

## 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 <sub>9-16</sub>	typ.	12 V
Supply current	I <sub>g</sub>	typ.	15 mA
<b>Input signals</b>			
Horizontal drive pulse (peak-to-peak value)	V <sub>3-16(p-p)</sub>	typ.	11 V
Flyback pulse (differentiated deflection current); peak-to-peak value	V <sub>2-16(p-p)</sub>	typ.	5 V
External reference voltage	V <sub>10-16</sub>	typ.	6,7 V
<b>Output signals</b>			
Duty factor of output pulse	$\delta$	> <	0 % 98 ± 0,6 %
Output voltage at I <sub>o</sub> < 20 mA (peak value)	V <sub>11-16M</sub>	typ.	11,8 V
Output current (peak value)	I <sub>11M</sub>	<	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 10 to 14 V
Protection voltage too low supply voltage	$V_{9-16}$	typ.	9,4 V 8,6 to 9,9 V
Supply current at $\delta = 50\%$	$I_g$	typ.	15 mA
Supply current during protection	$I_g$	typ.	15 mA
Minimum required supply current	$I_g$	<	18,5 mA*
Power consumption	P	typ.	180 mW
<b>Required input signals</b>			
Reference voltage	$V_{10-16}$	typ.	6,7 V 5,6 to 7,5 V**
High reference voltage protection: threshold voltage	$V_{10-16}$	typ.	8,4 V 7,9 to 8,9 V
Feedback input impedance at pin 8	$ Z_{8-16} $	typ.	200 k $\Omega$
Horizontal drive pulse (square-wave or differentiated; negative transient is reference) peak-to-peak value	$V_{3-16(p-p)}$	typ.	11 V 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 690 to 695 mV $\blacktriangle$
	$+V_{6-16}$	typ.	680 mV 640 to 735 mV $\blacktriangle$
Over-voltage protection: threshold voltage	$V_{7-16}$	typ.	$V_{10-16} - 60$ mV $V_{10-16} - 130$ 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.

$\blacktriangle$  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.

**TDA2581**  
**TDA2581Q**

**CHARACTERISTICS (continued)**

Remote control voltage; switch off  
switch on

V <sub>4-16</sub>	>	5,8 V*
V <sub>4-16</sub>	<	4,5 V*

**Delivered output signals**

Horizontal drive pulse (loaded with a resistor  
of 560 Ω to +12 V)  
peak-to-peak value

V <sub>11-16(p-p)</sub>	>	11,6 V
I <sub>11M</sub>	<	40 mA

Output current; peak value

Saturation voltage of output transistor  
at I<sub>11</sub> = 20 mA

V <sub>CEsat</sub>	typ.	200 mV
	<	400 mV

at I<sub>11</sub> = 40 mA

V <sub>CEsat</sub>	<	525 mV
	>	0 %

Duty factor of output pulse\*\*

δ	<	98 ± 0,6 %
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Charge current for capacitor on pin 4

I <sub>4</sub>	typ.	120 μA
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Charge current for capacitor on pin 5

I <sub>5</sub>	typ.	130 μA
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Supply current for reference

I <sub>10</sub>	typ.	1 mA
		0,6 to 1,45 mA

**Oscillator**

Temperature coefficient

	typ.	-300 ppm/°C
	<	-400 ppm/°C

Relative frequency deviation for V<sub>10-16</sub>  
changing from 6 to 7 V

	typ.	-1,5 %
	≤	-2 %

Oscillator frequency spread (with fixed  
external components)

	≤	±3 %
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Frequency control sensitivity at pin 15

	typ.	4,5 kHz/V <sup>▲</sup>
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**Phase control loop**

Loop gain of APC-system (automatic phase control)

	typ.	5 kHz/μs
Δf	typ.	±1,5 kHz

Catching range

Phase relation between negative transient of  
sync pulse and middle of flyback

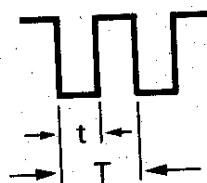
t	typ.	1 μs
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Tolerance of phase relation

Δt	≤	±0,4 μs
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\* See pin 4 on pages 7 and 8.

\*\* The duty factor is specified as follows:



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

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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**

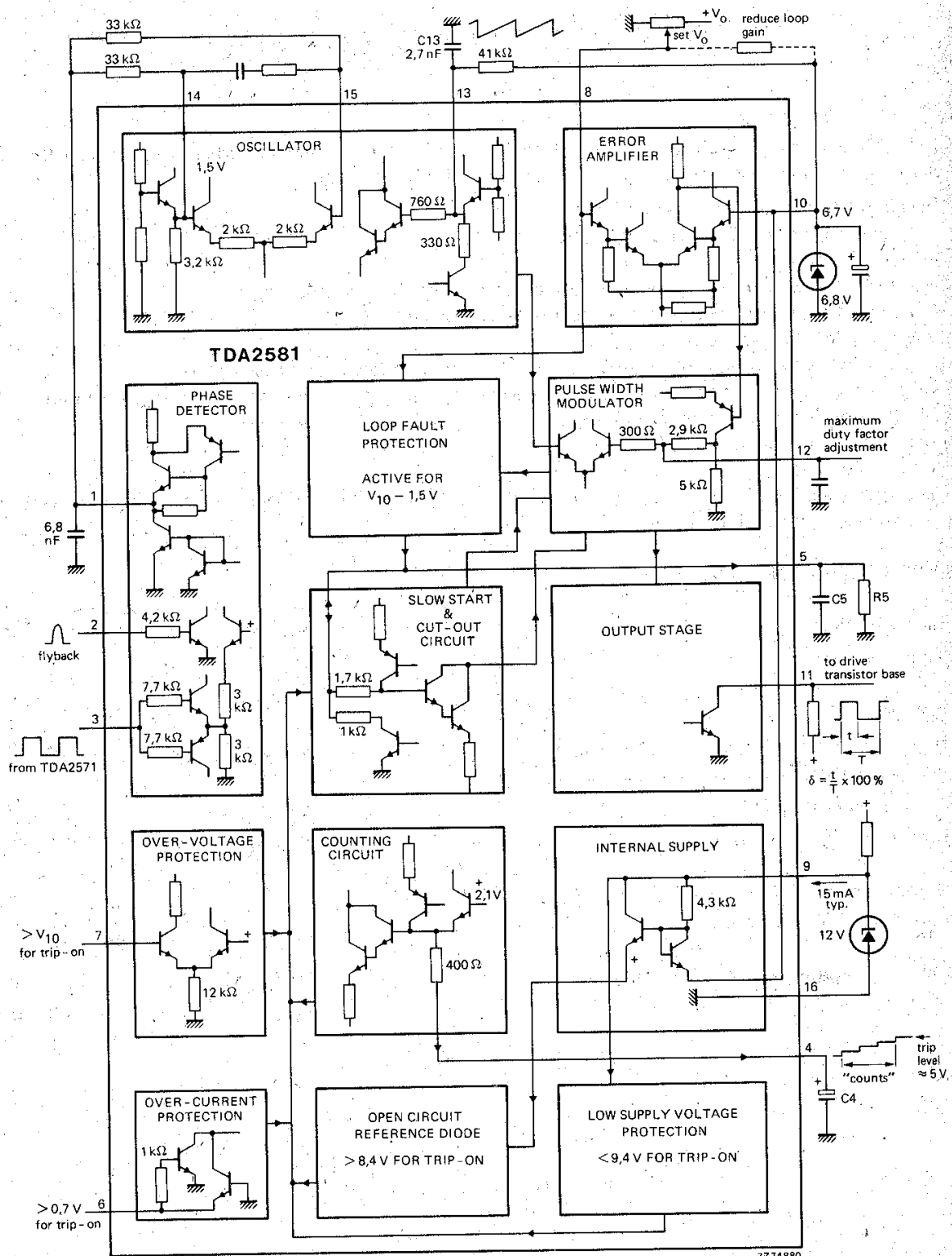
1. Phase detector output
2. Flyback pulse position input
3. Reference frequency input
4. Re-start count capacitor/remote control input
5. Slow start and transfer characteristic for low feedback voltages
6. Over-current protection input
7. Over-voltage protection input
8. Feedback voltage input
9. Positive 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)

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TDA2581Q

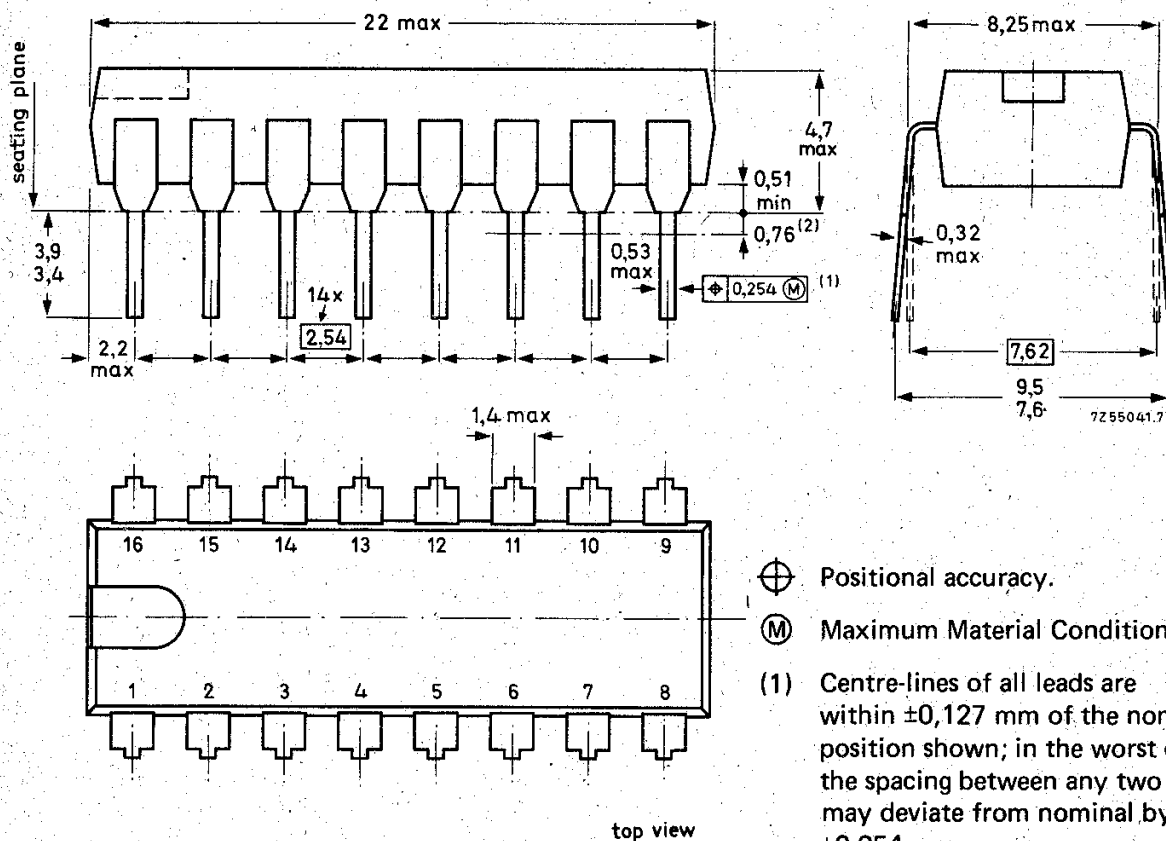
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**BLOCK DIAGRAM**



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  $\pm 0,127$  mm of the nominal position shown; in the worst case, the spacing between any two leads may deviate from nominal by  $\pm 0,254$  mm.
- (2) Lead spacing tolerances apply from seating plane to the line indicated.

Dimensions in mm

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**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.

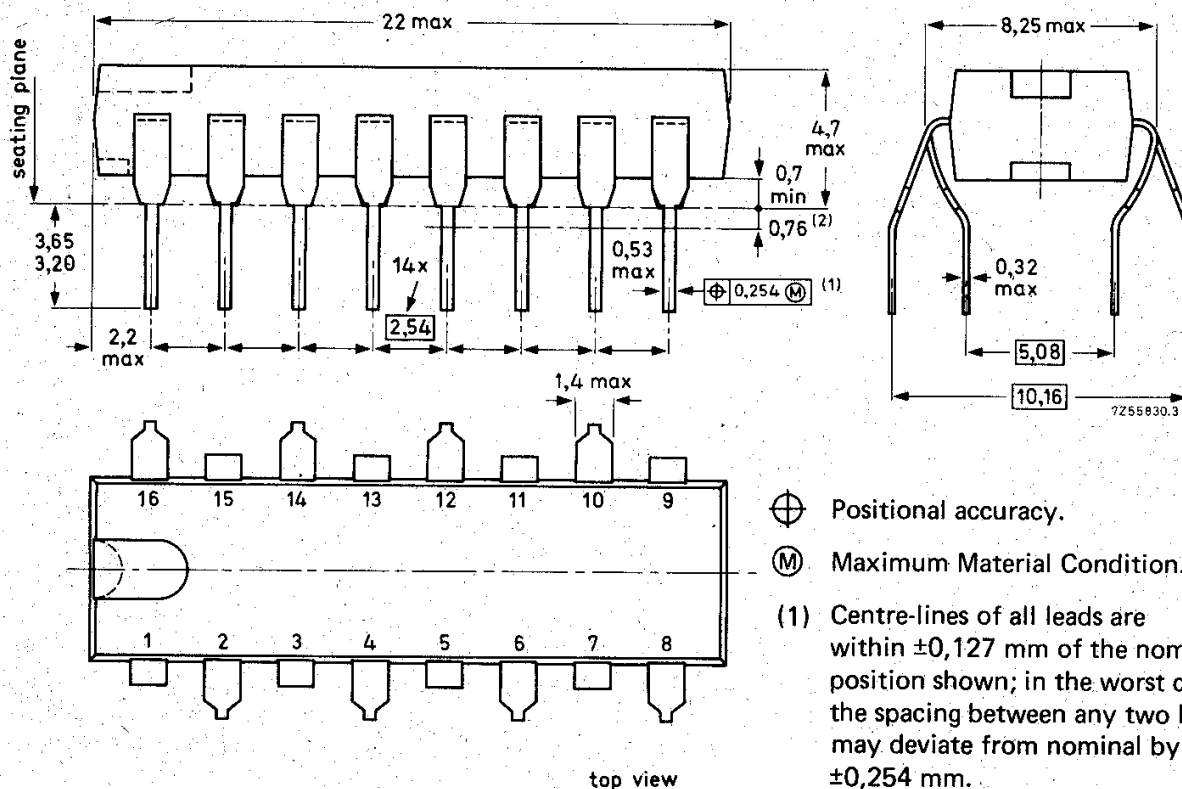
**2. By dip or wave**

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.

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



- ⊕ Positional accuracy.
- Ⓜ Maximum Material Condition.
- (1) Centre-lines of all leads are within  $\pm 0,127$  mm of the nominal position shown; in the worst case, the spacing between any two leads may deviate from nominal by  $\pm 0,254$  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.