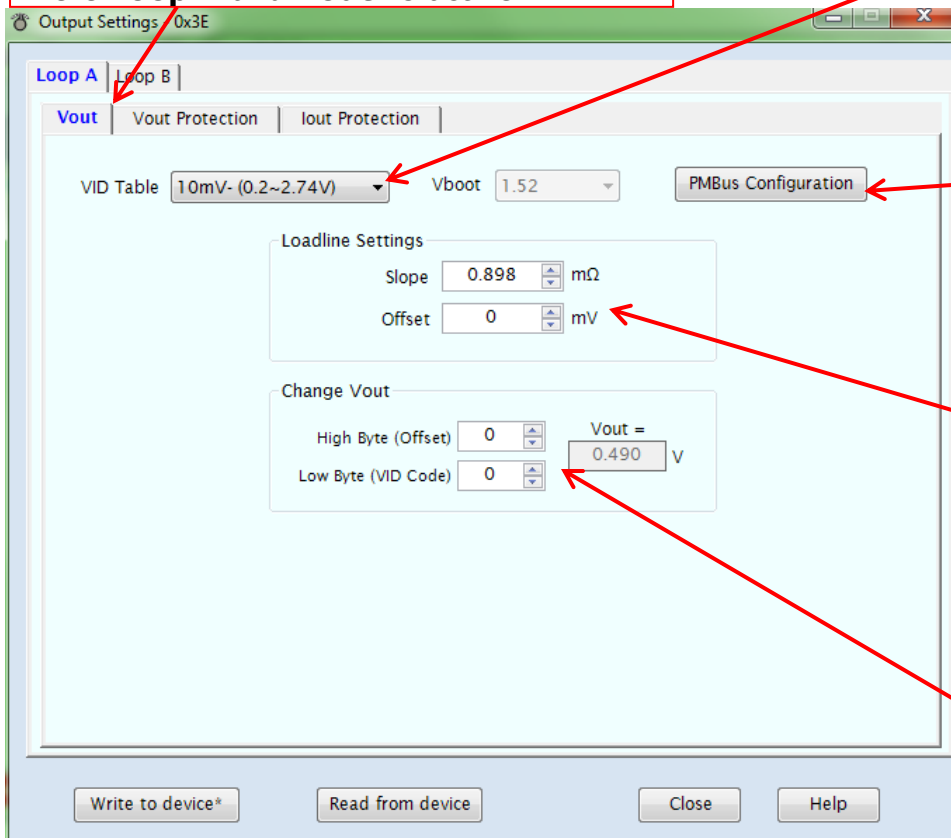


# Output Settings... Loop A Vout

This window have 2 main tabs, one for each loop, and 3 sub tabs for each loop. The active tab is highlighted in bold blue text

Here **Loop A** and **Vout** is active



**VID table** allow selection of VID voltage step. Here the part is in AMD mode and only one selection possible. Therefore it is grayed out and not changable

When In Intel mode 5 or 10mV table can be selected by going to the SVID window and change it there.

## PMBus configuration:

Click this button to use PMBus commands to set Vout. It will open a PMBus window.

## Loadline settings:

**Loadline Slope:** The wanted loadline can be entered or set using the small up/down arrows

**Loadline offset:** A drop down menu to select wanted offset

## Change Vout: Manual control of Vout

### HighByte (offset)

add an offset to existing voltage output

### Low Byte (VID code)

Set a VID code for a specific Vout.

The Vout window helps telling what voltage the VID code will give.

# Output Settings... Loop A Vout Protection

Check box to select if this setting should be active or not

Output Settings - 0x7C

Loop A | Loop B

Vout | **Vout Protection** | Iout Protection

**OOV**

Fixed OOV Threshold: 3.45V ☒

Tracking OOV Threshold: 0.2V ☒

OOV Response: Latch

**OUV**

Fixed OUV Threshold: 0.5V ☒

Tracking OUV Threshold: 0.4V ☒

OUV Response: Latch

HSS Response: Latch

Driver Fault Response: Latch

Write Close Refresh

**OOVP:** (Output Over Voltage protection)

**Fixed OOV Threshold:** At what output voltage shall it be treated as Overvoltage. This is a fixed level  
Recommended setting: <output cap rating and>Vout\_max

**Tracking OOV Threshold:** at what positive deviation from the wanted output voltage shall it be treated as Overvoltage. Used when voltage ramps from one level to another.

Recommended setting: 400mV

**Response:** What to do if any of the limits above are exceeded and the check box is selected.

Response time:

It will be flagged if 4 consecutive samples at rate of 50Mhz are over the threshold

Note: Tracking OOV won't turn on low side FET.

**OUVP:** (Output Under Voltage protection)

**Fixed OUV Threshold:** At what output voltage shall it be treated as Undervoltage. This is a fixed level  
Recommended setting: <system required min Vout and > fixed OUV disable threshold

**Tracking OUV Threshold:** at what negative deviation from the wanted output voltage shall it be treated as Undervoltage. Used when voltage ramps from one level to another.

Recommended setting: 300mV

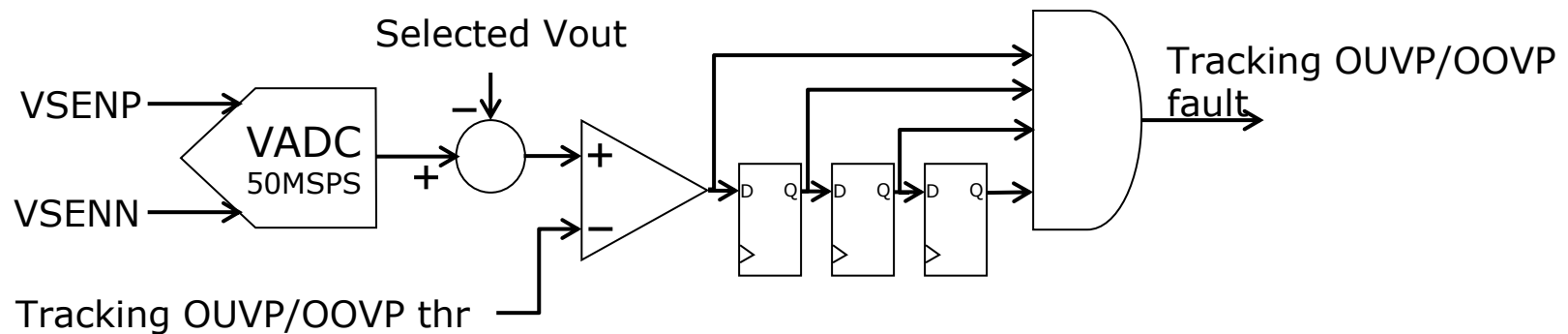
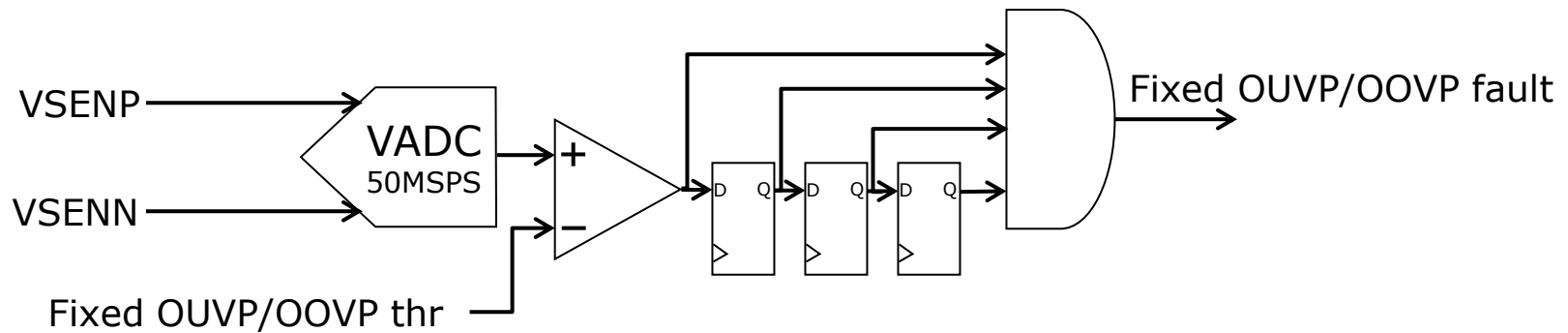
**Response:** What to do if any of the limits above are exceeded and the check box is selected.

Response time:

It will be flagged if 4 consecutive samples at rate of 50Mhz are over the threshold.

# Output Settings...

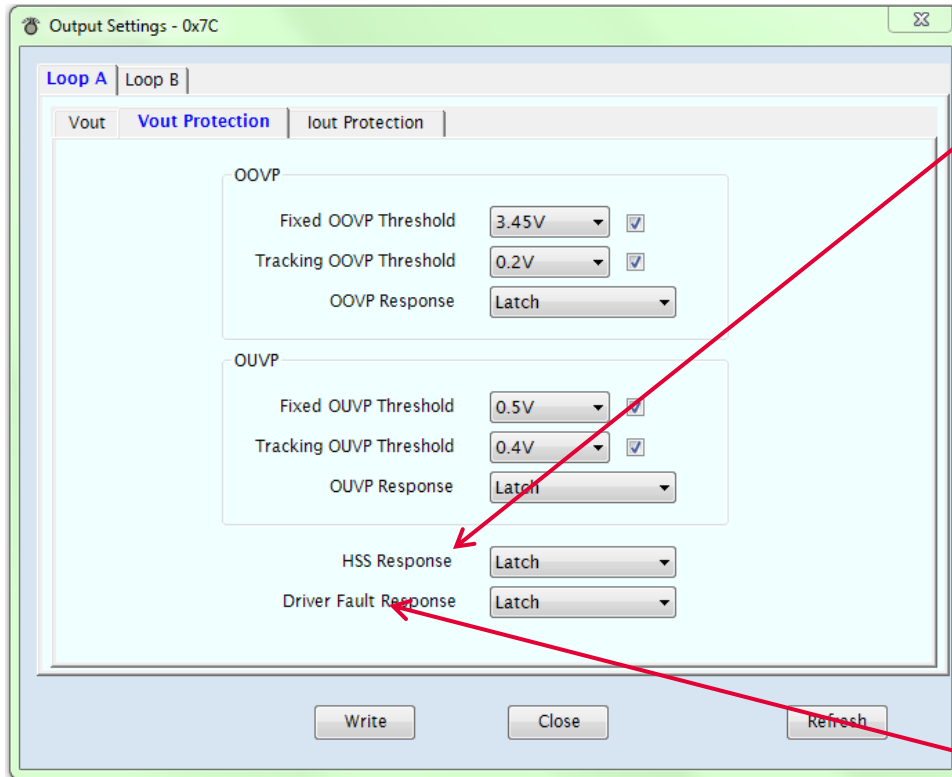
## Fixed/Tracking OOVV/OUVP fault



**\*4 consecutive samples over/under the limit will trigger the fault.**

# Output settings...

## Driver fault / HSS Response



**HSS Response:** What to do if a High Side Short is detected. i.e. High side MOSFET is shorted and Vout is raising by itself.

Input: phase current sampled at 50Mhz rate  
Default threshold:  $1.6 \times P2CL$   
Response time:  
80ns; 4 consecutive samples at 50Mhz rate  
greater than threshold

**Driver Fault Response:** What action to do if a Driver Fault signal from Powerstages is detected

Input: Tmon Voltage signal

Detection is enabled all the time

If Tmon voltage is higher than 2 Volt Dr\_fault (Driver Fault) will be reported

Response time:

- Tmon have to be high for minimum 200ns before fault is flagged
- Shutdown response at 60ns after fault is flagged

Shutdown response: Shutdown/Ignore/Hiccup

# Output Settings... Loop A Iout Protection

**Instant OCP** (OverCurrent Protection) This looks at the instant peak current in each phase

In AMD mode if above this level for more than 10us then take action determined by the Response selected.

In Intel mode there is a 5 switching cycles delay before any action is taken.

See next page for block diagram of function

**Inductance.** Displayed as info as the value is important for the calculations for the P2CL function. If a change is needed click on the blue Edit link that will open another window where Inductance value can be edited.

## Pulse to Pulse Cycle limit (P2CL).

A pulldown menu with phase current in Ampere. Designed to prevent output inductor saturation by monitoring peak inductor current per phase and limit PWM pulse width cycle by cycle. Recommended value is Isat @ 125 degC in inductor datasheet minus 1 or 2 A.

If current exceed this limit for 255 consecutive switchpulses a response will occur according to the setting of P2CL Response

## Negative Current Limit (NCL)

If the current in one phase goes too much negative its PWM output will go to High Impedance ( Hi-Z) for a specified minimum time. This function can be enabled by marking the box next to Enable. See explanation on following pages for function

**Fast OC warning.** A fast selectable filtered OverCurrent warning signal. Filter can be selected for how long average time. The output can be selected for how long it will stay on after detection. It will reset itself after selected time if no more OC detected.

Output Settings - 0x3E

Loop A | Loop B

Vout | Vout Protection | **Iout Protection**

**Inst. OCP**

Threshold  A/Ph

Total Threshold  A

Response

**Avg OCP**

Threshold  A/Ph

Total Threshold  A

Response

**OC Warning**

Threshold  A/Ph

Total Threshold  A

**Fast OC Warning**

Filter

Signal Min On Time

**Pulse to Pulse Cycle Limit (P2CL)**

Inductance  nH [Edit](#)

P2CL Threshold

P2CL Response

**Negative Current Limit (NCL)**

NCL Threshold  A/Ph ☒ Enable

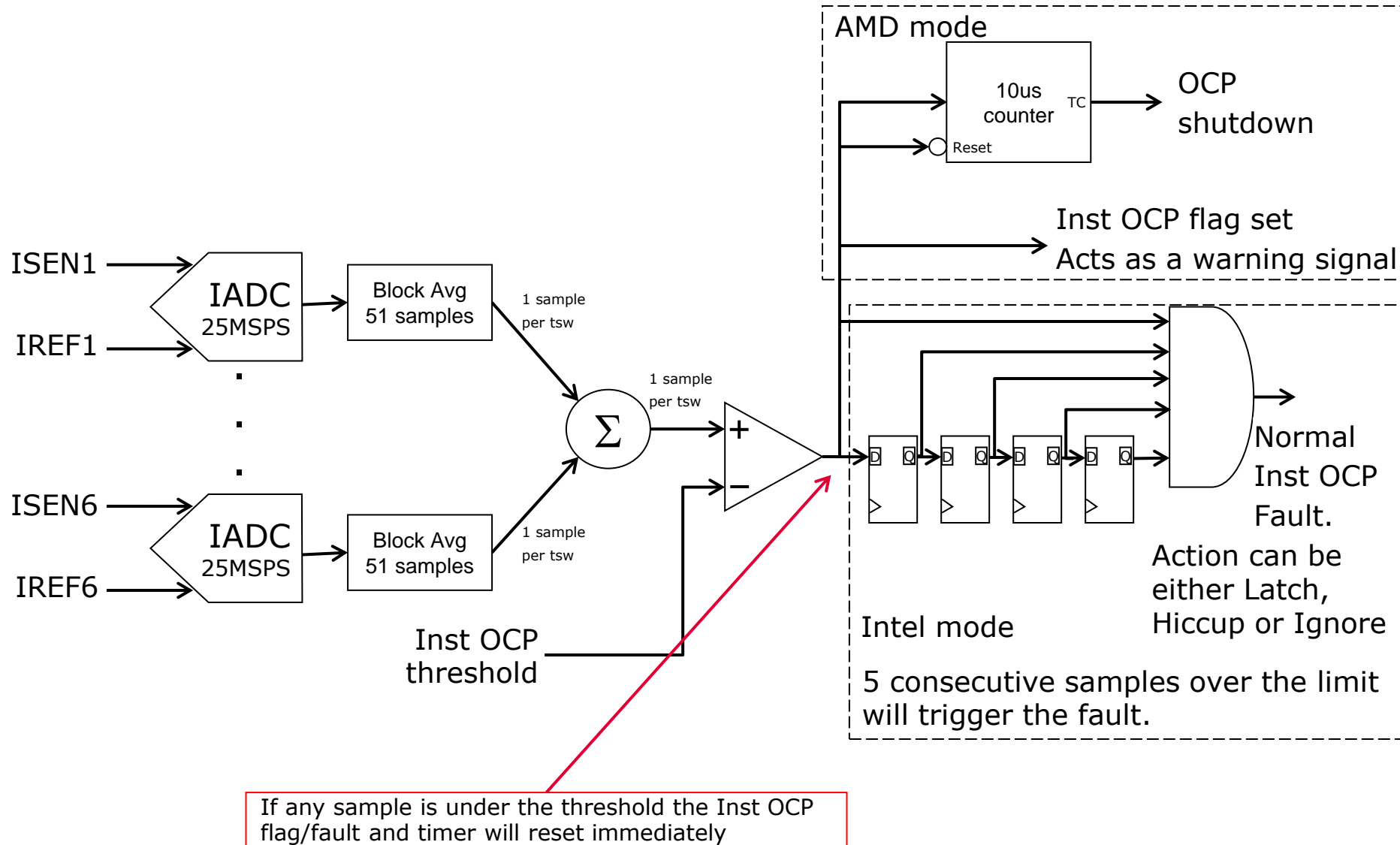
Min Hi-Z for NCP

Phase Fault Response

Max Current (Imax) Digitized  A/Ph [Edit](#)

# Output settings...

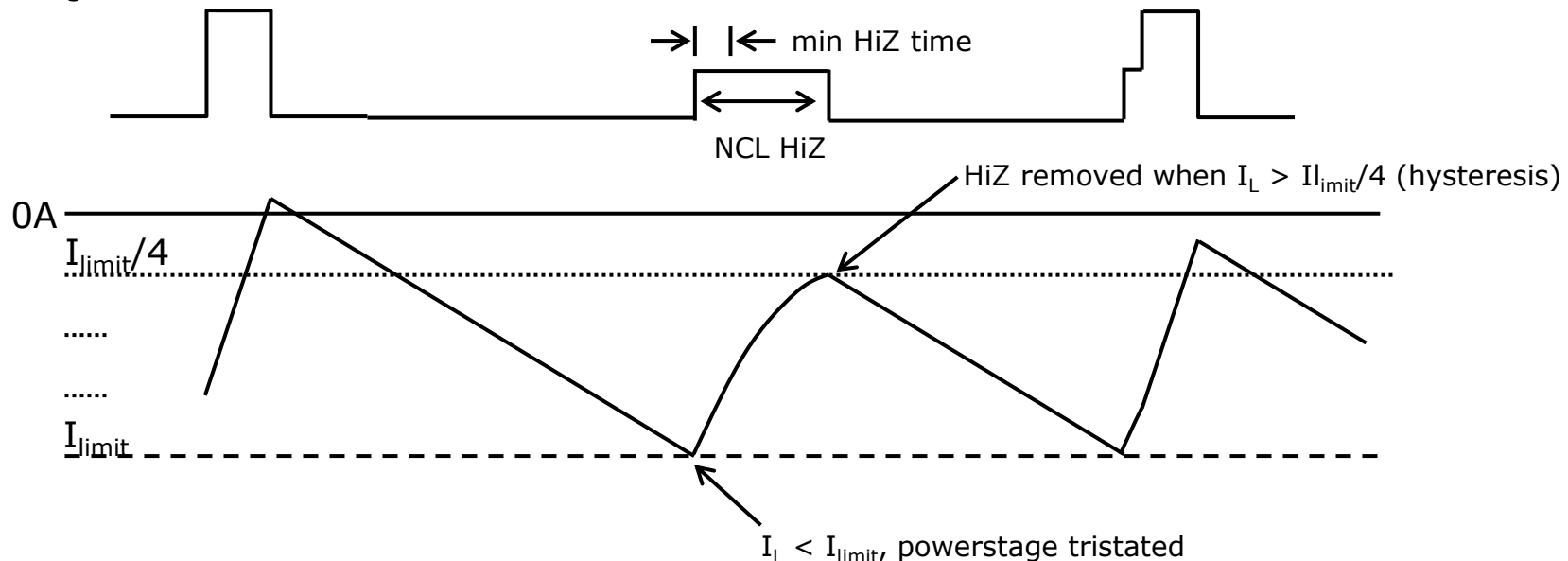
## Inst OCP behavior in AMD and Intel mode



# Output Settings...

## NCL function explanation

- › Input:  $I_{out}$
- › Response time: 5ns; No shutdown response available
- › Recommended settings: amplitude should be greater than the negative current induced by  $C_{dv}/dt$  during DVID down.
- › Shutdown response: Not available
- › If inductor current is too negative, highside FET may fail during the dead time between lowside off and highside on due to too much current going into the highside body diode.
- › NCL will set lowside to off once the inductor current reaches the negative current limit
- › To avoid chatting, the hysteresis level is set to release the HiZ only when the inductor reaches  $1/4$  of the negative current limit and a minimum HiZ on time is satisfied.



# Output Settings... Loop A Iout Protection

**Average OCP** (OverCurrent Protection) This looks at the average current in each phase and if above this level then take action determined by the Response selected. Recommended settings: Maximum expected loadcurrent\*1.15/Nph\_max per phase Example in a 6phase system with Max 260A Threshold=260\*1.15/6 = 50A

**Phase Fault Response:** What to do when a PhaseFault Signal comes from powerstages.

**Max Current (Imax) Digitized:** for information To change click the blue Edit text that open a new window

**Average OC Warning** (OverCurrent) This looks at the average current in each phase and if above this level then the corresponding warning flag in fault register is activated.

**Total threshold** is calculated from the Threshold entered and the GUI knows number of phases to present the total output current where the warning trigger.



# Output Settings...

## Avg OCP or Avg OC Warning behavior

### Filter

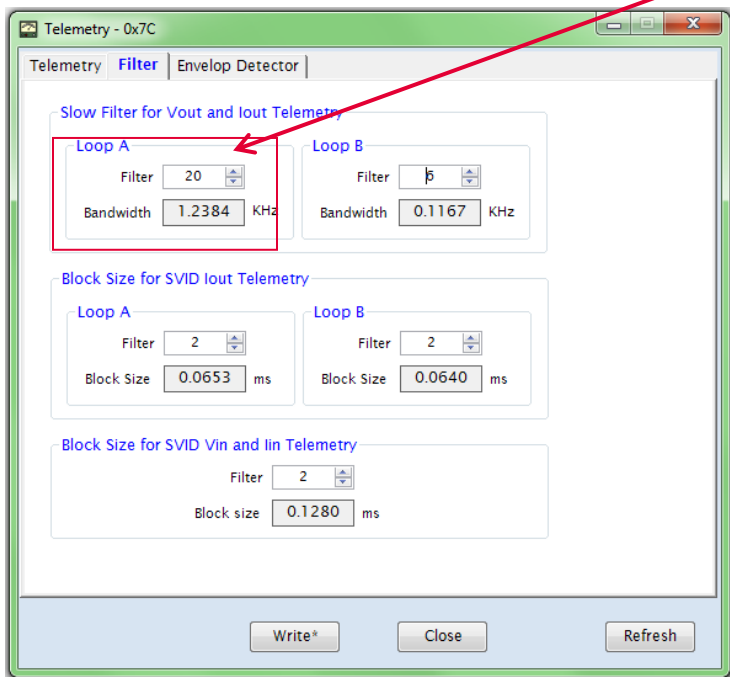
Filter frequency can be selected.

Time for a overcurrent signal to pass through the filter will depend on how much overcurrent.

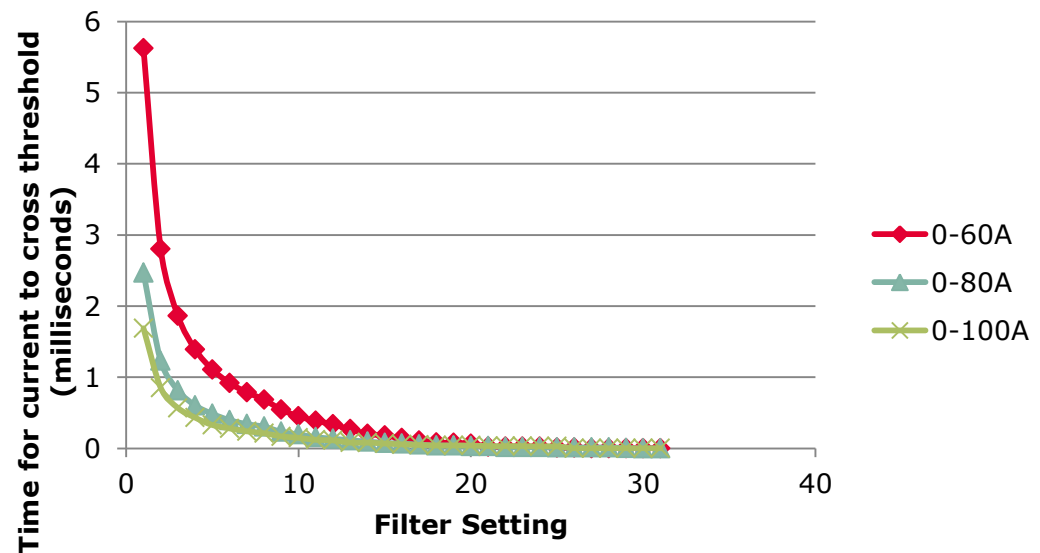
Like for any low pass filter a small current step take longer time to get to the threshold than a large overcurrent. See graph for example where limit is selected to 45A and different current steps

Total delay times from an Overcurrent to fault response is the sum of Filter frequency selected and the corresponding delay time and also depend on switching frequency as there is an 5 consecutive sample digital delay after the filter. This digital delay makes higher filter frequencies insignificant to total time delay.

See blockdiagram on next page for more details.



### AVG OCP Low Pass Filter Time to cross a 45 Amp threshold



# Output Settings...

## Avg OCP and Avg OCP warning

