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NTE7230
Integrated Circuit
2 x 8W Stereo BTL Audio Output Amplifier with DC Volume Control

Description:

The NTE7230 is a stereo BTL output amplifier with DC volume control in a 13-Lead Staggered SIP type package designed for use in TVs and monitors, but is also suitable for battery-fed portable recorders and radios.

A missing current limiter (MCL) circuit is built-in. The MCL circuit is activated when the difference in current between the output terminal of each amplifier exceeds 100mA (typical 300mA). This level of 100mA allows for single-ended headphone applications.

Features:

- DC Volume Control
- Mute Mode
- Thermal Protection
- Short-Circuit Proof
- No Switch-On and Switch-Off Clicks
- Good Overall Stability
- Low Power Consumption
- Low HF Radiation
- ESD Protected on All Pins

Absolute Maximum Ratings:

Supply Voltage, V_P 18V
Input Voltage (Pin1, Pin3, Pin5, and Pin7), V_n 5V
Repetitive Peak Output Current, I_{ORM} 1.25A
Non-Repetitive Peak Output Current, I_{OSM} 1.5A
Total Power Dissipation (T_C < +60°C), P_{tot} 2.25W
Short-Circuit Time, t_{sc} . . . . 1 Hour
Virtual Junction Temperature, T_{VJ} . . . . +150°C
Operating Ambient Temperature Range, T_A . . . . -40° to +85°C
Storage Temperature Range, T_{stg} . . . . -55° to +150°C
Thermal Resistance, Junction-to-Case, R_{thJC} 4K/W
Thermal Resistance, Junction-to-Ambient (In Free Air), R_{thJA} 40K/W

Power Dissipation:

Assume V_P = 12V and R_L = 16∞. The maximum sine wave dissipation is 2 x 1.8W = 3.6W.

At $T_{A(max)}$ = +60°C:

$R_{th\ tot}$ = (150 − 60)/3.6 = 25K/W.

$R_{th\ tot} = R_{thJC} + R_{thCHS} = R_{thHS}$.

$R_{thCHS} + R_{thHS}$ = 25 − 4 = 21K/W.

Electrical Characteristics: (V_P = 12V, T_A = +25°C, f_i = 1kHz, R_L = 16∞ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Supply Voltage	V_P		4.5	–	18.5	V
Total Quiescent Current	$I_{q(tot)}$	V_P = 12V, R_L = ∞, Note 1	–	22	25	mA
Maximum Gain; $V_{1.7} \geq 1.4V$						
Output Power	P_O	THD = 10%, R_L = 16∞	3.0	3.5	–	W
		THD = 10%, R_L = 8∞	–	5.3	–	W
		THD = 10%, R_L = 8∞, V_P = 15V	–	8	–	W
Total Harmonic Distortion	THD	P_O = 0.5W	–	0.3	1.0	%
Voltage Gain	G_V		39.5	40.5	41.5	dB
Input Signal Handling (RMS Value)	$V_{i(RMS)}$	G_V = 0dB, THD < 1%	1	–	–	V
Noise Output Voltage	$V_{o(n)}$	f_i = 500kHz, Note 2	–	210	–	V
Bandwidth	B	at −1dB	–	Note 3	–	dB
Supply Voltage Ripple Rejection	SVRR	Note 4	34	38	–	dB
DC Output Offset Voltage	$\lvert V_{OS} \rvert$	$\lvert V_{13} - V_{11} \rvert$ and $\lvert V_{10} - V_8 \rvert$	–	0	200	mV
Input Impedance (Pin3 and Pin5)	Z_i		15	20	25	k∞
Channel Separation	α_{cs}	R_S = 5k∞	40	–	–	dB
Channel Unbalance	$\lvert G_v \rvert$	Note 5	–	–	1	dB
		G_1 = 0dB, Note 6	–	–	1	dB
Mute Position; $V_1 = V_7 = 0.4V \pm 30mV$						
Output Voltage in Mute Position	$V_{O(mute)}$	V_i = 1.0V, Note 7	–	35	45	V
DC Volume Control						
Gain Control Range	° G_V		68	73.5	–	dB
Volume Control Current	I_{DC}	$V_1 = V_7$ = 0V	–20	–25	–30	A

Note 1. With a load connected to the outputs the quiescent current will increase, the maximum value of this increase being equal to the DC output offset voltage divided by R_L.

Note 2. The noise output voltage (RMS value) at f_i = 500kHz is measured with R_S = 0∞ and bandwidth = 5kHz.

Note 3. 20Hz to 300kHz (typical).

Note 4. The ripple rejection is measured with R_S = 0∞ and f = 100Hz to 10kHz. The ripple voltage (V_{ripple} = 200mV RMS) is applied to the positive supply rail.

Note 5. The channel unbalance is measured with $V_{DC1} = V_{DC2}$.

Note 6. The channel unbalance at G_1 = 0dB is measured with $V_{DC1} = V_{DC2}$.

Note 7. The noise output voltage (RMS value) is measured with R_S = 5k∞ unweighted.

Functional Description:

The NTE7230 is a stereo BTL output amplifier with two DC volume control stages. The device is designed for TVs and monitors, but is also suitable for battery−fed portable recorders and radios.

In conventional DC volume control circuits, the control or input stage is AC−coupled to the output stage via external capacitors to keep the offset voltage low.

In the NTE7230 the two DC volume control stages are integrated into the input stages so that no coupling capacitors are required and a low offset voltage is still maintained. The minimum supply voltage also remains low.

The BTL principle offers th following advantages:

- Lower peak value of the supply current
- The frequency of the ripple on the supply voltage is twice the signal frequency

Consequently, a reduced power supply voltage with smaller capacitors can be used which results in cost reductions.

Functional Description (Cont'd):

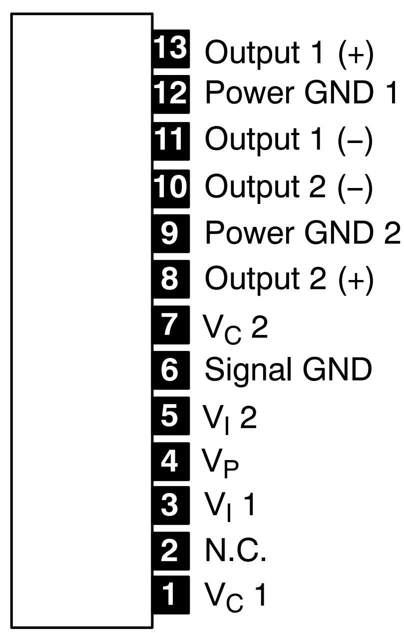
For portable applications there is a trend to decrease the supply voltage, resulting in a reduction of output power at conventional output stages. Using the BTL principle increases the output power.

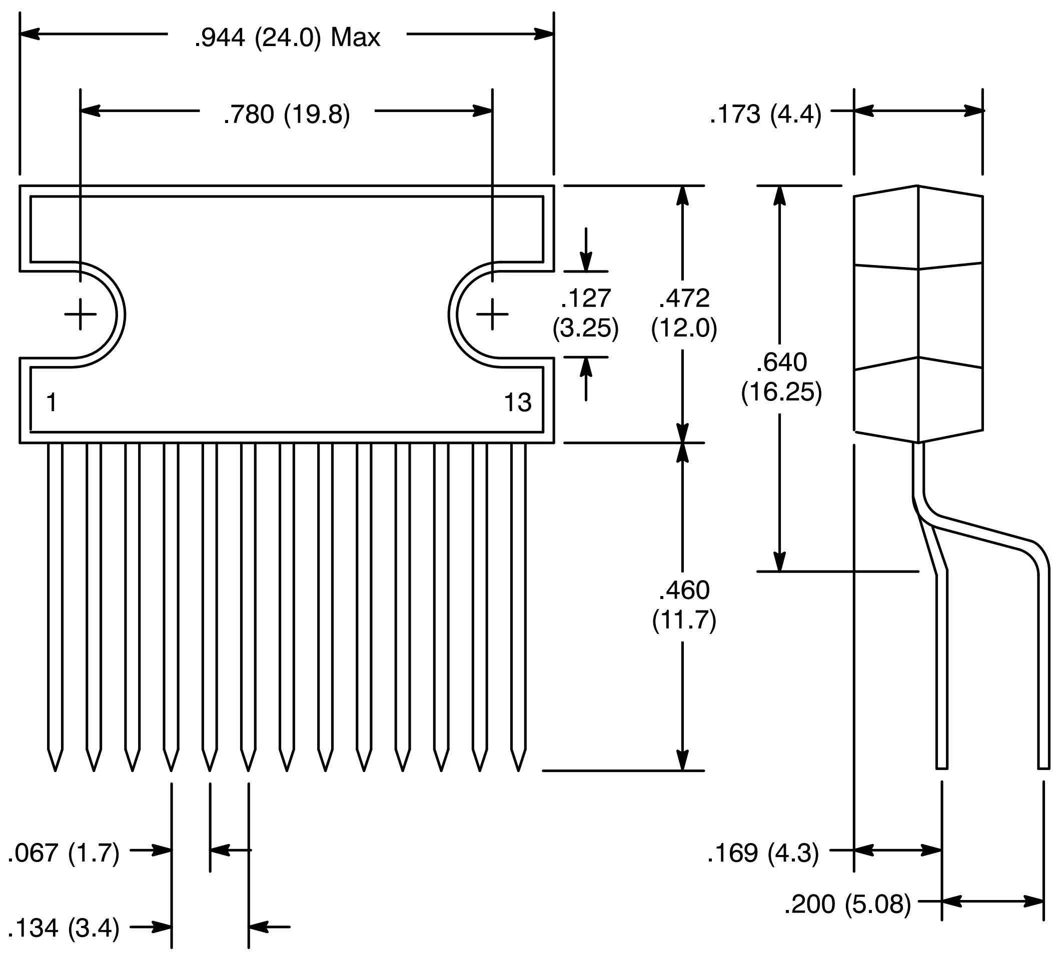
The maximum gain of the amplifier is fixed at 40.5dB. The DC volume control stages have a logarithmic control characteristic. Therefore, the total gain can be controlled from +40.5dB to –33dB. if the DC volume control voltage falls below 0.4V, the device will switch to the mute mode.

The amplifier is short–circuit protected to GND, V_P, and across the load. A thermal protection circuit is also implemented. If the crystal temperature rises above +150°C the gain will be reduced, thereby reducing the output power.

Special attention is given to switch–on and switch–off clicks, low HF radiation, and a good overall stability.

Pin Connection Diagram
(Front View)





.944 (24.0) Max
.780 (19.8)
.173 (4.4)
.127
(3.25)
.472
(12.0)
.640
(16.25)
1
13
.460
(11.7)
.067 (1.7)
.134 (3.4)
.169 (4.3)
.200 (5.08)