



**MICRO NETWORKS**

# MN343 MN344

**GENERAL-PURPOSE  
TRACK-HOLD AMPLIFIERS**

## FEATURES

- Small 14-Pin DIP
- Internal Hold Capacitor
- 10 $\mu$ sec Max Acquisition Time (10V Step to  $\pm 0.01\%$ , MN343)
- $\pm 0.3\mu V/\mu$ sec Max Droop Rate (MN343)
- $\pm 10V$  Range,  $G = -1$
- Low Glitch 100mV
- Full Mil Operation  $-55^\circ C$  to  $+125^\circ C$
- MIL-H-38534 Screening Optional. MIL-STD-1772 Qualified Facility

## DESCRIPTION

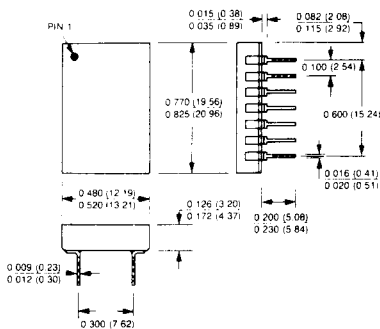
MN343 and MN344 are complete, adjustment-free track-hold amplifiers in small, 14-pin, hermetically sealed dual-in-line packages. Employing an operational "track and hold" design with neutralization of track-to-hold charge offset, they offer low offsets and fast acquisition times. MN343 acquires a signal to  $\pm 0.01\%$  in 10 $\mu$ sec. MN344 acquires a signal to  $\pm 0.05\%$  in 10 $\mu$ sec. Both devices guarantee hold offset including pedestal error to be less than 8.5mV.

Both models are complete with hold capacitor and are laser trimmed as complete units, eliminating the need for user adjustment. Feedthrough in the hold mode and track-hold track transients are minimized by the unique compensation scheme employed. Maximum droop rate is  $\pm 0.3\mu V/\mu$ sec for MN343 and  $\pm 1\mu V/\mu$ sec for MN344.

MN343 and MN344 are available for operation over the full  $-55^\circ C$  to  $+125^\circ C$  temperature range ("H" models). For military/aerospace or harsh-environment commercial/industrial applications, MN343H/B CH and MN344H/B CH are fully screened to MIL-H-38534 in Micro Networks' MIL-STD-1772 qualified facility.

MN343 and MN344 track-hold amplifiers offer circuit designers a convenient, reliable, one-component track-hold function. They are ideal for data acquisition systems, for holding time-varying analog signals during A/D conversion, and for deglitching D/A converter outputs. Small size and weight combined with reliable thin-film hybrid construction and specs guaranteed from  $-55^\circ C$  to  $+125^\circ C$  make these track-holds particularly well suited for military, avionics and aerospace applications.

## 14 PIN DIP



Dimensions in Inches  
(millimeters)

MN343/344



**MICRO NETWORKS**

324 Clark St., Worcester, MA 01606 (508) 852-5400

April 1988

# MN343 MN344 GENERAL-PURPOSE T/H AMPLIFIERS

## ABSOLUTE MAXIMUM RATINGS

Operating Temperature Range	-55°C to +125°C
Specified Temperature Range:	
MN343, MN344	0°C to +70°C
MN343H, H/B; MN344H, H/B	-55°C to +125°C
Storage Temperature Range	-65°C to +150°C
+15V Supply (+V <sub>CC</sub> , Pin 11)	-0.5 to +18 Volts
-15V Supply (-V <sub>CC</sub> , Pin 14)	+0.5 to -18 Volts
Analog Input (Pin 13)	±15 Volts
Digital Input (Pin 1)	-0.5 to +7 Volts
Output Current (Note 1)	±20mA

## ORDERING INFORMATION

PART NUMBER	_____	MN343H/B CH
Select MN343 or MN344.	_____	
Standard Part is specified for 0°C to +70°C operation.		
Add "H" suffix for specified -55°C to +125°C operation.		
Add "B" to "H" devices for Environmental Stress Screening.		
Add "CH" to "H/B" devices for 100% screening according to MIL-H-38534.		

## SPECIFICATIONS (T<sub>A</sub> = +25°C, ±V<sub>CC</sub> = ±15V unless otherwise indicated) (Note 2)

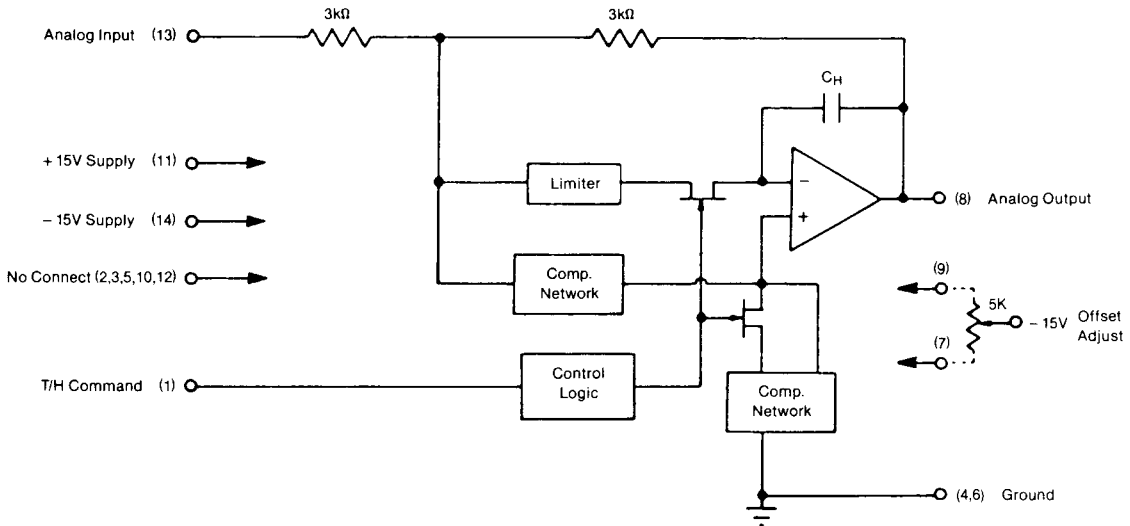
ANALOG INPUT/OUTPUT	MIN.	TYP.	MAX.	UNITS
Input/Output Voltage Range (Note 4)	±10	±11		Volts
Input Resistance (Note 3)		3		kΩ
Output Current (Note 1)	±3			mA
<b>DIGITAL INPUT</b>				
Logic Levels: Logic "1" (Track Mode)	+2.0			Volts
Logic "0" (Hold Mode)			+0.8	Volts
Logic Currents: Logic "1" (V <sub>IH</sub> = +2.4V)			+40	μA
Logic "0" (V <sub>IL</sub> = +0.4V)			-1.6	mA
<b>TRANSFER CHARACTERISTICS</b>				
Gain		-1		V/V
Gain Linearity Error (Note 5)		±0.005	±0.01	%FSR
Gain Accuracy: Initial (+25°C): MN343		±0.01	±0.02	%
MN344		±0.03	±0.05	%
Over Temperature (Note 6)		±0.03	±0.05	%
Offset Voltage (Track Mode, Note 7): Initial (+25°C)		±1	±2.5	mV
Over Temperature (Note 6)		±4	±10	mV
Pedestal (Note 8): Initial (+25°C)		±3	±6	mV
Over Temperature (Note 6)		±5	±10	mV
<b>DYNAMIC CHARACTERISTICS</b>				
Acquisition Time: MN343: 10V Step to ±0.01% (±1mV)		7.5	10	μsec
20V Step to ±0.01% (±2mV)		10	15	μsec
MN344: 10V Step to ±0.05% (±5mV)		7.5	10	μsec
20V Step to ±0.05% (±10mV)		10	15	μsec
Track-to-Hold Transient (Note 9): Amplitude (Note 3)		±100		mV
Settling Time to ±1mV		1.5	2.5	μsec
Aperture Delay Time (Note 3)		60		nsec
Aperture Jitter (Note 3)		2		nsec
Output Slew Rate (Note 3)		±3		V/μsec
Full Power Bandwidth (10Vp-p, -3dB, Note 3)		80		kHz
Output Droop Rate: Initial (+25°C): MN343		±0.1	±0.3	μV/μsec
MN344		±0.4	±1	μV/μsec
0°C to +70°C (Note 3)		±3.5		μV/μsec
-55°C to +125°C ("H" models, Note 3)		±20		μV/μsec
Feedthrough Attenuation (@1kHz)		0.01	0.04	%
<b>POWER SUPPLIES</b>				
Voltage Range (Note 4)	±12	±15	±16	Volts
Power Supply Rejection Ratio (Note 3)		±100		μV/V
Current Drains: +15V Supply		+13	+17	mA
-15V Supply		-10	-12	mA
Power Consumption		345	435	mW

### SPECIFICATION NOTES:

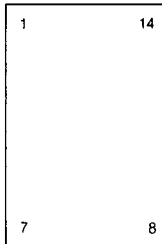
1. MN343/344's output is short-circuit protected, and units can withstand sustained shorts to ground or either supply with current limiting at approximately  $\pm 20\text{mA}$ . In normal operation, output current should not exceed  $\pm 3\text{mA}$ .
2. Listed specifications apply for both MN343 and MN344 unless otherwise indicated.
3. These parameters are listed for reference only and are not tested.
4. Maximum output voltage swing is typically  $\pm V_{CC} \pm 4\text{V}$ .
5. FS stands for full scale and is equivalent to 10 Volts. FSR stands for full scale range and is equivalent to 20 Volts. For a 12-bit system,  $1\text{ LSB} = 0.024\% \text{FSR}$ .
6. Unless otherwise indicated, listed specifications apply over the  $0^\circ\text{C}$  to  $+70^\circ\text{C}$  temperature range for MN343 and MN344 and over the  $-55^\circ\text{C}$  to  $+125^\circ\text{C}$  temperature range for MN343H, MN343H/B, MN344H and MN344H/B.

7. Adjustable to zero with user-optional external potentiometer.
8. Pedestal refers to the unwanted step in output voltage that occurs as a T/H is switched from the track to the hold mode. For many T/H's, pedestal amplitude is a function of input/output voltage level. For the MN343 and MN344, pedestal is constant regardless of input/output level.
9. Track-to-hold settling time refers to the time interval between the point at which a device is commanded from the track to the hold mode and the point at which the analog output (following a transient) settles to within a specified error band around its final value.

### BLOCK DIAGRAM



### PIN DESIGNATIONS



- |                 |                        |
|-----------------|------------------------|
| 1 T/H Command   | 14 - 15V Supply (-Vcc) |
| 2 No Connect    | 13 Analog Input        |
| 3 No Connect    | 12 No Connect          |
| 4 Ground        | 11 + 15V Supply (+Vcc) |
| 5 No Connect    | 10 No Connect          |
| 6 Ground        | 9 Offset Adjust        |
| 7 Offset Adjust | 8 Analog Output        |

### APPLICATIONS INFORMATION

**LAYOUT CONSIDERATIONS**—Proper attention to layout and decoupling is necessary to obtain specified accuracy and speed performance from MN343 and MN344. The units' two Ground pins (pins 4 and 6) are not connected to each other internally. They should be tied together as close to the unit as possible and both connected to system analog ground, preferably through a large analog ground plane underneath the package. If p.c. card ground lines must be run separately, wide conductor runs should be used with  $0.01\mu\text{F}$  ceramic capacitors interconnecting them as close to the package as possible.

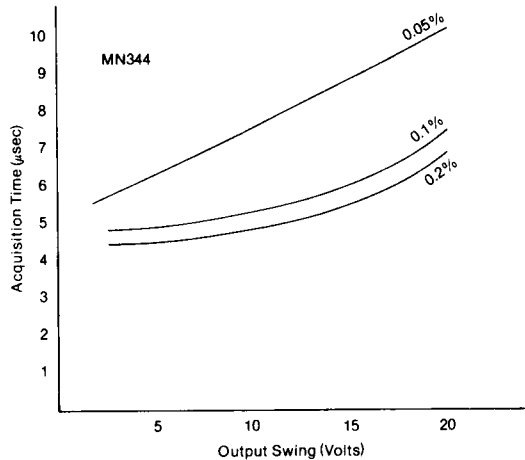
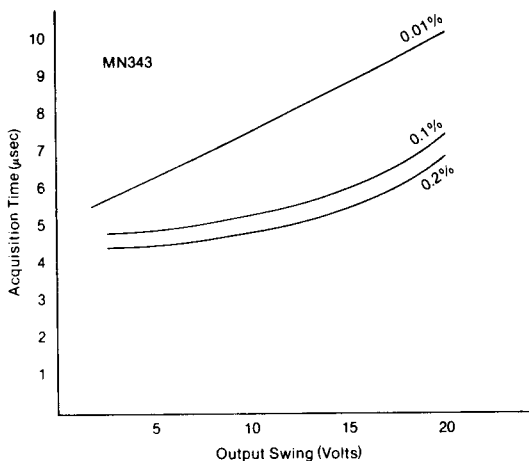
Coupling between analog inputs and digital signals should be minimized to avoid noise pick-up. Care should be taken to avoid long runs or analog runs close to digital lines. Input and output signal lines should be kept as short as possible, and if external offset adjustment is used, the potentiometer should be located as close to the unit as possible. If offset adjust is not used, pins 7 and 9 should be left open.

Power supply connections should be short and direct, and all power supplies should be decoupled with high-frequency bypass capacitors to ground.  $1\mu\text{F}$  tantalum capacitors in parallel with  $0.01\mu\text{F}$  ceramic capacitors are the most effective combination. Single  $1\mu\text{F}$  ceramic capacitors can be used if necessary to save board space.

**OFFSET ADJUSTMENT**—MN343/344's track-mode offset error can be reduced to zero with a  $5\text{k}\Omega$  potentiometer connected between pins 7 and 9 with its wiper connected to  $-15\text{V}$ . With the analog signal path grounded, the pot should be adjusted until the output equals zero volts. The pot can also be used to compensate for the effects of pedestal by per-

forming the adjustment in the hold mode. This adjustment is normally made while continually switching from track to hold and observing the T/H output on a scope. This procedure will eliminate adjustment ambiguities resulting from output droop.

**TRACK-HOLD COMMAND**—A TTL logic "1" applied to pin 1 will put the MN343/344 into the track (sample) mode. In this mode, the device acts as an inverting unity gain amplifier, and its output will follow (track) its input. A logic "0" applied to pin 1 will put the MN343/344 into the hold mode, and the output will be held constant at the level present when the hold command was given.



## ORDERING INFORMATION

Part Number	Specified Temperature Range	Gain Accuracy (+25°C, Max)	Offset Voltage (+25°C, Max)	Acquisition Time (2) (10V Step, Max)	Output Droop Rate (+25°C, Max)	Power Consumption (Maximum)	Ceramic DIP Package
MN343	0°C to +70°C	±0.02%	±2.5mV	10µsec	±0.3µV/µsec	435mW	14-pin
MN343H	-55°C to +125°C	±0.02%	±2.5mV	10µsec	±0.3µV/µsec	435mW	14-pin
MN343H/B (1)	-55°C to +125°C	±0.02%	±2.5mV	10µsec	±0.3µV/µsec	435mW	14-pin
MN344	0°C to +70°C	±0.05%	±2.5mV	10µsec	±1µV/µsec	435mW	14-pin
MN344H	-55°C to +125°C	±0.05%	±2.5mV	10µsec	±1µV/µsec	435mW	14-pin
MN344H/B (1)	-55°C to +125°C	±0.05%	±2.5mV	10µsec	±1µV/µsec	435mW	14-pin

### Notes:

1. Add "CH" to "H/B" models for 100% screening to MIL-H-38534.
2. For the MN343, acquisition time is specified for a final error band of ±0.01%. For the MN344, acquisition time is specified for a final error band of ±0.05%.



**MICRO NETWORKS**

324 Clark St., Worcester, MA 01606 (508) 852-5400