



ELECTRONICS, INC.
 44 FARRAND STREET
 BLOOMFIELD, NJ 07003
 (973) 748-5089
<http://www.nteinc.com>

NTE867 Integrated Circuit BiMOS Input Op-Amp

Description:

The NTE867 is a linear integrated circuit that has three major sections for interfacing television tuning systems: an input op-amp, a band-select switch, and an internally referenced quad-comparator. The op-amp output voltage has a wide dynamic range with a 3mA source or sink capability and can be clamped to three discrete levels in response to logic inputs. The op-amp also has internal bias reference and phase compensation. High impedance PMOS input transistors are protected by input limiting diode clippers.

The band-select switch has two logic inputs controlling four outputs: VHF B+, VHF HIGH, SUPER-BAND CATV, and UHF B+. The VHF B+ and UHF B+ outputs are current sources which are short-circuit protected by current limiting. VHF HIGH and SUPERBAND CATV outputs are current sinks with low off-state leakage. The quad comparator features internal reference bias, low output leakage, and a 6mA current sinking capability. The outputs of two of the comparators are internally connected to form a window comparator.

Features:

- Input op-amp: high impedance PMOS input transistors and internal reference bias
- Low input bias current and internal diode protection at op-amp inputs
- High op-amp output voltage swing (0.7-28.0V) with 3mA source sink capability
- Three op-amp output voltage logic-controlled clamp levels
- Logic-controlled bandswitching with four separate outputs
- Two bandswitch output current sinks
- Two bandswitch current-limited output current sources
- Internally referenced quad comparator
- Low drive current input requirement
- Low output leakage
- High output current sink capability
- Bipolar and PMOS processes on a single chip

Absolute Maximum Ratings: ($T_A = +25^\circ\text{C}$, unless otherwise specified)

Supply Current, I_{SS}	20mA
Supply Voltage (Pin 8), V_{CC}	$\pm 18\text{V}$
Supply Voltage (Pin 12), V_{DD}	$\pm 8\text{V}$
Device Dissipation Per Package, P_D	
Up to 55°C	750mW
Above 55°C (Derate Linearly)	7.9mW/ $^\circ\text{C}$
Operating Ambient Temperature Range, T_A	0° to $+70^\circ\text{C}$
Storage Ambient Temperature Range	-55°C to $+150^\circ\text{C}$

Electrical Characteristics: ($T_A = +25^\circ\text{C}$, $I_{SS} = 9\text{mA}$, $V_{DD} = 5\text{V}$, $V_{CC} = 12\text{V}$, unless otherwise specified)

Parameter	Test Conditions	Min	Max	Unit
I_{CC} Supply Current, I_8	All Outputs Open	0.1	2	mA
I_{DD} Supply Current, I_{12}	All Outputs Open	0.1	1.5	mA
Tuning Voltage Supply Regulation, V_{17}	$I_{SS} = 9\text{mA}$	29	35	V
V_{17} Regulation, ΔV_{17}	$V_1 = V_{17} @ I_{SS} = 6\text{mA}$, $V_2 = V_{17} @ I_{SS} = 12\text{mA}$, $\Delta V_{17} = V_1 - V_2 $	0	0.8	V
Input Bias Current, I_{10} BIAS L	$V_{10} = 0\text{V}$	-	-750	nA
Input Bias Current, I_{10} BIAS H	$V_{10} = 6\text{V}$	1	-0.450	mA
Input Bias Current, I_{15} BIAS L	$V_{15} = 0\text{V}$	0	-250	nA
Input Bias Current, I_{15} BIAS H	$V_{15} = 6\text{V}$	1	-0.160	mA
Output Sink Current, I_{11} Sink	$V_{10} = 0\text{V}$, $V_{11} = 1.5\text{V}$	6	-	mA
Output Sink Current, I_{11} Sink	$V_{10} = 6\text{V}$, $V_{11} = 1.5\text{V}$	6	-	mA
Output Saturation Voltage, V_{11} SAT1	$V_{10} = 0\text{V}$, I_{11} SINK = 4mA	100	700	mV
Output Saturation Voltage, V_{11} SAT2	$V_{10} = 6\text{V}$, I_{11} SINK = 4mA	100	700	mV
Output Leakage Current, I_{11} LEAKAGE	$V_{10} = 2.25\text{V}$, $V_{11} = 12\text{V}$	-0.2	1.0	μA
Output Sink Current, I_{13} SINK	$V_{10} = 6\text{V}$, $V_{13} = 1.5\text{V}$	6	-	mA
Output Saturation Voltage, V_{13} SAT	$V_{10} = 6\text{V}$, I_{13} SINK = 4mA	100	700	mV
Output Leakage Current, I_{13} LEAKAGE	$V_{10} = 2.25\text{V}$, $V_{13} = 12\text{V}$	-0.2	1.0	μA
Output Sink Current I_{14} SAT	$V_{15} = 0\text{V}$, $V_{14} = 1.5\text{V}$	6	-	mA
Output Saturation Voltage, V_{14} SAT	$V_{15} = 0\text{V}$, I_{14} SINK = 4mA	100	700	mV
Output Leakage Current, I_{14} LEAKAGE	$V_{15} = 2.25\text{V}$, $V_{14} = 12\text{V}$	-0.2	1.0	μA
AFT Center Reference Voltage, V_{13} REF		2.8	3.2	V
AFT Window Reference Voltage Low, V_{11} REF LOW		0.8	1.2	V
AFT Window Reference Voltage High, V_{11} REF HIGH		4.95	5.05	V
Vertical Output Reference, V_{14} REF		1.3	1.7	V

Op-Amp Electrical Characteristics: ($T_A = +25^\circ\text{C}$, $I_{SS} = 9\text{mA}$, $V_{DD} = 5\text{V}$, $V_{CC} = +12\text{V}$, $V_H = 2.4\text{V Min.}$, $V_L = 0.8\text{V Max.}$, $V_A = \text{Pin 3}$, $V_B = \text{Pin 4}$, unless otherwise specified)

Parameter	V_A	V_B	Test Conditions	Min	Max	Unit
Bias Voltage, V_1 Bias	V_L	V_L	Pin 1 through 10K Ω	2.35	2.65	V
Bias Voltage, I_1 Bias	V_L	V_L	Pin 1 to Ground	-	100	pA
Output Source Current I_{16} Source	V_L	V_L	$V_1 = 0\text{V}$, $V_{16} = 17.5\text{V}$	-3	-	mA
Output Sink Current, I_{16} Sink	V_L	V_L	$V_1 = 5\text{V}$, $V_{16} = 17.5\text{V}$	3	-	mA
Output Sink Current, I_{16} AOL	V_L	V_L	$I_{SS} = 10\text{mA}$, $R_L = 10\text{K}\Omega$, $V_1 = 2.5\text{V}$, $V_{16} = 17.5\text{V}$	1	-	v/mV
High Clamp Output Voltage, V_{16} HCL	V_L	V_L	$V_1 = 0\text{V}$	28	34	V
Low Clamp Output Voltage, V_{16} CL1	V_L	V_L	$V_1 = 5\text{V}$	0.7	1.1	V
Low Clamp Output Voltage, V_{16} CL2	V_L	V_H	$V_1 = 5\text{V}$	1.6	2.1	V
Low Clamp Output Voltage, V_{16} CL3	V_H	V_L	$V_1 = 5\text{V}$	4.9	5.75	V

Bandswitch Electrical Characteristics: ($T_A = +25^\circ\text{C}$, $I_{SS} = 9\text{mA}$, $V_{DD} = 5\text{V}$, $V_{CC} = 12\text{V}$, $V_H = 2.4\text{V}$ Min., $V_L = 0.8\text{V}$ Max., $V_A = \text{Pin 3}$, $V_B = \text{Pin 4}$, $V_I = 5\text{V}$, unless otherwise specified)

Parameter	V_A	V_B	Test Conditions	Min	Max	Unit
Pin 7 ON (VHF ON)	V_H	V_L	$I_7 = 15\text{mA}$	11.3	-	V
Pin 9 ON (UHF ON)	V_H	V_H	$I_9 = -15\text{mA}$	11.3	-	V
Pin 7 ON (VHF OFF)	V_H	V_H	$I_7 = 1\text{mA}$	-	1.5	V
Pin 9 OFF (UHF OFF)	V_H	V_L	$I_9 = 1\text{mA}$	-	1.5	V
VHF Short Circuit Current, I_7 SC	V_L	V_L		20	45	mA
UHF Short Circuit Current, I_9 SC	V_H	V_H		20	45	mA
V5 Saturation Voltage, V_5 SAT	V_H	V_L	$I_5 = 2.5\text{mA}$	-	0.5	V
V6 Saturation Voltage, V_6 SAT	V_H	V_L	$I_6 = 2.5\text{mA}$	-	0.5	V
Bandswitch Leakage Current, I_5 L	V_L	V_L	$V_5 = 15\text{V}$	-0.2	1	μA
Superbandswitch Leakage Current, I_6 L	V_L	V_L	$V_6 = 15\text{V}$	-0.2	1	μA
Logic Input Low Current, I_3 L	-	-	$V_A = 0\text{V}$, $V_B = 5\text{V}$	0	-30	μA
Logic Input Low Current, I_4 L	-	-	$V_A = 5\text{V}$, $V_B = 0\text{V}$	0	-30	μA
Logic Input High Input Current, I_3 H	-	-	$V_A = 5\text{V}$, $V_B = 0\text{V}$	-	1	μA
Logic Input High Input Current, I_4 H	-	-	$V_A = 0\text{V}$, $V_B = 5\text{V}$	-	1	μA

Logic Table for Bandswitch and Op-Amp Outputs:

Inputs			Band	Outputs					
Op-Amp Pin 1	V_A Pin 3	V_B Pin 4		VHF B+ SRC Pin 7	UHF B+ SRC Pin 9	VHF High Sink Pin 5	Bandswitch CATV Sink Pin 6	Pin 16 Voltage	
								Min.	Max
1	0	0	Low VHF	ON	OFF	OFF	OFF	0.7V	1.1V
1	0	1	High VHF Midband CATV	ON	OFF	ON	OFF	1.6V	2.1V
1	1	0	Superband CATV	ON	OFF	ON	ON	4.9V	5.75V
1	1	1	UHF	OFF	ON	ON	OFF	0.7V	1.1V
0	0	0		ON	OFF	OFF	OFF	28V	34V
0	0	1		ON	OFF	ON	OFF	28V	34V
0	1	0		ON	OFF	ON	ON	28V	34V
0	1	1		OFF	ON	ON	OFF	28V	34V

Pin Connection Diagram

