MMG25HD120XB6TC

1200V 25A PIM Module

November 2022 Version 02 RoHS Compliant

PRODUCT FEATURES

☐ Substrate for Low Thermal Resistance

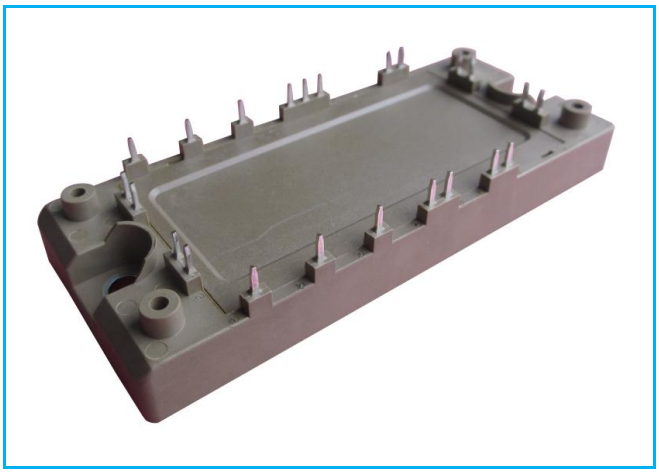
☐ Low saturation voltage and positive temperature coefficient

☐ Fast switching and short tail current

☐ Free wheeling diodes with fast and soft reverse recovery

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

☐ Temperature sense included



Rectifier+Brake+Inverter

APPLICATIONS

☐ AC motor control

☐ Motion/servo control

☐ Inverter and power supplies

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℃	39	A
		T_C=100℃, T_{Jmax}=175℃	25	
I_{CM}	Repetitive Peak Collector Current	tp=1ms	50	
P_{tot}	Power Dissipation Per IGBT	T_C=25℃, T_{Jmax}=175℃	166	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		25	A
I_{FRM}	Repetitive Peak Forward Current	tp=1ms	50	
I^2t		T_J =125℃, t=10ms, V_R=0V	110	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=0.8mA		5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	I_C=25A, V_{GE}=15V, T_J=25℃			1.85	2.3	
		I_C=25A, V_{GE}=15V, T_J=125℃			2.15		
		I_C=25A, V_{GE}=15V, T_J=150℃			2.25		
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	mA
I_{GES}	Gate Leakage Current	V_{CE}=0V,V_{GE}=±15V, T_J=25℃		-400		400	nA
R_{Gint}	Integrated Gate Resistor				0		Ω
Q_G	Gate Charge	V_{CE}=600V, I_C=25A , V_{GE}=15V			0.15		μC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz			1.9		nF
C_{res}	Reverse Transfer Capacitance				85		pF
$t_{d(on)}$	Turn on Delay Time	V_{CC}=600V,I_C=25A R_G =30Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		35		ns
			T_J=125℃		40		ns
			T_J=150℃		40		ns
t_r	Rise Time		T_J=25℃		35		ns
			T_J=125℃		40		ns
			T_J=150℃		40		ns
$t_{d(off)}$	Turn off Delay Time	V_{CC}=600V,I_C=25A R_G =30Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		210		ns
			T_J=125℃		250		ns
			T_J=150℃		270		ns
t_f	Fall Time		T_J=25℃		190		ns
			T_J=125℃		210		ns
			T_J=150℃		230		ns
E_{on}	Turn on Energy	V_{CC}=600V,I_C=25A R_G =30Ω, V_{GE}=±15V, Inductive Load	T_J=125℃		3.5		mJ
			T_J=150℃		3.7		mJ
E_{off}	Turn off Energy		T_J=125℃		2.4		mJ
			T_J=150℃		2.55		mJ
I_{SC}	Short Circuit Current	tpsc≤10μS , V_{GE}=15V T_J=150℃,V_{CC}=600V			110		A
R_{thJC}	Junction to Case Thermal Resistance (Per IGBT)					0.9	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=25A , V_{GE}=0V, T_J=25℃		1.9	2.3	V
		I_F=25A , V_{GE}=0V, T_J=125℃		1.7		
		I_F=25A , V_{GE}=0V, T_J=150℃		1.65		
t_{rr}	Reverse Recovery Time	I_F=25A , V_R=600V dI_F/dt=-550A/μs T_J =150℃		450		ns
I_{RRM}	Max. Reverse Recovery Current			27		A
Q_{RR}	Reverse Recovery Charge			4.3		μC
E_{rec}	Reverse Recovery Energy			1.6		mJ
R_{thJCD}	Junction to Case Thermal Resistance （Per Diode）				1.4	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℃	2000	V
$I_{F(AV)}$	Average Forward Current Per Diode	T_C=80℃	30	A
I_{FRMS}	R.M.S. Forward Current Per Diode		75	
I_{RMS}	R.M.S. Current at rectifier output		80	
I_{FSM}	Non Repetitive Surge Forward Current	T_J=45℃, t=10ms, 50Hz	500	
		T_J=45℃, t=8.3ms, 60Hz	560	
I^2t		T_J=45℃, t=10ms, 50Hz	1250	A^2s
		T_J=45℃, t=8.3ms, 60Hz	1250	

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=25A , T_J=25℃		1.1	1.25	V
		I_F=25A , 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）				0.8	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℃	25	A
		T_C=105℃, T_{Jmax}=175℃	15	
I_{CM}	Repetitive Peak Collector Current	tp=1ms	30	
P_{tot}	Power Dissipation Per IGBT	T_C=25℃, T_{Jmax}=175℃	107	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		10	A
I_{FRM}	Repetitive Peak Forward Current	tp=1ms	20	
I^2t		T_J=125℃, t=10ms, V_R=0V	25	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=0.38mA		5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector - Emitter Saturation Voltage	I_C=15A, V_{GE}=15V, T_J=25℃			1.9	2.3	
		I_C=15A, V_{GE}=15V, T_J=125℃			2.2		
		I_C=15A, V_{GE}=15V, T_J=150℃			2.3		
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	mA
I_{GES}	Gate Leakage Current	V_{CE}=0V,V_{GE}=±20V, T_J=25℃		-400		400	nA
R_{Gint}	Integrated Gate Resistor				0		Ω
Q_G	Gate Charge	V_{CE}=600V, I_C=15A , V_{GE}=15V			0.1		μC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz			1.1		nF
C_{res}	Reverse Transfer Capacitance				50		pF
$t_{d(on)}$	Turn on Delay Time	V_{CC}=600V,I_C=15A R_G =50Ω, 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℃		35		ns
			T_J=125℃		40		ns
			T_J=150℃		40		ns
$t_{d(off)}$	Turn off Delay Time	V_{CC}=600V,I_C=15A R_G =50Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		200		ns
			T_J=125℃		235		ns
			T_J=150℃		245		ns
t_f	Fall Time		T_J=25℃		150		ns
			T_J=125℃		210		ns
			T_J=150℃		230		ns
E_{on}	Turn on Energy	V_{CC}=600V,I_C=15A R_G =50Ω, V_{GE}=±15V, Inductive Load	T_J=125℃		1.8		mJ
			T_J=150℃		1.9		mJ
E_{off}	Turn off Energy		T_J=125℃		1.15		mJ
			T_J=150℃		1.2		mJ
I_{SC}	Short Circuit Current	tpsc≤10μS , V_{GE}=15V T_J=125℃,V_{CC}=800V			62		A
R_{thJC}	Junction to Case Thermal Resistance (Per IGBT)					1.4	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=10A , V_{GE}=0V, T_J=25℃		1.9	2.3	V
		I_F=10A , V_{GE}=0V, T_J=125℃		1.6		
		I_F=10A , V_{GE}=0V, T_J=150℃		1.55		
I_{RRM}	Max. Reverse Recovery Current	I_F=10A , V_R=600V dI_F/dt=-230A/μs T_J =150℃		13		A
Q_{RR}	Reverse Recovery Charge			2.3		μC
E_{rec}	Reverse Recovery Energy			0.66		mJ
R_{thJCD}	Junction to Case Thermal Resistance (Per Diode)				2.3	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			180	g

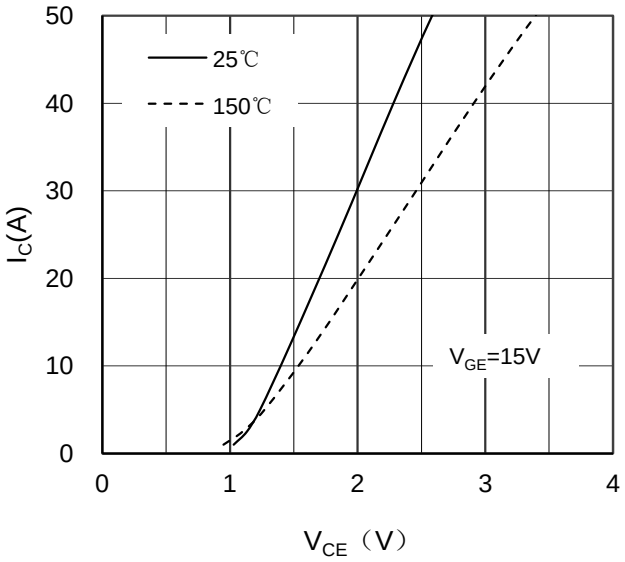


Figure 1. Typical Output Characteristics IGBT-inverter

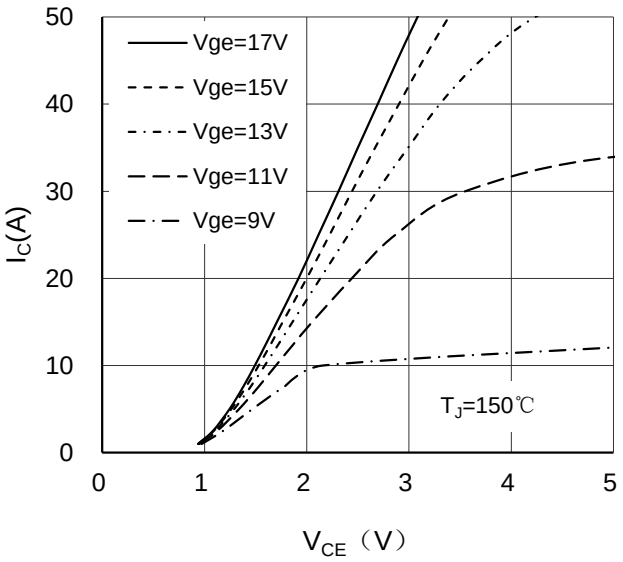


Figure 2. Typical Output Characteristics IGBT-inverter

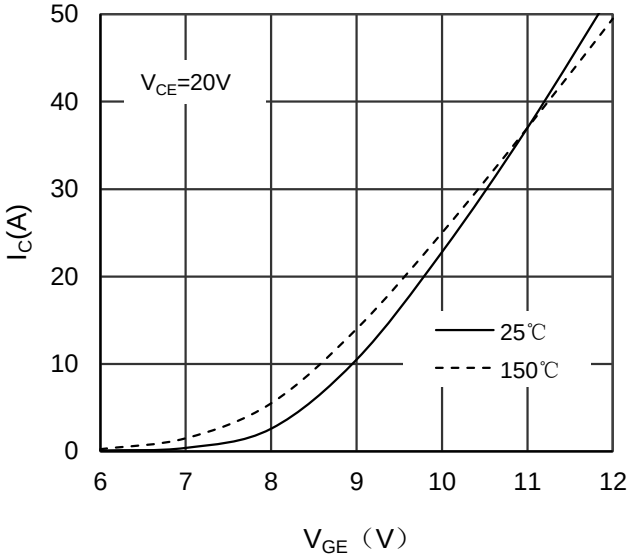


Figure 3. Typical Transfer characteristics IGBT-inverter

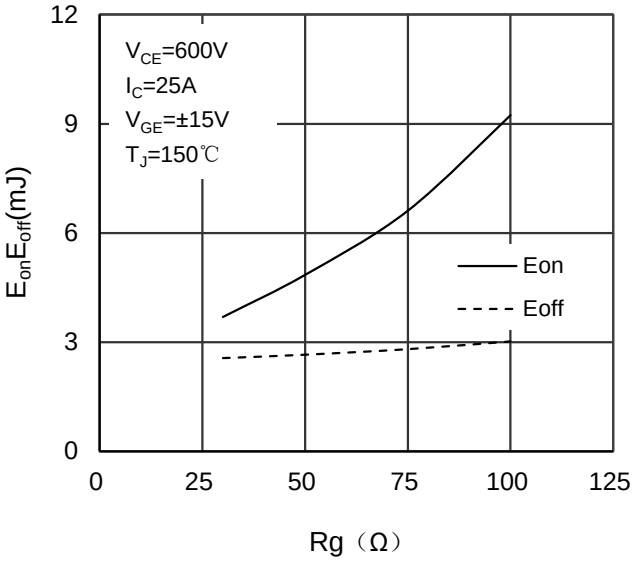


Figure 4. Switching Energy vs Gate Resistor IGBT-inverter

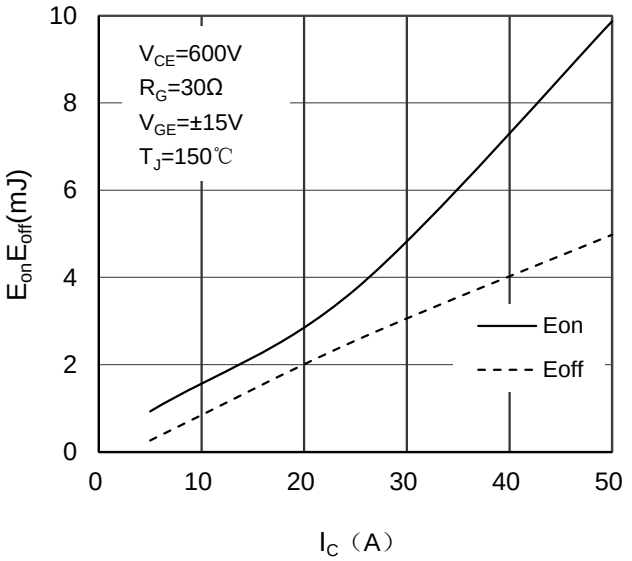


Figure 5. Switching Energy vs Collector Current IGBT-inverter

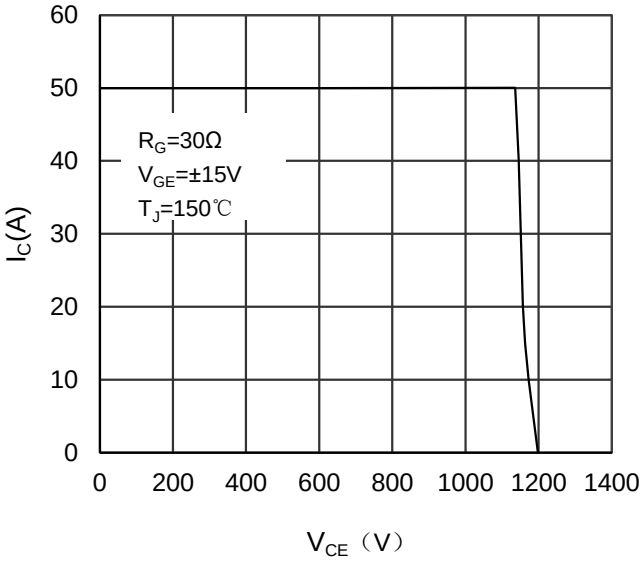


Figure 6. Reverse Biased Safe Operating Area IGBT-inverter

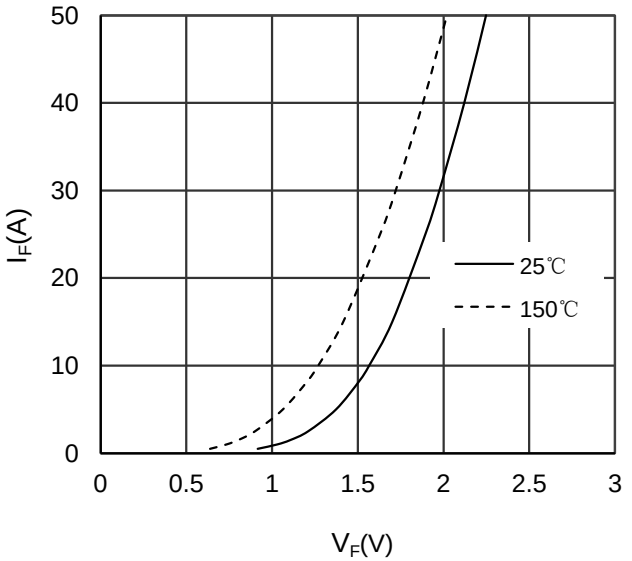


Figure 7. Diode Forward Characteristics Diode -inverter

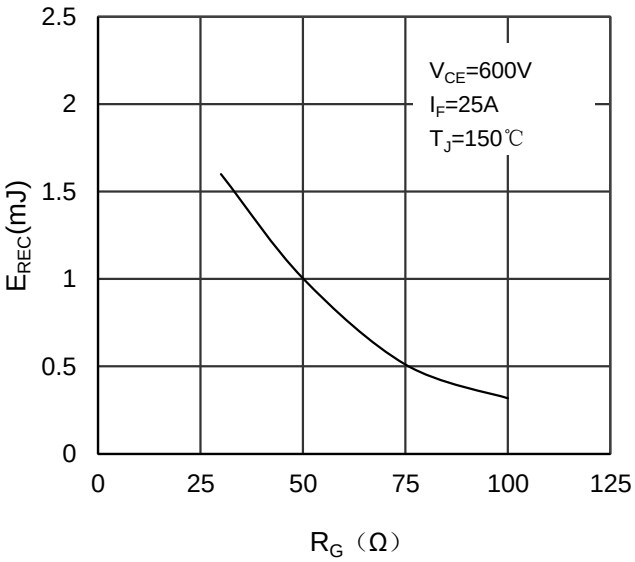


Figure 8. Switching Energy vs Gate Resistor Diode -inverter

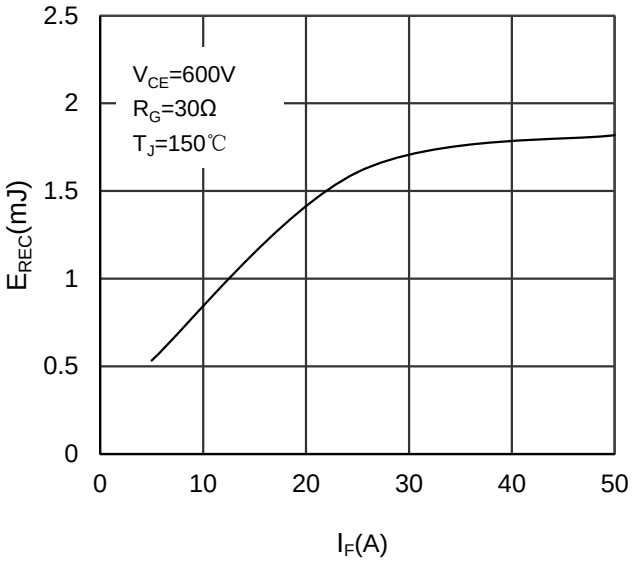


Figure 9. Switching Energy vs Forward Current Diode-inverter

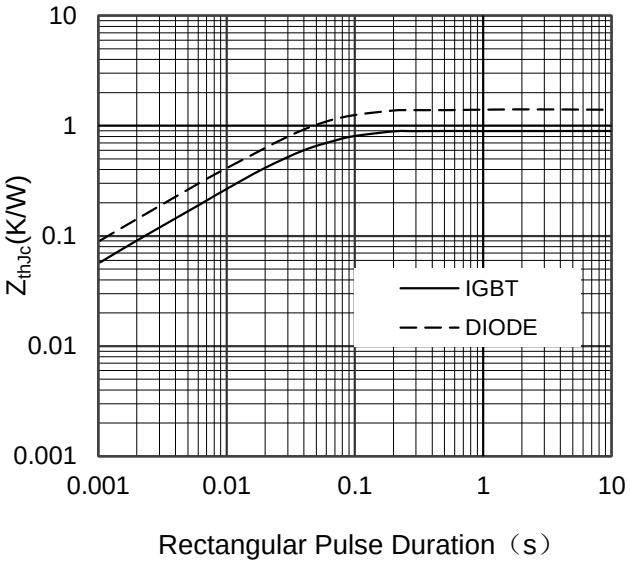


Figure 10. Transient Thermal Impedance of Diode and IGBT-inverter

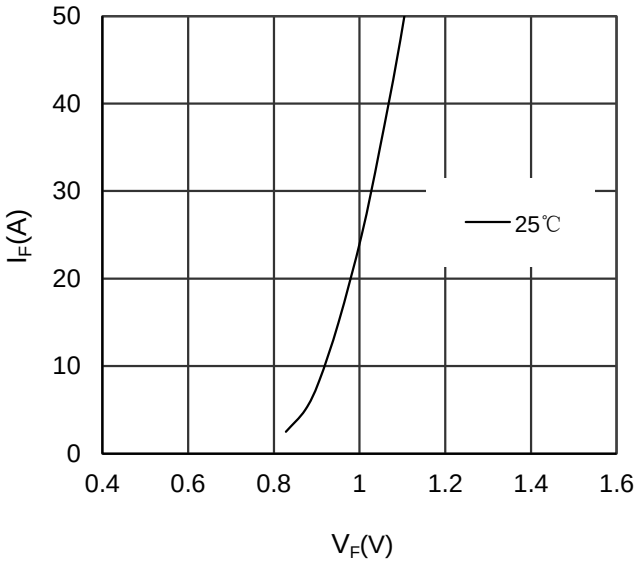


Figure 11. Diode Forward Characteristics Diode- rectifier

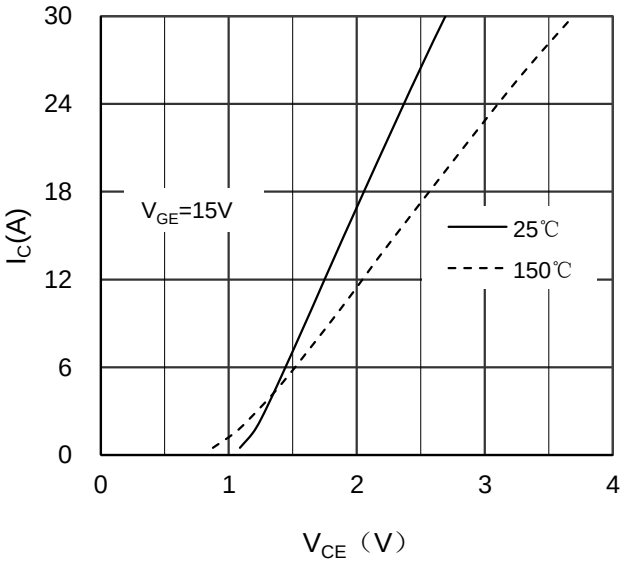


Figure 12. Typical Output Characteristics IGBT- brake chopper

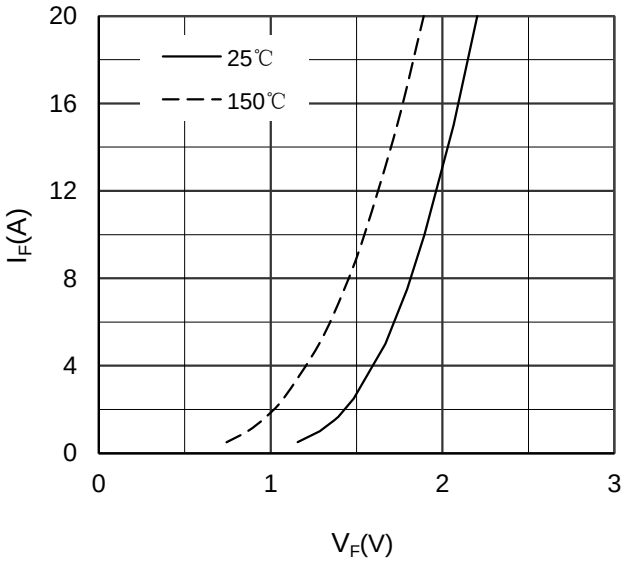


Figure 13. Diode Forward Characteristics Diode - brake chopper

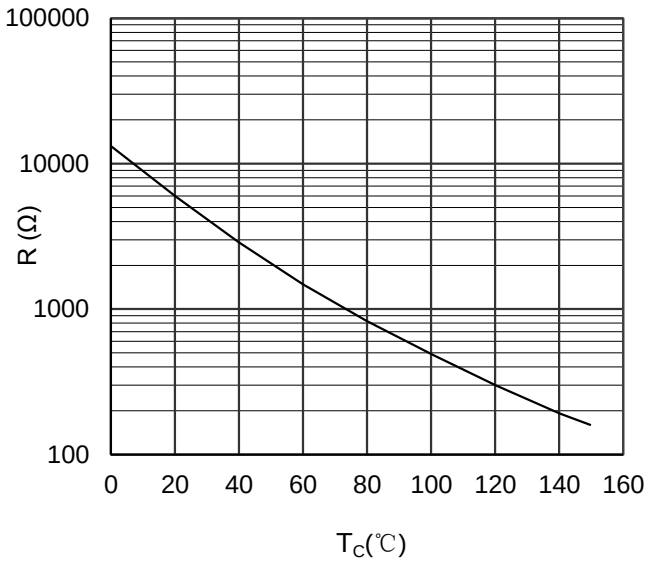


Figure 14. NTC Characteristics

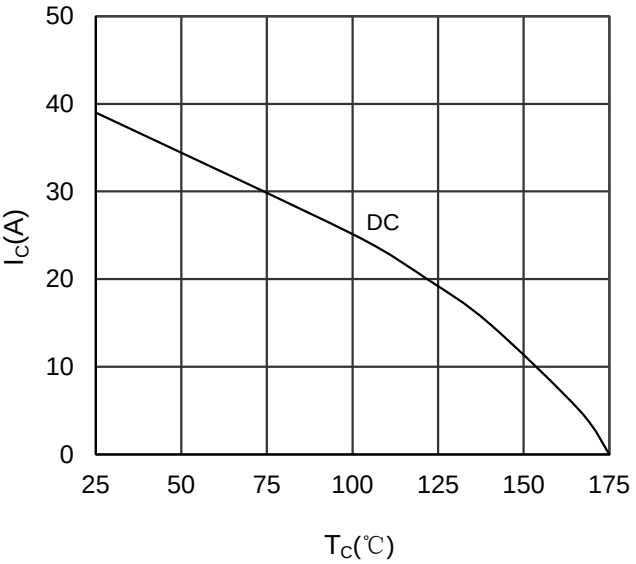


Figure 15. Collector Current vs Case temperature
IGBT -inverter

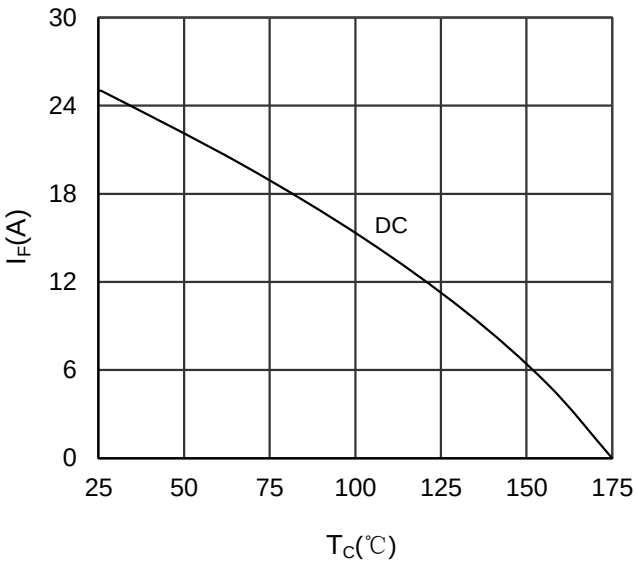


Figure 16. Forward current vs Case temperature
Diode -inverter

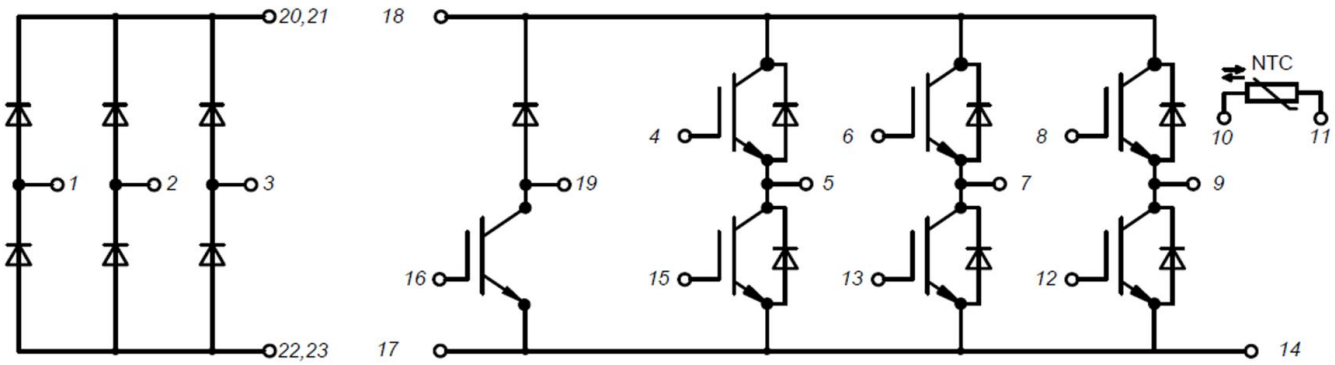
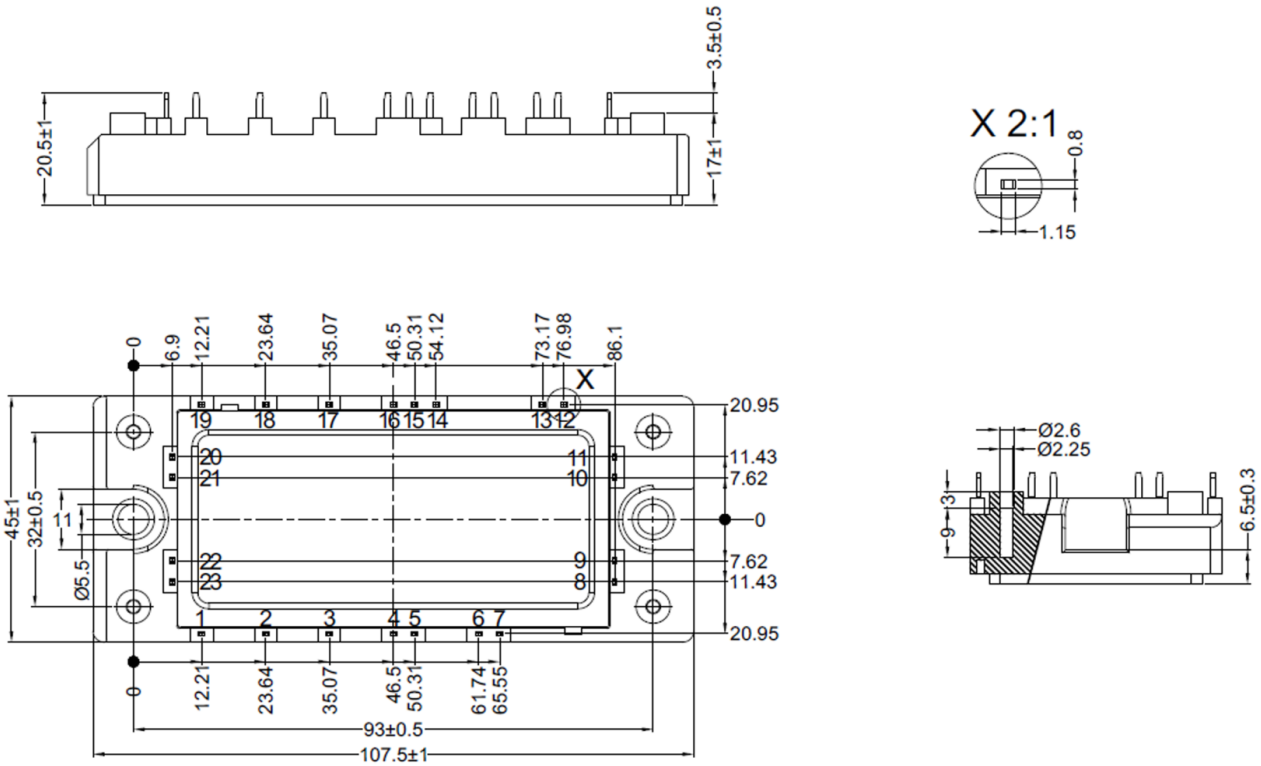


Figure 17. Circuit Diagram



Dimensions in (mm)

Figure 18. Package Outline