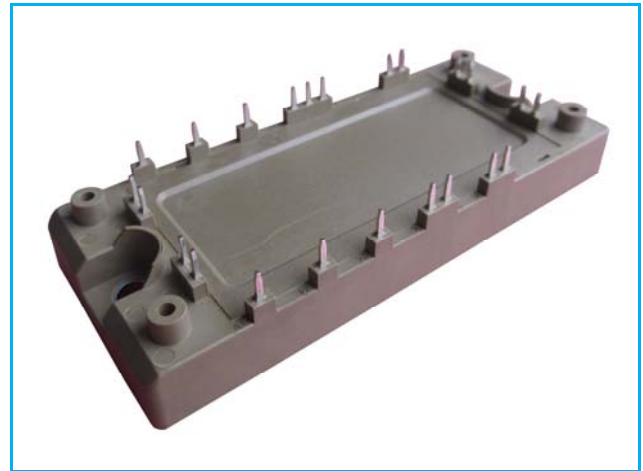


PRODUCT FEATURES

- ☐ 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($T_C=25^{\circ}\text{C}$ 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		± 20	
I_C	DC Collector Current	$T_C=25^{\circ}\text{C}, T_{Jmax}=175^{\circ}\text{C}$	77	A
		$T_C=100^{\circ}\text{C}, T_{Jmax}=175^{\circ}\text{C}$	50	
I_{CM}	Repetitive Peak Collector Current	$t_p=1\text{ms}$	100	
P_{tot}	Power Dissipation Per IGBT	$T_C=25^{\circ}\text{C}, T_{Jmax}=175^{\circ}\text{C}$	278	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		$T_J=125^{\circ}\text{C}, t=10\text{ms}, V_R=0\text{V}$	560	A^2S

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MMG50HD120XB6TC

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 =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	2.25		
		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℃			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			3.6		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		3.85		nF	
C _{res}	Reverse Transfer Capacitance			160		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℃		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		T _J =25℃		250	ns	
			T _J =125℃		290	ns	
			T _J =150℃		310	ns	
t _f	Fall Time		V _{GE} =±15V, Inductive Load	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 =50A R _G =10Ω, V _{GE} =±15V, Inductive Load	T _J =125℃		8	mJ	
			T _J =150℃		8.5	mJ	
E _{off}	Turn off Energy		T _J =125℃		4	mJ	
			T _J =150℃		4.3	mJ	
I _{SC}	Short Circuit Current	tpsc≤10μS , V _{GE} =15V T _J =150℃,V _{CC} =600V		195		A	
R _{thJC}	Junction to Case Thermal Resistance (Per IGBT)				0.54	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 =50A , V _{GE} =0V, T _J =25℃		1.7	2.15	V
		I _F =50A , V _{GE} =0V, T _J =125℃		1.65		
		I _F =50A , V _{GE} =0V, T _J =150℃		1.65		
t _{rr}	Reverse Recovery Time	I _F =50A , V _R =600V dI _F /dt=-1500A/μs T _J =150℃		390		ns
I _{RRM}	Max. Reverse Recovery Current			60		A
Q _{RR}	Reverse Recovery Charge			9.5		μC
E _{rec}	Reverse Recovery Energy			3.4		mJ
R _{thJCD}	Junction to Case Thermal Resistance （Per Diode）				0.81	K /W

MMG50HD120XB6TC

Diode-RECTIFIER

ABSOLUTE MAXIMUM RATINGS ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter/Test Conditions		Values	Unit
V_{RRM}	Repetitive Reverse Voltage	$T_J=25^{\circ}\text{C}$	1600	V
$I_{F(AV)}$	Average Forward Current Per Diode	$T_C=80^{\circ}\text{C}$	50	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	$T_J=45^{\circ}\text{C}$, $t=10\text{ms}$, 50Hz	480	
		$T_J=45^{\circ}\text{C}$, $t=8.3\text{ms}$, 60Hz	527	
I^2t		$T_J=45^{\circ}\text{C}$, $t=10\text{ms}$, 50Hz	1152	A^2S
		$T_J=45^{\circ}\text{C}$, $t=8.3\text{ms}$, 60Hz	1152	

Diode-RECTIFIER

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

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
V_F	Forward Voltage	$I_F=50\text{A}$, $T_J=25^{\circ}\text{C}$		1.1	1.25	V
		$I_F=50\text{A}$, $T_J=150^{\circ}\text{C}$		1.05		V
I_R	Reverse Leakage Current	$V_R=1600\text{V}$, $T_J=25^{\circ}\text{C}$			50	μA
		$V_R=1600\text{V}$, $T_J=150^{\circ}\text{C}$			1	mA
R_{thJC}	Junction to Case Thermal Resistance (Per Diode)				0.8	K /W

IGBT-Brake chopper

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		± 20	
I_C	DC Collector Current	$T_C=25^{\circ}\text{C}$, $T_{Jmax}=175^{\circ}\text{C}$	54	A
		$T_C=100^{\circ}\text{C}$, $T_{Jmax}=175^{\circ}\text{C}$	35	
I_{CM}	Repetitive Peak Collector Current	$t_p=1\text{ms}$	70	
P_{tot}	Power Dissipation Per IGBT	$T_C=25^{\circ}\text{C}$, $T_{Jmax}=175^{\circ}\text{C}$	208	W

Diode-Brake chopper

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		25	A
I_{FRM}	Repetitive Peak Forward Current	$t_p=1\text{ms}$	50	
I^2t		$T_J=125^{\circ}\text{C}$, $t=10\text{ms}$, $V_R=0\text{V}$	110	A^2S

MMG50HD120XB6TC

IGBT-Brake chopper

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 =1.2mA	5.0	5.8	6.5	V
V _{CE(sat)}	Collector Emitter Saturation Voltage	I _C =35A, V _{GE} =15V, T _J =25°C		1.85	2.25	
		I _C =35A, V _{GE} =15V, T _J =125°C		2.15		
		I _C =35A, V _{GE} =15V, T _J =150°C		2.25		
I _{CES}	Collector Leakage Current	V _{CE} =1200V, V _{GE} =0V, T _J =25°C			1	mA
		V _{CE} =1200V, V _{GE} =0V, T _J =150°C			10	
I _{GES}	Gate Leakage Current	V _{CE} =0V,V _{GE} =±20V, T _J =25°C	-400		400	nA
R _{gint}	Integrated Gate Resistor			0		Ω
Q _g	Gate Charge	V _{CE} =600V, I _C =35A , V _{GE} =15V		0.21		μC
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V, f =1MHz		2.8		nF
C _{res}	Reverse Transfer Capacitance			110		pF
t _{d(on)}	Turn on Delay Time	V _{CC} =600V,I _C =35A R _G =20Ω, V _{GE} =±15V, Inductive Load	T _J =25°C		35	ns
			T _J =125°C		40	ns
			T _J =150°C		40	ns
t _r	Rise Time		T _J =25°C		35	ns
			T _J =125°C		40	ns
			T _J =150°C		40	ns
t _{d(off)}	Turn off Delay Time		T _J =25°C		240	ns
			T _J =125°C		280	ns
			T _J =150°C		300	ns
t _f	Fall Time	T _J =25°C		190	ns	
		T _J =125°C		210	ns	
		T _J =150°C		230	ns	
E _{on}	Turn on Energy	V _{CC} =600V,I _C =35A R _G =20Ω, V _{GE} =±15V, Inductive Load	T _J =125°C		4.4	mJ
			T _J =150°C		4.7	mJ
E _{off}	Turn off Energy		T _J =125°C		3.3	mJ
			T _J =150°C		3.5	mJ
I _{SC}	Short Circuit Current	tpsc≤10μS , V _{GE} =15V T _J =150°C,V _{CC} =600V		145		A
R _{thJC}	Junction to Case Thermal Resistance (Per IGBT)				0.72	K /W

Diode-Brake chopper

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 =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=-850A/μs T _J =150℃		300		ns
I _{RRM}	Max. Reverse Recovery Current			39		A
Q _{RR}	Reverse Recovery Charge			4.7		μC
E _{rec}	Reverse Recovery Energy			1.6		mJ
R _{thJCD}	Junction to Case Thermal Resistance （ Per Diode ）				1.4	K /W

MMG50HD120XB6TC

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		K Ω
$B_{25/50}$	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298.15 \text{ K}))]$			3375		K

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

Symbol	Parameter/Test Conditions		Values	Unit
T_{Jmax}	Max. Junction Temperature	Inverter, Brake-Chopper	175	$^{\circ}\text{C}$
		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

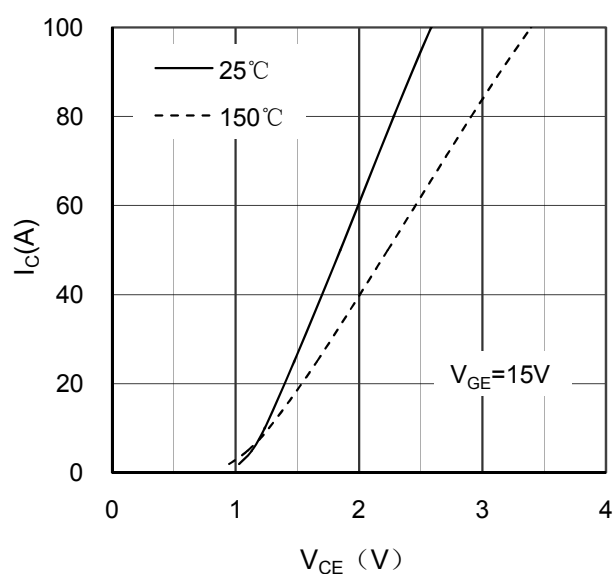


Figure 1. Typical Output Characteristics IGBT-inverter

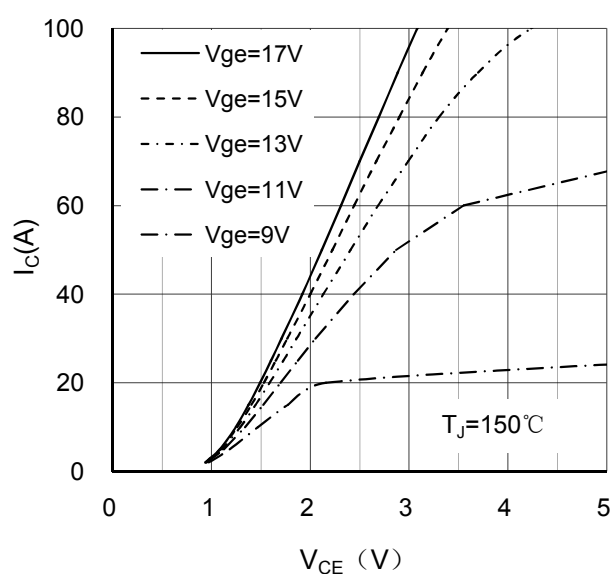


Figure 2. Typical Output Characteristics IGBT-inverter

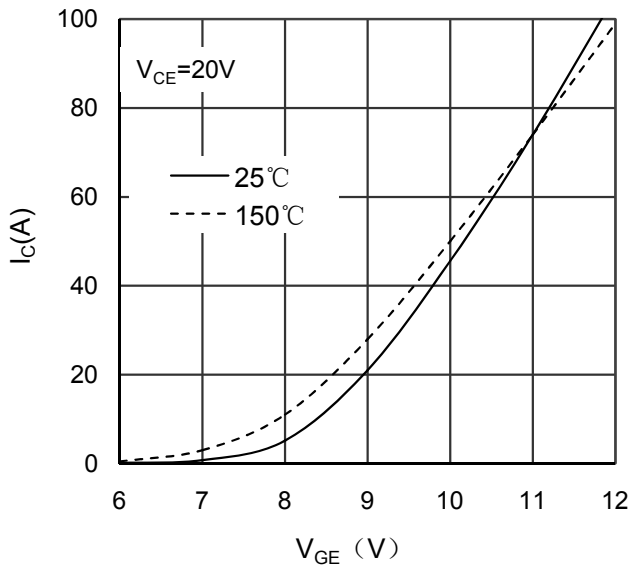


Figure 3. Typical Transfer characteristics IGBT-inverter

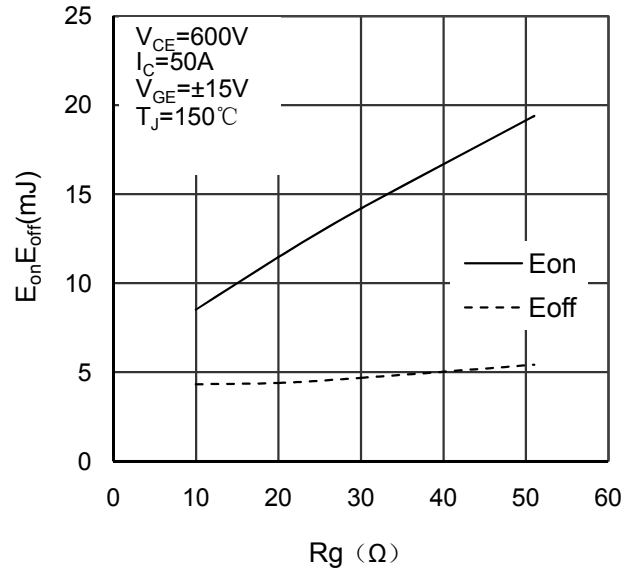


Figure 4. Switching Energy vs Gate Resistor IGBT-inverter

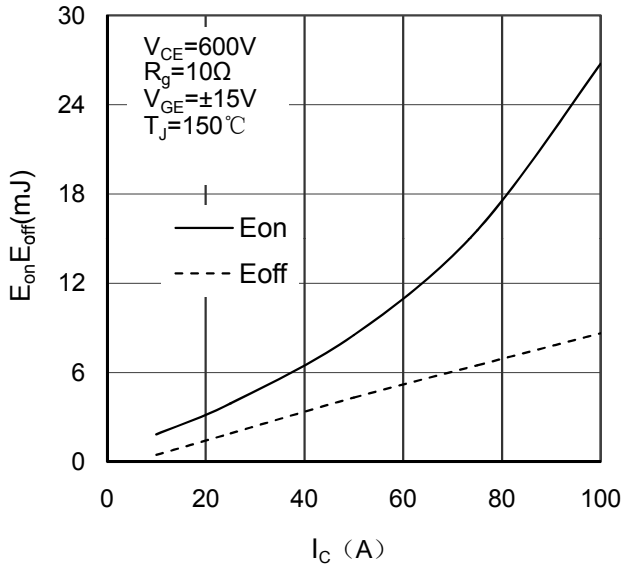


Figure 5. Switching Energy vs Collector Current IGBT-inverter

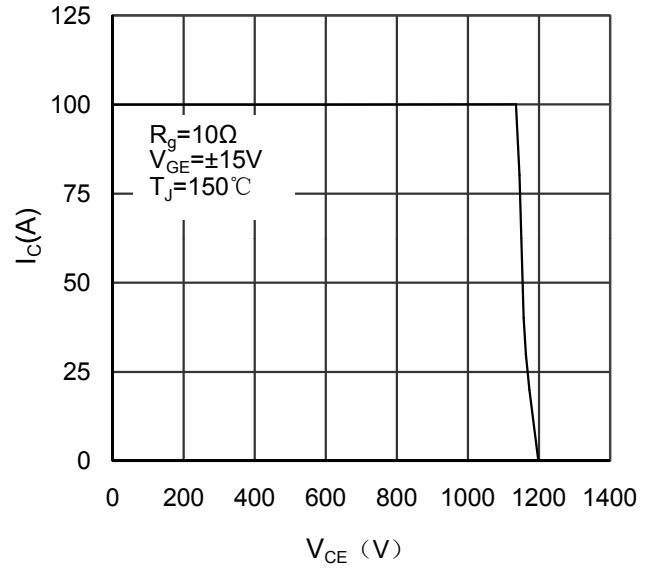


Figure 6. Reverse Biased Safe Operating Area IGBT-inverter

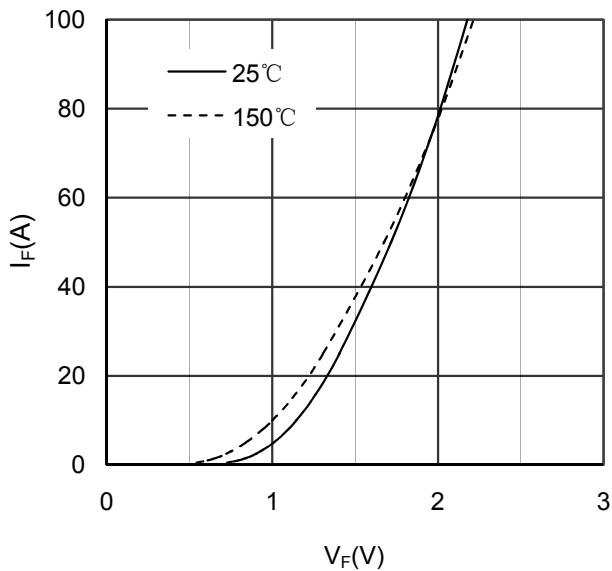


Figure 7. Diode Forward Characteristics Diode -inverter

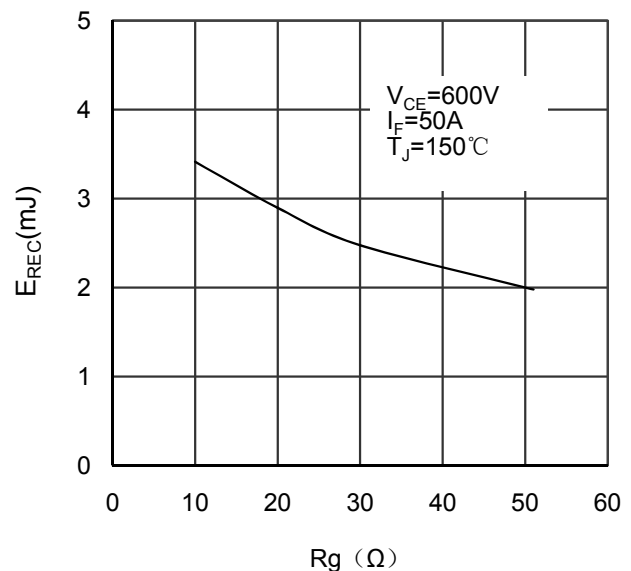


Figure 8. Switching Energy vs Gate Resistor Diode -inverter

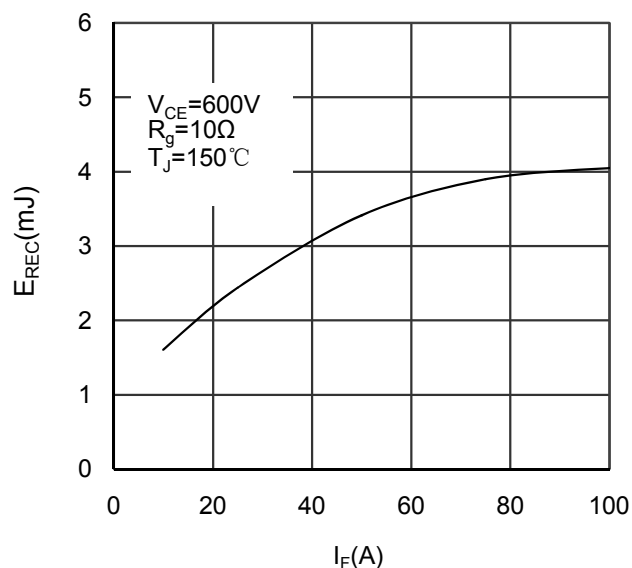


Figure 9. Switching Energy vs Forward Current Diode-inverter

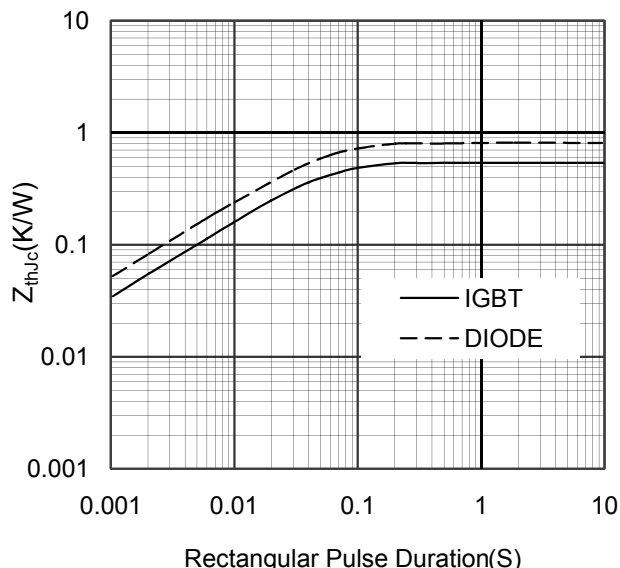


Figure 10. Transient Thermal Impedance of Diode and IGBT-inverter

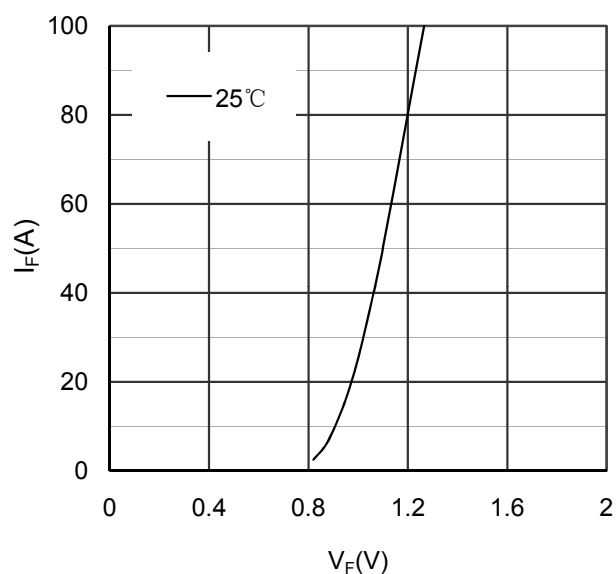


Figure 11. Diode Forward Characteristics Diode- rectifier

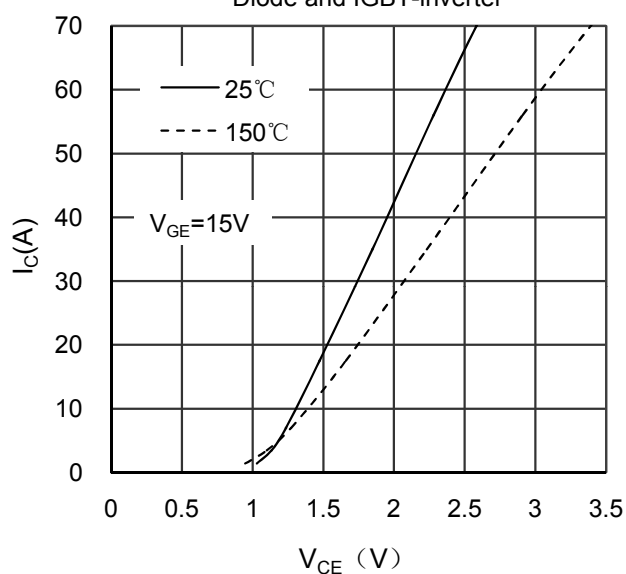


Figure 12. Typical Output Characteristics IGBT- brake chopper

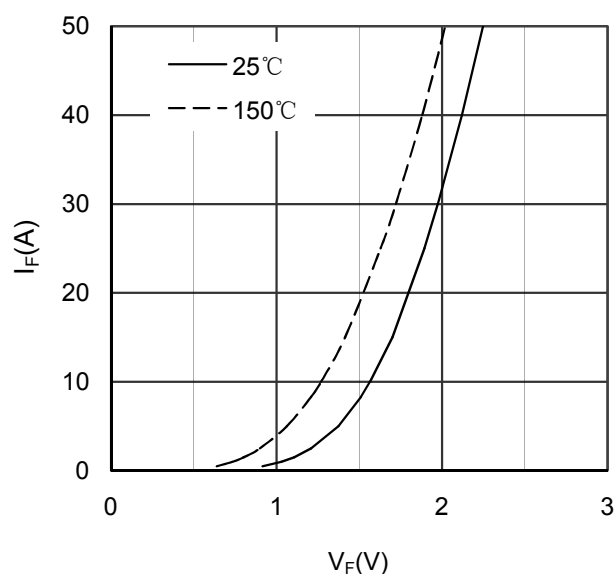


Figure 13. Diode Forward Characteristics Diode - brake chopper

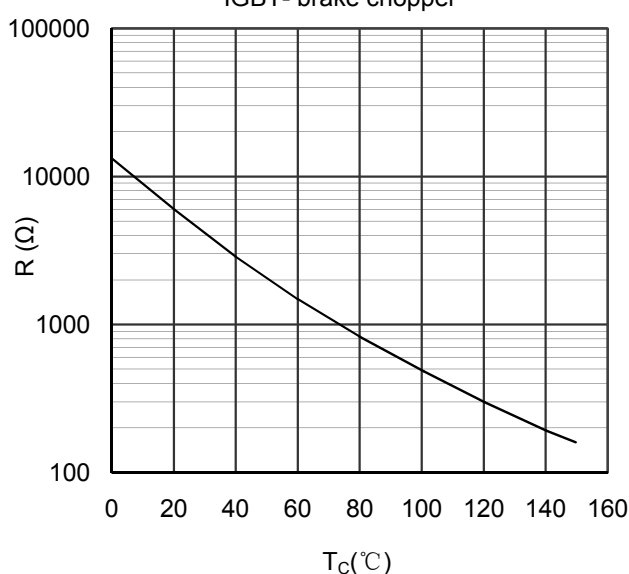


Figure 14. NTC Characteristics

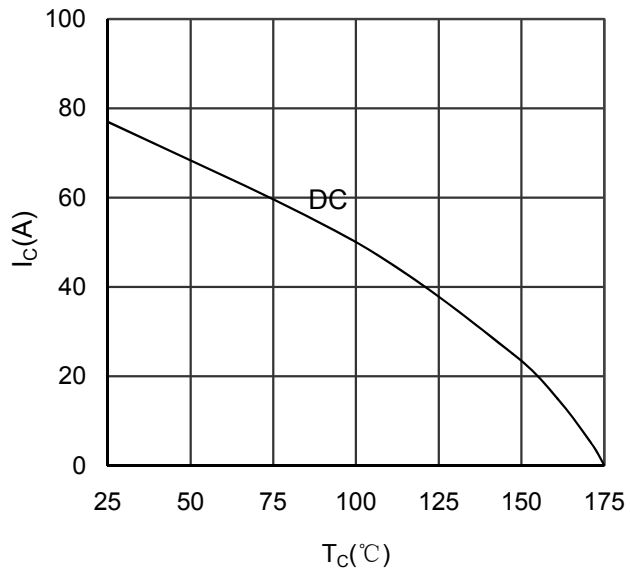


Figure 15. Collector Current vs Case temperature
IGBT -inverter

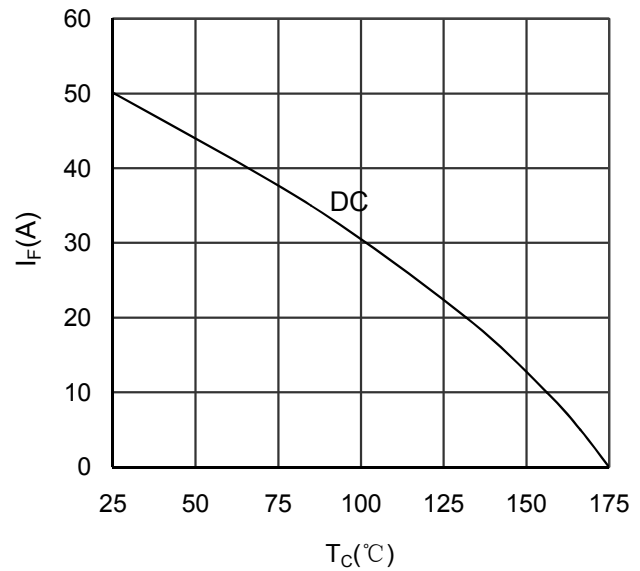


Figure 16. Forward current vs Case temperature
Diode -inverter

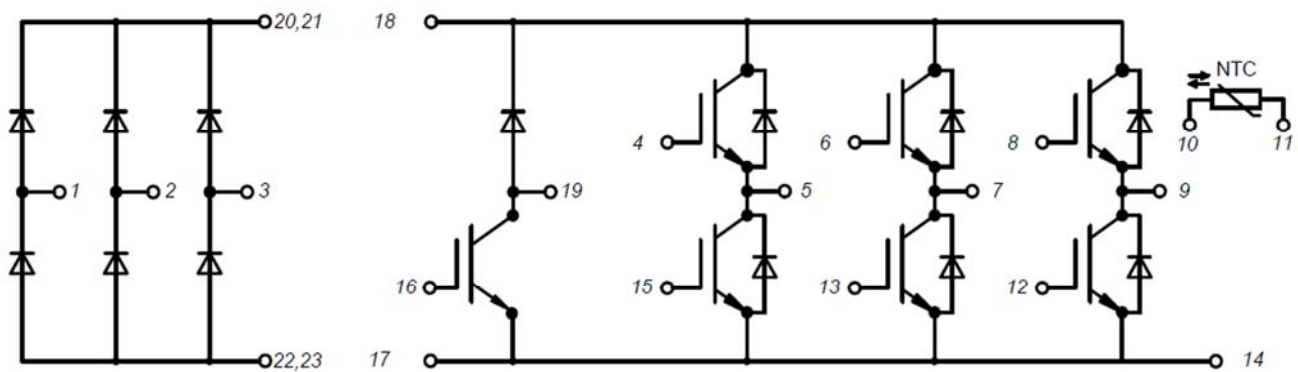
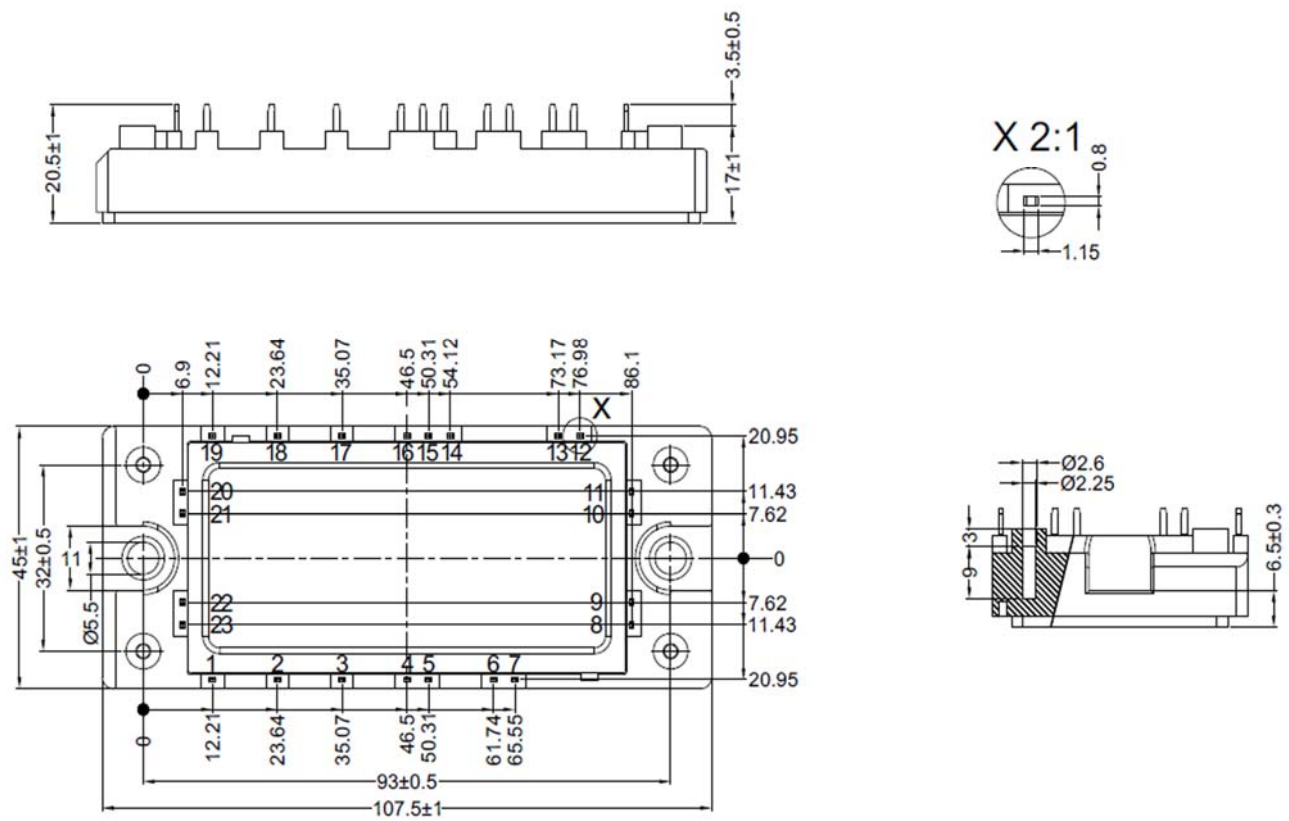


Figure 17. Circuit Diagram



Dimensions in (mm)
Figure 18. Package Outline