Product Bulletin

TRF1x/2x RF Chipsets
TRF11xx/12xx/24xx—Integrated Solutions for 802.16 Broadband Wireless Access

Complete RF Front Ends

Texas Instruments (TI) offers complete RF front-end solutions for the 2.5, 3.5 and 5.8 GHz wavebands. The TRFxxxx chipsets provide support for not only fixed wireless access, but also emerging portable and mobile applications. The chipsets' low device counts and versatile configurations benefit 802.16d/e applications such as:

- Wireless base stations
- Wireless access points
- Customer Premise Equipment (CPE)
- Backhaul
- Point-to-point microwave
- Safety band
- Other FDD-based applications

Demonstrated Technology

TI's TRFxxxx chipsets provide integration and versatility for use in a variety of system configurations with TI and other baseband processors. The three RF chipsets and their operating frequencies are:

- TRF11xx: 2.3 to 2.7 GHz
- TRF12xx: 3.3 to 3.8 GHz
- TRF24xx: 4.9 to 5.9 GHz

Architectural Flexibility

The super-heterodyne architecture of the TRFxxxx chipsets allows greater flexibility in terms of frequency planning and filtering. Different combinat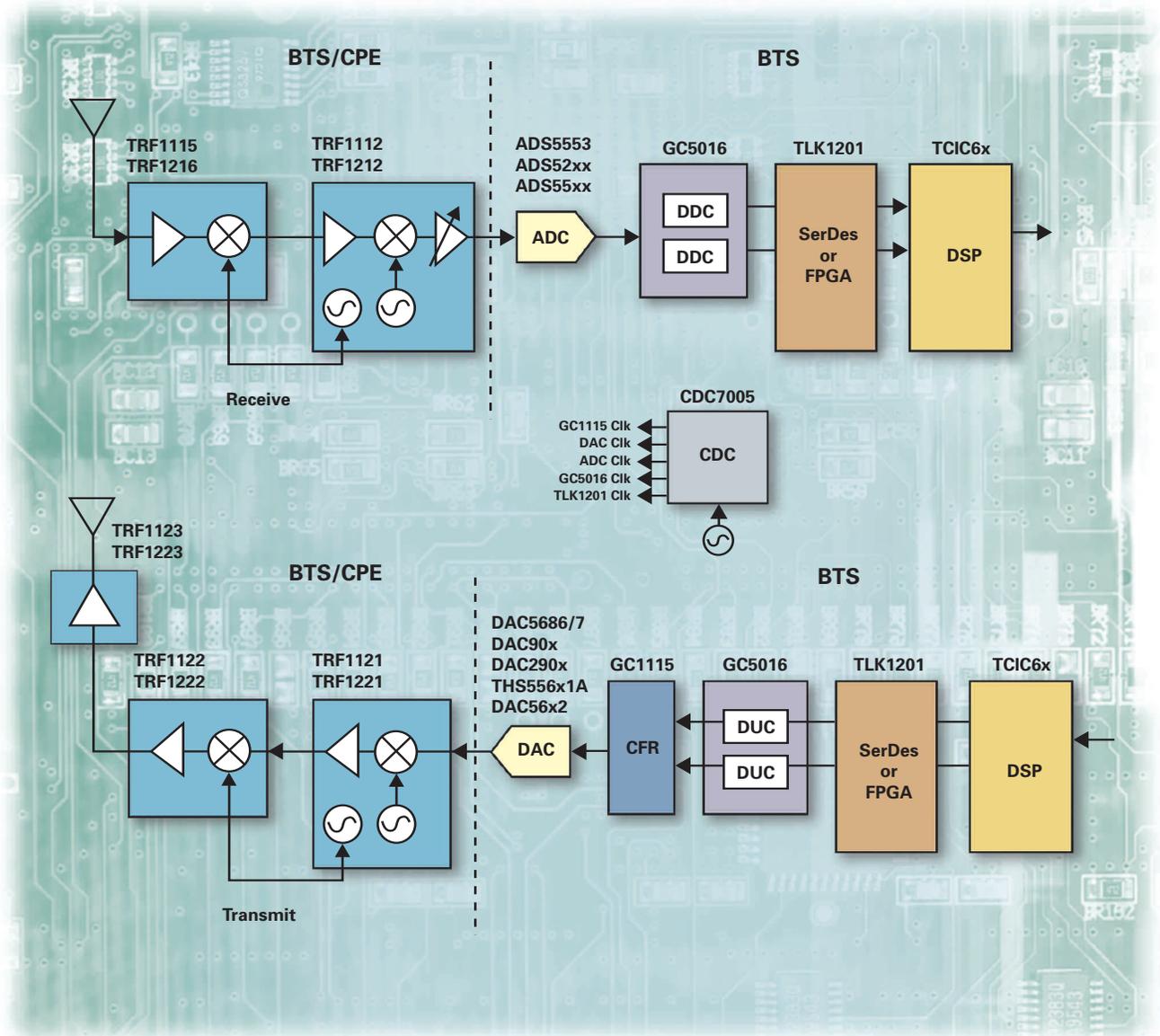ions of the devices in the three chipsets provide different overall architectural solutions. Since the IF downconverters and upconverters provide both I/Q and low IF interfaces to the data converters, they can be used in combination with the 2.5, 3.5 and 5.8 GHz front-end devices,

Key Features

- Complete portfolio for 2.5, 3.5 and 5.8 GHz wavebands
- Fully compliant with IEEE 802.16d/e
- Supports portable mobile applications such as WiMAX and WiBro
- 2.5 / 3.5 GHz chipset for high-performance and flexibility
- 5.8 GHz offers highly integrated compact solutions
- Optimized BOM saves system costs
- Flexible options for CPE and base stations
- Complete RF reference designs for 2.5, 3.5 and 5.8 GHz wavebands
- Lead (Pb)-Free and RoHS-compliant packaging

Complete RF offering: 2.5 GHz, 3.5 GHz and 5.8 GHz

| Device | Description | Bands | | | ADC/DAC Interface | Mode |
		3.5 GHz	2.5 GHz	5.8 GHz		
TRF1223	Power Amplifier Driver	■				FDD-TDD
TRF1222	RF Upconverter	■				FDD-TDD
TRF1221	Dual PLL / VCO w/ IF Upconverter	■		■	Low IF	FDD-TDD
TRF1216	RF Downconverter	■				FDD-TDD
TRF1212	Dual PLL / VCO w/ IF Downconverter	■		■	Low IF	FDD-TDD
TRF1123	Power Amplifier Driver		■			FDD-TDD
TRF1122	RF Upconverter		■			FDD-TDD
TRF1121	Dual PLL/VCO w/ IF Upconverter		■		Low IF	FDD-TDD
TRF1115	RF Downconverter		■			FDD-TDD
TRF1112	Dual PLL / VCO w/ IF Downconverter		■		Low IF	FDD-TDD
TRF2432	IF Transceiver w/ Dual VCO / PLL	■	■	■	IQ BB	TDD
TRF2436	Dual Band RF Front-end		■	■		TDD

Green = primary configuration. Yellow = secondary configuration for alternate ADC/DAC interface.

802.16 BTS: 2.5 GHz and 3.5 GHz Receive and Transmit Solutions

BTS/CPE   **BTS**

TRF1115
TRF1216

TRF1112
TRF1212

ADS5553
ADS52xx
ADS55xx

ADC

GC5016

DDC
DDC

TLK1201

SerDes
or
FPGA

TCIC6x

DSP

Receive

CDC7005

GC1115 Clk
DAC Clk
ADC Clk
GC5016 Clk
TLK1201 Clk

CDC

TRF1123
TRF1223

BTS/CPE   **BTS**

TRF1122
TRF1222

TRF1121
TRF1221

DAC5686/7
DAC90x
DAC290x
THS556x1A
DAC56x2

DAC

GC1115

CFR

GC5016

DUC
DUC

TLK1201

SerDes
or
FPGA

TCIC6x

DSP

Transmit

TI's flexible TRF11xx chipset at 2.5 GHz and TRF12xx RF chipset at 3.5 GHz support a variety of system configurations for versatility and high performance in designing RF front ends for wireless broadband systems.
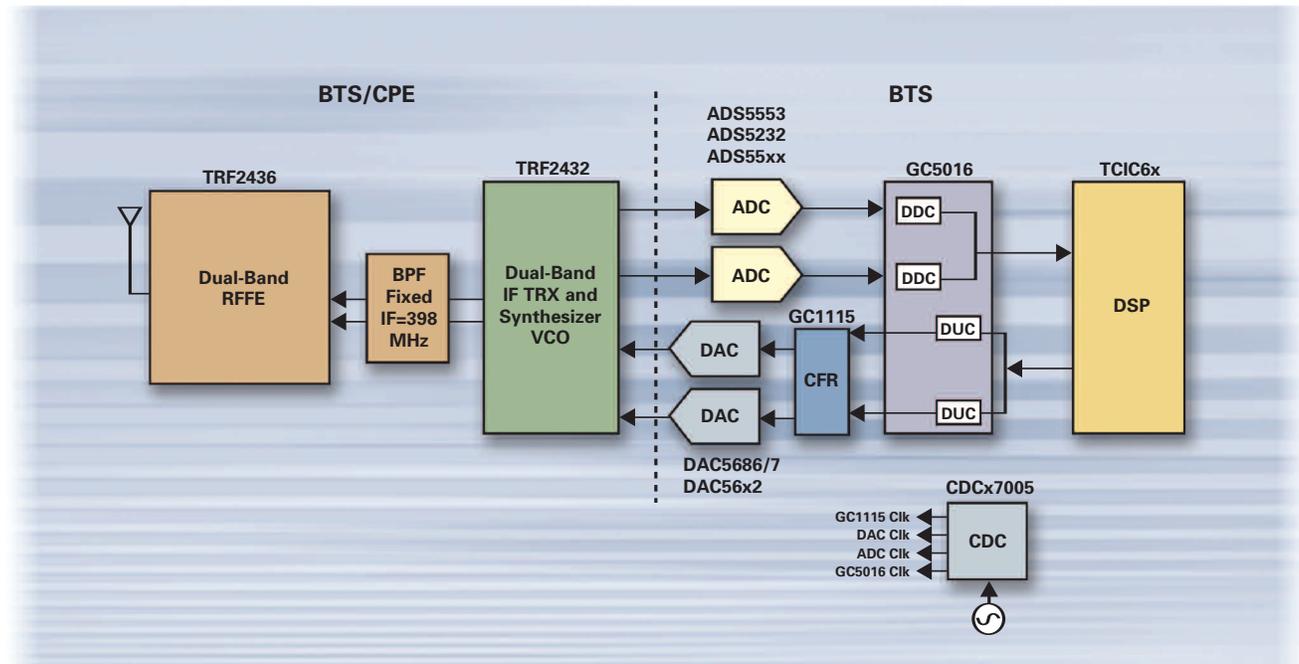
Key RF Chipset Specifications			
Specification	**TRF11xx (2.5 GHz)**	**TRF12xx (3.5 GHz)**	**TRF243x (5.8 GHz)**
Transmission *(including integrated transmission power detector in all)*			
P1-dB	+31.5 dBm	+30 dBm	+22.5 dBm
OIP3	+48 dBm	+45 dBm	+32.5 dBm
RMS Phase Error	0.5º	0.5º	1.2º
Digital Gain Control	80 dB (1 dB steps)	80 dB (1 dB steps)	31 dB (1 dB step)
Reception *(including excellent blocker suppression in all)*			
Cascaded NF*	4 dB	< 3.5 dB	6 dB
IP1 dB	–3 dBm	≥5 dBm	–3 dBm
Max Gain*	~100 dB	~110 dB	~94 dB
LO RMS Phase Error	0.5º	0.5º	1.2º
AGC range	~90 dB	~100 dB	~75 dB
Output	≥1.2 Vp-p differential	≥1.2 Vp-p differential	—

* Including filter losses.

enabling the development of different RF subsystems that operate with the same baseband processor.

The flexibility of the chipset architecture also enables the selection of more filtering masks for better immunity to blockers for receiving. Outstanding sensitivity provides compliance to spurious emission in transmission, even at high output power levels.

RF Chipset 5.8 GHz for 802.16

TI's TRF243x RF chipset at 5.8 GHz provides the entire RF and IF functionality of an RF front end in two highly integrated devices, saving components and costs.

2.5 and 3.5 GHz Chipset Solutions

Both the TRF11xx at 2.5 GHz and the TRF12xx at 3.5 GHz chipsets consist of four chips, each with fully integrated super heterodyne receivers and transmitters. The RF chipsets are capable of supporting frequency division duplex (FDD), half frequency division duplex (HFDD) and time division duplex (TDD) modes with a real interface at low IF to the data conversion subsystem. TI's flexible transmitters are compliant with today's demanding mask requirements, while the receivers feature excellent sensitivity and blocker suppression.

The 2.5 GHz and 3.5 GHz chipsets are also complemented by the optimized power amplifiers, TRF1123 and TRF1223. Supporting a range of frequencies between 2.1 - 2.7 GHz and 3.3 - 3.8 GHz,

these power amplifiers provide excellent output third order intercept point (OIP3) of 45dBm or better, enabling the support of complex orthogonal frequency division multiplexing (OFDM) signals. These power amplifiers can also be used as driver amplifiers in applications requiring larger output power.

5.8 GHz Solution

The TRF2432 and TRF2436 chipset provides high integration with both RF and IF transceivers, supporting air interface frequencies of both 2.5 and 5.8 GHz, and an IF transceiver. The chipset operates in TDD mode with a complex I/Q interface to the baseband processor and modem. This highly integrated chipset makes it easier to design and lowers bill of materials (BOM) cost.
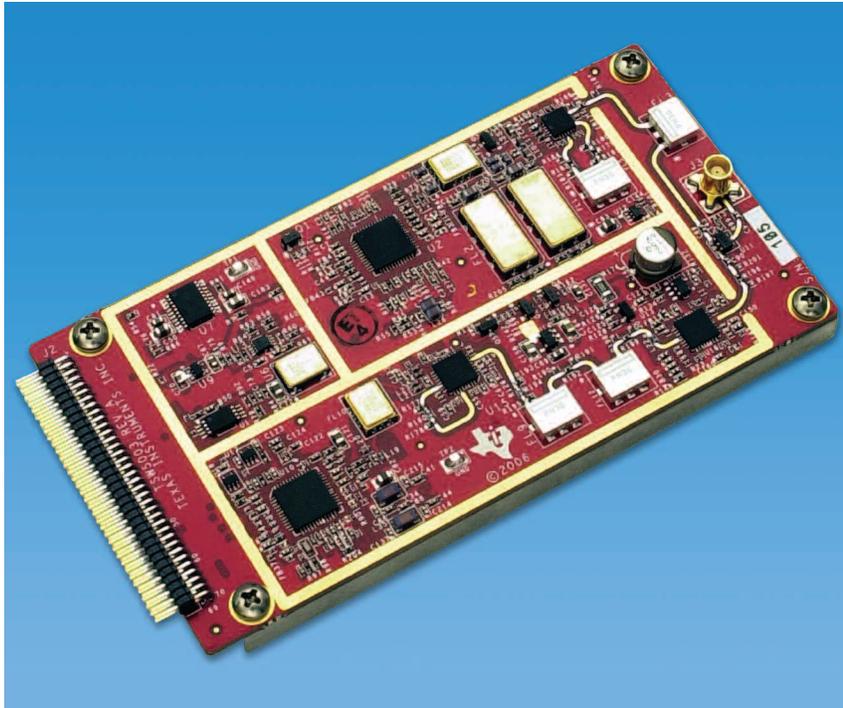
"Green" Packaging

TI's TRFxx RF chipsets are Lead (Pb)-Free, complying with the European Union's "Restriction on Use of Hazardous Substances in Electrical and Electronic Equipment" (RoHS) in regard to the use of lead and other environmentally hazardous substances. TI recognizes the multinational markets that its customers address and is an industry leader in the movement to supply products, such as the TRFxx chipsets, that are Lead (Pb)-Free and RoHS-compatible.

Comprehensive RF Solutions and Support

To help simplify design and optimize BOM, TI offers reference designs for all three RF chipsets, along with thorough documentation

3.5 GHz Reference Design Board.

plus software support by a highly experienced development team. TI complements its RF chipsets with a complete analog signal chain for broadband wireless systems, including ADCs, DACs, digital upconverters and downconverters and flexible clock distribution options. TI offerings also include power management devices and DSPs that are industry leaders in high performance and low power consumption.

For More Information

To learn more about how the flexibility and integration of TI's TRFxx RF chipsets can help you design your next 802.16 or other system for wireless broadband access, contact your regional TI field sales office or visit:
www.ti.com/wi

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