PE42823

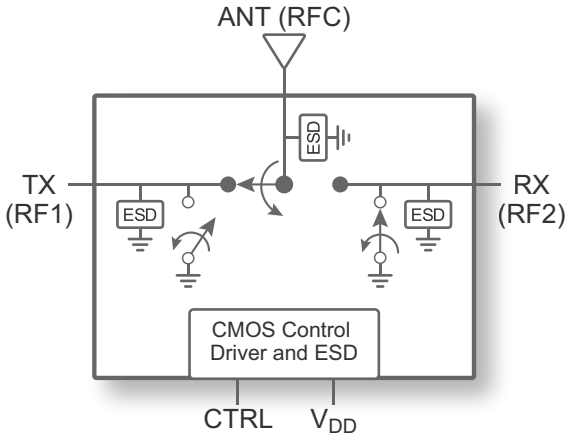
Document Category: Product Specification

UltraCMOS® SPDT RF Switch, 700 MHz–6 GHz

Features

- Excellent single-event peak power handling of 51-dBm LTE
- Exceptional linearity performance across all frequencies:
  - Input IP3: 70 dBm
  - Input IP2: 105 dBm
- Extended operating temperature: +105 °C
- 1.8V/3.3V TTL-compatible control
- High ESD performance: 4.5 kV HBM on RF pins to ground
- Packaging: 16-lead 3 × 3 × 0.75 mm QFN

Figure 1 • PE42823 functional diagram



Applications

- 4G/4.5G wireless infrastructures
- Pre-5G/5G massive MIMO systems
- TDD-based RF transceivers

Product description

The PE42823 is a HaRP™ technology-enhanced 50Ω SPDT RF protection switch designed for use in high-power and high-performance wireless infrastructure applications, such as macrocells supporting frequencies up to 6 GHz.

This switch features high linearity, which remains invariant across the full supply range. The PE42823 also features exceptional isolation, fast switching time, and is offered in a 16-lead 3 × 3 × 0.75 mm QFN package. In addition, no external blocking capacitors are required if 0 VDC is present on the RF ports.

The PE42823 is manufactured on pSemi's UltraCMOS® process, a patented advanced form of silicon-on-insulator (SOI) technology.

pSemi's HaRP technology enhancements deliver high linearity and excellent harmonics performance. It is an innovative feature of the UltraCMOS process, offering the performance of GaAs with the economy and integration of conventional CMOS.

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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 • PE42823 absolute maximum ratings

Parameter	Condition	Min	Typ	Max	Unit
Power supply voltage	–	–0.3	–	5.5	V
Voltage on CTRL input	–	–0.3	–	3.6	V
Voltage on LS input	–	–0.3	–	3.6	V
Storage temperature range	–	–65	–	150	°C
Input power, average(1)	700 –1800 MHz	–	–	43	dBm
	1801–3800 MHz	–	–	42.5	
	3801–6000 MHz	–	–	42	
ESD voltage, HBM(2)	RF pins to ground	–	–	4500	V
	All pins	–	–	4000	
ESD voltage, CDM(3)	All pins	–	–	1250	V

Notes:
1) Tx mode, 10-second duration, 8-dB PAR LTE signal. No power applied to off-terminated port. No hot switching.
2) Human body model (MIL-STD 883 Method 3015).
3) Charged device model (JEDEC JESD22-C101).

Recommended operating conditions

Table 2 lists the PE42823 recommending operating conditions. Do not operate devices outside the recommended operating conditions listed below.

Table 2 • PE42823 recommended operating conditions

Parameter	Min	Typ	Max	Unit
Power supply voltage	2.3	–	5.5	V
Power supply current	–	120	200	µA
Control voltage high	1.17	–	3.6	V
Control voltage low	–0.3	–	0.6	V
Control current	–	–	10	µA
Operating temperature range	–40	+25	+105	°C

Electrical specifications

Table 3 lists the PE42823 key electrical specifications at +25 °C and V_{DD} = 2.3–5.5V, unless otherwise specified.

Table 3 • PE42823 electrical specifications

Parameter	Path	Condition	Min	Typ	Max	Unit
Operational frequency	–	–	700	–	6000	MHz
Insertion loss	ANT–Rx	700 MHz 2100 MHz 2700 MHz 3800 MHz 6000 MHz	–	0.39 0.51 0.55 0.68 1.28	0.50 0.60 0.70 0.85 1.80	dB
	ANT–Tx	700 MHz 2100 MHz 2700 MHz 3800 MHz 6000 MHz	–	0.25 0.33 0.36 0.41 0.53	0.35 0.45 0.50 0.60 0.80	dB
Isolation	ANT–Rx	700 MHz 2100 MHz 2700 MHz 3800 MHz 6000 MHz	58 46 42 37 30	59 47 43 38 31	–	dB
	ANT–Tx	700 MHz 2100 MHz 2700 MHz 3800 MHz 6000 MHz	47 36 33 28 22	48 37 34 29 23	–	dB
Return loss	ANT–Rx	700–2700 MHz 2701–3800 MHz 3800–6000 MHz	–	24 17 12	–	dB
	ANT–Tx	700–2700 MHz 2701–3800 MHz 3800–6000 MHz	–	26 26 28	–	dB
Input 1-dB compression point	ANT–Tx	700–3800 MHz 3801–6000 MHz	–	46 43	–	dBm
Input IP3	ANT–Rx	–	–	70	–	dBm
Input IP2	ANT–Rx	–	–	105	–	dBm
Max RF input power	Tx mode	Continuous wave, –40°C to 105°C	–	–	38.5	dBm
	Rx mode	Continuous wave, –40°C to 105°C	–	–	33	dBm
Settling time	–	50% CTRL to 0.05 dB final value (–40°C to +105°C) rising edge	–	2	–	µs
Settling time	–	50% CTRL to 0.05 dB final value (–40°C to +105°C) falling edge	–	0.58	–	µs
Switching time	ANT–Rx	50% CTRL to 90% or 10% of final value	–	0.84	–	µs
	ANT–Tx	50% CTRL to 90% or 10% of final value	–	0.62	–	µs

Control logic

Table 4 lists the PE42823 control logic truth table.

Table 4 • PE42823 truth table

CTRL	ANT–Tx	ANT–Rx
0	OFF	ON
1	ON	OFF

Typical performance data

Figure 2 • Insertion loss vs. temperature (RF1)

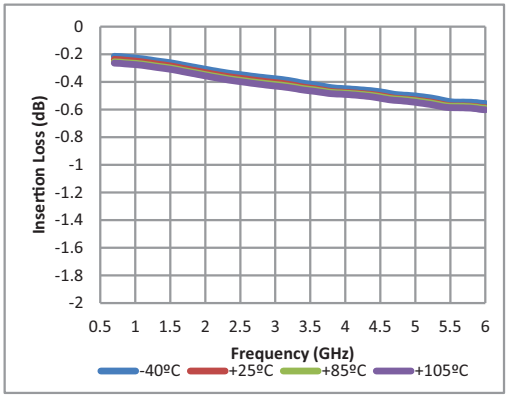


Figure 3 • Insertion loss vs. V_{DD} (RF1)

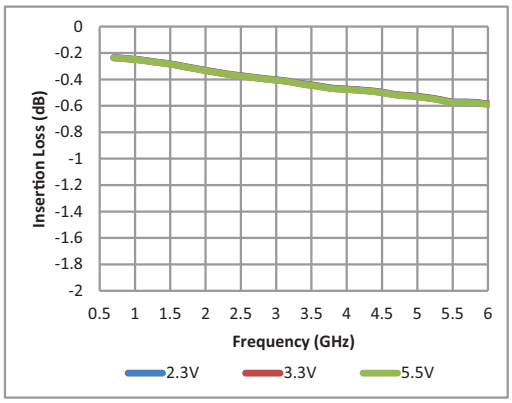


Figure 4 • Insertion loss vs. temperature (RF2)

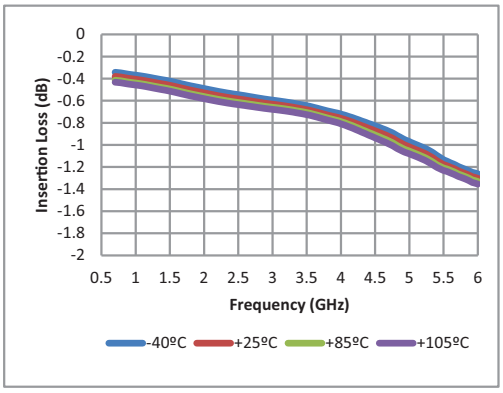


Figure 5 • Insertion loss vs. V_{DD} (RF2)

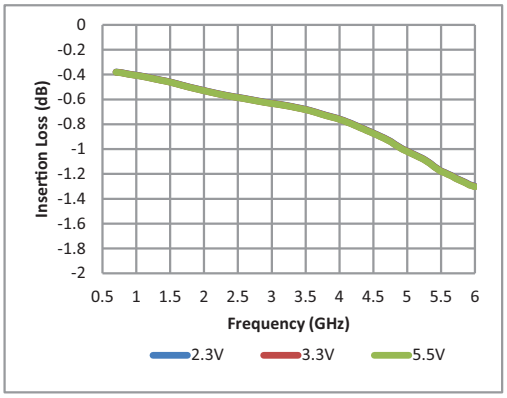


Figure 6 • RFC port return loss vs. temperature (RF1)

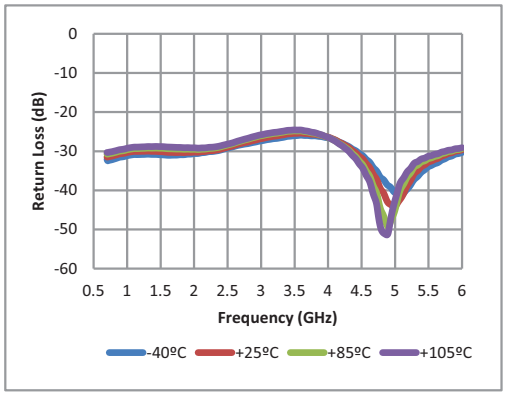


Figure 7 • RFC port return loss vs. temperature (RF2)

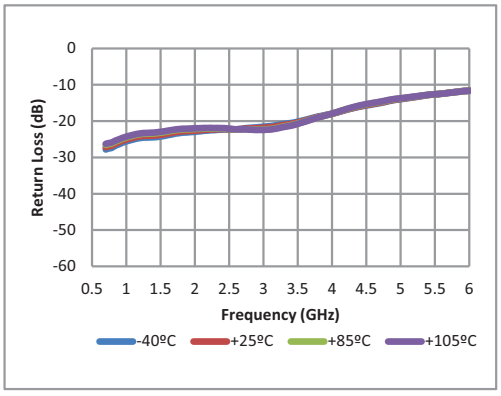


Figure 8 • Isolation vs. temperature (RF1-RF2, RF1 active)

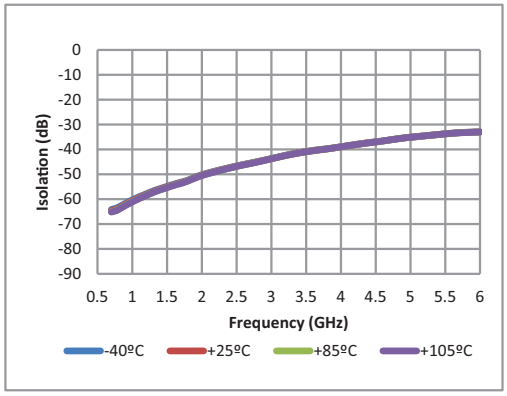


Figure 9 • Isolation vs. temperature (RF2-RF1, RF2 active)

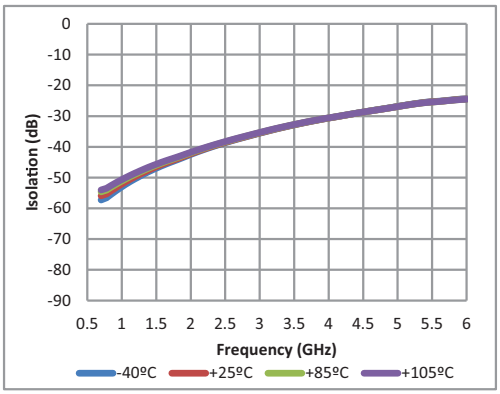
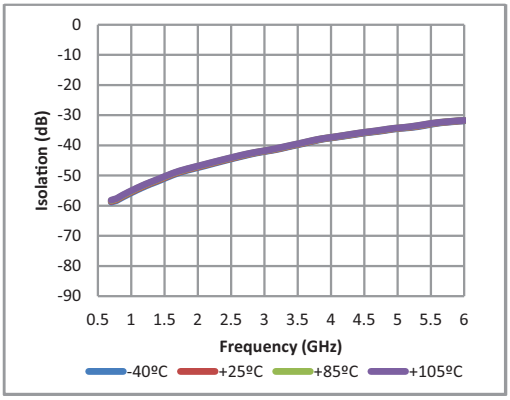
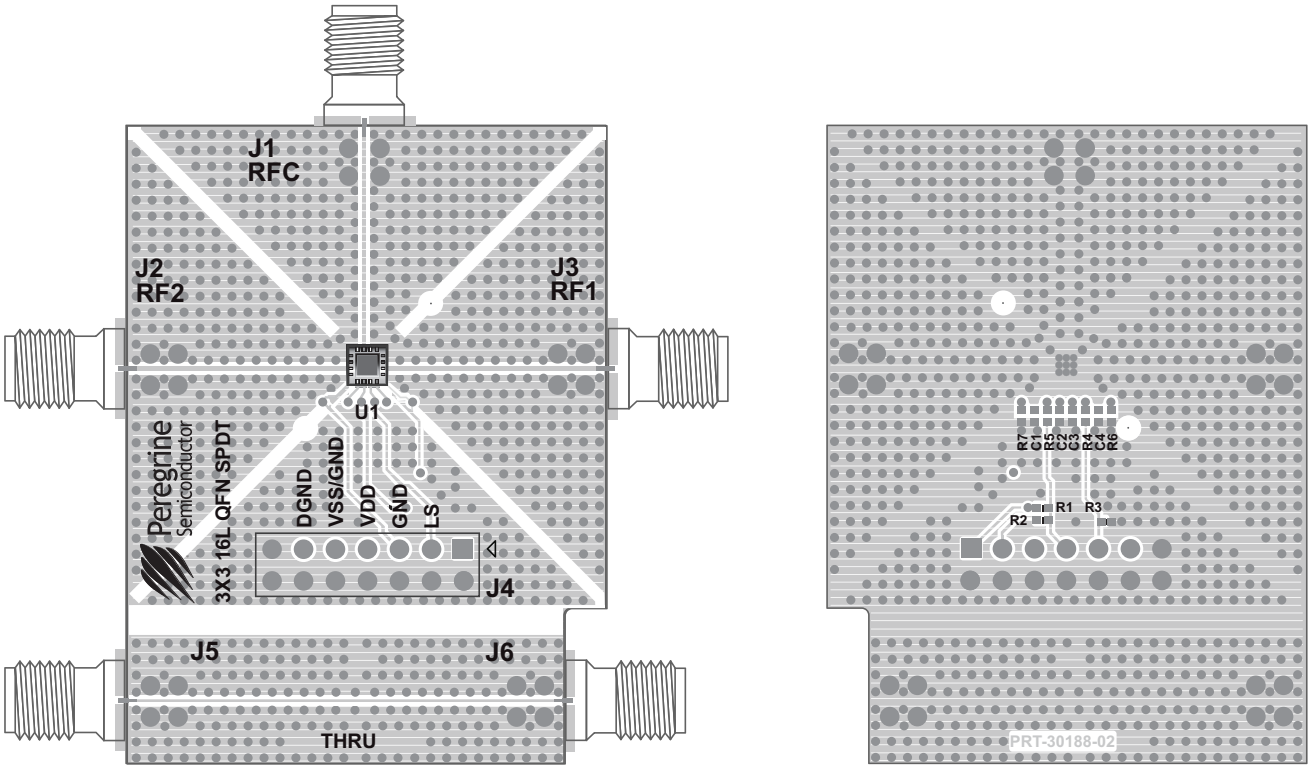


Figure 10 • Isolation vs. temperature (RFC-RF1, RF2 active)



Evaluation board

Figure 11 • PE42823 evaluation board layout



Pin configuration

Figure 12 shows the PE42823 pin map for the 16-lead 3 × 3 × 0.75 mm QFN package, and **Table 5** lists the description for each pin.

Figure 12 • Pin configuration, top view

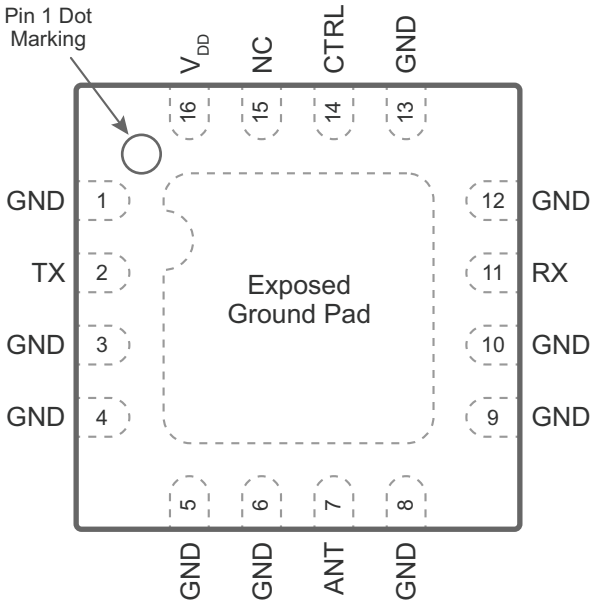


Table 5 • PE42823 pin descriptions

Pin no.	Pin name	Description
1, 3, 4, 5, 6, 8, 9, 10, 12, 13	GND	Ground
2	TX(*)	Tx RF port
7	ANT(*)	ANT RF port
11	RX(*)	Rx RF port
14	CTRL	Digital control logic input
15	NC	No connection
16	V_{DD}	Positive power supply voltage

Note: * RF pins 2, 7, and 11 must be at 0 VDC. These RF pins do not require DC blocking capacitors for proper operation if the 0 VDC requirement is met.

Packaging information

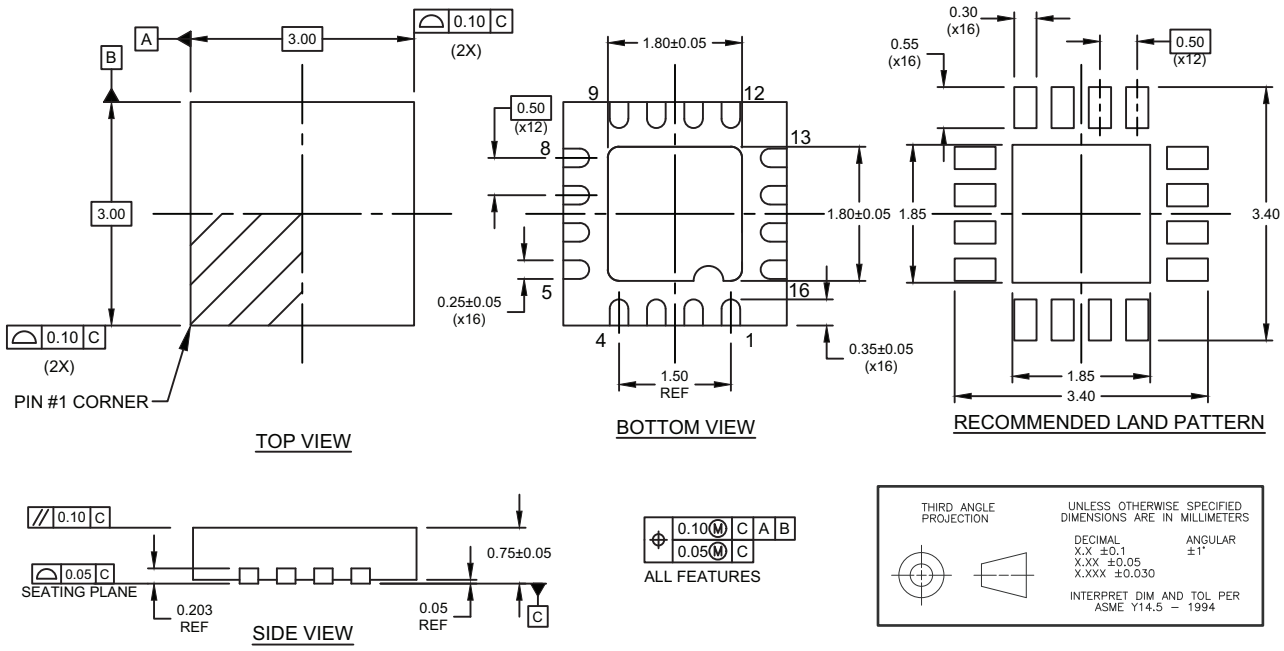
This section provides PE42823 packaging data including the moisture sensitivity level, package drawing, package marking, and tape-and-reel information.

Moisture sensitivity level

The PE42823 moisture sensitivity level rating for the 16-lead 3 × 3 × 0.75 mm QFN package is MSL1.

Package drawing

Figure 13 • Package mechanical drawing for the 16-lead 3 × 3 × 0.75 mm QFN package



Top-marking specification

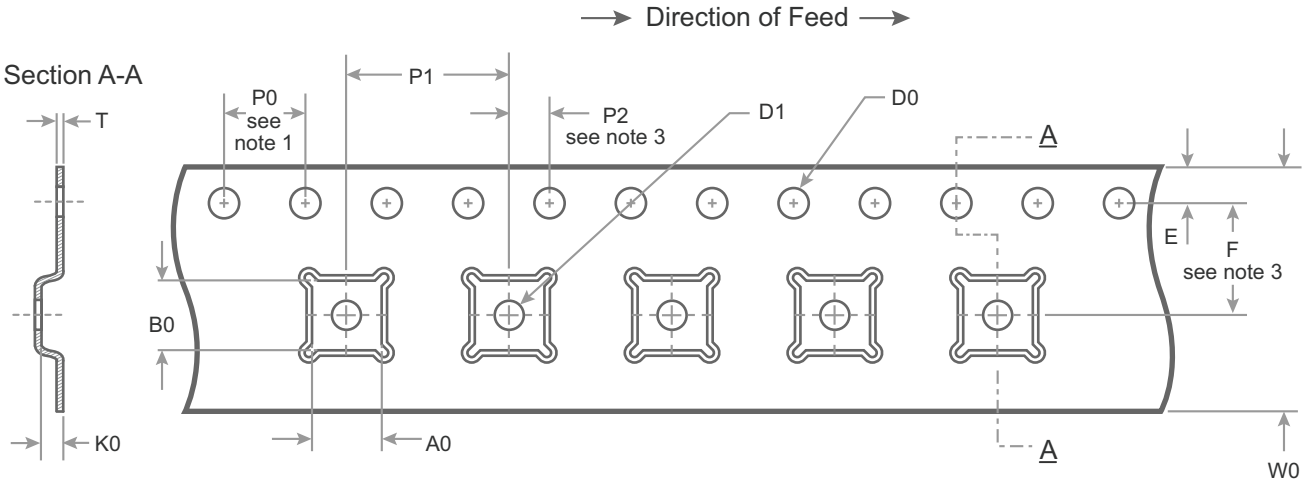
Figure 14 • PE42823 package marking specification



● = Pin 1 indicator
YY = Last two digits of assembly year
WW = Assembly work week
ZZZZZZ = Assembly lot code (maximum six characters)

Tape and reel specification

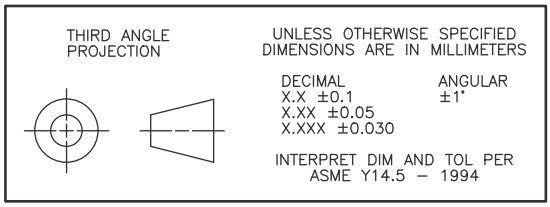
Figure 15 • Tape and reel specification for the 16-lead 3 × 3 × 0.75 mm QFN package

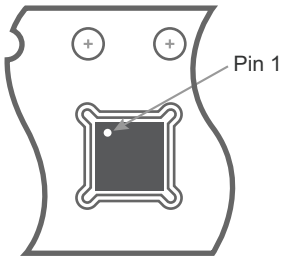


A0	3.30
B0	3.30
K0	1.10
D0	1.50 + 0.1/ -0.0
D1	1.5 min
E	1.75 ± 0.10
F	5.50 ± 0.05
P0	4.00
P1	8.00
P2	2.00 ± 0.05
T	0.30 ± 0.05
W0	12.00 ± 0.3

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





Device Orientation in Tape

Ordering information

Table 6 lists the PE42823 order codes and shipping methods.

Table 6 • PE42823 order codes and shipping methods

Order code	Description	Packaging	Shipping method
PE42823A–X	PE42823 SPDT RF switch	16-lead 3 × 3 × 0.75 mm QFN	500 units/T&R
EK42823–01	PE42823 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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