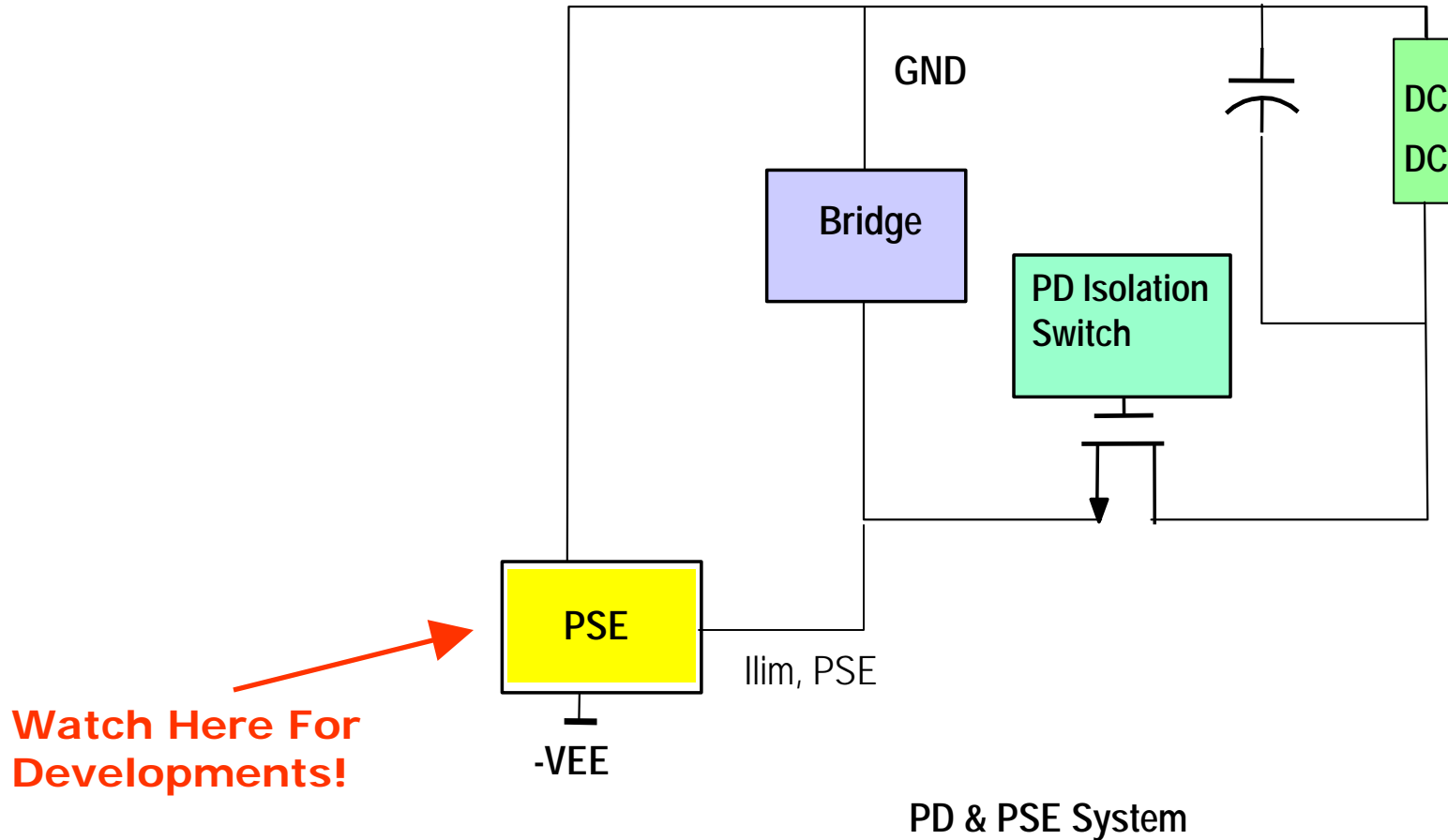


QUASI-CONSTANT POWER DISSIPATION IN THE PSE SWITCH MOSFET

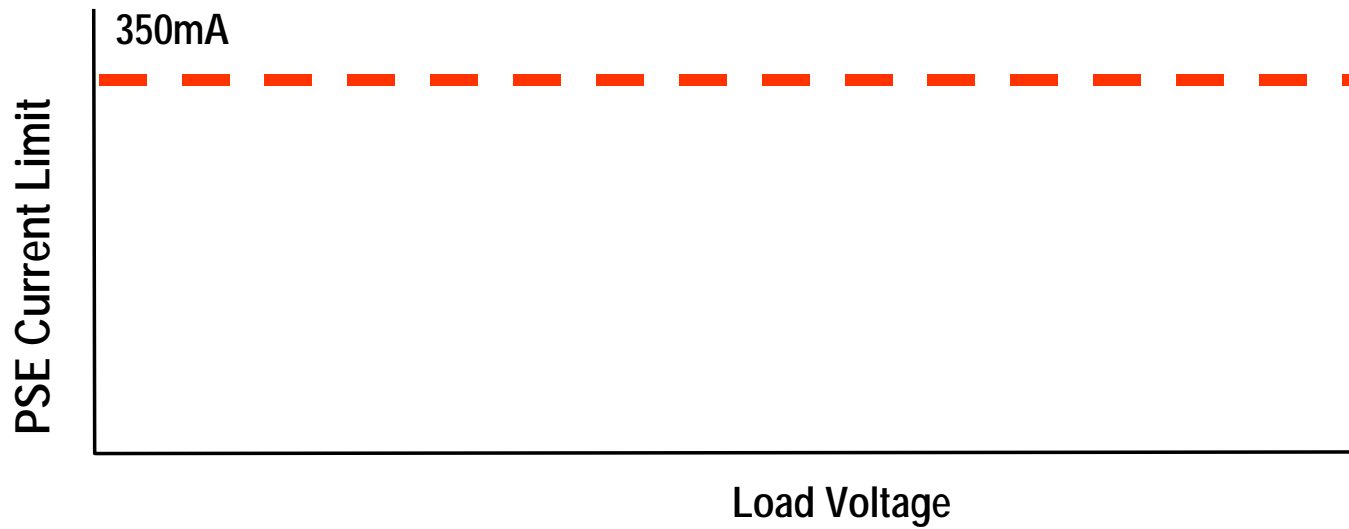
Power Dissipation During Startup For Constant Current vs. Ramped Current

- Describe two alternative current limit vs. load voltage schemes
- Show simulation results
- Summarize findings / Get feedback from group

Two alternative PSE I_{LIMIT} vs. PD voltage characteristics



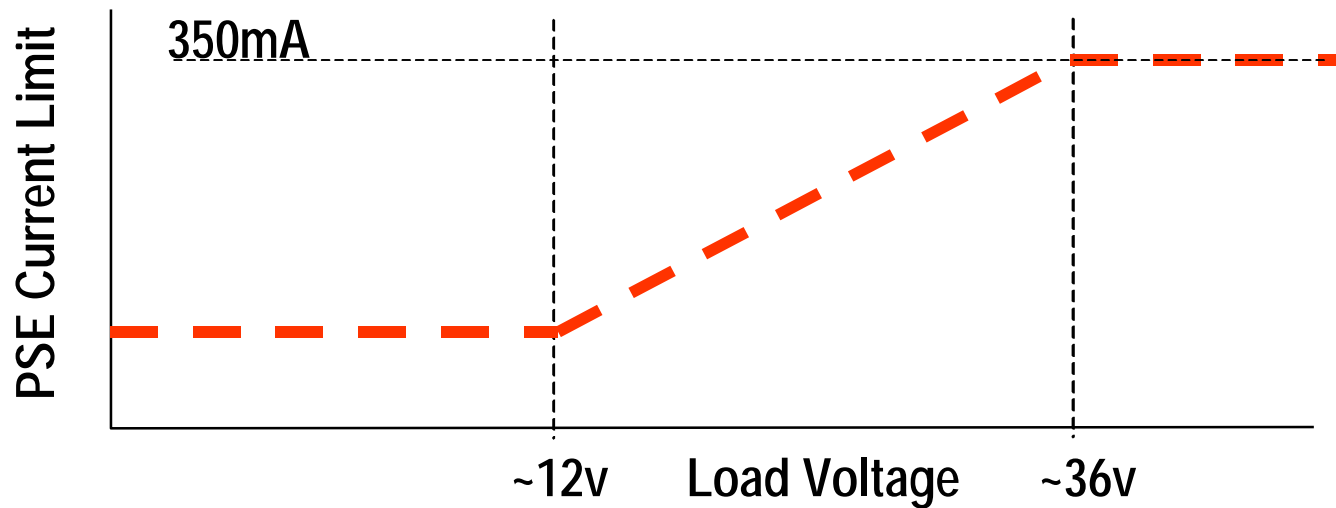
Constant PSE Current Limit During PD Charge-Up



Constant Current Limit Characteristic

- **Current limit constant over load voltage**
 - PD capacitance charges slightly faster
 - Greater thermal stress on PSE power device

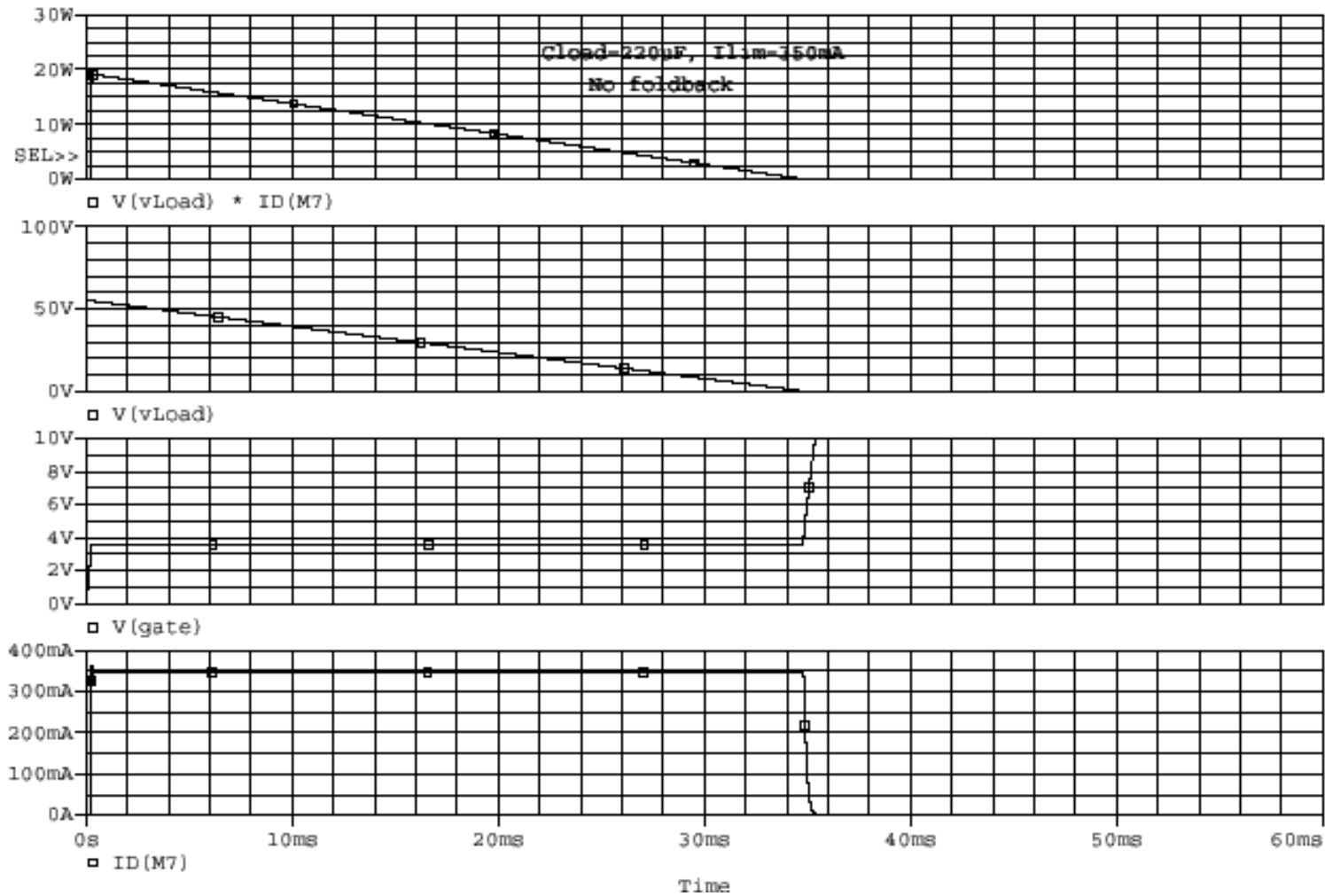
Ramped or “Foldback” Current Limit



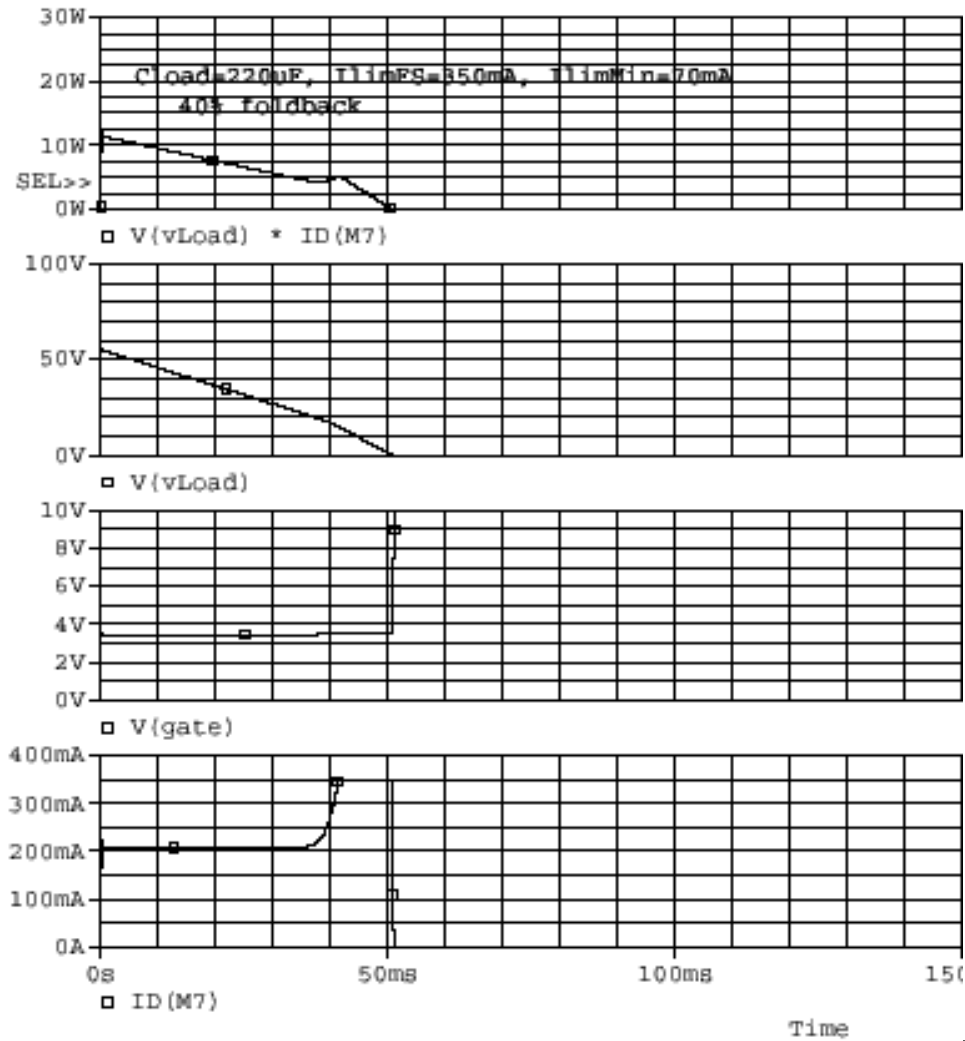
Ramped or Foldback Limit Characteristic

- **Current limit rises to full level as load voltage rises to final value.**
 - Reduces power dissipation in PSE power device
 - Slightly increases time for PD voltage to achieve final value

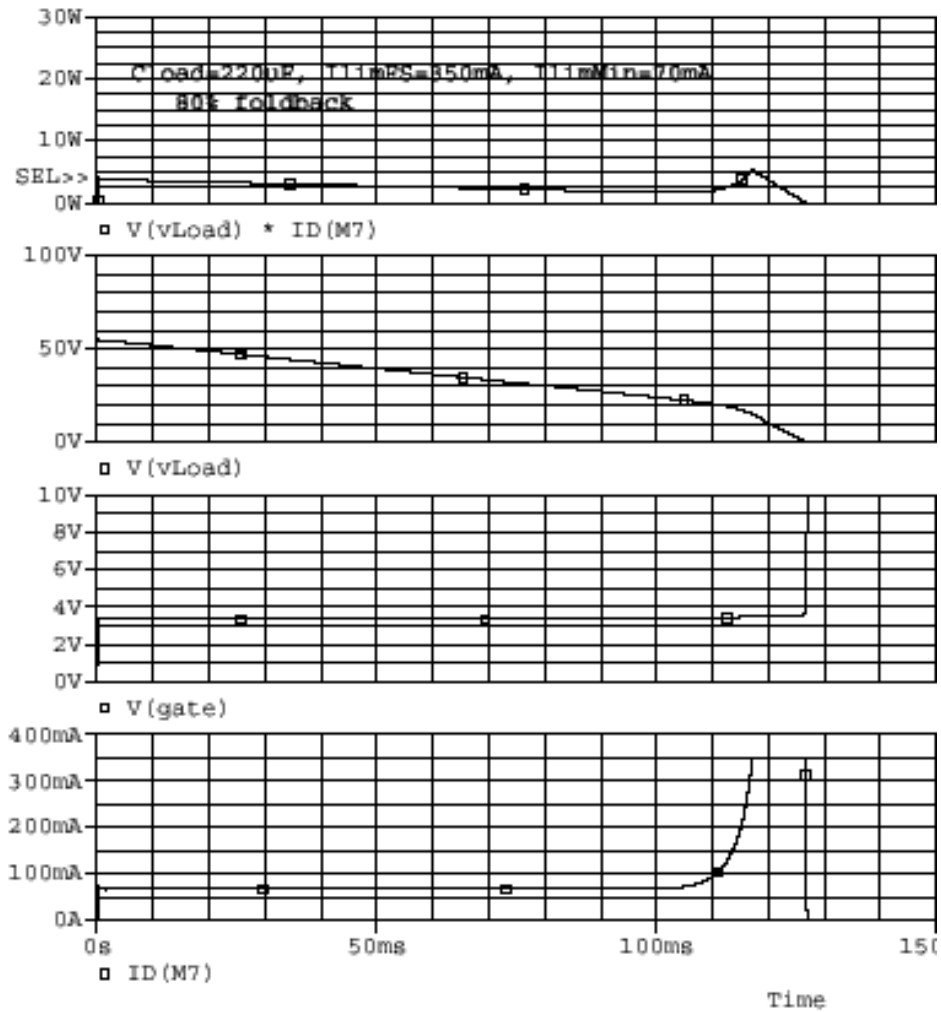
$C_{PD} = 220\mu\text{F}$, No PSE Foldback



$C_{PD} = 220\mu F$, 40% PSE Foldback



$C_{PD} = 220\mu F, 80\% \text{ PSE Foldback}$



Summary

Foldback current limit

- lowers power dissipation
- slightly extends startup time
- lowers thermal stress on PSE
- Suppose θ_{JA} is $30^{\circ}\text{C}/\text{W}$
- Thermal time constant of PSE power device of $\sim 125\text{mS}$
- How much temp rise occurs during startup?

Under foldback, average power is 3W for 120mS

so temp rise = $(1-1/e)*3*30 = .63*3*30 = 54^{\circ}\text{C}$

Under constant current, average power is 10W

so temp rise = $10*0.3*30 = 90^{\circ}\text{C}$

Summary

Foldback current limit

- allows smaller power device in PSE
- lowers power dissipation
- lengthens startup time

Recommendation:

ALLOW PSE to deliver from TBD1 to TBD2 mA during start-up. TBD1 ~ 150mA; TBD2 ~ 400mA.