SK6018S 1.6μA I_Q, 300mA Low Noise CMOS LDO

GENERAL DESCRIPTION

The SK6018S is a high accuracy, low quiescent current, low noise, high speed, low dropout CMOS Linear regulator with high ripple rejection and fast load transient response function. The device offers a new level of cost-effective performance in portable, Battery powered equipment.

The SK6018S can provide product selections of output value in the range of 1.2V~3.6V by every 0.1V step.

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

The SK6018S are available in SOT23-5L, DFN1x1-4L and TDFN1x1-4L packages. Standard products are Pb-free and Halogen-free.

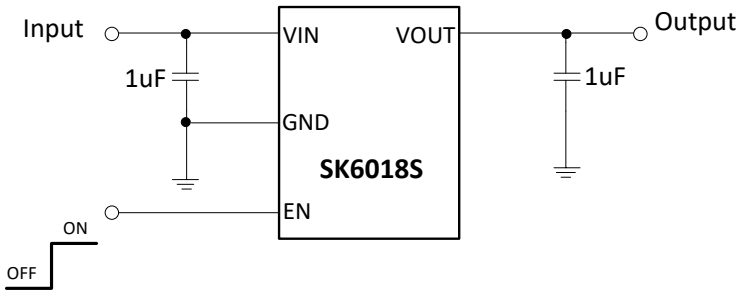
FEATURES

- Input Voltage: 1.8V~6.5V
- Output Voltage Range: 1.2V~3.6V
- Output Accuracy: ±2%
- Low Quiescent Current : 1.6μA Typ.
- Shut-down Current: < 0.5μA
- Current Limit Protection
- Over Temperature Protection
- PSRR: 75dB @1KHz
- Noise: 50μV_{RMS}@10Hz to 100KHz, I_{OUT}=30mA
- Maximum Output Current: 300mA @ V_{IN}-V_{OUT}=1V
- Dropout Voltage: 0.48V Typ.@ I_{OUT}=300mA, V_{OUT}≥3V
- Recommend capacitor: 1μF

APPLICATIONS

- Portable, Battery powered equipment
- Ultra-low power microcontrollers
- Notebook computers

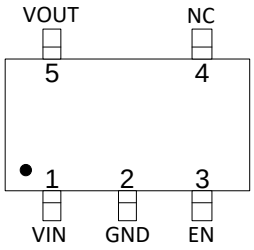
TYPICAL APPLICATION CIRCUIT



PIN CONFIGURATION

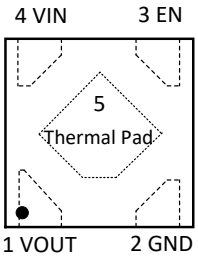
SOT23-5L

TOP VIEW



SOT23-5L

xDFN1x1-4L



DFN-4L/TDFN-4L

PIN DESCRIPTION

PIN NO		SYMBOL	I/O	DESCRIPTTION
SOT23-5L	DFN1x1-4L TDFN1x1-4L			
1	4	VIN	P	Input Power Supply
2	2	GND	G	Ground
3	3	EN	I	Enable (active high, do not float)
4	5	NC/Thermal pad	/	Not connected/Thermal Pad. Thermal pad is not connected to GND pin internally. This pad should be soldered to a large PCB and connected to GND for maximum thermal dissipation.
5	1	VOUT	O	Output pin

ORDERING INFORMATION

PART NO	PACKAGE	V_{OUT} DISCHARGE	TEMPERATURE	TAPE & REEL
SK6018SS5-XX	SOT23-5L	Yes	-40°C ~ +85°C	3000/REEL
SK6018SD4-XX	DFN1x1-4L	Yes	-40°C ~ +85°C	10000/REEL
SK6018STD4-XX	TDFN1x1-4L	Yes	-40°C ~ +85°C	10000/REEL

Note: XX indicates 1.2V~3.6V by 0.1V step. For example, 33 means product outputs 3.3V

ABSOLUTE MAXIMUM RATINGS (Note 1)

SYMBOL	ITEMS		VALUE	UNIT
V_{IN}	Input Voltage		-0.3~8	V
I_{OUT}	Continues Output Current		300	mA
P_{DMAX}	Power Dissipation	SOT23-5L	0.45	W
		DFN1x1-4L/ TDFN1x1-4L	0.5	
$R_{\theta JA}$	Thermal Resistance of Junction to Ambient	SOT23-5L	270	°C /W
		DFN1x1-4L/ TDFN1x1-4L	220	°C /W
T_J	Junction Temperature		-40~150	°C
T_A	Ambient Temperature		-40~85	°C
T_{STG}	Storage Temperature		-55~150	°C
T_{SOLDER}	Package Lead Soldering Temperature		260℃, 10s	
ESD	HBM		±7	KV
LU	Latch up		±500	mA

Note (1): Exceed these limits could damage the device potentially. Exposure to absolute maximum rating conditions may affect device reliability.

RECOMMENDED OPERATING CONDITIONS

SYMBOL	ITEMS	VALUE	UNIT
V_{IN}	Supply Voltage	1.8~6.5	V
I_{OUT}	Output Current	≤300	mA
C_{IN}	Input Capacitor	1	μF
C_{OUT}	Output Capacitor	1	μF

ELECTRICAL CHARACTERISTICS

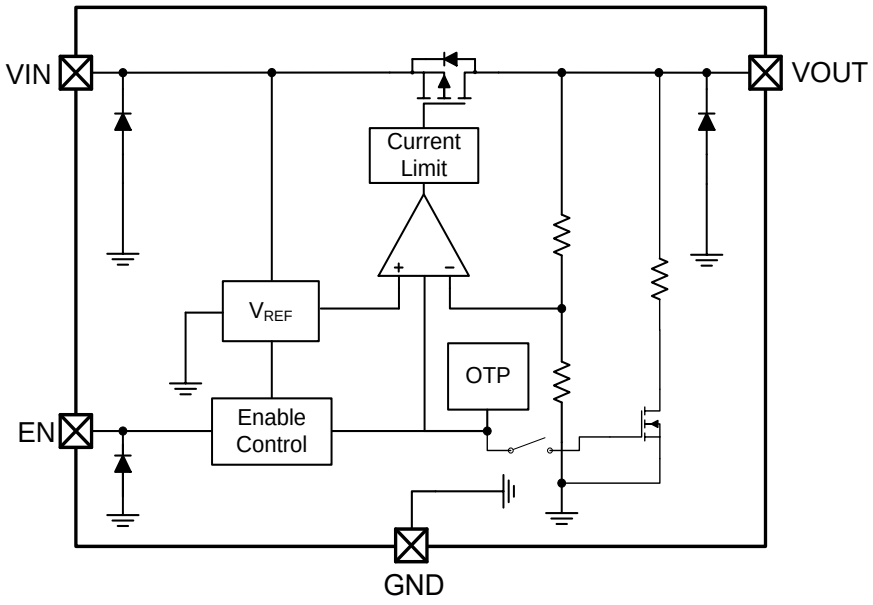
The following specifications apply for V_{OUT} + 1 ≤ V_{IN} ≤ 6.5V, C_{IN}=C_{OUT}=1μF, T_A=25°C , unless specified otherwise.

SYMBOL	ITEMS	CONDITIONS		MIN	TYP	MAX	UNIT
V_{IN}	Input Voltage Range			1.8		6.5	V
V_{OUT}	Output Voltage Range			1.2		3.6	V
	Output Accuracy	V_{OUT} < 1.5V, I_{OUT} = 1mA		-30		+30	mV
		V_{OUT} ≥ 1.5V, I_{OUT} = 1mA		-2		+2	%
I_Q	Quiescent Current	V_{IN} = 5V, I_{OUT} = 0			1.6	3	μA
I_{SHDN}	Shut-down Current	V_{EN} = 0V			0.1	0.5	μA
I_{LIM}	Output Current Limit	Peak output current		350	500		mA
V_{DROP}	Dropout Voltage (I_{OUT} = 50mA) Note (1)	1.2V ≤ V_{OUT} < 1.5V			0.4	0.5	V
		1.5V ≤ V_{OUT} < 1.8V			0.2	0.24	V
		1.8V ≤ V_{OUT} < 2.5V			0.15	0.18	V
		2.5V ≤ V_{OUT} < 3.0V			0.1	0.15	V
		3.0V ≤ V_{OUT}			0.08	0.12	V
	Dropout Voltage (I_{OUT} = 300mA) Note (1)	1.2V ≤ V_{OUT} < 1.5V			1.2	1.4	V
		1.5V ≤ V_{OUT} < 1.8V			1	1.1	V
		1.8V ≤ V_{OUT} < 2.5V			0.82	1	V
		2.5V ≤ V_{OUT} < 3.0V			0.61	0.7	V
		3.0V ≤ V_{OUT}			0.48	0.6	V
$\triangle V_{LINE}$	Line Regulation $\lvert \frac{\triangle V_{OUT}}{\triangle V_{IN} \times V_{OUT}} \rvert$	I_{OUT}= 10mA	2.1V ≤ V_{IN} < 6.5V		0.02	0.15	%/V
$\triangle V_{LOAD}$	Load Regulation $\lvert \triangle V_{OUT} \rvert$ (1mA ≤ I_{OUT} ≤ 300mA)	V_{IN} = V_{OUT} + 1.5V	1.2V ≤ V_{OUT} < 1.8V		15	30	mV
		V_{IN} = V_{OUT} + 1V	1.8V ≤ V_{OUT} ≤ 3.6V		10	30	mV
PSRR	Power Supply Rejection Ratio Note (2)	V_{IN} = 5V, f = 1KHz, I_{OUT} = 50mA, C_{OUT} = 1μF			75		dB
e_{NO}	Output Voltage Noise Note (2)	C_{OUT} = 1μF, I_{OUT} = 30mA, BW = 10Hz to 100kHz, V_{IN} = V_{OUT} + 2V			50		μV_{RMS}
V_{ENH}	EN logic high voltage	V_{IN} = 6.5V		1.2			V
V_{ENL}	EN logic low voltage	V_{IN} = 6.5V				0.4	V
I_{EN}	EN Input Current	V_{EN}= 6.5V				0.1	μA
R_{DIS}	Output discharge resistance	V_{IN}=5V, EN=0, V_{OUT}=1V			100		Ω
T_{SD}	Thermal Shutdown Temperature	I_{OUT} = 30mA, V_{IN} ≥ 1.5V			160		°C
ΔT_{SD}	Thermal Shutdown Hysteresis				20		°C

Note (1): The dropout voltage is defined as V_{IN} − V_{OUT}, when V_{OUT} is 98% of the normal value of V_{OUT}.

Note (2): Guaranteed by design, not FT item.

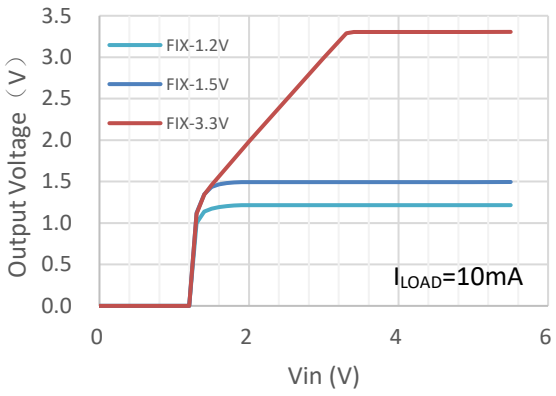
BLOCK DIAGRAM



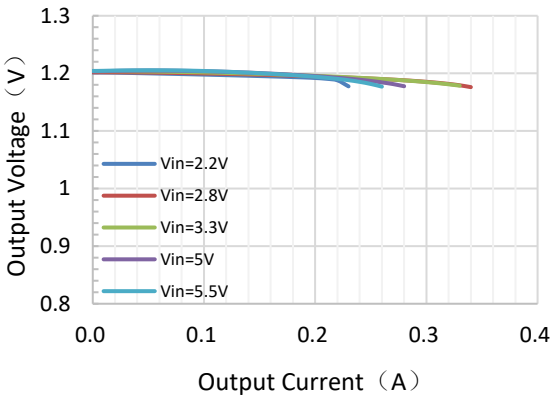
TYPICAL PERFORMANCE CHARACTERISTICS

C_{IN}=1uF, C_{OUT}=1uF, V_{IN}=V_{OUT} +1V, T_A=25 °C, unless specified otherwise.

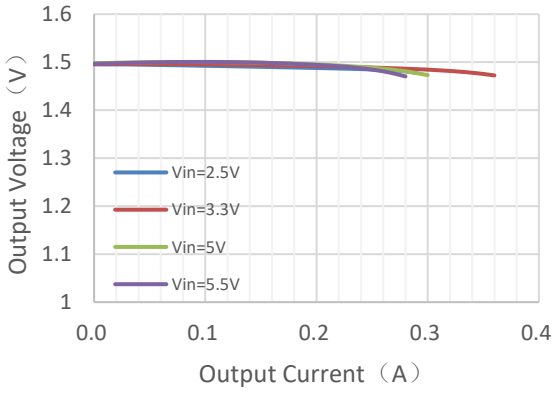
Line Regulation



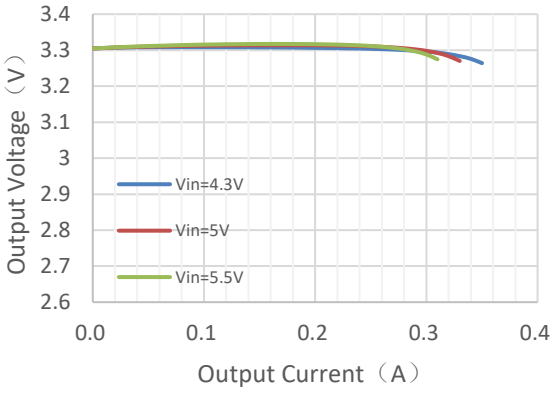
Load Regulation-FIX 1.2V



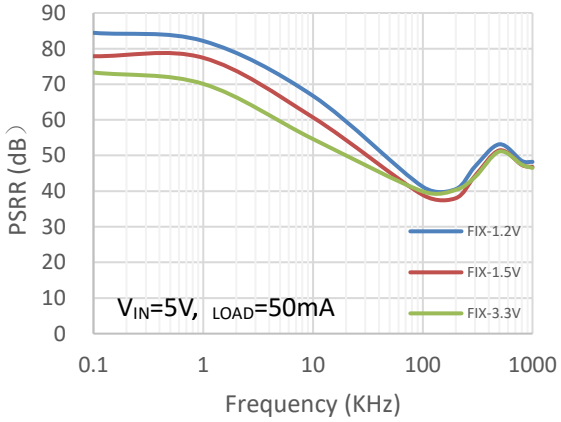
Load Regulation-FIX 1.5V



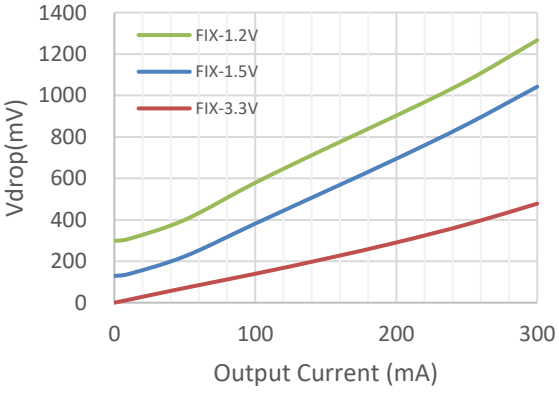
Load Regulation-FIX 3.3V



PSRR



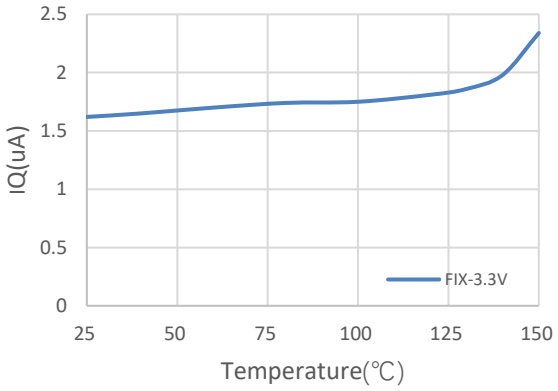
Dropout voltage



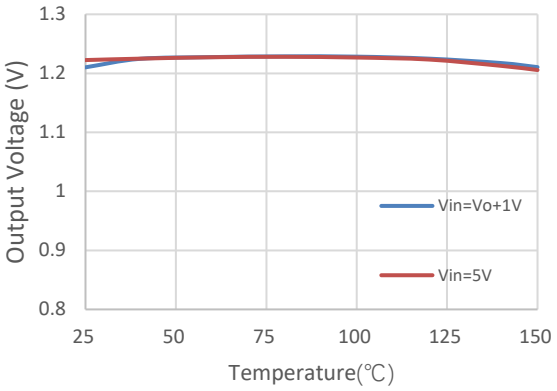
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

C_{IN}=1uF, C_{OUT}=1uF, V_{IN}=V_{OUT} +1V, T_A=25 °C, unless specified otherwise.

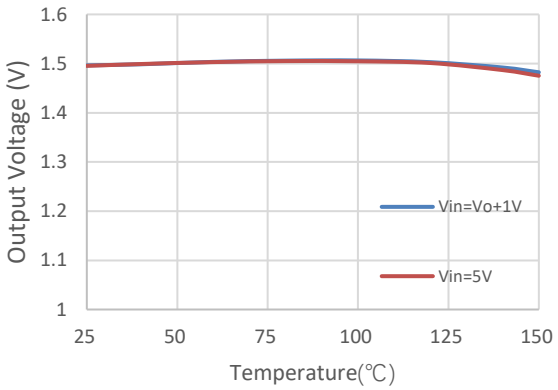
IQ vs Temperature



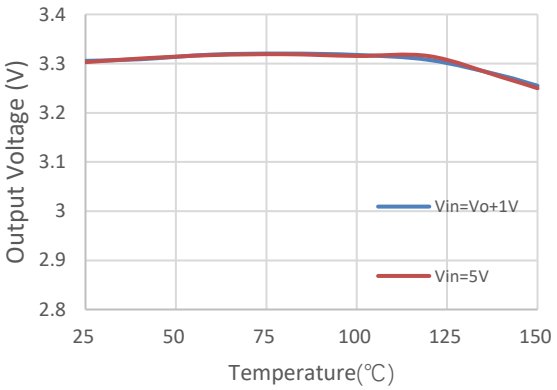
Output Voltage vs Temperature (FIX-1.2V)



Output Voltage vs Temperature (FIX-1.5V)



Output Voltage vs Temperature (FIX-3.3V)

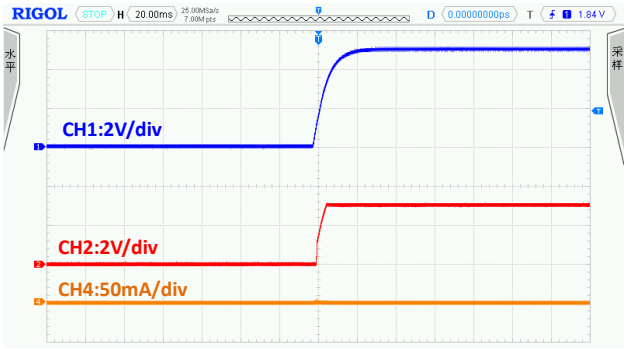


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

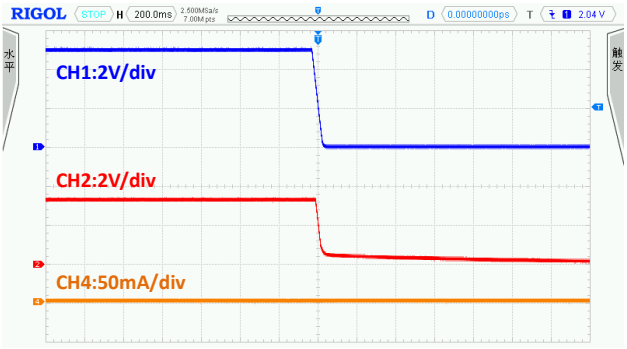
Power ON / OFF

CH1:V_{IN} **CH2:V_{OUT}** **CH4:I_{IN}**

Power ON(V_{IN}: 0V to 5V)



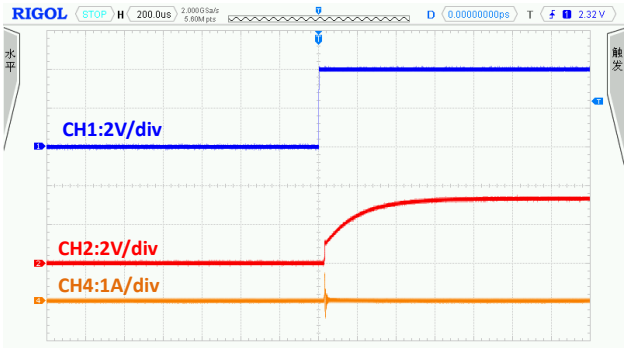
Power OFF(V_{IN}: 5V to 0V)



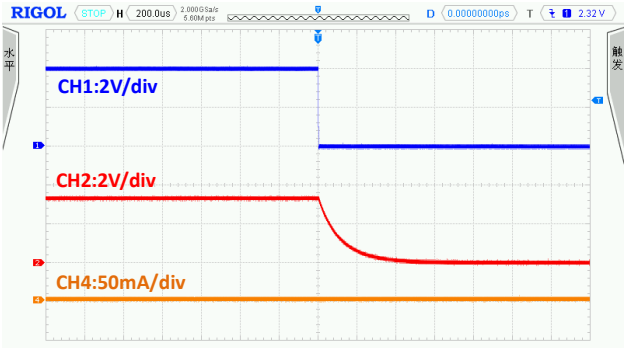
EN ON / OFF

CH1:EN **CH2:V_{OUT}** **CH4:I_{IN}**

EN ON(EN: 0V to 4V)



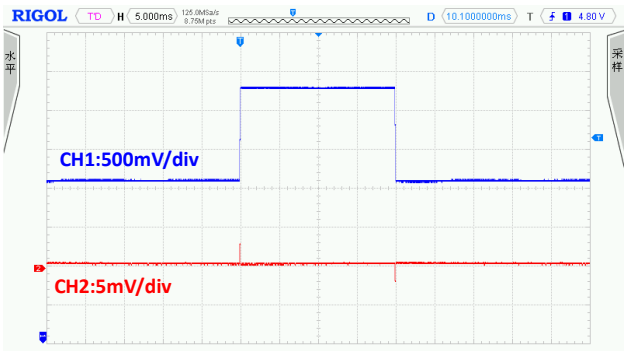
EN OFF(EN: 4V to 0V)



Line Transient

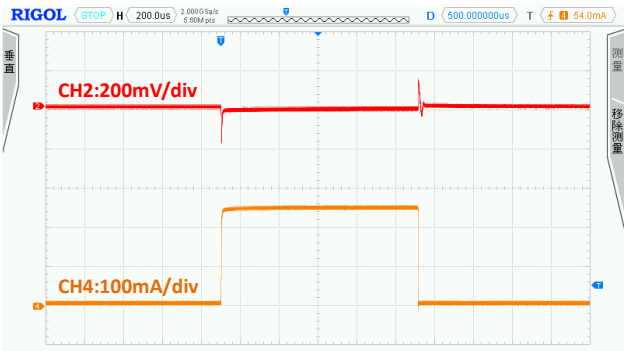
CH1:V_{IN} **CH2:V_{OUT}** **CH4:I_{OUT}**

V_{IN}=4.3V to 5V, V_{OUT}=3.3V, I_{LOAD}=10mA

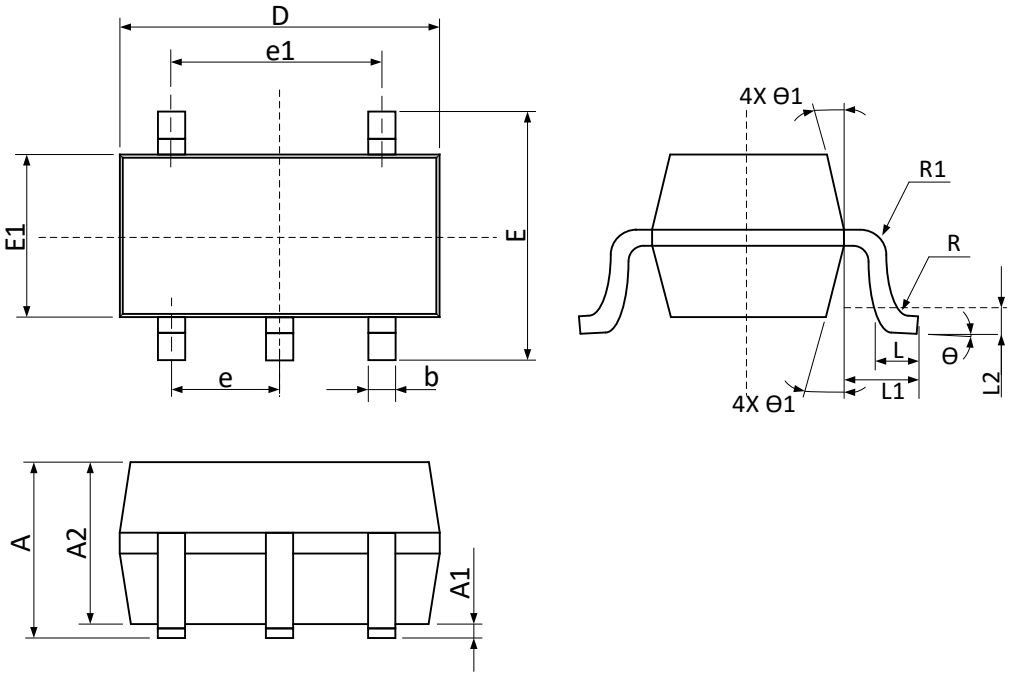


Load Transient

V_{IN}=5V, V_{OUT}=3.3V, I_{LOAD}=10mA to 250mA



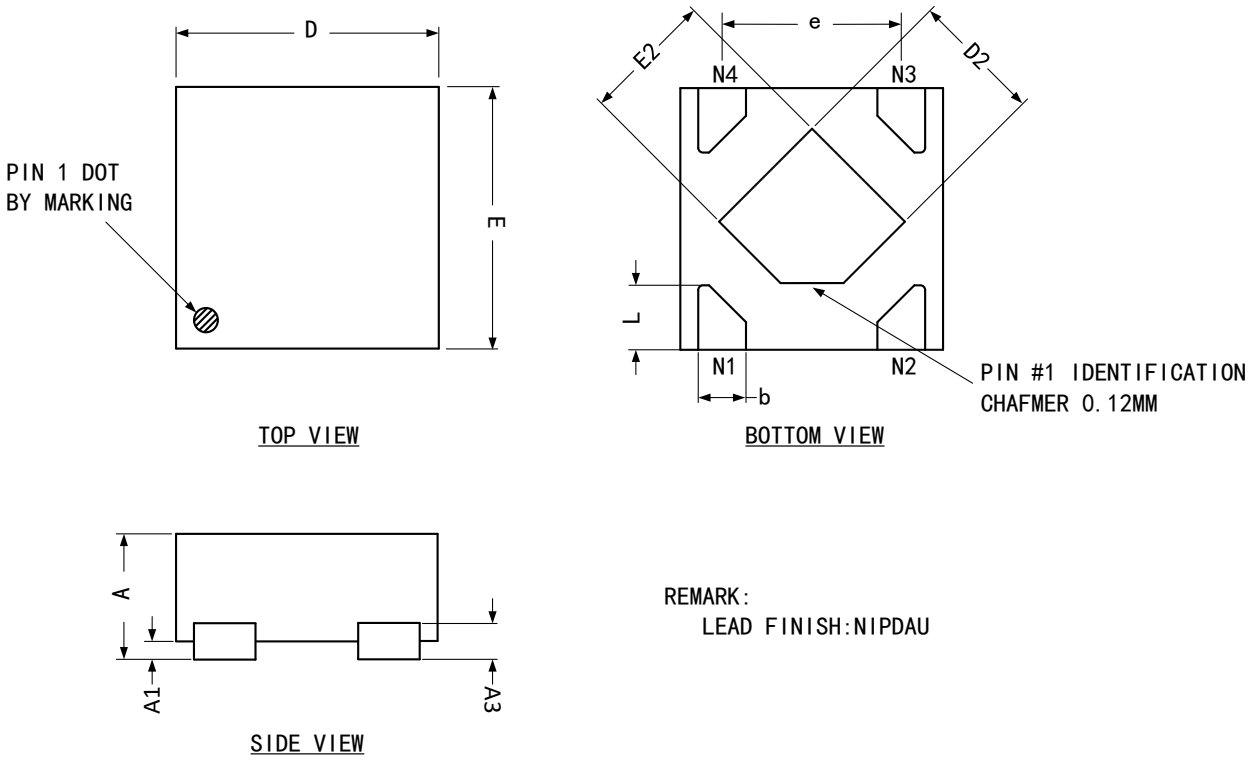
PACKAGE DIMENSIONS: SOT23-5L



Unit:mm

DIMENSIONS IN MILLIMETERS			
SYMBOL	MINIMUM	NOMINAL	MAXIMUM
A	-	-	1.35
A1	0.00	-	0.15
A2	1.00	1.10	1.20
b		0.35 REF	
D	2.82	2.92	3.02
E	2.60	2.80	3.00
E1	1.50	1.60	1.70
e		0.95 REF	
e1		1.90 REF	
L	0.30	0.45	0.60
L1		0.60 REF	
L2		0.25 REF	
R	0.10	-	-
R1	0.10	-	0.25
Θ	0°	4°	8°
Θ1	5°	10°	15°

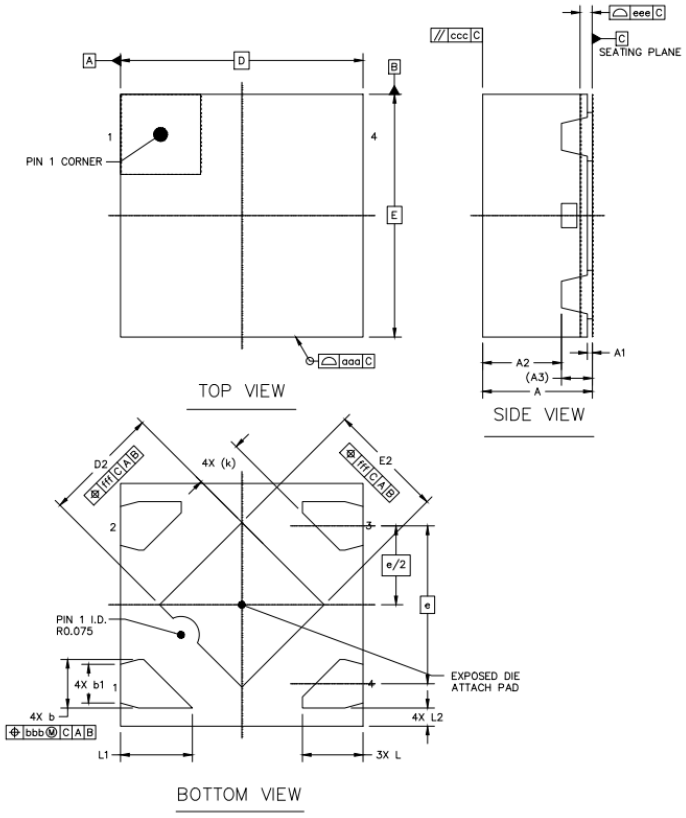
PACKAGE DIMENSIONS: DFN1x1-4L (#1)



Unit:mm

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	

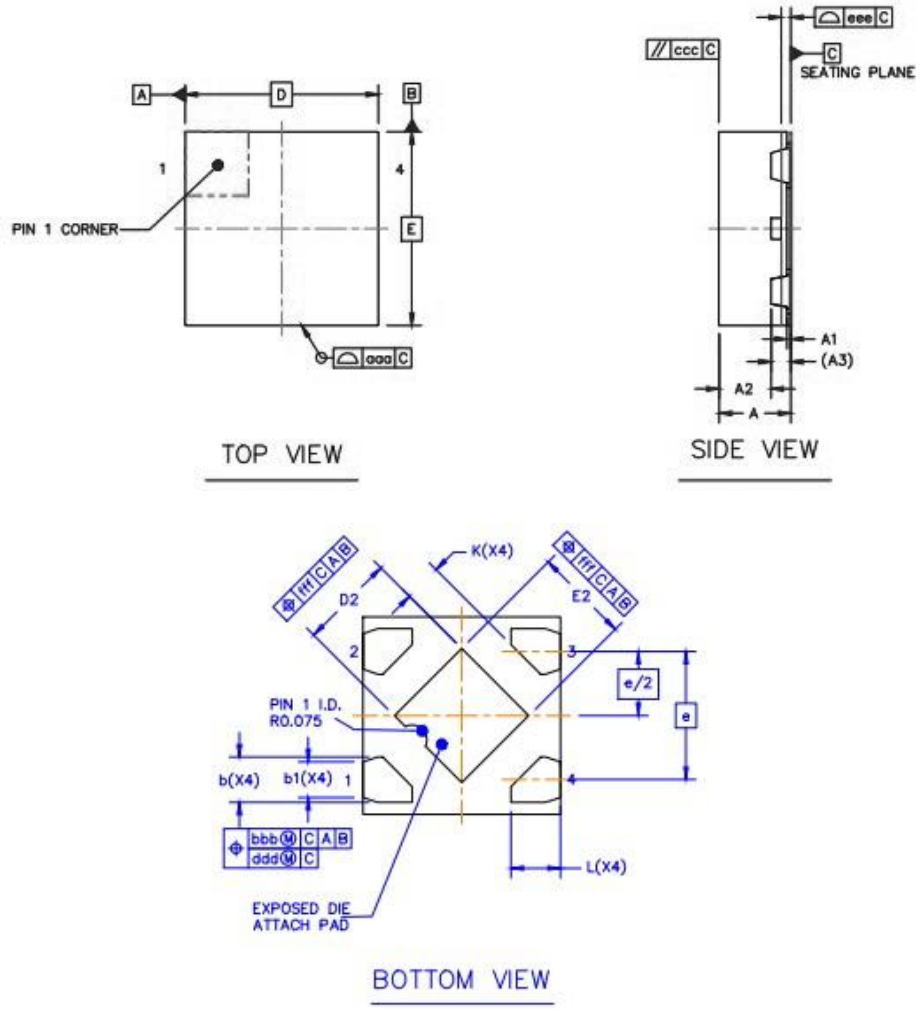
PACKAGE DIMENSIONS: DFN1x1-4L (#2)



Unit:mm

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		

PACKAGE DIMENSIONS: TDFN1x1-4L



Unit:mm

DIMENSIONS IN MILLIMETERS			
Symbol	**Min.**	**Nom.**	**Max.**
A	0.32	0.37	0.40
A1	0.00	0.02	0.05
A2	-	0.27	-
A3		0.102 REF	
b	0.18	0.23	0.28
D		1 BSC	
E		1 BSC	
e		0.65 BSC	
D2	0.43	0.48	0.53
E2	0.43	0.48	0.53
L	0.2	0.25	0.3
K		0.191 REF	