

Linear Products

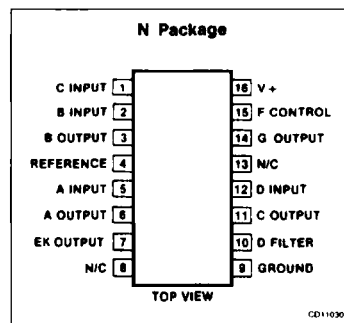
DESCRIPTION

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



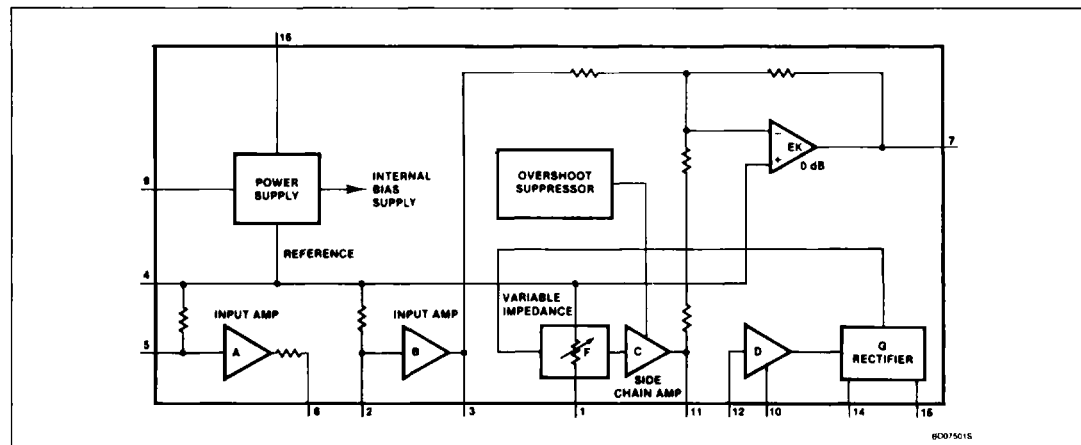
ORDERING INFORMATION

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
T _A	Temperature range	0 to +70	°C
T _{STG}	Operating ambient Storage	-65 to +150	°C
T _{SOLD}	Lead soldering temperature (10 sec. max)	+300	°C

BLOCK DIAGRAM



Dolby B-Type Noise Reduction Circuit

NE650

DC ELECTRICAL CHARACTERISTICS $V_{CC} = 12V$, $f = 20Hz$ to $20kHz$. All levels referenced to $580mV_{RMS}(0db)$ at Pin 3, $T_A = +25^{\circ}C$, 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	68	72		dB
		Playback mode	78	82		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	0	+0.5	dB
			-16.1	-15.6	-15.1	dB
			-23.5	-22.5	-21.5	dB
		$f = 5kHz$ 0dB -20dB -30dB -40dB	-0.7	+0.3	+1.3	dB
			-17.3	-16.8	-16.3	dB
			-22.3	-21.8	-21.3	dB
			-30.2	-29.7	-29.2	dB
		$f = 20kHz$ 0dB -20dB -30dB	-0.3	+0.7	+1.7	dB
			-18.3	-17.3	-16.3	dB
			-24.5	-23.5	-22.5	dB
R_{IN}	Input resistance	Pin 5	35	50	65	k Ω
		Pin 2	3.1	4.2	5.3	k Ω
R_{OUT}	Output resistance	Pin 6	1.9	2.4	3.1	k Ω
		Pin 3		80	120	Ω
		Pin 7		80	120	Ω
	Back-to-back frequency response shift vs T_A vs V_{CC}	$0^{\circ}C$ to $-70^{\circ}C$ 8 to 20V		± 0.4 ± 0.4		dB dB

NOTE:

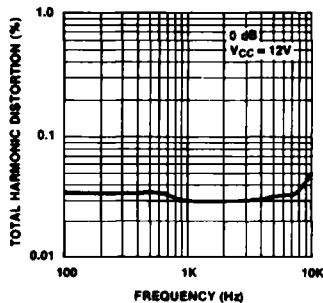
*All noise levels are measured CCIR/ARM weighted using a 10k source with respect to Dolby level. See Dolby Laboratories Bulletin 19.

Dolby B-Type Noise Reduction Circuit

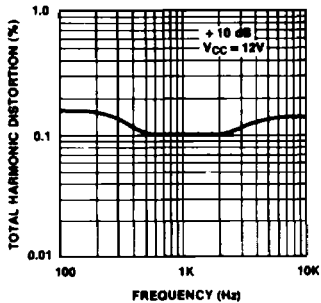
NE650

PERFORMANCE CHARACTERISTICS

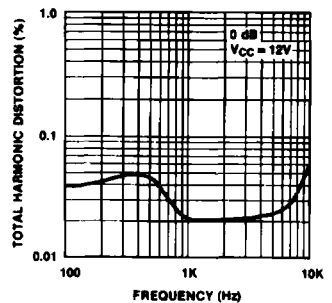
THD vs Frequency Record Mode



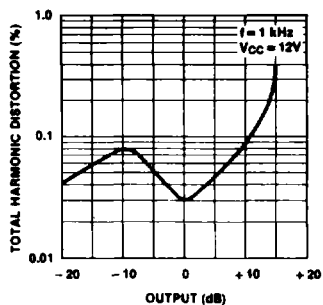
THD vs Frequency Record Mode



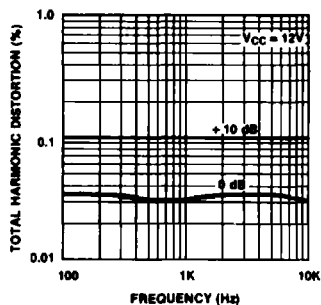
THD vs Frequency Play Mode



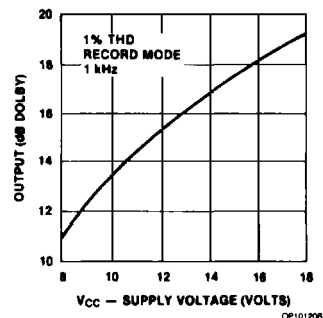
THD vs Output Record Mode



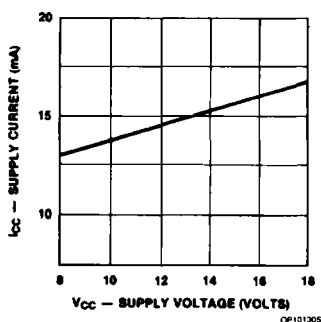
THD vs Frequency Noise Reduction (NR) Off



Maximum Signal Handling vs Supply Voltage



Supply Current vs Supply Voltage



Dolby B-Type Noise Reduction Circuit

NE650

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.

Dolby B-Type Noise Reduction Circuit

NE650

TEST CIRCUIT

