

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 ₉₋₁₆	typ.	12	V
Supply current	I _g	typ.	15	mA
Input signals				
Horizontal drive pulse (peak-to-peak value)	V _{3-16(p-p)}	typ.	11	V
Flyback pulse (differentiated deflection current); peak-to-peak value	V _{2-16(p-p)}	typ.	5	V
External reference voltage	V ₁₀₋₁₆	typ.	6,7	V
Output signals				
Duty factor of output pulse	δ	>	0	%
		<	98 ± 0,6	%
Output voltage at I _O < 20 mA (peak value)	V _{11-16M}	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

 $V_{9-16} = 12 \text{ V}$; $V_{10-16} = 6,7 \text{ V}$; $T_{amb} = 25 \text{ °C}$; 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
Required input signals			
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 Ω
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 Δ
	$+V_{6-16}$	typ.	680 mV 640 to 735 mV Δ
Over-voltage protection: threshold voltage	V_{7-16}	typ.	$V_{10-16} - 60 \text{ mV}$
		V_{10-16}	-130 to $V_{10-16} - 0 \text{ mV}$

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

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

 Δ 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 $-1,85 \text{ mV/°C}$.

TDA2581 TDA2581Q

CHARACTERISTICS (continued)

Remote control voltage; switch off
switch on

V_{4-16}	>	5,8 V*
V_{4-16}	<	4,5 V*

Delivered output signals

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

$V_{11-16(p-p)}$	>	11,6 V
I_{11M}	<	40 mA

Output current; peak value

Saturation voltage of output transistor
at $I_{11} = 20$ mA

V_{CEsat}	typ.	200 mV
V_{CEsat}	<	400 mV

at $I_{11} = 40$ mA

V_{CEsat}	<	525 mV
δ	>	0 %

Duty factor of output pulse**

δ	<	$98 \pm 0,6$ %
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Charge current for capacitor on pin 4

I_4	typ.	120 μ A
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Charge current for capacitor on pin 5

I_5	typ.	130 μ A
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Supply current for reference

I_{10}	typ.	1 mA
		0,6 to 1,45 mA

Oscillator

Temperature coefficient

	typ.	-300 ppm/ $^{\circ}$ C
	<	-400 ppm/ $^{\circ}$ C

Relative frequency deviation for V_{10-16}
changing from 6 to 7 V

	typ.	-1,5 %
	$\leq$	-2 %

Oscillator frequency spread (with fixed
external components)

	$\leq$	± 3 %
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Frequency control sensitivity at pin 15

	typ.	4,5 kHz/V $^{\Delta}$
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Phase control loop

Loop gain of APC-system (automatic phase control)

Δf	typ.	5 kHz/ μ s
	typ.	$\pm 1,5$ kHz

Catching range

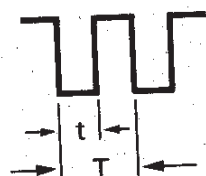
Phase relation between negative transient of
sync pulse and middle of flyback

t	typ.	1 μ s
Δt	$\leq$	$\pm 0,4$ μ s

Tolerance of phase relation

* 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).

Δ For component values see circuit diagram on page 2.

PINNING

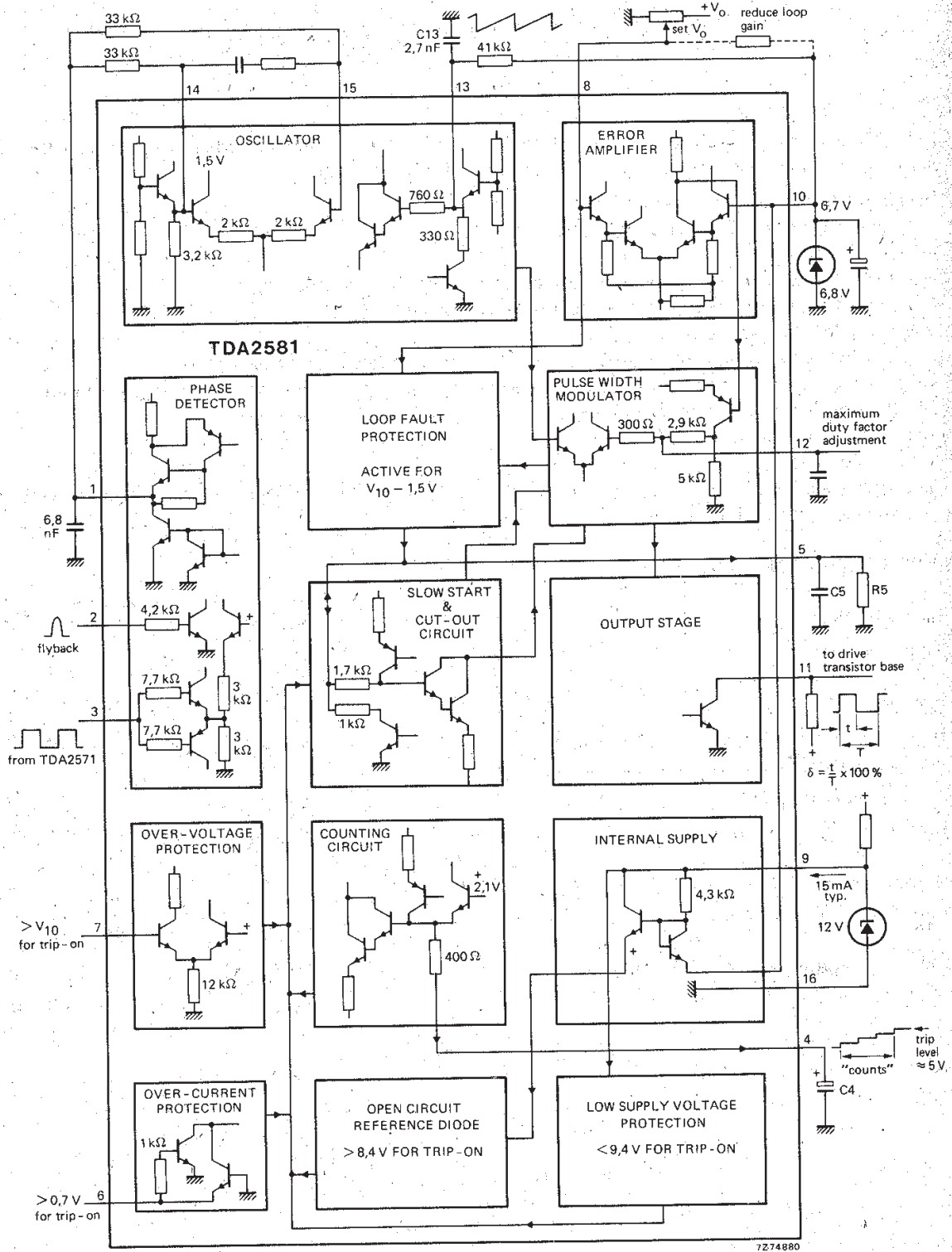
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|---|--|
| 1. Phase detector output | 9. Positive supply |
| 2. Flyback pulse position input | 10. Reference input |
| 3. Reference frequency input | 11. Output |
| 4. Re-start count capacitor/remote control input | 12. Maximum duty factor adjustment/smoothing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

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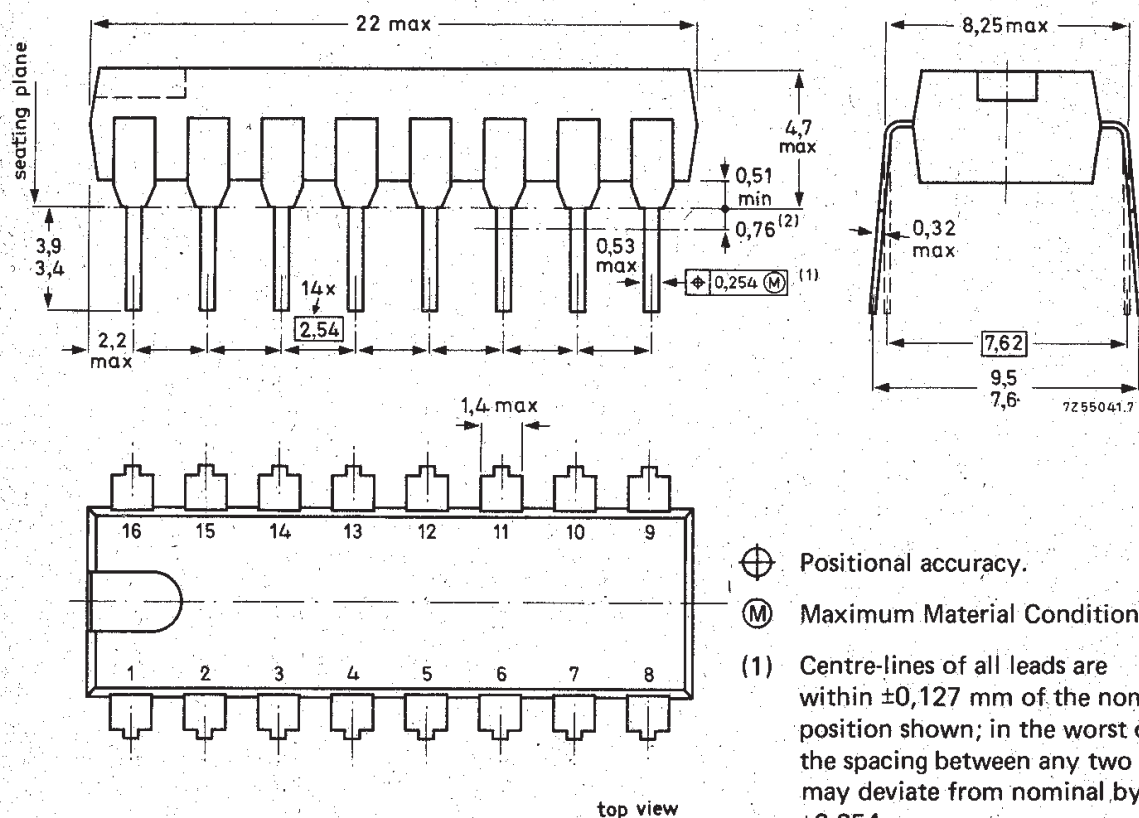
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BLOCK DIAGRAM



Note: trip levels are nominal values.

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



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.

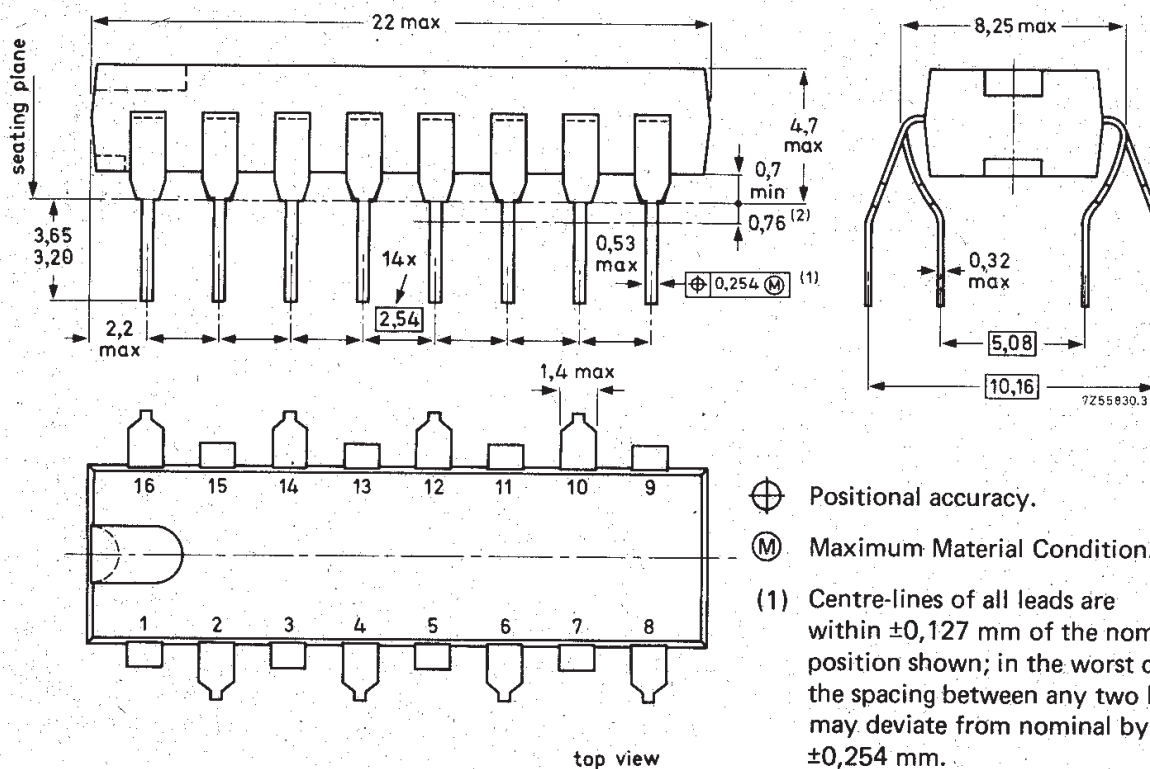
⊕ Positional accuracy.

Ⓜ 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.

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.