FEATURES

- **Typical Carrier Suppression > 35 dBc**
- **Large Signal Output**
- **Differential or Single-Ended Signal Output**
- **Silicon Germanium Technology**

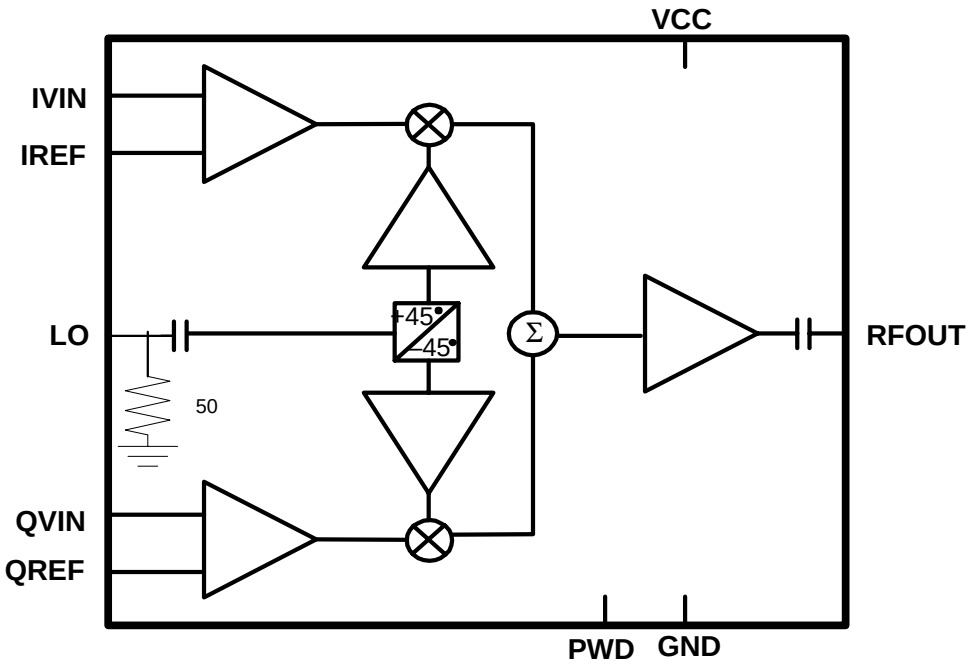
APPLICATIONS

- **Transmit Channel TDMA: GSM, IS-136, Edge/UMC-136**
- **CDMA: IS-95, UMTS, CDMA2000**
- **Wireless Local Loop**
- **Wireless LAN IEEE 802.11**
- **LMDS, MMDS**

description

The TRF3701 is a low noise quadrature direct modulator that is capable of converting complex input signals from 0 – 300 MHz up to RF. An internal analog combiner sums the real and imaginary components of the RF outputs. This combined output can directly feed the RF pre-amp at frequencies of up to 1.0 GHz. The modulator is implemented as a double balanced mixer. An internal LO phase splitter accommodates a single LO input.

functional block diagram



PRODUCT PREVIEW

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

absolute maximum ratings over operating free-air temperature (unless otherwise noted)†

Supply voltage range, V_{CC} . . . . . –0.5 V to 5.5 V
Input current range, I_I: IVIN . . . . . TBD
QVIN . . . . . TBD
IREF . . . . . TBD
QREF . . . . . TBD
V_{CC} . . . . . TBD
Total current, peak (all inputs) . . . . . TBD
Operating free-air temperature range, T_A: TRF3701C . . . . . 0°C to 70°C
TRF3701I . . . . . –40°C to 85°C
Lead temperature 1, 6 mm (1/16 inch) from the case for 10 seconds . . . . . 260°C

† Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

recommended operating conditions

	MIN	NOM	MAX	UNIT
Supplies and References				
Analog DC supply voltage, V_{CC}	4.75	5	5.5	V
Reference voltage, IREF, QREF	3.9	4.1	V_{CC}–0.5	V
Local Oscillator Input (LO)				
Input Frequency, f	TBD		1000	MHz
Power level (refer to specified input impedance)	–6		6	dBm
Signal Inputs (IVIN, QVIN)				
Input frequency range (1dB)	0		300	MHz

PRODUCT PREVIEW

electrical characteristics, GSM 900 (925 MHz) signal performance over recommended operating conditions, V_{CC} = 5 V, $V_{I(IREF)}$=$V_{I(QREF)}$ = 4.1 V, Z_L = 50 Ω, $P_{(LO)}$ = –5 dBm, single-ended input

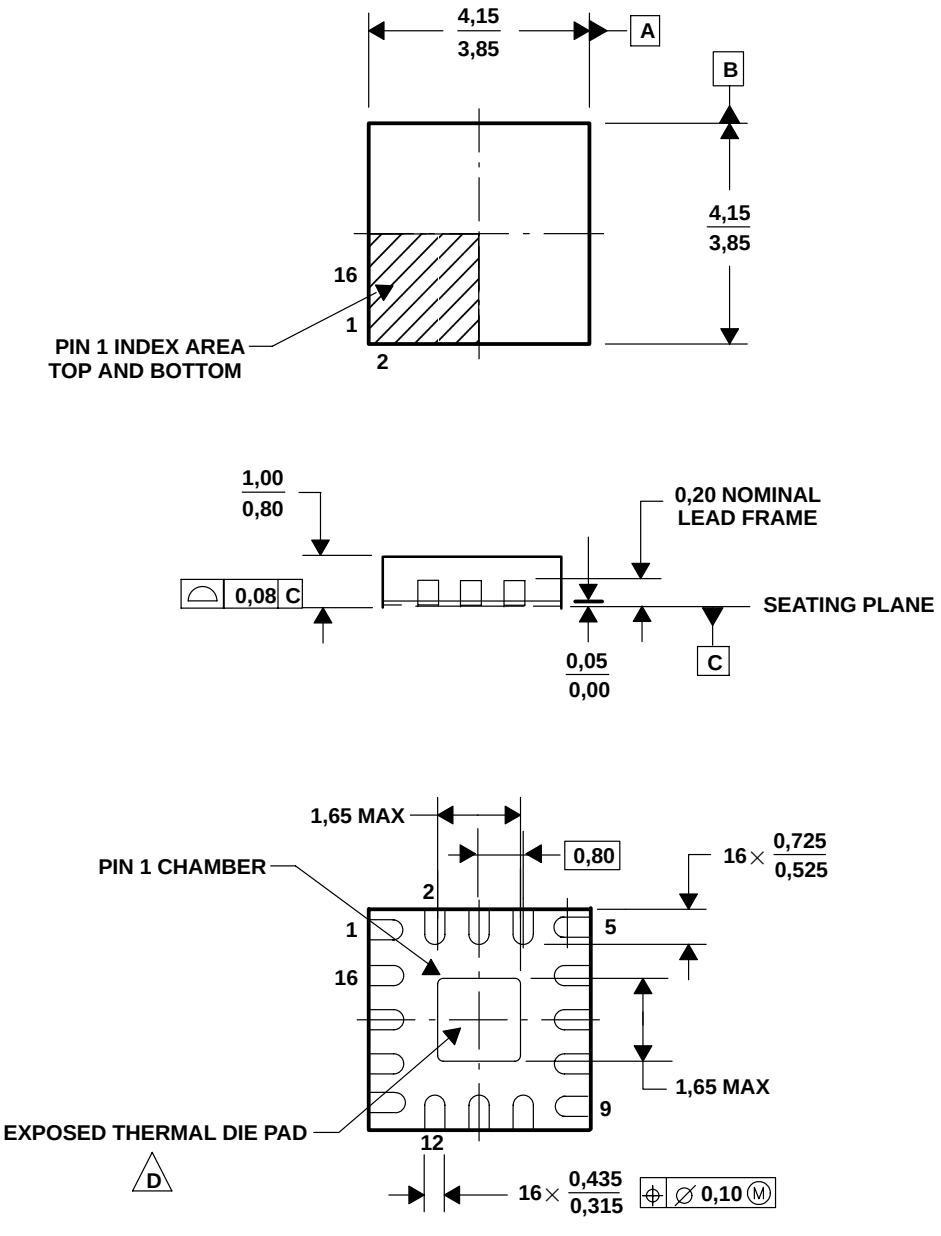
PARAMETER	CONDITIONS		MIN	TYP	MAX	UNIT
IMD	I Signal: $f_{(1)}$ = 100 kHz, $f_{(2)}$ = 300 kHz, Q Signal: $f_{(1)}$ = 100 kHz, $f_{(2)}$ = 300 kHz, $f_{(LO)}$ = 925 MHz, $V_{I(IVIN)}$=$V_{I(QVIN)}$ = 0.6 V, $P_{(LO)}$ = –5 dBm			65		dBc
IP3 (Output referred)	$f_{(LO)}$ = 925 MHz, $f_{(1)}$= 100 kHz, $f_{(2)}$ = 300 kHz, $V_{I(IVIN)}$=$V_{I(QVIN)}$ = 0 – 1.5 V			18		dBm
1–dB Intercept point (Output referred)	$f_{(LO)}$ = 925 MHz, $f_{(1)}$=100 kHz, $V_{I(IVIN)}$=$V_{I(QVIN)}$ = 0 – 1.5 V			5		dBm
Noise spectral density (NSD)	$f_{(LO)}$ = 925 MHz, offset –20 Mhz, 30 kHz Resolution = .B/W, $V_{I(IVIN)}$=$V_{I(QVIN)}$=$V_{I(IREF)}$ =$V_{I(QREF)}$ = 4.1 V			–157		dBm/Hz
Output Power	Single tone 100 kHz, IVIN =QVIN= 1.0V, I and Q signals driven in quadrature.		–5	–4		dBm
Output Impedance	$P_{(LO)}$ = 0, IVIN =QVIN= O/C			30 – j1		Ω
Carrier suppression (unadjusted)	Single tone 100 kHz, IVIN =QVIN= 1.0, I and Q signals driven in quadrature. $P_{(RFOUT)}$ = –4 dBm.		35			dBc
Sideband suppression (unadjusted)	Single tone 100 kHz, IVIN =QVIN= 1.0V, I and Q signals driven in quadrature. $P_{(RFOUT)}$ = –4 dBm.		30	35		dB
Phase error	Single tone 100 kHz, IVIN =QVIN= 1.0 V, I and Q signals driven in quadrature. $P_{(RFOUT)}$ = –4 dBm.			1°		
Noise figure	Single tone 100 kHz, IVIN =QVIN= 1.0 V, I and Q signals driven in quadrature			24	27	dB
Conversion loss	Single tone 100 kHz, IVIN =QVIN= 1.0 V, I and Q signals driven in quadrature. $P_{(RFOUT)}$ = –5 dBm			8		dB
EVM	Integrated across GSM 28 symbol midamble, GSM DC – 100 kHz, $P_{(RFOUT)}$ = –5 dBm, IVIN = QVIN = 1.0 V			2		%
Modulation mask	Single GSM 200 kHz carrier, 20 MHz Offset $P_{(RFOUT)}$ = –5 dBm	100 kHz offset, 30 kHz bandwidth	–3.5			dBc
		200 kHz offset, 30 kHz bandwidth	–35			
		250 kHz offset, 30 kHz bandwidth	–38			
		400 kHz offset, 30 kHz bandwidth	–72			
		≥ 600 kHz < 1200 kHz, 30 kHz BW	–82			
		≥ 1200 kHz < 1800 kHz, 30 kHz BW	–85			
		≥ 1800 kHz < 6000 kHz, 30 kHz BW	–87			
		≥ 6000 kHz, 100 kHz BW	–92			

PRODUCT PREVIEW

PRODUCT PREVIEW

MECHANICAL DATA

RHC (S–PQFP–N16) **(CUSTOM PACKAGE)** **PLASTIC QUAD FLATPACK**



NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. QFN (Quad Flatpack No–Lead) Package configuration.
D. The Package thermal performance may be enhanced by bonding the thermal die pad to an external thermal plane. This pad is electrically and thermally connected to the backside of the die and possibly selected ground leads.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third–party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Mailing Address:

Texas Instruments
Post Office Box 655303
Dallas, Texas 75265