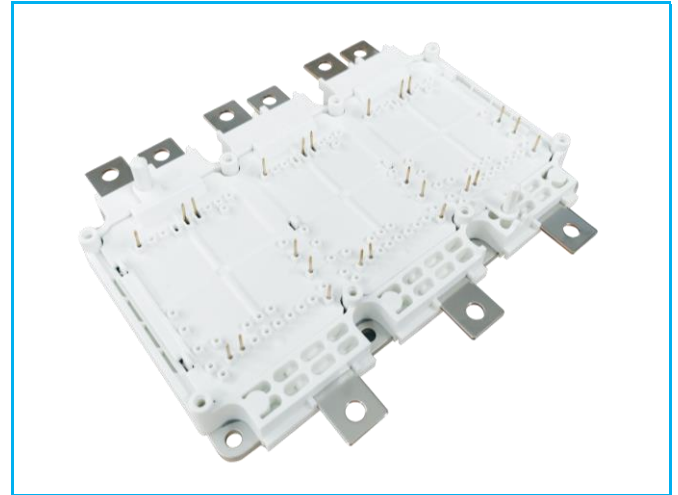


PRODUCT FEATURES

- 750V Field Stop Trench IGBT
- $V_{CE(sat)}$ with positive temperature coefficient
- Fast switching and short tail current
- Free wheeling diodes with fast and soft reverse recovery
- Max Junction Temperature 175°C
- Temperature sense included



APPLICATIONS

- Automotive Traction Modules
- General Power Modules

IGBT-inverter

ABSOLUTE MAXIMUM RATINGS ($T_F=25^\circ\text{C}$ 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_{CN}	Implemented Collector Current		950	A
I_C	DC Collector Current	$T_F=90^\circ\text{C}, T_{Jmax}=175^\circ\text{C}$	450	
I_{CM}	Repetitive Peak Collector Current	$tp=1\text{ms}$	1900	
P_{tot}	Power Dissipation Per IGBT	$T_F=60^\circ\text{C}, T_{Jmax}=175^\circ\text{C}$	958	W

Diode-inverter

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

Symbol	Parameter/Test Conditions		Values	Unit
V_{RRM}	Repetitive Reverse Voltage	$T_J=25^\circ\text{C}$	750	V
I_{FN}	Implemented Forward Current		950	A
$I_{F(AV)}$	Average Forward Current		450	
I_{FRM}	Repetitive Peak Forward Current	$tp=1\text{ms}$	1900	
I^2t		$T_J=150^\circ\text{C}, t=10\text{ms}, V_R=0\text{V}$	28	kA^2s

MacMic Science & Technology Co., Ltd.

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

Tel.: +86-519-85163708 Fax: +86-519-85162291 Post Code: 213022 Website: www.macmicst.com

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IGBT-inverter

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

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Emitter Threshold Voltage	$V_{CE}=V_{GE}, I_C=9\text{mA}$	5.2	5.9	6.6	
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$I_C=450\text{A}, V_{GE}=15\text{V}, T_J=25^{\circ}\text{C}$		1.08		V
		$I_C=450\text{A}, V_{GE}=15\text{V}, T_J=125^{\circ}\text{C}$		1.09		
		$I_C=450\text{A}, V_{GE}=15\text{V}, T_J=150^{\circ}\text{C}$		1.1		
		$I_C=950\text{A}, V_{GE}=15\text{V}, T_J=25^{\circ}\text{C}$		1.38		
		$I_C=950\text{A}, V_{GE}=15\text{V}, T_J=125^{\circ}\text{C}$		1.54		
		$I_C=950\text{A}, V_{GE}=15\text{V}, T_J=150^{\circ}\text{C}$		1.55		
I_{CES}	Collector Leakage Current	$V_{CE}=750\text{V}, V_{GE}=0\text{V}, T_J=25^{\circ}\text{C}$			1	mA
		$V_{CE}=750\text{V}, V_{GE}=0\text{V}, T_J=150^{\circ}\text{C}$		5		mA
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			0.6		Ω
Q_G	Gate Charge	$V_{CE}=400\text{V}, I_C=450\text{A}, V_{GE}=15\text{V}$		2.3		μC
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=100\text{kHz}$		82		nF
C_{ies}	Output Capacitance			2.3		nF
C_{res}	Reverse Transfer Capacitance			0.38		nF
$t_{d(on)}$	Turn on Delay Time	$V_{CC}=400\text{V}, I_C=450\text{A}$ $R_G=2.7\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^{\circ}\text{C}$	210		ns
			$T_J=125^{\circ}\text{C}$	225		ns
			$T_J=150^{\circ}\text{C}$	230		ns
t_r	Rise Time		$T_J=25^{\circ}\text{C}$	66		ns
			$T_J=125^{\circ}\text{C}$	83		ns
			$T_J=150^{\circ}\text{C}$	77		ns
$t_{d(off)}$	Turn off Delay Time	$T_J=25^{\circ}\text{C}$	600		ns	
		$T_J=125^{\circ}\text{C}$	675		ns	
		$T_J=150^{\circ}\text{C}$	710		ns	
t_f	Fall Time	$T_J=25^{\circ}\text{C}$	100		ns	
		$T_J=125^{\circ}\text{C}$	135		ns	
		$T_J=150^{\circ}\text{C}$	140		ns	
E_{on}	Turn on Energy	$T_J=25^{\circ}\text{C}$	14.4		mJ	
		$T_J=125^{\circ}\text{C}$	21.3		mJ	
		$T_J=150^{\circ}\text{C}$	24.5		mJ	
E_{off}	Turn off Energy	$T_J=25^{\circ}\text{C}$	20.5		mJ	
		$T_J=125^{\circ}\text{C}$	30.5		mJ	
		$T_J=150^{\circ}\text{C}$	32.5		mJ	
I_{SC}	Short Circuit Current	$tpsc \leq 5\mu\text{s}, V_{GE}=15\text{V}$ $T_J=150^{\circ}\text{C}, V_{CC}=400\text{V}$		4100		A
R_{thJF}	Junction to cooling fluid, $\Delta V/\Delta t = 10 \text{ dm}^3/\text{min}, T_F = 60^{\circ}\text{C}$ (Per IGBT)			0.1	0.115	K/W

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Diode-inverter

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

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
V_F	Forward Voltage	$I_F=450\text{A}$, $V_{GE}=0\text{V}$, $T_J=25^\circ\text{C}$		1.45		V
		$I_F=450\text{A}$, $V_{GE}=0\text{V}$, $T_J=125^\circ\text{C}$		1.43		
		$I_F=450\text{A}$, $V_{GE}=0\text{V}$, $T_J=150^\circ\text{C}$		1.39		
		$I_F=950\text{A}$, $V_{GE}=0\text{V}$, $T_J=25^\circ\text{C}$		1.88		
		$I_F=950\text{A}$, $V_{GE}=0\text{V}$, $T_J=125^\circ\text{C}$		1.94		
		$I_F=950\text{A}$, $V_{GE}=0\text{V}$, $T_J=150^\circ\text{C}$		1.94		
t_{rr}	Reverse Recovery Time			325		ns
I_{RRM}	Max. Reverse Recovery Current	$I_F=450\text{A}$, $V_R=400\text{V}$ $di_F/dt=-7400\text{A}/\mu\text{s}$		68		A
Q_{RR}	Reverse Recovery Charge	$T_J=150^\circ\text{C}$		475		μC
E_{rec}	Reverse Recovery Energy			25.9		mJ
R_{thJF}	Junction to cooling fluid, $\Delta V/\Delta t = 10 \text{ dm}^3/\text{min}$, $T_F = 60^\circ\text{C}$ (Per Diode)			0.14	0.16	K /W

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

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
R_{25}	Resistance	$T_F=25^\circ\text{C}$		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 ($T_F=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter/Test Conditions		Values		Unit
T_{Jmax}	Max. Junction Temperature		175		$^\circ\text{C}$
T_{Jop}	Operating Temperature		-40~150		
T_{stg}	Storage Temperature		-40~125		
V_{isol}	Isolation Breakdown Voltage	RMS, $f = 0 \text{ Hz}$, $t = 1 \text{ sec}$	4200		V
CTI	Comparative Tracking Index		> 200		
Torque	baseplate to heatsink	Recommended (M4)	1.8~2.2		Nm
	PCB to frame	Recommended (M3)	0.4~0.6		Nm
Weight			775		g

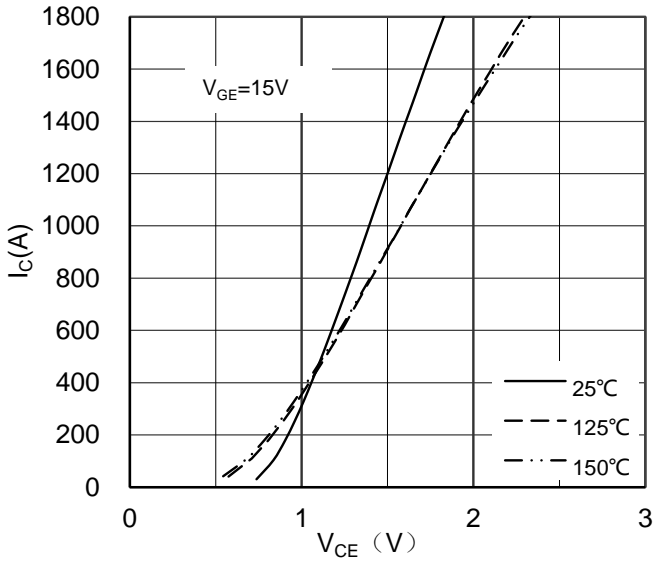


Figure 1. Typical Output Characteristics IGBT-inverter

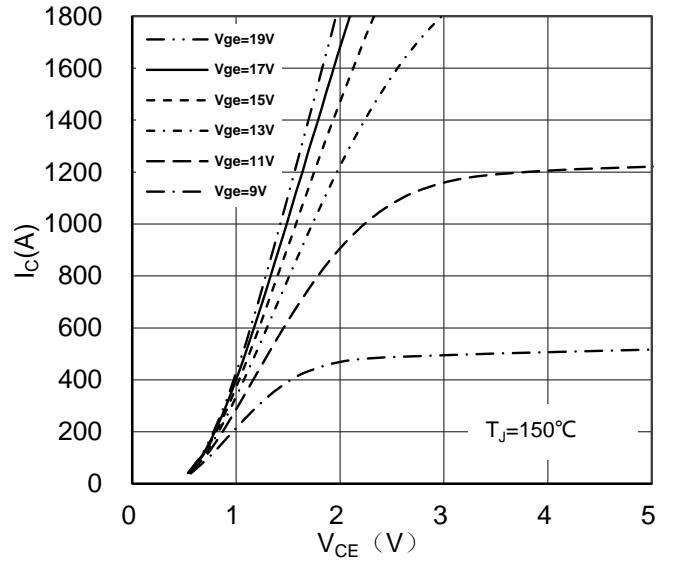


Figure 2. Typical Output Characteristics IGBT-inverter

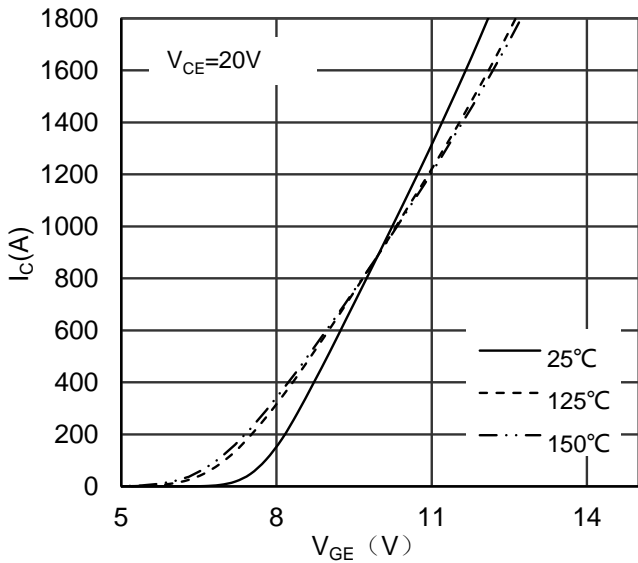


Figure 3. Typical Transfer characteristics IGBT-inverter

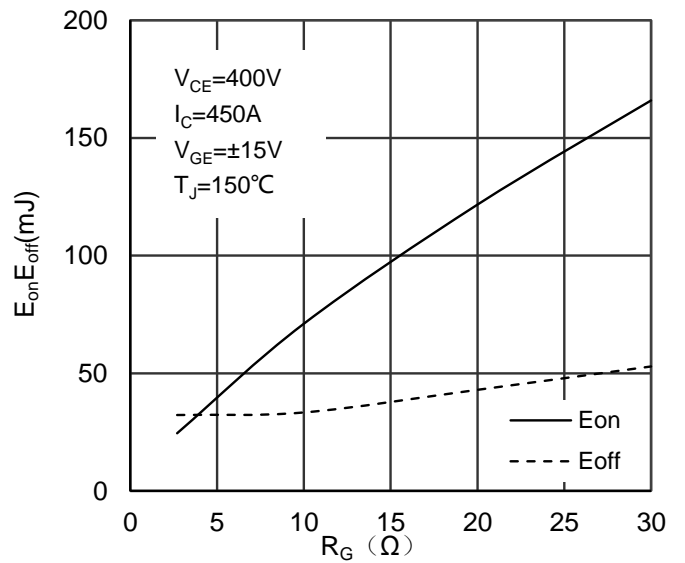


Figure 4. Switching Energy vs Gate Resistor IGBT-inverter

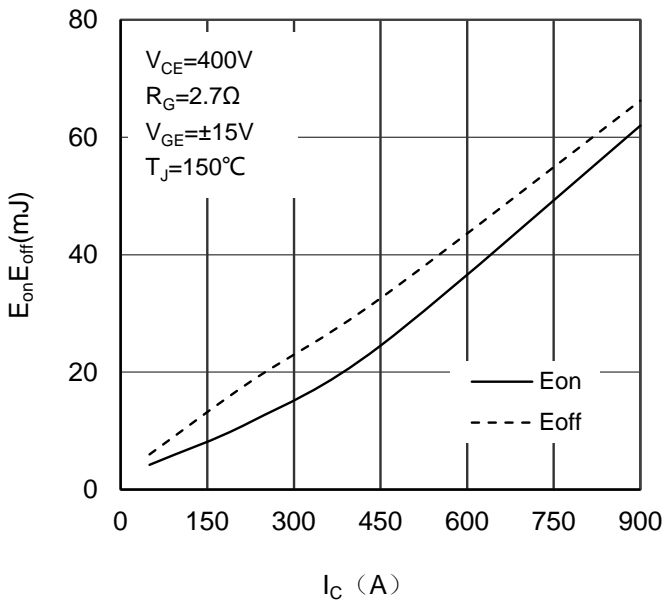


Figure 5. Switching Energy vs Collector Current IGBT-inverter

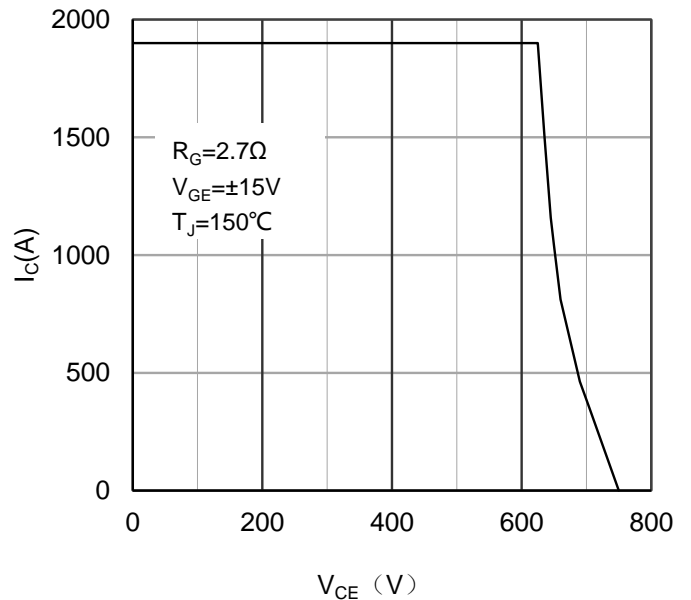


Figure 6. Reverse Bias Safe Operating Area IGBT-inverter

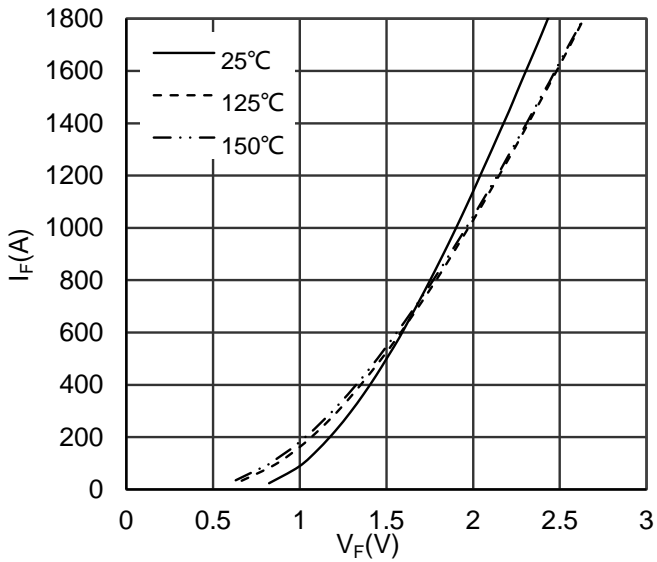


Figure 7. Diode Forward Characteristics Diode-inverter

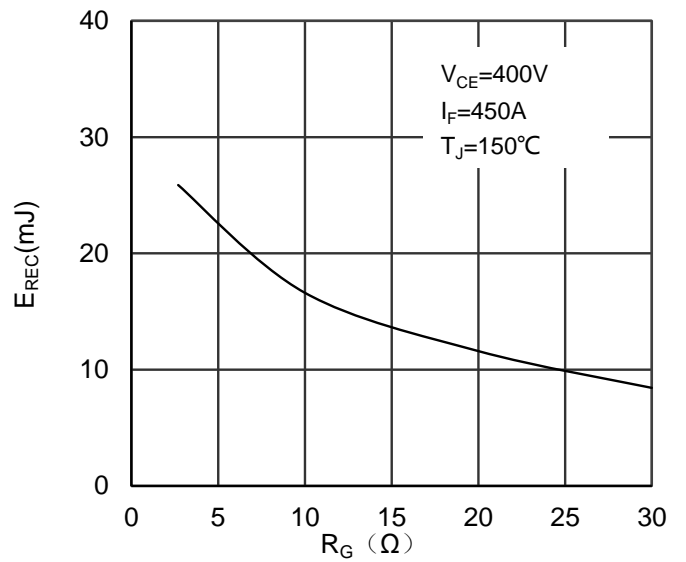


Figure 8. Switching Energy vs Gate Resistor Diode-inverter

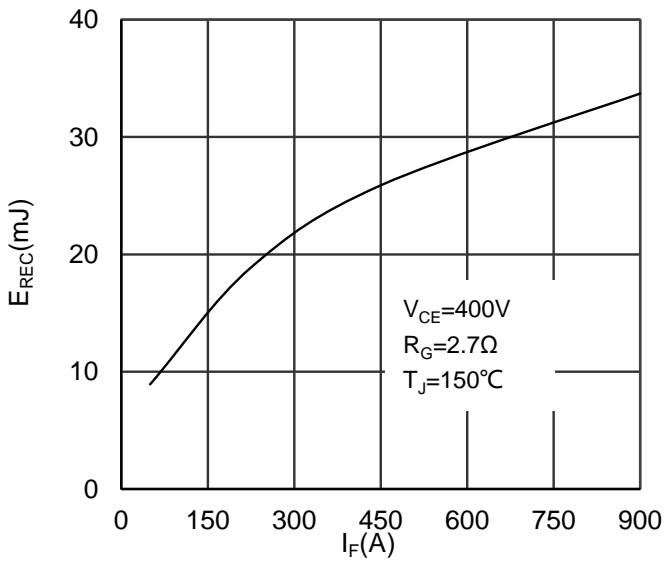


Figure 9. Switching Energy vs Forward Current Diode-inverter

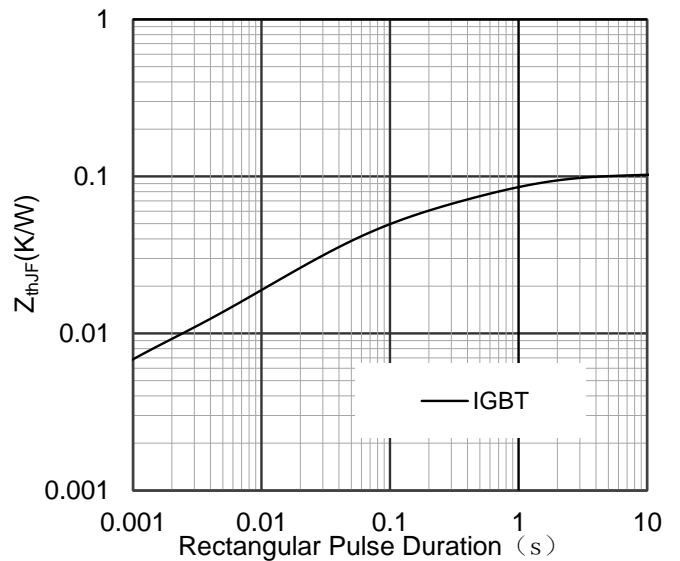


Figure 10. Transient Thermal Impedance of IGBT-inverter

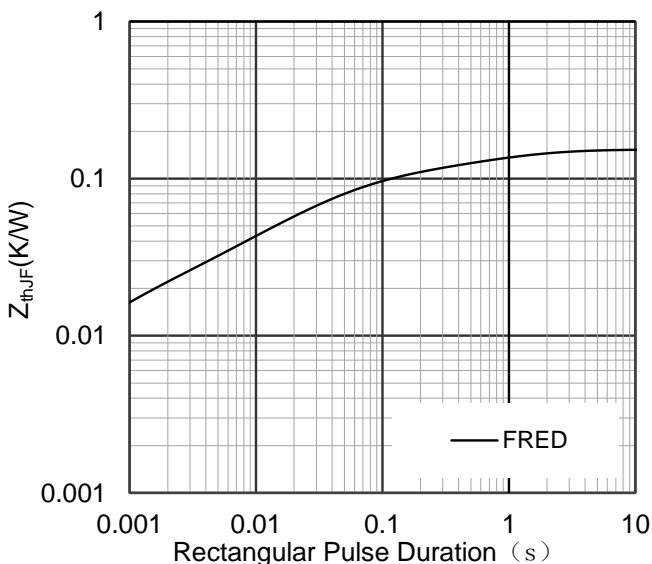


Figure 11. Transient Thermal Impedance of Diode-inverter

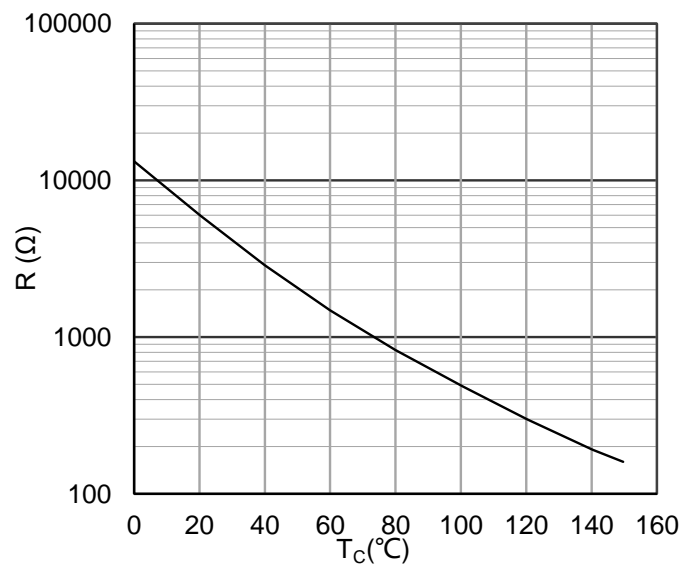


Figure 12. NTC Characteristics

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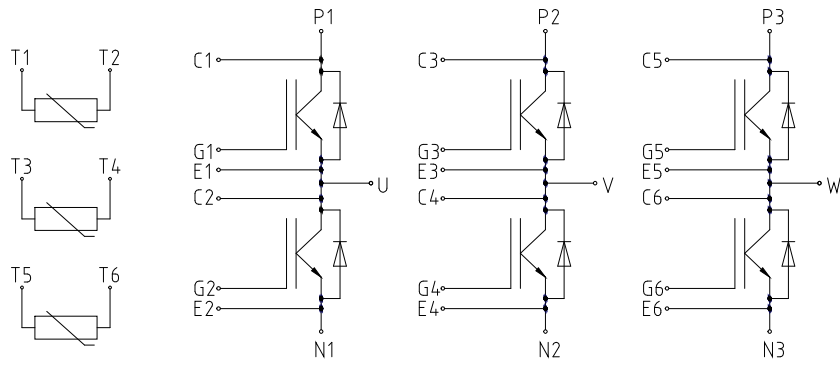


Figure 13. Circuit Diagram

