

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 (Tc=25°C)

Item	Symbol	Unit	MBL1600E17F
Collector Emitter Voltage	V _{CES}	V	1,700
Gate Emitter Voltage	V _{GES}	V	±20
Collector Current	DC	A	1,600
	1ms		3,200
Forward Current (Free wheel Diode)	DC	A	1,200
	1ms		2,400
Forward Current (Chopper Diode)	DC	A	1,200
	1ms		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)	N·m	2/15 (1)
	Mounting (M6)		6 (2)

Notes: (1) Recommended Value $1.8 \pm 0.2/15^{+0}_{-3}$ N·m (2) Recommended Value 5.5 ± 0.5 N·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(TH)}	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
Forward Voltage Drop	V _{FM}	V	-	2.0	-	I _F =1,200A, V _{GE} =0V, T _j =25°C
			-	2.3	-	Measured at auxiliary terminals 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)}	-	-	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)

MBL1600E17F

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
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.

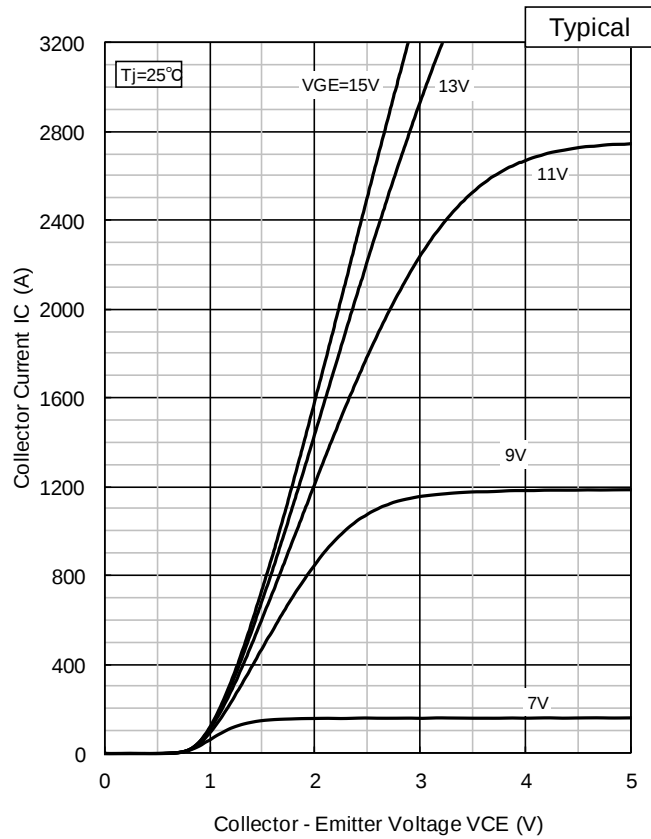
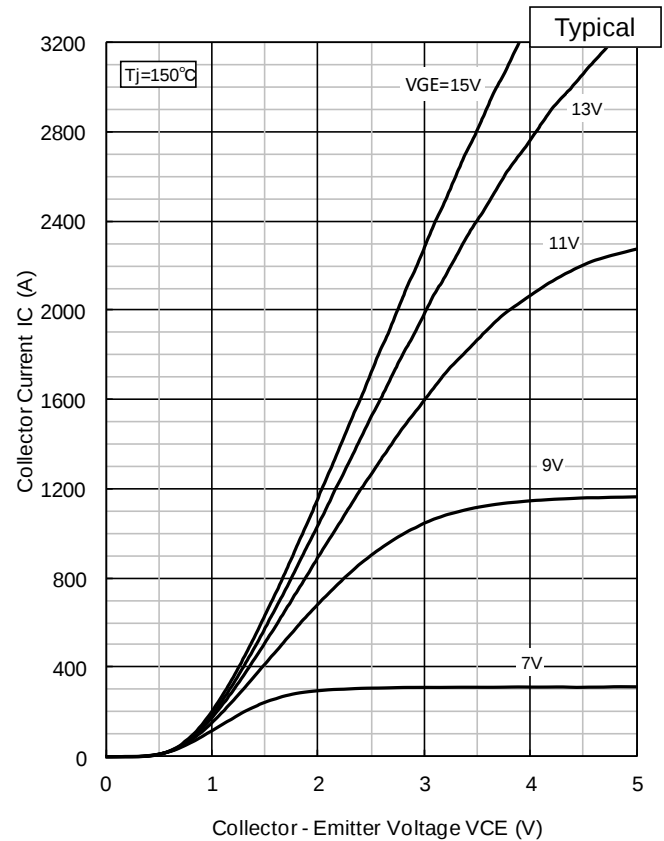
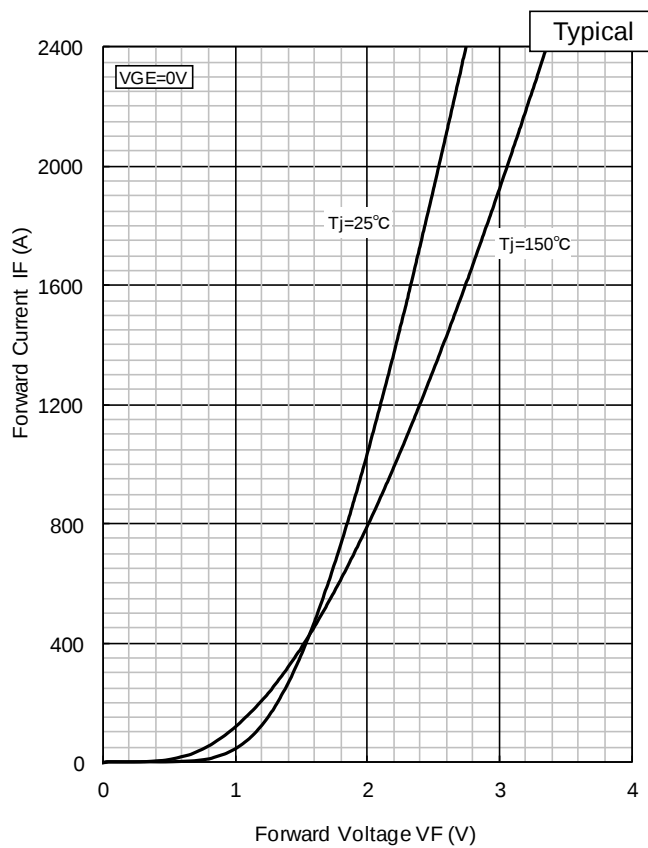
* Please contact our representatives at order.

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

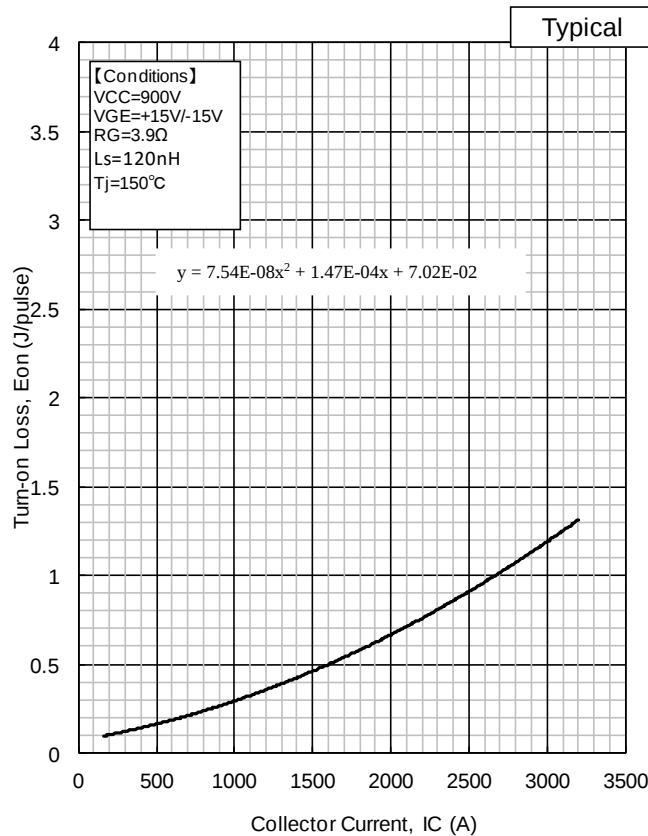
* For actual application, please confirm this spec sheet is the newest revision.

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

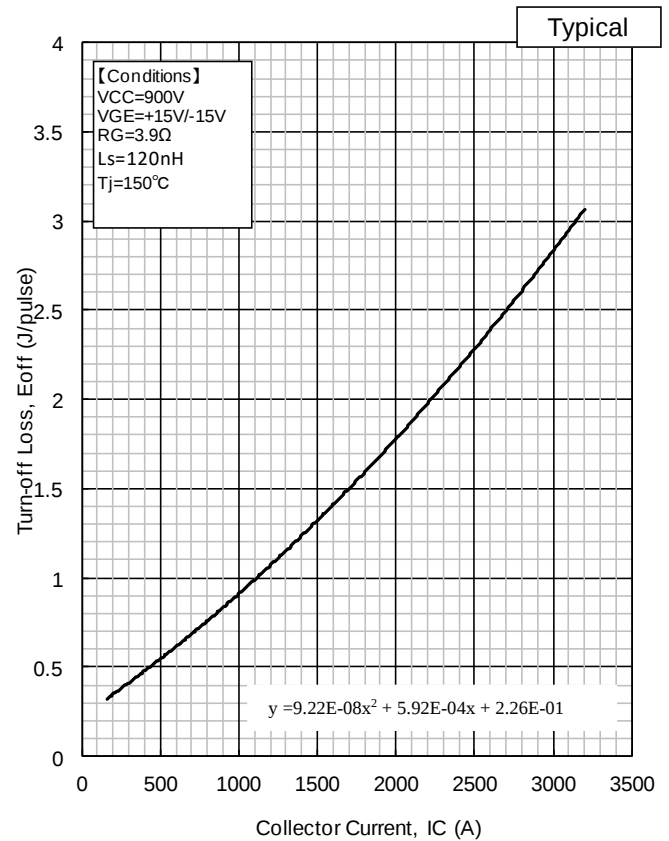
MBL1600E17F

**IC vs. VCE ($T_j=25^\circ\text{C}$)****IC vs. VCE ($T_j=150^\circ\text{C}$)****IF vs. VF of Chopper Diode**

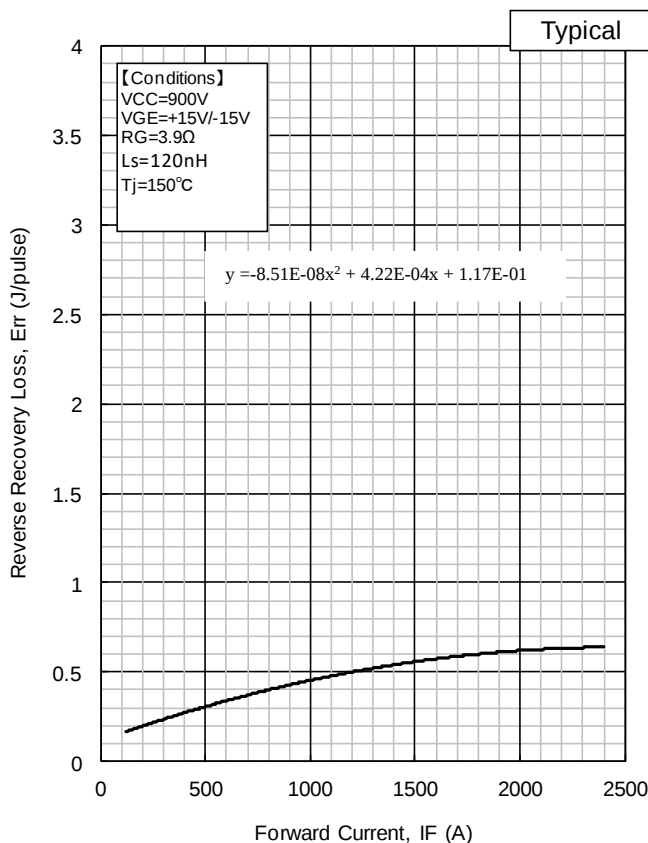
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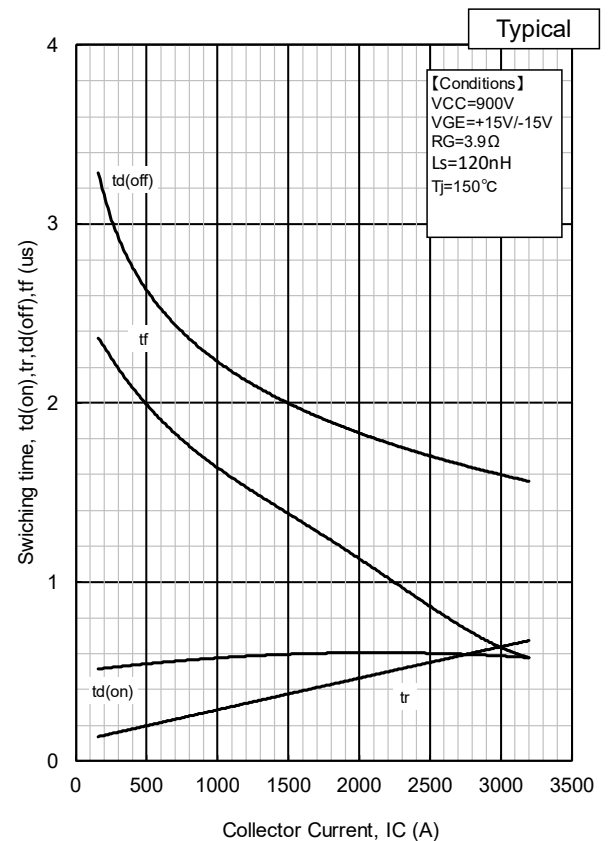
Turn-on loss vs. Collector current



Turn-off loss vs. Collector current

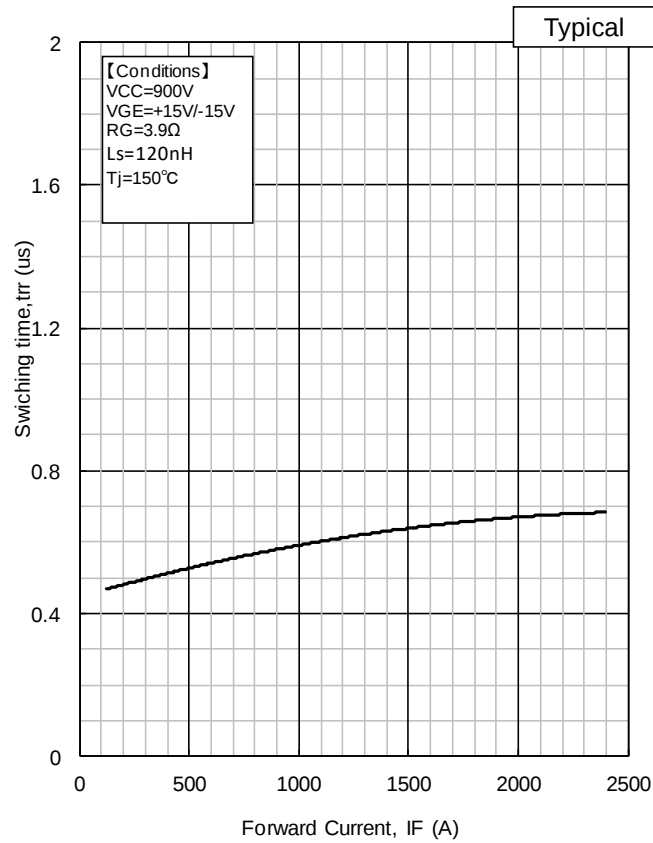


Recovery loss vs. Forward current of chopper diode



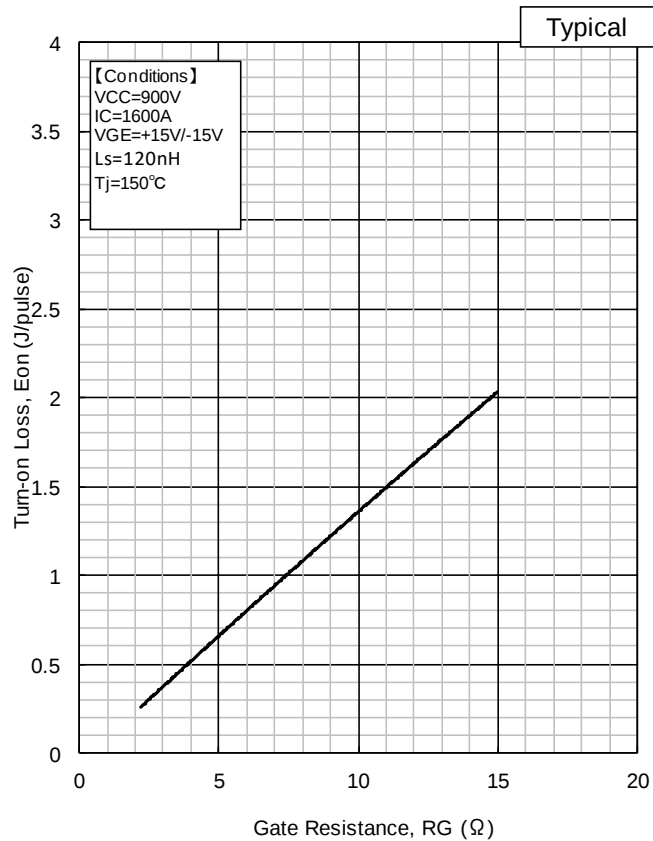
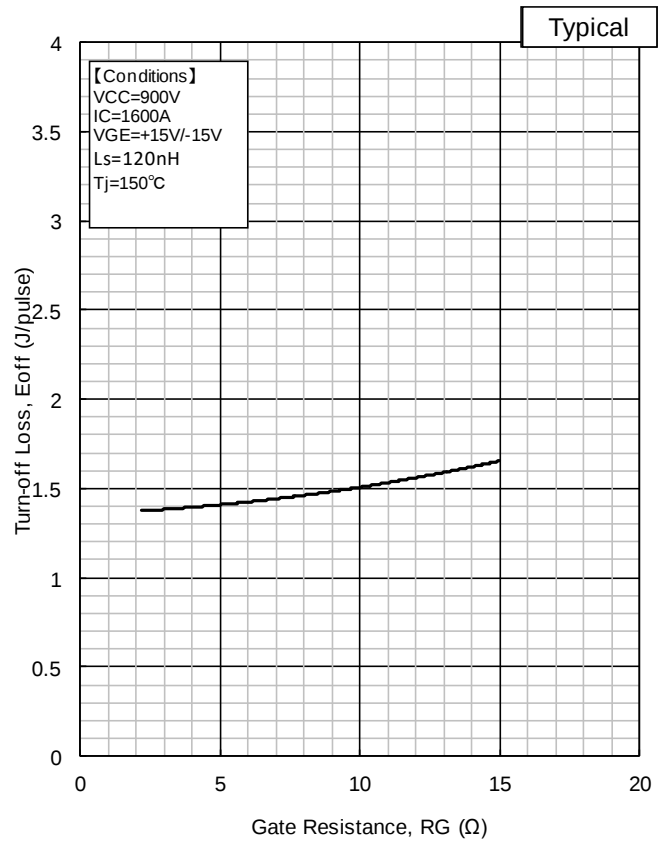
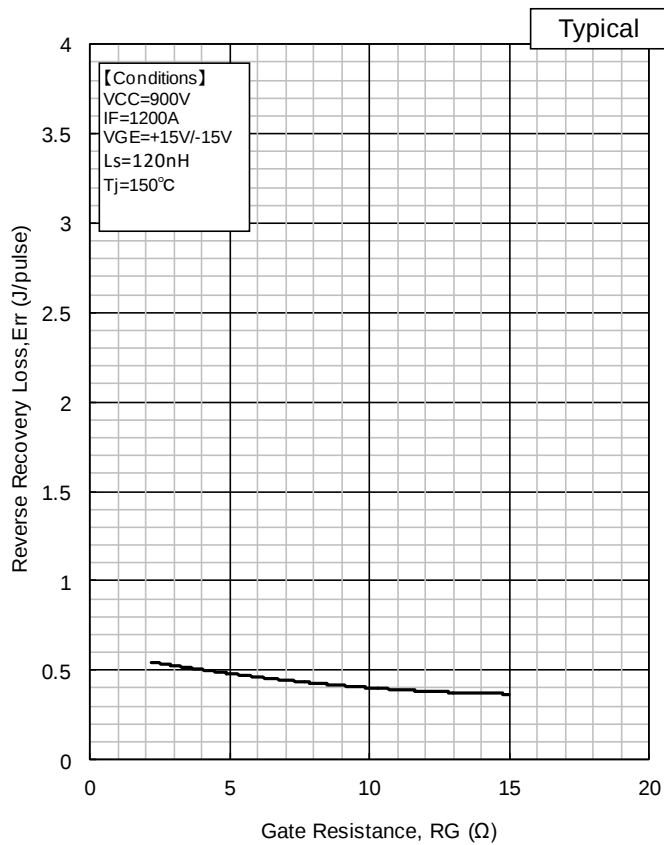
Switching time vs. Collector current

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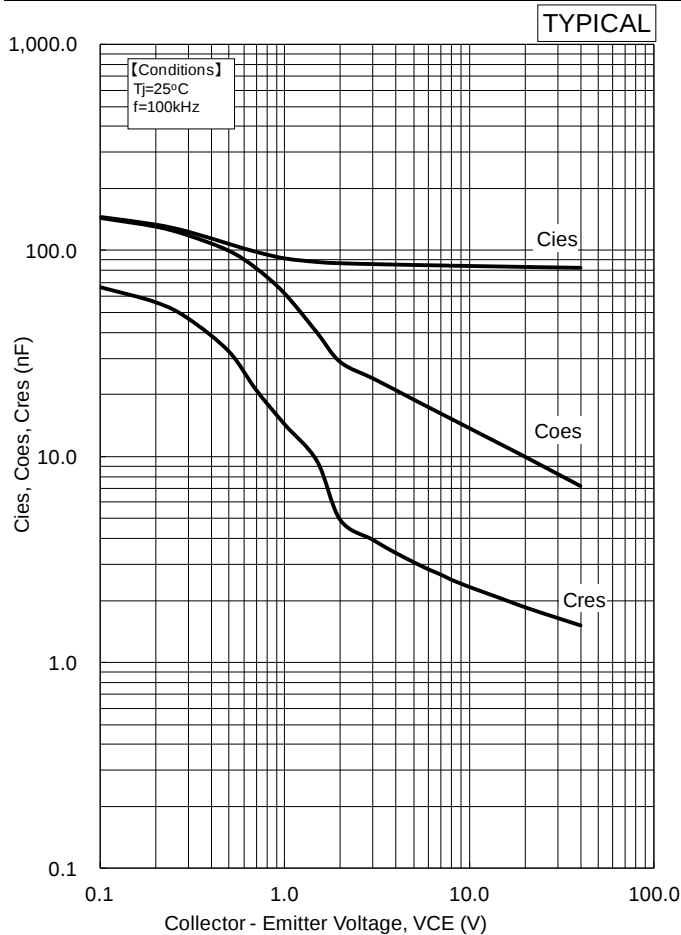


Switching time vs. Forward current of chopper diode

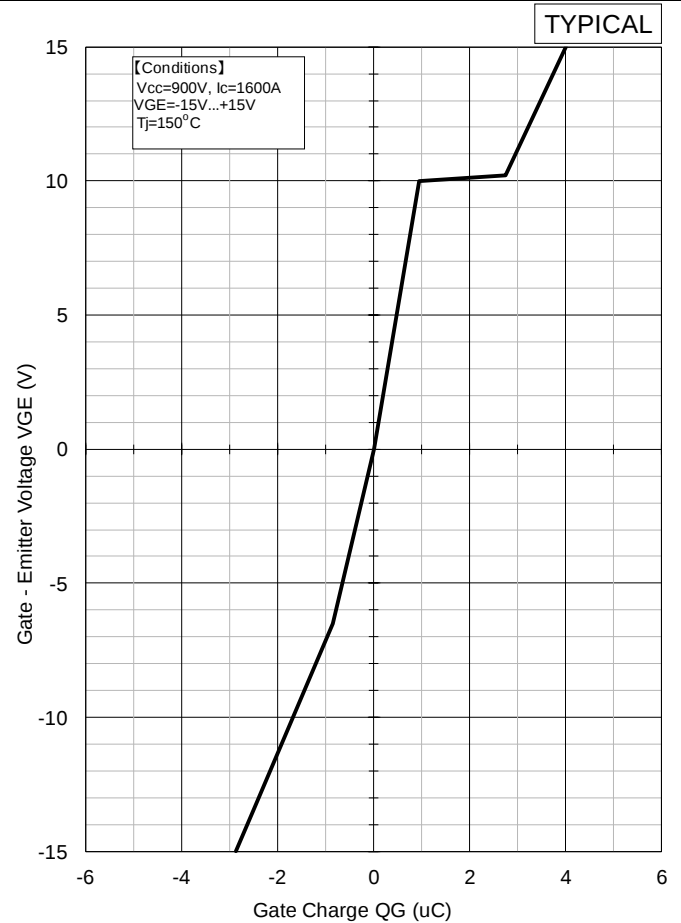
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**Turn-on loss vs. Gate Resistance****Turn-off loss vs. Gate Resistance****Recovery loss vs. Gate Resistance of chopper diode**

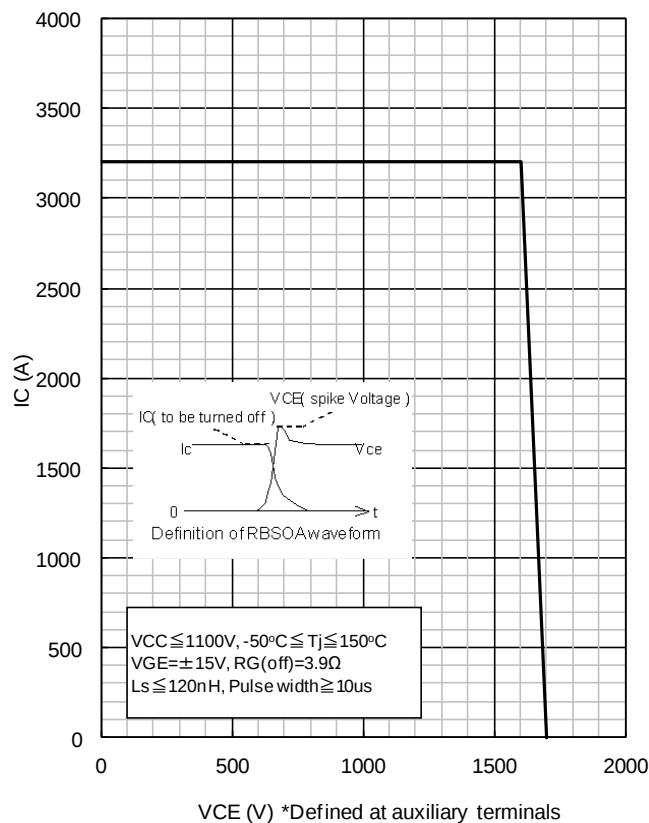
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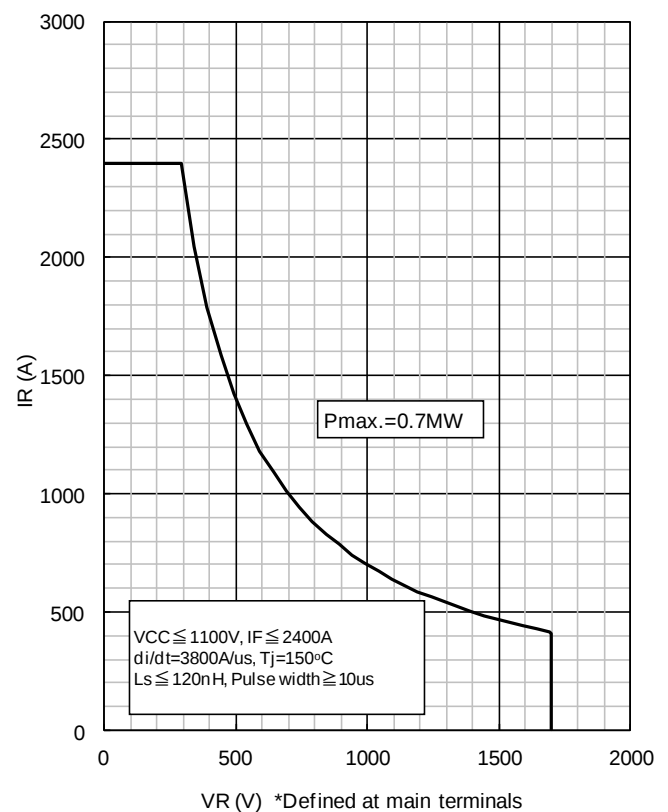
Cies, Coes, Cres - VCE



QG-VGE Curve



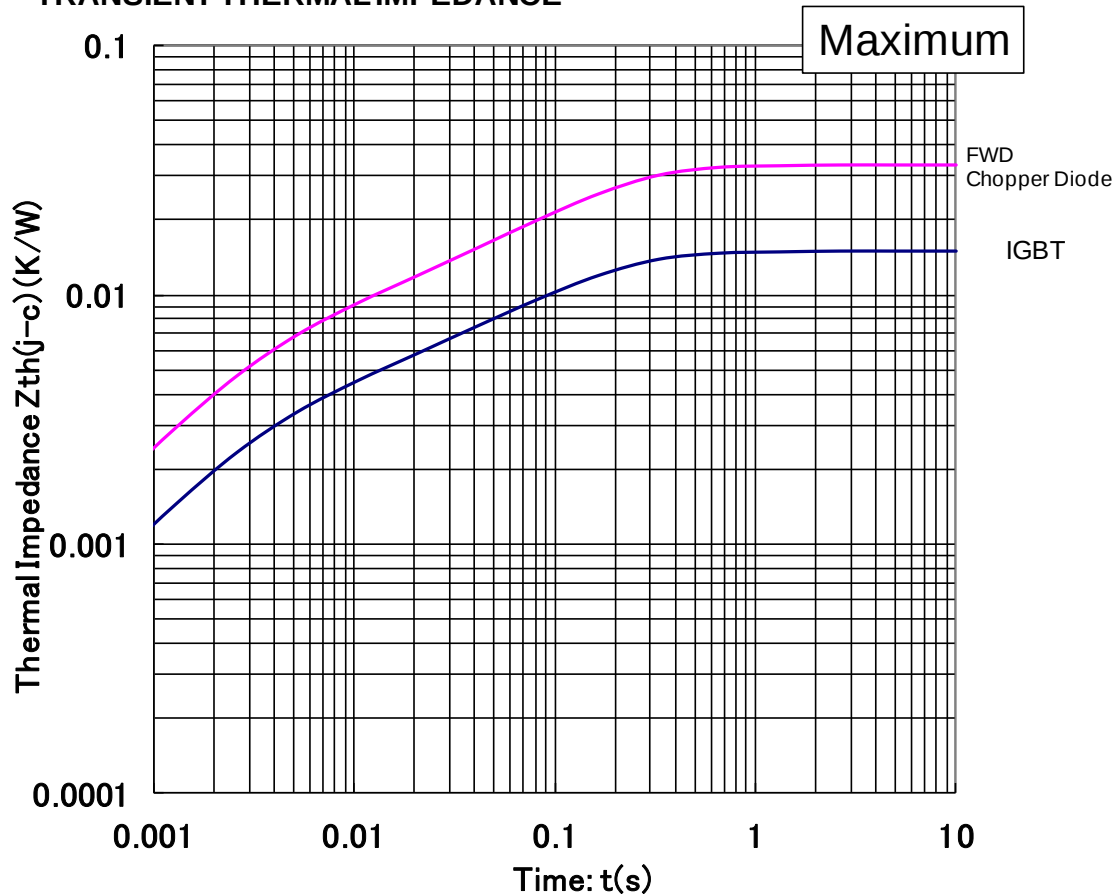
RBSOA



RecSOA of chopper diode

MBL1600E17F

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

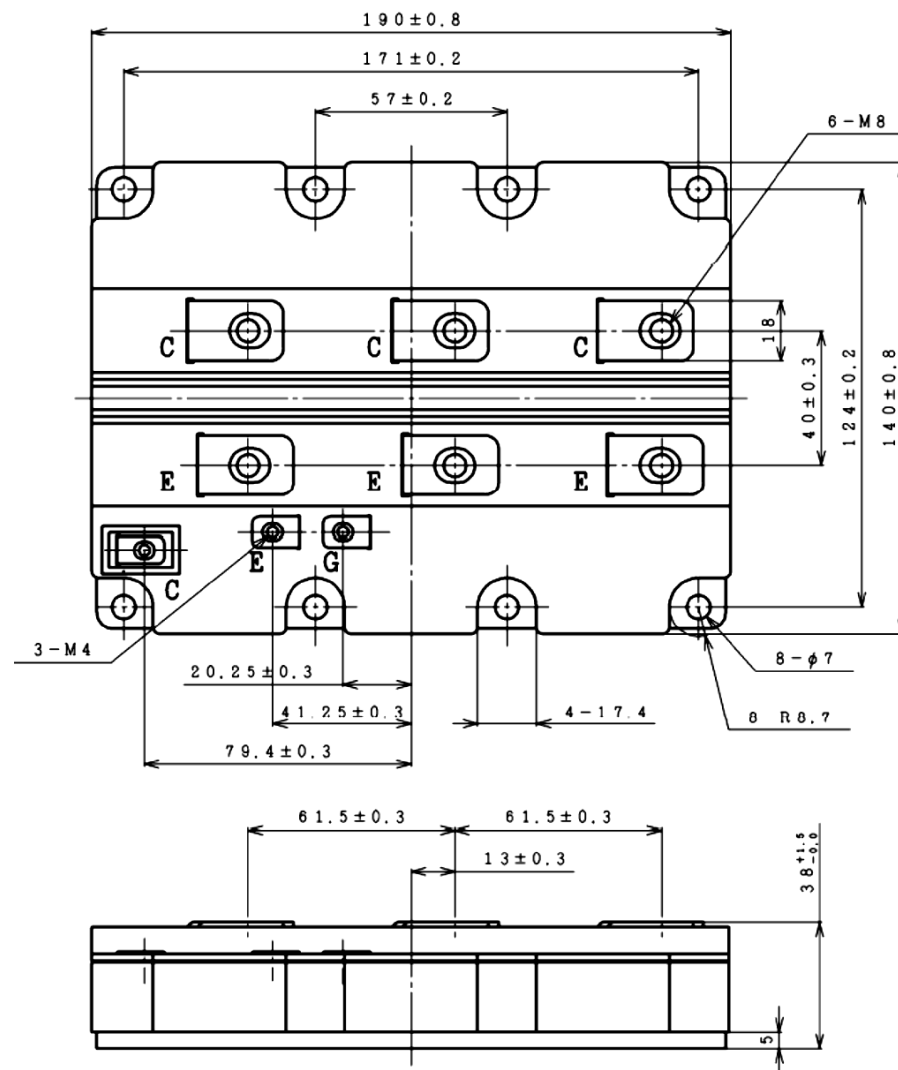
Material declaration

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

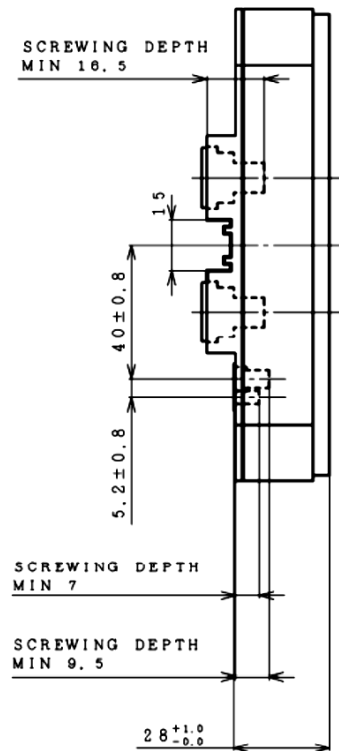
Material	Contained part
Lead (Pb) and its compounds	Solder

MBL1600E17F

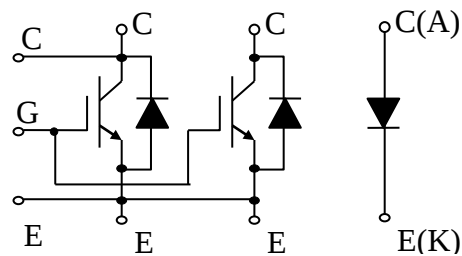
Outline Drawing



Unit in mm



Weight: 1300g



Circuit diagram

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Minebea POWER SEMICONDUCTORS

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