ANALOG DEVICES

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802.3da Clause 169 MPoE Features

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Clause 169

- Describes MPoE
  - Multidrop Power over Ethernet
- Defies 2 new entities
  - MPSE – Multidrop PSE
  - MPD – Multidrop PD
- 2 system types
  - Type 0 is a 24V system
  - Type 1 is a 50V system
- Power is statically allocated per PD
  - Power level TBD

Clause 169 Features

- Discovery
  - Look for MPDs requesting power
  - Determine what types of MPDs are requesting power
  - Determine if mixing segment is shorted
  - Determine if mixing segment is open circuit
- Inrush
  - Controlled application of power
- Fault Handling
  - Current limit
  - Overcurrent
- Maintain Power Signature
  - Remove power when no MPD is present

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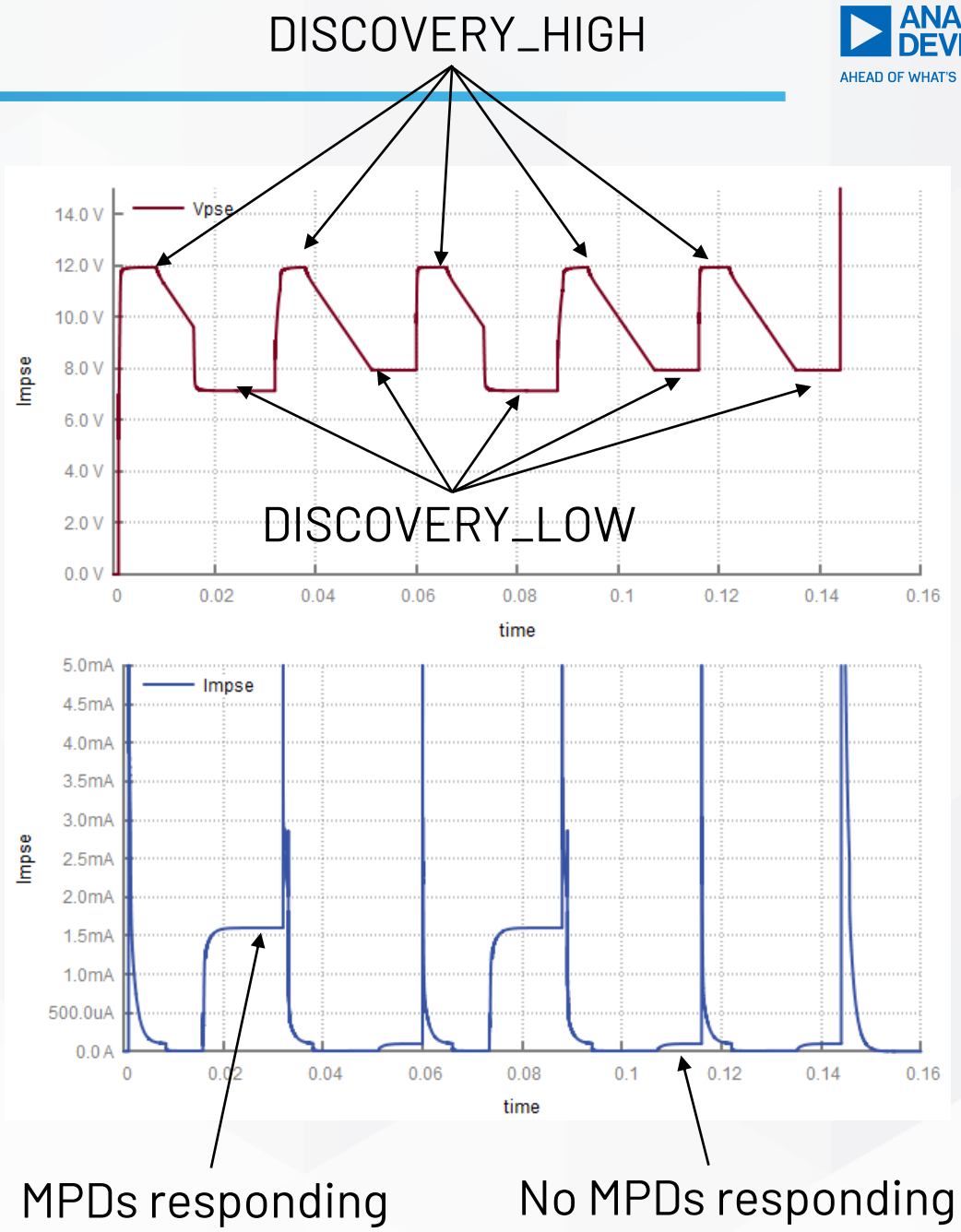
Discovery Algorithm

Discovery

- Determine mixing segment is ready for power
  - Not short circuited
  - At least one MPD ready to accept power
    - No Opens
    - Dictated by Objective 10
- Gather telemetry in case of issues applying power
  - Incompatible MPSE / MPD types
  - Overloaded mixing segments – too many devices to power
  - Short circuits
  - Open circuits

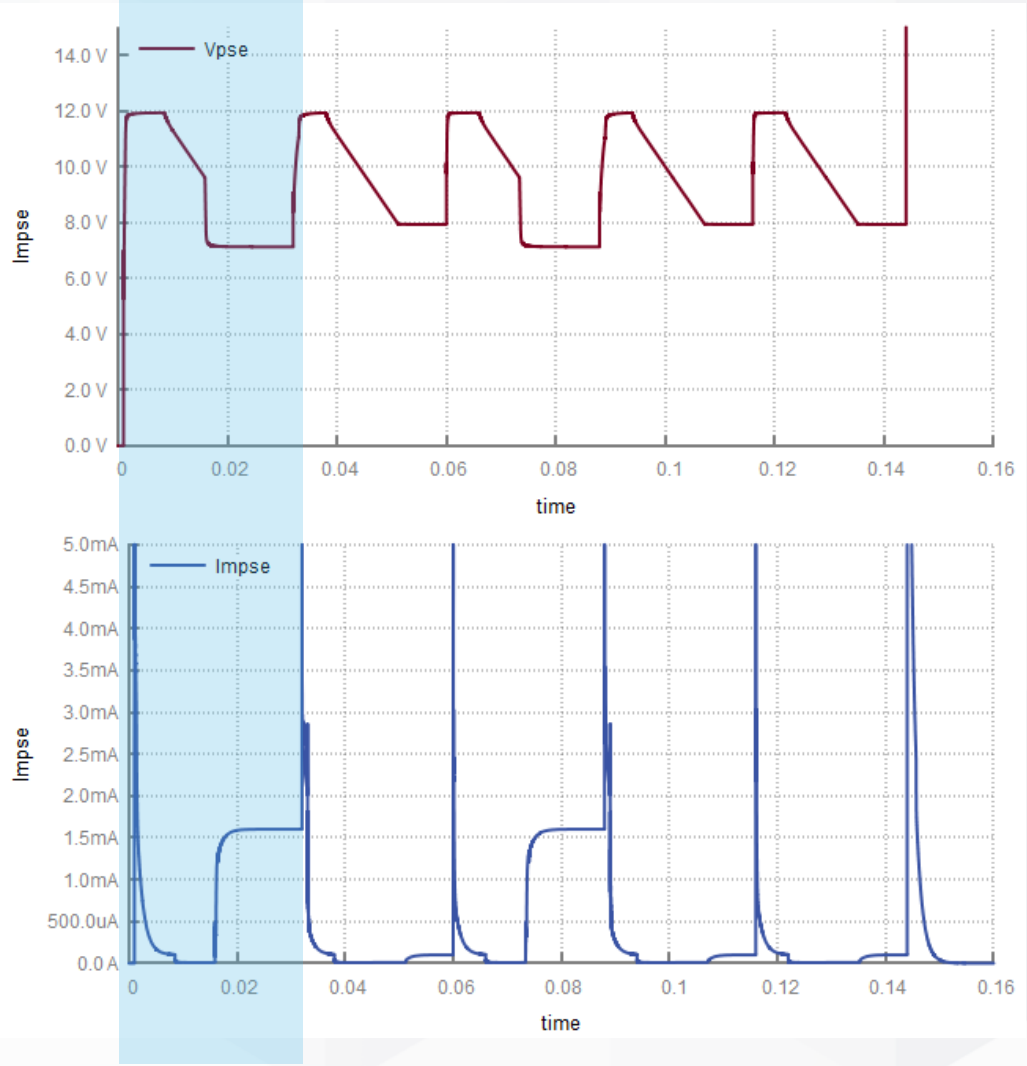
Discovery Basics

- **MPSE Voltage moves** between “DISCOVERY_HIGH” and “DISCOVERY_LOW” states
- **MPDs respond with current** during certain DISCOVER_LOW states
- Determine
  - Open
  - Short
  - 24V PDs attached
  - 48V PDs attached
  - 24/48V Capable PDs attached



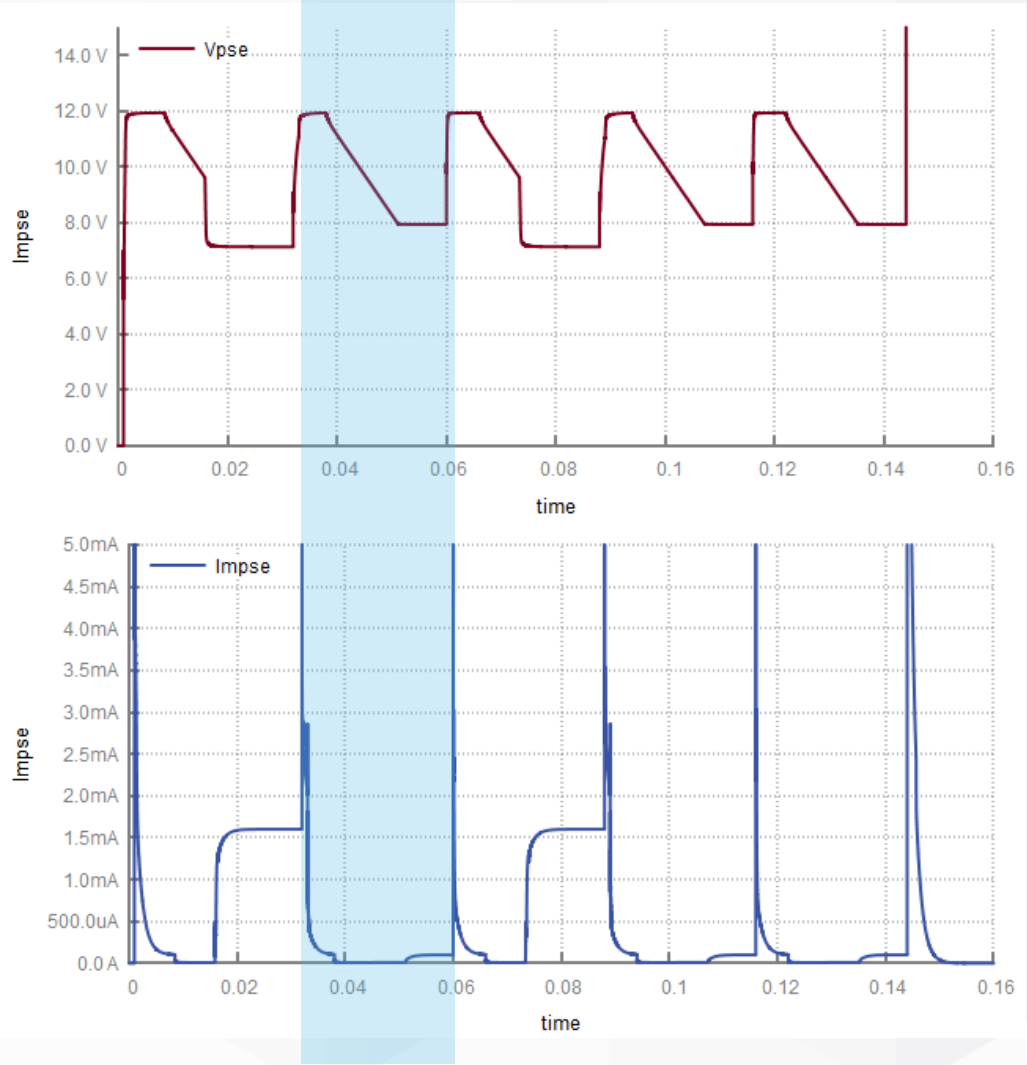
Discovery Step 1

- DISCOVERY_HIGH_MARK1 and DISCOVERY_LOW_ALL
- **All MPDs respond**
- PSE Compares current in DISCOVERY_HIGH_MARK1 and DISCOVERY_LOW_ALL
- Look for much larger current in DISCOVERY_LOW_ALL than DISCOVERY_HIGH_MARK1



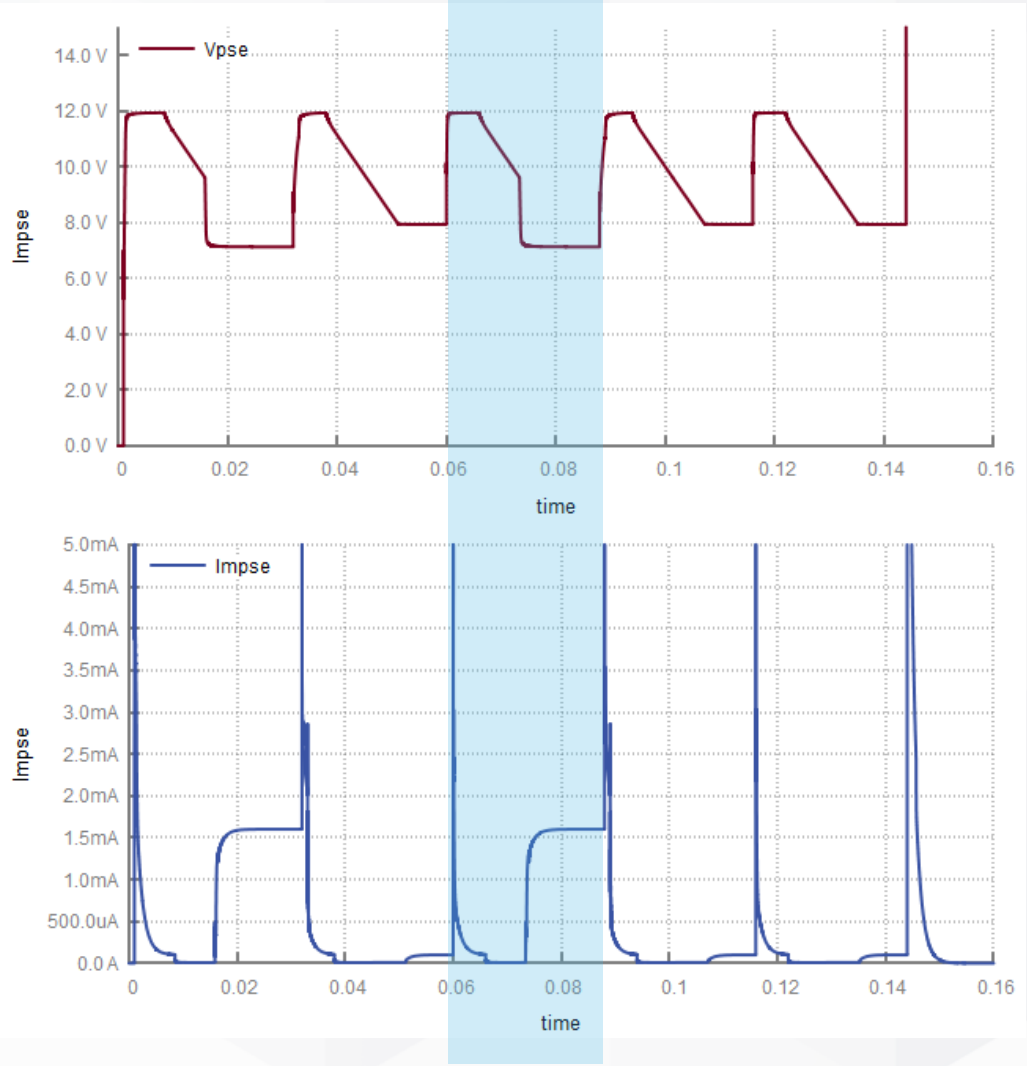
Discovery Step 2

- Move through DISCOVERY_HIGH_MARK2 to advance state to DISCOVERY_LOW_TARE
- **No MPDs respond**
- MPSE measures and records quiescent current of attached MPDs



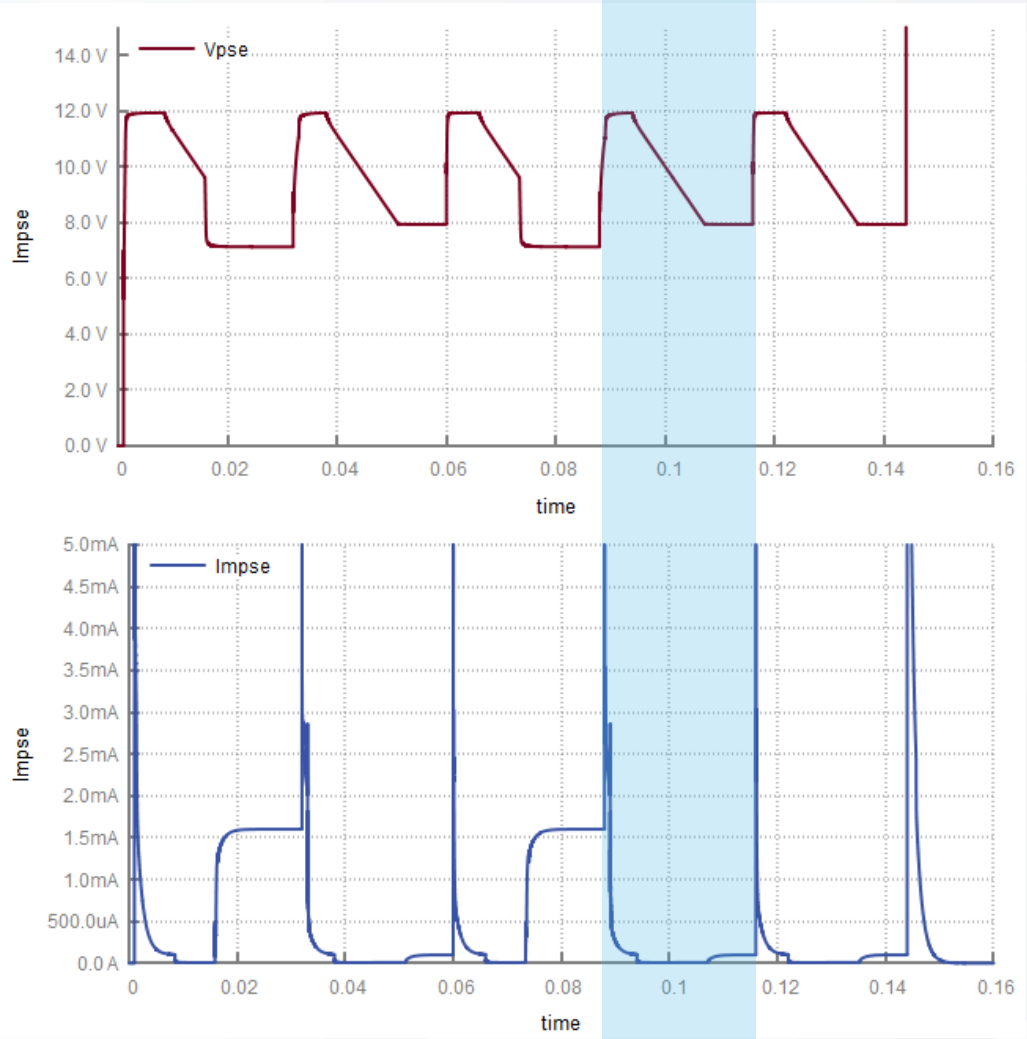
Discovery Step 3

- Move through DISCOVERY_HIGH_MARK3 to advance state to DISCOVERY_LOW_TYPE0
- **24V MPDs respond**
- MPSE measures channel current and subtracts tare current from step 2 to determine if 24V MPDs are attached



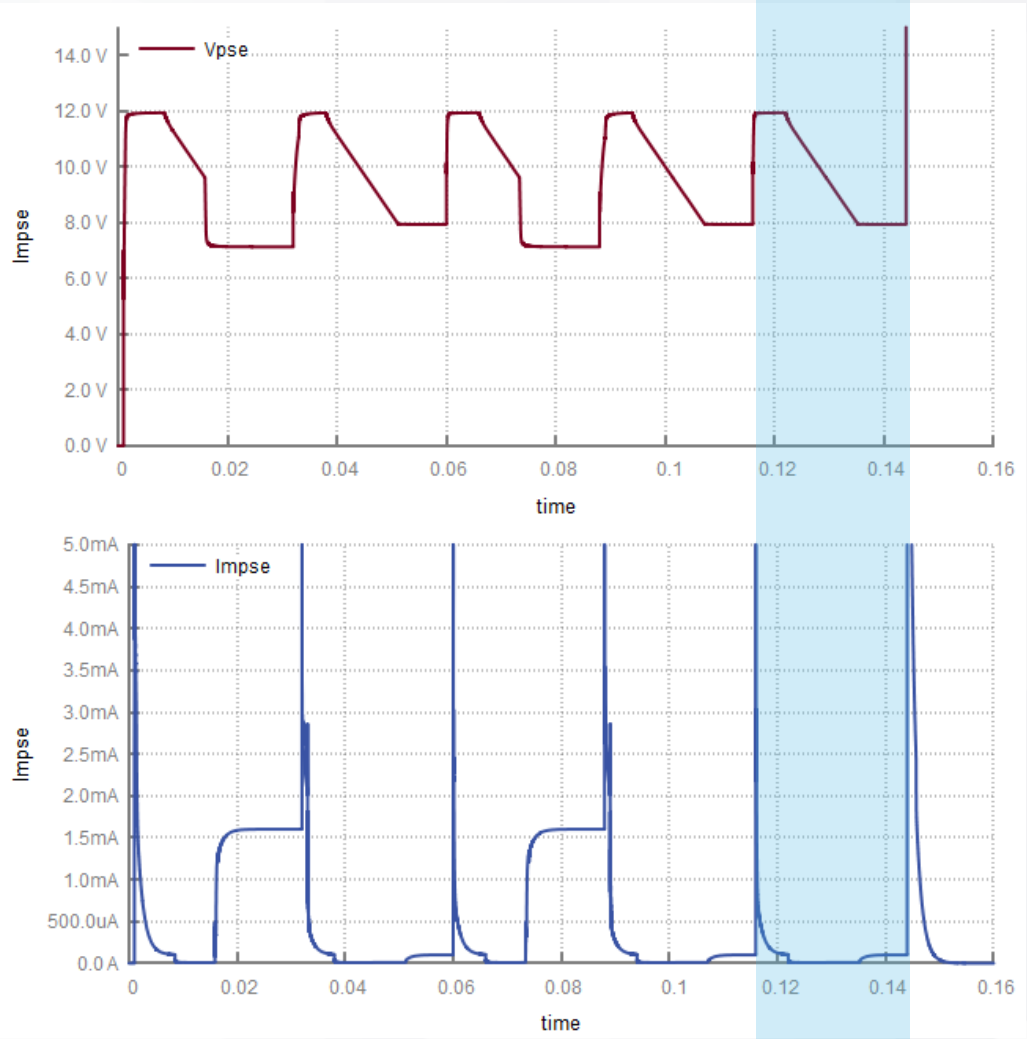
Discovery Step 4

- Move through DISCOVERY_HIGH_MARK4 to advance state to DISCOVERY_LOW_TYPE1
- **50V MPDs respond**
- MPSE measures channel current and subtracts tare current from step 2 to determine if 50V MPDs are attached



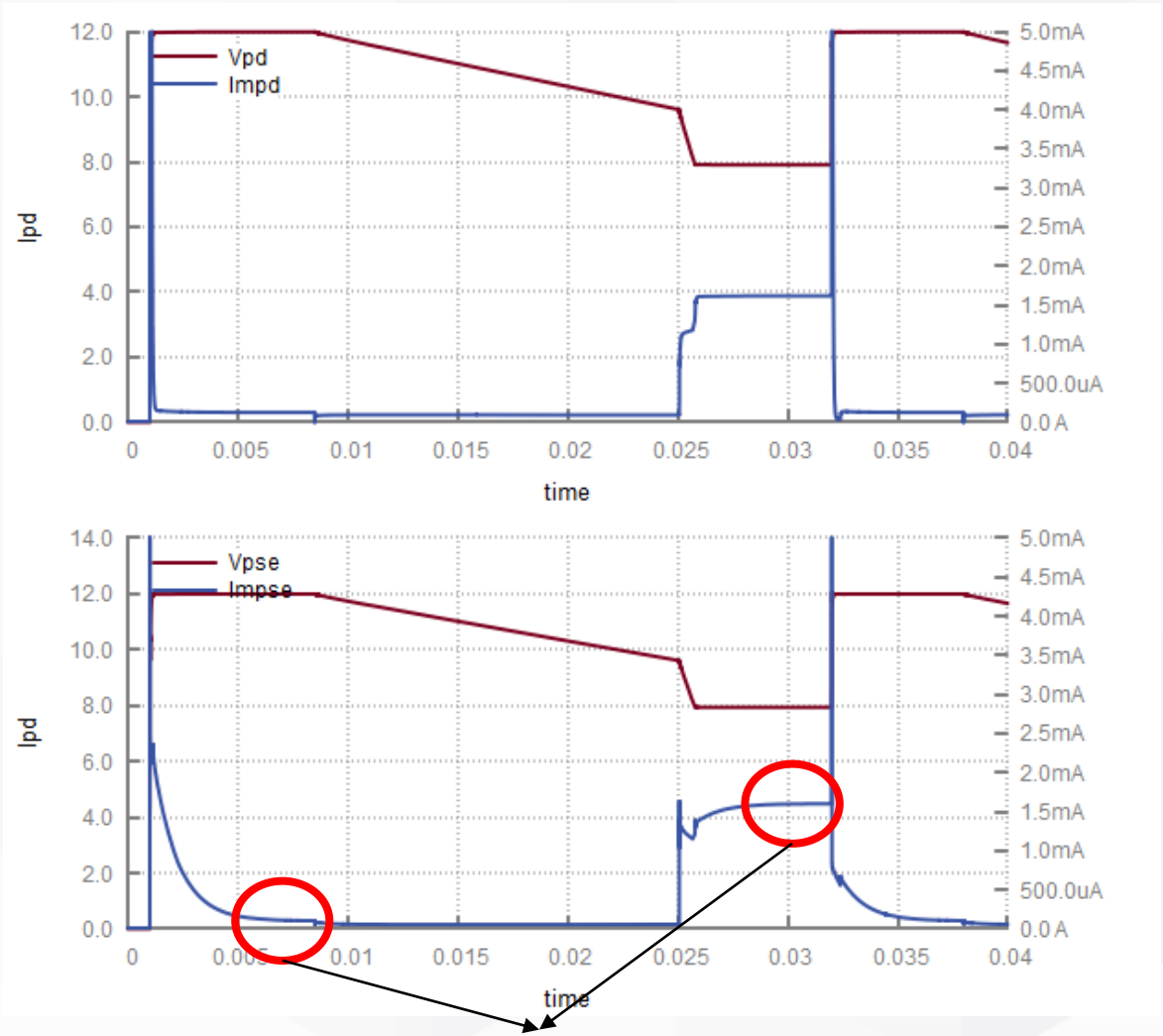
Discovery Step 5

- Move through DISCOVERY_HIGH_MARK5 to advance state to DISCOVERY_LOW_TYPE_MIXED
- **24V/50V MPDs respond**
- MPSE measures channel current and subtracts tare current from step 2 to determine if mixed type MPDs are attached



MPSE Discovery Parameters

- Tdiscover_high = 7ms (min.)
  - Based on
  - Ilim_discover pull up current
  - Cpd + Cphy_couple
- Tdiscover_low = 22ms (min.)
  - Based on
  - Ipd pulldown current
  - Cpd + Cphy_couple



$I_{discovery} - I_{mark} > 800uA$

PSE Discovery Parameters

Parameter	min	typical	max	units	Notes
Vdiscover_high		10		V	
Vdiscover_low		7		V	
Tdiscover_high_settle		7		ms	Driven by Impse, Cmpd, Cphy_couple
Tdiscover_low_settle		22		ms	Driven by Idiscover_mpd, Cmpd, Cphy_couple
Imark_short	4			mA	
Idiscovery_present	0.8		40	mA	$I_{discovery} - I_{mark}$
Idiscovery_type	0.8		40	mA	$I_{discovery} - I_{tare}$

MPD Discovery Parameters

Parameter	Min	Typical	Max	Units	Notes
Vmark	8		9	V	Discovery_high – Discovery low threshold
Vreset		3		V	Reset Threshold
Idiscover	100		200	uA	Baseline quiescent current during discovery
Irespond	1		2	mA	Current during discovery response

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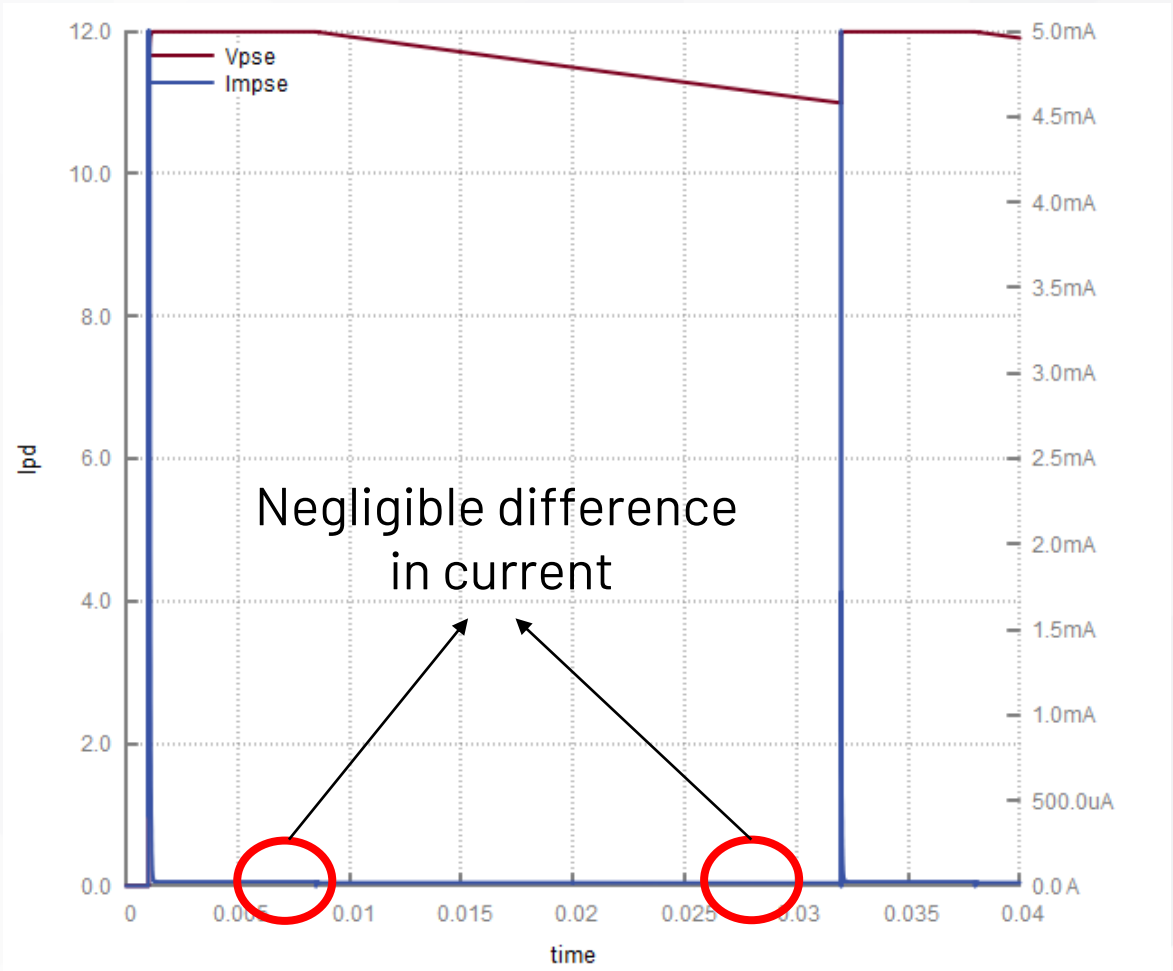
Discovery Examples

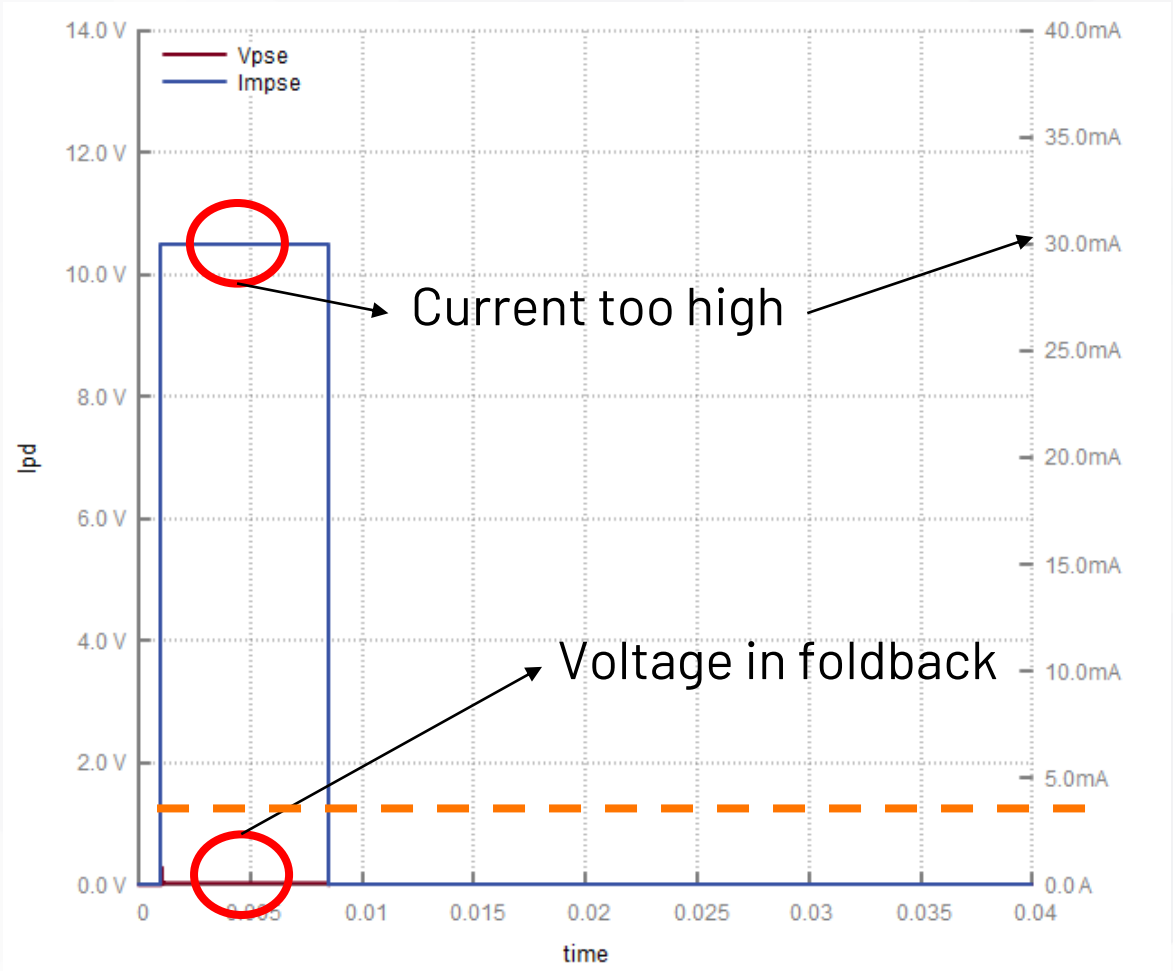
Discover open circuit

- Look for absence of response current at ‘DISCOVER_LOW_ALL’ state
- $I_{mark} - I_{discovery} < 800uA$, typ

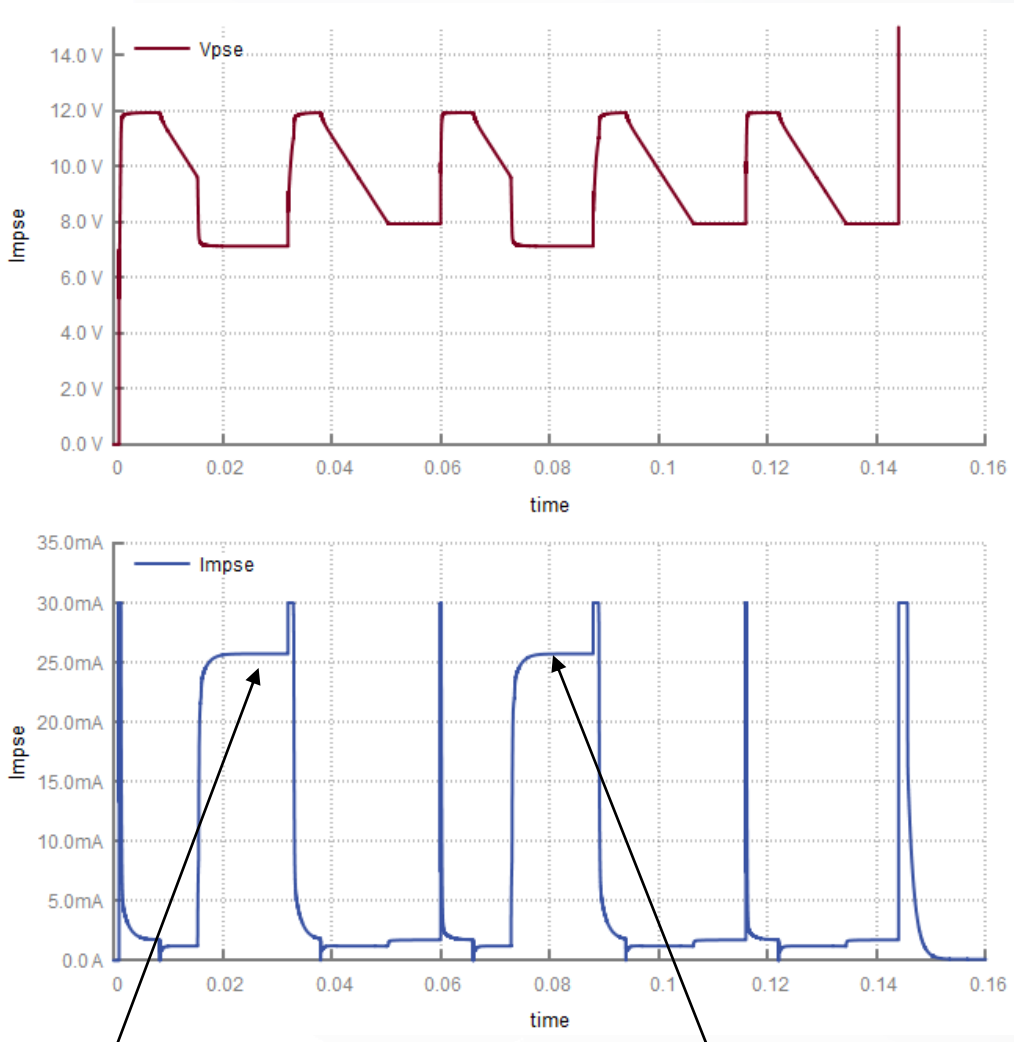


Discover Short

- Nominal response to DISCOVERY_HIGH_MARK_1 is in the range 100uA to 2mA
- Declare short when DISCOVERY_HIGH_MARK_1 current is above ~ 3mA

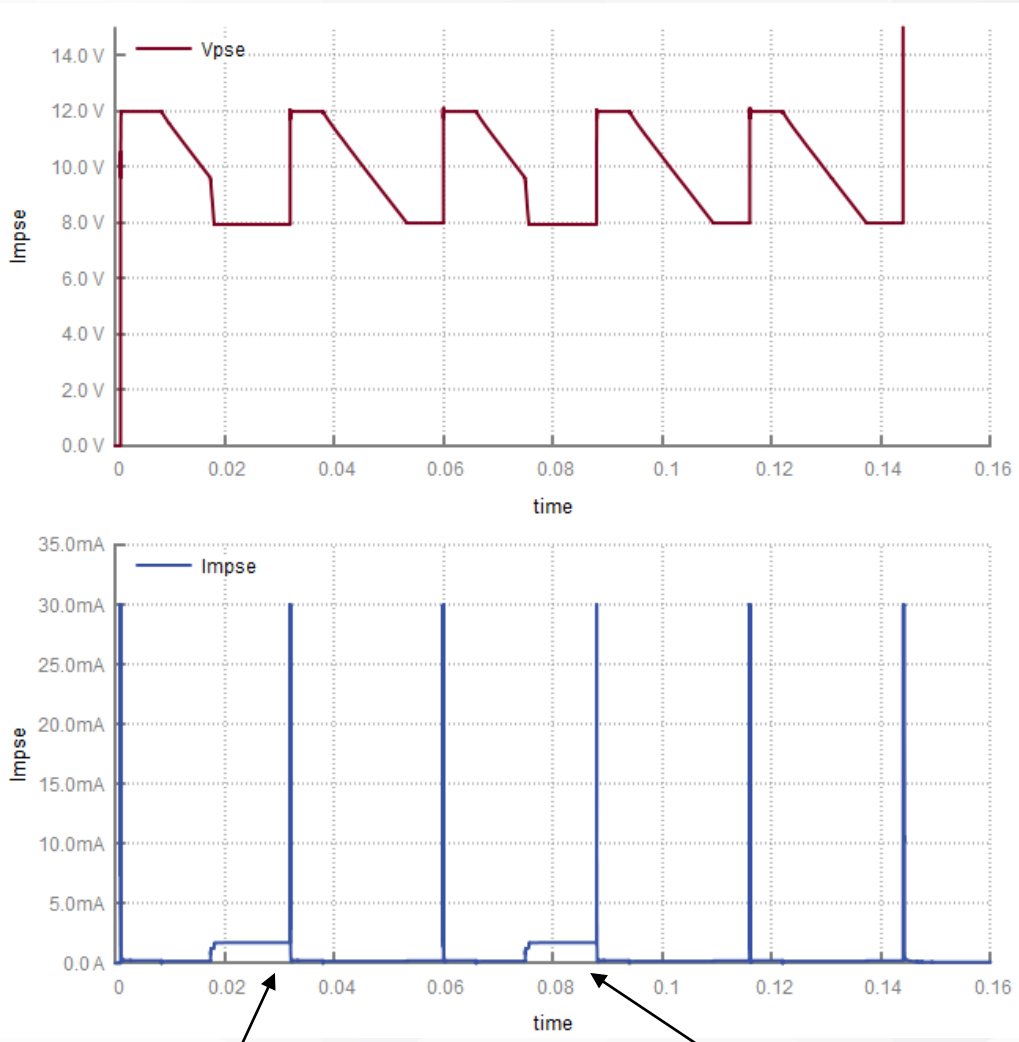


16x 24V MPD Attached and 1x 24V MPD Attached



All (16) MPDs responding

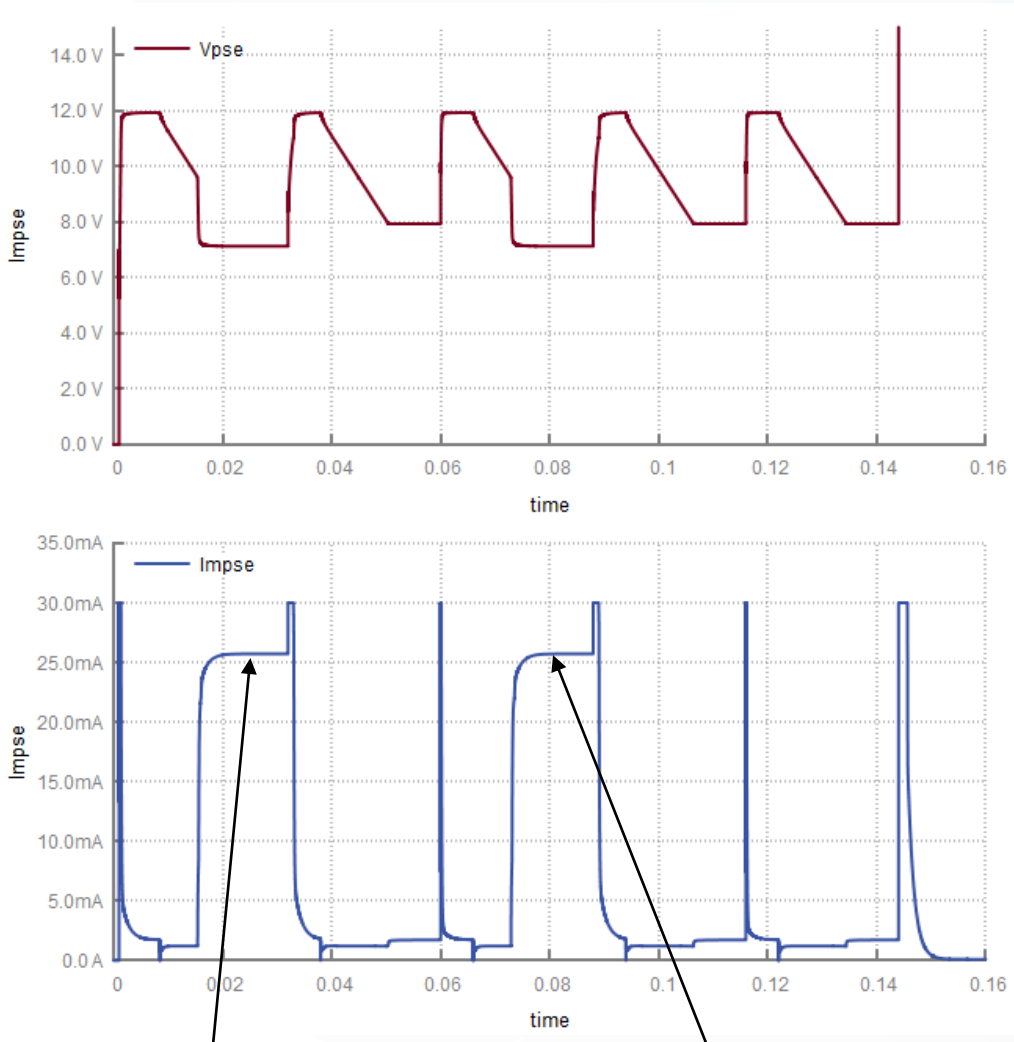
16x24V MPD responding



All (1) MPDs responding

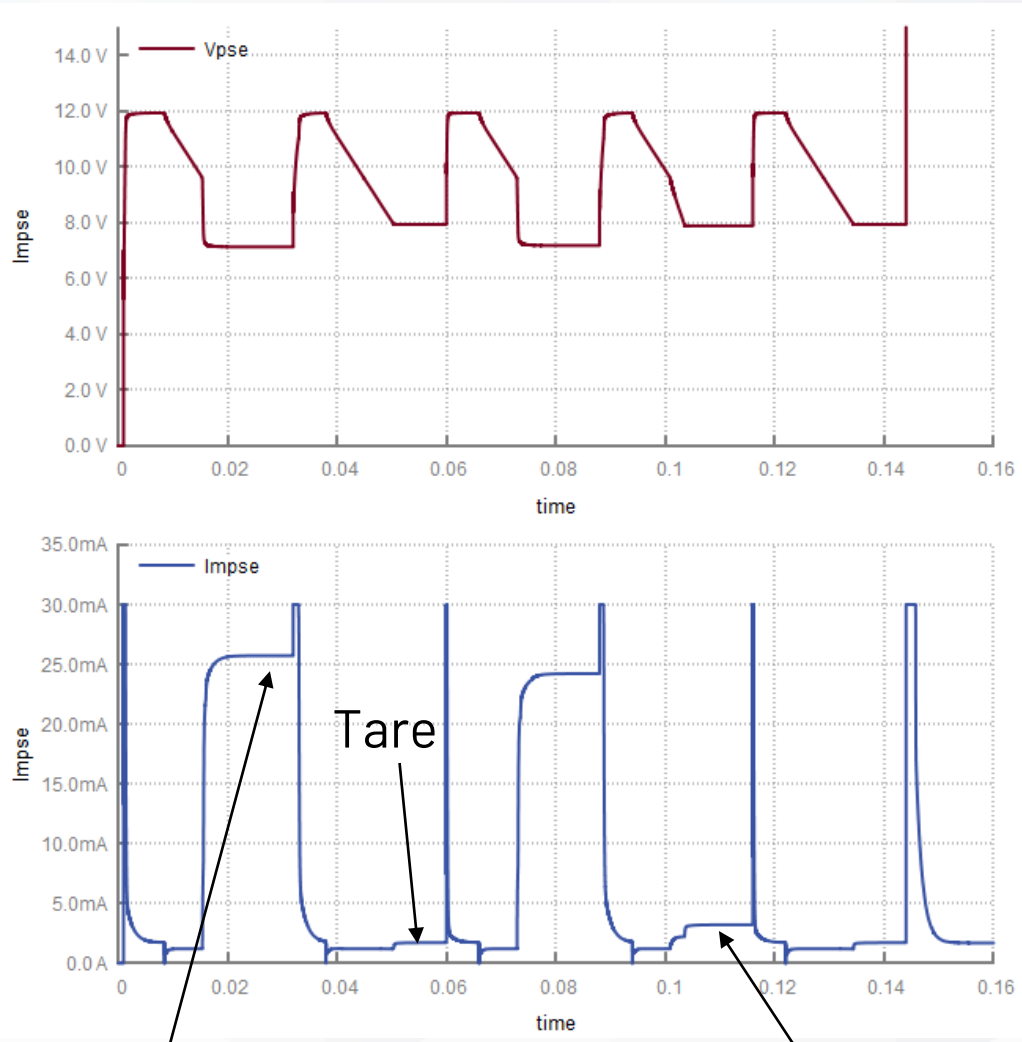
1x24V MPD responding

Compare 16 x Type 0 MPDs w/ 15x Type 0 + 1x Type 1



All (16) MPDs responding

1x24V MPD responding



All (16) MPDs responding

1x50V MPD responding

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Thank You