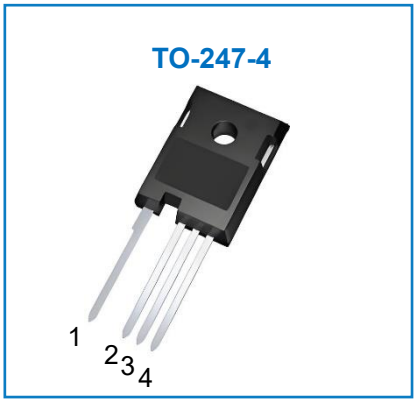
WSCM013R120T2C

N-Ch SiC Power MOSFET

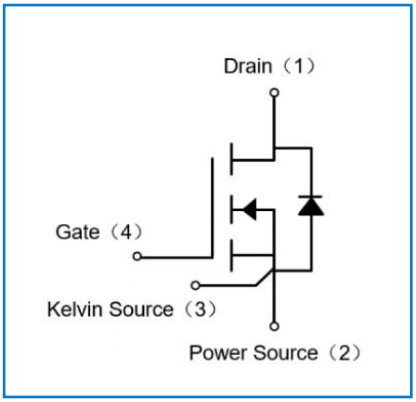
Key Parameters

- V_{DSS}=1200V
- I_D=127A@T_J=25℃
- $R_{DS(ON).typ}$=13mΩ (V_{GS}=18V, T_J=25℃)



Features

- Low On-Resistance with High Blocking Voltage
- High Speed Switching with Low Capacitance
- High Switching Frequency Operation
- High System Efficiency
- Increased Power Density
- Reduction of Heat Sink Requirements
- Avalanche Ruggedness
- Halogen Free, Rohs Compliant



Applications

- Switch Mode Power Supplies (SMPS)
- Pulsed Power applications
- Motor Drivers & Battery Chargers

Package pin definition	1	2	3	4
	Drain	Power Source	Kelvin Source	Gate

Part	Package	Marking	Packing method	MPQ
WSCM013R120T2C	TO-247-4	13R120T2C	Tube	30/Tube

1 Maximum Rated Valued of MOSFET

Table 1 Maximum rated Values(T_C=25℃ unless otherwise specified)

Parameter	Symbol	Condition	Values	Unit
Drain-source voltage	V_{DSS}		1200	V
Recommend Gate-Source Voltage	V_{GSop}		-5/18	V
Gate-Source Voltage	V_{GSmax}		-10/22	V
Continuous drain current [1]	I_D	Tc=25℃	127	A
		Tc=100℃	89	A
Pulsed drain current	I_{DM}	t_{Pulse} limited by Tjmax	120	A
Maximum power dissipation	P_{tot}	Tc=25℃, T_J=175℃	500	W
Operating Junction Temperature	T_J		-55~+175	℃
Storage Temperature	T_{stg}		-55~+150	℃
Thermal resistance, junction-to-case	$R_{\theta JC}$		0.3	℃/W

Notes:

1. Pulse width is limited by the maximum junction temperature.

2 Electrical Characteristics of MOSFET

Table 2 Characteristics Values(T_J=25℃ unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	I_D=1mA, V_{GS}=0V	1200	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	I_D=20mA, V_{DS}=V_{GS}	2.2	3.2	4.2	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=1200V, V_{GS}=0V	-	1	10	μA
Gate-Source Leakage Current	I_{GSS}	V_{DS}=0V, V_{GS}=-10/22V	-	-	±100	nA
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=18V, I_D=80A, T_J=25℃	-	13	16	mΩ
		V_{GS}=18V, I_D=80A, T_J=175℃	-	25	-	mΩ
Internal Gate Resistor	R_{Gint}	f=1MHz, I_D=0A	-	1.5	-	Ω
Input Capacitance	C_{iss}	f=1MHz, V_{DS}=1000V, V_{GS}=0V	-	5293	-	pF
Output Capacitance	C_{oss}		-	263	-	pF
Reverse Transfer Capacitance	C_{rss}		-	14	-	pF
Total Gate Charge	Q_g	V_{DS}=800V, I_{DS}=80A, V_{GS}=-5V/18V	-	208	-	nC
Gate to Source Charge	Q_{gs}		-	53	-	nC
Gate to Drain Charge	Q_{gd}		-	85	-	nC
Turn-On Delay Time	$t_{d\ on}$	V_{DS}=800V, I_{DS}=80A, $R_{G\text{-}ext}$=10Ω, V_{GS}=-5V/18V	-	23	-	ns
Rising Time	t_r		-	48	-	ns
Turn-Off Delay Time	$t_{d\ off}$		-	86	-	ns
Falling Time	t_f		-	28	-	ns
Turn-On Loss Energy Per Pulse	E_{on}		-	1337	-	μJ
Turn-Off Loss Energy Per Pulse	E_{off}		-	1382	-	μJ

3 Characteristics of Body Diode

Table 3 Characteristics Values(T_J=25℃ unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V_{SD}	I_{SD}=80A, V_{GS}=-5V, T_J=25℃	-	4.0	-	V
		I_{SD}=80A, V_{GS}=-5V, T_J=175℃	-	3.7	-	V
Continuous Diode Forward Current [1]	I_{SD}	T_C=25℃	-	128	-	A
		T_C=100℃	-	72	-	A
Peak Reverse Recovery Current	I_{RM}	V_{DS}=800V, I_{SD}=80A, V_{GS}=-5V, -di/dt=1000A/μs	-	15	-	A
Reverse Recovery Time	t_{rr}		-	25	-	ns
Reverse Recovery Charge	Q_{rr}		-	225	-	nC

Notes:

1. Pulse width is limited by bonding wires.

4 Typical Characteristics diagrams

Fig.1 Typical Forward Output Characteristics at T_J=25℃

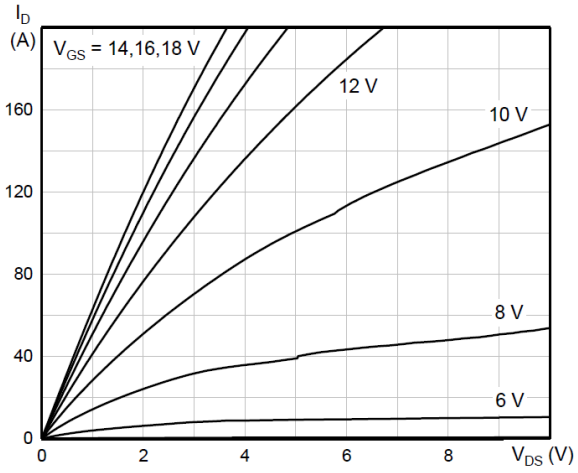


Fig.2 Typical Forward Output Characteristics at T_J=175℃

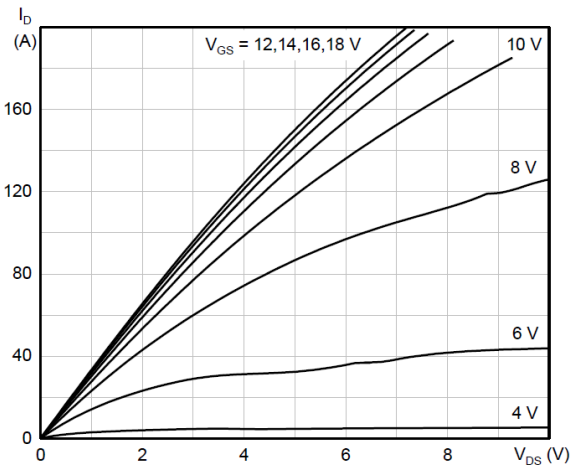


Fig.3 Typical Transfer Characteristics

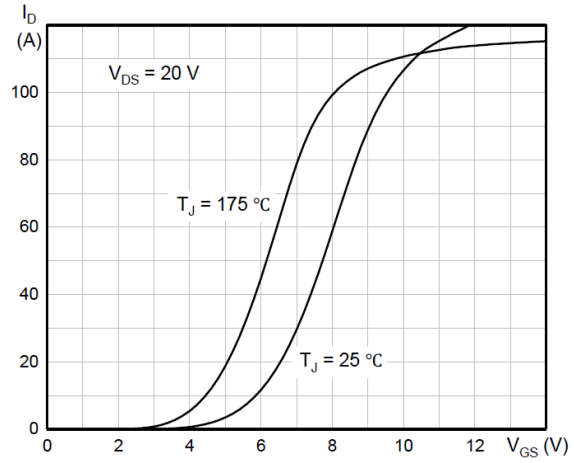


Fig.4 Gate Threshold Voltage vs. Temperature

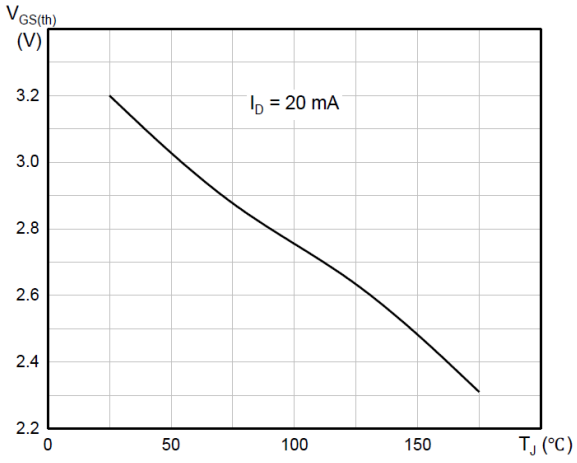


Fig.5 On-Resistance vs. Temperature

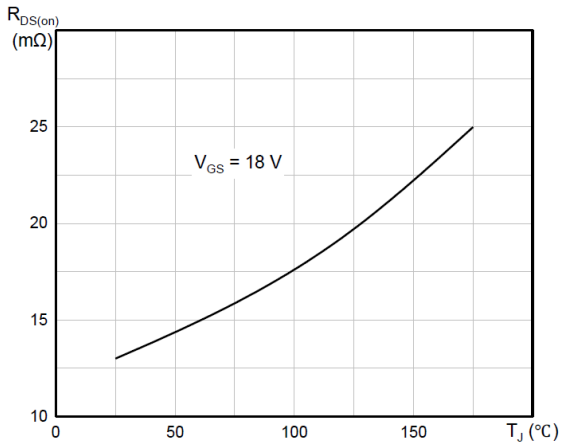


Fig.6 Breakdown Voltage vs. Temperature

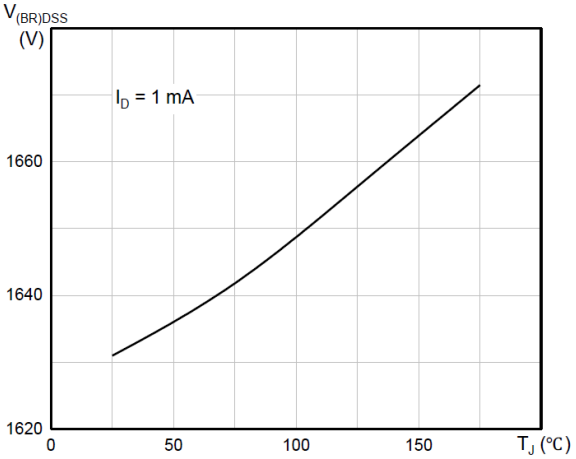


Fig.7 Body Diode Characteristics at T_J = 25℃

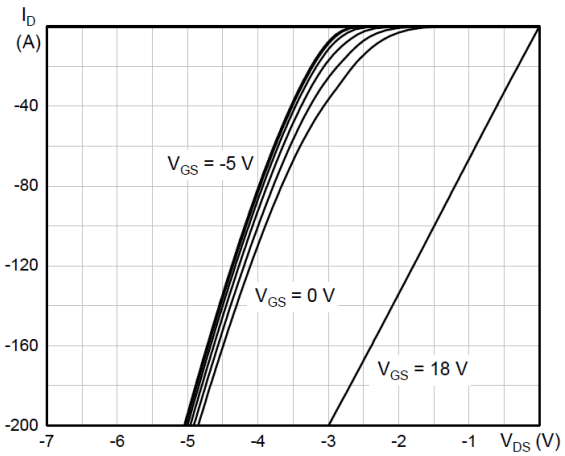


Fig.8 Body Diode Characteristics at T_J = 175℃

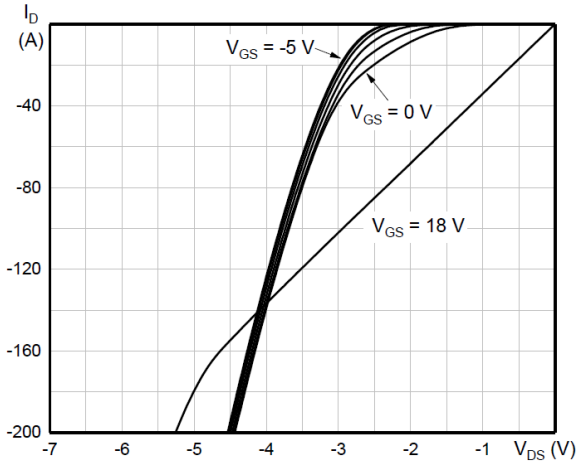


Fig.9 Typical Switching Energy vs. Gate Resistance

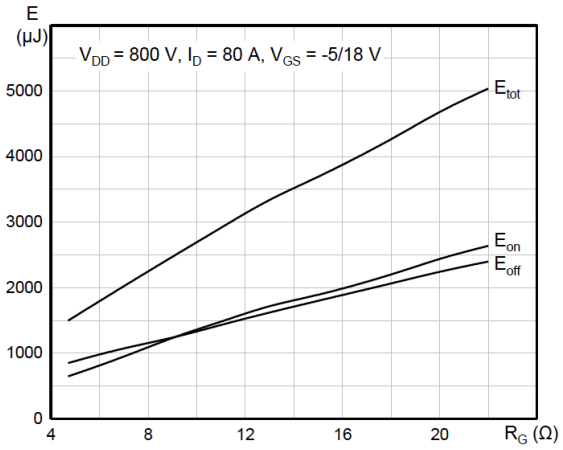


Fig.10 Typical Switching Energy vs. Drain Current

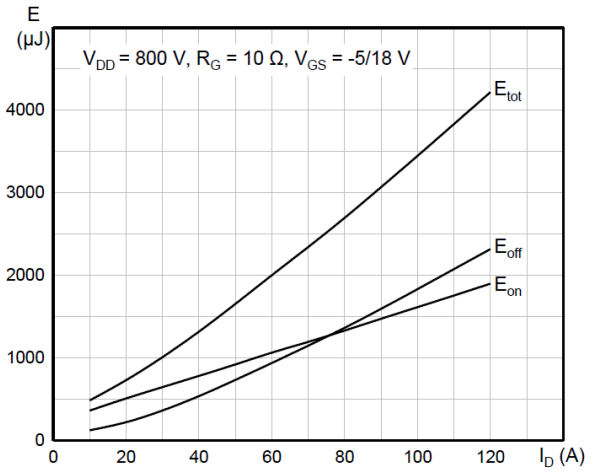


Fig.11 Typical Switching Energy vs. Supply Voltage

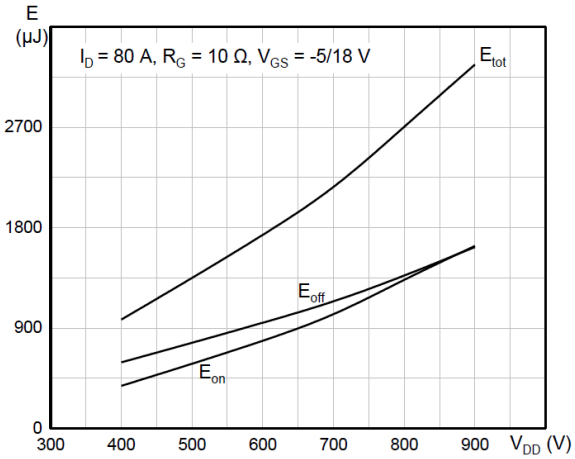


Fig.12 Typical Switching Energy vs. Temperature

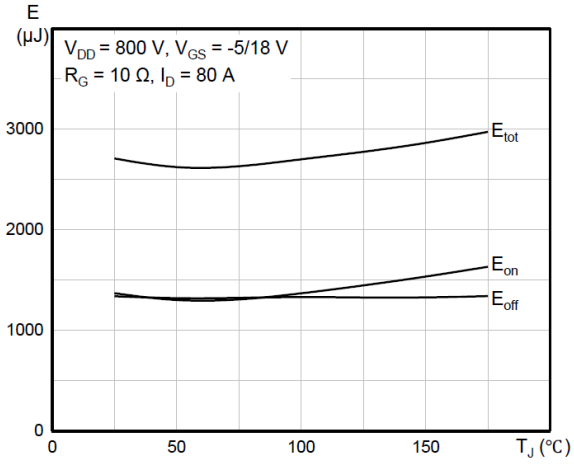


Fig.13 Typical Gate Charge Characteristics

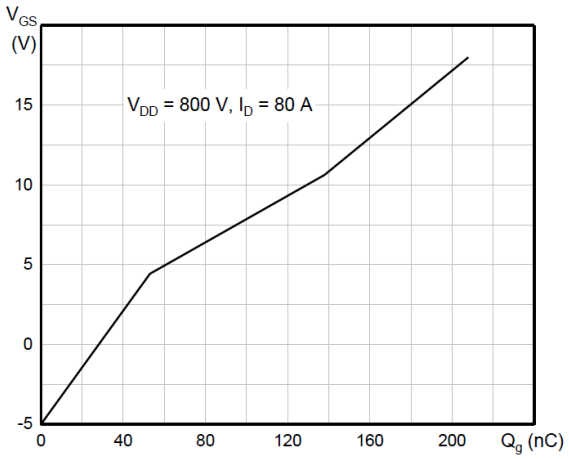


Fig.14 Typical Capacitance Characteristics

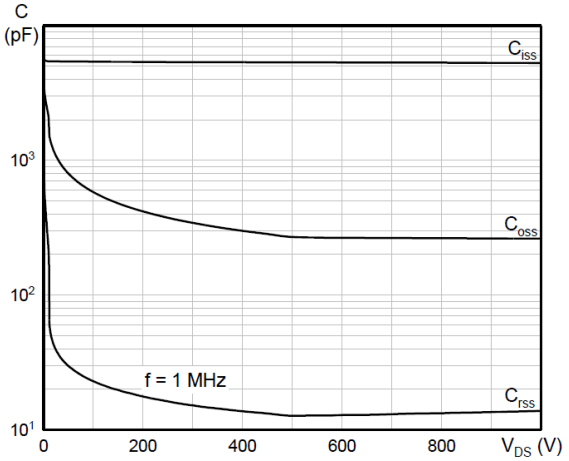


Fig.15 Safe Operating Area

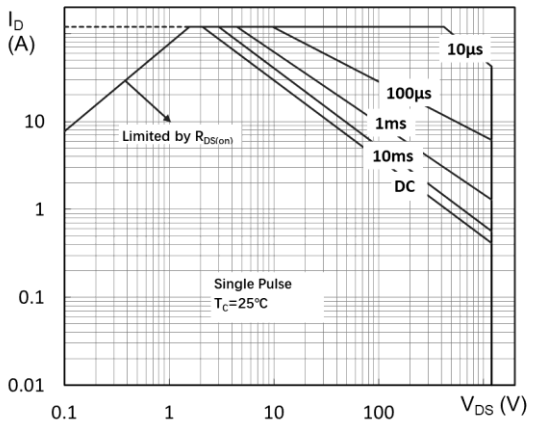
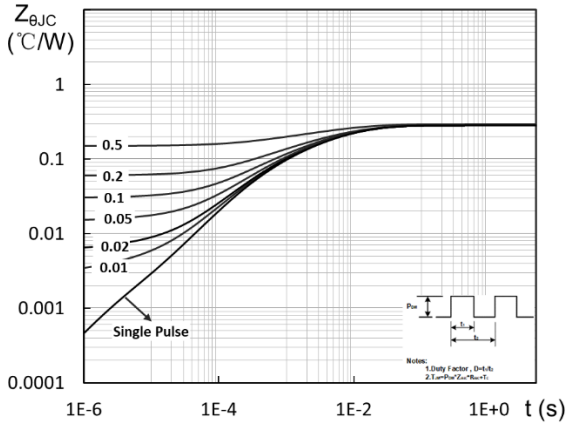
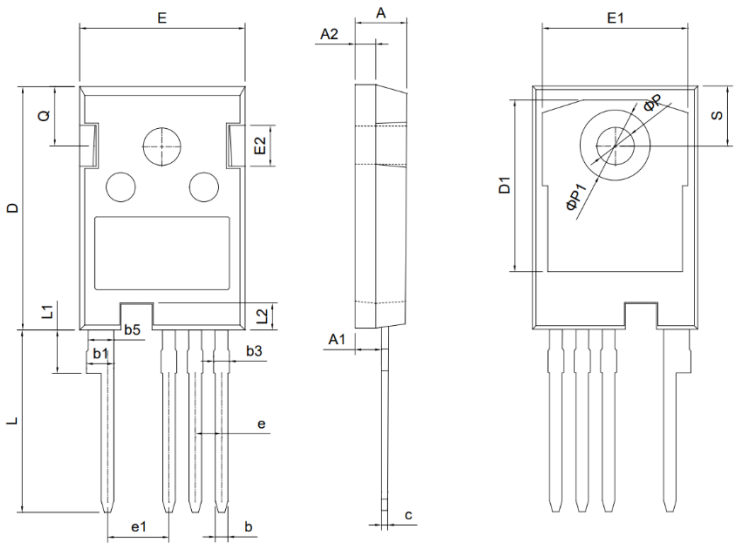


Fig.16 Transient Thermal Impedance (Junction – Case)



5 Package Outlines

Mechanical Dimensions for TO-247-4



SYMBOL	mm		
	MIN	NOM	MAX
A	4.80	5.00	5.21
A1	2.21	2.41	2.61
A2	1.80	2.00	2.20
b	1.06	1.21	1.36
b1	2.33	2.63	2.93
b3	1.07	1.30	1.60
b5	2.30	2.53	2.72
c	0.51	0.61	0.75
D	23.30	23.45	23.60
D1	16.25	16.55	17.65
E	15.74	15.94	16.14
E1	13.72	14.02	14.32
E2	3.68	5.00	5.20
e		2.54BSC	
e1		5.44BSC	
L	17.27	17.57	17.87
L1	3.97	4.19	4.39
L2	2.35	2.50	2.60
ΦP	3.40	3.60	3.80
ΦP1		7.19REF	
Q	5.49	5.79	6.09
S	6.00	6.17	6.40

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Product Specification Statement

1. The product specification aims to provide users with a reference regarding various product parameters, performance, and usage. It presents certain aspects of the product's performance in graphical form and is intended solely for users to select product and make product comparisons, enabling users to better understand and evaluate the characteristics and advantages of the product. It does not constitute any commitment, warranty, or guarantee.

2. The product parameters described in the product specification are numerical values, characteristics, and functions obtained through actual testing or theoretical calculations of the product in an independent or ideal state. Due to the complexity of product applications and variations in test conditions and equipment, there may be slight fluctuations in parameter test values. WAYON shall not guarantee that the actual performance of the product when installed in the customer's system or equipment will be entirely consistent with the product specification, especially concerning dynamic parameters. It is recommended that users consult with professionals for product selection and system design. Users should also thoroughly validate and assess whether the actual parameters and performance when installed in their respective systems or equipment meet their requirements or expectations. Additionally, users should exercise caution in verifying product compatibility issues, and WAYON assumes no responsibility for the application of the product.

3. WAYON strives to provide accurate and up-to-date information to the best of our ability. However, due to technical, human, or other reasons, WAYON cannot guarantee that the information provided in the product specification is entirely accurate and error-free. WAYON shall not be held responsible for any losses or damages resulting from the use or reliance on any information in these product specifications. WAYON reserves the right to revise or update the product specification and the products at any time without prior notice, and the user's continued use of the product specification is considered an acceptance of these revisions and updates. Prior to purchasing and using the product, users should verify the above information with WAYON to ensure that the product specification is the most current, effective, and complete. If users are particularly concerned about product parameters, please consult WAYON in detail or request relevant product test reports. Any data not explicitly mentioned in the product specification shall be subject to separate agreement.

4. Users are advised to pay attention to the parameter limit values specified in the product specification and maintain a certain margin in design or application to ensure that the product does not exceed the parameter limit values defined in the product specification. This precaution should be taken to avoid exceeding one or more of the limit values, which may result in permanent irreversible damage to the product, ultimately affecting the quality and reliability of the system or equipment.

5. The design of the product is intended to meet civilian needs and is not guaranteed for use in harsh environments or precision equipment. It is not recommended for use in systems or equipment such as medical devices, aircraft, nuclear power, and similar systems, where failures in these systems or equipment could reasonably be expected to result in personal injury. WAYON shall assume no responsibility for any consequences resulting from such usage.

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