

VISION IF SYSTEM WITH AFC

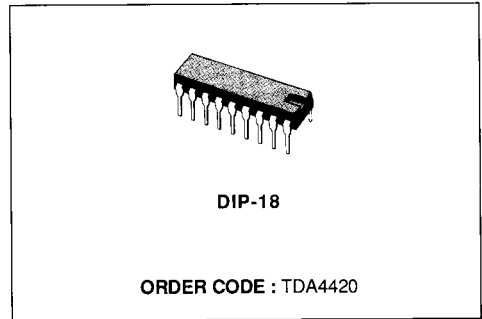
- HIGH GAIN-HIGH STABILITY
- VERY LOW INTERMODULATION PRODUCTS
- MINIMUM DIFFERENTIAL ERROR
- CONSTANT INPUT IMPEDANCE INDEPENDENT OF AGC
- FAST AGC GATING-ACTION, LARGELY INDEPENDENT OF PULSE SHAPE AND AMPLITUDE
- ADJUSTABLE WHITE LEVEL
- LARGE AFC OUTPUT CURRENT SWING (push-pull output)
- SWITCHABLE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

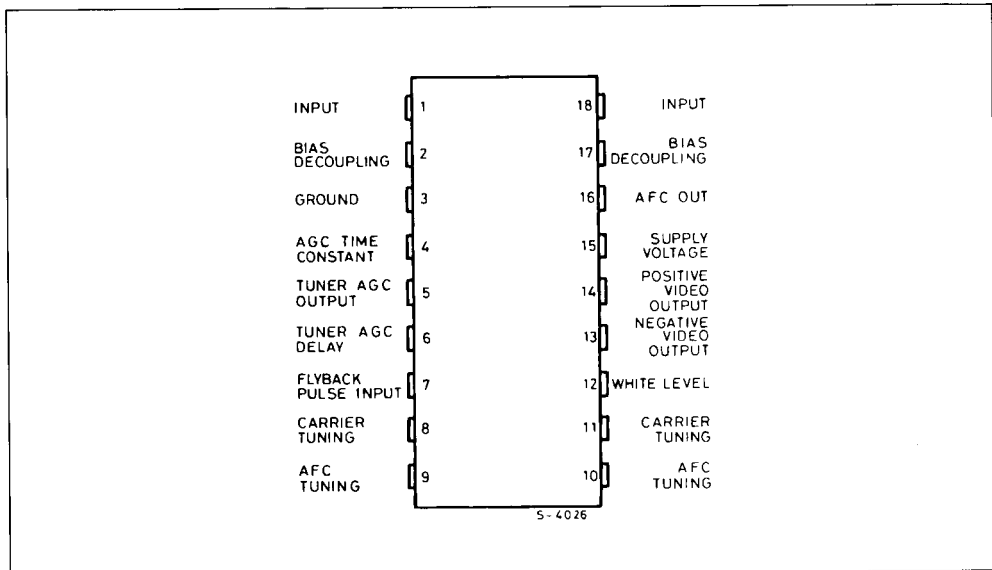
DESCRIPTION

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

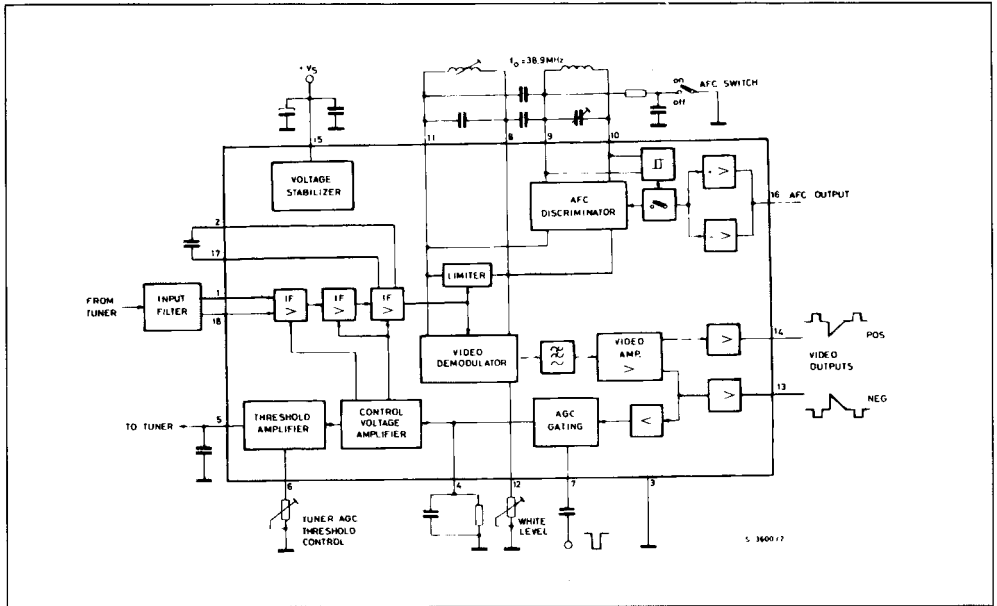
- gain controlled vision IF amplifier
- video demodulator controlled by picture carrier
- AGC detector with gating facility



CONNECTION DIAGRAM (top view)



BLOCK DIAGRAM



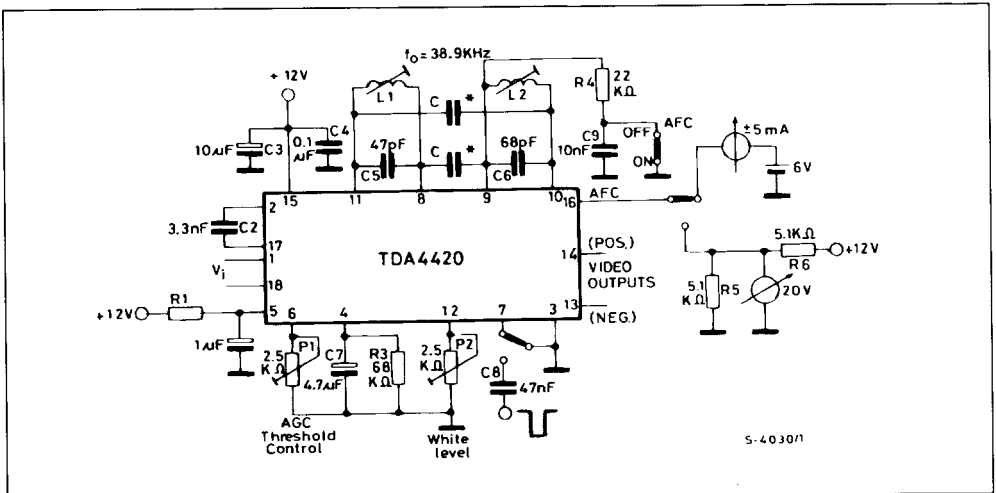
ABSOLUTE MAXIMUM RATINGS

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	$^\circ C/W$
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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 Ω ; 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		μ 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 Ω ; 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
ΔV_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	μV
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
		(4) $2 f_o = 77.8 \text{ MHz}$			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 Ω
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)			± 3	mA
$\frac{\Delta I_{16}}{\Delta f}$	AFC Slope	(13)		± 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).
 - $V_i = 40 \text{ dB}$; $R_5 = R_6 = 5.1 \text{ K}\Omega$; 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 ; $V_{16} = 6 \text{ V}$.
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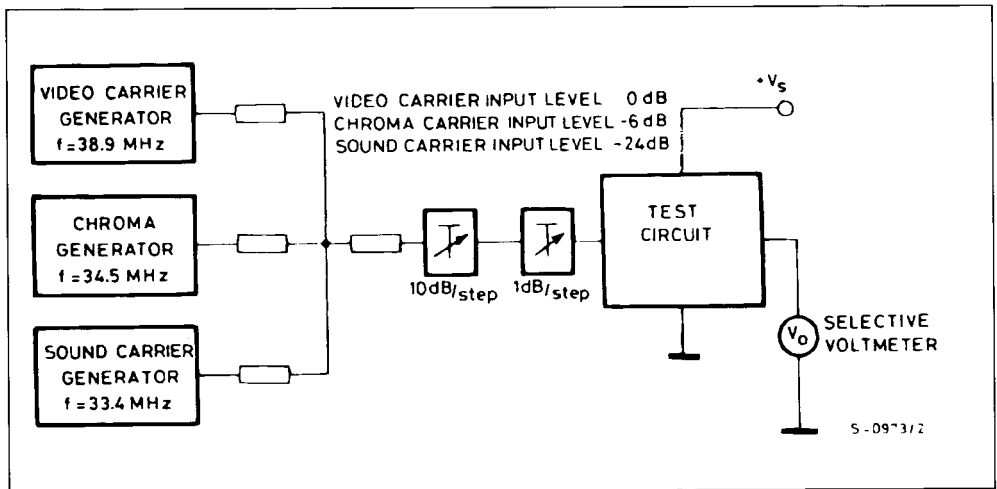
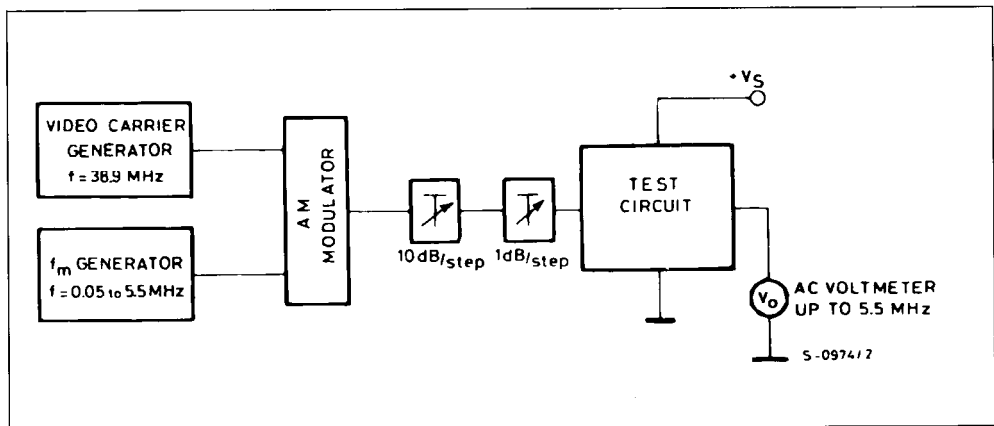
Figure 1 : Set-up for Measurement of d_{im} .Figure 2 : Set-up for Measurement of ΔV_o .

Figure 3 : Application Circuit.

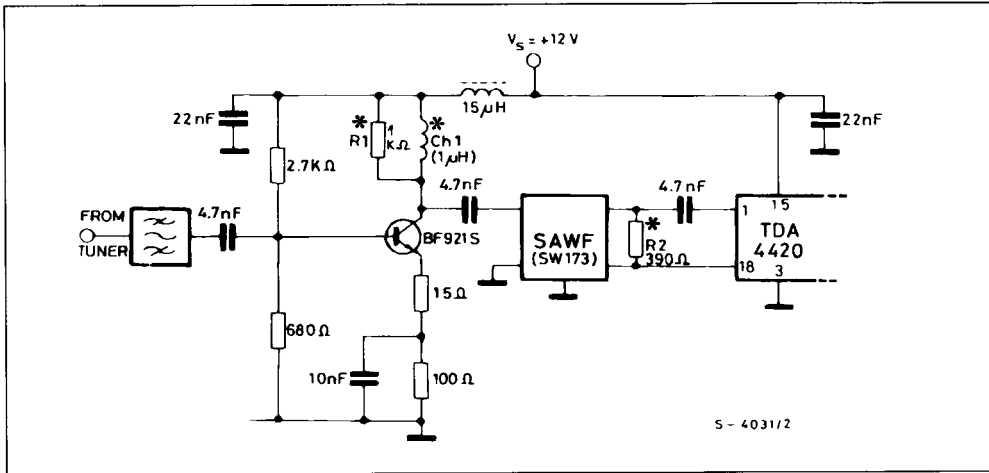
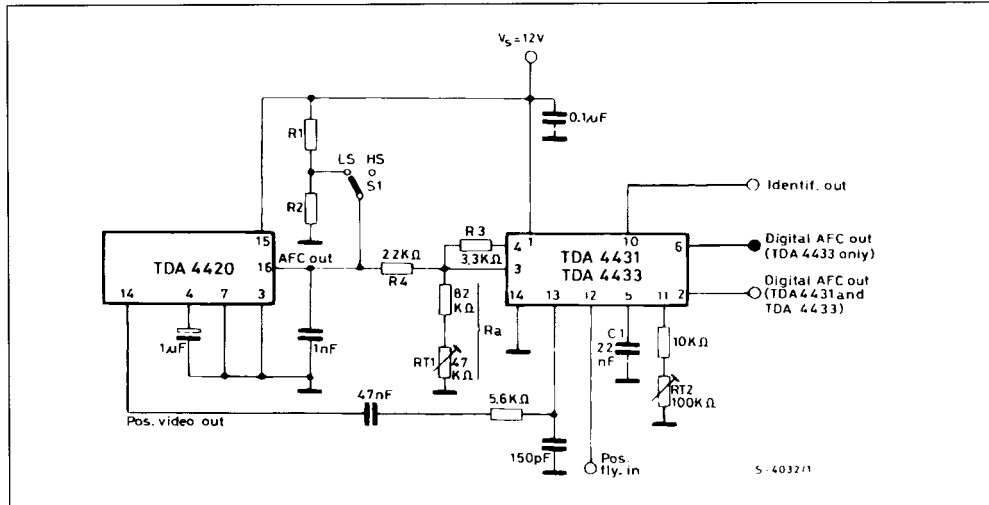


Figure 4 : TV Signal Identification Circuit.



TV signal identification circuit :

The suggested application circuit is shown in fig. 4.

The passive components are chosen as follows :

R₁ and R₂ : these define the AFC response slope.
For R₁ = R₂ = 5.1 KΩ, the typical slope is 750/11 KHz/V (with AFC output unloaded).

S₁ : switches between low slope (LS) and high slope (HS). The high slope is typically 88/11 KHz/V.

R₃ and R₄ : the ratio (R₃ + R₄)/R₃ defines the digital AFC width (δf) calculated from the linear AFC width (2Δf). With V_s = 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).

