

PRODUCT FEATURES

- High short circuit capability, self limiting short circuit current
- IGBT CHIP(T4 Fast Trench+Field Stop technology)
- $V_{CE(sat)}$ with positive temperature coefficient
- Fast switching and short tail current
- Free wheeling diodes with fast and soft reverse recovery
- Low switching losses
- Internal insulation ceramic substrates : ALN
- $T_{Jmax} = 175^{\circ}C$

APPLICATIONS

- High frequency switching application
- Medical applications
- Motion/servo control
- UPS systems



IGBT-inverter

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^{\circ}C$ unless otherwise specified)

Symbol	Parameter/Test Conditions	Values	Unit
V_{CES}	Collector Emitter Voltage	$T_J = 25^{\circ}C$	V
V_{GES}	Gate Emitter Voltage		
I_C	DC Collector Current	$T_C = 25^{\circ}C, T_{Jmax} = 175^{\circ}C$	A
		$T_C = 105^{\circ}C, T_{Jmax} = 175^{\circ}C$	
I_{CM}	Repetitive Peak Collector Current	$t_p = 1ms$	
P_{tot}	Power Dissipation Per IGBT	$T_C = 25^{\circ}C, T_{Jmax} = 175^{\circ}C$	W

Diode-inverter

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^{\circ}C$ unless otherwise specified)

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

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MMG400D120B6BHN

IGBT-inverter

ELECTRICAL CHARACTERISTICS ($T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit	
$V_{GE(th)}$	Gate Emitter Threshold Voltage	$V_{CE}=V_{GE}, I_C=16\text{mA}$	5.4	6.0	6.5	V	
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$I_C=400\text{A}, V_{GE}=15\text{V}, T_J=25^\circ\text{C}$		2.1	2.5		
		$I_C=400\text{A}, V_{GE}=15\text{V}, T_J=125^\circ\text{C}$		2.5			
I_{CES}	Collector Leakage Current	$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$			1	mA	
		$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_J=125^\circ\text{C}$			10		
I_{GES}	Gate Leakage Current	$V_{CE}=0\text{V}, V_{GE}=\pm 15\text{V}, T_J=25^\circ\text{C}$	-400		400	nA	
R_{gint}	Integrated Gate Resistor			1.9		Ω	
Q_g	Gate Charge	$V_{CE}=600\text{V}, I_C=400\text{A}, V_{GE}=15\text{V}$		1.9		μC	
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$		25		nF	
C_{res}	Reverse Transfer Capacitance				1.4		nF
$t_{d(on)}$	Turn on Delay Time	$V_{CC}=600\text{V}, I_C=400\text{A}$ $R_G=1.8\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$		170	ns	
			$T_J=125^\circ\text{C}$		180	ns	
			$T_J=150^\circ\text{C}$		190	ns	
t_r	Rise Time		$T_J=25^\circ\text{C}$		75	ns	
			$T_J=125^\circ\text{C}$		85	ns	
			$T_J=150^\circ\text{C}$		90	ns	
$t_{d(off)}$	Turn off Delay Time	$T_J=25^\circ\text{C}$		440	ns		
		$T_J=125^\circ\text{C}$		490	ns		
		$T_J=150^\circ\text{C}$		520	ns		
t_f	Fall Time	$T_J=25^\circ\text{C}$		45	ns		
		$T_J=125^\circ\text{C}$		65	ns		
		$T_J=150^\circ\text{C}$		75	ns		
E_{on}	Turn on Energy	$V_{CC}=600\text{V}, I_C=400\text{A}$ $R_G=1.8\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=125^\circ\text{C}$		28	mJ	
			$T_J=150^\circ\text{C}$		31	mJ	
E_{off}	Turn off Energy		$T_J=125^\circ\text{C}$		22	mJ	
			$T_J=150^\circ\text{C}$		24	mJ	
I_{SC}	Short Circuit Current		$tpsc \leq 10\mu\text{s}, V_{GE}=15\text{V}$ $T_J=125^\circ\text{C}, V_{CC}=600\text{V}$		1600		A
R_{thJC}	Junction to Case Thermal Resistance (Per IGBT)				0.05	K /W	

Diode-inverter

ELECTRICAL CHARACTERISTICS ($T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
V_F	Forward Voltage	$I_F=400\text{A}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$		1.65	2.15	V
		$I_F=400\text{A}, V_{GE}=0\text{V}, T_J=125^\circ\text{C}$		1.65		
t_{rr}	Reverse Recovery Time	$I_F=400\text{A}, V_R=600\text{V}$ $dI_F/dt=-4000\text{A}/\mu\text{s}$ $T_J=125^\circ\text{C}$		450		ns
I_{RRM}	Max. Reverse Recovery Current			365		A
Q_{RR}	Reverse Recovery Charge			77		μC
E_{rec}	Reverse Recovery Energy			31		mJ
R_{thJCD}	Junction to Case Thermal Resistance (Per Diode)				0.085	K /W

MMG400D120B6BHN

MODULE CHARACTERISTICS ($T_c=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter/Test Conditions	Values	Unit	
T_{Jmax}	Max. Junction Temperature	175	$^\circ\text{C}$	
T_{Jop}	Operating Temperature	-40~150		
T_{stg}	Storage Temperature	-40~125		
V_{isol}	Isolation Breakdown Voltage	AC, 50Hz(R.M.S), $t=1$ minute	3000	V
	Internal isolation		ALN	
CTI	Comparative Tracking Index		> 225	
Torque	to heatsink	Recommended (M6)	3~5	Nm
	to terminal	Recommended (M6)	2.5~5	Nm
Weight			300	g

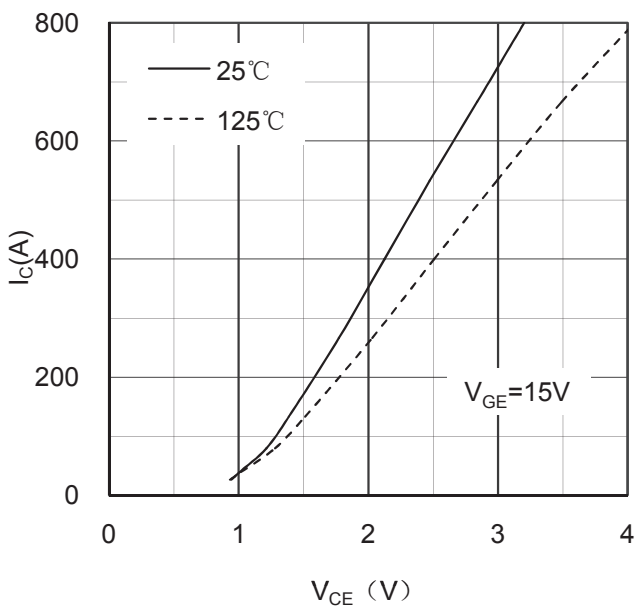


Figure 1. Typical Output Characteristics IGBT-inverter

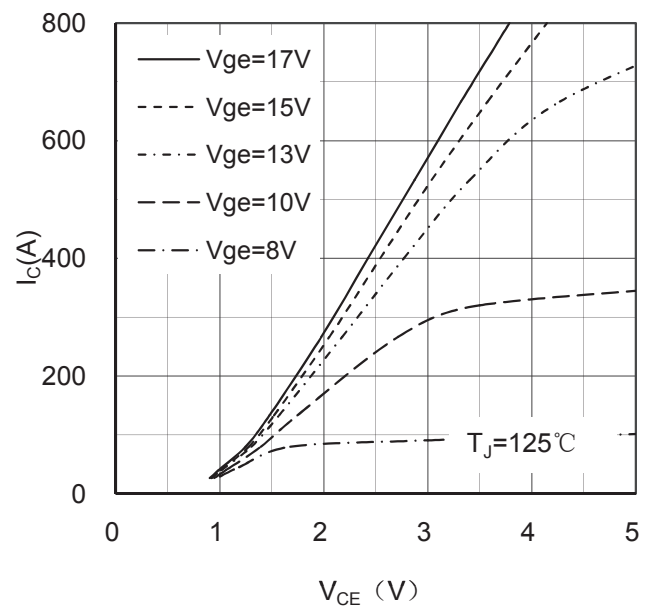


Figure 2. Typical Output Characteristics IGBT-inverter

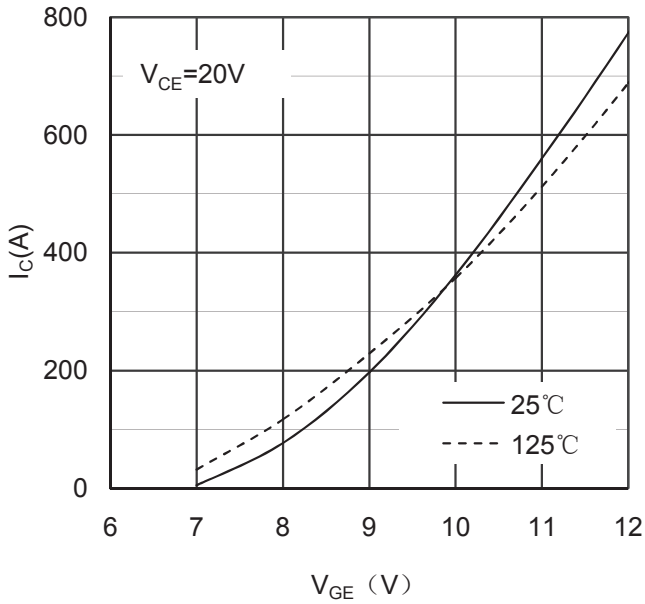


Figure 3. Typical Transfer characteristics IGBT-inverter

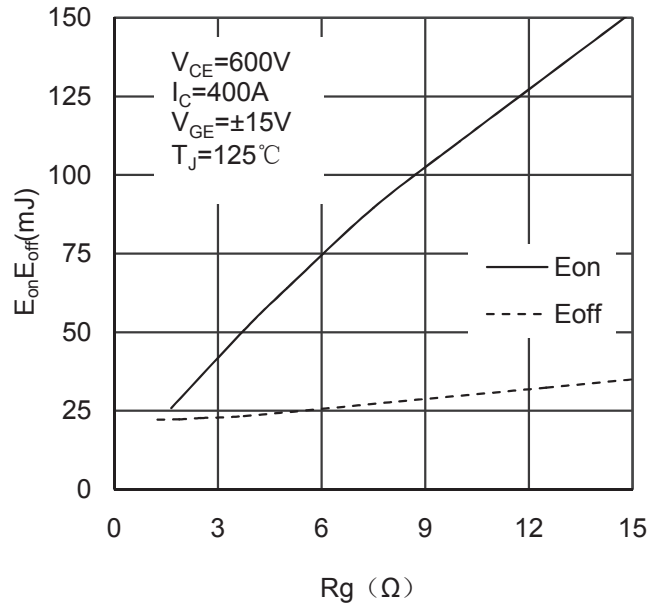


Figure 4. Switching Energy vs Gate Resistor IGBT-inverter

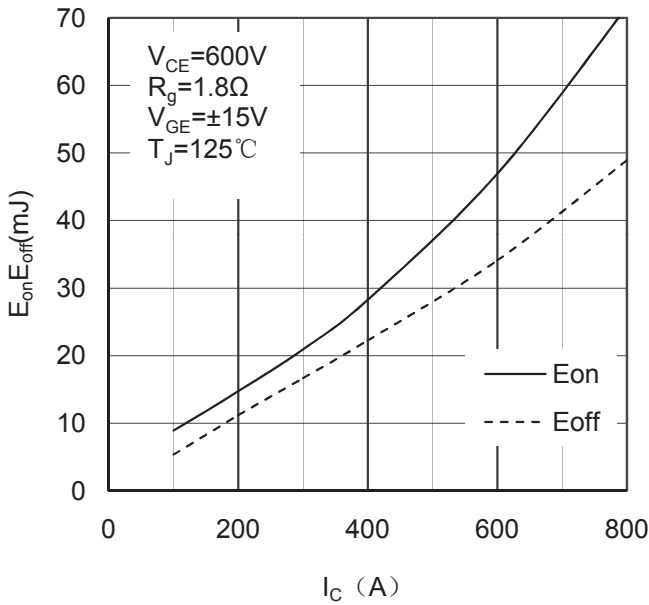


Figure 5. Switching Energy vs Collector Current IGBT-inverter

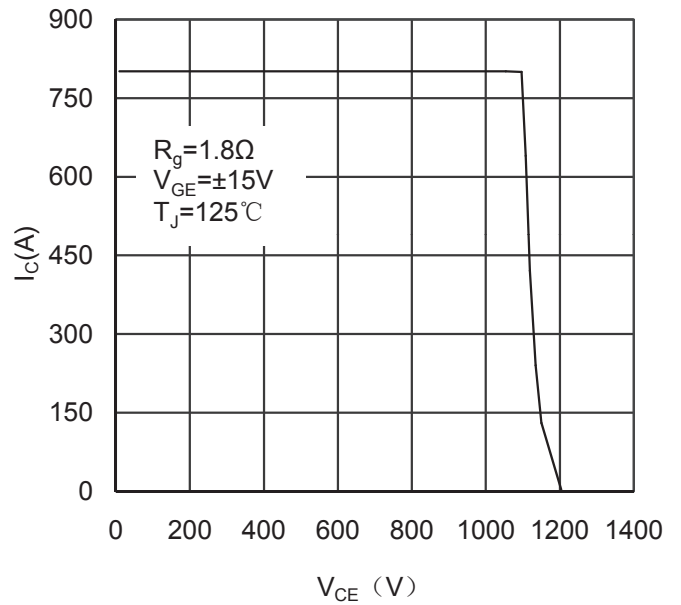


Figure 6. Reverse Biased Safe Operating Area IGBT-inverter

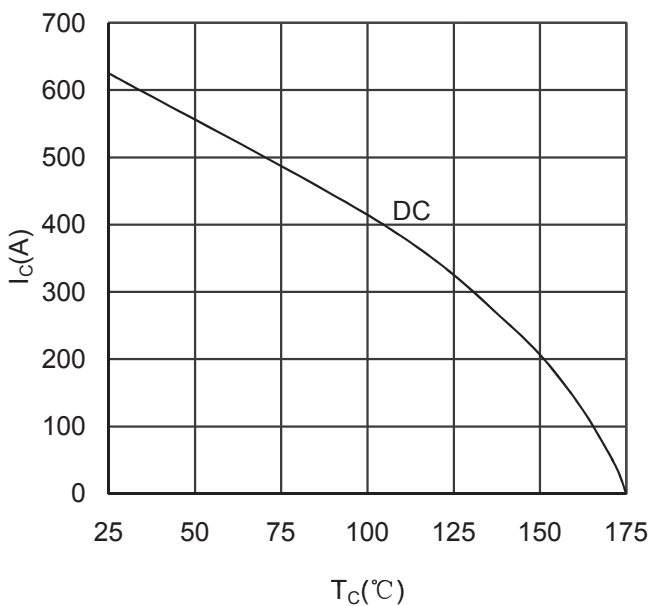


Figure 7. Collector Current vs Case temperature IGBT-inverter

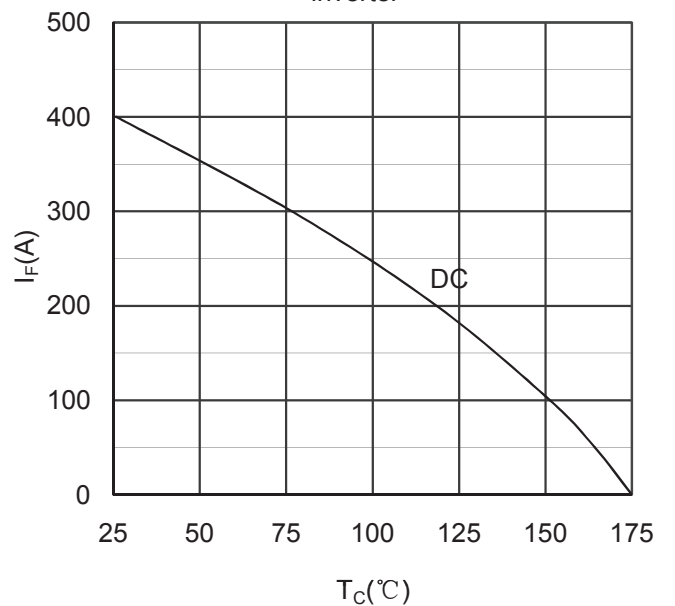


Figure 8. Forward current vs Case temperature Diode-inverter

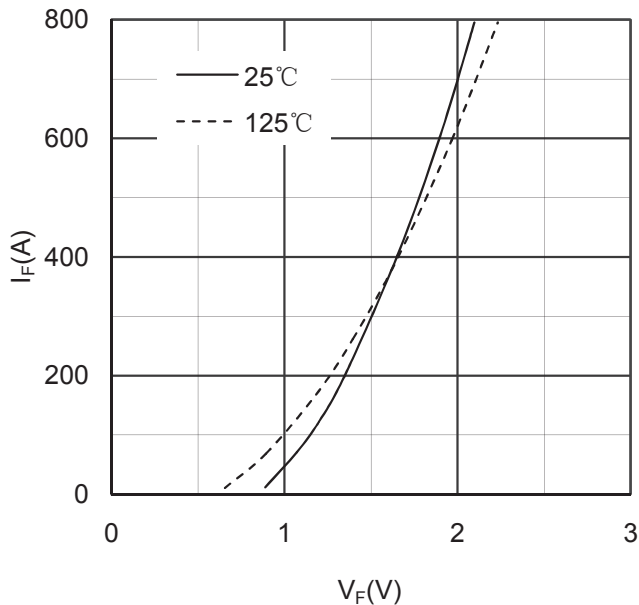


Figure 9. Diode Forward Characteristics Diode-inverter

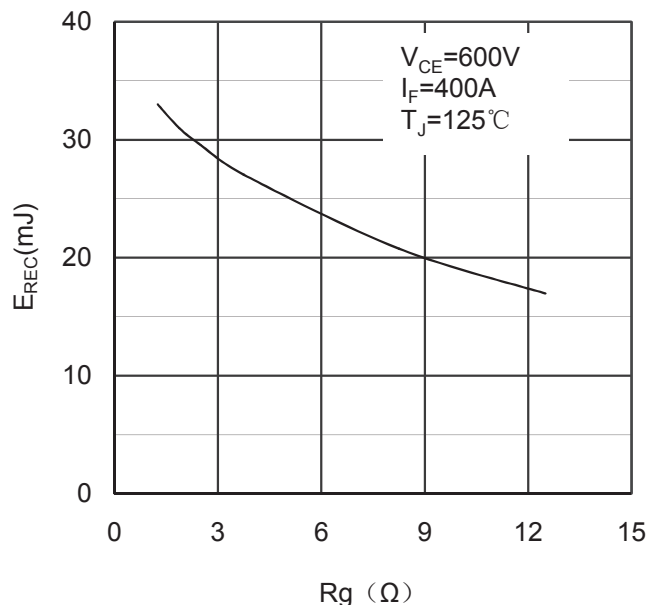


Figure 10. Switching Energy vs Gate Resistor Diode-inverter

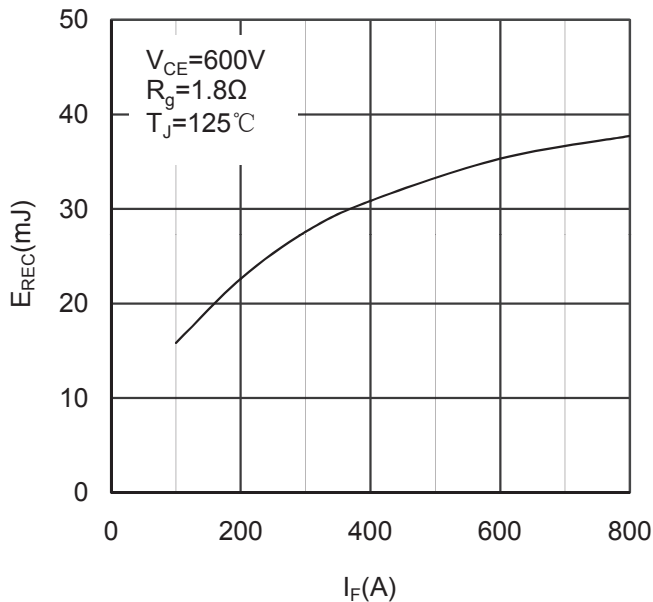


Figure 11. Switching Energy vs Forward Current Diode-inverter

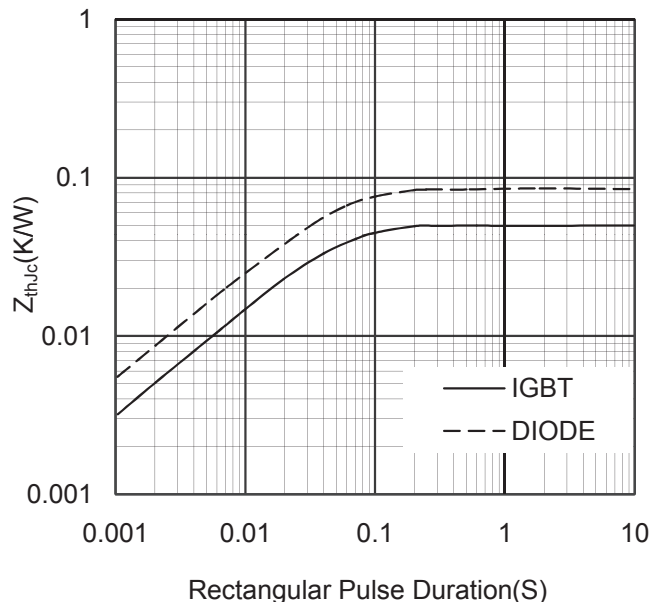


Figure 12. Transient Thermal Impedance of Diode-inverter and IGBT-inverter

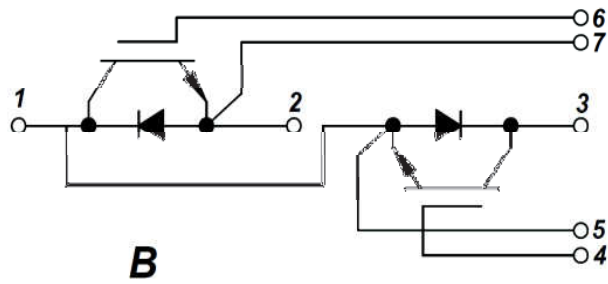
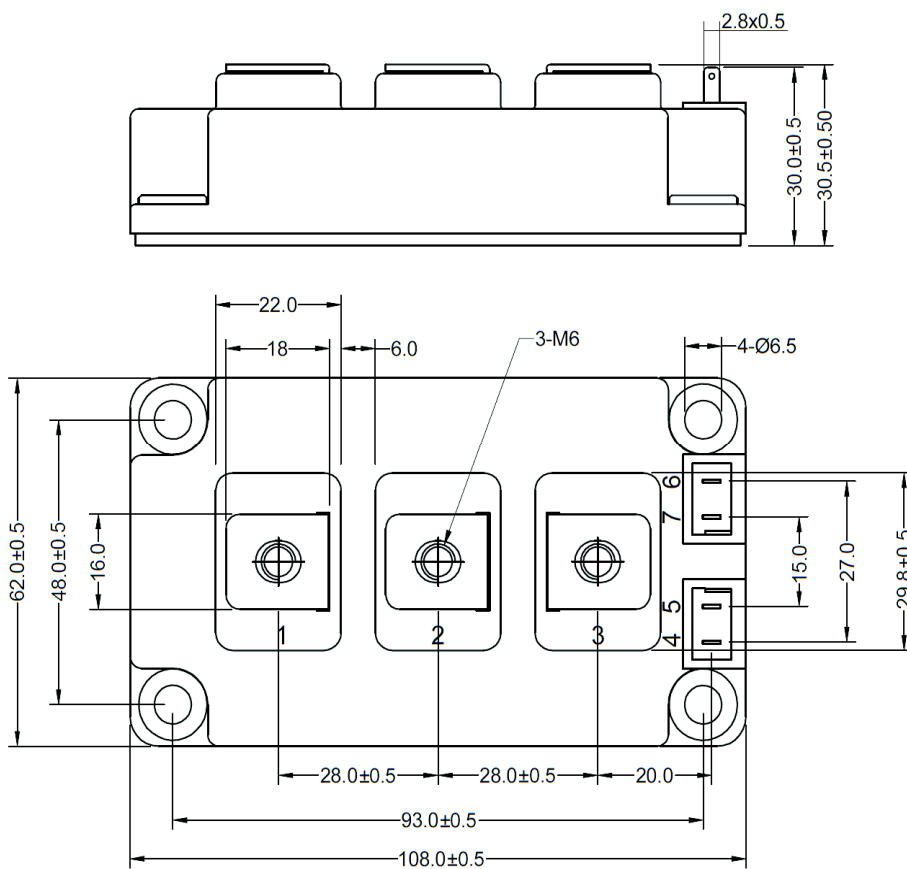


Figure 13. Circuit Diagram



Dimensions in (mm)

Figure 14. Package Outline