MMG200B065PD6EN

650V 200A Three Level Inverter Module

November 2017 Version 01 RoHS Compliant

PRODUCT FEATURES

☐ 650V IGBT^3 CHIP(Trench+Field Stop technology)

☐ Low saturation voltage and positive temperature coefficient

☐ Low switching losses and short tail current

☐ Free wheeling diodes with fast and soft reverse recovery

☐ Temperature sense included

APPLICATIONS

☐ 3-Level-Applications

☐ Solar Applications

☐ UPS Systems

IGBT(T1、T2、T3、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℃	650	V
V_{GES}	Gate Emitter Voltage		±20	
I_C	DC Collector Current	T_C=25℃,T_{Jmax}=175℃	235	A
		T_C=60℃,T_{Jmax}=175℃	200	
I_{CM}	Repetitive Peak Collector Current	tp=1ms	400	
P_{tot}	Power Dissipation Per IGBT	T_C=25℃, T_{Jmax}=175℃	600	W

Diode(D1～D6) ABSOLUTE MAXIMUM RATINGS (T_C *=25°C unless otherwise specified*)

Symbol	Parameter/Test Conditions		Values	Unit
V_{RRM}	Repetitive Reverse Voltage	T_J=25℃	650	V
$I_{F(AV)}$	Average Forward Current(D1～D4)		150	A
I_{FRM}	Repetitive Peak Forward Current(D1～D4)	tp=1ms	300	
I^2t	(D1～D4)	T_J=125℃, t=10ms, V_R=0V	1450	A^2S
$I_{F(AV)}$	Average Forward Current(D5、D6)		200	A
I_{FRM}	Repetitive Peak Forward Current(D5、D6)	tp=1ms	400	
I^2t	(D5、D6)	T_J=125℃, t=10ms, V_R=0V	2650	A^2S

IGBT(T1、T2、T3、T4)

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=3.2mA		4.9	5.8	6.5	V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	I_C=200A, V_{GE}=15V, T_J=25℃			1.45	1.9	
		I_C=200A, V_{GE}=15V, T_J=150℃			1.7		
I_{CES}	Collector Leakage Current	V_{CE}=650V, V_{GE}=0V, T_J=25℃				1	mA
		V_{CE}=650V, V_{GE}=0V, T_J=150℃				5	
I_{GES}	Gate Leakage Current	V_{CE}=0V,V_{GE}=±15V, T_J=25℃		-400		400	nA
R_{gint}	Integrated Gate Resistor				2		Ω
Q_g	Gate Charge	V_{CE}=300V, I_C=200A , V_{GE}=±15V			2.15		μC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz			12.4		nF
C_{res}	Reverse Transfer Capacitance				0.37		nF
$t_{d(on)}$	Turn on Delay Time	V_{CC}=300V,I_C=200A R_G =2.7Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		90		ns
			T_J=150℃		110		ns
t_r	Rise Time		T_J=25℃		60		ns
			T_J=150℃		60		ns
$t_{d(off)}$	Turn off Delay Time	V_{CC}=300V,I_C=200A R_G =2.7Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		390		ns
			T_J=150℃		420		ns
t_f	Fall Time		T_J=25℃		60		ns
			T_J=150℃		80		ns
E_{on}	Turn on Energy	V_{CC}=300V,I_C=200A R_G =2.7Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		2.5		mJ
			T_J=150℃		3.1		mJ
E_{off}	Turn off Energy		T_J=25℃		5.5		mJ
			T_J=150℃		7.1		mJ
I_{SC}	Short Circuit Current	tpsc≤6μS , V_{GE}=15V T_J=125℃,V_{CC}=360V			1000		A
R_{thJC}	Junction to Case Thermal Resistance （ Per IGBT）					0.25	K /W

Diode(D1～D6) ELECTRICAL CHARACTERISTICS *(T_C=25°C unless otherwise specified)*

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
V_F	Forward Voltage(D1～D4)	I_F=150A , V_{GE}=0V, T_J=25℃		1.55	1.95	V
		I_F=150A , V_{GE}=0V, T_J=150℃		1.45		
t_{rr}	Reverse Recovery Time(D1～D4)	I_F=150A , V_R=300V dI_F/dt=-1700A/μs T_J =150℃		130		ns
I_{RRM}	Max. Reverse Recovery Current(D1～D4)			80		A
Q_{RR}	Reverse Recovery Charge(D1～D4)			13		μC
E_{rec}	Reverse Recovery Energy(D1～D4)			3.5		mJ
R_{thJCD}	Junction to Case Thermal Resistance（ Per Diode）(D1～D4)				0.6	K /W
V_F	Forward Voltage(D5、D6)	I_F=200A , V_{GE}=0V, T_J=25℃		1.55	1.95	V
		I_F=200A , V_{GE}=0V, T_J=150℃		1.45		
t_{rr}	Reverse Recovery Time(D5、D6)	I_F=200A , V_R=300V dI_F/dt=-2300A/μs T_J =150℃		135		ns
I_{RRM}	Max. Reverse Recovery Current(D5、D6)			148		A
Q_{RR}	Reverse Recovery Charge(D5、D6)			20		μC
E_{rec}	Reverse Recovery Energy(D5、D6)			5		mJ
R_{thJCD}	Junction to Case Thermal Resistance（ Per Diode）(D5、D6)				0.45	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		175	℃
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	
Torque	to heatsink	Recommended（M6）	3~5	Nm
	to terminal	Recommended（M6）	3~5	Nm
Weight			300	g

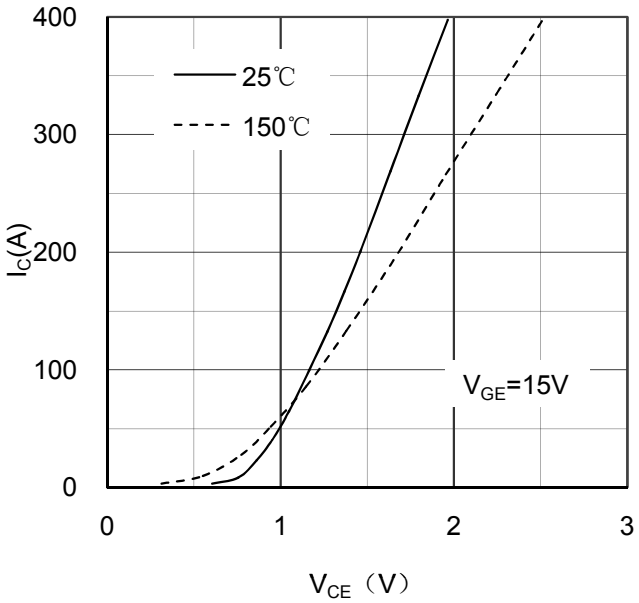


Figure 1. Typical Output Characteristics IGBT

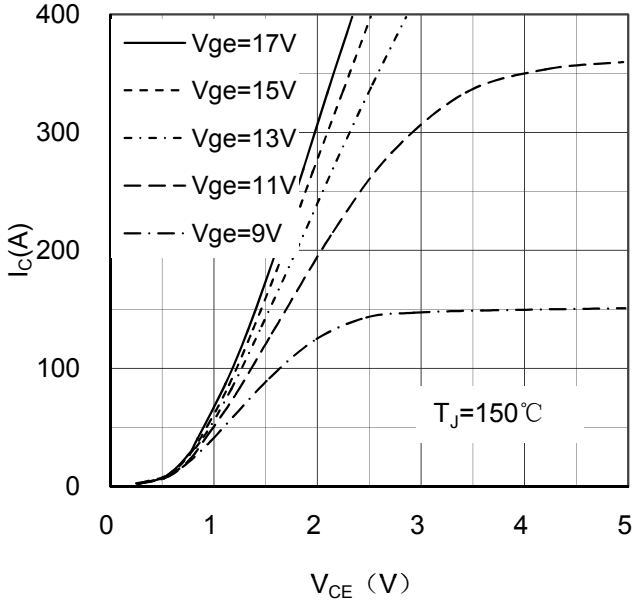


Figure 2. Typical Output Characteristics IGBT

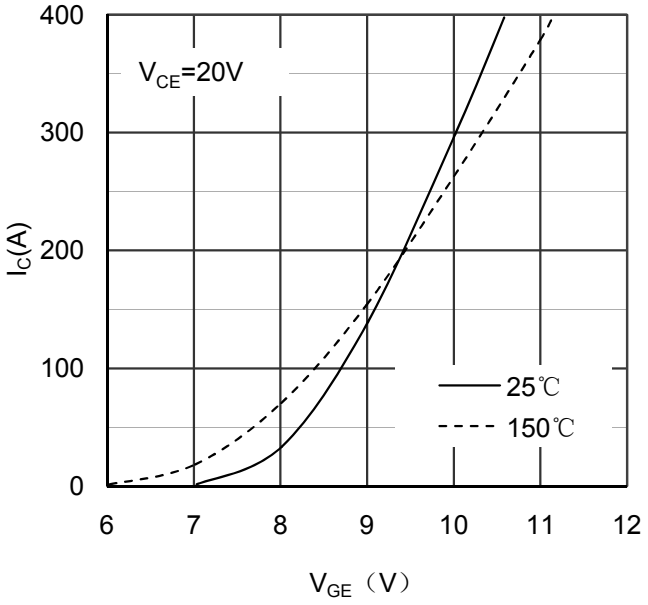


Figure 3. Typical Transfer characteristics IGBT

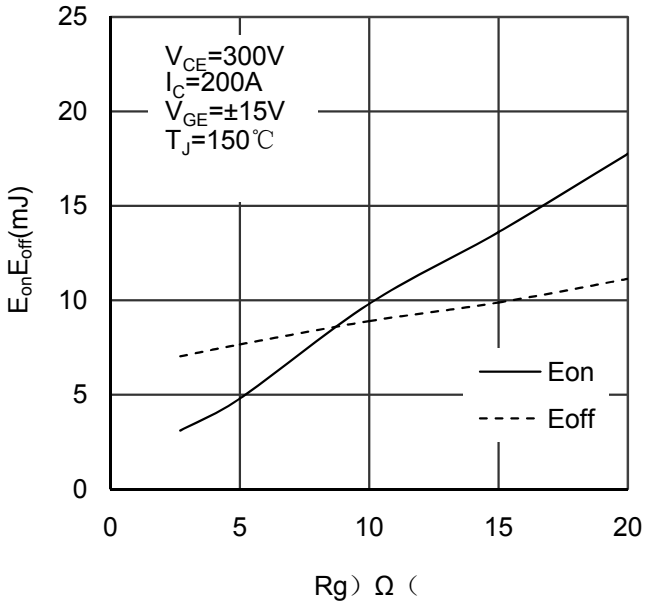


Figure 4. Switching Energy vs Gate Resistor IGBT

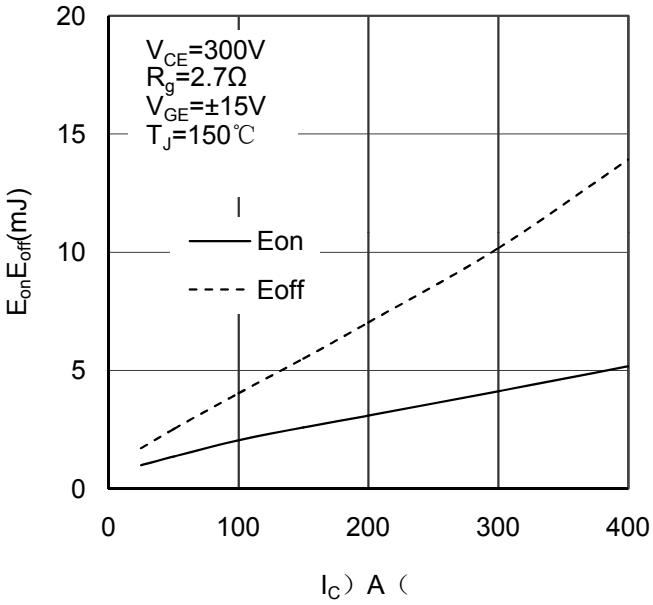


Figure 5. Switching Energy vs Collector Current IGBT

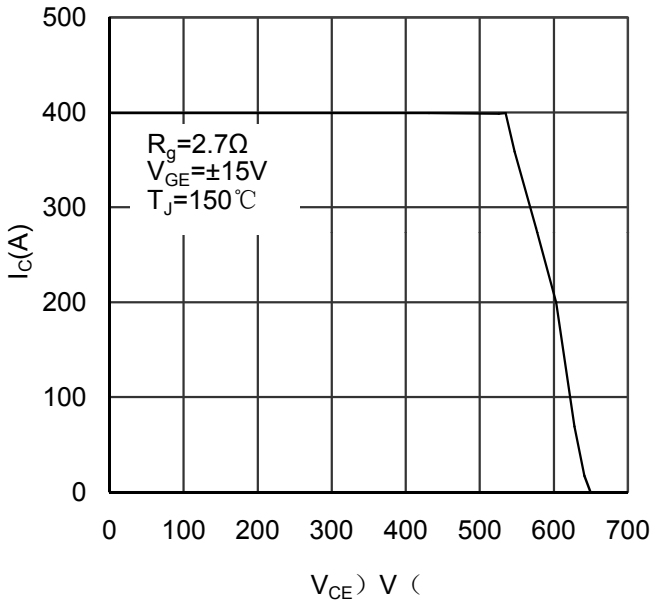


Figure 6. Reverse Biased Safe Operating Area IGBT

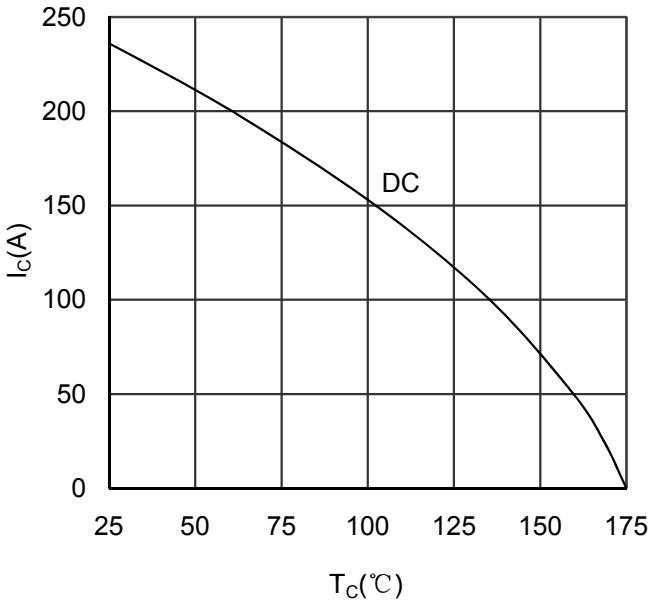


Figure 7. Collector Current vs Case temperature IGBT

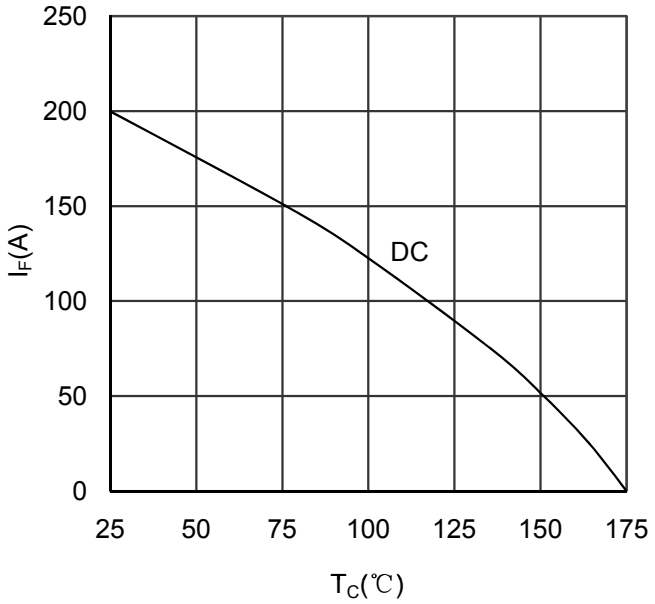


Figure 8. Forward current vs Case temperature Diode(D5、D6)

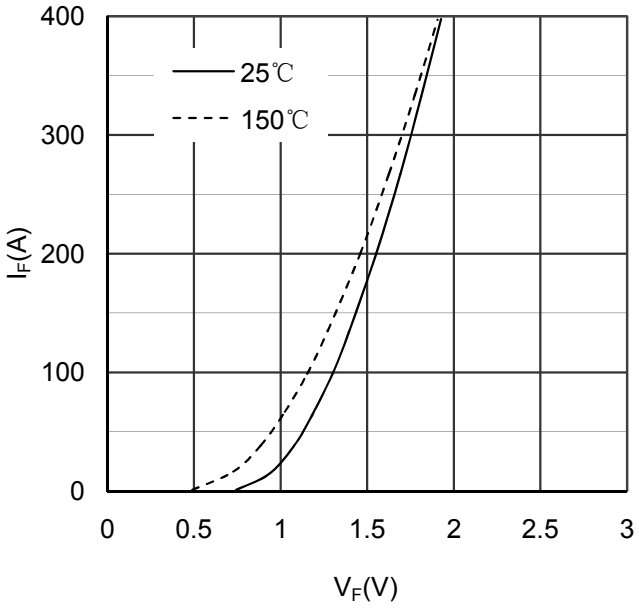


Figure 9. Diode Forward Characteristics Diode(D5、D6)

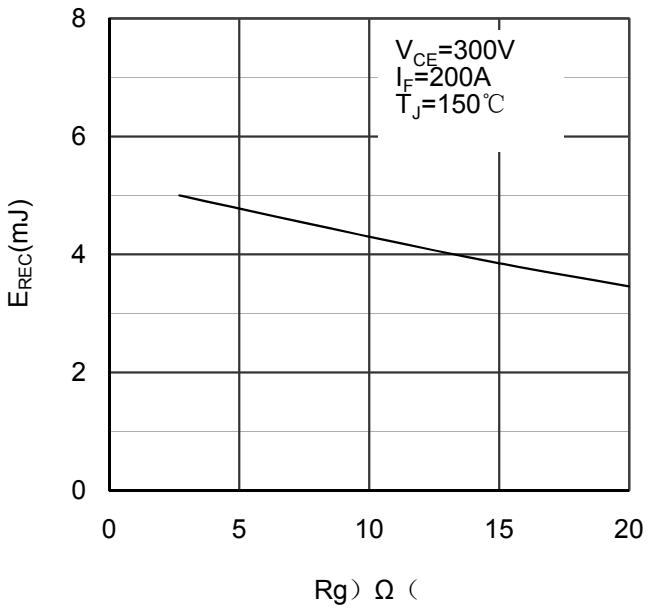


Figure 10. Switching Energy vs Gate Resistor Diode(D5、D6)

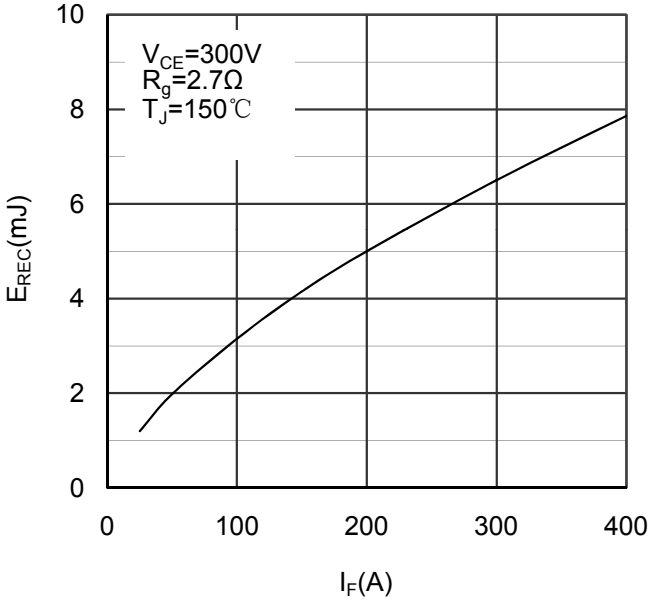


Figure 11. Switching Energy vs Forward Current Diode(D5、D6)

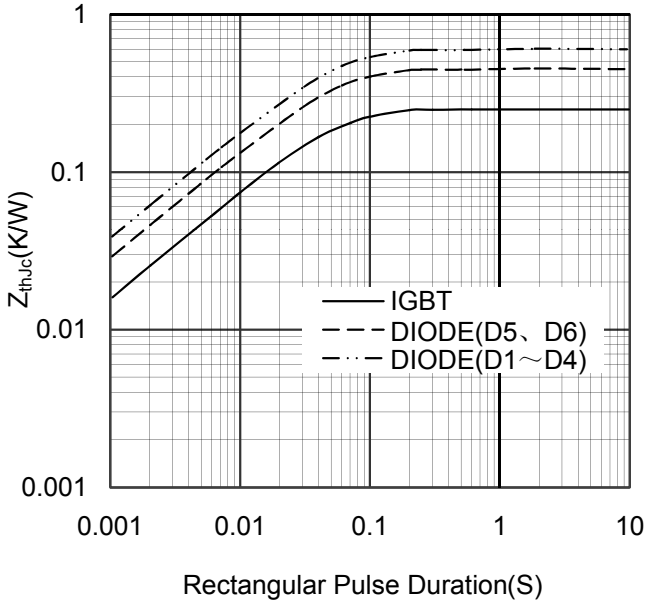


Figure 12. Transient Thermal Impedance of Diode and IGBT

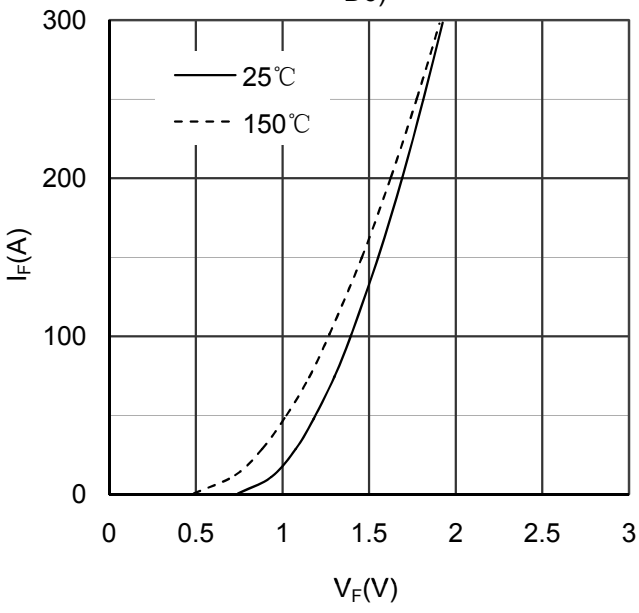


Figure 13. Diode Forward Characteristics Diode(D1～D4)

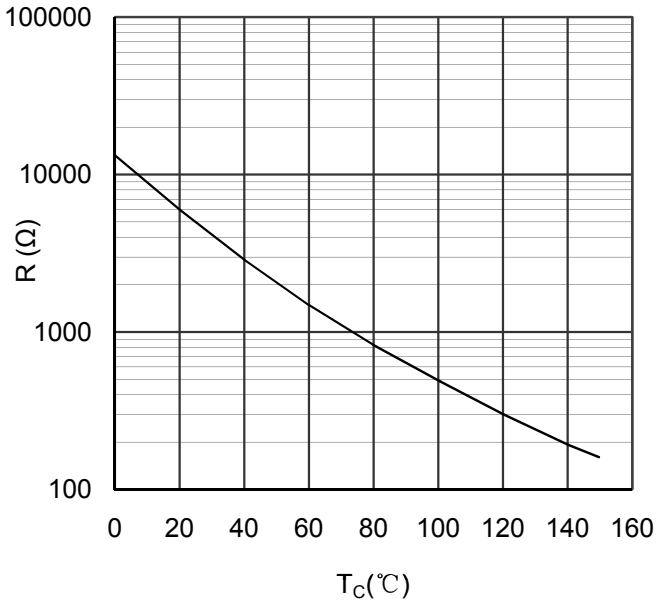


Figure 14. NTC Characteristics

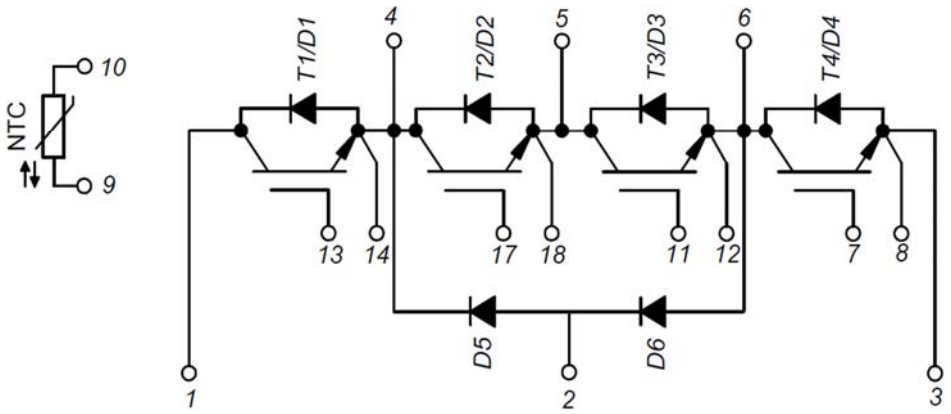
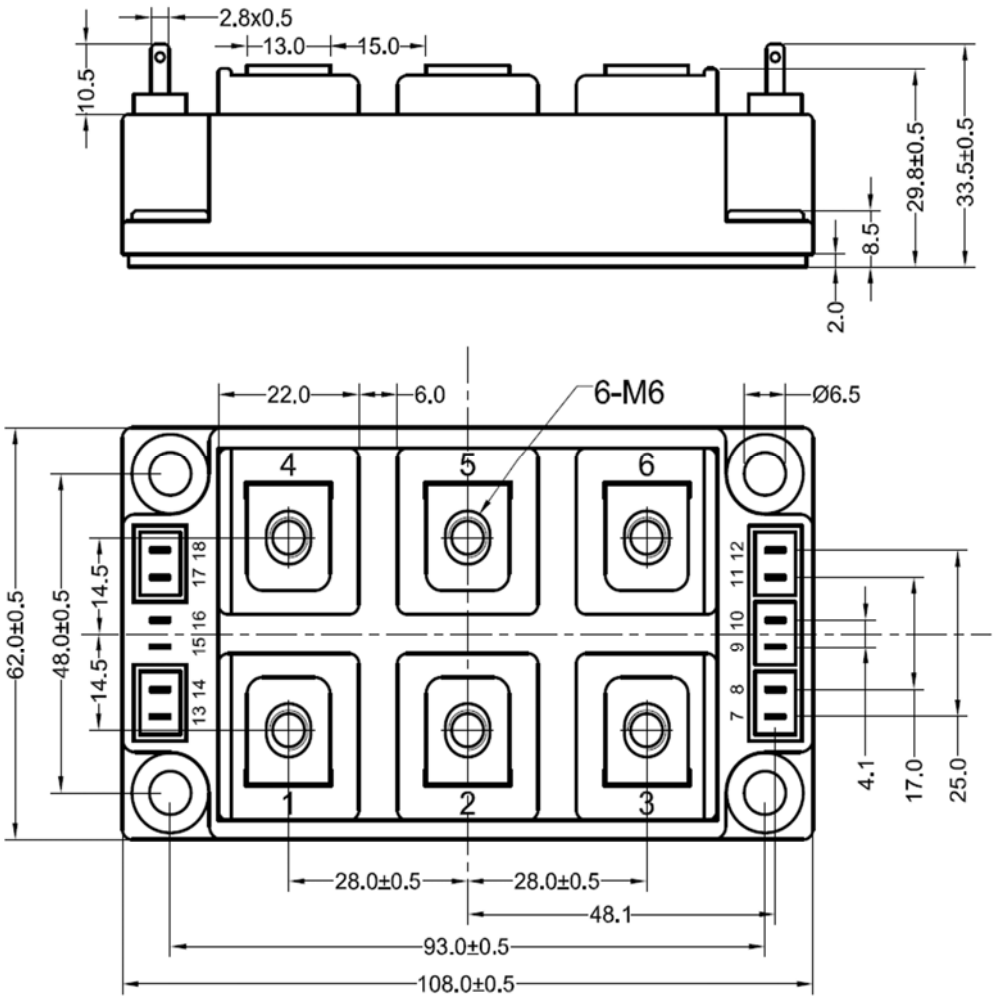


Figure 15. Circuit Diagram



Dimensions in (mm)

Figure 16. Package Outline