

LMV101/102/105/110 Fixed-Gain Amplifiers

General Description

The LMV101/102/105/110 fixed-gain amplifier family integrates a rail-to-rail op amp, two internal gain-setting resistors and a $V^+/2$ bias circuit into one ultra tiny package, SC70-5 or SOT23-5. Fixed inverting gains of -1, -2, -5, and -10 are available.

The core op amp in this series is an LMV321, which provides rail-to-rail output swing, excellent speed-power ratio, 1MHz bandwidth, and 1V/ μ s of slew rate with low supply current.

The LMV101/102/105/110 family reduces external component count. It is the most cost effective solution for applications where low voltage operation, low power consumption, space savings, and reliable performance are needed. It enables the design of small portable electronic devices, and allows the designer to place the device closer to the signal source to reduce noise pickup and increase signal integrity.

Features

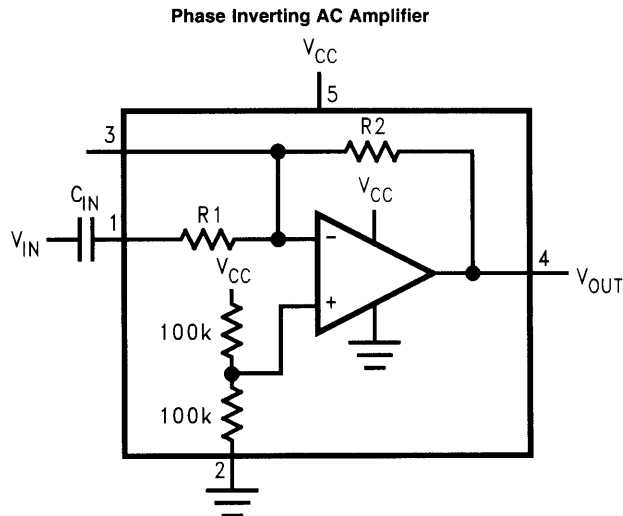
(For 5V Supply. Typical Unless Otherwise Noted)

- Fixed inverting gain available -1, -2, -5, -10
- DC gain accuracy @2.7V supply
 - LMV101/102/105 2% (typ)
 - LMV110 6% (typ)
- Space saving packages SC70-5 & SOT23-5
- Industrial temperature range -40°C to +85°C
- Low supply current 130 μ A
- Rail-to-Rail output swing
- Guaranteed 2.7V and 5V performance

Applications

- General purpose portable devices
- Mobile communications
- Battery powered electronics
- Active filters
- Microphone preamplifiers

Typical Application



DS101234-10

$$V_{OUT} = 0.5V_{CC} - V_{IN} (R_2/R_1)$$

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

ESD Tolerance (Note 2)

Machine Model	200V
Human Body Model	1500V
Supply Voltage ($V^+ - V^-$)	5.5V
Output Short Circuit to V^+	(Note 3)
Output Short Circuit to V^-	(Note 4)
Mounting Temperature	
Infrared or Convection (20 sec)	235°C

Storage Temperature Range	-65°C to 150°C
Junction Temperature (T_J , max)	150°C
(Note 5)	

Operating Ratings (Note 1)

Supply Voltage	2.7V to 5.0V
Temperature Range	-40°C ≤ T_J ≤ 85°C
Thermal resistance (θ_{JA})	
5-pin SC70-5	478°C/W
5-pin SOT23-5	265°C/W

2.7V Electrical Characteristics

Unless otherwise specified, all limits guaranteed for $T_J = 25^\circ\text{C}$, $V^+ = 2.7\text{V}$, $V^- = 0\text{V}$, $V_O = V^+ / 2$ and $R_L > 1\text{M}\Omega$. **Boldface** limits apply at the temperature extremes.

Symbol	Parameter	Conditions	Typ (Note 6)	Max (Note 7)	Units
V_O	Output Swing	$R_L = 10\text{k}\Omega$ to 1.35V	$V^+ - 0.01$	$V^+ - 0.1$	V min
			0.08	0.18	V max
I_S	Supply Current		80	170	μA max
	DC Gain Accuracy	LMV101, Gain = -1	2	5	%
		LMV102, Gain = -2	2	5	%
		LMV105, Gain = -5	2	6	%
		LMV110, Gain = -10	6	12	%
GBW	-3dB Bandwidth	LMV101, Gain = -1, $R_L = 2\text{k}\Omega$, $C_L = 100\text{pF}$	1.6		MHz
		LMV102, Gain = -2, $R_L = 2\text{k}\Omega$, $C_L = 100\text{pF}$	1.8		MHz
		LMV105, Gain = -5, $R_L = 2\text{k}\Omega$, $C_L = 100\text{pF}$	0.8		MHz
		LMV110, Gain = -10, $R_L = 2\text{k}\Omega$, $C_L = 100\text{pF}$	0.2		MHz

5V Electrical Characteristics

Unless otherwise specified, all limits guaranteed for $T_J = 25^\circ\text{C}$, $V^+ = 5\text{V}$, $V^- = 0\text{V}$, $V_O = V^+ / 2$ and $R_L > 1\text{M}\Omega$. **Boldface** limits apply at the temperature extremes.

Symbol	Parameter	Conditions	Typ (Note 6)	Max (Note 7)	Units
V_O	Output Swing	$R_L = 2\text{k}\Omega$ to 2.5V	$V^+ - 0.04$	$V^+ - 0.3$ $V^+ - 0.4$	V min
			0.14	0.3 0.4	V max
		$R_L = 10\text{k}\Omega$ to 2.5V	$V^+ - 0.01$	$V^+ - 0.1$ $V^+ - 0.2$	V min
			0.1	0.18 0.28	V max
I_O	Output Current	Sourcing, $V_O = 0\text{V}$	60	5	mA min
		Sinking, $V_O = 5\text{V}$	160	10	mA min

5V Electrical Characteristics (Continued)

Unless otherwise specified, all limits guaranteed for $T_J = 25^\circ\text{C}$, $V^+ = 5\text{V}$, $V^- = 0\text{V}$, $V_O = V^+ / 2$ and $R_L > 1\text{M}\Omega$. **Boldface** limits apply at the temperature extremes.

Symbol	Parameter	Conditions	Typ (Note 6)	Max (Note 7)	Units
I_S	Supply Current		130	250 350	μA max
	DC Gain Accuracy	LMV101, Gain = -1	3.5	5	%
		LMV102, Gain = -2	3.5	5	%
		LMV105, Gain = -5	3.5	6	%
		LMV110, Gain = -10	9.0	12	%
SR	Slew Rate	(Note 8)	1		$\text{V}/\mu\text{s}$
GBW	-3dB Bandwidth	LMV101, Gain = -1, $R_L = 2\text{k}\Omega$, $C_L = 100\text{pF}$	1.6		MHz
		LMV102, Gain = -2, $R_L = 2\text{k}\Omega$, $C_L = 100\text{pF}$	1.8		MHz
		LMV105, Gain = -5, $R_L = 2\text{k}\Omega$, $C_L = 100\text{pF}$	0.8		MHz
		LMV110, Gain = -10, $R_L = 2\text{k}\Omega$, $C_L = 100\text{pF}$	0.2		MHz

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but specific performance is not guaranteed. For guaranteed specifications and the test conditions, see the Electrical Characteristics.

Note 2: Human body model, $1.5\text{k}\Omega$ in series with 100pF . Machine model, 0Ω in series with 100pF .

Note 3: Shorting circuit output to V^+ will adversely affect reliability.

Note 4: Shorting circuit output to V^- will adversely affect reliability.

Note 5: The maximum power dissipation is a function of $T_{J(\text{max})}$, θ_{JA} , and T_A . The maximum allowable power dissipation at any ambient temperature is $P_D = (T_{J(\text{max})} - T_A) / \theta_{JA}$. All numbers apply for packages soldered directly into a PC board.

Note 6: Typical Values represent the most likely parametric norm.

Note 7: All limits are guaranteed by testing or statistical analysis.

Note 8: Number specified is the slower of the positive and negative slew rates.