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NTE7141

Integrated Circuit

Dual BIMOS Operational Amplifier

w/MOSFET Input, Bipolar Output

Description:

The NTE7141 is a dual, operational amplifier in an 8-Lead Mini-DIP type package that combines the advantages of MOS and bipolar transistors on the same monolithic chip. The gate-protected MOS-FET (PMOS) input transistors provide high input impedance and a wide common-mode input voltage range (typically to 0.5V below the negative supply rail). The bipolar output transistors allow a wide output voltage swing and provide a high output current capability.

Features:

- Internally Compensated
- MOSFET Input Stage:
 - Very High Input Impedance
 - Very Low Input Current
 - Wide Common-Mode Input Voltage Range
 - Rugged Input Stage – Bipolar Diode Protected
- Directly Replaces Industry Type 1458 in Most Applications
- Operation From 4V-to-36V Single or Dual Supplies
- Characterized for $\pm 15\text{V}$ Operation for TTL Supply Systems with Operation down to 4V
- Wide Bandwidth
- High Voltage-Follower Slew Rate
- Output Swings to Within 0.5V of Negative Supply at $V^+ = 5\text{V}$, $V^- = 0$

Applications:

- Ground-Referenced Single-Supply Amplifiers in Automobile and Portable Instrumentation
- Sample and Hold Amplifiers
- Long-Duration Timers/Multivibrators (Microseconds – Minutes – Hours)
- Photocurrent Instrumentation
- Active Filters
- Intrusion Alarm Systems
- Comparators
- Instrumentation Amplifiers
- Function Generators
- Power Supplies

Absolute Maximum Ratings:

DC Supply Voltage (Between V+ and V– Terminals)	36V
Operating Voltage Range	4 to 36V or ± 2 to ± 18 V
Differential–Mode Input Voltage	± 8 V
Common–Mode DC Input Voltage	(V+ +8V) to (V– –0.5V)
Input–Terminal Current	1mA
Device Dissipation, P_D	630mW
Derate Linearly Above +55°C	6.67mW/°C
Operating Temperature Range, T_{opr}	–40° to +85°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. Temperature and/or supply voltages must be limited to keep dissipation within maximum rating.

Electrical Characteristics: (V+ = +15V, V– = –15V unless otherwise specified)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Input Offset Voltage	$ V_{IO} $	$T_A = +25^\circ\text{C}$		–	5	15	mV
		$T_A = -40^\circ \text{ to } +85^\circ\text{C}$		–	10	–	mV
Input Offset Current	$ I_{IO} $	$T_A = +25^\circ\text{C}$		–	0.5	30	pA
		$T_A = +85^\circ\text{C}$		–	32	–	pA
Input Current	I_I	$T_A = +25^\circ\text{C}$		–	10	50	pA
		$T_A = +85^\circ\text{C}$		–	640	–	pA
Large–Signal Voltage Gain	A_{OL}	Note 2	$T_A = +25^\circ\text{C}$	20k	100k	–	V/V
				86	100	–	dB
			$T_A = -40^\circ \text{ to } +85^\circ\text{C}$	–	63k	–	V/V
				–	96	–	dB
Common–Mode Rejection Ratio	CMRR	$T_A = +25^\circ\text{C}$		–	32	320	$\mu\text{V/V}$
				70	90	–	dB
		$T_A = -40^\circ \text{ to } +85^\circ\text{C}$		–	32	–	$\mu\text{V/V}$
				–	90	–	dB
Common–Mode Input–Voltage Range	V_{ICR}	$T_A = +25^\circ\text{C}$		–15	–15.5 to +12.5	+11	V
		$T_A = -40^\circ \text{ to } +85^\circ\text{C}$		–	–15 to +12.3	–	V
Power Supply Rejection Ratio	$\Delta V_{IO}/\Delta V$	$T_A = +25^\circ\text{C}$		–	100	150	$\mu\text{V/V}$
	PSSR			76	80	–	dB
	$\Delta V_{IO}/\Delta V$	$T_A = -40^\circ \text{ to } +85^\circ\text{C}$		–	150	–	$\mu\text{V/V}$
	PSSR			–	76	–	dB

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

Electrical Characteristics (Cont'd): ($V^+ = +15V$, $V^- = -15V$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Maximum Output Voltage	V_{OM+}	$T_A = +25^\circ C$, $R_L = 2k\Omega$	+12	+13	–	V
	V_{OM-}		–14	–14.4	–	V
		$T_A = +25^\circ C$, Note 3	0.4	0.13	–	V
	V_{OM+}	$T_A = -40^\circ$ to $+85^\circ C$, $R_L = 2k\Omega$	–	+12.4	–	V
	V_{OM-}		–	–14.2	–	V
Supply Current, For Both Amps	I^+	$T_A = +25^\circ C$	–	8	12	mA
		$T_A = -40^\circ$ to $+85^\circ C$	–	8.4	–	mA
Total Device Dissipation	P_D	$T_A = +25^\circ C$	–	240	360	mW
		$T_A = -40^\circ$ to $+85^\circ C$	–	252	–	mW
Temperature Coefficient of Input Offset Voltage	$\Delta V_{IO}/\Delta T$	$T_A = -40^\circ$ to $+85^\circ C$	–	15	–	$\mu A/^\circ C$
Input Resistance	R_I	$T_A = +25^\circ C$	–	1.5	–	$T\Omega$
Input Capacitance	C_I	$T_A = +25^\circ C$	–	4	–	pF
Output Resistance	R_O	$T_A = +25^\circ C$	–	60	–	Ω
Equivalent Wideband Input Noise Voltage	e_n	$T_A = +25^\circ C$, $R_S = 100\Omega$, $f = 1kHz$	–	40	–	$nV/\sqrt{Hz}$
		$f = 10kHz$	–	12	–	$nV/\sqrt{Hz}$
Short-Circuit Current to Opposite Supply Source	I_{OM+}	$T_A = +25^\circ C$	–	40		mA
Sink	I_{OM-}		–	11	–	mA
Gain–Bandwidth Product	f_T	$T_A = +25^\circ C$	–	4.5	–	MHz
Slew Rate	SR	$T_A = +25^\circ C$	–	9	–	V/ μs
Transient Response: Rise Time	t_r	$T_A = +25^\circ C$, $R_L = 2k\Omega$, $C_L = 100pF$	–	0.08	–	μs
Overshoot			–	10	–	%
Setting Time at $10V_{P-P}$ 1mV	t_s	$T_A = +25^\circ C$, $R_L = 2k\Omega$, $C_L = 100pF$, Voltage Follower	–	4.5	–	μs
10mV			–	1.4	–	μs
Crosstalk	CT	$T_A = +25^\circ C$, $f = 1kHz$	–	120	–	dB

Note 3. $V^+ = 5V$, $V^- = GND$, $I_{Sink} = 200\mu A$.

Electrical Characteristics: ($T_A = +25^\circ C$, $V^+ = +5V$, $V^- = -5V$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Offset Voltage	$ V_{IO} $		–	5	–	mV
Input Offset Current	$ I_{IO} $		–	0.1	–	pA
Input Current	I_I		–	2	–	pA
Input Resistance	R_I		–	1	–	$T\Omega$
Large–Signal Voltage Gain	A_{OL}		–	100k	–	V/V
			–	100	–	dB
Common–Mode Rejection Ratio	CMRR		–	32	320	$\mu V/V$
			70	90	–	dB

Electrical Characteristics (Cont'd): ($T_A = +25^{\circ}\text{C}$, $V_+ = +5\text{V}$, $V_- = -5\text{V}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Common-Mode Input-Voltage Range	V_{ICR}		–	–0.5	–	V
			–	+2.6	–	V
Power Supply Rejection Ratio	$\Delta V_{IO}/\Delta V$		–	31.6	–	$\mu\text{V/V}$
	PSSR		–	90	–	dB
Maximum Output Voltage	V_{OM+}		–	3.0	–	V
	V_{OM-}		–	0.3	–	V
Maximum Output Current: Source	I_{OM+}		–	20	–	mA
Sink	I_{OM-}		–	1	–	mA
Slew Rate	SR		–	7	–	$\text{V}/\mu\text{s}$
Gain-Bandwidth Product	f_T		–	4.5	–	MHz
Supply Current	I_+		–	4	–	mA
Device Dissipation	P_D		–	20	–	mW

Pin Connection Diagram

