PoDL PD V_{on}, V_{off}, and R_{Loop} Specifications

David Abramson

Texas Instruments

IEEE802.3bu Task Force

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Texas Instruments

D1.0 V_{on} and V_{off} Specifications

- The current V_{on} and V_{off} specifications are written as an equation based on both the power of the PD and the loop resistance.

The PD shall turn on at a voltage greater than $V_{on(min)}$ which is the maximum of 4V or $\sqrt{7.2 P_{PD} R_{Loop}}$.

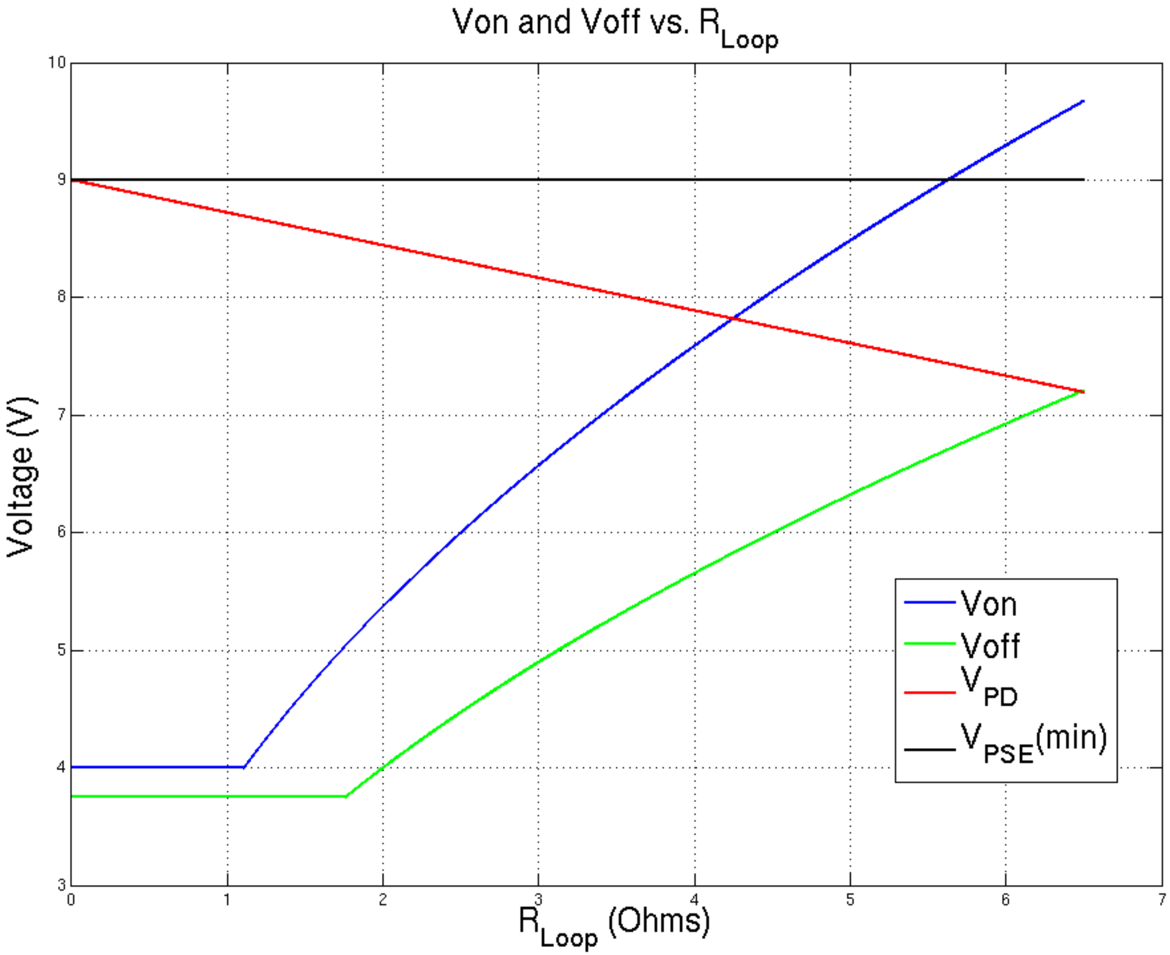
The PD shall turn off at a voltage no less than $V_{off(min)}$ which is the maximum of 3.75V or $\sqrt{4 P_{PD} R_{Loop}}$.

- This requires that the PD controller know both the power it will draw and the loop resistance.
  - This would be very expensive to implement, particularly for PDs in systems that do not implement SCCP.
- In addition, the R_{Loop}(max) values currently listed in Table 104-1 result in turn on voltages that are higher than V_{PSE}(min).

Example D1.0 Specification: Class I (12V)

- Plot shows V_{on} and V_{off} as a function of R_{Loop} for values of R_{Loop} less than or equal to R_{Loop}(max)

- Note that V_{on} is higher than V_{PSE}(min) for R_{Loop} values greater than ~5.5Ω.
- Also note that the minimum V_{off} requirement is exactly the minimum requirement for system stability.
- Furthermore, the PD voltage actually intersects this curve when R_{Loop} = R_{Loop}(max).
- The minimum V_{on} curve provides ~34% margin over the stability requirements.
- All of the classes listed in Table 104-1 have analogous graphs (see Appendix).

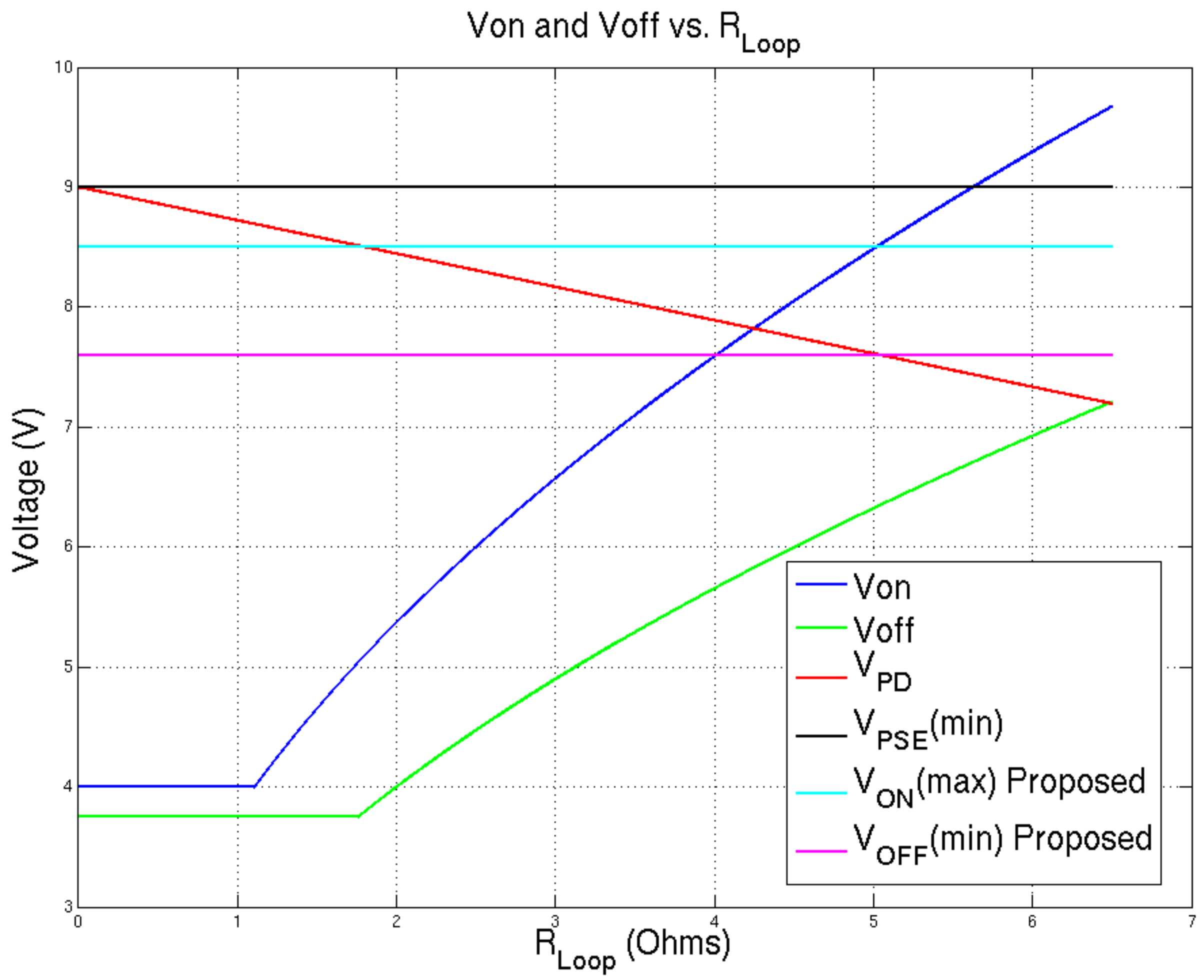


What Specifications Make Sense?

- From an implementer's perspective, fixed numbers would be preferred.
- We should include a maximum turn on voltage that guarantees the PD will turn on below V_{PSE}(min).
- We should include a minimum turn off voltage that guarantees system stability.
  - The turn off voltage also acts as a minimum turn on voltage.
- Since PoDL has different voltage classes, different specifications will be needed for each PSE voltage class.
  - Specifications should be kept constant across different classes that use the same voltage range.
- The difference between maximum turn on voltage and minimum turn off voltage should allow room for significant hysteresis.
  - Startup behavior should be investigated to make sure hiccups are avoided.
  - Specs affecting startup behavior need to be defined (e.g. dv/dt for PSE).
  - R_{Loop}(max) may need to be reduced in order to allow for more hysteresis.

Example of Proposed Specification

- Plot shows existing specifications and an example of the proposed specifications for the Class I (12V).
- The PD must turn on by V_{on}(max) when the voltage is rising. This example is 5% lower than V_{PSE} (min).
- The PD must turn off by V_{off}(min) when the voltage is falling. This example is 5% higher than the stability point.



The Proposal

- Replace PD V_{on} and V_{off} specifications that are currently stated as equations and apply to all voltage classes with:
  - A maximum V_{on} specification for each voltage class.
  - A minimum V_{off} specification for each voltage class.
  - All specifications shall be TBD until the level of hysteresis needed is determined.

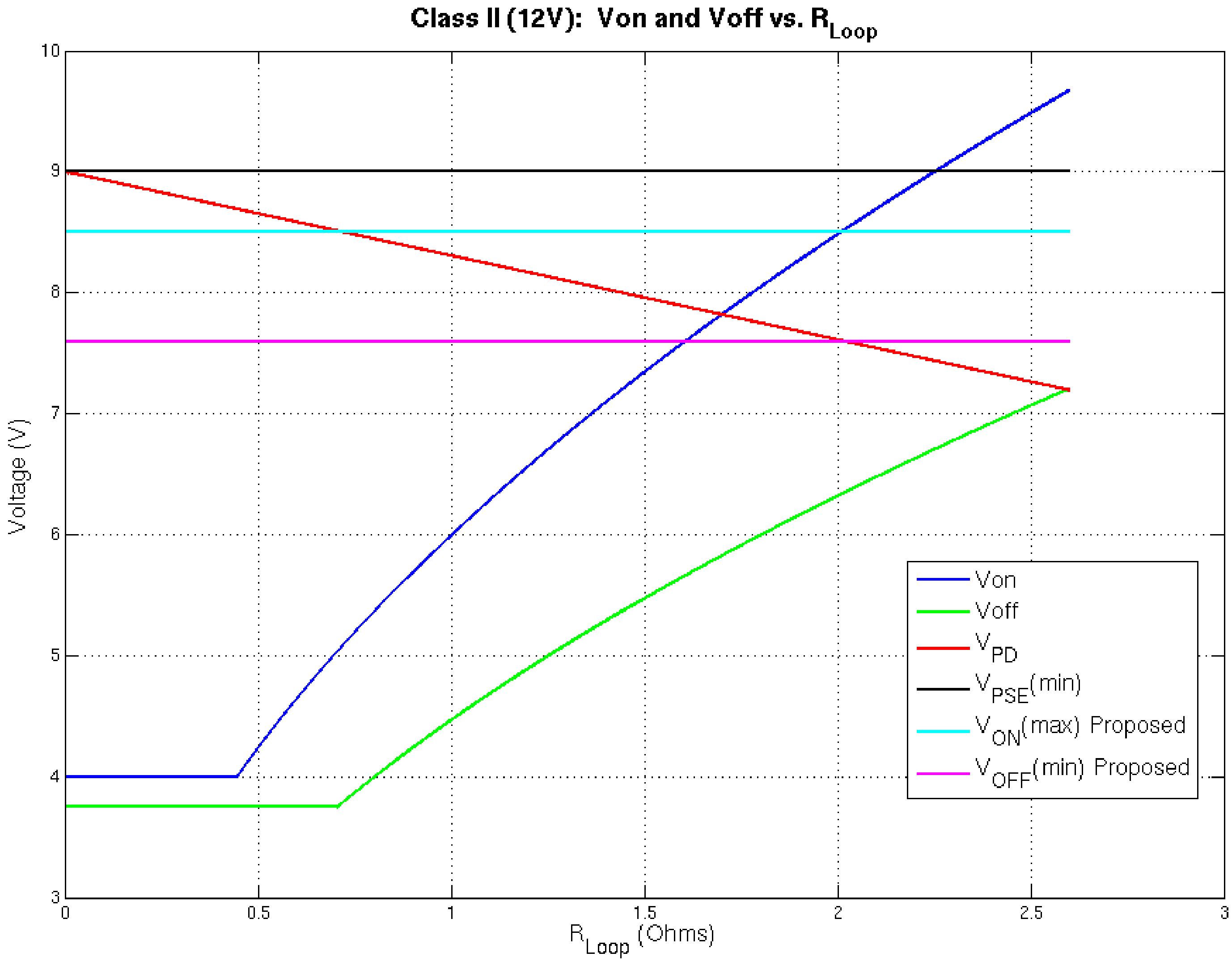
Item	Paramter	Symbol	Unit	Min	Max	PD Type	Additional Information
4a	Maximum power supply turn on voltage (12V Classes)	Von(max)	V		TBD		
4b	Maximum power supply turn on voltage (24V Classes)				TBD		
4c	Maximum power supply turn on voltage (48V Classes)				TBD		
5a	Minimum power supply turn off voltage (12V Classes)	Voff(max)	V	TBD			
5b	Minimum power supply turn off voltage (24V Classes)			TBD			
5c	Minimum power supply turn off voltage (48V Classes)			TBD			

Summary

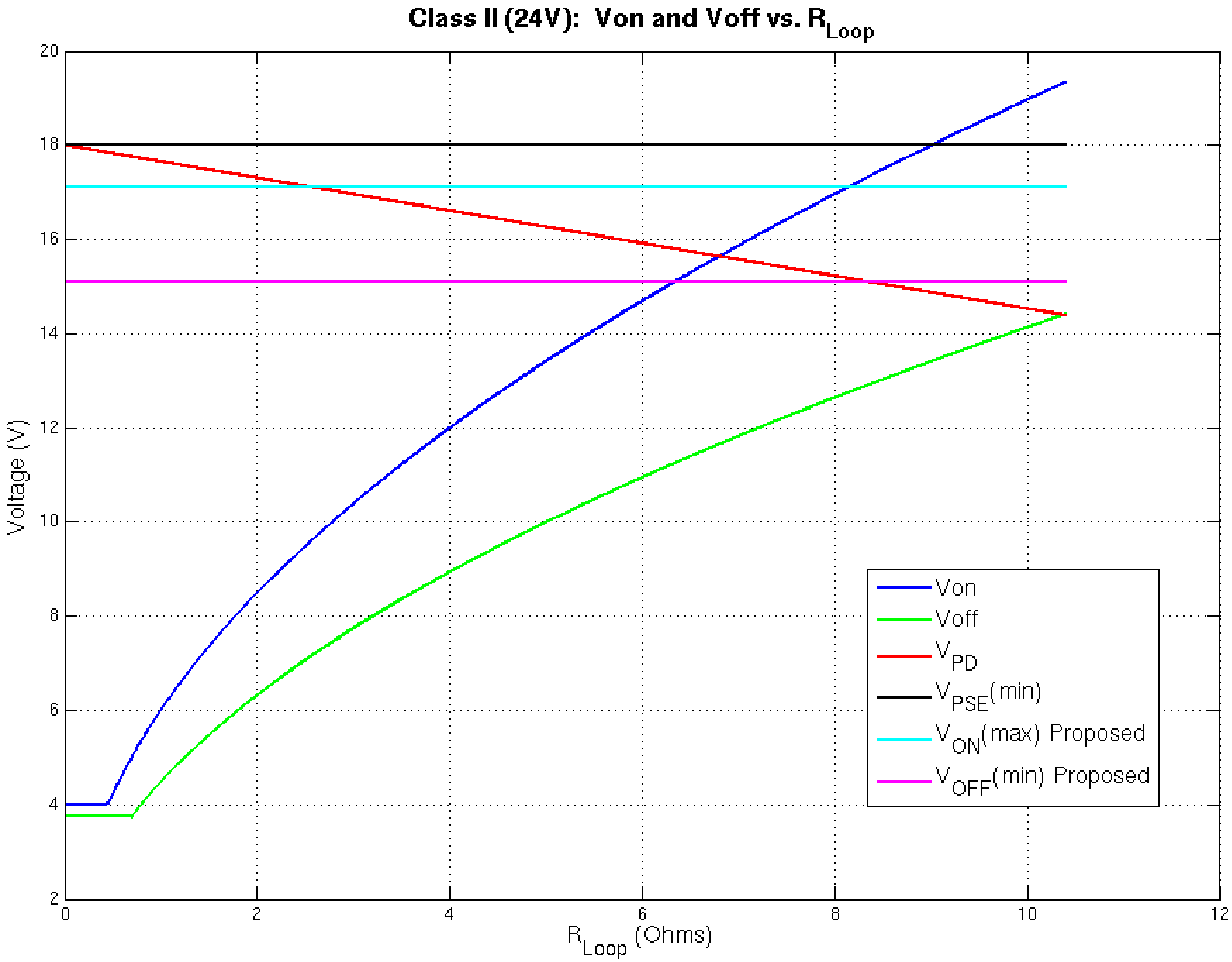
- The current specifications for PD V_{on} and V_{off} voltages are written in a way that:
  - is hard for implementers to understand.
  - is hard to implement.
  - would lead to interoperability problems.
- We should rewrite the V_{on} and V_{off} specifications so that they are easier to understand and implement.
  - Use constant values as opposed to equations.
  - Include both a maximum V_{on} and a minimum V_{off}.
  - These values will need to be different for each supply voltage.
- Startup behavior for PoDL systems needs to be studied in order to determine the amount of hysteresis needed between V_{on} and V_{off}.
  - All V_{on} and V_{off} values should by TBD until this work is completed.

Appendix: Other Class Plots

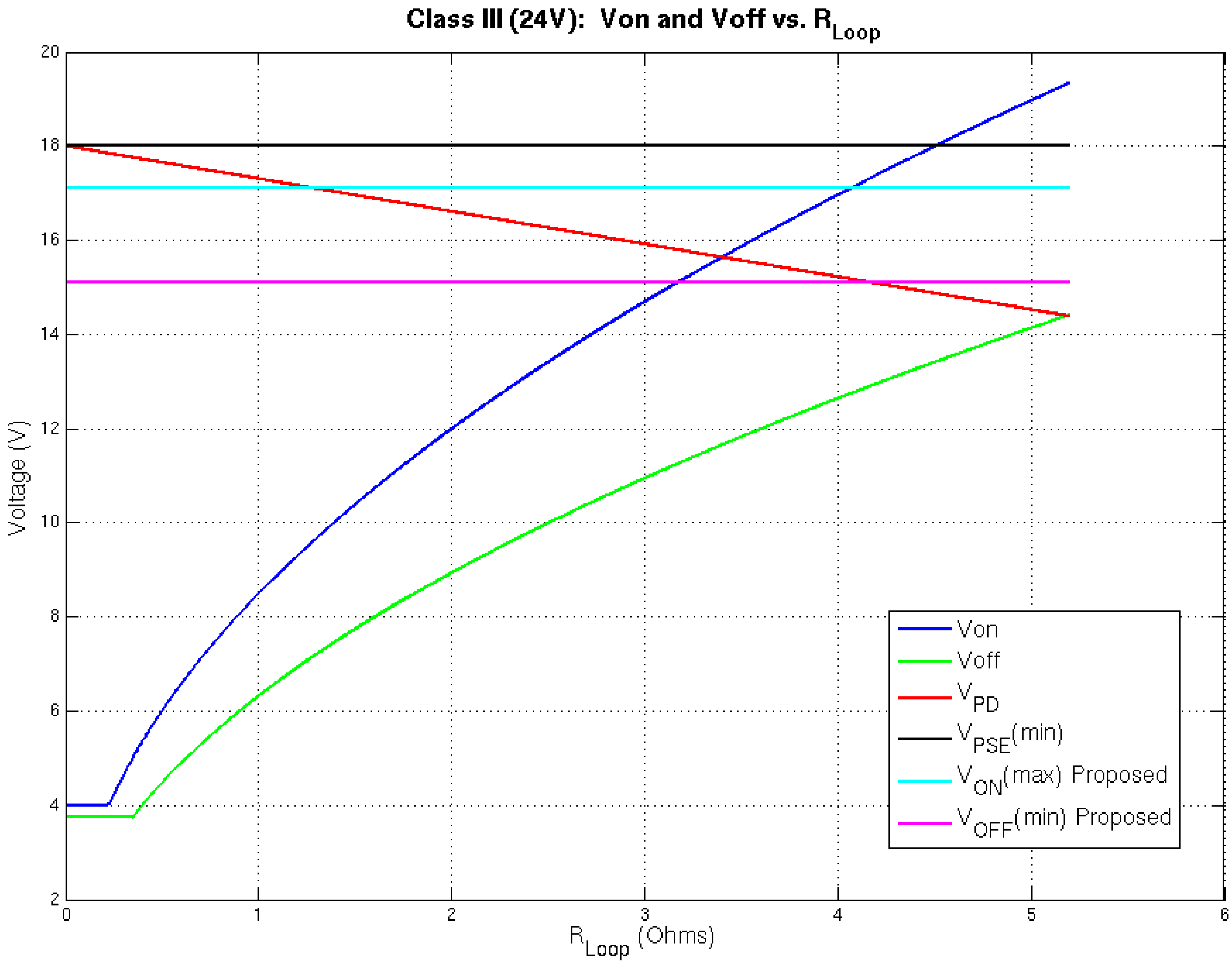
Example of Proposed Specification: Class II (12V)



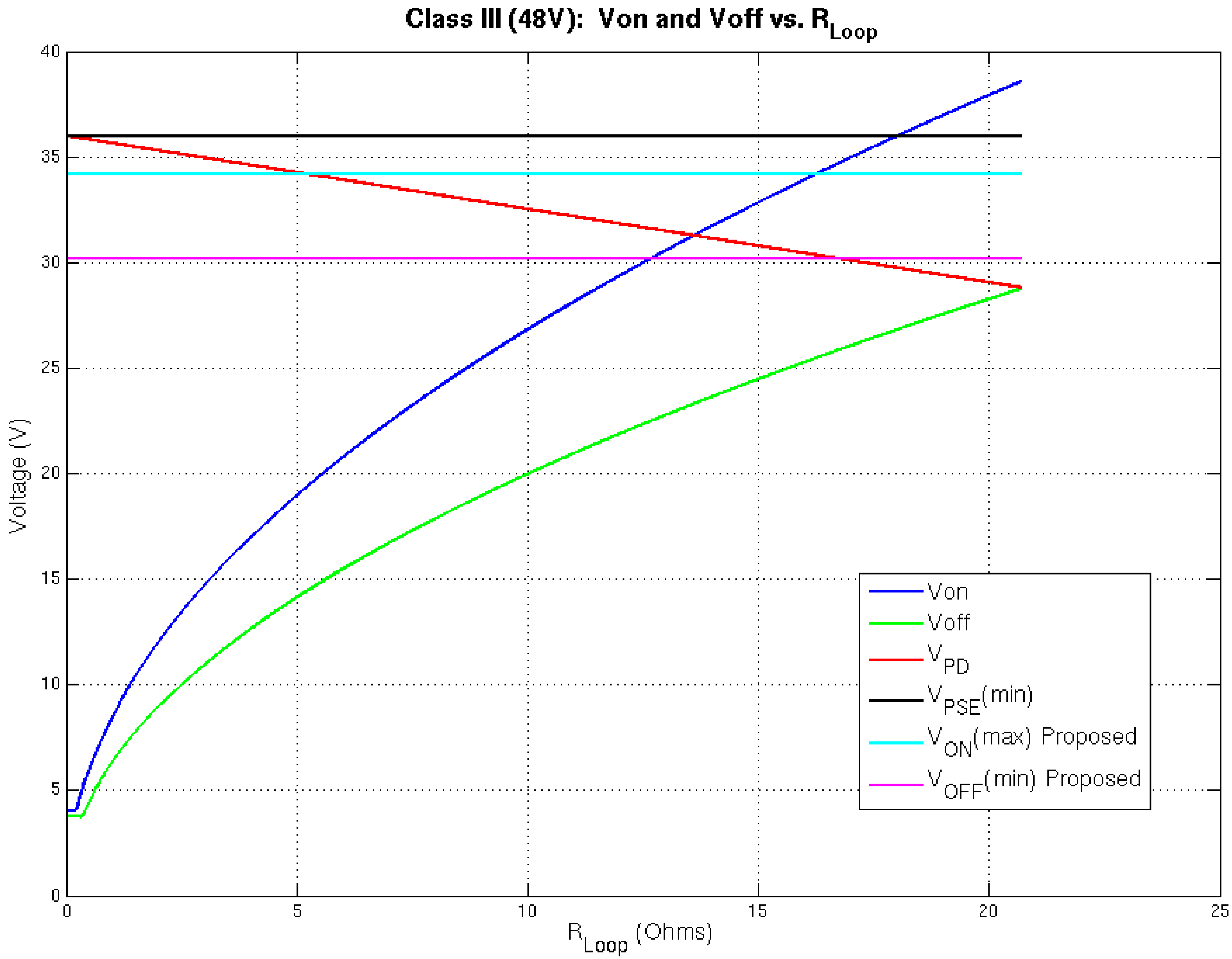
Example of Proposed Specification: Class II (24V)



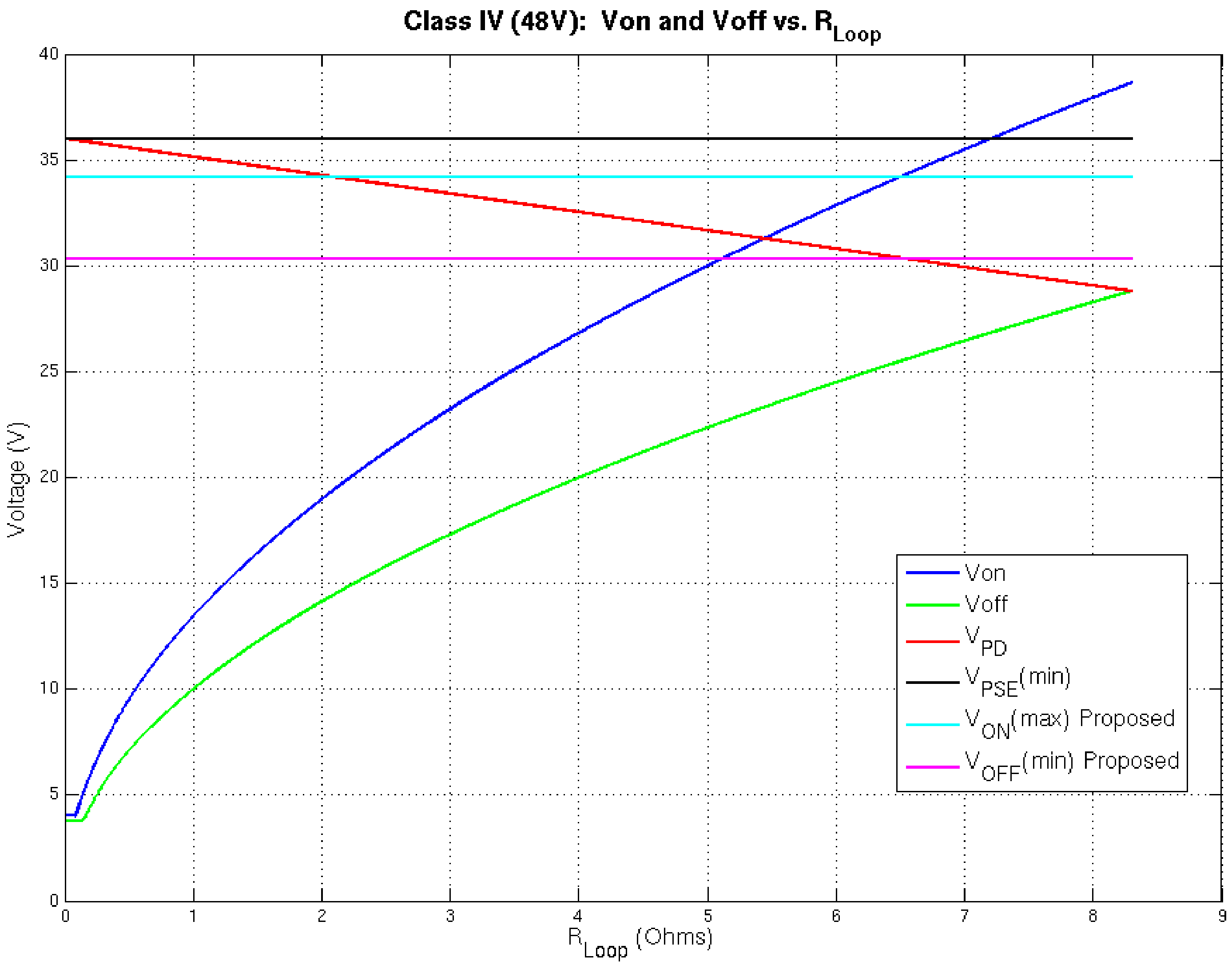
Example of Proposed Specification: Class III (24V)



Example of Proposed Specification: Class III (48V)



Example of Proposed Specification: Class IV (48V)



Example of Proposed Specification: Class V (48V)