GENERAL DESCRIPTION

The LW51XX Series is a low drop-out voltage regulator that features high accurate, high ripple rejection, low power consumption with enable and soft-start function.

The current limiter's fold-back circuit operates as a short circuit protection as well as the output current limiter for the output pin.

Output voltage is selectable from 0.8V to 5.0V which fixed by laser trimming technologies, Step=100mV.

The LW51XX Series is available in SOT23, SOT23-3L, SOT23-5L and DFN1x1-4L packages.

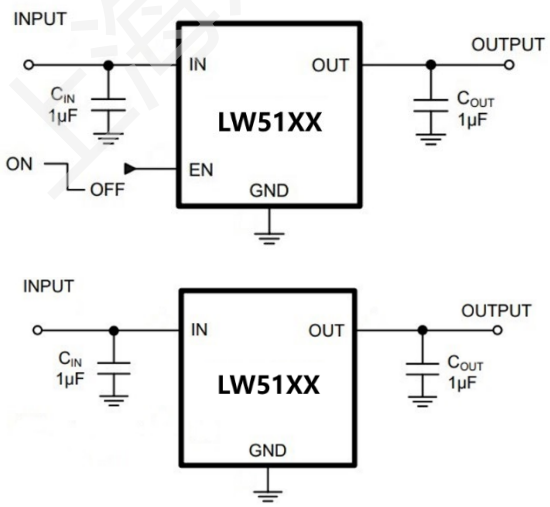
FEATURES

- Output Accuracy: ±1.5%
- Low Quiescent Current: 40uA
- Low Dropout Voltage: 42mV@100mA/3.3V
- High PSRR: 95dB@1KHz, 1mA
- Output Current: 300mA
- Excellent Line and Load Transient Response
- Operating Voltage Range: from 1.5V to 6.0V
- Output Voltage Range: from 0.8V to 5.0V
- Soft-Start Function
- Over-Temperature Protection
- Current Limiting Protection
- Output Short-Circuit Protection
- Available in SOT23, SOT23-3L, SOT23-5L and DFN1x1-4L Packages

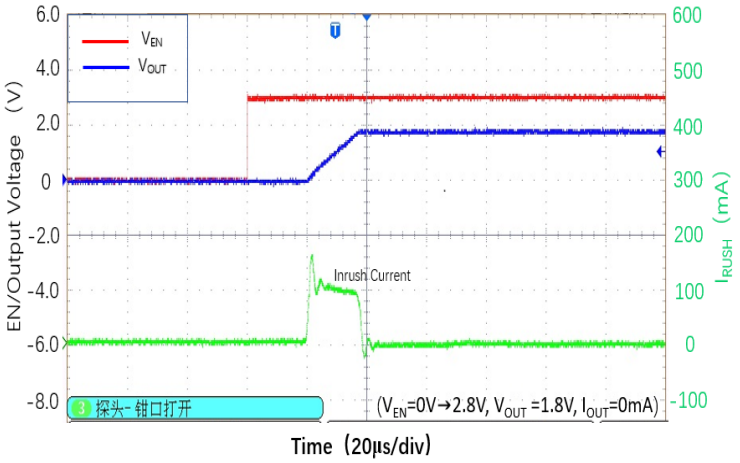
APPLICATIONS

- Battery-Powered Devices
- Reference Voltage Sources
- Other Low Voltage Power Suppliers

TYPICAL APPLICATION CIRCUIT



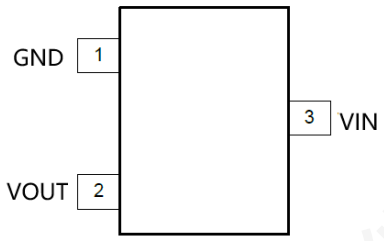
TYPICAL PERFORMANCE CHARACTERISTICS



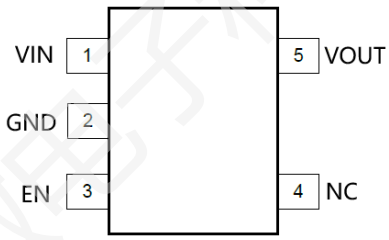
PIN DESCRIPTION:

PIN No			SYMBOL	DESCRIPTTION
SOT23/ SOT23-3L	SOT23-5L	DFN1x1-4L		
3	1	4	VIN	Power Supply Input
1	2	2,E-PAD	GND	Ground
--	3	3	EN	Chip Enable
--	4	--	NC	Not Connected
2	5	1	VOUT	Output

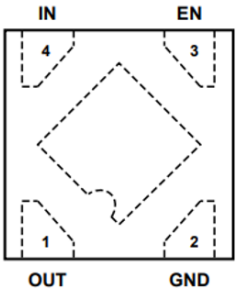
PIN ASSIGNMENT



SOT23/SOT23-3L



SOT23-5L



DFN1x1-4L

MARK INFORMATION:

SOT23

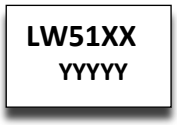
XX: VOLTAGE

YY: DATE CODE

SOT23-3L/5L

XX: VOLTAGE

YY: DATE CODE



DFN1x1-4L

X: VOLTAGE

0.8V	0.9V	1.0V	1.2V	1.5V	1.8V	2.5V	2.8V	3.0V	3.3V	3.6V	4.2V	5.0V
A	R	B	C	D	G	H	J	L	M	P	S	T

ABSOLUTE MAXIMUM RATINGS (1):

(T_A =25℃, unless otherwise specified.)

SYMBOL	ITEM		RATING	UNIT
V_{IN}	Supply Voltage		-0.3~7.0	V
V_{EN}	EN Pin Voltage		-0.3~7.0	V
V_{OUT}	V_{OUT} pin Voltage		-0.3~ (V_{IN}+0.3)	V
$V_{(ESD)}$	ESD Susceptibility, HBM(2)		±4000	V
P_D	Maximum Power Dissipation(3)	SOT23	391	mW
		SOT23-3L	431	
		SOT23-5L	438	
		DFN1x1-4L	446	
$R_{\theta JA}$	Package Thermal Resistance Θ_{JA}(3)	SOT23	319	℃/W
		SOT23-3L	290	
		SOT23-5L	285	
		DFN1x1-4L	280	
T_J	Junction Temperature Range		-40~150	℃
T_{STG}	Storage Temperature Range		-40~150	℃
T_{SOLDER}	Lead Temperature (Soldering)		260℃, 10s	

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 or any other conditions beyond those indicated under Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability

2. per ANSI/ESDA/JEDEC JS-001

3. Device mounted on FR-4 PCB

RECOMMANDED OPERATING RANGE:

SYMBOL	ITEM	VALUE	UNIT
V_{IN}	VIN Supply Voltage	1.5~6.0	V
V_{EN}	EN Pin Voltage	0~6.0	V
V_{OUT}	V_{OUT} Pin Voltage	0.8~5.0	V
I_{OUT}	Output Current	0~300	mA
T_J	Junction Temperature Range	-40~125	℃

ELECTRICAL CHARACTERISTICS:

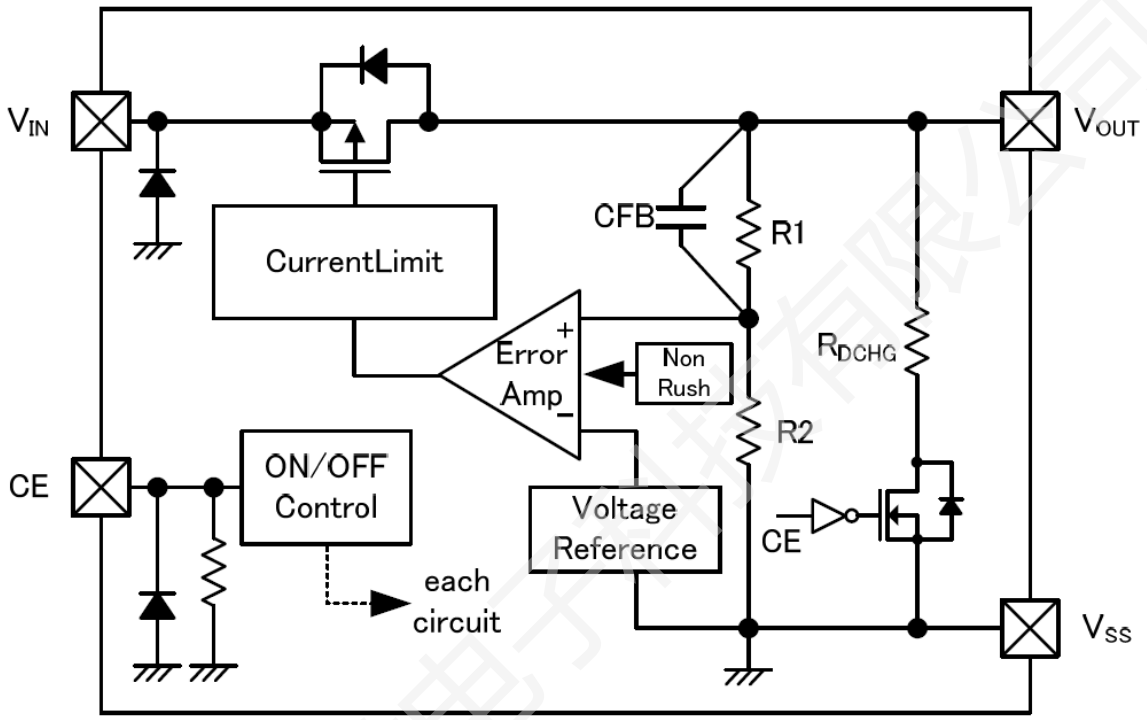
(V_{IN}=V_{OUT}+1V, V_{OUT} =3.3V, C_{IN}= C_{OUT}=1uF, T_A =25℃, unless otherwise specified.)

Symbol	Parameter	Test Conditions		MIN	TYP	MAX	Units
V_{IN}	Input Voltage			1.5		6.0	V
V_{OUT}	Output Accuracy	I_{OUT}= 1mA		-1.5		+1.5	%
I_{LIM}	Current Limit(1)	V_{IN}=4.3V, V_{OUT} =3.3V		310	380		mA
I_Q	Quiescent Current	V_{IN}=V_{EN}=V_{OUT}+1V, No Load			40	60	μA
I_{SHD}	Shutdown Current	V_{IN}=6.0V, V_{EN}=0V				0.1	μA
V_{DROP}	Dropout Voltage(2)	I_{OUT}=100mA, V_{OUT}=3.3V			42		mV
		I_{OUT}=200mA, V_{OUT}=3.3V			85		
		I_{OUT}=300mA, V_{OUT}=3.3V			130		
S_{LINE}	Line Regulation	V_{IN}= V_{OUT} +1V to 6.0V, I_{OUT}=1mA			0.06	0.13	%/V
S_{LOAD}	Load Regulation	1mA≤I_{OUT}≤300mA			0.001	0.01	%/mA
I_{SHORT}	Short Current	V_{OUT}=0V			40		mA
V_{ENH}	EN High Voltage	V_{IN}=1.5V to 6.0V, I_{OUT}=1mA		1.5			V
V_{ENL}	EN Low Voltage					0.5	V
PSRR	Power Supply Rejection Ratio	C_{IN} =None, V_{OUT}=3.3V, I_{OUT}=1mA	f=217Hz		93		dB
			f=1KHz		95		
			f=10KHz		73		
T_{SD}	Thermal Shutdown	Temperature rising			155		℃
△T_{SD}	TSD Hysteresis	Temperature falling			20		℃
R_{DSCHG}	R_{ON} of Discharge MOSFET	V_{IN}= 6V, V_{EN}=0V			200		Ω
I_{RUSH}	Inrush Current	V_{IN}=5.0V, No load			180		mA

NOTES:

1. Guaranteed by design
2. The dropout voltage is defined as V_{IN} - V_{OUT}, when V_{OUT} =95%*$V_{OUT(NOM)}$

SIMPLIFIED BLOCK DIAGRAM:



DETAIL OPERATION DESCRIPTION:

The LW51XX Series is a low power consumption low drop-out voltage regulator. It consists of a current limiter circuit, a driver transistor, a precision voltage reference and an error correction circuit, and is compatible with low ESR ceramic capacitors. The current limiter's fold-back circuit operates as a short circuit protection as well as the output current limiter. The LW51XX Series built-in soft-start circuit limits the inrush current at start-up. During approximate 70μs after the EN pin becomes high, the inrush current, which occurs at charging the capacitor of C_{OUT}, is limited at about 180mA.

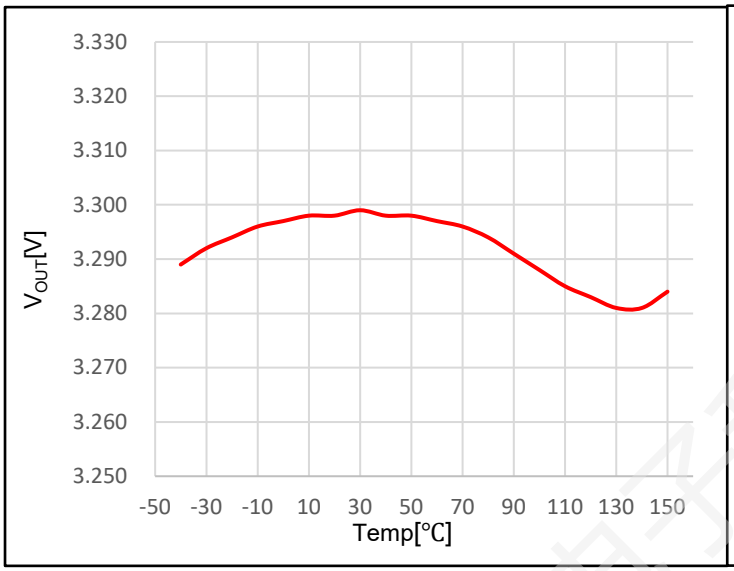
Current Limiting and Short-Circuit Protection

The current limit circuitry prevents damage to the MOSFET switch and the hub downstream port but can deliver load current up to the current limit threshold through the switch. When a heavy load or short circuit is applied to an enabled switch, a large transient current may flow until the current limit circuitry responds. Once this current limit threshold is exceeded the device enters constant current mode until the thermal shutdown occurs or the fault is removed.

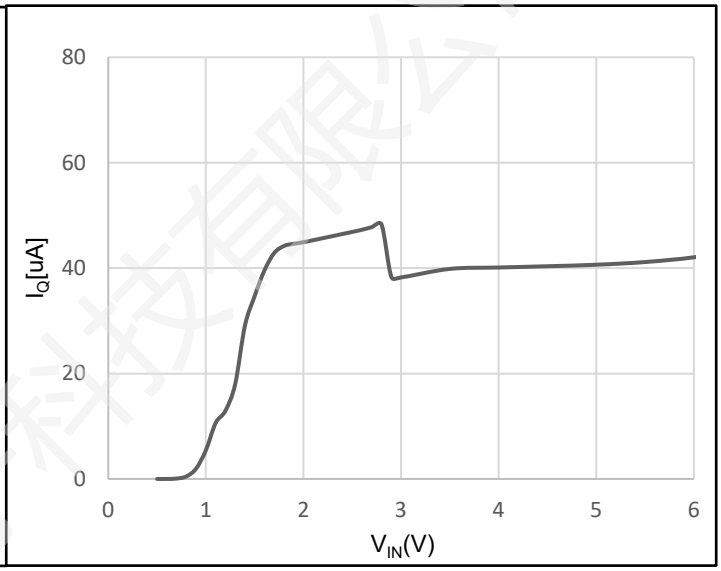
TYPICAL OPERATING CHARACTERISTICS:

（*Tested under* T_A *=25*°C, unless otherwise specified）

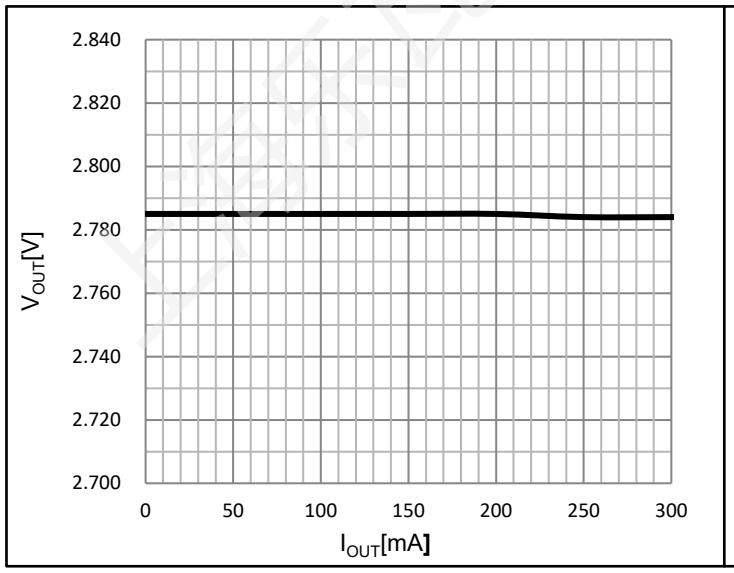
1. V_{OUT} vs Temperature
(V_{IN}=4.3V, V_{OUT} =3.3V, I_{OUT}=10mA)



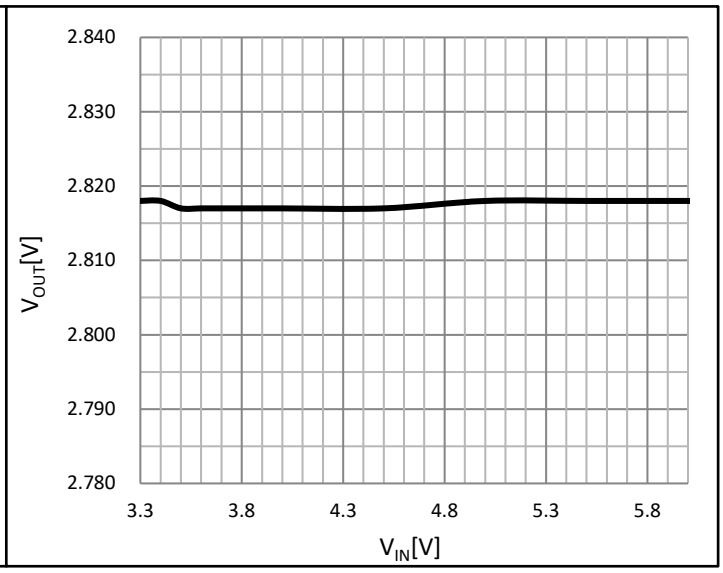
2. I_Q vs V_{IN}
(V_{OUT} =2.8V, I_{OUT}=0mA)



3. V_{OUT} vs I_{OUT}
(V_{IN}=3.8V, V_{OUT} =2.8V, I_{OUT}=0→300mA)

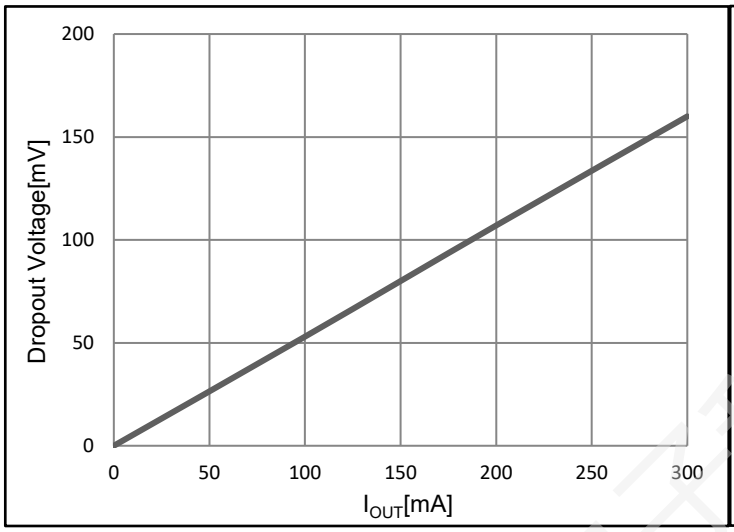


4. V_{OUT} vs V_{IN}
(V_{IN}=3.3V→6.0V, V_{OUT} =2.8V, I_{OUT}=10mA)



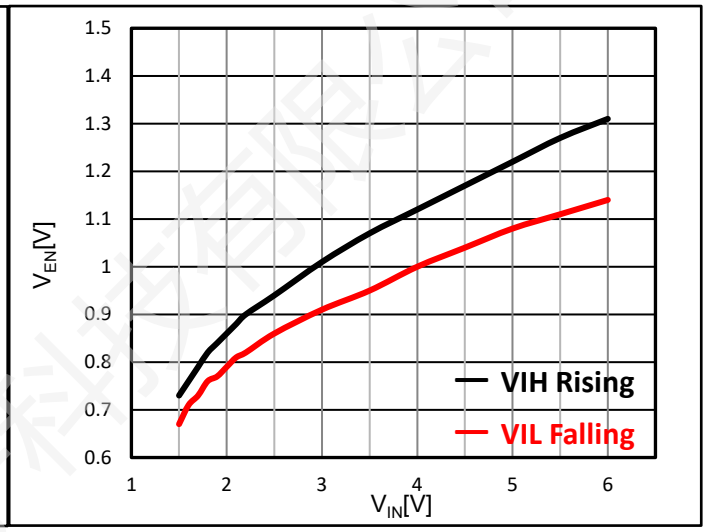
5. Dropout Voltage

(V_{OUT} =95%*2.8V, I_{OUT}=0→300mA)



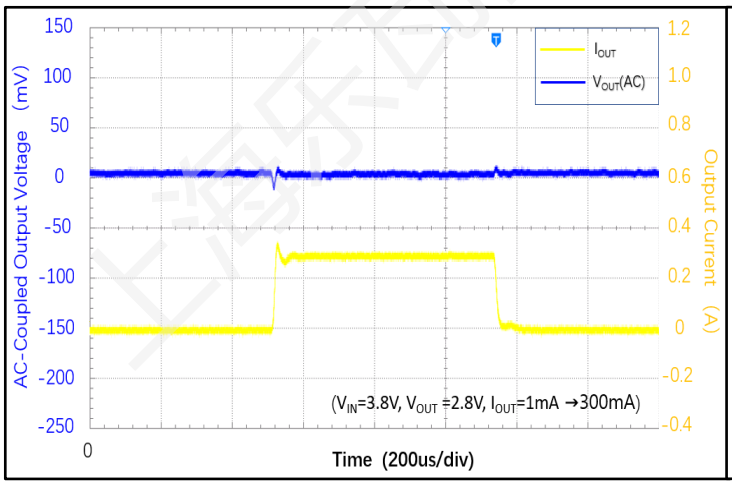
6. V_{EN} Thresholds vs V_{IN}

(V_{OUT} =2.8V, I_{OUT}=0mA)



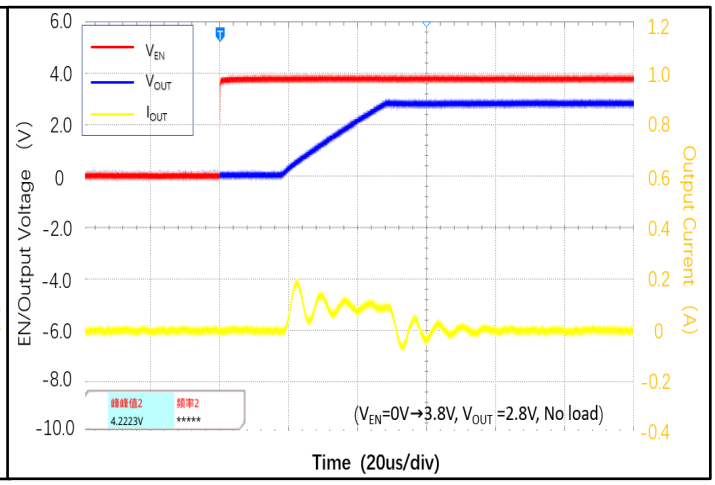
7. Load Transient

(V_{IN}=3.8V, V_{OUT} =2.8V, I_{OUT}=1→300mA)



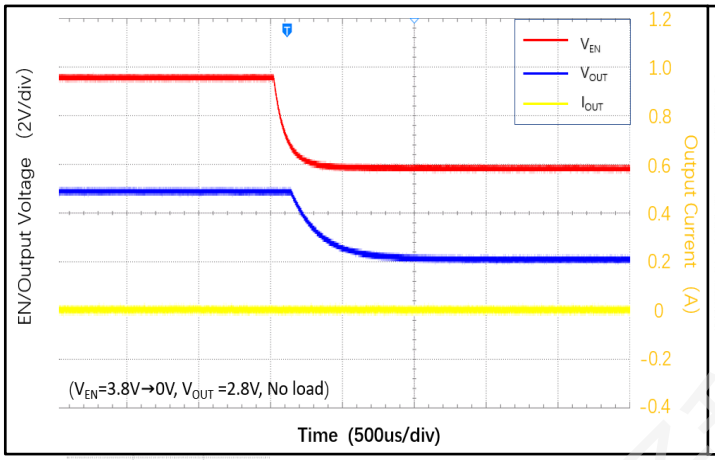
8. Start-Up

(V_{EN}=0V→3.8V, V_{IN} =3.8V, V_{OUT} =2.8V, No load)



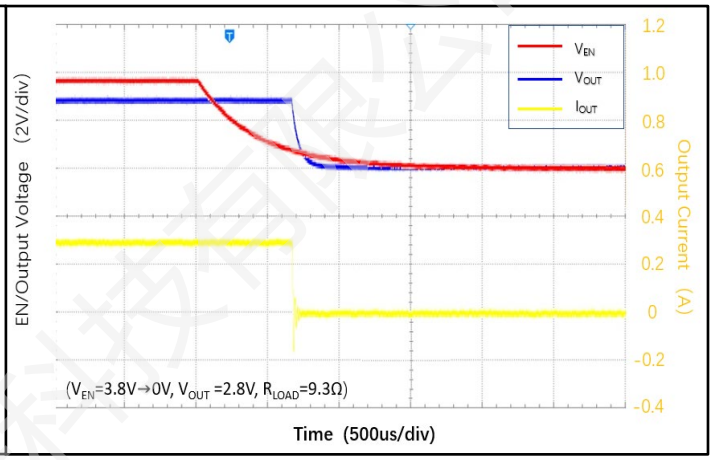
9. Shut-Down

(V_{EN}=3.8V→0V, V_{IN} =3.8V, V_{OUT} =2.8V, No load)



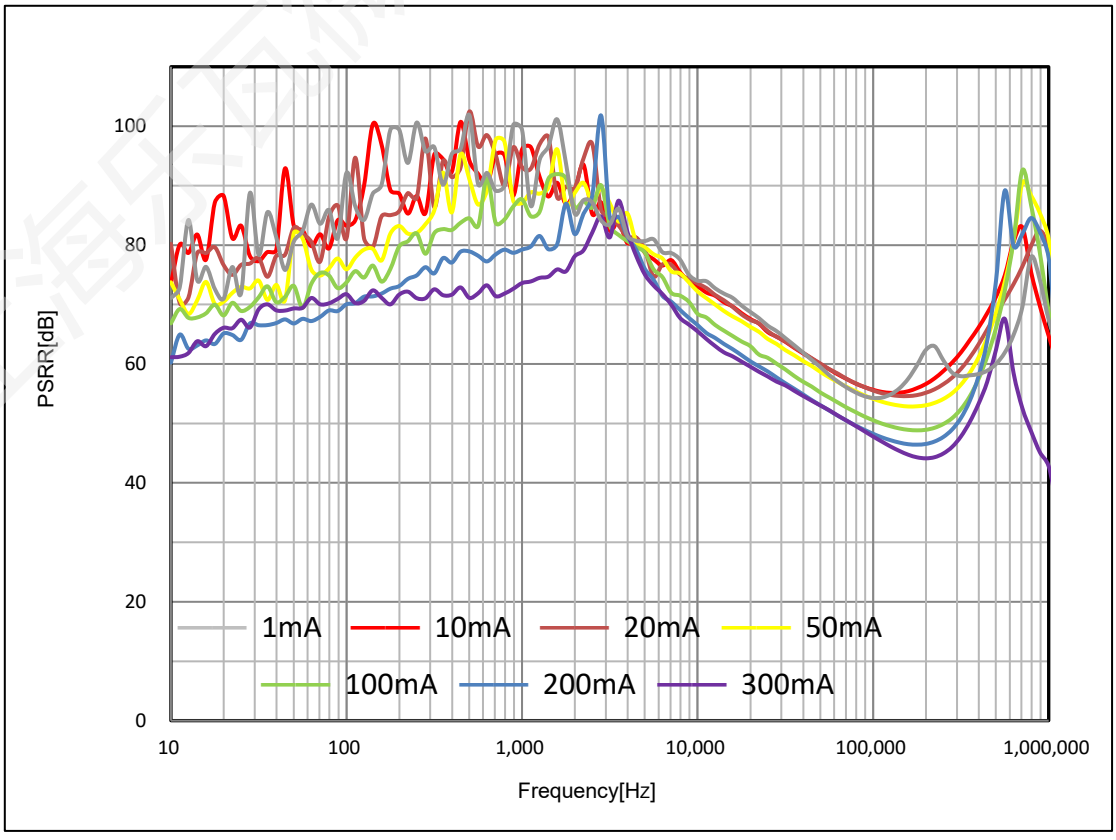
10. Shut-Down

(V_{EN}=3.8V→0V, V_{IN} =3.8V, V_{OUT} =2.8V, R_{OUT}=9.3 Ω)



11. PSRR

(V_{IN}=4.3V, V_{OUT} =3.3V, V_{PP}=1.0V, C_{IN}=none, C_{OUT} =1uF)



APPLICATION INFORMATION:

- **Input Capacitor Selection**

Like any low-dropout regulator, the external capacitors used with the LW51XX Series must be carefully selected for regulator stability and performance. Using a capacitor whose value is >=1μF on the LW51XX Series input and the amount of capacitance can be increased without limit. An at least 10uF input capacitor is needed if input ripple voltage V_{PP}>1V. The input capacitor must be located a distance less than 0.5 inch from the input pin of the IC and returned to a clean analog ground. Any good quality ceramic or tantalum can be used for this capacitor. The capacitor with larger value and lower ESR (equivalent series resistance) provides better PSRR and line-transient response.

- **Output Capacitor Selection**

The output capacitor must meet both requirements for minimum amount of capacitance and ESR in all LDOs application. The LW51XX Series is designed specifically to work with low ESR ceramic output capacitor in space-saving and performance consideration. Using a ceramic capacitor whose value is at least 1μF on the LW51XX Series output ensures stability. An appropriate output capacitor can reduce noise and improve load transient response and PSRR. The output capacitor should be located not more than 0.5 inch from the VOUT pin of the LW51XX Series and returned to a clean analog ground.

- **Layout considerations**

To improve ac performance such as PSRR, output noise, and transient response, it is recommended that the PCB be designed with separate ground planes for VIN and VOUT, with each ground plane connected only at the GND pin of the device.

ORDER INFORMATION:

LW51①②③④⑤⑥

Designator	Item	Symbol	Description
①②	Output Voltage	08~50	e.g.0.8V→①=0,②=8
③④⑤⑥	Packages	N23C	SOT23
		N23D	SOT23-3L
		A23E	SOT23-5L
		N11E	DFN1x1-4L

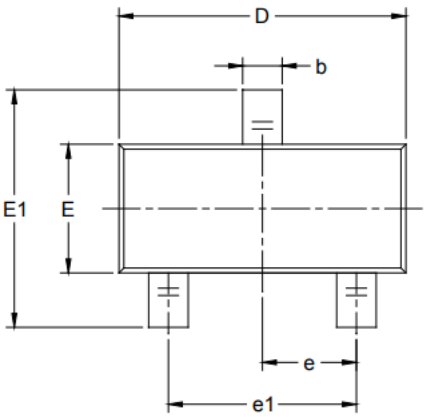
Part #	Output Voltage	Package	Shipping
LW5108N23C	0.8V	SOT23	3000 Pcs/ Tape & Reel
LW5109N23C	0.9V		
LW5110N23C	1.0V		
LW5112N23C	1.2V		
LW5115N23C	1.5V		
LW5118N23C	1.8V		
LW5125N23C	2.5V		
LW5128N23C	2.8V		
LW5130N23C	3.0V		
LW5133N23C	3.3V		
LW5136N23C	3.6V		
LW5142N23C	4.2V		
LW5150N23C	5.0V		
LW5108N23D	0.8V	SOT23-3L	3000 Pcs/ Tape & Reel
LW5109N23D	0.9V		
LW5110N23D	1.0V		
LW5112N23D	1.2V		
LW5115N23D	1.5V		
LW5118N23D	1.8V		
LW5125N23D	2.5V		
LW5128N23D	2.8V		
LW5130N23D	3.0V		
LW5133N23D	3.3V		
LW5136N23D	3.6V		
LW5142N23D	4.2V		
LW5150N23D	5.0V		

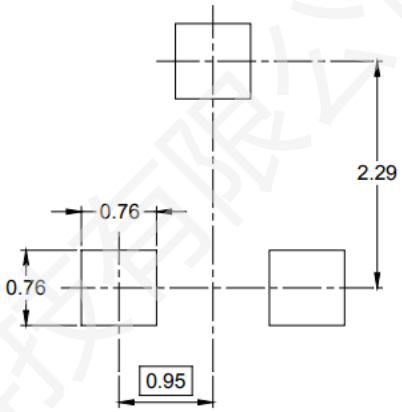
Part #	Output Voltage	Package	Shipping
LW5108A23E	0.8V	SOT23-5L	3000 Pcs/ Tape & Reel
LW5109A23E	0.9V		
LW5110A23E	1.0V		
LW5112A23E	1.2V		
LW5115A23E	1.5V		
LW5118A23E	1.8V		
LW5125A23E	2.5V		
LW5128A23E	2.8V		
LW5130A23E	3.0V		
LW5133A23E	3.3V		
LW5136A23E	3.6V		
LW5142A23E	4.2V		
LW5150A23E	5.0V		
LW5108N11E	0.8V	DFN1x1-4L	10000 Pcs/ Tape & Reel
LW5109N11E	0.9V		
LW5110N11E	1.0V		
LW5112N11E	1.2V		
LW5115N11E	1.5V		
LW5118N11E	1.8V		
LW5125N11E	2.5V		
LW5128N11E	2.8V		
LW5130N11E	3.0V		
LW5133N11E	3.3V		
LW5136N11E	3.6V		
LW5142N11E	4.2V		
LW5150N11E	5.0V		

If customers have special output voltage requirements, please contact us.

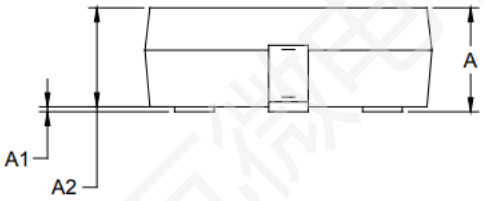
PACKAGE OUTLINE:

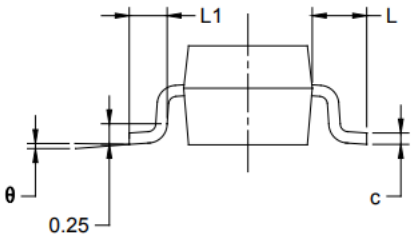
SOT23 Package





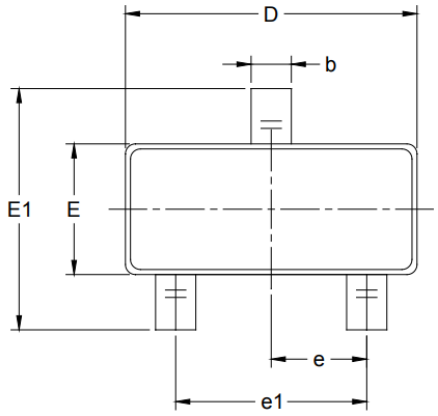
RECOMMENDED LAND PATTERN (Unit: mm)

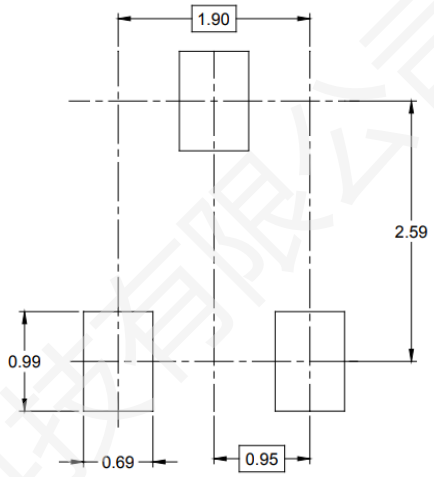




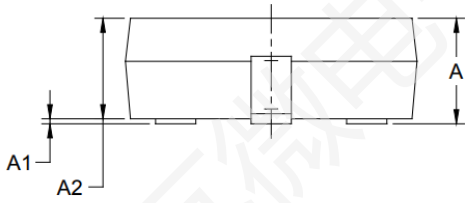
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

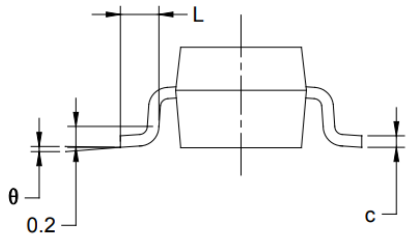
SOT23-3L Package





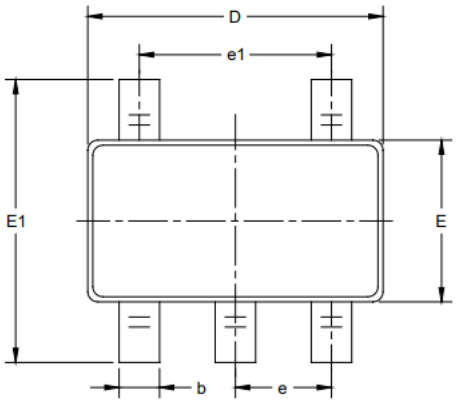
RECOMMENDED LAND PATTERN (Unit: mm)

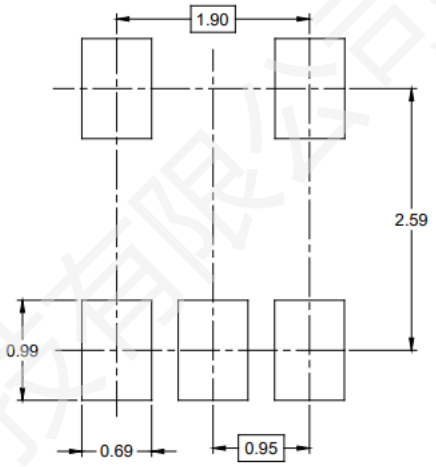




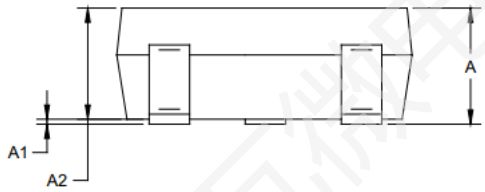
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

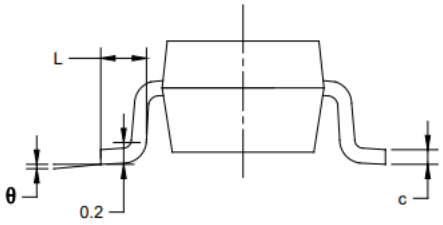
SOT23-5L Package





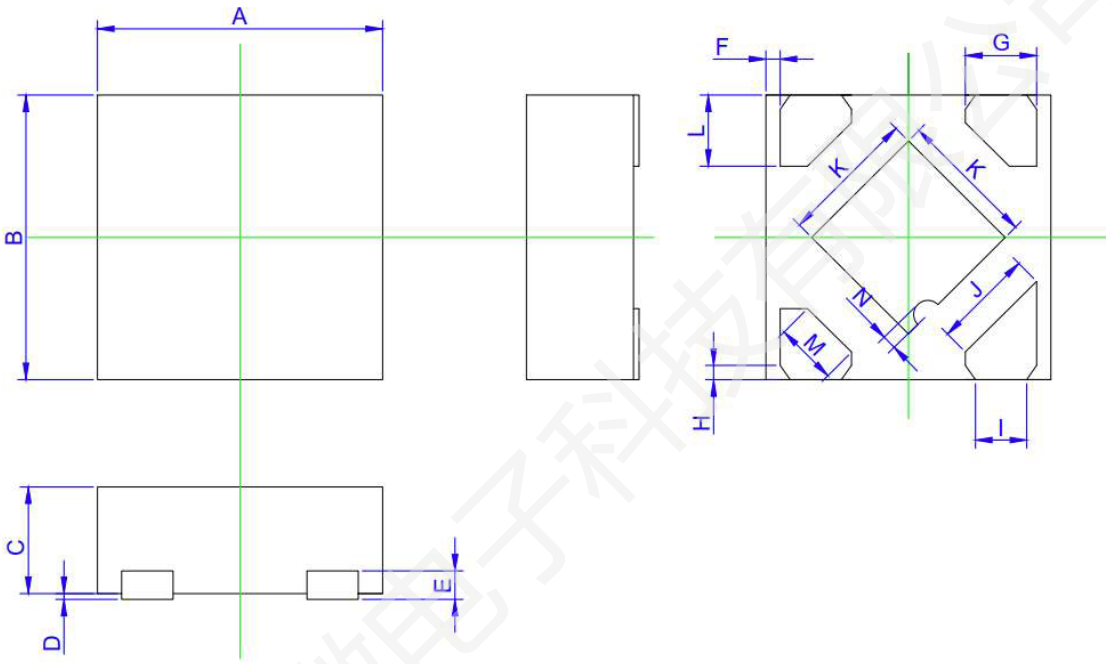
RECOMMENDED LAND PATTERN (Unit: mm)





Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

DFN1x1-4L Package



符号	标准	下公差	上公差	下限值	上限值
A	1.0	0.03	0.03	0.97	1.03
B	1.0	0.03	0.03	0.97	1.03
C	0.375	0.03	0.03	0.345	0.405
D	0.02	0.005	0.02	0.015	0.04
E	0.10REF				
F	0.05REF				
G	0.25REF				
H	0.05REF				
I	0.18REF				
J	0.34REF				
K	0.48REF				
L	0.25REF				
M	0.245REF				
N	0.06REF				

Revision History:

Revision	Date	Descriptions
Rev 0.1	Oct.2021	Initial Version
Rev 0.2	May.2022	Define package type
Rev 0.3	Aug.2022	Modify Typical Performance Characteristcs
Rev 0.4	Sep.2022	Adjust Order Information
Rev 1.0	May.2023	Release Version
Rev 1.1	Jun.2023	Update Typical Operating Characteristcs 9-12

DISCLAIMER:

The information in this document is believed to be accurate and reliable. However, no responsibility is assumed by LW-Micro for its use. All operating parameters must be designed, validated and tested to ensure they meet the requirements of your application. LW-Micro reserves the right to make any specification and/or circuitry changes without prior notification. Before starting a brand-new project, please contact LW-Micro Sales to get the most recent relevant information.

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