

measuring point for the secondary output voltages. After start-up (via an internal switch) this Vpin 1 is internally tapped (voltage divided) to a voltage which can be measured at pin 6 (so Vpin 6 is also a measuring point for the secondary output voltages). As soon as the voltage Vpin 6 > 2V5 the logic in IC 7520 will shut down the output at pin 3. This 2V5 threshold at Vpin 6 is equivalent to a Vpin1 of 16V DC which is equivalent to a voltage at the supply voltage +VBATT of approx. 95V DC (normal operation) and 102V DC (standby). After switching "off" because of over voltage protection, the IC starts up again (see slow-start).

→ In case an over voltage situation is sensed at the secondary output voltages, the SMPS will go in over voltage protection. In case the over voltage situation remains present, the SMPS will give over voltage protection slow-start, over voltage protection slow-start, etc. → a very good audible hick-up mode.

9.4.2 Under voltage protection of the secondary voltages

If the supply voltage Vpin 1 9V DC the output pulse at pin 3 will be shut down. As soon as Vpin 1 7V5, the IC7520 will be totally shut "off". Vpin 1 of 9V DC is equivalent to a voltage at +VBATT of approx. 70V DC (normal operation) and 95V DC (standby). Vpin 1 of 7V5 is equivalent to a voltage at +VBATT of approx. 55V DC (normal operation) and 65V DC (standby).

→ In case an over voltage situation is sensed at the secondary output voltages, the SMPS will first switch "off" the pulse and then switch "off" the complete IC 7520. In case the IC 7520 is switched "off", the SMPS will switch "off". In case the under voltage situation remains present, the SMPS will give under voltage protection, slow-start, undervoltage protection, slow-start, etc. → a very good audible hick-up mode.

9.4.3 Unload protection

In case the load goes down (e.g. the line goes down because of standby mode or some failure in the line) this is detected by IC7520 via I-prim and secondary output voltages sensing. In case the load decreases below a certain threshold the SMPS will switch in "reduced frequency mode" of 20 kHz (this threshold is determined by the voltage level at pin 12 IC7520);

→ In case of an unload situation the set will switch to "low frequency mode" or standby mode. Whether this unload situation of the SMPS is caused by the standby command or by a failure (e.g. in the line), can only be determined by switching on the set again which the remote control, in case of standby mode the TV will switch "on" again, in case of unload situation the set will not switch "on".

9.4.4 Overload (short-circuit) protection (see Fig. 9.1)

If the secondary load becomes too high, I-prim becomes too high which is sensed by the current sense voltage Vpin 7. This voltage Vpin 7 is not allowed to exceed 1V DC by IC 7520 and so gives current limiting.

As the I-prim is limited, the secondary output voltages will also drop and so supply voltage Vpin 1 will drop. As soon as Vpin 1 < 9V DC the driving pulse at pin 3 will stop. As a result of these 2 mechanism in case of an overload the secondary voltages will drop very fast. This is called the fold-back mechanism, the foldback point can be adjusted by pin 5 IC7520 (for the L7.2 this point is adjusted to a maximum tolerable output power of 85W at 90V AC and 165W at 276VAC. After this foldback, the IC starts up again (see slow-start). In case the overload situation remains present, the SMPS will give foldback again, slow-start, foldback, slow-start, etc;

→ As a result in case of short-circuit (or overload) the TV will be in a very good audible hick-up mode.

9.5 Secondary side

9.5.1 Output voltages

- +VBATT (95V) for the output stage and the tuning system is made via the positive winding 14 - 16, rectifier diode D6550 and smoothing capacitor C2551.
- +10V / 14V for the audio amplifier is made via the positive winding 10 - 12, rectifier diode D6570 and smoothing capacitor C2571.
- +14V for the horizontal synchronisation drive is made via the positive winding 13 - 15, rectifier diode D6560 and smoothing capacitor C2651.
- +5V for the control circuit (this voltage is also available in standby). The output from pin 9 of IC7541 via the smoothing capacitor C2563. The input +14V come from the same rectifier diode D6560 and smoothing capacitor C2651.
- +8V for the video processing. The output from pin 8 of IC7541, via the smoothing capacitor C2562. And the input +14V come from the same rectifier diode D6560 and smoothing capacitor C2651. The +8V output is depending of IC 7541 Pin 7 program network 3552 and 3554.

9.5.2 DC Output Voltages Protections

There is a protections available at the secondary & LOT side.

- **+5V protection:** when any overload at +5V supply the IC7541 Pin 1 6.5V the IC7541 protection circuit will turn on and shut down the output +5V supply. and also shut down the +8V supply.
- **+8V protection:** when any overload at +8V supply the IC7541 Pin 1 6.5V the IC7541 protection circuit will turn on and shut down the output +8V supply. IC 7541 Pin 7 are depending 3552 and 3554 so called program network of +8V supply. If the voltage 2.4V the +8V will shut down.
- **+13V protection:** when any overload at +13V supply (5445 LOT +13V) output will shut down by the IC7600 via pin 16 also for the vertical frame protection.

9.5.3 Fast discharge circuit

TS7420 and TS7421 forms a fast discharge circuit. When the voltage on the collector of TS7421 is 6V the circuit will switch off the horizontal drive immediately via pin 50 of IC 7225-5D.

9.6 Single chip TV-processor IC7225 (TDA8373/74)

Introduction:

In this chip most of the video, audio and sync circuits are integrated. In the diagrams the IC is split up in next 5 parts (5A, 5B, 5C, 5D and 5E).

- IC7225-5A, video detector (see diagram A3).
- IC7225-5B, source select en PAL demodulator (see diagram A3).
- IC7225-5C, video control (see diagram A3).
- IC7225-5D, horizontal and vertical sync (see diagram A2).
- IC7225-5E, mono sound demodulator (see diagram A5).

9.6.1 IC7225-5A, IF video detector (see diagram A3)

Tuning system

The tuner 1000 can be a VST or a PLL type. In both cases the tuner is controlled by the μ C:

- The VST tuner is controlled via V_TUNE, AFC and the BS1 and BS2 band switching signals.
- The PLL tuner is fully I²C controlled. IC 7225-5A contains the IF amplifier and the IF detector. The IF signal is present at the output pin 11 of the tuner.
- BS1 and BS2 (pin 17-18): Switching signals used for band switching of a VST tuner.