



Consumer Circuits

LM175/LM275/LM375

LM175/LM275/LM375 oscillator and buffer with TTL output

general description

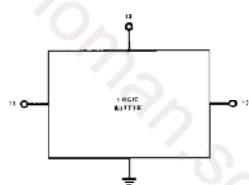
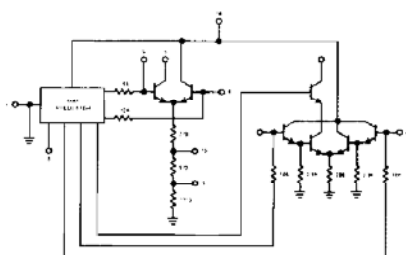
The LM175/LM275/LM375 is a monolithic, differential pair, general purpose oscillator. It may be used with crystal control or with LC or RC tanks. Two output configurations are possible. It may be connected to the internal isolating buffer to provide sine or square wave outputs, or to the internal logic buffer with output levels and switching times compatible with TTL and DTL logic circuitry. It provides extremely high temperature and power supply versus frequency rejection.

The LM175 is specified for operation over the -55°C to $+125^{\circ}\text{C}$ military temperature range. The LM275 is specified for operation over the -25°C to $+85^{\circ}\text{C}$ temperature range. The LM375 is specified for operation over the 0°C to $+70^{\circ}\text{C}$ temperature range.

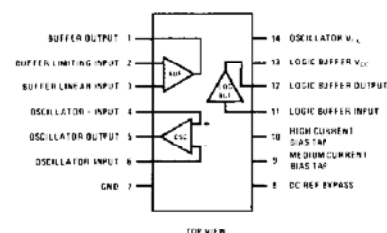
features

- Oscillation up to 200 MHz
- Operation from supplies from 4.5V to 24V (Logic buffer maximum supply at 7.0V)
- High supply voltage rejection, typically 0.1 opm/V
- Low temperature coefficient, typically 0.05 $\text{ppm}^{\circ}\text{C}$
- Variable drive to crystal to limit dissipation
- Capable of fundamental or overtone, series or parallel mode of operation
- Separate power supply lead for logic buffer for noise isolation
- Low power dissipation

schematic and connection diagrams



Dual-In-Line Package



Order Number LM175D
or LM275D or LM375D
See Package 1

Order Number LM375N
See Package 22

typical applications

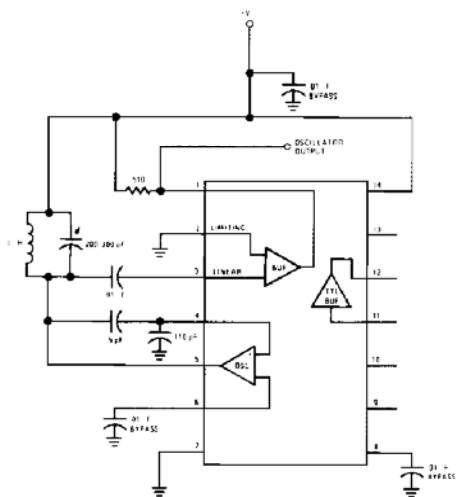


FIGURE 1. 10 MHz L-C Sine Wave Oscillator

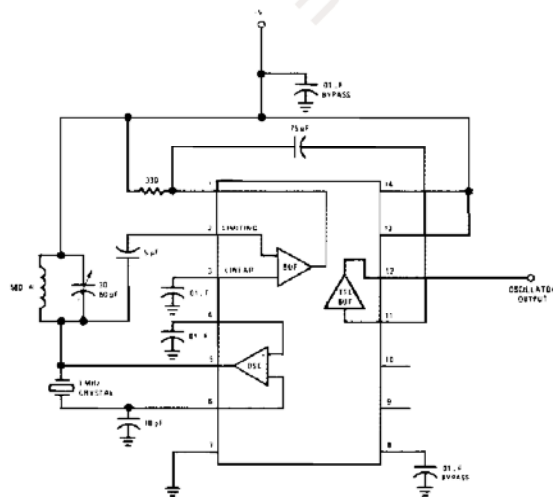


FIGURE 2. 1 MHz Crystal Oscillator with TTL Output

5

absolute maximum ratings

Supply Operating Voltage (Pin 14)	24V	Storage Temperature Range	-65°C to +150°C
Supply Operating Voltage (Pin 13)	7V	Operating Temperature Range LM175	-55°C to +125°C
Differential Input Voltage ΔV_{P_4} to Pin 6	5V	LM275	-25°C to +85°C
ΔV_{P_2} to Pin 3	5V	LM375	0°C to 70°C
Power Dissipation (Note 1)	500 mW	Lead Temperature (Soldering, 10 sec)	300°C

electrical characteristics ($T_A = 25^\circ\text{C}$, $V_{CC} = 5\text{V}$ unless otherwise noted)

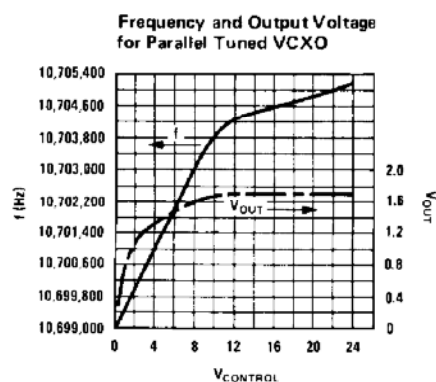
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
DC CHARACTERISTICS						
Power Supply Current (Pin 14)	I_{PS14}	$V_{CC} = 24\text{V}$	4.0	6.0	12.0	mA
Power Supply Current (Pin 13)	I_{PS13}	No Load at Pin 12	4.0	6.0	14.0	mA
Oscillator Output Current	I_{OSC}	R_L (Pin 5) = 1 k Ω Pin 9 Open, Pin 10 Open	120	140		μA_{p-p}
		Pin 9 Tied to Pin 10	160	190		μA_{p-p}
		Pin 9 Grounded, Pin 10 Open	300	360		μA_{p-p}
		Pin 10 Grounded, Pin 9 Open	750	1000		μA_{p-p}
Buffer Output Current	I_{BUF}		2.5	3.0		mA_{p-p}
Logic Buffer Output Voltage	V_{TTL}	Input LOW Input HIGH $I_{SINK} = 1.6\text{ mA}$	2.1	2.7		
				200	400	mV
The Following Specifications apply to $-55^\circ\text{C} < T_A < +125^\circ\text{C}$						
Oscillator Output Current	I_{OSC}	R_L (Pin 5) = 1 k Ω Pin 9 Open, Pin 10 Open	100			μA_{p-p}
		Pin 9 Tied to Pin 10	130			μA_{p-p}
		Pin 9 Grounded, Pin 10 Open	250			μA_{p-p}
		Pin 10 Grounded, Pin 9 Open	600			μA_{p-p}
Buffer Output Current	I_{BUF}		2.0			mA_{p-p}
AC CHARACTERISTICS						
Oscillator Gain (at 1 kHz)	g_{mOSC}	Pin 9 Open, Pin 10 Open		1.4		mmhos
		Pin 9 Tied to Pin 10		1.9		mmhos
		Pin 9 Grounded, Pin 10 Open		3.6		mmhos
		Pin 9 Open, Pin 10 Grounded		10.0		mmhos
Oscillator 3 dB Bandwidth	BW_{OSC}	$R_S = R_L$ (Pin 5) = 50 Ω		200		MHz
Buffer Gain (at 1 kHz)	g_{mBUF}	R_L (Pin 1) = 500 Ω Linear Mode		8		mmhos
		Limiting Mode		30		mmhos
Buffer 3 dB Bandwidth	BW_{BUF}	$R_S = R_L$ (Pin 1) = 50 Ω Linear Mode		200		MHz
		Limiting Mode		80		MHz
Logic Buffer Rise Time				20	50	ns
Logic Buffer Fall Time				20	50	ns

Note 1: For operation at elevated temperatures, the device must be operated based on a 150°C maximum junction temperature with a thermal resistance of 140°C/W for the metal DIP package and 100°C maximum junction temperature with a thermal resistance of 150°C/W for the plastic DIP package.

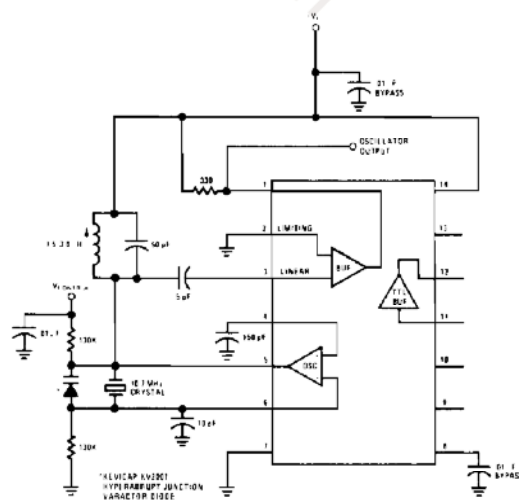
electrical characteristics (con't)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
OSCILLATOR CHARACTERISTICS (See Oscillator Circuit)						
Frequency vs. Power Supply Rejection		$5V < V_{CC} < 10V$		0.1		ppm/V
Frequency vs. Temperature Rejection		$-55^{\circ}C < T_A < +125^{\circ}C$		0.05		ppm/ $^{\circ}C$
Load Pull (Change in Frequency vs. Change in Buffer Load Impedance)		$0 \leq R_{L\text{ BUF}} \leq \infty$		0.01		ppm
INPUT-OUTPUT TERMINAL CHARACTERISTICS						
Oscillator Input Resistance	R_4	Minimum Current		10		k Ω
		Maximum Current		4.5		k Ω
	R_6	Minimum Current		10		k Ω
		Maximum Current		4.5		k Ω
Oscillator Input Capacitance	C_4			3		pF
	C_6			3		pF
Oscillator Output Resistance	R_5	Minimum Current		100		k Ω
		Maximum Current		30		k Ω
Oscillator Output Capacitance	C_6			3		pF
Buffer Input Resistance	R_2			10		k Ω
	R_3			10		k Ω
Buffer Input Capacitance	C_2			2		pF
	C_3			2		pF
Buffer Output Resistance	R_1			100		k Ω
Buffer Output Capacitance	C_1			5		pF
Logic Buffer Input Resistance	R_{11}			1.2		k Ω
Logic Buffer Input Capacitance	C_{11}			4		pF

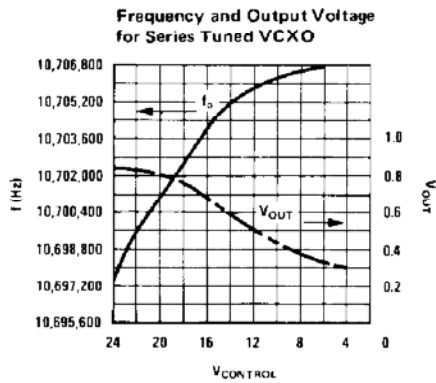
typical oscillator circuit connections



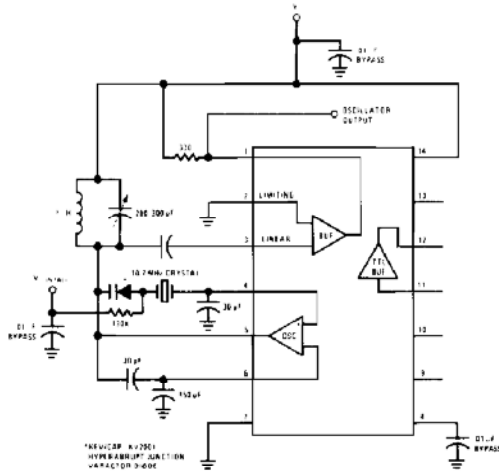
10.7 MHz Voltage-Controlled Crystal Oscillator Parallel Tuning



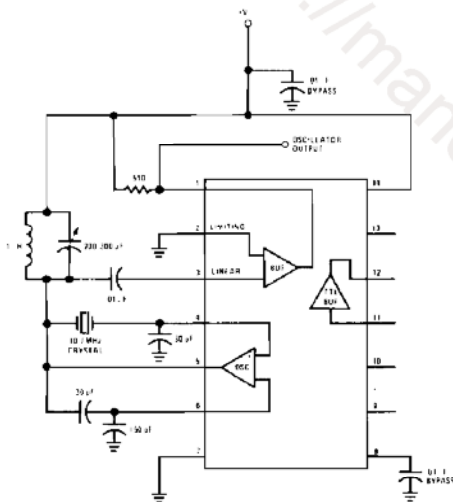
typical oscillator circuit connections (con't)



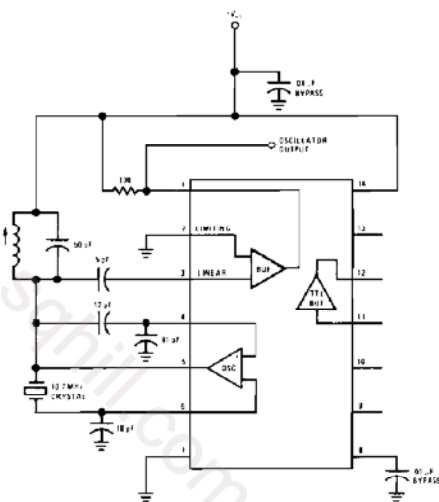
10.7 MHz Voltage Controlled Crystal Oscillator Series Tuning



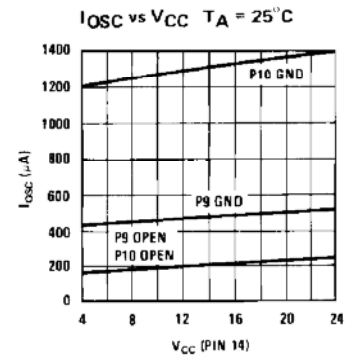
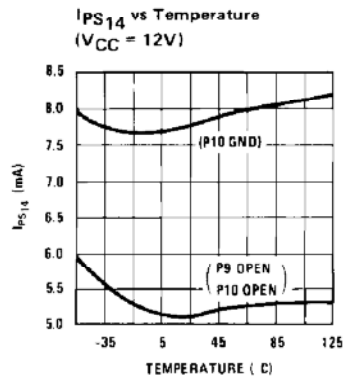
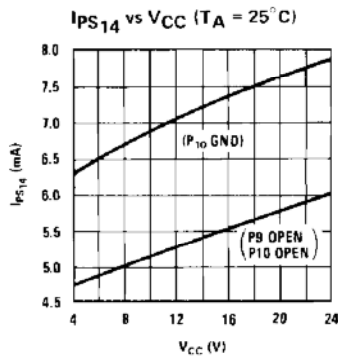
10.7 MHz Series Resonant Crystal Oscillator



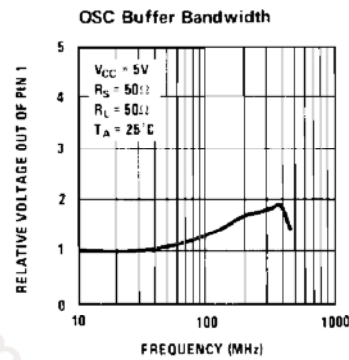
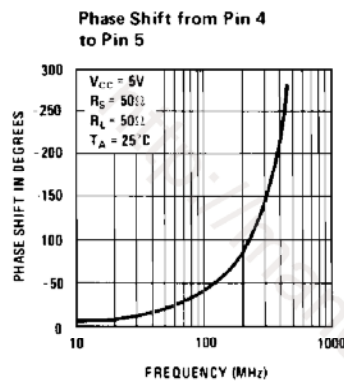
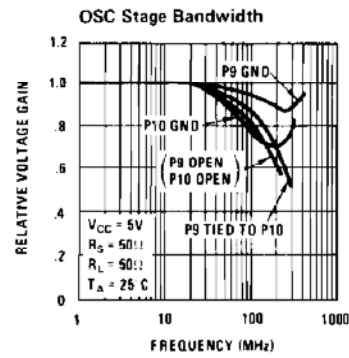
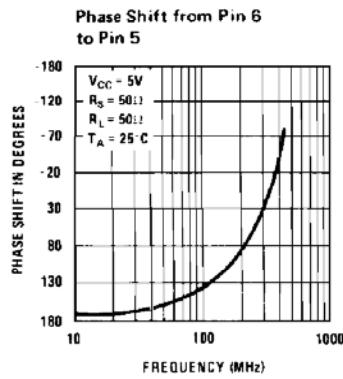
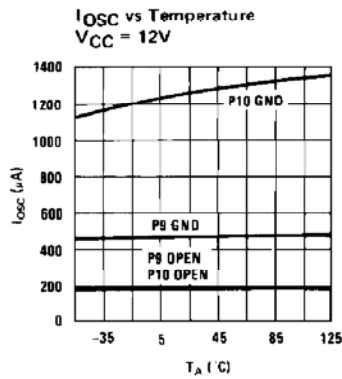
10.7 MHz Parallel Resonant Crystal Oscillator



typical performance characteristics



typical performance characteristics (con't)



dc test circuit

