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## NTE1657 Integrated Circuit Phase Lock Loop (PLL) FM Stereo Multiplex

**Description:**

The NTE1657 is a PLL FM stereo multiplex integrated circuit in a 9-Lead SIP type package suitable for automotive applications and portable radio applications because of space merit by the package and wide supply voltage range.

**Features:**

- Excellent Pilot Lamp Sensitivity:  $V_{L(ON)} = 9mV_{rms}$  (Typ)
- Suitable for LED Driving:  $I_{LAMP} = 20mA$  (Max)
- Recommended Input Voltage Range:  $V_{IN} = 200$  to  $500mV_{rms}$
- Operating Supply Voltage Range:  $V_{CC} = 3.5$  to  $12V$
- Excellent Channel Separation Through Entire Audio Frequency Range:  $Sep = 45dB$  (Typ)
- Low Distortion:  $THD = 0.08\%$  (Typ) @  $V_{IN} = 200mV_{rms}$  (Stereo)
- VCO Stop Capability (The VCO is stopped when the pin 7 is connected with the power supply line and then the stereo indicator is turn off).
- Easy Adjustment (The monitored free running frequency of VCO is  $38kHz$  @ Pin6).

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

Supply Voltage, $V_{CC}$ .....	12V
Lamp Voltage, $V_{LAMP}$ .....	16V
Lamp Current, $I_{LAMP}$	
Continuous .....	20mA
Peak .....	40mA
Power Dissipation, $P_D$ .....	500mW
Derate Above $25^\circ C$ .....	4mW/ $^\circ C$
Operating Temperature Range, $T_{opr}$ .....	$-30^\circ$ to $+75^\circ C$
Storage Temperature Range, $T_{stg}$ .....	$-55^\circ$ to $+150^\circ C$

**DC Characteristics:** ( $V_{CC} = 8V$ , Pin Voltage at No Signal, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input (Pin1)	$V_1$		–	3.5	–	V
LP Filter 1 (Pin2)	$V_2$		–	6.6	–	V
$V_{CC}$ (Pin3)	$V_3$		–	8.0	–	V
VCO (Pin4)	$V_4$		–	7.1	–	V
GND (Pin5)	$V_5$		–	0	–	V
Stereo Lamp (Pin6)	$V_6$		–	–	–	V
LP Filter 2	$V_7$		–	7.4	–	V
Left Channel Output (Pin8)	$V_8$		–	4.0	–	V
Right Channel Output (Pin9)	$V_9$		–	4.0	–	V

**AC Electrical Characteristics:** ( $T_A = +25^\circ C$ ,  $V_{CC} = 8V$ ,  $f = 1kHz$ , unless otherwise specified)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit	
Supply Current	$I_{CC}$	at Lamp Off	–	11	18	mA	
Input Resistance	$R_{IN}$		–	33	–	k $\Omega$	
Max Composite Signal Input Voltage	$V_{IN}$ Max Stereo	L + R = 90%, P = 10%	–	550	–	mV <sub>rms</sub>	
Separation	Sep	L – R = 180mV <sub>rms</sub> , P = 20mV <sub>rms</sub>	36	45	–	dB	
Total Harmonic Distortion Monaural	THD	$V_{IN} = 200mV_{rms}$	–	0.08	0.3	%	
Stereo		L + R = 180mV <sub>rms</sub> , P = 20mV <sub>rms</sub>	–	0.08	–	%	
Voltage Gain	$G_V$	$V_{IN} = 200mV_{rms}$	–2.0	0.5	+2.0	dB	
Channel Balance	CB	$V_{IN} = 200mV_{rms}$	–	0	1.5	dB	
Lamp Sensitivity ON	$V_{L(ON)}$	Pilot Input	–	10	15	mV <sub>rms</sub>	
OFF	$V_{L(OFF)}$		2	6	–	mV <sub>rms</sub>	
Stereo Lamp Hysteresis	$V_H$	To Turn Off From Lamp Turn On	–	3	–	mV <sub>rms</sub>	
Capture Range	CR	P = 20mV <sub>rms</sub>	–	$\pm 3$	–	%	
Carrier Leak 9kHz	CL	L + R = 180mV <sub>rms</sub> , P = 20mV <sub>rms</sub>	–	34	–	dB	
38kHz			–	42	–	dB	
SCA Rejection Ratio	SCA Rej	L + R = 160mV <sub>rms</sub> , P = 20mV <sub>rms</sub> SCA = 20mV <sub>rms</sub> , $f_{SCA} = 67kHz$	–	70	–	dB	
Signal-to-Noise Ratio	S/N	$V_{IN} = 180mV_{rms}$ , $f = 1kHz$ , $R_g = 620\Omega$	–	74	–	dB	
Output Current (Pin8, Pin9)	$I_{OUT}$	$R_L = 3.3k\Omega$	$V_{CC} = 3.5V$	–	0.3	0.6	mA
			$V_{CC} = 8V$	–	1.2	1.8	mA
			$V_{CC} = 12V$	–	1.4	2.1	mA

**Pin Connection Diagram**  
(Front View)

