

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.

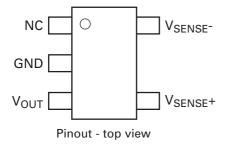
The ZXCT1022 provides a fixed gain of 100 for applications where minimal sense voltage is required.

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



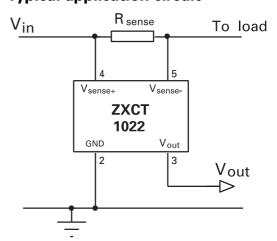
giving better tolerances for small sense resistors necessary at higher currents.

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_{S+} +0.5V

 V_{SENSE} ^(‡) -0.6V to +0.5V

Operating temperature $-40 \text{ to } 85^{\circ}\text{C}$ Storage temperature $-55 \text{ to } 150^{\circ}\text{C}$ Package power dissipation $(T_A = 25^{\circ}\text{C})$

- 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 _{OUT}	Voltage output referenced to GND. Intended to drive high impedance loads
V _{S-}	High impedance negative sense voltage input
V _{S+}	Supply and positive sense voltage input

Electrical characteristics test conditions T_{amb} = 25°C, V_{IN} = 15V

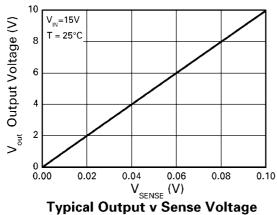
Symbol	Parameter	Conditions	Limits			Unit
			Min.	Тур.	Max.	
V _{IN}	V _{CC} range		2.5		20	V
V _{OUT}	Output voltage	V _{SENSE} = 0V	0	30	100	mV
		V _{SENSE} = 10mV	0.97	1.0	1.03	V
		V _{SENSE} = 30mV	2.91	3.0	3.09	V
		V _{SENSE} = 100mV	9.7	10.0	10.3	V
R _{OUT}	Output resistance		10	15	20	kΩ
T _C (*)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

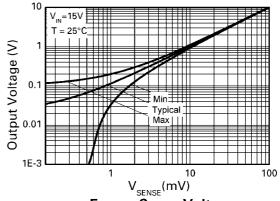
NOTES:

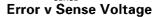
(*) T_C limits are determined by characterization
(†) V_{SENSE} = V_{IN} - V_{LOAD}
(‡) For linear operation maximum V_{SENSE} is limited by operating voltage and is approximately:

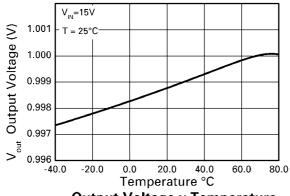
$$V_{SENSE} = \frac{(V_{IN} - 2)}{100}$$

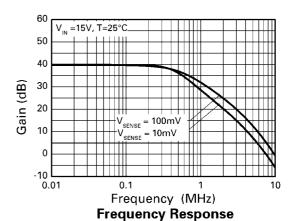
Typical characteristics



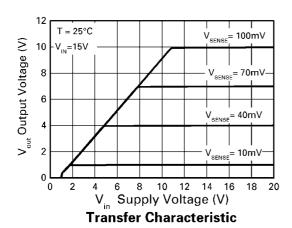




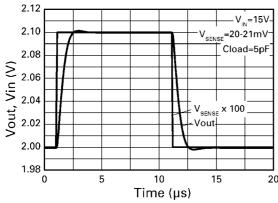




Output Voltage v Temperature

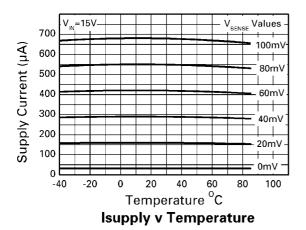


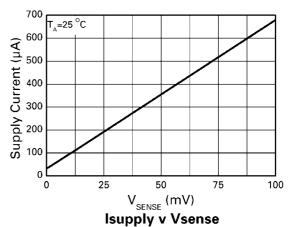
Typical characteristics



Small Signal Step Response

Large Signal Step Response





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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 Ω 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.

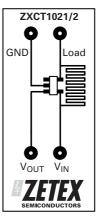
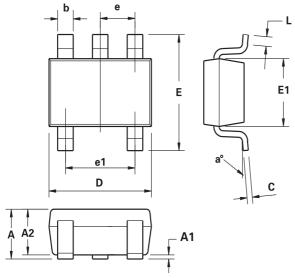


Figure 1 PCB layout suggestion

Package outline - SOT23-5



DIM	Millimeters		Inc	hes	
	Min.	Max.	Min.	Max.	
А	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	
Е	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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Zetex sales offices

Europe	Americas	Asia Pacific	Corporate Headquarters
Zetex GmbH Kustermann-park Balanstraße 59 D-81541 München Germany	Zetex Inc 700 Veterans Memorial Highway Hauppauge, NY 11788 USA	Zetex (Asia Ltd) 3701-04 Metroplaza Tower 1 Hing Fong Road, Kwai Fong Hong Kong	Zetex Semiconductors plc Zetex Technology Park, Chadderton Oldham, OL9 9LL United Kingdom
Telefon: (49) 89 45 49 49 0 Fax: (49) 89 45 49 49 9 europe.sales@zetex.com	Telephone: (1) 631 360 2222 Fax: (1) 631 360 8222 usa.sales@zetex.com	Telephone: (852) 26100 611 Fax: (852) 24250 494 asia.sales@zetex.com	Telephone: (44) 161 622 4444 Fax: (44) 161 622 4446 hq@zetex.com

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