

# PE42528

Document Category: Advance Information

UltraCMOS® SPDT RF Switch, 9 kHz–30 GHz



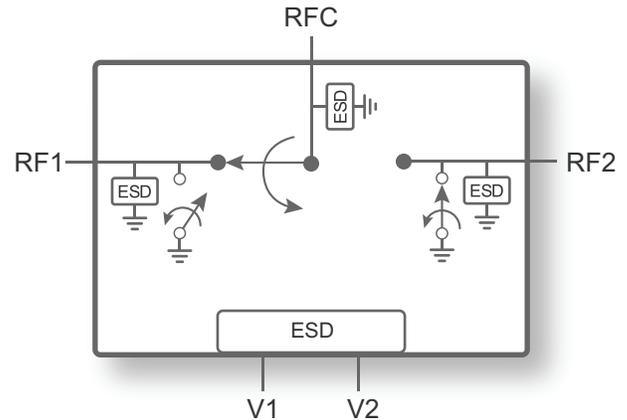
## Features

- Ultra wide frequency: 9 kHz–30 GHz
- Low insertion loss:
  - 1.3 dB @ 10 GHz
  - 1.6 dB @ 30 GHz
- IP3: 48 dBm
- Power handling: 34 dBm peak
- High return loss: >17 dB across the band
- Fast switching time: 8 ns
- Package: 20-lead 3×3 mm LGA

## Applications

- Test and measurement (T&M)
- 5G mmWave
- Microwave backhaul
- Radar
- Satellite communications

Figure 1 • PE42528 Functional Diagram



## Product Description

The PE42528 is a HaRP™ technology-enhanced reflective SPDT RF switch that supports a wide frequency range from 9 kHz to 30 GHz. It delivers low insertion loss, fast switching time, and high isolation performance, making this device ideal for test and measurement (T&M), 5G mmWave, microwave backhaul, radar, and satellite communications applications. No blocking capacitors are required if DC voltage is not present on the RF ports.

The PE42528 is manufactured on pSemi's UltraCMOS® process, a patented variation of silicon-on-insulator (SOI) technology.

## 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 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 • PE42528 Absolute Maximum Ratings*

Parameter/Condition	Min	Max	Unit
Control voltage (V1, V2)	-3.6	3.6	V
RF input power (RFc–RFx, 50Ω)	–	TBD	dBm
Maximum junction temperature	–	+150	°C
Storage temperature range	-65	+150	°C
ESD voltage HBM <sup>(*)</sup>			
All pins	–	600	V
RF pins to GND		1000	V
<b>Note:</b> * Human body model (MIL-STD 883 Method 3015).			

## Recommended Operating Conditions

**Table 2** lists the PE42528 recommended operating conditions. Do not operate devices outside the recommended operating conditions listed below.

*Table 2 • PE42528 Recommended Operating Conditions*

Parameter	Min	Typ	Max	Unit
Control high (V1, V2)	2.7	3.0	3.3	V
Control low (V1, V2)	-3.3	-3.0	-2.7	V
Control current	-	390	-	nA
RF input power, CW (RFc–RFx) <sup>(1)</sup>	-	-	TBD	dBm
RF input power, pulsed (RFc–RFx) <sup>(2)</sup>	-	-	TBD	dBm
Operating temperature range	-40	+25	+105	°C

**Notes:**

- 1) 100% duty cycle, all bands, 50Ω.
- 2) Pulsed, 5% duty cycle of 4620 μs period, 50Ω.

## Electrical Specifications

**Table 3** lists the PE42528 key electrical specifications @ +25 °C, V1 = +3.0V, V2 = -3.0V or V1 = -3.0V, V2 = +3.0V ( $Z_S = Z_L = 50\Omega$ ), unless otherwise specified.

**Table 3 • PE42528 Electrical Specifications**

Parameter	Path	Condition	Min	Typ	Max	Unit
Operating frequency	–	–	9 kHz	–	40 GHz	As shown
Insertion loss	RFc–RFx	<100 MHz	–	0.86	–	dB
		100 MHz–1 GHz		1.00		dB
		1 GHz–10 GHz		1.33		dB
		10 GHz–20 GHz		1.61		dB
		20 GHz–30 GHz		1.61		dB
		30 GHz–40 GHz		2.00		dB
Return loss RFc port	RFc–RFx	<100 MHz	–	21.8	–	dB
		100 MHz–1 GHz		22.0		dB
		1 GHz–10 GHz		18.3		dB
		10 GHz–20 GHz		18.1		dB
		20 GHz–30 GHz		18.1		dB
		30 GHz–40 GHz		12.7		dB
Return loss RFx port	RFc–RFx	<100 MHz	–	22.0	–	dB
		100 MHz–1 GHz		22.5		dB
		1 GHz–10 GHz		22.5		dB
		10 GHz–20 GHz		18.4		dB
		20 GHz–30 GHz		18.6		dB
		30 GHz–40 GHz		16.9		dB
Isolation RFc–RFx OFF port	All paths	<100 MHz	–	65	–	dB
		100 MHz–1 GHz		61		dB
		1 GHz–10 GHz		46		dB
		10 GHz–20 GHz		43		dB
		20 GHz–30 GHz		40		dB
		30 GHz–40 GHz		35		dB
Isolation RFx–RFx OFF port	All paths	<100 MHz	–	66	–	dB
		100 MHz–1 GHz		62		dB
		1 GHz–10 GHz		51		dB
		10 GHz–20 GHz		50		dB
		20 GHz–30 GHz		47		dB
		30 GHz–40 GHz		38		dB
Pin CW maximum	–	–	–	29 dBm @ T <sub>CASE</sub> 85 °C 25 dBm @ T <sub>CASE</sub> 105 °C	–	dBm
Supply current	–	–	–	0.39	–	µA

Table 3 • PE42528 Electrical Specifications (Cont.)

Parameter	Path	Condition	Min	Typ	Max	Unit
2nd harmonic, 2fo	RFc–RFx	+25 dBm output power, 1 GHz	–	73	–	dBc
		+25 dBm output power, 2 GHz		77		dBc
		+25 dBm output power, 6.5 GHz		89		dBc
		+25 dBm output power, 13.4 GHz		92		dBc
Input 1dB compression point <sup>(1)</sup>	–	18 GHz	–	34	–	dBm
Input IP2	–	1 GHz	–	93	–	dBm
		2 GHz		98		dBm
		6.5 GHz		109		dBm
		13.4 GHz		112		dBm
Input IP3	–	1 GHz	–	49	–	dBm
		2 GHz		48		dBm
		6 GHz		46		dBm
		13.4 GHz		46		dBm
Video feed through <sup>(2)</sup>	–	DC measurement	–	30	–	mV <sub>PP</sub>
RF T <sub>RISE</sub> /T <sub>FALL</sub>	–	10%/90% RF	–	3	–	ns
Settling time	–	50% CTRL to 0.05 dB final value	–	48	60	ns
Switching time	–	50% CTRL to 90% or 10% RF	–	8	12	ns
<b>Notes:</b>						
1) The input 1-dB compression point is a linearity figure of merit. The RF input power (50Ω) is TBD.						
2) Measured with a 3.5 ns rise time, ±3.0V pulse and 100 MHz bandwidth.						

## Pin Configuration

Figure 2 shows the PE42528 pin configuration for the 20-lead 3×3 mm LGA package. Table 4 lists the description for each pin.

Figure 2 • PE42528 Pin Configuration (Top View)

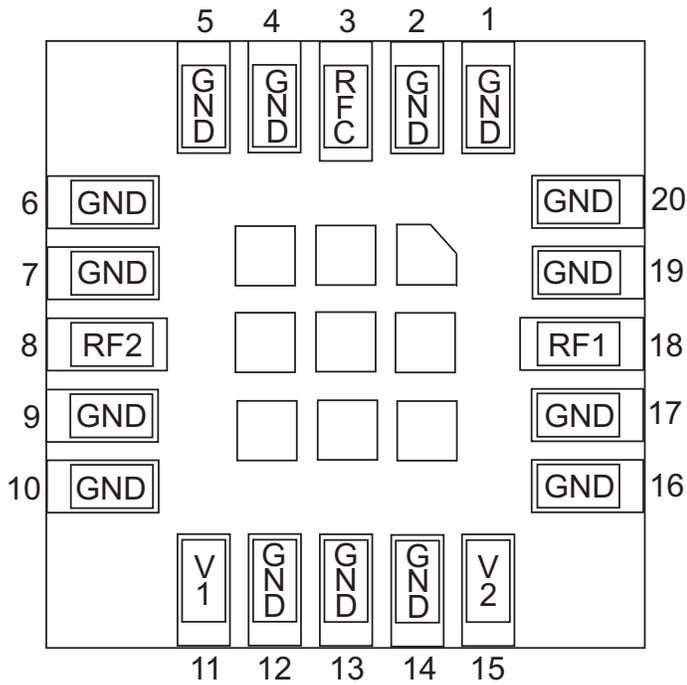


Table 4 • PE42528 Pin Descriptions

Pin No.	Pin Name	Description
1, 2, 4, 5, 6, 7, 9, 10, 12, 13, 14, 16, 17, 19, 20	GND	Ground
3	RFC	RF common port
8	RF2	RF port 2
11	V2	Control input 2
15	V1	Control input 1
18	RF1	RF port 1

## Control Logic

**Table 5** lists the PE42528 control logic truth table. States 2 and 3 are used during normal switching operations.

*Table 5 • PE42528 Truth Table*

V1	V2	RF1	RF2	State
-3.0V	-3.0V	OFF	OFF	1
-3.0V	+3.0V	OFF	ON	2
+3.0V	-3.0V	ON	OFF	3

## Packaging Information

This section provides the following packaging data:

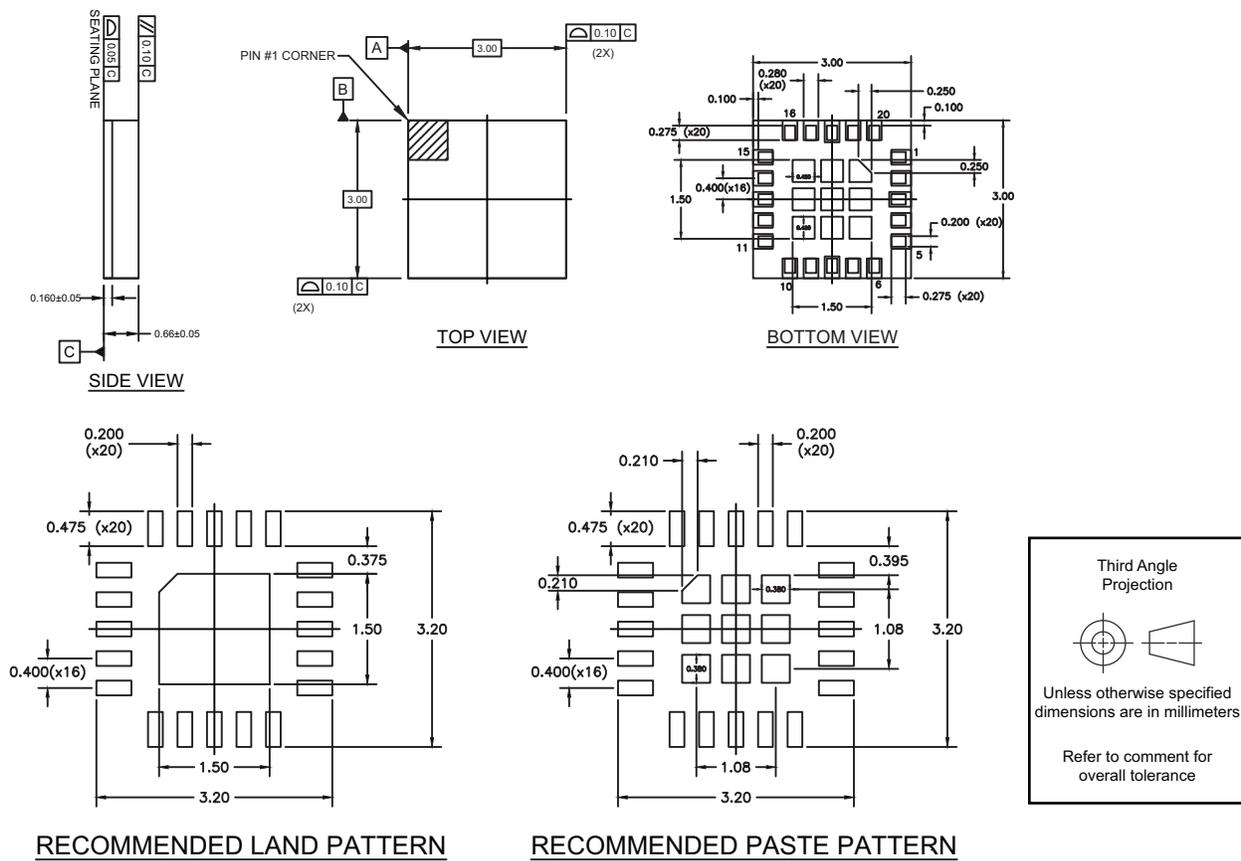
- Moisture sensitivity level
- Package drawing
- Package marking
- Tape-and-reel information

### Moisture Sensitivity Level

The PE42528 moisture sensitivity level rating for the 20-lead 3×3 mm LGA package is MSL 3.

### Package Drawing

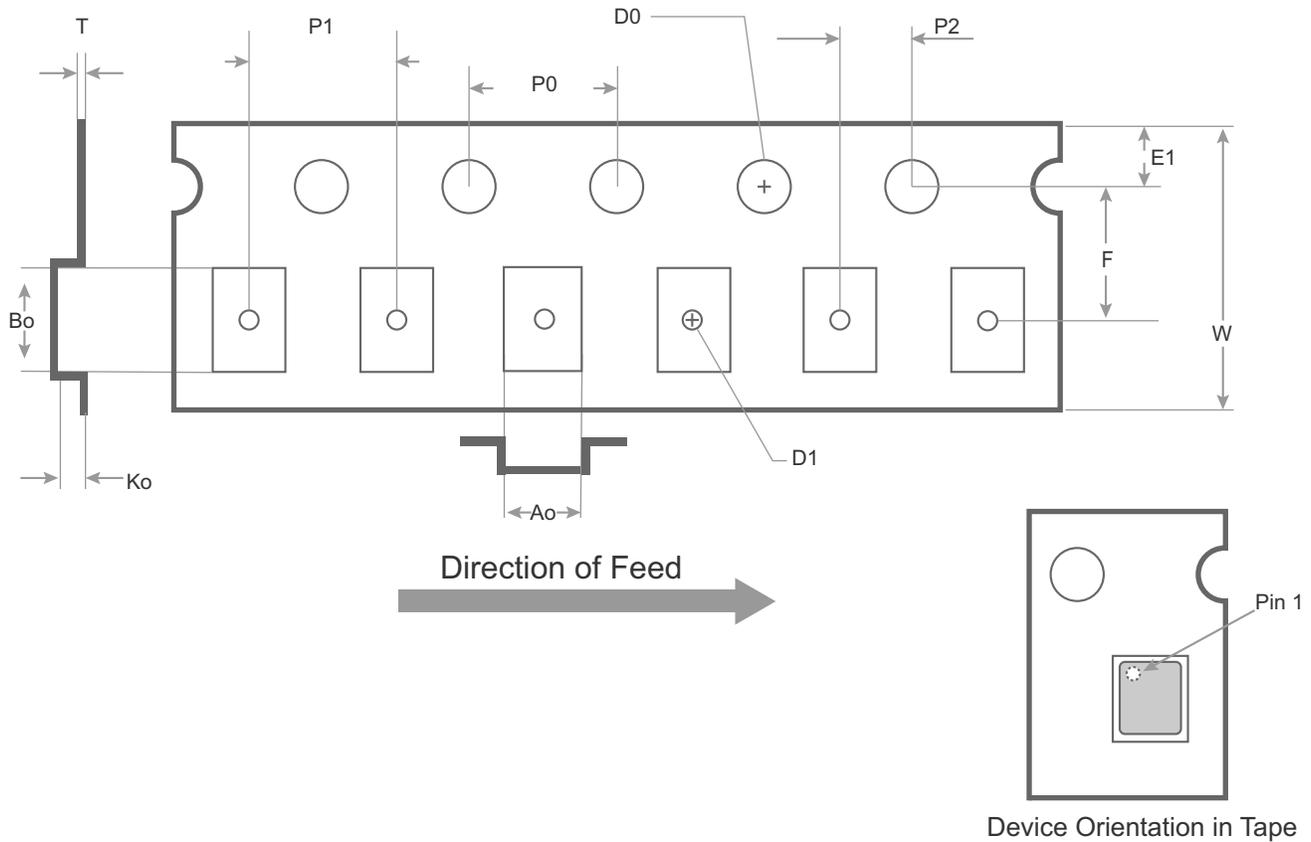
Figure 3 • Package Mechanical Drawing for the 20-lead 3×3 mm LGA



## Tape and Reel Specification

This section provides the PE42528 tape and reel specification.

Figure 4 • PE42528 Tape and Reel Specification



### Notes:

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

Table 6 • PE42528 Tape and Reel Dimensions

Carrier Tape Dimensions					
Pocket	Nominal	Tolerance	Pocket	Nominal	Tolerance
Ao	3.30	±0.1	D1	1.5	Min.
Bo	3.30	±0.1	D0	1.55	±0.05
Ko	1.10	±0.1	E1	1.75	±0.1
P1	8.00	±0.1	P0	4.0	±0.1
W	12.00	±0.3	P2	2.0	±0.05
F	5.5	±0.05	T	0.2	±0.05

## Ordering Information

Table 7 • PE42528 Order Codes and Shipping Methods

Order Code	Description	Packaging	Shipping Method
PE42528A-X	PE42528 SPDT RF Switch	20-lead 3×3 mm LGA	500 IC/tape and reel
PE42528A-Z			3000 IC/tape and reel
EK42528-88	PE42528 SPDT RF Switch Connectorized EVK	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](mailto:sales@psemi.com).

## Sales Contact

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

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