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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	ΔV _{IO} /ΔV		–	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	ΔV _{IO} /ΔT		–	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
			f = 10kHz	–	12	–	nV/√Hz
Short–Circuit Current to Opposite Supply Source	I _{OM+}		–	40	–	mA	
	I _{OM–}		–	18	–	mA	

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

Electrical Characteristics (Cont'd): ($T_A = +25^\circ\text{C}$, $V_+ = +15\text{V}$, $V_- = -15\text{V}$ 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	$R_L = 2\text{k}\Omega$, $C_L = 100\text{pF}$	–	0.08	–	μs
Overshoot			–	10	–	%
Setting Time at $10V_{P-P}$ 1mV	t_s	$R_L = 2\text{k}\Omega$, $C_L = 100\text{pF}$, Voltage Follower	–	4.5	–	μs
10mV			–	1.4	–	μs

Note 2. $V_O = 26V_{P-P}$, $+12\text{V}$, -14V and $R_L = 2\text{k}\Omega$.

Electrical Characteristics: ($T_A = +25^\circ\text{C}$, $V_+ = +5\text{V}$, $V_- = -5\text{V}$ 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	–	$\text{T}\Omega$
Large–Signal Voltage Gain	A_{OL}		–	100k	–	V/V
			–	100	–	dB
Common–Mode Rejection Ratio	CMRR		–	32	–	$\mu\text{V/V}$
			–	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	–	$\mu\text{V/V}$
	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

