

# MC3470, MC3470A FLOPPY DISK READ-AMPLIFIER SYSTEMS

D2759, NOVEMBER 1983—REVISED FEBRUARY 1988

- Combines All Read-Amplifier Active Circuitry into One Monolithic Circuit
- Peak Shift . . . 2% Max (MC3470A)
- Designed to be Interchangeable with Motorola MC3470

## description

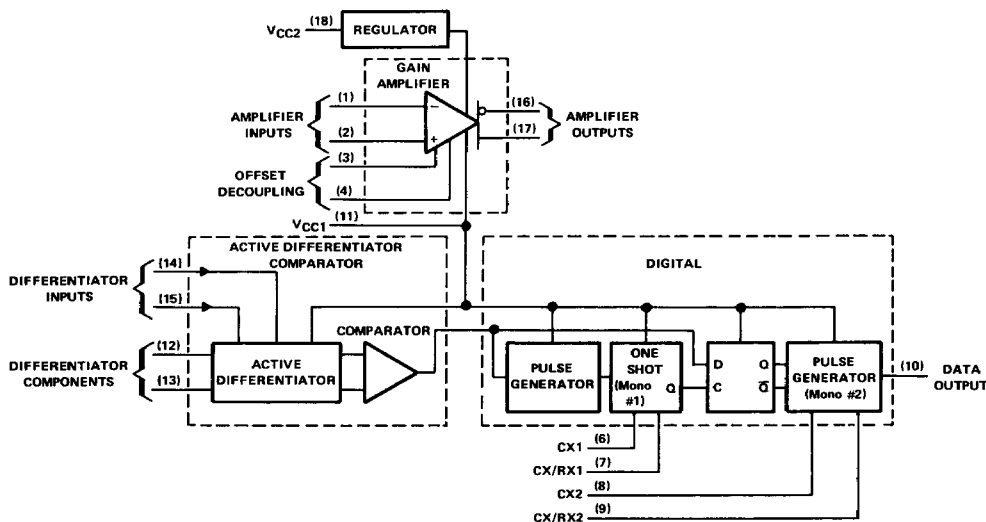
The MC3470 and MC3470A are monolithic read-amplifier systems each containing all the active circuitry necessary for obtaining digital information from floppy disk storage. They are designed to accept the ac differential signal from the magnetic head and produce a digital output pulse corresponding to each peak of the input signal. The gain stage amplifies the input waveform and applies it to an external filter network, enabling the active differentiator and time domain filter to produce the desired output.

The MC3470 and MC3470A are characterized for operation from 0°C to 70°C.

## N DUAL-IN-LINE PACKAGE (TOP VIEW)

AMPLIFIER	1	18	VCC2
INPUTS	2	17	AMPLIFIER
OFFSET	3	16	OUTPUTS
DECOUPLING	4	15	DIFFERENTIATOR
GND	5	14	INPUTS
CX1	6	13	DIFFERENTIATOR
CX/RX1	7	12	COMPONENTS
CX2	8	11	VCC1
CX/RX2	9	10	DATA OUTPUT

## functional block diagram



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## absolute maximum ratings over operating temperature range (unless otherwise noted)

Supply voltage, $V_{CC1}$ (see Note 1) . . . . .	7 V
Supply voltage, $V_{CC2}$ . . . . .	16 V
Input voltage range (amplifier inputs) . . . . .	-0.2 V to 7 V
Output voltage, $V_O$ (data output) . . . . .	-0.2 V to 7 V
Operating free-air temperature range . . . . .	0°C to 70°C
Storage temperature range . . . . .	-65°C to 150°C

NOTE 1: All voltage values are with respect to network ground terminal.

## recommended operating conditions

		MIN	NOM	MAX	UNIT
Supply voltage $V_{CC1}$		4.75	5	5.25	V
Supply voltage $V_{CC2}$		10	12	14	V
Timing capacitor CX1 (see Note 2)		150		680	pF
Timing capacitor CX2		100		800	pF
Timing resistors RX1 and RX2		1.5		10	k $\Omega$
Timing of digital section	Monostable no. 1	500		4000	ns
	Monostable no. 2	150		1000	ns
Operating free-air temperature, $T_A$		0		70	°C

NOTE 2: To minimize current transients, CX1 should be kept as small as convenient.

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**electrical characteristics over recommended ranges of supply voltages and operating free-air temperature (unless otherwise noted)**

**gain amplifier section**

PARAMETER		TEST CONDITIONS	MIN	TYP <sup>†</sup>	MAX	UNIT
A <sub>VD</sub>	Differential voltage amplification	V <sub>id</sub> = 5 mV rms, f = 200 kHz	80	100	120	V/V
			100	110	130	
I <sub>IB</sub>	Input bias current		-10	-25		μA
V <sub>ICR</sub>	Common-mode input voltage range	THD ≤ 5%	-0.1 to 1.5			V
V <sub>IDR</sub>	Differential input voltage range	THD ≤ 5%	± 25			mV
V <sub>OPP</sub>	Peak-to-peak differential output voltage		3	4		V
V <sub>OC</sub>	Common-mode output voltage	V <sub>I</sub> = 0, V <sub>ID</sub> = 0		3		V
V <sub>OD</sub>	Differential output offset voltage	V <sub>I</sub> = 0, V <sub>ID</sub> = 0, T <sub>A</sub> = 25°C			0.4	V
I <sub>OS</sub>	Short-circuit output current (each amplifier output)	Output shorted to ground		-8		mA
		Output shorted to V <sub>CC1</sub>	2.8	4		
r <sub>i</sub>	Small-signal input resistance	T <sub>A</sub> = 25°C	100	250		kΩ
r <sub>o</sub>	Small-signal output resistance (single-ended)	V <sub>CC1</sub> = 5 V, V <sub>CC2</sub> = 12 V, T <sub>A</sub> = 25°C		15		Ω
BW	Bandwidth (3 dB)	V <sub>id</sub> = 2 mV rms, V <sub>CC1</sub> = 5 V, V <sub>CC2</sub> = 12 V, T <sub>A</sub> = 25°C		5		MHz
CMRR	Common-mode rejection ratio	V <sub>CC1</sub> = 5 V, V <sub>CC2</sub> = 12 V, V <sub>id</sub> = 2 mV rms, V <sub>IP</sub> = 200 mV, A <sub>VD</sub> = 40 dB, f = 100 kHz, T <sub>A</sub> = 25°C		50		dB
k <sub>SVR</sub>	Supply voltage rejection ratio	A <sub>VD</sub> = 40 dB, T <sub>A</sub> = 25°C	V <sub>CC1</sub> = 5 ± 0.25 V, V <sub>CC2</sub> = 12 V	50		dB
			V <sub>CC1</sub> = 5 V, V <sub>CC2</sub> = 12 ± 2 V	60		
V <sub>n</sub>	Equivalent input noise voltage	BW = 10 Hz to 1 MHz, T <sub>A</sub> = 25°C		15		μV

<sup>†</sup>All typical values are at V<sub>CC1</sub> = 5 V, V<sub>CC2</sub> = 12 V, T<sub>A</sub> = 25°C.

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## active-differentiator section

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
$I_{sink}$	Sink current at pins 12 and 13	$V_{OD} = V_{CC1}$		1	1.4		mA
Peak shift	MC3470	$V_{CC1} = 5\text{ V}$ ,	$V_{CC2} = 12\text{ V}$ ,			5%	
	MC3470A	$V_{IDPP} = 1\text{ V}$ ,	$f = 250\text{ kHz}$ ,			2%	
		$I_{cap} = 500\text{ }\mu\text{A}$ ,	See Figure 1				
$r_{id}$	Differential input resistance					30	k $\Omega$
$r_{od}$	Differential output resistance					40	$\Omega$

## digital section

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
$V_{OH}$	High-level output voltage (pin 10)	$V_{CC1} = 4.75\text{ V}$ ,	$V_{CC2} = 12\text{ V}$ ,	2.7			V
		$I_{OH} = -0.4\text{ mA}$					
$V_{OL}$	Low-level output voltage (pin 10)	$V_{CC1} = 4.75\text{ V}$ ,	$V_{CC2} = 12\text{ V}$ ,			0.5	V
		$I_{OL} = 8\text{ mA}$					
$I_{CC1}$	Supply current from $V_{CC1}$	$V_{CC1} = 5.25\text{ V}$				35	mA
$I_{CC2}$	Supply current from $V_{CC2}$	$V_{CC2} = 14\text{ V}$				4.5	mA

timing characteristics over recommended ranges of supply voltages and operating free-air temperature (unless otherwise noted) (see Figure 2)

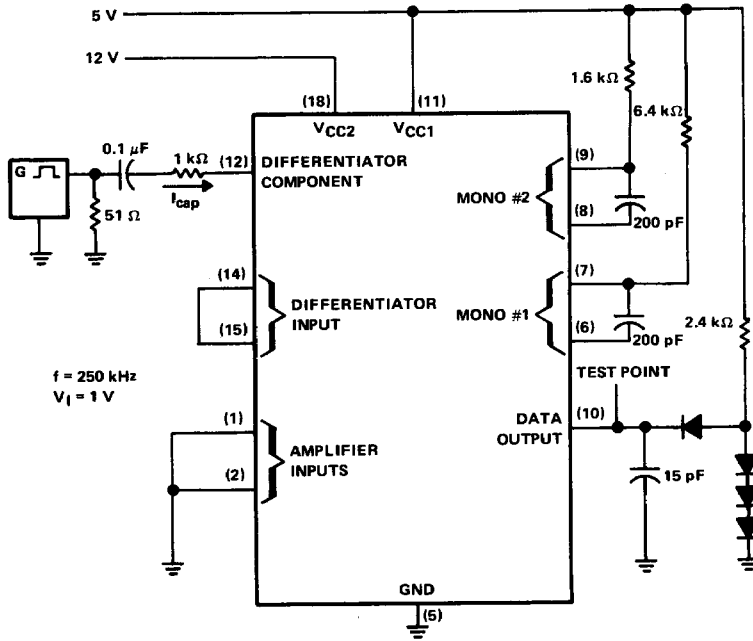
PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
$t_r$	Rise time (pin 10)					20	ns
$t_f$	Fall time (pin 10)					25	ns
	Timing accuracy of monostable no. 1 compared to $0.625\text{ }RX1 \cdot CX1 + 200\text{ ns}$	$RX1 = 1.5\text{ k}\Omega$ to $10\text{ k}\Omega$ , $CX1 = 150\text{ pF}$ to $680\text{ pF}$		85%		115%	
	Timing accuracy of monostable no. 2 compared to $0.625\text{ }RX2 \cdot CX2$	$RX2 = 1.5\text{ k}\Omega$ to $10\text{ k}\Omega$ , $CX2 = 100\text{ pF}$ to $800\text{ pF}$		85%		115%	

†All typical values are at  $V_{CC1} = 5\text{ V}$ ,  $V_{CC2} = 12\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

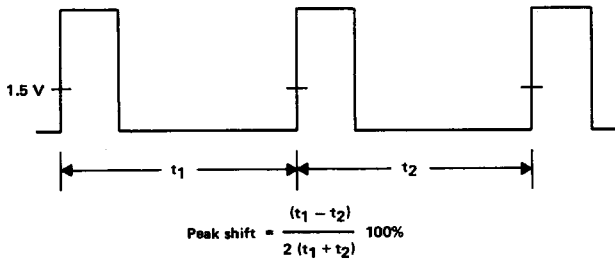
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PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



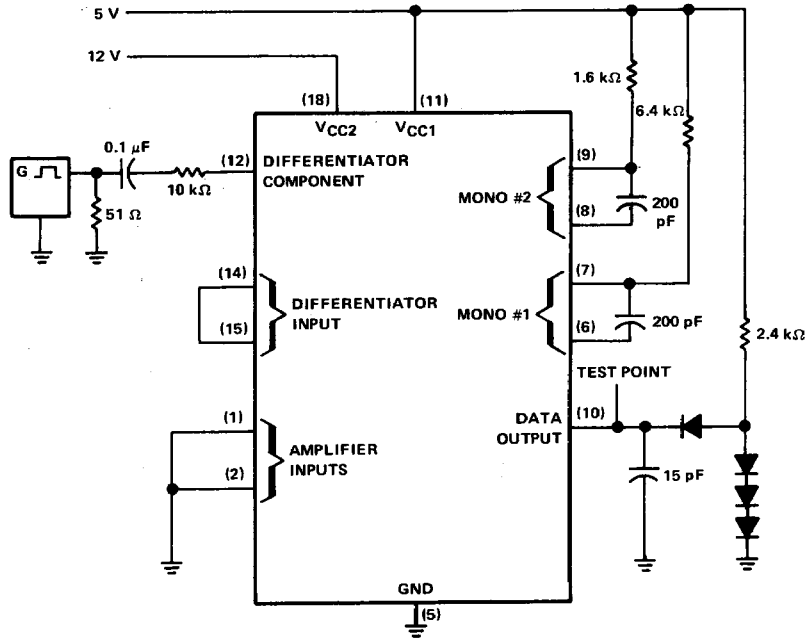
VOLTAGE WAVEFORMS

FIGURE 1. PEAK SHIFT

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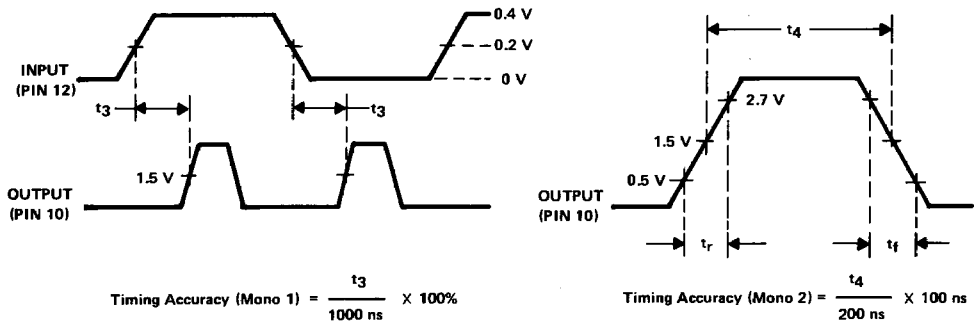
Special Functions

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT

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Special Functions



VOLTAGE WAVEFORMS

FIGURE 2. TIMING ACCURACY

TYPICAL CHARACTERISTICS

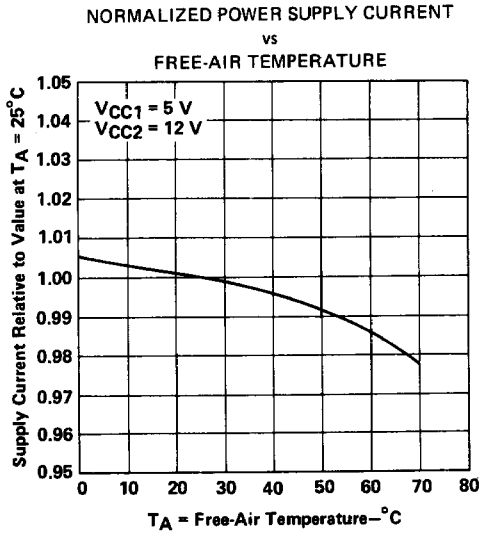


FIGURE 3

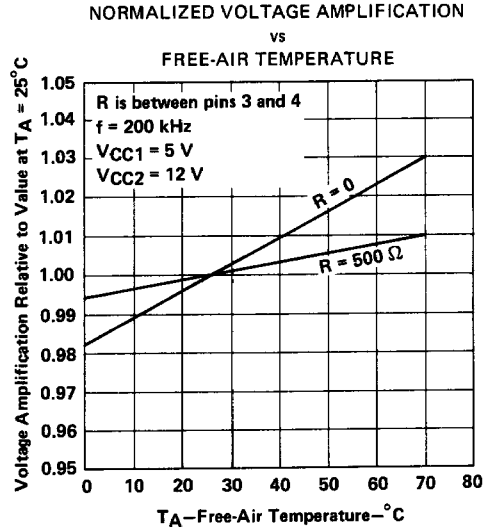


FIGURE 4

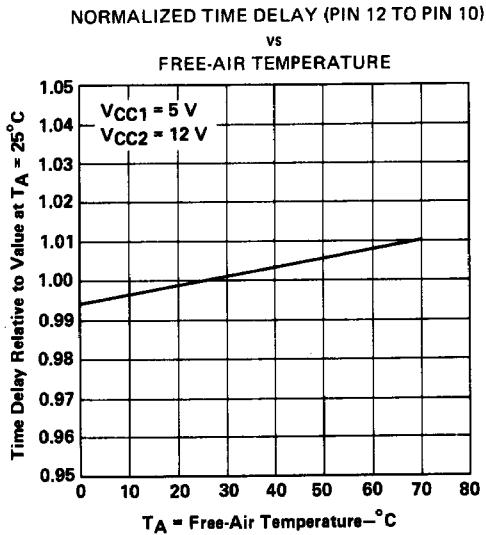


FIGURE 5

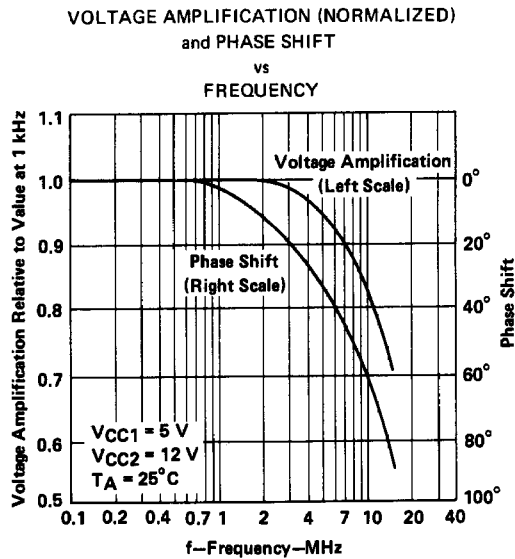


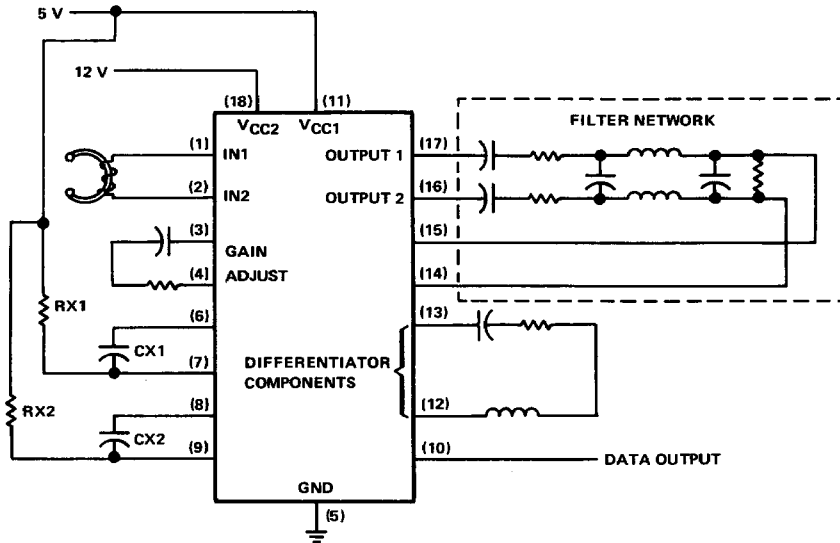
FIGURE 6

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**TYPICAL APPLICATION INFORMATION**



**FIGURE 7**

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**Special Functions**