

# Replacing the PE4302 with the PE4312

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*Application Note 60*

## Introduction

The pSemi PE4312 is a pin-compatible and upgraded version of the PE4302 with higher linearity, improved attenuation accuracy, and faster switching speed. Although it was designed to be pin-for-pin compatible with the PE4302, there are some subtle differences to consider when using the PE4312 as a direct replacement.

## Summary

The pSemi PE4312 is the updated digital step attenuator (DSA) designed as a direct replacement for the PE4302 series DSA. Although primarily designed as a PE4302 replacement, it can also be used to replace the PE4305 and PE4306 DSA devices.

## PE4312 functional differences

The PE4312 functional differences are specified as the following:

- Application circuit
- Logic threshold levels

### Application circuit

The PE4302 application circuit contained one 10-kΩ resistor in the C16 and DATA lines.

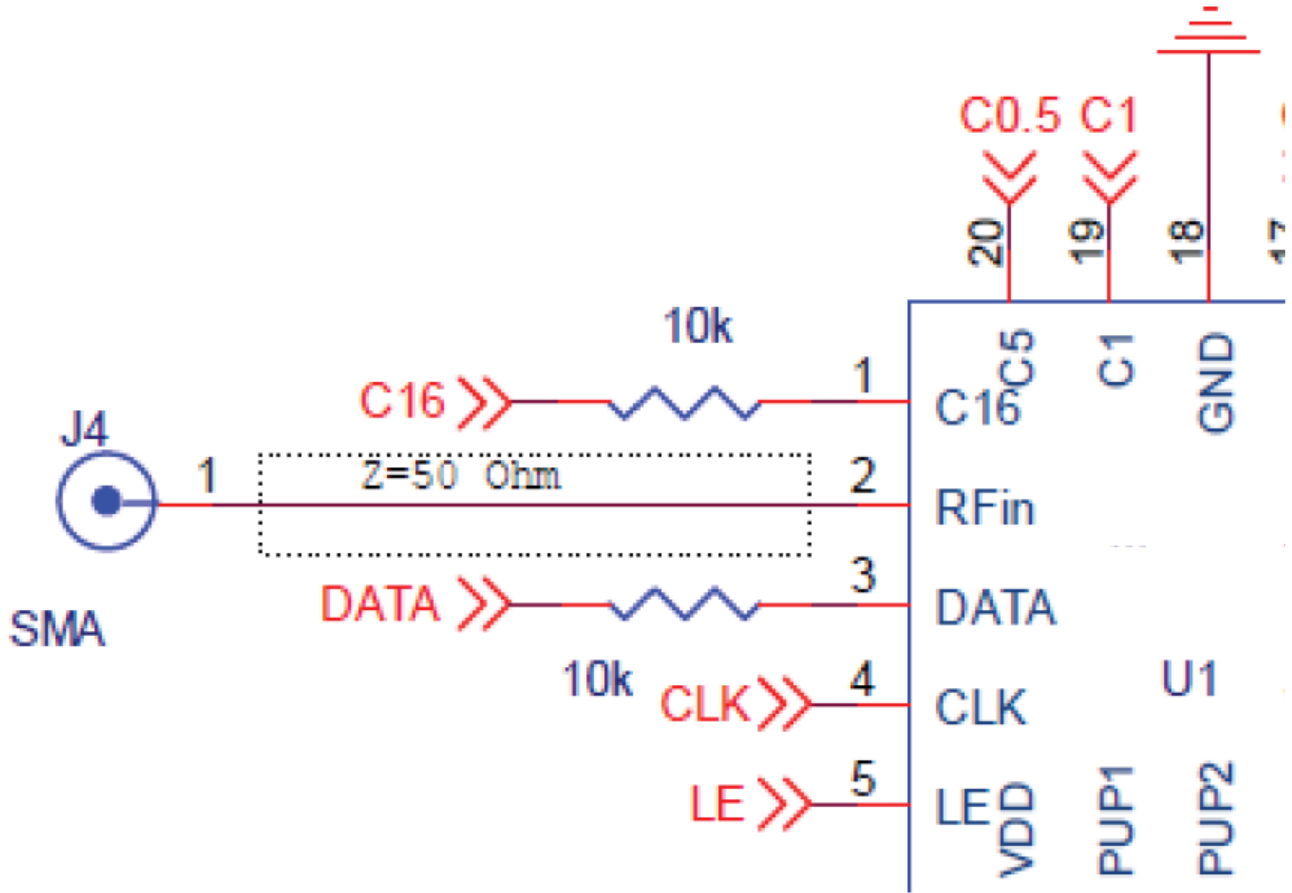


Figure 1. PE4302 application circuit

These resistors were originally placed to remove a resonance between the  $R_{FIN}$  pin and the connection to the adjacent pins. This resonance caused degradation in the PE4302 DSA performance above 2.5 GHz. The PE4312 does not need resistors on the C16 or DATA lines and it is better to remove the resistors or reduce their values so that the logic threshold levels are met.

## Logic threshold levels

The PE4302 was designed for 3V logic levels. The logic levels depend on the  $V_{DD}$  used.

Table 1. PE4302 logic levels

Parameter	Symbol	Min	Typ	Max	Unit
Digital input high	$V_{IH}$	$0.7 \times V_{DD}$	–	–	V
Digital input low	$V_{IL}$	–	–	$0.3 \times V_{DD}$	V

The PE4312 logic threshold is not dependent on the  $V_{DD}$  level. The PE4312 is designed to accept 1.8V logic threshold levels, which have been extended to accept 3.6V logic  $V_{IH}$  max.

Table 2. PE4312 logic levels

Parameter	Symbol	Min	Typ	Max	Unit
Digital input high	$V_{IH}$	1.17	–	3.6	V
Digital input low	$V_{IL}$	-0.3	–	0.6	V

Verify that the PE4312 logic levels are compatible with the data levels in your design. If the series 10-k $\Omega$  resistor is left in the circuit on the DATA line, or if the clock period is too short, the data  $V_{IL}$  threshold might not be met during the high-to-low transition.

## Transferring a PE4302 design

If transferring the PE4302 design to a new design using the PE4312, you can increase  $V_{DD}$  to 5V, which might allow the removal of a 3V supply and regulator. However, if using the higher  $V_{DD}$ , remember that the PE4312 maximum digital input voltage is still 3.6V. This applies to both the dynamic SPI and static logic pins—such as PUP1/PUP2 and P/S—that can be permanently tied to a logic high.


 Do NOT tie these lines to a 5V  $V_{DD}$  line.

Table 3. PE4302 supply voltage

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage	$V_{DD}$	2.7	–	3.3	V
Digital input voltage	$V_I$	–	–	3.3	V

Table 4. PE4312 supply voltage

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage	$V_{DD}$	2.7	–	5.5	V
Digital input voltage	$V_I$	–	–	3.6	V

## Conclusion

The PE4312 can successfully replace the PE4302 in an existing design with proper consideration for the logic levels and the removal or reduction in value of the DATA line resistors. The PE4312 can also be used in new designs based upon older PE4302 designs provided the maximum digital input voltage remains 3.3V.

## Sales contact

For additional information, contact Sales at [sales@psemi.com](mailto:sales@psemi.com).

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