

## GENERAL DESCRIPTION

The XRT84L18 octal T1 Framer is a single chip device which integrates 8 T1 framers and transmitters for terminating DS1 Signals. Each framer has its own framing synchronizer and transmit-receive slip buffers, and can be independently enabled or disabled as required and can be configured to frame to the common DS1 signal formats

Each Framer block contains its own Transmit and Receive T1 Framing function. The Transmit HDLC controller encapsulates contents of the Transmit HDLC buffers into LAPD Message frames. The Receive HDLC controller extracts payload content of Receive LAPD Message frames from the incoming T1 data stream and writes it into the Receive HDLC buffer. Each framer also contains a Transmit and Overhead Data Input port, which permits "Data Link" Terminal Equipment direct access to the outbound T1 frames Likewise, a Receive Overhead output data port permits Data Link Terminal Equipment direct access to the Data Link bits of the inbound T1 frames.

The XRT84L18 fully meets all of the latest T1 specifications: ANSI T1.403-1995, ANSI T1.231-1993, AT&T TR62411 (12-90), AT&T TR54016 and TR62411, and ITU G-703, G.704, G706 and G.733. Extensive test and diagnostic functions include Loopbacks, Boundary scan, Pseudo Random bit sequence (PRBS) test pattern generation, Performance

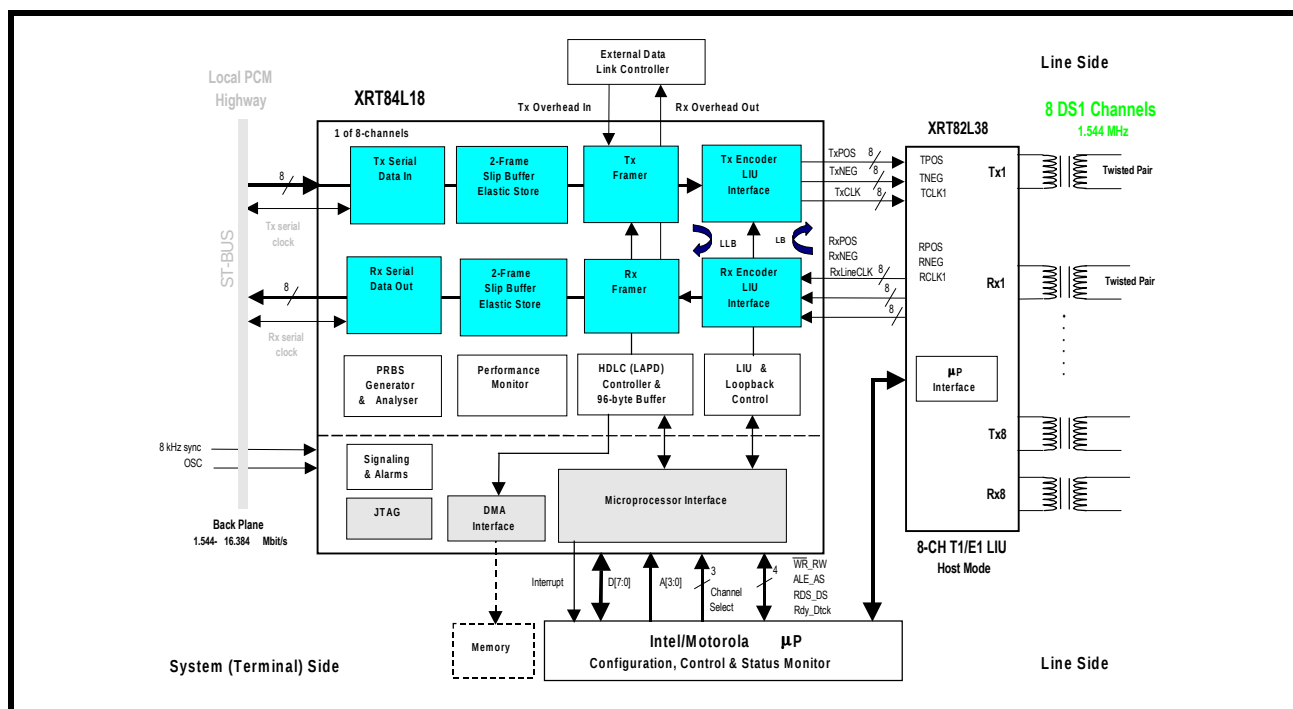
Monitor, Bit Error Rate (BER) meter, and forced error insertion.

## APPLICATIONS

- High-Density T1 interfaces for Multiplexers, Switches, LAN Routers and Digital Modems
- SONET/SDH terminal or Add/Drop multiplexers (ADMs)
- T1 add/drop multiplexers (MUX)
- Channel Service Units (CSUs): T1 and Fractional T1
- Digital Access Cross-connect System (DACs)
- Digital Cross-connect Systems (DCS)
- Frame Relay Switches and Access Devices (FRADS)
- ISDN Primary Rate Interfaces (PRA)
- PBXs and PCM channel bank
- T3 channelized access concentrators and M13 MUX
- Wireless base stations
- ATM equipment with integrated DS1 interfaces
- Multichannel DS1 Test Equipment
- T1 Performance Monitoring

## FEATURES (NEXT PAGE)

FIGURE 1. XRT84L18 8-CHANNEL DS1 (T1) FRAMER

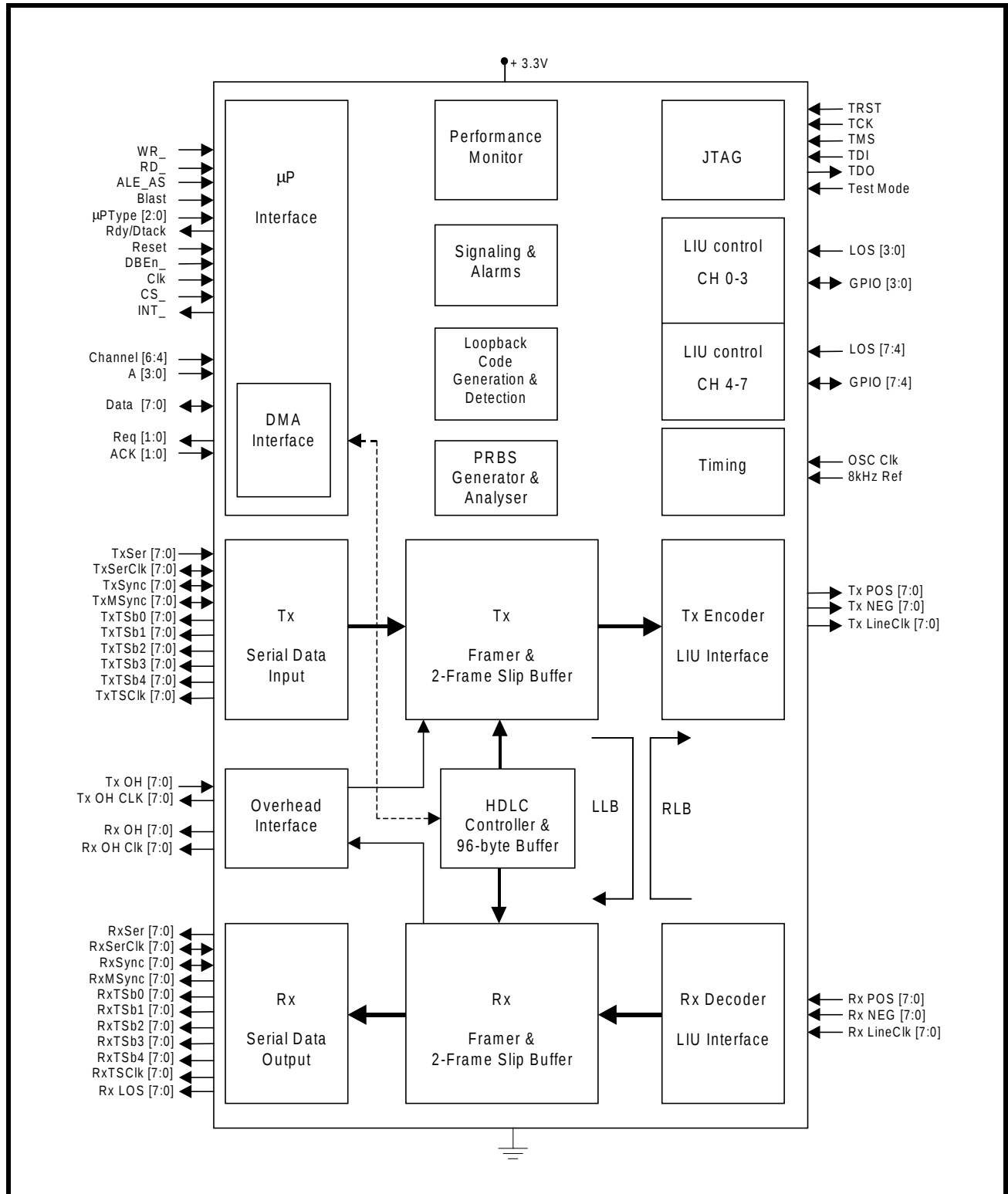


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## **FEATURES**

- Eight independent, full duplex DS1 Tx and Rx Framers
- Two 512-bit (two-frame) elastic store, PCM frame slip buffers (FIFO) on TX and Rx provide up to 8.192 MHz asynchronous back plane connections with jitter and wander attenuation
- Supports input PCM and signaling data from 1.544 to 8.192 MHz. Also supports 4-channel multiplexed 12.352/16.384 Mbit/s on the back plane bus
- Programmable output clocks for Fractional T1
- Supports channel associated signaling (CAS)
- Extracts and inserts robbed bit signaling (RBS)
- Supports Common-channel and ISDN Primary Rate Interface (ISDN PRI) signaling
- Integrated HDLC controller with two 96-byte Transmit HDLC buffers and two 96-byte Receive HDLC buffers
- Timeslot assignable HDLC
- 8-bit Intel/Motorola  $\mu$ P interface for configuration, control and status monitoring
- Programmable Interrupt output pin
- Supports programmed I/O, Burst and DMA modes of Read-Write access
- Each framer block encodes and decodes the T1 Frame serial data into and from the Single-rail or Dual-rail (B8ZS) format
- Dual or single rail line side digital PCM inputs
- Detects and forces Red (SAI), Yellow (RAI) and Blue (AIS) Alarms
- Detects OOF, LOF, LOS errors and COFA conditions
- Loopbacks: Local (LLB) and Line remote (LB)
- Facilitates Inverse Multiplexing for ATM
- Performance monitor with one second polling
- Boundary scan (IEEE 1149.1) JTAG test port
- Accepts external 8kHz Sync reference
- 3.3V CMOS operation with 5V tolerant inputs
- 388-pin BGA package with  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  operation
- 4-channel T1 framer version (XRT84L14) is pin-compatible with the XRT84V24, 4-channel E1 framer
- Direct Interface to Exar's LIUs: XRT82L38 and XRT82L34

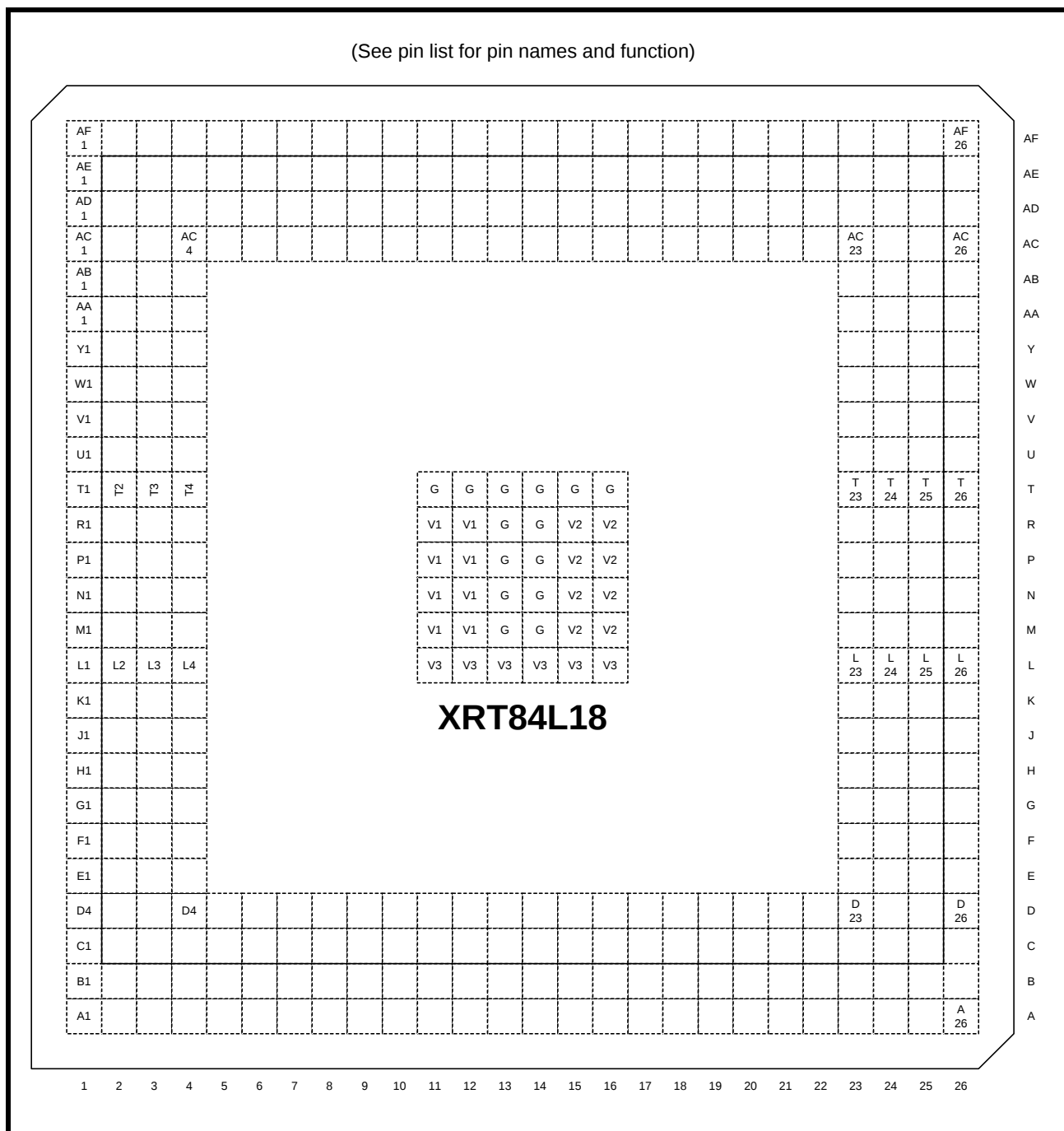
**FIGURE 2. 84L18 BLOCK DIAGRAM**



## ORDERING INFORMATION

| PART NUMBER | PACKAGE                                 | OPERATING TEMPERATURE RANGE              |
|-------------|-----------------------------------------|------------------------------------------|
| XRT84L18    | 35 x 35 mm, 388 Plastic Ball Grid Array | -40 <sup>0</sup> C to +85 <sup>0</sup> C |

FIGURE 3. PIN OUT OF 84L18 388 BALL GRID ARRAY



**TABLE 1: LIST BY PIN  
NUMBER**

| PIN | PIN NAME   | PIN | PIN NAME   | PIN | PIN NAME    |
|-----|------------|-----|------------|-----|-------------|
| A1  | TCK        | B6  | TxSer 0    | C13 | NC          |
| A2  | RxTSb0_0   | B7  | NC         | C14 | TxOH 1      |
| A3  | RxSync 0   | B8  | TxTSb3_0   | C15 | TxOHClk 1   |
| A4  | NC         | B9  | RxSerCLK 1 | C17 | NC          |
| A5  | TxOHClk 0  | B10 | RxOH 1     | C17 | TxTSb4_1    |
| A6  | NC         | B11 | RxSync 1   | C18 | RxSer 2     |
| A7  | TxOH 0     | B12 | RxOH Clk 1 | C19 | RxOH 2      |
| A8  | TxTSb2_0   | B13 | TxMSync 1  | C20 | RxTSb3 2    |
| A9  | RxSer 1    | B14 | TxTSClk 1  | C21 | TxTSClk 2   |
| A10 | RxTSb1_1   | B15 | TxTSb1_1   | C22 | TxTSb1_2    |
| A11 | NC         | B16 | RxSync 2   | C23 | NC          |
| A12 | TxSync 1   | B17 | NC         | C24 | RxSync 3    |
| A13 | RxTSb4_1   | B18 | NC         | C25 | RxTSb0_3    |
| A14 | TxSer 1    | B19 | Rx1) 2     | C26 | RxTSb1_3    |
| A15 | TxTSb2_1   | B20 | RxTSb2_2   | D1  | RxLineClk 1 |
| A16 | TxSerClk 1 | B21 | RxTSb4_2   | D2  | RxLOS 0     |
| A17 | RxSerCLK 2 | B22 | TxSer 2    | D3  | TDO         |
| A18 | RxTSb0_2   | B23 | TxTSb2_2   | D4  | RxSer 0     |
| A19 | RxMSync 2  | B24 | RxSer 3    | D5  | RxTSb1_0    |
| A20 | NC         | B25 | RxOH Clk 3 | D6  | TxSync 0    |
| A21 | TxSync 2   | B26 | RxOH 3     | D7  | RxTSb_0     |
| A22 | TxMSync 2  | C1  | RxNeg 0    | D8  | TxSerClk 0  |
| A23 | TxTSb0_2   | C2  | TMS        | D9  | TxTSb1_0    |
| A24 | TxTSb3_2   | C3  | TRST       | D10 | TxTSClk 0   |
| A25 | RxTSClk 3  | C4  | RxTSClk 0  | D11 | RxTSClk 1   |
| A26 | RxMSync 3  | C5  | RxOH Clk 0 | D12 | RxTSb0_1    |
| B1  | TDI        | C6  | TxMSync 0  | D13 | RxTSb3_1    |
| B2  | RxSerCLK 0 | C7  | RxOH 0     | D14 | NC          |
| B3  | RxMSync 0  | C8  | TxTSb0_0   | D15 | TxTSb0_1    |
| B4  | RxTSb2_0   | C9  | RxMSync 1  | D16 | TxTSb3_1    |
| B5  | RxTSb3_0   | C10 | TxTSb4_0   | D17 | NC          |
|     |            | C11 | RxTSb2_1   | D18 | RxTSClk 2   |
|     |            | C12 | NC         | D19 | RxOH Clk 2  |
|     |            |     |            | D20 | TxSerClk 2  |
|     |            |     |            | D21 | TxOHClk 2   |
|     |            |     |            | D22 | TxTSb4_2    |
|     |            |     |            | D23 | TxOH 2      |
|     |            |     |            | D24 | NC          |
|     |            |     |            | D25 | TxTSClk 3   |
|     |            |     |            | D26 | RxTSb3_3    |
|     |            |     |            | E1  | NC          |
|     |            |     |            | E2  | NC          |
|     |            |     |            | E3  | TxPOS 0     |
|     |            |     |            | E4  | RxPOS 0     |
|     |            |     |            | E23 | RxSerCLK 3  |
|     |            |     |            | E24 | RxTSb2_3    |
|     |            |     |            | E25 | TxSync 3    |
|     |            |     |            | E26 | RxTSb4_3    |
|     |            |     |            | F1  | RxNeg 1     |
|     |            |     |            | F2  | TxLineClk 0 |
|     |            |     |            | F3  | TxNEG 0     |
|     |            |     |            | F4  | NC          |
|     |            |     |            | F23 | TxOH 3      |
|     |            |     |            | F24 | TxOHClk 3   |
|     |            |     |            | F25 | TxSer 3     |
|     |            |     |            | F26 | TxMSync 3   |
|     |            |     |            | G1  | RxLineClk 0 |
|     |            |     |            | G2  | TxLineClk 1 |
|     |            |     |            | G3  | RxPOS 1     |
|     |            |     |            | G4  | LOS 0       |
|     |            |     |            | G23 | TxSerClk 3  |
|     |            |     |            | G24 | TxTSb0_3    |
|     |            |     |            | G25 | CS_         |
|     |            |     |            | G26 | WR_         |
|     |            |     |            | H1  | RxPOS 2     |
|     |            |     |            | H2  | TxNEG 1     |

| PIN | PIN NAME    | PIN | PIN NAME    | PIN | PIN NAME  | PIN | PIN NAME    |
|-----|-------------|-----|-------------|-----|-----------|-----|-------------|
| H3  | TxPOS 1     | L24 | Data 4      | N23 | A 1       | T2  | RxNeg 4     |
| H4  | RxLOS 1     | L25 | Blast       | N24 | ALE_AS    | T3  | RxLineClk 3 |
| H23 | TxTSb1_3    | L26 | A 3         | N25 | Data 3    | T4  | TxPOS 4     |
| H24 | TxTSb3_3    | M1  | GPIO 3      | N26 | Data 2    | T11 | VSS         |
| H25 | NC          | M2  | LOS 3       | P1  | GPIO 7    | T12 | VSS         |
| H26 | NC          | M3  | TxNEG 3     | P2  | GPIO 6    | T13 | VSS         |
| J1  | RxLOS 2     | M4  | RxLineClk 2 | P3  | Test Mode | T14 | VSS         |
| J2  | TxLineClk 2 | M11 | VDD         | P4  | GPIO 5    | T15 | VSS         |
| J3  | RxNeg 2     | M12 | VDD         | P11 | VDD       | T16 | VSS         |
| J4  | LOS 1       | M13 | VSS         | P12 | VDD       | T23 | ACK 1       |
| J23 | TxTSb2_3    | M14 | VSS         | P13 | VSS       | T24 | NC          |
| J24 | Data 7      | M15 | VDD         | P14 | VSS       | T25 | Type 0      |
| J25 | TxTSb4_3    | M16 | VDD         | P15 | VDD       | T26 | Req 0       |
| J26 | A 5         | M23 | NC          | P16 | VDD       | U1  | RxLOS 4     |
| K1  | LOS 2       | M24 | INT_        | P23 | Dack      | U2  | 8kHz Ref    |
| K2  | TxNEG 2     | M25 | Type 2      | P24 | Type 1    | U3  | NC          |
| K3  | TxPOS 2     | M26 | A 2         | P25 | DBEn      | U4  | NC          |
| K4  | RxLineClk 1 | N1  | GPIO 0      | P26 | A 0       | U23 | Req 1       |
| K23 | A 6         | N2  | GPIO 2      | R1  | GPIO 4    | U24 | RxSerCLK 4  |
| K24 | Data 6      | N3  | GPIO 1      | R2  | RxPOS 4   | U25 | NC          |
| K25 | Data 5      | N4  | TxLineClk 3 | R3  | Reset_    | U26 | ACK 0       |
| K26 | NC          | N11 | VDD         | R4  | NC        | V1  | TxNEG 4     |
| L1  | TxPOS 3     | N12 | VDD         | R11 | VDD       | V2  | LOS 4       |
| L2  | RxPOS 3     | N13 | VSS         | R12 | VDD       | V3  | NC          |
| L3  | RxNeg 3     | N14 | VSS         | R13 | VSS       | V4  | TxLineClk 4 |
| L4  | RxLOS 3     | N15 | VDD         | R14 | VSS       | V25 | RxMSync 4   |
| L11 | VDD         | N16 | VDD         | R15 | VDD       | V26 | RxSync 4    |
| L12 | VDD         | N23 | A 1         | R16 | VDD       | W1  | RxNeg 5     |
| L13 | VDD         | N24 | ALE_AS      | R23 | Clk       | W2  | RxPOS 5     |
| L14 | VDD         | N25 | Data 3      | R24 | Data 0    | W3  | TxPOS 5     |
| L15 | VDD         | N26 | Data 2      | R25 | Data 1    | W4  | RxLineClk 4 |
| L16 | VDD         | P1  | GPIO 7      | R26 | RD_       | W23 | RxTSb3_4    |
| L23 | A 4         | N16 | VDD         | T1  | OSC Clk   | W24 | RxTSb0_4    |

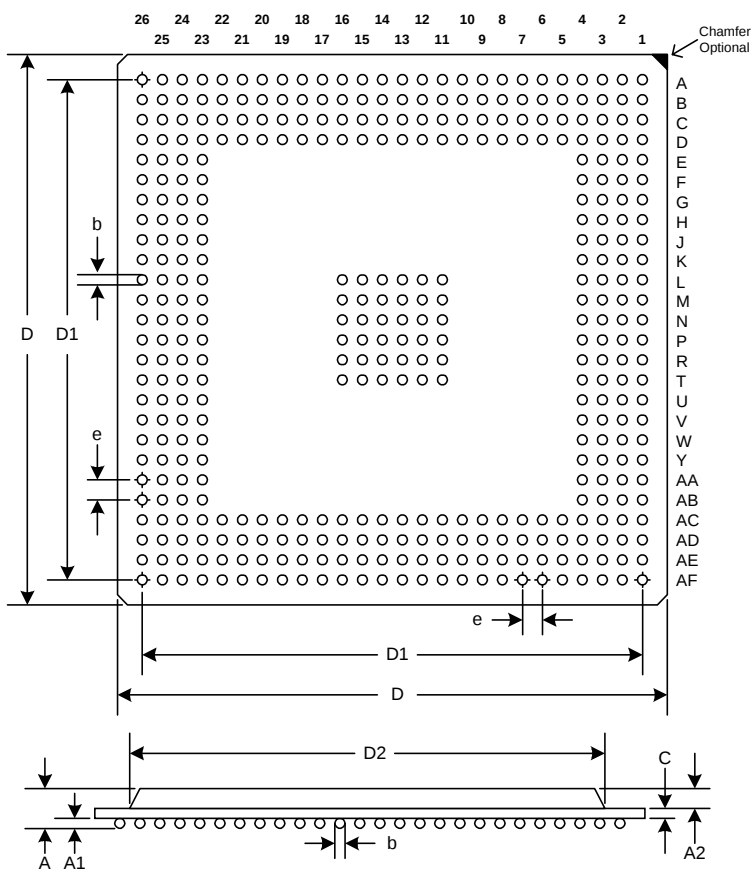
| PIN  | PIN NAME    | PIN  | PIN NAME   | PIN  | PIN NAME    | PIN  | PIN NAME   |
|------|-------------|------|------------|------|-------------|------|------------|
| W25  | RxOH 4      | AC10 | NC         | AD19 | TxSer 5     | AE26 | TxTSb2_4   |
| W26  | RxSer 4     | AC11 | RxOH 7     | AD20 | TxOHClk 5   | AF1  | LOS 7      |
| Y1   | RxLOS 5     | AC12 | TxTSb3_6   | AD21 | RxTSb4_5    | AF2  | NC         |
| Y2   | TxNEG 5     | AC13 | TxTSb0_6   | AD22 | RxTSb0_5    | AF3  | TxOHClk 7  |
| Y3   | TxLineClk 5 | AC14 | TxOH 6     | AD23 | NC          | AF4  | TxTSb3_7   |
| Y4   | NC          | AC15 | RxTSb4_6   | AD24 | RxMSync 5   | AF5  | TxSer 7    |
| Y23  | TxSerClk 4  | AC16 | RxTSb0_6   | AD25 | RxTSClk 5   | AF6  | TxSync 7   |
| Y24  | NC          | AC17 | TxOH 5     | AD26 | NC          | AF7  | RxTSb4_7   |
| Y25  | RxTSb2_4    | AC18 | TxSerClk 5 | AE1  | TxNEG 7     | AF8  | RxTSb2_7   |
| Y26  | RxTSb1_4    | AC19 | TxSync 5   | AE2  | RxLineClk 6 | AF9  | RxTSb0_7   |
| AA1  | LOS 5       | AC20 | RxOH 5     | AE3  | NC          | AF10 | TxMSync 6  |
| AA2  | RxPOS 6     | AC21 | RxTSb1_5   | AE4  | TxTSb4_7    | AF11 | NC         |
| AA3  | RxLOS 6     | AC22 | RxSync 5   | AE5  | TxTSb2_7    | AF12 | TxTSb1_6   |
| AA4  | RxLineClk 5 | AC23 | NC         | AE6  | TxMSync 7   | AF13 | RxMSync 6  |
| AA23 | TxSync 4    | AC24 | TxTSb1_4   | AE7  | RxSync 7    | AF14 | NC         |
| AA24 | TxOH 4      | AC25 | TxOHClk 4  | AE8  | RxTSb3_7    | AF15 | RxTSClk 6  |
| AA25 | NC          | AC26 | TxMSync 4  | AE9  | RxTSb1_7    | AF16 | RxTSb3_6   |
| AA26 | RxTSb4_4    | AD 1 | RxNeg 7    | AE10 | TxSync 6    | AF17 | RxTSb1_6   |
| AB1  | RxNeg 6     | AD2  | TxPOS 7    | AE11 | TxSer 6     | AF18 | RxOH 6     |
| AB2  | TxPOS 6     | AD5  | TxOH 7     | AE12 | TxTSb2_6    | AF19 | TxTSb1_5   |
| AB3  | LOS6        | AD6  | TxTSb1_7   | AE13 | TxCHClk 6   | AF20 | TxTSb0_5   |
| AB4  | RxLOS 7     | AD7  | RxSerCLK 7 | AE14 | NC          | AF21 | TxMSync 5  |
| AB25 | TxTSClk 4   | AD8  | RxSer 7    | AE15 | NC          | AF22 | NC         |
| AB26 | TxSer 4     | AD9  | TxSerClk 6 | AE16 | RxSer 6     | AF23 | RxTSb2_5   |
| AC1  | TxNEG 6     | AD10 | RxOH Clk 7 | AE17 | NC          | AF24 | NC         |
| AC2  | RxPOS 7     | AD11 | TxTSb4_6   | AE18 | TxTSb4_5    | AF25 | RxSerCLK 5 |
| AC3  | TxLineClk 6 | AD12 | NC         | AE19 | TxTSb2_5    | AF26 | TxTSb3_4   |
| AC4  | TxLineClk 7 | AD13 | TxOHClk 6  | AE20 | TxTSClk 5   |      |            |
| AC5  | TxTSClk 7   | AD14 | RxSync 6   | AE21 | RxOH Clk 5  |      |            |
| AC6  | TxSerClk 7  | AD15 | RxSerCLK 6 | AE22 | RxTSb3_5    |      |            |
| AC7  | TxTSb0_7    | AD16 | RxTSb2_6   | AE23 | RxSer 5     |      |            |
| AC8  | RxMSync 7   | AD17 | RxOH Clk 6 | AE24 | TxTSb4_4    |      |            |
| AC9  | RxTSClk 7   | AD18 | TxTSb3_5   | AE25 | NC          |      |            |

## ORDERING INFORMATION

| PART NUMBER | PACKAGE                                 | OPERATING TEMPERATURE RANGE              |
|-------------|-----------------------------------------|------------------------------------------|
| XRT84L18    | 35 x 35 mm, 388 Plastic Ball Grid Array | -40 <sup>0</sup> C to +85 <sup>0</sup> C |

## PACKAGE DIMENSIONS

### 388 Ball Plastic Ball Grid Array (35 x 35 mm PBGA) Rev. 1.0



| Symbol | Inches   |       | Millimeters |       |
|--------|----------|-------|-------------|-------|
|        | MIN      | MAX   | MIN         | MAX   |
| A      | 0.075    | 0.106 | 1.90        | 2.70  |
| A1     | 0.020    | 0.028 | 0.50        | 0.70  |
| A2     | 0.039    | 0.051 | 1.00        | 1.30  |
| b      | 0.024    | 0.035 | 0.60        | 0.90  |
| C      | 0.016    | 0.028 | 0.40        | 0.70  |
| D      | 1.370    | 1.386 | 34.80       | 35.20 |
| D1     | 1.250BSC |       | 31.75BSC    |       |
| D2     | 1.177    | 1.185 | 29.90       | 30.10 |
| e      | 0.050BSC |       | 1.27BSC     |       |

Note: The control dimension is the millimeter column

**REVISION HISTORY**

Rev. A1.0.1 minor edits to description and document format

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