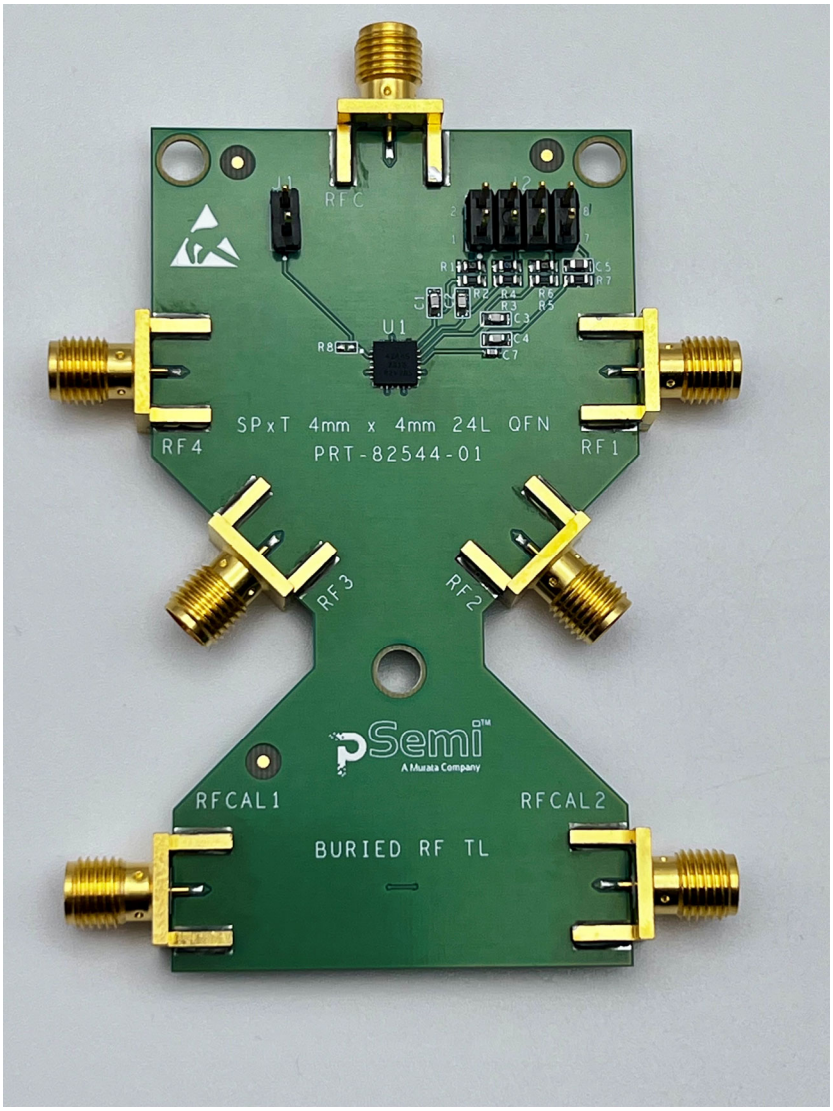
PE42446

Evaluation Kit User's Manual

High-isolation UltraCMOS© SP4T RF Switch, 10 MHz–8.5 GHz



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Introduction

The PE42446 is a HaRP™ technology-enhanced SP4T RF switch designed for use in 4G/5G wireless infrastructure and other high performance RF applications. It consists of four symmetric RF ports with very high isolation up to 8.5 GHz and is available in a 24-lead 4 × 4 mm LGA package.

The PE42446 is manufactured on pSemi's UltraCMOS® process, a patented variation of silicon-on-insulator (SOI) technology. pSemi's HaRP technology enhancements deliver high isolation, linearity and excellent harmonics performance.

The PE42446 evaluation kit (EVK) is intended and made available for evaluation and testing purposes only.

Evaluation Kit Overview

The PE42446 evaluation kit (EVK) is a hardware platform that allows you to easily test the SP4T RF switch. For more information about the PE42446, see the *PE42446 Data Sheet*.

Document Overview

This *PE42446 Evaluation Kit (EVK) User's Manual* includes information about the hardware required to control and evaluate the high-isolation SP4T RF switch functionality.

EVK Contents and Requirements

Kit Contents

Table 1 lists the hardware required for evaluation.

Table 1. EVK Contents

Quantity	Description	Part Number
1	PE42446 High-isolation UltraCMOS© SP4T RF Switch, 10 MHz–8.5 GHz evaluation board assembly	PRT-82543-01

Hardware Requirements

To test the performance of the evaluation board, you will need the following test equipment:

- Vector network analyzer
- Vector signal generator
- Signal/spectrum analyzer

You will also need 50Ω loads to terminate any unused RF connectors.

Warning: The PE42446 EVK contains components that could be damaged by exposure to voltages higher than the maximum specified voltage, including voltages produced by electrostatic discharges. Handle the board in accordance with procedures for handling static-sensitive components. Avoid applying excessive voltages to the power supply terminals, or to signal inputs and outputs.

Quick Start Guide

The evaluation board is designed to ease your evaluation of the PE42446. This section guides you through the hardware configuration and testing procedures.

Evaluation Board Overview

The evaluation board EVB is assembled with the following:

- PE42446 high-isolation SP4T RF switch
- Two PCB headers
- Seven SMA connectors

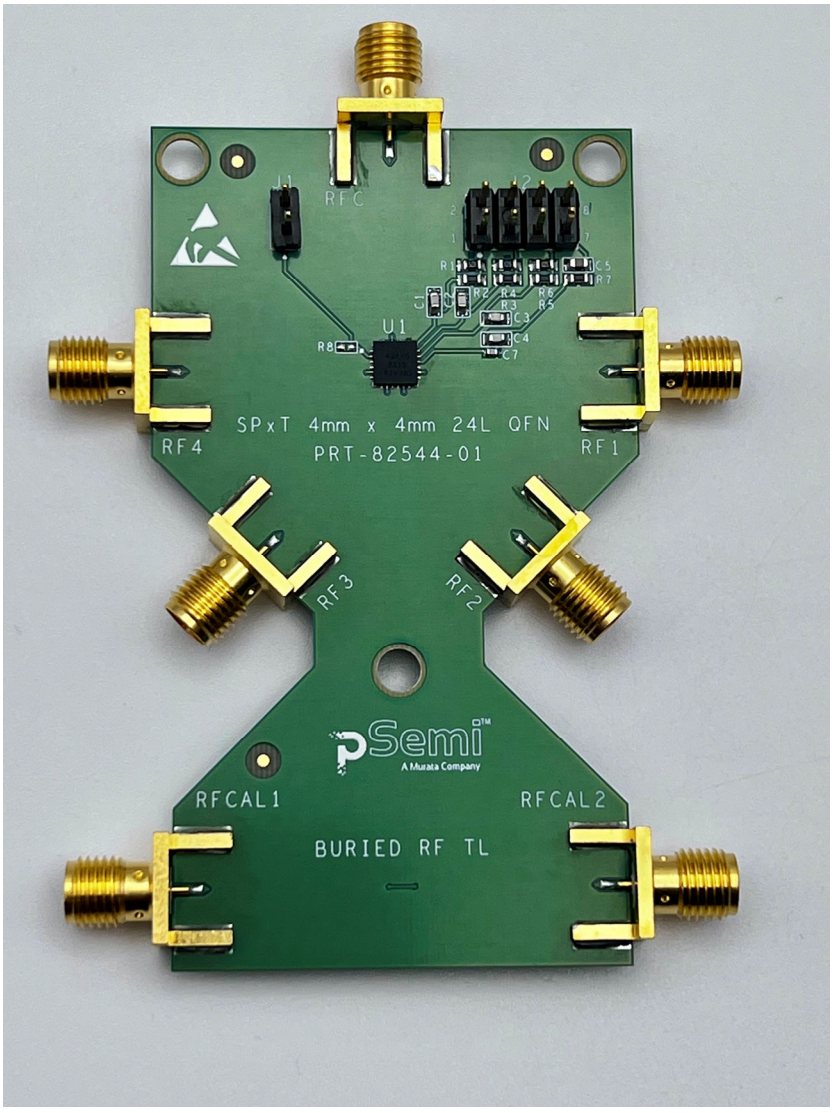

Figure 1. PE42446 Evaluation Board Assembly

Evaluation Board Schematic

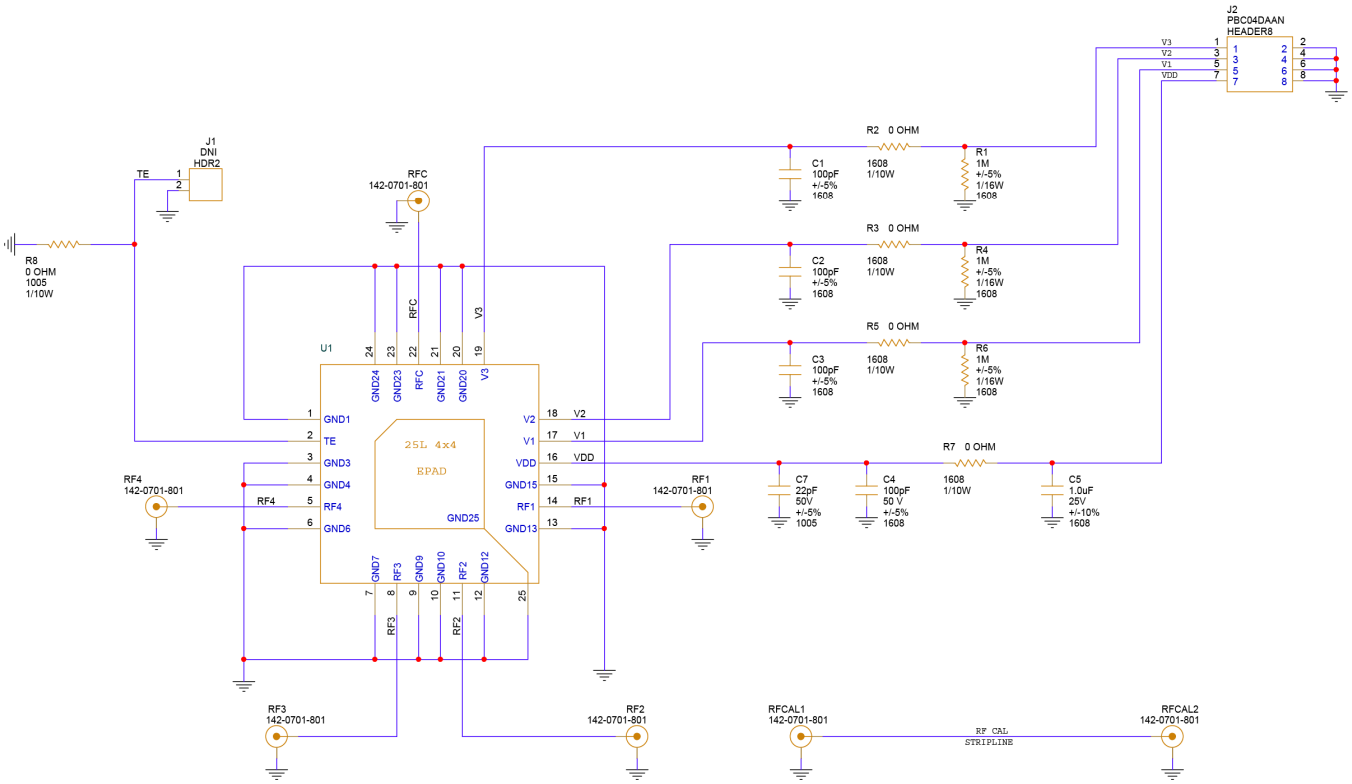

Figure 2. PE42446 Evaluation Board Schematic

Bill of Materials

Table 2. PE42446 Evaluation Board Bill of Materials

Component	Value	Manufacturer	Part number	Description	Size
C1, C2, C3, C4	100 pF	Panasonic Electronic Components	ECJ-1VC1H101J	CAP, SMD, CER, C0G	0603 (1608 Metric)
C5	1.0 uF	Murata Corporation	GRM188R7YA105MA12D	CAP, SMD, CER, XR7	0603 (1608 Metric)
C7	22 pF	Murata Corporation	GCM1555C1H220JA16D	CAP, SMD, CER, C0G	0402 (1005 Metric)
J1	–	Sullins Connector Solutions	PBC01DABN	CONN, Rectangular Connectors, 2 Pin	–
J2	–	Sullins Connector Solutions	PBC04DAAN	CONN, Rectangular Connectors, 8 Pin	–
PCB1	–	pSemi Corporation	PRT-82544-01	PCB	–
RF1, RF2, RF3, RF4, RFC, RFCAL1, RFCAL2	–	Cinch Connectivity	142-0701-801	SMA, SMD, Jack, 50 Ohm	–
R1, R4, R7	1 MΩ	Xicon	301-1.0M-RC	RES, SMD, Thick Film	0603 (1608 Metric)
R2, R3, R5, R7	0 Ω	Stackpole Electronics	RMCF0603ZT0R00	RES, SMD, Thick Film	0603 (1608 Metric)
R8	0 Ω	Panasonic	ERJ-2GE0R00X	RES, SMD, Thick Film	0402 (1005 Metric)
U1	–	pSemi Corporation	PE42446	SP4T RF switch	4 × 4 mm

Hardware Configuration

When testing the PE42446 evaluation board, the RF signals, DC power and control signals are easily connected using J1, J2, RFC, and RF1–4 on the PCB assembly.

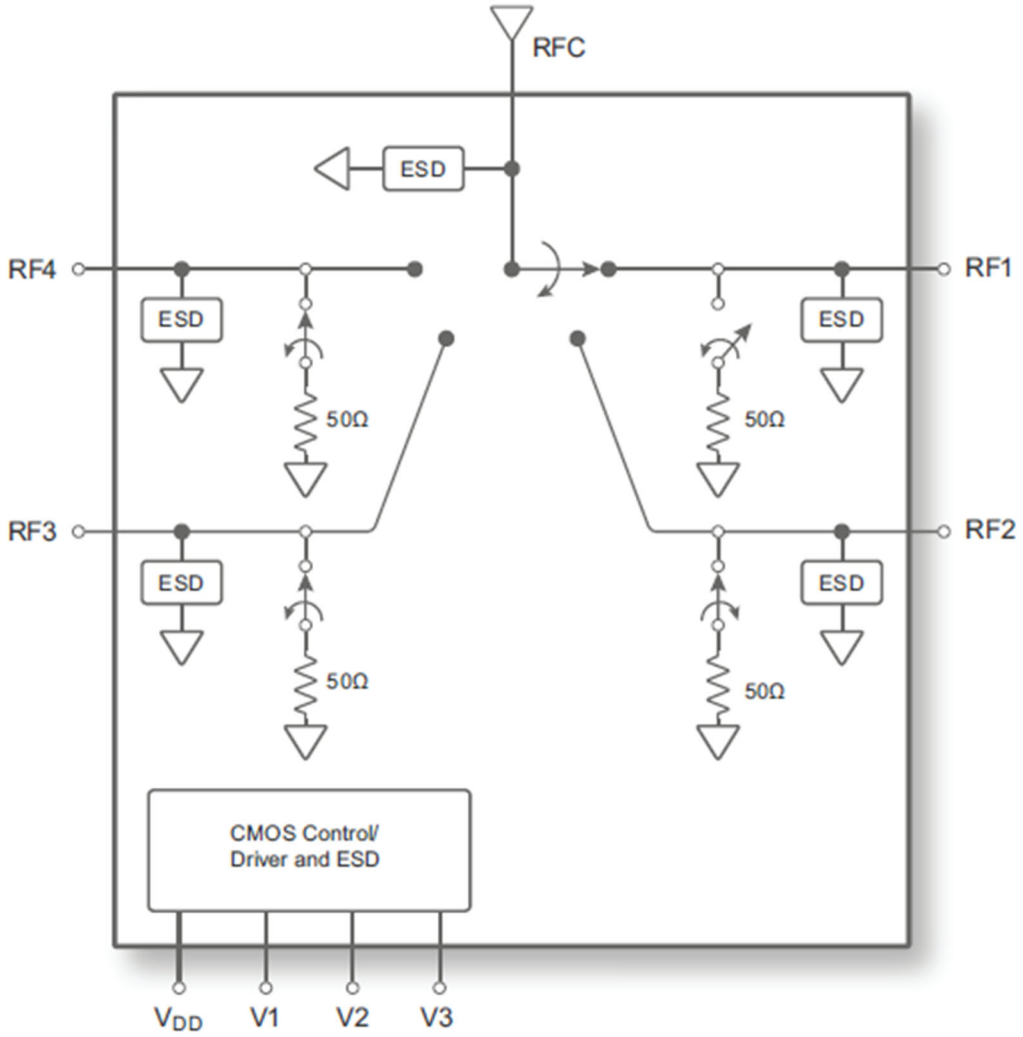

Figure 3. PE42446 Block Diagram

Pin Configuration

Figure 4 shows the PE42446 pin map for the 24-lead 4 × 4 mm LGA package, and Table 3 lists the description for each pin.

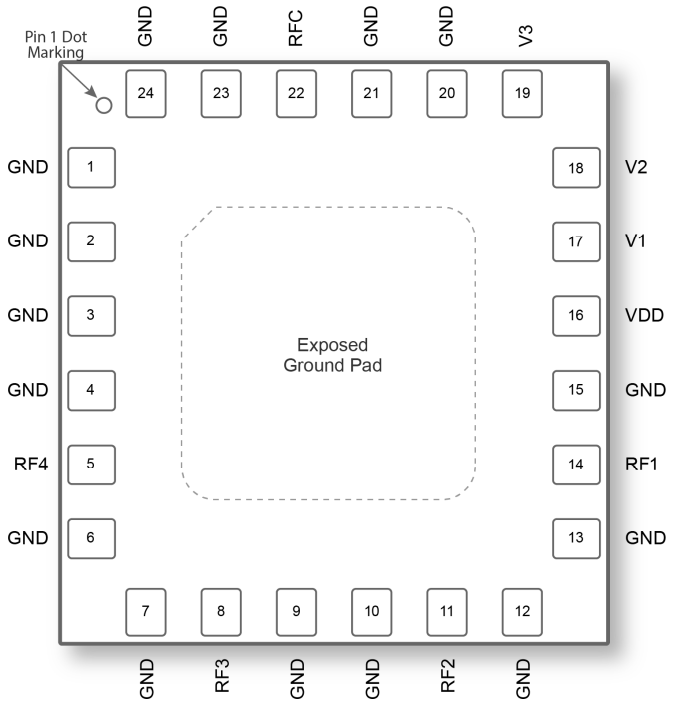

Figure 4. PE42446 Pin Configuration (Top View)

Table 3. PE42446 Pin Descriptions

Pin number	Pin name	Description
1,2,3,4,6,7,9,10,12,13,15,20,21,23,24	GND	Ground
5(*)	RF4	RF port 4
8(*)	RF3	RF port 3
11(*)	RF2	RF port 2
14(*)	RF1	RF port 1
16	VDD	Supply voltage
17	V1	Digital control logic input 1
18	V2	Digital control logic input 2
19	V3	Digital control logic input 3
22	RFC	RF common
25	GND	Exposed pad. Ground for proper operation.

Note:
* RF pins 5, 8, 11, and 14 must be at 0 VDC. These RF pins do not require DC blocking capacitors for proper operation if the 0 VDC requirement is met.

EVK Connector Configuration

Table 4. Evaluation Board DC, Logic, and RF Signal Interface

Connector	Name	Description	Min VDC	Typ VDC	Max VDC	RF input power CW (dBm)
J1-1	GND	Ground	–	0	–	–
J1-2	GND	Ground	–	0	–	–
J2-1	V3	Digital control logic input 3	0	–	3.6	–
J2-2	GND	Ground	–	0	–	–
J2-3	V2	Digital control logic input 2	0	–	3.6	–
J2-4	GND	Ground	–	0	–	–
J2-5	V1	Digital control logic input 1	0	–	3.6	–
J2-6	GND	Ground	–	0	–	–
J2-7	VDD	Supply voltage	2.3	3.3	5.5	–
J2-8	GND	Ground	–	0	–	–
RFC	RFC	RF common	–	–	–	+21
RF1	RF1	RF port 1	–	–	–	+21
RF2	RF2	RF port 2	–	–	–	+21
RF3	RF3	RF port 3	–	–	–	+21
RF4	RF4	RF port 3	–	–	–	+21
RFCAL1	–	Thru	–	–	–	–
RFCAL2	–	Thru	–	–	–	–

Absolute Maximum RF Ratings

Table 5. Absolute Maximum RF Ratings

Parameter	Max	Unit
RF input RMS power, RFx to RFC, hot switching, LTE PAR 9 dB, frequency = 3.8 GHz @ 105 °C	+29	dBm
RF input RMS power, RFx to RFC, hot switching, LTE PAR 9 dB, frequency = 3.8 GHz @ 125 °C	+26	dBm
RF input RMS power terminated port, hot switching, LTE PAR 9 dB, frequency = 3.8 GHz @ 105 °C	+29	dBm
RF input RMS power terminated port, hot switching, LTE PAR 9 dB, frequency = 3.8 GHz @ 125 °C	+26	dBm

SP4T Control Logic

Table 6 lists the PE42446 control logic truth table.

Table 6. PE42446 Truth Table

ON port	V3	V2	V1
RF4 on(*)	0	0	0
RF1 on	0	0	1
RF2 on	0	1	0
RF3 on	0	1	1
RF4 on	1	0	0
All off	1	0	1
All off	1	1	0
All off	1	1	1

Note:
* Pin 19 (V3) must be grounded for 2-pin control. You can use 2-pin control if All Off mode is not required.

Table 7 lists the PE42446 2-pin control logic truth table.

Table 7. PE42446 2-pin Control Truth Table

Mode	V2	V1
RF4 on(*)	0	0
RF1 on	0	1
RF2 on	1	0
RF3 on	1	1

Note:
* Pin 19 (V3) must be grounded for 2-pin control. You can use 2-pin control if All Off mode is not required.

Hardware Operation

This section includes the general guidelines for operating the EVK. To configure the EVK and achieve optimal performance, follow these steps for the power-up sequence:

1. Before you power-up the EVK, verify that no RF signal is applied to the RFC and RFx connectors.
2. Set VDD to 3.3V.
3. Set the V1, V2, and V3 logic for the preferred RF path, as listed in Table 6.
4. The device is safe to operate after 30 µs.
5. Terminate the unused RF ports with 50 Ω loads.
6. Apply the preferred RF signal to the preferred path (RFC to RFx).
7. The maximum RF input is +34 dBm.

Technical Resources

For any technical inquiries regarding the evaluation kit, see the applications support at www.psemi.com (for the fastest response) or call +1-858-731-9400.

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Sales Contact

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

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