Micro Networks
A DIVISION OF UNITRODE CORPORATION

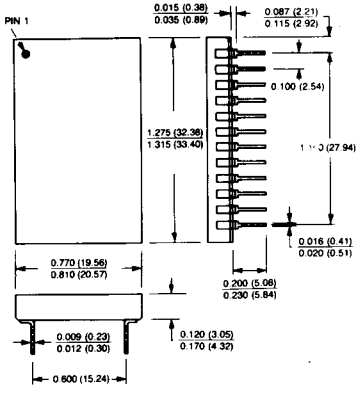
MN375

HIGH-SPEED
HIGH-RESOLUTION
TRACK-HOLD AMPLIFIER

FEATURES

- **±0.005%FSR Linearity Guaranteed Over Temperature**
- **Fast Acquisition Time:**
  700nsec to ±0.005%FSR
  500nsec to ±0.01%FSR
- **5nsec Aperture Delay**
  100psec Aperture Jitter
- **±100V/μsec Minimum Slew Rate**
- **±7mV Max Offset Error**
- **−25°C to +85°C Operation**
- **MIL-STD-883 Screening Optional. MIL-STD-1772 Certified Facility**

24 PIN DIP



Dimensions in Inches (millimeters)

DESCRIPTION

MN375 is a dual-in-line packaged track-hold (T/H) amplifier that offers an excellent combination of precision performance and speed. Its balanced performance specifications make it suitable for use in fast 12, 13 and 14-bit systems. Linearity is guaranteed to be better than ±0.005%FSR over the entire operating temperature range. Offset and pedestal drifts are typically ±50μV/°C. Aperture delay time is a low 5nsec, and aperture uncertainty is guaranteed to be under 100psec. Acquisition time to ±0.005%FSR (the equivalent of ±½LSB at the 13-bit level) is typically 700nsec, and track-to-hold settling time (also to ±0.005%FSR) is 150nsec maximum.

MN375 is adjustment free. Functional laser trimming of our own thin-film nichrome resistor networks allows us to list maximum linearity, gain-accuracy, offset and pedestal specifications that apply over the device's entire operating temperature range. MN375 is packaged in a standard, hermetically sealed, 24-pin, ceramic dual-in-line package and is specified for 0°C to +70°C or −25°C to +85°C operation. For military/aerospace or harsh-environment commercial/industrial applications, MN375E/B is fully screened to Method 5008 of MIL-STD-883 in Micro Networks MIL-STD-1772 certified facility.

MN375's low aperture uncertainty (100psec maximum) and excellent linearity (±0.005%FSR maximum) make it ideally suited for use as an aperture reducer in high-speed, high-resolution data acquisition systems. At the 13-bit level, frequencies as high as 190kHz can be accurately captured and held for a mimimum of 120μsec.

MN375 is particularly well suited for military, avionics and aerospace applications. Thin-film hybrid construction and optional MIL-STD-883 screening make it extremely reliable. Its fully guaranteed performance specifications eliminate external trimming potentiometers and assure field interchangeability without the need for recalibration.

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Micro Networks
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MN375 HIGH-SPEED HIGH-RESOLUTION T/H AMPLIFIER

ABSOLUTE MAXIMUM RATINGS

Operating Temperature Range	−25° C to +85° C (Note 1)
Specified Temperature Range	0° C to +70° C
	−25° C to +85° C ("E" Models)
Storage Temperature Range	−65° C to +150° C
+15V Supply (+Vcc, Pin 12)	−0.5 to +18 Volts
−15V Supply (−Vcc, Pin 9)	+0.5 to −18 Volts
+5V Supply (+Vdd, Pin 4)	−0.5 to +7 Volts
Analog Input (Pin 23)	±10 Volts
Digital Input (Pin 5)	0 to +5.5 Volts
Output Current	(Note 2)

ORDERING INFORMATION

PART NUMBER — **MN375E/B**

Standard device is specified for 0° C to +70° C operation. Add "E" suffix for specified −25° C to +85° C operation.

Add "/B" suffix for 100% screening according to MIL-STD-883, Method 5008

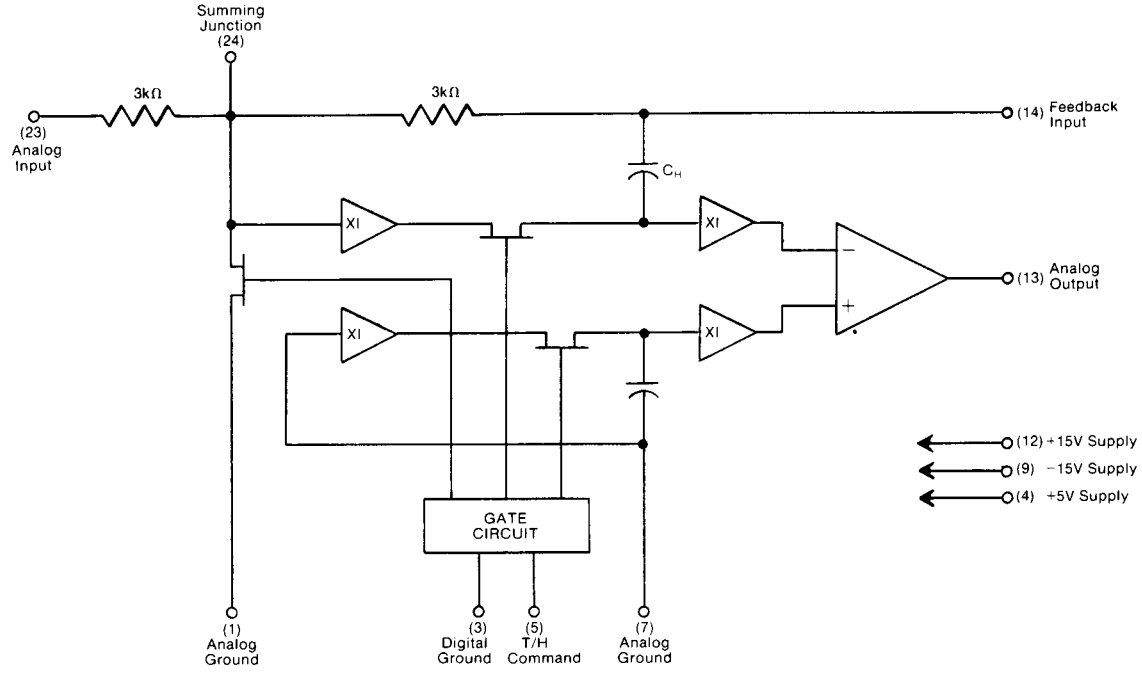
SPECIFICATIONS (T_A = +25°C, Supply Voltages ±15V and +5V, unless otherwise noted).

ANALOG INPUT/OUTPUT	MIN.	TYP.	MAX.	UNITS
Input Voltage Range	±5.0	±8.0		Volts
Input Impedance		3		kΩ
Output Voltage Range	±5.0	±8.0		Volts
Output Current (Note 2)	±20	±25		mA
Output Impedance		0.025		Ω
Load Capacitance			50	pF
DIGITAL INPUT				
Logic Levels: Logic "1" (Hold Mode)	+2			Volts
Logic "0" (Track Mode)			+0.8	Volts
Input Currents: Logic "1"			+50	μA
Logic "0"			−2	mA
TRANSFER CHARACTERISTICS				
Gain		−1		V/V
Gain Error: −25° C to +85° C (Note 3)		±0.02	±0.05	%
Drift (Note 4)		±2		ppm/° C
Linearity Error: +25° C		±0.001		%FSR
−25° C to +85° C (Note 3)		±0.002	±0.005	%FSR
Track Offset (Note 5): +25° C		±2	±7	mV
−25° C to +85° C (Note 3)		±5	±15	mV
Drift (Note 4)		±50		μV/° C
Pedestal (Note 6): −25° C to +85° C (Note 3)		±3	±10	mV
Drift (Note 4)		±50		μV/° C
DYNAMIC CHARACTERISTICS				
Acquisition Time: 10V step to ±0.02%FSR		300	500	nsec
10V step to ±0.01%FSR		500	700	nsec
10V step to ±0.005%FSR		700		nsec
Track to Hold Transient Settling Time (to ±0.005%FSR)		100	150	nsec
Aperture Delay Time		5		nsec
Aperture Uncertainty			100	psec
Small Signal Bandwidth (1Vp-p, −3dB)		5		MHz
Large Signal Bandwidth		3		MHz
Output Slew Rate	100	150		V/μsec
Droop Rate (Note 7): +25° C		±0.5	±5	mV/msec
−25° C to +85° C (Note 3)		±20	±200	mV/msec
Feedthrough Attenuation (10Vp-p, 1 MHz)	72	78		dB
POWER SUPPLY REQUIREMENTS				
Power Supply Range: ±15V Supplies	±14.25	±15.00	±15.75	Volts
+5V Supply	+4.75	+5.00	+5.25	Volts
Power Supply Rejection (±15V Supplies)		±0.002		%FSR/%Vs
Current Drains: +15V Supply		40	50	mA
−15V Supply		−40	−50	mA
+5V Supply		25	35	mA
Power Consumption		1325	1675	mW

SPECIFICATION NOTES:

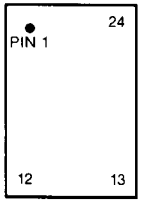
1. +85°C ambient temperature is equivalent to a case temperature of +125°C. For the MN375, Θ_{CA} = 25°C/Watt.
2. The MN375 does not have output short circuit protection. Short circuits to ground can be tolerated for approximately 10 seconds. Short circuits to either supply will result in immediate destruction of the device. In applications where short circuiting is possible, current limiting resistors in the supply lines are recommended.
3. For commercial models, this parameter is guaranteed to the limit specified over the 0°C to +70°C temperature range.
4. Though the maximum limit for this parameter is guaranteed over the device's entire operating temperature range, typical drift specifications are provided for use in limited temperature range operation.
5. This parameter refers to the offset voltage appearing at the output with the device in the tracking mode and the input grounded.
6. This parameter refers to the change in output voltage as the device is switched from the track to the hold mode with the input held constant.
7. For a ±5V input/output range, a droop rate of 5mV/msec means that the output will change ±1 LSB for 12 bits in 488 μsec. It will change ±1 LSB for 13 bits in 244 μsec.

BLOCK DIAGRAM



PIN DESIGNATIONS

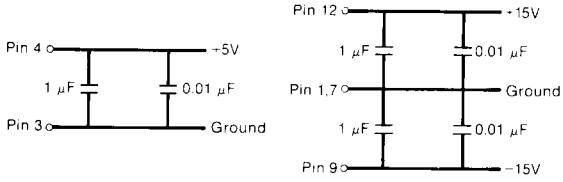
1.	Analog Ground	24.	Summing Junction
2.	N.C.	23.	Analog Input
3.	Digital Ground	22.	N.C.
4.	+5V Supply	21.	N.C.
5.	T/H Command	20.	T.P. Make No Connection
6.	N.C.	19.	T.P. Make No Connection
7.	Analog Ground	18.	N.C.
8.	N.C.	17.	N.C.
9.	−15V Supply	16.	N.C.
10.	N.C.	15.	N.C.
11.	N.C.	14.	Feedback Input
12.	+15V Supply	13.	Analog Output



APPLICATIONS INFORMATION

LAYOUT CONSIDERATIONS — Proper attention to layout and decoupling is necessary to obtain specified performance from the MN375. The unit's three ground pins (pins 1, 3, and 7) are not connected to each other internally, and all three must be connected to system grounds. If your system employs a digital ground, the MN375's digital ground pin should be connected to it, and the 2 analog ground pins should be connected to system analog ground, preferably through a large analog ground plane beneath the package. If your system does not employ separate digital and analog grounds, all three of the MN375's ground pins should be tied together as close to the package as possible and all connected to system ground, preferably through a large ground plane beneath the package.

Power supply connections should be short and direct, and all power supplies should be bypassed with high frequency bypass capacitors to their respective grounds — the ±15V supplies to analog ground and the +5V supply to digital ground. We have found 1 μF tantalum capacitors paralleled with 0.01 μF ceramic capacitors to be a cost-effective combination. Single 1 μF ceramic capacitors can be used to save board space.

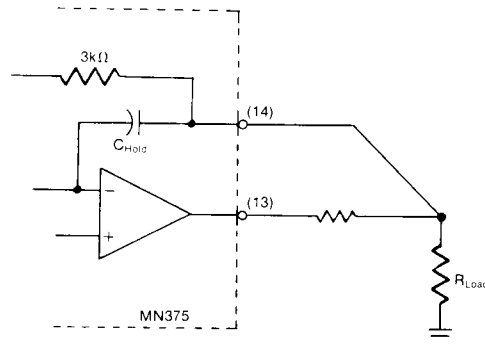


POWER SUPPLY DECOUPLING

Coupling between the analog input and the digital T/H command signal should be minimized to avoid noise pickup. Care should be taken to avoid long analog runs or analog runs parallel to digital lines.

TRACK/HOLD COMMAND — When a TTL logic "0" is applied to the T/H COMMAND pin (pin 5), the MN375 will be in the "track" mode. In this mode, the device acts as a precision amplifier with a gain of −1. When a logic "1" is applied to the T/H COMMAND input, the MN375 is put into the "hold" mode. In this mode, the output will be frozen at the value that was present when the "hold" signal was applied. See the tutorial section of the Micro Networks Product Guide and Applications Manual for a complete discussion of track/hold performance parameters.

ANALOG OUTPUT AND FEEDBACK INPUT — The MN375's output feedback loop is not connected internally (see Block Diagram), and normally the ANALOG OUTPUT (pin 13) will be connected to the FEEDBACK INPUT (pin 14) directly at the package. If necessary, the FEEDBACK INPUT can be used as a remote sense to bypass unwanted resistance in the output connection as shown below.



If the series resistance between the ANALOG OUTPUT and the actual load exceeds 0.01Ω, the FEEDBACK INPUT should be connected with a low impedance run to a point just beyond the resistance. Care should be taken not to extend the feedback input connection for more than 2 inches or a loss of speed and/or an instability may result.

SUMMING JUNCTION — Pin 24 is a direct input to the MN375's summing junction. It can be driven directly if the MN375 is to be used as a current input T/H amplifier, or it can be used to parallel the MN375's internal 3kΩ feedback resistor with an external resistor to reduce the MN375's gain. If an external resistor is used, it should be a metal-film type with an absolute T.C. below 100ppm/°C to maximize resistor tracking and minimize gain drift with temperature. If pin 23 is connected to pin 14, the MN375 can be used as a current input device with a feedback resistor of 1.5 kΩ.