

# ZXCT1021

## Low offset high-side current monitor

### Description

The ZXCT1021 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 ZXCT1021 provides a fixed gain of 10 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
- Output voltage scaling
- 2.5V – 20V supply range
- 25µA quiescent current
- 1% typical accuracy
- SOT23-5 package

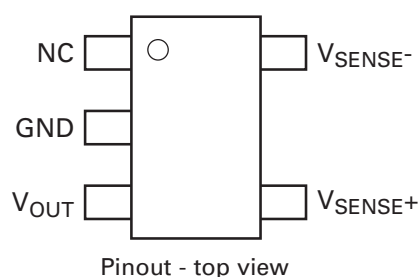
giving better tolerances for small sense resistors necessary at higher currents.

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 25µA, combined with its SOT23-5 package make it suitable for portable battery equipment too.

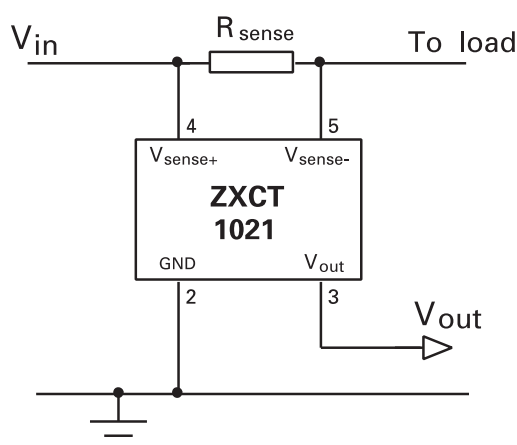
### Applications

- Battery chargers
- Smart battery packs
- DC motor control
- Over current monitor
- Power management
- Level translating
- Programmable current source

### Pinout information



### Typical application circuit



### Ordering information

Order reference	Package	Device marking	Status	Reel size (inches)	Quantity per reel	Tape width (mm)
ZXCT1021E5TA	SOT23-5	1021	Released	7	3000	8

## Absolute maximum ratings

Voltage on any pin with respect to END pin	-0.6V to 20V
$V_{\text{SENSE}}$	-0.6V to $V_{\text{IN}} + 0.5\text{V}$
Operating temperature	-40 to 85°C
Storage temperature	-55 to 150°C
Package power dissipation	( $T_{\text{amb}} = 25^\circ\text{C}$ )
SOT23-5	300mW

## Pinout information

Pin name	Pin function
N/C	Not internally connected
GND	Ground
$V_{\text{OUT}}$	Voltage output referenced to GND. Intended to drive high impedance loads
$V_{\text{SENSE-}}$	High impedance negative sense voltage input
$V_{\text{SENSE+}}$	Supply and positive sense voltage input

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

Symbol	Parameter	Conditions	Limits			Unit
			Min.	Typ.	Max.	
$V_{IN}$	$V_{CC}$ range		2.5		20	V
$V_{OUT}$	Output voltage	$V_{SENSE} = 30\text{mV}$	291	300	309	mV
		$V_{SENSE} = 100\text{mV}$	0.98	1.00	1.02	V
		$V_{SENSE} = 150\text{mV}$	1.47	1.50	1.53	V
$R_{OUT}$	Output resistance		10	15	20	$\text{k}\Omega$
$T_C^{(*)}$	Output voltage temperature coefficient			50	300	ppm
$I_Q$	Ground pin current	$V_{SENSE} = 0\text{V}$		25	35	$\mu\text{A}$
$V_{SENSE}^{(\dagger)}$	Sense voltage	$V_{IN} = 20\text{V}$	0		1.5 <sup>(‡)</sup>	V
$I_{LOAD}$	$V_{SENSE}$ - load pin input current	$V_{SENSE} = 0\text{V}$			100	nA
Acc	Accuracy	$V_{SENSE} = 100\text{mV}$	-2		2	%
Gain	$V_{OUT} / V_{SENSE}$	$V_{SENSE} = 100\text{mV}$	9.8	10	10.2	V/V
BW	Bandwidth	$V_{SENSE} = 10\text{mV}$		300		kHz
		$V_{SENSE} = 100\text{mV}$		2		MHz

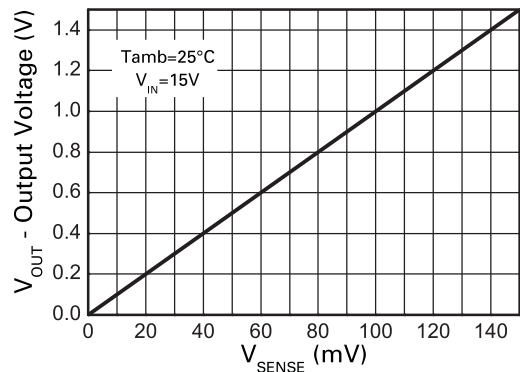
### NOTES:

(\*)  $T_C$  limits are determined by characterization

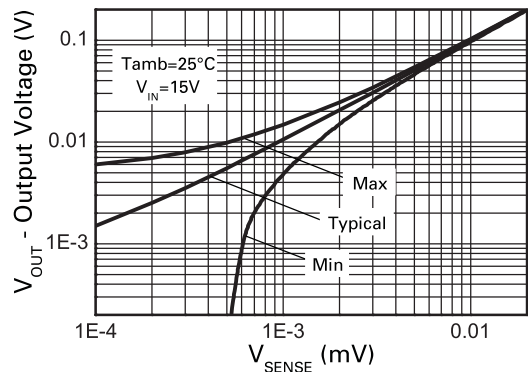
(†)  $V_{SENSE} = V_{IN} - V_{LOAD}$

(‡) This will be reduced at lower  $V_{IN}$  voltages due to clipping of output voltage.

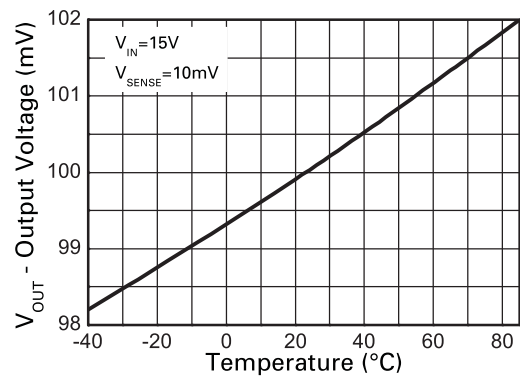
Typical characteristics



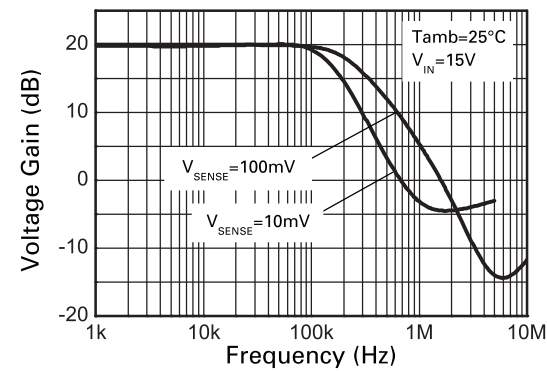
Typical Output v Sense Voltage



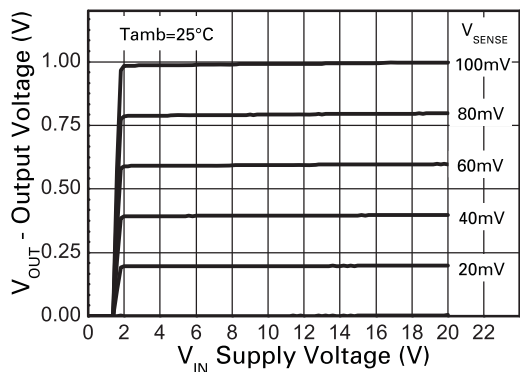
$V_{OUT}$  v Sense Voltage



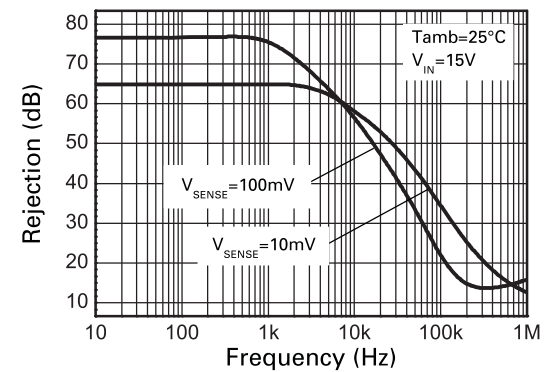
Output Voltage v Temperature



Frequency Response

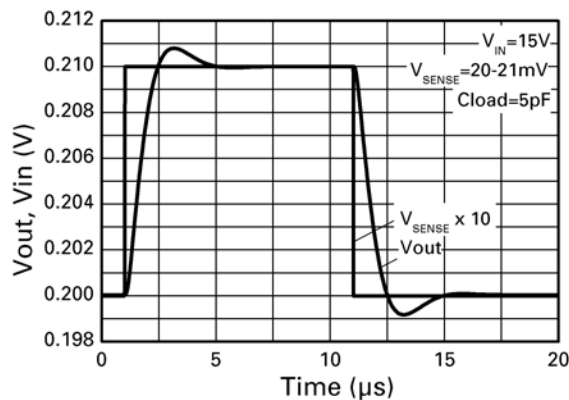


Transfer Characteristic

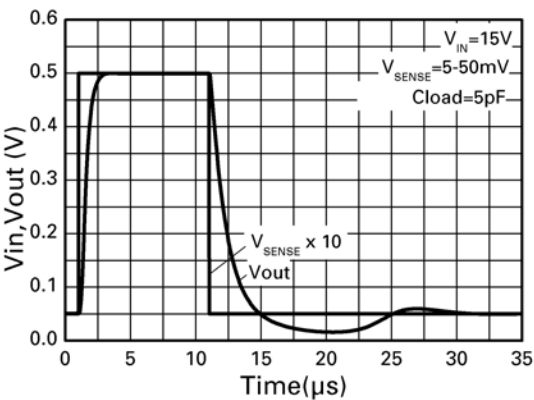


Common Mode Rejection

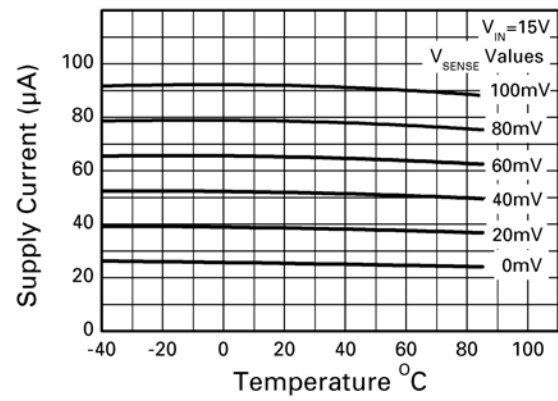
Typical characteristics



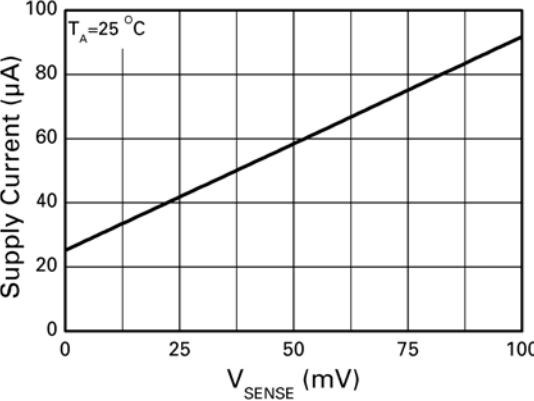
Small Signal Step Response



Large Signal Step Response



I<sub>supply</sub> v Temperature



I<sub>supply</sub> v Vtemp

## Application information

The ZXCT1021 has a fixed dc voltage gain of 100. No external scaling resistors are required for the output. Output voltage is simply defined as:

$$V_{OUT} = 10 \times V_{SENSE} (V)$$

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 150mΩ using 1 oz copper. Smaller resistances can be used if required.

Total circuit solution: 1 component. Shows area of 150mΩ sense resistor compared to SOT23 package.

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

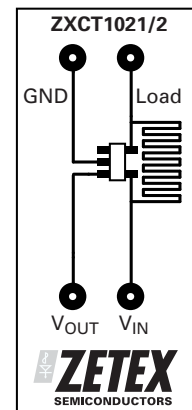
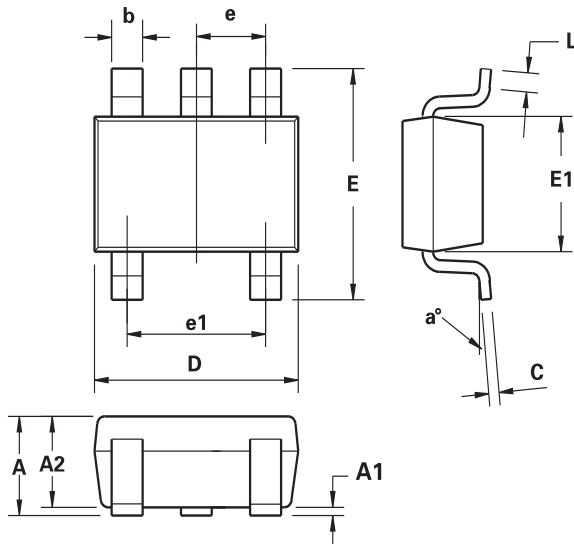


Figure 1 PCB layout suggestion

# ZXCT1021

## Package outline - SOT23-5



DIM	Millimeters		Inches	
	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
C	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
e	0.95 REF		0.0374 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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"Last time buy (LTB)"	Device will be discontinued and last time buy period and delivery is in effect
"Not recommended for new designs"	Device is still in production to support existing designs and production
"Obsolete"	Production has been discontinued

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