

74AC08, Alternative LED Transmitter Driver Chip for DC-10MBd

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Application Note 5374

Introduction

Avago Technologies manufactures fiber optic components for industrial, medical, transportation, power generation and gaming market. Its products have been adopted in various applications for years since it started producing fiber optic components. Avago Technologies' offers both discrete and integrated fiber optic components that can be easily designed into customer board. Discrete component requires customer to design the transmitter driving circuit, while the integrated component has incorporated the driving circuit in the product. However, the advantage of using discrete component is the flexibility in designing optical link solution that suits the customer application..

We have recommended the transmitter driving circuit in our datasheets and application notes to help customers to design-in fiber optic discrete components. Nevertheless, the challenge is to ensure supply continuity of the recommended electronic components from the manufacturers. Over the years, some electronic component manufacturers have obsolete their parts that are recommended in our datasheet and application notes. This has caused limitation of supply for similar part in the market.

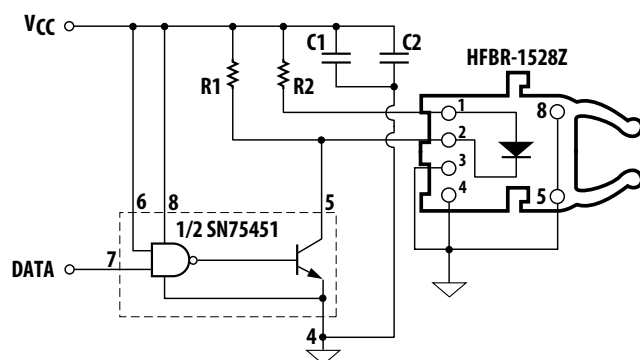


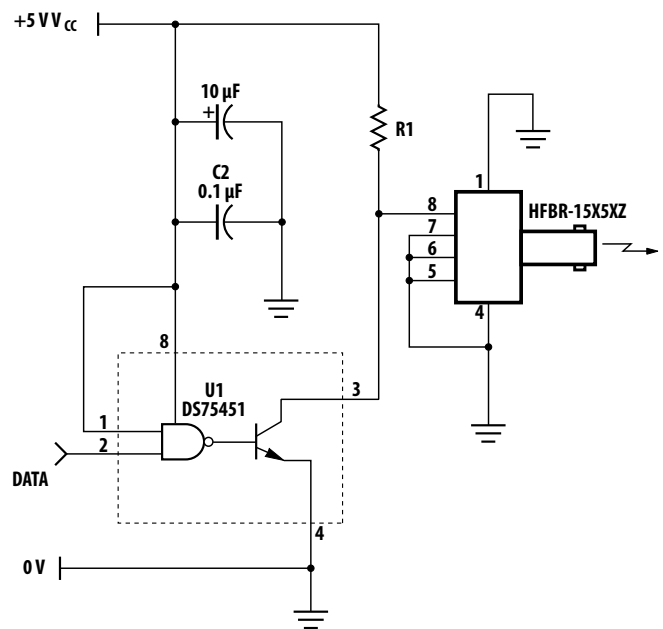
Figure 1. SN75451 as HFBR-1528Z DC-10MBd Driver

Objective

It is Avago Technologies' interest that our customers can source alternative component to interface with our products. This application note discusses alternative line driver 74AC08 besides the existing SN75451, which is recommended as LED driver by Avago Technologies in the existing datasheets and application notes. This gives more choices to our customers to select their preferred component suppliers.

Existing Driver SN75451

SN75451 has been recommended in our product datasheets and application notes as the LED transmitter driver in many parts from DC to 10MBd optical link.



R1	I _F
82.5 Ω	35 mA
47 Ω	60 mA

Figure 2. SN75451 as HFBR-15X5XZ DC-10MBd Driver

New Driver 74AC08

74AC08 from Fairchild Semiconductor is recommended as the alternative driver because of its performance similarity to the existing driver SN75451. In this investigation, optical T_r , T_f and Pulse Width Distortion are measured.

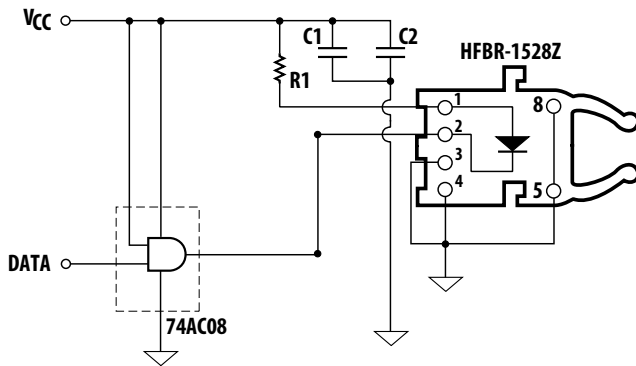


Figure 3. 74AC08 as HFBR-1528Z DC-10MBd Driver

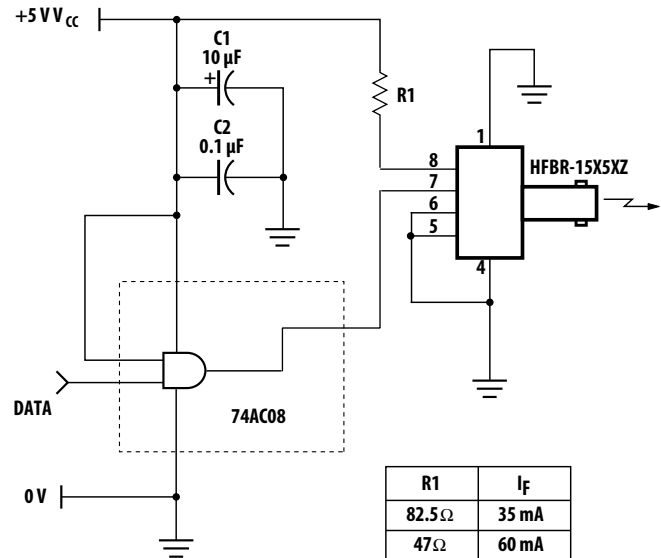


Figure 4. 74AC08 as HFBR-15X5XZ DC-10MBd Driver

Test Methodology

In order to measure the characteristics of the optical transmitter performance, an O/E converter is used to convert the optical signal to an electrical signal. The output of the O/E converter is measured using an oscilloscope. The LED driving circuit is set to supply 60mA at 25°C temperature.

Pulse Width Distortion (PWD)

PWD is measured by subtracting the pulse width of

74AC08's electrical input (DATA) from the pulse width of O/E converter's output. 40%, 50% and 60% duty cycle data pattern is applied at DATA to examine the transmitter light output performance due to duty cycle variance.

Optical Rise Time (t_r) and Fall Time (t_f)

Optical t_r and t_f are measured from 10% to 90% and 90% to 10%, respectively.

Measurement Results

Table 1. HFBR-1528Z at Temperature 0°C, 10MBd with 1010 data pattern

HFBR-1528Z	V _{cc}	PWD (ns)			Optical t_r (ns)	Optical t_f (ns)
		40%	50%	60%		
DUT 1	4.75V	4.2	4.1	4.3	11.3	5.3
	5.00V	4.1	4	4.2	11.3	5.2
	5.25V	3.8	3.8	4	10.7	5.1
DUT 2	4.75V	4	4.3	4.1	11.5	5.3
	5.00V	4.1	4.2	3.9	11.8	5.5
	5.25V	3.9	4.1	3.7	11.6	5.4
DUT 3	4.75V	4.3	4.2	4.3	12	5.7
	5.00V	4	4.2	4.1	11.2	5.3
	5.25V	4	4	3.9	11.7	5.5
DUT 4	4.75V	4.8	4.7	4.5	11.7	8.8
	5.00V	4.4	4.5	4.6	11.7	8.6
	5.25V	4	4.3	3.9	10.9	5.7

Table 2. HFBR-1528Z at Temperature 25°C, 10MBd with 1010 data pattern

HFBR-1528Z	V _{cc}	PWD (ns)			Optical t _r (ns)	Optical t _f (ns)
		40%	50%	60%		
DUT 1	4.75V	4.4	4.4	4.2	12.3	6.3
	5.00V	4.1	4	4.1	11.3	5.7
	5.25V	4	4.1	3.9	12.2	5.6
DUT 2	4.75V	4.3	4.6	4.4	11.9	5.6
	5.00V	4.2	4.4	4.2	12.4	5.6
	5.25V	3.8	4.4	3.8	11.2	5.4
DUT 3	4.75V	4.2	4.6	4.6	12.1	5.4
	5.00V	4.1	4.4	4.3	11.5	5.4
	5.25V	4.1	4.3	4.1	12	5.8
DUT 4	4.75V	4.8	4.5	5	11.5	6.2
	5.00V	4.6	4.6	4.6	10.9	6.1
	5.25V	4	4.1	4.4	11.2	6.5

Table 3. HFBR-1528Z at Temperature 70°C, 10MBd with 1010 data pattern

HFBR-1528Z	V _{cc}	PWD (ns)			Optical t _r (ns)	Optical t _f (ns)
		40%	50%	60%		
DUT 1	4.75V	4.5	4.6	4.5	13.1	6
	5.00V	4.4	4.2	4.3	13.8	5.9
	5.25V	4	4.4	4.4	12.4	6
DUT 2	4.75V	4.6	4.9	4.5	13.1	5.7
	5.00V	4.4	4.8	4.4	13.6	6.1
	5.25V	4	4.3	4.2	12	5.7
DUT 3	4.75V	4.5	4.8	4.7	13.4	5.8
	5.00V	4.2	4.5	4.5	12.6	5.7
	5.25V	4.4	4.4	4.3	12.8	6
DUT 4	4.75V	5.3	5.1	4.9	11.3	8.4
	5.00V	4.4	5	4.8	12.8	8.4
	5.25V	4.6	4.4	4.1	12.2	8.7

Table 4. HFBR-1505AZ at Temperature 0°C, 10MBd with 1010 data pattern

HFBR_1505AZ	V _{cc}	PWD (ns)			Optical t _r (ns)	Optical t _f (ns)
		40%	50%	60%		
DUT 1	4.75V	-4	-4.1	-3.9	11.9	8.4
	5.00V	-3.8	-4.1	-4	12	8.3
	5.25V	-3.7	-3.9	-3.8	11.6	8.7
DUT 2	4.75V	-3.8	-4	-3.8	11.8	9.4
	5.00V	-4	-4	-3.7	11.6	10
	5.25V	-3.5	-3.7	-3.8	11.7	10.2
DUT 3	4.75V	-4.1	-4.3	-4.1	12.1	8.3
	5.00V	-4	-4.3	-4	11.7	8.8
	5.25V	-3.8	-4	-3.9	11.5	8.3

Table 5. HFBR-1505AZ at Temperature 25°C, 10MBd with 1010 data pattern

HFBR_1505AZ	V _{cc}	PWD (ns)			Optical t _r (ns)	Optical t _f (ns)
		40%	50%	60%		
DUT 1	4.75V	-4.8	-4.7	-5	12.9	8.2
	5.00V	-4.7	-4.5	-4.2	13.2	8.6
	5.25V	-4.3	-4.6	-4.7	12.3	8.4
DUT 2	4.75V	-4.9	-4.7	-4.7	13.4	9.7
	5.00V	-4.6	-4.7	-4.9	13.2	9
	5.25V	-4.5	-4.6	-4.3	13.5	8.7
DUT 3	4.75V	-4.7	-4.8	-4.7	12.9	8.2
	5.00V	-4.5	-4.9	-4.6	13.7	9
	5.25V	-4.3	-4.6	-4.4	12.4	8.4

Table 6. HFBR-1505AZ at Temperature 70°C, 10MBd with 1010 data pattern

HFBR_1505AZ	V _{cc}	PWD (ns)			Optical t _r (ns)	Optical t _f (ns)
		40%	50%	60%		
DUT 1	4.75V	-5.8	-5.5	-5.6	15.7	8.6
	5.00V	-5.5	-5.5	-5	15.4	8.6
	5.25V	-5.1	-5	-4.9	14.7	8.3
DUT 2	4.75V	-5.8	-5.4	-5.7	15.8	9.4
	5.00V	-5.6	-5.4	-5.5	15.2	9
	5.25V	-5.2	-5.2	-5.3	14.2	10
DUT 3	4.75V	-5.3	-5.2	-5.5	14.8	8.4
	5.00V	-5	-5.5	-5.2	15	9.1
	5.25V	-4.8	-5.4	-5	15.5	8.7

Summary

SN75451 is recommended as the driver for our LED transmitter from DC to 10MBd. An alternative driver 74AC08 is chosen due to its similar performance to SN75451. To ensure the performance of 74AC08, PWD, optical tr and tf are measured.

Optical tr and tf for HFBR-1528Z with 74AC08 are within the HFBR-1528Z datasheet limit, which is based on SN75451 driver. On the other hand, optical tr for HFBR-

1505AZ with 74AC08 is slower as compared to SN75451 driver. Nevertheless, the optical tr for HFBR-1505AZ and 74AC08 combination is still good to run at 10MBd. On top of that, both HFBR-1528Z and HFBR-1505AZ with 74AC08 driver show small PWD results.

Therefore, we conclude that 74AC08 driver can be used with our LED transmitter from DC to 10MBd application.

For product information and a complete list of distributors, please go to our web site: www.avagotech.com

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