

MBN750H65E2

Silicon N-channel IGBT 6500V 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 ($T_c=25^\circ C$)

Item		Symbol	Unit	MBN750H65E2
Collector Emitter Voltage	$T_{vj}=125^\circ C$	V_{CES}	V	6,500
	$T_{vj}=25^\circ C$			6,500
	$T_{vj}=-40^\circ C$			6,000
Gate Emitter Voltage		V_{GES}	V	± 20
Collector Current	DC	I_C	A	750
	1ms	I_{CRM}		1,500
Forward Current	DC	I_F	A	750
	1ms	I_{FRM}		1,500
Operating Junction Temperature		$T_{vj op}$	$^\circ C$	-40 ~ +125
Storage Temperature		T_{stg}	$^\circ C$	-50 ~ +125
Isolation Voltage		V_{ISO}	V_{RMS}	10,200(AC 1 minute)
Screw Torque	Terminals (M4/M8)	-	N·m	2/10 (1)
	Mounting (M6)	-		6 (2)

Notes: (1) Recommended Value $1.8 \pm 0.2/9 \pm 1 N \cdot m$ (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	-	-	25	$V_{CE}=6,500V$, $V_{GE}=0V$, $T_{vj}=25^\circ C$
Gate Emitter Leakage Current	I_{GES}	nA	-500	-	+500	$V_{CE}=6,500V$, $V_{GE}=0V$, $T_{vj}=125^\circ C$
Collector Emitter Saturation Voltage	V_{CEsat}	V	-	3.2	-	$I_C=750A$, $V_{GE}=15V$, $T_{vj}=25^\circ C$
			3.4	4.3	5.2	$I_C=750A$, $V_{GE}=15V$, $T_{vj}=125^\circ C$
Gate Emitter Threshold Voltage	$V_{GE(th)}$	V	5.8	6.3	6.8	$V_{CE}=10V$, $I_C=750mA$, $T_{vj}=25^\circ C$
Input Capacitance	C_{ies}	nF	-	130	-	$V_{CE}=10V$, $V_{GE}=0V$, $f=100kHz$, $T_{vj}=25^\circ C$
Internal Gate Resistance	$R_{G(int)}$	Ω	-	0.7	-	$V_{CE}=10V$, $V_{GE}=0V$, $f=100kHz$, $T_{vj}=25^\circ C$
Turn On Delay Time	$t_{d(on)}$	μs	-	0.7	-	$V_{CC}=3,600V$, $I_C=750A$
Rise Time	t_r		2.2	3.2	4.8	$L_S=200nH$
Turn Off Delay Time	$t_{d(off)}$		-	3.3	-	$R_G=8.2\Omega$ (3)
Fall Time	t_f		2.2	3.1	4.7	$V_{GE}=\pm 15V$, $T_{vj}=125^\circ C$
Forward Voltage Drop	V_F	V	-	3.6	-	$I_F=750A$, $V_{GE}=0V$, $T_{vj}=25^\circ C$
			3.5	3.9	4.4	$I_F=750A$, $V_{GE}=0V$, $T_{vj}=125^\circ C$
Reverse Recovery Time	t_{rr}	μs	-	0.8	1.6	$V_{CC}=3,600V$, $I_F=750A$, $L_S=200nH$ $T_{vj}=125^\circ C$
Turn On Loss	$E_{on(10\%)}$	J/P	-	4.9	6.4	$V_{CC}=3,600V$, $I_C=750A$, $L_S=200nH$ $R_G=8.2\Omega$ (3) $V_{GE}=\pm 15V$, $T_{vj}=125^\circ C$
	$E_{on(full)}$		-	5.5	-	
Turn Off Loss	$E_{off(10\%)}$	J/P	-	3.9	5.1	
	$E_{off(full)}$		-	4.2	-	
Reverse Recovery Loss	$E_{rr(10\%)}$	J/P	-	2.1	2.7	
	$E_{rr(full)}$		-	2.3	-	
Short Circuit Pulse Width	t_{sc}	μs	10	-	-	$V_{CC}=4,500V$, $L_S=200nH$ $R_{G(on/off)}=8.2/82\Omega$, $V_{GE}=\pm 15V$, $T_{vj}=25^\circ C$
Partial discharge extinction voltage	V_e	V_{RMS}	5,100	-	-	$f=50Hz$, $Q_{PD} \leq 10pC$ (acc. to IEC 61287)

Notes: (3) R_G value is a test condition value for evaluation, not recommended value.Please, determine the suitable R_G value by measuring switching behaviors.

- * 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.
- * ELECTRICAL CHARACTERISTIC items shown in above table are according to IEC 60747-2 and IEC 60747-9.

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THERMAL CHARACTERISTICS

Item		Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Thermal Impedance	IGBT	$R_{th(j-c)}$	K/W	-	-	0.009	Junction to case
	FWD	$R_{th(f-c)}$		-	-	0.017	
Contact Thermal Impedance		$R_{th(c-f)}$	K/W	-	0.005	-	Case to fin (λ grease = 1W/(m·K) heat-sink flatness $\leq 50\mu\text{m}$)

MODULE MECHANICAL CHARACTERISTICS

Item		Unit	Characteristics	Conditions
Weight		g	1,550	
Stray inductance in module	LS(CM-EM)	nH	14	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-Phenylene Sulfide	
Fire and Smoke Category		-	I2 / F3	NFF 16-102

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DEFINITION OF TEST CIRCUIT

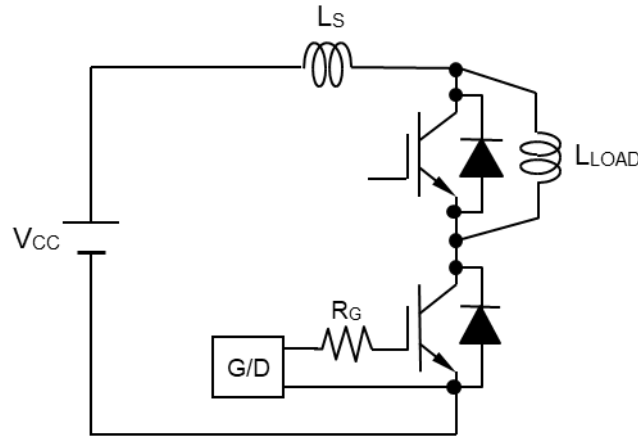


Fig.1 Switching test circuit

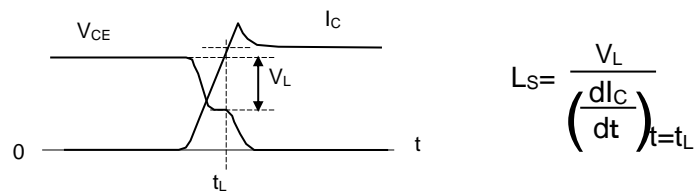


Fig.2 Definition of stray inductance

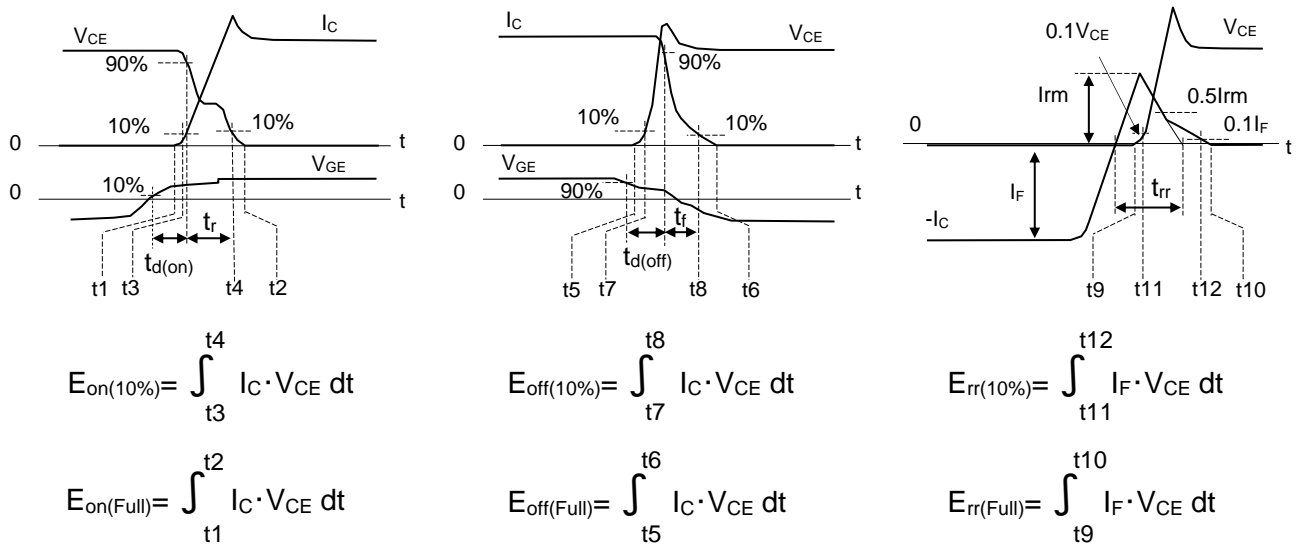
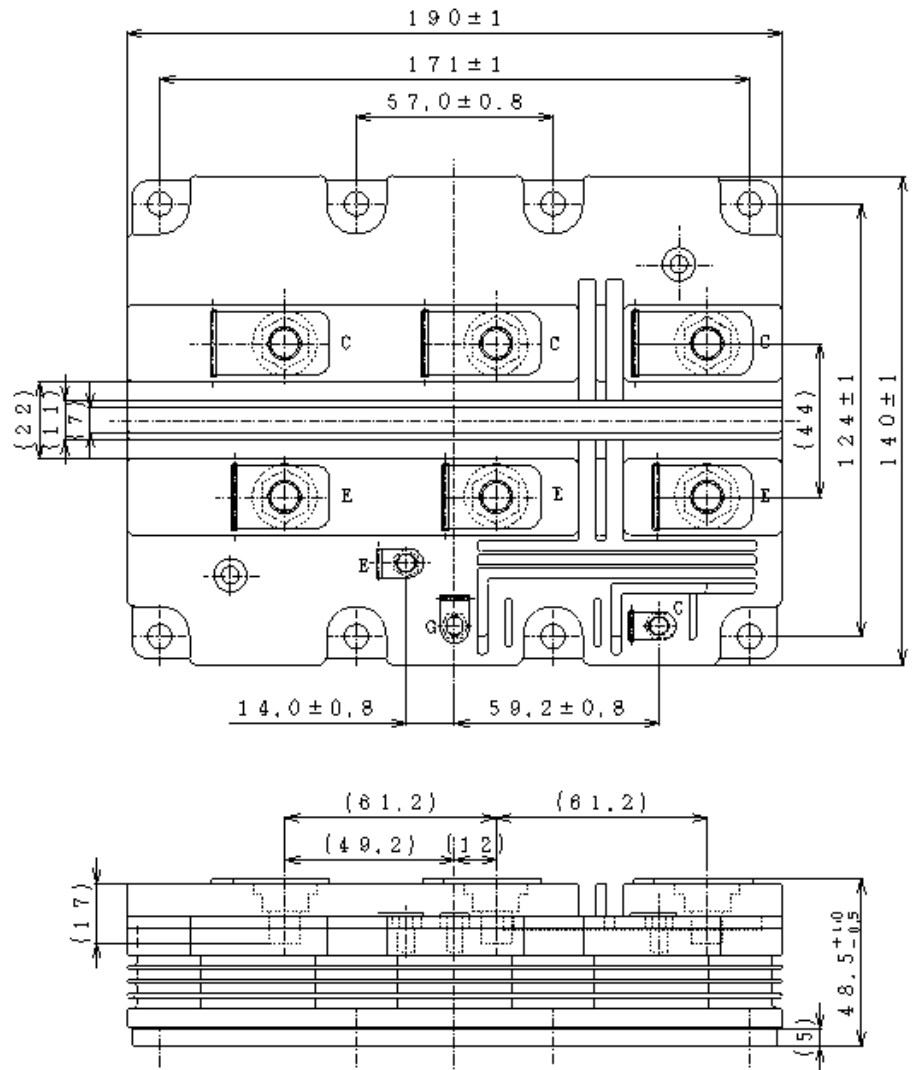


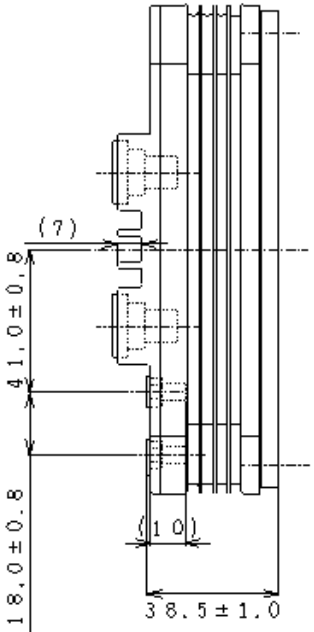
Fig.3 Definition of switching loss

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OUTLINE DRAWING

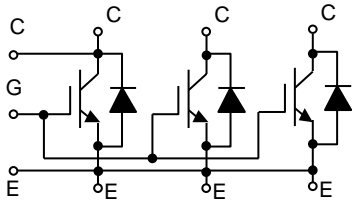


Unit in mm

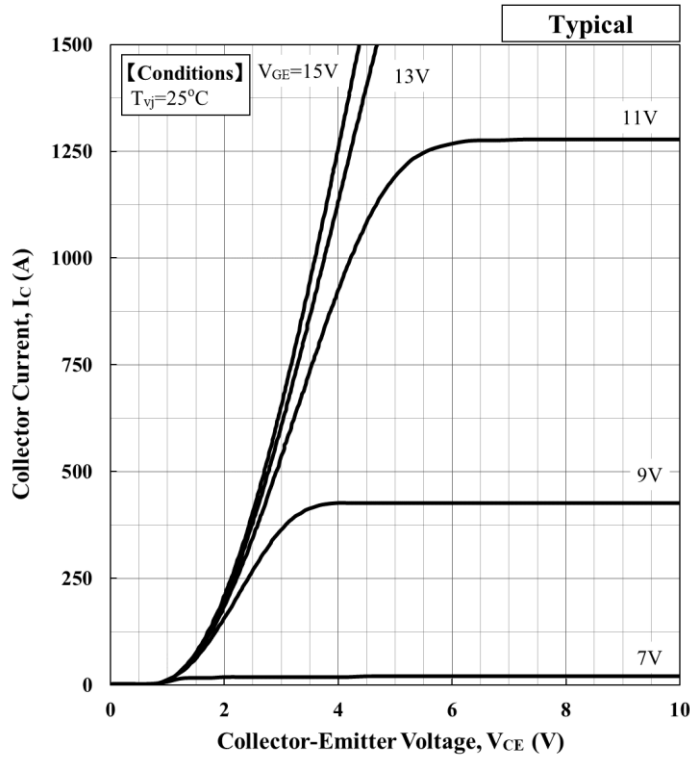


Weight: 1,550g

CIRCUIT DIAGRAM

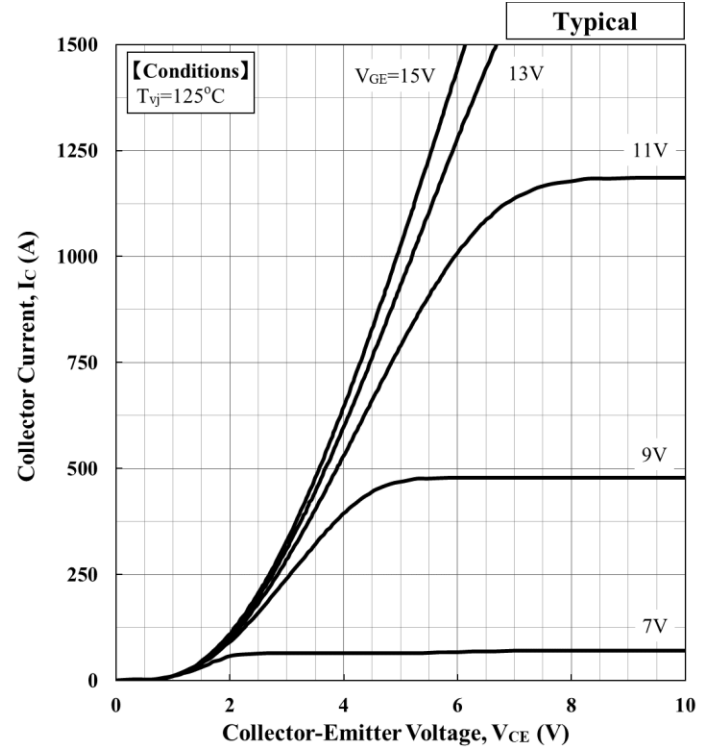


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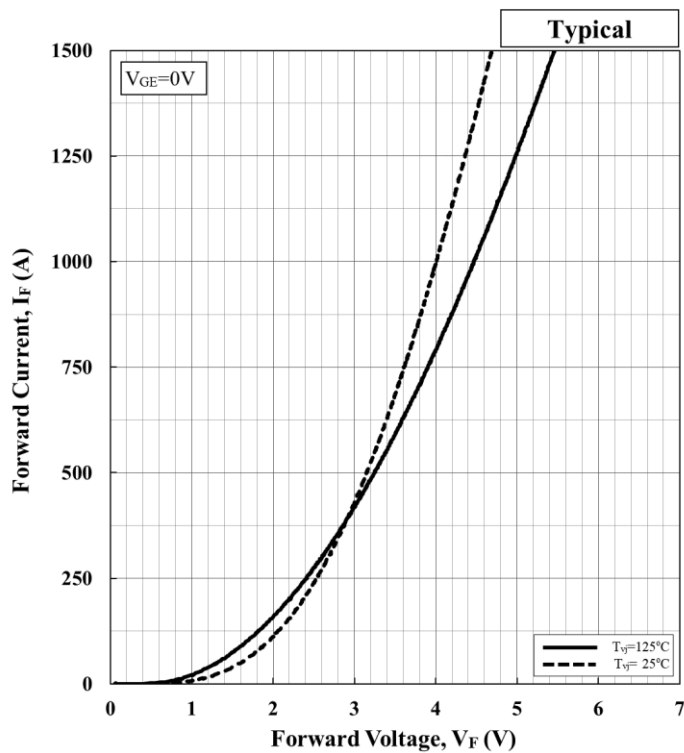
$V_{CE}(sat)[V] = a_3 \cdot I_c ^3 + a_2 \cdot I_c ^2 + a_1 \cdot I_c + a_0$					
Temp.[°C]	$V_{GE}[V]$	a_3	a_2	a_1	a_0
25	15	4.88E-10	-1.71E-06	3.49E-03	1.32E+00

Collector Current vs. Collector Emitter Voltage



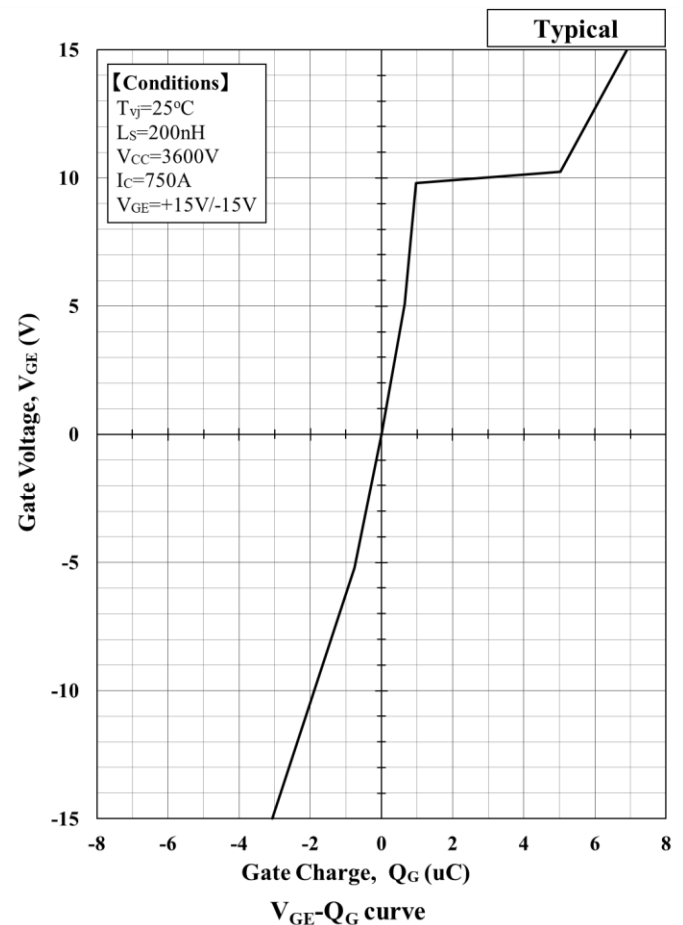
$V_{CE}(sat)[V] = a_3 \cdot I_c ^3 + a_2 \cdot I_c ^2 + a_1 \cdot I_c + a_0$					
Temp.[°C]	$V_{GE}[V]$	a_3	a_2	a_1	a_0
125	15	7.26E-10	-2.51E-06	5.23E-03	1.50E+00

Collector Current vs. Collector Emitter Voltage

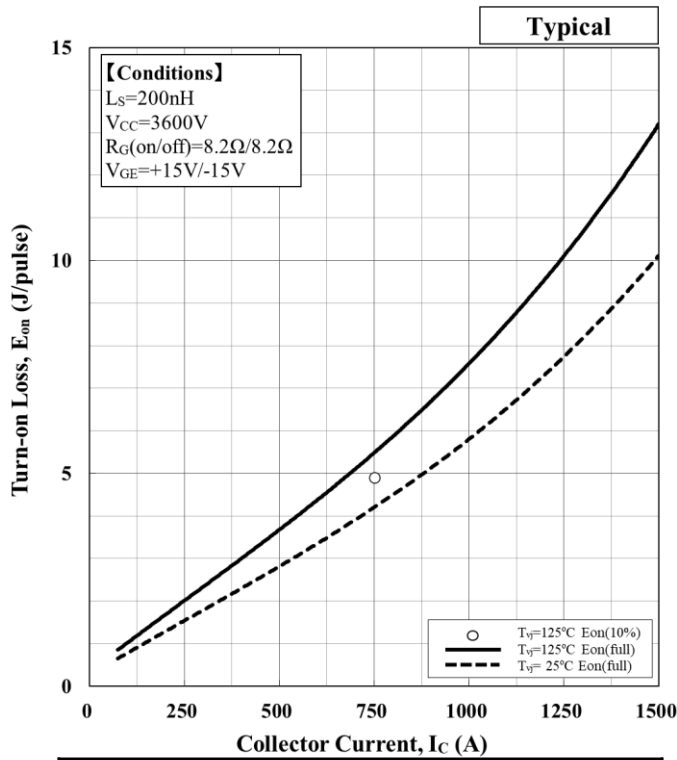


$V_F[V] = a_3 \cdot I_F ^3 + a_2 \cdot I_F ^2 + a_1 \cdot I_F + a_0$				
Temp.[°C]	a_3	a_2	a_1	a_0
25	6.82E-10	-2.40E-06	4.13E-03	1.60E+00
125	7.26E-10	-2.65E-06	5.17E-03	1.23E+00

Forward Voltage of free-wheeling diode



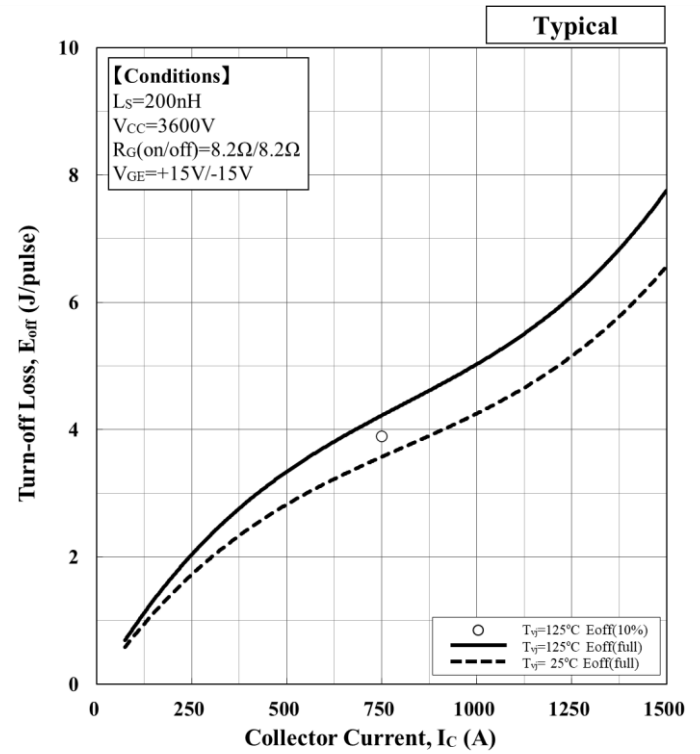
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$$E [J] = a_3 \cdot |I_c|^3 + a_2 \cdot |I_c|^2 + a_1 \cdot |I_c| + a_0$$

Temp.[°C]	a_3	a_2	a_1	a_0
25	1.17E-09	-8.75E-07	5.24E-03	2.68E-01
125	1.53E-09	-1.14E-06	6.84E-03	3.50E-01

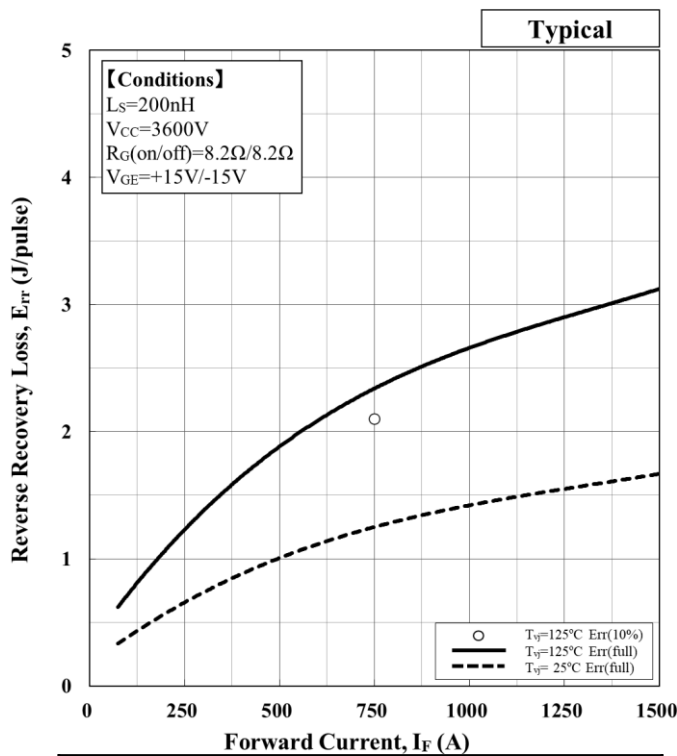
Turn-on loss vs. Collector current



$$E [J] = a_3 \cdot |I_c|^3 + a_2 \cdot |I_c|^2 + a_1 \cdot |I_c| + a_0$$

Temp.[°C]	a_3	a_2	a_1	a_0
25	3.07E-09	-7.44E-06	8.65E-03	-2.08E-02
125	3.63E-09	-8.80E-06	1.02E-02	-2.46E-02

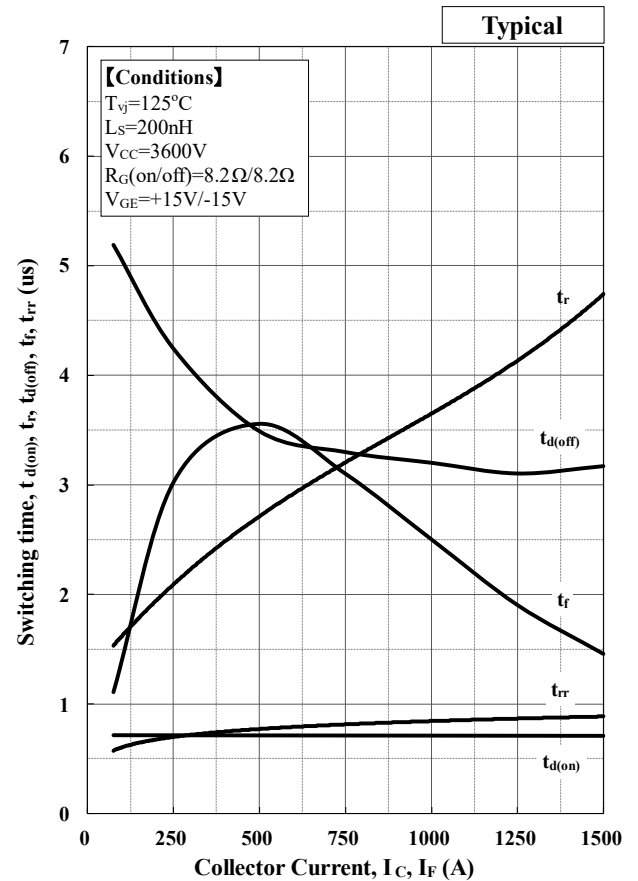
Turn-off loss vs. Collector current



$$E [J] = a_3 \cdot |I_F|^3 + a_2 \cdot |I_F|^2 + a_1 \cdot |I_F| + a_0$$

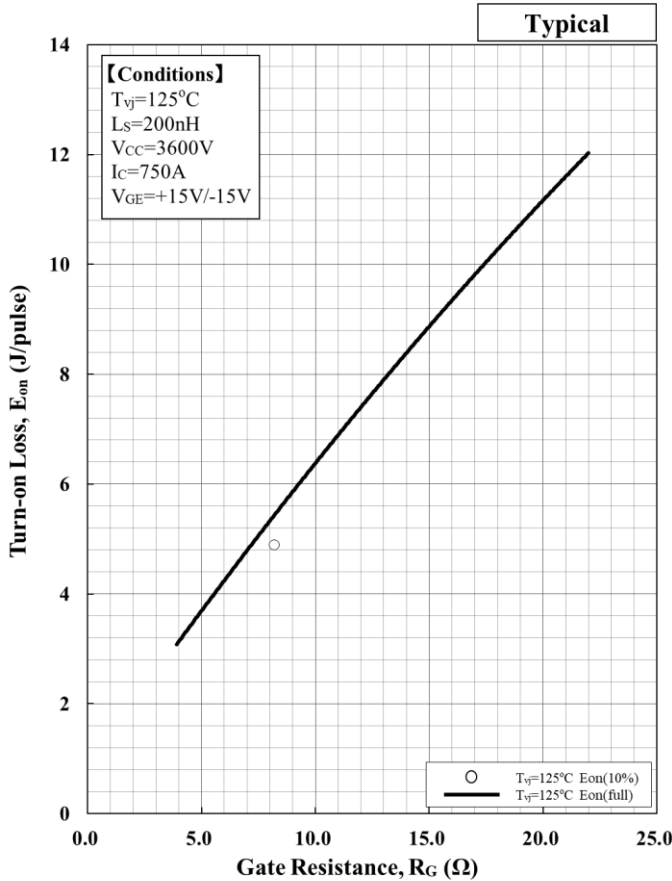
Temp.[°C]	a_3	a_2	a_1	a_0
25	3.39E-10	-1.35E-06	2.26E-03	1.70E-01
125	6.34E-10	-2.53E-06	4.23E-03	3.19E-01

Recovery loss vs. Forward current

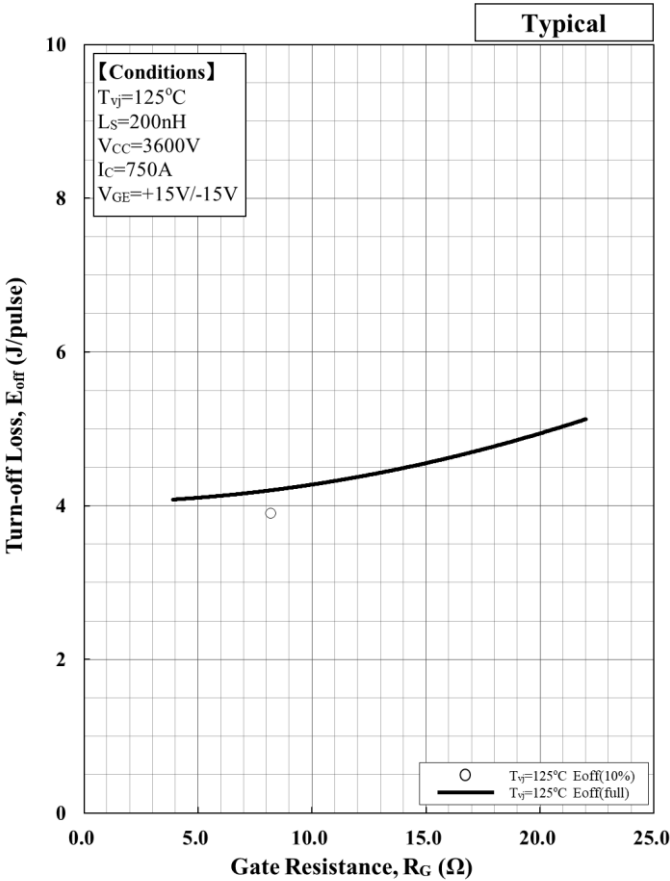


Switching time vs. Collector Current

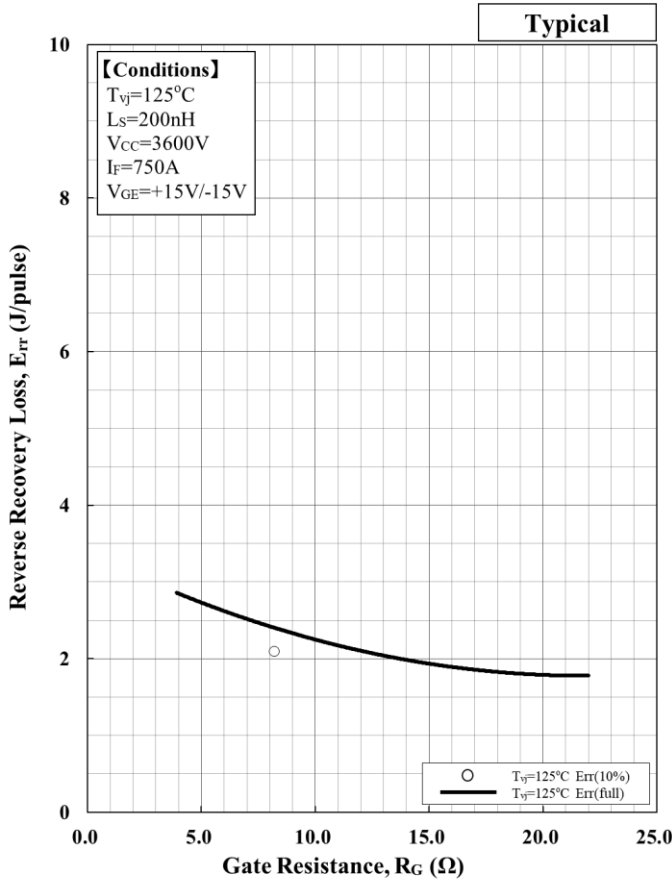
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Turn-on loss vs. Gate Resistance

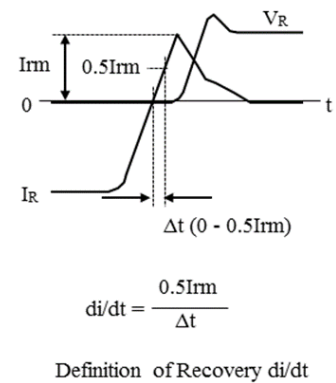
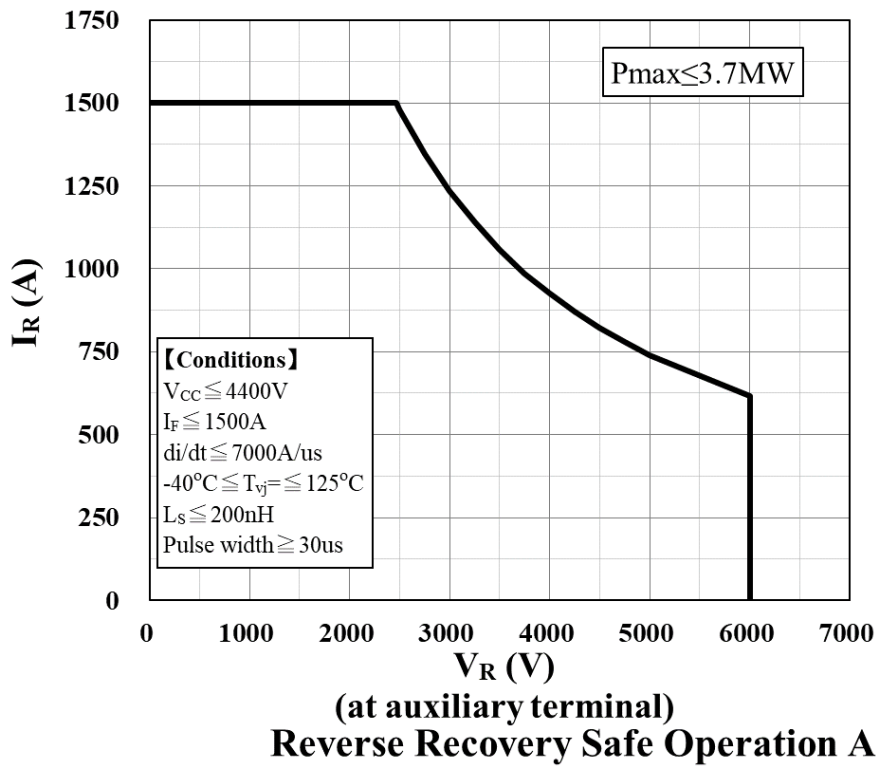
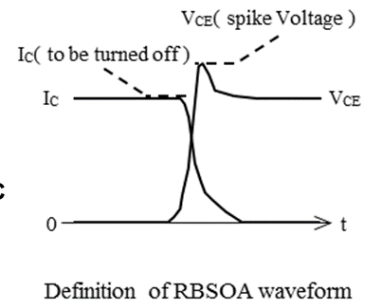
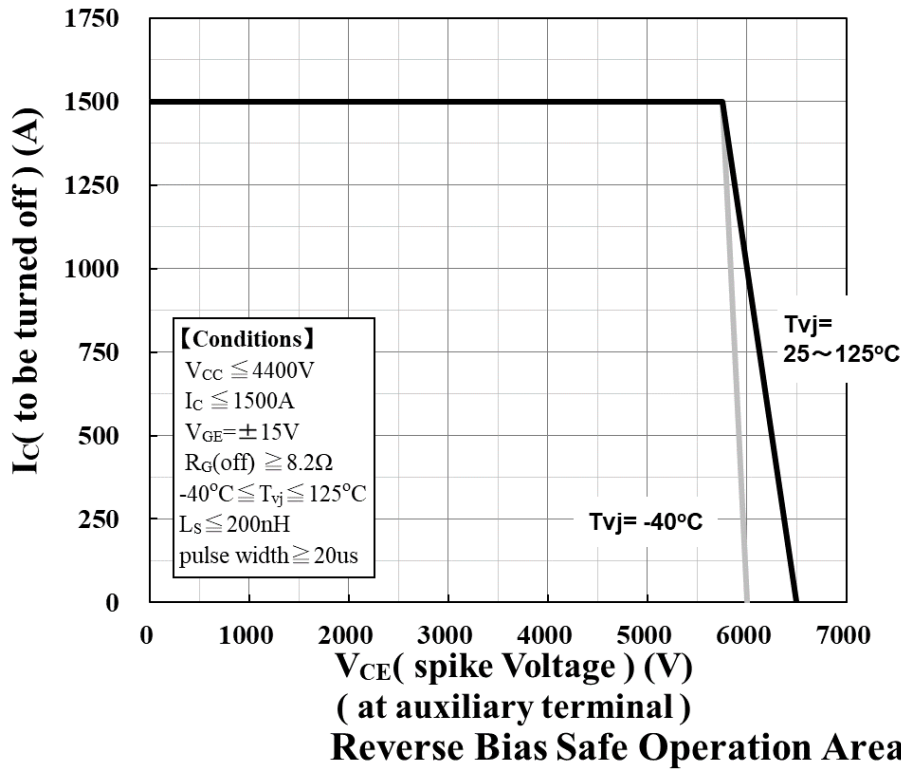


Turn-off loss vs. Gate Resistance

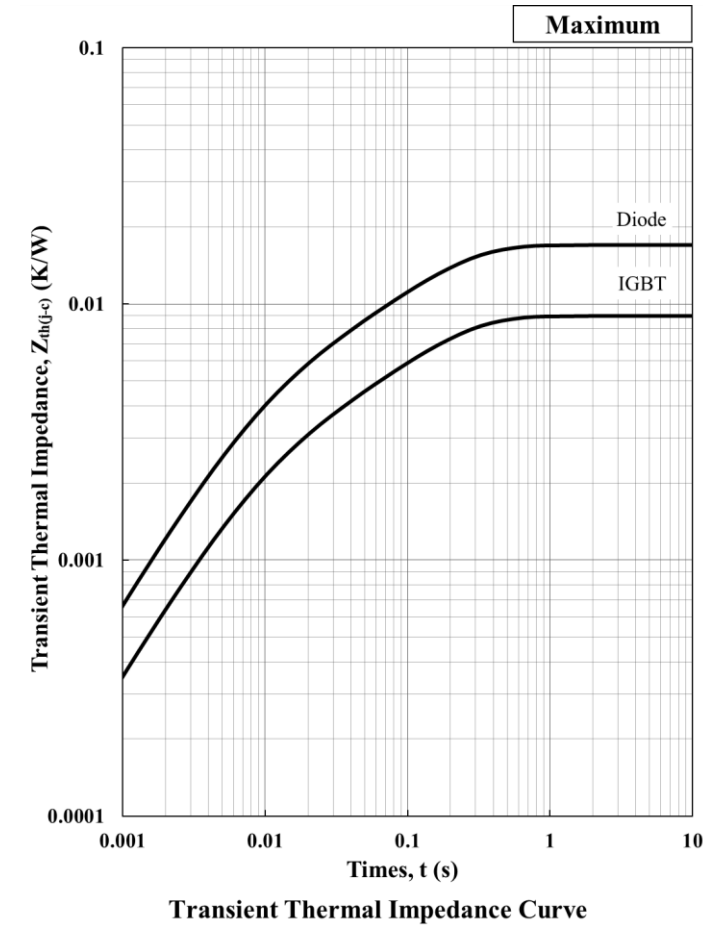
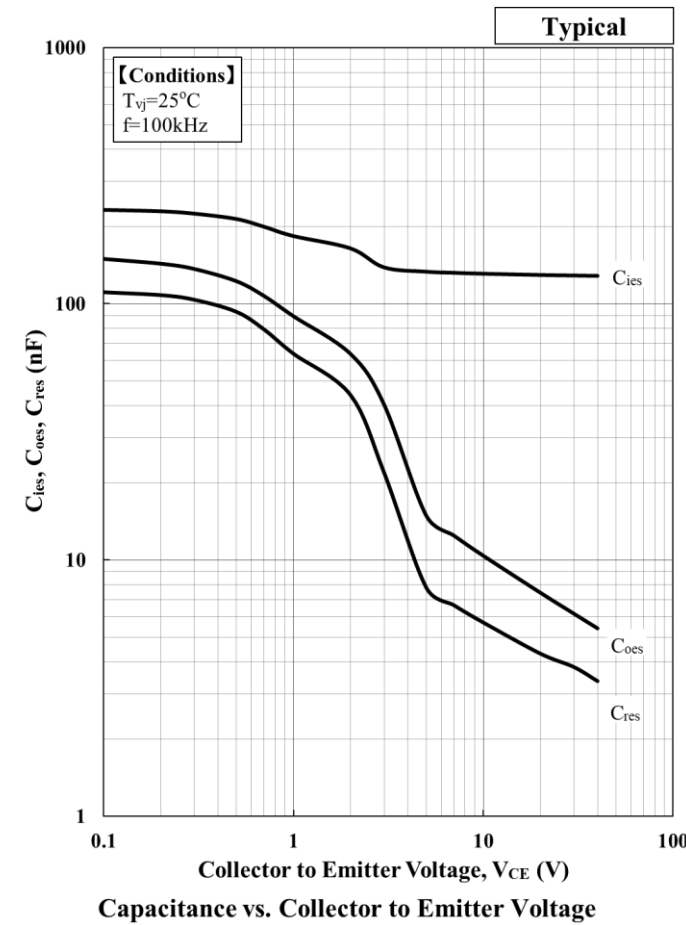


Reverse Recovery loss vs. Gate Resistance

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Foster model lumped circuit constant

n	1	2	3	4	Unit
R th, IGBT [n]	5.61E-03	1.78E-03	1.56E-03	4.97E-05	[K/W]
C th, IGBT [n]	2.92E+01	1.55E+01	4.28E+00	1.49E+01	[J/K]
R th, Diode [n]	1.06E-02	3.41E-03	2.92E-03	1.00E-04	[K/W]
C th, Diode [n]	1.55E+01	8.07E+00	2.29E+00	7.41E+00	[J/K]

Cauer model lumped circuit constant

n	1	2	3	4	Unit
R th, IGBT [n]	1.25E-03	1.88E-03	2.79E-03	3.08E-03	[K/W]
C th, IGBT [n]	2.50E+00	1.19E+00	1.16E+01	3.21E+01	[J/K]
R th, Diode [n]	2.29E-03	3.63E-03	5.27E-03	5.81E-03	[K/W]
C th, Diode [n]	1.32E+00	6.42E-01	6.08E+00	1.71E+01	[J/K]

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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1. Since mishandling of semiconductor devices may cause malfunctions, please be sure to read "Precautions for Safe Use and Notices" in the individual brochure before use.
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8. For handling other than described in this manual, follow the handling instructions (IGBT-HI-00002).

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