MMGT75W120XB6C

1200V 75A PIM Module

September 2015 Version 1 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

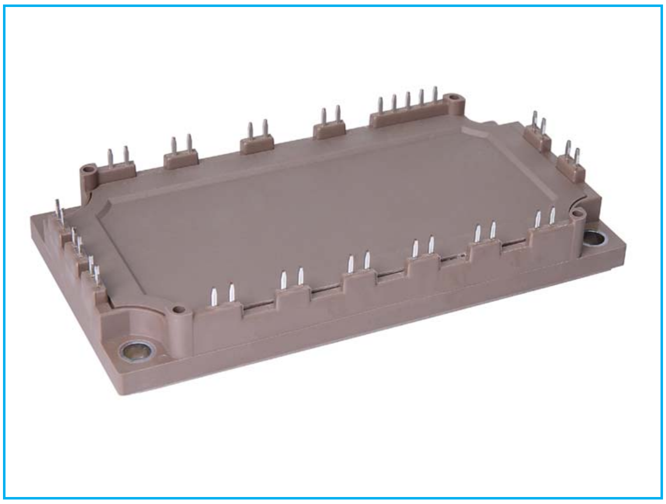
☐ Temperature sense included

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℃	115	A
		T_C=100℃, 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℃	440	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	1800	A^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=3mA		5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	I_C=75A, V_{GE}=15V, T_J=25℃			1.85	2.3	
		I_C=75A, V_{GE}=15V, T_J=125℃			2.15		
		I_C=75A, V_{GE}=15V, T_J=150℃			2.25		
I_{CES}	Collector Leakage Current	V_{CE}=1200V, V_{GE}=0V, T_J=25℃				100	µA
		V_{CE}=1200V, V_{GE}=0V, T_J=150℃				10	mA
I_{GES}	Gate Leakage Current	V_{CE}=0V,V_{GE}=±15V, T_J=25℃		-400		400	nA
R_{gint}	Integrated Gate Resistor				10		Ω
Q_g	Gate Charge	V_{CE}=600V, I_C=75A , V_{GE}=15V			0.39		µC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz			11		nF
C_{res}	Reverse Transfer Capacitance				100		pF
$t_{d(on)}$	Turn on Delay Time	V_{CC}=600V,I_C=75A R_G =7.5Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		300		ns
			T_J=125℃		310		ns
			T_J=150℃		310		ns
t_r	Rise Time		T_J=25℃		78		ns
			T_J=125℃		82		ns
			T_J=150℃		84		ns
$t_{d(off)}$	Turn off Delay Time	V_{CC}=600V,I_C=75A R_G =7.5Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		320		ns
			T_J=125℃		350		ns
			T_J=150℃		360		ns
t_f	Fall Time		T_J=25℃		80		ns
			T_J=125℃		150		ns
			T_J=150℃		160		ns
E_{on}	Turn on Energy	V_{CC}=600V,I_C=75A R_G =7.5Ω, V_{GE}=±15V, Inductive Load	T_J=125℃		9.2		mJ
			T_J=150℃		10.1		mJ
E_{off}	Turn off Energy		T_J=125℃		6.7		mJ
			T_J=150℃		7.0		mJ
I_{SC}	Short Circuit Current	tpsc≤10µS , V_{GE}=15V T_J=150℃,V_{CC}=600V			340		A
R_{thJC}	Junction to Case Thermal Resistance （Per IGBT）					0.34	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=75A , V_{GE}=0V, T_J =25℃		1.9	2.4	V
		I_F=75A , V_{GE}=0V, T_J =125℃		1.65		
		I_F=75A , V_{GE}=0V, T_J =150℃		1.6		
t_{rr}	Reverse Recovery Time	I_F=75A , V_R=600V dI_F/dt=-1000A/µs T_J =150℃		360		ns
I_{RRM}	Max. Reverse Recovery Current			68		A
Q_{RR}	Reverse Recovery Charge			12.8		µC
E_{rec}	Reverse Recovery Energy			4.5		mJ
R_{thJCD}	Junction to Case Thermal Resistance （Per Diode）				0.6	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℃	80	A
I_{RMS}	R.M.S. Current at rectifier output		140	
I_{FSM}	Non Repetitive Surge Forward Current	T_J=45℃, t=10ms, 50Hz	1000	
		T_J=45℃, t=8.3ms, 60Hz	1100	
I^2t		T_J=45℃, t=10ms, 50Hz	5000	A^2S
		T_J=45℃, t=8.3ms, 60Hz	5021	

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℃		1.03		V
		I_F=75A , T_J =150℃		1.00		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）				0.5	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℃	75	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℃	340	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		50	A
I_{FRM}	Repetitive Peak Forward Current	tp=1ms	100	
I^2t		T_J=125℃, t=10ms, V_R=0V	800	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℃			1.85	2.3	
		I_C=50A, V_{GE}=15V, T_J=125℃			2.15		
		I_C=50A, V_{GE}=15V, T_J=150℃			2.25		
I_{CES}	Collector Leakage Current	V_{CE}=1200V, V_{GE}=0V, T_J=25℃				100	μA
		V_{CE}=1200V, V_{GE}=0V, T_J=150℃				10	mA
I_{GES}	Gate Leakage Current	V_{CE}=0V,V_{GE}=±15V, T_J=25℃		-400		400	nA
R_{gint}	Integrated Gate Resistor				4		Ω
Q_g	Gate Charge	V_{CE}=600V, I_C=50A , V_{GE}=15V			0.27		μC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz			7.5		nF
C_{res}	Reverse Transfer Capacitance				66		pF
$t_{d(on)}$	Turn on Delay Time	V_{CC}=600V,I_C=50A R_G =10Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		95		ns
			T_J=125℃		100		ns
			T_J=150℃		100		ns
t_r	Rise Time		T_J=25℃		50		ns
			T_J=125℃		54		ns
			T_J=150℃		58		ns
$t_{d(off)}$	Turn off Delay Time	V_{CC}=600V,I_C=50A R_G =10Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		250		ns
			T_J=125℃		280		ns
			T_J=150℃		290		ns
t_f	Fall Time		T_J=25℃		80		ns
			T_J=125℃		150		ns
			T_J=150℃		170		ns
E_{on}	Turn on Energy	V_{CC}=600V,I_C=50A R_G =10Ω, V_{GE}=±15V, Inductive Load	T_J=125℃		5.6		mJ
			T_J=150℃		6.5		mJ
E_{off}	Turn off Energy		T_J=125℃		4.5		mJ
			T_J=150℃		4.8		mJ
I_{SC}	Short Circuit Current	tpsc≤10μS , V_{GE}=15V T_J=150℃,V_{CC}=600V			230		A
R_{thJC}	Junction to Case Thermal Resistance （ Per IGBT）					0.44	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=50A , V_{GE}=0V, T_J =25℃		1.9	2.4	V
		I_F=50A , V_{GE}=0V, T_J =125℃		1.65		
		I_F=50A , V_{GE}=0V, T_J =150℃		1.6		
t_{rr}	Reverse Recovery Time	I_F=50A , V_R=600V dI_F/dt=-1200A/μs T_J =150℃		270		ns
I_{RRM}	Max. Reverse Recovery Current			70		A
E_{rec}	Reverse Recovery Energy			3.6		mJ
R_{thJCD}	Junction to Case Thermal Resistance (Per Diode)				0.72	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		KΩ
$B_{25/50}$	$R_2 = R_{25}$ 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

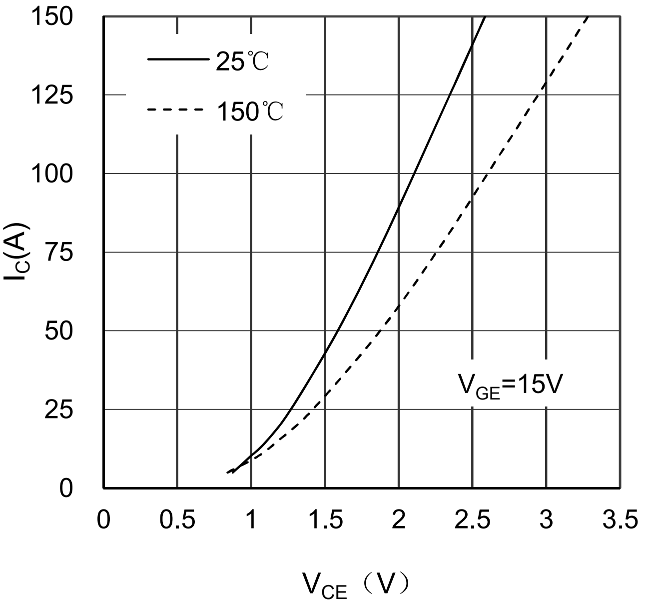


Figure 1. Typical Output Characteristics IGBT-inverter

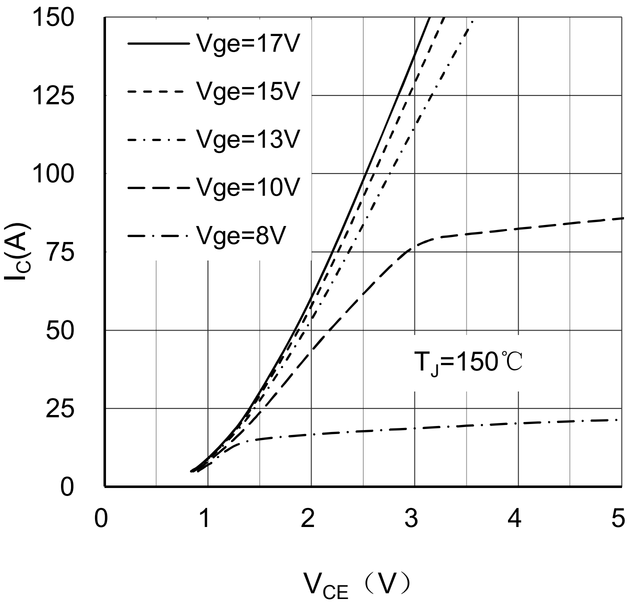


Figure 2. Typical Output Characteristics IGBT-inverter

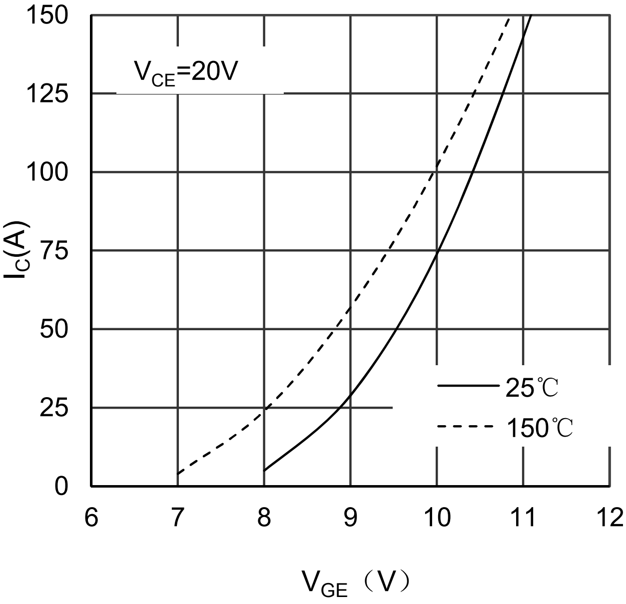


Figure 3. Typical Transfer characteristics IGBT-inverter

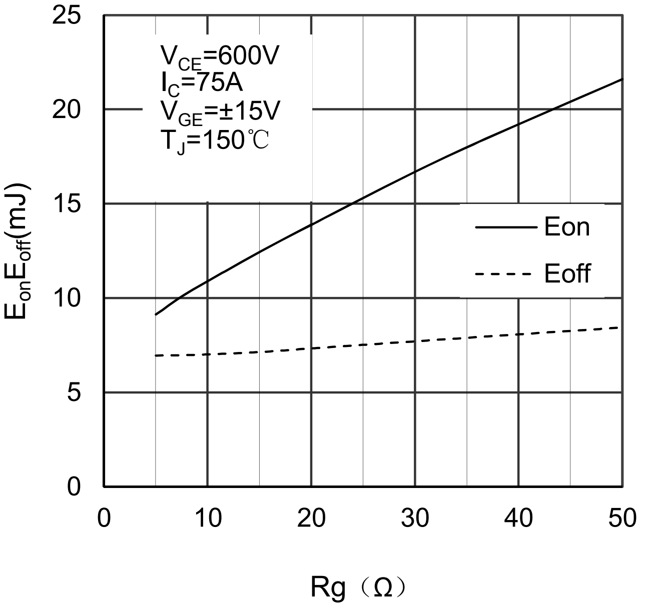


Figure 4. Switching Energy vs Gate Resistor IGBT-inverter

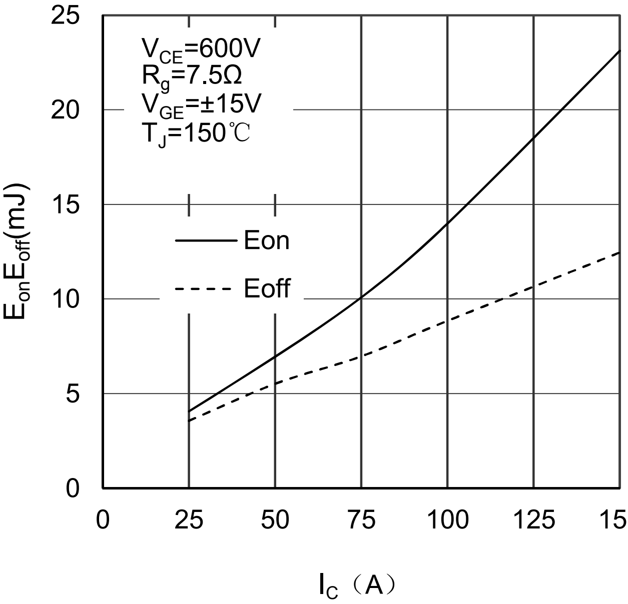


Figure 5. Switching Energy vs Collector Current IGBT-inverter

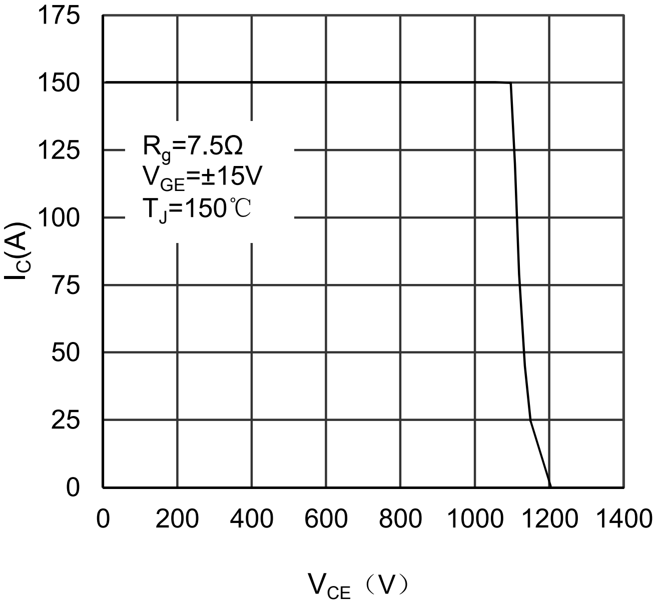


Figure 6. Reverse Biased Safe Operating Area IGBT-inverter

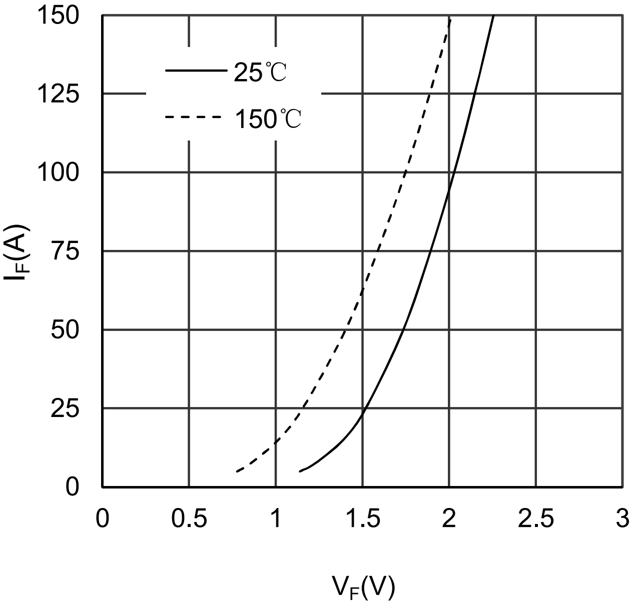


Figure 7. Diode Forward Characteristics Diode -inverter

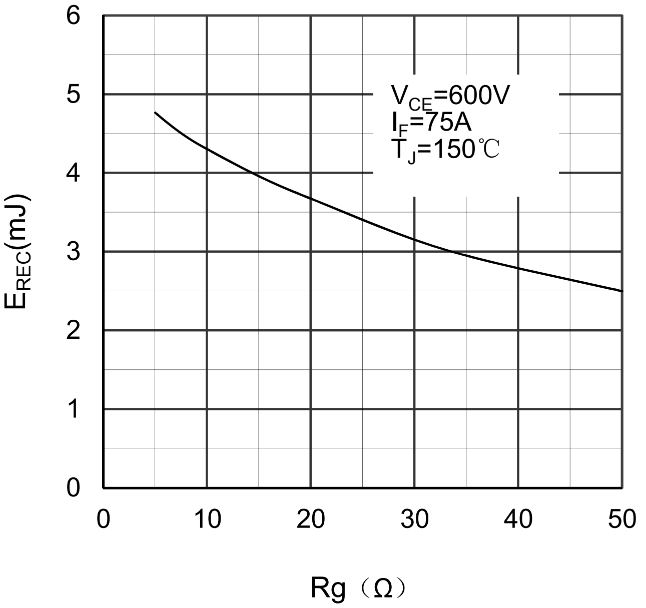


Figure 8. Switching Energy vs Gate Resistor Diode -inverter

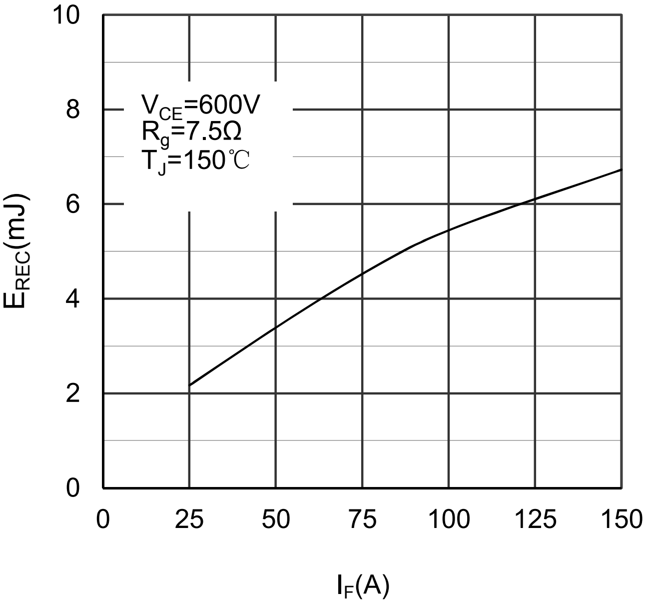


Figure 9. Switching Energy vs Forward Current Diode-inverter

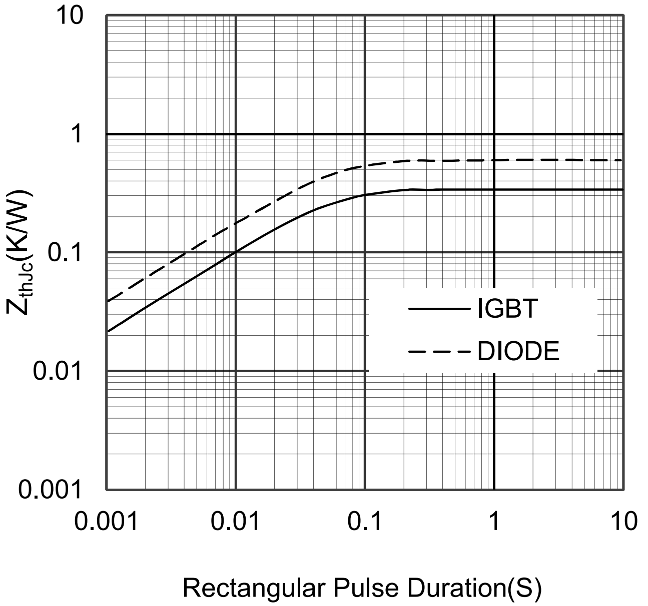


Figure 10. Transient Thermal Impedance of Diode and IGBT-inverter

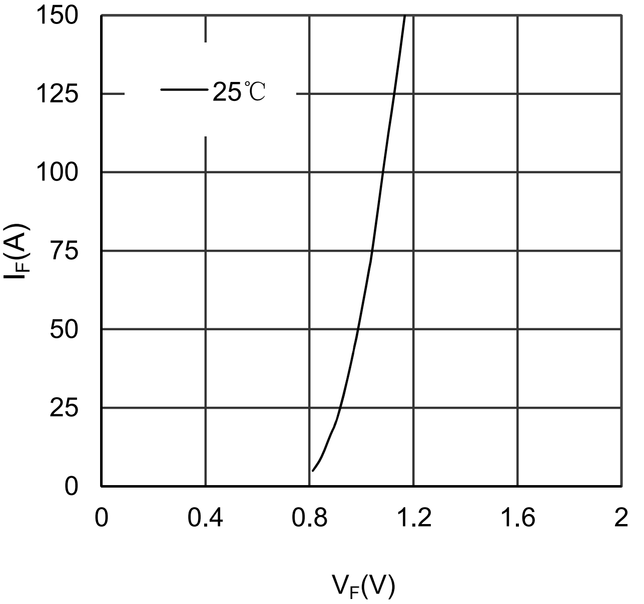


Figure 11. Diode Forward Characteristics Diode- rectifier

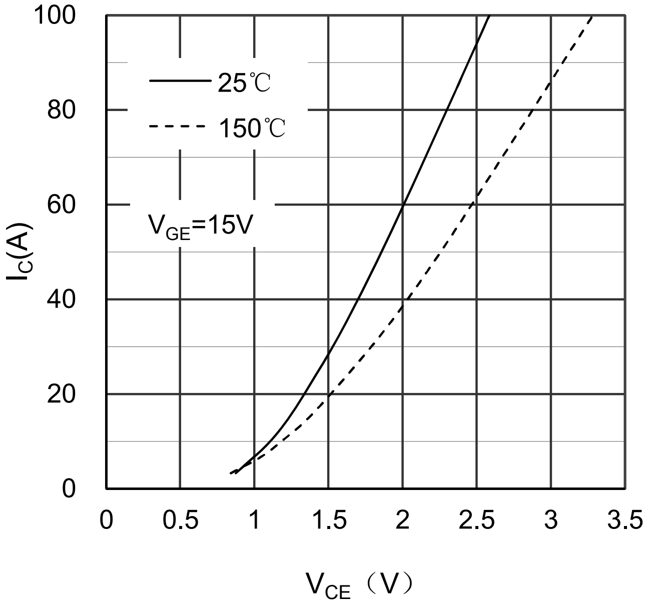


Figure 12. Typical Output Characteristics IGBT- brake chopper

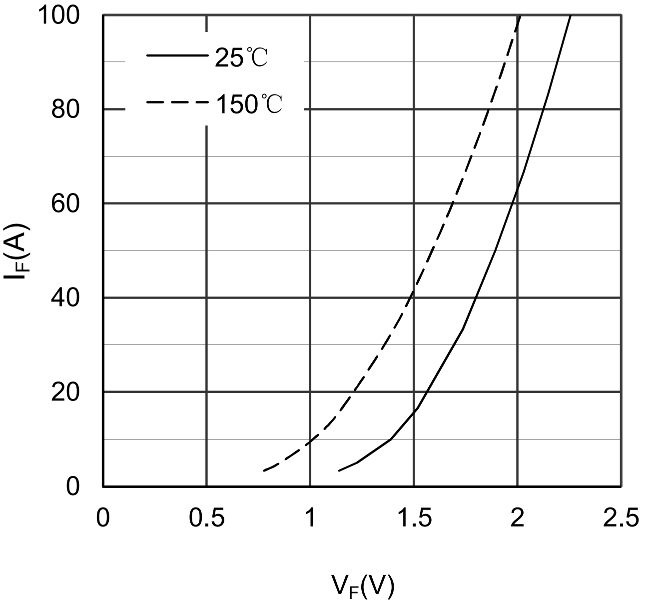


Figure 13. Diode Forward Characteristics Diode - brake chopper

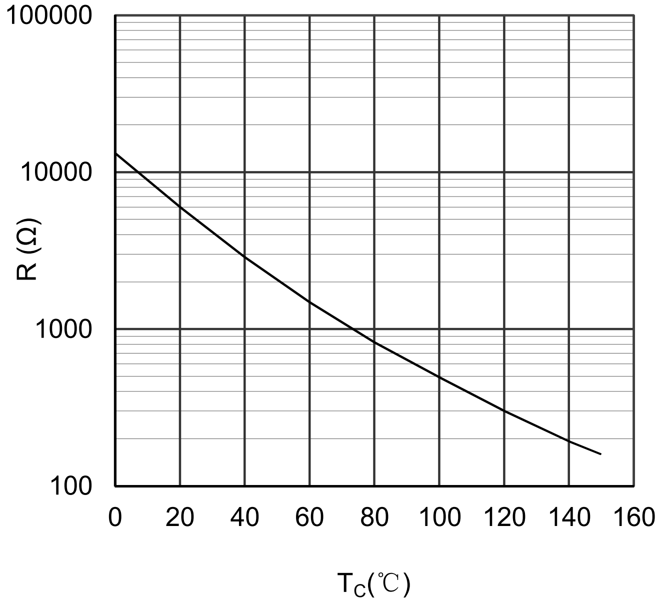


Figure 14. NTC Characteristics

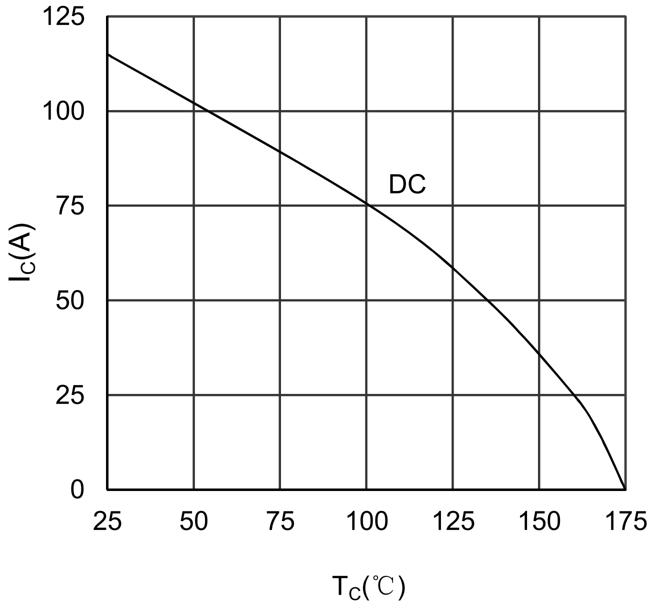


Figure 15. Collector Current vs Case temperature IGBT -inverter

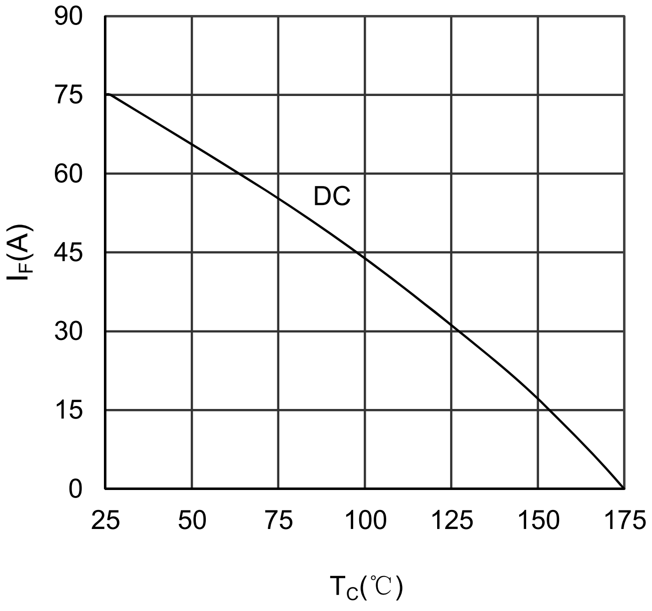


Figure 16. Forward current vs Case temperature Diode -inverter

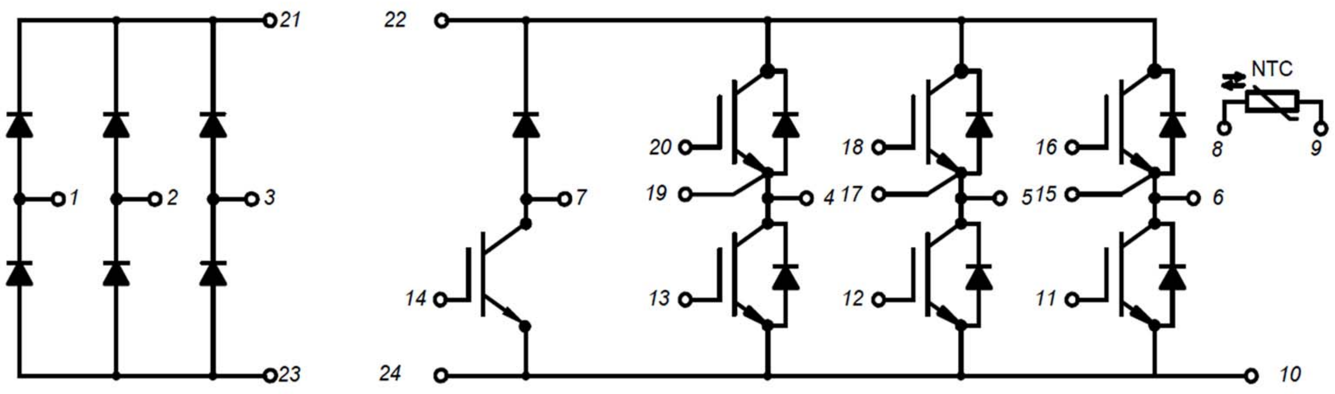
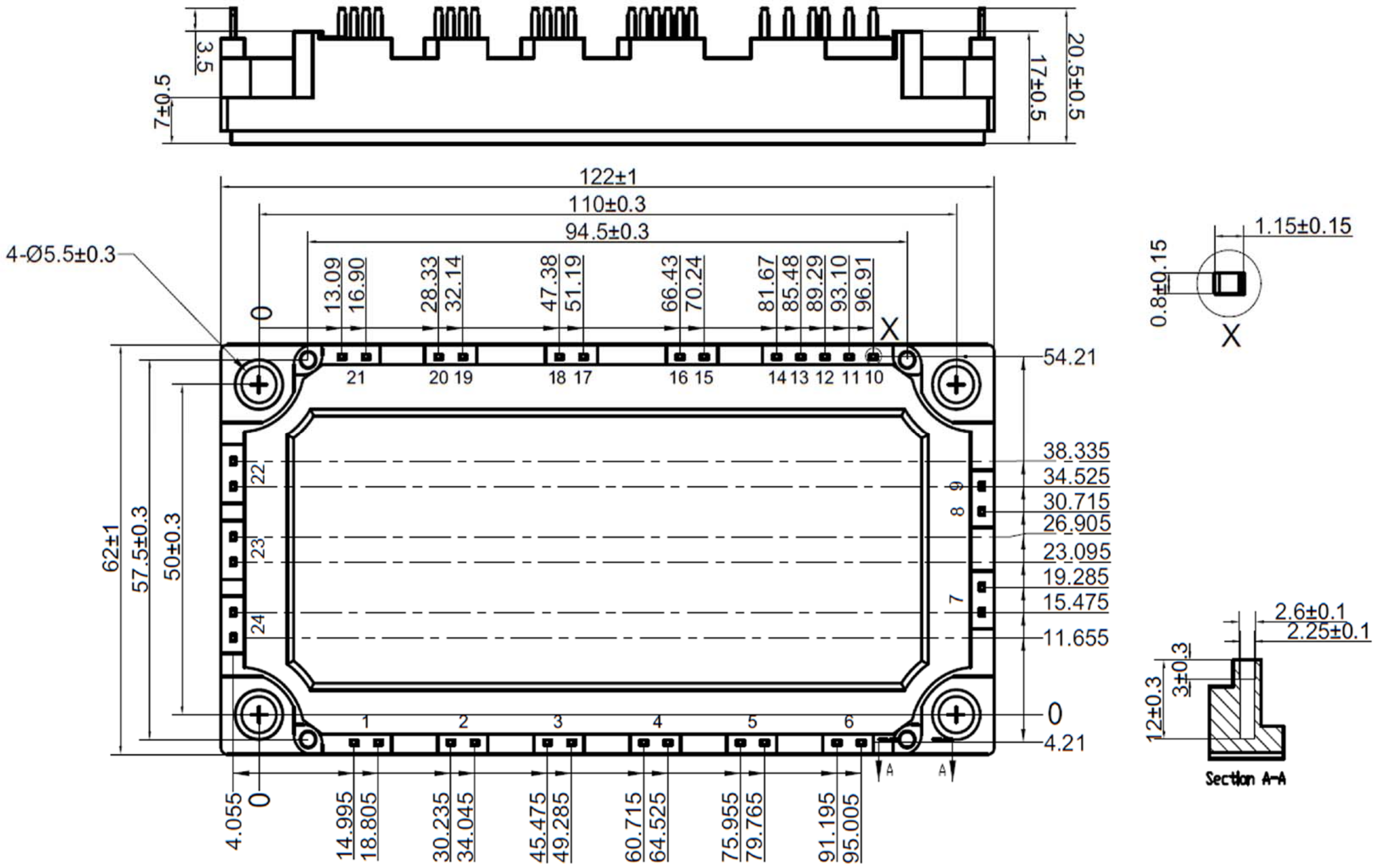


Figure 17. Circuit Diagram



Dimensions in (mm)

Figure 18. Package Outline