SK6013 Low Noise, High PSRR, High Speed, CMOS LDO

GENERAL DESCRIPTION

The SK6013 is a high accuracy, low noise, high speed, low dropout CMOS Linear regulator with high ripple rejection and fast discharge function. The device offers a new level of cost effective performance in cellular phones, surveillance system, Bluetooth, wireless and other portable electronic devices.

SK6013 can provide product selections of output value in the range of 1.2V~3.6V by every 0.1V step.

The current limiter's fold-back circuit also operates as a short circuit protection and an output current limiter at the output pin.

The SK6013 regulators arezavailable in standard SOT23-5Land DFN1x1-4L packages. Standard products are Pb-free and Halogen-free.

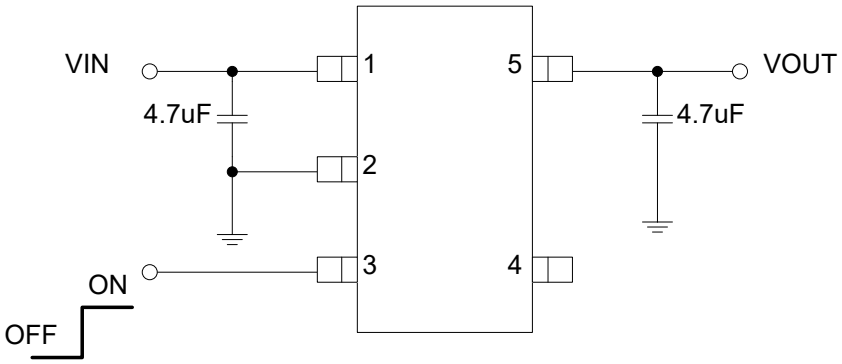
FEATURES

- Input voltage: 2.5V~6.5V
- Output range: 1.2V~3.6V (customized by every 0.1V step)
- Maximum output current: 400mA@ V_{IN}-V_{OUT}=0.5V
- PSRR: 75dB @1KHz
- Dropout voltage: 220mV @ I_{OUT}=200mA
- Quiescent current : 50μA Typ.
- Shut-down current: <1μA
- Recommend capacitor: 4.7μF
- Ultra-low output noise: 50μV_{RMS}

APPLICATIONS

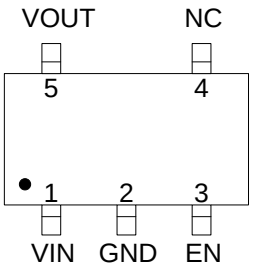
- Digital cameras
- Cellphones
- Bluetooth and wireless handsets
- Other portable electronic devices

TYPICAL APPLICATION CIRCUIT



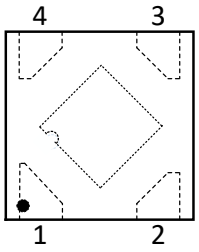
PIN ASSIGNMENT

SOT23-5L



SOT23-5L（Top View）

DFN1x1-4L



1 VOUT
2 GND
3 EN
4 VIN
Thermal Pad: GND

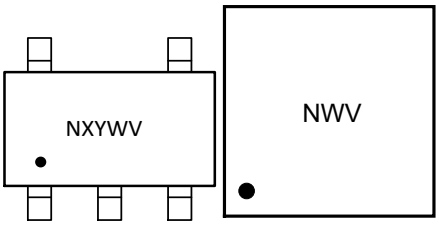
DFN1x1-4L（Top View）

PART NUMBER RULES

SK6013[1]-[2]-[3]

Code	Description
[1]	V_{OUT} discharge " ": w/o fast discharge A/B: with fast discharge
[2]	Package: S5: SOT23-5L D4: DFN1x1-4L
[3]	Voltage version: XX: 1.0V~3.6V by 0.1V step Example: 28: 2.8V

MARKING DESCRIPTION:



SOT23-5L DFN1x1-4L

"N": Product code

"X":Packagefactory

"Y":Wafer foundry vendor.

"W": The week of manufacturing. "A" stands for week1, "Z" stands for week 26, "a" stands for week 27, "z" stands for week 52.

"V": Output voltage code.

ORDERING INFORMATION

PART NO	PACAKGE	V_{OUT} DISCHARGE	TEMPERATURE	TAPE & REEL
SK6013BS5-XX Note	SOT23-5L	Yes	-40 ~ +85℃	3000/REEL
SK6013AD4-XX Note	DFN1x1-4L	Yes	-40 ~ +85℃	10000/REEL
SK6013NS5-XX Note	SOT23-5L	No	-40 ~ +85℃	3000/REEL
SK6013ND4-XX Note	DFN1x1-4L	No	-40 ~ +85℃	10000/REEL

Note:*XX indicates 1.0V~3.6V by 0.1V step. For example, 28 means product outputs 2.8V.Without Auto Discharge Options Available on Request.*

PIN DESCRIPTION

PIN NO SOT23-5L	SYMBOL	I/O	DESCRIPTTION
1	VIN	Power	Input
2	GND	Ground	Ground
3	EN	I	Enable (active high, do not float)
4	NC	/	Not connected
5	VOUT	O	Output

PIN NO DFN1x1-4L	SYMBOL	I/O	DESCRIPTTION
1	VOUT	O	Output
2	GND	Ground	Ground
3	EN	I	Enable (active high, do not float)
4	VIN	Power	Input

ABSOLUTE MAXIMUM RATINGS(Note)

SYMBOL	ITEMS		VALUE	UNIT
V_{IN}	Input Voltage		-0.3~8	V
I_{OUT}	Output Current		550	mA
P_{DMAX}	Power Dissipation	SOT23-5L	0.45	W
		DFN1x1-4L	0.55	
$R_{\theta JA}$	Thermal Resistance	SOT23-5L	270	℃/W
		DFN1x1_4L	220	
T_J	Junction Temperature		-40~125	℃
T_A	Ambient Temperature		-40~85	℃
T_{STG}	Storage Temperature		-55 to 150	℃
T_{SOLDER}	Package Lead Soldering Temperature		260℃, 10s	

Note: *Exceed these limits to damage to the device. Exposure to absolute maximum rating conditions may affect device reliability.*

RECOMMANDED OPERATING RANGE

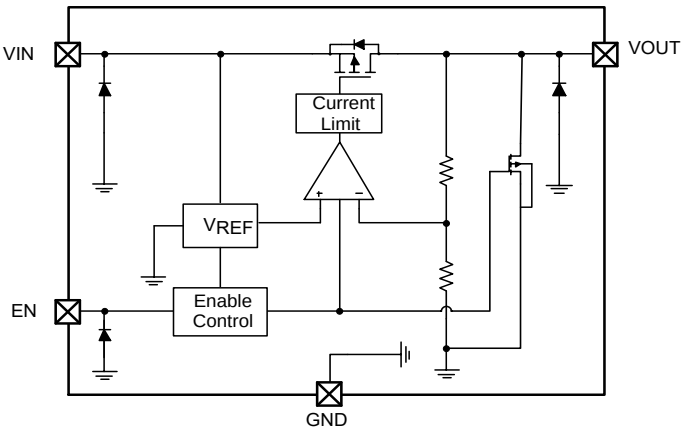
SYMBOL	ITEMS	VALUE	UNIT
V_{IN}	Supply Voltage	2.5 to 6.5	V
I_{OUT}	Output Current	<300	mA
T_{OPT}	Operating Temperature	-40 to +85	℃
C_{IN}	Input Capacitor	1μF ~10μF, 4.7μF or 10uF is recommended	μF
C_{OUT}	Output Capacitor		μF

ELECTRICAL CHARACTERISTICS

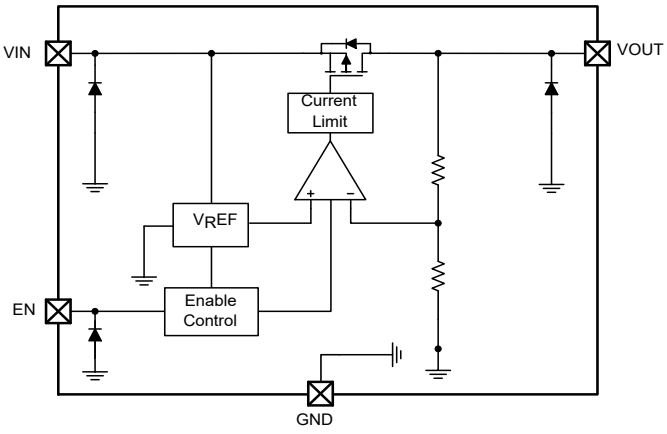
The following specifications apply for V_{OUT}=2.8VT_A=25℃, unless specified otherwise.

SYMBOL	ITEMS	CONDITIONS	MIN	TYP	MAX	UNIT
V_{IN}	Input Voltage		2.5		6.5	V
V_{OUT}	Output Range	V_{OUT} <1.8V V_{IN}=2.7V, I_{OUT}=1mA	-3	V_{OUT}	3	%
		V_{OUT}≥1.8V, I_{OUT}=1mA	-2	V_{OUT}	2	
I_Q	Quiescent Current	V_{IN}=5.0V, I_{OUT}=0		50		μA
I_{LIMIT}	Current Limit	V_{IN}=V_{OUT}+1V		500		mA
V_{DROP}	Dropout Voltage	V_{OUT}>=2.5V, I_{OUT}=200mA		220	250	mV
		V_{OUT}>=2.5V, I_{OUT}=300mA		320	350	
△V_{LINE}	Line Regulation	V_{IN}=2.7~5.5V, I_{OUT}=1mA		0.01	0.15	%/V
△V_{LOAD}	Load Regulation	V_{OUT}>1.8V, IOUT=1~300mA V_{OUT}<=1.8V, IOUT=1~200mA		40	70	mV
I_{SHORT}	Output Short Current	V_{EN}=V_{IN}, V_{OUT} Short to GND with 1Ω		100		mA
I_{SHDN}	Shut-down Current	V_{EN}=0V			1	μA
PSRR	Power Supply Rejection Rate	V_{IN}=5V_{DC}+0.5V_{P-P} F=1KHz, I_{OUT}=10mA		75		dB
		V_{IN}=5V_{DC}+0.5V_{P-P} F=1MHz, I_{OUT}=10mA		45		
V_{ENH}	EN logic high voltage	V_{IN}=5.5V, I_{OUT}=1mA	1.2		V_{IN}	V
V_{ENL}	EN logic low voltage	V_{IN}=5.5V, V_{OUT}=0V			0.4	V
I_{EN}	EN Input Current	V_{EN}= 0 to 5.5V			1.0	μA
e_{NO}	Output Noise Voltage	10Hz to 100KHz, C_{OUT}=1μF		50		$μV_{RMS}$
R_{DIS}	Output Discharge Resistance	V_{IN}=5.0V, V_{EN}= 0V		50		Ω

SIMPLIFIED BLOCK DIAGRAM



With auto-discharge

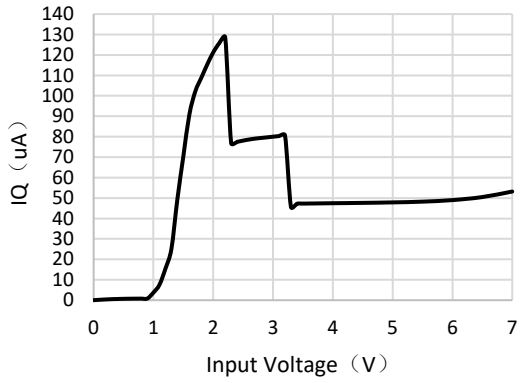


Without auto-discharge

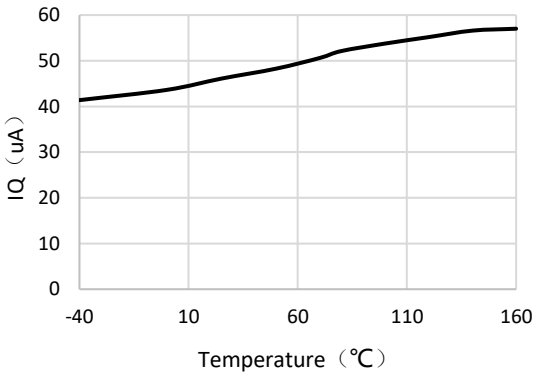
TYPICAL PERFORMANCE CHARACTERISTICS

C_{IN}=4.7uF, C_{OUT}=4.7uF, V_{IN}=4.3V, V_{OUT}=3.3V TA=25 ºC, Package is SOT23-5L, unless specified otherwise.

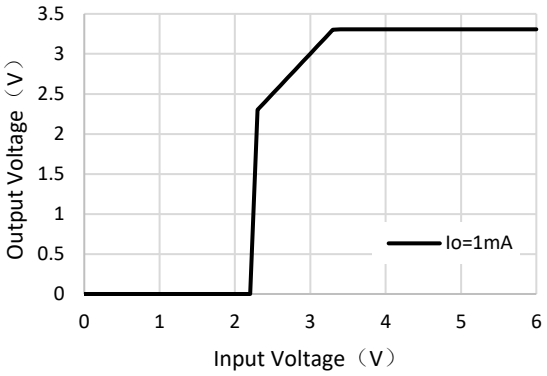
IQ vs. Input Voltage



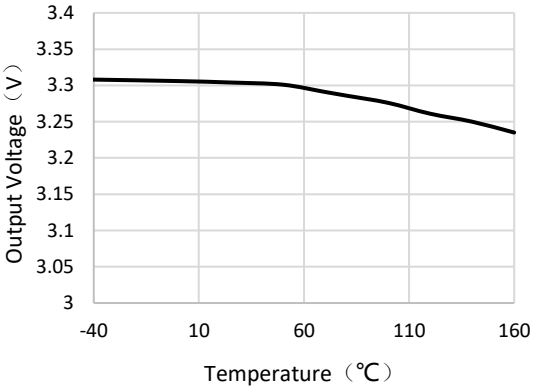
IQ vs. Temperature



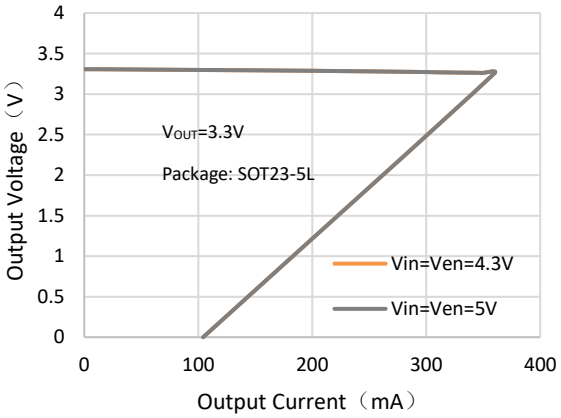
Output Voltage vs. Input Voltage



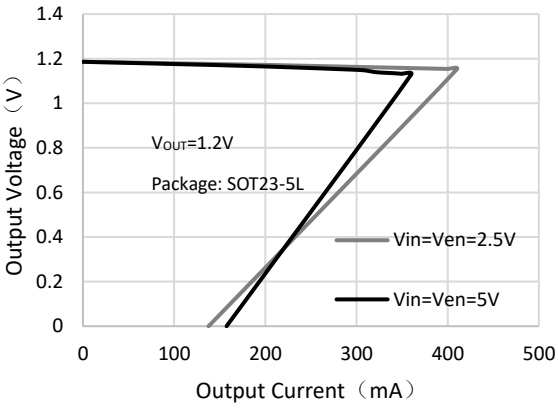
Output Voltage vs. Temperature



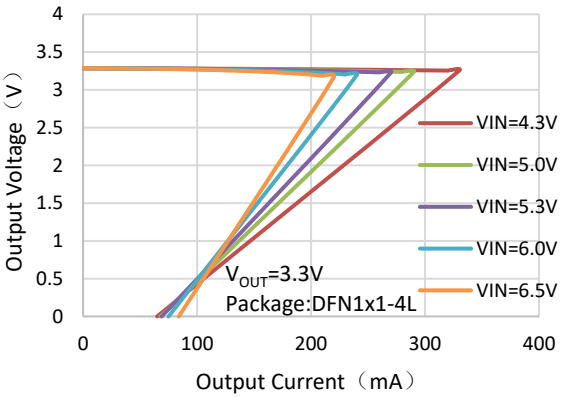
Output Voltage vs. Output Current



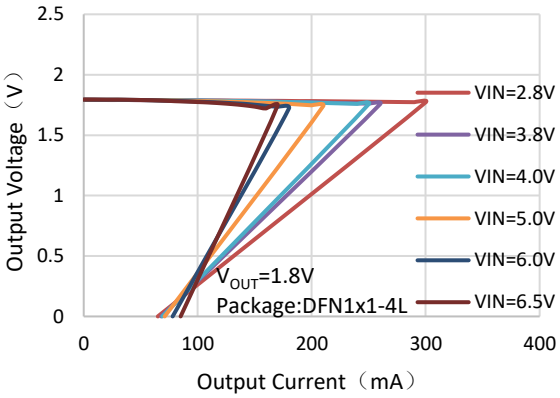
Output Voltage vs. Output Current



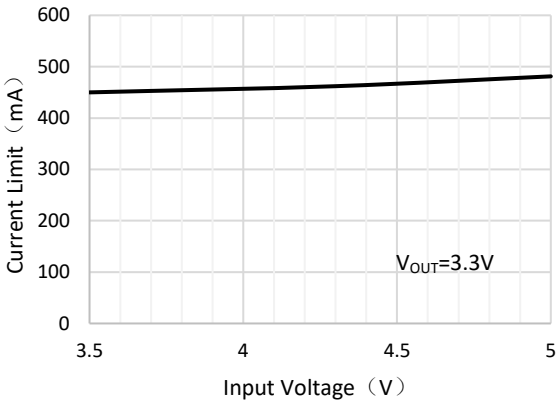
Output Voltage vs. Output Current



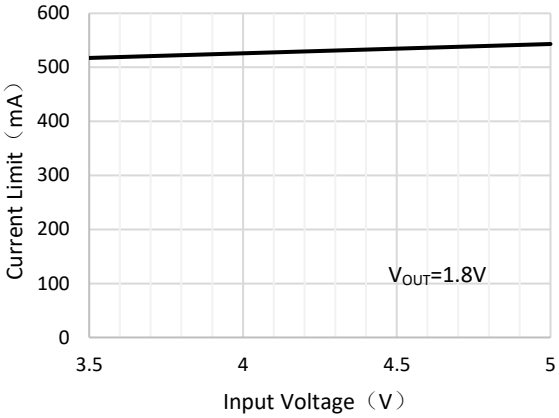
Output Voltage vs. Output Current



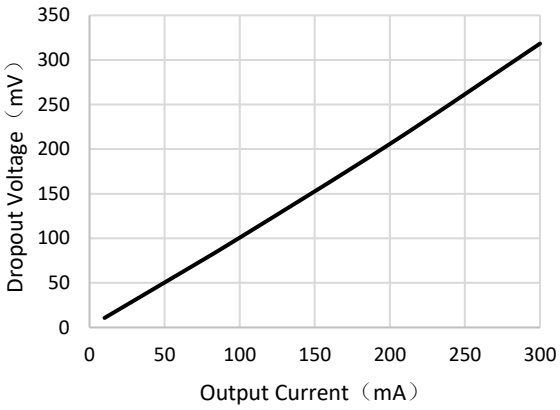
Current Limit vs. Input Voltage



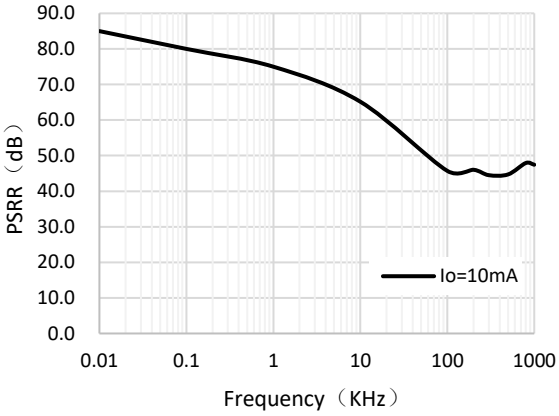
Current Limit vs. Input Voltage



Dropout Voltage vs. Output Current

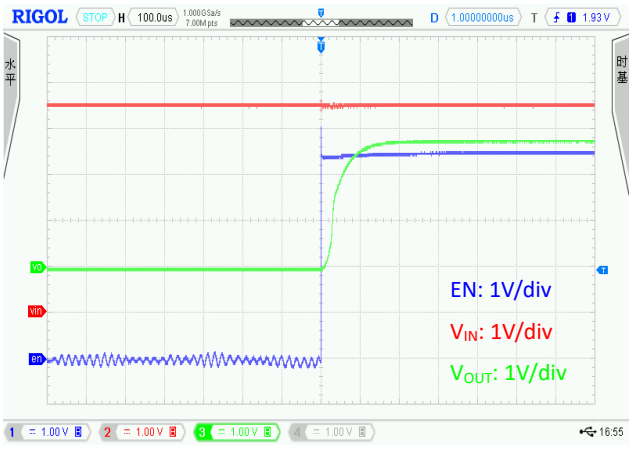


PSRR vs. Frequency



EN ON / OFF

V_{EN}=0V to 4.5V I_{OUT}=10mA



V_{EN}=4.5V to 0V I_{OUT}=10mA

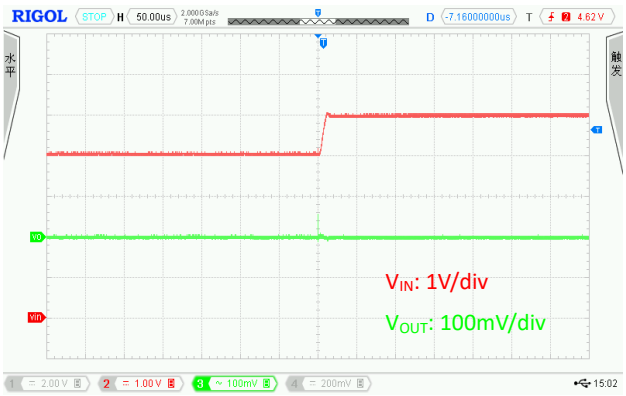
Power ON / OFF

V_{IN}=0V to 4.5V I_{OUT}=10mA

V_{IN}=4.5V to 0V I_{OUT}=10mA

Line Transient

V_{IN}=4V to 5V I_{OUT}=10mA



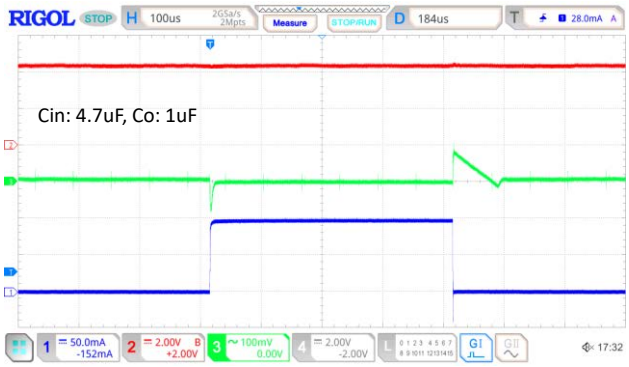
V_{IN}=5V to 4V I_{OUT}=10mA

Load Transient

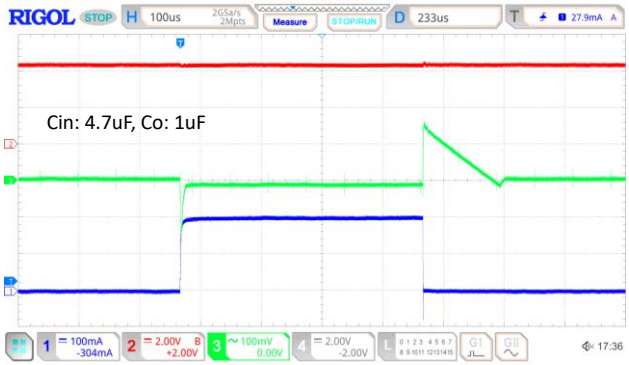
CH1: Io CH2: Vin CH3: Vo

V_{IN}=4.3V, Vo=3.3V I_{OUT}=1mA to 50mA

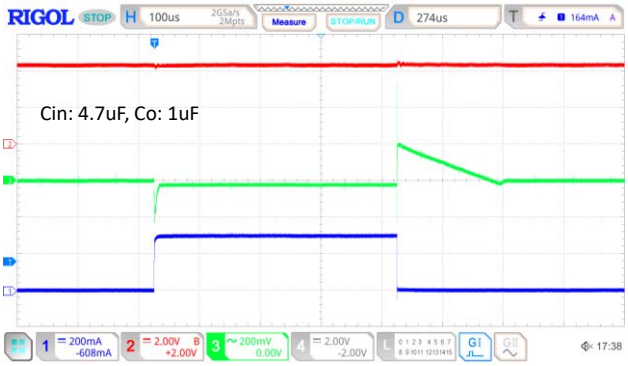
V_{IN}=4.3V, Vo=3.3V I_{OUT}=1mA to 100mA



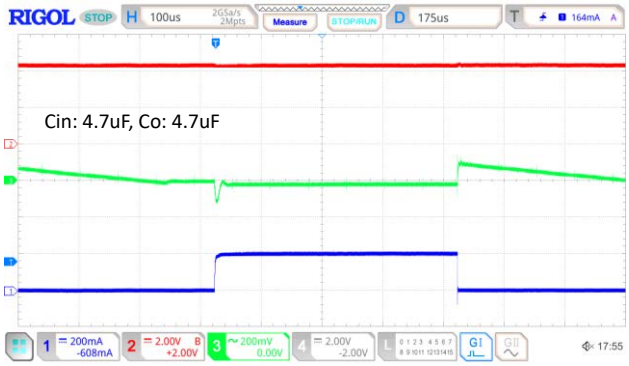
V_{IN}=4.3V, Vo=3.3V I_{OUT}=1mA to 200mA



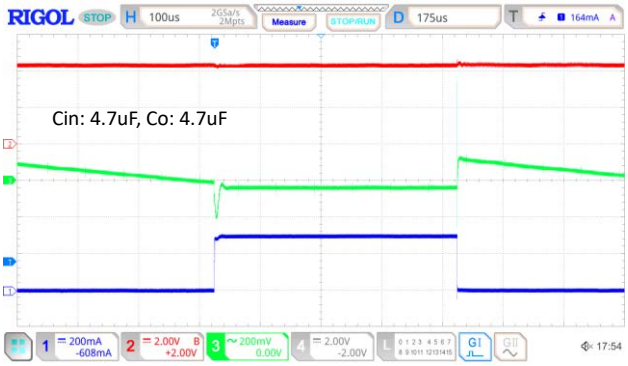
V_{IN}=4.3V, Vo=3.3V I_{OUT}=1mA to 300mA



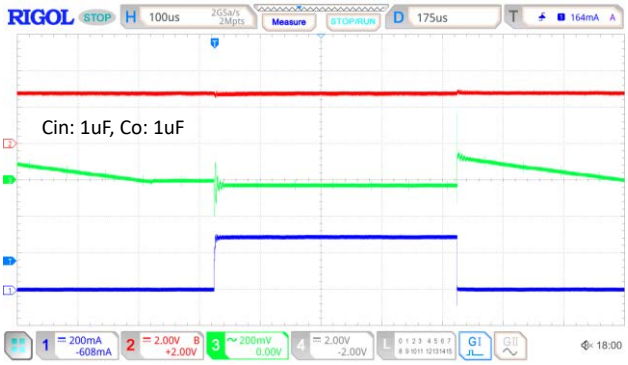
V_{IN}=4.3V, Vo=3.3V I_{OUT}=1mA to 200mA



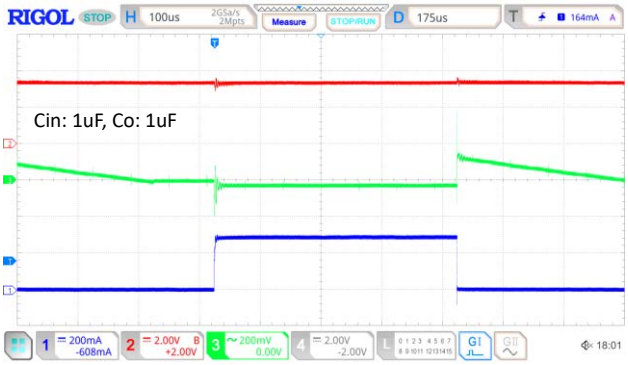
V_{IN}=4.3V, Vo=3.3V I_{OUT}=1mA to 300mA



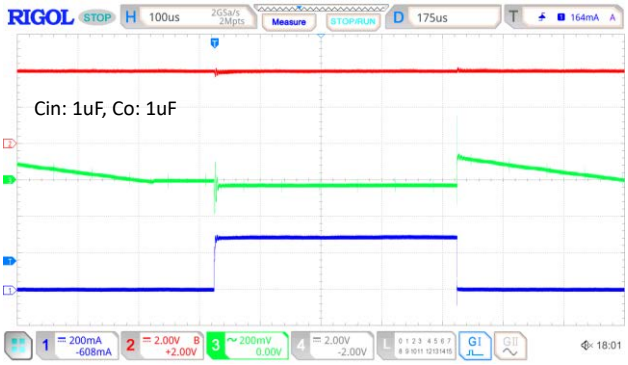
V_{IN}=2.8V, Vo=1.2V I_{OUT}=1mA to 300mA



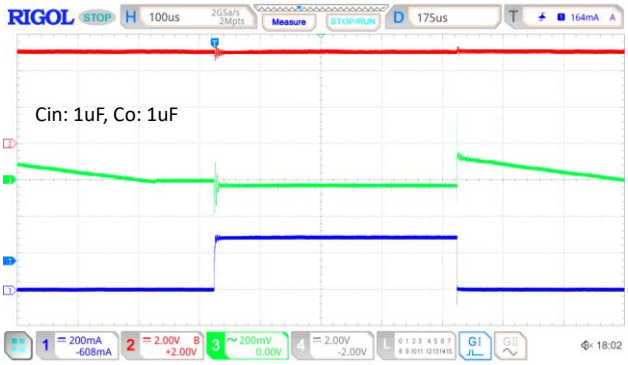
V_{IN}=3.3V, Vo=1.2V I_{OUT}=1mA to 300mA



V_{IN}=4V, Vo=1.2V I_{OUT}=1mA to 300mA



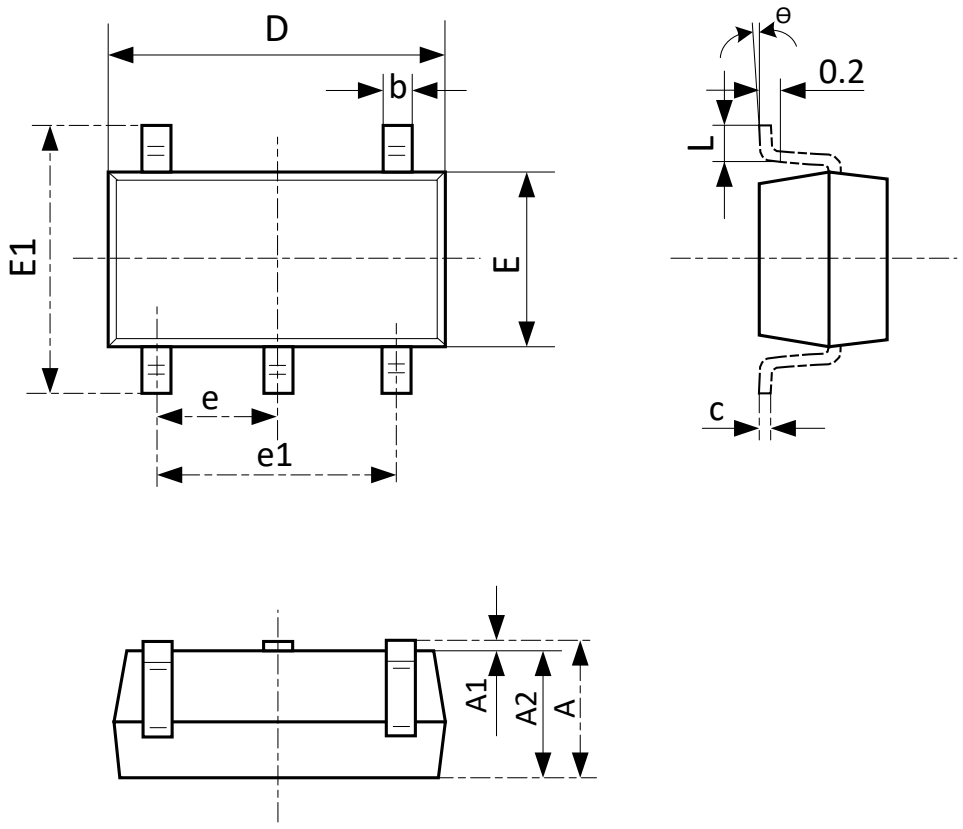
V_{IN}=5V, Vo=1.2V I_{OUT}=1mA to 300mA



PACKAGE OUTLINE

Package	SOT23-5L	Devices per reel	3000Pcs	Unit	mm

Package Dimension：

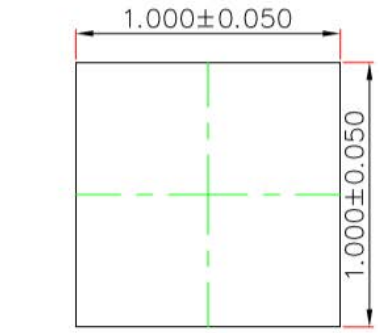


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0℃	8℃	0℃	8℃

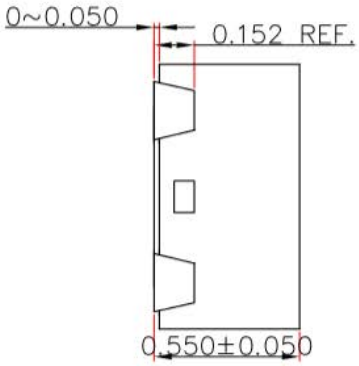
PACKAGE OUTLINE

Package	DFN1x1-4L	Devices per reel	10000Pcs	Unit	mm

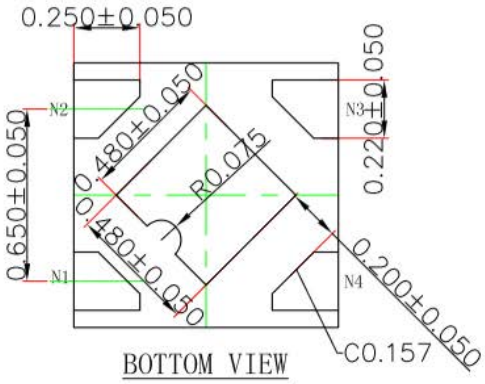
Package Dimension #1：



TOP VIEW
[顶视图]



SIDE VIEW
侧视图

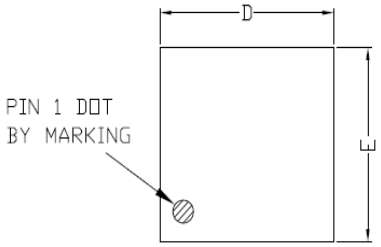


BOTTOM VIEW
背视图

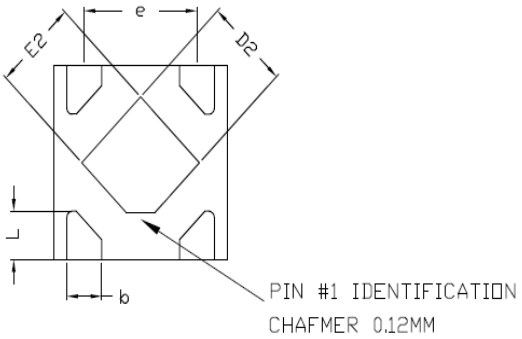
PACKAGE OUTLINE

Package	DFN1x1-4L	Devices per reel	10000Pcs	Unit	mm

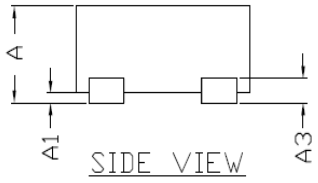
Package Dimension #2：



TOP VIEW



BOTTOM VIEW

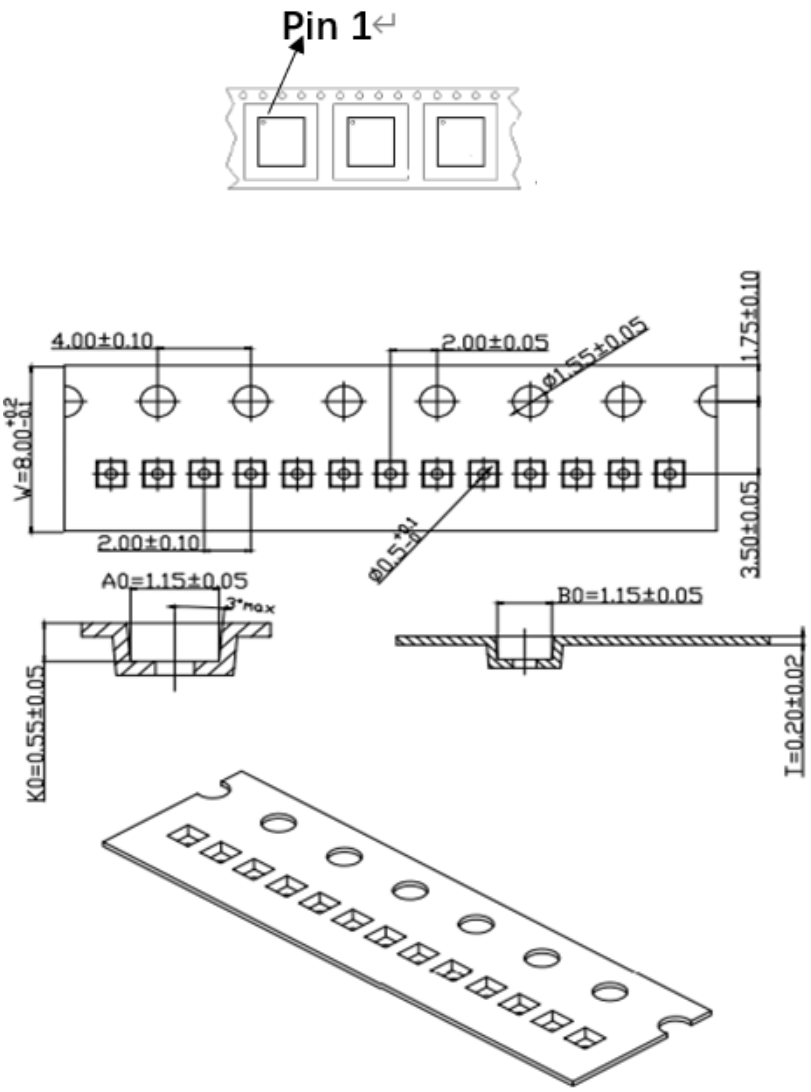


SIDE VIEW

COMMON DIMENSIONS(MM)			
PKG.	X1:EXTREME THIN		
REF.	MIN.	NOM.	MAX
A	0.40	–	0.50
A1	0.00	–	0.05
A3	0.125REF.		
D	0.95	1.00	1.05
E	0.95	1.00	1.05
b	0.15	0.20	0.25
L	0.15	0.25	0.35
D2	0.38	0.48	0.58
E2	0.38	0.48	0.58
e	0.65 BSC		

REMARK:
LEAD FINISH: NIPDAU

Tape


Pin 1
4.00±0.10
2.00±0.05
Ø1.55±0.05
1.75±0.10
W=8.00+0.2 -0.1
2.00±0.10
Ø0.5+0.1
3.50±0.05
A0=1.15±0.05
3°max
B0=1.15±0.05
K0=0.55±0.05
T=0.20±0.02