Signetics

NE650
Dolby B-Type Noise Reduction Circuit

Product Specification

Linear Products

DESCRIPTION

The NE650 is a monolithic audio noise reduction circuit designed for use in Dolby™B-Type noise reduction systems. The NE650 is used to reduce the level of background noise introduced during recording and playback of audio signals on magnetic tape.

The NE650 features excellent dynamic characteristics over a wide range of operating conditions and is pin-compatible with NE645/646. This circuit is available only to licensees of Dolby Laboratories Licensing Corp., San Francisco.

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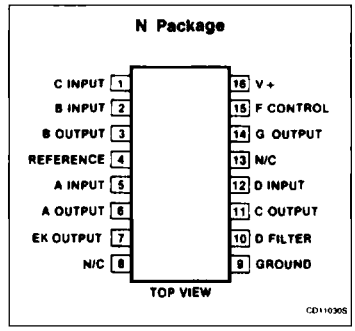
PIN CONFIGURATION



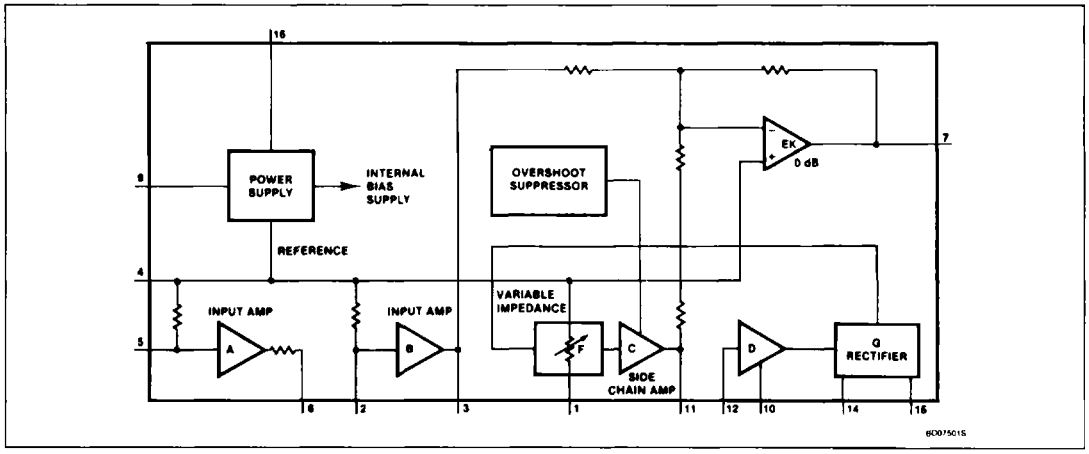
ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE
16-Pin Plastic DIP	0 to +70°C	NE650N

ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING	UNIT
V_{CC}	Supply voltage	24	V
	Temperature range		
T_A	Operating ambient	0 to +70	°C
T_{STG}	Storage	−65 to +150	°C
T_{SOLD}	Lead soldering temperature (10 sec. max)	+300	°C

BLOCK DIAGRAM



DC ELECTRICAL CHARACTERISTICS V_{CC} = 12V, f = 20Hz to 20kHz. All levels referenced to 580mV_{RMS}(0db) at Pin 3, T_A = +25°C, unless otherwise noted.

SYMBOL	PARAMETER	TEST CONDITIONS	NE650			UNIT
			Min	Typ	Max	
V_{CC}	Supply voltage range		8		20	V
I_{CC}	Supply current	Electronic switching on		16	24	mA
A_V	Voltage gain (Pins 5 - 3)	f = 1kHz (Pins 6 and 2 connected)	25.5	26	26.5	dB
A_V	Voltage gain (Pins 3 - 7)	f = kHz, 0dB at Pin 3, noise reduction out	-0.5	0	+0.5	dB
A_V	Voltage gain (Pins 2 - 3)	f = 1kHz		13		dB
	Distortion THD: 2nd and 3rd harmonic	f=20Hz to 10kHz, 0dB f=20Hz to 10kHz, +10dB		0.05 0.15	0.1 0.3	% %
	Signal handling	1% distortion at 1kHz	+12	+15		dB
S/N	Signal-to-noise ratio*	Record mode Playback mode	68 78	72 82		dB dB
	Back-to-back frequency response	Using typical record mode response		±0.5		dB
	Record mode frequency response (at Pin 7) referenced to encode monitor point (Pin 3)	f = 1.4kHz 0dB -20dB -30dB	 -0.5 -16.1 -23.5	 0 -15.6 -22.5	 +0.5 -15.1 -21.5	 dB dB dB
		f = 5kHz 0dB -20dB -30dB -40dB	 -0.7 -17.3 -22.3 -30.2	 +0.3 -16.8 -21.8 -29.7	 +1.3 -16.3 -21.3 -29.2	 dB dB dB dB
		f = 20kHz 0dB -20dB -30dB	 -0.3 -18.3 -24.5	 +0.7 -17.3 -23.5	 +1.7 -16.3 -22.5	 dB dB 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
	Back-to-back frequency response shift vs T_A vs V_{CC}	 0°C to -70°C 8 to 20V		 ±0.4 ±0.4		 dB dB

NOTE:
*All noise levels are measured CCIR/ARM weighted using a 10k source with respect to Dolby level. See Dolby Laboratories Bulletin 19.

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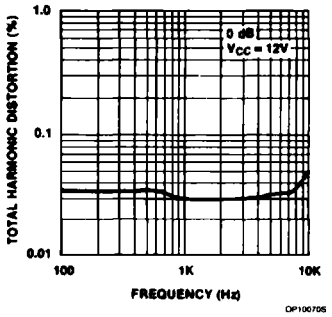
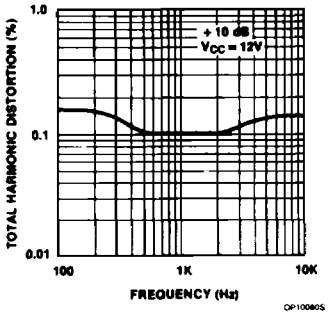
PERFORMANCE CHARACTERISTICS

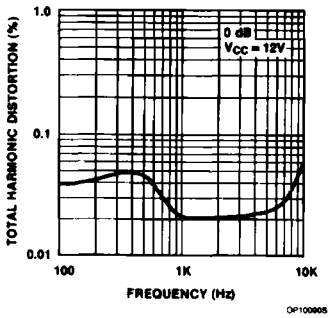
THD vs Frequency Record Mode



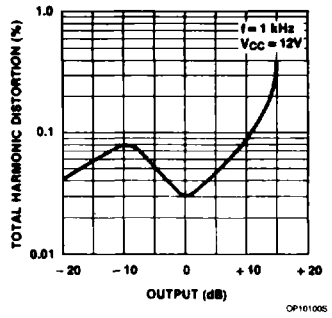
THD vs Frequency Record Mode



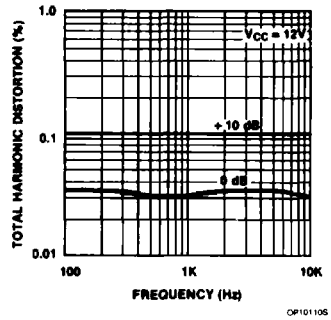
THD vs Frequency Play Mode



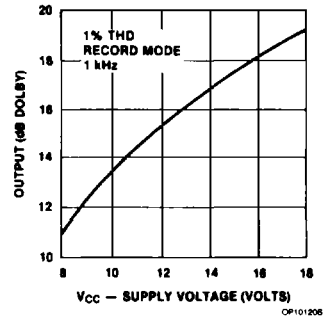
THD vs Output Record Mode



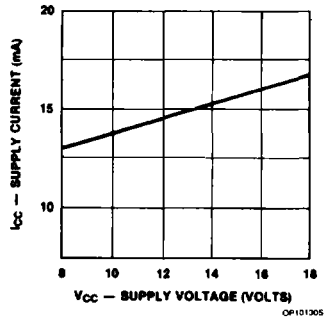
THD vs Frequency
Noise Reduction (NR) Off



Maximum Signal Handling vs
Supply Voltage



Supply Current vs
Supply Voltage



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.

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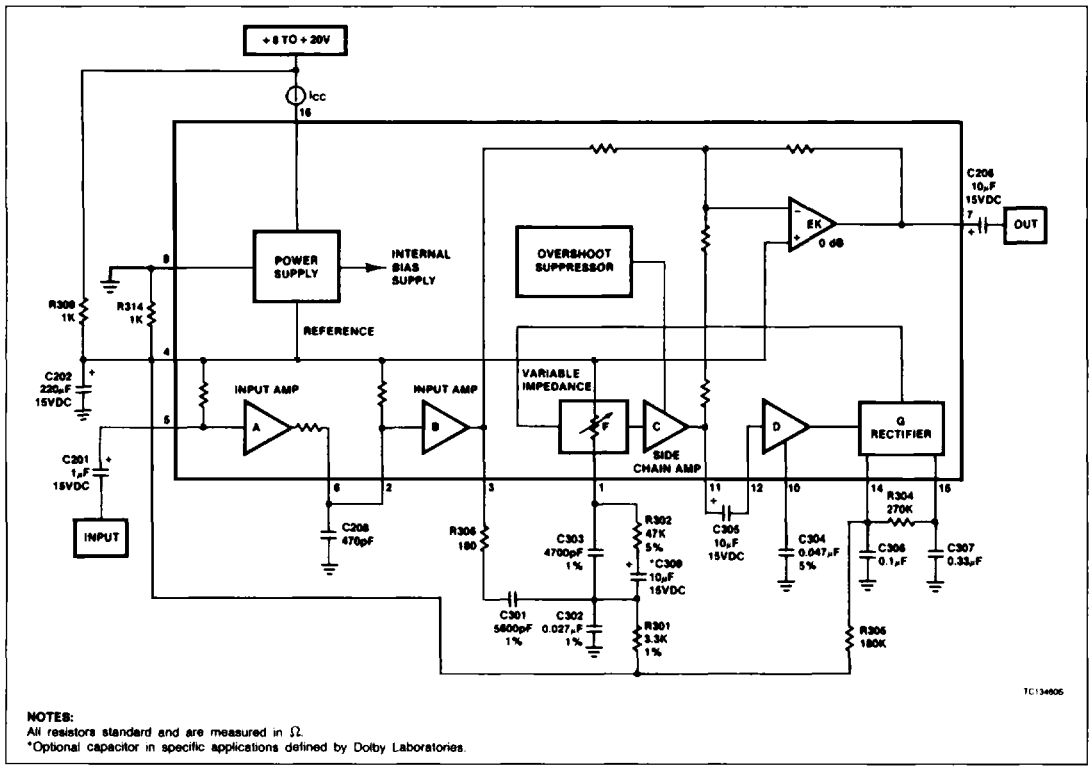
TEST CIRCUIT



NOTES:
All resistors standard and are measured in Ω.
*Optional capacitor in specific applications defined by Dolby Laboratories.