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 are available in standard SOT23-5L and DFN1x1-4L packages. Standard products are Pb-free and Halogen-free.

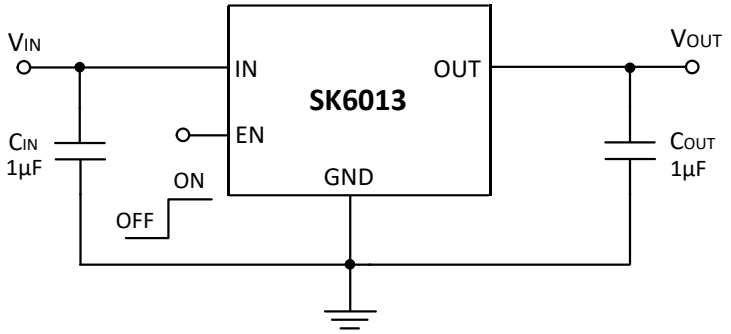
FEATURES

- Input voltage: 2.5V~6.5V
- Output range: 1.2V~3.6V
  (customized by every 0.1V step)
- Maximum output current: 300mA
- PSRR: 75dB @1KHz
- Dropout voltage: 220mV @ I_{OUT}=200mA
- Quiescent current : 50μA Typ.
- Shut-down current: <1μA
- Recommend capacitor:1μF
- Low output noise: 100μV_{RMS}

APPLICATIONS

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

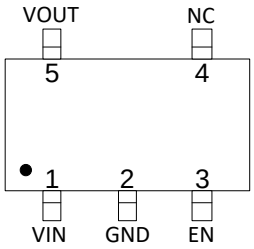
TYPICAL APPLICATION CIRCUIT



PIN CONFIGURATION

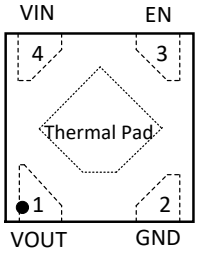
SOT23-5L

TOP VIEW



SOT23-5L

DFN1x1-4L



DFN1x1-4L

PIN DESCRIPTION

PIN NO		SYMBOL	I/O	DESCRIPTTION
SOT23-5L	DFN1x1-4L			
1	4	VIN	Power	Input
2	2	GND	Ground	Ground
3	3	EN	I	Enable (active high, do not float)
4	-	NC	/	Not connected
5	1	VOUT	O	Output
-	Thermal Pad	-	/	Thermal pad, connect to GND

ORDERING INFORMATION

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

Note: *XX indicates 1.2V~3.6V by 0.1V step. For example, 28 means product outputs 2.8V.*
The SK6013 devices are Pb-free and RoHS compliant.

PART NUMBER RULES

SK6013 [1] [2] - [3]

Output Voltage

XX: 1.2V~3.6V by 0.1V step, Example: 28 - 2.8V

Package

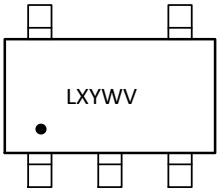
S5: SOT23-5L; D4: DFN1x1-4L

V_{OUT} discharge

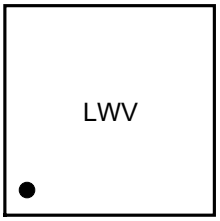
N: without fast discharge

A/B: with fast discharge

MARKING DESCRIPTION



SOT23-5L



DFN1x1-4L

"**L**": Product code

"**XY**":Internal control code

"**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

TYPICAL OUTPUT VOLTAGE CODE TABLE

V_{OUT}	CODE	V_{OUT}	CODE
1.2V	B	1.5V	C
1.8V	D	2.5V	E
2.6V	F	2.7V	L
2.8V	M	2.9V	N
3.0V	G	3.3V	H
3.6V	I	2.2V	V
1.3V	3		

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.*

RECOMMENDED OPERATING RANGE

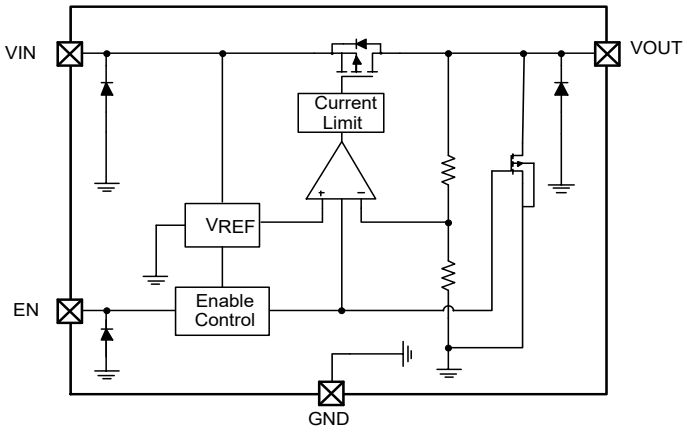
SYMBOL	ITEMS	VALUE	UNIT
V_{IN}	Supply Voltage	2.5 to 6.5	V
I_{OUT}	Output Current	<300	mA
T_{OPT}	Operating Temperature	-40 to +85	℃
C_{IN}	Input Capacitor	1μF ~10μF, 1μF isrecommended	μF
C_{OUT}	Output Capacitor		μF

ELECTRICAL CHARACTERISTICS

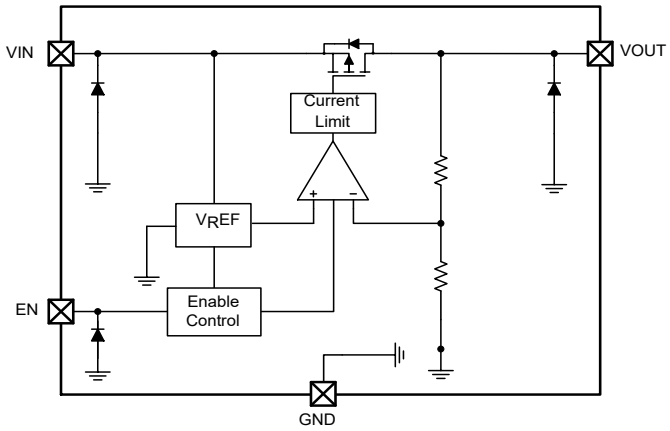
The following specifications apply for VOUT=2.8V, T_A=25 °C, unless otherwise specified.

SYMBOL	ITEMS	CONDITIONS	MIN	TYP	MAX	UNIT
V_{IN}	Input Voltage				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_{OUT}=2.8V, I_{OUT}=0		50		μA
I_{LIMIT}	Current Limit	V_{IN}=V_{EN}=4.5V		500		mA
V_{DROP}	Dropout Voltage	V_{OUT}=2.8V, I_{OUT}=200mA		220	250	mV
		V_{OUT}=2.8V, 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}=2.8V, I_{OUT}=1~300mA		40	70	mV
I_{SHORT}	Short Current	V_{EN}=V_{IN}, V_{OUT} Short to GND with 1Ω		80		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		55		
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		100		$μV_{RMS}$

SIMPLIFIED BLOCK DIAGRAM



With auto-discharge

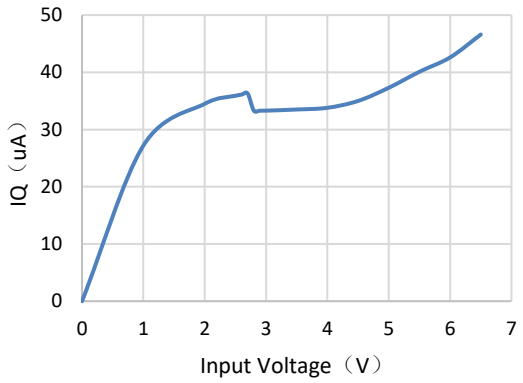


Without auto-discharge

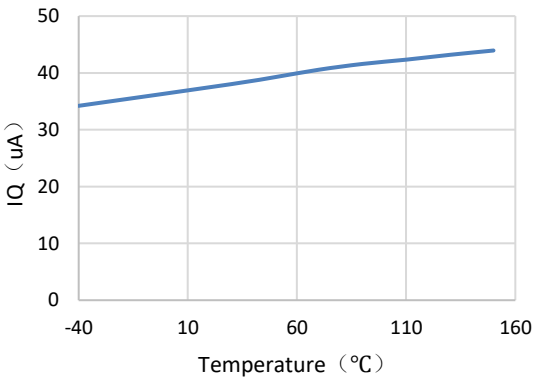
TYPICAL PERFORMANCE CHARACTERISTICS

C_{IN}=C_{OUT}=1μF, V_{IN}=4.5V, V_{OUT}=2.8V, T_A=25 °C, unless otherwise specified. Package：SOT23-5L

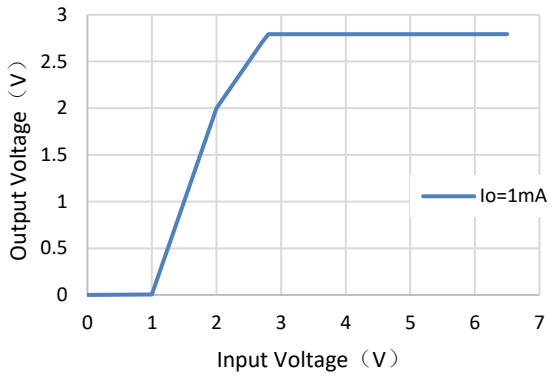
IQ vs. Input Voltage



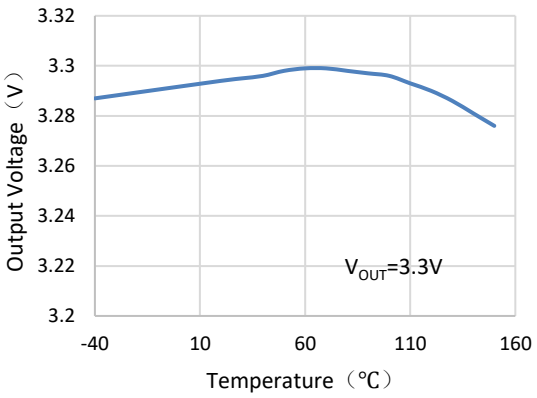
IQ vs. Temperature



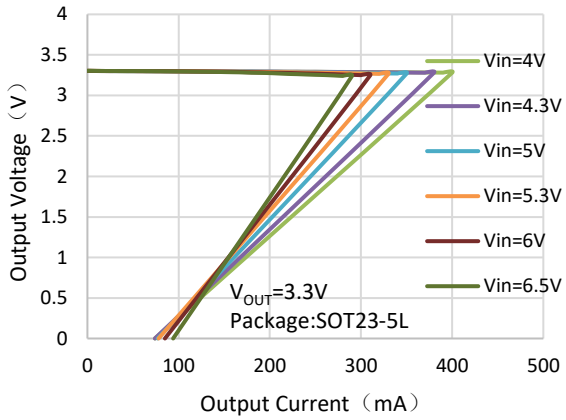
Output Voltage vs. Input Voltage



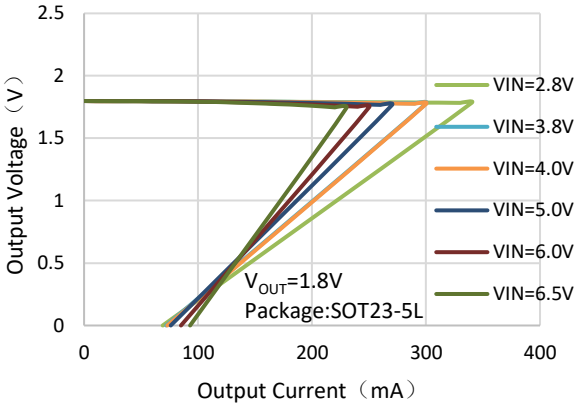
Output Voltage vs. Temperature



Output Voltage vs. Output Current



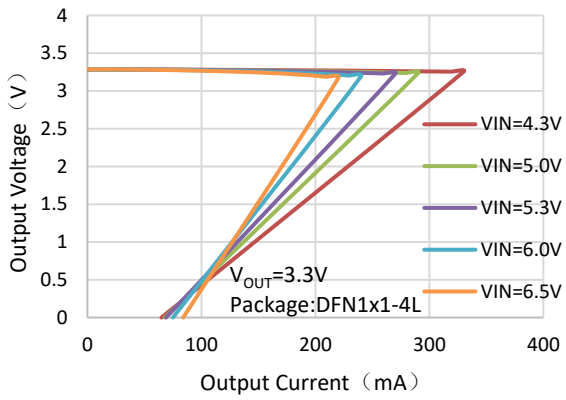
Output Voltage vs. Output Current



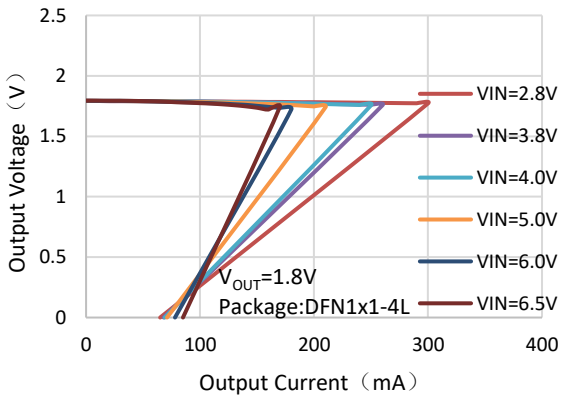
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

C_{IN}=C_{OUT}=1μF, V_{IN}=4.5V, V_{OUT}=2.8V, T_A=25 °C, unless otherwise specified. Package：SOT23-5L

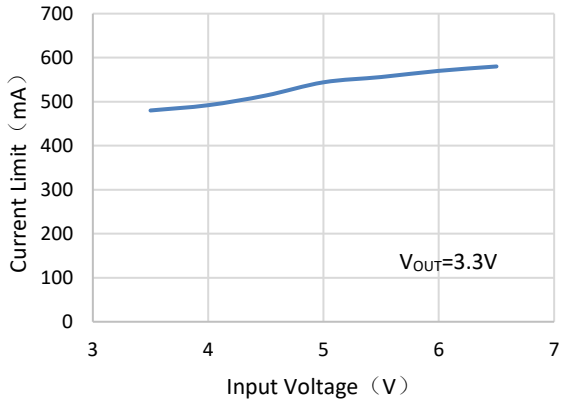
Output Voltage vs. Output Current



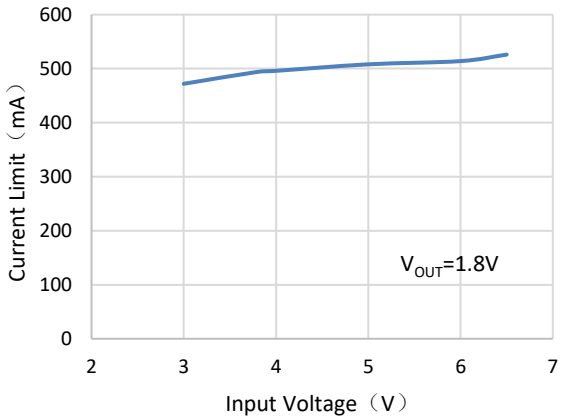
Output Voltage vs. Output Current



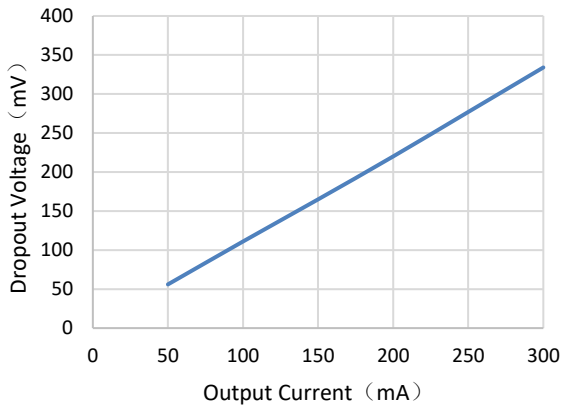
Current Limit vs. Input Voltage



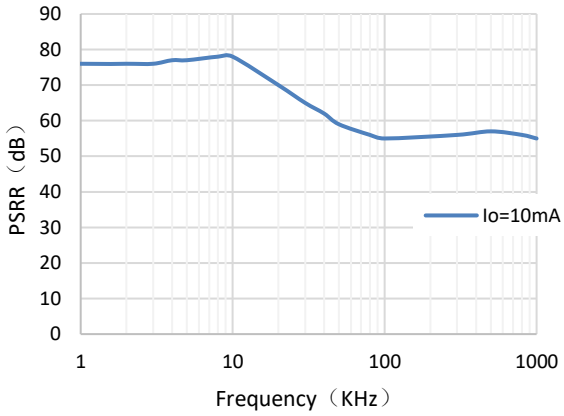
Current Limit vs. Input Voltage



Dropout Voltage vs. Output Current



PSRR vs. Frequency



TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

C_{IN}=C_{OUT}=1μF, V_{IN}=4.5V, V_{OUT}=2.8V, T_A=25 °C, unless otherwise specified. Package：SOT23-5L

EN ON / OFF

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

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

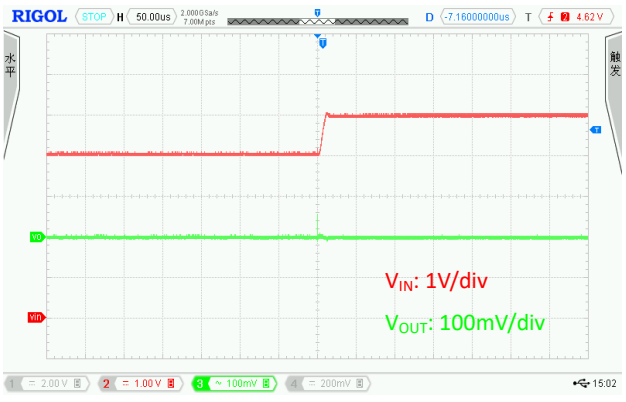
Power ON / OFF

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



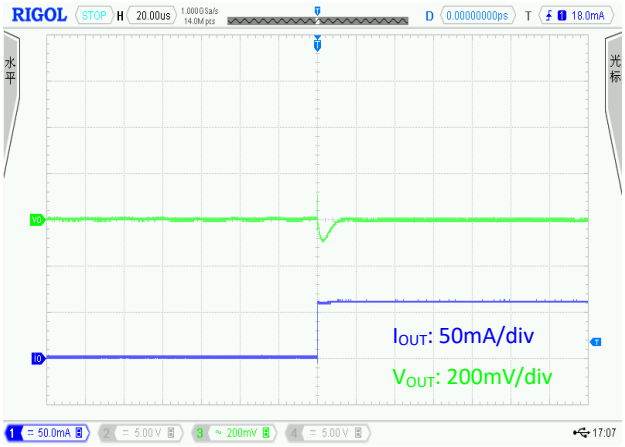
V_{IN}=5V to 4V I_{OUT}=10mA

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

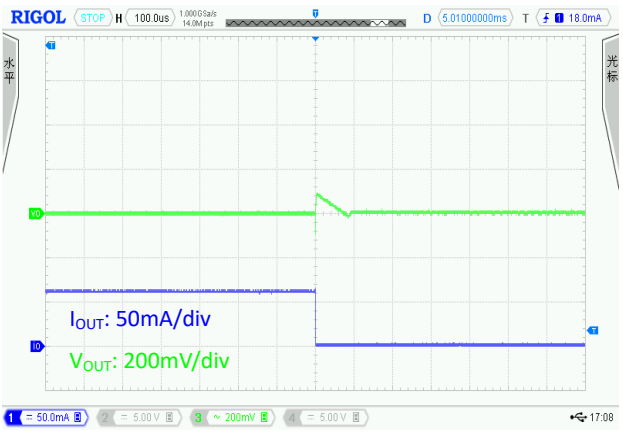
C_{IN}=C_{OUT}=1μF, V_{IN}=4.5V, V_{OUT}=2.8V, T_A=25 °C, unless otherwise specified. Package：SOT23-5L

Load Transient

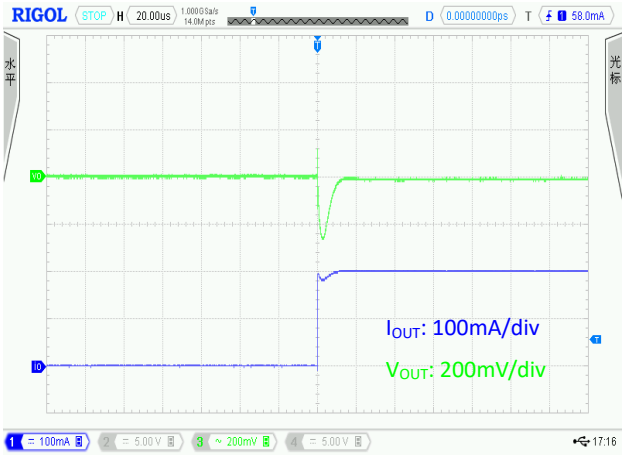
V_{IN}=4.5V I_{OUT}=1mA to 60mA



V_{IN}=4.5V I_{OUT}=60mA to 1mA

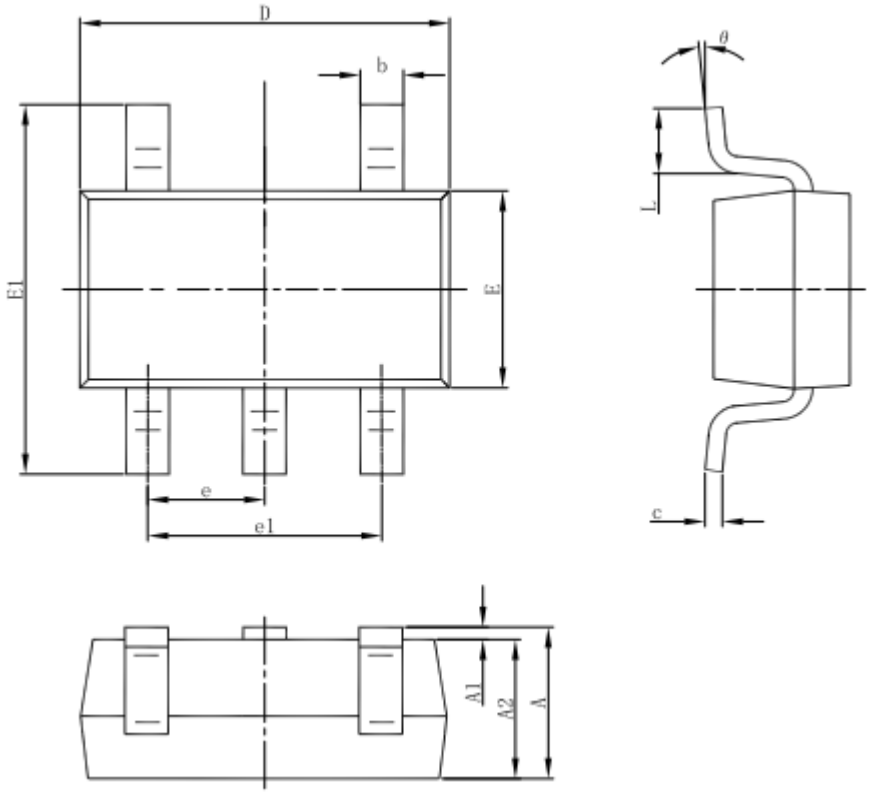


V_{IN}=4.5V I_{OUT}=1mA to 200mA



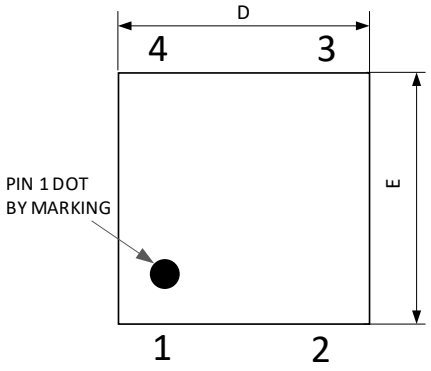
V_{IN}=4.5V I_{OUT}=200mA to 1mA

PACKAGE DIMENSIONS: SOT23-5L

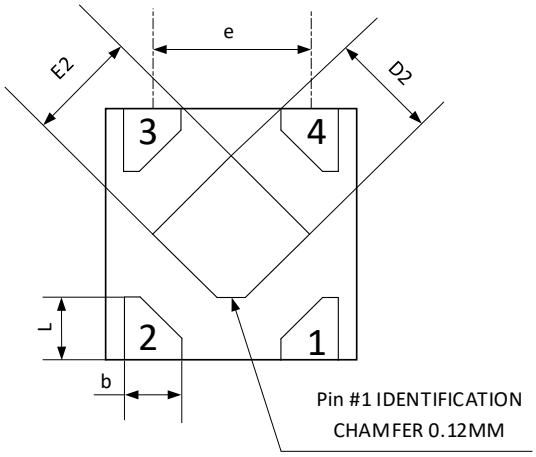


DIMENSIONS IN MILLIMETERS			
SYMBOL	MINIMUM	NOMINAL	MAXIMUM
A	1.05	-	1.35
A1	0.00	-	0.15
A2	1.00	1.10	1.20
b	0.3	-	0.5
D	2.82	2.92	3.02
E	1.50	1.60	1.70
E1	2.60	2.80	3.00
e	0.90	0.95	1.00
e1	1.80	1.90	2.00
L	0.30	0.45	0.60
θ	0°	-	8°

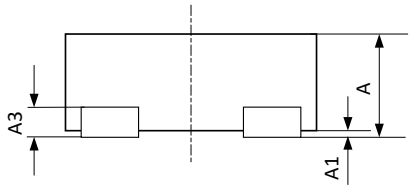
PACKAGE DIMENSIONS: DFN1X1-4L #1



TOP VIEW



BOTTOM VIEW

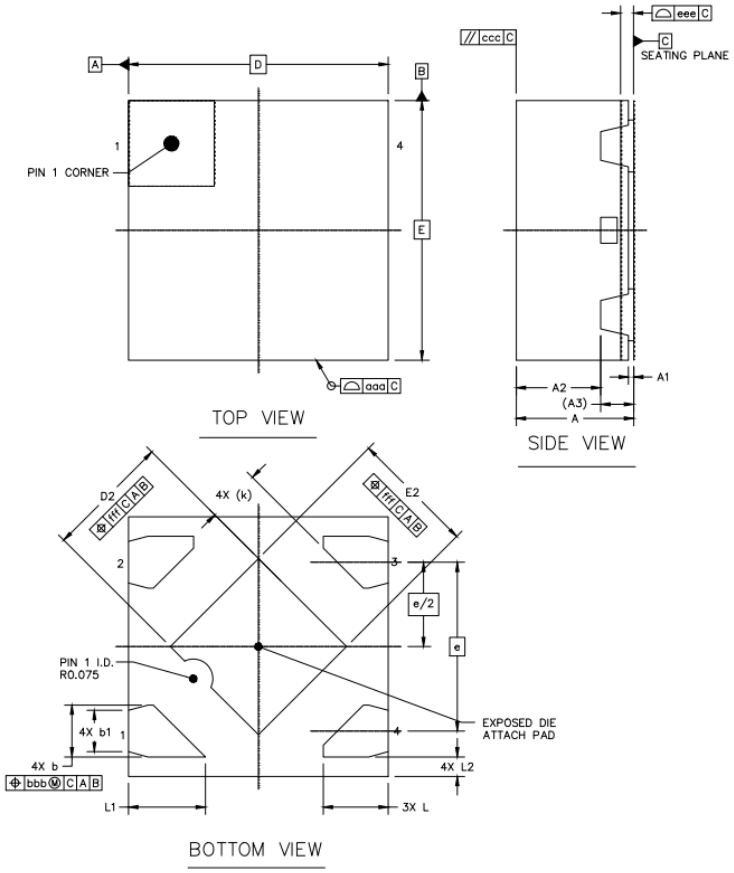


SIDE VIEW

REMARK:
LEAD FINISH: NIPDAU

DIMENSIONS IN MILLIMETERS			
Symbol	**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		

PACKAGE DIMENSIONS: DFN1X1-4L #2



DIMENSIONS IN MILLIMETERS			
Symbol	**Min.**	**Nom.**	**Max.**
A	0.40	0.45	0.50
A1	0.00	0.02	0.05
A2	-	0.325	-
A2		0.127 REF	
b	0.15	0.2	0.25
b1		0.16 REF	
D		1 BSC	
E		1 BSC	
e		0.65 BSC	
D2	0.38	0.48	0.58
E2	0.38	0.48	0.58
L	0.2	0.25	0.3
L1	0.286	0.296	0.306
L2	0.025	0.075	0.125
K		0.205 REF	