

PRELIMINARY - September 11, 2000

TEL:805-498-2111 FAX:805-498-3804 WEB:http://www.semtech.com

## DESCRIPTION

The SC4431 is a four terminal device for regulating an isolated power supply with very low output voltage.

It is intended to be used as a replacement for three terminal shunt regulators such as SC431L where the output voltage is too low for them to function in conjunction with an opto-isolator. It achieves this by having separate supply and output pins, allowing the output to sink current at voltages as low as 0.2V, while the supply pin still has sufficient voltage for the device to function. In this way, allowing for a 1.6V drop through an opto-isolator diode, regulation down to 1.8V out can be achieved.

The SC4431 shunt regulator is available with three initial reference voltage accuracies (0.5%, 1.0% and 2.0%) in the space saving 5-lead SOT-23 package. The three voltage tolerances allow the designer the opportunity to select the proper cost/tolerance for their application.

## FEATURES

- Trimmed bandgap design - initial accuracies to  $\pm 0.5\%$
- 40mA drive capability
- Wide supply voltage range - 1.5V to 15V
- Low supply current - typically 110 $\mu$ A
- Full industrial temperature range

## APPLICATIONS

- Opto driver for very low output voltage isolated power supplies

## ORDERING INFORMATION

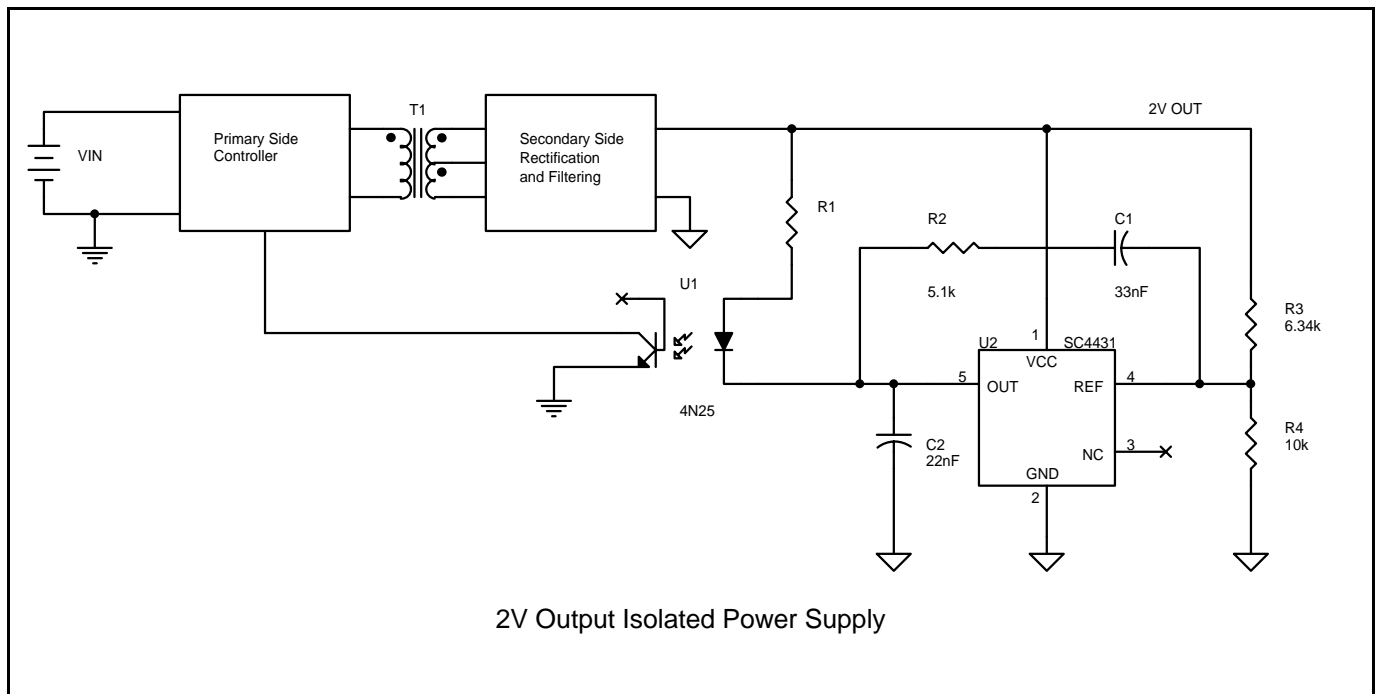
Part Number <sup>(1)(2)</sup>	Package
SC4431CSK-X.TR	SOT-23-5

Notes:

(1) Where “-X” denotes initial reference voltage tolerance. Available options are  $\pm 0.5\%$  (-.5),  $\pm 1\%$  (-1) and  $\pm 2\%$  (-2).

(2) Only available in tape and reel packaging. A reel contains 3000 devices.

## TYPICAL APPLICATION CIRCUIT



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**ABSOLUTE MAXIMUM RATINGS**

Parameter	Symbol	Maximum	Units
Input Supply Voltage	$V_{CC}$	-0.5 to +16	V
Output Voltage	$V_{OUT}$	-0.5 to $V_{CC}$	V
Reference Voltage	$V_{REF}$	-0.5 to +4	V
Continuous Output Current	$I_{OUT}$	40	mA
Reference Input Current	$I_{REF}$	5	mA
Operating Ambient Temperature Range	$T_A$	-40 to +85	°C
Operating Junction Temperature Range	$T_J$	-40 to +150	°C
Storage Temperature Range	$T_{STG}$	-65 to +150	°C
Thermal Impedance Junction to Ambient	$\theta_{JA}$	256	°C/W
Thermal Impedance Junction to Case	$\theta_{JC}$	81	°C/W
Power Dissipation at $T_A = 25^\circ\text{C}$	$P_D$	475	mW
Lead Temperature (Soldering) 10 seconds	$T_{LEAD}$	300	°C
ESD Rating (Human Body Model)	ESD	2	kV

**ELECTRICAL CHARACTERISTICS**

 Unless specified,  $T_A = 25^\circ\text{C}$ ,  $V_{CC} = 2\text{V}$ ,  $I_{OUT} = 2\text{mA}$ . Values in **bold** apply over full operating temperature range.

Parameter	Symbol	Test Conditions	MIN	TYP	MAX	Units
<b>VCC</b>						
Input Supply Voltage	$V_{CC}$		<b>1.5</b>		<b>15</b>	V
Input Supply Current	$I_{CC}$	$V_{REF} = V_{OUT}$		110	<b>200</b>	$\mu\text{A}$
Off State Input Supply Current	$I_{CC(OFF)}$	$V_{REF} = 1.187\text{V}$ , $V_{OUT} = 2\text{V}$		65	100	$\mu\text{A}$
					<b>150</b>	
<b>REF</b>						
Reference Voltage	$V_{REF}$	SC4431-.5, $V_{REF} = V_{OUT}$	1.219	1.224	1.231	V
			<b>1.207</b>		<b>1.243</b>	
		SC4431-1, $V_{REF} = V_{OUT}$	1.212	1.224	1.236	V
			<b>1.200</b>		<b>1.250</b>	
		SC4431-2, $V_{REF} = V_{OUT}$	1.200	1.224	1.250	V
			<b>1.187</b>		<b>1.261</b>	
Change in $V_{REF}$ due to change in $V_{CC}$	$\frac{dV_{REF}}{dV_{CC}}$	$V_{CC} = 1.5\text{V to }15\text{V}$		8	15	mV
					<b>20</b>	
Change in $V_{REF}$ due to change in $I_{OUT}$	$\frac{dV_{REF}}{dI_{OUT}}$	$I_{OUT} = 0.1\text{mA to }40\text{mA}$		8	28	mV
					<b>36</b>	

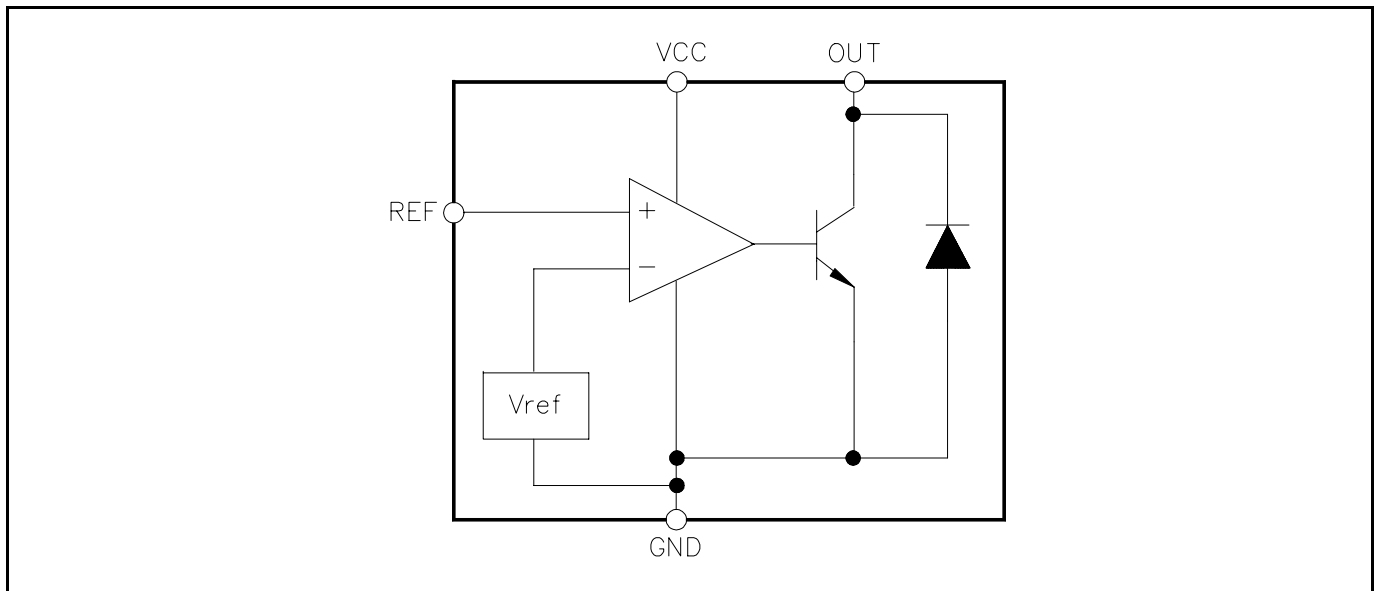
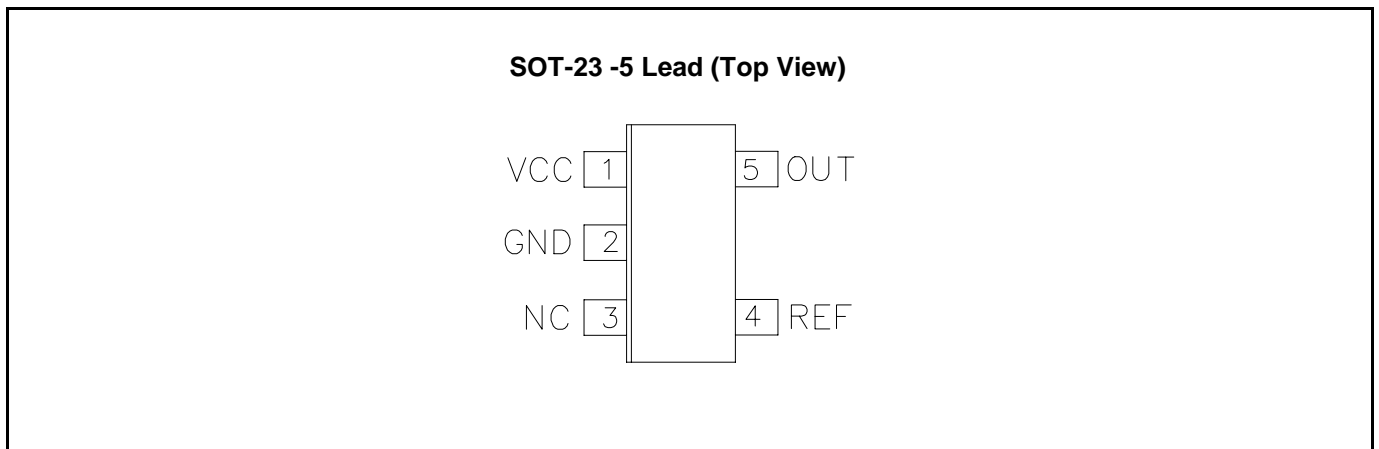
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**ELECTRICAL CHARACTERISTICS (Cont.)**

 Unless specified,  $T_A = 25^\circ\text{C}$ ,  $V_{CC} = 2\text{V}$ ,  $I_{OUT} = 2\text{mA}$ . Values in **bold** apply over full operating temperature range.

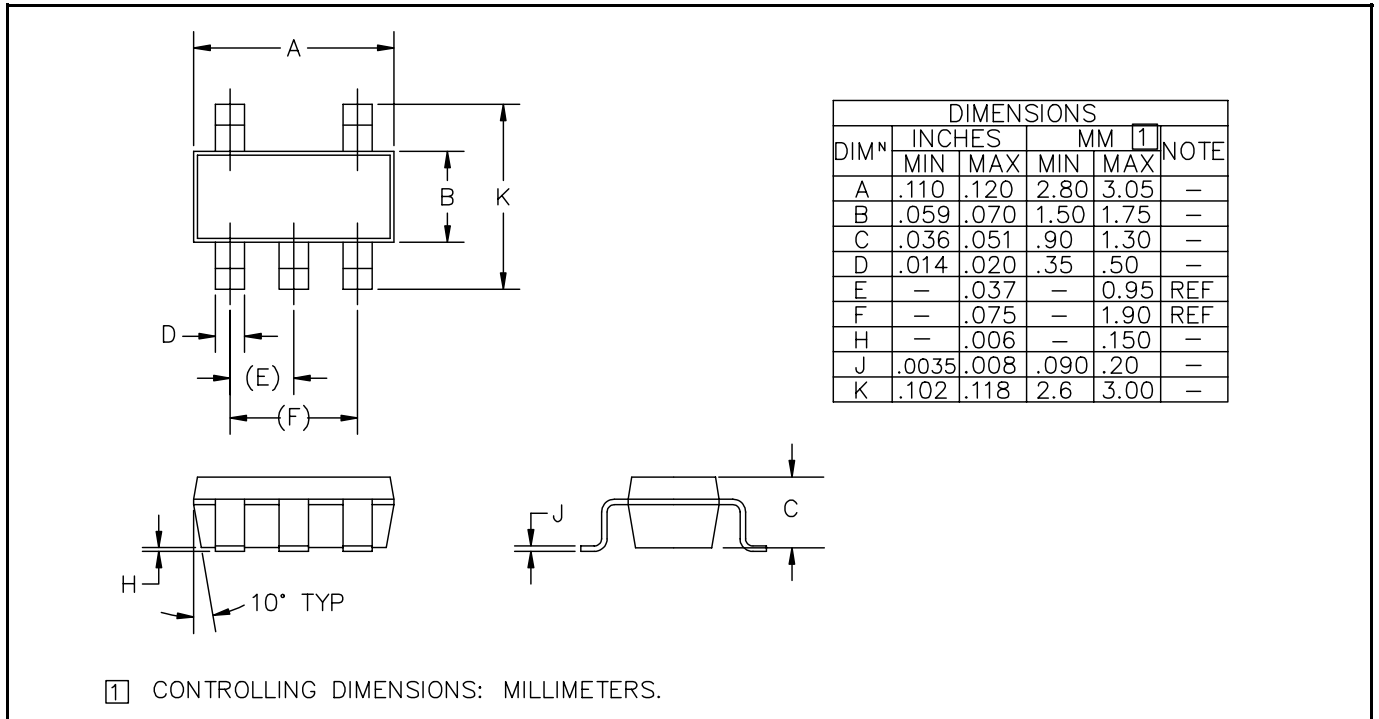
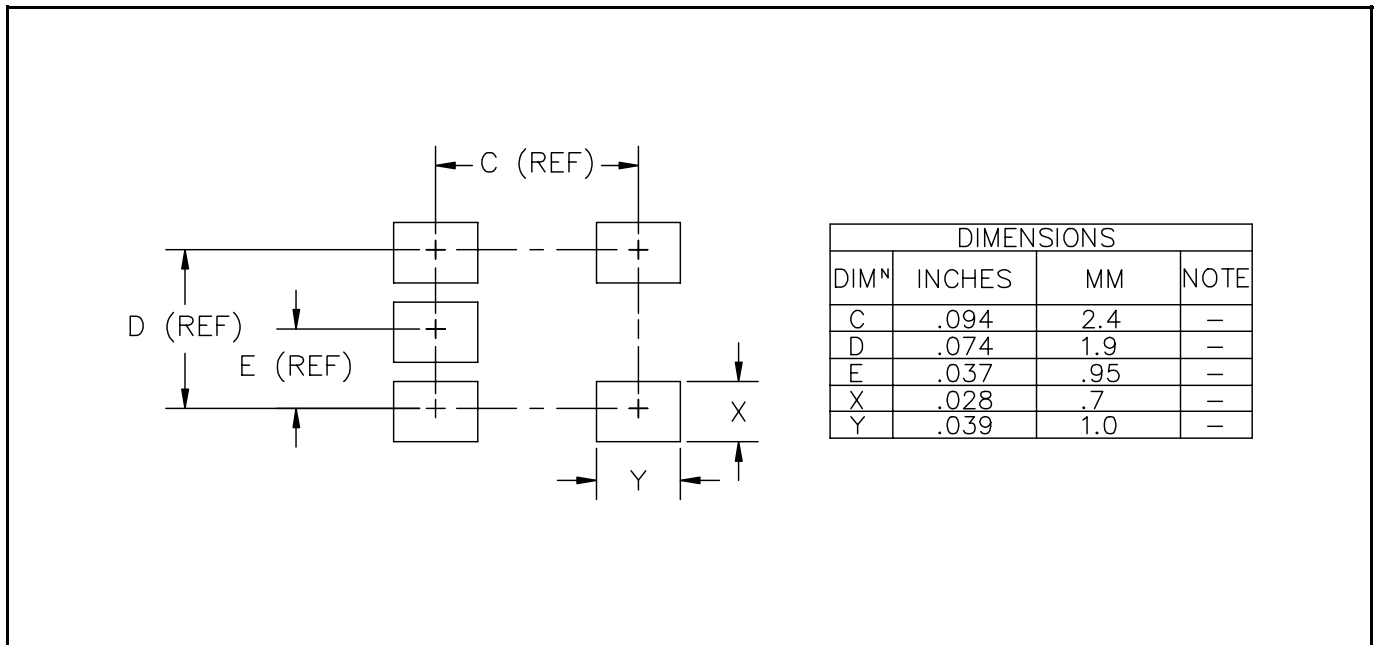
Parameter	Symbol	Test Conditions	MIN	TYP	MAX	Units
<b>REF (Cont.)</b>						
Reference Input Current	$I_{REF}$	$0.1\text{mA} \leq I_{OUT} \leq 10\text{mA}$		0.3	0.5	$\mu\text{A}$
					<b>1.0</b>	
<b>OUT</b>						
Saturation Voltage	$V_{OUT(SAT)}$	$I_{OUT} = 5\text{mA}, I_{CC} = 500\mu\text{A}$		50	75	mV
					<b>100</b>	
		$V_{REF} = 1.261\text{V}, I_{OUT} = 40\text{mA}$		275	300	mV
					<b>400</b>	
Off State Output Current	$I_{OUT(OFF)}$	$V_{REF} = 1.187\text{V}, V_{OUT} = 2\text{V}$		0.5	1	$\mu\text{A}$
					<b>10</b>	

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**BLOCK DIAGRAM**

**PIN CONFIGURATION**

**PIN DESCRIPTION**

Pin	Pin Name	Pin Function
1	VCC	This is the input supply pin for the IC.
2	GND	Logic and power ground.
3	NC	No connection.
4	REF	This is connected to the non-inverting input of the error amplifier.
5	OUT	This is the output pin of the device, essentially an open collector.

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**DEVICE OUTLINE - SOT-23-5**

**LAND PATTERN - SOT-23-5**


ECN 00-1315