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.

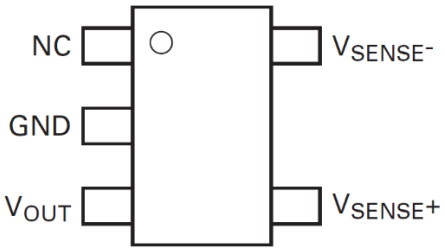
The ZXCT1021 provides a fixed gain of 10 for applications where minimal sense voltage is required.

The very low offset voltage enables a typical accuracy of 3% for sense voltages of only 10mV, 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 makes it suitable for a range of applications. With a minimum operating current of just 25µA, combined with its SOT25 package makes it suitable for portable battery equipment too.

Pin Assignments

SOT25



Pinout - top view

Features

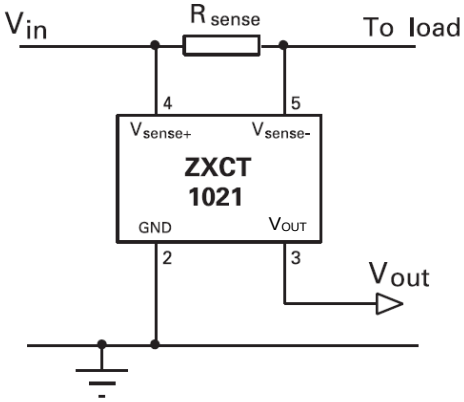
- Accurate High-Side Current Sensing
- Output Voltage Scaling
- 2.5V to 20V Supply Range
- 25µA Quiescent Current
- 1% Typical Accuracy
- SOT25 Package
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative. https://www.diodes.com/quality/product-definitions/**

Applications

- Battery chargers
- Smart battery packs
- DC motor controls
- Overcurrent monitors
- Power management
- Level translating
- Programmable current sources

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

Typical Applications Circuit



Pin Descriptions

Pin Name	Function
NC	Not Internally Connected
GDN	Ground
V_{OUT}	Voltage Output Referenced to GND. Intended to drive high impedance loads.
V_{SENSE-}	High Impedance Negative Sense Voltage Input
V_{SENSE+}	Supply and Positive Sense Voltage Input

Absolute Maximum Ratings

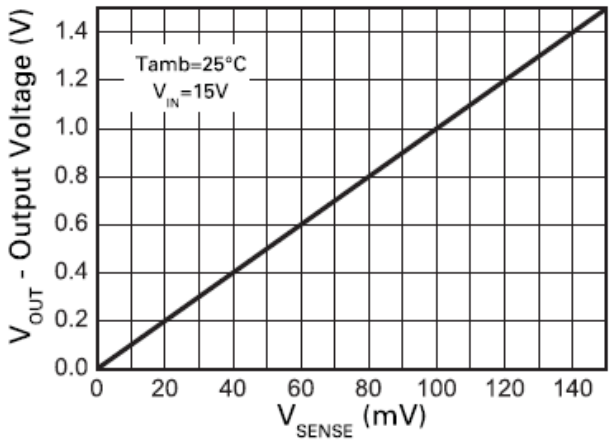
Parameter	Rating	Unit
Voltage on Any Pin with Respect to END Pin	-0.6 to 20	V
V_{SENSE}	-0.6 to V_{IN} +0.5	V
Operating Temperature	-40 to +85	°C
Storage Temperature	-55 to +150	°C
Package Power Dissipation (T_{amb} = +25°C)	300	mW

Electrical Characteristics (@T_{amb} = +25°C, V_{IN} = 15V, unless otherwise specified.)

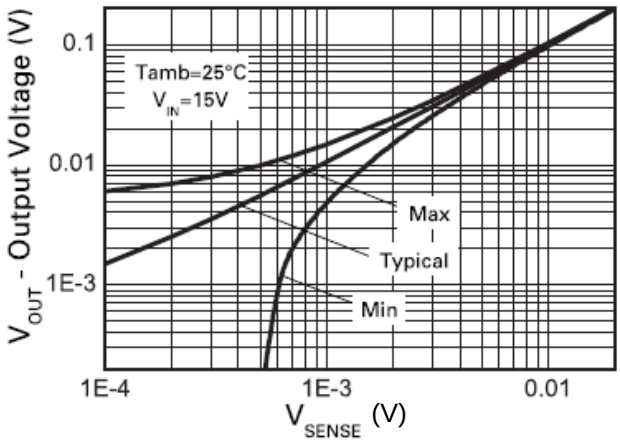
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{IN}	V_{CC} Range	—	2.5	—	20	V
V_{OUT}	Output Voltage	V_{SENSE} = 30mV	291	300	309	mV
		V_{SENSE} = 100mV	0.98	1.00	1.02	V
		V_{SENSE} = 150mV	1.47	1.50	1.53	V
R_{OUT}	Output Resistance	—	10	15	20	kΩ
T_C (Note 4)	Output Voltage Temperature Coefficient	—	—	50	300	ppm
I_Q	Ground Pin Current	V_{SENSE} = 0V	—	25	35	µA
V_{SENSE} (Note 5)	Sense Voltage	V_{IN} = 20V	0	—	1.5 (Note 6)	V
I_{LOAD}	V_{SENSE-} Load Pin Input Current	V_{SENSE} = 0V	—	—	100	nA
A_{CC}	Accuracy	V_{SENSE} = 100mV	-2	—	2	%
Gain	V_{OUT} / V_{SENSE}	V_{SENSE} = 100mV	9.8	10	10.2	V/V
BW	Bandwidth	V_{SENSE} = 10mV	—	300	—	kHz
		V_{SENSE} = 100mV	—	2	—	MHz

Notes: 4. T_C limits are determined by characterization.
5. $V_{SENSE} = V_{IN} – V_{LOAD}$
6. This will be reduced at lower V_{IN} voltages due to clipping of output voltage.

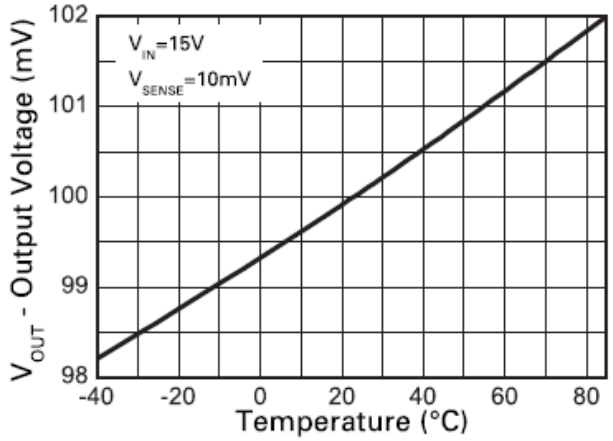
Typical Characteristics



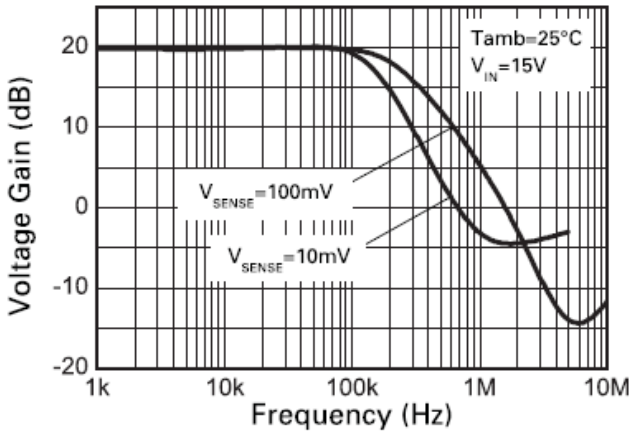
Typical Output v Sense Voltage



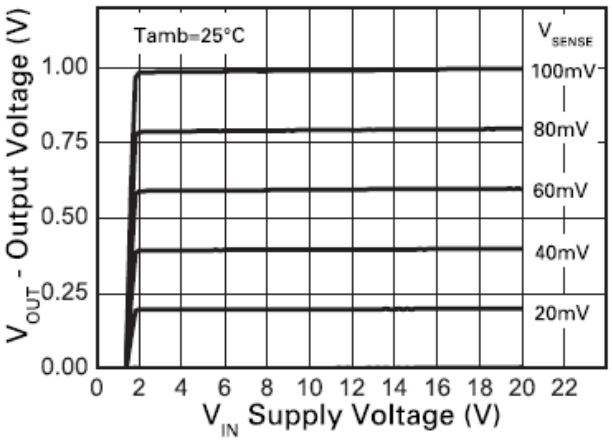
V_{OUT} v Sense Voltage



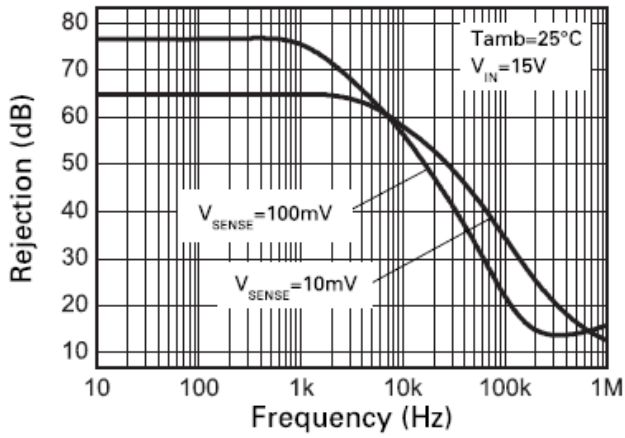
Output Voltage v Temperature



Frequency Response

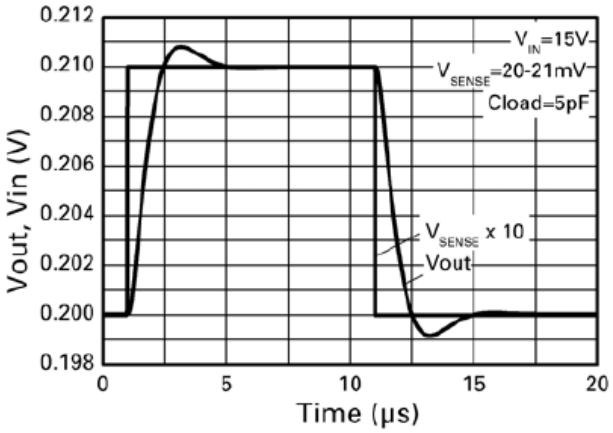


Transfer Characteristic

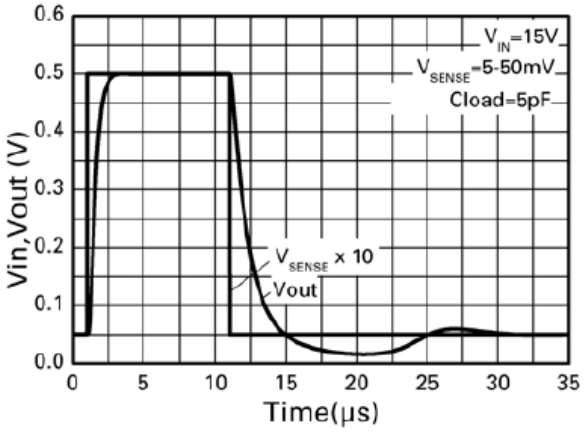


Common Mode Rejection

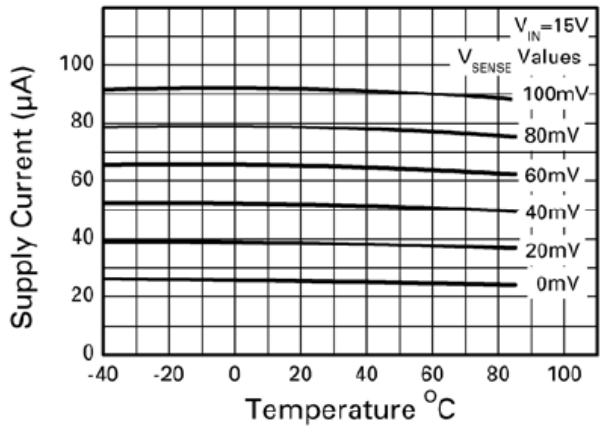
Typical Characteristics (continued)



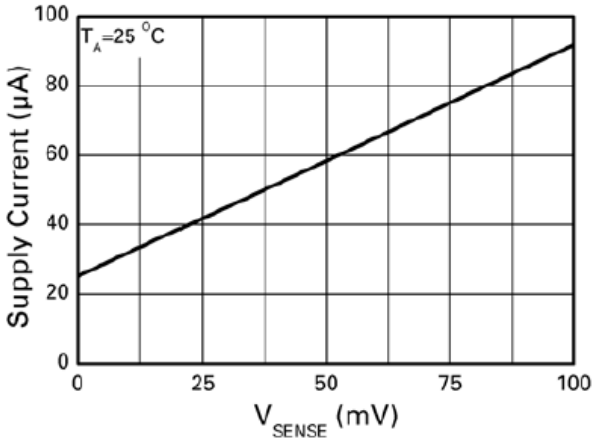
Small Signal Step Response



Large Signal Step Response



Isupply v Temperature



Isupply 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 resistance 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.

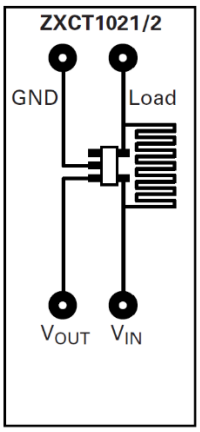
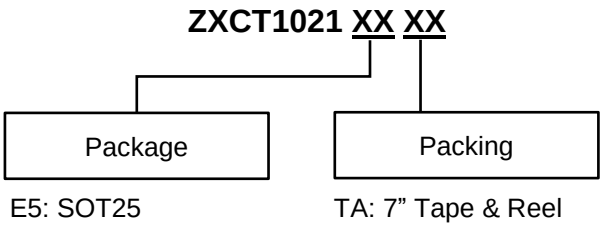


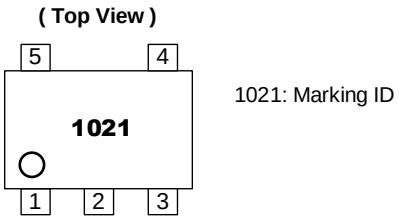
Figure 1. PCB Layout Suggestion

Ordering Information



Orderable Part Number	Package	Package Code	Reel Size (inches)	Tape Width (mm)	Packing	
					Qty.	Carrier
ZXCT1021E5TA	SOT25	E5	7	8	3000	Tape & Reel

Marking Information

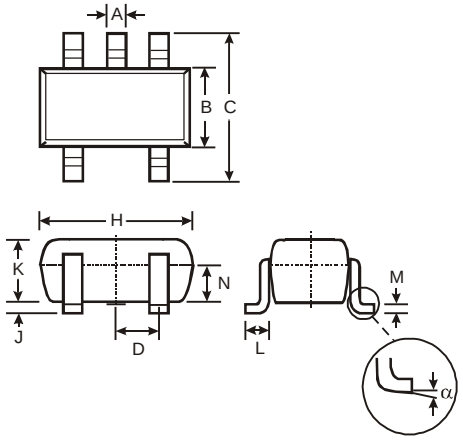


Orderable Part Number	Package	Marking ID
ZXCT1021E5TA	SOT25	1021

Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

SOT25

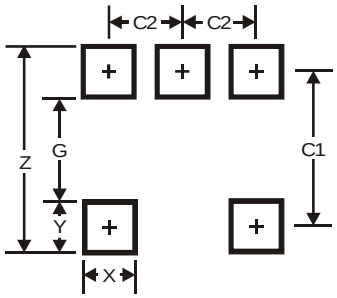


SOT25			
Dim	**Min**	**Max**	**Typ**
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	-	-	0.95
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
N	0.70	0.80	0.75
α	0°	8°	-
All Dimensions in mm			

Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

SOT25



Dimensions	Value
Z	3.20
G	1.60
X	0.55
Y	0.80
C1	2.40
C2	0.95

Mechanical Data

- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 (e3)
- Weight: 0.015298 grams (Approximate)

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