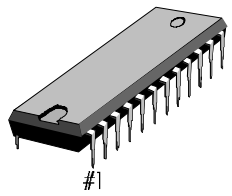
## WIDE BAND ANALOG SWITCH

The device has internal switches for switching between wideband R/G/B signals and H/V Sync. also, has an internal Sync. Seperator.

24-SDIP-300




## INTRODUCTION

- Video Input Switch for High-End Color Monitor
- 5V Power Supply Voltage Operating Condition
- WideBand R/G/B Video Switch (~300 MHz)
- 0.7Vpp R/G/B Video Input (typ.)
- TTL H/V Sync. Input
- Schmitt-Trigger Input Design for H/V Sync.
- Sync. Separator for SOG (Sync On Green) Input
- 24-SDIP-300 Package

## FEATURES

- Total Current: 27 mA
- f-3dB Band Width: 300 MHz
- R/G/B Voltage Gain: -1.0 dB
- R/G/B Maximum Output Level: 2.4 Vpp
- Channel Crosstalk 10 MHz: -40 dB
- Channel Crosstalk 100 MHz: -30 dB
- Input Crosstalk 10MHz: -40 dB
- Input Crosstalk 100MHz: -30 dB

## ORDERING INFORMATION

| Device | Package | Operating Temperature |
|---|---|---|
| KA2507 | 24-SDIP-300 | -25 °C ~ +75 °C |

## BLOCK DIAGRAM

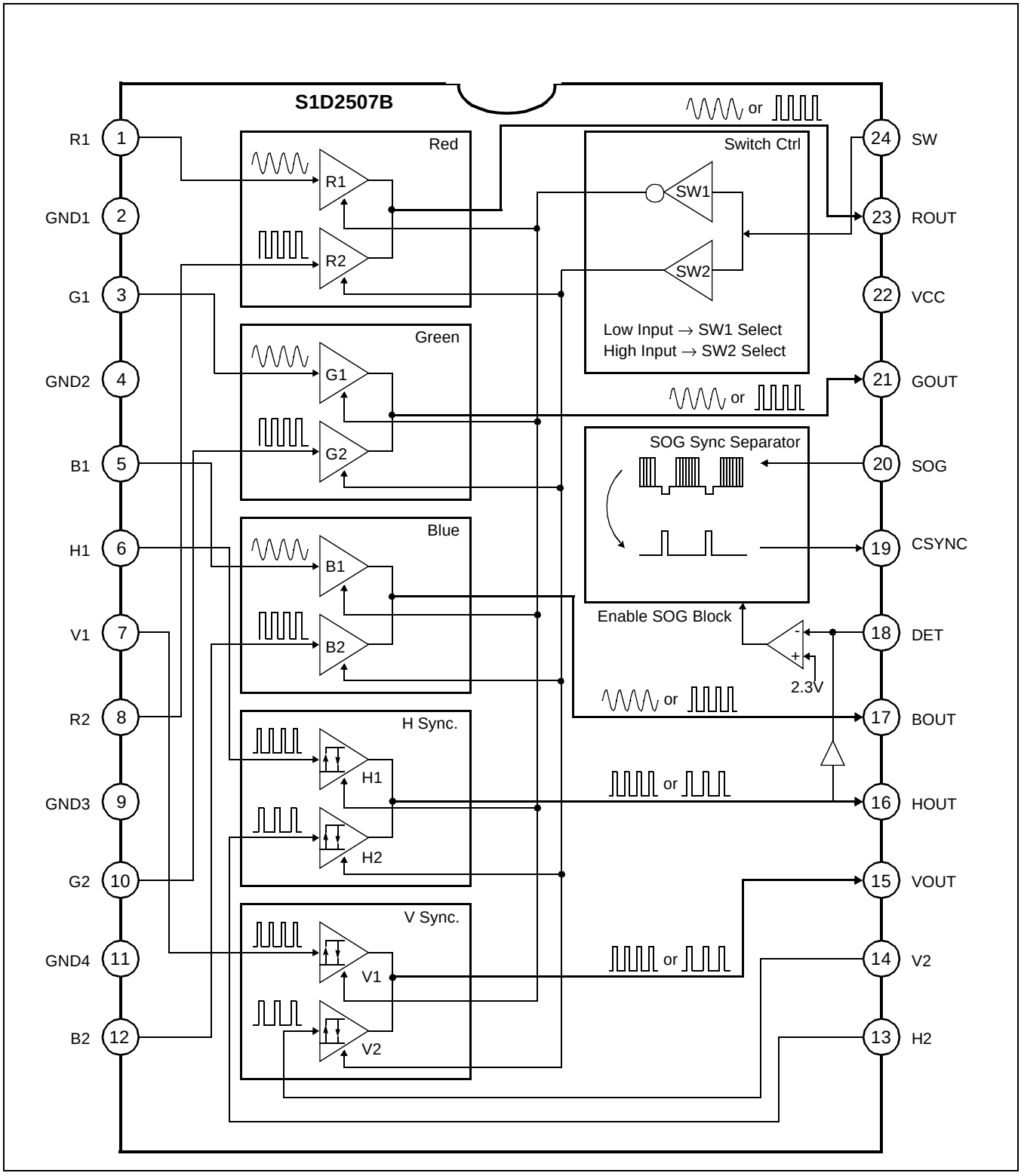



**Figure 1. Block Diagram**

## PIN CONFIGURATIONS

**Table 1. Pin Configurations**

| Pin No | Symbol | I/O | Configurations |
|---|---|---|---|
| 1 | R1 | I | Red 1 Input |
| 2 | GND1 | - | Ground 1 (Red) |
| 3 | G1 | I | Green 1 Input |
| 4 | GND2 | - | Ground 2 (Green) |
| 5 | B1 | I | Blue 1 Input |
| 6 | H1 | I | Horizontal Sync. 1 Input |
| 7 | V1 | I | Vertical Sync. 1 Input |
| 8 | R2 | I | Red 2 Input |
| 9 | GND3 | - | Ground 3 (Blue) |
| 10 | G2 | I | Green 2 Input |
| 11 | GND4 | - | Ground 4 (HV, SOG, SW) |
| 12 | B2 | I | Blue 2 Input |
| 13 | H2 | I | Horizontal Sync. 2 Input |
| 14 | V2 | I | Vertical Sync. 2 Input |
| 15 | VOUT | O | Vertical Sync. Output |
| 16 | HOUT | O | Horizontal Sync. Output |
| 17 | BOUT | O | Blue Output |
| 18 | DET | - | Horizontal Sync. Detection & SOG Mute Cap |
| 19 | CSYNC | O | Composite Sync. Output |
| 20 | SOG | I | SOG Input |
| 21 | GOUT | O | Green Output |
| 22 | $V_{CC}$ | - | Power Supply |
| 23 | ROUT | O | Red Output |
| 24 | SW | I | Input 1, 2 Select Switch |

## PIN DESCRIPTION

**Table 2. Pin Description**

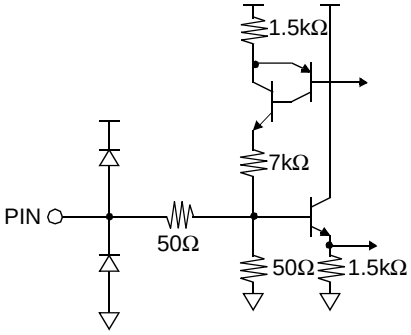
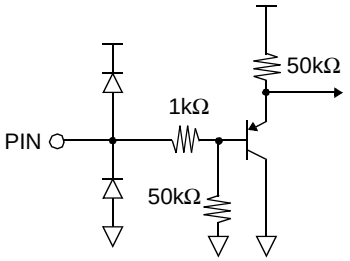
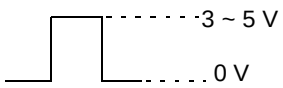
| Pin No | Pin Name | Schematic | Description |
|---|---|---|---|
| 1<br>3<br>5<br>8<br>10<br>12 | R1<br>G1<br>B1<br>R2<br>G2<br>B2 |  | Video Input<br>• max. Level = 2.4 $V_{PP}$<br>• f-3dB = 300 MHz |
| 2 | GND1 | - | Red Block Ground |
| 4 | GND2 | - | Green Block Ground |
| 9 | GND3 | - | Blue Block Ground |
| 11 | GND4 | - | HV, SOG, SW Block Ground |
| 6<br>7<br>13<br>14 | H1<br>V1<br>H2<br>V2 |  | Horizontal/Vertical Sync Input<br>• TTL Level<br> |

**Table 2. Pin Description (Continued)**

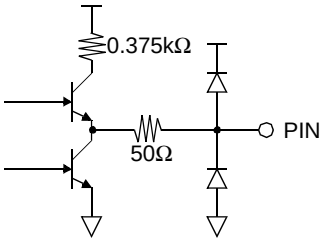
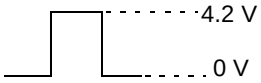
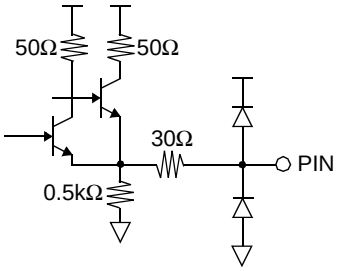
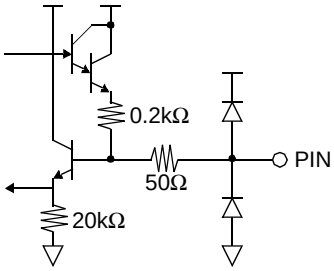
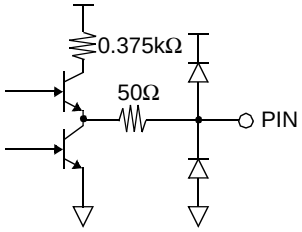
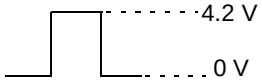
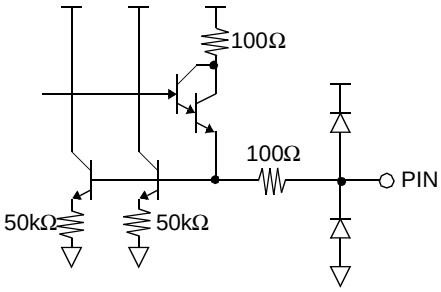
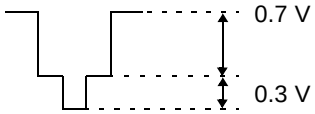
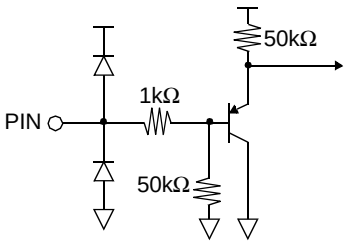
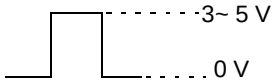
| Pin No | Pin Name | Schematic | Description |
|---|---|---|---|
| 15<br>16 | VOUT<br>HOUT |  | Horizontal/Vertical Sync Output<br>• TTL Level<br> |
| 17<br>21<br>23 | BOUT<br>GOUT<br>ROUT |  | Video Output<br>• Max. Level = 2.4 Vpp |
| 18 | DET |  | H Sync Detection → SOG Mute<br>• CSYNC Mutable Cap Voltage<br>= 2.3 V ↑ |

**Table 2. Pin Description (Continued)**

| Pin No | Pin Name | Schematic | Description |
|---|---|---|---|
| 19 | CSYNC |  | Composite Sync Output<br>Separated from SOG<br>• TTL Level<br> |
| 20 | SOG |  | Sync on Green Input<br>• Video + Sync = 1 $V_{PP}$<br> |
| 22 | $V_{CC}$ | - | Power Supply |
| 24 | SW |  | Switch Input<br>• TTL Level Input<br><br>• Low → Input1 Select<br>High → Input2 Select |

## ABSOLUTE MAXIMUM RATINGS

(Ta = 25 °C) (1)

**Table 3. Absolute Maximum Ratings**

| No | Item | Symbol | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| 1 | Maximum Supply Voltage | Vccmax | - | - | 7 | V |
| 2 | Operating Temperature (2) | Topr | -25 | - | 75 | °C |
| 3 | Storage Temperature | Tstg | -65 | - | 150 | °C |
| 4 | Operating Supply Voltage | Vccop | 4.5 | 5.0 | 5.5 | V (3) |
| 5 | Maximum Power Dissipation | Pdmax | - | - | 0.42 | W |

## THERMAL & ESD PARAMETER

**Table 4. Thermal & ESD Parameter**

| No | Item | Symbol | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| 1 | Thermal Resistance (Junction-ambient) | θja | - | 83 | - | °C/W |
| 2 | Junction Temperature | Tj | - | 110 | - | °C |
| 3 | Human Body Model (C = 100 p, R = 1.5 k) | HBM | ±2 | - | - | KV |
| 4 | Machine Model (C = 200 p, R = 0) | MM | ±300 | - | - | V |
| 5 | Charge Device Model | CDM | ±800 | - | - | V |

## ELECTRICAL CHARACTERISTICS

### SWITCH CONTROL ELECTRICAL CHARACTERISTICS

Ta = 25 °C, $V_{CC}$ = 5 V; Unless Otherwise Stated

**Table 5. Switch Control Electrical Characteristics**

| Parameter | Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Supply Current | V24 = 0, 5V | ICC | 15 | 27 | 35 | mA |
| Maximum Supply Current | V22 = 7V, V24 = 0, 5V | ICCmax | 30 | 45 | 60 | mA |
| Switch Low Input Voltage | V24 = 2V → OV<br>V6. 7 = 5V, V13. 14 = 0V | VL24 | 1.2 | 1.7 | - | V |
| Switch High Input Voltage | V24 = 0V → 2V<br>V6. 7 = 5V, V13. 14 = 0V | VH24 | - | 1.5 | 1.8 | V |
| Switch Low Input Current | V24 = 0V | IL24 | -5.0 | -1.0 | - | µA |
| Switch High Input Current | V24 = 5V | IH24 | 80 | 100 | 120 | µA |

### RGB VIDEO SWITCH ELECTRICAL CHARACTERISTICS

Ta = 25 °C, VCC = 5 V; Unless Otherwise Stated

**Table 6. RGB Video Switch Electrical Characteristics**

| Parameter | Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Input Voltage<br>(RGB Input Pin DC) | V24 = 0, 5V | Vi | 3.2 | 3.5 | 3.8 | V |
| Output Voltage<br>(RGB Output Pin DC) | V24 = 0, 5V | Vo | 1.4 | 1.9 | 2.4 | V |
| Voltage Gain | V24 = 0V, V1. 3. 5 = S1(1 MHz)<br>V24 = 5 V, V8. 10. 12 = S1(1 MHz) | Av | -1.0 | -0.5 | - | dB |
| Voltage Gain Difference | V24 = 0V, V1. 3. 5 = S1(1 MHz)<br>V24 = 5V, V8. 10. 12 = S1(1 MHz) | ΔAv | -0.2 | - | 0.2 | dB |
| Voltage Gain 100 MHz | V24 = 0V, V1. 3. 5 = S2 (100 MHz)<br>V24 = 5V, V8. 10. 12 = S2 (100 MHz) | Av' | -2.0 | -1.0 | - | dB |
| Voltage Gain Difference<br>100 MHz | V24 = 0V, V1. 3. 5 = S2 (100 MHz)<br>V24 = 5V, V8. 10. 12 = S2 (100 MHz) | ΔAv' | -0.2 | - | 0.2 | dB |
| f - 3dB Bandwidth | V24 = 0V, V1. 3. 5 = S2<br>V24 = 5V, V8. 10. 12 = S2 | f - 3dB | 300 | 350 | - | MHz |
| input crosstalk 10 MHz | V24 = 0V, V8. 10. 12 = S2 (10 MHz)<br>V24 = 5V, V1. 3. 5 = S2 (10 MHz) | CT1 | - | -50 | -40 | dB |
| Input Crosstalk 100 MHz | V24 = 0V, V8. 10. 12 = S2 (100 MHz)<br>V24 = 5V, V1. 3. 5 = S2 (100 MHz) | CT1' | - | -40 | -30 | dB |

**Table 6. RGB Video Switch Electrical Characteristics (Continued)**

| Parameter | Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Channel Crosstalk 10 MHz | V24 = 0V, V3 = S2 (10 MHz)<br>V24 = 5 V, V10 = S2 (10 MHz) | CTC | - | -50 | -40 | dB |
| Channel Crosstalk 100 MHz | V24 = 0V, V3 = S2 (100 MHz)<br>V24 = 5V, V10 = S2 (100 MHz) | CTC' | - | -40 | -30 | dB |
| Rise Time | V24 = 0V, V1. 3. 5 = S3<br>V24 = 5 V, V8. 10. 12 = S3 | Tr | - | 1.0 | 1.2 | nS |
| Fall Time | V24 = 0V, V1. 3. 5 = S3<br>V24 = 5V, V8. 10. 12 = S3 | Tf | - | 1.0 | 1.2 | nS |

## HV SYNC SWITCH ELECTRICAL CHARACTERISTICS

Ta = 25 °C, $V_{CC}$ = 5V; Unless Otherwise Stated

**Table 7. HV Sync Switch Electrical Characteristics**

| Parameter | Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Low Output Voltage<br>(HV Output Pin DC) | V24 = 0V, V6. 7 = 0V<br>V24 = 5 V, V13. 14 = 0V | VL | - | 0.1 | 0.2 | V |
| High Output Voltage<br>(HV Output Pin DC) | V24 = 0V, V6. 7 = 5V<br>V24 = 5V, V13. 14 = 5V | VH | 3.9 | 4.2 | - | V |
| Low Input Voltage<br>(HV Input Pin DC) | V24 = 0V, V6. 7 = 3V $\rightarrow$ 0V<br>V24 = 5V, V13. 14 = 3V $\rightarrow$ 0V | ViL | 1.2 | 1.5 | 1.8 | V |
| High Input Voltage<br>(HV Input Pin DC) | V24 = 0V, V6. 7 = 0V $\rightarrow$ 3V<br>V24 = 5V, V13. 14 = 0V $\rightarrow$ 3V | ViH | 2.2 | 2.5 | 2.8 | V |
| Low Input Current | V24 = 0V, V6. 7 = 0V<br>V24 = 5V, V13. 14 = 0V | IL | -5.0 | -1.0 | - | uA |
| High Input Current | V24 = 0V, V6. 7 = 5V<br>V24 = 5V, V13. 14 = 5V | IH | 80 | 100 | 120 | uA |
| Rise Time | V24 = 0V, V6. 7 = S4<br>V24 = 5V, V13. 14 = S4 | Tr | - | 20 | 40 | nS |
| Fall Time | V24 = 0V, V6. 7 = S4<br>V24 = 5V, V13. 14 = S4 | Tf | - | 10 | 20 | nS |
| Rise Delay Time | V24 = 0V, V6. 7 = S4<br>V24 = 5V, V13. 14 = S4 | Trd | - | 50 | 80 | nS |
| Fall Delay Time | V24 = 0V, V6. 7 = S4<br>V24 = 5V, V13. 14 = S4 | Tfd | - | 30 | 50 | nS |

## SOG SYNC SEPARATOR ELECTRICAL CHARACTERISTICS

Ta = 25 °C, $V_{CC}$ = 5 V; Unless Otherwis Stated

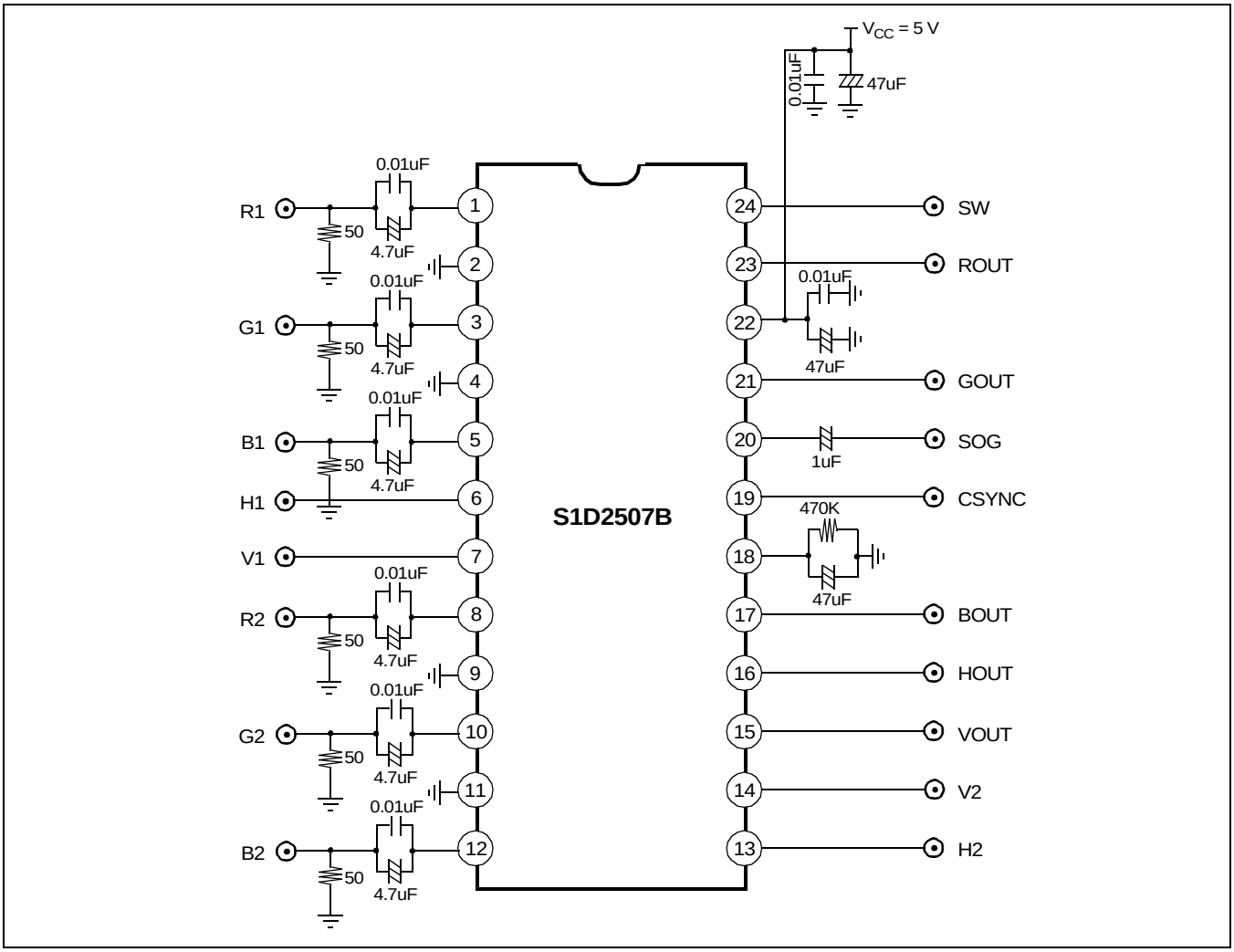
**Table 8. SOG Sync Separator Electrical Characteristics**

| Parameter | Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| SOG Low Output Voltage | V20 = S5 (30 kHz, Pw = 3μS) | VL19 | - | 0.1 | 0.2 | V |
| SOG High Output Voltage | V20 = S5 (30 kHz, Pw = 3μS) | VH19 | 3.9 | 4.2 | - | V |
| SOG Rise Time | V20 = S5 (30 kHz, Pw = 3μS) | Tr_sog | - | 20 | 40 | nS |
| SOG Fall Time | V20 = S5 (30 kHz, Pw = 3μS) | Tf_sog | - | 10 | 20 | nS |
| SOG Rise Delay Time | V20 = S5 (30 kHz, Pw = 3μS) | Trd_sog | - | 70 | 100 | nS |
| SOG Fall Delay Time | V20 = S5 (30 kHz, Pw = 3μS) | Tfd_sog | - | 50 | 80 | nS |
| SOG Min Pulse Width 1 (f = 20 kHz, Video Black) | V20 = S5 (20 kHz, 150mV, Pw = 2μS → 0μS ) | PWmin 1 | - | 0.5 | 2.5 | uS |
| SOG Min Pulse Width 2 (f = 200 kHz, Video Black) | V20 = S5 (200 kHz, 150mV, Pw = 0.2μS → 0μS ) | PWmin 2 | - | 0.05 | 0.25 | uS |
| SOG Min Pulse Width 1' (f = 20 kHz, Video White) | V20 = S6 (20 kHz, Sync = 150mV, Pw = 2μS → 0μS ) | PWmin 1' | - | 0.5 | 2.5 | uS |
| SOG Min Pulse Width 2' (f = 200 kHz, Video White) | V20 = S6 (200 kHz, Sync = 150mV, Pw = 0.2μS → 0μS ) | PWmin 2' | - | 0.05 | 0.25 | uS |
| SOG Min Separatable Level 1 (f = 20 kHz, Video Black) | V20 = S5 (20 kHz, Pw = 2μS, Sync = 0.3V → 0V) | VSmin 1 | - | 50 | 100 | mV |
| SOG Min Separatable Level 2 (f = 200 kHz, Video Black) | V20 = S5 (200 kHz, Pw = 0.2μS, Sync = 0.3V → 0V) | VSmin 2 | - | 50 | 100 | mV |
| SOG Min Separatable Level 1' (f = 20 kHz, Video White) | V20 = S6 (20 kHz, Pw = 2μS, Sync = 0.3V → 0V) | VSmin 1' | - | 50 | 100 | mV |
| SOG Min Separatable Level 2' (f = 200 kHz, Video White) | V20 = S6 (200 kHz, Pw = 0.2μS, Sync = 0.3V → 0V) | VSmin 2' | - | 50 | 100 | mV |

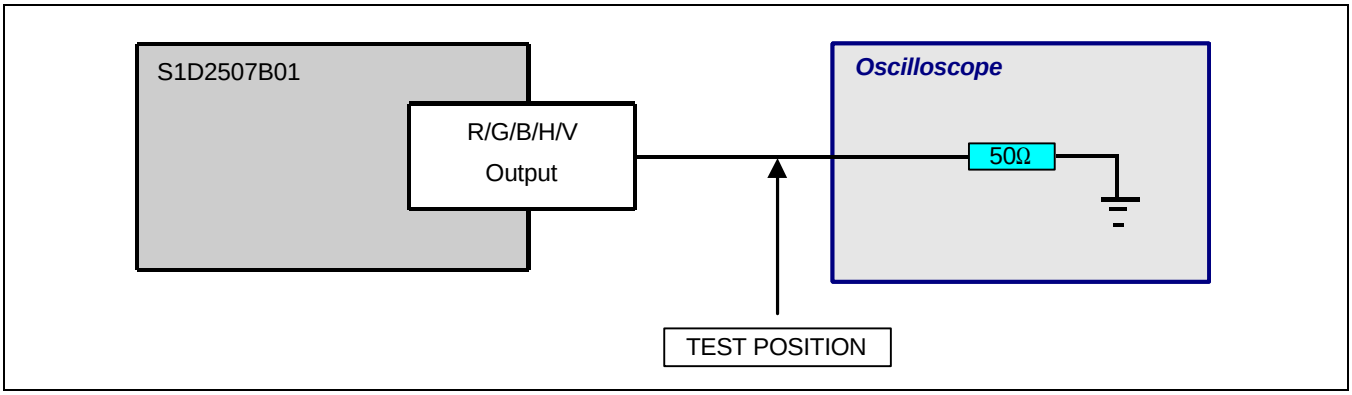
**NOTES:**

1. Absolute Maximum Rating Indicates limit beyond which damage to the device may occur.
2. Operating Ratings indicate conditions for which the device is functional but do not guarantee specific performance limits. For guaranteed specifications and test conditions, See the Electrical Characteristics. The guaranteed specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.
3. $V_{CC}$ supply pin22 must be externally wired to gether to prevent internal damage during $V_{CC}$ power on/off cycles.

## TEST CIRCUIT

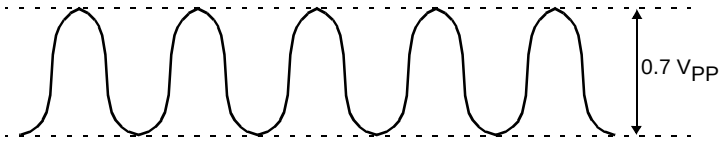
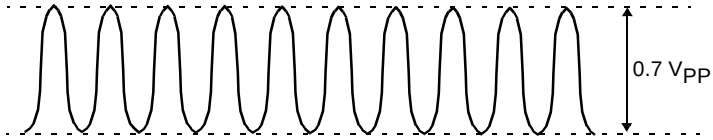
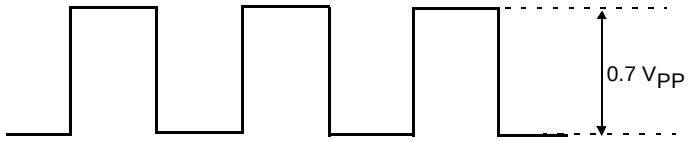
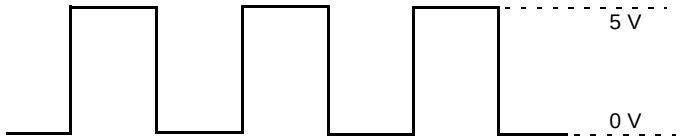
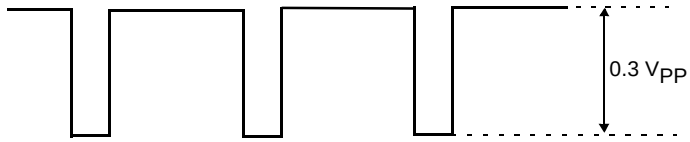
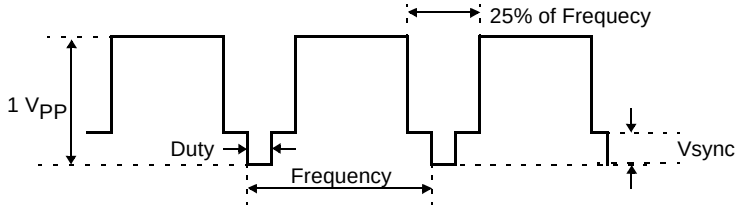



## TEST METHODS



## TEST SIGNAL FORMAT

**Table 9. Test Signal Format**

| SG No. | Input Signals | |
|---|---|---|
| S1 | Sine Wave<br><br>Frequency = 1 MHz<br>Amplitude = 0.7 $V_{PP}$, Var. |  |
| S2 | Sine Wave<br><br>Frequency = Var.<br>Amplitude = 0.7 $V_{PP}$ |  |
| S3 | Square Wave<br><br>Frequency = 200 kHz<br>Amplitude = 0.7 $V_{PP}$<br>Duty = 50% |  |
| S4 | Square Wave<br><br>Frequency = 200 kHz<br>Low/High Level = 0V/5V<br>Duty = 50% |  |
| S5 | Pulse<br><br>Frequency = Var.<br>Duty = Var.<br>Vsync = Var. |  |
| S6 | Sync on Green<br><br>Frequency = Var.<br>Duty = Var.<br>Vsync = Var. |  |



SAMSUNG ELECTRONICS

## APPLICATION BOARD CIRCUIT

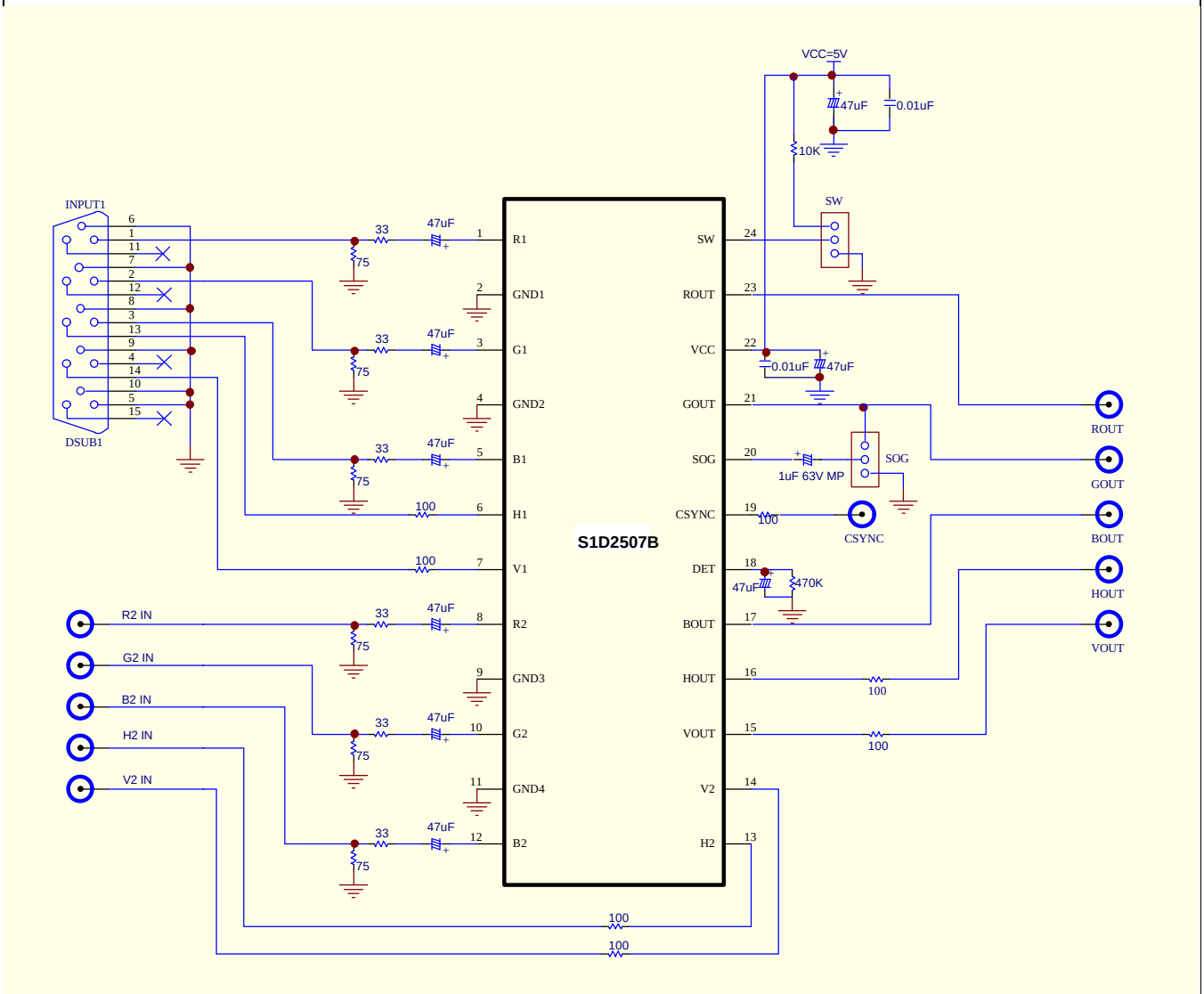



**Figure 2. Application Board Circuit**

## TYPICAL APPLICATION CIRCUIT

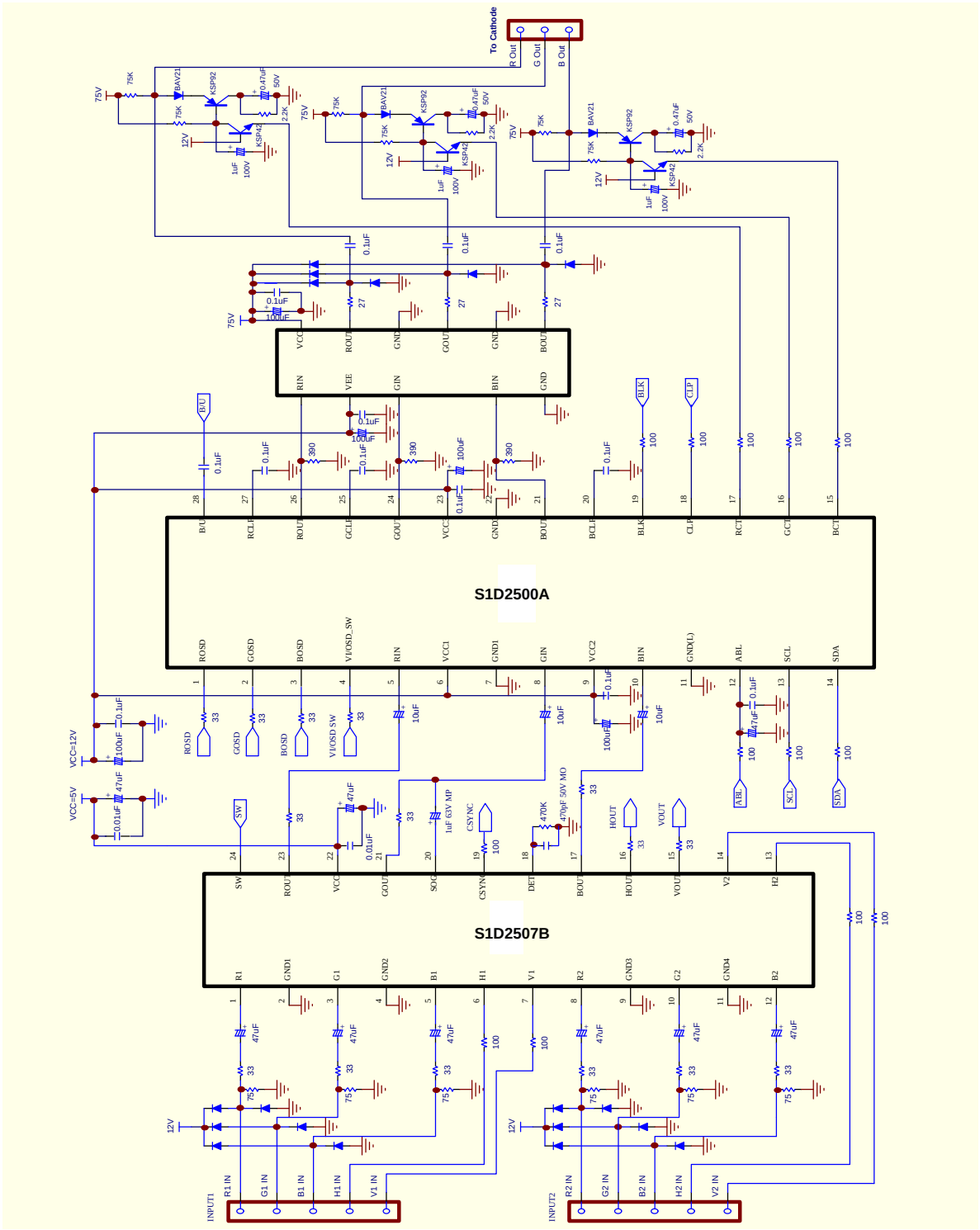



**Figure 3. Typical Application circuit**



SAMSUNG ELECTRONICS