Designing with 10K and 100K ECL / PECL Devices

SEMTECH

HIGH-PERFORMANCE PRODUCTS

10K/100K ECL/PECL Devices

The basic differences between 10K and 100K devices are circuit stability and performance with variation in supply voltage and ambient temperature. 100K ECL parts are both temperature and voltage compensated and 10K ECL parts are only voltage compensated.

ECL is used to obtain the required circuit speed and provide the circuit features necessary to optimize high-speed system design. The problem caused by mixing 10K ECL and 100K ECL logics is illustrated in Figures 1 & 2.

10K output levels and input threshold vary with temperature, whereas 100K output levels and input threshold remain essentially constant over supply voltage and temperature change. This means that the noise margins vary with the temperature, even if the temperatures of the driving and receiving circuits track. Perhaps the worse-case is shown in Figure 2, which illustrates 100K driving 10K. At T_A = 75°C, the high margins are seen to be less than 100 mV. Clearly this would not represent acceptable DC margins in any real systems.

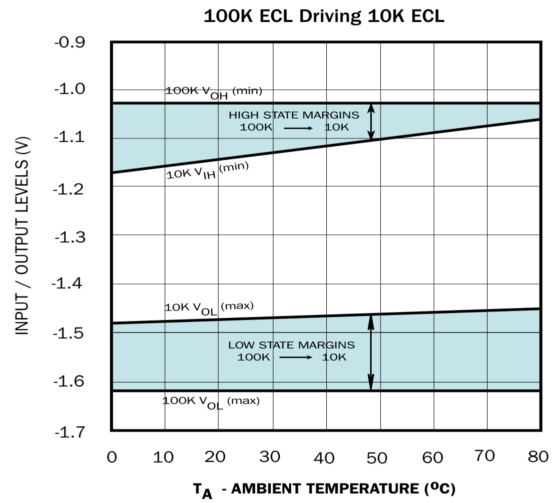


Figure 2

If the use of 10K ECL in a 100K system is unavoidable, it is recommended that all interfacing be done differentially. This is illustrated in Figure 3, which is applicable in either direction. Also if the operating ambient temperature for all the ECL devices is under control, this type of connection is allowed. For ECL/PECL output termination techniques refer to application note AN1003.

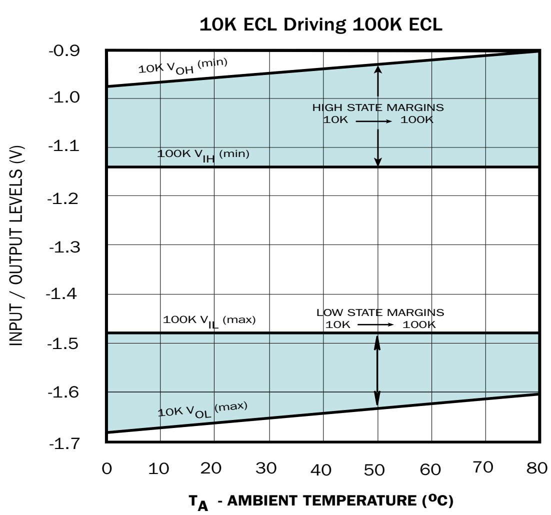
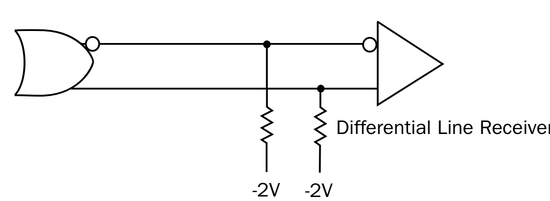


Figure 1



Interfacing 10K and 100K

Figure 3

Noise Margin

Noise margin is a DC voltage specification that measures the immunity of a circuit to adverse operating conditions. This is defined as the difference between the worst-case input logic level (VIHmin or VILmax) and the worst-case output logic level (VOHmin or VOLmax).

Noise margins, NM, for 10K at T_A = 25°C are:

Logic 1 = V_{OH} min - V_{IH} min
= - 980 - (-1130) = 150 mV

Logic 0 = V_{IL} max – V_{OL} max
= - 1480 - (- 1630) = 150 mV

NM for 100K at TA = 25°C are:

Logic 1 = V_{OH} min – V_{IH} min
= -1025 - (-1165) = 140 mV

Logic 0 = V_{IL} max - V_{OL} max
= -1475 - (-1620) = 145 mV

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