WR1117AN

1A, High Efficiency, Low Dropout Regulator

1. General Descriptions

The WR1117AN series is a high efficiency regulator with high accuracy, low dropout voltage and 1A output current. Includes fixed output voltage version and adjustable output voltage version. The input voltage range is 2.0V to 15V and the output voltage range is 1.2V to 5.0V, making the device suitable for use in a variety of high-power electronic devices. WR1117AN has the function of fold back maximum output current. The current is related to the output voltage. With the increase of the output voltage, the fold back maximum output current value will increase to some extent. Therefore, the current limiter has both short circuit protection and output current limiting function.

WR1117AN regulators are available in standard SOT89-3 and SOT223-3 packages. Standard products are lead - and halogen-free.

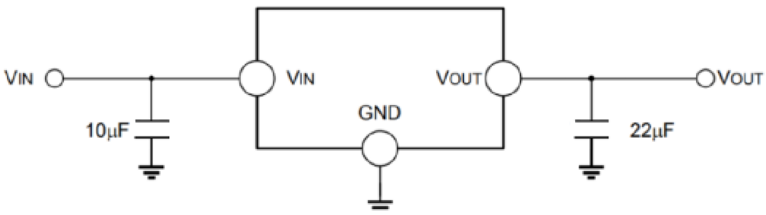
2. Features

- Input Voltage: 2.0V~15V
- Output Voltage: 1.2V~5.0V
- Adjustable or fixed output
- Output current of 0.8/1A
- Low dropout 1.3V typ. at 1A output current
- Fast transient response
- Operating temperature：-40°C to 125°C

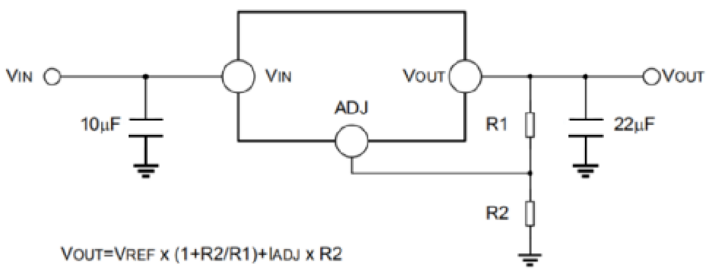
3. Applications

- High efficiency linear regulators
- Post regulators for switching supplies
- Adjustable power supply
- TV, STB, LCD, Monitor, DATACOM

4. Typical Application



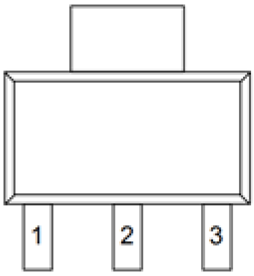
Fixed Voltage Regulator



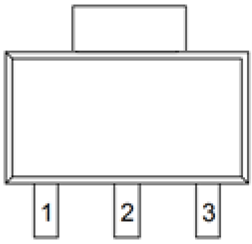
Adjustable Voltage Regulator

5. Pin Configuration

(Top View)



SOT223-3



SOT89-3

6. Pin Description

PIN NUMBER		PIN NAME	TYPE	PIN FUNCTIONS
SOT223-3	SOT89-3			
1	1	ADJ/GND	I/O	Adjust pin for adjustable output option. Ground pin for fixed output option.
2,TAB	2,TAB	V_{OUT}	O	Output voltage pin for the regulator.
3	3	V_{IN}	I	Input voltage pin for the regulator.

7. Absolute Maximum Ratings[1]

PARAMETER		RATING	UNIT
Input voltage range		18	V
Maximum output current		1[2]	A
Power Dissipation PD @T_A = 25ºC	SOT89-3	0.57	W
	SOT223-3	1.05	W
Thermal Resistance, $θ_{JA}$	SOT89-3	175	℃/W
	SOT223-3	95	℃/W
Thermal Resistance, $θ_{JB}$	SOT89-3	38.5	℃/W
	SOT223-3	39.3	℃/W
Top Thermal Resistance, $θ_{JC}$	SOT89-3	45	℃/W
	SOT223-3	46.9	℃/W
Bottom Thermal Resistance, $θ_{Jc}$	SOT89-3	15.5	℃/W
	SOT223-3	16.3	℃/W
Junction Temperature		150	℃
Lead Temperature Range		260	℃
Storage Temperature Range		-65 to 150	℃
ESD Susceptibility	HBM	±1000	V

Note1: Greater than these given values, the device will be damaged.

Note2: The maximum current that can be output, but not guaranteed to work properly.

8. Recommended Operating Conditions

PARAMETER	RATING	UNIT
Input voltage range	2.0 to 15	V
Nominal output voltage range	1.2 to 5	V
Output current	0 to 1	A
Input capacitor	10	μF
Output capacitor	22	μF
Operating temperature range	-40 to 125	℃

9. Electrical Characteristics (V_{IN}=$V_{OUT(NOMINAL)}$+2V, C_{IN}=C_{OUT}=10μF, Full= -40℃ to 125℃, unless otherwise noted)

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{REF}	Reference voltage	WR1117AN-ADJ, 10mA≤I_{OUT}≤1A , V_{IN}=3.25V	1.225	1.250	1.275	V
V_{OUT}	Output Voltage Range	V_{OUT}<1.5V, 10mA≤I_{OUT}≤800mA, Full	0.98 V_{OUT}	V_{OUT}	1.02 V_{OUT}	V
		V_{OUT}≥1.5V, 10mA≤I_{OUT}≤1A, Full				
V_{DO}[1]	Dropout Voltage	I_{OUT} =100mA, Full		1.15	1.30	V
		I_{OUT} =500mA, Full		1.15	1.30	
		I_{OUT} =800mA, Full		1.20	1.30	
		I_{OUT} =1A, Full		1.30	1.50	
I_{LIM}	Output current limit	V_{IN}=$V_{OUT(NOMINAL)}$+2, Full		2.1		A
I_{OUT}[2]	Maximum output current in the accuracy range	V_{IN}=$V_{OUT(NOMINAL)}$+2,V_{OUT}<1.5V, Full	0.8			A
		V_{IN}=$V_{OUT(NOMINAL)}$+2, V_{OUT}≥1.5V, Full	1			
I_Q	Quiescent Current	V_{OUT}=1.5V,I_{OUT}=0mA , Full		2	5	mA
I_{ADJ}	Adjust pin current	WR1117AN-ADJ V_{IN}=5V,10mA≤I_{OUT}≤1A		55	120	μA
△ I_{ADJ}	I_{ADJ} change	WR1117AN-ADJ V_{IN}=5V,10mA≤I_{OUT}≤1A		0.2	10	μA
I_{SHORT}	Short Current	V_{IN}=$V_{OUT(NOMINAL)}$+2, V_{OUT} Short to GND,T_A=25℃		820		mA
LNR	Line Regulation	WR1117AN-12, I_{OUT}=10mA, 2.7V≤V_{IN}≤10V		4	19	mV
		WR1117AN-15, I_{OUT}=10mA, 3.0V≤V_{IN}≤10V		5	26	
		WR1117AN-18, I_{OUT}=10mA, 3.3V≤V_{IN}≤12V		5	32	
		WR1117AN-33, I_{OUT}=10mA, 4.8V≤V_{IN}≤12V		9	49	
		WR1117AN-50 , I_{OUT}=10mA, 6.5V≤V_{IN}≤12V		10	56	
		WR1117AN-ADJ,I_{OUT}=10mA, 2.75V≤V_{IN}≤12V		5	24	

Electrical Characteristics ($V_{IN}=V_{OUT(NOMINAL)}+2V$, $C_{IN}=C_{OUT}=10\mu F$, Full= -40℃ to 125℃, unless otherwise noted)

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
LDR[3]	Load Regulation	WR1117AN-12, V_{IN}=2.7V, 10mA≤I_{OUT}≤1A		3	8	mV
		WR1117AN-15, V_{IN}=3.0V,10mA≤I_{OUT}≤1A		3	8	
		WR1117AN-18, V_{IN}=3.3V, 10mA≤I_{OUT}≤1A		4	12	
		WR1117AN-33, V_{IN}=4.8V,10mA≤I_{OUT}≤1A		7	24	
		WR1117AN-50 , V_{IN}=6.5V,10mA≤I_{OUT}≤1A		10	36	
		WR1117AN-ADJ, V_{IN}=2.75V,10mA≤I_{OUT}≤1A		4	8	
PSRR	Power Supply Ripple Rejection	$V_{IN}=(V_{OUT}+2V)_{DC}+1V_{P-P}$ f=120Hz, I_{OUT}=200mA, @V_{OUT}=1.5V ,T_A=25℃	60	70		dB
		$V_{IN}=(V_{OUT}+2V)_{DC}+1V_{P-P}$ f=1kHz, I_{OUT}=200mA, @V_{OUT}=1.5V ,T_A=25℃	55	65		
		$V_{IN}=(V_{OUT}+2V)_{DC}+1V_{P-P}$ f=10kHz, I_{OUT}=200mA, @V_{OUT}=1.5V ,T_A=25℃	45	50		
		$V_{IN}=(V_{OUT}+2V)_{DC}+1V_{P-P}$ f=120Hz, I_{OUT}=500mA, @V_{OUT}=1.5V ,T_A=25℃	60	70		dB
		$V_{IN}=(V_{OUT}+2V)_{DC}+1V_{P-P}$ f=1kHz, I_{OUT}=500mA, @V_{OUT}=1.5V ,T_A=25℃	55	65		
		$V_{IN}=(V_{OUT}+2V)_{DC}+1V_{P-P}$ f=10kHz, I_{OUT}=500mA, @V_{OUT}=1.5V ,T_A=25℃	45	50		

Note1: The dropout voltage is defined as (V_{IN}-V_{OUT}) when V_{OUT} is $V_{OUT(NOM)}$*98%.

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_{DROP}.

Note3: The Load regulation is measured using pulse techniques with duty cycle < 5%.

10. Typical Performance Characteristics (T_A= -40 to 125ºC, $V_{IN}=V_{OUT}+2V$, $C_{IN}=C_{OUT}=10\mu F$, unless otherwise oted)

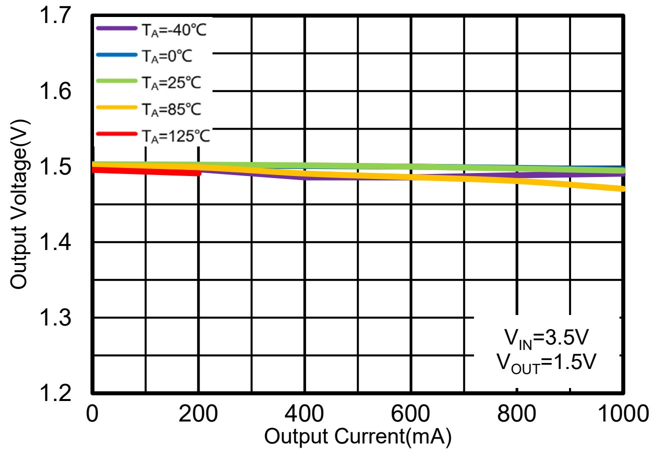


Figure 1. WR1117AN-ADA20R(V_{OUT}=1.5V)
Load Regulation vs. I_{OUT} & Ambient Temperature

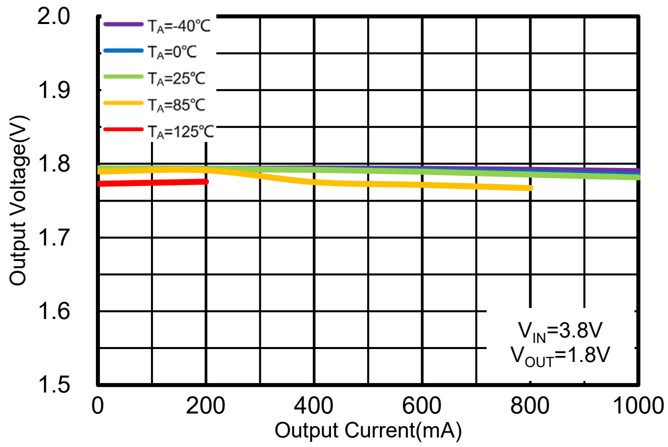


Figure 2. WR1117AN-18A20R
Load Regulation vs. I_{OUT} & Ambient Temperature

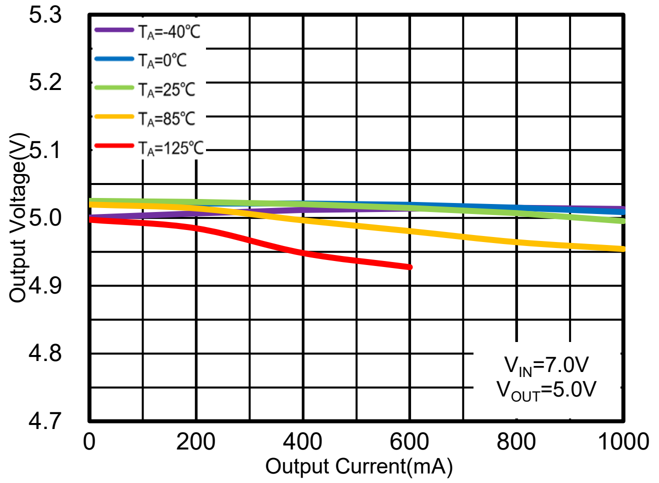


Figure 3. WR1117AN-ADA20R(V_{OUT}=5.0V)
Load Regulation vs. I_{OUT} & Ambient Temperature

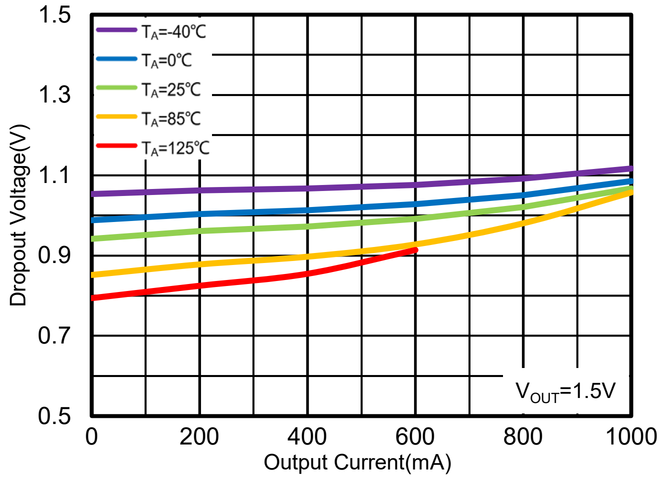


Figure4. WR1117AN-ADA20R(V_{OUT}=1.5V)
Dropout Voltage vs. I_{OUT} & Ambient Temperature

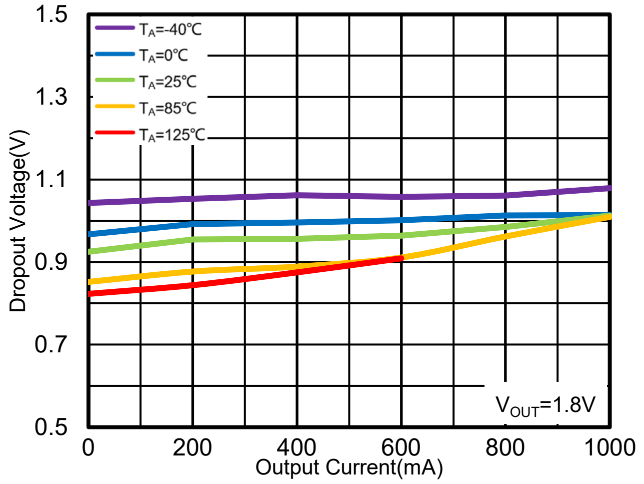


Figure 5. WR1117AN-18A20R
Dropout Voltage vs. I_{OUT} & Ambient Temperature

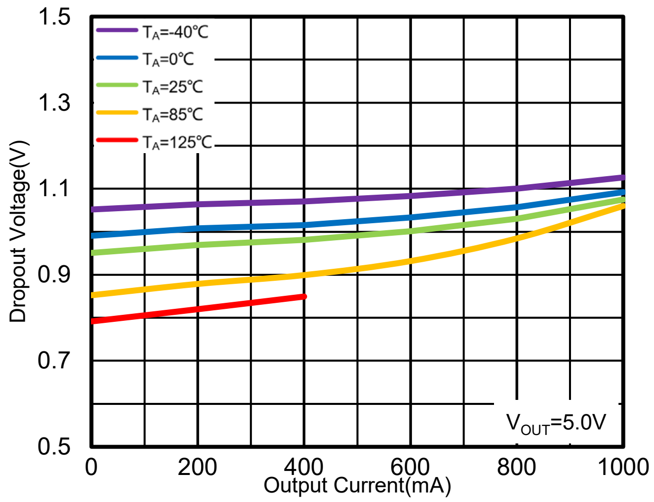


Figure 6. WR1117AN-ADA20R(V_{OUT}=5.0V)
Dropout Voltage vs. I_{OUT} & Ambient Temperature

Typical Performance Characteristics (T_A= -40 to 125ºC, V_{IN}=V_{OUT}+2V, C_{IN}=C_{OUT}=10μF, unless otherwise noted)

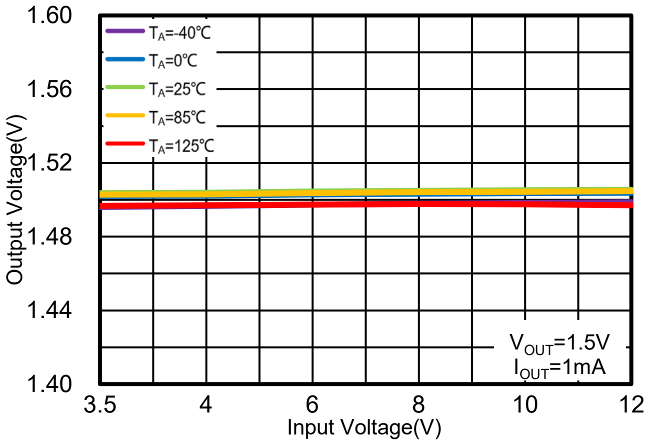


Figure 7. WR1117AN-ADA20R(V_{OUT}=1.5V)
Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

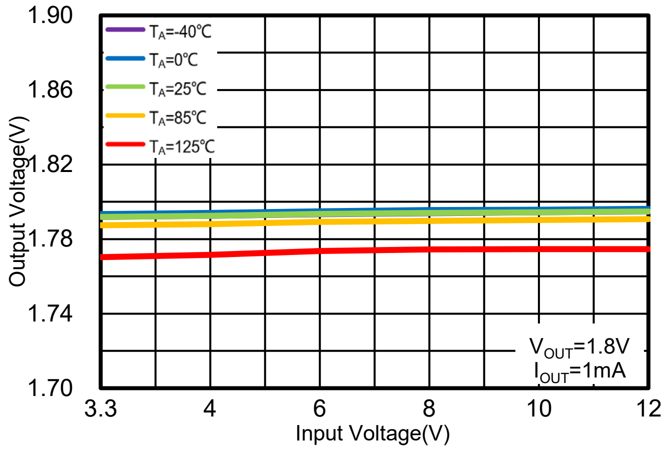


Figure 8. WR1117AN-18A20R
Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

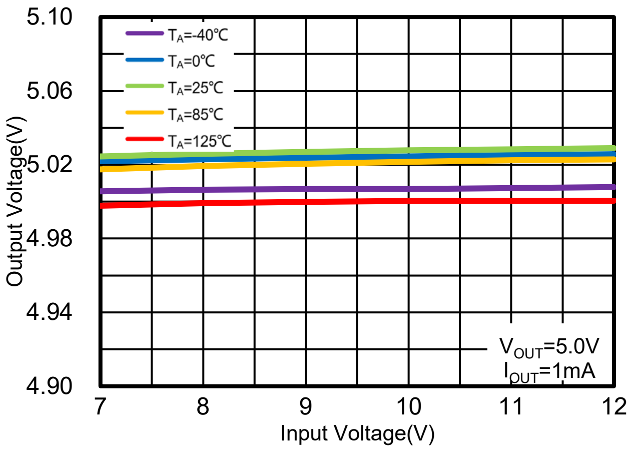


Figure9.WR1117AN-ADA20R(V_{OUT}=5.0V)
Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

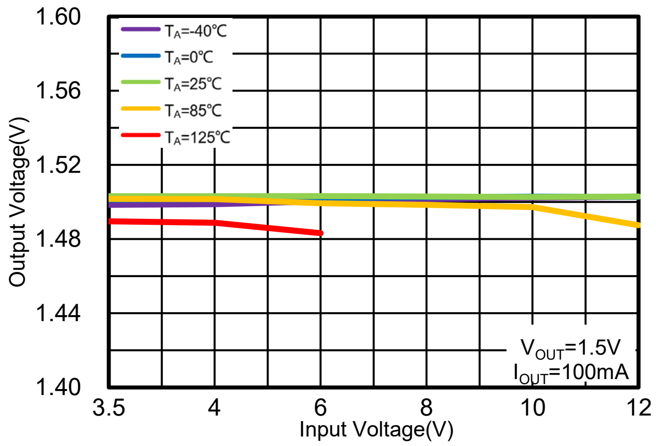


Figure10.WR1117AN-ADA20R(V_{OUT}=1.5V)
Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

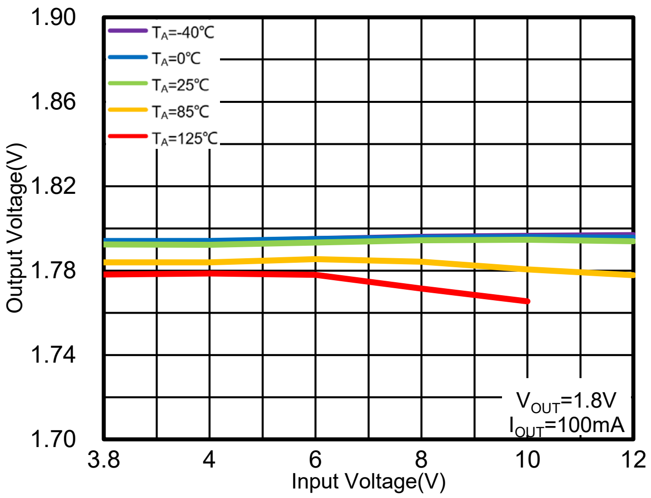


Figure11.WR1117AN-18A20R
Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

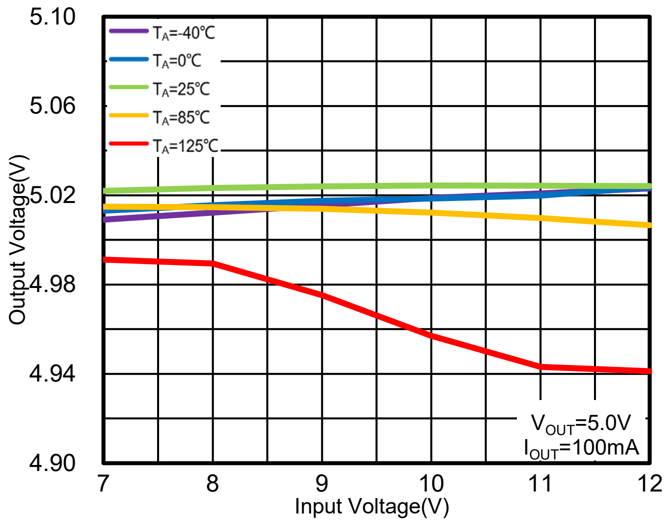


Figure12.WR1117AN-ADA20R(V_{OUT}=5.0V)
Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

Typical Performance Characteristics (T_A= -40 to 125ºC, V_{IN}=V_{OUT}+2V, C_{IN}=C_{OUT}=10µF, unless otherwise noted)

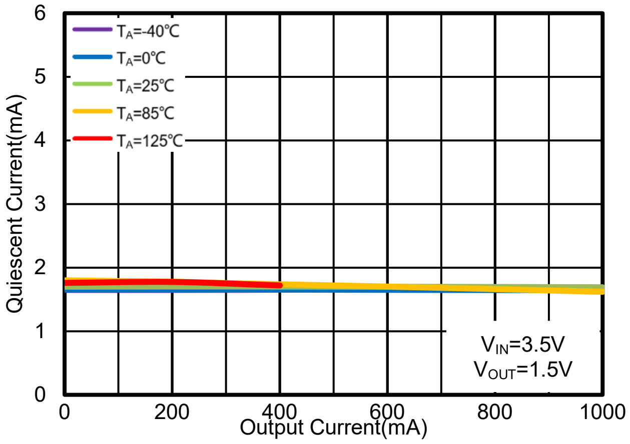


Figure 13. WR1117AN-ADA20R(V_{OUT}=1.5V)
Ground Pin Current vs. I_{OUT} & Ambient Temperature

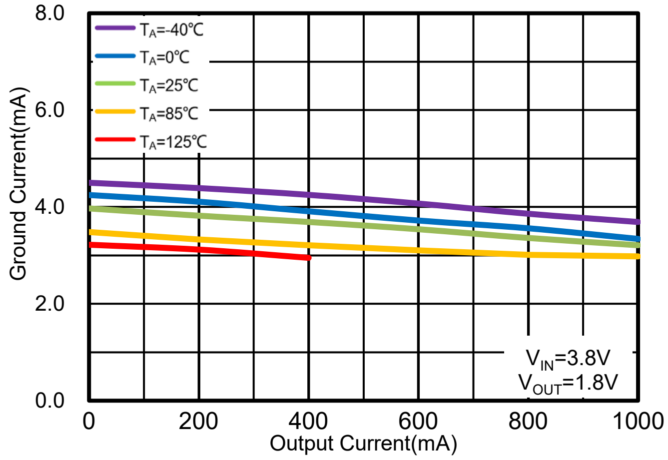


Figure 14. WR1117AN-18A20R
Ground Pin Current vs. I_{OUT} & Ambient Temperature

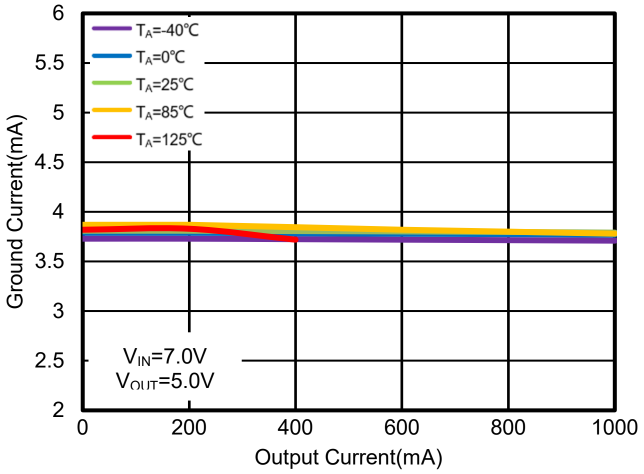


Figure 15. WR1117AN-ADA20R(V_{OUT}=5.0V)
Ground Pin Current vs. I_{OUT} & Ambient Temperature

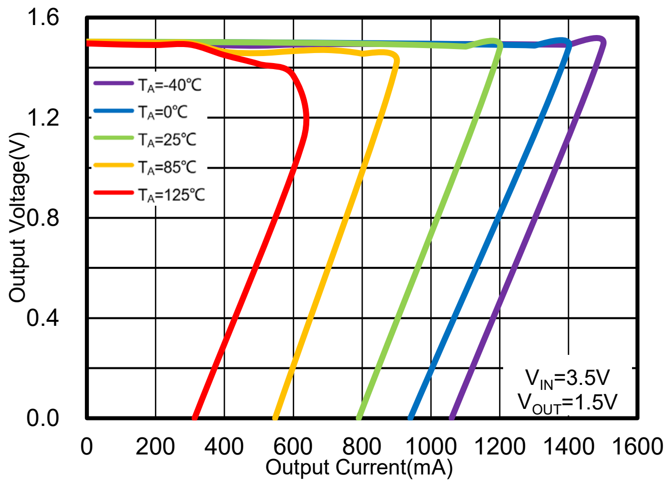


Figure 16. WR1117AN-ADA20R(V_{OUT}=1.5V)
Foldback Current Limit vs. I_{OUT} & Ambient Temperature

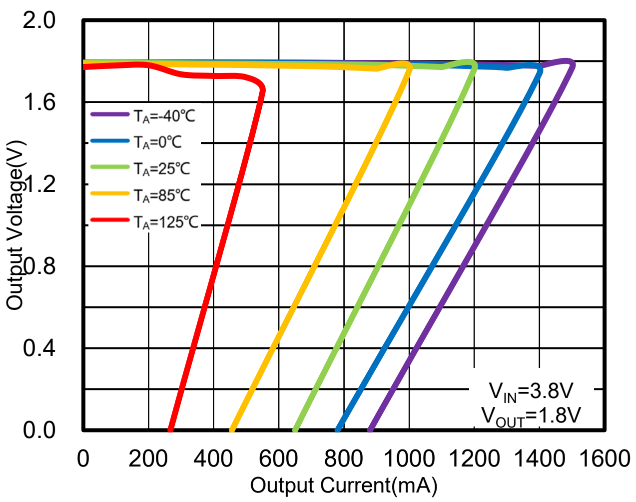


Figure 17. WR1117AN-18A20R
Foldback Current Limit vs. I_{OUT} & Ambient Temperature

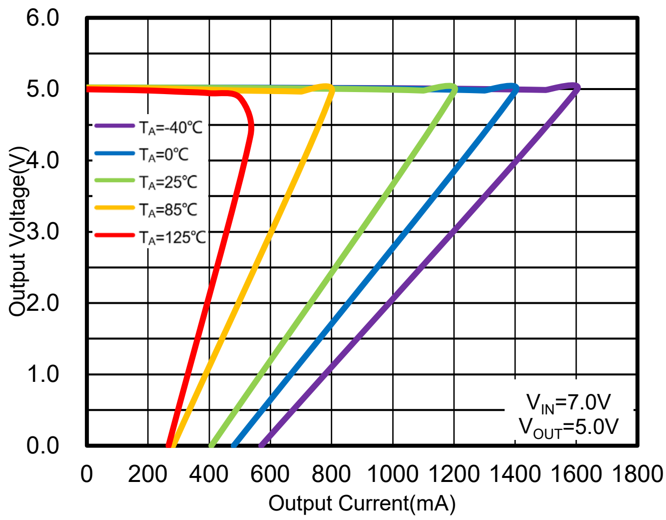


Figure 18. WR1117-ADA20R(V_{OUT}=5.0V)
Foldback Current Limit vs. I_{OUT} & Ambient Temperature

Typical Performance Characteristics (T_A= -40 to 125ºC, V_{IN}=V_{OUT}+2V, C_{IN}=C_{OUT}=10μF, unless otherwise noted)

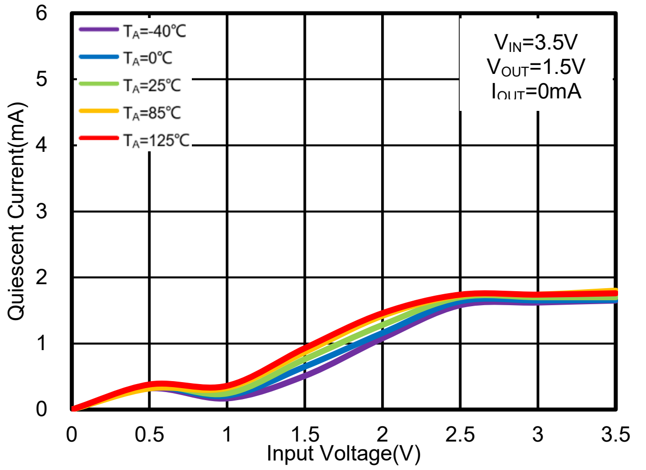


Figure 19. WR1117AN-ADA20R(V_{OUT}=1.5V)
Quiescent Current vs. V_{IN} & Ambient Temperature

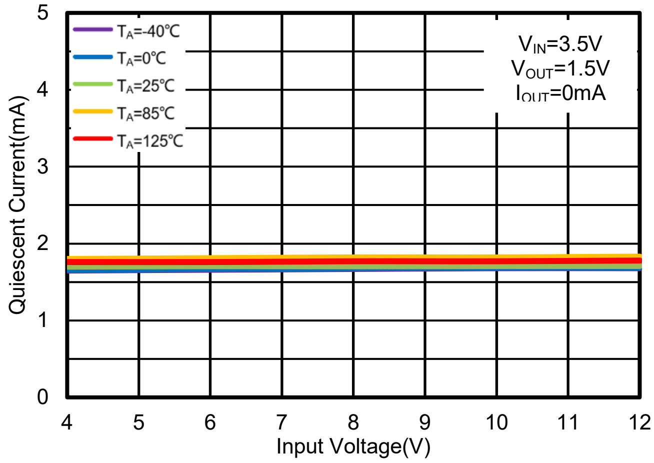


Figure 20. WR1117AN-ADA20R(V_{OUT}=1.5V)
Quiescent Current vs. V_{IN} & Ambient Temperature

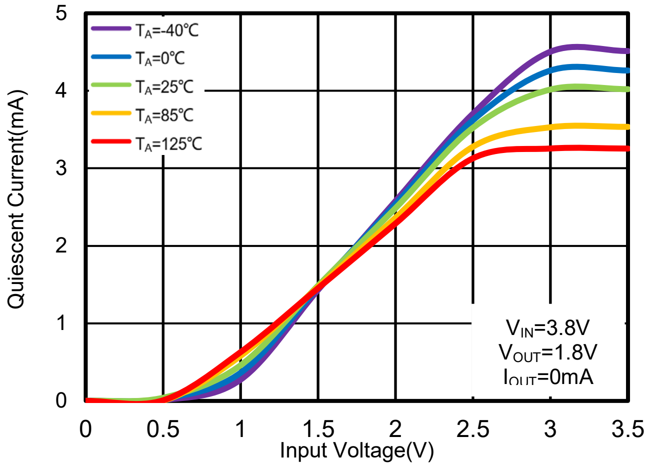


Figure 21. WR1117AN-18A20R
Quiescent Current vs. V_{IN} & Ambient Temperature

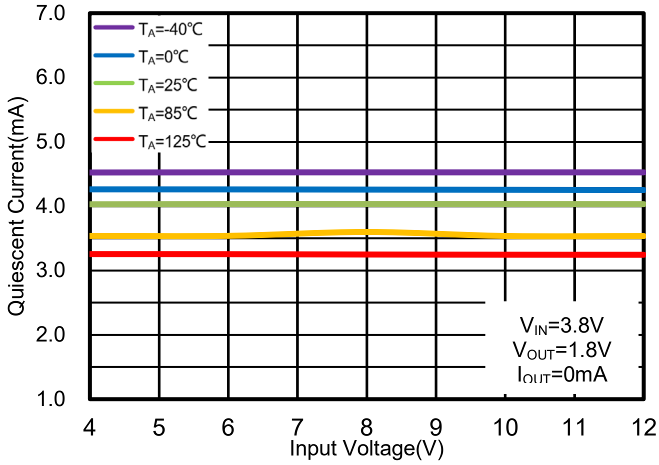


Figure 22. WR1117NA-18A20R
Quiescent Current vs. V_{IN} & Ambient Temperature

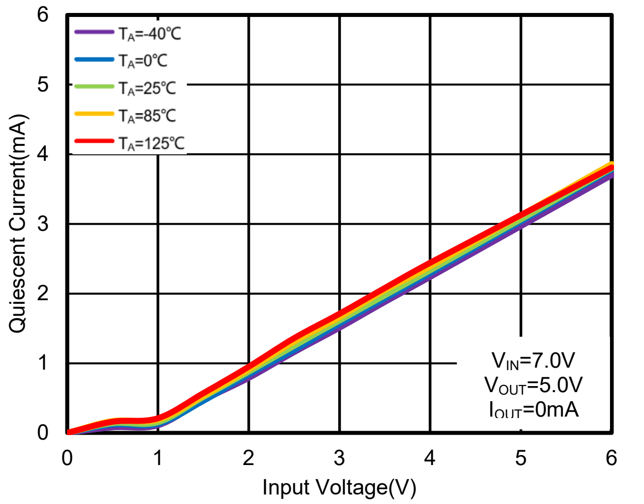


Figure 23. WR1117AN-ADA20R(V_{OUT}=5.0V)
Quiescent Current vs. V_{IN} & Ambient Temperature

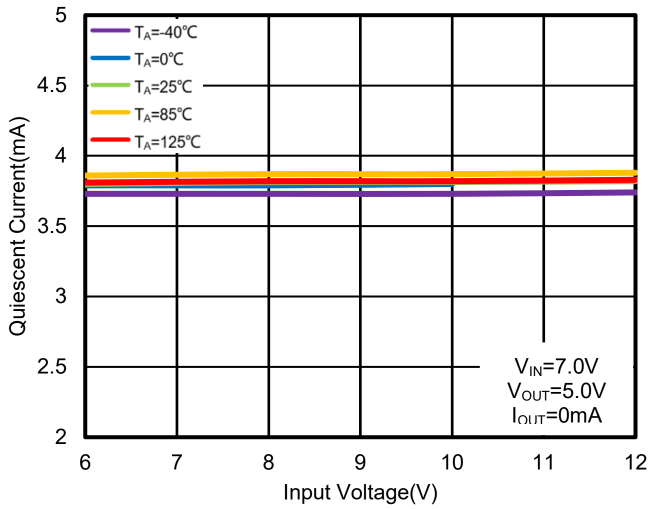


Figure 24. WR1117AN-ADA20R(V_{OUT}=5.0V)
Quiescent Current vs. V_{IN} & Ambient Temperature

Typical Performance Characteristics (T_A= -40 to 125ºC, V_IN=V_OUT+2V, C_IN=C_OUT=10μF, unless otherwise noted)

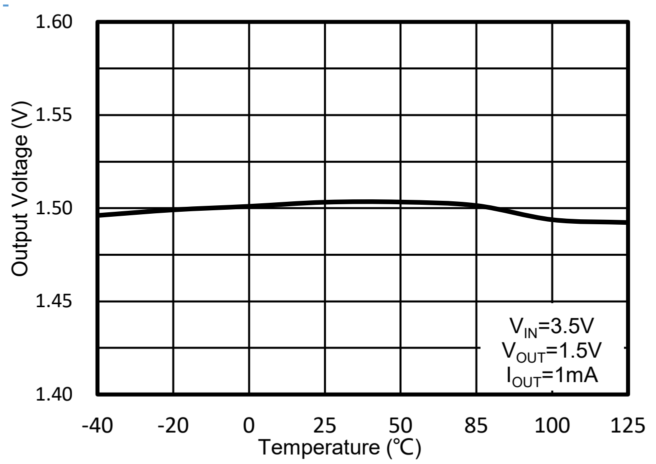


Figure 25. WR1117AN-ADA20R(V_{OUT}=1.5V)
Output Voltage vs. Ambient Temperature

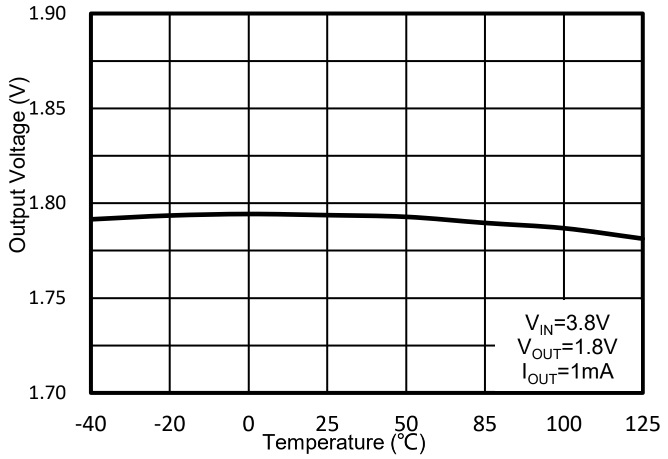


Figure 26. WR1117AN-18A20R
Output Voltage vs. Ambient Temperature

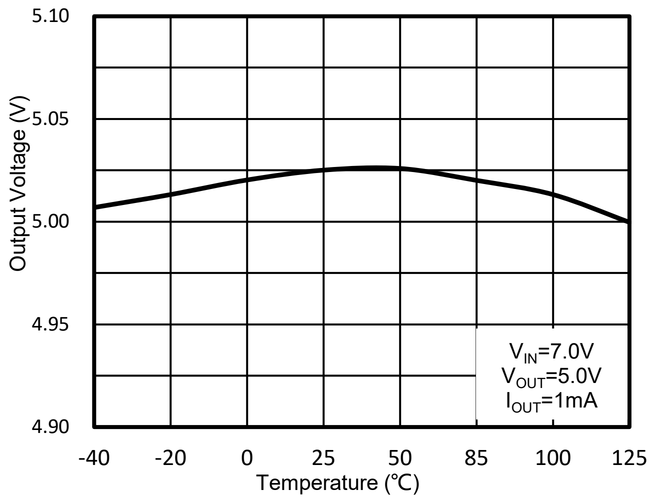


Figure 27. WR1117AN-ADA20R(V_{OUT}=5.0V)
Output Voltage vs. Ambient Temperature

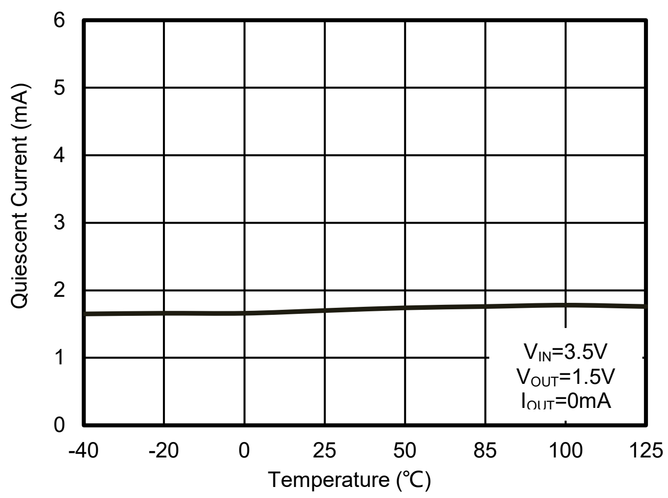


Figure 28. WR1117AN-ADA20R(V_{OUT}=1.5V)
Quiescent Current vs. Ambient Temperature

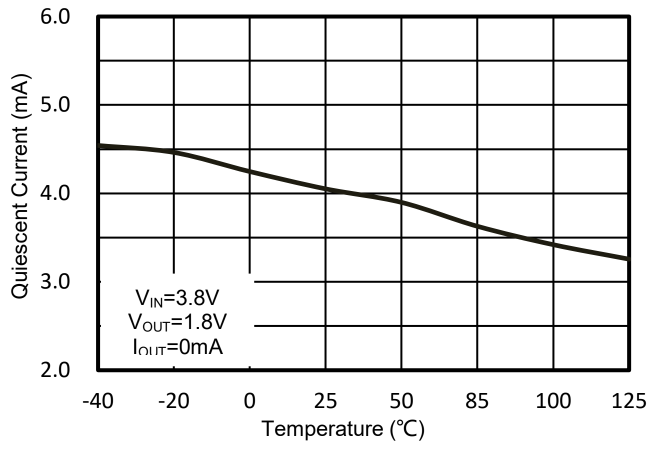


Figure 29. WR1117AN-18A20R
Quiescent Current vs. Ambient Temperature

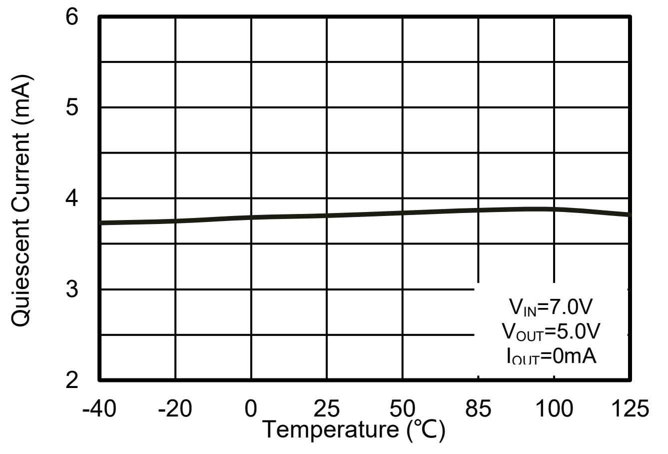
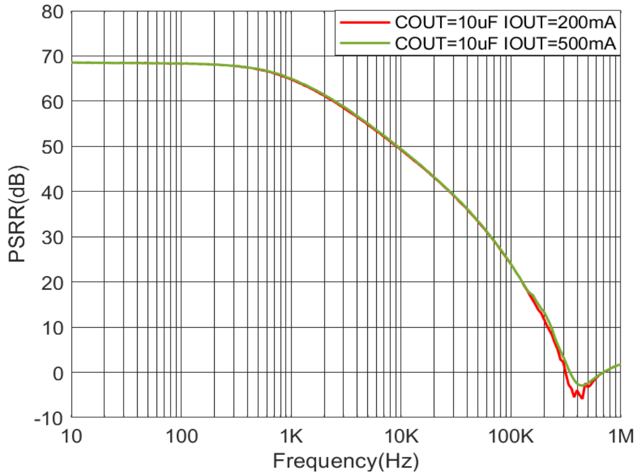
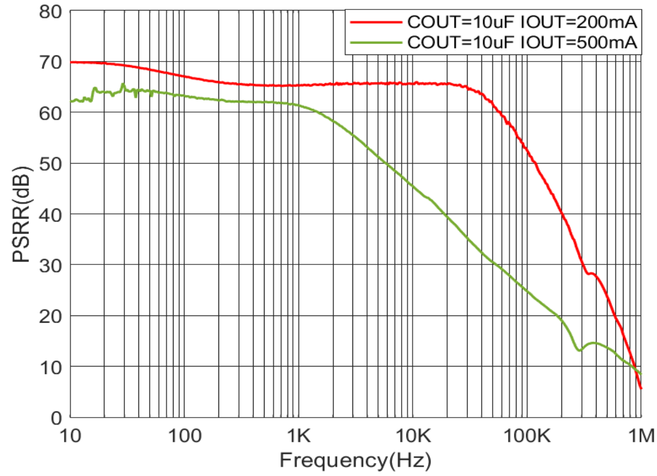


Figure 30. WR1117AN-ADA20R(V_{OUT}=5.0V)
Quiescent Current vs. Ambient Temperature

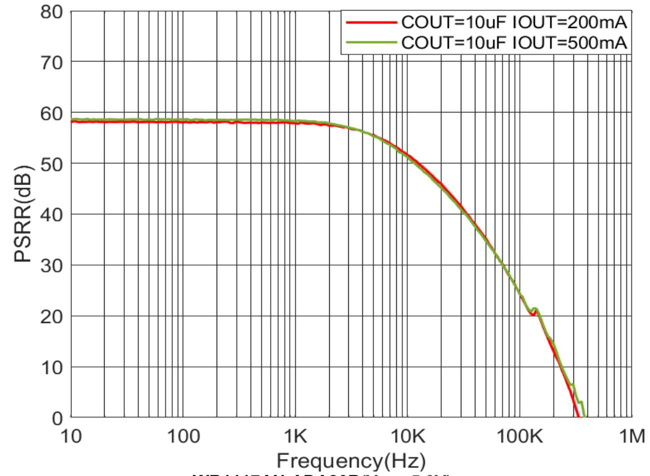
Typical Performance Characteristics (T_A= -40 to 125ºC, V_{IN}=V_{OUT}+2V, C_{IN}=C_{OUT}=10μF, unless otherwise noted)



WR1117AN-ADA20R(V_{OUT}=1.5V)
Figure 31. Power Supply Rejection Ratio vs. Frequency



WR1117AN-18A20R
Figure 32. Power Supply Rejection Ratio vs. Frequency



WR1117AN-ADA20R(V_{OUT}=5.0V)
Figure 33. Power Supply Rejection Ratio vs. Frequency

Typical Performance Characteristics (T_A= 25ºC, V_{IN}=V_{OUT}+2V, C_{IN}=C_{OUT}=10μF, unless otherwise noted)

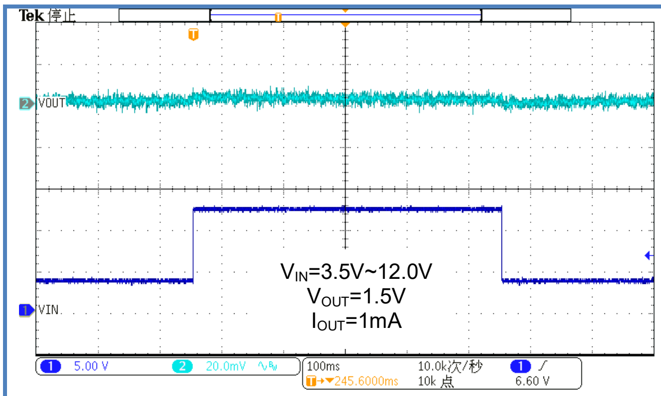


Figure 37. WR1117AN-ADA20R(V_{OUT}=1.5V)
Line Transient

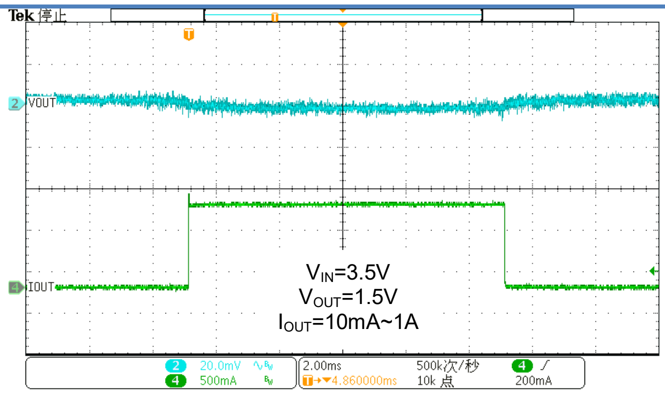


Figure 38. WR1117AN-ADA20R(V_{OUT}=1.5V)
Load Transient

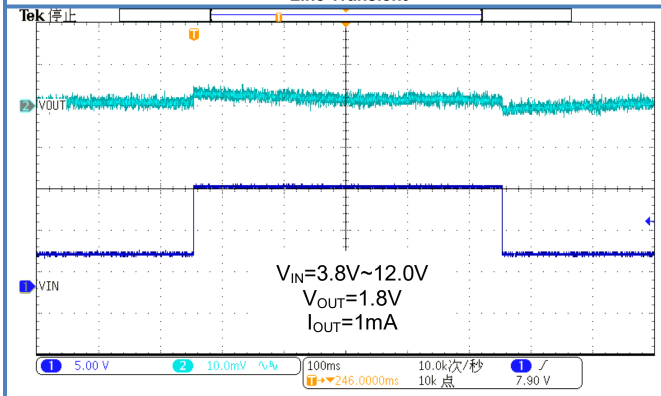


Figure 39. WR1117AN-18A20R
Line Transient

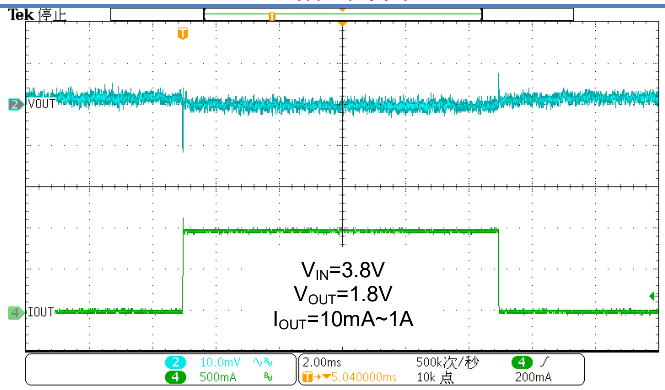


Figure 40. WR1117AN-18A20R
Load Transient

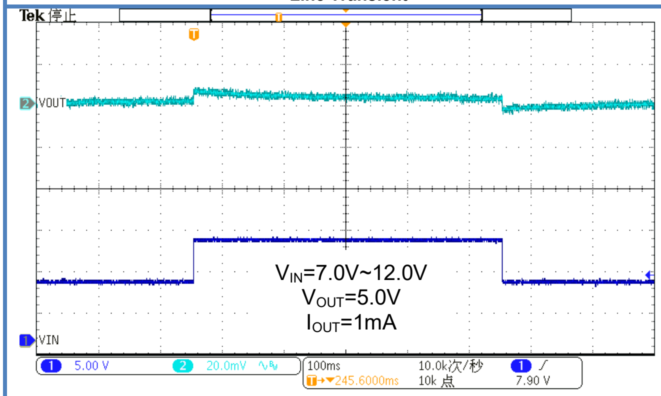


Figure 41. WR1117AN-ADA20R(V_{OUT}=5.0V)
Line Transient

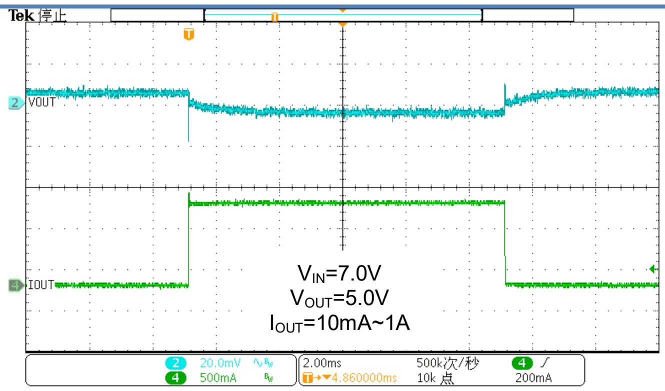


Figure 42. WR1117AN-ADA20R(V_{OUT}=5.0V)
Load Transient

11. Function Description

11.1 Overview

The WR1117AN series is a high efficiency regulator with high accuracy, low dropout voltage and 1A output current. Includes fixed output voltage version and adjustable output voltage version. The input voltage range is 2.0V to 15V and the output voltage range is 1.2V to 5.0V, making the device suitable for use in a variety of high-power electronic devices.

11.2 Block Diagram

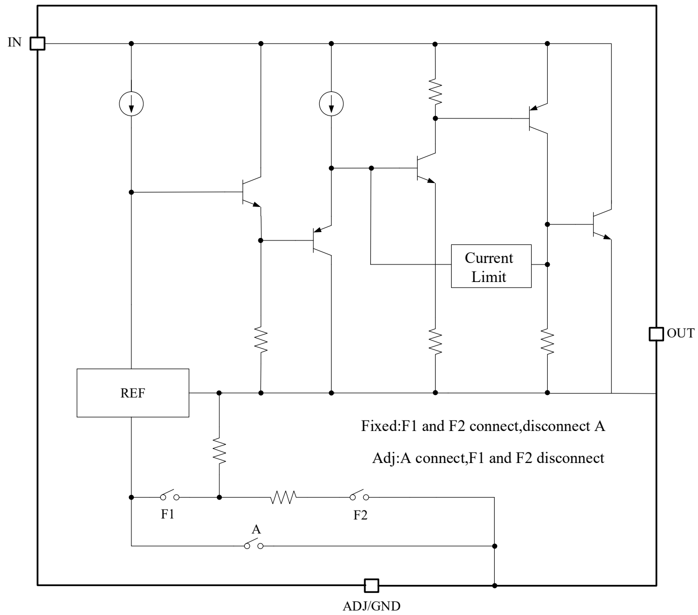


Figure 43. Block Diagram

11.3 Feature Description

11.3.1 Output Voltage Accuracy

The WR1117AN has an output voltage accuracy of 2%. 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 Dropout Voltage (V_{DO})

WR1117AN is a low dropout voltage LDO that can achieve nominal output voltage at lower input voltages. Dropout voltage is defined as the V_{IN}-V_{OUT} at the rated maximum output current. When the input voltage is below the nominal output voltage, the output voltage varies with the input voltage.

11.3.3 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 = 20log(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.

11.3.4 Fold back Current Limit (I_{CL})

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_{MAX}, and when an overload or short circuit occurs, the output current will be maintained at I_{MAX}, and the output voltage will be reduced to $I_{MAX}R_{LOAD}$.

However, 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. To improve this situation, a fold back current limiting circuit can be used. In a fold back current limiting circuit, both the output current and the output voltage are gradually reduced when the output current

Reaches the set maximum current I_{MAX}. The output current is reduced to the set current threshold I_{FB} and the output voltage is reduced to $I_{FB}R_{LOAD}$. The output current is clamped to a smaller value in the event of an overload or short circuit and the system power consumption is reduced and the device temperature does not rise significantly.

The fold back current limiting circuit is essentially a constant current limiting circuit with an output voltage feedback loop, so that in the event of an overload or short circuit, the output current is gradually reduced due to the reduction in output voltage and eventually clamped at a smaller value.

The WR1117AN uses a fold back current limiting mode where the final current is clamped to around 1.5A, thus providing good protection to the device.

More information on current limiting can be found in Electrical Characteristics *Figure 16* to *Figure 18*.

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 WR1117AN is a linear voltage regulator with an input voltage of 2.0 V to 15 V and an output voltage of 1.2 V to 5.0 V. The accuracy is 2% for output voltages up to 1.2 V to 5.0V. The maximum output current is 1A. 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.

12.1.1 Capacitor Recommendation

The WR1117AN 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. WR1117AN is designed to use ceramic capacitors of 10µF 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.

Increasing the input capacitance can reduce the transient input drop during start-up and load current. If the C_{OUT} produces high Q peak effects during transients, using only very large ceramic input capacitors can cause unwanted ringing at the OUT side, which requires well-designed short interconnects to the upstream supply to reduce ringing. Using a tantalum capacitor with an ESR of several hundred milliohms in parallel with the ceramic input capacitor can avoid unwanted ringing.

The load step transient response is the output voltage response of the LDO to a step change in load current. A larger output capacitor reduces any voltage dips or spikes that occur during the load step, but at the same time the control loop bandwidth is reduced, which slows the response time.

Because, the LDO cannot consume charge, the control loop must close through the FET when the output load is removed or greatly reduced and wait for any excess charge to be depleted.

12.1.2 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 (θ_{JA}) and ambient air temperature (T_A) of the PCB and package and are calculated as follows

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

The thermal resistance (θ_{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.

12.1.3 Detailed Design Procedure

The adjustable version of the WR1117AN has a thermally stable reference voltage of 1.25 ± 0.012 V between the OUT and ADJ pins. The I_{ADJ} is approximately 55µA and a maximum of 120µA. The ΔI_{ADJ} at 10mA and 1A with load is 0.2µA and a maximum of 5µA. According to the formula

$$V_{OUT} = V_{REF}\left(1 + \frac{R_2}{R_1}\right) + (I_{ADJ} * R_2)$$

the value of R2 value causes an error in the output voltage value, the larger the R2 value, the greater the error. Therefore, R1 is usually chosen to be 240 Ω to reduce the effect of R2 on the output voltage. In normal applications, the value of R2 is within 1k, so the product of R2 x I_{ADJ} has a negligible effect on V_{OUT}.

The above expression then becomes.

$$V_{OUT} = V_{REF}\left(1 + \frac{R_2}{R_1}\right)$$

To have better load regulation, R1 must be connected very close to the OUT and ADJ pins, while R2's ground must be as close as possible to the load pin.

Suggested Component Values

V_{OUT}(V)	R1(Ω)	R2(Ω)
1.5	240	48
1.8	240	110
3.3	240	400
5.0	240	720

13. Power supply recommendation

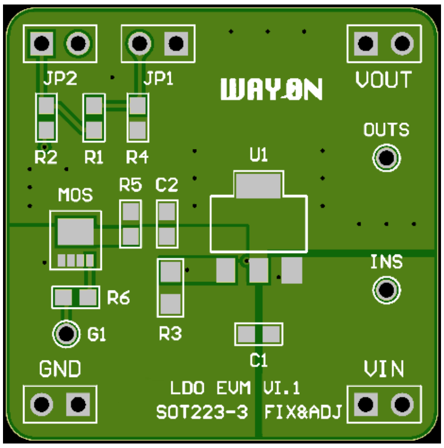
The WR1117AN has a V_{IN} range of between 2.0 V and 15 V and an input capacitance of 10μF. The input voltage should have some redundancy to ensure a stable output voltage when the load fluctuates. If the input supply is noisy, additional input capacitors can be used to improve the noise performance of the output.

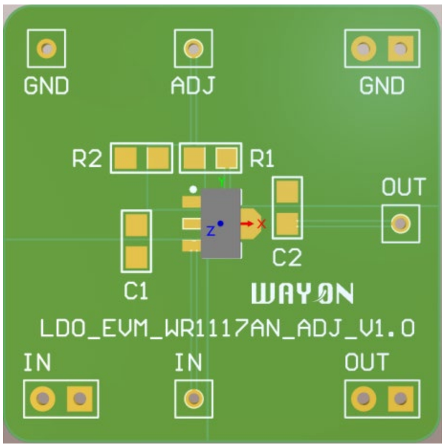
14. Layout Guidelines

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. Connect the C_{IN} and C_{OUT} grounds, with all LDO ground pins as close together as possible, through a wide copper surface. Using through-holes and long wires for connections is strongly discouraged and can seriously affect system performance.

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. Evaluation Modules

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

The module names are listed in the table below.

Name	Package	Evaluation Module
WR1117AN	SOT223-3	WAYON LDO EVM V1.0 –SOT223-3
	SOT89-3	WAYON LDO EVM V1.0 –SOT89-3

16. Naming conventions

WR AA BBBB-CC DDD E

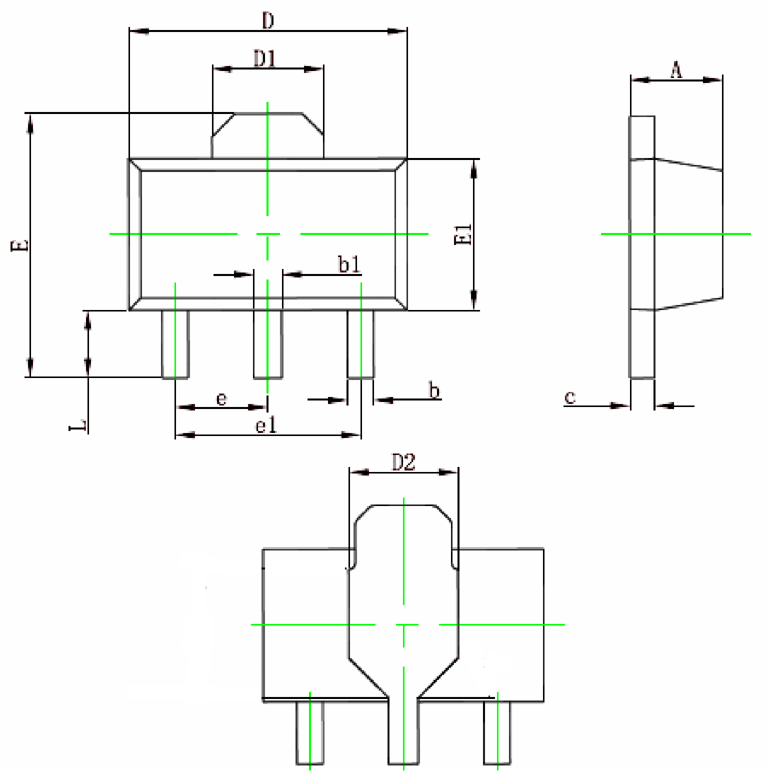
WR: WAYON Regulator
AA: 11- Output Current, 800mA/1000mA
BBBB: Product Name
CC: Output Voltage/AD-Output Voltage, Adjustable Voltage
DDD:A70-Package, SOT223-3
A20-Package, SOT89-3/3L
E: R-Reel & T-tube

17. 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.

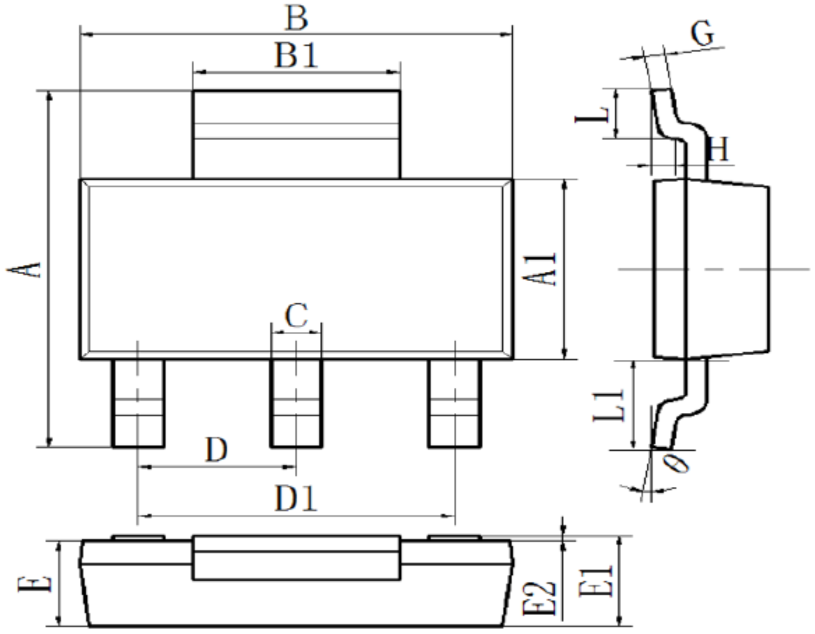
18. Package Information

SOT 89-3



SYMBOL	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	1.4	1.5	1.6
b	0.320	0.420	0.520
b1	0.380	0.480	0.580
c	0.350	0.405	0.460
D	4.400	4.500	4.600
D1	1.65REF		
D2	1.700	1.950	2.200
E	3.940	4.120	4.300
E1	2.300	2.450	2.600
e	1.5BSC		
e1	3.00BSC		
L	0.800	1.000	1.200

SOT 223-3



SYMBOL	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	6.7	7.0	7.3
A1	3.3	3.5	3.7
B	6.3	6.5	6.7
B1	2.9	3.0	3.1
C	0.66	0.74	0.82
D	2.25	2.3	2.35
D1	4.5	4.6	4.7
E	1.45	1.6	1.75
E1	1.51	1.66	1.81
E2	0.02	0.08	0.14
G	0.25	0.3	0.35
H	0.20	0.25	0.30
L	0.75	0.95	1.15
L1	1.65	1.75	1.85
θ	0	4	8

19. Ordering Information

Part Number	Output Voltage	Package	Packing Quantity	Marking*
WR1117AN-ADA70R	ADJ	SOT223-3	2.5k/Reel	WR1117AN AD XXXX
WR1117AN-12A70R	1.2V	SOT223-3	2.5k/Reel	WR1117AN 12 XXXX
WR1117AN-15A70R	1.5V	SOT223-3	2.5k/Reel	WR1117AN 15 XXXX
WR1117AN-18A70R	1.8V	SOT223-3	2.5k/Reel	WR1117AN 18 XXXX
WR1117AN-25A70R	2.5V	SOT223-3	2.5k/Reel	WR1117AN 25 XXXX
WR1117AN-33A70R	3.3V	SOT223-3	2.5k/Reel	WR1117AN 33 XXXX
WR1117AN-50A70R	5.0V	SOT223-3	2.5k/Reel	WR1117AN 50 XXXX
WR1117AN-ADA20R	ADJ	SOT89-3	1k/Reel	WR1117AN AD XXXX
WR1117AN-12A20R	1.2V	SOT89-3	1k/Reel	WR1117AN 12 XXXX
WR1117AN-15A20R	1.5V	SOT89-3	1k/Reel	WR1117AN 15 XXXX
WR1117AN-18A20R	1.8V	SOT89-3	1k/Reel	WR1117AN 18 XXXX
WR1117AN-25A20R	2.5V	SOT89-3	1k/Reel	WR1117AN 25 XXXX
WR1117AN-33A20R	3.3V	SOT89-3	1k/Reel	WR1117AN 33 XXXX
WR1117AN-50A20R	5.0V	SOT89-3	1k/Reel	WR1117AN 50 XXXX

* XXXX is variable.

STATEMENTS

WAY-ON provides data sheets based on the actual performance of the device, and users should verify actual device performance in their specific applications. The device characteristics and parameters in this data sheet can and do vary from application to application, and actual device performance may change over time.This information is intended for developers designing with WAY-ON products. Users are responsible for selecting the appropriate WAY-ON product for their application and for designing and verifying the application to ensure that your application meets the appropriate standards or other requirements, and users are responsible for all consequences. Specifications are subject to change without notice.

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For additional information, please contact your local Sales Representative.