

NTE789

Integrated Circuit

Stereo Multiplex Decoder

Description:

The NTE789, a monolithic silicon integrated circuit, is a stereo multiplex decoder intended for FM multiplex systems.

This stereo multiplex decoder requires only one low-inductance tuning coil (requires only one adjustment for complete alignment), provides automatic stereo switching, energizes a stereo indicator lamp, and operates from a wide range of voltage supplies.

Figure 1 shows the block diagram for the NTE789. The input signal from the detector is amplified by a low-distortion preamplifier and simultaneously applied to both signal, generated by a local voltage-controlled oscillator (VCO), is counted down by two frequency dividers to a 38kHz signal and to two 19-kHz pilot-tone supplied by the FM detector is compared to the locally generated 19-kHz signal in a synchronous detector.

The resultant signal controls the voltage controlled oscillator (VCO) so that it produces an output signal to phase-lock the stereo decoder with the pilot tone. A second synchronous detector compares the locally generated 19-kHz signal with the 19-kHz pilot tone. If the pilot tone exceeds an externally adjustable threshold voltage, a Schmitt trigger circuit is energized. The signal from the Schmitt trigger lights the stereo indicator, enables the 38-kHz synchronous detector, and automatically switches the NTE789 from monaural to stereo operation. The output signal from the 38-kHz detector and the composite signal from the preamplifier are applied to a matrixing circuit from which emerge the resultant left and right channel audio signals. These signals are applied to their respective left and right post amplifiers for amplification to a level sufficient to drive most audio amplifiers.

The NTE789 utilizes the 16-lead quad-in-line plastic package and operates over the ambient temperature range of -40°C to +85°C.

Features:

- Requires the use of only one low-inductance tuning coil
- Automatic stereo switching
- Directly drives a stereo indicator lamp up to 100mA
- Includes driver for stereo-lamp indicator
- Operates from a wide range of power supplies: 10 to 16 volts
- Requires only one adjustment for alignment
- Switching from monaural to stereo and stereo to monaural produces no audible thumps
- Low distortion: under 0.5%
- Separate dc input permits stereo defeat or enable
- High signal output: directly drives audio amplifiers
- Excellent SCA (storecast) rejection: 55dB typ.
- High audio channel separation: 40dB typ.

Absolute Maximum Ratings: ($T_A = +25^{\circ}\text{C}$ unless otherwise specified)

DC Supply Voltage	16V
Current at Pin12	100mA
Input Signal Voltage (Composite)(Note 1)	400mV
Operating Ambient Temperature Range	-40 to $+85^{\circ}\text{C}$
Storage Ambient Temperature Range	-65 to $+150^{\circ}\text{C}$
Lead Temperature (During Soldering, 1/32" (0.79mm) from case, 10s max.)	$+265^{\circ}\text{C}$

Note 1. For stereo operation, a minimum input signal voltage (composite) of 40mV is required.

Electrical Characteristics: ($T_A = +25^{\circ}\text{C}$, $V_+ = 12$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Static Characteristics						
Total Current (Pin9, Pin10, Pin11)	I_{total}	Lamp OFF	–	22	27	mA
DC Voltage Pin1	V_1		1.6	2.3	3.1	V
Pin6 (Indicator Lamp OFF)	V_6		–	2.1	3.6	V
Pin9 and Pin10	V_9, V_{10}		3.7	5.4	7.4	V
Pin12 (Indicator Lamp OFF)	V_{12}	$V_+ = 16\text{V}$	12.7	–	–	V
Voltage Differential (Pin2 – Pin1)	$V_2 - V_1$		–	0	0.1	V
Current at Pin12 (In actual use external circuit resistance (e.g. lamp should limit Pin12 to the maximum rated value of 100mA)		V_{IN} (at $f = 19\text{kHz}$) = 18mV	75	100	–	mA
Static Characteristics						
Input Impedance	Z_{in}		–	50k	–	Ω
Channel Separation (L + R Reference)		$V_{\text{IN}} = 180\text{mV}$, Note 3	25	40	–	dB
Channel Balance (Monaural)		$V_{\text{IN}} = 180\text{mV}$	–	0.3	3.0	dB
Monaural Gain		$V_{\text{IN}} = 180\text{mV}$	3	6	9	dB
Stereo/Monaural Gain Ratio		$V_{\text{IN}} = 180\text{mV}$, Note 3	–	± 0.3	± 3.0	dB
Indicator Lamp – Turn-ON Voltage		19kHz pilot-tone at Pin1	–	4	–	mV
Capture Range (Deviation from 76kHz center frequency)		19kHz pilot-tone voltage = 18mV	± 6.6	± 10	–	%
Distortion (75 μs De-emphasis) 2 nd Harmonic		$V_{\text{IN}} = 240\text{mV}$	–	0.2	–	%
3 rd , 4 th , and 5 th Harmonic			–	< 0.1	–	%
19kHz Rejection			–	35	–	dB
38kHz Rejection			–	25	–	dB
SCA (Storecast) Rejection			–	55	–	dB
Stereo Defeat Voltage (V_4)			–	–	< 0.9	V
Stereo Enable Voltage (V_4)			> 1.6	–	–	V

Note 2. For improved pilot sensitivity and overload characteristics, replace the .039 μF capacitor between Pin7 and Pin8 with a Series L–C Network ($L = 4.7\text{mH}$, $C = 0.015\mu\text{F}$). Under these conditions, Indicator Lamp Sensitivity: “ON” = 3.3mV, “OFF” = 2.0mV.

Note 3. For stereo operation, test conditions require a composite stereo input signal (modulated at 1kHz) including a 19kHz (18mV) pilot-tone signal.

Pin Connection Diagram

Composite FM	1	16	Indicator Input
Detected Signal Input	2	15	76kHz Network
Bypass	3	14	Capacitor Input
GND	4	13	76kHz Network
GND	5	12	Phase Lock Filter
GND	6	11	Loop Network
RC Network	7	10	GND
19kHz Pilot Lamp	8	9	Lamp Drive Circuit
Sensitivity Network			(+) V _{CC}
			Right Ch Output
			Left Ch Output

