

SM-8 COMPLEMENTARY CURRENT MIRROR

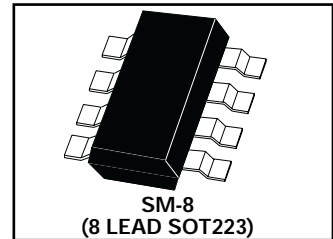
DESCRIPTION

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.

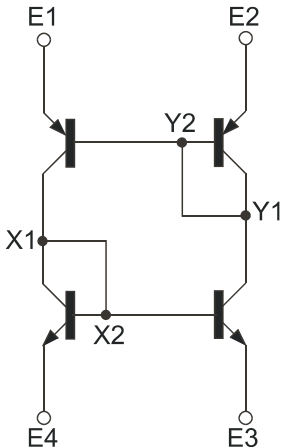
The device functions by sensing the voltage developed across an external (user defined) high side current sense resistor, and by an arrangement of current mirrors refer this sensed voltage, with or without multiplication, to a low side referenced signal. This signal can then be used, for example, to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

FEATURES

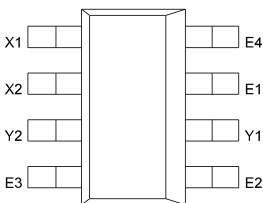
- Excellent Temperature Tracking Characteristics
- Compact Cost Effective Solution
- Simplifies Circuit Implementation
- Broad application base from Single Cell Li-ion High Side Current sense chargers to Multi-cell Lead-Acid systems
- Only 4 Connections required



SCHEMATIC DIAGRAM



CONNECTION DIAGRAM



TYPICAL APPLICATION CIRCUIT

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

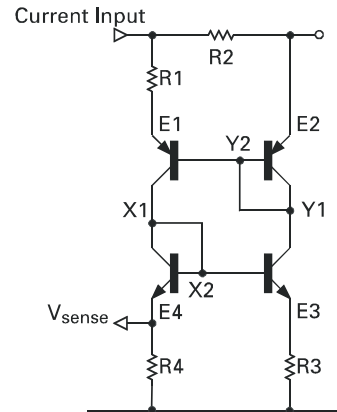
For balance $R_3=R_4$

eg

$$R_2=100\text{m}\Omega$$

$$R_1=R_3=R_4=100\Omega$$

V_{sense} sensitivity = 100mV/A



ZDS1009

ABSOLUTE MAXIMUM RATINGS.

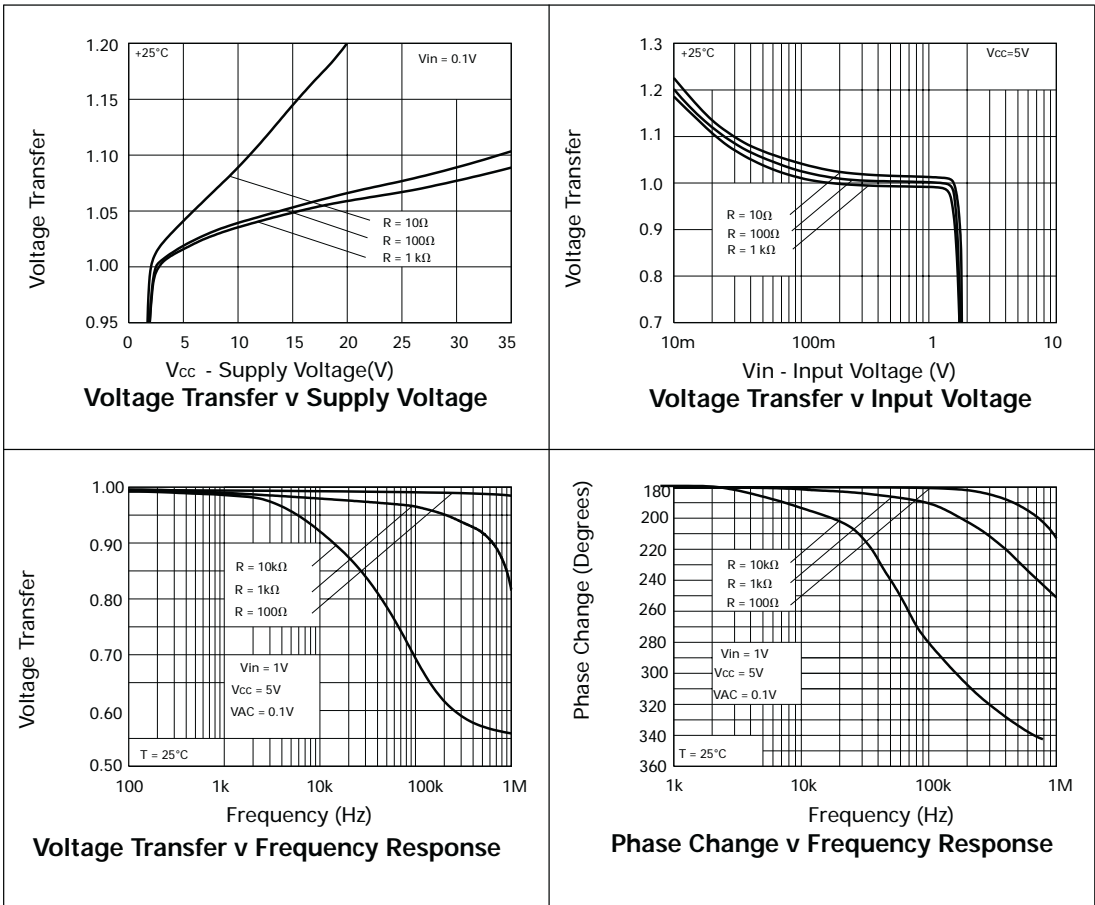
| PARAMETER | SYMBOL | VALUE | UNIT |
|------------------------------------------------------|---------------|-------------|-------------|
| Maximum Operating Voltage | V_{y1-x1} | 120 | V |
| Maximum Voltage (E1-E2,E3-E4) | $V_{E-E'}$ | 10 | V |
| Peak Pulse Current | I_M | 4 | A |
| Continuous Current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

* 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 $T_{amb}=25^{\circ}C$)

| Parameter | Symbol | Min | Max | Unit | Conditions |
|----------------------------|--------------|-------|-------|---------|------------------------------------------------------------|
| Breakdown Voltage | BV_{Y1-X1} | 120 | | V | $I_{Y1}=100\mu A$ |
| Breakdown Voltage | BV_{X1-E1} | -30 | | V | $I_{X1}=-10mA$ |
| Breakdown Voltage | BV_{Y1-E3} | 30 | | V | $I_{Y1}=10mA$ |
| Breakdown Voltage | BV_{E1-Y1} | -12 | | V | $I_{E1}=-100\mu A$ |
| Breakdown Voltage | BV_{E2-Y1} | -6 | | V | $I_{E2}=-100\mu A$ |
| Breakdown Voltage | BV_{E3-X1} | 12 | | V | $I_{E3}=100\mu A$ |
| Breakdown Voltage | BV_{E4-X1} | 6 | | V | $I_{E4}=100\mu A$ |
| Leakage | I_{Y1} | | 50 | nA | $V_{Y1-X1}=100V$ |
| Leakage | I_{X1} | | -10 | μA | $V_{X1-E1}=-30V, V_{Y1}=V_{E1}$ |
| Leakage | I_{Y1} | | 10 | μA | $V_{Y1-E3}=30V, V_{X1}=V_{E3}$ |
| Leakage | I_{E1} | | -100 | nA | $V_{E1-Y1}=-8V$ |
| Leakage | I_{E2} | | -100 | nA | $V_{E2-Y1}=-4V$ |
| Leakage | I_{E3} | | 100 | nA | $V_{E3-X1}=8V$ |
| Leakage | I_{E4} | | 100 | nA | $V_{E4-X1}=4V$ |
| Input Voltage | V_{Y1-E2} | -1.45 | -1.65 | V | $I_{Y1}=-1A$ |
| Input Voltage | V_{Y1-E3} | 1.45 | 1.75 | V | $I_{Y1}=1A, V_{X1}=V_{Y1}$ |
| Input Voltage | V_{X1-E1} | -1.45 | -1.75 | V | $I_{X1}=-1A, V_{X1}=V_{Y1}$ |
| Input Voltage | V_{X1-E4} | 1.45 | 1.65 | V | $I_{X1}=1A$ |
| Transfer Characteristic | V_{OUT} | 0.99 | 1.01 | V | See Fig 1. $V_{CC}=5V$ $R1=R3=R4=100\Omega, V_{IN}=1V$ |
| Transfer Characteristic | V_{OUT} | 1 | | mV | See Fig 1. $V_{CC}=5V$ $R1=R3=R4=100\Omega, V_{IN}=5mV$ |
| Output Zero-Offset Voltage | V_{OFFSET} | | 4 | mV | See Fig 2. $V_{CC}=5V, R2<1\Omega$ $R1=R3=R4=100\Omega$ |

TYPICAL CHARACTERISTICS



TEST CIRCUITS

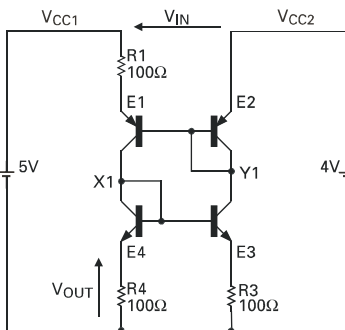


Figure 1
Transfer Characteristic Test Circuit

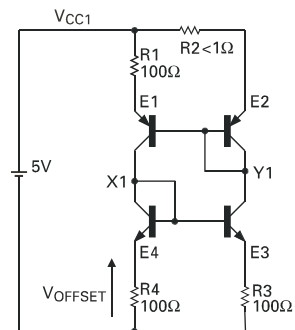
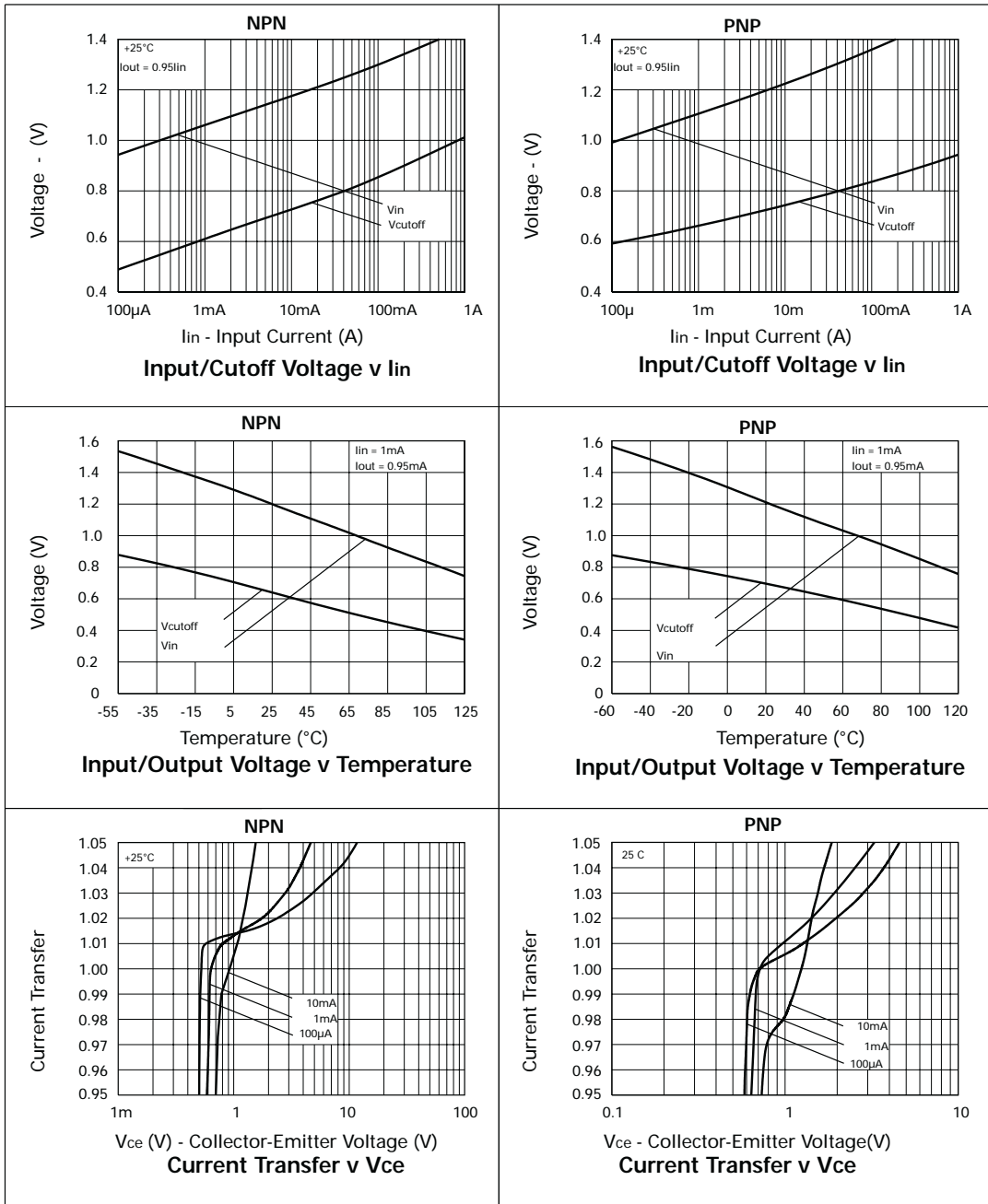
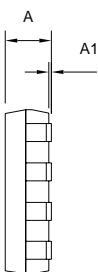
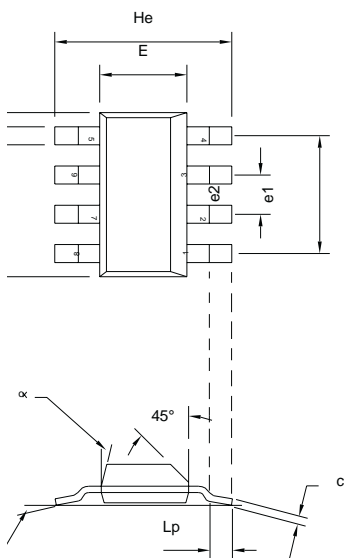


Figure 2
Output Zero-Offset Voltage Test Circuit

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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