# SIEMENS

## Satellite-Video IC

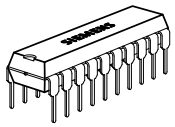
**TDA 6151-5**
**TDA 6151-5X**

**Preliminary Data**

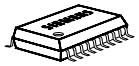
**Bipolar IC**

### Features

- Adjustable gain for different FM deviations
- Video buffer and special baseband output for the sound processor SDA 6102-5X are available
- Clamping circuit for elimination of "Energy Dispersal" signal
- Built-in video switch for external applied video signal
- Application in satellite receiving systems.



**P-DIP-20-1**



**P-DSO-20-1**

| Type | Ordering Code | Package |
|---|---|---|
| TDA 6151-5 | Q67000-A5175 | P-DIP-20-1 |
| TDA 6151-5X | Q67000-A5074 | P-DSO-20-1 (SMD) |

The video circuit for a satellite application consists of a voltage controlled AGC-amplifier, driver for two external de-emphasis networks, followed by a three-stage switch. An additional baseband output is available via a driver. The output signal of the video switch is applied to a video clamping circuit, this clamping circuit removes the energy dispersal signal from the video signal. The clamped signal is applied via a video switch to the SCART-output.

### Circuit Description

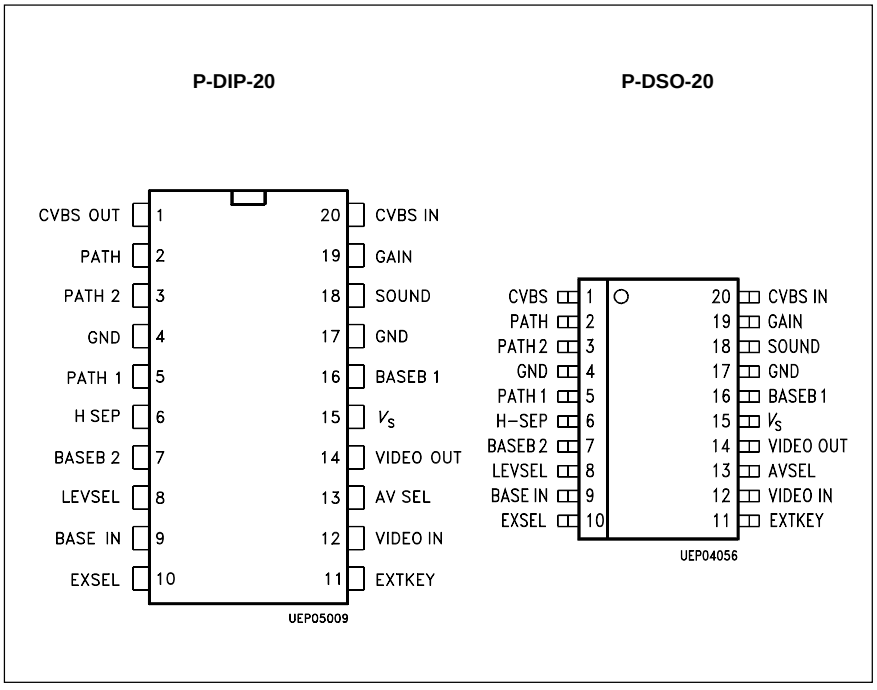
The demodulated FM-satellite video signal is fed via a buffer amplifier to a gain controlled amplifier. The gain control is done using an external applied DC-voltage. The output signal of this amplifier is used to drive three separate signal pathes. First of all the baseband is fed via a high pass filter with a cut off frequency of approx. 4 MHz to the input of a SAT-TV-sound processor, e.g. TDA 6160 X. A second output with a buffer amplifier is used to drive two external de-emphasis networks. After passing through the de-emphasis networks the baseband signals are fed into two inputs of the de-

emphasis selector switch. The third output of the gain controlled amplifier has a direct connection to the de-emphasis selector switch. This allows the selection of the sufficient frequency response of the de-emphasis network or a linear frequency response by passing the de-emphasis networks.

The output signal of the de-emphasis selector switch is fed separately via two driver amplifiers to the baseband 1 output and to the baseband 2 output. This baseband 2 output is fed via an external low pass filter to the input of the energy dispersal clamping circuit. This circuit removes the energy dispersal signal from the baseband signal. The clamping circuit can be operated with an internally generated clamping signal or a clamp pulse applied to the IC from an external source.

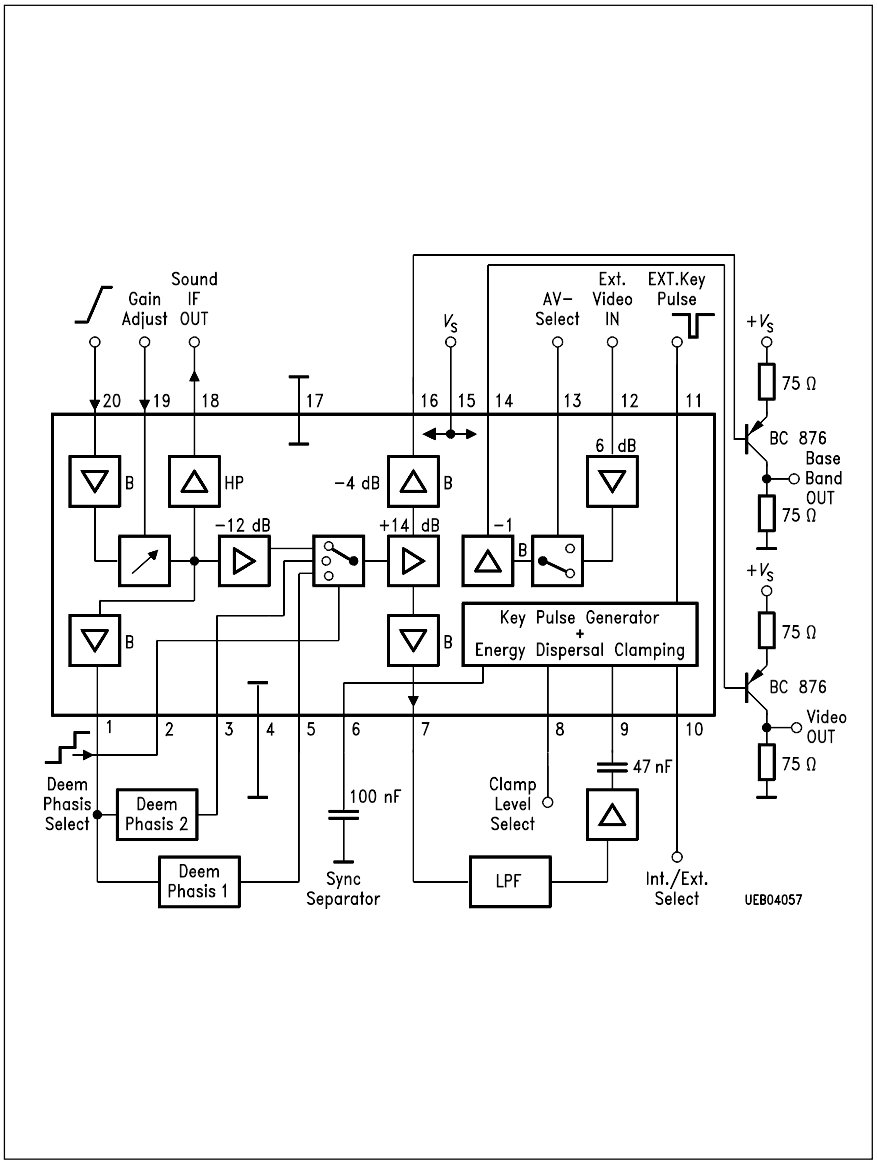
The internal generated clamping pulse can only be used if the incoming baseband signal is a standard CVBS-signal. The clamping pulse is then located in the H-sync pulse period. The impulse width is approx. 2 µs. The external clamping pulse must be active low. The timing of the pulse is not critical. The clamping level used in conjunction with the video signal can be selected according to the operation mode (CVBS- or MAC-mode). The clamping level differs by 1 V. The baseband output (pin 16) and CVBS-output (pin 14) require 75 Ω line drivers implemented as internal drivers followed by a PNP-emitter follower.

**Pin Configuration**
(top view)



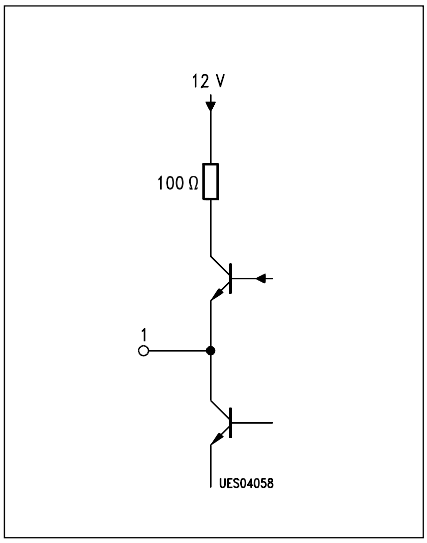
**Pin Definitions and Functions**

| Pin No. | Symbol | Function |
|---|---|---|
| 1 | CVBS | CVBS-output (controlled) |
| 2 | PATH | De-emphasis select |
| 3 | PATH 2 | De-emphasis 2 input |
| 4 | GND | Ground |
| 5 | PATH 1 | De-emphasis 1 input |
| 6 | H-SEP | Sync separator |
| 7 | BASEB 2 | Baseband output 2 |
| 8 | LEVSEL | Clamping level select |
| 9 | BASE IN | Baseband input |
| 10 | EXSEL | Int./ext. clamping select |
| 11 | EXTKEY | Ext. key pulse input |
| 12 | VIDEO IN | Ext. video input |
| 13 | AVSEL | AV select |
| 14 | VIDEO OUT | Video output |
| 15 | $V_S$ | Supply voltage |
| 16 | BASE B1 | Baseband output 1 |
| 17 | GND | Ground |
| 18 | SOUND | Sound output |
| 19 | GAIN | GAIN adjust |
| 20 | CVBS IN | CVBS-input |

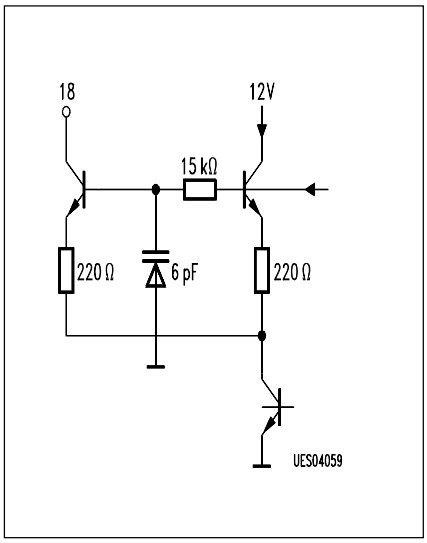



**Block Diagram**

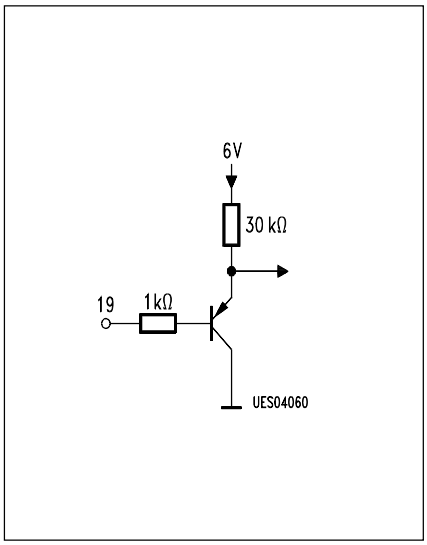
**Pin Functions**



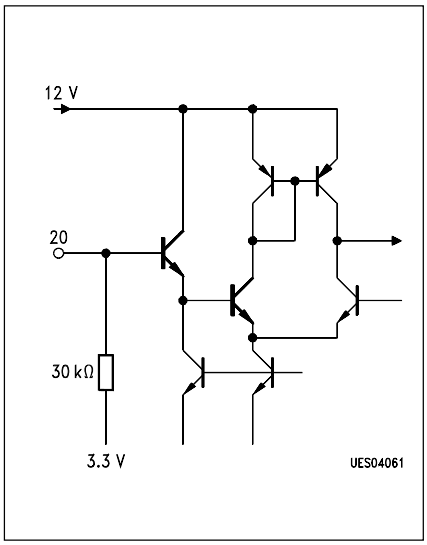

**CVBS (Pin 1)**



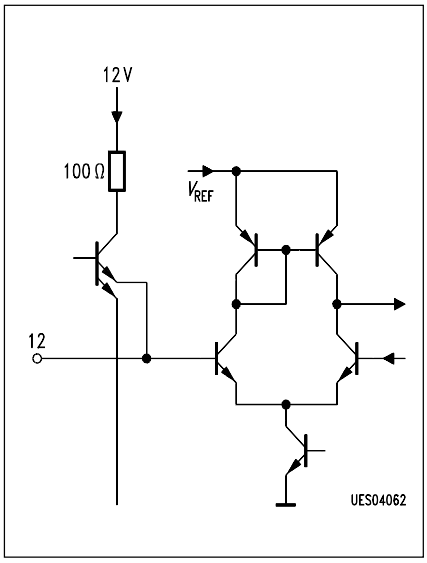

**SOUND (Pin 18)**



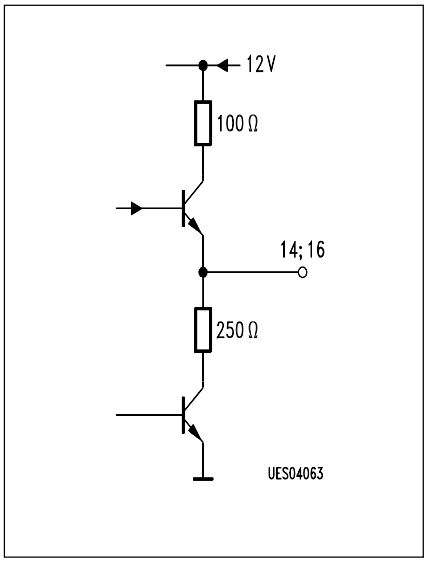

**GAIN (Pin 19)**



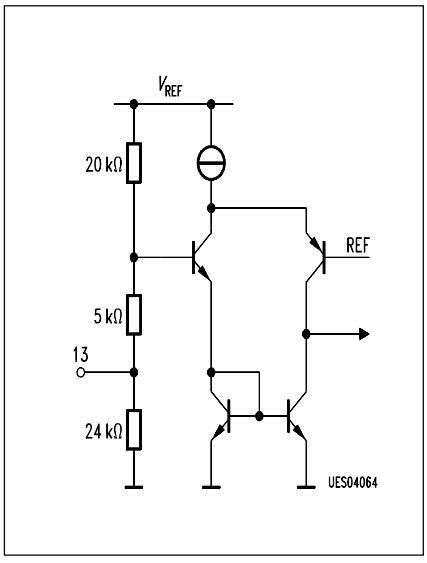

**CVBS IN (Pin 20)**



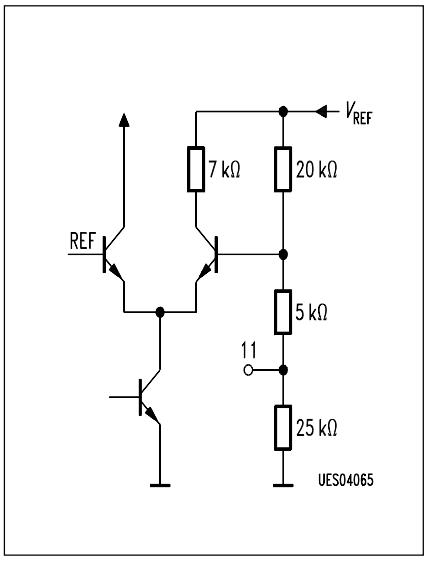

**VIDEO IN (Pin 12)**



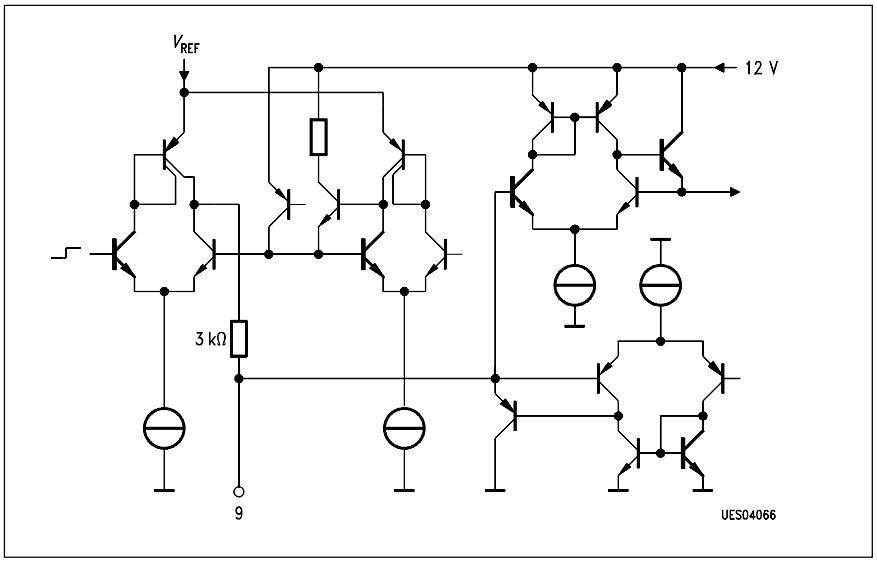

**VIDEO OUT, BASEB1 (Pin 14, 16)**



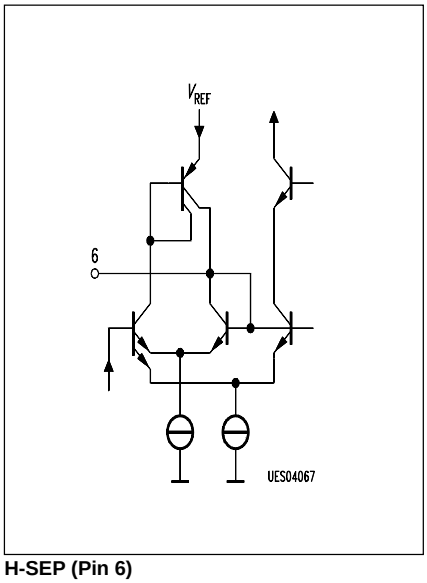

**AVSEL (Pin 13)**



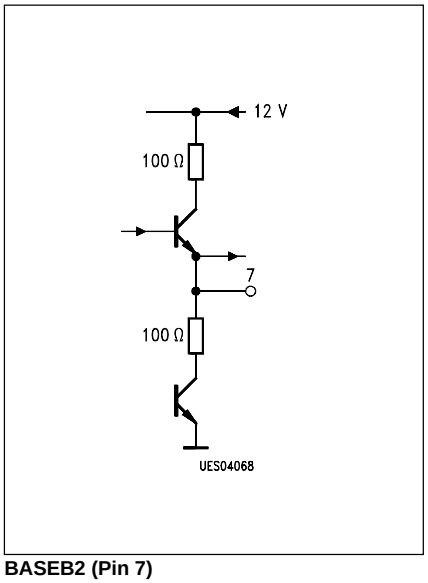

**EXTKEY (Pin 11)**



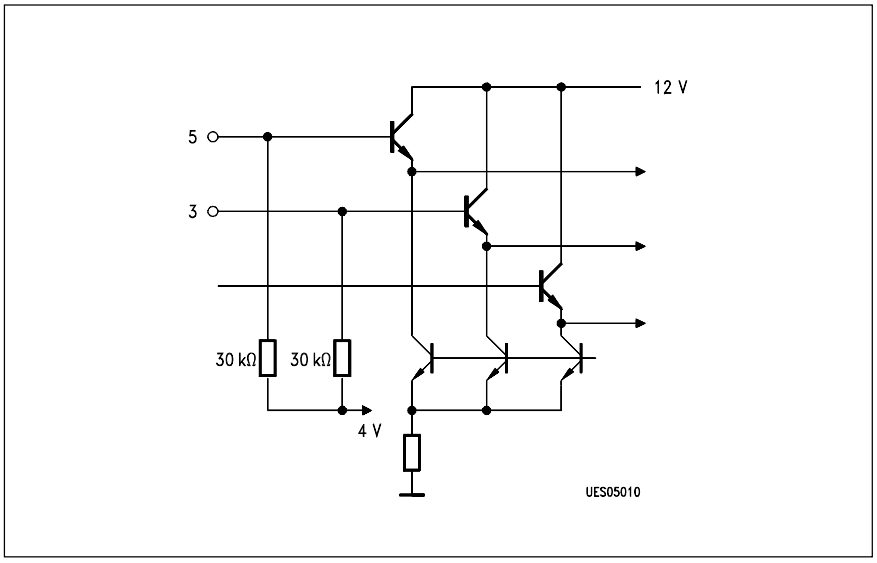

**BASE IN (Pin 9)**



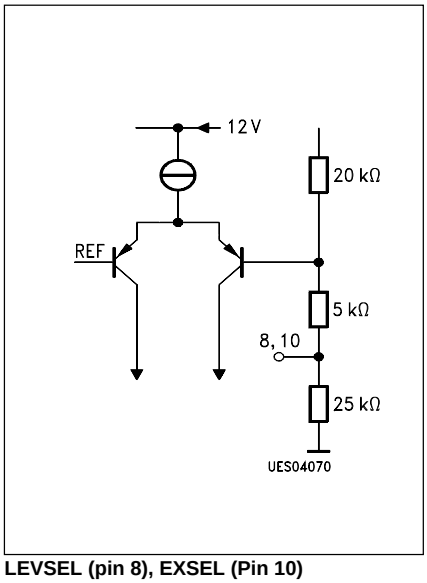

**H-SEP (Pin 6)**



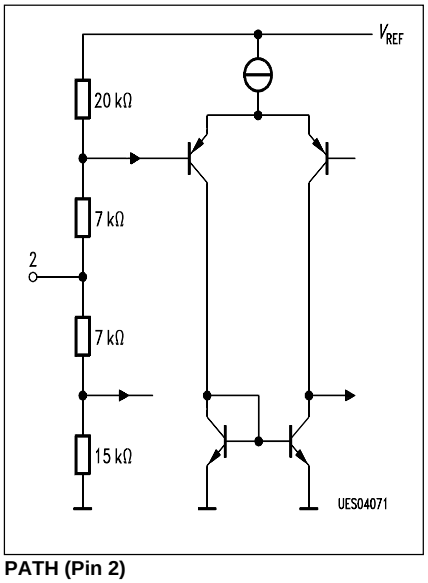

**BASEB2 (Pin 7)**




**PATH1/PATH2 (Pin 5, 3)**




**LEVSEL (pin 8), EXSEL (Pin 10)**




**PATH (Pin 2)**

**Absolute Maximum Ratings**

$T_A$ = 0 to 70 °C

All voltage are referred to ground, unless stated otherwise. All currents are designated by the source and sink principle, i.e. if the device pin has to be regarded as a sink (the current flows in the started pin to the internal ground), it has a negative prefix; if the device pin is the source on the other hand (the current flows from $V_S$ across the stated pin), it has a positive prefix.

| Parameter | Symbol | Limit Values | | Unit |
|---|---|---|---|---|
| | | min. | max. | |
| Supply voltage | $V_{15}$ | 0 | 15 | V |
| Buffer output current (de-emphasis) | $I_1$ | – 3 | 5 | mA |
| Voltage on sound IF output | $V_{18}$ | | 16 | V |
| Video buffer output currents | $I_{14, 16}$ | – 3 | 5 | mA |
| Setting voltages for gain adjust | $V_{2, 19}$ | 0 | 6 | V |
| Switching voltages for video switch | $V_{13}$ | 0 | 6 | V |
| Junction temperature | $T_j$ | | 150 | °C |
| Storage temperature | $T_{stg}$ | – 40 | 125 | °C |
| Thermal resistance system air | $R_{th\ SA}$ | | 65/77* | K/W |
| **Operating Range** | | | | |
| Supply voltage | $V_{15}$ | 10.8 | 13.2 | V |
| Input frequency range | $f_{20}$ | 10 Hz** | 15 | MHz |
| Frequency range of sound IF output coupling stage | $f_{18}$ | 4 | 10 | MHz |
| 3 -dB band width of baseband output | $B_{16}$ | 10 | | MHz |
| Ambient temperature in operation | $T_A$ | 0 | 70 | °C |

* SMD Package

** Depending on the used coupling capacitors

**DC-Characteristics**
$T_A$ = 25 °C; $V_S$ = 12 V

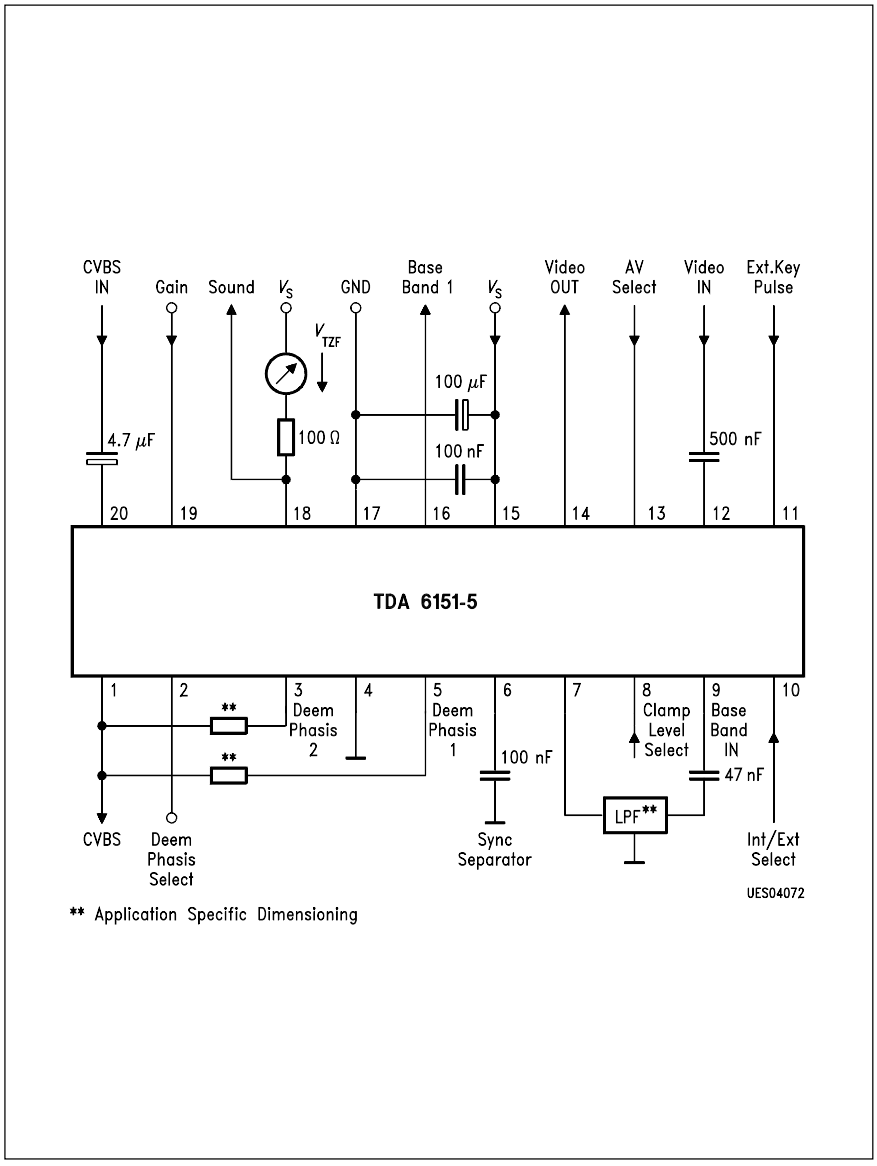
| Parameter | Symbol | Limit Values | | | Unit | Test Condition |
|---|---|---|---|---|---|---|
| | | min. | typ. | max. | | |
| Current consumption | $I_{15}$ | 26 | 38 | 50 | mA | |
| Input voltage | $V_{20}$ | 3 | 3.3 | 3.6 | V | |
| Input current | $I_{20}$ | 3.5 | 5 | 6.5 | µA | $\Delta V_{20}$ = 0,15 V |
| Output voltage of de-emphasis buffer | $V_1$ | 3.75 | 4.15 | 4.55 | V | $V_{20}$ = 0 $V_{PP}$ |
| Quiescent current of de-emphasis output | $I_1$ | – 2.5 | – 3.7 | – 4.8 | mA | $V_1 = V_1$ + 350 mV |
| Resistive load of de-emphasis output | $R_{1/4}$ | 1.5 | | | kΩ | |
| Sound IF output current | $I_{18}$ | 350 | 500 | 650 | µA | $V_{18}$ = 12 V |
| Input current on de-emphasis inputs | $I_{3,5}$ | | ± 5 | | µA | $\Delta V_{3,5}$ = ± 0.15 V |
| Output voltages of baseband buffer | $V_{16}$ | $V_S$ – 3.9 | $V_S$ – 3.25 | $V_S$ – 2.6 | V | $V_{19}$ = 5 V, $V_{20}$ = 0 $V_{PP}$, $V_{3,5} = V_1$ |
| Quiescent current of baseband buffer | $I_{16}$ | – 2.5 | – 3.2 | – 4.2 | mA | $V_{16} = V_{16}$ + 350 mV |
| Output voltage at low pass output | $V_7$ | 3.35 | 4.15 | 4.95 | V | $V_{19}$ = 0 V, $V_{20}$ = 0 $V_{PP}$, $V_{3,5} = V_1$ |
| Quiescent current at low pass output | $I_7$ | – 2.3 | – 3.0 | – 3.9 | mA | $V_7 = V_7$ + 350 mV |
| Resistive load of low pass output | $R_{7/4}$ | 1.5 | | | kΩ | |
| Input current of clamping circuit | $I_9$ | 3.5 | 6 | 10 | µA | $V_9$ = 3 V, 5 V > $V_8$ > 2 V |
| Output voltage of video buffer | $V_{14}$ | $V_S$ – 3.9 | $V_S$ – 3.2 | $V_S$ – 2.5 | V | 5 V > $V_{13}$ > 2 V, $V_{12}$ = 0 $V_{PP}$ |
| Quiescent current of video buffer | $I_{14}$ | – 2.0 | – 2.7 | – 3.4 | mA | $V_{14}$ = 12 V |
| Input current ext. CVBS-input | $I_{12}$ | 0.13 | 0.4 | 1 | µA | |
| Setting voltage for deviation | $V_{19}$ | 0 | | 5 | V | |
| Gain<br>Gain<br>(see diagram) | $V_{1/20}$<br>$V_{1/20}$ | 17<br>0 | 21<br>1.5 | 25<br>3 | dB<br>dB | $V_{19}$ = 0 V,<br>$V_{19}$ = 5 V |

**DC-Characteristics** (cont'd)

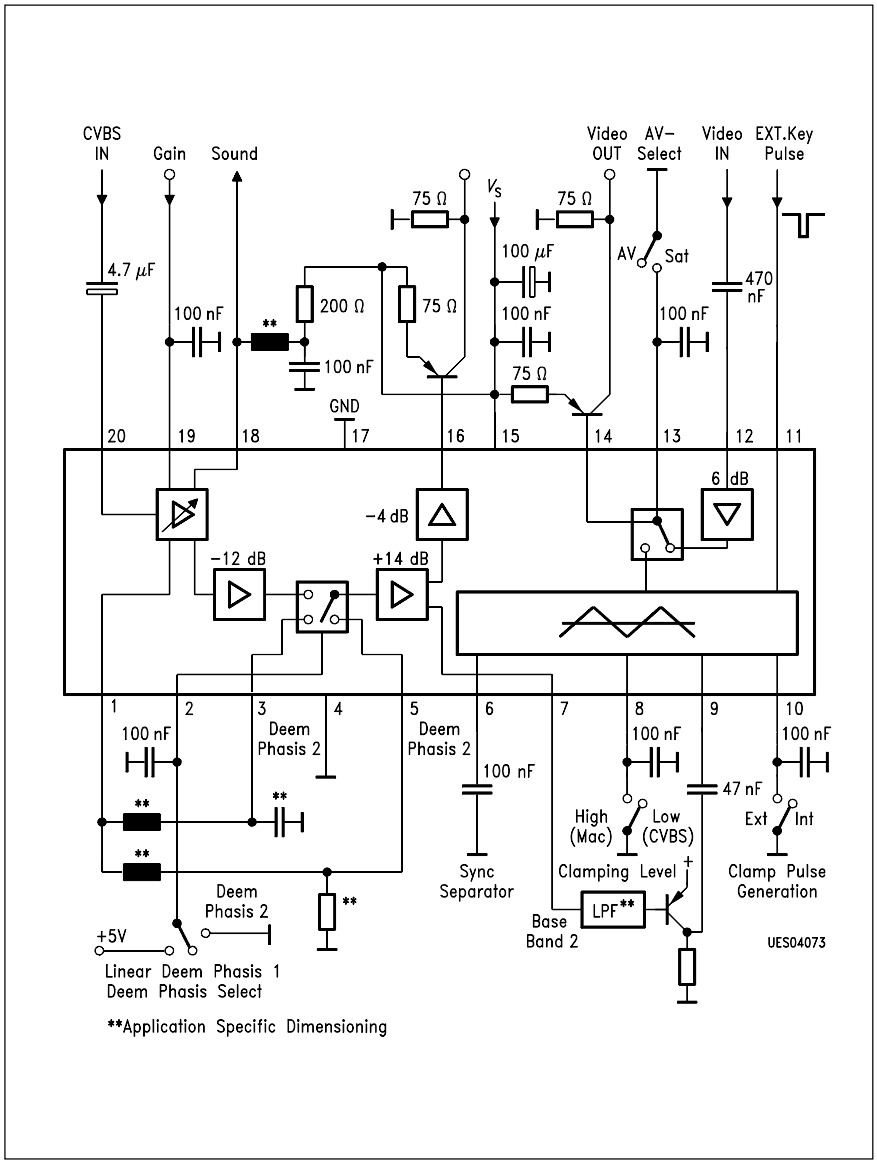
| Parameter | Symbol | Limit Values | | | Unit | Test Condition |
|---|---|---|---|---|---|---|
| | | min. | typ. | max. | | |
| Switching level for de-emphasis | $V_2$ | | | | | |
| L = de-emphasis 2 | | 0 | | 1 | V | |
| M (or open) = de-emphasis 1 | | 2.3 | 2.8 | 3.3 | V | |
| H = linear | | 4.0 | | 5 | V | |
| Switching level for video switch | $V_{13}$ | | | | | |
| L = RF-mode | | 0 | | 1 | V | |
| H (or open) = external | | 2 | | 5 | V | |
| Input current of the switches | $I_{2,13,8,10}$ | | | | | |
| H | | – 300 | – 200 | – 100 | µA | |
| L | | 100 | 200 | 330 | µA | |
| Switching level for setting the clamping level | $V_8$ | | | | | |
| L = high level (Mac operation) | | 0 | | 1 | V | |
| H (or open) = low clamping level (CVBS operation) | | 2 | | 5 | V | |
| Switching level for setting the clamping mode | $V_{10}$ | | | | | |
| L = external clamping (Mac operation) | | 0 | | 1 | V | |
| H (or open) = internal (CVBS-operation) | | 2 | | 5 | V | |

**AC-Characteristics**
$T_A$ = 25 °C; $V_S$ = 12 V

| Parameter | Symbol | Limit Values | | | Unit | Test Condition |
|---|---|---|---|---|---|---|
| | | min. | typ. | max. | | |
| Input voltage range | $V_{20}$ | 0.2 | | 1 | $V_{PP}$ | |
| Input impedance | $R_{20}$ | 22 | 31 | 42 | kΩ | |
| Sound IF-output frequency range (– 3 dB) | $f_{18}$ | | 4 | | MHz | $V_{20}$ = 1 V, $R_{18/15}$ = 200 Ω |
| Sound IF-output upper frequency limit (– 3 dB) | $f_{18}$ | | 10 | | MHz | $V_{20}$ = 1 V, $R_{18/15}$ = 200 Ω |
| Output voltage | $V_{18}$ | | 30 | | $mV_{PP}$ | $TT_{20}$ = 130 $mV_{PP}$ $R_{18/15}$ = 200 Ω |
| Gain 10 MHz<br>4 MHz<br>400 kHz | $G_{1/18}$ | | – 17<br>– 26<br>– 80 | | dB<br>dB<br>dB | $R_{18/15}$ = 200 Ω |
| Output voltage of de-emphasis buffer | $V_1$ | | 2 | | $V_{PP}$ | $V_{20}$ = 1 $V_{PP}$ $V_{19}$ = 4,4 V |
| Output voltage of baseband buffer | $V_{16}$ | | 2 | | $V_{PP}$ | $V_7$ = 3 $V_{PP}$ |
| Output voltage | $V_7$ | | 3 | | $V_{PP}$ | $V_1$ = 2.4 $V_{PP}$ |
| Gain | $V_{7/3;5}$ | | 14 | | dB | |
| Gain | $V_{16/3;5}$ | | 10 | | dB | |
| Gain | $V_{7/1}$ | | 2 | | dB | linear path (de-emphasis) |
| Suppression of the energy dispersal signal | $EDR$ | 46 | | | dB | $V_{20}$ = 1 $V_{PP}$ measured at the synch pulse |
| Output voltage video buffer | $V_{14}$ | | 2 | | $V_{PP}$ | $V_9$ = 2 $V_{PP}$ |
| Gain AV-input video buffer | $V_{14/12}$ | | 2 | | | $V_{12}$ = 1 $V_{PP}$ |
| Gain (clamping input video buffer) | $V_{14/9}$ | | 0 | | dB | $V_9$ = 1 $V_{PP}$ (without triangular signal) |
| External clamping pulse<br>L = active<br>H (or open) = inactive | | | <br>0<br>2 | <br>1<br>5 | <br>V<br>V | |




**Test Circuit**




**Application Circuit**