

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

ABSOLUTE MAXIMUM RATINGS (T_C=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	1,000 (T _C =95°C)
	1ms	I _{Cp}	
Forward Current	DC	I _F	1,000
	1ms	I _{FM}	
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)	-	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 $5.5 \pm 0.5 N \cdot m$

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, T _J =25°C	
Gate Emitter Leakage Current	I _{GES}	nA	-500	-	+500	V _{GE} =±20V, V _{CE} =0V, T _J =25°C	
Collector Emitter Saturation Voltage	V _{CE(sat)}	V	2.5	2.95	3.5	I _C =1,000A, V _{GE} =15V, T _J =25°C	
			-	3.10	-	I _C =1,000A, V _{GE} =15V, T _J =150°C	
Gate Emitter Threshold Voltage	V _{GE(TO)}	V	5.5	6.5	7.5	V _{CE} =10V, I _C =1,000mA, T _J =25°C	
Input Capacitance	C _{ies}	nF	-	130	-	V _{CE} =10V, V _{GE} =0V, f=100kHz, T _J =25°C	
Internal Gate Resistance	R _{ge}	Ω	-	1.5	-	V _{CE} =10V, V _{GE} =0V, f=100kHz, T _J =25°C	
Switching Times	Rise Time	t _r	1.6	2.1	2.6	V _{CC} =1,650V, I _C =1,000A L=120nH R _G =3.9Ω/3.9Ω, C _{GE} =100nF (3)	
	Turn On Time	t _{on}	1.9	3.0	3.4		
	Fall Time	t _f	1.0	1.8	2.7		
	Turn Off Time	t _{off}	2.2	3.9	5.0		
Peak Forward Voltage Drop	V _{FM}	V	2.2	2.5	3.0	I _F =1,000A, V _{GE} =0V, T _J =125°C	
			-	2.5	-	I _F =1,000A, V _{GE} =0V, T _J =150°C	
Reverse Recovery Time	t _{rr}	μs	0.2	0.8	1.2	V _{CC} =1,650V, I _F =1,000A, L=120nH T _J =125°C, R _G =3.9Ω/3.9Ω, C _{GE} =100nF	
Short Circuit Pulse Width	t _{sc}	μs	10	-	-	V _{CC} =2000V, L _s =130nH R _G (on/off)=3.9/39Ω, V _{GE} =±15V, T _J =125°C	
Turn On Loss	E _{on(10%)}	J/P	-	2.0	2.4	T _J =125°C	V _{CC} =1,650V, I _C = I _F =1,000A, L=120nH, R _G =3.9Ω/3.9Ω, C _{GE} =100nF (3) V _{GE} =±15V
	E _{on(full)}		-	2.2	-		
Turn Off Loss	E _{off(10%)}	J/P	-	1.4	1.8	T _J =125°C	
	E _{off(full)}		-	1.5	-	T _J =150°C	
Reverse Recovery Loss	E _{rr(10%)}	J/P	-	1.0	1.3	T _J =125°C	
	E _{rr(full)}		-	1.2	-	T _J =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.

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THERMAL CHARACTERISTICS

Item	Symbol	Unit	Min.	Typ.	Max.	Conditions
Thermal Impedance	IGBT	$R_{th(j-c)}$	-	-	0.012	Junction to case
	FWD	$R_{th(j-c)}$	-	-	0.024	
Contact Thermal Impedance		$R_{th(c-f)}$	-	0.007	-	Case to fin ($\lambda_{grease}=1W/(m \cdot K)$, heat-sink flatness $\leq 50\mu m$)

DEFINITION OF TEST CIRCUIT

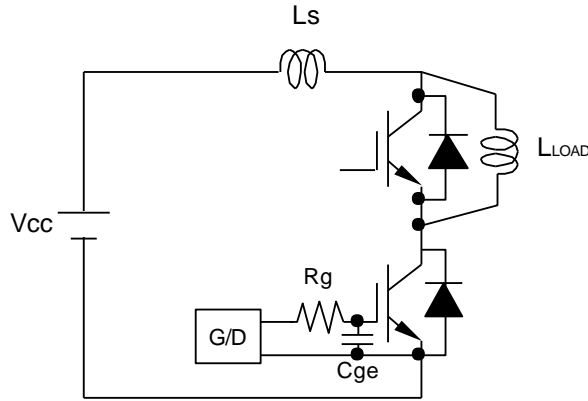


Fig.1 Switching test circuit

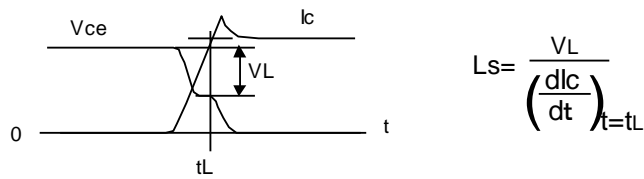


Fig.2 Definition of Ls

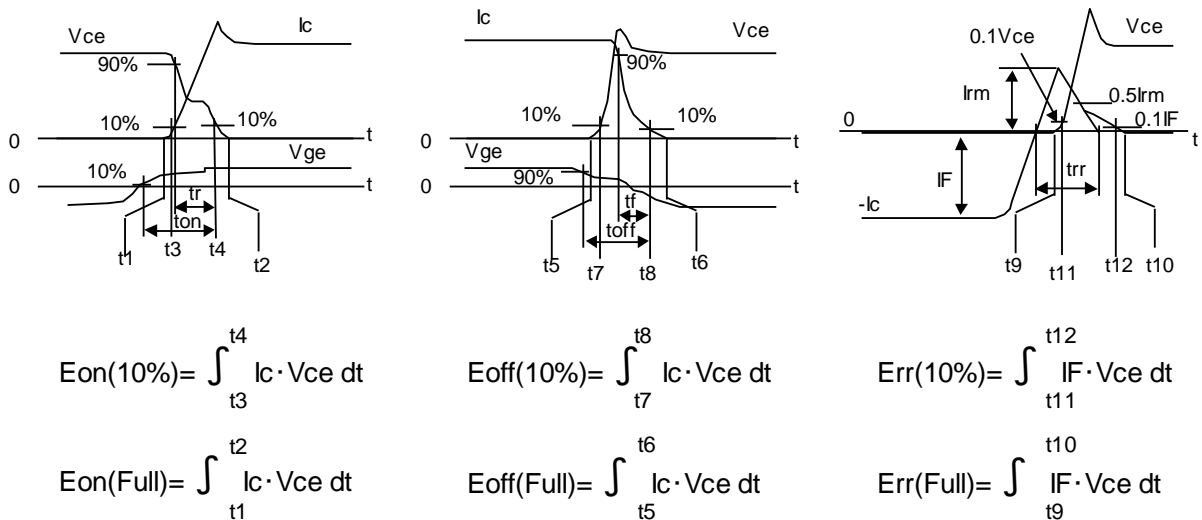
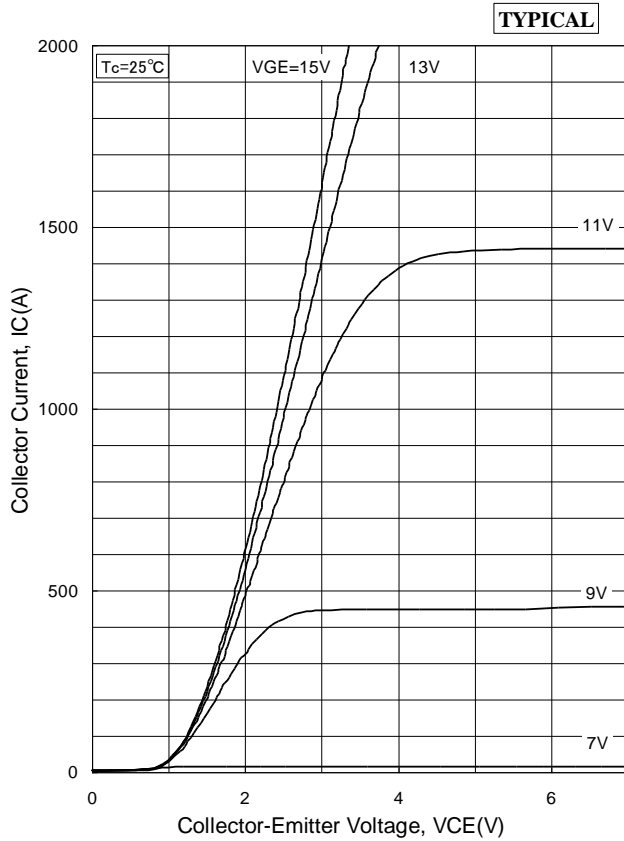


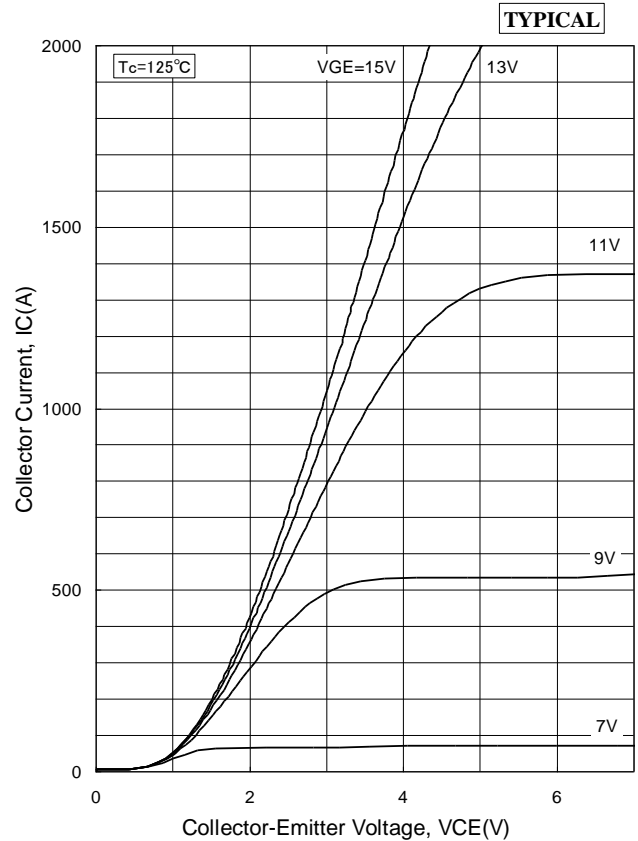
Fig.3 Definition of switching loss

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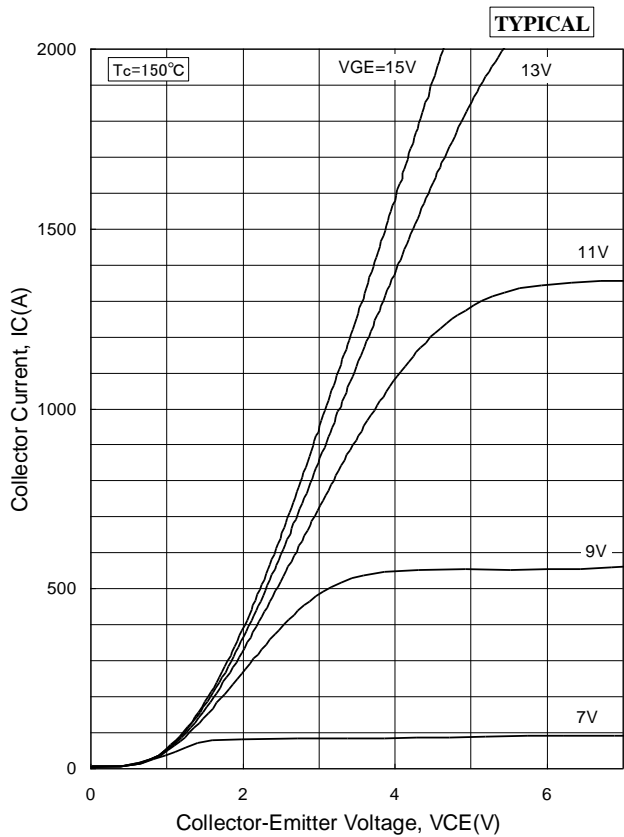
STATIC CHARACTERISTICS



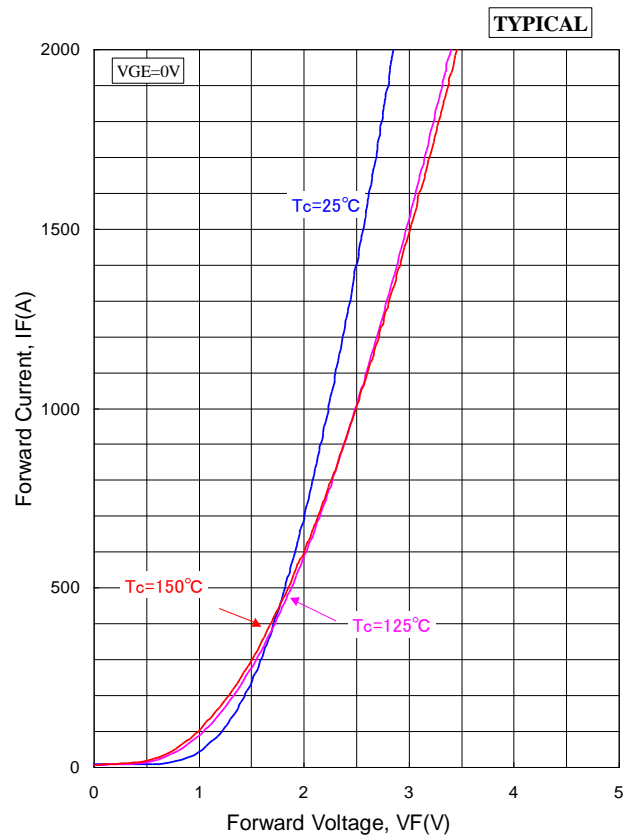
Collector Current vs. Collector to Emitter Voltage



Collector Current vs. Collector to Emitter Voltage



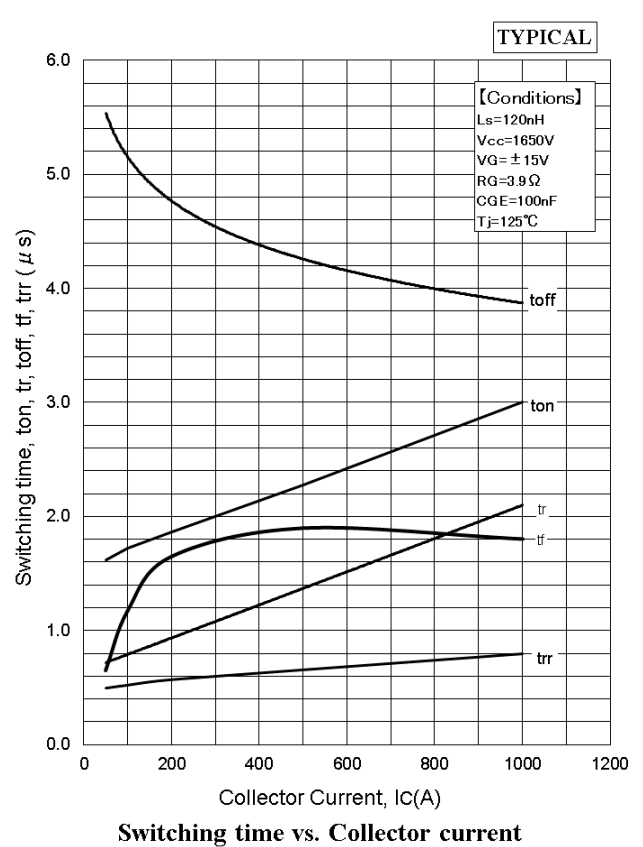
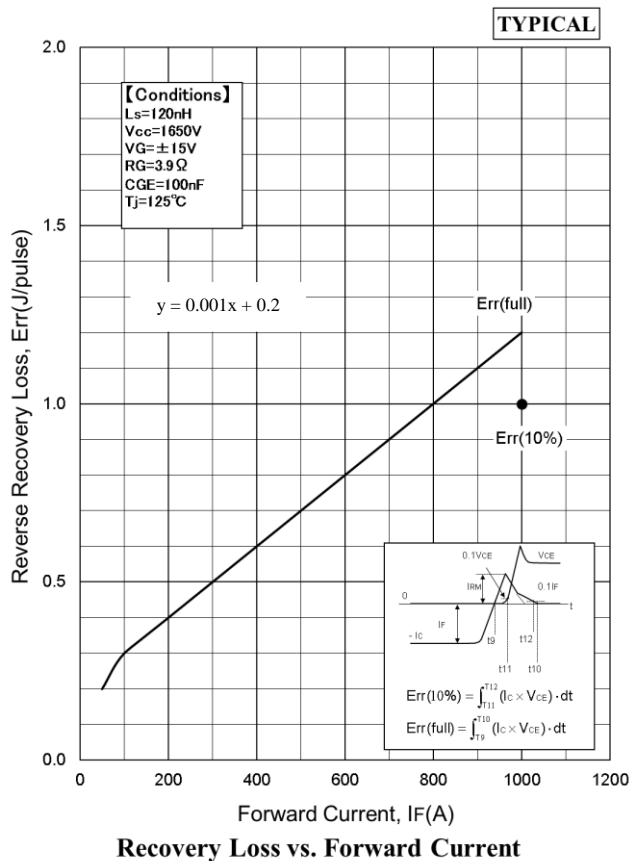
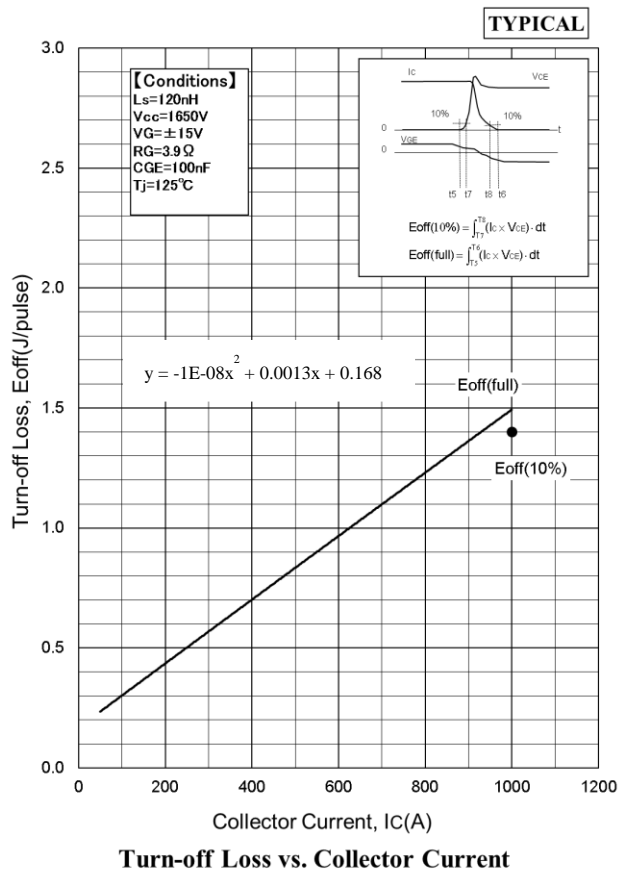
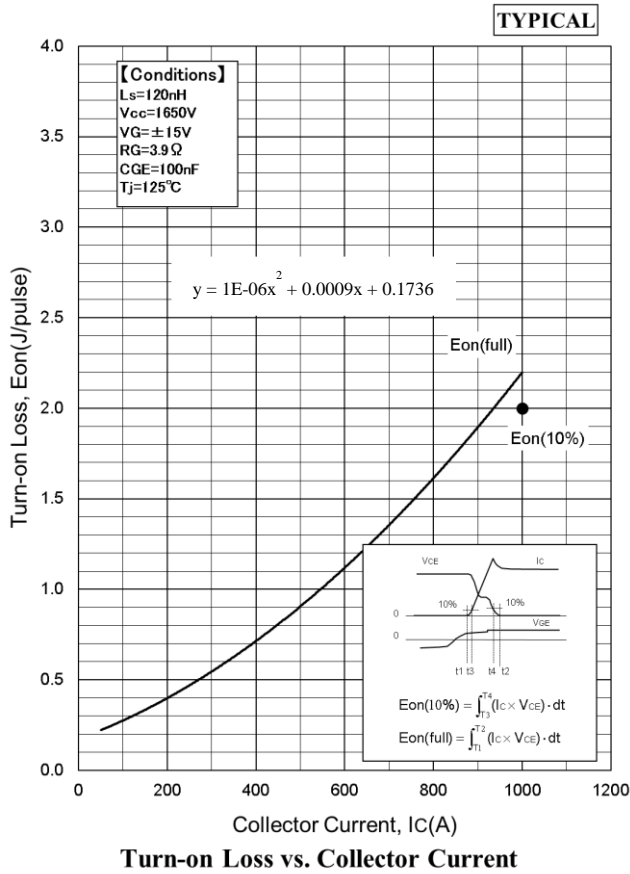
Collector Current vs. Collector to Emitter Voltage



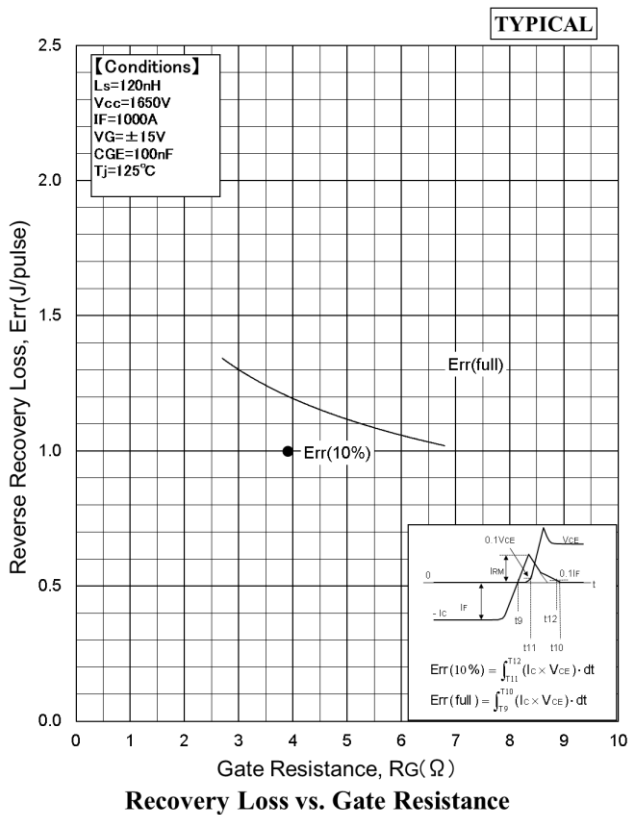
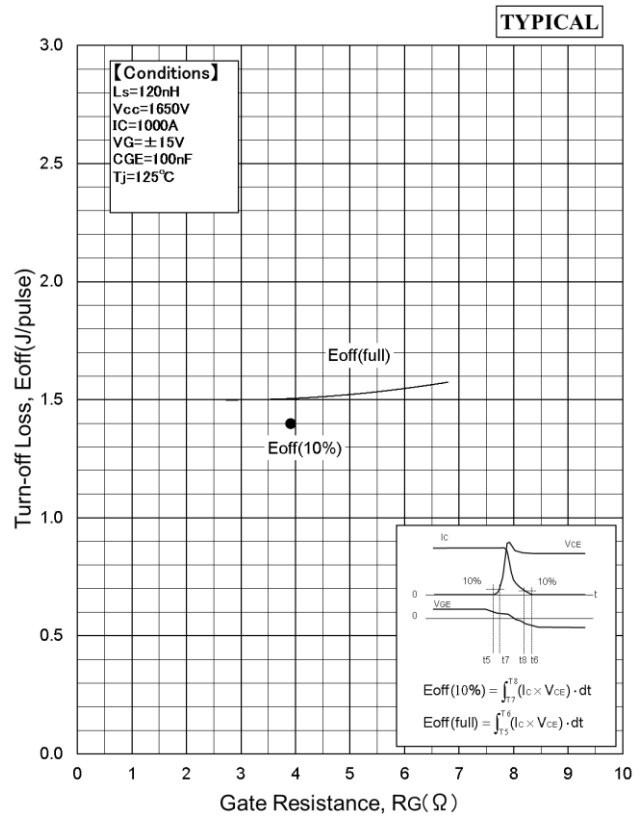
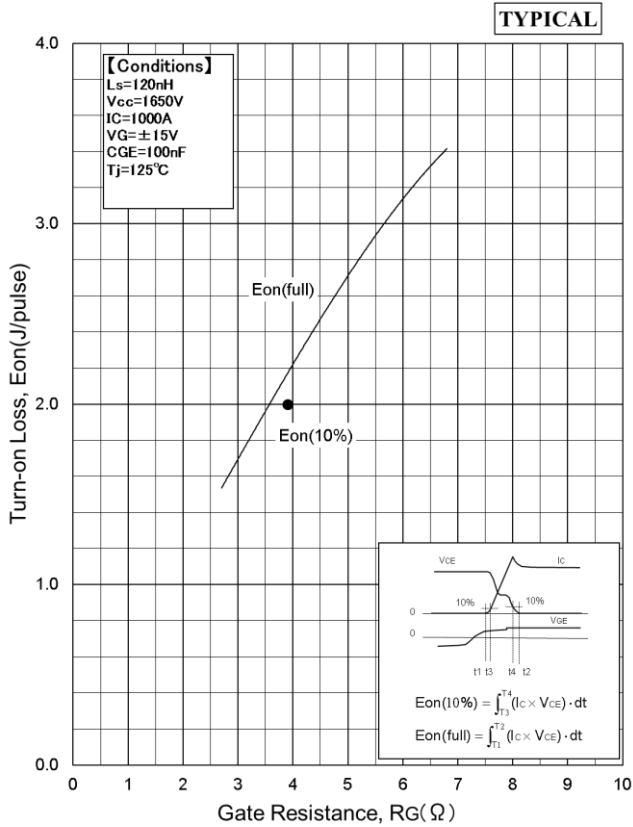
Forward Voltage of free-wheeling diode

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DYNAMIC CHARACTERISTICS

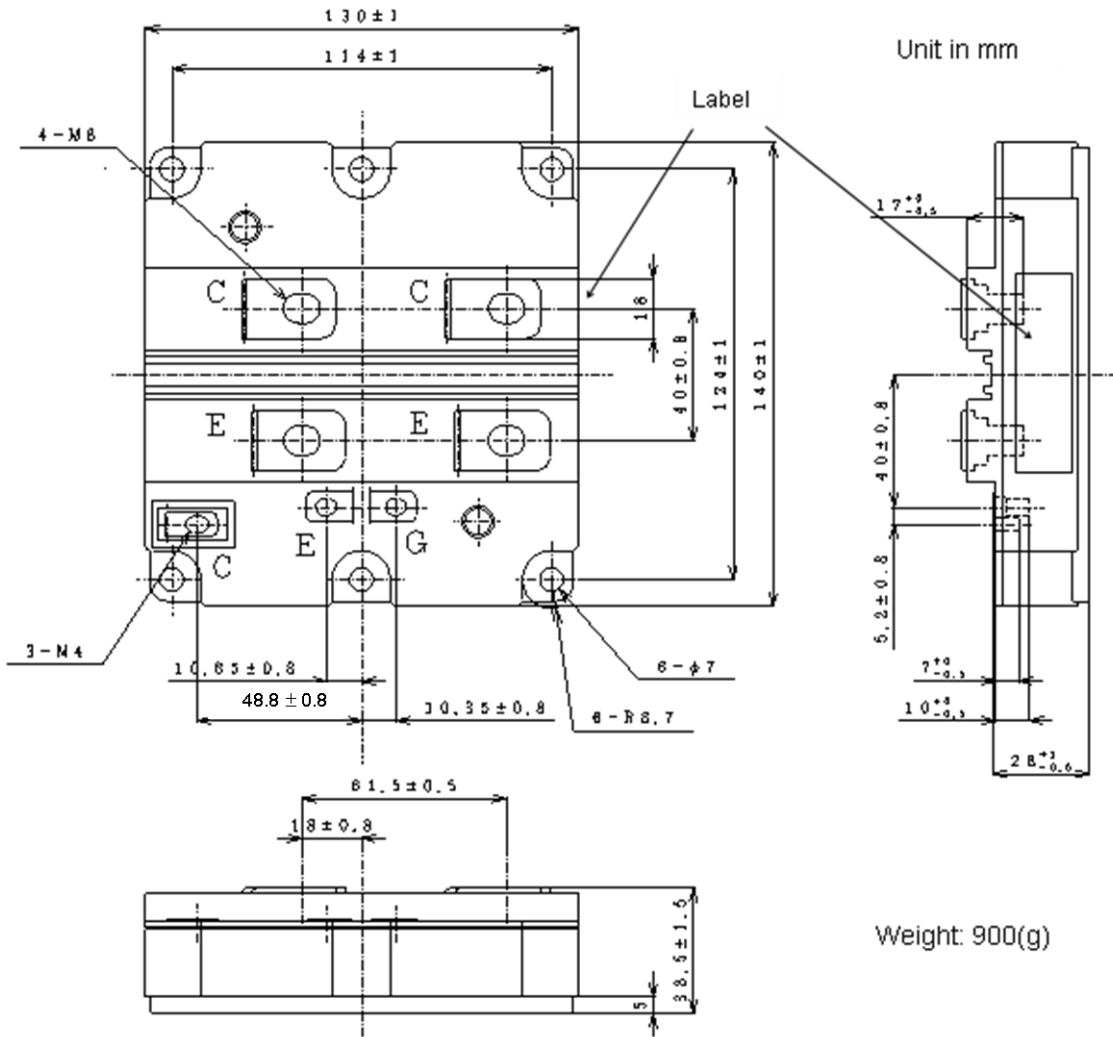


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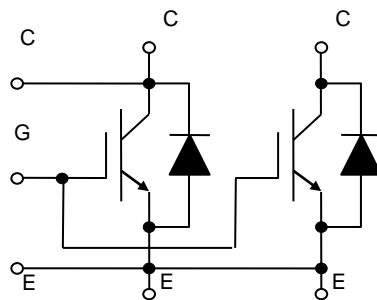


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OUTLINE DRAWINGS



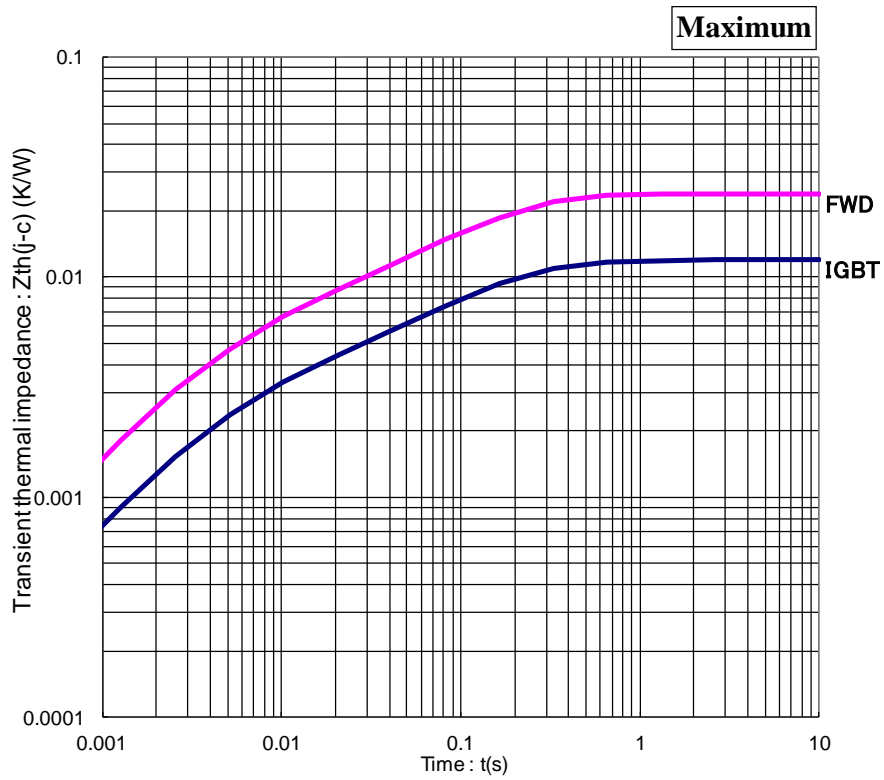
Weight: 900(g)



Circuit diagram

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TRANSIENT THERMAL IMPEDANCE



Transient Thermal Impedance Curve

Curve approximation model

$$Z_{th} = \sum r_{th}[n] * (1 - \exp(-t/r_{th}[n]))$$

n	1	2	3	4	Unit
r _{th} [n]	1.60E-01	2.74E-02	4.04E-03	7.37E-04	sec
r _{th} [n,IGBT]	7.46E-03	2.17E-03	2.16E-03	2.21E-04	K/W
r _{th} [n,Diode]	1.48E-02	4.47E-03	4.24E-03	4.53E-04	K/W

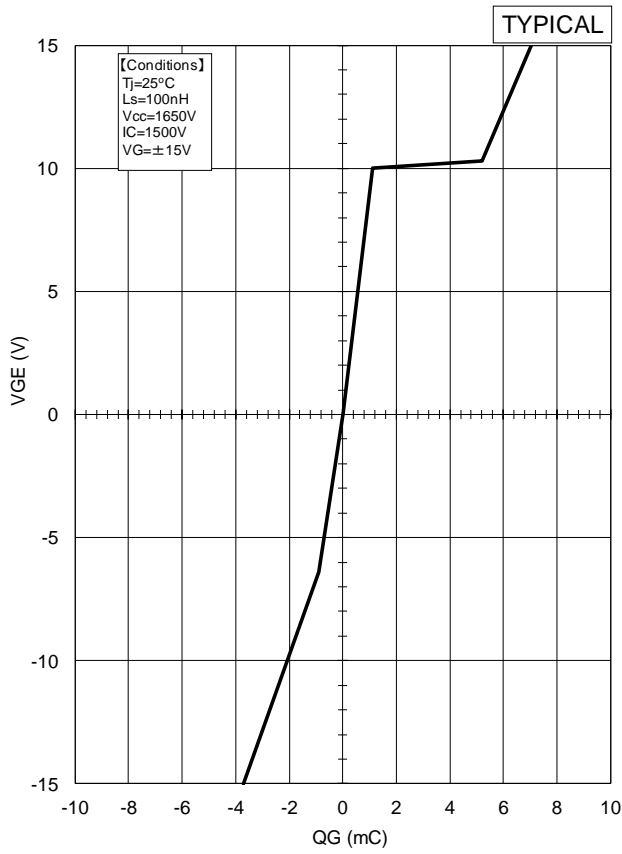
Material declaration

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

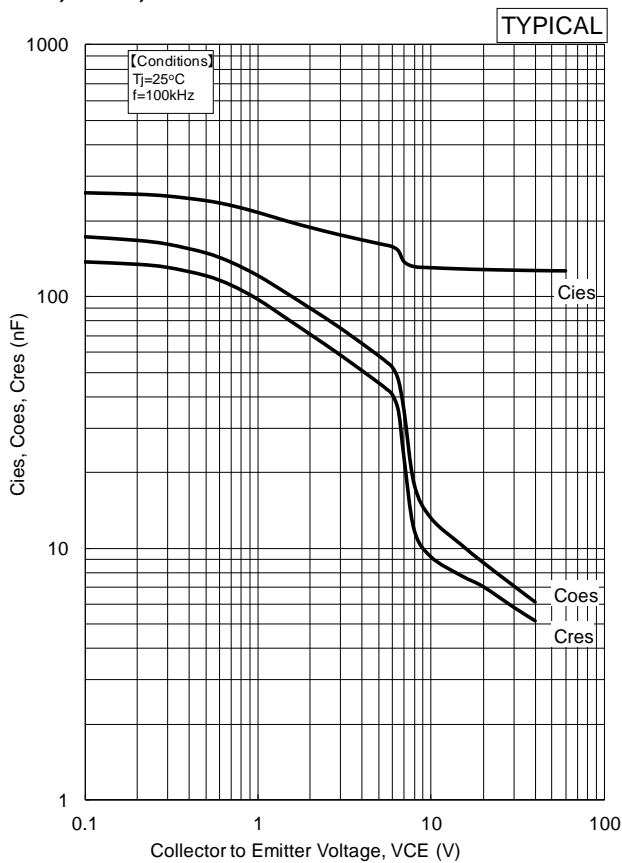
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QG-VG Curve



QG-VGE curve

Cies, Coes, Cres Curve

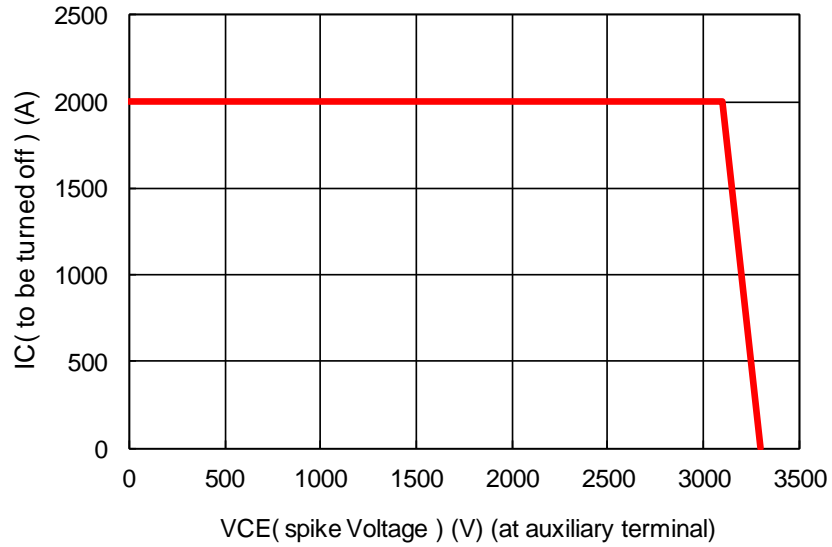
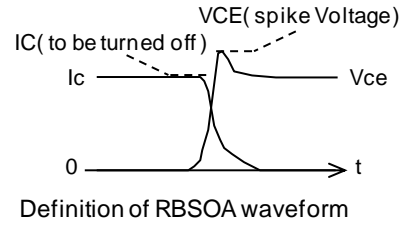


Capacitance vs. Collector to Emitter Voltage

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RBSOA

**Conditions: $V_{cc} \leq 2200V$, $I_c \leq 2000A$,
 $R_g \geq 3.9\Omega$, $C_{ge} \geq 100nF$,
 $V_{GE} = \pm 15V$, $-40^\circ C \leq T_j \leq 150^\circ C$,
 $L_s \leq 120nH$, on pulse width $\geq 10\mu s$
 (Vce spike voltage and L_s are defined at auxiliary terminal)**



Reverse bias safe operation area (RBSOA)

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HITACHI POWER SEMICONDUCTORS

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