PE42429

Product Specification

High-isolation UltraCMOS+™ SPDT RF Switch, 9 kHz to 8.5 GHz

Features

- Operating frequency: 9 kHz to 8.5 GHz
- High isolation: 46 dB at 6 GHz
- Low insertion loss: 0.8 dB at 6 GHz
- High linearity: 65 dBm IIP3
- Fast switching time: 490 ns
- Operating temperature range: -40 to +105 °C
- Package: 12-lead 2.0 × 2.0 mm QFN

Applications

- General-purpose Tx and Rx switches
- Wireless infrastructure
- Test and measurement
- Automated test equipment (ATE)

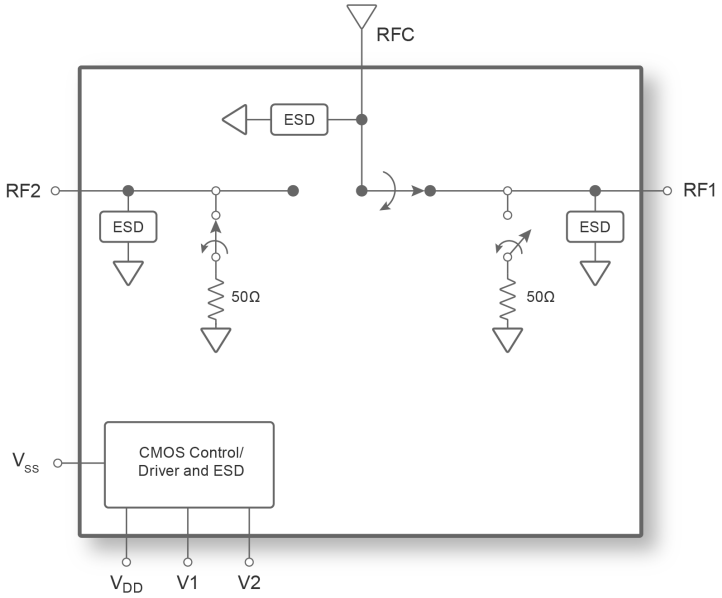

Figure 1. PE42429 functional diagram

Product description

The PE42429 is a HaRP™ technology-enhanced SPDT RF switch designed for use in 4G/5G wireless infrastructure and other high-performance RF applications. It consists of two symmetric RF ports with very high isolation up to 8.5 GHz.

The PE42429 is manufactured using the pSemi UltraCMOS+™ process, a patented silicon-on-insulator (SOI) technology. pSemi's HaRP technology enhancements deliver high isolation and excellent linearity performance.

Headquarters: 9369 Carroll Park Dr, San Diego, CA 92121

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 could 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 listed in Table 1.

Latch-up immunity

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

Table 1. PE42429 absolute maximum ratings

Parameter or condition	Min	Typ	Max	Unit
Power supply voltage	2.3	–	5.5	V
Negative supply voltage	-3.6	–	0	V
Digital input voltage (V1, V2)	0	–	3.6	V
Storage temperature range	-60	–	150	°C
Maximum power through path (RF power in) at 105 °C, 10 MHz–8.6 GHz, pulsed signal (PW = 0.577 ms; P = 8 × PW; duration = 1 s)	–	–	34	dBm
Maximum power into termination at 105 °C, 10 MHz–8.6 GHz, pulsed signal (PW = 0.577 ms; P = 8 × PW; duration = 1 s)	–	–	24	dBm
ESD voltage HBM, all pins(1)	–	–	2000	V
ESD voltage CDM, all pins(2)	–	–	500	V

Notes:
1. Human body model (MIL-STD 883 Method 3015)
2. Charged device model (JEDEC JESD11-C101)

Recommended operating conditions

Table 2 lists the PE42429 recommended operating conditions. Do not operate the device outside the operating conditions listed below.

Table 2. PE42429 recommended operating conditions

Parameter	Condition	Min	Typ	Max	Unit
V_{DD} positive supply voltage (internal negative voltage generator)	–	2.3	3.3	5.5	V
V_{SS} negative supply voltage (external V_{SS} applied)	–	-3.6	-3.3	-3	V
I_{DD} positive supply current (internal negative voltage generator)	–	–	135	200	µA
I_{DD} positive supply current (external negative voltage generator)	–	–	100	150	µA
I_{SS} negative supply current (internal negative voltage generator)	–	–	15	25	µA
Operating temperature range	–	-40	25	105	°C
Switching pins logic levels, 1.8V JEDEC compliant	Logic low	-0.3	–	0.56	V
	Logic high	0.91	–	1.9	

Electrical specifications

Table 3 lists the PE42429 key electrical specifications at 25 °C and $Z_L = Z_S = 50\Omega$, unless otherwise specified.

Table 3. PE42429 electrical specifications

Parameter	Condition	Min	Typ	Max	Unit
Operating frequency	–	9 kHz	–	8.5 GHz	As shown
Insertion loss	9 kHz < Freq ≤ 6 GHz	–	0.8	–	dB
	6 GHz < Freq ≤ 8.5 GHz	–	1.1	–	
Isolation	RFC–RFx, 9 kHz < Freq ≤ 6 GHz	–	46	–	dB
	RFC–RFx, 6 GHz < Freq ≤ 8.5 GHz	–	38	–	
	RFx–RFx, 9 kHz < Freq ≤ 6 GHz	–	50	–	
	RFx–RFx, 6 GHz < Freq ≤ 8.5 GHz	–	45	–	
Return loss, ON port	RFC–RFx, 9 kHz < Freq ≤ 6 GHz	–	19	–	dB
	RFC–RFx, 6 GHz < Freq ≤ 8.5 GHz	–	16	–	
Return loss, terminated port	RFC–RFx, 9 kHz < Freq ≤ 6 GHz	–	27	–	dB
	RFC–RFx, 6 GHz < Freq ≤ 8.5 GHz	–	21	–	
Input P0.1 dB compression point	RFC–RFx, Freq = 2500 MHz	–	37	–	dBm
Input IP3	P_{IN} = 20 dBm/tone, F_{RF1} = 2500 MHz, F_{RF2} = 2570 MHz	–	65	–	dBm
Switching time	50% CTRL to 90% or 10% RF P_{IN} = 10 dBm, Freq = 8 GHz	–	490	–	ns
Settling time	Power settled to ± 0.1 dB of the final value P_{IN} = 10 dBm, Freq = 8 GHz	–	510	–	ns

Control logic

Table 4. PE42429 truth table

Mode	V2	V1
RF1 and RF2 OFF	0	0
RF1 ON	0	1
RF2 ON	1	0
RF1 and RF2 OFF	1	1

Power derating curve

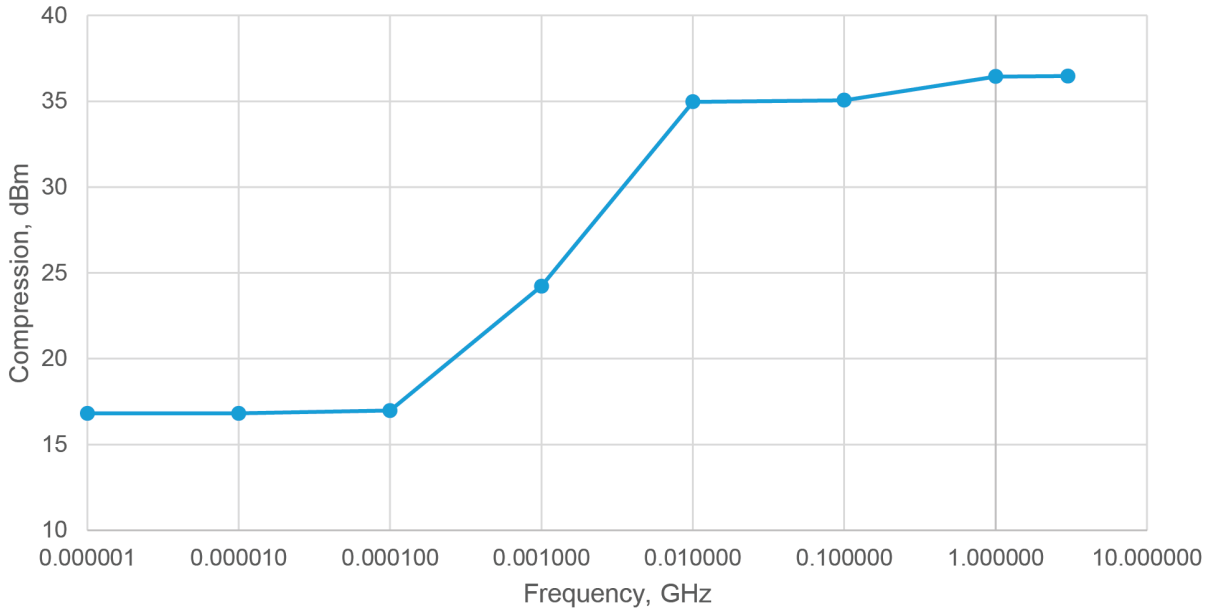

Figure 2. Low-frequency power derating curve

Typical performance data

Figure 3 through Figure 12 show the typical performance data at 25 °C and $Z_L = Z_S = 50\Omega$, unless otherwise specified.

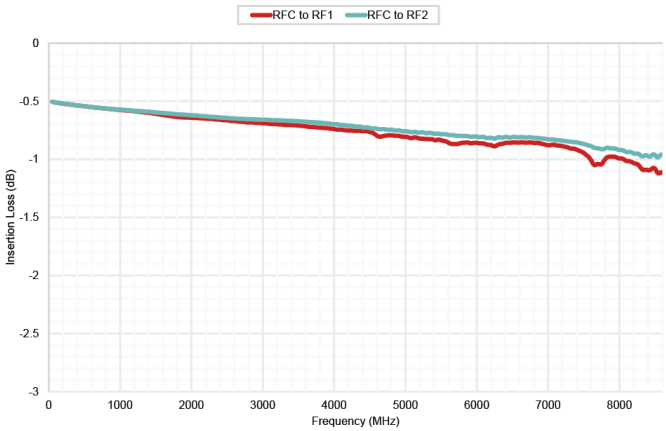

Figure 3. Insertion loss vs. frequency at V_{SS} = -3.3V

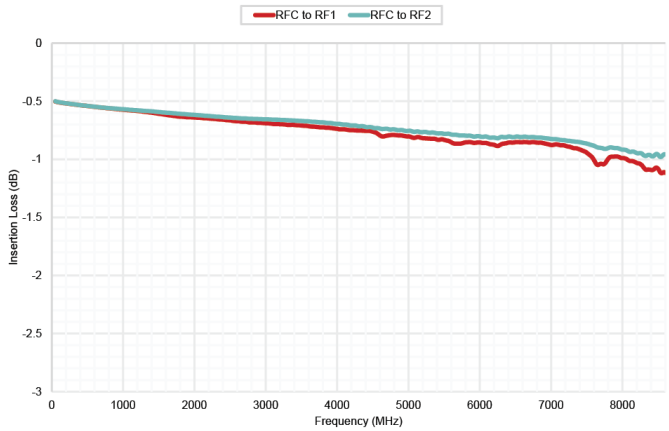

Figure 4. Insertion loss vs. frequency at V_{SS} = 0V

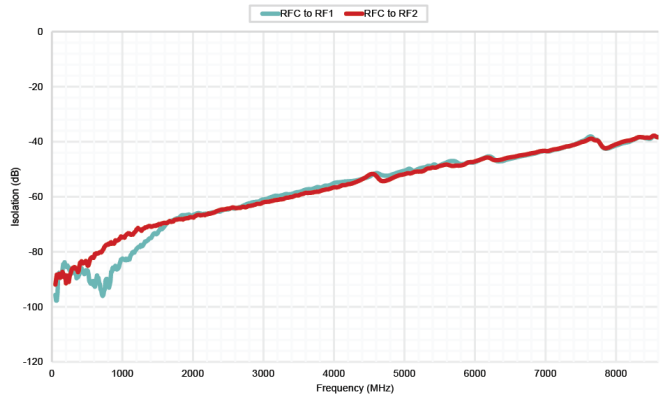

Figure 5. Isolation (RFC–RFx) vs. frequency at V_{SS} = -3.3V

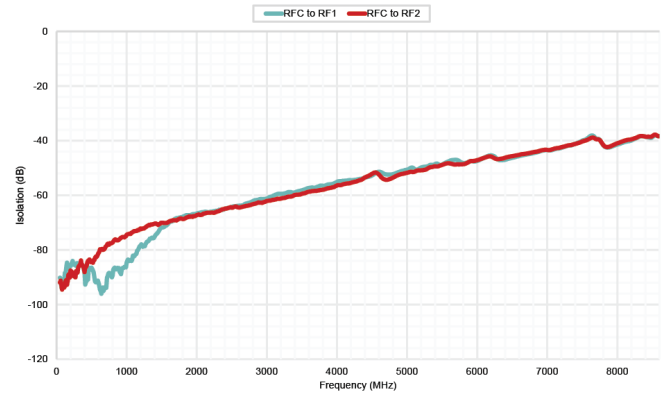

Figure 6. Isolation (RFC–RFx) vs. frequency at V_{SS} = 0V

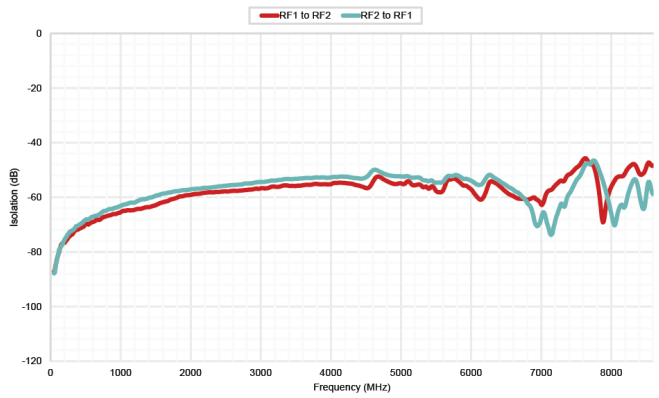

Figure 7. Isolation (RFx–RFx) vs. frequency at V_{SS} = -3.3V

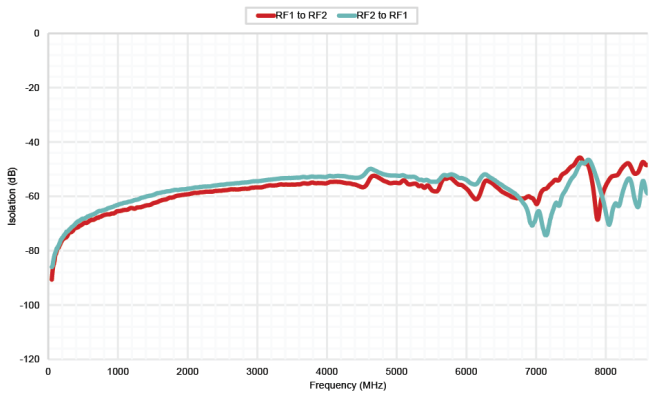

Figure 8. Isolation (RFx–RFx) vs. frequency at V_{SS} = 0V

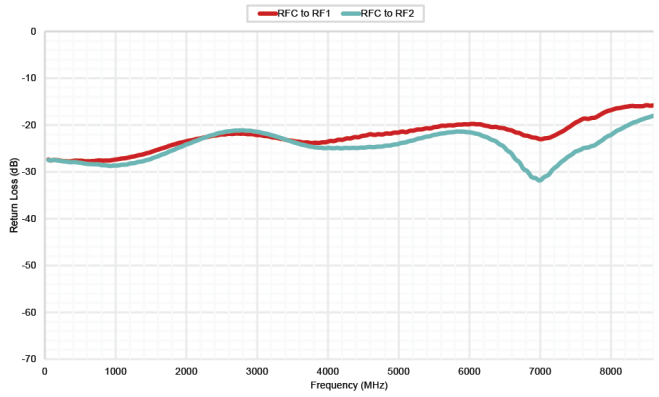

Figure 9. Return loss (RFC–RFx) vs. frequency at V_{SS} = -3.3V

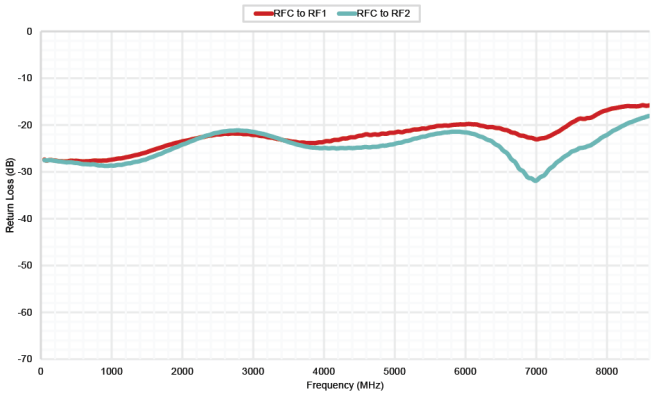

Figure 10. Return loss (RFC–RFx) vs. frequency at V_{SS} = 0V

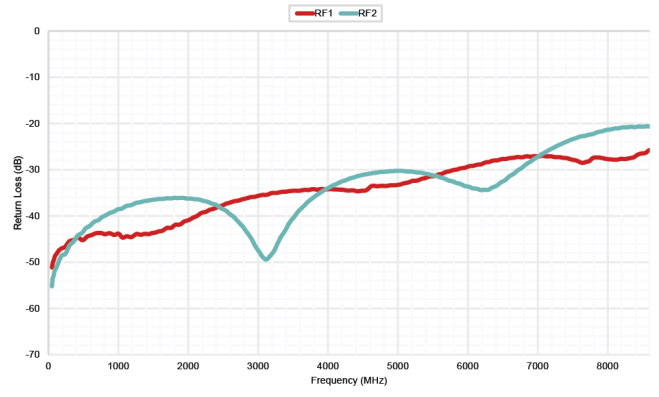

Figure 11. Return loss (RFx terminated) vs. frequency at V_{SS} = -3.3V

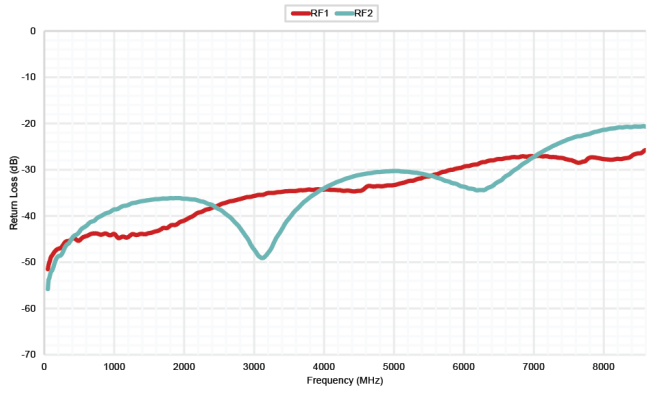

Figure 12. Return loss (RFx terminated) vs. frequency at V_{SS} = 0V

Pin configuration

Figure 13 shows the PE42429 pin configuration for the 12-lead 2.0 × 2.0 mm QFN package, and Table 5 lists the description for each pin.

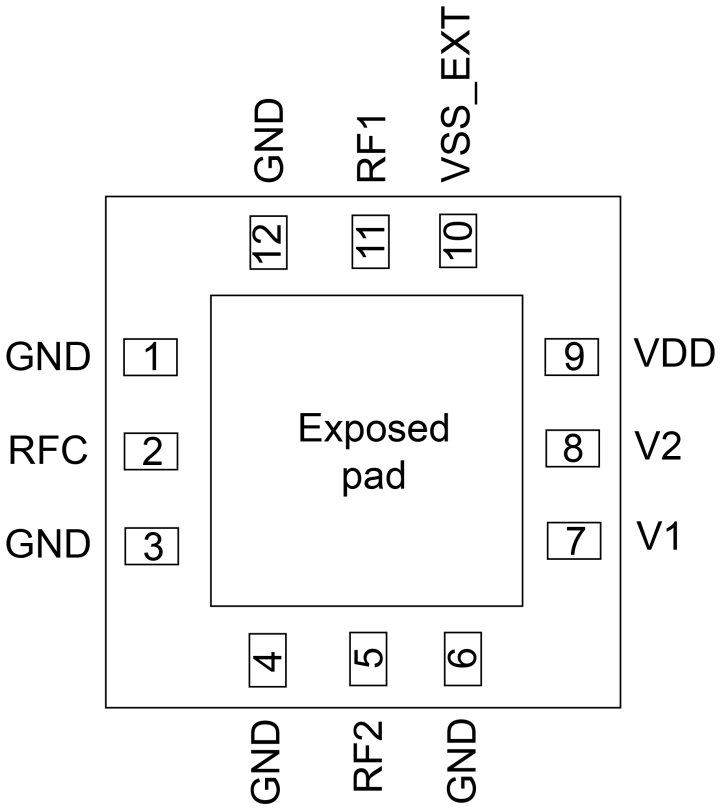

Figure 13. PE42429 pin configuration, top view

Table 5. PE42429 pin descriptions

Pin no.	Pin name	Description
1, 3, 4, 6, 12	GND	Ground
2	RFC	RF common port
5	RF2	RF port 2
7	V1	Digital control input 1
8	V2	Digital control input 2
9	VDD	Supply voltage
10	VSS_EXT	V_{SS} external input
11	RF1	RF port 1
Pad	GND	Exposed pad. Ground for proper operation.

Packaging information

This section provides the following information:

- Moisture sensitivity level
- Package drawing
- Package marking
- Tape and reel information

Moisture sensitivity level

The PE42429 moisture sensitivity level rating for the 12-lead 2.0 × 2.0 mm QFN package is MSL1.

Package drawing

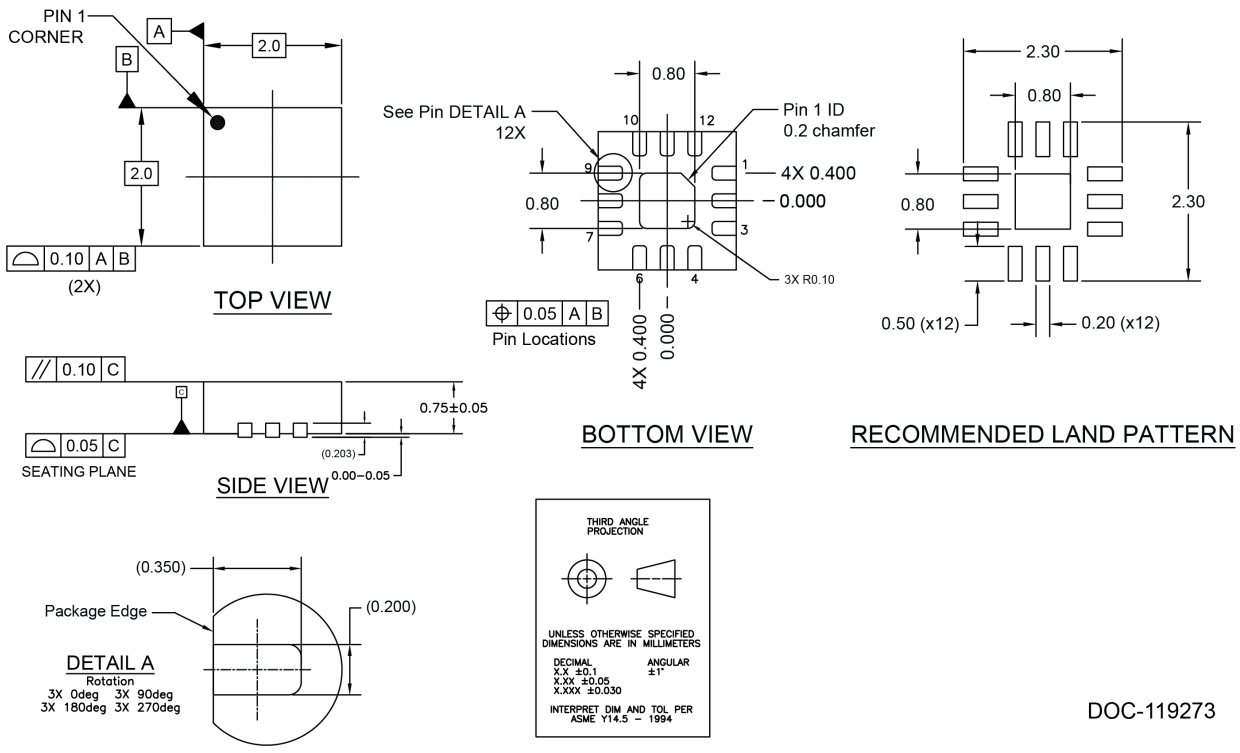

Figure 14. Package mechanical drawing for the 12-lead 2.0 × 2.0 mm QFN package

Top-marking specification

● = Pin 1 indicator
PP = Product part number code (GY)
ZZ = Assembly lot code last two digits
YY = Assembly year last two digits
WW = Assembly lot work week

Figure 15. PE42429 package marking specification

Tape and reel specification

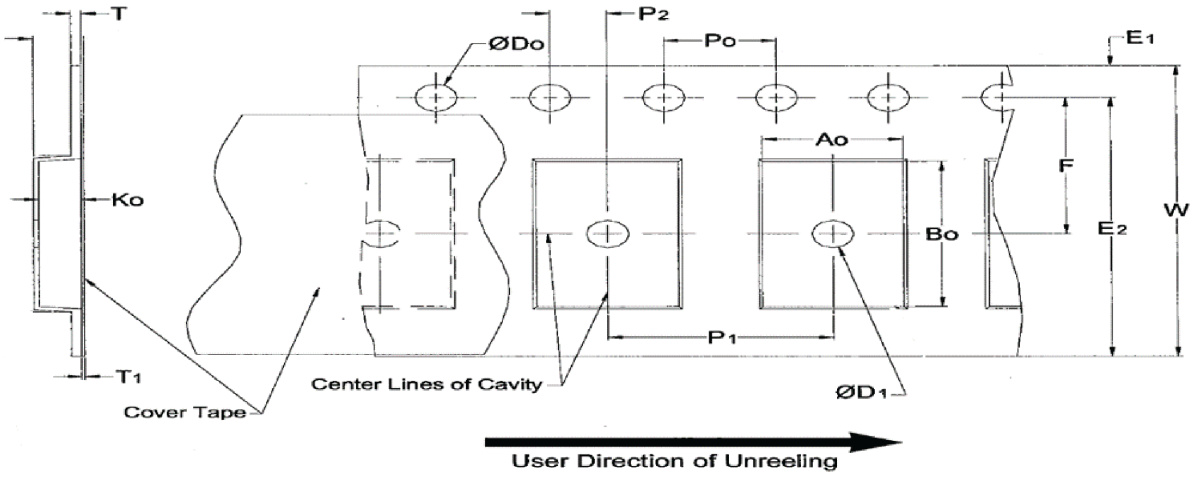

Figure 16. Tape and reel specification for the 12-lead 2.0 × 2.0 mm QFN package

Notes:

- The diagram is not drawn to scale.
- The units are in millimeters (mm).
- The maximum cavity angle is five degrees.
- The bumped die is oriented active side down.

Table 6. Tape and reel dimensions

Carrier tape variable dimensions			**Carrier tape constant dimensions**		
Pocket	**Nominal**	**Tolerance**	**Pocket**	**Nominal**	**Tolerance**
Ao	2.300	±0.1	**D0**	1.5	+0.1/-0
Bo	2.300	±0.1	**E1**	1.75	±0.1
Ko	1.100	±0.1	**P0**	4.00	±0.1
P1	4.00	±0.1	**P2**	2.00	±0.05
W	8.00	+0.3/-0.1	**T**	0.2	±0.05
F	3.5	±0.05	–	–	–
D1	0.5	±0.05	–	–	–

Ordering information

Order code	Description	Packaging	Shipping method
PE42429A-Z	PE42429 UltraCMOS+™ SPDT RF Switch	Green 12-lead 2.0 × 2.0 mm QFN	3000 units/T&R
EK42429-01	PE42429 evaluation kit	Evaluation kit	1/box

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