CDCI6214 Ultra-Low Power Clock Generator With PCIe Support, Four Programmable Outputs and EEPROM

1 Features

- One Configurable High Performance, Low-Power PLL With 4 Programmable Outputs
- RMS Jitter Performance
  - Supports PCIe Gen1/ Gen2 / Gen3 / Gen4 without SSC
- Typical Power Consumption: 150 mW at 1.8 V(2)
- Universal Clock Input
  - Differential AC-Coupled or LVCMOS: 1 MHz to 250 MHz
  - Crystal: 8 MHz to 50 MHz
- Flexible Output Frequencies
  - 44.1 kHz to 350 MHz
  - Glitchless Output Divider Switching
- Four Individually Configurable Outputs
  - LVCMOS, LVDS or HCSL
  - Differential AC-Coupled With Programmable Swing (LVDS-, CML-, LVPECL-Compatible)
- Fully Integrated PLL, Configurable Loop Bandwidth: 100 kHz to 3 MHz
- Single or Mixed Supply Operation for Level Translation: 1.8 V, 2.5 V and 3.3 V
- Configurable GPIOs
  - Status Signals
  - Up to 4 Individual Output Enables
  - Output Divider Synchronization
- Flexible Configuration Options
  - I^2C-Compatible Interface: Up to 400 kHz
  - Integrated EEPROM With Two Pages and External Select Pin
- Only Supports 100 Ω Systems
- Industrial Temperature Range: –40ºC to 85ºC
- Small Footprint: 24-Pin VQFN (4 mm × 4 mm)

2 Applications

- PCIe Gen 1/2/3/4 clocking
- 1G / 10G Ethernet Switches, NIC, Accelerators
- Test & Measurement, Handheld Equipment
- Multi-Function Printers
- Broadcast Infrastructure

3 Description

The CDCI6214 device is an ultra-low power clock generator. The device selects between two independent reference inputs to a phase-locked loop and generates up to four different frequencies on configurable differential output channels and also a copy of the reference clock on a LVCMOS output channel.

Each of the four output channels has a configurable integer divider. Together with the output muxes, this allows up to five different frequencies. Clock distribution dividers are reset in a deterministic way for clean clock gating and glitch-less update capability. Flexible power-down options allow to optimize the device for lowest power consumption in active and standby operation. Typically four 156.25-MHz LVDS outputs consume 150 mW at 1.8 V. Typical RMS jitter of 386 fs for 100-MHz HCSL output enhances system margin for PCIe applications.

The CDCI6214 is configured using internal registers that are accessed by an I^2C-compatible serial interface and internal EEPROM.

The CDCI6214 enables high-performance clock trees from a single reference at ultra-low power with a small footprint. The factory- and user-programmable EEPROM make the CDCI6214 ideal as easy-to-use, instant-on clocking solution with low power consumption.

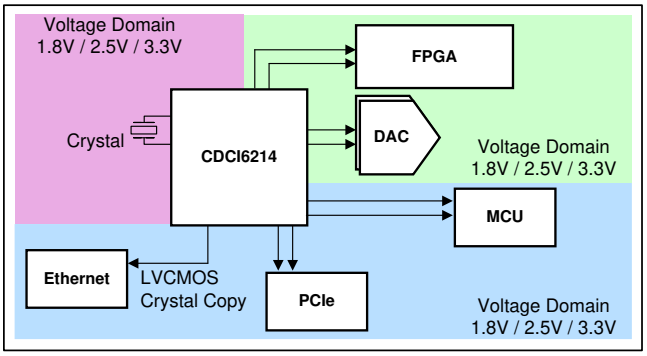
Device Information(1)

PART NUMBER	PACKAGE	BODY SIZE (NOM)
CDCI6214	VQFN (24)	4.00 mm × 4.00 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

(2) Four LVDS outputs, 156.25 MHz with crystal reference.

Application Example CDCI6214



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4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision D (June 2019) to Revision E	Page
• Removed fractional output divider (FOD) and spread spectrum clocking (SSC) information from the data sheet	1
• Added footnote to *Timing Characteristics* table	10
• Removed FOD from *Functional Block Diagram*	17
• Changed REFSEL selection from L to H.	19
• Removed *Output Channel Divider Types and Delay* table	21
• Removed the FOD control bits in the *Power Management* graphic	26
• Added Page-mode EEPROM read instructions	29
• Changed *Pre-Configured EEPROM Page 0* graphic	34
• Changed *Pre-Configured EEPROM Page 1* graphic	35
• Removed fractional output divider information from the registers	36
• Removed FOD information from the *CDCI6214 Registers* table	36
• Added additional details on pullup resistor and load capacitor added to power-up sequence	91

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Changes from Revision C (November 2018) to Revision D **Page**

- Added VDDREF and tablenote to the output supply voltage parameter in the *Recommended Operating Conditions* 5
- Added statement on chX_1p8vdet setting 20
- Changed *CDCI6214 - Pre-Configured EEPROM Page 0* graphic..... 34

Changes from Revision B (April 2018) to Revision C **Page**

- Changed pin names for pins 1 and 2 from: XIN and XOUT to: XOUT/FB_P and XIN/FB_N. 4
- Changed descriptions for pins 1 and 2..... 4
- Changed pin names for pins 1 and 2 in *Absolute Maximum Ratings* 5
- Changed pin names for pins 1 and 2 in *Reference Input, Single-Ended and Differential Mode Characteristics (REFP, REFN, FB_P, FB_N)*..... 6
- Changed Input capacitance specification symbols in *Reference Input, Single-Ended and Differential Mode Characteristics (REFP, REFN, FB_P, FB_N)* from: C_{IN_XOUT} and C_{IN_XIN} to: C_{IN_XOUT/FB_P} and C_{IN_XIN/FB_P} 6
- Changed pins 1 and 2 from: XIN and XOUT to: XOUT/FB_P and XIN/FB_N in the *Functional Block Diagram* 17
- Changed pins 1 and 2 from: XIN and XOUT to: XOUT/FB_P and XIN/FB_N in the *Reference Block* graphic..... 18
- Changed External (XIN) pin to: FB_P/N in the *Phase-Locked Loop Circuit* graphic..... 20
- Changed pins 1 and 2 from: XIN and XOUT to: XOUT/FB_P and XIN/FB_N in the *CDCI6214 - Pre-Configured EEPROM Page 0* and *CDCI6214 - Pre-Configured EEPROM Page 1* graphics..... 34
- Changed pins XIN and XOUT to: XOUT/FB_P and XIN/FB_N in the *Typical Applications* schematics..... 86
- Changed design parameter superscript to a subscript 87

Changes from Revision A (October 2017) to Revision B **Page**

- Changed pinout pins 5 and 6 from NC to REFP, REFN inputs..... 4
- Changed supply voltage maximum from: 3.6 V to: 3.65 V..... 5
- Removed Skew between HCSL maximum from the *Output Skew and Delay Characteristics* table 10

Changes from Original (July 2017) to Revision A **Page**

- Changed device status from Advanced Info to Production Data..... 1
- Changed REFSEL pin description to reflext REFMUX control. 22

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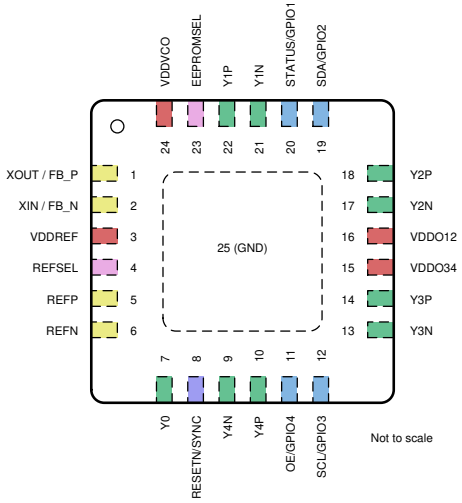
5 Pin Configuration and Functions

RGE Package
24-Pin VQFN
Top View



Pin Functions

PIN		TYPE	DESCRIPTION
NAME	NO.		
XOUT/FB_P	1	IO	Crystal Driver Output / LVCMOS Input / Differential Positive Reference
XIN/FB_N	2	I	Crystal Input / Differential Negative Reference
VDDREF	3	P	Power Supply Pin for Input Path, Digital and EEPROM
REFSEL	4	I	Manual Reference Selection MUX for PLL, R_{PU} = 50 kΩ, R_{PD} = 50 kΩ
REFP	5	I	Differential Positive Reference
REFN	6	I	Differential Negative Reference
Y0	7	O	Output 0 Pin
RESETN/SYNC	8	I	Chip Reset. Alternatively, Output Divider Sync, R_{PU} = 50 kΩ(1)
Y4N	9	O	Output 4 Negative Pin
Y4P	10	O	Output 4 Positive Pin
OE/GPIO4	11	IO	Global output enable (default) or programmable GPIO, R_{PU} = 50 kΩ(1)
SCL/GPIO3	12	IO	Serial interface clock (default) or programmable GPIO
Y3N	13	O	Output 3 Negative Pin
Y3P	14	O	Output 3 Positive Pin
VDDO34	15	P	Power Supply for Outputs 3 and 4
VDDO12	16	P	Power Supply for Outputs 1 and 2
Y2N	17	O	Output 2 Negative Pin
Y2P	18	O	Output 2 Positive Pin
SDA/GPIO2	19	IO	Serial interface data (default) or programmable GPIO
STATUS/GPIO1	20	IO	Status (default) or programmable GPIO, R_{PU} = 50 kΩ(1)
Y1N	21	O	Output 1 Negative Pin
Y1P	22	O	Output 1 Positive Pin
EEPROMSEL	23	I	EEPROM Page Mode Select, R_{PU} = 50 kΩ, R_{PD} = 50 kΩ(1)
VDDVCO	24	P	Power Supply Pin for VCO / PLL
GND	25	G	Ground, Thermal Pad

(1) R_{PU} is an internal pullup resistor. R_{PD} is an internal pulldown resistor.

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6 Specifications

6.1 Absolute Maximum Ratings

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

		MIN	MAX	UNIT
VDDREF, VDDVCO, VDDO12, VDDO34	Supply voltage	–0.3	3.65	V
XIN/FB_P, XOUT/FB_N, REFP, REFN	Input voltage	–0.3	VDDREF + 0.3	V
STATUS/GPIO1, SDA/GPIO2, SCL/GPIO3, OE/GPIO4, REFSEL, EEPROMSEL, RESETN/SYNC	Input voltage	–0.3	VDDREF + 0.3	V
Y0, Y1P, Y1N, Y2P, Y2N, Y3P, Y3N, Y4P, Y4N	Output voltage	–0.3	VDDO_x + 0.3	V
STATUS/GPIO1, SDA/GPIO2, SCL/GPIO3, OE/GPIO4	Output voltage	–0.3	VDDREF + 0.3	V
T_J	Junction temperature		125	ºC
T_{stg}	Storage temperature		150	ºC

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

6.2 ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001(1)	2000	V
		Charged-device model (CDM), per JEDEC specification JESD22-C101(2)	500	

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

6.3 Recommended Operating Conditions

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

		MIN	NOM	MAX	UNIT
VDDREF, VDDVCO	Core supply voltage(1)	1.71		3.465	V
VDDO1	Output supply voltage	1.71		3.465	V
VDDO2	Output supply voltage	1.71		3.465	V
VDDO3	Output supply voltage	1.71		3.465	V
VDDO4	Output supply voltage	1.71		3.465	V
T_A	Ambient temperature	–40ºC		85	ºC

(1) VDDREF and VDDVCO must be powered from the same supply voltage.

6.4 Thermal Information

THERMAL METRIC(1)		CDCI6214 RGE (VQFN) 24 PINS	UNIT
$R_{\theta JA}$	Junction-to-ambient thermal resistance	39.5	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	29.5	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	16.9	°C/W
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	2.6	°C/W
ψ_{JT}	Junction-to-top characterization parameter	0.4	°C/W
ψ_{JB}	Junction-to-board characterization parameter	16.8	°C/W

(1) For more information about traditional and new thermal metrics, see the *Semiconductor and IC Package Thermal Metrics* application report.

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6.5 EEPROM Characteristics

VDDVCO, VDDO12, VDDO34, VDDREF = 1.8 V ±5%, 2.5 V ±5%, 3.3 V ±5% and T_A = –40ºC to 85°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
n_{EEcyc}	EEPROM programming cycles	each word	10		10,000	cycles
t_{EEret}	EEPROM data retention		10			years

6.6 Reference Input, Single-Ended and Differential Mode Characteristics (REFP, REFN, FB_P, FB_N)

VDDVCO, VDDO12, VDDO34, VDDREF = 1.8 V ±5%, 2.5 V ±5%, 3.3 V ±5% and T_A = –40ºC to 85°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
f_{IN_Ref}	Reference frequency		1		250	MHz
V_{IH}	Input high voltage	LVCMOS input buffer	0.8 × VDDREF			V
V_{IL}	Input low voltage	LVCMOS input buffer			0.2 × VDDREF	V
V_{IN_DIFF}	Differential input voltage swing, peak-to-peak	VDDREF = 2.5 V or 3.3 V, AC-coupled differential input buffer	0.5		1.6	V
V_{IN_DIFF}	Differential input voltage swing, peak-to-peak	VDDREF = 1.8 V, AC-coupled differential input buffer	0.5		1.0	V
dV_{IN}/dT	Input slew rate	20% – 80%	3			V/ns
IDC	Input duty cycle		40%		60%	
C_{IN_XOUT/FB_P}	Input capacitance	No xtal active, on-chip load disabled, at 25°C		7		pF
C_{IN_XIN/FB_P}	Input capacitance	No xtal active, on-chip load disabled, at 25°C		5		pF
C_{IN_REF}	Input capacitance	at 25°C		5		pF

6.7 Reference Input, Crystal Mode Characteristics (XIN, XOUT)

VDDVCO, VDDO12, VDDO34, VDDREF = 1.8 V ±5%, 2.5 V ±5%, 3.3 V ±5% and T_A = –40ºC to 85°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
f_{IN_Xtal}	Crystal frequency	Fundamental mode	8		50	MHz
Z_{ESR}	Crystal equivalent series resistance	A supported crystal is within	30		100	Ω
C_L	Crystal load capacitance	Using on-chip load capacitance. A supported crystal is within.	5		8	pF
P_{XTAL}	Crystal tolerated drive power	A supported crystal tolerates up to	100			uW
C_{XIN_LOAD}	On-Chip load capacitance	Programmable in typical 200-fF steps at room temp	3		9.1	pF
DNL_{XIN_LOAD}	Differential non-linearity	at room temp		200		fF

6.8 General-Purpose Input and Output Characteristics (GPIO[4:1], SYNC/RESETN)

VDDVCO, VDDO12, VDDO34, VDDREF = 1.8 V ±5%, 2.5 V ±5%, 3.3 V ±5% and T_A = –40ºC to 85°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{IH}	Input high voltage		0.8 × VDDREF			V
V_{IL}	Input low voltage				0.2 × VDDREF	V
I_{IH}	Input high level current	VIH = VDDREF		–0.02		µA
I_{IH}	Input high level current	VIH = VDDREF, Pin 12, 19		0.004		µA
I_{IL}	Input low level current	VIL = GND		–50		µA
I_{IL}	Input low level current	VIL = GND, Pin 12, 19		–0.004		µA
dV_{IN}/dT	Input slew rate	20% – 80%	0.5			V/ns
C_{IN_GPIO}	Input Capacitance				10	pF

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General-Purpose Input and Output Characteristics (GPIO[4:1], SYNC/RESETN) (continued)

VDDVCO, VDDO12, VDDO34, VDDREF = 1.8 V ±5%, 2.5 V ±5%, 3.3 V ±5% and T_A = –40ºC to 85°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{OH}	Output high voltage	only capacitive load	0.8 × VDDREF			V
V_{OL}	Output low voltage	only capacitive load			0.2 × VDDREF	V
dV_{OUT}/dT	Output slew rate	20% - 80%, at 10pF		0.3		V/ns
R_{PU}	Pullup resistance	Pin 11, 20		77		kΩ

6.9 Triple Level Input Characteristics (EEPROMSEL, REFSEL)

VDDVCO,VDDO12, VDDO34, VDDREF = 1.8V ±5%, 2.5V ±5%, 3.3V ±5% and T_A = –40ºC to 85°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{IH}	Input high voltage		0.8 × VDDREF			V
V_{IM}	Input mid voltage		0.41 × VDDREF	0.5 × VDDREF	0.58 × VDDREF	V
V_{IL}	Input low voltage				0.2 × VDDREF	V
I_{IH}	Input high level current	VIH = VDDREF		40		µA
I_{IM}	Input mid level current	VIH = VDDREF/2		–1		µA
I_{IL}	Input low level current	VIL = GND		–40		µA
t_{RIN}	input slew rate	10% - 90%	50			ns
C_{IN_TRI}					10	pF
R_{PDPU}				64		kΩ

6.10 Reference Mux Characteristics(1)

VDDVCO, VDDO12, VDDO34, VDDREF = 1.8 V ±5%, 2.5 V ±5%, 3.3 V ±5% and T_A = –40ºC to 85°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
L_{REF_MUX}	Reference mux isolation	XIN = Crystal 25 MHz, REF = 27 MHz		89		dBc
L_{REF_MUX}	Reference mux isolation	XIN = Crystal 25 MHz, REF = 24.576 MHz		78		dBc

(1) Mux isolation is defined as the attenuation relative to the carrier base harmonic as a positive dBc number.

6.11 Phase-Locked Loop Characteristics

VDDVCO, VDDO12, VDDO34, VDDREF = 1.8 V ±5%, 2.5 V ±5%, 3.3 V ±5% and T_A = –40ºC to 85°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
f_{PFD}	Phase detector frequency		1		100	MHz
f_{VCO}	Voltage-controlled oscillator frequency		2400		2800	MHz
f_{BW}	Configurable closed-loop PLL bandwidth	REF = 25 MHz	100		3000	kHz
$f_{CLKDIST}$	Clock distribution frequency		400		700	MHz
K_{VCO}	Voltage-controlled oscillator gain	f_{VCO} = 2.4 GHz		62		MHz/V
K_{VCO}	Voltage-controlled oscillator gain	f_{VCO} = 2.5 GHz		62		MHz/V
K_{VCO}	Voltage-controlled oscillator gain	f_{VCO} = 2.8 GHz		92		MHz/V
$\lvert\Delta T_{CL}\rvert$	Allowable temperature drift for continuous lock	dT/dt ≤ 20 K / min			125	ºC

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6.12 Closed-Loop Output Jitter Characteristics

VDDVCO, VDDO12, VDDO34, VDDREF = 1.8 V ±5%, 2.5 V ±5%, 3.3 V ±5% and T_A = –40ºC to 85°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{RJ_CL}	RMS phase jitter	int. Range from 10 kHz to 20 MHz , XIN = Crystal 25 MHz, Integer Output Divider, Yx = 156.25 MHz LVDS		500	750	fs
		int. Range from 10 kHz to 20 MHz , XIN = Crystal 25 MHz, Integer Output Divider, Yx = 100 MHz HCSL		386	800	fs
		PCIe Gen 3/4 Common Clock transfer functions applied, XIN = Crystal 25 MHz, Integer Output Divider, Yx = 100 MHz HCSL			500	fs

6.13 Output Mux Characteristics(1)

VDDVCO, VDDO12, VDDO34, VDDREF = 1.8 V ±5%, 2.5 V ±5%, 3.3 V ±5% and T_A = –40ºC to 85°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
L_{OUT_MUX}	Output mux isolation	REF = 27 MHz, XIN = 25 MHz, VCO = 2500 MHz, PSFB = 4, Y_ODD = 312.5 MHz, Y_EVEN = 208.3 MHz, LVPECL		65		dBc
L_{OUT_MUX}	Output mux isolation	REF = 27 MHz, XIN = 25 MHz, VCO = 2500 MHz, PSFB = 4, Y_ODD = 312.5 MHz, Y_EVEN = 250 MHz, LVPECL		63		dBc
L_{OUT_MUX}	Output mux isolation	REF = 27 MHz, XIN = 25 MHz, VCO = 2500 MHz, PSFB = 4, Y_ODD = 312.5 MHz, Y_EVEN = 89.3 MHz, LVPECL		72		dBc
L_{OUT_MUX}	Output mux isolation	REF = 27 MHz, XIN = 25 MHz, VCO = 2500 MHz, PSFB = 4, IODs = 312.5 MHz, Yx=BYPASS (XIN), LVPECL		64		dBc
L_{OUT_MUX}	Output mux isolation	REF = 27 MHz, XIN = 25 MHz, VCO = 2500 MHz, PSFB = 4, Y_ODD = 100 MHz, Y_EVEN = 266.6 MHz, LVPECL		57		dBc

(1) Mux isolation is defined as the attenuation relative to the carrier base harmonic as a positive dBc number.

6.14 LVCMOS Output Characteristics

VDDVCO, VDDO12, VDDO34, VDDREF = 1.8 V ±5%, 2.5 V ±5%, 3.3 V ±5% and T_A = –40ºC to 85°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
f_{O_LVCMOS}	Output frequency	VDDO_x = 2.5 V or 3.3 V, normal drive	0.1		350	MHz
f_{O_LVCMOS}	Output frequency	VDDO_x = 1.8 V, normal drive	0.1		250	MHz
V_{OH_LVCMOS}	Output high voltage	Normal mode, only capacitive load	0.8 × VDDREF			V
V_{OL_LVCMOS}	Output low voltage	Normal mode, only capacitive load			0.2 × VDDREF	V
V_{OH_LVCMOS}	Output high voltage	Slow mode, only capacitive load	0.7 × VDDREF			V
V_{OL_LVCMOS}	Output low voltage	Slow mode, only capacitive load			0.3 × VDDREF	V
R_{ON_LVCMOS}	Output impedance	Normal mode		28		Ω
R_{ON_LVCMOS}	Output impedance	Weak mode		80		Ω

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LVCMOS Output Characteristics (continued)

VDDVCO, VDDO12, VDDO34, VDDREF = 1.8 V ±5%, 2.5 V ±5%, 3.3 V ±5% and T_A = –40ºC to 85°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
L_{LVCMOS_100M}	Phase noise floor, single side band	$f_{CARRIER}$ = 100 MHz, f_{OFFSET} = 10 MHz		–148		dBc/Hz

6.15 HCSL Output Characteristics

VDDVCO, VDDO12, VDDO34, VDDREF = 1.8 V ±5%, 2.5 V ±5%, 3.3 V ±5% and T_A = –40ºC to 85°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
f_{O_HCSL}	Output frequency		0.1		350	MHz
V_{CM_HCSL}	Output common mode		0.2	0.34	0.55	V
V_{OD}	Differential output voltage	f_{O_HCSL} = 100 MHz	0.4		1.0	V
V_{SS}	Differential output voltage, peak to peak	f_{O_HCSL} = 100 MHz	0.8		2.0	Vpp
V_{CROSS}	Absolute crossing point	R_p = 49.9 Ω ±5%, f_{O_HCSL} = 100 MHz	250		550	mV
ΔV_{CROSS}	Relative crossing point variation	w.r.t to average crossing point, f_{O_HCSL} = 100 MHz		100		mV
dV/dt	Slew rate for rising and falling edge	Differential, at V_{CROSS} ±150 mV, f_{O_HCSL} = 100 MHz (1)	1		4	V/ns
ΔdV/dt	Slew rate matching	Single-ended, at V_{CROSS} ±75 mV, f_{O_HCSL} = 100 MHz (1)			20%	
ODC	Output duty cycle	Not in PLL bypass mode	45%		55%	
R_P	Parallel termination	R_p = 49.9 Ω ±5% required	45		55	Ω
L_{HCSL_100M}	Phase noise floor, single side band	$f_{CARRIER}$ = 100 MHz, f_{OFFSET} = 10 MHz		-152		dBc/Hz

(1) PCIe test load slew rate

6.16 LVDS DC-Coupled Output Characteristics

VDDVCO, VDDO12, VDDO34, VDDREF = 1.8 V ±5%, 2.5 V ±5%, 3.3 V ±5% and T_A = –40ºC to 85°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
$f_{O_PRG_AC}$	Output frequency		0.1		350	MHz
V_{CM}	Output common mode	VDDO_X = 2.5 V, 3.3 V, chx_lvds_cmtrim_inc = 2	1.125	1.2	1.375	V
V_{CM}	Output common mode	VDDO_X = 1.8 V, chx_lvds_cmtrim_inc = 2	0.8	0.9	1	V
V_{OD}	Differential output voltage	LVDS	0.25	0.3	0.45	V
t_{RF}	Output rise/fall times	LVDS (20% to 80%)		675		ps
ODC	Output duty cycle	Not in PLL bypass mode	45%		55%	
$L_{LVDS_DC_100M}$	Phase noise floor, single side band	$f_{CARRIER}$ = 100MHz, f_{OFFSET} = 10MHz		–152		dBc/Hz

6.17 Programmable Differential AC-Coupled Output Characteristics

VDDVCO, VDDO12, VDDO34, VDDREF = 1.8 V ±5%, 2.5 V ±5%, 3.3 V ±5% and T_A = –40ºC to 85°C and AC-coupled outputs

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
$f_{O_PRG_AC}$	Output frequency		0.1		350	MHz
V_{OD}	Differential output voltage	LVDS-like		0.45		V
V_{OD}	Differential output voltage	CML-like		0.8		V
V_{OD}	Differential output voltage	LVPECL-like		0.9		V
t_{RF}	Output rise/fall times	LVDS-like (20% to 80%)		675		ps

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Programmable Differential AC-Coupled Output Characteristics (continued)

VDDVCO, VDDO12, VDDO34, VDDREF = 1.8 V ±5%, 2.5 V ±5%, 3.3 V ±5% and T_A = –40ºC to 85°C and AC-coupled outputs

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{RF}	Output rise/fall times	CML-like (20% to 80%)		520		ps
t_{RF}	Output rise/fall times	LVPECL-like (20% to 80%)		500		ps
ODC	Output duty cycle	Not in PLL bypass mode	45%		55%	
$L_{DIFF_AC_100M}$	Phase noise floor, single side band	$f_{CARRIER}$ = 100 MHz, f_{OFFSET} = 10 MHz		–152		dBc/Hz

6.18 Output Skew and Delay Characteristics

VDDVCO, VDDO12, VDDO34, VDDREF = 1.8 V ±5%, 2.5 V ±5%, 3.3 V ±5% and T_A = –40ºC to 85°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{SK_HCSL}	Skew between HCSL	Y[4:1] = HCSL, $f_{OY[4:1]}$ = 100 MHz		140		ps
t_{SK_DIFFAC}	Skew between progr. differential AC	Y[4:1] = programmable output swing, $f_{OY[4:1]}$ = 100 MHz		150		ps
t_{SK_LVCMOS}	Skew between LVCMOS	Y[4:1] = LVCMOS, $f_{OY[4:1]}$ = 100 MHz		100		ps
$t_{SK_LVCMOS_BYP}$	Skew between LVCMOS to Bypass	Y[4:0] = LVCMOS, $f_{OY[4:0]}$ = 100 MHz		3		ns
t_{PD_ZDM}	Propagation delay	REF = 67 MHz, VCO = 2680 MHz, PSFB = 4, PSA_{Y_ODD} = 4, PSB_{Y_EVEN} = 4, IOD_{Y_ODD} = 10, IOD_{Y_EVEN} = 10, Y_{P_ODD} = Y_{N_ODD} = IOD, in ext. ZDM, LVCMOS	–600		600	ps

6.19 Output Synchronization Characteristics

VDDVCO, VDDO12, VDDO34, VDDREF = 1.8 V ±5%, 2.5 V ±5%, 3.3 V ±5% and T_A = –40ºC to 85°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{SU_SYNC}	Setup time SYNC pulse	With respect to PLL reference rising edge at 100 MHz with R = 1	3			ns
t_{H_SYNC}	Hold time SYNC pulse	With respect to PLL reference rising edge at 100 MHz with R = 1			3	ns
t_{PWH_SYNC}	High pulse width for SYNC	With R = 1, at least 2 PFD periods + 24 feedback pre-scaler periods	60			ns
t_{PWL_SYNC}	Low pulse width for SYNC	With R = 1, at least 1 PFD period	6			ns
t_{EN}	Individual output enable time(1)	Tri-state to first rising edge, $f_{Y[4:1]}$ < 200 MHz		4		nCK
t_{DIS}	Individual output disable time(1)	Last falling edge to tri-state, $f_{Y[4:1]}$ < 200 MHz		4		nCK

(1) Output clock cycles of respective output channel. Global output enable handled by digital logic, additional propagation will be added.

6.20 Timing Characteristics

VDDVCO, VDDO12, VDDO34, VDDREF = 1.8 V ±5%, 2.5 V ±5%, 3.3 V ±5% and T_A = –40ºC to 85°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{INIT}	Initialization time(1)	Initialization time from POR to device releasing PLL outputs.			5	ms
t_{VDD}	Power supply ramp(2)(3)	Timing requirement for any VDD pin while RESETN = LOW	50		2000	µs

(1) t_{INIT} = t_{EELOAD}+ t_{STAB}
(2) RESETN pin should be LOW until VDD reaches 95% of final value. TI recommends adding a pullup resistor of 4.7 kΩ and a capacitance of 0.47 µF to Ground on RESETN pin to meet the POR timing requirement.
(3) After supply is settled within ±5% of target value, initial rising edge on RESETN will start internal logic. When POR voltage is exceeded

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6.21 I²C-Compatible Serial Interface Characteristics (SDA/GPIO2, SCL/GPIO3)

VDDVCO, VDDO12, VDDO34, VDDREF = 1.8 V ±5%, 2.5 V ±5%, 3.3 V ±5% and T_A = –40ºC to 85°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{IH}	Input voltage, logic high		0.7 × VDDREF			V
V_{IL}	Input voltage, logic low				0.3 × VDDREF	V
V_{HYS}	Input Schmitt trigger hysteresis	VDDREF = 3.3 V, f_{SCL} = 400 kHz	156			mV
V_{HYS}	Input Schmitt trigger hysteresis	VDDREF = 2.5 V, f_{SCL} = 400 kHz	118			mV
V_{HYS}	Input Schmitt trigger hysteresis	VDDREF = 1.8 V, f_{SCL} = 400 kHz	85			mV
I_{IH}	Input leakage current	VDDREF = 0.17 V..3.12 V	–10		10	µA
V_{OL}	Low-level output voltage	At 3-mA sink current, VDDREF = 3.3 V – 5%			0.4	V
V_{OL}	Low-level output voltage	At 3-mA sink current, VDDREF = 2.5 V – 5%			0.4	V
V_{OL}	Low-level output voltage	At 2-mA sink current, VDDREF = 1.8 V – 5%			0.342	V
I_{OL}	Low-level output current	V_{OL} = 0.4 V	3			mA
C_{IN}	Input capacitance				10	pF

6.22 Timing Requirements, I²C-Compatible Serial Interface (SDA/GPIO2, SCL/GPIO3)

VDDVCO, VDDO12, VDDO34, VDDREF = 1.8 V ±5%, 2.5 V ±5%, 3.3 V ±5% and T_A = –40ºC to 85°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PW_G}	Pulse width of suppressed glitches				50	ns
f_{SCL}	SCL clock frequency	Standard		100		kHz
f_{SCL}	SCL clock frequency	Fast-mode		400		kHz
t_{SU_STA}	Setup time start condition	SCL = V_{IH} before SDA = V_{IL}		0.6		µs
t_{H_STA}	Hold time start condition	SCL = V_{IL} after SCL = V_{IL}. After this time, the first clock edge is generated.		0.6		µs
t_{SU_SDA}	Setup time data	SDA valid after SCL = V_{IL}, f_{SCL} = 100 kHz	250			ns
t_{SU_SDA}	Setup time data	SDA valid after SCL = V_{IL}, f_{SCL} = 400 kHz	100			ns
t_{H_SDA}	Hold time data	SDA valid before SCL = V_{IH}	0			µs
t_{PWH_SCL}	Pulse width high, SCL	f_{SCL} = 100 kHz	4			µs
t_{PWH_SCL}	Pulse width high, SCL	f_{SCL} = 400 kHz	0.6			µs
t_{PWL_SCL}	Pulse width low, SCL	f_{SCL} = 100 kHz	4.7			µs
t_{PWL_SCL}	Pulse width low, SCL	f_{SCL} = 400 kHz	1.3			µs
t_{OF}	Output fall time	C_{OUT} = 10..400 pF			250	ns

6.23 Power Supply Characteristics

VDDVCO, VDDO12, VDDO34, VDDREF = 1.8 V ±5%, 2.5 V ±5%, 3.3 V ±5% and T_A = –40ºC to 85°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
I_{DD_REF}	Reference input current	DBL = on		4		mA
I_{DD_XIN}	Crystal input current	Crystal with P_{max} = 200 µW		2		mA
I_{DD_VCO}	VCO and PLL current	f_{VCO} = 2500 MHz, PSFB = PSA = 4 and PSB = off		13		mA
I_{DD_OUT}	Output channel current	Activated output channel, 1x LVDS 156.25 MHz		10		mA
I_{DD_IOD}	Output integer divider current			2		mA
I_{DD_PDN}	Power-down current	Using reset pin / bits		3		mA

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Power Supply Characteristics (continued)

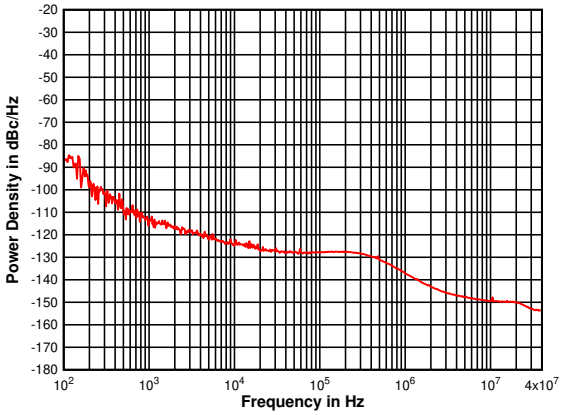
VDDVCO, VDDO12, VDDO34, VDDREF = 1.8 V ±5%, 2.5 V ±5%, 3.3 V ±5% and T_A = –40ºC to 85°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
I_{DD_TYP}	Typical current	4x 156.25-MHz LVDS case using crystal input and doubler		83		mA
L_{PSNR}	Power supply noise rejection(1)	Yx = 100 MHz LVDS, on one of VDDx injected sine wave 50 mV at f_{INJ} = 10 kHz,		–56		dBc
L_{PSNR}	Power supply noise rejection(1)	Yx = 100MHz LVDS, on one of VDDx injected sine wave 50 mV at f_{INJ} = 100 kHz		–46		dBc
L_{PSNR}	Power supply noise rejection(1)	Yx = 100MHz LVDS, on one of VDDx injected sine wave 50 mV at f_{INJ} = 1 MHz		–49		dBc
L_{PSNR}	Power supply noise rejection(1)	Yx = 100MHz LVDS, on one of VDDx injected sine wave 50 mV at f_{INJ} = 10 MHz		–69		dBc
L_{PSNR}	Power supply noise rejection(1)	Yx = 100MHz LVDS, on one of VDDx injected sine wave 50 mV at f_{INJ} = 20 MHz		–74		dBc
L_{PSNR}	Power supply noise rejection(1)	Yx = 100MHz LVDS, on one of VDDx injected sine wave 50 mV at f_{INJ} = 40 MHz		–73		dBc

(1) dBc with respect to output carrier frequency.

6.24 Typical Characteristics

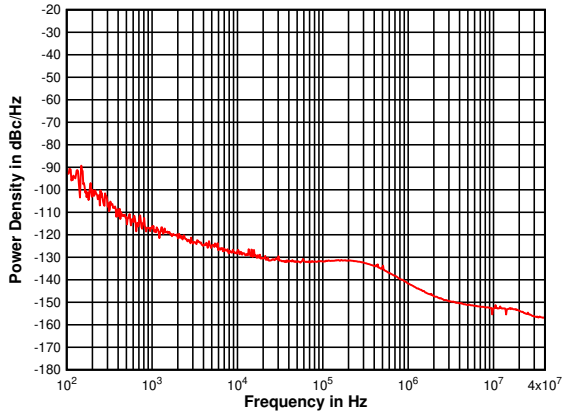
VDDx = 1.8 V at room temperature



Reference: Crystal 25 MHz

Closed-Loop Phase Noise 100-MHz HCSL from 2.4-GHz VCO

Figure 1. 100-MHz Carrier



Reference: Crystal 25 MHz

Closed-Loop Phase Noise 156.25-MHz LVDS from 2.5-GHz VCO

Figure 2. 156.25-MHz Carrier

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7 Parameter Measurement Information

7.1 Parameters

7.1.1 Reference Inputs

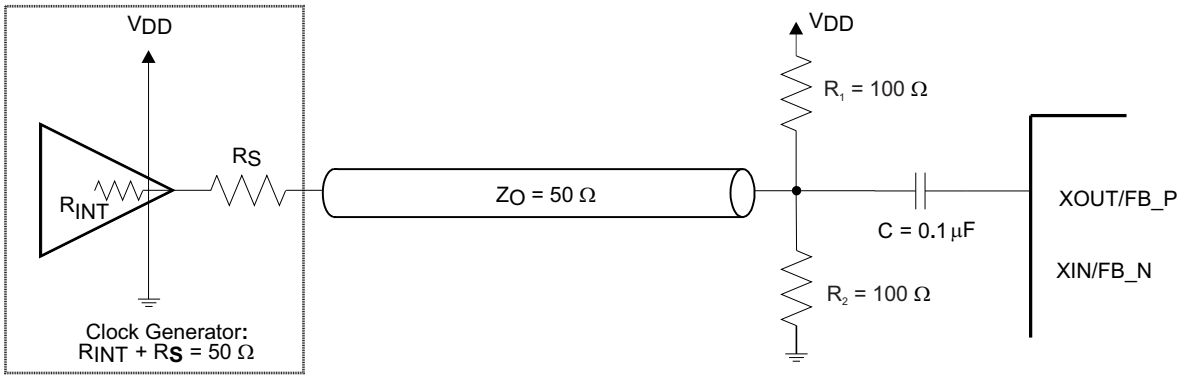
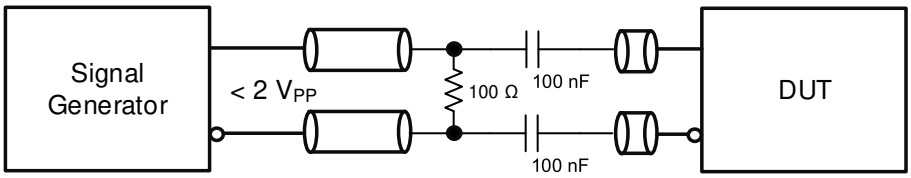


Figure 3. Single-Ended LVCMOS Crystal Input



(1) Applied signal has to stay within V_{IN_DIFF} limits.

Figure 4. Differential AC-Coupled Input

7.1.2 Outputs

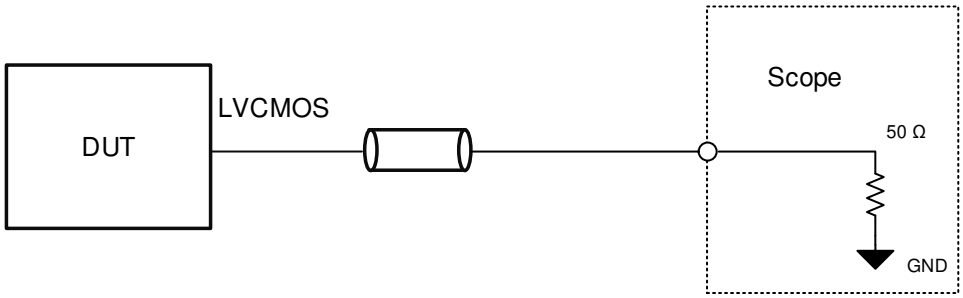


Figure 5. LVCMOS Output

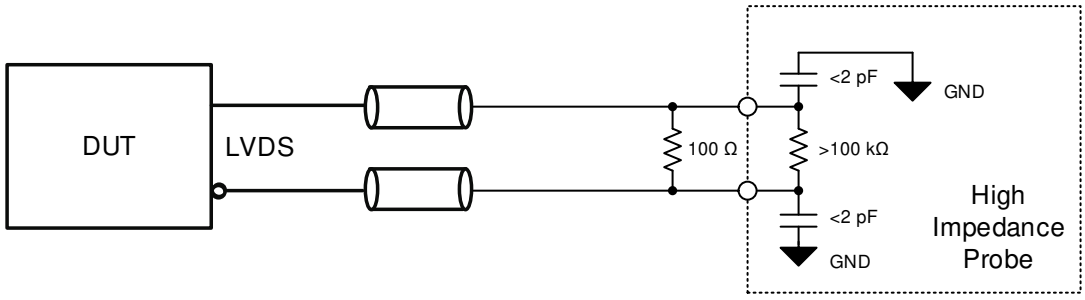


Figure 6. LVDS Output, DC-Coupled

Parameters (continued)

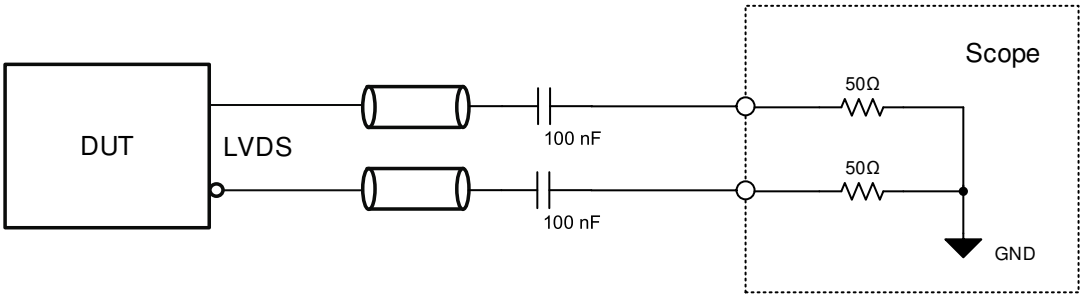


Figure 7. LVDS Output AC-Coupled

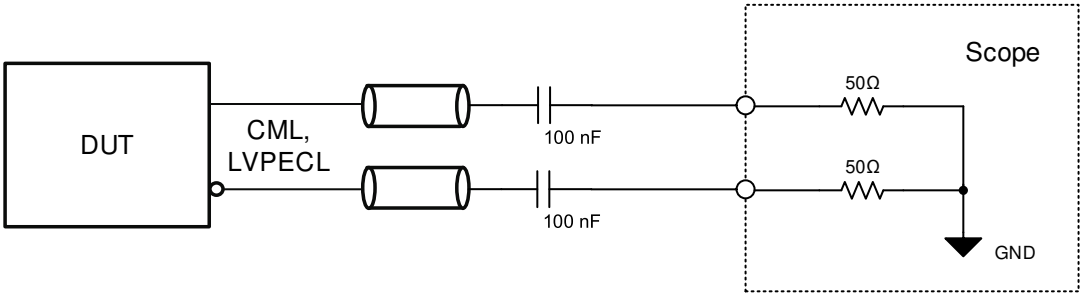


Figure 8. Differential AC-Coupled (CML, LVPECL)

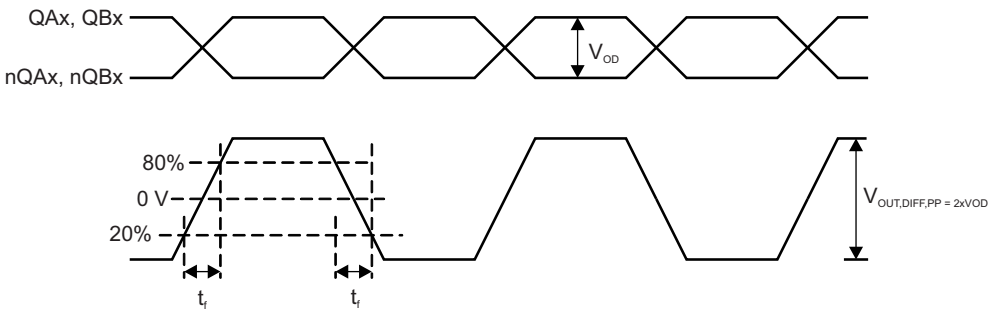
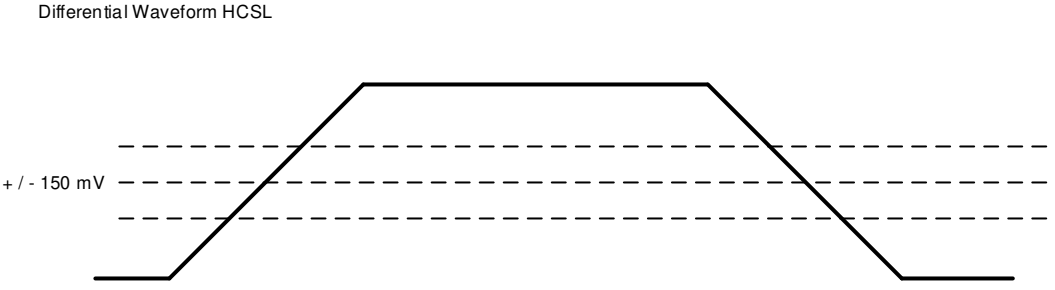


Figure 9. Differential Output Voltage and Rise/Fall Time



(1) Differential waveform created using math function in scope subtracting positive from negative output pin waveform: YxP - YxN.

(2) Slew rate measured using absolute ± 150 mV on the differential waveform. This correlates to the cross-point of the single ended positive and negative waveform.

Figure 10. HCSL, Differential Rise and Fall Time

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Parameters (continued)

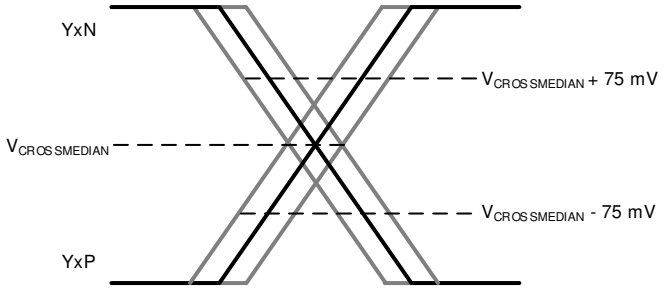
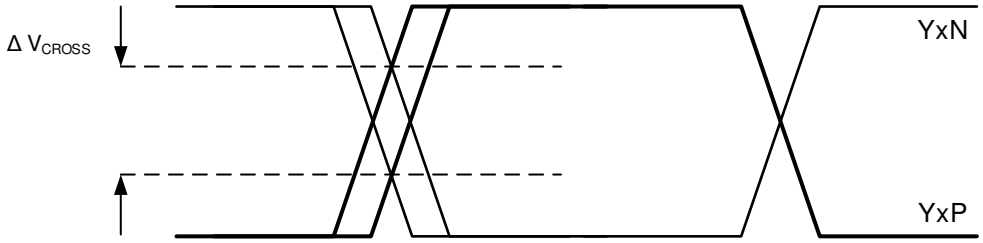


Figure 11. HCSL, Slew Rate Variation



(1) Measurement conducted using the single ended waveforms. Total variation of the crossing point of rising YxP and falling YxN edges.

Figure 12. HCSL, Delta Crossing Voltage

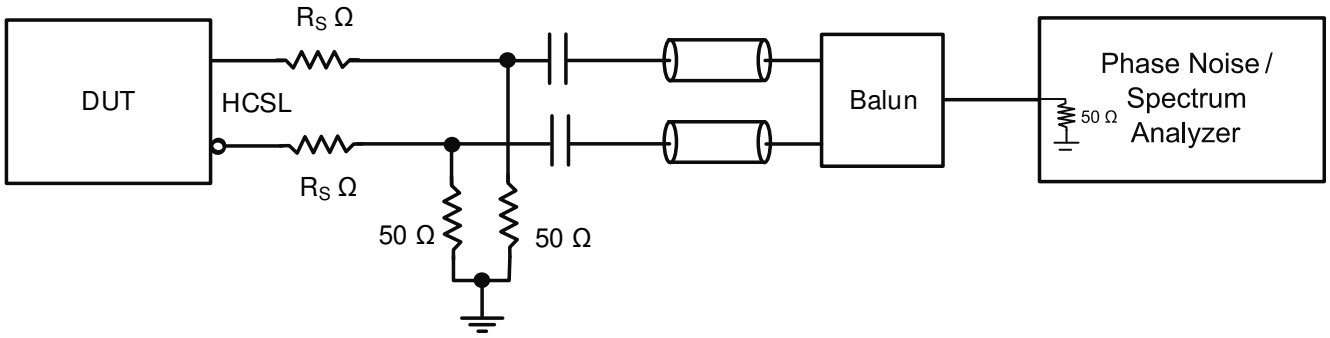
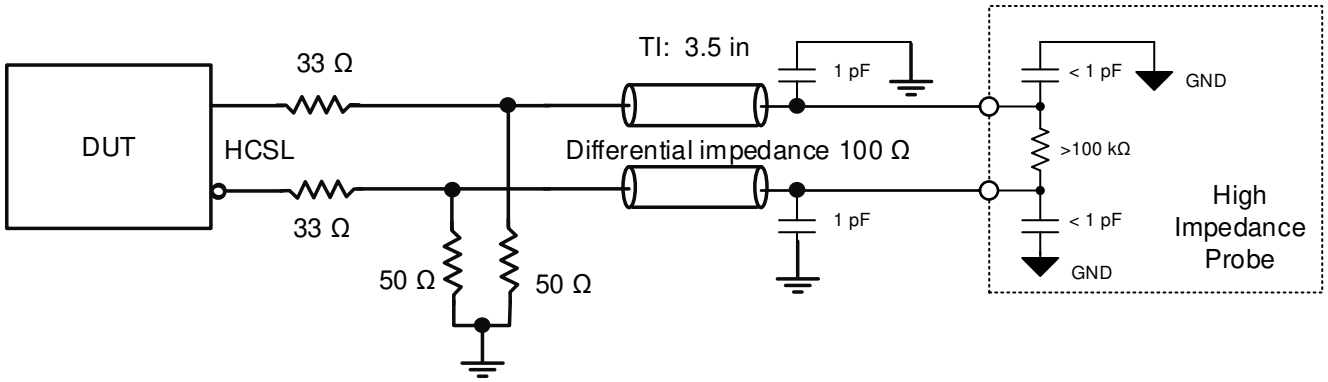


Figure 13. HCSL, Phase Noise Measurement

Parameters (continued)



(1) Measured using Tektronix DPO75902SX oscilloscope. Recommended to use an oscilloscope bandwidth setting of 4/8 GHz and vertical setting of 50mV/division. Data processed using Clock Jitter Tool: Ver:1.6.7.2.

Figure 14. HCSL PCIe Test Load Setup

7.1.3 Serial Interface

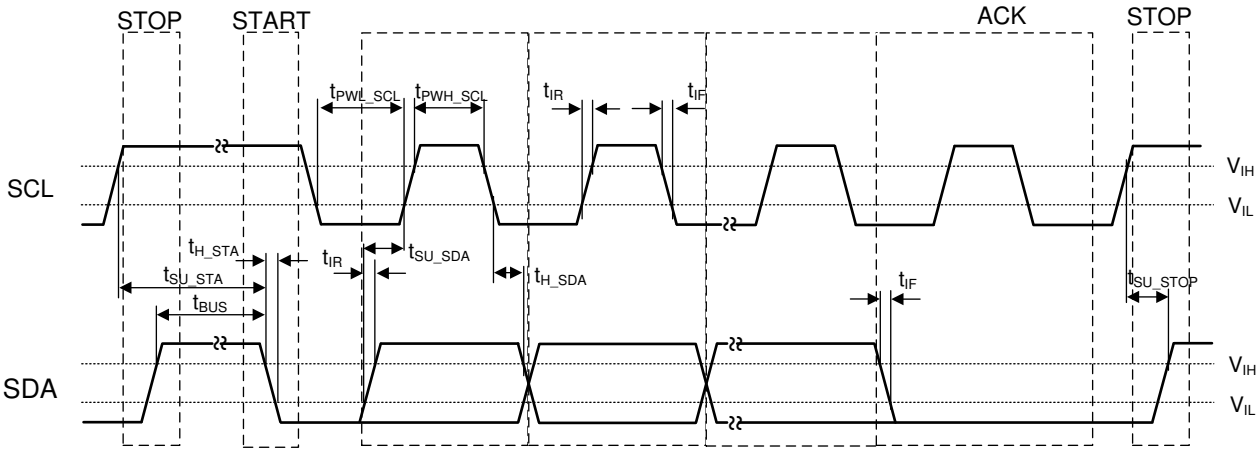


Figure 15. I^2C Timing

7.1.4 Power Supply

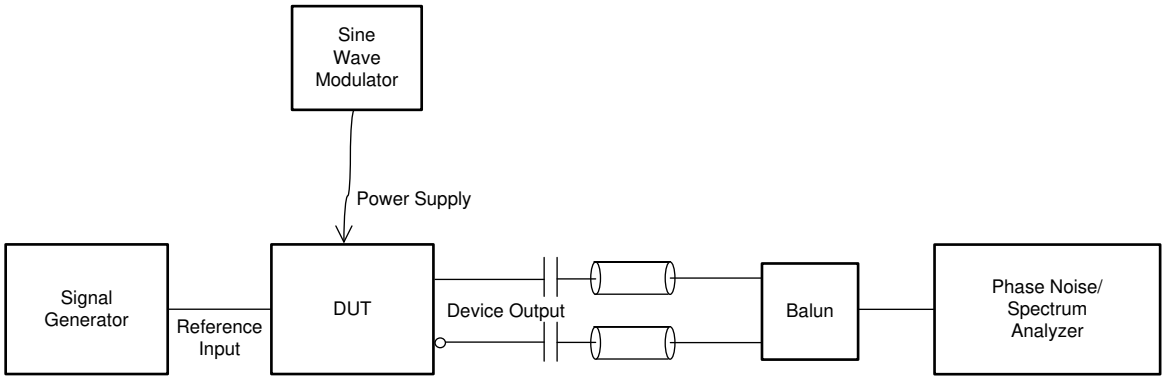


Figure 16. PSNR Setup

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8 Detailed Description

8.1 Overview

The CDCI6214 clock generator is a phase-locked loop with integrated loop filter and selectable input reference. The output of the integrated voltage-controlled oscillator (VCO) is connected to a clock distribution network, which includes multiple frequency dividers and feeds four output channels with configurable differential and single-ended output buffers.

8.2 Functional Block Diagram

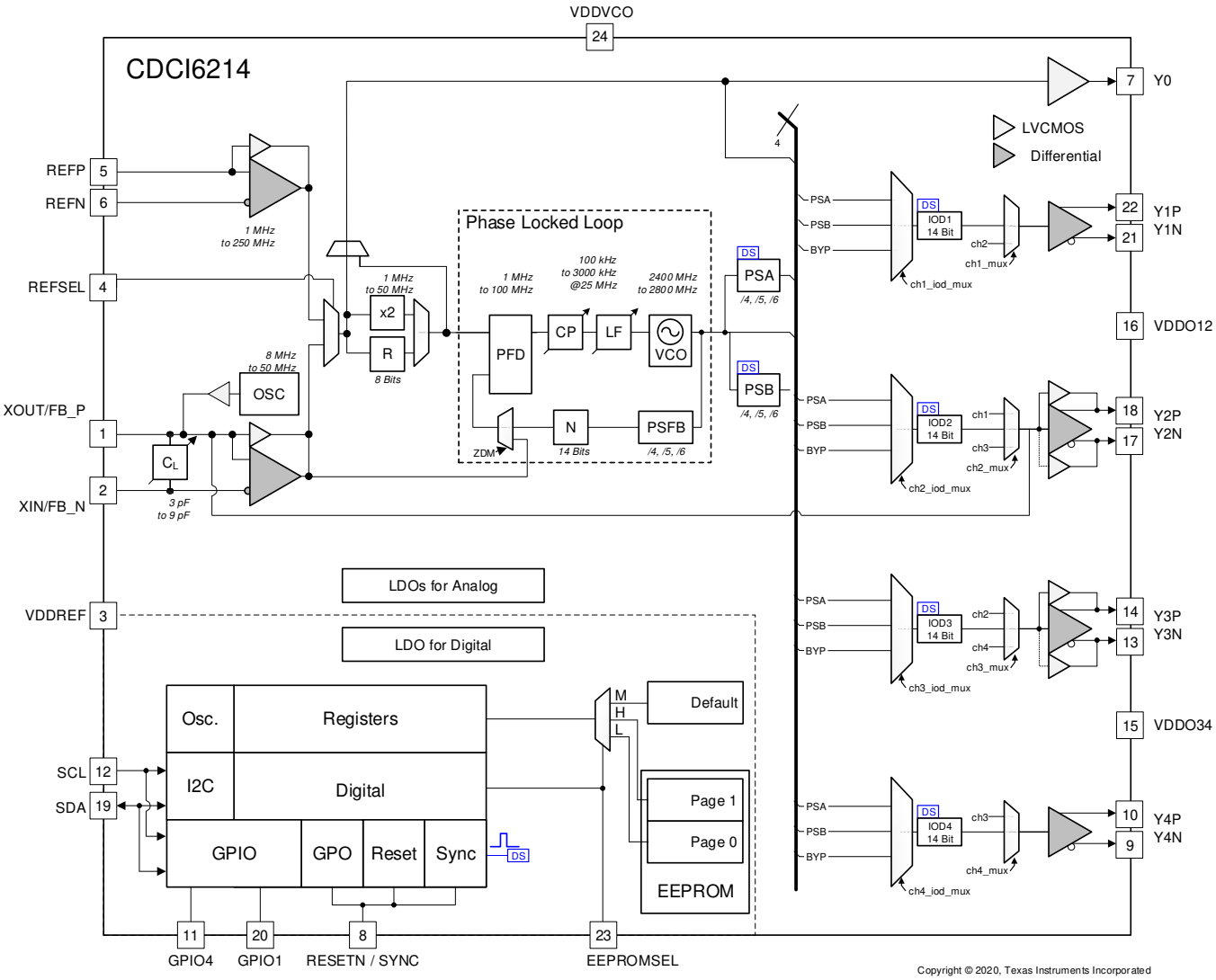

Figure 17. CDCI6214 Clock Generator With Four Outputs

8.3 Feature Description

The following sections describe the individual blocks of the CDCI6214 ultra-low power clock generator.

8.3.1 Reference Block

A reference clock to the PLL is fed to pins 1 (XOUT/FB_P) and 2 (XIN/FB_N) or to pins 5 (REFP) and 6 (REFN). There are multiple input stages available to adapt to many clock references. The bit-fields that control the reference input type selection are xin_inbuf_ctrl and ref_inbuf_ctrl.

The reference mux selects the reference for the PLL and the PLL-bypass path. For debug purposes ip_byp_mux allows to connect the reference divider or doubler output to the clock distribution.

The buffers for the PLL-bypass path can be individually enabled and disabled using ip_byp_en_ch[4:1] and ip_byp_en_y0.

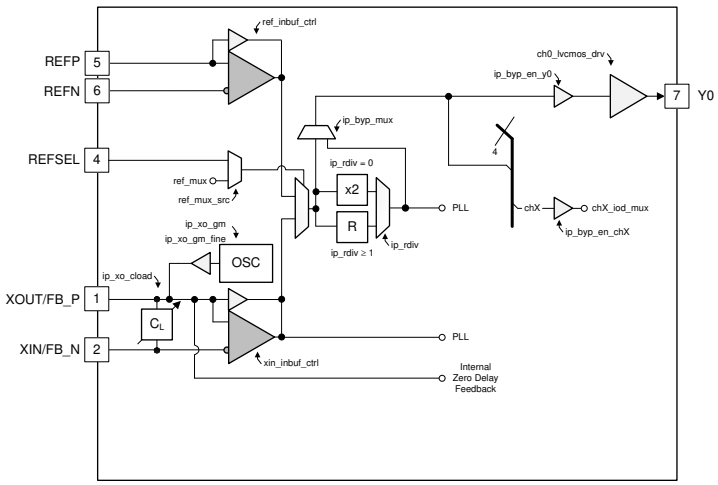

Figure 18. Reference Block

8.3.1.1 Input Stages

8.3.1.1.1 Crystal Oscillator

The XIN and XOUT pins provide a crystal oscillator stage to drive a fundamental mode crystal in the range of 8 MHz to 50 MHz. The crystal input stage integrates a tunable load capacitor array up to 9 pF using ip_xo_cload. The drive capability of the oscillator is adjusted using ip_xo_gm.

8.3.1.1.2 LVCMOS

The LVCMOS input buffer threshold voltage follows VDDREF. This helps to use the device as a level shifter as the outputs have separate supplies.

8.3.1.1.3 Differential AC-Coupled

The differential input stage has an internal bias generator and should only be used with AC-coupled reference inputs.

8.3.1.2 Reference Mux

Either XIN or REF can be selected as reference to the PLL and clock distribution path. The reference mux is controlled using the REFSEL pin with ref_mux_src = 0 or the ref_mux bit-field with ref_mux_src = 1.

8.3.1.3 Reference Divider

A reference divider can be used to divide higher input frequencies to the permitted PFD range. It supports division values of 1 to 255 using ip_rdiv.

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Feature Description (continued)

8.3.1.3.1 Doubler

The reference path contains a doubler circuit. It is used to double the input frequency and can be used to achieve the highest PFD update frequency of 100 MHz using a 50-MHz crystal. The doubler activates using ip_rdiv = 0.

8.3.1.4 Bypass-Mux

The input reference or the input to the PFD can be routed to the bypass path using ip_byp_mux.

8.3.1.5 Zero Delay, Internal and External Path

In zero delay mode the REF input clock is used as reference clock at the PFD. The FB_P clock (LVCMOS) or FB_P/N clock (differential) can be used to feed an external source as feedback clock to the PFD. The external feedback path is recommended for zero delay operation. Moreover there is an additional internal feedback path which is sourced by output channel 2.

Table 1. Zero Delay Operation(1)

Operation	Reference					Feedback							
	REFSEL	ref_mux	ref_mux_src	ip_rdiv	ref_inbuf_ctrl	xin_inbuf_ctrl	zdm_mode	zdm_clocksel	zdm_auto	pll_psfb	pll_psa	pll_ndiv	ch2_iod_div(2)
Normal PLL, XIN Reference	L	x	0	1	x	0	0	x	x	x	x	x	x
Normal PLL, REF Reference	H	x	0	1	x	x	0	x	x	x	x	x	x
Normal PLL, REF Reference	x	1	1	1	x	x	0	x	x	x	x	x	x
Zero Delay, Internal Feedback	x	1	1	1	A	A	1	0	1	B	B	C	C
Zero Delay, External Feedback	x	1	1	1	A	A	1	1	1	B	B	C	C

(1) 'x' allows any possible bit-field value. An entry of 'A', 'B' or 'C' indicates the same bit-field value.
(2) For internal feedback channel 2 is required. For external feedback the output clock connected to FB_P/N is recommended to have same settings as default PLL feedback path.

8.3.2 Phase-Locked Loop

The CDCI6214 contains a fully integrated phase-locked loop circuit. The error between a reference phase and an internal feedback phase is compared at the phase-frequency-detector. The comparison result is fed to a charge pump that is connected to an integrated loop filter. The control voltage resulting from the loop filter tunes an internal voltage-controlled oscillator (VCO). The frequency of the VCO is fed through a pre-scaler feedback divider (PSFB) and another feedback divider back to the PFD.

The PLL closed-loop bandwidth is configurable using registers PLL0, PLL1, and PLL2.

- Integer PLL
- PFD operates 1 MHz to 100 MHz
- Live Lock-Detector provides PLL lock status on status pin and bit lock_det (there is an additional sticky bit unlock_s)
- Integrated selectable loop filter components
- For 25-MHz PFD bandwidths between 100 kHz and 3000 kHz can be achieved to optimize PLL to input reference
- Voltage-Controlled Oscillator (VCO) tuning range of 2400 to 2800 MHz
- VCO is compatible to 0.5% spread spectrum (SSC) references at 100 MHz.

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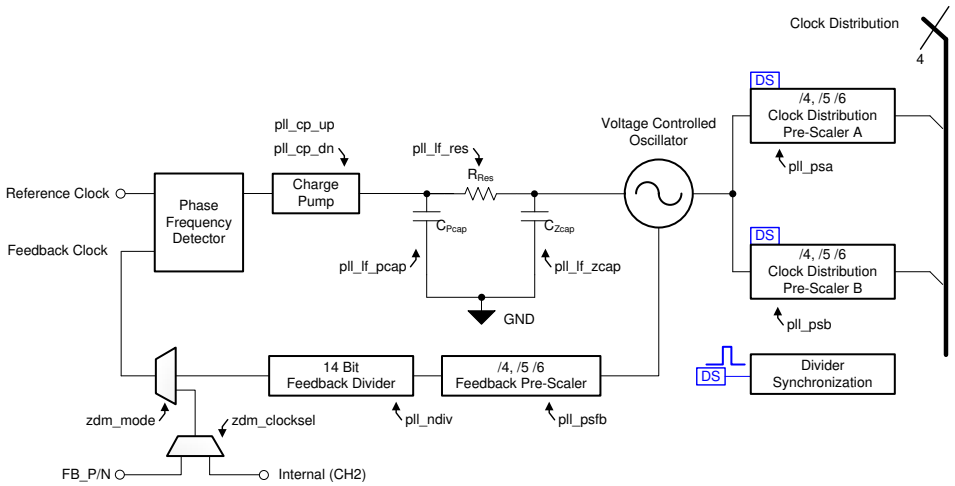

Figure 19. Phase-Locked Loop Circuit

Table 2. Common Clock Generator Loop Filter Settings(1)

f_{VCO} in MHz	f_{PFD} in MHz	BW in MHz	Phase Margin in °	Damping Factor	I_{CP} in mA	C_{Pcap} IN pF	R_{Res} IN kΩ	C_{Zcap} IN pF
					pll_cp_up(2)	pll_lf_pcap	pll_lf_res	pll_lf_zcap
2400	25	0.51	67	0.9	2.0	17.5	2.5	450
2400	50	0.97	67	1.3	2.0	17.5	2.5	450
2400	100	1.41	68	1.2	2.4	17.5	1.5	450
2457.6	61.44	1.04	67	1.4	1.8	17.5	2.5	450
2500	25	0.49	67	0.9	2.0	17.5	2.5	450
2500	50	0.93	68	1.3	2.0	17.5	2.5	450
2680	67	0.38	67	1.3	0.2	19.5	5.5	480
2688	48	0.93	68	1.3	1.5	17.5	2.5	480
2688	96	0.36	67	1.0	0.2	19.5	3.5	480
2800	50	1.00	68	1.0	2.6	17.5	1.5	450
2800	100	1.00	68	1.0	1.3	17.5	1.5	450

(1) All values typical design targets.
(2) Program same value to pll_cp_dn.

8.3.3 Clock Distribution

The VCO connects to two individually configurable pre-scaler dividers sourcing the on-chip clock distribution.

The clock distribution consists of four output channels. Each output channel contains a divider with integer division and synchronization capabilities.

A mux after each divider allows to feed the generated frequency to the adjacent output buffers. Thus for single frequency clock generation only a single output divider needs to be active.

The output buffers are compatible to various signaling standards: LVDS, CML-like, LVPECL-like, LVCMOS and HCSL using ch1_outbuf_ctrl.

- HCSL must be directly connected to a load termination to ground. A series resistance can be used to adapt to the trace impedance.
- LVDS requires a differential termination connected between the positive and negative output buffer pins. The termination can be connected directly or using AC-coupling. When using the LVDS output type, set ch1_1p8vdet, ch2_1p8vdet, ch3_1p8vdet, andch4_1p8vdet to match the VDDO12 and VDDO34.
- CML and LVPECL are only supported in an AC-coupled configuration. The receiver and the termination may only be connected through AC-coupling capacitors to the device pins.
- LVCMOS outputs are designed for capacitive loads only. A series resistance should be used to adapt the

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driver impedance to the trace impedance. For a typical 50-Ω trace, a resistor between 22 Ω to 33 Ω should be used. The polarity of the positive and negative pins can be adjusted separately.

The output buffers support a wide frequency range of up to 350 MHz. Higher output frequencies up to 700 MHz are functional, but are not covered by electrical specifications.

8.3.3.1 Output Channel

Figure 20. Clock Distribution Pre-Scaler Dividers (1)

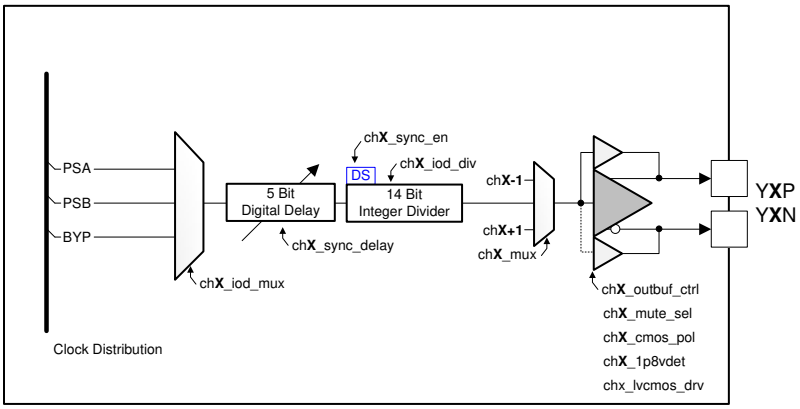

Figure 21. Clock Distribution, Output Channel

INSTANCES	DIVISION VALUES
PSA	4, 5, 6
PSB	4, 5, 6

(1) A known phase relationship for divider synchronization with mixed division values is ensured by architecture.

Table 3. Output Buffer Signal Standards

OUTPUT	LVCMOS	HCSL (1)	LVDS	AC-CML (2)	AC-LVPECL (2)
Y0	X				
Y1		X	X	X	X
Y2	X	X	X	X	X
Y3	X	X	X	X	X
Y4		x	X	x	X

(1) For highest performance it is recommended to use HCSL on output Y1 or Y4.
(2) The common mode shall be provided externally through an external bias source, like a voltage divider or pullup resistor. The output buffer will provide sufficient swing.

Table 4. Output Channel Signal Selection

NO.	INPUT SOURCE	Y1 (N=1)	Y2 (N=2)	Y3 (N=3)	Y4 (N=4)
0	Channel N-1		x	x	x
1	IOD N	x	x	x	x
2	Channel N+1	x	x	x	

Table 5. Integer Divider Input Selection

NO.	SOURCE
0	Pre-scaler A
1	Pre-scaler B
3	Bypass

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8.3.3.2 Divider Glitch-Less Update

The bit fields ch1_glitchless_en can be used to enable glitch-less output divider update. This feature ensures that the high pulse of a clock period is not cut off by the output divider update process. It ensures that setup and hold time of a receiver is not violated. The low pulse in the *transition* from earlier period to the new period is extended accordingly.

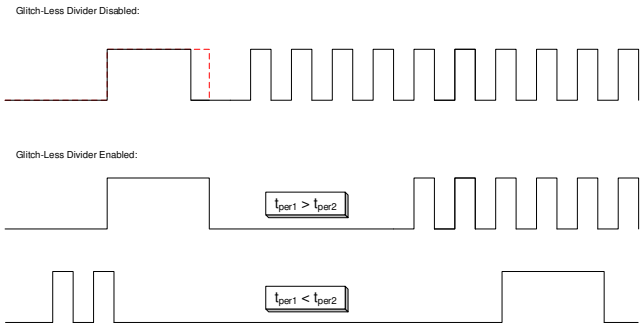

Figure 22. Glitch-Less Divider Update

8.3.4 Control Pins

The ultra-low power clock generator is controlled by multiple LVCMOS input pins.

EEPROMSEL acts as EEPROM page select. The CDCI6214 clock generator contains two pages of configuration settings. The level of this pin is sampled after device power-up. A low level selects page zero. A high level selects page one. The EEPROMSEL pin is a tri-level input pin. This third voltage level is automatically applied by an internal voltage divider. The mid-level is used to select an internal default where the serial interface is enabled.

RESETN/SYNC (pin 8) , SCL (pin 12), and SDA (pin 19) have a secondary functionality and can act as general-purpose inputs and outputs (GPIO). This means that either the serial interface or the GPIO functionality can be active.

RESETN/SYNC resets the internal circuitry and is used in the initial power-up sequence. The pin can be reconfigured to act as synchronization input. The differential outputs are kept in mute while SYNC is low. When SYNC is high, outputs are active. Moreover status signals can be driven by this pin.

SCL can act as general-purpose input.

SDA can act as general-purpose input and output.

REFSEL is used to select between the input references to the PLL. A low level selects the crystal reference on XIN. A high level selects the differential input reference on REFP, REFN.

Table 6. Control and GPIO List

PIN			RECONFIGURABLE?	INPUT		OUTPUT	TERMINATION	
NO.	NAME	GPIO		2-LOGIC-LEVELS	3-LOGIC-LEVELS	2-LEVEL	PULLDOWN	PULLUP
23	EEPROMSEL	-	–	–	yes	–	50 kΩ	50 kΩ
20	STATUS	GPIO1	yes	yes	–	yes	–	50 kΩ
19	SDA	GPIO2	yes	yes	–	yes	–	–
12	SCL	GPIO3	yes	yes	–	–	–	–
11	OE	GPIO4	yes	yes	–	yes	–	50 kΩ
8	RESETN	GPIO0	yes	yes	–	yes	–	50 kΩ
4	REFSEL	-	–	–	yes	–	50 kΩ	50 kΩ

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Table 7. GPIO - Input Signal List(1)

SIGNAL NO.	ABBREVIATION	DESCRIPTION
0	FREQ_INC	Frequency increment; increments the IOD(2)
1	FREQ_DEC	Frequency decrement; decrements the IOD.(2)
2	OE (global)	Enables or disables all differential outputs Y[4:1] (bypass not affected).(3)
4	OE_Y1	Enables or disables Y1. (3)
5	OE_Y2	Enables or disables Y2. (3)
6	OE_Y3	Enables or disables Y3. (3)
7	OE_Y4	Enables or disables Y4. (3)

(1) Signals from this list are available on pin 11 (OE / GPIO4) and pin 20 (STATUS / GPIO1), see GENERIC1.
(2) Selected using bit mask in GENERIC3.
(3) Disable / Mute behaviour configured individually using ch_mute_sel bit in GENERIC0 table.

Table 8. GPIO - Output Signal List(1)

SIGNAL NO.	ABBREVIATION	DESCRIPTION
0	PLL_LOCK	0 = PLL out of lock; 1 = indicates PLL in lock
1	XTAL_OSC	0 = crystal failure; 1 = crystal oscillates
2	CAL_DONE	0 = PLL (VCO) calibration ongoing; 1 = calibration done
3	CONF_DONE	0 = device logic busy; 1 = device operational
4	SYNC_DONE	0 = output sync ongoing, muted; 1 = outputs released operational
5	EEPROM_BUSY	0 = EEPROM idle; 1 = EEPROM access ongoing
6	EEPROM_Y12	0 = EEPROM pin sees low level; 1 = EEPROM pin sees high level
7	EEPROM_M12	0 = EEPROM pin sees low or high level; 1 = EEPROM pin sees mid level
8	I2C_LSB	Indicates I^2C slave address LSB config from loaded EEPROM
9	CLK_FSM	Clock, State machine
10	CLK_PFD_REF	Clock, PFD, reference
11	CLK_PFD_FB	Clock, PFD, feedback
12	BUF_SYNC	buffered SYNC pin
13	BUF_SCL	buffered SCL pin
14	BUF_SDA	buffered received SDA pin

(1) Signals from this list are available on pin 8 (RESETN/SYNC or GPIO0), pin 11 (OE / GPIO4) and pin 20 (STATUS / GPIO1).

8.3.4.1 Global and Individual Output Enable: OE and OE_Y[4:1]

The output enable functionality allows to enable or disable all or a specific output buffer. The bypass copy on Y0 is excluded from the global output enable signal. When an output is disabled, it drives a configurable mute-state, ch[4:1]_mute_sel. When the serial interface is deactivated one can use all individual output enable signals at the same time, see mode. The individual output enable signal controls the respective output channel integer divider to gate the clock. Therefore each integer divider needs to be active. When multiple outputs are sourced from the same integer divider, the respective OE signal will enable/disable the output(s). (1)

NOTE

When multiple output enable signals are configured on multiple-GPIO pins, then the global output enable OE has higher priority than the individual output enable OE[4:1]. An individual output enable OE[4:1] may only be configured on a single pin.

The individual output enable signal enables and disables the respective output in a deterministic way. Therefore the high and low level of the signal is qualified by counting four cycles of the respective output clock. The following steps can be seen in Figure 23:

1. The OE falling edge which disables the outputs.
2. Transition from *logic high to logic low* / *logic low to logic high* for Y2 after four rising edges.

(1) The GPIO direction of pins 12 and 19 is automatically set through the mode bit. Pin 11 and 20 must be set as inputs using gpio1_dir_sel and gpio4_dir_sel bit in the GENERIC0 table.

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3. Transition from *logic high to logic low* / *logic low to logic high* for Y1 after four rising edges.
4. The OE rising edge which enables the outputs.
5. Output Y2 starts toggling after four rising edges.
6. Output Y1 starts toggling after four rising edges.

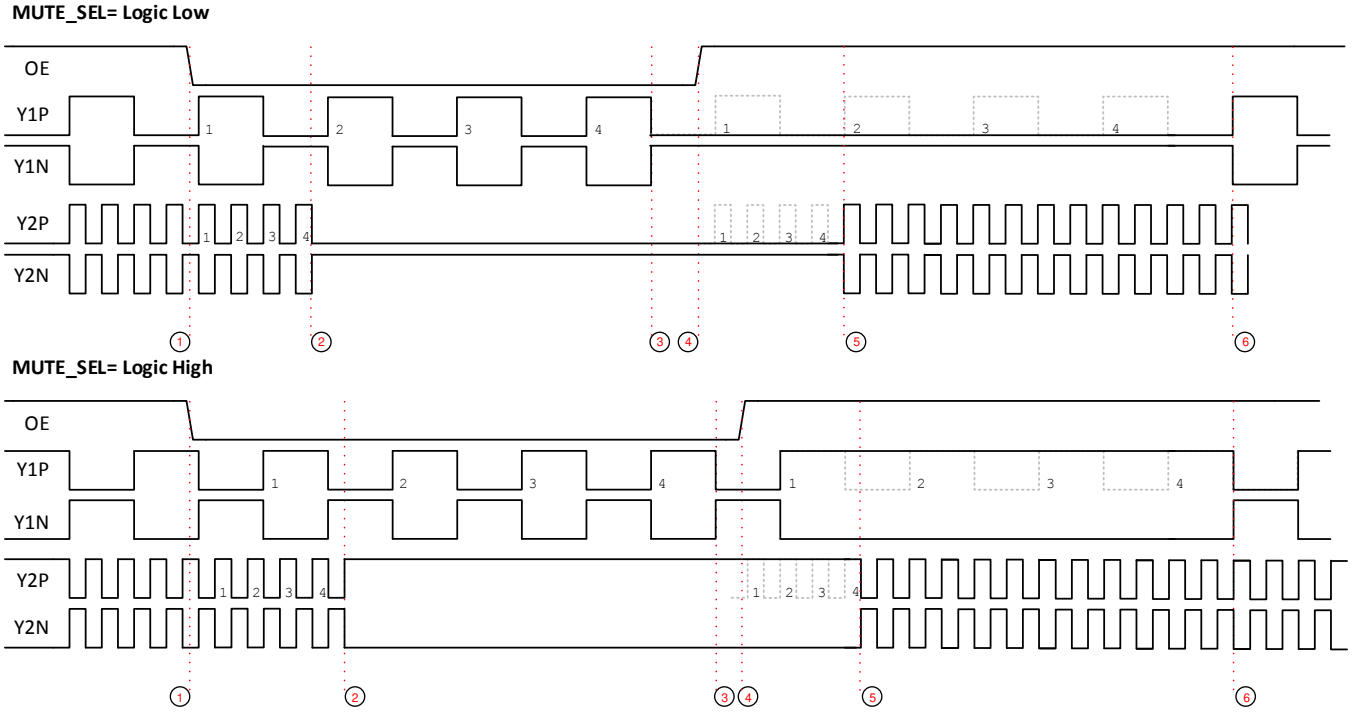

Figure 23. Individual Output Enable and Disable

NOTE

The deterministic behaviour of the individual output enable is designed for an output frequency up to 200 MHz.

8.3.5 Operation Modes

The device can operate in different modes.

Following operating modes can be set and the GPIOs configured. An operating mode change only becomes effective when it is loaded from the EEPROM after a power cycle.

Table 9. Modes of Operation

DESCRIPTION	MODE	REFSEL	EEPROMSEL	GPIO4	GPIO3	GPIO2	GPIO1
I^2C + GPIOs	Fallback	M	M	I/O	SCL	SDA	I/O
I^2C + GPIOs	0	LH	LH	I/O	SCL	SDA	I/O
OEs	1	LH	LH	OE4	OE3	OE2	OE1

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8.3.6 Divider Synchronization - SYNC

The output dividers can be reset in a deterministic way. This can be achieved using the sync bit or the pin 8 configured for SYNC function using gpio0_input_sel and gpio0_dir_sel. The level of the pin is qualified internally using the reference frequency at the PFD. A low level will mute the outputs. A high level will synchronously release all output dividers to operation, so that all outputs share a common rising edge, see Figure 24. The first rising edge can be individually delayed in steps of the respective pre-scaler period, up to 32 cycles using ch1_sync_delay. This allows to compensate external delays like routing mismatch, cables or inherent delays introduced by logic gates in an FPGA design. Each channel can be included or excluded from the SYNC process using ch1_sync_en. (1) (2)

For a deterministic behaviour over power-cycles seen from input to output the reference divider must be set to 1. It should not divide the reference clock nor should the reference doubler be used.

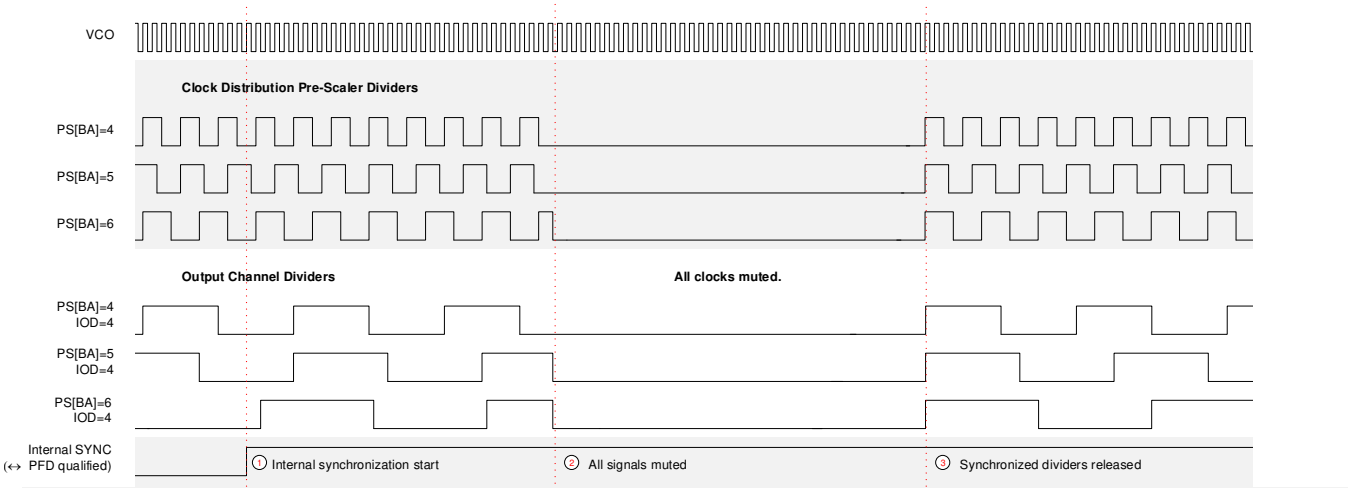

Figure 24. Divider Synchronization

(1) ch[4:1]_sync_en may only be activated with an active clock source selected in ch1_iod_mux bit in the CH1_CTRL2 table.
(2) The LVCMOS bypass output Y0 is not part of the SYNC process, neither are the dividers of the PLL.

Table 10. Digital Delay Step Size

VCO FREQUENCY IN MHz	PRE-SCALER STEP IN ns		
	/4	/5	/6
2400	1.67	2.08	2.50
2457.6	1.63	2.03	2.44
2500	1.60	2.00	2.40
2800	1.43	1.79	2.14

8.3.7 EEPROM - Cyclic Redundancy Check

The device contains a cyclic redundancy check (CRC) function for reads from the EEPROM to the device registers. At start-up the EEPROM will be read internally and a CRC value calculated. One of the EEPROM words contains an earlier stored CRC value. The stored and the actual CRC value are compared and the result transferred to STATUS1 register. The CRC calculation can be triggered again by writing a '1' to the update_crc bit. A mismatch between stored and calculated CRC value is informational only and non-blocking to the device operation. Just reading back the CRC status bit and the live CRC value can speed up in-system EEPROM programming and avoid reading back each word of the EEPROM for known configurations.

The polynomial used is CCITT-CRC16: $x^{16} + x^{12} + x^5 + 1$.

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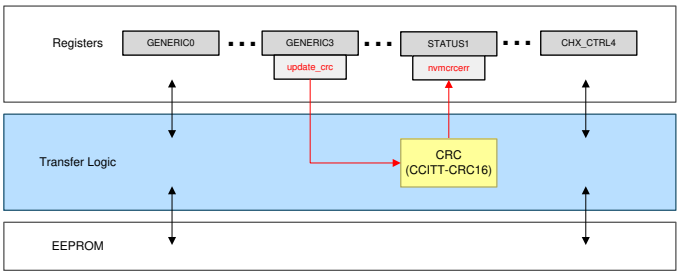

Figure 25. EEPROM CRC

8.3.8 Power Supplies

The CDCI6214 provides multiple power supply pins. Each of the power supplies supports 1.8 V, 2.5 V, or 3.3 V. Internal low-dropout regulators (LDO) source the internal blocks and allow each pin to be supplied with its individual supply voltage. The VDDREF pin supplies the control pins and the serial interface. Therefore, any pullup resistors shall be connected to the same domain as VDDREF. By default the LDOs are configured for 1.8-V ±5% operation.

8.3.8.1 Power Management

The device is very flexible with respect to internal power management. Each block offers a power-down bit and can be disabled to save power when the block is not required. The available bits are illustrated in Figure 26. The bypass output Y0 is connected to the pdn_ch4 bit. Each output channel has a bit which should be adapted to the applied supply voltage, ch[4:1]_1p8vdet.

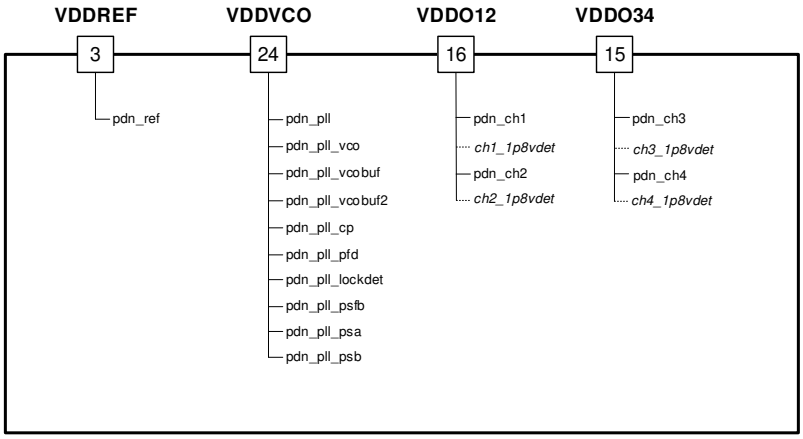

Figure 26. Power Management

8.4 Device Functional Modes

8.4.1 Pin Mode

In pin mode, pins 12 and 19 are input pins that act as *individual output enable* pins. Together with pins 11 and 20, this mode allows for one output enable pin per output channel.

8.4.2 Serial Interface Mode

In serial interface mode, pins 12 and 19 are configured as an I^2C interface.

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Device Functional Modes (continued)

8.4.2.1 Fall-Back Mode

As the programming interface can be intentionally deactivated using the EEPROM, an accidental disabling of the I^2C blocks further access to the device. The serial interface can be forced using the fall-back mode. To enter this mode, the user leaves pin 4 and pin 23 floating while the supply voltage is applied to VDDREF. In this mode, pin 11 is preconfigured as an input and pin 20 is configured as an output.

8.5 Programming

The CDCI6214 ultra-low power clock generator provides an I^2C-compatible serial interface for register and EEPROM access. The device is compatible to standard-mode I^2C at 100 kHz and the fast-mode I^2C at 400-kHz clock frequency.

Table 11. I^2C-Compatible Serial Interface, Slave Address Byte

7	6	5	4	3	2	1	0
Slave Address A[6:0](1)							R/W# Bit(2)

(1) The slave address consists of two sections. The hardwired MSBs A[6:2] and the software-selectable LSBs A[1:0].
(2) The R/W# bit indicates a read (1) or a write (0) transfer.

Table 12 shows the slave address decoding with respect to EEPROMSEL pin. This enables the user to avoid in-system conflicts with different configurations, as the selected EEPROM page can be reflected in the slave address least significant bit A0. Moreover a device being powered up in the silicon default, can always be expected under the default address of 0xE9 for reads (or 0xE8 for writes).

Table 12. I^2C-Compatible Serial Interface, Programmable Slave Address

A6	A5	A4	A3	A2	A1	A0	EEPROMSEL	DESCRIPTION
1	1	1	0	1	0	0	MID	Device Default
					1	I2C_A0(1)	LOW	EEPROM, Page 0
					1	I2C_A0(2)	HIGH	EEPROM, Page 1

(1) Configuration Bit in EEPROM Page 0, default value of 0.
(2) Configuration Bit in EEPROM Page 1, default value of 1.

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The serial interface uses the following protocol as shown in Figure 27. The slave address is followed by a word-wide register offset and a word-wide register value.

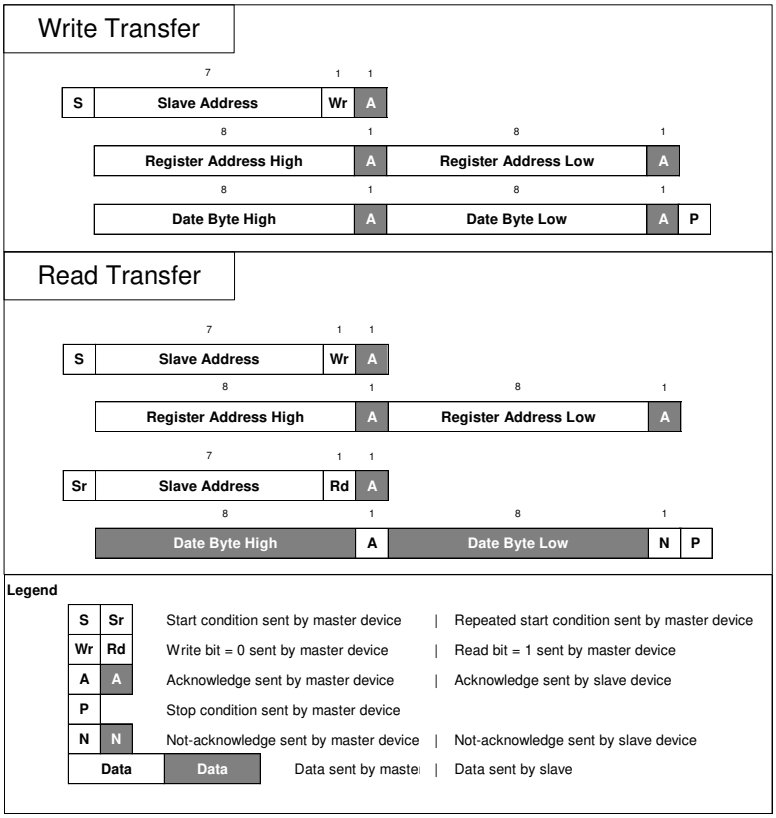

Figure 27. I²C-Compatible Serial Interface, Supported Protocol

8.5.1 Recommended Programming Procedure

TI recommends programming the registers of the device in the following way:

1. Ensure that ee_lock is set when overwriting the EEPROM.
2. Configure the voltage domain bits appropriately ch[4:1]_1p8vdet.
3. Program register addresses in descending order from 0x44 to 0x00 including all register addresses with reserved values.

8.5.2 EEPROM Access

NOTE

The EEPROM word write access time is typically 8 ms. The EEPROM_BUSY signal indicates when the EEPROM is busy and can be observed as a status signal on a GPIO pin to optimally time the writes (for example, in gpio4_output_sel).

There are two methods to write into the internal EEPROM:

1. Register Commit
2. EEPROM Direct Access

   Use the following steps to bring the device into a known state and be able to conduct the programming:

   1. Power down all device supplies
   2. Apply RESETN=LOW.
   3. Apply REFSEL=MID (leave tri-stated).
   4. Apply EEPROMSEL=MID (leave tri-stated).

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5. Apply 1.8 V/2.5 V/3.3 V to all device supplies. When device operation is not required, only apply 1.8 V/2.5V/3.3 V to VDDREF.
6. Apply RESETN=HIGH.
7. Use the I^{2}C interface to configure the device using slave address 0x74. See Table 12 for more details.

In the *Register Commit* flow all bits from the device registers are copied into the EEPROM. The recommended flow is:

1. Pre-configure the device as desired, except the serial interface using mode.
2. Write 1 to recal to calibrate the VCO in this operation mode.
3. Select the EEPROM page, to copy the register settings into, using regcommit_page.
4. Unlock the EEPROM for write access with ee_lock = 0x5
5. Start the commit operation by writing a 1 to regcommit
6. Force a CRC update by writing a 1 to update_crc.
7. Read back the calculated CRC in nvmlcrc.
8. Store the read CRC value in the EEPROM by writing 0x3F to nvm_wr_addr and then the CRC value to nvm_wr_data.

In the *EEPROM Direct Access* flow the EEPROM words are directly accessed using the address and the data bit-fields. The recommended flow is:

1. Prepare an EEPROM image consisting of 64 words.
2. Unlock the EEPROM for write access with ee_lock = 0x5
3. Write the initial address offset to the address bit-field. Write a 0x00 to nvm_wr_addr.
4. Loop through the EEPROM image from address 0 to 63 by writing each word from the image to nvm_wr_data. The EEPROM word address is automatically incremented by every write access to nvm_wr_data.
5. The EEPROM read is similar to EEPROM write. First write 0x00 to nvm_rd_addr, then loop through all bytes by reading from nvm_rd_data. The EEPROM word address is automatically incremented by every write access to nvm_rd_data.

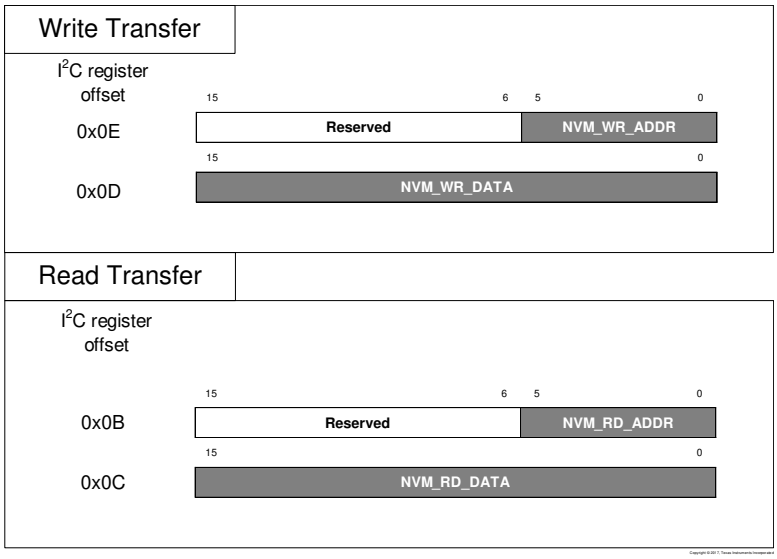

Figure 28. EEPROM Direct Access Using I^{2}C

8.5.3 Device Defaults

The CDCI6214 contains the following defaults:

Table 13. CDCI6214 Register Defaults

ADDRESS	DEFAULT	EEPROM PAGE 0	EEPROM PAGE 1
0x46	0x00460000	0x00460000	0x00460000
0x45	0x00450000	0x00450000	0x00450000
0x44	0x00440000	0x00440000	0x00440000
0x43	0x00430020	0x00430020	0x00430020
0x42	0x00420000	0x00420200	0x00420200
0x41	0x00410F34	0x00410F34	0x00410F34
0x40	0x0040000D	0x0040000D	0x0040000D
0x3F	0x003F0210	0x003F4210	0x003F4210
0x3E	0x003E4210	0x003E4218	0x003E4218
0x3D	0x003D1000	0x003D1500	0x003D1500
0x3C	0x003C0010	0x003C0018	0x003C0018
0x3B	0x003B0009	0x003B0061	0x003B0061
0x3A	0x003A0008	0x003A0008	0x003A0008
0x39	0x00390A65	0x00398851	0x00398851
0x38	0x00380405	0x00380409	0x00380008
0x37	0x00370004	0x00370006	0x00370000
0x36	0x00360000	0x00360000	0x00360000
0x35	0x00358000	0x00358000	0x00358000
0x34	0x00340008	0x00340008	0x00340008
0x33	0x00330A65	0x00338861	0x00338861
0x32	0x00320405	0x00320429	0x00320431
0x31	0x00310004	0x00310006	0x00310006
0x30	0x00300000	0x00300000	0x00300000
0x2F	0x002F8000	0x002F8000	0x002F8000
0x2E	0x002E0008	0x002E0008	0x002E0008
0x2D	0x002D0A65	0x002D0851	0x002D0851
0x2C	0x002C0405	0x002C0409	0x002C0010
0x2B	0x002B0004	0x002B0006	0x002B0000
0x2A	0x002A0000	0x002A0000	0x002A0000
0x29	0x00298000	0x00298000	0x00298000
0x28	0x00280008	0x00280008	0x00280008
0x27	0x00270A65	0x00270851	0x00270851
0x26	0x00260405	0x00260409	0x00260409
0x25	0x00250004	0x00250006	0x00250006
0x24	0x00240000	0x00240000	0x00240000
0x23	0x00238000	0x00238000	0x00238000
0x22	0x00220050	0x00220050	0x00220050
0x21	0x00210007	0x00210007	0x00210007
0x20	0x00200000	0x00200000	0x00200000
0x1F	0x001F1E72	0x001F1E72	0x001F1E72
0x1E	0x001E5140	0x001E5140	0x001E5140
0x1D	0x001D400A	0x001D000C	0x001D000C
0x1C	0x001C0000	0x001C0000	0x001C0000
0x1B	0x001B0000	0x001B0000	0x001B0000
0x1A	0x001A0718	0x001A0A1C	0x001A0A1C
0x19	0x00190000	0x00190406	0x00192406
0x18	0x00180601	0x00180601	0x00180601
0x17	0x00170000	0x00170595	0x00170595

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Table 13. CDCI6214 Register Defaults (continued)

ADDRESS	DEFAULT	EEPROM PAGE 0	EEPROM PAGE 1
0x16	0x00160000	0x00160000	0x00160000
0x15	0x00150000	0x00150000	0x00150000
0x14	0x00140000	0x00140001	0x00140001
0x13	0x00130000	0x00130000	0x00130000
0x12	0x00120000	0x0012FFFF	0x0012FFFF
0x11	0x001126C4	0x001126C4	0x001126C4
0x10	0x0010921F	0x0010921F	0x0010921F
0xF	0x000FA037	0x000FA037	0x000FA037
0xE	0x000E0000	0x000E0000	0x000E0000
0xD	0x000D0000	0x000D0000	0x000D0000
0xC	0x000C0000	0x000C0000	0x000C0000
0xB	0x000B0000	0x000B0000	0x000B0000
0xA	0x000A0000	0x000AC964	0x000AC964
0x9	0x00090000	0x0009C964	0x0009C964
0x8	0x00080000	0x00080001	0x00080001
0x7	0x00070000	0x00070C0D	0x00070C0D
0x6	0x00060000	0x0006159F	0x000619CA
0x5	0x00050028	0x00050028	0x00050028
0x4	0x00040055	0x00040055	0x000400DD
0x3	0x00030000	0x00030000	0x00030800
0x2	0x00020053	0x00020053	0x00020053
0x1	0x00016882	0x00016865	0x00016864
0x0	0x00000000	0x00000001	0x00000000

Table 14. Default EEPROM Image

ADDRESS	Section	Word Value
0x0	Base	0xEE00
0x1		0x490F
0x2		0x0362
0x3		0x0E00
0x4		0x1400
0x5		0xC104
0x6		0x0C00
0x7		0x5000
0x8		0x0861
0x9		0x8421
0xA		0x0006
0xB		0x0000

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Table 14. Default EEPROM Image (continued)

ADDRESS	Section	Word Value
0xC	Page 0	0x6501
0xD		0x5368
0xE		0xAA80
0xF		0x4382
0x10		0x0001
0x11		0x0030
0x12		0x4500
0x13		0x79C9
0x14		0x8000
0x15		0x0C00
0x16		0x1200
0x17		0x2904
0x18		0x0002
0x19		0x3002
0x1A		0x4800
0x1B		0xA410
0x1C		0x0008
0x1D		0xC008
0x1E		0x2000
0x1F		0x1045
0x20		0x0033
0x21		0x0020
0x22		0x8003
0x23		0x4104
0x24		0x39CA
0x25		0x0000

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Table 14. Default EEPROM Image (continued)

ADDRESS	Section	Word Value
0x26	Page 1	0x6400
0x27		0x5368
0x28		0xEE80
0x29		0x4382
0x2A		0x0001
0x2B		0x0030
0x2C		0x4500
0x2D		0x79C9
0x2E		0x8000
0x2F		0x0C00
0x30		0x1200
0x31		0x2904
0x32		0x0002
0x33		0x0002
0x34		0x8000
0x35		0xA400
0x36		0x0008
0x37		0xC008
0x38		0x2000
0x39		0x1046
0x3A		0x0033
0x3B		0x0020
0x3C		0x0000
0x3D		0x4004
0x3E		0x39CA
0x3F		0xC964

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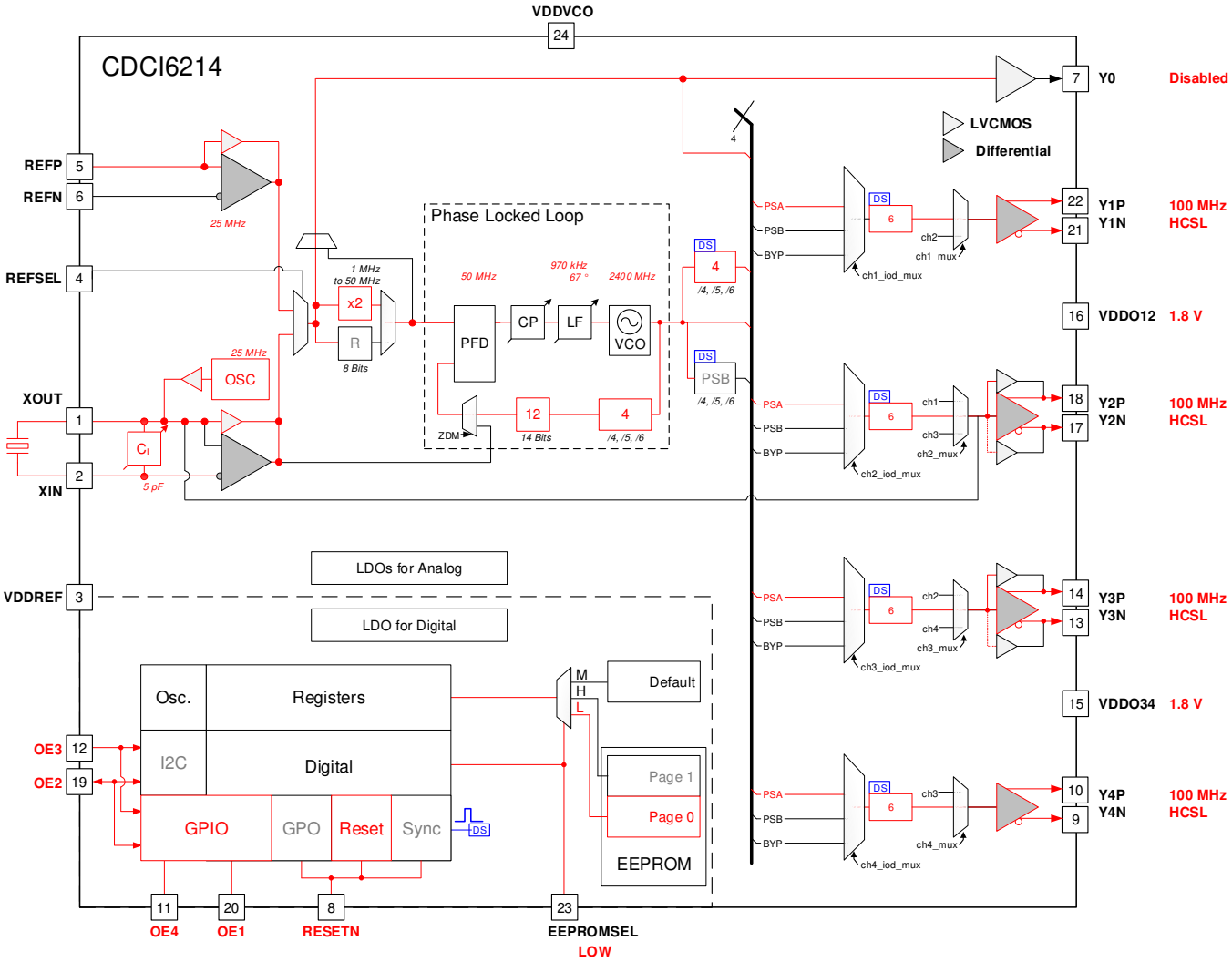

Figure 29. CDCI6214 - Pre-Configured EEPROM Page 0

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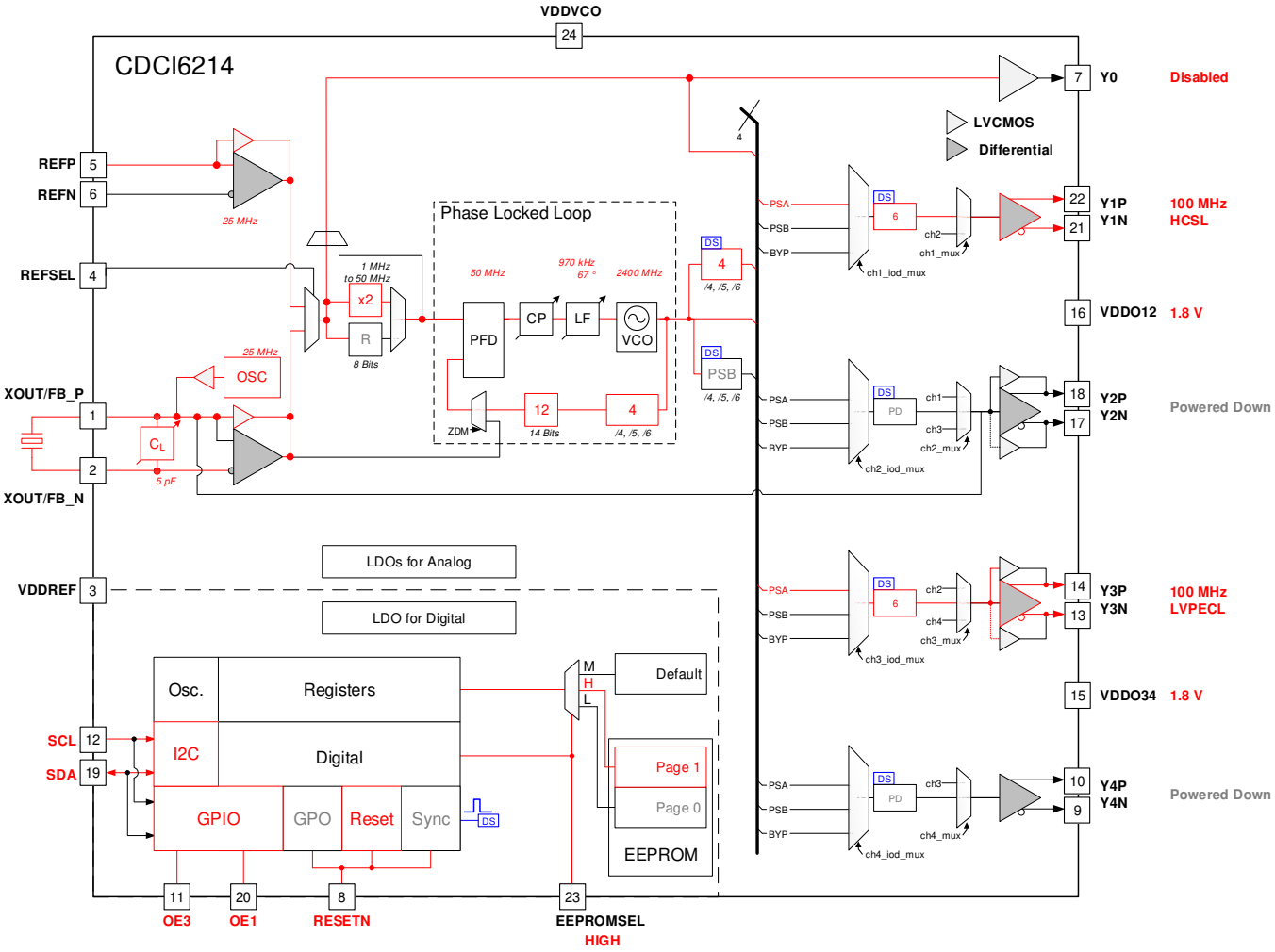

Figure 30. CDCI6214 - Pre-Configured EEPROM Page 1

8.6 Register Maps

8.6.1 CDCI6214 Registers

Table 15 lists the memory-mapped registers for the CDCI6214.

NOTE

All register offset addresses not listed in Table 15 should be considered as reserved locations and the register contents should not be modified.

NOTE

All bit-field combinations not listed in the description column should be considered as reserved combinations and should only be programmed using the given values.

Table 15. CDCI6214 Registers

ADDRESS	ACRONYM	REGISTER NAME	SECTION
0h	GENERIC0	Generic setting, device operation mode, synchronization, control pins, reset, and power down.	Go
1h	GENERIC1	Generic settings, GPIO input signal selection.	Go
2h	GENERIC2	Generic settings, GPIO output signal selection.	Go
3h	GENERIC3	Generic settings, EEPROM and frequency increment / decrement.	Go
4h	POWER0	Power-down bits, output channels.	Go
5h	POWER1	Power-down bits, phase-locked-loop.	Go
6h	STATUS0	Status information, calibration bus.	Go
7h	STATUS1	Status information, PLL lock and EEPROM.	Go
8h	STATUS2	Status information, miscellaneous	Go
9h	STATUS3	Status information, live CRC of EEPROM	Go
Ah	EEPROM0	EEPROM, stored CRC of EEPROM	Go
Bh	EEPROM1	EEPROM, direct access read address	Go
Ch	EEPROM2	EEPROM, direct access read data	Go
Dh	EEPROM3	EEPROM, direct access write address	Go
Eh	EEPROM4	EEPROM, direct access write data	Go
Fh	STARTUP0	Start-up configuration, EEPROM lock, auto-calibration, and I2C glitch filter	Go
10h	STARTUP1	Start-up configuration, digital state machine counters	Go
11h	STARTUP2	Start-up configuration, digital state machine counters	Go
18h	REV0	Revision ID	Go
1Ah	INPUT0	Input reference, buffer configuration, and crystal oscillator controls.	Go
1Bh	INPUT1	Input reference, reference divider, and bypass buffers.	Go
1Ch	INPUT_DBG0	Input reference debug, status pin buffers.	Go
1Dh	PLL0	PLL, feedback dividers.	Go
1Eh	PLL1	PLL, charge pump current and clock distribution pre-scaler dividers.	Go
1Fh	PLL2	PLL, loop filter configuration	Go
21h	PLL4	PLL, lock detector and PFD delay	Go
23h	CH1_CTRL0	Output channel 1, RESERVED	Go
24h	CH1_CTRL1	Output channel 1, RESERVED	Go
25h	CH1_CTRL2	Output channel 1, integer divider and mux control.	Go
26h	CH1_CTRL3	Output channel 1, synchronization, digital delay, output buffer, mux and mute controls.	Go
27h	CH1_CTRL4	Output channel 1, divider glitchless enable and spread spectrum controls.	Go
28h	CH1_CTRL5	Output channel 1, RESERVED	Go

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Table 15. CDCI6214 Registers (continued)

ADDRESS	ACRONYM	REGISTER NAME	SECTION
29h	CH2_CTRL0	Output channel 2, RESERVED	Go
2Ah	CH2_CTRL1	Output channel 2, RESERVED	Go
2Bh	CH2_CTRL2	Output channel 2, integer divider and mux control.	Go
2Ch	CH2_CTRL3	Output channel 2, synchronization, digital delay, output buffer, mux and mute controls.	Go
2Dh	CH2_CTRL4	Output channel 2, divider glitchless enable and spread spectrum controls.	Go
2Eh	CH2_CTRL5	Output channel 2 , RESERVED	Go
2Fh	CH3_CTRL0	Output channel 3, RESERVED	Go
30h	CH3_CTRL1	Output channel 3, RESERVED	Go
31h	CH3_CTRL2	Output channel 3, integer divider and mux control.	Go
32h	CH3_CTRL3	Output channel 3, synchronization, digital delay, output buffer, mux and mute controls.	Go
33h	CH3_CTRL4	Output channel 3, divider glitchless enable and spread spectrum controls.	Go
34h	CH3_CTRL5	Output channel 3, RESERVED	Go
35h	CH4_CTRL0	Output channel 4, RESERVED	Go
36h	CH4_CTRL1	Output channel 4, RESERVED	Go
37h	CH4_CTRL2	Output channel 4, integer divider and mux control.	Go
38h	CH4_CTRL3	Output channel 4, synchronization, digital delay, output buffer, mux and mute controls.	Go
39h	CH4_CTRL4	Output channel 4, divider glitchless enable and spread spectrum controls.	Go
3Ah	CH4_CTRL5	Output channel 4, RESERVED	Go
3Bh	CHX_CTRL0	Output channels, generic clock distribution and bypass output controls.	Go
3Ch	CHX_CTRL1	Output channels, RESERVED	Go
3Dh	CHX_CTRL2	Output channels, RESERVED	Go
3Eh	CHX_CTRL3	Output channels, RESERVED	Go
3Fh	CHX_CTRL4	Output channels, RESERVED	Go

Complex bit access types are encoded to fit into small table cells. Table 16 shows the codes that are used for access types in this section.

Table 16. CDCI6214 Access Type Codes

ACCESS TYPE	CODE	DESCRIPTION
READ TYPE		
R	R	Read
RC	C R	to Clear Read
WRITE TYPE		
W	W	Write
WEX	W	Write
WMC	W	Write
WPD	W	Write
WSC	W	Write
WST	W	Write
RESET OR DEFAULT VALUE		
-n		Value after reset or the default value

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8.6.1.1 GENERIC0 Register (Address = 0h) [reset = 0h]

GENERIC0 is shown in Figure 31 and described in Table 17.

Return to Summary Table.

Figure 31. GENERIC0 Register

15	14	13	12	11	10	9	8
i2c_a0	gpio0_input_sel	gpio4_dir_sel	gpio1_dir_sel	gpio0_dir_sel	zdm_clocksel	RESERVED	zdm_mode
R/W-0h	R/W-0h	R/W-0h	R/W-0h	R/W-0h	R/W-0h	R/W-0h	R/W-0h
7	6	5	4	3	2	1	0
RESERVED	pll_rst_lockdet	sync	recal	resetn_soft	swrst	powerdown	mode
R/W-0h	R/W-0h	R/WSC-0h	R/WSC-0h	R/W-0h	R/WSC-0h	R/WPD-0h	R/W-0h

Table 17. GENERIC0 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15	i2c_a0	R/W	0h	When regcommit is used to program an EEPROM page, using regcommit_page, this defines the LSB of the I^2C slave address. When a configuration is loaded into the registers from an EEPROM page, this represents the saved LSB bit.
14	gpio0_input_sel	R/W	0h	Input signal select for GPIO0, Pin 8. 0h = RESETN 1h = SYNC
13	gpio4_dir_sel	R/W	0h	GPIO4 direction select. 0h = Input 1h = Output
12	gpio1_dir_sel	R/W	0h	GPIO1 direction select. 0h = Input 1h = Output
11	gpio0_dir_sel	R/W	0h	Direction select for Pin 8. 0h = Input 1h = Output
10	zdm_clocksel	R/W	0h	Selects the internal or external clock for calibration, in the ZDM mode. In non-ZDM mode, always internal clock will be selected and this register doesn't have any meaning. 0h = Internal Feedback 1h = External Feedback
9	RESERVED	R/W	0h	RESERVED
8	zdm_mode	R/W	0h	Zero Delay Mode 0h = ZDM Off 1h = ZDM On
7	RESERVED	R/W	0h	RESERVED.
6	pll_rst_lockdet	R/W	0h	Reset (active high) to PLL lock detect circuit.
5	sync	R/WSC	0h	Generates sync pulse (for output decoder). This is a self clearing register bit and writing '1' will create the SYNC pulse.
4	recal	R/WSC	0h	Self clearing bit. Writing '1' will do the re-calibration. For example - after the configuration followed by calibration if '1' is written to this register the calibration engine will start with the current capcode and cross code.

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Table 17. GENERIC0 Register Field Descriptions (continued)

BIT	FIELD	TYPE	RESET	DESCRIPTION
3	resetn_soft	R/W	0h	Configure the pin RESETN/SYNC as a soft reset. 0h = Hard Reset (reset state machines and registers) 1h = Soft Reset (state machines only, register content stays as is)
2	swrst	R/WSC	0h	Soft reset bit. This is a self clearing bit. Writing a '0' has no effect and writing a '1' creates a reset pulse which resets the digital logic except the programmable registers. Also, this soft reset has similar effect on digital logic as hard reset (RESENTN/SYNC). Soft reset will restart the configuration and calibration.
1	powerdown	R/WPD	0h	Analog Power Down. 0h = Active 1h = Power down
0	mode	R/W	0h	Mode of Operation. 0h = Serial Interface, I2C 1h = Pin Mode, Output Enable

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8.6.1.2 GENERIC1 Register (Address = 1h) [reset = 6A32h]

GENERIC1 is shown in Figure 32 and described in Table 18.

Return to Summary Table.

Figure 32. GENERIC1 Register

15	14	13	12	11	10	9	8
RESERVED						ref_mux_src	ref_mux
R/W-1Ah						R/W-0h	R/W-0h
7	6	5	4	3	2	1	0
gpio4_input_sel				gpio1_input_sel			
R/W-3h				R/W-2h			

Table 18. GENERIC1 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-10	RESERVED	R/W	1Ah	RESERVED
9	ref_mux_src	R/W	0h	Reference mux control signal source. 0h = Pin 1h = ref_mux bit-field
8	ref_mux	R/W	0h	Reference mux bit override. 0h = XIN 1h = REF
7-4	gpio4_input_sel	R/W	3h	GPIO4 input signal select. *Do not choose the same signal on gpio1_input_sel.* 2h = OE 4h = OE1 5h = OE2 6h = OE3 7h = OE4
3-0	gpio1_input_sel	R/W	2h	GPIO1 input signal select.*Do not choose the same signal on gpio4_input_sel.* 2h = OE 4h = OE1 5h = OE2 6h = OE3 7h = OE4

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8.6.1.3 GENERIC2 Register (Address = 2h) [reset = 53h]

GENERIC2 is shown in Figure 33 and described in Table 19.

Return to Summary Table.

Figure 33. GENERIC2 Register

15	14	13	12	11	10	9	8
RESERVED	RESERVED	RESERVED		gpio0_output_sel			
R/W-0h	R/W-0h	R/W-0h		R/W-0h			
7	6	5	4	3	2	1	0
gpio4_output_sel				gpio1_output_sel			
R/W-5h				R/W-3h			

Table 19. GENERIC2 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-12	RESERVED	R/W	0h	Reserved.
11-8	gpio0_output_sel	R/W	0h	GPIO0, Pin 8, output select , 0h = PLL_LOCK 1h = XTAL_OSC 2h = CAL_DONE 3h = CONF_DONE 4h = SYNC_DONE 5h = EEPROM_BUSY 6h = EEPROM_Y12 7h = EEPROM_M12 8h = I2C_LSB 9h = CLK_FSM Ah = CLK_PFD_REF Bh = CLK_PFD_FB Ch = BUF_SYNC Dh = BUF_SCL Eh = BUF_SDA
7-4	gpio4_output_sel	R/W	5h	GPIO4 , output select , 0h = PLL_LOCK 1h = XTAL_OSC 2h = CAL_DONE 3h = CONF_DONE 4h = SYNC_DONE 5h = EEPROM_BUSY 6h = EEPROM_Y12 7h = EEPROM_M12 8h = I2C_LSB 9h = CLK_FSM Ah = CLK_PFD_REF Bh = CLK_PFD_FB Ch = BUF_SYNC Dh = BUF_SCL Eh = BUF_SDA

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Table 19. GENERIC2 Register Field Descriptions (continued)

BIT	FIELD	TYPE	RESET	DESCRIPTION
3-0	gpio1_output_sel	R/W	3h	GPIO1 , output select , 0h = PLL_LOCK 1h = XTAL_OSC 2h = CAL_DONE 3h = CONF_DONE 4h = SYNC_DONE 5h = EEPROM_BUSY 6h = EEPROM_Y12 7h = EEPROM_M12 8h = I2C_LSB 9h = CLK_FSM Ah = CLK_PFD_REF Bh = CLK_PFD_FB Ch = BUF_SYNC Dh = BUF_SCL Eh = BUF_SDA

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8.6.1.4 GENERIC3 Register (Address = 3h) [reset = 0h]

GENERIC3 is shown in Figure 34 and described in Table 20.

Return to Summary Table.

Figure 34. GENERIC3 Register

15	14	13	12	11	10	9	8
disable_crc	update_crc	nvmcommit	regcommit	regcommit_page	RESERVED	RESERVED	RESERVED
R/W-0h	R/WMC-0h	R/WSC-0h	R/WSC-0h	R/W-0h	R/W-0h	R/W-0h	R/W-0h
7	6	5	4	3	2	1	0
RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED
R/W-0h	R/W-0h	R/W-0h	R/W-0h	R/W-0h	R/WSC-0h	R/WSC-0h	R/W-0h

Table 20. GENERIC3 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15	disable_crc	R/W	0h	Disable the CRC computation. However if Page is selected CRC will happen after PoR (power on reset from analog). For example- after the calibration if this bit is set to '1' and apply a soft reset (or reset through pin) the configuration will bypass the CRC computation.
14	update_crc	R/WMC	0h	This is a self clearing register bit. Writing a '1' will cause the re-computation of CRC. The computed CRC can be read from the live CRC (nvmlcrc) register after the status bit nvmbusyh = 0.
13	nvmcommit	R/WSC	0h	Commits contents of the EEPROM page selected by REGCOMMIT_PAGE to internal register. This register will self-clear
12	regcommit	R/WSC	0h	Commits contents of the registers to EEPROM selected by REGCOMMIT_PAGE register. This register will self-clear.
11	regcommit_page	R/W	0h	Decide which page of EEPROM to use for the Register/NVM commit operations. Note= this register is used only after the initial power-up configuration from EEPROM if any. Once power-up configuration is done with the page chosen by EEPROMSEL the value of this register will be used for subsequent configurations using Register/NVM commit operations. 0h = Page 0 1h = Page 1
10-3	RESERVED	R/W	0h	Reserved
2-1	RESERVED	R/WSC	0h	Reserved
0	RESERVED	R/W	0h	Reserved

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8.6.1.5 POWER0 Register (Address = 4h) [reset = 54h]

POWER0 is shown in Figure 35 and described in Table 21.

Return to Summary Table.

Figure 35. POWER0 Register

15	14	13	12	11	10	9	8
RESERVED							
R/W-0h							
7	6	5	4	3	2	1	0
pdn_ch4	RESERVED	pdn_ch3	RESERVED	pdn_ch2	RESERVED	pdn_ch1	RESERVED
R/W-0h	R/W-1h	R/W-0h	R/W-1h	R/W-0h	R/W-1h	R/W-0h	R/W-0h

Table 21. POWER0 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-8	RESERVED	R/W	0h	Reserved.
7	pdn_ch4	R/W	0h	Powers Down CH4 LDO. 0h = Active 1h = Power down
6	RESERVED	R/W	1h	Reserved.
5	pdn_ch3	R/W	0h	Powers Down CH3 LDO. 0h = Active 1h = Power down
4	RESERVED	R/W	1h	Reserved.
3	pdn_ch2	R/W	0h	Powers Down CH2 LDO. 0h = Active 1h = Power down
2	RESERVED	R/W	1h	Reserved.
1	pdn_ch1	R/W	0h	Powers Down CH1 LDO. 0h = Active 1h = Power down
0	RESERVED	R/W	0h	Reserved.

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8.6.1.6 POWER1 Register (Address = 5h) [reset = 30h]

POWER1 is shown in Figure 36 and described in Table 22.

Return to Summary Table.

Figure 36. POWER1 Register

15	14	13	12	11	10	9	8
RESERVED					pdn_pll_vcobuf2	pdn_pll_vco	pdn_pll_vcobuf
R/W-0h					R/W-0h	R/W-0h	R/W-0h
7	6	5	4	3	2	1	0
pdn_pll_cp	pdn_pll_lockdet	pdn_pll_psfbb	pdn_pll_psfba	RESERVED	pdn_pll_pfd	pdn_pll_psfb	pdn_ref
R/W-0h	R/W-0h	R/W-1h	R/W-1h	R/W-0h	R/W-0h	R/W-0h	R/W-0h

Table 22. POWER1 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-11	RESERVED	R/W	0h	Reserved.
10	pdn_pll_vcobuf2	R/W	0h	Power down of VCO buffer LDO. 0h = Active 1h = Power down
9	pdn_pll_vco	R/W	0h	Power down of VCO LDO. 0h = Active 1h = Power down
8	pdn_pll_vcobuf	R/W	0h	Power down of VCO buffer. 0h = Active 1h = Power down
7	pdn_pll_cp	R/W	0h	Power down of charge pump LDO. 0h = Active 1h = Power down
6	pdn_pll_lockdet	R/W	0h	Power down of PLL lock detector. 0h = Active 1h = Power down
5	pdn_pll_psfbb	R/W	1h	Power down of PLL feedback pre-scaler. 0h = Active 1h = Power down
4	pdn_pll_psfba	R/W	1h	Active low enable of prescaler-a. Active (low) during PoR and '1' later. 1h = Power Down PFD. 0h = Otherwise.
3	RESERVED	R/W	0h	Reserved.
2	pdn_pll_pfd	R/W	0h	Active low enable of PFD. Inactive (high) till calibration and '0' afterwards. 1h = Power Down PFD. 0h = Otherwise.
1	pdn_pll_psfb	R/W	0h	Active low enable of prescaler. Active (low) during PoR and '1' later. 1h = Powers Down PS, 0h = Otherwise.
0	pdn_ref	R/W	0h	Powers Down Input Path LDO. Kill Switch. Do not use. 1h = PD, 0h = Otherwise.

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8.6.1.7 STATUS0 Register (Address = 6h) [reset = 0h]

STATUS0 is shown in Figure 37 and described in Table 23.

Return to Summary Table.

Figure 37. STATUS0 Register

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
cal_status															
R-0h															

Table 23. STATUS0 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-0	cal_status	R	0h	Calibration word.

8.6.1.8 STATUS1 Register (Address = 7h) [reset = 0h]

STATUS1 is shown in Figure 38 and described in Table 24.

Return to Summary Table.

Figure 38. STATUS1 Register

15	14	13	12	11	10	9	8
RESERVED				lock_det_a	pll_vco_cal_ready	nvm_rd_error	nvm_wr_error
R-0h				R-0h	R-0h	RC-0h	RC-0h
7	6	5	4	3	2	1	0
rd_error	wr_error	nvmcrcerr	nvmbusy	cal_done	config_done	unlock_s	lock_det
R-0h	R-0h	R-0h	R-0h	R-0h	R-0h	R/WEX-0h	R-0h

Table 24. STATUS1 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-12	RESERVED	R	0h	Reserved.
11	lock_det_a	R	0h	Reads the PLL Lock status. 0h: PLL is Unlocked. 1h: PLL is locked.
10	pll_vco_cal_ready	R	0h	VCO Buffer LDO POR can be read through this register.
9	nvm_rd_error	RC	0h	Occurs when any NVM operation is issued during Read Phase of the NVM. The Read Phase of the NVM includes CRC calculation or a simple read through RD NVM Addr/Data registers from any NVM location or a NVM commit operation.
8	nvm_wr_error	RC	0h	Occurs when any NVM operation is issued during Write Phase of the NVM. Write Phase of the NVM includes a simple write into any NVM location through WR NVM Addr/Data registers or a Register Commit operation.
7	rd_error	R	0h	Reading using the I2C interface with an address above the address of the last register gives this error.
6	wr_error	R	0h	Writing using the I2C interface with an address above the address of the last register gives this error.
5	nvmcrcerr	R	0h	NVM CRC Error Indication. The NVMCRCERR bit is set to 1 if a CRC Error has been detected when reading back from on-chip EEPROM during device configuration. This bit will be cleared when NVMCOMMIT is submitted or Update CRC is issued.
4	nvmbusy	R	0h	NVM Program Busy Indication. The NVMBUSY bit is 1 during an on-chip EEPROM Erase/Program cycle. While NVMBUSY is 1 the on-chip EEPROM cannot be accessed. When the NVM operation is completed this bit will be cleared. NVM related operations are REGcommit NVMcommit CRC calculation or simple Read/Write through RD/WR NVM.

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Table 24. STATUS1 Register Field Descriptions (continued)

BIT	FIELD	TYPE	RESET	DESCRIPTION
3	cal_done	R	0h	1h = Calibration (Two rounds of Amplitude followed by calibration) is done.
2	config_done	R	0h	1 h = Configuration (CRC Check followed by transfer of EEPROM to registers) is done.
1	unlock_s	R/WEX	0h	Lock Detect Sticky Bit. This indicates the loss of lock of the PLL and this is cleared only by recalibration or a hard reset through RESETN/SYNC pin 0h = locked 1h = unlocked
0	lock_det	R	0h	When the calibration is done frequency may or may not be locked. 1h = Frequency is locked. 0h = Otherwise 0h = unlocked 1h = locked

8.6.1.9 STATUS2 Register (Address = 8h) [reset = 0h]

STATUS2 is shown in Figure 39 and described in Table 25.

Return to Summary Table.

Figure 39. STATUS2 Register

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
misc_status															
R-0h															

Table 25. STATUS2 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-0	misc_status	R	0h	Miscellaneous status word.

8.6.1.10 STATUS3 Register (Address = 9h) [reset = 0h]

STATUS3 is shown in Figure 40 and described in Table 26.

Return to Summary Table.

Figure 40. STATUS3 Register

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
nvmlcrc															
R-0h															

Table 26. STATUS3 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-0	nvmlcrc	R	0h	The NVMLCRC register holds the Live CRC byte that has been calculated while reading on-chip EEPROM.

8.6.1.11 EEPROM0 Register (Address = Ah) [reset = 0h]

EEPROM0 is shown in Figure 41 and described in Table 27.

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Figure 41. EEPROM0 Register

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
nvmscrc															
R-0h															

Table 27. EEPROM0 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-0	nvmscrc	R	0h	Stored CRC value. This value is used to compare with the computed CRC and to update the CRC Status bit

8.6.1.12 EEPROM1 Register (Address = Bh) [reset = 0h]

EEPROM1 is shown in Figure 42 and described in Table 28.

Return to Summary Table.

Figure 42. EEPROM1 Register

15	14	13	12	11	10	9	8
RESERVED							
R/W-0h							
7	6	5	4	3	2	1	0
RESERVED		nvm_rd_addr					
R/W-0h		R/W-0h					

Table 28. EEPROM1 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-6	RESERVED	R/W	0h	Reserved.
5-0	nvm_rd_addr	R/W	0h	Writing an address into the NVM WR Address starts the read loop. This register will contain the data read from the EEPROM at the address provided by the NVM WR Address. The address is auto-incremented and subsequent read from the NVM RD Data register will give the data from the next EEPROM location.

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8.6.1.13 EEPROM2 Register (Address = Ch) [reset = 0h]

EEPROM2 is shown in Figure 43 and described in Table 29.

Return to Summary Table.

Figure 43. EEPROM2 Register

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
nvm_rd_data															
R-0h															

Table 29. EEPROM2 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-0	nvm_rd_data	R	0h	Reading from this register will return the data present at the EEPROM from the immediate next address location than what was programmed in the NVM RD Address register since writing into NVM RD Address register already returned the data from EEPROM from the written address. Subsequent read from this register will cause the address to be auto-incremented and cause a read from the next EEPROM location.

8.6.1.14 EEPROM3 Register (Address = Dh) [reset = 0h]

EEPROM3 is shown in Figure 44 and described in Table 30.

Return to Summary Table.

Figure 44. EEPROM3 Register

15	14	13	12	11	10	9	8
RESERVED							
R/W-0h							
7	6	5	4	3	2	1	0
RESERVED		nvm_wr_addr					
R/W-0h		R/W-0h					

Table 30. EEPROM3 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-6	RESERVED	R/W	0h	Reserved.
5-0	nvm_wr_addr	R/W	0h	Writing an address into the NVM WR Address starts the write loop. But Writing a data into the NVM WR Data register will program the EEPROM with that data at the address provided by writing into NVM WR Address initially.

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8.6.1.15 EEPROM4 Register (Address = Eh) [reset = 0h]

EEPROM4 is shown in Figure 45 and described in Table 31.

Return to Summary Table.

Figure 45. EEPROM4 Register

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
nvm_wr_data															
R/W-0h															

Table 31. EEPROM4 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-0	nvm_wr_data	R/W	0h	Writing a data into this register will program the EEPROM with the written data at the address given by NVM WR Address. Subsequent write into this register will cause the address to be auto-incremented and cause a program at the next EEPROM location.

8.6.1.16 STARTUP0 Register (Address = Fh) [reset = 37h]

STARTUP0 is shown in Figure 46 and described in Table 32.

Return to Summary Table.

Figure 46. STARTUP0 Register

15	14	13	12	11	10	9	8
ee_lock				RESERVED			zdm_auto
R/W-0h				R/W-0h			R/W-0h
7	6	5	4	3	2	1	0
bypass_cal	bypass_config	cal_mute	shift_left		gpio3_gf_en	gpio2_gf_en	acal_en
R/W-0h	R/W-0h	R/W-1h	R/W-2h		R/W-1h	R/W-1h	R/W-1h

Table 32. STARTUP0 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-12	ee_lock	R/W	0h	Locks EEPROM for regcommit and EEPROM write operations. To unlock, write 5h, any other value to lock.
11-9	RESERVED	R/W	0h	Reserved.
8	zdm_auto	R/W	0h	Setting this bit 1 will allow state machine to control the value of pll_ndiv and pll_psfb internally in Normal/ZDM mode of calibration. If set 0 the user has to manually program the pll_ndiv and pll_psfb
7	bypass_cal	R/W	0h	Bypass the calibration. By default two rounds of calibrations (AC followed by FC) will be done. Setting this bit to 1 will bypass the calibration.
6	bypass_config	R/W	0h	Bypass the configuration. Note that on PoR this bit is zero and hence configuration will happen. However after the first configuration this bit can be set and apply the soft/pin reset so that configuration will be bypassed.
5	cal_mute	R/W	1h	Mute the output during the calibration. 0h = Outputs stay active 1h = Outputs muted

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Table 32. STARTUP0 Register Field Descriptions (continued)

BIT	FIELD	TYPE	RESET	DESCRIPTION
4-3	shift_left	R/W	2h	Divide the ref clock (PFD clock) during calibration by 2 to the power of value 0h = 1 1h = 2 2h = 4 3h = 8
2	gpio3_gf_en	R/W	1h	Enable the glitch filter for SCL, GPIO3. 0h = Disabled 1h = Enabled
1	gpio2_gf_en	R/W	1h	Enable the glitch filter for SDA, GPIO2. 0h = Disabled 1h = Enabled
0	acal_en	R/W	1h	Enable automatic frequency calibration at power-up or EEPROM re-load. 0h = Disabled 1h = Enabled

8.6.1.17 STARTUP1 Register (Address = 10h) [reset = 921Fh]

STARTUP1 is shown in Figure 47 and described in Table 33.

Return to Summary Table.

Figure 47. STARTUP1 Register

15	14	13	12	11	10	9	8
pll_lock_dly					ac_init_dly		
R/W-12h					R/W-10h		
7	6	5	4	3	2	1	0
ac_init_dly			cp_dly				
R/W-10h			R/W-1Fh				

Table 33. STARTUP1 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-11	pll_lock_dly	R/W	12h	Wait time before lock detect goes high after the calibration. Expected value is approximately 1 ms. The actual delay will be 4 × T × {programmed value} where T = 200ns typically.
10-5	ac_init_dly	R/W	10h	Peak detector settlig time, that is, pll_en_peakdet_vco going high to first cross code change. Expected value is 1.6 µs. The actual delay will be 4 × T × {programmed value} where T = 200ns typically.
4-0	cp_dly	R/W	1Fh	Delay from vtune driver enable (pll_en_vtune_drv) going high to peak detector enable (pll_en_peakdet_vco) going high. Expected delay is 200 µs. The actual delay will be 64 × T × {programmed value} where T = 200ns typically.

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8.6.1.18 STARTUP2 Register (Address = 11h) [reset = 6C4h]

STARTUP2 is shown in Figure 48 and described in Table 34.

Return to Summary Table.

Figure 48. STARTUP2 Register

15	14	13	12	11	10	9	8
RESERVED	switch_dly				err_cnt		
R/W-0h	R/W-0h				R/W-6h		
7	6	5	4	3	2	1	0
fc_setl_dly		ac_cmp_dly					
R/W-3h		R/W-4h					

Table 34. STARTUP2 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15	RESERVED	R/W	0h	Reserved.
14-11	switch_dly	R/W	0h	Indicates number of digital clocks to wait before SSM clock is turned off after all the active signals are low. Internally scaled up by 2^6. Digital clock period is 200ns typically.
10-8	err_cnt	R/W	6h	Indicates how long to wait for before declaring lock detect. In PFD clocks period. 0h = 32 1h = 64 2h = 128 3h = 256
7-6	fc_setl_dly	R/W	3h	Delay between two cap codes in terms of REFCLK period. Expected value is 1 µs. The actual delay will be 32 × T × {programmed value} where T is the refclk period.
5-0	ac_cmp_dly	R/W	4h	Delay between successive cross code change. Expected value is 1 µs. The actual delay will be 4 × T × {programmed value} where T = 200ns typically.

8.6.1.19 REV0 Register (Address = 18h) [reset = 601h]

REV0 is shown in Figure 49 and described in Table 35.

Return to Summary Table.

Figure 49. REV0 Register

15	14	13	12	11	10	9	8
RESERVED							
R/W-6h							
7	6	5	4	3	2	1	0
rev_reg							
R-1h							

Table 35. REV0 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-8	Reserved	R	06h	Reserved
7-0	rev_reg	R	1h	Revision ID register. 1h = CDCI6214

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8.6.1.20 INPUT0 Register (Address = 1Ah) [reset = B14h]

INPUT0 is shown in Figure 50 and described in Table 36.

Return to Summary Table.

Figure 50. INPUT0 Register

15	14	13	12	11	10	9	8
ref_inbuf_ctrl	RESERVED	RESERVED	ip_xo_cload				
R/W-0h	R/W-0h	R/W-0h	R/W-Bh				
7	6	5	4	3	2	1	0
RESERVED		ip_xo_gm				xin_inbuf_ctrl	
R/W-0h		R/W-5h				R/W-0h	

Table 36. INPUT0 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15	ref_inbuf_ctrl	R/W	0h	Reference input buffer select. 0h = LVCMOS 1h = AC-Differential
14	RESERVED	R/W	0h	RESERVED
13	RESERVED	R/W	0h	RESERVED

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Table 36. INPUT0 Register Field Descriptions (continued)

BIT	FIELD	TYPE	RESET	DESCRIPTION
12-8	ip_xo_cload	R/W	Bh	Selects load cap for XO (up to 9 pF) in 5 bit binary selection). Step size is about 200 fF. 0h = 3.0 pF 1h = 3.2 pF 2h = 3.4 pF 3h = 3.6 pF 4h = 3.8 pF 5h = 4.0 pF 6h = 4.2 pF 7h = 4.4 pF 8h = 4.6 pF 9h = 4.8 pF Ah = 5.0 pF Bh = 5.2 pF Ch = 5.4 pF Dh = 5.6 pF Eh = 5.8 pF Fh = 6.0 pF 10h = 6.2 pF 11h = 6.4 pF 12h = 6.5 pF 13h = 6.7 pF 14h = 6.9 pF 15h = 7.1 pF 16h = 7.3 pF 17h = 7.5 pF 18h = 7.7 pF 19h = 7.9 pF 1Ah = 8.1 pF 1Bh = 8.3 pF 1Ch = 8.5 pF 1Dh = 8.7 pF 1Eh = 8.9 pF 1Fh = 9.0 pF
7-6	RESERVED	R/W	0h	RESERVED

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Table 36. INPUT0 Register Field Descriptions (continued)

BIT	FIELD	TYPE	RESET	DESCRIPTION
5-2	ip_xo_gm	R/W	5h	Tune bias current for XO. Gm programmability. Typical values: 0h = Disabled 1h = 14 µA 2h = 29 µA 3h = 44 µA 4h = 59 µA 5h = 148 µA 6h = 295 µA 7h = 443 µA 8h = 591 µA 9h = 884 µA Ah = 1177 µA Bh = 1468 µA Ch = 1758 µA
1-0	xin_inbuf_ctrl	R/W	0h	Input buffer select. 0h = XO 1h = CMOS 2h = DIFF

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8.6.1.21 INPUT1 Register (Address = 1Bh) [reset = 0h]

INPUT1 is shown in Figure 51 and described in Table 37.

Return to Summary Table.

Figure 51. INPUT1 Register

15	14	13	12	11	10	9	8
RESERVED	ip_byp_en_ch4	ip_byp_en_ch3	ip_byp_en_ch2	ip_byp_en_ch1	ip_byp_en_y0	ip_byp_mux	ip_rst_rdiv
R/W-0h	R/W-0h	R/W-0h	R/W-0h	R/W-0h	R/W-0h	R/W-0h	R/W-0h
7	6	5	4	3	2	1	0
ip_rdiv							
R/W-0h							

Table 37. INPUT1 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15	RESERVED	R/W	0h	RESERVED
14	ip_byp_en_ch4	R/W	0h	Bypass path buffer enable for CH4. This is required to drive a bypass signal using ch4_iod_mux. 0h = disabled 1h = enabled
13	ip_byp_en_ch3	R/W	0h	Bypass path buffer enable for CH3. This is required to drive a bypass signal using ch3_iod_mux. 0h = disabled 1h = enabled
12	ip_byp_en_ch2	R/W	0h	Bypass path buffer enable for CH2. This is required to drive a bypass signal using ch2_iod_mux. 0h = disabled 1h = enabled
11	ip_byp_en_ch1	R/W	0h	Bypass path buffer enable for CH1. This is required to drive a bypass signal using ch1_iod_mux. 0h = disabled 1h = enabled
10	ip_byp_en_y0	R/W	0h	Enable input clock to come out on Y0 buffer.
9	ip_byp_mux	R/W	0h	Selects Y0 clock between "REF_CLK" and "PFD_CLK". 0h = REF 1h = PFD
8	ip_rst_rdiv	R/W	0h	Resets flops in ref divider. Active (high) during power on reset or SWRST or pin reset and inactive afterwards.
7-0	ip_rdiv	R/W	0h	Reference clock divider. 0 = Doubler ON, 1 = /1, 2 = /2. and so forth. 0h = x2 1h = /1 2h = /2 3h = /3 4h = /4 5h = /5 ... FFh = /255

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8.6.1.22 INPUT_DBG0 Register (Address = 1Ch) [reset = 0h]

INPUT_DBG0 is shown in and described in Table 38.

Return to Summary Table.

Figure 52. INPUT_DBG0 Register

15	14	13	12	11	10	9	8
RESERVED		RESERVED		RESERVED			RESERVED
R/W-0h		R/W-0h		R/W-0h			R/W-0h
7	6	5	4	3	2	1	0
RESERVED		RESERVED	RESERVED	RESERVED	RESERVED	RESERVED	RESERVED
R/W-0h		R/W-0h	R/W-0h	R/W-0h	R/W-0h	R/W-0h	R/W-0h

Table 38. INPUT_DBG0 Register Field Descriptions

Bit	Field	Type	Reset	Description
15-6	RESERVED	R/W	0h	RESERVED.
5	RESERVED	R/W	0h	RESERVED
4	RESERVED	R/W	0h	RESERVED
3	RESERVED	R/W	0h	RESERVED
2	RESERVED	R/W	0h	RESERVED
1	RESERVED	R/W	0h	RESERVED
0	RESERVED	R/W	0h	RESERVED

8.6.1.23 PLL0 Register (Address = 1Dh) [reset = Ch]

PLL0 is shown in Figure 53 and described in Table 39.

Return to Summary Table.

Figure 53. PLL0 Register

15	14	13	12	11	10	9	8
pll_psfb		pll_ndiv					
R/W-0h		R/W-Ch					
7	6	5	4	3	2	1	0
pll_ndiv							
R/W-Ch							

Table 39. PLL0 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-14	pll_psfb	R/W	0h	Programming bits for PLL feedback pre-scaler. 0h = /4 1h = /5 2h = /6
13-0	pll_ndiv	R/W	Ch	Feedback divider, must be at least 6h.

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8.6.1.24 PLL1 Register (Address = 1Eh) [reset = 5140h]

PLL1 is shown in Figure 54 and described in Table 40.

Return to Summary Table.

Figure 54. PLL1 Register

15	14	13	12	11	10	9	8
pll_cp_up						pll_cp_dn	
R/W-14h						R/W-14h	
7	6	5	4	3	2	1	0
pll_cp_dn				pll_psb		pll_psa	
R/W-14h				R/W-0h		R/W-0h	

Table 40. PLL1 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-10	pll_cp_up	R/W	14h	Programming bits for up current of CP. 0h = 0.0 mA 1h = 0.1 mA 2h = 0.2 mA 3h = 0.3 mA [...] 1Fh = 3.1 mA ***37h = 3.2 mA*** 38h = 3.3 mA [...] 3Dh = 3.8 mA 3Eh = 3.9 mA 3Fh = 4.0 mA
9-4	pll_cp_dn	R/W	14h	Programming bits for down current of CP. 0h = 0.0 mA 1h = 0.1 mA 2h = 0.2 mA 3h = 0.3 mA [...] 1Fh = 3.1 mA ***37h = 3.2 mA*** 38h = 3.3 mA [...] 3Dh = 3.8 mA 3Eh = 3.9 mA 3Fh = 4.0 mA
3-2	pll_psb	R/W	0h	Programming bits for pre-scaler B. 0h = /4 1h = /5 2h = /6
1-0	pll_psa	R/W	0h	Programming bits for pre-scaler A. 0h = /4 1h = /5 2h = /6

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8.6.1.25 PLL2 Register (Address = 1Fh) [reset = 1E72h]

PLL2 is shown in Figure 55 and described in Table 41.

Return to Summary Table.

Figure 55. PLL2 Register

15	14	13	12	11	10	9	8
RESERVED		pll_lf_zcap					pll_lf_res
R/W-0h		R/W-Fh					R/W-3h
7	6	5	4	3	2	1	0
pll_lf_res			pll_lf_pcap				
R/W-3h			R/W-12h				

Table 41. PLL2 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-14	RESERVED	R/W	0h	RESERVED.
13-9	pll_lf_zcap	R/W	Fh	Programming bits of cap value of zero of loop-filter. 0h = 000 pF 1h = 030 pF 2h = 060 pF 3h = 090 pF 4h = 120 pF 5h = 150 pF 6h = 180 pF 7h = 210 pF 8h = 240 pF 9h = 270 pF Ah = 300 pF Bh = 330 pF Ch = 360 pF Dh = 390 pF Eh = 420 pF Fh = 450 pF 10h = 480 pF 11h = 510 pF 12h = 540 pF 13h = 570 pF 14h = 600 pF

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Table 41. PLL2 Register Field Descriptions (continued)

BIT	FIELD	TYPE	RESET	DESCRIPTION
8-5	pll_lf_res	R/W	3h	Programming bits of res value of zero of loop-filter. 0h = open kΩ 1h = 00.5 kΩ 2h = 01.5 kΩ 3h = 02.5 kΩ 4h = 03.5 kΩ 5h = 04.5 kΩ 6h = 05.5 kΩ 7h = 06.5 kΩ 8h = 07.5 kΩ 9h = 08.5 kΩ Ah = 09.5 kΩ Bh = 10.5 kΩ Ch = 11.5 kΩ
4-0	pll_lf_pcap	R/W	12h	Programming bits of cap value of pole of loop-filter. 0h = 00.0 pF 1h = 00.5 pF 2h = 01.5 pF 3h = 02.5 pF 4h = 03.5 pF 5h = 04.5 pF 6h = 05.5 pF 7h = 06.5 pF 8h = 07.5 pF 9h = 08.5 pF Ah = 09.5 pF Bh = 10.5 pF Ch = 11.5 pF Dh = 12.5 pF Eh = 13.5 pF Fh = 14.5 pF 10h = 15.5 pF 11h = 16.5 pF 12h = 17.5 pF 13h = 18.5 pF 14h = 19.5 pF

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8.6.1.26 PLL4 Register (Address = 21h) [reset = 7h]

PLL4 is shown in Figure 56 and described in Table 42.

Return to Summary Table.

Figure 56. PLL4 Register

15	14	13	12	11	10	9	8
RESERVED	RESERVED			RESERVED			RESERVED
R/W-0h	R/W-0h			R/W-0h			R/W-0h
7	6	5	4	3	2	1	0
RESERVED	pll_pfd_dly_ctrl		pll_lockdet_window			pll_lockdet_wait	
R/W-0h	R/W-0h		R/W-1h			R/W-3h	

Table 42. PLL4 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-7	RESERVED	R/W	0h	Reserved.
6-5	pll_pfd_dly_ctrl	R/W	0h	Programming of PFD reset delay. In PFD period. 0h = 2 1h = 6 2h = 10 3h = 14
4-2	pll_lockdet_window	R/W	1h	Programmability of PFD input and output time window for lock detect. 0h = disabled 1h = typical 1.4 ns 2h = typical 2.6 ns 3h = typical 3.9 ns 4h = typical 5.2 ns 5h = typical 6.4 ns 6h = typical 7.6 ns 7h = typical 8.9 ns
1-0	pll_lockdet_wait	R/W	3h	Programmability of analog lock detect timer. In PFD cycles 0h = 1 1h = 16 2h = 64 3h = 128

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8.6.1.27 CH1_CTRL0 Register (Address = 23h) [reset = 8000h]

CH1_CTRL0 is shown in Figure 57 and described in Table 43.

Return to Summary Table.

Figure 57. CH1_CTRL0 Register

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RESERVED															
R/WEX-8000h															

Table 43. CH1_CTRL0 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-0	RESERVED	R/WEX	8000h	RESERVED

8.6.1.28 CH1_CTRL1 Register (Address = 24h) [reset = 0h]

CH1_CTRL1 is shown in Figure 58 and described in Table 44.

Return to Summary Table.

Figure 58. CH1_CTRL1 Register

15	14	13	12	11	10	9	8
RESERVED							RESERVED
R/W-0h							R/WEX-0h
7	6	5	4	3	2	1	0
RESERVED							
R/WEX-0h							

Table 44. CH1_CTRL1 Register Field Descriptions

Bit	Field	Type	Reset	Description
15-9	RESERVED	R/W	0h	RESERVED.
8-0	RESERVED	R/WEX	0h	RESERVED.

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8.6.1.29 CH1_CTRL2 Register (Address = 25h) [reset = 8003h]

CH1_CTRL2 is shown in Figure 59 and described in Table 45.

Return to Summary Table.

Figure 59. CH1_CTRL2 Register

15	14	13	12	11	10	9	8
ch1_iod_mux		ch1_iod_div					
R/W-2h		R/WEX-3h					
7	6	5	4	3	2	1	0
ch1_iod_div							
R/WEX-3h							

Table 45. CH1_CTRL2 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-14	ch1_iod_mux	R/W	2h	Input Clock selection for IOD. 0h = PSA 1h = PSB 3h = REF
13-0	ch1_iod_div	R/WEX	3h	IOD Division Value. 0h = Powers Down, Output=Input/IOD_DIV

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8.6.1.30 CH1_CTRL3 Register (Address = 26h) [reset = 9h]

CH1_CTRL3 is shown in Figure 60 and described in Table 46.

Return to Summary Table.

Figure 60. CH1_CTRL3 Register

15	14	13	12	11	10	9	8
ch1_sync_delay					ch1_sync_en	RESERVED	ch1_mute_sel
R/W-0h					R/W-0h	R/W-0h	R/W-0h
7	6	5	4	3	2	1	0
ch1_mute	ch1_cmos_pol		ch1_outbuf_ctrl			ch1_mux	
R/W-0h	R/W-0h		R/W-2h			R/W-1h	

Table 46. CH1_CTRL3 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-11	ch1_sync_delay	R/W	0h	Sync Delay cycles of IOD Input Clock. One cycle is a period of the selected pre-scaler clock.
10	ch1_sync_en	R/W	0h	Enables SYNC for the channel. 0h = Disabled 1h = Enabled
9	RESERVED	R/W	0h	Reserved.
8	ch1_mute_sel	R/W	0h	Mute selection for Output Channel. 0h = P=L N=H 1h = P=H N=L
7	ch1_mute	R/W	0h	To mute the output on this channel. 0h = Un-mutes the output. 1h = mutes the output.
4-2	ch1_outbuf_ctrl	R/W	2h	Select the output buffer format. 0h = disabled 1h = LVDS (1) 2h = HCSL 3h = CML 4h = LVPECL
1-0	ch1_mux	R/W	1h	Output Clock Selection. 1h = CH1 2h = CH2

(1) For DC-connection program *chx_lvds_cmtrim_inc* = 2 and *ch[4:1]_1p8vdet* in Table 67 and Table 66 accordingly.

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8.6.1.31 CH1_CTRL4 Register (Address = 27h) [reset = 679h]

CH1_CTRL4 is shown in Figure 61 and described in Table 47.

Return to Summary Table.

Figure 61. CH1_CTRL4 Register

15	14	13	12	11	10	9	8
RESERVED	RESERVED	RESERVED	RESERVED	RESERVED			RESERVED
R/W-0h	R/W-0h	R/W-0h	R/W-0h	R/W-3h			R/W-0h
7	6	5	4	3	2	1	0
RESERVED		RESERVED		RESERVED	RESERVED	RESERVED	ch1_glitchless_en
R/W-1h		R/W-3h		R/W-1h	R/W-0h	R/W-0h	R/W-1h

Table 47. CH1_CTRL4 Register Field Descriptions

Bit	Field	Type	Reset	Description
15-12	RESERVED	R/W	0h	RESERVED
11-9	RESERVED	R/W	3h	RESERVED
8	RESERVED	R/W	0h	RESERVED
7-6	RESERVED	R/W	1h	RESERVED
5-4	RESERVED	R/W	3h	RESERVED
3	RESERVED	R/W	1h	RESERVED
2	RESERVED	R/W	0h	RESERVED
1	RESERVED	R/W	0h	RESERVED
0	ch1_glitchless_en	R/W	1h	Enables Glitchless switching for Output Channel. 0h = Immediate 1h = Glitchless

8.6.1.32 CH1_CTRL5 Register (Address = 28h) [reset = 8h]

CH1_CTRL5 is shown in Figure 62 and described in Table 48.

Return to Summary Table.

Figure 62. CH1_CTRL5 Register

15	14	13	12	11	10	9	8
RESERVED							
R/W-0h							
7	6	5	4	3	2	1	0
RESERVED				ch1_1p8vdet	RESERVED	RESERVED	RESERVED
R/W-0h				R/W-1h	R/W-0h	R/W-0h	R/W-0h

Table 48. CH1_CTRL5 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-4	RESERVED	R/W	0h	RESERVED.
3	ch1_1p8vdet	R/W	1h	Specify supply on the channel. 0h = 2.5 V or 3.3 V 1h = 1.8 V
2-0	RESERVED	R/W	0h	RESERVED

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8.6.1.33 CH2_CTRL0 Register (Address = 29h) [reset = 8000h]

CH2_CTRL0 is shown in Figure 63 and described in Table 49.

Return to Summary Table.

Figure 63. CH2_CTRL0 Register

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RESERVED															
R/WEX-8000h															

Table 49. CH2_CTRL0 Register Field Descriptions

Bit	Field	Type	Reset	Description
15-0	RESERVED	R/WEX	8000h	RESERVED

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8.6.1.34 CH2_CTRL1 Register (Address = 2Ah) [reset = 0h]

CH2_CTRL1 is shown in Figure 64 and described in Table 50.

Return to Summary Table.

Figure 64. CH2_CTRL1 Register

15	14	13	12	11	10	9	8
RESERVED							RESERVED
R/W-0h							R/WEX-0h
7	6	5	4	3	2	1	0
RESERVED							
R/WEX-0h							

Table 50. CH2_CTRL1 Register Field Descriptions

Bit	Field	Type	Reset	Description
15-9	RESERVED	R/W	0h	RESERVED.
8-0	RESERVED	R/WEX	0h	RESERVED.

8.6.1.35 CH2_CTRL2 Register (Address = 2Bh) [reset = 0h]

CH2_CTRL2 is shown in Figure 65 and described in Table 51.

Return to Summary Table.

Figure 65. CH2_CTRL2 Register

15	14	13	12	11	10	9	8
ch2_iod_mux		ch2_iod_div					
R/W-0h		R/WEX-0h					
7	6	5	4	3	2	1	0
ch2_iod_div							
R/WEX-0h							

Table 51. CH2_CTRL2 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-14	ch2_iod_mux	R/W	0h	Input Clock selection for IOD. 0h = PSA 1h = PSB 3h = REF
13-0	ch2_iod_div	R/WEX	0h	IOD Division Value. 0h = Powers Down, Output = Input/IOD_DIV

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8.6.1.36 CH2_CTRL3 Register (Address = 2Ch) [reset = 8h]

CH2_CTRL3 is shown in Figure 66 and described in Table 52.

Return to Summary Table.

Figure 66. CH2_CTRL3 Register

15	14	13	12	11	10	9	8
ch2_sync_delay					ch2_sync_en	RESERVED	ch2_mute_sel
R/W-0h					R/W-0h	R/W-0h	R/W-0h
7	6	5	4	3	2	1	0
ch2_mute	ch2_cmos_pol		ch2_outbuf_ctrl			ch2_mux	
R/W-0h	R/W-0h		R/W-2h			R/W-0h	

Table 52. CH2_CTRL3 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-11	ch2_sync_delay	R/W	0h	Sync Delay cycles of IOD Input Clock. One cycle is a period of the selected pre-scaler clock.
10	ch2_sync_en	R/W	0h	Enables SYNC for the channel. 0h = Disabled 1h = Enabled
9	RESERVED	R/W	0h	RESERVED.
8	ch2_mute_sel	R/W	0h	Mute selection for Output Channel. 0h = P=L N=H 1h = P=H N=L
7	ch2_mute	R/W	0h	To mute the output on this channel. 0h = Un-mutes the output. 1h = mutes the output.
6-5	ch2_cmos_pol	R/W	0h	programmability of output CMOS buffer polarity. 0h = P+ N+ 1h = P+ N– 2h = P– N+ 3h = P– N–
4-2	ch2_outbuf_ctrl	R/W	2h	Select the output buffer format. 0h = disabled 1h = LVDS(1) 2h = HCSL 3h = CML 4h = LVPECL 5h = CMOSPN 6h = CMOSP 7h = CMOSN
1-0	ch2_mux	R/W	0h	Output Clock Selection. 0h = CH1 1h = CH2 2h = CH3

(1) For DC-connection program *chx_lvds_cmtrim_inc* = 2 and *ch[4:1]_1p8vdet* in Table 67 and Table 66 accordingly.

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8.6.1.37 CH2_CTRL4 Register (Address = 2Dh) [reset = 71h]

CH2_CTRL4 is shown in Figure 67 and described in Table 53.

Return to Summary Table.

Figure 67. CH2_CTRL4 Register

15	14	13	12	11	10	9	8
RESERVED	RESERVED	RESERVED	RESERVED	RESERVED			RESERVED
R/W-0h	R/W-0h	R/W-0h	R/W-0h	R/W-0h			R/W-0h
7	6	5	4	3	2	1	0
RESERVED		RESERVED		RESERVED	RESERVED	RESERVED	ch2_glitchless_en
R/W-1h		R/W-3h		R/W-0h	R/W-0h	R/W-0h	R/W-1h

Table 53. CH2_CTRL4 Register Field Descriptions

Bit	Field	Type	Reset	Description
15-12	RESERVED	R/W	0h	RESERVED
11-8	RESERVED	R/W	0h	RESERVED
7-6	RESERVED	R/W	1h	RESERVED
5-4	RESERVED	R/W	3h	RESERVED
3-1	RESERVED	R/W	0h	RESERVED
0	ch2_glitchless_en	R/W	1h	Enables Glitchless switching for Output Channel. 0h = Immediate 1h = Glitchless

8.6.1.38 CH2_CTRL5 Register (Address = 2Eh) [reset = 8h]

CH2_CTRL5 is shown in Figure 68 and described in Table 54.

Return to Summary Table.

Figure 68. CH2_CTRL5 Register

15	14	13	12	11	10	9	8
RESERVED							
R/W-0h							
7	6	5	4	3	2	1	0
RESERVED				ch2_1p8vdet	RESERVED	RESERVED	RESERVED
R/W-0h				R/W-1h	R/W-0h	R/W-0h	R/W-0h

Table 54. CH2_CTRL5 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-4	RESERVED	R/W	0h	RESERVED.
3	ch2_1p8vdet	R/W	1h	Specify supply on the channel. 0h = 2.5 V or 3.3 V 1h = 1.8 V
2-0	RESERVED	R/W	0h	RESERVED

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8.6.1.39 CH3_CTRL0 Register (Address = 2Fh) [reset = 8000h]

CH3_CTRL0 is shown in Figure 69 and described in Table 55.

Return to Summary Table.

Figure 69. CH3_CTRL0 Register

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RESERVED															
R/WEX-8000h															

Table 55. CH3_CTRL0 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-0	RESERVED	R/WEX	8000h	RESERVED

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8.6.1.40 CH3_CTRL1 Register (Address = 30h) [reset = 0h]

CH3_CTRL1 is shown in Figure 70 and described in Table 56.

Return to Summary Table.

Figure 70. CH3_CTRL1 Register

15	14	13	12	11	10	9	8
RESERVED							RESERVED
R/W-0h							R/WEX-0h
7	6	5	4	3	2	1	0
RESERVED							
R/WEX-0h							

Table 56. CH3_CTRL1 Register Field Descriptions

Bit	Field	Type	Reset	Description
15-9	RESERVED	R/W	0h	RESERVED.
8-0	RESERVED	R/WEX	0h	RESERVED

8.6.1.41 CH3_CTRL2 Register (Address = 31h) [reset = 0h]

CH3_CTRL2 is shown in Figure 71 and described in Table 57.

Return to Summary Table.

Figure 71. CH3_CTRL2 Register

15	14	13	12	11	10	9	8
ch3_iod_mux		ch3_iod_div					
R/W-0h		R/WEX-0h					
7	6	5	4	3	2	1	0
ch3_iod_div							
R/WEX-0h							

Table 57. CH3_CTRL2 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-14	ch3_iod_mux	R/W	0h	Input Clock selection for IOD. 0h = PSA 1h = PSB 3h = REF
13-0	ch3_iod_div	R/WEX	0h	IOD Division Value. 0h = Powers Down, Output=Input/IOD_DIV

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8.6.1.42 CH3_CTRL3 Register (Address = 32h) [reset = 4h]

CH3_CTRL3 is shown in Figure 72 and described in Table 58.

Return to Summary Table.

Figure 72. CH3_CTRL3 Register

15	14	13	12	11	10	9	8
ch3_sync_delay					ch3_sync_en	RESERVED	ch3_mute_sel
R/W-0h					R/W-0h	R/W-0h	R/W-0h
7	6	5	4	3	2	1	0
ch3_mute	ch3_cmos_pol		ch3_outbuf_ctrl			ch3_mux	
R/W-0h	R/W-0h		R/W-1h			R/W-0h	

Table 58. CH3_CTRL3 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-11	ch3_sync_delay	R/W	0h	Sync Delay cycles of IOD Input Clock. One cycle is a period of the selected pre-scaler clock.
10	ch3_sync_en	R/W	0h	Enables SYNC for the channel. 0h = Disabled 1h = Enabled
9	RESERVED	R/W	0h	RESERVED.
8	ch3_mute_sel	R/W	0h	Mute selection for Output Channel. 0h = P=L N=H 1h = P=H N=L
7	ch3_mute	R/W	0h	To mute the output on this channel. 0h = Un-mutes the output. 1h = mutes the output.
6-5	ch3_cmos_pol	R/W	0h	programmability of output CMOS buffer polarity. 0h = P+ N+ 1h = P+ N– 2h = P– N+ 3h = P– N–
4-2	ch3_outbuf_ctrl	R/W	1h	Select the output buffer format. 0h = disabled 1h = LVDS(1) 2h = HCSL 3h = CML 4h = LVPECL 5h = CMOSPN 6h = CMOSP 7h = CMOSN
1-0	ch3_mux	R/W	0h	Output Clock Selection. 0h = CH2 1h = CH3 2h = CH4

(1) For DC-connection program *chx_lvds_cmtrim_inc* = 2 and *ch[4:1]_1p8vdet* in Table 67 and Table 66 accordingly.

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8.6.1.43 CH3_CTRL4 Register (Address = 33h) [reset = 671h]

CH3_CTRL4 is shown in Figure 73 and described in Table 59.

Return to Summary Table.

Figure 73. CH3_CTRL4 Register

15	14	13	12	11	10	9	8
RESERVED	RESERVED	RESERVED	RESERVED	RESERVED			RESERVED
R/W-0h	R/W-0h	R/W-0h	R/W-0h	R/W-3h			R/W-0h
7	6	5	4	3	2	1	0
RESERVED		RESERVED		RESERVED	RESERVED	RESERVED	ch3_glitchless_en
R/W-1h		R/W-3h		R/W-0h	R/W-0h	R/W-0h	R/W-1h

Table 59. CH3_CTRL4 Register Field Descriptions

Bit	Field	Type	Reset	Description
15-12	RESERVED	R/W	0h	RESERVED
11-9	RESERVED	R/W	3h	RESERVED
8	RESERVED	R/W	0h	RESERVED
7-6	RESERVED	R/W	1h	RESERVED
5-4	RESERVED	R/W	3h	RESERVED
3-1	RESERVED	R/W	0h	RESERVED
0	ch3_glitchless_en	R/W	1h	Enables Glitchless switching for Output Channel. 0h = Immediate 1h = Glitchless

8.6.1.44 CH3_CTRL5 Register (Address = 34h) [reset = 8h]

CH3_CTRL5 is shown in Figure 74 and described in Table 60.

Return to Summary Table.

Figure 74. CH3_CTRL5 Register

15	14	13	12	11	10	9	8
RESERVED							
R/W-0h							
7	6	5	4	3	2	1	0
RESERVED				ch3_1p8vdet	RESERVED	RESERVED	RESERVED
R/W-0h				R/W-1h	R/W-0h	R/W-0h	R/W-0h

Table 60. CH3_CTRL5 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-4	RESERVED	R/W	0h	RESERVED.
3	ch3_1p8vdet	R/W	1h	Specify supply on the channel. 0h = 2.5 V or 3.3 V 1h = 1.8 V
2-0	RESERVED	R/W	0h	RESERVED

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8.6.1.45 CH4_CTRL0 Register (Address = 35h) [reset = 8000h]

CH4_CTRL0 is shown in Figure 75 and described in Table 61.

Return to Summary Table.

Figure 75. CH4_CTRL0 Register

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RESERVED															
R/WEX-8000h															

Table 61. CH4_CTRL0 Register Field Descriptions

Bit	Field	Type	Reset	Description
15-0	RESERVED	R/WEX	8000h	RESERVED

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8.6.1.46 CH4_CTRL1 Register (Address = 36h) [reset = 0h]

CH4_CTRL1 is shown in and described in .

Return to Summary Table.

Figure 76. CH4_CTRL1 Register

15	14	13	12	11	10	9	8
RESERVED							RESERVED
R/W-0h							R/WEX-0h
7	6	5	4	3	2	1	0
RESERVED							
R/WEX-0h							

Table 62. CH4_CTRL1 Register Field Descriptions

Bit	Field	Type	Reset	Description
15-9	RESERVED	R/W	0h	RESERVED.
8-0	RESERVED	R/WEX	0h	RESERVED

8.6.1.47 CH4_CTRL2 Register (Address = 37h) [reset = 0h]

CH4_CTRL2 is shown in Figure 77 and described in Table 63.

Return to Summary Table.

Figure 77. CH4_CTRL2 Register

15	14	13	12	11	10	9	8
ch4_iod_mux		ch4_iod_div					
R/W-0h		R/WEX-0h					
7	6	5	4	3	2	1	0
ch4_iod_div							
R/WEX-0h							

Table 63. CH4_CTRL2 Register Field Descriptions

Bit	Field	Type	Reset	Description
15-14	ch4_iod_mux	R/W	0h	Input Clock selection for IOD. 0h = PSA 1h = PSB 3h = REF
13-0	ch4_iod_div	R/WEX	0h	IOD Division Value. 0h = Powers Down, Output=Input/IOD_DIV.

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8.6.1.48 CH4_CTRL3 Register (Address = 38h) [reset = 4h]

CH4_CTRL3 is shown in Figure 78 and described in Table 64.

Return to Summary Table.

Figure 78. CH4_CTRL3 Register

15	14	13	12	11	10	9	8
ch4_sync_delay					ch4_sync_en	RESERVED	ch4_mute_sel
R/W-0h					R/W-0h	R/W-0h	R/W-0h
7	6	5	4	3	2	1	0
ch4_mute	ch4_cmos_pol		ch4_outbuf_ctrl			ch4_mux	
R/W-0h	R/W-0h		R/W-1h			R/W-0h	

Table 64. CH4_CTRL3 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-11	ch4_sync_delay	R/W	0h	Sync Delay cycles of IOD Input Clock. One cycle is a period of the selected pre-scaler clock.
10	ch4_sync_en	R/W	0h	Enables SYNC for the channel. 0h = Disabled 1h = Enabled
9	RESERVED	R/W	0h	RESERVED.
8	ch4_mute_sel	R/W	0h	Mute selection for Output Channel. 0h = P=L N=H 1h = P=H N=L
7	ch4_mute	R/W	0h	To mute the output on this channel. 0h = Un-mutes the output. 1h = mutes the output.
4-2	ch4_outbuf_ctrl	R/W	1h	Select the output buffer format. 0h = disabled 1h = LVDS(1) 2h = HCSL 3h = CML 4h = LVPECL
1-0	ch4_mux	R/W	0h	Output Clock Selection. 0h = Previous Channel, 1h = Current Channel, 2h = Next Channel, 3h = AGND 0h = CH3 1h = CH4

(1) For DC-connection program *chx_lvds_cmtrim_inc* = 2 and *ch[4:1]_1p8vdet* in Table 67 and Table 66 accordingly.

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8.6.1.49 CH4_CTRL4 Register (Address = 39h) [reset = 71h]

CH4_CTRL4 is shown in Figure 79 and described in Table 65.

Return to Summary Table.

Figure 79. CH4_CTRL4 Register

15	14	13	12	11	10	9	8
RESERVED	RESERVED	RESERVED	RESERVED	RESERVED			RESERVED
R/W-0h	R/W-0h	R/W-0h	R/W-0h	R/W-0h			R/W-0h
7	6	5	4	3	2	1	0
RESERVED		RESERVED		RESERVED	RESERVED	RESERVED	ch4_glitchless_en
R/W-1h		R/W-3h		R/W-0h	R/W-0h	R/W-0h	R/W-1h

Table 65. CH4_CTRL4 Register Field Descriptions

Bit	Field	Type	Reset	Description
15-12	RESERVED	R/W	0h	RESERVED
11-8	RESERVED	R/W	0h	RESERVED
7-6	RESERVED	R/W	1h	RESERVED
5-4	RESERVED	R/W	3h	RESERVED
3-1	RESERVED	R/W	0h	RESERVED
0	ch4_glitchless_en	R/W	1h	Enables Glitchless switching for Output Channel. 0h = Immediate 1h = Glitchless

8.6.1.50 CH4_CTRL5 Register (Address = 3Ah) [reset = 8h]

CH4_CTRL5 is shown in Figure 80 and described in Table 66.

Return to Summary Table.

Figure 80. CH4_CTRL5 Register

15	14	13	12	11	10	9	8
RESERVED							
R/W-0h							
7	6	5	4	3	2	1	0
RESERVED				ch4_1p8vdet	RESERVED	RESERVED	RESERVED
R/W-0h				R/W-1h	R/W-0h	R/W-0h	R/W-0h

Table 66. CH4_CTRL5 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-4	RESERVED	R/W	0h	RESERVED.
3	ch4_1p8vdet	R/W	1h	Specify supply on the channel. 0h = 2.5 V or 3.3 V 1h = 1.8 V
2-0	RESERVED	R/W	0h	RESERVED

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8.6.1.51 CHX_CTRL0 Register (Address = 3Bh) [reset = 61h]

CHX_CTRL0 is shown in Figure 81 and described in Table 67.

Return to Summary Table.

Figure 81. CHX_CTRL0 Register

15	14	13	12	11	10	9	8
RESERVED	RESERVED	chx_rst	chx_lvds_cmtrim_inc		chx_lvds_cmtrim_dec		chx_diffbuf_ibias_trim
R/W-0h	R/W-0h	R/W-0h	R/W-0h		R/W-0h		R/W-3h
7	6	5	4	3	2	1	0
chx_diffbuf_ibias_trim			chx_lvcmos_drv	RESERVED	ch0_lvcmos_drv		RESERVED
R/W-3h			R/W-1h	R/W-0h	R/W-0h		R/W-1h

Table 67. CHX_CTRL0 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-14	RESERVED	R/W	0h	RESERVED
13	chx_rst	R/W	0h	All Channel RST during power up and later. 1h = RST, 0h = Normal.
12-11	chx_lvds_cmtrim_inc	R/W	0h	Increments differential output buffer output common-mode programmability. Use either CHX_LVDS_CMTRIM_INC or CHX_LVDS_CMTRIM_DEC.
10-9	chx_lvds_cmtrim_dec	R/W	0h	Decrements differential output buffer output common-mode programmability. Increment Use either CHX_LVDS_CMTRIM_INC or CHX_LVDS_CMTRIM_DEC.
8-5	chx_diffbuf_ibias_trim	R/W	3h	Differential output buffer tail current programmability. Ch = 350 µA 8h = 400 µA 4h = 450 µA 0h = 500 µA 0h = 500 µA 1h = 550 µA 2h = 600 µA 3h = 650 µA
4	chx_lvcmos_drv	R/W	1h	Adjust CH1 to CH4 LVCMOS driver strength. 0h = Normal 1h = Fast
3	RESERVED	R/W	1h	RESERVED
2-1	ch0_lvcmos_drv	R/W	0h	Enable Y0 channel and adjust LVCMOS driver strength. 0h = Off 1h = Normal 3h = Fast
0	RESERVED	R/W	1h	RESERVED

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8.6.1.52 CHX_CTRL1 Register (Address = 3Ch) [reset = 18h]

CHX_CTRL1 is shown in Figure 82 and described in Table 68.

Return to Summary Table.

Figure 82. CHX_CTRL1 Register

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RESERVED															
R/W-18h															

Table 68. CHX_CTRL1 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-0	RESERVED	R/W	18h	RESERVED

8.6.1.53 CHX_CTRL2 Register (Address = 3Dh) [reset = 1500h]

CHX_CTRL2 is shown in Figure 83 and described in Table 69.

Return to Summary Table.

Figure 83. CHX_CTRL2 Register

15	14	13	12	11	10	9	8
RESERVED		RESERVED	RESERVED				
R/W-0h		R/W-0h	R/W-15h				
7	6	5	4	3	2	1	0
RESERVED	RESERVED	RESERVED	RESERVED	RESERVED			
R/W-0h	R/W-0h	R/W-0h	R/W-0h	R/W-0h			

Table 69. CHX_CTRL2 Register Field Descriptions

Bit	Field	Type	Reset	Description
15-13	RESERVED	R/W	0h	RESERVED
12-8	RESERVED	R/W	15h	RESERVED
7-0	RESERVED	R/W	0h	RESERVED

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8.6.1.54 CHX_CTRL3 Register (Address = 3Eh) [reset = 4210h]

CHX_CTRL3 is shown in and described in Table 70.

Return to Summary Table.

Figure 84. CHX_CTRL3 Register

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RESERVED															
R/W-4210h															

Table 70. CHX_CTRL3 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-0	RESERVED	R/W	4210h	RESERVED

8.6.1.55 CHX_CTRL4 Register (Address = 3Fh) [reset = 210h]

CHX_CTRL4 is shown in Figure 85 and described in Table 71.

Return to Summary Table.

Figure 85. CHX_CTRL4 Register

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RESERVED															
R/W-210h															

Table 71. CHX_CTRL4 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-0	RESERVED	R/W	210h	RESERVED

8.6.1.56 DBG0 Register (Address = 42h) [reset = 200h]

DBG0 is shown in and described in Table 72.

Return to Summary Table.

Figure 86. DBG0 Register

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
RESERVED															
R/W-200h															

Table 72. DBG0 Register Field Descriptions

BIT	FIELD	TYPE	RESET	DESCRIPTION
15-0	RESERVED	R/W	200h	RESERVED

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8.6.2 EEPROM Map

The EEPROM is split into a common base page which holds common settings. Then there are two pages for customized settings. Page 0 is selected using EEPROMSEL = Low. Page 1 is selected using EEPROMSEL = High.

The CRC value is stored at the end of page 1 in word 0x3F.

Table 73. EEPROM, Base

WORD NO.	SECTION	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0h	Base	cp_dly[0]	cal_mute	shift_left[1]	shift_left[0]	gpio3_gf_en	gpio2_gf_en	acal_en	pdn_pll_vcobuf2	pdn_pll_vco	pdn_pll_vcobuf	pdn_pll_cp	pdn_pll_lockdet	pdn_pll_pfd	pdn_pll_psfb	regcommit_page	resetn_soft
1h	Base	ac_cmp_dly[0]	pll_lock_dly[4]	pll_lock_dly[3]	pll_lock_dly[2]	pll_lock_dly[1]	pll_lock_dly[0]	ac_init_dly[5]	ac_init_dly[4]	ac_init_dly[3]	ac_init_dly[2]	ac_init_dly[1]	ac_init_dly[0]	cp_dly[4]	cp_dly[3]	cp_dly[2]	cp_dly[1]
2h	Base	0	0	0	0	0	0	err_cnt[2]	err_cnt[1]	err_cnt[0]	fc_setl_dly[1]	fc_setl_dly[0]	ac_cmp_dly[5]	ac_cmp_dly[4]	ac_cmp_dly[3]	ac_cmp_dly[2]	ac_cmp_dly[1]
3h	Base	pll_pfd_dly_ctrl[1]	pll_pfd_dly_ctrl[0]	pll_lockdet_window[2]	pll_lockdet_window[1]	pll_lockdet_window[0]	pll_lockdet_wait[1]	pll_lockdet_wait[0]	0	0	0	0	0	0	0	0	0
4h	Base	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
5h	Base	chx_diffbuf_ibias_trim[1]	chx_diffbuf_ibias_trim[0]	chx_lvcmos_drv	chx_en_cmosslow	0	0	0	1	0	0	0	0	0	1	0	0
6h	Base	0	0	0	0	1	1	0	0	0	0	chx_lvds_cmtrim_inc[1]	chx_lvds_cmtrim_inc[0]	chx_lvds_cmtrim_dec[1]	chx_lvds_cmtrim_dec[0]	chx_diffbuf_ibias_trim[3]	chx_diffbuf_ibias_trim[2]
7h	Base	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
8h	Base	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	1
9h	Base	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1
Ah	Base	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
Bh	Base	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Table 74. EEPROM, Page 0

WORD NO.	SECTION	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Ch	Page 0	gpio4_input_sel[3]	gpio4_input_sel[2]	gpio4_input_sel[1]	gpio4_input_sel[0]	gpio1_input_sel[3]	gpio1_input_sel[2]	gpio1_input_sel[1]	gpio1_input_sel[0]	i2c_a0	gpio0_input_sel	gpio4_dir_sel	gpio1_dir_sel	gpio0_dir_sel	zdm_clocksel	zdm_mode	mode
Dh	Page 0	gpio4_output_sel[3]	gpio4_output_sel[2]	gpio4_output_sel[1]	gpio4_output_sel[0]	gpio1_output_sel[3]	gpio1_output_sel[2]	gpio1_output_sel[1]	gpio1_output_sel[0]	0	1	1	0	1	0	ref_mux_src	ref_mux
Eh	Page 0	1	pdn_ch4	1	pdn_ch3	1	pdn_ch2	1	pdn_ch1	1	0	rsrvd_1[1]	rsrvd_1[0]	gpio0_output_sel[3]	gpio0_output_sel[2]	gpio0_output_sel[1]	gpio0_output_sel[0]
Fh	Page 0	ip_xo_cload[2]	ip_xo_cload[1]	ip_xo_cload[0]	0	0	ip_xo_gm[3]	ip_xo_gm[2]	ip_xo_gm[1]	ip_xo_gm[0]	xin_inbuf_ctrl[1]	xin_inbuf_ctrl[0]	zdm_auto	bypass_cal	bypass_config	pdn_pll_psb	pdn_pll_psa
10h	Page 0	ip_byp_en_ch3	ip_byp_en_ch2	ip_byp_en_ch1	ip_byp_en_y0	ip_byp_mux	ip_rdiv[7]	ip_rdiv[6]	ip_rdiv[5]	ip_rdiv[4]	ip_rdiv[3]	ip_rdiv[2]	ip_rdiv[1]	ip_rdiv[0]	ref_inbuf_ctrl	ip_xo_cload[4]	ip_xo_cload[3]
11h	Page 0	pll_ndiv[13]	pll_ndiv[12]	pll_ndiv[11]	pll_ndiv[10]	pll_ndiv[9]	pll_ndiv[8]	pll_ndiv[7]	pll_ndiv[6]	pll_ndiv[5]	pll_ndiv[4]	pll_ndiv[3]	pll_ndiv[2]	pll_ndiv[1]	pll_ndiv[0]	0	ip_byp_en_ch4
12h	Page 0	pll_cp_up[3]	pll_cp_up[2]	pll_cp_up[1]	pll_cp_up[0]	pll_cp_dn[5]	pll_cp_dn[4]	pll_cp_dn[3]	pll_cp_dn[2]	pll_cp_dn[1]	pll_cp_dn[0]	pll_psb[1]	pll_psb[0]	pll_psa[1]	pll_psa[0]	pll_psfb[1]	pll_psfb[0]
13h	Page 0	pll_lf_zcap[4]	pll_lf_zcap[3]	pll_lf_zcap[2]	pll_lf_zcap[1]	pll_lf_zcap[0]	pll_lf_res[3]	pll_lf_res[2]	pll_lf_res[1]	pll_lf_res[0]	pll_lf_pcap[4]	pll_lf_pcap[3]	pll_lf_pcap[2]	pll_lf_pcap[1]	pll_lf_pcap[0]	pll_cp_up[5]	pll_cp_up[4]
14h	Page 0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15h	Page 0	ch1_iod_div[6]	ch1_iod_div[5]	ch1_iod_div[4]	ch1_iod_div[3]	ch1_iod_div[2]	ch1_iod_div[1]	ch1_iod_div[0]	0	0	0	0	0	0	0	0	0
16h	Page 0	0	0	ch1_outbuf_ctrl[2]	ch1_outbuf_ctrl[1]	ch1_outbuf_ctrl[0]	ch1_mux[1]	ch1_mux[0]	ch1_iod_mux[1]	ch1_iod_mux[0]	ch1_iod_div[13]	ch1_iod_div[12]	ch1_iod_div[11]	ch1_iod_div[10]	ch1_iod_div[9]	ch1_iod_div[8]	ch1_iod_div[7]
17h	Page 0	0	0	1	0	1	0	0	ch1_glitchless_en	ch1_sync_delay[4]	ch1_sync_delay[3]	ch1_sync_delay[2]	ch1_sync_delay[1]	ch1_sync_delay[0]	ch1_sync_en	ch1_mute_sel	ch1_mute
18h	Page 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	ch1_1p8vdet	0
19h	Page 0	ch2_iod_div[4]	ch2_iod_div[3]	ch2_iod_div[2]	ch2_iod_div[1]	ch2_iod_div[0]	0	0	0	0	0	0	0	0	0	1	0
1Ah	Page 0	ch2_outbuf_ctrl[2]	ch2_outbuf_ctrl[1]	ch2_outbuf_ctrl[0]	ch2_mux[1]	ch2_mux[0]	ch2_iod_mux[1]	ch2_iod_mux[0]	ch2_iod_div[13]	ch2_iod_div[12]	ch2_iod_div[11]	ch2_iod_div[10]	ch2_iod_div[9]	ch2_iod_div[8]	ch2_iod_div[7]	ch2_iod_div[6]	ch2_iod_div[5]
1Bh	Page 0	1	0	1	0	0	ch2_glitchless_en	ch2_sync_delay[4]	ch2_sync_delay[3]	ch2_sync_delay[2]	ch2_sync_delay[1]	ch2_sync_delay[0]	ch2_sync_en	ch2_mute_sel	ch2_mute	ch2_cmos_pol[1]	ch2_cmos_pol[0]
1Ch	Page 0	0	0	0	0	0	0	0	0	0	0	0	0	ch2_1p8vdet	0	0	0
1Dh	Page 0	ch3_iod_div[2]	ch3_iod_div[1]	ch3_iod_div[0]	0	0	0	0	0	0	0	0	0	1	0	0	0
1Eh	Page 0	ch3_outbuf_ctrl[0]	ch3_mux[1]	ch3_mux[0]	ch3_iod_mux[1]	ch3_iod_mux[0]	ch3_iod_div[13]	ch3_iod_div[12]	ch3_iod_div[11]	ch3_iod_div[10]	ch3_iod_div[9]	ch3_iod_div[8]	ch3_iod_div[7]	ch3_iod_div[6]	ch3_iod_div[5]	ch3_iod_div[4]	ch3_iod_div[3]
1Fh	Page 0	0	0	0	ch3_glitchless_en	ch3_sync_delay[4]	ch3_sync_delay[3]	ch3_sync_delay[2]	ch3_sync_delay[1]	ch3_sync_delay[0]	ch3_sync_en	ch3_mute_sel	ch3_mute	ch3_cmos_pol[1]	ch3_cmos_pol[0]	ch3_outbuf_ctrl[2]	ch3_outbuf_ctrl[1]
20h	Page 0	0	0	0	0	0	0	0	0	0	0	ch3_1p8vdet	1	0	0	1	0
21h	Page 0	ch4_iod_div[0]	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0

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Table 74. EEPROM, Page 0 (continued)

WORD NO.	SECTION	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
22h	Page 0	ch4_mux[0]	ch4_iod_mux[1]	ch4_iod_mux[0]	ch4_iod_div[13]	ch4_iod_div[12]	ch4_iod_div[11]	ch4_iod_div[10]	ch4_iod_div[9]	ch4_iod_div[8]	ch4_iod_div[7]	ch4_iod_div[6]	ch4_iod_div[5]	ch4_iod_div[4]	ch4_iod_div[3]	ch4_iod_div[2]	ch4_iod_div[1]
23h	Page 0	0	ch4_glitchless_en	ch4_sync_delay[4]	ch4_sync_delay[3]	ch4_sync_delay[2]	ch4_sync_delay[1]	ch4_sync_delay[0]	ch4_sync_en	ch4_mute_sel	ch4_mute	0	0	ch4_outbuf_ctrl[2]	ch4_outbuf_ctrl[1]	ch4_outbuf_ctrl[0]	ch4_mux[1]
24h	Page 0	0	0	1	1	pll_en_cp	ch0_lvcmos_drv[1]	ch0_lvcmos_drv[0]	1	ch4_1p8vdet	1	0	0	1	0	1	0
25h	Page 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Table 75. EEPROM, Page 1

WORD NO.	SECTION	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
26h	Page 1	gpio4_input_sel[3]	gpio4_input_sel[2]	gpio4_input_sel[1]	gpio4_input_sel[0]	gpio1_input_sel[3]	gpio1_input_sel[2]	gpio1_input_sel[1]	gpio1_input_sel[0]	i2c_a0	gpio0_input_sel	gpio4_dir_sel	gpio1_dir_sel	gpio0_dir_sel	zdm_clocksel	zdm_mode	mode
27h	Page 1	gpio4_output_sel[3]	gpio4_output_sel[2]	gpio4_output_sel[1]	gpio4_output_sel[0]	gpio1_output_sel[3]	gpio1_output_sel[2]	gpio1_output_sel[1]	gpio1_output_sel[0]	0	1	1	0	1	0	ref_mux_src	ref_mux
28h	Page 1	1	pdn_ch4	1	pdn_ch3	1	pdn_ch2	1	pdn_ch1	1	0	rsrvd_1[1]	rsrvd_1[0]	gpio0_output_sel[3]	gpio0_output_sel[2]	gpio0_output_sel[1]	gpio0_output_sel[0]
29h	Page 1	ip_xo_cload[2]	ip_xo_cload[1]	ip_xo_cload[0]	0	0	ip_xo_gm[3]	ip_xo_gm[2]	ip_xo_gm[1]	ip_xo_gm[0]	xin_inbuf_ctrl[1]	xin_inbuf_ctrl[0]	zdm_auto	bypass_cal	bypass_config	pdn_pll_psb	pdn_pll_psa
2Ah	Page 1	ip_byp_en_ch3	ip_byp_en_ch2	ip_byp_en_ch1	ip_byp_en_y0	ip_byp_mux	ip_rdiv[7]	ip_rdiv[6]	ip_rdiv[5]	ip_rdiv[4]	ip_rdiv[3]	ip_rdiv[2]	ip_rdiv[1]	ip_rdiv[0]	ref_inbuf_ctrl	ip_xo_cload[4]	ip_xo_cload[3]
2Bh	Page 1	pll_ndiv[13]	pll_ndiv[12]	pll_ndiv[11]	pll_ndiv[10]	pll_ndiv[9]	pll_ndiv[8]	pll_ndiv[7]	pll_ndiv[6]	pll_ndiv[5]	pll_ndiv[4]	pll_ndiv[3]	pll_ndiv[2]	pll_ndiv[1]	pll_ndiv[0]	0	ip_byp_en_ch4
2Ch	Page 1	pll_cp_up[3]	pll_cp_up[2]	pll_cp_up[1]	pll_cp_up[0]	pll_cp_dn[5]	pll_cp_dn[4]	pll_cp_dn[3]	pll_cp_dn[2]	pll_cp_dn[1]	pll_cp_dn[0]	pll_psb[1]	pll_psb[0]	pll_psa[1]	pll_psa[0]	pll_psfb[1]	pll_psfb[0]
2Dh	Page 1	pll_lf_zcap[4]	pll_lf_zcap[3]	pll_lf_zcap[2]	pll_lf_zcap[1]	pll_lf_zcap[0]	pll_lf_res[3]	pll_lf_res[2]	pll_lf_res[1]	pll_lf_res[0]	pll_lf_pcap[4]	pll_lf_pcap[3]	pll_lf_pcap[2]	pll_lf_pcap[1]	pll_lf_pcap[0]	pll_cp_up[5]	pll_cp_up[4]
2Eh	Page 1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2Fh	Page 1	ch1_iod_div[6]	ch1_iod_div[5]	ch1_iod_div[4]	ch1_iod_div[3]	ch1_iod_div[2]	ch1_iod_div[1]	ch1_iod_div[0]	0	0	0	0	0	0	0	0	0
30h	Page 1	0	0	ch1_outbuf_ctrl[2]	ch1_outbuf_ctrl[1]	ch1_outbuf_ctrl[0]	ch1_mux[1]	ch1_mux[0]	ch1_iod_mux[1]	ch1_iod_mux[0]	ch1_iod_div[13]	ch1_iod_div[12]	ch1_iod_div[11]	ch1_iod_div[10]	ch1_iod_div[9]	ch1_iod_div[8]	ch1_iod_div[7]
31h	Page 1	0	0	1	0	1	0	0	ch1_glitchless_en	ch1_sync_delay[4]	ch1_sync_delay[3]	ch1_sync_delay[2]	ch1_sync_delay[1]	ch1_sync_delay[0]	ch1_sync_en	ch1_mute_sel	ch1_mute
32h	Page 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	ch1_1p8vdet	0
33h	Page 1	ch2_iod_div[4]	ch2_iod_div[3]	ch2_iod_div[2]	ch2_iod_div[1]	ch2_iod_div[0]	0	0	0	0	0	0	0	0	0	1	0
34h	Page 1	ch2_outbuf_ctrl[2]	ch2_outbuf_ctrl[1]	ch2_outbuf_ctrl[0]	ch2_mux[1]	ch2_mux[0]	ch2_iod_mux[1]	ch2_iod_mux[0]	ch2_iod_div[13]	ch2_iod_div[12]	ch2_iod_div[11]	ch2_iod_div[10]	ch2_iod_div[9]	ch2_iod_div[8]	ch2_iod_div[7]	ch2_iod_div[6]	ch2_iod_div[5]
35h	Page 1	1	0	1	0	0	ch2_glitchless_en	ch2_sync_delay[4]	ch2_sync_delay[3]	ch2_sync_delay[2]	ch2_sync_delay[1]	ch2_sync_delay[0]	ch2_sync_en	ch2_mute_sel	ch2_mute	ch2_cmos_pol[1]	ch2_cmos_pol[0]
36h	Page 1	0	0	0	0	0	0	0	0	0	0	0	0	ch2_1p8vdet	0	0	0
37h	Page 1	ch3_iod_div[2]	ch3_iod_div[1]	ch3_iod_div[0]	0	0	0	0	0	0	0	0	0	1	0	0	0
38h	Page 1	ch3_outbuf_ctrl[0]	ch3_mux[1]	ch3_mux[0]	ch3_iod_mux[1]	ch3_iod_mux[0]	ch3_iod_div[13]	ch3_iod_div[12]	ch3_iod_div[11]	ch3_iod_div[10]	ch3_iod_div[9]	ch3_iod_div[8]	ch3_iod_div[7]	ch3_iod_div[6]	ch3_iod_div[5]	ch3_iod_div[4]	ch3_iod_div[3]
39h	Page 1	0	0	0	ch3_glitchless_en	ch3_sync_delay[4]	ch3_sync_delay[3]	ch3_sync_delay[2]	ch3_sync_delay[1]	ch3_sync_delay[0]	ch3_sync_en	ch3_mute_sel	ch3_mute	ch3_cmos_pol[1]	ch3_cmos_pol[0]	ch3_outbuf_ctrl[2]	ch3_outbuf_ctrl[1]
3Ah	Page 1	0	0	0	0	0	0	0	0	0	0	ch3_1p8vdet	1	0	0	1	1
3Bh	Page 1	ch4_iod_div[0]	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0

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Table 75. EEPROM, Page 1 (continued)

WORD NO.	SECTION	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
3Ch	Page 1	ch4_mux[0]	ch4_iod_mux[1]	ch4_iod_mux[0]	ch4_iod_div[13]	ch4_iod_div[12]	ch4_iod_div[11]	ch4_iod_div[10]	ch4_iod_div[9]	ch4_iod_div[8]	ch4_iod_div[7]	ch4_iod_div[6]	ch4_iod_div[5]	ch4_iod_div[4]	ch4_iod_div[3]	ch4_iod_div[2]	ch4_iod_div[1]
3Dh	Page 1	0	ch4_glitchless_en	ch4_sync_delay[4]	ch4_sync_delay[3]	ch4_sync_delay[2]	ch4_sync_delay[1]	ch4_sync_delay[0]	ch4_sync_en	ch4_mute_sel	ch4_mute	0	0	ch4_outbuf_ctrl[2]	ch4_outbuf_ctrl[1]	ch4_outbuf_ctrl[0]	ch4_mux[1]
3Eh	Page 1	0	0	1	1	pll_en_cp	ch0_lvcmos_drv[1]	ch0_lvcmos_drv[0]	1	ch4_1p8vdet	1	0	0	1	0	1	0
3Fh	Page 1	1	1	0	0	1	0	0	1	0	1	1	0	0	1	0	0

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9 Application and Implementation

NOTE

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

9.1 Application Information

An ultra-low power clock generator is ideal to drive clocks in industrial, portable and data center applications. The device is flexible in its configuration and be pre-preprogramed with two separate configuration. For example a production test and an application configuration, or two different configurations for two flavors of a product. The internal EEPROM is protected by a CRC hash which is available as a status bit. The two EEPROM pages are selected using a control pin. As each major block of the device is powered by its own supply pin, the device can easily be used for signal translation and to accommodate various supply voltages which may be available in a system. Up to five different frequencies can be generated from a single device and feed different parts of an application. Each of the four differential outputs supports various signal standards. On one hand the general purpose pin functionality allows to provide status information to other parts of the system, on the other hand it adds modularity and flexibility to an application. Clock outputs can be muted individually or globally, the division ratio updated, the output dividers synchronized and a spread spectrum function enabled or disabled. The clock generator PLL can also be used in a zero delay mode which will compensate most of the seen phase delay between an external reference clock and the output clocks. Together with an external feedback option this allows to compensate traces on top of the digital delay steps provided inside the device. All these features make the ultra-low power clock generator for design library integration and re-use in modular projects.

9.2 Typical Applications

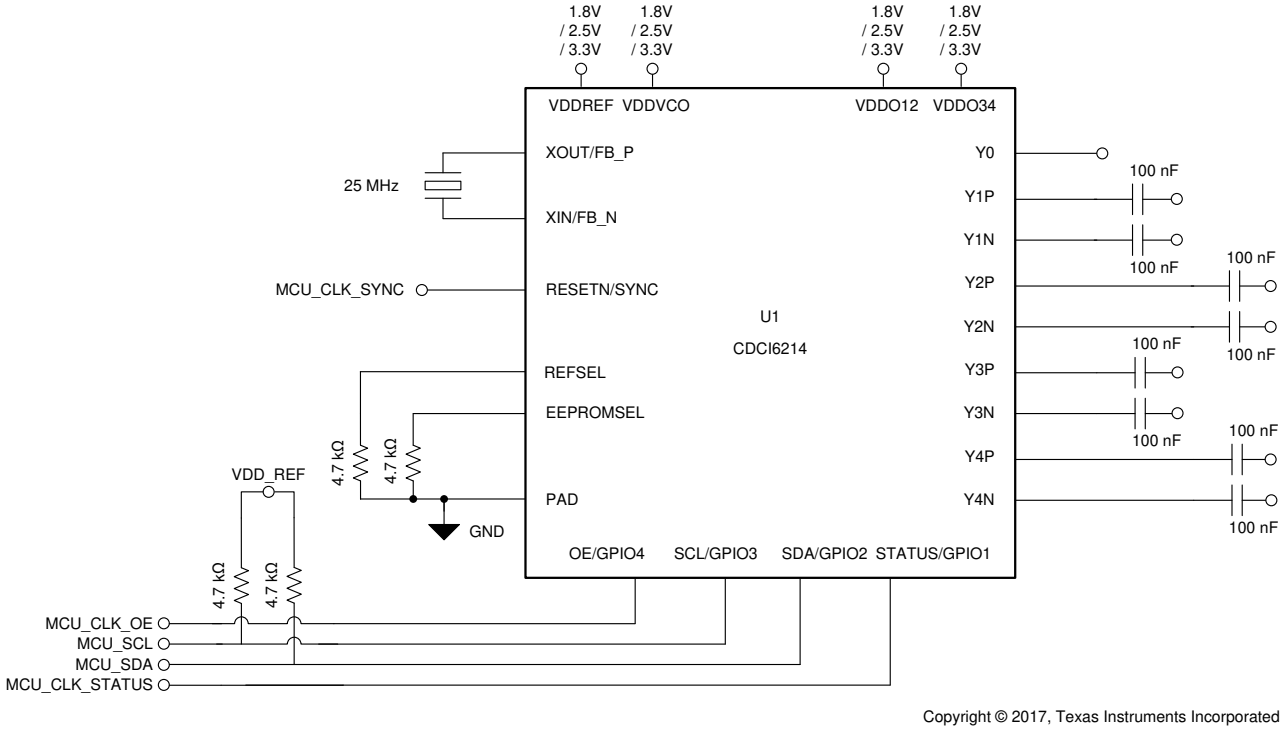

Figure 87. Typical *Serial Interface* Application Schematic

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Typical Applications (continued)

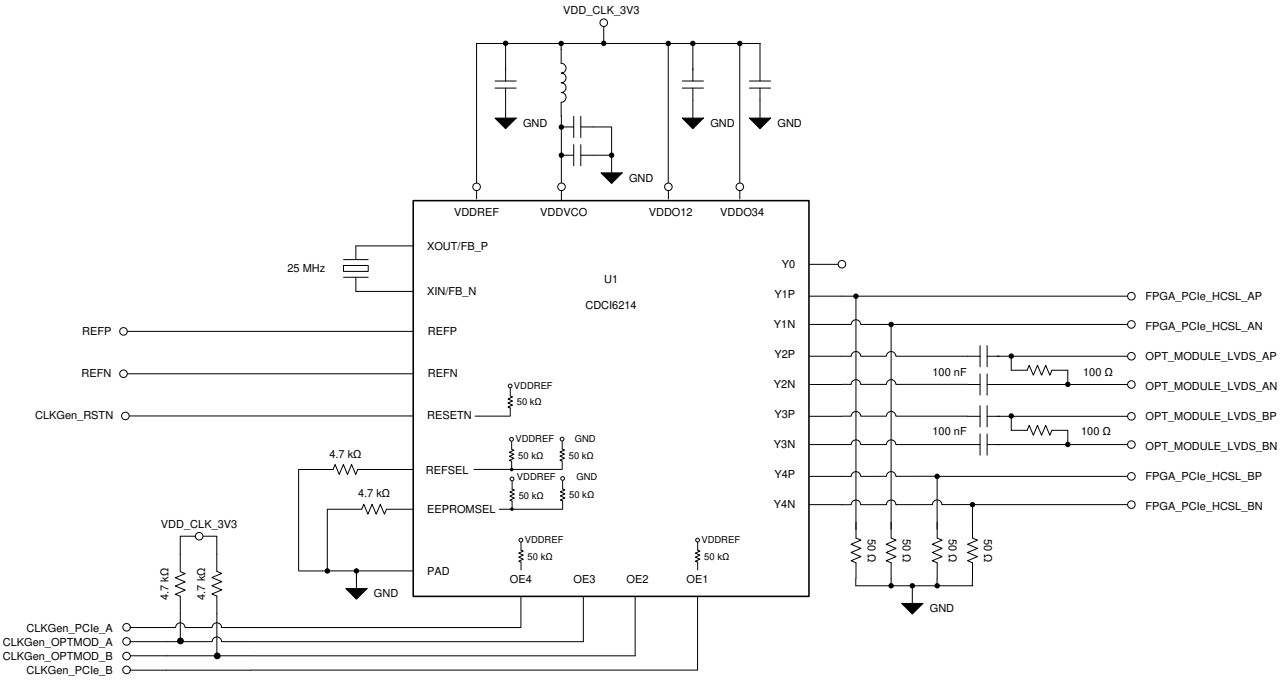

Figure 88. Typical *Individual Output Enable* Application Schematic

9.2.1 Design Requirements

For this example, the design parameters are listed in Table 76

Table 76. Design Parameters

PARAMETER	EXAMPLE VALUE
t_{VDD}	Larger than 50 µs and smaller than 3 ms
t_{PWL_SYNC}	Larger than (1 / f_{XIN})
f_{XIN}	Crystal 8 MHz to 50 MHz
dV_{IN} /dT	Input slew rate for external clock reference better than 3 V / ns

9.2.2 Detailed Design Procedure

For this application, TI recommends the following steps:

1. Decide how the device shall receive the register settings to plan for in-system programming of the EEPROM.
2. Choose which operation mode to use on the device (I^2C or GPIOs) and which pins are inputs and which are outputs (see registers GENERIC0, GENERIC1, and GENERIC2).
3. Consider that the serial interface and the GPIOs are supplied by VDDREF as well as the input pins (for example, a 3.3-V crystal oscillator (XO) driving XIN forces uses 3.3-V I^2C).
4. Keep track of which voltage levels the output supplies will have. There are configuration bits in the output channels (see CH1_CTRL5, CH2_CTRL5, CH3_CTRL5, and CH4_CTRL5).
5. Consider which output frequency has the most stringent phase noise specifications. Select this frequency to decide on the reference and VCO frequency.
6. Cross-check if your specific bandwidth requirement for an external reference can be achieved using the internal loop filter components (see registers PLL1 and PLL2).
7. Optimize the clock distribution using output muxes to run the least amount of blocks to conserve power,

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8. For HCSL output buffer format, optimize the signal integrity and slew rate at the receiver input using a series resistor between device pin and the 50 Ω termination to GND.Y1,Y4 provide higher slew rates compared to Y2,Y3.

Use Equation 1 through Equation 4 to calculate the a basic frequency plan or use the provided software TICS Pro to generate settings.

NOTE

The user has to ensure PLL stability is given by applying the adequate loop filter and charge pump settings. A phase margin of ≥ 68º is recommended. The target bandwidth is recommended between 600 kHz .. 1100 kHz.

$$f_{Y0} = f_{XIN} = f_{REF} \quad (1)$$

$$f_{PFD} = f_{REF} / ip_ref_div$$

where

- ip_ref_div ≥ 1
- 1 MHz <= f_{PFD} <= 100 MHz (2)

$$f_{VCO} = f_{PFD} \cdot pll_nc \cdot (pll_ps + 4)$$

with

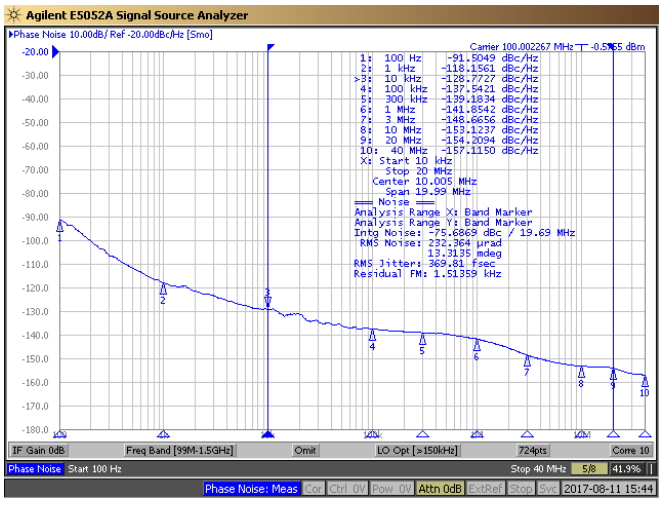
- 2400 <= f_{VCO} <= 2800
- 0 <= pll_ps <= 2 (3)

$$f_{Y[4:1]} = f_{VCO} / ((pll_ps[ab] + 4) \cdot ch[4:1]_iod_div)$$

with

- 0 <= pll_ps[ab] <= 2
- 1 <= ch[4:1]_iod_div <= 16383
- 44.1 kHz <= $f_{Y[4:1]}$ <= 350 MHz (4)

9.2.3 Application Curves

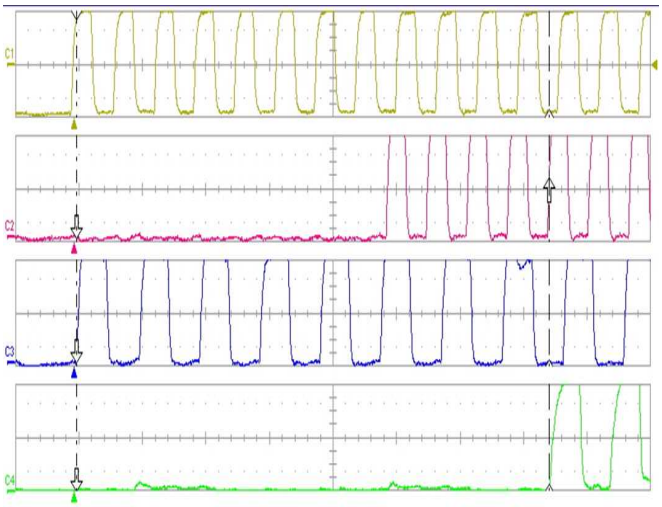


Reference 25 MHz crystal with Doubler to VCO 2.4 GHz

HCSL output with 50 Ω onboard termination to balun into 5052A Signal Source Analyzer

Integrated RMS Jitter from 10 kHz to 40 MHz 370 fs at 3.3 V, room temperature

Figure 89. Typical Phase Noise Y1, HCSL, 3.3 V



PSA=4, PSB=6

C1 = PSA/4, C2 = PSA/4 and 30 PSA cycles delayed

C3 = PSB/4, C4 = PSB/4 and 30 PSA cycles delayed

Figure 90. Divider Sync and Digital Delay

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9.3 Do's and Don'ts

The maximum swing and level must match to the applied VDDREF (for example, for a 3.3-V XO as reference, VDDREF must be 3.3 V).

VDDREF and VDDVCO must be powered from the same supply voltage.

9.4 Initialization Setup

The device digital logic starts after the internal power-on-release circuit triggered (POR). The digital core is connected to the VDDREF domain. The EEPROM settings are loaded into the device registers and the new settings applied to the device. The EEPROM page is selected according to the EEPROMSEL pin logic level. A low level loads *page 0*, and a logic high level loads *page 1*. By default, the differential outputs are muted for the initial VCO calibration and PLL lock process. After the PLL circuit achieved a phase lock to the input reference, the output dividers are synchronized and then released to operation. By default, pin 8 is configured as RESETN pin (see gpio0_dir_sel and gpio0_input_sel). The start of the initialization sequence, as well the as serial interface, can be kept in reset using RESETN= LOW. When pin 8 is not configured as RESETN, the device initialization relies on the POR triggered by application of VDDREF.

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Initialization Setup (continued)

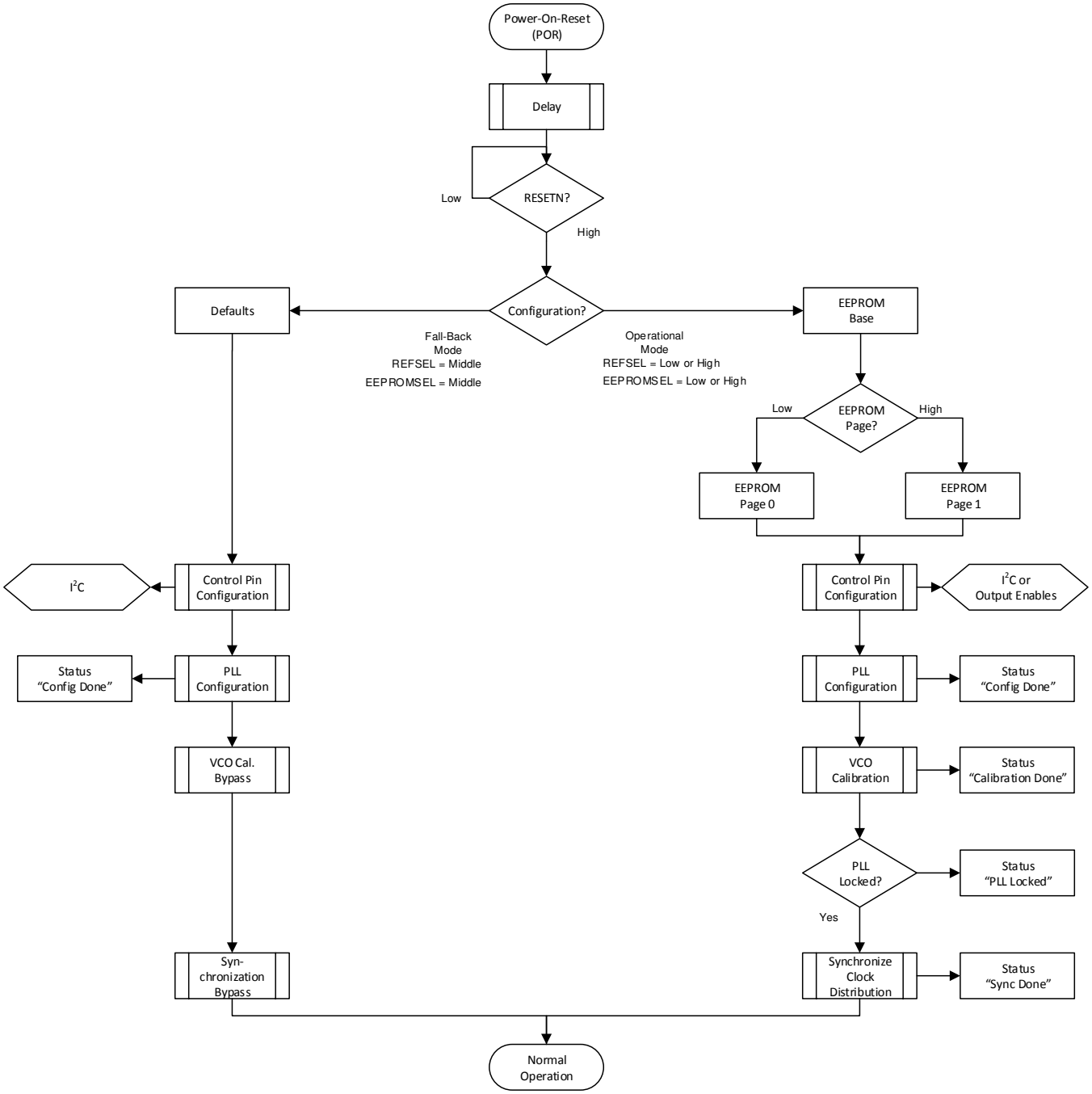

Figure 91. Initialization Flow Chart

The pins 8, 11, 12, 19, and 20 are general-purpose inputs and outputs (GPIO). The functions are determined through the register settings saved in the selected EEPROM page. See GENERIC0, GENERIC1, and GENERIC2 for the relevant bit-fields.

The EEPROM allows to choose between two modes of operation: pin Mode and serial interface mode. This is done using mode.

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10 Power Supply Recommendations

10.1 Power-Up Sequence

There are no restrictions from the device for applying power to the supply pins. From an application perspective, TI recommends to either apply all VDDs at the same time or apply VDDREF first. The digital core is connected to VDDREF, and thus the settings of the EEPROM are applied automatically. All VDDs should reach 95% of final value within 2 ms. RESETN should be held low before VDDREF reaches 95% of the final value. TI recommends adding a 4.7-kΩ pullup resistor on RESETN and a 470-nF capacitor to ground to provide additional delay in release of RESETN at power-up.

10.2 De-Coupling

TI recommends isolating all power supplies using a ferrite bead and provide decoupling for each of the supplies. TI also recommends optimizing the decoupling for the respective layout and consider the power supply impedance and optimize for the individual frequency plan.

An example for a decoupling per supply pin: 1x 4.7 µF, 1x 470 nF, and 1x 100 nF.

11 Layout

11.1 Layout Guidelines

For this example, follow these guidelines:

- Isolate inputs and outputs using a GND shield. Figure 92 routes all inputs and outputs as differential pairs.
- Isolate outputs to adjacent outputs when generating multiple frequencies.
- Isolate the crystal area, connect the GND pads of the crystal package and flood the adjacent area. Figure 93 shows a foot print which supports multiple crystal sizes.
- Try to avoid impedance jumps in the fan-in and fan-out areas when possible.
- Use five VIAs to connect the thermal pad to a solid GND plane. Full-through VIAs are prefered.
- Place decoupling capacitors with small capacitance values very close to the supply pins. Try to place them very close on the same layer or directly on the backside layer. Larger values can be placed more far away. Figure 93 shows three de-coupling capacitors close to the device. Ferrite beads are recommended to isolate the different frequency domains and the VDDVCO domain.
- Preferably use multiple VIAs to connect wide supply traces to the respective power planes.

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11.2 Layout Examples

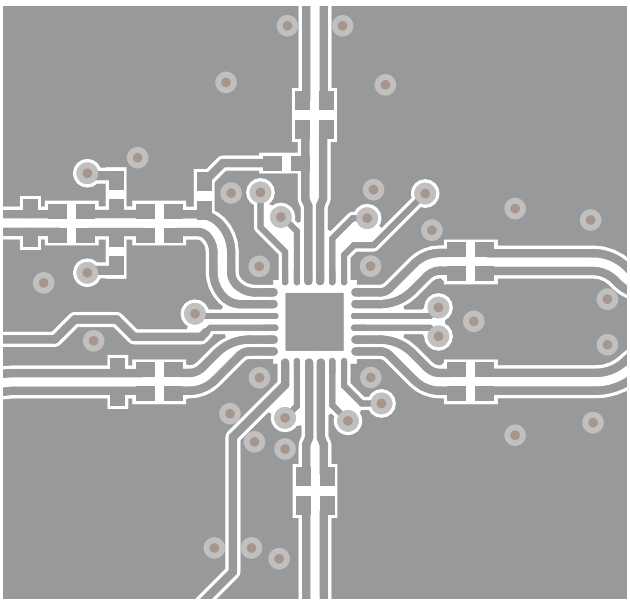

Figure 92. Layout Example, Top Layer

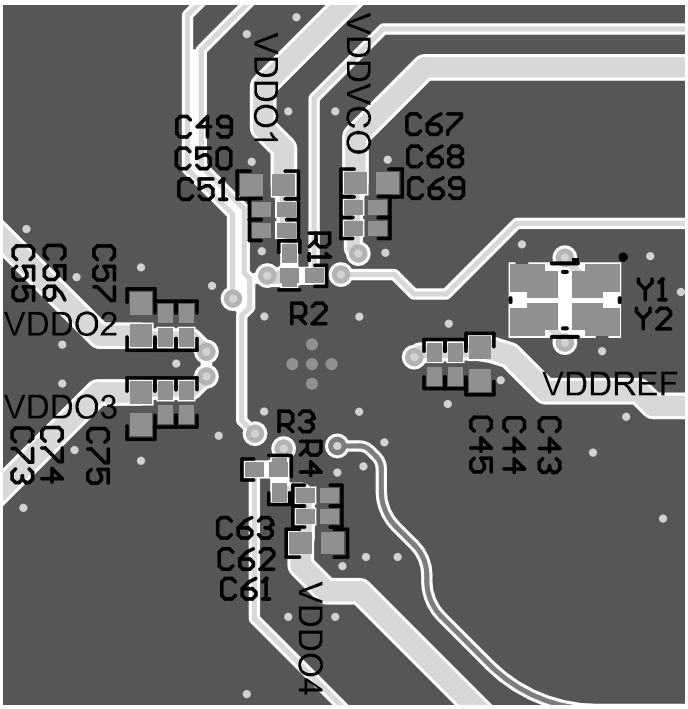

Figure 93. Layout Example, Bottom Layer

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Layout Examples (continued)

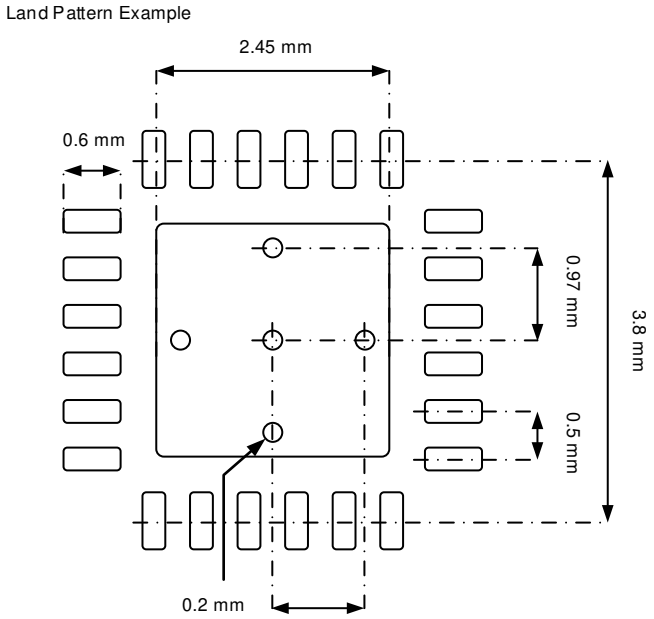

Figure 94. Layout Example, Land Pattern

12 Device and Documentation Support

12.1 Device Support

12.1.1 Development Support

Contact your TI representative for more information.

12.1.2 Device Nomenclature

CDCI6214 – 62= clock generator 1= 1x PLL 4=4x outputs I = individual output enables

12.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. In the upper right corner, click on *Alert me* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

12.3 Community Resources

TI E2E™ support forums are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

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12.4 Trademarks

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All other trademarks are the property of their respective owners.

12.5 Electrostatic Discharge Caution

These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

12.6 Glossary

SLYZ022 — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

13 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

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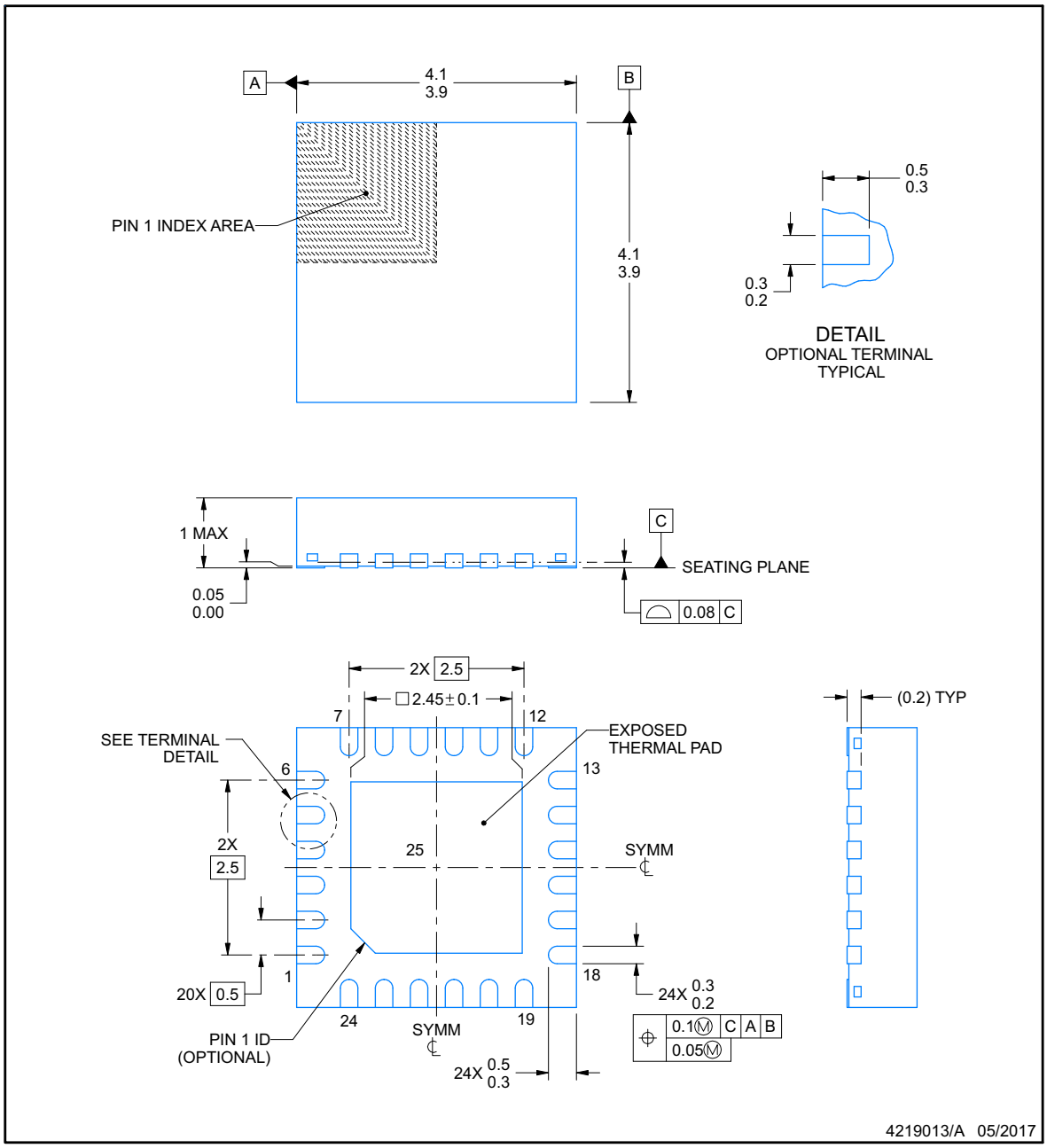
PACKAGE OUTLINE

RGE0024B

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

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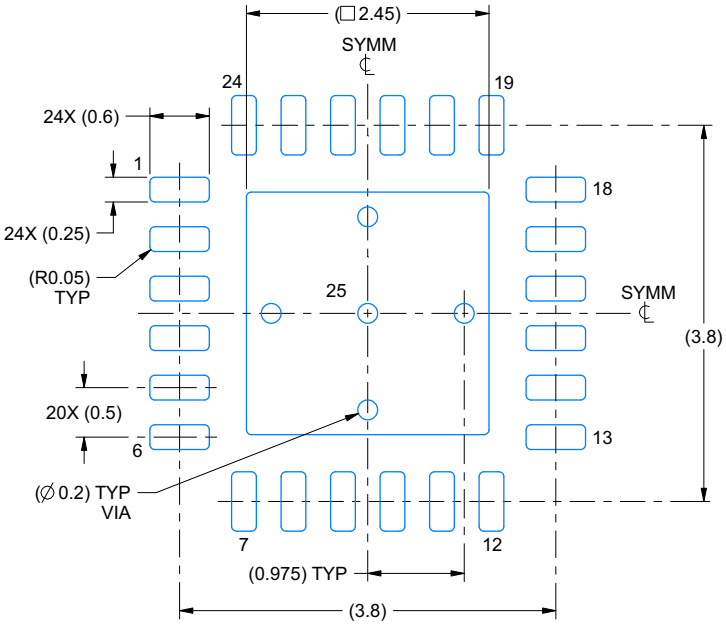
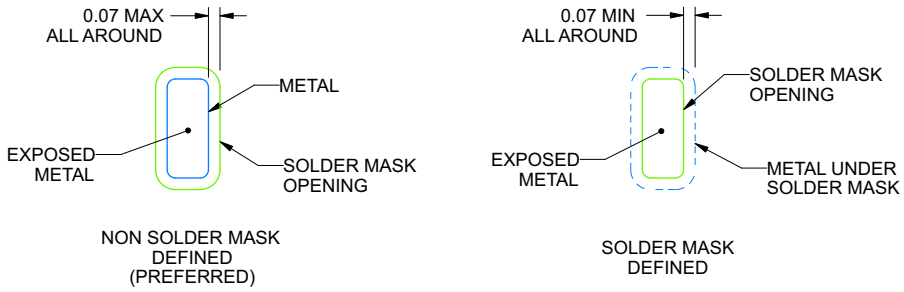
EXAMPLE BOARD LAYOUT

RGE0024B — **VQFN - 1 mm max height**

PLASTIC QUAD FLATPACK - NO LEAD



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:15X



SOLDER MASK DETAILS

4219013/A 05/2017

NOTES: (continued)

4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).
5. Vias are optional depending on application, refer to device data sheet. If any vias are implemented, refer to their locations shown on this view. It is recommended that vias under paste be filled, plugged or tented.

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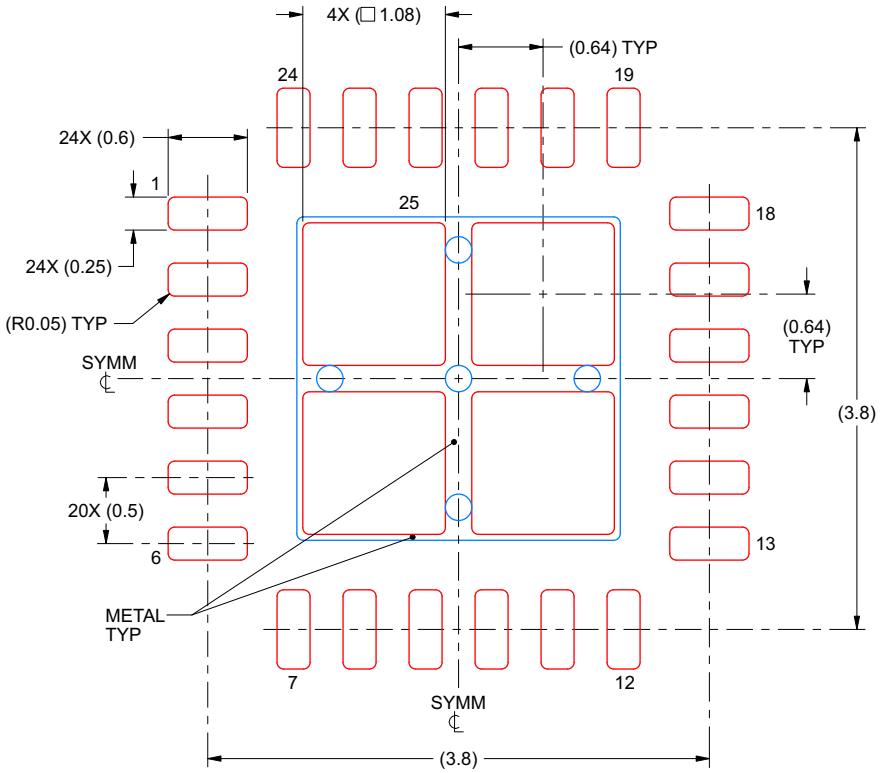
EXAMPLE STENCIL DESIGN

RGE0024B

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL

EXPOSED PAD 25
78% PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE
SCALE:20X

4219013/A 05/2017

NOTES: (continued)

6. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

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PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
CDCI6214RGER	ACTIVE	VQFN	RGE	24	3000	Green (RoHS & no Sb/Br)	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	CDCI 6214A1	Samples
CDCI6214RGET	ACTIVE	VQFN	RGE	24	250	Green (RoHS & no Sb/Br)	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	CDCI 6214A1	Samples

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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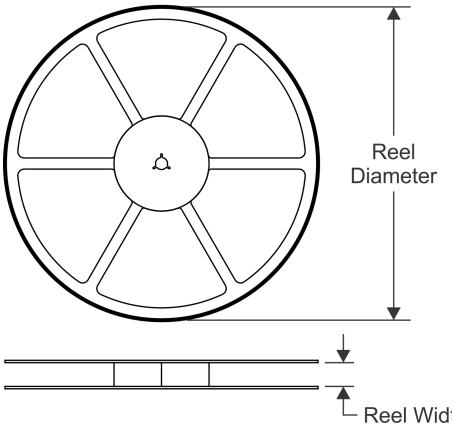
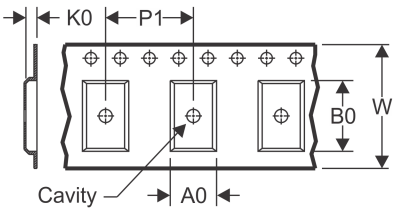
TAPE AND REEL INFORMATION

REEL DIMENSIONS

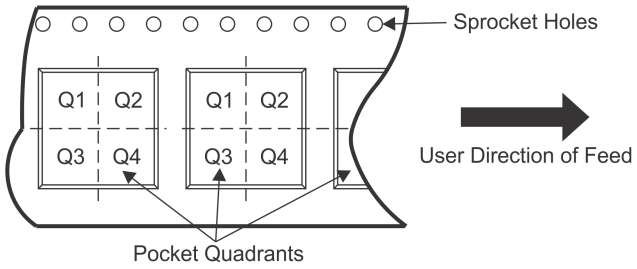


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

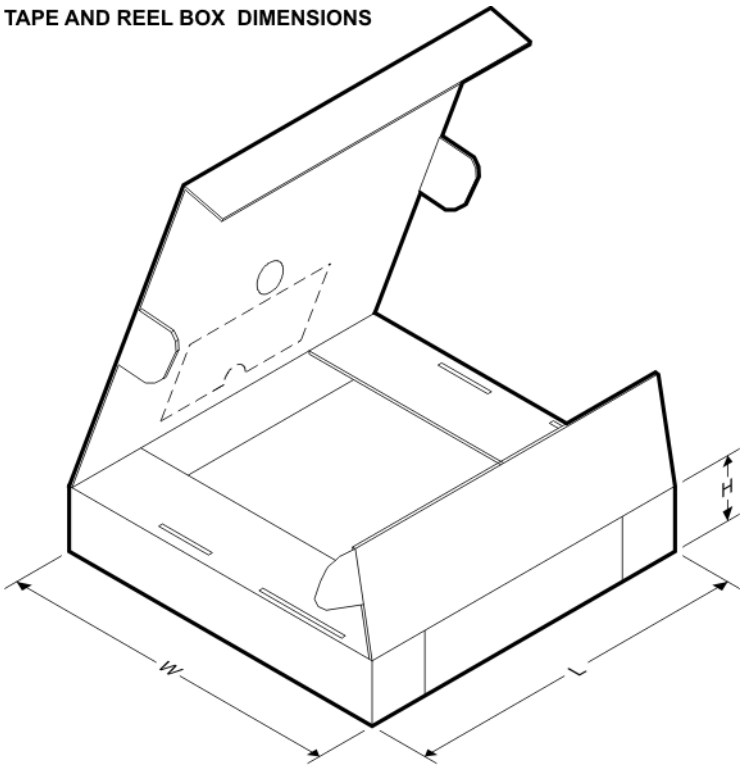
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
CDCI6214RGER	VQFN	RGE	24	3000	330.0	12.4	4.25	4.25	1.15	8.0	12.0	Q2
CDCI6214RGET	VQFN	RGE	24	250	180.0	12.4	4.25	4.25	1.15	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)
CDCI6214RGER	VQFN	RGE	24	3000	367.0	367.0	35.0
CDCI6214RGET	VQFN	RGE	24	250	210.0	185.0	35.0

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