

PRODUCT FEATURES

- IGBT CHIP(Trench+FS)
- Low saturation voltage and positive temperature coefficient
- Fast switching and short tail current
- Free wheeling diodes with fast and soft reverse recovery
- Temperature sense included



APPLICATIONS

- Automotive application
- Hybrid and electric vehicle
- Inverter for motor drive

IGBT-ABSOLUTE MAXIMUM RATINGS ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter/Test Conditions		Values	Unit
V_{CES}	Collector Emitter Voltage	$T_J=25^{\circ}\text{C}$	750	V
V_{GES}	Gate Emitter Voltage		± 20	
I_C	DC Collector Current	$T_C=25^{\circ}\text{C}, T_{Jmax}=175^{\circ}\text{C}$	553	A
		$T_C=85^{\circ}\text{C}, T_{Jmax}=175^{\circ}\text{C}$	395	
I_{CM}	Repetitive Peak Collector Current	$t_p=1\text{ms}$	800	
P_{tot}	Power Dissipation Per IGBT	$T_C=25^{\circ}\text{C}, T_{Jmax}=175^{\circ}\text{C}$	1027	W

Diode-ABSOLUTE MAXIMUM RATINGS ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter/Test Conditions		Values	Unit
V_{RRM}	Repetitive Reverse Voltage	$T_J=25^{\circ}\text{C}$	750	V
$I_{F(AV)}$	Average Forward Current		400	A
I_{FRM}	Repetitive Peak Forward Current	$t_p=1\text{ms}$	800	
I^2t		$T_J=125^{\circ}\text{C}, t=10\text{ms}, V_R=0\text{V}$	19.6	kA^2s

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MMG400VD075X6TC-12

IGBT-inverter

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	$V_{CE}=V_{GE}, I_C=5.72\text{mA}$		5.55		V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$I_C=400\text{A}, V_{GE}=15\text{V}, T_J=25^\circ\text{C}$		1.40		
		$I_C=400\text{A}, V_{GE}=15\text{V}, T_J=125^\circ\text{C}$		1.50		
		$I_C=400\text{A}, V_{GE}=15\text{V}, T_J=175^\circ\text{C}$		1.60		
I_{CES}	Collector Leakage Current	$V_{CE}=750\text{V}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$			1	mA
		$V_{CE}=750\text{V}, V_{GE}=0\text{V}, T_J=175^\circ\text{C}$			10	
I_{GES}	Gate Leakage Current	$V_{CE}=0\text{V}, V_{GE}=\pm 20\text{V}, T_J=25^\circ\text{C}$	-400		400	nA
R_{Gint}	Integrated Gate Resistor			1.17		Ω
Q_g	Gate Charge	$V_{CE}=400\text{V}, I_C=400\text{A}, V_{GE}=15\text{V}$		1.3		μC
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$		55		nF
C_{res}	Reverse Transfer Capacitance				0.60	
$t_{d(on)}$	Turn on Delay Time	$V_{CC}=400\text{V},$ $I_C=400\text{A},$ $R_{Gon}=2.5\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$		180	ns
			$T_J=175^\circ\text{C}$		195	ns
t_r	Rise Time		$T_J=25^\circ\text{C}$		90	ns
			$T_J=175^\circ\text{C}$		105	ns
E_{on}	Turn on Energy		$T_J=25^\circ\text{C}$		9.5	mJ
			$T_J=125^\circ\text{C}$		16.5	mJ
		$T_J=175^\circ\text{C}$		20.3	mJ	
$t_{d(off)}$	Turn off Delay Time	$T_J=25^\circ\text{C}$		790	ns	
		$T_J=175^\circ\text{C}$		840	ns	
t_f	Fall Time	$T_J=25^\circ\text{C}$		160	ns	
		$T_J=175^\circ\text{C}$		200	ns	
E_{off}	Turn off Energy	$T_J=25^\circ\text{C}$		30.9	mJ	
		$T_J=125^\circ\text{C}$		34.9	mJ	
		$T_J=175^\circ\text{C}$		36.8	mJ	
I_{SC}	Short Circuit Current	$t_{psc}\leq 5\mu\text{s}, V_{GE}=15\text{V}$ $T_J=150^\circ\text{C}, V_{CC}=400\text{V}$		3000		A
R_{thJC}	Junction to Case Thermal Resistance (Per IGBT)				0.146	K /W

Diode-inverter

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

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
V_F	Forward Voltage	$I_F=400\text{A}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$		1.60		V
		$I_F=400\text{A}, V_{GE}=0\text{V}, T_J=125^\circ\text{C}$		1.49		
		$I_F=400\text{A}, V_{GE}=0\text{V}, T_J=175^\circ\text{C}$		1.42		
t_{rr}	Reverse Recovery Time	$I_F=400\text{A}, V_R=400\text{V}$ $dI_F/dt=-4000\text{A}/\mu\text{s}$ $T_J=175^\circ\text{C}$		380		ns
I_{RRM}	Max. Reverse Recovery Current			310		A
Q_{RR}	Reverse Recovery Charge			55		μC
E_{rec}	Reverse Recovery Energy			20		mJ
R_{thJCD}	Junction to Case Thermal Resistance (Per Diode)				0.164	K /W

MMG400VD075X6TC-12

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 Ω
$B_{25/50}$	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298.15 \text{ K}))]$		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	$^\circ\text{C}$	
T_{jop}	Operating Temperature	-40~175		
T_{stg}	Storage Temperature	-40~125		
V_{isol}	Isolation Breakdown Voltage	AC, 50Hz(R.M.S), t=1minute	3300	V
CTI	Comparative Tracking Index		> 100	
Torque	to heatsink	Recommended (M5)	3~5	Nm
	to terminal	Recommended (M6)	3~5	Nm
Weight			450	g

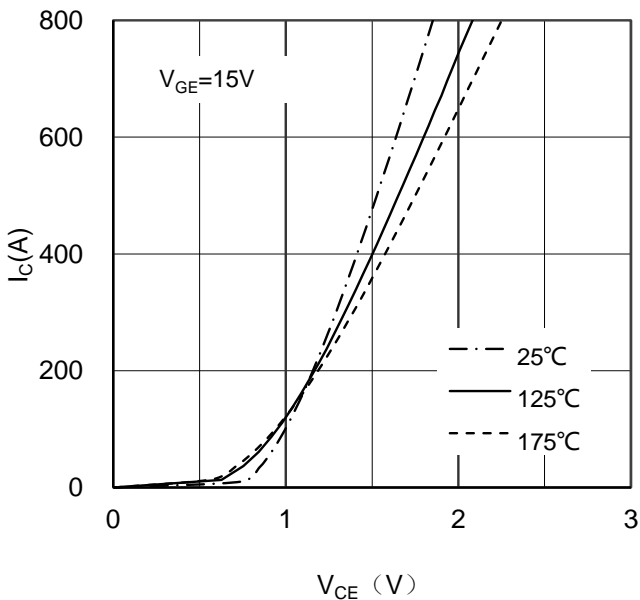


Figure 1. Typical Output Characteristics IGBT

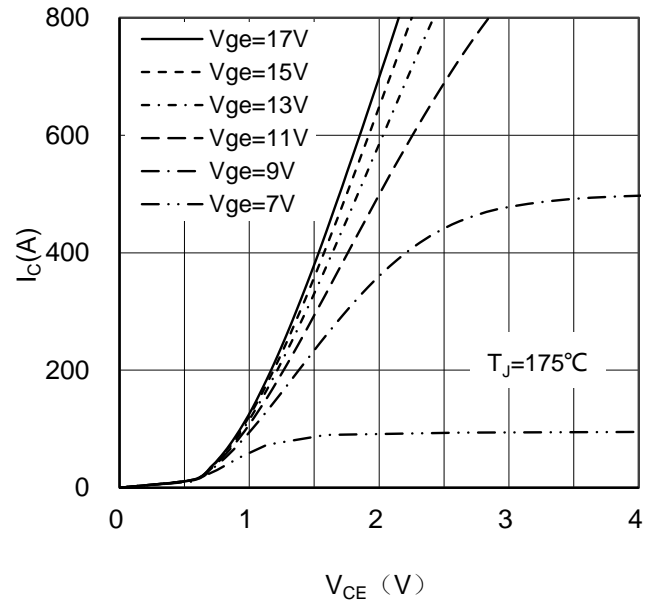


Figure 2. Typical Output Characteristics IGBT

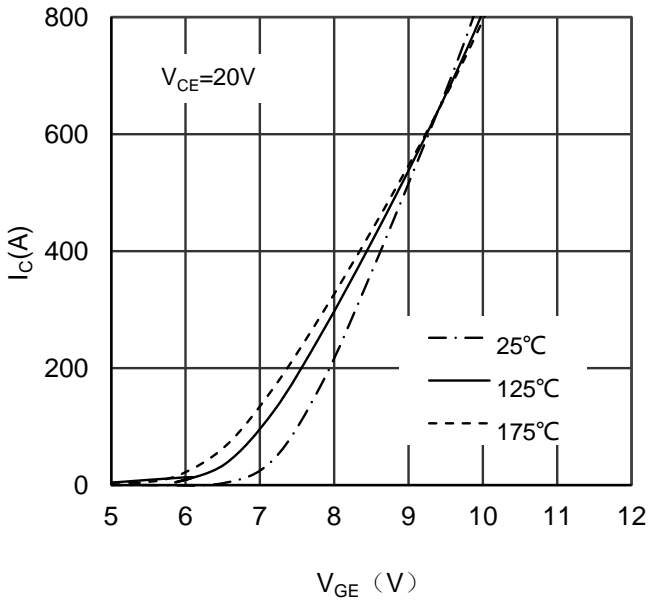


Figure 3. Typical Transfer characteristics IGBT

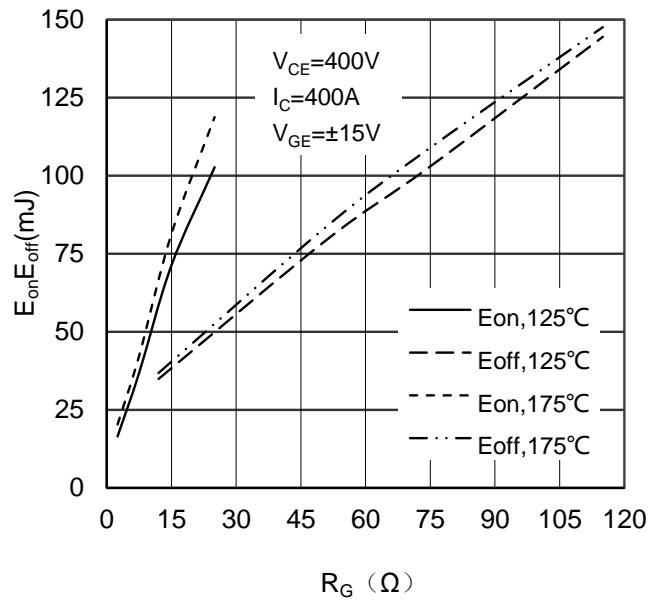


Figure 4. Switching Energy vs Gate Resistor IGBT

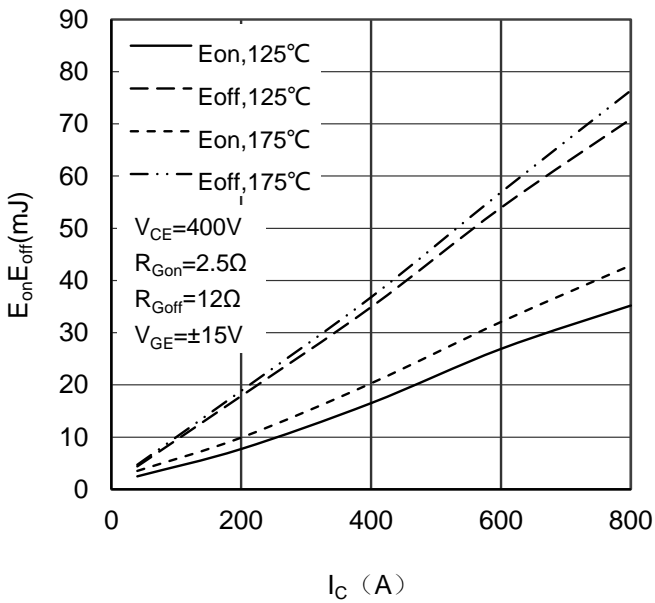


Figure 5. Switching Energy vs Collector Current IGBT

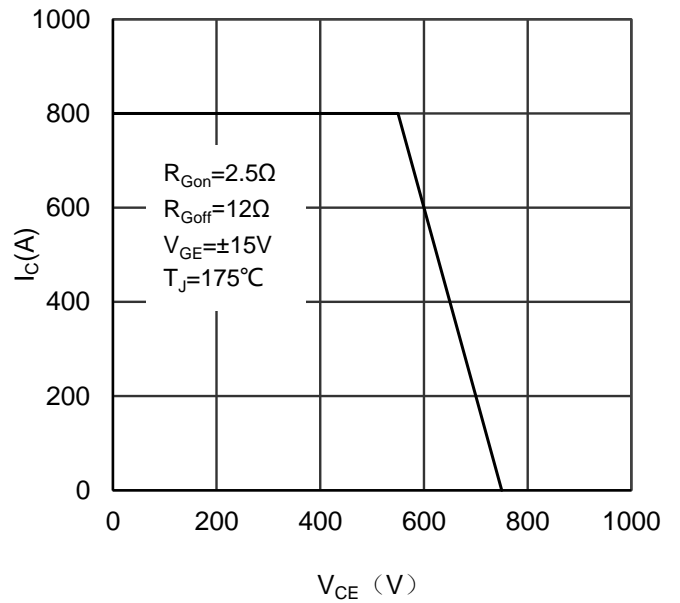


Figure 6. Reverse Biased Safe Operating Area IGBT

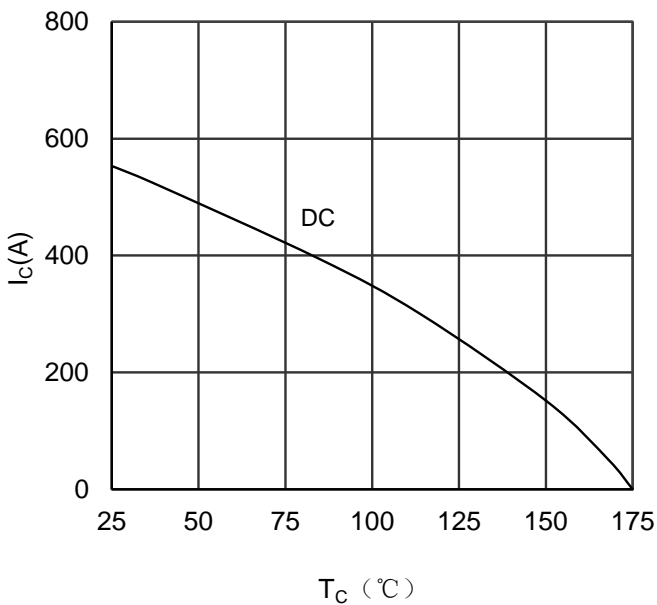


Figure 7. Collector Current vs Case temperature IGBT

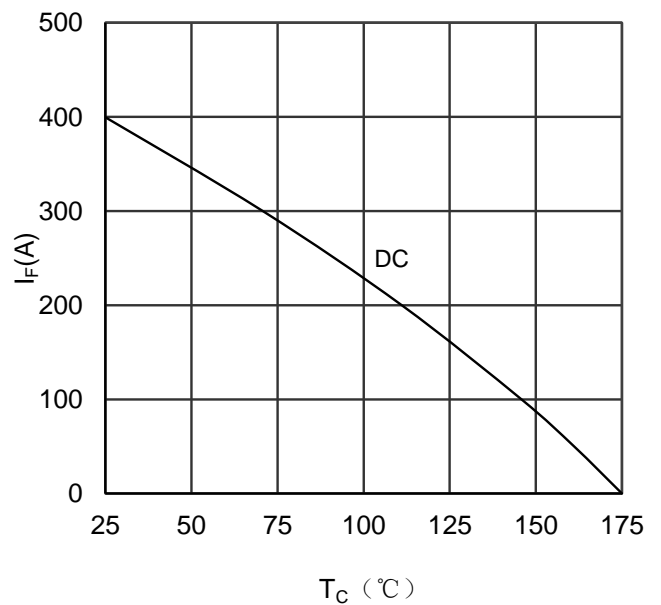


Figure 8. Forward current vs Case temperature Diode

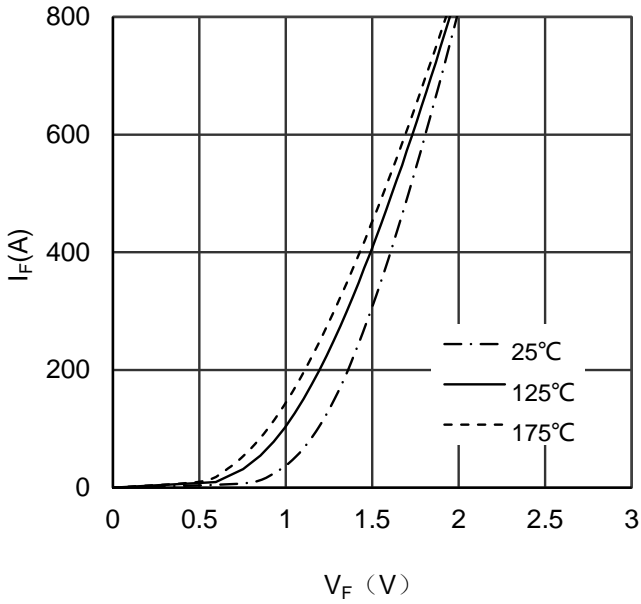


Figure 9. Diode Forward Characteristics Diode

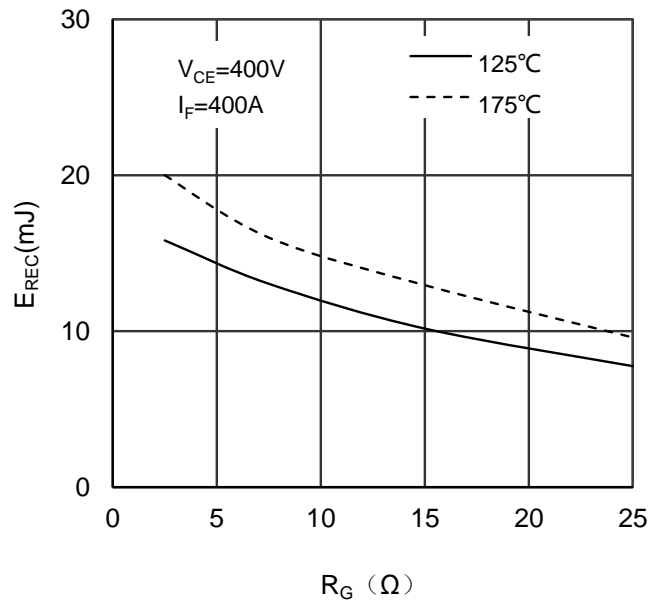


Figure 10. Switching Energy vs Gate Resistor Diode

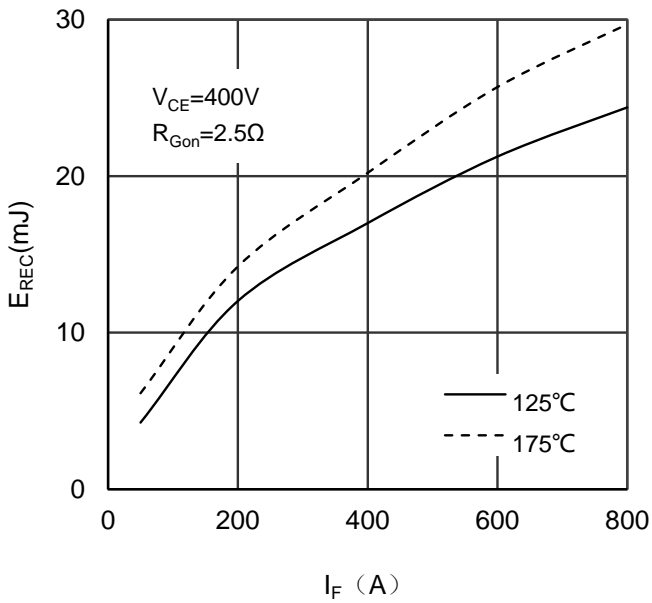


Figure 11. Switching Energy vs Forward Current Diode

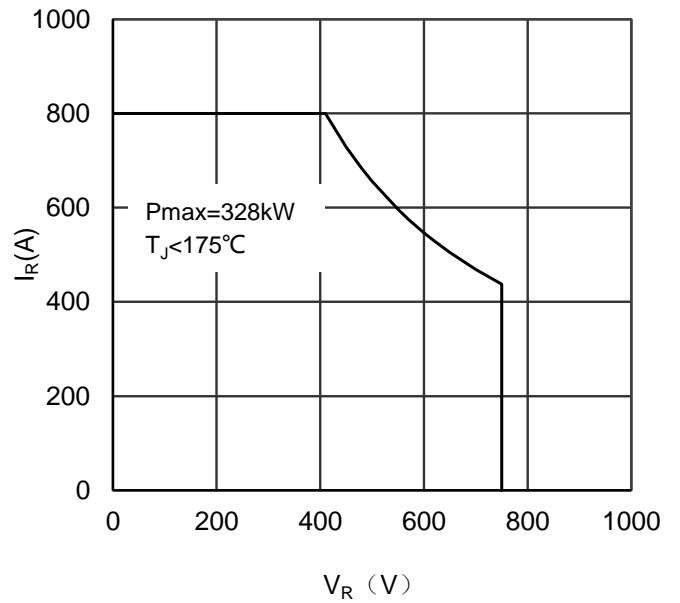


Figure 12. Safe Operating Area Diode

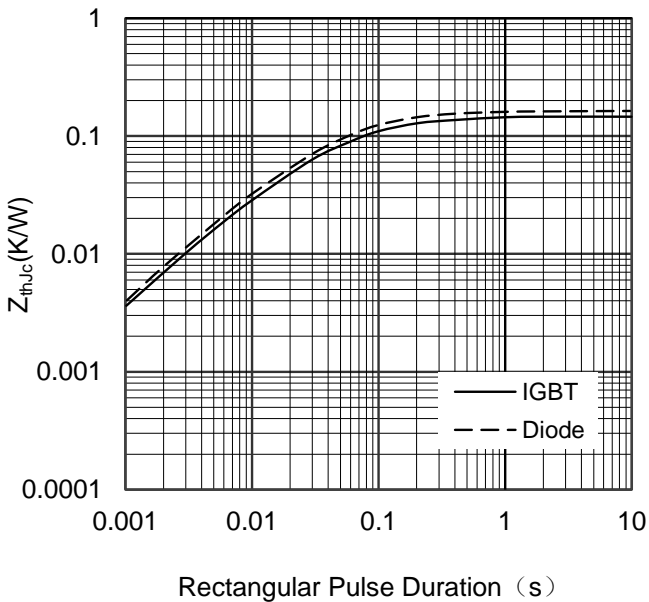


Figure 13. Transient Thermal Impedance of Diode and IGBT

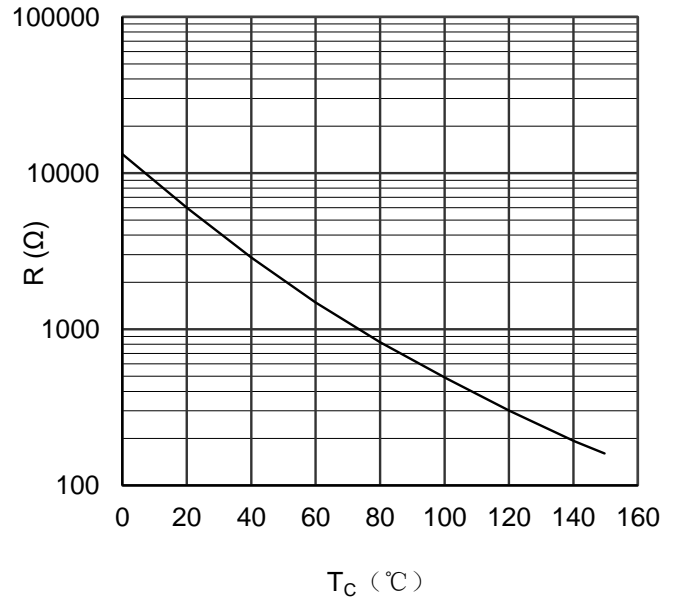


Figure 14. NTC Characteristics

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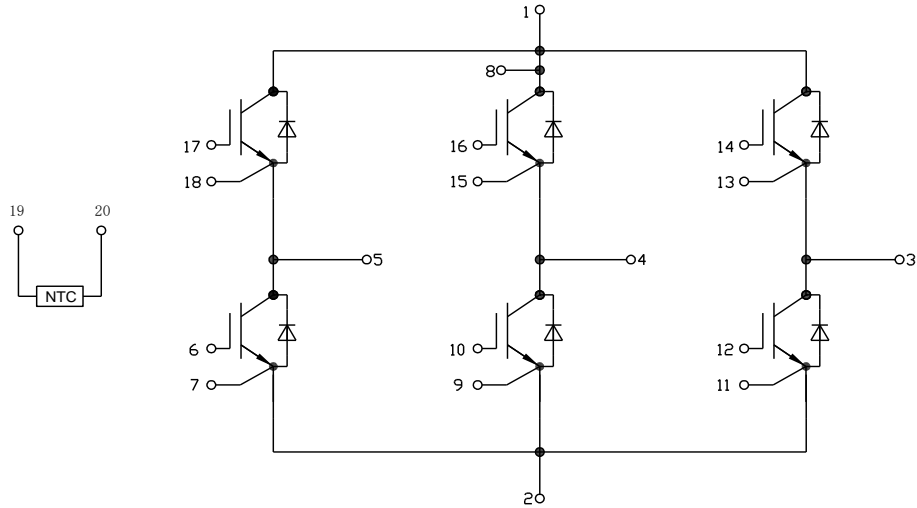
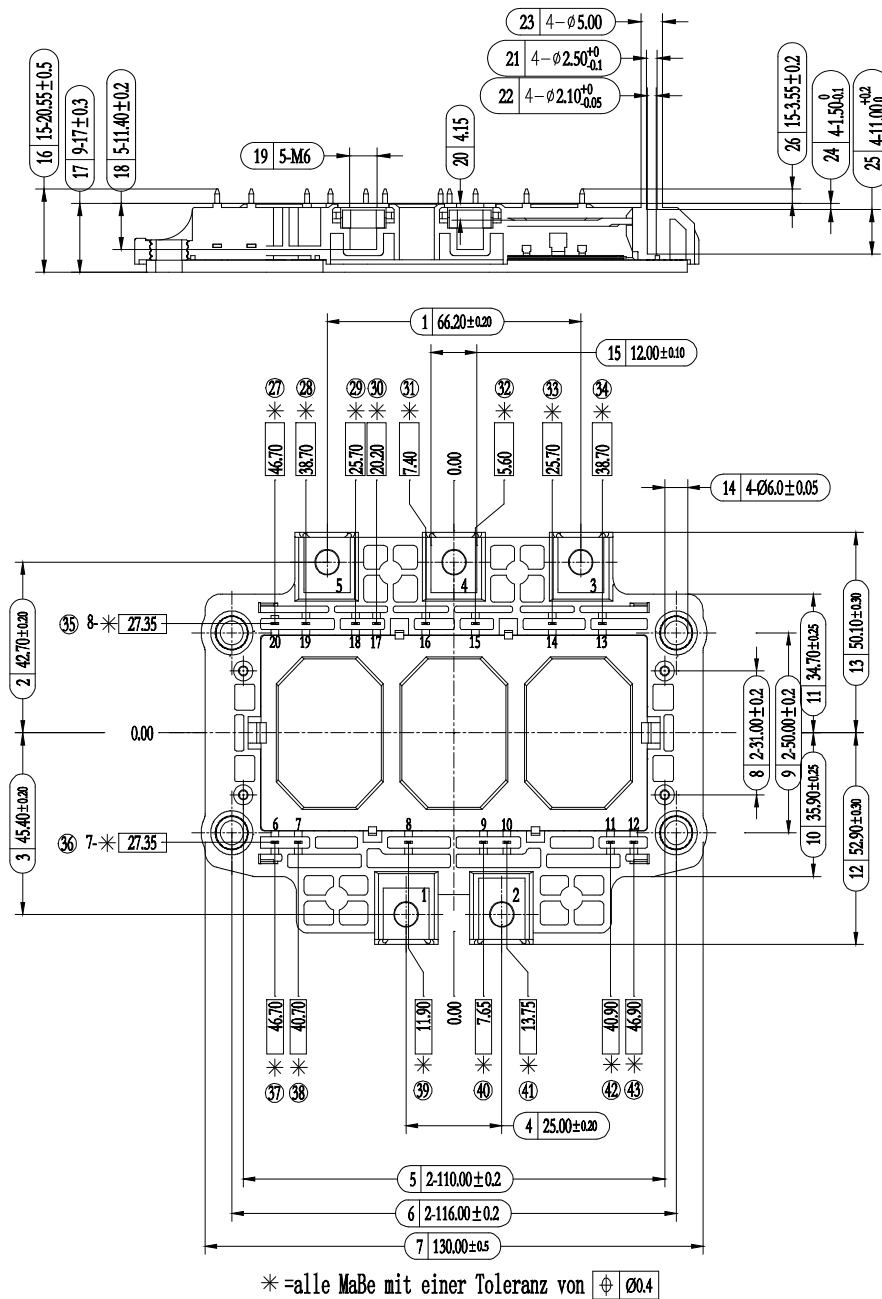


Figure 15. Circuit Diagram



Dimensions in (mm)

Figure 16. Package Outline