MACMIC

MMG75W120XB6TC

1200V 75A PIM Module

November 2022 Version 02 RoHS Compliant

PRODUCT FEATURES

☐ High level of integration

☐ IGBT CHIP(Trench+Field Stop technology)

☐ Low saturation voltage and positive temperature coefficient

☐ Fast switching and short tail current

☐ Free wheeling diodes with fast and soft reverse recovery

☐ Industry standard package with insulated copper base plate and soldering pins for PCB mounting

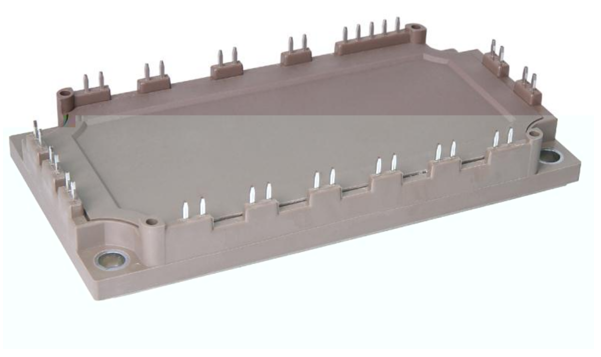
☐ Temperature sense included

APPLICATIONS

☐ AC motor control

☐ Motion/servo control

☐ Inverter and power supplies



Rectifier+Brake+Inverter

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	110	A
		T_C=95 , T_{Jmax}=175	75	
I_{CM}	Repetitive Peak Collector Current	tp=1ms	150	
P_{tot}	Power Dissipation Per IGBT	T_C=25 , T_{Jmax}=175	385	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		75	A
I_{FRM}	Repetitive Peak Forward Current	tp=1ms	150	
I^2t		T_J =125 , t=10ms, V_R=0V	1250	A^2s

MMG75W120XB6TC

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			5.0	5.8	6.5	
		I_C=75A, V_{GE}=15V, T_J=25			1.8	2.25	V
$V_{CE(sat)}$		I_C=75A, V_{GE}=15V, T_J=125			2.1		
					2.15		
						1	mA
		V_{CE}=1200V, V_{GE}=0V, T_J=150				10	
	Gate Leakage Current	V_{CE}=0V,V_{GE}=±20V, T_J=25		-400		400	nA
R_{Gint}					5		
Q_G	Gate Charge				0.4		µC
	Input Capacitance				8		nF
	Reverse Transfer Capacitance				220		pF
			T_J=25		70		ns
	Turn on Delay Time	V_{CC}=600V,I_C=75A	T_J=125		80		ns
		R_G	T_J=150		85		ns
		V_{GE}=±15V,			50		ns
	Rise Time	Inductive Load			60		ns
			T_J=150		60		ns
			T_J=25		300		ns
$t_{d(off)}$		V_{CC}=600V,I_C=75A	T_J=125		350		ns
		R_G			360		ns
		V_{GE}=±15V,			120		ns
t_f		Inductive Load	T_J=125				ns
			T_J=150		220		ns
							mJ
	Turn on Energy						mJ
							mJ
					6.5		mJ
							A
							K /W

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

	Parameter/Test Conditions	Max.	Unit
		2.3	
V_F			
			ns
			A
			µC
			mJ
			K /W

Diode-RECTIFIER

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

Symbol	Parameter/Test Conditions		Values	Unit
V_{RRM}	Repetitive Reverse Voltage	T_J=25	1600	V
I_{FRMS}	R.M.S. Forward Current Per Diode	T_C=80	100	A
I_{RMS}	R.M.S. Current at rectifier output		150	
I_{FSM}	Non Repetitive Surge Forward Current	T_J=45 , t=10ms, 50Hz	740	
		T_J=45 , t=8.3ms, 60Hz	814	
I^2t		T_J=45 , t=10ms, 50Hz	2738	A^2s
		T_J=45 , t=8.3ms, 60Hz	2749	

Diode-RECTIFIER

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

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=75A , T_J =25		1.1	1.25	V
		I_F=75A , T_J =150		1.05		V
I_R	Reverse Leakage Current	V_R=1600V, T_J=25			50	μA
		V_R=1600V, T_J=150			1	mA
R_{thJCD}	Junction to Case Thermal Resistance	Per Diode			0.63	K /W

IGBT-Brake chopper

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	76	A
		T_C=100 , T_{Jmax}=175	50	
I_{CM}	Repetitive Peak Collector Current	tp=1ms	100	
P_{tot}	Power Dissipation Per IGBT	T_C=25 , T_{Jmax}=175	278	W

Diode-Brake chopper

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		35	A
I_{FRM}	Repetitive Peak Forward Current	tp=1ms	70	
I^2t		T_J=125 , t=10ms, V_R=0V	250	A^2s

IGBT-Brake chopper

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=2mA		5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector - Emitter Saturation Voltage	I_C=50A, V_{GE}=15V, T_J=25			1.8	2.25	
		I_C=50A, V_{GE}=15V, T_J=125			2.1		
		I_C=50A, V_{GE}=15V, T_J=150			2.15		
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				4		
Q_G	Gate Charge	V_{CE}=600V, I_C=50A , V_{GE}=15V			0.28		μC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz			5.9		nF
C_{res}	Reverse Transfer Capacitance				137		pF
$t_{d(on)}$	Turn on Delay Time	V_{CC}=600V,I_C=50A R_G V_{GE}=±15V, Inductive Load	T_J=25		30		ns
			T_J=125		35		ns
			T_J=150		35		ns
t_r	Rise Time		T_J=25		34		ns
			T_J=125		36		ns
			T_J=150		36		ns
$t_{d(off)}$	Turn off Delay Time	V_{CC}=600V,I_C=50A R_G V_{GE}=±15V, Inductive Load	T_J=25		260		ns
			T_J=125		310		ns
			T_J=150		330		ns
t_f	Fall Time		T_J=25		120		ns
			T_J=125		190		ns
			T_J=150		200		ns
E_{on}	Turn on Energy	V_{CC}=600V,I_C=50A R_G V_{GE}=±15V, Inductive Load	T_J=125		5.5		mJ
			T_J=150		6		mJ
E_{off}	Turn off Energy		T_J=125		3.9		mJ
			T_J=150		4.2		mJ
I_{SC}	Short Circuit Current	tpsc ≤ 10μs , V_{GE}=15V T_J=150 ,V_{CC}=800V			220		A
R_{thJC}	Junction to Case Thermal Resistance (Per IGBT)					0.54	K /W

Diode-Brake chopper

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

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=35A , V_{GE}=0V, T_J =25		1.9	2.4	V
		I_F=35A , V_{GE}=0V, T_J =125		1.7		
		I_F=35A , V_{GE}=0V, T_J =150		1.65		
t_{rr}	Reverse Recovery Time	I_F=50A , V_R=600V dI_F T_J =150		530		ns
I_{RRM}	Max. Reverse Recovery Current			41		A
Q_{RR}	Reverse Recovery Charge			8.9		μC
E_{rec}	Reverse Recovery Energy			4		mJ
R_{thJCD}	Junction to Case Thermal Resistance (Per Diode)				1.1	K /W

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

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

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

Symbol	Parameter/Test Conditions		Values	Unit
T_{Jmax}	Max. Junction Temperature	Inverter, Brake-Chopper	175	
		Rectifier	150	
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		>200	
Md	Mounting Torque	Recommended M5	2.5~5	Nm
Weight			300	g

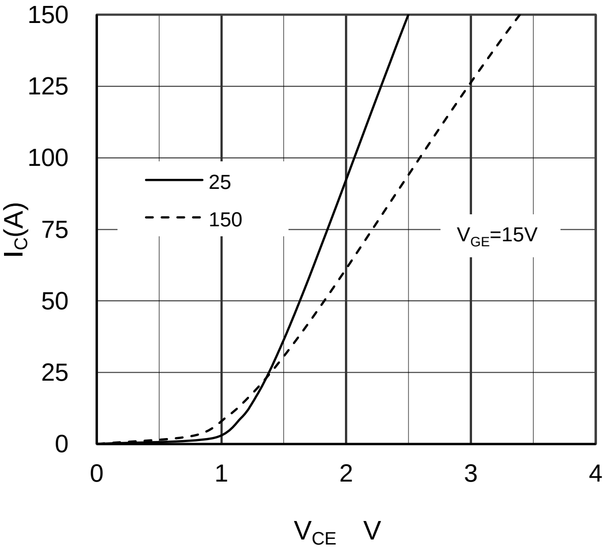


Figure 1. Typical Output Characteristics IGBT-inverter

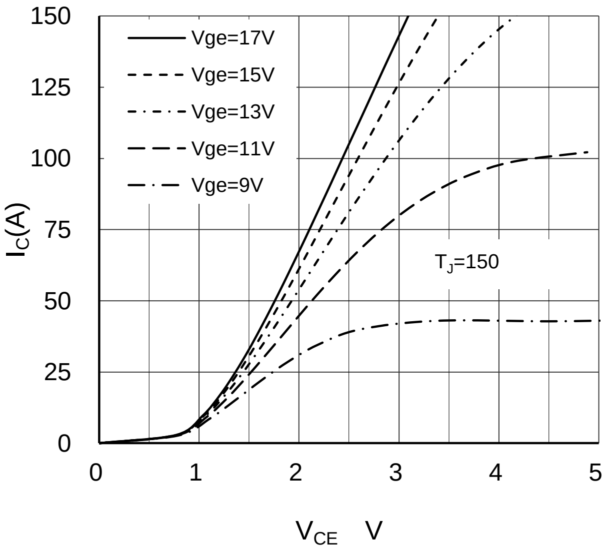


Figure 2. Typical Output Characteristics IGBT-inverter

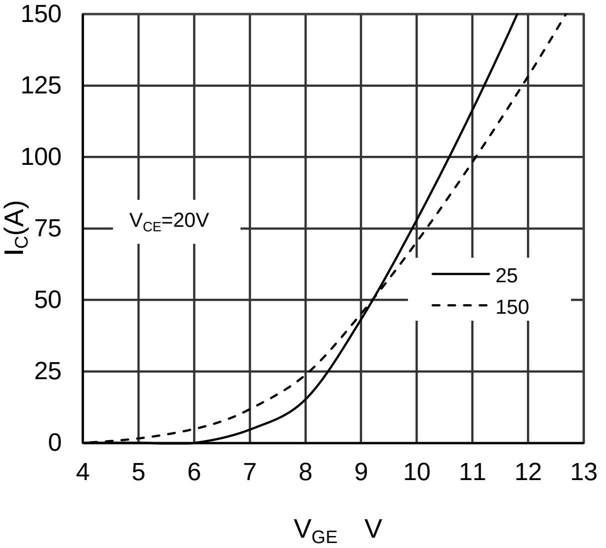


Figure 3. Typical Transfer characteristics IGBT-inverter

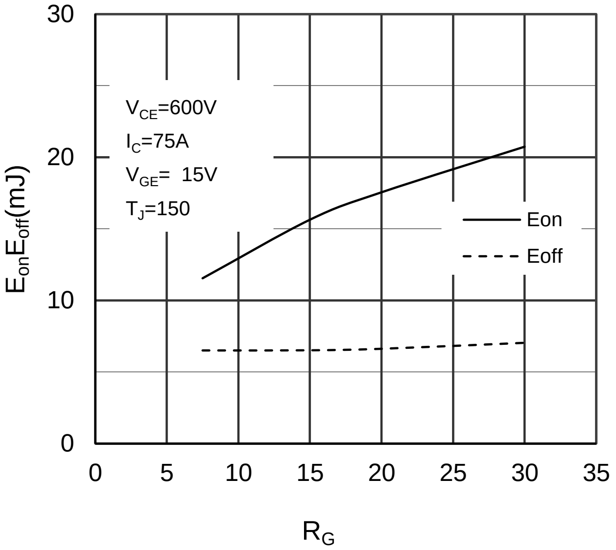


Figure 4. Switching Energy vs Gate Resistor IGBT-inverter

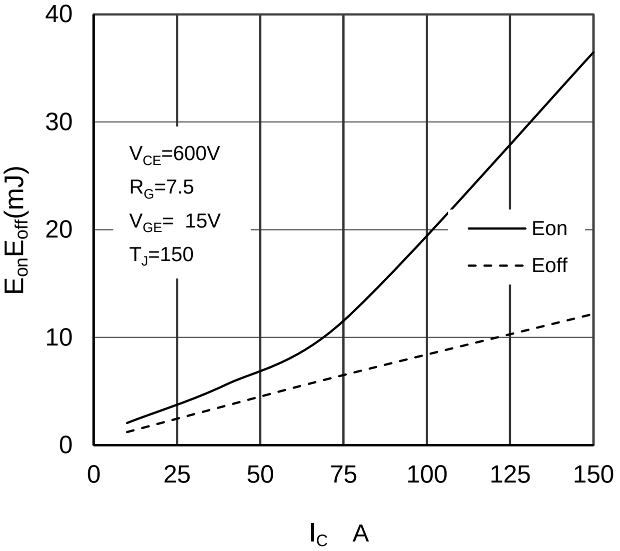


Figure 5. Switching Energy vs Collector Current IGBT-inverter

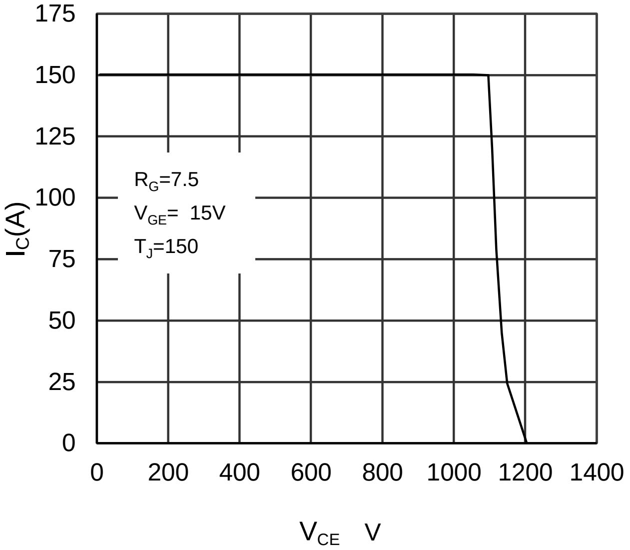


Figure 6. Reverse Biased Safe Operating Area IGBT-inverter

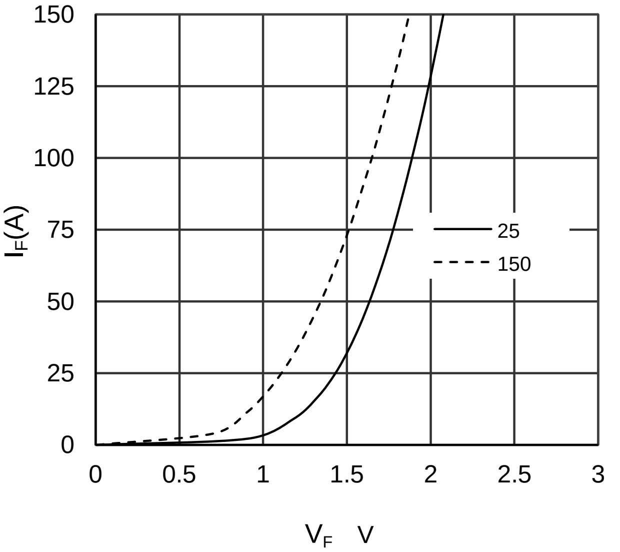


Figure 7. Diode Forward Characteristics Diode -inverter

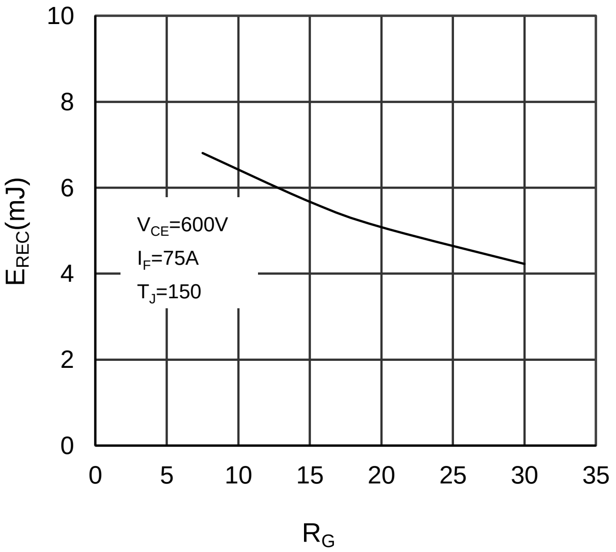


Figure 8. Switching Energy vs Gate Resistor Diode -inverter

E_{REC}(mJ)

I_F A

Z_{thJc}(K/W)

Rectangular Pulse Duration s

Figure 10. Transient Thermal Impedance of Diode and IGBT-inverter

I_F(A)

I_C(A)

Figure 12. Typical Output Characteristics IGBT- brake chopper

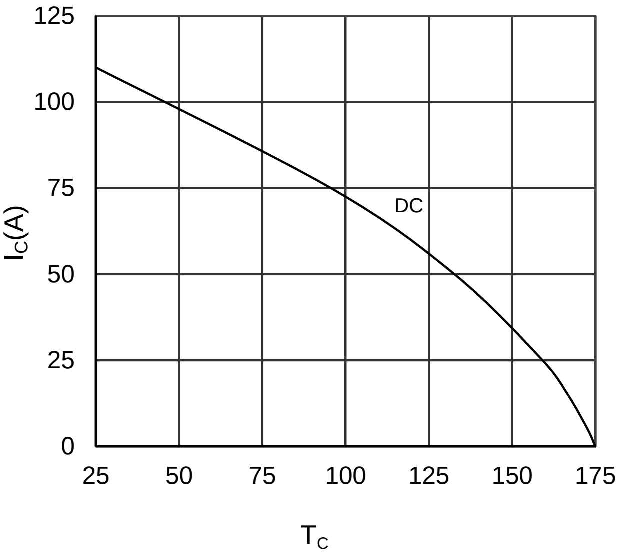


Figure 15. Collector Current vs Case temperature IGBT -inverter

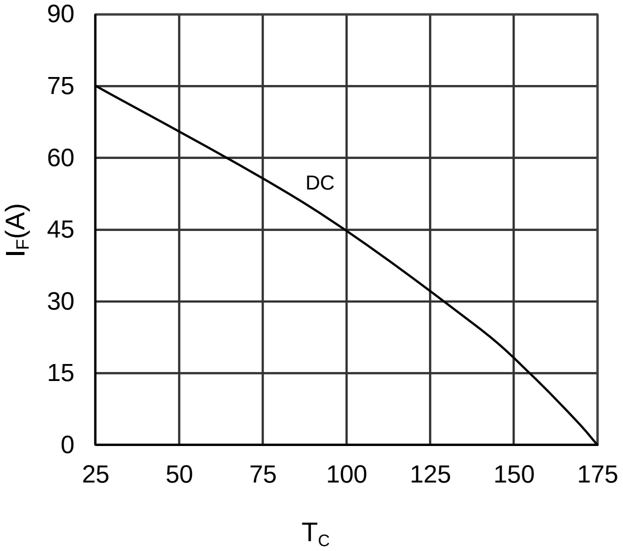


Figure 16. Forward current vs Case temperature Diode -inverter

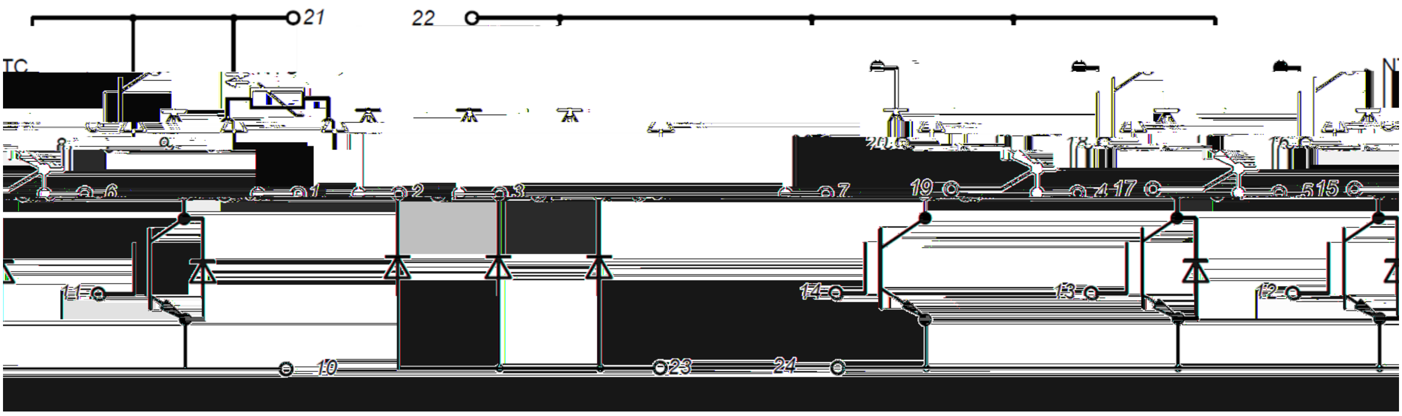
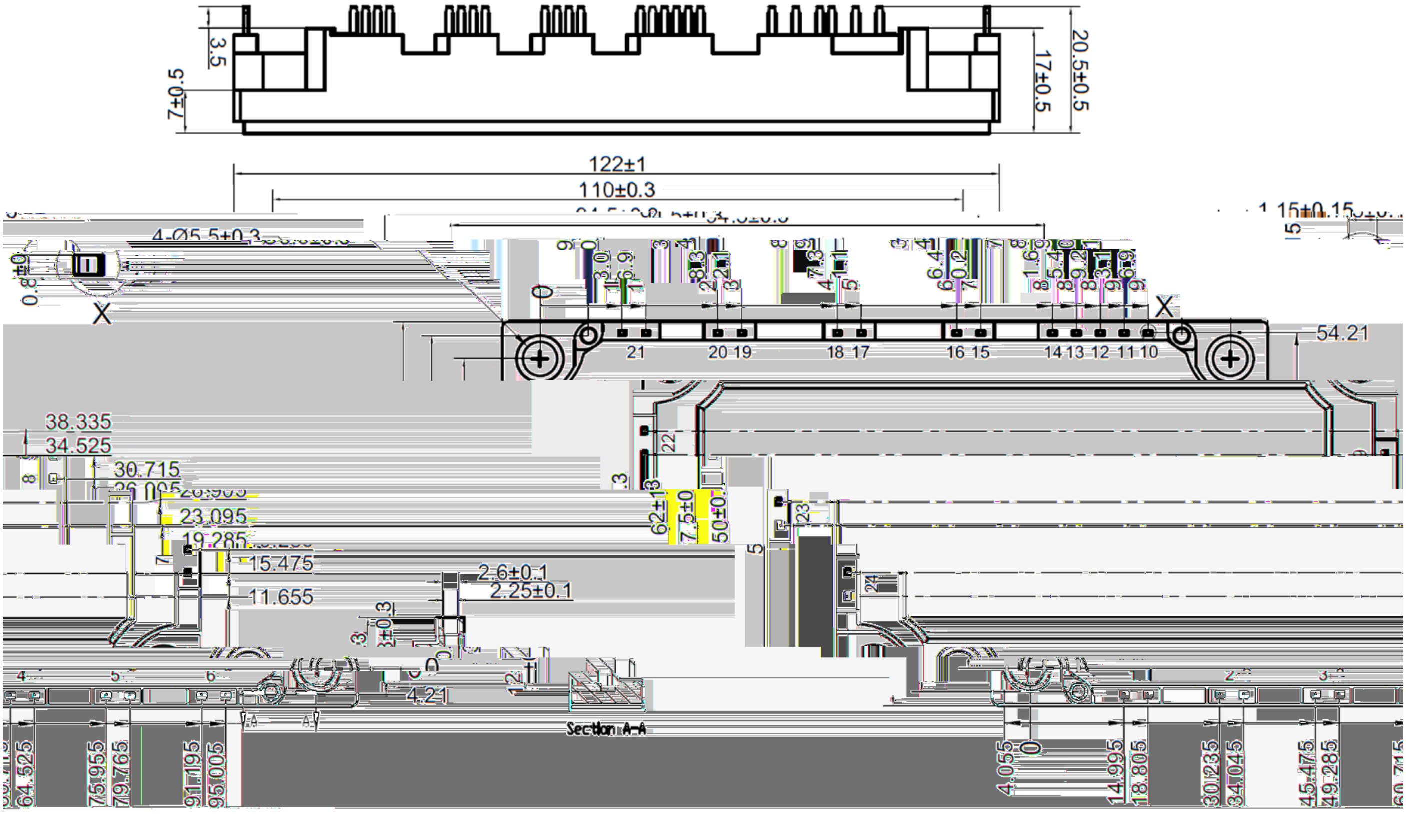


Figure 17. Circuit Diagram



Dimensions in mm

Figure 18. Package Outline