Memory/Clock Drivers

MH0012/MH0012C high speed MOS clock driver

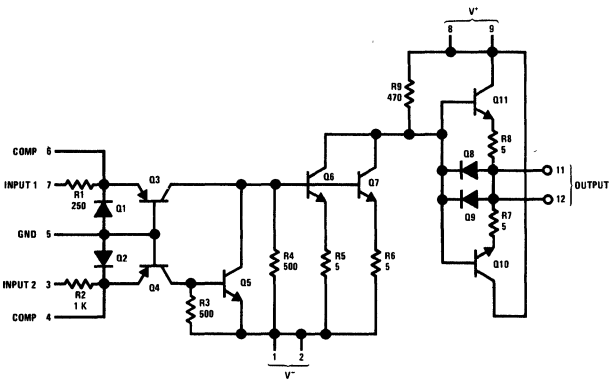
general description

The MH0012/MH0012C is a high performance clock driver that is designed to be driven by the DM7830/DM8830 or other line drivers or buffers with high output current capability. It will provide a fixed width pulse suitable for driving MOS shift registers and other clocked MOS devices.

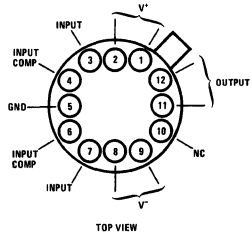
features

- High output voltage swings—12 to 30 volts
- High output current drive capability—1000 mA peak
- High repetition rate—10 MHz at 18 volts into 100 pF
- Low standby power—less than 30 mW

schematic and connection diagrams

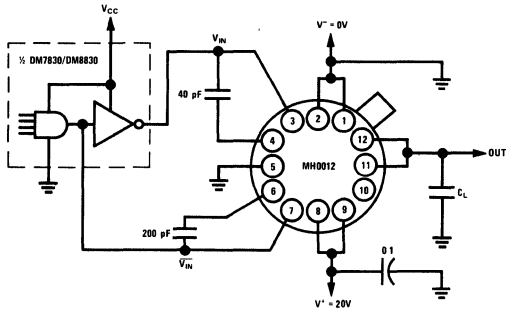


12-lead TO-8 Package

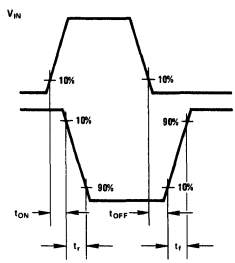


Order Number MH0012G
or MH0012CG
See Package 6

typical application (ac test circuit)



timing diagram



absolute maximum ratings

V^- Supply Voltage	Differential (Pin 1 or 2 to Pin 5)	−40V
V^+ Supply Voltage	Differential (Pin 8 or 9 to Pin 1 or 2)	30V
Input Current (Pin 3 or 7)		±75 mA
Peak Output Current		±1000 mA

Maximum Output Load – See Figure 2	
Power Dissipation – See Figure 1	1 5W
Storage Temperature	−65°C to +150°C
Operating Temperature MH0012	−55°C to +125°C
MH0012C	0°C to +85°C
Lead Temperature (Soldering, 10 sec)	300°C

dc electrical characteristics (Note 1)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Logic "1" Input Voltage (Pins 7 and 3)	$V^+ - V^- = 20V$, $V_{OUT} \leq V^- + 2V$		1 0	2 0	V
Logic "0" Input Voltage (Pins 7 and 3)	$V^+ - V^- = 20V$, $V_{OUT} \geq V^+ - 1\,5V$	0 4	0 6		V
Logic "1" Output Voltage	$V^+ - V^- = 20V$, $I_{OUT} = 1mA$, $V_{IN} = 2\,0V$		V^- + 1 0	V^- + 2 0	V
Logic "0" Output Voltage	$V^+ - V^- = 20V$, $I_{OUT} = -1mA$, $V_{IN} = 0\,4V$	$V^+ - 1\,5$	$V^+ - 0\,7$		V
I_{DC} (V^- Supply)	$V^+ - V^- = 20V$, $V_{IN} = 2\,0V$		34	60	mA

ac electrical characteristics

PARAMETER	CONDITIONS (Note 3)	MIN	TYP	MAX	UNITS
Turn-On Delay (t_{ON})	$V^+ - V^- = 20V$, $V_{CC} = 5\,0V$ $C_L = 200$ pF, f = 1 0 MHz $T_A = 25°C$		10	15	ns
Rise Time (t_r)			5	10	ns
Turn-Off Delay (t_{OFF})			35	50	ns
Fall Time (t_f)			35	45	ns

Note 1: Characteristics apply for circuit of Figure 1. Min and max limits apply from −55°C to +125°C for the MH0012 and from 0°C to +85°C for the MH0012C. Typical values are for T_A = +25°C.

Note 2: Due to the very fast rise and fall times, and the high currents involved, extremely short connections and good by passing techniques are required.

Note 3: All conditions apply for each parameter.

Power Dissipation

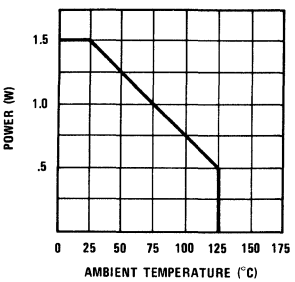


Figure 1.

Maximum Output Load vs Voltage Swing vs Rise Times

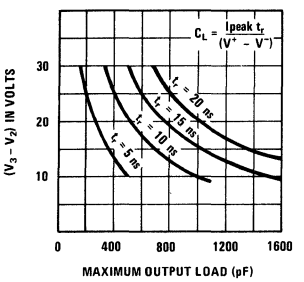
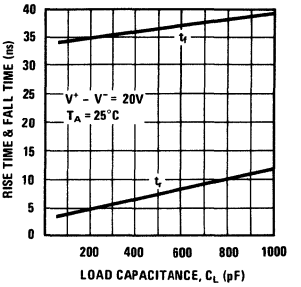


Figure 2.

Rise and Fall Times vs Load Capacitance



applications information

Power Dissipation Considerations

The power dissipated by the MH0012 may be divided into three areas of operation = ON, OFF and switching. The OFF power is approximately 30 mW and is dissipated by R_2 when Pin 3 is in the logic "1" state The OFF power is neglible and will be ignored in the subsequent discussion. The ON power is dissipated primarily by Q_3 and R_9 and is given by:

$$P_{ON} \cong [V^- I_{IN} + \frac{(V^+ - V^-)^2}{R_9}] \text{ DC} \quad (1)$$

Where

$$\text{DC} = \text{Duty Cycle} = \frac{\text{ON Time}}{\text{ON Time \& OFF Time}}$$

I_{IN} is given by $\frac{V_{IN} - V_{BE3}}{R_1}$ and equation (1) becomes

$$P_{ON} = \left[\frac{(V_{IN} - V_{BE3})|V^-|}{R_1} + \frac{(V^+ - V^-)^2}{R_9}\right] \text{DC} \quad (2)$$

For V_{IN} = 2 5V, V_{BE3} = 0 7V, V^+ = 0V, V^- = −20V, and DC = 20%, $P_{ON} \cong$ 200 mW

The transient power incurred during switching is given by:

$$P_{AC} = (V^+ - V^-)^2\, C_L f \quad (3)$$

For V^+ = 0V, V^- = −20V, C_L = 200 pF, and f = 5.0 MHz, P_{AC} = 400 mW.

The total power is given by

$$P_T = P_{AC} + P_{ON} \quad (4)$$

$$P_T \leq P_{MAX}$$

For the above example, P_T = 600 mW.