

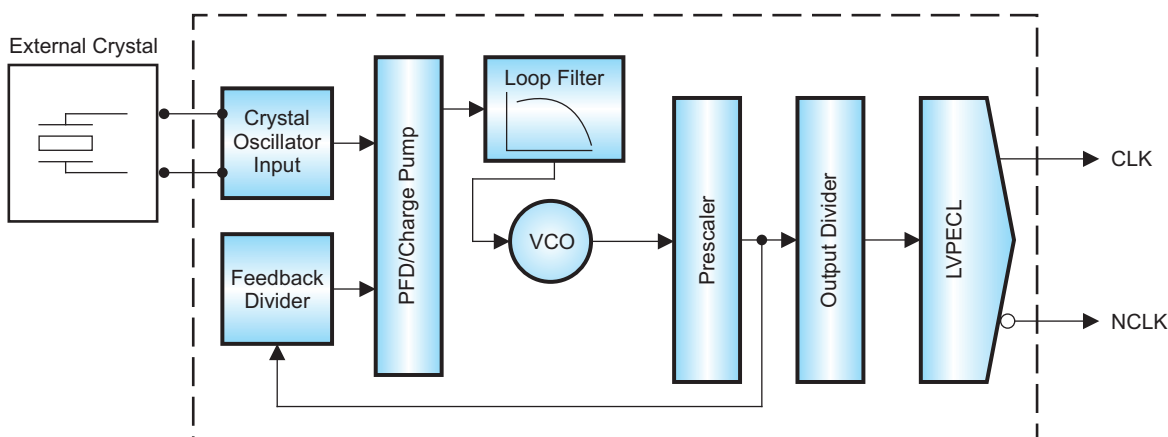
FULLY INTEGRATED FIXED FREQUENCY LOW-JITTER, CRYSTAL-OSCILLATOR CLOCK GENERATOR

FEATURES

- Single 3.3 V Supply
- High-Performance Clock Generator, Incorporating Crystal Oscillator Circuitry With Integrated Frequency Synthesizer
- Low Output Jitter, as Low as 380 fs (rms integrated between 10 kHz–20 MHz)
- Low Phase Noise at 312.5 MHz, Less Than –120 dBc/Hz at 10 kHz and –147 dBc/Hz at 10 MHz Offset From the Carrier
- Supports Crystal Frequencies or LVCMOS Input Frequencies at 31.25 MHz, 33.33 MHz, and 35.42 MHz
- Output Frequencies: 100 MHz, 106.25 MHz, 125 MHz, 156.25 MHz, 212.5 MHz, 250 MHz, and 312.5 MHz
- Differential Low-Voltage Positive Emitter Coupled Logic (LVPECL) Output
- Fully Integrated Voltage-Controlled Oscillator (VCO) Running from 1.75 GHz to 2.35 GHz
- Typical Power Consumption 300 mW
- Chip-Enable Control Pin
- QFN-24 Package
- ESD Protection Exceeds 2 kV HBM
- Industrial Temperature Range –40°C to 85°C

APPLICATIONS

- Low-Cost, Low-Jitter Frequency Multiplier



B0216-02

DESCRIPTION

CDC421xxx is a high-performance, low-phase-noise clock generator. It has an integrated low-noise, LC-based voltage-controlled oscillator (VCO) that operates within the 1.75 GHz–2.35 GHz frequency range. It has an integrated crystal oscillator that operates in conjunction with an external AT-cut crystal to produce a stable frequency reference for the PLL-based frequency synthesizer. The output frequency (f_{out}) is proportional to the frequency of the input crystal (f_{xtal}).

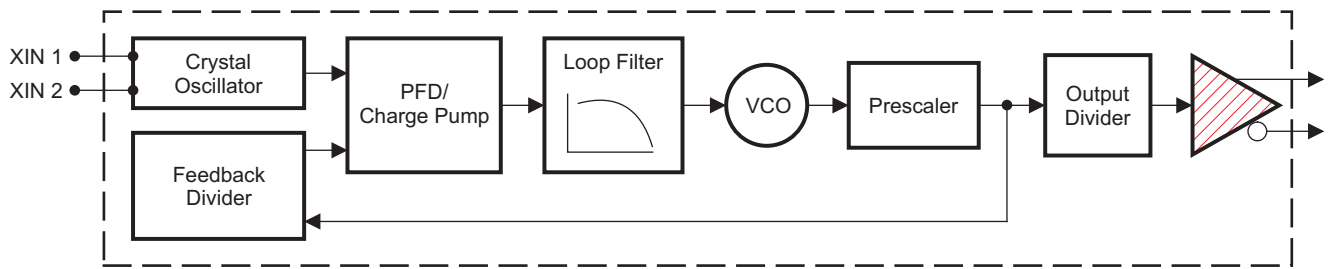
The device operates in a 3.3 V supply environment and is characterized for operation from –40°C to 85°C.

CDC421xxx is available in a QFN-24 package.

A high-level block diagram of the CDC421xxx is shown in [Figure 1](#).



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.

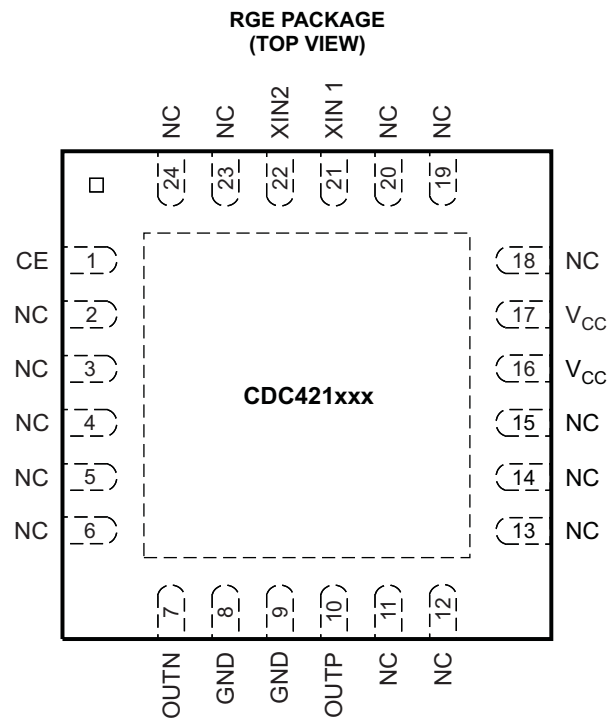


B0230-01

Figure 1. High-Level Block Diagram of the CDC421xxx

PACKAGE (QFN-24)

The CDC421xxx is packaged in a QFN-24 terminal package. The QFN package footprint is shown. Terminal locations and numbers are shown in Figure 2.



P0024-06

Figure 2. Pinout of the CDC421xxx QFN-24 Package

The terminal functions table shows the terminal descriptions for the CDC421xxx QFN-24 package.

Table 1. TERMINAL FUNCTIONS

TERMINAL		TYPE	ESD PROTECTION	DESCRIPTION
NAME	NO.			
V _{CC}	16, 17	Power	Y	3.3V power supply
GND	8, 9	GND	Y	Ground
XIN 1	21	I	Y	In crystal input mode, connect XIN1 to one end of the crystal and XIN2 to the other end of the crystal. In LVCMOS single-ended driven mode, XIN1 (pin 21) acts as input reference and XIN2 should connect to GND.
XIN 2	22	I	N	

Table 1. TERMINAL FUNCTIONS (continued)

TERMINAL		TYPE	ESD PROTECTION	DESCRIPTION
NAME	NO.			
CE	1	I	Y	Chip enable (LVCMOS input) CE = 1 enables the device and the outputs. CE = 0 disables all current sources (LVPECLP = LVPECLN = Hi-Z).
OUTP	10	O	Y	High-speed positive differential LVPECL output. (Outputs are enabled by CE)
OUTN	7	O	Y	High-speed negative differential LVPECL output. (Outputs are enabled by CE)
NC	2–6, 11–15, 18–20, 23, 24	I or O	Y	TI test pin. Do not connect; leave floating.

DEVICE SELECTION

The CDC421xxx device is an LVPECL low-phase-noise clock generator designed to work with a low-frequency AT-crystal oscillator of a single-ended LVCMOS.

Table 2. Device Selection Table for CDC421xxx

CDC421xxx		PACKAGE	INPUT FREQUENCY OR CRYSTAL VALUE (MHz)	OUTPUT FREQUENCY FOR THE SPECIFIED INPUT FREQUENCY (MHz)
DEVICE MARKING	ORDERING PART NUMBER			
421100	CDC421100RGER	QFN-24 tape and reel	33.3333	100.00
421100	CDC421100RGET	QFN-24 small tape and reel	33.3333	100.00
421106	CDC421106RGER	QFN-24 tape and reel	35.4167	106.25
421106	CDC421106RGET	QFN-24 small tape and reel	35.4167	106.25
421125	CDC421125RGER	QFN-24 tape and reel	31.2500	125.00
421125	CDC421125RGET	QFN-24 small tape and reel	31.2500	125.00
421156	CDC421156RGER	QFN-24 tape and reel	31.2500	156.25
421156	CDC421156RGET	QFN-24 small tape and reel	31.2500	156.25
421212	CDC421212RGER	QFN-24 tape and reel	35.4167	212.50
421212	CDC421212RGET	QFN-24 small tape and reel	35.4167	212.50
421250	CDC421250RGER	QFN-24 tape and reel	31.2500	250.00
421250	CDC421250RGET	QFN-24 small tape and reel	31.2500	250.00
421312	CDC421312RGER	QFN-24 tape and reel	31.2500	312.50
421312	CDC421312RGET	QFN-24 small tape and reel	31.2500	312.50

ABSOLUTE MAXIMUM RATINGS

over operating free-air temperature range (unless otherwise noted)⁽¹⁾

		VALUE	UNIT
V _{CC}	Supply voltage ⁽²⁾	–0.5 to 4.6	V
V _I	Voltage range for all other input pins ⁽²⁾	–0.5 to V _{CC} + 0.5	V
I _O	Output current for LVPECL	–50	mA
	Electrostatic discharge (HBM)	2 k	V
T _A	Characterized free-air temperature range (no airflow)	–40 to 85	°C
T _J	Maximum junction temperature	125	°C
T _{stg}	Storage temperature range	–65 to 150	°C

(1) 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.

(2) All voltage values are with respect to network ground terminal.

RECOMMENDED OPERATING CONDITIONS

over operating free-air temperature range (unless otherwise noted)

		MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage	3	3.3	3.6	V
T_A	Ambient temperature, no airflow, no heat sink	–40		85	°C

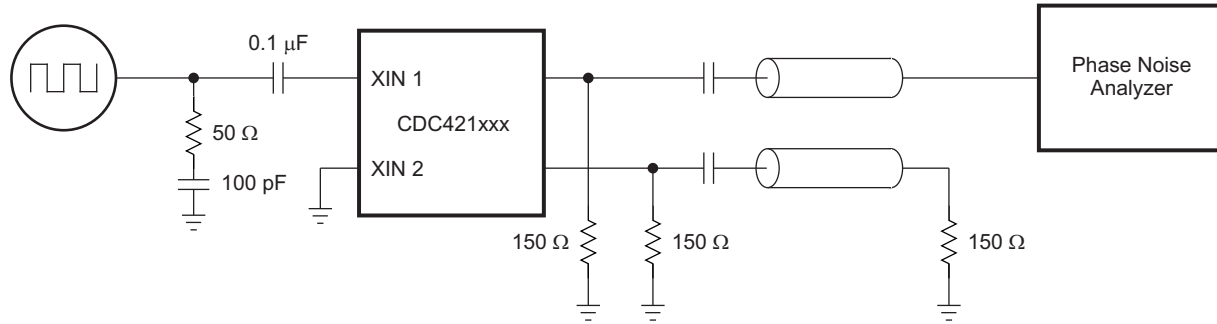
ELECTRICAL CHARACTERISTICS

over recommended operating conditions for CDC421xxx device

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
V_{CC}	Supply voltage	3	3.3	3.6	V	
I_{VCC}	Total current at 3.3 V	3.3 V, 312.5 MHz		91	110	mA
LVPECL OUTPUT						
f_{CLK}	Output frequency	100		312.5	MHz	
V_{OH}	LVPECL high-level output voltage	$V_{CC} - 1.20$		$V_{CC} - 0.81$	V	
V_{OL}	LVPECL low-level output voltage	$V_{CC} - 2.17$		$V_{CC} - 1.36$	V	
$ V_{OD} $	LVPECL differential output voltage	407		1076	mV	
t_r	Output rise time	20% to 80% of V_{OUTpp}		170	ps	
t_f	Output fall time	80% to 20% of V_{OUTpp}		170	ps	
	Duty cycle of the output waveform	45%		55%		
LVCMOS INPUT						
$V_{IL,CMOS}$	Low-level CMOS input voltage	$V_{CC} = 3.3$ V		$0.3 V_{CC}$	V	
$V_{IH,CMOS}$	High-level CMOS input voltage	$V_{CC} = 3.3$ V		$0.7 V_{CC}$	V	
$I_{L,CMOS}$	Low-level CMOS input current	$V_{CC} = V_{CC\ max}$, $V_{IL} = 0$ V		–200	μA	
$I_{H,CMOS}$	High-level CMOS input current	$V_{CC} = V_{CC\ min}$, $V_{IH} = 3.7$ V		200	μA	

JITTER CHARACTERISTICS IN INPUT CLOCK MODE

The jitter characterization test is performed using an LVCMOS input signal driving the CDC421xxx device.



S0246-02

Figure 3. Jitter Test Configuration for an LVTTTL Input Driving CDC421xxx

For the cases of the CDC421xxx being referenced by an external, clean LVCMOS input of 31.25 MHz, 33.33 MHz and 35.4167 MHz, the following tables list the measured SSB phase noise of all the outputs supported by the CDC421xxx device, (100 MHz, 106.25 MHz, 125 MHz, 156.25 MHz, 212.5 MHz, 250 MHz, and 312.5 MHz) from 100 Hz to 20 MHz from the carrier.

Table 3. Phase Noise Parameters With LVCMOS Input of 33.3333 MHz and LVPECL Output at 100.00 MHz

PARAMETER		MIN	TYP	MAX	UNIT
Phase Noise Specifications Under Following Conditions: $f_{in} = 33.3333$ MHz, $f_{out} = 100.00$ MHz					
phn ₁₀₀	Phase noise at 100 Hz		-111		dBc/Hz
phn _{1K}	Phase noise at 1 kHz		-121		dBc/Hz
phn _{10k}	Phase noise at 10 kHz		-131		dBc/Hz
phn _{100k}	Phase noise at 100 kHz		-133		dBc/Hz
phn _{1M}	Phase Noise at 1 MHz		-142		dBc/Hz
phn _{10M}	Phase noise at 10 MHz		-149		dBc/Hz
phn _{20M}	Phase noise at 20 MHz		-149		dBc/Hz
J _{RMS}	RMS jitter integrated from 12 kHz to 20 MHz		507		fs
T _j	Total jitter		35.33		ps
D _j	Deterministic jitter		11.54		ps

Table 4. Phase Noise Parameters With LVCMOS Input of 35.4167 MHz and LVPECL Output at 106.25 MHz

PARAMETER		MIN	TYP	MAX	UNIT
Phase Noise Specifications Under Following Conditions: $f_{in} = 35.4167$ MHz, $f_{out} = 106.25$ MHz					
phn ₁₀₀	Phase noise at 100 Hz		-112		dBc/Hz
phn _{1K}	Phase noise at 1 kHz		-121		dBc/Hz
phn _{10k}	Phase noise at 10 kHz		-125		dBc/Hz
phn _{100k}	Phase noise at 100 kHz		-129		dBc/Hz
phn _{1M}	Phase noise at 1 MHz		-142		dBc/Hz
phn _{10M}	Phase noise at 10 MHz		-151		dBc/Hz
phn _{20M}	Phase noise at 20 MHz		-151		dBc/Hz
J _{RMS}	RMS jitter integrated from 12 kHz to 20 MHz		530		fs
T _j	Total jitter		30.39		ps
D _j	Deterministic jitter		11		ps

Table 5. Phase Noise Parameters With LVCMOS Input of 31.2500 MHz and LVPECL Output at 125.00 MHz

PARAMETER		MIN	TYP	MAX	UNIT
Phase Noise Specifications Under Following Conditions: $f_{in} = 31.2500$ MHz, $f_{out} = 125.00$ MHz					
phn ₁₀₀	Phase noise at 100 Hz		-108		dBc/Hz
phn _{1K}	Phase noise at 1 kHz		-118		dBc/Hz
phn _{10k}	Phase noise at 10 kHz		-127		dBc/Hz
phn _{100k}	Phase noise at 100 kHz		-130		dBc/Hz
phn _{1M}	Phase noise at 1 MHz		-139		dBc/Hz
phn _{10M}	Phase noise at 10 MHz		-147		dBc/Hz
phn _{20M}	Phase noise at 20 MHz		-147		dBc/Hz
J _{RMS}	RMS jitter integrated from 12 kHz to 20 MHz		529		fs
T _j	Total jitter		47.47		ps
D _j	Deterministic jitter		25.2		ps

Table 6. Phase Noise Parameters With LVCMOS Input of 31.2500 MHz and LVPECL Output at 156.25 MHz

PARAMETER		MIN	TYP	MAX	UNIT
Phase Noise Specifications Under Following Conditions: $f_{in} = 31.2500$ MHz, $f_{out} = 156.25$ MHz					
phn ₁₀₀	Phase noise at 100 Hz		-106		dBc/Hz
phn _{1K}	Phase noise at 1 kHz		-117		dBc/Hz
phn _{10k}	Phase noise at 10 kHz		-126		dBc/Hz
phn _{100k}	Phase noise at 100 kHz		-128		dBc/Hz
phn _{1M}	Phase noise at 1 MHz		-139		dBc/Hz
phn _{10M}	Phase noise at 10 MHz		-147		dBc/Hz
phn _{20M}	Phase noise at 20 MHz		-147		dBc/Hz
J _{RMS}	RMS jitter integrated from 12 kHz to 20 MHz		472		fs
T _j	Total jitter		31.54		ps
D _j	Deterministic jitter		9.12		ps

Table 7. Phase Noise Parameters With LVCMOS Input of 35.4167 MHz and LVPECL Output at 212.50 MHz

PARAMETER		MIN	TYP	MAX	UNIT
Phase Noise Specifications Under Following Conditions: $f_{in} = 35.4167$ MHz, $f_{out} = 212.50$ MHz					
phn ₁₀₀	Phase noise at 100 Hz		-105		dBc/Hz
phn _{1K}	Phase noise at 1 kHz		-115		dBc/Hz
phn _{10k}	Phase noise at 10 kHz		-119		dBc/Hz
phn _{100k}	Phase noise at 100 kHz		-123		dBc/Hz
phn _{1M}	Phase noise at 1 MHz		-135		dBc/Hz
phn _{10M}	Phase noise at 10 MHz		-148		dBc/Hz
phn _{20M}	Phase noise at 20 MHz		-148		dBc/Hz
J _{RMS}	RMS jitter integrated from 12 kHz to 20 MHz		512		fs
T _j	Total jitter		33.96		ps
D _j	Deterministic jitter		13.78		ps

Table 8. Phase Noise Parameters With LVCMOS Input of 31.2500 MHz and LVPECL Output at 250.00 MHz

PARAMETER		MIN	TYP	MAX	UNIT
Phase Noise Specifications Under Following Conditions: $f_{in} = 31.2500$ MHz, $f_{out} = 250.00$ MHz					
phn ₁₀₀	Phase noise at 100 Hz		-103		dBc/Hz
phn _{1K}	Phase noise at 1 kHz		-112		dBc/Hz
phn _{10k}	Phase noise at 10 kHz		-121		dBc/Hz
phn _{100k}	Phase noise at 100 kHz		-124		dBc/Hz
phn _{1M}	Phase noise at 1 MHz		-134		dBc/Hz
phn _{10M}	Phase noise at 10 MHz		-148		dBc/Hz
phn _{20M}	Phase noise at 20 MHz		-149		dBc/Hz
J _{RMS}	RMS jitter integrated from 12 kHz to 20 MHz		420		fs
T _j	Total jitter		36.98		ps
D _j	Deterministic jitter		18.52		ps

Table 9. Phase Noise Parameters With LVCMOS Input of 31.2500 MHz and LVPECL Output at 312.50 MHz

PARAMETER		MIN	TYP	MAX	UNIT
Phase Noise Specifications Under Following Conditions: $f_{in} = 31.2500$ MHz, $f_{out} = 312.50$ MHz					
phn ₁₀₀	Phase noise at 100 Hz		-102		dBc/Hz
phn _{1K}	Phase noise at 1 kHz		-111		dBc/Hz
phn _{10k}	Phase noise at 10 kHz		-120		dBc/Hz
phn _{100k}	Phase noise at 100 kHz		-123		dBc/Hz
phn _{1M}	Phase noise at 1 MHz		-135		dBc/Hz
phn _{10M}	Phase noise at 10 MHz		-147		dBc/Hz
phn _{20M}	Phase noise at 20 MHz		-147		dBc/Hz
J _{RMS}	RMS jitter integrated from 12 kHz to 20 MHz		378		fs
T _j	Total jitter		29.82		ps
D _j	Deterministic jitter		11		ps

TAPE AND REEL INFORMATION



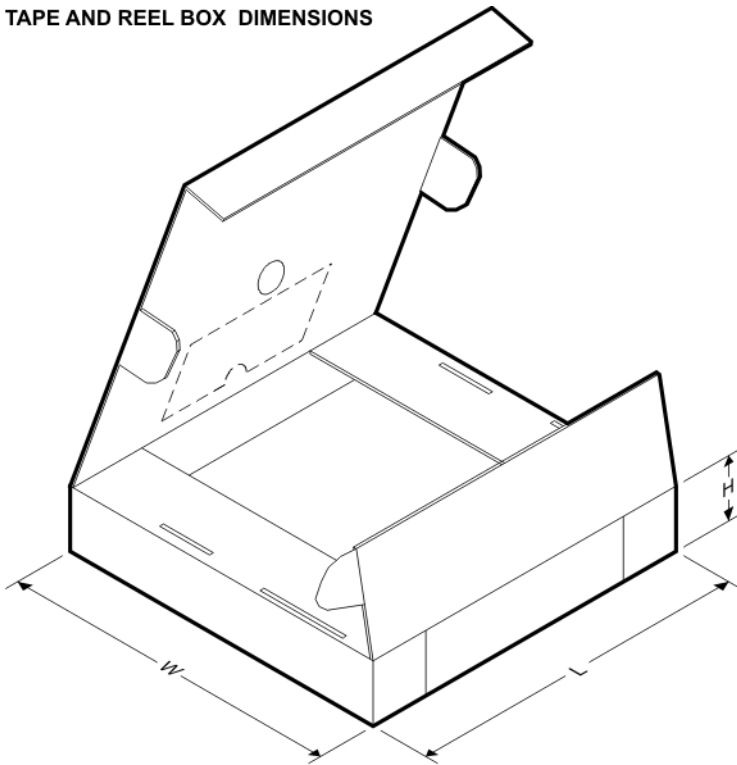
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
CDC421100RGER	VQFN	RGE	24	3000	330.0	12.4	4.3	4.3	1.5	8.0	12.0	Q2
CDC421100RGET	VQFN	RGE	24	250	180.0	12.4	4.3	4.3	1.5	8.0	12.0	Q2
CDC421106RGER	VQFN	RGE	24	3000	330.0	12.4	4.3	4.3	1.5	8.0	12.0	Q2
CDC421106RGET	VQFN	RGE	24	250	180.0	12.4	4.3	4.3	1.5	8.0	12.0	Q2
CDC421125RGER	VQFN	RGE	24	3000	330.0	12.4	4.3	4.3	1.5	8.0	12.0	Q2
CDC421125RGET	VQFN	RGE	24	250	180.0	12.4	4.3	4.3	1.5	8.0	12.0	Q2
CDC421156RGER	VQFN	RGE	24	3000	330.0	12.4	4.3	4.3	1.5	8.0	12.0	Q2
CDC421156RGET	VQFN	RGE	24	250	180.0	12.4	4.3	4.3	1.5	8.0	12.0	Q2
CDC421212RGER	VQFN	RGE	24	3000	330.0	12.4	4.3	4.3	1.5	8.0	12.0	Q2
CDC421212RGET	VQFN	RGE	24	250	180.0	12.4	4.3	4.3	1.5	8.0	12.0	Q2
CDC421250RGER	VQFN	RGE	24	3000	330.0	12.4	4.3	4.3	1.5	8.0	12.0	Q2
CDC421250RGET	VQFN	RGE	24	250	180.0	12.4	4.3	4.3	1.5	8.0	12.0	Q2
CDC421312RGER	VQFN	RGE	24	3000	330.0	12.4	4.3	4.3	1.5	8.0	12.0	Q2
CDC421312RGET	VQFN	RGE	24	250	180.0	12.4	4.3	4.3	1.5	8.0	12.0	Q2

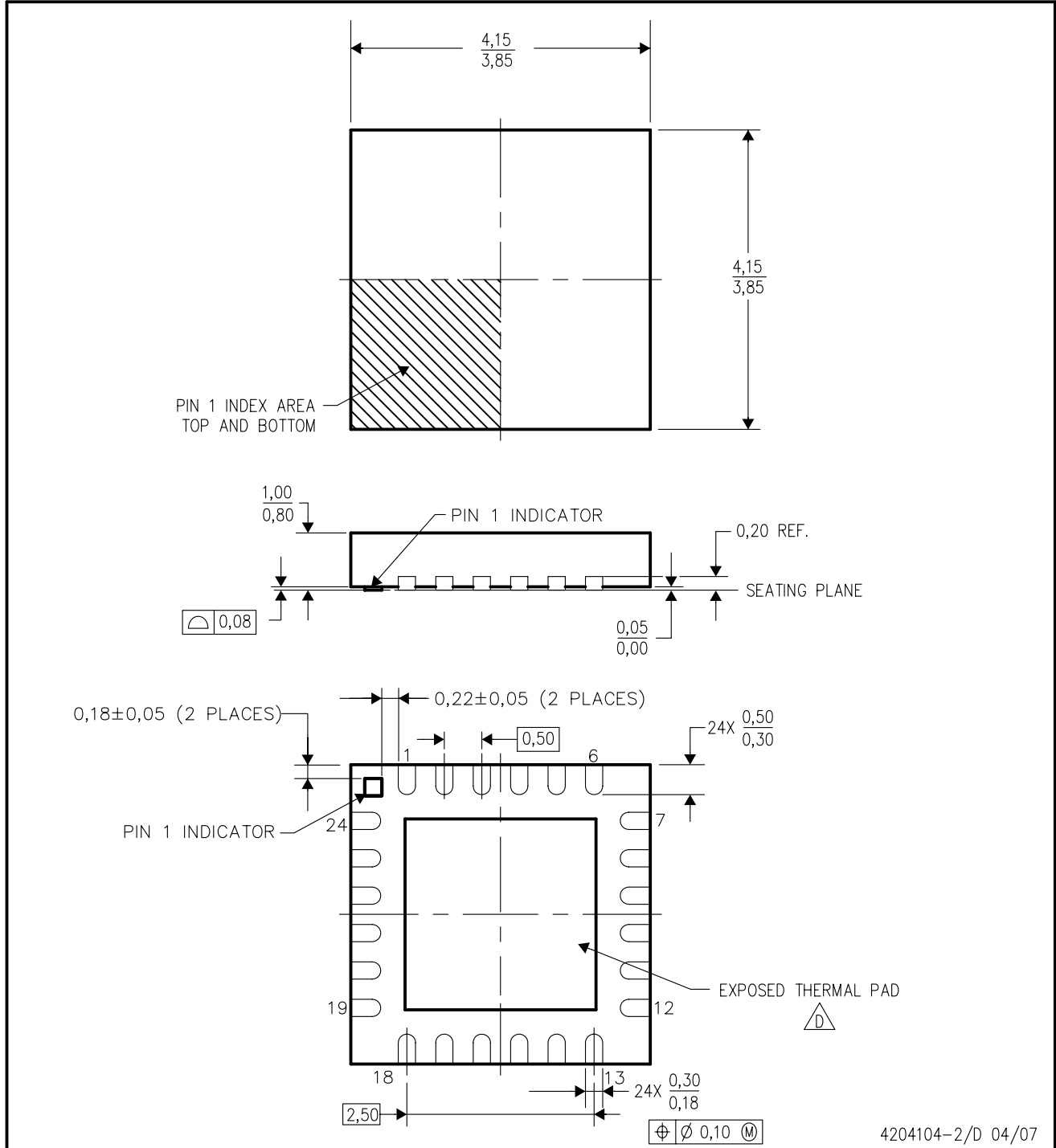
TAPE AND REEL BOX DIMENSIONS




*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CDC421100RGER	VQFN	RGE	24	3000	346.0	346.0	29.0
CDC421100RGET	VQFN	RGE	24	250	190.5	212.7	31.8
CDC421106RGER	VQFN	RGE	24	3000	346.0	346.0	29.0
CDC421106RGET	VQFN	RGE	24	250	190.5	212.7	31.8
CDC421125RGER	VQFN	RGE	24	3000	346.0	346.0	29.0
CDC421125RGET	VQFN	RGE	24	250	190.5	212.7	31.8
CDC421156RGER	VQFN	RGE	24	3000	346.0	346.0	29.0
CDC421156RGET	VQFN	RGE	24	250	190.5	212.7	31.8
CDC421212RGER	VQFN	RGE	24	3000	346.0	346.0	29.0
CDC421212RGET	VQFN	RGE	24	250	190.5	212.7	31.8
CDC421250RGER	VQFN	RGE	24	3000	346.0	346.0	29.0
CDC421250RGET	VQFN	RGE	24	250	190.5	212.7	31.8
CDC421312RGER	VQFN	RGE	24	3000	346.0	346.0	29.0
CDC421312RGET	VQFN	RGE	24	250	190.5	212.7	31.8

RGE (S-PQFP-N24) PIN 1 BUMP OPTION PLASTIC QUAD FLATPACK



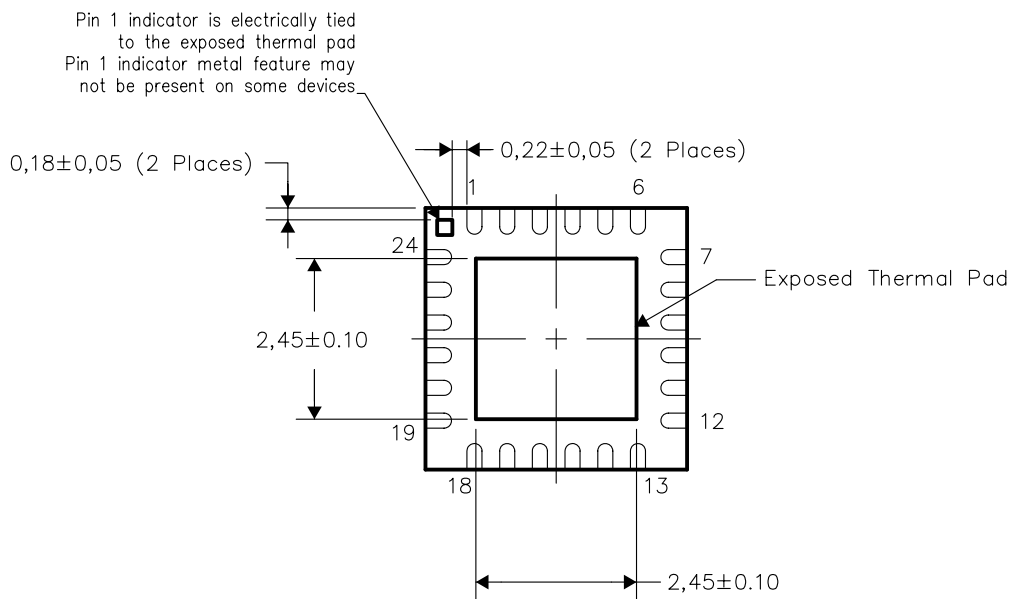
- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. Quad Flatpack, No-Leads (QFN) package configuration.
 -  The package thermal pad must be soldered to the board for thermal and mechanical performance. See the Product Data Sheet for details regarding the exposed thermal pad dimensions.
 - E. Falls within JEDEC MO-220.

THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No-Lead (QFN) package and its advantages, refer to Application Report, Quad Flatpack No-Lead Logic Packages, Texas Instruments Literature No. SCBA017. This document is available at www.ti.com.

The exposed thermal pad dimensions for this package are shown in the following illustration.

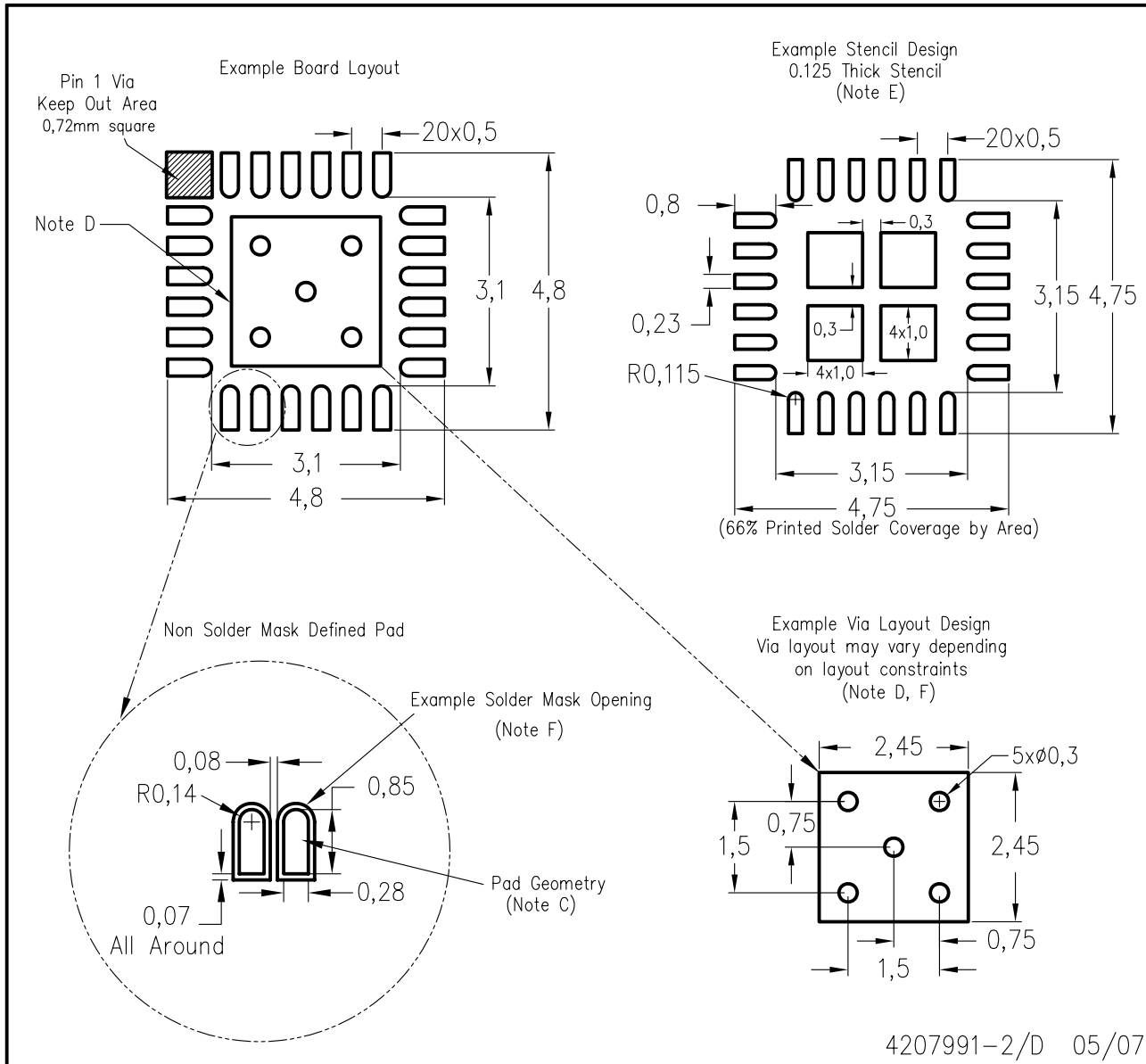


Bottom View

NOTE: All linear dimensions are in millimeters

Exposed Thermal Pad Dimensions

RGE (S-PQFP-N24)



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate designs.
 - D. This package is designed to be soldered to a thermal pad on the board. Refer to Application Note, Quad Flat-Pack Packages, Texas Instruments Literature No. SCBA017, SLUA271, and also the Product Data Sheets for specific thermal information, via requirements, and recommended board layout. These documents are available at www.ti.com <<http://www.ti.com>>.
 - E. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC 7525 for stencil design considerations.
 - F. Customers should contact their board fabrication site for recommended solder mask tolerances and via tenting recommendations for vias placed in the thermal pad.

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 TI 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. Information of third parties may be subject to additional restrictions.

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.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products

Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
RF/IF and ZigBee® Solutions	www.ti.com/lprf

Applications

Audio	www.ti.com/audio
Automotive	www.ti.com/automotive
Broadband	www.ti.com/broadband
Digital Control	www.ti.com/digitalcontrol
Medical	www.ti.com/medical
Military	www.ti.com/military
Optical Networking	www.ti.com/opticalnetwork
Security	www.ti.com/security
Telephony	www.ti.com/telephony
Video & Imaging	www.ti.com/video
Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2008, Texas Instruments Incorporated