SK601802 High PSRR, Low IQ, 500mA LDO

GENERAL DESCRIPTION

The SK601802 is high-PSRR low-dropout regulator designed in an advanced CMOS process, capable of delivering up to 500mA load current.

The SK601802 features 0.5μA quiescent current, which is optimized for battery-powered and always-on applications.

The SK601802 is stable with 1μF ceramic capacitors at both the input and output. Other features include over current protection, short circuit protection, and over temperature protection.

The SK601802 is available in SOT23-3, SOT23-5, and DFN1×1-4 packages.

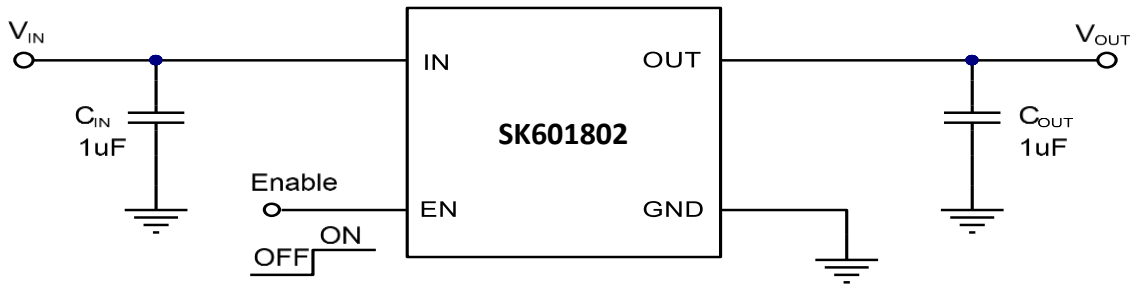
FEATURE

- Wide Input Voltage Range: 2.2V to 7.0V
- Maximum Load Current: 500mA
- Standard Fixed Output Voltage Options: 1.2V ~ 5.0V
- Output voltage accuracy: ±1.5%
- Low Dropout: 370mV @ I_{OUT}=300mA, when V_{OUT}=3.3V
- High PSRR: 85dB @1KHz
- Ultra-low quiescent current: 0.5μA (TYP.)
- With Auto Discharge

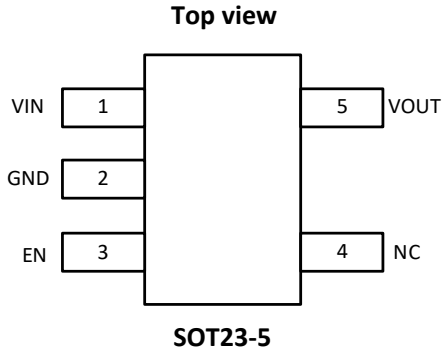
APPLICATIONS

- • Wearable devices
- • Battery-powered equipment
- • IoT devices
- • Smart locks

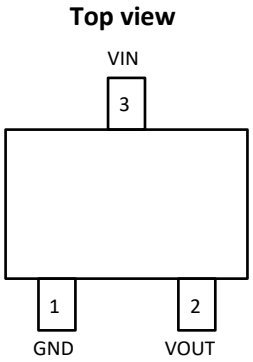
TYPICAL APPLICATION CIRCUIT



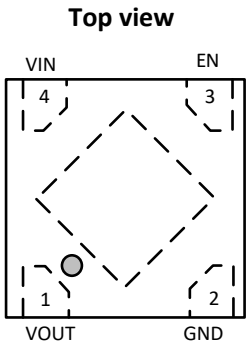
PIN CONFIGURATION



SOT23-5



SOT23-3



DFN1x1-4

PIN DESCRIPTION

SOT23-5	SOT23-3	DFN1×1-4	PIN NAME	FUNCTION
1	3	4	VIN	Supply input.
2	1	2	GND	Ground
3	-	3	EN	Enable control input, active high.
4	-	-	NC	No connection
5	2	1	VOUT	Regulated output.

ORDERING INFORMATION

Part Number	Package	Tape & Reel
SK601802D4-XX	DFN1×1-4	12000 /Reel
SK601802S5-XX	SOT23-5	3000 / Reel
SK601802S3-XX	SOT23-3	3000 / Reel

Note: XX indicates output voltage. For example 28 means product outputs 2.8V.
SK601802 devices are Pb-free and RoHS compliant.

ABSOLUTE MAXIMUM RATINGS(Note1)

Parameter	Rating	Unit
Maximum IN Voltage (VIN)	9.0	V
Output voltage (VOUT)	-0.3 to V_{IN} + 0.3	V
Maximum Load Current	500	mA
EN voltage	0 to V_{IN}	V
Operating Junction Temperature	150	°C
Storage Temperature	-65 to 150	°C
Lead Temperature (Soldering, 10 sec)	260	°C
Electrostatic discharge (ESD), HBM	±2000	V

Note(1): Stresses beyond "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 in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

THERMAL INFORMATION

Parameter	Package	Rating	Unit
Junction-to-ambient thermal resistance (θ_{JA})	SOT23-3	240	°C/W
	SOT23-5	250	°C/W
	DFN1×1-4	250	°C/W
Power dissipation, P_D @T_A = 25°C	SOT23-3	0.52	W
	SOT23-5	0.50	W
	DFN1×1-4	0.50	W

RECOMMENDED OPERATING RANGE

Symbol	Parameter	Rating	Unit
V_{IN}	Input Voltage	2.2 to 7.0	V
I_{OUT}	Output Current	0 to 500	mA
T_A	Operating Ambient Temperature	-40 to +85	°C

ELECTRICAL CHARACTERISTICS

SK601802-12 (V_{OUT}=1.2V Version)

V_{IN} = 2.2V, V_{EN} = V_{IN}, C_{IN} = C_{OUT} = 1μF, T_A = 25°C, unless otherwise specified.

Parameter	Symbol	Test condition	Min.	Typ.	Max.	Unit
Input Voltage	V_{IN}		2.2		7.0	V
Output voltage accuracy		I_{OUT} = 10mA	-1.5		+1.5	%V_{OUT}
Line regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} * V_{OUT}}$	V_{IN} = (V_{OUT} + 1V) to 7V, I_{OUT} =1mA		0.05		%/V
Load regulation	ΔV_{OUT}	I_{OUT} = 1 mA to 100 mA		7		mV
Maximum load current	I_{LOAD_MAX}		250			mA
Quiescent current	I_Q	V_{EN}= 0V		0.01	0.1	μA
		V_{EN}=V_{IN} = V_{OUT}+1V, I_{OUT} =0mA		0.5		μA
Dropout voltage	V_{DROP}	I_{OUT} =200mA		740		mV
Power-supply rejection ratio	PSRR	f=1kHz, I_{OUT}=10mA		80		dB
		f=10kHz, I_{OUT}=100mA		50		dB
EN high threshold	V_{ENH}	V_{IN}=2.2V to 7V, V_{EN} rising	1.2			V
EN low threshold	V_{ENL}	V_{IN}=2.2V to 7V, V_{EN} falling			0.4	V
Output discharge resistance	$R_{discharge}$	V_{EN}= 0V		60		Ω
Short-circuit current	I_{short}			40		mA
Thermal shutdown	T_{SD}	V_{IN} = V_{OUT}+0.6V, I_{LOAD} =50mA		155		℃
Thermal shutdown hysteresis	T_{SDHYS}			30		℃

Note(1): The dropout voltage is defined as V_{IN} - V_{OUT}, when V_{OUT} =98%*$V_{OUT(SET)}$.

Note(2): Guaranteed by design and characterization. not a FT item.

ELECTRICAL CHARACTERISTICS

SK601802-15 (V_{OUT}=1.5V Version)

V_{IN} = 2.5V, V_{EN} = V_{IN}, C_{IN} = C_{OUT} = 1μF, T_A = 25°C, unless otherwise specified.

Parameter	Symbol	Test condition	Min.	Typ.	Max.	Unit
Input Voltage	V_{IN}		2.2		7.0	V
Output voltage accuracy		I_{OUT} = 10mA	-1.5		+1.5	%V_{OUT}
Line regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} * V_{OUT}}$	V_{IN} = (V_{OUT} + 1V) to 7V, I_{OUT} =1mA		0.05		%/V
Load regulation	ΔV_{OUT}	I_{OUT} = 1 mA to 100 mA		7		mV
Maximum load current	I_{LOAD_MAX}		250			mA
Quiescent current	I_Q	V_{EN}= 0V		0.01	0.1	μA
		V_{EN}=V_{IN} = V_{OUT}+1V, I_{OUT} =0mA		0.5		μA
Dropout voltage	V_{DROP}	I_{OUT} =200mA		520		mV
Power-supply rejection ratio	PSRR	f=1kHz, I_{OUT}=10mA		85		dB
		f=10kHz, I_{OUT}=100mA		60		dB
EN high threshold	V_{ENH}	V_{IN}=2.2V to 7V, V_{EN} rising	1.2			V
EN low threshold	V_{ENL}	V_{IN}=2.2V to 7V, V_{EN} falling			0.4	V
Output discharge resistance	$R_{discharge}$	V_{EN}= 0V		70		Ω
Short-circuit current	I_{short}			40		mA
Thermal shutdown	T_{SD}	V_{IN} = V_{OUT}+0.6V, I_{LOAD} =50mA		155		℃
Thermal shutdown hysteresis	T_{SDHYS}			30		℃

Note(1): The dropout voltage is defined as V_{IN} - V_{OUT}, when V_{OUT} =98%*$V_{OUT(SET)}$.

Note(2): Guaranteed by design and characterization. not a FT item.

ELECTRICAL CHARACTERISTICS

SK601802-18 (V_{OUT}=1.8V Version)

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

Parameter	Symbol	Test condition	Min.	Typ.	Max.	Unit
Input Voltage	V_{IN}		2.2		7.0	V
Output voltage accuracy		I_{OUT} = 10mA	-1.5		+1.5	%V_{OUT}
Line regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} * V_{OUT}}$	V_{IN} = (V_{OUT} + 1V) to 7V, I_{OUT} =1mA		0.05		%/V
Load regulation	ΔV_{OUT}	I_{OUT} = 1 mA to 100 mA		7		mV
Maximum load current	I_{LOAD_MAX}		400			mA
Quiescent current	I_Q	V_{EN}= 0V		0.01	0.1	μA
		V_{EN}=V_{IN} = V_{OUT}+1V, I_{OUT} =0mA		0.5		μA
Dropout voltage	V_{DROP}	I_{OUT} =200mA		410		mV
Power-supply rejection ratio	PSRR	f=1kHz, I_{OUT}=10mA		87		dB
		f=10kHz, I_{OUT}=100mA		60		dB
EN high threshold	V_{ENH}	V_{IN}=2.2V to 7V, V_{EN} rising	1.2			V
EN low threshold	V_{ENL}	V_{IN}=2.2V to 7V, V_{EN} falling			0.4	V
Output discharge resistance	$R_{discharge}$	V_{EN}= 0V		70		Ω
Short-circuit current	I_{short}			40		mA
Thermal shutdown	T_{SD}	V_{IN} = V_{OUT}+0.6V, I_{LOAD} =50mA		155		℃
Thermal shutdown hysteresis	T_{SDHYS}			30		℃

Note(1): The dropout voltage is defined as V_{IN} - V_{OUT}, when V_{OUT} =98%*$V_{OUT(SET)}$.

Note(2): Guaranteed by design and characterization. not a FT item.

ELECTRICAL CHARACTERISTICS

SK601802-25 (V_{OUT}=2.5V Version)

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

Parameter	Symbol	Test condition	Min.	Typ.	Max.	Unit
Input Voltage	V_{IN}		2.2		7.0	V
Output voltage accuracy		I_{OUT} = 10mA	-1.5		+1.5	%V_{OUT}
Line regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} * V_{OUT}}$	V_{IN} = (V_{OUT} + 1V) to 7V, I_{OUT} =1mA		0.05		%/V
Load regulation	ΔV_{OUT}	I_{OUT} = 1 mA to 100 mA		7		mV
Maximum load current	I_{LOAD_MAX}		500			mA
Quiescent current	I_Q	V_{EN}= 0V		0.01	0.1	µA
		V_{EN}=V_{IN} = V_{OUT}+1V, I_{OUT} =0mA		0.5		µA
Dropout voltage	V_{DROP}	I_{OUT} =200mA		300		mV
Power-supply rejection ratio	PSRR	f=1kHz, I_{OUT}=10mA		80		dB
		f=10kHz, I_{OUT}=100mA		58		dB
EN high threshold	V_{ENH}	V_{IN}=2.2V to 7V, V_{EN} rising	1.2			V
EN low threshold	V_{ENL}	V_{IN}=2.2V to 7V, V_{EN} falling			0.4	V
Output discharge resistance	$R_{discharge}$	V_{EN}= 0V		60		Ω
Short-circuit current	I_{short}			35		mA
Thermal shutdown	T_{SD}	V_{IN} = V_{OUT}+0.6V, I_{LOAD} =50mA		160		℃
Thermal shutdown hysteresis	T_{SDHYS}			30		℃

Note(1): The dropout voltage is defined as V_{IN} - V_{OUT}, when V_{OUT} =98%*$V_{OUT(SET)}$.

Note(2): Guaranteed by design and characterization. not a FT item.

ELECTRICAL CHARACTERISTICS

SK601802-28 (V_{OUT}=2.8V Version)

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

Parameter	Symbol	Test condition	Min.	Typ.	Max.	Unit
Input Voltage	V_{IN}		2.2		7.0	V
Output voltage accuracy		I_{OUT} = 10mA	-1.5		+1.5	%V_{OUT}
Line regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} * V_{OUT}}$	V_{IN} = (V_{OUT} + 1V) to 7V, I_{OUT} =1mA		0.05		%/V
Load regulation	ΔV_{OUT}	I_{OUT} = 1 mA to 100 mA		7		mV
Maximum load current	I_{LOAD_MAX}		500			mA
Quiescent current	I_Q	V_{EN}= 0V		0.01	0.1	µA
		V_{EN}=V_{IN} = V_{OUT}+1V, I_{OUT} =0mA		0.5		µA
Dropout voltage	V_{DROP}	I_{OUT} =200mA		270		mV
Power-supply rejection ratio	PSRR	f=1kHz, I_{OUT}=10mA		80		dB
		f=10kHz, I_{OUT}=100mA		58		dB
EN high threshold	V_{ENH}	V_{IN}=2.2V to 7V, V_{EN} rising	1.2			V
EN low threshold	V_{ENL}	V_{IN}=2.2V to 7V, V_{EN} falling			0.4	V
Output discharge resistance	$R_{discharge}$	V_{EN}= 0V		60		Ω
Short-circuit current	I_{short}			50		mA
Thermal shutdown	T_{SD}	V_{IN} = V_{OUT}+0.6V, I_{LOAD} =50mA		155		℃
Thermal shutdown hysteresis	T_{SDHYS}			30		℃

Note(1): The dropout voltage is defined as V_{IN} - V_{OUT}, when V_{OUT} =98%*$V_{OUT(SET)}$.

Note(2): Guaranteed by design and characterization. not a FT item.

ELECTRICAL CHARACTERISTICS

SK601802-30 (V_{OUT}=3.0V Version)

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

Parameter	Symbol	Test condition	Min.	Typ.	Max.	Unit
Input Voltage	V_{IN}		2.2		7.0	V
Output voltage accuracy		I_{OUT} = 10mA	-1.5		+1.5	%V_{OUT}
Line regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} * V_{OUT}}$	V_{IN} = (V_{OUT} + 1V) to 7V, I_{OUT} =1mA		0.05		%/V
Load regulation	ΔV_{OUT}	I_{OUT} = 1 mA to 100 mA		7		mV
Maximum load current	I_{LOAD_MAX}		500			mA
Quiescent current	I_Q	V_{EN}= 0V		0.01	0.1	µA
		V_{EN}=V_{IN} = V_{OUT}+1V, I_{OUT} =0mA		0.5		µA
Dropout voltage	V_{DROP}	I_{OUT} =200mA		270		mV
Power-supply rejection ratio	PSRR	f=1kHz, I_{OUT}=10mA		85		dB
		f=10kHz, I_{OUT}=100mA		60		dB
EN high threshold	V_{ENH}	V_{IN}=2.2V to 7V, V_{EN} rising	1.2			V
EN low threshold	V_{ENL}	V_{IN}=2.2V to 7V, V_{EN} falling			0.4	V
Output discharge resistance	$R_{discharge}$	V_{EN}= 0V		60		Ω
Short-circuit current	I_{short}			50		mA
Thermal shutdown	T_{SD}	V_{IN} = V_{OUT}+0.6V, I_{LOAD} =50mA		160		℃
Thermal shutdown hysteresis	T_{SDHYS}			30		℃

Note(1): The dropout voltage is defined as V_{IN} - V_{OUT}, when V_{OUT} =98%*$V_{OUT(SET)}$.

Note(2): Guaranteed by design and characterization. not a FT item.

ELECTRICAL CHARACTERISTICS

SK601802-33 (V_{OUT}=3.3V Version)

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

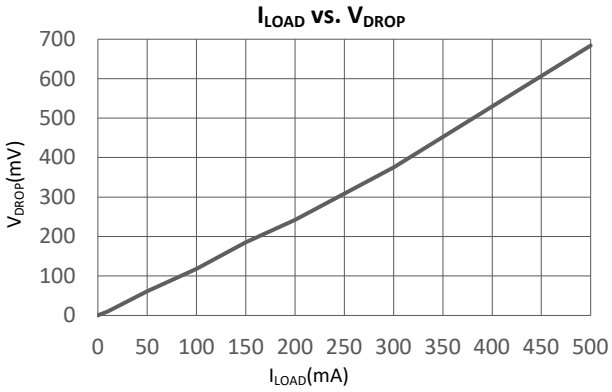
Parameter	Symbol	Test condition	Min.	Typ.	Max.	Unit
Input Voltage	V_{IN}		2.2		7.0	V
Output voltage accuracy		I_{OUT} = 10mA	-1.5		+1.5	%V_{OUT}
Line regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} * V_{OUT}}$	V_{IN} = (V_{OUT} + 1V) to 7V, I_{OUT} =1mA		0.05		%/V
Load regulation	ΔV_{OUT}	I_{OUT} = 1 mA to 100 mA		7		mV
Maximum load current	I_{LOAD_MAX}		500			mA
Quiescent current	I_Q	V_{EN}= 0V		0.01	0.1	µA
		V_{EN}=V_{IN} = V_{OUT}+1V, I_{OUT} =0mA		0.5		µA
Dropout voltage	V_{DROP}	I_{OUT} =300mA		370		mV
Power-supply rejection ratio	PSRR	f=1kHz, I_{OUT}=10mA		85		dB
		f=10kHz, I_{OUT}=100mA		60		dB
EN high threshold	V_{ENH}	V_{IN}=2.2V to 7V, V_{EN} rising	1.2			V
EN low threshold	V_{ENL}	V_{IN}=2.2V to 7V, V_{EN} falling			0.4	V
Output discharge resistance	$R_{discharge}$	V_{EN}= 0V		60		Ω
Short-circuit current	I_{short}			50		mA
Thermal shutdown	T_{SD}	V_{IN} = V_{OUT}+0.6V, I_{LOAD} =50mA		160		℃
Thermal shutdown hysteresis	T_{SDHYS}			30		℃

Note(1): The dropout voltage is defined as V_{IN} - V_{OUT}, when V_{OUT} =98%*$V_{OUT(SET)}$.

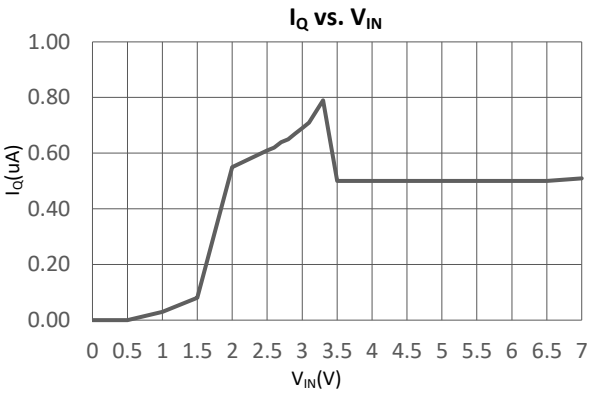
Note(2): Guaranteed by design and characterization. not a FT item.

TYPICAL CHARACTERISTICS

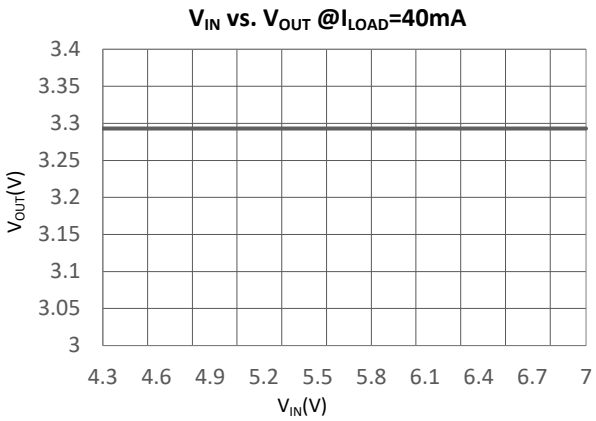
V_{IN} = 4.3V, $V_{OUT=}$3.3V ,C_{IN} = Ceramic 1.0μF, C_{OUT} = Ceramic 1.0μF.



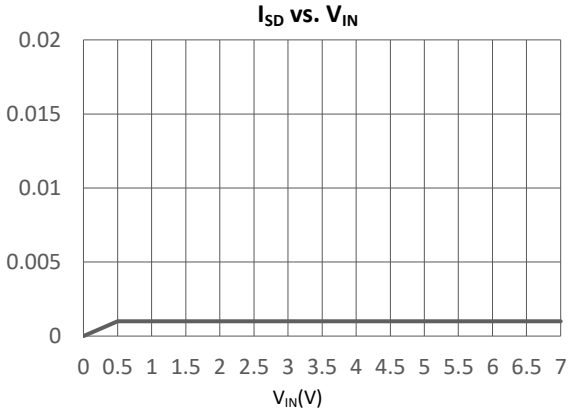
Dropout Voltage *VS.* Output Current



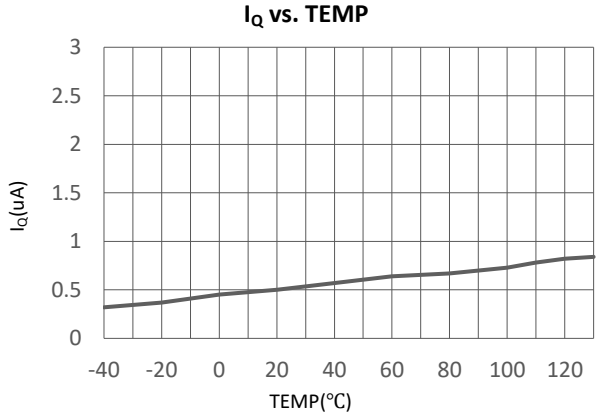
Quiescent Current *VS.* Input Voltage



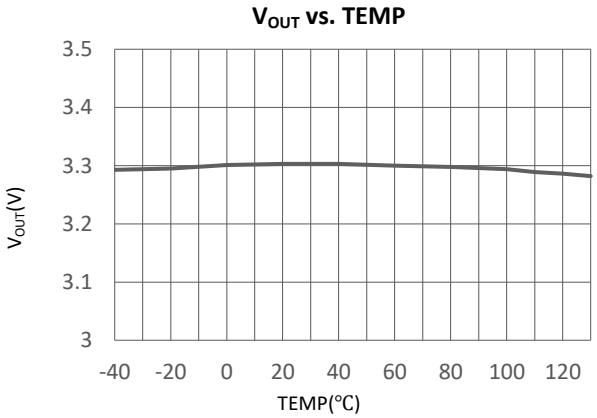
Output Voltage *VS.* V_{IN} Input Voltage



Shutdown Current *VS.* Input Voltage



Quiescent Current *VS.* Temperature

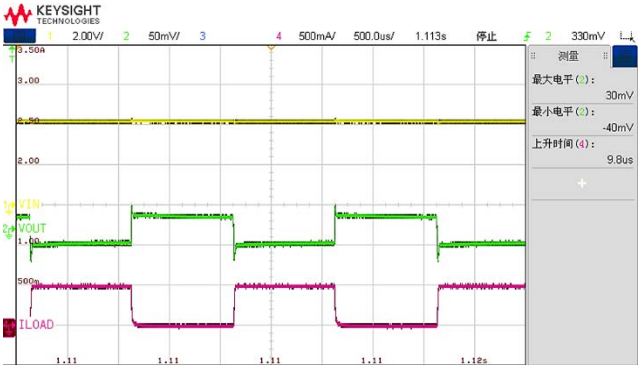


Output Voltage *VS.* Temperature

TYPICAL CHARACTERISTICS (Continued)

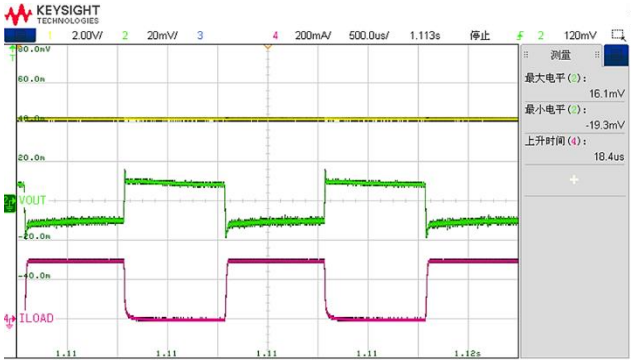
V_{IN} = 4.3V, V_{OUT}=3.3V ,C_{IN} = Ceramic 1.0μF, C_{OUT} = Ceramic 1.0μF.

$V_{IN}=V_{OUT}+1V$, $C_{IN}=C_{OUT}=1\mu F$,
I_{LOAD}=1mA~500mA~1mA
CH1:V_{IN} CH2:V_{OUT} CH4:I_{OUT}



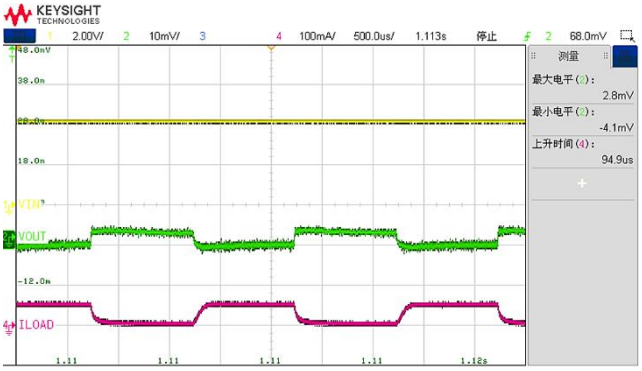
Load Transient

$V_{IN}=V_{OUT}+1V$, $C_{IN}=C_{OUT}=1\mu F$,
I_{LOAD}=1mA~300mA~1mA
CH1:V_{IN} CH2:V_{OUT} CH4:I_{OUT}



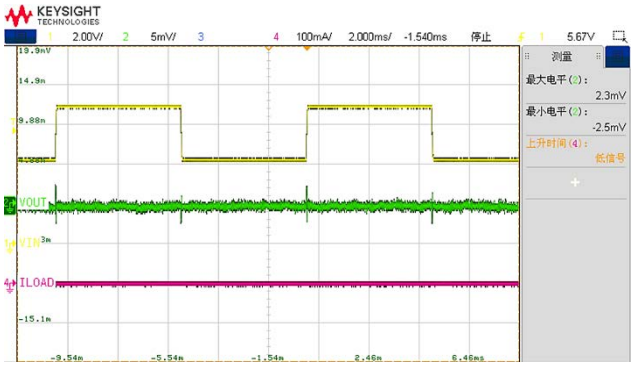
Load Transient

$V_{IN}=V_{OUT}+1V$, $C_{IN}=C_{OUT}=1\mu F$,
I_{LOAD}=1mA~50mA~1mA
CH1:V_{IN} CH2:V_{OUT} CH4:I_{OUT}



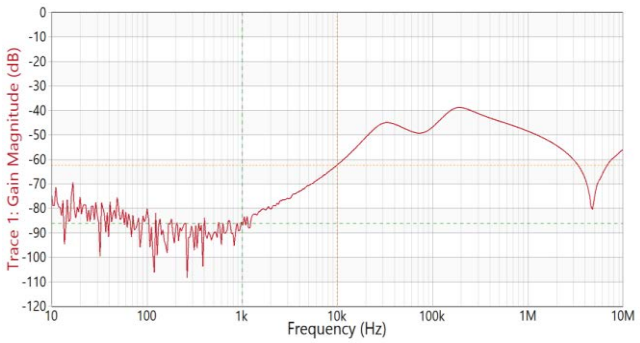
Load Transient

$V_{IN}=V_{OUT}+1V$~7V,
$C_{IN}=C_{OUT}=1\mu F$, I_{LOAD}=1mA
CH1:V_{IN} CH2:V_{OUT} CH4:I_{OUT}



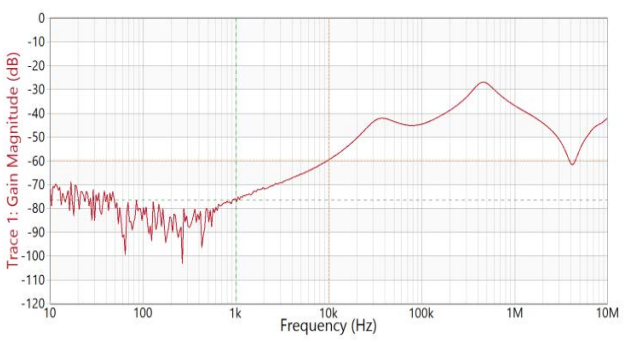
Input Transient

V_{IN}=4.3V, V_{OUT}=3.3V, I_{LOAD}=10mA,
f=10Hz~10MHz



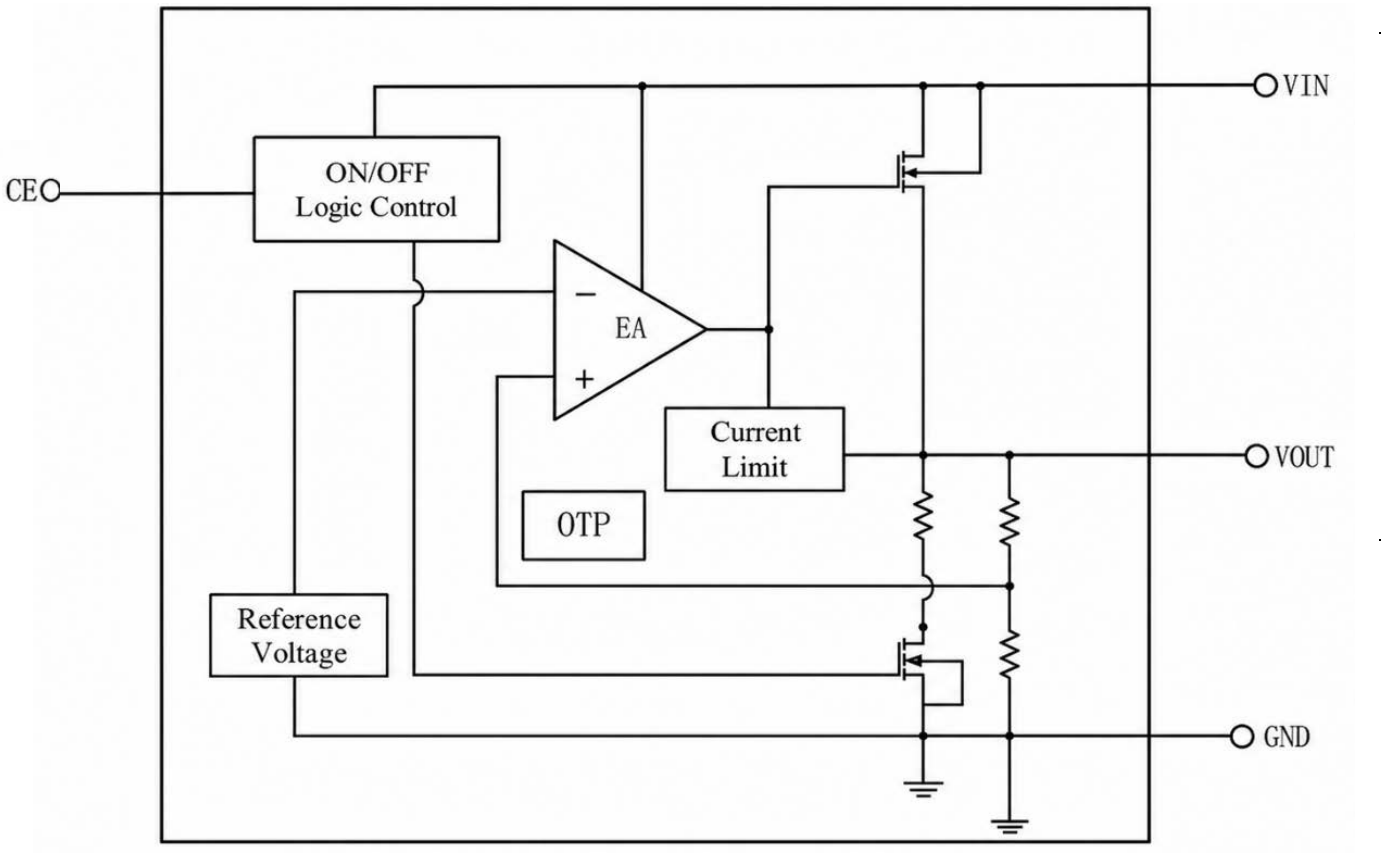
PSRR *VS.* Frequency

V_{IN}=4.3V, V_{OUT}=3.3V, I_{LOAD}=100mA,
f=10Hz~10MHz

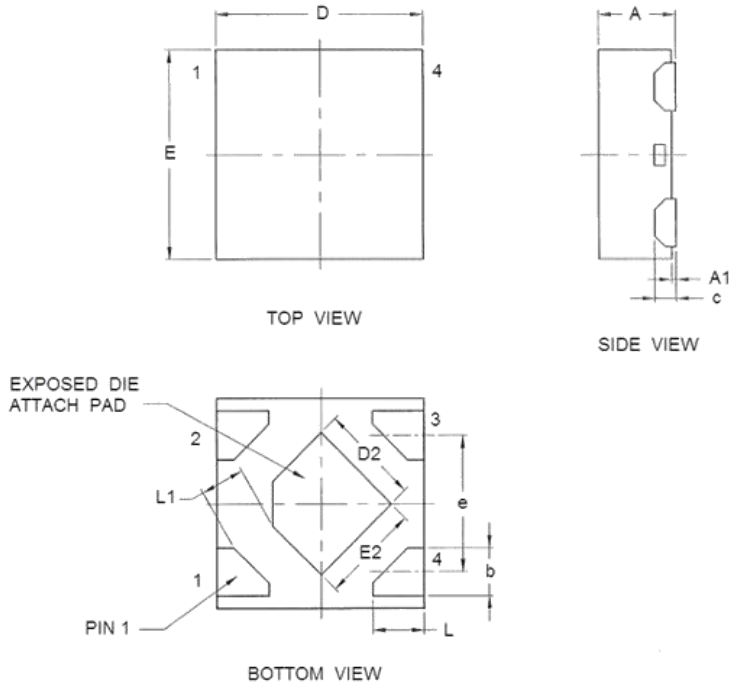


PSRR *VS.* Frequency

FUNCTIONAL BLOCK DIAGRAM

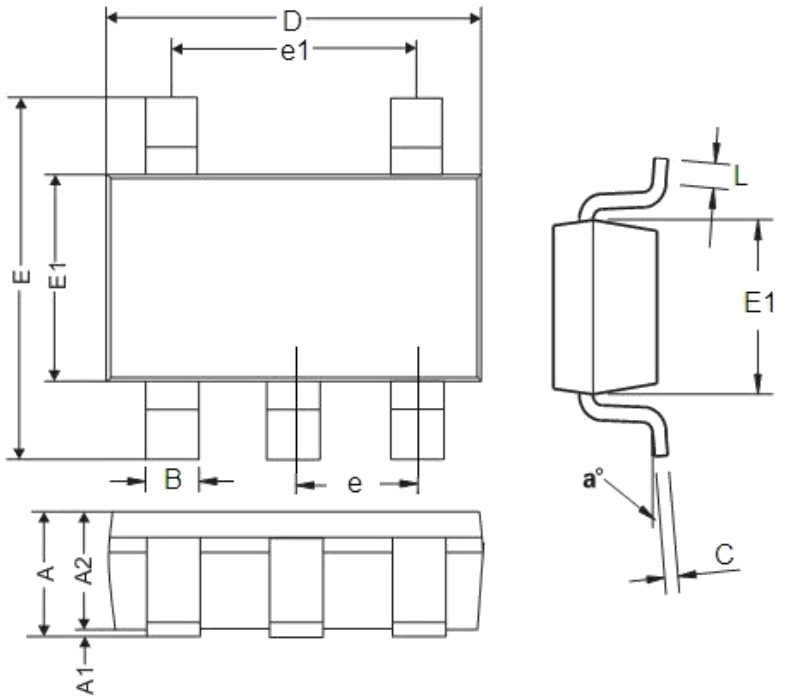


PACKAGE DIMENSIONS: DFN1×1-4L



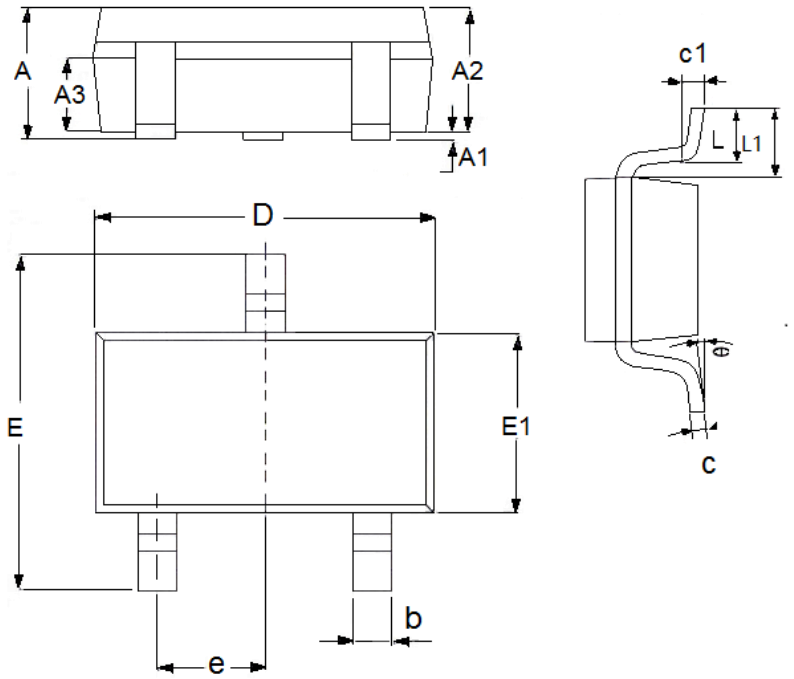
Symbol	Dimensions In Millimeters		Dimensions (Inch)	
	MIN	MAX	MIN	MAX
A	0.32	0.4	0.0126	0.0157
A1	0	0.05	0	0.0020
b	0.18	0.28	0.0071	0.0110
c	0.102		0.0040	
D	0.95	1.05	0.0374	0.0413
D2	0.43	0.53	0.0169	0.0209
e	0.65(typical.)		0.0256(typical.)	
E	0.95	1.05	0.0374	0.0413
E2	0.43	0.53	0.0169	0.0209
L	0.2	0.3	0.0079	0.0118
L1	0.205(typical.)		0.0081(typical.)	

PACKAGE DIMENSIONS: SOT23-5L



Symbol	Dimensions In Millimeters		Dimensions (Inch)	
	MIN	MAX	MIN	MAX
A	1.05	1.45	0.0413	0.0570
A1	0	0.15	0	0.0059
A2	0.9	1.3	0.0354	0.0511
B	0.25	0.5	0.0098	0.0196
C	0.10	0.23	0.0039	0.0090
D	2.82	3.05	0.1110	0.1200
E	2.60	3.05	0.1023	0.1200
E1	1.50	1.75	0.0590	0.0688
e	0.95REF		0.0374REF	
e1	1.90REF		0.0748REF	
L	0.10	0.60	0.0039	0.0236
a°	0°	30°	0°	30°

PACKAGE DIMENSIONS: SOT23-3



Symbol	Dimensions In Millimeters		Dimensions (Inch)	
	MIN	MAX	MIN	MAX
A	1.05	1.45	0.0413	0.0571
A1	0	0.15	0.0000	0.0059
A2	0.9	1.3	0.0354	0.0512
A3	0.6	0.7	0.0236	0.0276
b	0.25	0.5	0.0098	0.0197
c	0.1	0.25	0.0039	0.0098
D	2.8	3.1	0.1102	0.1220
E	2.6	3.1	0.1023	0.1220
E1	1.5	1.8	0.0591	0.0709
e	0.95(typical.)		0.0374(typical.)	
L	0.25	0.6	0.0098	0.0236
L1	0.59(typical.)		0.0232(typical.)	
θ	0	8°	0.0000	8°
c1	0.2(typical.)		0.0079(typical.)	