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NTE7072
Integrated Circuit
Dual DC Controlled Potentiometer Circuit

Description:

The NTE7072 is a monolithic integrated circuit designed for use as a volume and tone control circuit in stereo amplifiers. This dual tandem potentiometer IC consists of two ganged pairs of electronic potentiometers with eight inputs connected via impedance converters, and the four outputs driving individual operational amplifiers. The setting of each electronic potentiometer pair is controlled by an individual DC control voltage. The potentiometers operate by current division between the arms of cross–coupled long–tailed pairs. The current division factor is determined by the level and polarity of the DC control voltage with respect to an externally available reference level of half the supply voltage. Since the electronic potentiometers are adjusted by a DC control voltage, each pair can be controlled by single linear potentiometers which can be located in any position dictated by the equipment styling. Since the input and feedback impedances around the operational amplifier gain blocks are external, the NTE7072 can perform bass/treble and volume/loudness control. It also can be used as a low–level fader to control the sound distribution between the front and rear loudspeakers in car radio installations.

Features:

- High impedance inputs to both ‘ends’ of each electronic potentiometer
- Ganged potentiometers track within 0.5dB
- Electronic rejection of supply ripple
- Internally–generated reference level available externally so that the control voltage can be made to swing positively and negatively around a well–defined 0V level
- The operational amplifiers have push–pull outputs for wide voltage swing and low current consumption
- The operation amplifier outputs are current limited to provide output short–circuit protection
- Although designed to operate from a 20V supply (giving a maximum input and output signal level of 6V), the NTE7072 can work from a supply as low as 7.5V with reduced input and output signal levels

Applications:

- Volume Control
- Tone Control
- Low Level Fader

Absolute Maximum Ratings:

Supply Voltage (Pin11), V_{CC} 23V

Control Voltages (Pin9 and Pin10) 1V

Input Voltage Ranges at Pin3, Pin4, Pin5, Pin6, Pin13, Pin14, Pin15, and Pin16, V_I (With respect to Pin18) . . . . . 0 to V_{CC}

Total Power Dissipation, P_{TOT} 800mW

Thermal Resistance, Crystal–to–Ambient, R_{thCRA} . . . . . 80°C/W

Operating Ambient Temperature Range, T_A . . . . . –30° to +80°C

Storage Temperature Range, T_{stg} . . . . . –65° to +150°C

Electrical Characteristics (Treble and Bass Control Circuit): (T_A = +25°C, V_{CC} = 20V, R_G = 60Ω, R_L > 4.7kΩ, C_L < 30pF, f = 1kHz, with a linear frequency response (V_{C1} = V_{C2} = 0V), unless otherwise specified)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Supply Current	I_{CC}	Without load		14	22	30	mA
Frequency Response (–1dB)	f	V_{C1} = V_{C2} = 0V		10	–	20k	Hz
Voltage Gain	A_V	at linear frequency response (V_{C1} = V_{C2} = 0V)		–	0	–	dB
Gain Variation	ΔA_V	f = 1kHz, at maximum bass/treble boost or cut at $\pm V_{C1}$ = $\pm V_{C2}$ = 120mV		–	±1	–	dB
Bass Boost		at 40Hz (ref. 1kHz) V_{C2} = 120mV		–	17.5	–	dB
Bass Cut		at 40Hz (ref. 1kHz) $–V_{C2}$ = 120mV		–	17.5	–	dB
Treble Boost		at 16kHz (ref. 1kHz) V_{C1} = 120mV		–	16	–	dB
Treble Cut		at 16kHz (ref. 1kHz) $–V_{C1}$ = 120mV		–	16	–	dB
Total Harmonic Distortion	THD	$V_{O(RMS)}$ = 300mV	f = 1kHz (measured selectively)	–	0.002	–	%
			f = 20Hz to 20kHz	–	0.005	–	%
		$V_{O(RMS)}$ = 5V	f = 1kHz	–	0.015	0.1	%
			f = 20Hz to 20kHz	–	0.05	0.1	%
Signal Level	V_I, $V_{O(RMS)}$	THD = 0.7% (input and output)		5.5	6.2	–	V
Power Bandwidth	BW	at reference level $V_{O(RMS)}$ = 5V (–3dB), THD = 0.1%		–	40	–	kHz
Output Noise Voltage	$V_{NO(RMS)}$	signal plus noise (RMS) value, f = 20Hz to 20kHz		–	75	–	µV
	$V_{NO(M)}$	noise (peak value) weighted to DIN 45405, CCITT filter		–	160	230	µV
Crosstalk Attenuation (Stereo)	∝CT	f = 1kHz		–	86	–	dB
		f = 20Hz to 20kHz		–	80	–	dB
Control Voltage Crosstalk to the Outputs	–∝CT	f = 1kHz, $V_{C1(RMS)}$ = $V_{C2(RMS)}$ = 1mV		–	20	–	dB
Ripple Rejection	∝100	f = 100Hz, $V_{CC(RMS)}$ < 200mV		–	46	–	dB

Pin Connection Diagram