**MARKING DIAGRAM**

14



14

1
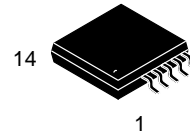
**TSSOP–14**
**TBD SUFFIX**
**CASE 948G**

NCS
2564
ALYW■

■

1

NCS2564 = Specific Device Code
A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week
■ = Pb−Free Package

**PINOUT**

| | | | |
|---|---|---|---|
| CVBS_IN | 1 | 14 | CVBS_OUT |
| CVBS_$\overline{EN}$ | 2 | 13 | GND |
| VCC | 3 | 12 | GND |
| $\overline{SD}$/HD | 4 | 11 | SD/HD_$\overline{EN}$ |
| SD/HD_IN1 | 5 | 10 | SD/HD_OUT1 |
| SD/HD_IN2 | 6 | 9 | SD/HD_OUT2 |
| SD/HD_IN3 | 7 | 8 | SD/HD_OUT3 |

(Top View)

**ORDERING INFORMATION**

| Device | Package | Shipping† |
|---|---|---|
| NCS2564DTBR2G | TSSOP–14 (Pb−Free) | 2500 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.
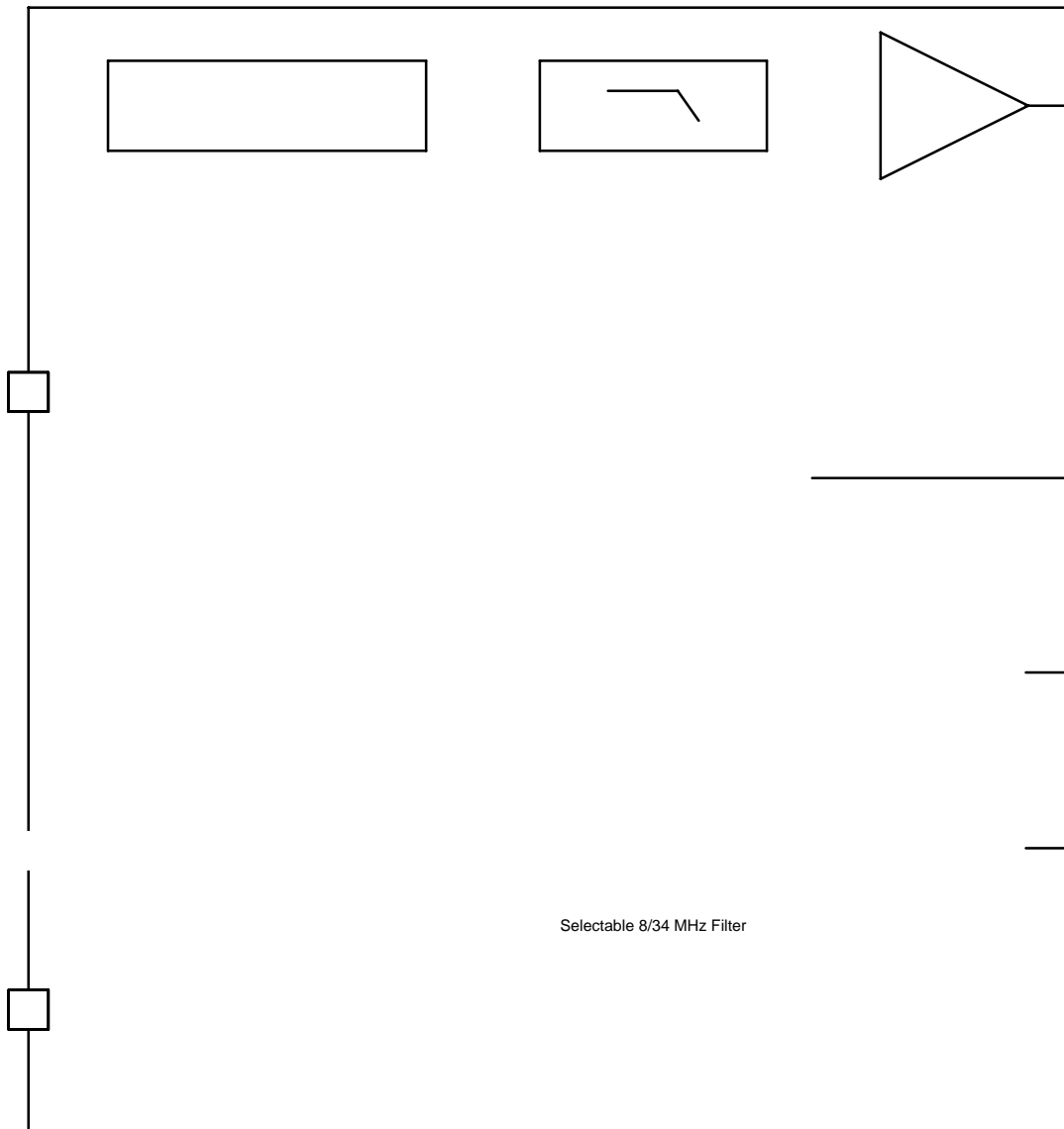
- Internal Fixed Gain: 6 dB ± 0.2
- Integrated Level Shifter
- AC or DC Coupled Inputs and Outputs
- Low Quiescent Current
- Shutdown Current 42 μA Typical (Disabled)
- Each channel Capable to Drive 2 by 150 Ω Loads
- Wide Operating Supply Voltage Range: +4.7 V to +5.3 V
- 8 kV ESD Protection (IEC61000 4 2 Compatible)
- TSSOP 14 Package
- These are Pb Free Devices

**Typical Application**
- Set Top Box Decoder
- DVD Player / Recorder
- HDTV

Selectable 8/34 MHz Filter

# NCS2564

## PIN DESCRIPTION

| Pin No. | Name | Type | Description |
|---|---|---|---|
| 1 | CVBS_IN | Input | Video Input for Video Signal featuring a frequency bandwidth compatible with NTSC / PAL / SECAM Video (8 MHz) – CVBS Channel |
| 2 | CVBS_$\overline{EN}$ | Input | CVBS Channel Enable /Disable Function: Low = Enable, High = Disable. When left open the default state is Enable. |
| 3 | VCC | Power | Power Supply / 4.7 V to 5.3 V |
| 4 | $\overline{SD}$/HD | Input | Pin of selection enabling the Standard Definition or High Definition Filters (8 MHz / 34 MHz) for channels SD/HD – when Low SD filters are selected, when High HD filters are selected. |
| 5 | SD/HD_IN1 | Input | Selectable SD or HD Video Input 1 – SD/HD Channel 1 |
| 6 | SD/HD_IN2 | Input | Selectable SD or HD Video Input 2 – SD/HD Channel 2 |
| 7 | SD/HD_IN3 | Input | Selectable SD or HD Video Input 3 – SD/HD Channel 3 |
| 8 | SD/HD_OUT3 | Output | SD/HD Video Output 3 – SD/HD Channel 3 |
| 9 | SD/HD_OUT2 | Output | SD/HD Video Output 2 – SD/HD Channel 2 |
| 10 | SD/HD_OUT1 | Output | SD/HD Video Output 1 – SD/HD Channel 1 |
| 11 | SD/HD_$\overline{EN}$ | Input | SD/HD Channel Enable/Disable Function: Low = Enable, High = Disable. When left open the default state is Enable. |
| 12 | GND | Ground | Ground |
| 13 | GND | Ground | Ground |
| 14 | CVBS_OUT | Output | CVBS Video Output – CVBS Channel |

**MAXIMUM RATINGS**

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Power Supply Voltages | $V_{CC}$ | $-0.3 \leq V_{CC} \leq 5.5$ | Vdc |
| I/O Voltage Range | $V_{IO}$ | $-0.3 \leq V_I \leq V_{CC}$ | Vdc |
| Input Differential Voltage Range | $V_{ID}$ | $-0.3 \leq V_I \leq V_{CC}$ | Vdc |
| Output Current (Indefinitely) per Channel | $I_O$ | 40 | mA |
| Maximum Junction Temperature (Note 1) | $T_J$ | 150 | |

**DC ELECTRICAL CHARACTERISTICS** ($V_{CC}$ = +5.0 V, $R_{source}$ = 37.5 $\Omega$, $T_A$ = 25°C, inputs AC−coupled with 0.1 $\mu$F, all outputs AC−coupled with 220 $\mu$F into 150 $\Omega$ referenced to 400 kHz; unless otherwise specified)

| Symbol | Characteristics | Conditions | Min | Typ | Max | Unit |
|--------|----------------|------------|-----|-----|-----|------|
| **POWER SUPPLY** | | | | | | |
| $V_{CC}$ | Supply Voltage Range | | 4.7 | 5.0 | 5.3 | V |
| $I_{CC}$ | Supply Current | SD Channels Selected + $C_{vbs}$<br>HD Channels Selected + $C_{vbs}$ | | 40<br>50 | 55<br>70 | mA |
| $I_{SD}$ | Shutdown Current (CVBS_$\overline{EN}$ and SD/H | | | | | |

**AC ELECTRICAL CHARACTERISTICS FOR HIGH DEFINITION CHANNELS** (pin numbers (5, 10) (6, 9), (7, 8))

($V_{CC}$ = +5.0 V, $V_{in}$ = 1 $V_{PP}$, $R_{source}$ = 37.5 Ω, $T_A$ = 25°C, inputs AC–coupled with 0.1 μF, all outputs AC–coupled with 220 μF into 150 Ω referenced to 400 kHz; unless otherwise specified, $\overline{SD}$/HD = High)

| Symbol | Characteristics | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $A_{VHD}$ | Voltage Gain | $V_{in}$ = 1 V – All HD Channels | 5.8 | 6.0 | 6.2 | dB |
| $BW_{HD}$ | Low Pass Filter Bandwidth | −1 dB (Note 6)<br>−3 dB (Note 7) | 26<br>30 | 31<br>34 | | MHz |
| $A_{RHD}$ | | MdB (Note 7)MdB (Not6 7) | | | | dB |

# NCS2564

## TYPICAL CHARACTERISTICS

$V_{CC}$ = +5.0 V, $V_{in}$ = 1 $V_{PP}$, $R_{source}$ = 37.5 $\Omega$, $T_A$ = 25°C, Inputs AC–coupled with 0.1 $\mu$F, All Outputs AC–coupled with 220 $\mu$F into 150 $\Omega$
Referenced to 400 kHz; unless otherwise specified



−1 dB @ 6.7 MHz
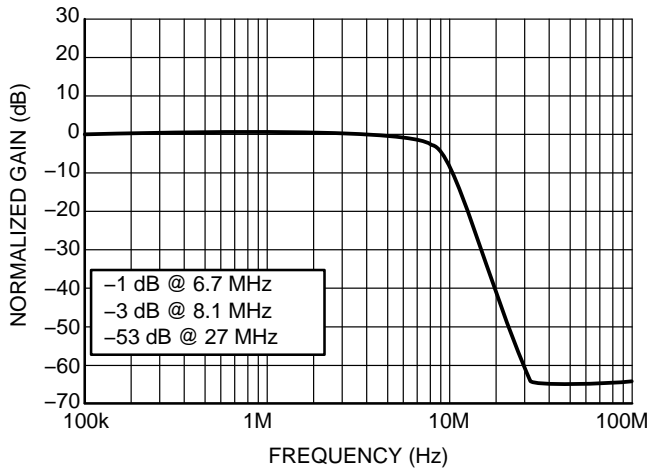−3 dB @ 8.1 MHz
−53 dB @ 27 MHz

**Figure 3. SD Normalized Frequency Response**



−1 dB @ 31 MHz
−3 dB @ 33 MHz
−16 dB @ 44.25 MHz
−37 dB @ 74.25 MHz

**Figure 4. HD Normalized Frequency Response**



0.226 dB @ 3.6 MHz

**Figure 5. SD Passband Flatness**

# NCS2564

## TYPICAL CHARACTERISTICS

$V_{CC}$ = +5.0 V, $V_{in}$ = 1 $V_{PP}$, $R_{source}$ = 37.5 $\Omega$, $T_A$ = 25°C, Inputs AC−coupled with 0.1 µF, All Outputs AC−coupled with 220 µF into 150 $\Omega$
Referenced to 400 kHz; unless otherwise specified



**Figure 18. SD Frequency Response and Group Delay**
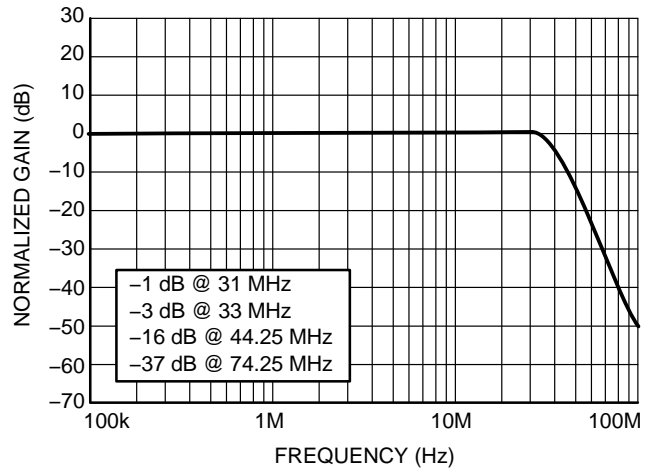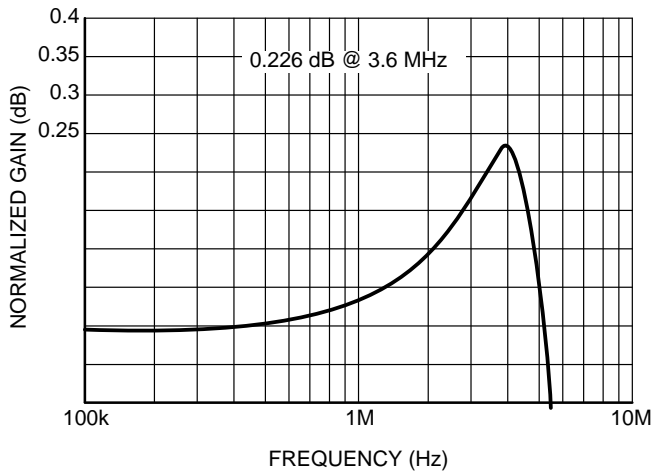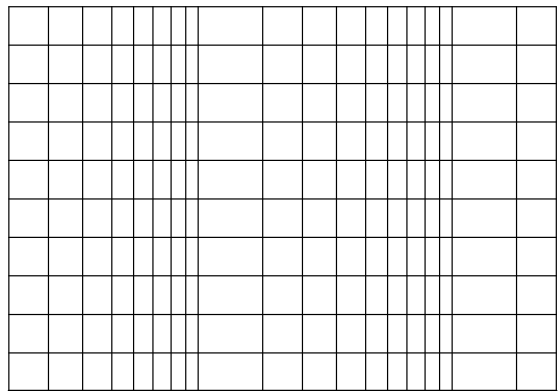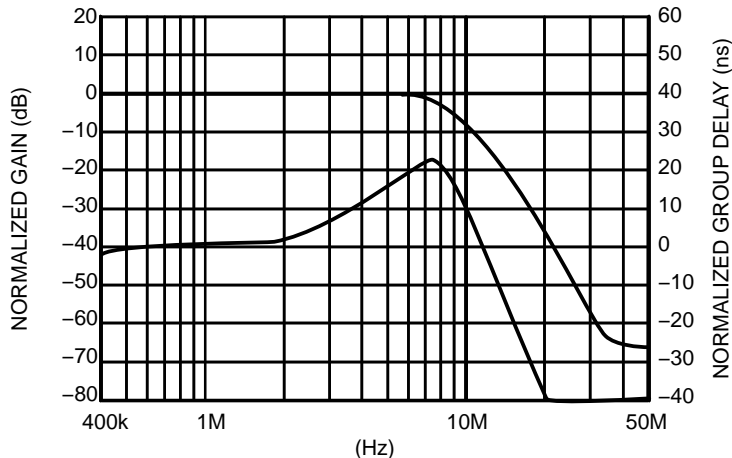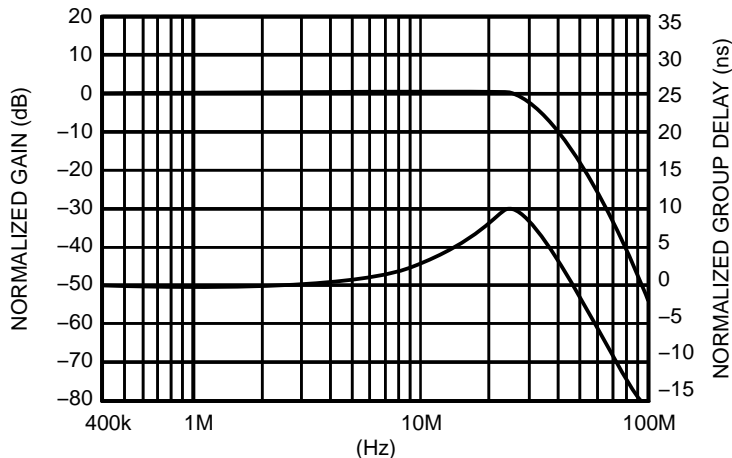


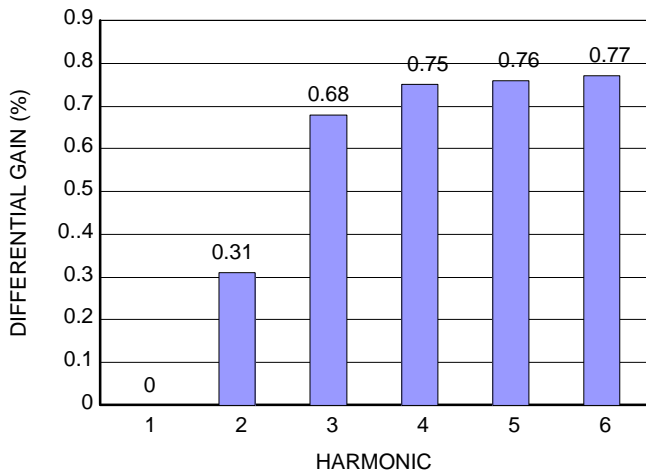**Figure 19. HD Frequency Response and Group Delay**
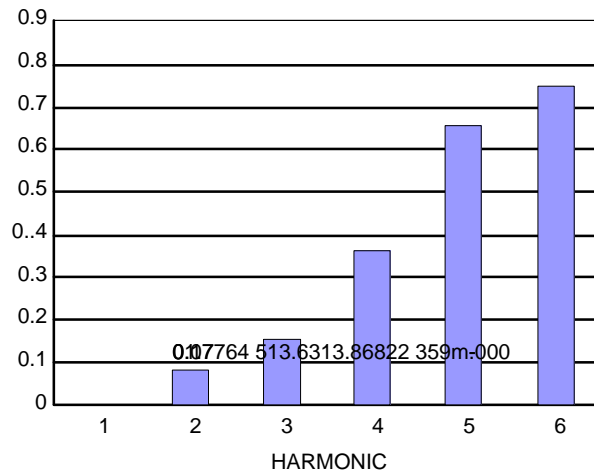


**Figure 20. SD Differential Gain**



**Figure 21. SD Differential Phase**
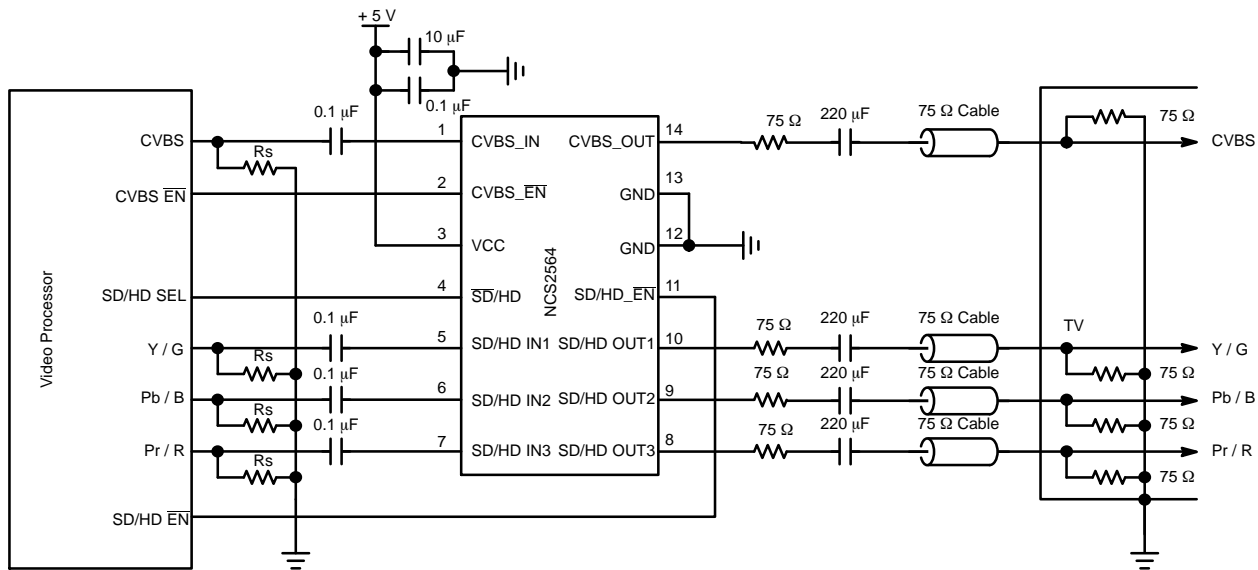
## APPLICATIONS INFORMATION

The NCS2564 quad video driver has been optimized for Standard and High Definition video applications covering the requirements of the standards Composite video (CVBS), S Video, Component Video (480i/525i, 576i/625i, 720p/1080i) and related (RGB). The three SD/HD channels have selectable filters (8 MHz and 34 MHz) for covering either standard definition like video applications or High Definition video applications. These frequencies are selectable using the pin $\overline{SD}$/HD.

In the regular mode of operation each channel provides an internal voltage to voltage gain of 2 from input to output. This effectively reduces the number of external components

required as compared to discrete approached implemented with stand alone op amps. An internal level shifter is employed shifting up the output voltage by adding an offset of 200 mV. This prevents sync pulse clipping and allows DC coupled output to the 150 Ω video load. In addition, the NCS2564 integrates a 6th order Butterworth filter for each. This allows rejection of the aliases or unwanted over-sampling effects produced by the video DAC. Similarly for the case of DVD recorders which use an ADC, this anti aliasing filter (reconstruction filter) will avoid picture quality issue and will aide filtration of parasitic signals caused by EMI interference.



**Figure 22. AC–Coupled Configuration at the Input and Output**

A built in diode like clamp is used into the chip for each channel to support the AC coupled mode of operation. The clamp is active when the input signal goes below 0 V.

The built in clamp and level shifter allow the device to operate in different configuration modes depending on the DAC output signal level and the input common mode voltage of the video driver. When the configuration is DC Coupled at the Inputs and Outputs the 0.1 μF and 220 μF coupling capacitors are no longer used, and the clamps are in that case inactive; this configuration provides a low cost solution which can be implemented with few external components (Figure 23).

The input is AC coupled when either the input signal amplitude goes over the range 0 V to 1.4 V or the video source requires such a coupling. In some circumstances it may be necessary to auto bias signals with the addition of a pullup and pulldown resistors or only pullup resistor (Typical 7.5 MΩ

# NCS2564

| | | |
|---|---|---|
| 1 | CVBS_IN | CVBS_OUT | 14 |
| 2 | | GND | 13 |
| 3 | VCC | GND | 12 |
| 4 | $\overline{SD}$/HD | SD/HD_$\overline{EN}$ | 11 |
| 5 | | | 10 |
| 6 | | | 9 |
| 7 | | | 8 |

# NCS2564

**Video Driving Capability**

With an output current capability of 40 mA the NCS2564 was designed to be able to drive at least 2 video display loads in parallel. This type of application is illustrated Figure 24. Figure 26 (multiburst) and Figure 27 (linearity) show that the video signal can efficiently drive a 75 Ω equivalent load and not degrade the video performance.

**ESD Protection**

All the device pins are protected against electrostatic discharge at a level of 4 kV HBM and 8 kV according to IEC61000 4 2. This feature has been considered with a particular attention with ESD structure able to sustain the typical values requested by the systems like Set Top Boxes or Blue Ray players. This parameter is particularly important for video driver which usually constitutes the last