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NTE867
Integrated Circuit
BiMOS Input Op–Amp

Description:

The NTE867 is a linear inetgrated 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, SUPERBAND 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 seperate 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°C, unless otherwise specified)

Supply Current, I_{SS} 20mA
Supply Voltage (Pin 8), V_{CC} . . . . . ±18V
Supply Voltage (Pin 12), V_{DD} . . . . . ±8V
Device Dissipation Perk Package, P_D
  Up to 55°C 750mW
  Above 55°C (Derate Linearly) . . . . . 7.9mW/°C
Operating Ambient Temperature Range, T_A . . . . . 0° to +70°C
Storage Ambient Temperature Range . . . . . –55° to +150°C

Electrical Characteristics: (T_A = +25°C, I_{SS} = 9mA, V_{DD} 5V, V_{CC} = 12V, 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} = 9mA	29	35	V
V_{17} Regulation, ΔV_{17}	$V_1 = V_{17}$ @ I_{SS} =6mA, $V_2 = V_{17}$ @ I_{SS}= 12mA, $\Delta V_{17} = \lvert V_1 - V_2 \rvert$	0	0.8	V
Input Bias Current, I_{10} BIAS L	V_{10} = 0V	–	–750	nA
Input Bias Current, I_{10} BIAS H	V_{10} = 6V	1	–0.450	mA
Input Bias Current, I_{15} BIAS L	V_{15} = 0V	0	–250	nA
Input Bias Current, I_{15} BIAS H	V_{15} = 6V	1	–0.160	mA
Output Sink Current, I_{11} Sink	V_{10} = 0V, V_{11} = 1.5V	6	–	mA
Output Sink Current, I_{11} Sink	V_{10} = 6V, V_{11} = 1.5V	6	–	mA
Output Saturation Voltage, V_{11} SAT1	V_{10} = 0V, I_{11} SINK = 4mA	100	700	mV
Output Saturation Voltage, V_{11} SAT2	V_{10} = 6V, I_{11} SINK = 4mA	100	700	mV
Output Leakage Current, I_{11} LEAKAGE	V_{10} = 2.25v, V_{11} = 12v	–0.2	1.0	µA
Output Sink Current, I_{13} SINK	V_{10} = 6V, V_{13} = 1.5V	6	–	mA
Output Saturation Voltage, V_{13} SAT	V_{10} = 6V, I_{13} SINK = 4mA	100	700	mV
Output Leakage Current, I_{13} LEAKAGE	V_{10} = 2.25V, V_{13} = 12V	–0.2	1.0	µA
Output Sink Current I_{14} SAT	V_{15} = 0V, V_{14} = 1.5V	6	–	mA
Output Saturation Voltage, V_{14} SAT	V_{15} = 0V, I_{14} SINK = 4mA	100	700	mV
Output Leakage Current, I_{14} LEAKAGE	V_{15} = 2.25V, V_{14} = 12V	–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°C, I_{SS} = 9mA, V_{DD} = 5V, V_{CC} = +12V, V_H = 2.4V Min., V_L = 0.8V Max., V_A = Pin 3, V_B = 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 10KΩ	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 = 0V, V_{16} = 17.5V	–3	–	mA
Output Sink Current, I_{16} Sink	V_L	V_L	V_1 = 5V, V_{16} = 17.5V	3	–	mA
Output Sink Current, I_{16} A_{OL}	V_L	V_L	I_{SS} = 10mA, R_L = 10KΩ, V_1 = 2.5V, V_{16} = 17.5V	1	–	v/mV
High Clamp Output Voltage, V_{16} HCL	V_L	V_L	V_1 = 0V	28	34	V
Low Clamp Output Voltage, V_{16} CL1	V_L	V_L	V_1 = 5V	0.7	1.1	V
Low Clamp Output Voltage, V_{16} CL2	V_L	V_H	V_1 = 5V	1.6	2.1	V
Low Clamp Output Voltage, V_{16} CL3	V_H	V_L	V_1 = 5V	4.9	5.75	V

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

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

Logic Table for Bandswitch and Op−Amp Outputs:

Inputs			Band	Outputs					
Op−Amp	V_A	V_B		VHF	UHF	VHF	Bandswitch	Pin 16 Voltage	
Pin 1	Pin 3	Pin 4		B+ SRC Pin 7	B+ SRC Pin 9	High Sink Pin 5	CATV Sink Pin 6	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