

## PRODUCT FEATURES

- 650V IGBT<sup>3</sup> 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( $T_C=25^{\circ}\text{C}$  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		$\pm 20$	
$I_C$	DC Collector Current	$T_C=25^{\circ}\text{C}, T_{Jmax}=175^{\circ}\text{C}$	235	A
		$T_C=60^{\circ}\text{C}, T_{Jmax}=175^{\circ}\text{C}$	200	
$I_{CM}$	Repetitive Peak Collector Current	$t_p=1\text{ms}$	400	
$P_{tot}$	Power Dissipation Per IGBT	$T_C=25^{\circ}\text{C}, T_{Jmax}=175^{\circ}\text{C}$	600	W

Diode(D1~D6) 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(D1~D4)		150	A
$I_{FRM}$	Repetitive Peak Forward Current(D1~D4)	$t_p=1\text{ms}$	300	
$I^2t$	(D1~D4)	$T_J=125^{\circ}\text{C}, t=10\text{ms}, V_R=0\text{V}$	1450	$\text{A}^2\text{S}$
$I_{F(AV)}$	Average Forward Current(D5、 D6)		200	A
$I_{FRM}$	Repetitive Peak Forward Current(D5、 D6)	$t_p=1\text{ms}$	400	
$I^2t$	(D5、 D6)	$T_J=125^{\circ}\text{C}, t=10\text{ms}, V_R=0\text{V}$	2650	$\text{A}^2\text{S}$

MacMic Science & Technology Co., Ltd.

Add: #18, Hua Shan Zhong Lu, New District, Changzhou City, Jiangsu Province, P. R .of China

# MMG200B065PD6EN

IGBT(T1、T2、T3、T4)

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

Diode(D1~D6) ELECTRICAL CHARACTERISTICS ( $T_C=25^\circ\text{C}$  unless otherwise specified)

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
$V_F$	Forward Voltage(D1~D4)	$I_F=150\text{A}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$		1.55	1.95	V
		$I_F=150\text{A}, V_{GE}=0\text{V}, T_J=150^\circ\text{C}$		1.45		
$t_{rr}$	Reverse Recovery Time(D1~D4)	$I_F=150\text{A}, V_R=300\text{V}$ $di_F/dt=-1700\text{A}/\mu\text{s}$ $T_J=150^\circ\text{C}$		130		ns
$I_{RRM}$	Max. Reverse Recovery Current(D1~D4)			80		A
$Q_{RR}$	Reverse Recovery Charge(D1~D4)			13		$\mu\text{C}$
$E_{rec}$	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)	$I_F=200\text{A}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$		1.55	1.95	V
		$I_F=200\text{A}, V_{GE}=0\text{V}, T_J=150^\circ\text{C}$		1.45		
$t_{rr}$	Reverse Recovery Time(D5、D6)	$I_F=200\text{A}, V_R=300\text{V}$ $di_F/dt=-2300\text{A}/\mu\text{s}$ $T_J=150^\circ\text{C}$		135		ns
$I_{RRM}$	Max. Reverse Recovery Current(D5、D6)			148		A
$Q_{RR}$	Reverse Recovery Charge(D5、D6)			20		$\mu\text{C}$
$E_{rec}$	Reverse Recovery Energy(D5、D6)			5		mJ
$R_{thJCD}$	Junction to Case Thermal Resistance ( Per Diode ) (D5、D6)				0.45	K /W

# MMG200B065PD6EN

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

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

Symbol	Parameter/Test Conditions	Values	Unit	
$T_{Jmax}$	Max. Junction Temperature	175	°C	
$T_{Jop}$	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

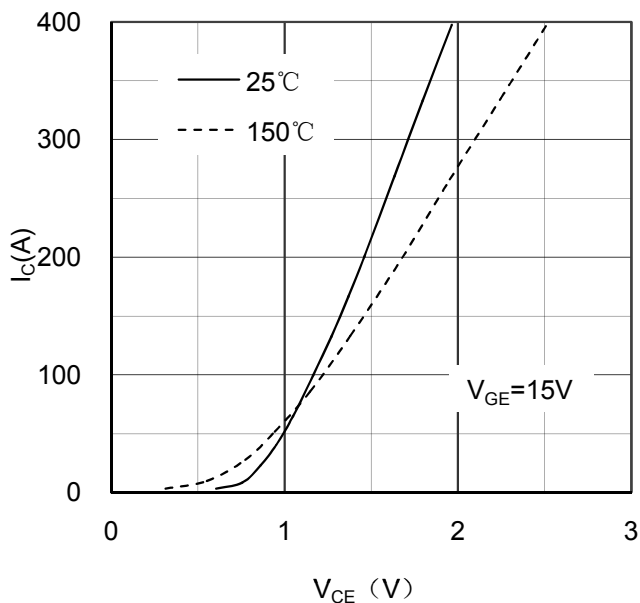


Figure 1. Typical Output Characteristics IGBT

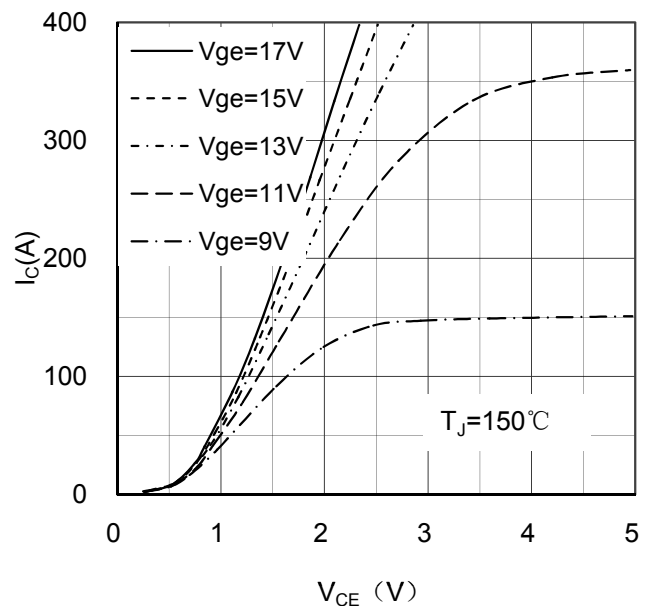


Figure 2. Typical Output Characteristics IGBT

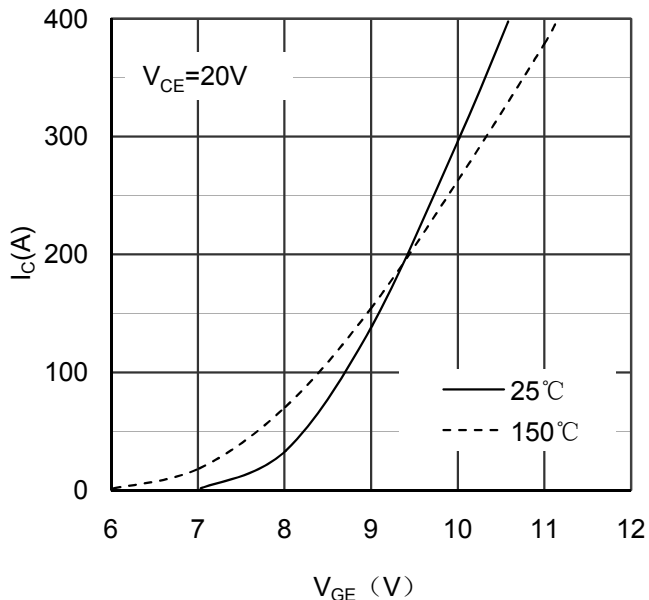


Figure 3. Typical Transfer characteristics IGBT

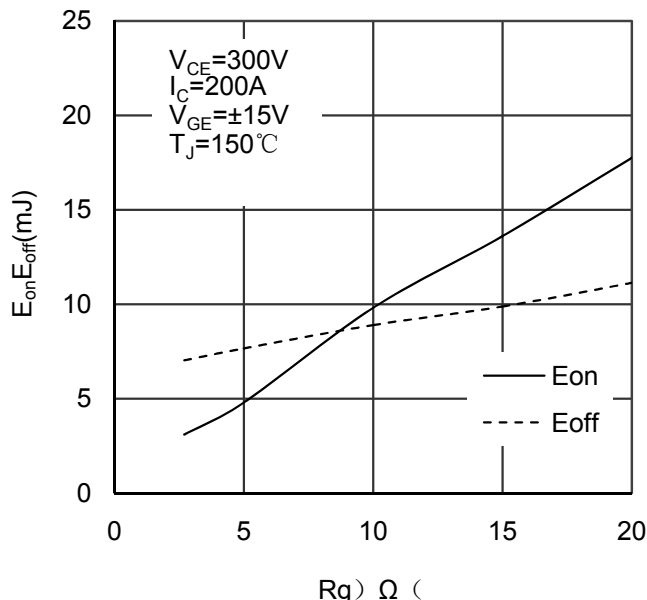


Figure 4. Switching Energy vs Gate Resistor IGBT

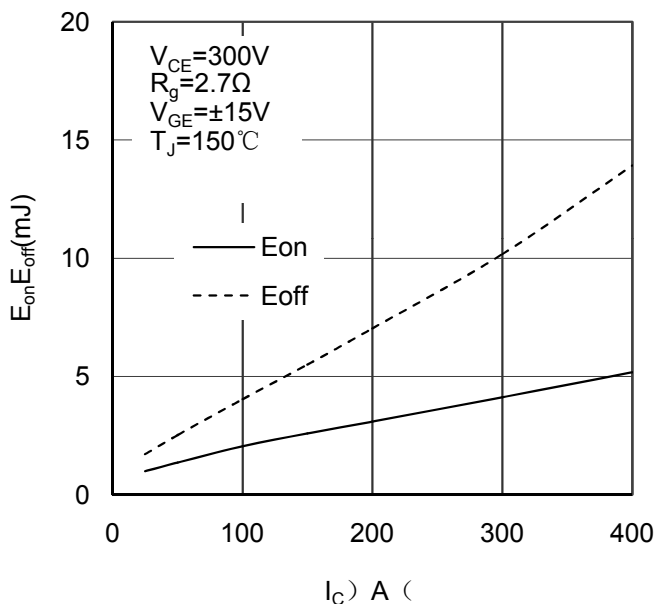


Figure 5. Switching Energy vs Collector Current IGBT

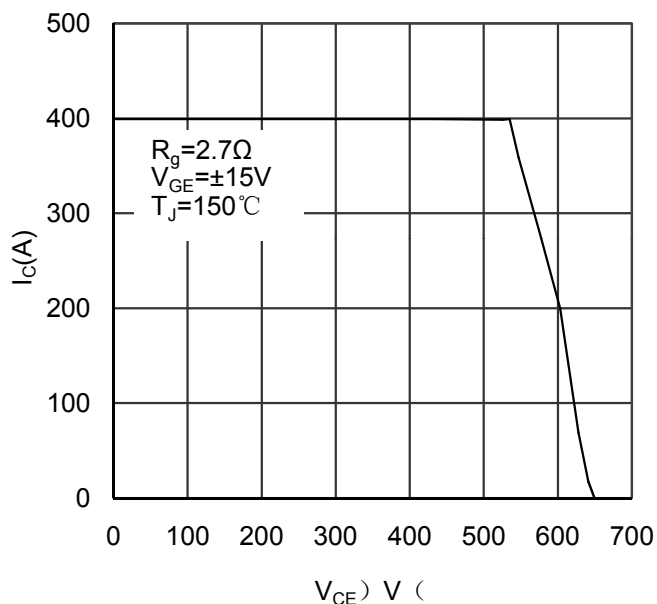


Figure 6. Reverse Biased Safe Operating Area IGBT

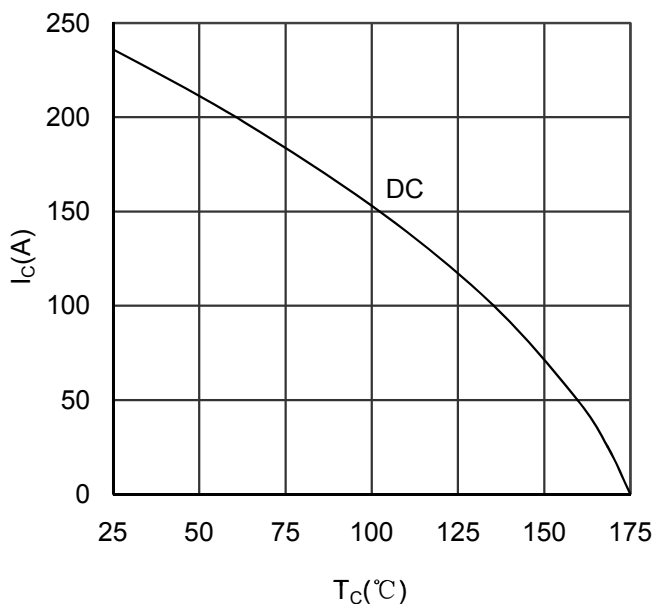


Figure 7. Collector Current vs Case temperature IGBT

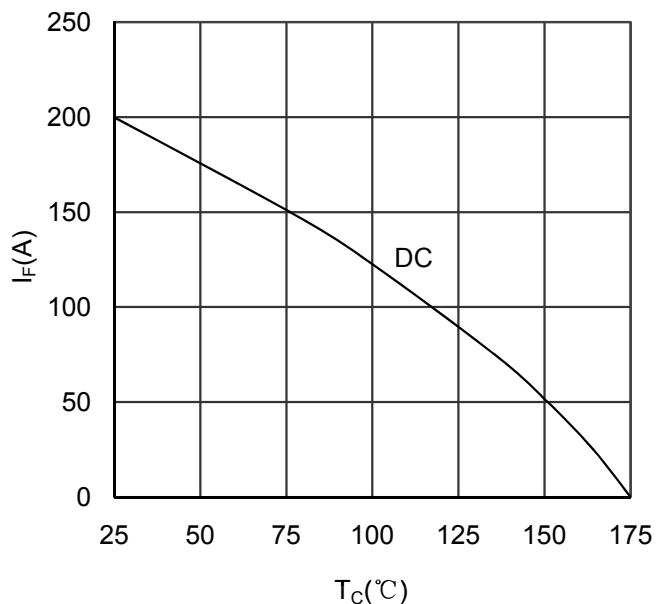


Figure 8. Forward current vs Case temperature Diode(D5, D6)

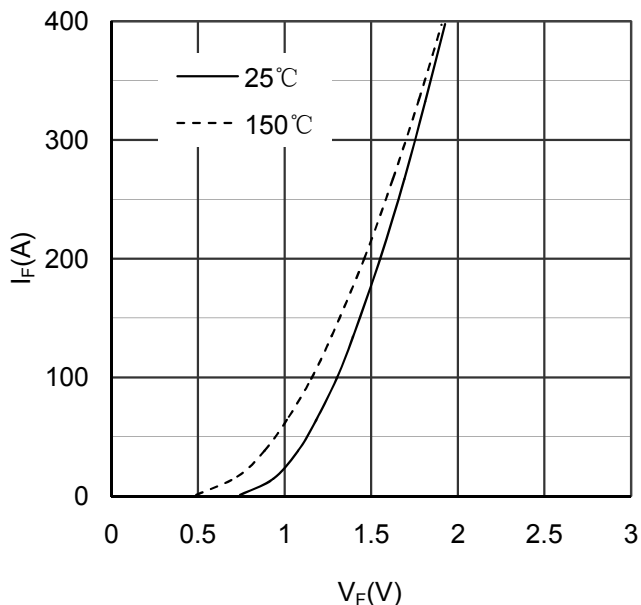


Figure 9. Diode Forward Characteristics Diode(D5, D6)

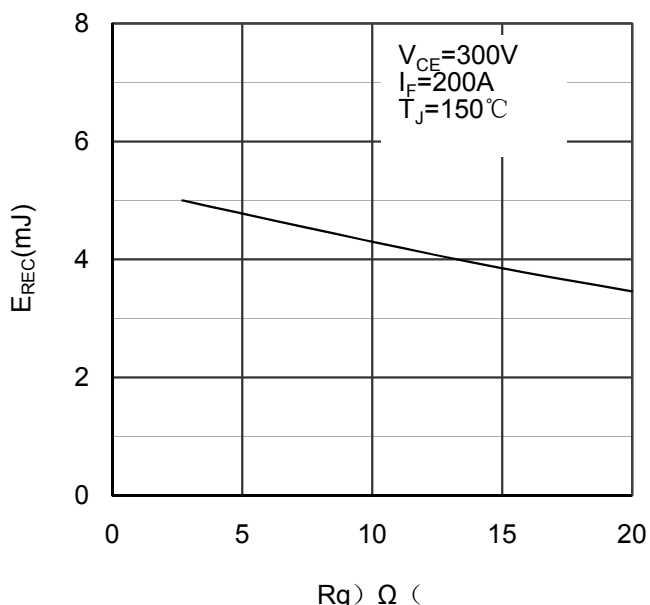


Figure 10. Switching Energy vs Gate Resistor Diode(D5, D6)

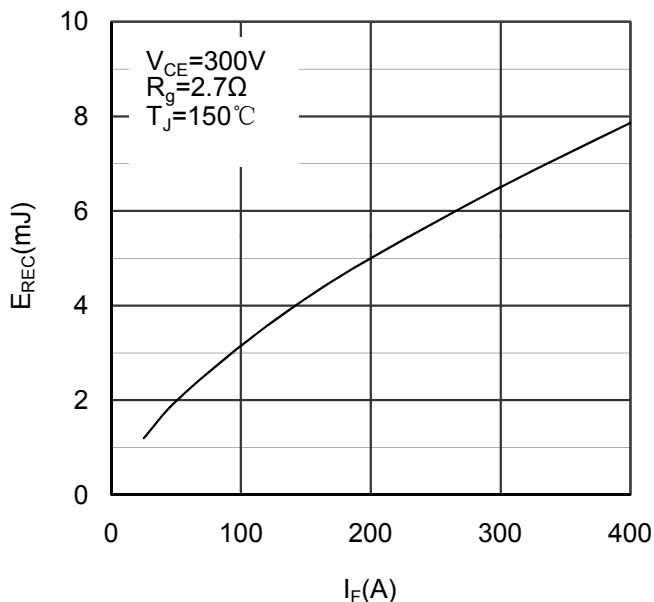


Figure 11. Switching Energy vs Forward Current Diode(D5, D6)

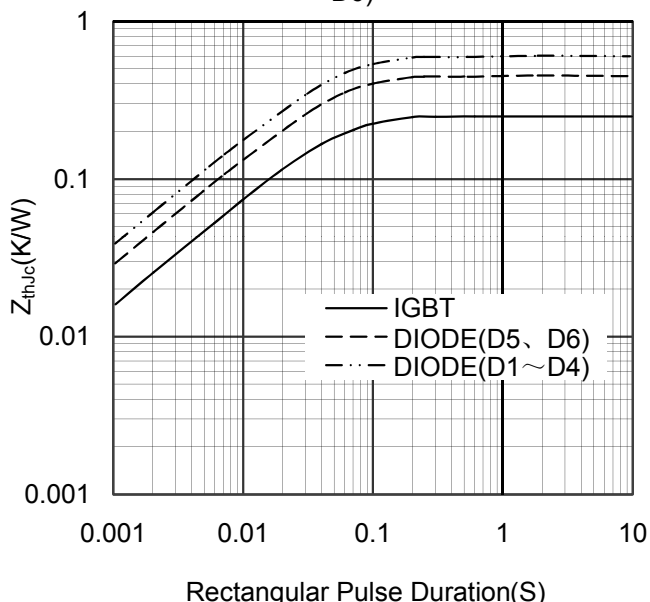


Figure 12. Transient Thermal Impedance of Diode and IGBT

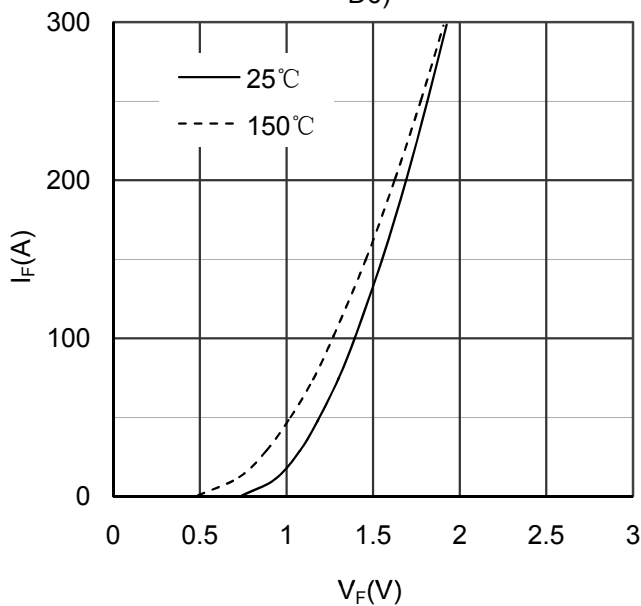


Figure 13. Diode Forward Characteristics Diode(D1~D4)

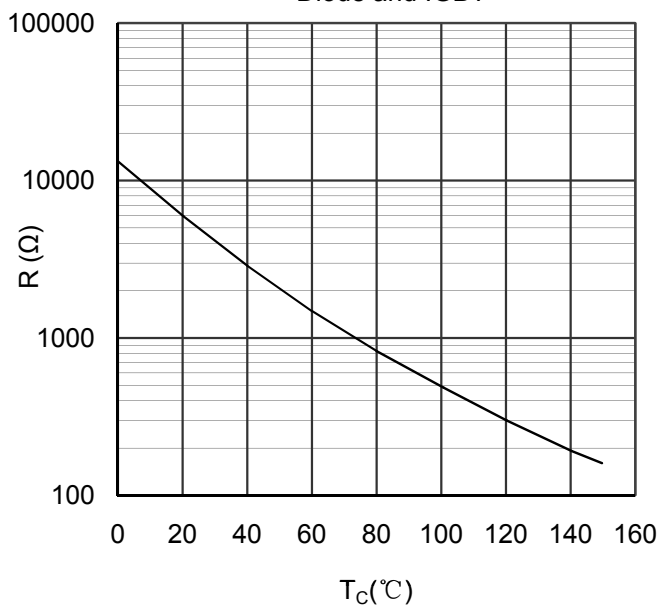


Figure 14. NTC Characteristics

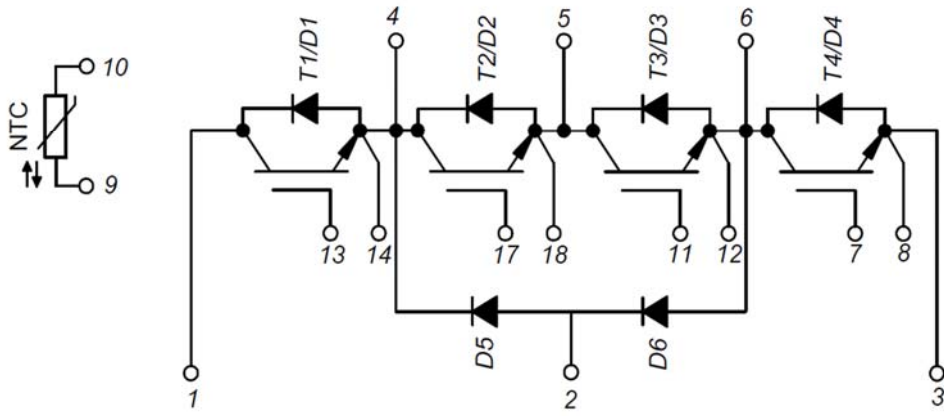
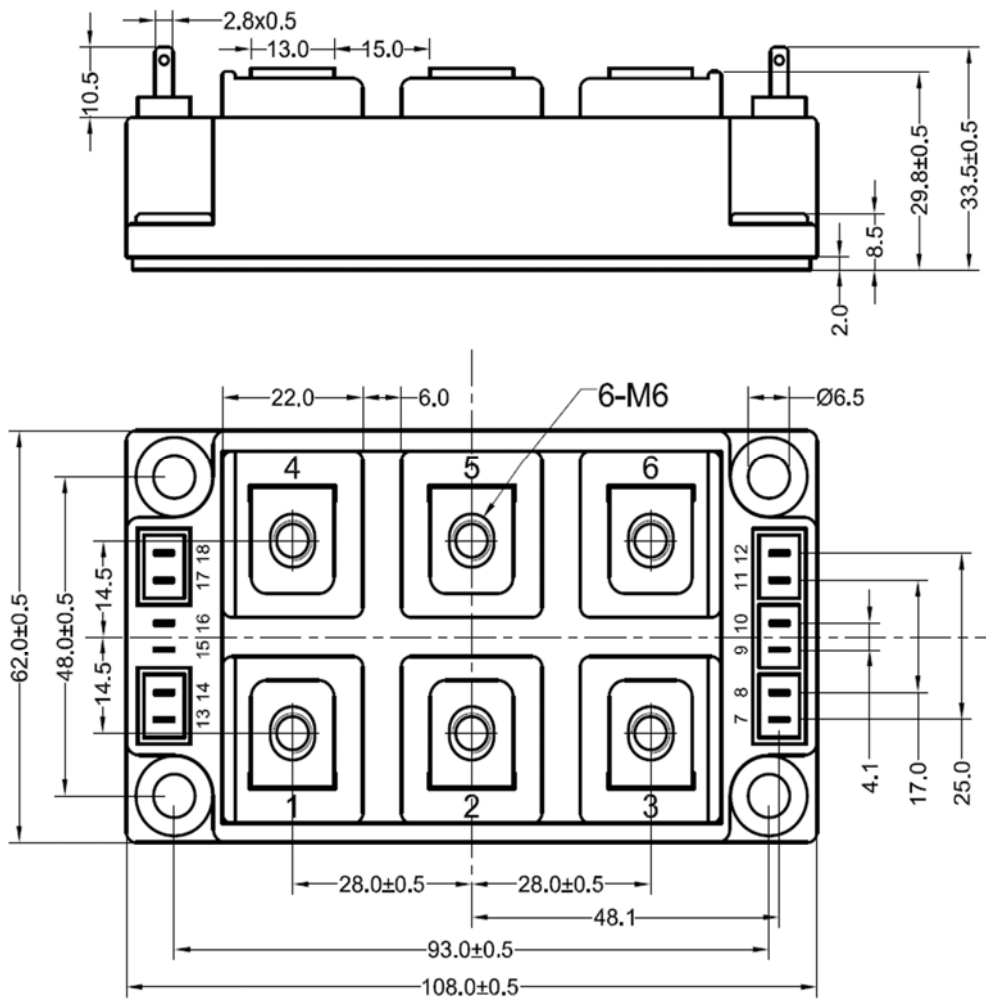


Figure 15. Circuit Diagram



Dimensions in (mm)

Figure 16. Package Outline