

MBL1600E17F

Silicon N-channel IGBT 1700V F version

FEATURES

- * Soft switching behavior & low conduction loss:
Soft low-injection punch-through with
Advanced trench HiGT* (*High conductivity IGBT).
- * Low driving power:
Low input capacitance advanced trench gate.
- * Low noise recovery: Ultra soft fast recovery diode.

ABSOLUTE MAXIMUM RATINGS (T_C=25°C)

Item	Symbol	Unit	MBL1600E17F	
Collector Emitter Voltage	V _{CES}	V	1,700	
Gate Emitter Voltage	V _{GES}	V	±20	
Collector Current	DC	I _C	1,600	
	1ms	I _{Cp}	3,200	
Forward Current (Free wheel Diode)	DC	I _{F(FWD)}	1,200	
	1ms	I _{FM(FWD)}	2,400	
Forward Current (Chopper Diode)	DC	I _{F(chopper)}	1,200	
	1ms	I _{FM(chopper)}	2,400	
Junction Temperature	T _{J op}	°C	-50 ~ +150	
Maximum Junction Temperature(3)	T _{vj max}	°C	175	
Storage Temperature	T _{stg}	°C	-50 ~ +125	
Isolation Voltage	V _{ISO}	V _{RMS}	4,000(AC 1 minute)	
Screw Torque	Terminals (M4/M8)	-	2/15	(1)
	Mounting (M6)	-	6	(2)

Notes: (1) Recommended Value $1.8 \pm 0.2/15^{+0}_{-3} \text{N}\cdot\text{m}$ (2) Recommended Value $5.5 \pm 0.5 \text{N}\cdot\text{m}$
 (3) Regarding the definition of T_{vj max} for each operation mode, please refer to LD-ES-130737.

ELECTRICAL CHARACTERISTICS

1) IGBT + FWD

Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions	
Collector Emitter Cut-Off Current	I _{CES}	mA	-	-	5	V _{CE} =1,700V, V _{GE} =0V, T _J =25°C	
			-	20	80	V _{CE} =1,700V, V _{GE} =0V, T _J =150°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	-	2.0	-	I _C =1,600A, V _{GE} =15V, T _J =25°C	
			2.0	2.4	2.8	I _C =1,600A, V _{GE} =15V, T _J =150°C	
Gate Emitter Threshold Voltage	V _{GE(TO)}	V	4.1	5.5	7.1	V _{CE} =10V, I _C =160mA, T _J =25°C	
Input Capacitance	C _{ies}	nF	-	87	-	V _{CE} =10V, V _{GE} =0V, f=100kHz, T _J =25°C	
Internal Gate Resistance	R _{ge}	Ω	-	2.3	-	V _{CE} =10V, V _{GE} =0V, f=100kHz, T _J =25°C	
Turn On Delay Time	t _{d(on)}	μs	-	0.6	1.2	V _{CC} =900V, I _C =1,600A	
Rise Time	t _r		-	0.4	0.8	L _s =120nH (4)	
Turn Off Delay Time	t _{d(off)}		-	1.8	3.6	R _{G(on/off)} =3.9/3.9Ω (4)	
Fall Time	t _f		-	1.4	2.8	V _{GE} =±15V, T _J =150°C	
Peak Forward Voltage Drop	V _{FM}	V	-	2.0	-	I _F =1,200A, V _{GE} =0V, T _J =25°C Measured at auxiliary terminals	
			-	2.3	-	I _F =1,200A, V _{GE} =0V, T _J =150°C Measured at auxiliary terminals	
Turn On Loss	E _{on}	J/P	-	0.5	-	V _{CC} =900V, I _C =1,600A L _s =120nH (4)	
Turn Off Loss	E _{off}	J/P	-	1.4	-	R _{G(on/off)} = 3.9/3.9Ω (4) V _{GE} =±15V, T _J =150°C	
Stray inductance in module	L _{SCE}	nH	-	12	-		
Thermal Impedance	IGBT	R _{th(j-c)}	K/W	-	-	0.015	Junction to case
	FWD	R _{th(j-c)}		-	-	0.033	
Contact Thermal Impedance	R _{th(c-f)}	K/W	-	0.008	-	Case to fin (λgrease=1W/(m·K), heat-sink flatness ≤50μm)	

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2) Chopper DIODE

Item	Symbol	Unit	Min.	Typ.	Max.	Test Conditions
Repetitive Reverse Current	I _{RRM}	mA	-	-	2.5	V _R =1,700V, T _j =25°C
			-	10	40	V _R =1,700V, T _j =150°C
Peak Forward Voltage Drop (Between main terminals)	V _F	V	-	2.1	-	I _F =1,200A, T _j =25°C Measured at main terminals
			-	2.4	-	I _F =1,200A, T _j =150°C Measured at main terminals
Reverse Recovery Time	t _{rr}	μs	-	0.6	-	V _{CC} =900V, I _F =1,200A, L _s =120nH, R _G (on)=3.9Ω (4)
Reverse Recovery Loss	E _{rr}	J/P	-	0.5	-	V _{GE} =±15V, T _j =150°C
Thermal Impedance	R _{th(j-c)}	K/W	-	-	0.033	Junction to case
Contact Thermal Impedance	R _{th(c-f)}	K/W	-	0.016	-	Case to fin (at Chopper Diode part)

Notes:(4) L_s 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.

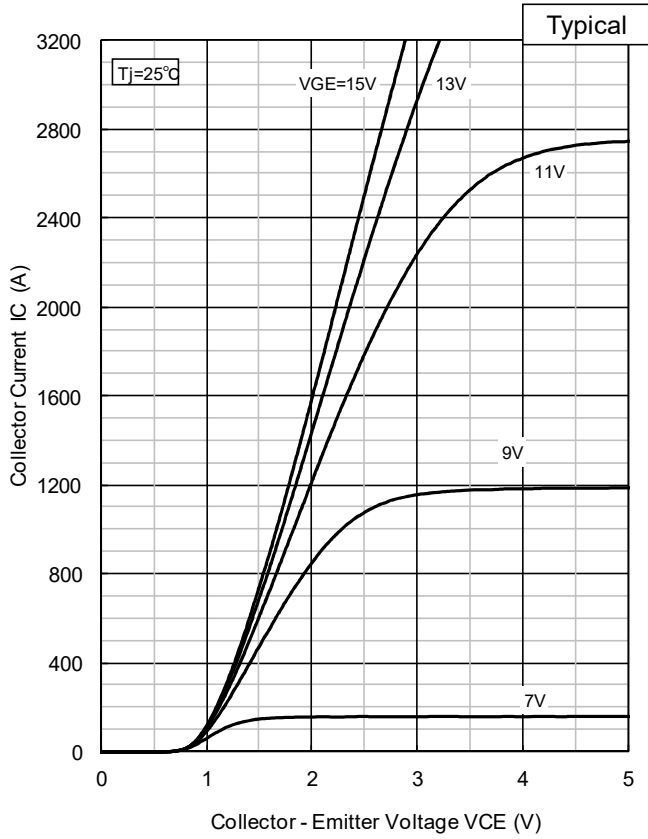
* Please contact our representatives at order.

* For improvement, specifications are subject to change without notice.

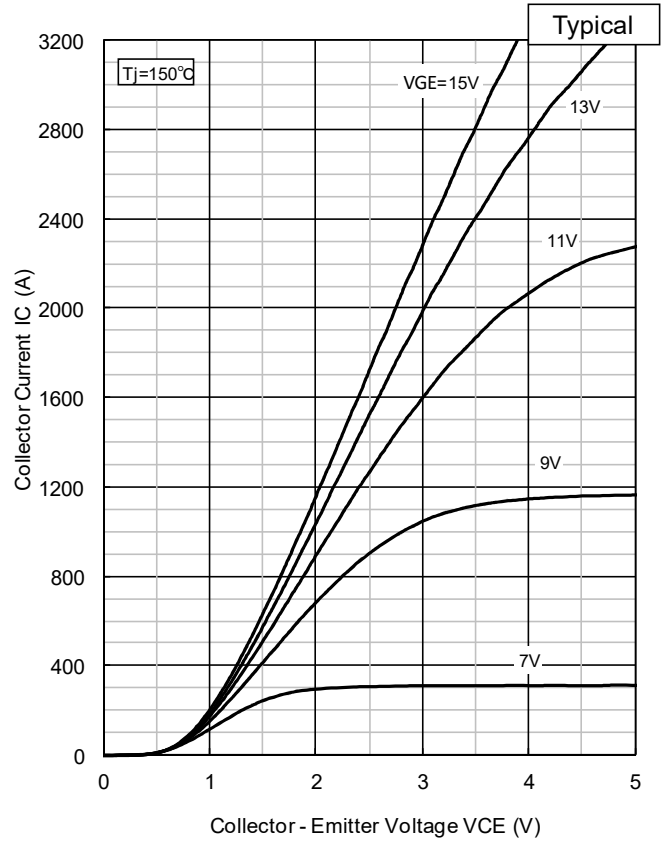
* For actual application, please confirm this spec sheet is the newest revision.

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

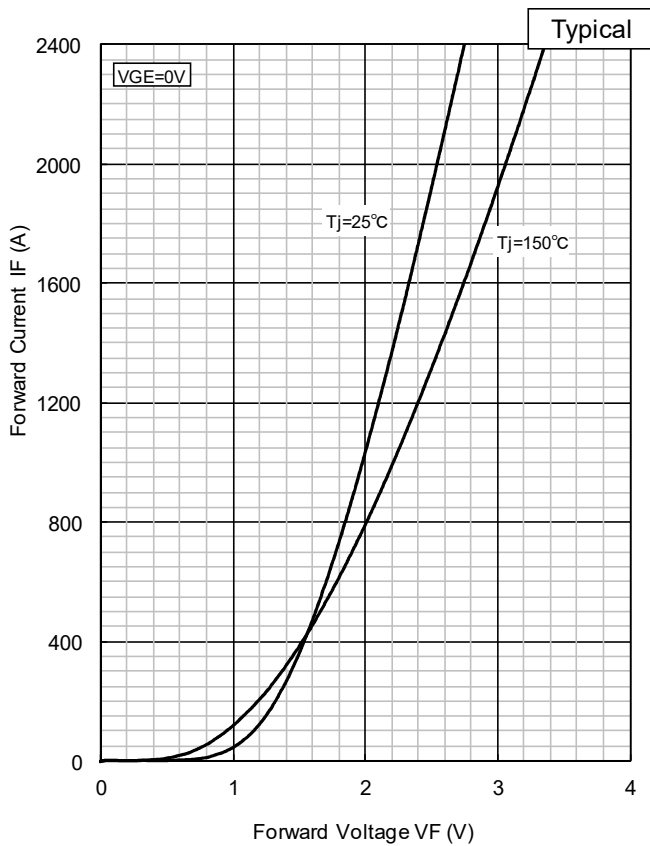
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IC vs. VCE ($T_j=25^\circ\text{C}$)

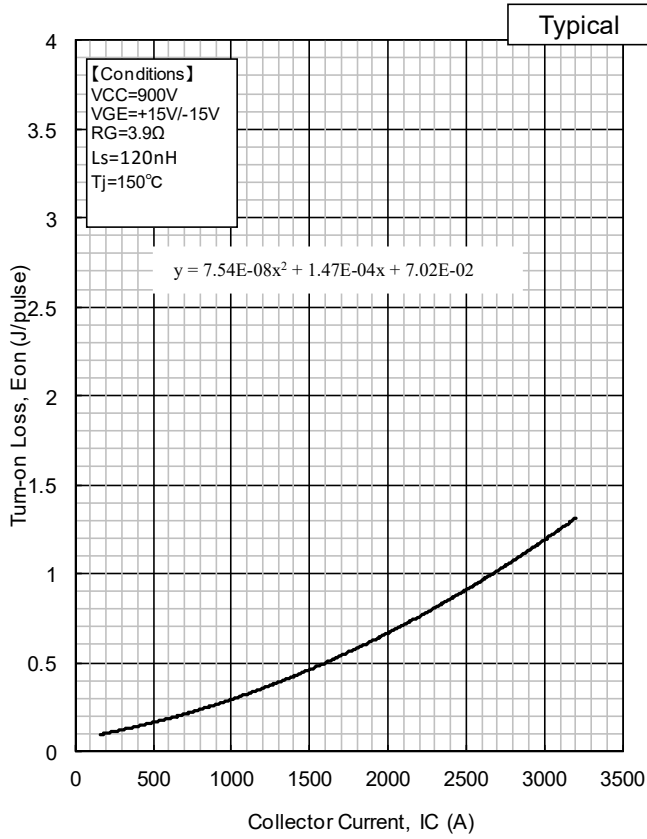


IC vs. VCE ($T_j=150^\circ\text{C}$)

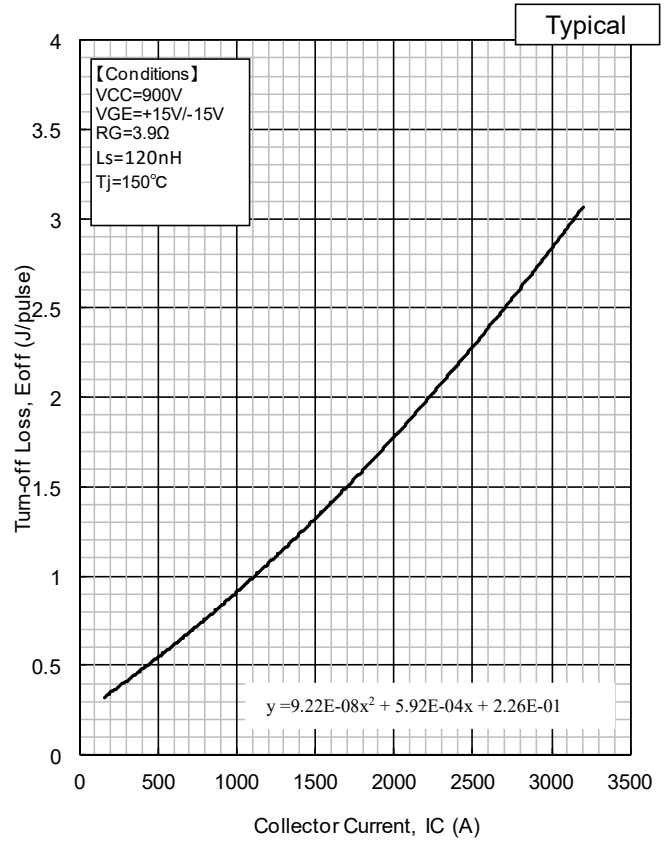


IF vs. VF of Chopper Diode

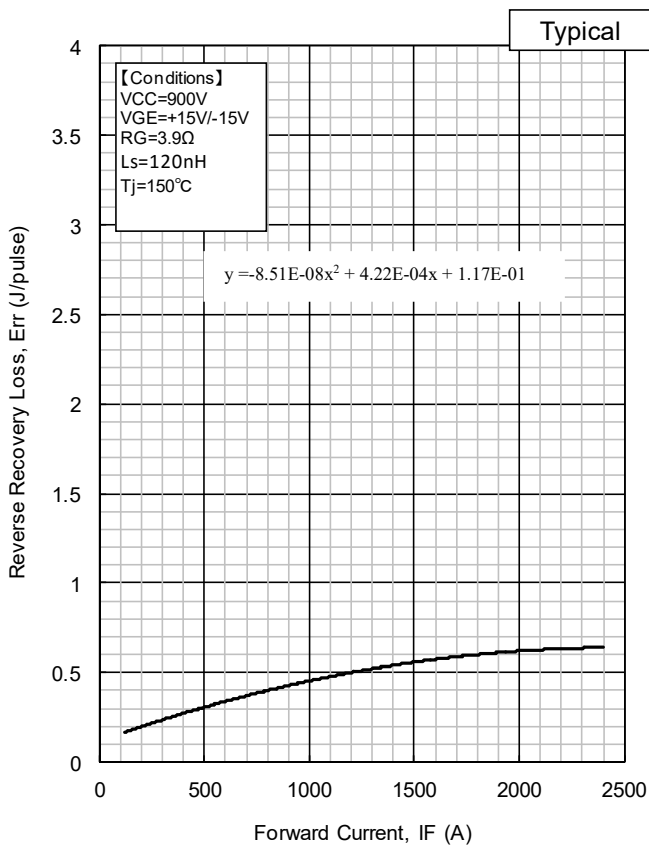
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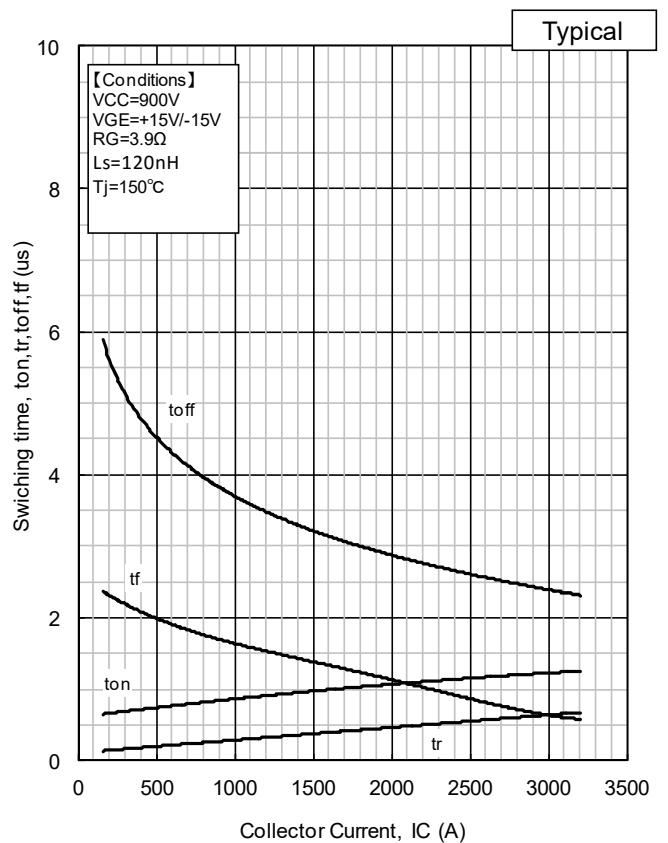
Turn-on loss vs. Collector current



Turn-off loss vs. Collector current

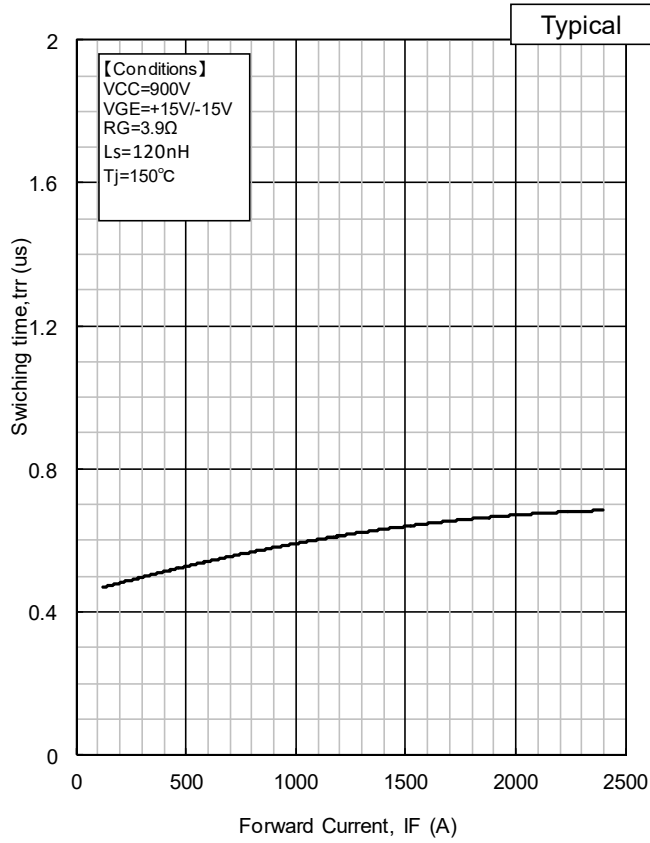


Recovery loss vs. Forward current of chopper diode



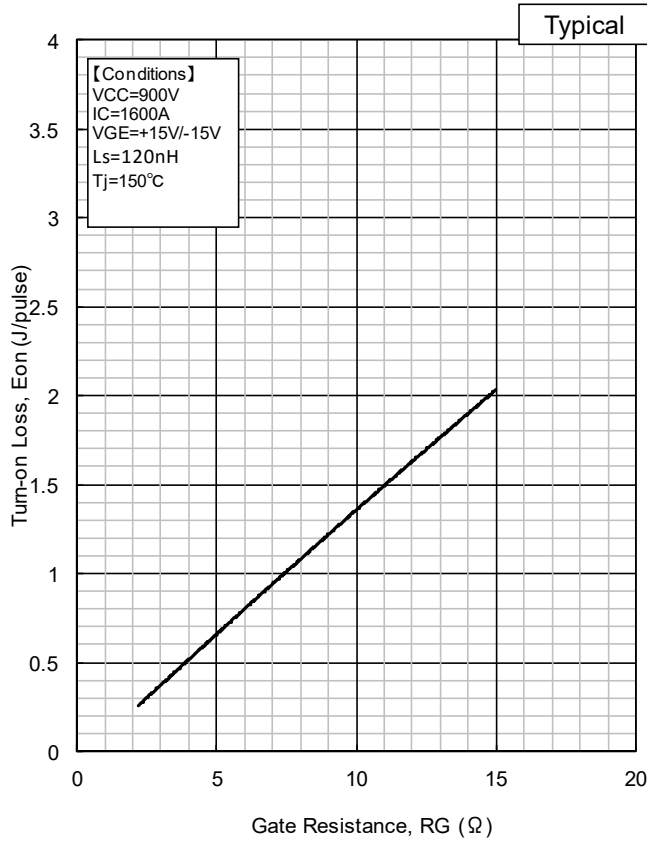
Switching time vs. Collector current

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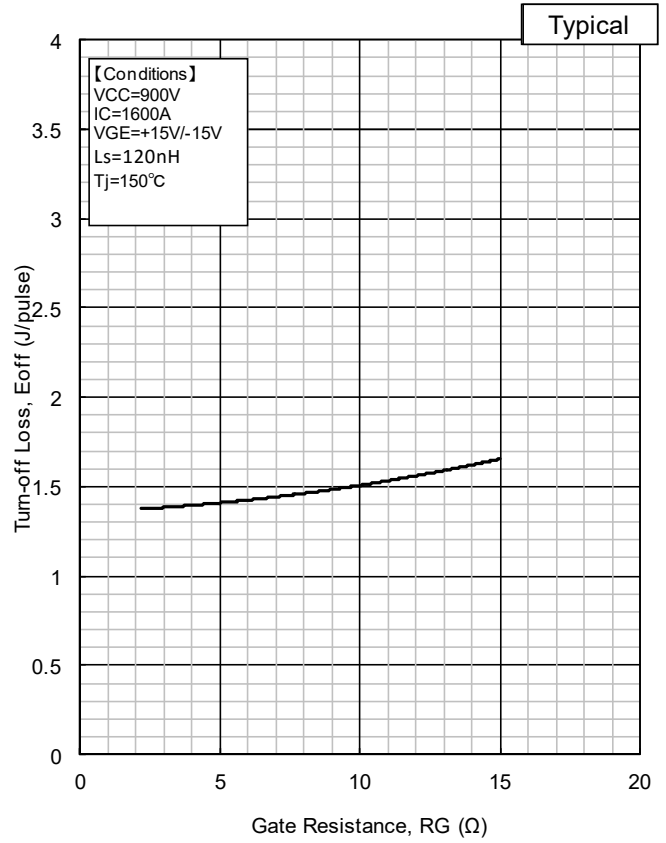


Switching time vs. Forward current of chopper diode

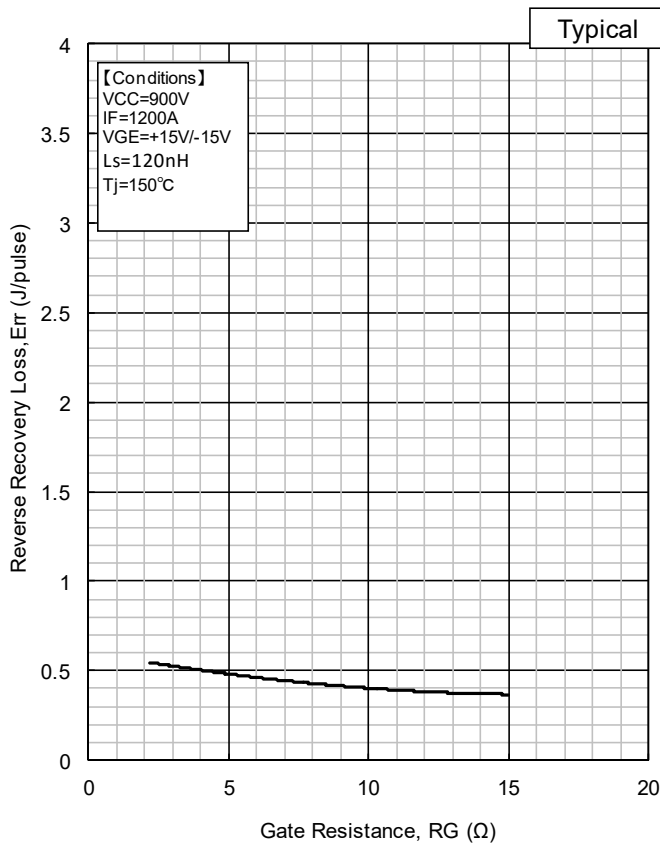
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Turn-on loss vs. Gate Resistance

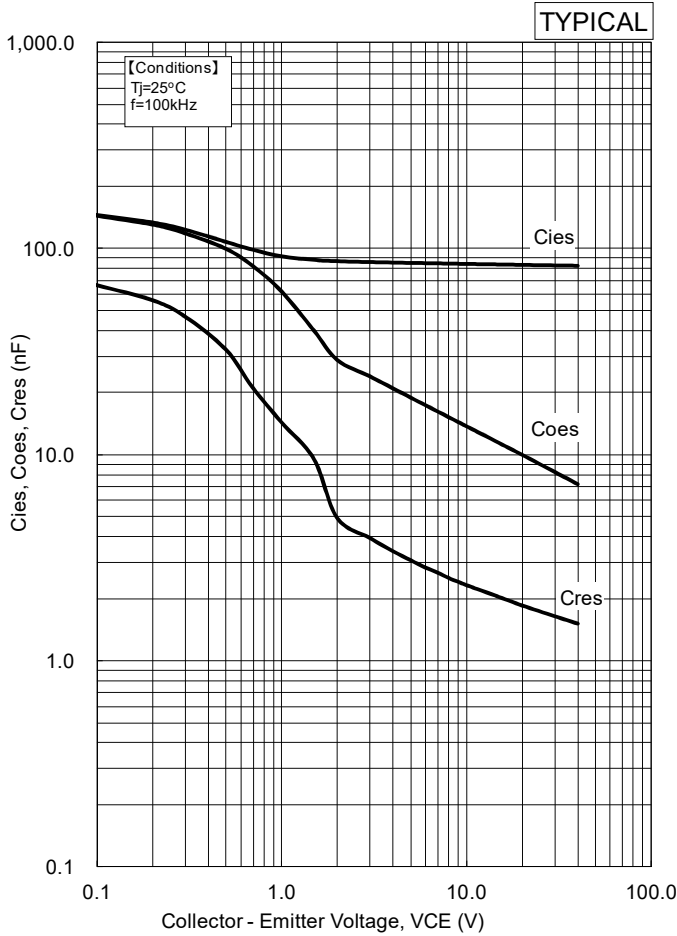


Turn-off loss vs. Gate Resistance

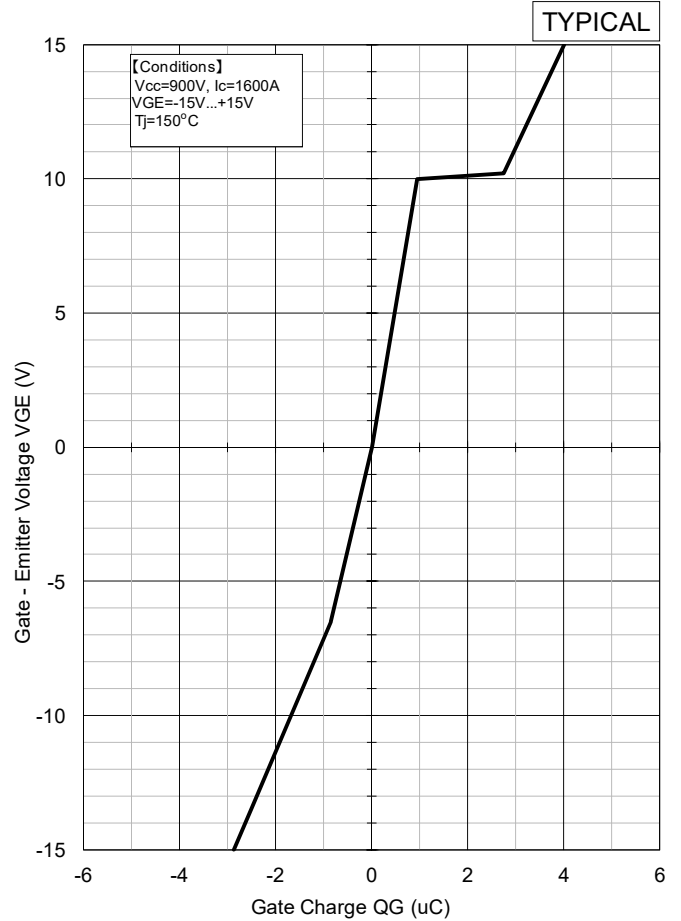


Recovery loss vs. Gate Resistance of chopper diode

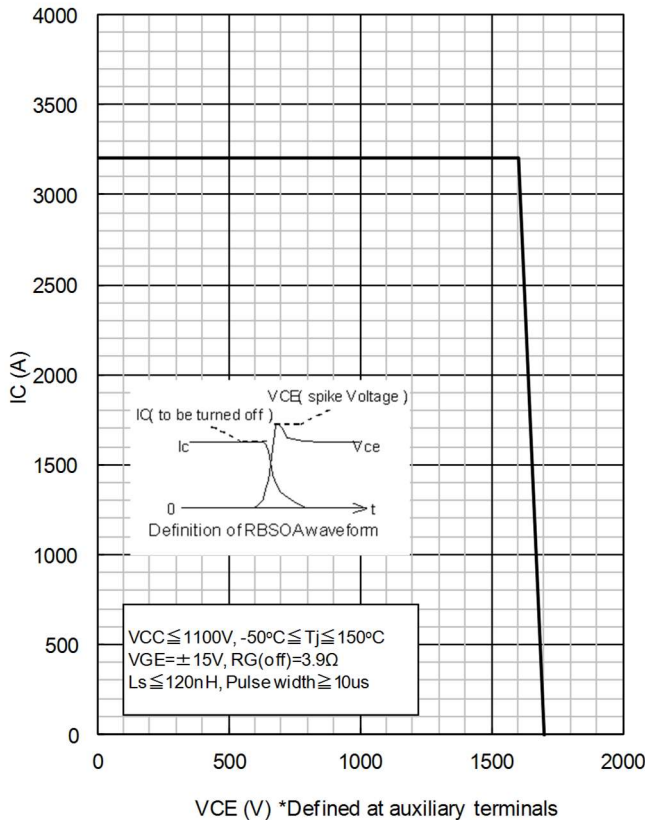
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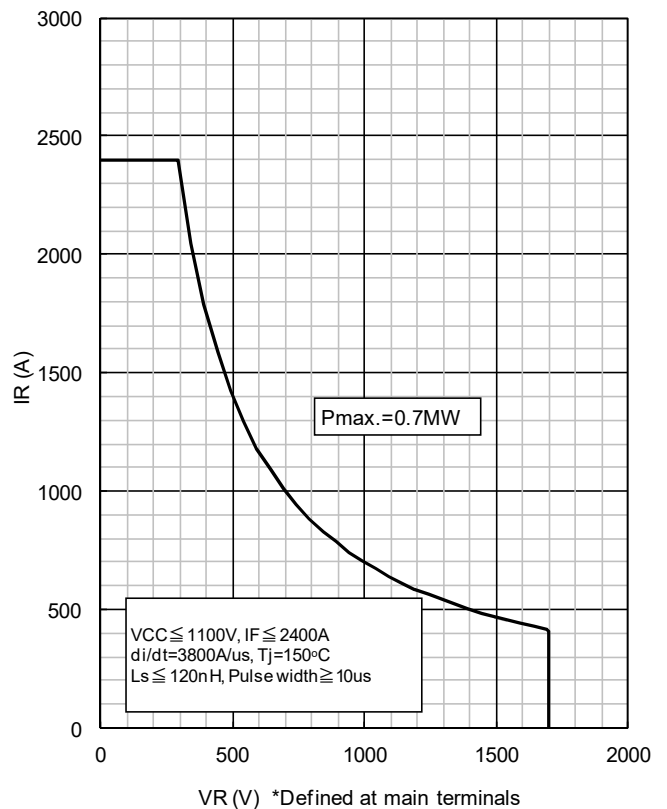
Cies, Coes, Cres - VCE



QG-VGE Curve



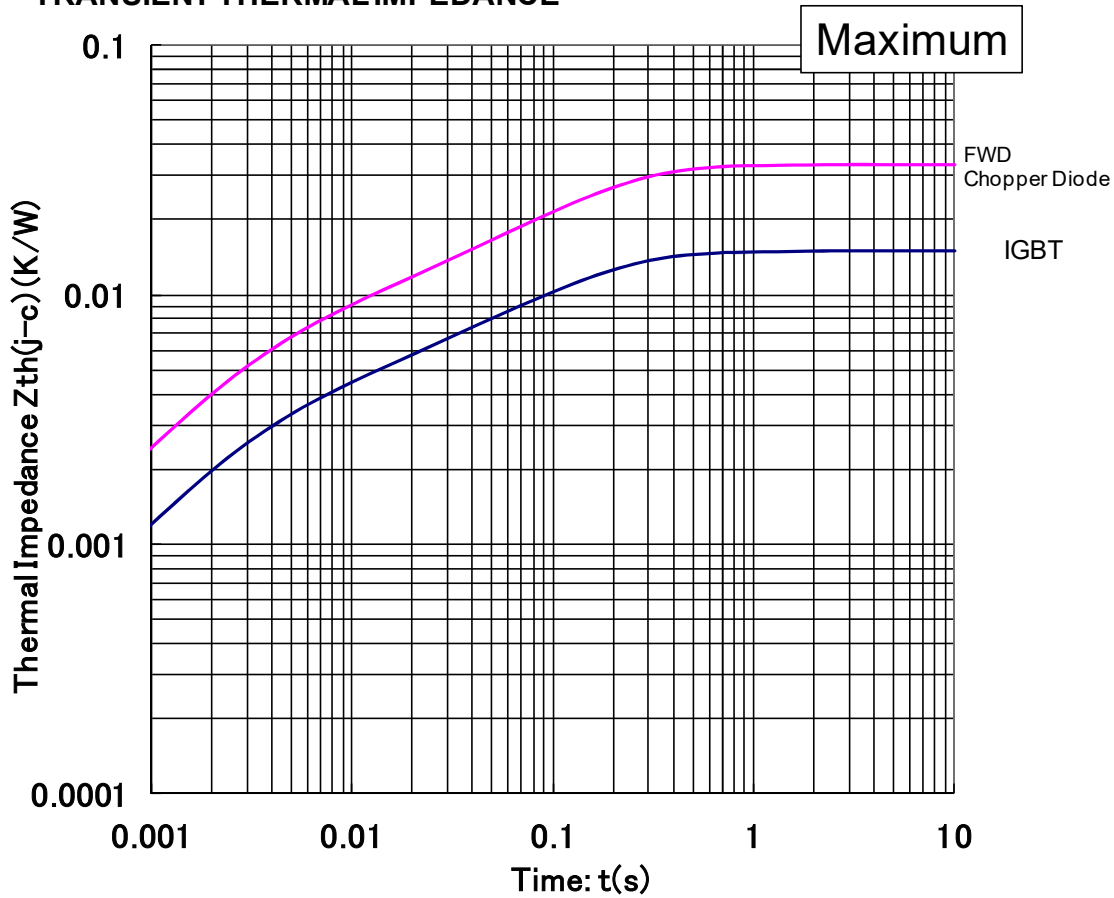
RBSOA



RecSOA of chopper diode

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TRANSIENT THERMAL IMPEDANCE



Transient Thermal Impedance Curve

Curve Approximation Model

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

n	1	2	3	4	Unit
$\tau_{th}[n]$	1.50E-01	2.58E-02	3.09E-03	5.61E-04	sec
$r_{th}[n,IGBT]$	8.97E-03	2.93E-03	2.70E-03	3.97E-04	K/W
$r_{th}[n,Diode]$	2.15E-02	5.30E-03	5.43E-03	8.00E-04	K/W

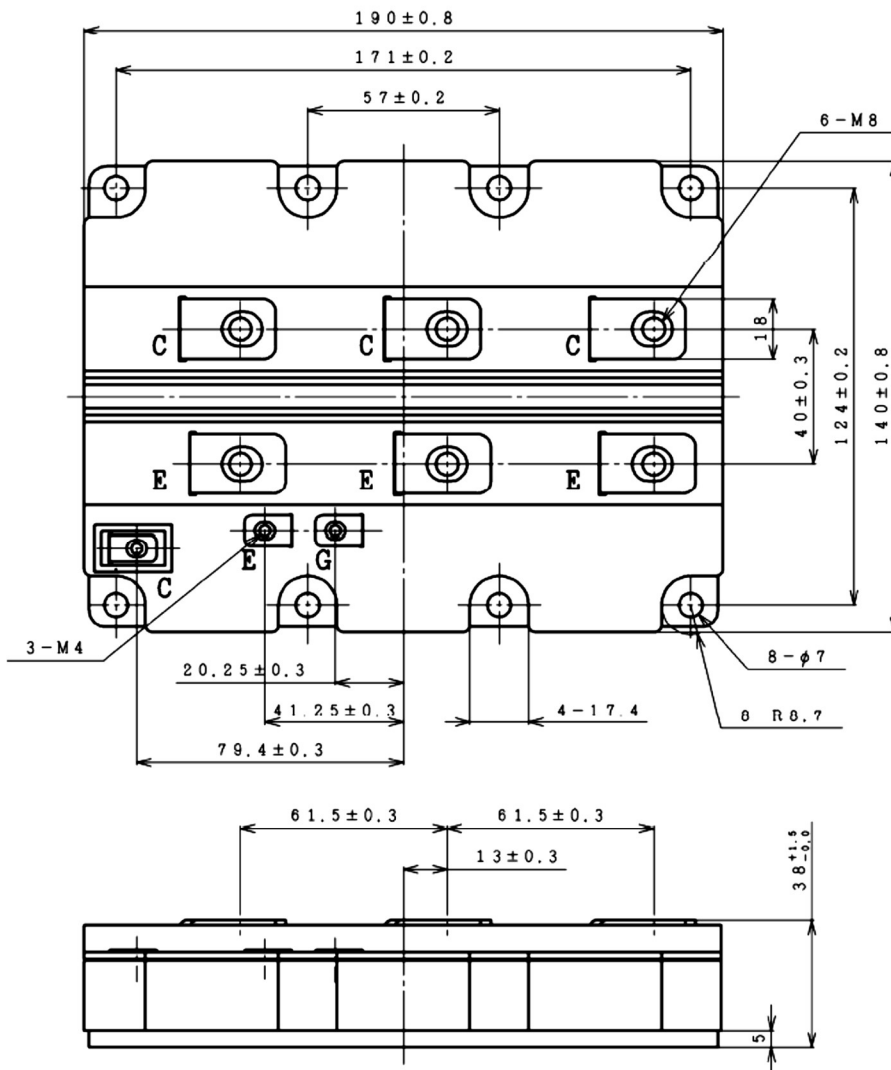
Material declaration

Please note the following materials are contained in the product, in order to keep characteristic and reliability level.

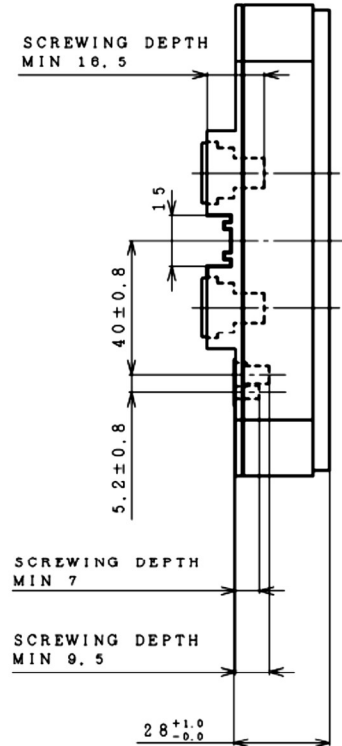
Material	Contained part
Lead (Pb) and its compounds	Solder

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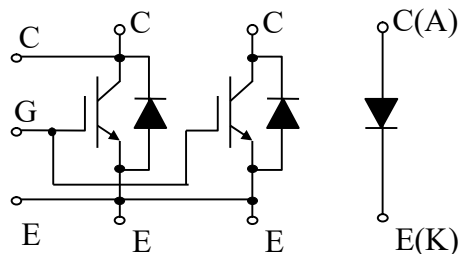
Outline Drawing



Unit in mm



Weight: 1300g



Circuit diagram

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HITACHI POWER SEMICONDUCTORS

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