
TV-Out Connection with CRT Discharge Protection

Introduction

This application note is applicable to 70xx and 720x (S-Video, Composite and SCART Video) family. This recommendation takes precedence over the same information presented in the datasheets.

It provides a suggestion on how to make a correct connection to S-Video, Composite or SCART connector of a TV with a protection to the encoder device from the CRT discharge of the TV.

Due to CRT discharge from the TV, the signal lead might have +ve or -ve voltage surge. To protect the DACs inside the device, two diodes are connected to each output signal Y, C, and CVBS as shown in the circuit below.

CRT discharge protection is achieved by using a BAT54S Schottky diode pair (or a couple of IN44 compatible diodes), one diode is connected to Vdd and the other diode is connected to GND. They are placed as close to the connectors as possible so that they are turned on earlier than the internal diode protection circuit. In case of +ve voltage surge, the diode connected to Vdd is turned on and in case of -ve surge, the diode connected to GND is turned on providing the proper discharge of the voltage.

Our device designed with the recommended BAT54S Schottky diode was subjected to ESD tests according to the international standard, BS EN 61000-4-2, IEC 1000-4-2; Electromagnetic compatibility (EMC), section 4.2 Electrostatic discharge immunity test. The results from our ESD tests shows that our device along with the recommended BAT54S Schottky diode can withstand ESD charges of up to 16kV. which far exceeds the Level 4 ESD standard test level of 8kV.

ESD Test Procedure:

1. Ground the unit to be tested.
2. Inject 4kV of positive ESD charge and 4kV of negative ESD charge into each DAC.
3. Verify that each DAC of the unit under test is still functional according to spec. Record the results.
4. Repeat steps 2 and step 3 with ESD charges of 8kV, 12kV, 16kV, 20kV, and 25kV.

ESD Standard Test Levels:

Level 1: 2kV

Level 2: 4kV

Level 3: 6kV

Level 4: 8kV

Level x: Open - to be specified by the manufacturer.

Figures 1 to 3 show the reference design for S-Video and Composite Video outputs.

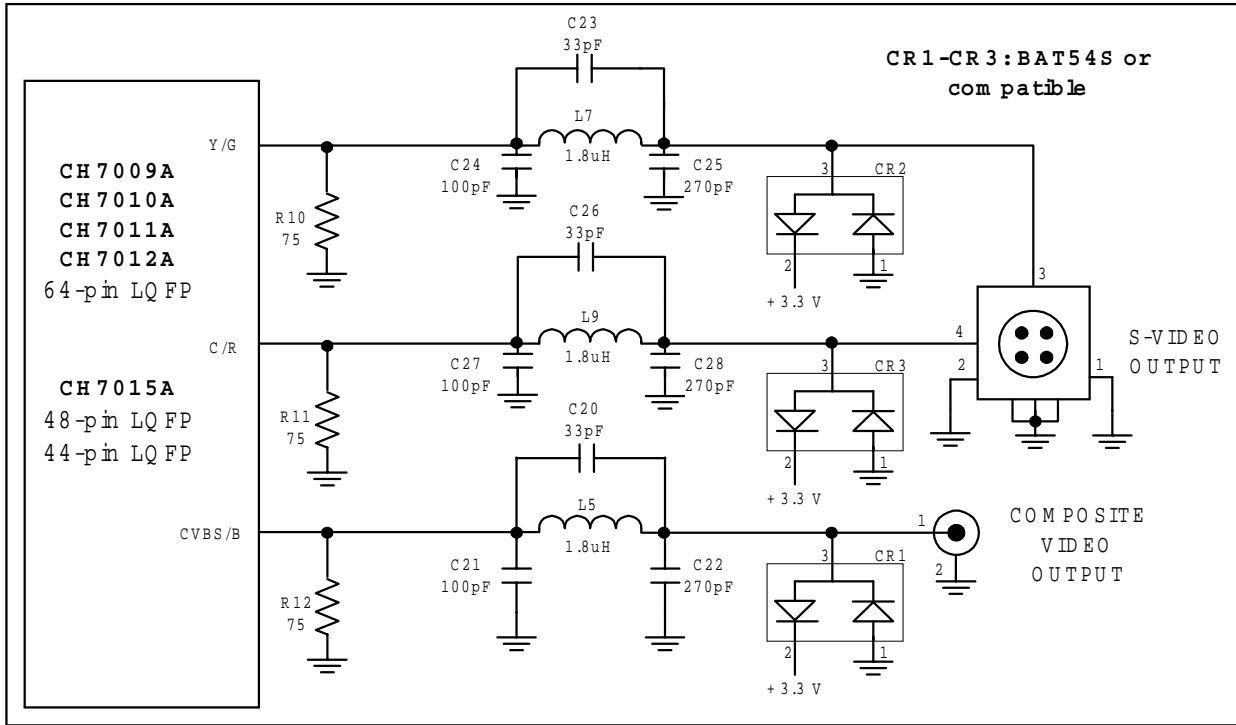


Figure 1: S-Video and Composite Video Outputs

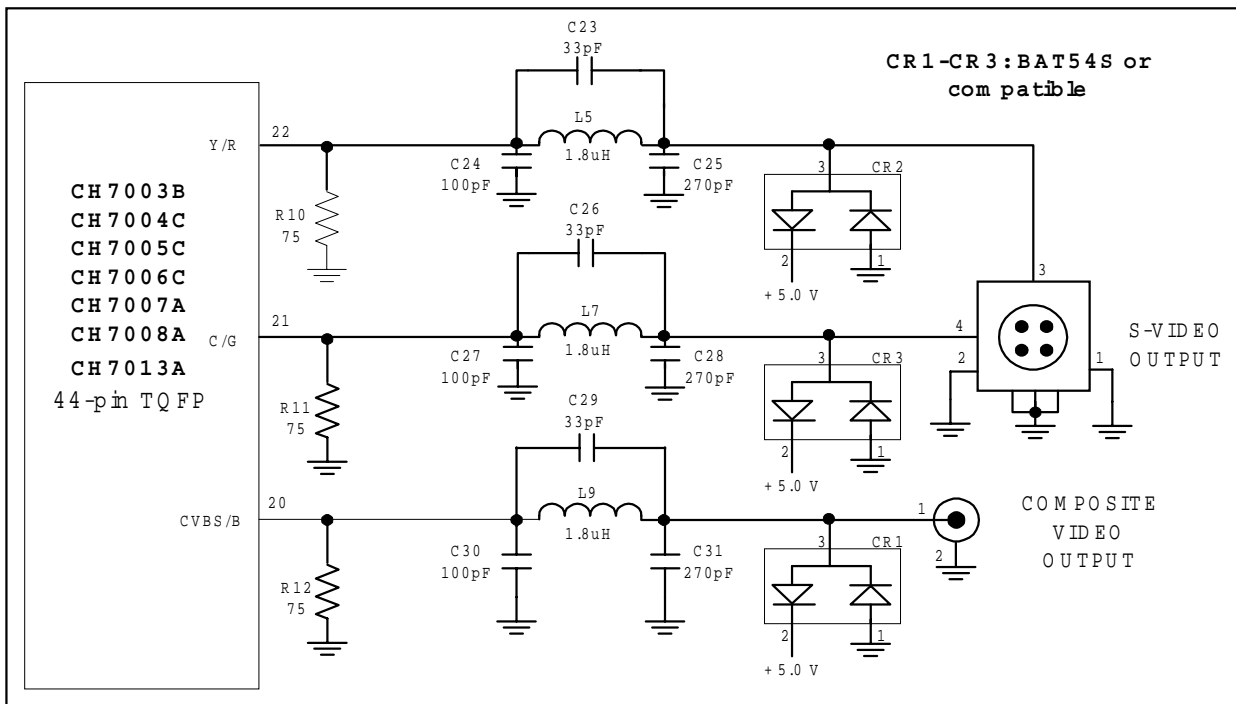


Figure 2: S-Video and Composite Video Outputs

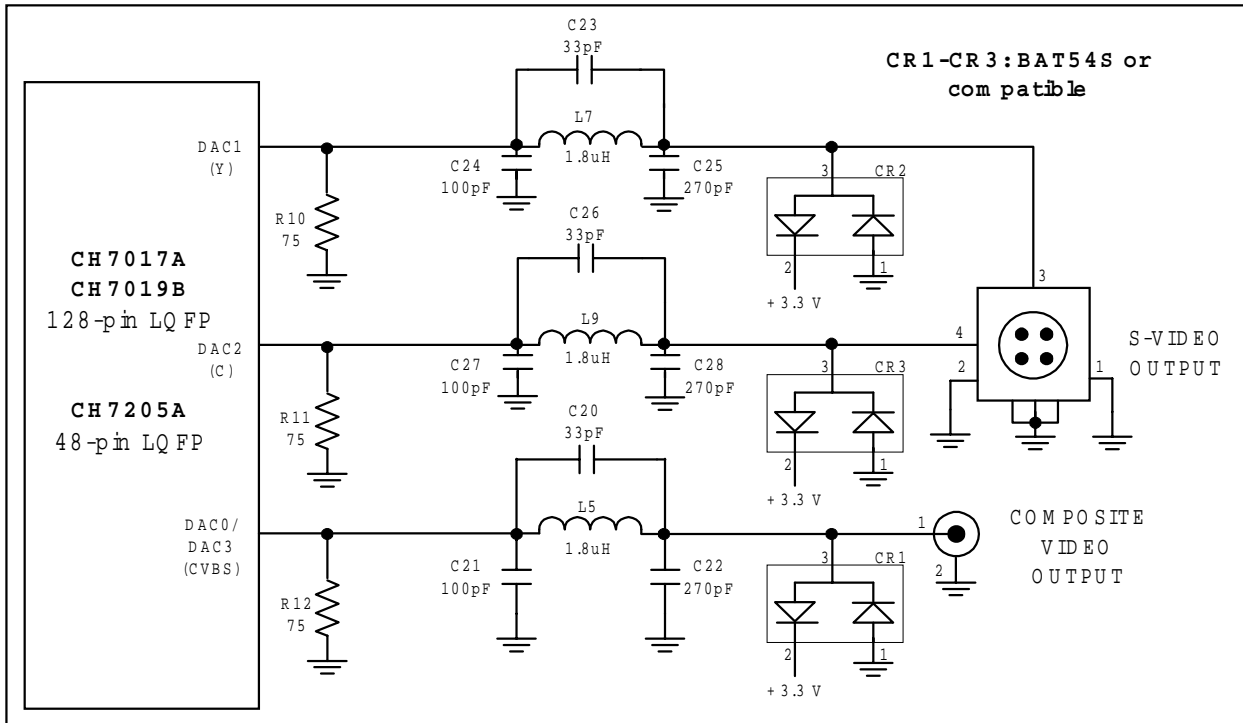


Figure 3: S-Video and Composite Video Outputs

Figures 4 to 8 show the reference design for SCART Outputs.

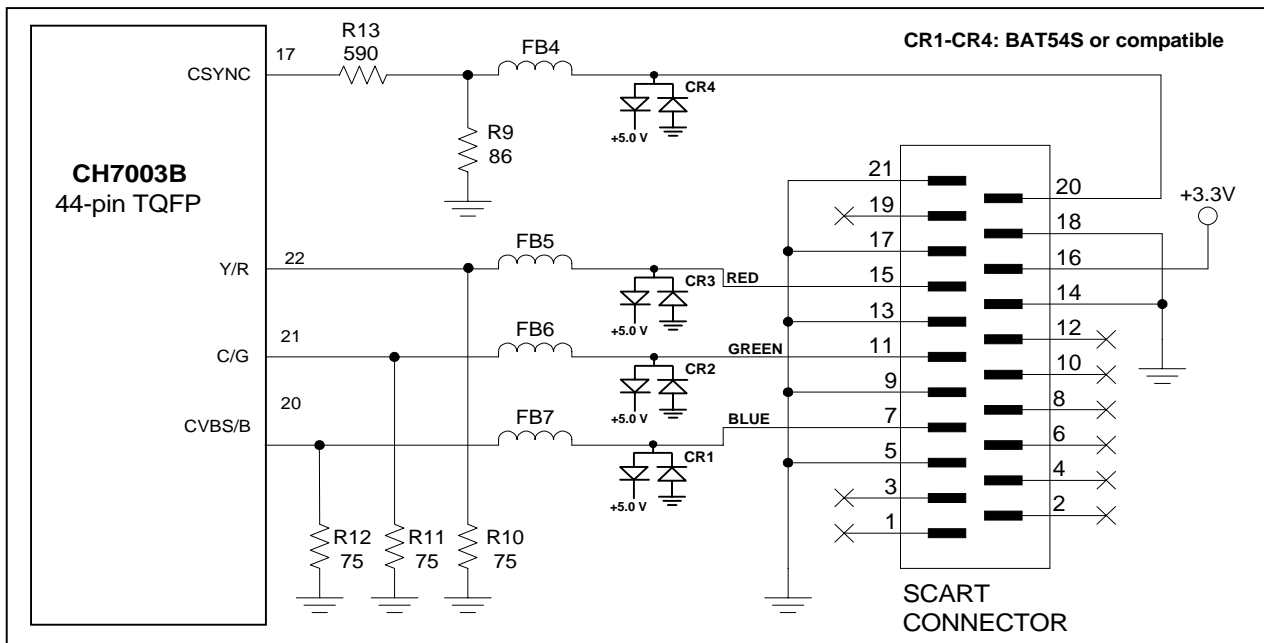


Figure 4: SCART type I Video Output

R13 and R9 set the peak voltage level at R9 to be around 0.4 V. This is used for the composite sync in SCART mode. The equivalent resistance at the node of R9 should be as close to 75 ohms as possible. Please note that there is a flexibility to select standard resistor values for R13 and R9.

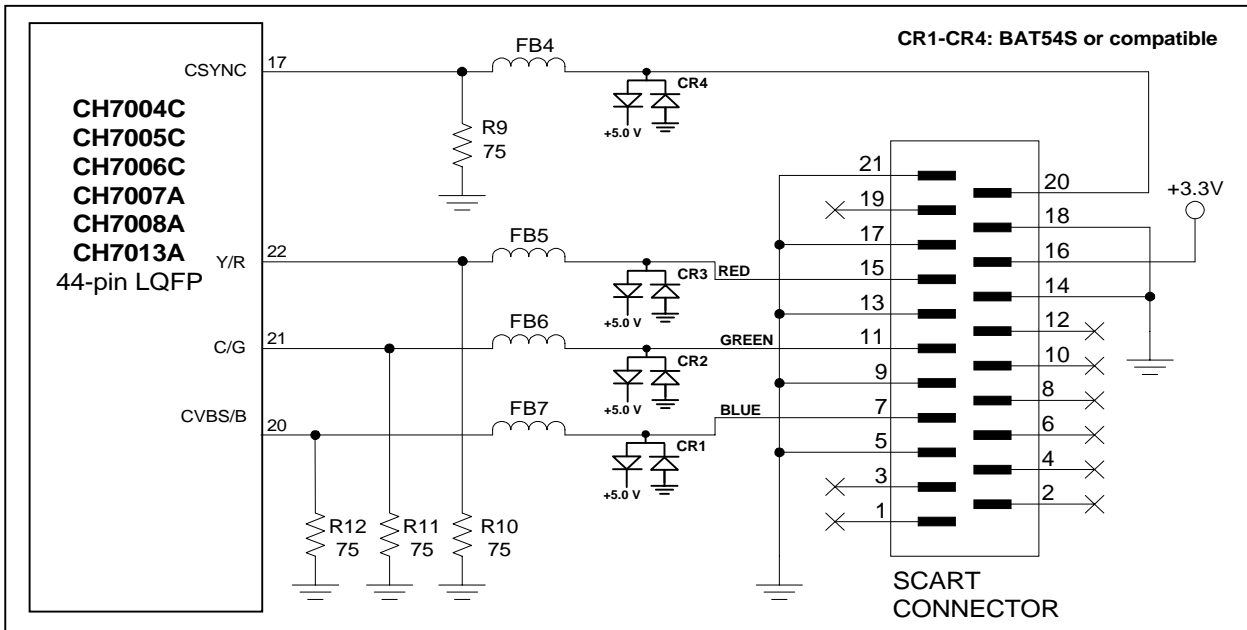


Figure 5: SCART type I Video Output

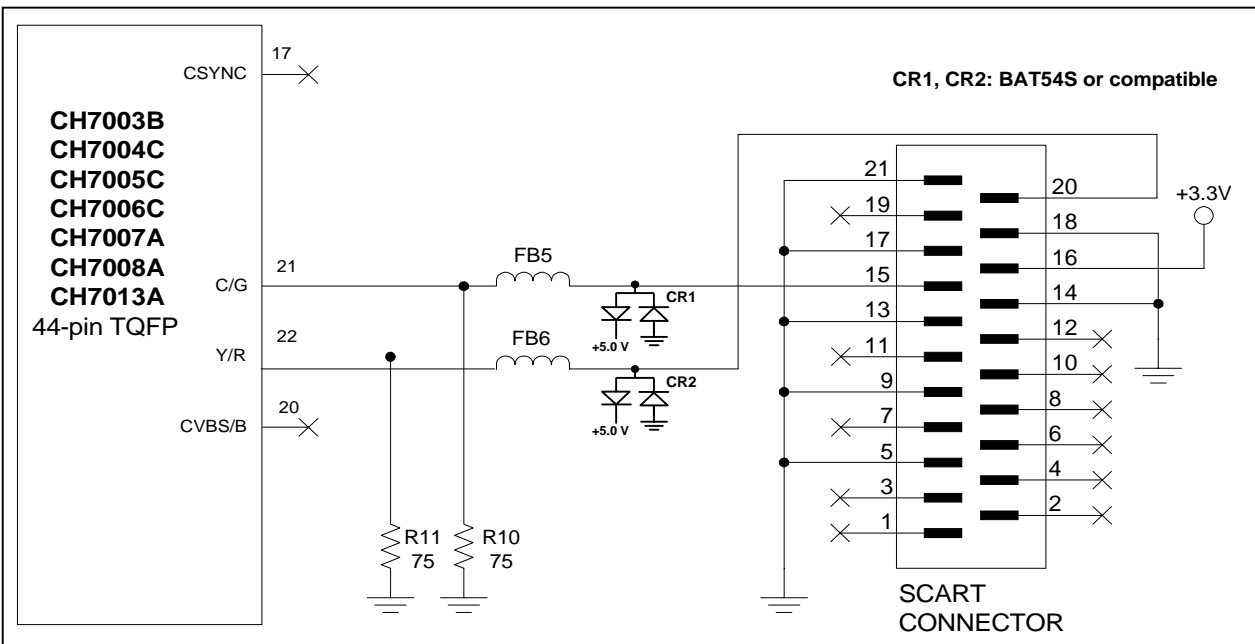


Figure 6: SCART type II Video Output

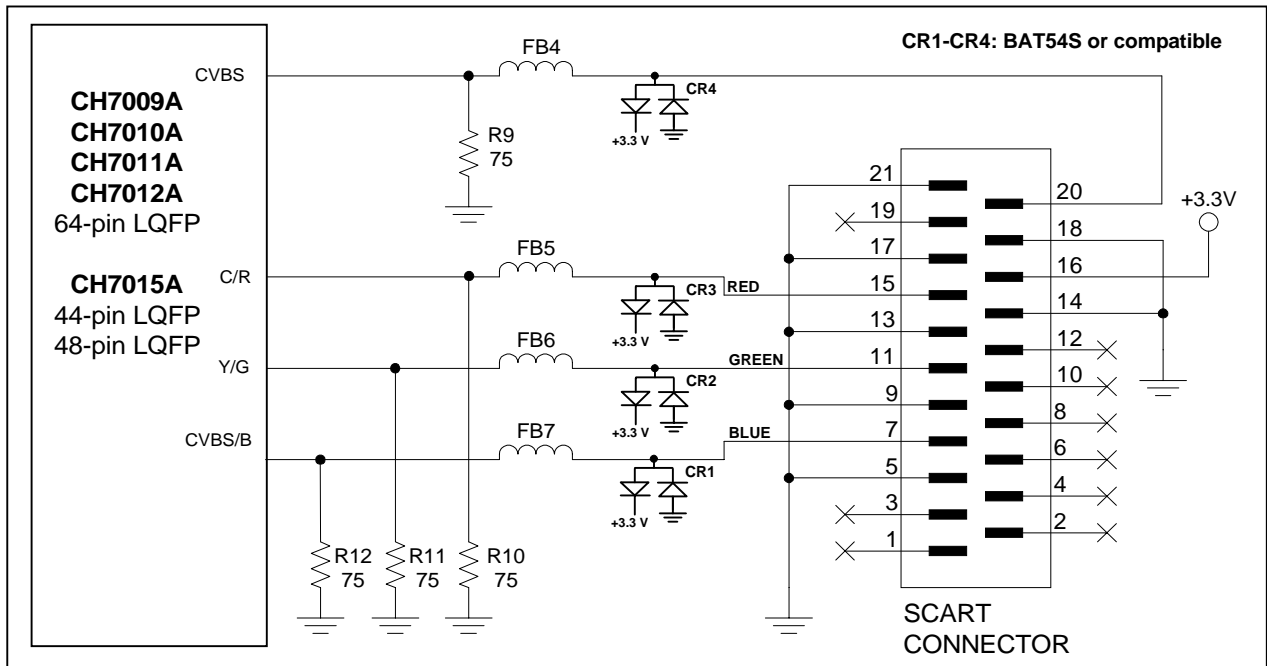


Figure 7: SCART Video Output

For the CH7009, CH7010, CH7011 and CH7012, this schematic can support both SCART type I and type II. For SCART arrangement 1, set the FF Register (address 01h) bit 6 VOF = 1 and the BL Register (address 07h) BL[7:0] = 0. For SCART arrangement 2, set VOF = 0 and BL[7:0] = 110, and CVBWB = 0 (Register 02h bit 5).

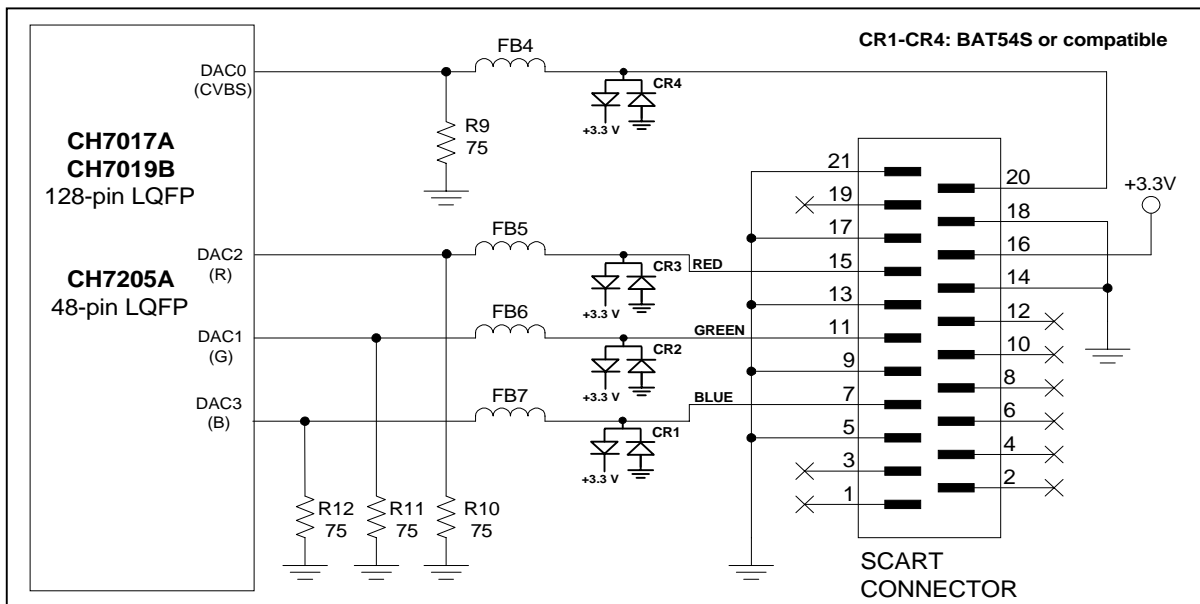


Figure 8: SCART Video Output

For the CH7017 and CH7205, this schematic can support both SCART type I and type II. For SCART arrangement 1, set FF Register (address 01h) bit 6 VOF = 1 and BL Register (address 07h) BL[7:0] = 0. For SCART arrangement 2, set VOF = 0 and BL[7:0] = 110, and CVBWB = 0 (Register 02h bit 5).

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