1. General Description

The WR0516 is a linear regulator capable of supplying 500mA output current. The input voltage is as low as Min. 1.6V and the output voltage can be set from 0.7V.

Each of these ICs consists of a voltage reference unit, an error amplifier, a resistor-net for voltage setting, a current-limiting circuit, and a thermal-shutdown circuit.

The WR0516 regulators are available in standard SOT23-5 package and DFN1x1-4 Package. Standard products are Pb-free and Halogen-free.

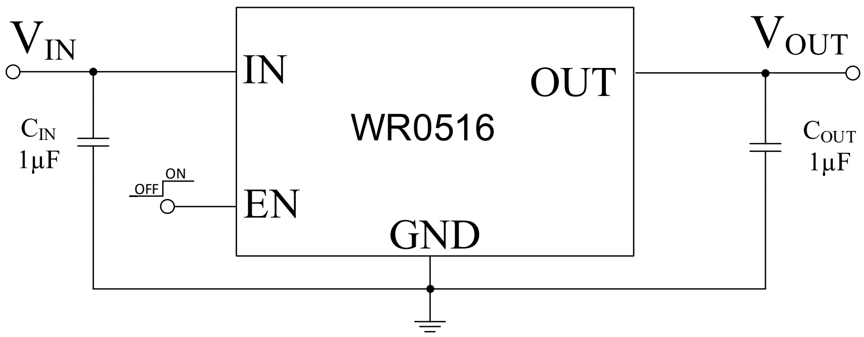
2. Features

- Wide Input Voltage Range: 1.6V to 5.5V
- Output Voltage Range: 0.7V to 3.6V
- Stable with Small 1μF Ceramic Capacitors
- High Output voltage Accuracy: ±0.8%
- Thermal Shutdown Protection: 165ºC
- Over-current Protection
- Dropout Voltage: 130mV Typ. at 500mA, V_{OUT_NOM} = 3.3V
- Excellent Load/Line Transient Response
- With Output Discharge Function
- Quiescent Current typ: 85μA

3. Applications

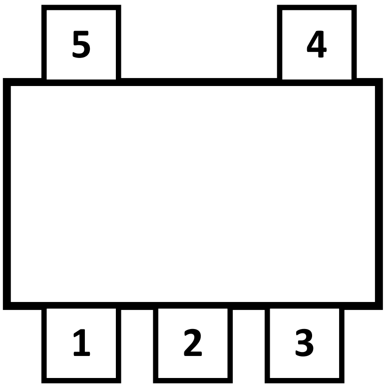
- Portable and Battery-Powered Equipment
- Portable Communication Equipment
- Cameras, Image Sensors and Camcorders

4. Typical Application

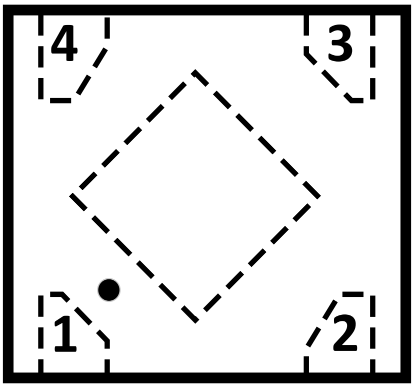


5. Pin Configuration

(Top View)



SOT23-5



DFN-4

6. Pin Description

PIN NUMBER		PIN NAME	I/O	PIN FUNCTION
SOT23-5	DFN-4			
1	4	IN	I	Input voltage supply. Bypass with a typical 1μF capacitor to GND. Place the input capacitor as close to the IN and GND pins of the device as possible.
2	2	GND	-	Common ground.
3	3	EN	I	Enable input. Active High. EN includes a small pull-down current source, nominally 0.1μ A.
4	-	NC	-	NC
5	1	OUT	O	Regulated output voltage. A low equivalent series resistance (ESR) capacitor, typically 1μF, is required from OUT to ground for stability. Place the output capacitor as close to the OUT and GND pins of the device as possible.
-	-	EPAD	-	Exposed pad .It should be connected directly to the GND pin as short as possible or leave floating. Connect the EPAD to a large-area ground plane for best thermal performance. Do not connect to any potential other than GND.

7. Absolute Maximum Ratings

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

PARAMETER		RATING	UNIT
Input Voltage Range		-0.3 to 6.0	V
EN Input Voltage Range		-0.3 to 6.0	
Output Voltage Range		-0.3 to 6.0	
Power Dissipation $P_{D(MAX)}$@T_A = 25°C	SOT23-5	600	mW
	DFN-4	560	
Thermal Resistance[2] [4], $R_{θJA}$	SOT23-5	208	℃/W
	DFN-4	223	
Thermal Resistance[2] [3] ,$R_{θJB}$	SOT23-5	189.09	
	DFN-4	204.8	
Top Thermal Resistance[2] [3],$R_{θJC}$	SOT23-5	98.9	
	DFN-4	131.6	
Bottom Thermal Resistance[2] [3] , $R_{θJC}$	SOT23-5	46.36	
	DFN-4	56.54	
Junction Temperature		150	℃
Lead Temperature Range		260	
Storage Temperature Range		-55 to 150	
ESD Susceptibility	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, 2 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 $P_{D(MAX)} = (T_J - T_A) / R_{θJA}$.

8. Recommended Operating Conditions

PARAMETER	RATING	UNIT
Input Voltage Range	1.6 to 5.5	V
EN Input Voltage Range	0 to 5.5	
Nominal Output Voltage Range	0.7 to 3.6	
Output Current Range	0 to 500	mA
Input Capacitor	1	μF
Output Capacitor	1	
Operating Temperature Range	-40 to 85	℃

9. Electrical Characteristics

(V_{IN} =$V_{OUT-NOM}$+0.5V or V_{IN}=1.6V (Whichever is higher), V_{EN}=1.2V, I_{OUT}=1mA, C_{IN}=C_{OUT}=1.0μF, T_A=25°C, Full=-40℃ to 85℃,unless otherwise noted)

SYMBOL	PARAMETER	TEST CONDITIONS		MIN	TYP.	MAX	UNIT
V_{OUT}	Output Voltage	V_{OUT_NOM}≥1.8V	T_A=+25℃	-0.8		0.8	%
			-40℃≤T_A≤85℃	-2.0		1.0	
		V_{OUT_NOM}<1.8V	T_A=+25℃	-1.2		1.2	
			-40℃≤T_A≤85℃	-2.5		1.5	
LDR	Load Regulation[5]	1mA ≤ I_{OUT} ≤ 500mA, V_{IN} ≥ 1.8V, T_A = +25°C			3	10	mV
LNR	Line Regulation	V_{IN} = $V_{OUT-NOM}$ + 0.5V to 5.25V V_{IN} ≥ 1.6V, I_{OUT} = 1mA, T_A = +25°C			0.02	0.1	%/V
V_{DO}	Dropout Voltage[6]	I_{OUT} = 500mA, Full	1.2V ≤ V_{OUT} < 1.4V		520	580	mV
			1.4V ≤ V_{OUT} < 1.8V		295	380	
			1.8V ≤ V_{OUT} < 2.1V		200	285	
			2.1V ≤ V_{OUT} < 2.5V		160	240	
			2.5V ≤ V_{OUT} < 3.0V		130	200	
			3.0V ≤ V_{OUT} < 3.6V		120	175	
I_Q	Quiescent Current	I_{OUT}=0mA, Full			85	110	μA
I_{SHDN}	Shut-down Current	V_{EN}=0V, T_A = +25°C			0.1	1	μA
I_{OUT}	Output Current Limit[7]	V_{OUT} = $V_{OUT-NOM}$ *98%, V_{IN}≥ 1.75V		500	1000		mA
		V_{OUT} = $V_{OUT-NOM}$ *98%, V_{IN}≥ 1.6V		300	600		
I_{SHORT}	Short Circuit Current	V_{OUT} = 0V, V_{IN} ≥ 1.75 V		500	1000		mA
V_{ENH}	EN Pin Threshold Voltage	EN Input Voltage "H"		1.0			V
V_{ENL}		EN Input Voltage "L"				0.4	
I_{EN}	Enable Input Current	V_{EN} = V_{IN} = 5.5V			0.1	0.6	μA
PSRR	Power Supply Rejection Ratio	V_{IN} = (V_{OUT} + 1.0)V +0.2V_{P-P},I_{OUT} = 30mA	f = 1kHz		75		dB
			f = 10kHz		60		
V_{NO}	Output Noise	f = 10 Hz to 100 kHz			54		$μV_{RMS}$

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
R_{DIS}	Output Discharge Resistance	V_{IN} = 4.0V, V_{EN} = 0V, V_{OUT} = $V_{OUT-NOM}$		60		Ω
$\frac{\Delta V_{OUT}}{\Delta T_A \times V_{OUT}}$	Output Voltage Temperature Coefficient	I_{OUT}=1mA , Full		40		ppm/ºC
T_{SD}	Thermal Shutdown Temperature	Temperature rising from 25°C		165		℃
T_{SD_HYST}	Thermal Shutdown Hysteresis	Temperature falling from T_{SD_TEMP}		25		℃

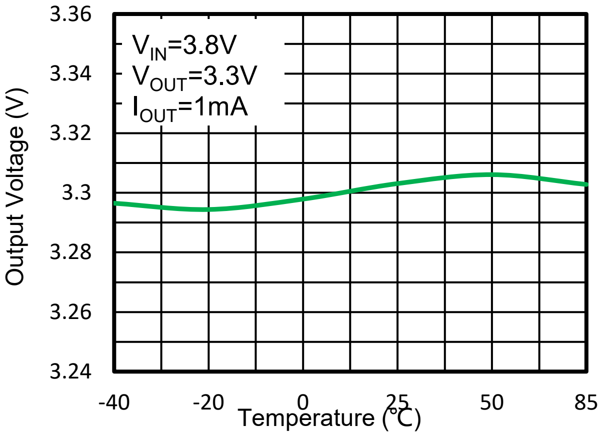
NOTE5: The Load regulation is measured using pulse techniques with duty cycle < 5%.

NOTE6: The dropout voltage is defined as (V_{IN}-V_{OUT}) when V_{OUT} is $V_{OUT(NOM)}$*98%.

NOTE7: 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}.

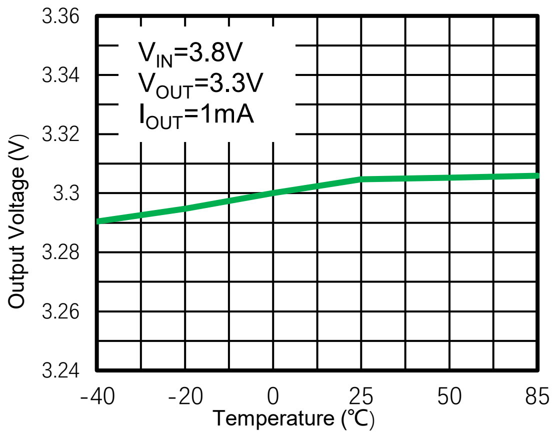
10. Typical Performance Characteristics

(T_A=-40°C to 85°C, V_{IN}=V_{OUT}+0.5V, C_{IN}=C_{OUT}=1μF, unless otherwise noted)



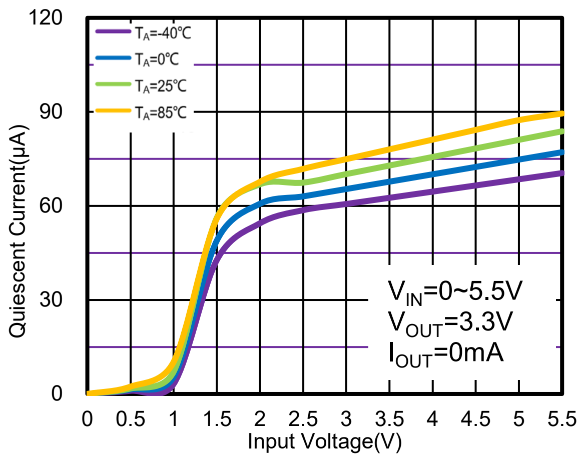
WR0516-33FF4R

Output Voltage vs. Ambient Temperature



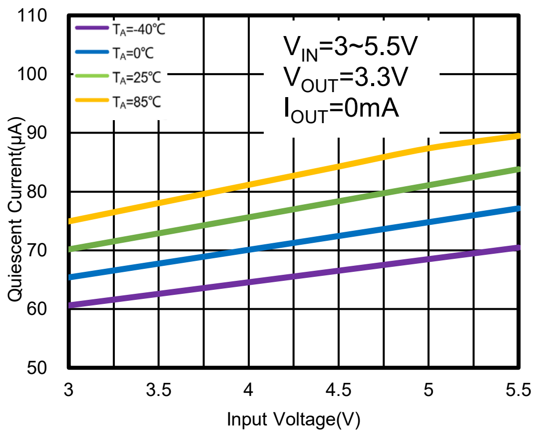
WR0516-33A50R

Output Voltage vs. Ambient Temperature



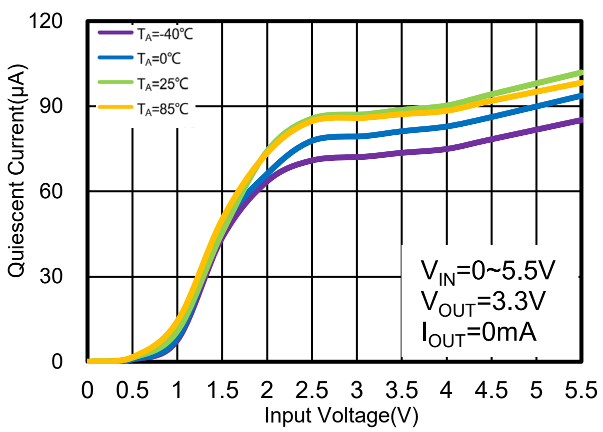
WR0516-33FF4R

Quiescent Current vs. V_{IN} & Ambient Temperature



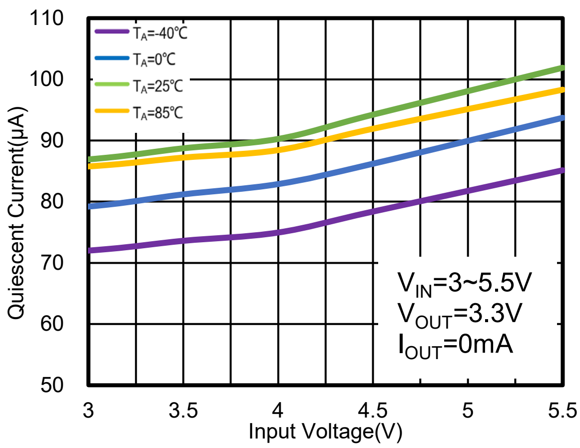
WR0516-33FF4R

Quiescent Current vs. V_{IN} & Ambient Temperature



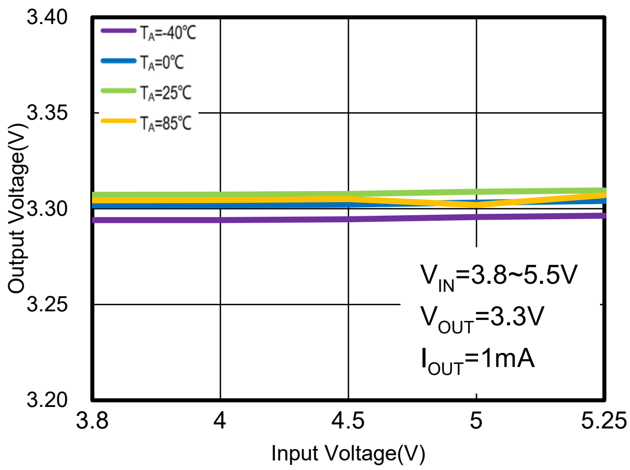
WR0516-33A50R

Quiescent Current vs. V_{IN} & Ambient Temperature



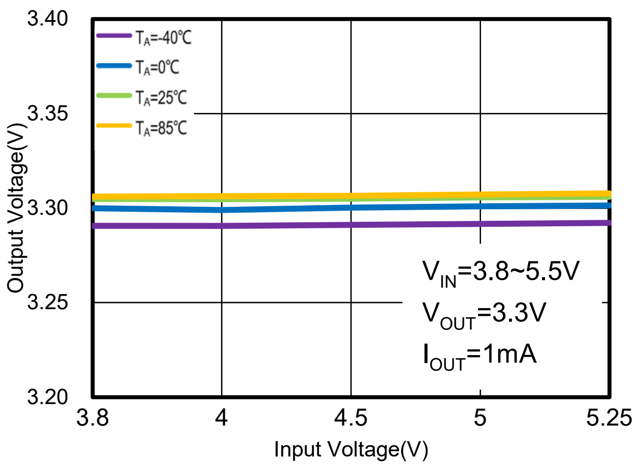
WR0516-33A50R

Quiescent Current vs. V_{IN} & Ambient Temperature



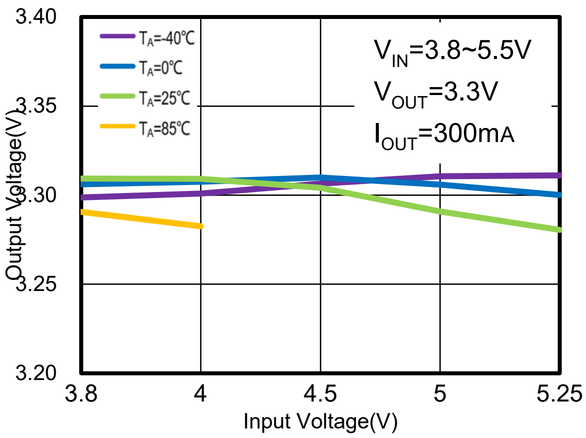
WR0516-33FF4R

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



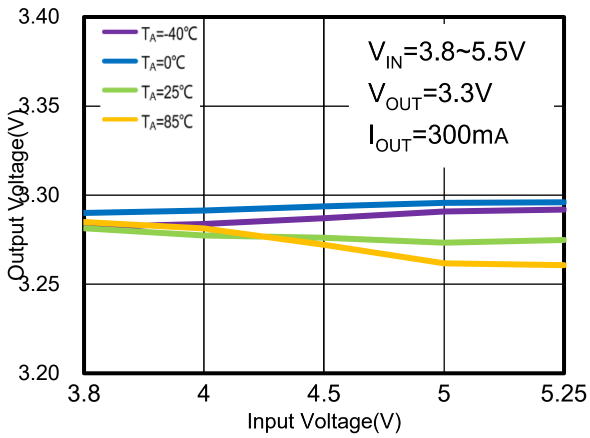
WR0516-33A50R

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



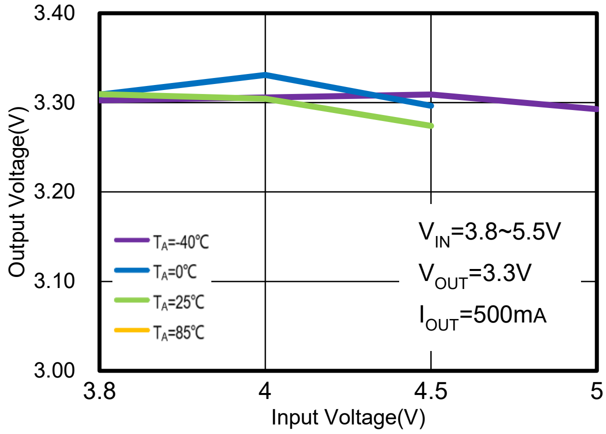
WR0516-33FF4R

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



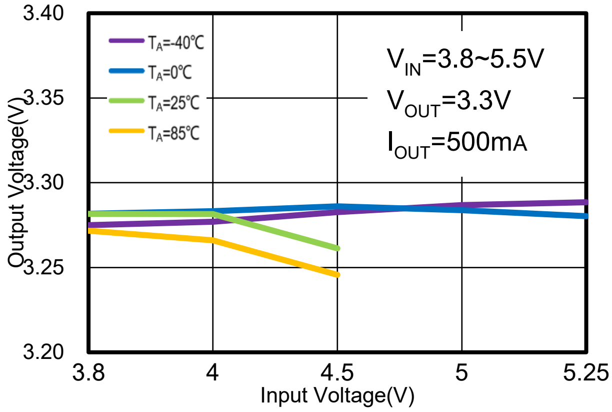
WR0516-33A50R

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



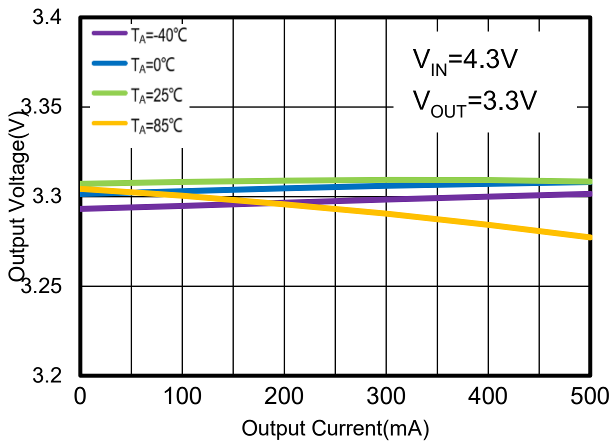
WR0516-33FF4R

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

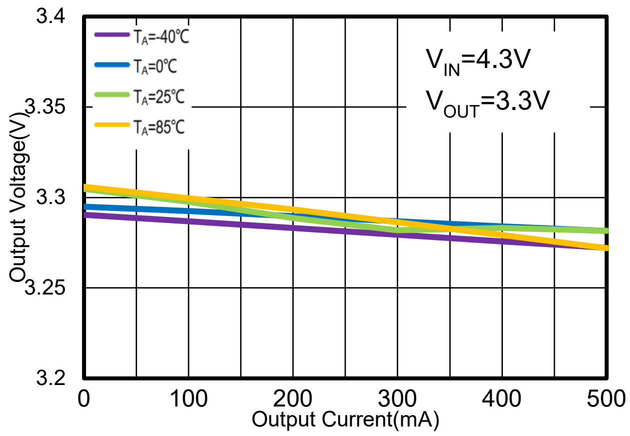


WR0516-33A50R

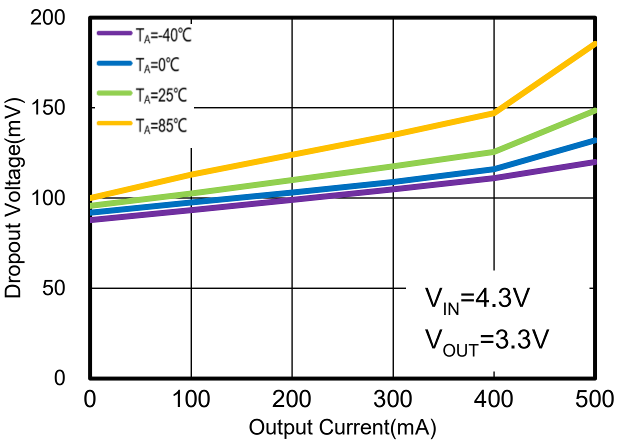
Regulation vs. V_{IN} (Line Regulation) & Ambient Temperature



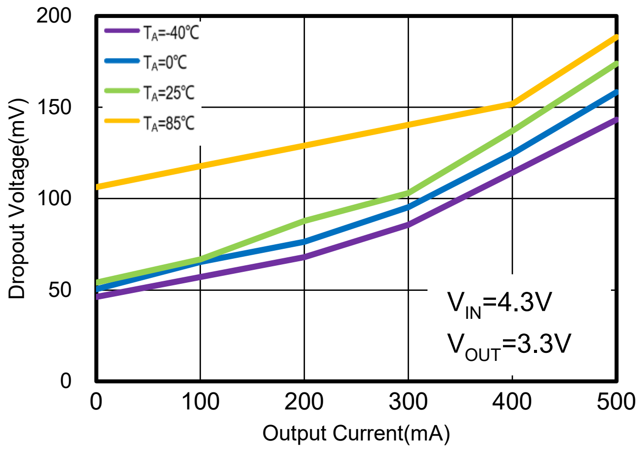
WR0516-33FF4R
Load Regulation vs. I_{OUT} & Ambient Temperature



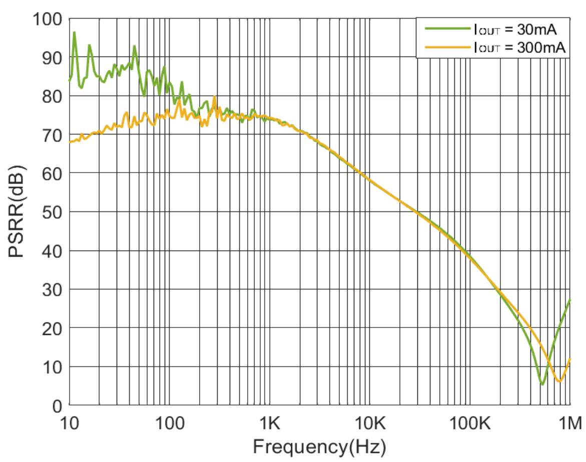
WR0516-33A50R
Load Regulation vs. I_{OUT} & Ambient Temperature



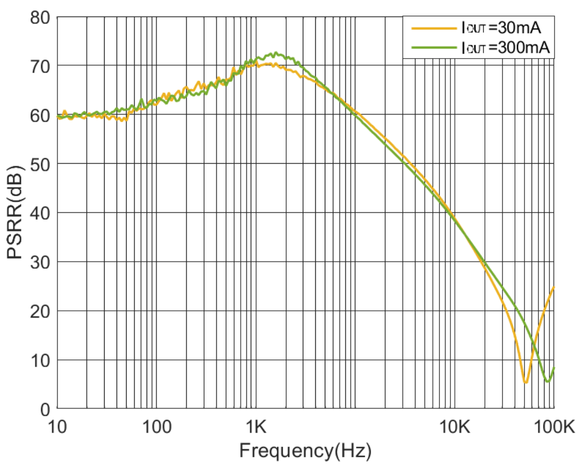
WR0516-33FF4R
Dropout Voltage vs. I_{OUT} & Ambient Temperature



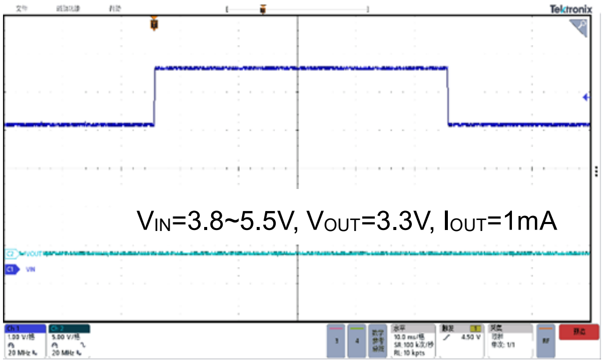
WR0516-33A50R
Dropout Voltage vs. I_{OUT} & Ambient Temperature



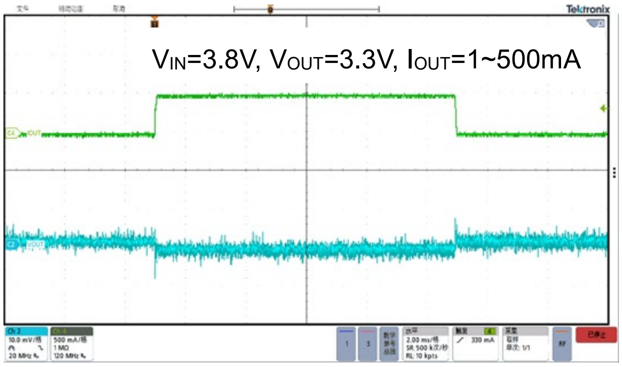
WR0516-12A50R PSRR



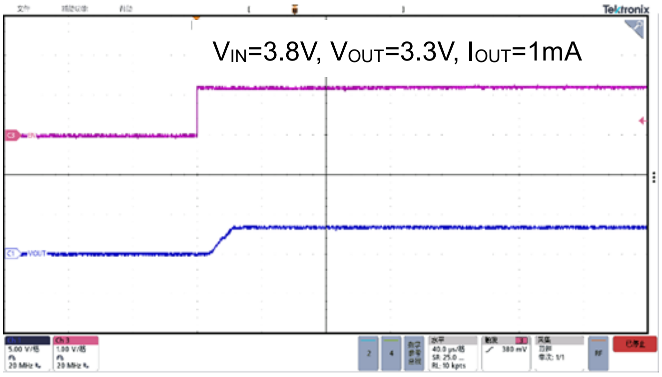
WR0516-33A50R PSRR



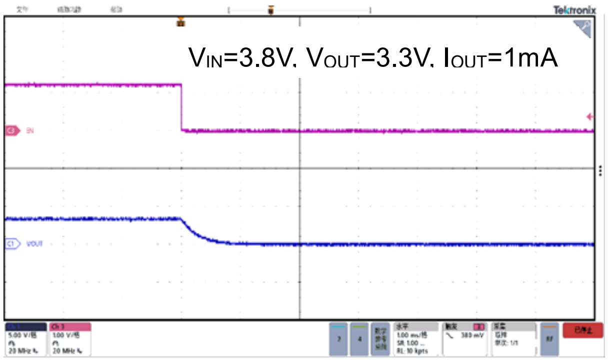
WR0516-33A50R
Line Transient



WR0516-33A50R
Load Transient



WR0516-33A50R
Soft Start from EN



WR0516-33A50R
EN Shutdown

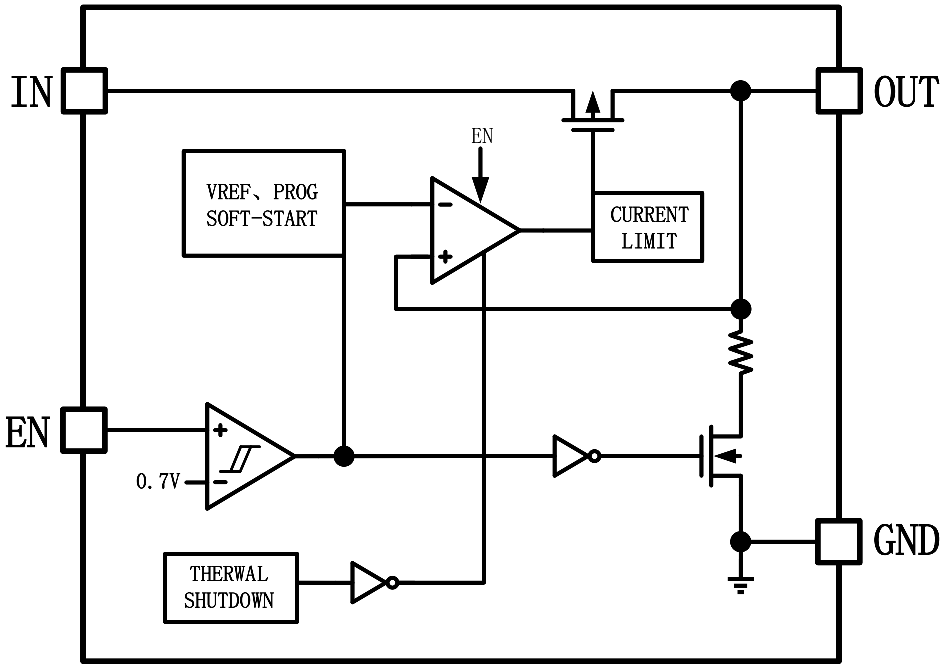
11. Function Description

11.1 Overview

The WR0516 is a linear regulator capable of supplying 500mA output current. The input voltage is as low as Min. 1.6V and the output voltage can be set from 0.7V.

Each of these ICs consists of a voltage reference unit, an error amplifier, a resistor-net for voltage setting, a current-limiting circuit, and a thermal-shutdown circuit.

11.2 Block Diagram



11.3 Feature Description

11.3.1 Output Voltage Accuracy

Output voltage accuracy specifies minimum and maximum output voltage error, relative to the expected nominal output voltage stated as a percent. The WR0516 features an output voltage accuracy of 0.8% that includes the errors introduced by the internal reference, load regulation, and line regulation variance across the full range of rated load and line operating conditions over temperature, as specified by the Electrical Characteristics table. Output voltage accuracy also accounts for all variations between manufacturing lots.

11.3.2 Enable (EN)

The WR0516 EN pin has internal pull−down current source with value of 100 nA typ. When the input voltage of the enable pin is higher than the high enable voltage threshold, the device output is normal. When the input voltage of the enable pin is lower than the low input voltage threshold of the EN pin, the device output is disabled. If you do not need to control the output voltage independently, connect the enable pin to the input of the device.

11.3.3 Dropout Voltage (V_{DO})

WR0516 is a low dropout voltage regulator 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. For CMOS regulators, the dropout voltage is determined by the $R_{DS\ (ON)}$ of the pass-FET.

The $R_{DS\ (ON)}$ is calculated as follows:

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

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:

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

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 WR0516 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 WR0516 has a low noise reference, high PSRR to ensure that output noise is reduced during normal operation.

11.3.6 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 in the 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_{SHORT}.

The WR0516 uses a constant current limiting mode where the final current is around 1000 mA, thus providing good protection to the device.

11.3.7 Thermal Protection

The WR0516 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 140°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 WR0516'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 WR0516 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	$5.5V \geq V_{IN} \geq V_{OUT}(NOM) + V_{DO}$	$V_{EN} > V_{IH(EN)}$	$I_{OUT} < I_{CL}$	$T_J < T_{sd}$
Dropout	$V_{UVLO} \leq V_{IN} < V_{OUT}(NOM) + V_{DO}$	$V_{EN} > V_{IH(EN)}$	$I_{OUT} < I_{CL}$	$T_J < T_{sd}$
Disabled	$V_{IN} < V_{UVLO}$	$V_{EN} < V_{IL(EN)}$	-	$T_J > T_{sd}$

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

11.4.2 Dropout Mode

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

11.4.3 Disabled

The WR0516 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 and Implementation

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 WR0516 is a linear voltage regulator with an input voltage of 1.6V to 5.5 V and an output voltage of 0.7 V to 3.6 V. The accuracy is 1.5% for output voltages up to 1.8V and 1% for output voltages greater than 1.8 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.

12.1.1 Start-Up

12.1.1.1 Enable (EN)

The WR0516 can determine the output of the device through the EN input voltage, EN is higher than the voltage threshold to turn on, in order to prevent the device from turning off when the input voltage drops during the turn-on period, EN has a certain hysteresis. WR0516 internal EN to GND has a small pull-down current source, the pull-down current is about 150nA, when EN floats default to low, if you do not need EN independent control, it is recommended to connect EN directly to IN. If you want to use the EN control, you need to give a control voltage to the EN side.

12.1.1.2 Automatic Discharge

The WR0516 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.

12.1.1.3 Soft-Start

Soft start refers to the characteristic that the output voltage rises gradually as the EN voltage jumps from low to high. Reducing the output voltage rise rate reduces the inrush current that charges the output capacitor. The inrush current is the current entering the LDO during startup and consists of the load current, the current charging the output capacitor, and the ground pin current.

The inrush current can be estimated by the following equation:

$$I_{OUT}(t) = \left(\frac{C_{OUT} \text{ x } dV_{OUT}(t)}{dt}\right) + \left(\frac{V_{OUT}(t)}{R_{LOAD}}\right)$$

The WR0516 controls soft-start through an external capacitor, which helps to reduce inrush current and reduce load transients on the input power bus, thus solving startup initialization problems that can result when powering FPGAs, DSPs, or other high-current loads.

12.1.2 Capacitor Recommendation

The WR0516 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. WR0516 is designed to use ceramic capacitors of 1 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.

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.

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

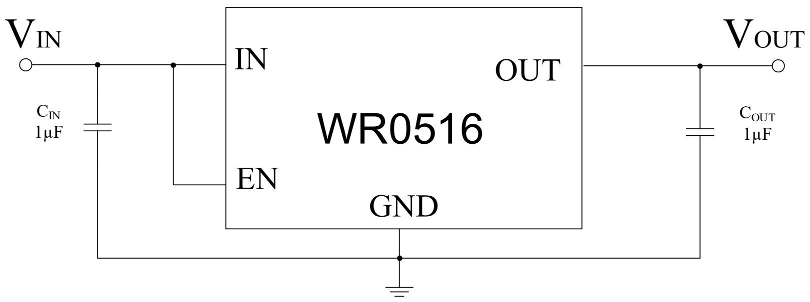
$$T_J = T_A + (\theta_{JA} \times P_D)$$

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.

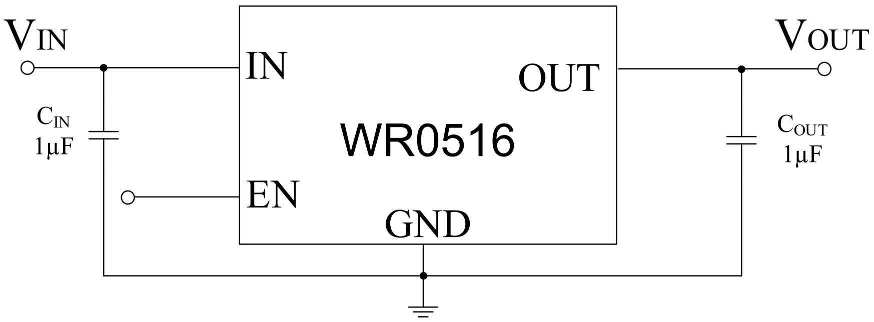
12.2 Typical Application

This section discusses the application of the WR0516 in the circuit. The following figure shows the schematic of the application circuit.

Circuit schematic 1: V_{OUT} normally open, no control.



Circuit schematic 2: V_{OUT} control by external voltage EN.



C_{IN} and C_{OUT} are to be selected with the recommended appropriate capacitance. 1μF ceramic capacitors are selected for both C_{IN} and C_{OUT} to help balance the charge needed to charge the output capacitor during startup, thus reducing the input voltage drop.

13. Power Supply Recommendations

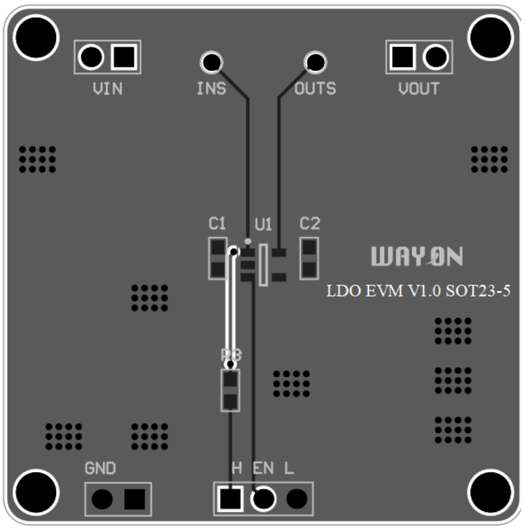
The WR0516 has a V_{IN} range of between 1.6 V and 5.5 V and an input capacitance of 1μF. The input voltage should have some redundancy to ensure a stable output voltage when the load fluctuates. If the input supply is noisy, additional input capacitors can be used to improve the noise performance of the output.

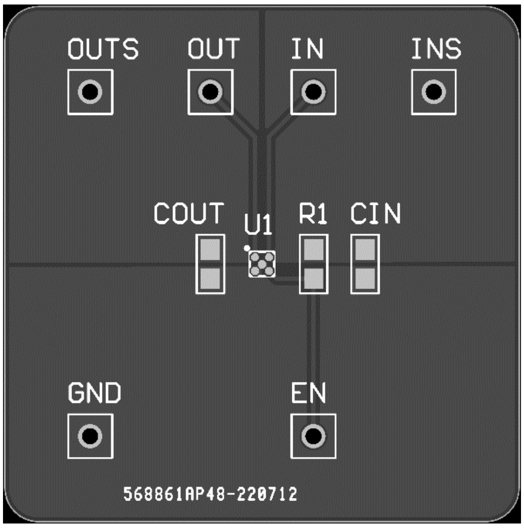
14. Layout

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.

14.1 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
WR0516	SOT23-5	WAYON LDO EVM V1.0-SOT23-5
	DFN-4	WAYON LDO EVM V1.0-DFN1*1-4

16. Naming Conventions

WR AA BB-CC DDD E

WR: WAYON Regulator;

AA: 05 –Output Current, 500mA;

BB: Serial number;

CC: Output Voltage;

DDD: A50-Package, SOT23-5;

FF4-Package, DFN-4

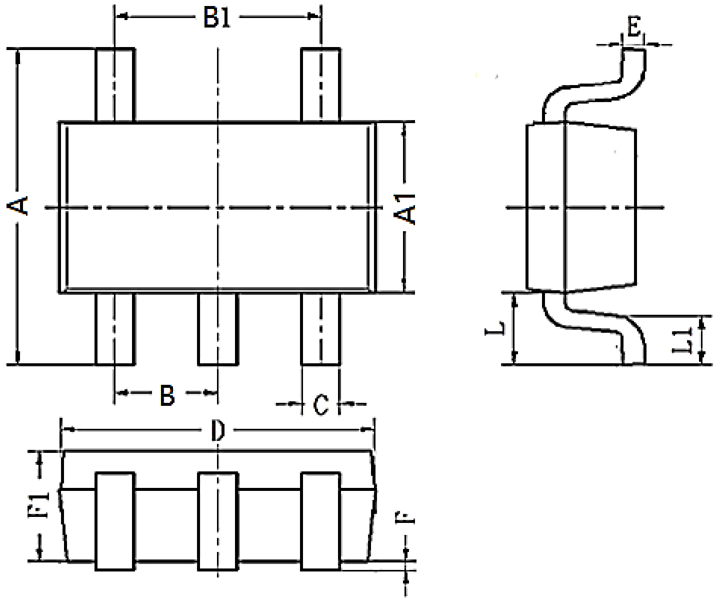
E: R-Reel & T-tube;

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.

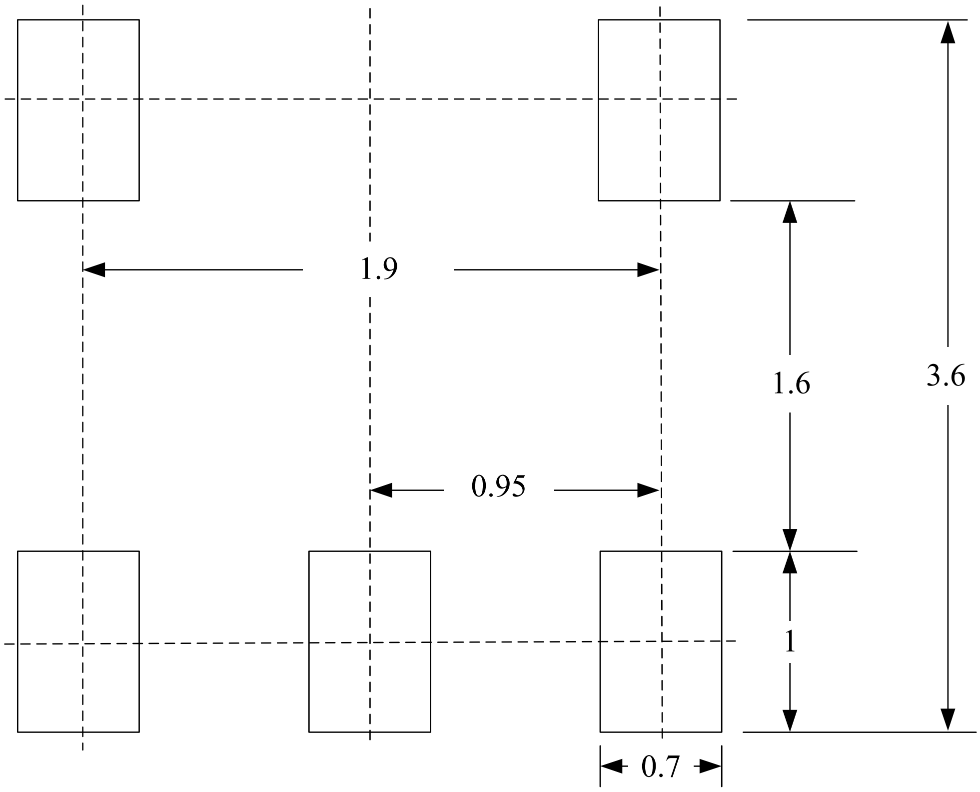
18. Package Information

SOT 23-5



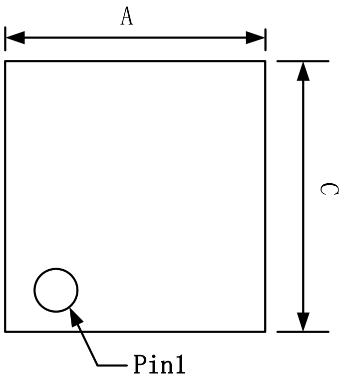
SYMBOL	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	2.60	2.80	3.00
A1	1.50	1.60	1.70
B	0.95BSC		
B1	1.90BSC		
C	0.25	0.40	0.50
D	2.82	2.92	3.02
E	0.10	0.15	0.20
F	0.00	0.08	0.15
L	0.59REF		
L1	0.30	0.45	0.60
F1	0.90	1.10	1.30

Suggested Pad Layout: SOT 23-5

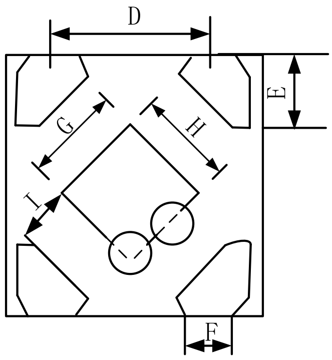


NOTE: Dimensions in Millimeters

DFN1*1-4



Top View

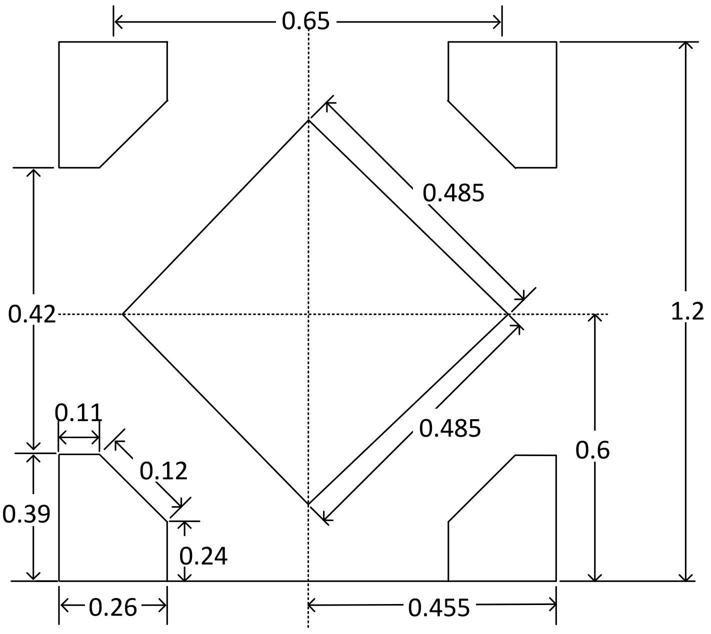


Bottom View

Side View

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

Suggested Pad Layout: DFN-4



NOTE: Dimensions in Millimeters

19. Ordering Information

PART NUMBER	OUTPUT VOLTAGE	PACKAGE	PACKING QUANTITY	MARKING*
WR0516-07FF4R	0.7V	DFN-4	10k/Reel	516 07
WR0516-08FF4R	0.8V	DFN-4	10k/Reel	516 08
WR0516-09FF4R	0.9V	DFN-4	10k/Reel	516 09
WR0516-10FF4R	1.0V	DFN-4	10k/Reel	516 10
WR0516-105FF4R	1.05V	DFN-4	10k/Reel	516 105
WR0516-11FF4R	1.1V	DFN-4	10k/Reel	516 11
WR0516-12FF4R	1.2V	DFN-4	10k/Reel	516 12
WR0516-15FF4R	1.5V	DFN-4	10k/Reel	516 15
WR0516-18FF4R	1.8V	DFN-4	10k/Reel	516 18
WR0516-28FF4R	2.8V	DFN-4	10k/Reel	516 28
WR0516-30FF4R	3.0V	DFN-4	10k/Reel	516 30
WR0516-33FF4R	3.3V	DFN-4	10k/Reel	516 33
WR0516-07A50R	0.7V	SOT23-5	3k/Reel	WR0516 07 XXXX
WR0516-08A50R	0.8V	SOT23-5	3k/Reel	WR0516 08 XXXX
WR0516-09A50R	0.9V	SOT23-5	3k/Reel	WR0516 09 XXXX
WR0516-10A50R	1.0V	SOT23-5	3k/Reel	WR0516 10 XXXX
WR0516-105A50R	1.05V	SOT23-5	3k/Reel	WR0516 105 XXXX
WR0516-11A50R	1.1V	SOT23-5	3k/Reel	WR0516 11 XXXX
WR0516-12A50R	1.2V	SOT23-5	3k/Reel	WR0516 12 XXXX
WR0516-15A50R	1.5V	SOT23-5	3k/Reel	WR0516 15 XXXX
WR0516-18A50R	1.8V	SOT23-5	3k/Reel	WR0516 18 XXXX
WR0516-28A50R	2.8V	SOT23-5	3k/Reel	WR0516 28 XXXX
WR0516-30A50R	3.0V	SOT23-5	3k/Reel	WR0516 30 XXXX
WR0516-33A50R	3.3V	SOT23-5	3k/Reel	WR0516 33 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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WAYON website: http://www.way-on.com
For additional information, please contact your local Sales Representative.

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.