–6 dB Differential Line Receiver

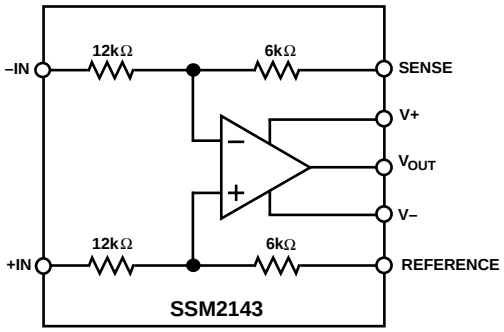
SSM2143

FEATURES

High Common-Mode Rejection
- **DC: 90 dB typ**
- **60 Hz: 90 dB typ**
- **20 kHz: 85 dB typ**

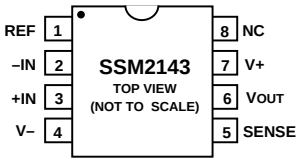
Ultralow THD: 0.0006% typ @ 1 kHz
Fast Slew Rate: 10 V/μs typ
Wide Bandwidth: 7 MHz typ (G = 1/2)
Two Gain Levels Available: G = 1/2 or 2
Low Cost

FUNCTIONAL BLOCK DIAGRAM



PIN CONNECTIONS

Epoxy Mini-DIP (P Suffix)
and
SOIC (S Suffix)



NC = NO CONNECT

GENERAL DESCRIPTION

The SSM2143 is an integrated differential amplifier intended to receive balanced line inputs in audio applications requiring a high level of immunity from common-mode noise. The device provides a typical 90 dB of common-mode rejection (CMR), which is achieved by laser trimming of resistances to better than 0.005%.

Additional features of the device include a slew rate of 10 V/μs and wide bandwidth. Total harmonic distortion (THD) is less than 0.004% over the full audio band, even while driving low impedance loads. The SSM2143 input stage is designed to handle input signals as large as +28 dBu at G = 1/2. Although primarily intended for G = 1/2 applications, a gain of 2 can be realized by reversing the +IN/–IN and SENSE/REFERENCE connections.

When configured for a gain of 1/2, the SSM2143 and SSM2142 Balanced Line Driver provide a fully integrated, unity gain solution to driving audio signals over long cable runs. For similar performance with G = 1, see SSM2141.

REV. 0

SSM2143–SPECIFICATIONS

(V_S = ±15 V, –40°C ≤ T_A ≤ +85°C, G = 1/2, unless otherwise noted. Typical specifications apply at T_A = +25°C)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
AUDIO PERFORMANCE						
Total Harmonic Distortion Plus Noise	THD+N	V_{IN} = 10 V rms, R_L = 10 kΩ, f = 1 kHz		0.0006		%
Signal-to-Noise Ratio	SNR	0 dBu = 0.775 V rms, 20 kHz BW, RTI		–107.3		dBu
Headroom	HR	Clip Point = 1% THD+N		+28.0		dBu
DYNAMIC RESPONSE						
Slew Rate	SR	R_L = 2 kΩ, C_L = 200 pF	6	10		V/µs
Small Signal Bandwidth	$BW_{-3\ dB}$	R_L = 2 kΩ, C_L = 200 pF				
		G = 1/2		7		MHz
		G = 2		3.5		MHz
INPUT						
Input Offset Voltage	V_{IOS}	V_{CM} = 0 V, RTI, G = 2	–1.2	0.05	+1.2	mV
Common-Mode Rejection	CMR	V_{CM} = ±10 V, RTO				
		f = dc	70	90		dB
		f = 60 Hz		90		dB
		f = 20 kHz		85		dB
		f = 400 kHz		60		dB
Power Supply Rejection	PSR	V_S = ±6 V to ±18 V	90	110		dB
Input Voltage Range	IVR	Common Mode		±15		V
		Differential		±28		V
OUTPUT						
Output Voltage Swing	V_O	R_L = 2 kΩ	±13	±14		V
Minimum Resistive Load Drive				2		kΩ
Maximum Capacitive Load Drive				300		pF
Short Circuit Current Limit	I_{SC}			+45, –20		mA
GAIN						
Gain Accuracy			–0.1	0.03	0.1	%
REFERENCE INPUT						
Input Resistance				18		kΩ
Voltage Range				±10		V
POWER SUPPLY						
Supply Voltage Range	V_S		±6		±18	V
Supply Current	I_{SY}	V_{CM} = 0 V, R_L = ∞		±2.7	±4.0	mA

Specifications subject to change without notice.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage . . . . . ±18 V
Common-Mode Input Voltage . . . . . ±22 V
Differential Input Voltage . . . . . ±44 V
Output Short Circuit Duration . . . . . Continuous
Operating Temperature Range . . . . . –40°C to +85°C
Storage Temperature Range . . . . . –65°C to +150°C
Junction Temperature (T_J) . . . . . +150°C
Lead Temperature (Soldering, 60 sec) . . . . . +300°C
Thermal Resistance
8-Pin Plastic DIP (P): θ_{JA} = 103, θ_{JC} = 43 . . . . . °C/W
8-Pin SOIC (S): θ_{JA} = 150, θ_{JC} = 43. . . . . °C/W

ORDERING GUIDE

Model	Operating Temperature Range	Package Description	Package Option
SSM2143P	–40°C to +85°C	8-Pin Plastic DIP	N-8
SSM2143S*	–40°C to +85°C	8-Pin SOIC	SO-8

*Contact sales office for availability.

LINE DRIVER/RECEIVER SYSTEM

The SSM2143 and SSM2142 provide a fully integrated line driver/receiver system. The SSM2142 is a high performance balanced line driver IC that converts an unbalanced input into a balanced output signal. It can drive large capacitive loads on long cables making it ideal for transmitting balanced audio signals. When combined with an SSM2143 on the receiving end of the cable, the system maintains high common-mode rejection and ultralow THD. The SSM2142 is designed with a gain of +2 and the SSM2143 with a gain of 1/2, providing an overall system gain of unity.

The following data demonstrates the typical performance of the two parts together, measured on an Audio Precision at the SSM2143's output. This configuration was tested with 500 feet of cable between the ICs as well as no cable. The combination of the two parts results in excellent THD+N and SNR and a noise floor of typically –105 dB over a 20 Hz to 20 kHz bandwidth.

A comment on SSM2142/SSM2143 system headroom is necessary. Figure 31 shows a maximum signal handling of approximately ±22 dBu, but it must be kept in mind that this is measured between the SSM2142's input and SSM2143's output, which has been attenuated by one half. Normally, the system would be shown as actually used in a piece of equipment, whereby the SSM2143 is at the input and SSM2142 at the output. In this case, the system could handle differential signals in excess of +24 dBu at the input and output, which is consistent with headroom requirements of most professional audio equipment.

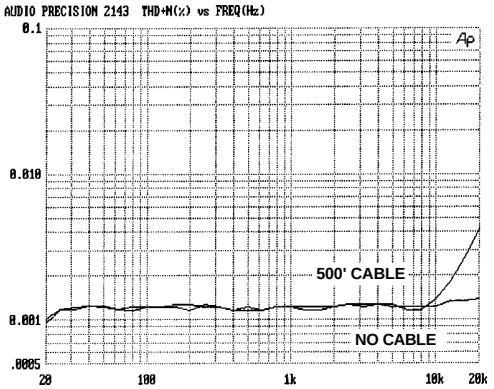


Figure 30. THD+N vs. Frequency of SSM2142/SSM2143 System (V_S = ±18 V, V_{IN} = 5 V rms, with 80 kHz Filter)

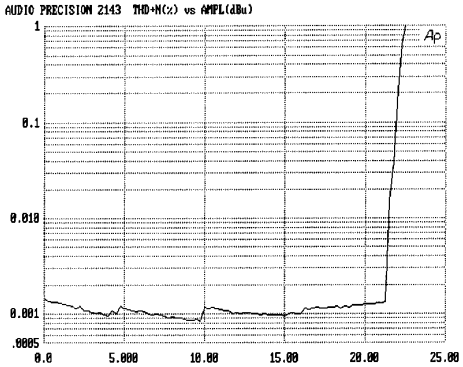


Figure 31. SSM2142/SSM2143 System Headroom–See Text—(V_S = ±18 V, R_L = 10 kΩ, 500' Cable)

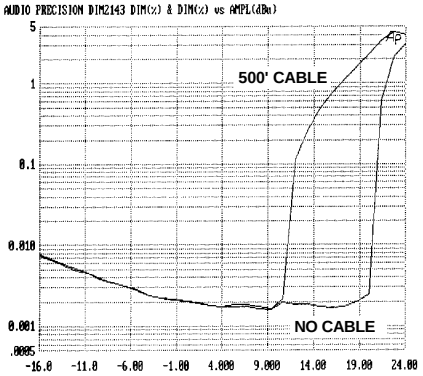


Figure 32. SSM2142/SSM2143 System DIM-100 Dynamic Intermodulation Distortion (V_S = ±18 V, R_L = 10 kΩ)

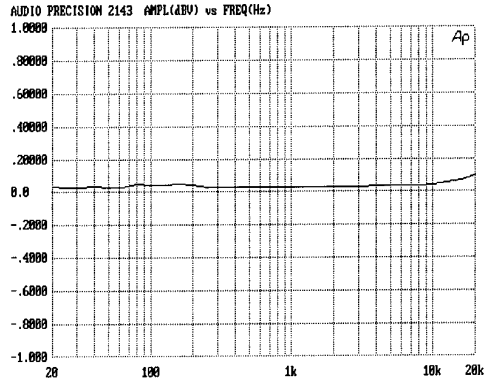


Figure 33. SSM2142/SSM2143 System Frequency Response (V_S = ±18 V, V_{IN} = 0 dBV, 500' Cable)

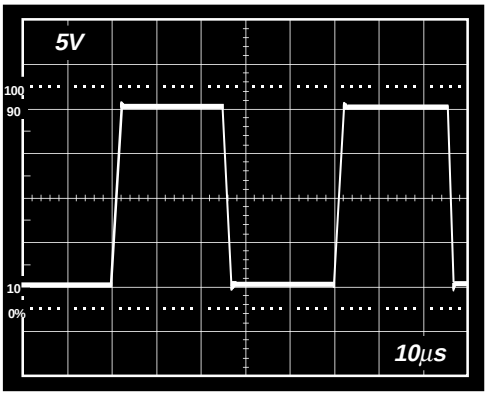
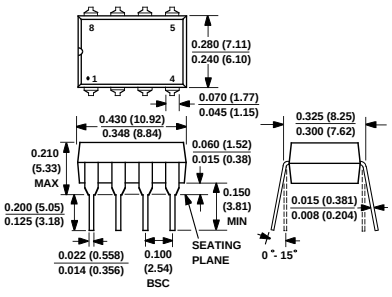


Figure 34. SSM2142/SSM2143 System Large Signal Pulse Response (V_S = ±18 V, R_L = 10 kΩ, No Cable)

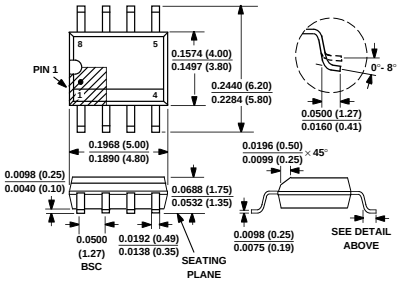
OUTLINE DIMENSIONS

Dimensions shown in inches and (mm).

N-8



SO-8



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