1. General Description

The WR0512 series are CMOS-based low-dropout, low-quiescent current linear regulators, offering 500mA with low dropout voltage and high output accuracy.

Using CMOS technology, the quiescent current consumed by the WR0512 is typically 60μA over the entire input voltage range, making it attractive for consumer, network applications that demand high output current. The WR0512 series are available in wide output voltage range version from 1.2V to 3.3V with 0.1V step.

The WR0512 series have thermal shutdown (OTP) and current limit functions, to assure the stability of chip and power system at wrong condition, and it uses trimming technique to guarantee output voltage accuracy within ±2%.

The WR0512 regulators are available in SOT23-3、SOT23-5、SOT89-3/L packages. Standard products are Pb-free and Halogen-free.

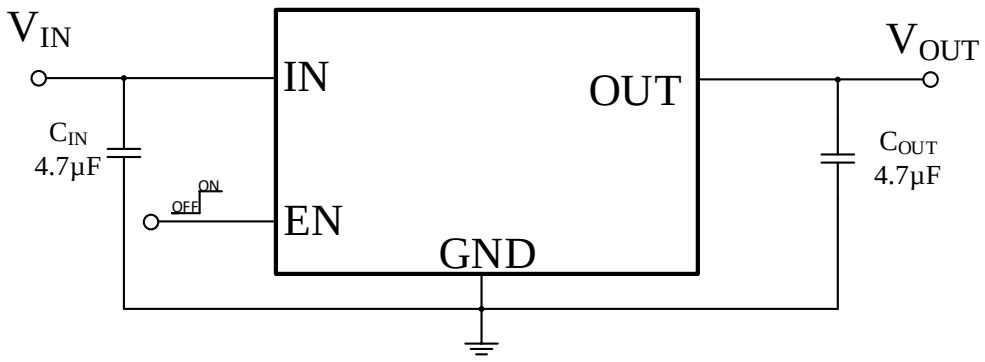
2. Features

- PSRR: 70dB@1kHz
- Output Current: 500mA
- Input Voltage: 2.5V to 5.5V
- Output Voltage: 1.2V to 3.3V
- Dropout Voltage: 130mV @ I_{OUT} = 500mA
- Quiescent Current: 60μA (Typical)
- Shut-down Current: < 1μA
- Recommend Capacitor: 4.7μF
- Operating Temperature: -40 to +85ºC
- Output Noise: 120μV_{RMS}

3. Applications

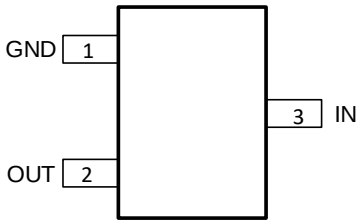
- Computer,
- Graphic card
- Network communication equipment
- Others portable electronic device
- LCD TV
- STB

4. Typical Application

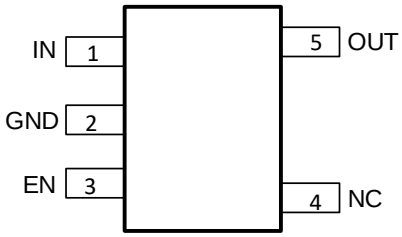


5. Pin Configuration

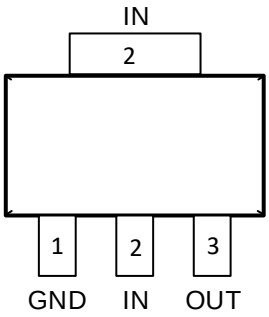
(Top View)



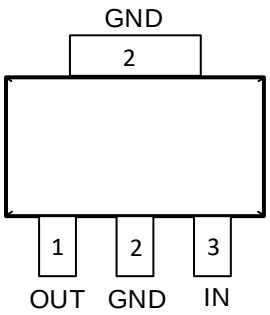
SOT23-3



SOT23-5



SOT89-3(A20)



SOT89-3L(A21)

6. Pin Description

PIN NUMBER				PIN NAME	I/O	PIN FUNCTION
SOT23-3	SOT23-5	SOT89-3 (A20)	SOT89-3L (A21)			
3	1	2	3	IN	I	Input voltage supply. Bypass with a typical 4.7μF capacitor to GND. Place the input capacitor as close to the IN and GND pins of the device as possible.
1	2	1	2	GND	-	Common ground.
-	3	-	-	EN	I	Enable input. Active High. EN includes a small pull-up current source, nominally 0.1μ A.
-	4	-	-	NC	-	NC.
2	5	3	1	OUT	O	Regulated output voltage. A low equivalent series resistance (ESR) capacitor, typically 4.7μF 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.

7. Absolute Maximum Ratings[1]

SYMBOL	PARAMETER		RATING	UNIT
V_{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 6.5	V
P_D	Power Dissipation@T_A = 25ºC	SOT23-3 & SOT23-5	500	mW
		SOT89-3/L	625	mW
$R_{\theta JA}$	Thermal Resistance[2] [4]	SOT23-3 & SOT23-5	250	℃/W
		SOT89-3/L	200	℃/W
$R_{\theta JC}$	Top Thermal Resistance[2] [3]	SOT23-5	120	℃/W
T_J	Operating Junction Temperature		150	℃
T_{STG}	Storage Temperature		-55 to 150	℃
T_{SDR}	Lead Temperature (Soldering, 10 sec)		260	℃
ESD	HBM		±4000	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: Measured according to JEDEC board specification. Detailed description of the board can be found in JESD51−7.

NOTE4: Power dissipation is calculate by $P_{D(MAX)} = (T_J - T_A) / R_{\theta JA}$.

8. Recommended Operating Conditions

SYMBOL	PARAMETER	MIN	MAX	UNIT
V_{IN}	Input Voltage	2.5	5.5	V
V_{EN}	EN Input Voltage	0	5.5	V
V_{OUT}	Nominal Output Voltage	1.2	3.3	V
I_{OUT}	Output Current	0	500	mA
C_{IN}	Input Capacitor	4.7		μF
C_{OUT}	Output Capacitor	4.7		μF
T_A	Operating Ambient Temperature	-40	85	ºC

9. Electrical Characteristics

(V_{IN} = $V_{OUT(NOMINAL)}$+1V, C_{IN}=4.7μF, C_{OUT}=4.7μF, T_A=25℃, unless otherwise noted)

SYMBOL	PARAMETER	TEST CONDITIONS		MIN	TYP.	MAX	UNIT
V_{OUT}	Output Voltage Range	V_{OUT} ≤1.5V, V_{IN}=2.5V, 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}	
V_{DO}	Dropout Voltage[5]	V_{OUT}=V_{OUTNOM}*0.98 , I_{OUT}=500mA	V_{OUT}=3.3V		110	150	mV
			V_{OUT}=3.0V		120	160	
			V_{OUT}=2.8V		130	170	
			V_{OUT}=2.5V		140	180	
			V_{OUT}=2.0V		150	190	
			V_{OUT}=1.8V		160	200	
I_{LIMIT}	Output current limit	V_{IN}=5V			800		mA
I_{OUT}	Maximum output current in the accuracy range[6]	V_{EN}=V_{IN}		500			mA
LNR	Line Regulation	V_{OUT}=3.3V, V_{IN}=4.3~5.5V, I_{OUT}=1mA			0.1		%/V
LDR	Load Regulation[7]	V_{OUT}=3.3V, I_{OUT}=1 to 500mA			20		mV
I_Q	Quiescent Current	V_{OUT}=3.3V, I_{OUT}=0mA			60	90	μA
I_{SHDN}	Shut-down Current	V_{EN} = 0V			0.1	1.0	μA
PSRR	Power Supply Ripple Rejection	V_{IN}=(V_{OUT}+1V) $_{DC}$+0.2V_{P-P} f=1kHz, I_{OUT}=10mA, @V_{OUT}=3.3V			70		dB
V_{NO}	Output noise voltage	BW=10Hz to 100kHz, C_{OUT}=4.7μF, I_{OUT}=10mA			120		μV_{RMS}
V_{ENH}	EN high voltage (enabled)	V_{IN}=5.5V, I_{OUT}=1mA		1.2			V
V_{ENL}	EN low voltage (disabled)	V_{IN}=5.5V, I_{OUT}=1mA				0.4	V
R_{DIS}	Output Discharge Resistance				120		Ω
T_{SD}	Thermal shutdown threshold				165		ºC
ΔT_{SD}	Thermal shutdown hysteresis				30		ºC

NOTE5: The dropout voltage is defined as (V_{IN}-V_{OUT}) when V_{OUT} is $V_{OUT(NOM)}$*98%.

NOTE6: 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}.

NOTE7: The Load regulation is measured using pulse techniques with duty cycle < 5%.

10. Typical Performance Characteristics

(V_{IN} = V_{OUT}+1V, C_{IN}=4.7μF, C_{OUT}=4.7μF, T_A=-25°C, unless otherwise noted)

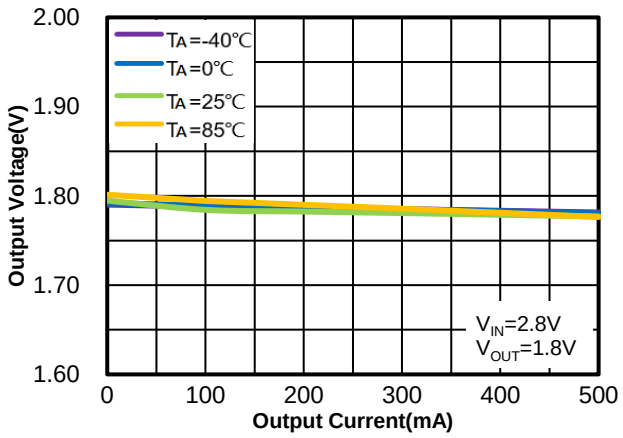


Figure 1. WR0512-18A20R

Load Regulation vs. I_{OUT} & Ambient Temperature

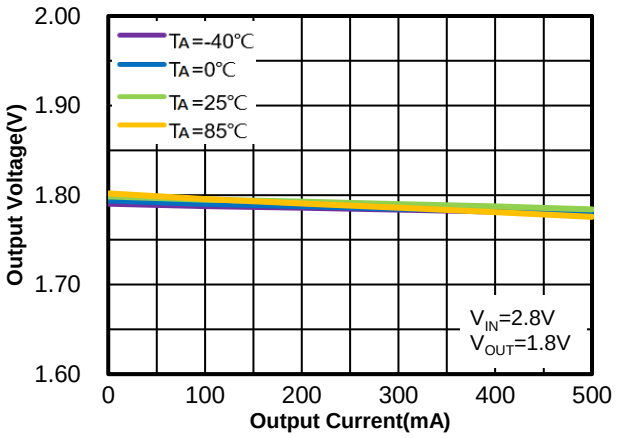


Figure 2. WR0512-18A50R

Load Regulation vs. I_{OUT} & Ambient Temperature

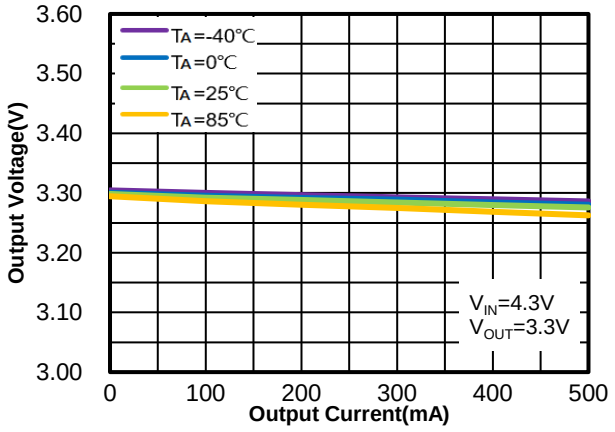


Figure 3. WR0512-33A20R

Load Regulation vs. I_{OUT} & Ambient Temperature

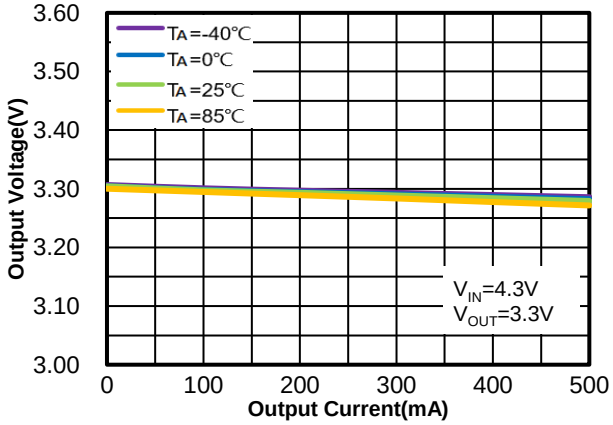


Figure 4. WR0512-33A50R

Load Regulation vs. I_{OUT} & Ambient Temperature

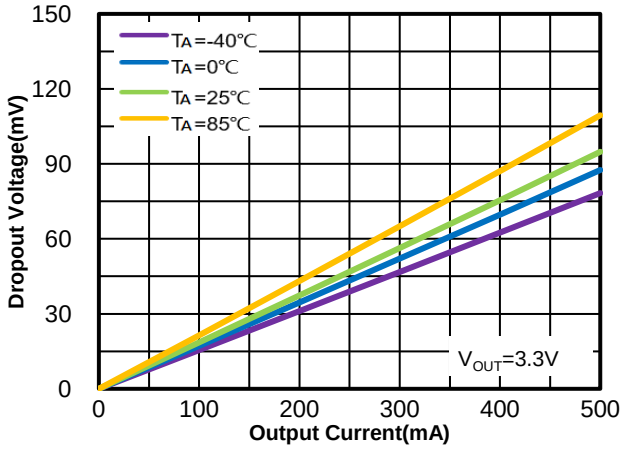


Figure 5. WR0512-33A20R

Dropout Voltage vs. I_{OUT} & Ambient Temperature

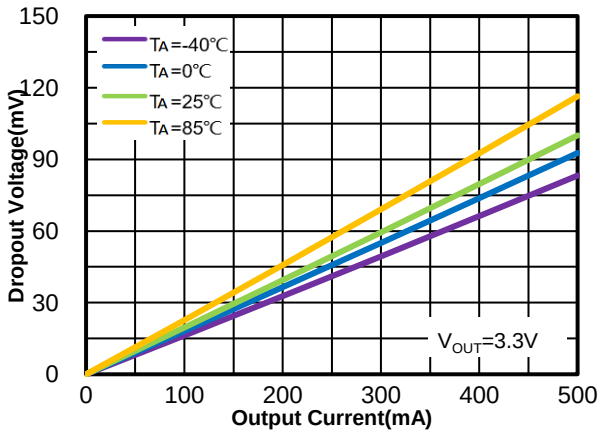


Figure 6. WR0512-33A50R

Dropout Voltage vs. I_{OUT} & Ambient Temperature

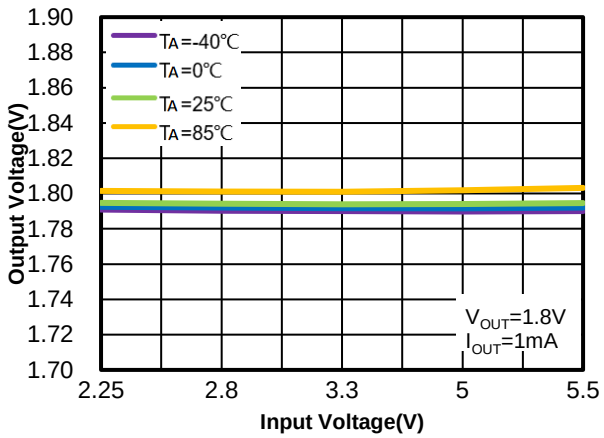


Figure 7. WR0512-18A20R

Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

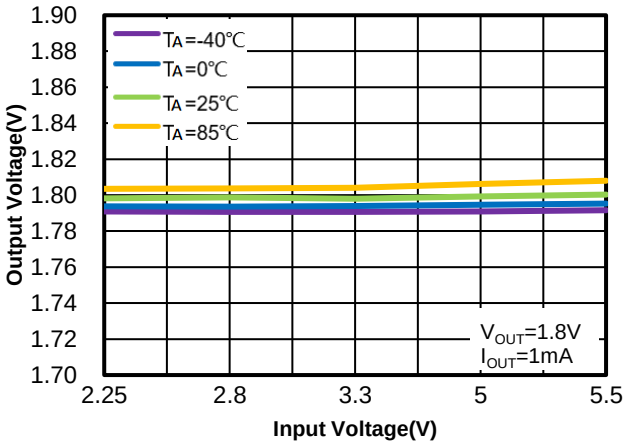


Figure 8. WR0512-18A50R

Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

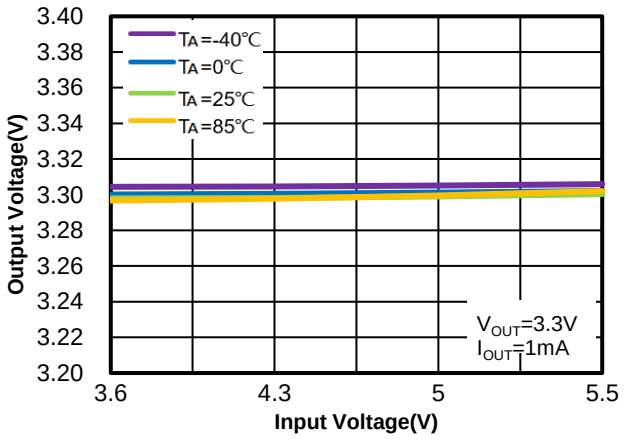


Figure 9. WR0512-33A20R

Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

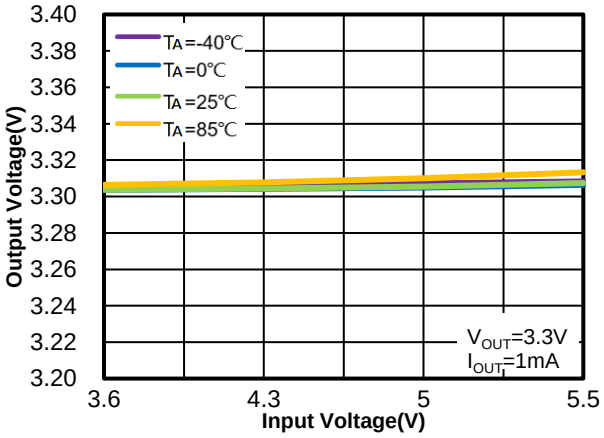


Figure 10. WR0512-33A50R

Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

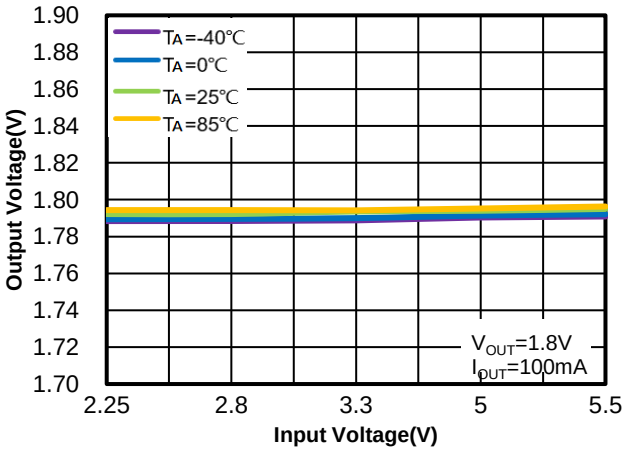


Figure 11. WR0512-18A20R

Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

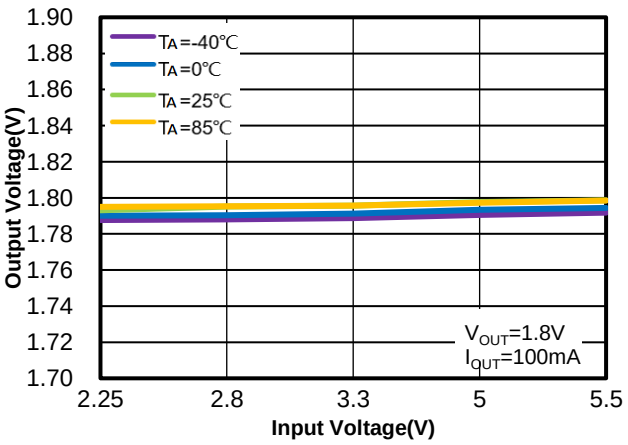


Figure 12. WR0512-18A50R

Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

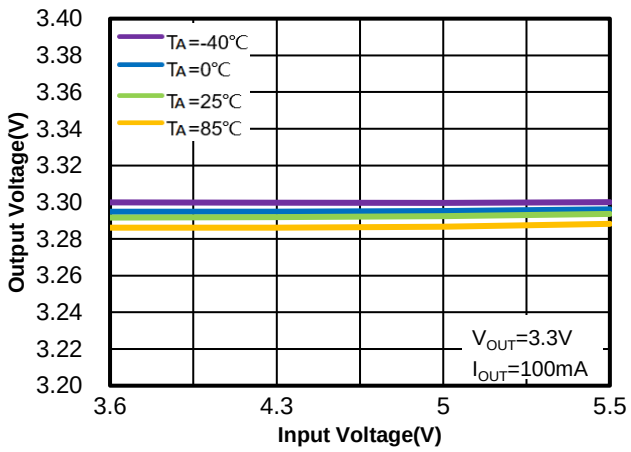


Figure 13. WR0512-33A20R

Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

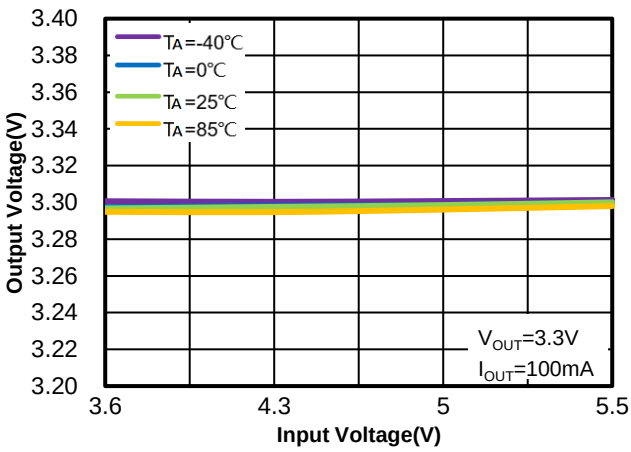


Figure 14. WR0512-33A50R

Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

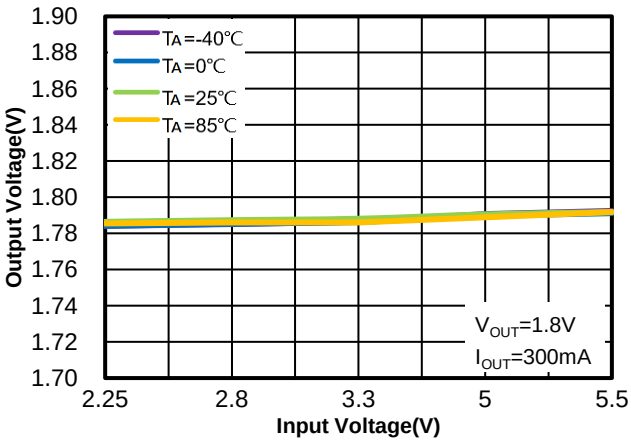


Figure 15. WR0512-18A20R

Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

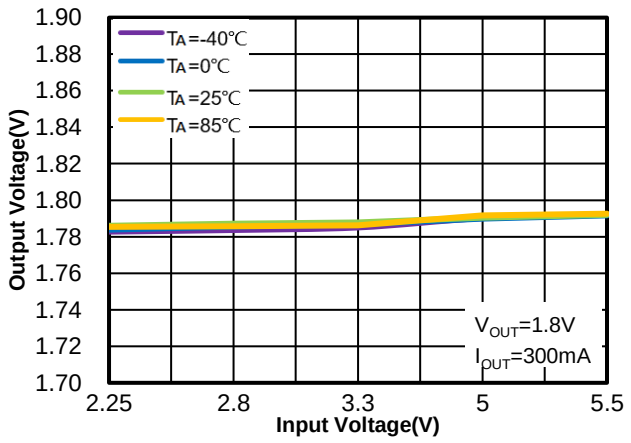


Figure 16. WR0512-18A50R

Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

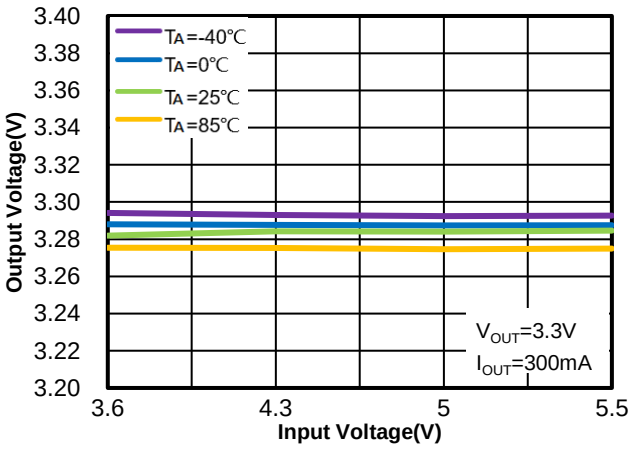


Figure 17. WR0512-33A20R

Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

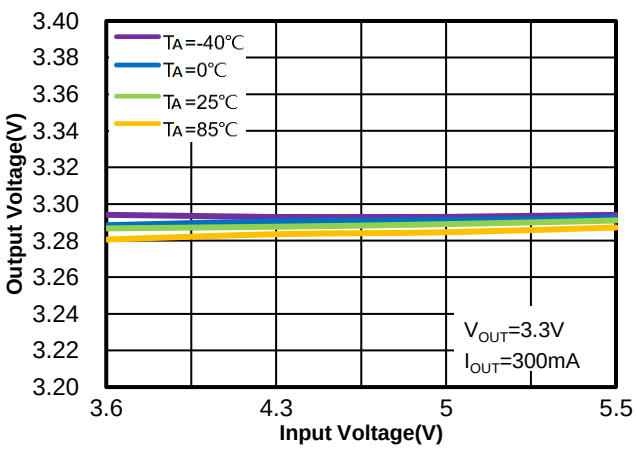


Figure 18. WR0512-33A50R

Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature

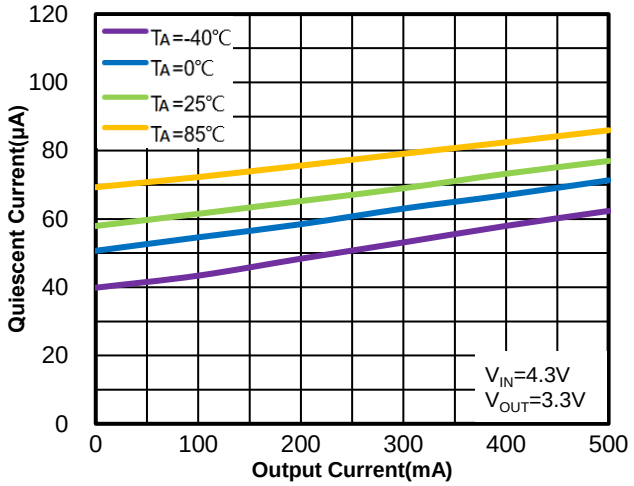


Figure 19. WR0512-33A20R

Quiescent Current vs. I_{OUT} & Ambient Temperature

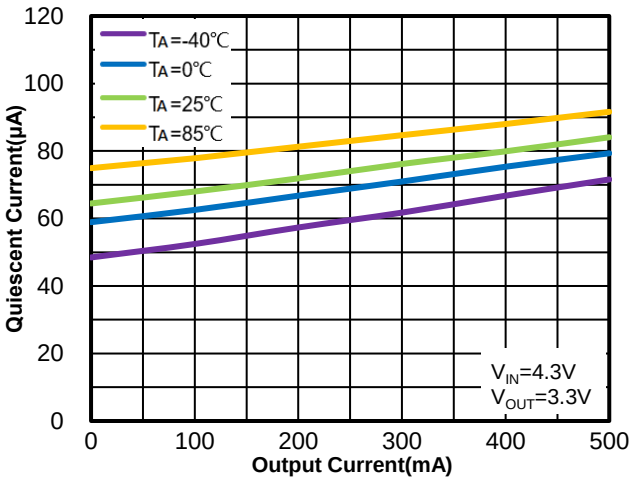


Figure 20. WR0512-33A50R

Quiescent Current vs. I_{OUT} & Ambient Temperature

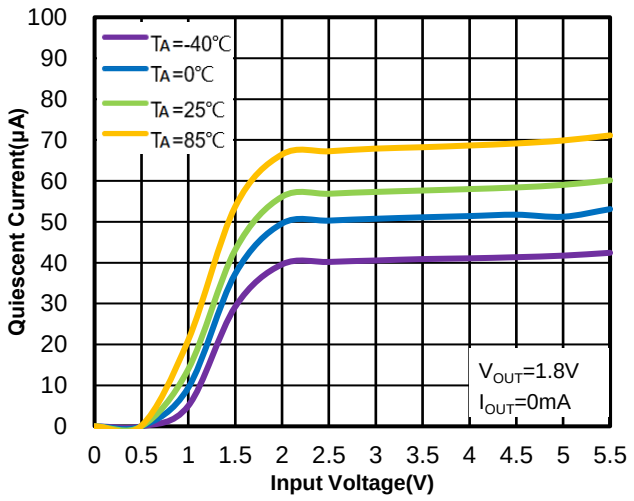


Figure 21. WR0512-18A20R

Quiescent Current vs. V_{IN} & Ambient Temperature

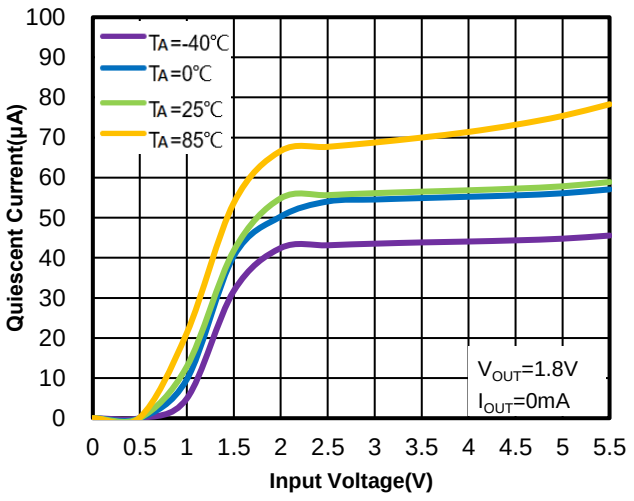


Figure 22. WR0512-18A50R

Quiescent Current vs. V_{IN} & Ambient Temperature

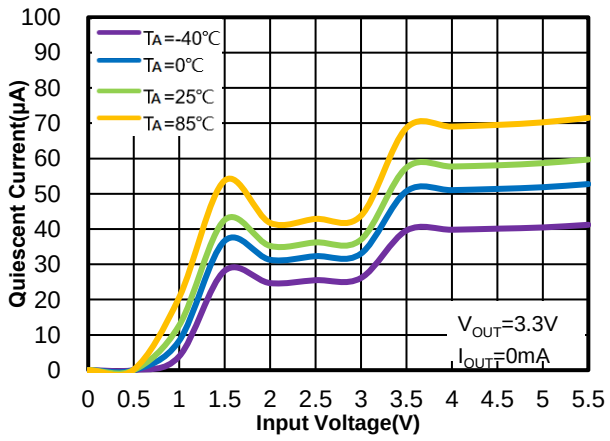


Figure 23. WR0512-33A20R

Quiescent Current vs. V_{IN} & Ambient Temperature

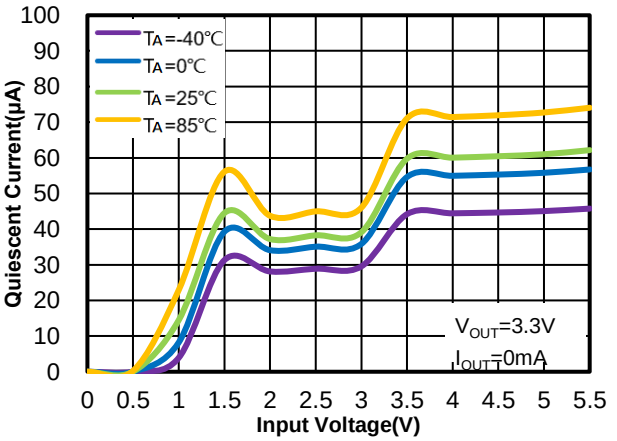


Figure 24. WR0512-33A50R

Quiescent Current vs. V_{IN} & Ambient Temperature

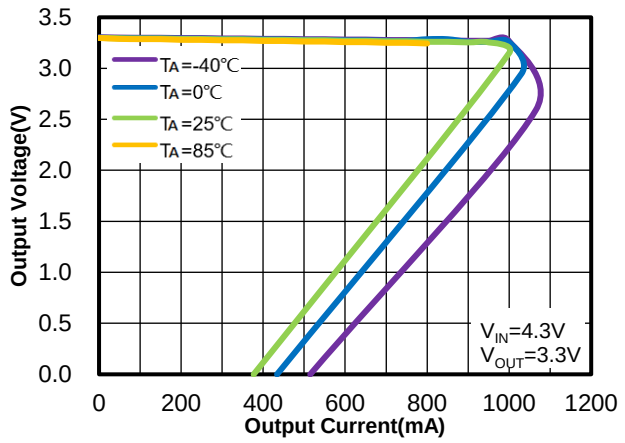


Figure 25. WR0512-33A20R

Foldback Current Limit vs. I_{OUT} & Ambient Temperature

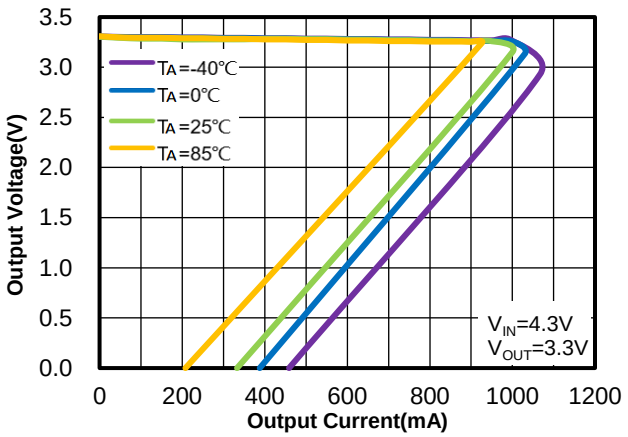


Figure 26. WR0512-33A50R

Foldback Current Limit vs. I_{OUT} & Ambient Temperature

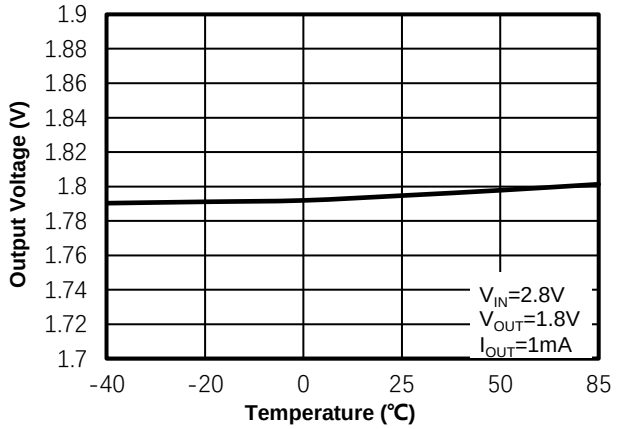


Figure 27. WR0512-18A20R

Output Voltage vs. Ambient Temperature

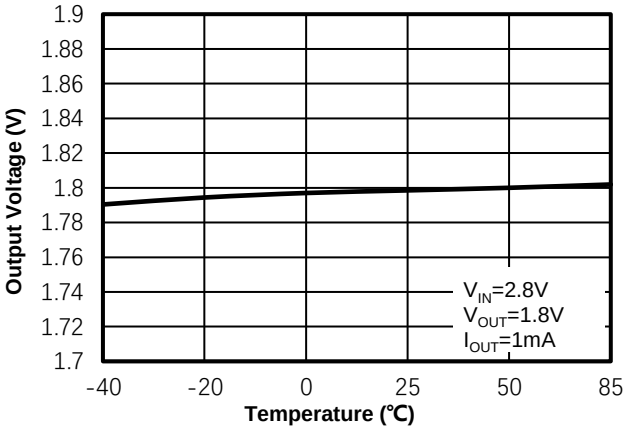


Figure 28. WR0512-18A50R

Output Voltage vs. Ambient Temperature

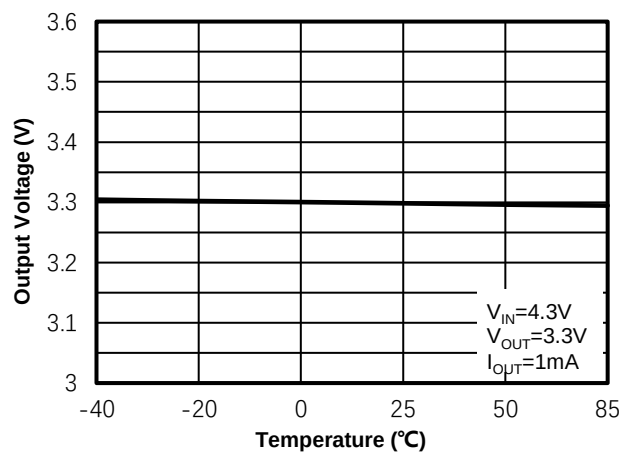


Figure 29. WR0512-33A20R

Output Voltage vs. Ambient Temperature

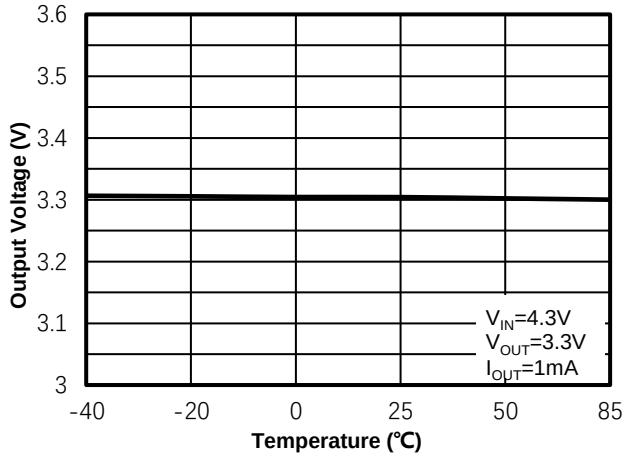


Figure 30. WR0512-33A50R

Output Voltage vs. Ambient Temperature

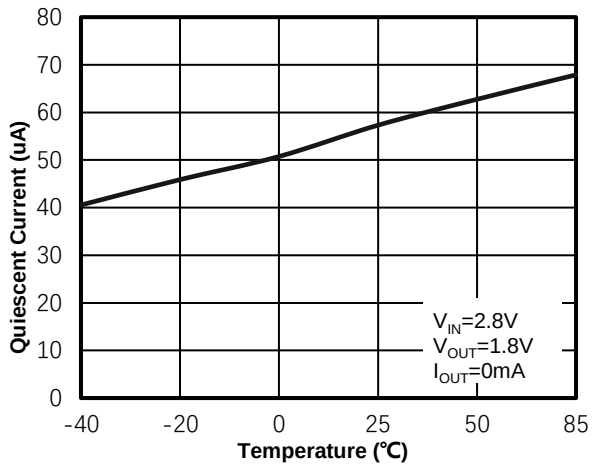


Figure 31. WR0512-18A20R
Quiescent Current vs. Ambient Temperature

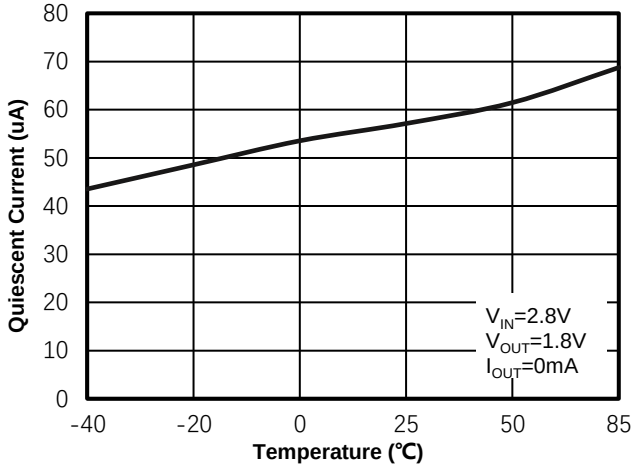


Figure 32. WR0512-18A50R
Quiescent Current vs. Ambient Temperature

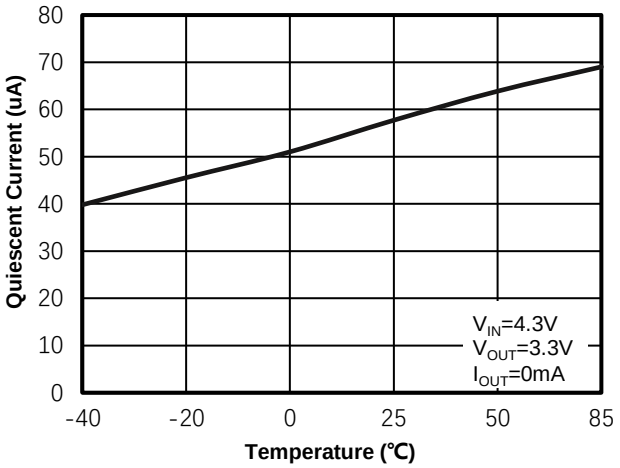


Figure 33. WR0512-33A20R
Quiescent Current vs. Ambient Temperature

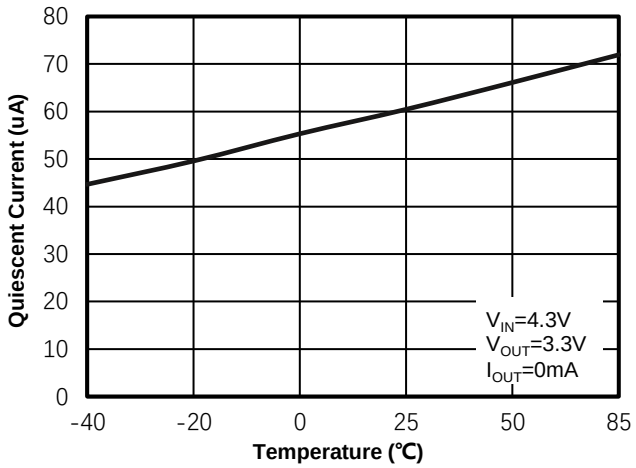


Figure 34. WR0512-33A50R
Quiescent Current vs. Ambient Temperature

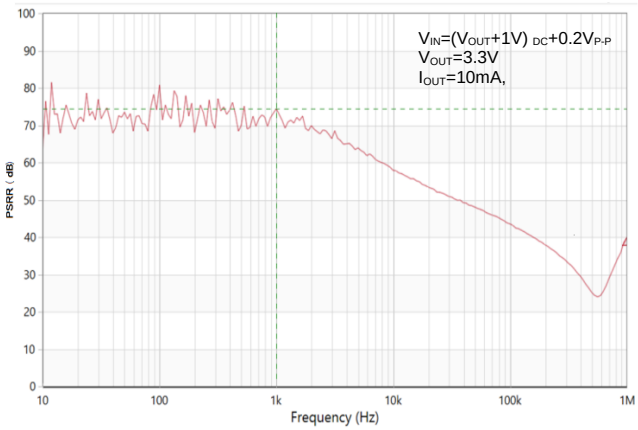


Figure 35. Power Supply Rejection Ratio vs. Frequency

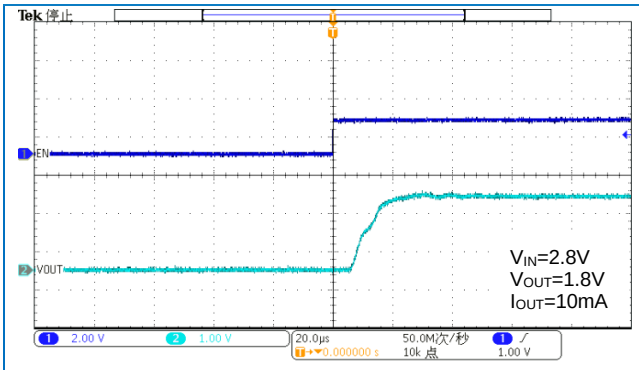


Figure 36. Soft Start from EN

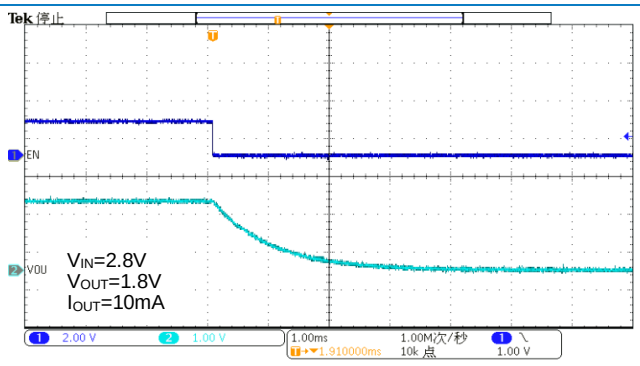


Figure 37. EN Shutdown

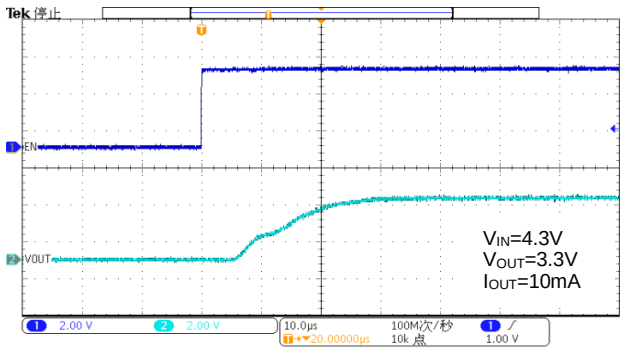


Figure 38. Soft Start from EN

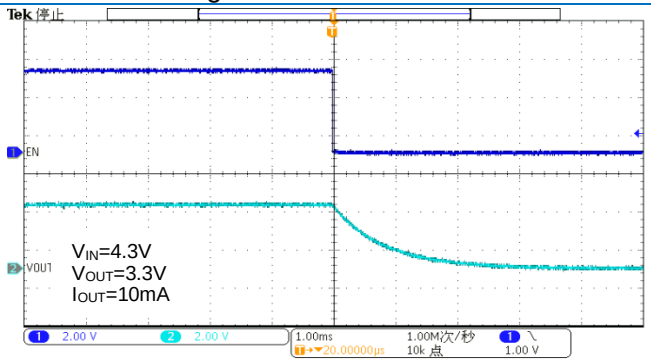


Figure 39. EN Shutdown

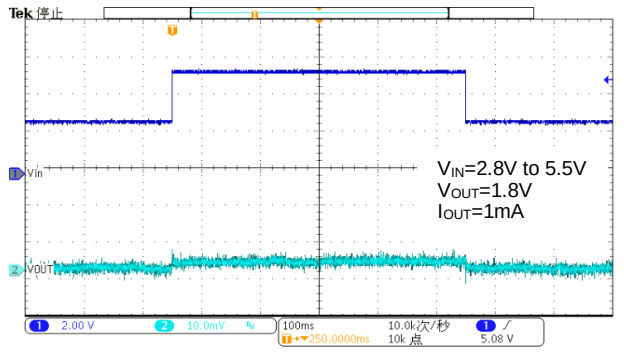


Figure 40. Line Transient

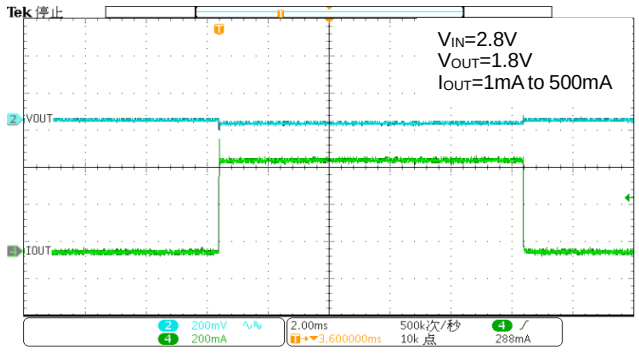


Figure 41. Load Transient

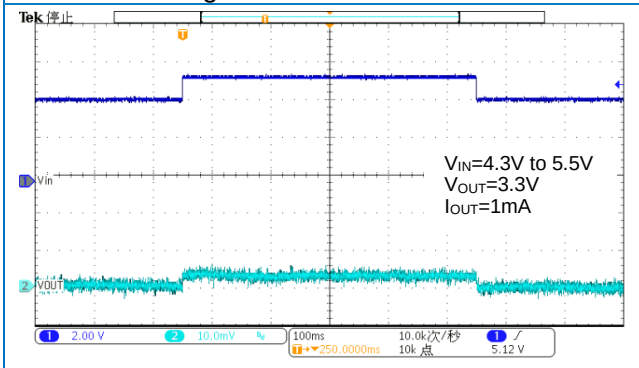


Figure 42. Line Transient

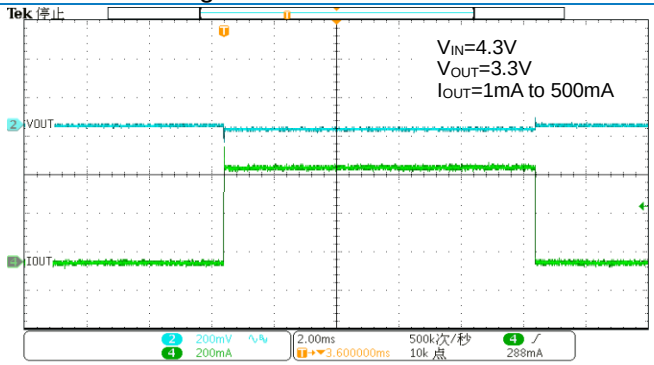


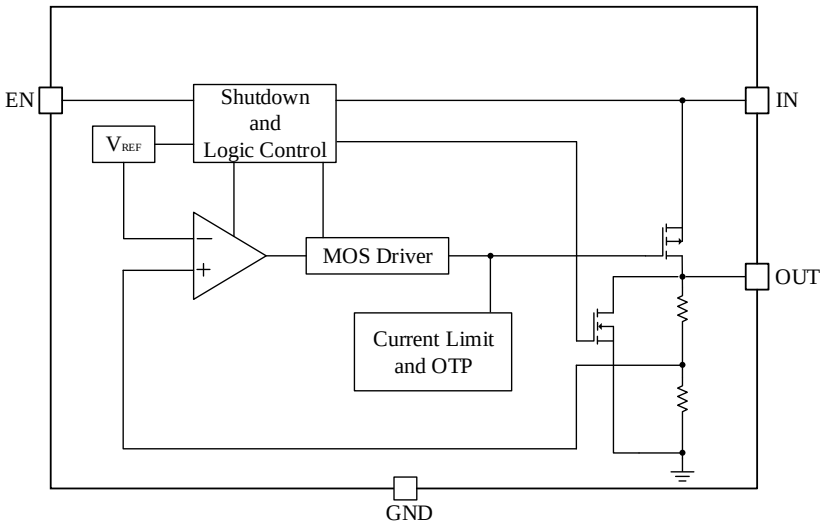
Figure 43. Load Transient

11. Function Description

11.1 Overview

The WR0512 series are ultra-low dropout, low quiescent current, high PSRR CMOS LDOs. The dropout voltage is 130mV (Typ.) at 500mA load current. Using CMOS technology, the quiescent current consumed by the WR0512 is typically 60μA over the entire input voltage range, making it attractive for consumer, network applications that demand high output current. The WR0512 series are available in wide output voltage range version from 1.2V to 3.3V with 0.1V step.

11.2 Block Diagram



11.3 Feature Description

11.3.1 Output Voltage Accuracy

The WR0512 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 WR0512 uses the EN pin to enable /disable its device and to activate /deactivate the discharge function. The enable pin contains a small pull-up current source, typically 0.1μA. 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 120ohms.

If the voltage of EN pin is higher than 1.2V, the device is guaranteed to be enabled. If the Enable function is not required, the EN pin should be connected directly to IN.

.

11.3.3 Dropout Voltage (V_{DO})

The WR0512 is an ultra-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 WR0512 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 WR0512 has a low noise reference, high PSRR to ensure that output noise is reduced during normal operation.

11.3.6 Foldback 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 $I_{LIM}R_{LOAD}$.

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 foldback current limiting circuit can be used. In a foldback current limiting circuit, both the output current and the output voltage are gradually reduced when the output current reaches the set maximum current I_{LIM}. The output current is reduced to the set current threshold I_{SHORT} and the output voltage is reduced to $I_{SHORT}R_{LOAD}$. 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 foldback 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 WR0512 uses a foldback current limiting mode where the final current is clamped to around 400mA, thus providing good protection to the device.

More information on current limiting can be found in Electrical Characteristics Figure 25 to Figure 26.

11.3.7 Automatic Discharge

The WR0512 has an internal pull-down MOSFET that connects a discharge resistor from V_{OUT} to ground to actively release the output voltage when the device is disabled.

11.3.8 Thermal Protection

The WR0512 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 165°C (typical). The thermal shutdown hysteresis ensures that the LDO resets (turns on) again when the temperature drops to 135°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 WR0512'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 WR0512 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	$5.5V \geq V_{IN} \geq V_{OUT(NOM)} + V_{DO}$	$V_{EN} > V_{ENH}$	$I_{OUT} < I_{LIM}$	$T_J < T_{SD}$
Dropout	$V_{IN} \leq V_{OUT(NOM)} + V_{DO}$	$V_{EN} > V_{ENH}$	$I_{OUT} < I_{LIM}$	$T_J < T_{SD}$
Disabled	-	$V_{EN} < V_{ENL}$	—	$T_J > T_{SD}$

11.4.1 Normal Mode

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

1. The input voltage is greater than the rated output voltage plus the differential voltage ($V_{OUT(NOM)} + V_{DO}$) 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, the device operates in the dropout state and the output voltage tracks the input voltage.

11.4.3 Disabled

The WR0512 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 WR0512 is a linear voltage regulator with an input voltage of 2.5V to 5.5 V and an output voltage of 1.2V to 3.3 V. The accuracy is 3% for output voltages up to 1.5 V and 2% for output voltages greater than 1.5 V. The maximum output current is 500 mA. 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 WR0512 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. WR0512 is designed to use ceramic capacitors of 4.7 μF 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 Recommendations

The WR0512 has a V_{IN} range of between 2.5V and 5.5 V and an input capacitance of 4.7μF. 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.

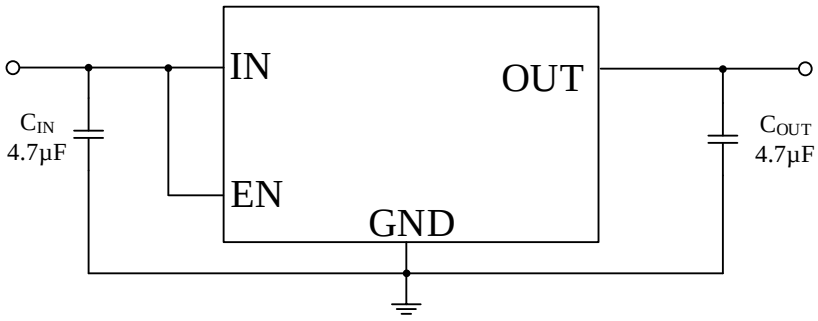
The module names are listed in the following table.

NAME	PACKAGE	EVALUATION MODULE
WR0512	SOT23-3	WAYON LDO EVM V1.1 -SOT23-3
	SOT23-5	WAYON LDO EVM V1.1 -SOT23-5
	SOT89-3	WAYON LDO EVM V1.1 -SOT89-3
	SOT89-3L	WAYON LDO EVM V1.1 -SOT89-3L

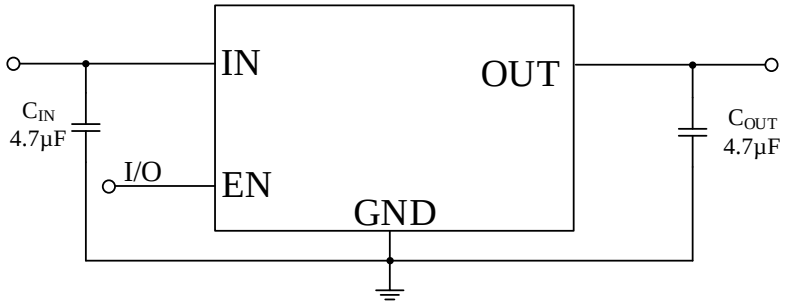
14.1 Typical Application Circuits

This section discusses the application of the WR0512 in the circuit. The following figure shows the schematic of the application circuit.

Circuit schematic 1: EN is connected to IN.



Circuit schematic 2: EN is controlled by external voltage.

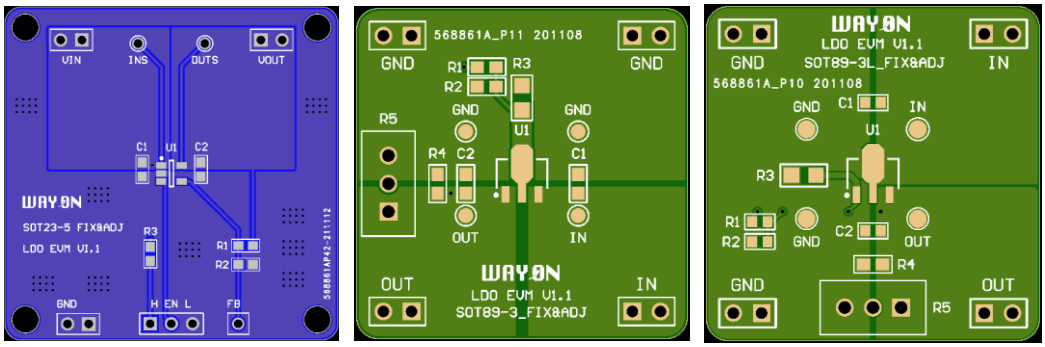


14.2 Layout of Typical Application Circuits

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 minimum 4.7μF 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 4.7μF output capacitor (C_{out}) is recommended to OUT. Connect the C_{IN} and C_{OUT} grounds, with LDO ground pins as close as possible, through a wide copper surface. Through-holes and long wires may seriously affect system performance and are not recommended.

Layout Example



15. Naming Conventions

WR AA BB-CC DDD E

WR: WAYON Regulator

AA: 05 - Output Current, 500mA

BB: Serial number

CC: Output Voltage

DDD: A20/21-Package, SOT89-3/3L

A30-Package, SOT23-3

A50-Package, SOT23-5

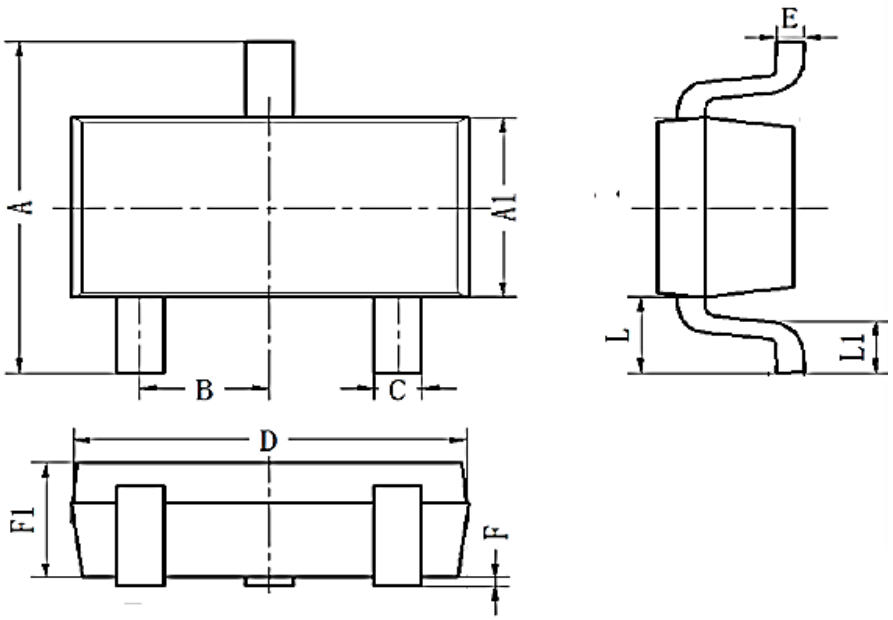
E: R-Reel & T-tube

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.

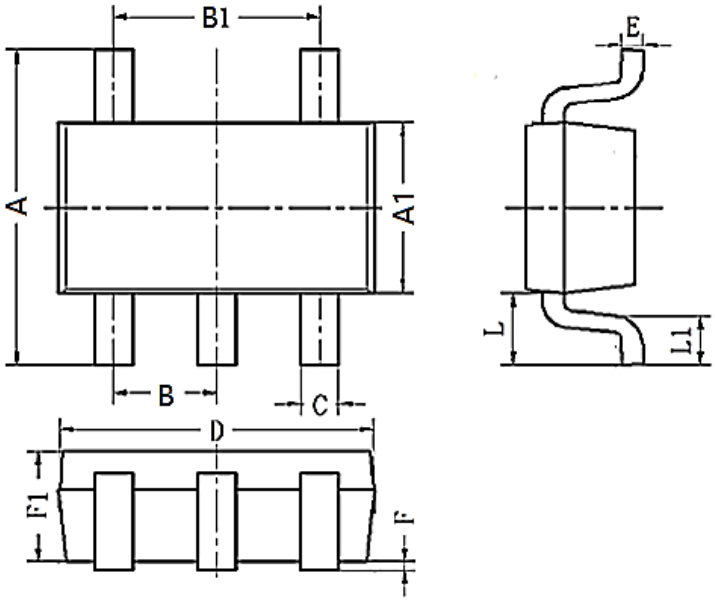
17. Package Information

SOT 23-3



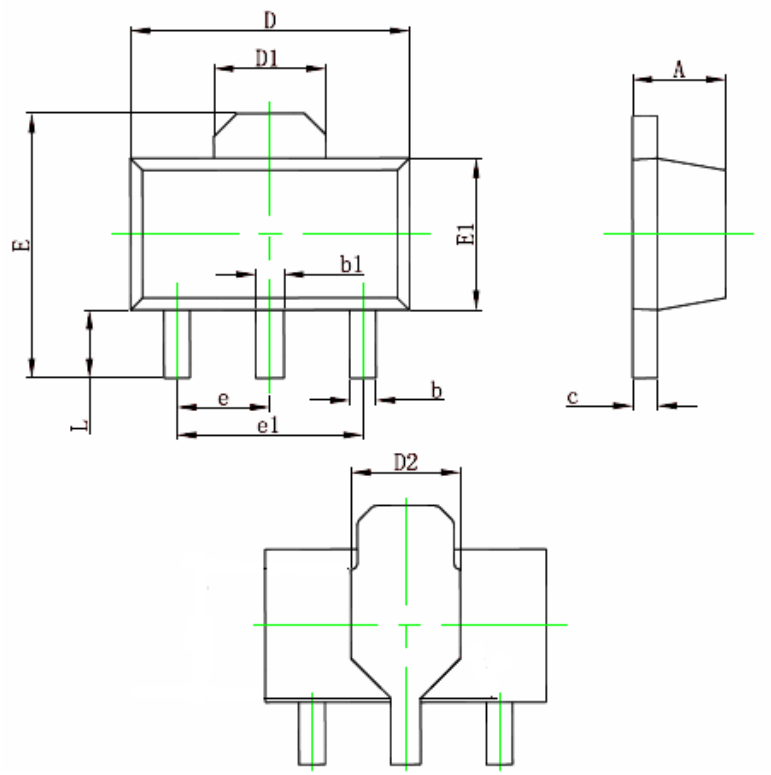
SYMBOL	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	2.60	2.80	3.00
A1	1.50	1.60	1.70
B		0.95BSC	
C	0.25	0.40	0.50
D	2.82	2.92	3.02
E	0.10	0.15	0.20
L		0.59REF	
L1	0.30	0.45	0.60
F1	0.90	1.10	1.30
F	0.00	0.08	0.15

SOT 23-5



SYMBOL	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MIN
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

SOT 89-3/L



SYMBOL	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	1.4	1.5	1.6
b	0.32	0.42	0.52
b1	0.38	0.48	0.58
c	0.35	0.405	0.46
D	4.40	4.50	4.60
D1	1.5	1.65	1.8
D2	1.70	1.95	2.20
E	3.94	4.12	4.30
E1	2.30	2.45	2.60
e	1.50BSC		
e1	3.00BSC		
L	0.80	1.00	1.20

18. Ordering Information

PART NUMBER	OUTPUT VOLTAGE	PACKAGE	PACKING QUANTITY	MARKING*
WR0512-12A50R	1.2V	SOT23-5	3k/Reel	WR0512 12 XXXX
WR0512-15A50R	1.5V	SOT23-5	3k/Reel	WR0512 15 XXXX
WR0512-18A50R	1.8V	SOT23-5	3k/Reel	WR0512 18 XXXX
WR0512-20A50R	2.0V	SOT23-5	3k/Reel	WR0512 20 XXXX
WR0512-22A50R	2.2V	SOT23-5	3k/Reel	WR0512 22 XXXX
WR0512-25A50R	2.5V	SOT23-5	3k/Reel	WR0512 25 XXXX
WR0512-28A50R	2.8V	SOT23-5	3k/Reel	WR0512 28 XXXX
WR0512-30A50R	3.0V	SOT23-5	3k/Reel	WR0512 30 JXXXX
WR0512-33A50R	3.3V	SOT23-5	3k/Reel	WR0512 33 JXXXX
WR0512-12A20R	1.2V	SOT89-3	1k/Reel	WR0512 12 XXXX
WR0512-15A20R	1.5V	SOT89-3	1k/Reel	WR0512 15 JXXXX
WR0512-18A20R	1.8V	SOT89-3	1k/Reel	WR0512 18 XXXX
WR0512-20A20R	2.0V	SOT89-3	1k/Reel	WR0512 20 XXXX
WR0512-22A20R	2.2V	SOT89-3	1k/Reel	WR0512 22 XXXX
WR0512-25A20R	2.5V	SOT89-3	1k/Reel	WR0512 25 XXXX
WR0512-28A20R	2.8V	SOT89-3	1k/Reel	WR0512 28 XXXX
WR0512-30A20R	3.0V	SOT89-3	1k/Reel	WR0512 30 JXXXX
WR0512-33A20R	3.3V	SOT89-3	1k/Reel	WR0512 33 JXXXX
WR0512-12A21R	1.2V	SOT89-3L	1k/Reel	WR0512 12 XXXX
WR0512-15A21R	1.5V	SOT89-3L	1k/Reel	WR0512 15 XXXX
WR0512-18A21R	1.8V	SOT89-3L	1k/Reel	WR0512 18 XXXX
WR0512-20A21R	2.0V	SOT89-3L	1k/Reel	WR0512 20 XXXX
WR0512-22A21R	2.2V	SOT89-3L	1k/Reel	WR0512 22 XXXX
WR0512-25A21R	2.5V	SOT89-3L	1k/Reel	WR0512 25 XXXX
WR0512-28A21R	2.8V	SOT89-3L	1k/Reel	WR0512 28 XXXX
WR0512-30A21R	3.0V	SOT89-3L	1k/Reel	WR0512 30 XXXX
WR0512-33A21R	3.3V	SOT89-3L	1k/Reel	WR0512 33 XXXX
WR0512-12A30R	1.2V	SOT23-3	3k/Reel	WR0512 12 XXXX
WR0512-15A30R	1.5V	SOT23-3	3k/Reel	WR0512 15 XXXX
WR0512-18A30R	1.8V	SOT23-3	3k/Reel	WR0512 18 XXXX
WR0512-20A30R	2.0V	SOT23-3	3k/Reel	WR0512 20 XXXX
WR0512-22A30R	2.2V	SOT23-3	3k/Reel	WR0512 22 XXXX

PART NUMBER	OUTPUT VOLTAGE	PACKAGE	PACKING QUANTITY	MARKING*
WR0512-25A30R	2.5V	SOT23-3	3k/Reel	WR0512 25 XXXX
WR0512-28A30R	2.8V	SOT23-3	3k/Reel	WR0512 28 XXXX
WR0512-30A30R	3.0V	SOT23-3	3k/Reel	WR0512 30 JXXXX
WR0512-33A30R	3.3V	SOT23-3	3k/Reel	WR0512 33 XXXX

* XXXX is variable. The chip is universal whether the marking has j or not.

Contact Information

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WAYON website: http://www.way-on.com
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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.