

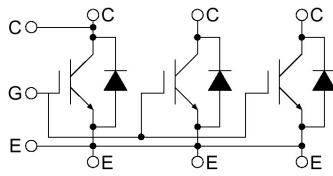
# MBN1200E33C

Silicon N-channel IGBT

## FEATURES

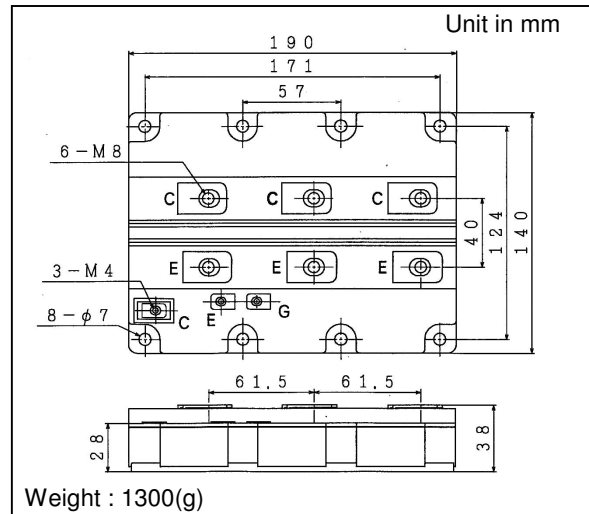
- \* High thermal fatigue durability.  
( $\Delta T_c=70^\circ\text{C}$ ,  $N>30,000$ cycles)
- \* Low noise due to ultra soft fast recovery diode.
- \* High speed, low loss IGBT module.
- \* Low driving power due to low input capacitance MOS gate.
- \* High reliability, high durability module.
- \*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

## CIRCUIT DIAGRAM



TERMINALS

## OUTLINE DRAWING



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

Item	Symbol	Unit	MBN1200E33C
Collector Emitter Voltage	$V_{CES}$	V	3,300
Gate Emitter Voltage	$V_{GES}$	V	$\pm 20$
Collector Current	DC	$I_C$	1,200
	1ms	$I_{Cp}$	2,400
Forward Current	DC	$I_F$	1,200
	1ms	$I_{FM}$	2,400
Junction Temperature	$T_j$	$^\circ\text{C}$	-40 ~ +125
Storage Temperature	$T_{stg}$	$^\circ\text{C}$	-40 ~ +125
Isolation Voltage	$V_{ISO}$	$V_{RMS}$	6,000(AC 1 minute)
Screw Torque	Terminals (M4/M8)	-	2/10 (1)
	Mounting (M6)	-	6 (2)

Notes: (1) Recommended Value  $1.8\pm 0.2/9\pm 1\text{N}\cdot\text{m}$  (2) Recommended Value  $5.5\pm 0.5\text{N}\cdot\text{m}$ 

## ELECTRICAL CHARACTERISTICS ( $T_c=25^\circ\text{C}$ )

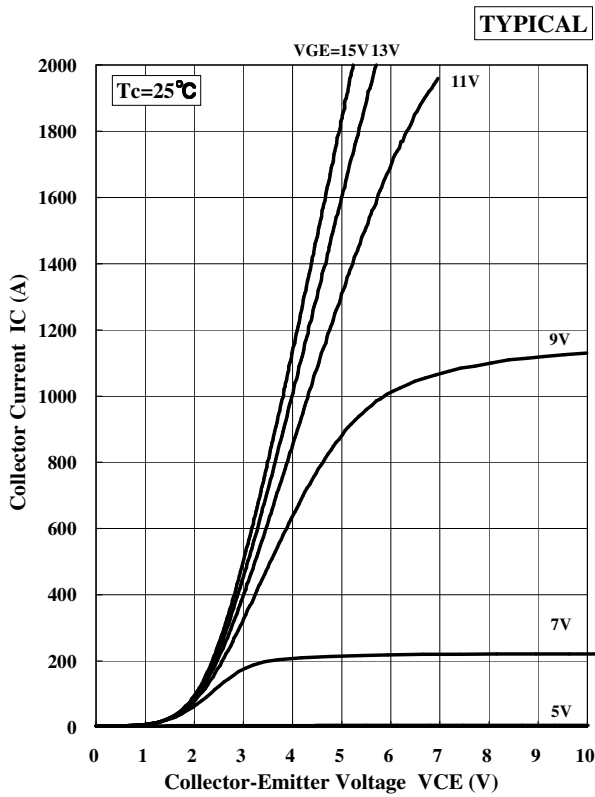
Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions		
Collector Emitter Cut-Off Current	$I_{CES}$	mA	-	-	12	$V_{CE}=3,300\text{V}$ , $V_{GE}=0\text{V}$ , $T_j=25^\circ\text{C}$		
			-	20	60	$V_{CE}=3,300\text{V}$ , $V_{GE}=0\text{V}$ , $T_j=125^\circ\text{C}$		
Gate Emitter Leakage Current	$I_{GES}$	nA	-	-	$\pm 500$	$V_{GE}=\pm 20\text{V}$ , $V_{CE}=0\text{V}$ , $T_j=25^\circ\text{C}$		
Collector Emitter Saturation Voltage	$V_{CE(sat)}$	V	-	4.1	4.7	$I_C=1,200\text{A}$ , $V_{GE}=15\text{V}$ , $T_j=25^\circ\text{C}$		
			-	4.8	5.3	$I_C=1,200\text{A}$ , $V_{GE}=15\text{V}$ , $T_j=125^\circ\text{C}$		
Gate Emitter Threshold Voltage	$V_{GE(To)}$	V	4.5	5.5	6.5	$V_{CE}=10\text{V}$ , $I_C=1200\text{mA}$ , $T_j=25^\circ\text{C}$		
Input Capacitance	$C_{ies}$	nF	-	140	-	$V_{CE}=10\text{V}$ , $V_{GE}=0\text{V}$ , $f=100\text{kHz}$ , $T_j=25^\circ\text{C}$		
			Rise Time	$t_r$	-	2.0	3.2	$V_{CC}=1,650\text{V}$ , $I_C=1,200\text{A}$
			Turn On Time	$t_{on}$	-	2.9	3.8	$L=100\text{nH}$
			Fall Time	$t_f$	-	1.7	3.2	$R_G=3.3\Omega$ (3)
Peak Forward Voltage Drop	$V_{FM}$	V	-	2.2	2.8	$I_C=1,200\text{A}$ , $V_{GE}=0\text{V}$ , $T_j=25^\circ\text{C}$		
			-	2.3	2.75	$I_C=1,200\text{A}$ , $V_{GE}=0\text{V}$ , $T_j=125^\circ\text{C}$		
Reverse Recovery Time	$t_{rr}$	$\mu\text{s}$	-	0.8	1.4	$V_{CC}=1,650\text{V}$ , $I_C=1,200\text{A}$ , $L=100\text{nH}$ , $T_j=125^\circ\text{C}$		
Turn On Loss	$E_{on(10\%)}$	J/P	-	2.3	2.6	$V_{CC}=1,650\text{V}$ , $I_C=1,200\text{A}$ , $L=100\text{nH}$		
Turn Off Loss	$E_{off(10\%)}$	J/P	-	1.4	2.1	$R_G=3.3\Omega$ (3)		
Reverse Recovery Loss	$E_{rr(10\%)}$	J/P	-	1.5	2.1	$V_{GE}=\pm 15\text{V}$ , $T_j=125^\circ\text{C}$		
Thermal Impedance	IGBT	$R_{th(j-c)}$	K/W	-	-	0.0085	Junction to case	
	FWD	$R_{th(j-c)}$		-	-	0.017		

Notes:(3)  $R_G$  value 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.Counter arm IGBT  $V_{GE}=-15\text{V}$

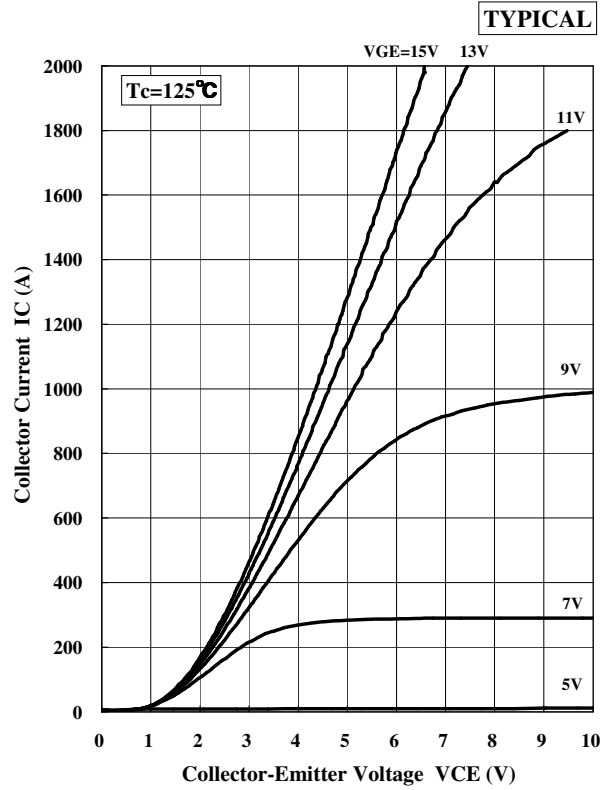
# MBN1200E33C

## CHARACTERISTICS CURVE

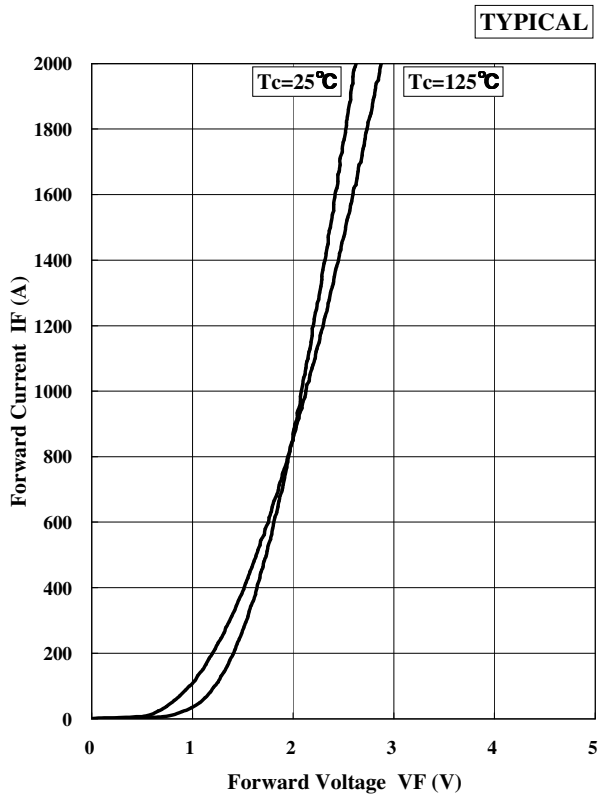
### STATIC CHARACTERISTICS



Collector Current vs. Collector to Emitter Voltage



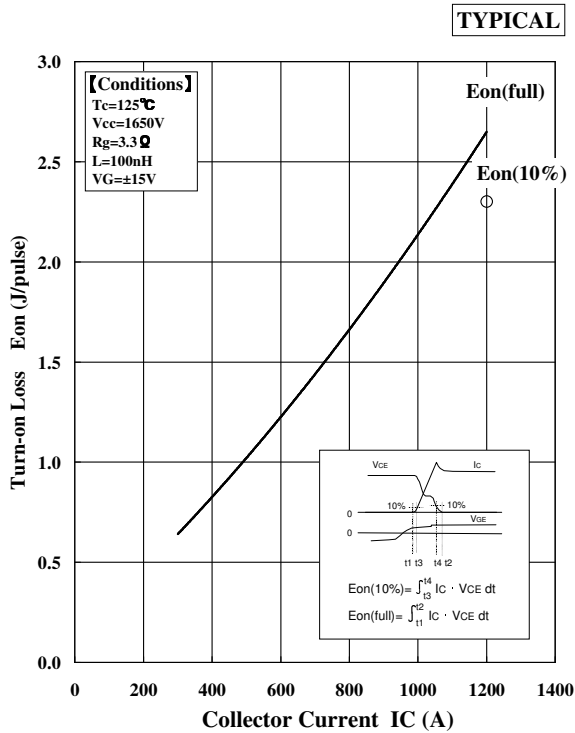
Collector Current vs. Collector to Emitter Voltage



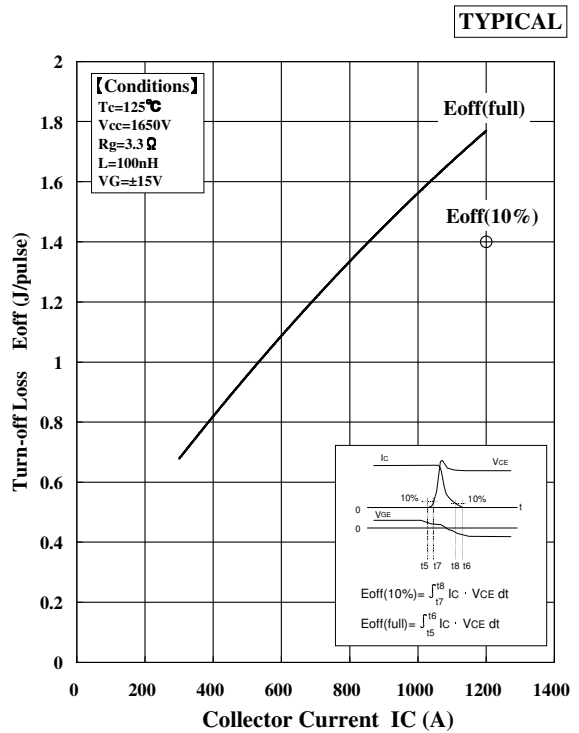
Forward Voltage of free-wheeling diode

# MBN1200E33C

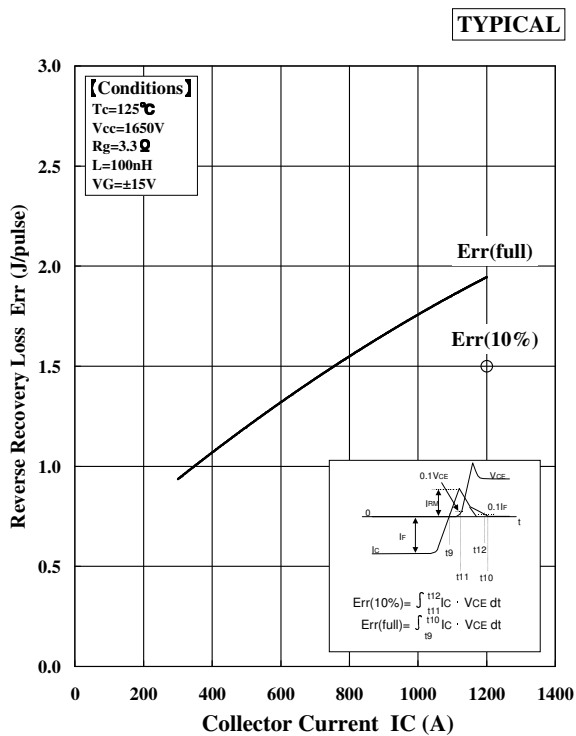
## DEPENDENCE OF CURRENT



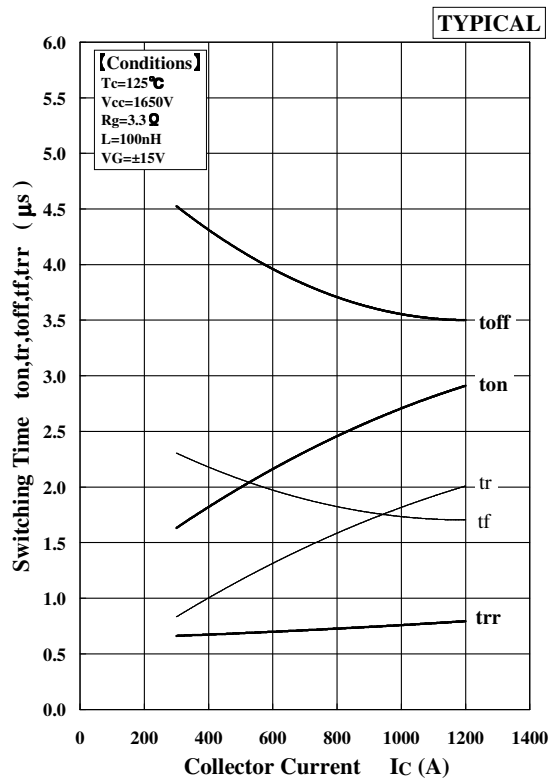
Turn-on Loss vs. Collector Current



Turn-off Loss vs. Collector Current



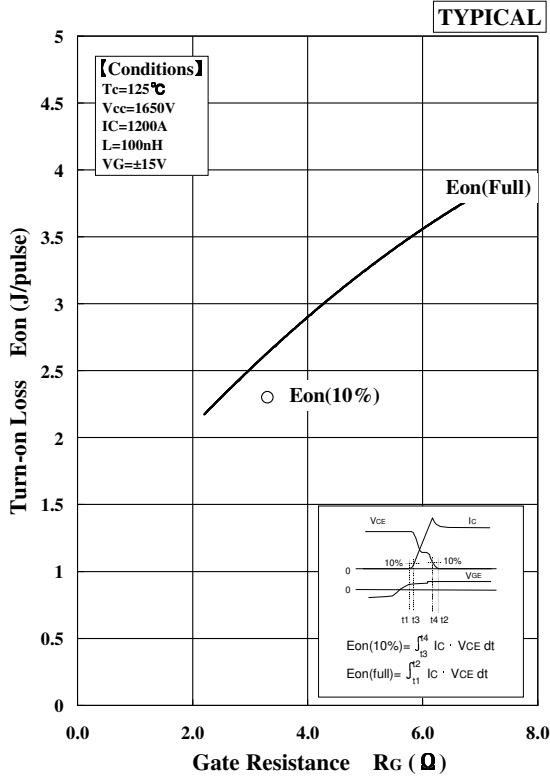
Turn-on Loss vs. Collector Current



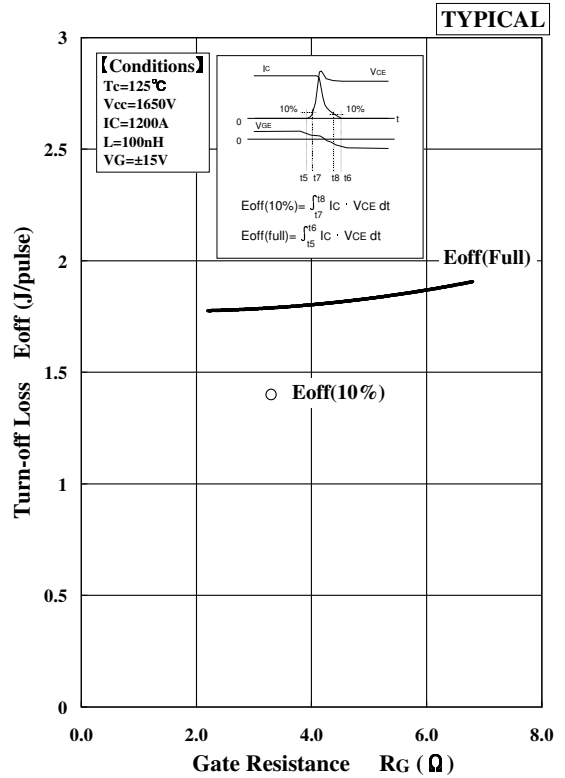
Switching Time vs. Collector Current

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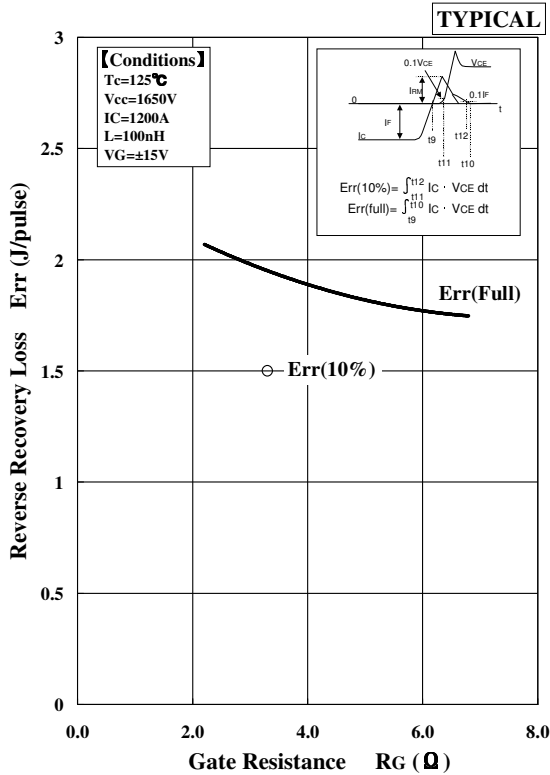
## DEPENDENCE OF RG



Turn-on Loss vs. Gate Resistance



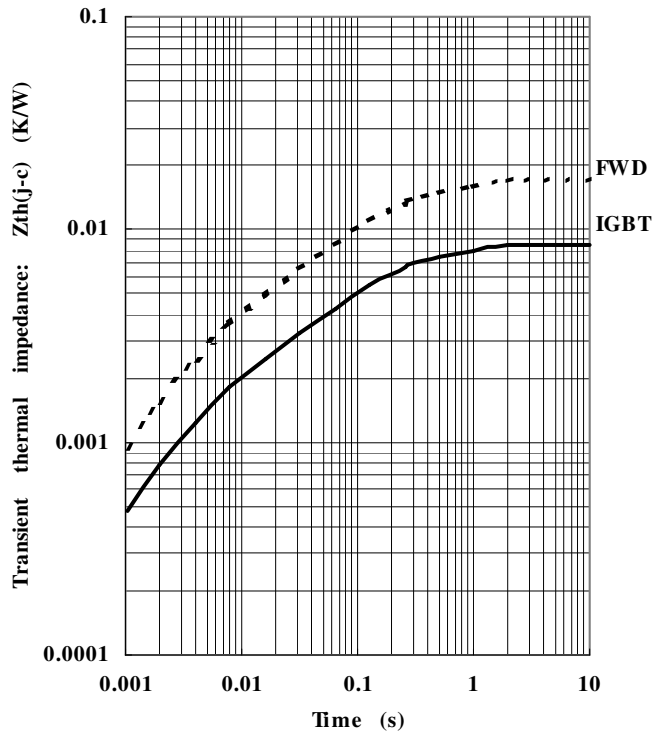
Turn-off Loss vs. Gate Resistance



Recovery Loss vs. Gate Resistance

# MBN1200E33C

## TRANSIENT THERMAL IMPEDANCE



Transient Thermal Impedance Curve

# HITACHI POWER SEMICONDUCTORS

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