MMG600K060U6TC

600V 600A IGBT Module

June 2020 | Preliminary | RoHS Compliant

PRODUCT FEATURES

☐ IGBT CHIP(Trench+Field Stop technology)

☐ High short circuit capability

☐ $V_{CE(sat)}$ with positive temperature coefficient

☐ Fast switching and short tail current

☐ Free wheeling diodes with fast and soft reverse recovery

☐ Low switching losses

☐10KΩ Gate Protected Resistance Inside

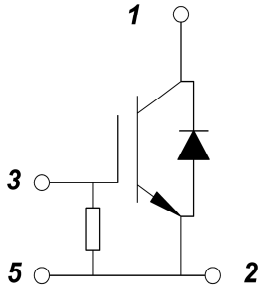
APPLICATIONS

☐ High Power Converters

☐ Medical applications

☐ Motion/servo control

☐ UPS systems/Wind Turbines



IGBT-inverter

ABSOLUTE MAXIMUM RATINGS(T_C =25°C unless otherwise specified)

Symbol	Parameter/Test Conditions		Values	Unit
V_{CES}	Collector Emitter Voltage	T_J=25℃	600	V
V_{GES}	Gate Emitter Voltage		±20	
I_C	DC Collector Current	T_C=25℃, T_{Jmax}=175℃	690	A
		T_C=55℃, T_{Jmax}=175℃	600	
I_{CM}	Repetitive Peak Collector Current	tp=1ms	1200	
P_{tot}	Power Dissipation Per IGBT	T_C=25℃, T_{Jmax}=175℃	1650	W

Reverse-Diode

ABSOLUTE MAXIMUM RATINGS (T_C =25°C unless otherwise specified)

Symbol	Parameter/Test Conditions		Values	Unit
V_{RRM}	Repetitive Reverse Voltage	T_J=25℃	600	V
$I_{F(AV)}$	Average Forward Current		600	A
I_{FRM}	Repetitive Peak Forward Current	tp=1ms	1200	
I^2t		T_J =125℃, t=10ms, V_R=0V	32	KA^2S

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IGBT-inverter

ELECTRICAL CHARACTERISTICS *(T_C=25°C unless otherwise specified)*

Symbol	Parameter/Test Conditions			Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Emitter Threshold Voltage	$V_{CE}=V_{GE}$, I_C=9.6mA		5.0	6.0	6.5	V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	I_C=600A, V_{GE}=15V, T_J=25℃			1.55	2.0	
		I_C=600A, V_{GE}=15V, T_J=125℃			1.75		
		I_C=600A, V_{GE}=15V, T_J=150℃			1.8		
I_{CES}	Collector Leakage Current	V_{CE}=600V, V_{GE}=0V, T_J=25℃				1	mA
		V_{CE}=600V, V_{GE}=0V, T_J=150℃				10	mA
I_{GES}	Gate Leakage Current	V_{CE}=0V,V_{GE}=±20V, T_J=25℃		-2		2	mA
R_{gint}	Integrated Gate Resistor				0.5		Ω
Q_g	Gate Charge	V_{CE}=300V, I_C=600A , V_{GE}=15V			2.9		μC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz			39		nF
C_{res}	Reverse Transfer Capacitance				1.6		nF
$t_{d(on)}$	Turn on Delay Time	V_{CC}=300V,I_C=600A R_G =2.7Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		80		ns
			T_J=150℃		90		ns
t_r	Rise Time		T_J=25℃		160		ns
			T_J=150℃		170		ns
$t_{d(off)}$	Turn off Delay Time	V_{CC}=300V,I_C=600A R_G =2.7Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		600		ns
			T_J=150℃		650		ns
t_f	Fall Time		T_J=25℃		100		ns
			T_J=150℃		110		ns
E_{on}	Turn on Energy	V_{CC}=300V,I_C=600A R_G =2.7Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		18.3		mJ
			T_J=150℃		22.1		mJ
E_{off}	Turn off Energy		T_J=25℃		31.3		mJ
			T_J=150℃		34.1		mJ
I_{SC}	Short Circuit Current	tpsc≤6μS , V_{GE}=15V T_J=125℃,V_{CC}=360V			2800		A
R_{thJC}	Junction to Case Thermal Resistance （Per IGBT）					0.09	K /W

Reverse-Diode

ELECTRICAL CHARACTERISTICS *(T_C=25°C unless otherwise specified)*

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=600A , V_{GE}=0V, T_J=25℃		1.7	2.1	V
		I_F=600A , V_{GE}=0V, T_J=125℃		1.55		
		I_F=600A , V_{GE}=0V, T_J=150℃		1.45		
t_{rr}	Reverse Recovery Time	I_F=600A , V_R=300V dI_F/dt=-3800A/μs T_J =150℃		330		ns
I_{RRM}	Max. Reverse Recovery Current			316		A
Q_{RR}	Reverse Recovery Charge			62		μC
E_{rec}	Reverse Recovery Energy			16		mJ
R_{thJCD}	Junction to Case Thermal Resistance （Per Diode）				0.15	K /W

MODULE CHARACTERISTICS *(T_C=25°C unless otherwise specified)*

Symbol	Parameter/Test Conditions		Values	Unit
T_{Jmax}	Max. Junction Temperature		175	℃
T_{Jop}	Operating Temperature		-40~150	
T_{stg}	Storage Temperature		-40~125	
V_{isol}	Isolation Breakdown Voltage	AC, 50Hz(R.M.S), t=1minute	3000	V
Torque	to heatsink	Recommended（M6）	3~5	Nm
	to terminal	Recommended（M6）	2.5~5	Nm
	to terminal	Recommended（M4）	0.7~1.1	Nm
Weight			330	g

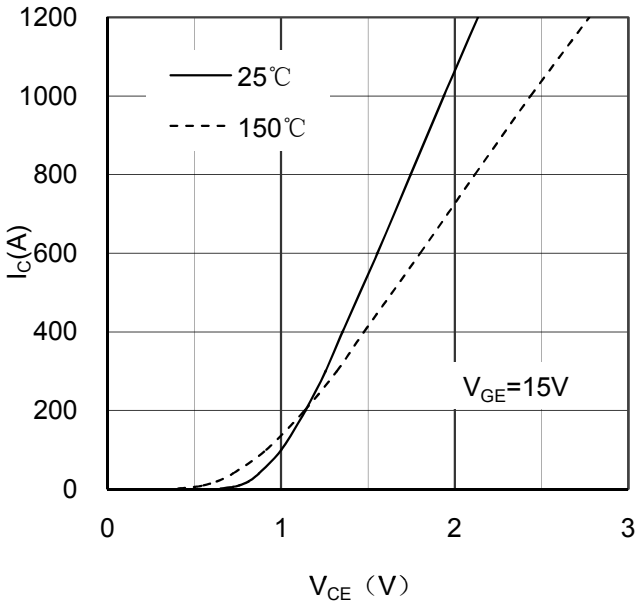


Figure 1. Typical Output Characteristics IGBT-inverter

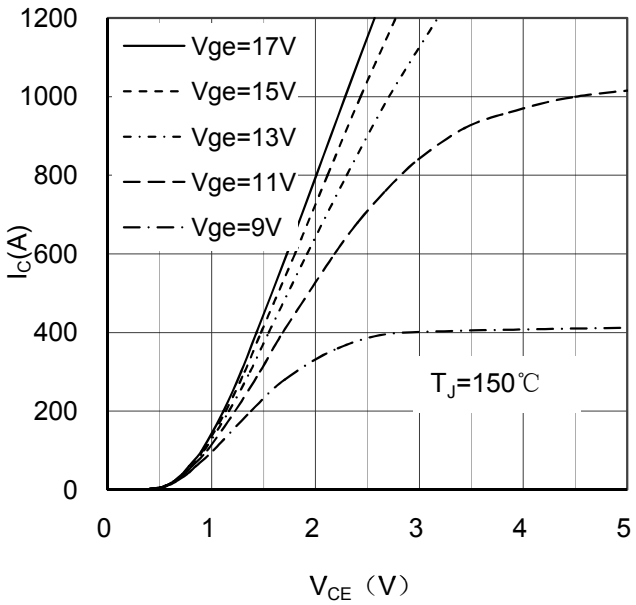


Figure 2. Typical Output Characteristics IGBT-inverter

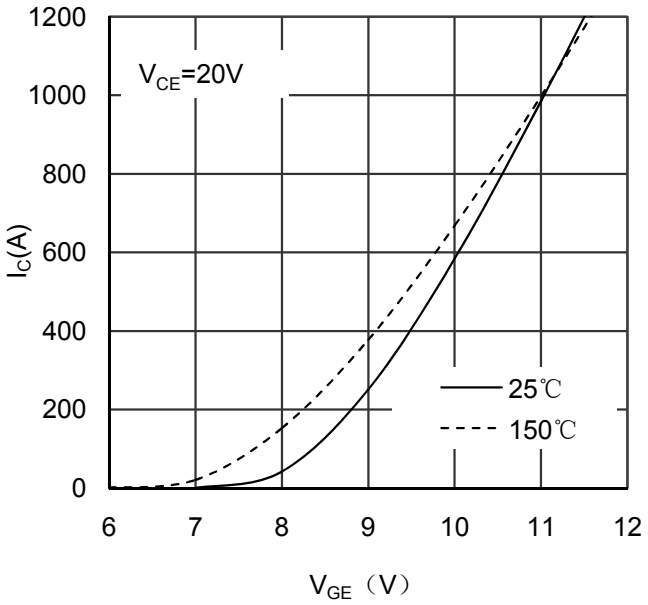


Figure 3. Typical Transfer characteristics IGBT-inverter

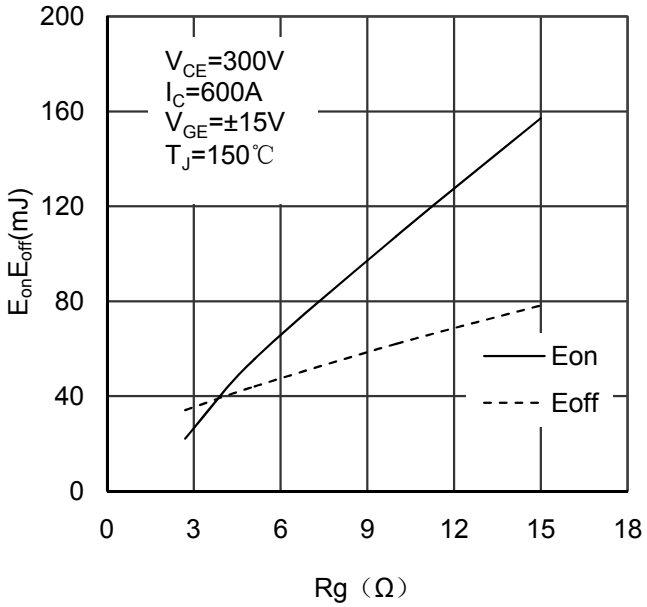


Figure 4. Switching Energy vs Gate Resistor IGBT-inverter

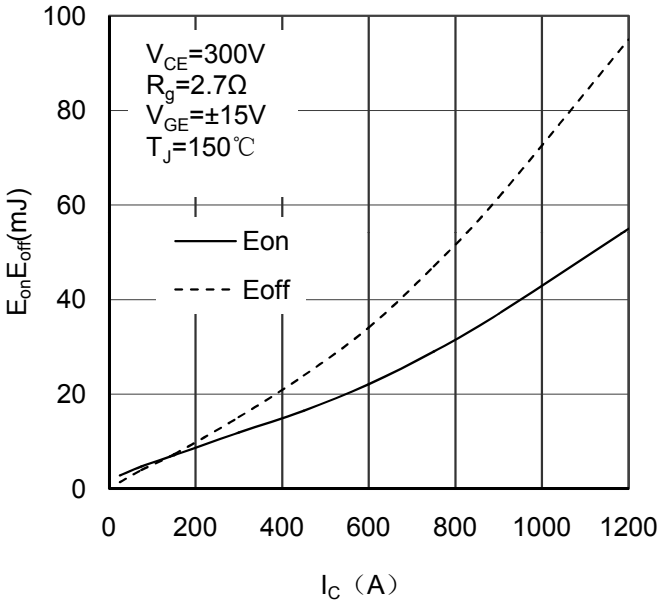


Figure 5. Switching Energy vs Collector Current IGBT-inverter

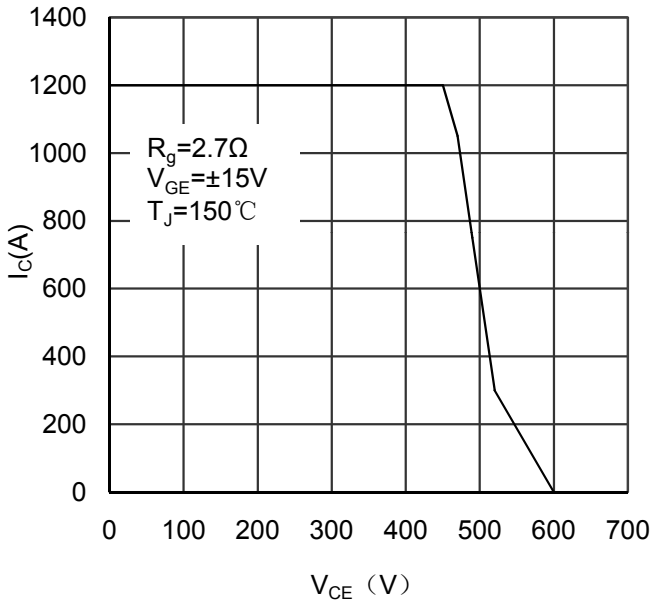


Figure 6. Reverse Biased Safe Operating Area IGBT-inverter

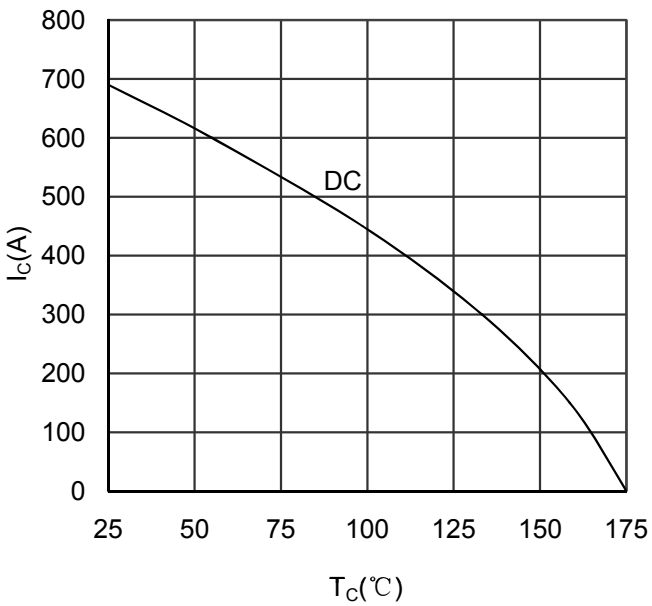


Figure 7. Collector Current vs Case temperature IGBT -inverter

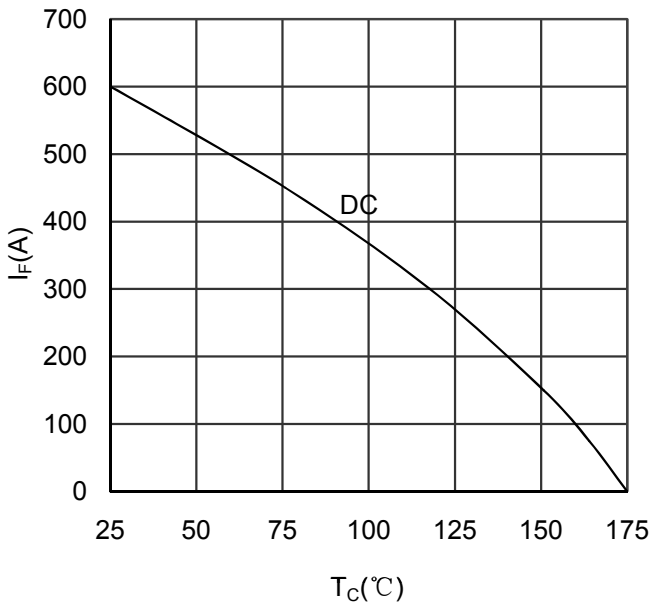


Figure 8. Forward current vs Case temperature Reverse-Diode

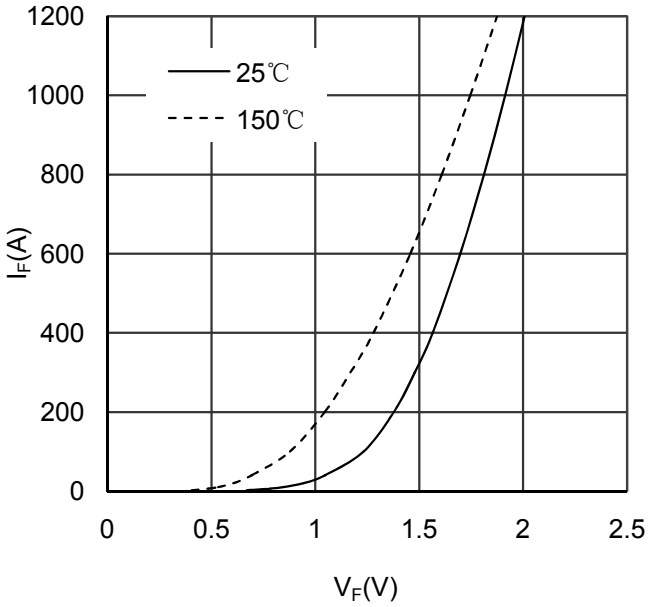


Figure 9. Diode Forward Characteristics Reverse-Diode

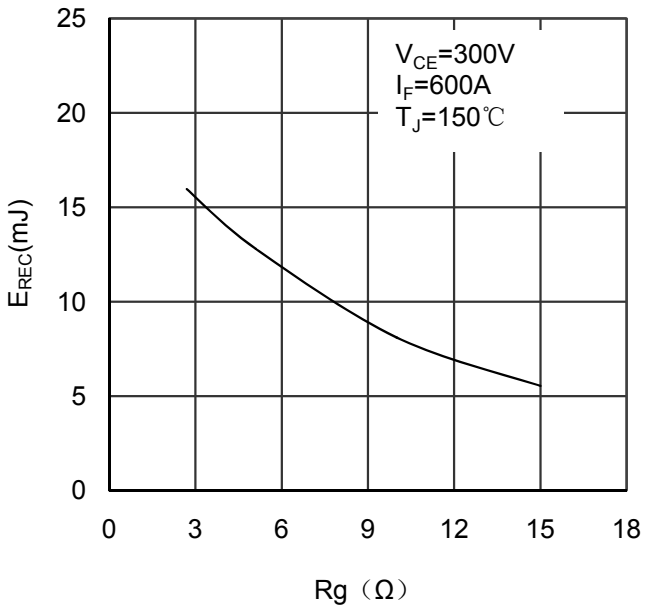


Figure 10. Switching Energy vs Gate Resistor Reverse-Diode

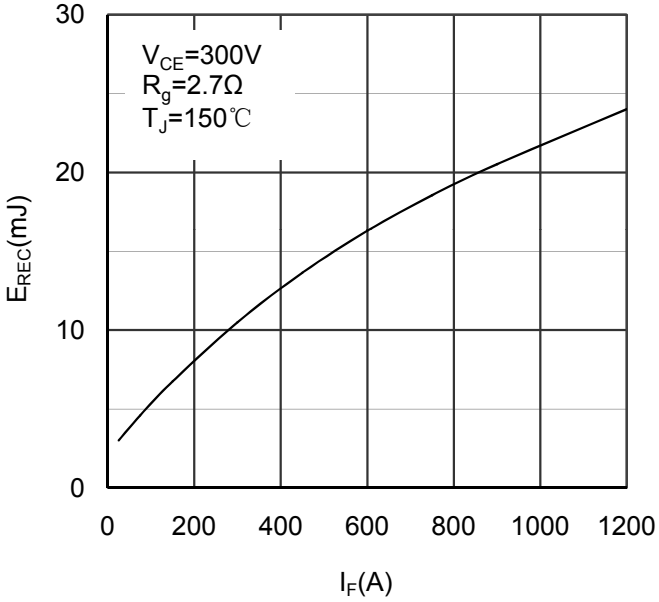


Figure 11. Switching Energy vs Forward Current Reverse-Diode

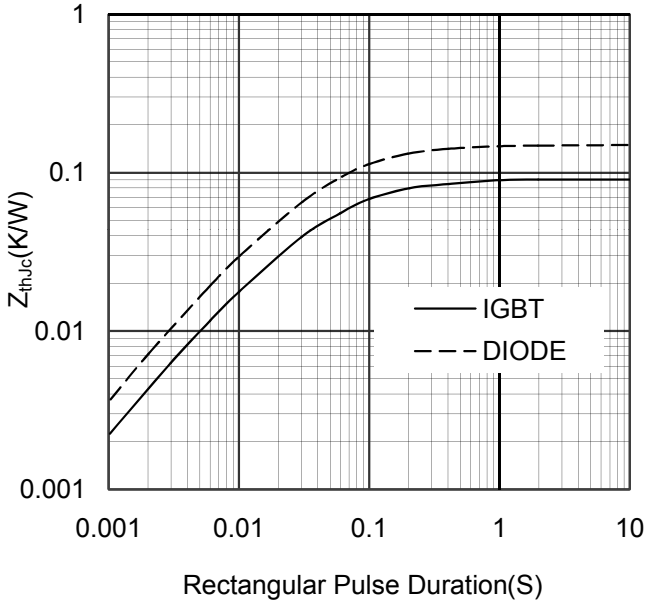
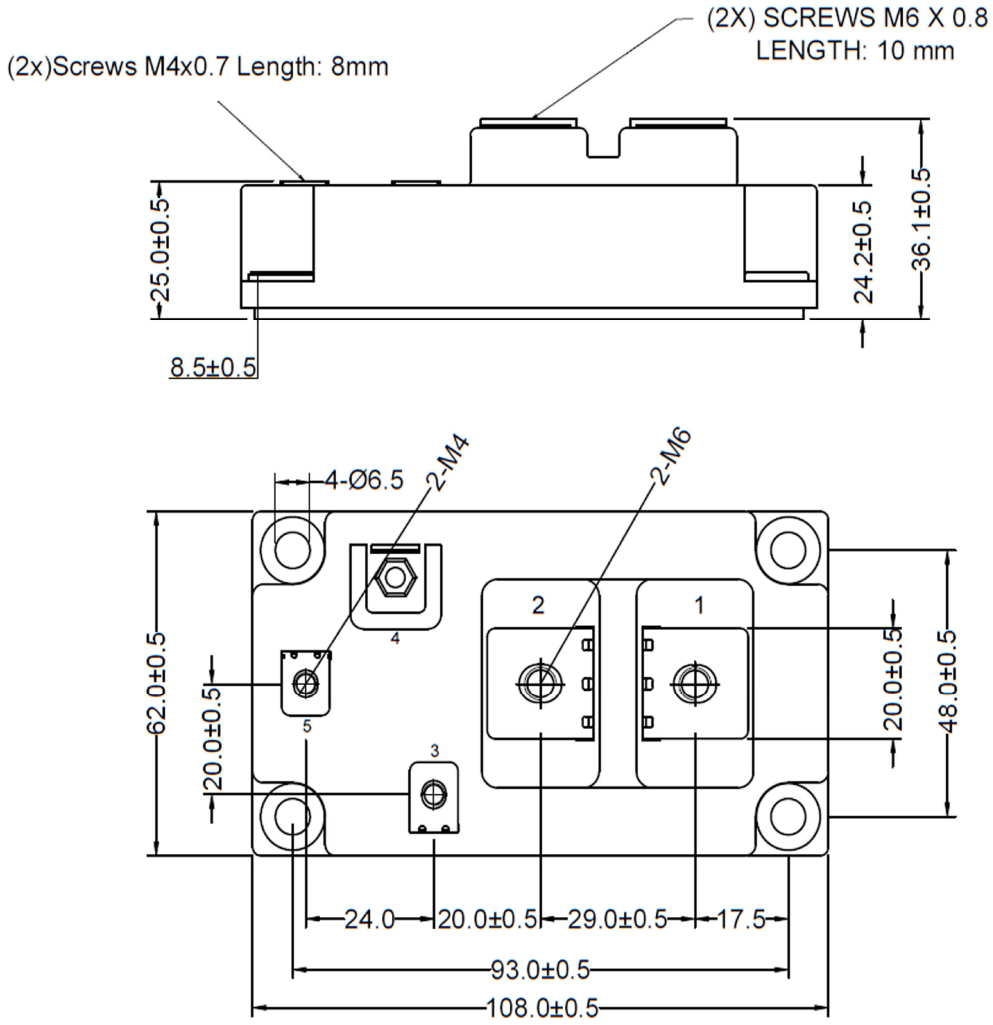


Figure 12. Transient Thermal Impedance of Reverse-Diode and IGBT-inverter



Dimensions in (mm)

Figure 13. Package Outline