SM-8 COMPLEMENTARY CURRENT MIRROR

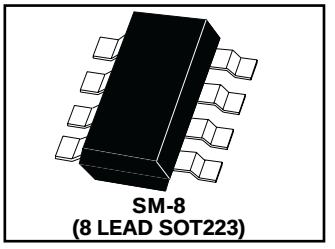
DESCRIPTION

The ZDS1009 current mirror has been developed specifically for high side, current sense plus level translation applications and as such will find a broad applications 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.

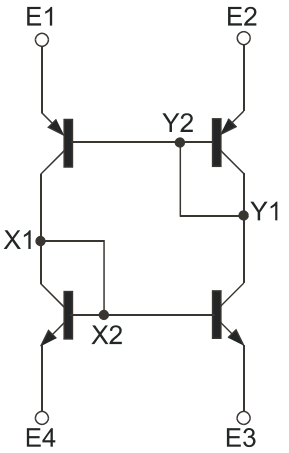
FEATURES

- 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



SM-8
(8 LEAD SOT223)

SCHEMATIC DIAGRAM



TYPICAL APPLICATION CIRCUIT

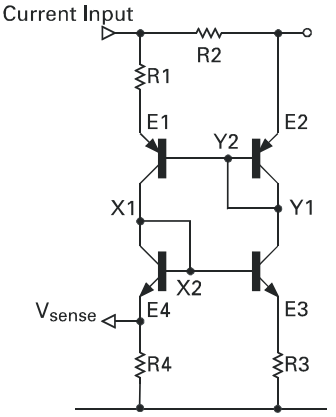
$$V_{sense} = IR_2 \frac{R_4}{R_1}$$

For balance R3=R4

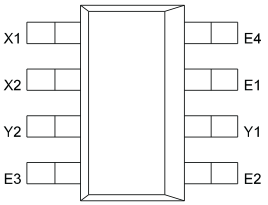
eg

R2=100mΩ
R1=R3=R4=100Ω

V_{sense} sensitivity = 100mV/A



CONNECTION DIAGRAM



ABSOLUTE MAXIMUM RATINGS.

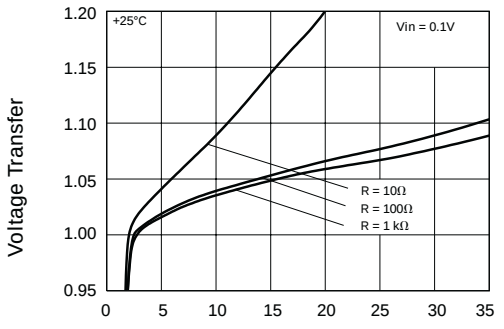
PARAMETER	SYMBOL	VALUE	UNIT
Maximum Operating Voltage	V_{y1-x1}	120	V
Maximum Voltage (E1-E2,E3-E4)	$V_{E-E'}$	10	V
Peak Pulse Current	I_M	4	A
Continuous Current (E1-E4,E2-E3)	I_C	1	A
Total Power Dissipation at T_{amb} = 25°C*	P_{tot}	2	W
Operating and Storage Temperature Range	T_j:T_{stg}	-55 to +150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

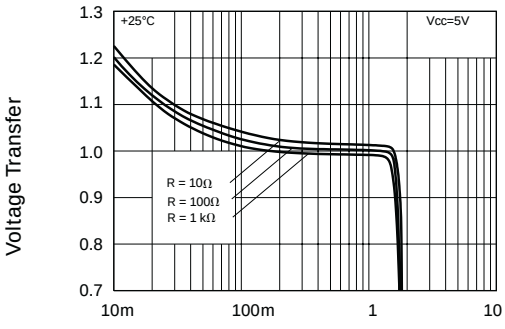
ELECTRICAL CHARACTERISTICS (at T_{amb}=25°C)

Parameter	**Symbol**	**Min**	**Max**	**Unit**	**Conditions**
Breakdown Voltage	BV_{Y1-X1}	120		V	I_{Y1}=100µA
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}=-100µA
Breakdown Voltage	BV_{E2-Y1}	-6		V	I_{E2}=-100µA
Breakdown Voltage	BV_{E3-X1}	12		V	I_{E3}=100µA
Breakdown Voltage	BV_{E4-X1}	6		V	I_{E4}=100uA
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=100Ω, V_{IN}=1V
Transfer Characteristic	V_{OUT}	1		mV	See Fig 1.V_{CC}=5V R1=R3=R4=100Ω, V_{IN}=5mV
Output Zero-Offset Voltage	V_{OFFSET}		4	mV	See Fig 2.V_{CC}=5V,R_2<1Ω R1=R3=R4=100Ω

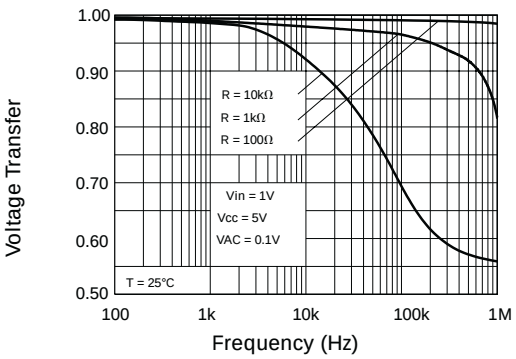
TYPICAL CHARACTERISTICS



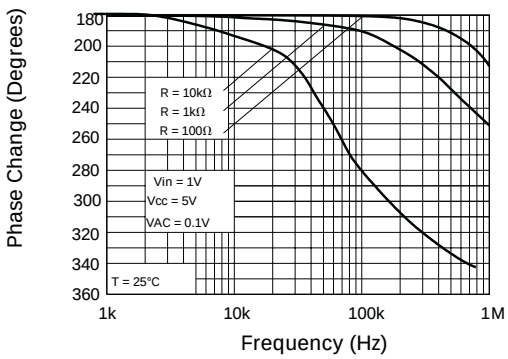
Voltage Transfer v Supply Voltage



Voltage Transfer v Input Voltage



Voltage Transfer v Frequency Response



Phase Change v Frequency Response

TEST CIRCUITS

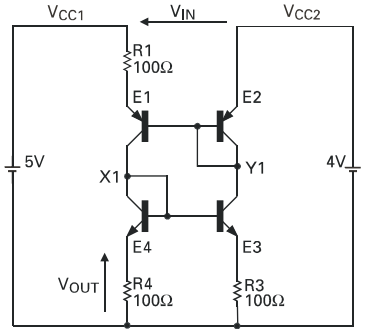


Figure 1
Transfer Characteristic Test Circuit

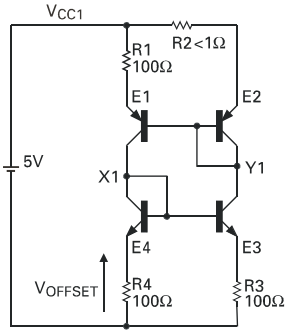
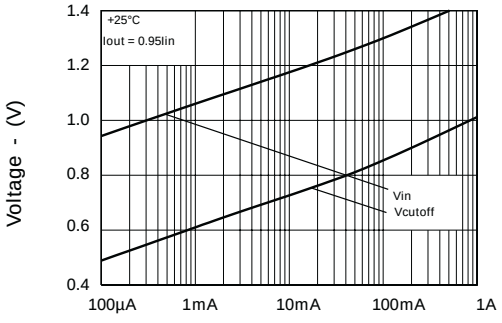


Figure 2
Output Zero-Offset Voltage Test Circuit

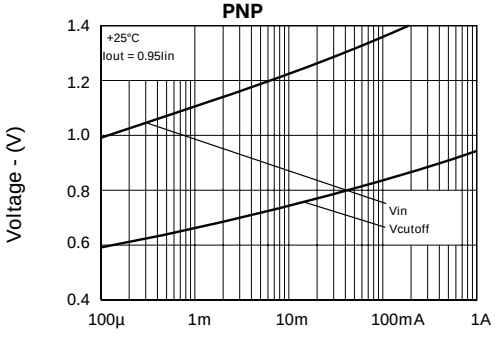
TYPICAL CHARACTERISTICS

NPN



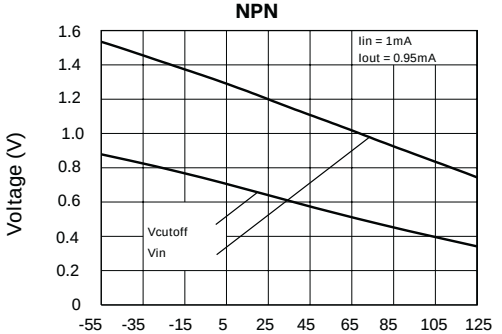
Input/Cutoff Voltage v Iin

PNP



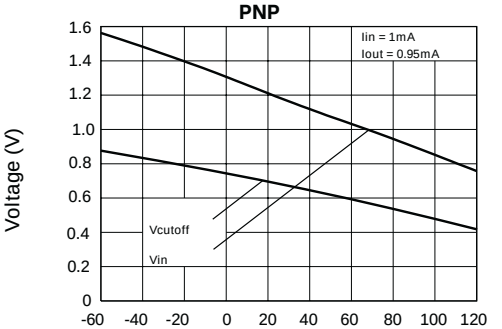
Input/Cutoff Voltage v Iin

NPN



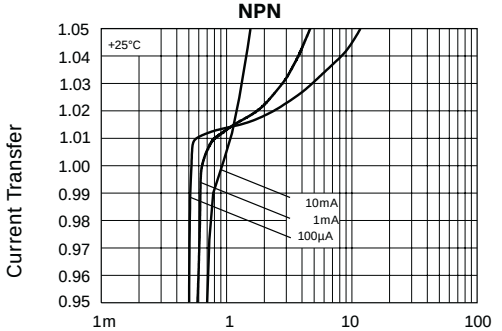
Input/Output Voltage v Temperature

PNP



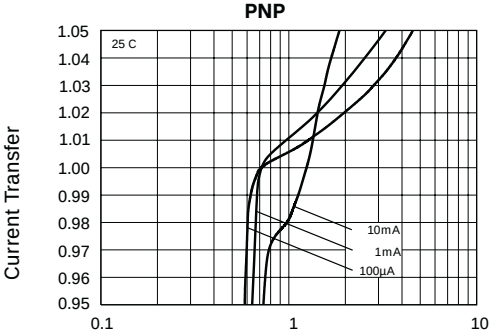
Input/Output Voltage v Temperature

NPN



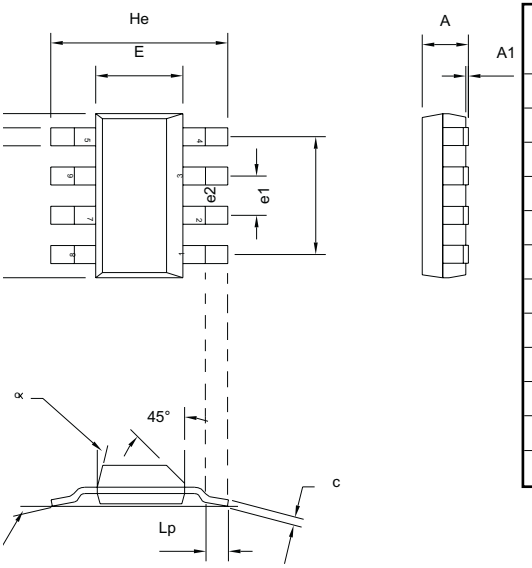
Current Transfer v Vce

PNP



Current Transfer v Vce

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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