

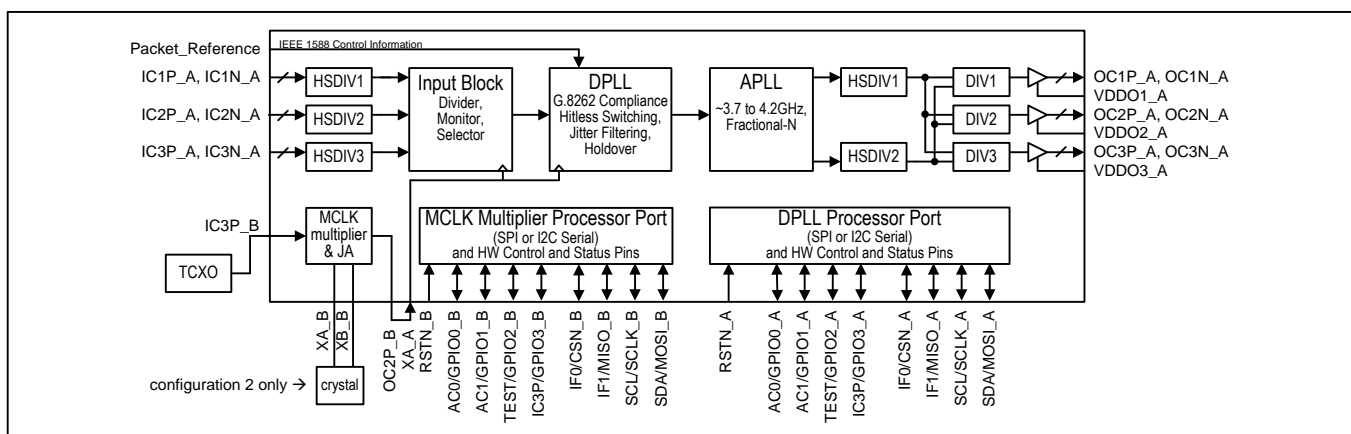
Features

- **Packet Network Frequency and Phase Sync**
 - Frequency accuracy for GSM, WCDMA-FDD, LTE-FDD basestations and small cells
 - Frequency performance for ITU-T G.823 and G.824 synchronization interface, G.8261 PNT PEC and CES interfaces and G.8263 PEC-S-F
 - Phase synchronization performance for WCDMA-TDD, TD-SCDMA, CDMA2000, LTE-TDD and LTE-A applications
 - Client holdover and reference switching between multiple servers
 - Support for new ITU-T packet clock drafts or recs: G.8263 PEC, G.8273.2 T-BC & T-TSC w/o SyncE, and G.8273.4 T-BC-P & T-TSC-P
 - Hybrid mode for mixing SyncE and IEEE1588
- **Physical Layer Clock Synchronization**
 - ITU-T G.8262 SyncE EEC options 1 and 2
- **Low-Bandwidth DPLL**
 - Low-jitter operation from any ≥ 10 MHz TCXO
 - Master clock jitter attenuator reduces cost by removing TCXO/OCXO low-jitter requirement
 - Hitless reference switching
 - High-resolution holdover averaging
 - Numerically controlled oscillator mode
- **Input Clocks**
 - Up to 3 inputs, 2 differential/CMOS, one CMOS
 - Any input frequency from 8kHz to 1250MHz (8kHz to 300MHz for CMOS)
 - Per-input activity and frequency monitoring

Ordering Information

| | | |
|-------------------------|------------|---------------|
| ZL30721LFG7 | 64 Pin LGA | Trays |
| ZL30721LFF7 | 64 Pin LGA | Tape and Reel |
| Ni Au | | |
| Package size: 5 x 10 mm | | |
| -40°C to +85°C | | |

- **Low-Jitter Fractional-N APLL and 3 Outputs**
 - Any output frequency from <1Hz to 1035MHz
 - High-resolution fractional frequency conversion with 0ppm error
 - Encapsulated design requires no external VCXO or loop filter components
 - Output jitter as low as 0.25ps RMS (12kHz-20MHz integration band)
 - Outputs are CML or 2xCMOS, can interface to LVDS, LVPECL, HSTL, SSTL and HCSL
 - Per-output supply pin with CMOS output voltages from 1.5V to 3.3V
 - Precise output alignment circuitry and per-output phase adjustment
 - Per-output enable/disable and glitchless start/stop (stop high or low)
- **General Features**
 - Automatic self-configuration at power-up from internal EEPROM; up to four configurations
 - Input-to-output alignment with external feedback
 - SPI or I²C processor Interface
 - Easy-to-use evaluation software


Figure 1 - Functional Block Diagram

1. Application Examples

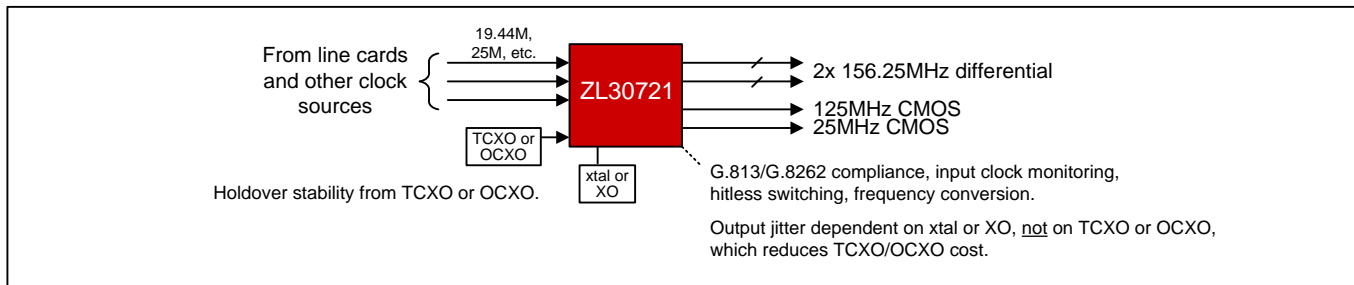


Figure 2 – Telecom Timing Card Application, TCXO + Crystal/XO for Lowest Jitter

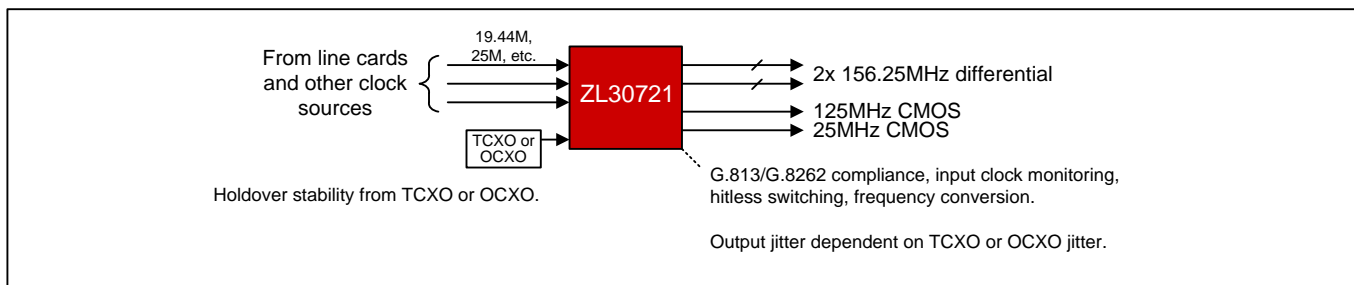


Figure 3 – Telecom Timing Card Application, TCXO Only

2. Detailed Features

2.1 Time Synchronization Algorithm

- External algorithm controls software digital PLL to adjust frequency and phase alignment
- Frequency, phase and time synchronization over IP, MPLS and Ethernet packet networks
- Frequency accuracy performance for GSM, WCDMA-FDD, LTE-FDD femtocell, small cell (residential, urban, rural, enterprise), picocell and macrocell applications, with target performance less than ± 15 ppb
- Frequency performance for ITU-T G.8263 for PEC-S-F (Packet Equipment Clock - Slave - Frequency)
- Frequency performance for ITU-T G.823 and G.824 synchronization interface, as well as G.8261 PNT EEC, PNT PEC and CES interface specifications
- Phase synchronization performance for WCDMA-TDD, Mobile WiMAX, TD-SCDMA, CDMA2000, LTE-TDD and LTE-A femtocell, small cell (residential, urban, rural, enterprise), picocell and macrocell applications with target performance less than $\pm 1\mu\text{s}$ phase alignment.
- Phase performance for ITU-T packet clock drafts or recommendations in development
 - ITU-T G.8273.2 T-BC & T-TSC, when not using SyncE input
 - ITU-T G.8273.4 T-BC-P & T-TSC-P
- Supports hybrid mode for mixing SyncE and IEEE1588 inputs
- Time Synchronization for TAI, UTC-traceability and GNSS/GPS replacement.
- Client reference switching between multiple servers
- Client holdover when server packet connectivity is lost
- Client synchronization to best server with monitoring of secondary server references

2.2 Master Clock Jitter Attenuator and Multiplier

- Enables the DPLL to operate from any TCXO or OCXO $\geq 10\text{MHz}$ regardless of jitter
- When a low-cost crystal or XO is used, output jitter depends on crystal/XO, not on TCXO/OCXO jitter
- Reduces cost by removing tight jitter requirement from TCXO or OCXO

2.3 Input Block Features

- Up to three input clocks, two differential or single-ended, one single-ended
- Input clocks can be any frequency from 8kHz up to 1250MHz (differential) or 300MHz (single-ended)

- Supported telecom frequencies include PDH, SDH, Synchronous Ethernet, OTN, wireless
- Inputs constantly monitored by programmable activity monitors and frequency monitors
- Fast activity monitor can disqualify the selected reference after a few missing clock cycles
- Frequency measurement and monitoring with 1ppm resolution and accept/reject hysteresis
- Optional input clock invalidation on GPIO assertion to react to LOS signals from PHYs

2.4 Electrical Clock Engine Features

- Very high-resolution DPLL architecture
- State machine automatically transitions between tracking and freerun/holdover states
- Revertive or nonrevertive reference selection algorithm
- Programmable bandwidth from 0.1Hz to 10Hz
- Less than 0.1dB gain peaking
- Programmable phase-slope limiting
- Programmable tracking range (i.e. hold-in range)
- Truly hitless reference switching with <200ps output clock phase transient
 - Physical-clock-to-physical-clock reference switching
 - Physical-clock-to-packet-timing reference switching
 - Packet-timing-to-physical-clock reference switching
 - Packet-timing-to-packet-timing reference switching
- Support for SyncE and SONET/SDH equipment clock specifications
 - ITU-T G.8262 option 1 EEC
 - ITU-T G.8262 option 2 EEC
 - ITU-T G.813 option 1 SEC
 - IUT-T G.813 option 2 SEC
- Output phase adjustment in 10ps steps
- High-resolution frequency and phase measurement
- Fast detection of input clock failure and transition to holdover mode
- Holdover frequency averaging with programmable averaging time and delay time

2.5 APLL Features

- Very high-resolution fractional scaling (i.e. non-integer multiplication)
- Any-to-any frequency conversion with 0ppm error
- Two high-speed dividers (integers 4 to 15, half divides 4.5 to 7.5)
- Easy-to-configure, completely encapsulated design requires no external VCXO or loop filter components

2.6 Output Clock Features

- Three low-jitter output clocks
- Each output can be one differential output or two CMOS outputs
- Output clocks can be any frequency from 1Hz to 1035MHz (250MHz max for CMOS and HSTL outputs)
- Output jitter as low as 0.25ps RMS (12kHz to 20MHz)
- In CMOS mode, an additional divider allows the OCxN pin to be an integer divisor of the OCxP pin (Example 1: OC3P 125MHz, OC3N 25MHz. Example 2: OC2P 25MHz, OC2N 1Hz)
- Outputs easily interface with CML, LVDS, LVPECL, HSTL, SSTL, HCSL and CMOS components
- Supported telecom frequencies include PDH, SDH, Synchronous Ethernet, OTN
- Sophisticated output-to-output phase alignment
- Per-output phase adjustment with high resolution and unlimited range
- Per-output enable/disable
- Per-output glitchless start/stop (stop high or low)

2.7 General Features

- SPI or I²C serial microprocessor interface
- Automatic self-configuration at power-up from internal EEPROM memory; pin control to specify one of four stored configurations
- Numerically controlled oscillator (NCO) mode allows system software to steer DPLL frequency with resolution better than 0.01ppb

- Input-to-output alignment with external feedback
- Up to eight general-purpose I/O pins each with many possible status and control options
- Output frame sync signals: 2kHz or 8kHz (SONET/SDH), 1Hz (IEEE 1588) or other frequency
- Internal compensation for local oscillator frequency error

2.8 API Software

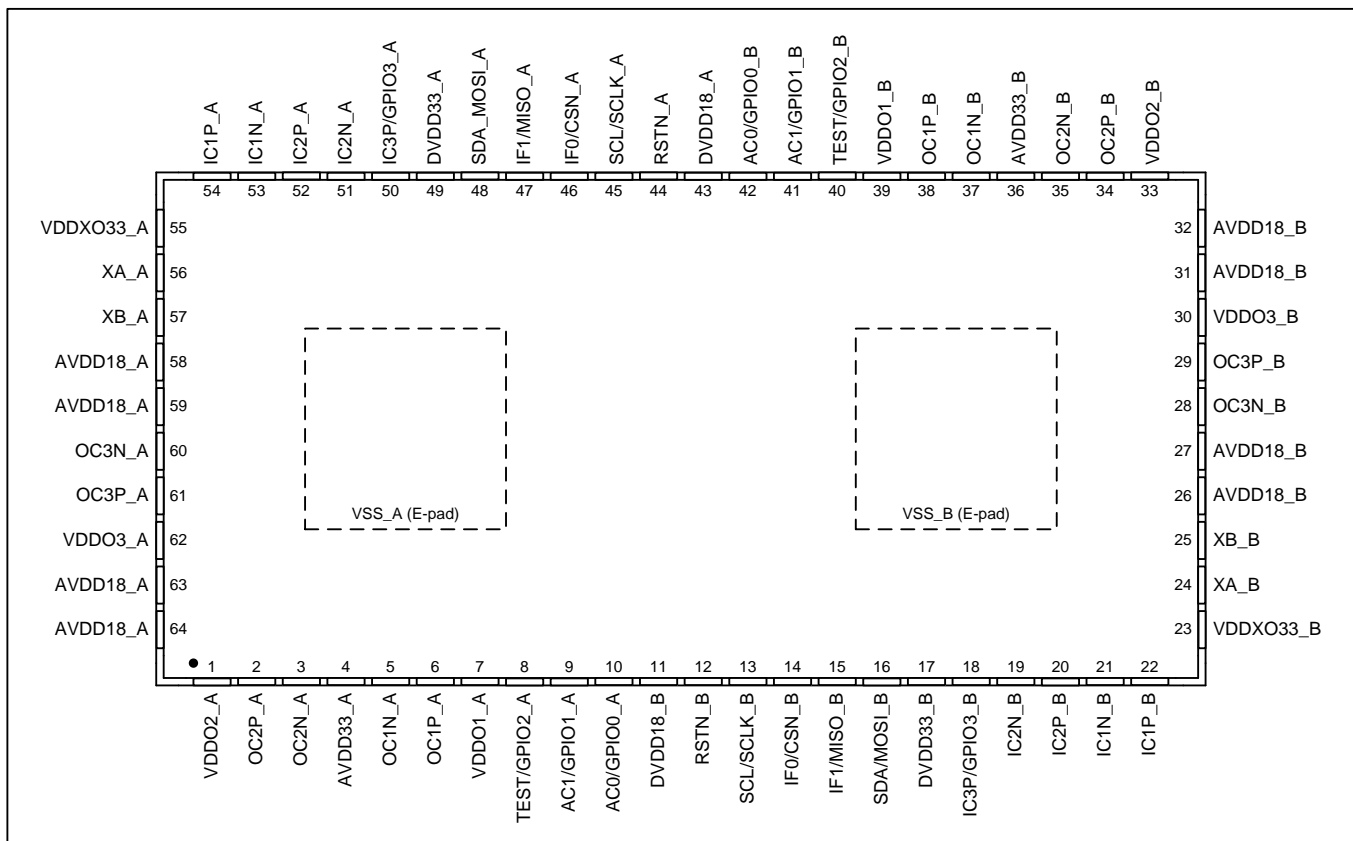
- Interfaces to 1588-capable PHYs and switches with integrated timestamping
- Abstraction layer for independence from OS and CPU, from embedded SoC to home-grown
- Fits into centralized, highly integrated “pizza box” architectures as well as distributed architectures with multiple line cards and timing cards

3. Applications

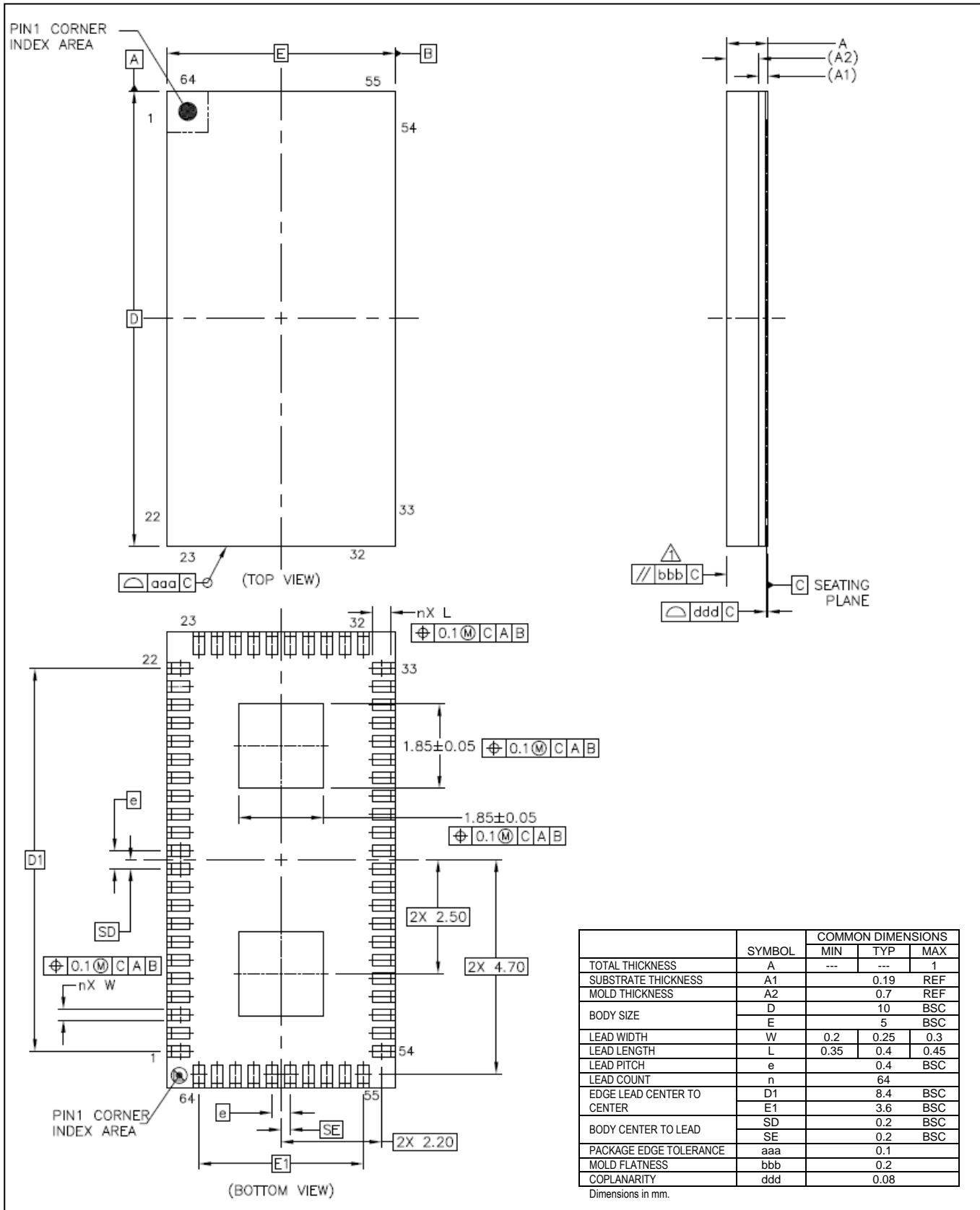
- ITU-T G.8262 system timing cards for Synchronous Ethernet systems
- System timing cards which support ITU-T G.781 SETS (SDH Equipment Timing Source)
- Integrated basestation reference synchronization for air interfaces for
 - GSM, WCDMA, TD-SCDMA, LTE and LTE-A
 - FDD or TDD mobile technology
 - Femtocells, small cells (residential, urban, rural, enterprise), picocells and macrocells
- Mobile Backhaul NID, cell-site router, edge switch/router, microwave or access aggregation node
- EPON/GPON OLT and ONU/ONT
- DSLAM and RT-DSLAM
- 10G, 40G and 100G line cards
- SONET/SDH, Fibre Channel, XAUI

4. Pin Diagram

The device is packaged in a 5x10mm 64-pin LGA.



5. Mechanical Drawing





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