Signetics

NE649
Low Voltage Dolby Noise Reduction Circuit

Product Specification

Linear Products

DESCRIPTION

The NE649 is an audio noise reduction circuit designed for use in low voltage entertainment systems. The circuit is used to reduce the level of background noise introduced during the recording and playback of audio signals on magnetic tape and improve the noise level in FM broadcast reception. The circuit is intended for use in automotive and portable cassette Dolby™ B-Type noise reduction systems. This circuit is available only to licensees of Dolby Laboratories Licensing Corp., San Francisco.

Dolby is a trademark of Dolby Laboratories Licensing Corporation

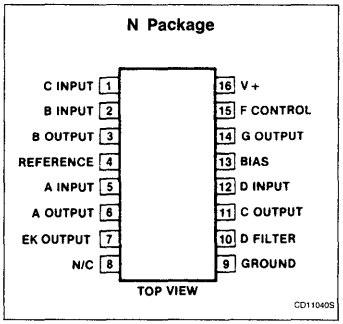
FEATURE

- **Low voltage operation**

APPLICATION

- **Tape decks**

PIN CONFIGURATION



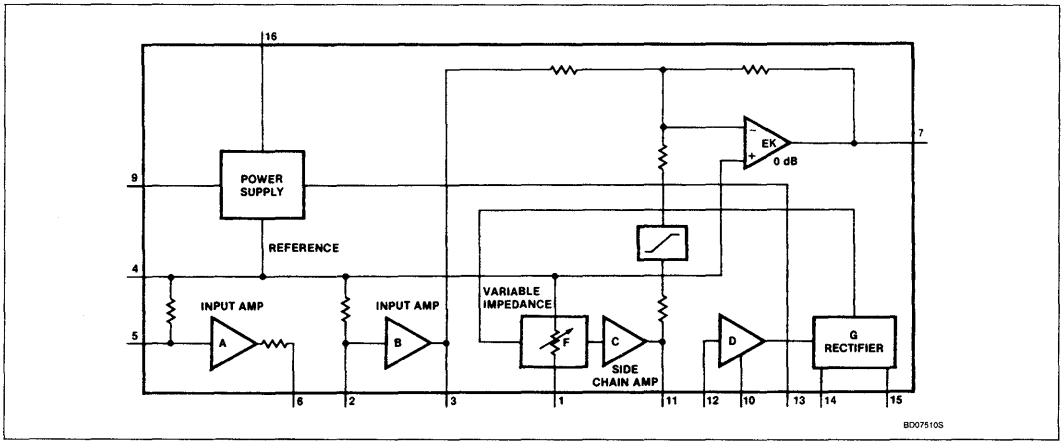
ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE
16-Pin Plastic DIP	0 to +70°C	NE649N

ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING	UNIT
V_{CC}	Supply voltage	16	V
T_A	Operating temperature range	−40 to +85	°C
T_{STG}	Storage temperature range	−65 to +150	°C
T_{SOLD}	Lead soldering temperature 10sec max	+300	°C

BLOCK DIAGRAM



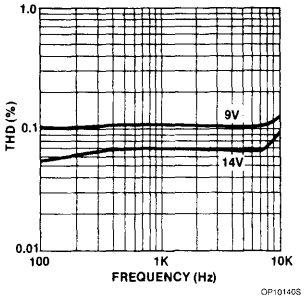
DC ELECTRICAL CHARACTERISTICS V_{CC} = 9V, f = 20Hz to 20kHz. All levels referenced to 580mV$_{RMS}$ (0dB) at Pin 3, T_A = +25°C, unless otherwise specified.

SYMBOL	PARAMETER	TEST CONDITIONS	NE649			UNIT
			Min	Typ	Max	
V_{CC}	Supply voltage range[3]		6	9	14	V
	Minimum voltage supply for 8dB headroom 10dB headroom	 f = 1.4kHz THD < 1%	 6.5 7.5			 V V
I_{CC}	Supply Current			11	18	mA
I_{CC}	Supply Current[1]				20	mA
A_V	Voltage gain (Pins 5 – 3)	f = 1kHz (Pins 6 and 2 connected)	24.5	26	27.5	dB
A_V	Voltage gain (Pins 3 – 7)	f = 1kHz, 0dB at Pin 3, noise reduction out	−0.5	0	+0.5	dB
	Distortion	f = 20kHz to 10kHz, 0dB f = 20Hz to 10kHz, +10dB		0.05 0.2	0.2 0.5	% %
	Signal Handling (See Performance Characteristics)					
S/N	Signal-to-noise ratio[2]	Record (Pins 6 and 2 connected) Playback (Pins 6 and 2 connected)	64 74	72 82		dB dB
	Record mode frequency response (at Pin 7) referenced to encode monitor point (Pin 3)	f = 1.4kHz 0dB −20dB −30dB	 −1.5 −17.1 −24.0	 0 −15.6 −22.5	 +1.5 −14.1 −21.0	 dB dB dB
		f = 5kHz 0dB −20dB −30dB −40dB	 −1.2 −18.3 −23.3 −30.2	 +0.3 −16.8 −21.8 −29.7	 +1.8 −15.3 −20.3 −28.2	 dB dB dB dB
		f = 20kHz 0dB −20dB −30dB	 −0.8 −18.8 −25.0	 +0.7 −17.3 −23.5	 +2.2 −15.8 −22.0	 dB dB dB
	Back-to-back frequency response	Using typical record mode response		±1.5		db
R_{IN}	Input resistance	Pin 5 Pin 2	35 3.1	50 4.2	65 5.3	kΩ kΩ
R_{OUT}	Output resistance	Pin 6 Pin 3 Pin 7	1.9	2.4 80 80	3.1 120 120	kΩ Ω Ω
	Record mode frequency response shift vs temperature vs V_{CC}	 0 to 70°C −40 to 85°C 6 to 14V				 dB dB dB/V

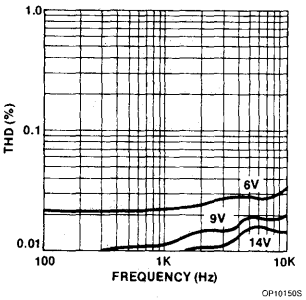
NOTES:
1. With electronic switching.
2. All noise levels are measured CCIR/ARM weighted using a 10k source with respect to Dolby level. See Dolby Laboratories Bulletin 19.
3. The circuit will function as low as V_{CC} = 4.5V (i.e., output signal present). See graphs of I_{CC} and signal handling vs V_{CC}.

TYPICAL PERFORMANCE CHARACTERISTICS

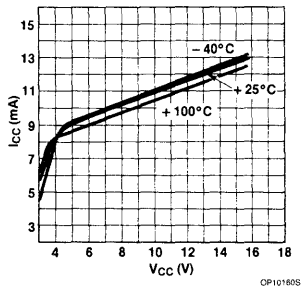
(+10dB) THD vs Frequency



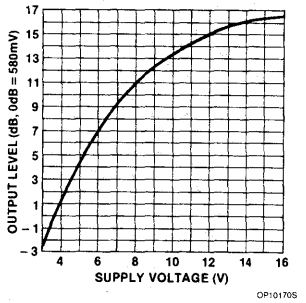
(0dB) THD vs Frequency



Current vs Supply Voltage



Maximum Signal Handling vs Supply Voltage for 1%THD (Record)



DOLBY ENCODER Output for constant level input (single tone frequency response)

FREQUENCY (kHz)	INPUT LEVEL (dB)								
	0 (DOLBY LEVEL)	-5	-10	-15	-20	-25	-30	-35	-40
0.1	0	0.1	0	0.1	0	0	0	0	0
0.14	0	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.1
0.2	0	0.3	0.4	0.5	0.5	0.6	0.6	0.5	0.5
0.3	0	0.3	0.6	1.1	1.3	1.3	1.3	1.3	1.3
0.4					2.0	2.1	2.2	2.3	2.1
0.5	0	0.3	0.8	1.8	2.6	2.9	2.9	3.0	2.9
0.6						3.6	3.7	3.8	3.7
0.7	0	0.4	0.9	2.1	3.5	4.3	4.4	4.5	4.4
0.8						4.8	5.0	5.3	5.1
0.9							5.6	5.8	5.6
1.0	0	0.4	1.0	2.3	4.2	5.7	6.1	6.3	6.2
1.2							6.9	7.1	7.1
1.4	0	0.3	0.9	2.3	4.4	6.6	7.5	7.7	7.7
2.0	0.1	0.4	0.9	2.2	4.3	7.0	8.5	8.9	8.9
3.0	0.2	0.6	0.9	1.9	3.9	6.6	8.8	9.7	9.7
5.0	0.3	0.6	1.0	1.7	3.2	5.4	8.2	10.0	10.3
7.0	0.3	0.6	1.0	1.7	2.8	4.7	7.3	9.7	10.4
10.0	0.4	0.7	1.1	1.7	2.6	4.2	6.5	9.1	10.4
14.0	0.5	0.8	1.1	1.8	2.7	4.4	6.5	8.7	10.3
20.0	0.7	0.7	1.2	1.9	2.7	4.4	6.5	8.7	10.3

NOTE:
The figures given in this table are the average response of many of Dolby Laboratories' professional encoders, and are not intended to be taken as required consumer equipment performance characteristics. Thus, no inference should be drawn on the tolerance which licensees must retain in consumer equipment. The figures can, however, be used to plot typical characteristics.

TEST CIRCUIT