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NTE7243
Integrated Circuit
Precision Voltage to Frequency Converter
8−Lead DIP

Description:

The NTE7243 is a voltage−to−frequency converter ideally suited for use in simple low−cost circuits for analog−to−digital conversion, precision frequency−to−voltage conversion, long−term integration, linear frequency modulation or demodulation, and many other functions. The output when used as a voltage−to−frequency converter is a pulse train at a frequency precisely proportional to the applied input voltage. Thus, it provides all the inherent advantages of the voltage−to−frequency conversion techniques, and is easy to apply in all standard voltage−to−frequency converter applications.

Further, the NTE7243 attains a new high level of accuracy versus temperature which could only be attained with expensive voltage−to−frequency modules. Additionally the NTE7243 is ideally suited for use in digital systems at low power supply voltages and can provide low−cost analog−to−digital conversion in microprocessor−controlled systems. And, the frequency from a battery−powered voltage−to−frequency converter can be easily channeled through a simple photo isolator to provide isolation against high common−mode levels.

Features:

- Ensured Linearity 0.01% Maximum
- Improved Performance in Existing Voltage−to−Frequency Conversion Applications
- Split or Single−Supply Operation
- Operates on Single 5V Supply
- Pulse Output Compatible With All Logic Forms
- Excellent Temperature Stability: ±50 ppm/°C Maximum
- Low Power Consumption: 15mW Typical at 5V
- Wide Dynamic Range, 100dB Minimum at 10−kHz Full Scale Frequency
- Wide Range of Full Scale Frequency: 1Hz to 100kHz
- Low−Cost

Applications:

- Voltage to Frequency Conversions
- Frequency to Voltage Conversions
- Remote−Sensor Monitoring
- Tachometers

RoHS
2002/95/EC

Absolute Maximum Ratings: (Note 1, Note 2)

Supply Voltage, Vs 40V
Output Short Circuit to Ground . . . . Continuous
Output Short Circuit to V_{CC} . . . . Continuous
Input Voltage, V_I . . . . −0.2 to $+V_SV$
Package Dissipation (T_A = +25°C, Note 3), P_D 1.25W
Thermal Resistance, Junction−to−Ambient, R_{thJA} . . . . 100°C/W
Lead Temperature (Soldering, 10sec.), T_L . . . . +260°C
Electrostatic Discharge (Note 4), $V_{(ESD)}$ . . . . ±500V

Note 1. Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under “Recommended Operating Conditions”. Exposure to absolute−maximum−rated conditions for extended periods may affect reliability.

Note 2. All voltages are measured with respect to GND = 0V, unless otherwise noted.

Note 3. The absolute maximum junction temperature (T_Jmax) for this device is +150°C. The maximum allowable power dissipation is dictated by T_Jmax, the junction−to−ambient thermal resistance (R_{thJA}), and the ambient temperature T_A, and can be calculated using the formula $P_Dmax = (T_Jmax - T_A) / R_{thJA}$. The values for maximum power dissipation will be reached only when the device is operated in a severe fault condition (e.g., when input or output pins are driven beyond the power supply voltages, or the power supply polarity is reversed). Obviously, such conditions should always be avoided.

Note 4. Human body model, 100pF discharge through a 1.5kΩ resistor.

Recommended Operating Conditions:

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Supply Voltage	V_S	Note 5	4	–	40	V
Operating Ambient Temperature			0	–	70	°C

Note 5. All voltages are measured with respect to GND = 0V, unless otherwise noted.

Electrical Characteristics: (4.0V ≤ V_S ≤ 40V, T_A = +25°C unless otherwise specified)

Parameter	Test Conditions	Min	Typ	Max	Unit
VFC Non−Linearity	4.5V ≤ V_S ≤ 20V, Note 6	–	±0.003	±0.01	%Full−Scale
	$T_{MIN} \le T_A \le T_{MAX}$	–	±0.006	±0.02	%Full−Scale
VFC Non−Linearity in Circuit	V_S = 15V, f = 10Hz to 11kHz	–	±0.024	±0.14	%Full−Scale
Conversion Accuracy Scale Factor (Gain)	V_{IN} = −10V, R_S = 14kΩ	0.9	1	1.1	KHz/V
Temperature Stability of Gain	$T_{MIN} \le T_A \le T_{MAX}$ 4.5V ≤ 20V	–	±20	±50	ppm/°C
Change of Gain with V_S	4.5V ≤ V_S ≤ 10V	–	0.01	0.1	%/V
	10V ≤ V_S ≤ 40V	–	0.006	0.06	%/V
Rated Full−Scale Frequency	V_{IN} = −10V	10.0	–	–	–
Gain Stability vs. Time (1000 Hours)	$T_{MIN} \le T_A \le T_{MAX}$	–	±0.02	–	%Full−Scale
Over Range (Beyond Full−Scale) Frequency	$V_I - V_O$ = 125V, t = 30ms	100	250	–	mA
Input Comparator					
Offset Voltage	$T_{MIN} \le T_A \le T_{MAX}$	–	±3	±10	mV
Bias Current		–	−80	−300	nA
Offset Current		–	±8	±100	nA
Common−Mode Range	$T_{MIN} \le T_A \le T_{MAX}$	−0.2	–	V_{cc}−2	V
Timer					
Timer Threshold Voltage, Pin 5		0.63 x V_S	0.667 x V_S	0.7 x V_S	–
Input Bias Current, Pin 5	$V_{PIN\ 5}$ = 10V	–	200	500	nA
$V_{SAT\ PIN\ 5}$ (Reset)	I = 5 mA	–	0.22	0.5	V

Note 6. Non−linearity is defined as the deviation of f_{OUT} from V_{IN} x (10 kHz/−10 V_{DC}) when the circuit has been trimmed for zero error at 10Hz and at 10kHz, over the frequency range 1Hz to 11kHz.

Electrical Characteristics (Cont'd): (4.0V ≤ V_S ≤ 40V, T_A = +25°C, unless otherwise specified)

Parameter	Test Conditions	Min	Typ	Max	Unit
Current Source (Pin 1)					
Output Current	R_S = 14kΩ, $V_{PIN\ 1}$ = 0	116	136	144	μA
Change with Voltage	0V ≤ $V_{PIN\ 1}$ ≤ 10V	–	0.2	1	μA
Current Source OFF Leakage	T_A = T_{MAX}	–	2	50	nA
Operating Range of Current (Typical)			(10 to 500)		μA
Reference Voltage (Pin 2)					
Reference Voltage		1.7	1.89	2.08	V_{DC}
Stability vs. Temperature		–	±60	–	ppm/°C
Stability vs. Time (1000 Hours)		–	±0.1%	–	–
Logic Output (Pin 3)					
Saturation Voltage	I = 5 mA	–	0.15	0.5	V
	I = 3.2mA (2 TTL Loads), T_{MIN} ≤ T_A ≤ T_{MAX}	–	0.1	0.4	V
OFF Leakage		–	±0.05	1	μA
Supply Current					
Supply Current	V_S = 5V	2	3	4	mA

Pin Connection Diagram