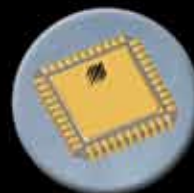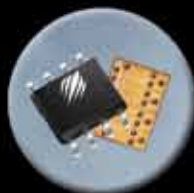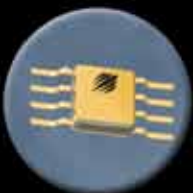# Peregrine
Semiconductor

# 2011
# Product Selection Guide
## First Edition

Changing how RF is designed. Forever.™

# Welcome to Peregrine Semiconductor

Peregrine Semiconductor is a leading provider of high-performance radio-frequency (RF) integrated circuits (ICs). Our solutions leverage our proprietary UltraCMOS™ technology, which enables the design, manufacture, and integration of multiple RF, mixed-signal, and digital functions on a single chip. Our products deliver what we believe is an industry leading combination of performance and monolithic integration, and target a broad range of applications in the aerospace and defense, broadband, industrial, mobile wireless device, test and measurement equipment, and wireless infrastructure markets.
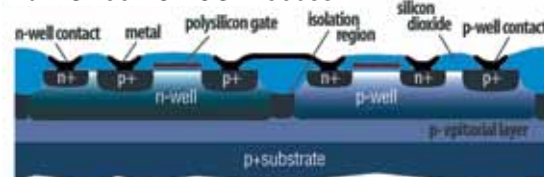
We leverage our extensive RF design expertise and systems knowledge to develop RFIC solutions that meet the stringent performance, integration, and reliability requirements of these rapidly evolving wireless markets. Measurable power and size savings offer advantages for both manufacturers and consumers, including longer battery life, smaller batteries, lower power consumption and bills, less electronic waste…and a greener RF solution. Additionally, because UltraCMOS devices are fabricated in standard high-volume CMOS facilities, products benefit from the fundamental reliability, cost effectiveness, high yields, scalability and integration of CMOS, while achieving the peak performance levels historically expected from SiGe and GaAs. It is this combination of attributes which enable ease-of-development essential to timely and cost-effective application design by our customers.

Peregrine's broad portfolio of high performance RFICs includes switches, digital attenuators, frequency synthesizers, mixers, prescalers and digitally tunable capactitors (DTCs), with power amplifiers, DVGAs and DC-DC converters on the horizon. Our products are sold worldwide through our direct sales and field applications engineering staff and through our network of independent sales representatives and distribution partners around the world. In addition to the sale of our products, we have established a technology licensing program to accelerate the adoption and deployment of UltraCMOS technology.

# UltraCMOS™: The Green RF Process Technology

UltraCMOS technology combines the fundamental benefits of standard CMOS, the most widely used semiconductor process technology, with a synthetic sapphire substrate that enables significant improvements in performance for RF applications. We own fundamental intellectual property in UltraCMOS technology consisting of numerous U.S. and international patents and trade secrets covering manufacturing processes, basic circuit elements, RF circuit designs, and design know-how. We also have engineered design advancements, including our patented HaRP™ technology which significantly improves harmonic and linearity performance, and our patent-pending DuNE™ technology, a circuit design technique that we have used to develop our advanced digitally tunable capacitor (DTC) products.
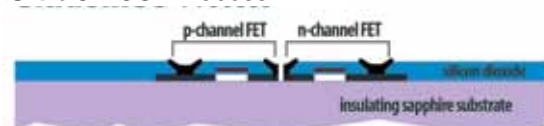


*The UltraCMOS process, with its insulating sapphire substrate, enables simpler RF circuit designs, and improved power handling, isolation and ESD tolerance.*

# Quality and Reliability

At Peregrine Semiconductor, we are committed to achieving excellence through customer satisfaction in everything we do. Our ISO9001-2008 and AS9100B certified quality systems, advanced designs, progressive process technology and industry-leading product performance enable us to deliver decidedly superior performance.

## The Innovative HaRP™ Technology Invention

Peregrine's HaRP™ technology enhancements provide for new RF architectures and excellent linearity in the RF front-end. Because UltraCMOS technology is composed of a stack of field effect transistors manufactured on a highly insulating sapphire substrate, it has an inherent ability to pass high power RF signals. The HaRP invention allows for highly linear FETs which, when stacked together, deliver exceptional RF performance. In demanding applications such as RF test equipment, HaRP-enhanced ATE switches settle very quickly, eliminating gate lag and insertion loss drift while maintaining high linearity and isolation over an extended frequency range. In high-power applications, HaRP-enhanced devices meet critical harmonics specifications with improved power handling. And, the HaRP-enabled high-throw, high-power switches for quad-band GSM and GSM/WCDMA handset applications have delivered a long-awaited breakthrough in Intermodulation Distortion (IMD) handling, a specification required by the 3GPP standards body for GSM/WCDMA applications.
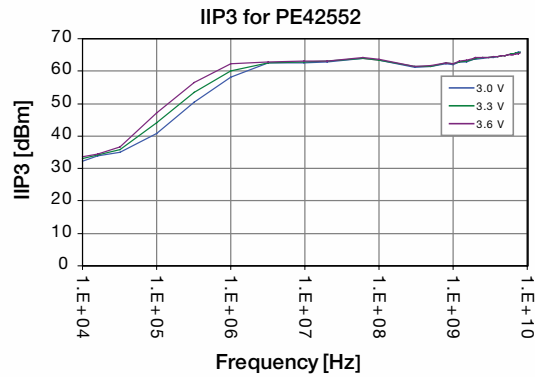
*PE42552 ATE/ TE switch uses HaRP technology to provide excellent linearity up to 7.5 GHz.*
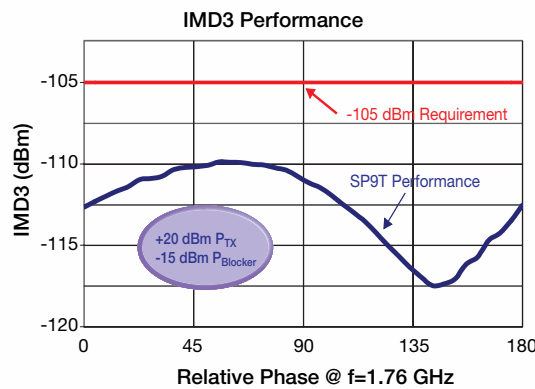
*IMD3 performance of HaRP-enhanced switches exceeds 3GPP industry standards.*
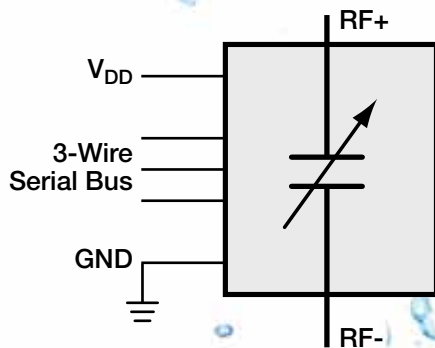
*DuNE tunable capacitors offer capacitance values from about 0.5pF to 10pF, with typical tuning ratios ranging from 3:1 to 6:1 with 5 bits or 32 states of resolution.*

## DuNE™ Digital Tuning Technology

By applying proven, patented UltraCMOS™ process and HaRP™ switch technologies, engineers at Peregrine developed DuNE™ tuning technology, a new design methodology used to develop digitally tunable capacitors (DTCs). Supporting a wide range of tuning applications—from tuning the center frequency of mobile-TV and cellular antennas to tunable impedance matching and filters—DuNE enhanced products offer power handling, performance and size advantages that are unrivaled by any other commercially-available digital tuning technology.
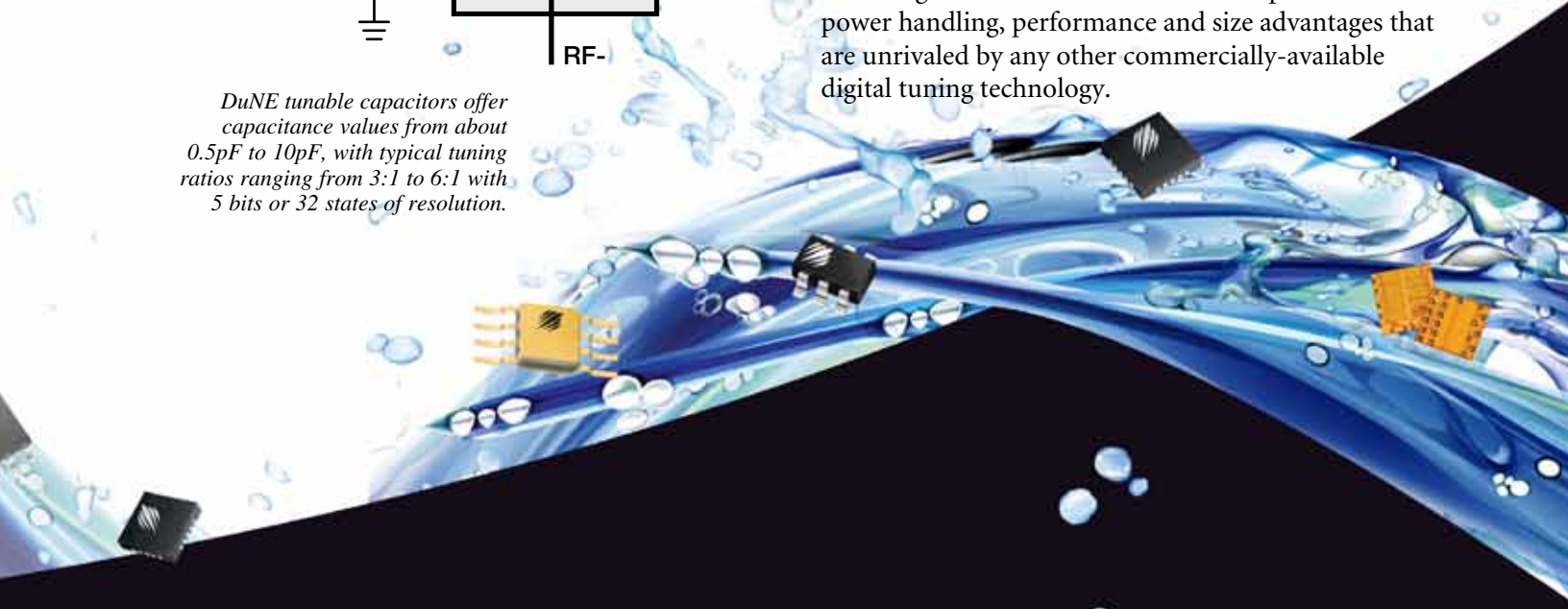
# Wireless and Broadband RF Products

## RF Switches - 50 Ω

| Product Description | Part Number | Operating Frequency (MHz) | IIP3 (dBm @ 2 GHz) | P1dB[1] (dBm @ 2 GHz) | Insertion Loss (dB @ 1 GHz) | Isolation (dB @ 1 GHz) | Typical Idd (μA @ 3 V) | Vdd Range (V) | Package |
|---|---|---|---|---|---|---|---|---|---|
| SPST, Absorptive | PE4246 | 1-5000 | 53 | 33 | 0.80 | 55 | 33 | 2.7-3.3 | 6L 3x3 DFN |
| **NEW** SPDT, Absorptive | PE4251 | 10-3000 | **59** | 30.5 | 0.60 | **62** | 55 | 3.0-3.6[4] | 8L MSOP (exposed) |
| SPDT, Absorptive | PE4257 | 5-3000 | 55 | 31[3] | 0.75 | **64** | 8 | 2.7-3.3 | 20L 4x4 QFN |
| SPDT, Reflective | PE4210 | 10-3000 | 34 | 15 | 0.30 | 36 | 0.25 | 2.7-3.3 | 8L MSOP |
| SPDT, Reflective | PE4230 | 10-3000 | 55 | 32 | 0.35 | 39 | 29 | 2.7-3.3 | 8L MSOP |
| SPDT, Reflective | PE4237 | 10-4000 | 55 | 32 | 0.35 | 43 | 29 | 2.7-3.3 | 6L 3x3 DFN |
| SPDT, Reflective | PE4239 | 10-3000[2] | 45 | 27 | 0.70 | 32 | 0.25 | 2.7-3.3 | 6L SC70 |
| SPDT, Reflective | PE4242 | 10-3000 | 45 | 27 | 0.70 | 32 | 0.25 | 2.7-3.3 | 6L SC70 |
| SPDT, Reflective | PE4244 | 10-3000[2] | 45 | 26 | 0.60 | 39 | 0.25 | 2.7-3.3 | 8L MSOP |
| SPDT, Reflective | PE4245 | 10-4000[2] | 45 | 27 | 0.60 | 42 | 0.25 | 2.7-3.3 | 6L 3x3 DFN |
| **NEW** SPDT, Reflective | PE4250 | 10-3000 | **59** | 30.5 | 0.65 | 51 | 55 | 3.0-3.6[4] | 8L MSOP |
| SPDT, Reflective | PE4259[1] | 10-3000[2] | 55 | 33[3] | 0.35 | 30 | 9 | 2.3-3.3 | 6L SC70 |
| SPDT, Reflective | PE4283 | 10-4000 | **57** | 32 | 0.65 | 33.5 | 8 | 2.0-3.3 | 6L SC70 |
| **NEW** SP4T, Reflective | PE42440 | 50-3000 | **67** | 41.5 | 0.45 | 34 | 13 | 2.65-3.0 | 16L 3x3 QFN |
| **NEW** SP5T, Reflective | PE42451 | 450-4000 | **58** | 35 | 1.65 | **62** | 14 | 2.7-3.3 | 24L 4x4 QFN |

**Note 1:** Power handling varies over frequency. See datasheet.
**Note 2:** Can be used in a 75 Ω environment.
**Note 3:** Measured at 1 GHz.
**Note 4:** Idd range of 4.5-5.5 also available
**Note 5:** To view S-parameter data for 50 Ω switches, visit the product section of our website at: www.psemi.com.

## Broadband Switches - 75 Ω

| Product Description | Part Number | Operating Frequency (MHz) | IIP2[1] (dBm) | CTB[2] (dBc) | P1dB[3] (dBm) | Insertion Loss (dB @ 1 GHz) | Isolation (dB @ 50 MHz) | Isolation (dB @ 1 GHz) | Typical Idd (μA @ 3 V) | Vdd Range (V) | Package |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SPST, Absorptive | PE4270 | 1-3000 | 80 | -90 | 30 | 0.75 | 90 | 63 | 8 | 2.7-3.3 | 6L 3x3 DFN |
| SPST, Absorptive | PE4271 | 1-3000 | 80 | -90 | 33 | 0.80 | 85 | 60 | 8 | 2.7-3.3 | 6L 3x3 DFN |
| SPDT, Absorptive | PE4256 | 5-3000 | 80 | -90 | 31 | 0.90 | 80 | 65 | 8 | 2.7-3.3 | 20L 4x4 QFN |
| SPDT, Absorptive | PE4280 | 5-2200 | 75 | -85 | 26 | 1.10 | 72 | 60 | 8 | 2.7-3.3 | 20L 4x4 QFN |
| SPDT, Reflective | PE4231 | 1-1300 | 80 | -90 | 32 | 0.80 | 75 | 42 | 29 | 2.7-3.3 | 8L MSOP |
| SPDT, Reflective | PE4272 | 5-3000 | 80 | -90 | 32 | 0.50 | 70 | 43 | 8 | 2.7-3.3 | 8L MSOP |
| SPDT, Reflective | PE4273 | 10-3000 | 80 | -90 | 32 | 0.50 | 63 | 34.5 | 8 | 2.7-3.3 | 6L SC70 |

## Broadband Switches - 75 Ω - with Unpowered Operation

| Product Description | Part Number | Operating Frequency (MHz) | IIP2[1] (dBm) | P1dB[3] pwr/unpwr (dBm) | Insertion Loss (pwr) (dB @ 0.8 GHz) | Isolation pwr/unpwr (dB @ 50 MHz) | Isolation pwr/unpwr (dB @ 0.8 GHz) | Typical Idd (μA @ 3 V) | Vdd Range (V) | Package |
|---|---|---|---|---|---|---|---|---|---|---|
| SPDT, Absorptive | PE42742 | 5-2200 | 80 | 30/24 | 0.7 | 94/90.5 | 75/77 | 8 | 2.7-3.3 | 20L 4x4 QFN |
| **NEW** SPDT, Absorptive | PE42750 | 5-2200 | 100 | 23.5 | 1.0 | 86/87 | 73/74 | 8 | 2.7-3.3 | 12L 3x3 QFN |

**Note 1:** Measurement is limited by test equipment
**Note 2:** CTB/CSO measured with 77 and 110 channels; PO=44 dBmV
**Note 3:** Measured at 1 GHz

## Test Equipment/ATE Switches - 50 Ω

| Product Description | Part Number | Operating Frequency | IIP3 (dBm) | P1dB (dBm) | Insertion Loss (dB @ 3 GHz) | Isolation (dB @ 1 GHz) | Typical Idd (μA @ 3.3 V) | Vdd Range (V) | Package |
|---|---|---|---|---|---|---|---|---|---|
| **NEW** SPDT, Reflective | PE42551[1] | 9 kHz-6 GHz | 50 @ 6 GHz | 34 @ 6 GHz | 0.65 | 29 @ 3GHz | 20 @ 2.75V | 2.5-3.0 | 20L 4x4 QFN |
| SPDT, Absorptive | PE42552[1] | 9 kHz-7.5 GHz | 65 @ 7.5 GHz | 34.5 @ 7.5 GHz | 0.65 | 47 | 15 | 3.0-3.6 | 16L 3x3 QFN |
| SPDT, Absorptive | PE42556[1] | **9 kHz-13.5 GHz** | 56 @ 13.5 GHz | 33 @ 13.5 GHz | 0.92 | 46 | 21.5 | 3.0-3.6 | Flip Chip |

**Note 1:** See also the PE43703 Digital Step Attenuator for TE/ATE designs

## Test Equipment/ATE Switches

*Peregrine offers complementary devices ideal for TE/ATE applications. HaRP™ technology enhancements eliminate gate lag and insertion loss drift while maintaining high linearity and isolation over an extended frequency range of 9 kHz-13.5 GHz with excellent low-frequency performance down to 9 kHz.*

## High Power RF Switches - 50 Ω

| Product Description | Part Number | Operating Frequency (MHz) | P0.1dB (dBm @ 0.8 GHz) | Insertion Loss (dB @ 0.8 GHz) | Isolation (dB @ 0.8 GHz) | Typical Idd (μA @ 3.4 V) | Vdd Range (V) | Package |
|---|---|---|---|---|---|---|---|---|
| SPDT, Reflective | PE42510A[1] | 30-2000 | 45.4 | 0.4 | 29 | 90 | 3.2-3.4 | 32L 5x5 QFN |
| SP3T, Reflective | PE42650A[1] | 30-1000 | 45.4 | 0.3 | 38 | 90 | 3.2-3.4 | 32L 5x5 QFN |

**Note 1:** Market restrictions apply

## High-Power RF Switches

*Peregrine's high-power switch products deliver a 50W P1dB compression point with high linearity and excellent harmonic performance of less than -84 dBc @ 42.5 dBm. These HaRP™-enhanced switches include outstanding power handling capabilities, with guaranteed operation at 10W into 8:1 VSWR.*

## RF Digital Step Attenuators (Monolithic) - 50 Ω

| Product Description | Attenuation | Programming Mode | Operating Freq. (MHz) | Insertion Loss (dB) | Input IP3 (dBm) | Attenuation Accuracy (dB @ 1 GHz) | Switching Speed (μs) | Package |
|---|---|---|---|---|---|---|---|---|
| PE4302 - 6-bit, 50 Ω | 31.5 range / 0.5 dB steps | Parallel[1], Serial | 1 - 4000 | 1.5 | 52 | ±(0.10+3% of setting) | 1 | 20L 4x4 QFN |
| PE4305 - 5-bit, 50 Ω | 15.5 range / 0.5 dB steps | Parallel[1], Serial | 1 - 4000 | 1.5 | 52 | ±(0.25+3% of setting) | 1 | 20L 4x4 QFN |
| PE4306 - 5-bit, 50 Ω | 31 range / 1.0 dB steps | Parallel[1], Serial | 1 - 4000 | 1.5 | 52 | ±(0.30+3% of setting) | 1 | 20L 4x4 QFN |
| PE4309 - 6-bit, 50 Ω | 31.5 range / 0.5 dB steps | Parallel | 5 - 4000 | 1.6 | 52 | ±(0.10+3% of setting) | 1 | 24L 4x4 QFN, DIE |
| PE43204 - 2-bit, 50 Ω | 18 range / 6 dB steps | Parallel | 50 - 3000 | 0.6 | 61 | -0.25 / +0.40 | 0.03 | 12L 3x3 QFN |
| PE43501 - 5-bit, 50 Ω | 7.75 range / 0.25 dB steps | Parallel[1], Ser-Addressable | 20 - 6000 | 2.3 | 58 | ±(0.15+4% of setting) | 0.65 | 32L 5x5 QFN |
| PE43502 - 5-bit, 50 Ω | 15.5 range / 0.5 dB steps | Parallel[1], Serial | 20 - 6000 | 2.4 | 58 | ±(0.3+3% of setting) | 0.65 | 24L 4x4 QFN |
| PE43503 - 5-bit, 50 Ω | 31 range / 1 dB steps | Parallel[1], Serial | 20 - 6000 | 2.4 | 58 | ±(0.3+3% of setting) | 0.65 | 24L 4x4 QFN |
| PE43601 - 6-bit, 50 Ω | 15.75 range / 0.25 dB steps | Parallel[1], Ser-Addressable | 20 - 6000 | 2.3 | 57 | ±(0.2+4% of setting) | 0.65 | 32L 5x5 QFN |
| PE43602 - 6-bit, 50 Ω | 31.5 range / 0.5 dB steps | Parallel[1], Serial | 20 - 5000 | 2.2 | 58 | ±(0.3+3% of setting) | 0.65 | 24L 4x4 QFN |
| PE43701 - 7-bit, 50 Ω | 31.75 range / 0.25 dB steps | Parallel[1], Ser-Addressable | 20 - 4000 | 1.9 | 59 | ±(0.2+1.5% of setting) | 0.65 | 32L 5x5 QFN |
| PE43702 - 7-bit, 50 Ω | 31.75 range / 0.25 dB steps | Parallel[1], Serial | 20 - 4000 | 2.0 | 57 | ±(0.2+3% of setting) | 0.65 | 24L 4x4 QFN |
| PE43703 - 7-bit, 50 Ω | 31.75 / 0.25, 0.5, 1.0 steps | Parallel[1], Ser-Addressable | 9kHz-6GHz | 1.9 | 59 | ±(0.2+1.5% of setting) | 0.65 | 32L 5x5 QFN |

**Note 1:** Parallel Modes: Latched and Direct

## Broadband Digital Step Attenuators (Monolithic) - 75 Ω

| Product Description | Attenuation | Programming Mode | Operating Freq. (MHz) | Insertion Loss (dB) | Input IP3 (dBm) | Attenuation Accuracy (1 GHz) | Switching Speed (μs) | Package |
|---|---|---|---|---|---|---|---|---|
| PE4304 - 6-bit, 75 Ω | 31.5 range / 0.5 steps | Parallel[1], Serial | 1 - 2000 | 1.4 | 52 | ±(0.15+4% of setting) | 1 | 20L 4x4 QFN |
| PE4307 - 5-bit, 75 Ω | 15.5 range / 0.5 steps | Parallel[1], Serial | 1 - 2000 | 1.4 | 52 | ±(0.15+4% of setting) | 1 | 20L 4x4 QFN |
| PE4308 - 5-bit, 75 Ω | 31 range / 1.0 steps | Parallel[1], Serial | 1 - 2000 | 1.4 | 52 | ±(0.20+4% of setting) | 1 | 20L 4x4 QFN |
| PE43404 - 4-bit, 75 Ω | 15 range / 1.0 steps | Parallel[1], Serial | 1 - 2000 | 1.4 | 52 | ±(0.25+7% of setting) | 1 | 20L 4x4 QFN |

**Note 1:** Parallel Modes: Latched and Direct

## Integer-N Phase Locked-Loop (PLL) Frequency Synthesizers

| Product Description | Φ Det Type | Programming Mode | Max Input Operating Freq. (GHz) RF PLL | (MHz) Ref. | (MHz) Compare | Prescaler | Main Counters M, A | Reference Counters | Typical Idd (mA @ 3 V) | Vdd Range (V) | Package |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PE3336 | PD | Parallel, Serial, Hardwire | 3.0 | 100 | 20 | 10/11 | 9bit, 4bit | 6bit | 19 | 2.85-3.15 | 48L 7x7 QFN |
| PE3341 | CP | Serial, EEPROM[1] | 2.7[2] | 100 | 20 | 10/11 | 9bit, 4bit | 6bit | 20 | 2.85-3.15 | 20L 4x4 QFN |
| PE3342 | PD | Serial, EEPROM[1] | 2.7[2] | 100 | 20 | 10/11 | 9bit, 4bit | 6bit | 20 | 2.85-3.15 | 20L 4x4 QFN |

**Note 1:** Programming Kit available-contains 10 samples. **Note 2:** 3 GHz available. See datasheet.

**ESD**

*UltraCMOS™ RFICs deliver extraordinary ESD tolerance – up to 4kV HBM*

psemi.com

# RoHS-Compliant Packaging Options.

Peregrine Semiconductor is proud to offer RoHS-compliant, Lead-free (Pb-free) versions of the most popular packages for its UltraCMOS™ products in order to reduce hazardous substances.

All Pb-free products use matte tin plating (Sn) onto copper lead frames, rather than tin-lead (PbSn) solder that is used on standard products. The electronics industry has considerable experience with matte Sn finishes, which have been widely used. The reliability aspects of matte Sn plating have been well-researched including solderability with both Pb-free and standard SnPb solders, and low whisker growth even in accelerated temperature/humidity conditions.

New Pb-free products are developed and released on a regular basis depending upon market demand and other factors. As new products are introduced and regulatory conditions change, Peregrine will maintain its commitment to doing its part to preserve our environment. If the Pb-free solution that you need is not shown, please consult with Peregrine or any of its worldwide sales representatives for solutions to your specific requirements.

## Choose from a variety of commercial packaging options to design-in the device that suits your application.
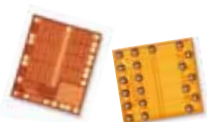
| Wire-bond Die and Flip Chip | 6L SC70 | 6L DFN | 8L MSOP | 8L TSSOP | 12L 3x3 QFN |
|---|---|---|---|---|---|
| | 1.3 x 2.0 x 1.0 | 3.0 x 3.0 x 0.9 Fused and Isolated versions | 3.0 x 3.0 x 1.1 Regular and exposed ground paddle | 3.0 x 4.4 x 1.1 | 3.0 x 3.0 x 0.75 |

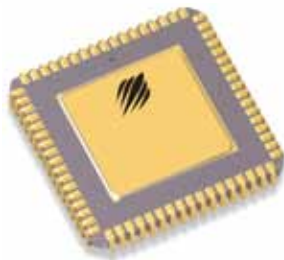| 16L 3x3 QFN | 20L 4x4 QFN | 24L 4x4 QFN | 32L 5x5 QFN | 48L QFN |
|---|---|---|---|---|
| 3.0 x 3.0 x 0.75 | 4.0 x 4.0 x 0.9 | 4.0 x 4.0 x 0.9 | 5.0 x 5.0 x 0.9 | 7.0 x 7.0 x 0.9 |

All dimensions are listed in millimeters (width x length x height) and are approximate.
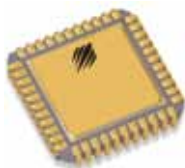See product datasheets for exact dimensions.

Available Lead-free (Pb-free) versions are indicated in green.

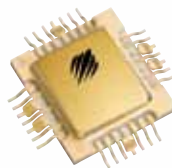## Ceramic Packaging. Hermetically Sealed, Rigorously Tested.

| 68L CQFJ | 44L CQF | 28L CQFP | 7L CSOIC | 8L CSOIC |
|---|---|---|---|---|
| 24.1 x 24.1 x 3.1 | 16.5 x 16.5 x 2.9 | 9.1 x 9.9 x 1.3 | 6.6 x 5.5 x 1.7 | 4.6 x 4.6 x 1.8 |

# Wireless and Broadband RF Products (continued)

## MOSFET Quad Array Mixer Core

| Product Description | Operating Frequency (MHz) | | | LO Drive (dBm) | Conv. Loss (dB) | Isolation (dB, typ.) | | Input IP3 (dBm, typ.) | Package |
|---|---|---|---|---|---|---|---|---|---|
| | LO | RF | IF, Nom. | | | LO-RF | LO-IF | | |
| PE4140 - MOSFET Quad Array | 0.01-6000 | 0.01-6000 | 0.01-6000 | 0-20 | 6.5-7.5 | 25-40 | 25-40 | 36 | 6L 3x3 DFN, DIE |
| **NEW** PE4150 - Buffered Quad FET Core | 245.65-885.65 | 136-941 | 44.85-109.65 | -10 to -6 | 6.5-8.7 | 25-30 | 20-30 | 25 | 20L 4x4 QFN |

## MOSFET Quad Array Mixer Core: Low Frequency for Multiplexor Applications

| Product Description | Operating Frequency (MHz) | | | LO Drive (dBm) | Conv. Loss (dB) | Isolation (dB, typ.) | | Input IP3 (dBm, typ.) | Package |
|---|---|---|---|---|---|---|---|---|---|
| | LO | RF | IF, Nom. | | | LO-RF | LO-IF | | |
| **NEW** PE4141 - MOSFET Quad Array | 0.01-1000 | 0.01-1000 | 0.01-1000 | 0-20 | 7.0-8.0 | 40 | 40 | 33 | 8L MSOP |

**Note:** Fully differential DC coupled ports. External baluns required.

## Prescalers

| Product Description | Input Operating Frequency (MHz) | Divide Ratio | Typical Idd mA @ 3 V) | Vdd Range (V) | Package |
|---|---|---|---|---|---|
| PE3501 - Divide-by-2 | 400 - 3500 | 2 | 12 | 2.85-3.15 | 8L TSSOP |
| PE3511 - Divide-by-2 | DC - 1500 | 2 | 8 | 2.85-3.15 | 6L SC70 |
| PE3512 - Divide-by-4 | DC - 1500 | 4 | 8 | 2.85-3.15 | 6L SC70 |
| PE3513 - Divide-by-8 | DC - 1500 | 8 | 8 | 2.85-3.15 | 6L SC70 |



*Peregrine UltraCMOS RFICs are uniquely suited for the RF front-end.*
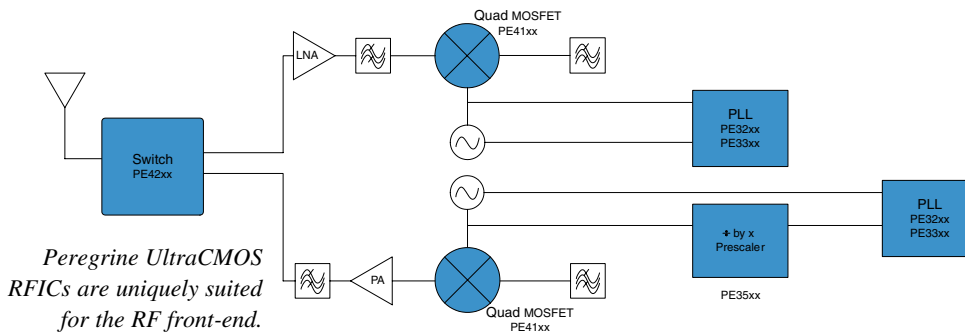
## Integrating The RF Front-End

*Monolithic integration is paramount to engineering unique mixed-signal solutions, and UltraCMOS™ high-performance RFICs deliver superior performance in linearity and isolation; robust ESD tolerance; scalability; and the foundation upon which to provide a highly integrated RF signal chain.*

## Mobile Wireless Switches - 50 Ω

| Product Description | Part Number[1] | 2nd Harmonic (dBc) | | 3rd Harmonic (dBc) | | Insertion Loss (dB @ 1 GHz) | Isolation (dB @ 1 GHz) | IMD3 (dBm) | Typical Idd (μA @ 2.75 V) | Vdd Range (V) | Package |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 35 dBm TX Input 850/900 MHz | 33 dBm TX Input 1800/1900 MHz | 35 dBm TX Input 850/900 MHz | 33 dBm TX Input 1800/1900 MHz | | | | | | |
| SP4T - 2Tx/2Rx | *PE42612[2] | -82 | -89 | -74 | -68 | 0.55 | 39 | – | 11[3] | 2.4-2.95 | Flip Chip |
| SP6T - 2Tx/4Rx | *PE42632[2] | -87 | -86 | -78 | -76 | 0.65 | 38 | – | 13 | 2.5-2.8 | Flip Chip |
| **NEW** SP6T - 6Tx | *PE42662[2] | -75 | -73 | -75 | -73 | **0.50** | 38 | -111 | 120 | 2.4-3.0 | Flip Chip |
| SP7T - 3Tx/4Rx | *PE42674[2] | -85 | -84 | -79 | -76 | 0.65 | 39 | -112 | 13 | 2.5-3.2 | Flip Chip |
| **NEW** SP9T - 2Tx/3TRx/4Rx | *PE42695 | -77 | -75 | -77 | -75 | **0.45** | 38 | -111 | 115 | 2.4-3.0 | Flip Chip |
| SP6T - 2Tx/4Rx | *PE42660 | -85 | -84 | -83 | -82 | 0.55 | 48 | – | 13 | 2.65-2.85 | DIE |
| SP7T - 2Tx/2TRx/3Rx | *PE42671[2] | -83 | -82 | -77.5 | -78 | 0.65 | 46 | -111 | 13 | 2.65-2.85 | DIE |
| SP7T - 3Tx/4Rx | *PE42672[2] | -85 | -84 | -79 | -77 | 0.60 | 44 | -109 | 13 | 2.65-2.85 | DIE |
| SP4T - 4RF | PE42641[2] | -86 | -87 | -81 | -80 | 0.45 | 35 | -110 | 13 | 2.65-2.85 | 16L 3x3 QFN |
| SP6T - 2Tx/4Rx | PE4268 | -84 | -80 | -70 | -66 | 0.60 | 50 | – | 13[3] | 2.4-2.8 | 20L 4x4 QFN |

**Note 1:** Operating Frequency 100-3000 MHz  
**Note 2:** 1.8 V-compliant logic (VIH / VIL = 1.4 / 0.4 V)

**\***Contact factory for pricing and availability.

# High-Reliability Products

## High-Rel Switches

| Product Description | Operating Frequency (MHz) | IIP3 (dBm @ 2 GHz) | P1dB (dBm @ 2 GHz) | Insertion Loss (dB @ 1 GHz) | Isolation (dB @ 1 GHz) | Typical Idd (μA @ 3 V) | Vdd Range (V) | Package |
|---|---|---|---|---|---|---|---|---|
| PE9354 - SPDT | 10-3000 | 55 | 31 | 0.55 | 32 | 28 | 2.7-3.3 | 8L CSOIC |
| **NEW** PE95420 - SPDT | 1-8500 | 60 | 33 | 0.85 | 55 | 100 @ 3.3 V | 3.0-3.6 | 7L CSOIC, DIE |

## High-Rel Integer-N Phase Locked-Loop (PLL) Frequency Synthesizers

| Product Description | Φ Det Type | Programming Mode | Normalized Phase Noise (dBc/Hz) | (GHz) RF PLL | (MHz) Ref. | (MHz) Compare | Prescaler | Main Counters M, A | Reference Counters | Typical Idd (mA @ 3 V) | Vdd Range (V) | Package |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PE83336* | PD | Par, Ser, Hardwire | -212 | 3.0 | 100 | 20 | 10/11 | 9bit, 4bi | 6bit | 20 | 2.85-3.15 | 44L CQFJ |
| PE9601 | CP | Par, Ser, Hardwire | -210 | 2.2 | 100 | 20 | 10/11 | 9bit, 4bit | 6bit | 24 | 2.85-3.15 | 44L CQFJ, DIE |
| PE9701 | CP | Par, Ser, Hardwire | -210 | 3.0 | 100 | 20 | 10/11 | 9bit, 4bit | 6bit | 24 | 2.85-3.15 | 44L CQFJ, DIE |
| PE9702 | PD | Par, Ser, Hardwire | -210 | 3.0 | 100 | 20 | 10/11 | 9bit, 4bit | 6bit | 24 | 2.85-3.15 | 44L CQFJ, DIE |
| PE97022 | PD | Par, Ser, Hardwire | **-216** | 3.5 | 100 | 50 | 10/11 | 9bit, 4bit | 6bit | 45[1] | 2.85-3.45 | 44L CQFJ, DIE |
| PE9704 | PD | Serial, Hardwire | -210 | 3.0 | 100 | 20 | 10/11 | 9bit, 4bit | 6bit | 24 | 2.85-3.15 | 44L CQFJ, DIE |
| PE97042 | PD | Serial, Hardwire | **-216** | 3.5 | 100 | 50 | 10/11 | 9bit, 4bit | 6bit | 45[1] | 2.85-3.45 | 44L CQFJ, DIE |

**Note 1**. Typical Idd = 45 mA @ 3.3 V          *Not available for Space Level Screening

## High-Rel Delta-Sigma Modulated Fractional-N Frequency Synthesizers

| Product Description | Programming Mode | Normalized Phase Noise (dBc/Hz) | (GHz) RF PLL | (MHz) Ref. | (MHz) Compare | Prescaler | Main Counters M, A, K | Reference Counters | Typical Idd (mA @ 3 V) | Vdd Range (V) | Package |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PE97632 Ultra-Low Phase Noise 3rd Order DSM | Ser, Hardwire | **-216** | 3.5 | 100 | 50 | 10/11 | 9bit, 4bit, 18 bit | 6bit | 40[1] | 2.85-3.45 | 68L CQFJ, DIE |
| PE9763 Low Phase Noise 3rd Order DSM | Ser, Hardwire | -210 | 3.2 | 100 | 50 | 10/11 | 9bit, 4bit, 18 bit | 6bit | 30 | 2.85-3.15 | 68L CQFJ, DIE |

**Note:** The PE97632 is pin for pin compatible with the PE9763 in up/down mode          **Note 1.** Typical Idd = 40 mA @ 3.3 V

## High-Rel RF Digital Step Attenuators (Monolithic) - 50 Ω

| Product Description | Attenuation | Programming Mode | Operating Freq. (MHz) | Insertion Loss (dB) | Input IP3 (dBm) | Attenuation Accuracy (1 GHz) | Switching Speed (μs) | Package |
|---|---|---|---|---|---|---|---|---|
| PE94302 - 6-bit, 50 Ω | 31.5 range / 0.5 steps | Parallel, Serial | DC-4000 | 1.5 | 52 | ±(0.55dB+7% of setting) | 1 | 28L CQFP, DIE |

## High-Rel Prescalers

| Product Description | Input Operating Frequency (MHz) | Divide Ratio | Typical Idd mA @ 3 V | Vdd Range (V) | Package |
|---|---|---|---|---|---|
| PE9301 - Divide-by-2 | 1500 - 3500 | 2 | 13 | 2.85-3.15 | 8L CSOIC |
| PE9303 - Divide-by-8 | 1500 - 3500 | 8 | 14 | 2.85-3.15 | 8L CSOIC |
| PE9304 - Divide-by-2 | 1000 - 7000 | 2 | 14 | 2.85-3.15 | 8L CSOIC |
| PE9309 - Divide-by-4 | **3000 - 13500** ◀ UltraCMOS Tops 13 GHz | 4 | 16 @ 2.6 V | 2.45-2.75 | 8L CSOIC, DIE |
| PE9311 - Divide-by-2 | DC - 1500 | 2 | 6.5 | 2.85-3.15 | 8L CSOIC |
| PE9312 - Divide-by-4 | DC - 1500 | 4 | 6.5 | 2.85-3.15 | 8L CSOIC |
| PE9313 - Divide-by-8 | DC - 1500 | 8 | 6.5 | 2.85-3.15 | 8L CSOIC |

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## Application Notes

AN10   Connecting the PE3336, PE9601, and PE9701 to a Serial Bus Interface

AN12   Considerations for Using the PE323x/PE333x in Fractional-N or Sigma-Delta Designs

AN14   Using the PE3501 Prescaler with the PE3236 PLL to Synthesize Frequencies up to 3.5 GHz

AN15   Impedance Matching the PE4210/20/30 RF Switches for 75 Ω Applications

AN16   Using Peregrine PLL in System Clock Applications

AN17   OC-12 622.08 MHz Reference Clock Design

AN18   RF Switch Performance Advantages of UltraCMOS™ Technology over GaAs Technology

AN20   Multi-Port Handset Switch S-Parameters

AN22   Migrating from PE9702 to PE97022

AN23   Migrating from PE9704 to PE97042

AN24   Migrating from PE9763 to PE97632

AN26   Advantages of UltraCMOS™ DSAs with Serial-Addressability

AN27   Using Blocking Capacitors with UltraCMOS™ Devices

AN33   5-bit and 6-bit RF Digital Step Attenuator Compatibility Attenuators
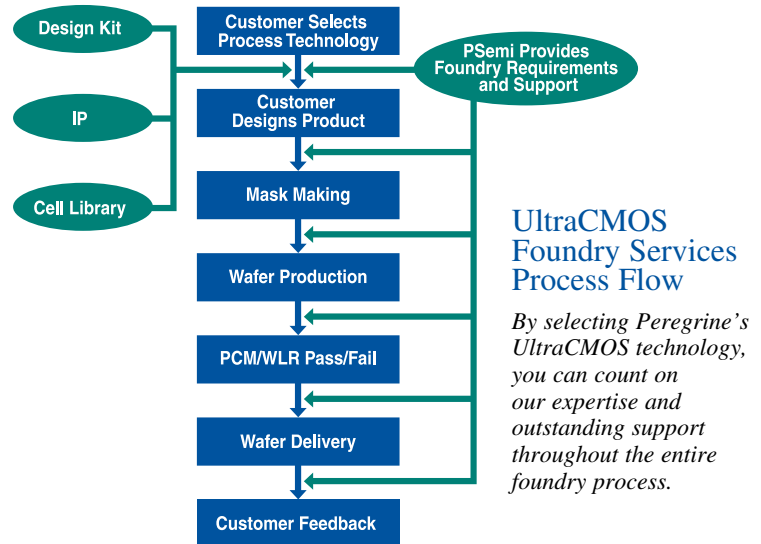
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IP

Cell Library

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## UltraCMOS Foundry Services Process Flow

*By selecting Peregrine's UltraCMOS technology, you can count on our expertise and outstanding support throughout the entire foundry process.*

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