

SM-8 COMPLEMENTARY CURRENT MIRROR

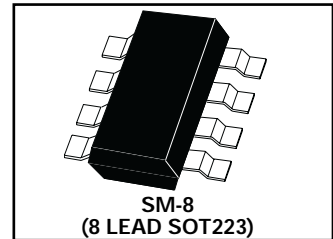
DESCRIPTION

The ZDS1009 current mirror has been developed specifically for high side, current sense plus level translation applications and as such will find a broad application base including battery charge management, DC motor control and over current monitoring functions. It is of particular interest for current sense applications for feedback purposes in fast battery chargers for Li-Ion cell based systems.

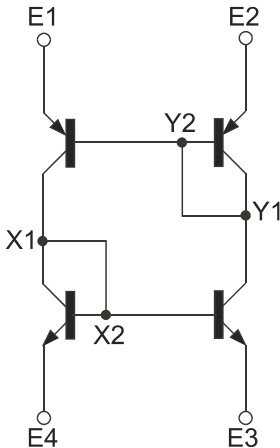
The device functions by sensing the voltage developed across an external (user defined) high side current sense resistor, and by an arrangement of current mirrors refer this sensed voltage, with or without multiplication, to a low side referenced signal. This signal can then be used, for example, to close the control loop to a controller IC, for a DC-DC converter providing charge to a battery.

FEATURES

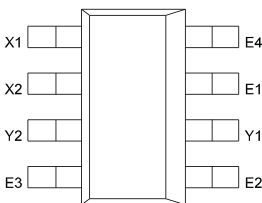
- Excellent Temperature Tracking Characteristics
- Compact Cost Effective Solution
- Simplifies Circuit Implementation
- Broad application base from Single Cell Li-ion High Side Current sense chargers to Multi-cell Lead-Acid systems
- Only 4 Connections required



SCHEMATIC DIAGRAM



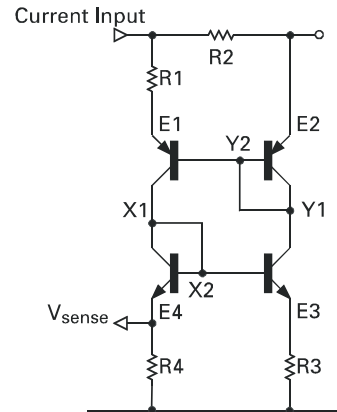
CONNECTION DIAGRAM



TYPICAL APPLICATION CIRCUIT

$$V_{\text{sense}} = IR_2 \frac{R_4}{R_1}$$

For balance $R_3=R_4$
eg
 $R_2=100\text{m}\Omega$
 $R_1=R_3=R_4=100\Omega$
 V_{sense} sensitivity = 100mV/A



ZDS1009

ABSOLUTE MAXIMUM RATINGS.

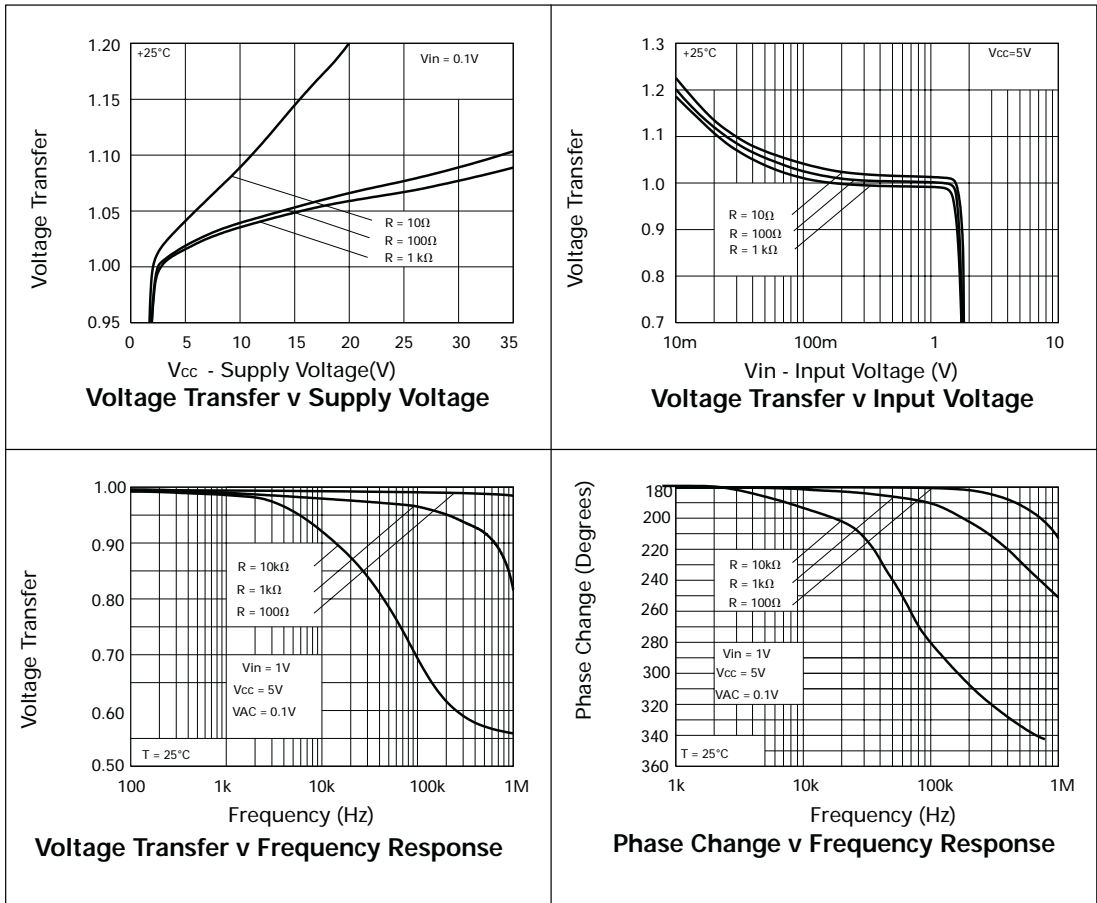
PARAMETER	SYMBOL	VALUE	UNIT
Maximum Operating Voltage	V_{y1-x1}	120	V
Maximum Voltage (E1-E2,E3-E4)	$V_{E-E'}$	10	V
Peak Pulse Current	I_M	4	A
Continuous Current (E1-E4,E2-E3)	I_C	1	A
Total Power Dissipation at $T_{amb} = 25^\circ\text{C}^*$	P_{tot}	2	W
Operating and Storage Temperature Range	$T_j:T_{stg}$	-55 to +150	$^\circ\text{C}$

* The power which can be dissipated assuming the device is mounted in a typical manner on a PCB with copper equal to 2 inches square.

ELECTRICAL CHARACTERISTICS (at $T_{amb}=25^\circ\text{C}$)

Parameter	Symbol	Min	Max	Unit	Conditions
Breakdown Voltage	BV_{Y1-X1}	120		V	$I_{Y1}=100\mu\text{A}$
Breakdown Voltage	BV_{X1-E1}	-30		V	$I_{X1}=-10\text{mA}$
Breakdown Voltage	BV_{Y1-E3}	30		V	$I_{Y1}=10\text{mA}$
Breakdown Voltage	BV_{E1-Y1}	-12		V	$I_{E1}=-100\mu\text{A}$
Breakdown Voltage	BV_{E2-Y1}	-6		V	$I_{E2}=-100\mu\text{A}$
Breakdown Voltage	BV_{E3-X1}	12		V	$I_{E3}=100\mu\text{A}$
Breakdown Voltage	BV_{E4-X1}	6		V	$I_{E4}=100\mu\text{A}$
Leakage	I_{Y1}		50	nA	$V_{Y1-X1}=100\text{V}$
Leakage	I_{X1}		-10	μA	$V_{X1-E1}=-30\text{V}, V_{Y1}=V_{E1}$
Leakage	I_{Y1}		10	μA	$V_{Y1-E3}=30\text{V}, V_{X1}=V_{E3}$
Leakage	I_{E1}		-100	nA	$V_{E1-Y1}=-8\text{V}$
Leakage	I_{E2}		-100	nA	$V_{E2-Y1}=-4\text{V}$
Leakage	I_{E3}		100	nA	$V_{E3-X1}=8\text{V}$
Leakage	I_{E4}		100	nA	$V_{E4-X1}=4\text{V}$
Input Voltage	V_{Y1-E2}	-1.45	-1.65	V	$I_{Y1}=-1\text{A}$
Input Voltage	V_{Y1-E3}	1.45	1.75	V	$I_{Y1}=1\text{A}, V_{X1}=V_{Y1}$
Input Voltage	V_{X1-E1}	-1.45	-1.75	V	$I_{X1}=-1\text{A}, V_{X1}=V_{Y1}$
Input Voltage	V_{X1-E4}	1.45	1.65	V	$I_{X1}=1\text{A}$
Transfer Characteristic	V_{OUT}	0.99	1.01	V	See Fig 1. $V_{CC}=5\text{V}$ $R1=R3=R4=100\Omega, V_{IN}=1\text{V}$
Transfer Characteristic	V_{OUT}	1		mV	See Fig 1. $V_{CC}=5\text{V}$ $R1=R3=R4=100\Omega, V_{IN}=5\text{mV}$
Output Zero-Offset Voltage	V_{OFFSET}		4	mV	See Fig 2. $V_{CC}=5\text{V}, R_2 < 1\Omega$ $R1=R3=R4=100\Omega$

TYPICAL CHARACTERISTICS



TEST CIRCUITS

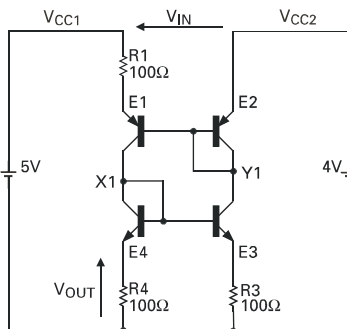


Figure 1
Transfer Characteristic Test Circuit

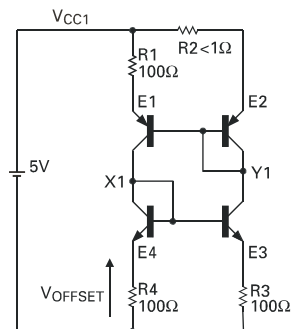
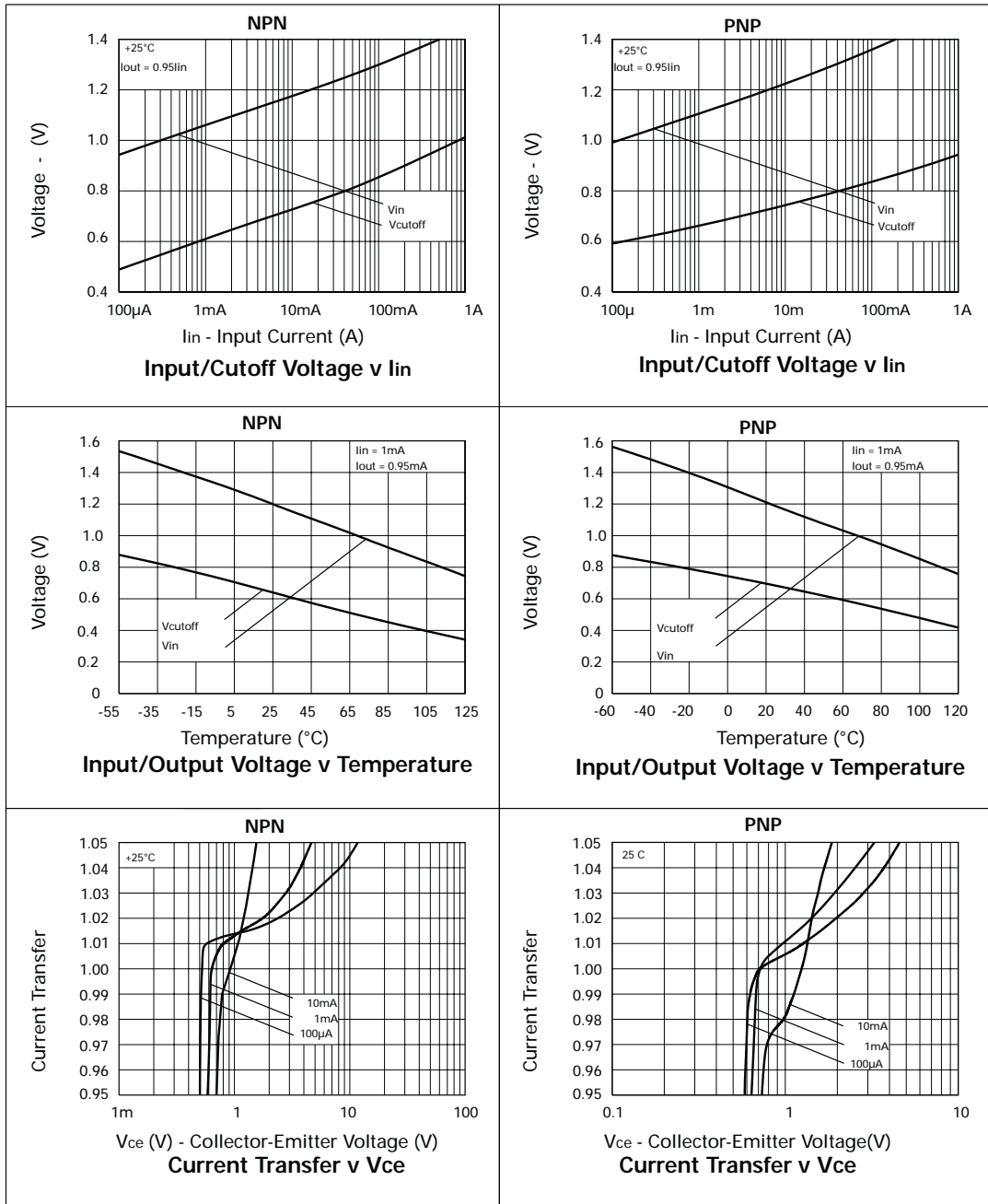
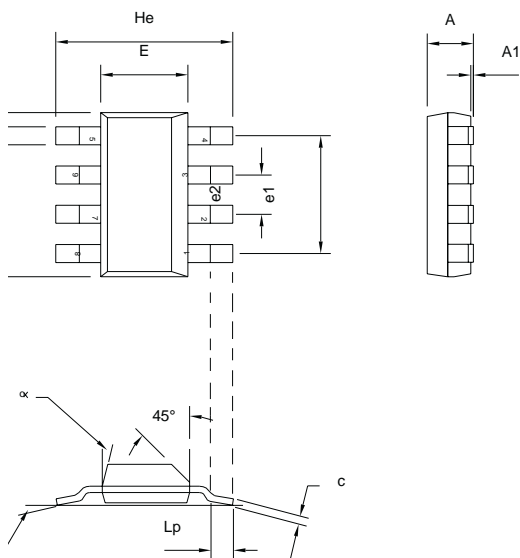


Figure 2
Output Zero-Offset Voltage Test Circuit

TYPICAL CHARACTERISTICS



PACKAGE DIMENSIONS



DIM	Millimetres			Inches		
	Min	Typ	Max	Min	Typ	Max
A	-	-	1.7	-	-	0.067
A1	0.02	-	0.1	0.0008	-	0.004
b	-	0.7	-	-	0.028	-
c	0.24	-	0.32	0.009	-	0.013
D	6.3	-	6.7	0.248	-	0.264
E	3.3	-	3.7	0.130	-	0.145
e1	-	4.59	-	-	0.180	-
e2	-	1.53	-	-	0.060	-
He	6.7	-	7.3	0.264	-	0.287
Lp	0.9	-	-	0.035	-	-
α	-	-	15°	-	-	15°
β	-	10°	-	-	10°	-

ORDERING INFORMATION

DEVICE	PARTMARKING
ZDS1009	S1009



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