PE42528

Document Category: Advance Information

UltraCMOS® SPDT RF Switch, 9 kHz–30 GHz

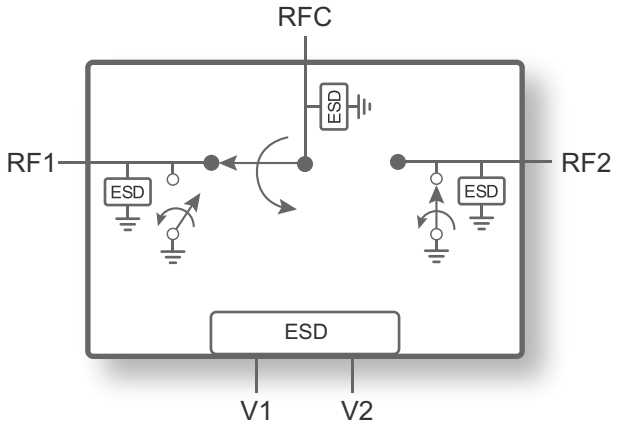
Features

- 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(*) All pins RF pins to GND	–	 600 1000	 V V
Note: * 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)[1]	–	–	TBD	dBm
RF input power, pulsed (RFc–RFx)[2]	–	–	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 = 50Ω), 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 100 MHz–1 GHz 1 GHz–10 GHz 10 GHz–20 GHz 20 GHz–30 GHz 30 GHz–40 GHz	–	0.86 1.00 1.33 1.61 1.61 2.00	–	dB dB dB dB dB dB
Return loss RFc port	RFc–RFx	<100 MHz 100 MHz–1 GHz 1 GHz–10 GHz 10 GHz–20 GHz 20 GHz–30 GHz 30 GHz–40 GHz	–	21.8 22.0 18.3 18.1 18.1 12.7	–	dB dB dB dB dB dB
Return loss RFx port	RFc–RFx	<100 MHz 100 MHz–1 GHz 1 GHz–10 GHz 10 GHz–20 GHz 20 GHz–30 GHz 30 GHz–40 GHz	–	22.0 22.5 22.5 18.4 18.6 16.9	–	dB dB dB dB dB dB
Isolation RFc–RFx OFF port	All paths	<100 MHz 100 MHz–1 GHz 1 GHz–10 GHz 10 GHz–20 GHz 20 GHz–30 GHz 30 GHz–40 GHz	–	65 61 46 43 40 35	–	dB dB dB dB dB dB
Isolation RFx–RFx OFF port	All paths	<100 MHz 100 MHz–1 GHz 1 GHz–10 GHz 10 GHz–20 GHz 20 GHz–30 GHz 30 GHz–40 GHz	–	66 62 51 50 47 38	–	dB dB dB dB dB dB
Pin CW maximum	–	–	–	29 dBm @ T_{CASE} 85 °C 25 dBm @ T_{CASE} 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 +25 dBm output power, 2 GHz +25 dBm output power, 6.5 GHz +25 dBm output power, 13.4 GHz	–	73 77 89 92	–	dBc dBc dBc dBc
Input 1dB compression point(1)	–	18 GHz	–	34	–	dBm
Input IP2	–	1 GHz 2 GHz 6.5 GHz 13.4 GHz	–	93 98 109 112	–	dBm dBm dBm dBm
Input IP3	–	1 GHz 2 GHz 6 GHz 13.4 GHz	–	49 48 46 46	–	dBm dBm dBm dBm
Video feed through(2)	–	DC measurement	–	30	–	mV_{PP}
RF T_{RISE}/T_{FALL}	–	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

Notes:
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)

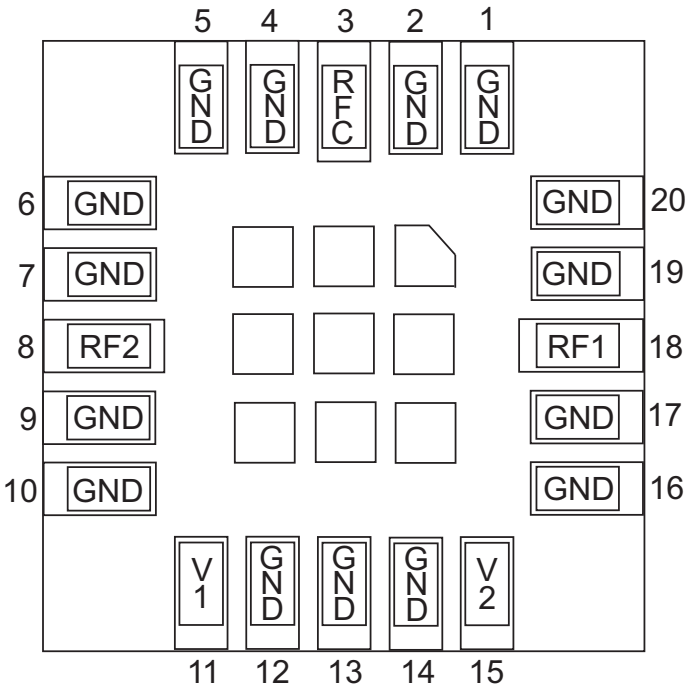


Table 4 • PE42528 Pin Descriptions

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:

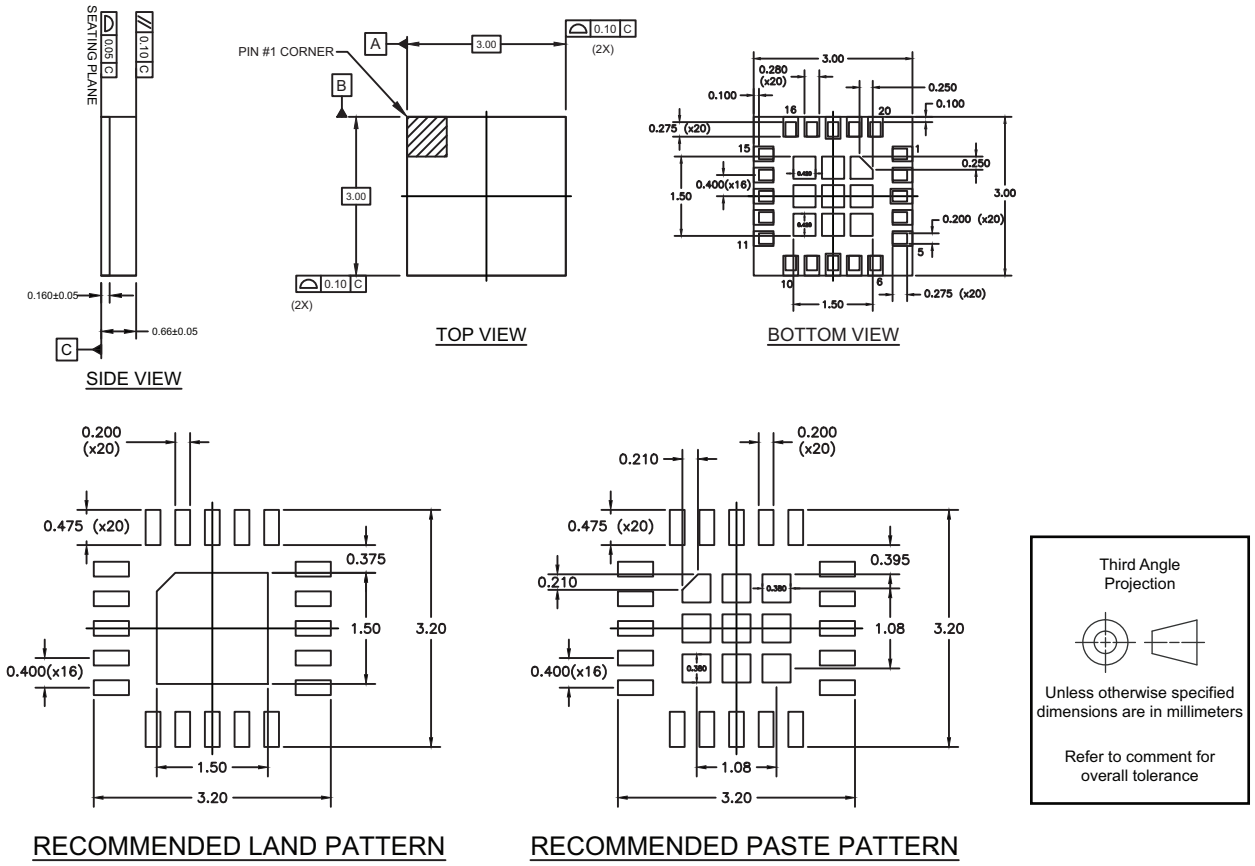
- Moisture sensitivity level
- Package drawing
- Package marking
- Tape-and-reel information

Moisture Sensitivity Level

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

Package Drawing

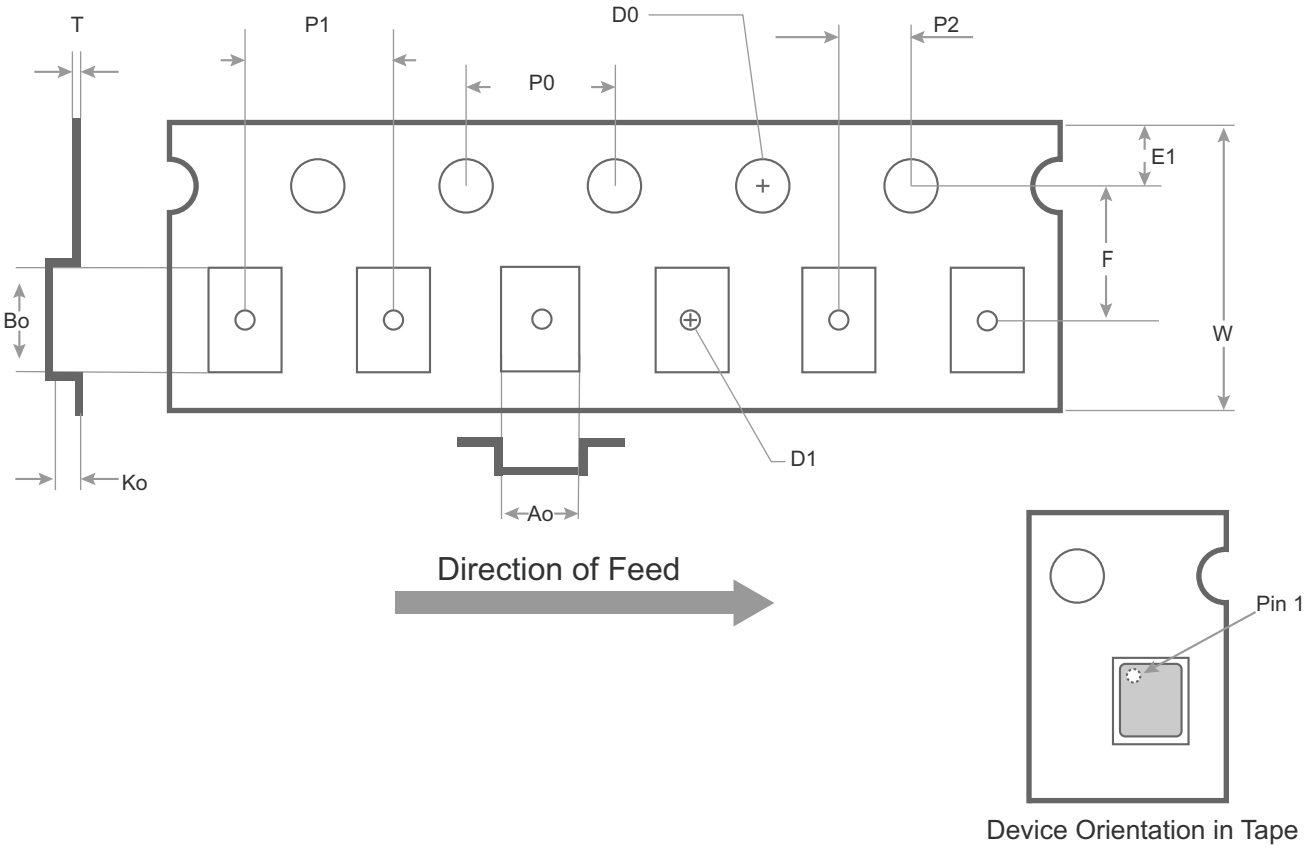
Figure 3 • Package Mechanical Drawing for the 20-lead 3×3 mm LGA



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.

Sales Contact

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

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