EVQ8112A-J-00A

60V, High-Side Current-Sense Amplifier Evaluation Board, AEC-Q100 Qualified

DESCRIPTION

The EVQ8112A-J-00A is an evaluation board designed to demonstrate the capabilities of the MPQ8112A, a low-cost, unipolar, high-side current-sense amplifier. The device operates from a 2.7V to 60V supply voltage and typically consumes a 300µA current. The common mode input voltage ranges between 0V and 60V with a 700kHz high bandwidth.

The MPQ8112A converts the differential input voltage to a current output. This current is converted back to a voltage with an external load resistor. The MPQ8112A has an adjustable gain based on the external, common input resistors and load resistor.

The EV8112A-J-00A is a fully assembled and tested evaluation board.

The MPQ8112A is available in a TSOT23-6L package.

ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Value	Units
VCC supply voltage	V_{CC}	2.7 to 60	V
Common input voltage	V_{CM}	0 to V_{CC}	V
V5 supply voltage	V5	2.7 to 5.5	V
Sense voltage	V_{SENSE}	0 to 200	mV
Output gain	A_V	50	V/V

FEATURES

- Low-Cost, Compact Current-Sense Solution
- 700kHz Bandwidth
- 300µA Typical Supply Current
- 2.7V to 60V Operating Supply Voltage Range
- 0V to 60V Common Mode Input Voltage Range
- 0.2µA Typical Shutdown Current
- 300µV Input Offset Voltage
- Available with Adjustable Gain
- ±1% Current-Sense Gain Accuracy
- High-Current Sensing Capabilities
- Available in a 6-Pin TSOT23-6L Package
- Available in AEC-Q100 Grade 1

APPLICATIONS

- Advanced Driver Assistance Systems (ADAS)
- Sensor Fusion Systems
- Electric Power Steering (EPS) Systems
- Electronic Stability Control (ESC) Systems
- Brake Systems
- Battery-Operated Systems
- Energy Management Systems

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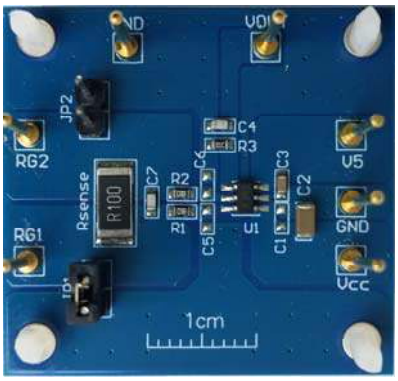
EVQ8112A-J-00A EVALUATION BOARD

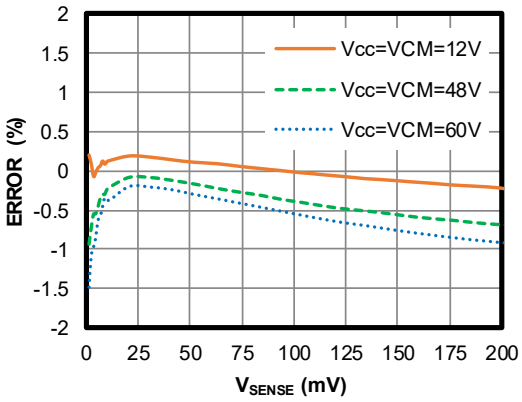


LxWxH (3.6cmx3.4cmx1.3cm)

Board Number	MPS IC Number
EVQ8112A-J-00A	MPQ8112A

Total Output Error vs. V_{SENSE}

V_{CC} = V_{CM}



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QUICK START GUIDE

1. Preset the power supply (V_{CC}) to be between 2.7V and 60V.
2. Turn the VCC power supply off.
3. Preset the V5 power supply to be between 2.7V and 5.5V.
4. Turn the V5 power supply off.
5. Preset the I_{SENSE} load to be between 0A and 2A. This sets V_{SENSE} between 0mV and 200mV (V_{SENSE} = I_{SENSE} x R_{SENSE}).
6. Turn the I_{SENSE} load off.
7. Ensure that JP1 and JP2 are not shorted simultaneously. To set the JP1 and JP2 connections, follow the guidelines below:
   a. To test with V_{CC} = V_{CM}, short JP1 and open JP2.
   b. To test with V_{CC} > V_{CM} and V_{CM} = 0V, open JP1 and short JP2.
8. Connect the VCC power supply terminals to:
   a. Positive (+): VCC
   b. Negative (-): GND
9. Connect the V5 power supply terminals to:
   a. Positive (+): V5
   b. Negative (-): GND
10. To test with V_{CC} = V_{CM}, short JP1 and open JP2, and then connect the load terminals to:
    a. Positive (+): RG2
    b. Negative (-): GND
11. To test with V_{CC} > V_{CM} and V_{CM} = 0V, open JP1 and short JP2. Isolate the I_{SENSE} load supply with an isolation transformer, and then connect the load terminals to:
    a. Positive (+): RG1
    b. Negative (-): GND
12. Turn the V5 power supply on. Then turn the VCC power supply on after making the connections.
13. Turn the I_{SENSE} load on and adjust the I_{SENSE} range. The MPQ8112A's output (V_{OUT}) can be estimated with Equation (1):

$$V_{OUT} = I_{SENSE} \times R_{SENSE} / R1 \times G_M \times R3 \quad (1)$$

Where G_M is 5A/A. The MPQ8112A's gain (A_V) can be adjusted by selecting different combinations of R3 and R1. A_V can be estimated with Equation (2):

$$A_V = V_{OUT} / V_{SENSE} = R3 / R1 \times G_M \quad (2)$$

Table 1 lists the possible A_V values using different resistors.

Table 1: Selecting A_V

A_V (V/V)	R1/R2 (kΩ)	R3 (kΩ)
100	1	20
50	1	10
25	1.02	5.1
10	1	2

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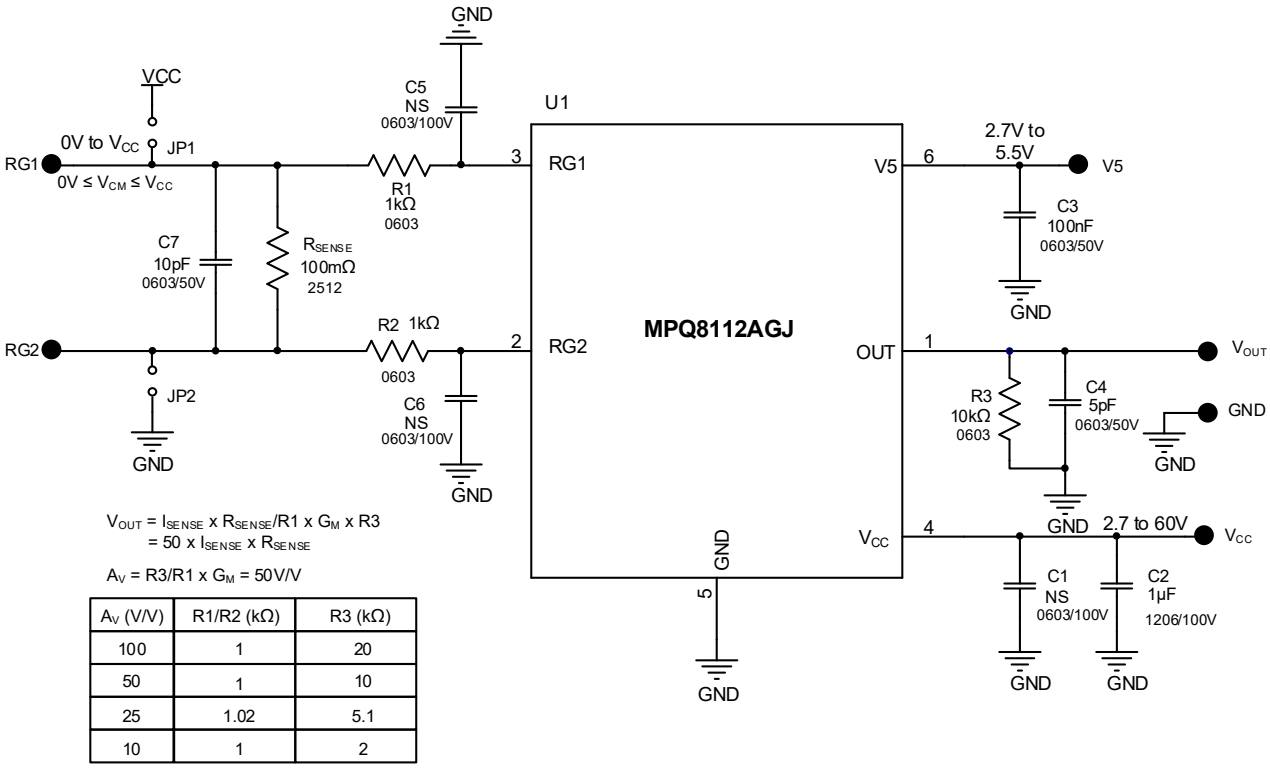
EVALUATION BOARD SCHEMATIC



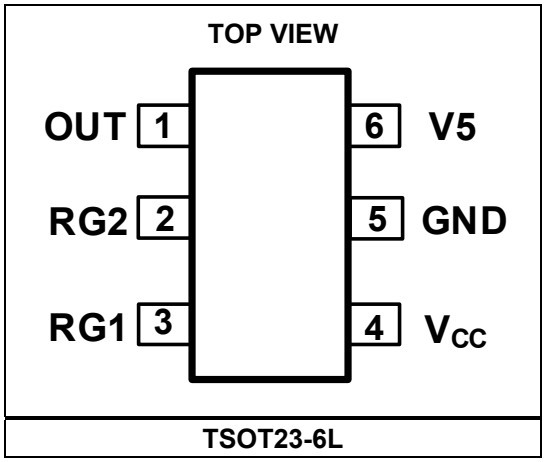
$V_{OUT} = I_{SENSE} \times R_{SENSE}/R1 \times G_M \times R3$
$= 50 \times I_{SENSE} \times R_{SENSE}$

$A_V = R3/R1 \times G_M = 50V/V$

A_V (V/V)	R1/R2 (kΩ)	R3 (kΩ)
100	1	20
50	1	10
25	1.02	5.1
10	1	2

Figure 1: Evaluation Board Schematic

PACKAGE REFERENCE



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EVQ8112A-J-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer P/N
3	C1, C5, C6	NS	Ceramic capacitor, 100V, X7R	0603		
1	C2	1μF	Ceramic capacitor, X7R, 100V	1206	Murata	GRM31CR72A105KA01L
1	C3	0.1μF	Ceramic capacitor, 50V, X7R	0603	Murata	GRM188R71H104KA93D
1	C4	5pF	Ceramic capacitor, COG, 50V	0603	TDK	C1608C0G1H050C
1	C7	10pF	Ceramic capacitor, COG, 50V	0603	muRata	GRM1885C1H100JA01
2	R1, R2	1kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-071KL
1	R3	10kΩ	Film resistor, 1%	0603	Yageo	RC0603FR-0710KL
1	R_{SENSE}	100mΩ	Film resistor, 1%, 1W	2512	Yageo	RL2512FK-070R1L
1	U1	MPQ8112A	Current-sense amplifier	TSOT23-6L	MPS	MPQ8112AGJ
2	JP1, JP2	2.54mm	2 x 1, 2.54mm, 180° connector		Custom	
1	JP1	2.54mm	2.54mm jumper		Custom	
7	V5, Vcc, RG1, RG2, GND, GND, VOUT	Test point	1.0 golden pin		Custom	

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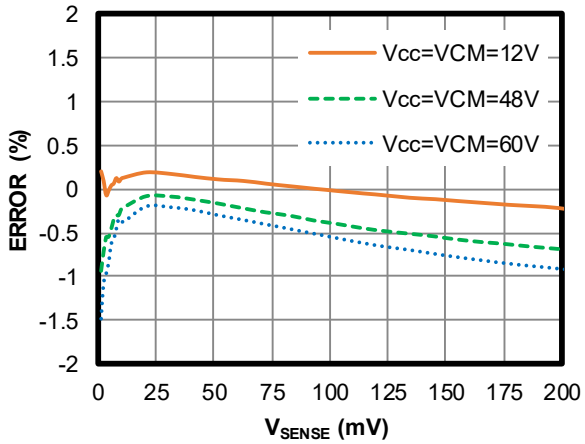
EVB TEST RESULTS

V_{CC} = 12V, V_{RG1} = 12V, V5 = 5V, T_A = 25°C, R1 = R2 = 1kΩ, and R3 = 10kΩ, unless otherwise noted.

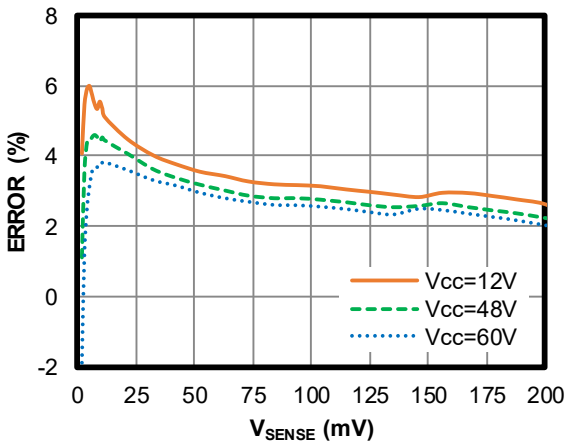
Total Output Error vs. V_{SENSE}

V_{CC} = V_{CM}



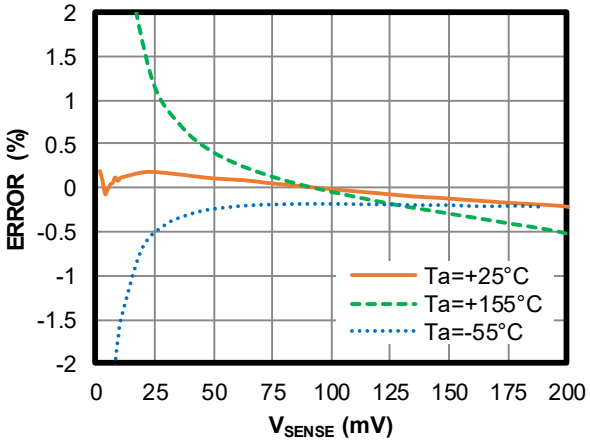
Total Output Error vs. V_{SENSE}

V_{CM} = 0V



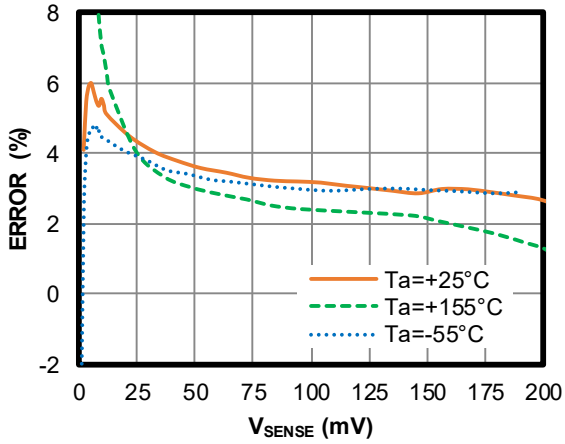
Total Output Error vs. V_{SENSE}

V_{CC} = V_{CM}



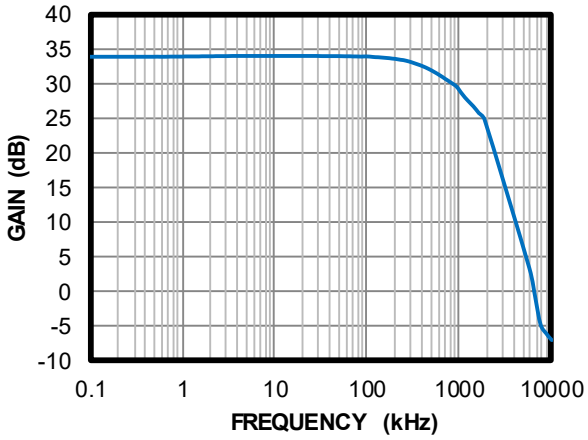
Total Output Error vs. V_{SENSE}

V_{CM} = 0V



Gain vs. Frequency

C_{OUT} = 5pF



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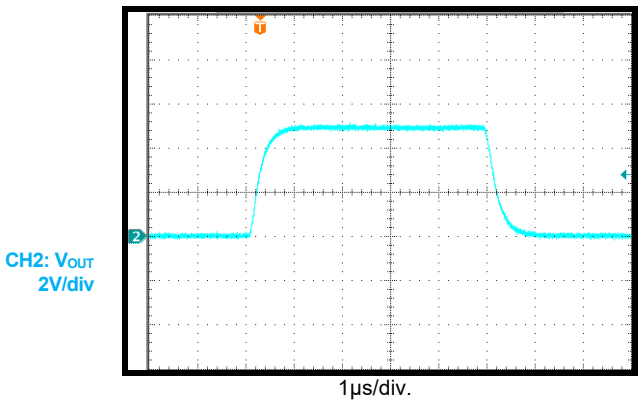
EVB TEST RESULTS *(continued)*

V_{CC} = 12V, V_{RG1} = 12V, V5 = 5V, T_A = 25°C, R1 = R2 = 1kΩ, and R3 = 10kΩ, unless otherwise noted.

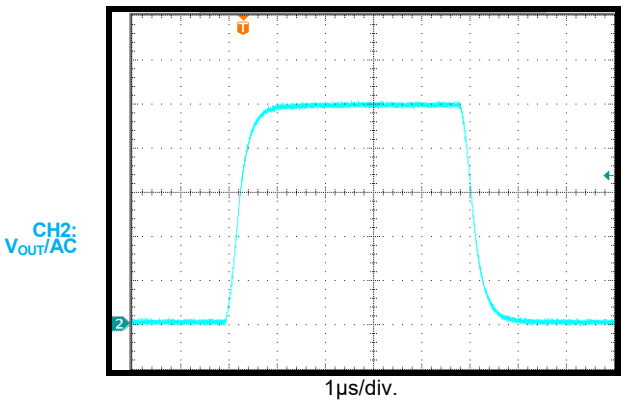
Transient Response

V_{SENSE} = 0mV to 100mV



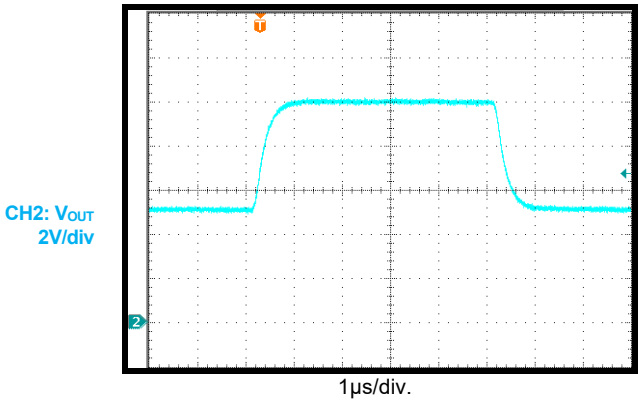
Transient Response

V_{SENSE} = 0mV to 200mV



Transient Response

V_{SENSE} = 100mV to 200mV



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PCB LAYOUT

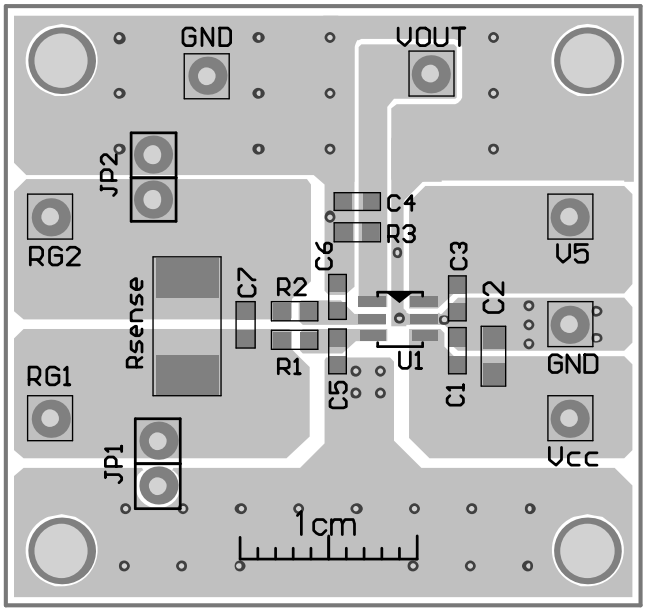

Figure 2: Top Silk Layer

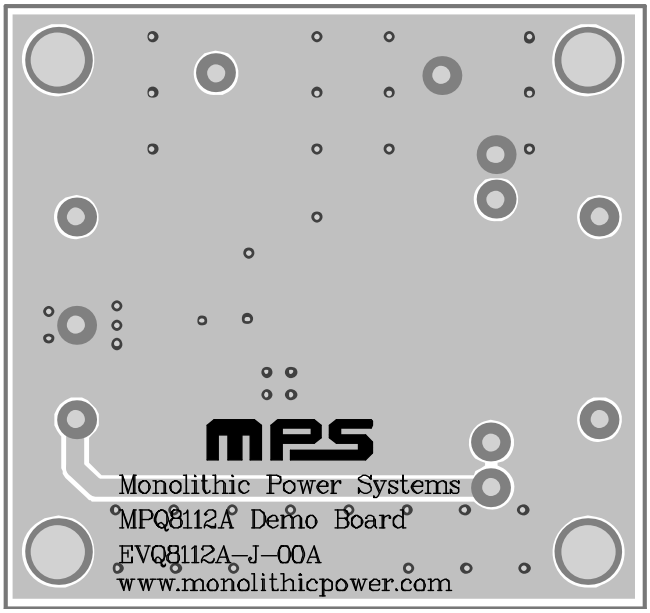

Figure 3: Bottom Layer

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REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	06/08/2021	Initial Release	-

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