

VERTICAL DEFLECTION CIRCUIT

The TDA2653A is a monolithic integrated circuit for vertical deflection in large screen colour television receivers.

The circuit incorporates the following functions:

- Oscillator; switch capability for 50 Hz/60 Hz operation
- Synchronization circuit
- Blanking pulse generator with guard circuit
- Sawtooth generator with buffer stage
- Preamplifier with fed-out inputs
- Output stage with thermal and short-circuit protection
- Flyback generator
- Voltage stabilizer

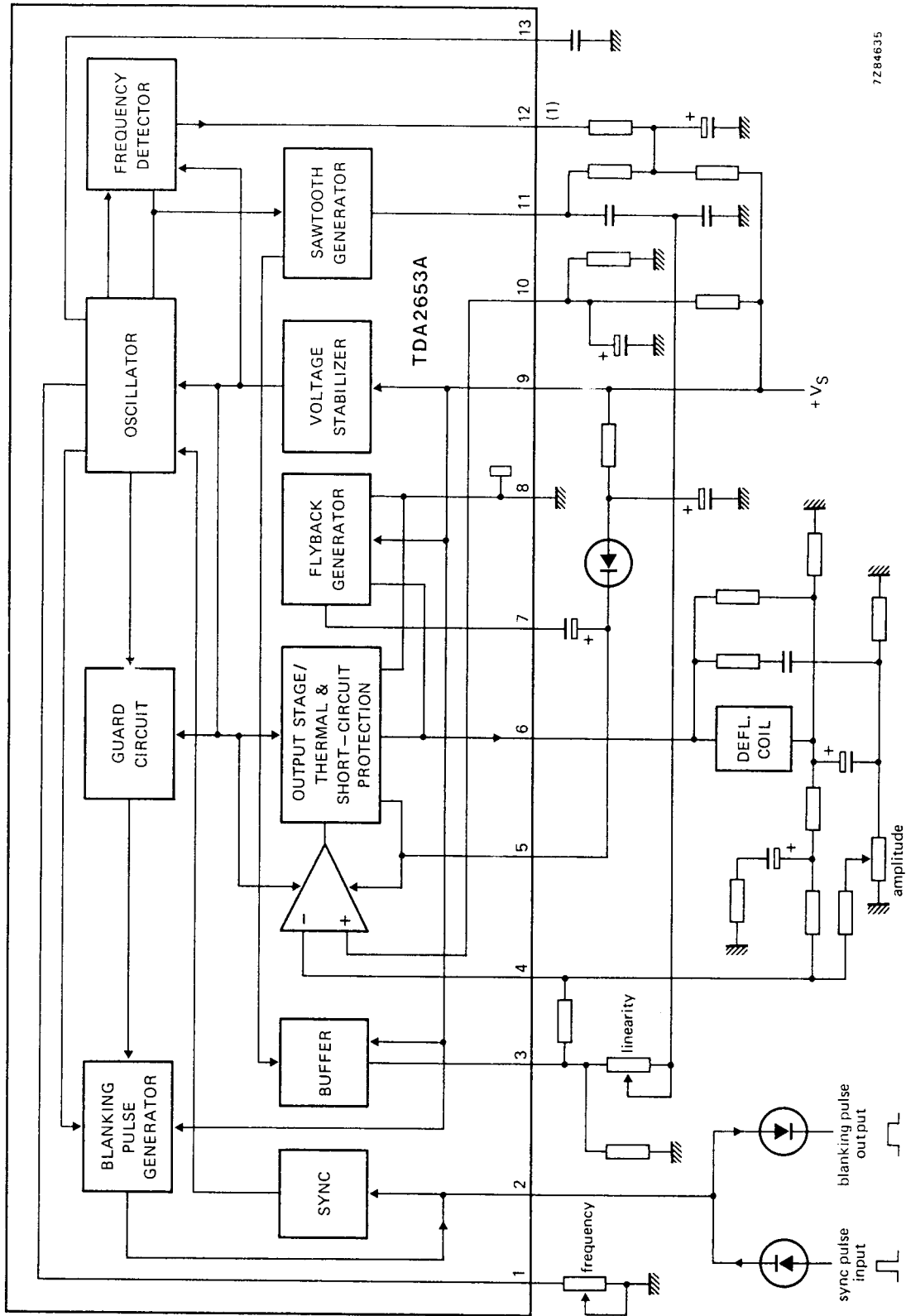
QUICK REFERENCE DATA

Supply voltage (pin 9)	$V_{9-8} = V_S$	typ.	26 V
Supply current (pin 5 + pin 9)*	$I_5 + I_9 = I_S$	typ.	325 mA
Output current (peak-to-peak value)*	$I_{6(p-p)}$	typ.	1,7 A
Maximum output current (peak-to-peak value)	$I_{6(p-p)}$	max.	2,6 A
Picture frequency	f		50 Hz/60 Hz
Sync input pulse (peak-to-peak value)	$V_{2-8(p-p)}$	\geq	1 V
Thermal resistance from junction to mounting base	$R_{th j-mb}$	\leq	5 K/W

* for 45 AX systems

PACKAGE OUTLINE

13-lead SIL; plastic power (SOT141RGA).



7Z84635

(1) Condition for pin 12: LOW voltage level = 50 Hz; HIGH voltage level = 60 Hz.

Fig. 1 Block diagram.

RATINGS

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

Supply voltage (pin 9)	$V_{9-8} = V_S$	max.	40 V
Supply voltage output stage (pin 5)	V_{5-8}	max.	60 V
Voltages			
Pin 3	V_{3-11}	max.	7 V
Pin 13	V_{13-8}	max.	7 V
Pins 4 and 10	$V_{4;10-8}$	max.	24 V
Pin 6	V_{6-8} $-V_{6-8}$	max.	60 V 0 V
Pins 7 and 11	$V_{7;11-8}$	max.	40 V
Currents			
Pin 1	I_1 $-I_1$	max.	0 mA 1 mA
Pin 2	$\pm I_2$	max.	10 mA
Pin 3	I_3 $-I_3$	max.	0 mA 5 mA
Pin 7	I_7 $-I_7$	max.	1,3 A 1,5 A
Pin 11	I_{11} $-I_{11}$	max.	50 mA 1 mA
Pin 12	I_{12} $-I_{12}$	max.	3 mA 0 mA

Pins 5, 6 and 8: internally limited by the short-circuit protection circuit.

Total power dissipation: internally limited by the thermal protection circuit.

Storage temperature range	T_{stg}	-25 to +150 °C
Operating ambient temperature range	T_{amb}	0 °C to limiting value

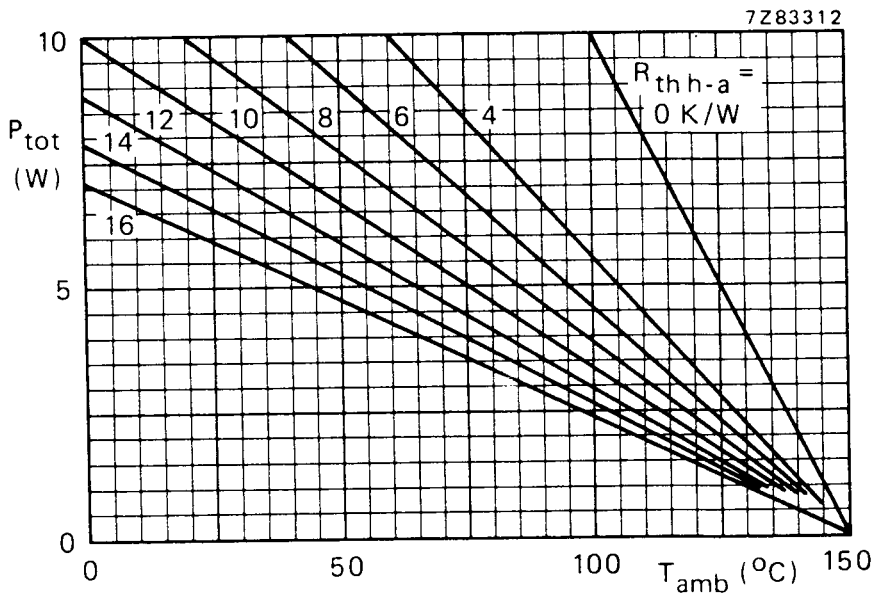


Fig. 2 Total power dissipation. $R_{th\ h-a}$ includes $R_{th\ mb-h}$ which is expected when heat-sink compound is used. $R_{th\ j-mb} \leq 5\ K/W$.

CHARACTERISTICS

$T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

Supply voltage/output stage

Supply voltage	$V_{9-8} = V_S$		9 to 30 V
Output voltage	V_{6-8}	\geq	$V_{5-8} - 2,2\text{ V}$
at $-I_6 = 1,1\text{ A}$		typ.	$V_{5-8} - 1,9\text{ V}$
		typ.	1,3 V
at $I_6 = 1,1\text{ A}$	V_{6-8}	\leq	1,6 V
Flyback generator output voltage at $-I_7 = 1,1\text{ A}$	V_{7-8}	typ.	$V_S - 2,2\text{ V}$
Peak output current	$\pm I_6$	\leq	1,3 A
Flyback generator peak current	$\pm I_7$	\leq	1,3 A

Feedback

Input quiescent current	$-I_4; 10$	typ.	0,1 μA
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Synchronization

Sync input pulse	V_{2-8}		1 to 12 V
Tracking range		typ.	28 %

Oscillator/sawtooth generator

Oscillator frequency control input voltage	V_{1-8}		6 to 9 V
Sawtooth generator output voltage	V_{3-8}		0 to $V_S - 1\text{ V}$
	V_{11-8}		0 to $V_S - 2\text{ V}$
Sawtooth generator output current	$-I_3$		0 to 4 mA
	I_{11}	\geq	-2 μA
		\leq	+30 mA
Oscillator temperature dependency	$(\Delta f/f)/\Delta T_{case}$	typ.	10^{-4} K^{-1}
$T_{case} = 20\text{ to }100\text{ }^{\circ}\text{C}$			
Oscillator voltage dependency	$(\Delta f/f)/\Delta V_S$	typ.	$4 \times 10^{-4}\text{ V}^{-1}$
$V_S = 10\text{ to }30\text{ V}$			

Blanking pulse generator

Output voltage	V_{2-8}	typ.	18,5 V
at $V_S = 24\text{ V}; I_2 = 1\text{ mA}$			
Output current	$-I_2$	\leq	3 mA
Output resistance	R_{2-8}	typ.	410 Ω
Blanking pulse duration at 50 Hz sync	t_b	typ.	$1,4 \pm 0,07\text{ ms}$

50 Hz/60 Hz switch capability

Saturation voltage; LOW voltage level	V_{12-8}	typ.	1 V
Output leakage current	I_{12}	typ.	1 μA

Thermal resistance/junction temperature

From junction to mounting base	$R_{th\ j-mb}$	\leq	5 K/W
Junction temperature; switching point thermal protection	T_j	typ.	150 ± 8 °C

PINNING

- | | |
|--|------------------------------------|
| 1. Oscillator adjustment | 8. Ground |
| 2. Synchronization input/blanking output | 9. Positive supply (V_G) |
| 3. Sawtooth generator output | 10. Reference voltage |
| 4. Preamplifier input | 11. Sawtooth capacitor |
| 5. Positive supply of output stage | 12. 50 Hz/ 60 Hz switching voltage |
| 6. Output | 13. Oscillator capacitor |
| 7. Flyback generator output | |

APPLICATION INFORMATION

The function is described against the corresponding pin number

1, 13. Oscillator

The oscillator frequency is determined by a potentiometer at pin 1 and a capacitor at pin 13.

2. Sync input/blanking output

Combination of sync input and blanking output. The oscillator has to be synchronized by a positive-going pulse between 1 and 12 V. The integrated frequency detector delivers a switching level at pin 12.

The blanking pulse amplitude is 20 V with a load of 1 mA.

3. Sawtooth generator output

The sawtooth signal is fed via a buffer stage to pin 3. It delivers the signal which is used for linearity control, and drive of the preamplifier. The sawtooth is applied via a shaping network to pin 11 (linearity) and via a resistor to pin 4 (preamplifier).

4. Preamplifier input

The DC voltage is proportional to the output voltage (DC feedback). The AC voltage is proportional to the sum of the buffered sawtooth voltage at pin 3 and the voltage, with opposite polarity, at the feedback resistor (AC feedback).

5. Positive supply of output stage

This supply is obtained from the flyback generator. An electrolytic capacitor between pins 7 and 5, and a diode between pins 5 and 9 have to be connected for proper operation of the flyback generator.

6. Output of class-B power stage

The vertical deflection coil is connected to this pin, via a series connection of a coupling capacitor and a feedback resistor, to ground.

7. Flyback generator output

An electrolytic capacitor has to be connected between pins 7 and 5 to complete the flyback generator.

8. Negative supply (ground)

Negative supply of output stage and small signal part.

9. Positive supply

The supply voltage at this pin is used to supply the flyback generator, voltage stabilizer, blanking pulse generator and buffer stage.

APPLICATION INFORMATION (continued)

10. Reference voltage of preamplifier

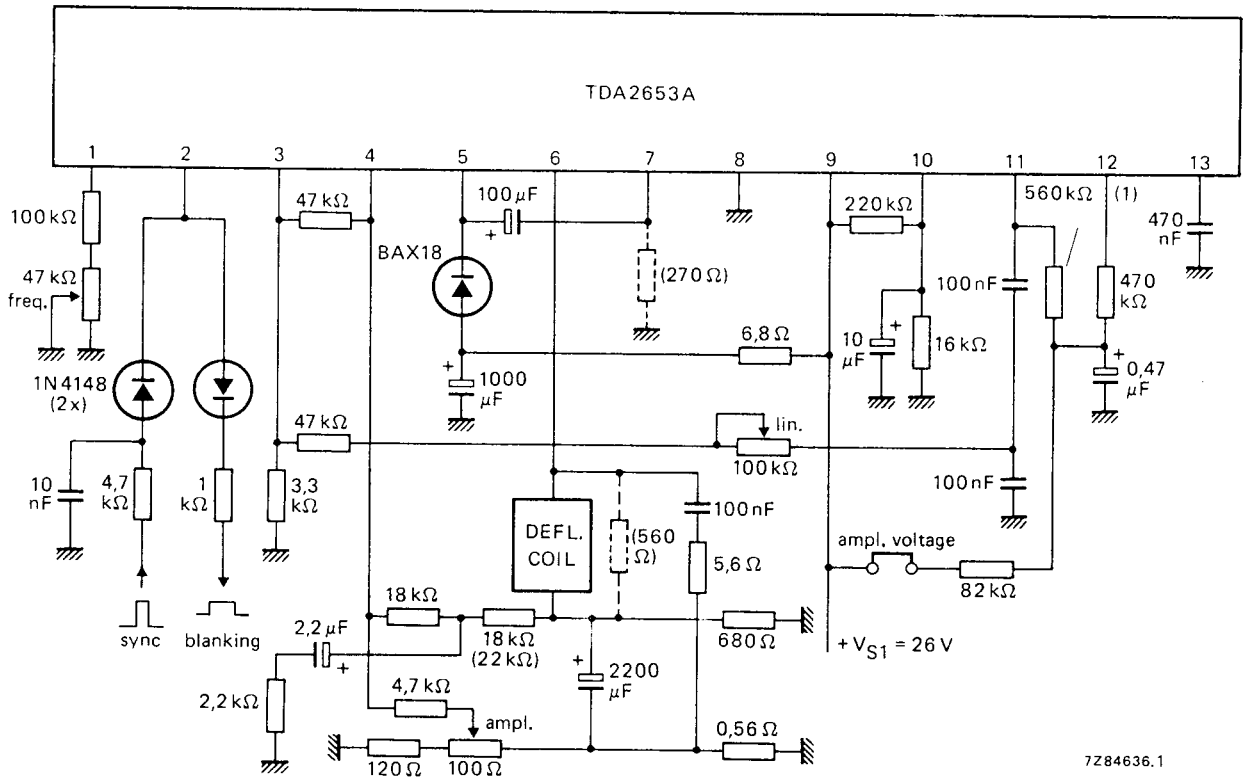
External adjustment and decoupling of reference voltage of the preamplifier.

11. Sawtooth capacitor

This sawtooth capacitor has been split to realize linearity control.

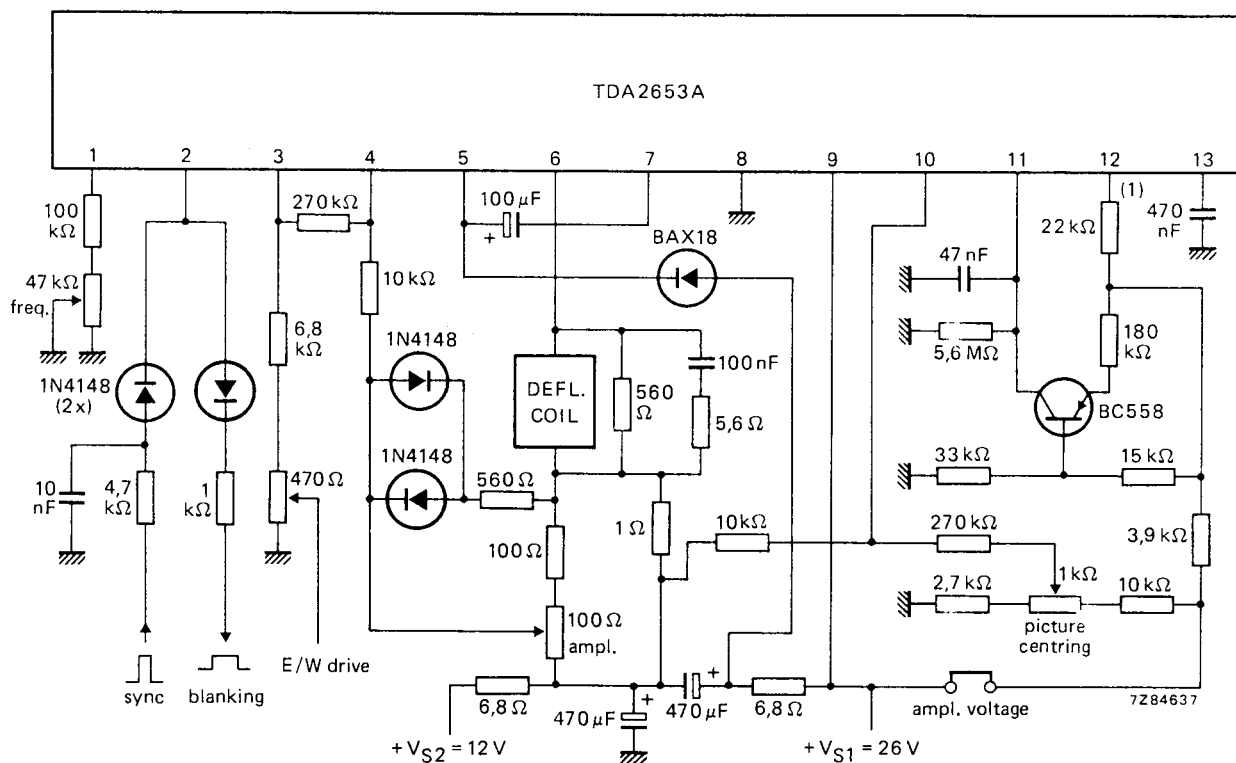
12. 50 Hz/60 Hz switching level

This pin delivers a LOW voltage level for 50 Hz and a HIGH voltage level for 60 Hz. The amplitudes of the sawtooth signals can be made equal for 50 Hz and 60 Hz with these levels.



(1) Condition for pin 12: LOW voltage level = 50 Hz; HIGH voltage level = 60 Hz.

Fig. 3 Typical vertical deflection circuit for 45AX system (26 V).



(1) Condition for pin 12: LOW voltage level = 50 Hz; HIGH voltage level = 60 Hz.

Fig. 4 Typical vertical deflection circuit for 45 AX system
 ($V_{S1} = 26\text{ V}$, $V_{S2} = 12\text{ V}$) in quasi-bridge connection.