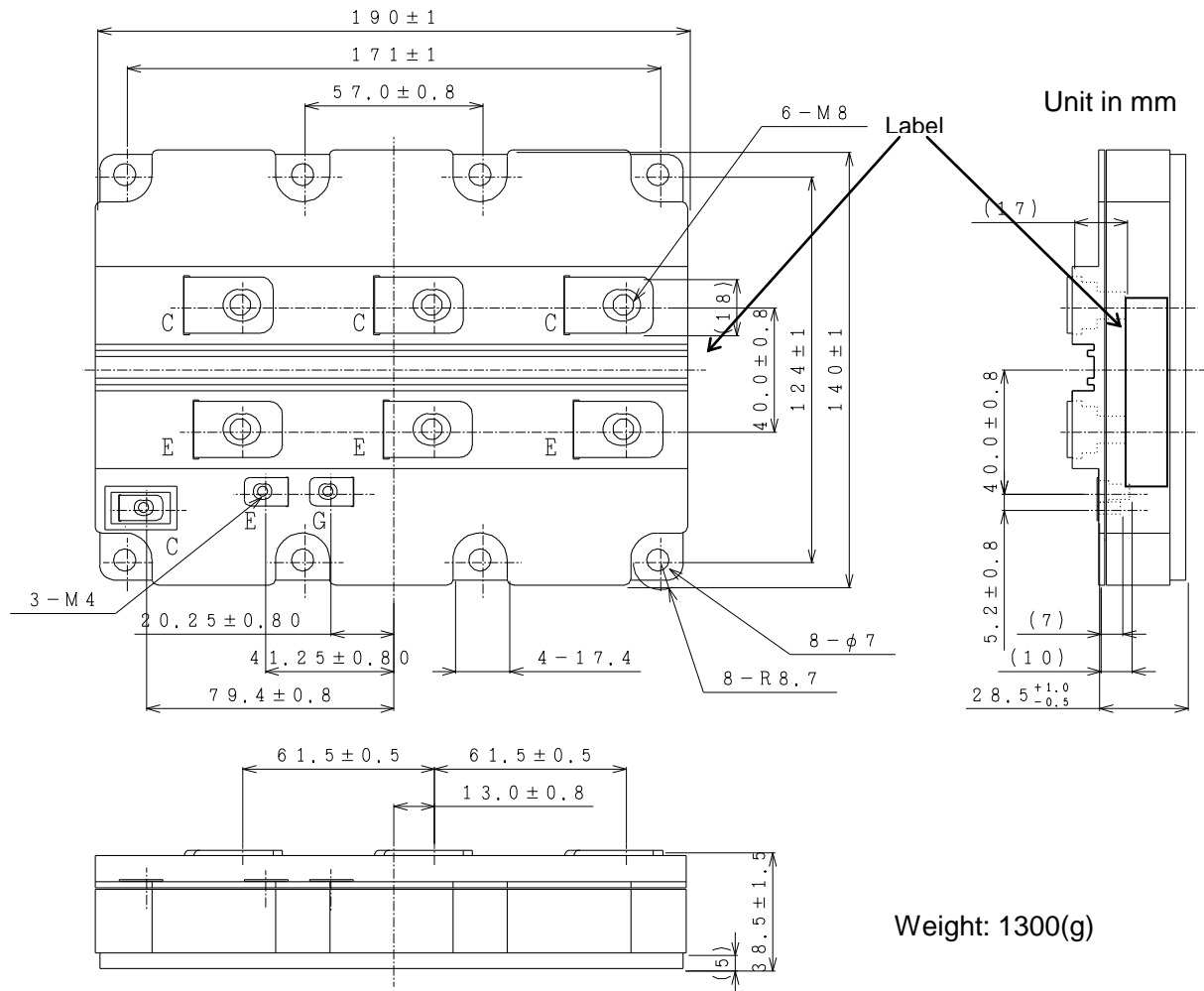
Collector Current vs. Collector to Emitter Voltage



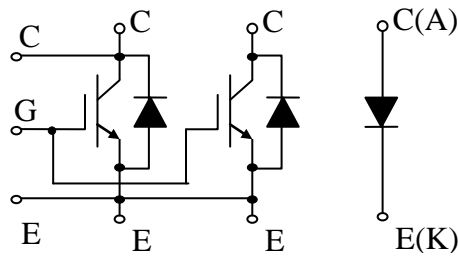
Forward Voltage of free-wheeling diode

# MBL1000E33E2-B

## OUTLINE DRAWINGS



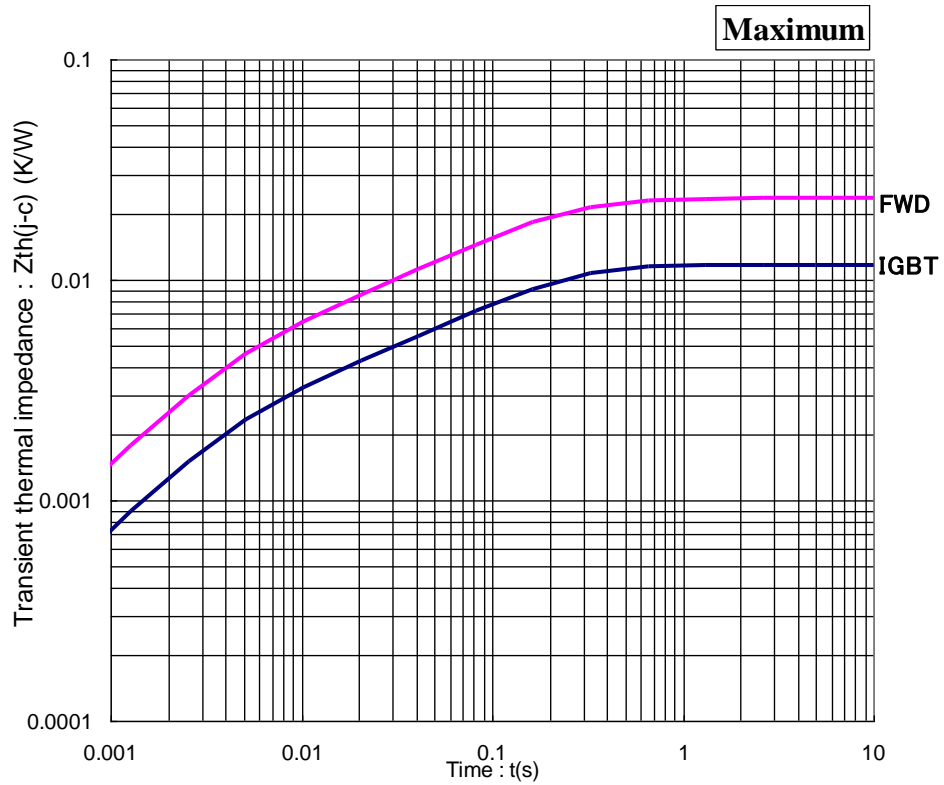
Weight: 1300(g)



Circuit diagram

# MBL1000E33E2-B

## 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

# MBL1000E33E2-B

## 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.
2. Please be sure to read "Precautions for Safe Use and Notices" in the individual brochure before use.
3. In cases where extremely high reliability is required (such as use in nuclear power control, aerospace and aviation, traffic equipment, life-support-related medical equipment, fuel control equipment and various kinds of safety equipment), safety should be ensured by using semiconductor devices that feature assured safety or by means of users' fail-safe precautions or other arrangement. Or consult Hitachi's sales department staff.
4. In no event shall Hitachi be liable for any damages that may result from an accident or any other cause during operation of the user's units according to this data sheets. Hitachi assumes no responsibility for any intellectual property claims or any other problems that may result from applications of information, products or circuits described in this data sheets.
5. In no event shall Hitachi be liable for any failure in a semiconductor device or any secondary damage resulting from use at a value exceeding the absolute maximum rating.
6. No license is granted by this data sheets under any patents or other rights of any third party or Hitachi Power Semiconductor Device, Ltd.
7. This data sheets may not be reproduced or duplicated, in any form, in whole or in part, without the expressed written permission of Hitachi Power Semiconductor Device, Ltd.
8. The products (technologies) described in this data sheets are not to be provided to any party whose purpose in their application will hinder maintenance of international peace and safety not are they to be applied to that purpose by their direct purchasers or any third party. When exporting these products (technologies), the necessary procedures are to be taken in accordance with related laws and regulations.

- For inquiries relating to the products, please contact nearest overseas representatives that is located "Inquiry" portion on the top page of a home page.

Hitachi power semiconductor home page address <http://www.hitachi-power-semiconductor-device.co.jp/en/>