MP8100

Precision High-Side Current-Sense Amplifier

The Future of Analog IC Technology™

DESCRIPTION

The MP8100 is a low-cost, precision, high-side current-sense amplifier. This device operates from a single 2.5V to 18V supply and typically consumes 12µA. It is ideal for today's notebook computers, cell phones and other systems where battery/DC current monitoring is critical.

High-side current monitoring is especially useful in battery-powered systems since it does not interfere with the ground path of the battery charger. The input common-mode range of 1.5V to 18V is independent of the supply voltage and ensures that the current-sense feedback remains viable even when connected to a 2-cell battery pack in deep discharge.

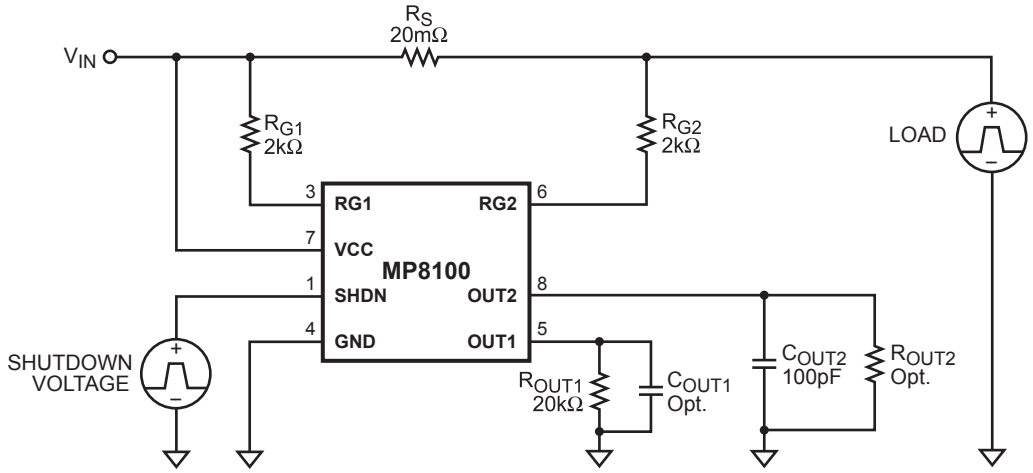
FEATURES

- Low-Cost, Compact Current-Sense Solution
- 12µA Typical Supply Current
- 2.5V to 18V Operating Supply Voltage
- 1.5V to 18V Input Common Mode Range
- 3µA Typical Shutdown Current
- 250µV Input Offset Voltage
- High Current Sensing Capability
- Low 100mΩ Output Impedance (Optional)
- Available in an 8-Pin SOIC Package

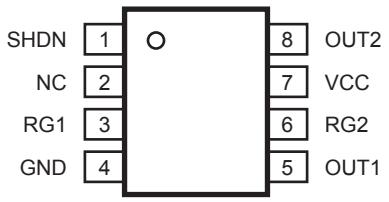
APPLICATIONS

- Portable PCs
- PDA's
- Smart Battery Packs
- Cell Phones
- Portable Test/Measurement Systems
- Battery-Operated Systems
- Energy Management Systems

TYPICAL APPLICATION



PACKAGE REFERENCE



Part Number*	Package	Temperature
MP8100DS	SOIC8	–40°C to +85°C

* For Tape & Reel, add suffix –Z (eg. MP8100DS–Z)
For RoHS Compliant Packaging, add suffix –LF
(eg. MP8100DS–LF–Z)

ABSOLUTE MAXIMUM RATINGS (1)

VCC, RG1, RG2 to GND ..... –0.3V to +20V
Maximum Differential Input Voltage, RG1 to RG2 ..... 5V
Storage Temperature ..... –65°C to +150°C

Recommended Operating Conditions (2)

V_{CC}, RG1, RG2 to GND ..... 2.5V to 18V
Operating Temperature ..... –40°C to +85°C

Thermal Resistance (3)

	θ_{JA}	θ_{JC}	
SOIC8	90	42	°C/W

Continuous Power Dissipation (T_A=70°C) 800mW

Notes:
1) Exceeding these ratings may damage the device.
2) The device is not guaranteed to function outside of its operating conditions.
3) Measured on approximately 1" square of 1 oz copper.

ELECTRICAL CHARACTERISTICS

V_{CC} = 10V, V_{SHDN} = 0V, T_A = +25°C, unless otherwise noted.

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Supply Voltage	V_{CC}		2.5		18	V
Supply Current	I_{CC}	I_{LOAD} = 0A; V_{CC} = 18V		12	30	µA
OUT1 Input Offset Voltage	V_{OS1}			0.25	1.20	mV
OUT2 Input Offset Voltage	V_{OS2}			0.25	1.20	mV
Input Bias Current (4)	I_{RG1}, I_{RG2}			4		nA
OUT1 Current Accuracy	I_{RG1}/I_{OUT1}	V_{SENSE} = 100mV		±2		%
No-Load OUT1 Error		V_{SENSE} = 0V		1		µA
Low-Level OUT1 Error		V_{SENSE} = 5mV		2		µA
No-Load OUT2 Error		V_{SENSE} = 0V		1		µA
Low-Level OUT2 Error		V_{SENSE} = 5mV		2		µA
Power Supply Rejection Ratio	PSRR	2.5V < V_{CC} < 18V, V_{SENSE} = 100mV		0.05		%/V
Shutdown Supply Current	$I_{CC(SHDN)}$	V_{SHDN} = 3V, V_{CC} = 18V		3	5	µA
SHDN Threshold Voltage	$V_{TH\_SHUTDOWN}$		0.7	1.0	1.8	V
SHDN Hysteresis				0.03		V
OUT1 Output Voltage Range	V_{OUT1}			V_{CC} – 0.15		V
OUT2 Output Voltage Range	V_{OUT2}			V_{CC} – 1		V

ELECTRICAL CHARACTERISTICS *(continued)*

V_{CC} = 10V, V_{SHDN} = 0V, T_A = +25°C, unless otherwise noted.

Parameter	Symbol	Conditions	Min	Typ	Max	Units
OUT1 Rise, Fall Time (4)	t_R	V_{SENSE} = 40mV, R_{OUT1} = 20kΩ, R_{OUT2} = 100kΩ, R_{G1} = R_{G2} = 2kΩ, C_{OUT1} = 100pF, C_{OUT2} = 100pF, 10% to 90%		17		µs
	t_F			29		
OUT2 Rise, Fall Time (4)	t_R	V_{SENSE} = 40mV, R_{OUT1} = 20kΩ, R_{OUT2} = 100kΩ, R_{G1} = R_{G2} = 2kΩ, C_{OUT1} = 100pF, C_{OUT2} = 100pF, 10% to 90%		18		µs
	t_F			26		
Maximum OUT1 Current (4)	I_{OUT1}			500		µA
Maximum OUT2 Current (4)	I_{OUT2}			5		mA

Notes:

4) Guaranteed by design.

5) Input common mode range cannot exceed the supply voltage.

PIN FUNCTIONS

Pin #	Name	Description
1	SHDN	Shutdown. Connect to ground for normal operation. When high, supply current is less than 5µA.
2	NC	Not Connected.
3	RG1	Gain Resistor. Connect to battery side of current-sense resistor through the gain resistor.
4	GND	Ground or Battery Negative Terminal.
5	OUT1	Output For Driving Resistive Loads.
6	RG2	Gain Resistor. Connect to load side of current-sense resistor through the gain resistor.
7	VCC	Power Input. Connect to Battery Input.
8	OUT2	Output For Driving Capacitive Loads.

OPERATION

The MP8100 is a current-sense amplifier with a wide operating input voltage range of 2.5V to 18V.

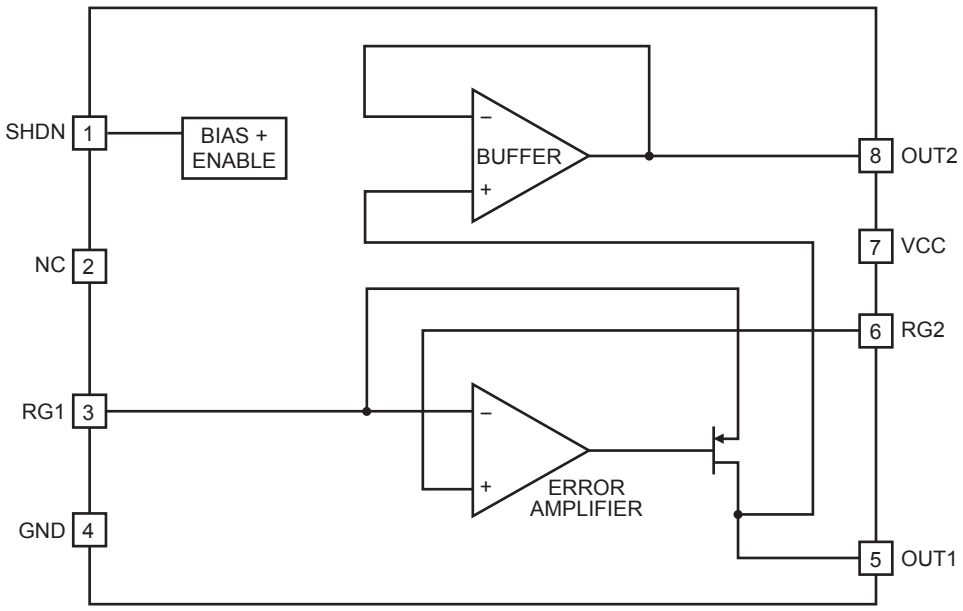


Figure 1—Functional Block Diagram

APPLICATION INFORMATION

COMPONENT SELECTION

Table 1—Suggested Component Values

Full-Scale Load Current, I_{SENSE} (A)	Current Sense Resistor (mΩ)	Gain Setting Resistor (kΩ) (R_{G1} = R_{G2})	R_{OUT1} (kΩ)	Gain
0.1	500	2	20	10
1	50	2	20	10
5	10	2	20	10
10	5	2	20	10

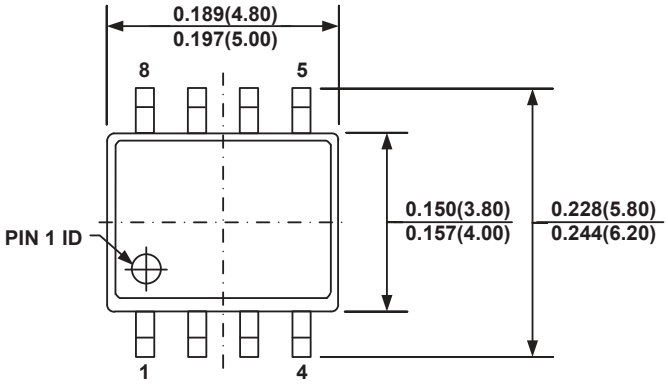
The value of V_{OUT1} can be obtained with the equation:

$$V_{OUT} = \frac{I_L \times R_S \times R_{OUT1}}{R_{G1}} = I_L \times R_S \times Gain$$

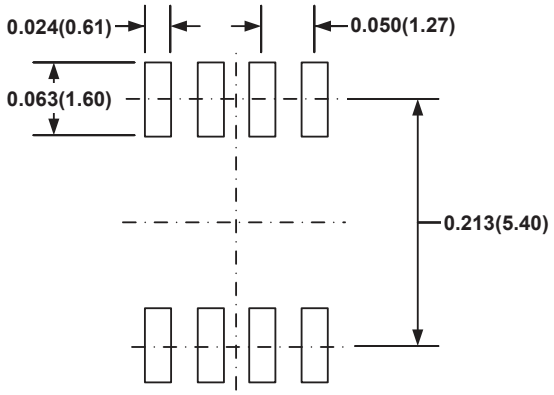
Where R_{G1} is the sense resistor and I_L is the load current.

PACKAGE INFORMATION

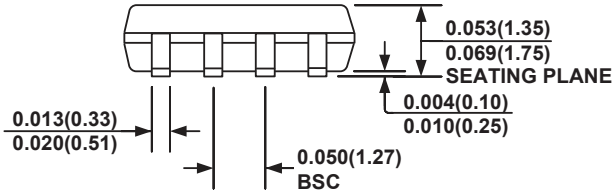
SOIC8



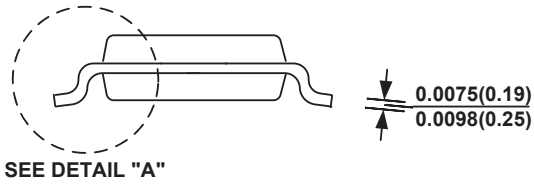
TOP VIEW



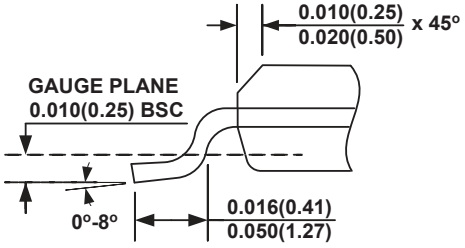
RECOMMENDED LAND PATTERN



FRONT VIEW



SIDE VIEW



DETAIL "A"

NOTE:

1) CONTROL DIMENSION IS IN INCHES. DIMENSION IN BRACKET IS IN MILLIMETERS.
2) PACKAGE LENGTH DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
3) PACKAGE WIDTH DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSIONS.
4) LEAD COPLANARITY (BOTTOM OF LEADS AFTER FORMING) SHALL BE 0.004" INCHES MAX.
5) DRAWING CONFORMS TO JEDEC MS-012, VARIATION AA.
6) DRAWING IS NOT TO SCALE.