

Product Brief

Product Summary

The PC805 is a purpose-designed PHY SoC for 5G NR/LTE small cell O-RU RAN architectures, and meets industry-leading Open RAN specifications. The PC805 interfaces with an O-DU as part of an Open RAN split 7.2, via an Open Fronthaul eCPRI interface and supports seamless connections to RFICs with a standardised JESD204B high-speed serial interface.

The PC805 does not require an external processor/controller for configuration or management. This is all done via an integrated RISC-V based Management processor running a Linux OS.

Key Applications

The PC805 SoC is designed for 5G and LTE small cell O-RU platforms in the following network deployments:

- ◆ Indoor residential, enterprise and industrial
- ◆ Neutral host and private
- ◆ Outdoor

The PC805 can be used in the following architectures:

- ◆ Split 7.2x O-RAN Radio Unit (O-RU CAT-A), this requires the use of the PC805E variant.
- ◆ Split 8 Remote Radio Heads (RRH or RRU), this requires the use of the PC805C variant.

Key Features

- ◆ Picocom's 5G NR and LTE low PHY software
- ◆ O-RAN eCPRI Open Fronthaul interface
- ◆ On-board supervisor Linux CPU for M-plane, S-plane processing, and radio control
- ◆ Fourier transforms: FFT, iFFT
- ◆ Digital Front End (DFE)
- ◆ Digital Pre-Distortion (DPD)
- ◆ Crest Factor Reduction (CFR)
- ◆ Simple cascade mode for eCPRI use cases¹
- ◆ PRACH processing
- ◆ IQ compression/decompression
- ◆ Secure on-chip boot capability
- ◆ Debug and device monitoring

¹ Simple Cascade mode is not the same as O-RAN Cascade mode, which includes an IQ 'copy/combine' function which operates across cascaded O-RU antennas."

Key Interfaces

- ◆ High speed 4-lane JESD204B radio interface
- ◆ 10/25Gbps eCPRI Open Fronthaul including support for 10Gbase-T copper
- ◆ 10.137/12.165/24.33 Gbit/s CPRI Interface
- ◆ 2x SPI and up to 48 timed GPIO interfaces
- ◆ 2x I2C, 3x UART and 100M Ethernet Debug interfaces
- ◆ Synchronisation and clock interfaces: SyncE, IEEE1588v2 and GNSS
- ◆ LPDDR4 external RAM
- ◆ QPSI flash

Key Performance

The PC805 supports 3GPP 5G NR releases 15 and 16, with headroom for future releases.

The PC805 supports flexible RF/bandwidth mapping, for example:

- ◆ 8 TX/8 RX RF ports at 100MHz BW
- ◆ 4 TX/4 RX RF ports at 200MHz BW
- ◆ 2 TX/2 RX RF ports at 400MHz BW

The PC805 supports a wide number of use cases for multi-carrier, simultaneous dual 5G NR/LTE mode, and neutral host applications.

Please see tables 1 and 2 for more details on use cases

Package summary

- ◆ 17mm x 17mm FC LFBGA Flip-Chip Ball Grid

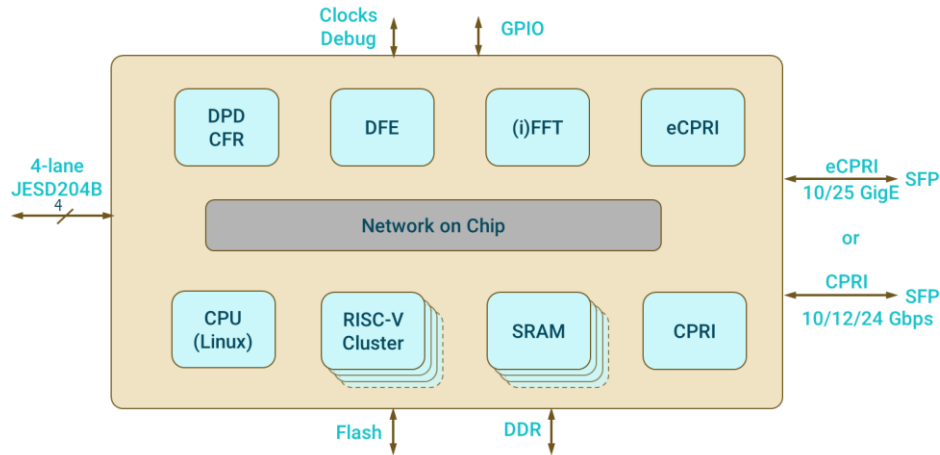




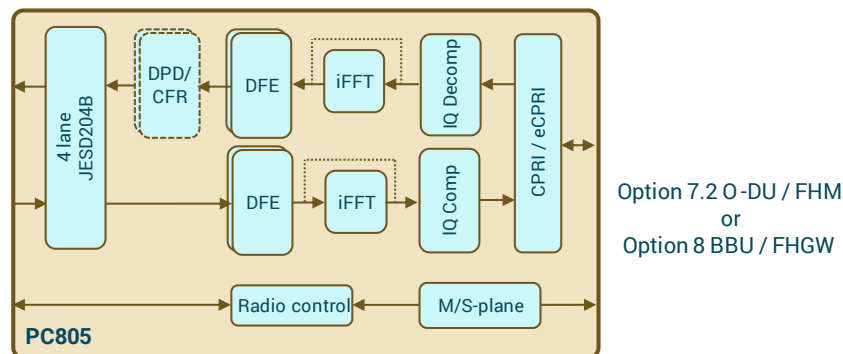
Device description

The PC805 device's function in a small cell use case is, at the highest level, seen as transforming O-RAN fronthaul eCPRI (or CPRI messages) from O-DU or fronthaul gateway to IQ samples for the radio, and vice versa. This includes driving the external physical and software interfaces, low PHY processing, Digital Front End (DFE), Digital Pre-Distortion (DPD) and Crest Factor Reduction (CFR) functions.

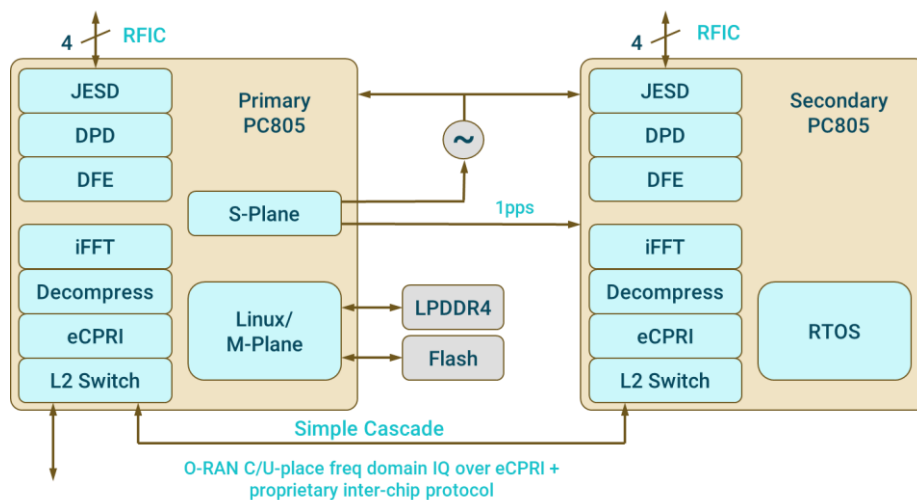
Architecture block diagram



Signal Flow Block Diagram



Simple Cascade mode for split 7.2



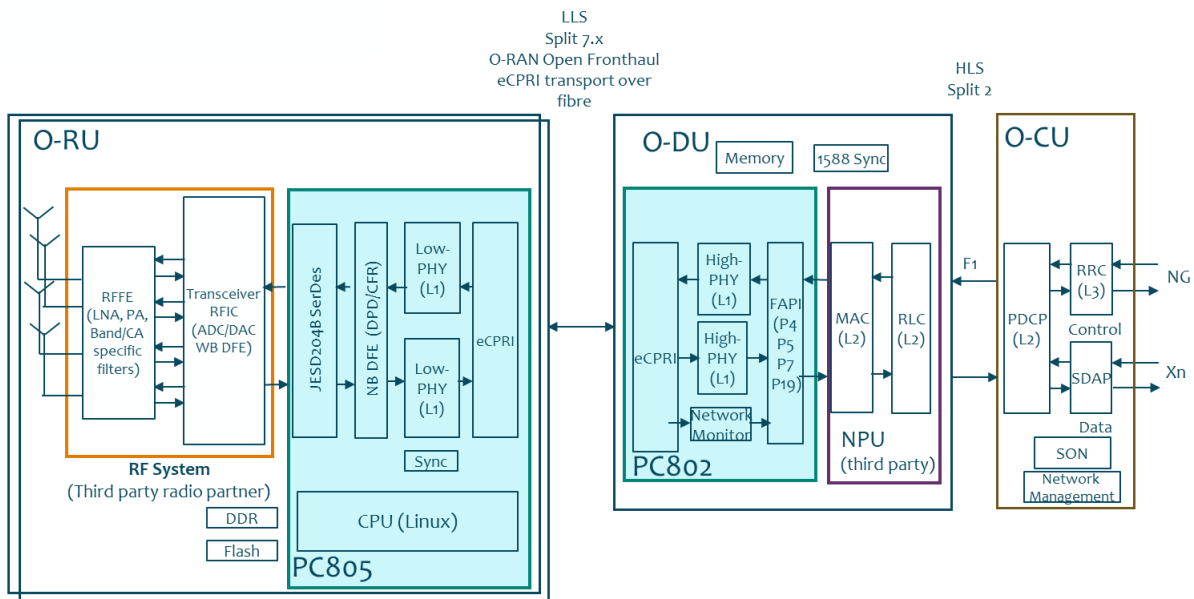


PC805 Use Cases

The block diagrams below provide examples of different small cell architecture use cases which the PC805 can be used. The examples illustrated are all for 4TX4RX FR1 Sub-6GHz, but other antenna configurations and FR2 can also be supported with the PC805.

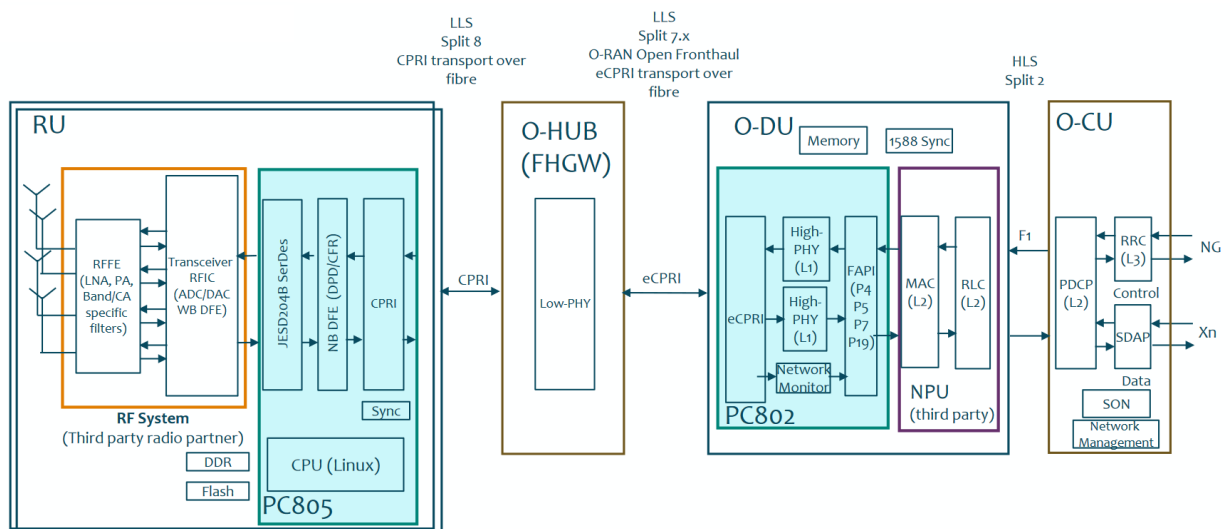
Split Options

The PC805 can be used as a split 7.2 O-RU, with the 5G NR RU software. The on-chip CPU is used to terminate the Open Fronthaul M and S planes.



PC805 in split 7.2 O-RU

In Split 8, the PC805C variant can be used in the RRH, using the CPRI and JESD interfaces and the DFE (DPD/CFR) functions. In the implementation below a Fronthaul GateWay (FHGW) is required to convert the eCPRI interface to a CPRI interface.



PC805 in split 8 with CPRI interface to RF



5G NR Use Cases

The following tables provides example and test 5G NR use cases including multiple cell, carrier aggregation and neutral host use cases. The DFE has flexibility to support other use cases.

Use cases are supported in conjunction with the Picocom 5G NR RU software, and a roadmap is available for use case support.

5G Use case e case #	FR1/FR2	Ant config	Aggregated BW (# CC BW)	TDD/FDD	# RFIC
PC805_UC_1	FR1	2T2R	100MHz (1 CC)	TDD	1 RFIC
PC805_UC_2	FR1	4T4R	100MHz (1 CC)	TDD	1 RFIC
PC805_UC_25	FR1	4T4R	150MHz (2 CC 100+50MHz contig)	TDD	1 RFIC
PC805_UC_5	FR1	4T4R	160MHz (2 CC 100+60MHz contig)	TDD	1 RFIC
PC805_UC_8	FR1	4T4R	200MHz (2 CC 100+100MHz contig)	TDD	1 RFIC
PC805_UC_14	FR1	2T2R	320MHz (4 CC 100+60MHz B1 + 100+60MHz contig B2)	TDD	2 RFIC
PC805_UC_28	FR2	4T4R	200MHz (1 CC)	TDD	1 RFIC

Example 5G NR use cases supported with single PC805 providing DPD

5G Use case #	FR1/FR2	Ant config	Aggregated BW (# CC BW)	TDD/FDD	# RFIC
PC805_UC_31	FR1	8T8R	100MHz (1 CC)	TDD	2 RFIC ²
PC805_UC_26	FR1	4T4R	200MHz (Dual band 100+100MHz))	TDD	2 RFIC
PC805_UC_12	FR1	2T2R	300MHz (3 CC 3x100MHz contig)	TDD	1 RFIC
PC805_UC_27	FR2	2T2R	400MHz (1 CC)	TDD	1 RFIC

Table 2 Example 5G NR use case supported with single PC805 (RFIC providing DPD)

5G Use case #	FR1/FR2	Ant config	Aggregated BW (# CC BW)	TDD/FDD	# RFIC
PC805_UC_13	FR1	4T4R	320MHz (4 CC 100+60MHz B1 + 100+60MHz contig B2)	TDD	2 RFIC ³
PC805_UC_16	FR1	2T2R	360MHz (2 CC 100+60MHz contig B1 + 100MHz B2 + 100MHz B3)	TDD	2 RFIC

Table 3 Example 5G NR use case support with two PC805s in simple cascade (PC805 providing DPD)

5G Use case #	FR1/FR2	Ant config	Aggregated BW (# CC BW)	TDD/FDD	# RFIC
PC805_UC_11	FR1	4T4R	300MHz (3 CC 3x100MHz contig)	TDD	2 RFIC
PC805_UC_22	FR1	4T4R	230MHz (4 CC 100+40+50+40 contig) neutral host	TDD	1 RFIC
PC805_UC_24	FR1	2T2R	280MHz (4 CC 100+40+20+100 contig) neutral host	TDD	1 RFIC

Table 4 Example 5G NR use case support with two PC805s in simple cascade (RFIC providing DPD)

Note: RFIC partner configurations assuming 4T4R capability assumed unless indicated

² Could be supported by single RFIC supporting 8T8R.

³ Assuming one RFIC can support dual band



LTE and Dual mode Use Cases

Table 5 details example and test LTE and dual mode use cases and the DPD/CFR and RFIC configurations. The DFE has flexibility to support other use cases, please contact Picocom for support for specific use cases.

Use case #	5G/LTE FR1/FR2	Ant config	Aggregated BW (# CC BW)	TDD/FDD	# RFIC
PC805_UC_29	LTE	2T2R	20MHz (1 CC)	TDD	1 RFIC
PC805_UC_30	LTE	2T2R	40MHz (2 CC)	TDD	1 RFIC
PC805_UC_20	5G FR1	2T2R	100MHz (1 CC)	TDD	1 RFIC ⁴
	LTE	2T2R	20MHz (1 CC)	FDD	
PC805_UC_21	5G FR1	2T2R	100MHz (1 CC)	TDD	1 RFIC ³
	LTE	2T2R	20MHz (1 CC)	TDD	
PC805_UC_17	5G/LTE DSS	4T4R	160MHz (2 CC 100+60MHz contig)	TDD	1 RFIC

Table 5 LTE and Dual mode PC805 use cases with single PC805 providing DPD

Use case #	5G/LTE FR1/FR2	Ant config	Aggregated BW (# CC BW)	TDD/FDD
PC805_UC_3	5G FR1	4T4R	100MHz (1 CC)	TDD
	LTE	2T2R	20MHz (1 CC)	TDD
PC805_UC_4	5G FR1	4T4R	100MHz (1 CC)	TDD
	LTE	2T2R	20MHz (1 CC)	FDD
PC805_UC_6	5G FR1	4T4R	160MHz (2 CC 100+60MHz contig)	TDD
	LTE	2T2R	20MHz (1 CC)	TDD
PC805_UC_7	5G FR1	4T4R	160MHz (2 CC 100+60MHz contig)	TDD
	LTE	2T2R	20MHz (1 CC)	FDD
PC805_UC_9	5G FR1	4T4R	200MHz (2 CC 100+100MHz contig)	TDD
	LTE	2T2R	20MHz (1 CC)	TDD
PC805_UC_10	5G FR1	4T4R	200MHz (2 CC 100+100MHz contig)	TDD
	LTE	2T2R	20MHz (1 CC)	FDD
PC805_UC_23	5G FR1	4T4R	100MHz (1 CC)	TDD
	LTE	2T2R	70MHz (6 CC 3x5+15+2x20))	TDD

Table 6 LTE and Dual mode PC805 use cases supported with two PC805s in simple cascade (PC805s providing DPD)

Order Information

Order Code	Product Name	Details
PC805	5G Small Cell RU SoC	Production parts
PC805C	5G Small Cell RU SoC with CPRI	Production parts

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⁴ Assuming RFIC support dual band is used