Application Note

USING THE CS61880/CS61884 IN REDUNDANCY APPLICATIONS

1. INTRODUCTION

Figure 1 shows the block diagram for a typical T1/E1/J1 redundancy system.

The primary and backup boards are two independent boards that are configured for the same operation (T1/E1/J1) and access the same T1/E1/J1 signals. The two boards are connected to the same signals through a common backplane, which in turn is connected to the line interface module (LIM). The control board is used to monitor the performance of the system and to select the desired board (primary or backup) to transmit and receive the T1/E1/J1 signals. The Line Interface Module contains the receiver and transmitter transformers and the termination components (such as resistors and capacitors) that are shared by both the primary and backup boards

Under normal operation, the primary board is receiving and transmitting the T1/E1/J1 signals, while the backup board is configured in a "wait" state. In the "wait" state the transmitters of the backup board are placed in a high impedance state, with a minimum number of circuits activated. The control board performs the following actions when a failure is observed in the primary board: places the primary board in the "wait" state, activates the backup board, and switches the T1/E1/J1 signals from the primary board to the backup board.

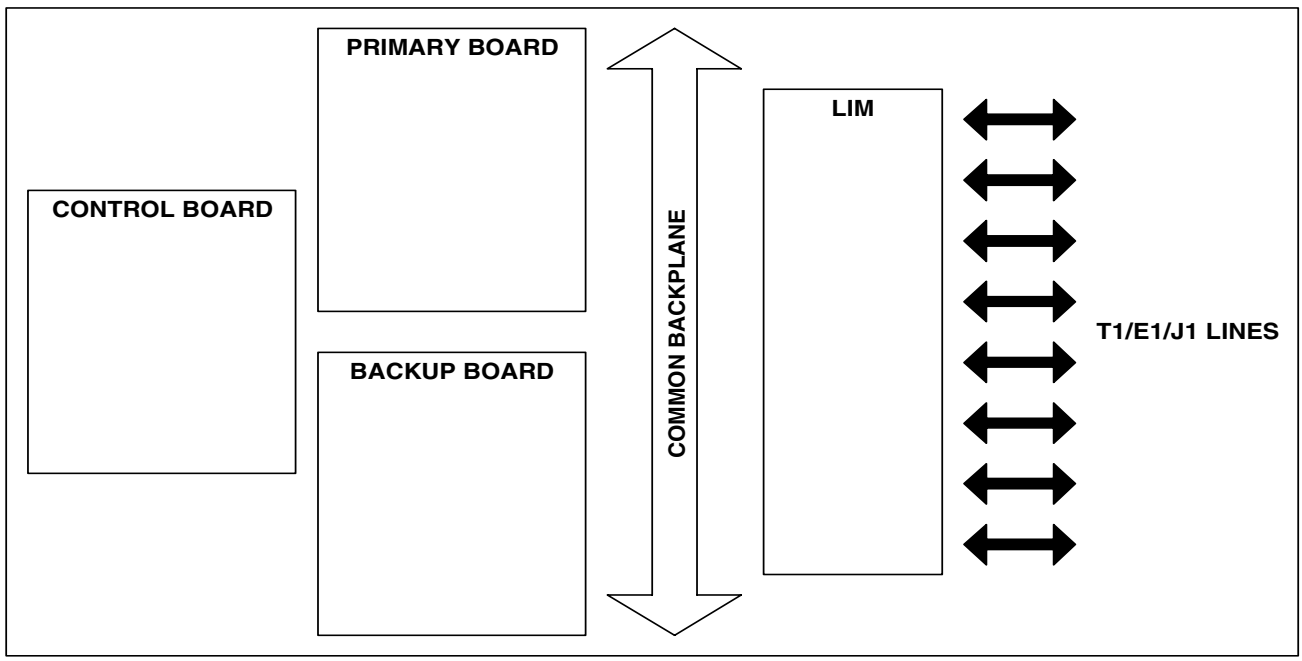

Figure 1. Block Diagram of a Typical Redundancy System

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Contacting Cirrus Logic Support

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This application note describes the necessary components and configurations for a CS61880/884 redundancy application without the use of external line relays.

2. RECEIVER LINE INTERFACE

Since the CS61880/884 LIU devices use the same receive line interface components, this section is applicable to both devices.

Figure 2 shows the receiver configuration necessary to use the CS61880/CS61884 LIU devices in a redundancy application using internal line impedance matching. When using the CS61880/884 LIUs with internal impedance matching, the external components do not have to change to match the appropriate line impedance.

Figure 3 on page 5 shows the receiver redundancy configuration with external line impedance matching. Table 1 shows the values of RT needed to match the receive line impedance for T1 100 Ω, E1 75Ω and E1 120 Ω modes with external line impedance matching.

Resistor	T1 100 Ω	E1 120 Ω	E1 75 Ω
RT	26.1 Ω	32.4 Ω	19.6 Ω

Table 1. Receiver External Line Impedance Matching

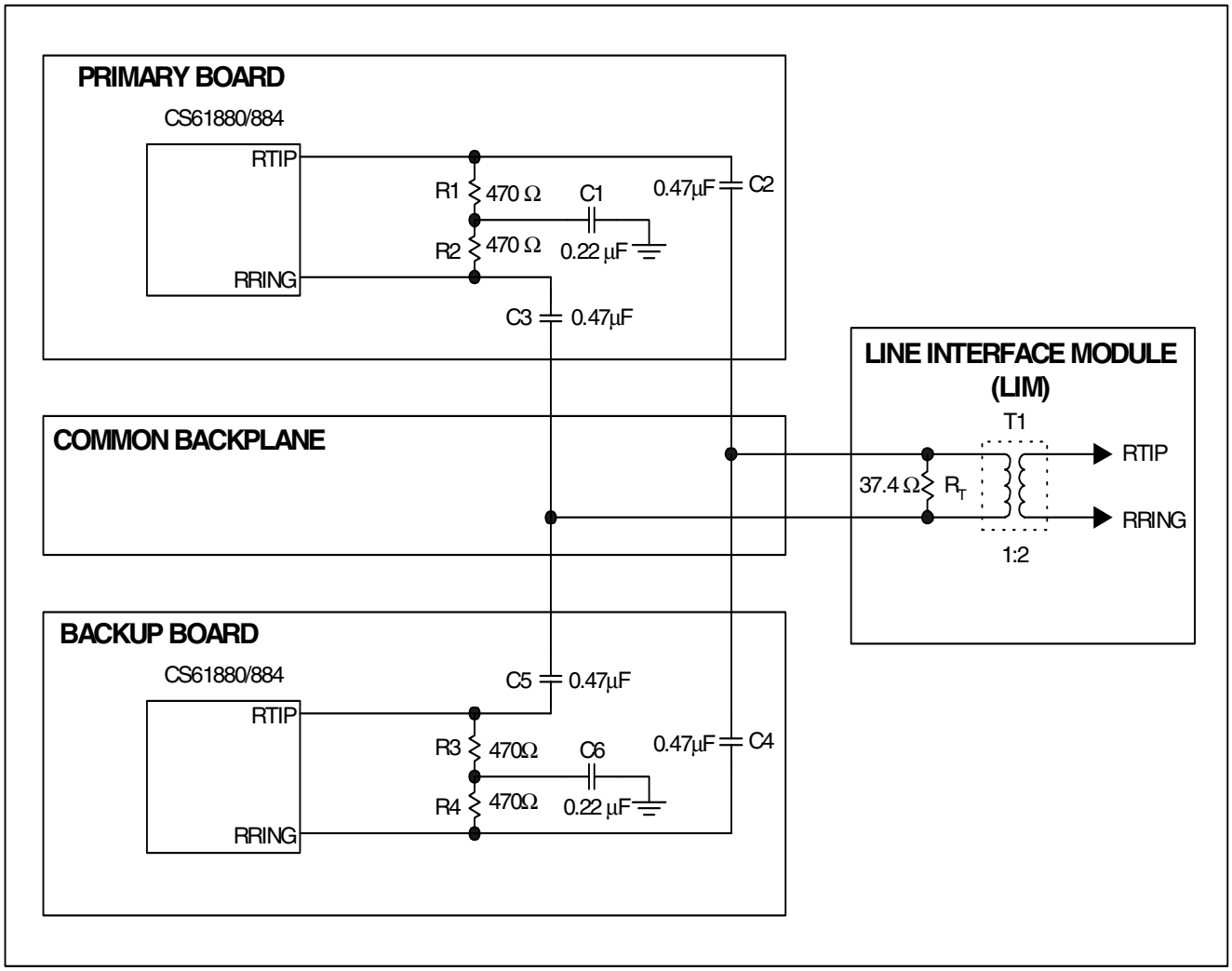

Figure 2. Receiver Internal Line Impedance Matching Configuration

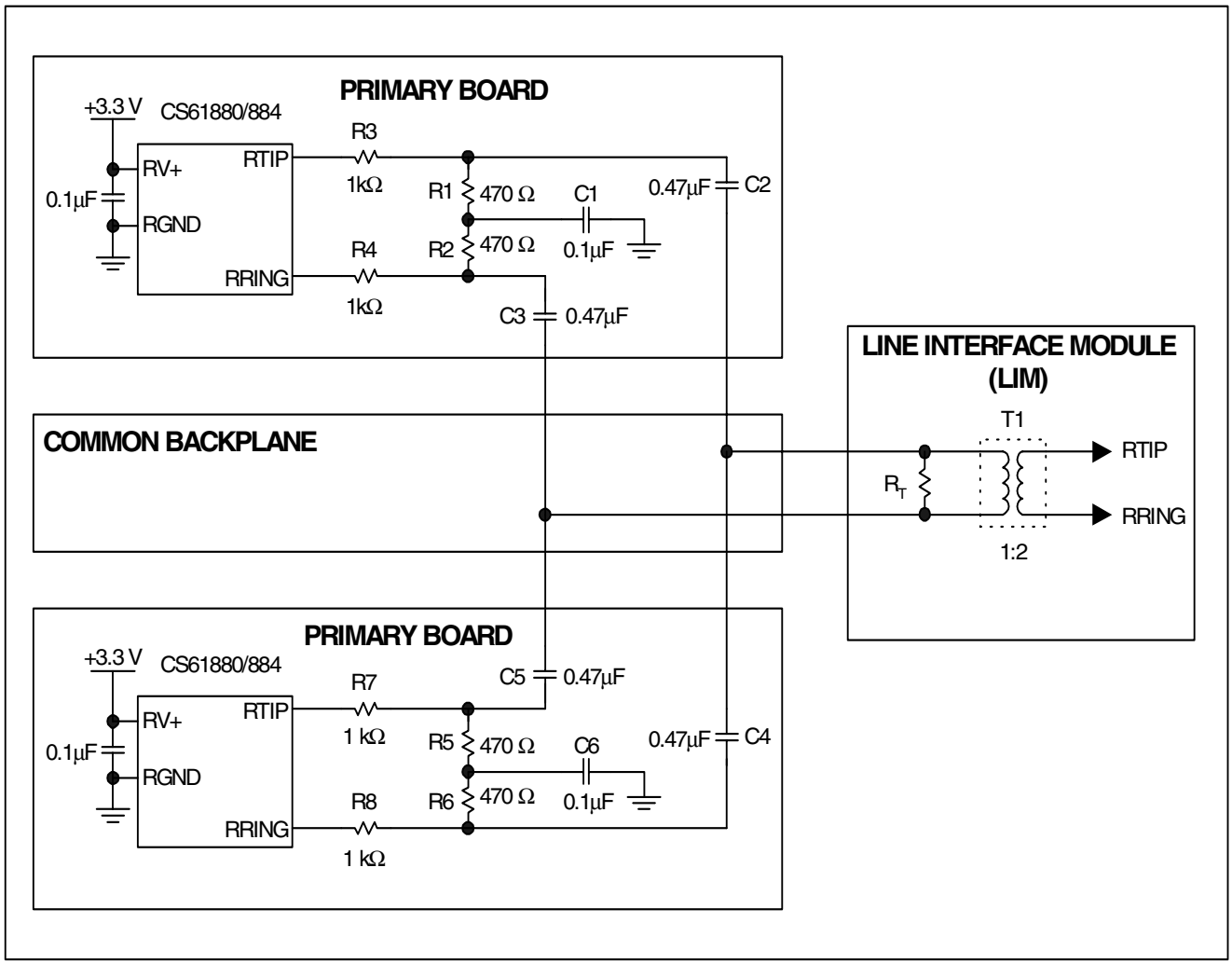

Figure 3. Receiver External Line Impedance Matching Configuration

3. TRANSMITTER LINE INTERFACE

The differences between the CS61880 and the CS61884 transmitter configurations are the transformer turns ratio and a capacitor across TTIP and TRING. The CS61880 does not require a capacitor across the TTIP and TRING signals. The capacitor, labeled $C_{T,}$ used with the CS61884 device can be used to adjust the transmitter return loss. The appropriate transformer turns ratio for the CS61880/884 devices are shown in Table 2.

Transformer	CS61880	CS61884
T2	1:1.15	1:2

Table 2. Transmitter Transformer Turns Ratio

The components needed to connect the CS61880/884 transmitters together in a redundancy application are shown in Figure 4.

Note: A relay or a FET must be placed between the supply lines and all the +TV power pins of the CS61880 and CS61884 devices. The FET or relay must be open when power is removed from the primary or backup boards. This is necessary to ensure that the transmitted pulse meets the appropriate template standard, when power is removed from the non-transmitting board. If the power supply impedance is high when power is turned off, then the relay or FET is not necessay.

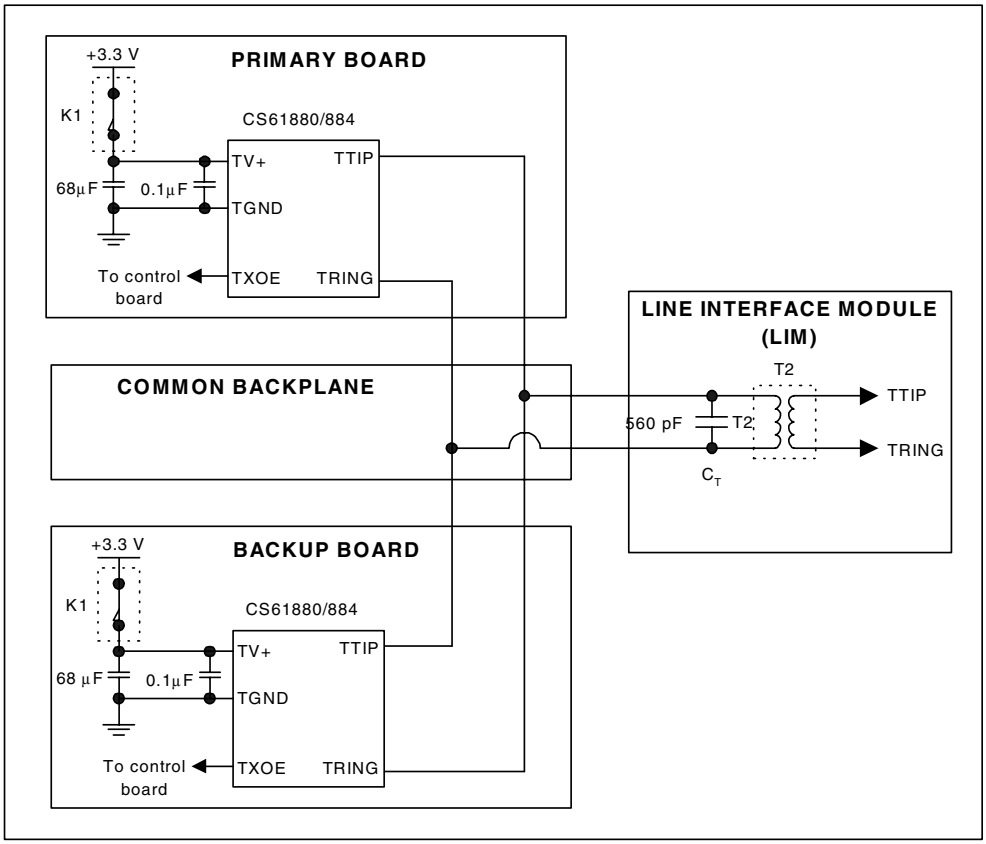

Figure 4. Transmitter Configuration

4. TEST RESULTS

The receiver sensitivity, receiver return loss, transmitter return loss, and transmitter pulse templates parameters were measured on the CDB61880/884 evaluation boards. All values discussed in this section are typical and do not show worst case. Each parameter was measured using the following configurations:

- Configuration #1: Only the primary board was powered up and connected to the LIM. The backup board is not connected to the LIM. NOTE: This is a non-redundancy configuration using the components described in this application note.
- Configuration #2: Both the primary and backup boards powered up and connected to the LIM. The transmitters on the backup board were placed in a high impedance state.
- Configuration #3: Both the primary and backup boards were connected to the LIM. The transmitters on the backup board were placed in a high impedance state.The backup board power supply turned off, and the +TV power pin disconnected from the power supply.

4.1 CS61880/884 Receiver Sensitivity

The CS61880/884 devices will recover data with up to 10 dB of cable attenuation at 772 kHz and 1.024 MHz under all the above configurations.

4.2 CS61880/884 Receiver Return Loss In External Impedance Matching Mode

Table 3 shows the measured receiver return loss for E1 75 Ω, E1 120 Ω, and T1 100 Ω modes under all the configurations listed in Section 4.

4.3 Receive Return Loss In Internal Impedance Matching Mode

Table 4 shows the measured receiver return loss for E1 75 Ω, E1 120 Ω and T1 100 Ω modes.

	Configuration #1			Configuration #2			Configuration #3		
Frequency	T1 100 Ω	E1 75 Ω	E1 120 Ω	T1 100 Ω	E1 75 Ω	E1 120 Ω	T1 100 Ω	E1 75 Ω	E1 120 Ω
51 kHz	-34 dB	-26 dB	-33 dB	-33 dB	-28 dB	-30 dB	-34 dB	-28 dB	-30 dB
102 kHz	-39 dB	-26 dB	-38 dB	-36 dB	-28 dB	-32 dB	-39 dB	-28 dB	-32 dB
2.048 MHz	-25 dB	-21 dB	-27 dB	-24 dB	-21 dB	-27 dB	-25 dB	-21 dB	-27 dB
3.072 MHz	-21 dB	-18 dB	-24 dB	-21 dB	-19 dB	-24 dB	-21 dB	-19 dB	-24 dB

Table 3. Receiver External Matched Impedance Return Loss

	Configuration #1			Configuration #2			Configuration #3		
Frequency	T1 100 Ω	E1 75 Ω	E1 120 Ω	T1 100 Ω	E1 75 Ω	E1 120 Ω	T1 100 Ω	E1 75 Ω	E1 120Ω
51 kHz	-21dB	-19 dB	-19 dB	-23 dB	-20 dB	-21 dB	-23 dB	-20 dB	-21 dB
102 kHz	-21dB	-21 dB	-20 dB	-23 dB	-23 dB	-21 dB	-23 dB	-23 dB	-22 dB
2.048 MHz	-20 dB	-20 dB	-19 dB	-21 dB	-21 dB	-22 dB	-21 dB	-21 dB	-21 dB
3.072 MHz	-19 dB	-18 dB	-19 dB	-20 dB	-19 dB	-21 dB	-20 dB	-19 dB	-21 dB

Table 4. Receiver Internal Matched Impedance Return Loss

4.4 CS61880/884 Transmitter Return Loss

Table 5 and Table 6 show the measured transmitter return loss for E1 75 Ω, E1 120 Ω and T1 100 Ω modes. All the measurements were taken with an all one's data pattern.

Note: The CS61880 does not use a 560 pF capacitor across the TTIP and TRING signals.

	Configuration #1		Configuration #2		Configuration #3	
Frequency	**E1 75 Ω**	**E1 120 Ω**	**E1 75 Ω**	**E1 120 Ω**	**E1 75 Ω**	**E1 120 Ω**
51 kHz	-20 dB	-18 dB	-21 dB	-18 dB	-21 dB	-18 dB
102 kHz	-23 dB	-20 dB	-23 dB	-21 dB	-24 dB	-22 dB
2.048 MHz	-21 dB	-28 dB	-23 dB	-33 dB	-21 dB	-25 dB
3.072 MHz	-21 dB	-33 dB	-24 dB	-26 dB	-21 dB	-22 dB

Table 5. CS61880 Transmitter Return Loss

	Configuration #1			Configuration #2			Configuration #3		
Frequency	**T1 100 Ω**	**E1 75 Ω**	**E1 120 Ω**	**T1 100 Ω**	**E1 75Ω**	**E1 120 Ω**	**T1 100 Ω**	**E1 75 Ω**	**E1 120 Ω**
51 kHz	-19 dB	-23 dB	-29 dB	-19 dB	-23 dB	-29 dB	-19 dB	-23 dB	-29 dB
102 kHz	-20 dB	-23 dB	-31 dB	-20 dB	-23 dB	-31 dB	-20 dB	-23 dB	-32 dB
2.048 MHz	-22 dB	-17 dB	-28 dB	-22 dB	-17 dB	-27 dB	-22 dB	-17 dB	-26 dB
3.072 MHz	-22 dB	-15 dB	-26 dB	-22 dB	-15 dB	-24 dB	-22 dB	-15 dB	-23 dB

Table 6. CS61884 Transmitter Return Loss

4.5 CS61880 Pulse Templates

Figures 5 through 10 show the transmitted pulse templates in E1 75 Ω and E1 120 Ω modes. All templates were measured without a 560pF capacitor across the TTIP and TRING signals.

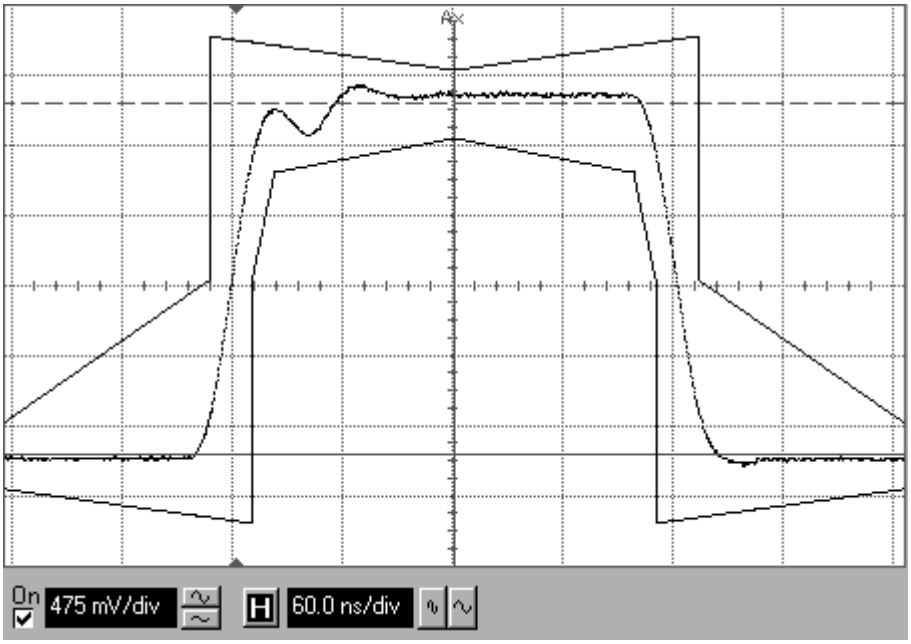

Figure 5. Configuration #1 CS61880 E1 75 Ω

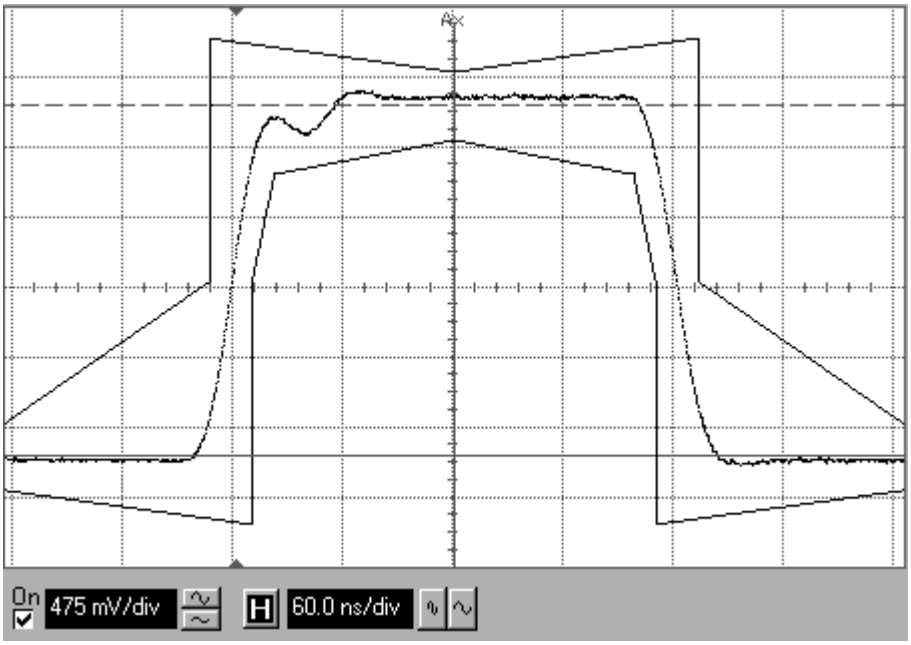

Figure 6. Configuration #2 CS61880 E1 75 Ω

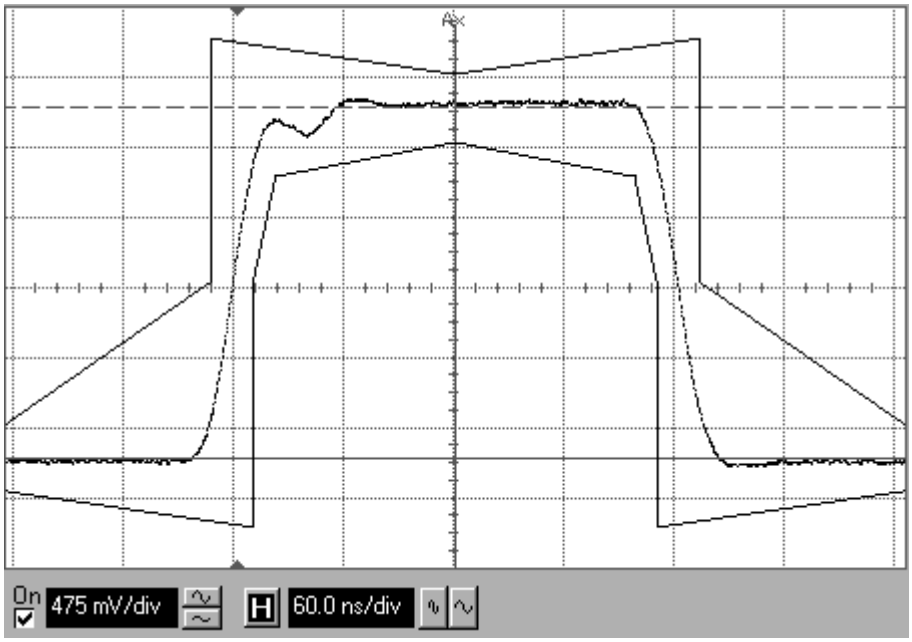

Figure 7. Configuration #3 CS61880 E1 75 Ω

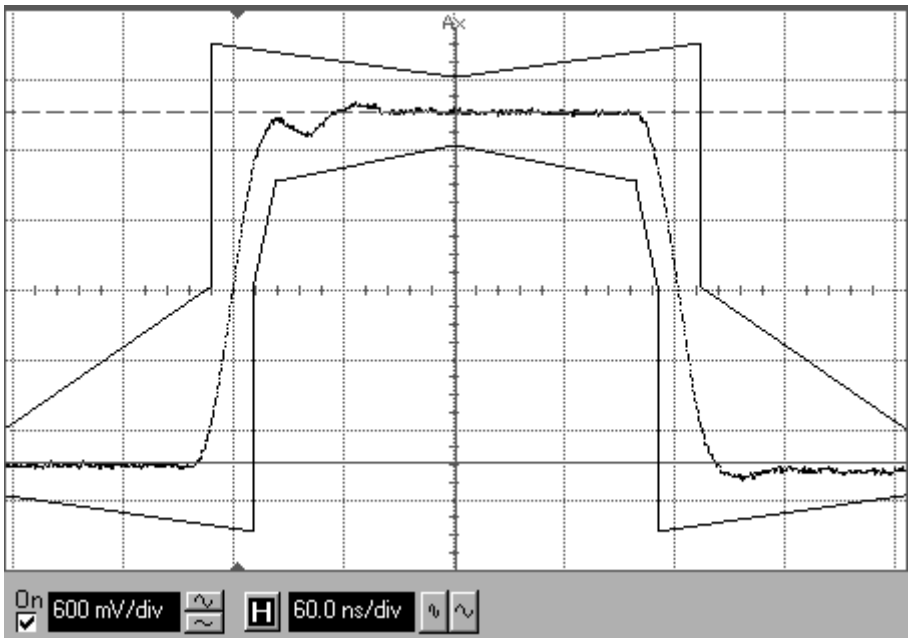

Figure 8. Configuration #1 CS61880 E1 120 Ω

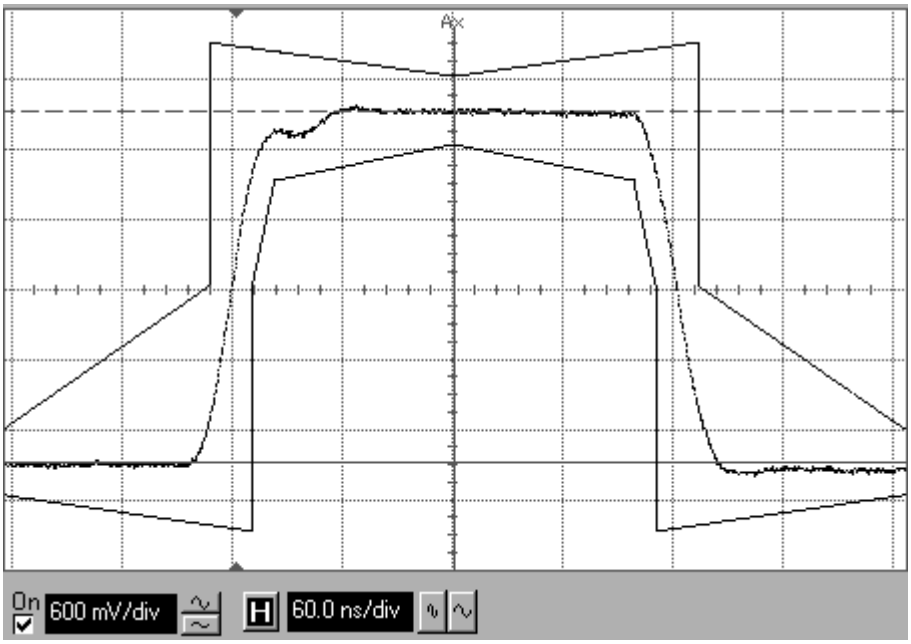

Figure 9. Configuration #2 CS61880 E1 120 Ω

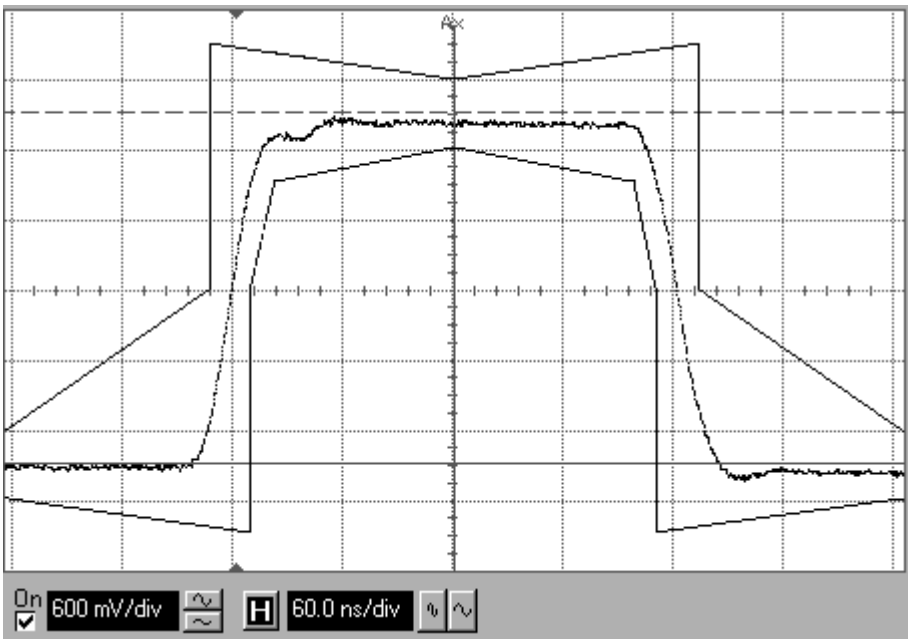

Figure 10. Configuration #3 CS61880 E1 120 Ω

4.6 CS61884 Pulse Templates

The remaining Figures 11 through 22 show the transmitted pulse templates in T1 100 Ω, E1 75 Ω and E1 120 Ω modes. All templates were measured with a 560 pF capacitor across the TTIP and TRING signals as shown in Figure 4.

Note: The 560 pF capacitor that is used across the TTIP and TRING signals to improve the transmitter return loss causes the E1 75 Ω and E1 120 Ω templates to ring. The capacitor can be adjusted or removed to decrease the ringing effect.

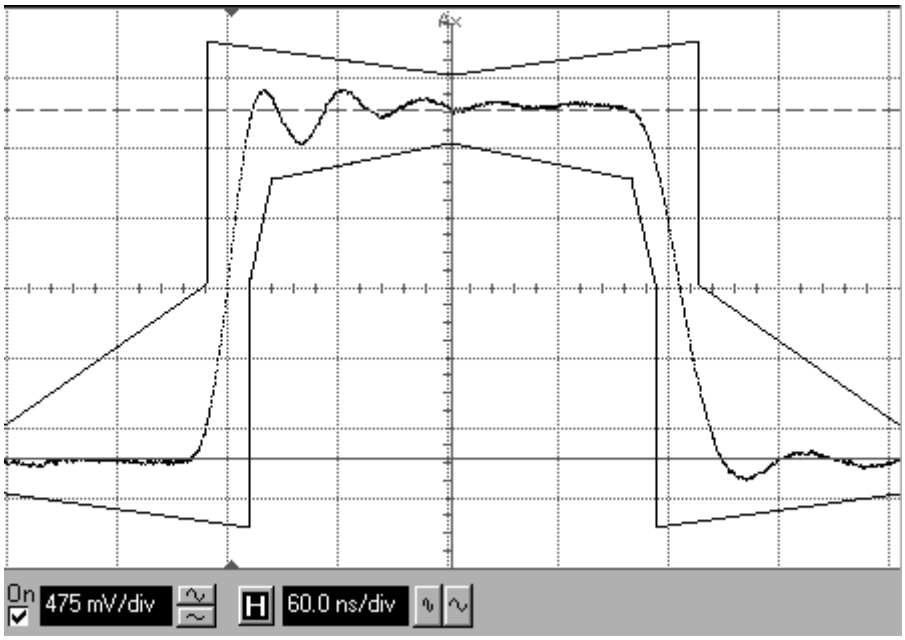

Figure 11. Configuration #1 CS61884 E1 75 Ω

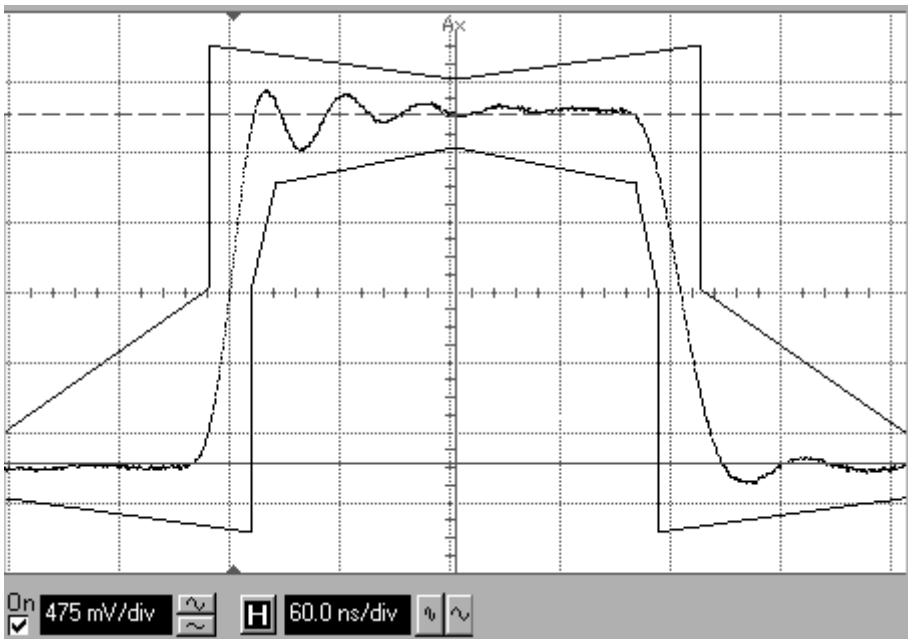

Figure 12. Configuration #2 CS61884 E1 75 Ω

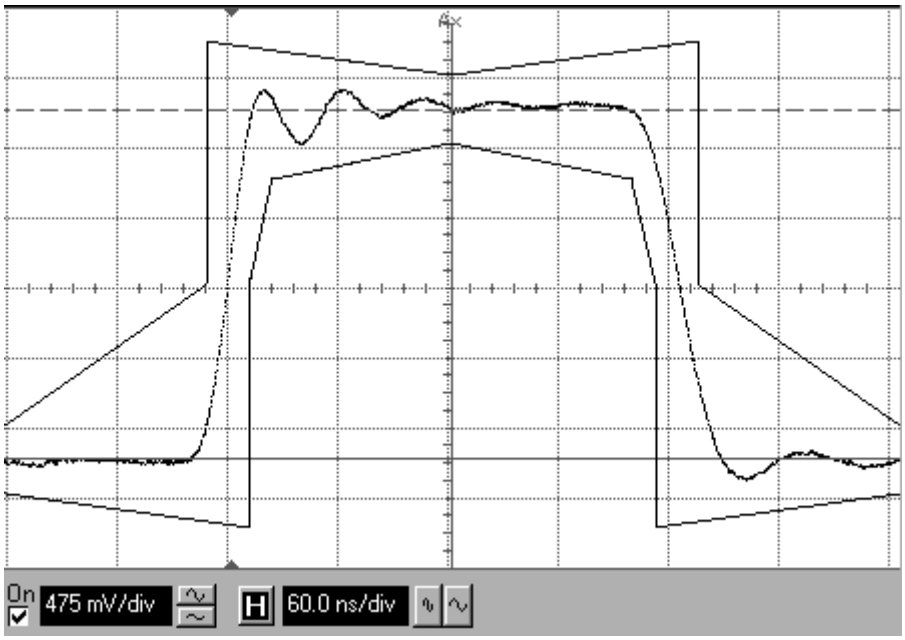

Figure 13. Configuration #3 CS61884 E1 75 Ω

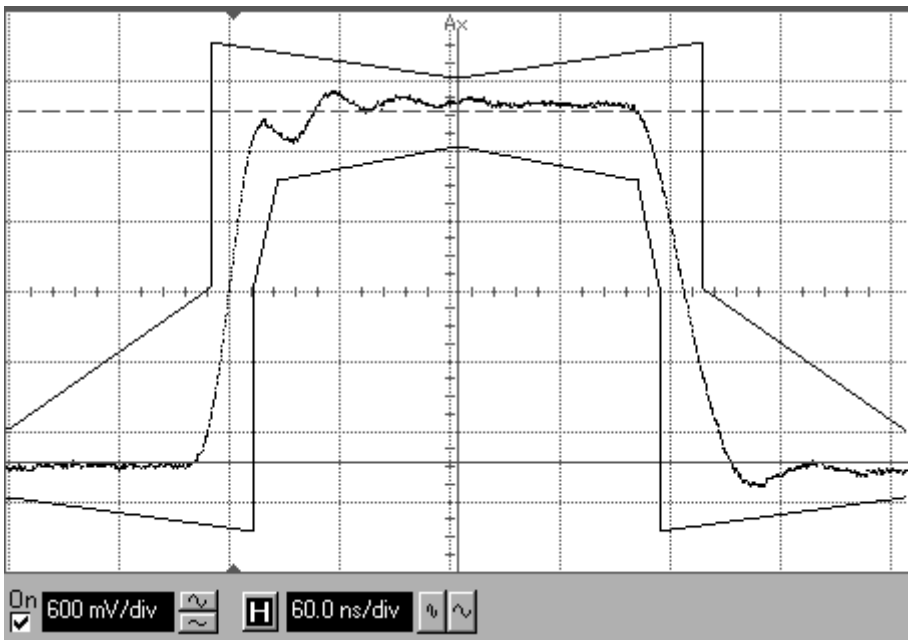

Figure 14. Configuration #1 CS61884 E1 120 Ω

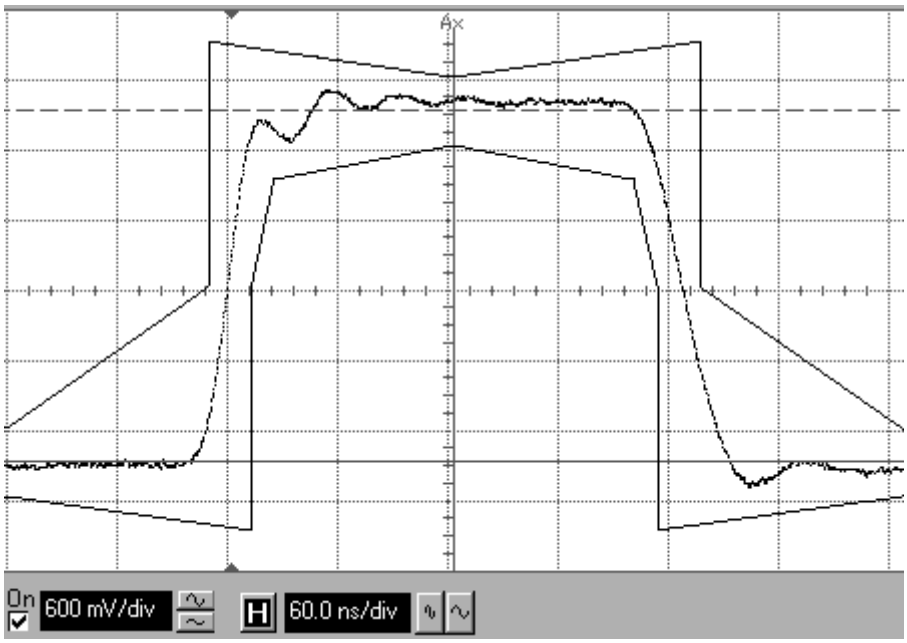

Figure 15. Configuration #2 CS61884 E1 120 Ω

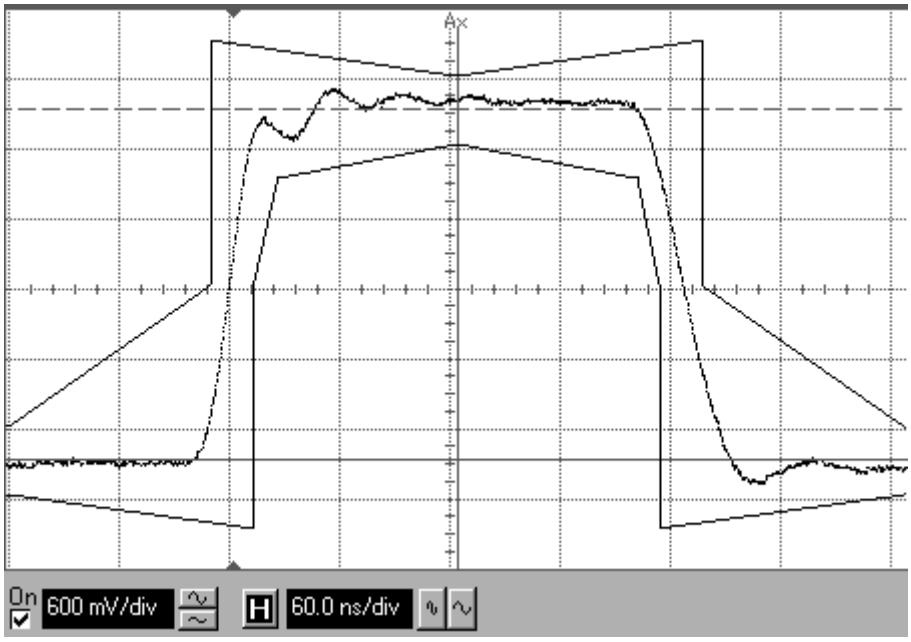

Figure 16. Configuration #3 CS61884 E1 120 Ω

Figure 17. Configuration #1 CS61884 T1 100 Ω 0 Ft.

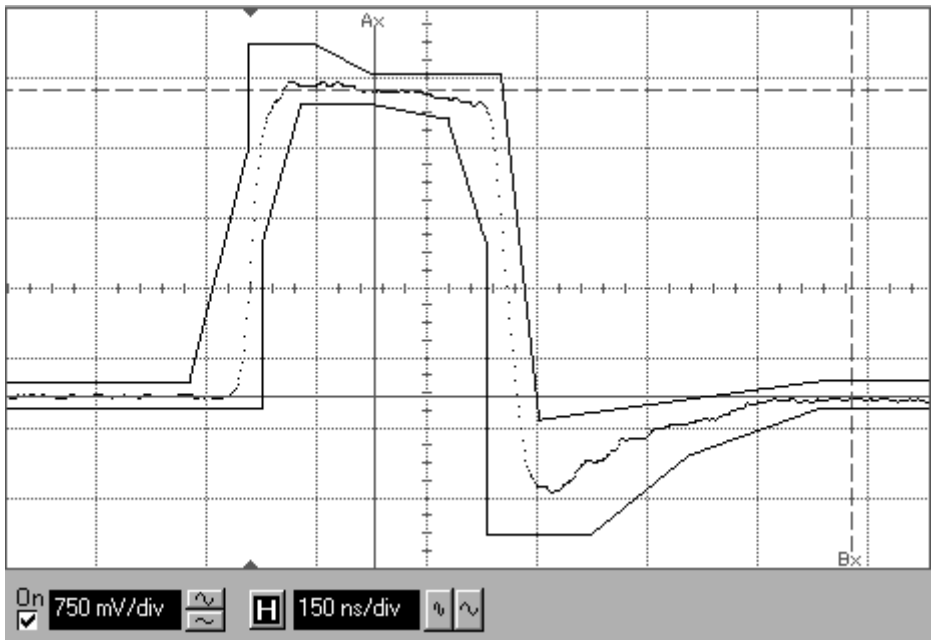

Figure 18. Configuration #2 CS61884 T1 100 Ω 0 Ft.

Figure 19. Configuration #3 CS61884 T1 100 Ω 0 Ft.

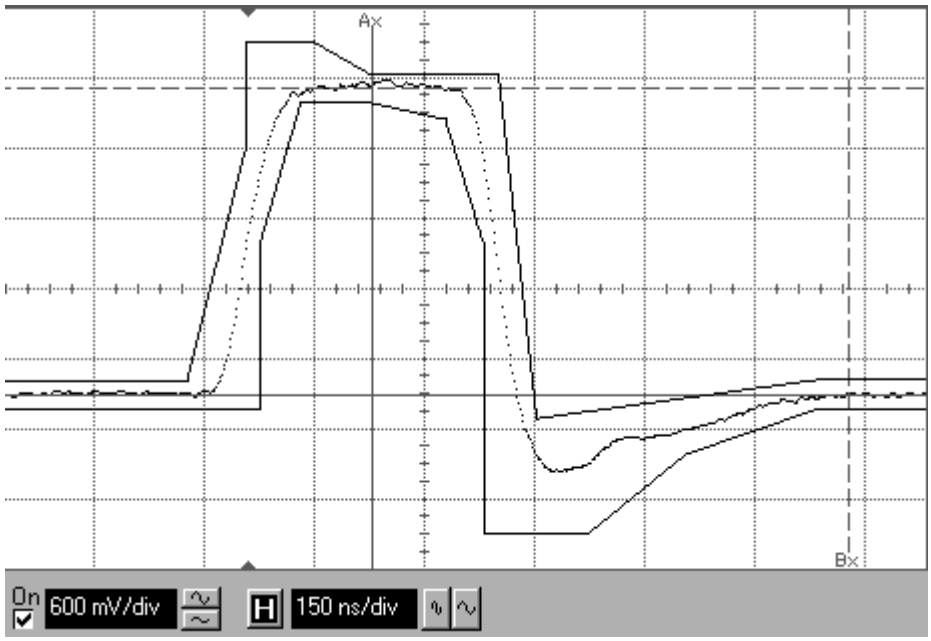

Figure 20. Configuration #1 CS61884 T1 100 Ω 655 Ft.

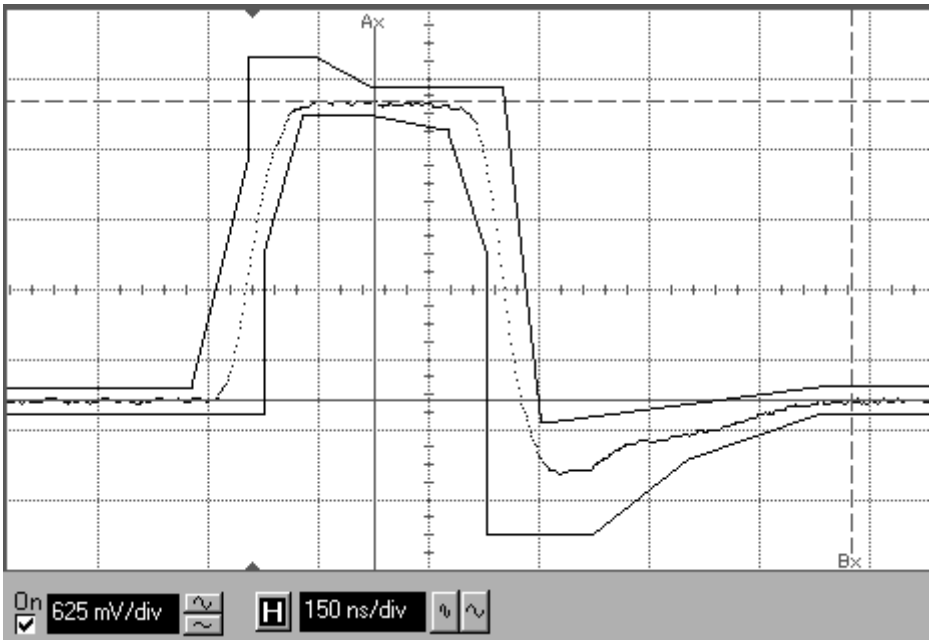

Figure 21. Configuration #2 CS61884 T1 100 Ω 655 Ft.

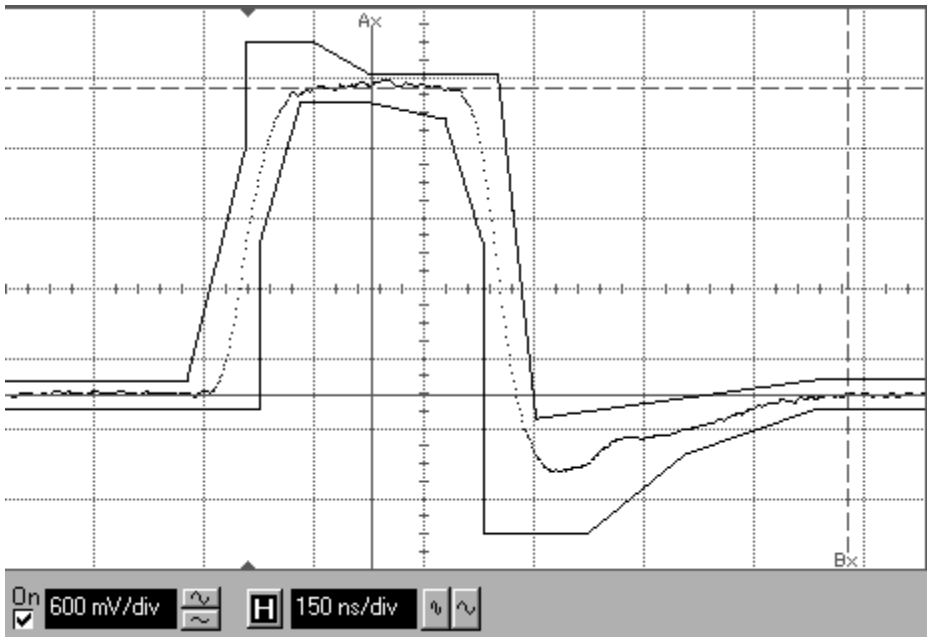

Figure 22. Configuration #3 CS61884 T1 100 Ω 655 Ft.


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