



E2EP2P Runb with Dual Signature PDs.
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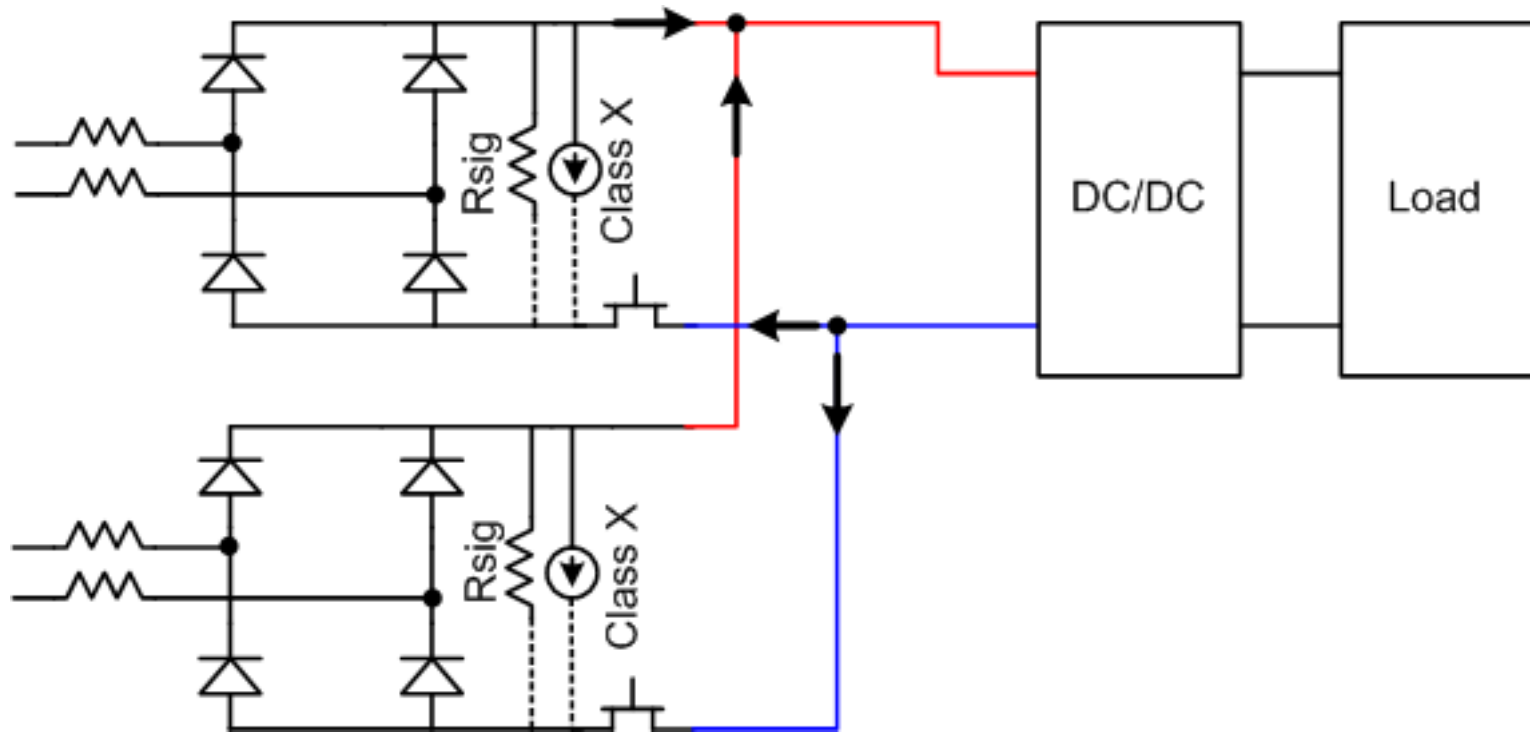
Objectives

- To investigate the PSE PI and PD PI P2PRunb requirements for Dual Signature PDs working at the following scenarios:
 - Dual Signature, Single Load (Same Class Signature)¹.
 - Dual Signature, Dual Load, Same Class Signature.
 - Dual Signature, Dual Load, Different class signature.

Notes:

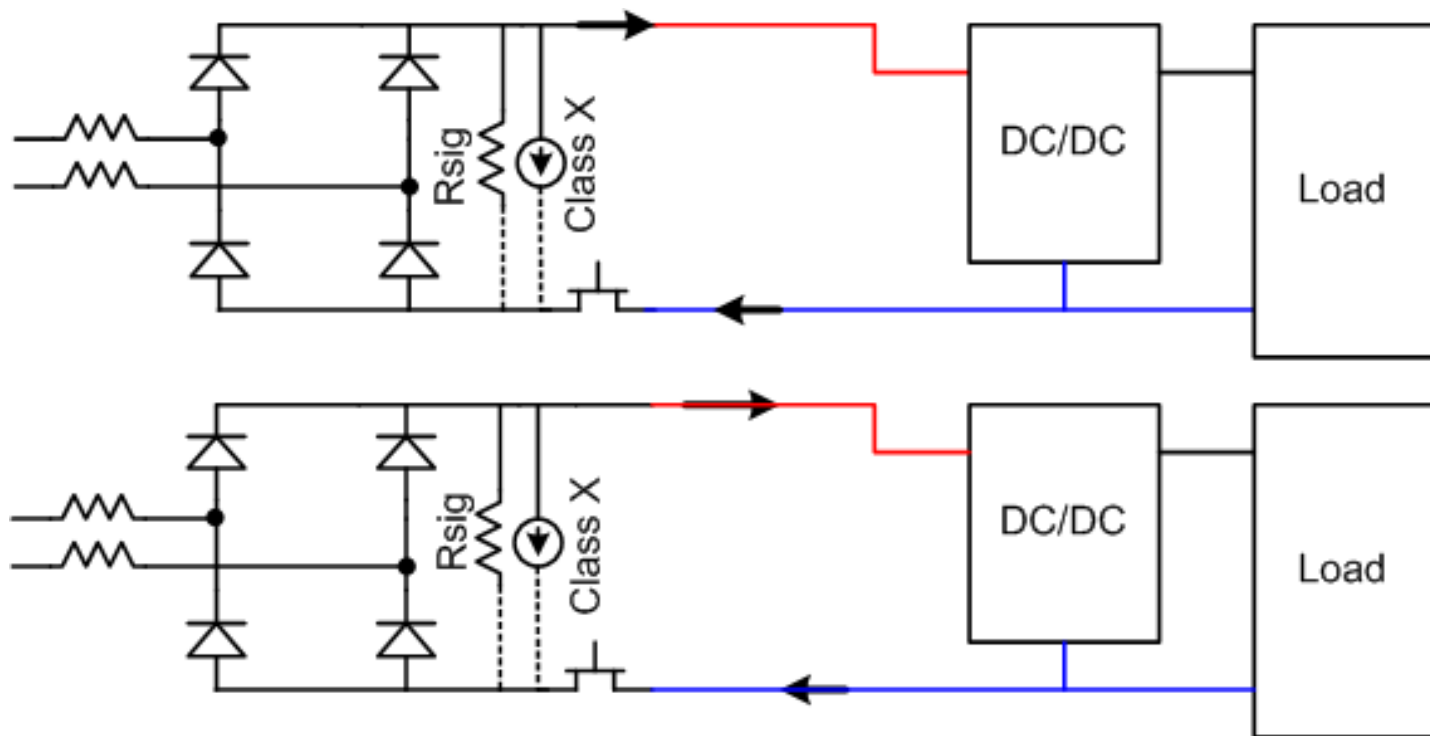
1. Same class, is the only physical possibility

Figure 1: Dual Signature PD, Single Load, Same class



- Positive and Negative Common path.
- Results with Pair to Pair Resistance Unbalance as in Single Signature PD.
- Need to meet all PD PI P2PRunb rules.
- Need to meet all PSE PI P2PRunb rules when connected to DS, SL PDs.

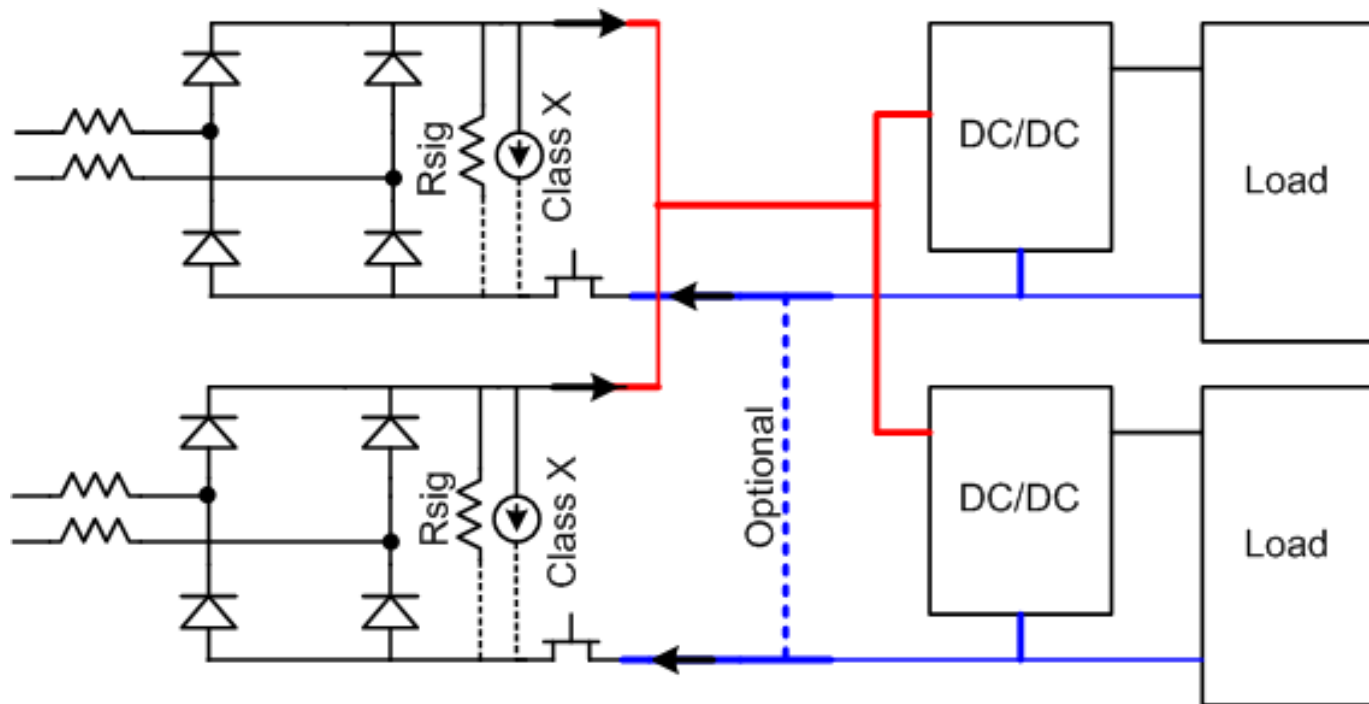
Figure 2a: Dual Signature PD, Dual Load, Same class



- Positive and Negative looks Isolated.
- If both class are the same, it doesn't mean that the power is the same...It just mean that the maximum power per pairset is the same.
 - That is why we agree that same class means DS PD with the same load requirement over each pairset and the rest is implementation specifics i.e. Figure 1=Figure 2a.
- Due to isolation, results with No Pair to Pair Resistance Unbalance requirements .. See Figure 2b too.

Figure 2b: Dual Signature PD, Dual Load (DS, DL), Same class

- But what if there is a common path?

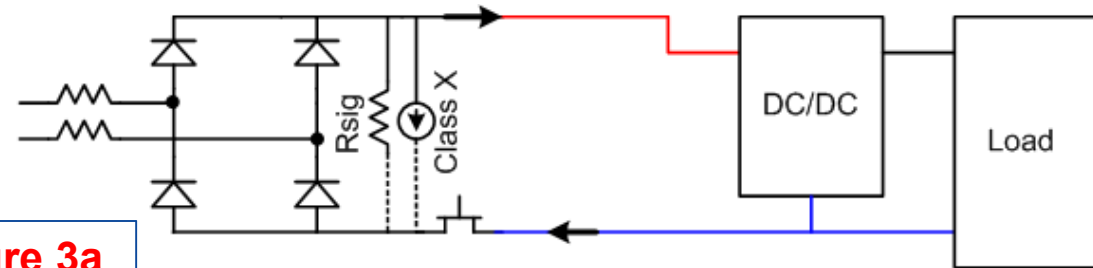


- In this case, there is P2P_{Runb} effect on positive pairs and optionally on negative pairs pending implementation.
- By definition Figure 2b = Figure 1 i.e. single load.
- PSE cannot distinguish between Fig 2a, Figure 2b or Figure 1 (unless cost is added..). Therefore they will be treated as the same as Figure 1.

Figure 3a/3b: Dual Signature PD, Dual Load, Different class

- In this case there are different loads represented by different class over each pairset.

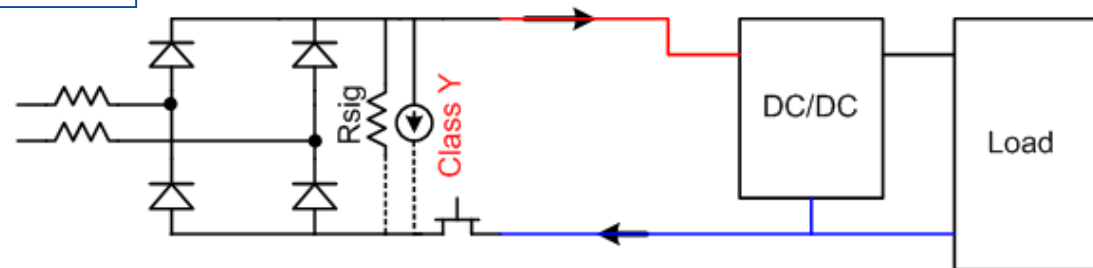
Figure 3a



- It results with isolated currents so no P2P_{Runb} effect.

- Is this entirely true? See Fig 3c.

Figure 3b



- Figure 3b doesn't make sense due to the fact that it behaves like single load at points a and b and has different classes.

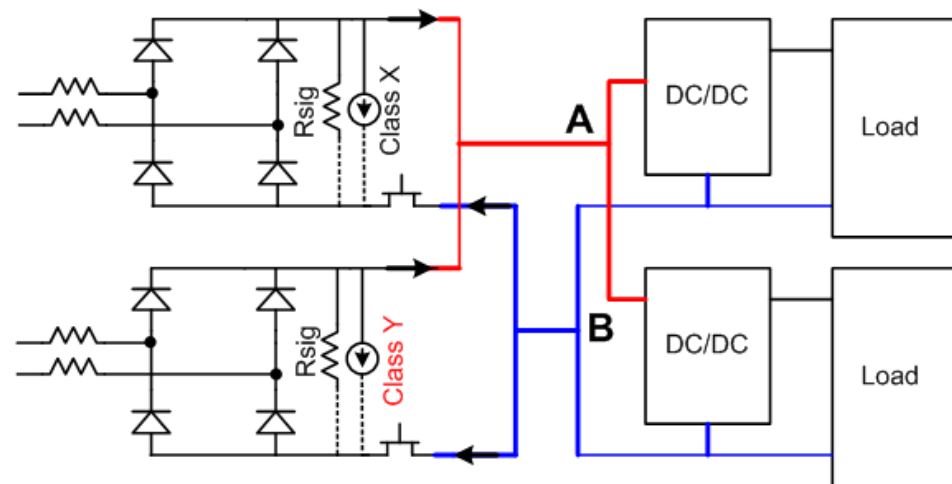
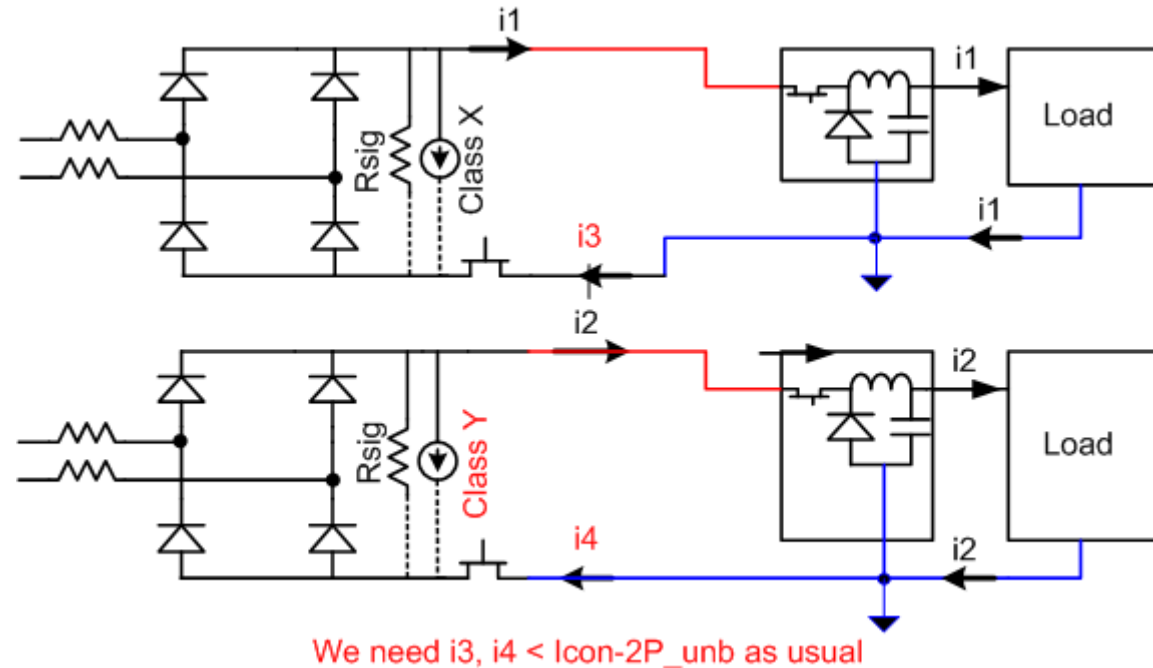


Figure 3c: Dual Signature PD, Dual Load, Different class

- What if the two DC/DC are not isolated and
- What if there is common path at the DC/DC outputs? (Typically the “PD system GND” is located at DC/DC output negative leads).
- The positive rail is well “isolated” so no P2P_{Runb} effects
- The negative rails do have P2P_{Runb} effect.
- We cannot impose isolated implementation due to cost.
- As a result, we need to treat this case as P2P_{Runb} sensitive too.



Is this a problem? Technically No.

From PSE point of view, it is dual different load so P_{class} per pairset applies.

We will need only to meet I_{con-2P_unb} of the pair with maximum power.

*On positive and negative rails although only the P2P_{Runb} is on positive or negative but not both. We could find implementations that has the P2P_{Runb} effect on positive rails but not both (otherwise it became Figure 3b).

Figure 3c – Numerical Example for P2PRunb

- $E2EP2PRunb=30\%$
- $Vpse=52V$
- Load1=Class 5=45W, $I1=0.865A$
- Load2=Class 2=4W, $I2=0.077A$
- Total $I_t=I1+I2=0.942A$
- The positive rails: will have $I1$ and $I2$ since they are isolated.
- $I3=0.5*(1+E2EP2PRunb)*I_t=1.3*0.5*0.942=0.612A$
- $I4=0.5*(1-E2EP2PRunb)*I_t=0.7*0.5*0.942=0.33A$
- We can see that $I3$ is well below class 5 current → OK
- We can see that $I4$ is below Type 1 current → OK.

Conclusions

- Dual Signature, Dual load, Same class PDs must be identical (behavior wise) to Dual Signature, Single load PD.
 - I believe we already agree on this.
- Dual Signature, Single load PD cannot use different classes.
 - We already agree on this.
- For all DS PDs with single load or same class, we need to meet:
 - $I_{cont-2P_unb}$ and
 - $I_{con} = P_{class_PD} / V_{port_PD}$.
- DS PDs with different classes. They have to be isolated only on positive or negative rails. Pclass per pair set applies. Need to meet NEW definition of $I_{cont-2P_unb}$ per pair **OR require both rails to be isolated.**

The question:

- To require dual signature, different class PDs to be isolated on positive and negative rails?
- **The answer:**
- There is no technical reason to require it.
- There is only the requirement that it will be isolated only on one of the rails.
- Requires **new** Icon-2P_unb definition
- **From specification point of view:**
- Requiring both rails to be isolated is easier to spec.
- Add some cost to the PD.

Summary – PD Dual Signature P2PRunb requirements

#	Load	Class	PD PI 33.7.10	PSE PI Eq-33-4a, Eq-334b, PSE Vdiff, Annex 33B	Icon- 2P_unb	Icon	Pclass
1	Single Load	Same	YES	YES	YES	YES	Pclass
2	Dual Load	Same	YES	YES	YES	YES	Pclass
3	Dual Load	Different ²	NO	YES	YES	YES	Pclass-2P ¹
4	Dual Load	Different ³	NO	YES	NO	YES	Pclass-2P ¹

Notes

1. **Pclass-2P** is used for describing PSE Pclass when supporting Dual Signature, Dual Load, Different class PDs
Pclass is used for:
 -Single Signature PD
 -Dual Signature PD dual load/Single load ,same class.
 -Type 1 and Type 2 PSEs
 See equations 33-3 and Equation 33-a which will be presented on October 2015 meeting.
2. Only one rail is isolated
3. Two rails are isolated

Proposal

- To follow the summary Table when addressing Dual Signature PDs in D1.3.
- To decide which approach to take:
 - Only one rail is isolated (option 3 in the table)
 - Both rails are isolated (option 4 in the table).

Discussion

THANK YOU