B & D Enterprises
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# CONTROL CIRCUIT FOR SMPS

The TDA2581 is a monolithic integrated circuit for controlling switched-mode power supplies (SMPS) which are provided with the drive for the horizontal deflection stage.

The circuit features the following:
- Voltage controlled horizontal oscillator.
- Phase detector.
- Duty factor control for the positive-going transient of the output signal.
- Duty factor increases from zero to its normal operation value.
- Adjustable maximum duty factor.
- Over-voltage and over-current protection with automatic re-start after switch-off.
- Counting circuit for permanent switch-off when n-times over-current or over-voltage is sensed.
- Protection for open-reference voltage.
- Protection for too low supply voltage.
- Protection against loop faults.
- Positive tracking of duty factor and feedback voltage when the feedback voltage is smaller than the reference voltage minus 1,5 V.

## QUICK REFERENCE DATA

| | | | | |
|---|---|---|---|---|
| Supply voltage | $V_{9\text{-}16}$ | typ. | 12 | V |
| Supply current | $I_9$ | typ. | 15 | mA |
| **Input signals** | | | | |
| Horizontal drive pulse (peak-to-peak value) | $V_{3\text{-}16(p\text{-}p)}$ | typ. | 11 | V |
| Flyback pulse (differentiated deflection current); peak-to-peak value | $V_{2\text{-}16(p\text{-}p)}$ | typ. | 5 | V |
| External reference voltage | $V_{10\text{-}16}$ | typ. | 6,7 | V |
| **Output signals** | | | | |
| Duty factor of output pulse | $\delta$ | $>$ | 0 | % |
| | | $<$ | 98 ± 0,6 | % |
| Output voltage at $I_o < 20$ mA (peak value) | $V_{11\text{-}16M}$ | typ. | 11,8 | V |
| Output current (peak value) | $I_{11M}$ | $<$ | 40 | mA |

## PACKAGE OUTLINES

TDA2581: 16-lead DIL; plastic (SOT-38).
TDA2581Q: 16-lead QIL; plastic (SOT-58).

## RATINGS

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

| | | | |
|---|---|---|---|
| Supply voltage | $V_{9-16}$ | max. | 14 V |
| Voltage at pin 11 | $V_{11-16}$ | | 0 to 14 V |
| Output current | $I_{11}$ | max. | 40 mA |
| Total power dissipation | $P_{tot}$ | max. | 340 mW |
| Storage temperature | $T_{stg}$ | | −25 to +125 °C |
| Operating ambient temperature | $T_{amb}$ | | −25 to +80 °C |

## CHARACTERISTICS

$V_{9-16}$ = 12 V; $V_{10-16}$ = 6,7 V; $T_{amb}$ = 25 °C; measured in the circuit on page 2

| | | | |
|---|---|---|---|
| Supply voltage range | $V_{9-16}$ | typ. | 12 V<br>10 to 14 V |
| Protection voltage too low supply voltage | $V_{9-16}$ | typ. | 9,4 V<br>8,6 to 9,9 V |
| Supply current at $\delta$ = 50% | $I_9$ | typ. | 15 mA |
| Supply current during protection | $I_9$ | typ. | 15 mA |
| Minimum required supply current | $I_9$ | < | 18,5 mA* |
| Power consumption | P | typ. | 180 mW |
| **Required input signals** | | | |
| Reference voltage | $V_{10-16}$ | typ. | 6,7 V<br>5,6 to 7,5 V** |
| High reference voltage protection: threshold voltage | $V_{10-16}$ | typ. | 8,4 V<br>7,9 to 8,9 V |
| Feedback input impedance at pin 8 | $\lvert Z_{8-16}\rvert$ | typ. | 200 kΩ |
| Horizontal drive pulse (square-wave or differentiated; negative transient is reference) peak-to-peak value | $V_{3-16(p-p)}$ | typ. | 11 V<br>5 to 12 V |
| Flyback pulse or differential deflection current | $V_{2-16}$ | | 1 to 5 V |
| Over-current protection: threshold voltage | $-V_{6-16}$ | typ. | 640 mV<br>690 to 695 mV▲ |
| | $+V_{6-16}$ | typ. | 680 mV<br>640 to 735 mV▲ |
| Over-voltage protection: threshold voltage | $V_{7-16}$ | typ. | $V_{10-16}$ −60 mV<br>$V_{10-16}$ −130 to $V_{10-16}$ −0 mV |

* This value refers to the minimum required supply current that will start all devices under the following conditions: $V_{9-16}$ = 10 V; $V_{10-16}$ = 6,8 V; $\delta$ = 50%.

** Voltage obtained via an external reference diode. Specified voltages do not refer to the nominal voltages of reference diodes.

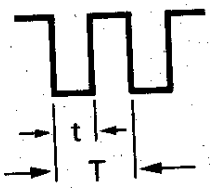
▲ This spread is inclusive temperature rise of the IC due to warming up. For other ambient temperatures the values must be corrected by using a temperature coefficient of typical −1,85 mV/°C.

**CHARACTERISTICS** (continued)

| | | | |
|---|---|---|---|
| Remote control voltage; switch off | $V_{4\text{-}16}$ | > | 5,8 V* |
| switch on | $V_{4\text{-}16}$ | < | 4,5 V* |
| **Delivered output signals** | | | |
| Horizontal drive pulse (loaded with a resistor of 560 Ω to +12 V) peak-to-peak value | $V_{11\text{-}16(p\text{-}p)}$ | > | 11,6 V |
| Output current; peak value | $I_{11M}$ | < | 40 mA |
| Saturation voltage of output transistor at $I_{11}$ = 20 mA | $V_{CEsat}$ | typ. | 200 mV |
| | | < | 400 mV |
| at $I_{11}$ = 40 mA | $V_{CEsat}$ | < | 525 mV |
| Duty factor of output pulse** | $\delta$ | > | 0 % |
| | | < | 98 ± 0,6 % |
| Charge current for capacitor on pin 4 | $I_4$ | typ. | 120 μA |
| Charge current for capacitor on pin 5 | $I_5$ | typ. | 130 μA |
| Supply current for reference | $I_{10}$ | typ. | 1 mA |
| | | | 0,6 to 1,45 mA |
| **Oscillator** | | | |
| Temperature coefficient | | typ. | −300 ppm/°C |
| | | < | −400 ppm/°C |
| Relative frequency deviation for $V_{10\text{-}16}$ changing from 6 to 7 V | | typ. | −1,5 % |
| | | ⩽ | −2 % |
| Oscillator frequency spread (with fixed external components) | | ⩽ | ±3 % |
| Frequency control sensitivity at pin 15 | | typ. | 4,5 kHz/V▲ |
| **Phase control loop** | | | |
| Loop gain of APC-system (automatic phase control) | | typ. | 5 kHz/μs |
| Catching range | $\Delta f$ | typ. | ±1,5 kHz |
| Phase relation between negative transient of sync pulse and middle of flyback | t | typ. | 1 μs |
| Tolerance of phase relation | $\Delta t$ | ⩽ | ±0,4 μs |

* See pin 4 on pages 7 and 8.

** The duty factor is specified as follows:




$$\delta = \frac{t}{T} \times 100\%.$$



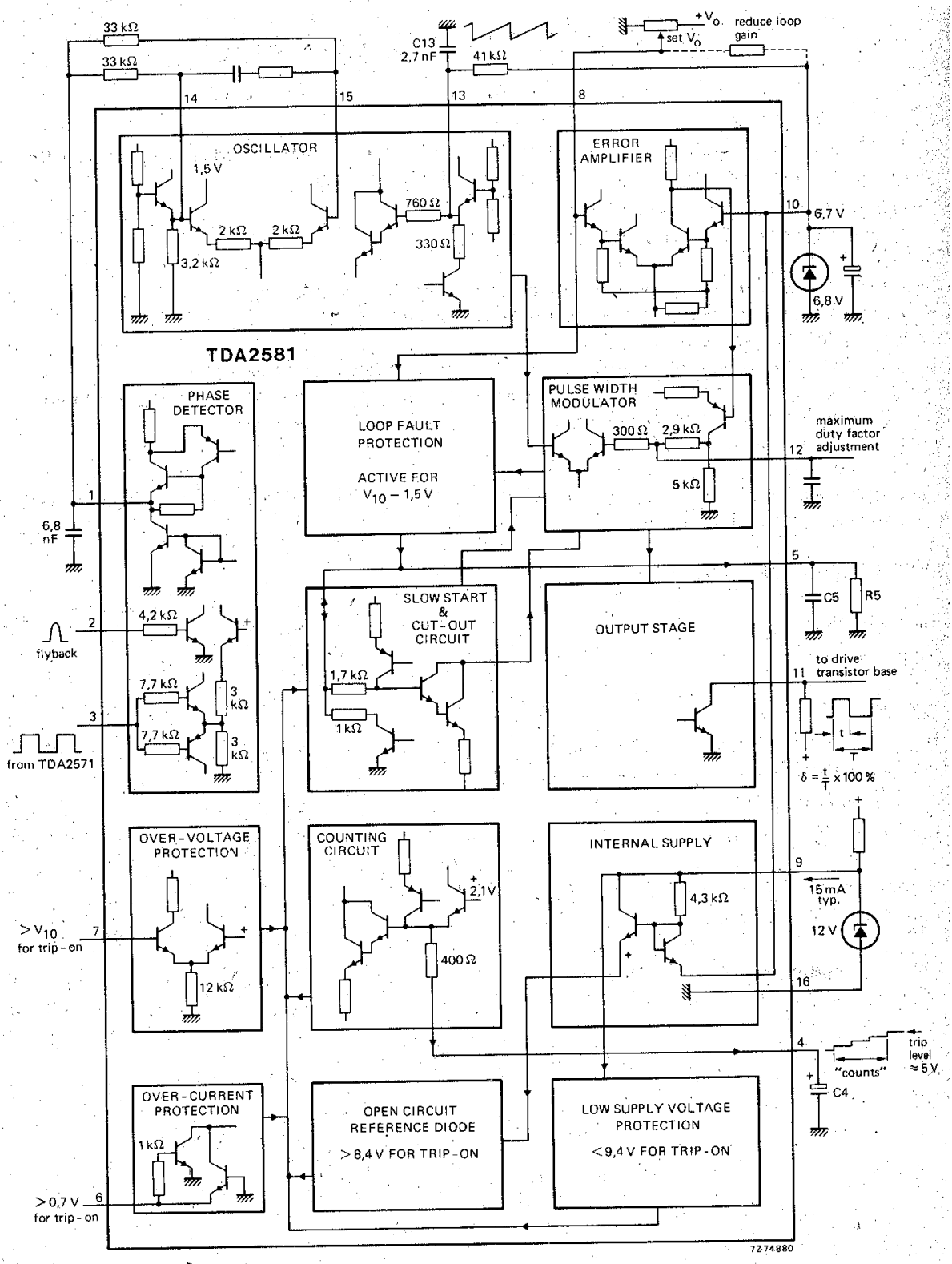
The maximum duty factor value can be set to a desired value (see application information pin 12 on page 9).

▲ For component values see circuit diagram on page 2.

## PINNING

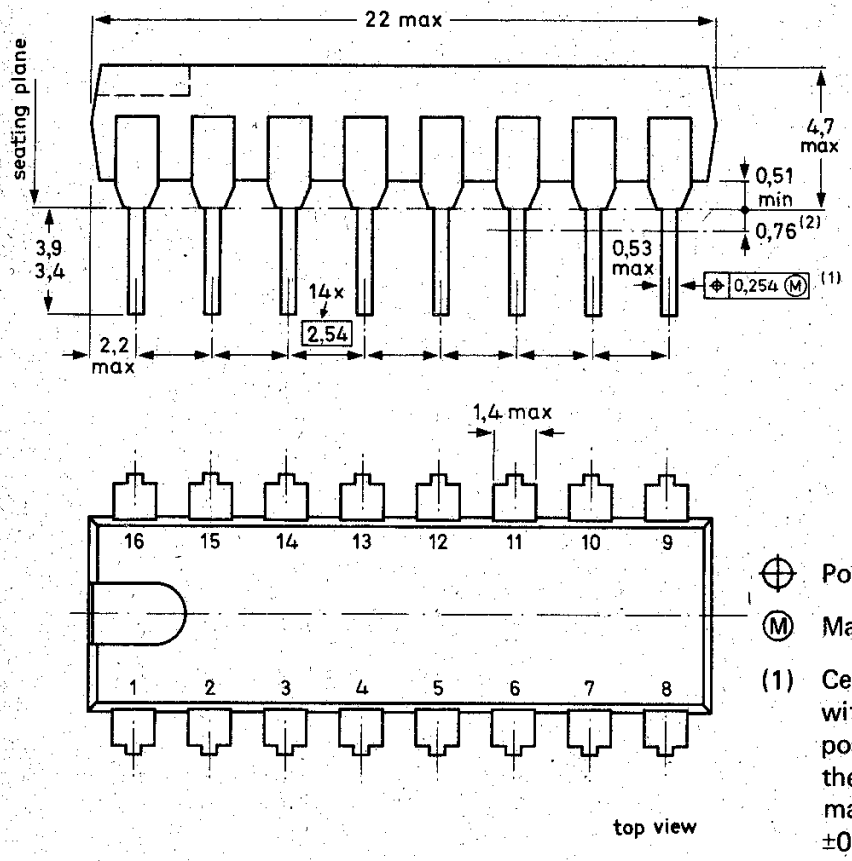
1. Phase detector output
2. Flyback pulse position input
3. Reference frequency input
4. Re-start count capacitor/remote control input
5. Slow start and transfer characteristic for low feedback voltages
6. Over-current protection input
7. Over-voltage protection input
8. Feedback voltage input
9. Positive supply
10. Reference input
11. Output
12. Maximum duty factor adjustment/smoothing
13. Oscillator timing network
14. Reactance stage reference voltage
15. Reactance stage input
16. Negative supply (ground)

## BLOCK DIAGRAM




Note: trip levels are nominal values.

# 16-LEAD DUAL IN-LINE; PLASTIC (SOT-38)




⊕ Positional accuracy.

Ⓜ Maximum Material Condition.

(1) Centre-lines of all leads are within ±0,127 mm of the nominal position shown; in the worst case, the spacing between any two leads may deviate from nominal by ±0,254 mm.

(2) Lead spacing tolerances apply from seating plane to the line indicated.

Dimensions in mm



## SOLDERING

**1. By hand**

Apply the soldering iron below the seating plane (or not more than 2 mm above it).
If its temperature is below 300 °C it must not be in contact for more than 10 seconds; if between 300 °C and 400 °C, for not more than 5 seconds.

**2. By dip or wave**

The maximum permissible temperature of the solder is 260 °C; this temperature must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.
The device may be mounted up to the seating plane, but the temperature of the plastic body must not exceed the specified storage maximum. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature within the permissible limit.

**3. Repairing soldered joints**

The same precautions and limits apply as in (1) above.

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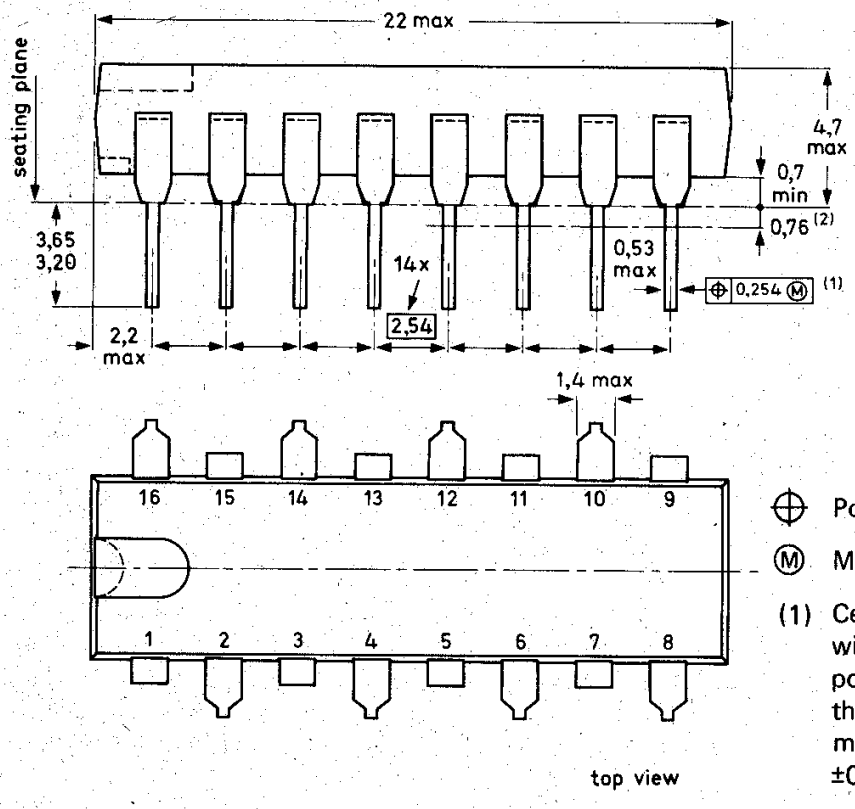
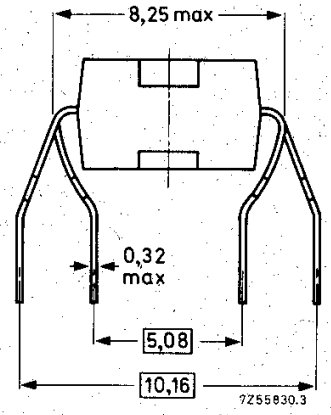
# 16-LEAD QUADRUPLE IN-LINE; PLASTIC (SOT-58)




⊕ Positional accuracy.

Ⓜ Maximum Material Condition.

(1) Centre-lines of all leads are within ±0,127 mm of the nominal position shown; in the worst case, the spacing between any two leads may deviate from nominal by ±0,254 mm.

(2) Lead spacing tolerances apply from seating plane to the line indicated.

**Dimensions in mm**

## SOLDERING

**1. By hand**

Apply the soldering iron below the seating plane (or not more than 2 mm above it).
If its temperature is below 300 °C it must not be in contact for more than 10 seconds; if between 300 °C and 400 °C, for not more than 5 seconds.

**2. By dip or wave**

The maximum permissible temperature of the solder is 260 °C; this temperature must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.
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