ELECTRONICS, INC.
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NTE973D
Integrated Circuit
Double Balanced Modulator/Demodulator

Description:

The NTE973D is a balanced modulatior/demodulator in a 14–Lead DIP type package designed for use where the output voltage is a product of an input voltage (signal) and a switching function (carrier). Typical applications include suppressed carrier and amplitude modulation, synchronous detection, FM detection, phase detection, and chopper applications.

Features:

- Excellent Carrier Suppression:
  65dB typ @ 0.5MHz
  50db typ @ 10MHz
- Adjustable Gain and Signal Handling
- Balanced Inputs and Outputs

Absolute Maximum Ratings: (T_A = +25°C unless otherwise specified)

Applied Voltage, ΔV
(V_6–V_7, V_8–V_1, V_9–V_7, V_9–V_8, V_7–V_4, V_7–V_1, V_8–V_4, V_6–V_8, V_2–V_5, V_3–V_5) 30V
Differential Input Signal, V_7–V_8 . . . . . +5.0V
Differential Input Signal, V_4–V_1 . . . . . $\pm(5 + I_5R_e)$ V
Maximum Bias Current, I_5 . . . . . 10mA
Operating Temperature Range, T_A . . . . . 0° to +70°C
Storage Temperature Range, T_{stg} . . . . . –65° to +150°C
Thermal Resistance, Junction–to–Ambient, R_{thJA} . . . . . 100°C/W

Electrical Characteristics: (V_{CC} = 12V, V_{EE} = –8V, I_5 = 1mA, R_L = 3.9kΩ, R_e = 1kΩ, T_A = +25°C, Note 1 unless otherwise specified)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
Carrier Feedthrough	V_{CFT}	V_C = 60mV$_{rms}$ sine wave and offset adjusted to zero	f_C = 1kHz	–	40	–	μV$_{rms}$
			f_C = 10MHz	–	140	–	μV$_{rms}$
		V_C = 300mV$_{P–P}$ square wave, f_C = 1kHz	Offset adjusted to zero	–	0.04	0.4	mV$_{rms}$
			Offset not adjusted	–	20	200	mV$_{rms}$
Carrier Suppression	V_{CS}	f_S = 10kHz, 300mV$_{rms}$, 60mV$_{rms}$ sine wave	f_C = 500kHz	40	65	–	dB
			f_C = 10MHz	–	50k	–	dB

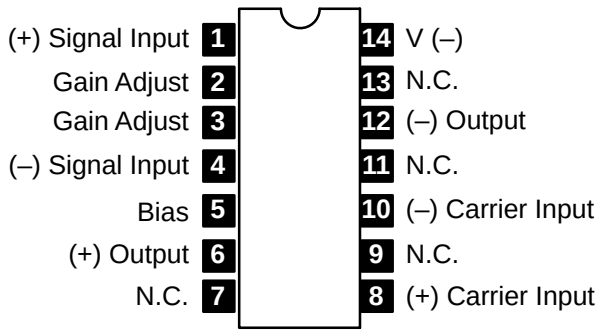
Note 1. All input and output characteristics are single–ended unless otherwise specified)

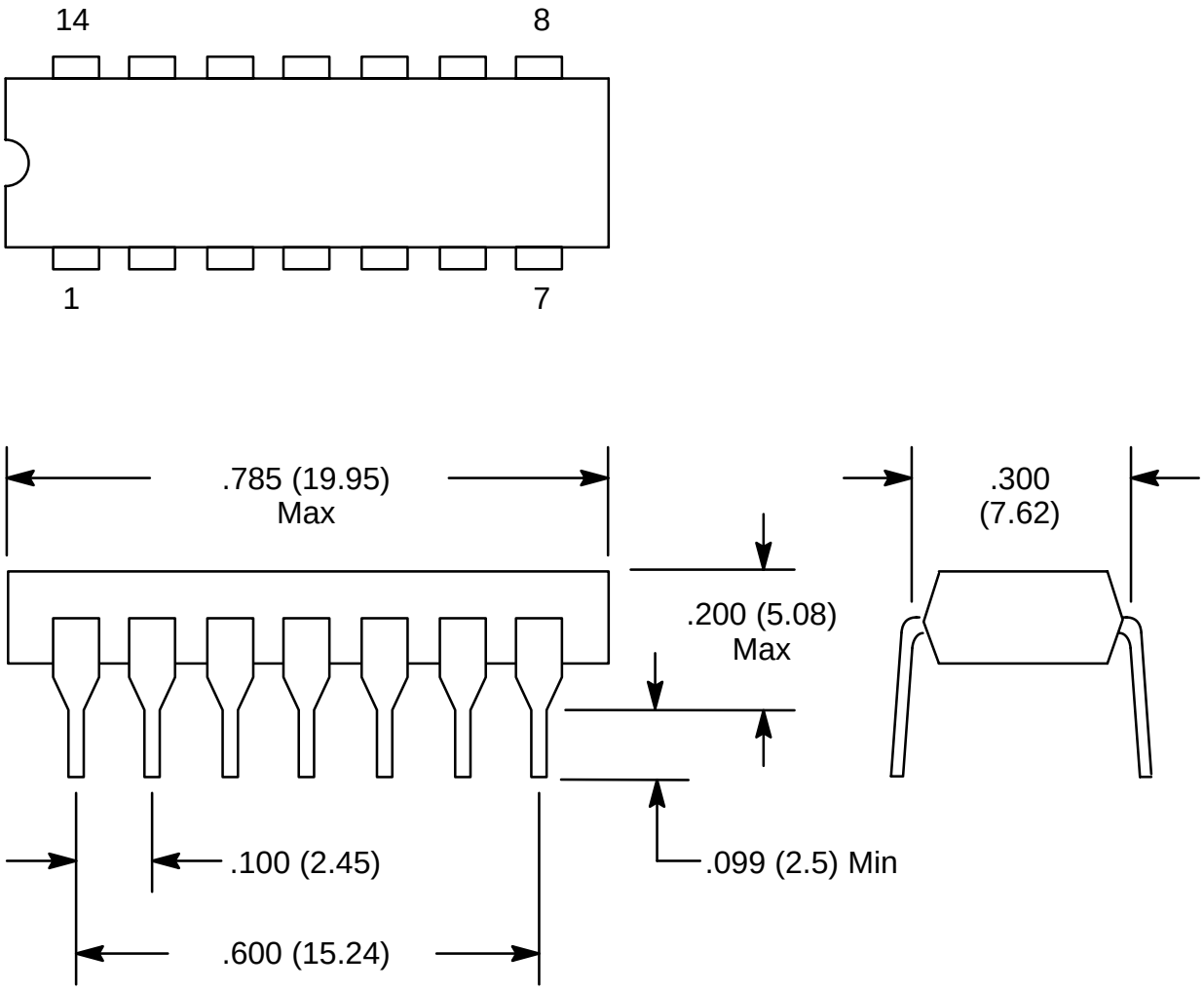
Electrical Characteristics (Cont'd): (V_{CC} = 12V, V_{EE} = –8V, I_5 = 1mA, R_L = 3.9kΩ, R_e = 1kΩ, T_A = +25°C, Note 1 unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Transadmittance Bandwidth (Magnitude)	BW_{3dB}	Carrier Input Port, R_L = 50Ω, V_C = 60mV_{rms} sine wave, f_S = 1kHz, 300mV_{rms} sine wave	–	300	–	MHz
		Signal Input Port, R_L = 50Ω, V_S = 300mV_{rms} sine wave, $\|V_C\|$ = 0.5V	–	80	–	MHz
Signal Gain	A_{VS}	V_S = 100mV_{rms}, f = 1kHz, $\|V_C\|$ = 0.5V	2.5	3.5	–	V/V
Single–Ended Input Impedance, Signal Port	r_{ip}	Parallel Input Resistance, f = 5MHz	–	200	–	kΩ
	c_{ip}	Parallel Input Capacitance, f = 5MHz	–	2.0	–	pF
Single–Ended Output Impedance, Signal Port	r_{op}	Parallel Output Resistance, f = 10MHz	–	40	–	kΩ
	c_{op}	Parallel Output Capacitance, f = 10MHz	–	5.0	–	pF
Input Bias Current	I_{bS}	$I_{bS} = (I_1 + I_4) / 2$	–	12	30	µA
	I_{bC}	$I_bC = (I_7 + I_8) / 2$	–	12	30	µA
Input Offset Current	$\|I_{ioS}\|$	$I_{ioS} = I_1 – I_4$	–	0.7	7.0	µA
	$\|I_{ioC}\|$	$I_{io}C = I_7 – I_8$	–	0.7	7.0	µA
Average Temperature Coefficient of Input Offset Current	$\|TC_{Iio}\|$	T_A = –55° to +125°C	–	2.0	–	nA/°C
Output Offset Current	$\|I_{oo}\|$	$I_6 – I_9$	–	14	80	µA
Average Temperature Coefficient of Output Offset Current	$\|TC_{Ioo}\|$	T_A = –55° to +125°C	–	90	–	nA/°C
Common–Mode Input Swing	CMV	Signal Port, f_S = 1kHz	–	5.0	–	$V_{P–P}$
Common–Mode Gain	ACM	Signal Port, f_S = 1kHz, $\|V_C\|$ = 0.5V	–	–85	–	dB
Common–Mode Quiescent Output Voltage	V_{out}	Pin6 or Pin9	–	8.0	–	$V_{P–P}$
Differential Output Voltage Swing Capability	V_{out}		–	8.0	–	$V_{P–P}$
Power Supply Current	I_{CC}	$I_6 + I_9$	–	2.0	4.0	mA
	I_{EE}	I_{10}	–	3.0	5.0	mA
DC Power Dissipation	P_D		–	33	–	mW

Note 1. All input and output characteristics are single–ended unless otherwise specified)

Pin Connection Diagram




14
8
1
7
.785 (19.95)
Max
.200 (5.08)
Max
.300
(7.62)
.100 (2.45)
.600 (15.24)
.099 (2.5) Min