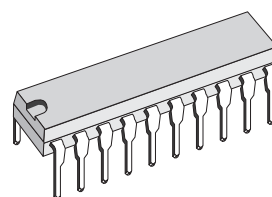


## HORIZONTAL AND VERTICAL DEFLECTION CIRCUIT

- 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 LOW COST POWER PACKAGE



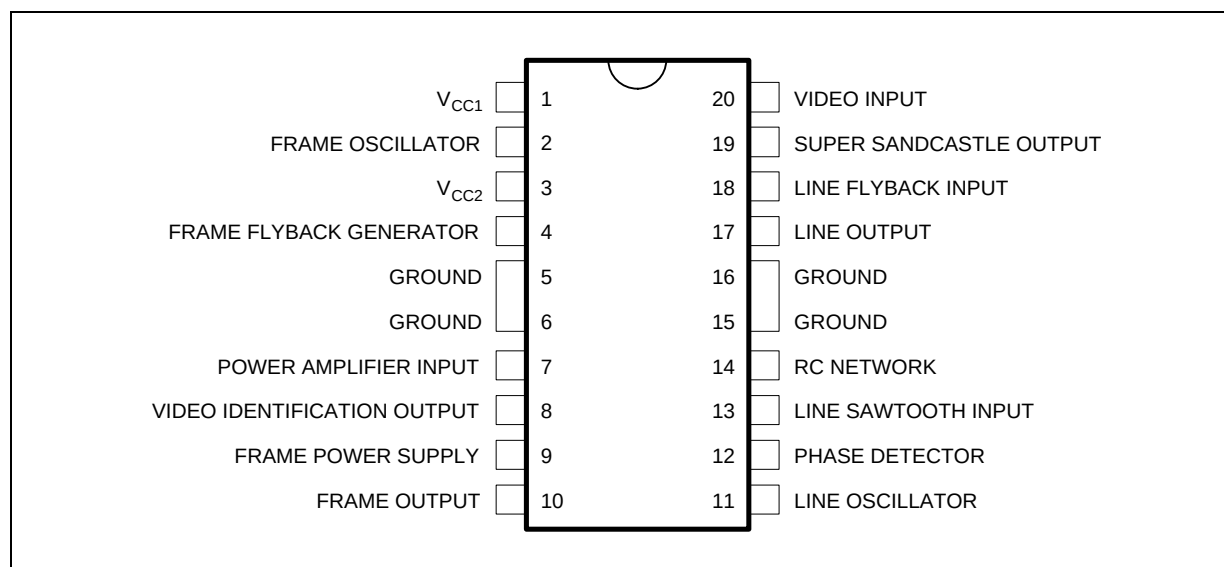
**POWERDIP 16 + 2 + 2**  
(Plastic Package)

**ORDER CODE : TDA8214B**

### DESCRIPTION

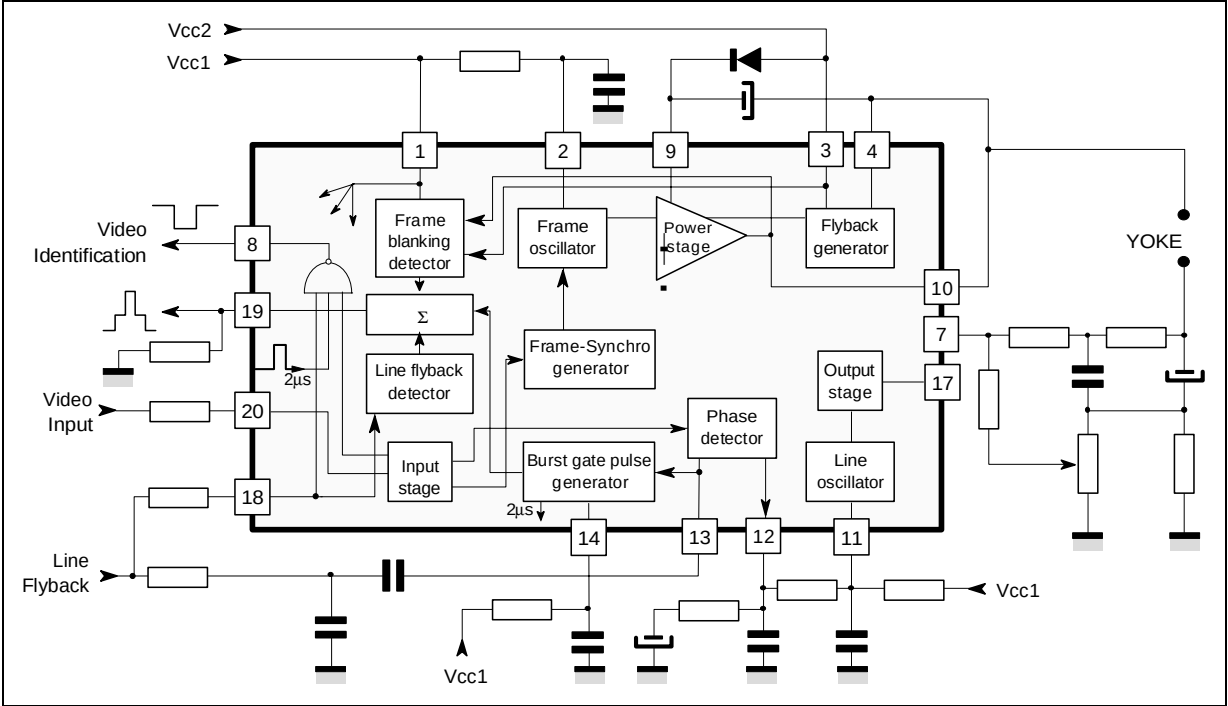
The TDA8214B is an horizontal and vertical deflection circuit with super sandcastle generator and video identification output. Used with TDA8213 (Video & Sound IF system) and TDA8217 (Pal decoder and video processor), this IC permits a complete low-cost solution for PAL applications.

### PIN CONNECTIONS



8214B-01.EPS

BLOCK DIAGRAM



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   |

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)

| Symbol | Parameter | Min. | Typ. | Max. | Unit |
|--------|-----------|------|------|------|------|
|--------|-----------|------|------|------|------|

**SUPPLY (Pin 1)**

|           |                |   |    |      |    |
|-----------|----------------|---|----|------|----|
| $I_{CC1}$ | Supply Current |   | 15 |      | mA |
| $V_{CC1}$ | Supply Voltage | 9 | 10 | 10.5 | V  |

**VIDEO INPUT (Pin 20)**

|     |                                                                  |     |      |   |         |
|-----|------------------------------------------------------------------|-----|------|---|---------|
| 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  |      |   | $\mu s$ |

**LINE OSCILLATOR (Pin 11)**

|                                  |                                                                                                 |     |     |     |                 |
|----------------------------------|-------------------------------------------------------------------------------------------------|-----|-----|-----|-----------------|
| 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/ $^{\circ}C$ |

**LINE OUTPUT (Pin 17)**

|      |                                               |    |     |     |         |
|------|-----------------------------------------------|----|-----|-----|---------|
| LV17 | Saturation Voltage ( $I_{17} = 200mA$ )       |    | 1.1 | 1.6 | V       |
| OPW  | Output Pulse width (line period = $64\mu s$ ) | 27 | 29  | 31  | $\mu s$ |

**LINE SAWTOOTH INPUT (Pin 13)**

|     |                 |     |     |     |            |
|-----|-----------------|-----|-----|-----|------------|
| V13 | Bias Voltage    | 1.8 | 2.4 | 3.2 | V          |
| Z13 | Input Impedance | 4.5 | 5.8 | 8   | k $\Omega$ |

**PHASE DETECTOR (Pin 12)**

|      |                                     |      |     |      |         |
|------|-------------------------------------|------|-----|------|---------|
| I12  | Output Current During Synchro Pulse | 250  | 350 | 500  | $\mu A$ |
| RI12 | Current Ratio (positive/negative)   | 0.95 | 1   | 1.05 |         |
| LI12 | Leakage Current                     | -2   |     | +2   | $\mu A$ |
| CV12 | Control Range Voltage               | 2.60 |     | 7.10 | V       |

**VIDEO IDENTIFICATION (Pin 8)**

|                                                                         |                                            |     |     |     |   |
|-------------------------------------------------------------------------|--------------------------------------------|-----|-----|-----|---|
| Low Level Output when the line syn. tip is centered in the line retrace |                                            |     |     |     |   |
| $V_{H8}$                                                                | Without video signal ( $I_8 = -500\mu A$ ) | 4.5 | 6.3 |     | V |
| $V_{L8}$                                                                | With video signal ( $I_8 = 50\mu A$ )      |     | 0.6 | 0.9 | V |

**FRAME OSCILLATOR (Pin 2)**

|                                  |                                                                                                 |      |             |     |                 |
|----------------------------------|-------------------------------------------------------------------------------------------------|------|-------------|-----|-----------------|
| 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 | $\Omega$        |
| FFP1                             | Free Running Frame Period<br>( $R = 845k\Omega$ Tied to $V_{CC1}$ , $C = 180nF$ Tied to Ground) | 20.5 | 23          | 25  | ms              |
| MFP                              | Minimum Frame Period ( $I_{20} = -100\mu A$ ) with the Same RC                                  |      | 12.8        |     | ms              |
| FFP2                             | Free Running Frame Period ( $R = 408k\Omega$ , $C = 220nF$ )                                    |      | 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)                                     |      | $4.10^{-3}$ |     | Hz/ $^{\circ}C$ |

8214B-03.TBL

**ELECTRICAL CHARACTERISTICS** (continued)V<sub>CC1</sub> = 10V, T<sub>AMB</sub> = 25°C (unless otherwise specified)

| Symbol | Parameter | Min. | Typ. | Max. | Unit |
|--------|-----------|------|------|------|------|
|--------|-----------|------|------|------|------|

## FRAME POWER SUPPLY (Pin 9)

|    |                                            |    |    |    |    |
|----|--------------------------------------------|----|----|----|----|
| V9 | Operating Voltage (with flyback Generator) | 10 |    | 58 | V  |
| I9 | Supply Current (V9 = 30V)                  |    | 11 | 22 | mA |

## FLYBACK GENERATOR SUPPLY (Pin 3)

|                  |                   |    |  |    |   |
|------------------|-------------------|----|--|----|---|
| V <sub>CC2</sub> | Operating Voltage | 10 |  | 30 | V |
|------------------|-------------------|----|--|----|---|

## FRAME OUTPUT (Pin 10)

|                                                     |             |  |      |     |   |
|-----------------------------------------------------|-------------|--|------|-----|---|
| Saturation Voltage to Ground (V9 = 30V)             |             |  |      |     |   |
| LV10A                                               | I10 = 0.1A  |  | 0.06 | 0.6 | V |
| LV10B                                               | I10 = 1A    |  | 0.37 | 1   | V |
| Saturation Voltage to V9 (V9 = 30V)                 |             |  |      |     |   |
| HV10A                                               | I10 = -0.1A |  | 1.3  | 1.6 | V |
| HV10B                                               | I10 = -1A   |  | 1.7  | 2.4 | V |
| Saturation Voltage to V9 in Flyback Mode (V10 > V9) |             |  |      |     |   |
| FV10A                                               | I10 = 0.1A  |  | 1.6  | 2.1 | V |
| FV10B                                               | I10 = 1A    |  | 2.5  | 4.5 | V |

## FLYBACK GENERATOR (Pin 3 and Pin 4)

|                                                                               |                           |  |     |     |    |
|-------------------------------------------------------------------------------|---------------------------|--|-----|-----|----|
| Flyback Transistor on (output = high state), V <sub>CC2</sub> = 30V V4/3 with |                           |  |     |     |    |
| F2DA                                                                          | I <sub>4</sub> → 3 = 0.1A |  | 1.5 | 2.1 | V  |
| F2DB                                                                          | I <sub>4</sub> → 3 = 1A   |  | 3.0 | 4.5 | V  |
| Flyback Transistor on (output = high state), V <sub>CC2</sub> = 30V V3/4 with |                           |  |     |     |    |
| FSVA                                                                          | I <sub>3</sub> → 4 = 0.1A |  | 0.8 | 1.1 | V  |
| FSVB                                                                          | I <sub>3</sub> → 4 = 1A   |  | 2.2 | 4.5 | V  |
| Flyback Transistor off (output = V9 - 8V), V9 - V <sub>CC2</sub> = 30V        |                           |  |     |     |    |
| FCI                                                                           | Leakage Current Pin 3     |  |     | 170 | μA |

## SUPER SANDCASTLE OUTPUT (Pin 19)

|                                  |                                                                        |     |             |     |    |
|----------------------------------|------------------------------------------------------------------------|-----|-------------|-----|----|
| Output Voltages (R load = 2.2kΩ) |                                                                        |     |             |     |    |
| 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 | μs |
| SC2                              | Duration of burst key pulse<br>Vertical blanking pulse width           | 3.7 | 4<br>Note 1 | 5   | μs |

## LINE FLYBACK INPUT (Pin 18)

|   |                                                   |  |     |  |    |
|---|---------------------------------------------------|--|-----|--|----|
|   | Switching level                                   |  | 2   |  | V  |
|   | Maximum input current at V <sub>PEAK</sub> = 800V |  | 8   |  | mA |
|   | Limiting voltage at maximum current               |  | 4.3 |  | V  |
| τ | RC network time constant (Note 2)                 |  | 6   |  | μs |

- Notes :**
1. Width of vertical blanking pulse on SSC output is proportional to the frame flyback time, the switching level is V<sub>CC2</sub> - 2V<sub>BE</sub> and the other input of the comparator is tied to the frame amplifier output. Application circuit uses the frame flyback generator.
  2. An RC network is connected to this input. Typical value for the resistor is 27kΩ 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 TDA8214B performs all the video and power functions required to provide signals for the line driver and frame yoke.

It contains:

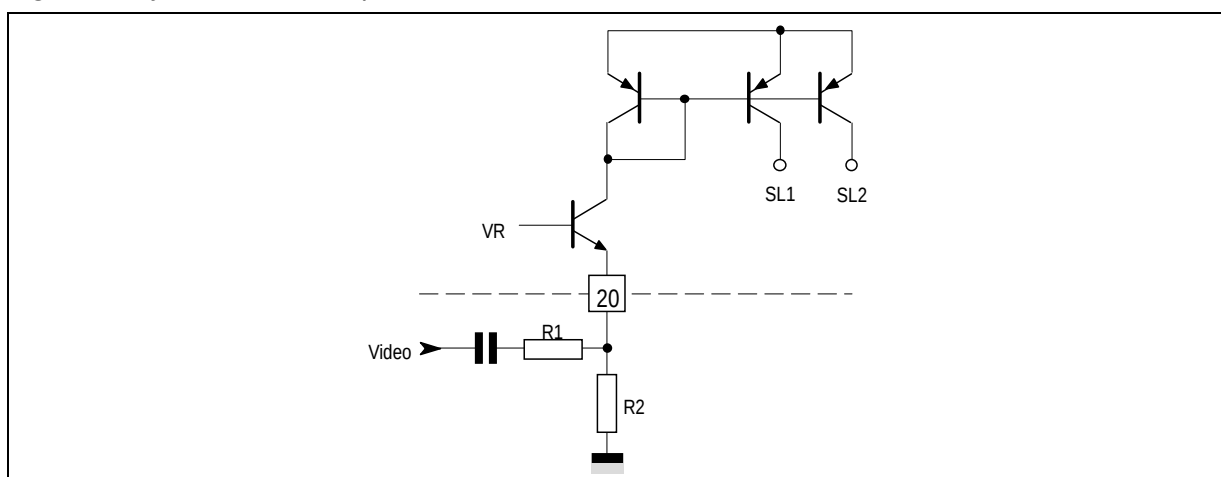
- A synchronization separator
- An integrated frame separator without external components
- A saw-tooth generator for the frame
- A power amplifier for direct drive of frame yoke (short circuit protected)
- An open collector output for the line driver

- 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.  $V_R$  is an internally fixed voltage.

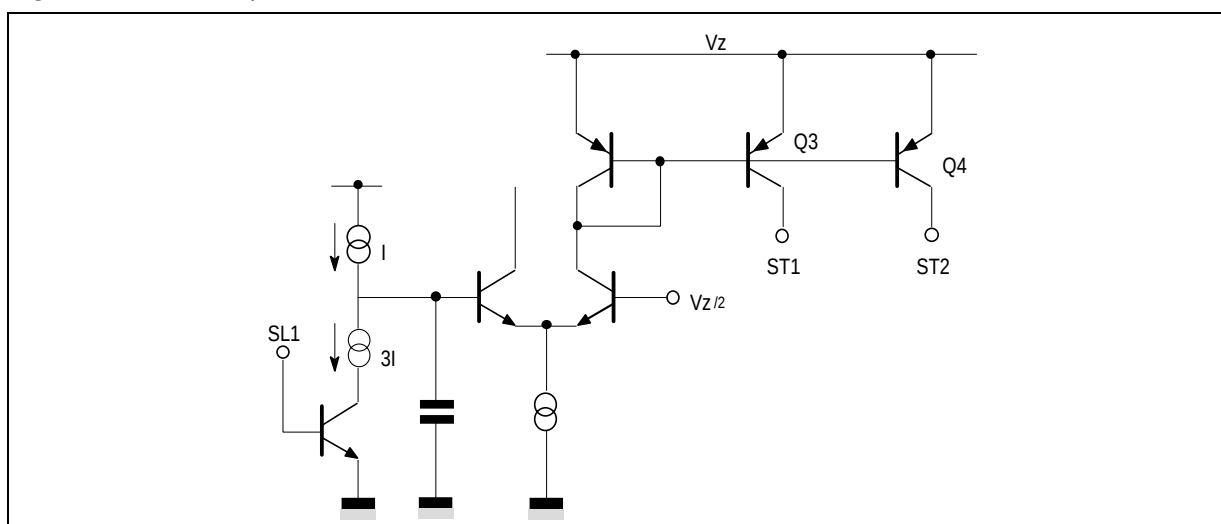
The sync-pulse allows the discharge of the capacitor by a  $2 \times I$  current. A line sync-pulse is not able to discharge the capacitor under  $V_Z/2$ . A frame sync-pulse permits the complete discharge of the capacitor, so during the frame sync-pulse  $Q_3$  and  $Q_4$  provide current for the other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

**Figure 1 : Synchronization Separator Circuit**

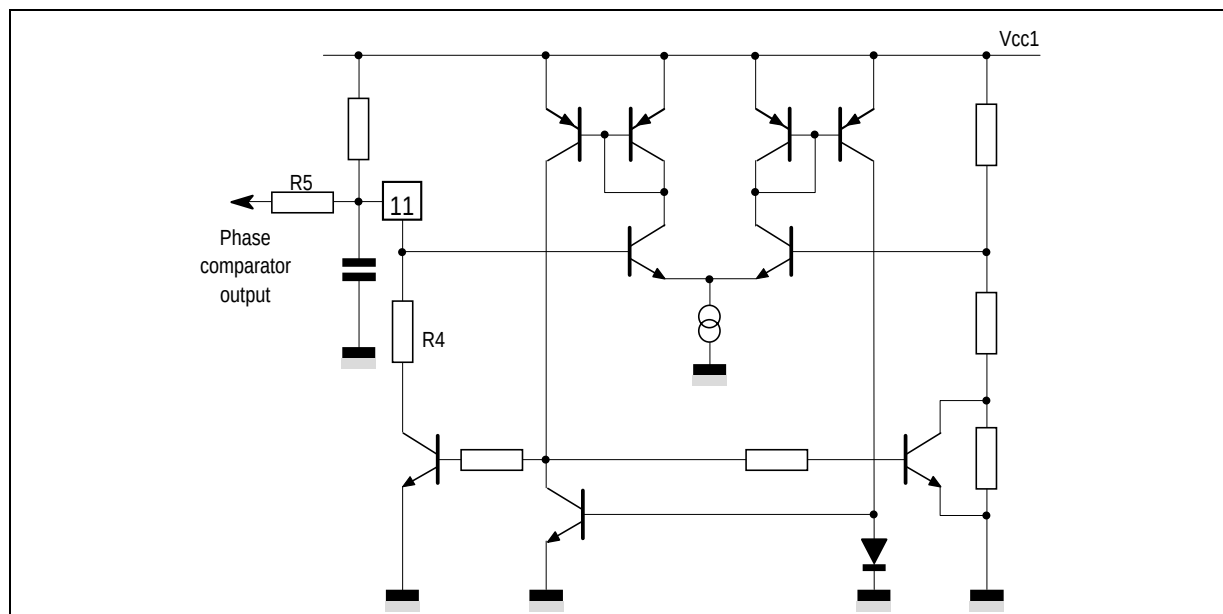


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**Figure 2 : Frame Separator**



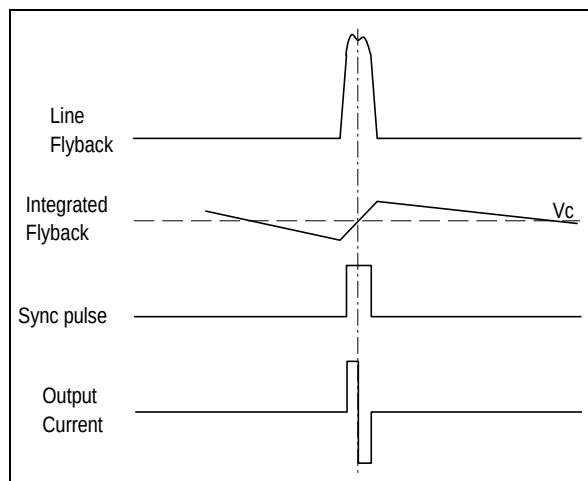
8214B-04.EPS

**Figure 3 : Line Oscillator**

8214B-05.EPS

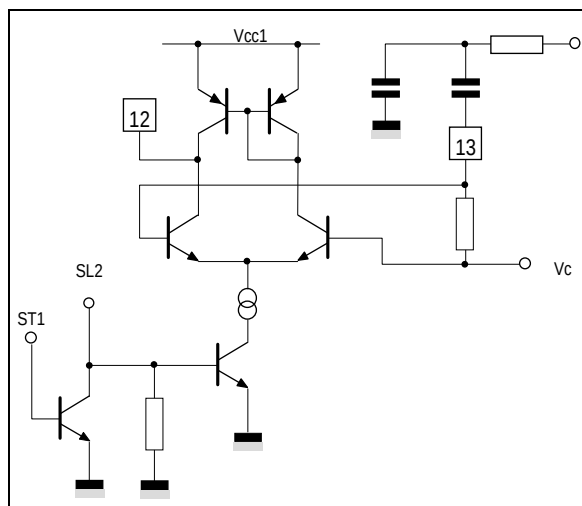
The oscillator thresholds are internally fixed by resistors. The discharge of the capacitor depends on the internal resistor R4. The control voltage is applied on resistor R5.

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 4 : Phase Comparator**

8214B-06.EPS

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

**Figure 5**

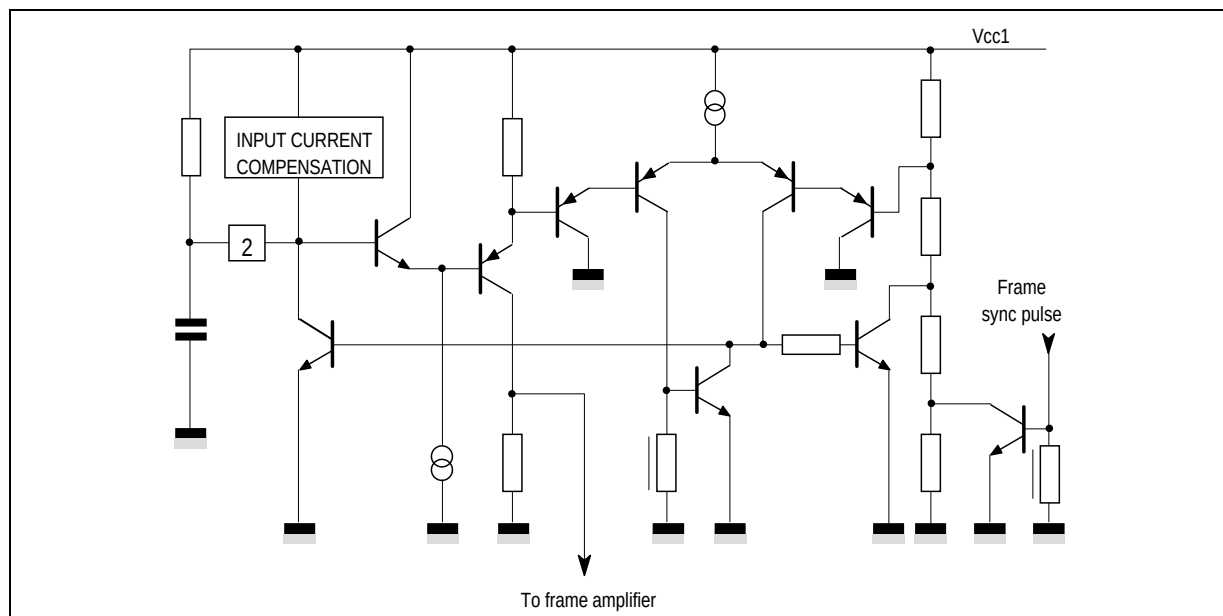
8214B-07.EPS

**Line output (Pin 17)**

It is an open-collector output. The output positive pulse time is  $29\mu\text{s}$  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 6 : 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 flyback 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 flyback 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

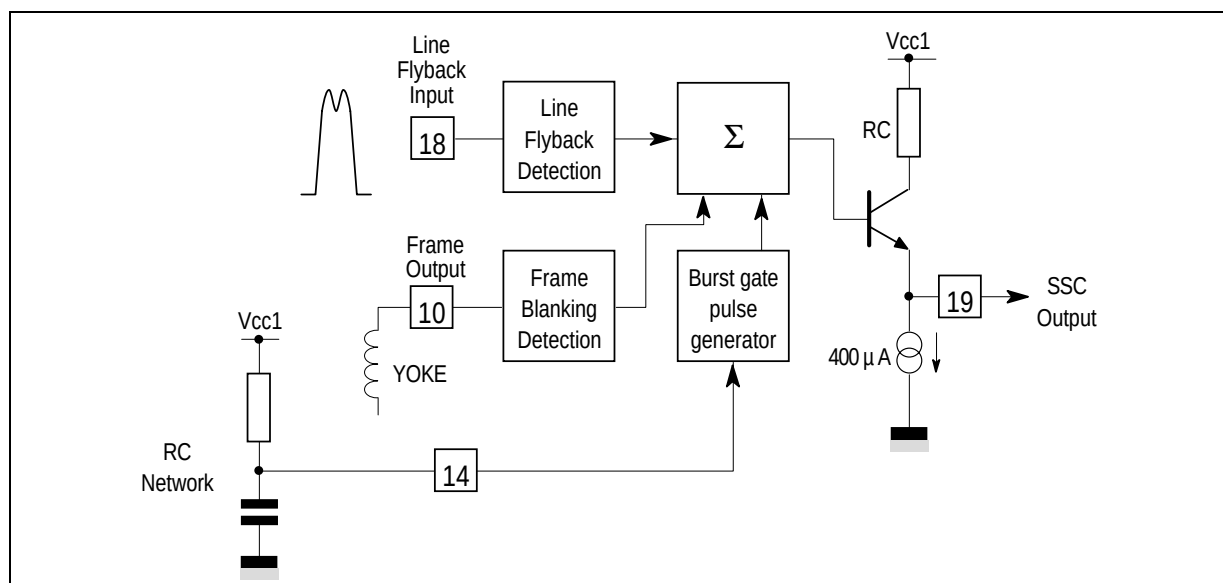
flyback.

This stage will detect the coincidence between the line sync pulse (if present) and a  $2\mu s$  sampling pulse. This  $2\mu s$  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 7 : Super Sandcastle Generator



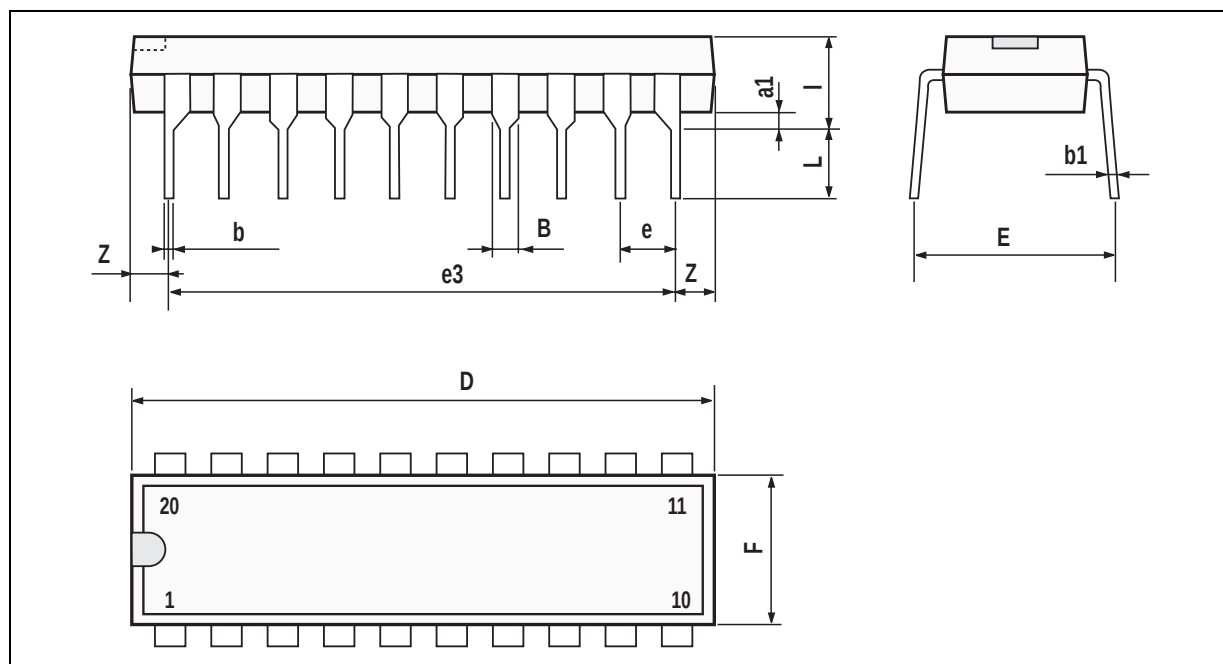


## 3214B-11.EPS





# **PACKAGE MECHANICAL DATA** **20 PINS - PLASTIC POWERDIP**



| Dimensions | 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 |

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