

MACRO BTS PRODUCT OVERVIEW

Complete RF signal chain solution



Renesas is a leader in developing circuit-level RF innovations and a trusted supplier to the leading communications systems providers. Unlike other suppliers, Renesas continues to invest in Macro Base Transceiver Station (BTS) RF devices with unique circuit design innovation to support next-generation system development, which requires lower Noise Figures, higher linearity, lower power consumption and more integration for next-generation 4G architecture and rolling over to 5G applications.

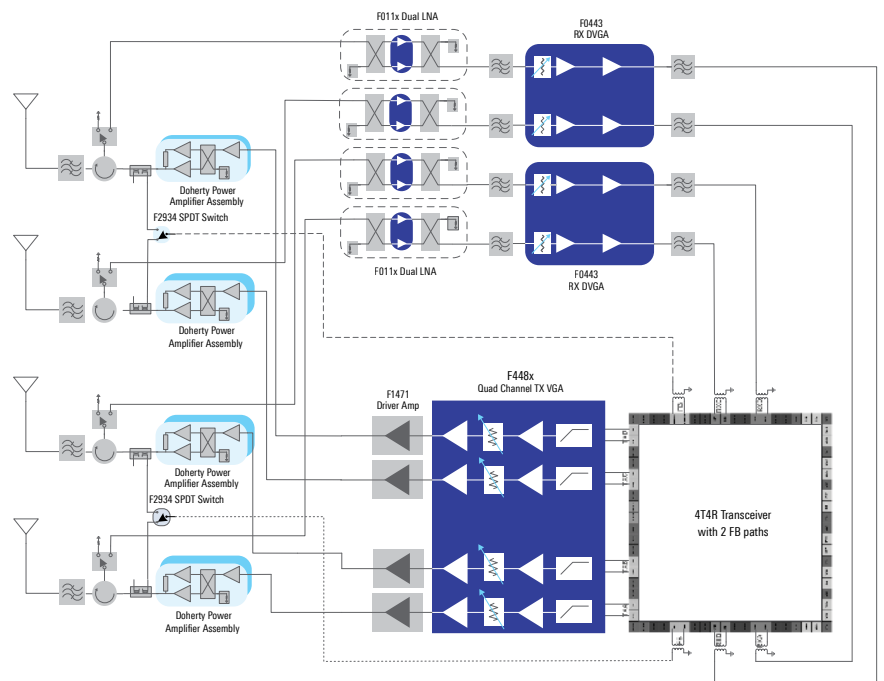
The Renesas portfolio delivers the high performance, high reliability, flexibility, and smaller form factor demanded by 5G Macro BTS systems. These devices perform well across a wide range of environmental conditions and frequency bandwidths, and integrate Renesas' Smart Silicon™ innovations, which enable smaller footprints for a given function, a key advantage for the large number of antenna paths required in each system.

Features

- Lower Noise Figures
- Higher linearity
- Lower power consumption
- Higher levels of integration

Advantages

- High isolation from channel to channel
- No glitches during switching gain
- Better return loss for both input and output
- Wide frequency range system support
- Current tuning to optimize balance between power consumption and performance
- Integration and flexibility simplify design to reduce time to market



Macro BTS System Diagram

RX CHAIN

Low Noise Amplifiers

| Part Number | Frequency (GHz) | Gain (dB) | NF (dB) | OP1dB (dBm) | OIP3 (dBm) |
|--------------------|-----------------|-----------|-------------------|-------------|------------|
| F0109 ² | 0.65 – 1 | 18 | 0.55 ³ | 24.5 | 41 |
| F0110 ² | 1.5 – 2.3 | 18.5 | 0.55 ³ | 22 | 39 |
| F0111 | 2.3 to 2.7 | 18 | 0.7 ³ | 23 | 38 |

RF VGA

| Part Number | Frequency (GHz) | # Ch | Att. Range (dB) | Att. Step (dB) | Gain (dB) | NF (dB) | OP1dB (dBm) |
|-------------|-----------------|------|-----------------|----------------|-----------|---------|-------------|
| F0440 | 0.6 – 2.7 | 2 | 6, 23, 18 | 6, 1, 6 | 11.6 | 4.7 | 20.2 |
| F0443 | 0.6 – 2.7 | 2 | 6, 6, 23, 18 | 6, 6, 1, 6 | 29.5 | 3.2 | 19.7 |
| F0448 | 3.4 – 3.8 | 2 | 6, 23, 18 | 6, 1, 6 | 13 | 5.9 | 18 |
| F0480 | 0.4 – 2.7 | 1 | 23 | 1 | 13 | 4 | 22.2 |
| F1106 | 1.4 – 3 | 2 | 31.5 | 0.5 | 32 | 7.3 | 20 |
| F1107 | 3 – 4 | 2 | 31.5 | 0.5 | 30.5 | 8.7 | 21 |

Amplifiers

| Part Number | Frequency (GHz) | Gain (dB) | NF (dB) | OP1dB (dBm) | OIP3 (dBm) |
|-------------|-----------------|-----------|---------|-------------|------------|
| F0424 | 0.6 – 5.0 | 17 | 2.3 | 21 | 40 |
| F1420 | 0.7 – 1.1 | 17.4 | 4.5 | 23.2 | 42 |
| F1421 | 1.7 – 2.2 | 20.3 | 5.5 | 23 | 40 |

Mixers

| Part Number | Description | RF Freq. (GHz) | LO Freq. (GHz) | IF Freq. (GHz) | Gain (dB) | IP1dB (dBm) | OIP3 (dBm) |
|-------------|-------------------------------|----------------|----------------|----------------|-----------|-------------|------------|
| F1102 | RF to IF Dual | 0.4 – 1 | 0.5 – 1.15 | 0.05 – 0.3 | 9.2 | 12.5 | 43 |
| F1152 | RF to IF Dual | 1.4 – 2.2 | 1.35 – 2.1 | 0.05 – 0.35 | 8.5 | 13.2 | 43 |
| F1162 | RF to IF Dual | 2.3 – 2.7 | 1.8 – 2.9 | 0.05 – 0.5 | 8.9 | 13 | 43 |
| F1178 | RF to IF Dual | 3.4 – 3.8 | 2.9 – 3.62 | 0.05 – 0.5 | 9 | 11 | 37.5 |
| F1192B | Dual Wideband Gain—settable | 0.4 – 3.8 | 0.4 – 3.6 | 0.05 – 0.6 | 11.1 | 7 | 35 |
| F1701 | RF to IF Single | 0.6 – 1.06 | 0.63 – 1.26 | 0.07 – 0.3 | 11.8 | 10.2 | 43 |
| F1751 | RF to IF Single | 1.4 – 2.5 | 1.4 – 2.5 | 0.05 – 0.5 | 11.8 | 9.7 | 43 |
| F1763 | RF to IF Single | 2 – 2.9 | 1.8 – 3 | 0.05 – 0.5 | 11.7 | 10.2 | 42 |
| F1792 | Single Wideband Gain—settable | 0.4 – 3.8 | 0.4 – 3.6 | 0.05 – 0.6 | 11.1 | 7 | 35 |

IF VGA

| Part Number | Frequency (GHz) | # Ch | Att. Range (dB) | Att. Step (dB) | Gain (dB) | NF (dB) | OP1dB (dBm) | OIP3 (dBm) |
|-------------|-----------------|------|-----------------|----------------|-----------|---------|-------------|------------|
| F1200 | 0.05 – 0.16 | 1 | 23 | 0.25 | 21.7 | 2.6 | 19.4 | 48 |
| F1240 | 0.01 – 0.5 | 2 | 31.5 | 0.5 | 20 | 4 | 19.7 | 47 |

Multi-Function AFE

| Part Number | Description | Frequency (GHz) | Gain (dB) | OP1dB (dBm) | OIP3 (dBm) |
|-------------|-----------------|-----------------|-----------|-------------|------------|
| F0502 | Dual Path Rx IC | 0.6 – 1.0 | 28.2 | 20.2 | 44 |
| F0552 | Dual Path Rx IC | 1.7 – 2.0 | 28 | 19.5 | 46 |
| F0562 | Dual Path Rx IC | 2.3 – 2.7 | 29 | 19.8 | 44 |
| F1130 | RF to IF Dual | 0.4 – 1.1 | 9.0 | 19 | 43 |
| F1180 | RF to IF Dual | 1.4 – 2.7 | 8.2 | 17.5 | 38 |

TX CHAIN

Amplifiers

| Part Number | Frequency (GHz) | Input | Output | Gain (dB) | NF (dB) | OP1dB (dBm) | OIP3 (dBm) |
|-------------|-----------------|----------|--------|--------------------------|---------|-------------|------------|
| F1423 | 0.6 – 3.0 | 50Ω DIFF | 50Ω SE | 13.1 | 5.1 | 21.5 | 41.8 |
| F1471 | 0.4 – 4.2 | 50Ω SE | 50Ω SE | 17 | 4.3 | 28.5 | 39 |
| F1475 | | | | | 5 | 30 | – |
| F1490 | 1.8 – 5 | 50Ω SE | 50Ω SE | 39.5 / 35.5 ¹ | 2.5 | 24 | 38 |
| F1495 | | | | | 5 | 30 | – |

VGA

| Part Number | Frequency (GHz) | # Ch | Att. Range (dB) | Att. Step (dB) | Gain (dB) | NF (dB) | OP1dB (dBm) | OIP3 (dBm) |
|-------------|-----------------|------|-----------------|----------------|-----------|---------|-------------|------------|
| F1451 | 0.45 – 1.1 | 1 | 29.5 | 0.5 | 32 | 3.6 | 23 | 41 |
| F1455 | 1.4 – 2.3 | 1 | 29.5 | 0.5 | 32.8 | 3.9 | 23 | 38.5 |
| F1456 | 2.1 – 2.95 | 1 | 31.5 | 0.5 | 32.1 | 3.9 | 21.5 | 38 |
| F4481 | 0.4 – 1.1 | 4 | 31.5 | 0.5 | 28 | 5.7 | 17 | 35 |
| F4482 | 1.3 – 2.8 | 4 | 31.5 | 0.5 | 27.5 | 5.7 | 16.7 | 36.8 |
| F1431B | 0.35 – 3 | 1 | 23 | 0.5 | 14.3 | 4.2 | 23.3 | 41.1 |

Modulator

| Part Number | Description | RF Freq. (GHz) | LO Freq. (GHz) | BB Freq. (GHz) | Gain (dB) | OP1dB (dBm) | OIP3 (dBm) |
|-------------|-------------|----------------|----------------|----------------|-----------|-------------|------------|
| F1653 | ZIF / CIF | 0.6 – 2.9 | 0.6 – 2.9 | 0 – 0.6 | 3 | 15 | 36 |

Integrated TX Solution

| Part Number | Description | Frequency (GHz) | Gain (dB) | OP1dB (dBm) | OIP3 (dBm) |
|-------------|-----------------|-----------------|-----------|-------------|------------|
| F159V | Dual Path Tx IC | 0.45 – 2.8 | 18.3 | 14 | 31 |

DPD

Down Converters

| Part Number | Description | RF Freq. (GHz) | LO Freq. (GHz) | IF Freq. (GHz) | Gain (dB) | IP1dB (dBm) | OIP3 (dBm) |
|-------------|-----------------|----------------|----------------|----------------|-----------|-------------|------------|
| F1701 | RF to IF Single | 0.6 – 1.06 | 0.63 – 1.26 | 0.07 – 0.3 | 11.8 | 10.2 | 43 |
| F1751 | RF to IF Single | 1.4 – 2.5 | 1.4 – 2.5 | 0.05 – 0.5 | 11.8 | 9.7 | 43 |
| F1763 | RF to IF Single | 2 – 2.9 | 1.8 – 3 | 0.05 – 0.5 | 11.7 | 10.2 | 42 |

Demodulators

| Part Number | Description | RF Freq. (GHz) | LO Freq. (GHz) | IF Freq. (GHz) | Gain (dB) | Max Att. (dB) | OIP3 (dBm) |
|-------------|--------------------------|----------------|----------------|----------------|-----------|---------------|------------|
| F1320 | DPD for PA Linearization | 0.55 – 1.15 | 0.5 – 1.3 | 0.02 – 0.035 | 12.5 | 25.5 | 43 |
| F1350 | DPD for PA Linearization | 1.30 – 2.90 | 1.40 – 2.90 | 0.02 – 0.500 | 12.5 | 25.5 | 41 |
| F1358 | DPD for PA Linearization | 3.2 – 4 | 3.1 – 3.8 | 0.02 – 0.5 | 10.2 | 25.5 | 41 |

SWITCHES

| Part Number | Description | Frequency (GHz) | Type | IL (dB) | IP0.1dB (dBm) | IP1dB (dBm) | IIP3 (dBm) |
|-------------|-------------|-----------------|------------|---------|---------------|-------------|------------|
| F2910 | SPST | 0.03 – 8 | Absorptive | 0.55 | 34 | 35 | 67 |
| F2912 | SPDT | 0.000009 – 9 | Absorptive | 0.4 | – | 30 | 66 |
| F2913 | SPDT | 0.05 – 6 | Absorptive | 0.79 | – | 36 | 65 |
| F2932 | SPDT | 0.05 – 8 | Absorptive | 0.79 | 32.3 | 36.5 | 64 |
| F2933 | SPDT | 0.05 – 8 | Absorptive | 0.79 | 32.3 | 36.5 | 64 |
| F2934 | SPDT | 0.05 – 8 | Absorptive | 0.79 | 32.3 | 36.5 | 64 |
| F2914 | SP4T | 0.05 – 8 | Absorptive | 1.1 | 35 | – | 60 |
| F2915 | SP5T | 0.05 – 8 | Absorptive | 1.1 | 35 | 36.5 | 60.5 |

DIGITAL STEP ATTENUATORS

| Part Number | Description | Frequency (GHz) | Max Att. (dB) | Resolution (dB) | IL (dB) | IP0.1dB (dBm) | IIP3 (dBm) |
|-------------|-------------|-----------------|---------------|-----------------|---------|---------------|------------|
| F1912 | 6-bit | 0.001 – 4 | 31.5 | 0.5 | 1.4 | 31 | 60 |
| F1950 | 7-bit | 0.15 – 4 | 31.75 | 0.25 | 1.3 | 27.5 | 63 |
| F1951 | 6-bit | 0.1 – 5 | 31.5 | 0.5 | 1.2 | 29 | 64 |
| F1953 | 6-bit | 0.4 – 4 | 31.5 | 0.5 | 1.4 | 28.5 | 66 |
| F1956 | 7-bit | 0.001 – 6 | 31.75 | 0.25 | 1.6 | 34.5 | 64 |
| F1958 | 7-bit | 0.001 – 6 | 31.75 | 0.25 | 1.6 | 35 | 64 |

¹ Dual gain modes (high gain and low gain settings)

² Dual path amplifiers specified in a balanced configuration

³ De-embedded to input pin of input hybrid couple

Visit [renesas.com/macrobs](https://www.renesas.com/macrobs) for more details on the complete portfolio of Macro BTS products, including datasheets, evaluation boards and samples.



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