Over current recovery with Hysteresis for Highside switches

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***Abstract*— Highside Power switches are vast used semiconductor devises in power management. Many Highside switches are not having inbuilt over current hysteresis protection. A technique is proposed in this document for over current protection with hysteresis and fixed time recovery. This can be implemented as a feedback circuit for Highside switches to protect from over current.**

Keywords: Power switch, Hysteresis, Highside switches, Fixed time recovery, Amplifier, Schmitt trigger, Buffer, OPAMP, NOT gate.

I. INTRODUCTION

HIGH side switches are used by designers in a broad range of applications such as portable electronics, consumer electronics, industrial or telecommunication systems . That can be used in variety of ways including control, sequencing, protection, power distribution, or system supply turn on management. Each of above needs switching solutions. In that Over current protection is also one.

FEEDBACK circuit is an interesting electronic block in electronic applications. It is used generally with power switch involving automatic control of output load current.

The proposing circuit is built using OPAMP, NOT gate and charging discharging blocks. This concept can be implemented where hysteresis reference and recovery of output with fixed time duration.

II. PROPOSED CONCEPT

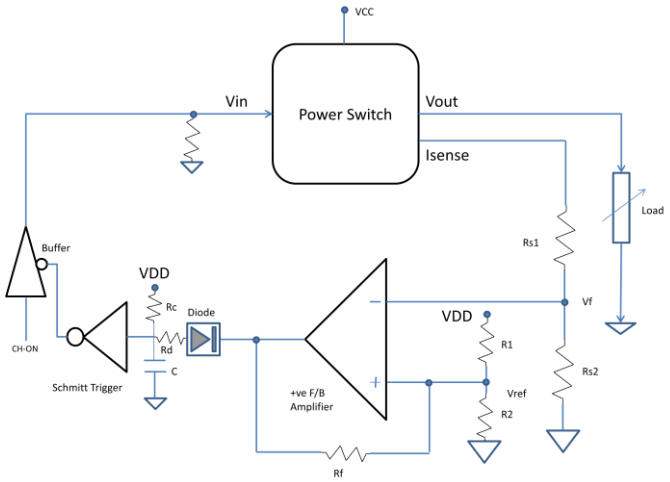

Figure: 1 Block Diagram

Above circuit diagram can be divided into four blocks. Power device, Feedback amplifier, Capacitor charging discharging components and Schmitt trigger NOT gate with Tristate Buffer. Power device input is driven from the Microcontroller CH-ON by comparing Load current with the reference voltage V_{ref}.

Amplifier: Proportional load current is sensed by Isense pin of the device, compared with V_{ref} in Positive feedback OPAMP Amplifier. Resistor R_f provide two hysteresis V_{ref} voltages.

$$Vref1 = \frac{R2}{(R1 \| Rf)} VDD \quad (1)$$

$$Vref2 = \frac{(R2 \| Rf)}{R1} VDD \quad (2)$$

Charging and Discharging circuit: Rc, Rd and Diode provide the charging discharging of Capacitor C. When $V_f < V_{ref}$ OPAMP output is HIGH, Capacitor C charges through Rc and $V_f > V_{ref}$. When OPAMP output is LOW, Capacitor C discharges through Rd resistor and Diode.

$$Tch = Rc \times C \quad (3)$$

$$Tdis = Rd \times C \quad (4)$$

Schmitt trigger NOT gate and Buffer: These two components are used to fasten the transition and for gitter free operation.

Figure:2 Waveform when feedback circuit active

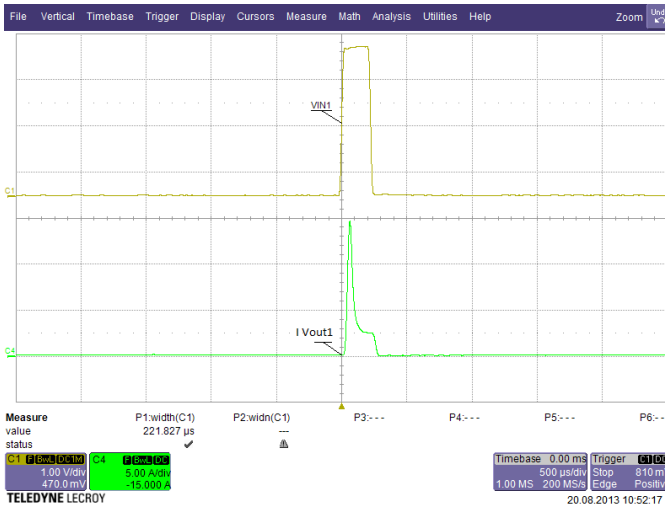

Figure:3 Waveform when feedback circuit active with ON pulse

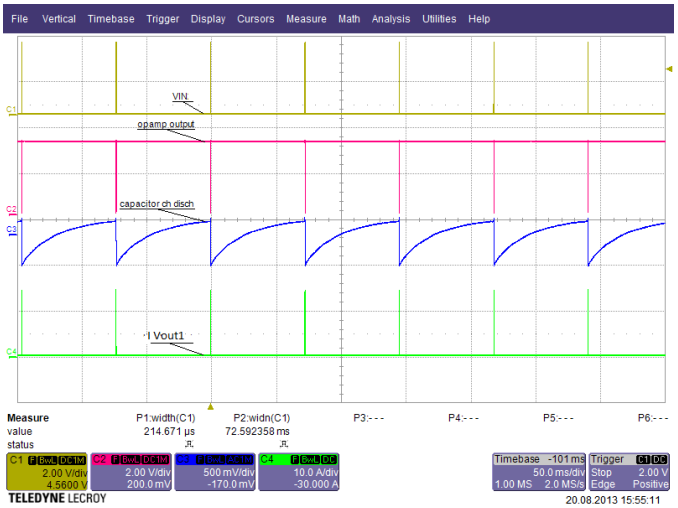

Figure:4 Waveform when feedback circuit active with Capacitor charging and discharging

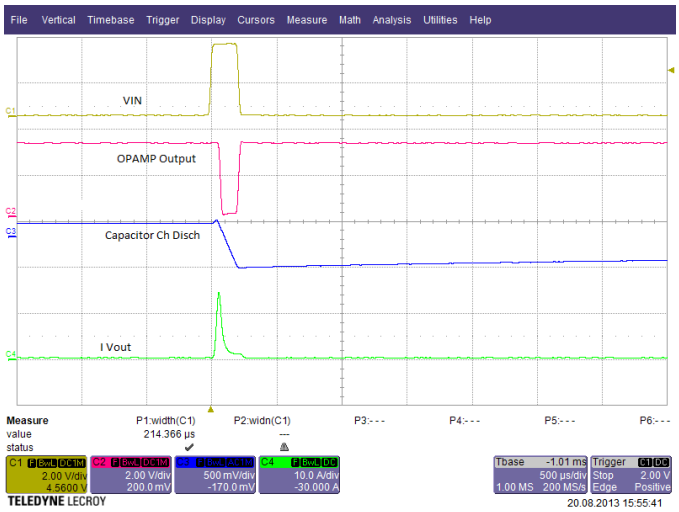

Figure:5 Zoom view of Figure 4

All above waveforms are captured when output is overloaded. Feedback circuit checks the load condition for every 75msec, VIN become high for 220µsec, feedback circuit monitors the load condition and goes low if load is more than the designed threshold.

REFERENCES

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