



## HORIZONTAL AND VERTICAL DEFLECTION CIRCUIT

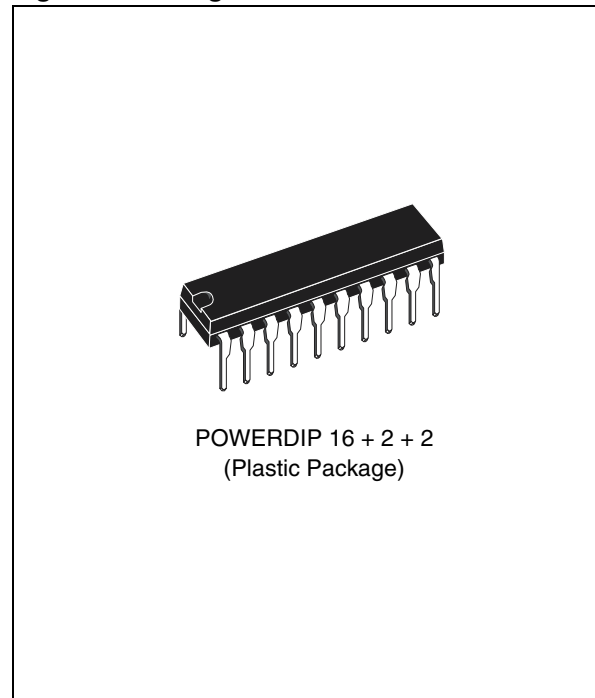
### FEATURES SUMMARY

- DIRECT LINE DARLINGTON DRIVE
- DIRECT FRAME-YOKE DRIVE ( $\pm 1A$ )
- COMPOSITE VIDEO SIGNAL INPUT CAPABILITY
- FRAME OUTPUT PROTECTION AGAINST SHORT CIRCUITS
- PLL
- VIDEO IDENTIFICATION CIRCUIT
- SUPER SANDCASTLE OUTPUT
- VERY FEW EXTERNAL COMPONENTS
- VERY LOWCOST POWER PACKAGE

### DESCRIPTION

The TDA8215B is an horizontal and vertical deflection circuit with super sandcastle generator and video identification output. Used with TDA8213 (Video & Sound IF system) and TDA8217 (Pal decoder and video processor), this IC permits a complete low-cost solution for PAL applications. The TDA8215B has been specially designed for direct drive of line DARLINGTON transistors.

Figure 1. Package



POWERDIP 16 + 2 + 2  
(Plastic Package)

Figure 2. Pin Connections

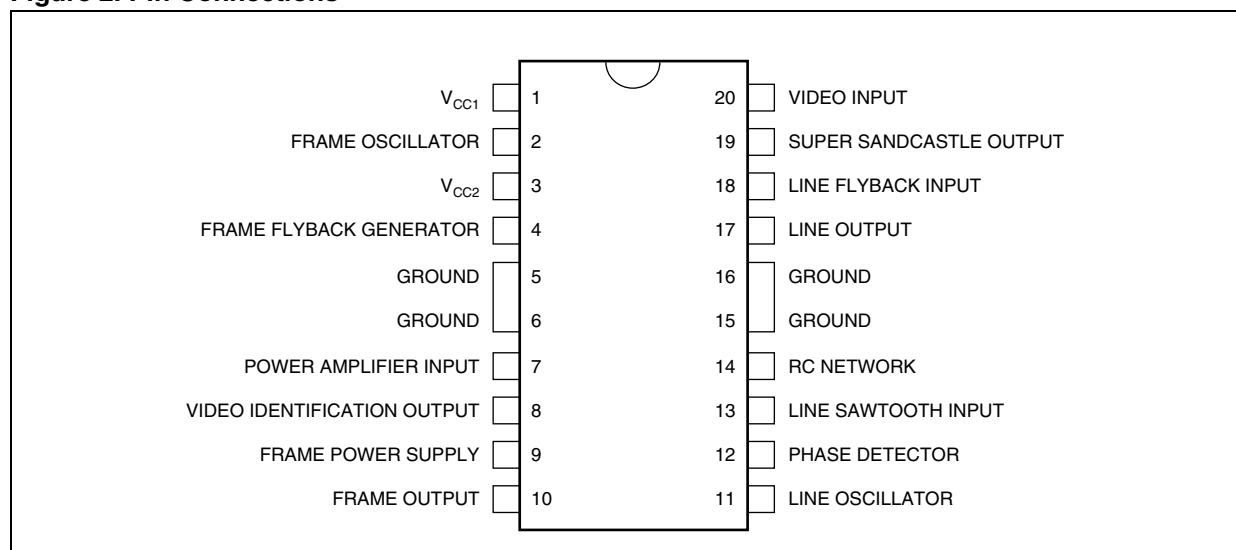


Figure 3. Block Diagram

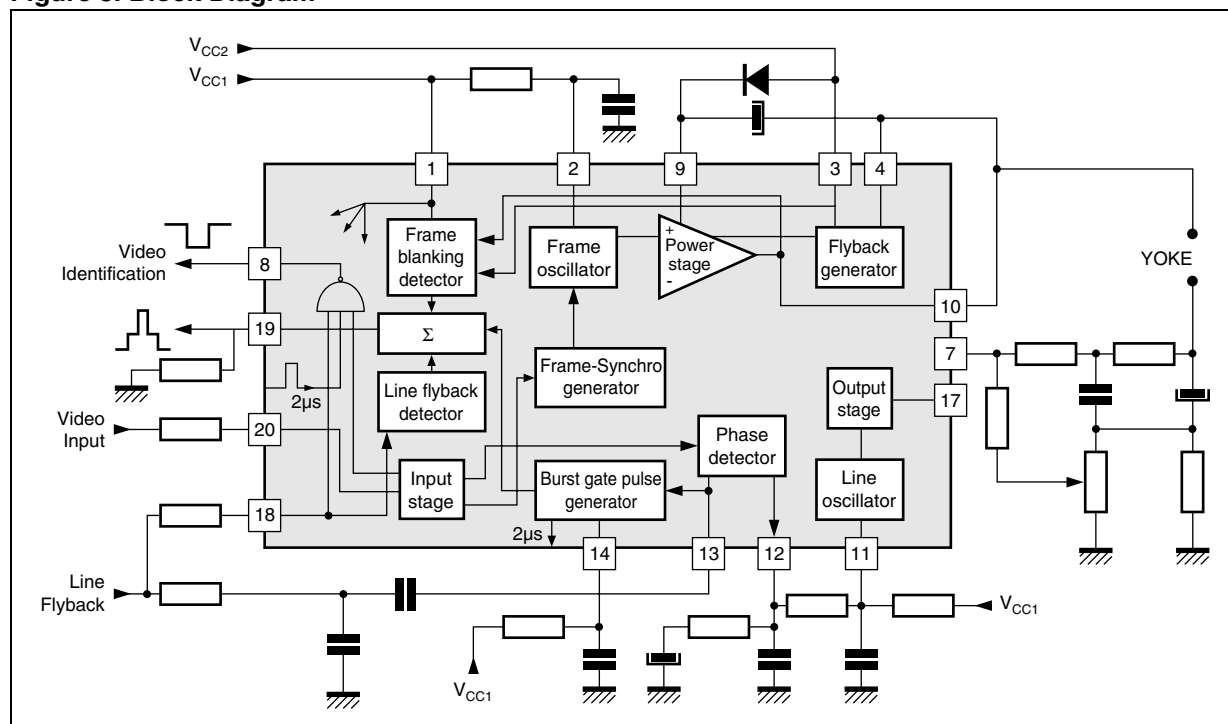


Table 1. Absolute Maximum Ratings

| Symbol            | Parameter                             | Value      | Unit |
|-------------------|---------------------------------------|------------|------|
| V <sub>CC1</sub>  | Supply Voltage                        | 30         | V    |
| V <sub>CC2</sub>  | Flyback Generator Supply Voltage      | 35         | V    |
| V <sub>9</sub>    | Frame Power Supply Voltage            | 60         | V    |
| I <sub>10NR</sub> | Frame Output Current (non repetitive) | ± 1.5      | A    |
| I <sub>10</sub>   | Frame Output Current (continuous)     | ± 1        | A    |
| V <sub>17</sub>   | Line Output Voltage (external)        | 60         | V    |
| I <sub>p17</sub>  | Line Output Peak Current              | 0.8        | A    |
| I <sub>C17</sub>  | Line Output Continuous Current        | 0.4        | A    |
| T <sub>STG</sub>  | Storage Temperature                   | -40 to 150 | °C   |
| T <sub>J</sub>    | Max Operating Junction Temperature    | + 150      | °C   |
| T <sub>AMB</sub>  | Operating Ambient Temperature         | 0 to 70    | °C   |

Table 2. Thermal Data

| Symbol               | Parameter                                                                                                        | Value | Unit |
|----------------------|------------------------------------------------------------------------------------------------------------------|-------|------|
| R <sub>TH(j-c)</sub> | Max Junction-case Thermal Resistance                                                                             | 10    | °C/W |
| R <sub>TH(j-a)</sub> | Typical Junction-ambient Thermal Resistance<br>(Soldered on a 35μm thick 45cm <sup>2</sup> PC Board copper area) | 40    | °C/W |
| T <sub>J</sub>       | Max Recommended Junction Temperature                                                                             | 120   | °C   |

**ELECTRICAL CHARACTERISTICS** $V_{CC1} = 10V$ ,  $T_{AMB} = 25^{\circ}C$  (unless otherwise specified)**Table 3. Supply (Pin 1)**

| Symbol    | Parameter      | Min. | Typ. | Max. | Unit |
|-----------|----------------|------|------|------|------|
| $I_{CC1}$ | Supply Current |      | 15   |      | mA   |
| $V_{CC1}$ | Supply Voltage | 9    | 10   | 10.5 | V    |

**Table 4. Video Input (Pin 20)**

| Symbol | Parameter                                                        | Min. | Typ. | Max. | Unit    |
|--------|------------------------------------------------------------------|------|------|------|---------|
| V20    | Reference Voltage ( $I_{20} = -1\mu A$ )                         | 1.4  | 1.75 | 2    | V       |
| MWF    | Minimum Width of Frame Pulse (When synchronized with TTL signal) | 50   |      |      | $\mu s$ |

**Table 5. Line Oscillator (Pin 11)**

| Symbol                           | Parameter                                                                                       | Min. | Typ. | Max. | Unit            |
|----------------------------------|-------------------------------------------------------------------------------------------------|------|------|------|-----------------|
| LT11                             | Low Threshold Voltage                                                                           | 2.8  | 3.2  | 3.6  | V               |
| HT11                             | High Threshold Voltage                                                                          | 5.4  | 6.6  | 7.8  | V               |
| BI11                             | Bias Current                                                                                    |      | 100  |      | nA              |
| DR11                             | Discharge Impedance                                                                             | 1.0  | 1.4  | 1.8  | $k\Omega$       |
| FLP1                             | Free Running Line Period<br>( $R = 34.9k\Omega$ Tied to $V_{CC1}$ , $C = 2.2nF$ Tied to Ground) | 62   | 64   | 66   | $\mu s$         |
| FLP2                             | Free Running Line Period ( $R = 13.7k\Omega$ , $C = 2.2nF$ )                                    |      | 27   |      | $\mu s$         |
| OT11                             | Oscillator Threshold for Line Output Pulse Triggering                                           |      | 4.6  |      | V               |
| $\frac{\Delta F}{\Delta \theta}$ | Horizontal Frequency Drift with Temperature (see application)                                   |      | 2    |      | Hz/ $^{\circ}C$ |

**Table 6. Line Output (Pin 17)**

| Symbol | Parameter                                                     | Min. | Typ. | Max. | Unit    |
|--------|---------------------------------------------------------------|------|------|------|---------|
| LV17   | Saturation Voltage ( $I_{17} = 800mA$ during $2\mu s$ )       |      | 2.2  |      | V       |
| OPW    | Output Pulse width (line period = $64\mu s$ , negative pulse) | 19   | 21   | 23   | $\mu s$ |

**Table 7. Line Sawtooth Input (Pin 13)**

| Symbol | Parameter       | Min. | Typ. | Max. | Unit      |
|--------|-----------------|------|------|------|-----------|
| V13    | Bias Voltage    | 1.8  | 2.4  | 3.2  | V         |
| Z13    | Input Impedance | 4.5  | 5.8  | 8    | $k\Omega$ |

**Table 8. Phase Detector (Pin 12)**

| Symbol | Parameter                           | Min. | Typ. | Max. | Unit |
|--------|-------------------------------------|------|------|------|------|
| I12    | Output Current During Synchro Pulse | 250  | 350  | 500  | μA   |
| RI12   | Current Ratio (positive/negative)   | 0.95 | 1    | 1.05 |      |
| LI12   | Leakage Current                     | -2   |      | +2   | μA   |
| CV12   | Control Voltage Range               | 2.60 |      | 7.10 | V    |

**Table 9. Video Identification (Pin 8)**

| Symbol                                                                     | Parameter                                      | Min. | Typ. | Max. | Unit |
|----------------------------------------------------------------------------|------------------------------------------------|------|------|------|------|
| Low Level Output when the line synchro tip is centered in the line retrace |                                                |      |      |      |      |
| V <sub>H8</sub>                                                            | Without Video Signal (I <sub>8</sub> = -500μA) | 4.5  | 6.3  | 0.9  | V    |
| V <sub>L8</sub>                                                            | With Video Signal (I <sub>8</sub> = 50μA)      |      | 0.6  | 0.9  | V    |

**Table 10. Frame Oscillator (Pin 2)**

| Symbol                           | Parameter                                                                                    | Min. | Typ.               | Max. | Unit  |
|----------------------------------|----------------------------------------------------------------------------------------------|------|--------------------|------|-------|
| LT2                              | Low Threshold Voltage                                                                        | 1.6  | 2.0                | 2.3  | V     |
| HT2                              | High Threshold Voltage                                                                       | 2.6  | 3.1                | 3.6  | V     |
| DIF2                             | LT2 - HT2                                                                                    |      | 1.0                |      | V     |
| BI2                              | Bias Current                                                                                 |      | 30                 |      | nA    |
| DR2                              | Discharge Impedance                                                                          | 300  | 470                | 700  | Ω     |
| FFP1                             | Free Running Frame Period<br>(R = 845kΩ Tied to V <sub>CC1</sub> , C = 180nF Tied to Ground) | 20.5 | 23                 | 25   | ms    |
| MFP                              | Minimum Frame Period (I <sub>20</sub> = -100μA) with the Same RC                             |      | 12.8               |      | ms    |
| FFP2                             | Free Running Frame Period (R = 408kΩ, C = 220nF)                                             |      | 14.3               |      | ms    |
| FPR                              | Frame Period Ratio = FFP/MFP                                                                 | 1.7  | 1.8                | 1.9  |       |
| FG                               | Frame Saw-tooth Gain Between Pin 1 and non Inverting Input of the Frame Amplifier            |      | -0.4               |      |       |
| $\frac{\Delta F}{\Delta \theta}$ | Vertical Frequency Drift with Temperature (see application)                                  |      | 4.10 <sup>-3</sup> |      | Hz/°C |

**Table 11. Frame Power Supply (Pin 9)**

| Symbol | Parameter                                  | Min. | Typ. | Max. | Unit |
|--------|--------------------------------------------|------|------|------|------|
| V9     | Operating Voltage (with flyback Generator) | 10   |      | 58   | V    |
| I9     | Supply Current (V9 = 30V)                  |      | 11   | 22   | mA   |

**Table 12. Flyback Generator Supply (Pin 3)**

| Symbol           | Parameter         | Min. | Typ. | Max. | Unit |
|------------------|-------------------|------|------|------|------|
| V <sub>CC2</sub> | Operating Voltage | 10   |      | 30   | V    |

**Table 13. Frame Output (Pin 10)**

| Symbol                                                         | Parameter        | Min. | Typ. | Max. | Unit |
|----------------------------------------------------------------|------------------|------|------|------|------|
| Saturation Voltage to Ground ( $V_9 = 30V$ )                   |                  |      |      |      |      |
| LV10A                                                          | $I_{10} = 0.1A$  |      | 0.06 | 0.6  | V    |
| LV10B                                                          | $I_{10} = 1A$    |      | 0.37 | 1    | V    |
| Saturation Voltage to $V_9$ ( $V_9 = 30V$ )                    |                  |      |      |      |      |
| HV10A                                                          | $I_{10} = -0.1A$ |      | 1.3  | 1.6  | V    |
| HV10B                                                          | $I_{10} = -1A$   |      | 1.7  | 2.4  | V    |
| Saturation Voltage to $V_9$ in Flyback Mode ( $V_{10} > V_9$ ) |                  |      |      |      |      |
| FV10A                                                          | $I_{10} = 0.1A$  |      | 1.6  | 2.1  | V    |
| FV10B                                                          | $I_{10} = 1A$    |      | 2.5  | 4.5  | V    |

**Table 14. Flyback Generator (Pin 3 and Pin 4)**

| Symbol                                                                        | Parameter                    | Min. | Typ. | Max. | Unit    |
|-------------------------------------------------------------------------------|------------------------------|------|------|------|---------|
| Flyback Transistor on (output = high state), $V_{CC2} = 30V$ , $V_{4/3}$ with |                              |      |      |      |         |
| F2DA                                                                          | $I_{4 \rightarrow 3} = 0.1A$ |      | 1.5  | 2.1  | V       |
| F2DB                                                                          | $I_{4 \rightarrow 3} = 1A$   |      | 3.0  | 4.5  | V       |
| Flyback Transistor on (output = high state), $V_{CC2} = 30V$ , $V_{3/4}$ with |                              |      |      |      |         |
| FSVA                                                                          | $I_{3 \rightarrow 4} = 0.1A$ |      | 0.8  | 1.1  | V       |
| FSVB                                                                          | $I_{3 \rightarrow 4} = 1A$   |      | 2.2  | 4.5  | V       |
| Flyback Transistor off (output = $V_9 - 8V$ ), $V_9 - V_{CC2} = 30V$          |                              |      |      |      |         |
| FCI                                                                           | Leakage Current Pin 3        |      |      | 170  | $\mu A$ |

**Table 15. Super Sandcastle Output (Pin 19)**

| Symbol                                      | Parameter                                                              | Min. | Typ.        | Max. | Unit    |
|---------------------------------------------|------------------------------------------------------------------------|------|-------------|------|---------|
| Output Voltages ( $R_{load} = 2.2k\Omega$ ) |                                                                        |      |             |      |         |
| SANDT2                                      | Frame blanking pulse level                                             | 2    | 2.5         | 3    | V       |
| SANDL2                                      | Line blanking pulse level                                              | 4    | 4.5         | 5    | V       |
| BG2                                         | Burst key pulse level                                                  | 8    | 9           |      | V       |
| Pulses width and timing                     |                                                                        |      |             |      |         |
| SC3                                         | Delay between middle of sync pulse and leading edge of burst key pulse | 2.3  | 2.7         | 3.1  | $\mu s$ |
| SC2                                         | Duration of burst key pulse<br>Vertical blanking pulse width           | 3.7  | 4<br>Note 1 | 5    | $\mu s$ |

Note: 1. Width of vertical blanking pulse on SSC output is proportional to the frame flyback time, the switching level is  $V_{CC2} - 2V_{BE}$  and the other input of the comparator is tied to the frame amplifier output. Application circuit uses the frame flyback generator.

**Table 16. Line Flyback Input (Pin 18)**

| Symbol | Parameter                                  | Min. | Typ. | Max. | Unit    |
|--------|--------------------------------------------|------|------|------|---------|
|        | Switching level                            |      | 2    |      | V       |
|        | Maximum input current at $V_{PEAK} = 800V$ |      | 8    |      | mA      |
|        | Limiting voltage at maximum current        |      | 4.3  |      | V       |
| $\tau$ | RC network time constant (Note 1)          |      | 6    |      | $\mu s$ |

Note: 1. An RC network is connected to this input. Typical value for the resistor is 27k $\Omega$  and 220pF for the capacitor. A different time constant for RC changes the delay between the middle of the line synchro pulse and the leading edge of the burst key pulse but also the duration of the burst key pulse.

## GENERAL DESCRIPTION

The TDA8215B performs all the video and power functions required to provide signals for the line driver and frame yoke.

It contains:

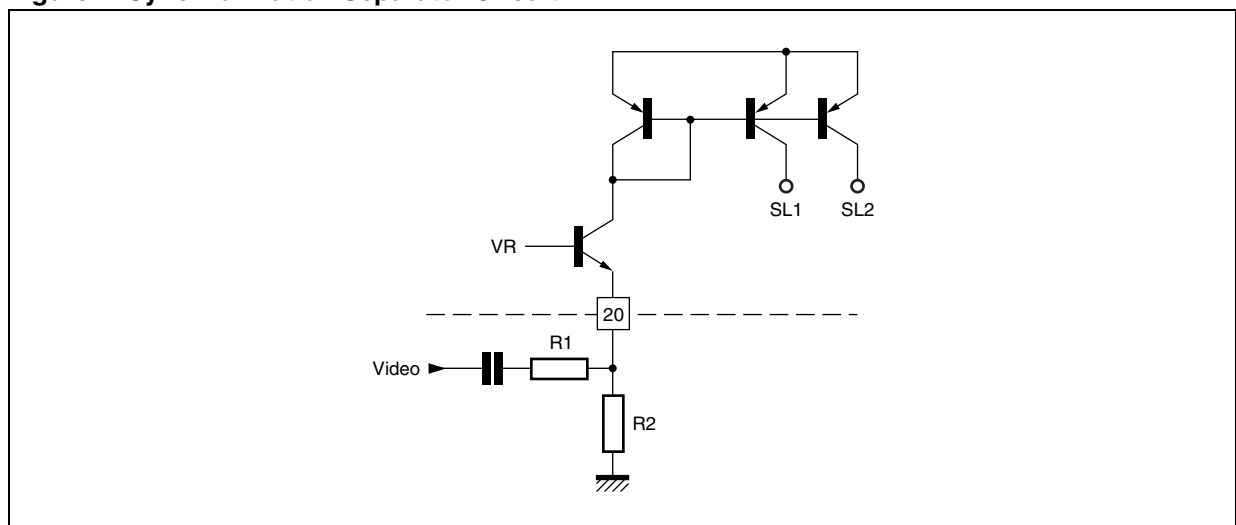
- A synchronization separator
- An integrated frame separator without external components
- A saw-tooth generator for the frame
- A power amplifier for direct drive of frame yoke (short circuit protected)
- An open collector output for the line darlington drive

- A line phase detector and a voltage control oscillator
- A super sandcastle generator
- Video identification output.

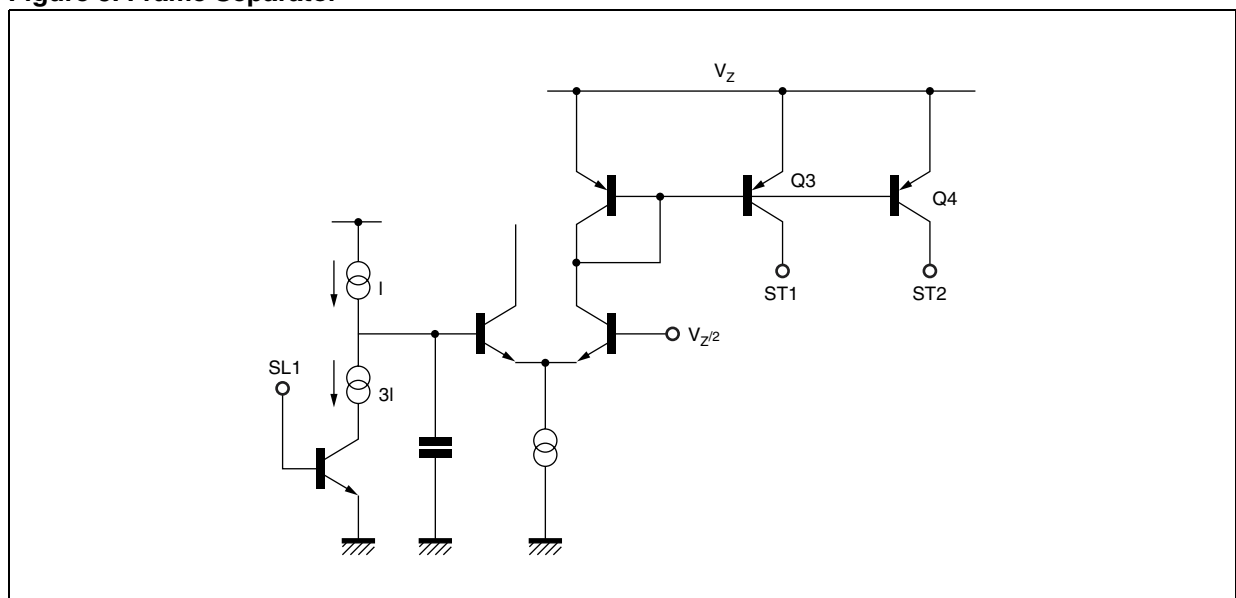
The slice level of sync-separation is fixed by value of the external resistors R1 and R2. VR is an internally fixed voltage.

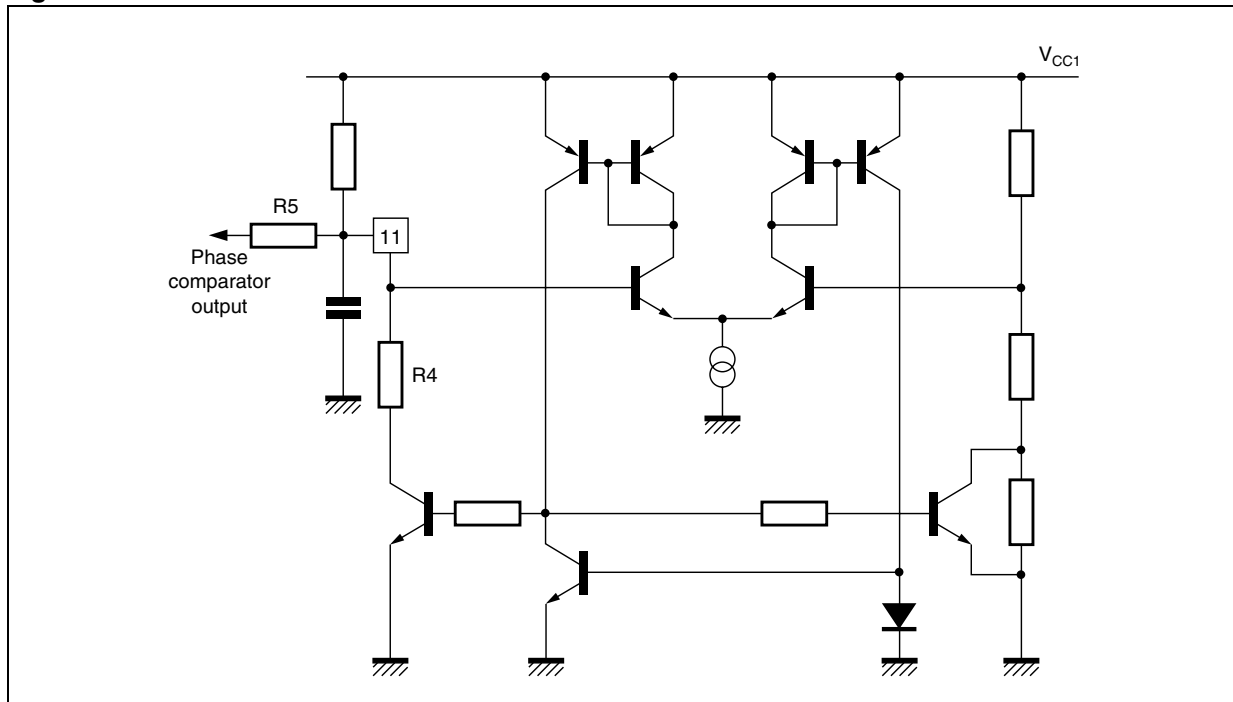
The sync-pulse allows the discharge of the capacitor by a  $2 \times I$  current. A line sync-pulse is not able to discharge the capacitor under  $V_Z/2$ . A frame sync-pulse permits the complete discharge of the capacitor, so during the frame sync-pulse  $Q_3$  and  $Q_4$  provide current for the other parts of the circuit.

### Figure 4. Synchronization Separator Circuit



### Figure 5. Frame Separator



**Figure 6. Line Oscillator**

The oscillator thresholds are internally fixed by resistors. The discharge of the capacitor depends on the internal resistor R4. The control voltage is applied on resistor R5. The sync-pulse drives the current in the comparator. The line flyback integrated by the external net work gives on pin 13 a saw tooth, the DC offset of this saw tooth is fixed by VC. The comparator output provides a positive current for the part of the signal on pin 13 greater than to VC and a negative current for the other part. When the line flyback and the video signal are synchronized, the output of the comparator is an alternatively negative and positive current. The frame sync-pulse inhibits the comparator to prevent frequency drift of the line oscillator on the frame beginning.

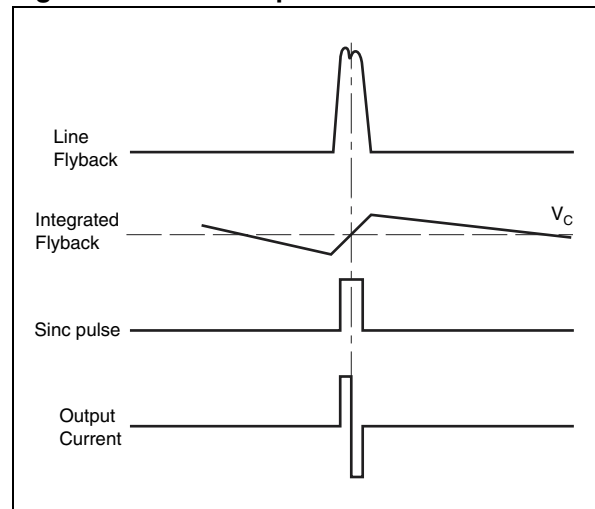
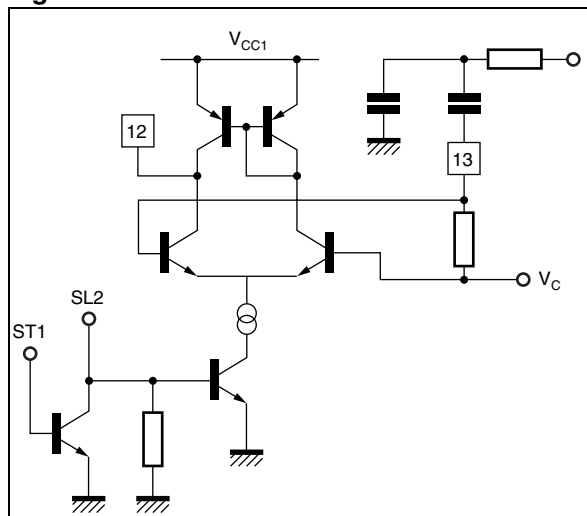
**Figure 7. Phase Comparator**



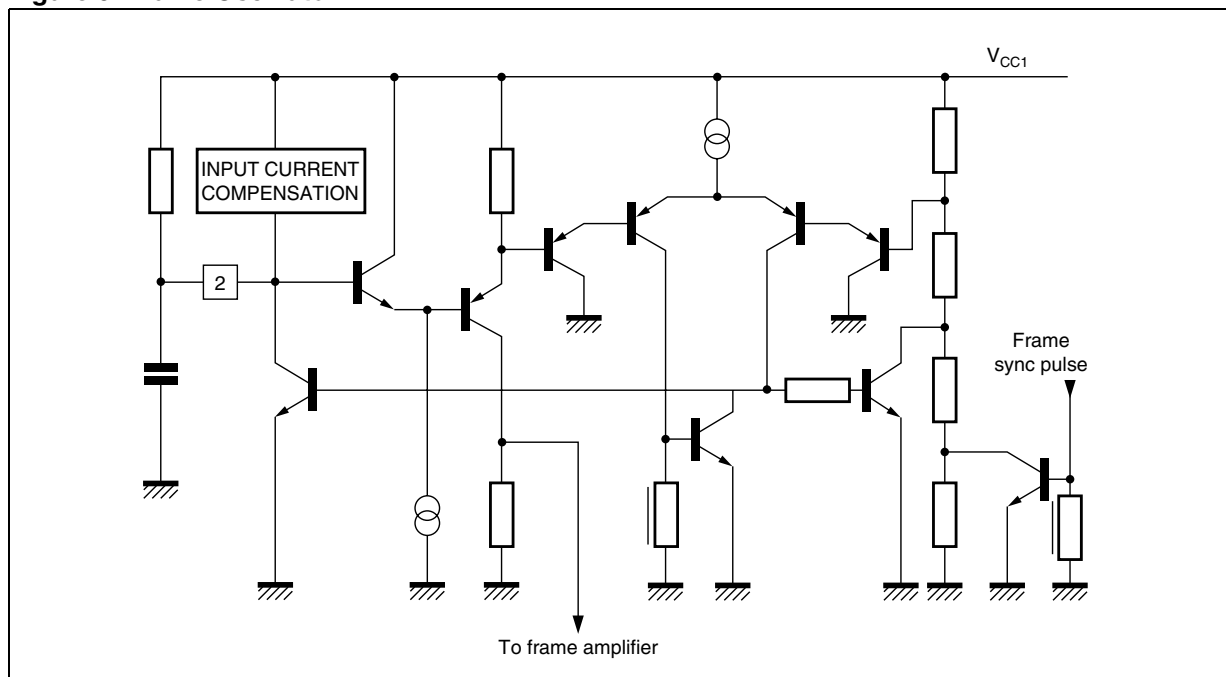
Figure 8.

**Line output (Pin 17)**

It is an open-collector output. The output negative pulse time is  $22\mu\text{s}$  for a  $64\mu\text{s}$  period.

The oscillator thresholds are internally fixed by resistors. The oscillator is synchronized during the last half free run period. The input current during the charge of the capacitor is less than  $100\text{nA}$ .

Figure 9. Frame Oscillator

**Frame output amplifier**

This amplifier is able to drive directly the frame yoke. Its output is short circuit and overload protected; it contains also a thermal protection.

The frame blanking is detected by the frame fly-back generator. When the output voltage of the frame amplifier exceeds  $V_{CC2} - 2V_{BE}$ , the pulse is detected. The line flyback detection is provided by a comparator which compares the input line fly-back pulse to an internal reference. The burst gate pulse position is fixed by the external RC network

(Pin 14). It is referenced to the middle of the line flyback.

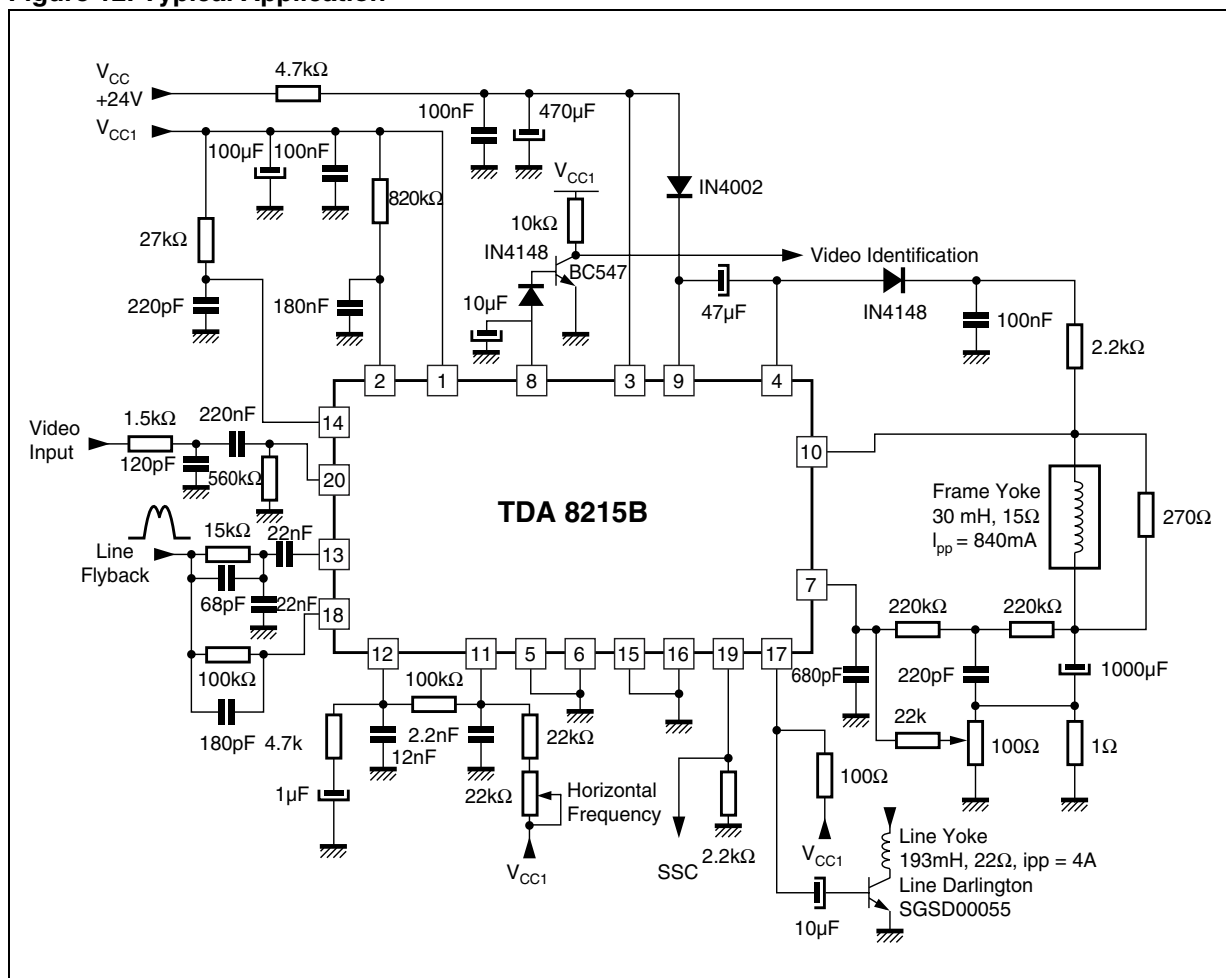
This stage will detect the coincidence between the line sync pulse (if present) and a  $2\mu\text{s}$  sampling pulse. This  $2\mu\text{s}$  pulse is positioned at the center of line sync pulse when the phase loop is locked. This sampled detection is stored by an external capacitor Pin 8.

The identification output level is high when video signal is present.

Important remark: minimum saw-tooth amplitude on Pin 13 has to be  $2V_{PP}$  (typ.:  $2.5V_{PP}$ ).



### Figure 12. Typical Application



## TDA8215B

---

### PART NUMBERING

**Table 17. Order Codes**

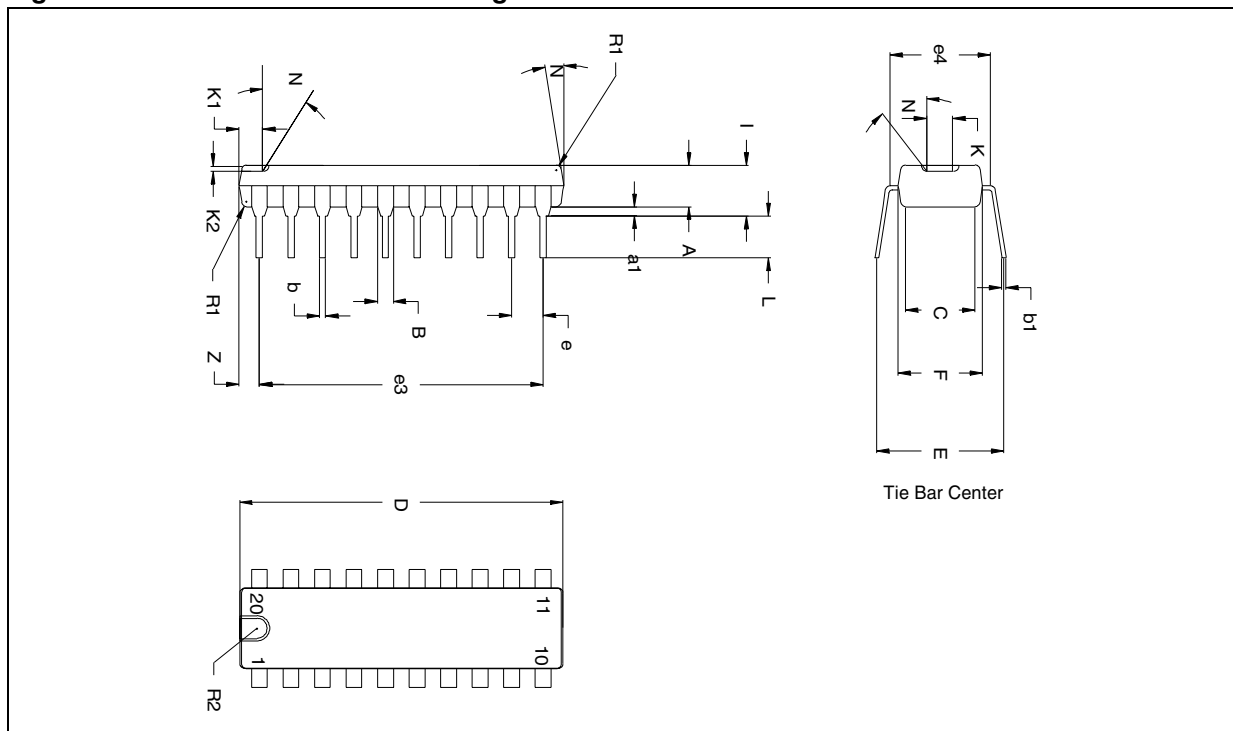
| Part Number | Package | Temperature Range |
|-------------|---------|-------------------|
| TDA8215B    | PDIP20  | -0 to 70 °C       |

## PACKAGE MECHANICAL

Table 18. PLASTIC POWERDIP Mechanical Data

| Symbol | millimeters |       |      | inches |       |       |
|--------|-------------|-------|------|--------|-------|-------|
|        | Min         | Typ   | Max  | Min    | Typ   | Max   |
| a1     | 0.51        |       |      | 0.020  |       |       |
| B      | 0.85        |       | 1.4  | 0.033  |       | 0.055 |
| b      |             | 0.5   |      |        | 0.020 |       |
| b1     | 0.38        |       | 0.5  | 0.015  |       | 0.020 |
| D      |             |       | 24.8 |        |       | 0.976 |
| E      |             | 8.8   |      |        | 0.346 |       |
| e      |             | 2.54  |      |        | 0.100 |       |
| e3     |             | 22.86 |      |        | 0.900 |       |
| F      |             |       | 7.1  |        |       | 0.280 |
| i      |             |       | 5.1  |        |       | 0.201 |
| L      |             | 3.3   |      |        | 0.130 |       |
| Z      |             |       | 1.27 |        |       | 0.050 |

Figure 13. PLASTIC POWERDIP Package Dimensions



Note: Drawing is not to scale.

**REVISION HISTORY**

**Table 19. Revision History**

| <b>Date</b>    | <b>Revision</b> | <b>Description of Changes</b>         |
|----------------|-----------------|---------------------------------------|
| September-1993 | 1               | First Issue                           |
| 17-May-2004    | 2               | Stylesheet update. No content change. |

Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is a registered trademark of STMicroelectronics.  
All other names are the property of their respective owners

© 2004 STMicroelectronics - All rights reserved

STMicroelectronics GROUP OF COMPANIES

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan -  
Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States

[www.st.com](http://www.st.com)