

8. Power supply (STR F6653)

8-1. STR-F6653 general description

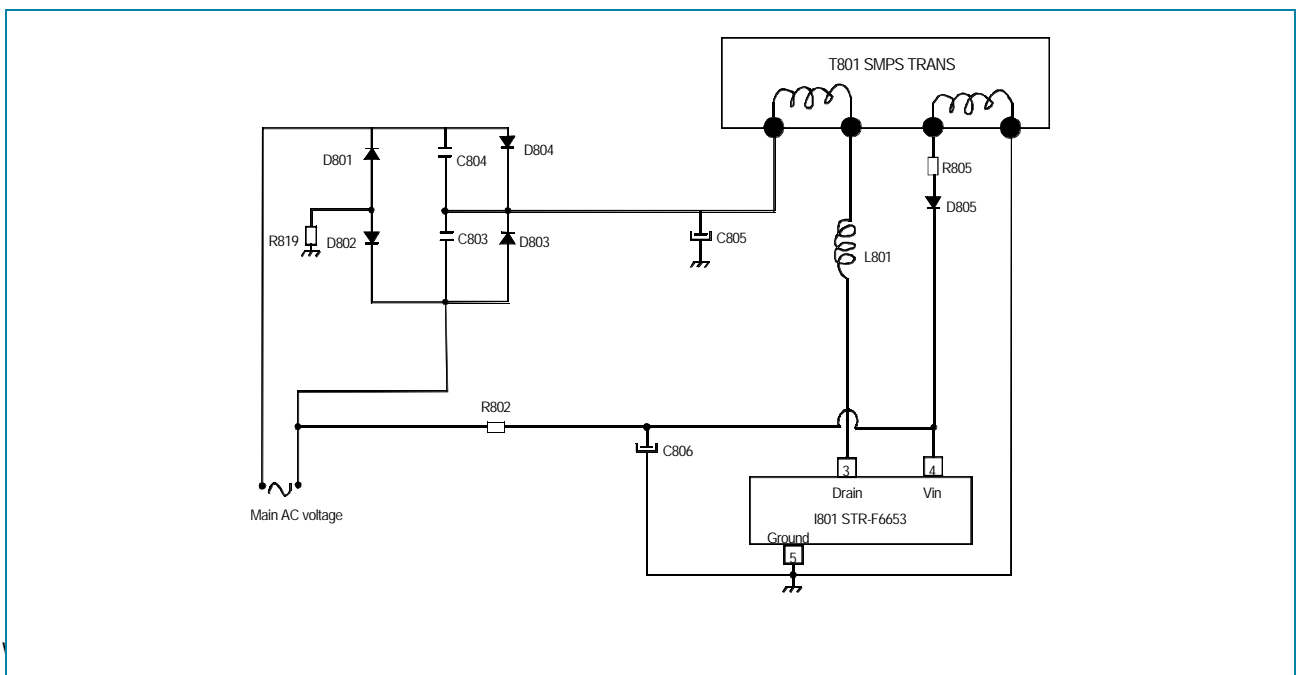
The STR-F6653 is an hybrid IC with a build-in MOSFET and control IC, designed for flyback converter type switch mode power supply applications.

8-2. Power supply primary part operations

An oscillator generates pulse signals which turn on and off a MOSFET transistor.

8-2-1. Start-up circuit: V_{IN}

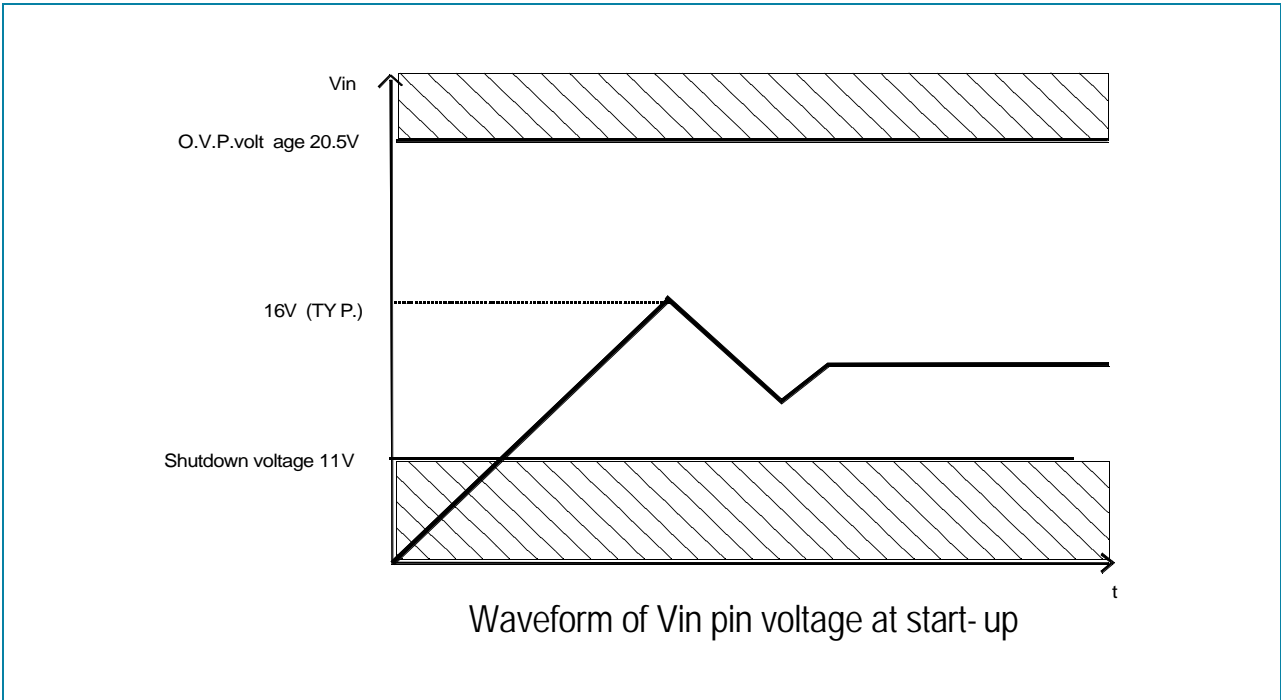
The start-up circuit is used to start and stop the operation of the control IC, by detecting a voltage appearing at the V_{IN} pin (pin 4).



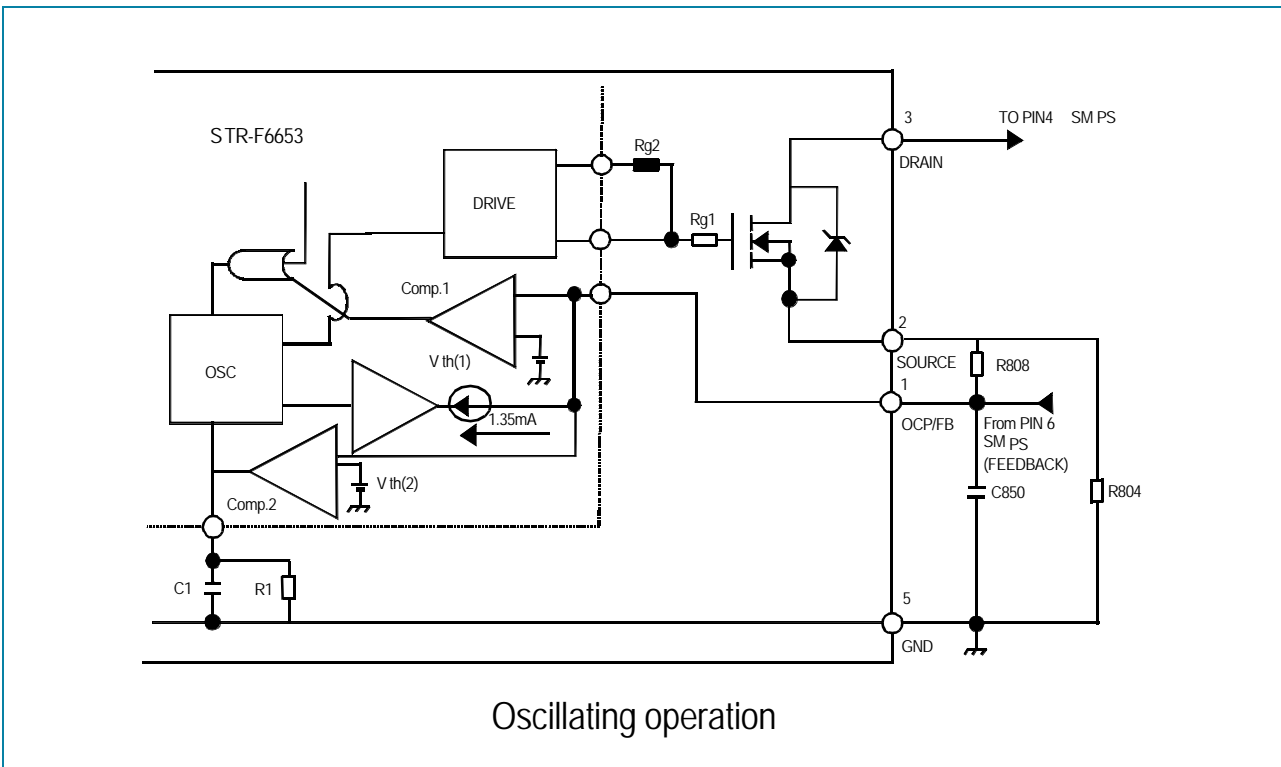
As soon as V_{IN} reaches 16V, the STR-F6653 control circuit starts operating. Then, V_{IN} is obtained by smoothing the winding voltage which appears between pin 6 and pin 7 of the SMPS transformer.

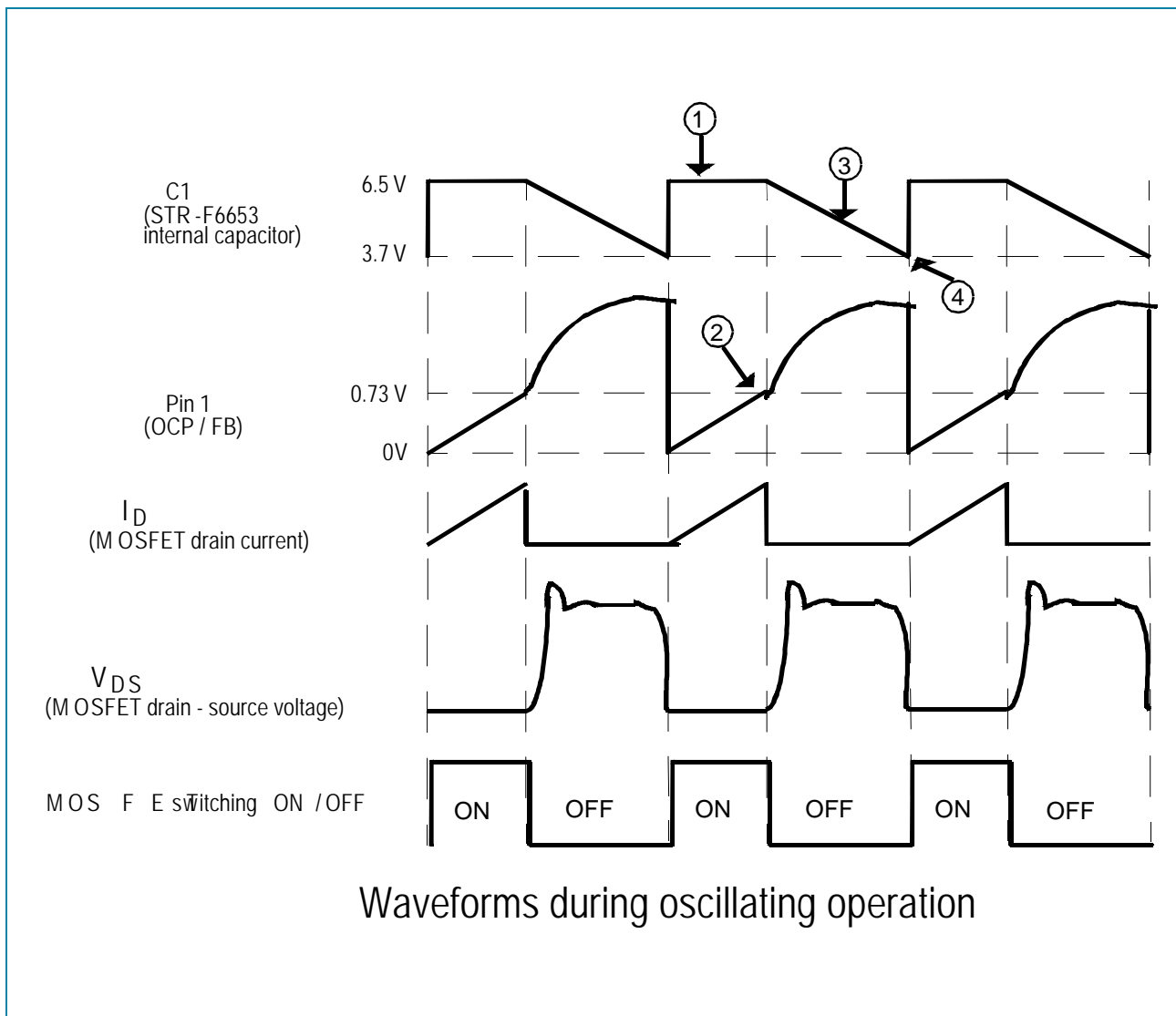
As this winding voltage does not increase to the set voltage immediately after the control circuit starts operating, V_{IN} starts dropping. However, as this winding voltage reaches the set value before V_{IN} voltage drops to the shutdown voltage (at 11V), the control circuit continues operating (see below, V_{IN} voltage at start-up). Resistor R805 prevents variations of voltage at the V_{IN} pin, as some regulation of the SMPS transformer occurs due to secondary side output current

V_{IN} must be set higher than the shutdown voltage ($V_{IN}(\text{off}) = 11V_{\text{max}}$) and lower than the O.V.P. (overvoltage protection) operating voltage ($V_{OVP} = 20.5V_{\text{min}}$).



8-2-1. STR-F6653 oscillating operation





- When the MOSFET is ON, the STR-F6653 internal capacitor C1 is charged at the constant voltage 6.5V. At the same time, the voltage at pin 1 (OCP / FB) increases with the same waveform as the MOSFET drain current.
- When the pin 1 voltage reaches the threshold voltage $V_{TH1} = 0.73V$, the STR-F6653 internal comparator 1 starts operating. The STR-F6653 internal oscillator is inverted and the MOSFET turns OFF.
- When the MOSFET turns OFF, charging of STR-F6653 internal capacitor C1 is released and C1 starts discharging by the STR-F6653 internal resistance R1. So, C1 voltage starts falling in accordance to the gradient regulated by the constant discharging time of C1 and R1. So, this means that the fixed time determined by C1 and R1 is the OFF-time of the MOSFET.
- When C1 voltage falls to around 3.7V, the STR-F6653 internal oscillator is reversed again and the MOSFET turns ON. C1 is quickly charged to around 6.5V

The MOSFET continues to oscillate by repeating the above procedure.

8-2-3. STR-F6653 protection circuits

overcurrent protection function (OCP)

Overcurrent protection is performed pulse by pulse detecting at STR-F6653 pin 1 (OCP) the peak of the MOSFET drain current in every pulse.

latch circuit

This circuit sustains an output low from the STR-F6653 internal oscillator and stops operation of the power supply when over-voltage protection (OVP) and thermal shutdown (TSD) circuit are in operation

thermal shutdown circuit (TSD)

This circuit triggers the latch circuit when the frame temperature of STR-F6653 IC exceeds 140 °C

overvoltage protection circuit (OVP)

This circuit triggers the latch circuit when the V_{in} voltage exceeds 22V (typ.)

9. TV start-up, TV normal run and stand by mode operations

9-1. TV start-up operations

9-1-1. Schematic diagram for start-up operations

