

**VISION IF SYSTEM WITH AFC**

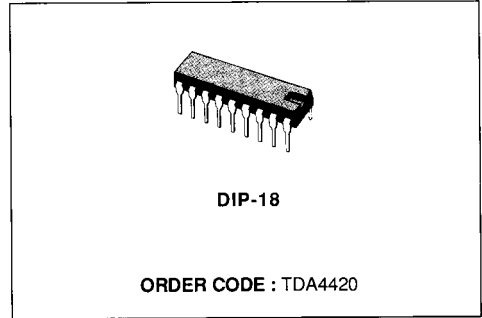
- HIGH GAIN-HIGH STABILITY
- VERY LOW INTERMODULATION PRODUCTS
- MINIMUM DIFFERENTIAL ERROR
- CONSTANT INPUT IMPEDANCE INDEPENDENT OF AGC
- FAST AGC GATING-ACTION, LARGELY INDEPENDENT OF PULSE SHAPE AND AMPLITUDE
- ADJUSTABLE WHITE LEVEL
- LARGE AFC OUTPUT CURRENT SWING (push-pull output)
- SWITCHABLE AFC

- AGC amplifier for tuner drive with variable delay
- phase comparator for AFC current generation
- electronic AFC switch, controlled by a DC threshold detector
- thermally compensated push-pull AFC output stage.

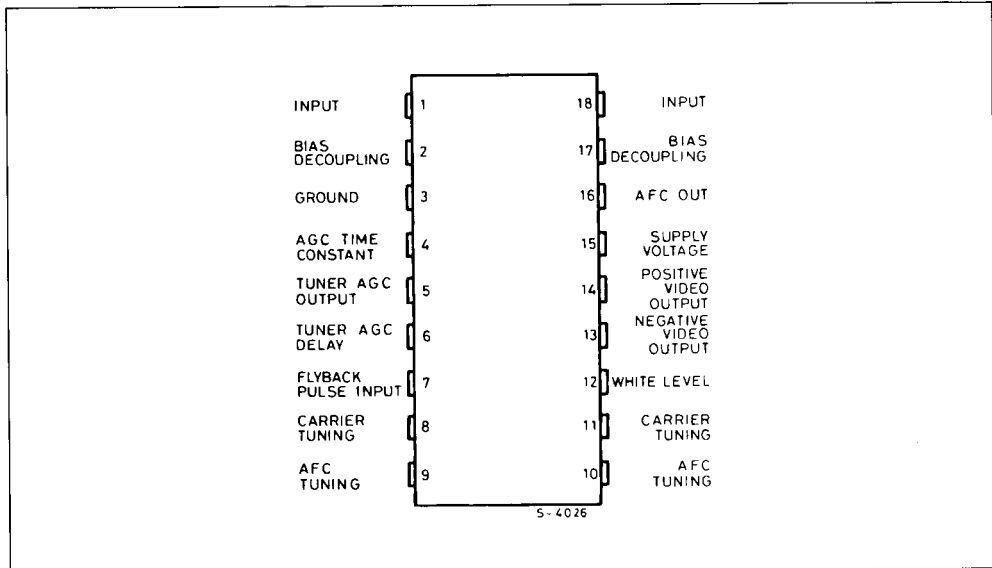
**DESCRIPTION**

The TDA4420 is a monolithic integrated circuit in 18 lead dual in-line plastic package. The functions incorporated are :

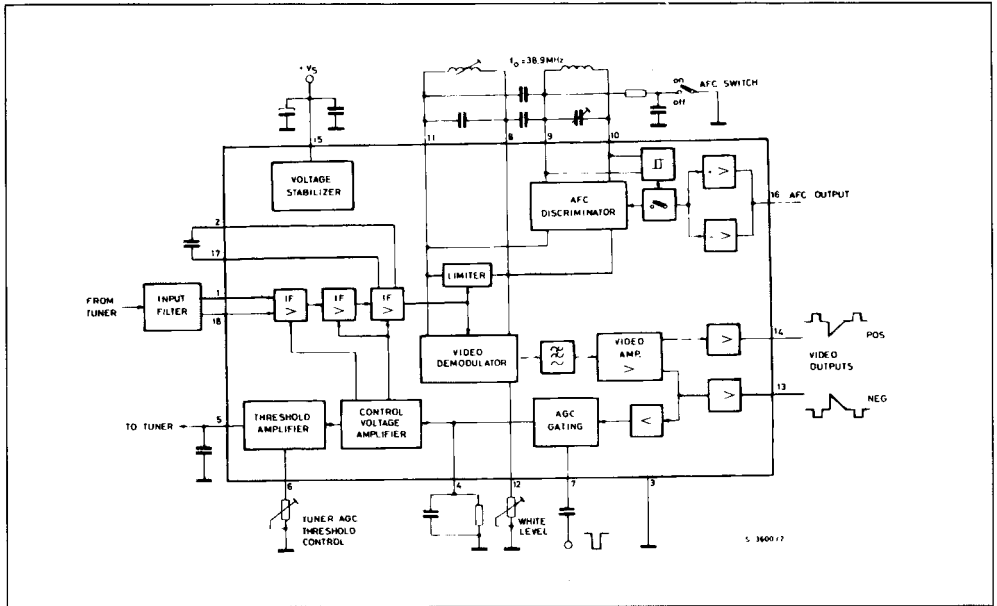
- gain controlled vision IF amplifier
- video demodulator controlled by picture carrier
- AGC detector with gating facility



**CONNECTION DIAGRAM (top view)**



BLOCK DIAGRAM



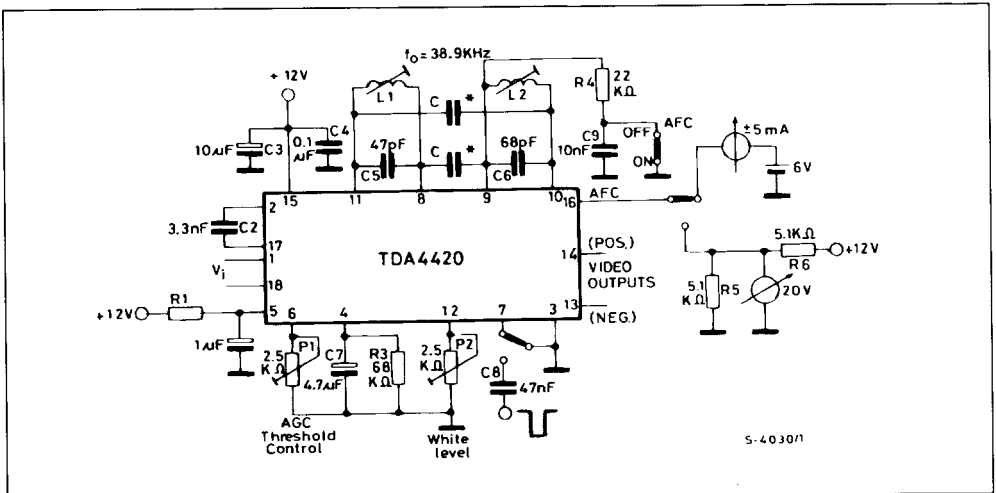
ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_S$	Supply Voltage (pin 15)	15	V
$V_5$	Voltage at Pin 5	15	V
$I_{13}, I_{14}$	Video DC Output Current	5	mA
$P_{tot}$	Total Power Dissipation at $T_{amb} \leq 70^\circ C$	1	W
$T_{stg}, T_j$	Storage and Junction Temperature	- 40 to 150	$^\circ C$

THERMAL DATA

$R_{th\ j-amb}$	Thermal Resistance Junction-ambient	Max	80	$^\circ C/W$
-----------------	-------------------------------------	-----	----	--------------

## TEST CIRCUIT



Note : (\*) C  $\cong$  1.5 pF (pin and lead capacitance).

**ELECTRICAL CHARACTERISTICS** (Refer to the test circuit ;  $V_s = 12$  V,  $f_0 = 38.9$  MHz ;  $P_1 = 2.5$  K $\Omega$  ; pin 7 connected to GND ;  $P_2$  adjusted for  $V_{13} = 3.3$  Vpp ; AFC off ;  $T_{amb} = 25$  °C unless otherwise specified)

## DC CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_s$	Supply Voltage Range (pin 15)		10	12	15	V
$I_s$	Supply Current (pin 15)			52		mA
$V_{14}$	Video Output DC Voltage	$V_{13} = 5.5$ V (1)		5.6		V
$V_{13}$	Video Output DC Voltage	Pin 12 Open (1)			4.5	V
		Pin 12 Grounded (1)	7			V
$V_{13}$	Peak Black Clamping Level at Negative Video Output		1.75	1.9	2.15	V
$I_{13}$	Output DC Current (pin 13)	$V_s = 15$ V $V_{13} = 8$ V		1.6		mA
$I_9, I_{10}$	DC Control Current for AFC off		150	300		$\mu$ A

- Notes :
- $V_{13}$  and  $V_{14}$  are simultaneously adjustable by means of the resistance connected between pin 12 and ground ( $P_2$ ).
  - $\Delta V_i = +60$  dB (see note 7) ;  $f_m = 100$  KHz ;  $m = 0.82$ .
  - Input at pin 7 through C8.
  - The input voltage  $V_i$  can have any value within the AGC range.
  - $P_2$  adjusted for  $V_{13} = 5.5$  V or  $V_{13} = 6.4$  V ;  $f_m = 100$  KHz ;  $m = 0.82$ .
  - $\Delta V_o = 1$  dB ;  $f_m = 100$  KHz ;  $m = 0.82$ .
  - The measured amplitude is assumed as 0 dB reference level of  $V_i$  that is the rms value of the unmodulated video carrier (modulation down).
  - $P_2$  is adjusted in order to have  $V_{13} = 3$  Vpp at  $V_i = 4$  mV, then the sensitivity is obtained as the minimum input voltage that maintains this output level.  $f_m = 100$  KHz ;  $m = 82$  %.
  - $f_0 = 38.9$  MHz (video carrier) ;  $f_a = 33.4$  MHz (sound carrier) ; the amplitude of the sound carrier is 30 dB below the amplitude of the video carrier.
  - $V_i$  at  $f_0 = 38.9$  MHz (video carrier) ;  $f_a = 33.4$  MHz, 6 dB below  $V_i$  (sound carrier) ;  $f_b = 34.47$  MHz, 24 dB below  $V_i$  (Chroma subcarrier).
  - $V_i = 40$  dB ;  $R_5 = R_6 = 5.1$  K $\Omega$  ; AFC on ;  $f_0 = 39.9$  MHz ;  $f_1 = 37.9$  MHz.
  - $V_i = 40$  dB ;  $f_0 = 39.2$  MHz ; AFC on ;  $V_{15} = 6$  V.
  - $V_i = 40$  dB ;  $f_0 = 38.9$  MHz ;  $f_2 = 39.2$  MHz ; AFC on ;  $V_{15} = 6$  V.

## ELECTRICAL CHARACTERISTICS (continued)

## AC CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_5$	Available Tuner AGC Current	(2)		10		mA
$V_7$	AGC Gating Pulse Input Peak Voltage	$f_{\text{pulse}} = 15625 \text{ Hz}$ (3)	- 1.5	- 3	- 5	V
$V_0$	Peak to Peak Video Output Signal (pin 13)	$V_{13} = 5.5 \text{ V}$ (4), (5)		3.3		V
		$V_{13} = 6.4 \text{ V}$ (4), (5)		4.2		V
$\Delta V_i$	AGC Range	(6)	50	60		dB
B	Frequency Response (- 3 dB)	(4)	8	10		MHz
$V_i$	Input Sensitivity	(7), (8)	100	150	200	$\mu\text{V}$
$V_{13}, V_{14}$	Video carrier and video carrier 2nd harmonic leakage at video output.	$V_i = 30 \text{ dB } f_o = 38.9 \text{ MHz}$			30	mV
		$2 f_o = 77.8 \text{ MHz}$			50	mV
$V_{14}$	Sound IF at Positive Video Output (5.5 MHz)	(4), (9)	30			mV
d	Differential Distortion of Negative Video Output Signal	$V_i = 30 \text{ dB}$ (standard staircase modulating signal)		3		%
$d_{im}$	Intermodulation Product at Video Outputs (1.07 MHz)	(4), (10)		- 50		dB
$R_i$	Input Resistance between Pins 1 and 18	(4)		1.4		K $\Omega$
$C_i$	Input Capacitance between Pins 1 and 18			2		pF
$V_{16}$	AFC Voltage Range	(11)	1		$V_s - 1.5$	V
$I_{16}$	Maximum Available AFC Current	(12)			$\pm 3$	mA
$\frac{\Delta I_{16}}{\Delta f}$	AFC Slope	(13)		$\pm 0.01$		$\frac{\text{mA}}{\text{KHz}}$

- Notes :**
- $V_{13}$  and  $V_{14}$  are simultaneously adjustable by means of the resistance connected between pin 12 and ground ( $P_2$ ).
  - $\Delta V_i = + 60 \text{ dB}$  (see note 7) ;  $f_m = 100 \text{ KHz}$  ;  $m = 0.82$ .
  - Input at pin 7 through C8.
  - The input voltage  $V_i$  can have any value within the AGC range.
  - $P_2$  adjusted for  $V_{13} = 5.5 \text{ V}$  or  $V_{13} = 6.4 \text{ V}$  ;  $f_m = 100 \text{ KHz}$  ;  $m = 0.82$ .
  - $\Delta V_s = 1 \text{ dB}$  ;  $f_m = 100 \text{ KHz}$  ;  $m = 0.82$ .
  - The measured amplitude is assumed as 0 dB reference level of  $V_i$  that is the rms value of the unmodulated video carrier (modulation down).
  - $P_2$  is adjusted in order to have  $V_{13} = 3 \text{ Vpp}$  at  $V_i = 4 \text{ mV}$ , then the sensitivity is obtained as the minimum input voltage that maintains this output level.  $f_m = 100 \text{ KHz}$  ;  $m = 82 \%$ .
  - $f_o = 38.9 \text{ MHz}$  (video carrier) ;  $f_a = 33.4 \text{ MHz}$  (sound carrier) ; the amplitude of the sound carrier is 30 dB below the amplitude of the video carrier.
  - $V_i$  at  $f_o = 38.9 \text{ MHz}$  (video carrier) ;  $f_a = 33.4 \text{ MHz}$ , 6 dB below  $V_i$  (sound carrier) ;  $f_b = 34.47 \text{ MHz}$ , 24 dB below  $V_i$  (Chroma subcarrier).
  - $V_i = 40 \text{ dB}$  ;  $R_s = R_6 = 5.1 \text{ K}\Omega$  ; AFC on ;  $f_o = 39.9 \text{ MHz}$  ;  $f_a = 37.9 \text{ MHz}$ .
  - $V_i = 40 \text{ dB}$  ;  $f_o = 39.2 \text{ MHz}$  ; AFC on ;  $V_{16} = 6 \text{ V}$ .
  - $V_i = 40 \text{ dB}$  ;  $f_o = 38.9 \text{ MHz}$  ;  $f_2 = 39.2 \text{ MHz}$  ; AFC on ;  $V_{16} = 6 \text{ V}$ .

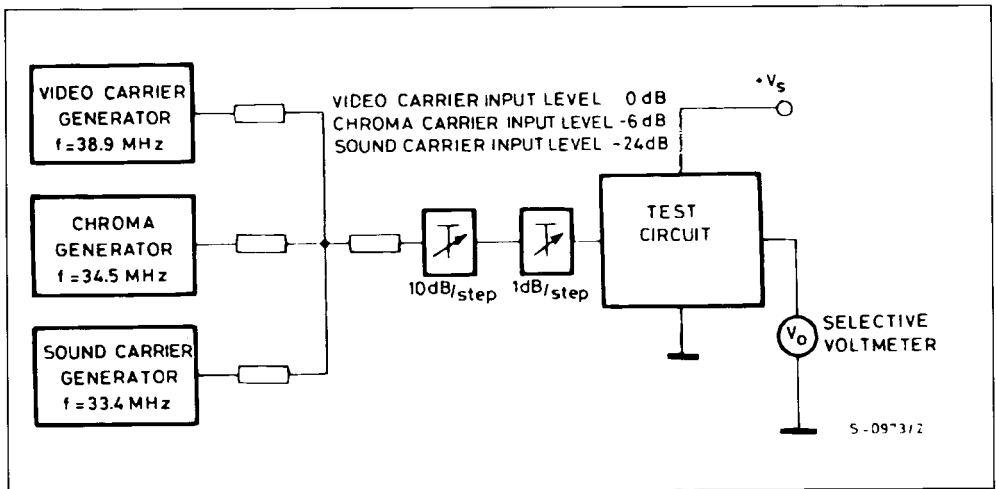
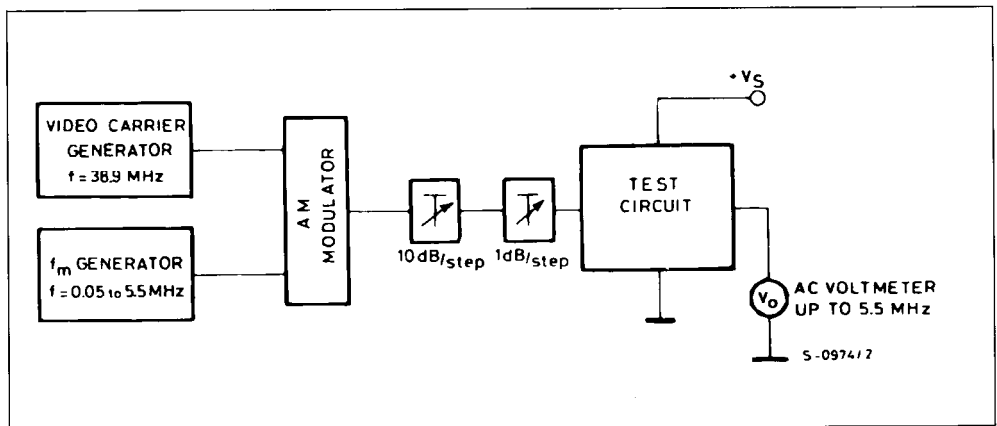
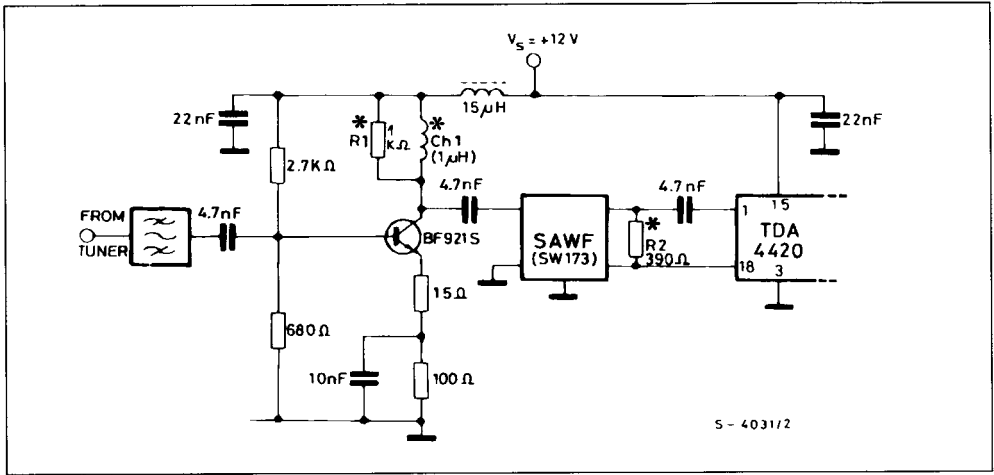
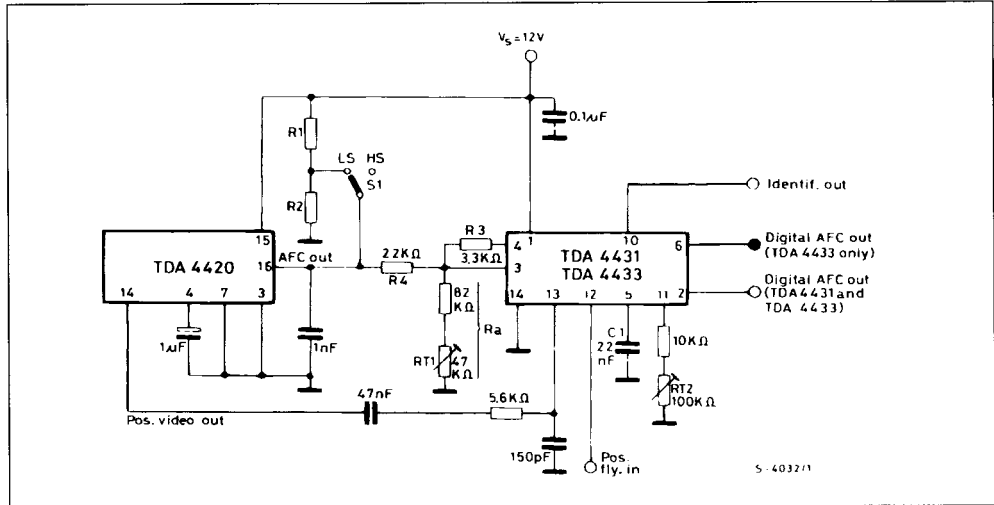
Figure 1 : Set-up for Measurement of  $d_{im}$ .Figure 2 : Set-up for Measurement of  $\Delta V_o$ .

Figure 3 : Application Circuit.



S - 4031/2

Figure 4 : TV Signal Identification Circuit.



S - 4032/1

**TV signal identification circuit :**

The suggested application circuit is shown in fig. 4.

The passive components are chosen as follows :

**R<sub>1</sub> and R<sub>2</sub> :** these define the AFC response slope.  
For R<sub>1</sub> = R<sub>2</sub> = 5.1 KΩ, the typical slope is 750/11 KHz/V (with AFC output unloaded).

**S<sub>1</sub> :** switches between low slope (LS) and high slope (HS). The high slope is typically 88/11 KHz/V.

**R<sub>3</sub> and R<sub>4</sub> :** the ratio (R<sub>3</sub> + R<sub>4</sub>)/R<sub>3</sub> defines the digital AFC width (δf) calculated from the linear AFC width (2Δf). With V<sub>s</sub> = 12 V, the relation is :

$$\delta f = 0.036 (2\Delta f) \frac{R_3 + R_4}{R_3}$$

$R_{T1}$  : by means of this trimmer it is possible to align the linear tuning with the digital one, at the same frequency. The typical relation is :

$$R_a = 33 R_3$$

with  $R_3 = 3.3 \text{ K}\Omega$ ,  $R_a$  can be a fixed resistor of  $110 \text{ K}\Omega$ .

To make better sensitivity adjustment of trimmer  $R_{T2}$ , it is necessary to use only a weak signal at the

antenna. The video information must be a black picture or a field of small white points on a black field. Furthermore, the action of the syncs separator must be as quick as possible.

In receivers with automatic program search,  $S1$  should be in the HS position and then the components  $S1$ ,  $R1$  and  $R2$  can be omitted completely.

**Figure 5** : Linear and Digital AFC Characteristics (TDA4420 and TDA4431).

