

## High Side Current Monitor 8.0 to 450V Voltage Gain of 5

### Features

- ▶ Supply voltage 8V to 450V
- ▶ Voltage output device
- ▶ Typical gain  $5.0 \pm 1\%$
- ▶ Max  $V_{SENSE}$  500mV
- ▶ Fast rise and fall time, 700ns to 2.0 $\mu$ s
- ▶ Maximum quiescent current 50 $\mu$ A

### Applications

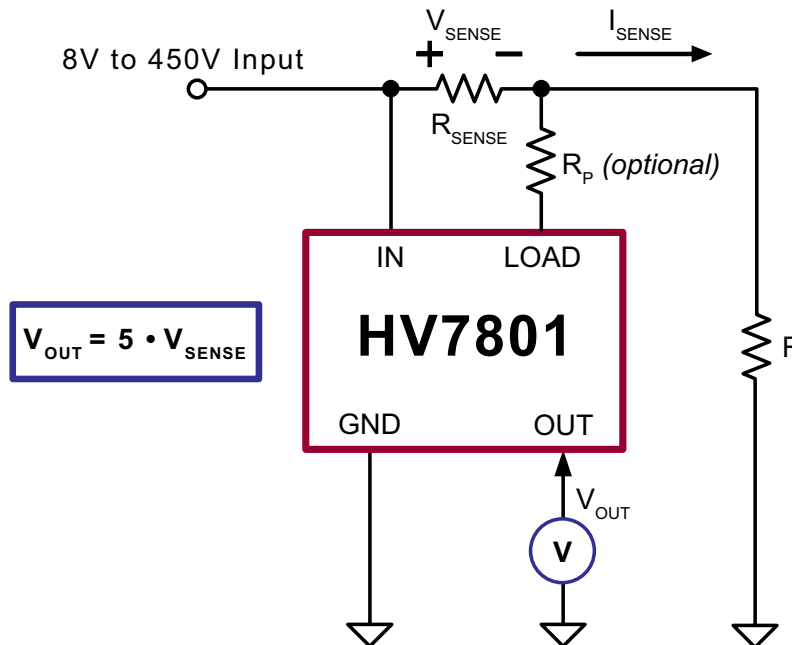
- ▶ SMPS current monitor
- ▶ Battery current monitor
- ▶ Motor control

### General Description

The HV7801 high side current monitor IC transfers a high-side current measurement voltage to its ground referenced output with a voltage gain of five. The measurement voltage typically originates at a current sense resistor which is located in a "high side" circuit, such as the positive supply line.

This monitor IC features a very wide input voltage range, high accuracy of transfer ratio, small size, low component count, low power consumption, ease of use, and low cost. Offline, battery, and portable applications can be served equally well due to the wide input voltage range and the low quiescent current.

### Typical Application Circuit



## Ordering Information

Part Number	Package Option	Packing
HV7801K1-G	5-Lead SOT-23	2500/Reel

-G denotes a lead (Pb)-free / RoHS compliant package

## Absolute Maximum Ratings

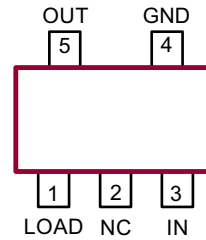
Parameter	Value
$V_{IN}, V_{LOAD}$	-0.5V to +460V
$V_{OUT}$	-0.5V to +10V
$V_{SENSE}$	-0.5V to +5.0V
$I_{LOAD}$	±10mA
Operating ambient temperature	-40°C to +85°C
Operating junction temperature	-40°C to +125°C
Storage temperature	-65°C to +150°C

Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied. Continuous operation of the device at the absolute rating level may affect device reliability. All voltages are referenced to device ground.

### Notes:

1. Referenced to GND
2.  $V_{SENSE} = V_{IN} - V_{LOAD}$

## Pin Configuration



5-Lead SOT-23  
(top view)

## Product Marking



Y = Last Digit of Year Sealed  
W = Code for Week Sealed  
— = "Green" Packaging

Package may or may not include the following marks: Si or

5-Lead SOT-23

## Typical Thermal Resistance

Package	$\theta_{ja}$
5-Lead SOT-23	253°C/W

### Note:

Thermal testboard per JEDEC JESD51-7

## Electrical Characteristics ( $T_A = 25^\circ\text{C}$ unless otherwise specified, $V_{IN} = 8\text{V}$ to $450\text{V}$ )

Sym	Parameter	Min	Typ	Max	Units	Conditions
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### Supply

$V_{IN}$	Supply voltage	8.0	-	450	V	* ---
$I_Q$	Quiescent supply current	-	-	50	μA	- $V_{IN} = 8\text{V}$ to $450\text{V}$ , $V_{SENSE} = 0\text{mV}$

### Input and Output

$R_{OUT}$	OUT pin output resistance	-	16.5	-	kΩ	- ---	
$V_{OUT}$	Output voltage	0	-	65	mV	-	$V_{SENSE} = 0\text{mV}$
		420	-	580			$V_{SENSE} = 100\text{mV}$
		913	-	1087			$V_{SENSE} = 200\text{mV}$
		2395	-	2605			$V_{SENSE} = 500\text{mV}$

### Dynamic Characteristics

$t_{RISE}$	Output rise time, 10% to 90%	-	0.7	-	μs	-	$V_{SENSE}$ step 5.0mV to 500mV
		-	-	2.0			$V_{SENSE}$ step 0mV to 500mV
$t_{FALL}$	Output fall time, 90% to 10%	-	0.7	2.0	μs	-	$V_{SENSE}$ step 500mV to 0mV

\* Values apply over the full temperature range.



## Transient Protection

Add a protection resistor ( $R_p$ ) in series with the LOAD pin if  $V_{SENSE}$  can exceed 5V in a positive sense or 600mV in a negative sense, whether in a steady state or in transient conditions.

A large  $V_{SENSE}$  may occur during system startup or shutdown due to the charging and discharging of bulk storage capacitors.  $V_{SENSE}$  may be large due to fault conditions, such as a short circuit condition, or a broken or missing sense resistor.

An internal 5.0V Zener diode with a current rating of 10mA protects the sense amplifier inputs. The block diagram shows the orientation of this diode. The Zener diode provides clamping at 5V for a positive  $V_{SENSE}$  and at 600mV for a negative  $V_{SENSE}$ .

Under worst case conditions, limit the Zener current to 10mA. A 100k $\Omega$  resistor limits the maximum Zener diode current to 4.5mA when  $V_{SENSE}$  is 450V, whether positive or negative. Note that the protection resistor may affect the bandwidth. The resistor forms a RC network with the trace and pin capacitance at the LOAD pin. A capacitance of 5.0pF results in a time constant of 500ns.

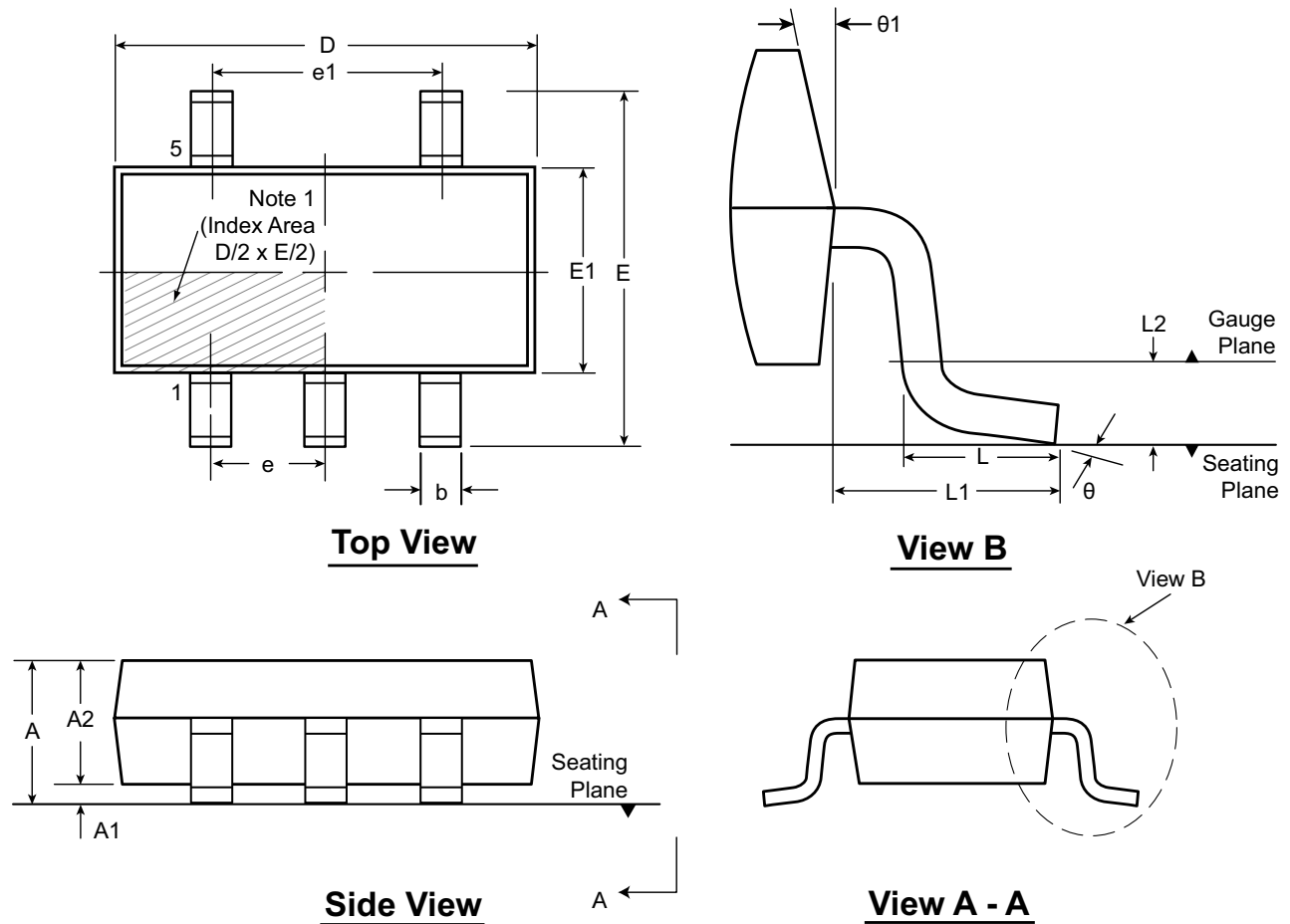
The protection resistor may cause an offset voltage due to bias current at the LOAD input. Under worst case bias current (1.0nA), a 100k $\Omega$  protection resistor could cause an offset of 100 $\mu$ V or 0.2% of full scale. Note that the bias current is nominally zero as the LOAD is a high impedance CMOS input.

## Pin Description

Pin #	Pin Name	Description
1	LOAD	Sense amplifier input. High impedance input with Zener diode protection. Add an external protection resistor in series with LOAD if $V_{SENSE}$ exceeds the range of -600mV to +5.0V.
2	NC	No connect. This pin must be left floating for proper operation.
3	IN	Sense amplifier input and supply.
4	GND	Supply return.
5	OUT	Output with a nominal output resistance of 16.5k $\Omega$ . Preservation of accuracy may require an external buffer amplifier to prevent excessive loading.

# 5-Lead SOT-23 Package Outline (K1)

2.90x1.60mm body, 1.45mm height (max), 0.95mm pitch



**Note:**  
 1. A Pin 1 identifier must be located in the index area indicated. The Pin 1 identifier can be: a molded mark/identifier; an embedded metal marker; or a printed indicator.

Symbol	A	A1	A2	b	D	E	E1	e	e1	L	L1	L2	$\theta$	$\theta 1$	
Dimension (mm)	MIN	0.90*	0.00	0.90	0.30	2.75*	2.60*	1.45*	0.95 BSC	1.90 BSC	0.30	0.60 REF	0.25 BSC	0°	5°
	NOM	-	-	1.15	-	2.90	2.80	1.60			0.45			4°	10°
	MAX	1.45	0.15	1.30	0.50	3.05*	3.00*	1.75*			0.60			8°	15°

JEDEC Registration MO-178, Variation AA, Issue C, Feb. 2000.

\* This dimension is not specified in the JEDEC drawing.

Drawings not to scale.

Supertex Doc. #: DSPD-5SOT23K1, Version A041309.

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information go to <http://www.supertex.com/packaging.html>.)

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