

SECAM Decoder

Description

The U4935B is an SECAM decoder designed for use with the PAL/NTSC TV baseband processor U4930B and the baseband delay line U3665M.

The circuit includes a bell filter, a demodulator and an identification circuit. A signal with stable reference frequency for calibration and a three-level sandcastle pulse

for blanking and burst gating are required.

The IC is realized in a bipolar VLSI technology and operates with +8 V supply voltage. Easy interfacing and few external components support the design of a multistandard TV.

Features

- Fully integrated and auto-tuned filters
- Minimum number of external components
- Easy interfacing with the TV baseband processor and the switched capacitor baseband delay line

Package

16-pin dual in-line plastic (DIP16)

Block Diagram

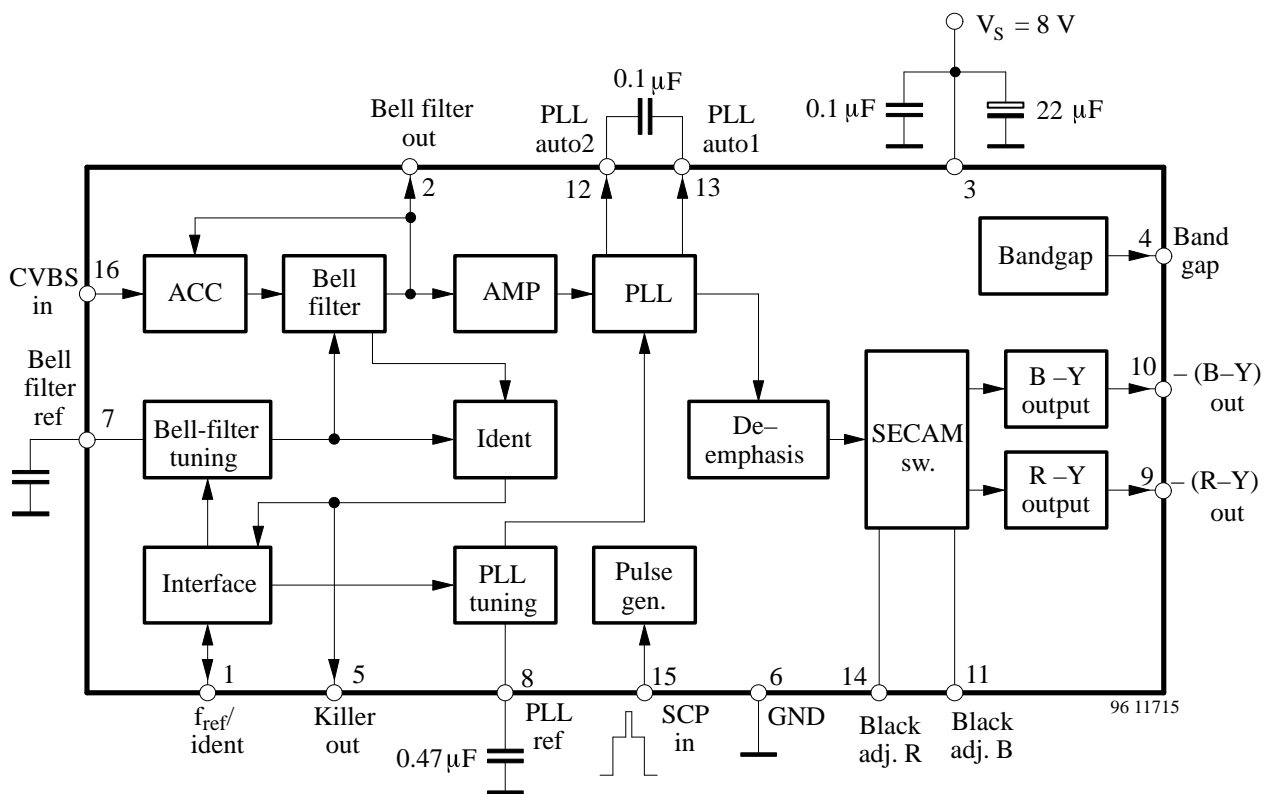


Figure 1. Block diagram

Ordering Information

| Extended Type Number | Package | Remarks |
|----------------------|---------|---------|
| U4935B-ADP | DIP16 | |

Pin Description

| Pin | Symbol | Function |
|-----|------------------|--|
| 1 | $f_{ref}/ident$ | $f_{ref}/ident$ |
| 2 | Bell out | Bell-filter output |
| 3 | V_S | 8-V supply voltage |
| 4 | Band gap | Band-gap reference voltage |
| 5 | Killer out | SECAM killer output |
| 6 | GND | Ground |
| 7 | $Bell_{ref}$ | Bell-filter reference – voltage output |
| 8 | PLLref | PLL reference |
| 9 | –(R–Y) | –(R–Y) output |
| 10 | –(B–Y) | –(B–Y) output |
| 11 | Black adj. B | Black level adjust B - channel |
| 12 | PLL ₁ | PLL auto 2 |
| 13 | PLL ₂ | PLL auto 1 |
| 14 | Black adj. R | Black-level adjust R - channel |
| 15 | SCP | Sandcastle pulse input |
| 16 | CVBS | CVBS input |

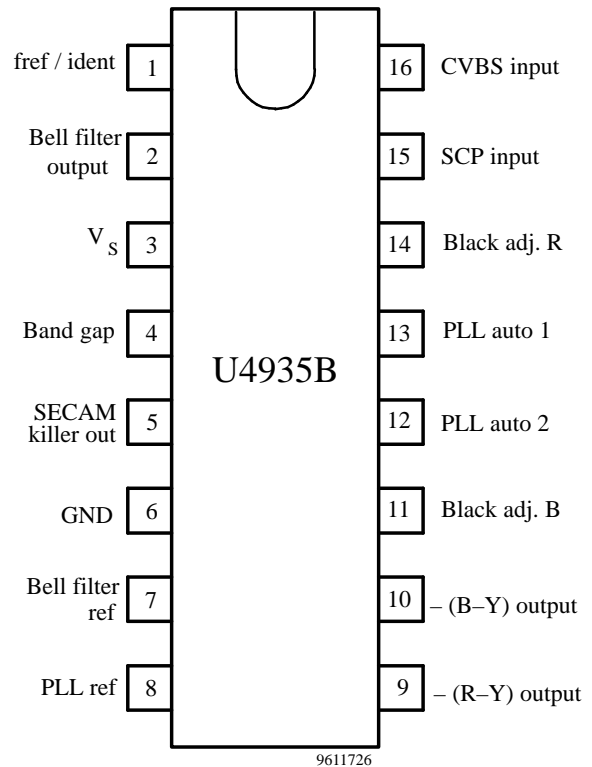


Figure 2. Connection diagram

Absolute Maximum Ratings

$V_S = 8\text{ V}$, $T_{amb} = 25^\circ\text{C}$, reference point Pin 6, unless otherwise specified
 Test conditions: $V_{pin\ 1} = 4.75\text{ V}$, $V_{pin\ 16} = 4\text{ V}$, unless otherwise specified

| Parameters | Symbol | Value | Unit |
|---------------------------|-----------------------|-------------|------------------|
| Supply voltage | Pin 3 VS | 8.0 | V |
| Junction temperature | T_j | 125 | $^\circ\text{C}$ |
| Storage temperature range | T_{stg} | –40 to +125 | $^\circ\text{C}$ |
| Electrostatic handling*) | all Pins V_{ESD} | ± 200 | V |

*) Equivalent to discharging a 200 pF capacitor via a 0- Ω resistor

Operating Range

| Parameters | Symbol | Value | Unit |
|----------------------|----------------|------------|------------------|
| Supply voltage range | Pin 3 V_S | 7.5 to 8.5 | V |
| Ambient temperature | T_{amb} | –20 to +70 | $^\circ\text{C}$ |

Thermal Resistance

| Parameters | Symbol | Value | Unit |
|---|------------|-------|------|
| Junction ambient (when soldered to PCB) | R_{thJA} | 80 | K/W |

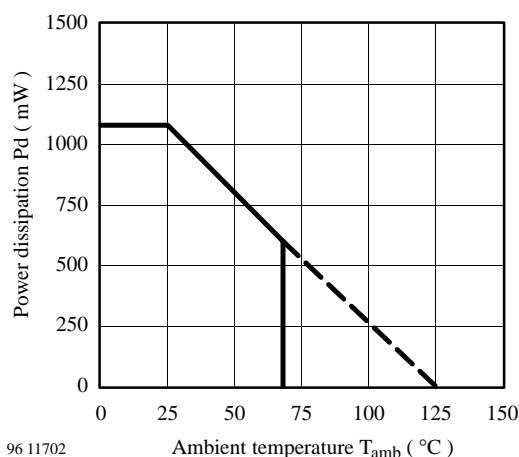


Figure 3. Thermal derating curve of the package (maximum rating)

Electrical Characteristics

$V_S = 8\text{ V}$, $T_{amb} = 25^\circ\text{C}$, reference point Pin 6, unless otherwise specified

Test conditions: $V_{pin\ 1} = 4.75\text{ V}$, $V_{pin\ 16} = 4\text{ V}$, unless otherwise specified

| Parameters | Test Conditions / Pins | Symbol | Min. | Typ. | Max. | Unit |
|---|---|-----------------|-------|-------|-------|------|
| DC supply | | | | | | |
| Supply voltage V_S | Pin 3 | V_S | 7.5 | 8.0 | 8.5 | V |
| Supply current I_S | Pin 3 Note 1 | I_S | 18 | 24 | 30 | mA |
| Bell filter | | | | | | |
| Resonance frequency | $f = 4.0 - 5.0\text{ MHz}$ sweep signal with 20 mV peak-to-peak amplitude at the CVBS input (see note 2, page 5), Pin 2 | f_{BO} | 4.236 | 4.286 | 4.336 | MHz |
| Bandwidth | $f = 4.0 - 5.0\text{ MHz}$ sweep signal with 20 mV peak-to-peak amplitude at the CVBS input, Pin 2 | f_{BW} | 250 | 320 | 368 | kHz |
| Demodulator | | | | | | |
| Output DC level during blanking | Pins 9 and 10 | V_O | 2.1 | 2.8 | 3.5 | V |
| Black level error $-(R-Y)$ | Black/ white signal at the CVBS input (see note 4, page 5), Pin 9 | ΔV_{RB} | -15 | | +15 | mV |
| Black level error $-(B-Y)$ | Black/ white signal at the CVBS input (see note 4, page 5), Pin 10 | ΔV_{BB} | -50 | | +20 | mV |
| $-(R-Y)$ output signal amplitude (peak-to-peak value) | (see note 1, page 5), Pin 9 | V_{R-Y} | 0.85 | 1.0 | 1.15 | V |
| $-(B-Y)$ output signal amplitude (peak-to-peak value) | (see note 1, page 5), Pin 10 | V_{B-Y} | 1.05 | 1.24 | 1.36 | V |

| Parameters | Test Conditions / Pins | Symbol | Min. | Typ. | Max. | Unit |
|--|---|-------------------|------|--------|------|------------|
| Ratio of $-(B-Y)/-(R-Y)$ output signal amplitude | | V_{B-Y}/V_{R-Y} | 1.10 | 1.24 | 1.36 | |
| Linearity | (see notes 1 and 3, page 5) Pin 10 | V_{LIN} | 2.6 | 2.9 | 3.2 | |
| Sandcastle pulse (see figures 16 and 17) | | | | | | |
| Vertical blanking detection level | Pin 15 | V_{VB} | 1.0 | 1.25 | 1.4 | V |
| Horizontal blanking detection level | Pin 15 | V_{HB} | 1.75 | 2.0 | 2.25 | V |
| Burst-gate detection level | Pin 15 | V_{BG} | 3.5 | 3.85 | 4.2 | V |
| Reference/ Identification | | | | | | |
| Reference frequency | During vertical blanking (see figure 4, 300 mVpp) Pin 1 | f_{ref} | | 4.4336 | | MHz |
| System switches detection level (at SECAM) | V_{ext1} = variable (see figure 6), Pin 1 | V_{TH1} | | 2.9 | 3.3 | V |
| System switches detection level (at no SECAM) | V_{ext1} = variable (see figure 6), Pin 1 | V_{TH2} | 1.5 | 2.0 | | V |
| Sink current (at SECAM) | (see note 5, page 5), Pin 1 | | 125 | 180 | 235 | μ A |
| Pin 5 voltage (at SECAM) | (see note 1, page 5), Pin 5 | V_{5S} | 2.4 | 3.1 | 3.6 | V |
| Sensitivity of identification and killer | Attenuate the amplitude (see notes 1 and 6, page 5) Pin 5 | I/K | -46 | -38 | -32 | dB |
| Unspecified characteristics (only for reference but not guaranteed limiting values) | | | | | | |
| Input dynamic range (peak-to-peak value) | Pin 16 | V_{DR} | | 1.0 | 1.4 | V |
| Chrominance input voltage (peak-to-peak value) | (see note 7, page 5), Pin 16 | V_{CL} | | 167 | 300 | mV |
| Pole frequency of the de-emphasis LPF | | f_p | | 85 | | kHz |
| Ratio of the pole and zero frequency | | f_p/f_o | | 3 | | |
| $-(R-Y)$, $-(B-Y)$ output impedance (at SECAM) | Pins 9 and 10 | Z_{o1} | | 200 | 600 | Ω |
| $-(R-Y)$, $-(B-Y)$ output impedance (at no SECAM) | Pins 9 and 10 | Z_{o2} | 1 | | | M Ω |
| Reference voltage amplitude (peak-to-peak value) | (see note 8, page 5), Pin 1 | V_{ref} | 0.2 | | 0.57 | V |
| Rising edge of SECAM burst-gate pulse (internal generated) | (see note 9, page 5) | T_r | | 4.5 | | μ s |
| Falling edge of SECAM burst-gate pulse | (see note 10, page 5) | T_f | | 0.2 | | μ s |

Notes:

1. CVBS input: 100/75 color bar signal. The (B–Y) burst signal [f_{OB}] amplitude is 167 mV_{pp} (= 0 dB).
2. Measure during scanning. An active probe is recommended for low capacitive loading.
3. Defined as $V_{LIN} = b / a$ (see figure 4).
4. Measure the difference between the blanking (V_1) and the black level (V_2) (see figure 5).
 $\Delta V_{RB} = V_2 - V_1$ (Pin 9), $\Delta V_{BB} = V_2 - V_1$ (Pin 10)

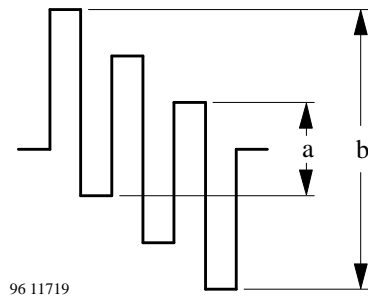


Figure 4. V_{LIN}

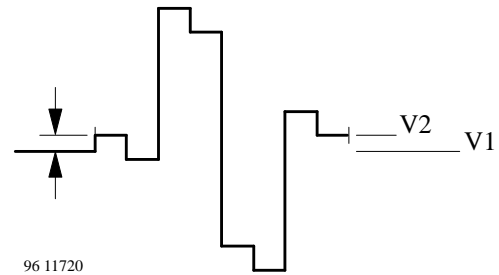


Figure 5. Black level error at Pin 9 (R–Y)

5. The external voltage at Pin 1 should exceed 0.5 V.
6. V_K (peak-to-peak value of the burst signal in a blue line) when “LOW” (0.2 V) at Pin 5 related to 167 mV_{pp} (= 0 dB)
 $I / K = 20 \times \log_{10} (V_K / 167 \text{ mV})$ [dB]
7. Measured in the burst period of a blue line
8. The reference frequency should be stable during the vertical blanking
9. Defined as the time from rising edge of the sandcastle burst-gate pulse at Pin 15.
10. Defined as the time from falling edge of the sandcastle burst-gate pulse at Pin 15.

Internal Pin Configuration

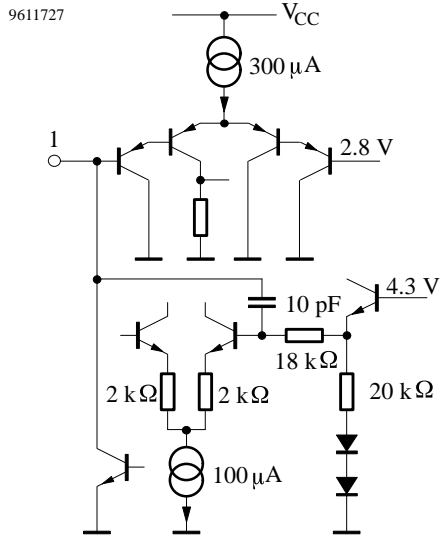


Figure 6. f_{ref} / ident

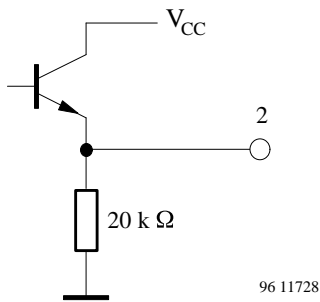


Figure 7. Bell-filter output

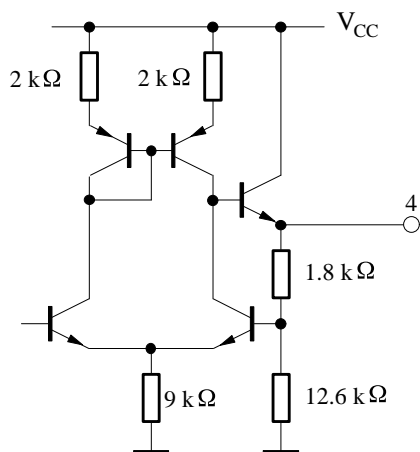


Figure 8. Band gap

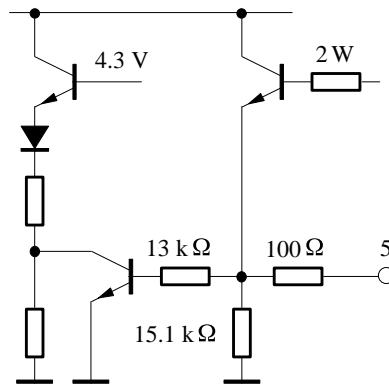


Figure 9. SECAM killer output

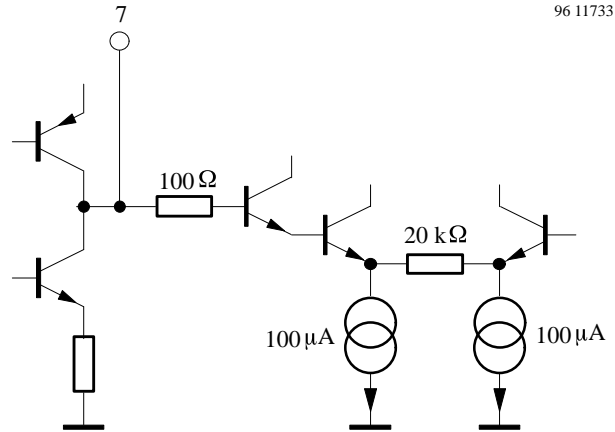


Figure 10. Bell-filter reference

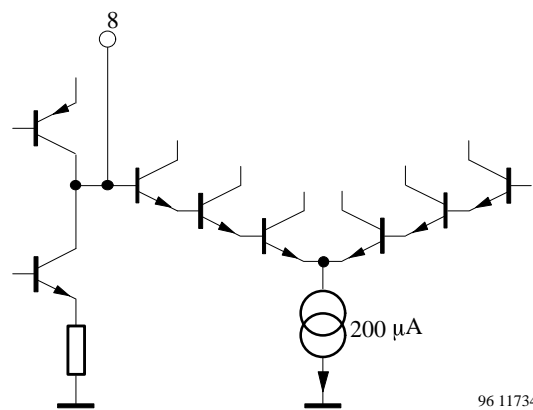


Figure 11. PLL reference

Internal Pin Configuration (continued)

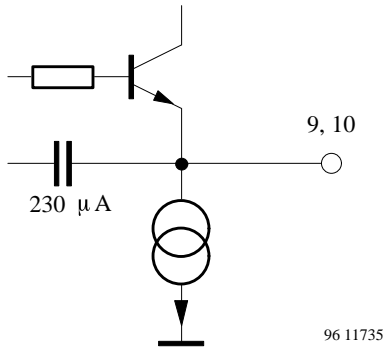


Figure 12. -(R-Y), -(B-Y) output

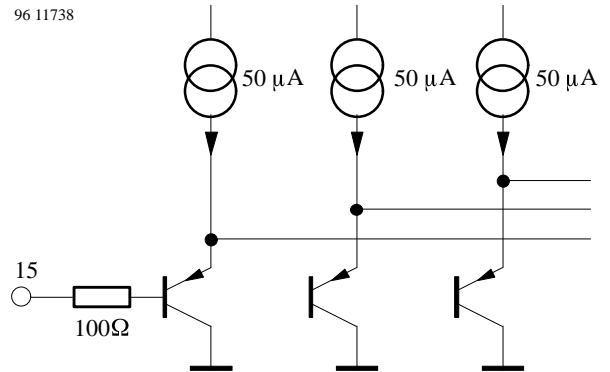


Figure 15. Sandcastle input

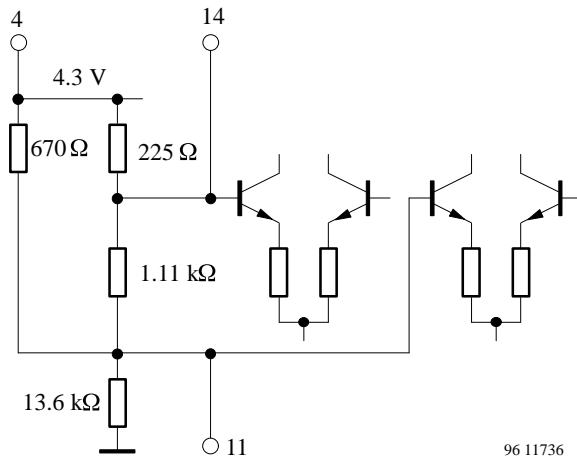


Figure 13. Black level adjust -(B-Y), -(R-Y) channel

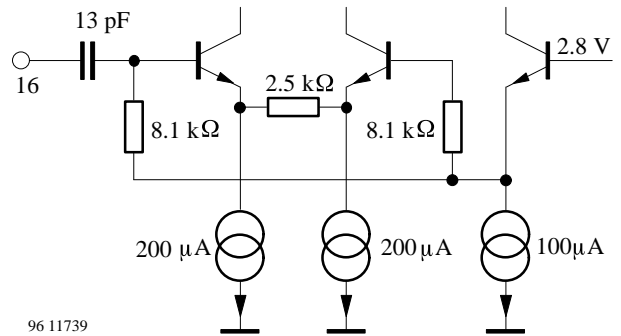


Figure 16. CVBS input

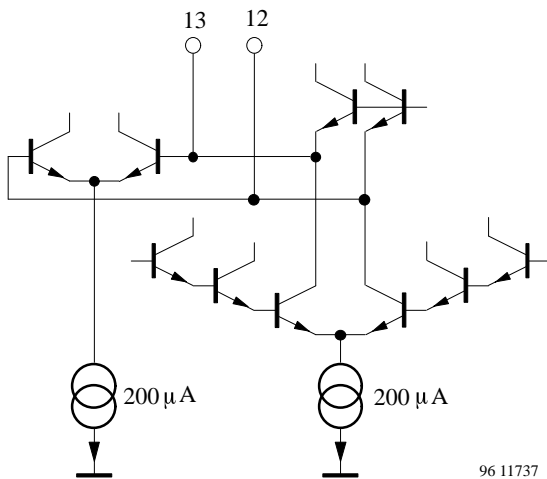


Figure 14. PLL auto 1, 2

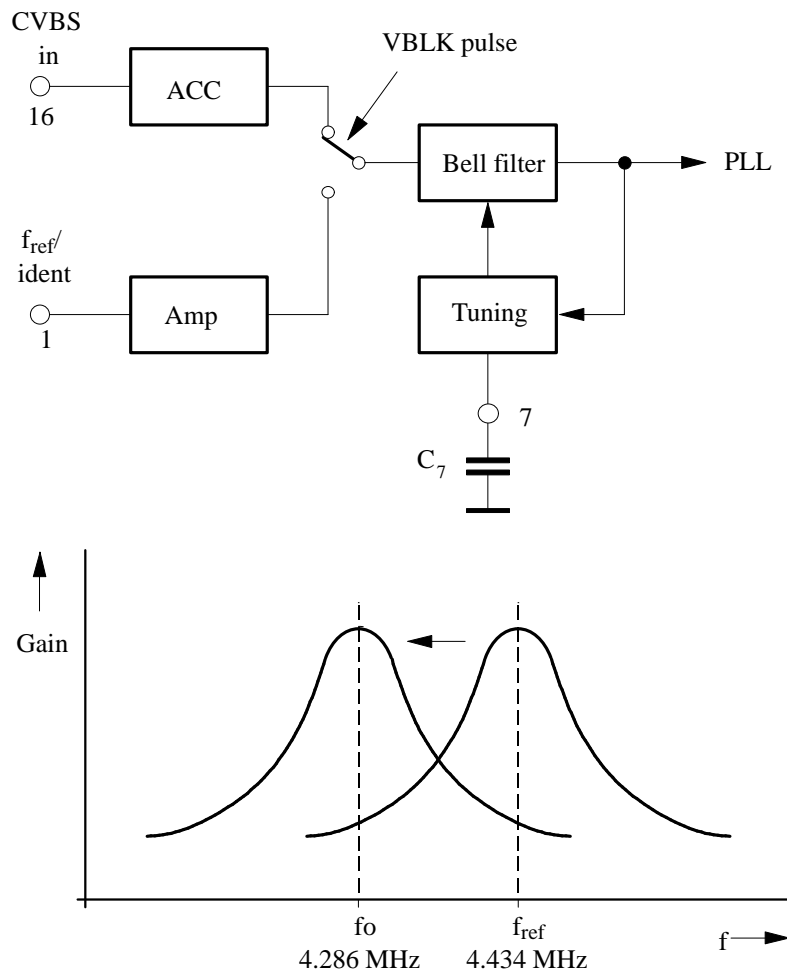
Functional Description

Bell Filter

The ACC amplifier provides a C- (chrominance) signal of a constant peak-to-peak level for the bell filter. The bell filter is of a gyrator-capacitor type. The resonance frequency is

- 4.433619 MHz during vertical blanking
- 4.286 MHz during scanning
- 4.33 MHz during burst gating.

The reference frequency should be stable during the vertical blanking because it is used to calibrate the filters and the demodulator. The capacitor C7 should be connected as close as possible to the ground Pin of the package. If not, this can result in a resonance frequency error.



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Figure 17. Block diagram of the bell filter

Demodulator

The bell filter delivers the C signal via a limiter amplifier to the demodulator. The demodulator is of a phase-locked loop (PLL) type VCO and a phase-emitter coupled multivibrator with the limiter output and is fed back to the VCO. The free-running frequency is adjusted by charging or discharging the capacitor at Pin 8 during the vertical blanking and is held during scanning.

Therefore, the IC needs no adjustment to enable constant operation

The low-frequency de-emphasis is matched to the PLL and is controlled by the tuning voltage of the PLL.

The capacitor, C8, should be connected as close as possible to the ground pin of the package. If this is not ensured, a black-level error for both channels may result.

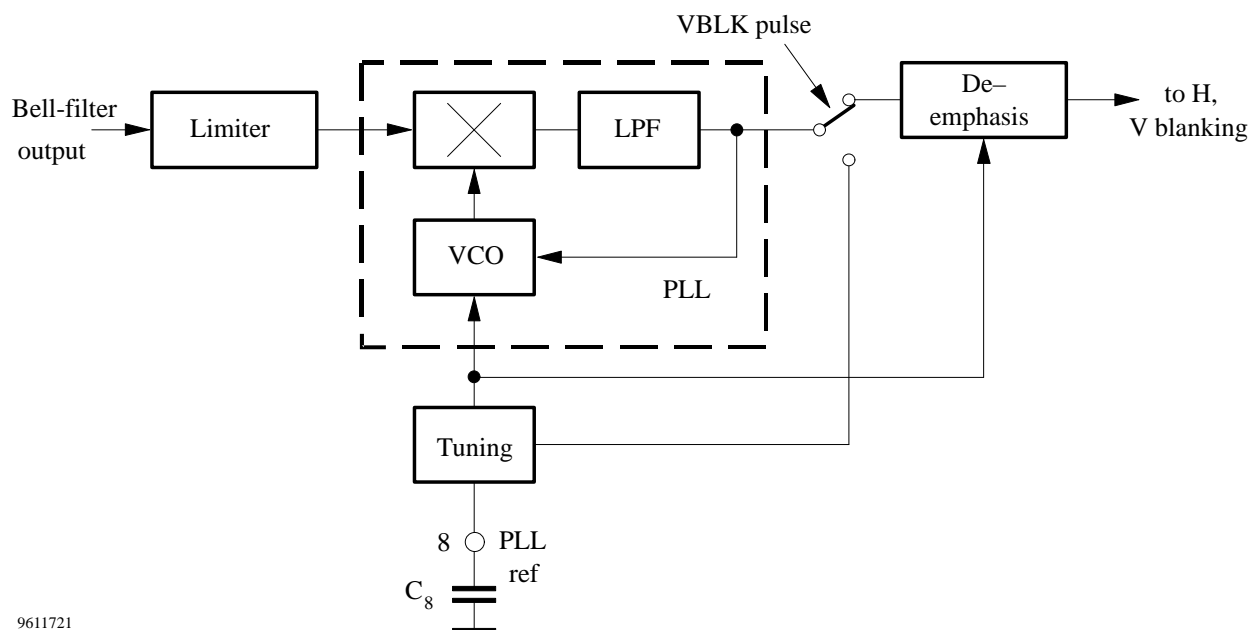


Figure 18. Block diagram of the demodulator

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Identification

The identification circuit is a quadrature-type FM demodulator which uses the bell filter as a phase shifter. The resonance frequency of the phase shifter is adjusted to 4.33 MHz – i.e., the frequency between the 4.25-MHz (B–Y) carrier and the 4.40625-MHz (R–Y) carrier – during burst gating. The output of the ACC is multiplied with the output of the phase shifter. The sample-and-hold circuit samples the output of the multiplier during burst gating and maintains this value outside of the burst-gate pulse time. The identification and killer detectors compare the sampled-and-hold voltage with internal detection levels. Only line identification (and no field identification) is implemented.

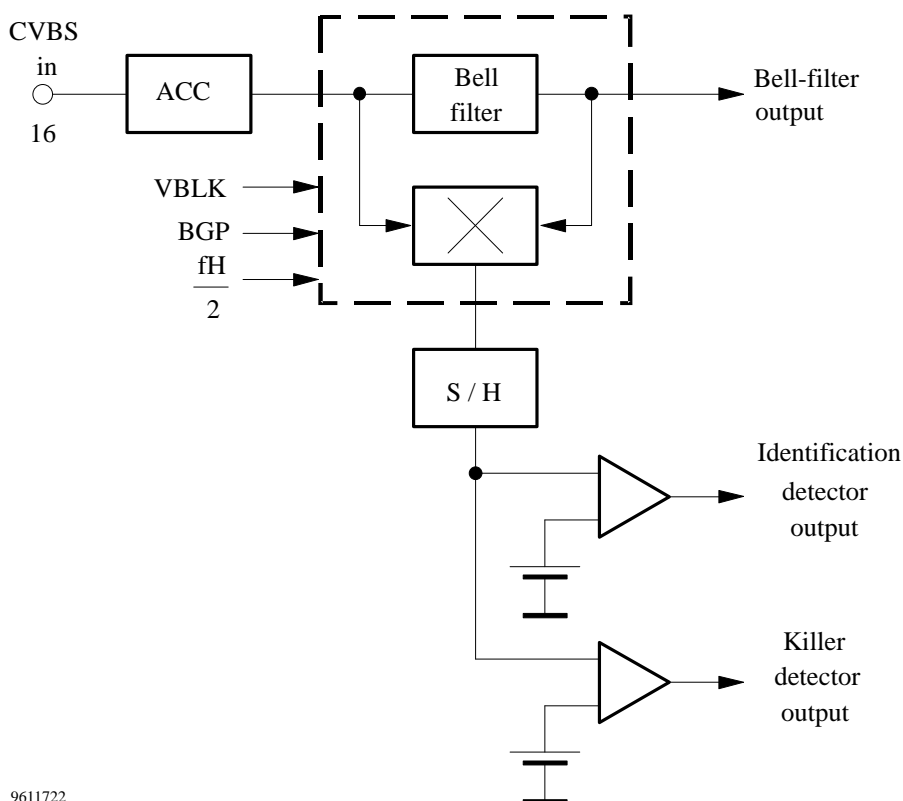
The identification circuit must communicate with the

U4930B (PAL/NTSC decoder) to guarantee that the output signal from the decoder is available when no PAL signal has been identified.

If a SECAM signal has been decoded, a request for “color on” is transmitted to Pin 1 (current sink: 180 μ A). If the signal request is grated (i.e., Pin q is “HIGH” therefore no PAL), the output signals from the U4935B are switched on and the output pins of the U4930B have a high impedance.

If no SECAM signal has been decoded, the outputs of the U4935B will be blanked or have high-impedance state depending on the logic level at Pin 1. (see table 1)

| System Identification of the U4930B | Logic Level; Pin 1 of the U4935B | SECAM Identification of the U4935B | Output Pins 9, 10 of the U4935B |
|-------------------------------------|----------------------------------|------------------------------------|---------------------------------|
| No PAL | HIGH (5.0 V) | SECAM; 180 μ A | (–R–Y), –(B–Y) signals |
| | | no SECAM; 0 μ A | Blanked |
| PAL | LOW (1.5 V) | SECAM; 180 μ A | High impedance |
| | | no SECAM; 0 μ A | |



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Figure 19. Block diagram of the identification

SECAM Switch, Output Stage

The de-emphasis circuit provides the color-difference signals which are blanked during the horizontal and vertical blanking pulses. After blanking, the color difference signals are switched every (B-Y) and (R-Y) line by the SECAM switch.

The (B-Y) signal is then amplified 3.8 times and available at Pin 10 after reversing. The (R-Y) signal is amplified 2.54 times and available at Pin 9. When the logic level at Pin 1 is "LOW", the outputs have high-impedance state.

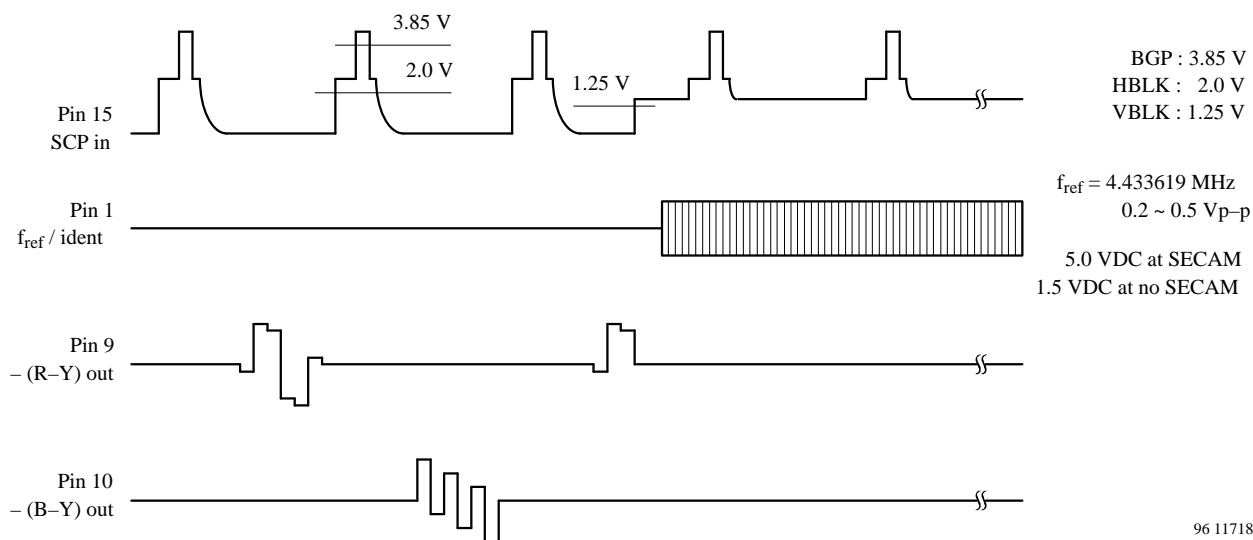


Figure 20. Timing waveforms of the output stage

Sandcastle Pulse

The required blanking burst and $f_{H/2}$ pulses are derived from a three-level sandcastle pulse. (see figures 16 and 17)

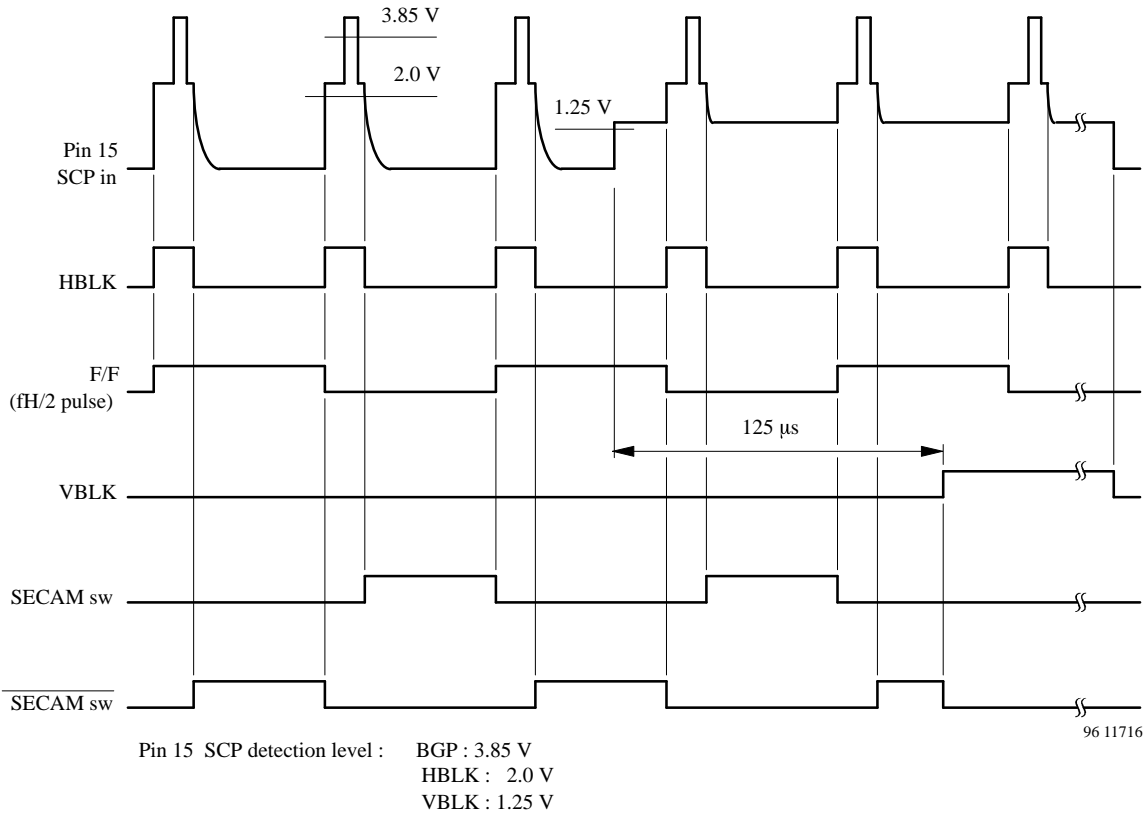


Figure 21. Timing chart of the internal pulses

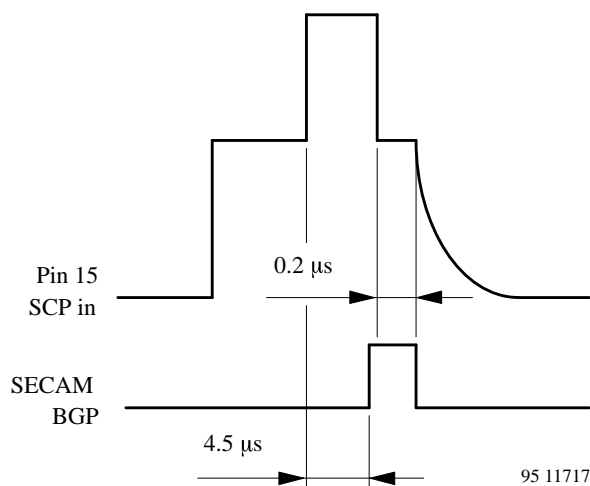
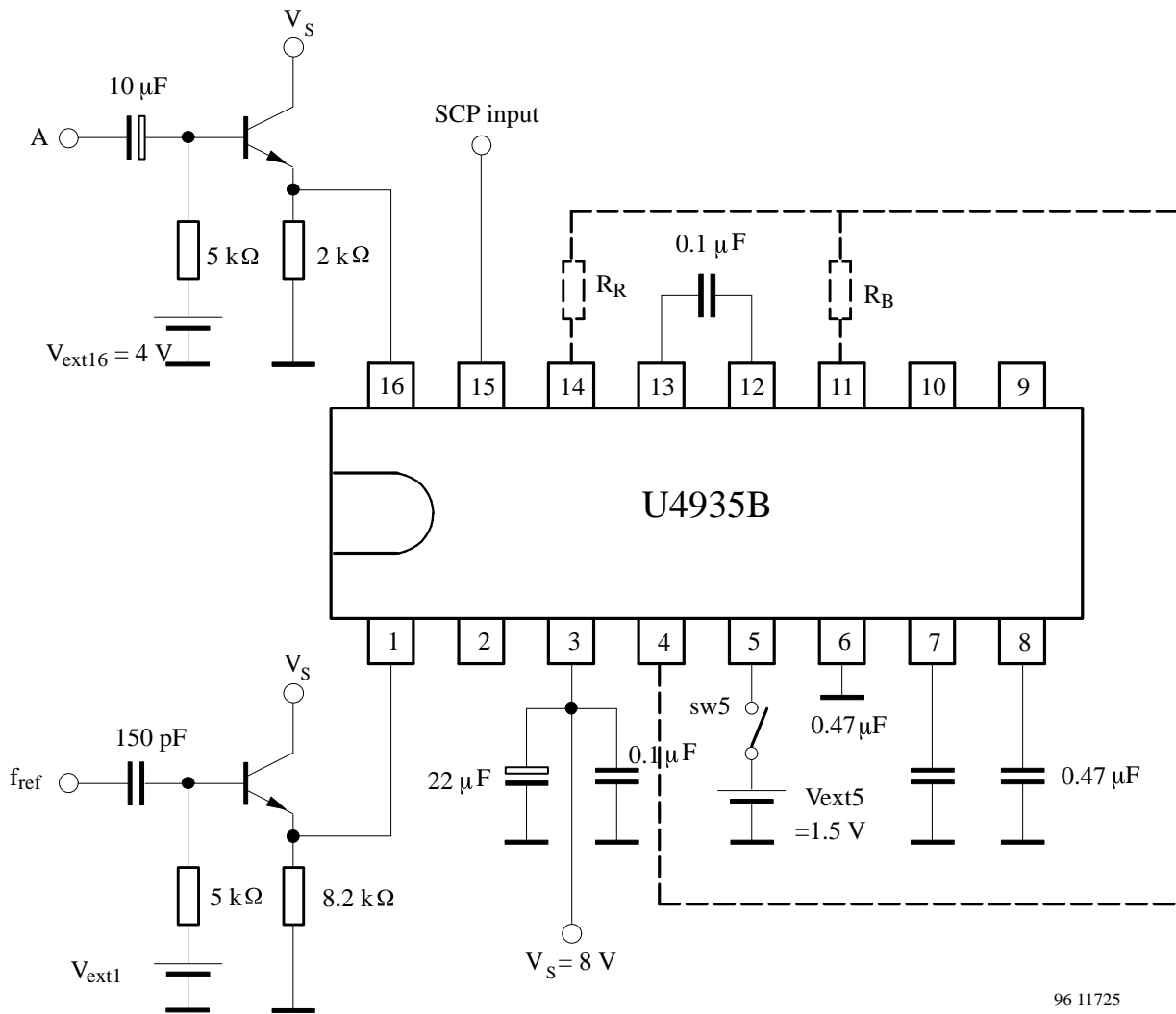


Figure 22. Timing chart of the internal SECAM burst gating pulse

Typical Voltages

| Pin | Function | DC Voltage | Comment |
|-----|---------------------------------|--------------|--|
| 1 | f_{ref} / ident | | For the - reference input, - PAL system identification input, - SECAM killer-signal output. 180 μ A typ. at SECAM 0 μ A typ. at no SECAM System switches detection level = 2.9 V. |
| 2 | Bell-filter output | 1.7 V | |
| 3 | Supply voltage | 8 V | |
| 4 | Bell-filter ref. voltage output | 4.3 V | |
| 5 | SECAM killer output | 3.1 V 0 V | When SECAM When no SECAM |
| 6 | Ground | | |
| 7 | Bell-filter reference | 3.3 V | |
| 8 | PLL reference | 4.3 V | The capacitor should be connected as close as possible to the ground pin of the package. |
| 9 | -(R-Y) output | 2.8 V | 1.0 V (peak-to-peak value) when the color-bar signal at Pin 16 is 100/75. |
| 10 | -(B-Y) output | 2.8 V | 1.24 V (peak-to-peak value) when the color-bar signal at Pin 16 is 100/75 |
| 11 | Black level adjust B - channel | 4.16 V | Black-level error can be compensated by an external resistor |
| 12 | PLL auto 2 | 5.0 V | Capacitor between Pin 12 and Pin 13 improves color S/N ratio. The value of the capacitor is typ. 0.1 μ F. |
| 13 | PLL auto 1 | 5.0 V | Capacitor between Pin 12 and Pin 13 improves color S/N ratio. The value of the capacitor is typ. 0.1 μ F. |
| 14 | Black level adjust R - channel | 4.28 V | Black-level error can be compensated by an external resistor |
| 15 | Sandcastle-pulse (SCP) input | | |
| 16 | CVBS input | 2.05 V | |

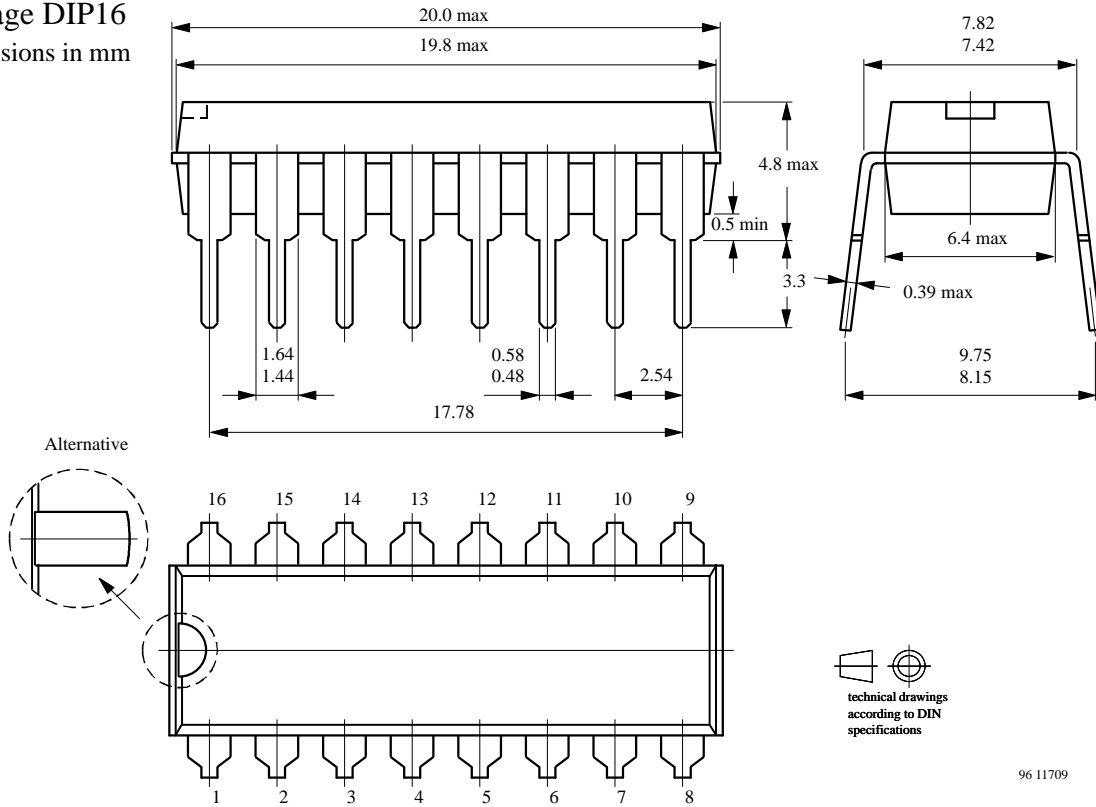


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Figure 23. Basic application circuit

Package Information

Package DIP16
Dimensions in mm



Ozone Depleting Substances Policy Statement

It is the policy of **TEMIC TELEFUNKEN microelectronic GmbH** to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

TEMIC TELEFUNKEN microelectronic GmbH semiconductor division has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

TEMIC can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

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