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NTE7144
Integrated Circuit
BIMOS Operational Amplifier
w/MOSFET Input, Bipolar Output

Description:

The NTE7144 is an integrated circuit operational amplifier in an 8–Lead Mini–DIP type package that combines the advantages of high–voltage PMOS transistors with high–voltage bipolar transistors on a single monolithic chip. This device features gate–protected MOSFET (PMOS) transistors in the input circuit to provide very–high–input impedance, very–low–input current, and high–speed performance. The NTE7144 operates at supply voltages from 4V to 36V (either single or dual supply) and is internally phase–compensated to achieve stable operation in unity–gain follower operation.

The use of PMOS field–effect transistors in the input stage results in common–mode input–voltage capability down to 0.5V below the negative–supply terminal, an important attribute for single–supply applications. The output stage uses bipolar transistors and includes built–in protection against damage from load–terminal short–circuiting to either supply–rail or to GND.

Features:

- MOSFET Input Stage:
  - Very High Input Impedance
  - Very Low Input Current
  - Wide Common–Mode Input Voltage Range
  - Output Swing Complements Input Common–Mode Range
- Directly Replaces Industry Type 741 in Most Applications

Applications:

- Ground–Referenced Single–Supply Amplifiers in Automobile and Portable Instrumentation
- Sample and Hold Amplifiers
- Long–Duration Timers/Multivibrators (Microseconds – Minutes – Hours)
- Photocurrent Instrumentation
- Peak Detectors
- Active Filters
- Comparators
- Interface in 5V TTL Systems and other Low–Supply Voltage Systems
- All Standard Operational Amplifier Applications
- Function Generators
- Tone Controls
- Power Supplies
- Portable Instruments
- Intrusion Alarm Systems

Absolute Maximum Ratings:

DC Supply Voltage (Between V+ and V– Terminals) 36V
Differential–Mode Input Voltage . . . . ±8V
Common–Mode DC Input Voltage . . . . (V+ +8V) to (V– –0.5V)
Input–Terminal Current 1mA
Device Dissipation (Without Heatsink), P_D 630mW
Derate Linearly Above +55°C . . . . 6.67mW/°C
Device Dissipation (With Heatsink), P_D 1W
Derate Linearly Above +55°C . . . . 16.7mW/°C
Operating Temperature Range, T_{opr} . . . . –55° to +125°C
Storage Temperature Range, T_{stg} . . . . –65° to +150°C
Lead Temperature (During Soldering, 1/16” from case, 10sec max), T_L . . . . +265°C
Output Short–Circuit Duration (Note 1) . . . . Unlimited

Note 1. Short circuit may be applied to GND or to either supply.

Electrical Characteristics: (T_A = +25°C, V+ = +15V, V– = –15V unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Offset Voltage	$\|V_{IO}\|$		–	2	5	mV
Input Offset Current	$\|I_{IO}\|$		–	0.5	20	pA
Input Current	I_I		–	10	40	pA
Large–Signal Voltage Gain	A_{OL}	Note 2	20k	100k	–	V/V
			86	100	–	dB
Common–Mode Rejection Ratio	CMRR		–	32	320	µV/V
			70	90	–	dB
Common–Mode Input–Voltage Range	V_{ICR}		–15	–15.5 to +12.5	+12	V
Power Supply Rejection Ratio	$\Delta V_{IO}/\Delta V$		–	100	150	µV/V
	PSSR		76	80	–	dB
Maximum Output Voltage	$V_{OM}+$	R_L = 2kΩ	+12	+13	–	V
	$V_{OM}-$		–14	–14.4	–	V
Supply Current	I+		–	4	6	mA
Device Dissipation	P_D		–	120	180	mW
Input Offset Voltage Temp. Drift	$\Delta V_{IO}/\Delta T$		–	6	–	µA/°C
Input Resistance	R_I		–	1.5	–	TΩ
Input Capacitance	C_I		–	4	–	pF
Output Resistance	R_O		–	60	–	Ω
Equivalent Wideband Input Noise Voltage	e_n	BW = 140kHz, R_S = 1MΩ	–	48	–	µV
Equivalent Input Noise Voltage	e_n	R_S = 100Ω, f – 1kHz	–	40	–	nV/√Hz
		R_S = 100Ω, f = 10kHz	–	12	–	nV/√Hz
Short–Circuit Current to Opposite Supply Source	$I_{OM}+$		–	40	–	mA
Sink	$I_{OM}-$		–	18	–	mA

Note 2. V_O = 26V_{P-P}, +12V, –14V and R_L = 2kΩ.

Electrical Characteristics (Cont'd): (T_A = +25°C, V+ = +15V, V– = –15V unless otherwise specified)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Gain–Bandwidth Product	f_T			–	4.5	–	MHz
Slew Rate	SR			–	9	–	V/µs
Sink Current from Pin8 to Pin4 to Swing Output Low				–	220	–	µA
Transient Response: Rise Time	t_r	R_L = 2kΩ, C_L = 100pF		–	0.08	–	µs
Overshoot				–	10	–	%
Setting Time at $10V_{P-P}$ 1mV	t_s	R_L = 2kΩ, C_L = 100pF, Voltage Follower		–	4.5	–	µs
10mV				–	1.4	–	µs

Note 2. V_O = $26V_{P-P}$, +12V, –14V and R_L = 2kΩ.

Electrical Characteristics: (T_A = +25°C, V+ = +5V, V– = –5V unless otherwise specified)

Input Offset Voltage	$\|V_{IO}\|$		–	2	–	mV
Input Offset Current	$\|I_{IO}\|$		–	0.1	–	pA
Input Current	I_I		–	2	–	pA
Input Resistance	R_I		–	1	–	TΩ
Large–Signal Voltage Gain	A_{OL}		–	100k	–	V/V
			–	100	–	dB
Common–Mode Rejection Ratio	CMRR		–	32	–	µV/V
			–	90	–	dB
Common–Mode Input–Voltage Range	V_{ICR}		–	–0.5	–	V
			–	+2.6	–	V
Power Supply Rejection Ratio	$\Delta V_{IO}/\Delta V$		–	100	–	µV/V
	PSSR		–	80	–	dB
Maximum Output Voltage	$V_{OM}+$		–	3.0	–	V
	$V_{OM}-$		–	0.13	–	V
Maximum Output Current: Source	$I_{OM}+$		–	10	–	mA
Sink	$I_{OM}-$		–	1	–	mA
Slew Rate	SR		–	7	–	V/µs
Gain–Bandwidth Product	f_T		–	3.7	–	MHz
Supply Current	I+		–	1.6	–	mA
Device Dissipation	P_D		–	8	–	mW
Sink Current from Pin8 to Pin4 to Swing Output Low			–	200	–	µA

Pin Connection Diagram