PE42544

Product Specification

High-isolation UltraCMOS+™ SP4T RF Switch, 9 kHz to 8.5 GHz

Features

- Operating frequency: 9 kHz to 8.5 GHz
- High isolation: 40 dB at 6 GHz
- Low insertion loss: 1.4 dB at 8.5 GHz
- High linearity: 61 dBm IIP3
- Fast switching time: 300 ns
- Operating temperature range: -40 to +105 °C
- Package: 20-lead 3.0 × 3.0 mm QFN

Applications

- Test and measurement:
  - Signal sources
  - Communication testers
  - Spectrum analyzers
  - Network analyzers
- Automated test equipment (ATE)
- General purpose Tx/Rx switches

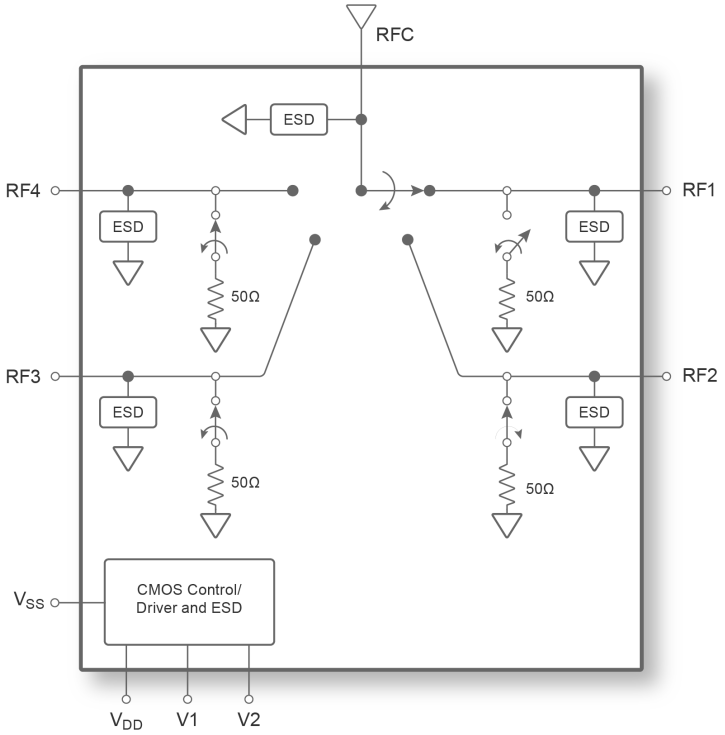

Figure 1. PE42544 functional diagram

Product description

The PE42544 is a HaRP™ technology-enhanced SP4T RF switch designed for use in test/ATE and other high-performance RF applications. It consists of four symmetric RF ports with very high isolation up to 8.5 GHz.

The PE42544 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.

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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 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. PE42544 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)	–	–	1500	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 PE42544 recommended operating conditions. Do not operate the device outside the operating conditions listed below.

Table 2. PE42544 recommended operating conditions

Parameter	Condition	Min	Typ	Max	Unit
V_{DD} positive supply voltage	–	2.3	3.3	5.5	V
V_{DD} negative supply voltage	–	-3.6	-3.3	-3	V
I_{DD} positive supply current (internal negative voltage generator)	–	–	100	200	µA
I_{DD} positive supply current (external negative voltage generator)	–	–	60	150	µA
I_{SS} external supply current	–	–	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 PE42544 key electrical specifications at 25 °C and $Z_L = Z_S = 50\Omega$, unless otherwise specified.

Table 3. PE42544 electrical specifications

Parameter	Condition	Min	Typ	Max	Unit
Operating frequency	–	9 kHz	–	8.5 GHz	As shown
Insertion loss	9 kHz < Freq ≤ 6 GHz	–	1.0	–	dB
	6 GHz < Freq ≤ 8.5 GHz	–	1.4	–	
Isolation	RFC–RFx, 9 kHz < Freq ≤ 6 GHz	–	40	–	dB
	RFC–RFx, 6 GHz < Freq ≤ 8.5 GHz	–	33	–	
	RFx–RFx, 9 kHz < Freq ≤ 6 GHz	–	41	–	
	RFx–RFx, 6 GHz < Freq ≤ 8.5 GHz	–	32	–	
Return loss, ON port	RFC–RFx, 9 kHz < Freq ≤ 6 GHz	–	19	–	dB
	RFC–RFx, 6 GHz < Freq ≤ 8.5 GHz	–	20	–	
Return loss, terminated port	RFC–RFx, 9 kHz < Freq ≤ 6 GHz	–	18	–	dB
	RFC–RFx, 6 GHz < Freq ≤ 8.5 GHz	–	16	–	
Input P0.1dB compression point	RFC–RFx, Freq = 2500 MHz	–	37	–	dBm
Input IP3	P_{IN} = 20 dBm/tone, F_{RF1} = 2500 MHz, F_{RF2} = 2570 MHz	–	61	–	dBm
Switching time	50% CTRL to 90% or 10% RF P_{IN} = 10 dBm, Freq = 8 GHz	–	300	–	ns
Settling time	Power settled to ± 0.1 dB of the final value P_{IN} = 10 dBm, Freq = 8 GHz	–	320	–	ns

Control logic

Table 4. PE42544 truth table

Mode	V2	V1
RF1 ON	0	0
RF2 ON	0	1
RF3 ON	1	0
RF4 ON	1	1

Power derating curve

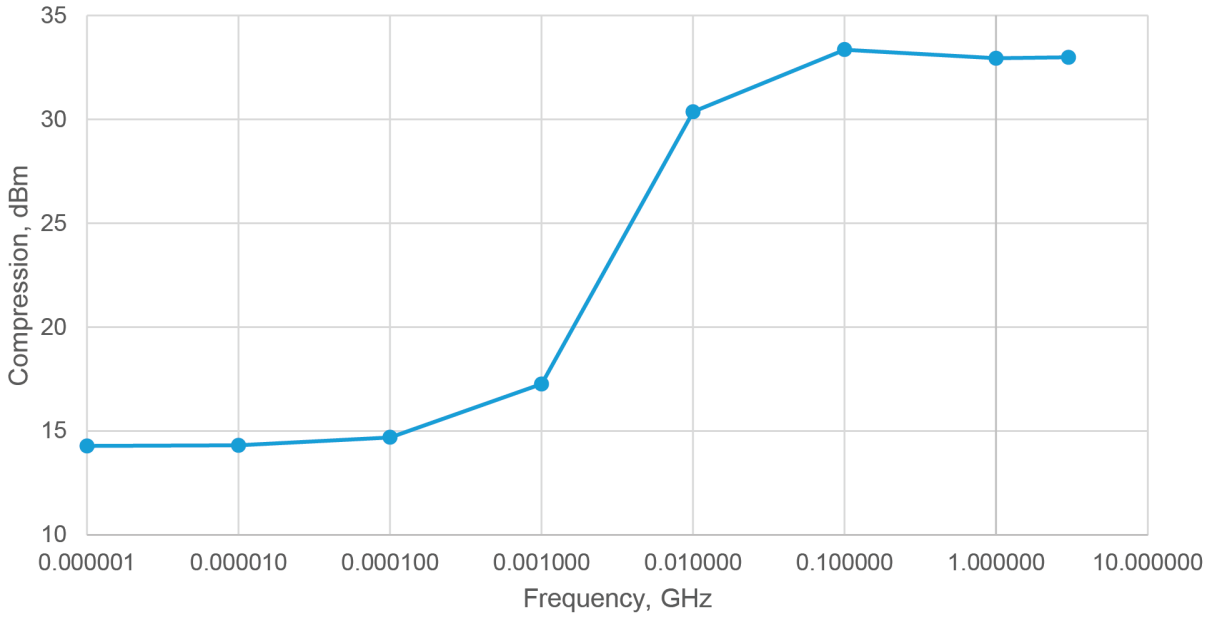


Figure 2. Low-frequency power derating curve

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.

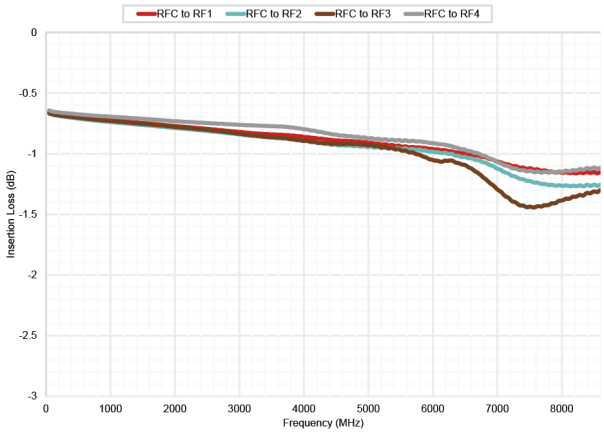


Figure 3. Insertion loss (RFC–RFx) vs. frequency at V_{SS} = -3.3V

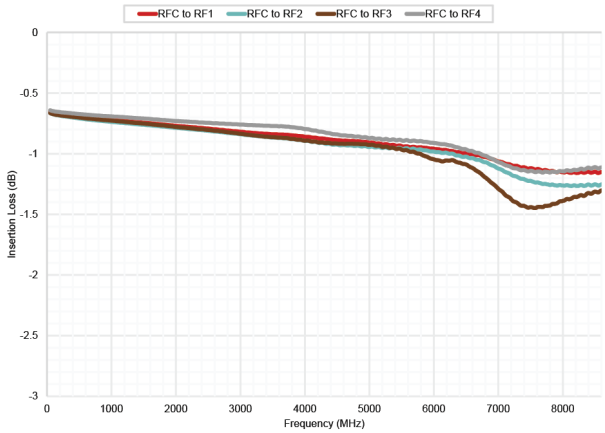


Figure 4. Insertion loss (RFC–RFx) vs. frequency at V_{SS} = 0V

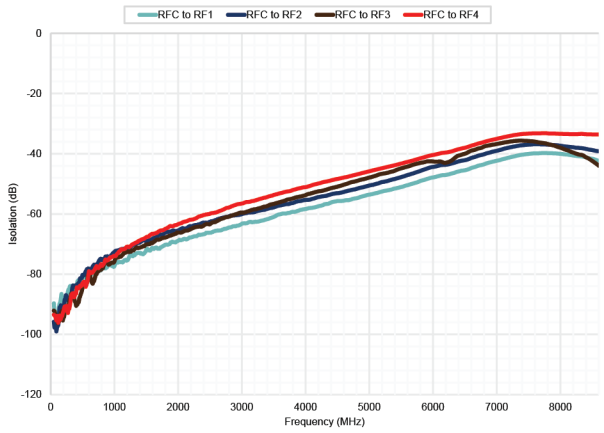


Figure 5. Isolation (RFC–RFx) vs. frequency at V_{SS} = -3.3V

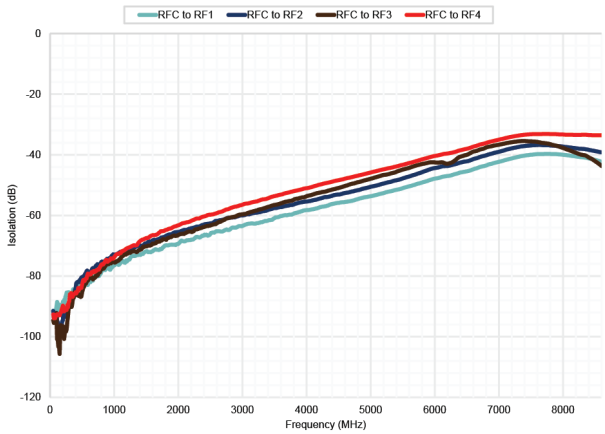


Figure 6. Isolation (RFC–RFx) vs. frequency at V_{SS} = 0V

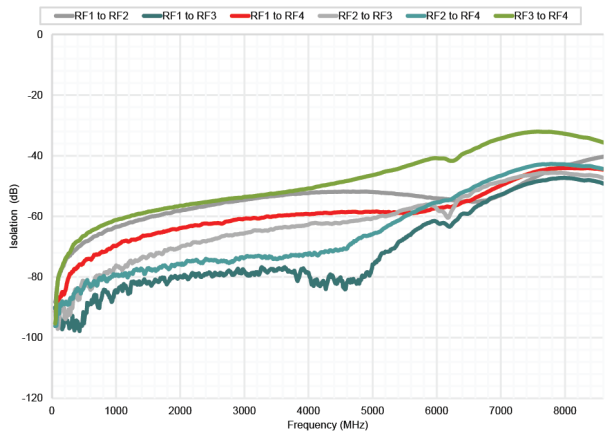


Figure 7. Isolation (RFx–RFx) vs. frequency at V_{SS} = -3.3V

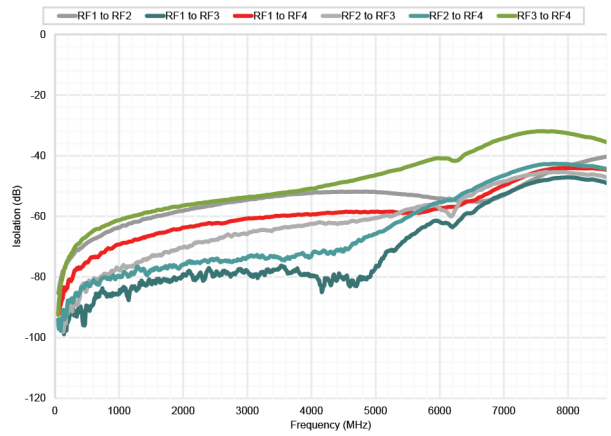


Figure 8. Isolation (RFx–RFx) vs. frequency at V_{SS} = 0V

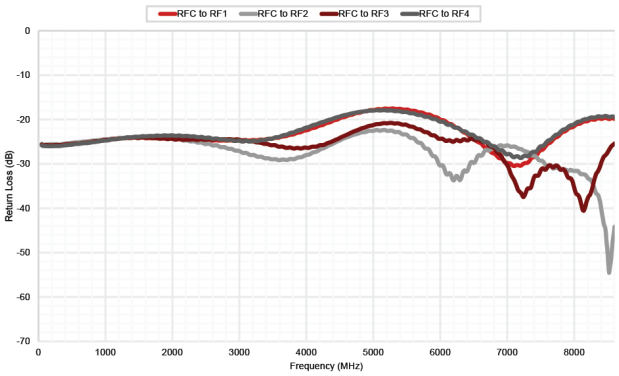


Figure 9. Return loss (RFC–RFx) vs. frequency at V_{SS} = -3.3V

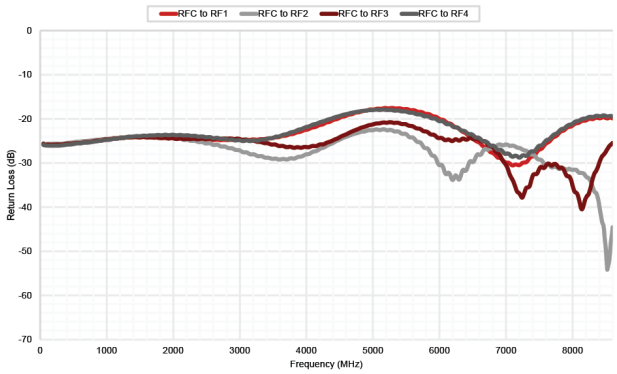


Figure 10. Return loss (RFC–RFx) vs. frequency at V_{SS} = 0V

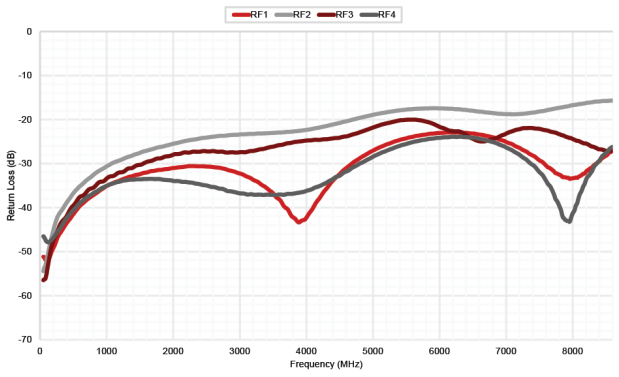


Figure 11. Return loss (RFx terminated) vs. frequency at V_{SS} = -3.3V

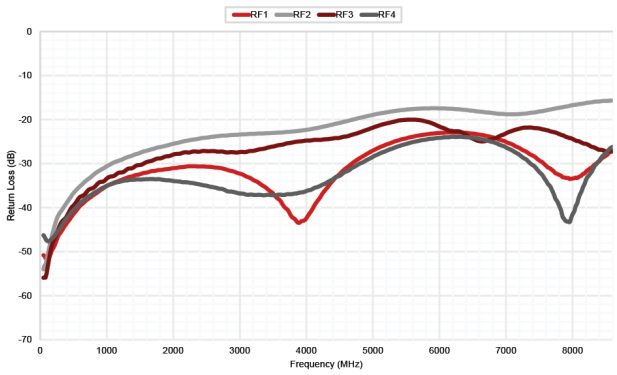


Figure 12. Return loss (RFx terminated) vs. frequency at V_{SS} = 0V

Pin configuration

Figure 13 shows the PE42544 pin configuration for the 20-lead 3.0 × 3.0 mm QFN package, and Table 5 lists the description for each pin.

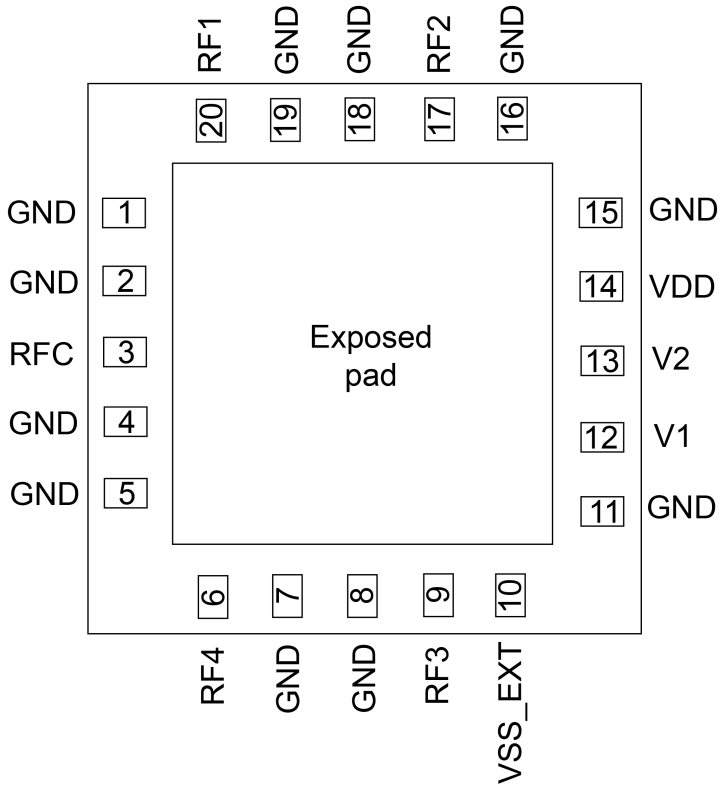


Figure 13. PE42544 pin configuration, top view

Table 5. PE42544 pin descriptions

Pin no.	Pin name	Description
1, 2, 4, 5, 7, 8, 11, 15, 16, 18, 19	GND	Ground
3	RFC	RF common port
6	RF4	RF port 4
9	RF3	RF port 3
10	VSS_EXT	V_{SS} external input
12	V1	Digital control input 1
13	V2	Digital control input 2
14	VDD	Supply voltage
17	RF2	RF port 2
20	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 PE42544 moisture sensitivity level rating for the 20-lead 3.0 × 3.0 mm QFN package is MSL1.

Package drawing

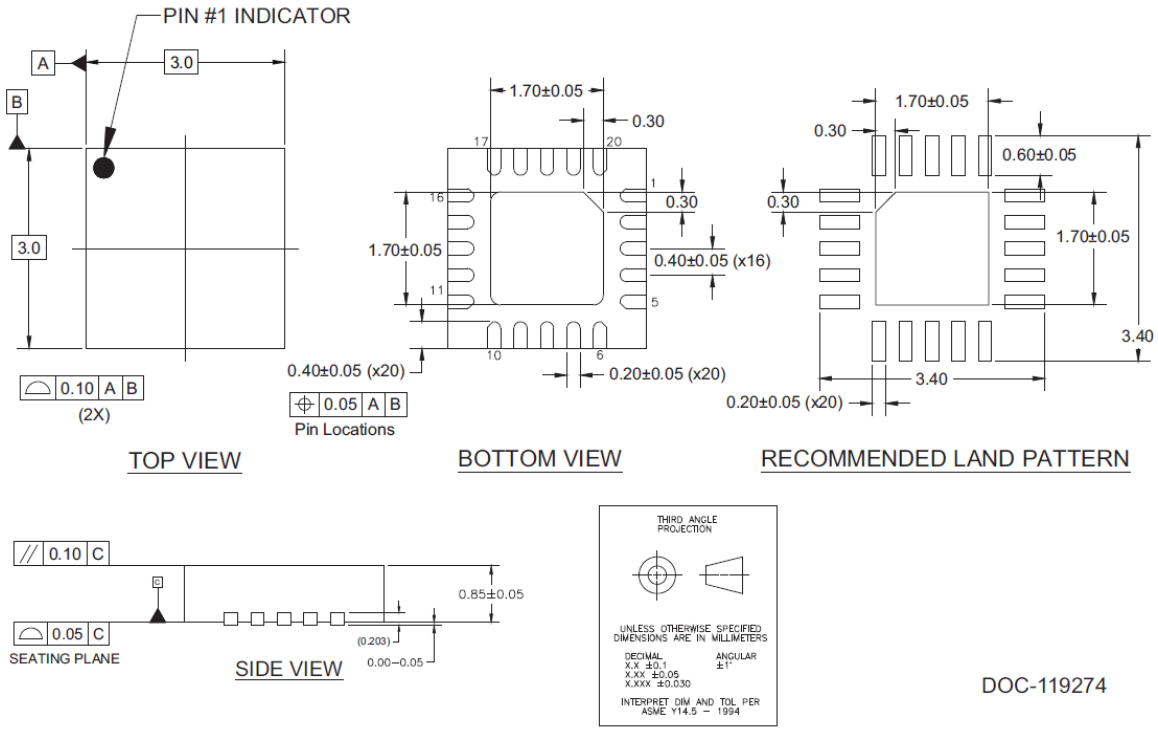


Figure 14. Package mechanical drawing for the 20-lead 3.0 × 3.0 mm QFN package

Top-marking specification

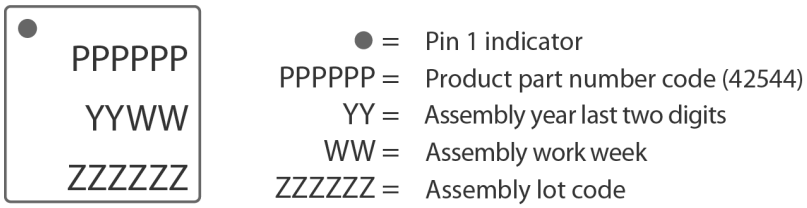
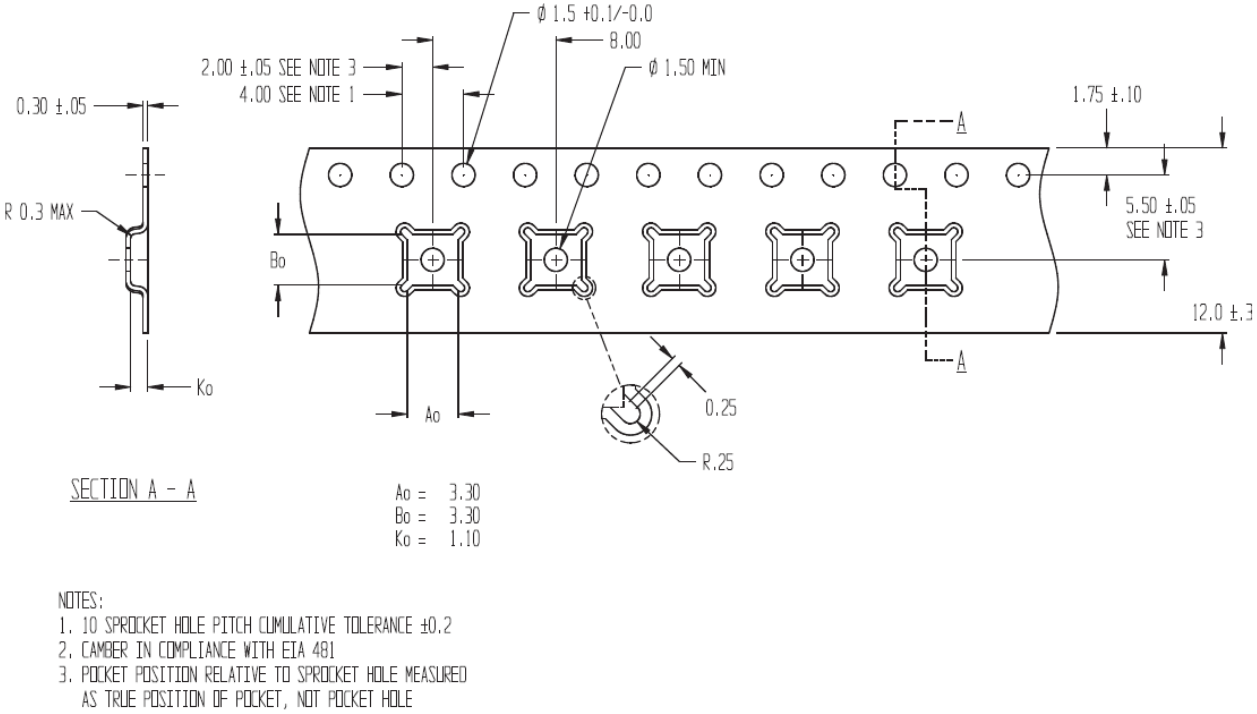


Figure 15. PE42544 package marking specification

Tape and reel specification



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

Figure 16. Tape and reel specification for the 20-lead 3.0 × 3.0 mm QFN package

Ordering information

Order code	Description	Packaging	Shipping method
PE42544A-Z	PE42544 UltraCMOS+™ SP4T RF Switch	Green 20-lead 3.0 × 3.0 mm QFN	3000 units/T&R
EK42544-01	PE42544 evaluation kit	Evaluation kit	1/box

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