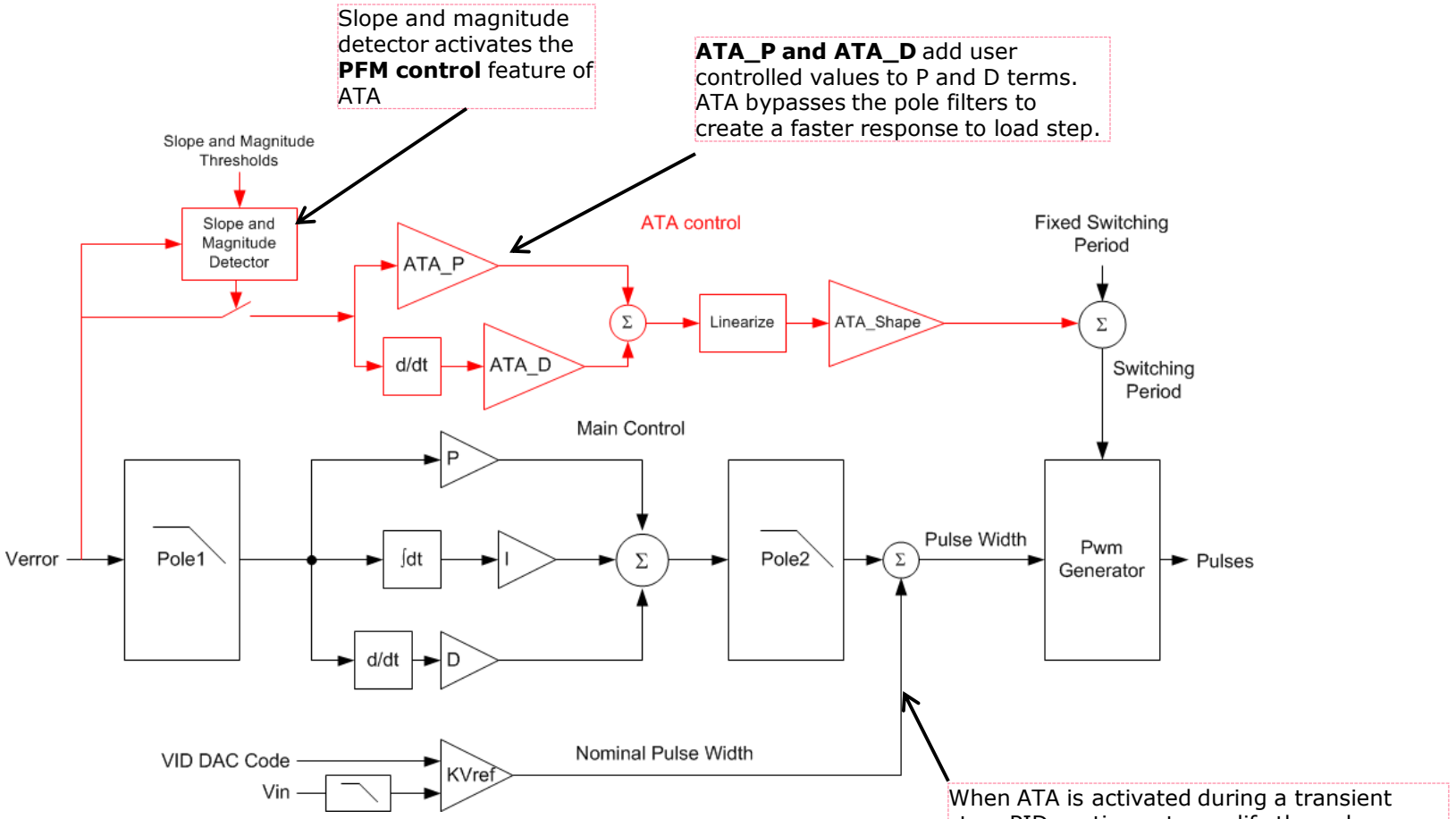
Design Tools
Transient Settings

8. Transient Settings
AC Load, Adaptive Transient Algorithm

Block diagram representing ATA working in parallel with PID control loop.



Design Tools
Transient Settings

8. Transient Settings
AC Load, Adaptive Transient Algorithm

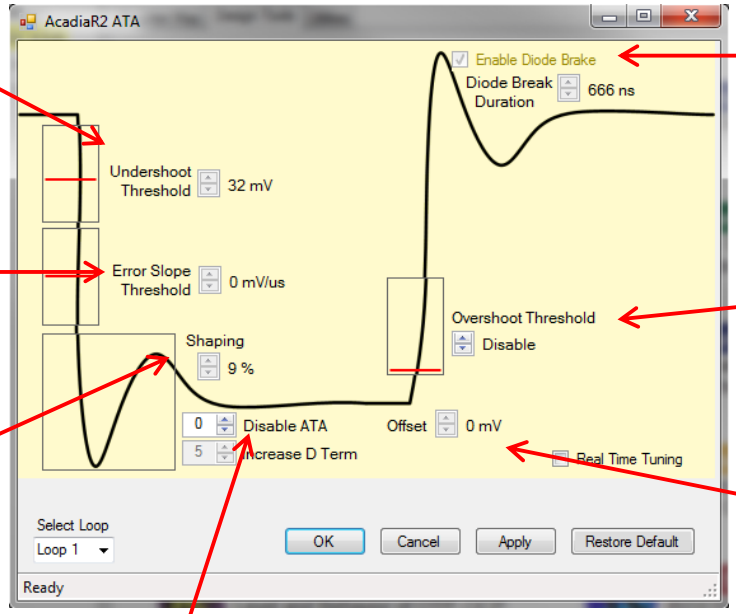
This tool is used to control the Adaptive Transient Algorithm (ATA), a high speed non-linear control technique to improve transient responses when PID isn't enough.

Note: ATA Overshoot and Undershoot controls and operations are independent of each other.

Undershoot Threshold
The threshold V_ERR must exceed for the ATA to work and limit the undershoot.

Error Slope Threshold
The V_RR slope must exceed this threshold. ATA start working to limit undershoot, when this threshold and undershoot threshold are exceeded.

Shaping
Provide additional gain to the ATA P and D terms if required. Only acts when slope is greater than threshold



Increase D Term
ATA D term multiplies switching frequency by the slope of V_ERR.

Enable Diode Brake
During load release events, the ATA can be programmed to turn off the low-side MOSFET and forces the load current to flow through the FET body diode. This reduces output voltage overshoot during a load release event. User can control maximum duration of diode body break event.

Overshoot Threshold
The threshold V_ERR must exceed for the ATA to work and limit overshoot. Can be independent of undershoot control

Offset
Temporary offset added to Vout following a positive load step event. Can be used when the application wants to **avoid undershoot**, but can **handle high overshoot**.

Design Tools
Transient Settings

8. Transient Settings
AC Load, Adaptive Transient Algorithm

The same functions from this tool can also be programmed in the I2C command tree list.

In Loop 1 and Loop 2 section, under **ATA Overshoot** and **ATA Undershoot** can be controlled independently

Indicate slope threshold when ATA will start working to limit under shoot

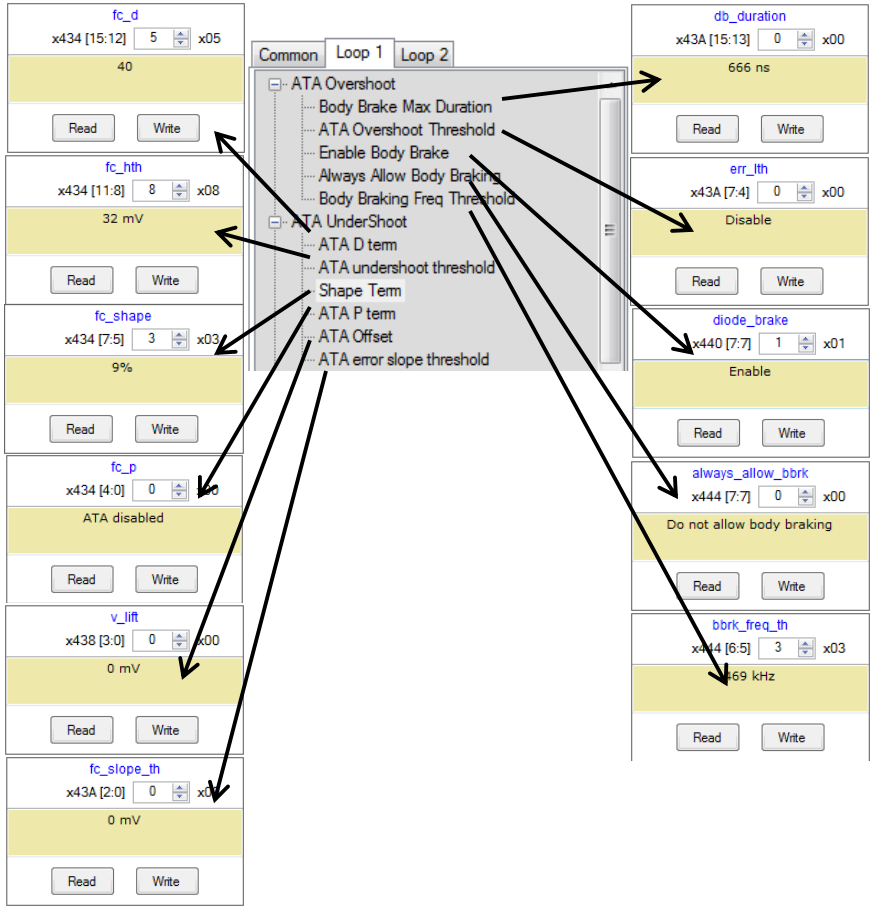
Indicate **voltage undershoot threshold** when ATA will start working to limit under shoot

Shape Term adds further gain to the P and D term. Only acts when slope is greater than threshold

Controls **ATA P term** value and whether **ATA Undershoot** is enabled or disabled(0).

Controls additional **offset voltage** during load oscillation.

Indicate **slope threshold** when ATA will start working to limit under shoot



Set Body Brake max duration.

Set **ATA Overshoot threshold** or disable(0) it.

Enable(1) or disable(0) diode body brake. This function is ANDed with **ATA Overshoot threshold.** It will not operate unless ATA overshoot is enabled as well

Always allow body braking regardless of transient load oscillation frequency

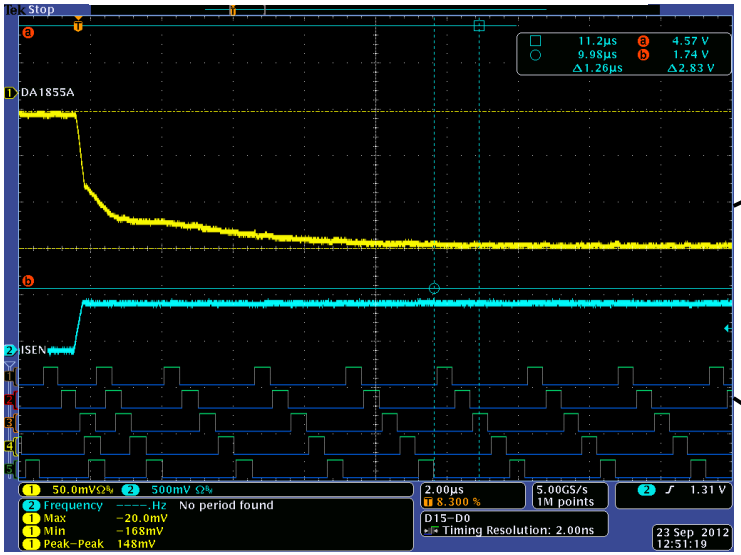
Indicate the max **transient load oscillation frequency** threshold, which body braking is allowed to operate under.

Design Tools
Recommendations for Tuning ATA

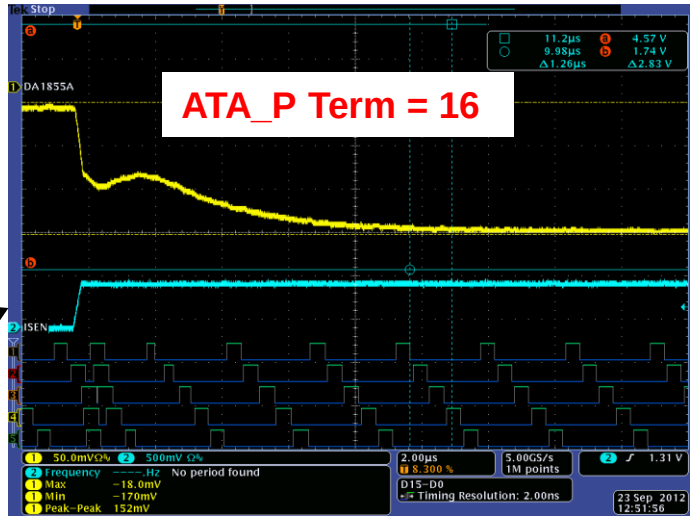
- Before ATA tuning, correctly tune the PID and check the output cap is capable of meeting the required LL.
- Start with setting high thresholds and decrease them until the ATA triggers at the smallest desired load step.
- Set ATA **error slope threshold** low to have a more reliable triggering of the ATA.
- Increase ATA_P, ATA_D, and Shape term to reduce undershoot. The D term has less effect because it is based on the slope of V_ERR and the slope is reduced to 0 quickly due to the nature of transient load step.
- ATA_P and ATA_D terms adds to the PID P and D terms, so when changing PID P and D terms, remember to change ATA_P and ATA_D in the opposite same amount to maintain the same non-linear response.
- Diode Brake is usually disabled.

ATA_P Term – Normal vs Too Much/Little

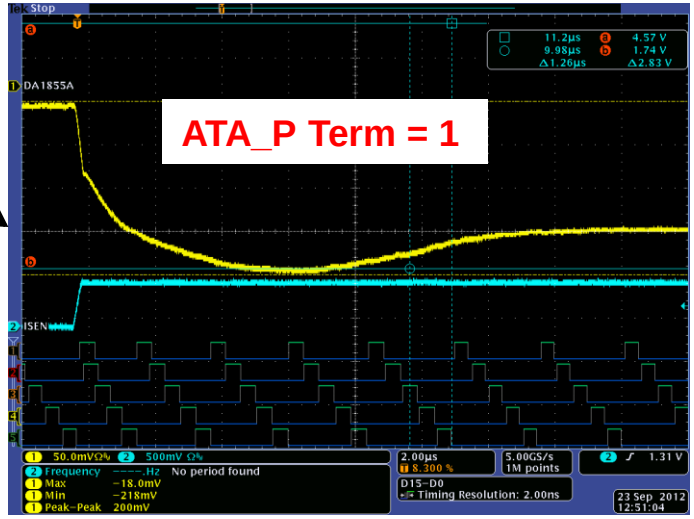
ATA_P Term = 6



ATA_P Term = 16

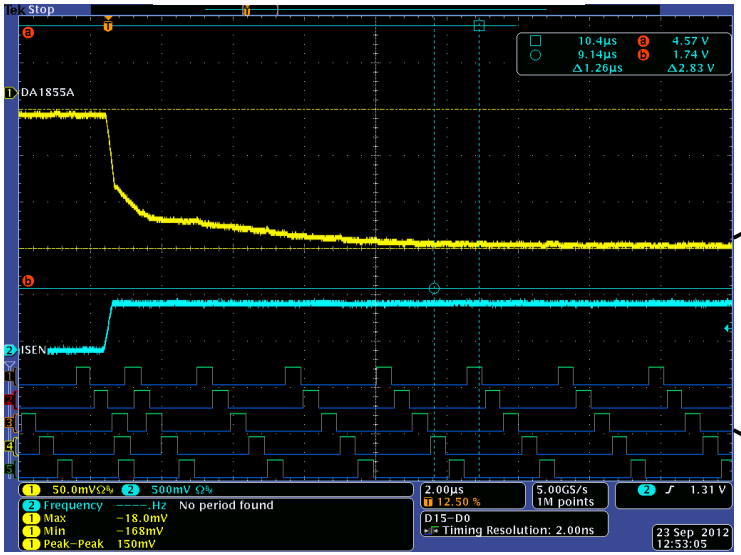


ATA_P Term = 1

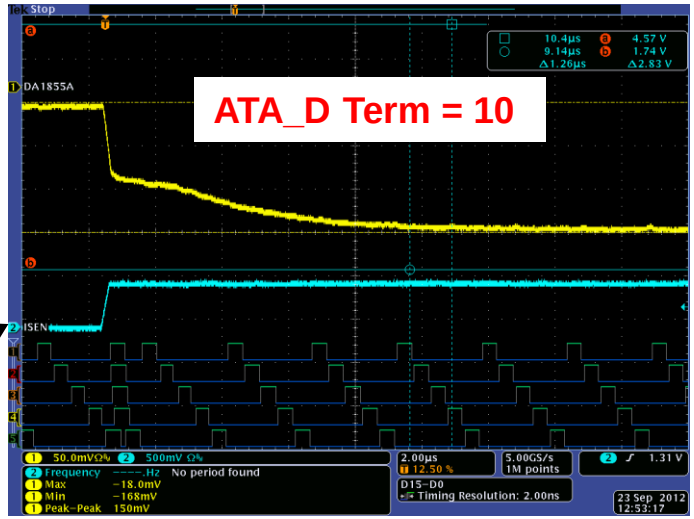


ATA_D Term – Normal vs Too Much/Little

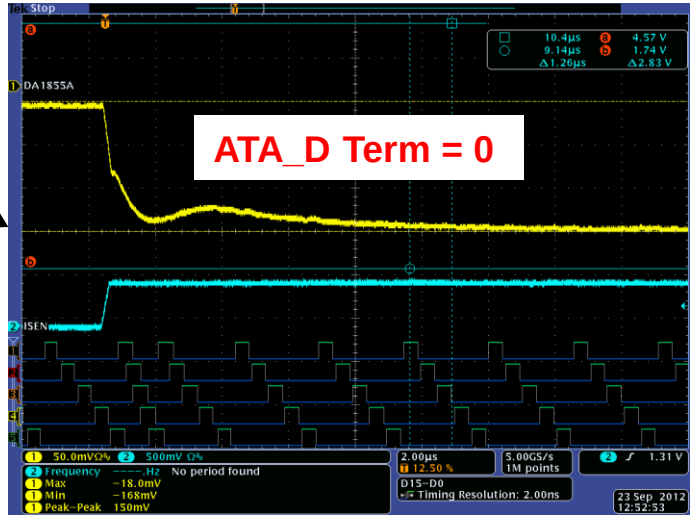
ATA_D Term = 5



ATA_D Term = 10

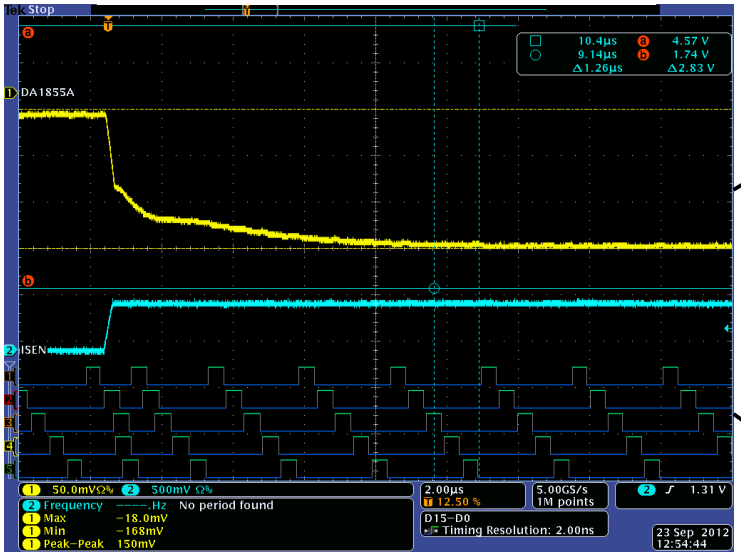


ATA_D Term = 0

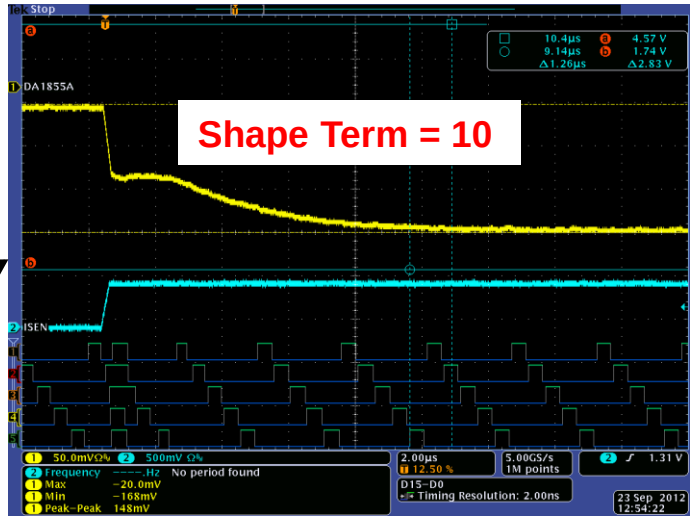


Shape Term – Normal vs Too Much/Little

Shape Term = 5



Shape Term = 10



Shape Term = 0