WINSOURCE ELECTRONICS

THE DATASHEET OF

PE423211A-Z

PE423211

Document Category: Product Specification

UltraCMOS® SPDT RF Switch, 300 MHz–10.6 GHz

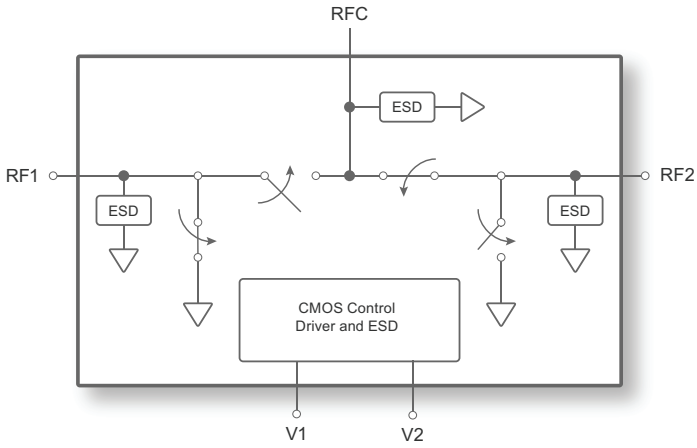
Features

- AEC-Q100 Grade 2-qualified
- Broadband frequency support: 0.3 to 10.6 GHz
- Suitable for ISM band, Bluetooth®, 802.11 a/b/g/n/ac/ax, and ultra-wideband (UWB)
- Low power consumption: 90 nA
- Low insertion loss:
  - 0.4 dB @ 6 GHz
  - 0.6 dB @ 8.5 GHz
  - 0.7 dB @ 10.6 GHz
- High isolation:
  - 27 dB @ 6 GHz
  - 18 dB @ 8.5 GHz
  - 18 dB @ 10.6 GHz
- P1dB: +24 dBm
- Switching time: 100 ns
- Operating temperature range: -40 to +105 °C
- ESD performance:
  - 2000V HBM
  - 500V CDM
- Packaging: 6-lead 1.6 × 1.6 mm DFN

Applications

- 802.11 a/b/g/n/ac/ax and Bluetooth
- Ultra-wideband (UWB)
- Remote keyless entry
- Telematics
- Infotainment
- In-cabin monitoring system (ICMS)
- General-purpose switching

Figure 1 ▪ PE423211 functional diagram



Product description

The PE423211 is a HaRP™ technology-enhanced reflective SPDT RF switch designed for use in high-performance ISM, WLAN 802.11 a/b/g/n/ac/ax, Bluetooth, and UWB applications, supporting bandwidths up to 10.6 GHz.

This switch features low power consumption, low insertion loss, high port-to-port isolation, fast switching speed, and high-power handling, all in a compact 6-lead 1.6 × 1.6 mm DFN package. The PE423211 device also has robust ESD and temperature performance.

The PE423211 is manufactured on pSemi's 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 specified in **Table 1**.

Latch-up immunity

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

Table 1 ▪ PE423211 absolute maximum ratings

Parameter or condition	Symbol	Min	Max	Unit
Digital input (V1)	V1	-0.3	3.6	V
Digital input (V2)	V2	-0.3	3.6	V
RF input power, 300-6000 MHz	$P_{MAX,ABS}$	–	25	dBm
RF input power, 8500-10600 MHz	$P_{MAX,ABS}$	–	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)	$V_{ESD,MM}$	–	500	V

Notes:
1) Human body model (MIL-STD 883 Method 3015).
2) Charged device model (JEDEC JESD22-C101).

Switching capability

The switching time is the time duration between the point that the control signal reaches 50% of the final value and the point that the output signal reaches within 10% or 90% of its target value.

Recommended operating conditions

Table 2 lists the PE423211 recommended operating conditions. Do not operate devices outside the operating conditions listed below.

Table 2 ▪ PE423211 recommended operating conditions

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage	–	2.7	3.3	3.6	V
Supply current	–	–	90	300	nA
Digital input high (V1/V2)	V_{IH}	2.7	–	3.6	V
Digital input low (V1/V2)	V_{IL}	-0.3	–	0.6	V
RF input power, CW, 300–10600 MHz	$P_{MAX,CW}$	–	–	22	dBm
Operating temperature range	T_{OP}	–40	25	105	°C

Control logic

Table 3 lists the PE423211 truth table.

Table 3 ▪ PE423211 truth table

V1	V2	ON Path
0	1	RFC-RF1
1	0	RFC-RF2

Electrical specifications

Table 4 lists the PE423211 key electrical specifications at 25°C, V1 = 0V, V2 = 3.3V, and $Z_L = Z_S = 50\Omega$, unless otherwise specified.

Table 4 ▪ PE423211 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 0.6 0.7	0.6 0.8 0.9	dB
Isolation	ISO	RFC-RFx	0.3 – 6.0 GHz 6.0 – 8.5 GHz 8.5 – 10.6 GHz	25 17 16	27 18 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	13 12 11	22 21 19	–	dB
Input 1-dB compression point	P1dB	RFC-RFx	0.3 – 10.6 GHz	–	24	–	dBm
Second harmonic	2fo	RFC-RFx	fo = 399 MHz	–	-60.0	-58.0	dBm
Third harmonic	3fo	RFC-RFx	fo = 399 MHz	–	-76.0	-70.0	dBm
Switching time	–	T_{SW}	50% CTRL to 90% or 10% of final value	–	100	200	ns

Typical performance data

Figure 2–Figure 18 show the typical performance data at 25°C, V1 = 0V, V2 = 3.3V, and ZL = ZS = 50Ω, unless otherwise specified.

Figure 2 ▪ Insertion loss vs. switch path

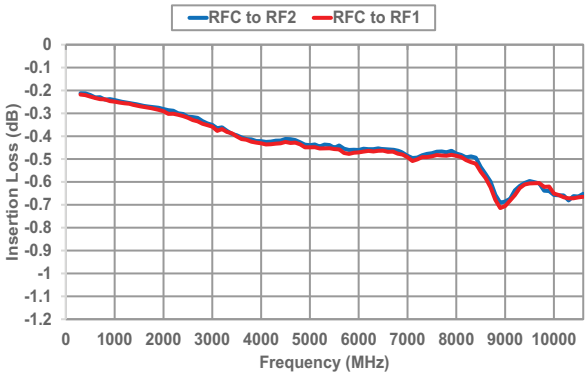


Figure 3 ▪ Insertion loss vs. temperature

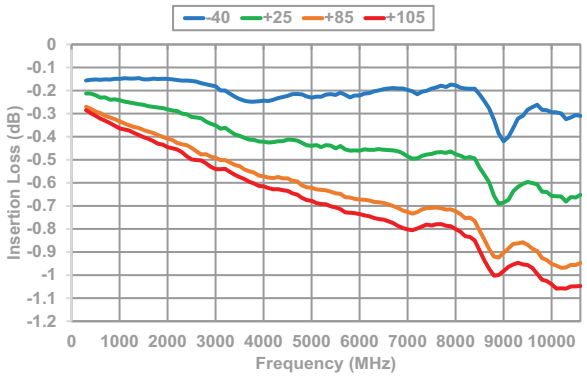


Figure 4 ▪ Insertion loss vs. voltage

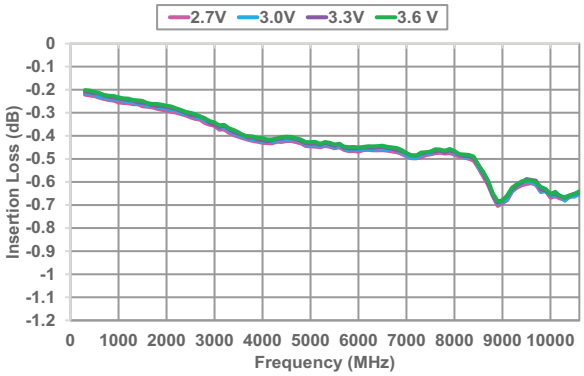


Figure 5 ▪ Isolation vs. temperature (RFC-RFx)

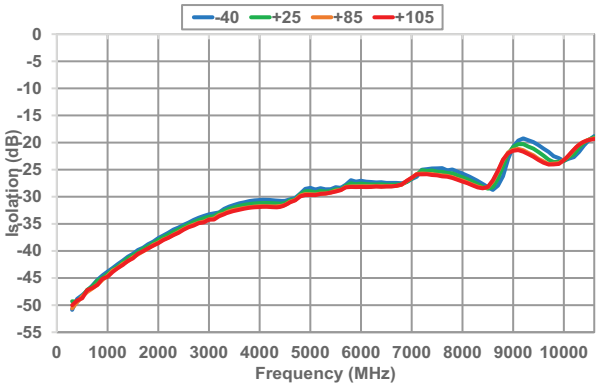


Figure 6 ▪ Isolation vs. voltage (RFC-RFx)

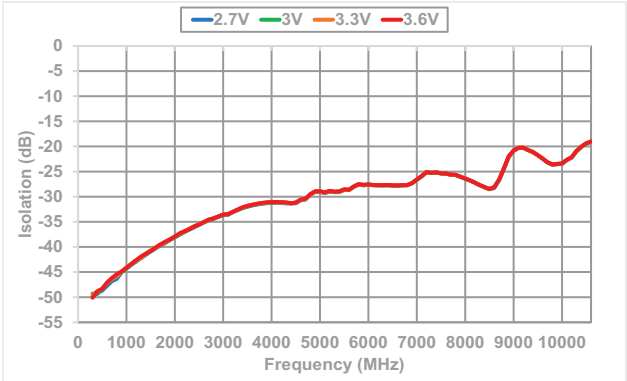


Figure 7 ▪ Isolation vs. temperature (RFx-RFx)

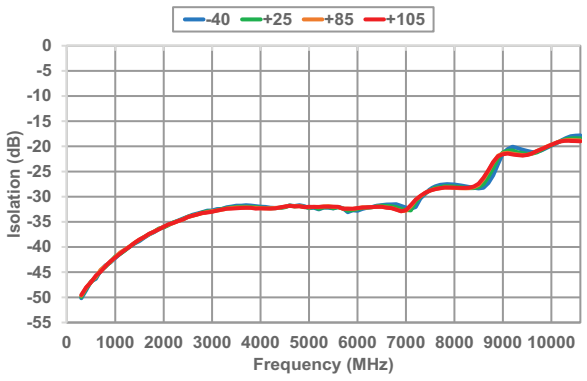


Figure 8 ▪ Isolation vs. voltage (RFx-RFx)

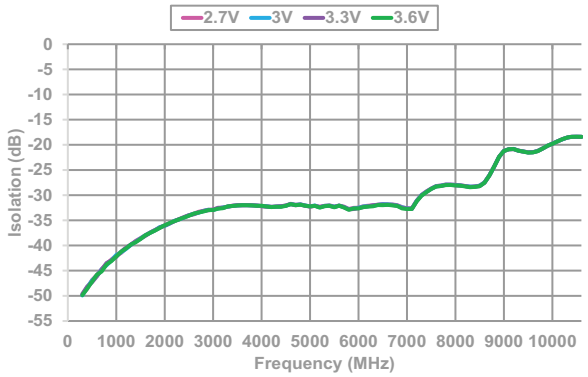


Figure 9 ▪ RFC port return loss vs. temperature (RF1 Active)

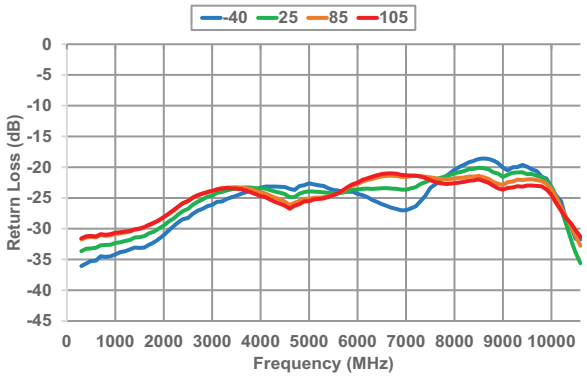


Figure 10 ▪ RFC port return loss vs. voltage (RF1 active)

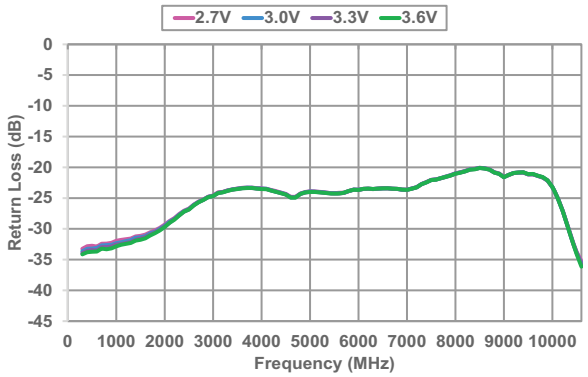


Figure 11 ▪ RFC port return loss vs. temperature (RF2 active)

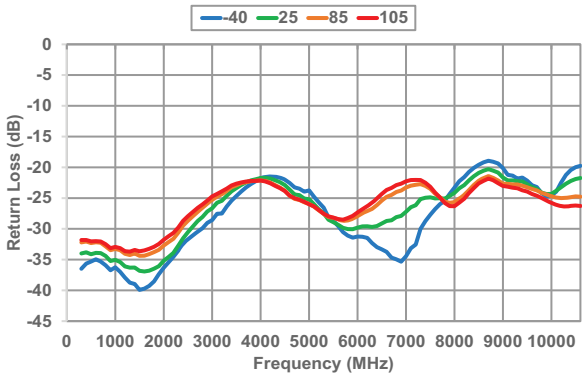


Figure 12 ▪ RFC port return loss vs. voltage (RF2 active)

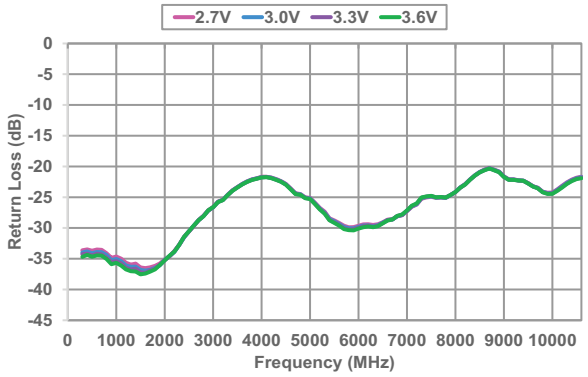


Figure 13 ▪ RF1 port return loss vs. temperature (RF1 active)

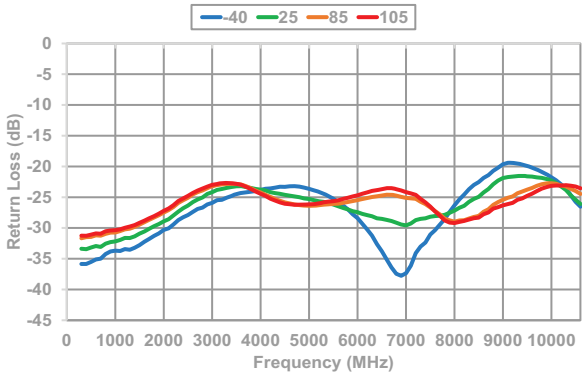


Figure 14 ▪ RF1 port return loss vs. voltage (RF1 active)

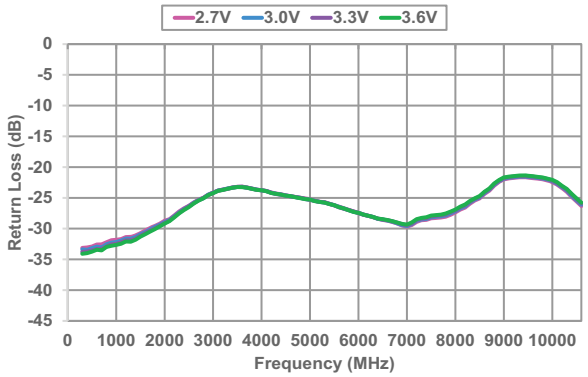


Figure 15 ▪ RF2 port return loss vs. temperature (RF2 active)

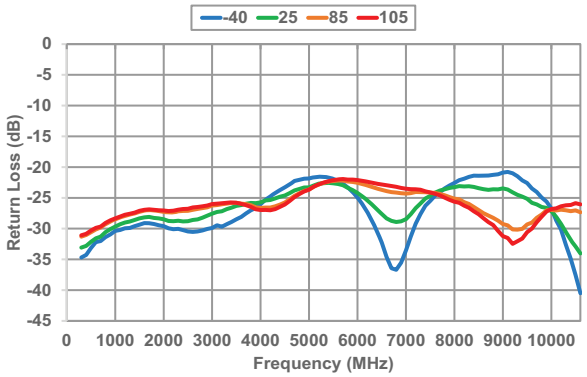


Figure 16 ▪ RF2 port return loss vs. Voltage (RF2 active)

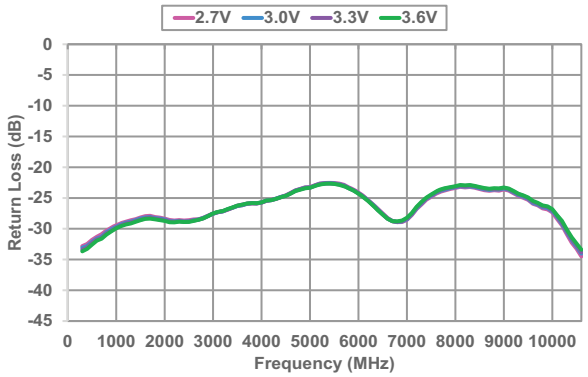


Figure 17 ▪ Maximum power handling (V_{DD} = 3.3V)

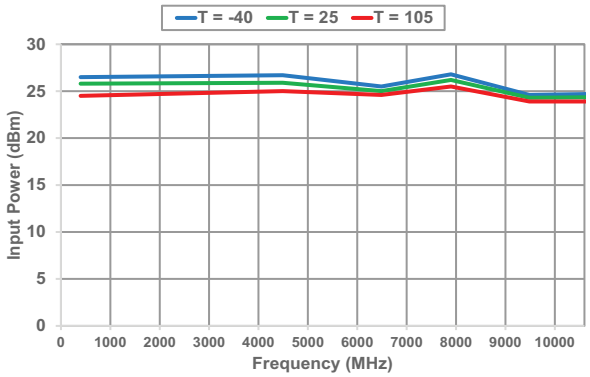
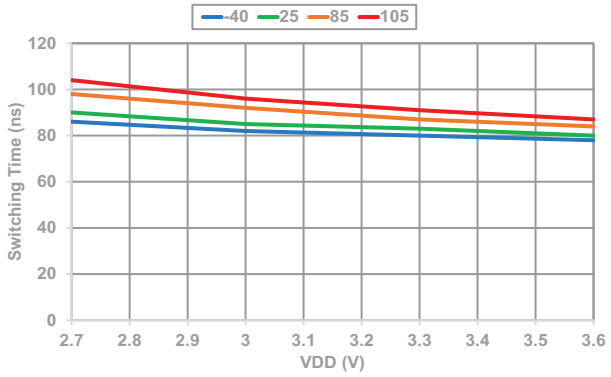


Figure 18 ▪ Switching time vs. V_{DD}



Pin configuration

Figure 19 shows the PE423211 pin map for the 6-lead 1.6 × 1.6 mm DFN package, and **Table 5** lists the description for each pin.

Figure 19 ▪ PE423211 pin configuration, top view

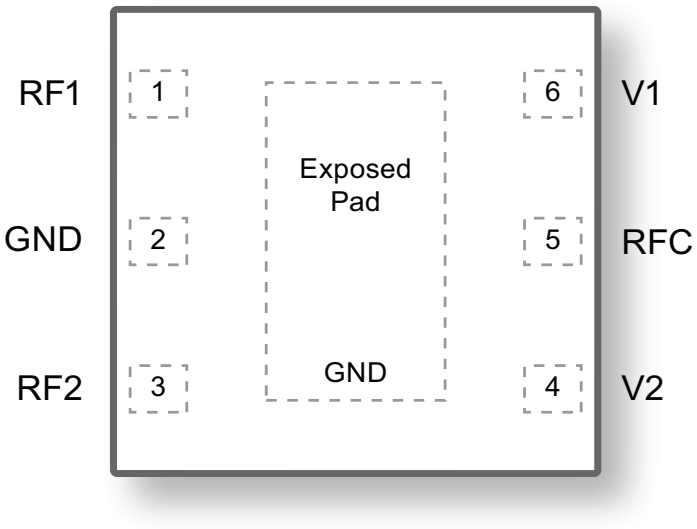


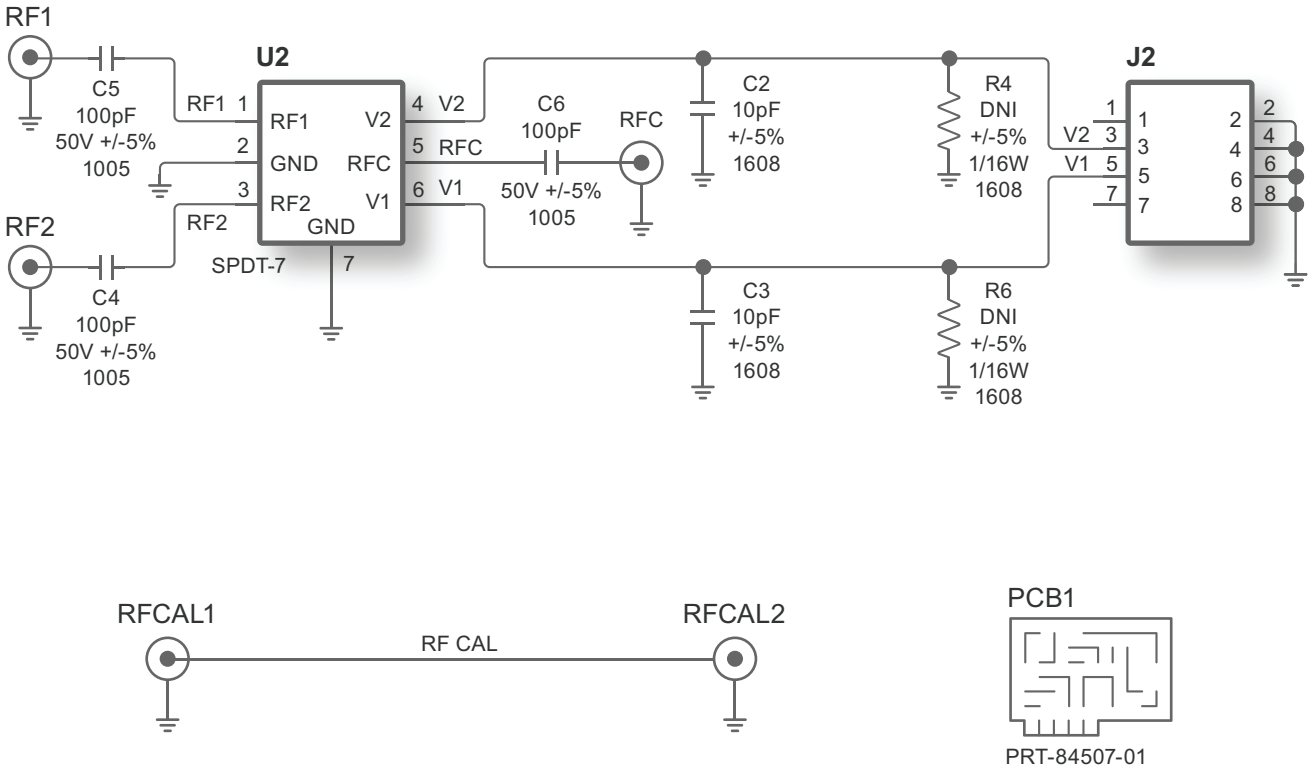
Table 5 ▪ PE423211 pin descriptions

Pin no.	Pin name	Description
1	RF1	RF port 1
2	GND	Ground
3	RF2	RF port 2
4	V2	Digital control logic input 2
5	RFC	RF common port
6	V1	Digital control logic input 1
Pad	GND	Ground

Application schematic

Figure 20 shows the PE423211 application schematic.

Figure 20 ▪ PE423211 application schematic



Packaging information

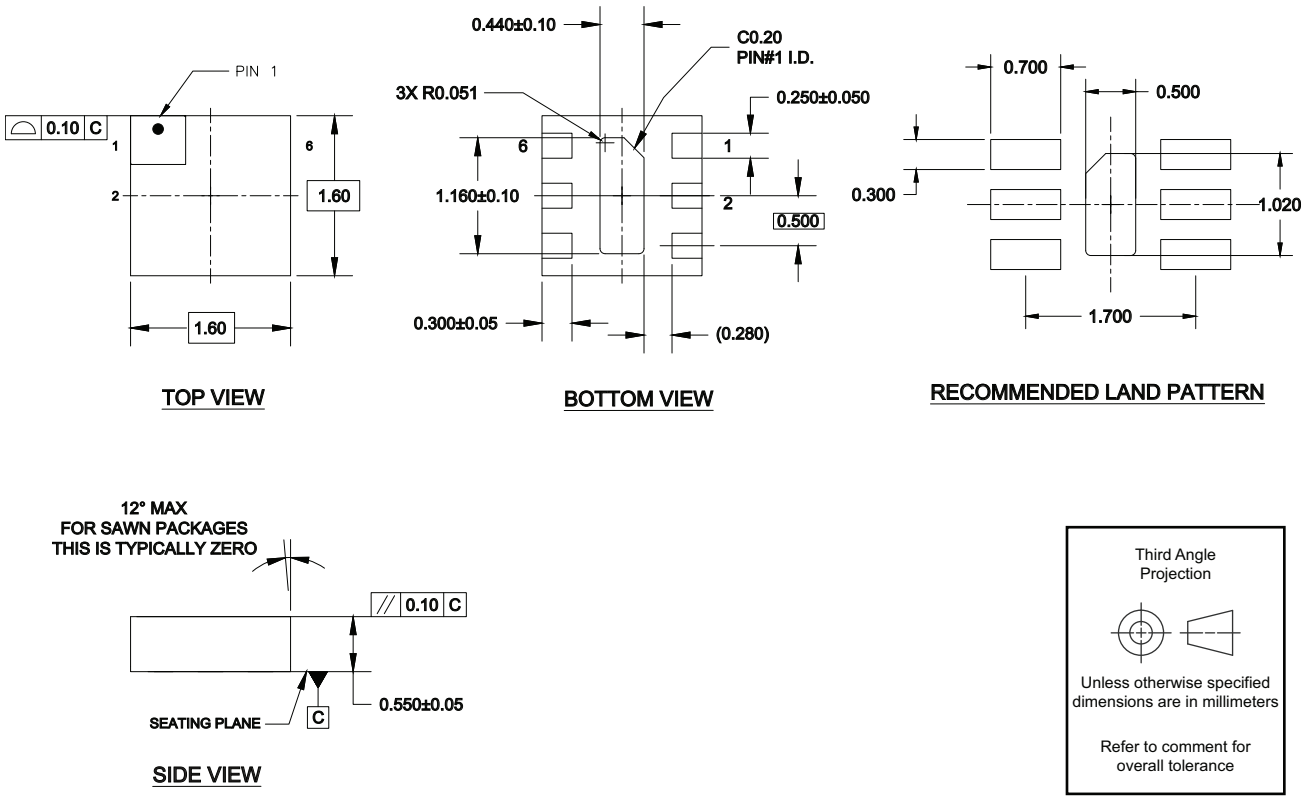
This section provides the PE423211 packaging data, including the moisture sensitivity level, package drawing, package marking, and tape-and-reel information.

Moisture sensitivity level

The PE423211 moisture sensitivity level rating for the 6-lead 1.6 × 1.6 mm DFN package is MSL1.

Package drawing

Figure 21 ▪ Package mechanical drawing for the 6-lead 1.6 × 1.6 mm DFN package



Top-marking specification

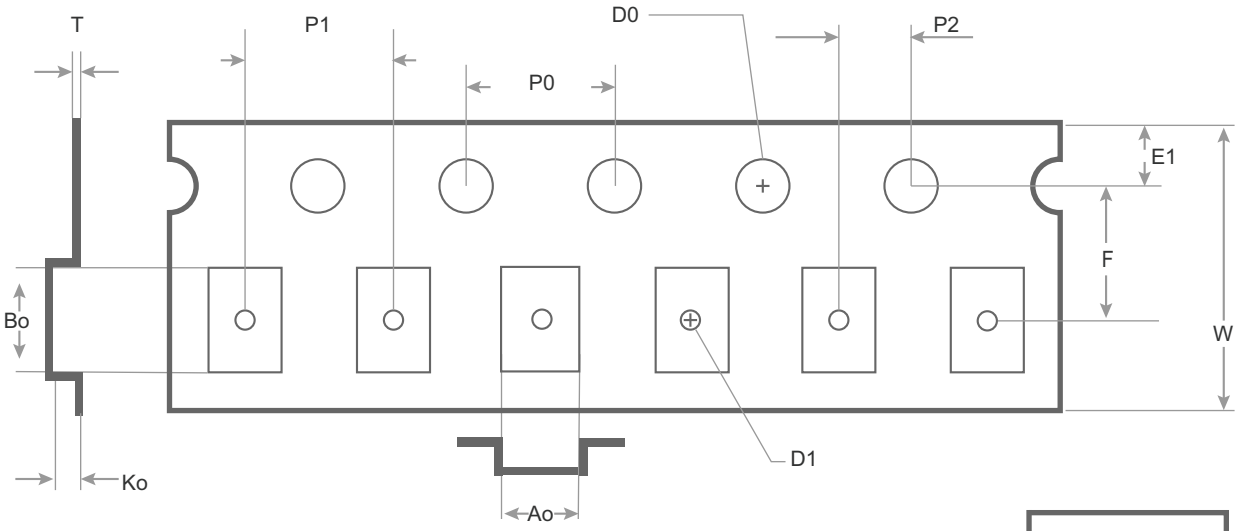
Figure 22 ▪ PE423211 package marking specifications

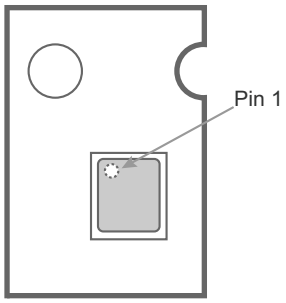


● = Pin 1 indicator
PP = Product part number code (FS)
Z = Last character of the assembly lot code
T = Last digit of the year
WW = Assembly lot work week

Tape and reel specification

Figure 23 ▪ Tape and reel specification for the 6-lead 1.6 × 1.6 mm DFN package





Device Orientation in Tape

Notes:

Not drawn to scale.
Dimensions are in millimeters.
Maximum cavity angle 5 degrees.
Bumped die are oriented active side down.

Carrier Tape Dimension Table

Pocket	Nominal	Tolerance	Pocket	Nominal	Tolerance
Ao	1.85	+/-0.05	D1	1.00	+0.1/-0.0
Bo	1.85	+/-0.05	D0	1.50	+0.1/-0.0
Ko	0.80	+/-0.10	E1	1.75	+/-0.1
P1	4.00		P0	4.00	+/-0.1
W	8.00	+0.3/-0.1	P2	2.00	+/-0.05
F	3.50	+/-0.05	T		+/-0.05

Ordering information

Table 6 lists the PE423211 ordering codes and shipping methods.

Table 6 ▪ PE423211 order codes and shipping methods

Order code	Description	Packaging	Shipping method
PE423211A-Z	PE423211 SPDT RF switch	Green 6-lead 1.6 × 1.6 mm DFN	3000 units/T&R
EK423211-01	PE423211 evaluation kit	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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