SC4431
Shunt Regulator With Open Collector Output

Description

The SC4431 is a four terminal device for regulating an isolated power supply with output voltages down to 1.5V.

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 the device to function in conjunction with an opto-isolator. SC4431 achieves this by having seperate supply and output pins, allowing the output to sink current at voltages as low as 0.1V, while the supply pin still has sufficient voltage for the device to function. In this way, allowing for a 1.4V drop through an opto-isolator diode, regulation down to 1.5V 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

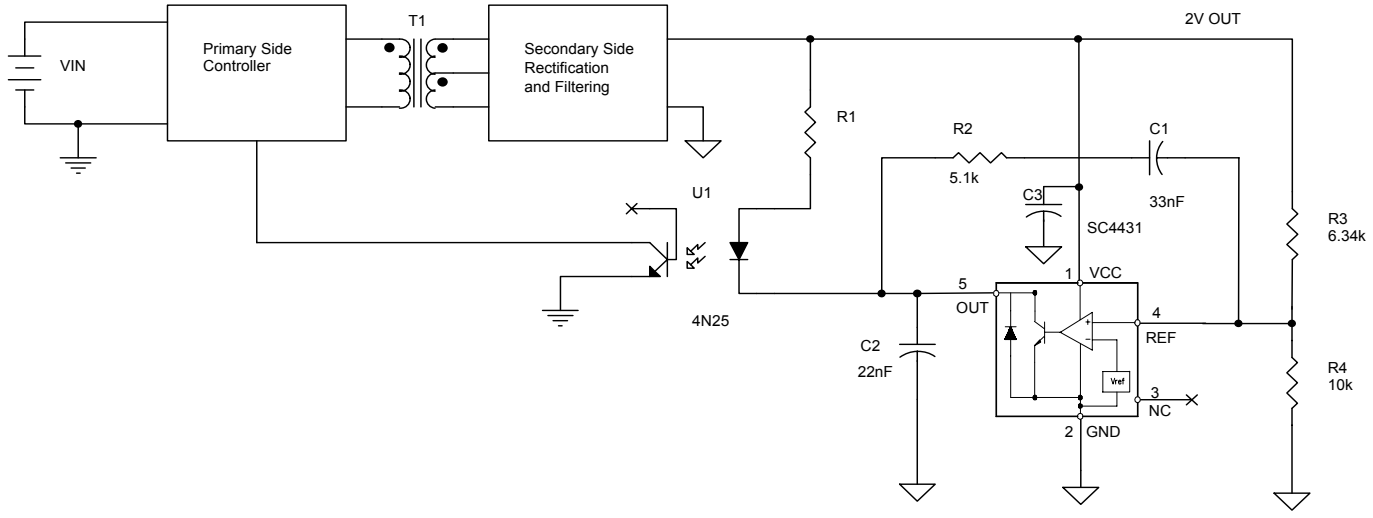
- Open Collector output drives Optoisolator with as little as 1.5V input voltage
- Trimmed bandgap design - initial accuracies to ± 0.5%
- 40mA drive capability
- Regulates output as low as 50mV
- Wide supply voltage range - 1.5V to 15V
- Low supply current - typically 110µA
- Full industrial temperature range
- SOT-23 5 lead package

Applications

- Telecom Power Supplies
- Opto driver for very low output voltage (1.5V) isolated power supplies
- Battery operated applications
- Point of use power supplies

Typical Application Circuit

2V Output Isolated Power Supply



Absolute Maximum Rating

Parameter	Symbol	Maximum	Units
Input Supply Voltage	V_{CC}	-0.5 to +16	V
Vcc pin current	I_{CC}	8	mA
Output Voltage	V_{OUT}	-0.5 to VCC	V
Reference Voltage (1)	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	θ_{JA}	256	°C/W
Thermal Impedance Junction to Case	θ_{JC}	81	°C/W
Power Dissipation at T_A = 25°C	P_D	475	mW
Lead Temperature (Soldering) 10 seconds	T_{LEAD}	300	°C
ESD Rating (Human Body Model)	ESD	2	kV

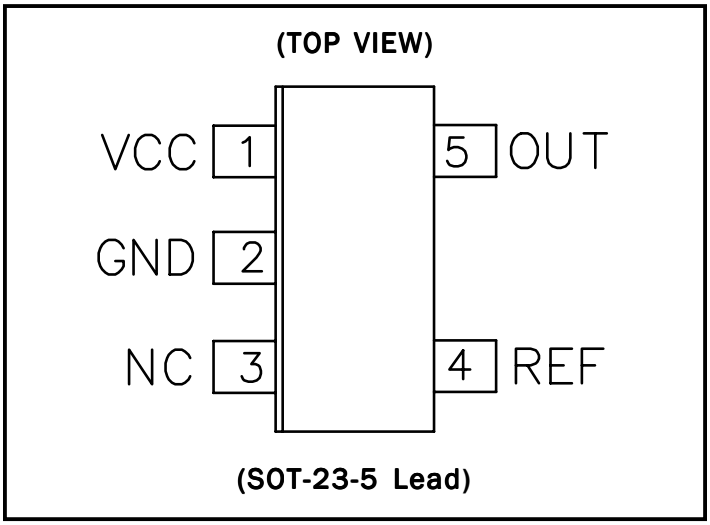
(1) If Vref will be forced above 1.224V, a resistor must be placed in series with the Vcc to limit the Icc current below 5mA.

Electrical Characteristics

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

Parameter	Symbol	Test Conditions	MIN	TYP	MAX	Units
VCC						
Input Supply Voltage	V_{CC}		**1.5**		**15**	V
Input Supply Current	I_{CC}	$V_{REF} = V_{OUT}$		110	**200**	µA
Off State Input Supply Current	$I_{CC(OFF)}$	V_{REF} = 1.187V, V_{OUT} = 2V		65	100	µA
					150	
REF						
Reference Voltage	V_{REF}	SC4431-.5, $V_{REF} = V_{OUT}$	1.219	1.224	1.231	V
			1.207		**1.243**	
		SC4431-1, $V_{REF} = V_{OUT}$	1.212	1.224	1.236	V
			1.200		**1.250**	
		SC4431-2, $V_{REF} = V_{OUT}$	1.200	1.224	1.250	V
			1.187		**1.261**	
Change in V_{REF} due to change in Vcc	dV_{REF}/dV_{CC}	V_{CC} = 1.5V to 15V		8	15	mV
					20	
Change in V_{REF} due to change in I_{OUT}	dV_{REF}/dI_{OUT}	I_{OUT} = 0.1mA to 40mA		8	28	mV
					36	
Reference Input Current	I_{REF}	0.1mA ≤ I_{OUT} ≤ 10mA		0.3	0.5	µA
					1.0	
OUT						
Saturation Voltage	$V_{OUT(SAT)}$	I_{OUT} = 5mA, I_{CC} = 500µA		50	75	mV
					100	
		V_{REF} = 1.261V, I_{OUT} = 40mA		275	300	mV
					400	
Off State Output Current	$I_{OUT(OFF)}$	V_{REF} = 1.187V, V_{OUT} = 2V		0.50	1	µA
					10	

Pin Configurations



Ordering Information

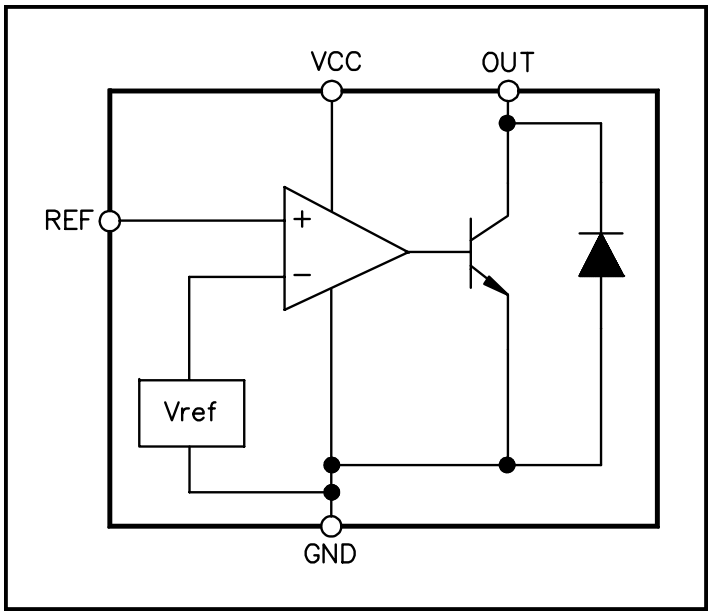
Part Number(1)(2)	Package
SC4431CSK-X	SOT-23-5

Notes: (1) Only available in tape and reel packaging. (Suffix '.TR' e.g. SC4431CSK-X.TR).
(2) Where "-X" denotes initial reference voltage tolerance. Available options are ±0.5% (-.5), ±1% (-1) and ±2% (-2).

Pin Descriptions

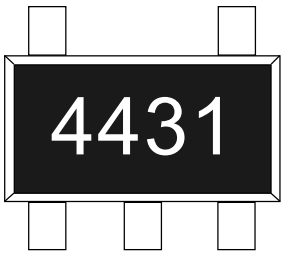
Pin#	Pin Name	Pin Function
1	VCC	This is the input supply pin for the SC4431. A low ESR capacitor should be used to bypass this pin to GND right at the IC.
2	GND	Logic and power ground.
3	NC	No connection.
4	REF	This is connected to the non-inverting input of the error amplifier.
5	OUT	This is the output pin of the device, essentially an open collector. Note: A 22nF low ESR (ceramic) capacitor is required from this pin to GND for stable operation.

Block Diagram

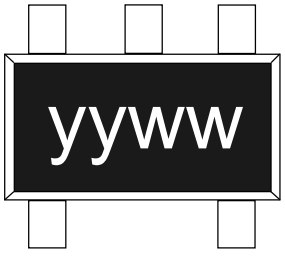


Marking Information

Top Mark

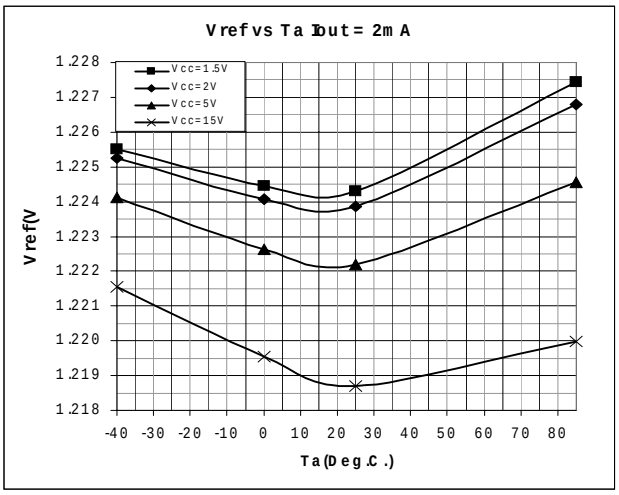


Bottom Mark

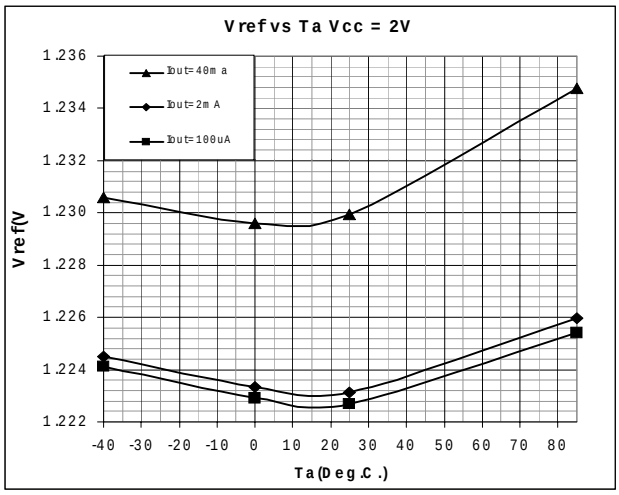


yyww = Datecode (Example: 9908)

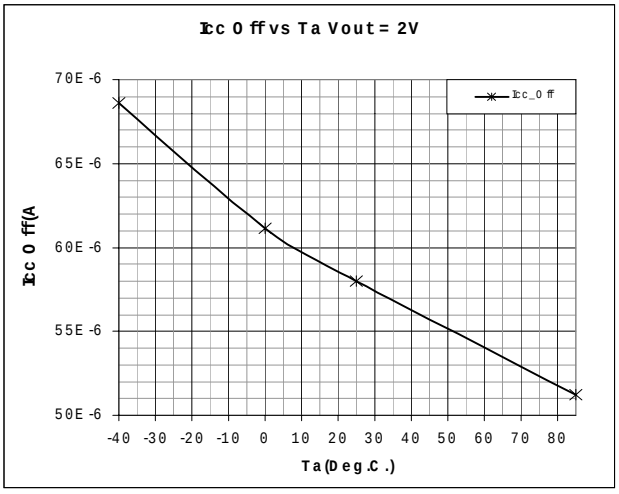
Typical Characteristics



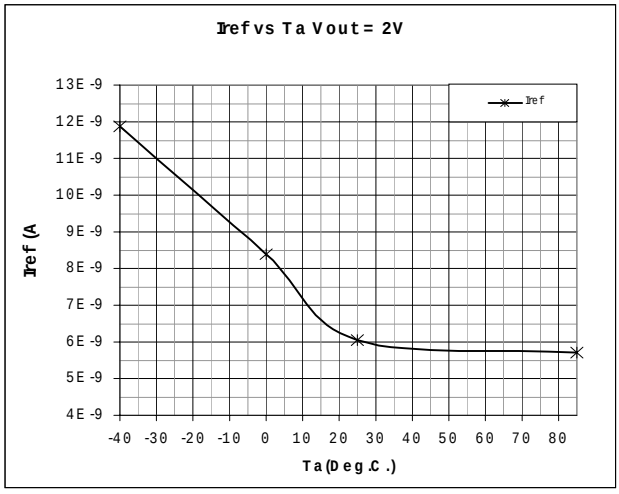
Typical Vref vs Ta Io = 2mA



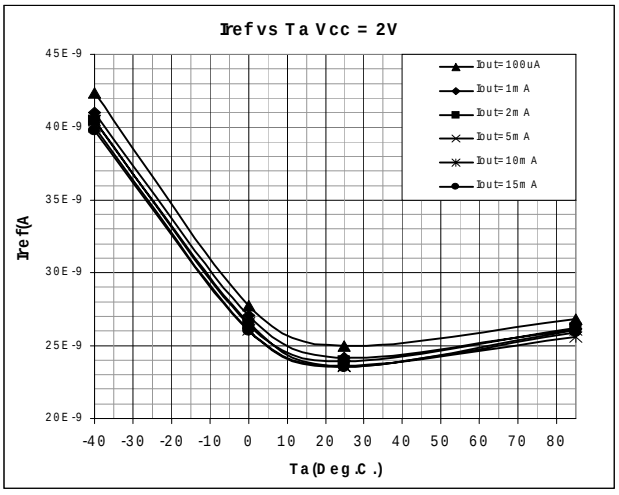
Typical Vref vs Ta Vcc = 2V



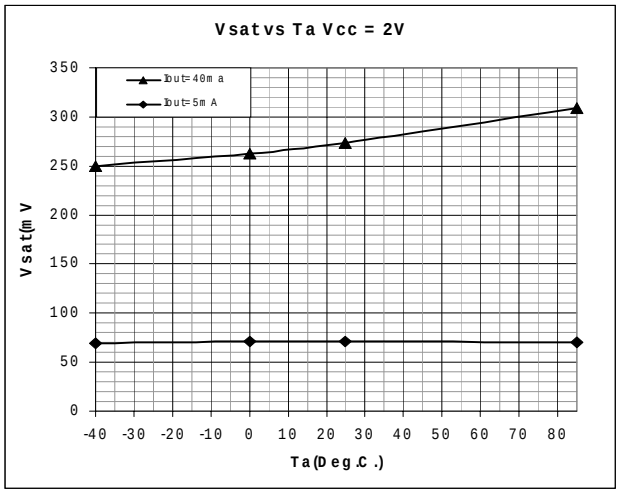
Typical Icc Off vs Ta Vo = 2V



Typical Iout vs Ta Vo = 2V

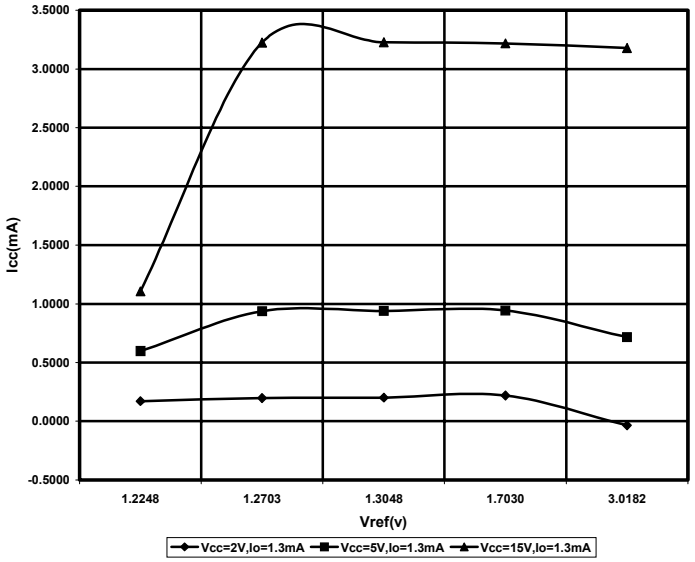


Typical Iref vs Ta Vcc = 2V

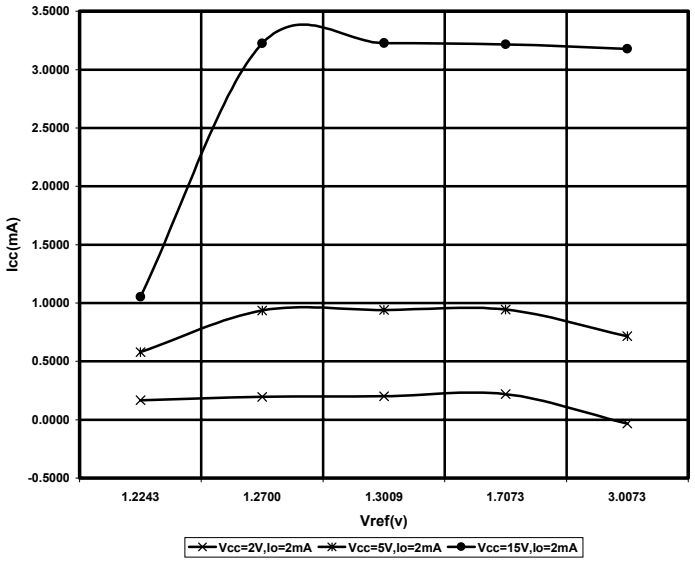


Typical Vsat vs Ta Vcc = 2V

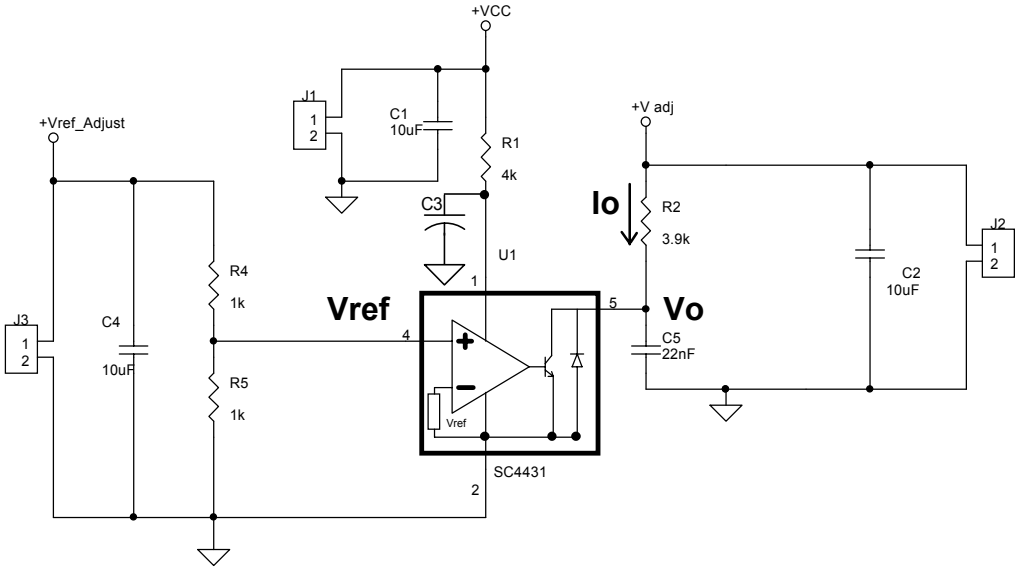
Typical Characteristics



Typical Icc vs Vref, Io = 1.3mA, Ta = 25 Deg.C.

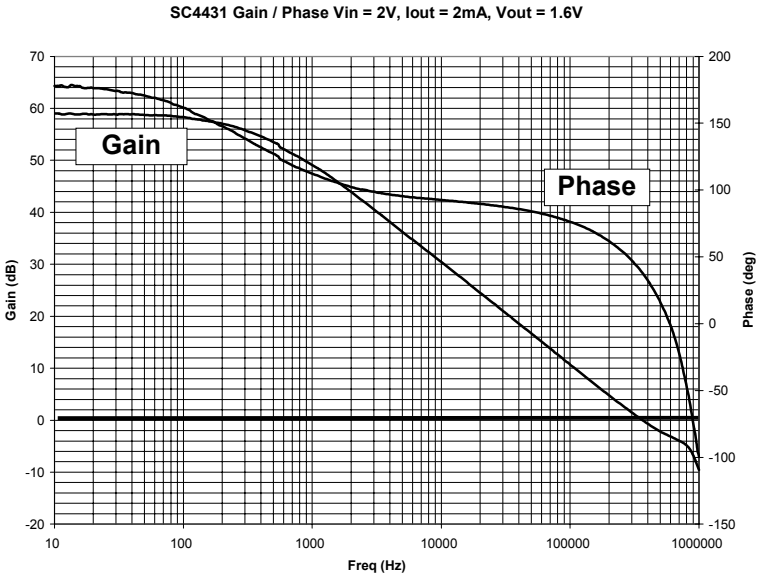


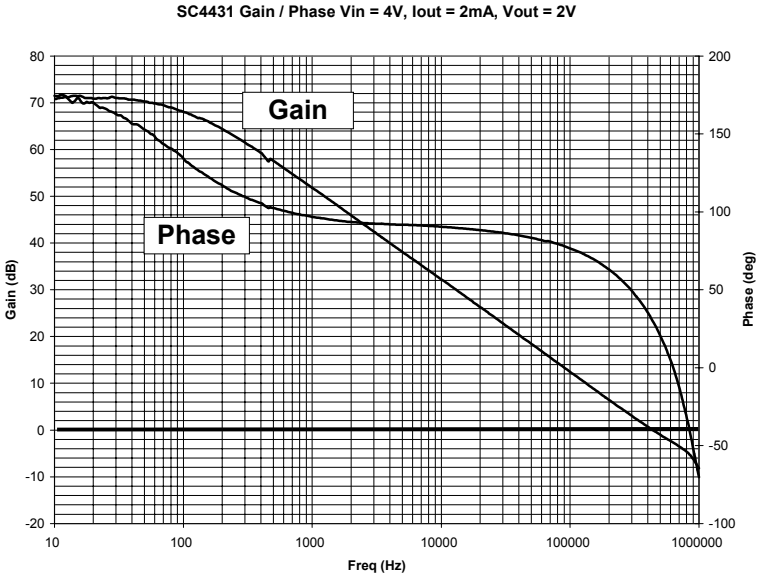
Typical Icc vs Vref, Io = 2mA, Ta = 25 Deg.C.

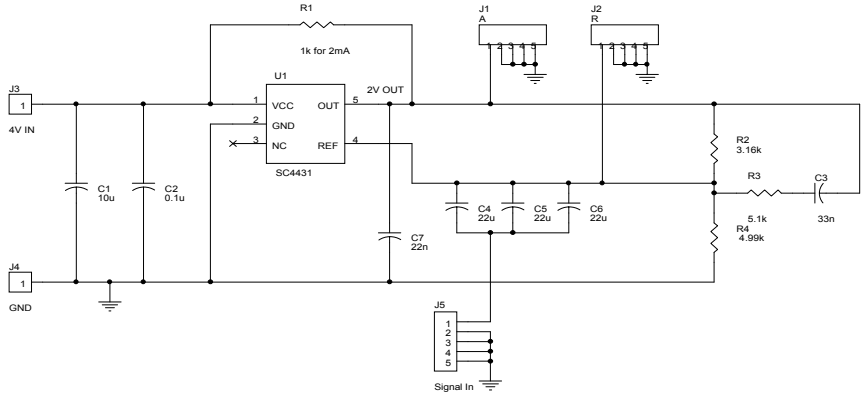


Icc vs Vref Test Circuit

Typical Gain Phase

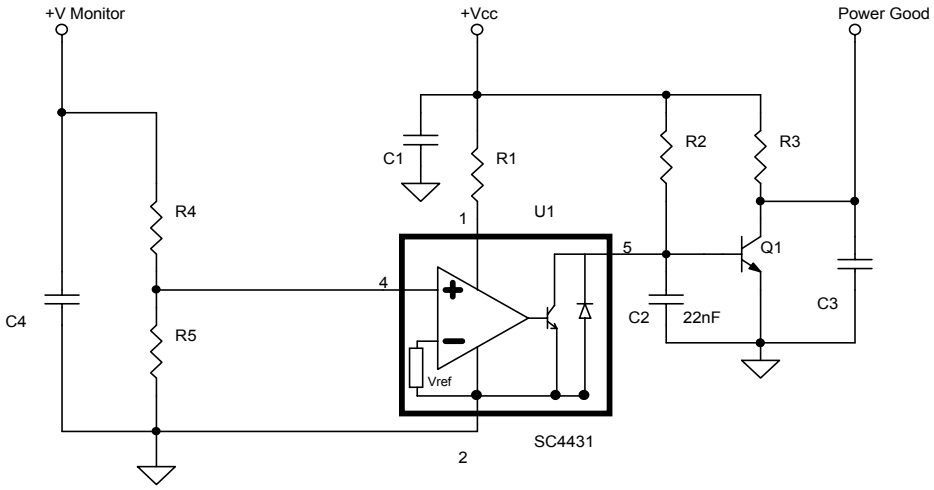




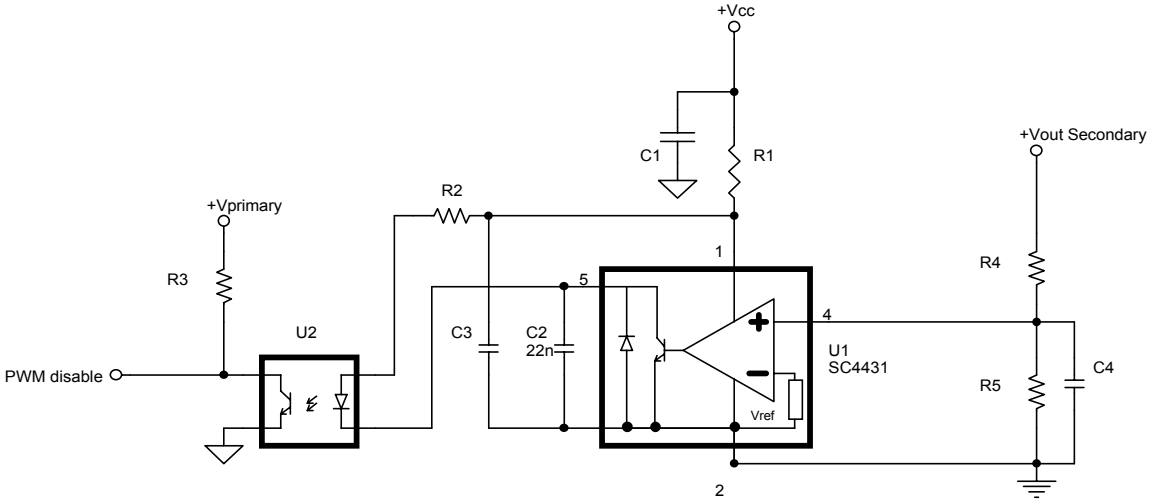


Gain Phase Test Circuit

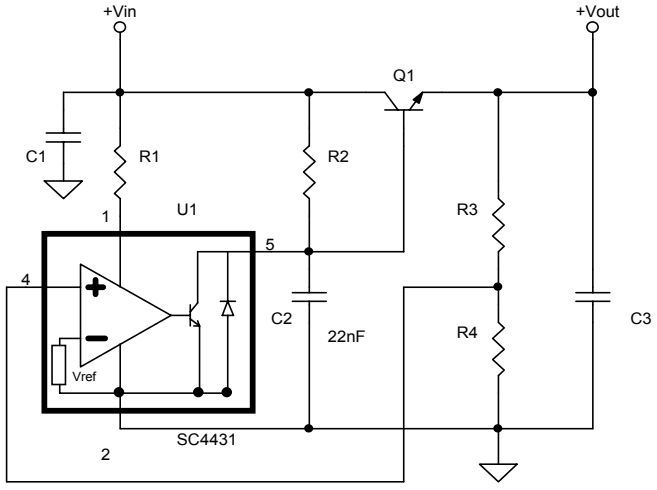
Typical Applications



Power good Circuit

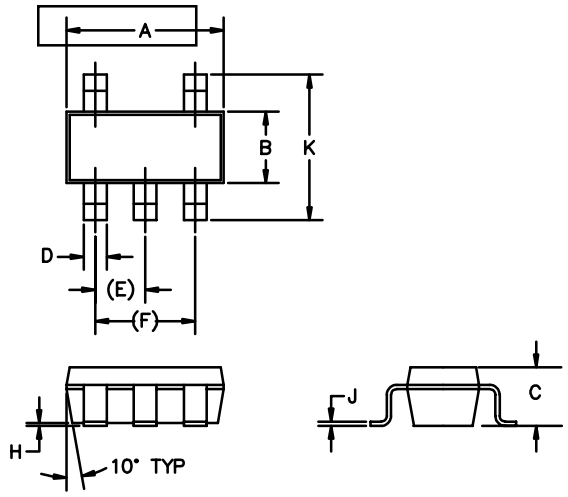


Isolated OVP Circuit



Linear Regulator Circuit

Outline Drawing

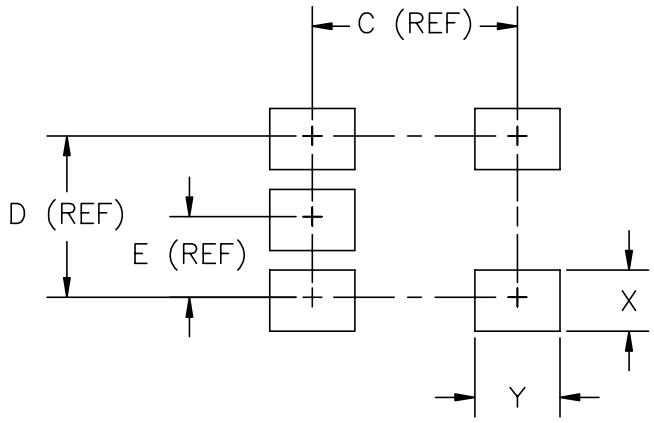


SOT-23- 5L ECN00 - 881

DIMENSIONS					
DIMⁿ	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	.110	.120	2.80	3.05	–
B	.059	.070	1.50	1.75	–
C	.036	.051	.90	1.30	–
D	.014	.020	.35	.50	–
E	–	.037	–	0.95	REF
F	–	.075	–	1.90	REF
H	–	.006	–	.150	–
J	.0035	.008	.090	.20	–
K	.102	.118	2.6	3.00	–

CONTROLLING DIMENSIONS: MILLIMETERS.

Land Pattern



SOT- 23- 5L ECN00 - 881

DIMENSIONS			
DIMⁿ	INCHES	MM	NOTE
C	.094	2.4	–
D	.074	1.9	–
E	.037	.95	–
X	.028	.7	–
Y	.039	1.0	–

Contact Information

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