PE423213

Product Specification

UltraCMOS+™ SPDT RF Switch, 0.3–10.6 GHz

Features

- Extended temperature range: -40 to +105 °C
- 1-bit control RF switch
- Broadband frequency support: 0.3 to 10.6 GHz
- Low current consumption: 95 nA
- Low insertion loss:
  - 0.4 dB at 6 GHz
  - 0.5 dB at 8.5 GHz
  - 0.7 dB at 10.6 GHz
- High isolation:
  - 28 dB at 6 GHz
  - 25 dB at 8.5 GHz
  - 18 dB at 10.6 GHz
- Input P1dB: +24 dBm at 8.0 GHz
- Switching time: 100 ns
- ESD performance:
  - 2000V HBM
  - 500V CDM
- Package: 6-lead 1.6 × 1.6 mm DFN

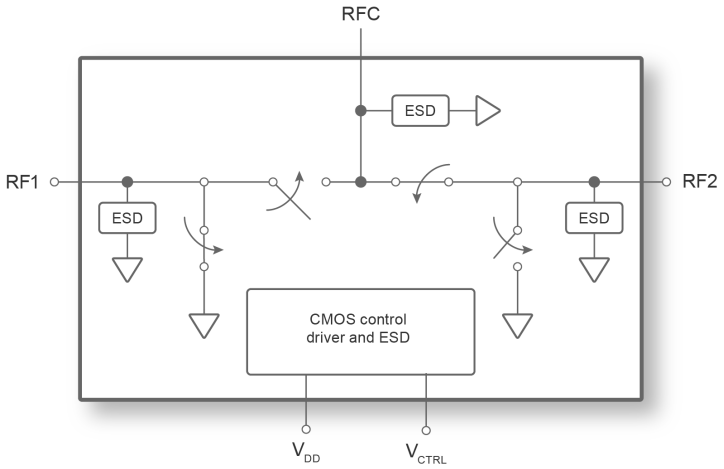


Figure 1. PE423213 functional diagram

Applications

- Wi-Fi®, Bluetooth®, UWB, and ISM-band connectivity
- Smart home automation, security, and surveillance
- Secure access control, asset tracking, and indoor positioning
- Wearables and industrial IoT

Product description

The PE423213 is a HaRP™ technology-enhanced reflective SPDT RF switch designed for use in high-performance ISM, WLAN, Wi-Fi, Bluetooth, and UWB applications supporting frequencies up to 10.6 GHz.

This switch features low power consumption, low insertion loss, high isolation, and fast switching speed, all in a compact 6-lead 1.6 × 1.6 mm DFN package. The PE423213 also has robust ESD and temperature performance.

The PE423213 is manufactured on the pSemi1 UltraCMOS+™ process, a patented silicon-on-insulator (SOI) technology.

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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. Absolute maximum ratings

Parameter or condition	Symbol	Min	Max	Unit
Supply voltage	V_{DD}	-0.3	3.6	V
Control voltage	V_{CTRL}	-0.3	3.6	V
RF input power, CW, 300 MHz–10.6 GHz	$P_{IN,MAX,CW}$	–	25	dBm
Storage temperature range	T_{ST}	-65	150	°C
ESD voltage HBM, all pins(1)	$V_{ESD,HBM}$	–	2000	V
ESD voltage CDM, all pins(2)	$V_{ESD,CDM}$	–	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 PE423213 recommended operating conditions. Do not operate devices outside the operating conditions listed below.

Table 2. Recommended operating conditions

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage	V_{DD}	2.7	3.3	3.6	V
Supply current	I_{DD}	85	95	110	nA
Control input high	V_{CTRL}	1.7	1.8	1.9	V
Control input low	V_{CTRL}	-0.1	0.0	0.7	V
RF input power, CW, 300 MHz–10.6 GHz	$P_{IN,CW}$	–	–	21	dBm
Operating temperature range	T_{OP}	-40	+25	+105	°C

Control logic

Table 3. Truth table

V_{CTRL}	ON port
0	RFC–RF1
1	RFC–RF2

Electrical specifications

Table 4 lists the PE423213 key electrical specifications at -40 °C to +105 °C, V_{CTRL} = 0V or 1.8V, V_{DD} = 3.3V, and Z_L = Z_S = 50Ω, unless otherwise specified.

Table 4. Electrical specifications

Parameter	Symbol	Path	Condition	Min	Typ	Max	Unit
Operating frequency	–	–	–	0.3	–	10.6	GHz
Insertion loss	IL	RFC–RFx	0.3–6.0 GHz 6.0–8.5 GHz 8.5–10.6 GHz	–	0.4 0.5 0.7	0.6 0.7 0.9	dB
Isolation	ISO	RFC–RFx	0.3–6.0 GHz 6.0–8.5 GHz 8.5–10.6 GHz	26 23 17	28 25 18	–	dB
Return loss (common and active port)	RL	RFC–RFx	0.3–6.0 GHz 6.0–8.5 GHz 8.5–10.6 GHz	14 13 12	21 22 23	–	dB
Input 1-dB compression point	P1dB	RFC–RFx	0.3–8.0 GHz 8.0–9.5 GHz	23 22	24 23	–	dBm
Second harmonic	2fo	RFC–RFx	fo = 399 MHz fo = 4492 MHz RF input power = 20 dBm	–	-70 -74	-66 -70	dBm
Third harmonic	3fo	RFC–RFx	fo = 399 MHz RF input power = 20 dBm	–	-79	-70	dBm
Switching time	t_{SW}	–	50% CTRL to 90% or 10% of final value	–	100	135	ns

Typical performance data

Figures 2–19 show the typical performance data at 25 °C, V_{CTRL} = 0V or 1.8V, V_{DD} = 3.3V, and $Z_L = Z_S$ = 50Ω, unless otherwise specified.

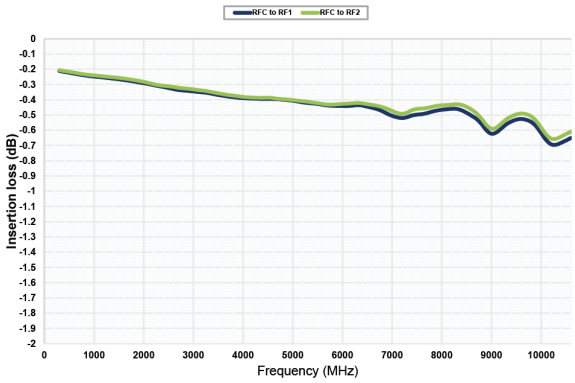


Figure 2. Insertion loss vs. switch path

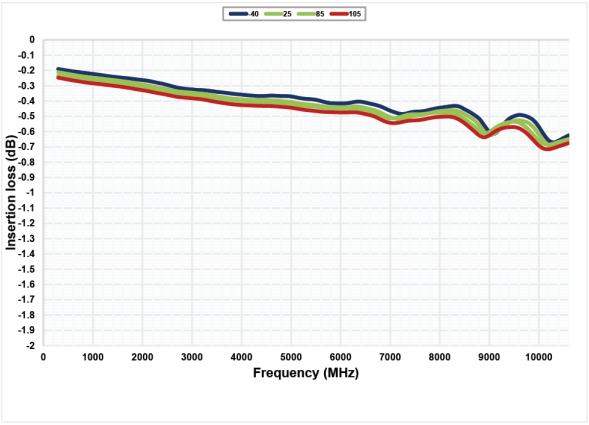


Figure 3. Insertion loss vs. temperature, RFC–RF1

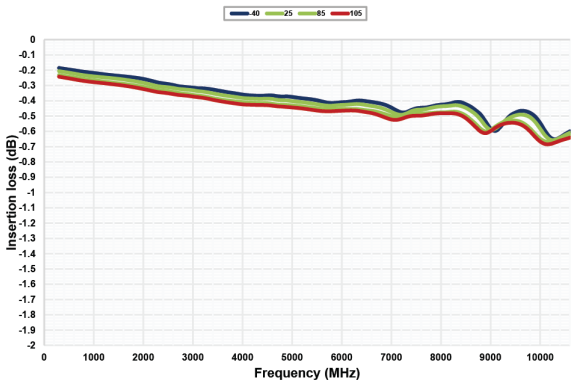


Figure 4. Insertion loss vs. temperature, RFC–RF2

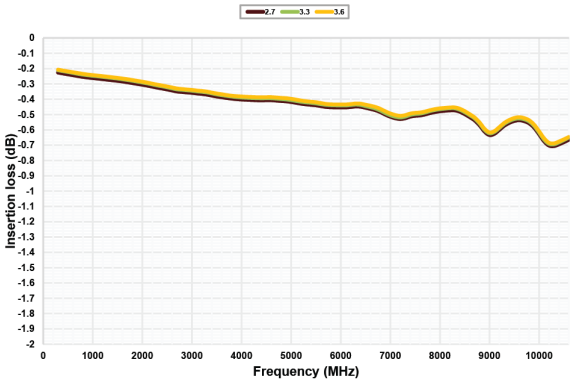


Figure 5. Insertion loss vs. V_{DD}, RFC–RF1

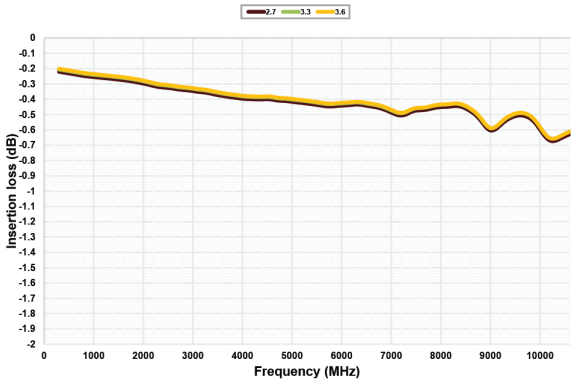


Figure 6. Insertion loss vs. V_{DD}, RFC–RF2

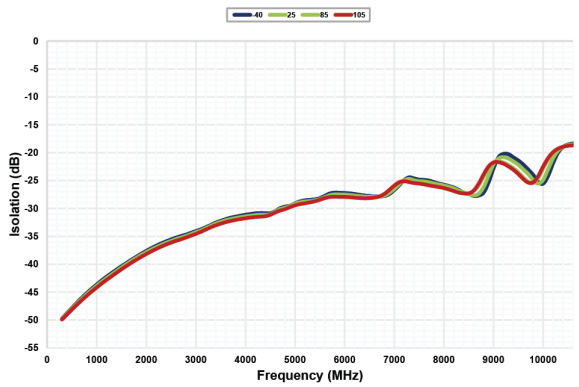


Figure 7. Isolation vs. temperature, RFC–RF1

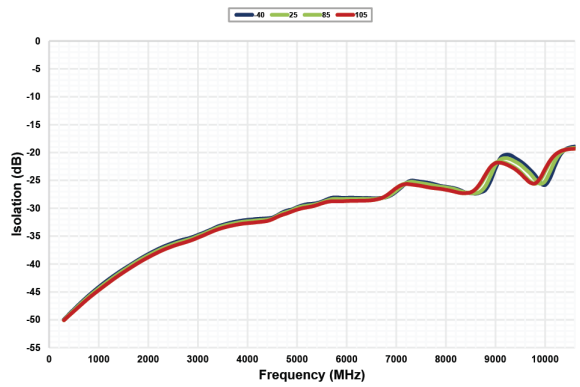


Figure 8. Isolation vs. temperature, RFC–RF2

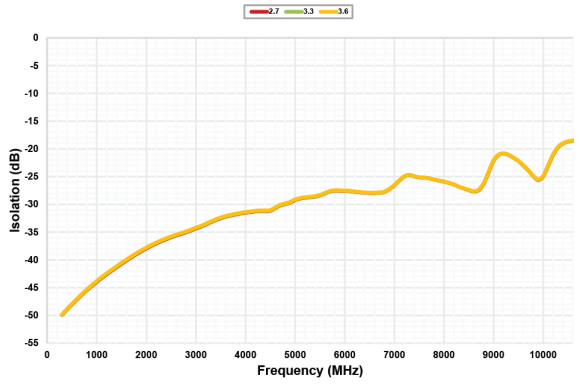


Figure 9. Isolation vs. V_{DD}, RFC–RF1

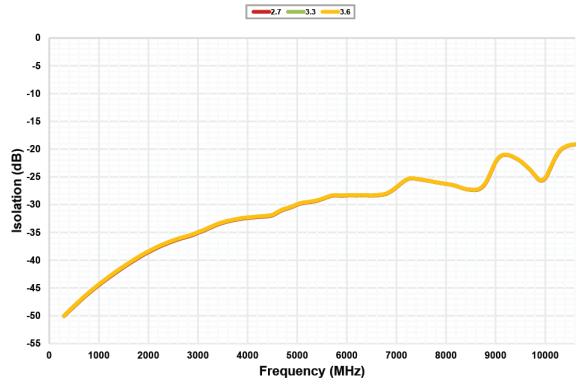


Figure 10. Isolation vs. V_{DD}, RFC–RF2

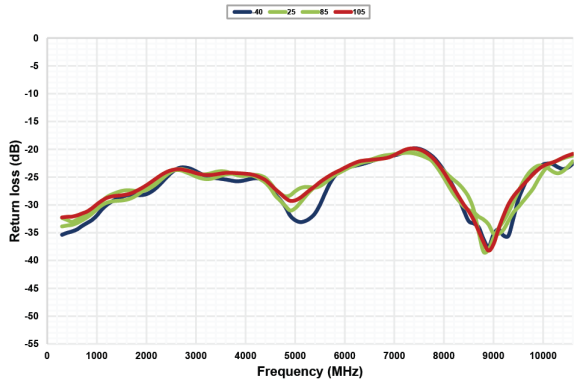


Figure 11. RFC port return loss vs. temperature

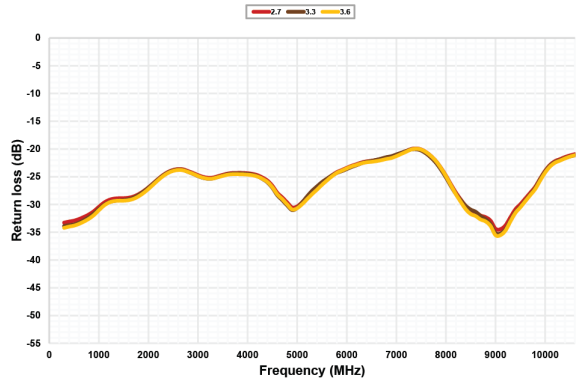


Figure 12. RFC port return loss vs. V_{DD}

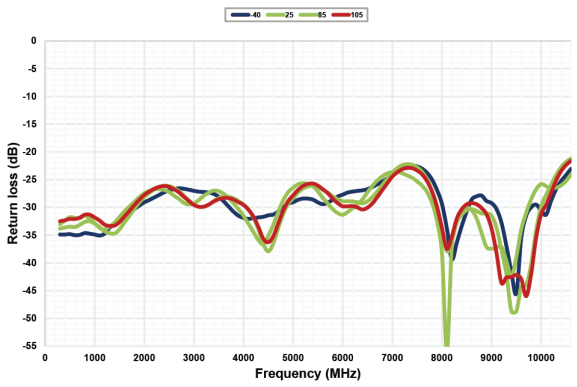


Figure 13. RF1 port return loss vs. temperature

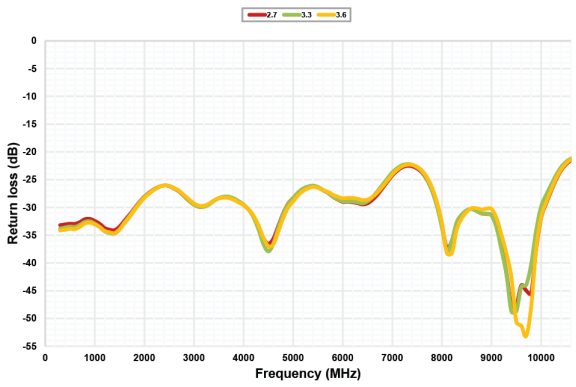


Figure 14. RF1 Port return loss vs. V_{DD}

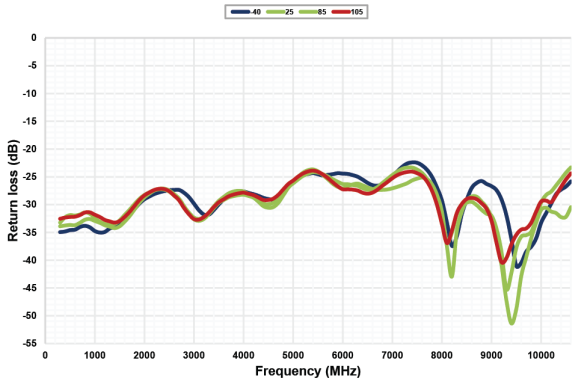


Figure 15. RF2 port return loss vs. temperature

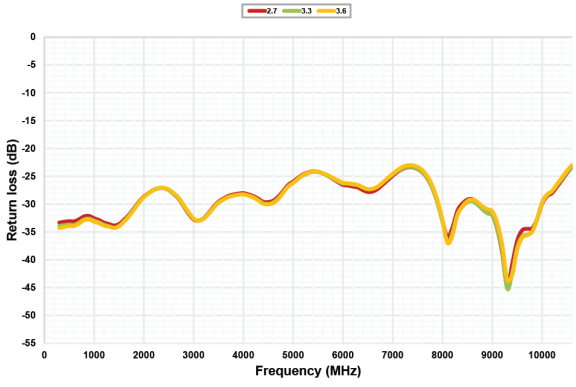


Figure 16. RF2 port return loss vs. V_{DD}

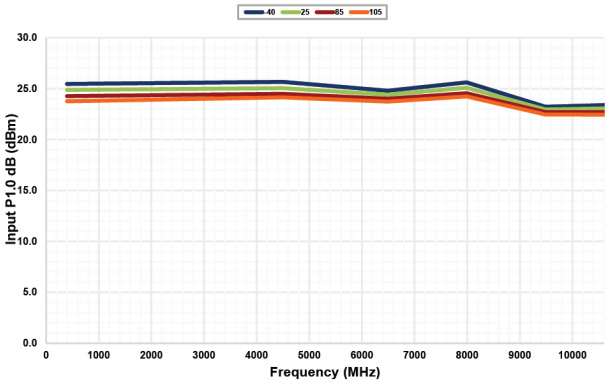


Figure 17. Compression vs. temperature, RFC–RF1

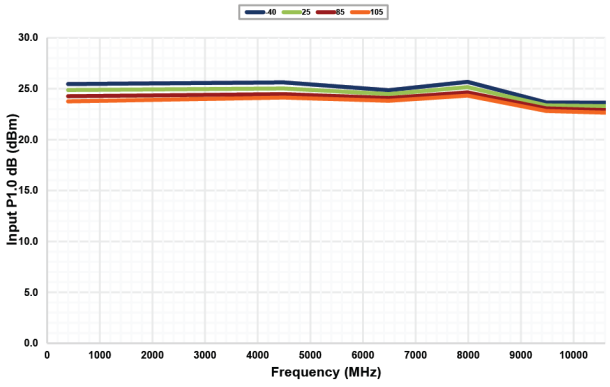


Figure 18. Compression vs. temperature, RFC–RF2

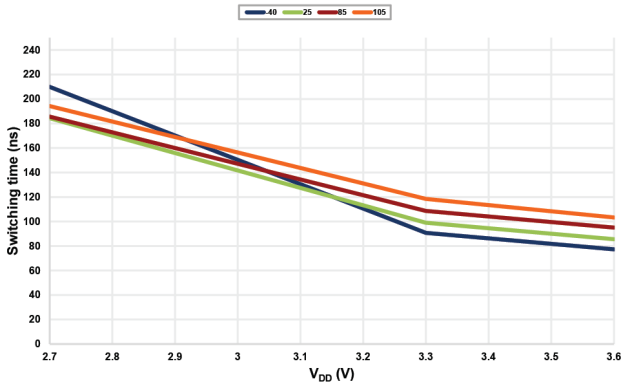


Figure 19. RF1 port switch on time vs. V_{DD}

Pin configuration

Figure 20 shows the PE423213 pin configuration for the 6-lead 1.6 × 1.6 mm DFN package, and Table 5 lists the description for each pin.

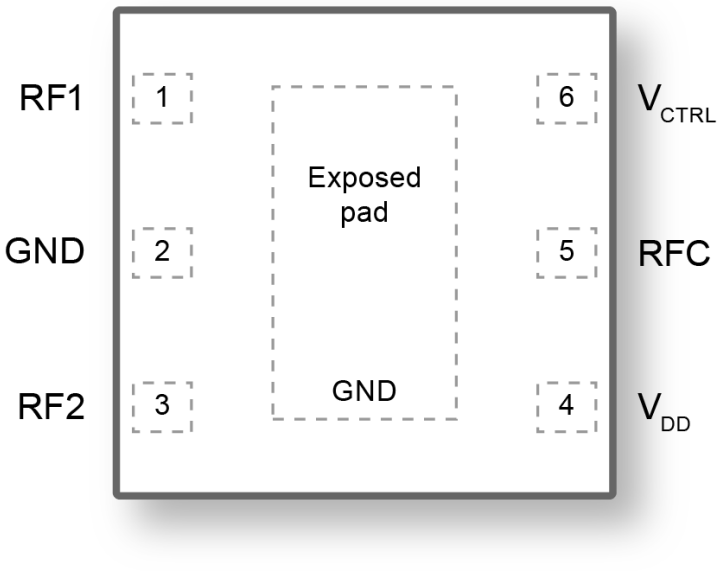


Figure 20. Pin configuration, top view

Table 5. Pin descriptions

Pin no.	Pin name	Description
1	RF1	RF port 1
2	GND	Ground
3	RF2	RF port 2
4	V_{DD}	Supply voltage
5	RFC	RF common port
6	V_{CTRL}	Control voltage
Pad	GND	Exposed pad. Ground for proper operation.

Application schematic

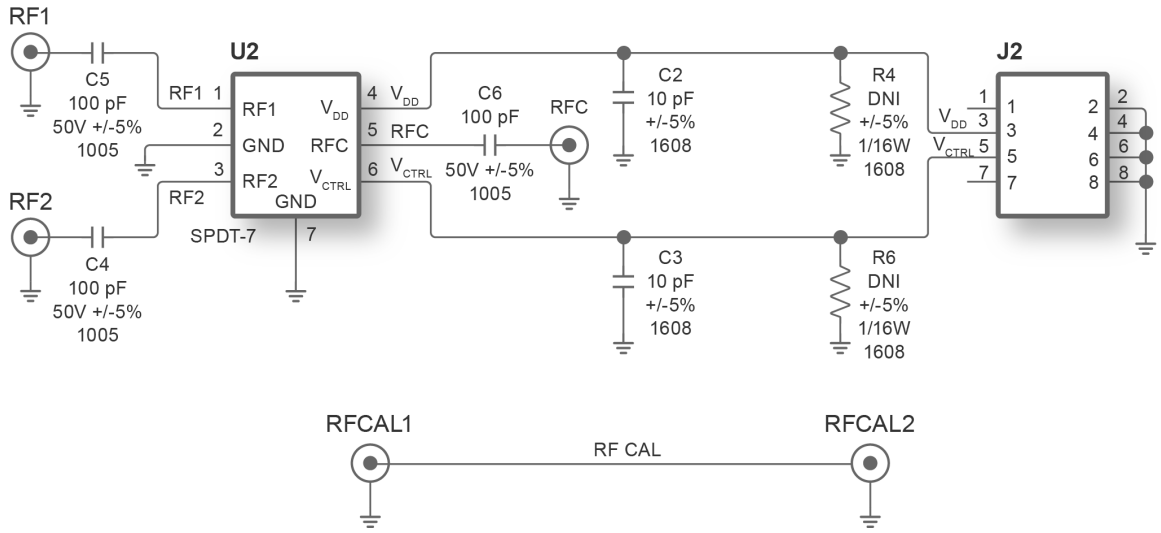


Figure 21. PE423213 application schematic

Packaging information

This section provides the following information:

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

Moisture sensitivity level

The PE423213 moisture sensitivity level rating for the 6-lead 1.6 × 1.6 mm DFN package is MSL1.

Package drawing

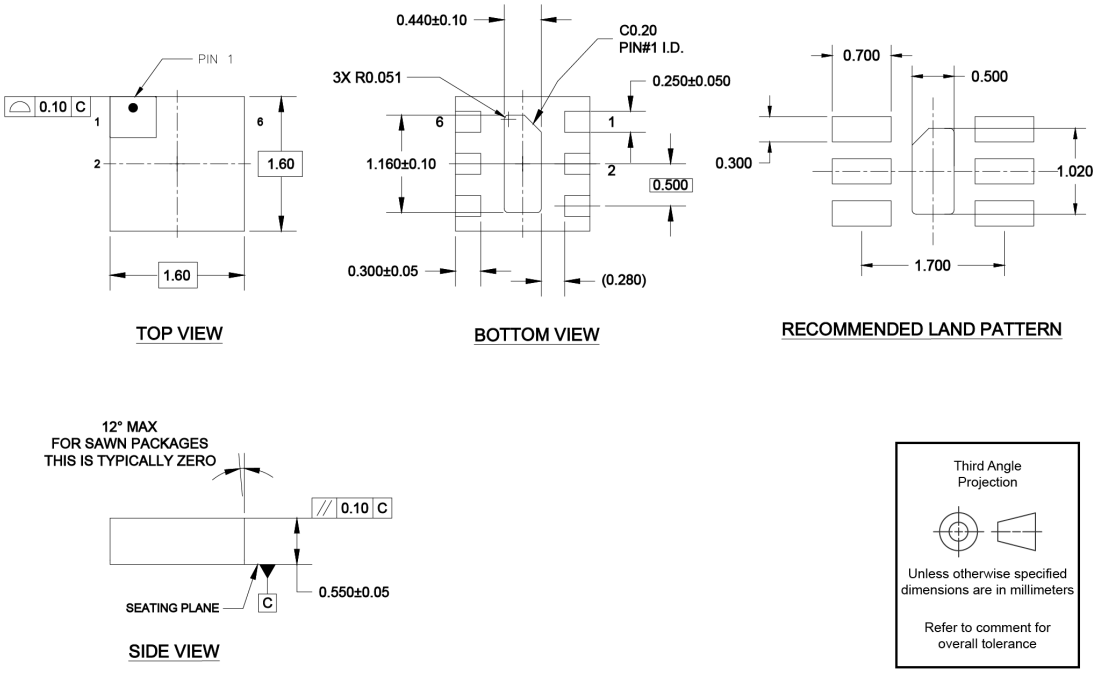


Figure 22. Package mechanical drawing for the 6-lead 1.6 × 1.6 mm DFN package

Top-marking specification

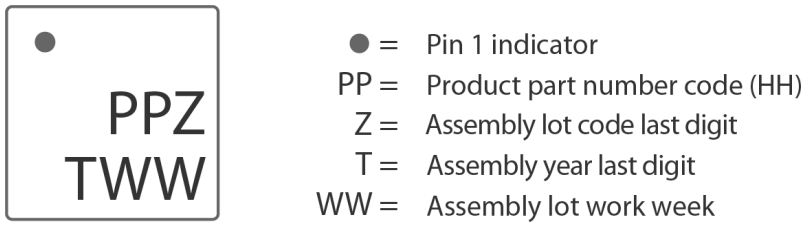


Figure 23. Package marking specification

Tape and reel specification

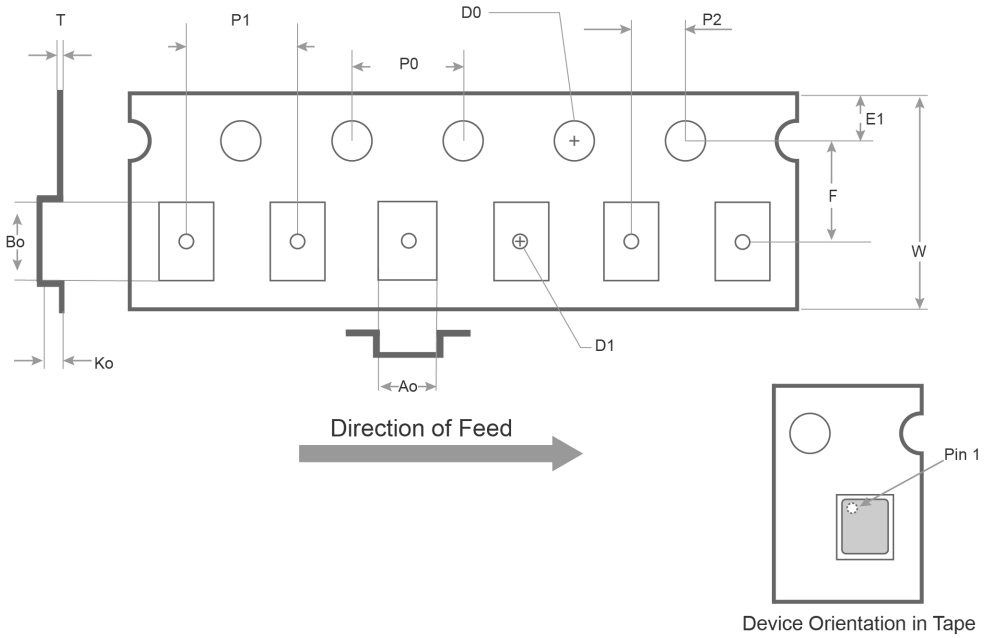


Figure 24. Tape and reel specification for the 6-lead 1.6 × 1.6 mm DFN package

Notes:

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

Table 6. Tape and reel dimensions

Carrier tape dimensions					
Pocket	**Nominal**	**Tolerance**	**Pocket**	**Nominal**	**Tolerance**
Ao	1.85	±0.05	**D1**	1.00	±0.05
Bo	1.85	±0.05	**D0**	1.50	+0.10/-0
Ko	0.80	±0.10	**E1**	1.75	±0.10
P1	4.00	±0.10	**P0**	4.00	±0.10
W	8.00	+0.30/-0.10	**P2**	2.00	±0.05
F	3.50	±0.05	**T**	0.20	±0.05

Ordering information

Order code	Description	Packaging	Shipping method
PE423213A-Z	PE423213 SPDT RF switch	Green 6-lead 1.6 × 1.6 mm DFN	3000 units/T&R
EK423213-01	PE423213 evaluation kit	Evaluation kit	1/box

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