

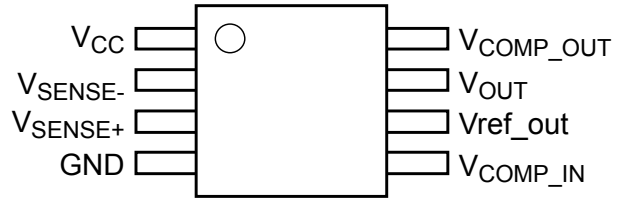
ZXCT1030X8
HIGH-SIDE CURRENT MONITOR WITH COMPARATOR

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



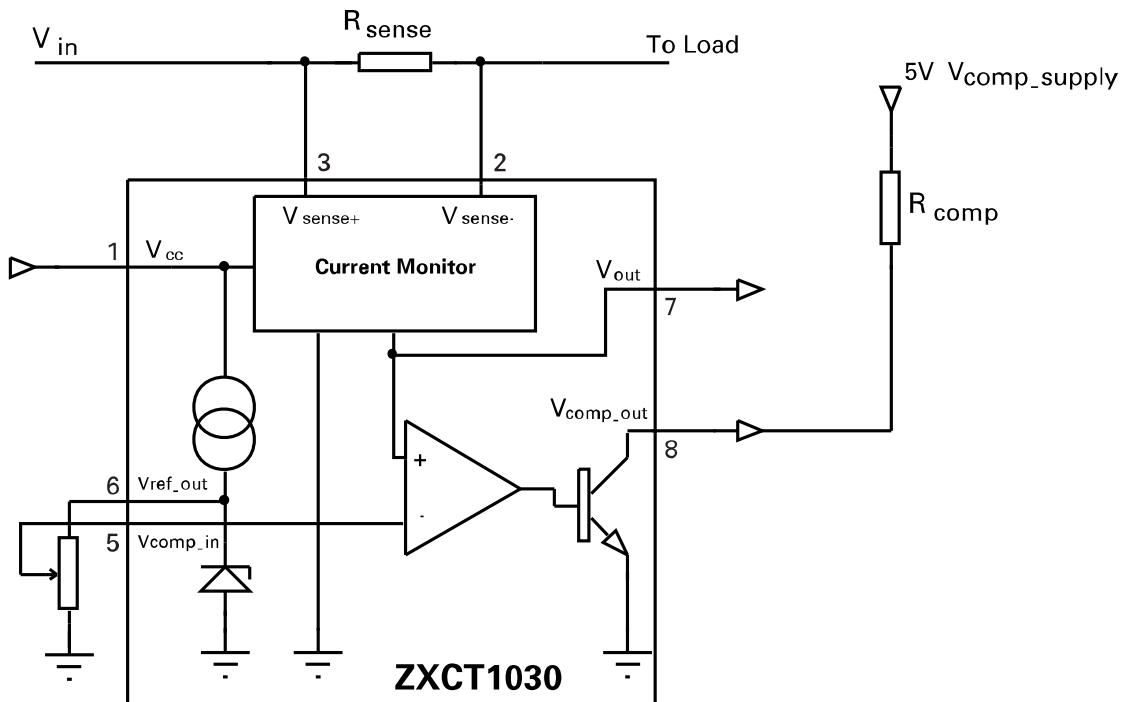
Features

- 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



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	700	mW
MSOP8	500	

Recommended Operating Conditions

Parameter	Min	Max	Units
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

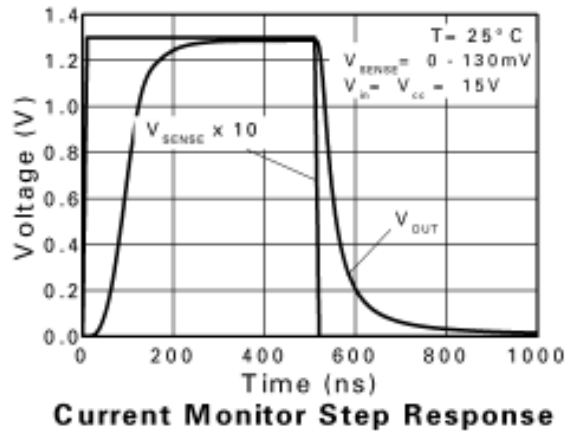
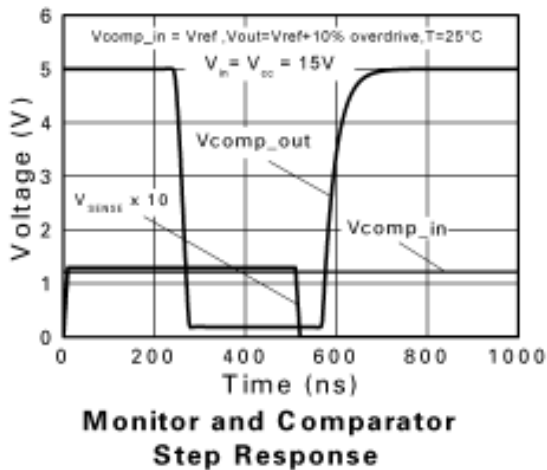
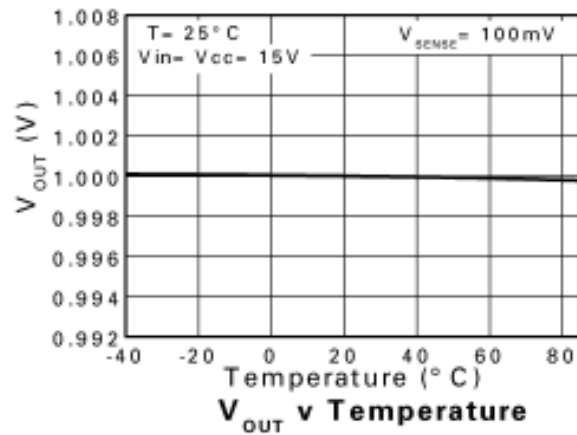
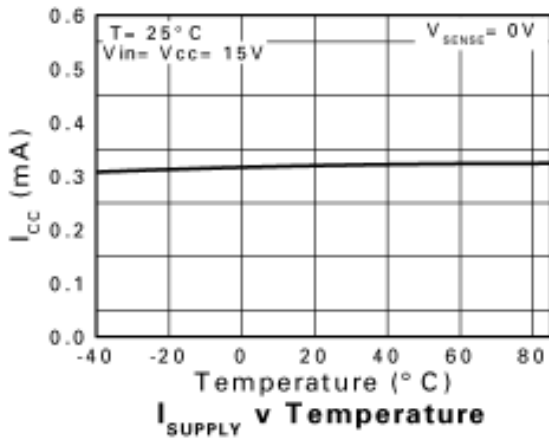
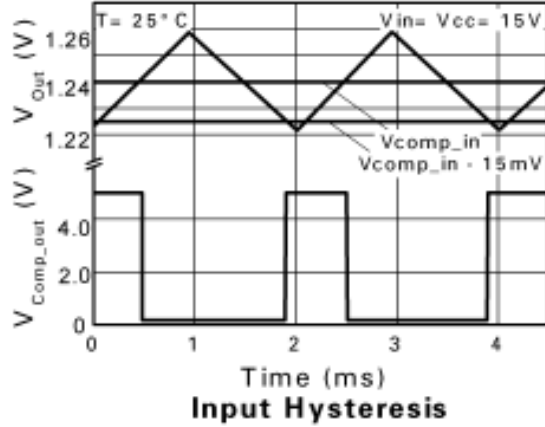
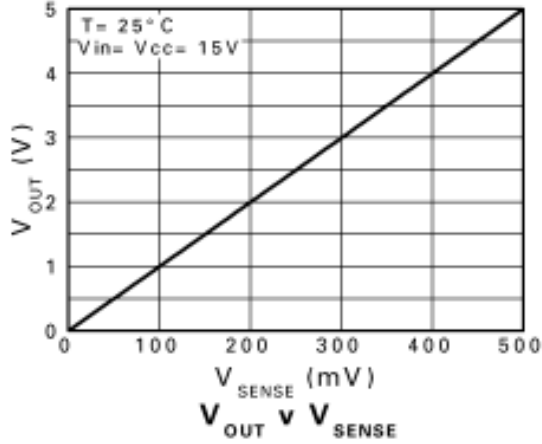
Electrical Characteristics (ZXCT1030X8) – Test conditions $T_{AMB} = 25^{\circ}\text{C}$, $V_{IN} = V_{CC} = 15\text{V}$, $R_{COMP} = 10\text{k}\Omega$,

$V_{COMP_SUPPLY} = 5\text{V}$ 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	$\text{k}\Omega$
V_{OUT} T_C	V_{OUT} Temperature Coefficient			30		$\text{ppm}/^{\circ}\text{C}$
I_{CC}	Supply Current	$V_{SENSE-} = 15\text{V}$	170	270	350	μA
I_{SENSE+}	V_{SENSE+} Input Current		25	48	90	μA
I_{SENSE-}	V_{SENSE-} Input Current	$V_{SENSE-} = 14.9\text{V}$	25	70	220	nA
$V_{CM(MIN)}^{(d)}$	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
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	$V_{ol} = 0.4\text{V}$	2			mA
I_{OH}	Output High Leakage Current				1.0	μA
Voltage Reference						
V_{REF}		Reference Current = +300 μA to -5 μA	1.200	1.240	1.280	V
Delta V_{REF}	Change in V_{REF}	SOURCE 5 μA to SINK 300 μA		10		mV
T_C				30		$\text{ppm}/^{\circ}\text{C}$
PSR	Supply Rejection			0.01		%/V

Notes: (c) $(V_{SENSE+}) - (V_{SENSE-})$
(d) 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 μ 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).

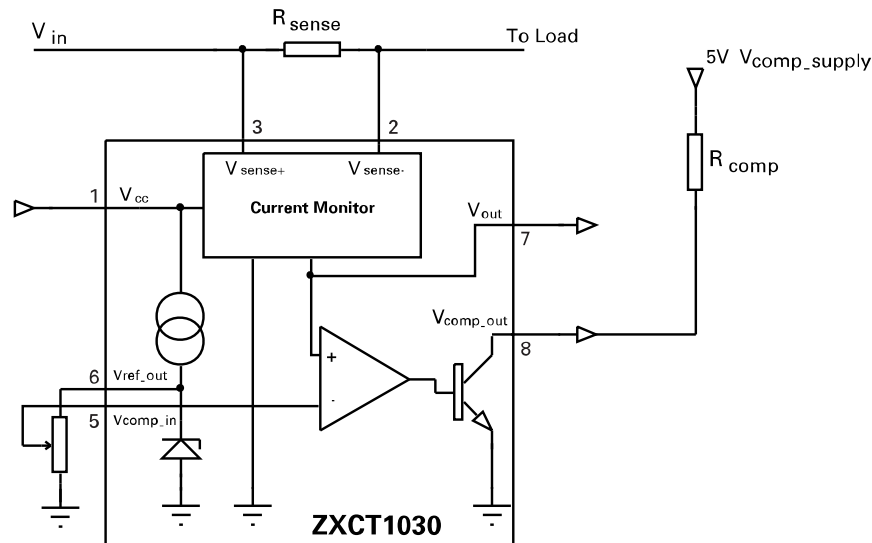


Figure 1: External Resistor for Reference Level

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 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.

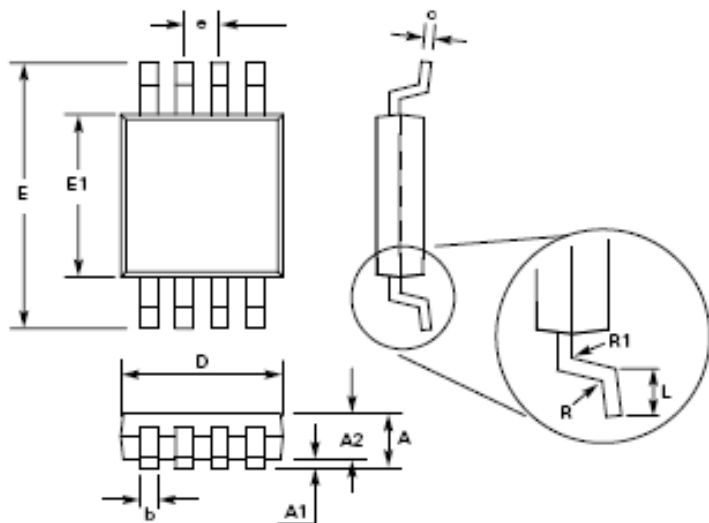
Stability

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 μ 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

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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