

PRODUCT FEATURES

- High level of integration
- IGBT CHIP(Trench+FS)
- 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	$T_C=95^\circ\text{C}, T_{Jmax}=175^\circ\text{C}$	150	A
I_{CM}	Repetitive Peak Collector Current	$t_p=1\text{ms}$	300	
P_{tot}	Power Dissipation Per IGBT	$T_C=25^\circ\text{C}, T_{Jmax}=175^\circ\text{C}$	882	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		150	A
I_{FRM}	Repetitive Peak Forward Current	$t_p=1\text{ms}$	300	
I^2t		$T_J=125^\circ\text{C}, t=10\text{ms}, V_R=0\text{V}$	2450	A^2s

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MMG150WJ120XB6T7

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	$V_{CE}=V_{GE}, I_C=3.5\text{mA}$	5.5	6.0	7.0	V	
$V_{CE(sat)}$	Collector - Emitter Saturation Voltage	$I_C=150\text{A}, V_{GE}=15\text{V}, T_J=25^\circ\text{C}$		1.45	2.25		
		$I_C=150\text{A}, V_{GE}=15\text{V}, T_J=125^\circ\text{C}$		1.55			
		$I_C=150\text{A}, V_{GE}=15\text{V}, T_J=175^\circ\text{C}$		1.6			
I_{CES}	Collector Leakage Current	$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$			0.1	mA	
I_{GES}	Gate Leakage Current	$V_{CE}=0\text{V}, V_{GE}=\pm 20\text{V}, T_J=25^\circ\text{C}$	-400		400	nA	
R_{Gint}	Integrated Gate Resistor			1		Ω	
Q_g	Gate Charge	$V_{CE}=600\text{V}, I_C=150\text{A}, V_{GE}=15\text{V}$		0.85		μC	
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$		42		nF	
C_{res}	Reverse Transfer Capacitance				2.1		nF
$t_{d(on)}$	Turn on Delay Time	$V_{CC}=600\text{V}, I_C=150\text{A}$ $R_G=3.3\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$		130		ns
			$T_J=125^\circ\text{C}$		140		ns
			$T_J=175^\circ\text{C}$		142		ns
t_r	Rise Time		$T_J=25^\circ\text{C}$		42		ns
			$T_J=125^\circ\text{C}$		45		ns
			$T_J=175^\circ\text{C}$		45		ns
$t_{d(off)}$	Turn off Delay Time	$T_J=25^\circ\text{C}$		338		ns	
		$T_J=125^\circ\text{C}$		392		ns	
		$T_J=175^\circ\text{C}$		412		ns	
t_f	Fall Time	$T_J=25^\circ\text{C}$		140		ns	
		$T_J=125^\circ\text{C}$		238		ns	
		$T_J=175^\circ\text{C}$		296		ns	
E_{on}	Turn on Energy	$V_{CC}=600\text{V}, I_C=150\text{A}$ $R_G=3.3\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=125^\circ\text{C}$		16.4		mJ
			$T_J=175^\circ\text{C}$		19.5		mJ
E_{off}	Turn off Energy		$T_J=125^\circ\text{C}$		20.2		mJ
			$T_J=175^\circ\text{C}$		24.2		mJ
I_{SC}	Short Circuit Current		$tpsc \leq 9\mu\text{s}, V_{GE}=15\text{V}$ $T_J=150^\circ\text{C}, V_{CC}=800\text{V}$		900		A
			$tpsc \leq 8\mu\text{s}, V_{GE}=15\text{V}$ $T_J=175^\circ\text{C}, V_{CC}=800\text{V}$		800		A
R_{thJC}	Junction to Case Thermal Resistance (Per IGBT)			0.17		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	$I_F=150\text{A}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$		2	2.4	V
		$I_F=150\text{A}, V_{GE}=0\text{V}, T_J=125^\circ\text{C}$		1.8		
		$I_F=150\text{A}, V_{GE}=0\text{V}, T_J=175^\circ\text{C}$		1.7		
t_{rr}	Reverse Recovery Time	$I_F=150\text{A}, V_R=600\text{V}$ $dI_F/dt=-3200\text{A}/\mu\text{s}$ $T_J=175^\circ\text{C}$		350		ns
I_{RRM}	Max. Reverse Recovery Current			220		A
Q_{RR}	Reverse Recovery Charge			34		μC
E_{rec}	Reverse Recovery Energy			22.7		mJ
R_{thJCD}	Junction to Case Thermal Resistance (Per Diode)			0.39		K/W

MMG150WJ120XB6T7

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_{FRMS}	R.M.S. Forward Current Per Diode	$T_C=80^\circ\text{C}$	150	A
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	1400	
		$T_J=45^\circ\text{C}$, $t=8.3\text{ms}$, 60Hz	1535	
I^2t		$T_J=45^\circ\text{C}$, $t=10\text{ms}$, 50Hz	9800	A^2s
		$T_J=45^\circ\text{C}$, $t=8.3\text{ms}$, 60Hz	9780	

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	$I_F=150\text{A}$, $T_J=25^\circ\text{C}$		1.15	1.3	V
		$I_F=150\text{A}$, $T_J=150^\circ\text{C}$		1.10		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_{thJCD}	Junction to Case Thermal Resistance (Per Diode)			0.28		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	$T_C=25^\circ\text{C}$, $T_{Jmax}=175^\circ\text{C}$	147	A
		$T_C=95^\circ\text{C}$, $T_{Jmax}=175^\circ\text{C}$	100	
I_{CM}	Repetitive Peak Collector Current	$t_p=1\text{ms}$	200	
P_{tot}	Power Dissipation Per IGBT	$T_C=25^\circ\text{C}$, $T_{Jmax}=175^\circ\text{C}$	937	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		50	A
I_{FRM}	Repetitive Peak Forward Current	$t_p=1\text{ms}$	100	
I^2t		$T_J=125^\circ\text{C}$, $t=10\text{ms}$, $V_R=0\text{V}$	650	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	$V_{CE}=V_{GE}, I_C=2.5\text{mA}$	5.0	5.8	6.5	V	
$V_{CE(sat)}$	Collector - Emitter Saturation Voltage	$I_C=100\text{A}, V_{GE}=15\text{V}, T_J=25^\circ\text{C}$		1.8	2.25		
		$I_C=100\text{A}, V_{GE}=15\text{V}, T_J=125^\circ\text{C}$		2.05			
		$I_C=100\text{A}, V_{GE}=15\text{V}, T_J=175^\circ\text{C}$		2.15			
I_{CES}	Collector Leakage Current	$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$			1	mA	
		$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_J=150^\circ\text{C}$			10		
I_{GES}	Gate Leakage Current	$V_{CE}=0\text{V}, V_{GE}=\pm 20\text{V}, T_J=25^\circ\text{C}$	-400		400	nA	
R_{Gint}	Integrated Gate Resistor			7		Ω	
Q_g	Gate Charge	$V_{CE}=600\text{V}, I_C=100\text{A}, V_{GE}=15\text{V}$		0.53		μC	
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$		12.8		nF	
C_{res}	Reverse Transfer Capacitance				270		pF
$t_{d(on)}$	Turn on Delay Time	$V_{CC}=600\text{V}, I_C=100\text{A}$ $R_G=4.3\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$	90		ns	
			$T_J=125^\circ\text{C}$	100		ns	
			$T_J=175^\circ\text{C}$	105		ns	
t_r	Rise Time		$T_J=25^\circ\text{C}$	35		ns	
			$T_J=125^\circ\text{C}$	40		ns	
			$T_J=175^\circ\text{C}$	42		ns	
$t_{d(off)}$	Turn off Delay Time	$T_J=25^\circ\text{C}$	315		ns		
		$T_J=125^\circ\text{C}$	350		ns		
		$T_J=175^\circ\text{C}$	375		ns		
t_f	Fall Time	$T_J=25^\circ\text{C}$	120		ns		
		$T_J=125^\circ\text{C}$	210		ns		
		$T_J=175^\circ\text{C}$	250		ns		
E_{on}	Turn on Energy	$V_{CC}=600\text{V}, I_C=100\text{A}$ $R_G=4.3\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=125^\circ\text{C}$	9.9		mJ	
			$T_J=175^\circ\text{C}$	12.4		mJ	
E_{off}	Turn off Energy		$T_J=125^\circ\text{C}$	8.4		mJ	
			$T_J=175^\circ\text{C}$	9.9		mJ	
I_{SC}	Short Circuit Current		$tpsc \leq 8\mu\text{s}, V_{GE}=15\text{V}$ $T_J=150^\circ\text{C}, V_{CC}=800\text{V}$		420		A
R_{thJC}	Junction to Case Thermal Resistance (Per IGBT)			0.22		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	$I_F=50\text{A}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$		1.8	2.3	V
		$I_F=50\text{A}, V_{GE}=0\text{V}, T_J=125^\circ\text{C}$		1.65		
		$I_F=50\text{A}, V_{GE}=0\text{V}, T_J=175^\circ\text{C}$		1.55		
t_{rr}	Reverse Recovery Time	$I_F=100\text{A}, V_R=600\text{V}$ $dI_F/dt=-2700\text{A}/\mu\text{s}$ $T_J=175^\circ\text{C}$		300		ns
I_{RRM}	Max. Reverse Recovery Current			110		A
Q_{RR}	Reverse Recovery Charge			12.5		μC
E_{rec}	Reverse Recovery Energy			6.9		mJ
R_{thJCD}	Junction to Case Thermal Resistance (Per Diode)			0.54		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	°C
		Rectifier	150	
T_{Jop}	Operating Temperature (under switching conditions)	Inverter, Brake-Chopper	-40~175	
		Rectifier	-40~150	
T_{stg}	Storage Temperature	-40~125		
V_{isol}	Isolation Breakdown Voltage	AC, 50Hz(R.M.S), t=1minute	2500	
CTI	Comparative Tracking Index		>200	
Md	Mounting Torque	Recommended (M5)	2.5~5	Nm
Weight			300	g

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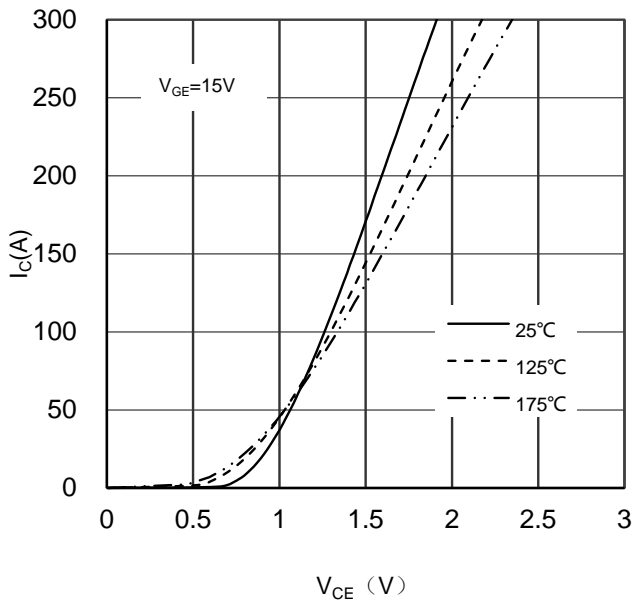


Figure 1. Typical Output Characteristics IGBT-inverter

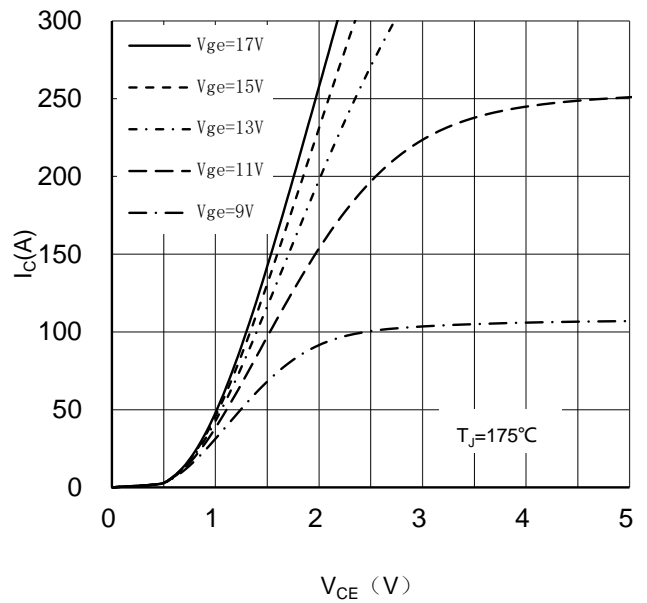


Figure 2. Typical Output Characteristics IGBT-inverter

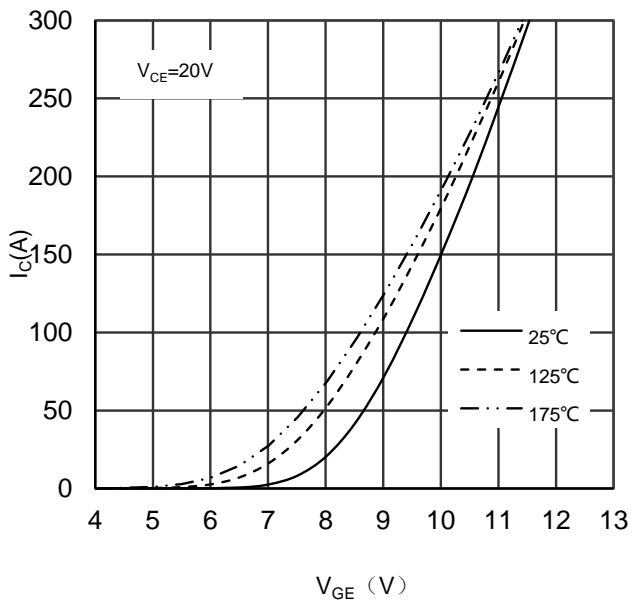


Figure 3. Typical Transfer characteristics IGBT-inverter

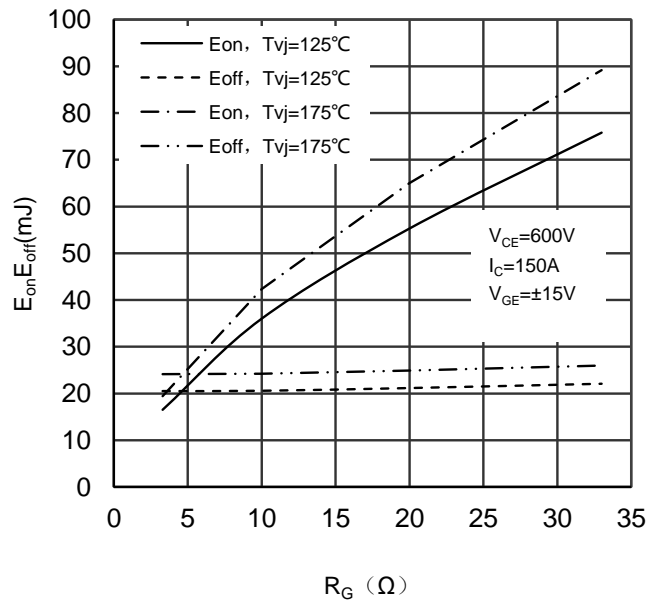


Figure 4. Switching Energy vs Gate Resistor IGBT-inverter

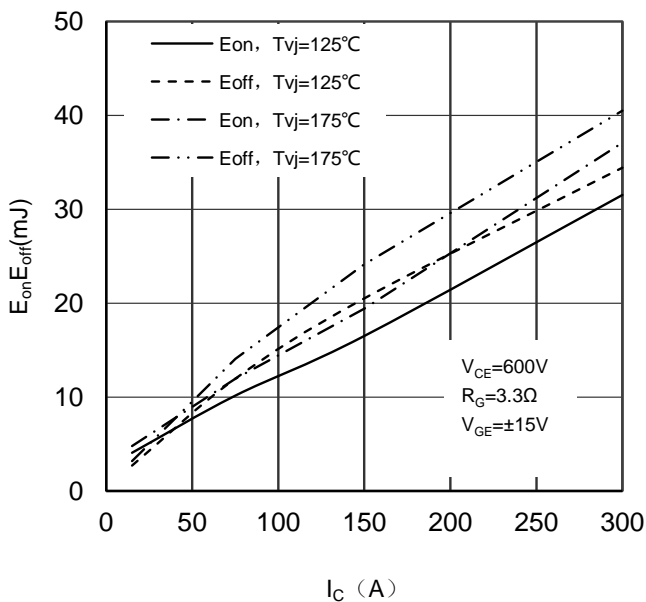


Figure 5. Switching Energy vs Collector Current IGBT-inverter

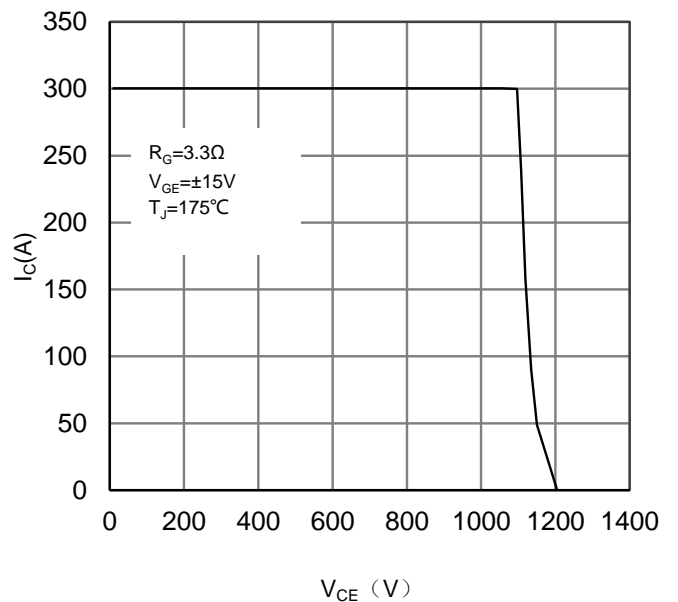


Figure 6. Reverse Biased Safe Operating Area IGBT-inverter

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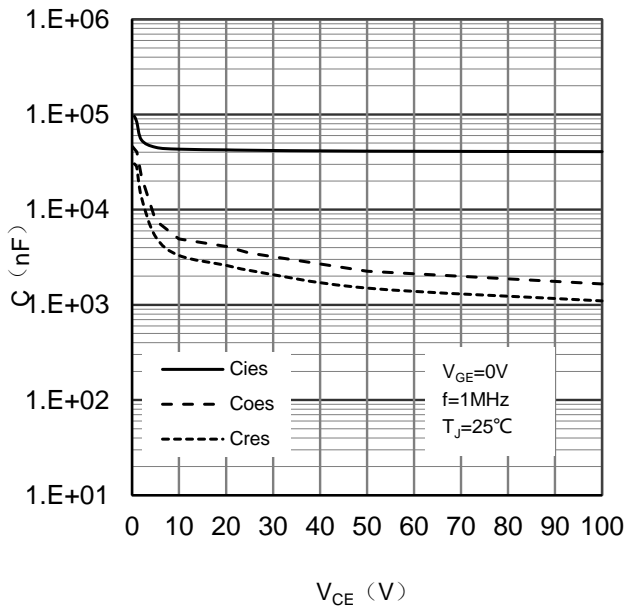


Figure 7. Typical capacitance

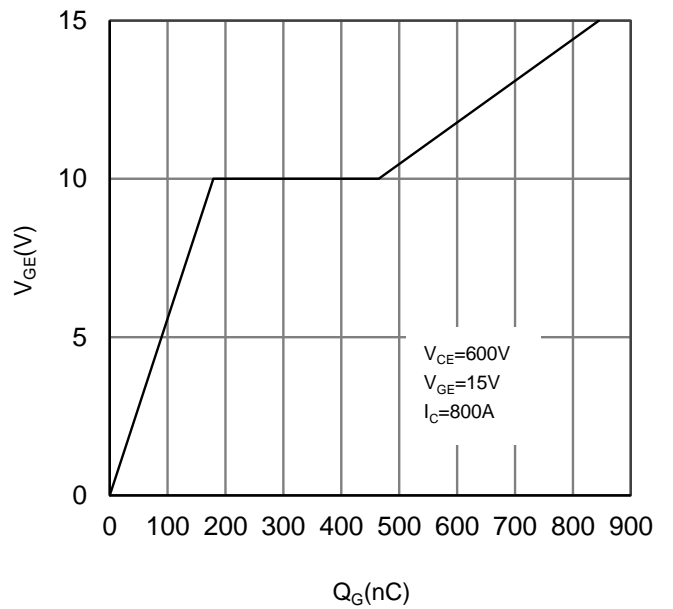


Figure 8. Typical Gate Charge

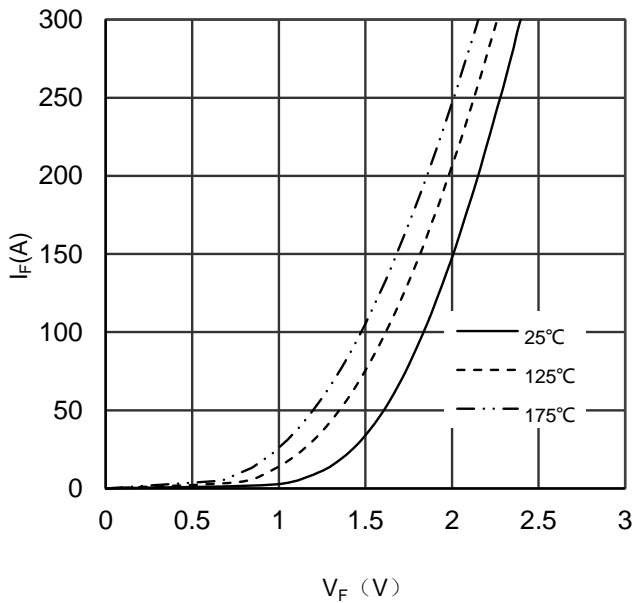


Figure 9. Diode Forward Characteristics Diode -inverter

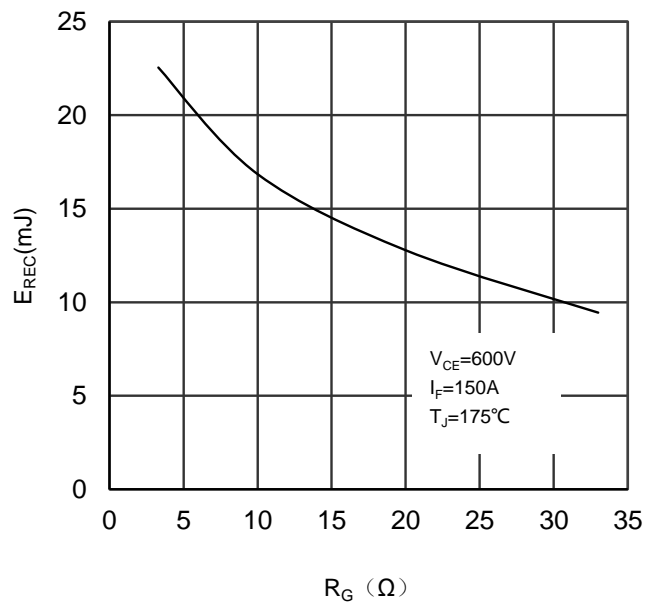


Figure 10. Switching Energy vs Gate Resistor Diode -inverter

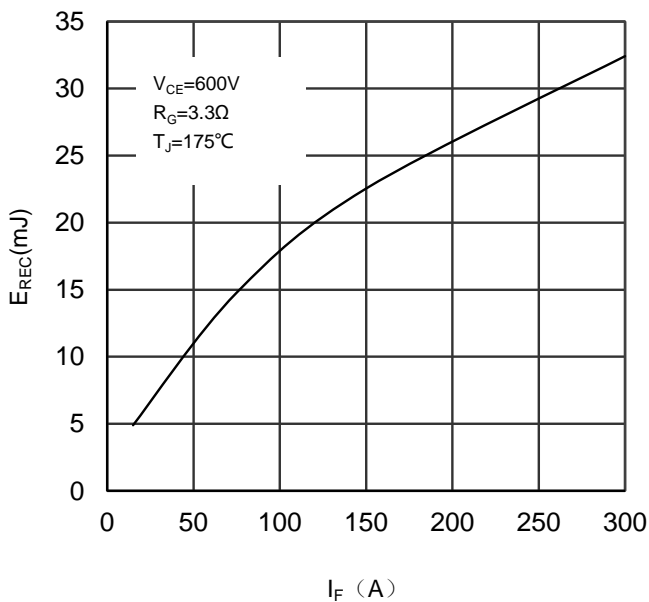


Figure 11. Switching Energy vs Forward Current Diode-inverter

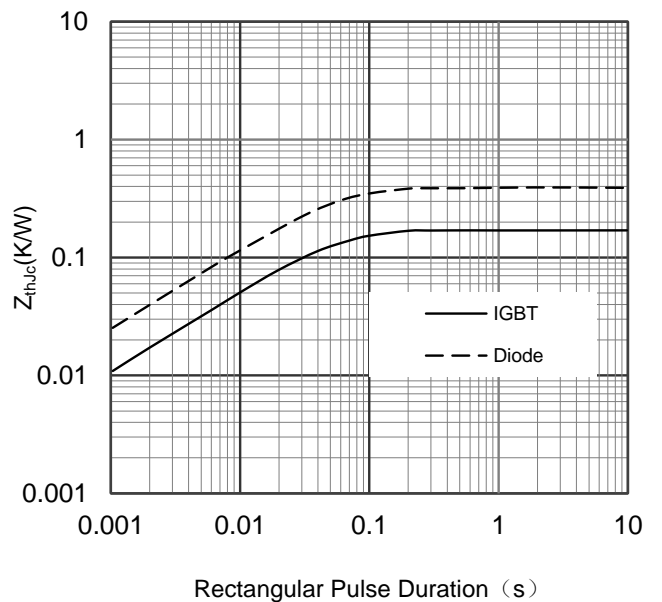


Figure 12. Transient Thermal Impedance of Diode and IGBT-inverter

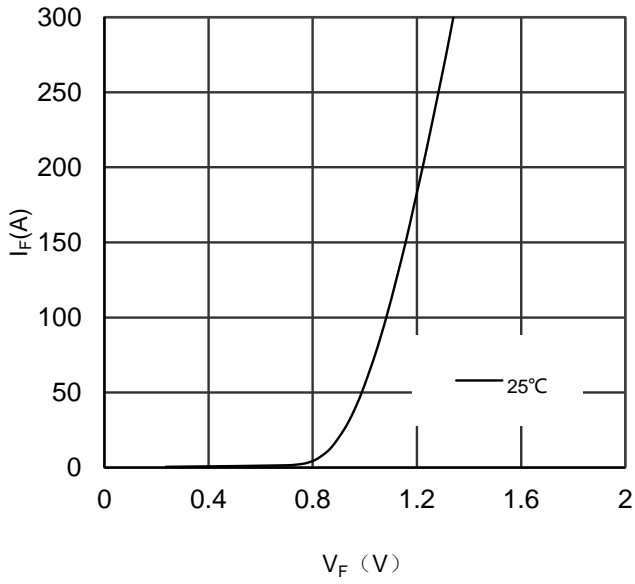


Figure 13. Diode Forward Characteristics Diode- rectifier

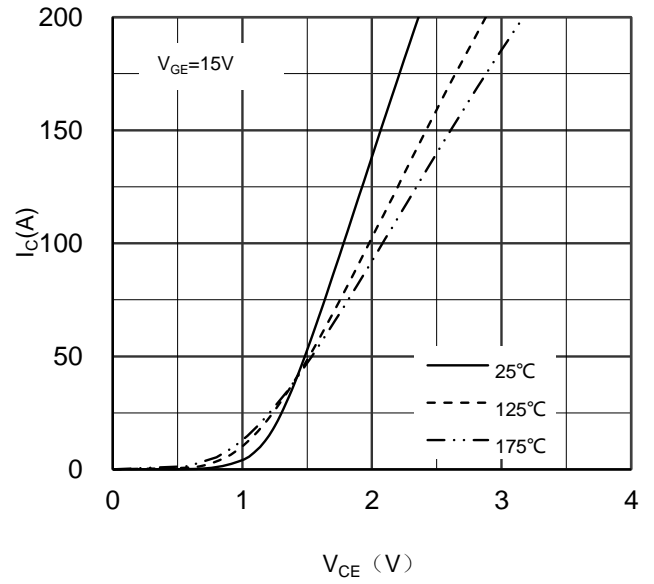


Figure 14. Typical Output Characteristics IGBT- brake chopper

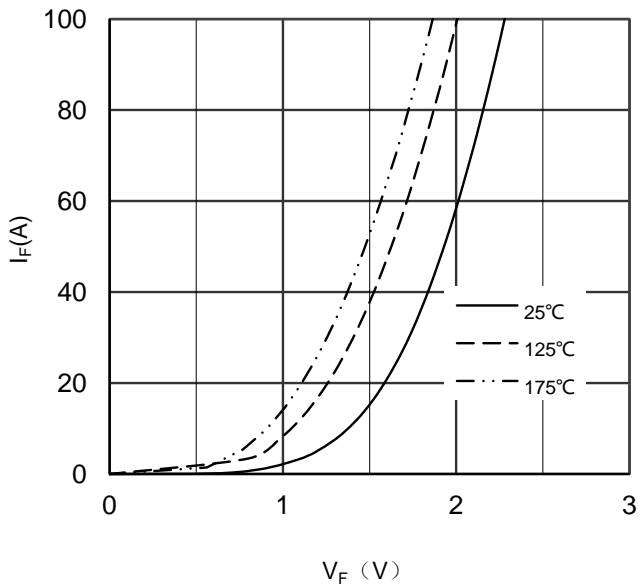


Figure 15. Diode Forward Characteristics Diode - brake chopper

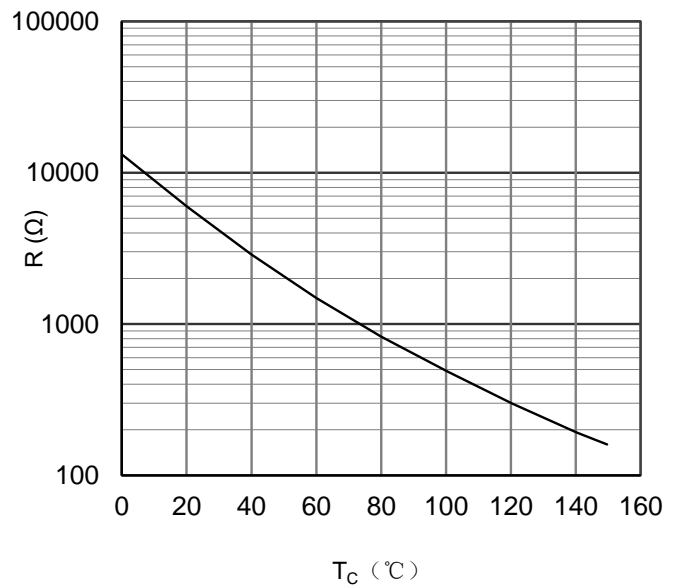


Figure 16. NTC Characteristics

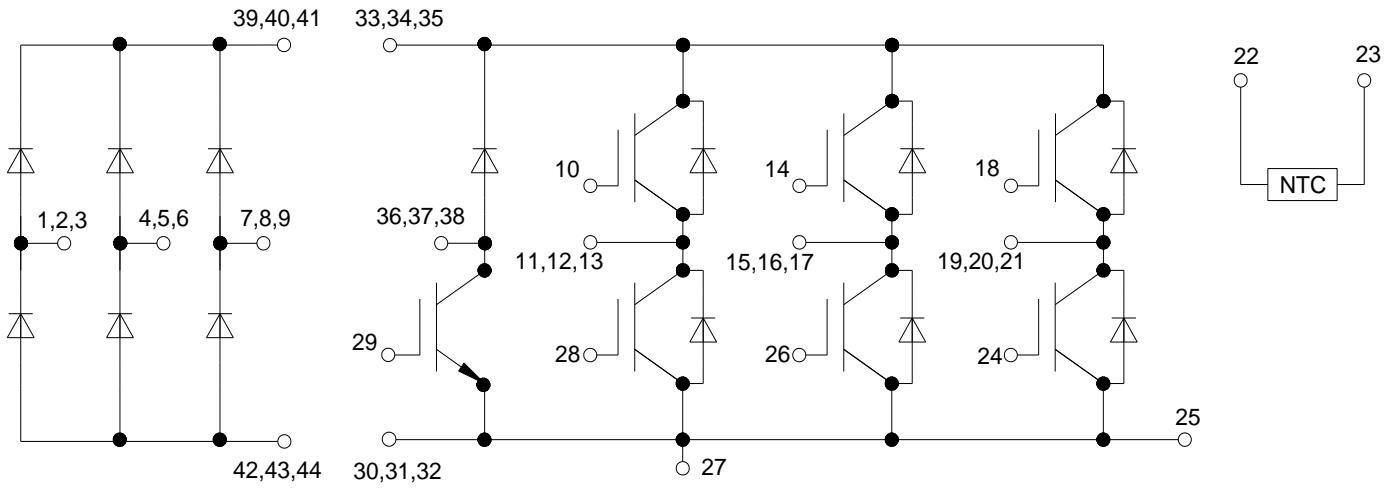
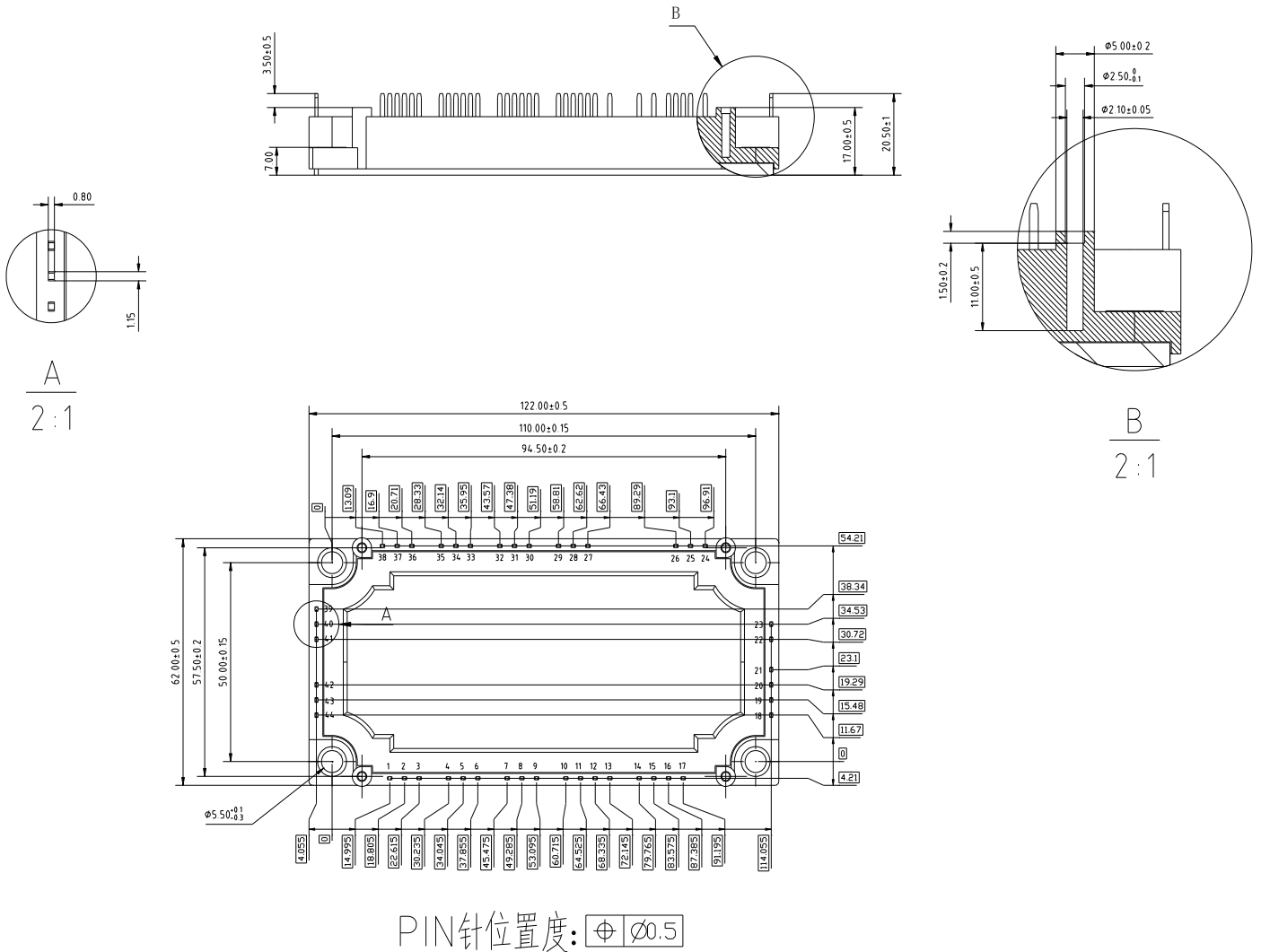


Figure 17. Circuit Diagram



Dimensions in (mm)
Figure 18. Package Outline