MMG600WB065TLA6EN

650V 600A 3-Level IGBT Module

August 2016 Preliminary RoHS Compliant

PRODUCT FEATURES

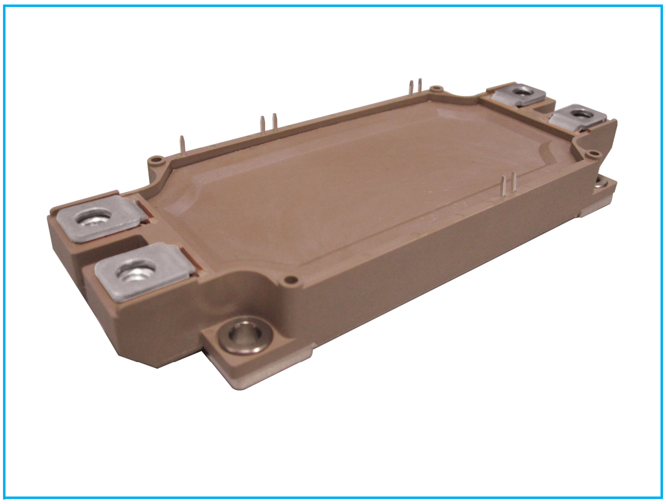
☐ 650V IGBT^3 CHIP(Trench+Field Stop technology)

☐ 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

IGBT

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

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

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

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

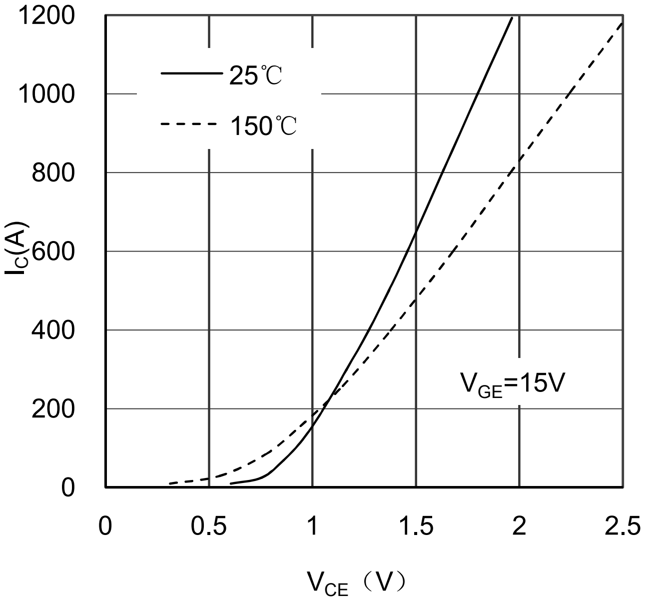


Figure 1. Typical Output Characteristics IGBT

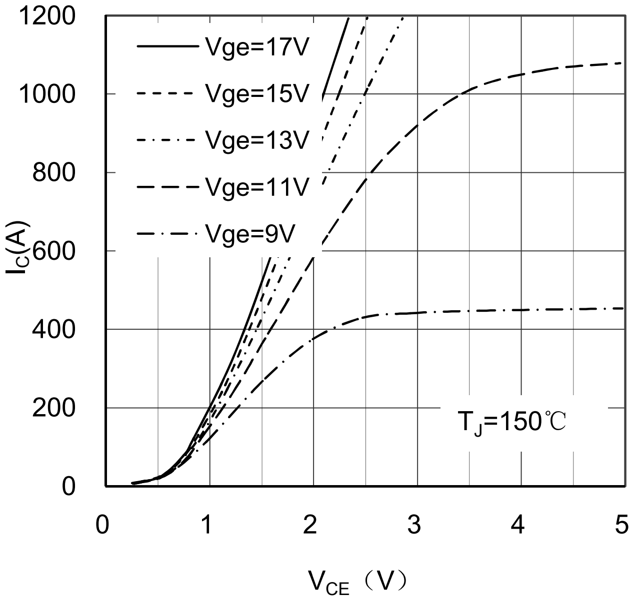


Figure 2. Typical Output Characteristics IGBT

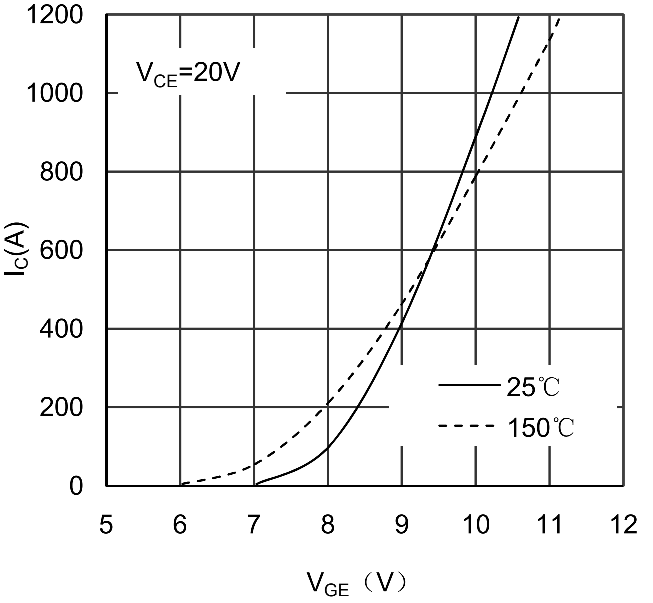


Figure 3. Typical Transfer characteristics IGBT

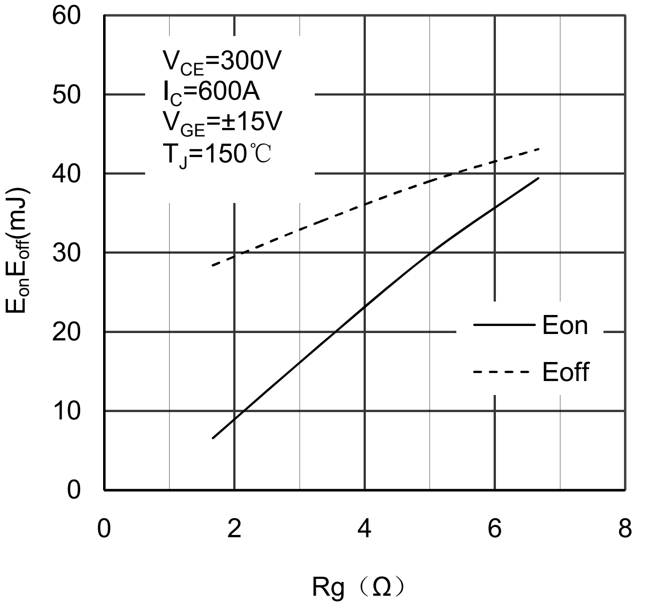


Figure 4. Switching Energy vs Gate Resistor IGBT

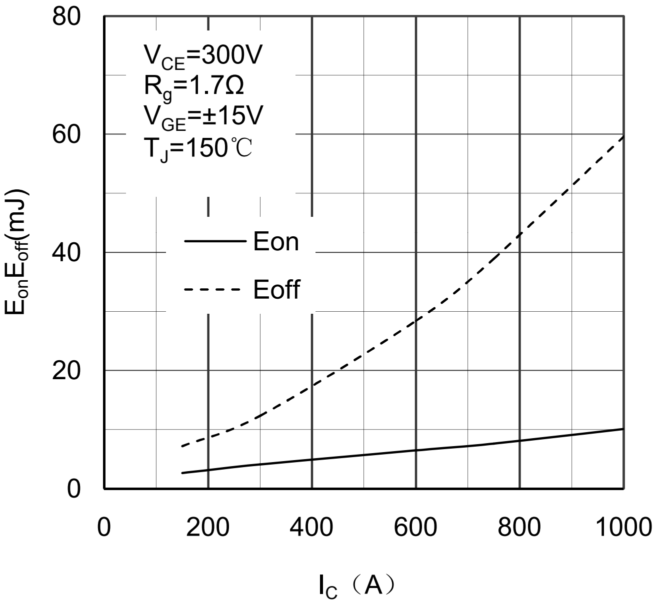


Figure 5. Switching Energy vs Collector Current IGBT

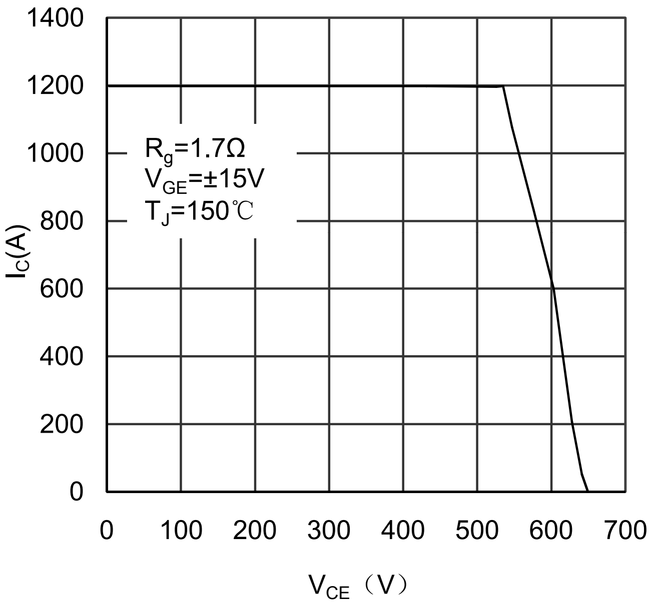


Figure 6. Reverse Biased Safe Operating Area IGBT

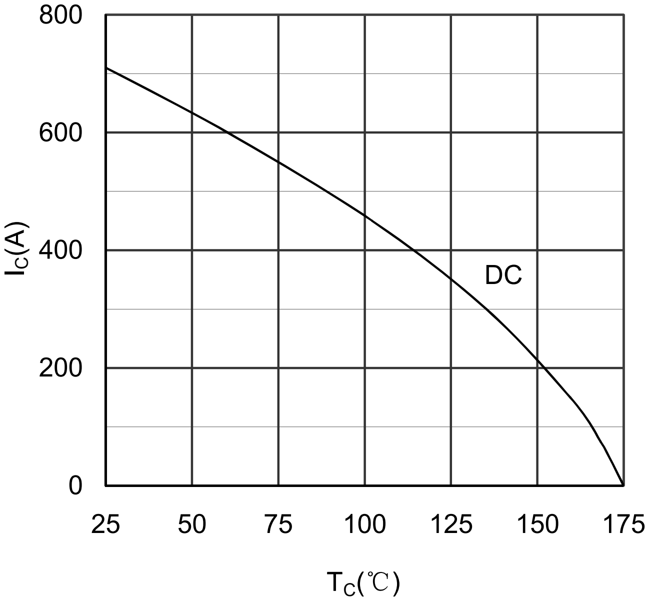


Figure 7. Collector Current vs Case temperature IGBT

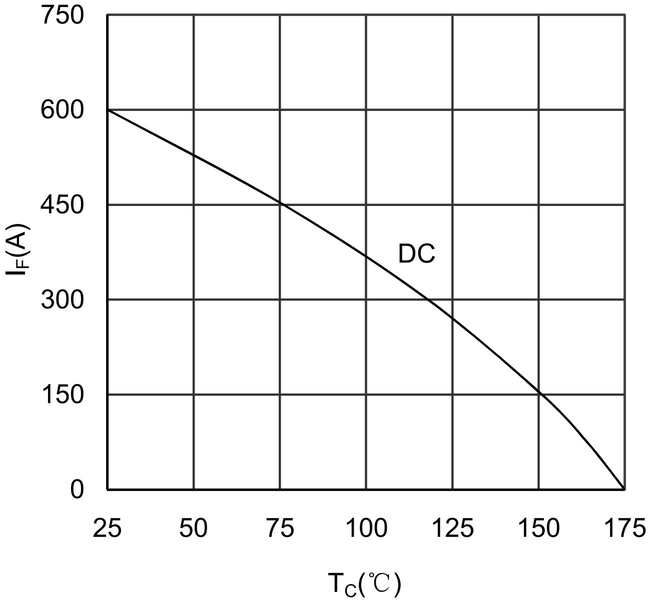


Figure 8. Forward current vs Case temperature Diode

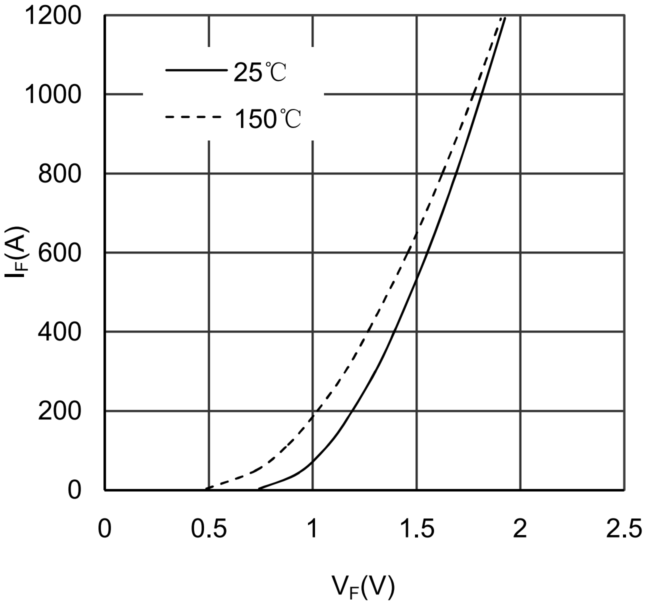


Figure 9. Diode Forward Characteristics Diode

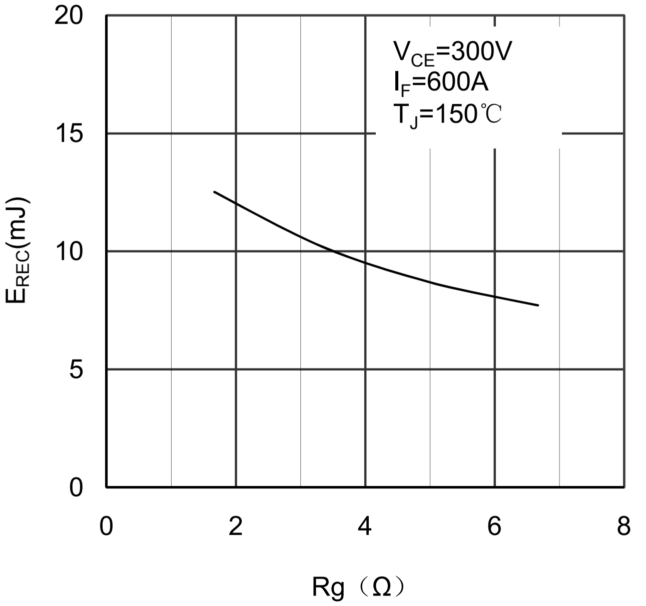


Figure 10. Switching Energy vs Gate Resistor Diode

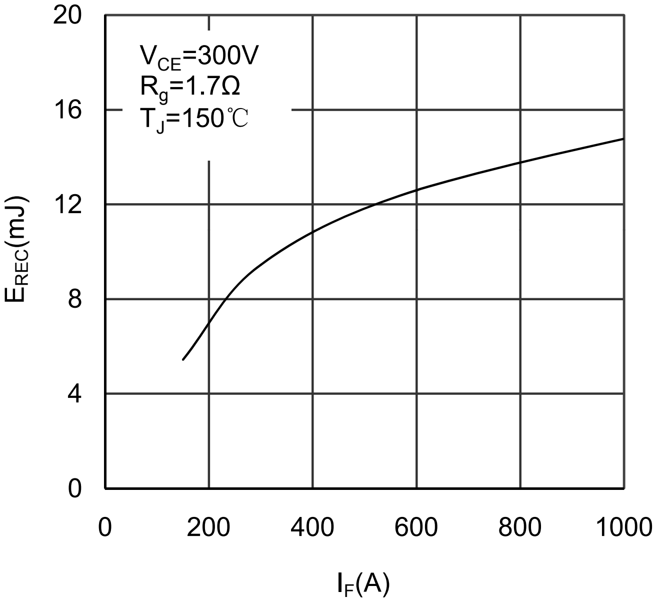


Figure 11. Switching Energy vs Forward Current Diode

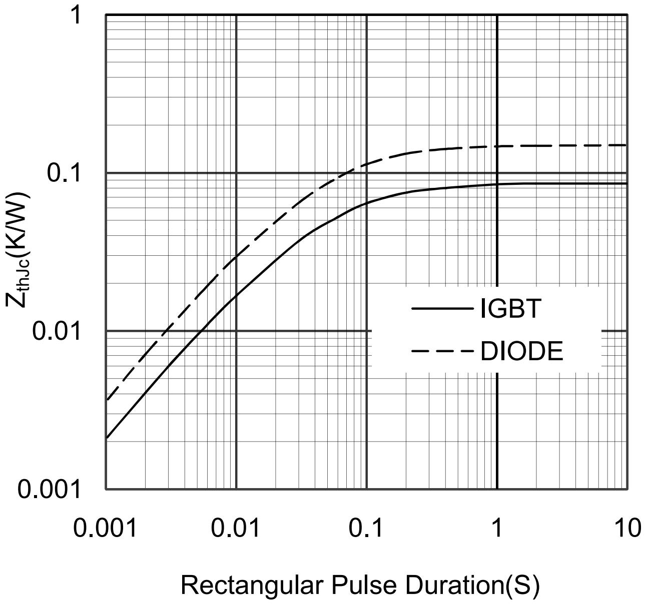


Figure 12. Transient Thermal Impedance of Diode and IGBT

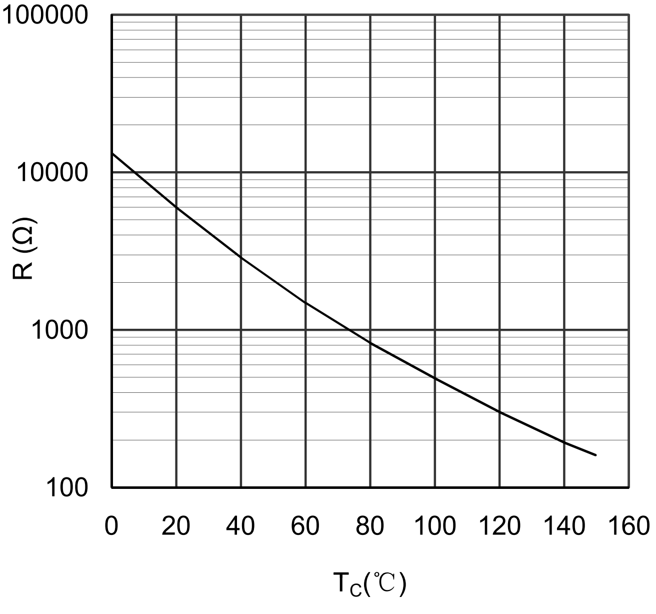


Figure 13. NTC Characteristics

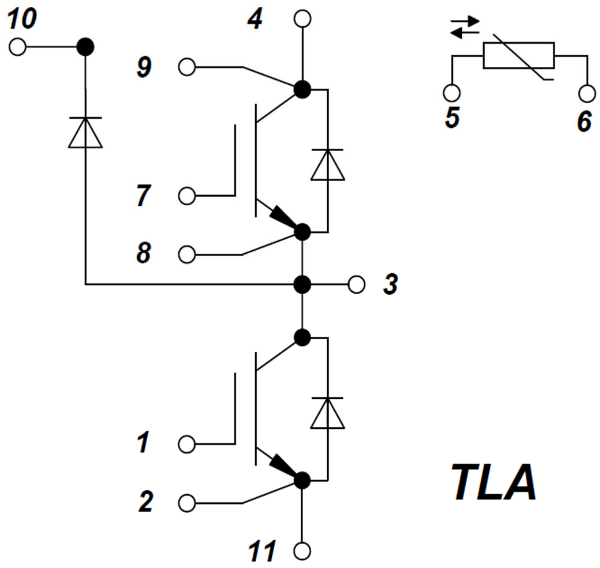
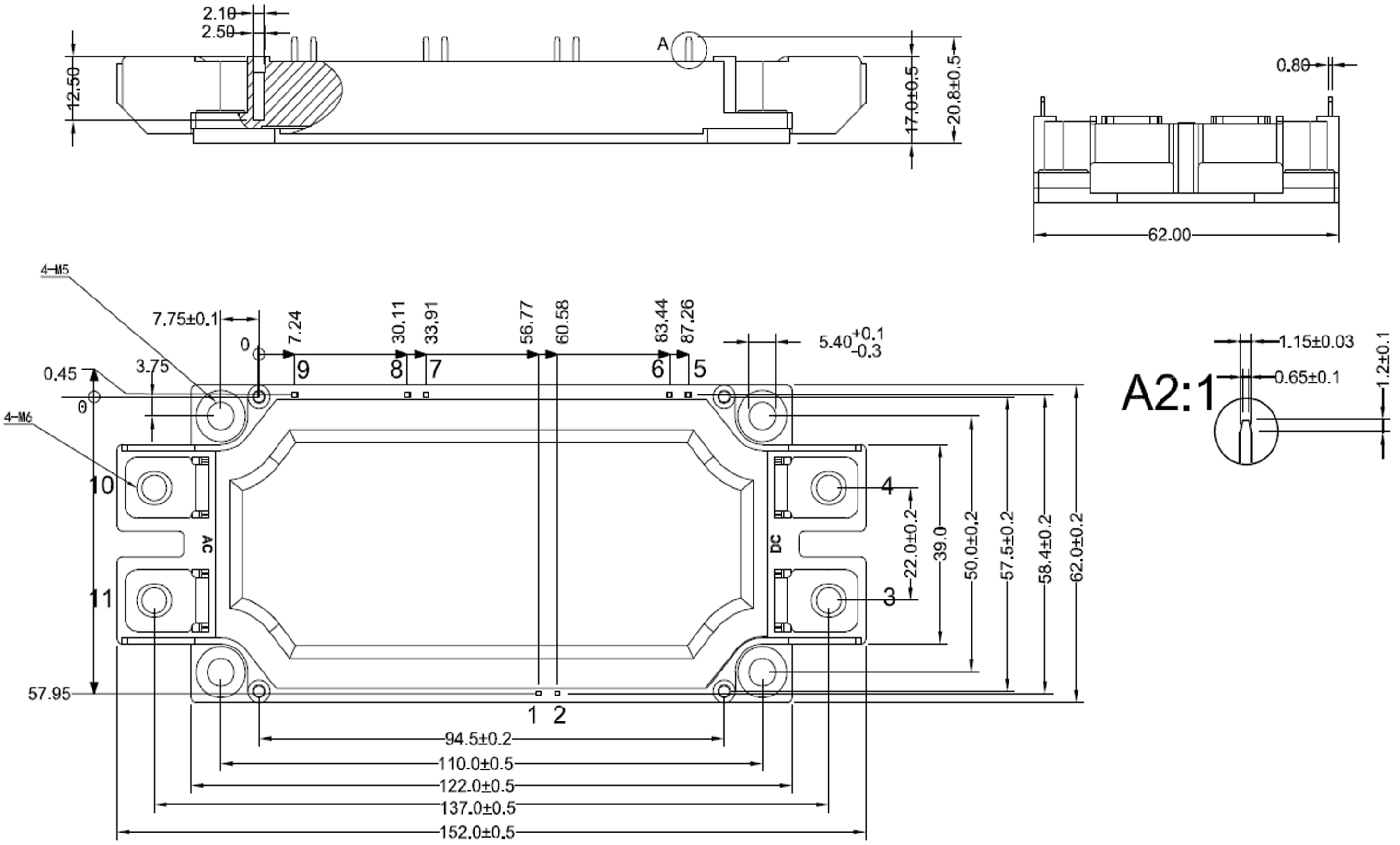


Figure 14. Circuit Diagram



Dimensions in (mm)

Figure 15. Package Outline