4PID-Related Issues

Dave Dwelley

Linear Technology

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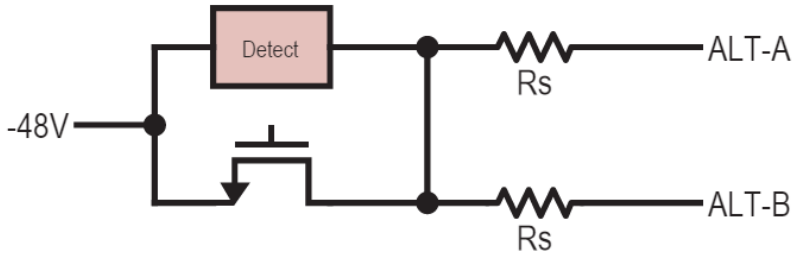
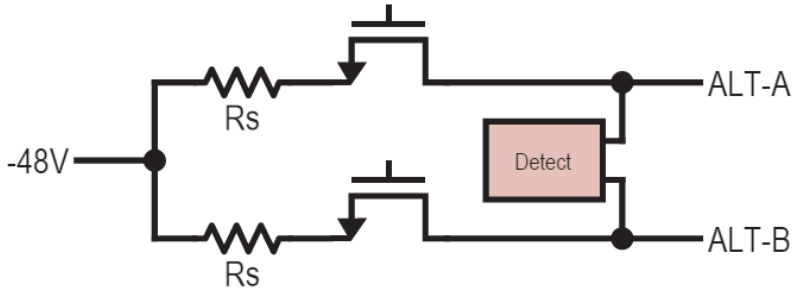
Why is Connection Check So Hard?

- 1-channel PSE:
  - ALT-A, ALT-B tied together
  - Cannot power one ALT while testing the other

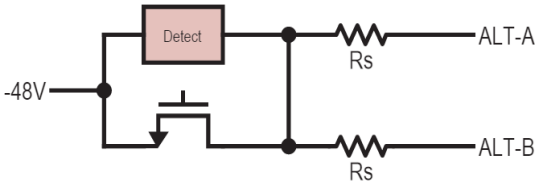


- 2-channel PSE:
  - ALT-A, ALT-B can be accessed separately
  - Two power switches allow mixing power and detection



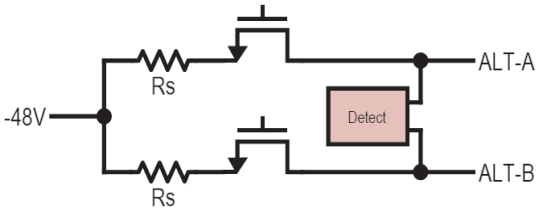
Connection Check Variations

1-channel PSE:



- **MOS Switch off**
- **Run detection, measure voltage and 2 currents**
- **V/Σ(IA, IB) = Parallel resistance**
- **V/IA = Alt-A resistance**
- **V/IB = Alt-B resistance**

2-channel PSE:



- Both MOS switches off
- Detect in parallel
- V/I = Parallel resistance
- Detect each ALT
- VA/IA = Alt-A resistance
- VB/IB = Alt-B resistance

Green Mode vs. Signature Disable

- Difference in PSE capability leads to inconsistent behavior with Green Mode
  - This makes using the Signature Disable Path problematic from a state machine point of view
- **Proposed solution: no Disable Path test in spec, 4P power can be denied or reduced to 2P "for any reason"**

Interface Circuits	Signature Disabled with Other Pair Powered	Possible Designer Intent	Actual Behavior 1ch 4P PSE (always Green)	Actual Behavior 2ch 4P PSE	Actual Behavior 2ch 4P PSE (Green Mode)
1	2nd signature always disabled	N/A	4P power	2P or 4P power	4P power
2	Present: 2nd signature disabled	Full AT compliance or 2P power only	4P power	2P power	4P power or no Green Mode power
2	Absent: 2nd signature active	Non-compliant 4P power desired	4P power	4P power	4P power

The Special Case of Dual Load PDs

- Dual Load PDs are a special case
  - May behave as one PD – indistinguishable from a single load PD
  - May behave as two independent PDs behind one PI
- Dual – Matched PDs:
  - Class signatures match
  - Electrically similar to Single Load PDs
  - Load currents match to within what P2PUNB would predict
  - Should be treated by the PSE as a single PD -> In Scope
- Dual – Independent PDs:
  - May have unmatched class signatures
  - May draw unmatched load currents (greater than P2PUNB would predict)
  - Requires two parallel PSE state machines
  - Should be treated by the PSE as two separate PDs -> **Leave Out of Scope**
- **Compliant PSEs should not be prevented from powering Dual-Independent PDs as two 2P PDs**

Class Signatures

- Single-Interface PDs always show the same class signature at each pairset
  - Connection Check allows the PSE to interpret this signature as the total power draw for the PD
- Dual-Interface/Single-Load PDs also show the same class signature at each pairset (Jan 2015 Motion 8)
  - Connection Check allows the PSE to know that two signatures are present
  - Could be matched dual load PDs – not testable at PI
  - We need to decide how to interpret this type of PD: class signature applies per-pair or per-PD
    - Per-PD matches the Single-Interface PD: simpler state machine but motorboats with legacy PDs
    - **Per-pair matches several legacy schemes: this is probably the better choice**

Class Mapping Proposal

PD Power	Single-Interface PD Signature (Power per PD)	Dual-Interface PD Signature (Power per pair)
AF	AF	2x AF*
25.5W	4	2x 3*
51W	4411	2x 444
70W	44222	2x 44000
LPS	44333	2x 44333**

* These may not exist in the field. Note that 2x 13W = 26W
** 44333 is always “max LPS power” regardless of PD type