MBN1000E33E2

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=25°C)

Item		Symbol	Unit	MBN1000E33E2
Collector Emitter Voltage		V_{CES}	V	3,300
Gate Emitter Voltage		V_{GES}	V	±20
Collector Current	DC	I_C	A	1,000 (Tc=95°C)
	1ms	I_{Cp}		2,000
Forward Current	DC	I_F	A	1,000
	1ms	I_{FM}		2,000
Junction Temperature		T_j	°C	-40 ~ +150
Storage Temperature		T_{stg}	°C	-50 ~ +125
Isolation Voltage		V_{ISO}	V_{RMS}	6,000(AC 1 minute)
Screw Torque	Terminals (M4/M8)	-	N·m	2/15 (1)
	Mounting (M6)	-		6 (2)

Notes: (1) Recommended Value 1.8±0.2/15$^{+0}_{-3}$N·m (2) 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	-	-	8	V_{CE}=3,300V, V_{GE}=0V, Tj=25°C
				-	14	40	V_{CE}=3,300V, V_{GE}=0V, Tj=125°C
Gate Emitter Leakage Current		I_{GES}	nA	-500	-	+500	V_{GE}=±20V, V_{CE}=0V, Tj=25°C
Collector Emitter Saturation Voltage		$V_{CE(sat)}$	V	2.5	2.95	3.5	I_C=1,000A, V_{GE}=15V, Tj=125°C
				-	3.10	-	I_C=1,000A, V_{GE}=15V, Tj=150°C
Gate Emitter Threshold Voltage		$V_{GE(TO)}$	V	5.5	6.5	7.5	V_{CE}=10V, I_C=1,000mA, Tj=25°C
Input Capacitance		C_{ies}	nF	-	130	-	V_{CE}=10V, V_{GE}=0V, f=100kHz, Tj=25°C
Internal Gate Resistance		Rge	Ω	-	1.5	-	V_{CE}=10V, V_{GE}=0V, f=100kHz, Tj=25°C
Switching Times	Rise Time	t_r	μs	1.6	2.1	2.6	V_{CC}=1,650V, Ic=1,000A
	Turn On Time	t_{on}		1.9	3.0	3.4	L=120nH
	Fall Time	t_f		1.0	1.8	2.7	R_G=3.9Ω/3.9Ω, CGE=100nF (3)
	Turn Off Time	t_{off}		2.2	3.9	5.0	V_{GE}=±15V, Tj=125°C
Peak Forward Voltage Drop		V_{FM}	V	2.2	2.5	3.0	IF=1,000A, V_{GE}=0V, Tj=125°C
				-	2.5	-	IF=1,000A, V_{GE}=0V, Tj=150°C
Reverse Recovery Time		t_{rr}	μs	0.2	0.8	1.2	Vcc=1,650V, IF=1,000A, L=120nH Tj=125°C, R_G=3.9Ω/3.9Ω, CGE=100nF
Turn On Loss		$E_{on(10\%)}$	J/P	-	2.0	2.4	Tj=125°C; V_{CC}=1,650V, Ic= IF=1,000A, L=120nH, R_G=3.9Ω/3.9Ω, CGE=100nF (3), V_{GE}=±15V
		$E_{on(full)}$		-	2.2	-	
				-	2.4	-	Tj=150°C
Turn Off Loss		$E_{off(10\%)}$	J/P	-	1.4	1.8	Tj=125°C
		$E_{off(full)}$		-	1.5	-	
				-	1.6	-	Tj=150°C
Reverse Recovery Loss		$E_{rr(10\%)}$	J/P	-	1.0	1.3	Tj=125°C
		$E_{rr(full)}$		-	1.2	-	
				-	1.4	-	Tj=150°C
Stray inductance module		L_{SCE}	nH	-	18	-	

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.

MBN1000E33E2

THERMAL CHARACTERISTICS

Item		Symbol	Unit	Min.	Typ.	Max.	Conditions
Thermal Impedance	IGBT	Rth(j-c)	K/W	-	-	0.012	Junction to case
	FWD	Rth(j-c)		-	-	0.024	
Contact Thermal Impedance		Rth(c-f)	K/W	-	0.007	-	Case to fin (λgrease=1W/(m·K), heat-sink flatness ≤ 50um)

DEFINITION OF TEST CIRCUIT

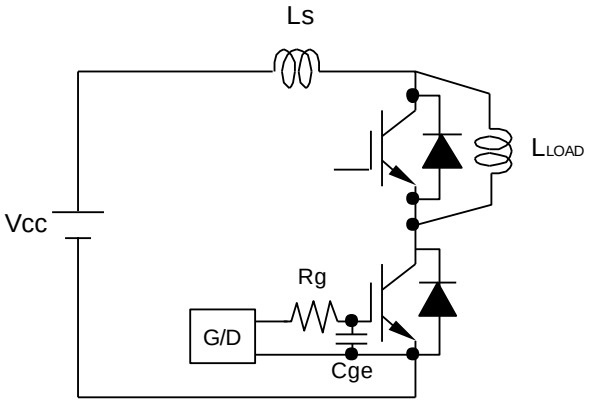
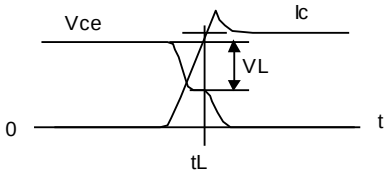
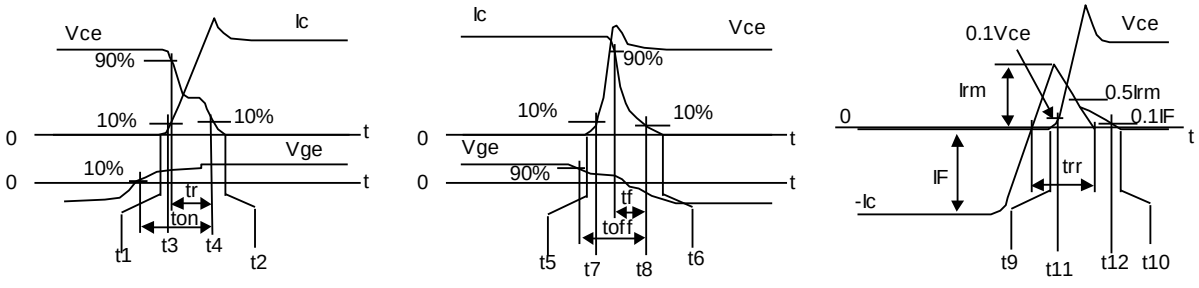


Fig.1 Switching test circuit



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

Fig.2 Definition of Ls



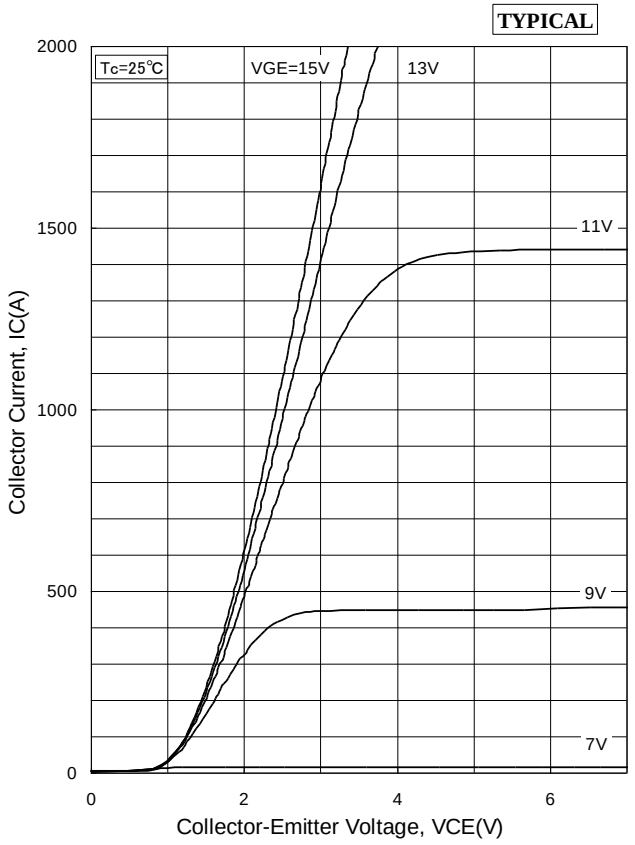
$$Eon(10\%) = \int_{t3}^{t4} Ic \cdot Vce\, dt \qquad Eoff(10\%) = \int_{t7}^{t8} Ic \cdot Vce\, dt \qquad Err(10\%) = \int_{t11}^{t12} IF \cdot Vce\, dt$$

$$Eon(Full) = \int_{t1}^{t2} Ic \cdot Vce\, dt \qquad Eoff(Full) = \int_{t5}^{t6} Ic \cdot Vce\, dt \qquad Err(Full) = \int_{t9}^{t10} IF \cdot Vce\, dt$$

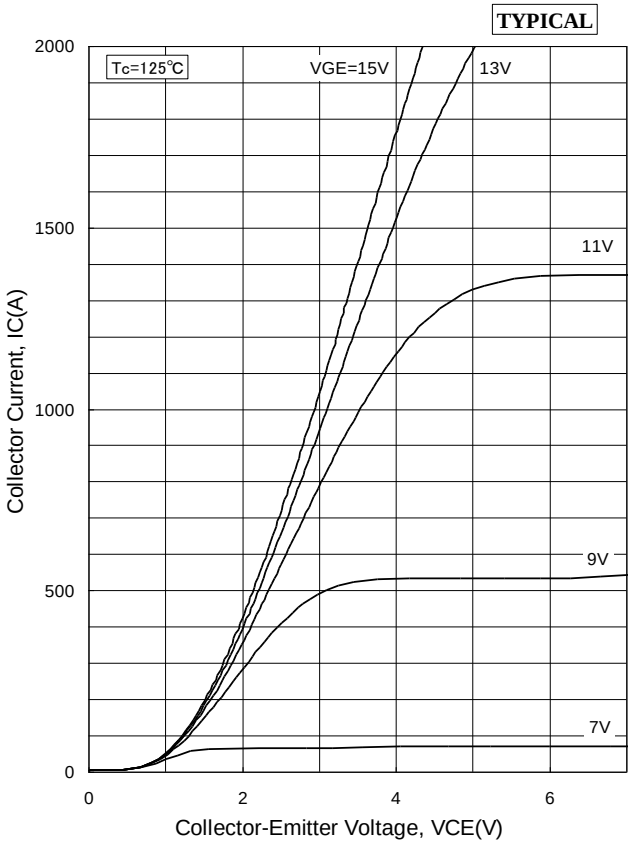
Fig.3 Definition of switching loss

MBN1000E33E2

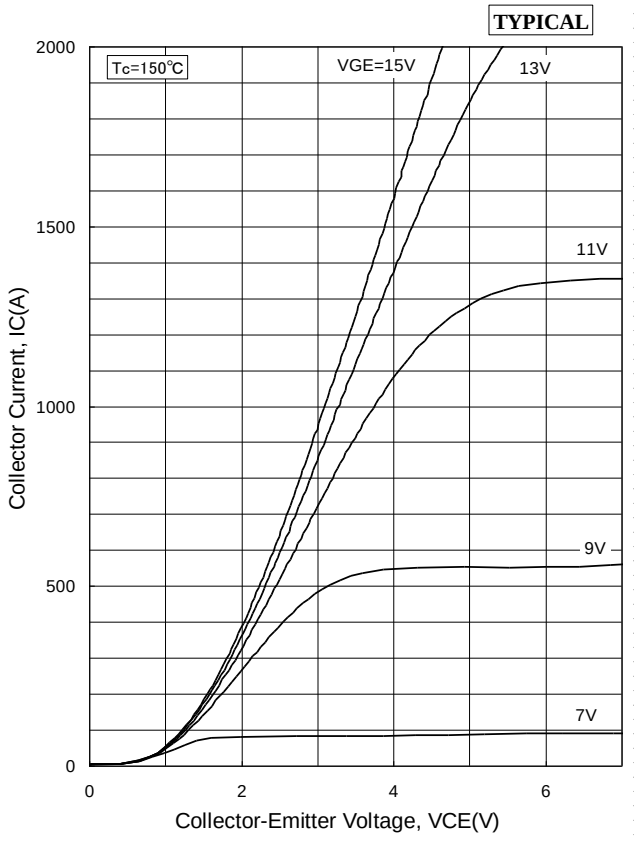
STATIC CHARACTERISTICS



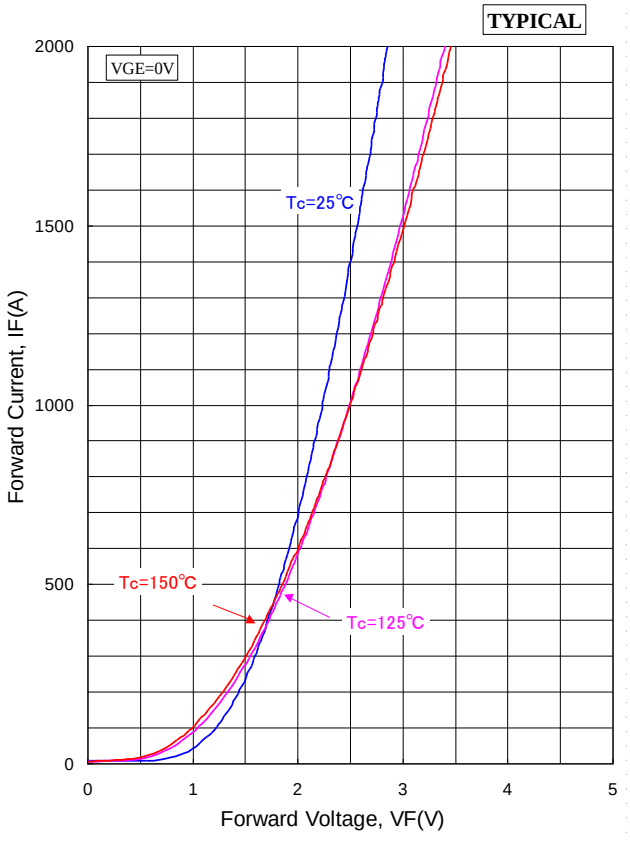
Collecter Current vs. Collector to Emitter Voltage



Collecter Current vs. Collector to Emitter Voltage



Collecter Current vs. Collector to Emitter Voltage

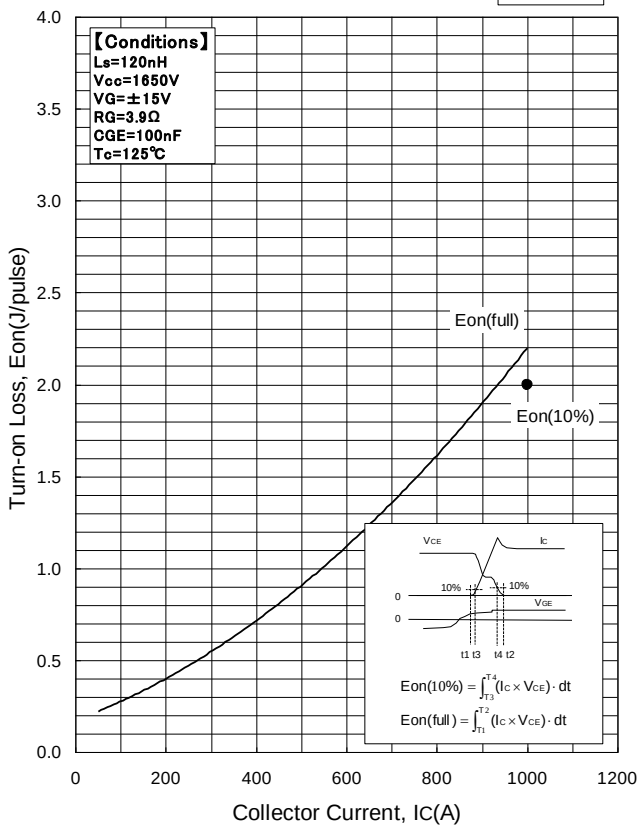


Forward Voltage of free-wheeling diode

MBN1000E33E2

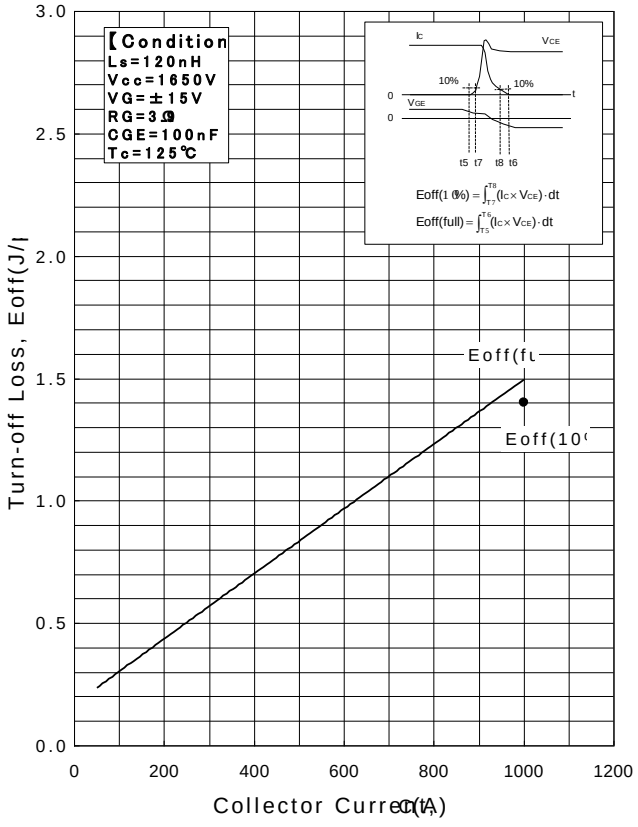
DYNAMIC CHARACTERISTICS

TYPICAL



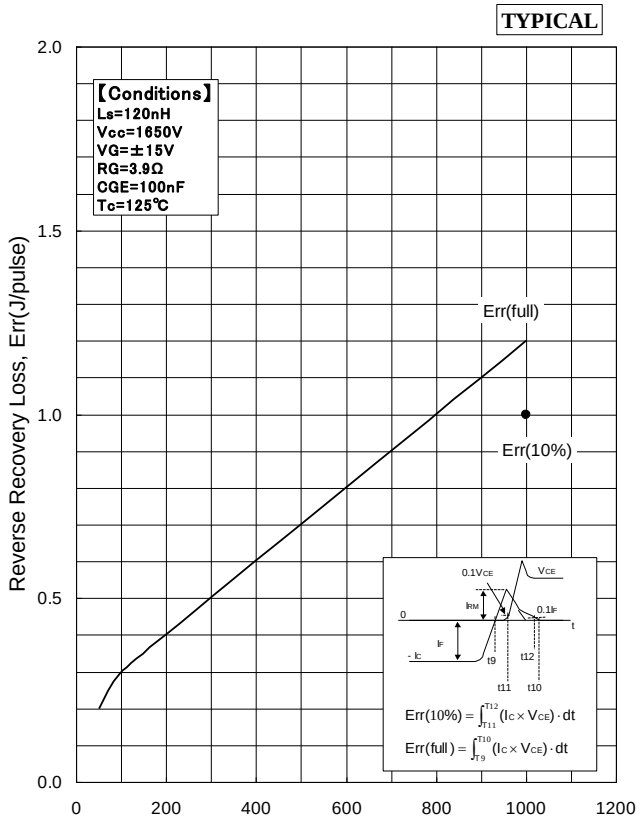
Turn-on Loss vs. Collector Current

TYPICA



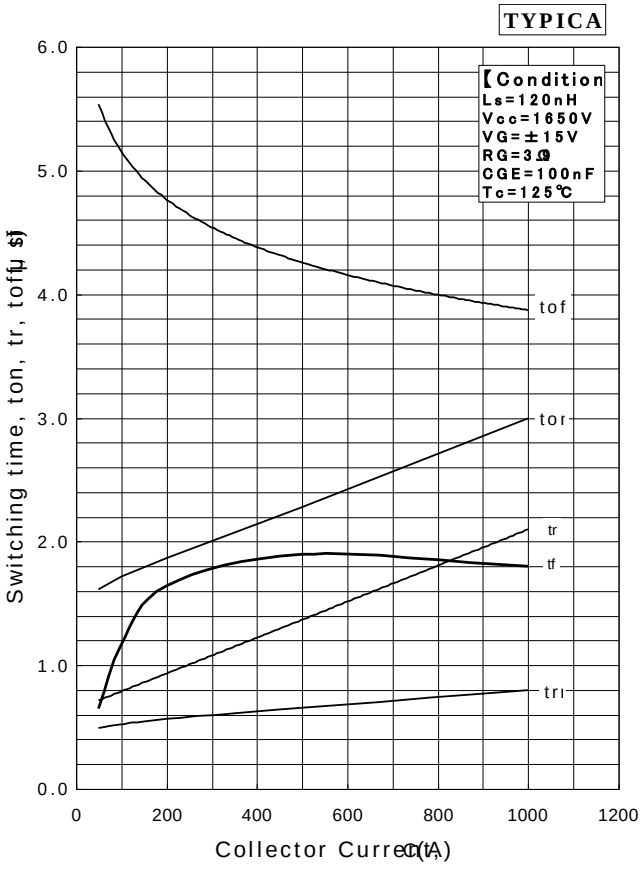
Turn-off Loss vs. Collector Current

TYPICAL



Recovery Loss vs. Forward Current

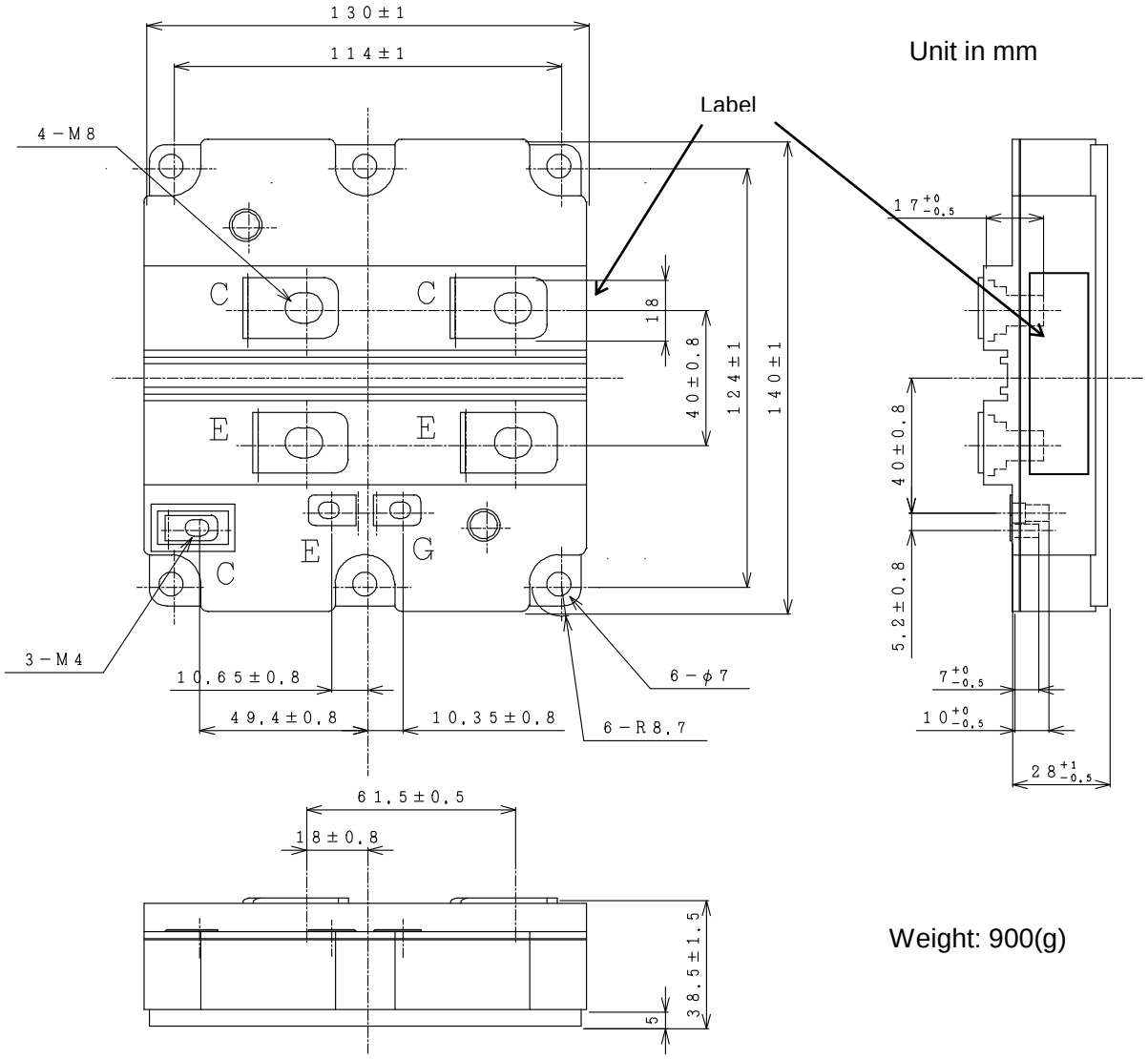
TYPICA

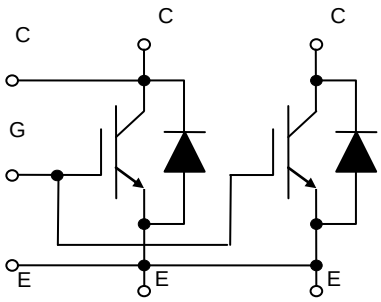


Switching time vs. Collector current

MBN1000E33E2

OUTLINE DRAWINGS



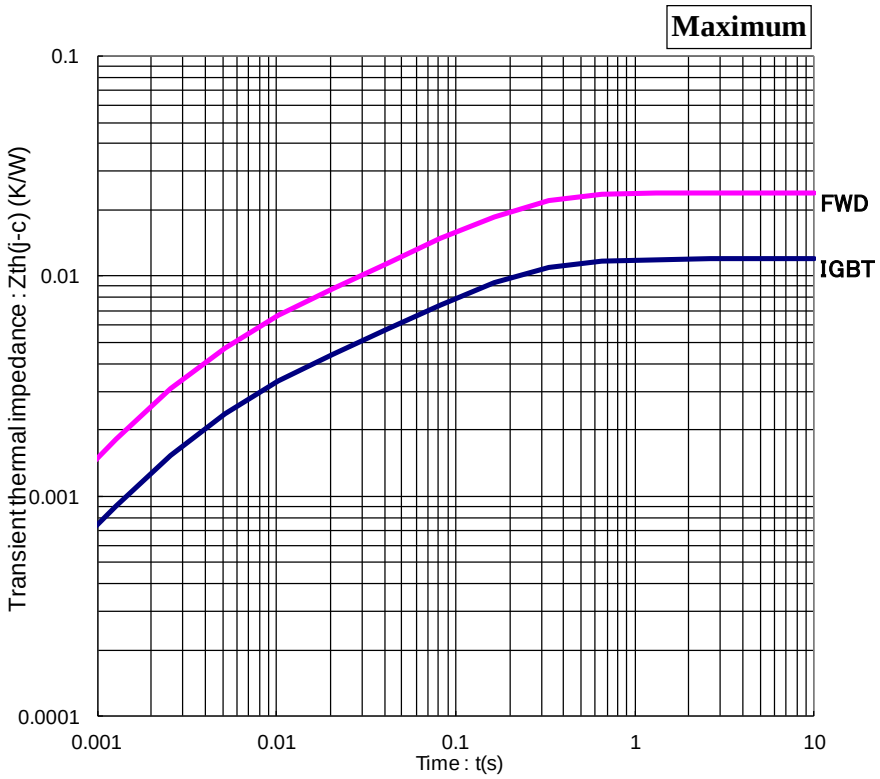


Circuit diagram

Weight: 900(g)

MBN1000E33E2

TRANSIENT THERMAL IMPEDANCE



Transient Thermal Impedance Curve

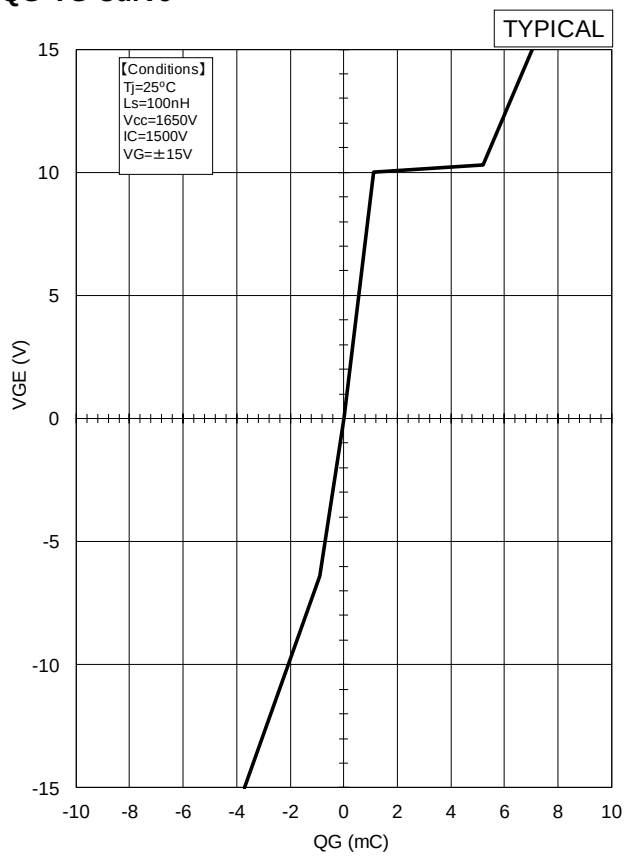
Material declaration

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

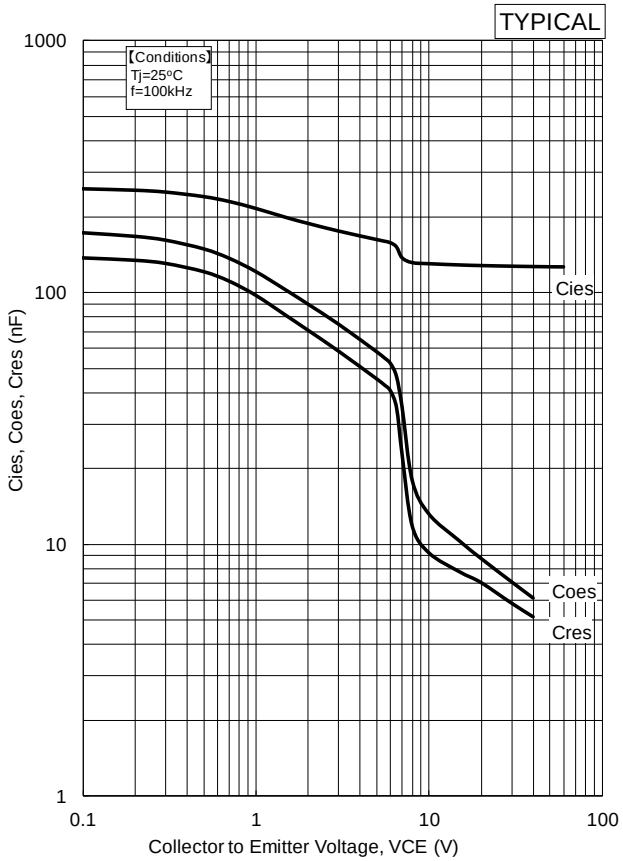
MBN1000E33E2

QG-VG Curve



QG-VGE curve

Cies, Coes, Cres Curve

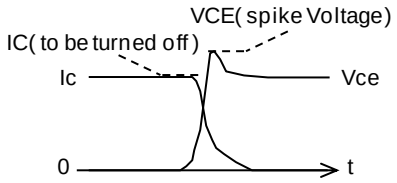


Capacitance vs. Collector to Emitter Voltage

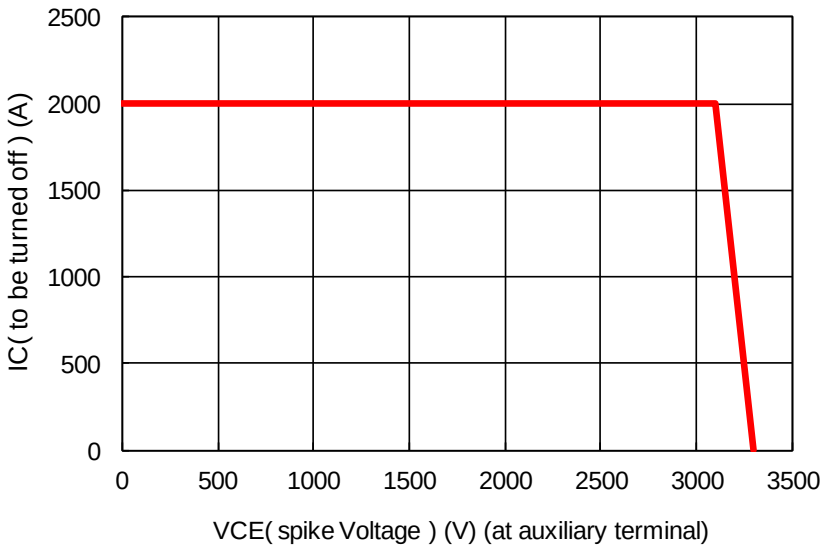
MBN1000E33E2

RBSOA

Conditions: Vcc≤2200V, Ic≤2000A,
Rg≥3.9Ω, Cge≥100nF,
VGE=±15V, -40°C≤Tj≤150°C,
Ls≤120nH, on pulse width≥ 10us
(Vce spike voltage and Ls are defined at auxiliary terminal)



Definition of RBSOA waveform



Reverse bias safe operation area (RBSOA)

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HITACHI POWER SEMICONDUCTORS

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