

## PRODUCT FEATURES

- IGBT CHIP(T4 Fast Trench+Field Stop technology)
- High short circuit capability,self limiting short circuit current
- $V_{CE(sat)}$  with positive temperature coefficient
- Fast switching and short tail current
- Free wheeling diodes with fast and soft reverse recovery
- Low switching losses
- Temperature sense included



## APPLICATIONS

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

### 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	$T_J=25^\circ\text{C}$	1200	V
$V_{GES}$	Gate Emitter Voltage		$\pm 20$	
$I_C$	DC Collector Current	$T_C=25^\circ\text{C}, T_{Jmax}=175^\circ\text{C}$	75	A
		$T_C=95^\circ\text{C}, T_{Jmax}=175^\circ\text{C}$	50	
$I_{CM}$	Repetitive Peak Collector Current	$t_p=1\text{ms}$	100	
$P_{tot}$	Power Dissipation Per IGBT	$T_C=25^\circ\text{C}, T_{Jmax}=175^\circ\text{C}$	300	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	$T_J=25^\circ\text{C}$	1200	V
$I_{F(AV)}$	Average Forward Current		50	A
$I_{FRM}$	Repetitive Peak Forward Current	$t_p=1\text{ms}$	100	
$I^2t$		$T_J=125^\circ\text{C}, t=10\text{ms}, V_R=0\text{V}$	680	$\text{A}^2\text{S}$

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# MMG50HB120H6HN

## 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	$V_{CE}=V_{GE}, I_C=2\text{mA}$	5.4	6.0	6.5	V	
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$I_C=50\text{A}, V_{GE}=15\text{V}, T_J=25^\circ\text{C}$		2.1	2.5		
		$I_C=50\text{A}, V_{GE}=15\text{V}, T_J=125^\circ\text{C}$		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	mA	
$I_{GES}$	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			4		$\Omega$	
$Q_g$	Gate Charge	$V_{CE}=600\text{V}, I_C=50\text{A}, V_{GE}=15\text{V}$		0.23		$\mu\text{C}$	
$C_{ies}$	Input Capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$		2.8		nF	
$C_{res}$	Reverse Transfer Capacitance				160		pF
$t_{d(on)}$	Turn on Delay Time	$V_{CC}=600\text{V}, I_C=50\text{A}$ $R_G=15\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$		60	ns	
			$T_J=125^\circ\text{C}$		70	ns	
			$T_J=150^\circ\text{C}$		80	ns	
$t_r$	Rise Time		$T_J=25^\circ\text{C}$		40	ns	
			$T_J=125^\circ\text{C}$		50	ns	
			$T_J=150^\circ\text{C}$		55	ns	
$t_{d(off)}$	Turn off Delay Time	$T_J=25^\circ\text{C}$		280	ns		
		$T_J=125^\circ\text{C}$		320	ns		
		$T_J=150^\circ\text{C}$		360	ns		
$t_f$	Fall Time	$T_J=25^\circ\text{C}$		40	ns		
		$T_J=125^\circ\text{C}$		60	ns		
		$T_J=150^\circ\text{C}$		70	ns		
$E_{on}$	Turn on Energy	$V_{CC}=600\text{V}, I_C=50\text{A}$ $R_G=15\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=125^\circ\text{C}$		5	mJ	
			$T_J=150^\circ\text{C}$		5.5	mJ	
$E_{off}$	Turn off Energy		$T_J=125^\circ\text{C}$		3	mJ	
			$T_J=150^\circ\text{C}$		3.3	mJ	
$I_{SC}$	Short Circuit Current		$t_{psc}\leq 10\mu\text{S}, V_{GE}=15\text{V}$ $T_J=125^\circ\text{C}, V_{CC}=600\text{V}$		200		A
$R_{thJC}$	Junction to Case Thermal Resistance ( Per IGBT)				0.5	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	$I_F=50\text{A}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$		1.65	2.15	V	
		$I_F=50\text{A}, V_{GE}=0\text{V}, T_J=125^\circ\text{C}$		1.65			
$t_{rr}$	Reverse Recovery Time	$I_F=50\text{A}, V_R=600\text{V}$ $dI_F/dt=-1300\text{A}/\mu\text{s}$ $T_J=125^\circ\text{C}$		330		ns	
$I_{RRM}$	Max. Reverse Recovery Current			55		A	
$Q_{RR}$	Reverse Recovery Charge			8.5		$\mu\text{C}$	
$E_{rec}$	Reverse Recovery Energy			3.2		mJ	
$R_{thJCD}$	Junction to Case Thermal Resistance ( Per Diode)				0.78	K /W	

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

Symbol	Parameter/Test Conditions	Min.	Typ.	Max.	Unit
$R_{25}$	Resistance $T_C = 25^\circ\text{C}$		5		$\text{K}\Omega$
$B_{25/50}$	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298.15 \text{ K}))]$		3375		K

## 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=1minute	3000	V
Torque	to heatsink	Recommended (M5)	2.5~5	Nm
	to terminal	Recommended (M6)	3~5	Nm
Weight			200	g

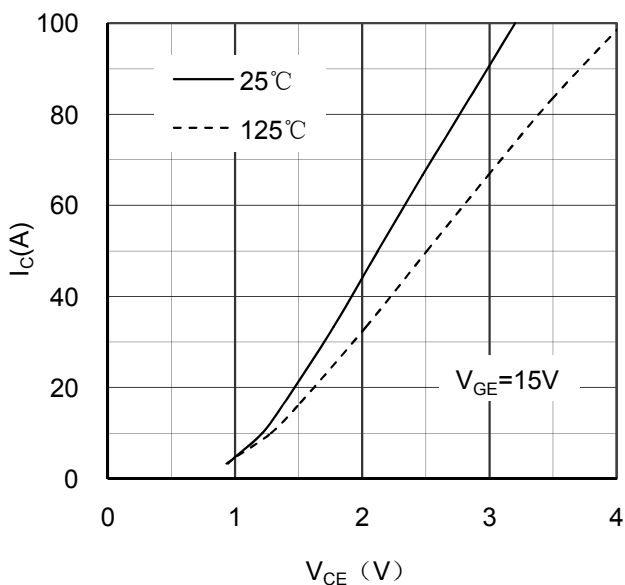


Figure 1. Typical Output Characteristics IGBT-inverter

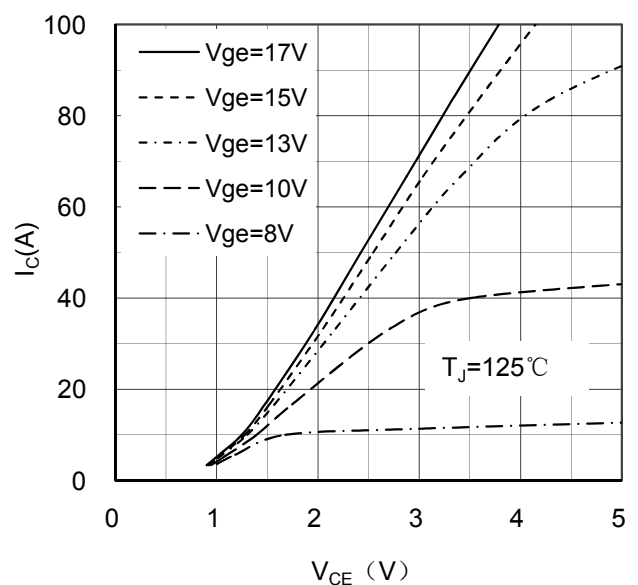


Figure 2. Typical Output Characteristics IGBT-inverter

# MMG50HB120H6HN

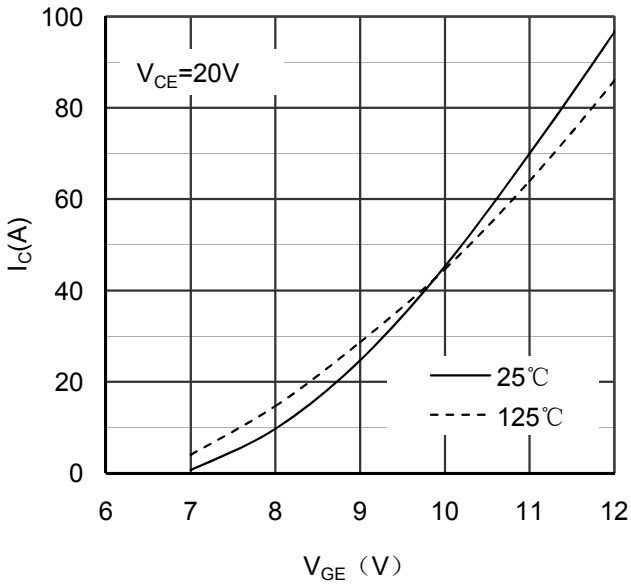


Figure 3. Typical Transfer characteristics IGBT-inverter

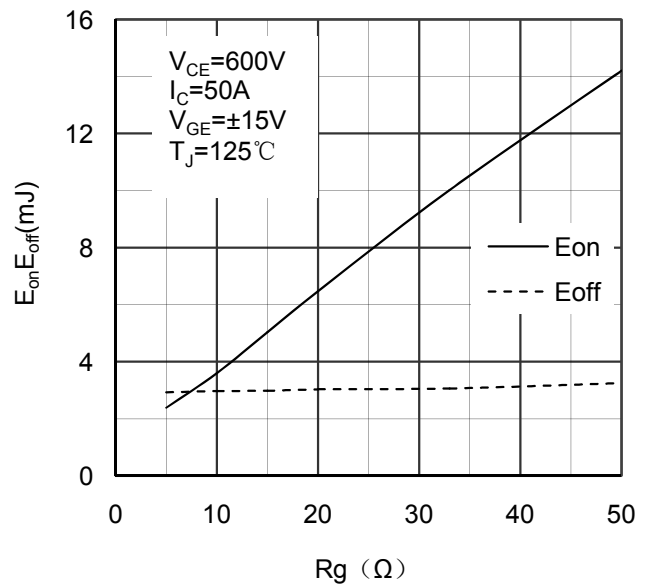


Figure 4. Switching Energy vs Gate Resistor IGBT-inverter

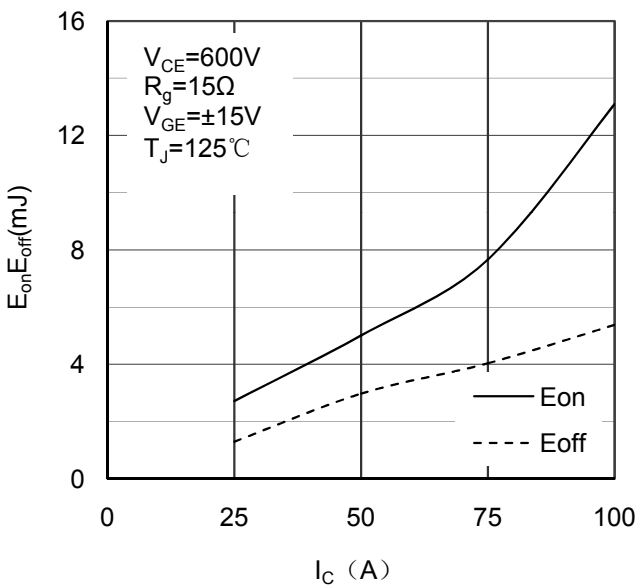


Figure 5. Switching Energy vs Collector Current IGBT-inverter

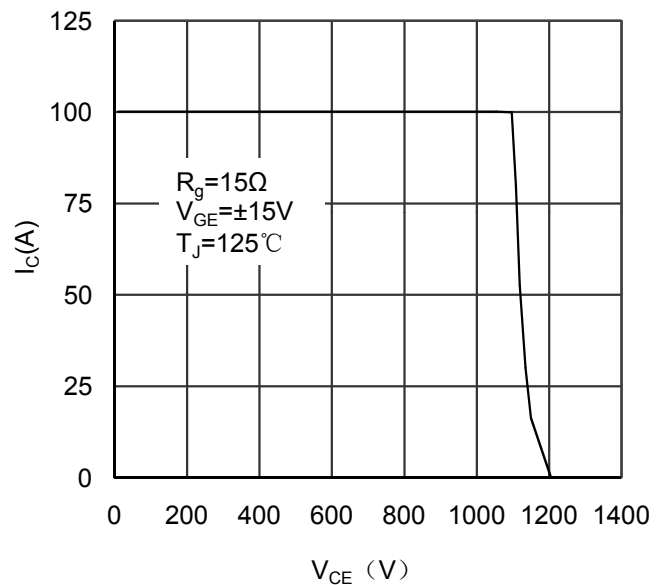


Figure 6. Reverse Biased Safe Operating Area IGBT-inverter

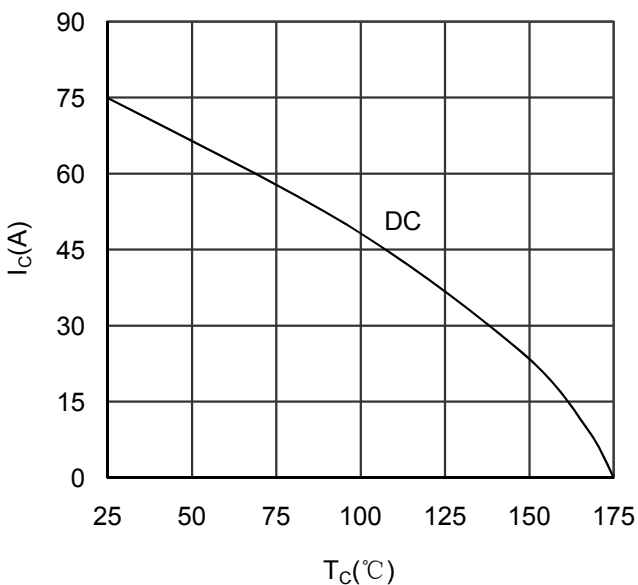


Figure 7. Collector Current vs Case temperature IGBT-inverter

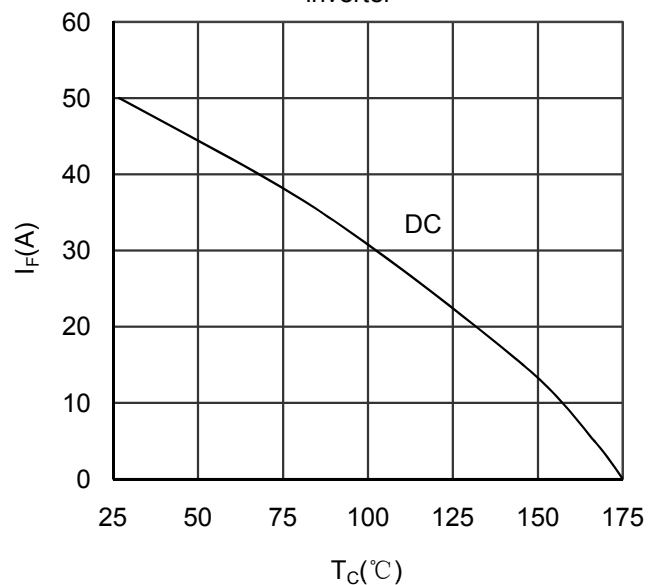


Figure 8. Forward current vs Case temperature Diode-inverter

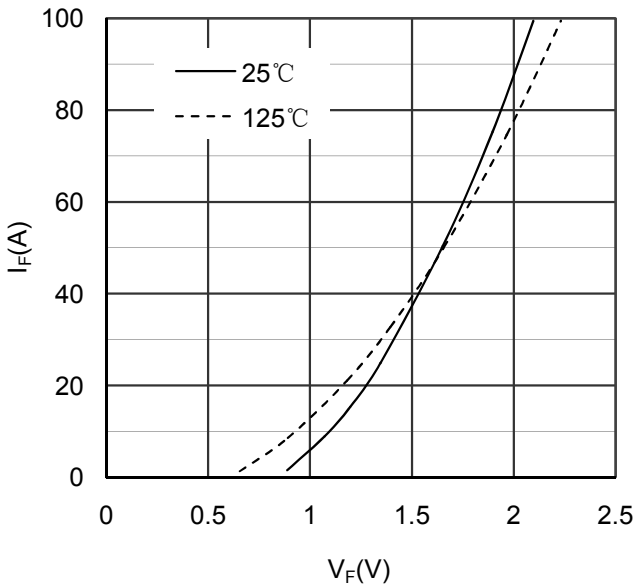


Figure 9. Diode Forward Characteristics Diode -inverter

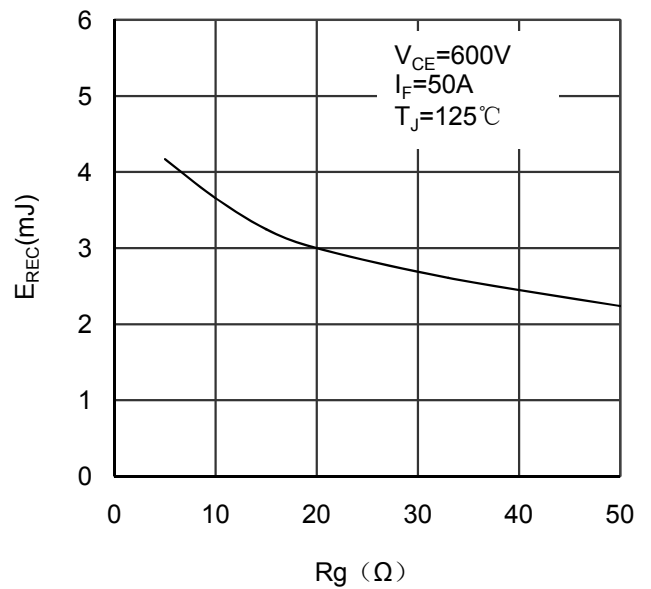


Figure 10. Switching Energy vs Gate Resistor Diode - inverter

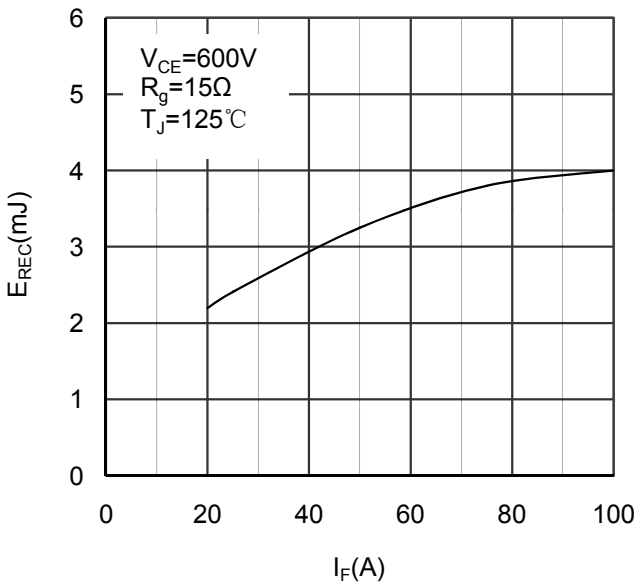


Figure 11. Switching Energy vs Forward Current Diode-

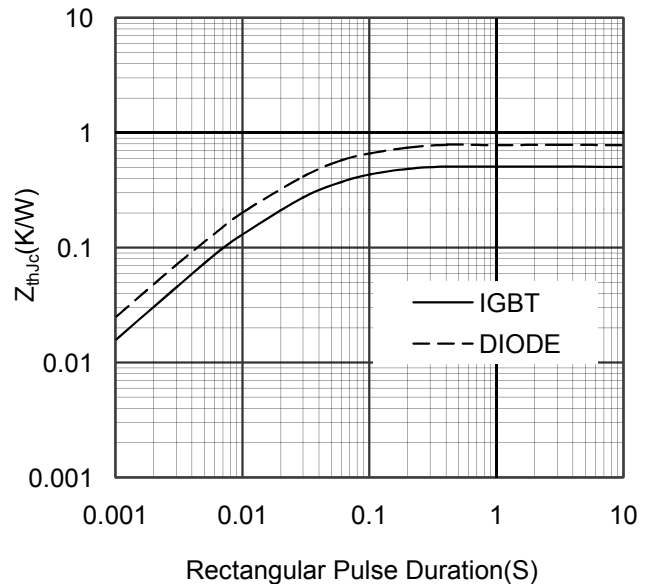


Figure 12. Transient Thermal Impedance of Diode and IGBT-inverter

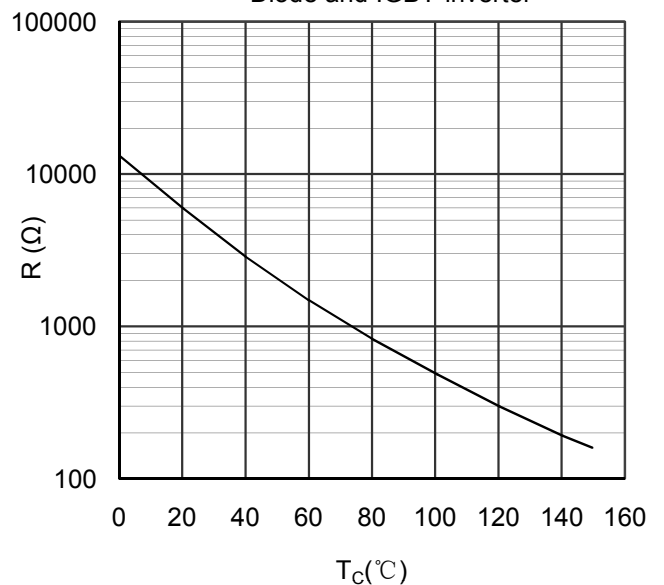


Figure 13. NTC Characteristics

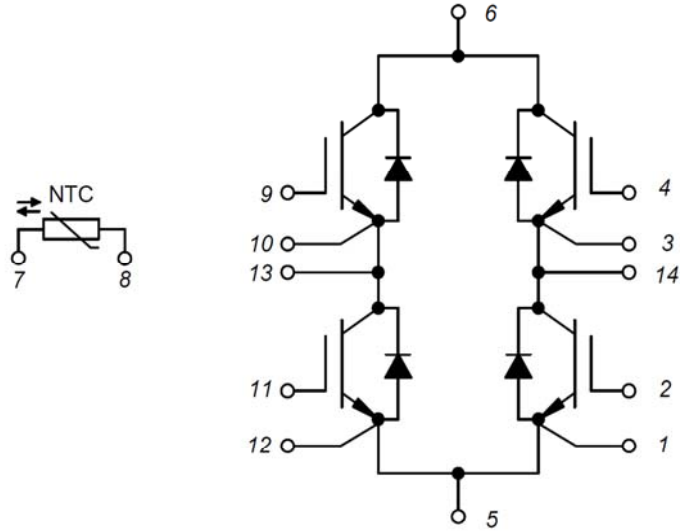
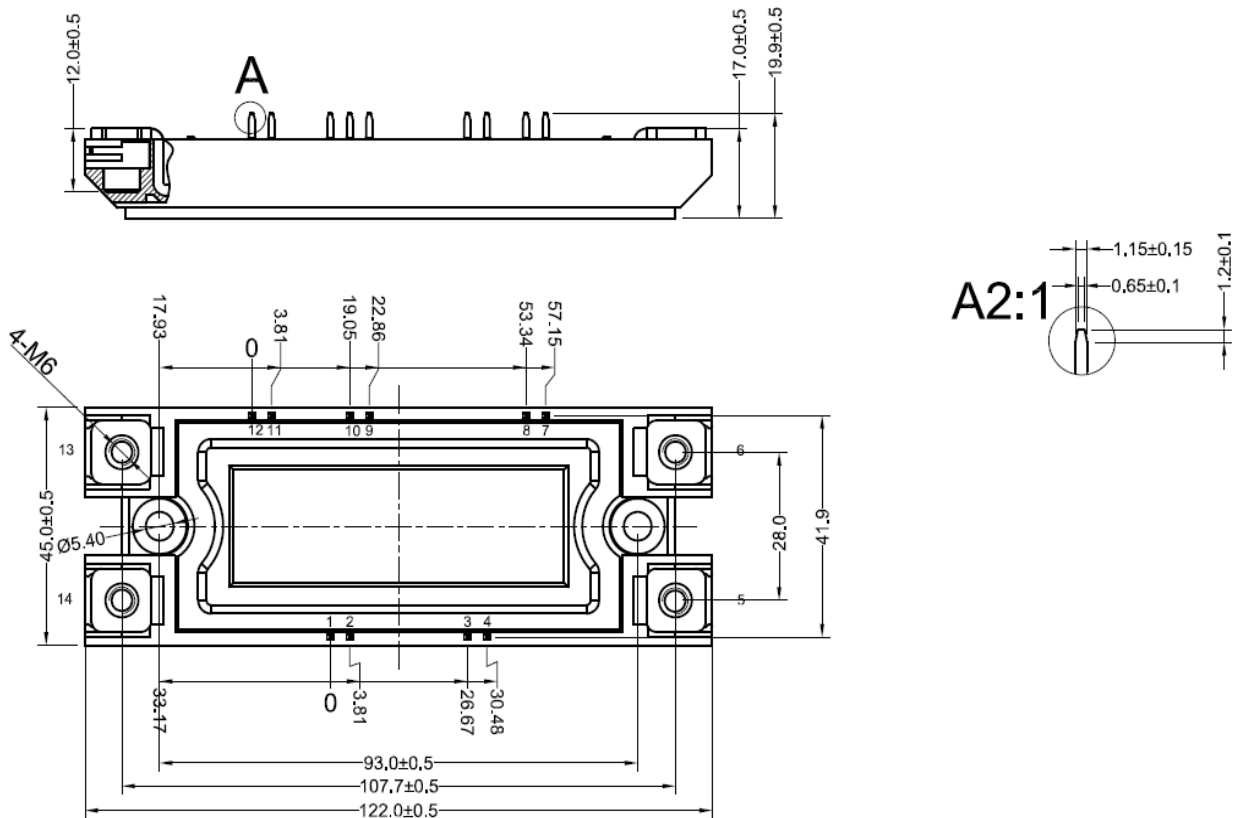


Figure 14. Circuit Diagram



Dimensions in (mm)  
Figure 15. Package Outline