WR1010

1A，Adjustable LDO with High Accuracy

1. General Description

The WR1010 is an adjustable 1A LDO with high accuracy. The supply voltage ranges from 1.5 V to 6.0V, output voltage ranges from 0.55 V to 5.5V.

The WR1010 is available low quiescent current with enable ability to minimize standby power consumption.

The circuit integrates over temperature protection, current limit and under voltage lockout functions. The WR1010 has the fold-back maximum output current with respect to the output voltage. WR1010 features a short current limit and an output current limit.

The WR1010 regulators are available in Green DFN2×2-6 package.

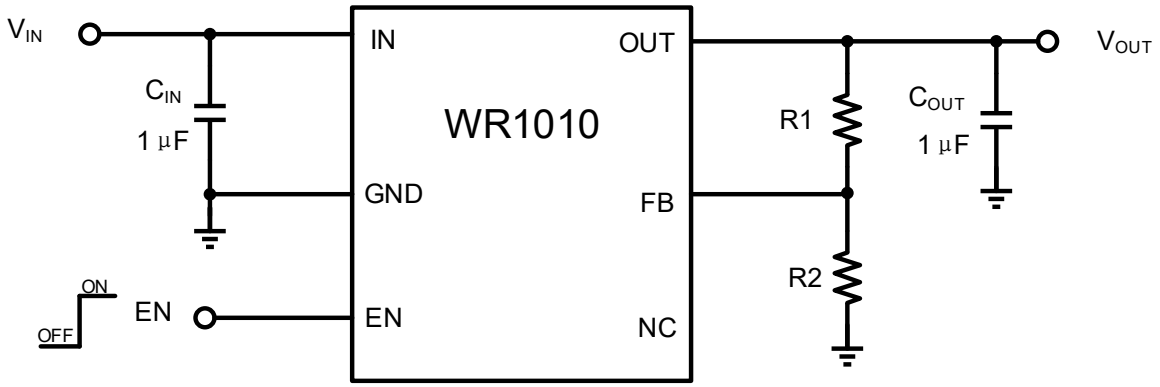
2. Features

- Input Voltage: 1.5V ~ 6V
- Adjustable Output Voltage: 0.55V~5.5V
- Output Current: 1A
- High Output accuracy: ±0.7%(Typical)
- Low Quiescent Current: 25μA (Typical)
- Shut-down Current: < 1μA
- Dropout Voltage: 275mV（max.） @ VOUT = 3.3V, IOUT=1A
- Enable Control Function

3. Applications

- Set-Top Boxes, Gaming Consoles
- Home Theater and Entertainment
- Desktop, Notebooks, Ultra-books
- Printers
- Servers
- Thermostat and Lighting Controls
- Electronic Point of Sale

4. Typical Application Circuit

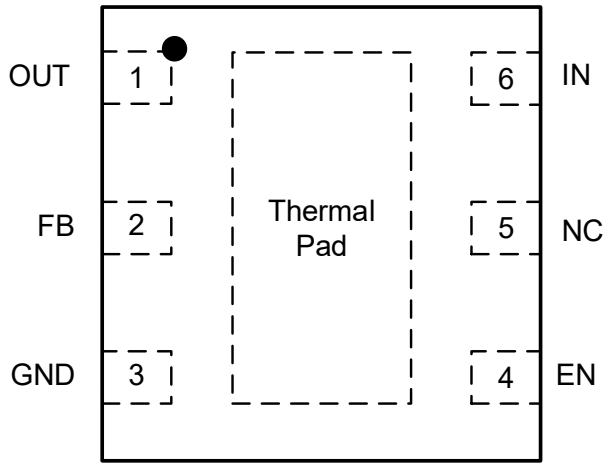


$$V_{OUT} = V_{FB} \times \left(1 + \frac{R_1}{R_2}\right)$$

Adjustable Voltage Regulator

5. Pin Configuration

(Top View)



DFN2×2-6

6. Pin Description

PIN NUMBER	PIN NAME	I/O	PIN FUNCTION
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.
2	FB	-	Adjustable output voltage feedback input. Connecting this pin to an external resistor divider receives the feedback voltage of the regulator.
3	GND	-	Common ground.
4	EN	I	Enable input，Active high.
5	NC	-	Not connect.
6	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.
Pad	Thermal pad	-	Connect the thermal pad to a large area GND plane for improved thermal performance.

7. Absolute Maximum Ratings

Operating free-air temperature range (unless otherwise noted)[1]

SYMBOL	PARAMETER		RATING	UNIT
V_{IN}	IN Input Voltage range		-0.3 to 6.5	V
V_{EN}	EN Input Voltage range		-0.3 to 6.5	V
V_{OUT}	Output Voltage range		-0.3 to V_{IN}+0.3	V
I_{OUT}	Output current		1	A
P_D	Power Dissipation, $P_{D(max)}$@T_A=25°C		1.47	W
$R_{\theta JA}$	Thermal resistance	DFN2×2-6	85	℃/W
T_J	Maximum Junction Temperature		150	℃
T_{STG}	Storage Temperature		-65 to 150	℃
T_{SDR}	Maximum Lead Soldering Temperature, 10 Seconds		260	℃
ESD	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.

8. Recommended Operating Conditions

SYMBOL	PARAMETER	MIN	MAX	UNIT
V_{IN}	Input Voltage	1.5	6.0	V
V_{EN}	Enable Voltage	0	6.0	V
V_{OUT}	Output Voltage	0.55	5.5	V
I_{OUT}	Output Current	0	1	A
C_{IN}	Input Capacitor	1		μF
C_{OUT}	Output Capacitor	1	220	μF
T_J	Operating junction temperature	-40	125	ºC

9. Electrical Characteristics

(V_{IN}=$V_{OUT(NOM)}$ +0.5V or 1.5V(whichever is greater), V_{EN}=V_{IN}, I_{OUT}=1mA, C_{IN}=C_{OUT}=1.0μF, T_A=25℃, unless otherwise noted)

SYMBOL	PARAMETER	TEST CONDITIONS		MIN	TYP.	MAX	UNIT
V_{FB}	Feedback voltage				0.55		V
V_{OUT}	Output accuracy			-0.7%		0.7%	
		-40°C≤T_J≤125°C[1]		-1.5%		1.5%	
LNR	Line Regulation	$V_{OUT(NOM)}$ +0.5V[2]≤ V_{IN} ≤ 6.0V			5		mV
LDR	Load Regulation	0.1mA≤I_{OUT}≤1A, V_{IN} ≥ 2.0V			0.03		V/A
I_Q	Quiescent Current	I_{OUT}=0mA	T_J=25°C	10	25	31	μA
			-40°C≤T_J≤125°C[1]			35	
I_{SD}	Shutdown Current	V_{EN}≤0.3V, 1.5V ≤ V_{IN} ≤ 6.0V			0.1	1	μA
I_{FB}	FB Input Current				0.01	0.1	μA
I_{LIM}	Output Current Limit	V_{IN} =$V_{OUT(NOM)}$ +1.0V			1.5		A
I_{SHORT}	Short-circuit Current Limit	V_{IN} =$V_{OUT(NOM)}$ +1.0V, V_{OUT}=0V			550		mA
V_{DROP}	Dropout Voltage	I_{OUT}=1A, V_{OUT}=0.95 $V_{OUT(NOM)}$	0.65V≤V_{OUT}<0.8V		950	1100	mV
			0.8V≤V_{OUT}<1.0V		750	970	
			1.0V≤V_{OUT}<1.2V		650	800	
			1.2V≤V_{OUT}<1.5V		515	635	
			1.5V≤V_{OUT}<1.8V		380	490	
			1.8V≤V_{OUT}<2.5V		315	410	
			2.5V≤V_{OUT}<3.3V		245	320	
			3.3V≤V_{OUT}≤5.5V		210	275	

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
PSRR	Power-supply Rejection Ration	V_{IN} =$V_{OUT(NOM)}$ +1.0V, I_{OUT}=50mA, f=1kHz		40		dB
V_{UVLO}	Rising V_{IN} Threshold	V_{IN} Rising		1.20		V
$V_{UVLO,HYST}$	V_{IN} Hysteresis			40		mV
t_{STR}	Startup Time	From EN Low-to-high Transition to V_{OUT}=$V_{OUT(NOM)}$×95%		500		μs
$V_{EN(HI)}$	EN Pin High Voltage		1.0			V
$V_{EN(LO)}$	EN Pin Low Voltage				0.3	V
I_{EN}	Enable Pin Current	V_{IN}=V_{EN}=6.0V		10		nA
R_{DIS}	Pulldown Resistance	V_{IN}=6.0V, V_{EN}=0V, V_{OUT}=1.0V		90		Ω
T_{SD}	Thermal shutdown temperature	Shutdown, temperature increasing		165		℃
		Reset, temperature decreasing		145		

NOTE1: Guaranteed by design, not tested in production.

NOTE2: V_{IN} = 1.5V for V_{OUT} < 1.0 V

10. Typical Performance Characteristics

(V_{IN} = $V_{OUT(NOM)}$+0.5V, I_{OUT}=1mA, C_{IN}=C_{OUT}=1μF, T_A=25°C，unless otherwise noted)

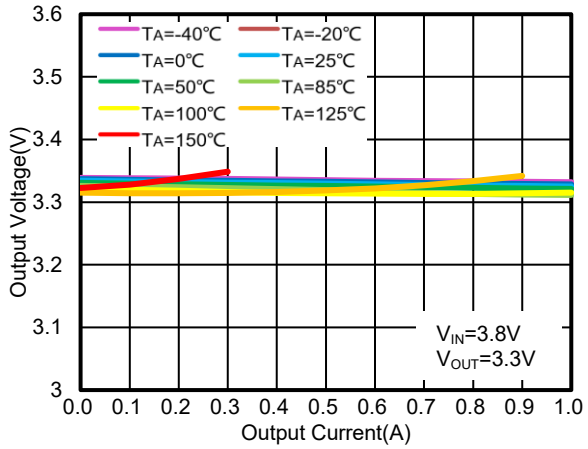


Figure 1. WR1010-ADFF6R
Load Regulation vs. I_{OUT} & Ambient Temperature

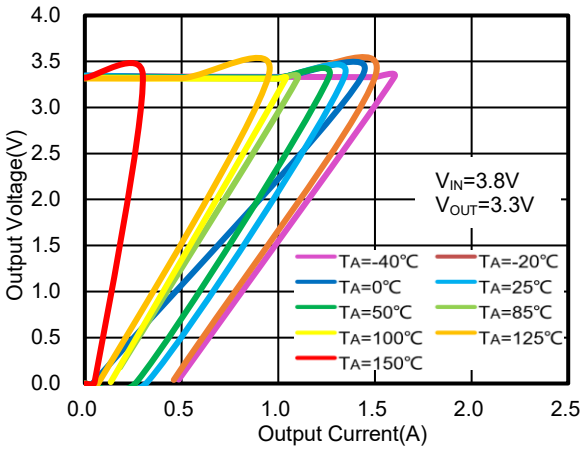


Figure 2. WR1010-ADFF6R
Fold-back Current Limit vs. I_{OUT}

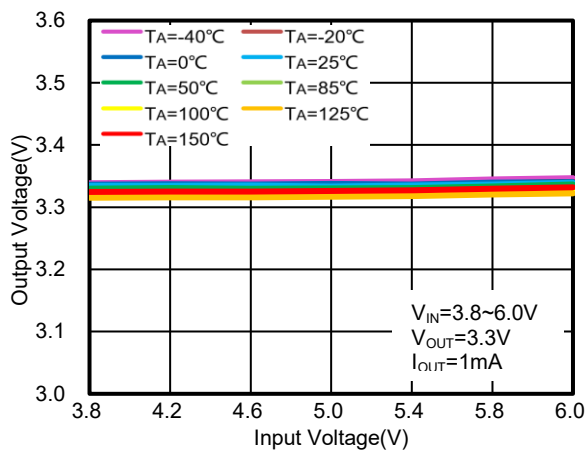


Figure 3. WR1010-ADFF6R
Regulation vs. V_{IN} (Line Regulation)

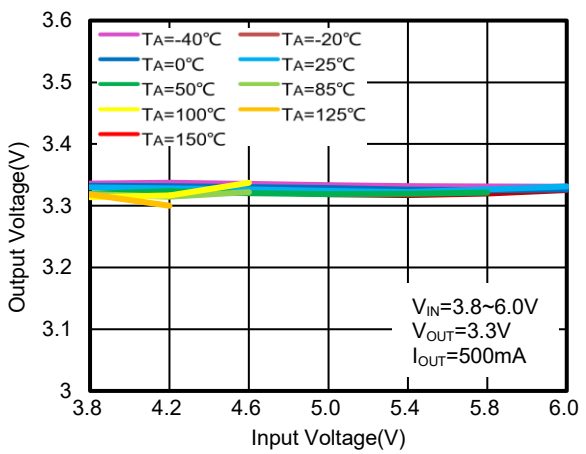


Figure 4. WR1010-ADFF6R
Regulation vs. V_{IN} (Line Regulation)

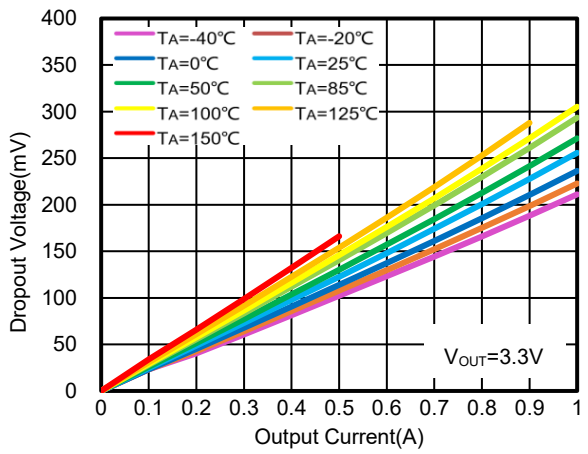


Figure 5. WR1010-ADFF6R
Dropout Voltage vs. I_{OUT}

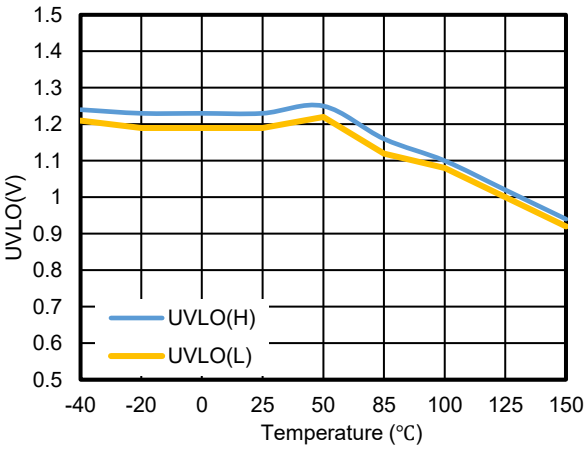


Figure 6. WR1010-ADFF6R
UVLO Threshold vs. Ambient Temperature

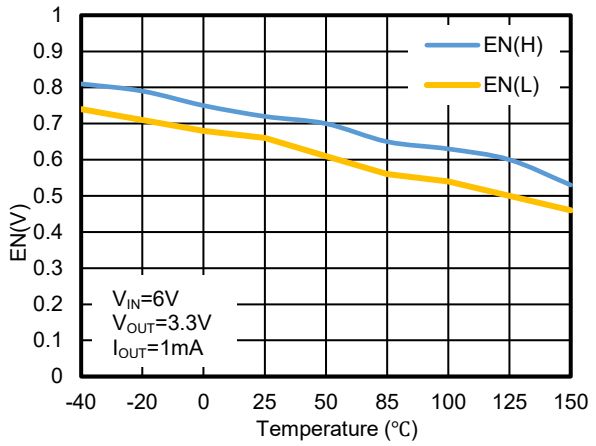


Figure 7. WR1010-ADFF6R
EN Threshold vs. Ambient Temperature

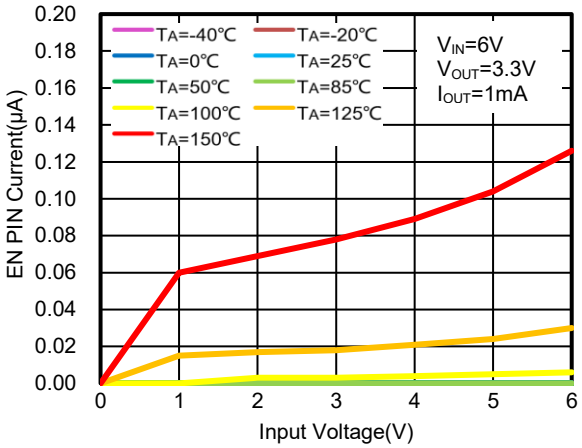


Figure 8. WR1010-ADFF6R
EN Current vs. V_{IN}

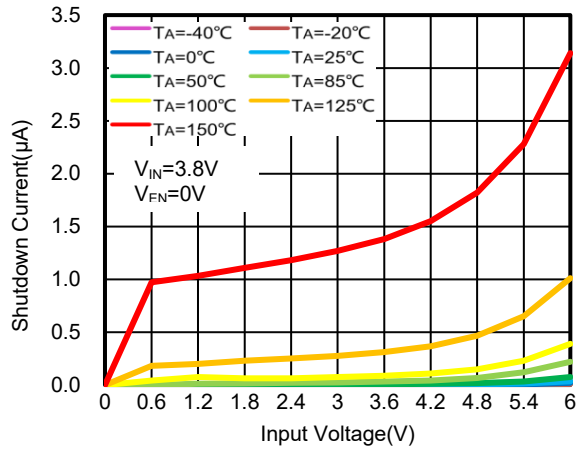


Figure 9. WR1010-ADFF6R
Shutdown Current vs. V_{IN}

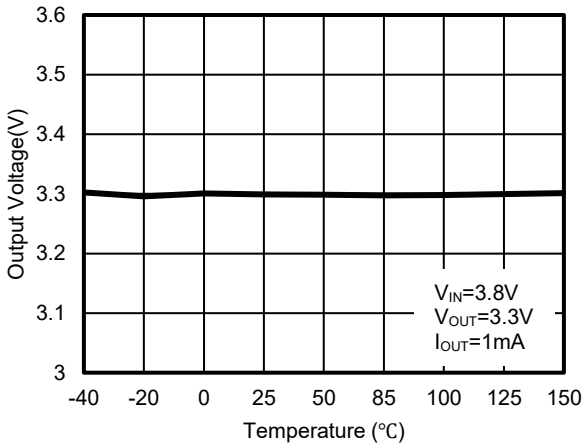


Figure 10. WR1010-ADFF6R
Output Voltage vs. Temperature

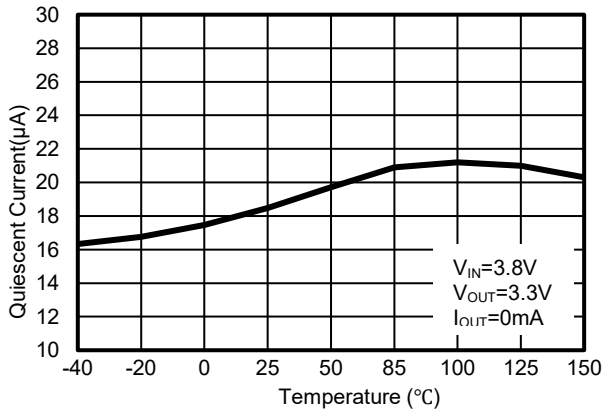


Figure 11. WR1010-ADFF6R
Quiescent Current vs. Temperature

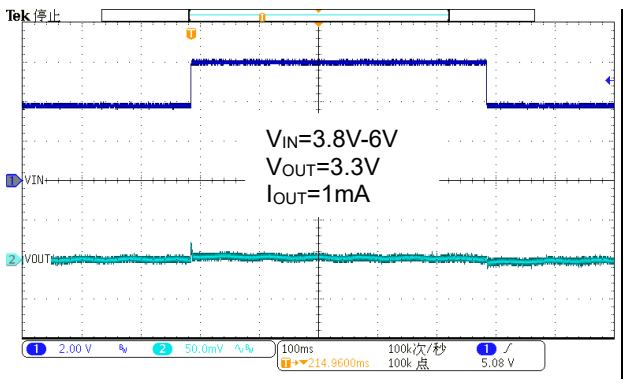


Figure 12. WR1010-ADFF6R
Line Transient

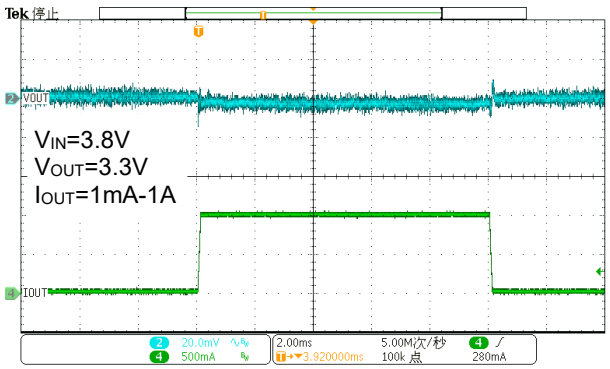


Figure 13. WR1010-ADFF6R
Load Transient

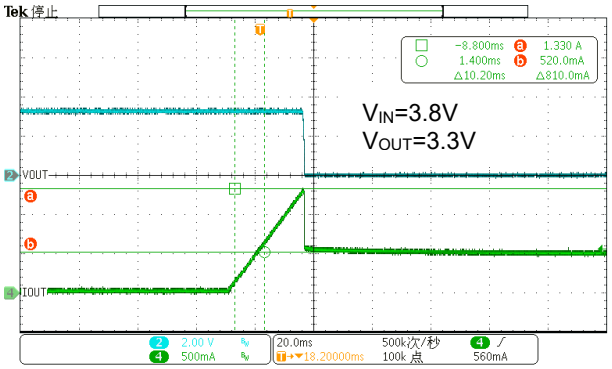


Figure 14. WR1010-ADFF6R
Current Limit

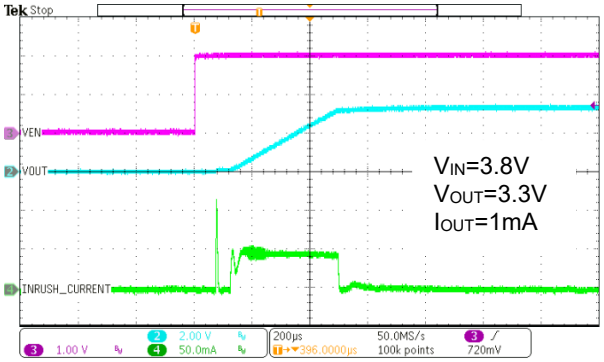


Figure 15. WR1010-ADFF6R
Soft Start from EN

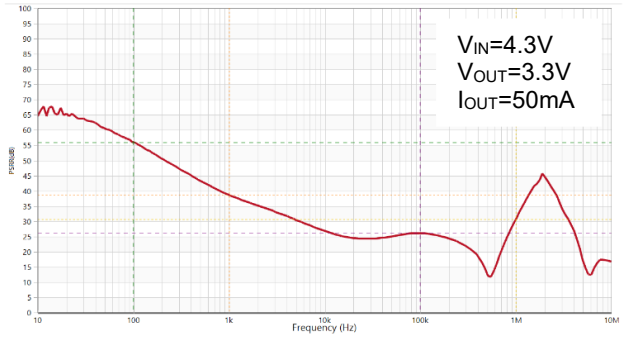
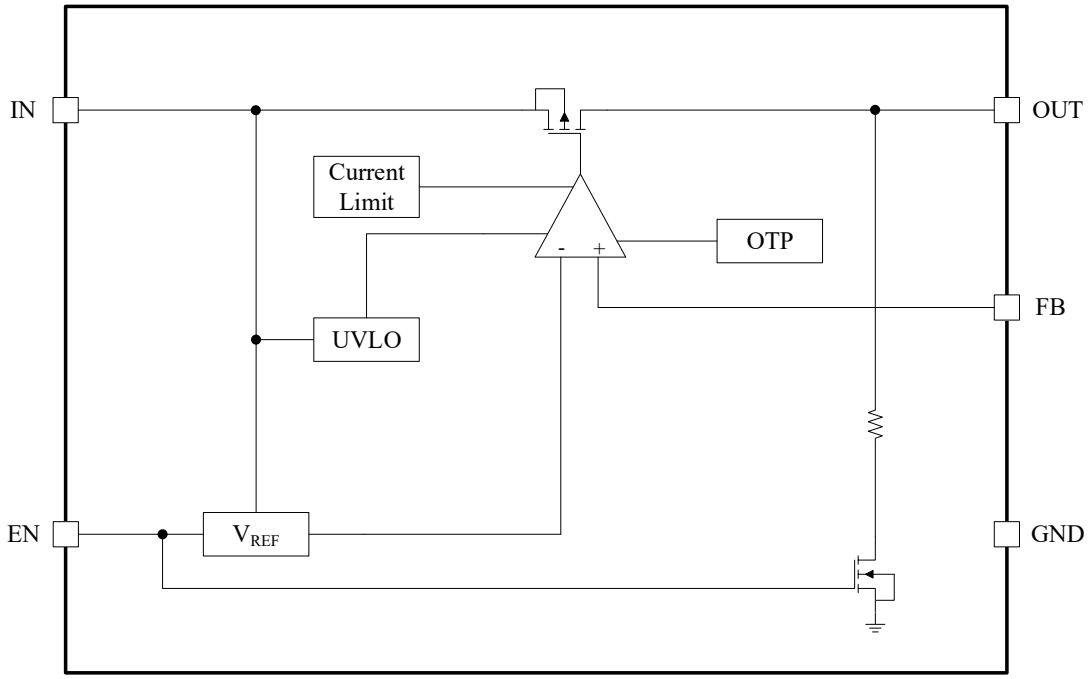


Figure 16. WR1010-ADFF6R
Power Supply Rejection Ratio vs. Frequency

11. Block Diagram



12. Power Supply Recommendations

The WR1010 has a V_{IN} range of between 1.5V and 6V 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.

13. 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 modules or schematics, PCB layout and BOM.

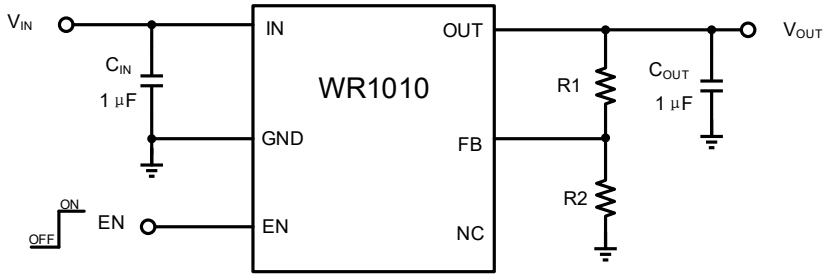
The module names are listed in the following table.

NAME	PACKAGE	EVALUATION MODULE
WR1010	DFN2×2-6	WAYON LDO_EVM_DFN2×2-6_V1.1

13.1 Typical Application Circuits

This section discusses the application of the WR1010 in the circuit. The following figure shows the schematic of the application circuit.

Circuit schematic:



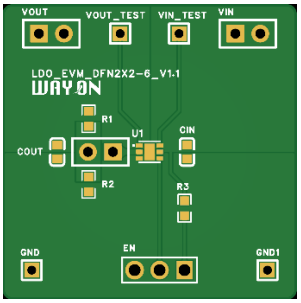
13.2 Layout of Typical Application Circuits

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 minimum 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 minimum 1.0µF output capacitor (C_{OUT}) is recommended to OUT. Connect the ground sides of CIN and COUT 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



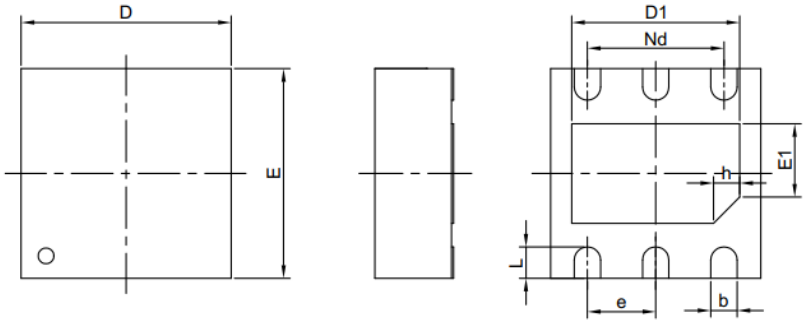
14. Naming Conventions

WR AA BB-CC DDD E

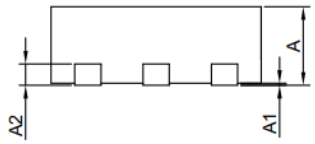
WR: WAYON Regulator;
AA: 10–Output Current, 1A;
BB: Serial number;
CC: Output Voltage—AD: adjustable;
DDD: Package – FF6: DFN2×2-6
E: R-Reel & T-tube;

15. Package Information

DFN2×2-6



Top View　　Side View　　Bottom View



Side View

SYMBOL	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A2		0.203REF	
b	0.18	0.25	0.35
D	1.90	2.00	2.10
D1	1.50	1.60	1.70
E	1.90	2.00	2.10
E1	0.85	0.95	1.10
e		0.65BSC	
Nd		1.30BSC	
L	0.18	0.25	0.35
h	0.15	0.25	0.30

16. Ordering Information

PART NUMBER	PACKAGE	PACKING QUANTITY	MARKING*
WR1010-ADFF6R	DFN2×2-6	3k/Reel	010 AD XXXX

* XXXX is variable.

Contact Information

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For additional information, please contact your local Sales Representative.
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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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