

High-Speed Communications Solutions

TSW3000: RF Transmit Signal Chain Demonstration Kit

Texas Instruments (TI) introduces a new tool in the TSW Solutions Family: the TSW3000, a demonstration kit to help design and optimize your RF transmit signal chain. This new tool demonstrates an In-phase and Quadrature (IQ) modulation transmit system with impressive RF performance numbers and the versatility to be adapted to various RF applications. The TSW3000 demo kit includes the DAC5687, a 16-bit, 500 MSPS DAC; a CDCM7005 clock device to satisfy clocking requirements for the accompanying devices; a passive interface to the TRF370x, a direct-launch IQ modulator; and the TRF3750, a monolithic PLL included as a part of the synthesizer to drive the local oscillator (LO) of the TRF370x.

The TSW3000 is designed for wireless base station transceivers, fixed wireless transmitters and digital predistortion applications using full IQ compensation, selectable interpolation, flexible input options and multiple outputs. This new tool implements all the necessary circuits from the DAC input to the output of the RF IQ modulation.

When the DAC5687 is interfaced with an IQ modulator, for which it is well suited, it has DC offset control and gain/phase control. The DC offset control provides tuning control for carrier suppression, and gain/phase control allows tuning control

for sideband rejection. This interface also allows the DAC to provide a passive interface that maximizes power to the modulator and provides a superior adjacent-channel power ratio (ACPR). Other features of the DAC include its use of interpolation capability and a numerically controlled oscillator (NCO) to output low intermediate frequencies (IFs) to the modulator. In addition, the IQ compensation feature in the DAC5687 allows optimization of phase, gain and DC offset to maximize sideband rejection and minimize LO feedthrough for an analog quadrature modulator.

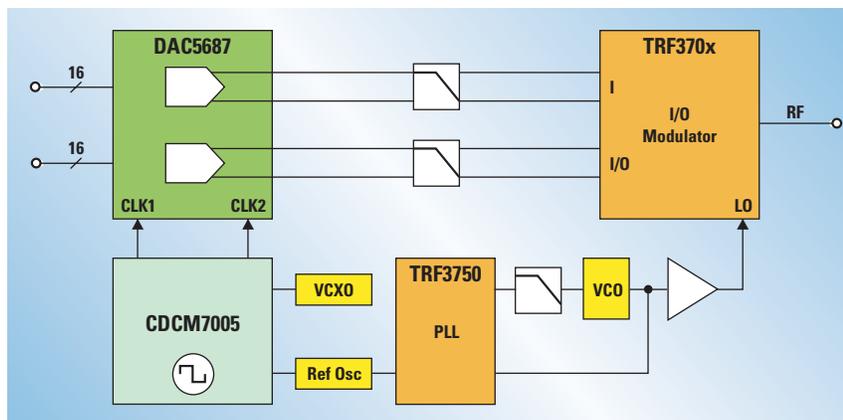
Applications

- Wireless base stations
- Communication test equipment
- Digital predistortion transmitters
- RF transmitter signal chain evaluation

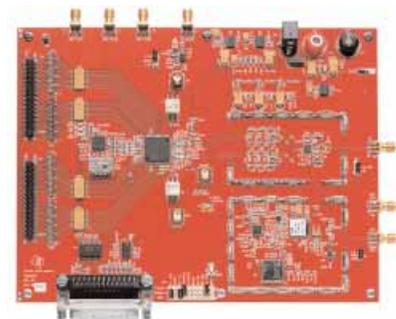
Key Features

- Over 70 dB of ACPR for one WCDMA carrier at 2.14 GHz
- Full IQ compensation including DC offset, gain and phase control for excellent LO and sideband suppression
- 500 MSPS, 16-bit-resolution DAC
- Complex mixer with 32-bit NCO, and coarse mixer at $F_s/4$ and $F_s/2$
- RF carriers tunable from 1.5 GHz to 2.4 GHz (VCO dependent)
- RF output power at 1 dB compression point of +7 dBm
- Two independent clock outputs selectable by $/2^n$, LVPECL/LVCMOS interface
- Requires single 6 VDC wall supply included, power management onboard
- Easy-to-use graphical user interface simplifies system setup
- Parallel-port interface

TSW3000 Demonstration Kit Block Diagram



TSW3000



The CDCM7005 is a high-performance, low-jitter clock solution that synchronizes an onboard voltage-controlled crystal oscillator (VCXO) to an external reference clock. Once the proper reference frequency and programming are applied, the CDCM7005 supplies two clock sources to the DAC and an additional two outputs for external equipment.

The TRF3701/02 is a low-noise direct IQ modulator that eliminates the need for an IF stage, improving efficiency and cost. It provides excellent carrier and sideband suppression and also offers high output power with an ultra-low noise floor. Typically the TRF3701/02 is capable of modulating one carrier WCDMA with 70 dBc ACPR.

The TRF3750 is a monolithic PLL optimized for low-noise performance. The PLL serves as part of the synthesizer used to drive the LO part of the TRF3701/02.

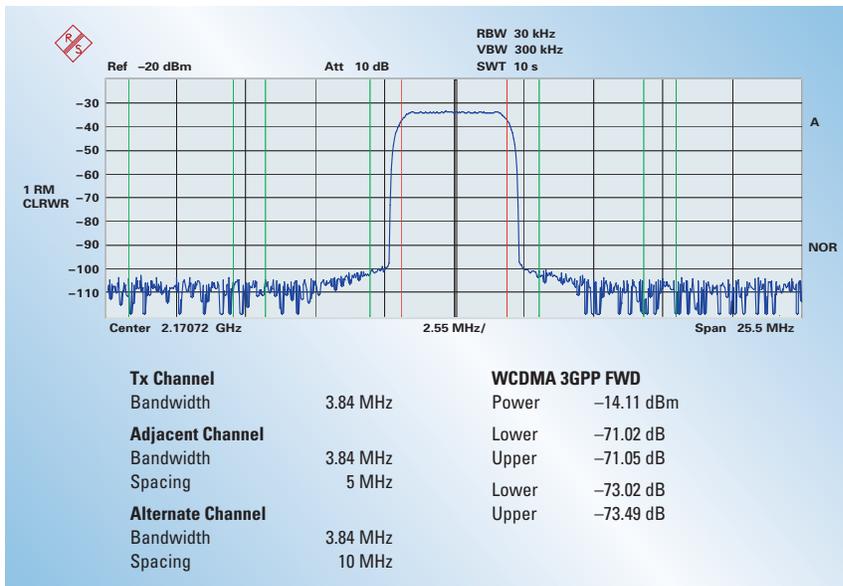
The TRF3701/02 combined with the TRF3750 in the TSW3000 provides lower cost by utilizing a low-IF system with a single upconversion. In addition, the RF family's controls for carrier suppression and sideband rejection reduce filter requirements in the system. The CDCM7005 supplies a suitable clocking solution for the entire transceiver so that less clock circuitry is required.

The TSW3000 supports a high-performance signal chain. This demo kit comes complete with a high-performance and versatile DAC, an onboard clock generator and an IQ modulator. This complete RF transmit system offers designers a low-risk, cost-effective alternative to designing a system from scratch. This system can be used to help shorten design cycles by helping with initial proof of concept and can be used as a reference for a reduced BOM RF transmit design.

TSW3000

Single-Carrier Test Mode 1 WCDMA

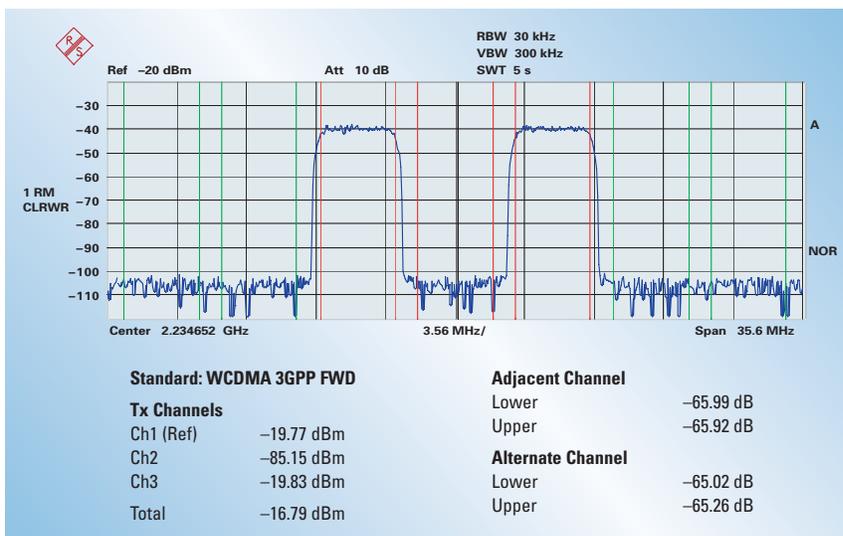
Typical Performance at 30.72 MHz IF with RF LO = 2.14 GHz



TSW3000

Multi-Carrier Test Mode 1 WCDMA

Typical Performance at 92.16 MHz IF with RF LO = 2.14 GHz



Benefits include:

- Shortens time-to-market
- Reduces BOM
- Lowers risk management
- Minimizes noise and distortion

To learn more about the TSW3000, visit: www.ti.com/tsw3000

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