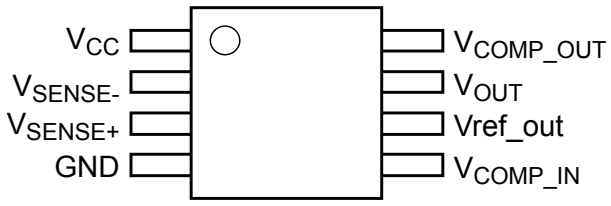
ZXCT1030X8
HIGH-SIDE CURRENT MONITOR WITH COMPARATOR

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.

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.

Pin Assignments



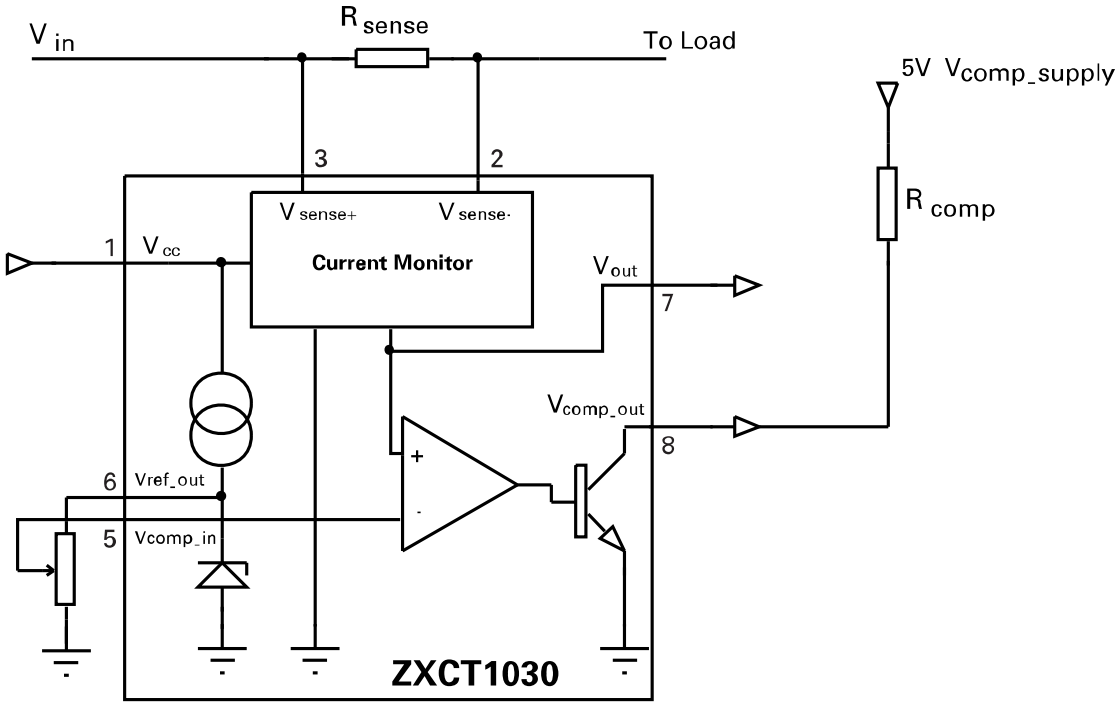
Features

- 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
- MSOP8 package

Applications

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

Typical Application Circuit



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Pin Description

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
V_{REF_OUT}	Reference output
V_{OUT}	Current monitor output voltage
V_{COMP_OUT}	Open collector comparator output

Absolute Maximum Ratings

Parameter	Rating	Unit
Voltage on any pin	-0.6 and V_{CC} +0.6	V
Operating Temperature	-40 to 85	°C
Storage Temperature	-55 to 125	°C
Package Power Dissipation	(T_{AMB} = 25)	°C
SO8 MSOP8	700 500	mW

Recommended Operating Conditions

Parameter	Min	Max	Units
V_{CC}	2.2	20	V
V_{SENSE+}	2.2	VCC	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

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Electrical Characteristics (ZXCT1030X8) – Test conditions T_{AMB} = 25°C, V_{IN} = V_{CC} = 15V, R_{COMP} = 10kΩ, V_{COMP_SUPPLY} = 5V unless otherwise stated.

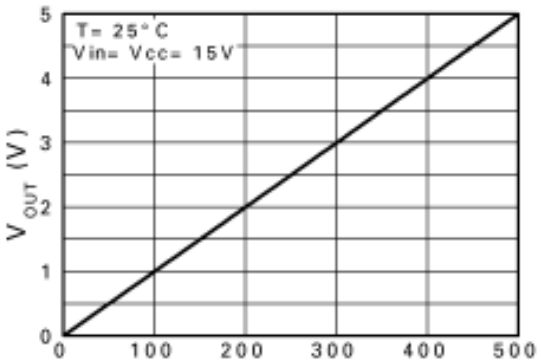
Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
V_{CC}	V_{CC} Range		2.2		20	V
V_{SENSE}+	Sense+ Range		2.2		V_{CC}	
V_{OUT}	Output Voltage	V_{SENSE} = 0 V_{SENSE} = 10 V_{SENSE} = 30 V_{SENSE} = 50 V_{SENSE} = 100 V_{SENSE} = 500	0 88 284 480 970 4500	2 100 300 500 1000 5000	10 112 316 520 1030 5500	mV
R_{OUT}	Output Resistance	$V_{SENSE\ -}$ = 15V, V_{OUT} = 1V	1.2	1.5	1.8	kΩ
V_{OUT} T_C	V_{OUT} Temperature Coefficient			30		ppm/°C
I_{CC}	Supply Current	$V_{SENSE\ -}$ = 15V	170	270	350	µA
I_{SENSE}+	V_{SENSE}+ Input Current		25	48	90	µA
I_{SENSE}-	V_{SENSE}- Input Current	V_{SENSE-} = 14.9V	25	70	220	nA
$V_{CM(MIN)}$ [d]	Minimum Active Common Mode Voltage	V_{CC} = 15V V_{COMP_SUPPLY} = 5V V_{COMP_IN} = V_{REF} V_{SENSE} = 10mV	2.8			V
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 V_{SENSE} = 100mVp-p		3 6		MHz
COMPARATOR						
$V_{COMP\ IN}$	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	Vol = 0.4V	2			mA
I_{OH}	Output High Leakage Current				1.0	µA
Voltage Reference						
V_{REF}		Reference Current = +300µA to -5µA	1.200	1.240	1.280	V
Delta V_{REF}	Change in V_{REF}	I_{SOURCE} 5µA to I_{SINK} 300µA		10		mV
T_C				30		ppm/°C
PSR	Supply Rejection			0.01		%/V

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

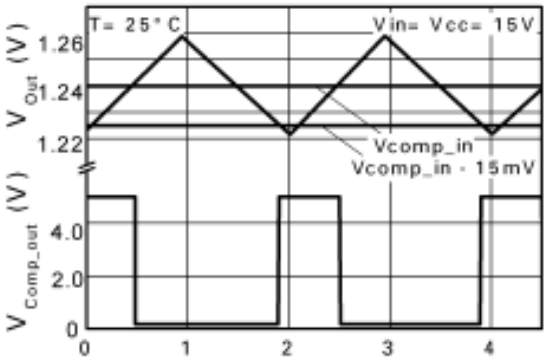
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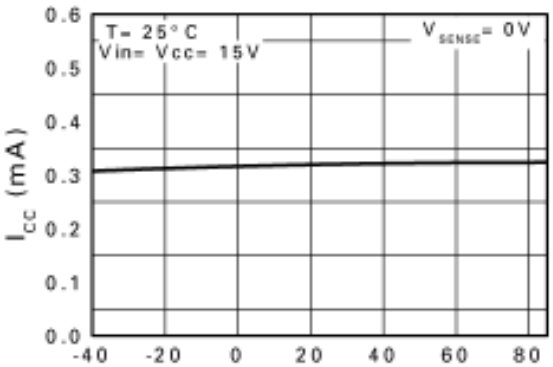
Typical Application Circuits



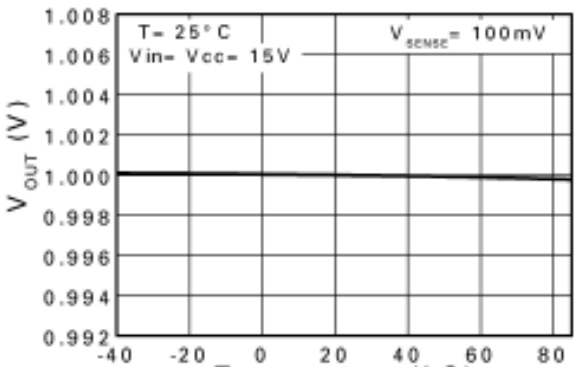
V_{OUT} v V_{SENSE}



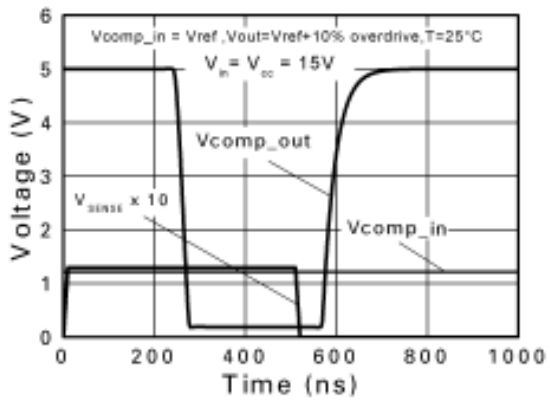
Input Hysteresis



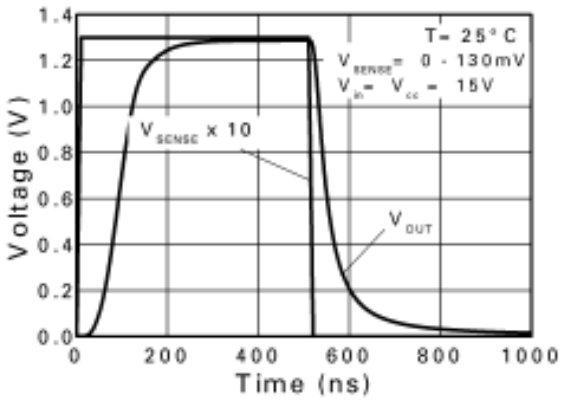
I_{SUPPLY} v Temperature



V_{OUT} v Temperature



Monitor and Comparator Step Response



Current Monitor Step Response

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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 5µA, making potentiometers ≥250kΩ 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).

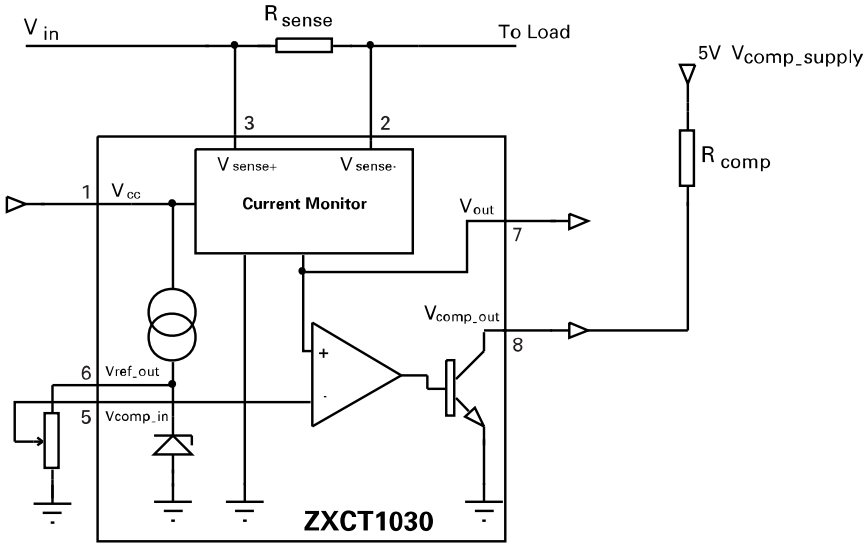


Figure 1: External Resistor for Reference Level

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} x 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 10-100kΩ.

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

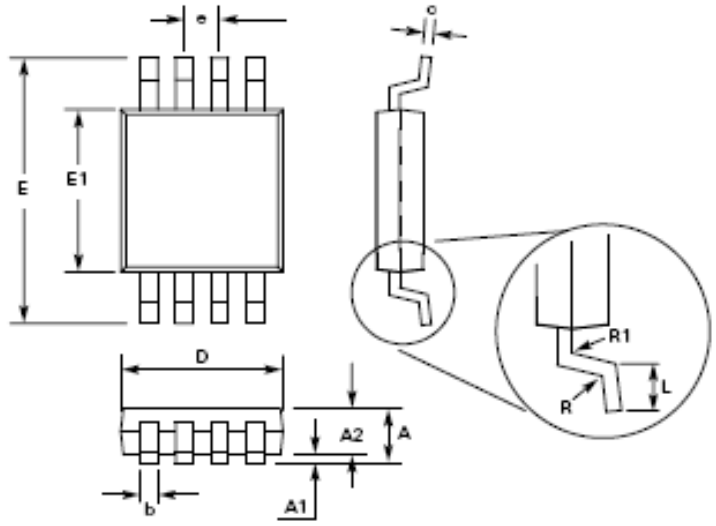
To ensure stable operation of the ZXCT1030, it is recommended a decoupling capacitor is placed across the V_{CC} and ground connections. A ceramic 10µF will be adequate.

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Ordering Information

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

Package Outline – MSOP8



DIM	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	-	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
c	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
e	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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