Replacing PE4302 with PE4312

Application Note 60

Summary

The Peregrine 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 devices.

Introduction

The Peregrine PE4312 is a pin-compatible 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 PE4302 there are some subtle differences that should be considered when using PE4312 as a direct replacement.

PE4312 Functional Differences

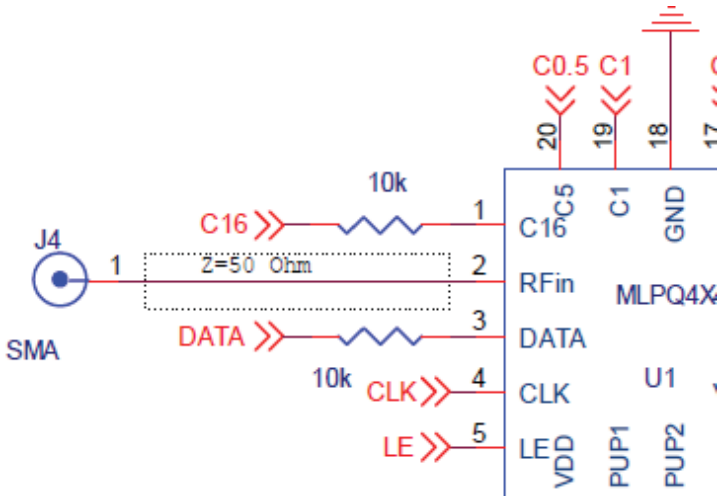
The PE4312 functional differences are specified as:

- The application circuit
- Logic threshold levels

The Application Circuit

The PE4302 application circuit contained two resistors in the C16 and DATA lines.

Figure 1 • *PE4302 Application Circuit*



These resistors were originally placed to remove a resonance between the RF_{IN} 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 the DATA line and it is preferable to remove them or reduce the values so the logic threshold levels are met.

Logic Threshold Levels

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

Table 1 • *PE4302 Logic Levels*

Parameter	Min	Typ	Max	Unit
Digital input high, V_{IH}	0.7 × V_{DD}			V
Digital input low, V_{IL}			0.3 × 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	Min	Typ	Max	Unit
Digital input high, V_{IH}	1.17		3.6	V
Digital input low, V_{IL}	–0.3		0.6	V

Users should ensure that the PE4312 logic levels are compatible with the data levels in the design. If the series 10k resistor is left in the circuit on the DATA line or if the clock period is too short, the data V_{IL} threshold may not be met in the high to low transition.

Transferring a PE4302 Design

If the PE4302 design is to be transferred to a new design using the PE4312, it is important to note that the V_{DD} can be increased to 5V. This may allow the removal of a 3V supply and regulator. However, if the higher V_{DD} is used then it is important to note the maximum digital input voltage for the PE4312 is still 3.6V. This applies to both the dynamic SPI and static logic pins, such as PUP1/PUP2 and P/S that may be permanently tied to a logic high. These lines must NOT be tied to a 5V V_{DD} line.

Table 3 • *PE4302 Supply Voltage*

Parameter	Min	Typ	Max	Unit
Supply voltage	2.7		3.3	V
Digital input voltage			3.3	V

Table 4 • *PE4312 Supply Voltage*

Parameter	Min	Typ	Max	Unit
Supply voltage	2.7		5.5	V
Digital input voltage			3.6	V

Conclusion

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

Sales Contact

For additional information, contact Sales at sales@psemi.com.

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