MMG600WQ100PD6T7

1000V 600A Three Level Inverter Module

July 2024 | Preliminary | RoHS Compliant

PRODUCT FEATURES

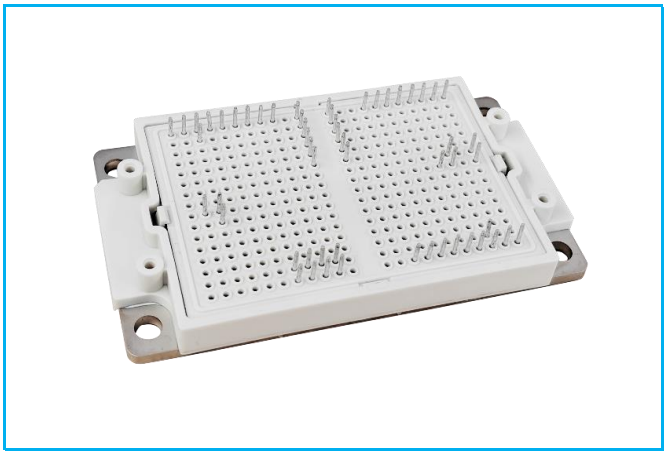
☐ 1000V IGBT CHIP

☐ Low VCE(sat) and Low switching losses

☐ Free wheeling diodes with fast and soft reverse recovery

☐ Maximum junction temperature 175°C

☐ PressFIT contact technology



APPLICATIONS

☐ 3-Level-Applications

☐ Solar Applications

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

Symbol	Parameter/Test Conditions		Values	Unit
T_{Jop}	Operating Temperature		-40~150	℃
T_{stg}	Storage Temperature		-40~125	
V_{isol}	Isolation Breakdown Voltage	AC, 50Hz(R.M.S), t=1minute	3200	V
RTI	RTI Elec.	housing	140	℃
CTI	Comparative Tracking Index		>400	
Md	Mounting Torque	Recommended（M5）	2.5~5	Nm

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IGBT(T1、T4)

ABSOLUTE MAXIMUM RATINGS(T_C *=25°C unless otherwise specified)*

Symbol	Parameter/Test Conditions		Values	Unit
V_{CES}	Collector Emitter Voltage	T_J=25℃	1000	V
V_{GES}	Gate Emitter Voltage		±20	
I_{CN}	Implemented Collector Current		600	A
I_{CDC}	Continuous DC Collector Current	T_C=25℃,T_{Jmax}=175℃	620	
		T_C=120℃,T_{Jmax}=175℃	300	
I_{CM}	Repetitive Peak Collector Current	tp=1ms	1200	
T_{Jmax}	Max. Junction Temperature		175	℃
P_{tot}	Power Dissipation Per IGBT	T_C=25℃,T_{Jmax}=175℃	1540	W

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		4.20	5.00	5.80	V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	I_C=600A, V_{GE}=15V, T_J=25℃			1.8		
		I_C=600A, V_{GE}=15V, T_J=125℃			1.9		
		I_C=600A, V_{GE}=15V, T_J=150℃			2.0		
I_{CES}	Collector Leakage Current	V_{CE}=1000V, V_{GE}=0V, T_J=25℃				100	μA
I_{GES}	Gate Leakage Current	V_{CE}=0V,V_{GE}=±20V, T_J=25℃		-400		400	nA
R_{Gint}	Integrated Gate Resistor				0.6		Ω
Q_G	Gate Charge	V_{CE}=500V, I_C=300A , V_{GE}=15V			1.9		μC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =100kHz			36.8		nF
C_{oes}	Output Capacitance				1.2		nF
C_{res}	Reverse Transfer Capacitance				130		pF
$t_{d(on)}$	Turn on Delay Time	V_{CC}=500V,I_C=300A R_{Gon} =5Ω, V_{GE}=±15V, Inductive Load di/dt=4300A/μs （T_J=150℃）	T_J=25℃		150		ns
			T_J=125℃		100		ns
			T_J=150℃		90		ns
t_r	Rise Time		T_J=25℃		60		ns
			T_J=125℃		64		ns
			T_J=150℃		66		ns
E_{on}	Turn on Energy		T_J=25℃		17.0		mJ
			T_J=125℃		21.6		mJ
			T_J=150℃		23.7		mJ
$t_{d(off)}$	Turn off Delay Time	V_{CC}=500V,I_C=300A R_{Goff} =15Ω, V_{GE}=±15V, Inductive Load dv/dt=4800V/μs （T_J=150℃）	T_J=25℃		570		ns
			T_J=125℃		640		ns
			T_J=150℃		660		ns
t_f	Fall Time		T_J=25℃		35		ns
			T_J=125℃		60		ns
			T_J=150℃		66		ns
E_{off}	Turn off Energy		T_J=25℃		11.8		mJ
			T_J=125℃		16.6		mJ
			T_J=150℃		17.9		mJ
R_{thJC}	Junction to Case Thermal Resistance					0.097	K /W

IGBT(T2、T3)

ABSOLUTE MAXIMUM RATINGS(T_C *=25°C unless otherwise specified)*

Symbol	Parameter/Test Conditions		Values	Unit
V_{CES}	Collector Emitter Voltage	T_J=25℃	1000	V
V_{GES}	Gate Emitter Voltage		±20	
I_{CN}	Implemented Collector Current		600	A
I_{CDC}	Continuous DC Collector Current	T_C=25℃,T_{Jmax}=175℃	620	
		T_C=100℃,T_{Jmax}=175℃	300	
I_{CM}	Repetitive Peak Collector Current	tp=1ms	1200	
T_{Jmax}	Max. Junction Temperature		175	℃
P_{tot}	Power Dissipation Per IGBT	T_C=25℃,T_{Jmax}=175℃	1540	W

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		4.20	5.00	5.80	V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	I_C=600A, V_{GE}=15V, T_J=25℃			1.8		
		I_C=600A, V_{GE}=15V, T_J=125℃			1.9		
		I_C=600A, V_{GE}=15V, T_J=150℃			2.0		
I_{CES}	Collector Leakage Current	V_{CE}=1000V, V_{GE}=0V, T_J=25℃				100	μA
I_{GES}	Gate Leakage Current	V_{CE}=0V,V_{GE}=±20V, T_J=25℃		-400		400	nA
R_{Gint}	Integrated Gate Resistor				0.6		Ω
Q_G	Gate Charge	V_{CE}=500V, I_C=300A , V_{GE}=15V			1.9		μC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =100kHz			36.8		nF
C_{oes}	Output Capacitance				1.2		nF
C_{res}	Reverse Transfer Capacitance				130		pF
$t_{d(on)}$	Turn on Delay Time	V_{CC}=500V,I_C=300A R_{Gon} =5Ω, V_{GE}=±15V, Inductive Load di/dt=4300A/μs （T_J=150℃）	T_J=25℃		150		ns
			T_J=125℃		100		ns
			T_J=150℃		90		ns
t_r	Rise Time		T_J=25℃		60		ns
			T_J=125℃		64		ns
			T_J=150℃		66		ns
E_{on}	Turn on Energy		T_J=25℃		15.3		mJ
			T_J=125℃		19.2		mJ
			T_J=150℃		21.1		mJ
$t_{d(off)}$	Turn off Delay Time	V_{CC}=500V,I_C=300A R_{Goff} =15Ω, V_{GE}=±15V, Inductive Load dv/dt=4800V/μs （T_J=150℃）	T_J=25℃		570		ns
			T_J=125℃		640		ns
			T_J=150℃		660		ns
t_f	Fall Time		T_J=25℃		35		ns
			T_J=125℃		60		ns
			T_J=150℃		66		ns
E_{off}	Turn off Energy		T_J=25℃		12.2		mJ
			T_J=125℃		16.9		mJ
			T_J=150℃		18.3		mJ
R_{thJC}	Junction to Case Thermal Resistance					0.097	K /W

Diode

ABSOLUTE MAXIMUM RATINGS (T_C =25°C unless otherwise specified)

Symbol	Parameter/Test Conditions		Values	Unit
V_{RRM}	Repetitive Reverse Voltage	T_J=25℃	1000	V
I_{FN}	Implemented Forward Current		300	A
I_{FRM}	Repetitive Peak Forward Current	tp=1ms	600	
T_{Jmax}	Max. Junction Temperature		175	℃

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

Symbol	Parameter/Test Conditions			Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=300A , V_{GE}=0V, T_J=25℃			2.35		V
		I_F=300A , V_{GE}=0V, T_J=125℃			2.2		
		I_F=300A , V_{GE}=0V, T_J=150℃			2.1		
t_{rr}	Reverse Recovery Time	I_F=300A , V_R=500V dI_F/dt=-4300A/μs T_J =150℃	T_J=25℃		86		ns
			T_J=150℃		155		ns
I_{RRM}	Max. Reverse Recovery Current		T_J=25℃		220		A
			T_J=150℃		310		A
Q_{RR}	Reverse Recovery Charge		T_J=25℃		9.1		μC
			T_J=150℃		24.8		μC
E_{rec}	Reverse Recovery Energy		T_J=25℃		3.9		mJ
			T_J=150℃		8.6		mJ
R_{thJC}	Junction to Case Thermal Resistance					0.08	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℃		22		kΩ
△R/R	T_{NTC}=100℃， R_{100}=1.486kΩ		-5		5	%
$B_{25/50}$	$R_2 = R_{25}$ exp [$B_{25/50}$(1/T_2 - 1/(298.15 K))]			3950		K

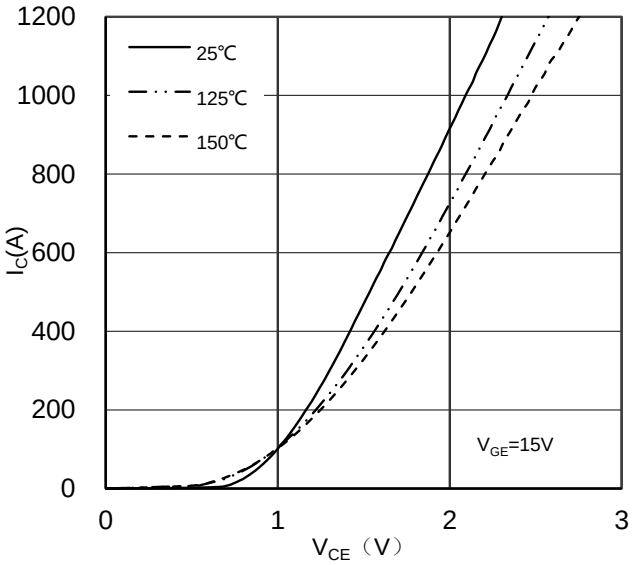


Figure 1. Typical Output Characteristics IGBT

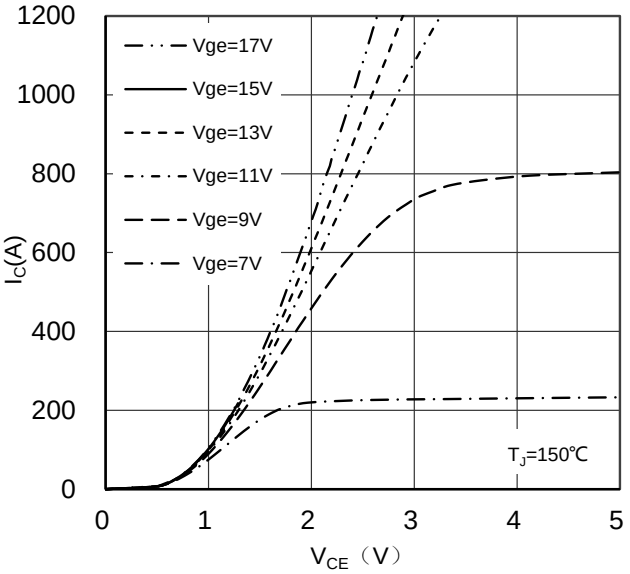


Figure 2. Typical Output Characteristics IGBT

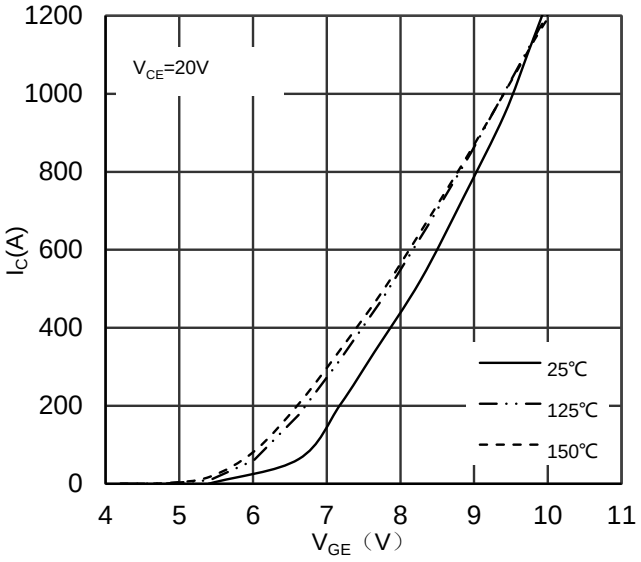


Figure 3. Typical Transfer characteristics IGBT

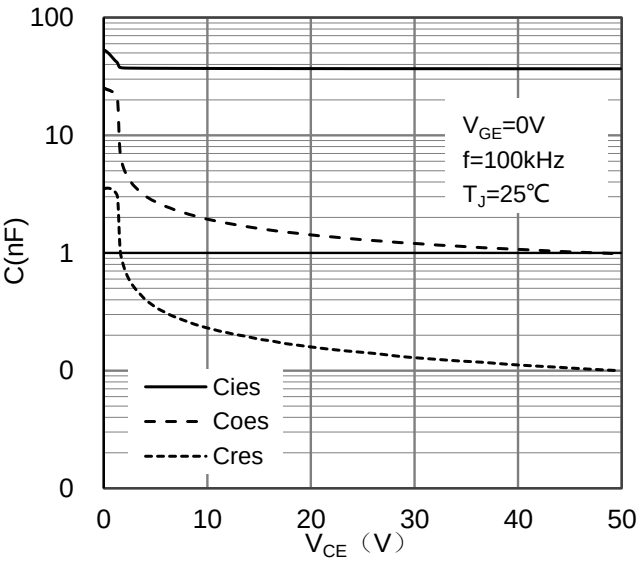


Figure 4. Typical capacitance

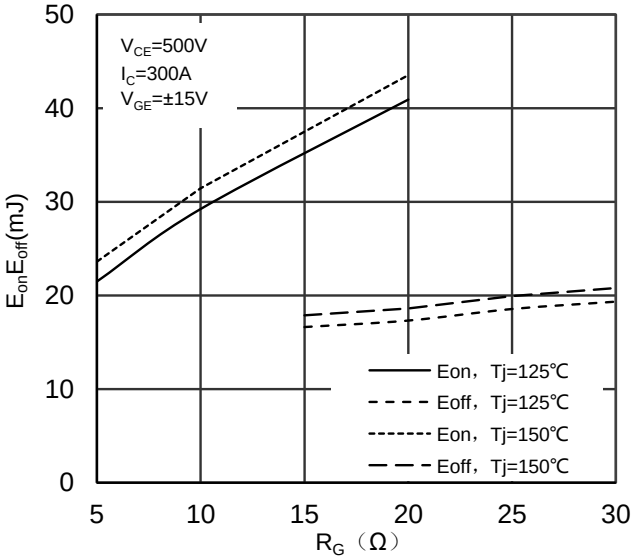


Figure 5. Switching Energy vs Gate Resistor IGBT
（T1、T4）

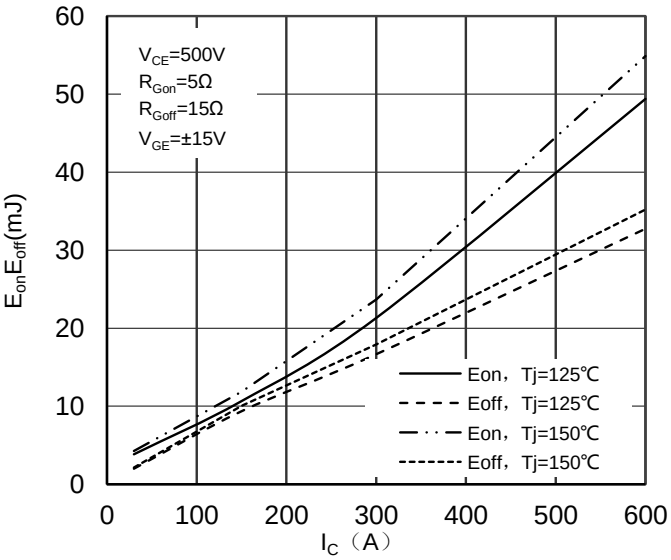


Figure 6. Switching Energy vs Collector Current IGBT
（T1、T4）

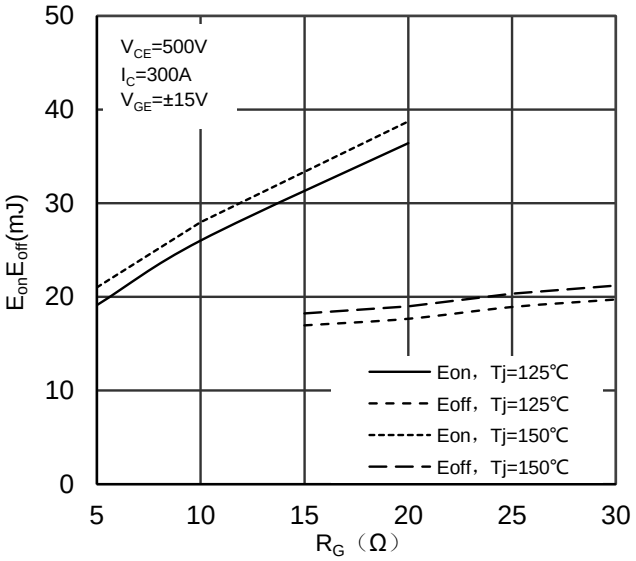


Figure 7. Switching Energy vs Gate Resistor IGBT （T2、T3）

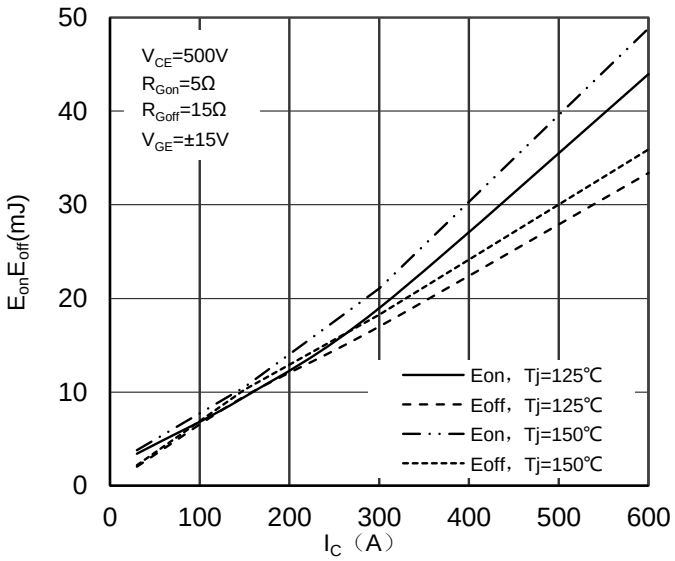


Figure 8. Switching Energy vs Collector Current IGBT （T2、T3）

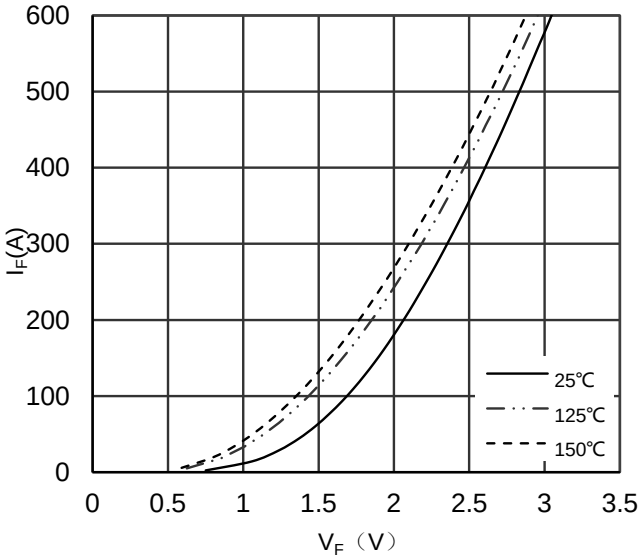


Figure 9. Diode Forward Characteristics Diode

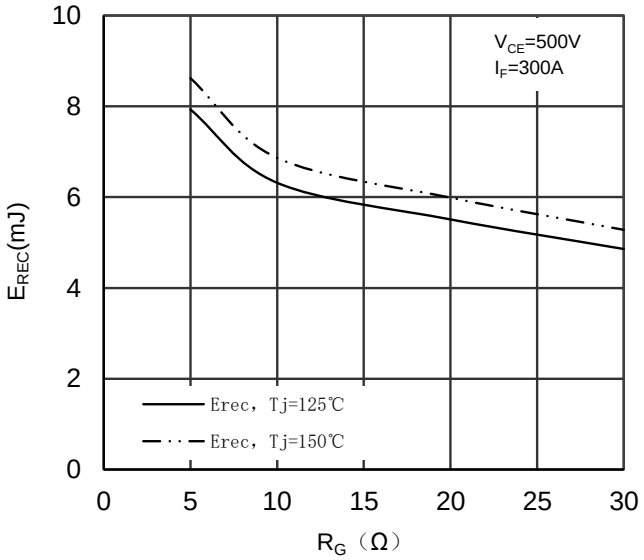


Figure 10. Switching Energy vs Gate Resistor Diode

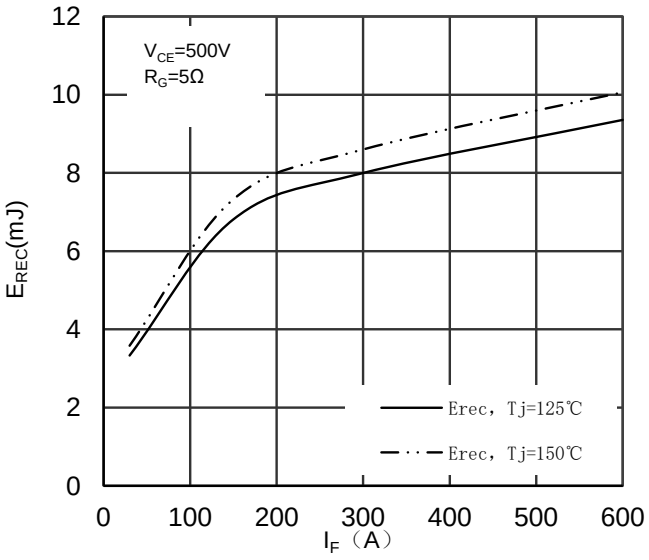


Figure 11. Switching Energy vs Forward Current Diode

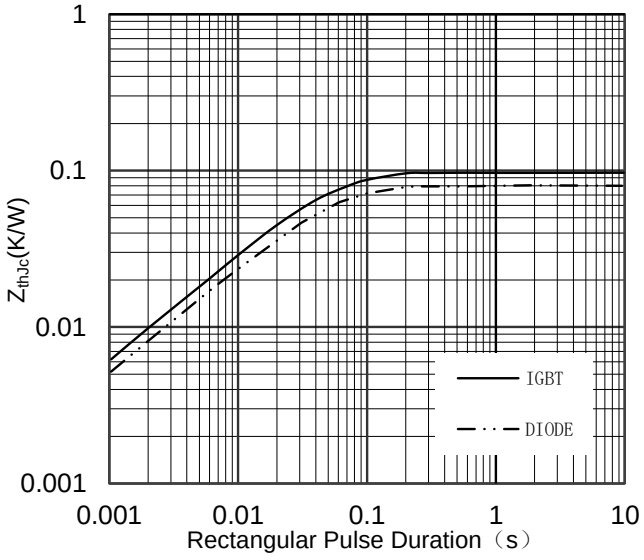


Figure 12. Transient Thermal Impedance

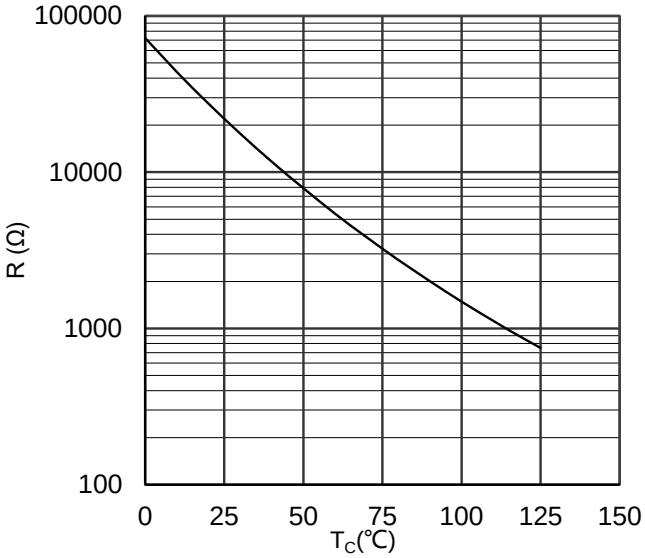


Figure 13. NTC Characteristics

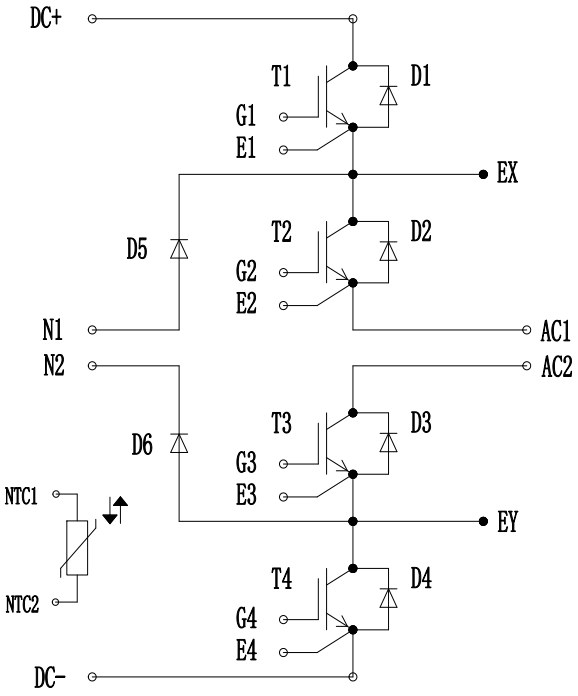
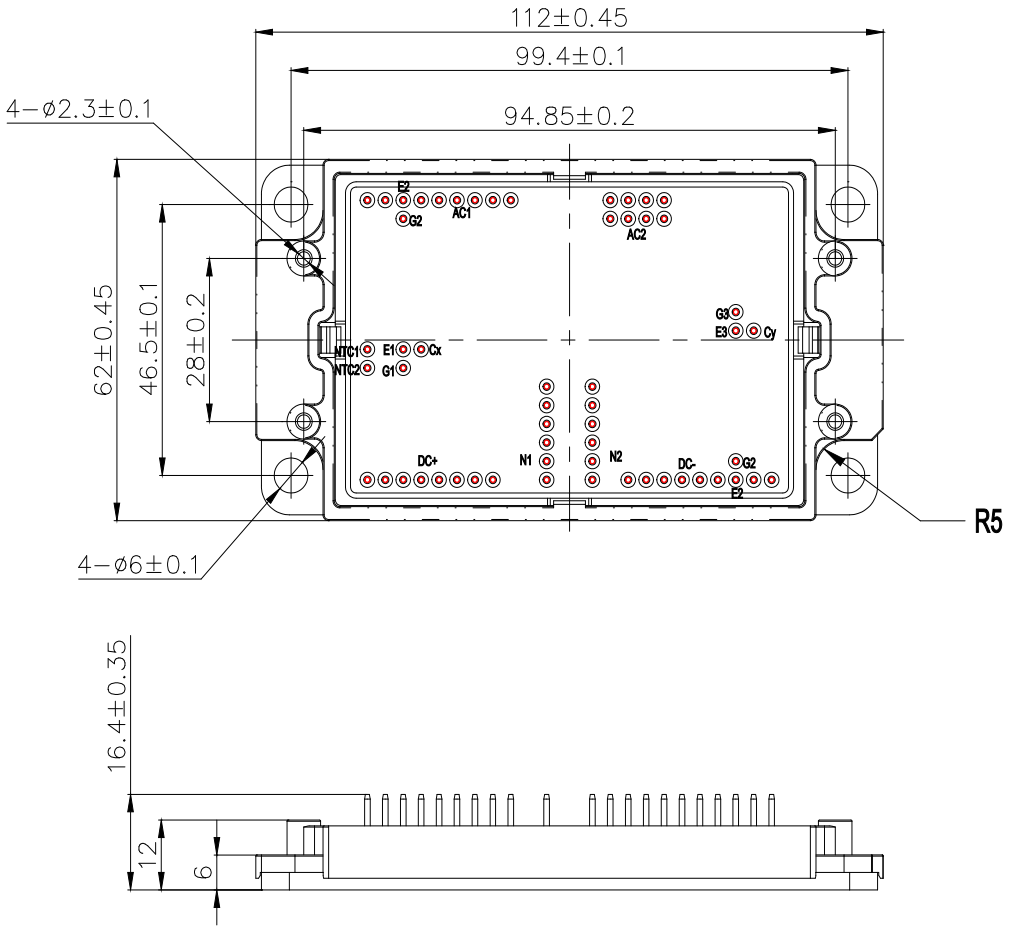


Figure 14. Circuit Diagram



Dimensions in (mm)

Figure 15. Package Outline

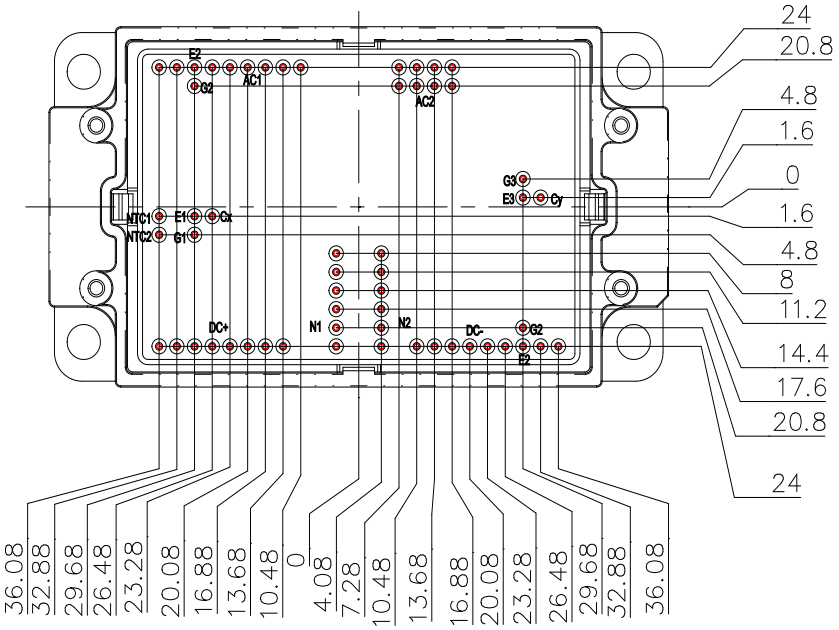


Figure 16. Pin Coordinates