Description

The WL9005 series are highly precise, low noise, positive voltage LDO regulators manufactured using CMOS processes. The series achieves high ripple rejection and low dropout and consists of a standard voltage source, an error correction, current limiter and a phase compensation circuit plus a driver transistor. Output voltage is selectable in 0.05V increments within a range of 0.8V ~ 5.0V. The series is also compatible with low ESR ceramic capacitors which give added output stability.It provides up to 500mA of output current in miniaturized packaging. The features of low quiescent current as low as 0.3μA and almost zero disable current is ideal for powering the battery equipment to a longer service life. The other features include current limit function, Integrated Short-Circuit Protection ,over temperature protection and Fast discharge function.

Features

- Low Power Consumption: 0.3 μA (Typ)
- Maximum Output Current: 500mA
- Low Dropout Voltage: 100mV@100mA (V_{OUT}=3.3V)
- Operating Voltage Range: 2.0V ~ 7.0V
- Output Voltage Accurate: ± 1.5%
- High PSRR: 70dB @1kHz
- Good Transient Response
- Integrated Short-Circuit Protection
- Over-Temperature Protection
- Output Current Limit
- Low Temperature Coefficient
- Stable with Ceramic Capacitor
- RoHS Compliant and Lead (Pb) Free
- -40°C to +85°C Operating Temperature Range
- Fixed Output Voltage Versions: 0.8,1.0,1.2,1.5,1.8,2.5,2.8,3.0,3.3,3.6 and 5.0V（steps 0.05V）
  Special Request: Any Voltagebetween 0.8V and 5.0V under specific business agreement
- Available in Green SOT23-3,SOT23-5,SOT89-3,DFN1x1-4L,DFN2x2-6L Packages

Applications

- Battery-powered equipment
- Wireless Communication Equipment
- Reference voltage sources
- Audio/Video Equipment
- Low Power Microcontrollers
- Portable games

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Application Circuits

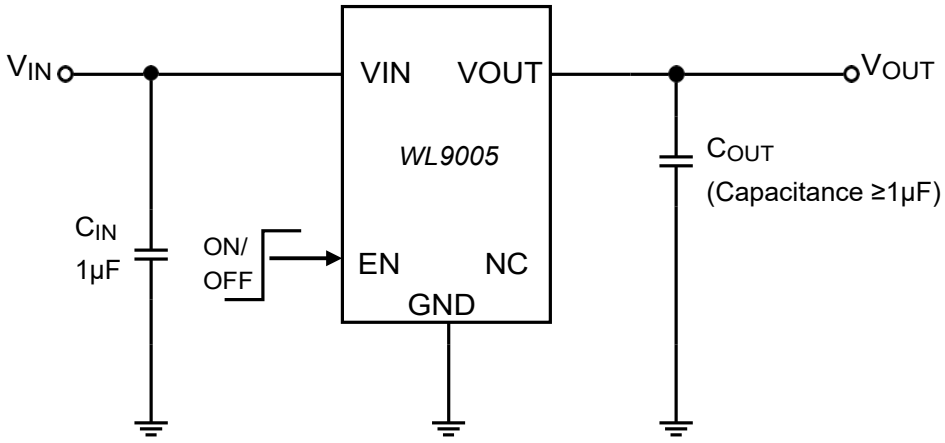
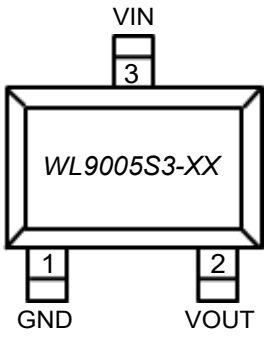
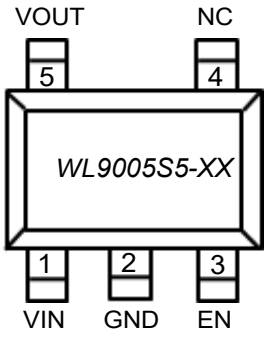


Figure 1. WL9005 Typical Application Circuit

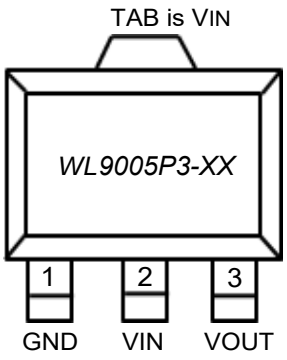
Pin Configuration （TOP VIEW）



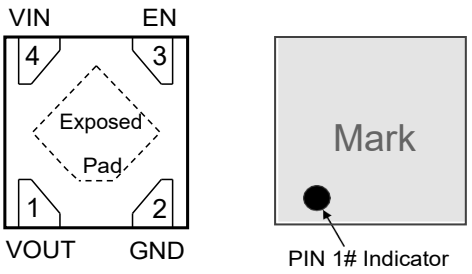
SOT23-3



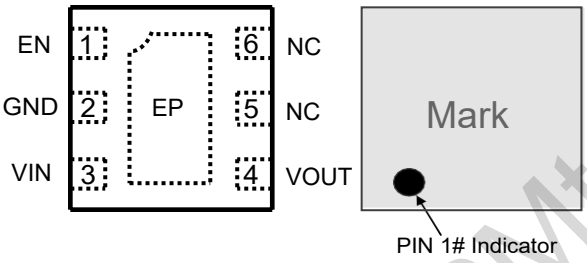
SOT23-5



SOT89-3



WL9005D4-XX
DFN-4L (1mm × 1mm)
0.4mm height(max),0.65mm pitch



WL9005F6-XX
DFN-6L (2mm × 2mm)
0.6mm height(max),0.65mm pitch

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Pin Description

Pin No.					Pin Name	Pin Function
SOT23-5	SOT23-3	SOT89-3	DFN1010-4L	DFN2020-6L		
S5	S3	P3	D4	D6		
1	3	2	4	3	VIN	Power Input
2	1	1	2	2	GND	Ground
3	-----	-----	3	1	EN	Enable Control Input
5	2	3	1	4	VOUT	Output Voltage
4	-----	-----	-----	5、6	NC	No Connect
EP / TAB	In PCB layout, prefer to use large copper area to cover this pad for better thermal dissipation					

Order Information

WL9005①②-③④

Designator	Symbol	Description
①②	S3 , S5 , P3 , D4 , F6	SOT23-3L , SOT23-5L , SOT89-3L , DFN1X1-4L , DFN2X2-6L
③④	Integer e.g 3.3=33	Output Voltage 0.8,1.0,1.2,1.5,1.8,2.5,2.8,3.0,3.3, 3.6 and 5.0V

Part NO.	Description	Package	T/R Qty
WL9005S3-XX	WL9005 7V ,0.3μA IQ ,High PSRR ,500mA Low-Dropout LDO	SOT23-3L	3,000 PCS
WL9005S5-XX		SOT23-5L	3,000 PCS
WL9005P3-XX		SOT89-3L	1,000 PCS
WL9005D4-XX		DFN1X1-4L	10,000 PCS
WL9005F6-XX		DFN2X2-6L	5,000 PCS

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Absolute Maximum Ratings

Item		Symbol	Rating	Unit
Supply Input Voltage		V_{IN}	-0.3 ~ 9	V
EN to GND		V_{EN}	-0.3 ~ 9	V
Regulated Output Voltage		V_{OUT}	-0.3 ~ 5	V
Output Current		I_{OUT}	Internally limited	mA
Power Dissipation P_D @T_A=+25℃	SOT23-3L	P_D	450	mW
	SOT23-5L		500	
	SOT89-3L		700	
	DFN1X1-4L		530	
	DFN2X2-6L		750	
Thermal Resistance (Junction to air)	SOT23-3L	θ_{JA}	275	°C /W
	SOT23-5L		250	
	SOT89-3L		180	
	DFN1X1-4L		235	
	DFN2X2-6L		165	
Human Body Model (HBM)		±4000		V
Charged Device Mode (CDM)		±2000		V
Machine Mode (MM)		200		V
Storage Temperature Range		T_{STG}	-65 ~ +150	°C
Operating Junction Temperature		T_J	+150	°C
Lead Temperature (Soldering 10s)		T_{LEAD}	+260	°C

Note：

1、Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these conditions is not implied. Exposure to absolute-maximum-rated conditions for extended period may affect device reliability.

2、Ratings apply to ambient temperature at +25°C.

3、The package thermal impedance is calculated in accordance to JESD 51-7.

Recommended Operating Conditions

Item	Min	Max	Unit
Operating Ambient Temperature	-40	+85	°C
Input Voltage	2.0	7.0	V
Output Voltage	0.8	5.0	V

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Electronic Characteristics

Test Conditions: V_{IN} = V_{OUT} +1V,C_{IN}=C_{OUT}=1uF,T_A=25℃, unless otherwise specifi

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Input Voltage	V_{IN}			2.0	——	7.0	V
Quiescent Current	I_Q	V_{IN} >V_{OUTNOM} , V_{IN}=EN I_{OUT} =0mA		——	0.3	0.5	μA
Shutdown Current	I_{SHDN}	EN=0 V , V_{OUT} =0 V			0	0.1	μA
Output Voltage	V_{OUT}	V_{IN} = V_{OUTNOM} +1V I_{OUT} =10mA		V_{OUT} x 0.985	——	V_{OUT} x 1.015	V
Output Current	I_{OUT}	V_{IN} = V_{OUTNOM} +1V		500	——	——	mA
Dropout Voltage V_{OUT} =3.3V	V_{DROP}	I_{OUT} =100mA		——	100	——	mV
		I_{OUT} =500mA		——	600	750	
Line Regulation	Δ V_{LINE}	I_{OUT} =10mA V_{OUTNOM} +1.0V ≦ V_{IN} ≦7V		——	0.05	——	% / V
Load Regulation	Δ V_{LOAD}	V_{IN} = V_{OUTNOM} +1V 1mA≦ I_{OUT} ≦100mA		——	5	20	mV
EN Threshold Voltage	V_{CEH}	CE“High”Voltage		1.2	——	——	V
	V_{CEL}	CE“Low”Voltage		——	——	0.4	V
EN PIN Current	I_{EN}			——	0.01	——	μA
Current Limit	I_{LIMIT}			——	650	——	mA
Short Current	I_{SHORT}	V_{OUT} = GND		——	100	——	mA
Output Noise Voltage	V_{ON}	V_{OUT}=3.3V , I_{OUT} =200mA BW = 100Hz~10KHz,		——	100	——	μVrms
Power Supply Rejection Rate	PSRR	I_{OUT} =100mA, V_{OUT} =3.3V	f=1kHz	——	70	——	dB
			f=10kHz	——	65	——	dB
Temperature Coefficient	Δ V_{OUT} / Δ T * V_{OUT}	I_{OUT} =30mA , T_A=0~70°C		——	± 100	——	ppm/°C
Thermal Shutdown Temperature	T_{SHDN}	——		——	160	——	°C
Thermal Shutdown Hysteresis	ΔT_{SHD}	——		——	20	——	°C

Note : All limits specified at room temperature (TA = 25°C) unless otherwise specified. All room temperature limits are 100% production tested. All limits at temperature extremes are ensured through correlation using standard Statistical Quality Control (SQC) methods. All limits are used to calculate Average Outgoing Quality Level (AOQL).

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Functional Block Diagram

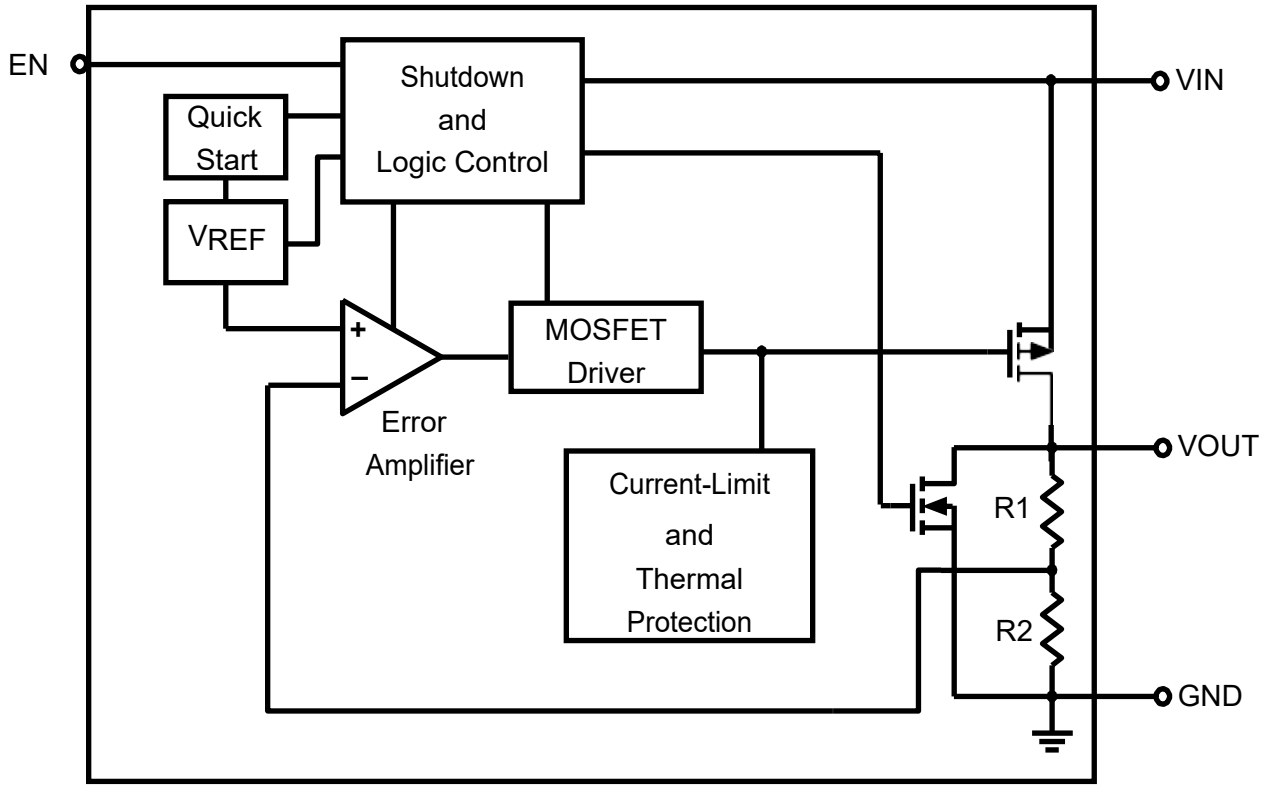

Figure 2. WL9005 Block Diagram

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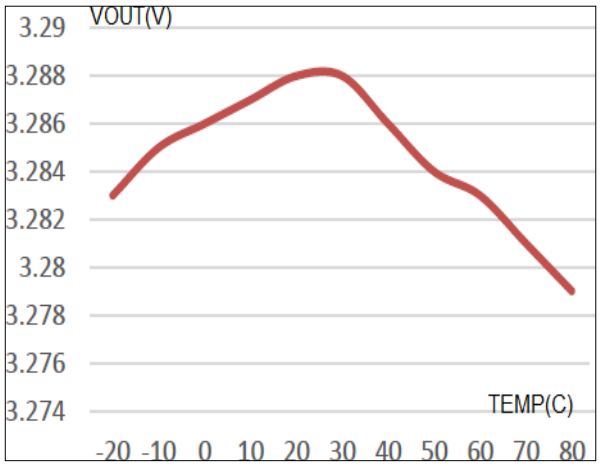
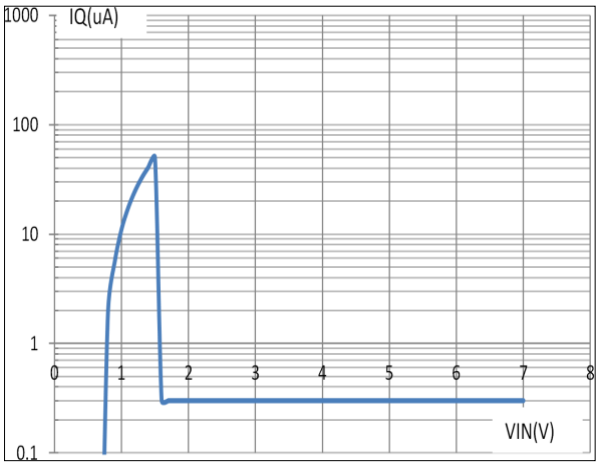
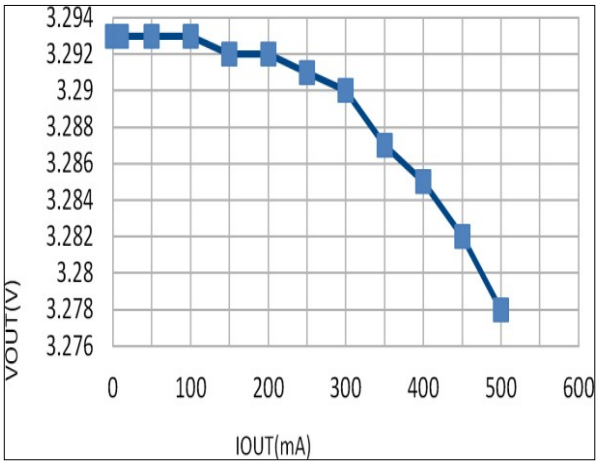
Typical Performance Characteristics (VIN = EN =4.3V ,VOUT=3.3V,CIN=COUT=1uF,TA=25℃)



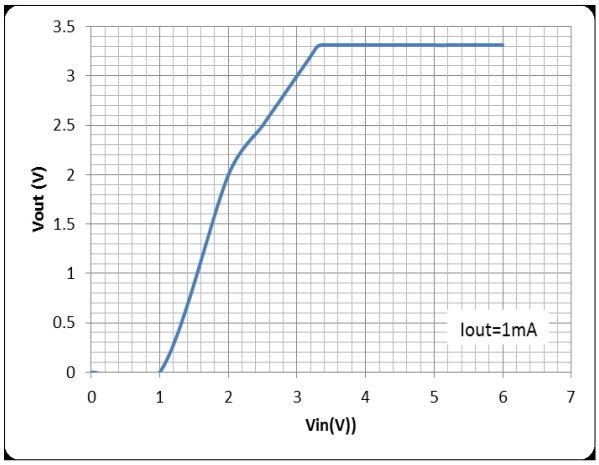
Output Voltage vs TEMP



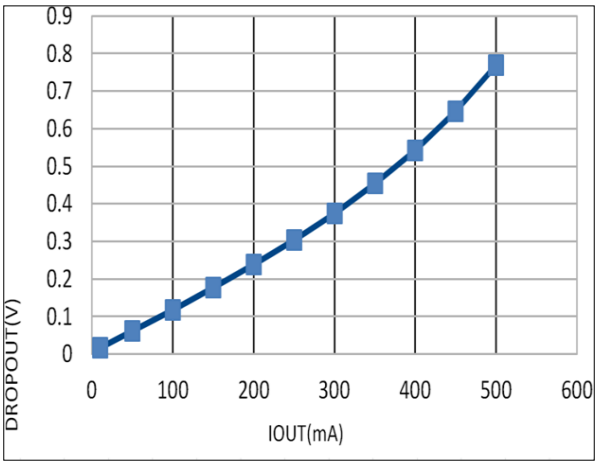
Input Voltage vs. IQ (**Note about IQ**)



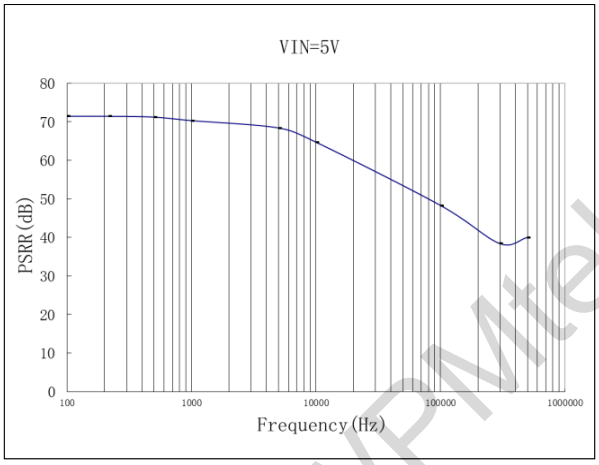
Load Regulation



Line Regulation



Dropout Voltage vs.Load Curren



PSRR vs. Frequency

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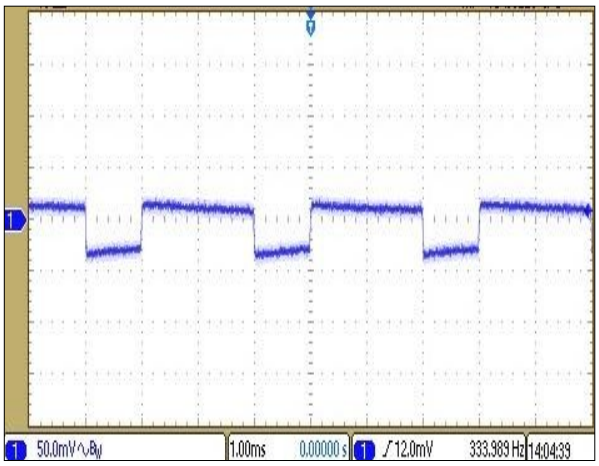
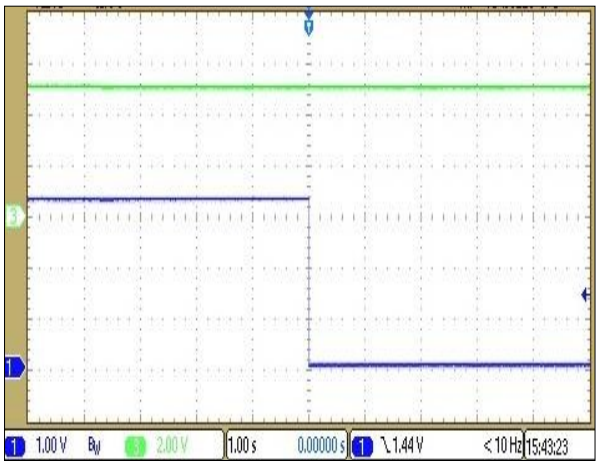
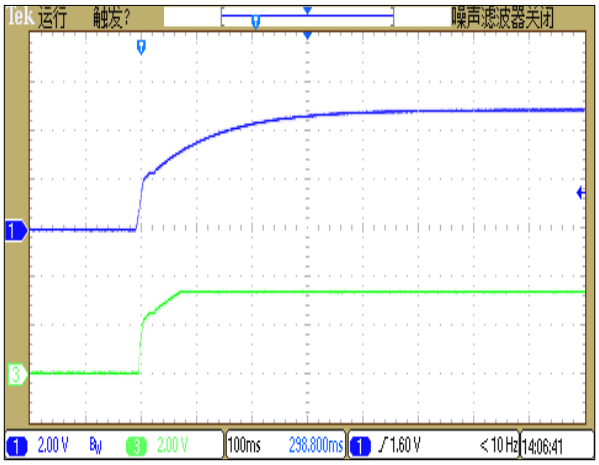


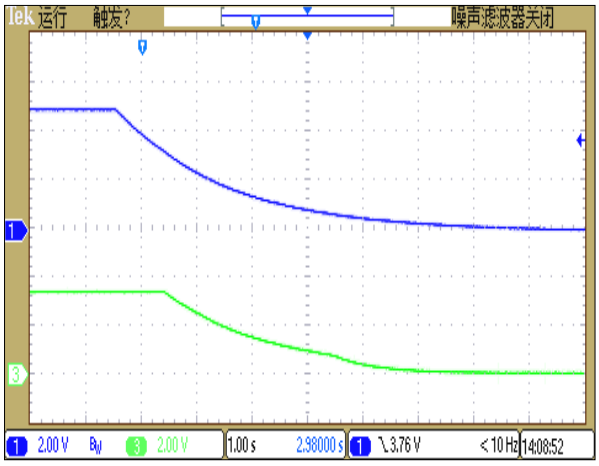
Load Transient Response



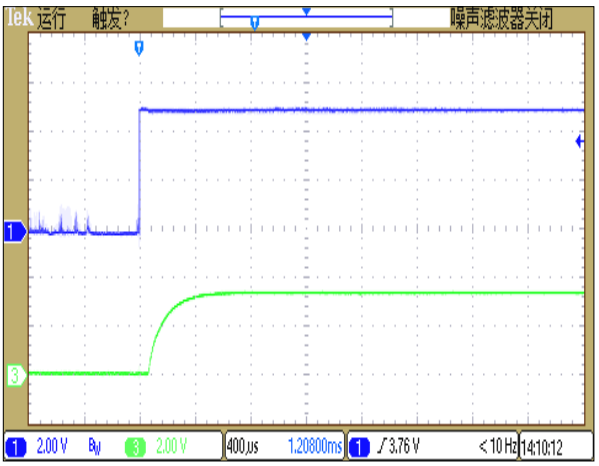
Short Output & Over-Current Response



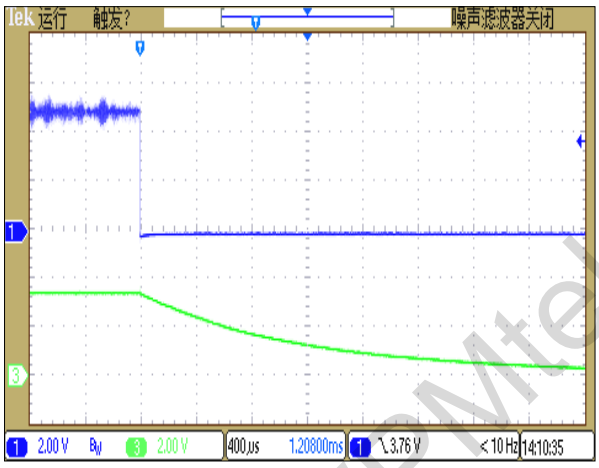
Power-On



Power-Off



Enable



Disable

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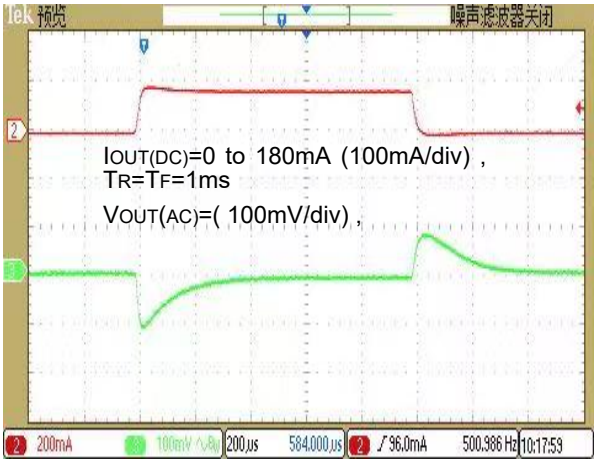
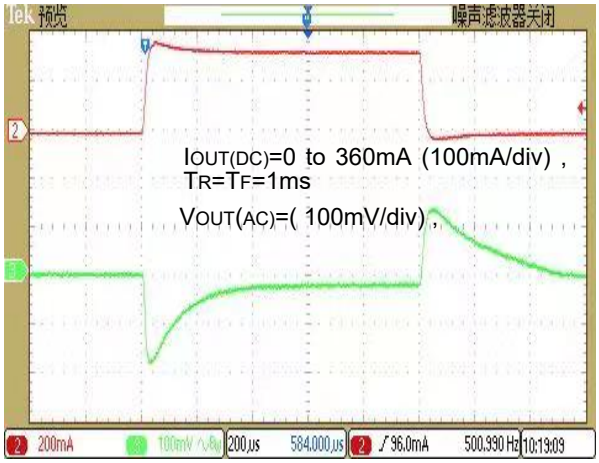


Load Transient VIN=EN=5V



Load Transient VIN=EN=5V

Note about IQ:

IQ refers to the working current when the chip is no-load, only when Vin >Vout The chip will have a very low working current, the above diagram is for Vout 1.5v Measured Curve, when Vin<Vout, the chip is in an abnormal state that can not reach the intended output, therefore, the operating current will increase significantly. For applications where IQ requirements are strict, make sure the chip stops working when Vin <Vout.

Application Guideline

■ Input Capacitor

A ≥ 1μF ceramic capacitor is recommended to connect between VIN and GND pins to decouple input power supply glitch and noise. The amount of the capacitance may be increased without limit. This input capacitor must be located as close as possible to the device to assure input stability and less noise. For PCB layout, a wide copper trace is required for both VIN and GND.

■ Output Capacitor

An output capacitor is required for the stability of the LDO. The recommended output capacitance is ≥1μF, ceramic capacitor is recommended, and temperature characteristics are X7R or X5R. Higher capacitance values help to improve load/line transient response. The output capacitance may be increased to keep low undershoot/overshoot. Place output capacitor as close as possible to VOUT and GND pins.

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■ Dropout Voltage

The dropout voltage refers to the voltage difference between the VIN and VOUT pins while operating at specific output current. The dropout voltage V_{DROP} also can be expressed as the voltage drop on the pass-FET at specific output current (I_{RATED}) while the pass-FET is fully operating at ohmic region and the pass-FET can be characterized asan resistance RDS(ON). Thus the dropout voltage can bedefined as ($V_{DROP} = V_{IN} - V_{OUT} = R_{DS(ON)} \times I_{RATED}$). Fornormal operation, the suggested LDO operating range is ($V_{IN} > V_{OUT} + V_{DROP}$) for good transient response and PSRR ability. Vice versa, while operating at the ohmic region will degrade the performance severely.

■ Thermal Application

For continuous operation, do not exceed the absolute maximum junction temperature. The maximum power dissipation depends on the thermal resistance of the IC package, PCB layout, rate of surrounding airflow, and difference between junction and ambient temperature. The maximum power dissipation can be calculated as below:

T_A=25°C, WPM DEMO PCB,

The max $P_D = (Tj - T_A) / \theta_{JA}$.

Power dissipation (P_D) is equal to the product of the output current and the voltage drop across the output pass element, as shown in the equation below:

$P_D = (V_{IN} - V_{OUT}) \times I_{OUT}$

■ Layout Consideration

By placing input and output capacitors on the same side of the PCB as the LDO, and placing them as close as is practical to the package can achieve the best performance. The ground connections for input and output capacitors must be back to the WL9005 ground pin using as wide and as short of a copper trace as is practical.Connections using long trace lengths, narrow trace widths, and/or connections through via must be avoided. These add parasitic inductances and resistance that results in worse performance especially during transient conditions.

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Marking Information

For marking information, contact our sales representative directly

WL9005S3-12	WL9005S3-15	WL9005S3-18	WL9005S3-25	WL9005S3-28
AJ12C	AJ15C	AJ18C	AJ25C	AJ28C
WL9005S3-30	WL9005S3-33	WL9005S3-36	WL9005S3-50	WL9005S5-12
AJ30C	AJ33C	AJ36C	AJ50C	AJ=Sa
WL9005S5-15	WL9005S5-18	WL9005S5-25	WL9005S5-28	WL9005S5-30
AJ=Se	AJ=Sh	AJ=2E	AJ=2H	AJ=3B
WL9005S5-33	WL9005S5-36	WL9005S5-50	WL9005P3-12	WL9005P3-15
AJ=3C	AJ=3F	AJ=5B	AJ=Sa	AJ=Se
WL9005P3-18	WL9005P3-25	WL9005P3-28	WL9005P3-30	WL9005P3-33
AJ=Sh	AJ=2E	AJ=2H	AJ=3B	AJ=3C
WL9005P3-36	WL9005P3-50	WL9005D4-12	WL9005D4-15	WL9005D4-18
AJ=3F	AJ=3F	AY	BY	CY
WL9005D4-25	WL9005D4-28	WL9005D4-30	WL9005D4-33	WL9005D4-36
DY	EY	FY	GY	HY
WL9005D4-50				
KY				

All WPMtek parts are Pb-Free and adhere to the RoHS directive.

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