

General Description

The KS8995M and KS8995X offer 100BASE-FX operation on two ports, which allows 100Mbps Ethernet to be transferred over long distances up to 2km using fiberoptic cables. The 100BASE-FX feature makes both the KS8995M and the KS8995X excellent choices for cost-sensitive media converter and fiber-to-the-subscriber (FTTx) applications.

This application note describes how to connect the KS8995M/X with 3.3V and 5.0V fiberoptic modules.

Configuring 100BASE-FX Operation

Ports 4 and 5 on the KS895M/X are normally in 10BASE-T or 100BASE-TX modes. In 100BASE-FX mode, the signaling on ports 4 or 5 switches from three level to two level. This occurs because in 100BASE-FX mode, the scrambler/descrambler and the MLT encoder/decoder are bypassed on transmission and reception.

Most fiberoptic modules have low voltage positive reference emitter coupled logic (LVPECL) or positive reference emitter coupled logic (PECL) electrical inputs and outputs. LVPECL signals are referenced to a V_{CC} of +3.3V and PECL signals are referenced to a V_{CC} of +5.0V. This difference requires two different interfacing schemes for connecting the KS8995M/X to a +3.3V LVPECL device or a +5.0V PECL device.

Interfacing the KS8995M/X with a 3.3V Fiber Optic Module

Figure 1 shows the typical connections from the KS8995M/X to the 3.3V fiber optic module. The SD signal from the fiber optic module needs to be connected to the FXSDx pin on the KS8995M/X through a voltage divider. R1 and R2 should be chosen so that when the fiber is "ON," the voltage at FXSDx is greater than 1.25V, and when the fiber is "OFF," the voltage at FXSDx is less than 1.25V. The output SD signal on Agilent's HFBR-5903 has a maximum output voltage low of 1.68V and a minimum output voltage high of 2.26V. The mid-range between these is approximately 2.0V. Choosing R1 and R2 to divide 2.0V down to 1.25V should provide maximum sensitivity for the FXSDx signal.

On the transmit side, the KS8995M/X TXP and TXM signals should be terminated with 50Ω to the 2.5V analog rail. TXP and TXM should be AC coupled to the TD+ and TD- signals on the fiberoptic module via 0.1μF capacitors. These capacitors are needed because of the DC bias differences between the KS8995M/X and the fiber optic module. The TD+ and TD- LVPECL inputs on the fiber optic module require a split load termination connected to +3.3V and ground as shown in Figure 1. These terminations have two purposes. The first is to correctly DC bias the signal, and the second is to provide a 50Ω termination for the PECL input circuitry.

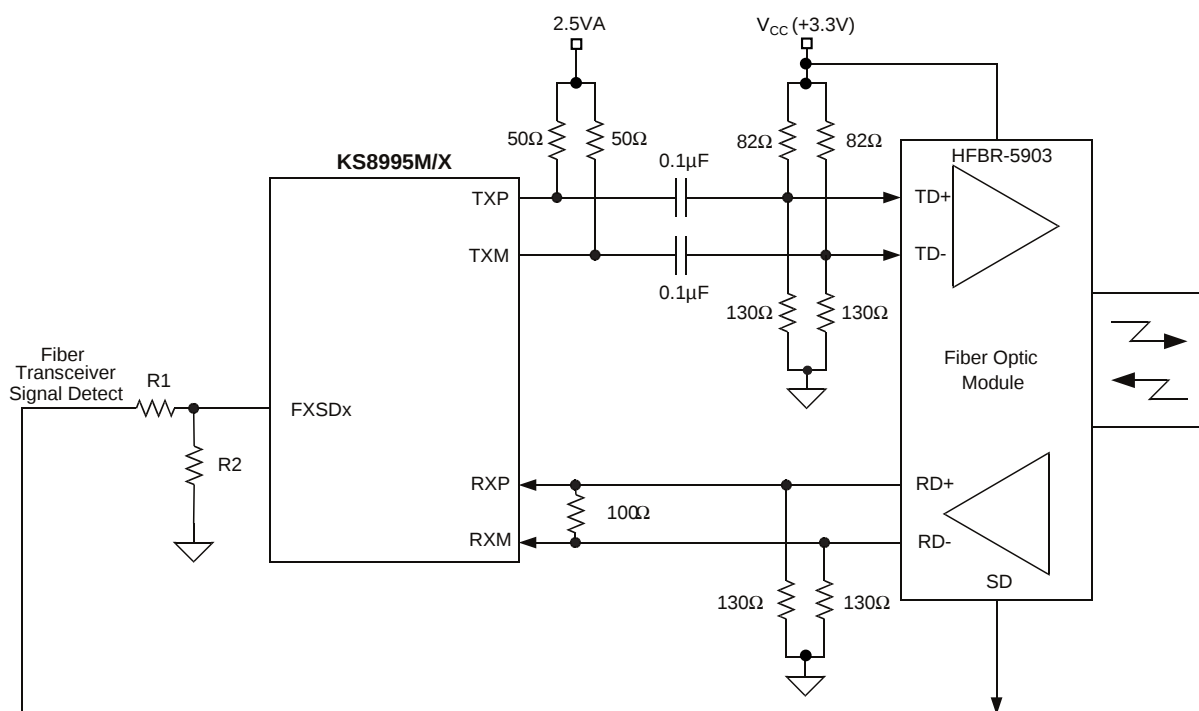


Figure 1. KS8995M/X Connections to a 3.3V Fiber Optic Module

The receive pair on the KS8995M/X (RXP and RXM) requires a 100Ω differential termination. The RXP and RXM signals can be directly connected to the RD+ and RD– signals on the fiberoptic module because the bias is acceptable in this case. The RD+ and RD– signals require 130Ω terminations to ground for proper operation.

Interfacing the KS8995M/X with a 5.0V Fiber Optic Module

The typical connections from the KS8995M/X to a 5.0V fiber optic module, such as the Agilent Technologies HFBR-5103, are shown in Figure 2. The system designer must connect the signal detect (SD) output from the module to the fiber signal detect (FXSDx) input for port 4 or 5 on the KS8995M/X through a comparator circuit such as the one shown in Figure 2.

The comparator circuit is used to translate the fiber optic module's PECL SD signal down to the FXSDx pin's input level. The LM311 compares the SD signal to the voltage set by RB1 and RB2. RB1 and RB2 should be chosen to divide the 5.0V V_{CC} down to 3.7V. This is the midpoint for the PECL voltage swing. The Q1 transistor acts as a switch. The Q1 collector will drive FXSDx high to +2.5V for signal detect or low to about +0.6V for no signal detect. The RE resistor can be used to adjust Q1's collector output level to be above +0.6V when Q1 is in saturation.

On the transmit side, the KS8995M/X TXP and TXM signals should be terminated with 50Ω to the 2.5V analog rail. TXP and TXM should be AC coupled to the TD+ and TD– signals

on the fiber optic module via 0.1 μ F capacitors. These capacitors are needed due to the DC bias difference between the KS8995M/X and the fiberoptic module. The TD+ and TD- PECL inputs on the fiber optic module require a split load termination connected to +5.0V and ground as shown in Figure 2. These terminations have two purposes. The first is to correctly DC bias the signal, and the second is to provide a 50 Ω termination for the PECL input circuitry.

On the receive side, the KS8995M/X RXP and RXM signals need to be properly DC-biased with 1k Ω resistors to the analog 2.5V supply and 3k Ω resistors to ground. The RXP and RXM signals also require a 100 Ω differential termination between them. Then the RXP and RXM signals are AC coupled to the RD+ and RD– signals on the fiberoptic module due to the difference in DC bias. On the fiberoptic module side, the RD+ and RD– signals require 270 Ω terminations to ground.

Conclusion

The KS8995M/X can be used to interface with both 3.3V and 5.0V fiberoptic modules. The KS8995M offers a powerful set of features such as tag based VLAN, rate limiting, and IGMP support, whereas the KS8995X offers a lower cost alternative to the KS8995M as a Quality of Service integrated switch.

The 100BASE-FX feature on the KS8995M/X allows the system designer to extend the reach of these switches to implement cost effective solutions for media conversion and fiber to the home, curb, building, or office applications.

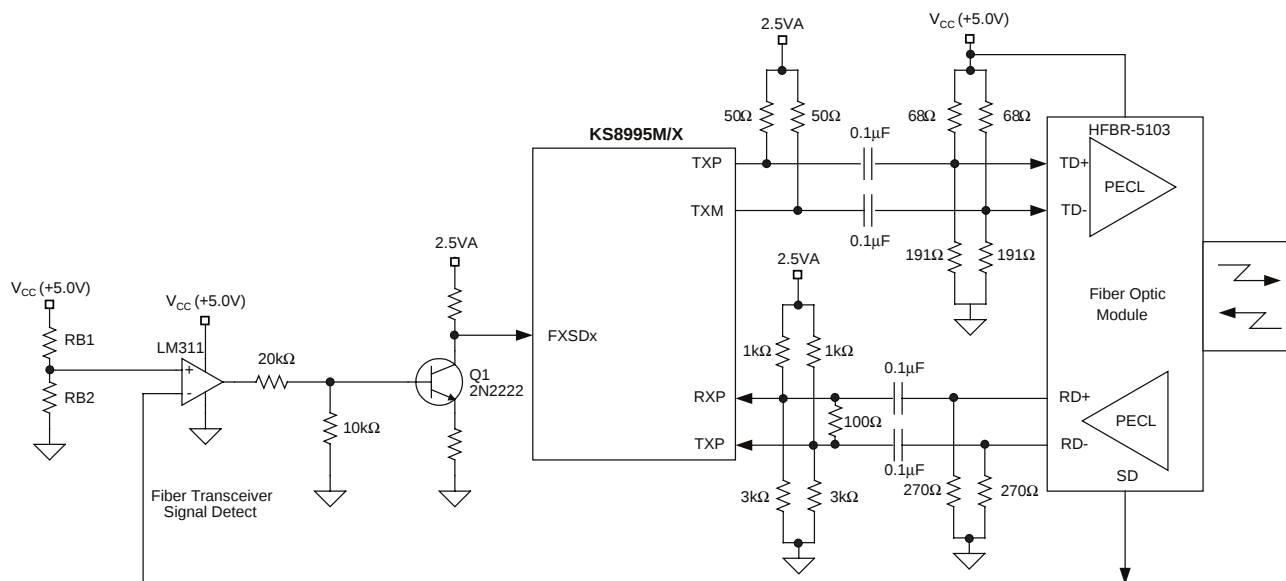


Figure 2. KS8995M/X Connections to 5.0V Fiber Optic Module

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