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

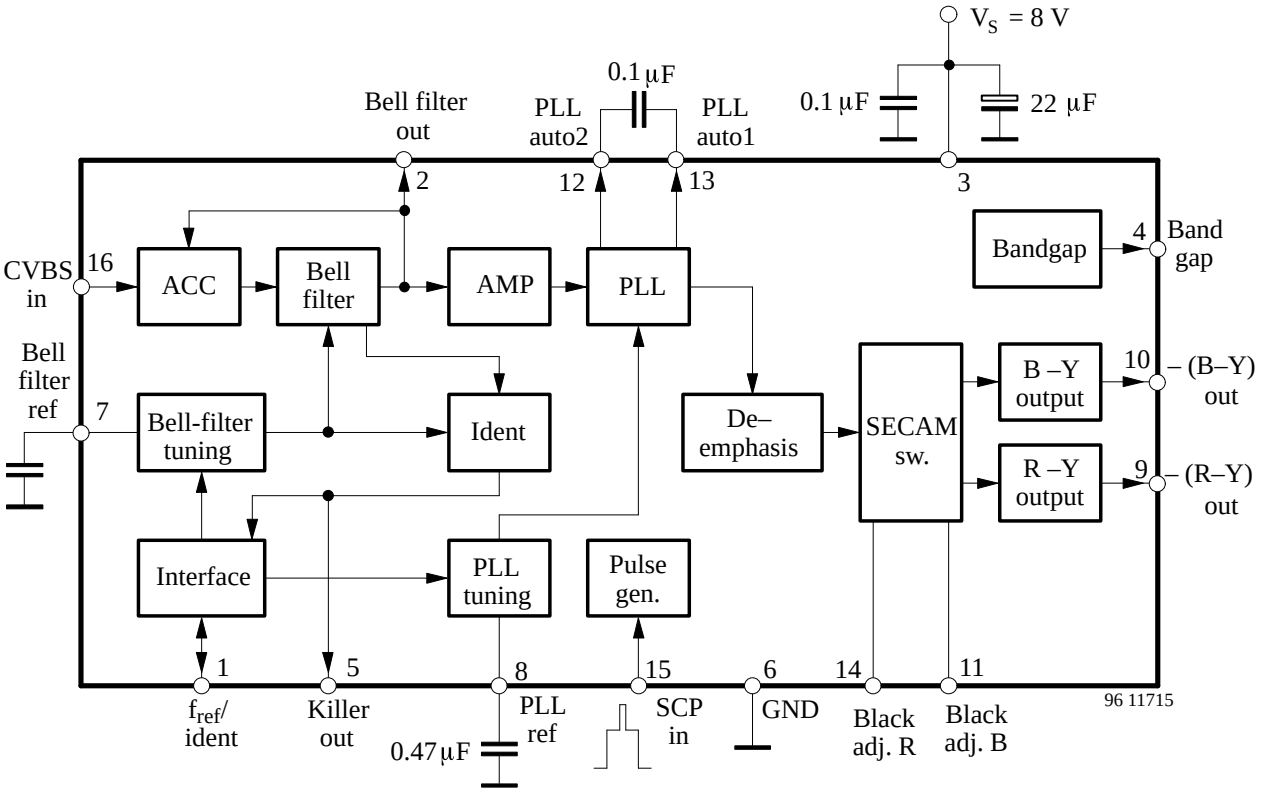


Figure 1. Block diagram

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

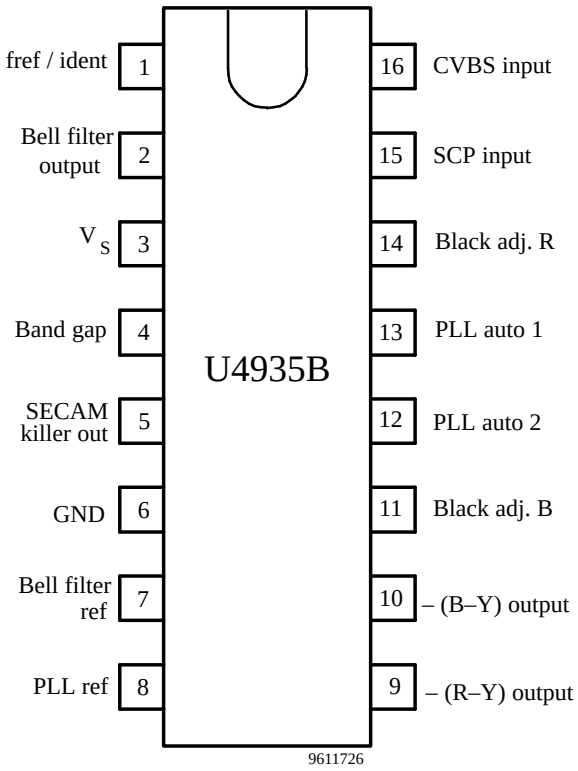


Figure 2. Connection diagram

Absolute Maximum Ratings

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

Parameters		Symbol	Value	Unit
Supply voltage	Pin 3	VS	8.0	V
Junction temperature		T_j	125	°C
Storage temperature range		T_{stg}	–40 to +125	°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	°C

Thermal Resistance

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

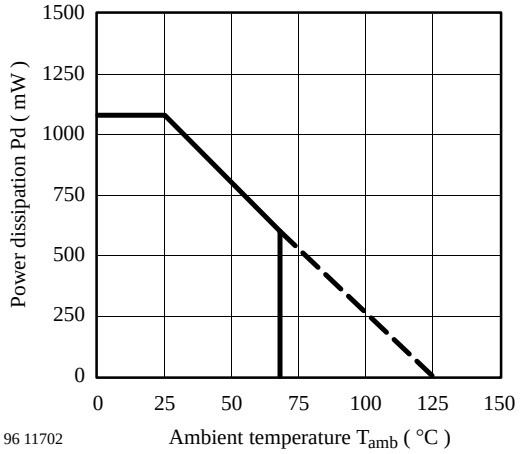


Figure 3. Thermal derating curve of the package (maximum rating)

Electrical Characteristics

V_S = 8 V, T_{amb} = 25°C, reference point Pin 6, unless otherwise specified
Test conditions: $V_{pin\ 1}$ = 4.75 V, $V_{pin\ 16}$ = 4 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 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 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_{B-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	µA
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			MΩ
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		µs
Falling edge of SECAM burst-gate pulse	(see note 10, page 5)	T_f		0.2		µs

Notes:

1. CVBS input: 100/75 color bar signal. The (B–Y) burst signal [f_{OB}] amplitude is 167 mVpp (= 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)

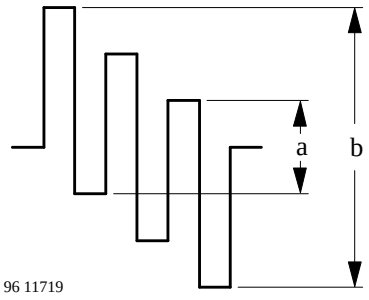


Figure 4. V_{LIN}

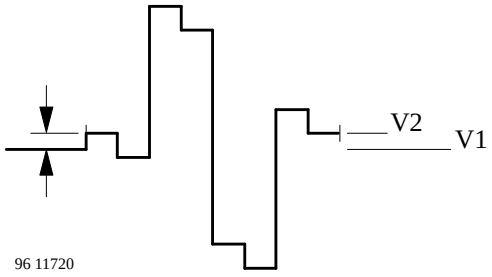


Figure 5. Black level error at Pin 9 (R–Y)

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)
   $I / K = 20 \times \log_{10} (V_K / 167\ m\ V)$ [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 sandxastle burst-gate pulse at Pin 15.
10. Defined as the time from falling edge of the sandxastle burst-gate pulse at Pin 15.

Internal Pin Configuration

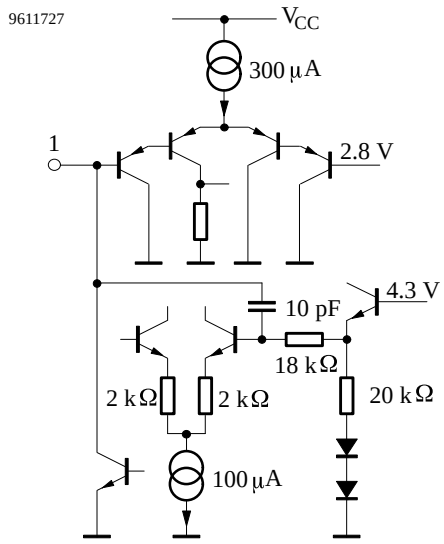


Figure 6. f_{ref} / ident

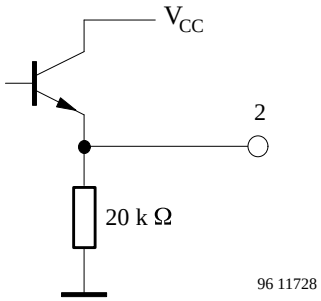


Figure 7. Bell-filter output

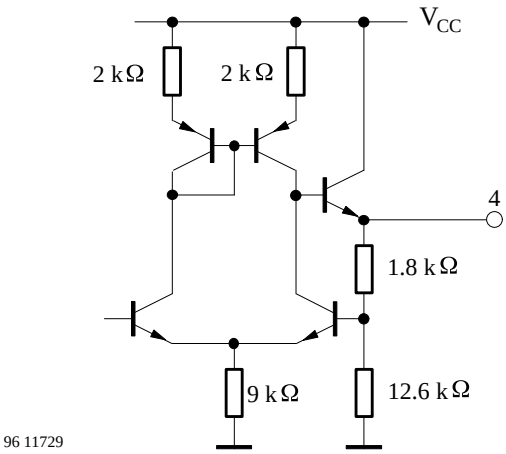


Figure 8. Band gap

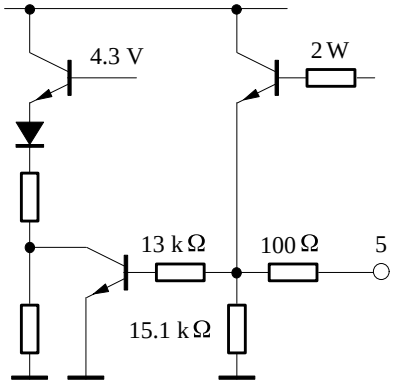


Figure 9. SECAM killer output

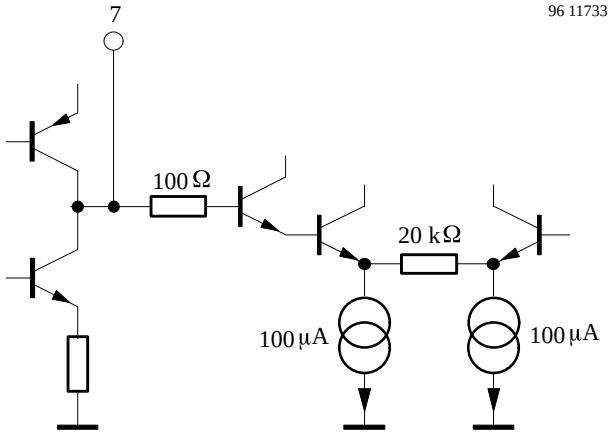


Figure 10. Bell-filter reference

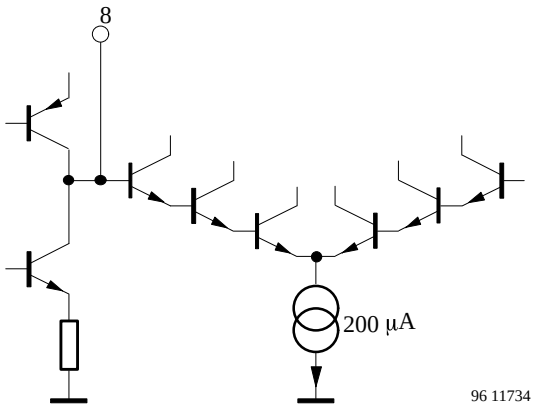


Figure 11. PLL reference

Internal Pin Configuration (continued)

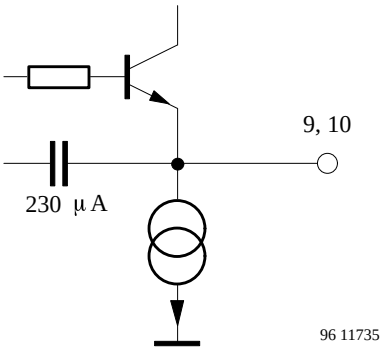


Figure 12. –(R–Y), –(B–Y) output

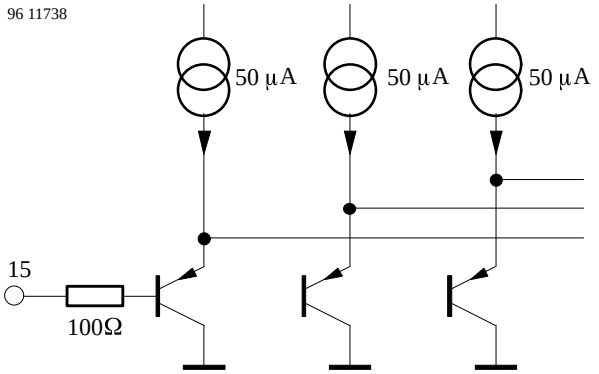


Figure 15. Sandcastle input

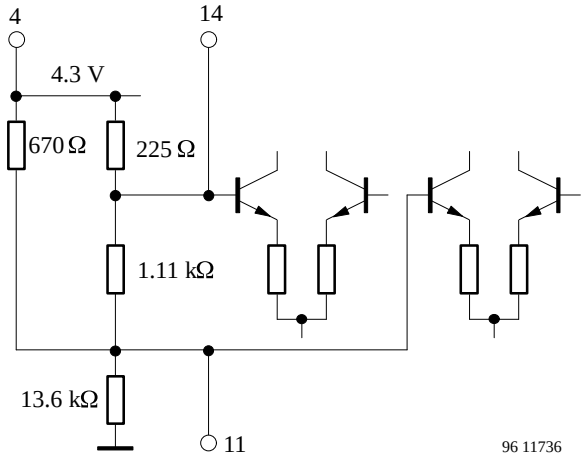


Figure 13. Black level adjust –(B–Y), –(R–Y) channel

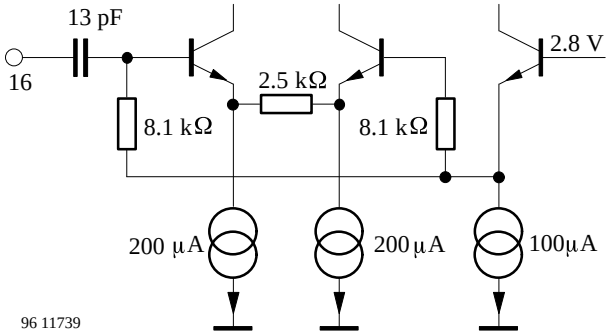


Figure 16. CVBS input

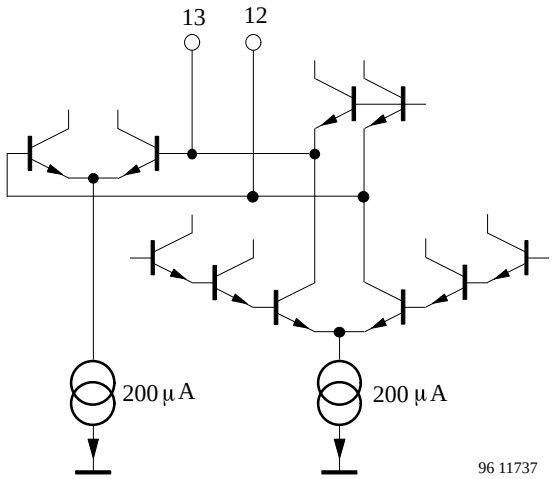


Figure 14. PLL auto 1, 2

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.

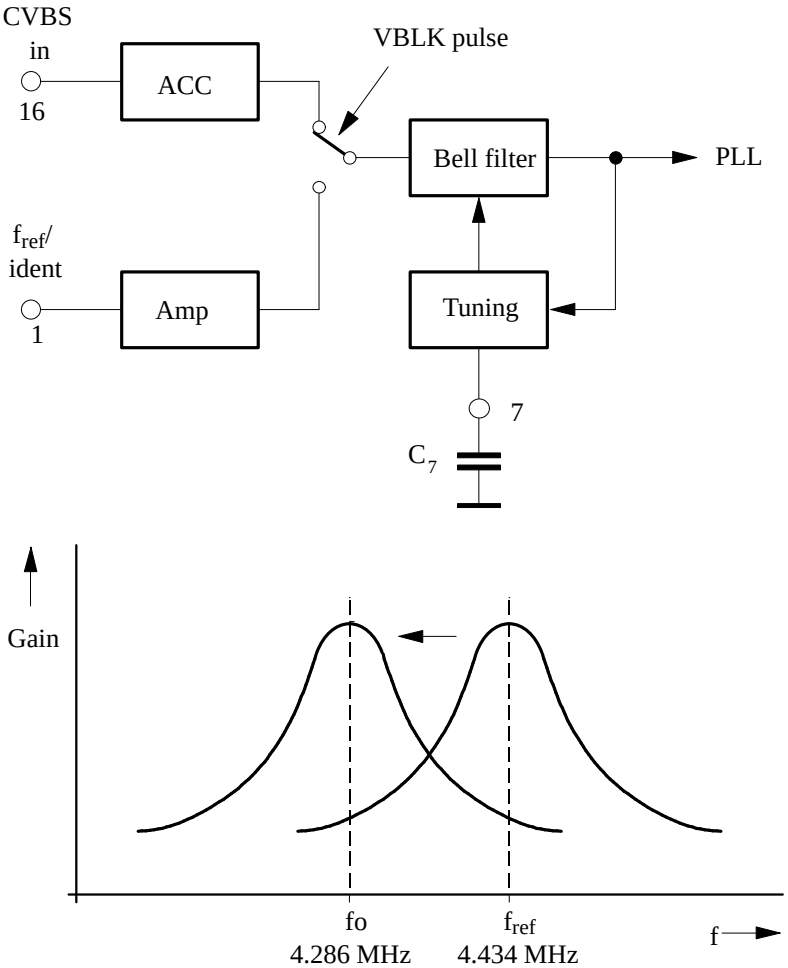


Figure 17. Block diagram of the bell filter

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.

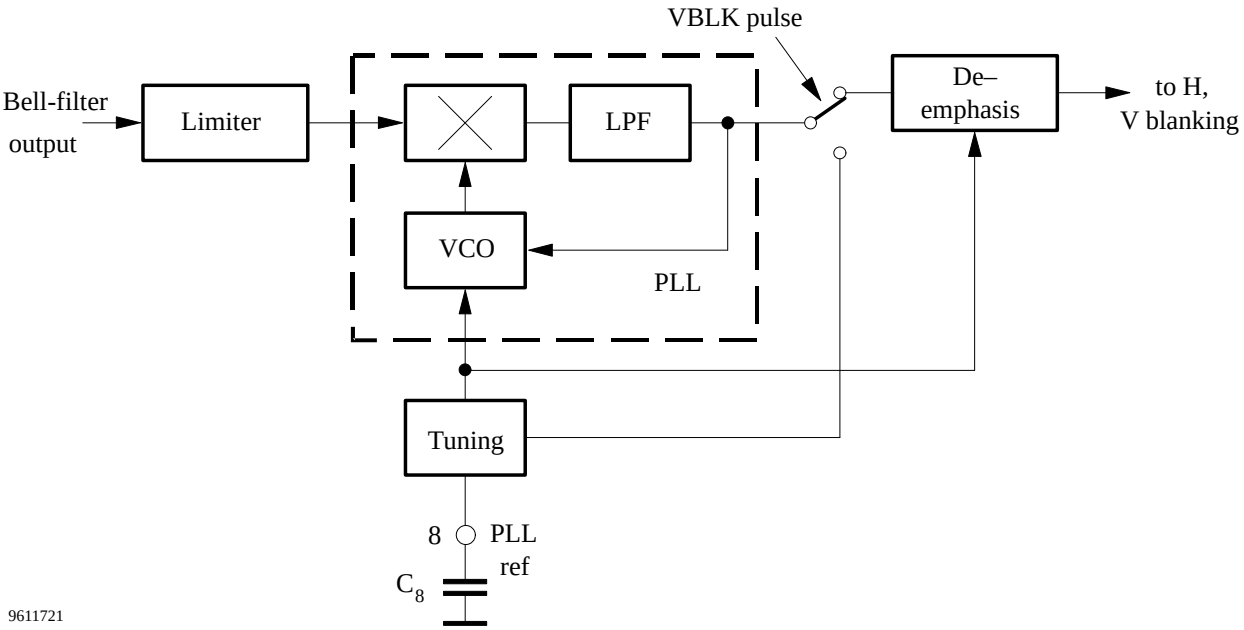


Figure 18. Block diagram of the demodulator

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 µA). 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 µA	(–R–Y), –(B–Y) signals
		no SECAM; 0 µA	Blanked
PAL	LOW (1.5 V)	SECAM; 180 µA	High impedance
		no SECAM; 0 µA	

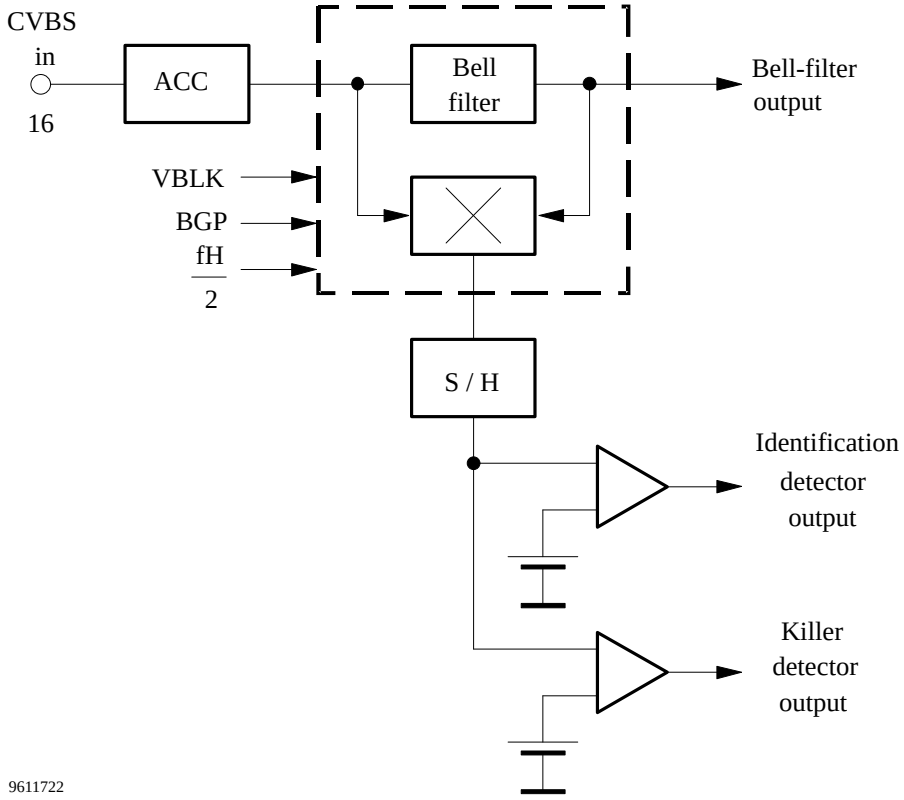


Figure 19. Block diagram of the identification

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.

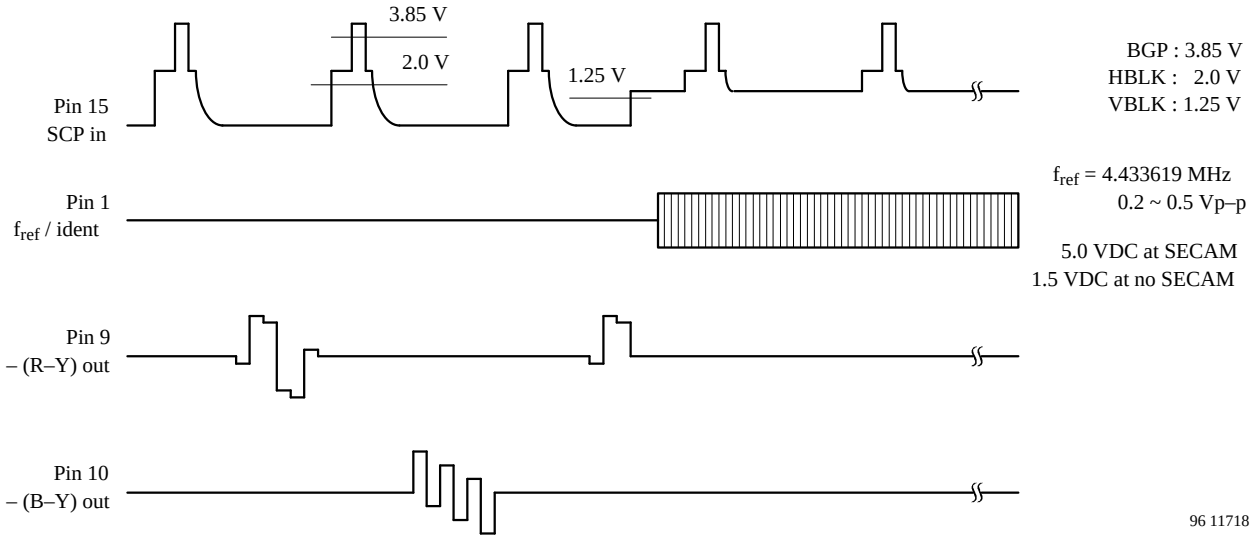
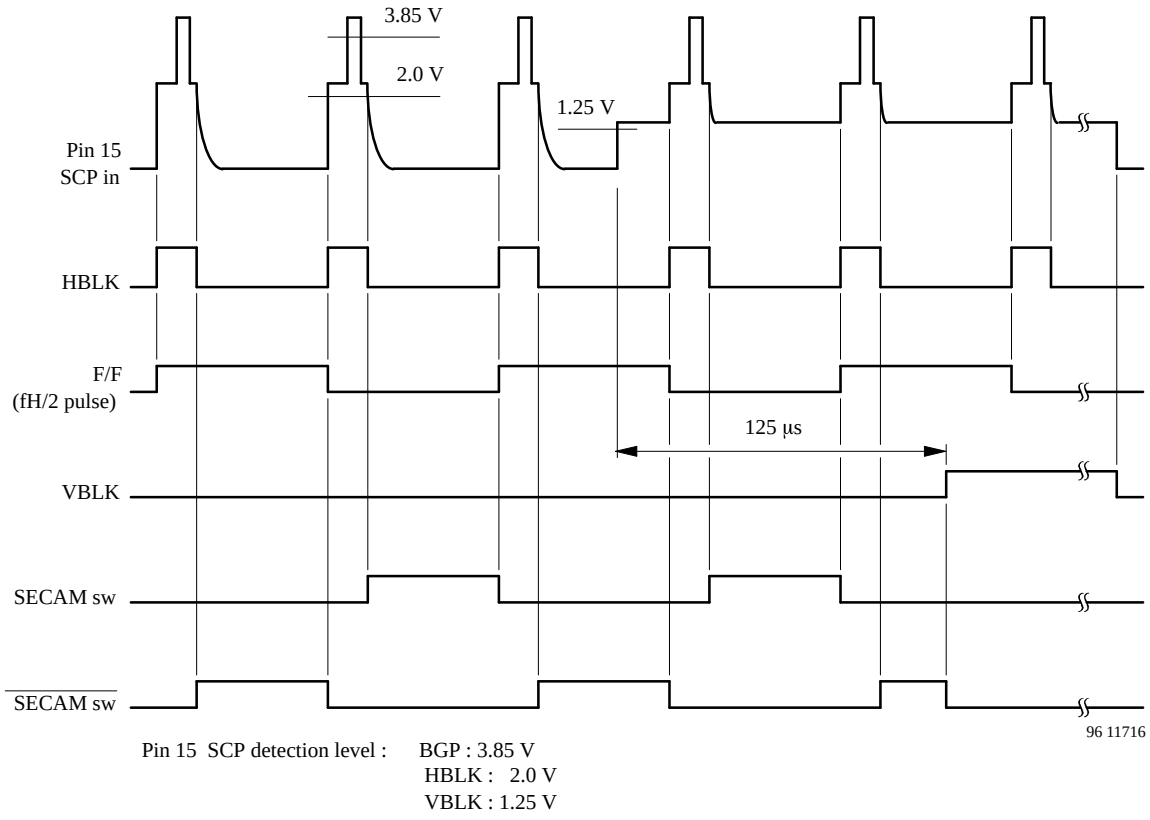


Figure 20. Timing waveforms of the output stage

Sandcastle Pulse

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



Pin 15 SCP detection level : BGP : 3.85 V
HBLK : 2.0 V
VBLK : 1.25 V

Figure 21. Timing chart of the internal pulses

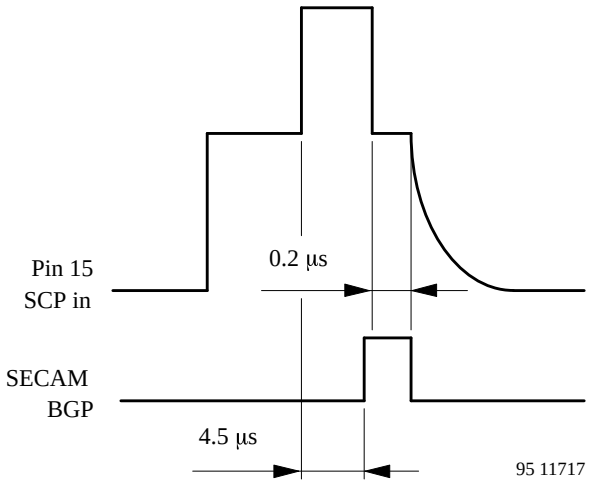


Figure 22. Timing chart of the internal SECAM burst gating pulse

Typical Voltages

Pin	Function	DC Voltage	Comment
1	f_{ref} / ident		For the - reference input, - PAL system identification input, - SECAM killer-signal output. 180 µA typ. at SECAM 0 µA 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 µF.
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 µF.
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	

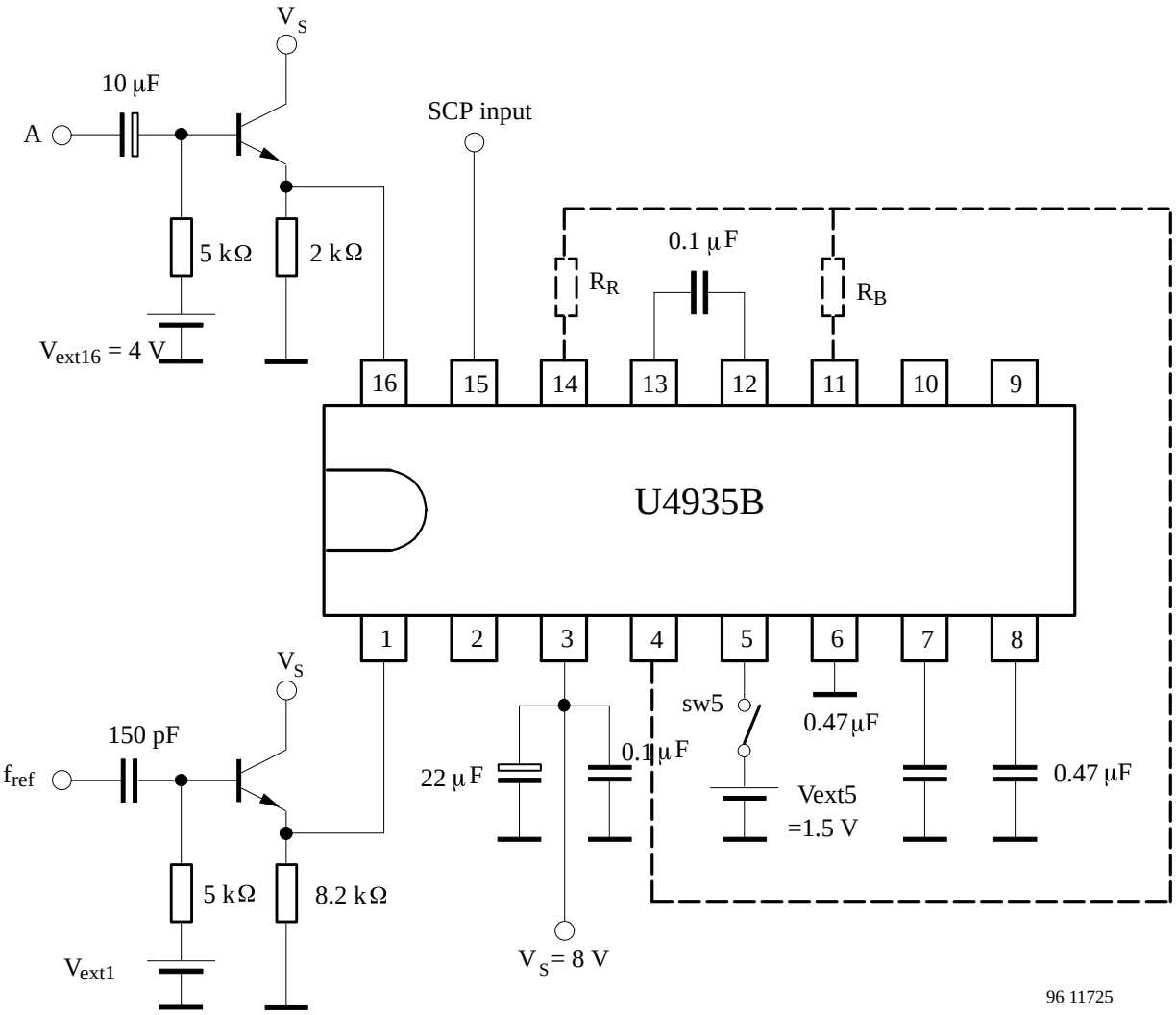
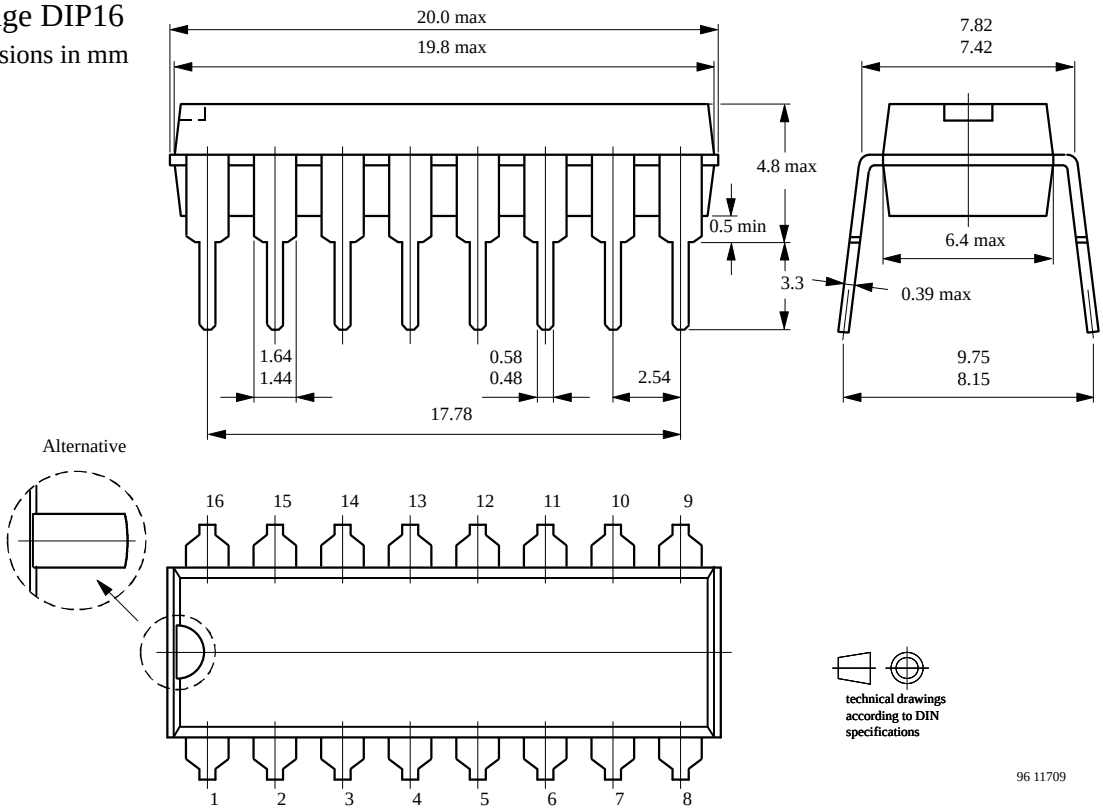


Figure 23. Basic application circuit

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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Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use TEMIC products for any unintended or unauthorized application, the buyer shall indemnify TEMIC against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

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