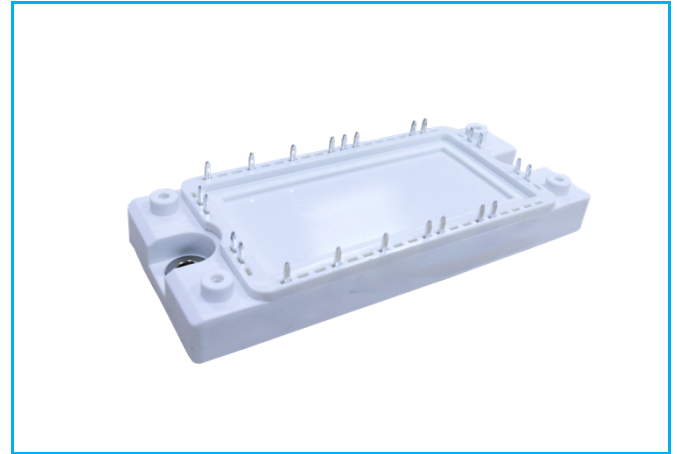


PRODUCT FEATURES

- High level of integration
- 650V IGBT³ 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	$T_J=25^{\circ}\text{C}$	650	V
V_{GES}	Gate Emitter Voltage		± 20	
I_C	DC Collector Current	$T_C=25^{\circ}\text{C}, T_{Jmax}=175^{\circ}\text{C}$	60	A
		$T_C=80^{\circ}\text{C}, T_{Jmax}=175^{\circ}\text{C}$	50	
I_{CM}	Repetitive Peak Collector Current	$t_p=1\text{ms}$	100	
P_{tot}	Power Dissipation Per IGBT	$T_C=25^{\circ}\text{C}, T_{Jmax}=175^{\circ}\text{C}$	187	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	$T_J=25^{\circ}\text{C}$	650	V
$I_{F(AV)}$	Average Forward Current		50	A
I_{FRM}	Repetitive Peak Forward Current	$t_p=1\text{ms}$	100	
I^2t		$T_J=125^{\circ}\text{C}, t=10\text{ms}, V_R=0\text{V}$	392	A^2s

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MMG50H065XB6TC

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	$V_{CE}=V_{GE}, I_C=2\text{mA}$	4.7	5.3	5.9	V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$I_C=50\text{A}, V_{GE}=15\text{V}, T_J=25^\circ\text{C}$		1.7	2.1	
		$I_C=50\text{A}, V_{GE}=15\text{V}, T_J=125^\circ\text{C}$		1.95		
		$I_C=50\text{A}, V_{GE}=15\text{V}, T_J=150^\circ\text{C}$		2.0		
I_{CES}	Collector Leakage Current	$V_{CE}=650\text{V}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$			1	mA
		$V_{CE}=650\text{V}, V_{GE}=0\text{V}, T_J=150^\circ\text{C}$			10	mA
I_{GES}	Gate Leakage Current	$V_{CE}=0\text{V}, V_{GE}=\pm 15\text{V}, T_J=25^\circ\text{C}$	-400		400	nA
R_{Gint}	Integrated Gate Resistor			1		Ω
Q_G	Gate Charge	$V_{CE}=300\text{V}, I_C=50\text{A}, V_{GE}=\pm 15\text{V}$		350		μC
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$		2.9		nF
C_{res}	Reverse Transfer Capacitance				132	
$t_{d(on)}$	Turn on Delay Time	$V_{CC}=300\text{V}, I_C=50\text{A}$ $R_G=10\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$	15		ns
			$T_J=150^\circ\text{C}$	20		ns
t_r	Rise Time	$V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$	35		ns
			$T_J=150^\circ\text{C}$	40		ns
$t_{d(off)}$	Turn off Delay Time	$V_{CC}=300\text{V}, I_C=50\text{A}$ $R_G=10\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$	180		ns
			$T_J=150^\circ\text{C}$	200		ns
t_f	Fall Time	$V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$	50		ns
			$T_J=150^\circ\text{C}$	100		ns
E_{on}	Turn on Energy	$V_{CC}=300\text{V}, I_C=50\text{A}$ $R_G=10\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$	1.5		mJ
			$T_J=125^\circ\text{C}$	2.05		mJ
			$T_J=150^\circ\text{C}$	2.2		mJ
E_{off}	Turn off Energy	$V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$	0.7		mJ
			$T_J=125^\circ\text{C}$	0.95		mJ
			$T_J=150^\circ\text{C}$	1		mJ
I_{SC}	Short Circuit Current	$t_{psc}\leq 6\mu\text{s}, V_{GE}=15\text{V}$ $T_J=150^\circ\text{C}, V_{CC}=360\text{V}$		150		A
R_{thJC}	Junction to Case Thermal Resistance (Per IGBT)				0.8	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	$I_F=50\text{A}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$		2	2.5	V
		$I_F=50\text{A}, V_{GE}=0\text{V}, T_J=125^\circ\text{C}$		1.70		
		$I_F=50\text{A}, V_{GE}=0\text{V}, T_J=150^\circ\text{C}$		1.65		
I_{RRM}	Max. Reverse Recovery Current	$I_F=50\text{A}, V_R=300\text{V}$		20		A
Q_{RR}	Reverse Recovery Charge	$di_F/dt=-850\text{A}/\mu\text{s}$		2.4		μC
E_{rec}	Reverse Recovery Energy	$T_J=150^\circ\text{C}$		0.4		mJ
R_{thJCD}	Junction to Case Thermal Resistance (Per Diode)				1.3	K/W

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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	$T_J=25^\circ\text{C}$	800	V
$I_{F(AV)}$	Average Forward Current Per Diode	$T_C=80^\circ\text{C}$	75	A
I_{FRMS}	R.M.S. Forward Current Per Diode		125	
I_{RMS}	R.M.S. Current at rectifier output		150	
I_{FSM}	Non Repetitive Surge Forward Current	$T_J=45^\circ\text{C}$, $t=10\text{ms}$, 50Hz	700	
		$T_J=45^\circ\text{C}$, $t=8.3\text{ms}$, 60Hz	782	
I^2t		$T_J=45^\circ\text{C}$, $t=10\text{ms}$, 50Hz	2450	A^2s
		$T_J=45^\circ\text{C}$, $t=8.3\text{ms}$, 60Hz	2450	

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	$I_F=75\text{A}$, $T_J=25^\circ\text{C}$		1.05	1.25	V
		$I_F=75\text{A}$, $T_J=150^\circ\text{C}$		0.98		V
I_R	Reverse Leakage Current	$V_R=800\text{V}$, $T_J=25^\circ\text{C}$			50	μA
		$V_R=800\text{V}$, $T_J=150^\circ\text{C}$			1	mA
R_{thJCD}	Junction to Case Thermal Resistance (Per Diode)				0.73	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	$T_J=25^\circ\text{C}$	650	V
V_{GES}	Gate Emitter Voltage		± 20	
I_C	DC Collector Current	$T_C=25^\circ\text{C}$, $T_{Jmax}=175^\circ\text{C}$	60	A
		$T_C=80^\circ\text{C}$, $T_{Jmax}=175^\circ\text{C}$	50	
I_{CM}	Repetitive Peak Collector Current	$t_p=1\text{ms}$	100	
P_{tot}	Power Dissipation Per IGBT	$T_C=25^\circ\text{C}$, $T_{Jmax}=175^\circ\text{C}$	187	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	$T_J=25^\circ\text{C}$	650	V
$I_{F(AV)}$	Average Forward Current		30	A
I_{FRM}	Repetitive Peak Forward Current	$t_p=1\text{ms}$	60	
I^2t		$T_J=125^\circ\text{C}$, $t=10\text{ms}$, $V_R=0\text{V}$	172	A^2s

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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	$V_{CE}=V_{GE}, I_C=2\text{mA}$	4.7	5.3	5.9	V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$I_C=50\text{A}, V_{GE}=15\text{V}, T_J=25^\circ\text{C}$		1.7	2.1	
		$I_C=50\text{A}, V_{GE}=15\text{V}, T_J=125^\circ\text{C}$		1.95		
		$I_C=50\text{A}, V_{GE}=15\text{V}, T_J=150^\circ\text{C}$		2		
I_{CES}	Collector Leakage Current	$V_{CE}=650\text{V}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$			1	mA
		$V_{CE}=650\text{V}, V_{GE}=0\text{V}, T_J=150^\circ\text{C}$			10	mA
I_{GES}	Gate Leakage Current	$V_{CE}=0\text{V}, V_{GE}=\pm 15\text{V}, T_J=25^\circ\text{C}$	-200		200	nA
R_{Gint}	Integrated Gate Resistor			1		Ω
Q_G	Gate Charge	$V_{CE}=300\text{V}, I_C=50\text{A}, V_{GE}=\pm 15\text{V}$		350		nC
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$		2.9		nF
C_{res}	Reverse Transfer Capacitance				132	
$t_{d(on)}$	Turn on Delay Time	$V_{CC}=300\text{V}, I_C=50\text{A}$ $R_G=40\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$	80		ns
			$T_J=150^\circ\text{C}$	75		ns
t_r	Rise Time	$V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$	120		ns
			$T_J=150^\circ\text{C}$	125		ns
$t_{d(off)}$	Turn off Delay Time	$V_{CC}=300\text{V}, I_C=50\text{A}$ $R_G=40\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$	380		ns
			$T_J=150^\circ\text{C}$	370		ns
t_f	Fall Time	$V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$	35		ns
			$T_J=150^\circ\text{C}$	45		ns
E_{on}	Turn on Energy	$V_{CC}=300\text{V}, I_C=50\text{A}$ $R_G=40\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$	3.2		mJ
			$T_J=125^\circ\text{C}$	3.6		mJ
			$T_J=150^\circ\text{C}$	3.7		mJ
E_{off}	Turn off Energy	$V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$	0.95		mJ
			$T_J=125^\circ\text{C}$	1.05		mJ
			$T_J=150^\circ\text{C}$	1.1		mJ
I_{SC}	Short Circuit Current	$tpsc \leq 6\mu\text{s}, V_{GE}=15\text{V}$ $T_J=150^\circ\text{C}, V_{CC}=360\text{V}$		150		A
R_{thJC}	Junction to Case Thermal Resistance (Per IGBT)				0.8	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	$I_F=30\text{A}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$		2.00	2.50	V
		$I_F=30\text{A}, V_{GE}=0\text{V}, T_J=125^\circ\text{C}$		1.70		
		$I_F=30\text{A}, V_{GE}=0\text{V}, T_J=150^\circ\text{C}$		1.65		
I_{RRM}	Max. Reverse Recovery Current	$I_F=30\text{A}, V_R=300\text{V}$		10		A
Q_{RR}	Reverse Recovery Charge	$di_F/dt=-300\text{A}/\mu\text{s}$		1.1		μC
E_{rec}	Reverse Recovery Energy	$T_J=150^\circ\text{C}$		0.2		mJ
R_{thJCD}	Junction to Case Thermal Resistance (Per Diode)				1.9	K/W

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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	
		Rectifier	150	
T_{Jop}	Operating Temperature	-40~150	°C	
T_{stg}	Storage Temperature	-40~125		
V_{isol}	Isolation Breakdown Voltage	AC, 50Hz(R.M.S), t=1minute		3000
CTI	Comparative Tracking Index		>200	
Md	Mounting Torque	Recommended (M5)	2.5~5	Nm
Weight			180	g

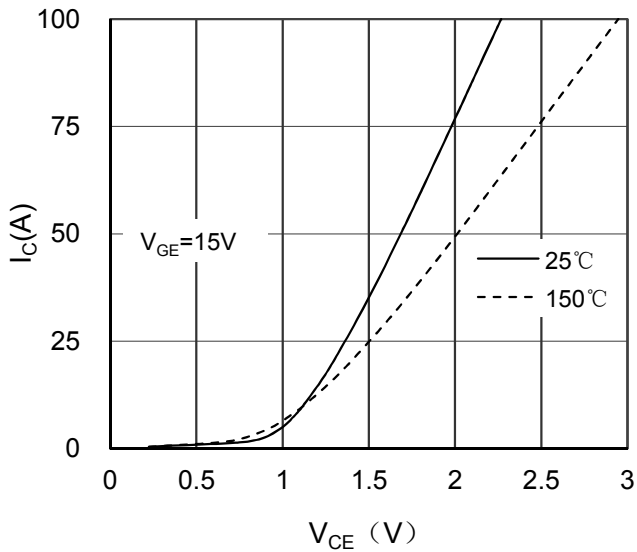


Figure 1. Typical Output Characteristics IGBT-inverter

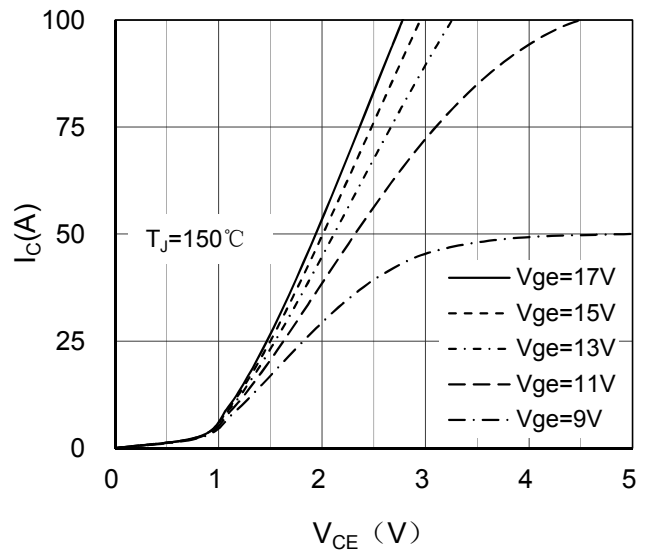


Figure 2. Typical Output Characteristics IGBT-inverter

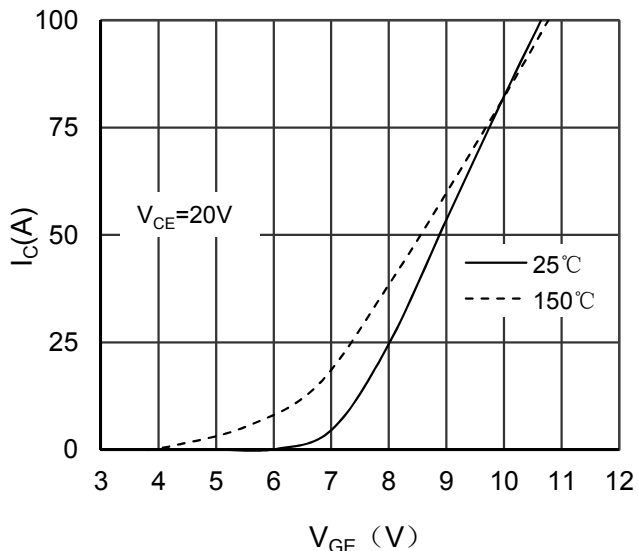


Figure 3. Typical Transfer characteristics IGBT-inverter

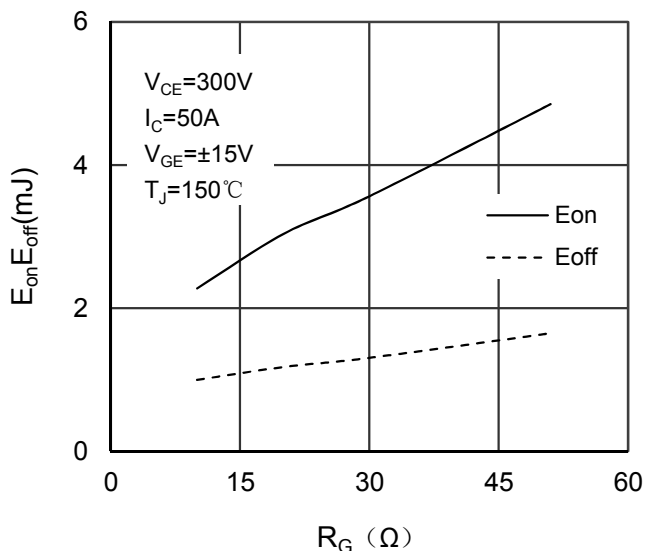


Figure 4. Switching Energy vs Gate Resistor IGBT-inverter

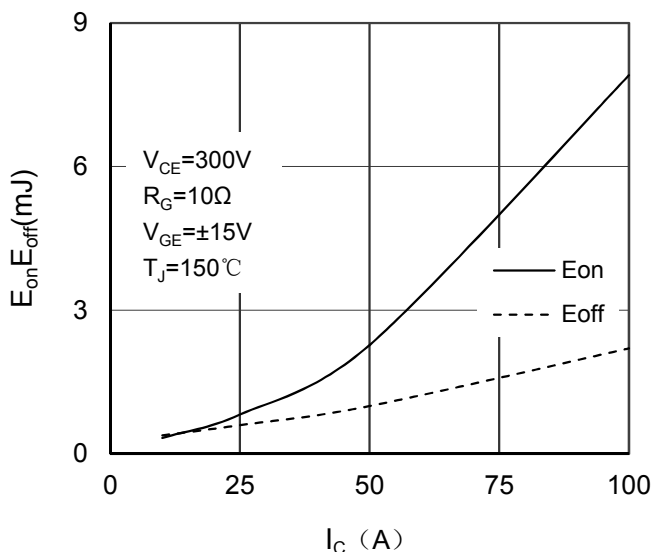


Figure 5. Switching Energy vs Collector Current IGBT-inverter

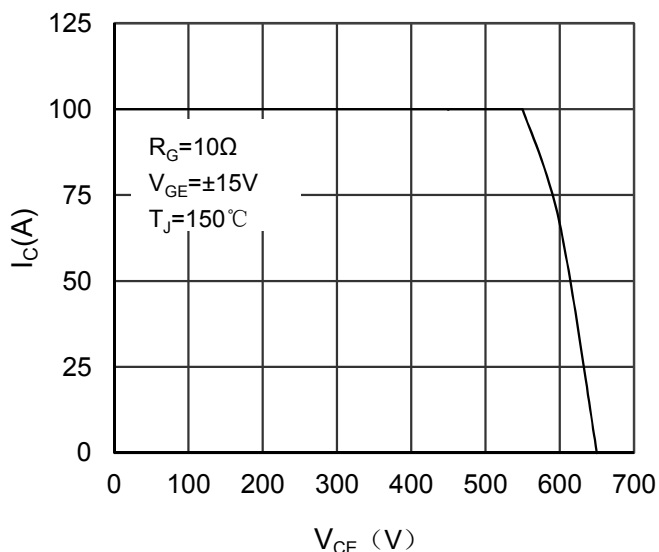


Figure 6. Reverse Biased Safe Operating Area IGBT-inverter

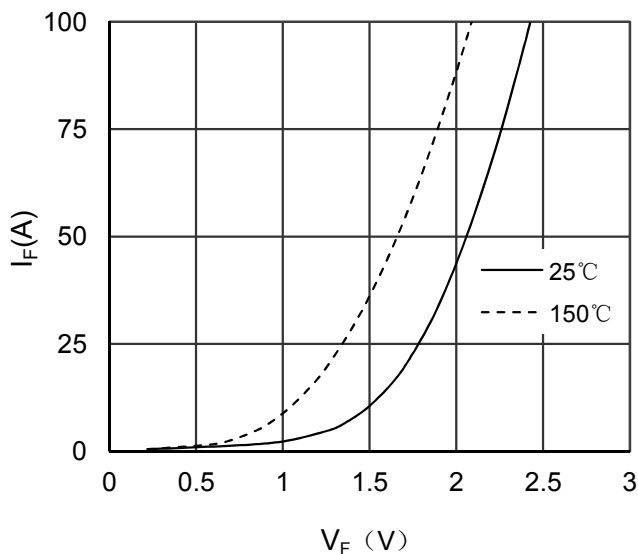


Figure 7. Diode Forward Characteristics Diode -inverter

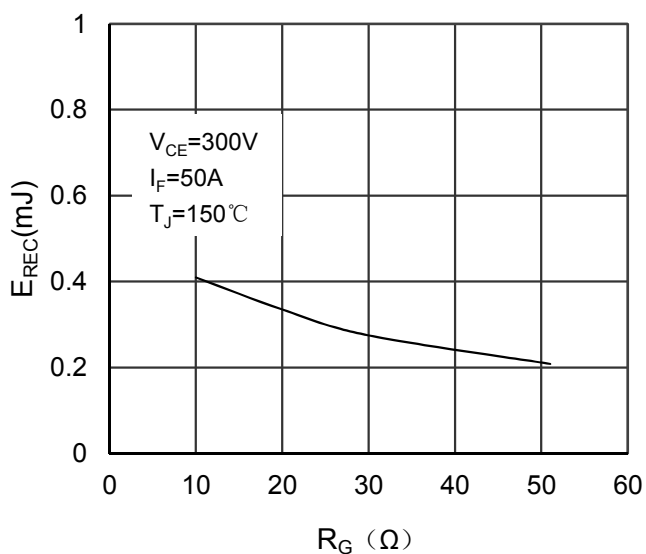


Figure 8. Switching Energy vs Gate Resistor Diode -inverter

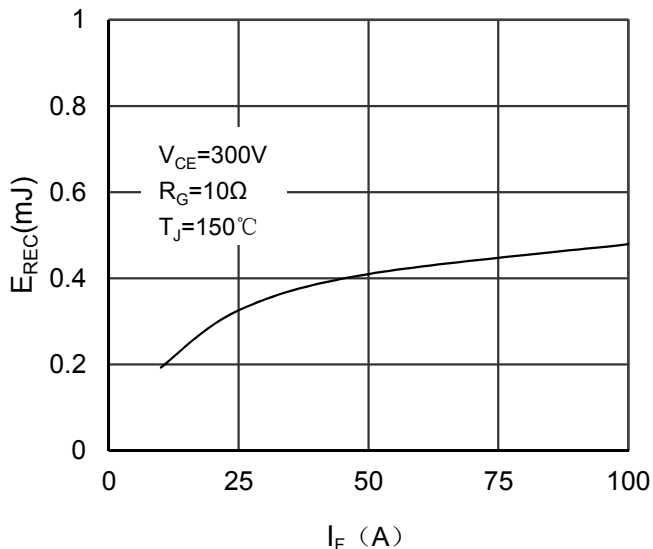


Figure 9. Switching Energy vs Forward Current Diode-inverter

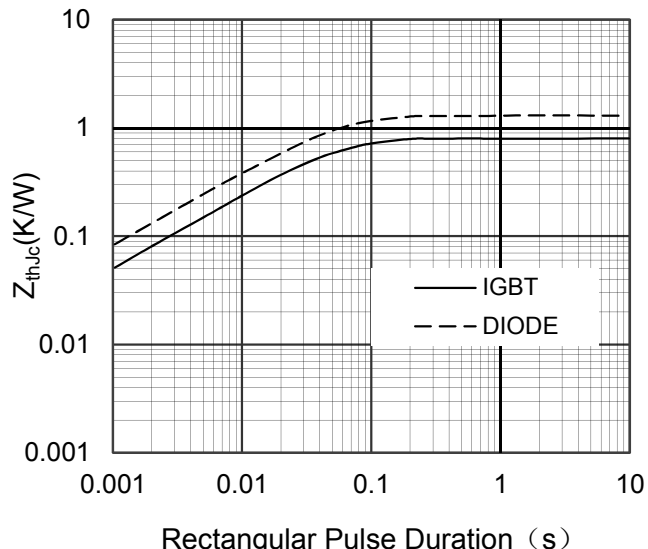


Figure 10. Transient Thermal Impedance of Diode and IGBT-inverter

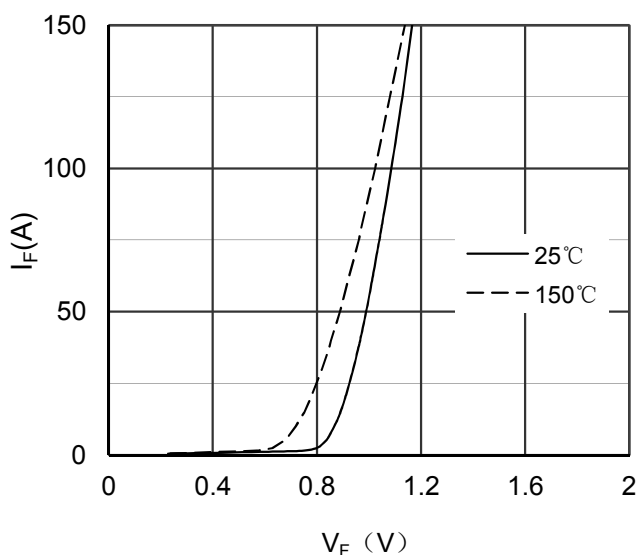


Figure 11. Diode Forward Characteristics Diode- rectifier

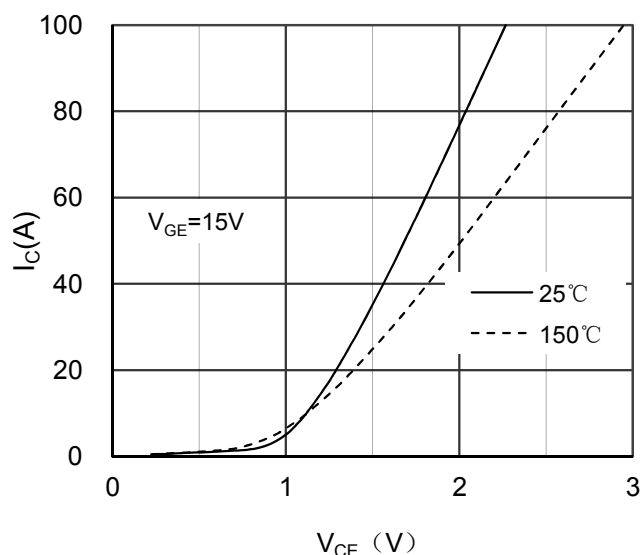


Figure 12. Typical Output Characteristics IGBT- brake chopper

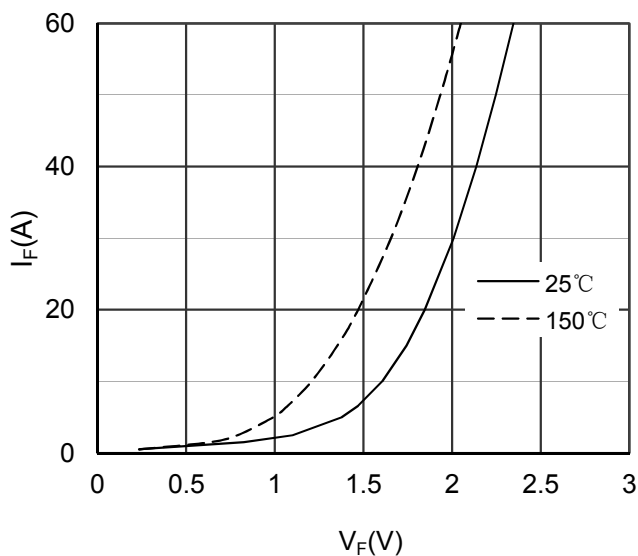


Figure 13. Diode Forward Characteristics Diode - brake chopper

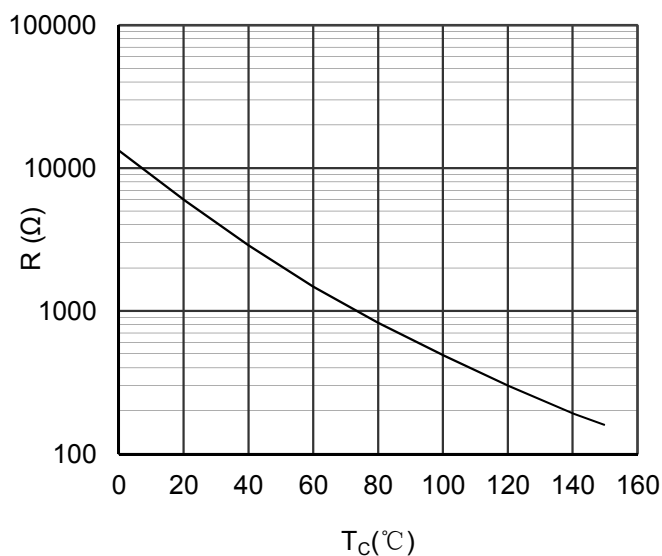


Figure 14. NTC Characteristics

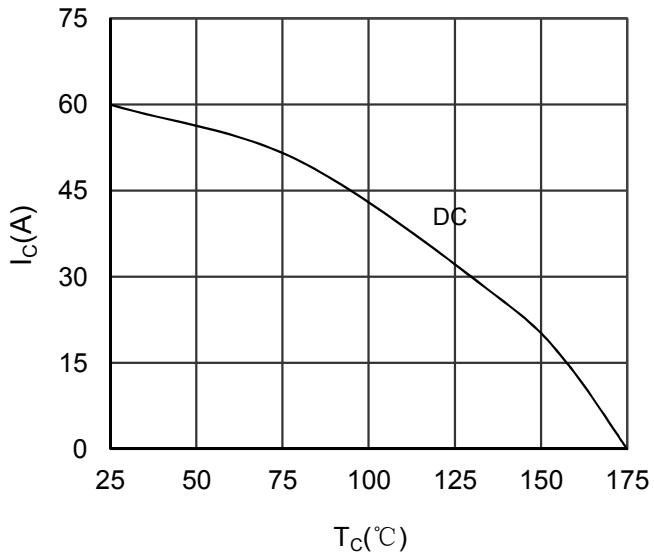


Figure 15. Collector Current vs Case temperature IGBT-inverter

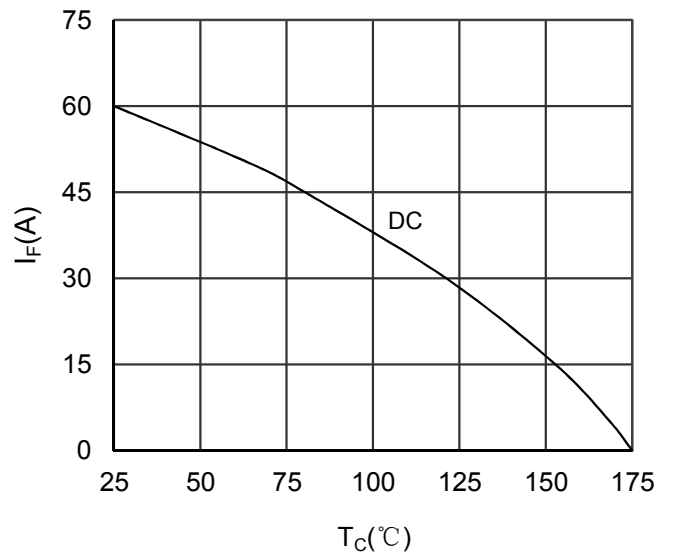


Figure 16. Forward current vs Case temperature Diode-inverter

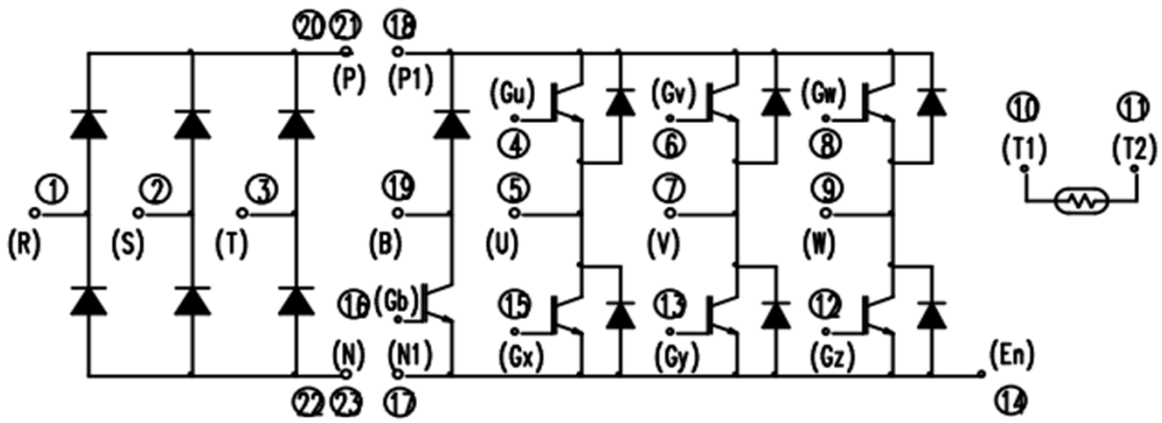
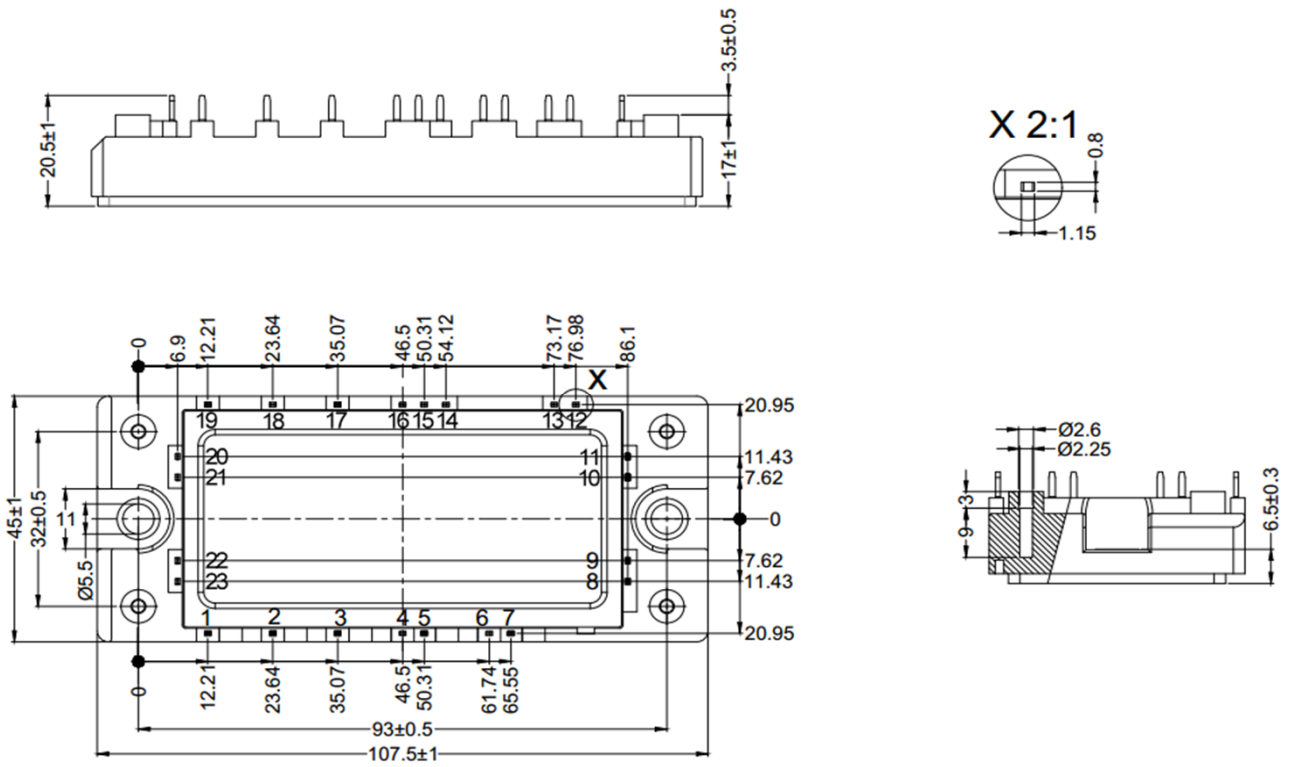


Figure 17. Circuit Diagram



Dimensions in (mm)
Figure 18. Package Outline