

Time-to-Digital Converters for Time-of-Flight Applications in LIDAR, Range Finders, and Flow Meters

1. FEATURES

- Typical time resolution: 38ps
- Standard Deviation:
 - 10ps (Mode 1, 100ns)
 - 50ps (Mode 2, 10μs)
- Measurement Range:
 - Mode 1: 3ns to 1000ns
 - Mode 2: 250ns to 8ms
 - Mode 3: 0ns to 1000ns (with inner delay compensation for dead time)
 - Mode 4: 250ns to 250ms
- Support up to 5 STOP Signals
- Autonomous Multi-Cycle Averaging Mode, up to 128 Sampling Average and Save Host Controller Power
- Support SPI Interface and Multiple Register Accessible
- Power Supply: 2.2V to 3.6V
- Low Current Consumption in Standby Mode with 200μA
- Operating Temperature: -40°C to 125°C
- Package: TSSOP14

2. APPLICATION

- Ultrasonic meter: Gas Meter, Water Meter.
- Time of Flight measurement in SONAR, LIDAR, Drones, Robot Vacuum Cleaner.
- Displacement Sensing.
- Collision Detection Systems
- Biomedical Engineering Instruments, PET-CT Image, Fluorescence-lifetime-image.

3. GENERAL DESCRIPTION

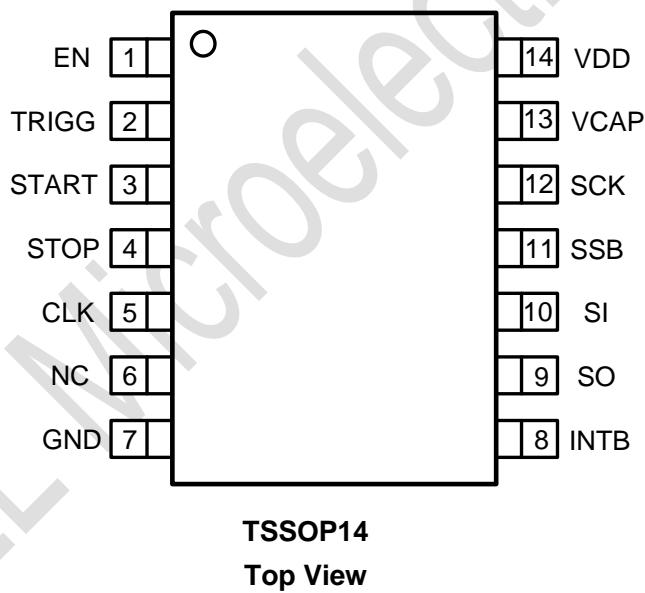
The TMIS7701 is a time to digital converters (TDC). It performs the function of a stopwatch and measures the elapsed picoseconds to microseconds between a START pulse and up to five STOP pulses. The ability to measure from START to multiple STOPs gives users the flexibility to select which STOP pulse yields the best echo performance.

The device has an internal self-calibrated time base which compensates for drift over time and temperature. Self-calibration enables time-to-digital conversion accuracy in the order of picoseconds. The high time resolution and accuracy make TMIS7701 ideal for time-of-flight sensing, such as in centimeter accuracy LIDAR application and ultrasonic flow metering. TMIS7701 can work in the Autonomous Multi-Cycle Averaging Mode. In this mode, the host can go to sleep to save power, and it can wake up when interrupted by the TDC upon completion of the measurement sequence. This working mode is optimized for low system power consumption, making it ideal for battery powered flow meters.

4. Absolute Maximum Ratings

| Symbol | Parameter | Min | Max | Unit |
|-------------------------|--|------|---------|------|
| VDD | Low-voltage digital supply | -0.3 | 3.9 | V |
| VI | Terminal Input voltage | -0.3 | VDD+0.3 | V |
| V _{DIFF_IN} | Voltage differential between any two input terminals | | 3.9 | V |
| V _{IN_GND_VDD} | Voltage differential between input terminals between GND and VDD | | 3.9 | V |
| I _{IN} | Input current at any pin | -5 | 5 | mA |
| T _A | Ambient operating temperature | -40 | 125 | °C |
| T _{stg} | Storage temperature | -40 | 150 | °C |

5. PIN CONFIGURATION



Top Mark: TMIS7701/XXXXXX (TMIS7701: Device Code, XXXXXX: Inside Code)

| Part Number | Package | Top mark | Quantity/Reel |
|-------------|---------|-----------------|---------------|
| TMIS7701 | TSSOP14 | T7701 XXXXXX | 4000 |

TMIS7701 devices are Pb-free and RoHS compliant.

6. PIN FUNCTIONS

| Pin | Name | Type | Function |
|-----|-------|--------|---|
| 1 | EN | Input | Input enable signal to TDC |
| 2 | TRIGG | Output | Trigger output signal |
| 3 | START | Input | START signal |
| 4 | STOP | Input | STOP signal |
| 5 | CLK | Input | Clock input |
| 6 | NC | - | Not Connected |
| 7 | GND | Ground | Ground |
| 8 | INTB | Output | Interrupt to MCU |
| 9 | SO | Output | SPI data output |
| 10 | SI | Input | SPI data input |
| 11 | SSB | Input | SPI chip selection for TDC1, Active low |
| 12 | SCK | Input | SPI clock |
| 13 | VCAP | Output | LDO output terminal for external decoupling cap |
| 14 | VDD | Power | Supply input |

7. ESD RATING

| Items | Description | Value | Unit |
|----------------|-----------------------------------|------------|------|
| V_{ESD_HBM} | Human Body Model for all pins | ± 4000 | V |
| V_{ESD_CDM} | Charged Device Model for all pins | ± 1000 | V |

JEDEC specification JS-002

8. Recommended Operating Conditions

$T_A = 25^\circ\text{C}$, $V_{DD1}=V_{DD2} = 3.3\text{V}$ (unless otherwise noted).

| Parameter | Test Conditions | Min | TYP | Max | Unit |
|------------------|--|---------------------|-----|---------------------|------|
| V_{DD} | Supply voltage | 2.2 | | 3.6 | V |
| VI | Terminal voltage | 0 | | V_{DD} | V |
| VIH | Voltage input high | $0.7 \times V_{DD}$ | | 3.6 | V |
| VIL | Voltage input low | 0 | | $0.3 \times V_{DD}$ | V |
| F_{CALIB_CLK} | Frequency (Reference or Calibration Clock) | 1 | 8 | 16 | MHz |
| T_{CLOCK} | Time period (Reference or Calibration clock) | 62.5 | 125 | 1000 | ns |
| $DUTY_{CLOCK}$ | Input clock duty cycle | | 50 | | % |

Timing Requirements: Measurement Mode 1

| | | | | | |
|-----------------------|---|----|------|--|----|
| $T_{1STARTSTOP_Min}$ | Minimum Time between Start and Stop Signal | 3 | | | ns |
| $T_{1STOPSTOP_Min}$ | Minimum Time between 2 Stop Signals | 40 | | | ns |
| $T_{1STARTSTOP_MAX}$ | Maximum Time between Start and Stop Signals | | 1500 | | ns |
| $T_{1STOPSTOP_MAX}$ | Maximum Time between Stop and Stop Signals | | 1500 | | ns |

Timing Requirements: Measurement Mode 2

| | | | | | |
|-----------------------|--|----------------------|--|-------------------------------|---|
| $T_{2STARTSTOP_Min}$ | Minimum Time between Start and Stop Signal | $2 \times t_{CLOCK}$ | | | s |
| $T_{2STOPSTOP_Min}$ | Minimum Time between Stop and Stop Signal | $2 \times t_{CLOCK}$ | | | s |
| $T_{2STARTSTOP_Max}$ | Maximum Time between Start and Stop Signal | | | $(2^{16}-2) \times t_{CLOCK}$ | s |
| $T_{2STOPSTOP_Max}$ | Maximum Time between Stop and Stop Signal | | | $(2^{16}-2) \times t_{CLOCK}$ | s |

Timing Requirements: Enable Input

| | | | | | |
|-----------|---------------------------------------|---|--|-----|----|
| T_{REN} | Rise Time for Enable Signal (20%-80%) | 2 | | 200 | ns |
| T_{FEN} | Fall Time for Enable Signal (20%-80%) | 2 | | 200 | ns |

Timing Requirements: START, STOP, CLK

| | | | | | |
|-----------------------|--|--|---|--|----|
| T_{RST}, T_{FST} | Maximum rise, fall time for START, STOP signals (20%- 80%) | | 2 | | ns |
| T_{XCLK}, T_{FXCLK} | Maximum rise, fall time for external CLOCK (20%-80%) | | 2 | | ns |

Timing Requirements: TRIGG

| | | | | | |
|-----------------|-------------------------|--|--|---|----|
| $T_{TRIGSTART}$ | Time from TRIG to START | | | 6 | ns |
|-----------------|-------------------------|--|--|---|----|

Temperature

| | | | | | |
|-------|----------------------|-----|--|-----|--------------------|
| T_A | Ambient temperature | -40 | | 125 | $^{\circ}\text{C}$ |
| T_J | Junction temperature | -40 | | 125 | $^{\circ}\text{C}$ |

9. Thermal Information

| Items | Description | Value | Unit |
|---------------------------|--|-------|------|
| θ_{JA} | Junction-to-ambient thermal resistance | 135 | °C/W |
| $\theta_{JC(\text{top})}$ | Junction-to-case (top) thermal resistance | 63 | °C/W |
| θ_{JB} | Junction-to-board thermal resistance | 75 | °C/W |
| Ψ_{JT} | Junction-to-top characterization parameter | 12 | °C/W |
| Ψ_{JB} | Junction-to-board characterization parameter | 76 | °C/W |

10. Electrical Characteristics

| PARAMETER | TEST CONDITIONS | Min | TYP | Max | Unit |
|--|--|------|------|-----|------|
| TDC Characteristics | | | | | |
| LSB | Single shot measurement | 38 | | | ps |
| T _{ACC-2} Accuracy Mode 2 | LOCK = 8 MHz | 25 | | | ps |
| T _{STD-2} Standard Deviation Mode 2 | Measured Time = 200μs Measured Time = 2μs | 50 | | | ps |
| Output Characteristics: TRIGG, INTB, SO | | | | | |
| V _{OH} Output voltage high | I _{source} = -2 mA | 2.32 | 2.95 | | V |
| V _{OL} Output voltage low | I _{sink} = 2 mA | 0.35 | 0.99 | | V |
| Input Characteristics: EN, START, STOP, CLK, SI, SSB, SCK | | | | | |
| C _{in} Input capacitance | | 3 | | | pF |
| Power Consumption | | | | | |
| I _{SD} Shutdown current | EN = LOW | 0.1 | | | μA |
| I _{QA} Quiescent Current A | EN=HIGH, TDC running | 1.4 | | | mA |
| I _{QB} Quiescent Current B | EN=HIGH, TDC OFF, Clock Counter running | 300 | | | μA |
| I _{QC} Quiescent Current C | EN = HIGH; measurement stopped, SPI communication only | 350 | | | μA |
| I _{QD} Quiescent Current D | EN = HIGH, TDC OFF, counter stopped, no communication | 200 | | | μA |

11. Timing Requirements

| PARAMETER | | MIN | TYP | MAX | UNIT |
|---|---|-----|-----|-----|------|
| Timing Requirements: START, STOP, CLOCK | | | | | |
| PW _{START} | Pulse width for START signal | 10 | | | ns |
| PW _{STOP} | Pulse width for STOP signal | 10 | | | ns |
| Serial Interface Timing Characteristics (VDD=3.3V, f_{SCLK}=25MHz) | | | | | |
| f _{SCLK} | SCK frequency | | | 25 | MHz |
| t ₁ | SCK period | 40 | | | ns |
| Serial Interface Timing Characteristics (VDD=3.3V, f_{SCLK}=20MHz) | | | | | |
| t ₁ | SCK period | 50 | | | ns |
| t ₂ | SCK high time | 16 | | | ns |
| t ₃ | SCK low time | 16 | | | ns |
| t ₄ | SI setup time | 5 | | | ns |
| t ₅ | SI hold time | 5 | | | ns |
| t ₆ | SSB fall to SCK rise | 6 | | | ns |
| t ₇ | Last SCK rising edge to SSB rising edge | 6 | | | ns |
| t ₈ | Minimum pause time (SSB high) | 40 | | | ns |
| t ₉ | SCK fall to SO bus transient | | | 12 | ns |
| Wake Up Time | | | | | |
| t _{Wakeup_period} | Time to be ready for measurement | | 300 | | μs |

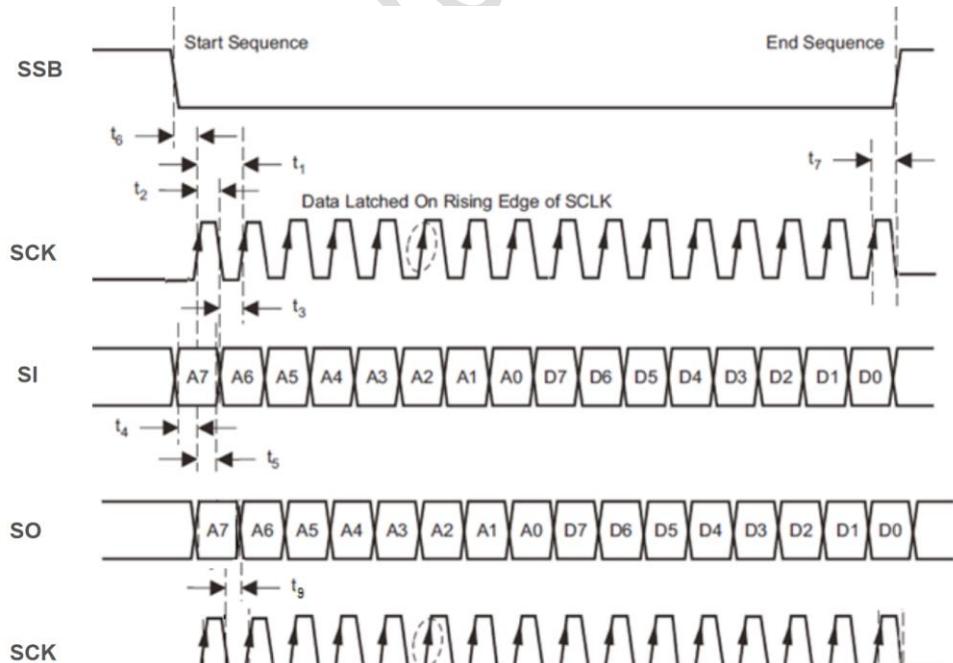


Figure 2. SPI Register Write: 8 bit Register Example

12.Detailed Description

Overview

TMIS7701 performs time measurement when START edge is asserted, and multiple subsequent measurements could be achieved when valid STOP edge is captured. The internal high precision time base can help measure time with accuracy in the order of picoseconds, this feature makes TMIS7701 ideal for wide application, such as LIDAR, flow meter.

Calculation Time-of-Flight (TOF)

With measurement mode 1, The TOF between the START to the nth STOP can be calculated using the below equation:

$$\text{normLSB} = \frac{T_{\text{OSC_PERIOD}}}{\text{calCount}} \quad \text{calCount} = \frac{\text{CALIBRATION2}-\text{CALIBRATION1}}{\text{CALIBRATION2}_{\text{PERIODS}}-1}$$

$$\text{TOF}_n = \text{TIME}_n \times \text{normLSB} + T_{\text{offset}}$$

Where:

- TOF_n [sec] = time-of-flight measurement from the START to the nth STOP
- TIME_n = nth TIME measurement given by the TIME1 to TIME6 registers
- normLSB [sec] = normalized LSB value from calibration
- CLOCKperiod [sec] = external CLOCK period
- CALIBRATION1 [count] = TDC count for first calibration cycle
- CALIBRATION2 [count] = TDC count for second calibration cycle
- CALIBRATION2_PERIODS = setting for the second calibration cycle; located in register CONFIG2

With measurement mode 2, The TOF between the START to the nth STOP can be calculated using the below equation:

$$\text{TOF}_n = \text{normLSB} \times (\text{TIME1}-\text{TIME}_{n+1}) + \text{CLKCOUNT}_n \times T_{\text{OSC_PERIOD}}$$

$$\text{normLSB} = \frac{T_{\text{OSC_PERIOD}}}{\text{calCount}} \quad \text{calCount} = \frac{\text{CALIBRATION2}-\text{CALIBRATION1}}{\text{CALIBRATION2}_{\text{PERIODS}}-1}$$

Where:

- TOF_n [sec] = time-of-flight measurement from the START to the n th STOP
- TIME1 = TIME1 register value = time 1 measurement given by the TMIS7701 register address 0x10.
- TIME_(n+1) = TIME_(n+1) register value = (n+1) time measurement, where n = 1 to 5 (TIME2 to TIME6 registers).
- normLSB [sec] = normalized LSB value from calibration.
- CLOCK_COUNT_n = nth clock count, where n = 1 to 5 (CLOCK_COUNT1 to CLOCK_COUNT5).
- CLOCKperiod [sec] = external CLOCK period.
- CALIBRATION1 = CALIBRATION1 register value = TDC count for first calibration cycle.
- CALIBRATION2 = CALIBRATION2 register value = TDC count for second calibration cycle.
- CALIBRATION2_PERIODS = setting for the second calibration; located in register TCONFIG2.

13.Functional Block Diagram

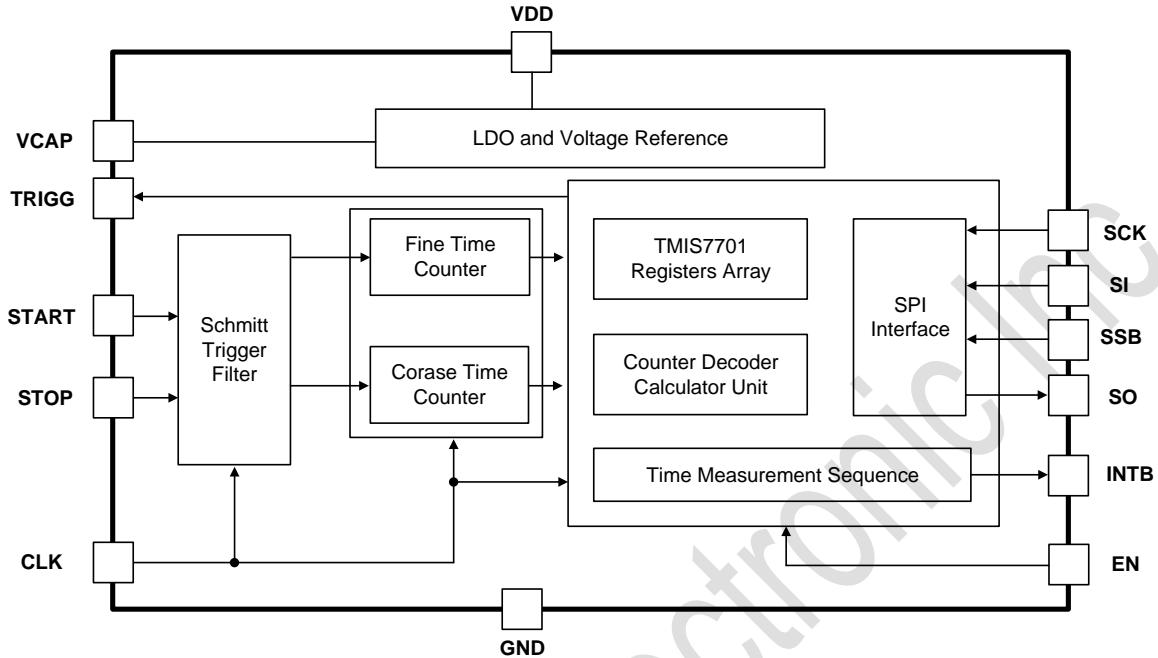


Figure 3. TMIS7701 Function Block Diagram

14. Typical Characteristics

VDD = 3.3 V, GND = 0 V, CLOCK = 8 MHz, CALIBRATION2_PERIODS = 10, AVG_CYCLES = 1, one STOP signal.

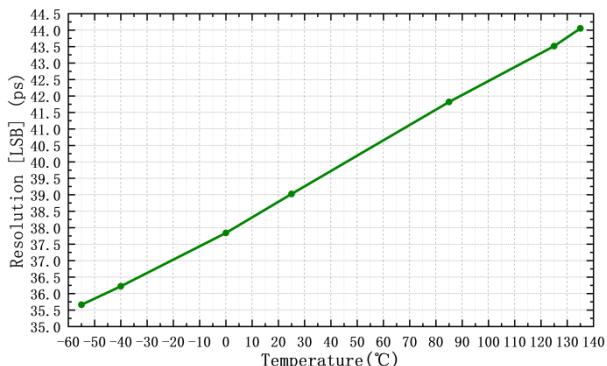


Figure 4. Resolution (LSB) vs. Temperature

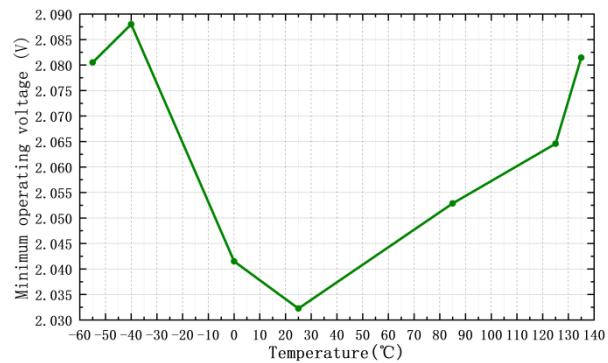


Figure 5. Minimum Operation Voltage vs. Temperature

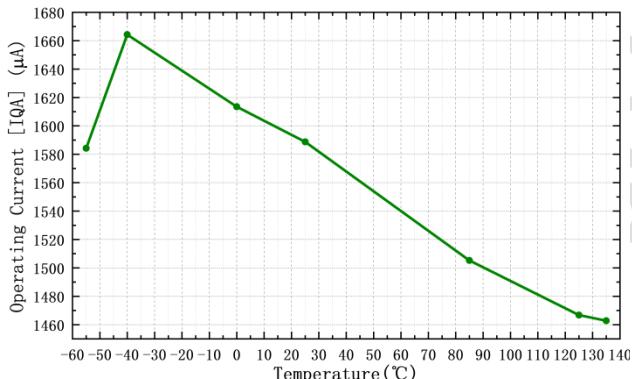


Figure 6. Operating Current (IQA) vs. Temperature

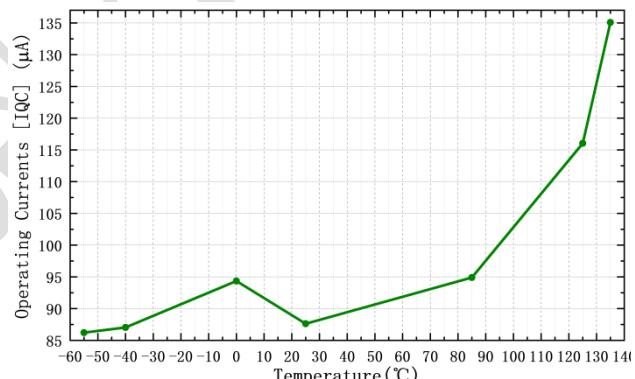


Figure 7. Operating Current (IQC) vs. Temperature

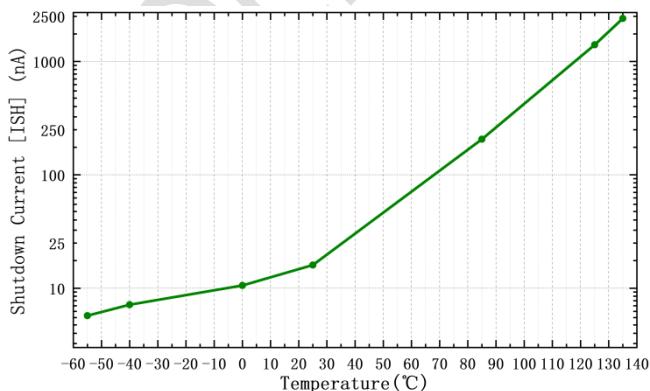


Figure 8. Shutdown Current (ISH) vs. Temperature

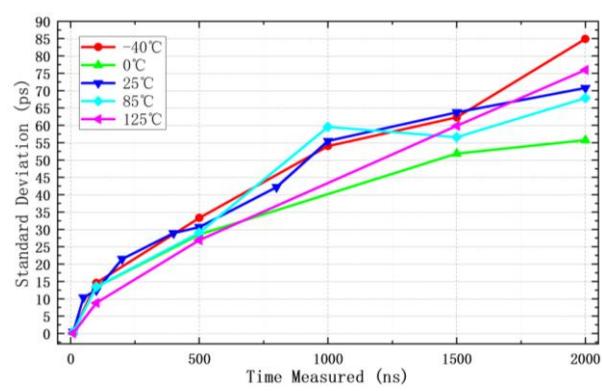
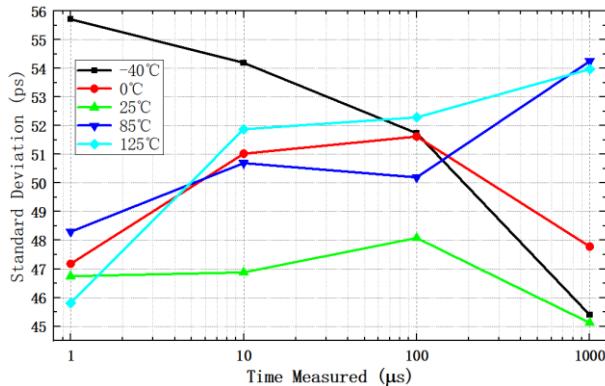


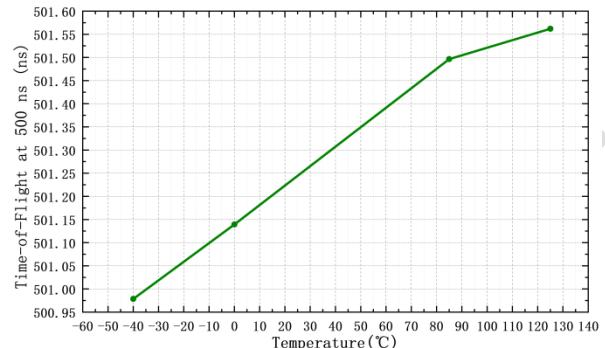
Figure 9. STDEV vs. Temperature & TOF (Measurement Mode 1)

14. Typical Characteristics

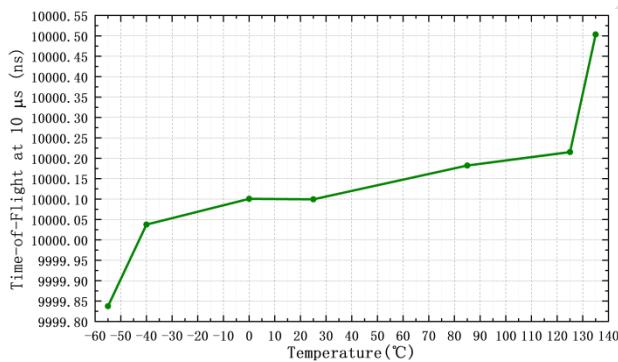
VDD = 3.3 V, GND = 0 V, CLOCK = 8 MHz, CALIBRATION2_PERIODS = 10, AVG_CYCLES = 1, one STOP signal.



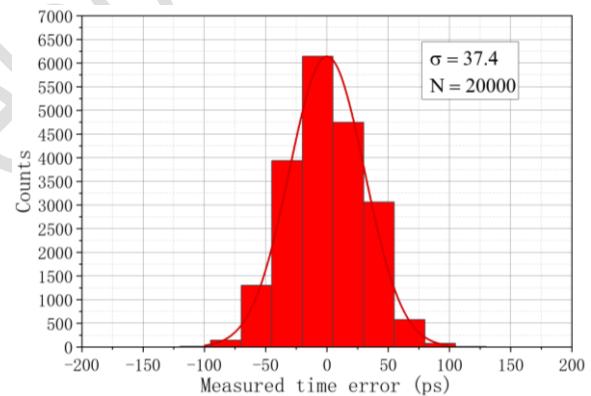
**Figure 10. STDEV vs. Temperature & TOF
(Measurement Mode 2)**



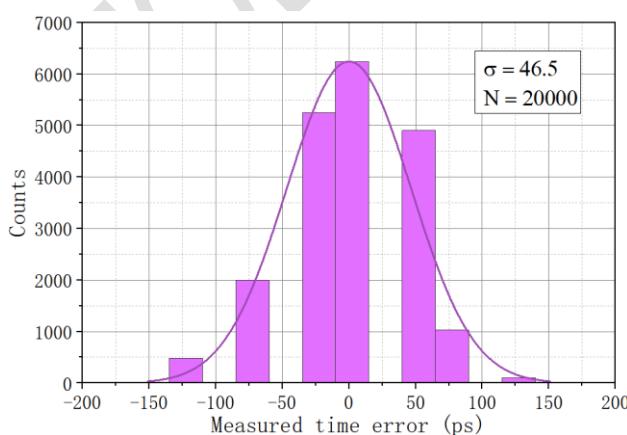
**Figure 11. TOF vs. Temperature
(Measurement Mode 1)**



**Figure 12. TOF vs. Temperature
(Measurement Mode 2)**



**Figure 13. TOF Error Histogram
(Measurement Mode 1, 500ns)**



**Figure 13. TOF Error Histogram
(Measurement Mode 2, 10μs)**

15.Register Array

| Register Address | Register Name | Description | Bits | Reset Value |
|------------------|------------------------|---|------|-------------|
| 00h | CONFIG1 | Configuration Register1 | 8 | 00h |
| 01h | CONFIG2 | Configuration Register2 | 8 | 40h |
| 02h | INT_STATUS | Interrupt Status Register | 8 | 00h |
| 03h | INT_MASK | Interrupt Mask Register | 8 | 07h |
| 04h | COARSE_CNTR_OVF_H | Coarse Counter Overflow Value High | 8 | 00h |
| 05h | COARSE_CNTR_OVF_L | Coarse Counter Overflow Value Low | 8 | FFh |
| 06h | CLOCK_CNTR_OVF_H | CLOCK Counter Overflow Value High | 8 | FFh |
| 07h | CLOCK_CNTR_OVF_L | CLOCK Counter Overflow Value Low | 8 | FFh |
| 08h | CLOCK_CNTR_STOP_MASK_H | CLOCK Counter STOP Mask High | 8 | 00h |
| 09h | CLOCK_CNTR_STOP_MASK_L | CLOCK Counter STOP Mask Low | 8 | 00h |
| 10h | TIME1 | Measure Time 1 | 24 | 00_0000h |
| 11h | CLOCK_COUNT1 | CLOCK Counter Value | 24 | 00_0000h |
| 12h | TIME2 | Measure Time 2 | 24 | 00_0000h |
| 13h | CLOCK_COUNT2 | CLOCK Counter Value | 24 | 00_0000h |
| 14h | TIME3 | Measure Time 3 | 24 | 00_0000h |
| 15h | CLOCK_COUNT3 | CLOCK Counter Value | 24 | 00_0000h |
| 16h | TIME 4 | Measure Time 4 | 24 | 00_0000h |
| 17h | CLOCK_COUNT4 | CLOCK Counter Value | 24 | 00_0000h |
| 18h | TIME 5 | Measure Time 5 | 24 | 00_0000h |
| 19h | CLOCK_COUNT5 | CLOCK Counter Value | 24 | 00_0000h |
| 1Ah | TIME6 | Measure Time 6 | 24 | 00_0000h |
| 1Bh | CALIBRATION1 | Calibration 1, 1 CLOCK Period | 24 | 00_0000h |
| 1Ch | CALIBRATION2 | Calibration 2, 2/10/20/40 CLOCK Periods | 24 | 00_0000h |

Table 1. Register Summery

CONFIG2: Configuration Register 2. R/W (address=00h) [reset=0h]**Table 2. Configuration Register 1**

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------|-----------|------------|-----------|------------|-----------|--------|------------|
| FORCE_CAL | PARITY_EN | TRIGG_EDGE | STOP_EDGE | START_EDGE | MEAS_MODE | | START_MEAS |
| R/W-0h | R/W-0h | R/W-0h | R/W-0h | R/W-0h | R/W-0h | R/W-0h | R/W-0h |

R/W=Read/Write; R=Read Only; -n=value after reset

Table 3. Configuration Register 1

| Bit | Field | Type | Reset | Description |
|-------|------------|------|-------|---|
| 7 | FORCE_CAL | R/W | 0 | 0: Calibration is not performed after interrupted measurement (for example, due to counter overflow or missing STOP signal) 1: Calibration is always performed at the end (for example, after a counter overflow) |
| 6 | PARITY_EN | R/W | 0 | 0: Parity bit for Measurement Result Registers* disabled (Parity Bit always 0) 1: Parity bit for Measurement Result Registers enabled (Even Parity) *The Measurement Results registers are the TIME1 to TIME6, CLOCK_COUNT1 to CLOCK_COUNT5, CALIBRATION1, CALIBRATION2 registers. |
| 5 | TRIGG_EDGE | R/W | 0 | 0: TRIGG is output as a Rising edge signal 1: TRIGG is output as a Falling edge signal |
| 4 | STOP_EDGE | R/W | 0 | 0: Measurement is stopped on Rising edge of STOP signal 1: Measurement is stopped on Falling edge of STOP signal |
| 3 | START_EDGE | R/W | 0 | 0: Measurement is started on Rising edge of START signal 1: Measurement is started on Falling edge of START signal |
| [2:1] | MEAS_MODE | R/W | 00h | 00: Measurement Mode 1 (for expected time-of-flight < 2μs). 01: Measurement Mode 2 (recommended, for expected time-of-flight < 8ms) 10: Measurement Mode 3 (internal 20ns delay and support time of flight 0ns) 11: Measurement Mode 4 (support maximum 1s time-of-flight, but the inner auto average mode measurement times is limited) |
| 0 | START_MEAS | R/W | 0 | Start New Measurement: This bit is cleared when Measurement is Completed. 0: No effect 1: Start New Measurement. Writing a 1 will clear all bits in the Interrupt Status Register and Start the measurement (by generating an TRIGG signal) and will reset the content of all Measurement Results registers. |

CONFIG2: Configuration Register 2. R/W (address=01h) [reset=40h]
Table 4. Configuration Register 2

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------------------|--------|------------|--------|--------|--------|--------|----------|
| CALIBRATION2_PERIODS | | AVG_CYCLES | | | | | NUM_STOP |
| R/W-0h | R/W-1h | R/W-0h | R/W-0h | R/W-0h | R/W-0h | R/W-0h | R/W-0h |

R/W=Read/Write; R=Read Only; -n=value after reset

Table 5. Configuration Register 2

| Bit | Field | Type | Reset | Description |
|-------|----------------------|------|-------|---|
| [7:6] | CALIBRATION2_PERIODS | R/W | 01h | 00: Calibration 2 - measuring 2 CLOCK periods ODS 01: Calibration 2 - measuring 10 CLOCK periods 10: Calibration 2 - measuring 20 CLOCK periods 11: Calibration 2 - measuring 40 CLOCK periods |
| [5:3] | AVG_CYCLES | R/W | 00h | Internal multi-cycle averaging mode. The interrupt is send after a series of measurements is finished. 000: 1 Measurement Cycle only 001: 2 Measurement Cycles 010: 4 Measurement Cycles 011: 8 Measurement Cycles 100: 16 Measurement Cycles 101: 32 Measurement Cycles 110: 64 Measurement Cycles 111: 128 Measurement Cycles |
| [2:0] | NUM_STOP | R/W | 00h | 000: Single Stop 001: Two Stops 010: Three Stops 011: Four Stops 100: Five Stops 101, 110, 111: No Effect. Single Stop |

INT_STATUS: Interrupt Status Register. R/W (address=02h) [reset=00h]
Table 6. Interrupt Status Register

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----------|----------|--------------------|-----------------------|----------------------|-------------------------|------------------|
| Reserved | Reserved | Reserved | MEAS_COMP _FLAG | MEAS_STARTED _FLAG | CLK_CNTR _OVF_INT | COARSE_CNTR _OVF_INT | NEW_MEAS _INT |
| R/W-0h | R/W-0h | R/W-0h | R/W-0h | R/W-0h | R/W-0h | R/W-0h | R/W-0h |

R/W=Read/Write; R=Read Only; -n=value after reset

Table 7. Interrupt Status Register Field Description

| Bit | Field | Type | Reset | Description |
|-----|-------------------------|------|-------|---|
| 7 | Reserved | R/W | 0 | |
| 6 | Reserved | R/W | 0 | |
| 5 | Reserved | R/W | 0 | |
| 4 | MEAS_COMP _FLAG | R/W | 0 | Writing a 1 will clear the status 0: Measurement has not completed 1: Measurement has completed |
| 3 | MEAS_STARTED _FLAG | R/W | 0 | Writing a 1 will clear the status 0: Measurement has not started 1: Measurement has started (START signal received) |
| 2 | CLK_CNTR _OVF_INT | R/W | 0 | Requires writing a 1 to clear interrupt status 0: No overflow detected 1: Clock overflow detected, running measurement will be stopped immediately |
| 1 | COARSE_CNTR _OVF_INT | R/W | 0 | Requires writing a 1 to clear interrupt status 0: No overflow detected 1: Coarse overflow detected, running measurement will be stopped immediately |
| 0 | NEW_MEAS _INT | R/W | 0 | Requires writing a 1 to clear interrupt status 0: Interrupt not detected 1: Interrupt detected – New Measurement has been completed |

INT_MASK: Interrupt Mask Register. R/W (address=03h) [reset=07h]
Table 8. Interrupt Mask Register

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----------|----------|----------|----------|-------------------------|--------------------------|-------------------|
| Reserved | Reserved | Reserved | Reserved | Reserved | CLOCK_CNTR _OVF_MASK | COARSE_CNTR _OVF_MASK | NEW_MEAS _MASK |
| R/W-0h | R/W-0h | R/W-0h | R/W-0h | R/W-0h | R/W-1h | R/W-1h | R/W-1h |

R/W=Read/Write; R=Read Only; -n=value after reset

Table 9. Interrupt Mask Register Field Description

| Bit | Field | Type | Reset | Description |
|-----|----------------------|------|-------|---|
| 7 | Reserved | R/W | 0 | |
| 6 | Reserved | R/W | 0 | |
| 5 | Reserved | R/W | 0 | |
| 4 | Reserved | R/W | 0 | |
| 3 | Reserved | R/W | 0 | |
| 2 | CLOCK_CNTR_OVF_MASK | R/W | 1 | 0: CLOCK Counter Overflow Interrupt disabled 1: CLOCK Counter Overflow Interrupt enabled |
| 1 | COARSE_CNTR_OVF_MASK | R/W | 1 | 0: Coarse Counter Overflow Interrupt disabled 1: Coarse Counter Overflow Interrupt enabled |
| 0 | NEW_MEAS_MASK | R/W | 1 | 0: New Measurement Interrupt disabled 1: New Measurement Interrupt enabled |

COARSE_CNTR_OVF_H: Coarse Counter Overflow High Value Register (address = 04h) [reset=FFh]**Table 10. Coarse Counter Overflow High Value Register**

| | | | | | | | |
|-------------------|--------|--------|--------|--------|--------|--------|--------|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| COARSE_CNTR_OVF_H | | | | | | | |
| R/W-1h | R/W-1h | R/W-1h | R/W-1h | R/W-1h | R/W-1h | R/W-1h | R/W-1h |

R/W=Read/Write; R=Read Only; -n=value after reset

Table 11. Coarse Counter Overflow High Value Register Field Description

| Bit | Field | Type | Reset | Description |
|-----|-------------------|------|-------|---|
| 7:0 | COARSE_CNTR_OVF_H | R/W | FFh | Coarse Counter Overflow Value, higher 8 Bit |

COARSE_CNTR_OVF_L: Coarse Counter Overflow Low Value Register (address = 05h) [reset=FFh]**Table 12. Coarse Counter Overflow Low Value Register**

| | | | | | | | |
|-------------------|--------|--------|--------|--------|--------|--------|--------|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| COARSE_CNTR_OVF_L | | | | | | | |
| R/W-1h | R/W-1h | R/W-1h | R/W-1h | R/W-1h | R/W-1h | R/W-1h | R/W-1h |

R/W=Read/Write; R=Read Only; -n=value after reset

Table 13. Coarse Counter Overflow Low Value Register Field Description

| Bit | Field | Type | Reset | Description |
|-----|-------------------|------|-------|---|
| 7:0 | COARSE_CNTR_OVF_L | R/W | FFh | Coarse Counter Overflow Value, lower 8 Bit Note: Don't set COARSE_CNTR_OVF_L to 1. |

CLOCK_CNTR_OVF_H: Clock Counter Overflow High Register (address = 06h) [reset = FFh]
Table 14. Clock Counter Overflow High Register

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------------------|--------|--------|--------|--------|--------|--------|--------|
| CLOCK_CNTR_OVF_H | | | | | | | |
| R/W-1h | R/W-1h | R/W-1h | R/W-1h | R/W-1h | R/W-1h | R/W-1h | R/W-1h |

R/W=Read/Write; R=Read Only; -n=value after reset

Table 15. Clock Counter Overflow High Register Field Description

| Bit | Field | Type | Reset | Description |
|-----|------------------|------|-------|---|
| 7:0 | CLOCK_CNTR_OVF_H | R/W | FFh | CLOCK Counter Overflow Value, upper 8 Bit |

CLOCK_CNTR_OVF_L: Clock Counter Overflow Low Register (address = 07h) [reset = FFh]
Table 16. Clock Counter Overflow Low Register

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------------------|--------|--------|--------|--------|--------|--------|--------|
| CLOCK_CNTR_OVF_L | | | | | | | |
| R/W-1h | R/W-1h | R/W-1h | R/W-1h | R/W-1h | R/W-1h | R/W-1h | R/W-1h |

R/W=Read/Write; R=Read Only; -n=value after reset

Table 17. Clock Counter Overflow Low Register Field Description

| Bit | Field | Type | Reset | Description |
|-----|------------------|------|-------|---|
| 7:0 | CLOCK_CNTR_OVF_L | R/W | FFh | CLOCK Counter Overflow Value, lower 8 Bit |

CLOCK_CNTR_STOP_MASK_H: CLOCK Counter STOP Mask High Value Register (address = 08h)

[reset = 00h]

Table 18. CLOCK Counter STOP Mask High Value Register

| | | | | | | | |
|------------------------|--------|--------|--------|--------|--------|--------|--------|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CLOCK_CNTR_STOP_MASK_H | | | | | | | |
| R/W-0h | R/W-0h | R/W-0h | R/W-0h | R/W-0h | R/W-0h | R/W-0h | R/W-0h |

R/W=Read/Write; R=Read Only; -n=value after reset

Table 19. CLOCK Counter STOP Mask High Value Register Field Description

| Bit | Field | Type | Reset | Description | | | |
|-----|------------------------|------|-------|--------------------------------------|--|--|--|
| 7:0 | CLOCK_CNTR_STOP_MASK_H | R/W | 00h | CLOCK Counter STOP Mask, upper 8 Bit | | | |

CLOCK_CNTR_STOP_MASK_L: CLOCK Counter STOP Mask Low Value Register (address = 09h)

[reset = 00h]

Table 20. CLOCK Counter STOP Mask Low Value Register

| | | | | | | | |
|------------------------|--------|--------|--------|--------|--------|--------|--------|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CLOCK_CNTR_STOP_MASK_L | | | | | | | |
| R/W-0h | R/W-0h | R/W-0h | R/W-0h | R/W-0h | R/W-0h | R/W-0h | R/W-0h |

R/W=Read/Write; R=Read Only; -n=value after reset

Table 21. CLOCK Counter STOP Mask Low Value Register Field Description

| Bit | Field | Type | Reset | Description | | | |
|-----|------------------------|------|-------|--------------------------------------|--|--|--|
| 7:0 | CLOCK_CNTR_STOP_MASK_L | R/W | 00h | CLOCK Counter STOP Mask, lower 8 Bit | | | |

TIME1: Time 1 Register (address: 10h) [reset = 00_0000h]
Table 22. TIME1 Register

| | | | | | | | | | | | | | | | | | | | | | | | |
|------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Parity Bit | Measurement Result: 23 bit integer value (Bit 22: MSB, Bit 0: LSB) | | | | | | | | | | | | | | | | | | | | | | |
| R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 |

R/W=Read/Write; R=Read Only; -n=value after reset

Table 23. TIME 1 Register Field Descriptions

| Bit | Field | Type | Reset | Description |
|------|--|------|-------|--------------------|
| 23 | Parity Bit | R | 0 | Parity Bit |
| 22-0 | Measurement Result: 23 bit integer value (Bit 22: MSB, Bit 0: LSB) | R | 0 | Measurement Result |

CLOCK_COUNT1: Clock Count Register (address: 11h) [reset = 00_0000h]
Table 24. CLOCK_COUNT1

| | | | | | | | | | | | | | | | | | | | | | | | |
|------------|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Parity Bit | CLOCK_COUNT1 Result | | | | | | | | | | | | | | | | | | | | | | |
| R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 |

R/W=Read/Write; R=Read Only; -n=value after reset

Table 25. CLOCK_COUNT1 Field Description

| Bit | Field | Type | Reset | Description |
|-------|---------------------------------|------|-------|---------------------------------|
| 23 | Parity Bit | R | 0 | Parity Bit |
| 22-16 | Not Used | R | 0 | Measurement Result |
| 15-0 | CLOCK_COUNT1 Measurement Result | R | 0 | CLOCK_COUNT1 Measurement Result |

TIME2: Time 2 Register (address: 12h) [reset = 00_0000h]**Table 26. TIME 2 Register**

| | | | | | | | | | | | | | | | | | | | | | | | |
|------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Parity Bit | Measurement Result: 23 bit integer value (Bit 22: MSB, Bit 0: LSB) | | | | | | | | | | | | | | | | | | | | | | |
| R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 |

R/W=Read/Write; R=Read Only; -n=value after reset

Table 27. TIME 2 Register Field Descriptions

| Bit | Field | Type | Reset | Description |
|------|--|------|-------|--------------------|
| 23 | Parity Bit | R | 0 | Parity Bit |
| 22-0 | Measurement Result: 23 bit integer value (Bit 22: MSB, Bit 0: LSB) | R | 0 | Measurement Result |

CLOCK_COUNT2: Clock Count Register (address: 13h) [reset = 00_0000h]**Table 28. CLOCK_COUNT2**

| | | | | | | | | | | | | | | | | | | | | | | | |
|------------|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Parity Bit | CLOCK_COUNT2 Result | | | | | | | | | | | | | | | | | | | | | | |
| R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 |

R/W=Read/Write; R=Read Only; -n=value after reset

Table 29. CLOCK_COUNT2 Field Description

| Bit | Field | Type | Reset | Description |
|-------|---------------------------------|------|-------|---------------------------------|
| 23 | Parity Bit | R | 0 | Parity Bit |
| 22-16 | Not Used | R | 0 | Measurement Result |
| 15-0 | CLOCK_COUNT2 Measurement Result | R | 0 | CLOCK_COUNT2 Measurement Result |

TIME3: Time 3 Register (address: 14h) [reset = 00_0000h]
Table 30. TIME 3 Register

| | | | | | | | | | | | | | | | | | | | | | | | |
|------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Parity Bit | Measurement Result: 23 bit integer value (Bit 22: MSB, Bit 0: LSB) | | | | | | | | | | | | | | | | | | | | | | |
| R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 |

R/W=Read/Write; R=Read Only; -n=value after reset

Table 31. TIME 3 Register Field Descriptions

| Bit | Field | Type | Reset | Description |
|------|--|------|-------|--------------------|
| 23 | Parity Bit | R | 0 | Parity Bit |
| 22-0 | Measurement Result: 23 bit integer value (Bit 22: MSB, Bit 0: LSB) | R | 0 | Measurement Result |

CLOCK_COUNT3: Clock Count Register (address: 15h) [reset = 00_0000h]
Table 32. CLOCK_COUNT3

| | | | | | | | | | | | | | | | | | | | | | | | |
|------------|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Parity Bit | CLOCK_COUNT3 Result | | | | | | | | | | | | | | | | | | | | | | |
| R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 |

R/W=Read/Write; R=Read Only; -n=value after reset

Table 33. CLOCK_COUNT3 Field Description

| Bit | Field | Type | Reset | Description |
|-------|---------------------------------|------|-------|---------------------------------|
| 23 | Parity Bit | R | 0 | Parity Bit |
| 22-16 | Not Used | R | 0 | Measurement Result |
| 15-0 | CLOCK_COUNT3 Measurement Result | R | 0 | CLOCK_COUNT3 Measurement Result |

TIME4: Time 4 Register (address: 16h) [reset = 00_0000h]**Table 34. TIME 4 Register**

| | | | | | | | | | | | | | | | | | | | | | | | |
|------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Parity Bit | Measurement Result: 23 bit integer value (Bit 22: MSB, Bit 0: LSB) | | | | | | | | | | | | | | | | | | | | | | |
| R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 |

R/W=Read/Write; R=Read Only; -n=value after reset

Table 35. TIME 4 Register Field Descriptions

| Bit | Field | Type | Reset | Description |
|------|--|------|-------|--------------------|
| 23 | Parity Bit | R | 0 | Parity Bit |
| 22-0 | Measurement Result: 23 bit integer value (Bit 22: MSB, Bit 0: LSB) | R | 0 | Measurement Result |

CLOCK_COUNT4: Clock Count Register (address: 17h) [reset = 00_0000h]**Table 36. CLOCK_COUNT4**

| | | | | | | | | | | | | | | | | | | | | | | | |
|------------|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Parity Bit | CLOCK_COUNT4 Result | | | | | | | | | | | | | | | | | | | | | | |
| R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 |

R/W=Read/Write; R=Read Only; -n=value after reset

Table 37. CLOCK_COUNT4 Field Description

| Bit | Field | Type | Reset | Description |
|-------|---------------------------------|------|-------|---------------------------------|
| 23 | Parity Bit | R | 0 | Parity Bit |
| 22-16 | Not Used | R | 0 | Measurement Result |
| 15-0 | CLOCK_COUNT4 Measurement Result | R | 0 | CLOCK_COUNT4 Measurement Result |

TIME5: Time 5 Register (address: 18h) [reset = 00_0000h]
Table 38. TIME 5 Register

| | | | | | | | | | | | | | | | | | | | | | | | |
|------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Parity Bit | Measurement Result: 23 bit integer value (Bit 22: MSB, Bit 0: LSB) | | | | | | | | | | | | | | | | | | | | | | |
| R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 |

R/W=Read/Write; R=Read Only; -n=value after reset

Table 39. TIME 5 Register Field Descriptions

| Bit | Field | Type | Reset | Description |
|------|--|------|-------|--------------------|
| 23 | Parity Bit | R | 0 | Parity Bit |
| 22-0 | Measurement Result: 23 bit integer value (Bit 22: MSB, Bit 0: LSB) | R | 0 | Measurement Result |

CLOCK_COUNT5: Clock Count Register (address: 19h) [reset = 00_0000h]
Table 40. CLOCK_COUNT5

| | | | | | | | | | | | | | | | | | | | | | | | |
|------------|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Parity Bit | CLOCK_COUNT5 Result | | | | | | | | | | | | | | | | | | | | | | |
| R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 |

R/W=Read/Write; R=Read Only; -n=value after reset

Table 41. CLOCK_COUNT5 Field Description

| Bit | Field | Type | Reset | Description |
|-------|---------------------------------|------|-------|---------------------------------|
| 23 | Parity Bit | R | 0 | Parity Bit |
| 22-16 | Not Used | R | 0 | Measurement Result |
| 15-0 | CLOCK_COUNT5 Measurement Result | R | 0 | CLOCK_COUNT5 Measurement Result |

TIME6: Time 6 Register (address: 1Ah) [reset = 00_0000h]**Table 42. TIME 6 Register**

| | | | | | | | | | | | | | | | | | | | | | | | |
|------------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Parity Bit | Measurement Result: 23 bit integer value (Bit 22: MSB, Bit 0: LSB) | | | | | | | | | | | | | | | | | | | | | | |
| R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 |

R/W=Read/Write; R=Read Only; -n=value after reset

Table 43. TIME 6 Register Field Descriptions

| Bit | Field | Type | Reset | Description |
|------|--|------|-------|--------------------|
| 23 | Parity Bit | R | 0 | Parity Bit |
| 22-0 | Measurement Result: 23 bit integer value (Bit 22: MSB, Bit 0: LSB) | R | 0 | Measurement Result |

CALIBRATION1: Calibration 1 Register (address: 1Bh) [reset = 00_0000h]**Table 44. CALIBRATION1 Register**

| | | | | | | | | | | | | | | | | | | | | | | | |
|------------|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Parity Bit | Calibration 1 | | | | | | | | | | | | | | | | | | | | | | |
| R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 |

R/W=Read/Write; R=Read Only; -n=value after reset

Table 45. CALIBRATION1 Field Description

| Bit | Field | Type | Reset | Description |
|------|--------------|------|-------|--|
| 23 | Parity Bit | R | 0 | Parity Bit |
| 22-0 | Calibration1 | R | 0 | Calibration 1 Result: 23 bit integer value (Bit 22: MSB, Bit 0: LSB) |

CALIBRATION2: Calibration 2 Register (address: 1Ch) [reset = 00_0000h]**Table 46. CALIBRATION2 Register**

| | | | | | | | | | | | | | | | | | | | | | | | |
|------------|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Parity Bit | Calibration 2 | | | | | | | | | | | | | | | | | | | | | | |
| R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 | R-0 |

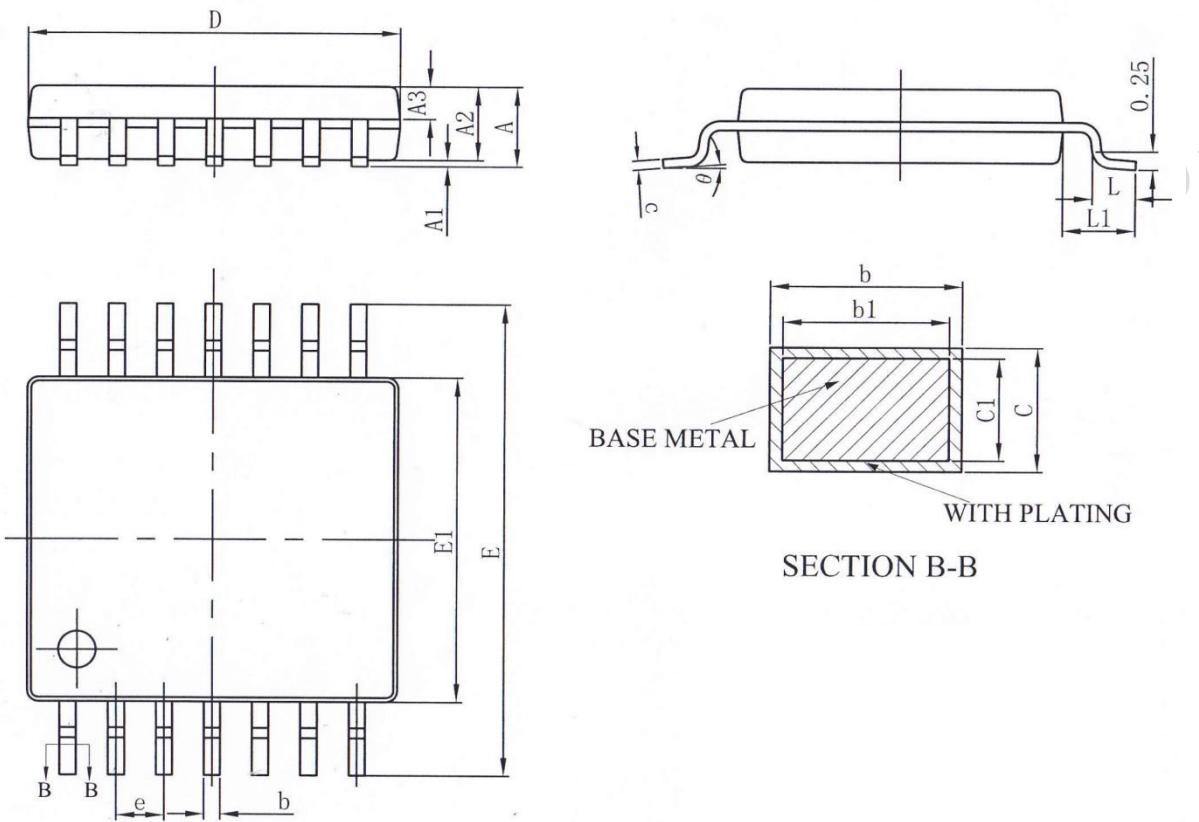
R/W=Read/Write; R=Read Only; -n=value after reset

Table 47. CALIBRATION2 Register Field Description

| Bit | Field | Type | Reset | Description |
|------|--------------|------|-------|--|
| 23 | Parity Bit | R | 0 | Parity Bit |
| 22-0 | Calibration1 | R | 0 | Calibration 2 Result: 23 bit integer value (Bit 22: MSB, Bit 0: LSB) |

16. PACKAGE INFORMATION

TSSOP14



Unit: mm

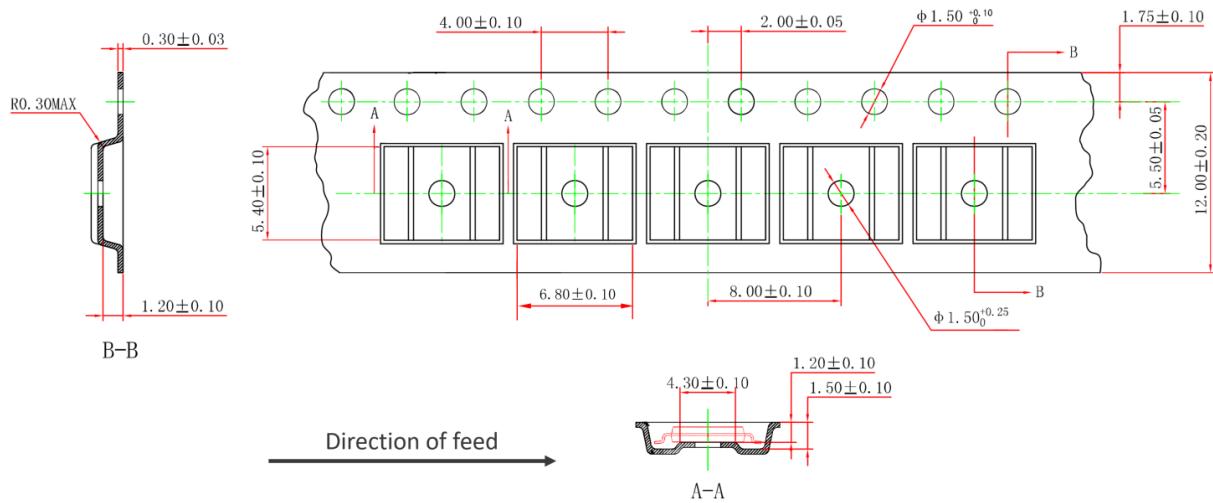
| Symbol | Dimensions In Millimeters | | | Symbol | Dimensions In Millimeters | | |
|--------|---------------------------|------|------|--------|---------------------------|------|------|
| | Min | NOM | Max | | Min | NOM | Max |
| A | - | - | 1.20 | c1 | 0.12 | 0.13 | 0.14 |
| A1 | 0.05 | - | 0.15 | D | 4.90 | 5.00 | 5.10 |
| A2 | 0.90 | 1.00 | 1.05 | E | 6.20 | 6.40 | 6.60 |
| A3 | 0.39 | 0.44 | 0.49 | E1 | 4.30 | 4.40 | 4.50 |
| b | 0.20 | - | 0.28 | e | 0.65BSC | | |
| b1 | 0.19 | 0.22 | 0.25 | L | 0.45 | - | 0.75 |
| c | 0.13 | - | 0.17 | L1 | 1.00BSC | | |
| θ | 0 | - | 8° | E2 | 2.80REF | | |
| D2 | 2.80REF | | | | | | |

Note:

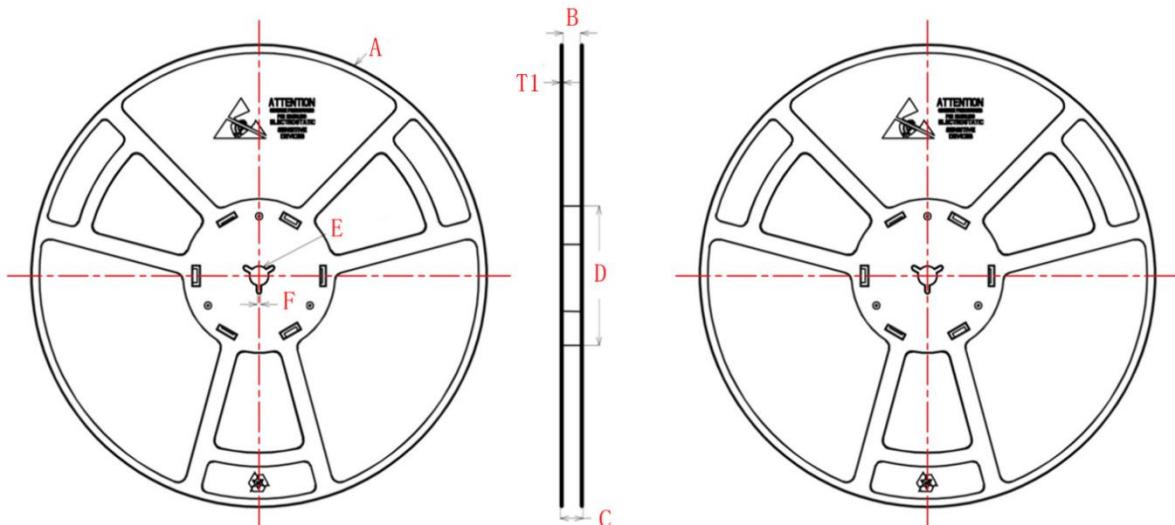
- 1) All dimensions are in millimeters.

17. TAPE AND REEL INFORMATION

TAPE DIMENSIONS: TSSOP16



REEL DIMENSIONS: TSSOP16



Unit: mm

| A | B | C | D | E | F | T1 |
|-----------|--------------------------------------|--------------------------------------|-------------|------------|---------|---------|
| Ø 330±1.0 | 12.4 ^{+1.0} _{-0.0} | 17.6 ^{+1.0} _{-0.0} | Ø 100.0±0.5 | Ø 13.0±0.2 | 1.9±0.4 | 1.9±0.2 |

Note:

- 1) All Dimensions are in Millimeter
- 2) Quantity of Units per Reel is 4000
- 3) MSL level is level 3.

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