

ZXCT1030

High-side current monitor with comparator

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.

Features

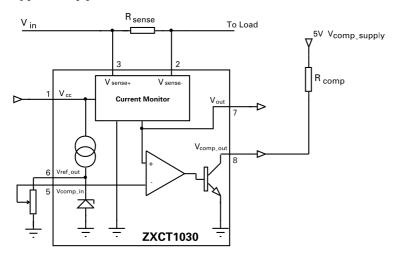
- · Low cost, accurate high-side current sensing
- Output voltage scaling
- Up to 18V output
- 2.2V 20V supply range
- 270µA quiescent current
- 1.5% typical accuracy
- SO8 package
- · Voltage reference on chip
- Comparator on chip

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.

Applications

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

Typical application circuit



Ordering information

Device	Status	Package	Device marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXCT1030X8TA	Last time buy	MSOP8	ZXCT1030	7	12	1000
ZXCT1030N8TA	Preview	S08	ZXCT1030	7	12	500

Absolute maximum ratings

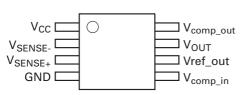
Voltage on any pin -0.6V and $V_{CC} +0.6V$

Operating temperature $-40 \text{ to } 85^{\circ}\text{C}$ Storage temperature $-55 \text{ to } 125^{\circ}\text{C}$ Package power dissipation $(T_{amb} = 25^{\circ}\text{C})$ MSOP8 500mW

Recommended operating conditions

Parameter	Min.	Max.	Unit
V _{CC}	2.2	20	V
V _{SENSE+}	2.2	V_{CC}	V
V _{SENSE} ^(a)	10	500	mV
V _{OUT}	0	V _{SENSE} -1V	V
$V_{comp-in}$	0.005	10	V
T _{amb}	-40	85	°C

Pin-out connections



Pin name	Function
V _{CC}	Supply voltage
V _{SENSE} -	Negative sense input
V _{SENSE+}	Positive sense input
GND	Ground
V _{comp_in}	Comparator input, usually a ratio of the reference or other control signal
Vref_out	Reference output
V _{OUT}	Current monitor output voltage
V _{comp_out}	Open collector comparator output

Electrical characteristics (ZXCT1030X8) - Test conditions $T_{amb} = 25^{\circ}C$, $V_{IN} = V_{CC} = 15V$, $R_{comp} = 10kV$, $V_{comp_supply} = 5V$ unless otherwise stated.

Symbol	Parameter	Conditions	Limits			Unit
			Min.	Тур.	Мах.	
V _{CC}	V _{CC} range		2.2		20	V
V _{SENSE+}	Sense+ range		2.2		V_{CC}	
V _{OUT}	Output voltage	V _{SENSE} = 0V	0	2	10	mV
		$V_{SENSE} = 10mV$	88	100	112	mV
		$V_{SENSE} = 30mV$	284	300	316	mV
		$V_{SENSE} = 50 \text{mV}$	480	500	520	mV
		$V_{SENSE} = 100 mV$	970	1000	1030	mV
		$V_{SENSE} = 500 \text{mV}$	4500	5000	5500	mV
R _{OUT}	Output resistance	V _{SENSE-} = 15V, V _{OUT} = 1V	1.2	1.5	1.8	kΩ
V _{OUT}	V _{OUT}			30		ppm/°C
T_{C}	temperature coefficient					
I _{CC}	Supply current	V _{SENSE-} = 15V	170	270	350	μΑ
I _{SENSE+}	V _{SENSE+} input current			48	90	μΑ
I _{SENSE-}	V _{SENSE} input current	V _{SENSE-} = 14.9V		70	220	nA
V _{CM(min)} ^(b)	Minimum active common	V _{CC} =15V	2.8			V
Civi(iiiiii)	mode voltage	$V_{comp_supply} = 5V$				
		$V_{comp_in} = V_{REF}$				
		V _{SENSE} = 10mV				
A _{CC}	Accuracy	V _{SENSE} =100mV	-3		3	%
Gain	V _{OUT} /V _{SENSE}	V _{SENSE} = 100mV	9.7	10.0	10.3	
BW	Bandwidth	V _{SENSE} =10mVp-p		3		MHz
		$V_{SENSE} = 100 \text{mVp-p}$		6		MHz
Comparate	or				I.	
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				$V_{comp_{-}}$	V
					supply	
I _{OL}	Output sink current	$V_{OL} = 0.4V$	2			mA
Гон	Output high leakage				1.0	μΑ
W-14-	current					
Voltage re	Terence	ID-f	1.000	1 0 10	1 000	
V _{ref}		Reference current =	1.200	1.240	1.280	V
delta V _{ref}	Change in V _{ref}	+300μA to -5μA Isource 5μA to		10		mV
ucita v _{ref}	Change in v _{ref}	Isink 300μA		10		''' v
T _C				30		ppm/°C
PSR	Supply rejection			0.01		%/V

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

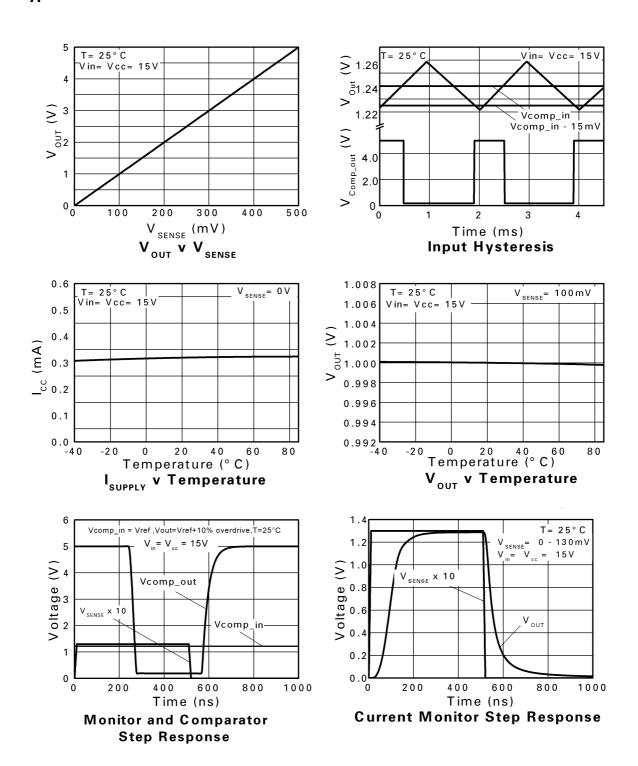
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T _C				30		ppm/°C
PSR	Supply rejection			0.01		%/V

NOTES:

(c) $V_{SENSE} = (V_{SENSE+}) - (V_{SENSE})$ (d) Level of V_{SENSE+} where comparator output defaults to 'off'.

Typical characteristics



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 Vsense with threshold value chosen by the user which can be any voltage from 0 to 1.24V, configured by two external resistors which forms $V_{\text{comp_in}}$.

The output current which can be drawn from the comparator reference (I_{ref} source) is limited to 5µA, making potentiometers $\geq 250 k\Omega$ 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).

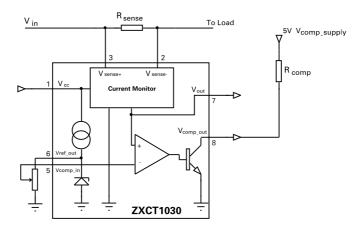


Figure 1: External resistor for reference level

The voltage reference has a maximum current sink capability. This magnitude of current will be influenced by the value of R1 which is inserted between V_{ref} and V_{CC} . The value of current flowing through R1 can be expressed as:

$$I = (V_{CC} - V_{ref}) / R1$$

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 Vin via a pull-up resistor. Suggest values for the resistor are in the range of 10-100k Ω .

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.

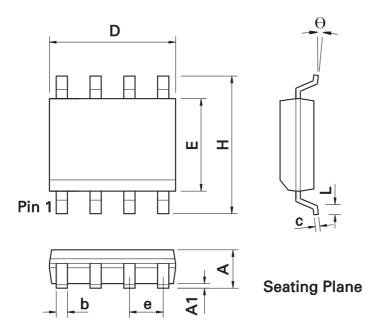
Stability

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.

ZXCT1030

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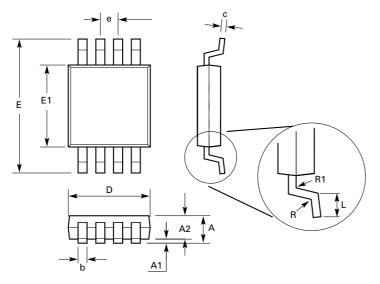
Package outline - SO8



DIM	Inc	hes	Millin	neters	DIM	Inc	hes	Millin	neters
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
Α	0.053	0.069	1.35	1.75	е	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	С	0.008	0.010	0.19	0.25
Н	0.228	0.244	5.80	6.20	θ	0°	8°	0°	8°
Е	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

Package outline - MSOP8



DIM	Millim	neters	Inc	hes
	Min.	Max.	Min.	Max.
Α	-	1.10	-	0.0433
A1	0.05	0.15	0.002	0.006
A2	0.75	0.95	0.0295	0.0374
b	0.25	0.40	0.010	0.0157
С	0.13	0.23	0.005	0.009
D	2.90	3.10	0.114	0.122
E	4.90	BSC	0.193	BSC
E1	2.90	3.10	0.114	0.122
е	0.65	BSC	0.025	BSC
L	0.40	0.70	0.0157	0.0192
R	0.07	-	0.0027	-
R1	0.07	-	0.0027	-

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

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