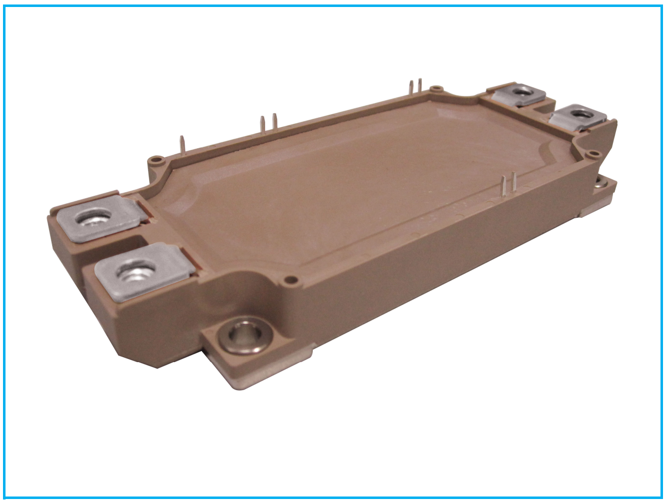
MMG600WB065B6EN

650V 600A IGBT Module

March 2017 Preliminary RoHS Compliant

PRODUCT FEATURES



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

☐ High short circuit capability,self limiting short circuit current

☐ $V_{CE(sat)}$ with positive temperature coefficient

☐ Fast switching and short tail current

☐ Free wheeling diodes with fast and soft reverse recovery

☐ Temperature sense included

APPLICATIONS

☐ AC motor control

☐ Motion/servo control

☐ Inverter and power supplies

☐ Photovoltaic/Fuel cell

IGBT-inverter

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℃	710	A
		T_C=60℃, T_{Jmax}=175℃	600	
I_{CM}	Repetitive Peak Collector Current	tp=1ms	1200	
P_{tot}	Power Dissipation Per IGBT	T_C=25℃, T_{Jmax}=175℃	1760	W

Diode-inverter

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		600	A
I_{FRM}	Repetitive Peak Forward Current	tp=1ms	1200	
I^2t		T_J=125℃, t=10ms, V_R=0V	19.8	KA^2S

IGBT-inverter

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=9.6mA		4.9	5.8	6.5	V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	I_C=600A, V_{GE}=15V, T_J=25℃			1.45	1.9	
		I_C=600A, V_{GE}=15V, T_J=125℃			1.6		
		I_C=600A, 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	mA
I_{GES}	Gate Leakage Current	V_{CE}=0V,V_{GE}=±15V, T_J=25℃		-600		600	nA
R_{gint}	Integrated Gate Resistor				0.7		Ω
Q_g	Gate Charge	V_{CE}=300V, I_C=600A , V_{GE}=±15V			6.5		μC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz			39		nF
C_{res}	Reverse Transfer Capacitance				1.15		nF
$t_{d(on)}$	Turn on Delay Time	V_{CC}=300V,I_C=600A R_G =1.7Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		120		ns
			T_J=150℃		140		ns
t_r	Rise Time		T_J=25℃		110		ns
			T_J=150℃		120		ns
$t_{d(off)}$	Turn off Delay Time	V_{CC}=300V,I_C=600A R_G =1.7Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		500		ns
			T_J=150℃		560		ns
t_f	Fall Time		T_J=25℃		70		ns
			T_J=150℃		90		ns
E_{on}	Turn on Energy	V_{CC}=300V,I_C=600A R_G =1.7Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		5		mJ
			T_J=125℃		6		mJ
			T_J=150℃		6.5		mJ
E_{off}	Turn off Energy		T_J=25℃		24		mJ
			T_J=125℃		27.5		mJ
			T_J=150℃		28.5		mJ
I_{SC}	Short Circuit Current	tpsc≤6μS , V_{GE}=15V T_J=150℃,V_{CC}=360V			3000		A
R_{thJC}	Junction to Case Thermal Resistance （ Per IGBT）					0.085	K /W

Diode-inverter

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

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=600A , V_{GE}=0V, T_J=25℃		1.55	1.95	V
		I_F=600A , V_{GE}=0V, T_J=125℃		1.50		
		I_F=600A , V_{GE}=0V, T_J=150℃		1.45		
t_{rr}	Reverse Recovery Time	I_F=600A , V_R=300V dI_F/dt=-5000A/μs T_J =150℃		450		ns
I_{RRM}	Max. Reverse Recovery Current			300		A
Q_{RR}	Reverse Recovery Charge			47		μC
E_{rec}	Reverse Recovery Energy			12.6		mJ
R_{thJCD}	Junction to Case Thermal Resistance （ Per Diode）				0.15	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		＞225	
Torque	to heatsink	Recommended（M5）	2.5~5	Nm
	to terminal	Recommended（M6）	3~5	Nm
Weight			350	g

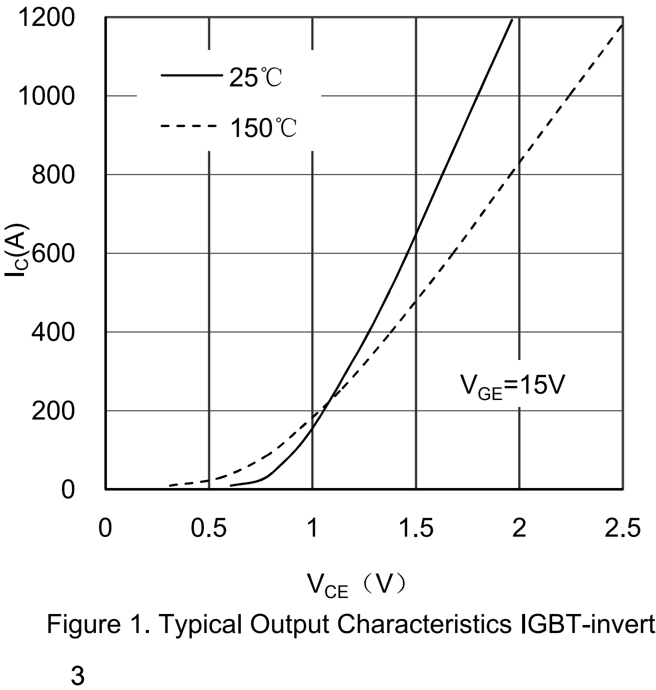


Figure 1. Typical Output Characteristics IGBT-inverter

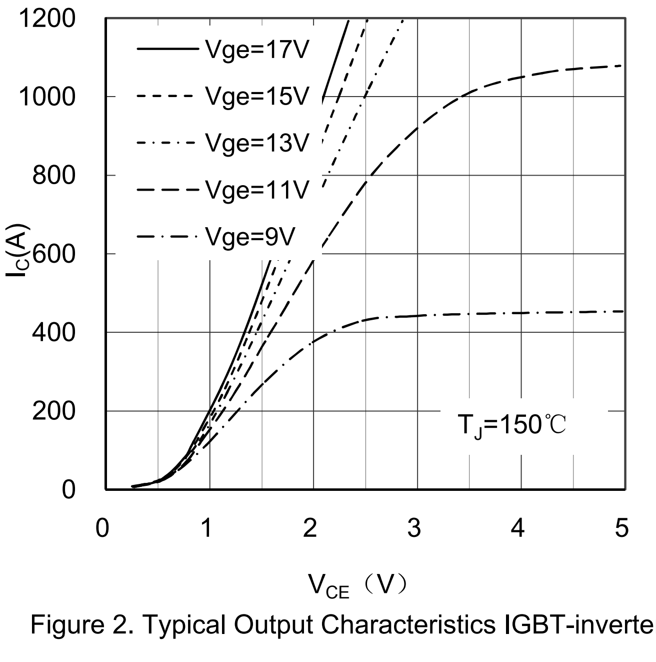


Figure 2. Typical Output Characteristics IGBT-inverter

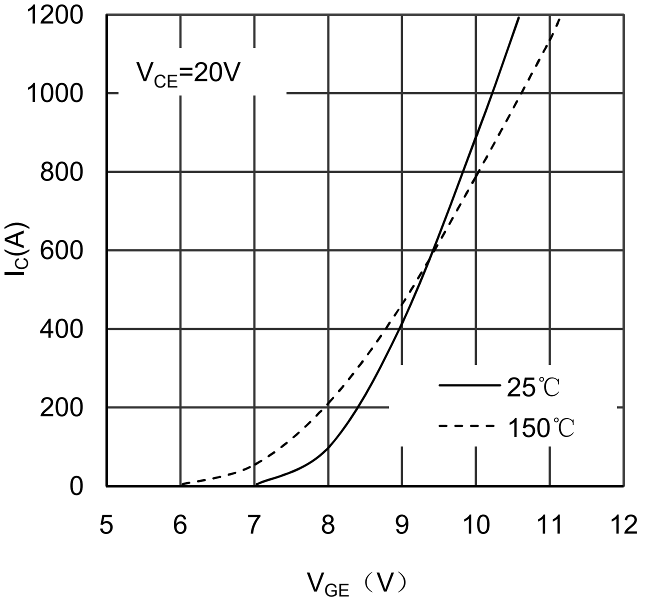


Figure 3. Typical Transfer characteristics IGBT-inverter

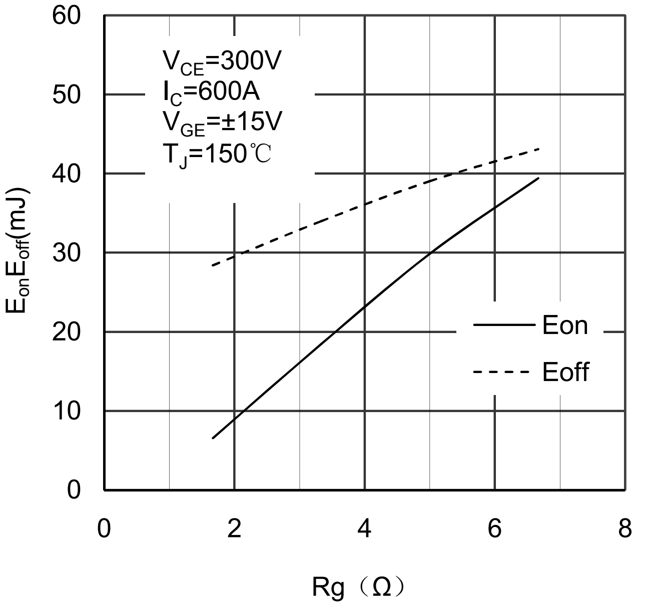


Figure 4. Switching Energy vs Gate Resistor IGBT-inverter

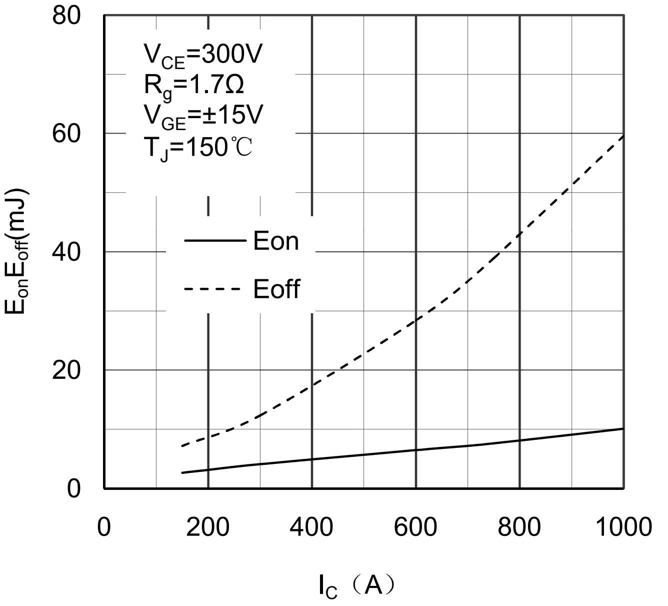


Figure 5. Switching Energy vs Collector Current IGBT-inverter

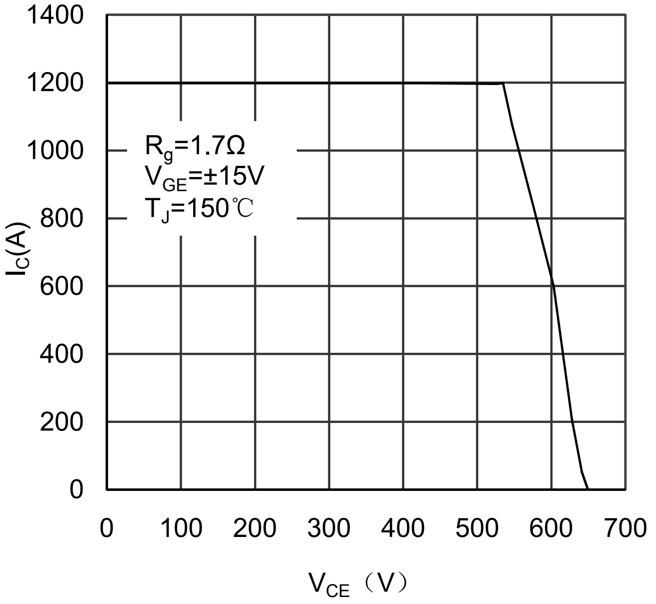


Figure 6. Reverse Biased Safe Operating Area IGBT-inverter

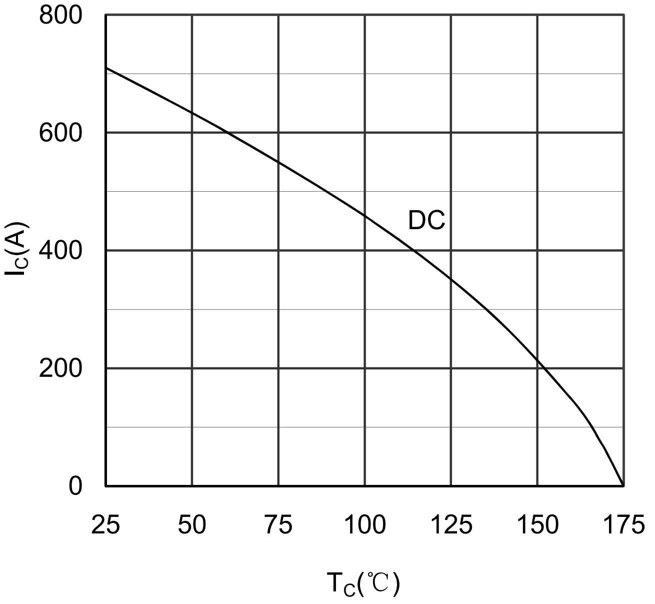


Figure 7. Collector Current vs Case temperature IGBT-inverter

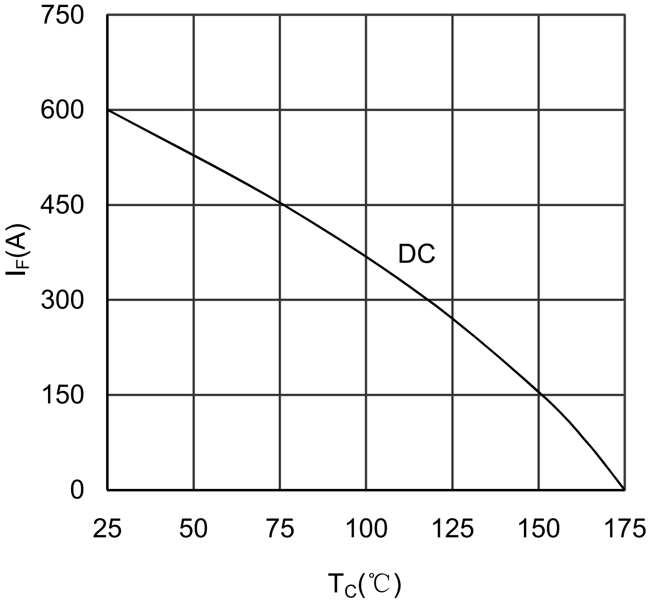


Figure 8. Forward current vs Case temperature Diode-inverter

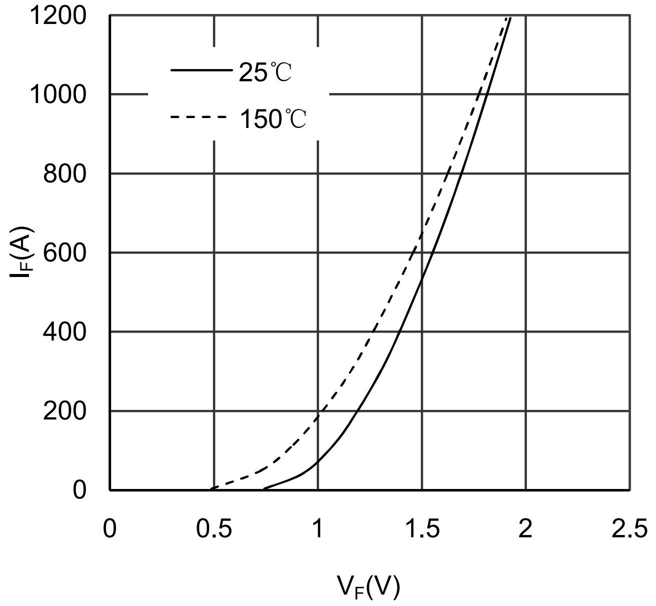


Figure 9. Diode Forward Characteristics Diode-inverter

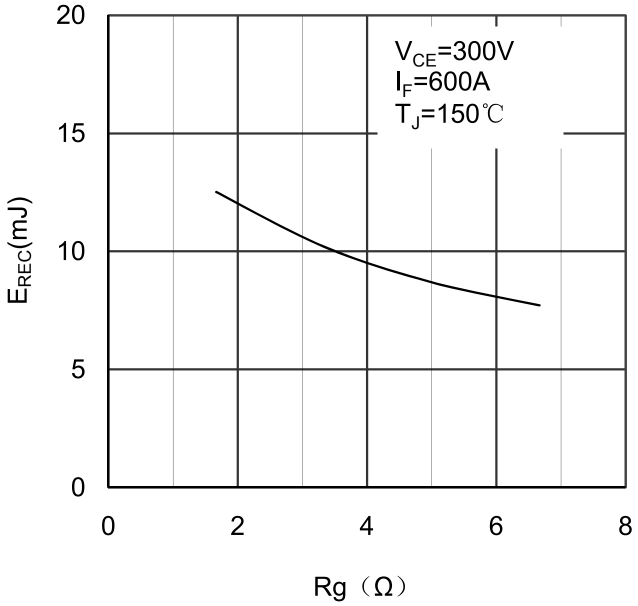


Figure 10. Switching Energy vs Gate Resistor Diode-inverter

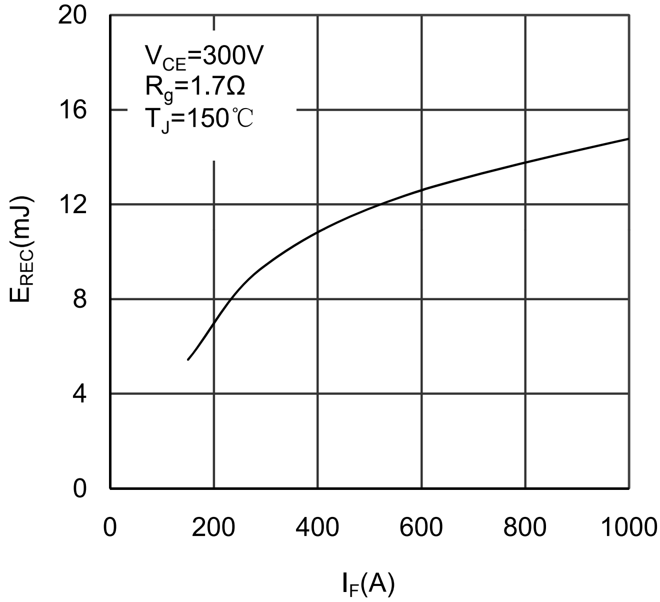


Figure 11. Switching Energy vs Forward Current Diode-inverter

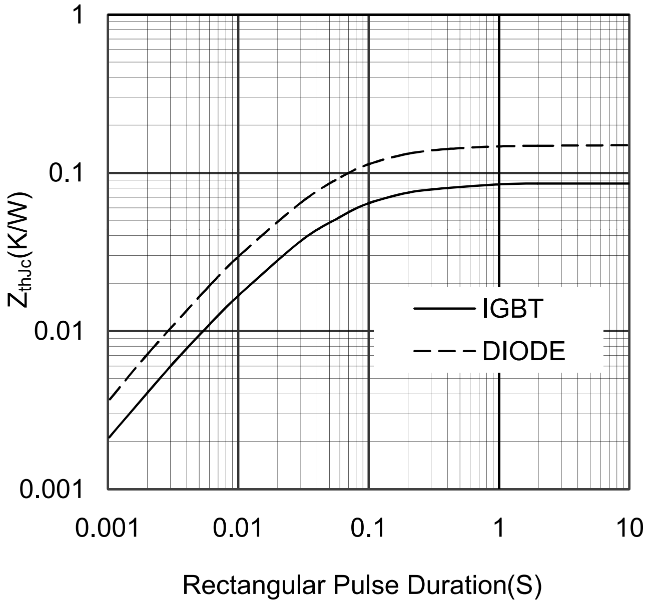


Figure 12. Transient Thermal Impedance of Diode and IGBT-inverter

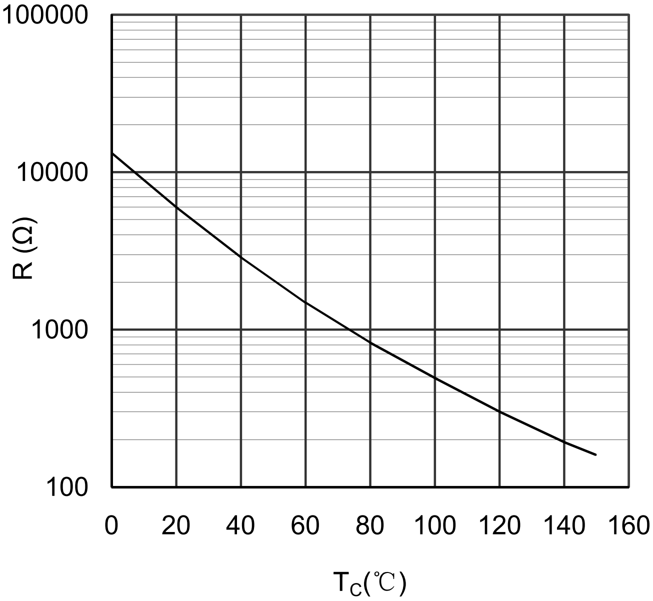


Figure 13. NTC Characteristics

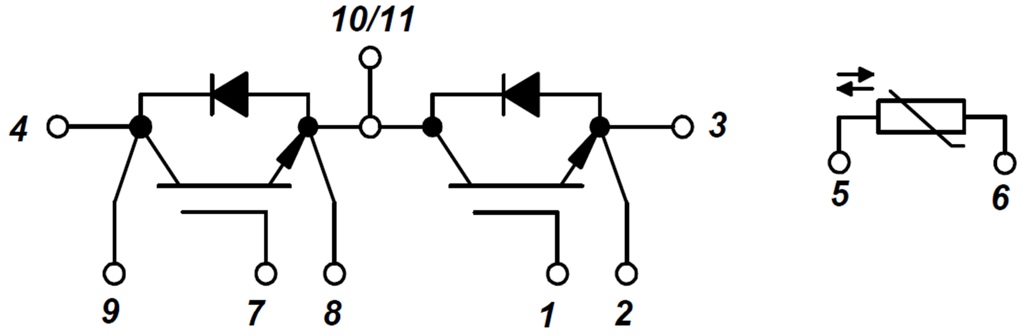
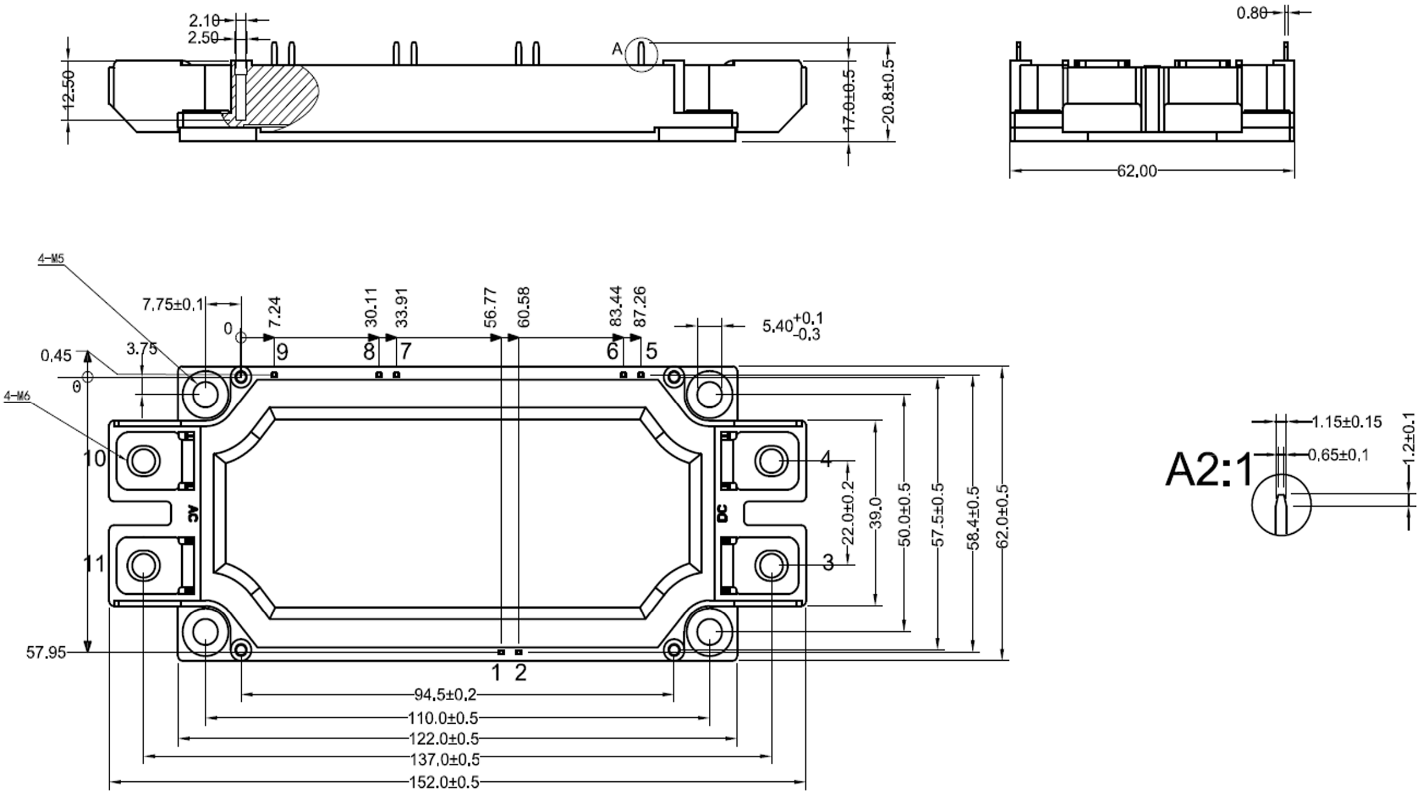


Figure 14. Circuit Diagram



Dimensions in (mm)

Figure 15. Package Outline