

## Description

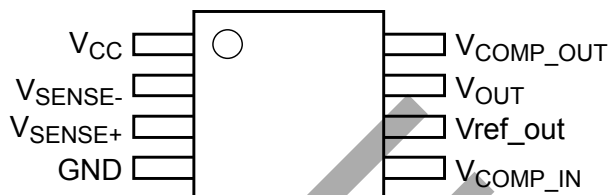
The ZXCT1030 is a high side current sense monitor containing an internal reference and comparator with a non-latching output. Using this device eliminates the need to disrupt the ground plane when sensing a load current.

The wide input voltage range of 20V down to as low as 2.2V make it suitable for a range of applications. Dynamics and supply current are optimized for the processing of fast pulses, associated with switch mode applications.

## Features

- Low cost, accurate high-side current sensing
- Output voltage scaling
- Up to 18V output
- 2.2V - 20V supply range
- Voltage reference on chip
- Comparator on chip
- SO8 package

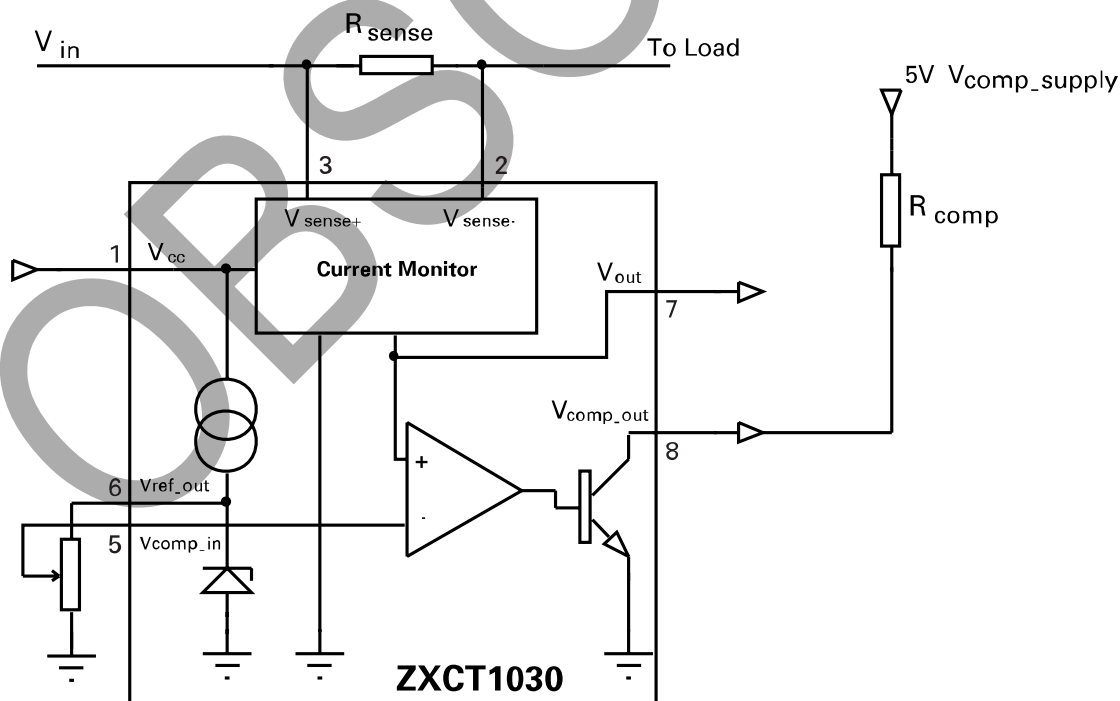
## Pin Assignments



## Applications

- Battery chargers
- Electronic fuse
- DC motor control
- Over current monitor
- Power management
- Inrush current limiting

## Typical Application Circuit



## Pin Description

Pin Name	Function
V <sub>CC</sub>	Supply voltage
V <sub>SENSE-</sub>	Negative sense input
V <sub>SENSE+</sub>	Positive sense input
GND	Ground
V <sub>COMP_IN</sub>	Comparator input, usually a ratio of the reference or other control signal
V <sub>REF_OUT</sub>	Reference output
V <sub>OUT</sub>	Current monitor output voltage
V <sub>COMP_OUT</sub>	Open collector comparator output

## Absolute Maximum Ratings

Parameter	Rating	Unit
Voltage on any pin	-0.6 and V <sub>CC</sub> +0.6	V
Operating Temperature	-40 to 85	°C
Storage Temperature	-55 to 125	°C
Package Power Dissipation	(T <sub>AMB</sub> = 25)	°C
SO8	700	mW

## Recommended Operating Conditions

Parameter	Min	Max	Units
V <sub>CC</sub>	2.2	20	V
V <sub>SENSE+</sub>	2.2	V <sub>CC</sub>	V
V <sub>SENSE</sub> <sup>(a)</sup>	10	500	mV
V <sub>OUT</sub>	0	V <sub>SENSE-</sub> -1V	V
V <sub>COMP_IN</sub>	0.005	10	V
T <sub>AMB</sub>	-40	85	°C

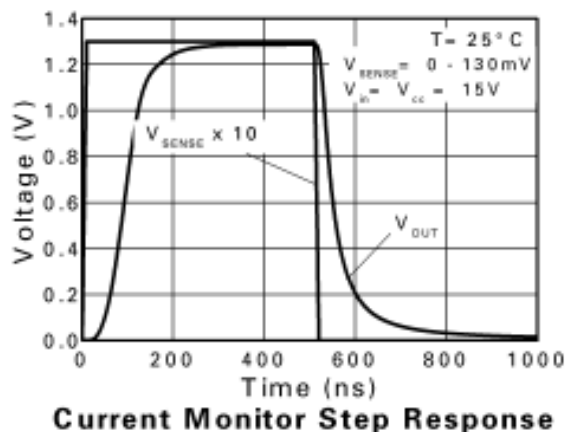
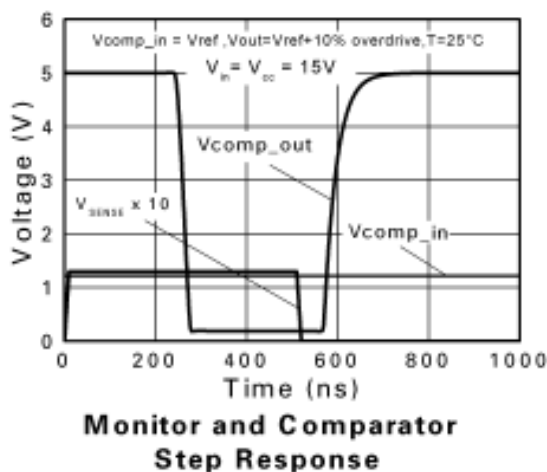
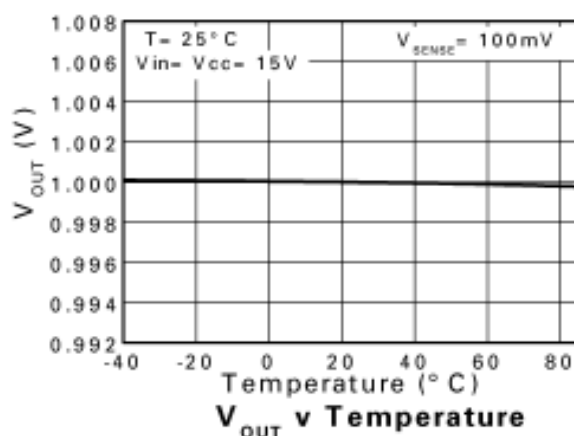
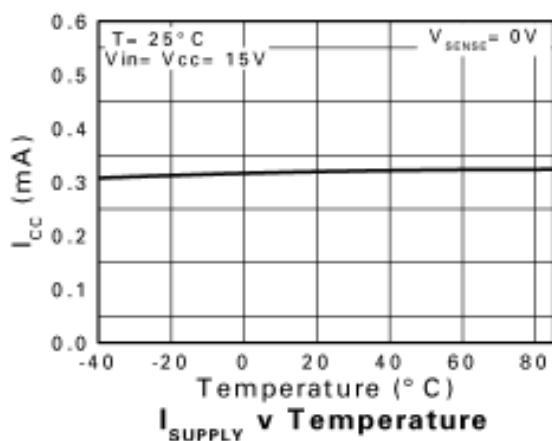
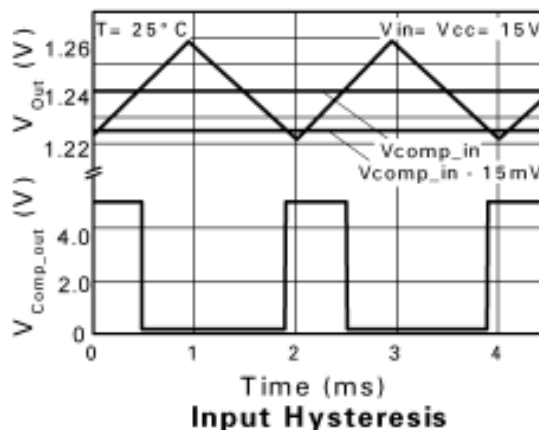
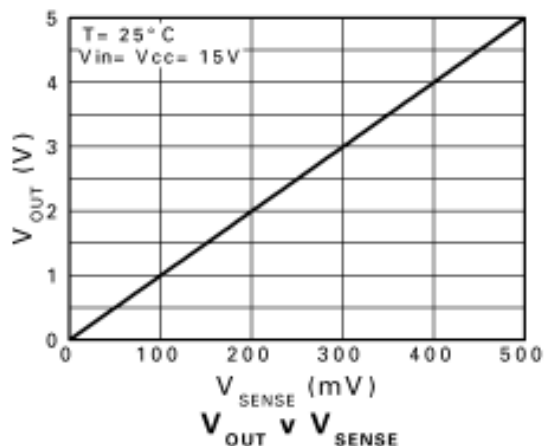
**Electrical Characteristics (ZXCT1030N8)** – Test conditions  $T_{AMB} = 25^{\circ}\text{C}$ ,  $V_{IN} = V_{CC} = 15\text{V}$ ,  $R_{COMP} = 10\text{k}\Omega$ ,

 $V_{COMP\_SUPPLY} = 5\text{V}$  unless otherwise stated.

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
$V_{CC}$	$V_{CC}$ Range		2.2		20	V
$V_{SENSE+}$	Sense+ Range		2.2		$V_{CC}$	
$V_{OUT}$	Output Voltage	$V_{SENSE} = 0$ $V_{SENSE} = 10$ $V_{SENSE} = 30$ $V_{SENSE} = 50$ $V_{SENSE} = 100$ $V_{SENSE} = 500$	0 88 284 480 970 4500	2 100 300 500 1000 5000	10 112 316 520 1030 5500	mV
$R_{OUT}$	Output Resistance	$V_{SENSE} = 15\text{V}$ , $V_{OUT} = 1\text{V}$	1.2	1.5	1.8	k $\Omega$
$V_{OUT}$ $T_C$	$V_{OUT}$ Temperature Coefficient			30		ppm/ $^{\circ}\text{C}$
$I_{CC}$	Supply Current	$V_{SENSE} = 15\text{V}$	170	270	350	$\mu\text{A}$
$I_{SENSE+}$	$V_{SENSE+}$ Input Current			48	90	$\mu\text{A}$
$I_{SENSE-}$	$V_{SENSE-}$ Input Current	$V_{SENSE-} = 14.9\text{V}$		70	220	nA
$V_{CM(MIN)}^{(B)}$	Minimum Active Common Mode Voltage	$V_{CC} = 15\text{V}$ $V_{COMP\_SUPPLY} = 5\text{V}$ $V_{COMP\_IN} = V_{REF}$ $V_{SENSE} = 10\text{mV}$	2.8			V
$A_{CC}$	Accuracy	$V_{SENSE} = 100\text{mV}$	-3		3	%
GAIN	$V_{OUT}/V_{SENSE}$	$V_{SENSE} = 100\text{mV}$	9.7	10.0	10.3	
BW	Bandwidth	$V_{SENSE} = 10\text{mVp-p}$ $V_{SENSE} = 100\text{mVp-p}$		3 6		MHz
<b>COMPARATOR</b>						
$V_{COMP\_IN}$	Input Voltage		0.005		10	V
$V_H$	Hysteresis			15		mV
$I_B$	Input Bias		5	80	150	nA
$T_D$	Propagation Delay			100		ns
$V_{OL}$	Output Voltage Low		30	150	200	mV
$V_{OH}$	Output Voltage High				$V_{COMP\_SUPPLY}$	
$I_{OL}$	Output Sink Current	$V_{OL} = 0.4\text{V}$	2			mA
$I_{OH}$	Output High Leakage Current				1.0	$\mu\text{A}$
<b>Voltage Reference</b>						
$V_{REF}$		Reference Current = +300 $\mu\text{A}$ to -5 $\mu\text{A}$	1.200	1.240	1.280	V
Delta $V_{REF}$	Change in $V_{REF}$	SOURCE 5 $\mu\text{A}$ to SINK 300 $\mu\text{A}$		10		mV
$T_C$				30		ppm/ $^{\circ}\text{C}$
PSR	Supply Rejection			0.01		%/V

Notes: (a)  $(V_{SENSE+}) - (V_{SENSE-})$   
 (b) Level of  $V_{SENSE+}$  where comparator output defaults to 'off'.

## Typical Application Circuits



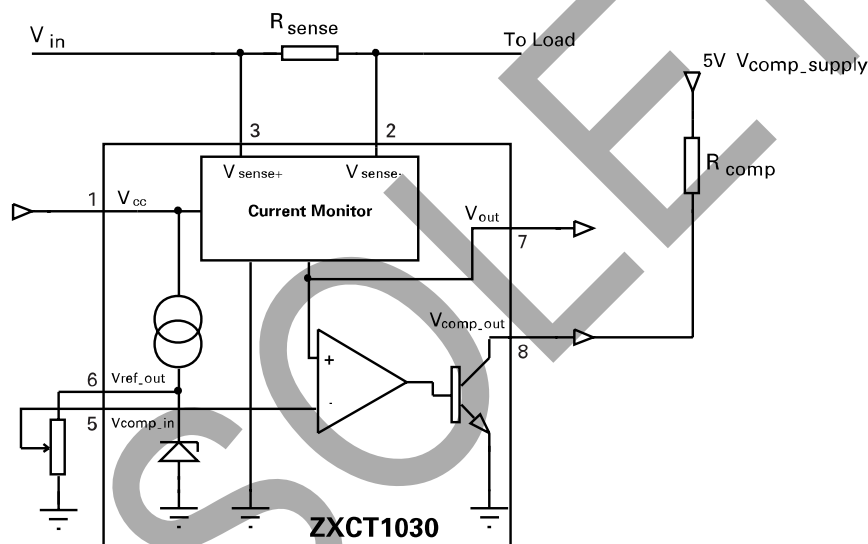
## Voltage output current monitor

Referring to the block diagram, the current monitor takes the small voltage developed across the sense resistor ( $V_{SENSE}$ ) and transfers it from the large common mode supply voltage to a ground referenced signal with a gain of 10. The sense input common mode range is 2.2V to 20V. In this range, a linear output voltage is delivered.

### Reference

The bandgap reference allows the comparator to compare the translated  $V_{SENSE}$  with threshold value chosen by the user which can be any voltage from 0 to 1.24V, configured by two external resistors which forms  $V_{COMP\_IN}$ .

The output current which can be drawn from the comparator reference ( $I_{REF}$  source) is limited to 5 $\mu$ A, making potentiometers  $\geq 250k\Omega$  suitable for setting a threshold level. Where a lower potentiometer resistor value is used, an additional resistor value should be inserted between  $V_{REF}$  and  $V_{CC}$  to maintain sufficient current for the reference. (as shown in Figure 1).



**Figure 1: External Resistor for Reference Level**

The voltage reference has a maximum current sink capability. This magnitude of current will be influenced by the value of  $R_1$  which is inserted between  $V_{REF}$  and  $V_{CC}$ . The value of current flowing through  $R_1$  can be expressed as:

$$I = (V_{CC} - V_{REF}) / R_1$$

### Comparator

The open collector output is active low and is asserted when  $V_{SENSE} \times 10 (V_{OUT}) > V_{COMP\_IN}$ . It can be connected to any voltage rail up to  $V_{IN}$  via a pull-up resistor. Suggest values for the resistor are in the range of 10-100k $\Omega$ .

In the case where high load currents or a short circuit occurs, thus reducing the common mode signals ( $V_+$ ,  $V_-$ ) typically below 2.2V, the comparator will default to the asserted state. This can eliminate a closed loop system 'latch-up' condition, allowing the controller to remove the applied power.

### Stability

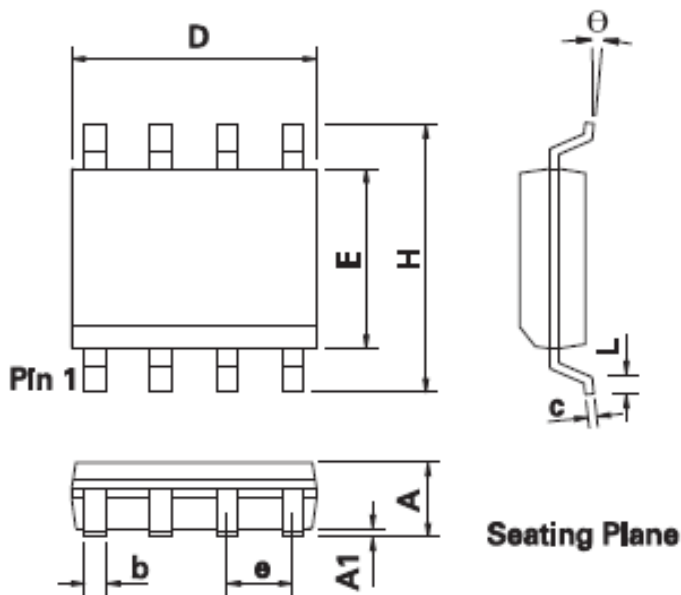
To ensure stable operation of the ZXCT1030, it is recommended a decoupling capacitor is placed across the  $V_{CC}$  and ground connections. A ceramic 10 $\mu$ F will be adequate.

## Ordering Information\*

Device	Status(*)	Package	Device Marking	Reel Size (inches)	Tape Width (mm)	Quantity Per reel
ZXCT1030X8TA	Obsolete	MSOP8	ZXCT1030	7	12	1000
ZXCT1030N8TA	Active	SO8	ZXCT1030	7	12	500

Notes: \*ZXCT1030X8TA is obsolete for more device information please check our obsolete products search on diodes website

## Package Outline – SO8



DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.053	0.069	1.35	1.75	e	0.050 BSC		1.27 BSC	
A1	0.004	0.010	0.10	0.25	b	0.013	0.020	0.33	0.51
D	0.189	0.197	4.80	5.00	c	0.008	0.010	0.19	0.25
H	0.228	0.244	5.80	6.20	$\theta$	0°	8°	0°	8°
E	0.150	0.157	3.80	4.00	h	0.010	0.020	0.25	0.50
L	0.016	0.050	0.40	1.27	-	-	-	-	-

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

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