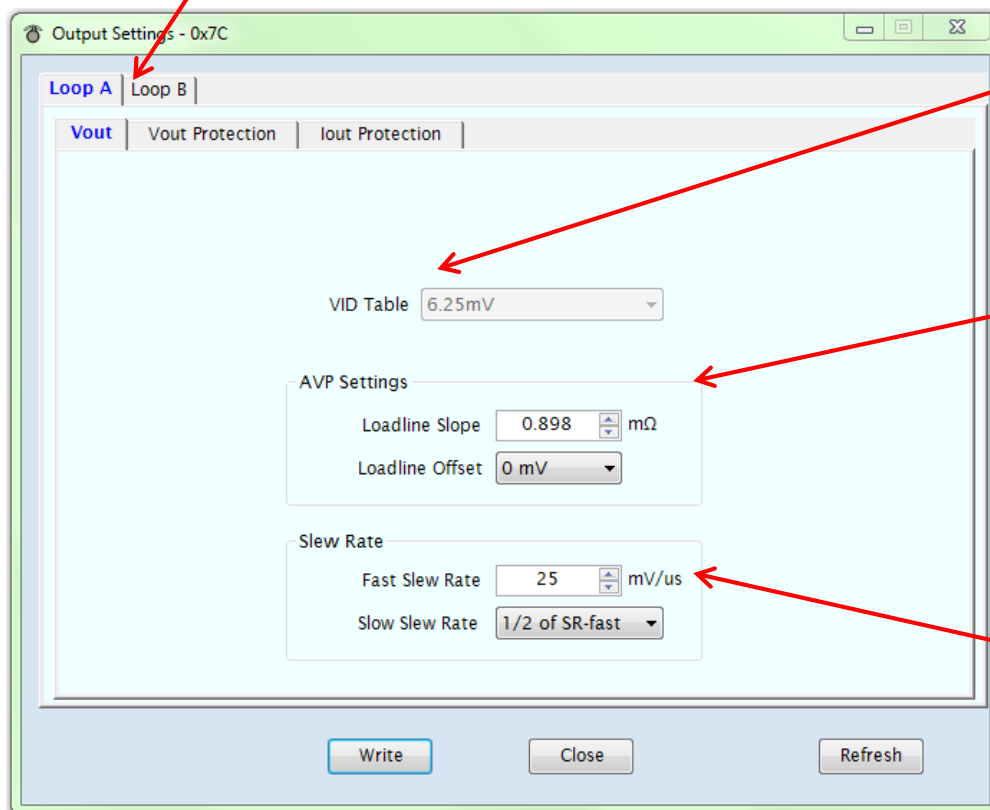


Output Settings... LoopA Vout

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

AVP 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

Slew rate:

Fast Slew Rate

The wanted slewrate can be entered or set using the small up/down arrows

Slow Slew Rate

Dropdown menu where the Slow Slew Rate can be selected as $\frac{1}{2}$ or $\frac{1}{4}$ of the Fast Slew Rate speed

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

OOVP

Fixed OOVP Threshold: 3.45V ☒

Tracking OOVP Threshold: 0.2V ☒

OOVP Response: Latch

OUVP

Fixed OUVP Threshold: 0.5V ☒

Tracking OUVP Threshold: 0.4V ☒

OUVP Response: Latch

HSS Response: Latch

Driver Fault Response: Latch

Write Close Refresh

OOVP: (Output Over Voltage protection)

Fixed OOVP 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 OOVP 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 OOVP won't turn on low side FET.

OUVP: (Output Under Voltage protection)

Fixed OUVP Threshold: At what output voltage shall it be treated as Undervoltage. This is a fixed level

Recommended setting: <system required min Vout and > fixed OUVP disable threshold

Tracking OUVP 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

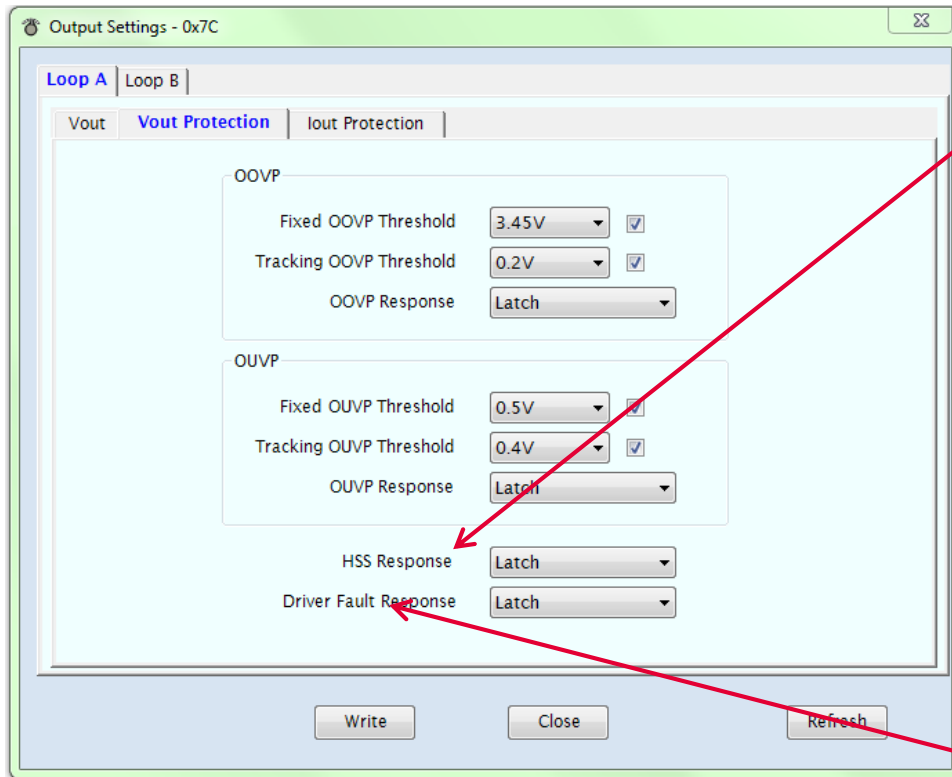
Response: What to do if any of the limits above are exceeded and the check box is selected.

Response time:

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

Output settings...

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 V Dr_fault will be reported

Response time:

- Tmon should 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 and if above this level for more than 10us then take action determined by the Response selected. The delay is according to AMD requirements to allow the CPU to reduce consumption before a shutoff happens.

In Intel mode there is a 5 switching cycles delay.

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

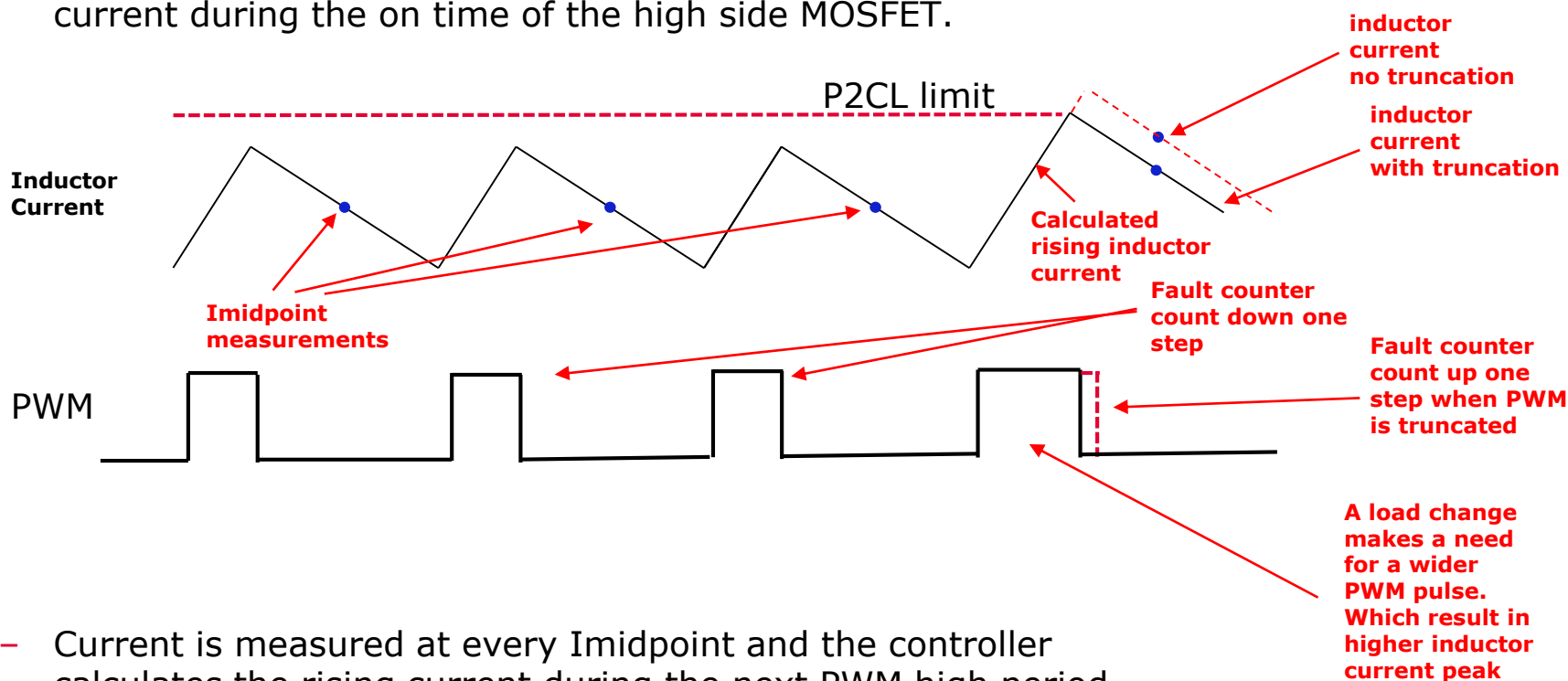
Negative Current Limit (NCL)

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 next page for function

P2CL Pulse to pulse cycle limit

› Internal Calculation of phase current

- Inductor value , Measured V_{in} , V_{out} and $I_{midpoint}$ are used to calculate the inductor current during the on time of the high side MOSFET.



- Current is measured at every Imidpoint and the controller calculates the rising current during the next PWM high period.
- When the calculated current reaches the P2CL limit the PWM will be truncated

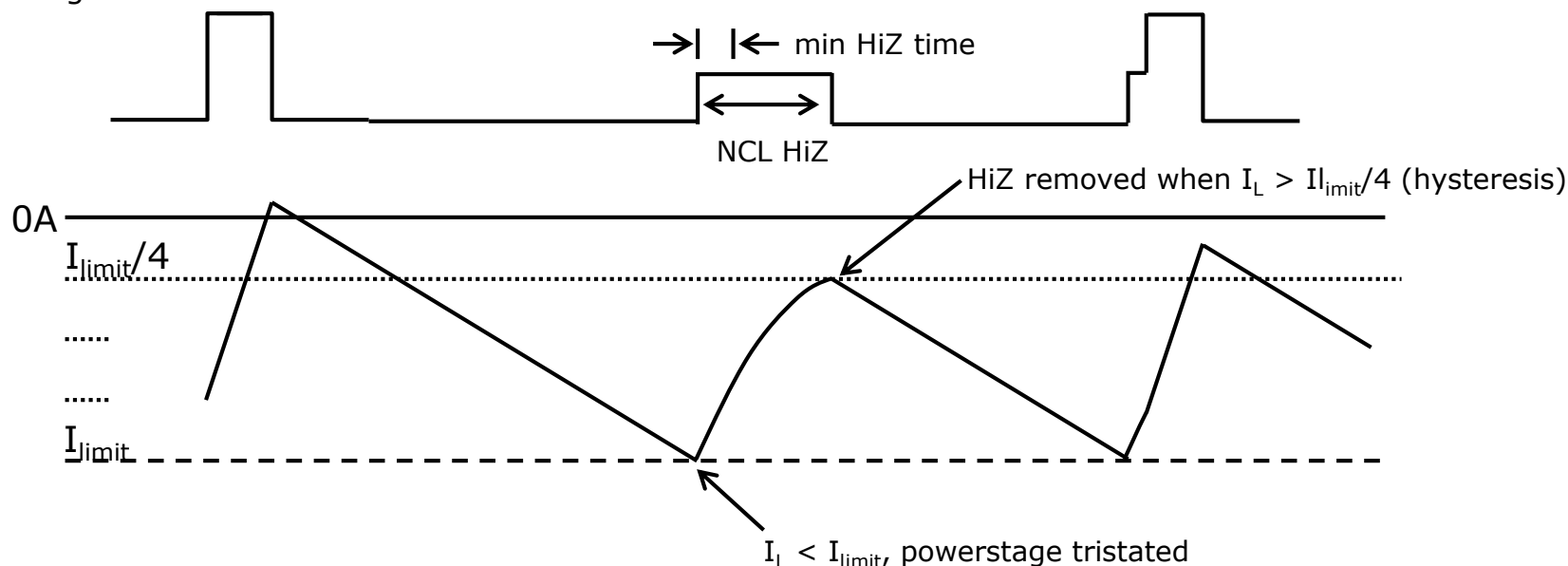
P2CL Pulse to pulse cycle limit

Response :

- Each PWM pulse will immediately be truncated when the phase current exceed the P2CL limit
- Fault flagged after 255 switching cycles above limit.
It uses an up/down counter.
It will count down for all pulses that are below threshold and up again if new pulses exceed threshold.
When number of accumulated above threshold pulses reaches 255 a fault signal is generated.
- A single pulse under threshold will not reset counter to 0 like the other current limit functions
- Counter do not go below 0
- › Recommended settings: Inductor saturation current or 1-2A below saturation current
- › Shutdown response: Shutdown/Ignore/Hiccup

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.

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

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.

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.

Avg OCP or Avg OC Warning behavior

Input:

- Slow Filter's output signal. Filter can be set in **Telemetry** window
- Input of the slow pass filter is Iout

Response time: low pass filter delay + 5 switching cycles

Recommended settings: $I_{ccMax} * 1.15 / N_{ph_max}$ per phase

Shutdown response: Shutdown/Ignore/Hiccup

