1. General Description

The WR0509-AT is an adjustable/fixed LDO with 300mA load current. The supply voltage ranges from 3V to 40V, which makes WR0509-AT series a good fit for severe operating conditions including load dump, cold cranking and start-stop.

The WR0509-AT output voltage ranges from 0.65V to 18V for adjustable version, 2.5V, 3.3V, 5V for fixed version.

The WR0509-AT 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 WR0509-AT regulators are available in Green EMSOP-8, ESOP-8, SOT89-3 and TO263-5 packages.

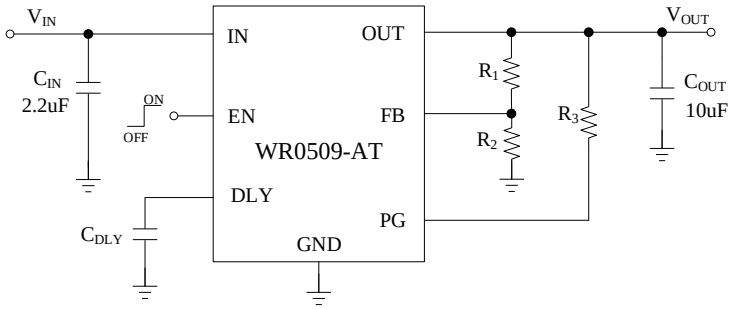
2. Features

- Input Voltage: 3V~40V
- Adjustable Output Voltage：0.65V~18V
- Fixed Output Voltage：2.5V,3.3V,5V
- Output Current: 500mA
- Output Accuracy：±1% (Typical)
- Low Quiescent Current: 6μA (Typical)
- Shut-down Current: < 1μA
- Dropout Voltage:
  580mV @ V_{OUT} = 3.3V, I_{OUT}=500mA
- Enable Control Function
- AEC-Q100 qualified for automotive applications:
  Ambient temperature grade 1: - 40°C to 125°C

3. Applications

- Infotainment
- Power Train
- Cluster
- Body Control Module
- Battery Connected Always-On System

4. Typical Application Circuit



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

Figure 1. Adjustable Voltage Regulator

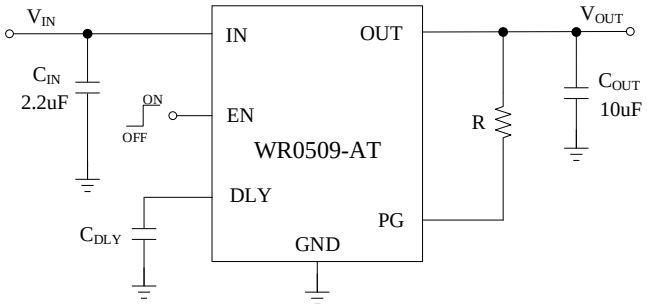
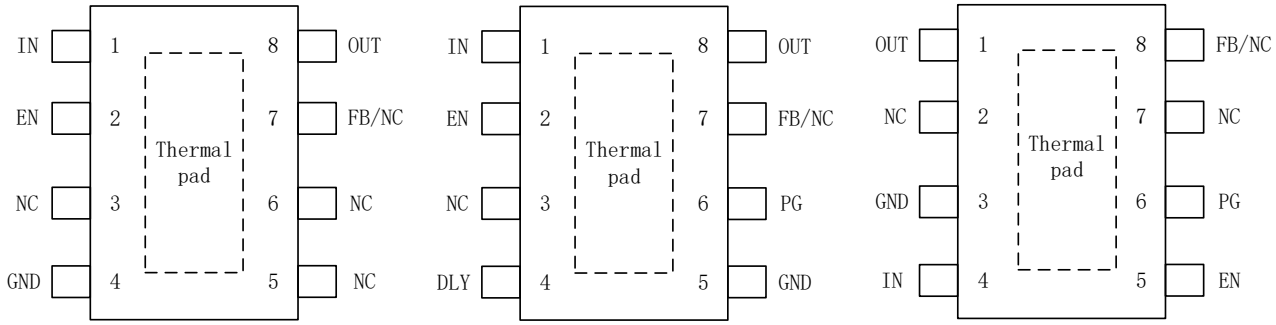


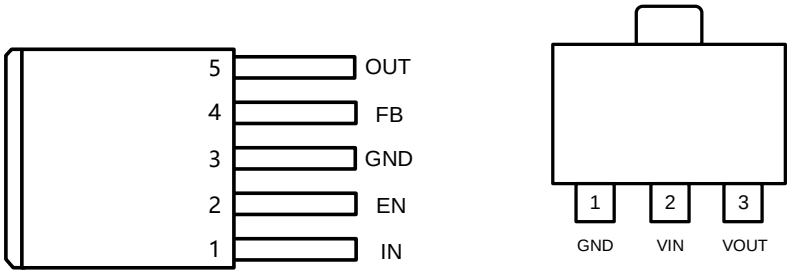
Figure 2. Fixed Voltage Regulator

5. Pin Configuration

(Top View)



EMSOP-8(M80) EMSOP-8(M81) ESOP-8



TO263-5 SOT89-3

6. Pin Description

PIN NUMBER					PIN NAME	I/O	PIN FUNCTION
EMSOP-8		ESOP-8	SOT89-3	TO263-5			
M80	M81	S80	A20	NE5			
1	1	4	2	1	IN	I	Input voltage supply.
2	2	5	-	2	EN	I	Enable input.
3,5,6	3	2,7	-	-	NC	-	Not connect.
-	4	-	-	-	DLY	-	Reset delay timer pin.PG reset delay is adjusted by the capacitor values connected to GND.
4	5	3	1	3	GND	-	Common ground.
-	6	6	-	-	PG	O	Power good indication pin. PG is an open drain output and requires a pull up resistor.
7	7	8	-	4	FB/NC	-	Adjustable output voltage feedback input pin. Connecting this pin to an external resistor divider receives the feedback voltage of the regulator. / Not connect for fixed version.
8	8	1	3	5	OUT	O	Regulated output voltage. A low equivalent series resistance (ESR) capacitor, typically 10μF, is required from OUT to ground for stability.
Pad	Pad	Pad	Pad	Pad	Thermal pad	-	Connect the thermal pad to a large area GND plane for improved thermal performance.

7. Absolute Maximum Ratings[1]

SYMBOL	PARAMETER		RATING	UNIT
V_{IN}	IN Input Voltage Range		-0.3 to 45	V
V_{EN}	EN Input Voltage Range		-0.3 to V_{IN}	V
V_{OUT_ADJ}	Adjustable Output Voltage Range		-0.3 to 20(≤V_{IN}+0.3)	V
V_{OUT_FIX}	Fixed Output Voltage Range		7	V
V_{FB}	FB Voltage		7	V
V_{PG}	Power Good Output Voltage		20	V
V_{DLY}	Delay Pin Voltage		6	V
I_{OUT}	Output Current		500	mA
P_D	Power Dissipation, $P_{D(max)}$@T_A=25°C	EMSOP8	2.5	W
		ESOP8	2.8	
$R_{\theta JA}$	Thermal Resistance	EMSOP8	50	℃/W
		ESOP8	46	
T_J	Maximum Junction Temperature		150	℃
T_{STG}	Storage Temperature		-40 to 150	℃
T_{SDR}	Maximum Lead Soldering Temperature, 10 Seconds		260	℃
ESD	HBM		±2000	V
	CDM		±750	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	3	40	V
V_{EN}	Enable Voltage	0	V_{IN}	V
V_{OUT_ADJ}	Adjustable Output Voltage Range	0.65	18	V
V_{OUT_FIX}	Fixed Output Voltage Range	2.5, 3.3, 5		V
V_{PG}	Power Good Output Voltage		18	V
V_{DLY}	Delay Pin Voltage		5.5	V
I_{OUT}	Output Current	0	500	mA
C_{IN}	Input Capacitor	0.1		μF
C_{OUT}	Output Capacitor	1	200	μF
C_{DLY}	Power Good Delay Capacitor		1	μF
ESR	Output Capacitor ESR Value	0.001	5	Ω
T_A	Operating Junction Temperature	-40	125	°C

9. Electrical Characteristics

(V_{IN} = 13.5V, V_{EN} = 2V, I_{OUT}=1mA, C_{IN}=2.2μF, C_{OUT}=10μF, T_A=25°C, unless otherwise noted)

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
V_{OUT}	Output Voltage Accuracy		0.99 V_{OUT}	V_{OUT}	1.01 V_{OUT}	V
V_{FB}	Feedback Voltage			0.65		V
V_{UVLO}	Rising V_{IN} Threshold	V_{IN} Rising			2.9	V
	Falling V_{IN} Threshold	V_{IN} Falling	2.5			V
LNR	Line Regulation	V_{IN} =6V to 40V, I_{OUT}=30mA		10		mV
LDR	Load Regulation	1mA≤I_{OUT}≤300mA		25		mV
I_Q	Quiescent Current	I_{OUT}=0mA		6	8.9	μA
I_{SHDN}	Shutdown Current	EN Low		0.27	0.4	μA
I_{LIM}	Output Current Limit	I_{OUT}=500mA		750		mA
V_{DO}	Dropout Voltage	I_{OUT}=500mA, V_{OUT}=0.95×$V_{OUT(NOM)}$		580		mV
V_{ENH}	EN High Voltage (Enabled)		1.7			V
V_{ENL}	EN Low Voltage (Disabled)				0.8	V
I_{EN}	Enable Pin Current			0.1	1	μA
PSRR	Power-supply Rejection Ration	I_{OUT}=10mA, f=100Hz, C_{OUT}=2.2μF		80		dB
		I_{OUT}=10mA, f=1kHz, C_{OUT}=2.2μF		44		
V_{PG_LO}	PG reset output, low voltage	I_{PG_LO} =0.5mA			0.18	V
V_{PG_lkg}	PG Leakage Current	PG leakage current when pulled high			0.05	μA
V_{PG_TH1}	Power Good Threshold (Rising)	V_{OUT} Rising		90		%×V_{OUT}

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
V_{PG_TH2}	Power Good Threshold (Falling)	V_{OUT} Falling		88		%×V_{OUT}
I_{DLY_CHG}	DLY external capacitor charging current			1.5		μA
V_{DLY_TH}	DLY Threshold			1		V
t_{PG_FIX}	Power Good Reset Delay time	No capacitor on DLY pin		300		μS
$t_{PG_Deglitch}$	Power Good Reset Deglitch Time			270		
T_{SD}	Thermal Shutdown Threshold	Shutdown, temperature increasing		160		ºC
ΔT_{SD}	Thermal Shutdown Hysteresis	Reset, temperature decreasing		25		ºC

10. Block Diagram

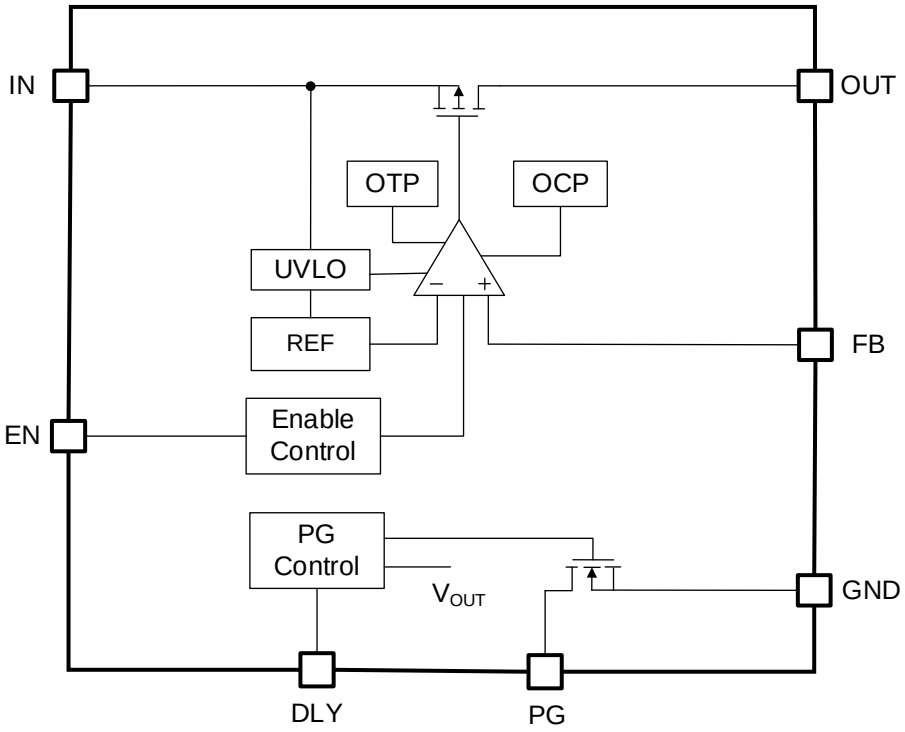


Figure 3. Adjustable Voltage Version

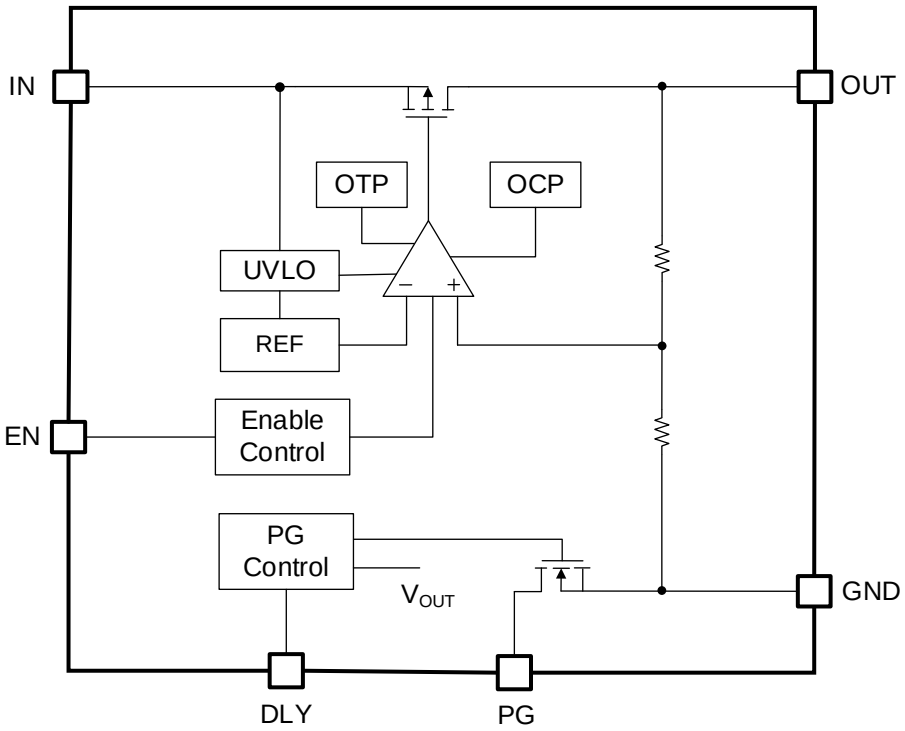


Figure 4. Fixed Voltage Version

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.
WAYON® is registered trademark of Wayon Corporation.

Specifications are subject to change without notice.
The device characteristics and parameters in this data sheet can and do vary in different applications and actual device performance may vary over time.
Users should verify actual device performance in their specific applications.

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.