1. General Description

The WR0305 series are CMOS-based ultra-low noise, high PSRR linear regulators, with 300mA low dropout voltage, low quiescent current, and low line or load transient response figures. The WR0305 series consist of an accurate voltage-reference block, pre-regulator block, LPF block, an error amplifier, a voltage-setting resistor net, a PMOSFET pass device, a thermal-shutdown circuit, and a current limit circuit.

The WR0305 series use a type of outstanding CMOS process to minimize the supply current. Using new innovative design techniques, the WR0305 offers class-leading noise performance without a noise bypass capacitor and the ability for remote output capacitor placement.

The device is designed to work with a 1μF input and a 1μF output ceramic capacitor (no separate noise bypass capacitor is required). The WR0305 regulators are available in SOT23-5 and DFN1×1-4 packages.

2. Features

- Input Voltage Range: 2.2V to 5.5V
- Output Voltage: 1.2V, 1.5V, 1.8V, 2.5V, 2.8V, 3.0V, 3.3V
- Output Current: 300mA
- Very Low I_Q(Enable): 20μA
- Excellent Load/Line Transient Response
- PSRR: 78dB @ 1kHz、50dB @ 100kHz
- Low Output Voltage Noise: 20μV_{RMS}
- Low Dropout: 130mV @ V_{OUT}=3.3V, I_{OUT} = 300mA
- Recommended Capacitor: 1μF
- Operating Temperature: -40~+85ºC

3. Applications

- Drones
- Mobile Phones, Tablets
- Smart Meters and Field Transmitter
- Digital Cameras and Audio Devices
- Portable and Battery-Powered Equipment
- RF, PLL, VCO, and Clock Power Supplies

4. Typical Application

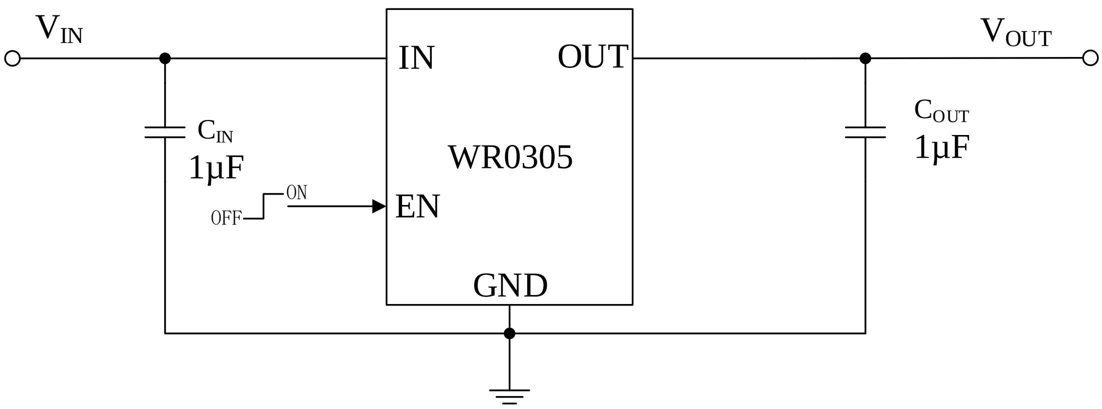
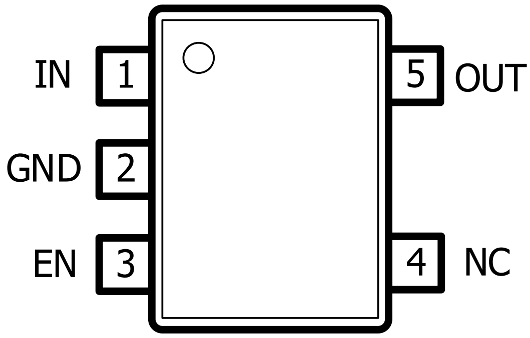


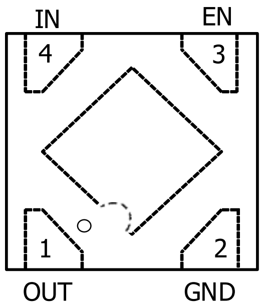
Figure 1. Typical Application Circuit

5. Pin Configuration

(Top View)



SOT23-5



DFN1×1-4

6. Pin Description

PIN NUMBER		PIN NAME	I/O	PIN FUNCTION
SOT23-5	DFN1×1-4			
1	4	IN	I	Input voltage supply. Bypass with a typical 1μF capacitor to GND. Place the input capacitor as close to the IN and GND pins of the device as possible.
2	2	GND	-	Common ground.
3	3	EN	I	Enable input. Active High. This pin has an internal 2.6MΩ pull-down resistor to hold the regulator off by default.
4	-	NC	-	NC
5	1	OUT	O	Regulated output voltage. A low equivalent series resistance (ESR) capacitor, typically 1μF, is required from OUT to ground for stability. Place the output capacitor as close to the OUT and GND pins of the device as possible. An internal 200Ω (typical) pull-down resistor prevents a charge from remaining on V_{OUT} when the regulator shutdowns.
-	-	EPAD	-	Exposed pad. It should be connected directly to the GND pin as short as possible or leave floating. Connect the EPAD to a large-area ground plane for best thermal performance. Do not connect to any potential other than GND.

7. Absolute Maximum Ratings [1]

SYMBOL	PARAMETER		RATING	UNIT
V_{IN}	Input voltage range		-0.3 to 6.0	V
V_{EN}	EN Input voltage range		-0.3 to 6.0	
V_{OUT}	Output voltage range		-0.3 to 6.0	
P_D	Power Dissipation P_D@T_A = 25℃	SOT23-5	925.2	mW
		DFN1×1-4	602.4	
$R_{\theta JA}$	Thermal resistance[2] [3]	SOT23-5	135.1	℃/W
		DFN1×1-4	207.5	
$R_{\theta JB}$	Thermal resistance[2] [3]	SOT23-5	83.43	
		DFN1×1-4	142.7	
$R_{\theta JC\_T}$	Top Thermal resistance[2] [3]	SOT23-5	42.56	
		DFN1×1-4	48.34	
$R_{\theta JC\_B}$	Bottom Thermal resistance[2] [3]	SOT23-5	35.4	
		DFN1×1-4	47.47	
T_J	Junction Temperature		150	℃
T_{SDR}	Lead Temperature Range		260	
T_{STG}	Storage Temperature Range		-55 to 150	
ESD	ESD susceptibility	HBM	±2000	V

NOTE1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE2: Measured on 2cm x 2cm 2-layer FR4 PCB board, 1 oz copper, no via holes on GND copper.

NOTE3: Power dissipation is calculate by $P_D = (T_J - T_A) / R_{\theta JA}$.

8. Recommended Operating Conditions

SYMBOL	PARAMETER	RATING	UNIT
V_{IN}	Input voltage range	2.2 to 5.5	V
V_{EN}	EN Input voltage range	0 to 5.5	
V_{OUT}	Nominal output voltage range	1.2, 1.5, 1.8, 2.5, 2.8, 3.0, 3.3	
I_{OUT}	Output current	0 to 300	mA
C_{IN}	Input capacitor	1	μF
C_{OUT}	Output capacitor	1	
T_A	Operating temperature range	-40 to 85	℃

9. Electrical Characteristics

(V_{IN} = $V_{OUT(NOM)}$+1V, I_{OUT}=1mA, C_{IN}=C_{OUT}=1μF, T_A=25°C, unless otherwise noted)

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
V_{OUT}	Output Voltage Range	V_{OUT} ≤ 1.5V, I_{OUT}=1mA	0.97 V_{OUT}	V_{OUT}	1.03 V_{OUT}	V
		V_{OUT} > 1.5V, I_{OUT}=1mA	0.98 V_{OUT}	V_{OUT}	1.02 V_{OUT}	
LNR	Line Regulation	V_{IN}= $V_{OUT(NOM)}$+1V ~5.5V, I_{OUT}=1mA		0.05	0.1	%/V
LDR	Load Regulation[1]	I_{OUT}=1~300mA		20		mV
I_{LIM}	Output current limit	V_{EN}=V_{IN}		500		mA
I_{OUT}	Maximum output current in the accuracy range [2]	V_{EN}=V_{IN}	300			mA
I_Q	Quiescent Current	V_{IN}=$V_{OUT(NOM)}$+1V, V_{EN} =1.2V, I_{OUT}=0mA		20	40	μA
		V_{IN}=$V_{OUT(NOM)}$+1V, V_{EN} =1.2V, I_{OUT}=300mA		350	500	
I_{SHDN}	Shut-down Current	V_{EN}=0V		0.2	1	μA
V_{DO}	Dropout Voltage[3]	V_{OUT}=1.2V, I_{OUT}=300mA		350	500	mV
		V_{OUT}=1.5V, I_{OUT}=300mA		250	400	
		V_{OUT}=1.8V, I_{OUT}=300mA		200	350	
		V_{OUT}=2.5V, I_{OUT}=300mA		180	330	
		V_{OUT}=2.8V, I_{OUT}=300mA		150	300	
		V_{OUT}=3.0V, I_{OUT}=300mA		140	250	
		V_{OUT}=3.3V, I_{OUT}=300mA		130	200	
V_{ENH}	High Input Threshold	V_{IN}=5.5V, V_{EN} rising until the output is enabled	0.9	-		V
V_{ENL}	Low Input Threshold	V_{IN}=5.5V, V_{EN} falling until the output is disabled	-	-	0.4	V

SYMBOL	PARAMETER	TEST CONDITIONS		MIN	TYP.	MAX	UNIT
I_{EN}	EN Input Current	V_{IN}=5.5V, V_{EN}=5.5V			2		μA
		V_{IN}=5.5V, V_{EN}=0V			0.1		
R_{DIS}	Output Discharge resistance	V_{IN}=5.5V, V_{EN}=0V			200		Ω
I_{INRUSH}	Inrush Current	I_{OUT}=0mA			110		mA
		I_{OUT}=300mA			150		
t_{ON}	Turn on time	From V_{EN} > V_{IH} to V_{OUT} = 95% of $V_{OUT(NOM)}$			240		μs
t_R	Rise time	From 10% of $V_{OUT(NOM)}$ to V_{OUT} = 90% of $V_{OUT(NOM)}$			180		μs
PSRR	Power Supply Ripple Rejection[4]	V_{IN}=(V_{OUT}+1V) DC+0.5V_{P-P} f=1kHz, I_{OUT}=50mA			78		dB
		V_{IN}=(V_{OUT}+1V) DC+0.5V_{P-P} f=10kHz, I_{OUT}=50mA			82		
		V_{IN}=(V_{OUT}+1V) DC+0.5V_{P-P} f=100kHz, I_{OUT}=50mA			50		
		V_{IN}=(V_{OUT}+1V) DC+0.5V_{P-P} f=1MHz, I_{OUT}=50mA			40		
V_{NO}	Output noise voltage	BW=10Hz to 100kHz	I_{OUT}=10mA		20		$μV_{RMS}$
			I_{OUT}=300mA		30		
T_C	Output Voltage Temperature Coefficient	-40° C≤T_A≤85° C			50		ppm/℃
T_{SD}	Thermal Shutdown Threshold				150		ºC
△T_{SD}	Thermal shutdown hysteresis				30		ºC

Note1: The Load regulation is measured by pulse test.

Note2: Maximum output current is affected by the PCB layout, size of metal trace, the thermal conduction path between metal layers, ambient temperature and the other environment factors of system. Attention should be paid to the dropout voltage when V_{IN}< V_{OUT} + V_{DO}.

Note3: The dropout voltage is defined as (V_{IN}-V_{OUT}) when V_{OUT} is $V_{OUT(NOM)}$*98%(V_{OUT}>1.5V) or 97%(V_{OUT}≤1.5V).

Note4: This specification is verified by design. PSRR maybe various with respect to V_{OUT} and package.

10. Typical Performance Characteristics

(V_{IN} = $V_{OUT(NOM)}$+1V, I_{OUT}=1mA, C_{IN}=C_{OUT}=1μF, T_A=25°C， unless otherwise noted)

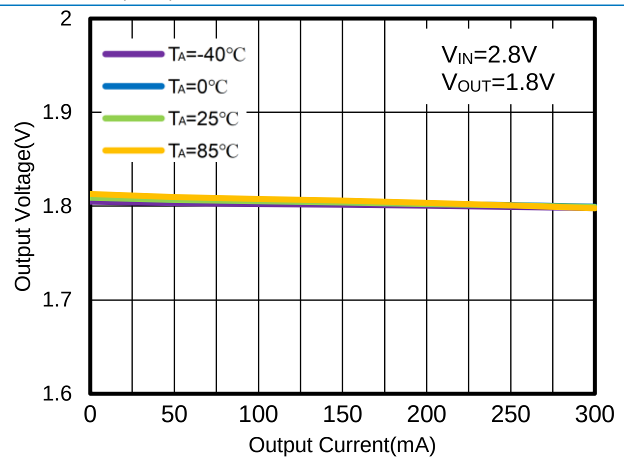


Figure 2. WR0305-18FF4R
Load Regulation vs. I_{OUT} & Ambient Temperature

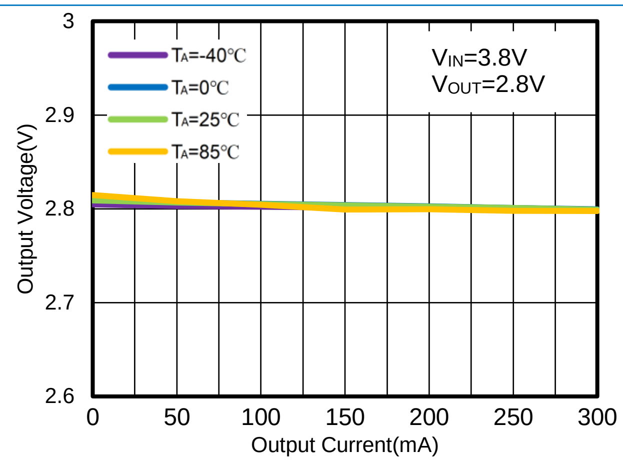


Figure 3. WR0305-28FF4R
Load Regulation vs. I_{OUT} & Ambient Temperature

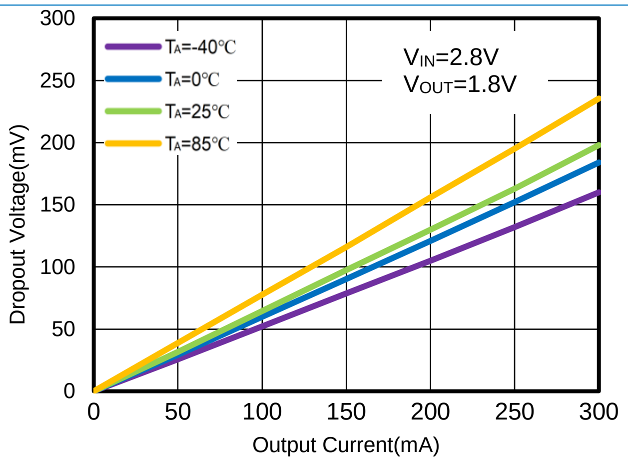


Figure 4. WR0305-18FF4R
Dropout Voltage vs. I_{OUT} & Ambient Temperature

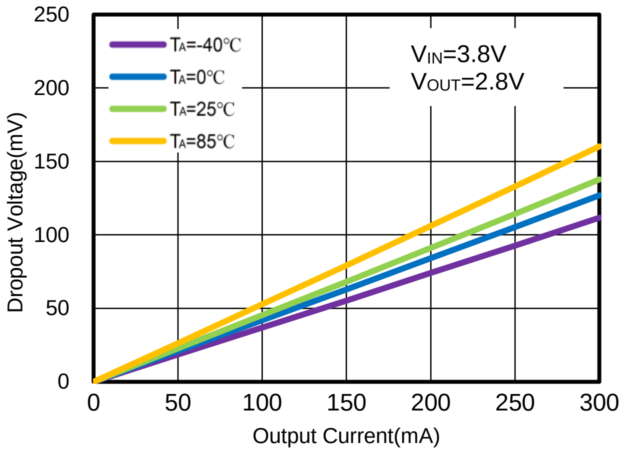


Figure 5. WR0305-28FF4R
Dropout Voltage vs. I_{OUT} & Ambient Temperature

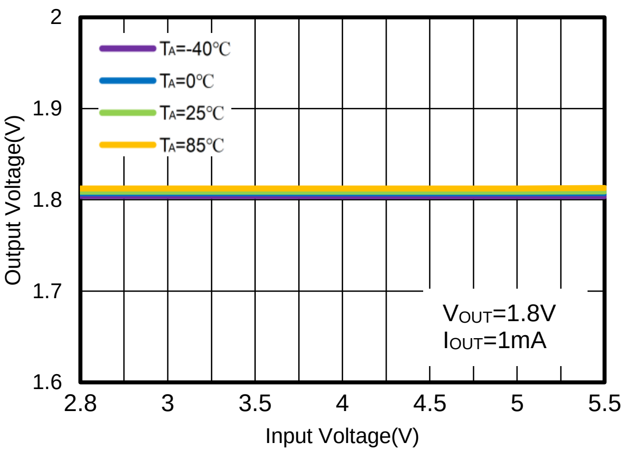


Figure 6. WR0305-18FF4R
Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

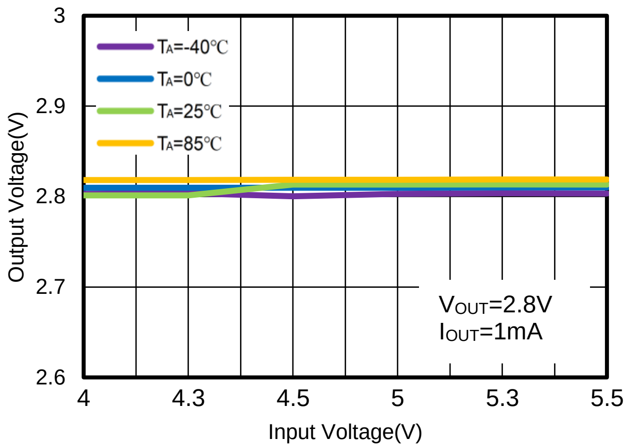


Figure 7. WR0305-28FF4R
Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

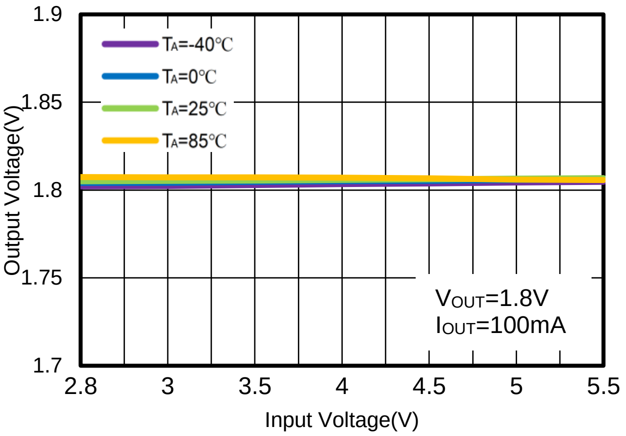


Figure 8. WR0305-18FF4R
Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

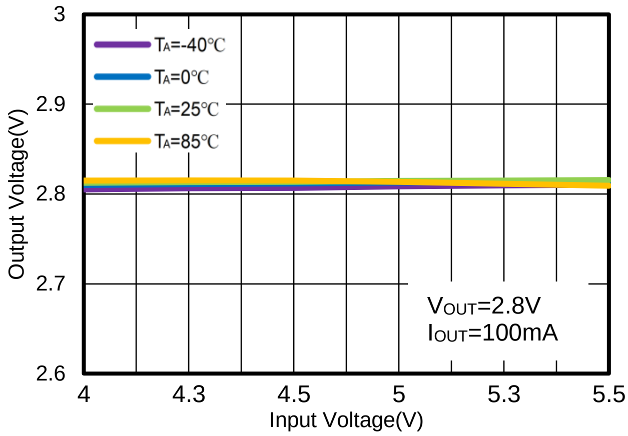


Figure 9. WR0305-28FF4R
Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

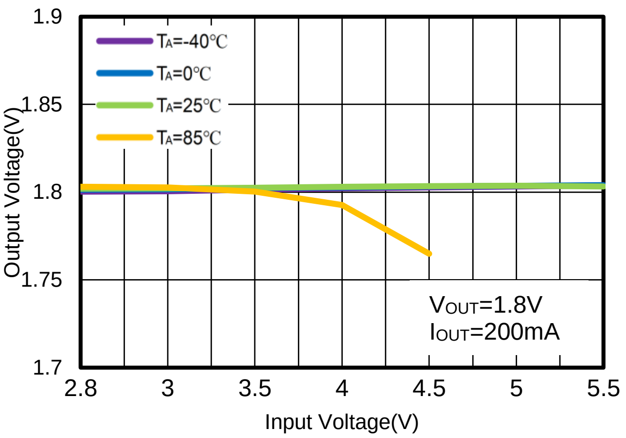


Figure 10. WR0305-18FF4R
Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

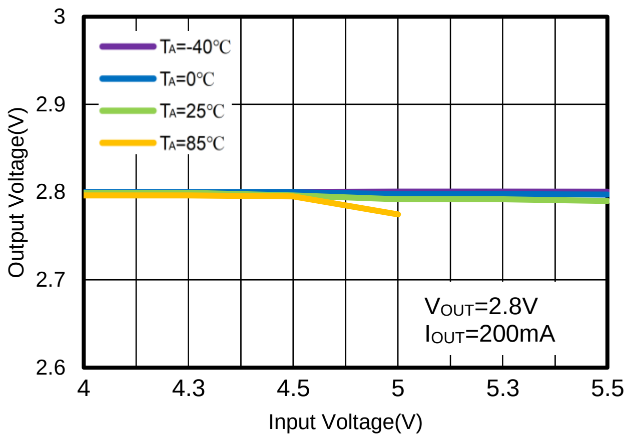


Figure 11. WR0305-28FF4R
Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

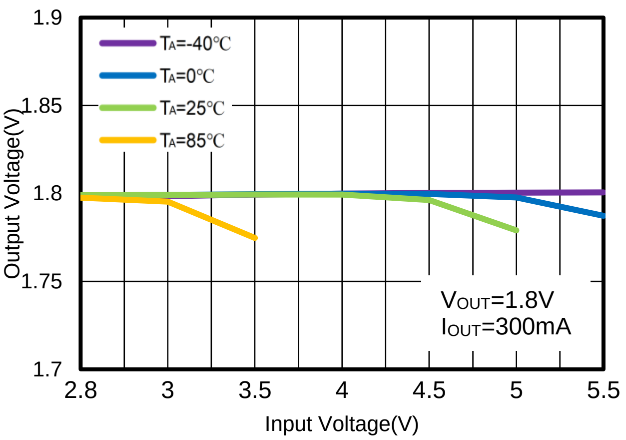


Figure 12. WR0305-18FF4R
Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

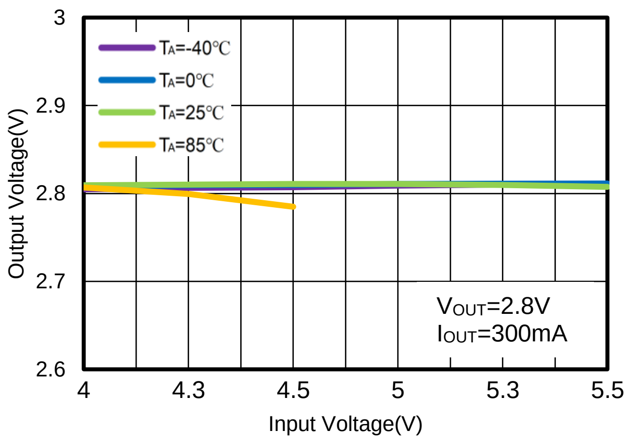


Figure 13. WR0305-28FF4R
Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

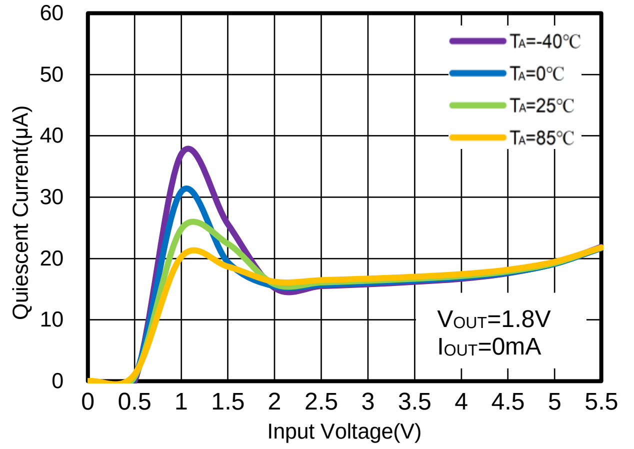


Figure 14. WR0305-18FF4R
Quiescent Current vs. V_{IN} & Ambient Temperature

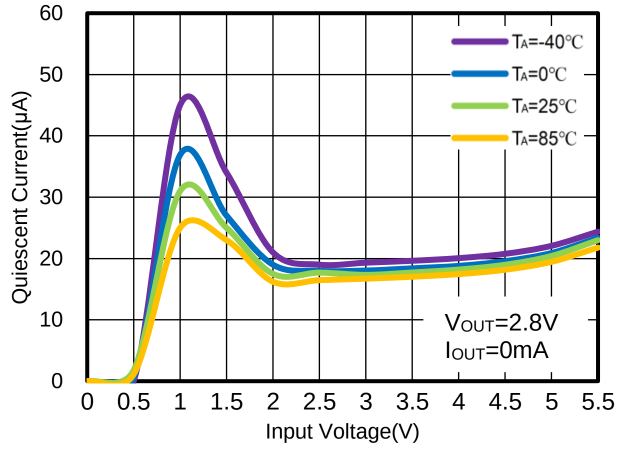


Figure 15. WR0305-28FF4R
Quiescent Current vs. V_{IN} & Ambient Temperature

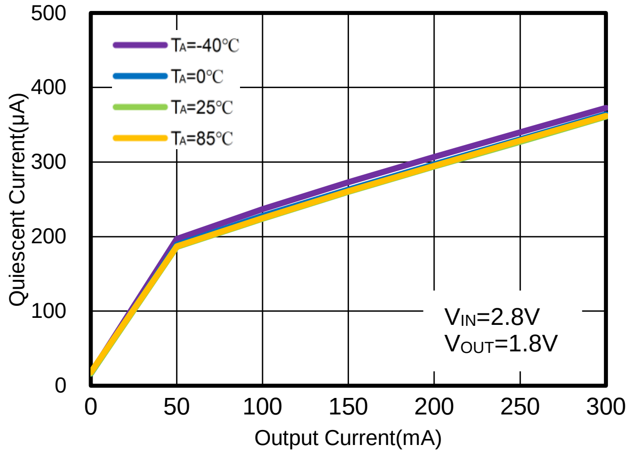


Figure 16. WR0305-18FF4R
Ground Current vs. I_{OUT} & Ambient Temperature

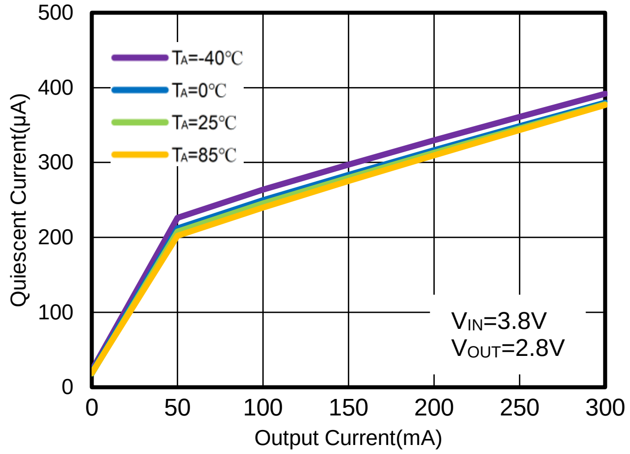


Figure 17. WR0305-28FF4R
Ground Current vs. I_{OUT} & Ambient Temperature

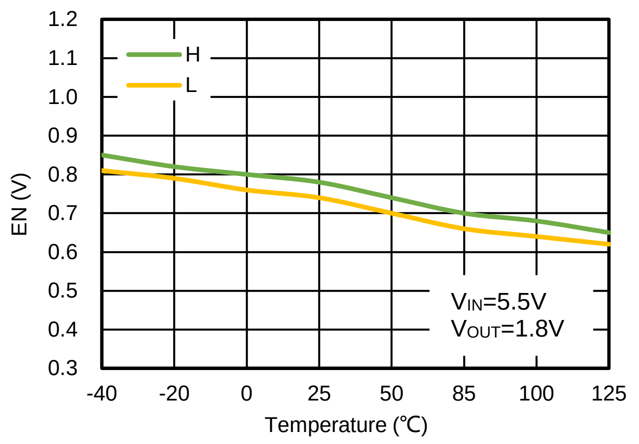


Figure 18. WR0305-18FF4R
Output Voltage vs. Ambient Temperature

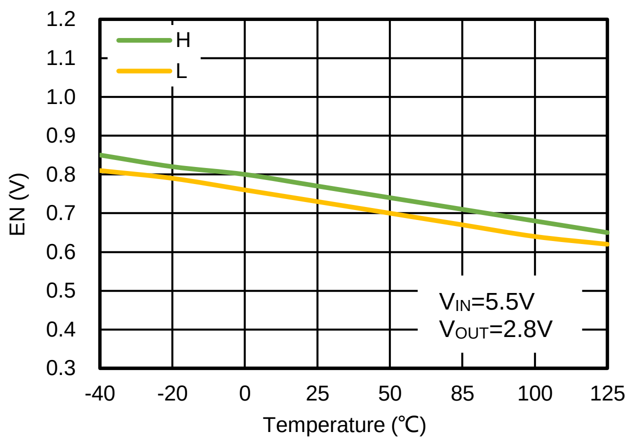


Figure 19. WR0305-28FF4R
Output Voltage vs. Ambient Temperature

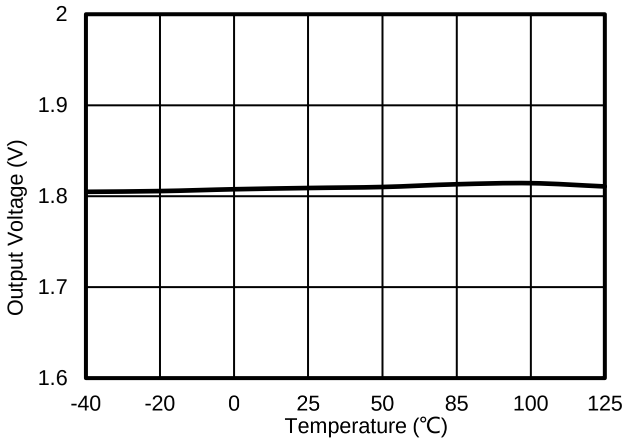


Figure 20. WR0305-18FF4R
Output Voltage vs. Ambient Temperature

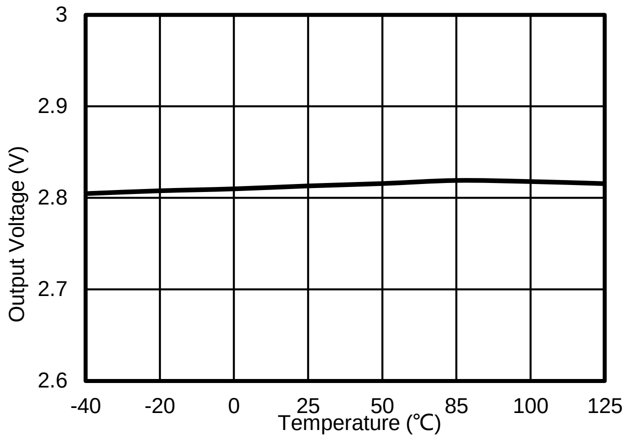


Figure 21. WR0305-28FF4R
Output Voltage vs. Ambient Temperature

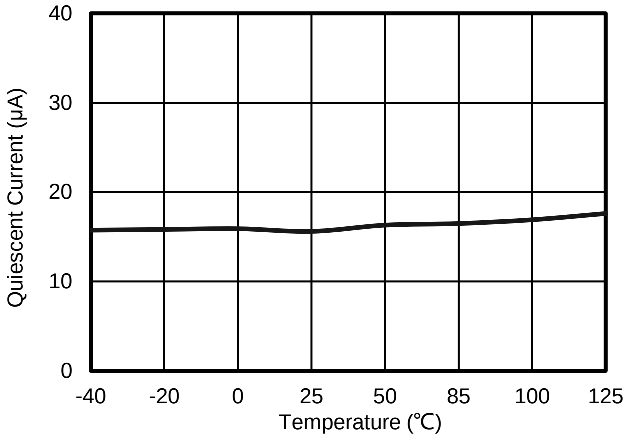


Figure 22. WR0305-18FF4R
Quiescent Current vs. Ambient Temperature

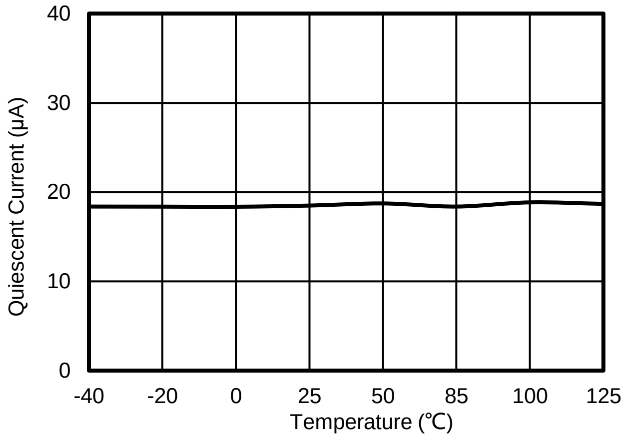


Figure 23. WR0305-28FF4R
Quiescent Current vs. Ambient Temperature

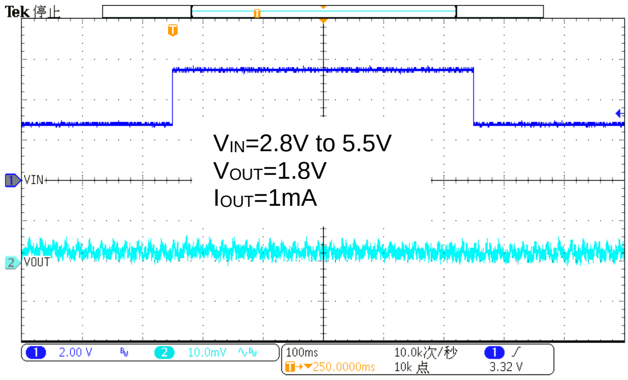


Figure 24. WR0305-18FF4R
Line Transient

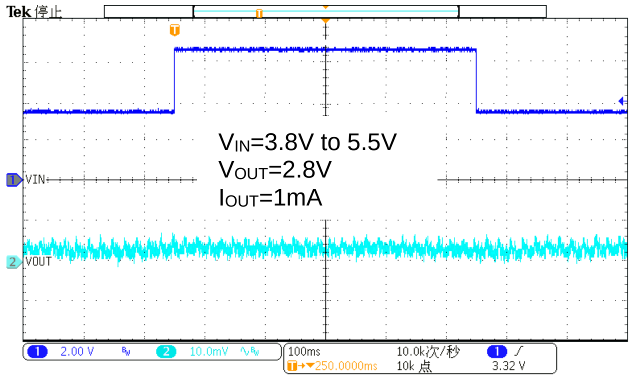


Figure 25. WR0305-28FF4R
Line Transient

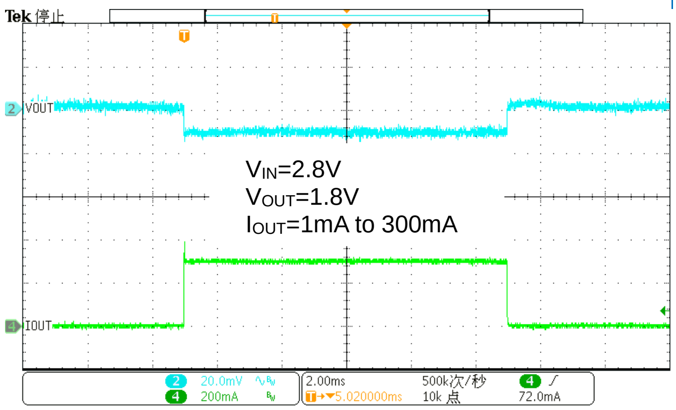


Figure 26. WR0305-18FF4R
Load Transient

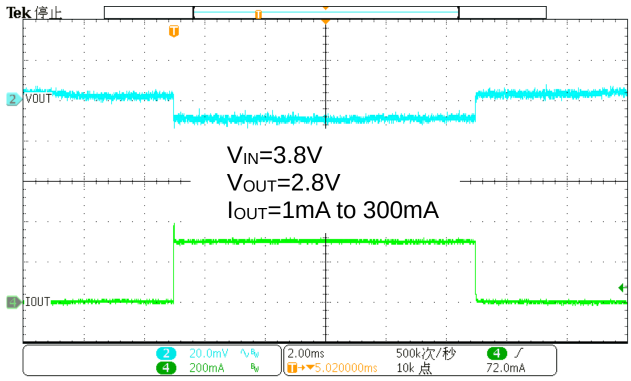


Figure 27. WR0305-28FF4R
Load Transient

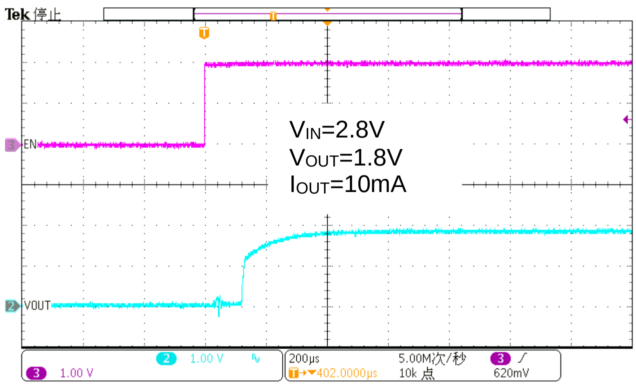


Figure 28. WR0305-18FF4R
Soft Start from EN

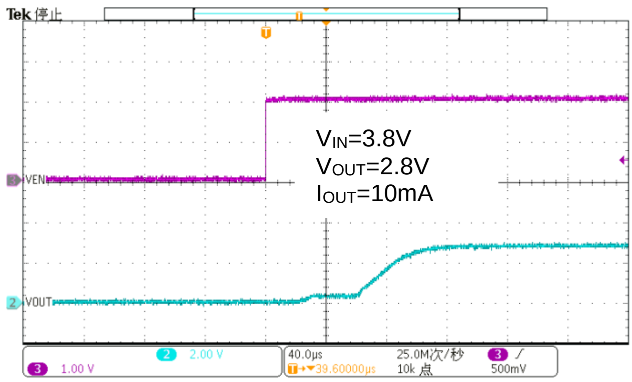


Figure 29. WR0305-28FF4R
Soft Start from EN

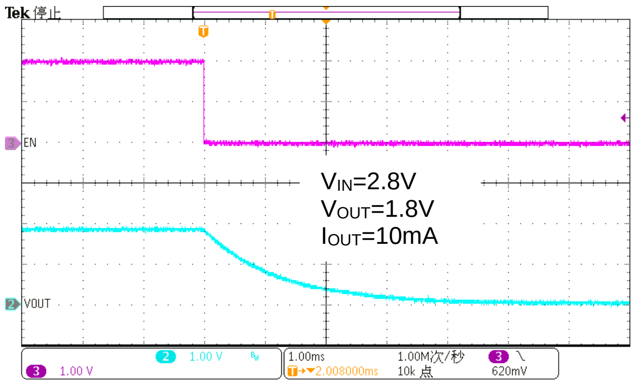


Figure 30. WR0305-18FF4R
EN Shutdown

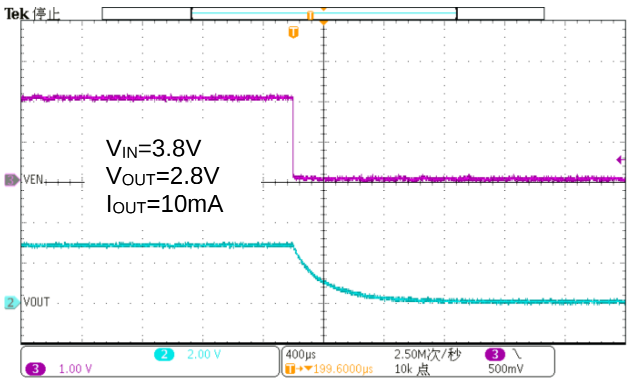


Figure 31. WR0305-28FF4R
EN Shutdown

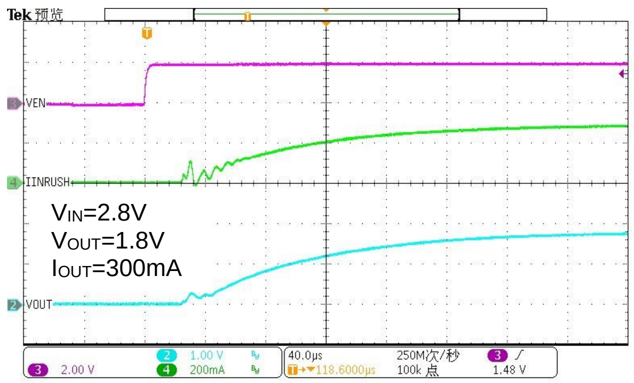


Figure 32. WR0305-18FF4R
Inrush Current

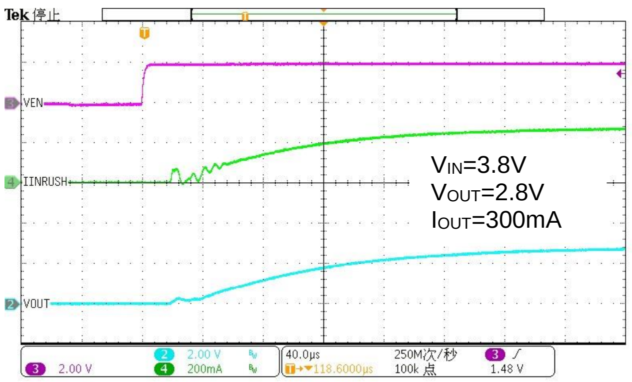


Figure 33. WR0305-28FF4R
Inrush Current

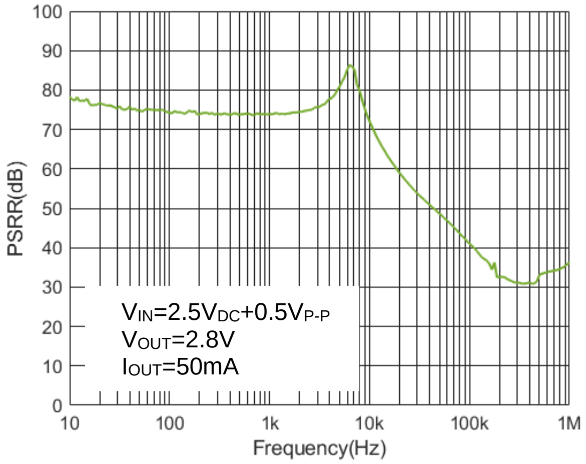


Figure 34. WR0305-15FF4R
Power Supply Rejection Ratio vs. Frequency

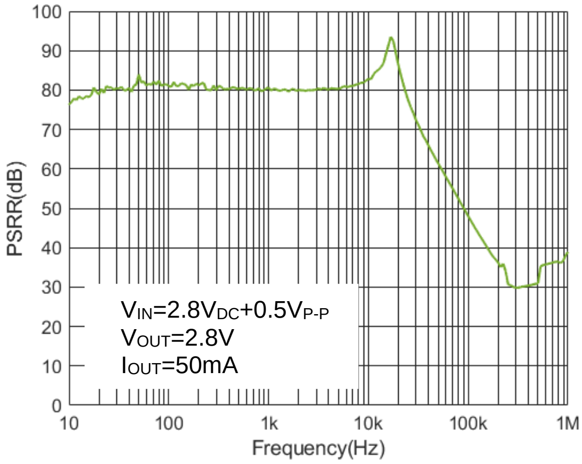


Figure 35. WR0305-18FF4R
Power Supply Rejection Ratio vs. Frequency

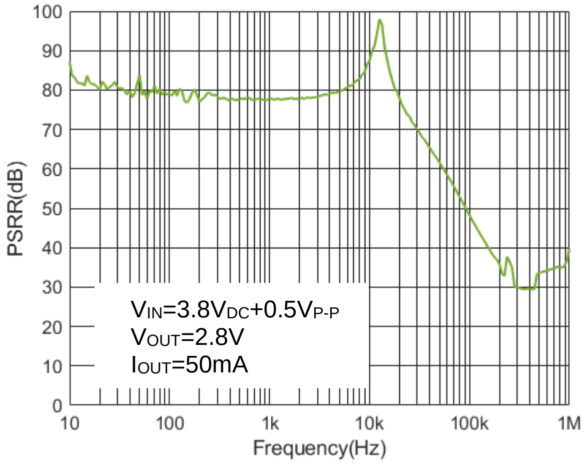


Figure 36. WR0305-28FF4R
Power Supply Rejection Ratio vs. Frequency

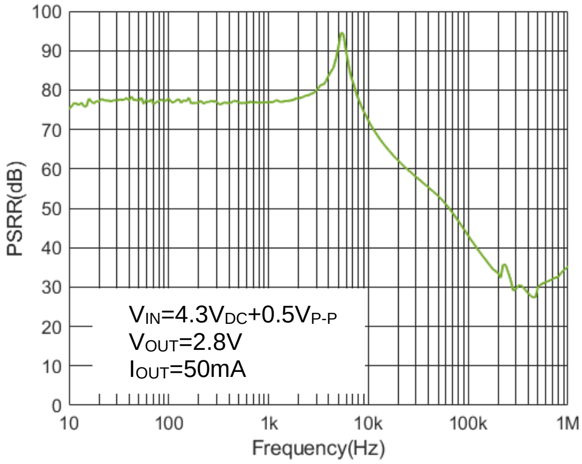


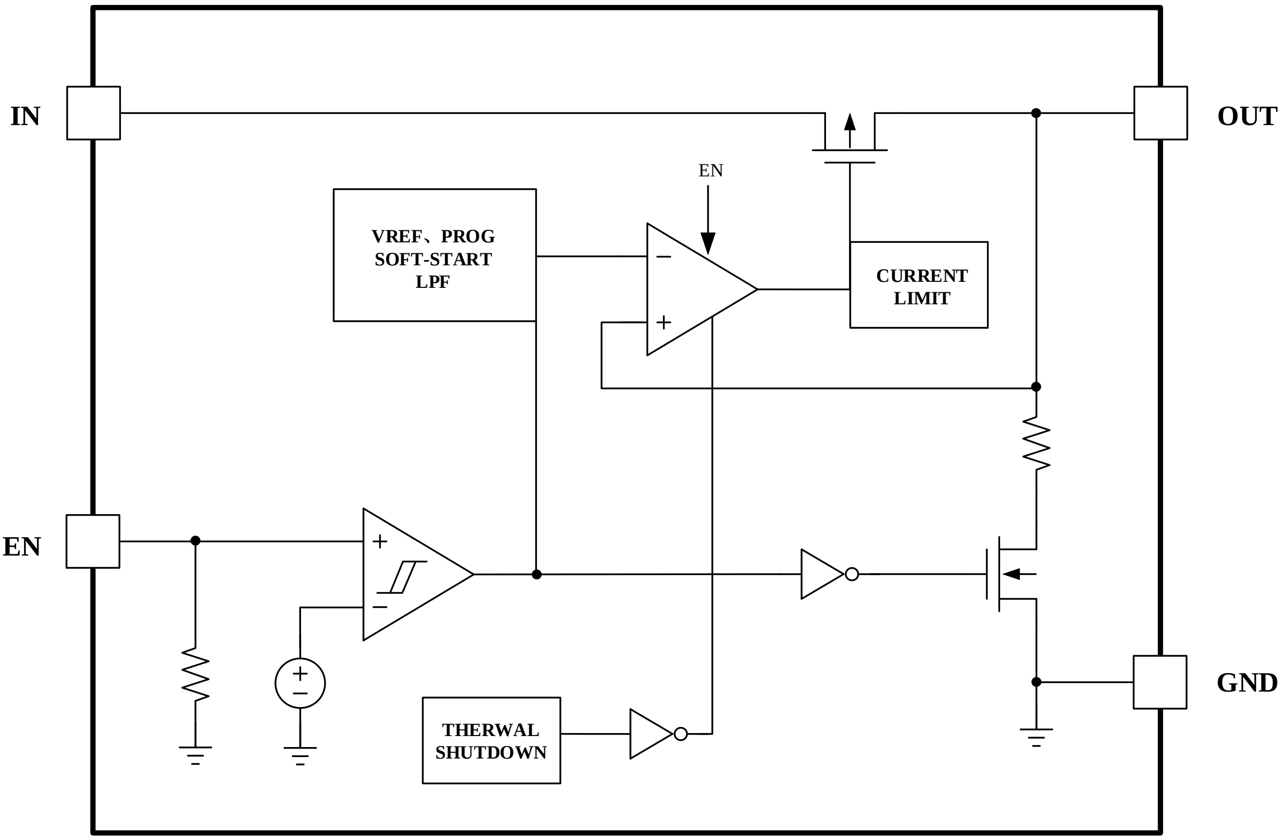
Figure 37. WR0305-33FF4R
Power Supply Rejection Ratio vs. Frequency

11. Function Description

11.1 Overview

Designed to meet the needs of sensitive RF and analog circuits, the WR0305 provides low noise, high PSRR, low quiescent current, as well as low line and load transient response figures. Using new innovative design techniques, the WR0305 offers class leading noise performance without the need for a separate noise filter capacitor. The WR0305 is designed to perform with a single 1µF input capacitor and a single 1µF ceramic output capacitor. With a reasonable PCB layout, the single 1µF ceramic output capacitor can be placed up to 10 cm away from the WR0305 device.

11.2 Block Diagram



11.3 Feature Description

11.3.1 Output Voltage Accuracy

The WR0305 has an output voltage accuracy of 2% or 3%. Output voltage accuracy is defined as the maximum and minimum error in output voltage. This includes the errors introduced by internal reference, load regulation and line regulation differences over the full range of rated load and line operating conditions, taking into account differences between manufacturing lots.

11.3.2 Enable (EN)

The WR0305 uses the EN pin to enable /disable its device and to activate /deactivate the active discharge function at devices with this feature. If the EN pin voltage is pulled below 0.4V the device is guaranteed to be disable. When EN is disabled, the active discharge transistor is activated and the output voltage V_{OUT} is pulled to GND through an internal circuitry with effective resistance about 200Ω.

The EN pin has an internal 2.6MΩ pull-down resistor to hold the regulator off by default. If the voltage of EN pin is higher than 0.9V, the device is guaranteed to be enabled. In case the Enable function is not required, the EN pin should be connected directly to V_{IN}.

11.3.3 Dropout Voltage (V_{DO})

WR0305 is a low dropout voltage LDO that can achieve nominal output voltage at lower input voltages. Dropout voltage is defined as the minimum of (V_{IN}-V_{OUT}) at the rated maximum output current where V_{OUT} is the minimum of $V_{OUT(NOM)}$. When the input voltage is below $V_{OUT(NOM)}$ plus V_{DO}, the output voltage varies with the input voltage.

For a CMOS regulator, the dropout voltage is determined by the drain-source on-state resistance ($R_{DS\ (ON)}$) of the pass transistor. Therefore, if the linear regulator operates at less than the rated current, the dropout voltage for that current scales accordingly. The $R_{DS\ (ON)}$ is calculated by following equation.

$$R_{DS\ (ON)} = V_{DO}/I_{OUT}$$

11.3.4 Power Supply Rejection Ratio (PSRR)

PSRR, which stands for Power Supply Rejection Ratio, represents the ratio of the two voltage gains obtained when the input and output power supplies are considered as two independent sources.

The basic calculation formula is

$$PSRR = 20lg\ (Ripple\ (in)\ /\ Ripple\ (out))$$

The units are in decibels (dB) and the logarithmic ratio is used.

The above equation shows that the output signal is influenced by the power supply in general, in addition to the circuit itself. PSRR is a quantity used to describe how the output signal is affected by the power supply; the larger the PSRR, the less the output signal is affected by the power supply.

As the level of integration continues to increase, the magnitude of supply current required is also increasing. End users want to extend battery life, i.e. they need very efficient DC/DC conversion processes, using more efficient switching regulators. However, switching regulators generate more ripple in the power line than linear regulators.

The PSRR shows the ability of the LDO to suppress input voltage noise. For a clean, noise-free DC output voltage, use an LDO with a high PSRR.

Noise coupling from the input voltage to the internal reference voltage is the main cause of PSRR performance degradation. Using noise reduction capacitors at the input can effectively filter out noise and improve PSRR performance at low frequencies. The LDO can be used not only to regulate the voltage but also to provide an exceptionally clean DC supply for noise sensitive components.

The WR0305 is a high PSRR LDO that can be used not only for voltage regulation but also for noise cancellation in the power supply.

11.3.5 Noise

LDO noise can be divided into two main categories: internal noise and external noise. Internal noise is the noise generated inside the electronics; external noise is the noise transmitted from outside the circuit to the circuit. The error amplifier determines the PSRR of the LDO and therefore its ability to suppress external noise at the input; internal noise is always present at the output of the LDO.

In practice, minimizing noise from the power supply is critical to system performance. In test and measurement systems, small fluctuations in power supply noise can alter the instantaneous measurement accuracy.

The WR0305 has a low noise reference, high PSRR to ensure that output noise is reduced during normal operation.

11.3.6 Current Limit (I_{LIM})

In LDO circuits, if an output short circuit or excessive load current occurs, the device may be burned out. Especially in the case of a short circuit, not only is there too much current flowing through the regulator, but the voltage across the source drain of the regulator is also at its maximum, which is likely to burn out the regulator and make the device inoperable. The current limiting circuit used in LDO is a constant current limiting circuit, where the maximum load current that the LDO can supply is limited to a set constant I_{LIM}, and when an overload or short circuit occurs, the output current will be maintained at I_{LIM}, and the output voltage will be reduced to $I_{LIM}×R_{LOAD}$.

If the external overload or short circuit condition lasts for a long time, the continuous high current will increase the device temperature and increase the power consumption of the whole system, the device will trigger the thermal protection function.

11.3.7 Thermal Protection

The WR0305 contains a thermal shutdown protection circuit that implements the required switching gate circuit function through a thermal switch integrated inside the chip. The output current is turned off when the heat in the LDO is too high. Thermal shutdown occurs when the thermal junction temperature (T_J) of the energized crystal exceeds 150°C (typical). The thermal shutdown hysteresis ensures that the LDO resets (turns on) again when the temperature drops to 120°C (typical). The thermal time constant of the semiconductor chip is quite short, so when thermal shutdown is reached, the output turns on and off at a higher rate until the power dissipation is reduced.

The WR0305's internal protection circuitry is designed to prevent thermal overload conditions. This circuitry is not a substitute for a proper heat sink. Continuously putting the WR0305 into a thermal shutdown state will reduce the reliability of the device.

11.4 Functional Mode of The Device

The device has three modes: normal, dropout, and disabled modes of operation.

The operating conditions of each mode are listed in the table below.

Operating conditions of each mode

FUNCTIONAL MODE	CONDITIONS			
	V_{IN}	V_{EN}	I_{OUT}	T_J
Normal	$5.5V>V_{IN}>V_{OUT(NOM)}+V_{DO}$	$V_{EN}>V_{ENH}$	$I_{OUT}<I_{LIM}$	$T_J<T_{SD}$
Dropout	$V_{IN}<V_{OUT(NOM)}+V_{DO}$	$V_{EN}>V_{ENH}$	$I_{OUT}<I_{LIM}$	$T_J<T_{SD}$
Disabled	—	$V_{EN}<V_{ENL}$	—	$T_J>T_{SD}$

11.4.1 Normal Mode

Normal operating mode requires that all of the following conditions are met.

1. The input voltage is greater than the rated output voltage plus the differential voltage ($V_{OUT(NOM)} + V_{DO}$) or 2.2V (which is greater) and is less than 5.5V.

2. The enable voltage has previously exceeded the enable rise threshold voltage and has not fallen below the enable fall threshold.

3. The output current is less than the current limit ($I_{OUT} < I_{LIM}$).

4. The device junction temperature is less than the thermal shutdown temperature ($T_J < T_{SD}$).

11.4.2 Dropout Mode

If the input voltage is below the rated output voltage plus a specified dropout voltage, but all other conditions are met for normal operation, the device operates in the dropout state and the output voltage tracks the input voltage. Because the transient performance of the device is significantly reduced through the device being in the triode state, the output current is no longer controlled. Line or load transients during power down can result in large output voltage deviations.

11.4.3 Disabled

The WR0305 can be turned off by forcing the enable pin low, typically with an enable voltage below 0.4V, at which point the pass device is turned off, internal circuits are shutdown, and the output voltage is actively discharged to ground through an internal resistor from output to ground.

12. Application

Note: The information in the Applications section below is not part of WAY-ON's product specifications and WAY-ON does not guarantee its accuracy or completeness. The customer is responsible for determining the suitability of the component for its intended use and should verify and test its design implementation to confirm system functionality.

12.1 Application Information

The WR0305 is a linear voltage regulator with an input voltage of 2.2V to 5.5V and an output voltage of 1.2V, 1.5V, 1.8V, 2.5V, 2.8V, 3.0V, 3.3V. The accuracy is 2% or 3% for output voltage. The maximum output current is 300mA. The efficiency of a linear voltage regulator is determined by the ratio of the output voltage to the input voltage, so in order to achieve high efficiency, the differential voltage (V_{IN} - V_{OUT}) must be as small as possible. This section discusses how best to use this device in practical applications.

12.2 Capacitor Recommendation

The WR0305 uses ceramic capacitors with low equivalent series resistance (ESR) at the V_{IN} and V_{OUT} pins to increase its stability. Multilayer ceramic capacitors are recommended. These capacitors also have limitations, and ceramic capacitors with X7R-, X5R-, and COG-rated dielectric materials have relatively good capacitance stability at different temperatures. WR0305 is designed to use ceramic capacitors of 1μF or larger at the input and output. Place C_{IN} and C_{OUT} as close to the IN and OUT pins as possible to minimize trace inductance from the capacitor to the device.

12.3 Power Dissipation (P_D)

The reliability of the circuit requires reasonable consideration of the power dissipation of the device, the location of the circuit on the PCB, and the proper sizing of the thermal plane. The regulator should be surrounded by no other heat generating devices as much as possible. The power dissipation of the regulator depends on the input and output voltage difference and the load conditions.

P_D can be calculated using the following equation:

$$P_D = (V_{IN} - V_{OUT}) \times I_{OUT}$$

Using the proper input voltage minimizes the power dissipation, resulting in greater efficiency. To obtain the lowest power dissipation, use the minimum input voltage required for normal output voltage.

The maximum power dissipation determines the maximum allowable ambient temperature (T_A) of the device. Power dissipation and junction temperature are typically related to the junction-ambient thermal resistance ($R_{\theta JA}$) and ambient air temperature (T_A) of the PCB and package and are calculated as follows

$$T_J = T_A + (R_{\theta JA} \times P_D)$$

The thermal resistance ($R_{\theta JA}$) depends primarily on the thermal dispersion capability of the PCB design. The total copper area, copper weight, and the location of the plane all affect the thermal dispersion capability, and the PCB and copper laydown area can only be used as a relative measure of the package's thermal performance.

13. Power Supply Recommendation

The WR0305 has a V_{IN} range of between 2.2V and 5.5V and an input capacitance of 1μF. The input voltage should have some redundancy to ensure a stable output voltage when the load fluctuates. If the input supply is noisy, additional input capacitors can be used to improve the noise performance of the output.

14. Evaluation Modules

Evaluation Modules (EVMs) are available to help evaluate initial circuit performance. We have evaluation modules for different packages, you can contact us to get the evaluation module or schematic.

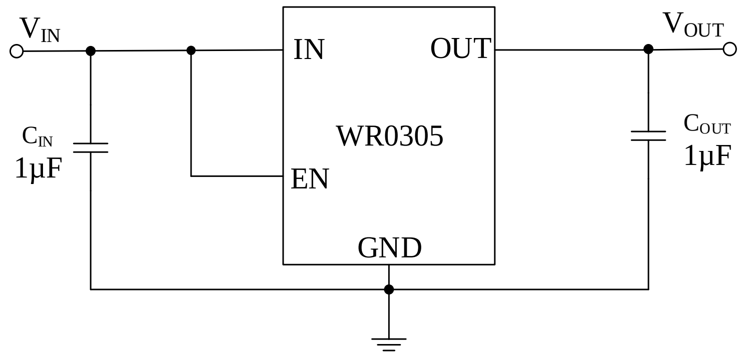
The module names are listed in the following table.

Name	Package	Evaluation Module
WR0305	SOT23-5	WAYON LDO EVM V1.1 -SOT23-5
	DFN1×1-4	WAYON LDO EVM V1.1 - DFN1×1-4

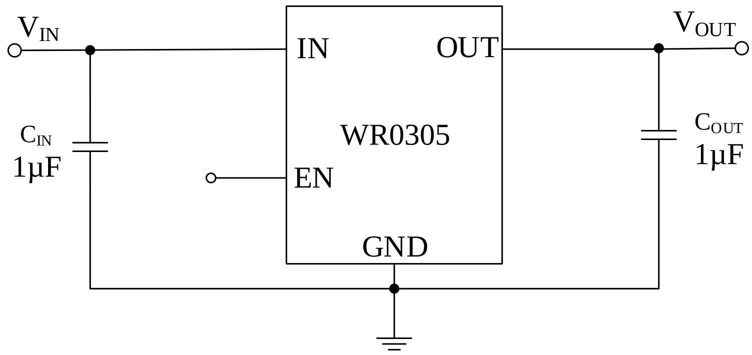
14.1 Typical Application Circuits

This section discusses the application of the WR0305 in the circuit. The following figures show the schematic of the application circuit.

Circuit schematic 1: EN is connected to IN.



Circuit schematic 2: EN is controlled by external voltage.



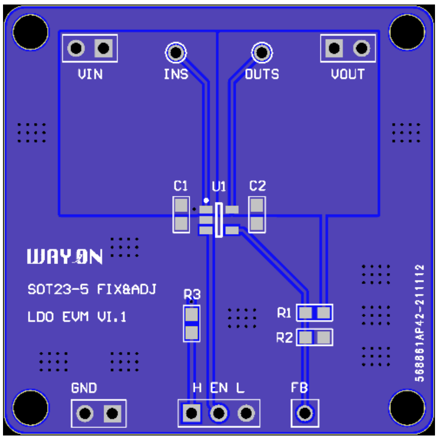
14.2 Layout of Typical Application Circuits

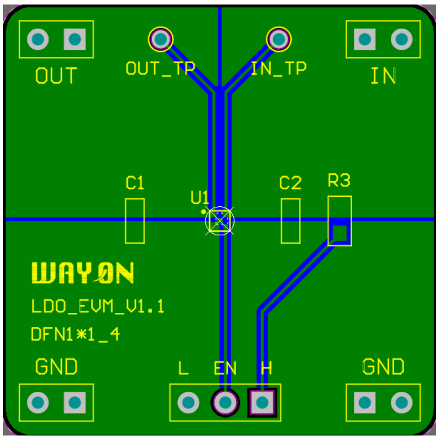
Layout Guidelines

The principle of LDO design is to place all components on the same side of the board and connect them as close as possible to their respective LDO pins. A 1.0μF input capacitor (C_{IN}) is recommended to IN to minimize the effect of resistance and inductance between the source and the LDO input. A 1.0μF or smaller output capacitor (C_{OUT}) is recommended to OUT. Connect the ground sides of C_{IN} and C_{OUT} with LDO ground pins as close as possible through a wide copper surface. Through-holes and long wires may seriously affect system performance and is not recommended.

To improve thermal performance, an array of thermal vias is used to connect the thermal pad to the ground plane. A larger ground plane improves the thermal performance of the device and reduces the operating temperature of the device.

Layout Example





15. Naming Conventions

WR AA BB-CC DDD E

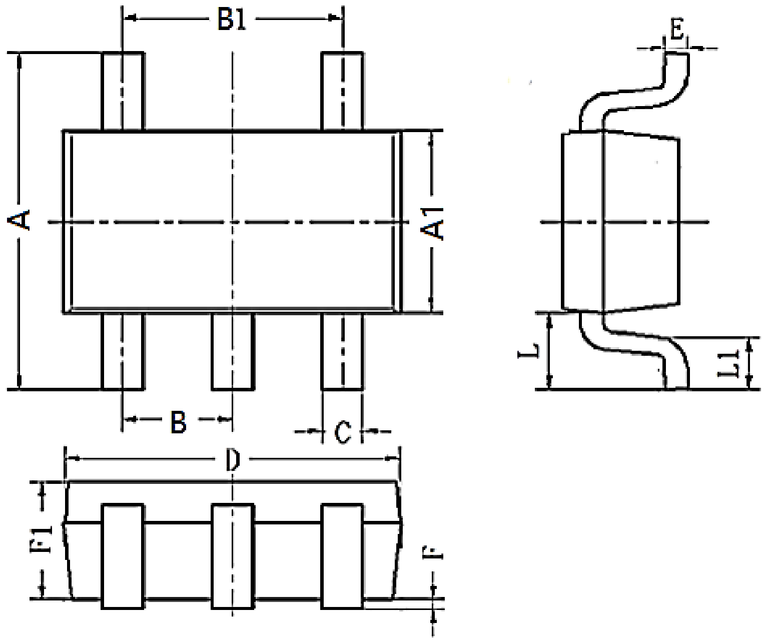
WR: WAYON Regulator
AA: 03 - Output Current, 300mA
BB: Product Name
CC: Output Voltage
DDD: A50-Package, SOT23-5
FF4- Package, DFN1×1-4
E: R-Reel & T-tube

16. Electrostatic Discharge Warning

ESD can cause irreversible damage to integrated circuits, ranging from minor performance degradation to device failure. Precision ICs are more susceptible to damage because very minor parameter changes can cause the device to be out of compliance with its published specifications. WAY-ON recommends that all ICs be handled with proper precautions. Failure to follow proper handling practices and installation procedures may damage the IC.

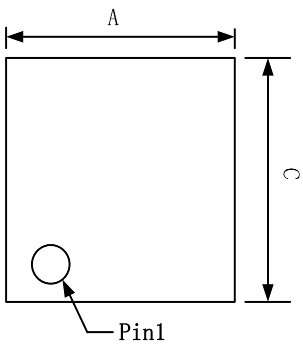
17. Package Information

SOT 23-5

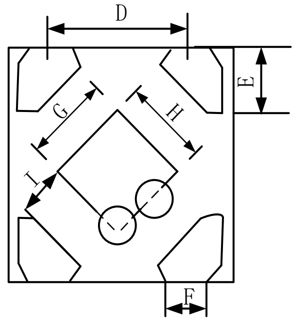


SYMBOL	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	2.60	2.80	3.00
A1	1.50	1.60	1.70
B	0.85	0.95	1.05
B1	1.80	1.90	2.00
C	0.25	0.37	0.50
D	2.79	2.90	3.02
E	0.10	0.15	0.20
F	0.00	0.10	0.20
L	0.60REF		
L1	0.30	0.45	0.60
F1	0.85	1.10	1.30

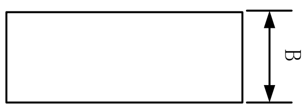
DFN1×1-4



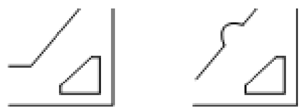
Top View



Bottom View



Side View



DETAIL A

Pin 1 ID and Tie Bar Mark Options

Note: The configuration of the Pin 1 identifier is optional, but must be located within the zone indicated.

SYMBOL	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	0.950	1.000	1.050
B	0.320	0.370	0.420
C	0.950	1.000	1.050
D	0.650BSC		
E	0.170	0.270	0.370
F	0.130	0.235	0.300
G	0.430	0.485	0.540
H	0.430	0.485	0.540
I	0.200REF		

18. Ordering Information

PART NUMBER	OUTPUT VOLTAGE	PACKAGE	PACKING QUANTITY	MARKING*
WR0305-12FF4R	1.2V	DFN1×1-4	10k/Reel	305 12
WR0305-15FF4R	1.5V	DFN1×1-4	10k/Reel	305 15
WR0305-18FF4R	1.8V	DFN1×1-4	10k/Reel	305 18
WR0305-25FF4R	2.5V	DFN1×1-4	10k/Reel	305 25
WR0305-28FF4R	2.8V	DFN1×1-4	10k/Reel	305 28
WR0305-30FF4R	3.0V	DFN1×1-4	10k/Reel	305 30
WR0305-33FF4R	3.3V	DFN1×1-4	10k/Reel	305 33
WR0305-12A50R	1.2V	SOT23-5	3k/Reel	WR0305 12 XXXX
WR0305-15A50R	1.5V	SOT23-5	3k/Reel	WR0305 15 XXXX
WR0305-18A50R	1.8V	SOT23-5	3k/Reel	WR0305 18 XXXX
WR0305-25A50R	2.5V	SOT23-5	3k/Reel	WR0305 25 XXXX
WR0305-28A50R	2.8V	SOT23-5	3k/Reel	WR0305 28 XXXX
WR0305-30A50R	3.0V	SOT23-5	3k/Reel	WR0305 30 XXXX
WR0305-33A50R	3.3V	SOT23-5	3k/Reel	WR0305 33 XXXX

* XXXX is variable.

Contact Information

No.1001, Shiwan(7) Road, Pudong District, Shanghai, P.R.China.201207
Tel: 86-21-50310888 Fax: 86-21-50757680 Email: market@way-on.com
WAYON website: http://www.way-on.com
For additional information, please contact your local Sales Representative.

Product Specification Statement

- 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.
- 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.
- 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.
- 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.
- 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.
- Users should also comply with relevant laws, regulations, policies, and standards when using the product specification. Users are responsible for the risks and liabilities arising from the use of the product specification and must ensure that it is not used for illegal purposes. Additionally, users should respect the intellectual property rights related to the product specification and refrain from infringing upon any third-party legal rights. WAYON shall assume no responsibility for any disputes or controversies arising from the above-mentioned issues in any form.