

NTE1803 Integrated Circuit Stereo Audio Control

Description:

The NTE1803 is an linear integrated circuit in a 18-Lead DIP type package designed as an active stereo tone/volume control for car radios, TV receivers, and audio equipment. It includes functions for bass and treble control, volume control with built-in contour (can be switched off), and balance. All these functions can be controlled by DC voltages or by single linear potentiometers. The bass and treble responses are defined by a single capacitor per control per channel.

Features:

- Few External Components Necessary
- Low Noise due to Internal Gain
- Bass Emphasis can be Increased by a Double-Pole Low-Pass Filter
- Wide Power Supply Range

Applications:

- Hi-Fi Radio
- Auto Radio
- TV
- Audio Systems

Absolute Maximum Ratings:

Supply Voltage (V_{3-18}), V_{CC}	20V
Total Power Dissipation, P_{TOT}	1200mW
Operating Ambient Temperature Range, T_A	-30° to +80°C
Storage Temperature Range, T_{stg}	-65° to +150°C

DC Electrical Characteristics: ($V_{CC} = 12V$, $T_A = +25^\circ C$, $R_G \leq 600\Omega$, $R_L \leq 4.7k\Omega$, $C_L \leq 200pF$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Supply (Pin3)						
Supply Voltage (V_{CC})	V_{3-18}		7.5	–	16.5	V
Supply Current (I_C)	I_3	$V_{CC} = 8.5V$	19	27	36	mA
		$V_{CC} = 12V$	25	35	45	mA
		$V_{CC} = 15V$	30	43	56	mA
DC Input Levels (Pin4 and Pin15)	$V_{4, 15-18}$	$V_{CC} = 8.5V$	3.8	4.25	4.7	V
		$V_{CC} = 12V$	5.3	5.9	6.6	V
		$V_{CC} = 15V$	6.5	7.3	8.2	V
DC Output Levels (Pin8 and Pin11) under all control voltage conditions with DC feedback	$V_{8, 11-18}$	$V_{CC} = 8.5V$	3.3	4.25	5.2	V
		$V_{CC} = 12V$	4.6	6.0	7.4	V
		$V_{CC} = 15V$	5.7	7.5	9.3	V
Pin17						
Application with Internal Potentiometer	V_{17-18}	$V_{CC} = 8.5V$	3.5	3.75	4.0	V
Contour ON/OFF Switch (Control by I_{17})	$-I_{17}$	Contour (Switch Open)	–	–	0.5	mA
		Linear (Switch Open)	1.5	–	10	mA
Application without Internal Potentiometer	V_{17-18}	$V_{CC} \geq 10.8V$, voltage range forced to Pin17(Contour cannot be switched OFF)	4.5	–	$V_{CC}/2 - V_{BE}$	V
DC Control Voltage Range for volume, bass, treble, and balance (Pin1, Pin9, Pin10, and Pin16 respectively)	$V_{1, 9, 10, 16}$	$V_{17-18} = 5V$	1.0	–	4.25	V
		Using internal supply	0.25	–	3.8	V
Input Current of Control Inputs (Pin1, Pin9, Pin10, and Pin16)	$-I_{1, 9, 10, 16}$		–	–	5	μA

AC Electrical Characteristics: ($V_{CC} = V_{3-18} = 12V$, $T_A = +25^\circ C$, contour switch closed (linear position), volume, balance, bass, and treble controls in mid-position, $R_G \leq 600\Omega$, $R_L \leq 4.7k\Omega$, $C_L \leq 200pF$, $f = 1kHz$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Control Range						
Maximum Gain of Volume	A_{Vmax}		20.5	21.5	23	dB
Volume Control Range	ΔA_V	A_{Vmax}/A_{Vmin}	90	100	–	dB
Balance Control Range	ΔA_V	$A_V = 0dB$	–	–40	–	dB
Bass Control Range at 40Hz	ΔA_V		± 12	± 15	–	dB
Treble Control Range at 16kHz	ΔA_V		± 12	± 15	–	dB
Signal Inputs, Outputs						
Input Resistance (Pin4 and Pin15)	$R_{14,15}$	$A_V = 20dB$, Note 1	10	–	–	k Ω
		$A_V = -40dB$, Note 1	–	160	–	k Ω
Output Resistance (Pin8 and Pin11)	$R_{O8,11}$		–	–	300	Ω

Note 1. Equation for input resistance:

$$R_I = \frac{160k\Omega}{1 + A_V}; A_{Vmax} = 12.$$

AC Electrical Characteristics (Cont'd): ($V_{CC} = V_{3-18} = 12V$, $T_A = +25^{\circ}C$, contour switch closed (linear position), volume, balance, bass, and treble controls in mid-position, $R_G \leq 600\Omega$, $R_L \leq 4.7k\Omega$, $C_L \leq 200pF$, $f = 1kHz$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Signal Processing						
Power Supply Ripple Rejection	PSRR	$V_{CC(RMS)} \leq 200mV$, $f = 100Hz$, $A_V = 0dB$	35	50	–	dB
Channel Separation (250Hz to 10kHz)	α_{CS}	$A_V = -20dB$ to $+21.5dB$	46	60	–	dB
Spread of Volume Control with Constant Control Voltage	ΔA_V	$V_{1-18} = 0.5V_{17-18}$	–	–	± 3	dB
Gain Tolerance Between Left and Right Channel	$\Delta A_{V, L-R}$	$V_{16-18} = V_{1-18} = 0.5V_{17-18}$	–	–	1.5	dB
Tracking Between Channels	ΔA_V	$A_V = 21.5dB$ to $-26dB$, $f = 250Hz$ to $6.3kHz$, balance adjusted at $A_V = 10dB$	–	–	2.5	dB
Signal Handling with DC Feedback						
Input Signal Handling	$V_{I(RMS)}$	$V_{CC} = 8.5V$, THD = 0.5%, $f = 1kHz$ (RMS Value)	1.4	–	–	V
		$V_{CC} = 8.5V$, THD = 0.7%, $f = 1kHz$ (RMS Value)	1.8	2.4	–	V
		$V_{CC} = 12V$, THD = 0.5%, $f = 40Hz$ to $16kHz$ (RMS Value)	1.4	–	–	V
		$V_{CC} = 12V$, THD = 0.7%, $f = 40Hz$ to $16kHz$ (RMS Value)	2.0	3.2	–	V
		$V_{CC} = 15V$, THD = 0.5%, $f = 40Hz$ to $16kHz$ (RMS Value)	1.4	–	–	V
		$V_{CC} = 15V$, THD = 0.7%, $f = 40Hz$ to $16kHz$ (RMS Value)	2.0	3.2	–	V
Output Signal Handling (Note 2, Note 3)	$V_{O(RMS)}$	$V_{CC} = 8.5V$, THD = 0.5%, $f = 1kHz$ (RMS Value)	1.8	2.0	–	V
		$V_{CC} = 8.5V$, THD = 10%, $f = 1kHz$ (RMS Value)	–	2.2	–	V
		$V_{CC} = 12V$, THD = 0.5%, $f = 40Hz$ to $16kHz$ (RMS Value)	2.5	3.0	–	V
		$V_{CC} = 15V$, THD = 0.5%, $f = 40Hz$ to $16kHz$ (RMS Value)	–	3.5	–	V
Noise Performance ($V_{CC} = 8.5V$)						
Output Noise Voltage (Unweighted) at $f = 20Hz$ to $20kHz$ (RMS value)	$V_{NO(RMS)}$	for maximum voltage gain, Note 4	–	260	–	μV
		$A_V = -3dB$, Note 4	–	70	140	μV
Output Noise Voltage (Weighted) CCIR recommendation 468–2 (peak value)	$V_{NO(M)}$	for maximum voltage gain, Note 4	–	890	–	μV
		for maximum emphasis of bass and treble (contour OFF, $A_V = -40dB$), Note 4	–	360	–	μV

Note 2. Frequencies below 200Hz and above 5kHz have reduced voltage swing. The reduction at 40Hz and at 16kHz is 30%.

Note 3. In the event of bass boosting the output signal handling is reduced. The reduction is 1dB for maximum bass boost.

Note 4. Linear frequency response.

AC Electrical Charactertistics (Cont'd): ($V_{CC} = V_{3-18} = 12V$, $T_A = +25^{\circ}C$, contour switch closed (linear position), volume, balance, bass, and treble controls in mid-position, $R_G \leq 600\Omega$, $R_L \leq 4.7k\Omega$, $C_L \leq 200pF$, $f = 1kHz$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Noise Performance ($V_{CC} = 12V$)						
Output Noise Voltage (Unweighted) at $f = 20Hz$ to $20kHz$ (RMS value), Note 5	$V_{NO(RMS)}$	for maximum voltage gain, Note 4	–	310	–	μV
		$A_V = -16dB$, Note 4	–	100	200	μV
Output Noise Voltage (Weighted) CCIR recommendation 468–2 (peak value)	$V_{NO(M)}$	for maximum voltage gain, Note 4	–	940	–	μV
		for maximum emphasis of bass and treble (contour OFF, $A_V = -40dB$)	–	400	–	μV
Noise Performance ($V_{CC} = 15V$)						
Output Noise Voltage (Unweighted) at $f = 20Hz$ to $20kHz$ (RMS value), Note 5	$V_{NO(RMS)}$	for maximum voltage gain, Note 4	–	350	–	μV
		$A_V = -16dB$, Note 4	–	110	220	μV
Output Noise Voltage (Weighted) CCIR recommendation 468–2 (peak value)	$V_{NO(M)}$	for maximum voltage gain, Note 4	–	980	–	μV
		for maximum emphasis of bass and treble (contour OFF, $A_V = -40dB$)	–	420	–	μV

Note 4. Linear frequency response.
Note 5. For peak values add 4.5dB to RMS values.



