

# MBM600E17D

Silicon N-channel IGBT

## FEATURES

- \* High speed, low loss IGBT module.
- \* Low driving power due to low input capacitance MOS gate.
- \* Low noise due to ultra soft fast recovery diode.
- \* High reliability, high durability module.
- \* High thermal fatigue durability.  
( $\Delta T_c=70^\circ\text{C}$ ,  $N>30,000$ cycles)
- \* Isolated heat sink (terminal to base).

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

Item	Symbol	Unit	MBM600E17D
Collector Emitter Voltage	$V_{CES}$	V	1,700
Gate Emitter Voltage	$V_{GES}$	V	$\pm 20$
Collector Current	DC	$I_C$	600
	1ms	$I_{Cp}$	1,200
Forward Current	DC	$I_F$	600
	1ms	$I_{FM}$	1,200
Junction Temperature	$T_j$	$^\circ\text{C}$	-40 ~ +125
Storage Temperature	$T_{stg}$	$^\circ\text{C}$	-40 ~ +125
Isolation Voltage	$V_{ISO}$	$V_{RMS}$	4,000(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

## ELECTRIC CHARACTERISTICS

Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Collector Emitter Cut-Off Current	$I_{CES}$	mA	-	-	5.0	$V_{CE}=1,700\text{V}$ , $V_{GE}=0\text{V}$ , $T_j=25^\circ\text{C}$
Gate Emitter Leakage Current	$I_{GES}$	nA	-500	-	+500	$V_{CE}=1,700\text{V}$ , $V_{GE}=0\text{V}$ , $T_j=125^\circ\text{C}$
Collector Emitter Saturation Voltage	$V_{CE(sat)}$	V	2.1	2.6	3.1	$I_C=600\text{A}$ , $V_{GE}=15\text{V}$ , $T_j=125^\circ\text{C}$
Gate Emitter Threshold Voltage	$V_{GE(TH)}$	V	5.0	6.5	8.0	$V_{CE}=10\text{V}$ , $I_C=60\text{mA}$ , $T_j=25^\circ\text{C}$
Input Capacitance	$C_{ies}$	nF	-	50	-	$V_{CE}=10\text{V}$ , $V_{GE}=0\text{V}$ , $f=100\text{kHz}$ , $T_j=25^\circ\text{C}$
Internal Gate Resistance	$R_{g(int)}$	$\Omega$	-	1.6	-	
Switching Times	Rise Time	$t_r$	0.25	0.5	1.0	$V_{CC}=900\text{V}$ , $I_C=600\text{A}$
	Turn On Time	$t_{on}$	0.4	0.8	1.6	$L=100\text{nH}$ , $C_{GE}=68\text{nF}$ (3)
	Fall Time	$t_f$	0.25	0.5	1.0	$R_G=1.5\Omega$ (3)
	Turn Off Time	$t_{off}$	0.75	1.5	3.0	$V_{GE}=\pm 15\text{V}$ , $T_j=125^\circ\text{C}$
Peak Forward Voltage Drop	$V_{FM}$	V	1.4	1.9	2.3	$I_F=600\text{A}$ , $V_{GE}=0\text{V}$ , $T_j=125^\circ\text{C}$
Reverse Recovery Time	$t_{rr}$	$\mu\text{s}$	0.1	0.5	1.0	$V_{CC}=900\text{V}$ , $I_C=I_F=600\text{A}$ ,
Turn On Loss	$E_{on(10\%)}$	J/P	-	0.13	0.2	$L=100\text{nH}$ , $C_{GE}=68\text{nF}$ (3)
Turn Off Loss	$E_{off(10\%)}$	J/P	-	0.2	0.3	$R_G=1.5\Omega$ (3)
Reverse Recovery Loss	$E_{rr(10\%)}$	J/P	-	0.2	0.3	$V_{GE}=\pm 15\text{V}$ , $T_j=125^\circ\text{C}$

Notes:(3)  $R_G$  and  $C_{GE}$  value is the test condition's value for evaluation of the switching times, not recommended value.

Please, determine the suitable  $R_G$  and  $C_{GE}$  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.

# MBM600E17D

## THERMAL CHARACTERISTICS

Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Thermal Impedance	IGBT	Rth(j-c)	-	-	0.038	Junction to case
	FWD	Rth(j-c)	-	-	0.060	
Contact Thermal Impedance	Rth(c-f)	K/W	-	0.008	-	Case to fin

## MODULE MECHANICAL CHARACTERISTICS

Item	Unit	Characteristics	Conditions
Weight	g	900	
Stray inductance in module	LS(CM-EM)	nH	21/arm 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

# MBM600E17D

## DEFINITION OF TEST CIRCUIT

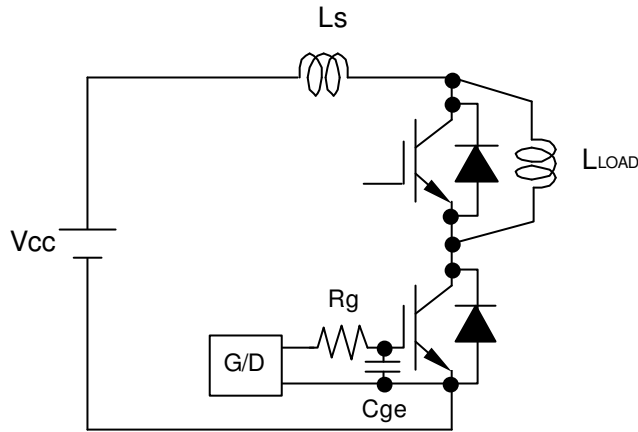


Fig.1 Switching test circuit

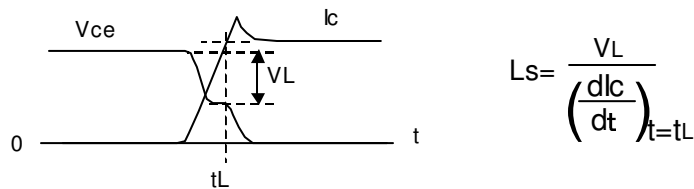


Fig.2 Definition of stray inductance

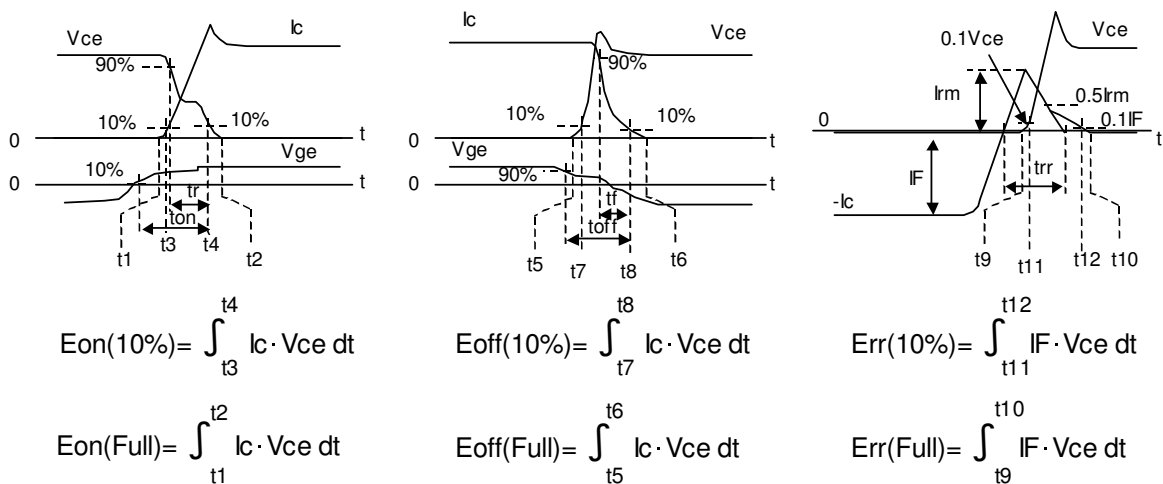
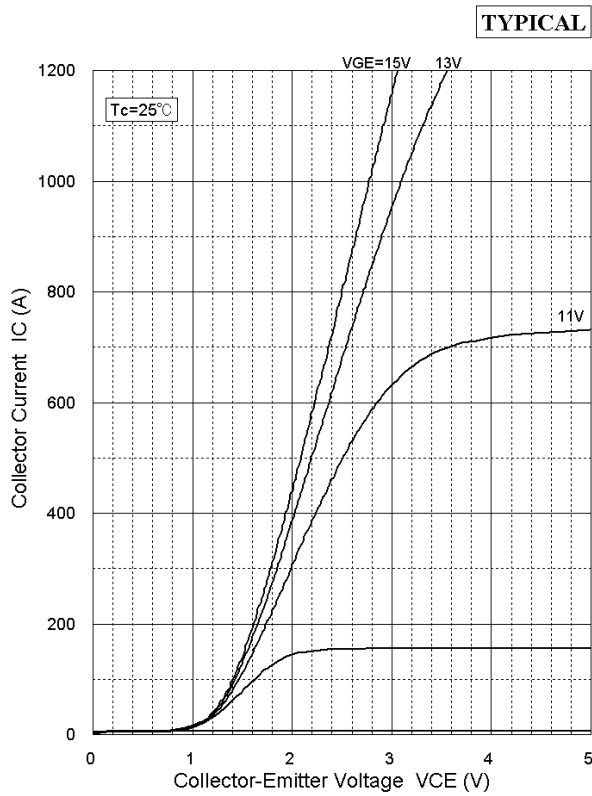


Fig.3 Definition of switching loss

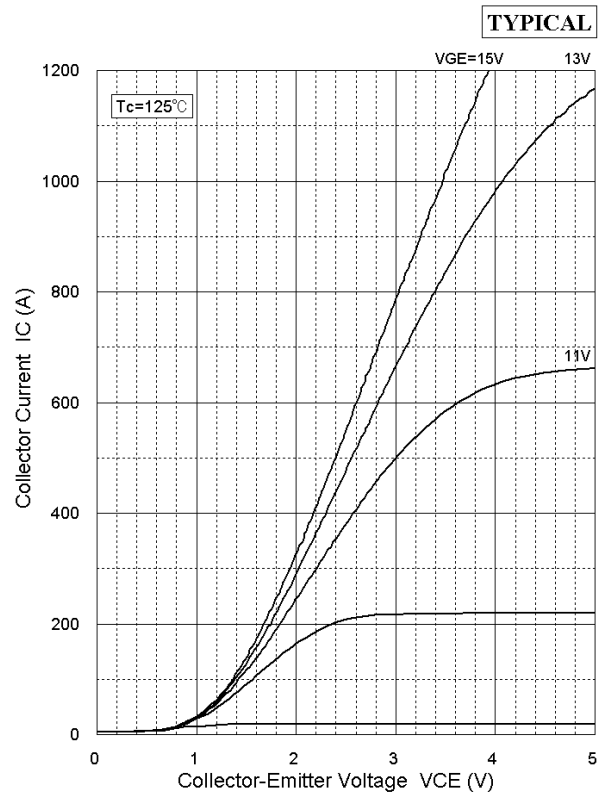
# MBM600E17D

## CHARACTERISTICS CURVE

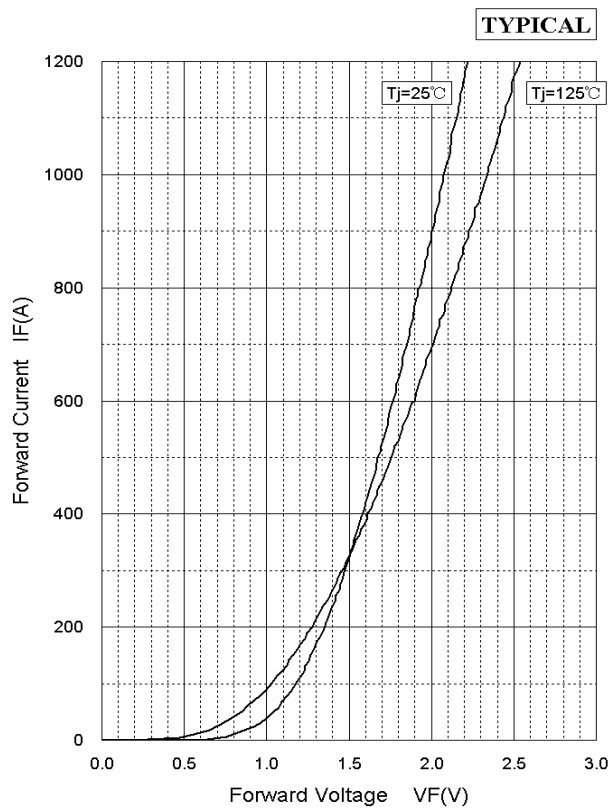
### STATIC CHARACTERISTICS



Collector Current vs. Collector to Emitter Voltage



Collector Current vs. Collector to Emitter Voltage

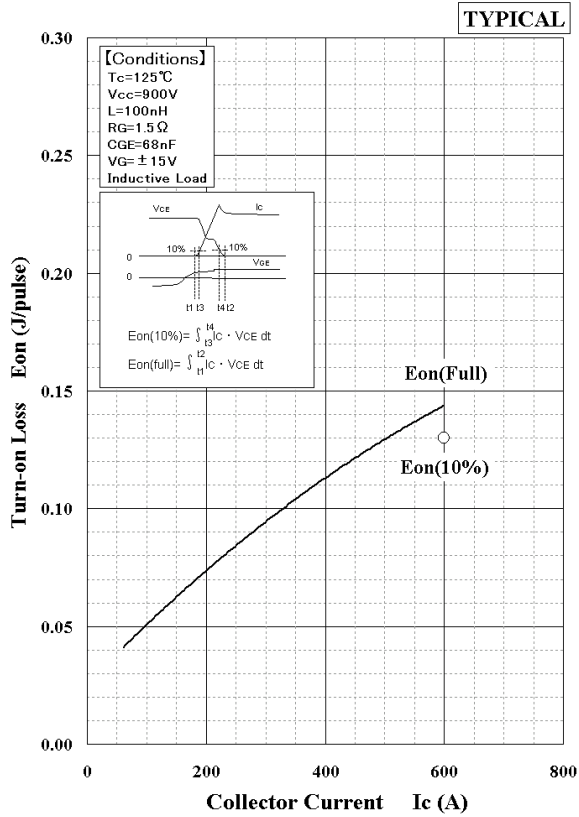


Forward Voltage of free-wheeling diode

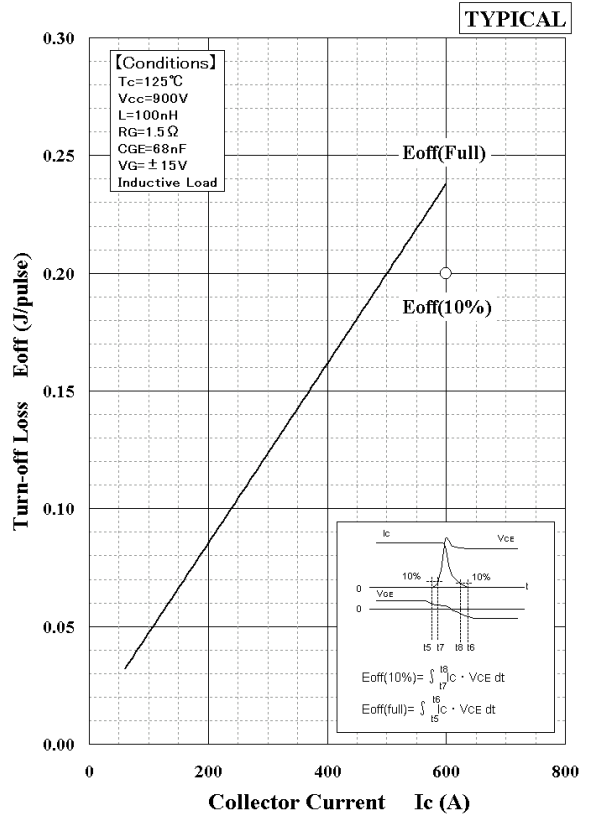
# MBM600E17D

## DYNAMIC CHARACTERISTICS

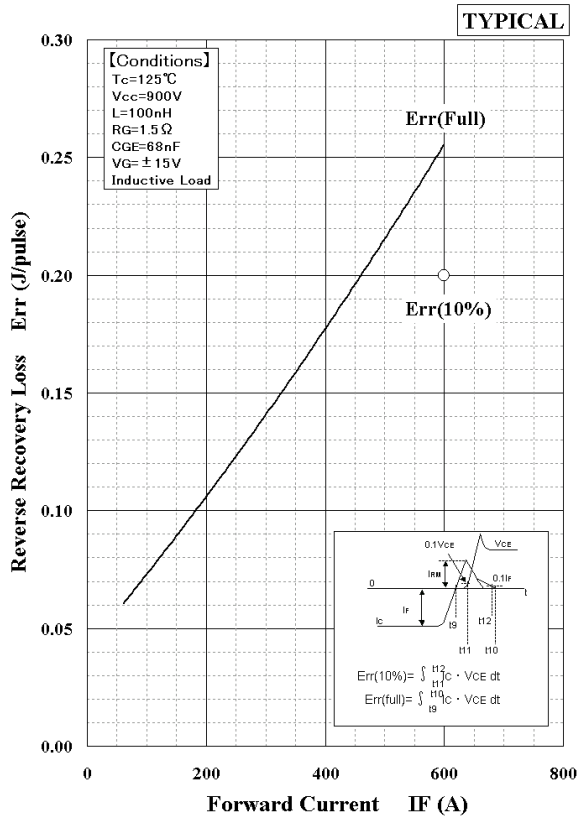
### DEPENDENCE OF CURRENT



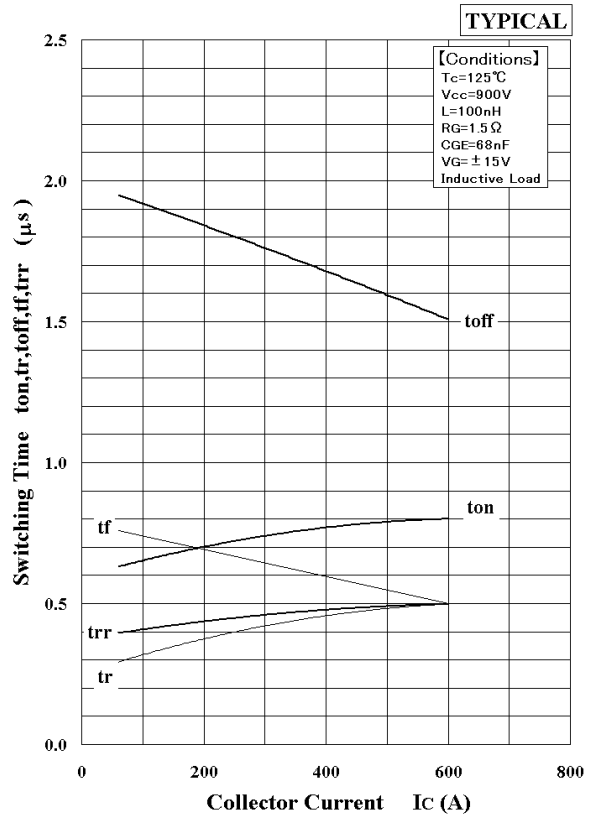
Turn-on Loss vs. Collector Current



Turn-off Loss vs. Collector Current



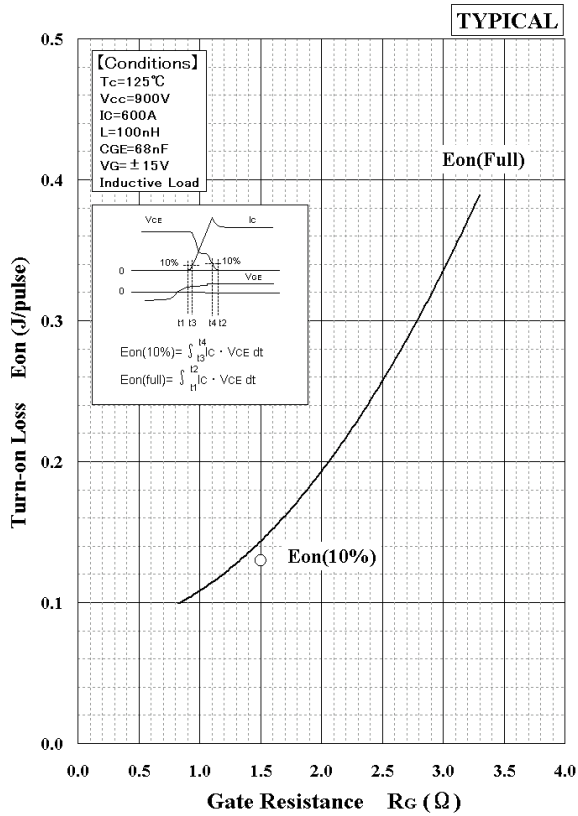
Recovery Loss vs. Collector Current



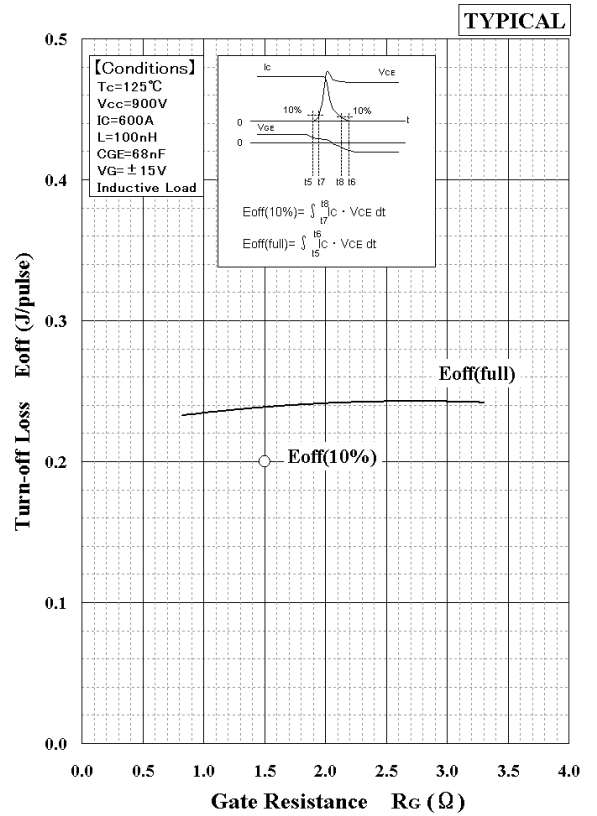
Switching Time vs. Collector Current

# MBM600E17D

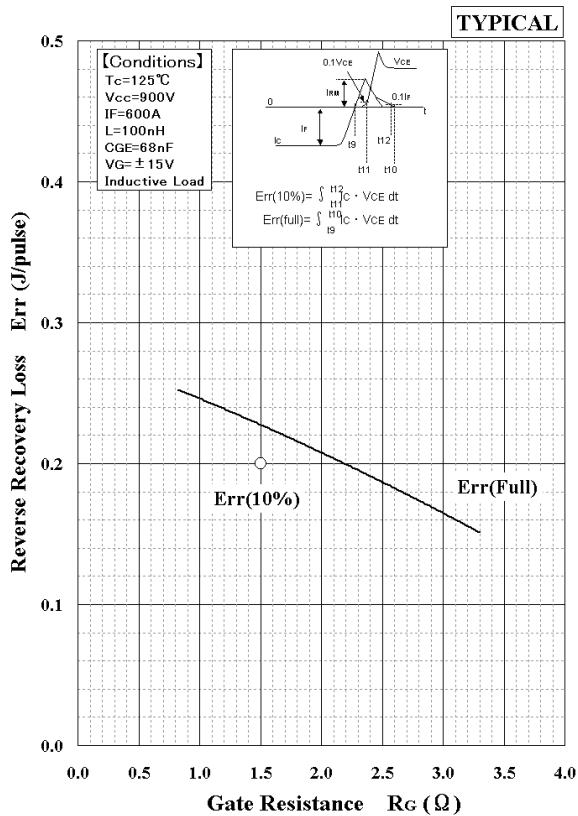
## DEPENDENCE OF RG



Turn-on Loss vs. Gate Resistance



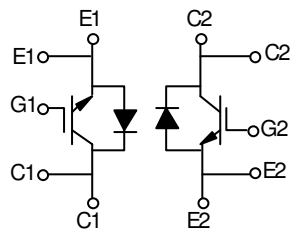
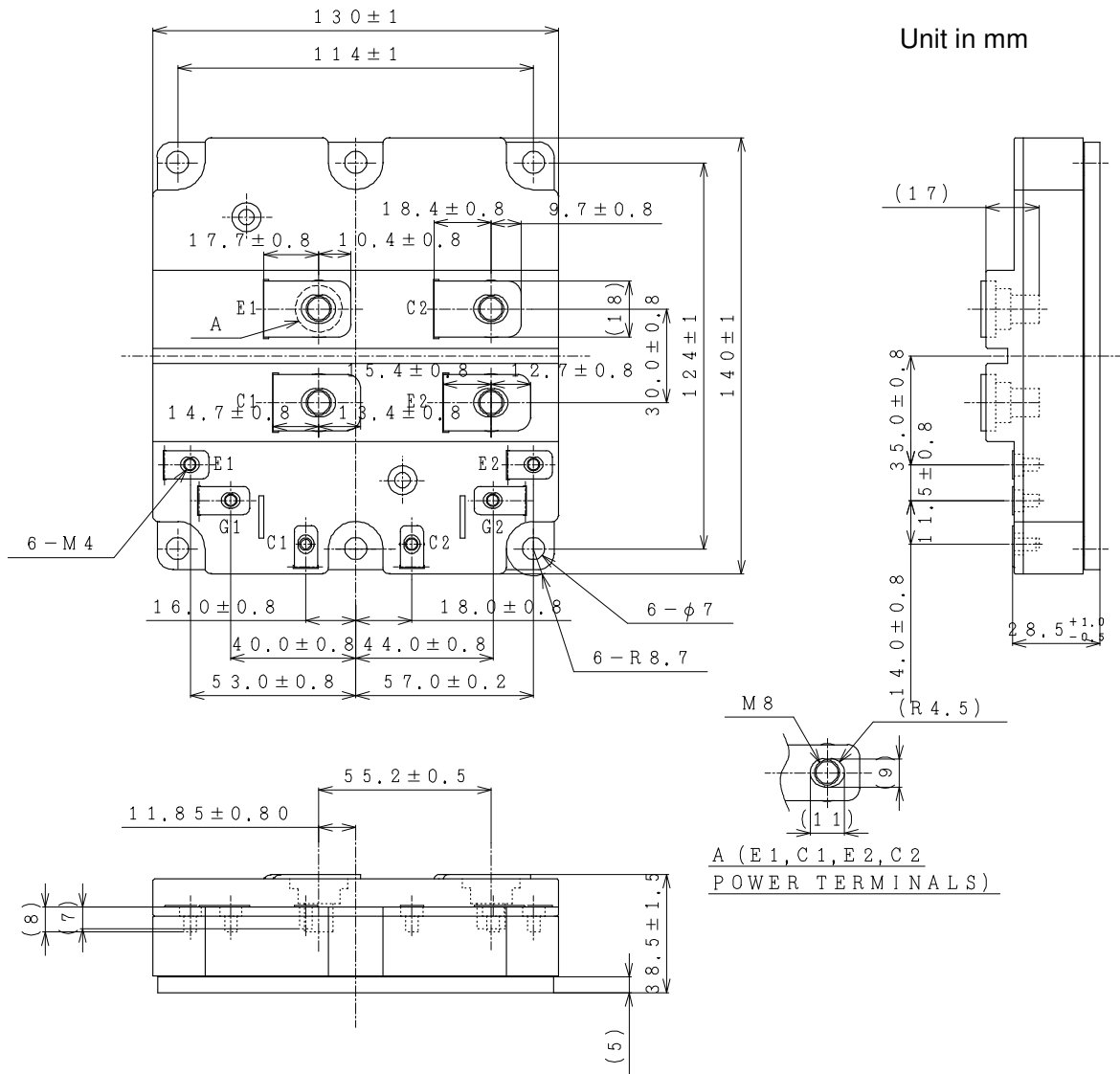
Turn-off Loss vs. Gate Resistance



Recovery Loss vs. Gate Resistance

# MBM600E17D

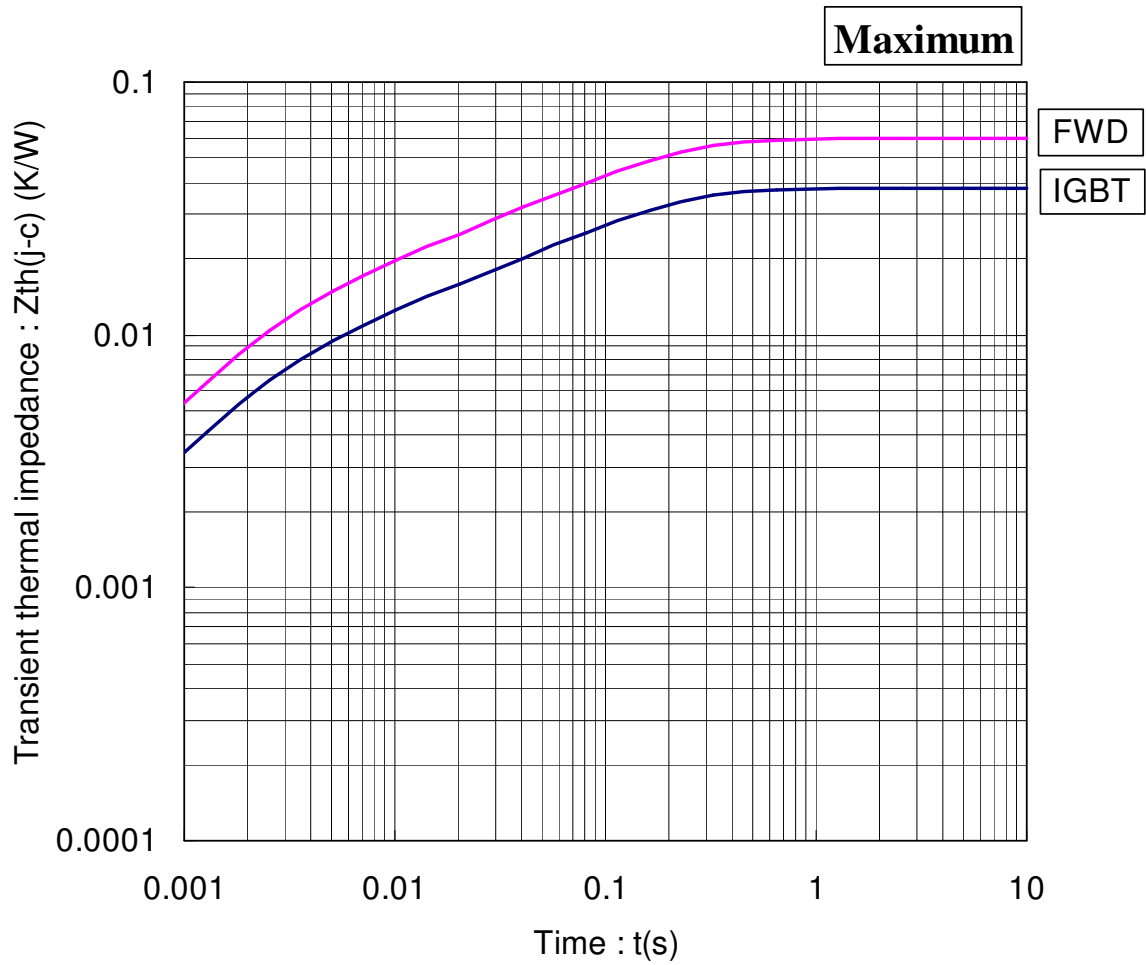
## PACKAGE OUTLINE DRAWING



Circuit diagram

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## TRANSIENT THERMAL IMPEDANCE

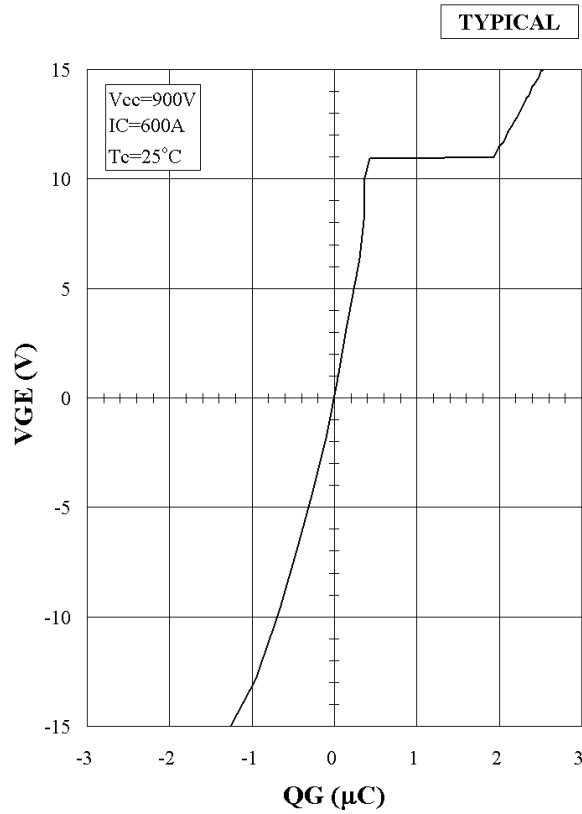


**Transient Thermal Impedance Curve**

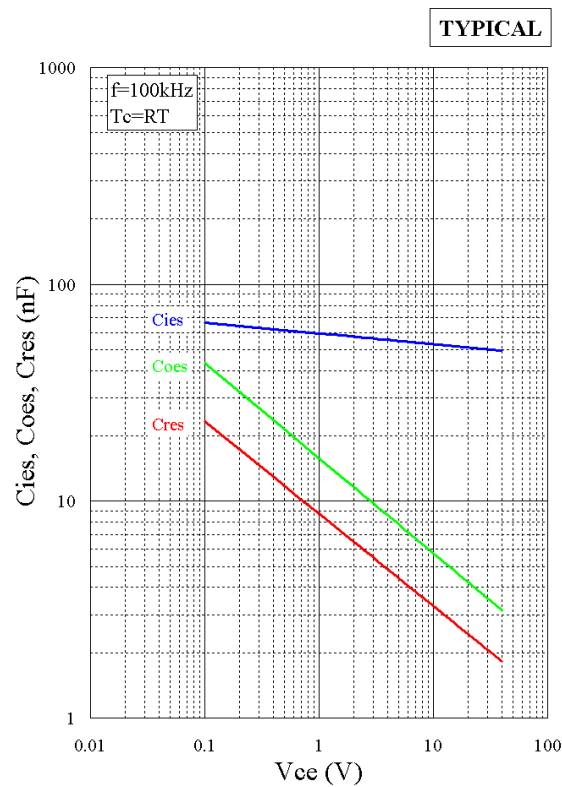


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QG-VG curve



Cies, Coes, Cres



# MBM600E17D

## Negative environmental impact material

Please note that following materials are contained in the product,  
In order to keep characteristics 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

### 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.
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