



DATA SHEET



MIPI C-PHY Reference Termination Board

C SERIES



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Introduction

OVERVIEW

Introspect Technology's CRTB MIPI C-PHY Reference Termination Board (RTB) allows users to emulate the behavior of a MIPI C-PHY receiver at data rates of up to 6.5 Gsps. The RTB engages termination upon the reception of a valid MIPI C-PHY high-speed signal and releases termination when high-speed transmissions are complete, thus creating a test bench for MIPI C-PHY transmitter evaluation. The RTB receives MIPI C-PHY signals via SMA connectors and uses a single USB 2.0 micro B cable connection for power, allowing users to quickly get up and running.

APPLICATIONS

- MIPI C-PHY transmitter evaluation at up to 6.5 Gsps
- MIPI C-PHY transmitter evaluation where direct receiver probe points are required

ORDERING INFORMATION

TABLE 1: ITEM NUMBERS FOR THE CRTB AND RELATED PRODUCTS

PART NUMBER	ΝΑΜΕ	KEY DIFFERENTIATORS	
6346	CRTB	6.5 Gsps MIPI C-PHY reference termination board	
7123	PV1 Universal Active	Universal probe system for 5 GHz applications	
	Probe	oniversal probe system for 5 GHz applications	
7104	PV1PSU PV1 Power	Power supply for PV1	
/ 124	Supply		
5783	SV5C-CPTX	6.5 Gsps MIPI C-PHY transmitter	

ADDITIONAL DOCUMENTATION

CRTB MIPI C-PHY Reference Termination Board: Quick Start Manual

• EN-G039E-E-24099 MIPI C-PHY Reference Termination Board: Quick Start Manual



PHYSICAL CONNECTIONS

Figure 1 shows a diagram of the physical ports of the CRTB MIPI C-PHY RTB.





The RTB has two user configurable sections, as shown in Figure 2 below:

- Termination Control
- LP Threshold Control



TERMINATION CONTROL

The termination control section of the RTB allows users to switch between automatic or user-controlled termination. This is done by sliding the "TERM CONTROL" switch to either the "AUTO" or "USER" position. In both modes, any time that termination is engaged on a channel, the corresponding LED indicators will light up, allowing users to easily identify which channels are being terminated.



AUTOMATIC TERMINATION MODE

When operating in the automatic mode, the RTB will automatically terminate a channel when an incoming high-speed MIPI C-PHY signal is detected.

USER-CONTROLLED TERMINATION MODE

When operating in the user-controlled mode, the RTB will always terminate all three MIPI C-PHY channels, regardless of receiving a high-speed signal or not. Users can engage or disengage termination by sliding the "TERM ENABLE" switch to "ON" or "OFF".

NOTE

The "TERM ENABLE" slide switch is only used when operating in "USER" mode.

LP THRESHOLD CONTROL

The LP threshold control section of the CRTB MIPI C-PHY RTB allows users to adjust the LP threshold voltage used to detect the start and end of a high-speed transmission.

Users can enable this adjustment by sliding the "LP THRESHOLD CONTROL" switch to the "EN" position. They can then adjust the threshold voltage by pushing the "+23mV" or "-23mV" buttons to raise or lower the threshold voltage in 23mV increments. Users can measure the LP threshold level by probing the "LPREF" pad located between the LP threshold adjustment buttons.

Users can also set the threshold to 0 mV by sliding the "LP THRESHOLD CONTROL" switch to "DIS".

NOTE

You can reset the LP threshold configuration by pressing the reset button shown in Figure 1.

Typical Performance

DIFFERENTIAL IMPEDANCE AND RETURN LOSS

Typical differential impedance for the RTB is shown in Figure 3 below. The differential impedance mismatch, ΔZ_{ID} , is 1.8%, based on the final settling values in the figure. Typical differential return loss data for the RTB is shown in Figure 4 below. The differential return loss conformance template for 6.5 Gsps operation is included in the figure in blue for reference. Please refer to the MIPI C-PHY specifications for additional details on calculating ΔZ_{ID} and for the return loss conformance template.



Figure 3: Differential impedance of the RTB.





COMMON MODE IMPEDANCE AND RETURN LOSS

Typical common mode impedance for the RTB is shown in Figure 5, and typical common mode return loss is shown in Figure 6. The common mode return loss conformance template for 6.5 Gsps operation is included in the figure in blue for reference. Please refer to the MIPI C-PHY specifications for additional details on MIPI specifications and the common mode return loss template.



Figure 5: Common mode impedance of the RTB.



Figure 6: Common mode return loss of the RTB.



TRIGGERED EYE WAVEFORMS

Triggered eye waveforms measured on the RTB at 4.5 Gsps and 6.5 Gsps are shown in Figure 7(a) and (b) below. The signal source for this waveform is the Introspect SV5C-CPTX programmed to 250 mV HS amplitude, and the measurement was made using a 20 GHz oscilloscope with 12 GHz active probes attached to the RTB.





Close-up views of the triggered eye waveforms from the previous page are shown in Figure 8 below. At 4.5 Gsps, a typical eye width of 155 ps and eye height of 115 mV are achieved. At 6.5 Gsps, a typical eye width of 90 ps and eye height of 105 mV are achieved. Each of these cases have been probed directly on the RTB. For further details on probing, please refer to the "CRBT MIPI C-PHY Reference Termination Board User Manual", as listed on page 3 of this datasheet.





Specifications

TABLE 2: GENERAL AND ELECTRICAL SPECIFICATIONS

PARAMETER	VALUE	UNITS	DESCRIPTION AND CONDITIONS
Application / Protocol Support			
Physical layer interface	C-PHY		
LP/HS handling	Automatic		
Ports			
C-PHY trios	3	Trios	Standard SMA connectors
Power requirement	5	Volts	Provided through USB 2.0 mini B
			connector from a PC
LP Threshold Range			
Maximum	1500	mV	
Minimum	0	mV	
Resolution	23	mV	
Input Impedance			
Differential impedance	100	ohms	
Differential impedance mismatch,	< 2.5	%	Typical. Refer to MIPI specification for
ΔZ _{ID}			calculation for ΔZ_{ID}
Return Loss			
Differential return loss	< -9	dB	For frequency < f_{max} = 4.875 GHz,
			where $f_{MAX} = \frac{3}{4}$ symbol rate (refer to
			MIPI specification and Figure 4)
Common mode return loss	< -11	dB	For frequency $< f_{max} = 4.875$ GHz,
			where $f_{MAX} = \frac{3}{4}$ symbol rate (refer to
			MIPI specification and Figure 6)



TABLE 3: GENERAL AND ELECTRICAL SPECIFICATIONS

PARAMETER	VALUE	UNITS	DESCRIPTION AND CONDITIONS
Physical Dimensions			
Length	104	mm	
Width	83	mm	
Height	14	mm	Board height without stand-offs



REVISION NUMBER	HISTORY	DATE
1.0	Document release	July 14, 2021
1.1	Additional updates	September 2, 2021
1.2	Updated ordering part numbers in Table 1	April 8, 2024
1.3	Updated figures 1 and 2	October 18, 2024

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