Apps Flash – CDC adjustment for InnoSwitch-CH based power supplies

To: Power Integrations – FAE staff

From: PI-SJ Applications Engineering

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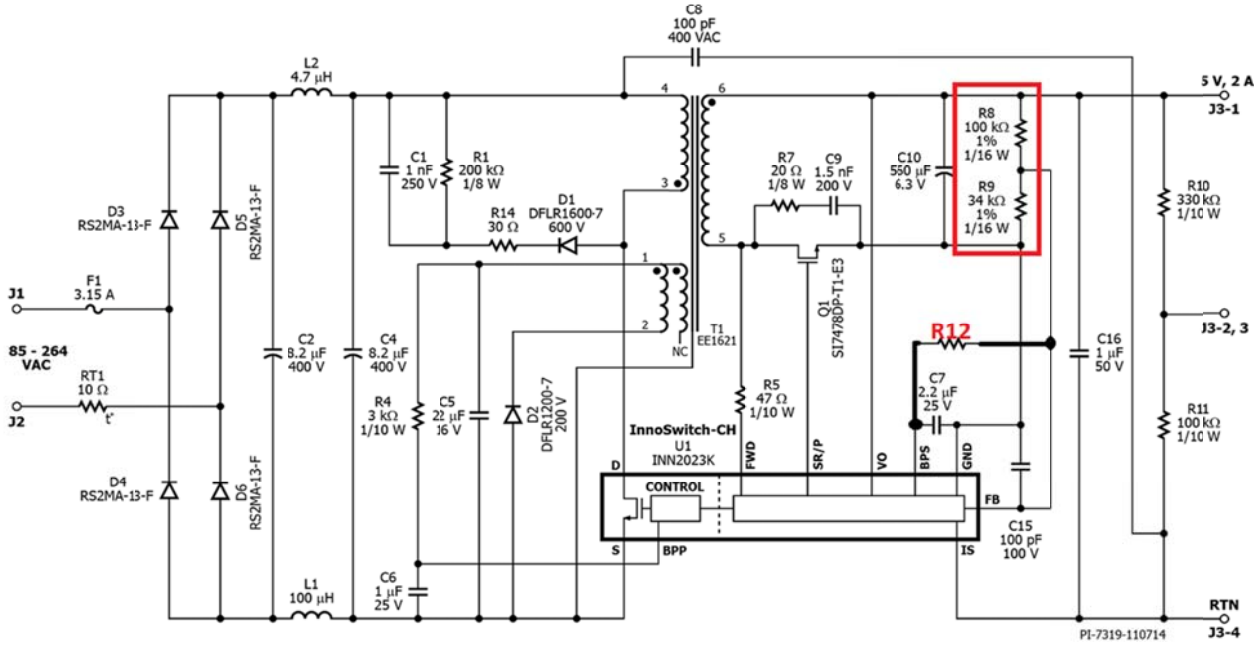
Revision: A

Re: Cable Drop Compensation (CDC) adjustment for InnoSwitch-CH based chargers with nominal output voltage of 5V.

The InnoSwitch-CH family of controllers offers cable compensation as a built-in feature. In some applications, where the cable drop is a value higher than 6% of the nominal power supply output voltage, the cable compensation offered by InnoSwitch-CH may not be adequate, and further adjustment may be necessary. For such situations, where the nominal output voltage of the charger is 5V, it is possible to adjust the cable drop compensation by simply adding a resistor from the BPS pin to the FB pin. In that case, feedback divider resistor values need to be adjusted as well. This Apps Flash provides a step-by-step method for determining those resistor values.

InnoSwitch-based power supply schematic (Example):



Application Information:
CDC adjustment for InnoSwitch-based power supplies

Procedure for resistor calculation:

Step:1 – Determine the required cable drop compensation. Let X be the required CDC (for example, if the required CDC is 9%, then X = 0.09)

Step:2 – Find the actual CDC of the part used. Let Y be the actual CDC (for example, if the actual CDC of the part is 6%, then Y = 0.06)

Step:3 – Choose R9 as 34kΩ.

Step:4 – Calculate R8

$$R8 = 2.953 * R9[1 + \frac{0.96 * (X - Y)}{Y}]$$

Step:5 – Calculate R12

$$R12 = 0.8914 * R8[\frac{Y}{(X - Y)}]$$

Note: This method of CDC adjustment is only applicable for cable compensation enabled parts.

Note: If the cable compensation needs to be increased, recalculate the resistor values again to get required CDC.

Note: All the calculations were made based on a 5V nominal output.

Example:

RDK-420 was used to verify the calculations on the bench. The actual CDC for the INN2023K is 6%, so Y is 0.06. For 9% cable drop compensation, X is 0.09. Based on Step:3, R9 is 34kΩ. Using Step:4 and Step:5, R8 and R12 are calculated as follows:

R8 (calculated) = 148.59kΩ; R12 (calculated) = 264.91kΩ.

The closest standard 1% resistors used on the modified RDK-420 are as follows:

R9 = 34kΩ; R8 = 147kΩ; and R12 = 267kΩ.

Actual bench results measured on the modified RDK-420:

Vin	No Load (0A)	Full load(2A)
85VAC	5.005V	5.446V
265VAC	4.967V	5.426V

Important consideration for application of this method:

When this method is used for CDC adjustment, it is important to note that any noise on the BPS pin can be coupled to the FB pin. As such, it is important to use a high-quality X7R capacitor for BPS-pin decoupling to minimize effects of noise coupling into the FB pin. Effectiveness of the capacitor used can be easily verified by evaluating the power supply operation at hot and cold conditions.

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Feedback

Please send feedback or comments to S. Fimiani, D. Chen, or R. Joshi

Revision History:

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