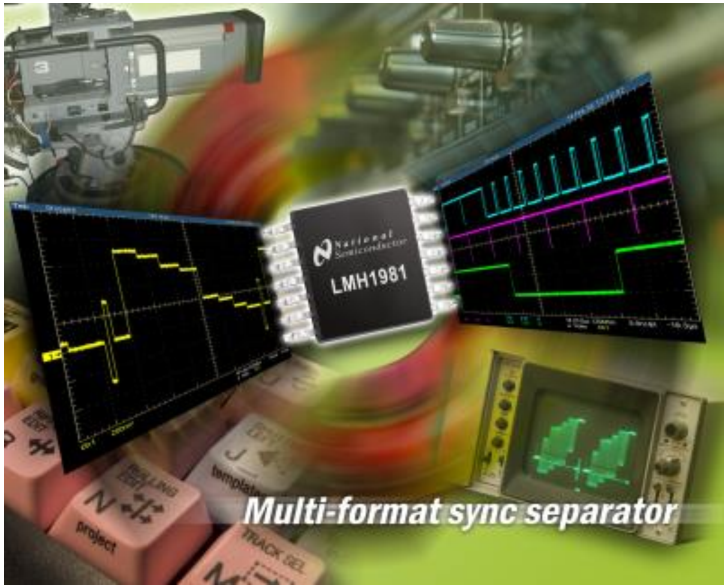
LMH1981 Video Sync Separator
Features and Benefits

- Supports major analog video standards
  - NTSC, PAL, 480I/P, 576I/P, 720P, 1080I/P
  - Auto format detection
- Low HSYNC output jitter
  - Helps to meet 3G-SDI Output Timing Jitter spec and/or relax PLL loop bandwidth
- 50% sync slicing of 0.5 to 2 VPP inputs
  - Supports improper video input termination
- Low HSYNC propagation delay variation
  - Reduces PLL clock phase drift
- -40 to +85˚C operation
- 3.3 to 5V supply voltage



Applications

- Broadcast/Pro Video Equipment
- Genlock Circuits
- Video Capture and Editing
- Set-Top Boxes (STB) & Digital Video Recorders (DVR)
- HDTV/DTV Systems
- TV/Video Displays

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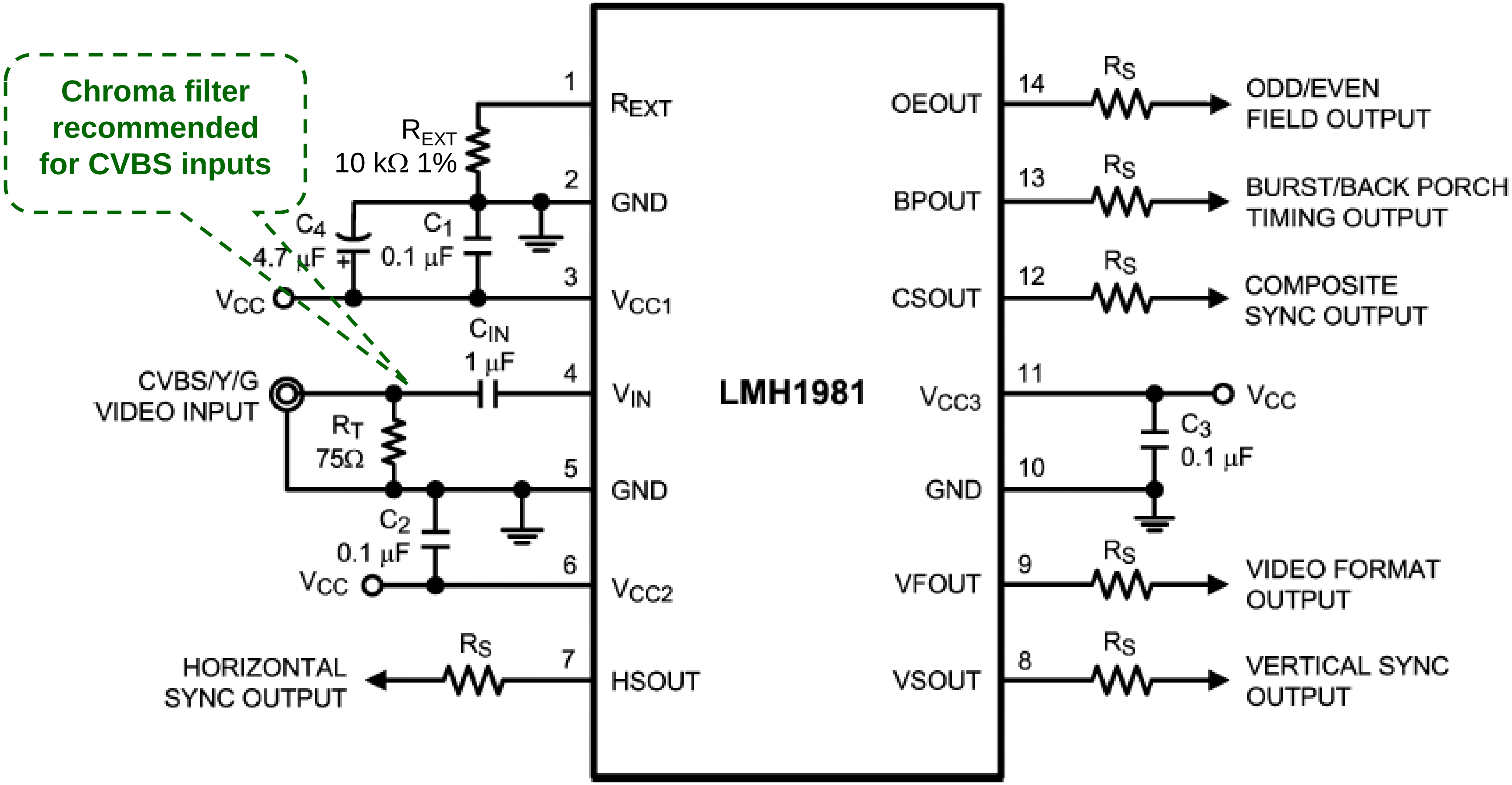
Pinout and Test Circuit

Low component count, small TSSOP package → Easy application



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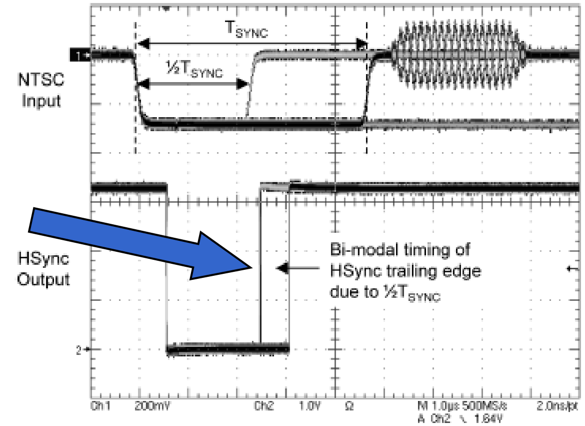
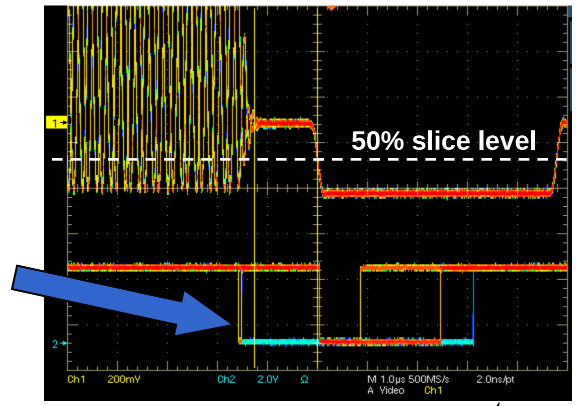
LMH1981 Design Tips

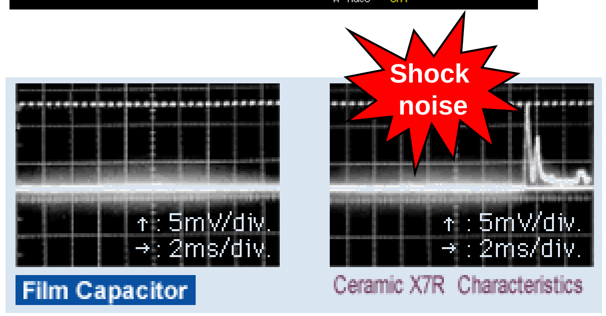
- **Use the <u>HSYNC leading edge</u> for the PLL's reference edge**



- **Use an input <u>low-pass filter</u> to prevent chroma-triggered output glitches for NTSC/PAL**
  - **Don't exceed 50% sync slice level**



- **Select a proper input coupling capacitor (Cin) value and type**
  - **E.g. Panasonic ECHU/ECPU series**



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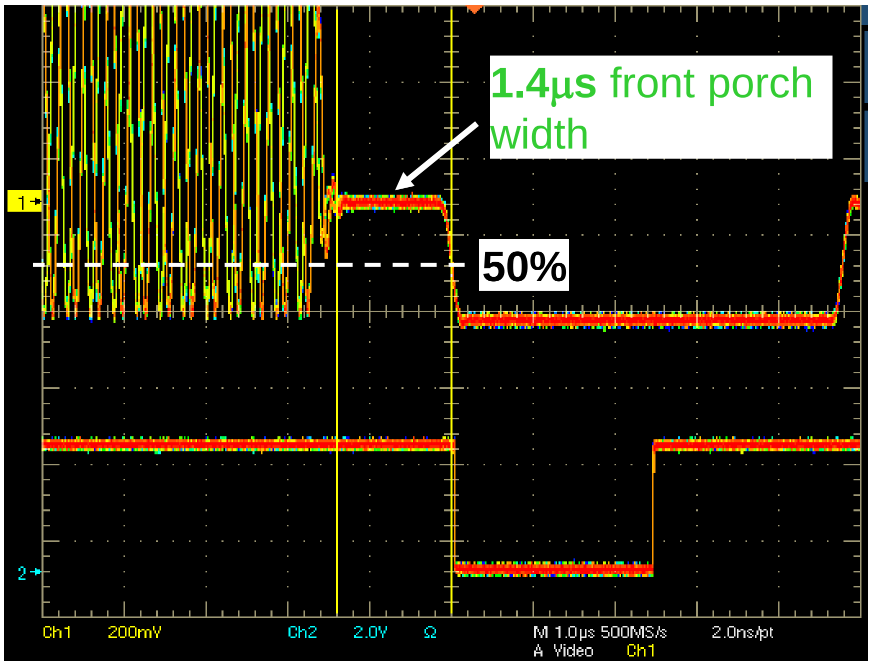
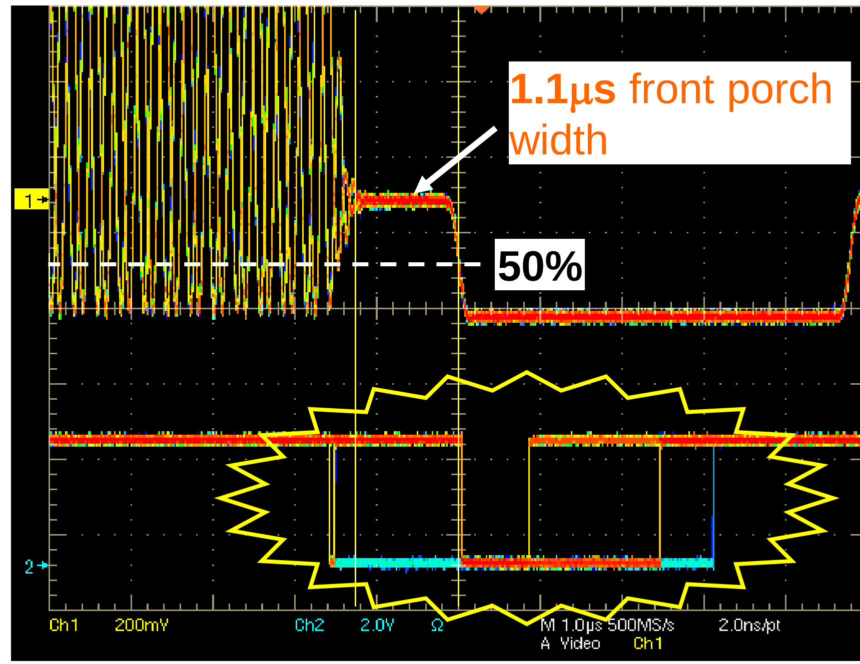
Glitches on Outputs
Due to Improper Sync Slicing on Large Chroma Signal

NTSC 100% Red Field



Normal HSync

NTSC 100% Red Field

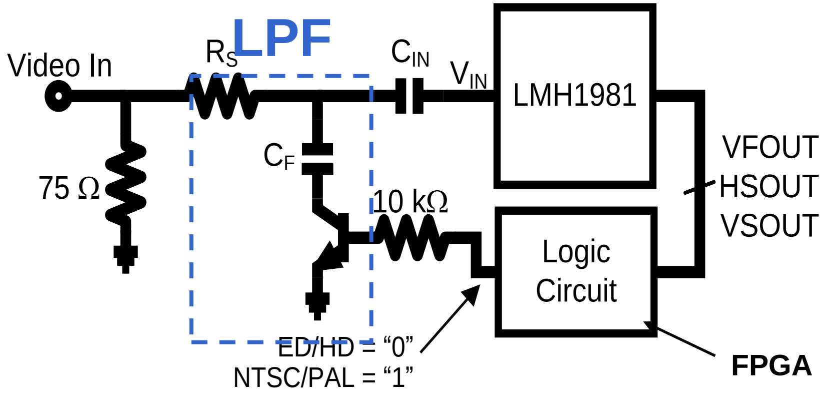


HSync with Glitches

Use a low-pass filter to prevent glitches due to large chroma signal near the sync tip.

Chroma Filter

- **Attenuates large chroma amplitudes and noise**
  - **Prevents Output Glitches!**
- **Switch-controlled LPF**
  - **For ED/HD video inputs, the transistor turns off to disable the LPF**
  - **Logic circuit should latch 3rd MSB* of VFOUT data to hold switch state over field**
  - **Can be implemented in FPGA or discrete logic**



Format	VFOUT[3]*	Filter
NTSC/PAL	1 (high)	ON
ED/HD	0 (low)	OFF

Chroma Filter: Component Values

- Rule of Thumb: Ensure min. chroma level at V_{IN} (pin 4) is above 50% sync level to prevent glitch.
- R_S & C_F determine filter cutoff frequency (f_{CO})
- f_{CO} depend on chroma attenuation needed:
  - Subcarrier Frequency
  - Chroma Level
    - Chroma Amplitude and Luma Component
- Output prop. delay increases as f_{CO} decreases

Chroma Filter: Design Example

- **What values for R_S & C_F ensure no output glitches for this worst-case test signal?**

- **Need $Chroma_{PP} < Sync_{PP}$:**

  $A = 20 \log_{10}(286mV / 857mV)$
  $= -9.6dB$ @ $f_{SC} = 3.58MHz$

- **RC LPF gain equation:**

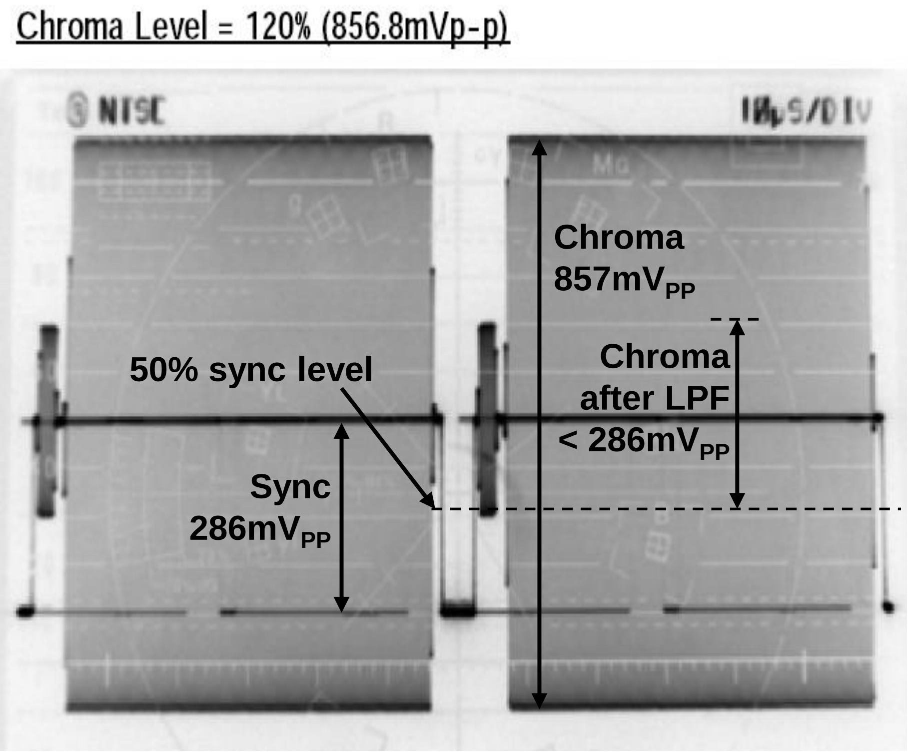
  $A = 20 \log_{10}[\mathrm{sqrt}(1+(f_{SC}/f_{CO})^2)]^{-1}$

- **Solve for f_{CO}:**

  $f_{CO} = 1.26\ MHz = 1 / 2\pi R_S C_F$

- **R_S=240Ω & C_F=560pF give f_{CO}=1.18MHz, or -10dB @ f_{SC}.**

NTSC <u>No Setup</u>
(f_{SC} = 3.58MHz)



C_{IN} Value Selection

- **Depends on Output Coupling Type of Video Source**
- **DC-coupled video source:**
  - **Large value (1 – 4.7 uF) will optimize HSync jitter.**
  - Smaller values will:
    - Reduce start-up time.
    - Offset video-dependent “jitter” due to Source DAC nonlinearity.
    - Increase rejection of Source AC hum.
- **AC-coupled source with $C_{OUT} \geq 220uF$:**
  - **Small value (1 – 31 nF) must be used.**
    - *Otherwise,* missing sync pulses occur w/ APL changes, ie: alternating W-B fields.

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