PE42426

Document Category: Product Specification

UltraCMOS® SPDT RF Switch, 5–6000 MHz

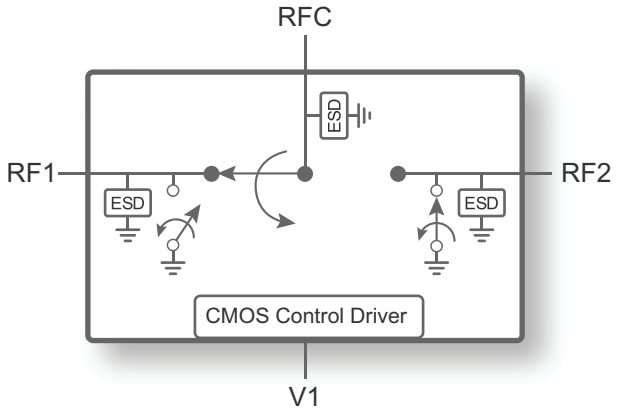
Features

- Best-in-class linearity across frequency band
- Exceptional harmonics:
  - 2fo of –121 dBc @ 900 MHz
  - 3fo of –135 dBc @ 900 MHz
- High isolation performance
- Low insertion loss: 0.3 dB @ 2000 MHz
- High ESD performance: 3 kV HBM
- Packaging: 12-lead 3 × 3 × 0.75 mm QFN

Applications

- Land mobile radio (LMR)
- General switching applications

Figure 1 • PE42426 functional diagram



Product description

The PE42426 is a HaRP™ technology-enhanced reflective SPDT RF switch designed for use in land mobile radio (LMR) and general switching applications. It delivers high linearity and excellent harmonics performance across the entire operational band. It also features low insertion loss and high isolation performance making the PE42426 ideal for general switching applications.

The PE42426 is manufactured on pSemi's UltraCMOS® process, a patented variation of silicon-on-insulator (SOI) technology on a sapphire substrate, offering the performance of GaAs with the economy and integration of conventional CMOS.

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Absolute maximum ratings

Exceeding the absolute maximum ratings listed in **Table 1** could cause permanent damage. Restrict operation to the limits in **Table 2**. Operation between the operating range maximum and the absolute maximum for extended periods can reduce reliability.

ESD precautions

When handling this UltraCMOS device, observe the same precautions as with any other ESD-sensitive devices. Although this device contains circuitry to protect it from damage due to ESD, do not exceed the rating specified in **Table 1**.

Latch-up immunity

Unlike conventional CMOS devices, UltraCMOS devices are immune to latch-up.

Table 1 • PE42426 absolute maximum ratings

Parameter or condition	Min	Max	Unit
Supply voltage, V_{DD}	–0.3	5.5	V
Digital input voltage, V_I	–0.3	3.6	V
RF input power	–	39	dBm
Maximum junction temperature	–	+150	°C
Storage temperature range	–65	+150	°C
ESD voltage HBM(1), all pins	–	3000	V
ESD voltage CDM(2), all pins	–	500	V

Notes:
1) Human body model (MIL-STD 883 Method 3015).
2) Charged device model (JEDEC JESD22-C101).

Recommended operating conditions

Table 2 lists the PE42426 recommended operating conditions. Do not operate devices outside the operating conditions listed below.

Table 2 • PE42426 recommended operating conditions

Parameter	Min	Typ	Max	Unit
Supply voltage, V_{DD}	2.3	3.3	5.5	V
Supply current, I_{DD}	–	130	200	µA
Digital input high, V_{IH}	1.17	–	3.6(1)	V
Digital input low, V_{IL}	–0.3	–	0.6	V
RF input power, CW(2)	–	–	33	dBm
RF input power, pulse(3)	–	–	38	dBm
Operating temperature range	–40	+25	+105	°C

Notes:
1) The maximum digital input voltage is limited to V_{DD} and cannot exceed 3.6V.
2) 100% duty cycle.
3) Pulsed, 5% duty cycle of 4620-µs period, 50Ω.

Electrical specifications

Table 3 lists the PE42426 key electrical specifications @ +25 °C and V_{DD} = 3.3V (Z_S = Z_L = 50Ω), unless otherwise specified.

Table 3 • PE42426 electrical specifications

Parameter	Path	Condition	Min	Typ	Max	Unit
Operating frequency	–	–	5	–	6000	MHz
Insertion loss[1]	RFC–RFx	5–2000 MHz 2000–3000 MHz 3000–4000 MHz 4000–5000 MHz 5000–6000 MHz	–	0.30 0.35 0.40 0.40 0.75	0.55 0.65 0.75 0.75 1.30	dB
Isolation	All paths	5–2000 MHz 2000–3000 MHz 3000–4000 MHz 4000–5000 MHz 5000–6000 MHz	31 27 23.5 20 17	33 29 25 22 20	–	dB
Return loss[1]	RFC, RFx	5–2000 MHz 2000–3000 MHz 3000–4000 MHz 4000–5000 MHz 5000–6000 MHz	–	33 22 20 25 12	–	dB
2nd harmonic, 2fo	RFx	P_{IN} = 18 dBm @ 900 MHz, fo	–	–121	–	dBc
3rd harmonic, 3fo	RFx	P_{IN} = 18 dBm @ 900 MHz, fo	–	–135	–	dBc
Input IP2	–	P_{IN} = 18 dBm @ 900 MHz	–	130	–	dBm
Input IP3	–	P_{IN} = 18 dBm @ 900 MHz	–	83	–	dBm
Input 0.1dB compression point[2]	–	5–6000 MHz	–	40	–	dBm
Switching time	–	50% CTRL to 90% or 10% RF	–	35	–	µs

Notes:
1) To improve high-frequency performance, use external matching.
2) The input 0.1dB compression point is a linearity figure of merit. For the operating RF input power (50Ω), see **Table 2**.

Switching frequency

The PE42426 has a maximum 10 kHz switching frequency. The switching frequency describes the time duration between switching events. The switching time is the time duration between the point that the control signal reaches 50% of the final value and the point that the output signal reaches within 10% or 90% of its target value.

Spurious performance

The PE42426 spurious fundamental occurs around 10 MHz. Its typical performance is –154 dBm/Hz (V1 = H) and –165 dBm/Hz (V1 = L), with 100 kHz bandwidth.

Thermal data

Psi-JT (Ψ_{JT}), the junction top-of-package, is a thermal metric to estimate junction temperature of a device on the customer application PCB (JEDEC JESD51-2).

$\Psi_{JT} = (T_J - T_T)/P$

where:

Ψ_{JT} = junction-to-top of package characterization parameter, °C/W

T_J = die junction temperature, °C

T_T = package temperature (top surface, in the center), °C

P = power dissipated by the device in Watts

Table 4 • PE42426 thermal data

Parameter	Typ	Unit
Ψ_{JT}	21	°C/W

Control logic

Table 5 lists the PE42426 control logic truth table.

Table 5 • PE42426 truth table

State	V1
RFC–RF1	H
RFC–RF2	L

Typical performance data

Figure 2–Figure 11 show the typical performance data @ +25 °C and V_{DD} = 3.3V (Z_S = Z_L = 50Ω), unless otherwise specified.

Figure 2 • Insertion loss vs. temperature (RFC–RFx)

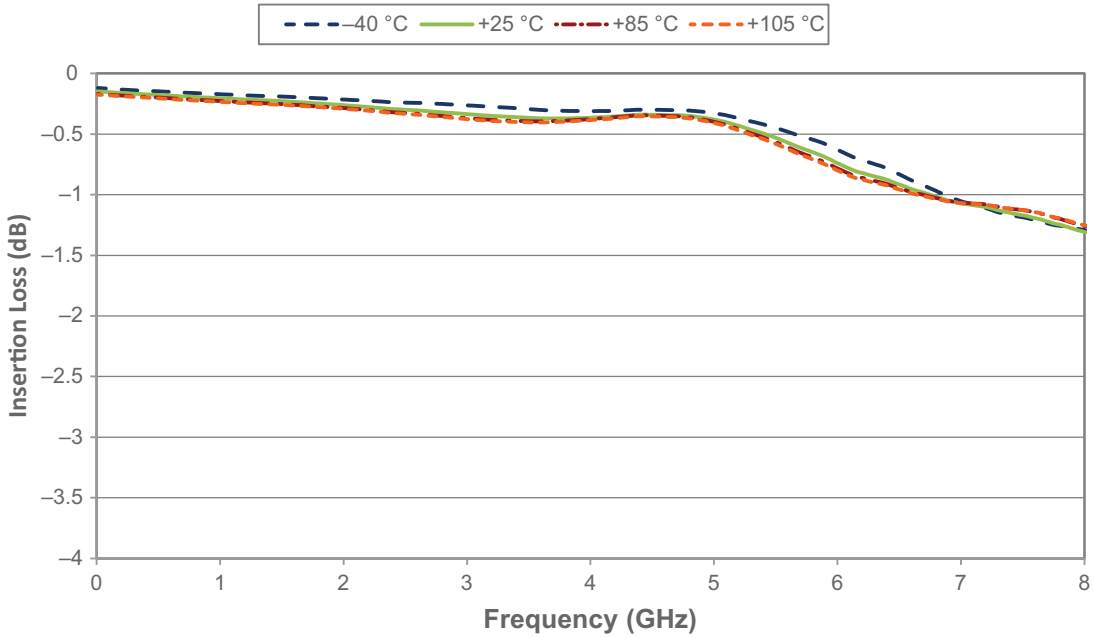


Figure 3 • Insertion loss vs. V_{DD} (RFC–RFx)

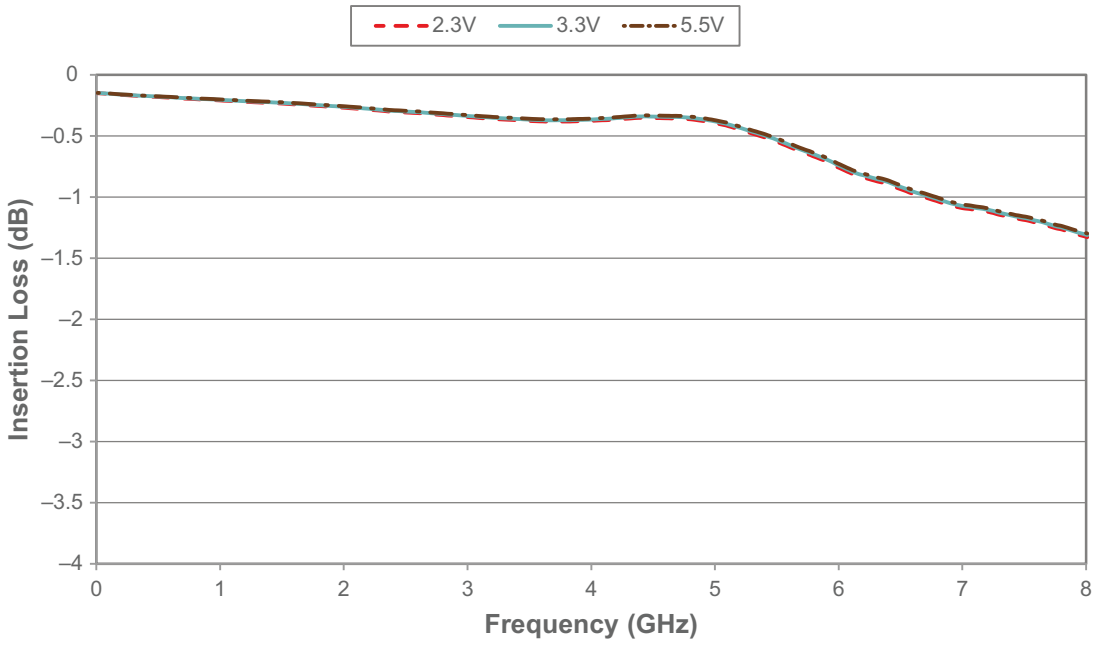


Figure 4 • RFC port return loss vs. temperature

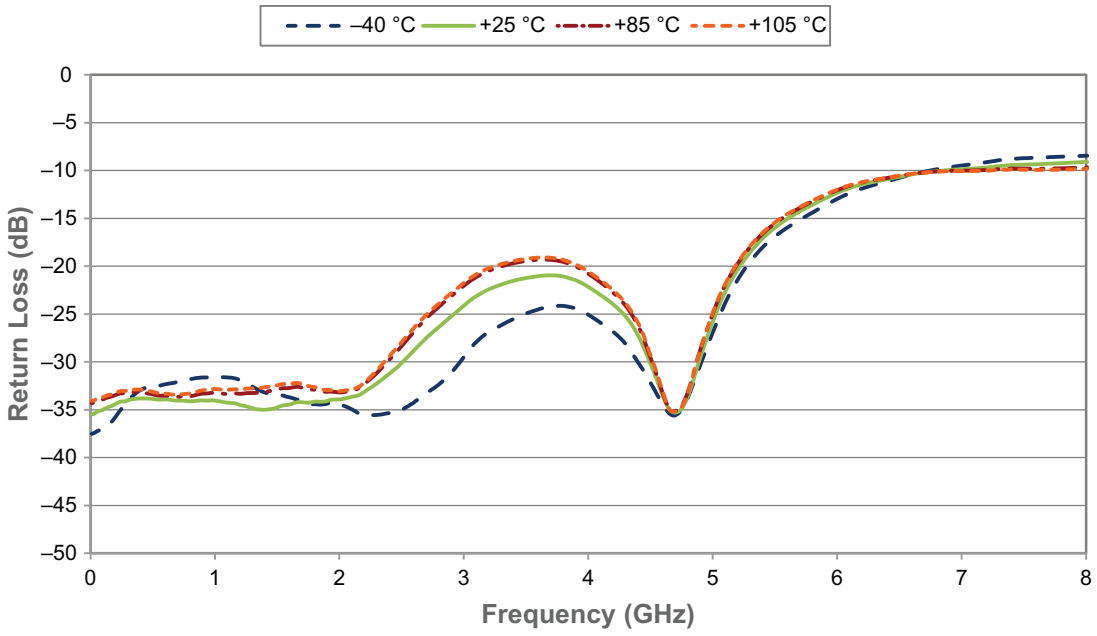


Figure 5 • RFC port return loss vs. V_{DD}

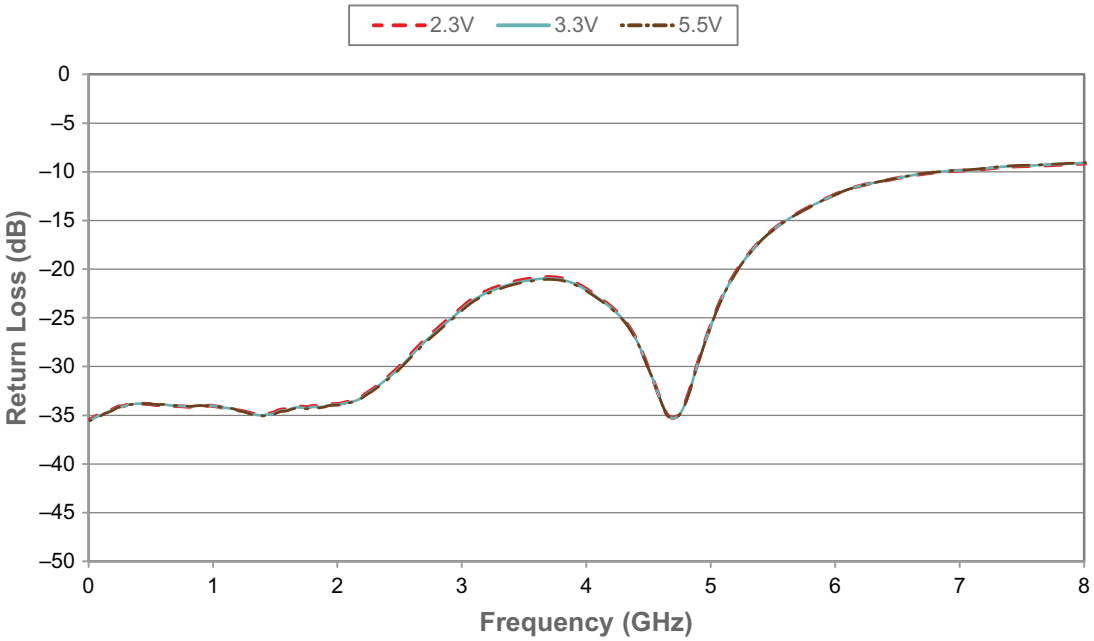


Figure 6 • Active port return loss vs. temperature

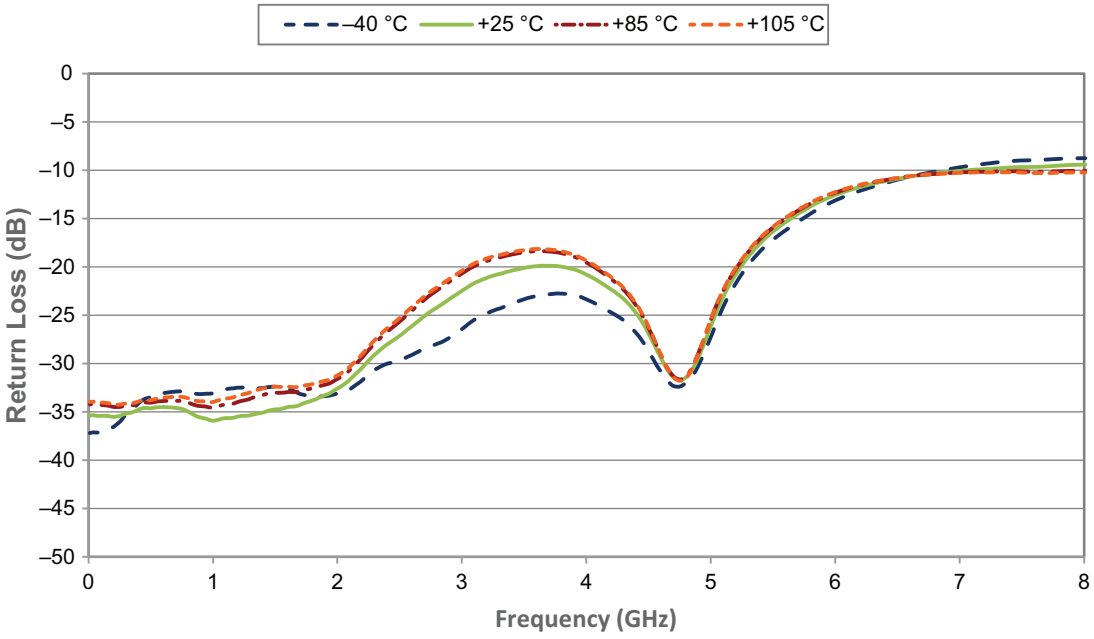


Figure 7 • Active port return loss vs. V_{DD}

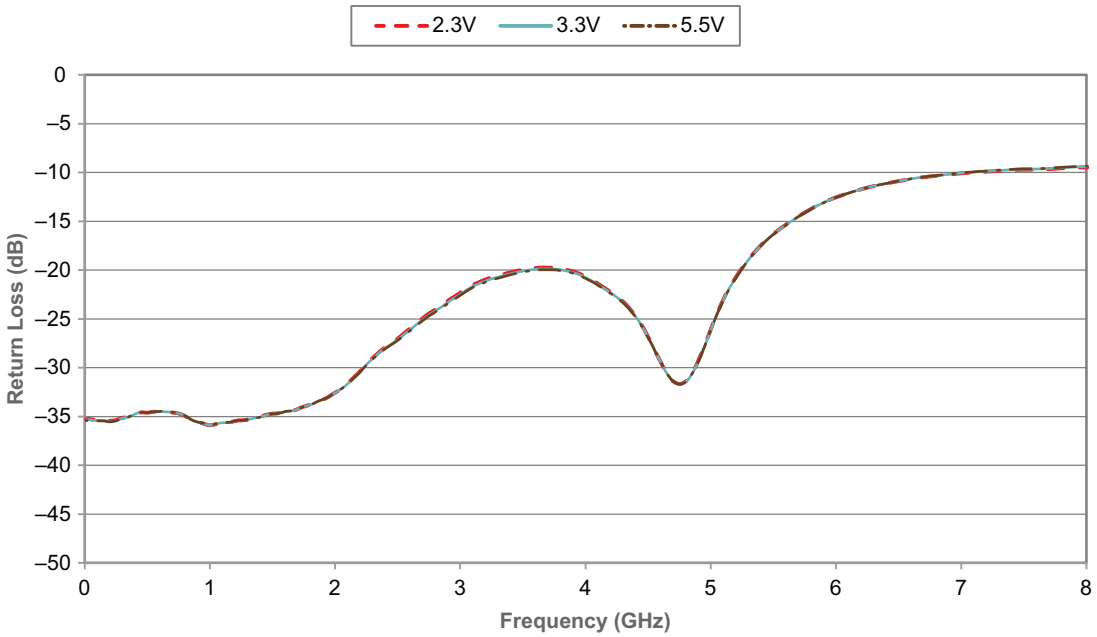


Figure 8 • Isolation vs. temperature (RFx–RFx)

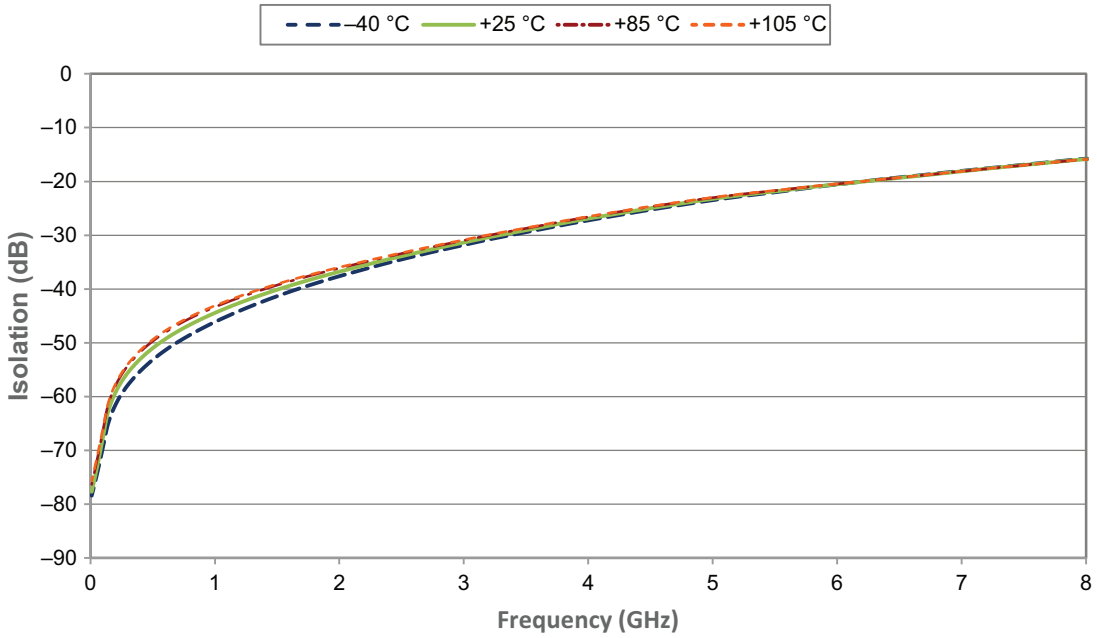


Figure 9 • Isolation vs. V_{DD} (RFx–RFx)

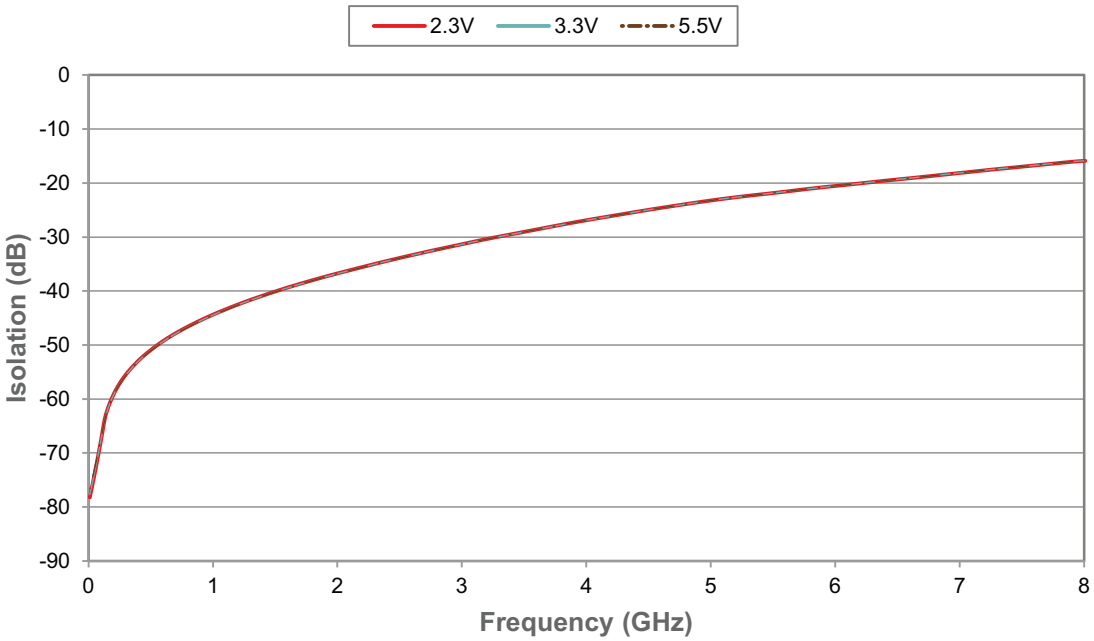


Figure 10 • Isolation vs. temperature (RFC–RFx)

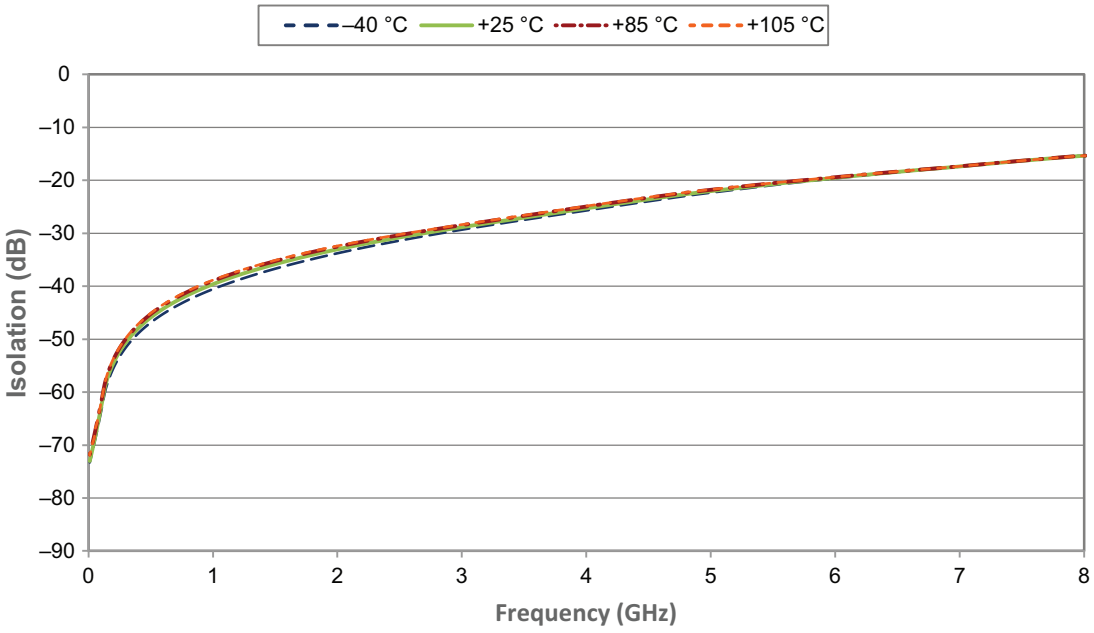


Figure 11 • Isolation vs. V_{DD} (RFC–RFx)

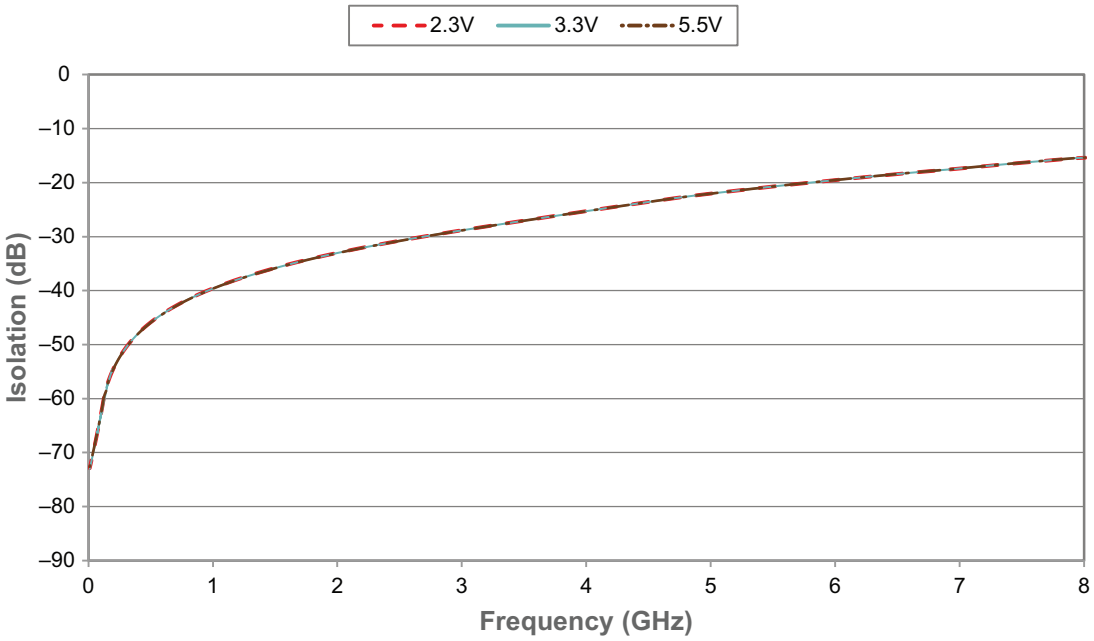


Figure 12 • IIP2 vs. frequency

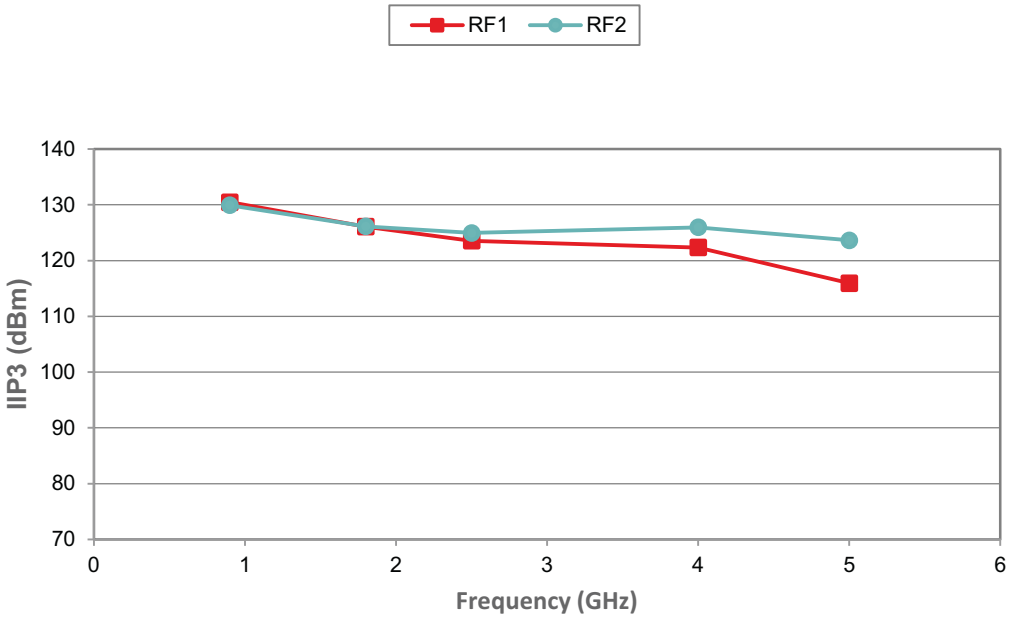
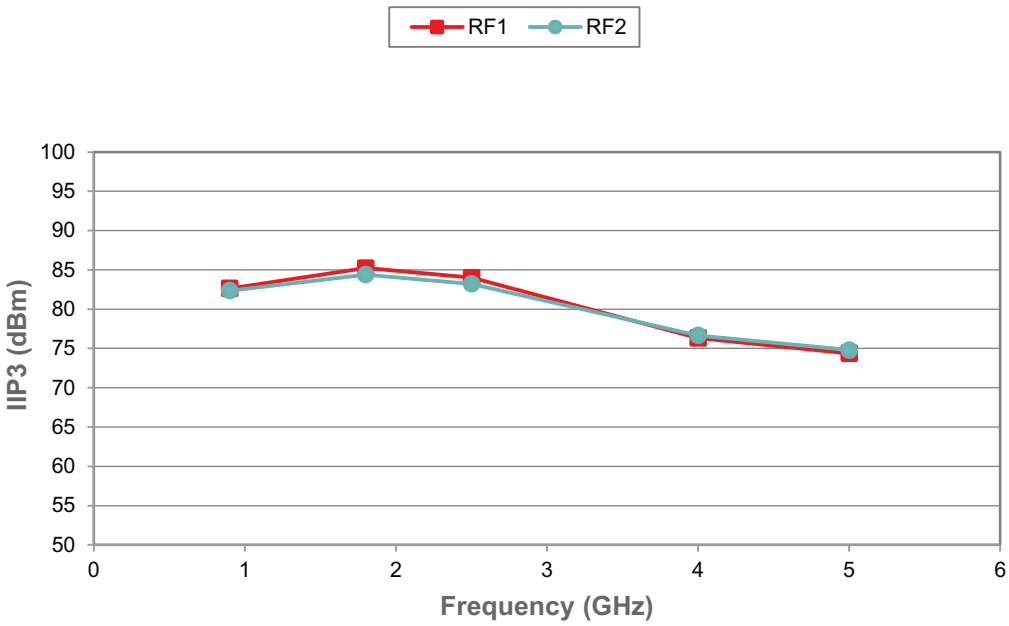


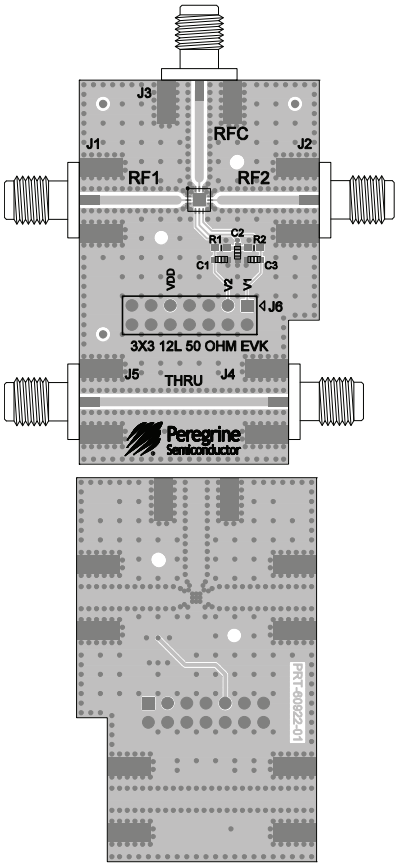
Figure 13 • IIP3 vs. frequency



Evaluation kit

pSemi designed the PE42426 evaluation board to ease your evaluation of the PE42426 RF switch. The RF common port connects through a 50Ω transmission line via J3. The RF1 and RF2 ports connect through 50Ω transmission lines via J1 and J2, respectively. A 50Ω through transmission line is available via J4 (THRU left) and J5 (THRU right), which you can use to de-embed the loss of the PCB. J6 provides DC and digital inputs to the device.

Figure 14 • PE42426 evaluation board layout



Pin information

Figure 15 shows the PE42426 pin map for the 12-lead 3 × 3 × 0.75 mm QFN package, and **Table 6** lists the description for each pin.

Figure 15 • Pin configuration (top view)

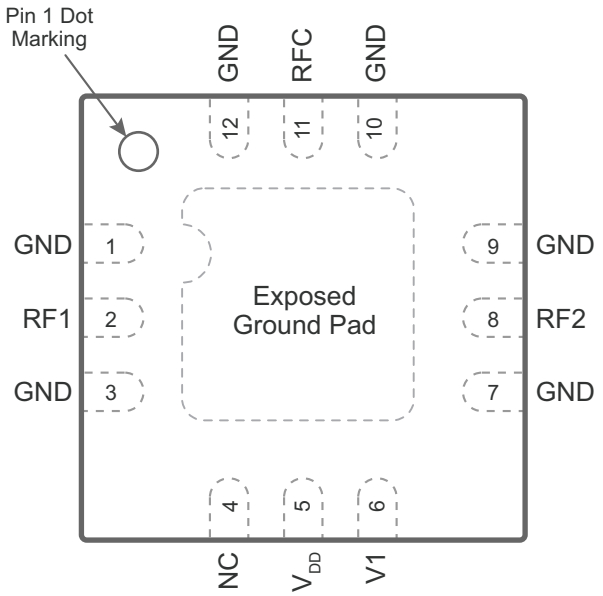


Table 6 • PE42426 pin descriptions

Pin no.	Pin name	Description
1, 3, 7, 9, 10, 12	GND	Ground
2(*)	RF1	RF port 1
4	NC	Do not connect
5	V_{DD}	Supply voltage (nominal 3.3V)
6	V1	Digital control logic input 1
8(*)	RF2	RF port 2
11(*)	RFC	RF common
Pad	GND	Exposed pad: ground for proper operation

Note: * RF pins 2, 8, and 11 must be at 0 VDC. These RF pins do not require DC blocking capacitors for proper operation if the 0 VDC requirement is met.

Packaging information

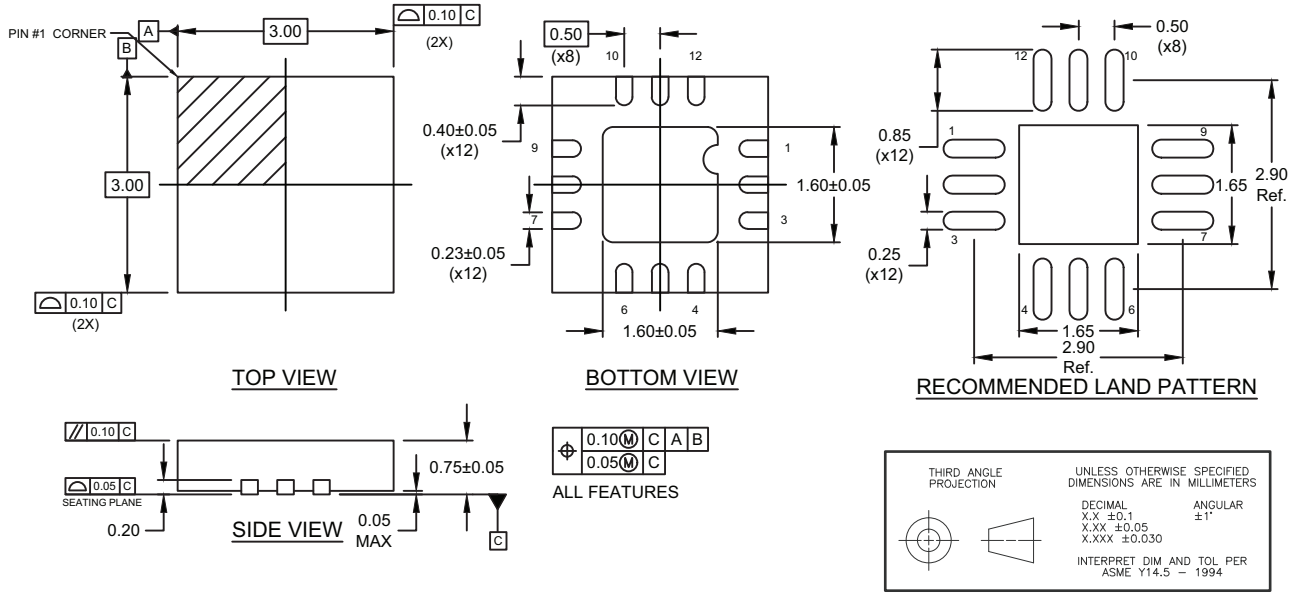
This section provides packaging data including the moisture sensitivity level, package drawing, package marking, and tape-and-reel information.

Moisture sensitivity level

The PE42426 moisture sensitivity level rating for the 12-lead 3 × 3 × 0.75 mm QFN package is MSL1.

Package drawing

Figure 16 • Package mechanical drawing for the 12-lead 3 × 3 × 0.75 mm QFN



Top-marking specification

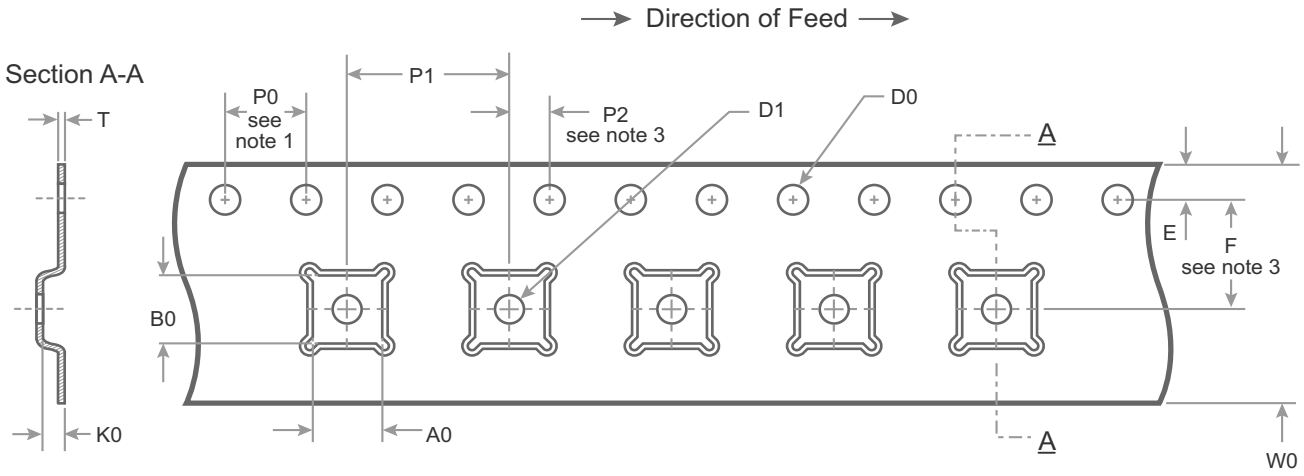
Figure 17 • PE42426 package marking specifications



● = Pin 1 indicator
YY = Last two digits of assembly year
WW = Assembly work week
ZZZZZZ = Assembly lot code (maximum six characters)

Tape and reel specification

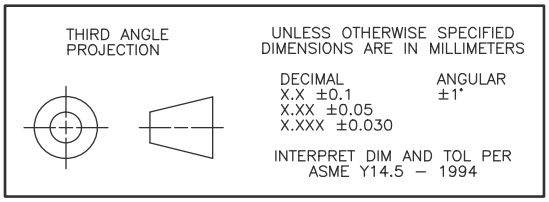
Figure 18 • Tape and reel specification for the 12-lead 3 × 3 × 0.75 mm QFN

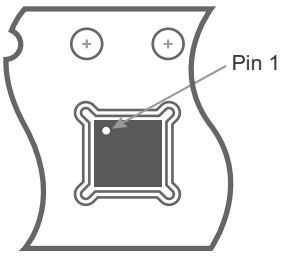


A0	3.30
B0	3.30
K0	1.10
D0	1.50 + 0.1/ -0.0
D1	1.5 min
E	1.75 ± 0.10
F	5.50 ± 0.05
P0	4.00
P1	8.00
P2	2.00 ± 0.05
T	0.30 ± 0.05
W0	12.00 ± 0.3

Notes:

1. 10 Sprocket hole pitch cumulative tolerance ±0.2
2. Camber in compliance with EIA 481
3. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole





Device Orientation in Tape

Ordering information

Table 7 lists the PE42426 ordering codes and shipping methods.

Table 7 • PE42426 order codes and shipping method

Order code	Description	Packaging	Shipping method
PE42426A-Z	PE42426 SPDT RF switch	12-lead 3 × 3 × 0.75 mm QFN	3000 units/T&R
EK42426-01	PE42426 evaluation kit	Evaluation kit	1/Box

Document Categories

Advance Information

The product is in a formative or design stage. The datasheet contains design target specifications for product development. Specifications and features may change in any manner without notice.

Preliminary Specification

The datasheet contains preliminary data. Additional data may be added at a later date. pSemi reserves the right to change specifications at any time without notice in order to supply the best possible product.

Product Specification

The datasheet contains final data. In the event pSemi decides to change the specifications, pSemi will notify customers of the intended changes by issuing a CNF (Customer Notification Form).

Product Brief

This document contains a shortened version of the datasheet. For the full datasheet, contact sales@psemi.com.

Sales Contact

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

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