

SUL6018 1.3 μ A, High PSRR, 350mA Low-Dropout Linear Regulator

FUNCTIONAL DESCRIPTION

The SUL6018 is an ultra-small, ultra-low quiescent current low-dropout linear regulator (LDO) that can source 350mA with excellent transient performance.

The SUL6018, with an ultra-low IQ of 1.3 μ A, is designed specifically for applications where very-low quiescent current is a critical parameter. This device maintains low IQ consumption even in dropout mode to further increase the battery life.

The feature of 1.3 μ A low quiescent current and 0.05 μ A shutdown current are ideal for the battery application with long service life. The other features include current limit function, over temperature protection and output discharge function.

The SUL6018 is available SOT23-5L and DFN-1x1-4L Packages. Standard products are Pb-free and Halogen-free.

FEATURES

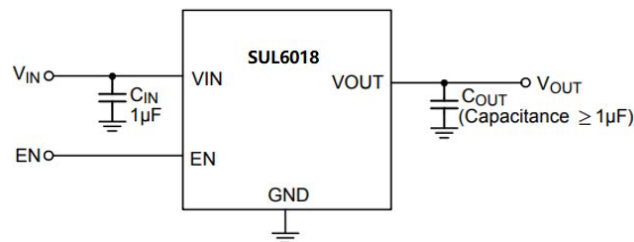
- Input Voltage Range: 1.2V to 5.5V
- Ultra Low IQ: 1.3 μ A
- High PSRR = 85dB @1KHz
- Output Voltage Range:
 - Adjustable Mode: 0.8V to 4.5V
 - Fixed Mode: 0.8V~4.5V, 0.05V step.
- High Output Accuracy: $\pm 1\%$
- Ultra Low Dropout Voltage: 150mV @ 350mA when $V_{OUT} \geq 3V$
- Low Noise: 30 μ Vrms
- Current Limit Protection
- Over Temperature Protection
- Output Active Discharge Function

APPLICATIONS

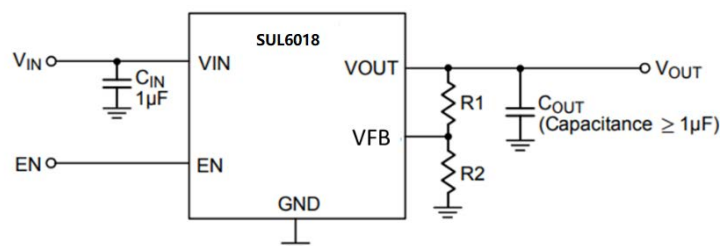
- Portable, Battery Powered Equipment
- Ultra Low Power Microcontrollers
- Notebook Computers

TYPICAL APPLICATION CIRCUIT

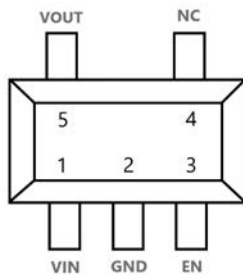
Fixed Mode



ADJ Mode

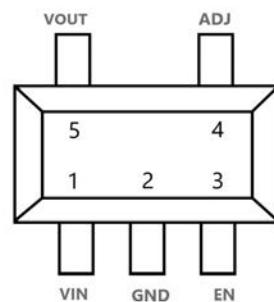


PIN CONFIGURATION & PIN DESCRIPTIONS



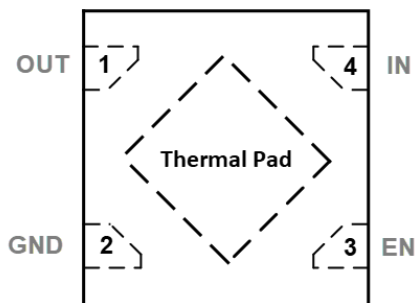
SOT-23-5 Pin Configuration (Fixed Mode)

PIN No	Symbol	Pin Description
1	VIN	Input Pin
2	GND	Ground Pin
3	EN	Chip Enable Pin
4	NC	No Connection
5	VOUT	Output Pin



SOT-23-5 Pin Configuration (ADJ Mode)

PIN No	Symbol	Pin Description
1	VIN	Input Pin
2	GND	Ground Pin
3	EN	Chip Enable Pin
4	ADJ	No Connection
5	VOUT	Output Pin



DFN1x1-4L Pin Configuration

PIN No	Symbol	Pin Description
1	VOUT	Output Pin
2	GND	Ground Pin
3	EN	Chip Enable Pin
4	VIN	Input Pin

ORDERING INFORMATION

PART NO	PACKAGE	TEMPERATURE	TAPE & REEL
SUL6018S5-XX ^{Note}	SOT23-5L	-40 ~ +85°C	3000/REEL
SUL6018D4-XX ^{Note}	DFN1x1-4L	-40 ~ +85°C	10000/REEL

Note:XX indicates Vout. For example, 28 means product outputs 2.8V

ABSOLUTE MAXIMUM RATINGS

Symbol	Item	Rating		Unit
V_{IN}	Input Voltage	6.0		V
V_{CE}	Input Voltage (CE Pin)	-0.3 to 6.0		V
V_{OUT}	Output Voltage	-0.3 to 6.0		V
P_D	Power Dissipation (Standard Land Pattern)	SOT23-5	400	mW
T_{OP}	Junction Temperature Range	-40 to 125		°C
T_{STG}	Storage Temperature Range	-55 to 125		°C

ELECTROSTATIC DISCHARGE

Symbol	Parameter	Value	Unit
ESD	Human Body Mode	± 2	kV
	Machine Mode	± 250	V
	Charge Device Mode	± 1000	V

THERMAL DATA

Symbol	Parameter	Value	Unit
θ_{JA}	Thermal resistance junction-ambient	260 (SOT23-5)	°C/W
θ_{JA}	Thermal resistance junction-ambient	250 (DFN1x1-4)	°C/W

RECOMMENDED OPERATING CONDITIONS

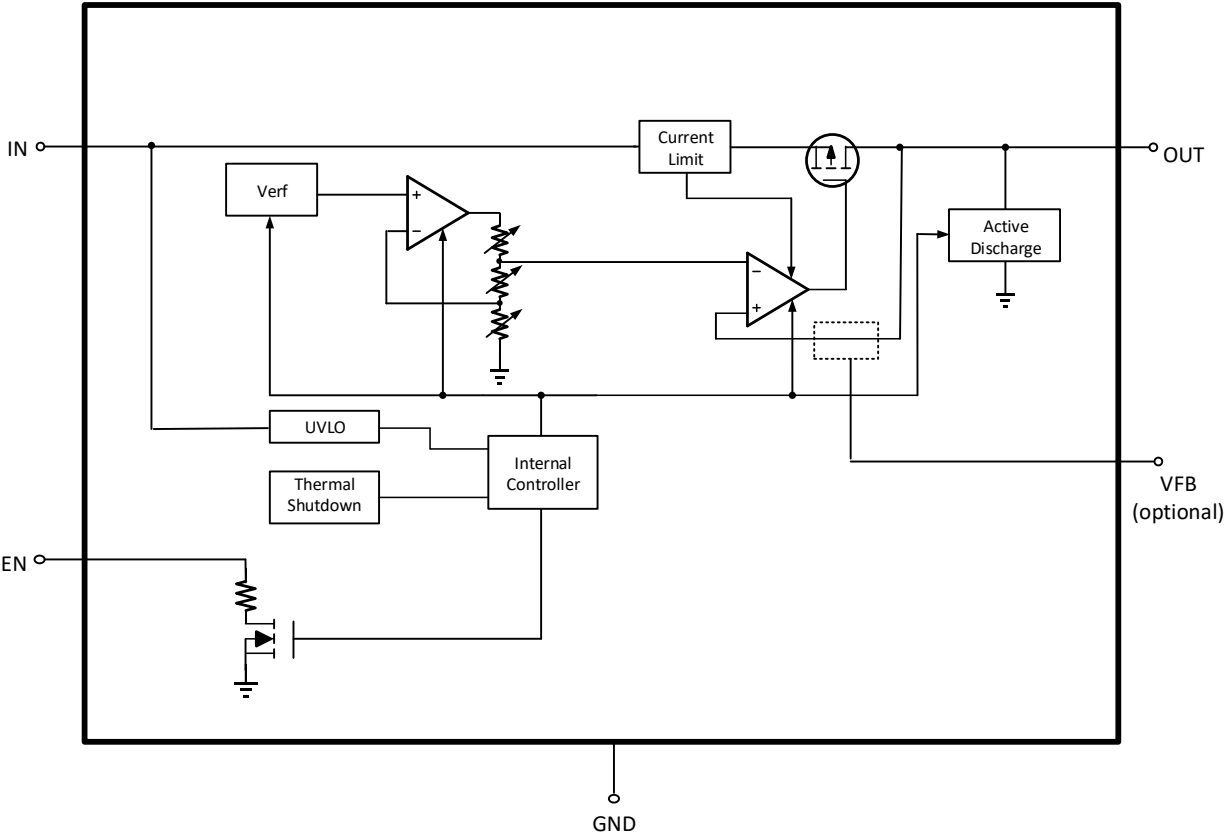
Symbol	Item	Rating	Unit
V_{IN}	Input Voltage	1.2 to 5.5	V
V_{OUT}	Output Voltage	0.8 to 4.5	V
T_a	Operating Temperature Range	-40 to 85	°C
C_{IN}/C_{OUT}	Input/Output Capacitance	1/1	uF

ELECTRICAL CHARACTERISTICS

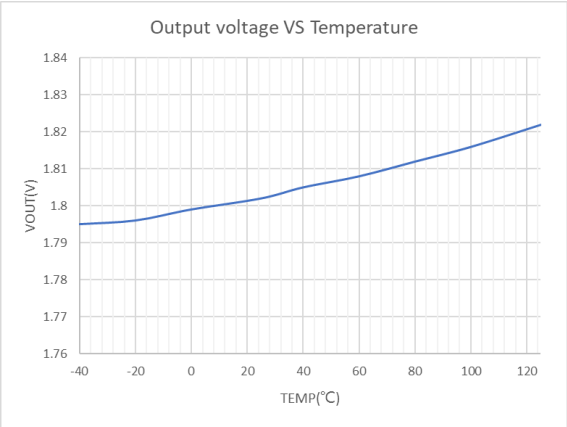
($V_{OUT} + 1 < V_{IN} < 5.5V$, $T_A = 25^\circ C$, unless otherwise specified)

Parameter		Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Fixed Output Voltage Range		V _{OUT}			0.8	--	4.5	V
DC Output Accuracy		V _{OUT_ACC}	I _{LOAD} = 1mA	V _{OUT} ≥ 1.8V	-1	--	1	%
				V _{OUT} < 1.8V	-1.5	--	1.5	%
Reference Voltage		V _{REF}	I _{LOAD} = 1mA		0.792	0.8	0.808	V
Dropout Voltage (I _{LOAD} = 350mA)		V _{DROP}	0.8V ≤ V _{OUT} < 1.05V		--	0.58	0.75	V
			1.05V ≤ V _{OUT} < 1.2V		--	0.4	0.56	
			1.2V ≤ V _{OUT} < 1.5V		--	0.33	0.45	
			1.5V ≤ V _{OUT} < 1.8V		--	0.24	0.35	
			1.8V ≤ V _{OUT} < 2.1V		--	0.2	0.3	
			2.1V ≤ V _{OUT} < 2.5V		--	0.17	0.25	
			2.5V ≤ V _{OUT} < 3V		--	0.16	0.23	
			3V ≤ V _{OUT}		--	0.15	0.2	
Current Limit		I _{LIM}	V _{OUT} = 90% of V _{OUT(NOM)}		450			mA
Short Circuit Current		I _{SC}	V _{OUT} = 0V			45		mA
Quiescent Current		I _Q	I _{LOAD} = 0mA, V _{OUT} ≤ 4.5V V _{IN} ≥ V _{OUT} + V _{DROP}		--	1.3	2.5	μA
Shutdown Current		I _{SHDN}	V _{EN} = 0V, V _{IN} = 5V		--	0.08	0.5	μA
EN Threshold Voltage	H-Level	V _{ENH}	V _{IN} = 5V		0.9			V
	L-Level	V _{ENL}	V _{IN} = 5V				0.4	V
EN Input Current		I _{EN}	V _{EN} = 5.5V		--	0.1	0.5	μA
Line Regulation		Δ _{LINE}	I _{LOAD} = 1mA		--	0.02	0.5	%
Load Regulation		Δ _{LOAD}	I _{LOAD} = 1mA to 350mA		--	20	50	mV
Power Supply Ripple Rejection		PSRR	V _{IN} =3V, I _{LOAD} = 60mA, V _{OUT} = 1.8V C _{OUT} = 1uF, f=1kHz		--	85	--	dB
Output Voltage Noise		e _N	V _{IN} =2.8V, I _{LOAD} = 30mA, V _{OUT} = 1.8V BW= 10Hz to 100 kHz			30		uV _{rms}
Thermal Shutdown Temperature		T _{SD}	I _{LOAD} = 5mA, V _{IN} ≥ 1.5V		--	160	--	°C
Thermal Shutdown Hysteresis		ΔT _{SD}			--	30	--	°C
Discharge Resistance		R _{Dis}	EN = 0V, V _{OUT} = 0.1V		--	10	--	Ω

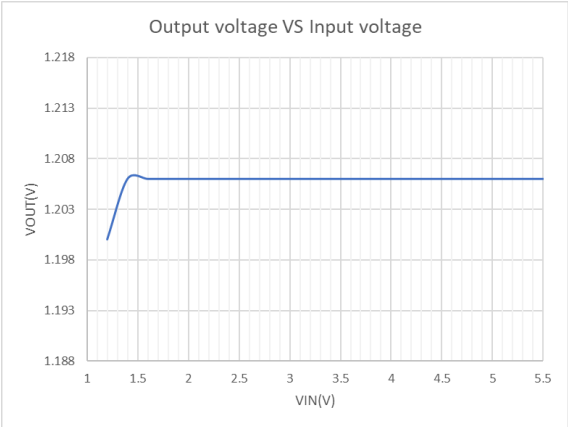
BLOCK DIAGRAM



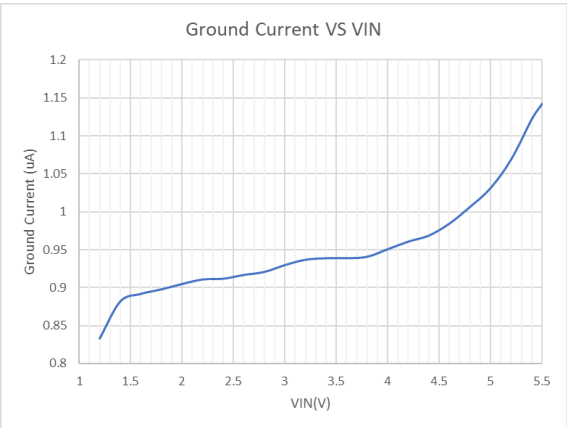
TYPICAL PERFORMANCE CHARACTERISTICS



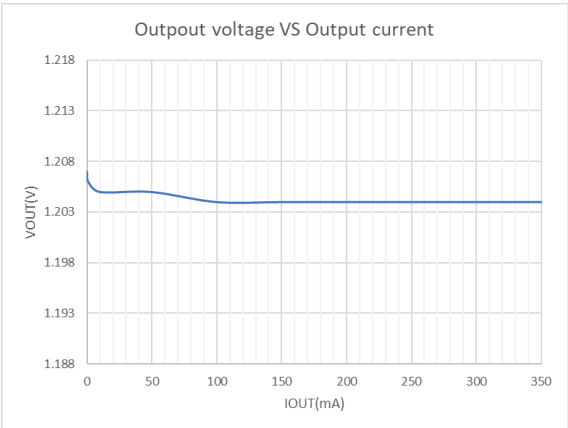
VOUT=1.8V, IOUT=1mA



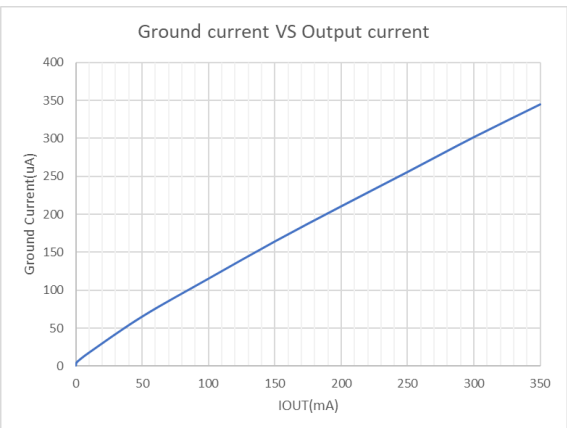
VOUT=1.2V, IOUT=1mA



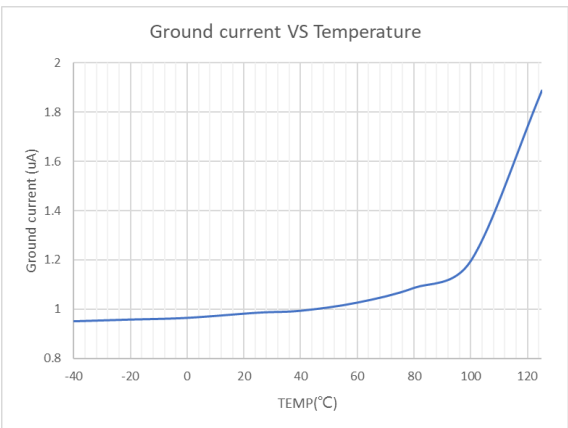
VOUT=0.8V



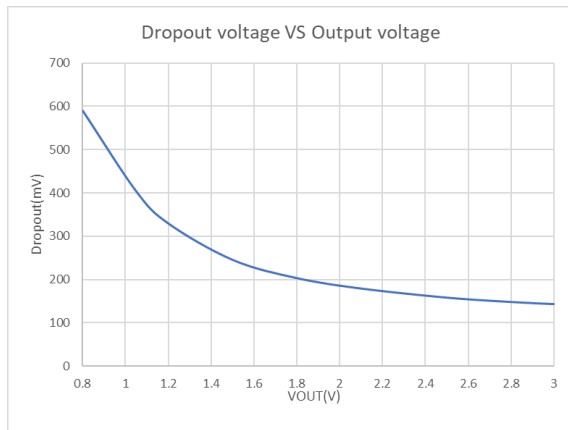
VOUT=1.2V



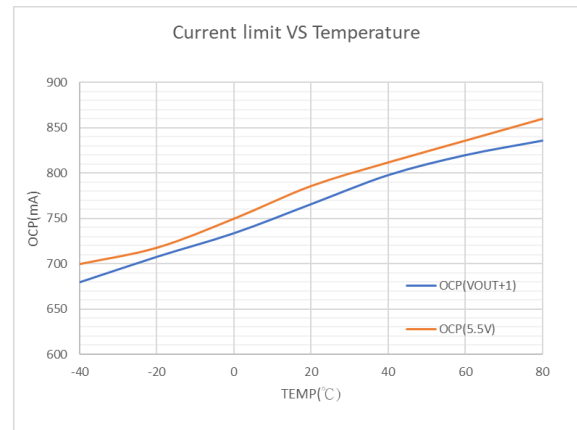
VOUT=1.2V



VOUT=1.2V



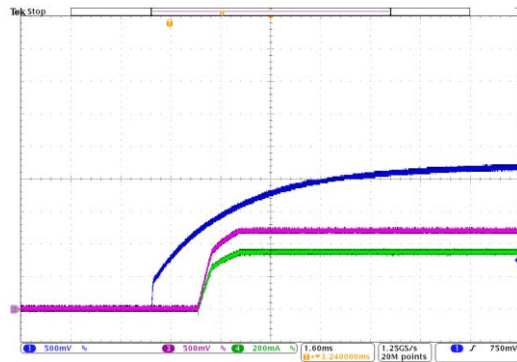
IOUT=300mA



VOUT=1.2V

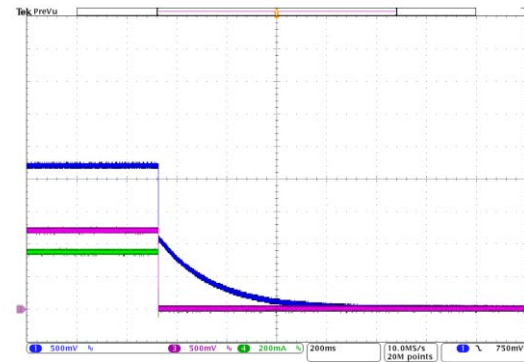
Power On From VIN

Ch1:VIN Ch3:VOUT Ch4:IOUT



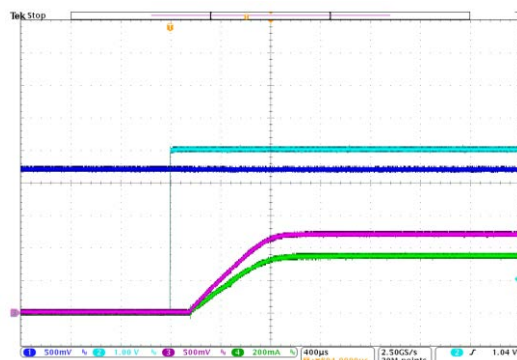
Power Off From VIN

Ch1:VIN Ch3:VOUT Ch4:IOUT



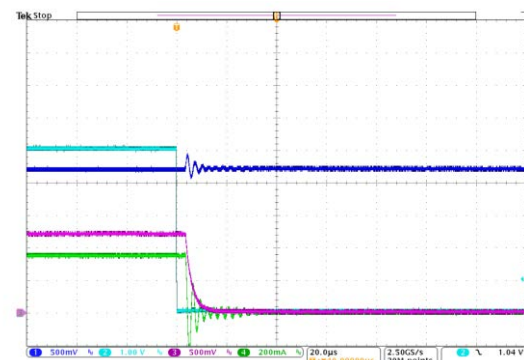
Power On From EN

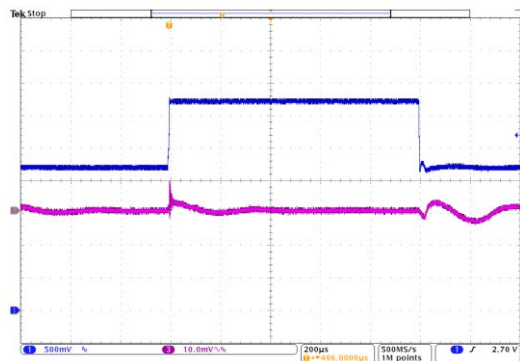
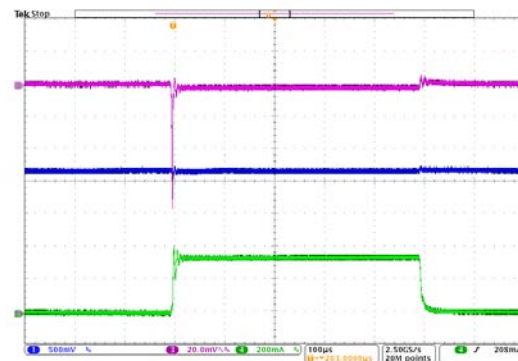
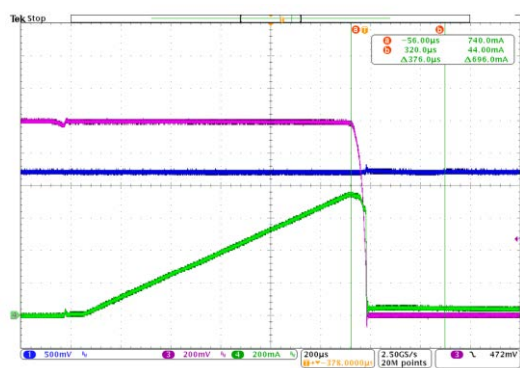
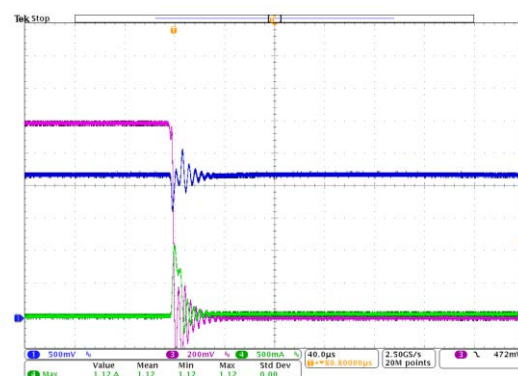
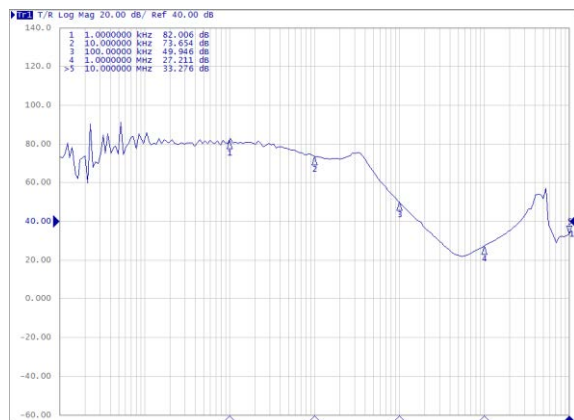
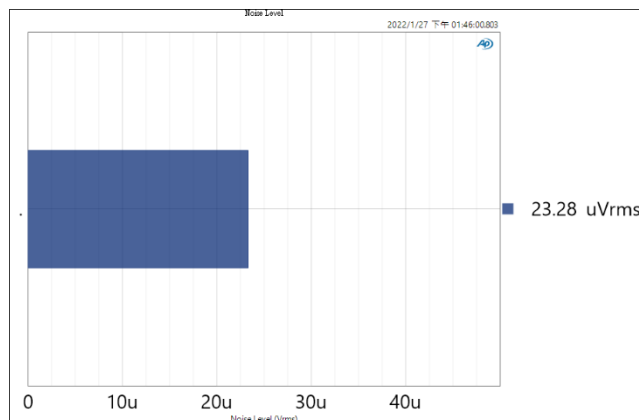
Ch1:VIN Ch2:EN Ch3:VOUT Ch4:IOUT



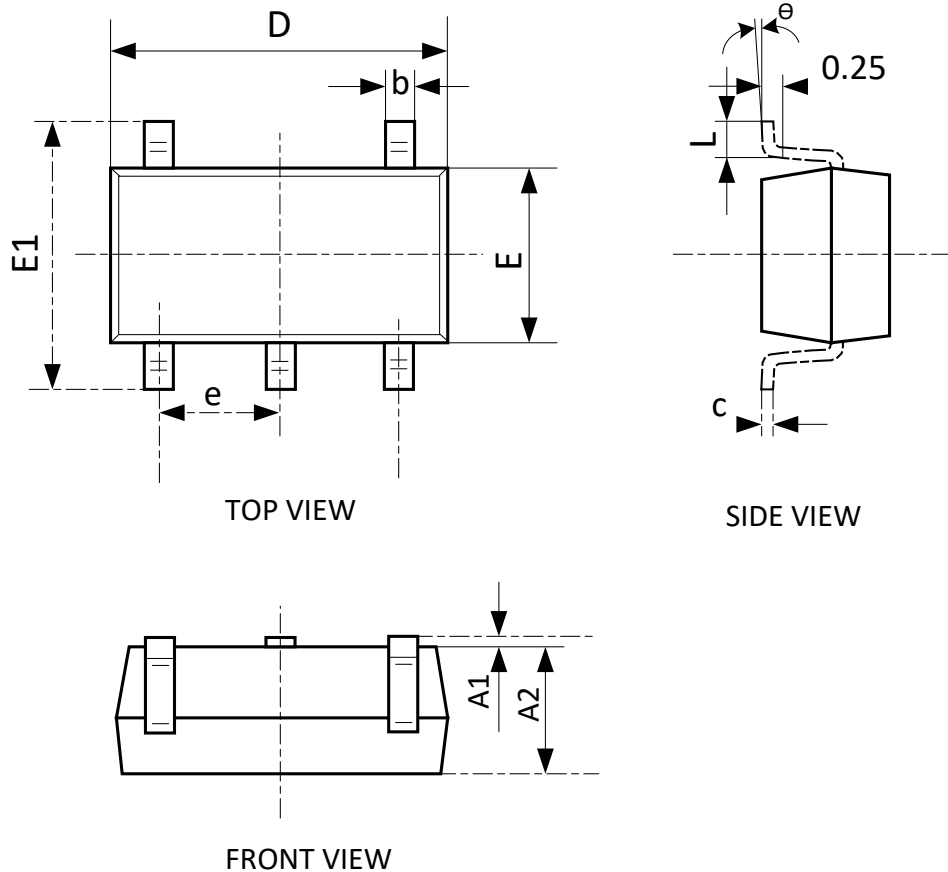
Power Off From EN

Ch1:VIN Ch2:EN Ch3:VOUT Ch4:IOUT



Line Transient Response
VIN=2.2V to 3.2V, IOUT=1mA
Ch1:VIN Ch3:VOUT

Load Transient Response
IOUT=1mA to 350mA
Ch1:VIN Ch3:VOUT Ch4:IOUT

Over Current Protection Ch1:VIN
Ch3:VOUT Ch4:IOUT

Output Short Protect
Ch1:VIN Ch3:VOUT Ch4:IOUT

PSRR vs. Frequency

Output Noise vs. Frequency


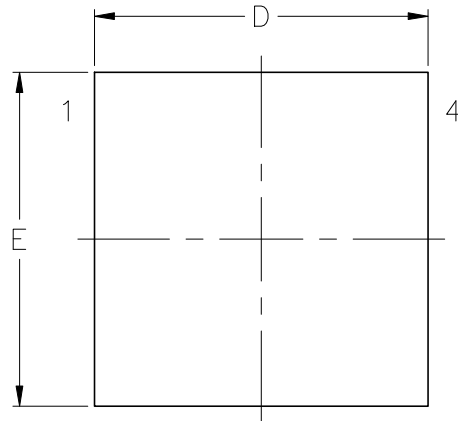
PACKAGE DIMENSIONS: SOT23-5L



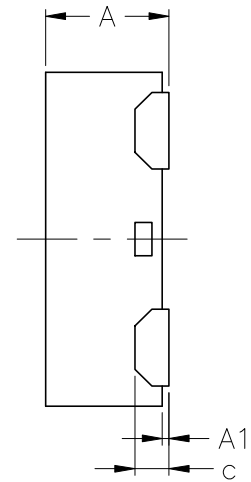
UNIT: mm

Symbol	MIN.	MAX.	Symbol	MIN.	MAX.
D	2.82	3.02	A2	1.05	1.15
e	0.95 (BSC)		A1	0.03	0.15
b	0.28	0.45	c	0.12	0.23
E	1.50	1.70	L	0.35	0.55
E1	2.60	3.00	θ	0°	8°

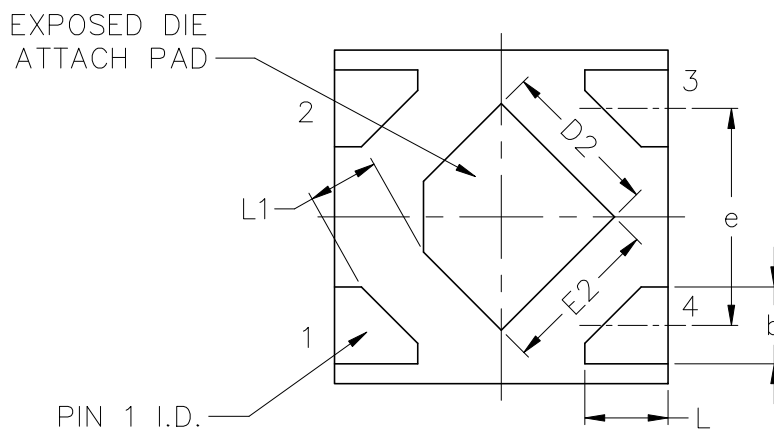
PACKAGE DIMENSIONS: DFN1X1-4L



TOP VIEW



SIDE VIEW



BOTTOM VIEW

UNIT: mm

Symbol	MIN.	NOM.	MAX.	Symbol	MIN.	NOM.	MAX.
A	0.32	0.37	0.41	C	0.65 BSC		
A1	0.00	0.02	0.05	E	0.95	1.00	1.05
b	0.18	0.23	0.28	E2	0.43	0.48	0.53
C	0.102 REF			L	0.20	0.25	0.30
D	0.95	1.00	1.05	L1	0.205 REF		
D2	0.43	0.48	0.53				