

## ZXCT1022 Low offset high-side current monitor

### Description

The ZXCT1022 is a precision high-side current sense monitor. Using this type of device eliminates the need to disrupt the ground plane when sensing a load current.

The ZXCT1022 provides a fixed gain of 100 for applications where minimal sense voltage is required.

The very low offset voltage enables a typical accuracy of 3% for sense voltages of only 10mV,

### Features

- Accurate high-side current sensing
- Ground referred output
- 2.5V 20V supply range
- 25µA quiescent current
- SOT23-5 package

Pinout information

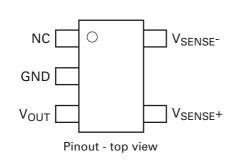
giving better tolerances for small sense resistors necessary at higher currents.

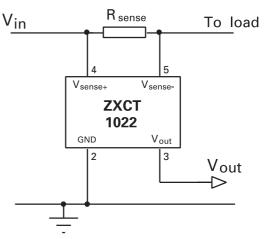
The wide input voltage range of 20V down to as low as 2.5V make it suitable for a range of applications. With a minimum operating current of just  $25\mu$ A, combined with its SOT23-5 package make it suitable for portable battery equipment too.

### Applications

- · Battery chargers
- Smart battery packs
- DC motor control
- Over-current protection
- Power supply current measurement
- Level translating

### **Typical application circuit**





### Ordering information

Order reference	Package	Device marking	Status	Reel size (inches)	Quantity per reel	Tape width (mm)
ZXCT1022E5TA	SOT23-5	1022	Active	7	3000	8

## Absolute maximum ratings

Voltage on $V_{s+}^{(*)}$ pin	-0.6V to 20V
Voltage on $V_{s-}^{(*)}$ (†) $V_{OUT}^{(*)}$ (†) pin	-0.6V to V <sub>S+</sub> +0.5V
V <sub>SENSE</sub> <sup>(‡)</sup>	-0.6V to +0.5V
Operating temperature	-40 to 85°C
Storage temperature	-55 to 150°C
Package power dissipation	$(T_A = 25^{\circ}C)$
- SOT23-5	- 450mW

#### NOTES:

(\*) with respect to GND pin (†) voltage not to exceed 20V (‡)  $V_{SENSE} = V_{S+} - V_{S-}$ 

## **Pinout information**

Pin name	Pin function
N/C	Not internally connected
GND	Ground
V <sub>OUT</sub>	Voltage output referenced to GND. Intended to drive high impedance loads
V <sub>S-</sub>	High impedance negative sense voltage input
V <sub>S+</sub>	Supply and positive sense voltage input

Symbol	Parameter	Conditions	Limits			Unit
			Min.	Тур.	Max.	
V <sub>IN</sub>	V <sub>CC</sub> range		2.5		20	V
V <sub>OUT</sub>	Output voltage	V <sub>SENSE</sub> = 0V	0	30	100	mV
		V <sub>SENSE</sub> = 10mV	0.97	1.0	1.03	V
		V <sub>SENSE</sub> = 30mV	2.91	3.0	3.09	V
		V <sub>SENSE</sub> = 100mV	9.7	10.0	10.3	V
R <sub>OUT</sub>	Output resistance		10	15	20	kΩ
T <sub>C</sub> <sup>(*)</sup>	Output temperature coefficient			50	300	ppm
۱ <sub>0</sub>	Ground pin current	V <sub>SENSE</sub> = 0V		25	35	μA
V <sub>SENSE</sub> (†)	Sense voltage	V <sub>IN</sub> = 20V	0		180 <sup>(‡)</sup>	mV
I <sub>SENSE</sub>	Load pin current	V <sub>SENSE</sub> = 0V			100	nA
Acc	Accuracy	V <sub>SENSE</sub> = 10mV	-3		3	%
Gain	V <sub>OUT</sub> / V <sub>SENSE</sub>	V <sub>SENSE</sub> = 10mV	97	100	103	V/V
BW	Bandwidth	V <sub>SENSE</sub> = 10mV		300		kHz
		V <sub>SENSE</sub> = 100mV		2		MHz

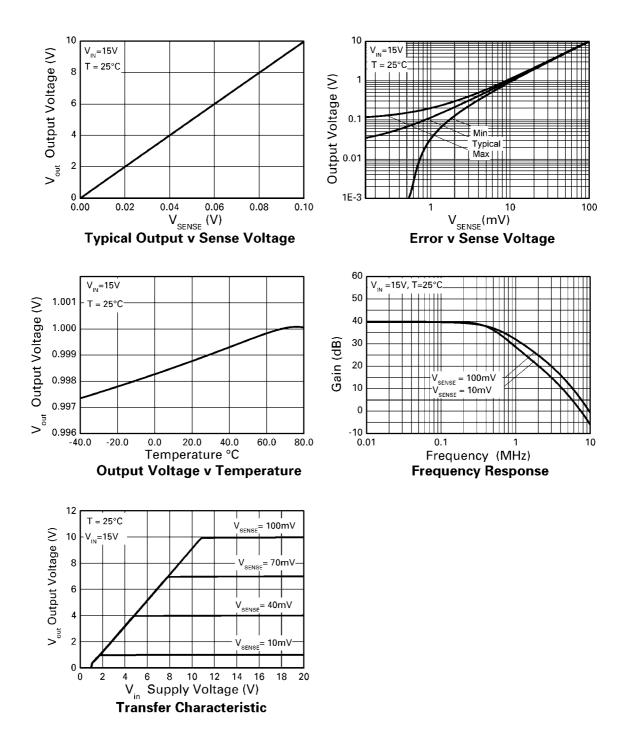
## Electrical characteristics test conditions $T_{amb} = 25^{\circ}C$ , $V_{IN} = 15V$

#### NOTES:

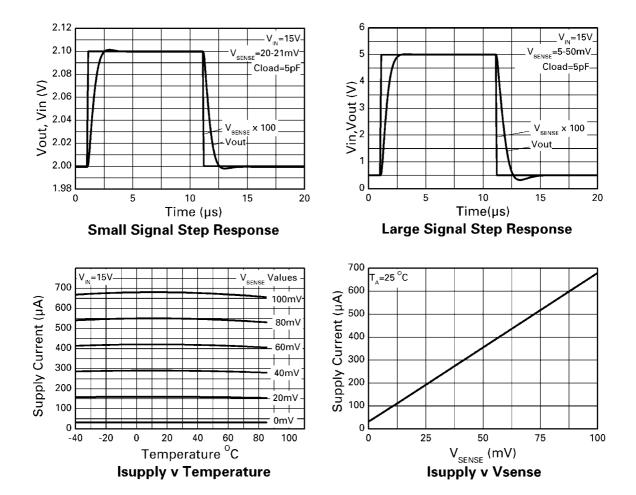
(\*)  $T_{C}$  limits are determined by characterization (†)  $V_{SENSE} = V_{IN} - V_{LOAD}$ (‡) For linear operation maximum  $V_{SENSE}$  is limited by operating voltage and is approximately:

$$V_{\text{SENSE}} = \frac{(V_{\text{IN}} - 2)}{100}$$

## **Typical characteristics**



## **Typical characteristics**



### **Application information**

The ZXCT1022 has a fixed dc voltage gain of 100. No external scaling resistors are required for the output. Output voltage is simply defined as:

### $V_{OUT} = 100 \times V_{SENSE} (V)$

Where  $V_{SENSE} = V_{IN} - V_{LOAD}$ 

### PCB trace shunt resistor for low cost solution

Figure 1 shows a PCB layout suggestion for a low cost solution where a PCB resistive trace in replacement for a conventional shunt resistor, can be used. The resistor section is 25mm x 0.25mm giving approximately 150m $\Omega$  using 1 oz copper. Smaller resistances can be used if required.

Total circuit solution: 1 component. Shows area of  $150m\Omega$  sense resistor compared to SOT23 package.

Practical tolerance of the PCB resistor will be around 5% depending on manufacturing methods.

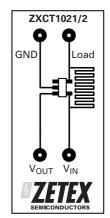
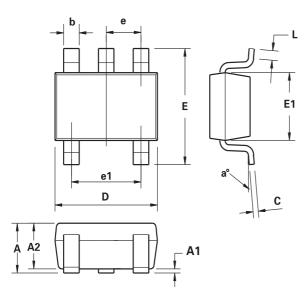


Figure 1 PCB layout suggestion

## Package outline - SOT23-5



DIM	Millimeters		Inc	hes
	Min.	Max.	Min.	Max.
A	0.90	1.45	0.0354	0.0570
A1	0.00	0.15	0.00	0.0059
A2	0.90	1.30	0.0354	0.0511
b	0.20	0.50	0.0078	0.0196
С	0.09	0.26	0.0035	0.0102
D	2.70	3.10	0.1062	0.1220
E	2.20	3.20	0.0866	0.1181
E1	1.30	1.80	0.0511	0.0708
е	0.95	REF	0.037	4 REF
e1	1.90 REF		0.0748 REF	
L	0.10	0.60	0.0039	0.0236
a°	0°	30°	0°	30°

Note: Controlling dimensions are in millimeters. Approximate dimensions are provided in inches

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