

NEL CRYSTAL CLOCK OSCILLATORS

ECL Oscillator Application Note

ECL is designed to drive 50 ohm transmission lines. ECL oscillators are generally used above 50MHz and frequently above 100MHz. Because of the speed of these signals and the fact that ECL provides no clamping circuits, good RF techniques must be used in handling these signals.

Power supply:

NEL assumes a typical system power supply operating on $-5.2V \pm 5\%$ will ramp from $-0.52V$ to $-4.68V$ in approximately 10 mSec (practical limit around this nominal is 2 to 5 mSec). The $+5.0V \pm 5\%$ versions would be measured from $+0.5V$ to $+4.5V$. The charge curve is assumed to be similar to the exponential curve typical of the capacitive charge of a linear ramp. Deviations in voltage, voltage tolerance, ramp time, or ramp shape (including steps or non-monotonicity) must be communicated to the oscillator manufacturer. One reason for this is that there are different ways of exciting the crystal during power up and changing the above characteristics could change the method of excitation which, in turn, could affect start up.

Load/Trace Length:

In all cases 50 ohm transmission line and 50 ohm load to -2.0 volts at the end is recommended. All electrical parameters for the devices are specified with a 50 ohm load. Deviation from this can significantly change symmetry, logic levels, and transition times(T_r & T_f). In addition, it also affects proper starting of the oscillator during power up. The length of the signal path is not critical when using proper transmission line theory. But, signal loss must be considered. When operating with a $+5.0$ volt power supply transmission lines are still recommended. The load should be the Thevenin equivalent of 50 ohms using an 81 ohm pull up and 130 ohm pull down to provide the proper bias. It is common to use higher impedances (as high as 530 ohms) in many applications. Although this is not recommended, these higher impedance loads can be used if lead lengths are kept to less than 2 inches. Also, note that the load impedance will greatly affect symmetry. In these cases the signal conductor should still be routed using good RF techniques. Connection of other active devices to the output of the oscillator should not be done (such as a wired configuration). All of these guidelines apply to both outputs in the case of a dual output oscillator. Under no circumstances should an unused output be left unterminated. The oscillator manufacturer should be consulted whenever the design deviates from the standard 50 ohm load condition. Other loads cause reflections, bias changes, and ringing which may affect the operation of the oscillator.