

## Low Power Multi-Rate Quad Channel Retimer

### General Description

The DS110DX410 is a four-channel multi-rate retimer with integrated signal conditioning. The DS110DX410 includes an input Continuous-Time Linear Equalizer (CTLE) on each channel. The DS110DX410 also includes a five-tap Decision Feedback Equalizer (DFE) on each channel.

The DS110DX410 can enhance the reach and robustness of long, lossy, crosstalk-impaired high-speed serial links to achieve BER <math>1 \times 10^{-15}</math>.

Each channel of the DS110DX410 independently locks to serial data at data rates from 8.5 to 11.3 Gbps and at submultiples of these data rates. A 25 MHz reference clock is required, which need not be synchronous with the serial data. The DS110DX410 supports multiple data rates.

Programmable transmit de-emphasis (up to -12 dB), transmit  $V_{OD}$  (up to 1300 mVp-p) and adaptive receive equalization (up to 34 dB boost at 5 GHz) enable data transmission over lossy copper cables of typical lengths greater than 10 m or backplanes with multiple connectors and typical trace lengths greater than 40 inches. The CDR function is ideal for use in parallel optical modules to reset the jitter budget and retiming high-speed serial data.

The programmable settings can be applied easily using the SMBus interface or they can be loaded via an external EEPROM. An on-chip eye monitor and a PRBS generator allow real-time measurement of high-speed serial data for system bring-up or field tuning.

The device is offered in a 48-pin LLP, 7 mm x 7 mm flow-through package.

**Notice: This document is not a datasheet. For more information regarding this product or to order samples please contact your local Texas Instruments sales office or visit <http://focus.ti.com/general/docs/dsnuprt.tsp>.**

### Features

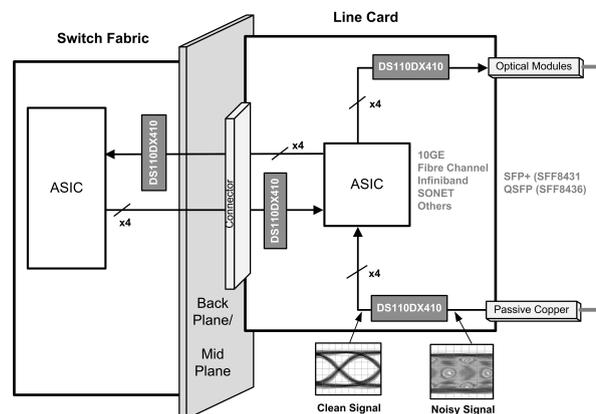
- All devices in the retimer family are pin compatible with each other and with the quad buffer-repeater. The pin-compatible device family includes the following:
  - DS100RT410 (EQ+CDR+DE): 10.3125 Gbps
  - DS100DF410 (EQ+DFE+CDR+DE): 10.3125 Gbps
  - DS110RT410 (EQ+CDR+DE): 8.5 - 11.3 Gbps
  - DS110DF410 (EQ+DFE+CDR+DE): 8.5 - 11.3 Gbps
  - DS110DX410 (EQ+DFE+CDR+DE): 8.5 - 11.3 Gbps
  - DS125RT410 (EQ+CDR+DE): 9.8 - 12.5 Gbps
  - DS125DF410 (EQ+DFE+CDR+DE): 9.8 - 12.5 Gbps
  - DS110BR410 (EQ+DE): Up to 10.3125 Gbps
- Typical Power Dissipation (EQ+CDR+DE): 150 mW / channel
- Typical Power Dissipation (EQ+DFE+CDR+DE): 180 mW / channel
- Locks to data rates from 8.5 to 11.3 Gbps and submultiples
- Fast lock operation based on protocol-select mode
- Adaptive equalization up to 34 dB boost at 5 GHz
- Adjustable transmit  $V_{OD}$  : 600 to 1300 mVp-p
- Adjustable transmit de-emphasis to -12 dB
- Programmable output polarity inversion
- Input signal detection, CDR lock detection/indicator
- On-chip Eye Monitor (EOM), PRBS generator
- Single 2.5 V  $\pm 5\%$  power supply
- SMBus/EEPROM configuration modes

### Applications

- Host-side front-port and backplane interface, SFF-8431, SFF-8436
- Ethernet: 10GbE, 1GbE

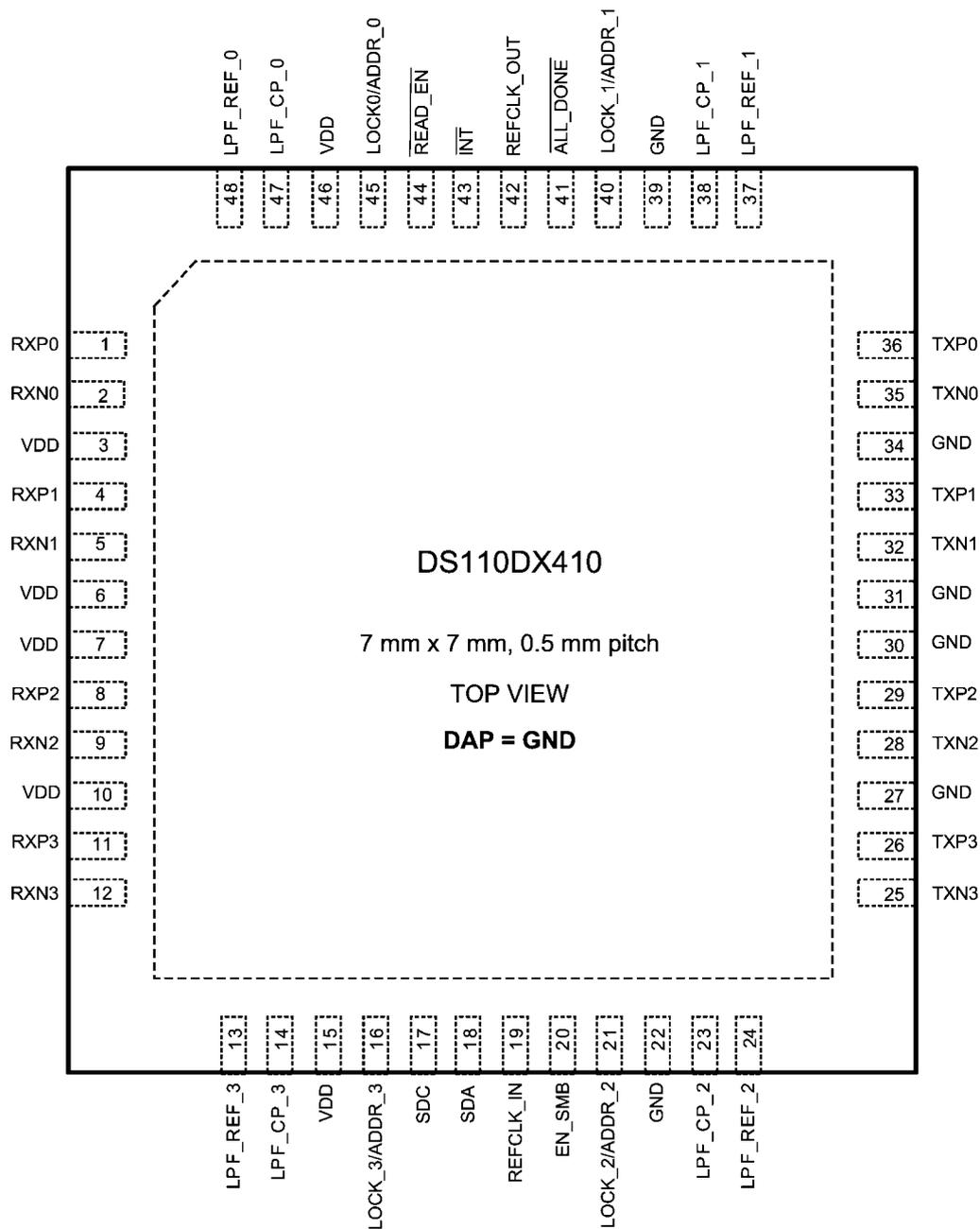
For other data rates and data transmission protocols, other pin-compatible devices in the retimer family can be used.

### Typical Application Diagram



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## Connection Diagram

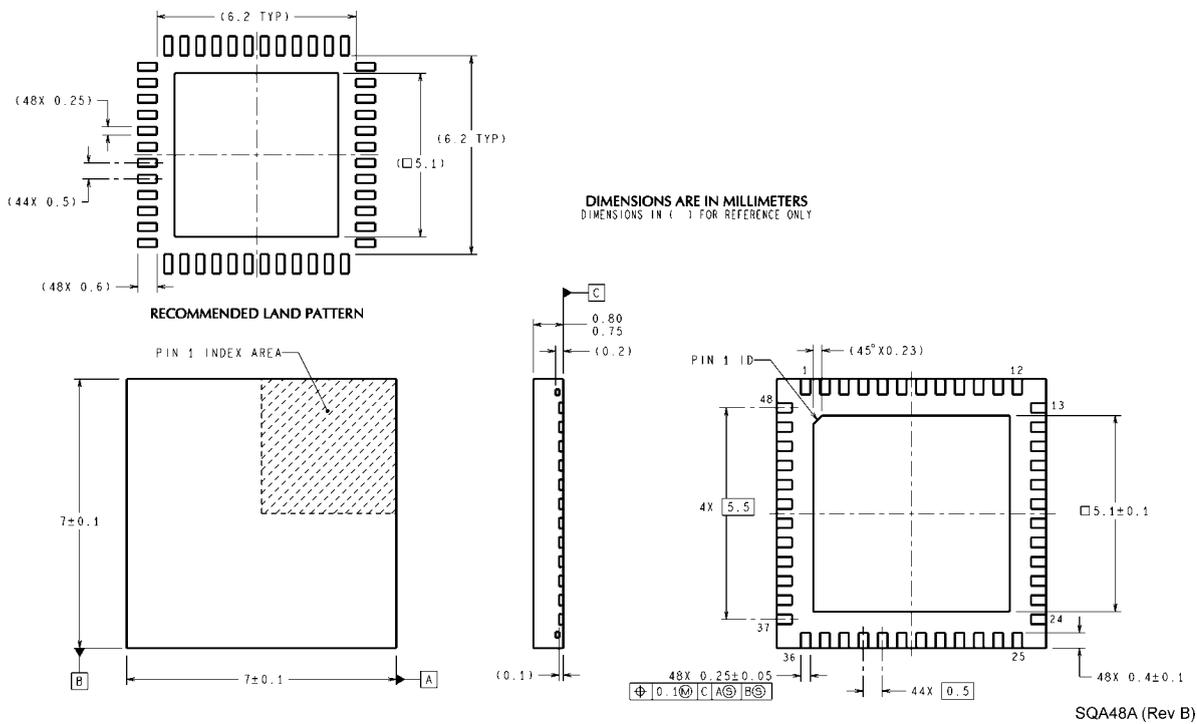


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## Ordering Information

NSID	Qty	Spec	Package
DS110DX410SQ	Tape & Reel Supplied As 1,000 Units	NOPB	SQA48A
DS110DX410SQE	Tape & Reel Supplied As 250 Units	NOPB	SQA48A

**Physical Dimensions** inches (millimeters) unless otherwise noted



# Notes

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**PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
DS110DX410SQ/NOPB	PREVIEW	WQFN	RHS	48	1000	Green (RoHS & no Sb/Br)	CU SN	Level-3-260C-168 HR		110DX410	

(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) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

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(4) Only one of markings shown within the brackets will appear on the physical device.

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## TAPE AND REEL INFORMATION



### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
DS110DX410SQ/NOPB	WQFN	RHS	48	1000	330.0	16.4	7.3	7.3	1.3	12.0	16.0	Q1

**TAPE AND REEL BOX DIMENSIONS**



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
DS110DX410SQ/NOPB	WQFN	RHS	48	1000	367.0	367.0	38.0



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