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_C=25°C)

Item		Symbol	Unit	MBL1000E33E2-B
Collector Emitter Voltage		V_{CES}	V	3,300
Gate Emitter Voltage		V_{GES}	V	±20
Collector Current	DC	I_C	A	1,000
	1ms	I_{CRM}		2,000
Forward Current (Free wheel Diode)	DC	$I_{F(FWD)}$	A	1,000
	1ms	$I_{FRM(FWD)}$		2,000
Forward Current (Chopper Diode)	DC	$I_{F(Chopper)}$	A	800
	1ms	$I_{FRM(Chopper)}$		1,600
Junction Temperature		$T_{vj\ op}$	°C	-40 ~ +125
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

1)IGBT+FWD

Item		Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Collector Emitter Cut-Off Current		I_{CES}	mA	-	-	12	V_{CE}=3,300V, V_{GE}=0V, T_{vj}=25°C
Gate Emitter Leakage Current		I_{GES}	nA	-500	-	+500	V_{GE}=±20V, V_{CE}=0V, T_{vj}=25°C
Collector Emitter Saturation Voltage		$V_{CE(sat)}$	V	2.5	2.95	3.5	I_C=1,000A, V_{GE}=15V, T_{vj}=125°C
Gate Emitter Threshold Voltage		$V_{GE(th)}$	V	5.5	6.3	7.7	V_{CE}=10V, I_C=1,000mA, T_{vj}=25°C
Input Capacitance		C_{ies}	nF	-	130	-	V_{CE}=10V, V_{GE}=0V, f=100kHz, T_{vj}=25°C
Internal Gate Resistance		$R_{G(int)}$	Ω	-	1.3	-	V_{CE}=10V, V_{GE}=0V, f=100kHz, T_{vj}=25°C
Turn On Delay Time		$t_{d(on)}$	μs	-	0.7	-	V_{CC}=1,650V, I_C=1,000A L_S=200nH R_G(on/off)=3.9/3.9Ω, C_{GE}=100nF (3) V_{GE}=±15V, T_{vj}=125°C
Rise Time		t_r		1.0	1.6	2.2	
Turn Off Delay Time		$t_{d(off)}$		-	2.1	-	
Fall Time		t_f		1.0	1.8	2.7	
Turn On Loss		$E_{on(10\%)}$	J/P	-	1.30	-	
Turn Off Loss		$E_{off(10\%)}$	J/P	-	1.60	-	
Forward Voltage Drop		V_F	V	-	2.5	-	I_F=1000A, V_{GE}=0V, T_{vj}=125°C
Reverse Recovery Time		t_{rr}	μs	-	0.8	-	V_{CC}=1,650V, I_F=1,000A L_S=200nH R_G(on/off)=3.9/3.9Ω, C_{GE}=100nF (3) V_{GE}=±15V, T_{vj}=125°C
Reverse Recovery Loss		$E_{rr(10\%)}$	J/P	-	1.08	-	
Thermal Impedance	IGBT	$R_{th(j-c)}$	K/W	-	-	0.012	Junction to case
	FWD	$R_{th(j-c)}$		-	-	0.024	
Contact Thermal Impedance		$R_{th(c-f)}$	K/W	-	0.010	-	Case to fin (at IGBT+FWD part)

Notes:(3) Ls and R_G are the test condition's values 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.

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2) Chopper Diode

Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Collector Emitter Cut-Off Current	I_{AKS}	mA	-	-	12	V_{KA}=3,300V, T_{vj}=25°C
Forward Voltage Drop	V_F	V	2.4	2.9	3.4	I_F=800A,T_{vj}=125°C at main terminals (Terminal resistance:0.5mΩ typical)
Reverse Recovery Time	t_{rr}	μs	0.4	1.0	1.7	V_{CC}=1,650V, I_F=800A L_S=200nH
Reverse Recovery Loss	$E_{rr(10\%)}$	J/P	-	1.03	-	R_G(on/off)=3.9/3.9Ω, C_{GE}=100nF (4) V_{GE}=±15V, T_{vj}=125°C
Thermal Impedance	$R_{th(j-c)}$	K/W	-	-	0.026	Junction to case
Contact Thermal Impedance	$R_{th(c-f)}$	K/W	-	0.015	-	Case to fin(at Chopper Diode part)

Notes:(4) Ls and R_G are the test condition's values 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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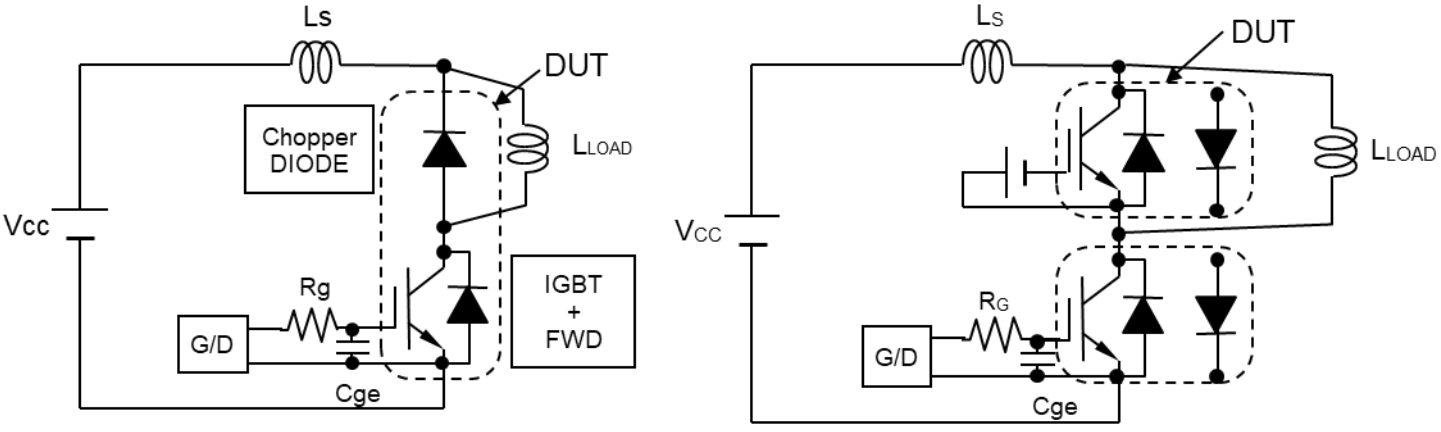
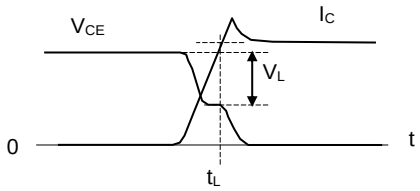
DEFINITION OF TEST CIRCUIT



Test for IGBT and Chopper Diode

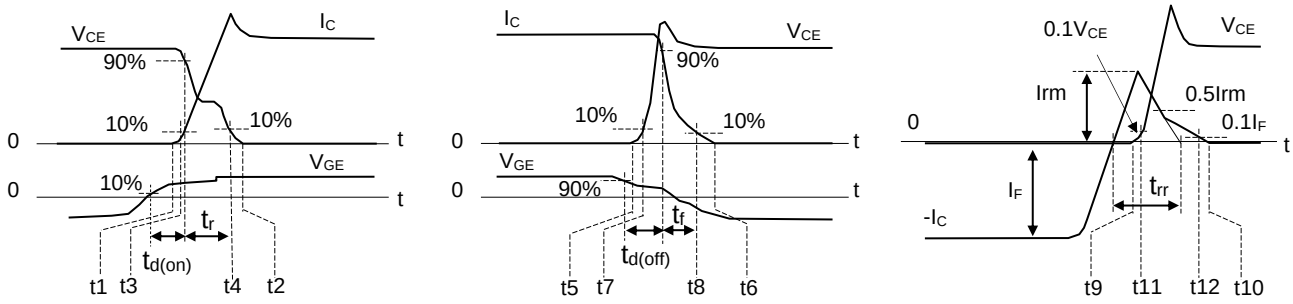
Test for FWD

Fig.1 Switching test circuit



$$L_S = \frac{V_L}{\left(\frac{dI_C}{dt}\right)_{t=t_L}}$$

Fig.2 Definition of stray inductance



$$E_{on(10\%)} = \int_{t3}^{t4} I_C \cdot V_{CE}\, dt \qquad E_{off(10\%)} = \int_{t7}^{t8} I_C \cdot V_{CE}\, dt \qquad E_{rr(10\%)} = \int_{t11}^{t12} I_F \cdot V_{CE}\, dt$$

$$E_{on(Full)} = \int_{t1}^{t2} I_C \cdot V_{CE}\, dt \qquad E_{off(Full)} = \int_{t5}^{t6} I_C \cdot V_{CE}\, dt \qquad E_{rr(Full)} = \int_{t9}^{t10} I_F \cdot V_{CE}\, dt$$

Fig.3 Definition of switching loss

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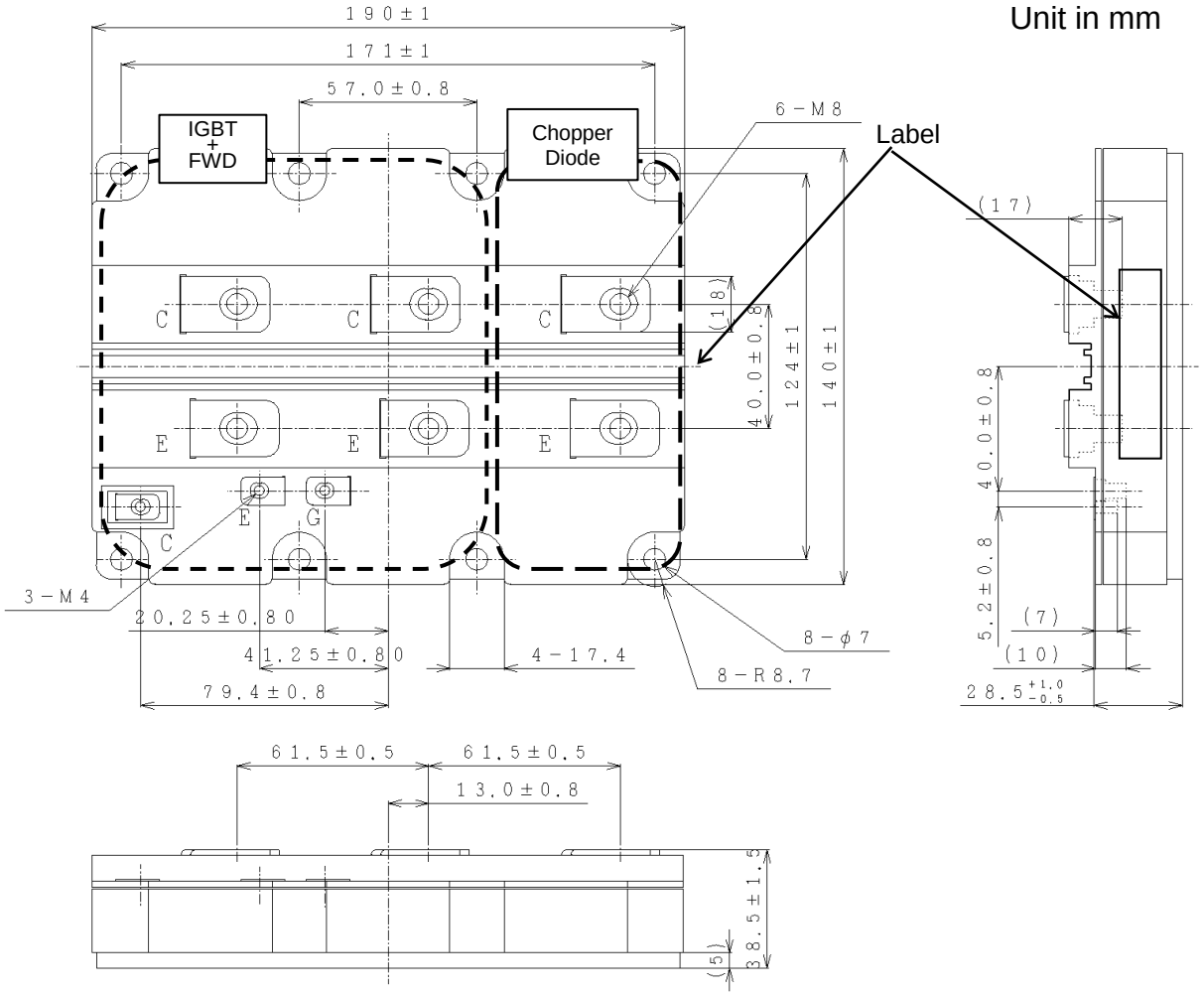
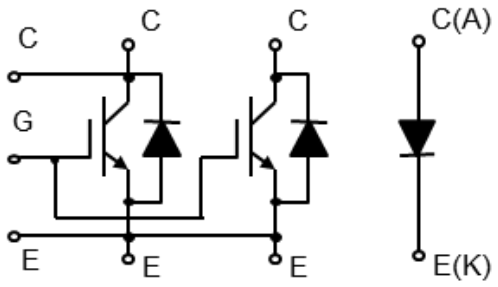
OUTLINE DRAWING

Unit in mm



Weight : 1300g

CIRCUIT DIAGRAM



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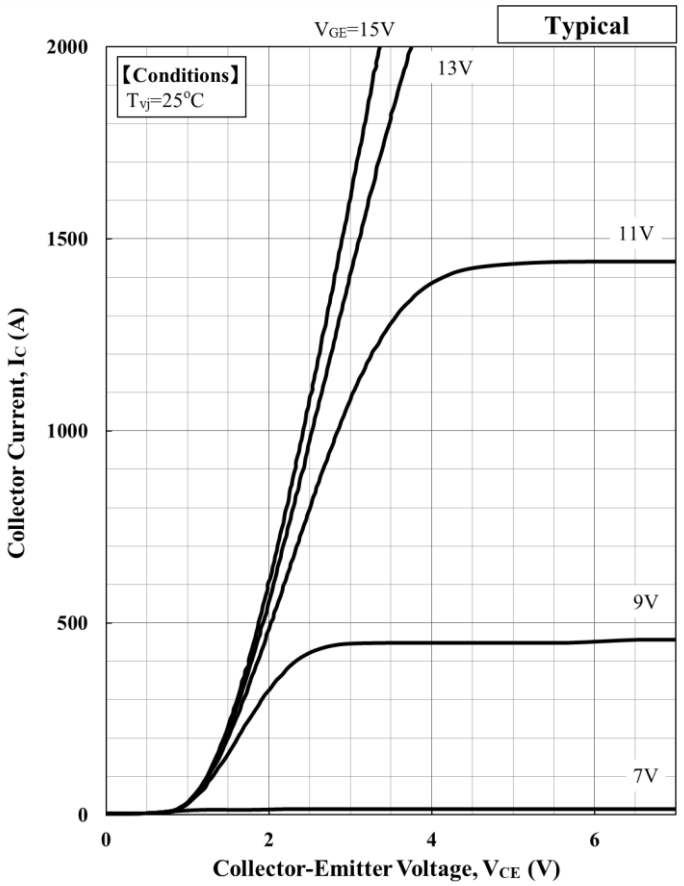
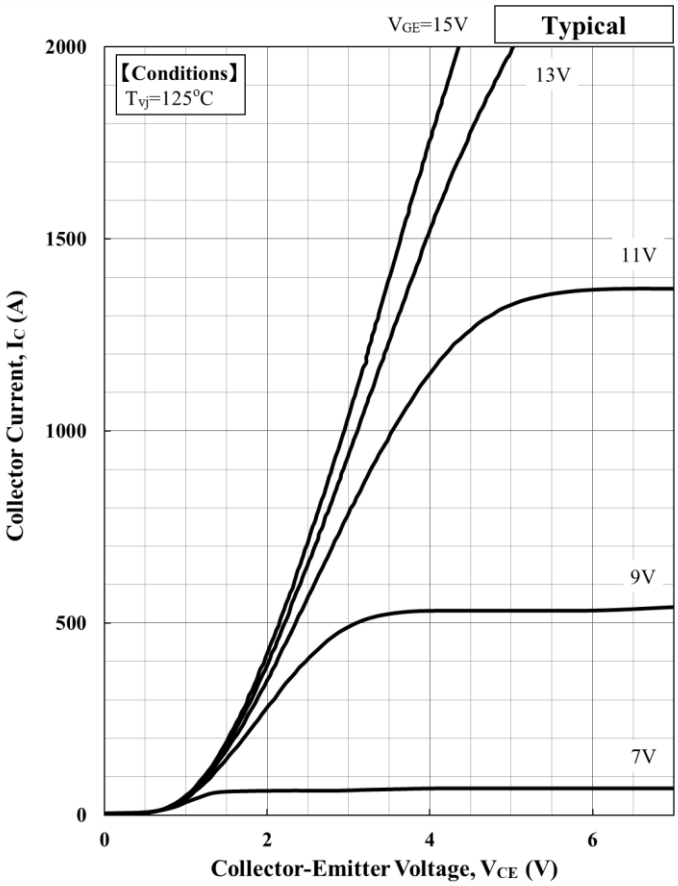
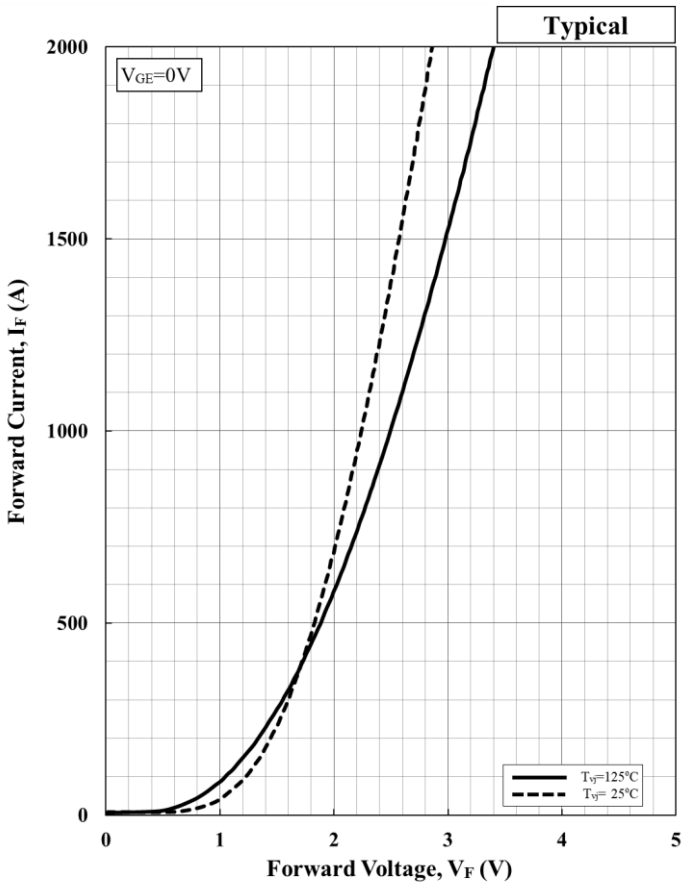


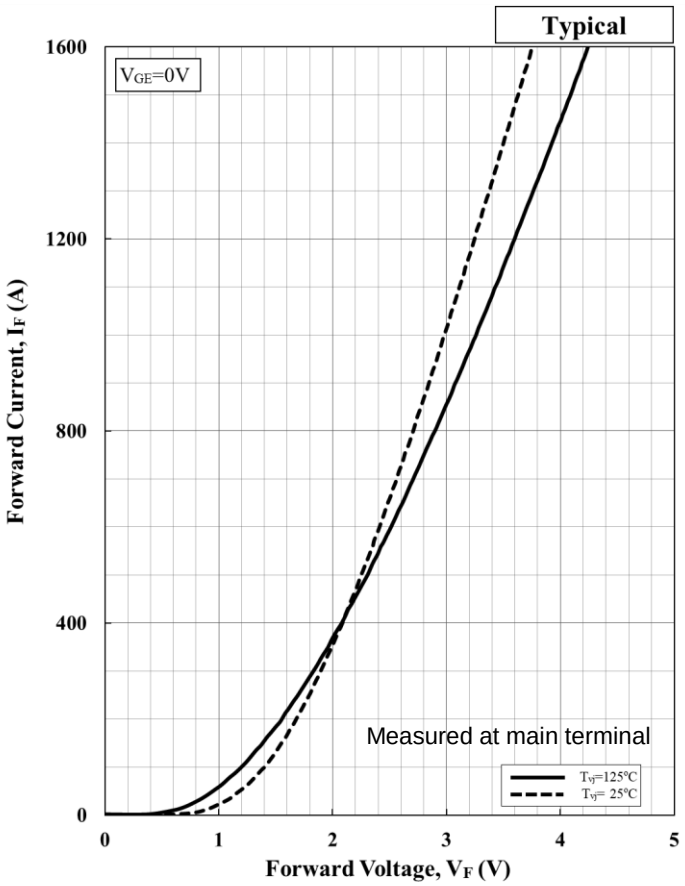
Collector Current vs. Collector Emitter Voltage



Collector Current vs. Collector Emitter Voltage



Forward Voltage of free-wheeling diode



Forward Voltage of Chopper diode

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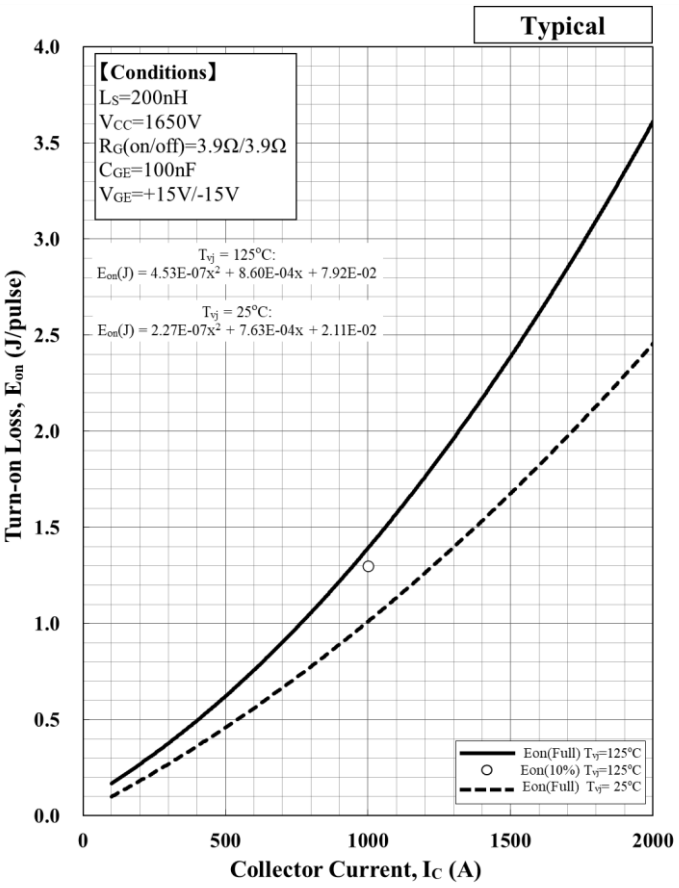
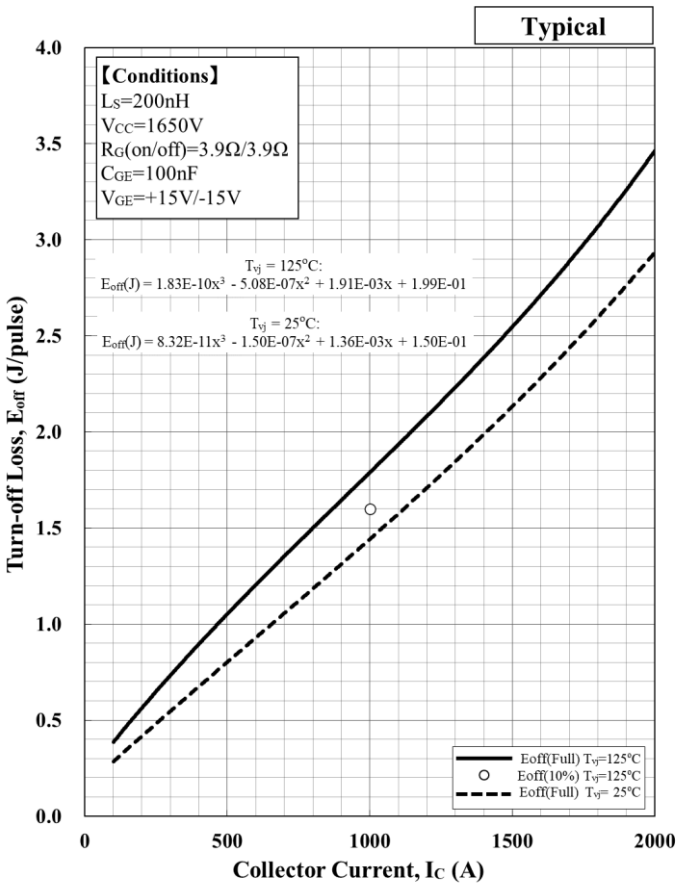
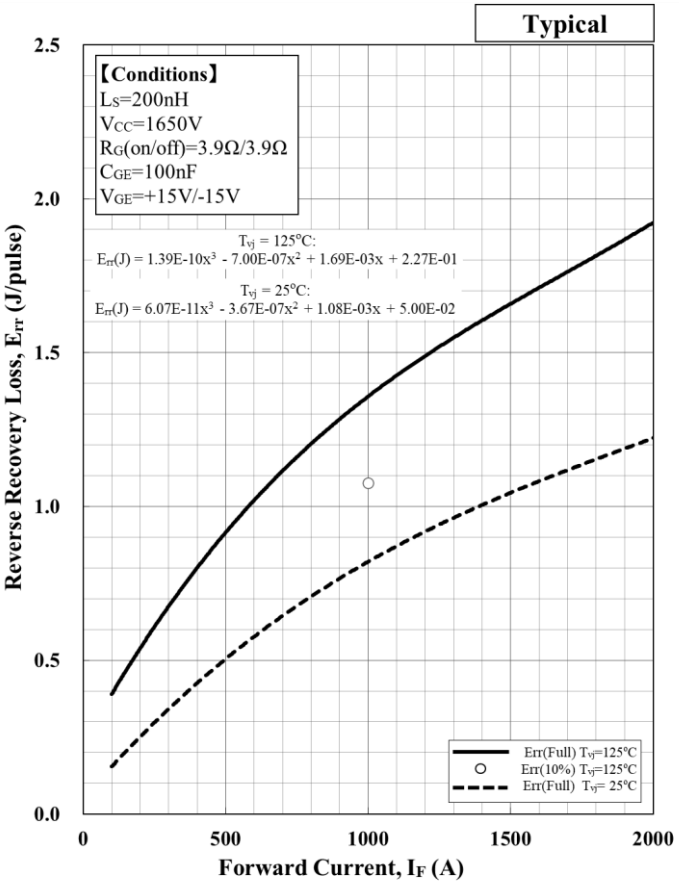


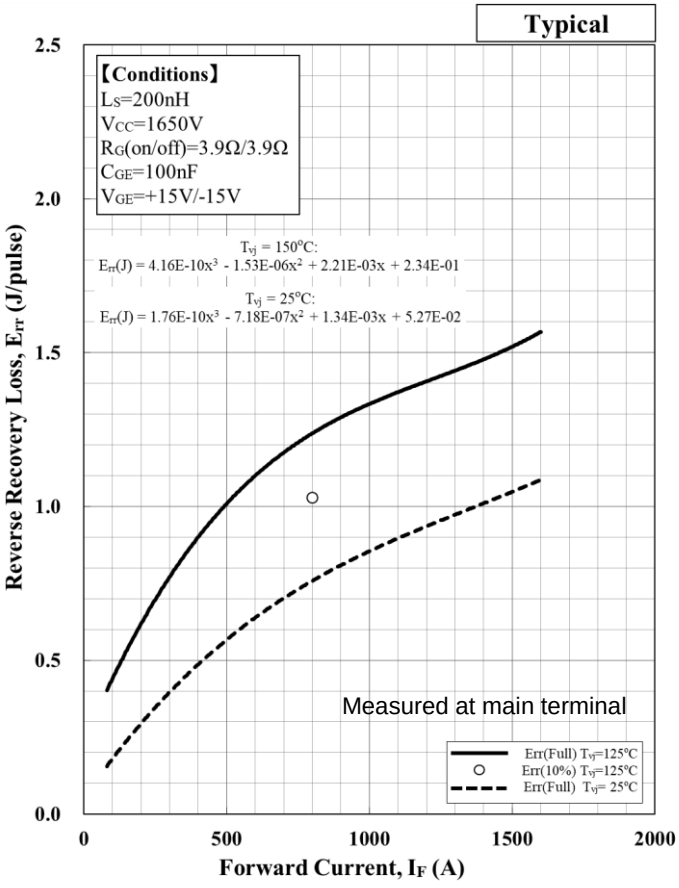
Turn-on loss vs. Collector current



Turn-off loss vs. Collector current



Recovery loss (FWD) vs. Forward current



Recovery loss (Chopper Diode) vs. Forward current

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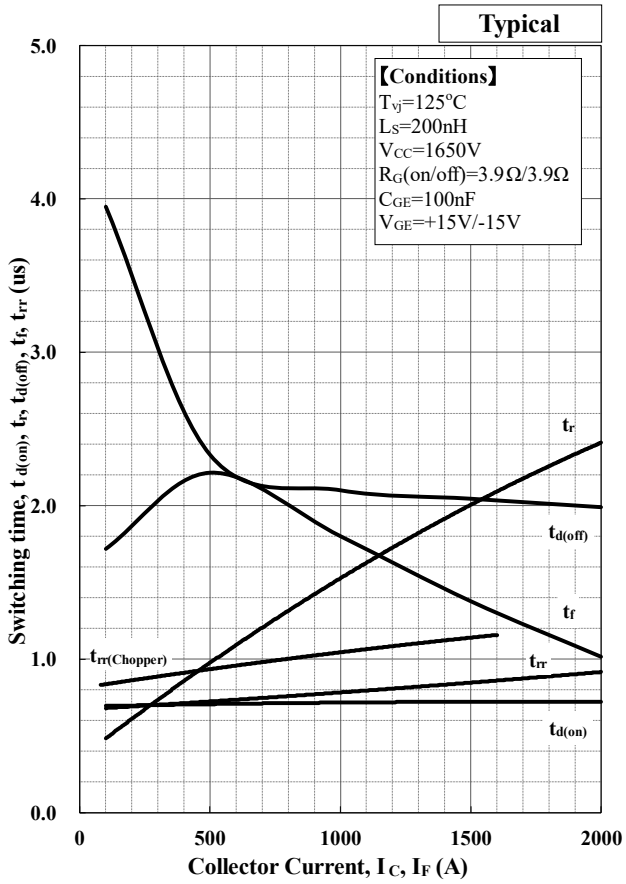
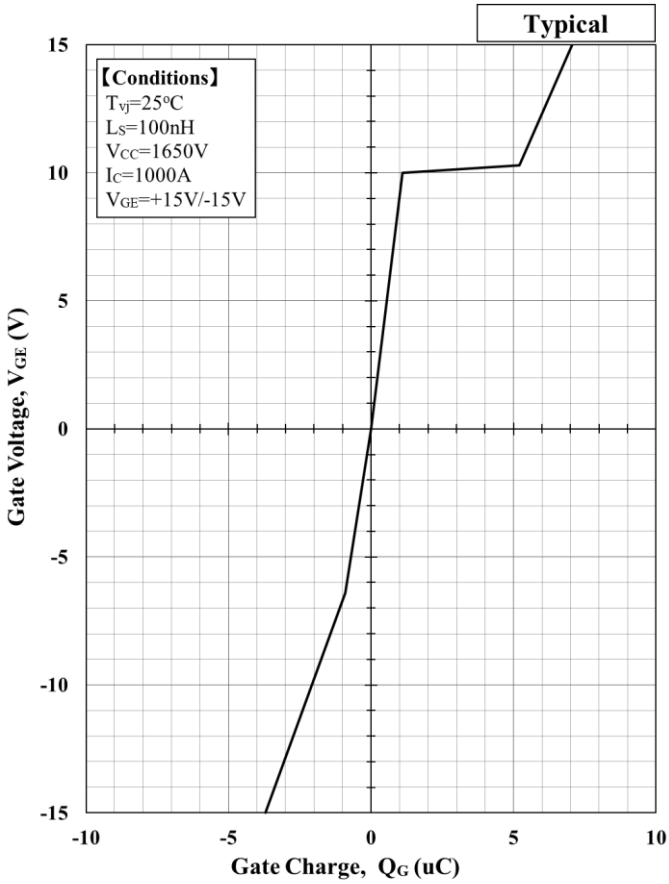


Switching time vs. Collector Current



V_{GE}-Q_G curve

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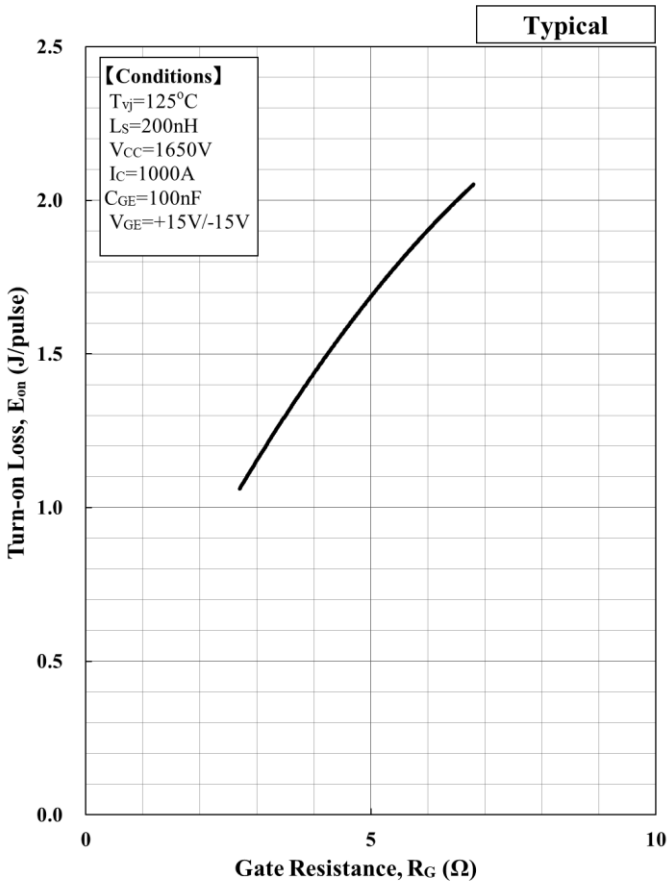
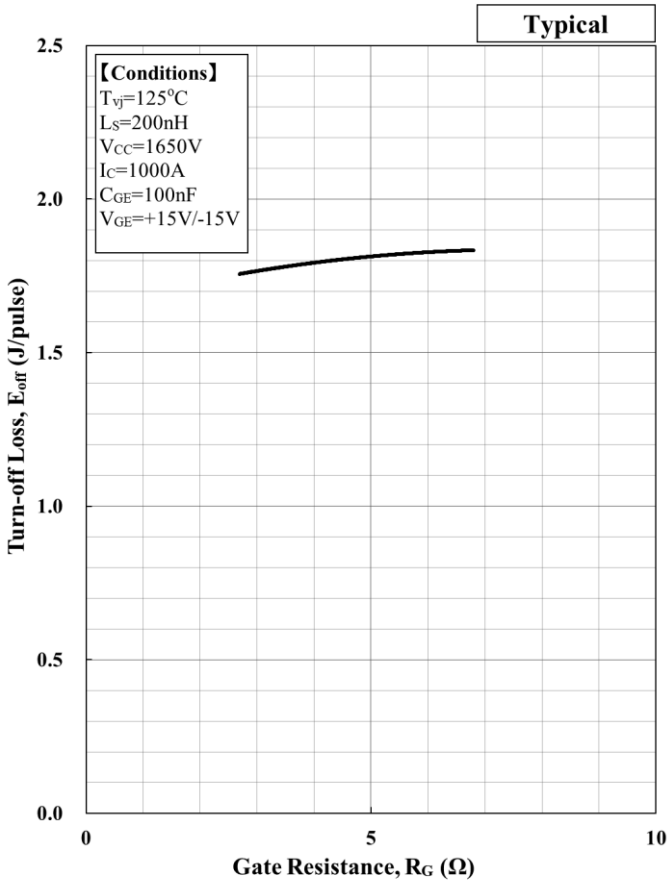
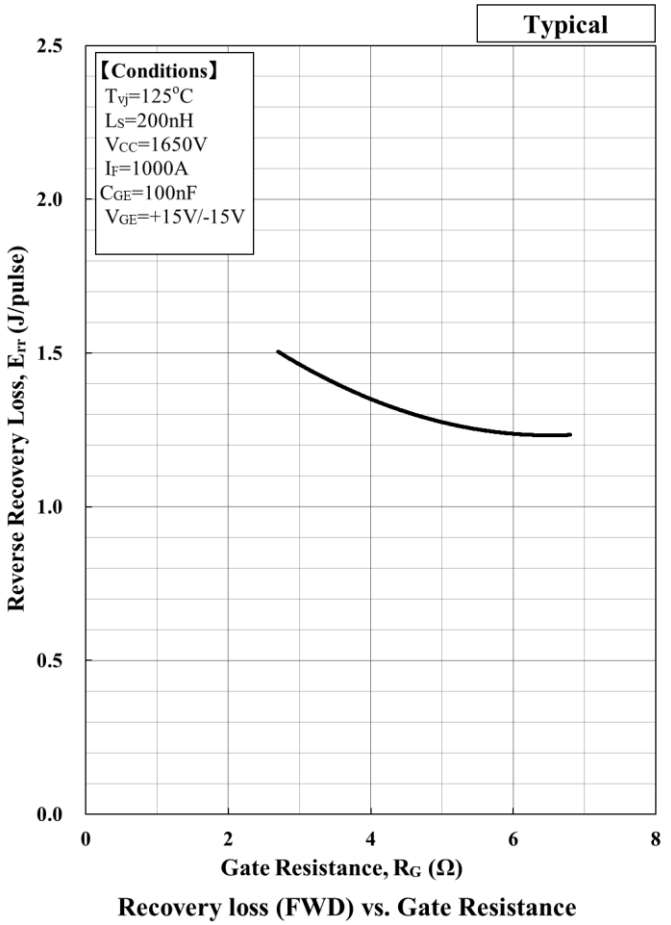


Turn-on loss vs. Gate Resistance



Turn-off loss vs. Gate Resistance



Recovery loss (FWD) vs. Gate Resistance

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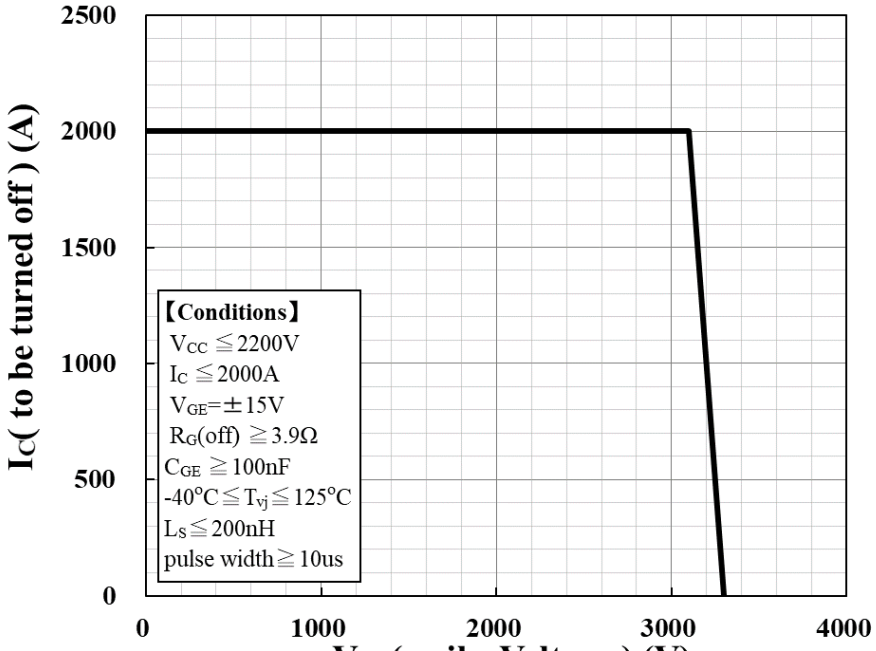
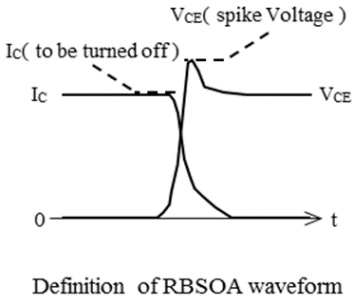
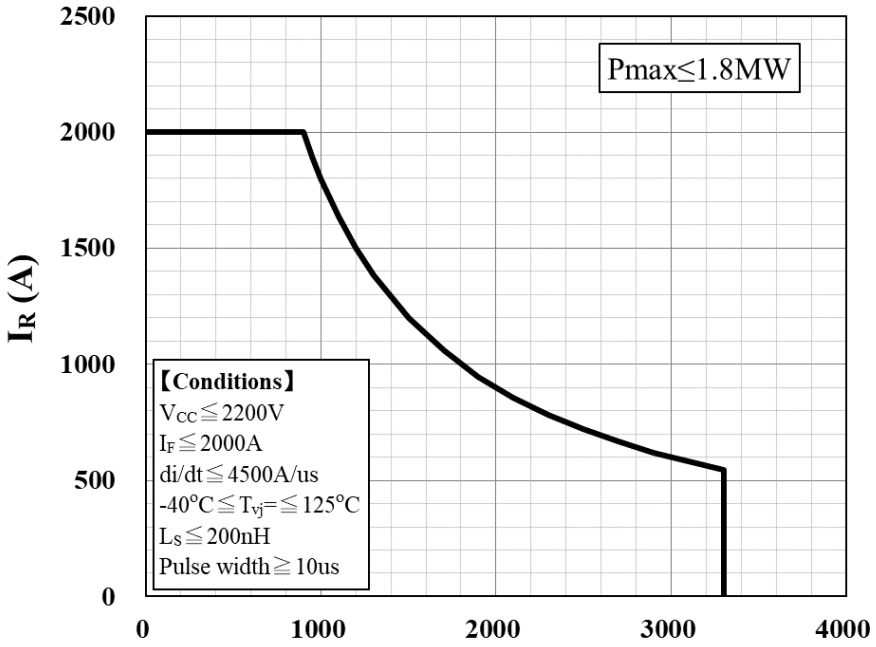
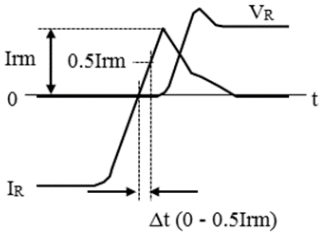




Definition of RBSOA waveform

Reverse Bias Safe Operation Area (RBSOA)





$$di/dt = \frac{0.5Irm}{\Delta t}$$

Definition of Recovery di/dt

Reverse Recovery Safe Operation Area (RRSOA) of FWD

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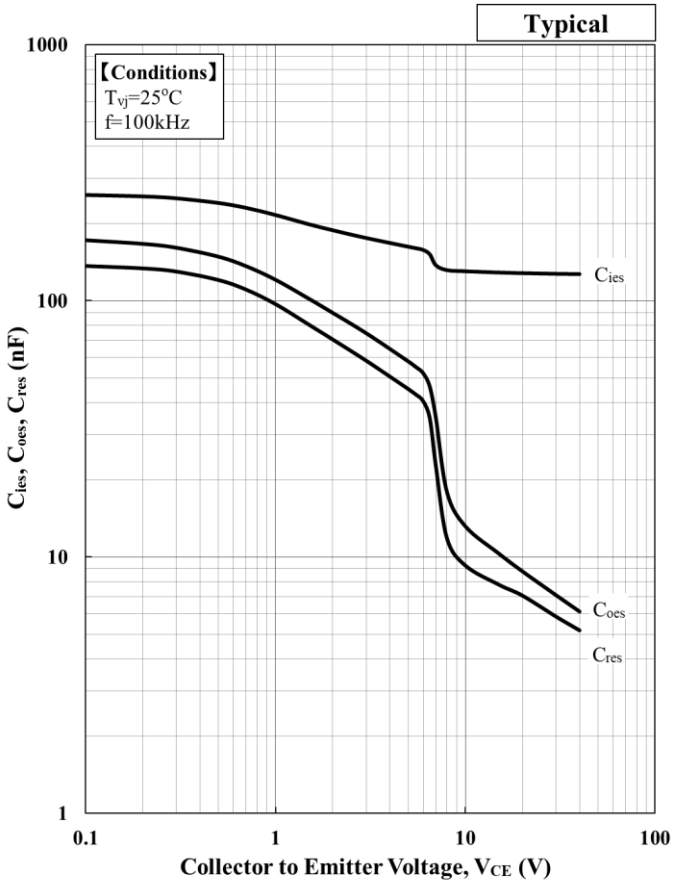
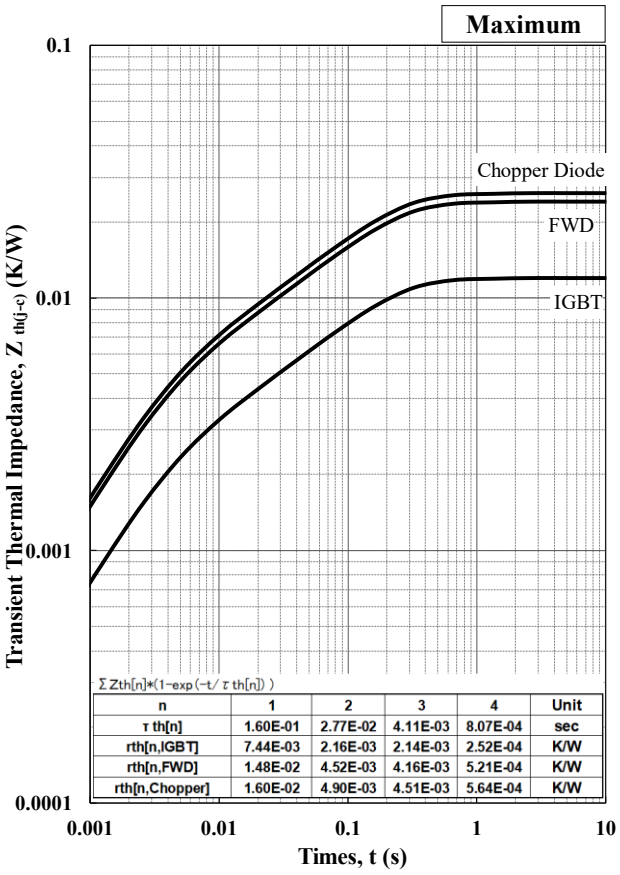


Capacitance vs. Collector to Emitter Voltage



Σ Zth[n]*(1−exp(−t/ τ th[n]))

n	1	2	3	4	Unit
τ th[n]	1.60E-01	2.77E-02	4.11E-03	8.07E-04	sec
rth[n,IGBT]	7.44E-03	2.16E-03	2.14E-03	2.52E-04	K/W
rth[n,FWD]	1.48E-02	4.52E-03	4.16E-03	5.21E-04	K/W
rth[n,Chopper]	1.60E-02	4.90E-03	4.51E-03	5.64E-04	K/W

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

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Minebea POWER SEMICONDUCTORS

Notices

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Minebea POWER SEMICONDUCTORS

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