Application Report
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Cable Requirements for the DS90UB913A & DS90UB914A

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ABSTRACT

The DS90UB913A and DS90UB914A chipset transports serialized video data over coaxial cables. A variety of cable assemblies meeting this generic description are available on the market, and not all perform equally. This document defines the cable characteristics required to properly support the high speed serial data transfer from a DS90UB913A serializer to a DS90UB914A deserializer. Three key parameters are described: insertion loss, return loss, and impedance. These requirements are for the entire interconnect system, including connectors, and cable. In addition, this application note provides some recommended handling characteristics for the cable.

Contents

1 Overview of the Operation of the DS90UB913A

1.1 Forward Channel

The data that the DS90UB913A receives from the imager is encoded and serialized. The encoded word (payload) is 14 bits long, so for each PCLK, there are 14 bit cells output from the DS90UB913A. This means that with a 100MHz PCLK, the serial rate out of the serializer is 1.4 Gbps, which corresponds to a bandwidth requirement of 700MHz, or a unit interval time of 714ps.

1.2 Back Channel

The back channel operates within a frequency band that is nominally centered at 2.5MHz, but it can change with process variation, power supply and temperature. The back channel frequency is kept low to minimize any potential interference with the forward channel. The back channel frequency is fixed, and does not scale with the PCLK frequency, so the backchannel frequency needs to be much lower than the slowest acceptable PCLK frequency.

1.3 Power Over Coax

In addition to the forward and backchannel data, the coax cable is often asked to carry power to the camera as well. When operating in this mode, the DC impedance of the cable is important as high DC impedance will lead to losses in the cable which may make powering the imager and serializer more difficult.

2 Cable Requirements

2.1 Insertion Loss

The DS90UB913A/914A are sensitive to insertion loss over the band from 1MHz to 700MHz. Within this range, the dominant loss is through the skin effect, so it is generally proportional to the square root of the frequency. The DS90UB914A has an adaptive equalizer at its input which allows it to compensate for various lengths of cable, provided the total attenuation stays within maximum allowable limits. Table 1 shows the maximum allowable insertion loss at a variety of frequencies.

Table 1. Maximum Cable/Connector Insertion Loss

Frequency (MHz)	Attenuation (dB)
50	1.0
100	1.4
200	5.3
400	7.6
700	10

2.2 Return Loss

Return Loss is the loss of the signal power resulting from a discontinuity in the characteristic impedance of the transmission line, and is most commonly encountered at the interface of one portion of the transmission line and another – such as the connector to a cable or board. Return Loss has been historically represented in dB as a negative number and we retain this convention here.

For reliable operation of the DS90UB913A and DS90UB914A the return loss must be less than -10dB for frequencies from 10MHz to 1GHz.

2.3 Characteristic Impedance

The DS90UB913A and DS90UB914A are designed to operate with 50Ω coaxial cable. It is recommended that the cable used in a system be nominally 50Ω characteristic impedance +/- 5%. If Power over Coax is going to be used, then the DC resistance of the cable should also be considered. TI reference designs assume that the center conductor DC resistance is < 8Ω for a 10m length of cable. If a cable with greater DC resistance is used, then the Power over Coax design may need to be reconsidered to accommodate this. Typically if the voltage sent over the cable is increased, then the DC drop is lessened and becomes less critical.

2.4 Mechanical Handling

The characteristics of coaxial cable can be adversely affected by handling, therefore it is recommended that the pulling tension when pulling cable through conduit or other areas be less than 53N, and that the bend radius not be less than 25mm.

3 Revision History

DATE	REVISION	NOTES
March 2015	*	Initial release.

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