MMG75HE120XB6T7_W11

1200V 75A PIM Module

September 2024 | Preliminary | RoHS Compliant

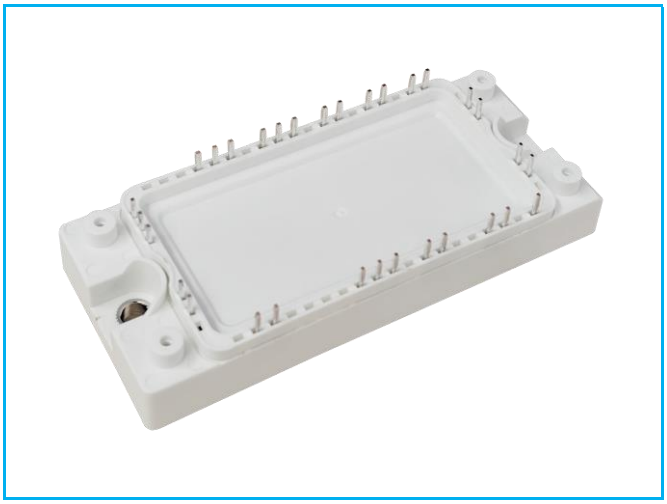
PRODUCT FEATURES

☐ Substrate for Low Thermal Resistance

☐ Low saturation voltage and positive temperature coefficient

☐ Solder Contact Technology, Rugged mounting due to integrated Mounting clamps

☐ High power density



Rectifier+Brake+Inverter

APPLICATIONS

☐ Air conditioning

☐ Auxiliary inverters

☐ Motor drives

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=105℃, T_{Jmax}=175℃	75	A
I_{CM}	Repetitive Peak Collector Current	tp=1ms	150	
P_{tot}	Power Dissipation Per IGBT	T_C=25℃, T_{Jmax}=175℃	340	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	Continue Forward Current	T_C=90℃, T_{Jmax}=175℃	75	A
I_{FRM}	Repetitive Peak Forward Current	tp=1ms	150	
I_{FSM}	Non Repetitive Peak Forward Current	T_J=150℃, t=10ms, V_R=0V	270	
I^2t			364	A^2s

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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
$V_{CE(sat)}$ chip	Collector - Emitter Saturation Voltage	I_C=75A, V_{GE}=15V, T_J=25℃			1.55		
		I_C=75A, V_{GE}=15V, T_J=125℃			1.80		
		I_C=75A, V_{GE}=15V, T_J=175℃			1.90		
I_{CES}	Collector Leakage Current	V_{CE}=1200V, V_{GE}=0V, T_J=25℃				1	mA
I_{GES}	Gate Leakage Current	V_{CE}=0V,V_{GE}=±20V, T_J=25℃		-200		200	nA
R_{Gint}	Integrated Gate Resistor				5.9		Ω
Q_G	Gate Charge	V_{CE}=600V, I_C=75A , V_{GE}=15V			0.38		μC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =100kHz			10.5		nF
C_{oes}	Output Capacitance				0.81		nF
C_{res}	Reverse Transfer Capacitance				0.0475		nF
$t_{d(on)}$	Turn on Delay Time	V_{CC}=600V,I_C=75A R_G =3.3Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		60		ns
			T_J=125℃		60		ns
			T_J=175℃		60		ns
t_r	Rise Time		T_J=25℃		17		ns
			T_J=125℃		24		ns
			T_J=175℃		30		ns
$t_{d(off)}$	Turn off Delay Time	V_{CC}=600V,I_C=75A R_G =3.3Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		345		ns
			T_J=125℃		385		ns
			T_J=175℃		450		ns
t_f	Fall Time		T_J=25℃		255		ns
			T_J=125℃		385		ns
			T_J=175℃		490		ns
E_{on}	Turn on Energy	V_{CC}=600V,I_C=75A R_G =3.3Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		1.81		mJ
			T_J=125℃		3.10		mJ
			T_J=175℃		3.96		mJ
E_{off}	Turn off Energy		T_J=25℃		8.66		mJ
			T_J=125℃		11.24		mJ
			T_J=175℃		14.04		mJ
I_{SC}	Short Circuit Current	tpsc≤8μs , V_{GE}=15V T_J=150℃,V_{CC}=800V			330		A
R_{thJC}	Junction to Case Thermal Resistance (Per IGBT)					0.44	K /W

Diode-inverter

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

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
V_F chip	Forward Voltage	I_F=75A , V_{GE}=0V, T_J=25℃		2.05		V
		I_F=75A , V_{GE}=0V, T_J=125℃		1.75		
		I_F=75A , V_{GE}=0V, T_J=175℃		1.65		
t_{rr}	Reverse Recovery Time	I_F=75A , V_R=600V dI_F/dt=-2100A/μs T_J =175℃		235		ns
I_{RRM}	Max. Reverse Recovery Current			190		A
Q_{RR}	Reverse Recovery Charge			15.3		μC
E_{rec}	Reverse Recovery Energy			11.36		mJ
R_{thJCD}	Junction to Case Thermal Resistance （ Per Diode）				0.63	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
$I_{F(AV)}$	Average Forward Current Per Diode	T_C=85℃	75	A
I_{FSM}	Non Repetitive Surge Forward Current	T_J=150℃, t=10ms, 50Hz	600	
I^2t		T_J=150℃, t=10ms, 50Hz	1800	A^2s

Diode-RECTIFIER

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

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
V_F chip	Forward Voltage	I_F=75A , T_J=25℃		1.10		V
		I_F=75A , T_J=150℃		1.04		
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）				0.66	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=115℃, T_{Jmax}=175℃	50	A
I_{CM}	Repetitive Peak Collector Current	tp=1ms	100	
P_{tot}	Power Dissipation Per IGBT	T_C=25℃, T_{Jmax}=175℃	250	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	Continue Forward Current		25	A
I_{FRM}	Repetitive Peak Forward Current	tp=1ms	50	
I^2t		T_J=125℃, t=10ms, V_R=0V	162	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=3mA		5.3	6.0	6.8	V
$V_{CE(sat)}$ chip	Collector Emitter Saturation Voltage	I_C=50A, V_{GE}=15V, T_J=25℃			1.55		
		I_C=50A, V_{GE}=15V, T_J=125℃			1.8		
		I_C=50A, V_{GE}=15V, T_J=175℃			1.90		
I_{CES}	Collector Leakage Current	V_{CE}=1200V, V_{GE}=0V, T_J=25℃				1	mA
I_{GES}	Gate Leakage Current	V_{CE}=0V,V_{GE}=±20V, T_J=25℃		-400		400	nA
Q_G	Gate Charge	V_{CE}=600V, I_C=50A , V_{GE}=15V			0.3		µC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz			7.15		nF
C_{oes}	Output Capacitance				0.407		nF
C_{res}	Reverse Transfer Capacitance				0.033		pF
$t_{d(on)}$	Turn on Delay Time	V_{CC}=600V,I_C=50A R_G =7.5Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		56		ns
			T_J=125℃		62		ns
			T_J=175℃		62		ns
t_r	Rise Time		T_J=25℃		36		ns
			T_J=125℃		44		ns
			T_J=175℃		46		ns
$t_{d(off)}$	Turn off Delay Time	V_{CC}=600V,I_C=50A R_G =7.5Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		360		ns
			T_J=125℃		400		ns
			T_J=175℃		415		ns
t_f	Fall Time		T_J=25℃		280		ns
			T_J=125℃		430		ns
			T_J=175℃		480		ns
E_{on}	Turn on Energy	V_{CC}=600V,I_C=50A R_G =7.5Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		2.8		mJ
			T_J=125℃		4.9		mJ
			T_J=175℃		5.7		mJ
E_{off}	Turn off Energy		T_J=25℃		6.3		mJ
			T_J=125℃		8.3		mJ
			T_J=175℃		8.8		mJ
I_{SC}	Short Circuit Current	tpsc≤8µs , V_{GE}=15V T_J=150℃,V_{CC}=800V			200		A
R_{thJC}	Junction to Case Thermal Resistance (Per IGBT)					0.6	K /W

Diode-Brake chopper

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

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
V_F chip	Forward Voltage	I_F=25A , V_{GE}=0V, T_J=25℃		1.8		V
		I_F=25A , V_{GE}=0V, T_J=125℃		1.55		
		I_F=25A , V_{GE}=0V, T_J=175℃		1.45		
t_{rr}	Reverse Recovery Time	I_F=50A , V_R=600V dI_F/dt=-1400A/μs T_J =175℃		680		ns
I_{RRM}	Max. Reverse Recovery Current			45		A
Q_{RR}	Reverse Recovery Charge			11.4		μC
E_{rec}	Reverse Recovery Energy			6.7		mJ
R_{thJCD}	Junction to Case Thermal Resistance (Per Diode)				1.2	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		-40~175	
T_{stg}	Storage Temperature		-40~125	
V_{isol}	Isolation Breakdown Voltage	AC, 50Hz(R.M.S), t=1minute	2500	V
CTI	Comparative Tracking Index		⩾200	
Md	Mounting Torque	Recommended（M5）	2.5~5	Nm
Weight			180	g

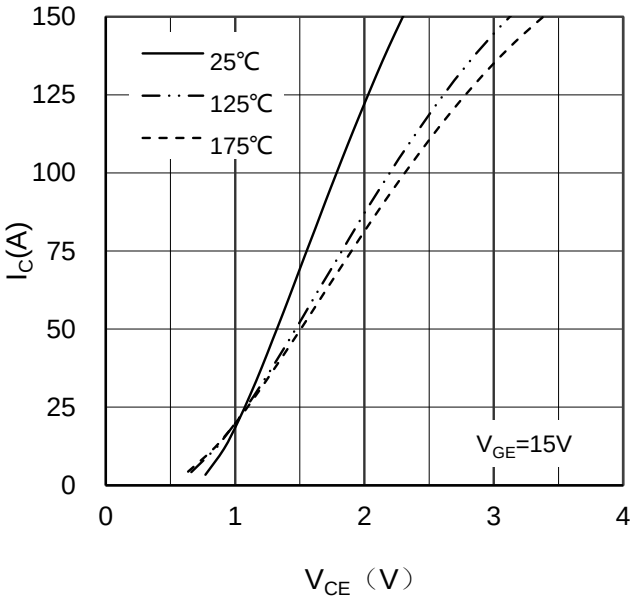


Figure 1. Typical Output Characteristics IGBT-inverter

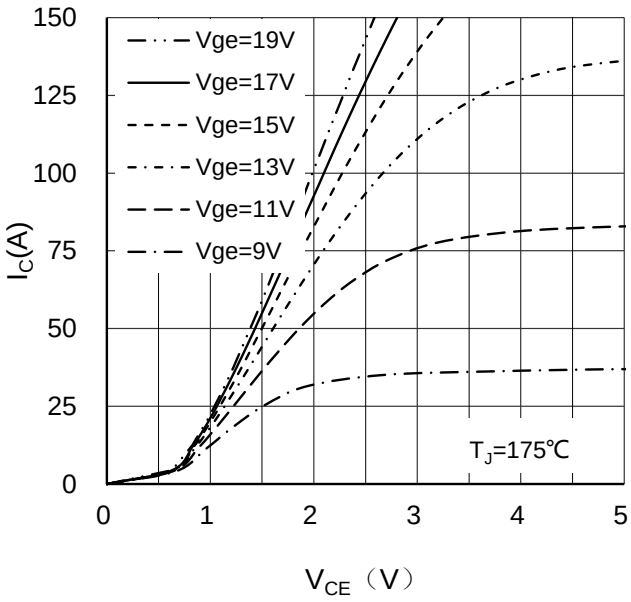


Figure 2. Typical Output Characteristics IGBT-inverter

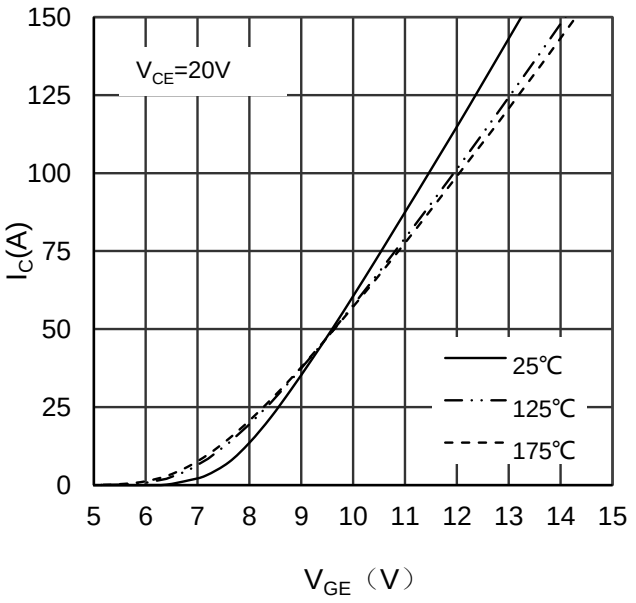


Figure 3. Typical Transfer characteristics IGBT-inverter

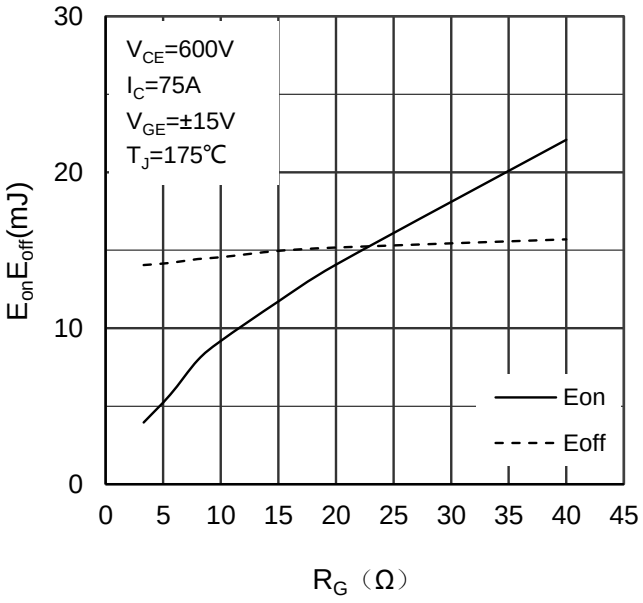


Figure 4. Switching Energy vs Gate Resistor IGBT-inverter

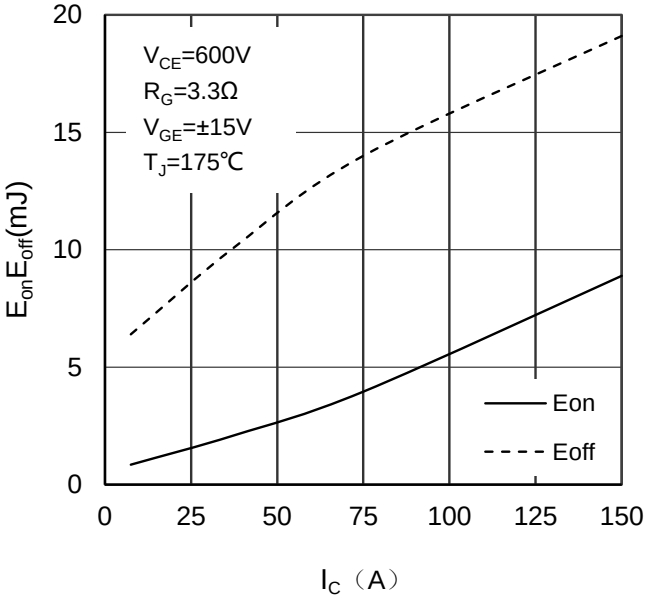


Figure 5. Switching Energy vs Collector Current IGBT-inverter

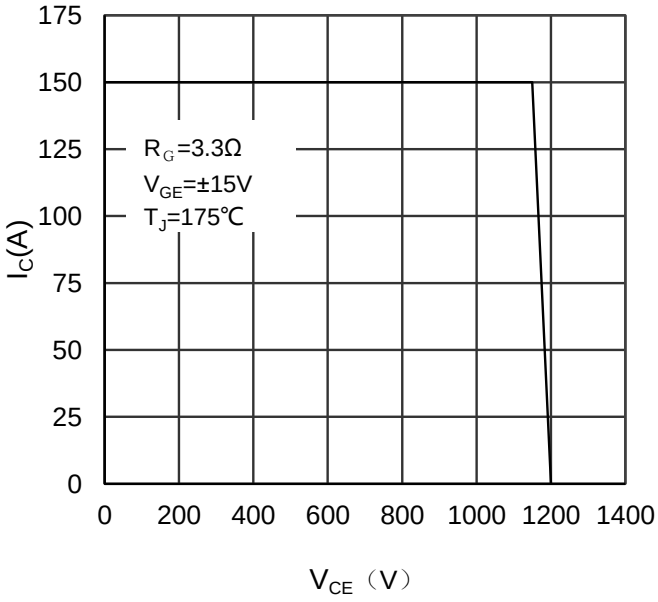


Figure 6. Reverse Biased Safe Operating Area IGBT-

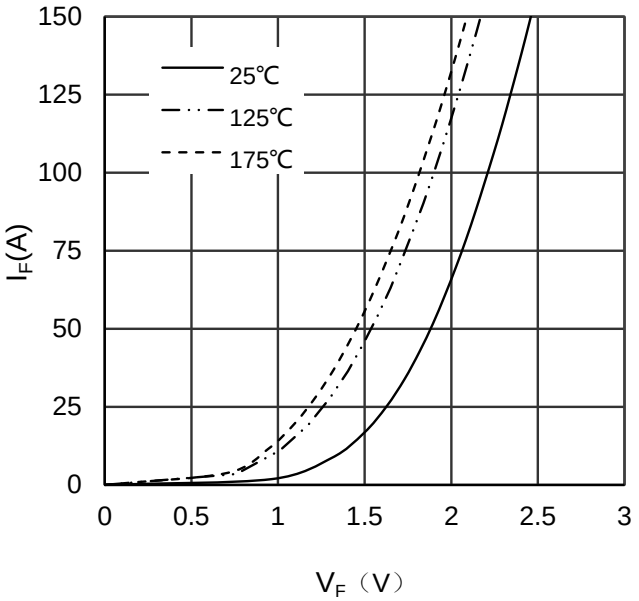


Figure 7. Diode Forward Characteristics Diode -inverter

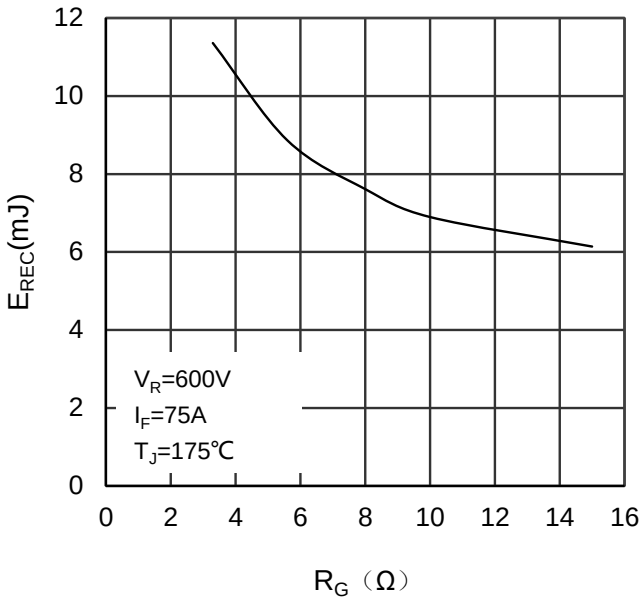


Figure 8. Switching Energy vs Gate Resistor Diode -inverter

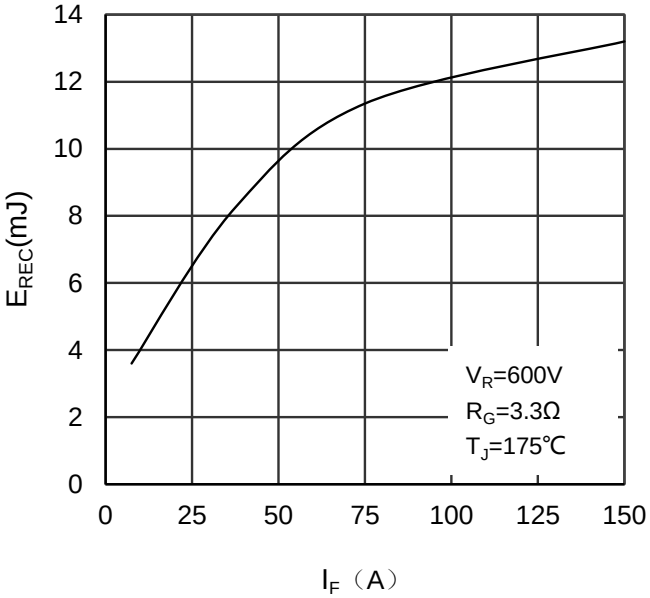


Figure 9. Switching Energy vs Forward Current Diode-inverter

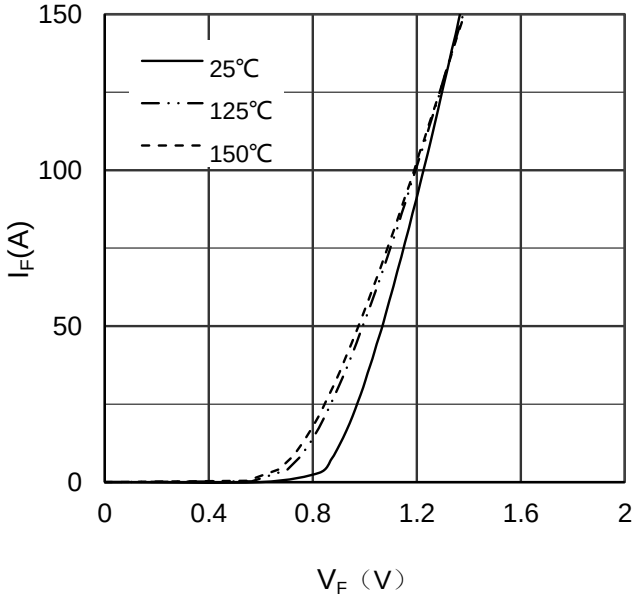


Figure 10. Diode Forward Characteristics Diode- rectifier

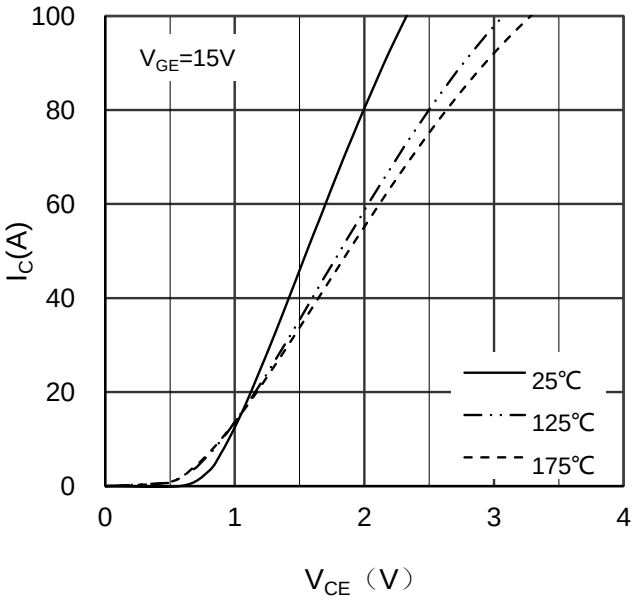


Figure 11. Typical Output Characteristics
IGBT- brake chopper

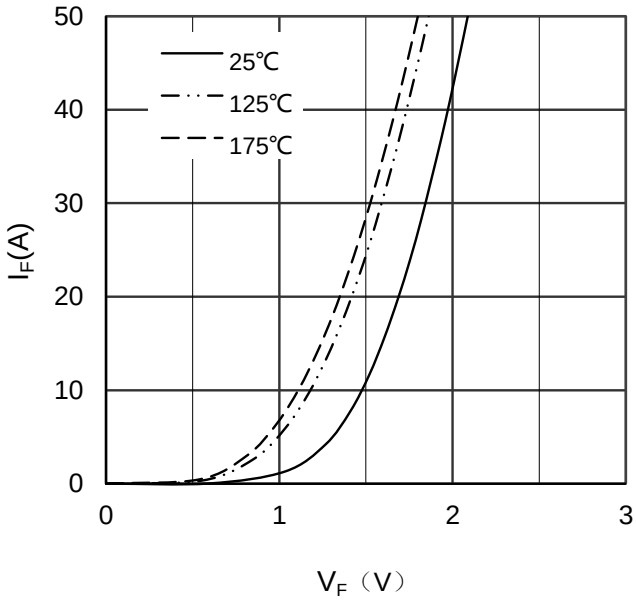


Figure 12. Diode Forward Characteristics
Diode - brake chopper

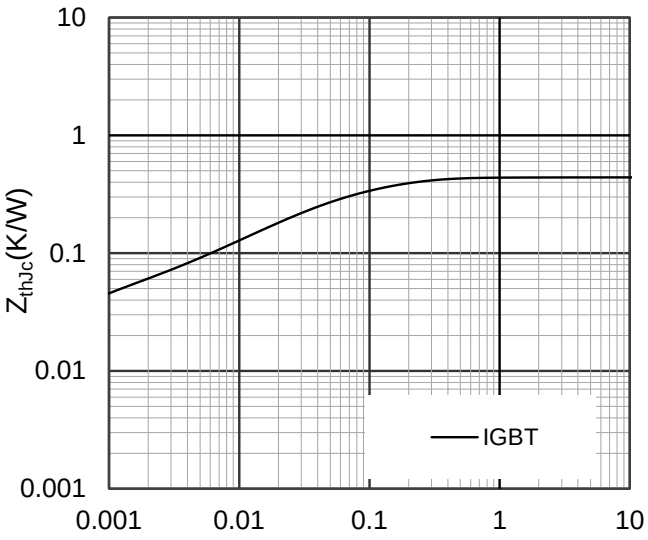


Figure 13. Transient Thermal Impedance of IGBT-inverter

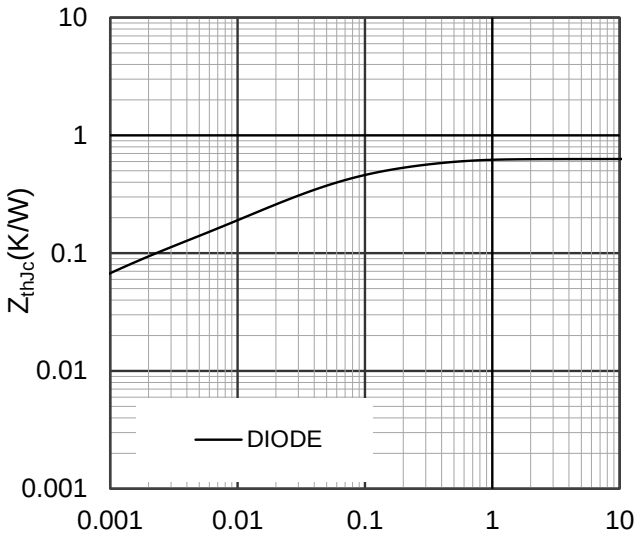


Figure 14. Transient Thermal Impedance of Diode-inverter

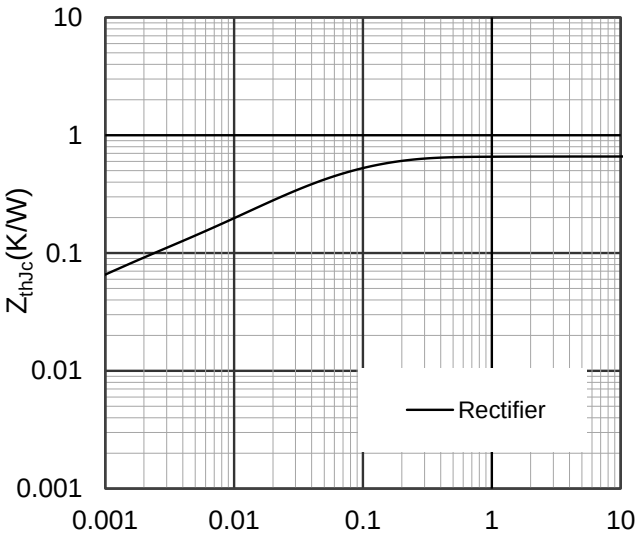


Figure 15. Transient Thermal Impedance of Rectifier

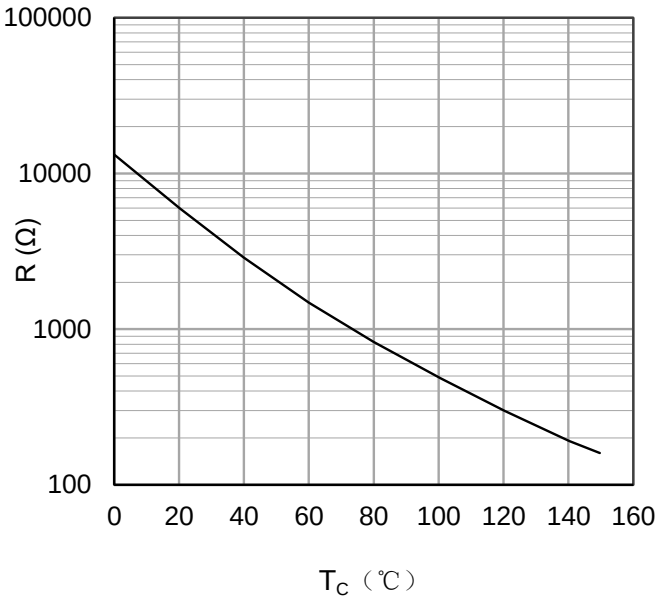


Figure 16. NTC Characteristics

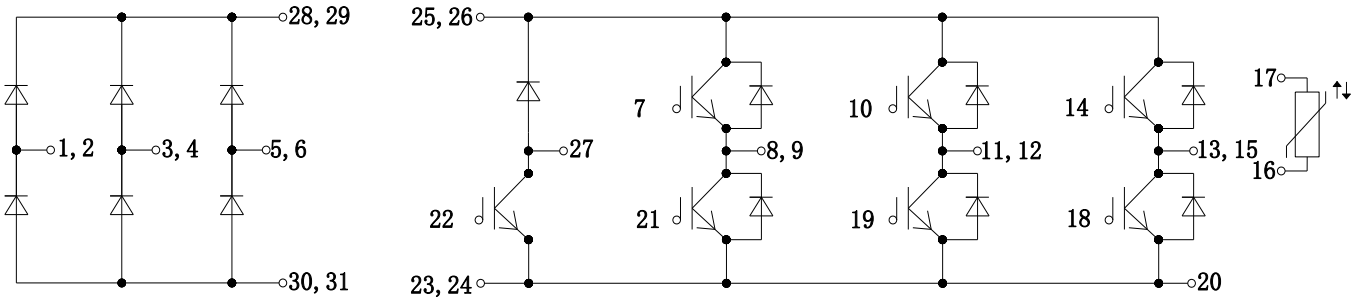
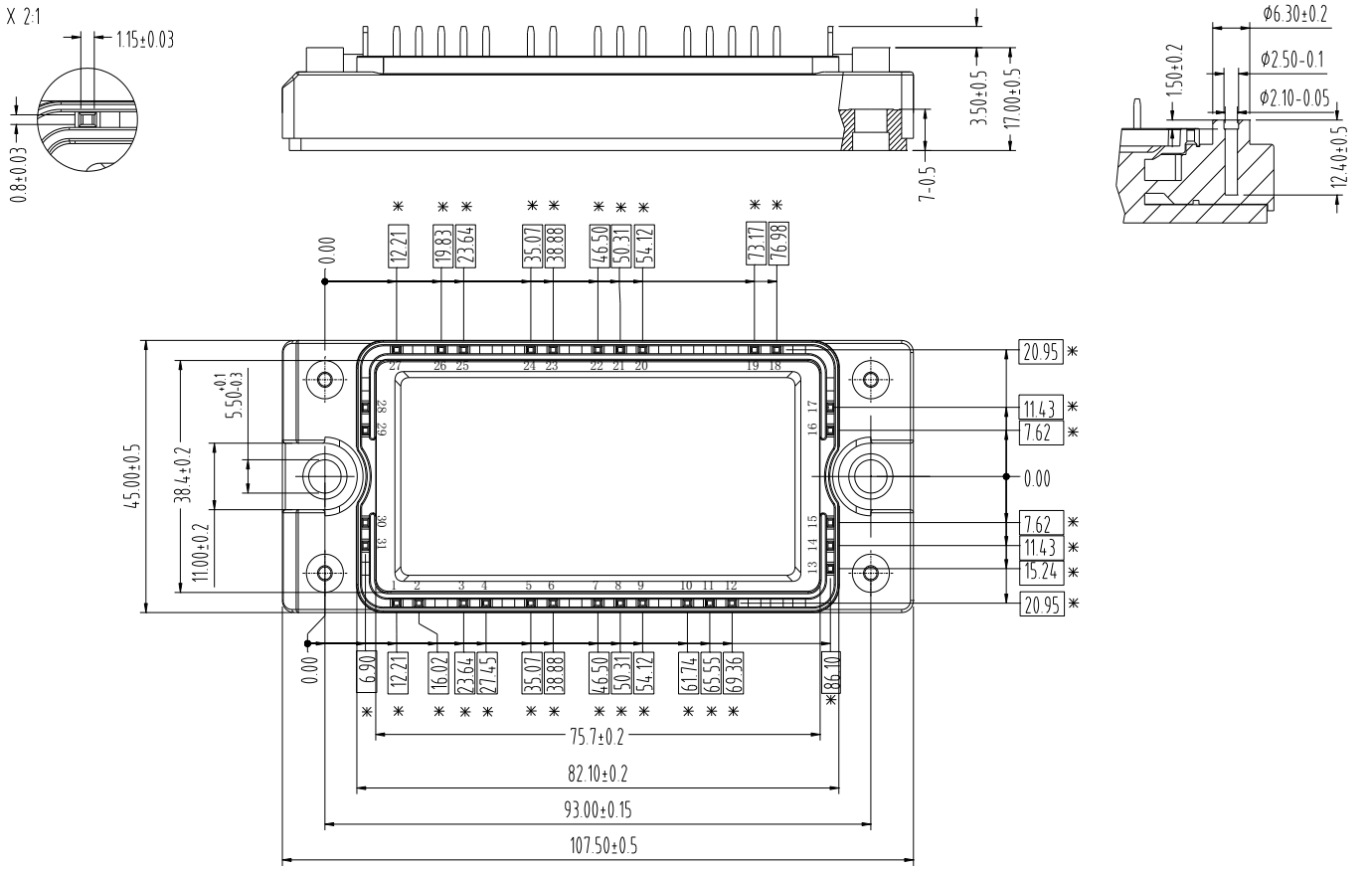


Figure 17. Circuit Diagram



Dimensions in （mm）

Figure 18. Package Outline