MMG400D120B6TC

1200V 400A IGBT Module

August 2020 Version 01 RoHS Compliant

PRODUCT FEATURES

☐ IGBT CHIP(Trench+Field Stop technology)

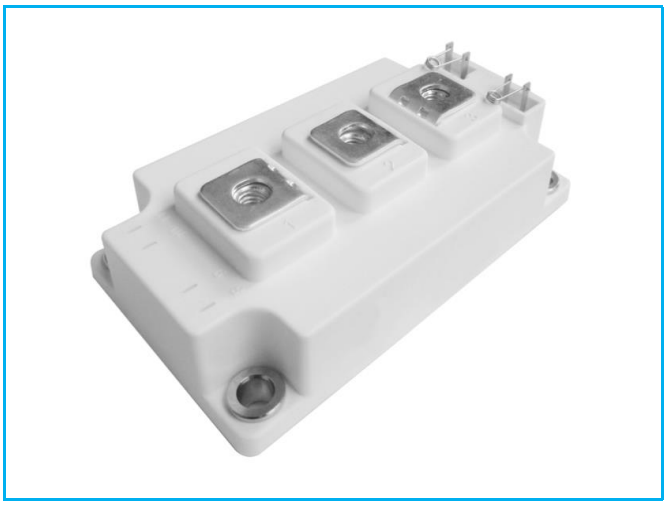
☐ $V_{CE(sat)}$ with positive temperature coefficient

☐ High short circuit capability

☐ Fast switching and short tail current

☐ Free wheeling diodes with fast and soft reverse recovery

☐ Low switching losses



APPLICATIONS

☐ High frequency switching application

☐ Medical applications

☐ Motion/servo control

☐ UPS systems

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℃	1200	V
V_{GES}	Gate Emitter Voltage		±20	
I_C	DC Collector Current	T_C=25℃, T_{Jmax}=175℃	568	A
		T_C=92℃, T_{Jmax}=175℃	400	
I_{CM}	Repetitive Peak Collector Current	tp=1ms	800	
P_{tot}	Power Dissipation Per IGBT	T_C=25℃, T_{Jmax}=175℃	1973	W

Diode-inverter

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

Symbol	Parameter/Test Conditions		Values	Unit
V_{RRM}	Repetitive Reverse Voltage	T_J=25℃	1200	V
$I_{F(AV)}$	Average Forward Current		400	A
I_{FRM}	Repetitive Peak Forward Current	tp=1ms	800	
I^2t		T_J=125℃, t=10ms, V_R=0V	39.2	KA^2S

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=16mA		5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector - Emitter Saturation Voltage	I_C=400A, V_{GE}=15V, T_J=25℃			1.85	2.25	
		I_C=400A, V_{GE}=15V, T_J=125℃			2.15		
		I_C=400A, V_{GE}=15V, T_J=150℃			2.2		
I_{CES}	Collector Leakage Current	V_{CE}=1200V, V_{GE}=0V, T_J=25℃				1	mA
		V_{CE}=1200V, V_{GE}=0V, T_J=150℃				10	
I_{GES}	Gate Leakage Current	V_{CE}=0V,V_{GE}=±20V, T_J=25℃		-400		400	nA
R_{gint}	Integrated Gate Resistor				1.1		Ω
Q_g	Gate Charge	V_{CE}=600V, I_C=400A , V_{GE}=15V			2.15		μC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz			30.5		nF
C_{res}	Reverse Transfer Capacitance				1.35		nF
$t_{d(on)}$	Turn on Delay Time	V_{CC}=600V,I_C=400A R_G =2.0Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		90		ns
			T_J=125℃		108		ns
			T_J=150℃		114		ns
t_r	Rise Time		T_J=25℃		68		ns
			T_J=125℃		74		ns
			T_J=150℃		76		ns
$t_{d(off)}$	Turn off Delay Time	V_{CC}=600V,I_C=400A R_G =2.0Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		510		ns
			T_J=125℃		550		ns
			T_J=150℃		560		ns
t_f	Fall Time		T_J=25℃		120		ns
			T_J=125℃		200		ns
			T_J=150℃		220		ns
E_{on}	Turn on Energy	V_{CC}=600V,I_C=400A R_G =2.0Ω, V_{GE}=±15V, Inductive Load	T_J=125℃		34.5		mJ
			T_J=150℃		38		mJ
E_{off}	Turn off Energy		T_J=125℃		42.4		mJ
			T_J=150℃		45		mJ
I_{SC}	Short Circuit Current	tpsc≤10μS , V_{GE}=15V T_J=125℃,V_{CC}=800V			1500		A
R_{thJC}	Junction to Case Thermal Resistance (Per IGBT)					0.076	K /W

Diode-inverter

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

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=400A , V_{GE}=0V, T_J=25℃		1.75	2.3	V
		I_F=400A , V_{GE}=0V, T_J=125℃		1.5		
		I_F=400A , V_{GE}=0V, T_J=150℃		1.45		
t_{rr}	Reverse Recovery Time	I_F=400A , V_R=600V dI_F/dt=-5600A/μs T_J =150℃		460		ns
I_{RRM}	Max. Reverse Recovery Current			626		A
Q_{RR}	Reverse Recovery Charge			160		μC
E_{rec}	Reverse Recovery Energy			72.5		mJ
R_{thJCD}	Junction to Case Thermal Resistance （Per Diode）				0.12	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
CTI	Comparative Tracking Index		> 225	
Torque	to heatsink	Recommended（M6）	3~5	Nm
	to terminal	Recommended（M6）	2.5~5	Nm
Weight			300	g

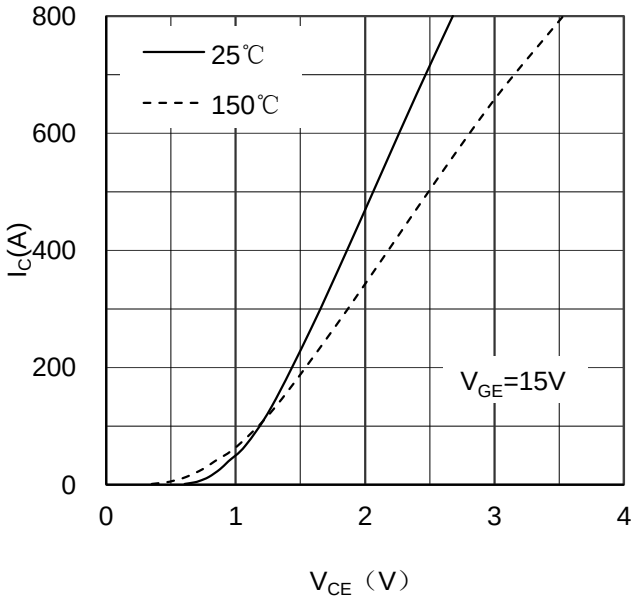


Figure 1. Typical Output Characteristics IGBT-inverter

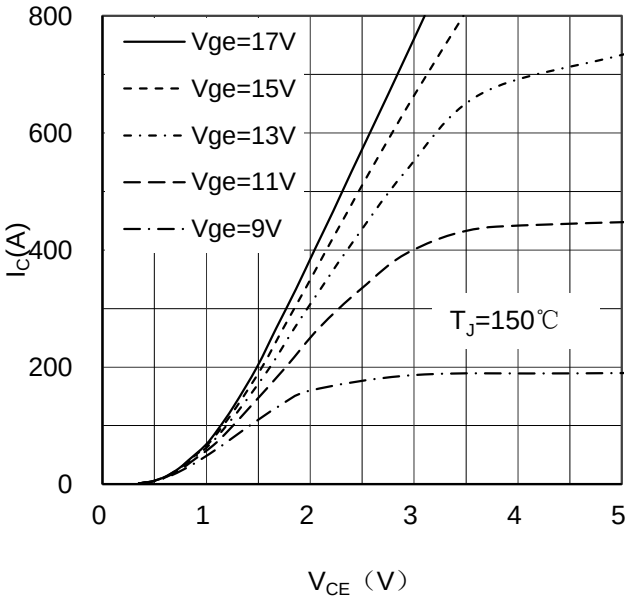


Figure 2. Typical Output Characteristics IGBT-inverter

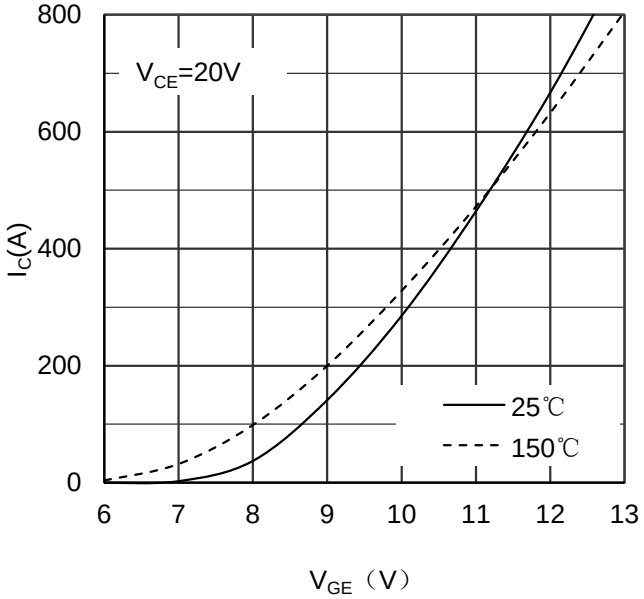


Figure 3. Typical Transfer characteristics IGBT-inverter

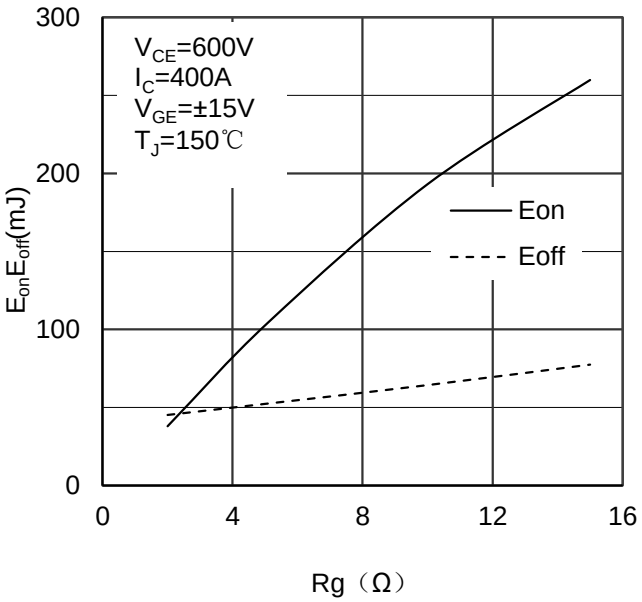


Figure 4. Switching Energy vs Gate Resistor IGBT-inverter

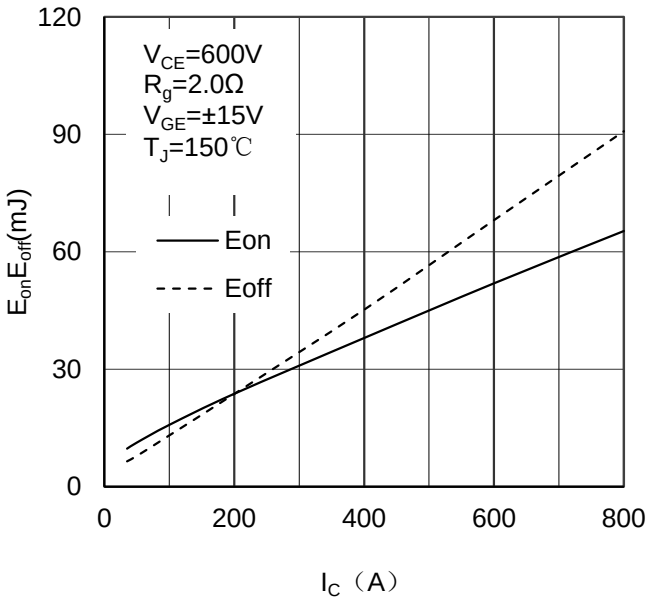


Figure 5. Switching Energy vs Collector Current IGBT-inverter

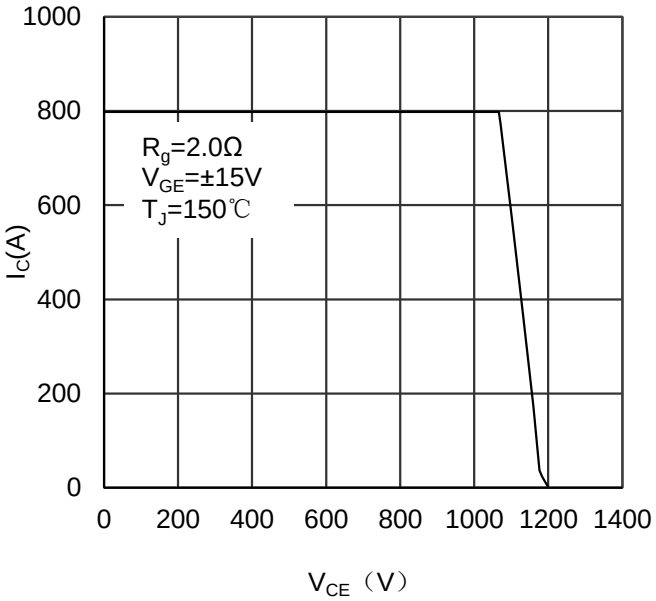


Figure 6. Reverse Biased Safe Operating Area IGBT-inverter

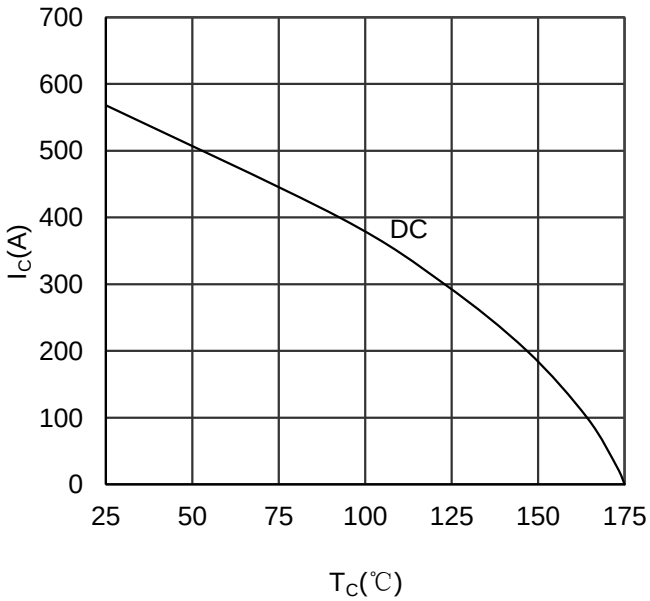


Figure 7. Collector Current vs Case temperature IGBT -inverter

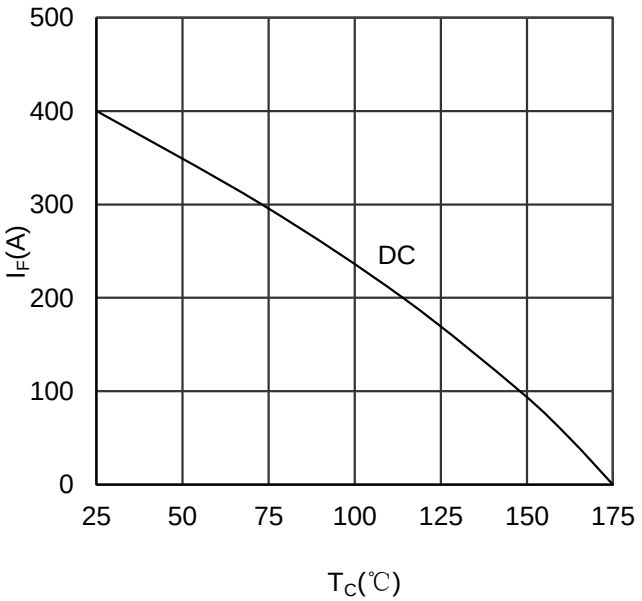


Figure 8. Forward current vs Case temperature Diode -inverter

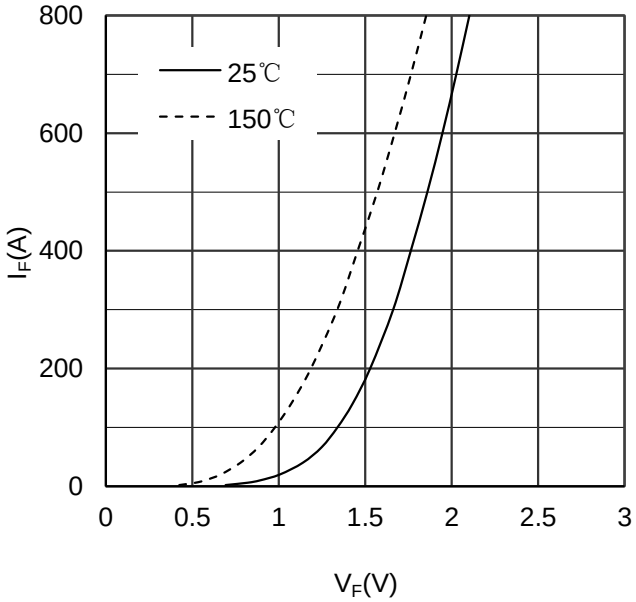


Figure 9. Diode Forward Characteristics Diode -inverter

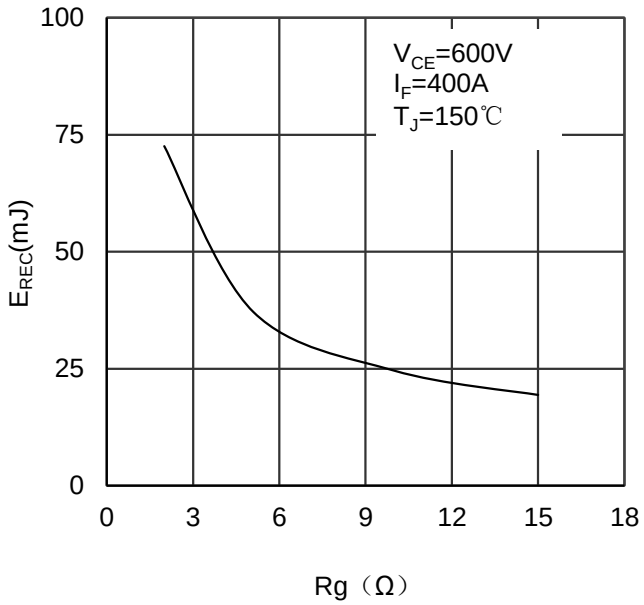


Figure 10. Switching Energy vs Gate Resistor Diode - inverter

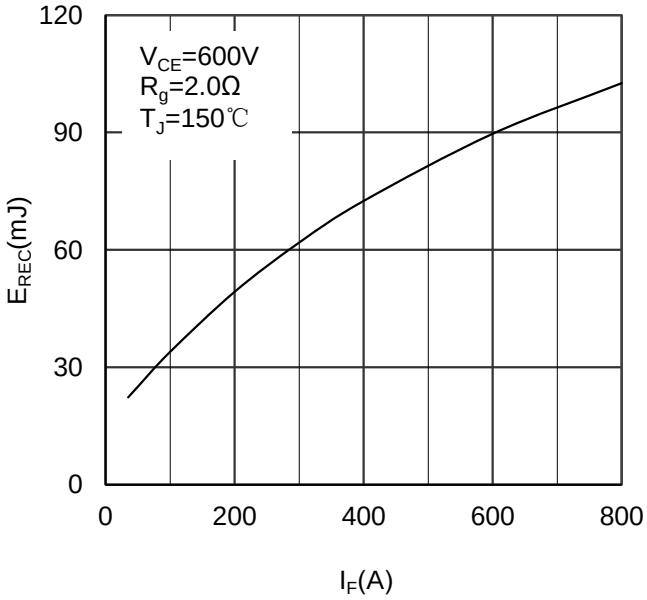


Figure 11. Switching Energy vs Forward Current Diode-inverter

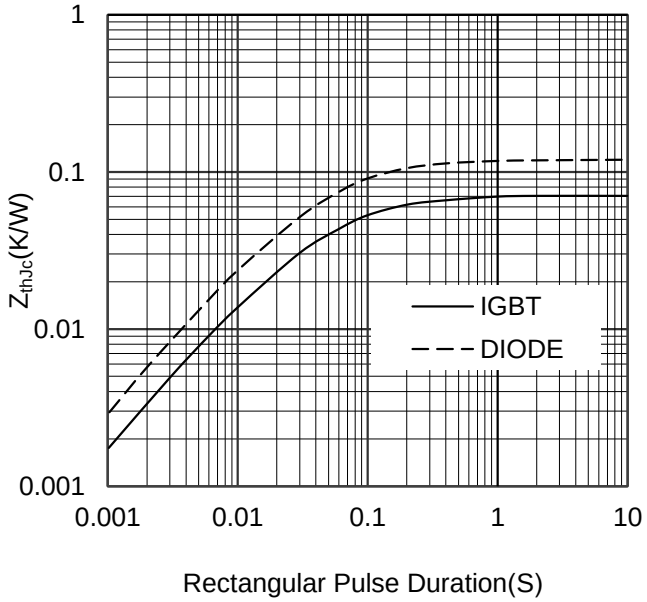


Figure 12. Transient Thermal Impedance of Diode and IGBT-inverter

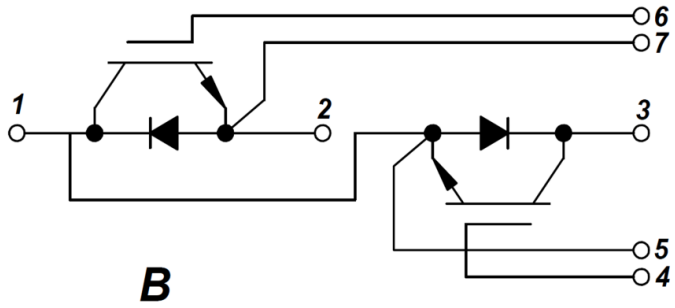
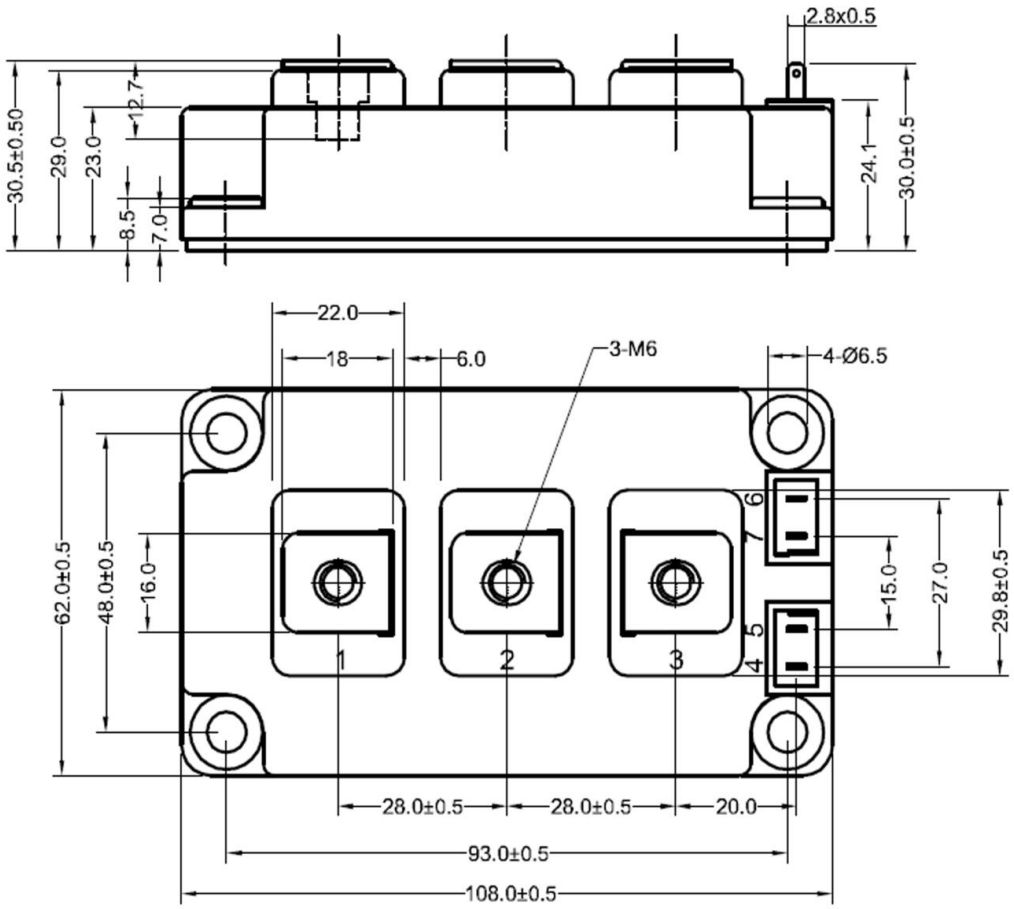


Figure 13. Circuit Diagram



Dimensions in (mm)

Figure 14. Package Outline