LSP2908
8-Channel, High-Voltage Driver

Features

- Eight amplifier channels in one package
- Outputs from –298 V to +160 V per channel
- Programmable output current limit (100 µA to 500 µA)
- Variable voltage gain set by external resistors

Applications

- Optical crosspoint switches
- Optical microelectromechanical systems (MEMS) components

Description

The LSP2908 eight-channel, high-voltage (HV) driver is targeted for microoptomechanical systems. Each device contains eight high-voltage amplifiers with an output voltage range of –298 V to +160 V on the condition that $|V_{HP} - V_{HN}| \leq 300$ V. Voltage gain is set by external resistors. Each amplifier can output up to 500 µA, ideal for deflection and control of optical MEMS mirrors. Output current limit is programmed by an external resistor. Additionally, careful attention is paid to minimizing offset drift over temperature.

The LSP2908 requires one negative high-voltage power supply (V_{HN}) and one positive low-voltage power supply (V_{LP}). For positive output voltage applications, one positive high-voltage power supply (V_{HP}) is required. Corresponding to the eight channels are the eight inverting input pins, –INx (x = 1, 2, . . . , 8), and the corresponding eight output pins, OUTPUTx (x = 1, 2, . . . , 8). Figure 1 is the internal functional block diagram.

+IN is the noninverting input for all eight amplifiers. All the amplifiers share the same noninverting input. +IN should be connected to GND. The I_{BIAS} pin will set the current limit ((100 µA to 500 µA) ± 20%) for the amplifiers by connecting it to an external resistor R_{ib}. The LSP2908 is available in a leaded surface-mount 44-pin MQFP package.

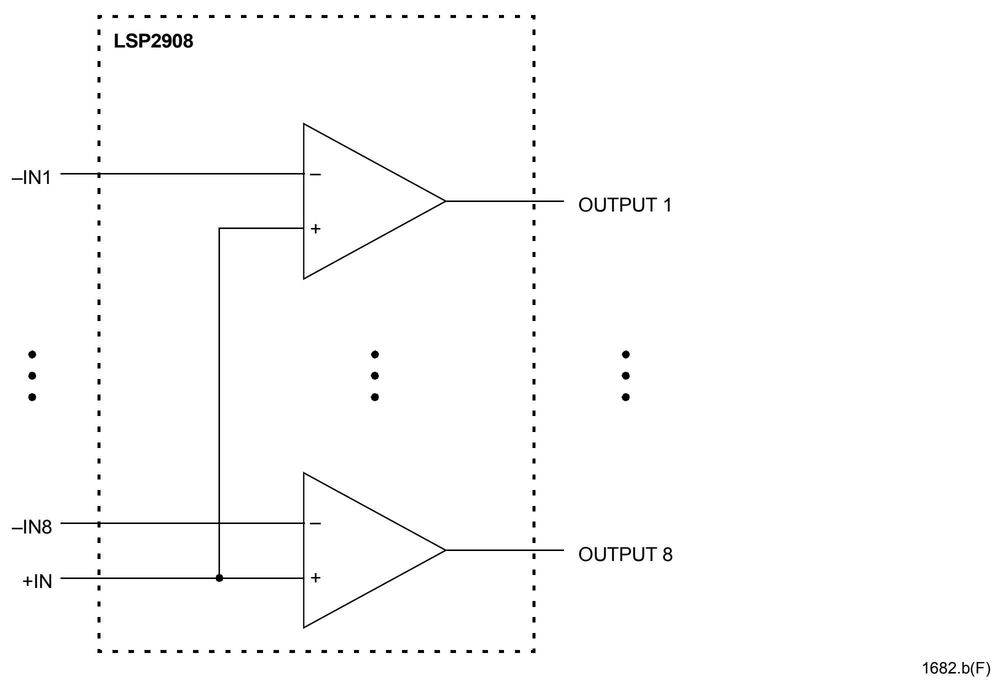

Figure 1. LSP2908 Internal Block Diagram

Pin Information

Pin Diagram

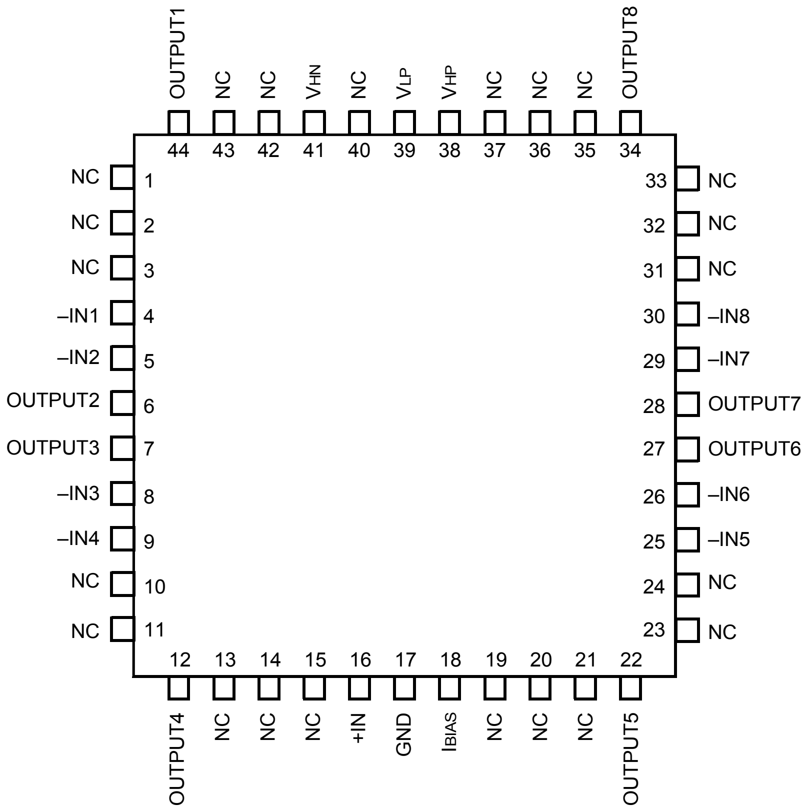

Figure 2. LSP2908 Pin Diagram

Pin Descriptions

Table 1. Pin Descriptions

Pin Number	Pin Name	Function	Pin Total Counts	Description
1, 2, 3, 10, 11, 13, 14, 15, 19, 20, 21, 23, 24, 31, 32, 33, 35, 36, 37, 40, 42, 43	NC	No Connect	22	Do not connect.
4, 5, 8, 9, 25, 26, 29, 30	–INx	Analog Input	8	Inverting input for each channel.
6, 7, 12, 22, 27, 28, 34, 44	OUTPUTx	Analog Output	8	Output for each channel.
16	+IN	Analog Input	1	Noninverting input for all channels. Should be grounded.
17	GND	Ground	1	Analog ground.
18	I_{BIAS}	Current Limit Control	1	Sets current limit with external resistor to GND.
38	V_{HP}	Power Supply	1	Positive high-voltage power supply.
39	V_{LP}	Power Supply	1	Positive low-voltage power supply.
41	V_{HN}	Power Supply	1	Negative high-voltage power supply.

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Table 2. Absolute Maximum Ratings

Parameter	Min	Typ	Max	Unit
Power Supply:				
V_{HN}	0	–180.0	–300.0	V
V_{HP}	V_{LP}	V_{LP}	160.0	V
V_{LP}	4.5	12.0	20.0	V
$V_{HP} – V_{HN}$	0	195.0	300.0	V
Operating Temperature	–40	25	85	°C
Storage Temperature	–65	25	150	°C
Lead Temperature (soldering 10 seconds)	—	—	300	°C

Handling Precautions

Although protection circuitry has been designed for this device, proper precautions should be taken to avoid exposure to electrostatic discharge (ESD) during handling and mounting. Agere Systems Inc. employs a human-body model (HMB) and charged-device model (CDM) for ESD-susceptibility testing and protection design evaluation. ESD voltage thresholds are dependent on the circuit parameters used in the defined model. No industry-wide standard has been adopted for CDM. However, a standard HBM (resistance = 1500 Ω, capacitance = 100 pF) is widely used, and therefore, can be used for comparison purposes. The HBM ESD threshold (>500 V) presented here was obtained by using these circuit parameters.

Application Considerations

Safe Handling of the High Voltage Device

LSP2908 is capable of operating with a negative power supply of up to –300 V or a positive power supply of up to 160 V. Due to the presence of high voltages, special care should be paid to safety issues.

Bypass Capacitors/Protection Series Resistor for the Power Supplies

To minimize noise coupling to the output, 0.1 µF bypass capacitors should be placed as close as possible to all power supply pins.

Handling Precautions (continued)

Typical Application Circuit

In a typical application, the LSP2908 will directly drive the MEMS devices, as shown in Figure 3. One integrated circuit replaces eight discrete amplifiers.

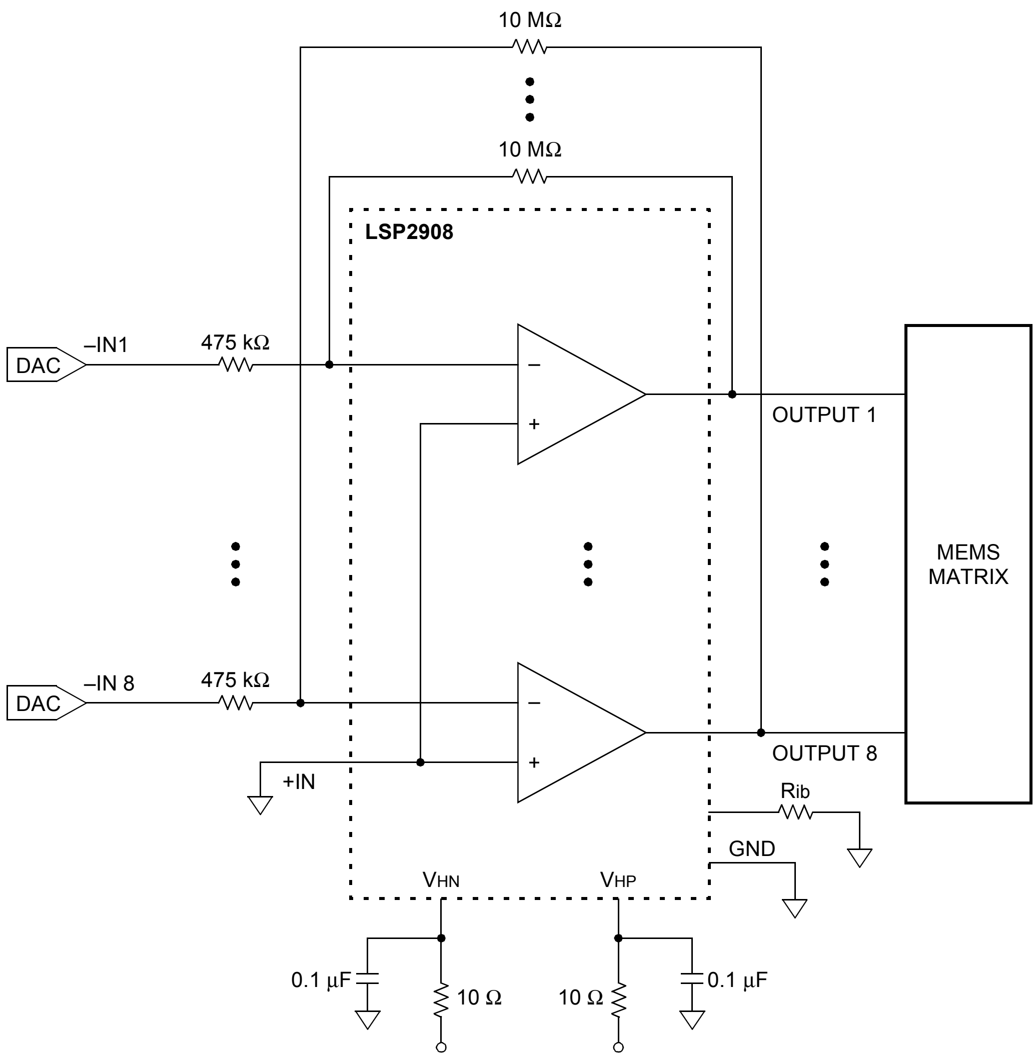

Figure 3. Typical Application Circuit

Electrical Characteristics

T_A = 25 °C, V_{LP} = 12 V, V_{HN} = –220 V, V_{HP} = 12 V, noninverting input +IN = 0 V, R_I = 475 kΩ, R_F = 10 MΩ, I_{BIAS} resistor = 425 kΩ.

Table 3. Electrical Characteristics

Parameters	Symbol	Condition	Min	Typ	Max	Unit
Input Characteristics						
Input Resistance	R	—	—	TBD	—	kΩ
Input Offset Voltage	—	–IN = 0 V	–30	0	30	mV
Input Offset Voltage Drift	—	–IN = 0 V 0 °C—70 °C	—	20		µV/°C
Input Bias Current	I(–INx)	–IN = 0 V	–5	0	5	nA
Input Bias Current	I(+IN)	–IN = 0 V	–40	0	40	nA
Power Supply Rejection Ratio	PSRR V_{HN} V_{HP} V_{LP}	—	 — — —	 85 85 52	 — — —	dB
Input Range*	–IN	—	–5	—	10	V
Gain						
Gain Temperature Coefficient	G_{TC}	—	—	TBD	—	V/V/°C
Amplifier Output Characteristics						
Output Resistance	—	—	—	TBD	—	kΩ
Amplifier Current Limit*	—	R_{ib} = 425 kΩ	80	100	120	µA
Output Voltage	—	—	V_{HN} + 3.0 V	—	V_{HP} – 3.0 V	V
Dynamics Characteristics						
–3 dB Bandwidth† C = 150 pF R = 10 MΩ	—	—	—	TBD	—	kHz
Slew Rate† C = 150 pF R = 10 MΩ	—	Input pulse = 0 V—5 V R_F = 10 MΩ R_I = 392 kΩ	 — —	 0.62 0.47	 — —	 V/s (rising) V/s (falling)
Settling Time†, ‡ C = 150 pF R = 10 MΩ	—	Input pulse = 0 V—5 V R_F = 10 MΩ R_I = 392 kΩ	 — —	 197 254	 — —	 µs (rising) µs (falling)
Power Supply Currents at Room Temperature						
Quiescent Current†	I(V_{HN})	V_{HN} = –150.0 V V_{LP} = 12.0 V V_{HP} = 150.0 V –IN = 0 V	400	500	600	µA
	I(V_{HP})		560	600	840	µA
	I(V_{LP})		184	230	276	µA
Power Consumption†	P	V_{HN} = –150.0 V V_{LP} = 12.0 V V_{HP} = 150.0 V –IN = 0 V	146	182.5	219	mW

* V_{LP} = 12 V, V_{HN} = –150 V, and V_{HP} = 150 V.
† Controlled by R_{ib} and V_{LP}.
‡ Settle to 5%.

Electrical Characteristics (continued)

Output Current Range at Different Resistance on Pin I_{BIAS}

Figure 4 shows the output current range when different resistances are applied to pin I_{BIAS}.

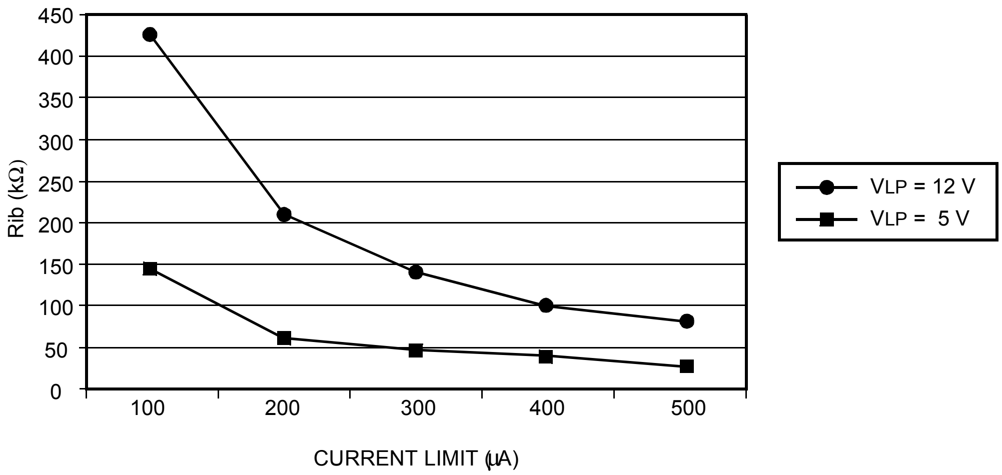

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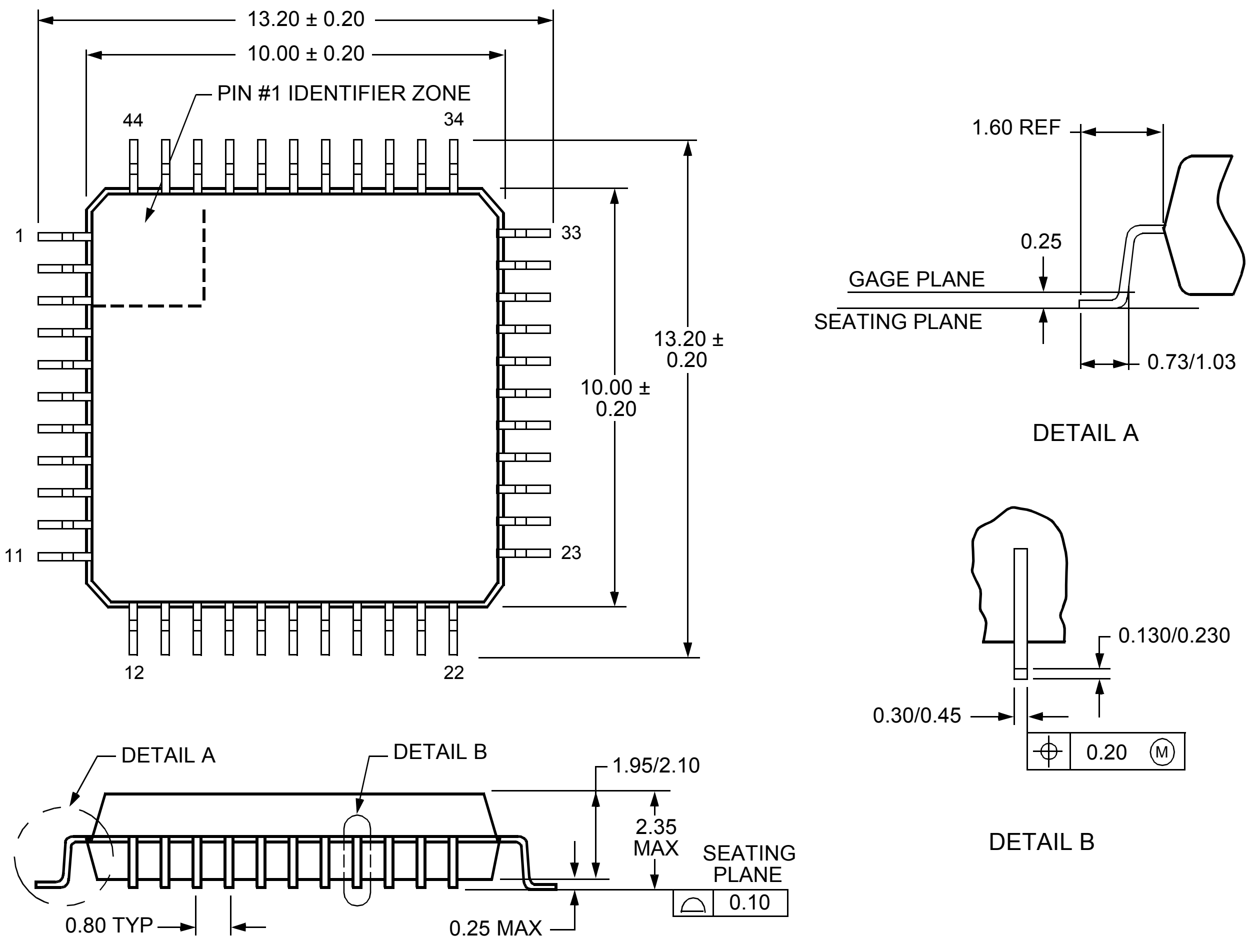
Figure 4. Resistor vs. Output Current Limit

Package Diagram



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