MOTOROLA

MC6870, MC6871 series

actual size

P/N WILL BE
~~MC6871A1.000MHZ~~
MC6871A1.000 MHZ

Two-Phase Microprocessor Clocks

Designed to drive the Motorola MC6800 MPU

(At least 3 places right of decimal pt.)

The *Functional Module* approach to data communications hardware design significantly decreases the time between the "idea" stage and the marketable product.

A fundamental building block in a modular microcomputer system is the 2-phase clock oscillator used to drive the microprocessor. Motorola is uniquely qualified to provide this building block because of expertise in the three relevant fields: oscillator design, quartz crystal technology, and thick film hybrid integrated circuit manufacturing.

This one-of-a-kind expertise has created several clocks designed to drive Motorola's MC6800 Microprocessor. This plug-in unit contains the crystal, the oscillator circuit, the NMOS and TTL drivers, and the waveshaping and interface circuitry; all the components necessary to provide the critical non-overlapping 2-phase waveforms used by the MC6800 MPU.

FEATURES

Clock Module — Each clock module requires only a single 5 volt power supply. The NMOS outputs can drive highly capacitive loads ranging from 80 pf to 160 pf and meet all MPU input waveshape and timing requirements.

Each TTL output signal leads the ϕ_2 NMOS so that additional system device delays can be accommodated. All TTL outputs are buffered so they can drive 5 TTL devices and maintain all output specifications.

Each module is crystal-controlled and is compensated for variations in temperature, voltage, and load. The standard frequency of each model is 1 MHz; however, other frequencies between 250 kHz and 2.5 MHz can be ordered.

Reliability — Decreased Component Count — Thick film hybrids offer a reliability advantage that comes primarily from reduced component count and therefore reduced interconnections. Further, the single hermetic seal on the hybrid package reduces the failure rate whereas in a discrete design a separate sealing process with an associated failure rate is needed for each component.

High Density Packaging — The hybrid MPU clock allows compact microcomputer design. It takes up only 1.34" x .840" space and has a seated height of .200".

Ruggedized Design — Maximum reliability at minimum cost is the result of combining three of Motorola's fields of experience: quartz crystal technology, clock oscillator design, and thick film hybrid integrated circuit manufacturing. Mass automated production techniques assure volume production. Gold plating of all crystals and Class 100 clean room processing testify that no short cuts are taken that might diminish reliability. Environmental testing proves the effectiveness of the rugged design for those applications in which shock and vibration are likely hazards.

Complete Process Control — Motorola is the only totally integrated manufacturer of quartz frequency control devices; full control of all processes from growing, sawing, lapping, and finishing quartz to combining it with other components into an electronic product — the MC6870A, MC6871A, and MC6871B MPU clocks.

Volume Production — Production facilities are oriented to mass automated production techniques. And, if required, capital for expansion is available to meet even greater requirements.

4

environmental specifications

Temperature Cycle: ±5 ppm max., 0 to 120°C, 3 cycles, 2 hrs. max. each, 25 ±2°C ref.

Shock: 1000G's 0.35 millisec, ½ sine wave, 3 shocks each plane

Vibration: 10-55 Hz, .060" D.A.; 55-2000Hz, 35 G's. Duration Time—12 Hours

Humidity: 85% Rel. Humidity, @ +85°C, 250 Hours

mechanical specifications

Gross Leak Test: All units 100% leak tested in de-ionized H_2O.

Hermetic Sealed Package: Mass spectrometer leak rate less than 2×10^{-8} atmos. cc/sec. of helium.

Seal Strength: 20 lbs. max. force perpendicular to top and bottom.

Pin Material: Phosphor bronze, ¼ hard, Grade A .00003" thick gold flash finish.

Bend Test: Will withstand maximum bend of 90° reference to base for 1 bend.

Marking Ink: Epoxy, heat cured.

Solvent Resistance: Isopropyl Alcohol Tricholoroethane Freon TMC. No marking or seal destruction. Dipped 1 minute @ +25°C ±5°C in solvent.

Note: (1) Unit can be cleaned by only one type solvent listed.

Note: (2) Ultrasonic degreaser not to be used unless frequency and vibration of cleaner specified

solderability specifications

Materials:

1.1 Solder: 60% tin and 40% lead.

1.2 Flux: The flux shall be 25 percent by weight of Grade WW rosin and 75 percent by weight of 99 percent isopropyl alcohol.

Procedure:

2.1 Solder Bath: The solder bath shall be maintained at 232 ±6°C.

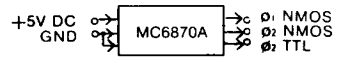
2.2 Solderability: Dip the terminals into the flux to the depth that is to be soldered or to a maximum depth of .025" from the body of the oscillator. Keep them in the flux for at least 5 seconds. Withdraw them from the flux. Dip them immediately into the molten solder to the same depth. Keep them in the molten solder for 2 to 5 seconds. Withdraw them and allow the solder to cool in air.

Requirements:

3.1 The terminals are considered solderable and acceptable for electrical connection purposes if 90 percent of the cold solder surface is uniform and free from breaks and pinholes. The other 10 percent of the cooled solder surface may show only pinholes, voids, or rough spots that are not concentrated in one area.

MC6870A

limited function microprocessor clock
250 kHz to 2.5 MHz



specifications

Rating	Symbol	Value	Unit
Supply Voltage	V_{cc}	5.00±5%	Vdc
Operating Temperature Range	T_A	0 to +70	°C
Storage Temperature	T_{stg}	−55 to +125	°C
Power Supply Drain (max.)	I_{pd}	100	mA

ELECTRICAL CHARACTERISTICS (V_{cc} = 5.0 ± 5%, V_{ss} = O,T_A = 0° to 70°C, unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Frequency					
Operating Frequency	f_c	.250		2.5	MHz
Frequency stability (inclusive of calibration tolerance at +25°C, operating temperature, input voltage change, load change, aging, shock and vibration)			±.01		%
NMOS Outputs at 1.0 MHz Operation**					
Pulse Width (meas. at V_{cc}= −.3V dc level)	TØ1H TØ2H	430 450			ns ns
Logic Levels	V_{OLC} V_{OHC}	V_{ss}-.1 V_{cc}-.3	— —	V_{ss}+.3 V_{cc}+.1	Vdc Vdc
Rise and Fall Times	t_r t_f	5 5	12 12	50 50	ns ns
*Overshoot/Undershoot Logic "1" Logic "0"	 V_{OS}	 V_{cc}-.5 V_{ss}-.5		 V_{cc}+.5 V_{ss}+.5	 Vdc Vdc
Pulse duration of any overshoot or undershoot	T_{OS}			40	ns
Period @ 0.3V dc Level	t_{cyc}		1.00		us
Edge Timing @ V_{cc}=0.3V dc	Tx	940			ns
NMOS Relationship @ +0.5V dc Level	t_{d1} t_{d2}	0 0		 8.0	 us
TTL Outputs					
In ref. to $Ø_2$ NMOS @ 0.3V dc					
$Ø_2$ TTL @ +1.4V dc	T_A T_H	15 10	30 25	45 40	ns ns
Logic Levels	V_{OH} V_{OL}	2.4	3.2 .3	 .4	Vdc Vdc
Rise and Fall Times .4V and 2.4V 2.4V and .4V	 t_r t_f			 15 15	 ns ns
Logic "0" Sink (/Gate)	I_{OL}			−1.6	mA
Logic "1" Source (/Gate)	I_{OH}			+40	uA
Current Output Shorted	I_{SC}	−18		−57	mA
Load					
NMOS—Load Capacity $Ø_1$, $Ø_2$	C_{NMOS}	80	120	160	pf
TTL—No. of Loads				5	ttl
TTL—Load Capacity	C_{TTL}			50	pf

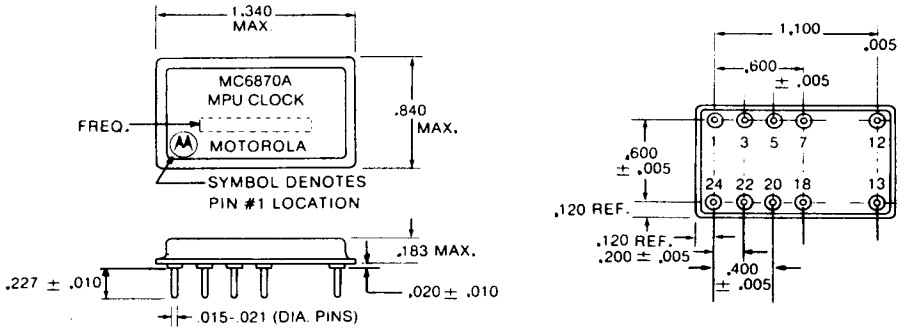
*Into specified test load

**Apply the following parameters for frequencies other than 1.0 MHz:
TØ1H=0.5 (P-140) ns
TØ2H=0.5 (P-100) ns
Tx=(P-60) ns
where P=desired period of operation in nanoseconds

PIN	CONNECTION
1	GND
3	NC
5	$Ø_2$ TTL
7	V_{cc} (+5VDC)
12	$Ø_2$ NMOS
13	$Ø_1$ NMOS
18	GND
20	NC
22	NC
24	NC

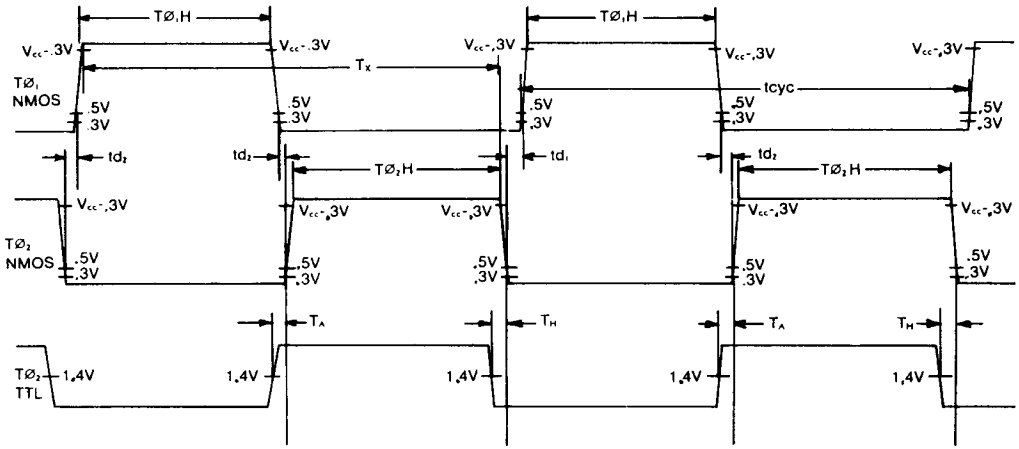
Note: All dimensions are in inches

DIMENSIONS

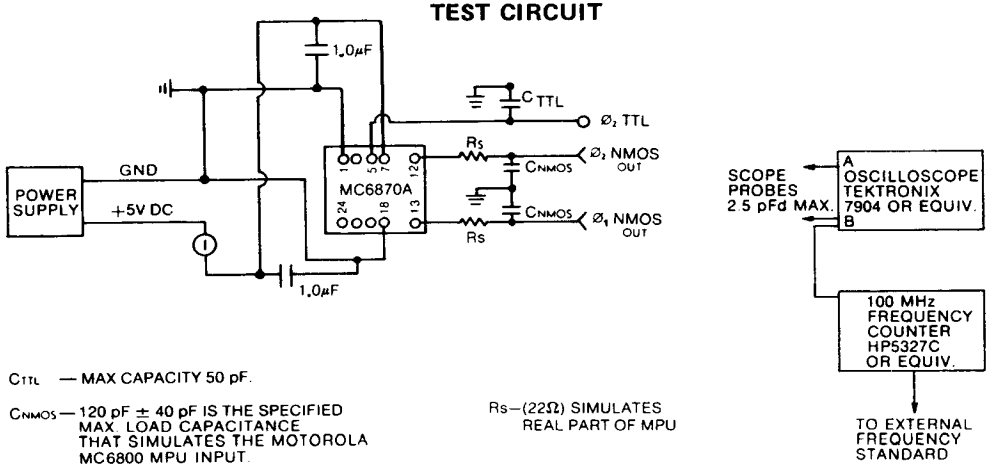


WAVEFORM TIMING

(ALL TIME IN NANOSECONDS)



TEST CIRCUIT



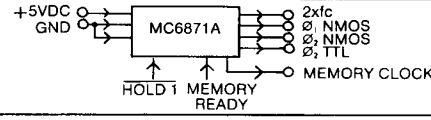
C_{TTL} — MAX CAPACITY 50 pF.

C_{NMOS} — 120 pF ± 40 pF IS THE SPECIFIED MAX. LOAD CAPACITANCE THAT SIMULATES THE MOTOROLA MC6800 MPU INPUT.

R_S — (22Ω) SIMULATES REAL PART OF MPU

MC6871A

full function microprocessor clock
, 850 kHz to 2.5 MHz



specifications

Rating	Symbol	Value	Unit
Supply Voltage	V_{cc}	5.00±5%	Vdc
Operating Temperature Range	T_A	0 to +70	°C
Storage Temperature	T_{stg}	−55 to +125	°C
Power Supply Drain (max.)	I_{pd}	100	mA

ELECTRICAL CHARACTERISTICS (V_{cc} = 5.0 ± 5%, V_{ss} = O,T_A = 0° to 70°C, unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Frequency					
Operating Frequency	f_c	.850		2.5	MHz
Frequency stability (inclusive of calibration tolerance at +25°C, operating temperature, input voltage change, load change, aging, shock and vibration)			±.01		%
NMOS Outputs at 1.0 MHz Operation* **					
Pulse Width (meas. at V_{cc} = −.3V dc level)	TØ1H TØ2H	430 450			ns ns
Logic Levels	V_{OLC} V_{OHC}	V_{ss}-.1 V_{cc}-.3	— —	V_{ss}+.3 V_{cc}+.1	Vdc Vdc
Rise and Fall Times	t_r t_f	5 5	12 12	50 50	ns ns
*Overshoot/Undershoot Logic "1" Logic "0"	 V_{OS}	 V_{cc}-.5 V_{ss}-.5		 V_{cc}+.5 V_{ss}+.5	 Vdc Vdc
Pulse duration of any overshoot or undershoot	T_{OS}			40	ns
Period @ 0.3V dc Level	t_{cyc}		1.00		us
Edge Timing @ V_{cc}=0.3V dc	Tx	940			ns
NMOS Relationship @ +0.5V dc Level	t_{d1} t_{d2}	0 0		8.0	us
TTL Outputs					
In ref. to $\varnothing_2$ NMOS @ 0.3V dc					
$\varnothing_2$ TTL @ 1.4V dc	T_A T_H	15 10	30 25	45 40	ns ns
Memory Clock @ 1.4V dc	T_C T_J	30 20	50 40	70 60	ns ns
2xfc @ 1.4V dc	T_B	40	80	120	ns
Logic Levels	V_{OH} V_{OL}	2.4	3.2 .3	 .4	Vdc Vdc
Rise and Fall Times .4V and 2.4V 2.4V and .4V	 t_r t_f			 15 15	 ns ns
Logic "0" Sink (/Gate)	I_{OL}			−1.6	mA
Logic "1" Source (/Gate)	I_{OH}			+40	uA
Current Output Shorted	I_{SC}	−18		−57	mA
Load					
NMOS—Load Capacity Ø1, Ø2	C_{NMOS}	80	120	160	pf
TTL—No. of Loads				5	ttl
TTL—Load Capacity	C_{TTL}			50	pf
Logic Inputs ("0" Level Applies HOLD or MEMORY READY)**					
Holds Ø1 NMOS 'High', Ø2 NMOS 'Low', Ø2 TTL 'Low'	$\overline{\text{HOLD 1}}$	−.2		+.4	Vdc
Holds Ø1 NMOS 'Low', Ø2 NMOS 'High', Ø2 TTL 'High', and MEMORY CLOCK 'High'	MEMORY READY	−.2		+.4	Vdc

*Into specified test load

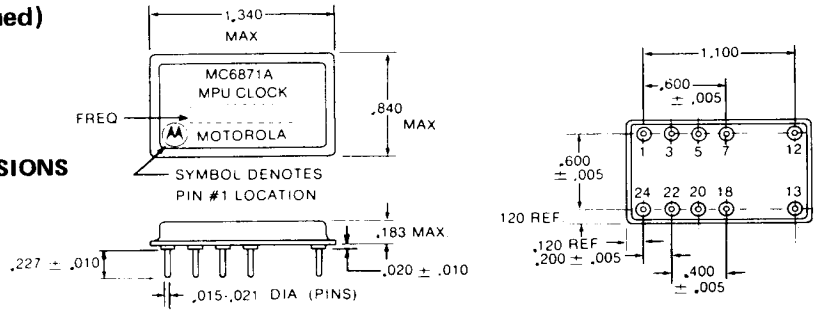
**Must be externally held at "1" level (2.4V min., 5.0V max.) if not used

***Apply the following parameters for frequencies other than 1 MHz:
TØ1H=0.5 (P-140) ns
TØ2H=0.5 (P-100) ns
Tx=(P-60) ns
where P=desired period of operation in nanoseconds

PIN	CONNECTION
1	GND
3	MEMORY CLOCK
5	Ø2 TTL
7	V_{cc} (+5VDC)
12	Ø2 NMOS
13	Ø1 NMOS
18	GND
20	$\overline{\text{HOLD 1}}$
22	MEMORY READY
24	2xfc

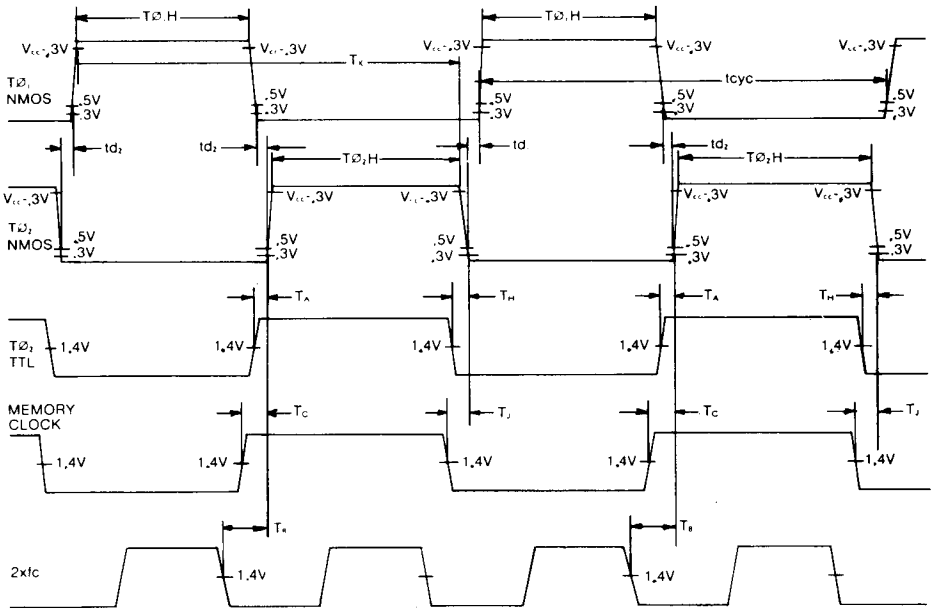
Note: All dimensions are in inches

DIMENSIONS

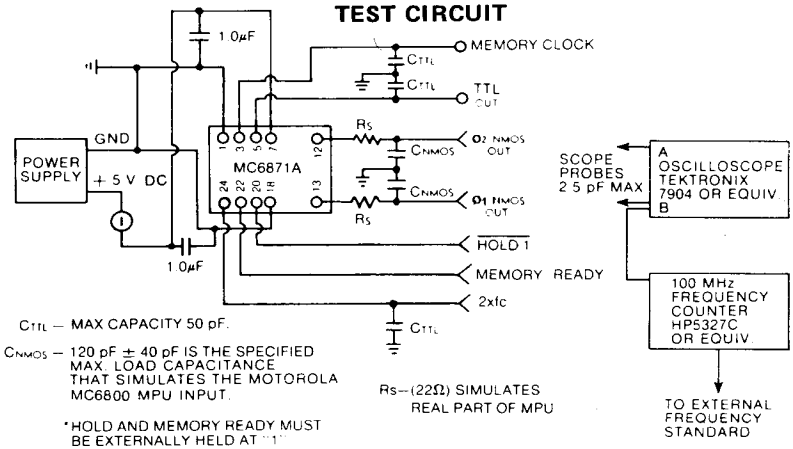


WAVEFORM TIMING

(ALL TIME IN NANOSECONDS)



TEST CIRCUIT



CTTL — MAX CAPACITY 50 pF.

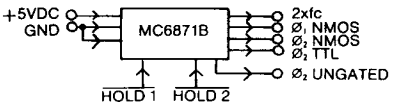
CNMOS — 120 pF ± 40 pF IS THE SPECIFIED MAX. LOAD CAPACITANCE THAT SIMULATES THE MOTOROLA MC6800 MPU INPUT.

RS — (22Ω) SIMULATES REAL PART OF MPU

*HOLD AND MEMORY READY MUST BE EXTERNALLY HELD AT "1" LEVEL (2.4VDC MIN., 5.0VDC MAX.) WHEN NOT USED

MC6871B

alternate function microprocessor clock
250 kHz to 2.5 MHz



specifications

Rating	Symbol	Value	Unit
Supply Voltage	V_{cc}	5.00±5%	Vdc
Operating Temperature Range	T_A	0 to +70	°C
Storage Temperature	T_{stg}	−55 to +125	°C
Power Supply Drain (max.)	I_{pd}	100	mA

ELECTRICAL CHARACTERISTICS (V_{cc} = 5.0 ± 5%, V_{ss} = O,T_A = 0° to 70°C, unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Frequency					
Operating Frequency Frequency stability (inclusive of calibration tolerance at +25°C, operating temperature, input voltage change, load change, aging, shock and vibration)	f_c	250	±.01	2.5	MHz %
NMOS Outputs at 1.0 MHz Operation* **					
Pulse Width (meas. at V_{cc} = −.3V dc level) $T\emptyset_1H$ $T\emptyset_2H$		430 450			ns ns
Logic Levels V_{OLC} V_{OHC}		V_{ss}-.1 V_{cc}-.3	— —	V_{ss}+.3 V_{cc}+.1	Vdc Vdc
Rise and Fall Times t_r t_f		5 5	12 12	50 50	ns ns
*Overshoot/Undershoot Logic "1" Logic "0" V_{OS}		V_{cc}-.5 V_{ss}-.5		V_{cc}+.5 V_{ss}+.5	Vdc Vdc
Pulse duration of any overshoot or undershoot T_{OS}				40	ns
Period @ 0.3V dc Level t_{cyc}			1.00		us
Edge Timing @ V_{cc}=0.3V dc Tx		940			ns
NMOS Relationship @ +0.5V dc t_{d1} t_{d2}		0 0		8.0	us
TTL Outputs					
In ref. to $\emptyset_2$ NMOS @ 0.3V dc					
$\emptyset_2$ TTL @ 1.4V dc T_A T_H		15 10	30 25	45 40	ns ns
$\emptyset_2$ Ungated @ 1.4V dc T_C T_J		30 20	50 40	70 60	ns ns
2xfc @ 1.4V dc T_B		40	80	120	ns
Logic Levels V_{OH} V_{OL}		2.4	3.2 .3	.4	Vdc Vdc
Rise and Fall Times .4V and 2.4V 2.4V and .4V t_r t_f				15 15	ns ns
Logic "0" Sink (/Gate) I_{OL}				−1.6	mA
Logic "1" Source (/Gate) I_{OH}				+40	uA
Current Output Shorted I_{SC}		−18		−57	mA
Load					
NMOS—Load Capacity $\emptyset_1$, $\emptyset_2$ C_{NMOS}		80	120	160	pf
TTL—No. of Loads				5	ttl
TTL—Load Capacity C_{TTL}				50	pf
Logic Inputs ("0" Level applies HOLD)**					
Holds $\emptyset_1$ NMOS 'High', $\emptyset_2$ NMOS 'Low', $\emptyset_2$ TTL 'Low'	$\overline{\text{HOLD 1}}$	−.2		+.4	Vdc
Holds $\emptyset_1$ NMOS 'Low', $\emptyset_2$ NMOS 'High', $\emptyset_2$ TTL 'High'	$\overline{\text{HOLD 2}}$	−.2		+.4	Vdc

*Into specified test load

**Must be externally held at "1" level (2.4V min., 5.0V max.) if not used

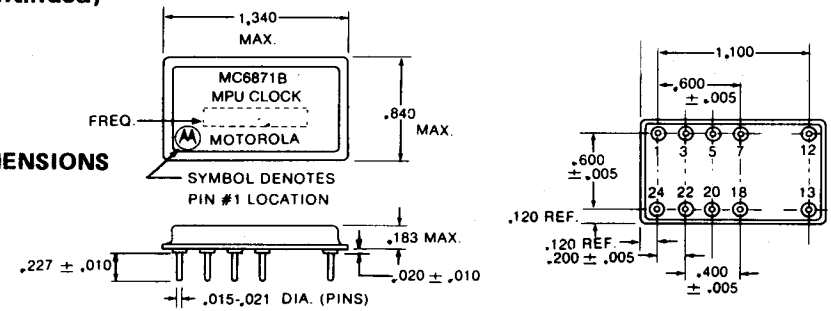
***Apply the following parameters for frequencies other than 1 MHz:
$T\emptyset_1H$=0.5 (P-140) ns
$T\emptyset_2H$=0.5 (P-100) ns
Tx=(P-60) ns
where P=desired period of operation in nanoseconds

PIN	CONNECTION
1	GND
3	$\emptyset_2$ TTL UNGATED
5	$\emptyset_2$ TTL
7	V_{cc} (+5VDC)
12	$\emptyset_2$ NMOS
13	$\emptyset_1$ NMOS
18	GND
20	$\overline{\text{HOLD 1}}$
22	$\overline{\text{HOLD 2}}$
24	2xfc

Note: 4xfc available on request

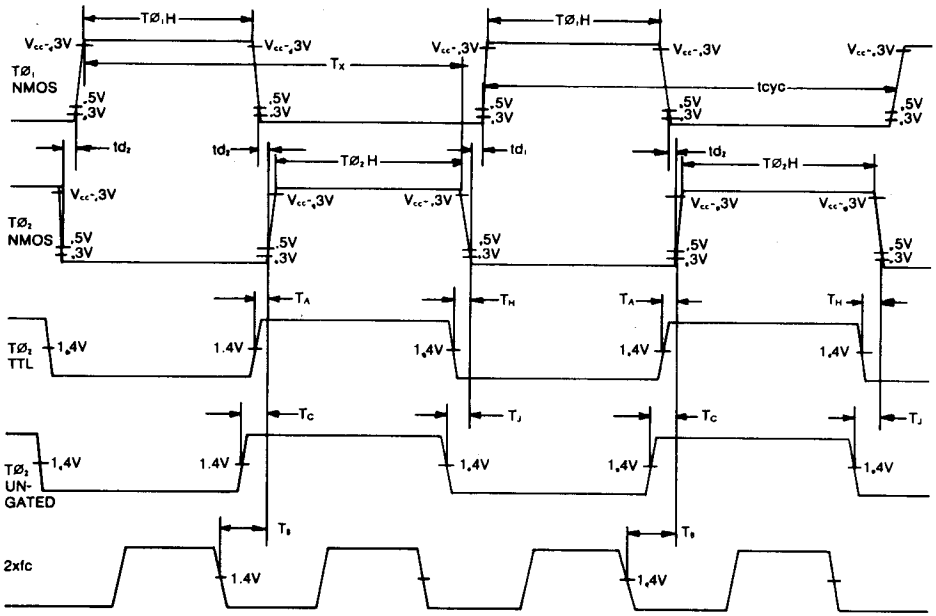
Note All dimensions are in inches

DIMENSIONS

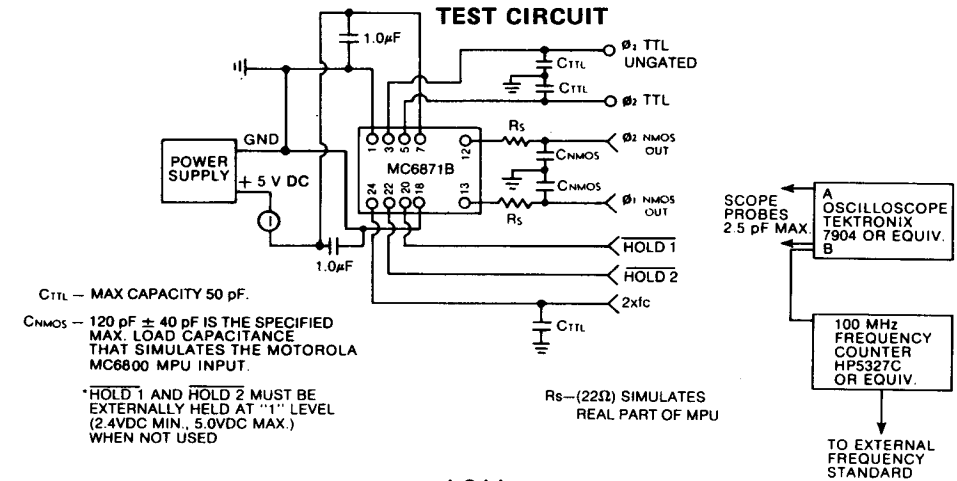


WAVEFORM TIMING

ALL TIME IN NANOSECONDS.



TEST CIRCUIT



CTTL — MAX CAPACITY 50 pF.

CNMOS — 120 pF ± 40 pF IS THE SPECIFIED MAX. LOAD CAPACITANCE THAT SIMULATES THE MOTOROLA MC6800 MPU INPUT.

*HOLD 1 AND HOLD 2 MUST BE EXTERNALLY HELD AT "1" LEVEL (2.4VDC MIN., 5.0VDC MAX.) WHEN NOT USED

Rs—(22Ω) SIMULATES REAL PART OF MPU