

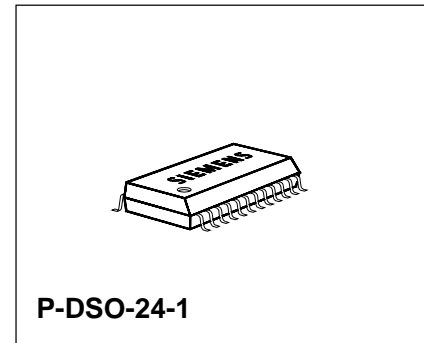
## Video and Sound IF with FM-PLL Demodulator, AFC and V & S SCART

TDA 5950X

Bipolar IC

### Features

- Features video and sound IF
- Video and sound SCART
- AFC
- NTSC option



Type	Ordering Code	Package
TDA 5950X	Q67000-A5112	P-DSO-24-1 (SMD)
TDA 5950X	Q67007-A5112	P-DSO-24-1 Tape and Reel dry

### Functional Description

#### Video IF Section

Video IF-broadband amplifier followed by a quasi-synchronous demodulator for negative modulated IF signals. A video switch interface is included in the video section. A separate video output after the demodulator permits the installation of one or more sound traps at the input of the video switch. The tuner AGC threshold is set by means of a potentiometer, all other functions can be switched with open collector transistors.

#### Sound IF Section

FM-IF limiter with FM-PLL demodulator for the frequency range of 5.5 MHz to 6.5 MHz. The AF section includes an audio switch followed by an audio buffer output.

#### Application

The TDA 5950X is suitable for application in television receivers or video tape recorders with A/V switches.

## Circuit Description

### Video IF Section

The video IF section incorporates a four-stage, capacitively coupled, symmetrical and controlled amplifier, a limiter with selection and a mixer for quasi-synchronous demodulation of negative modulated IF signals followed by a video output amplifier. The video demodulator output and the video switch input are connected by means of a sound trap. The video switch has two inputs (for signals from video demodulator and from external source) and two outputs. Parallel to the video output amplifier the video signal is used for generating the AGC voltage. The control circuit is designed on the integralaction AGC principle, employing a noise-free peak value detector. A delayed tuner AGC voltage with positive control direction is derived from the AGC voltage via a threshold amplifier that is set by means of an external potentiometer. An AFC push pull output current is generated from picture carrier tank circuit.

### Sound IF Section

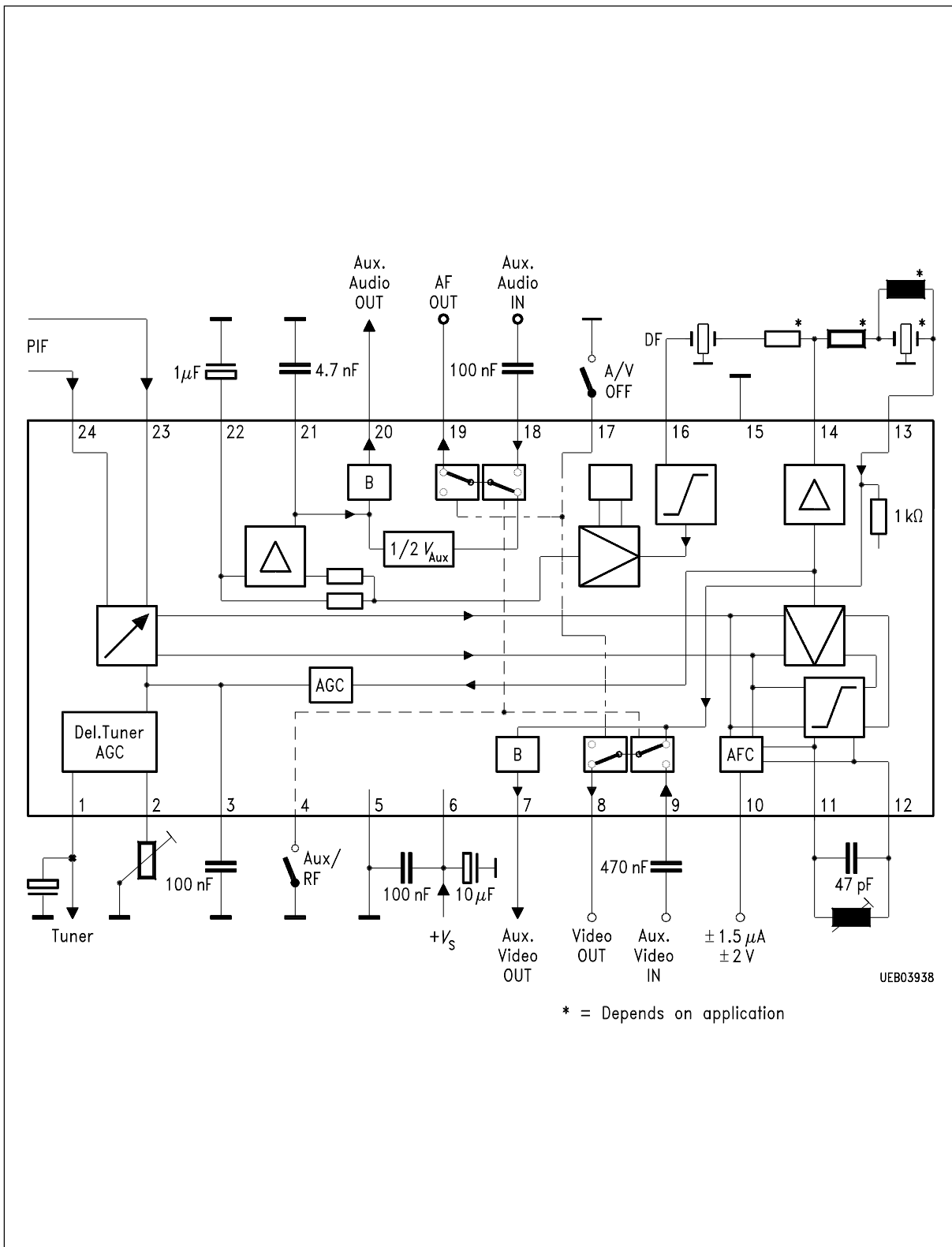
The sound IF section incorporates a five-stage, symmetrical limiter amplifier followed by a PLL demodulator. The AF section contains an audio switch followed by an output buffer.

### Switch Matrix

AUX/RF-Control (Pin 4)	AV-OFF (Pin 17)	Output (Pin 8 / Pin 19)
0	0	muted
0	1	IF
1	0	muted
1	1	SCART

**Pin Functions**

Pin No.	Function
1	Delayed tuner AGC output
2	Delayed tuner AGC threshold
3	AGC-time constant
4	Aux / RF control
5	Ground
6	+ $V_S$ supply voltage
7	Auxiliary video output
8	Video output
9	Auxiliary video input
10	AFC output
11	Demodulator tank circuit
12	Demodulator tank circuit
13	Video input at sound trap output
14	Video demodulator output
15	Sound IF ground
16	Sound IF input
17	A / V OFF
18	Auxiliary audio input
19	Audio output
20	Auxiliary audio output
21	De-emphasis capacitor
22	Low-pass capacitor
23	Video IF input
24	Video IF input



Block Diagram

**Absolute Maximum Ratings** $T_A = 0$  to  $70$  °C

Parameter	Symbol	Limit Values		Unit
		min.	max.	
Supply voltage	$V_6$	0	8	V
Junction temperature	$T_j$	0	150	°C
Storage temperature	$T_{stg}$	- 40	125	°C
Thermal resistance	$R_{th JA}$		70	K/W

**Operating Range**

Supply voltage	$V_6$	4.5	8	V
Supply voltage delayed tuner AGC	$V_1$	1	13.2	V
Ambient temperature during operation	$T_A$	0	70	°C
Input frequency range	$f_{IF}$	12	80	MHz

**DC Characteristics** $T_A = 0$  to  $70$  °C;  $V_S = 5.0$  V

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
Total current	$I_6$	47	55	63	mA	
DC voltage; pin 1	$V_1$			12	V	
Aux/RF switch; pin 4 H/open = Aux L = RF	$V_4$ $V_4$	2.4 0		5.5 1.5	V V	
Sync tip level; pin 7	$V_7$	1.35	1.5	1.65	V	$R_L \geq 2.7$ k $\Omega$    10 pF
Sync tip level; pin 8	$V_8$	1.35	1.5	1.65	V	$R_L \geq 2.7$ k $\Omega$    10 pF
Sync tip level; pin 9	$V_9$	1.35	1.5	1.65	V	
DC voltage; pin 10	$V_{10}$	0.4		$V_6 - 0.4$	V	
DC voltage; pin 11	$V_{11}$		$V_6 - 1.3$		V	
DC voltage; pin 12	$V_{12}$		$V_6 - 1.3$		V	
Sync tip level; pin 13	$V_{13}$	1.35	1.5	1.65	V	
Sync tip level; pin 14	$V_{14}$	1.15	1.3	1.45	V	
DC voltage; pin 16	$V_{16}$		0		V	
DC voltage; pin 18	$V_{18}$	1.6	2	2.4	V	
DC voltage; pin 19	$V_{19}$	1.6	2	2.4	V	
DC voltage; pin 20	$V_{20}$	1.6	2	2.4	V	
DC voltage; pin 21	$V_{21}$	1.6	2	2.4	V	
DC voltage; pin 22	$V_{22}$		2.2		V	
DC voltage; pin 23	$V_{23}$		3.6		V	
DC voltage; pin 24	$V_{24}$		3.6		V	

## AC Characteristics

$T_A = 0$  to  $70$  °C;  $V_S = 5.0$  V

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		

### Video IF Section

IF-input sensitivity	$V_{23/24}$		70	100	$\mu$ V	$V_{\text{Video}} - 3$ dB
Max. IF-input voltage	$V_{23/24}$	100	140		mV	$V_{\text{Video}} + 3$ dB
IF-control range	$\Delta V_{\text{IF}}$	60	66	72	dB	
Video demodulator output voltage	$V_{14\text{pp}}$	1.35	1.5	1.65	V	$V_{\text{IF IN}} = 10$ mV
			3.6		V	upper video clipping
			3.0		V	zero carrier level
			1.1		V	lower video clipping
			1.3		V	sync tip level
- 3 dB video bandwidth	$B_{14}$	8	10		MHz	$C_L < 20$ pF, $R_L > 1$ k $\Omega$
Output impedance	$R_{14}$			10	$\Omega$	
Output sink current	$I_{14}$			2	mA	DC and AC
Output source current	$I_{14}$			- 3	mA	DC and AC

### Sound IF Section

Min. sound IF-input voltage (min. control)	$V_{16}$		70	100	$\mu$ V	
AF-output voltage	$V_{19}$	175	250	350	mV	$\Delta f = 30$ kHz $f_{\text{mod}} = 1$ kHz $F_{\text{SIF}} = 5.5$ MHz...6.5 MHz
Aux. AF-output voltage	$V_{20}$	350	500	700	mV	$\Delta f = 30$ kHz $f_{\text{mod}} = 1$ kHz $F_{\text{SIF}} = 5.5$ MHz...6.5 MHz
Total harmonic distortion	$THD_{\text{AFo}}$		0.2	0.3	%	$\Delta f = 30$ kHz $f_{\text{mod}} = 1$ kHz $F_{\text{SIF}} = 5.5$ MHz...6.5 MHz
Max. aux. input voltage	$V_{18\text{rms}}$			1	V	
Gain audio switch	$G_{18-19}$		1			
AM-Suppression	$\alpha_{\text{AM}19/20}$	50	55		dB	$f_{\text{mod}} = 1$ kHz $m = 30$ % $V_{16} = 1$ mV...100 mV
			60			
Signal to noise ratio (weighted)	$S/N_{19/20}$	50	55		dB	$V_{16} = 500$ $\mu$ V...1 mV
		60	65		dB	$V_{16} = 1$ mV...100 mV

## AC Characteristics (cont'd)

$T_A = 0$  to  $70$  °C;  $V_S = 5.0$  V

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
Ripple rejection	$RR_{19/20}$	35	40		dB	
Input impedance	$Z_{18}^{*)}$		50		k $\Omega$	

## SCART-SWITCH

Input impedance	$Z_{13}$		1    2		k $\Omega$    pF	
Gain of Video switch						
Aux. $V_{IN}$ -video output	$G_{9-8}$	0.9	1	1.1		
Video $_{IN}$ -aux. output	$G_{13-7}$	0.9	1	1.1		
Video $_{IN}$ -video output	$G_{13-8}$	0.9	1	1.1		
$f_{mod} = 5$ MHz						
– 3 dB video bandwidth	$B_7$	8	10		MHz	$C_L < 20$ pF, $R_L > 1$ k $\Omega$
– 3 dB video bandwidth	$B_8$	8	10		MHz	$C_L < 50$ pF, $R_L > 1$ k $\Omega$
Cross talk attenuation	$a_{9-8}$	50			dB	$V_4 = 0$ V
$f_{mod} = 5$ MHz						
Intermodulation	$\alpha_{7/8}$	54	60		dB	$f_{1.07 \text{ MHz}} = f_{SC} - f_{CC}$
Suppression of video signal harmonics		35	40		dB	
Signal to noise ratio (weighted)	$S/N_{7/8}$	56	60		dB	CCIR – 567
Ripple rejection on pin 7 and 8	$RR_{7/8}$	35	40		dB	$f_{Vs} = 0 \dots 100$ kHz
Max. input current	$I_9$		0.5	1	$\mu$ A	

## AFC

AFC-control steepness	$\Delta I_{10}/\Delta f$	0.6	0.8	1.0	$\mu$ A/kHz	
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## Tuner AGC

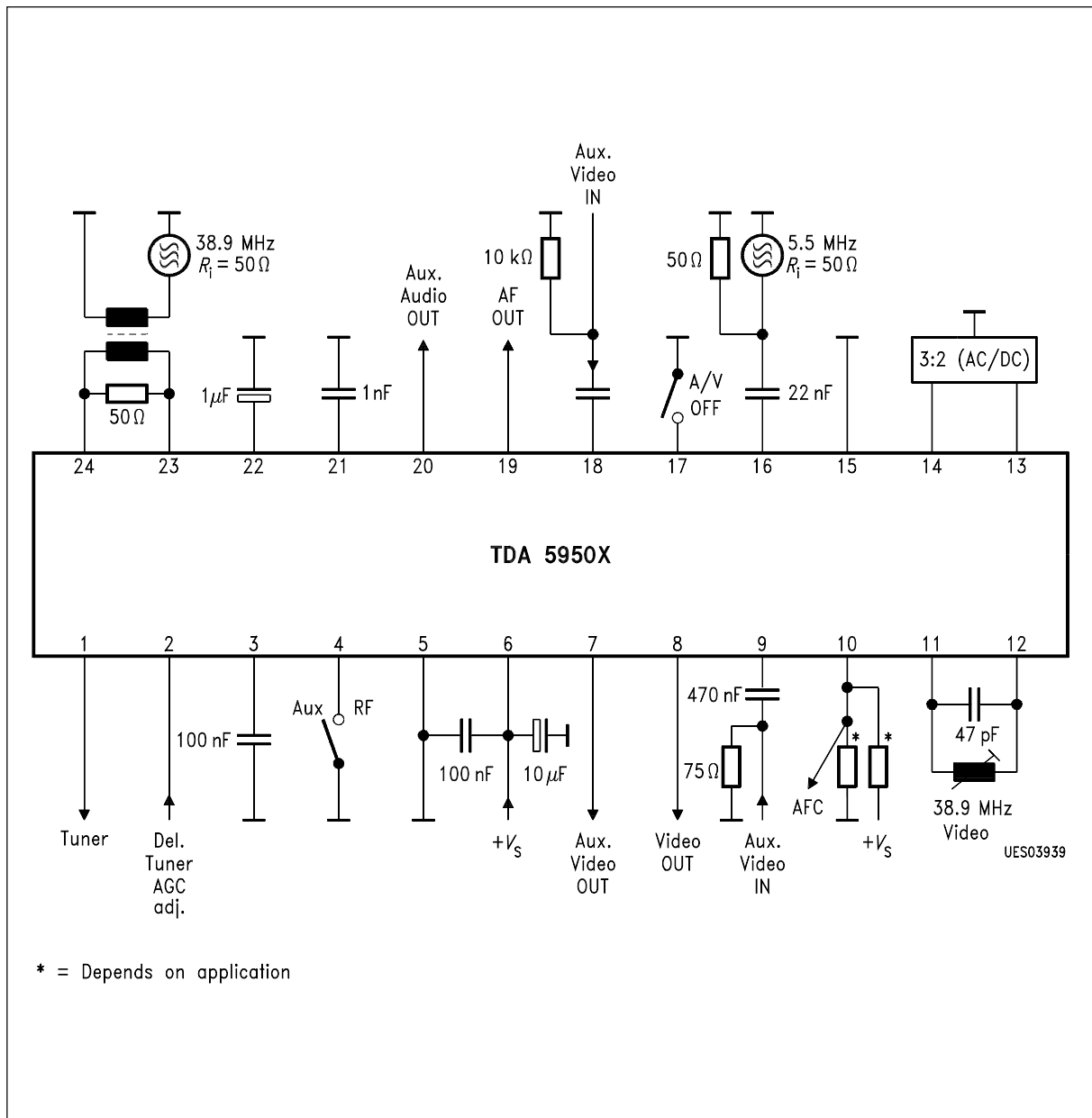
Sink current	$I_1$	0 2.5	3.5	10	$\mu$ A mA	no tuner gain reduction max. tuner gain reduction
Threshold range for del. Tuner-AGC	$V_{IF}$	50		5	mV mV	$R_2 = 4.7$ k $\Omega$ $R_2 = 0$ $\Omega$

\*) Design hints

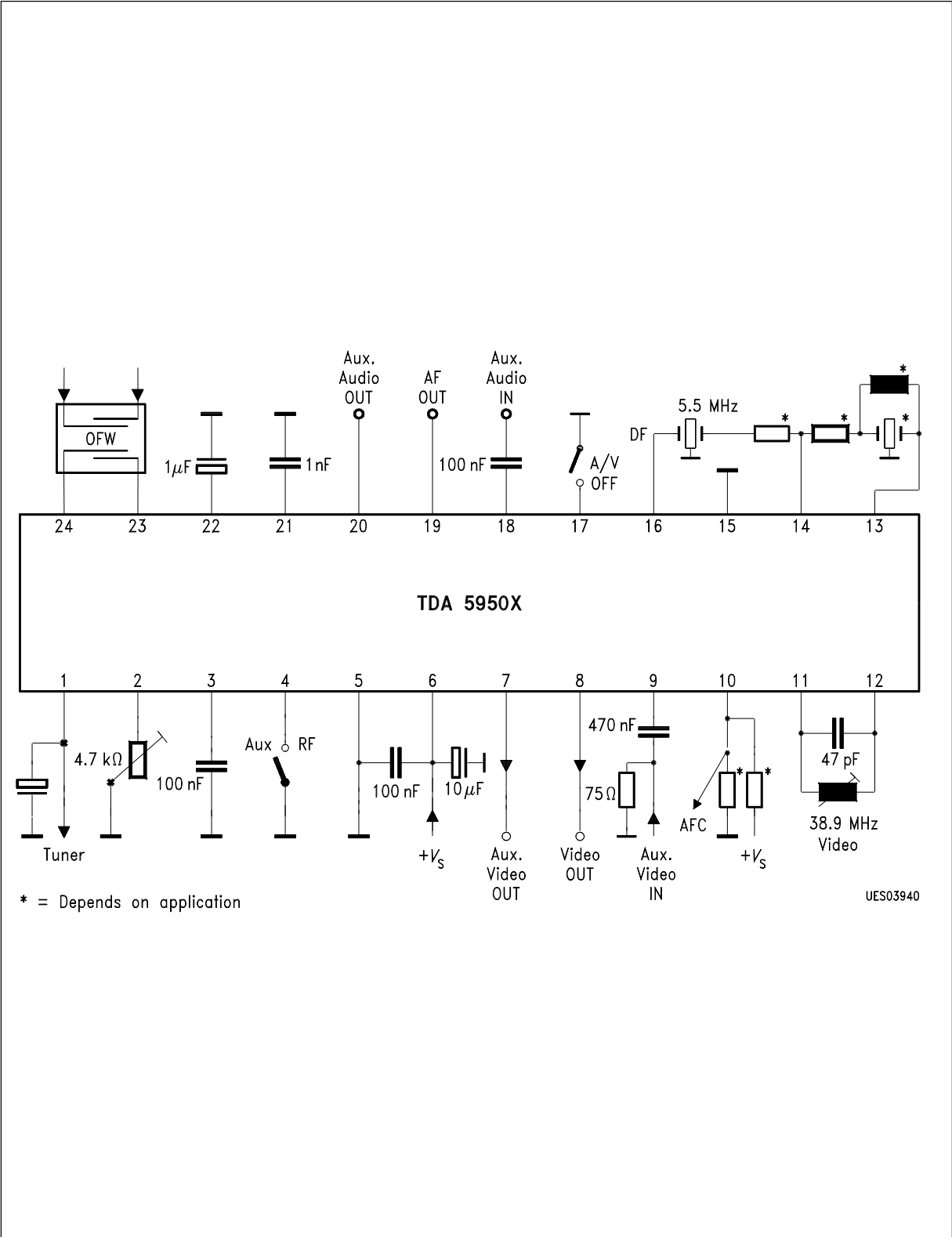


**Alignment Instructions**

At a video carrier input level of  $V_{23/24} = 4 \text{ mVrms}$ ,  $f_{P/C} = 38.9 \text{ MHz}$ , and a superimposed AGC voltage of  $V_3 = 1.5 \text{ V}$ , the demodulator tank circuit is preliminarily aligned until a max. video signal 14 Vpp is obtained at the video output. Any suitable video test signal can be used for modulation. The AGC voltage  $V_3$  is reduced until the signal is approx. 1 Vpp and the max. video signal is obtained when fine-aligning the demodulator tank circuit. The alignment is not critical due to relatively large bandwidth of the demodulator tank circuit. Fine-tuning to intercarrier  $S/N$ , differential phase or 2T-pulse characteristics is possible.



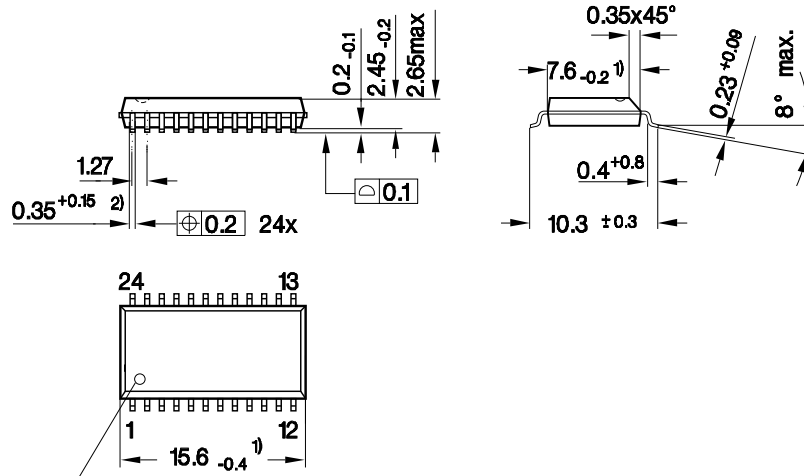
**Test Circuit**



Application Circuit

Package Outlines

**Plastic-Package, P-DSO-24-1 (SMD)**  
(Plastic Dual Small Outline)



Index Marking

- 1) Does not include plastic or metal protrusion of 0.15 max. per side
- 2) Does not include dambar protrusion of 0.05 max. per side

GPS05144

**Sorts of Packing**

Package outlines for tubes, trays etc. are contained in our Data Book "Package Information"

SMD = Surface Mounted Device

Dimensions in mm