

## PRODUCT FEATURES

- IGBT CHIP(1700V Trench+Field Stop technology)
- Low turn-off losses, short tail current
- $V_{CE(sat)}$  with positive temperature coefficient
- Ultra Low Loss,High Ruggedness
- Free wheeling diodes with fast and soft reverse recovery

## APPLICATIONS

- AC motor control
- Motion/servo control
- Inverter and power supplies
- Photovoltaic/Fuel cell

## Product Summary

$V_{CE}$	$V_{CE(sat)}$	ID
1700V	2.15V	400A

## IGBT Module



### IGBT-inverter

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

Symbol	Parameter/Test Conditions		Values	Unit
$V_{CES}$	Collector Emitter Voltage	$T_J=25^\circ\text{C}$	1700	V
$V_{GES}$	Gate Emitter Voltage		$\pm 20$	
$I_C$	DC Collector Current	$T_C=25^\circ\text{C}, T_{Jmax}=175^\circ\text{C}$	446	A
		$T_C=95^\circ\text{C}, T_{Jmax}=175^\circ\text{C}$	400	
$I_{CM}$	Repetitive Peak Collector Current	$t_p=1\text{ms}$	800	
$P_{tot}$	Power Dissipation Per IGBT	$T_C=25^\circ\text{C}, T_{Jmax}=175^\circ\text{C}$	1760	W

### Diode-inverter

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

Symbol	Parameter/Test Conditions		Values	Unit
$V_{RRM}$	Repetitive Reverse Voltage	$T_J=25^\circ\text{C}$	1700	V
$I_{F(AV)}$	Average Forward Current		400	A
$I_{FRM}$	Repetitive Peak Forward Current	$t_p=1\text{ms}$	600	
$I^2t$		$T_J=125^\circ\text{C}, t=10\text{ms}, V_R=0\text{V}$	14500	$\text{A}^2\text{S}$

## 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	$V_{CE}=V_{GE}, I_C=12\text{mA}$	5.0	6.0	6.5	V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$I_C=400\text{A}, V_{GE}=15\text{V}, T_J=25^\circ\text{C}$		2.15	2.6	
		$I_C=400\text{A}, V_{GE}=15\text{V}, T_J=125^\circ\text{C}$		2.35		
		$I_C=400\text{A}, V_{GE}=15\text{V}, T_J=150^\circ\text{C}$		2.45		
$I_{CES}$	Collector Leakage Current	$V_{CE}=1700\text{V}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$			2	mA
		$V_{CE}=1700\text{V}, V_{GE}=0\text{V}, T_J=150^\circ\text{C}$			20	mA
$I_{GES}$	Gate Leakage Current	$V_{CE}=0\text{V}, V_{GE}=\pm 20\text{V}, T_J=25^\circ\text{C}$	-500		500	nA
$R_{gint}$	Integrated Gate Resistor			1.8		$\Omega$
$Q_g$	Gate Charge	$V_{CE}=900\text{V}, I_C=400\text{A}, V_{GE}=15\text{V}$		2.1		$\mu\text{C}$
$C_{ies}$	Input Capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$		29.4		nF
$C_{res}$	Reverse Transfer Capacitance				900	
$t_{d(on)}$	Turn on Delay Time	$V_{CC}=900\text{V}, I_C=400\text{A}$ $R_G=4.7\Omega,$	$T_J=25^\circ\text{C}$		170	ns
			$T_J=150^\circ\text{C}$		190	ns
$t_r$	Rise Time	$V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$		150	ns
			$T_J=150^\circ\text{C}$		165	ns
$t_{d(off)}$	Turn off Delay Time	$V_{CC}=900\text{V}, I_C=400\text{A}$ $R_G=4.7\Omega,$	$T_J=25^\circ\text{C}$		690	ns
			$T_J=150^\circ\text{C}$		770	ns
$t_f$	Fall Time	$V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$		240	ns
			$T_J=150^\circ\text{C}$		360	ns
$E_{on}$	Turn on Energy	$V_{CC}=900\text{V}, I_C=400\text{A}$ $R_G=4.7\Omega,$	$T_J=25^\circ\text{C}$		173	mJ
			$T_J=125^\circ\text{C}$		223	mJ
			$T_J=150^\circ\text{C}$		232	mJ
$E_{off}$	Turn off Energy	$V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$		58	mJ
			$T_J=125^\circ\text{C}$		90	mJ
			$T_J=150^\circ\text{C}$		96	mJ
$I_{SC}$	Short Circuit Current	$tpsc \leq 10\mu\text{s}, V_{GE}=15\text{V}$ $T_J=150^\circ\text{C}, V_{CC}=1000\text{V}$		1000		A
$R_{thJC}$	Junction to Case Thermal Resistance (Per IGBT)				0.085	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	$I_F=400\text{A}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$		1.8	2.2	V
		$I_F=400\text{A}, V_{GE}=0\text{V}, T_J=125^\circ\text{C}$		1.9		
		$I_F=400\text{A}, V_{GE}=0\text{V}, T_J=150^\circ\text{C}$		1.9		
$t_{rr}$	Reverse Recovery Time	$I_F=300\text{A}, V_R=900\text{V}$ $di_F/dt=-1500\text{A}/\mu\text{s}$ $T_J=150^\circ\text{C}$		1380		ns
$I_{RRM}$	Max. Reverse Recovery Current			212		A
$Q_{RR}$	Reverse Recovery Charge			143		$\mu\text{C}$
$E_{rec}$	Reverse Recovery Energy			63		mJ
$R_{thJCD}$	Junction to Case Thermal Resistance (Per Diode)				0.13	K/W

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

Symbol	Parameter/Test Conditions		Values	Unit
$T_{Jmax}$	Max. Junction Temperature		175	°C
$T_{Jop}$	Operating Temperature		-40~150	
$T_{stg}$	Storage Temperature		-40~125	
$V_{isol}$	Isolation Breakdown Voltage	AC, 50Hz(R.M.S), t=1minute	4000	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

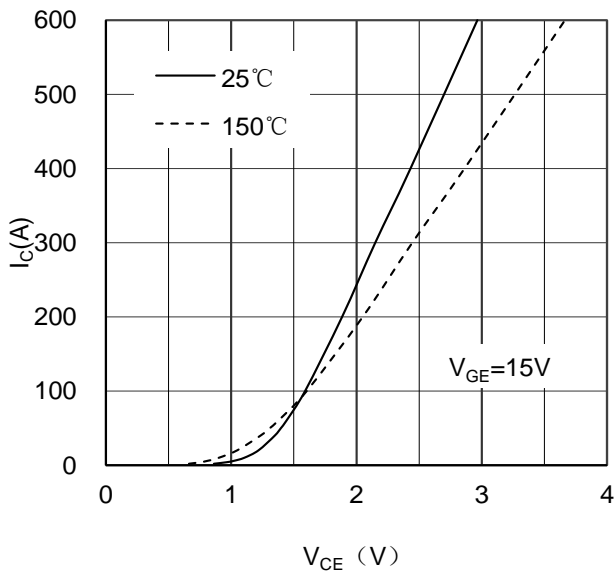


Figure 1. Typical Output Characteristics IGBT-inverter

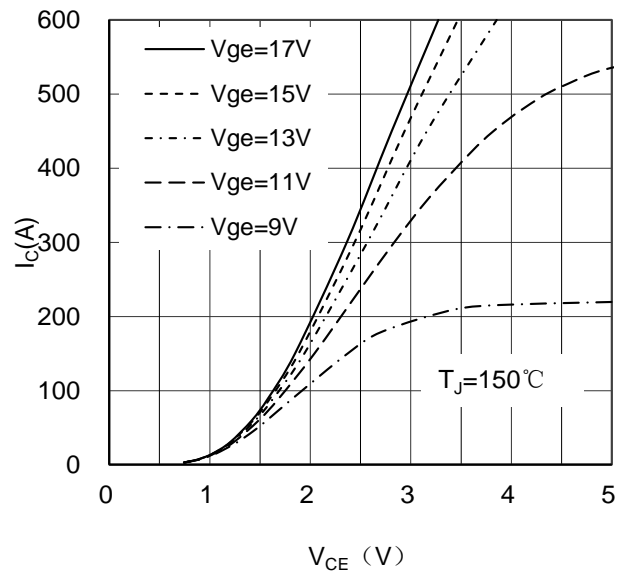


Figure 2. Typical Output Characteristics IGBT-inverter

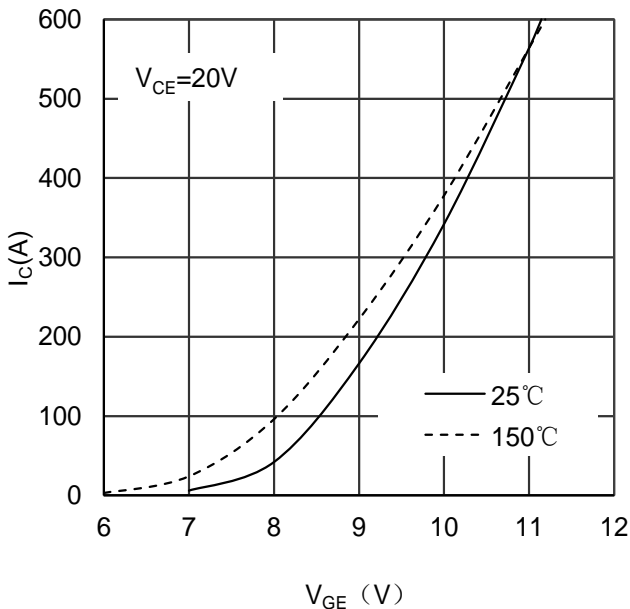


Figure 3. Typical Transfer characteristics IGBT-inverter

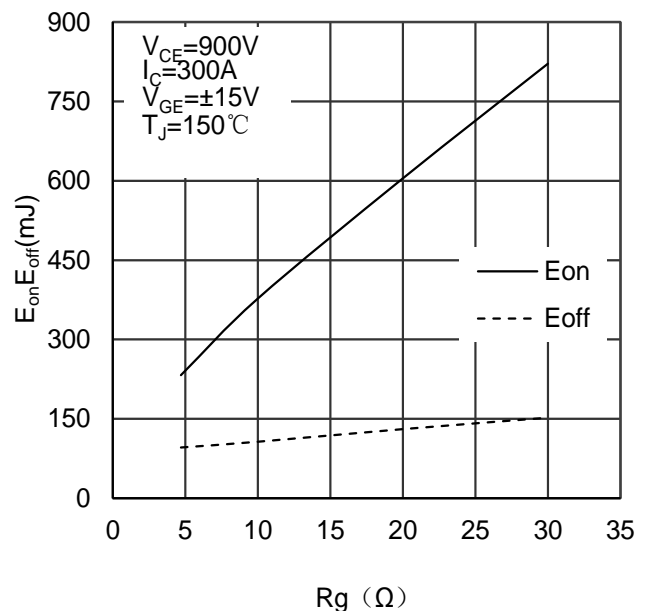


Figure 4. Switching Energy vs Gate Resistor IGBT-inverter

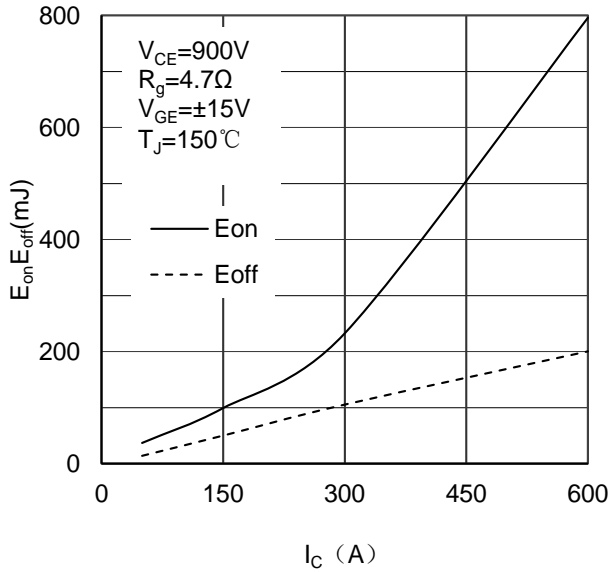


Figure 5. Switching Energy vs Collector Current IGBT-inverter

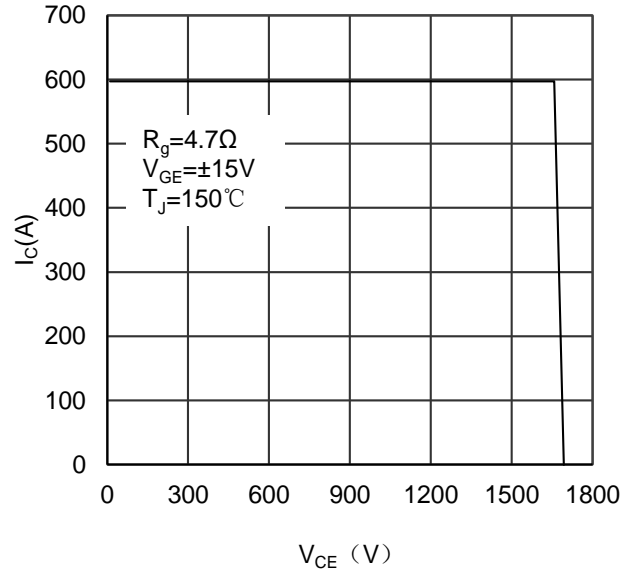


Figure 6. Reverse Biased Safe Operating Area IGBT-inverter

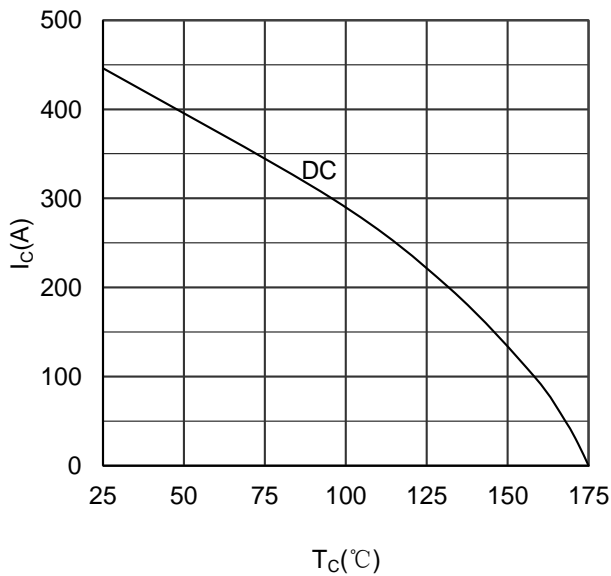


Figure 7. Collector Current vs Case temperature IGBT-inverter

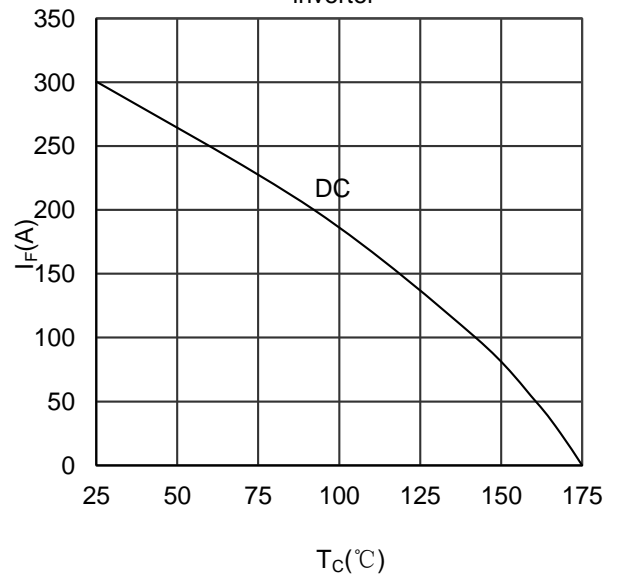


Figure 8. Forward current vs Case temperature Diode-inverter

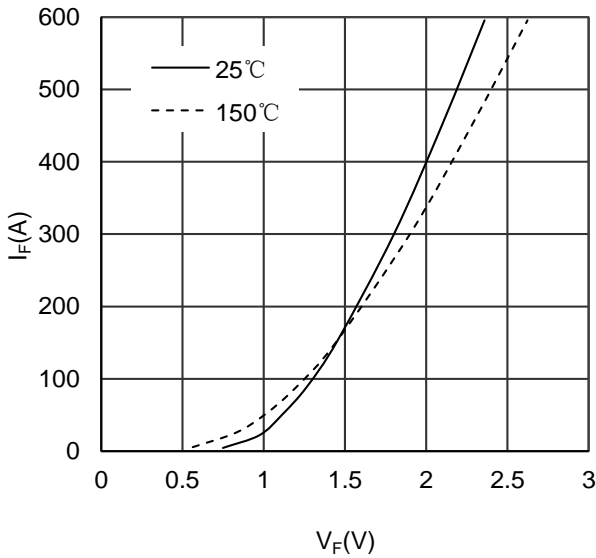


Figure 9. Diode Forward Characteristics Diode -inverter

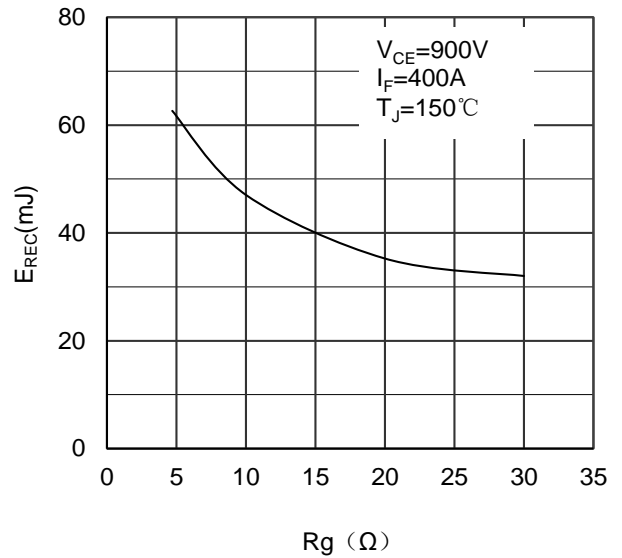


Figure 10. Switching Energy vs Gate Resistor Diode -inverter

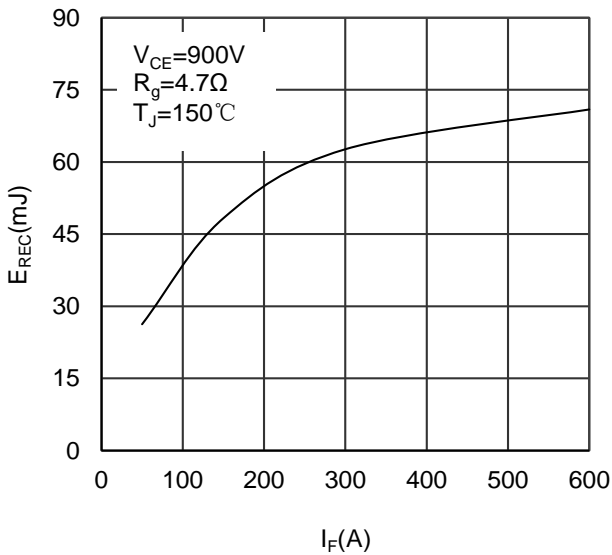


Figure 11. Switching Energy vs Forward Current Diode-inverter

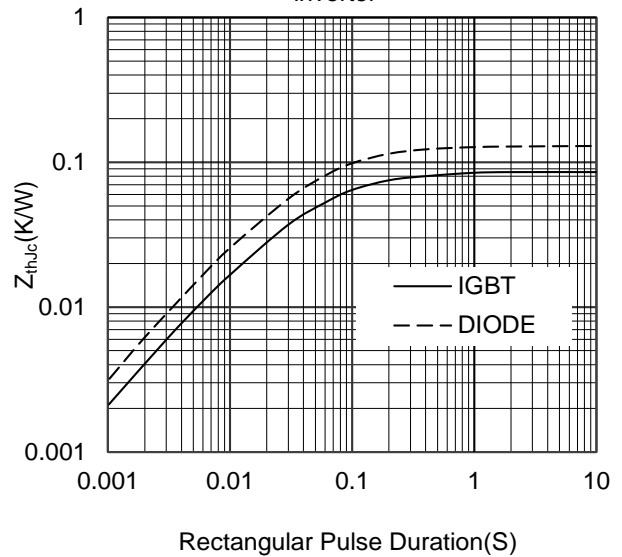


Figure 12. Transient Thermal Impedance of Diode and IGBT-inverter

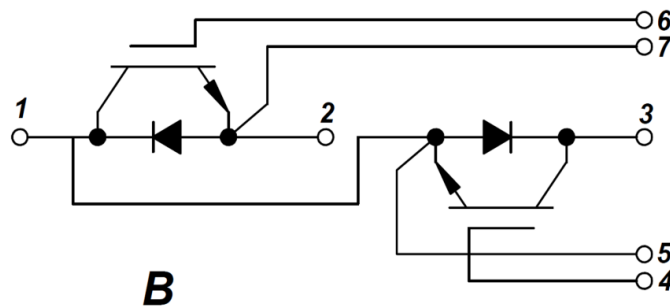
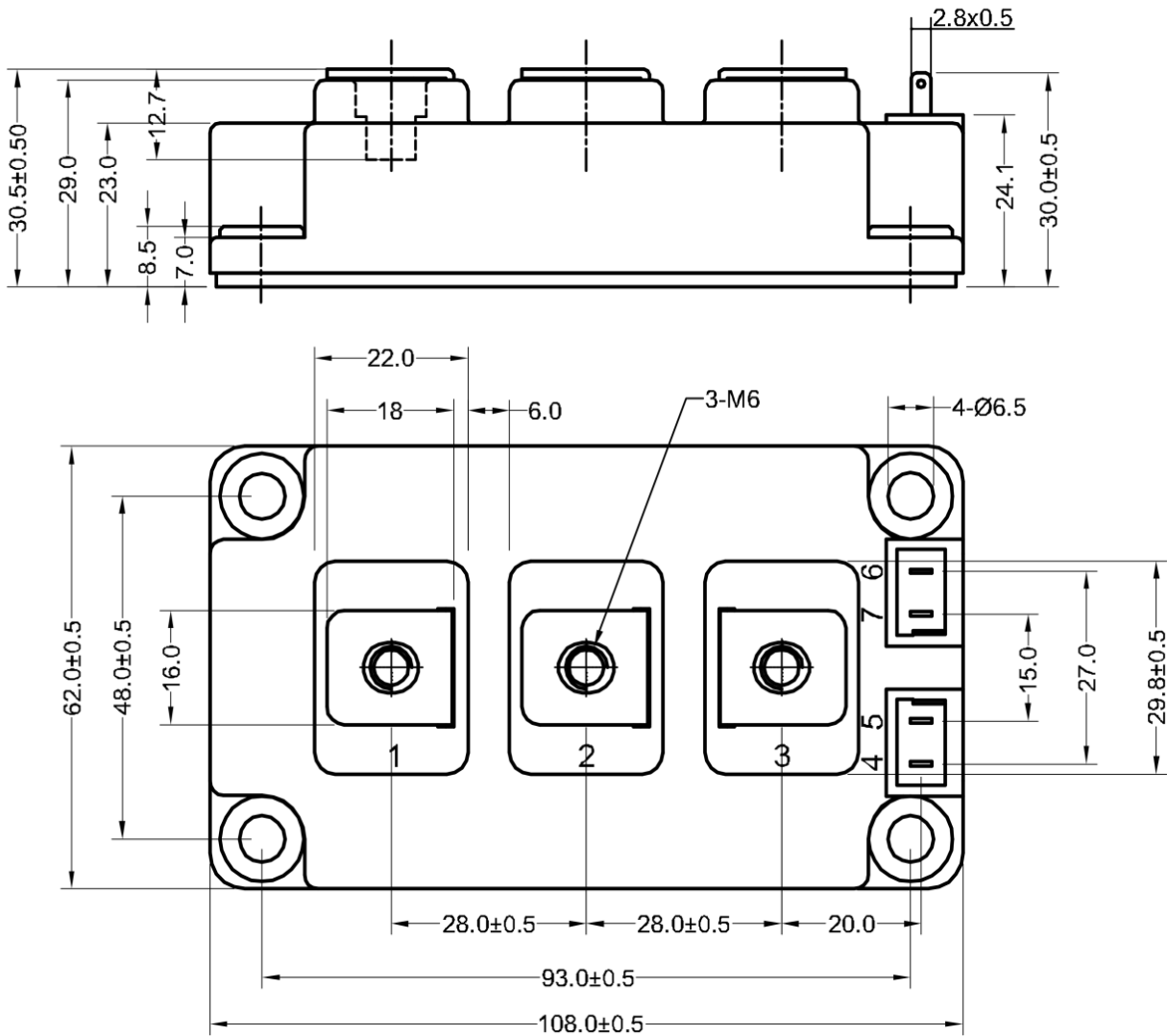


Figure 13. Circuit Diagram



Dimensions in (mm)  
Figure 14. Package Outline

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