APPLICATION NOTE

Application of PLT and PLR on S/PDIF

1. Introduction

The PLT(Photo-link Transmitter) and PLR(Photo-link Receiver) are commonly used components for transmission optical fiber communication, and are usually used in the optical fiber transmission field of S/PDIF (Sony/Philips Digital Interface Format). PLT is used as a transmission source to convert electrical signals into optical signals as output, and PLR is used as receiver to convert light signal to electrical signals to achieve optical fiber communication.

2. Application Circuit

The application circuit of PLT and PLC is as shown in Figure 1. The filter circuit in the red box is reserved design. When the actual application has noise problem, it can be adjusted via the filter circuit.

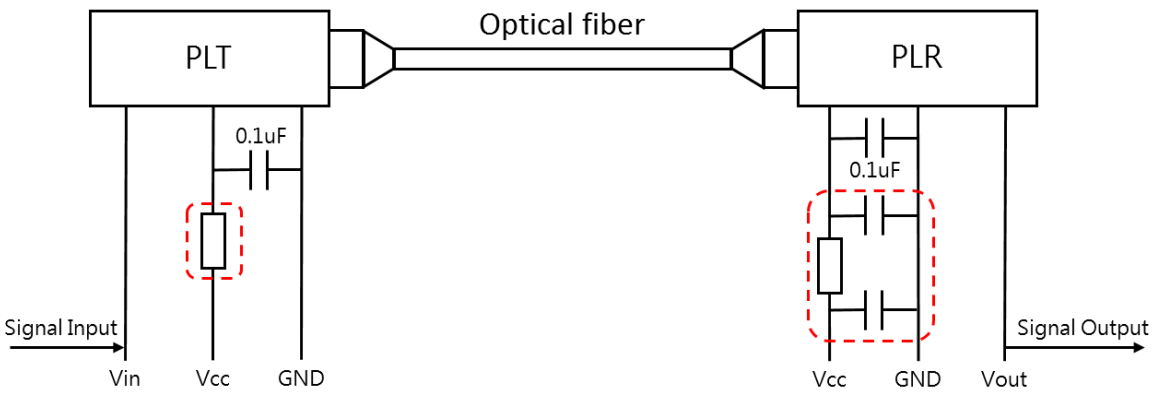

Figure 1. Application Circuit

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3. Parameter Description

Common Parameter：

1. Switching Time (Tr, Tf)

The Switching time includes rise time (Tr) and fall time (Tf). As shown in Figure 2, the time requires to reach the signal voltage level (10% ~ 90%).

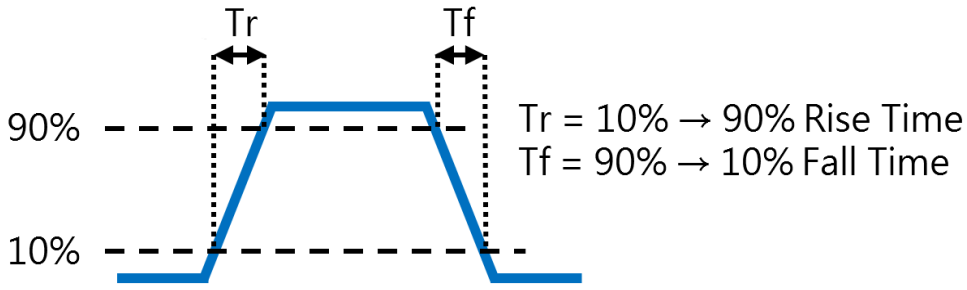

Figure 2. Switching Time

2. Propagation Delay (T_{PLH}, T_{PHL})

As shown in Figure 3, T_{PLH} =Transmission propagation delay time for the input signal and output signal from Low rise to 50% High. T_{PHL}= Transmission propagation delay time of input signal and output signal from High go down to 50% Low.

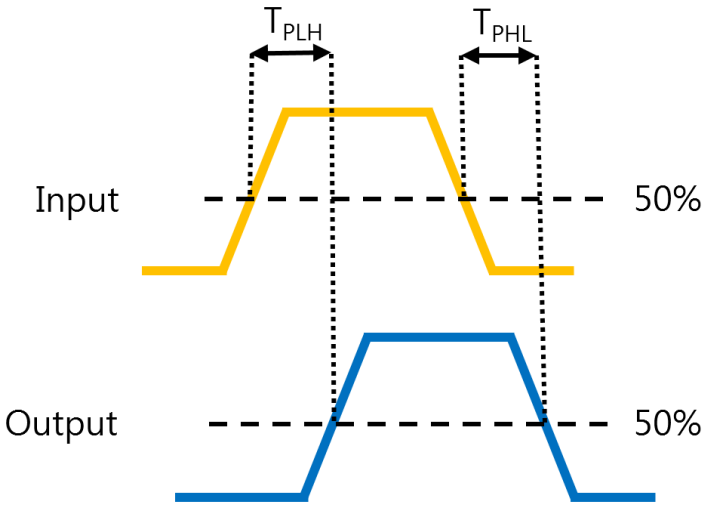

Figure 3. Propagation Delay

3. Pulse Width Distortion (ΔTw)

Input PLT or PLT pulse signal, the error after component conversion.

ΔTw is defined as ΔTw = T_{PHL}-T_{PLH} .

PLT parameter :

1. Signal input voltage level (V_{IH}, V_{IL})
   Define the voltage limit of Vin signal, V_{IL} is the highest voltage limit of Low signal and V_{IH} is the lowest voltage of High signal.
2. Output optical power (Pf)
   Input the PLT Vin pin with DC signal, and measure the optical power output by the PLT after passing through one meter long fiber.

PLR parameter :

1. Input optical signal intensity (Pc,max, Pc,min)
   Input signal transmission rate : 6 Mbps, Duty : 50%, Detect PLR that can receive the maximum and minimum optical power value .
2. Output voltage level (V_{OL}, V_{OH})
   Define the voltage range of Vout pin output. V_{OL} is the highest output voltage of Low signal. V_{OH} is the lowest output voltage of High signal.
3. Transmission rate
   The amount of data that PLR can receive per second. Generally, PLR cannot receive DC signals. S/PDIF encoding format will make the signal constantly change state, so it is suitable for PLR product.

4. Application Examples (S/PDIF, BMC)

The audio signal needs to be encoded before transmission, as shown in Figure 4. In order to improve the sound quality, DTS and Dolby, the two largest audio companies have developed many audio encoding formats.

AC3 (Dolby Digital) and DTS (Digital Theater Systems) two encoding formats can use S/PDIF as the transmission interface. S/PDIF only needs to use a single fiber transmission to achieve the 5.1 channel effect. And the optical signal transmission is not easy to be interfered by noise.

Audio encoding mode		Surround Sound	Maximum Transmission Rate	Interface
AC3(Dolby Digital)		5.1	640 kbps	S/PDIF. HDMI
DTS(DTS Digital Surround)		5.1	1.5 Mbps	S/PDIF. HDMI
EAC3(Dolby Digital Plus)		7.1	6.1 Mbps	HDMI 1.3
Dolby TrueHD(AC3 core + MLP)		7.1	18 Mbps	HDMI 1.3
DTS HD HR(DTS HD High)		7.1	6 Mbps	HDMI 1.3
DTS HDMA(DTS HD Master Audio)		7.1	24.5 Mbps	HDMI 1.3
LPCM		7.1	27 Mbps	HDMI 1.0
Dolby Atmos	EAC3 + Joint Object Coding	7.1(Physical)	6.1 Mbps	HDMI 2.0
	MLP FBA 16ch	7.1(Physical)	18 Mbps	
DTS:X	XLL DTS HDMA+Object Based Data	7.1(Physical)	24.5 Mbps	

Figure 4. Common audio encoding formats

The minimum transmission rate of S/PDIF is 100 kbps, and the S/PDIF coding format is BMC (Bi-phase Mark Coding). In BMC coding, Logic 0 and Logic 1 are represented by 2 bits respectively. Logic 0 = 00 or 11, Logic 1 = 01 or 10, so the bandwidth required for BMC is twice the amount of data. As shown in Figure 5, BMC must transition every time a piece of data is sent. When this signal is continuously transmitted through Logic 0 or Logic 1, it will continue to transition to avoid generating DC signals.

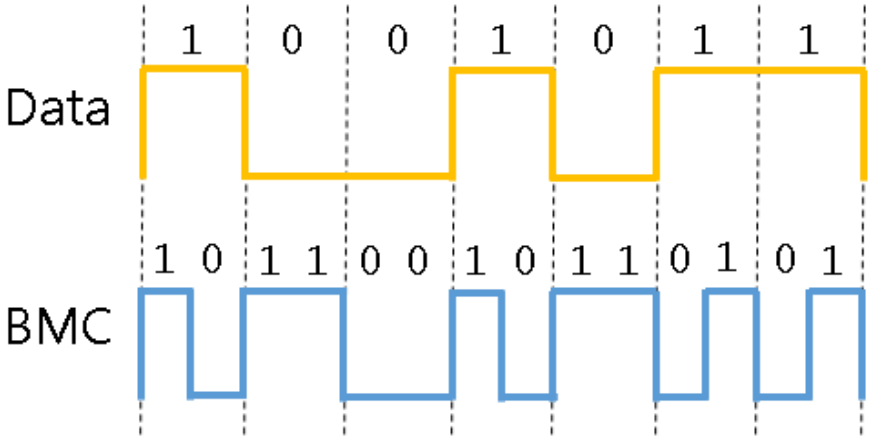

Figure 5. BMC encoding format

5. Suggestion Part List

PLT		PLR	
Part No.	Transfer rate	Part No.	Receive rate
PLT133	DC~16MHz	PLR135	
PLT153		PLR138	
PLT132	DC~25MHz	PLR155	100k~16MHz
PLT137		PLR162	
PLT232		PLR137	
PLT237		PLR237	100k~25MHz
PLT262			
PLT272			

This application manual provides customer design reference. If there are design changes, system performance may be degraded. If there are any problems in the design of the system, please contact Everlight for further technical support.