

National Semiconductor
TDA440 Video IF Amplifier

General Description

The integrated circuit has the following functions incorporated: 3 symmetrical IF (broad band) amplifier with first and second regulated stages, controlled color carrier demodulator; video post-amplifier with low pass response and output independent of supply fluctuations; gated AGC section for the IF amplifier; delayed regulated output voltage for the tuner pre-stage.

Features

- High gain – high stability
- Constant input impedance independent of AGC
- Poor noise increase due to AGC action
- Negative video signal hardly affected by supply voltage variations

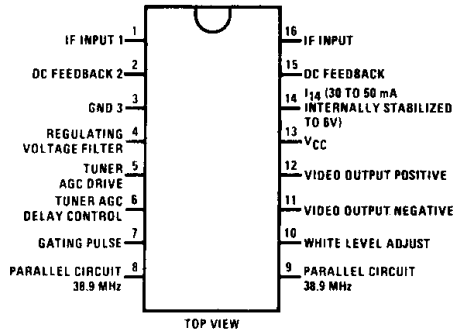
- Minimum RF breakthrough to video outputs
- Fast AGC action – gating largely independent of pulse shape and amplitude
- Very low intermodulation products
- Minimum differential error
- Positive as well as negative video signal available from low impedance outputs
- Integrated temperature compensating circuit
- DC output component adjustable (peak white)

Applications

- Video IF amplifier for color and monochrome television receivers

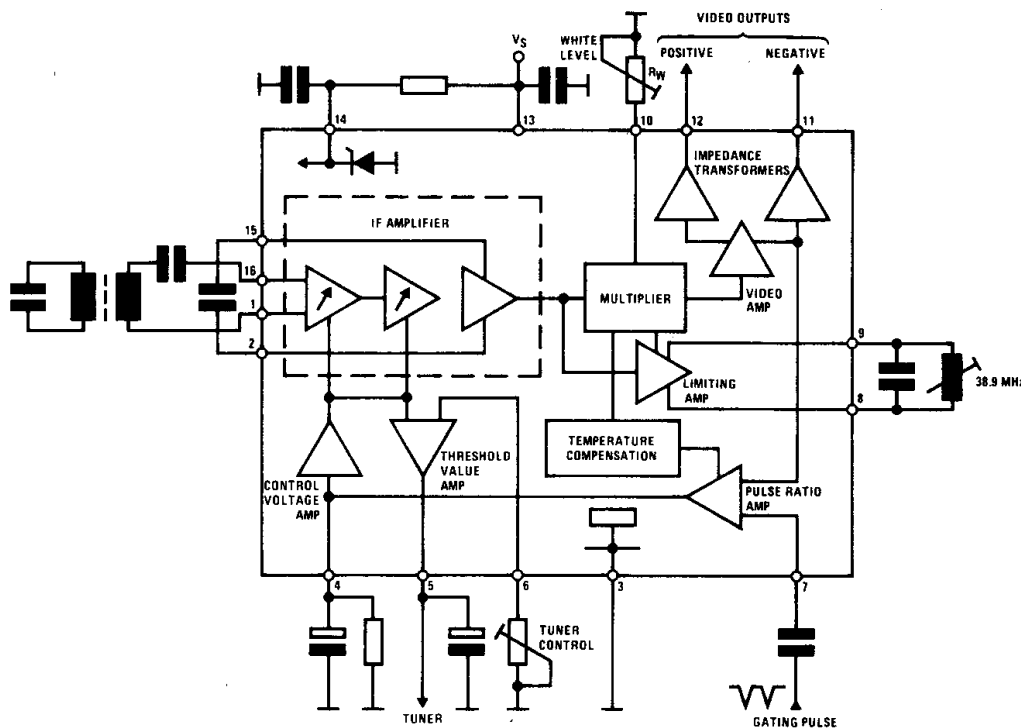
Connection and Block Diagrams

Dual-In-Line Package



Dual-In-Line Package, Order Number TDA440
 See NS Package N16A

Quad-In-Line Package, Order Number TDA440Q
 See NS Package N16C



Absolute Maximum Ratings

V_S , Supply Voltage Range (Pin 13)	10 to 15V	V_{EXT} , External Voltage (Pin 4)	3.2V
I_S , Supply Current of Low Voltage Stabilizer (Pin 14)	50 mA	Power Dissipation	
V_Q , Open Loop Voltage (Pin 5)	15V	P_{TOT} , $T_A \leq 55^\circ\text{C}$	700 mW
Video DC Output Current		T_J , Junction Temperature	125°C
I_Q , Positive (Pin 12)	5 mA	T_A , Ambient Temperature Range	-25°C to +70°C
I_Q , Positive (Pin 12)	30 mA	t_{STG} , Storage Temperature Range	-25°C to +125°C
I_Q , Negative (Pin 11)	5 mA		
I_Q , Negative (Pin 11)	30 mA	Thermal Resistance	
V_W , White Level Control (R_W) (Pin 10)	-1 to +3V	R_{thJA} , Junction Ambient	100°C/W Max

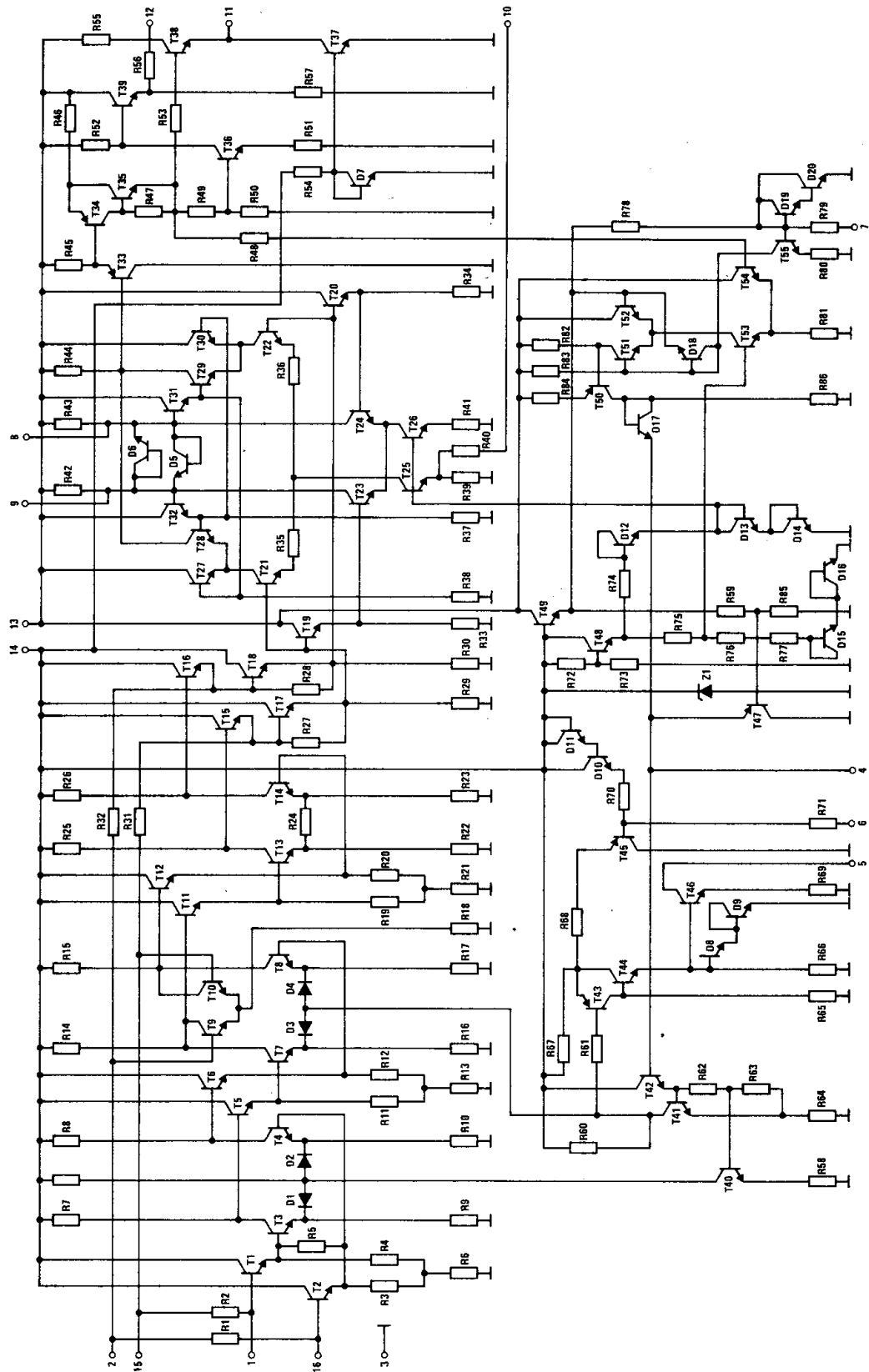
Electrical Characteristics $V_S = 12V$, $T_A = 25^\circ\text{C}$, Reference point pin 3 unless otherwise specified

PARAMETER		CONDITIONS	MIN	TYP	MAX	UNITS
V_S	Supply Voltage	Pin 13	10	12	15	V
I_S	Supply Current	Pin 13	15	19	25	mA
V_S	Supply Voltage	Pin 14, $I_S = 40$ mA	5.5	5.8	6.4	V
V_Q	Negative Video DC Output Voltage	Pin 11		5.5		V
V_Q	With White Level Adjustable	Pins 10 and 11, $R_W = \infty$ $R_W = 0$	6.5		4.8	V V
V_Q	Peak Black Clamping Level for Negative Video DC Output Voltage	Pin 11	1.75	1.9	2.15	V
I_Q	Output DC Current Reference Point	Pins 11 and 13		3.2		mA
V_Q	Positive Video DC Output Voltage	Pin 12		5.6		V
I_Q	Available Tuner Control Current 10 dB after Onset of Tuner Control Action (Note 1)	Pin 5	3	4.5		mA
V_i	Negative Gating Pulse	Pin 7	1.5	3	5	V _{SS}
$-v_q$	Composite Video Output Level	Pin 11 $V_Q = 5.5V$ $V_Q = 6.4V$		3.3 4.2		V _{SS} V _{SS}
$\Delta A_{(IF)}$	AGC Range		50	56		dB
B_{VIDEO}	Video Bandwidth	$\Delta v_{VIDEO} = -3$ dB	8	10		MHz
Δv_{VIDEO}	Video Frequency Response Change	$\Delta A_{(IF)} = 50$ dB, $B_{VIDEO} = 0-5$ MHz		1.0	2.0	dB
v_i	Symmetrical Input Voltage	Pins 1-16, $-v_q = 3.3$ V _{SS} (Pin 11)	100	150	220	μ V
	Maximum IF Voltage Level Present at Video Outputs Over the Full AGC Range	Pins 11 and 12 $f = 38.9$ MHz $f = 77.8$ MHz (2. Harm)			30 50	mV mV
	Sound IF Voltage Level Present at Video Outputs with Selective Circuit	Pin 12, $f = 5.5$ MHz, $B_T/T_T = 30$ dB	30			mV
d	Differential Gain of Negative Comp. Video Output Signal, for Full Black to White Swing				15	%
a_{IM}	Suppression of Sound Carrier/Color Subcarrier IP (1.07 MHz) with Respect to Color Subcarrier Level		40			dB
	Picture Carrier			0		dB
	IF Color Subcarrier Level			-6		dB
	IF Sound Carrier Level			-24		dB
	Input Impedance Reference Point	Pin 16				
R_i	$A_{(IF)}$ Max	Pin 1		1.4		k Ω
C_i				2		pF
R_i	$A_{(IF)}$ Min	Pin 1		1.4		k Ω
C_i				1.9		pF

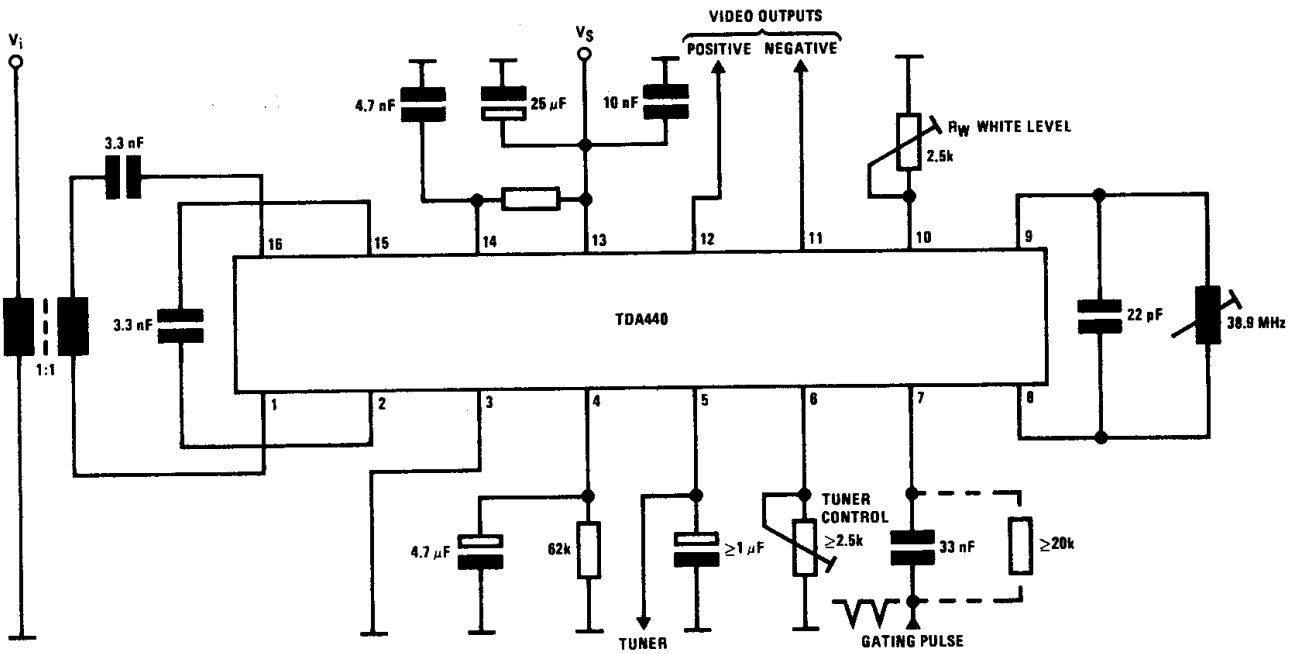
Note 1: On request ≥ 7 mA

Schematic Diagram

Application Note for Reference Circuit to Improve Audio Interference and Cross Color Characteristics



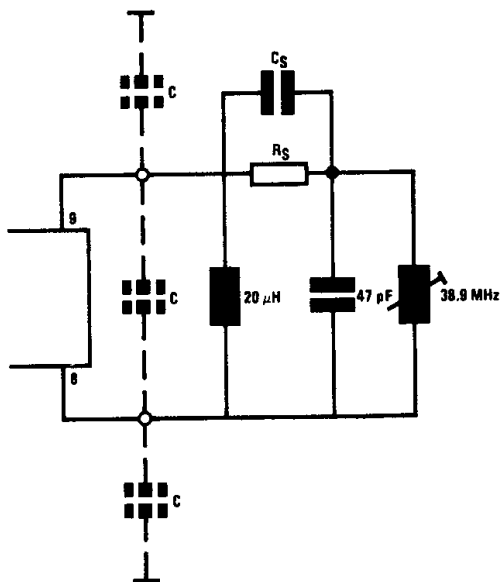
Test Circuit



Note. Supply voltage must be disconnected before inserting the integrated circuit in the socket.

Typical Application

Improved Tank Circuit to Reduce Audio Interference and Chroma Beat



C = Parasitic capacitance at pins 8 and 9 should be kept minimum

C_S = 6–10 pF -- series capacitance

f_o = 38.9–(1.8–2.75) MHz--series resonance frequency

R_S = 1.8–3.3 k Ω -- series resonance damping determine the tuning characteristics

i.e., R_S = 2.4 k Ω tuning range, f = 3 MHz