

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

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TDA2579B

HORIZONTAL/VERTICAL SYNCHRONIZATION CIRCUIT

GENERAL DESCRIPTION

The TDA2579B generates and synchronizes horizontal and vertical signals. The device has a 3 level sandcastle output; a transmitter identification signal and also 50/60 Hz identification.

Features

- Horizontal phase detector, (sync to oscillator), sync separator and noise inverter
- Triple current source in the phase detector with automatic selection
- Second phase detector for storage compensation of the horizontal output
- Stabilized direct starting of the horizontal oscillator and output stage from mains supply
- Horizontal output pulse with constant duty cycle value of 29 μ s
- Internal vertical sync separator, and two integration selection times
- Divider system with three different reset enable windows
- Synchronization is set to 628 divider ratio when no vertical sync pulses and no video transmitter is identified
- Vertical comparator with a low DC feedback signal
- 50/60 Hz identification output combined with mute function
- Automatic amplitude adjustment for 50 and 60 Hz and blanking pulse duration
- Automatic adaption of the burst-key pulsewidth

QUICK REFERENCE DATA

| parameter | condition | symbol | min. | typ. | max. | unit |
|--|-----------|---------------------|------|-----------------|------|------|
| Supply | | | | | | |
| Minimum required current for starting horizontal oscillator and output stage | | I ₁₆ | 6.2 | — | — | mA |
| Main supply voltage | | V ₁₀ | — | 12 | — | V |
| Supply current | | I ₁₀ | — | 70 | — | mA |
| Input signals | | | | | | |
| Sync pulse input amplitude | | V _{5(p-p)} | 0.05 | — | 1.0 | V |
| Horizontal flyback pulse input current | | I ₁₂ | — | 1 | — | mA |
| Vertical comparator input signal | | | | | | |
| Voltage AC | | V ₂ | — | 0.8 | — | V |
| Voltage DC | | V ₂ | — | 1 | — | V |
| Output signals | | | | | | |
| Horizontal output (open collector) I ₁₁ = 25 mA | | V ₁₁ | — | — | 0.5 | V |
| Vertical output stage driver (emitter follower) I ₁ = 1.5 mA | | V ₁ | 5 | — | — | V |
| Sandcastle output levels | | | | | | |
| V ₁₇ burst-key | | V ₁₇ | 9.8 | — | — | V |
| horizontal blanking | | V ₁₇ | — | 4.5 | — | V |
| vertical blanking | | V ₁₇ | — | 2.5 | — | V |
| Video transmitter identification output stage (open collector loaded with external resistor to positive supply). No sync. pulse present | | | | | | |
| | | V ₁₃ | — | — | 0.5 | V |
| | | I ₁₃ | — | — | 5 | mA |
| Sync pulse present | | | | | | |
| divider ratio > 576 | | V ₁₃ | — | V ₁₀ | — | V |
| divider ratio < 576 | | V ₁₃ | — | 7.65 | — | V |

PACKAGE OUTLINE

18-lead dual in line; plastic (SOT102).

RATINGS

Limiting values in accordance with Absolute Maximum System (IEC 134)

| parameter | symbol | min. | max. | unit |
|-------------------------------------|-----------|------|-------|------|
| Start current | I_{16} | — | 9.7 | mA |
| Supply voltage | V_{10} | — | 13.2 | V |
| Total power dissipation | P_{tot} | — | 1.2 | W |
| Storage temperature range | T_{stg} | -55 | + 150 | °C |
| Operating ambient temperature range | T_{amb} | -25 | + 70 | °C |

Thermal resistance

From junction to ambient in free air

 $R_{th\ j-a}$ 50 K/W

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CHARACTERISTICS

$T_{amb} = 25\text{ }^{\circ}\text{C}$; $I_{16} = 6.2\text{ mA}$; $V_{10} = 12\text{ V}$; unless otherwise specified
 Voltage measurements are taken with respect to pin 9 (ground)

| parameter | conditions | symbol | min. | typ. | max. | unit |
|---|------------|------------|-----------|-----------|------------|----------------------|
| Supply | | | | | | |
| Supply current (pin 16) | | | | | | |
| $V_{10} = 0\text{ V}$ | | I_{16} | 6.2 | — | 9.7 | mA |
| $V_{10} = 10\text{ V}$ | | I_{16} | 2.5 | — | 9.7 | mA |
| Stabilized voltage (pin 16) | | V_{16} | 8.8 | 9.3 | 9.7 | V |
| Current consumption (pin 10) | | I_{10} | — | 70 | 85 | mA |
| Supply voltage range (pin 10) | | V_P | 10 | 12 | 13.2 | V |
| Video input (pin 5) | | | | | | |
| Top sync level | | V_5 | 1.5 | 3.1 | 3.75 | V |
| Sync pulse amplitude (peak-to-peak value) | note 1 | $V_5(p-p)$ | 0.05 | 0.6 | 1.0 | V |
| Slicing level | note 2 | | 35 | 50 | 65 | % |
| Delay between video input and detector output (see also Fig. 3) | | | 0.2 | 0.3 | 0.55 | μs |
| Sync pulse noise level detector circuit active | note 3 | S/N | — | 19 | — | dB |
| Sync pulse | | | | | | |
| Noise level detector circuit hysteresis | | | — | 3 | — | dB |
| Noise gate (pin 5) | | | | | | |
| Switching level | | V_5 | — | + 0.7 | + 1 | V |
| First control loop (pin 8) (horizontal oscillator to sync) | | | | | | |
| Holding range | | Δf | — | ± 800 | | Hz |
| Catching range | | Δf | ± 700 | ± 800 | ± 1100 | |
| Control sensitivity video with respect to burst-key and flyback-pulse | | | | | | |
| Slow time constant | | | — | 2 | — | kHz/ μs |
| Normal time constant | | | — | 5 | — | kHz/ μs |
| Fast time constant | | | — | 3 | — | kHz/ μs |
| Phase modulation due to hum on the supply line (pin 10) | note 4 | | — | 0.2 | — | $\mu\text{s}/V_{tt}$ |
| Phase modulation due to hum on input current (pin 16) | note 4 | | — | 0.08 | — | $\mu\text{s}/V_{tt}$ |

DEVELOPMENT DATA

| parameter | conditions | symbol | min. | typ. | max. | unit |
|--|---|---------------------------|------|-----------------------|----------|--------------------|
| Second control loop (pin 14) (horizontal flyback to horizontal oscillator) | | | | | | |
| Control sensitivity | $t_d = 10 \mu s$ | $\Delta t_d / \Delta t_o$ | 200 | 300 | 600 | μs |
| Control range | | t_d | 1 | — | >45 | μs |
| Control range for constant duty factor horizontal output | | t_d | 1 | 29 (—t flyback pulse) | | μs |
| Controlled edge of horizontal output signal (pin 11) | | | | positive | | |
| Phase adjustment (pin 14) (via second control loop) | | | | | | |
| Control sensitivity | $t_d = 10 \mu s$ | I_{14} | — | 25 | — | $\mu A / \mu s$ |
| Maximum allowed control current | | | — | — | ± 60 | μA |
| Horizontal oscillator (pin 15) | | | | | | |
| | $C = 2.7 \text{ nF};$ $R_{osc} = 34.8 \text{ k}\Omega$ | | | | | |
| Frequency (no sync) | | f | — | 15625 | — | Hz |
| Spread (fixed external component, no sync) | | Δf | — | — | ± 4 | % |
| Frequency deviation between starting point output signal and stabilized condition | | Δf | — | + 5 | + 8 | % |
| Temperature coefficient | | T_C | — | -1.10^{-4} | — | /K |
| Horizontal output (pin 11) (Open collector) | | | | | | |
| Output voltage high | | V_{11} | — | — | 13.2 | V |
| Start voltage protection (internal zener diode) | | V_{11} | 13 | — | 15.8 | V |
| Low input current (pin 16) protection output enabled | | I_{16} | — | 5.0 | 6.2 | mA |
| Output voltage low start condition | $I_{11} = 10 \text{ mA}$ | V_{11} | — | 0.1 | 0.5 | V |
| Duty factor output current during starting | $I_{16} = 6.2 \text{ mA}$ | | 50 | 60 | 70 | % |
| Output voltage low normal condition | $I_{11} = 25 \text{ mA}$ | V_{11} | — | 0.3 | 0.5 | V |
| Duty factor output current without flyback pulse (pin 12) | | | 45 | 50 | 55 | % |
| Duration of the output pulse HIGH | $t_d = 10 \mu s$ | | 27 | 29 | 31 | μs |
| Controlled edge | | | | positive | | |
| Temperature coefficient horizontal output pulse | | | — | -5.10^{-2} | — | $\mu s / ^\circ C$ |
| Influence of delay time on pulse width of the horizontal output signal | | $\Delta H_W / t_d$ | — | 0.16 | — | $\mu s / \mu s$ |

CHARACTERISTICS (continued)

| parameter | conditions | symbol | min. | typ. | max. | unit |
|--|------------------------------------|-----------------|--------|------|------|------|
| Sandcastle output signal (pin 17) | $I_L = 1 \text{ mA}$ | | | | | |
| Output voltage during: | | | | | | |
| burst-key | | V ₁₇ | 9.8 | 10.4 | — | V |
| horizontal blanking | | V ₁₇ | 4.1 | 4.5 | 4.9 | V |
| vertical blanking | $I_L = 0.3 \text{ mA}$ | V ₁₇ | 2.1 | 2.5 | 2.9 | V |
| Zero level output voltage | $I_{\text{sink}} = 0.5 \text{ mA}$ | V ₁₇ | — | — | 0.7 | V |
| Pulse width: | | | | | | |
| burst-key (50 Hz) | | t _p | 3.85 | 4.15 | 4.6 | μs |
| burst-key (60 Hz) | | t _p | 3.40 | 3.65 | 4.0 | μs |
| Horizontal blanking | | V ₁₂ | — | 1.0 | — | V |
| Vertical blanking | note 5 | | | | | |
| Phase position burstkey | | | | | | |
| time between middle sync | | | | | | |
| pulse at pin 5 and start of | | | | | | |
| burst pulse at pin 17 | | | 2.3 | 2.7 | 3.1 | μs |
| Time between start sync pulse | | | | | | |
| and end of burst pulse at pin 17 | | | | | | |
| (50 Hz) | | | — | 9.3 | 9.7 | μs |
| (60 Hz) | | | — | 8.8 | 9.2 | μs |
| Coincidence detector, video transmitter identification circuit and time constant switching levels (see also Fig. 1) | | | | | | |
| Detector output current | | I ₁₈ | — | 0.25 | — | mA |
| Voltage level for in sync condition (φ ₁ normal) | | V ₁₈ | 5.8 | 6.5 | 7.0 | V |
| Voltage for noisy sync pulse (φ ₁ slow and gated) | | V ₁₈ | 9 | 10 | — | V |
| Voltage level for noise only | note 6 | V ₁₈ | — | 0.3 | — | V |
| Switching level normal to fast | | V ₁₈ | < 3.2 | 3.5 | 3.8 | V |
| Switching level | | | | | | |
| mute output active and | | | | | | |
| fast to normal | | V ₁₈ | < 1.0 | 1.2 | 1.4 | V |
| Switching level frame period | | | | | | |
| counter (3 periods fast) | | V ₁₈ | < 0.08 | 0.12 | 0.16 | V |
| Switching level: | | | | | | |
| normal to fast (locking) | | | | | | |
| mute output inactive | | V ₁₈ | > 1.5 | 1.75 | 2.0 | V |
| Switching level fast to normal | | | | | | |
| (locking) | | V ₁₈ | > 4.7 | 5.0 | 5.3 | V |
| Switching level normal to slow | | | | | | |
| (gated sync pulse) | | V ₁₈ | 7.4 | 7.8 | 8.2 | V |

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| parameter | conditions | symbol | min. | typ. | max. | unit |
|---|--------------------------|----------|------|----------|------|--------------------|
| Video transmitter identification output (pin 13) | | | | | | |
| Output voltage active (no sync) | $I_{13} = 1 \text{ mA}$ | V_{13} | — | 0.15 | 0.32 | V |
| Sink current active (no sync) | $V_{13} < 1 \text{ V}$ | I_{13} | — | — | 5 | mA |
| Output current inactive (sync 50 Hz) | | I_{13} | — | — | 1 | μA |
| 50/60 Hz identification (pin 13) (R_{13} positive supply 12 k Ω) | | | | | | |
| Emitter follower, pnp: | | | | | | |
| 60 Hz: $\frac{2 \times f_H}{f_V} < 576$ voltage | | V_{13} | 7.2 | 7.65 | 8.1 | V |
| 50 Hz: $\frac{2 \times f_H}{f_V} > 576$ voltage | | V_{13} | — | V_{10} | — | V |
| Flyback input pulse (pin 12) | | | | | | |
| Switching level | | V_{12} | — | +1 | — | V |
| Input current | | I_{12} | +0.2 | — | +3 | mA |
| Input pulse | | V_{12} | — | — | 12 | V _p |
| Input resistance | | | — | 3.5 | — | k Ω |
| Phase position without shift time between the middle of the sync pulse at pin 5 and the middle of the horizontal blanking pulse at pin 17 | | t_d | 2.1 | 2.5 | 2.9 | μs |
| Vertical ramp generator (pin 3) | | | | | | |
| Pulse width charge current | | — | — | 26 | — | clock pulses |
| Charge current | | I_3 | — | 3 | — | mA |
| Top level ramp signal voltage | | | | | | |
| Divider in 50 Hz mode | note 7 | V_3 | 5.5 | 5.85 | 6.3 | V |
| Divider in 60 Hz mode | note 7 | V_3 | 4.55 | 4.85 | 5.25 | V |
| Ramp amplitude | $C_3 = 150 \text{ nF}$, | | | | | |
| $R_4 = 330 \text{ k}\Omega$ 50 Hz | note 7 | | — | 3.1 | — | V _p |
| $R_4 = 330 \text{ k}\Omega$ 60 Hz | note 7 | | — | 2.5 | — | V _p |
| Temperature coefficient | $I_4 = 30 \mu\text{A}$ | I_3 | — | +100 | — | $10^{-6}/\text{K}$ |

CHARACTERISTICS (continued)

| parameter | conditions | symbol | min. | typ. | max. | unit |
|--|--|--------|--------|------|------|--------------------|
| Current source (pin 4) | | | | | | |
| Output voltage | $I_4 = 20 \mu\text{A}$ | V_4 | 7.0 | 7.5 | 7.9 | V |
| Allowed current range | | I_4 | 10 | — | 75 | μA |
| Temperature coefficient output voltage | $I_4 = 30 \mu\text{A}$ | TC | — | + 50 | — | $10^{-6}/\text{K}$ |
| Comparator (pin 2) | | | | | | |
| | $C_3 = 150 \text{ nF};$ $R_4 = 330 \text{ k}\Omega$ | | | | | |
| Input voltage | | | | | | |
| DC level | note 7 | V_2 | 0.97 | 1.07 | 1.17 | V |
| AC level | | V_2 | — | 0.8 | — | V_p |
| Deviation amplitude 50/60 Hz | | | — | 1.75 | 2.5 | % |
| Vertical output stage (pin 1) (nnp emitter follower) | | | | | | |
| Output voltage | $I_O \text{ pin 1} = +1.5 \text{ mA}$ note 7 | V_1 | 5.0 | 5.5 | 6.3 | V |
| R_S , sync separator resistor | | | — | 170 | — | Ω |
| Continuous sink current | | | — | 0.25 | — | mA |
| Vertical guard circuit (pin 2) | | | | | | |
| Active ($V_{17} = 2.5 \text{ V}$) | | | | | | |
| Switching level LOW | note 7 | V_2 | > 1.7 | 1.85 | 2.0 | V |
| Switching level HIGH | note 7 | V_2 | < 0.25 | 0.35 | 0.45 | V |

Notes to the characteristics

- Up to 1 V peak-to-peak the slicing level is constant, at amplitudes exceeding 1 V peak-to-peak the slicing level will increase.
- The slicing level is fixed by the formula:

$$P = \frac{R_S}{5.3 + R_S} \times 100\% \quad (R_S \text{ value in } \text{k}\Omega)$$

- $S/N = 20 \log \frac{\text{video voltage black to white (p-p)}}{\text{noise (rms)}}$

measured with 1 V_{p-p} video input

- Measured between pin 5 and sandcastle output pin 17.
- Divider in search (large) mode:
 start: reset divider = start vertical sync plus 1 clock pulse
 stop:
$$n = \frac{2 \times f_H}{f_V} > 576 \text{ clock pulse } 44$$

$$n = \frac{2 \times f_H}{f_V} < 576 \text{ clock pulse } 34$$

Divider in small window mode:

start: clock pulse 517 (60 Hz) clock pulse 618 (50 Hz)

stop: clock pulse 34 (60 Hz) clock pulse 44 (50 Hz)

- Depends on DC level of pin 5, given value is valid for $V_5 \approx 5 \text{ V}$.
- Value related to internal zener diode reference voltage source spread includes the complete spread of reference voltage.