

## SSM-2017

### FEATURES

- Excellent Noise Performance:  $950 \text{ pV}/\sqrt{\text{Hz}}$  or 1.5 dB Noise Figure
- Ultralow THD:  $<0.01\%$  @  $G = 100$  Over the Full Audio Band
- Wide Bandwidth: 1 MHz @  $G = 100$
- High Slew Rate:  $17 \text{ V}/\mu\text{s}$  typ
- Unity Gain Stable
- True Differential Inputs
- Subaudio 1/f Noise Corner
- 8-Pin Mini-DIP with Only One External Component Required
- Very Low Cost
- Extended Temperature Range:  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$

### APPLICATIONS

- Audio Mix Consoles
- Intercom/Paging Systems
- Two-Way Radio
- Sonar
- Digital Audio Systems

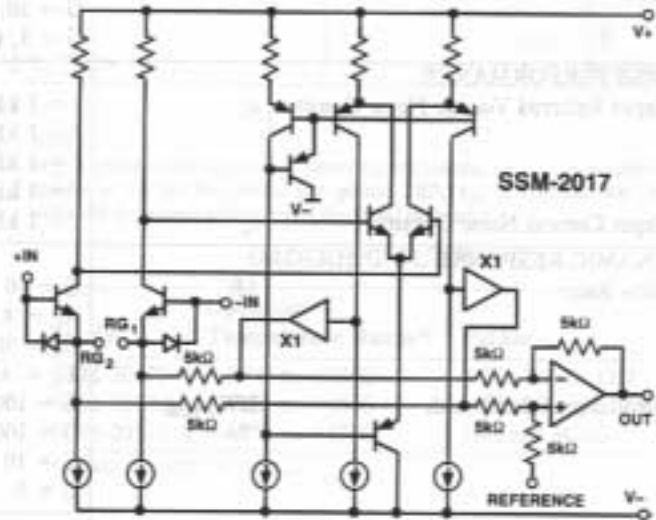
### GENERAL DESCRIPTION

The SSM-2017 is a latest generation audio preamplifier combining SSM preamplifier design expertise with advanced processing. The result is excellent audio performance from a self-contained 8-pin mini-DIP device, requiring only one external gain set resistor or potentiometer. The SSM-2017 is further enhanced by its unity gain stability.

Key specifications include ultralow noise (1.5 dB noise figure) and THD ( $<0.01\%$  at  $G = 100$ ), complemented by wide bandwidth and high slew rate.

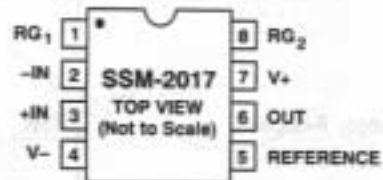
Applications for this low cost device include microphone preamplifiers and bus summing amplifiers in professional and consumer audio equipment, sonar, and other applications requiring a low noise instrumentation amplifier with high gain capability.

### FUNCTIONAL BLOCK DIAGRAM

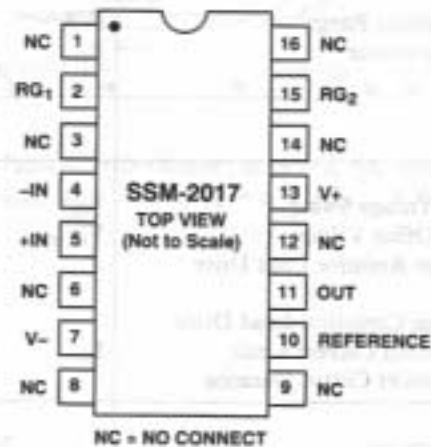


### PIN CONNECTIONS

Epoxy Mini-DIP (P Suffix)  
and  
Hermetic DIP (Z Suffix)



### 16-Pin SOIC (S Suffix)



# SSM-2017 — SPECIFICATIONS ( $V_S = \pm 15\text{ V}$ and $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ , unless otherwise specified. Typical specifications apply at $T_A = +25^\circ\text{C}$ .)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
<b>DISTORTION PERFORMANCE</b>						
Total Harmonic Distortion Plus Noise	THD+N	$T_A = +25^\circ\text{C}$ $V_O = 7\text{ V}_{\text{RMS}}$ $R_L = 5\text{ k}\Omega$ $G = 1000, f = 1\text{ kHz}$ $G = 100, f = 1\text{ kHz}$ $G = 10, f = 1\text{ kHz}$ $G = 1, f = 1\text{ kHz}$		0.012 0.005 0.004 0.008		% % % %
<b>NOISE PERFORMANCE</b>						
Input Referred Voltage Noise Density	$e_n$	$f = 1\text{ kHz}, G = 1000$ $f = 1\text{ kHz}; G = 100$ $f = 1\text{ kHz}; G = 10$ $f = 1\text{ kHz}; G = 1$		0.95 1.95 11.83 107.14		$\text{nV}/\sqrt{\text{Hz}}$ $\text{nV}/\sqrt{\text{Hz}}$ $\text{nV}/\sqrt{\text{Hz}}$ $\text{nV}/\sqrt{\text{Hz}}$
Input Current Noise Density	$i_n$	$f = 1\text{ kHz}, G = 1000$		2		$\text{pA}/\sqrt{\text{Hz}}$
<b>DYNAMIC RESPONSE</b>						
Slew Rate	SR	$G = 10$ $R_L = 4.7\text{ k}\Omega$ $C_L = 50\text{ pF}$ $T_A = +25^\circ\text{C}$	10	17		$\text{V}/\mu\text{s}$
Small Signal Bandwidth	$\text{BW}_{-3\text{dB}}$	$G = 1000$ $G = 100$ $G = 10$ $G = 1$		200 1000 2000 4000		$\text{kHz}$ $\text{kHz}$ $\text{kHz}$ $\text{kHz}$
<b>INPUT</b>						
Input Offset Voltage	$V_{\text{IOS}}$			0.1	1.2	mV
Input Bias Current	$I_{\text{IB}}$	$V_{\text{CM}} = 0\text{ V}$		6	25	$\mu\text{A}$
Input Offset Current	$I_{\text{IOS}}$	$V_{\text{CM}} = 0\text{ V}$		$\pm 0.002$	$\pm 2.5$	$\mu\text{A}$
Common-Mode Rejection	CMR	$V_{\text{CM}} = \pm 8\text{ V}$ $G = 1000$ $G = 100$ $G = 10$ $G = 1, T_A = +25^\circ\text{C}$ $G = 1, T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$	80 60 40 26	112 92 74 54		dB dB dB dB
Power Supply Rejection	PSR	$V_S = \pm 6\text{ V}$ to $\pm 18\text{ V}$ $G = 1000$ $G = 100$ $G = 10$ $G = 1$	80 60 40 26	124 118 101 82		dB dB dB dB
Input Voltage Range	IVR			$\pm 8$		V
Input Resistance	$R_{\text{IN}}$	Differential, $G = 1000$ $G = 1$ Common Mode, $G = 1000$ $G = 1$		1 30 5.3 7.1		$\text{M}\Omega$ $\text{M}\Omega$ $\text{M}\Omega$ $\text{M}\Omega$
<b>OUTPUT</b>						
Output Voltage Swing	$V_O$	$R_L = 2\text{ k}\Omega; T_A = +25^\circ\text{C}$	$\pm 11.0$	$\pm 12.3$		V
Output Offset Voltage	$V_{\text{OOS}}$			-40	500	mV
Minimum Resistive Load Drive		$T_A = +25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$		2 4.7		$\text{k}\Omega$ $\text{k}\Omega$
Maximum Capacitive Load Drive				50		pF
Short Circuit Current Limit	$I_{\text{SC}}$	Output-to-Ground Short		$\pm 50$		mA
Output Short Circuit Duration					10	sec
<b>GAIN</b>						
Gain Accuracy	$R_G = \frac{10\text{ k}\Omega}{G - 1}$	$T_A = +25^\circ\text{C}$ $R_G = 10\ \Omega, G = 1000$ $R_G = 101\ \Omega, G = 100$ $R_G = 1.1\text{ k}\Omega, G = 10$ $R_G = \infty, G = 1$		0.25 0.20 0.20 0.05	1 1 1 0.5	dB dB dB dB
Maximum Gain	G			70		dB

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
<b>REFERENCE INPUT</b>						
Input Resistance				10		k $\Omega$
Voltage Range				$\pm 8$		V
Gain to Output				1		V/V
<b>POWER SUPPLY</b>						
Supply Voltage Range	$V_S$		$\pm 6$		$\pm 22$	V
Supply Current	$I_{SY}$	$V_{CM} = 0\text{ V}, R_L = \infty$		$\pm 10.6$	$\pm 14.0$	mA

Specifications subject to change without notice.

### ABSOLUTE MAXIMUM RATINGS

Supply Voltage	$\pm 22\text{ V}$
Input Voltage	Supply Voltage
Output Short Circuit Duration	10 sec
Storage Temperature Range (P, Z Packages)	$-65^\circ\text{C}$ to $+150^\circ\text{C}$
Junction Temperature ( $T_J$ )	$-65^\circ\text{C}$ to $+150^\circ\text{C}$
Lead Temperature Range (Soldering, 60 sec)	$300^\circ\text{C}$
Operating Temperature Range	$-40^\circ\text{C}$ to $+85^\circ\text{C}$
Thermal Resistance <sup>1</sup>	
8-Pin Hermetic DIP (Z): $\theta_{JA} = 134; \theta_{JC} = 12$	$^\circ\text{C/W}$
8-Pin Plastic DIP (P): $\theta_{JA} = 96; \theta_{JC} = 37$	$^\circ\text{C/W}$
16-Pin SOIC (S): $\theta_{JA} = 92; \theta_{JC} = 27$	$^\circ\text{C/W}$

### NOTE

<sup>1</sup> $\theta_{JA}$  is specified for worst case mounting conditions, i.e.,  $\theta_{JA}$  is specified for device in socket for cerdip and plastic DIP;  $\theta_{JA}$  is specified for device soldered to printed circuit board for SOIC package.

### ORDERING GUIDE

Model	Operating Temperature Range*	Package
SSM-2017P	$-40^\circ\text{C}$ to $+85^\circ\text{C}$	8-Pin Plastic DIP
SSM-2017Z	$-40^\circ\text{C}$ to $+85^\circ\text{C}$	8-Pin Hermetic DIP
SSM-2017S	$-40^\circ\text{C}$ to $+85^\circ\text{C}$	16-Lead SOIC

\*XIND =  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$ .

## Typical Performance Characteristics

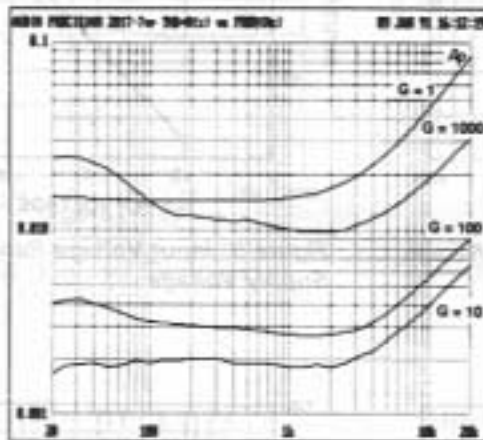


Figure 1. Typical THD+Noise\* at  $G = 1, 10, 100, 1000$ ;  
 $V_O = 7 V_{RMS}, V_S = \pm 15\text{ V}, R_L = 5\text{ k}\Omega; T_A = +25^\circ\text{C}$

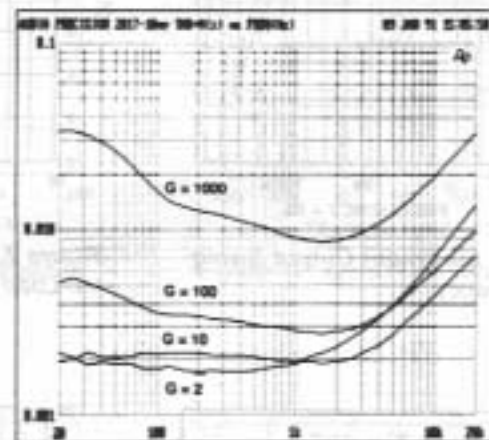


Figure 2. Typical THD+Noise\* at  $G = 2, 10, 100, 1000$ ;  
 $V_O = 10 V_{RMS}, V_S = \pm 18\text{ V}, R_L = 5\text{ k}\Omega; T_A = +25^\circ\text{C}$

\*80 kHz low-pass filter used for Figures 1-2.