

MBN1800F33F

Silicon N-channel IGBT 3300V F version

FEATURES

- * Soft switching behavior, low switching loss & low conduction loss :
Soft low-injection punch-through
Advanced Trench High conductivity IGBT.
- * Low driving power due to low input capacitance with trench MOS gate.
- * Low noise recovery: Ultra soft fast recovery diode.
- * High Current rate Package.
- * Low $R_{th(j-c)}$ & low stray inductance.
- * RoHS
- * High thermal fatigue durability: ($\Delta T_c=70K$, $N>30,000$ cycles)

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

Item	Symbol	Unit	MBN1800F33F
Collector Emitter Voltage	V_{CES}	V	3,300
Gate Emitter Voltage	V_{GES}	V	± 20
Collector Current	DC	I_C	1,800
	1ms	I_{CRM}	3,600
Forward Current	DC	I_F	1,800
	1ms	I_{FRM}	3,600
Junction Temperature	$T_{vj\text{op}}$	$^\circ\text{C}$	-50 ~ +150
Storage Temperature	T_{stg}	$^\circ\text{C}$	-55 ~ +150
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 $1.8\pm 0.2/15^{+0}_{-0.3}$ N·m (2) Recommended Value 5.5 ± 0.5 N·m

ELECTRICAL CHARACTERISTICS

Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions	
Collector Emitter Cut-Off Current	I_{CES}	mA	-	-	0.6	$V_{CE}=3,300\text{V}$, $V_{GE}=0\text{V}$, $T_{vj}=25^\circ\text{C}$	
Gate Emitter Leakage Current	I_{GES}	nA	-500	-	+500	$V_{CE}=3,300\text{V}$, $V_{GE}=0\text{V}$, $T_{vj}=150^\circ\text{C}$	
Collector Emitter Saturation Voltage	V_{CEsat}	V	2.5	2.85	3.5	$I_C=1,800\text{A}$, $V_{GE}=15\text{V}$, $T_{vj}=150^\circ\text{C}$	
Gate Emitter Threshold Voltage	$V_{GE(th)}$	V	5.5	6.5	7.5	$V_{CE}=10\text{V}$, $I_C=1,800\text{mA}$, $T_{vj}=25^\circ\text{C}$	
Input Capacitance	C_{ies}	nF	-	132	-	$V_{CE}=10\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$, $T_{vj}=25^\circ\text{C}$	
Internal Gate Resistance	$R_{G(int)}$	Ω	-	1.3	-	$V_{CE}=10\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$, $T_{vj}=25^\circ\text{C}$	
Turn On Delay Time	$t_{d(on)}$	μs	-	0.8	-	$V_{CC}=1,800\text{V}$, $I_C=1,800\text{A}$	
Rise Time	t_r		-	0.3	-	$L_S=80\text{nH}$	
Turn Off Delay Time	$t_{d(off)}$		-	2.2	-	$R_G(\text{on/off})=4.7\Omega/5.6\Omega$ (3)	
Fall Time	t_f		-	1.8	-	$V_{GE}=\pm 15\text{V}$, $T_{vj}=150^\circ\text{C}$	
Peak Forward Voltage Drop	V_F	V	2.2	2.6	2.9	$I_F=1,800\text{A}$, $V_{GE}=0\text{V}$, $T_{vj}=150^\circ\text{C}$	
Reverse Recovery Time	t_{rr}	μs	-	0.7	-	$V_{CC}=1,800\text{V}$, $I_F=1,800\text{A}$, $L_S=80\text{nH}$ $T_{vj}=150^\circ\text{C}$	
Turn On Loss	E_{on}	J/P	-	3.7	-	$V_{CC}=1,800\text{V}$, $I_C=1,800\text{A}$, $L_S=80\text{nH}$	
Turn Off Loss	E_{off}	J/P	-	3.3	-	$R_G(\text{on/off})=4.7\Omega/5.6\Omega$ (3)	
Reverse Recovery Loss	E_{rr}	J/P	-	2.4	-	$V_{GE}=\pm 15\text{V}$, $T_{vj}=150^\circ\text{C}$	
Short Circuit Pulse Width	t_{sc}	μs	10	-	-	$V_{CC}=2,000\text{V}$, $L_S=80\text{nH}$ $R_G(\text{on/off})=4.7/56\Omega$, $V_{GE}=\pm 15\text{V}$, $T_{vj}=150^\circ\text{C}$	
Stray inductance module	L_{SCE}	nH	-	7	-		
Thermal Impedance	IGBT	$R_{th(j-c)}$	K/W	-	-	0.0067	Junction to case
	FWD	$R_{th(f-c)}$		-	-	0.012	
Contact Thermal Impedance	$R_{th(c-f)}$	K/W	-	0.005	-	Case to fin	

Notes: (3) R_G value is a test condition value for evaluation, not recommended value.

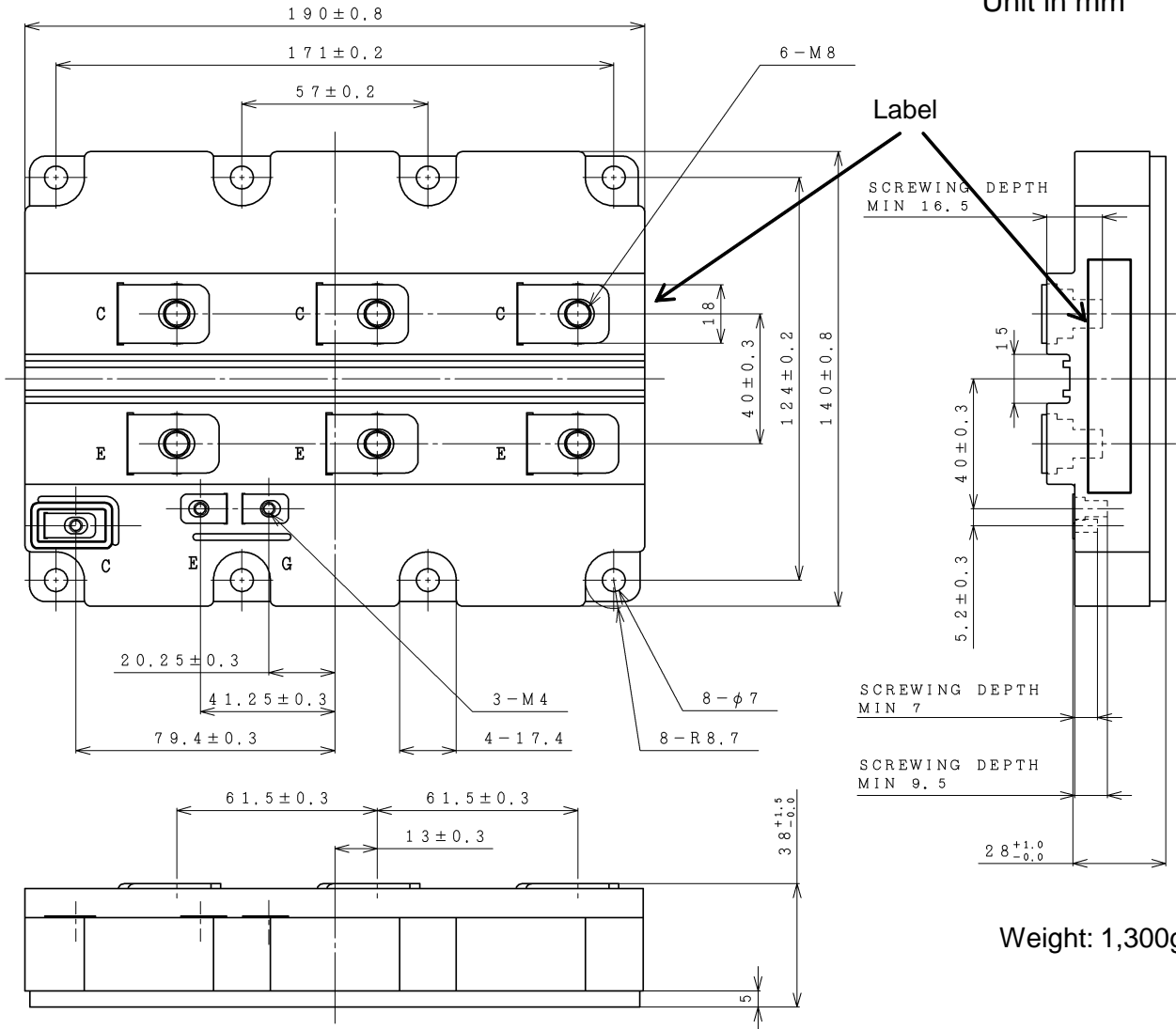
Please, determine the suitable R_G value by measuring switching behaviors.

- * 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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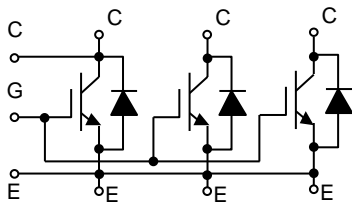
OUTLINE DRAWING

Unit in mm

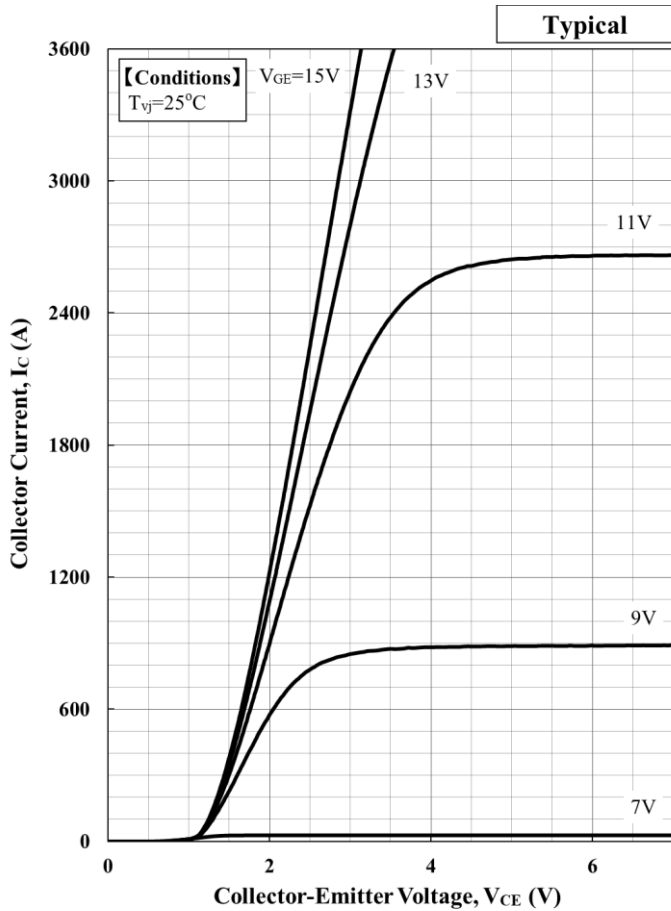


Weight: 1,300g

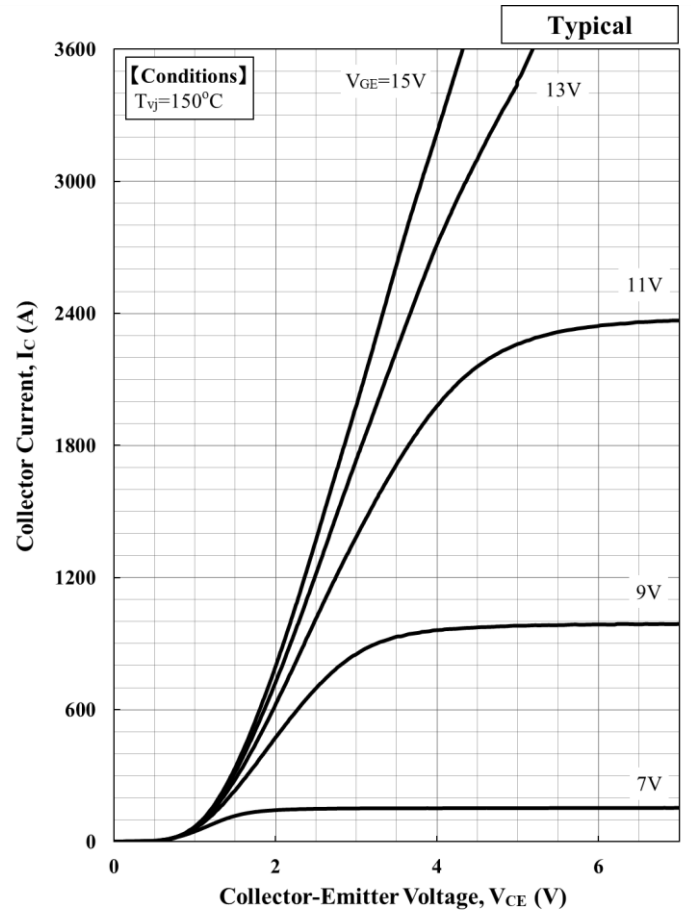
CIRCUIT DIAGRAM



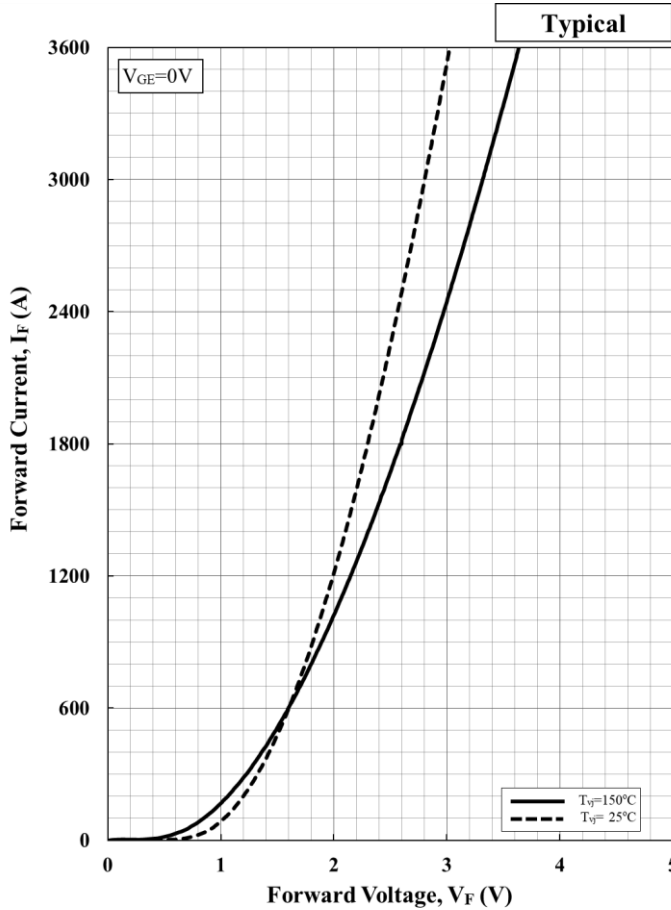
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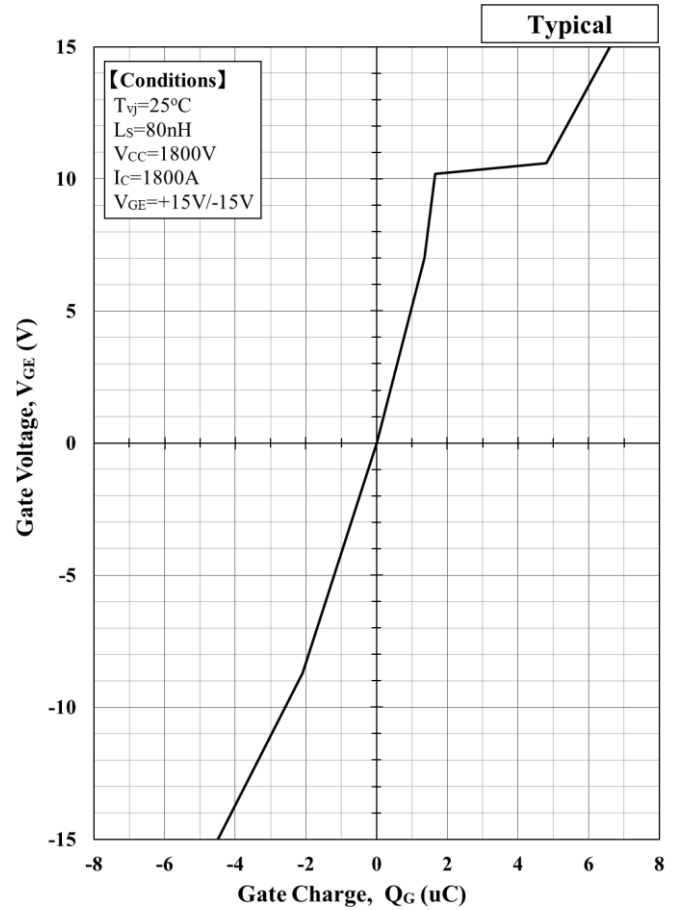
Collector Current vs. Collector Emitter Voltage



Collector Current vs. Collector Emitter Voltage

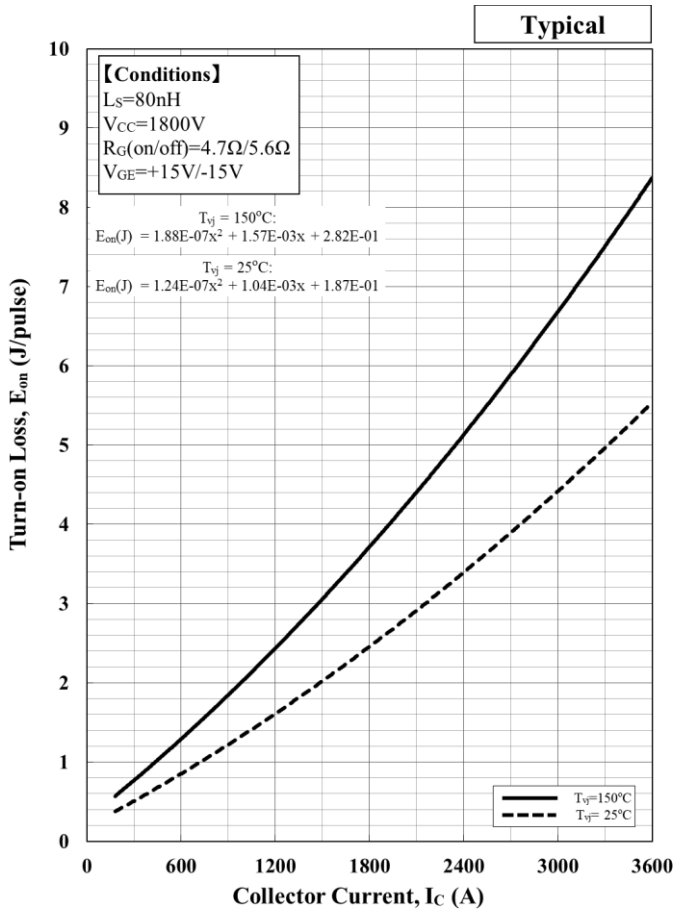


Forward Voltage of free-wheeling diode

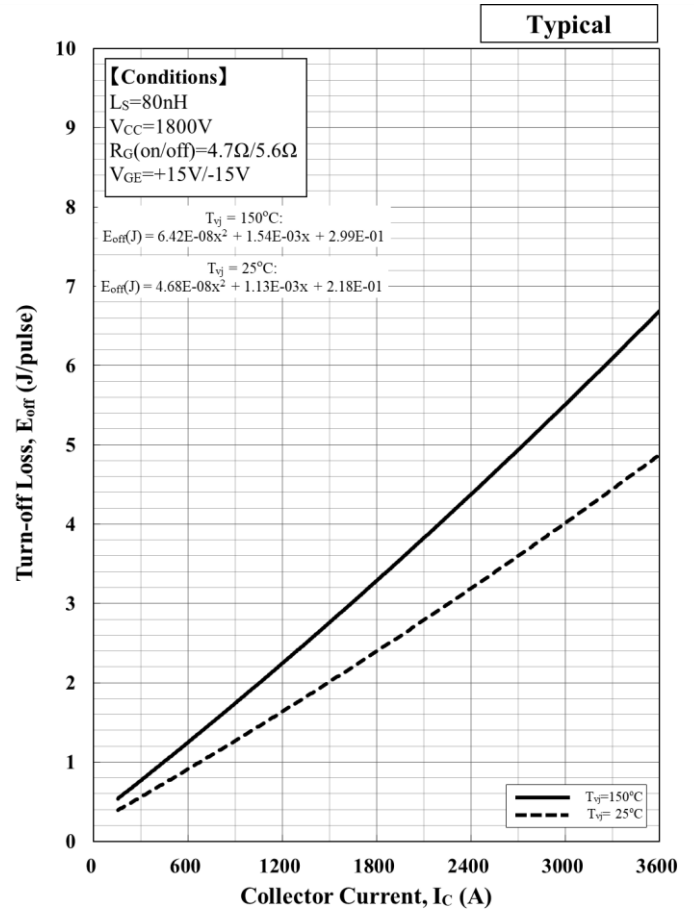


V_{GE} - Q_G curve

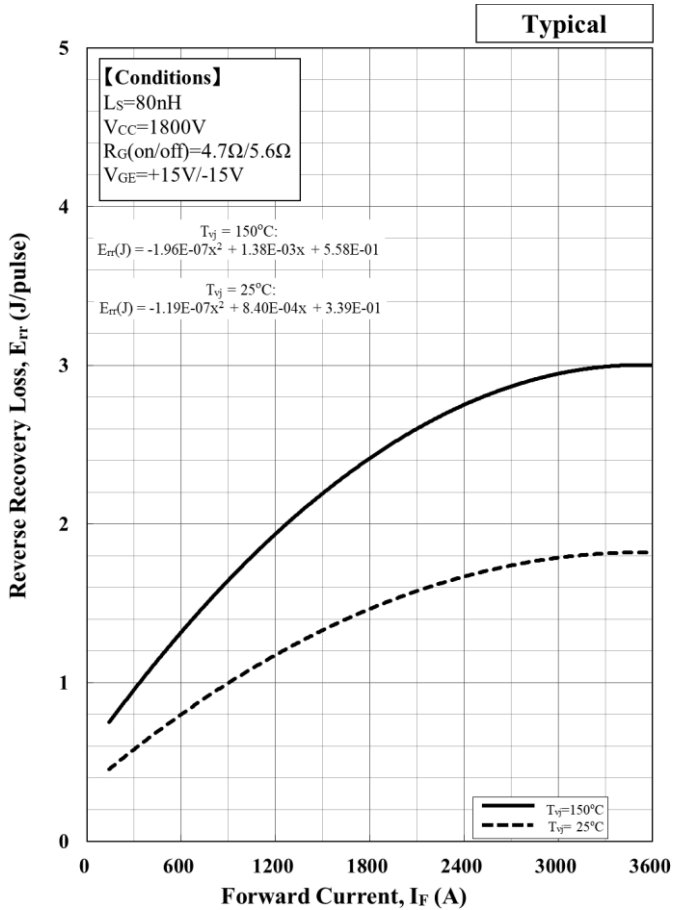
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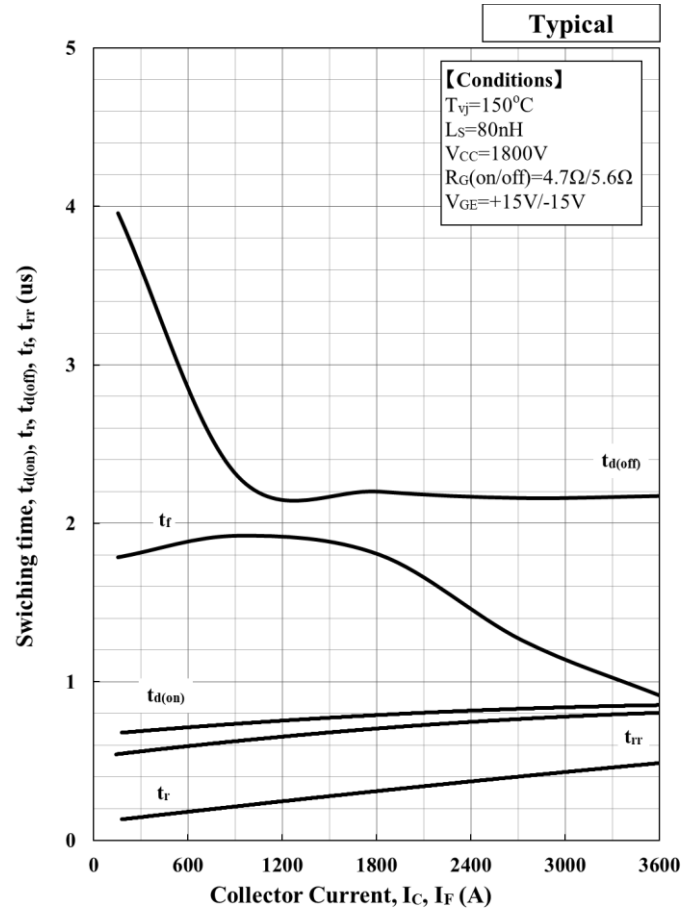
Turn-on loss vs. Collector current



Turn-off loss vs. Collector current

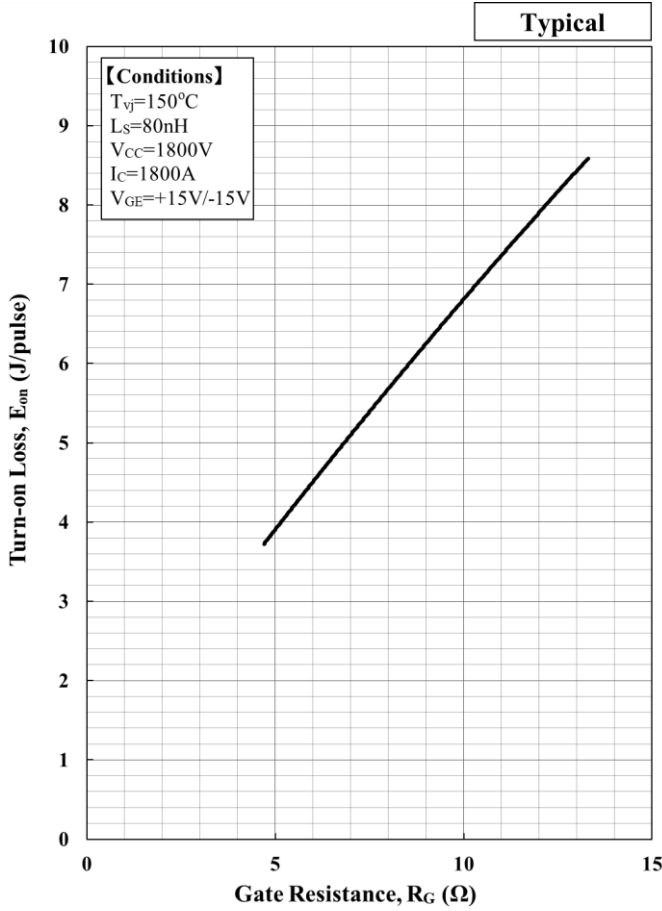


Recovery loss vs. Forward current

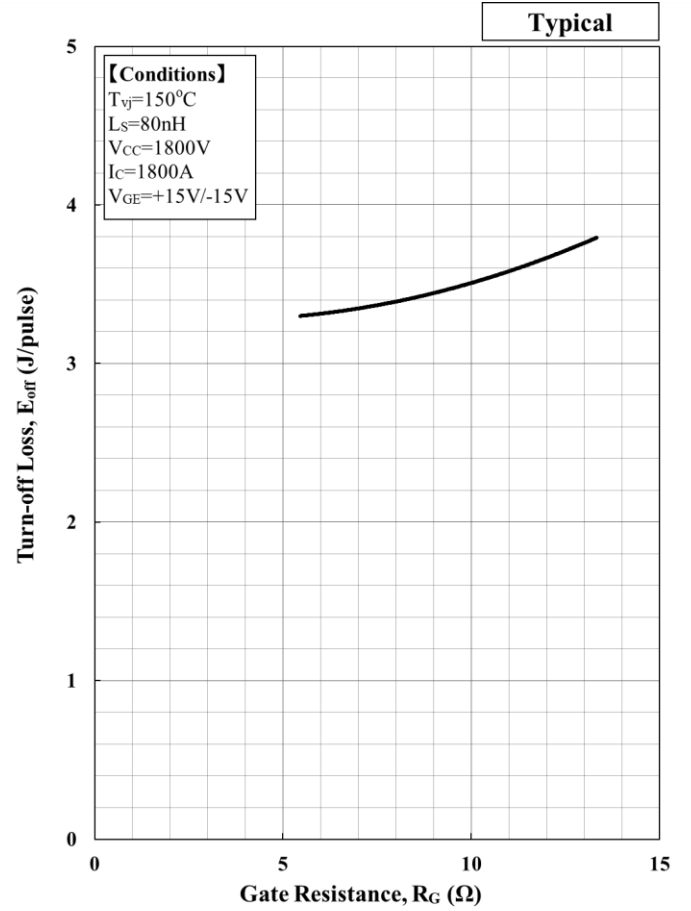


Switching time vs. Collector Current

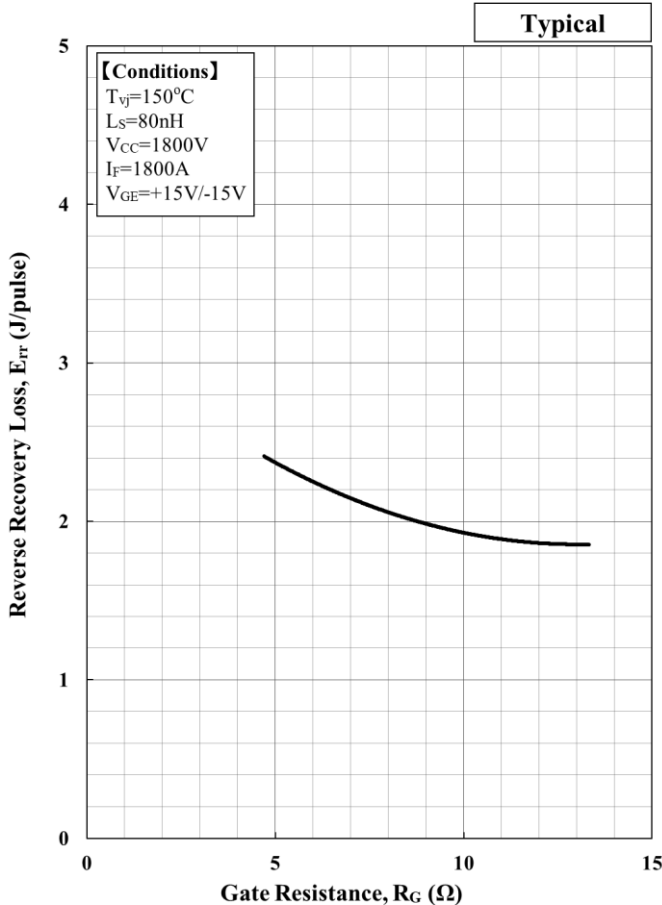
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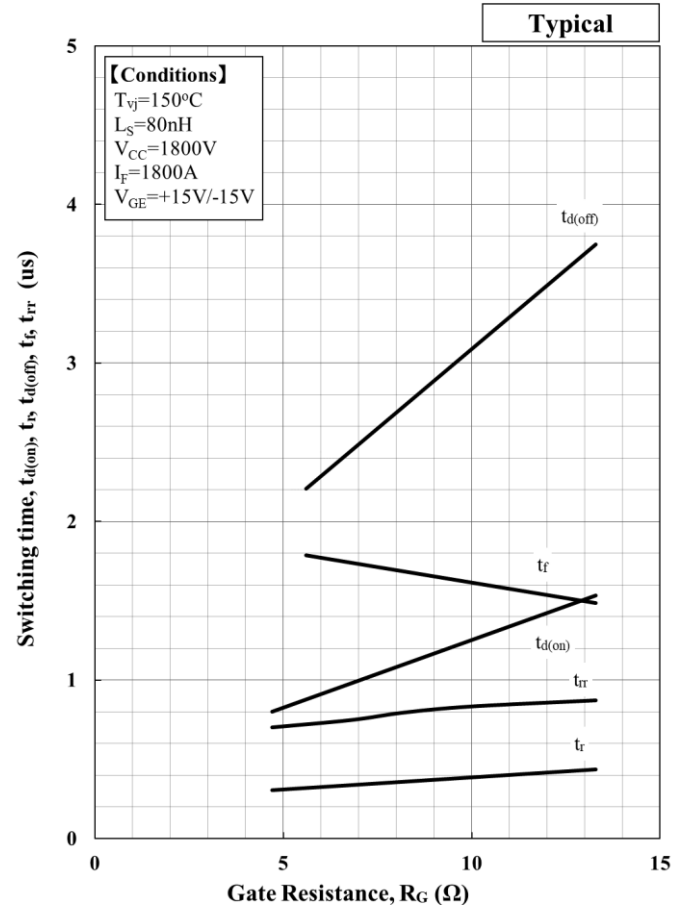
Turn-on loss vs. Gate Resistance



Turn-off loss vs. Gate Resistance

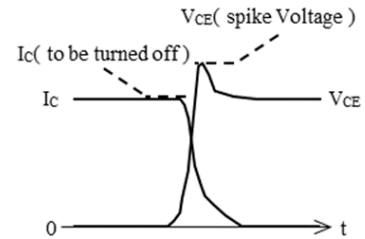
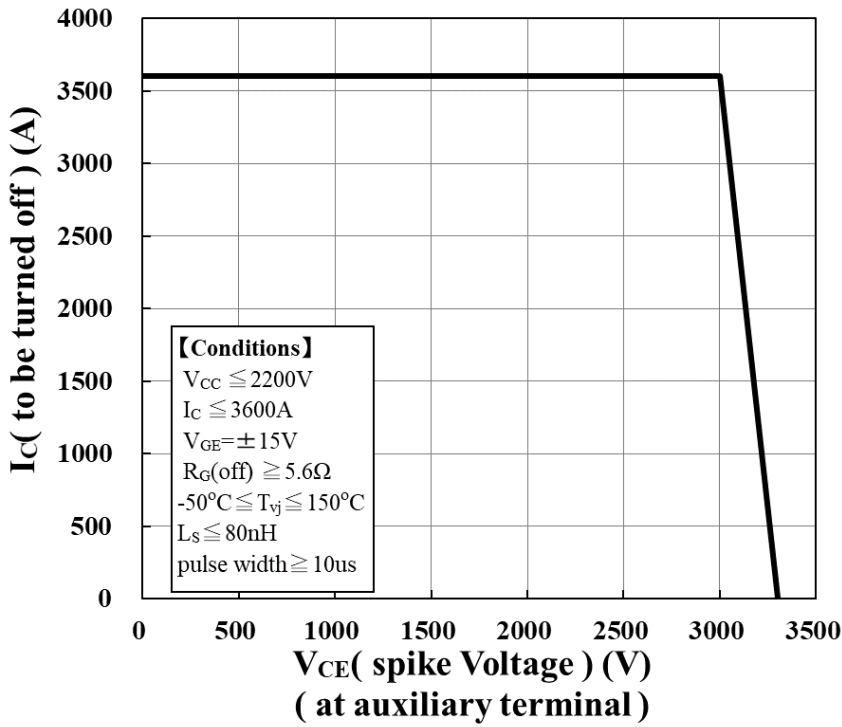


Recovery loss vs. Gate Resistance



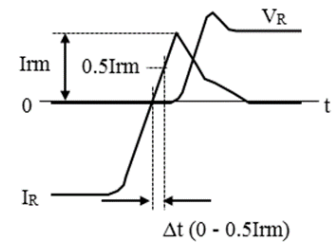
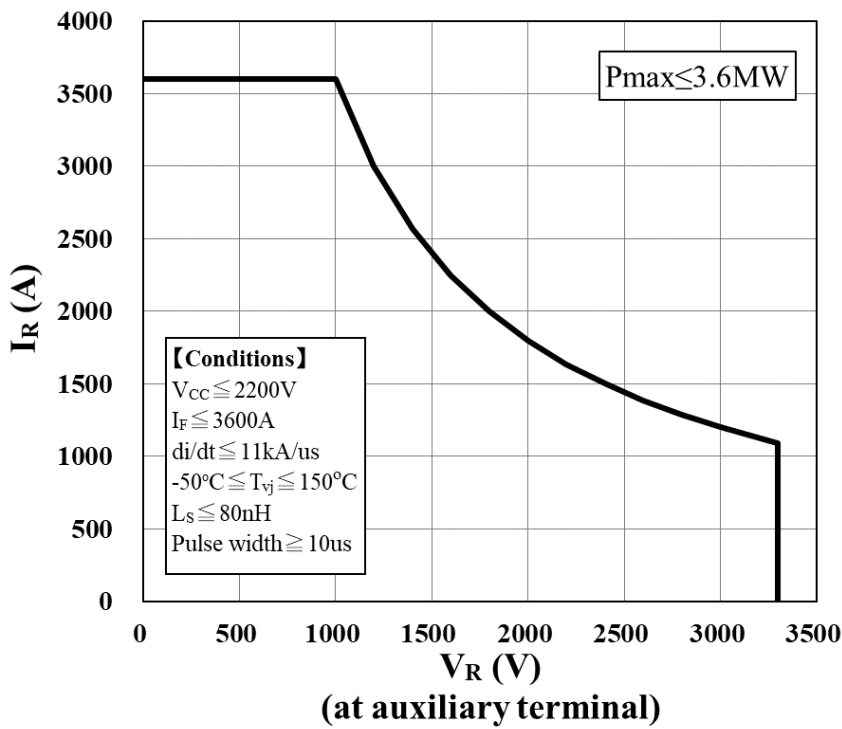
Switching time vs. Gate Resistance

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Definition of RBSOA waveform

Reverse Bias Safe Operation Area (RBSOA)

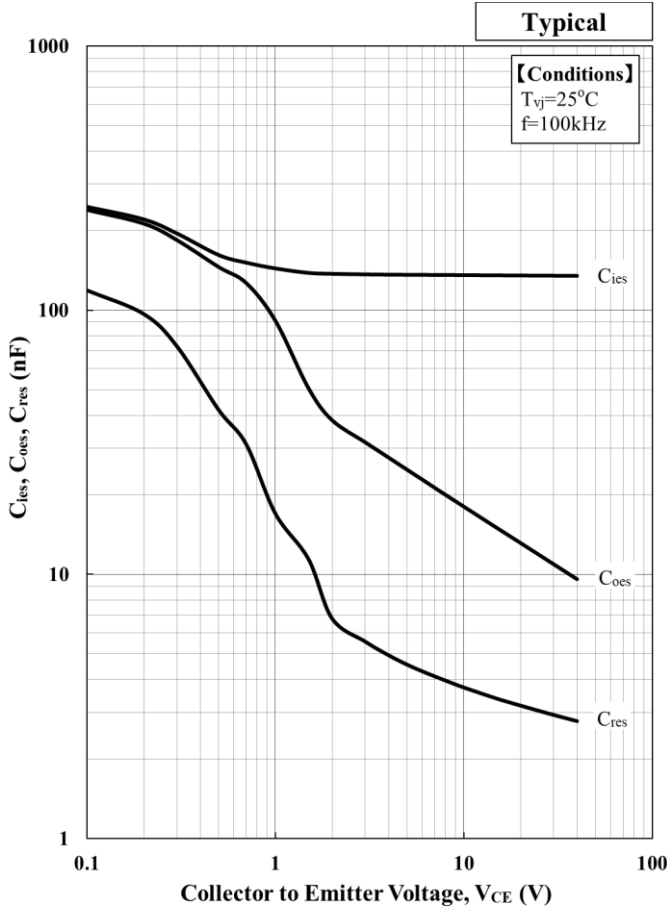


$$di/dt = \frac{0.5I_{rm}}{\Delta t}$$

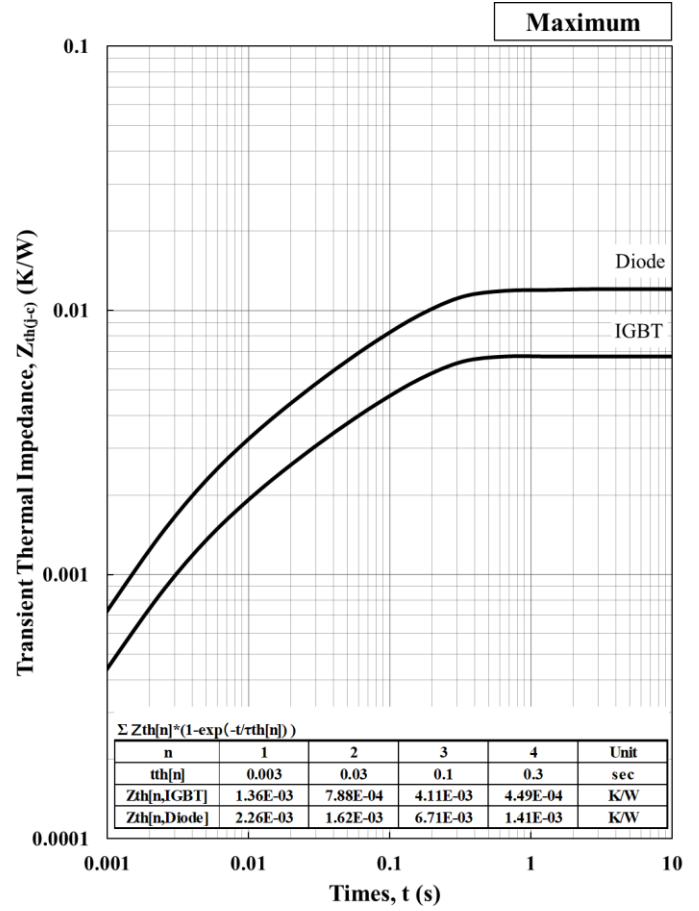
Definition of Recovery di/dt

Reverse Recovery Safe Operation Area (RRSOA)

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Capacitance vs. Collector to Emitter Voltage



Transient Thermal Impedance Curve

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HITACHI POWER SEMICONDUCTORS

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