DS75LX

Digital Thermometer and Thermostat with Extended Addressing

www.maxim-ic.com

GENERAL DESCRIPTION

This low-voltage (1.7V to 3.7V) digital thermometer and thermostat provides 9, 10, 11, or 12-bit digital temperature readings over a -55°C to +125°C range with ±2°C accuracy over a -25°C to +100°C range. At power-up, the DS75LX defaults to 9-bit resolution for software compatibility with the LM75. Communication with the DS75LX is achieved through a simple 2-wire serial interface. Three tri-state address pins allow up to 27 DS75LX devices to operate on the same 2-wire bus, which greatly simplifies distributed temperature-sensing applications.

The DS75LX thermostat has a dedicated open-drain output (O.S.) and programmable fault tolerance, which allow the user to define the number of consecutive error conditions that must occur before O.S. is activated. There are two thermostatic operating modes that control thermostat operation based on user-defined trip-points (T_{OS} and T_{HYST}).

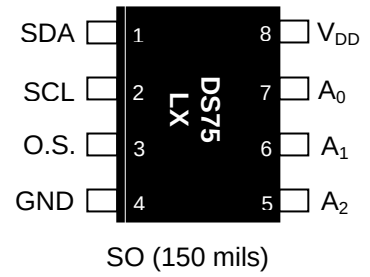
APPLICATIONS

Any Thermally Sensitive System
Cellular Base Stations
Telecom Switches and Routers
Servers

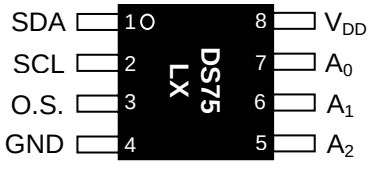
FEATURES

- **1.7V to 3.7V Operating Range**
- **Tri-State Address Pins Allow Up to 27 Unique Bus Addresses**
- **Temperature Measurements Require No External Components**
- **Measures Temperatures from -55°C to +125°C (-67°F to +257°F)**
- **±2°C Accuracy from -25°C to +100°C**
- **Thermometer Resolution Is User-Configurable from 9 (Default) to 12 Bits (0.5°C to 0.0625°C Resolution)**
- **9-Bit Conversion Time is 25ms (max)**
- **Thermostatic Settings are User-Definable**
- **Data is Read/Written Through 2-Wire Serial Interface (SDA and SCL Pins)**
- **Data Lines Filtered Internally for Noise Immunity (50ns Deglitch)**
- **Bus Timeout Feature Prevents Lockup Problems on 2-Wire Interface**
- **Multidrop Capability Simplifies Distributed Temperature-Sensing Applications**
- **Pin/Software Compatible with the LM75**
- **Available in 8-Pin µSOP (µMAX®) and SO Packages**

PIN CONFIGURATIONS



SO (150 mils)



µSOP/µMAX

ORDERING INFORMATION

PART	TEMP RANGE	PIN PACKAGE
DS75LXS+	-55°C to +125°C	8 SO (150 mils)
DS75LXS+T&R	-55°C to +125°C	8 SO (150 mils), 2500 Piece
DS75LXU+	-55°C to +125°C	8 µSOP (µMAX)
DS75LXU+T&R	-55°C to +125°C	8 µSOP (µMAX), 3000 Piece

+ Denotes lead-free package.
T&R denotes tape-and-reel.

***Note:** A "+" symbol will also be marked on the package near the pin 1 indicator.*

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ABSOLUTE MAXIMUM RATINGS

Voltage Range on V_{DD}, Relative to Ground	-0.3V to +4.0V
Voltage Range on Any Other Pin, Relative to Ground	-0.3V to +6.0V
Operating Temperature Range	-55°C to +125°C
Storage Temperature Range	-55°C to +125°C
Soldering Temperature	See IPC/JEDEC J-STD-020

These are stress ratings only and functional operation of the device at these or any other conditions above those indicated in the operation sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

The Dallas Semiconductor DS75LX is built to the highest quality standards and manufactured for long-term reliability. All Dallas Semiconductor devices are made using the same quality materials and manufacturing methods. However, the DS75LX is not exposed to environmental stresses, such as burn-in, that some industrial applications require. For specific reliability information on this product, contact the factory in Dallas at (972) 371-4448.

DC ELECTRICAL CHARACTERISTICS

($1.7V \le V_{DD} \le 3.7V$, T_A = -55°C to +125°C.)

PARAMETER	SYMBOL	CONDITIONS	MIN	MAX	UNITS
Supply Voltage	V_{DD}	(Note 1)	1.7	3.7	V
Thermometer Error (Note 2)	T_{ERR}	-25°C to +100°C		±2.0	°C
		-55°C to +125°C		±3.0	
Input Logic-High SDA, SCL	V_{IH}	(Note 3)	0.7 x V_{DD}	V_{DD} + 0.3	V
Input Logic-Low SDA, SCL	V_{IL}		V_{SS} - 0.3	0.3 x V_{DD}	V
SDA Output Logic-Low Voltage (Note 3)	V_{OL1}	3mA sink current	0	0.4	V
	V_{OL2}	6mA sink current	0	0.6	
O.S. Saturation Voltage	V_{OL}	4mA sink current (Notes 2, 3)		0.8	V
Input Current SDA, SCL		$0.4 < V_{I/O} < 0.9V_{DD}$	-10	+10	µA
I/O Capacitance	$C_{I/O}$			10	pF
Address Input Sink Current	I_{LAH}	A0, A1, or A2 tied to V_{DD} (Notes 4, 5)	0.2	3.5	µA
Address Input Source Current	I_{LAL}	A0, A1, or A2 tied to GND (Notes 4, 5)	0.2	3.5	µA
Address Voltage High	V_{AH}	(Note 6)	V_{DD} - .04		V
Address Voltage Low	V_{AL}	(Note 6)		V_{SS} + .04	V
Standby Current	I_{DD1}	(Notes 4, 5)		13	µA
Active Current (Notes 1, 4, 5)	I_{DD}	Active temp conversions		1000	µA
		Communication only		100	

AC ELECTRICAL CHARACTERISTICS

($1.7V \le V_{DD} \le 3.7V$, T_A = -55°C to +125°C.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Resolution			9		12	Bits
Temperature Conversion Time	t_{CONVT}	9-bit conversions			25	ms
		10-bit conversions			50	
		11-bit conversions			100	
		12-bit conversions			200	

SCL Frequency	f_{SCL}			400	kHz

AC ELECTRICAL CHARACTERISTICS (continued)

($1.7V \le V_{DD} \le 3.7V$, T_A = -55°C to +125°C.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Bus Free Time Between a STOP and START Condition	t_{BUF}	(Note 7)	1.3			µs
START and Repeated START Hold Time from Falling SCL	$t_{HD:STA}$	(Notes 7, 8)	600			ns
Low Period of SCL	t_{LOW}	(Note 7)	1.3			µs
High Period of SCL	t_{HIGH}	(Note 7)	0.6			µs
Repeated START Condition Setup Time to Rising SCL	$t_{SU:STA}$	(Note 7)	600			ns
Data-Out Hold Time from Falling SCL	$t_{HD:DAT}$	(Notes 7, 9)	0		0.9	µs
Data-In Setup Time to Rising SCL	$t_{SU:DAT}$	(Note 7)	100			ns
Rise Time of SDA and SCL (Receive)	t_R	(Notes 7, 10)	$20 + 0.1C_B$		300	ns
Fall Time of SDA and SCL (Receive)	t_F	(Notes 7, 10)	$20 + 0.1C_B$		300	ns
Spike Suppression Filter Time (Deglitch Filter)	t_{SS}		0		50	ns
STOP Setup Time to Rising SCL	$t_{SU:STO}$	(Note 7)	600			ns
Capacitive Load for Each Bus Line	C_B				400	pF
Input Capacitance	C_I			5		pF
Serial Interface Reset Time	$t_{TIMEOUT}$	SDA time low (Notes 11, 12)	75		325	ms

Note 1: V_{DD} must be decoupled with a high-quality 0.1µF bypass capacitor. X5R or X7R ceramic surface-mount capacitors are recommended.
Note 2: Internal heating caused by O.S. loading causes the DS75LX to read approximately 0.5°C higher if O.S. is sinking the max rated current.
Note 3: All voltages are referenced to ground.
Note 4: I_{DD} specified with O.S. pin open and A0–A2 pins grounded.
Note 5: I_{DD} and address leakage specified with V_{DD} at 3.0V and SDA, SCL = 3.0V at 0°C to +70°C.
Note 6: Address pins A0, A1, A2 are directly connected to V_{DD}, V_{SS}, or floating with less than 50pF capacitive load.
Note 7: See the timing diagram (Figure 1). All timing is referenced to 0.9 x V_{DD} and 0.1 x V_{DD}.
Note 8: After this period, the first clock pulse is generated.
Note 9: The DS75LX provides an internal hold time of at least 75ns on the SDA signal to bridge the undefined region of SCL's falling edge.
Note 10: For example, if C_B = 300pF, then t_R[min] = t_F[min] = 50ns.
Note 11: This timeout applies only when the DS75LX is holding SDA low. Other devices can hold SDA low indefinitely and the DS75LX will not reset.
Note 12: The DS75LX is available with timeout feature disabled upon special order. Contact Factory.

PIN DESCRIPTION

PIN	NAME	FUNCTION
1	SDA	Data Input/Output for 2-Wire Serial Communication Port (Open Drain)
2	SCL	Clock Input for 2-Wire Serial Communication Port
3	O.S.	Thermostat Output Open Drain
4	GND	Ground
5	A_2	Address Input
6	A_1	Address Input
7	A_0	Address Input
8	V_{DD}	Supply Voltage. +1.7V to +3.7V supply pin. V_{DD} must have an external bypass capacitor to GND. 0.1µF X5R or X7R ceramic SMT caps recommended.

BLOCK DIAGRAM

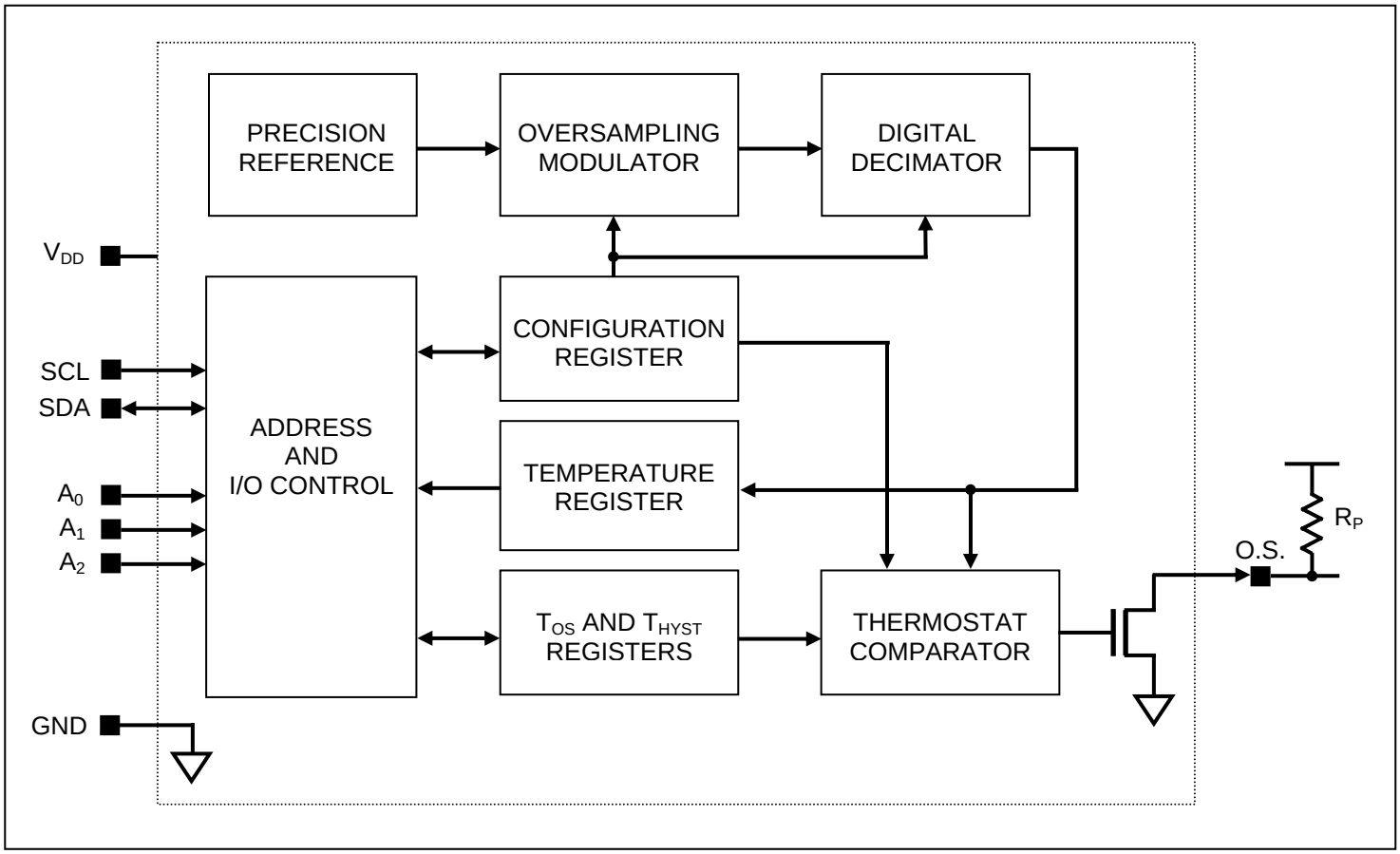
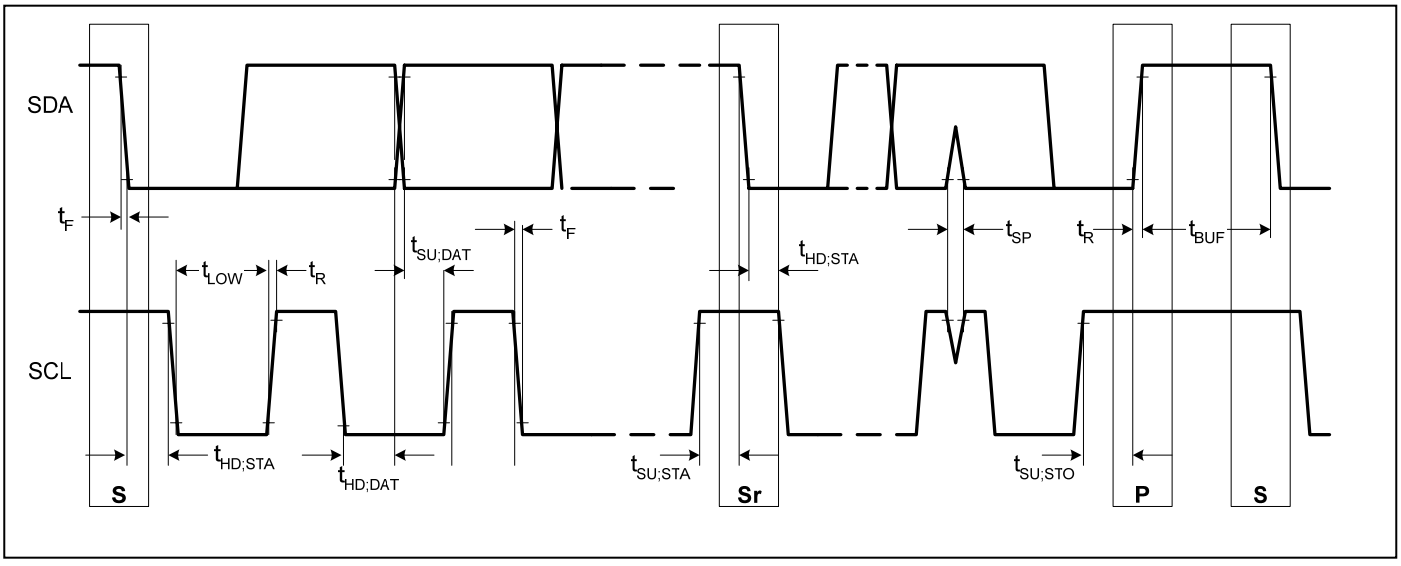


Figure 1. Timing Diagram



OPERATION—MEASURING TEMPERATURE

The DS75LX measures temperature using a bandgap temperature-sensing architecture. An on-board delta-sigma analog-to-digital converter (ADC) converts the measured temperature to a digital value that is calibrated in degrees celsius; for Fahrenheit applications a lookup table or conversion routine must be used. The DS75LX is factory-calibrated and requires no external components to measure temperature.

At power-up the DS75LX immediately begins measuring and converting its own temperature to a digital value. The resolution of the digital output data is user-configurable to 9, 10, 11, or 12 bits, corresponding to temperature increments of 0.5°C, 0.25°C, 0.125°C, and 0.0625°C, respectively, with 9-bit default resolution at power-up. The resolution is controlled via the R0 and R1 bits in the configuration register as explained in the *Configuration Register* section of this data sheet. Note that the conversion time doubles for each additional bit of resolution.

After each temperature measurement and analog-to-digital conversion, the DS75LX stores the temperature as a 16-bit two's complement number in the 2-byte temperature register (see Figure 2). The sign bit (S) indicates if the temperature is positive or negative: for positive numbers S = 0 and for negative numbers S = 1. The most recently converted digital measurement can be read from the temperature register at any time. Since temperature conversions are performed in the background, reading the temperature register does not affect the operation in progress.

Bits 3 through 0 of the temperature register are hardwired to 0. When the DS75LX is configured for 12-bit resolution, the 12 MSbs (bits 15 through 4) of the temperature register contain temperature data. For 11-bit resolution, the 11 MSbs (bits 15 through 5) of the temperature register contain data, and bit 4 reads out as 0. Likewise, for 10-bit resolution, the 10 MSbs (bits 15 through 6) contain data, and for 9-bit the 9 MSbs (bits 15 through 7) contain data, and all unused LSbs will contain 0s. Table 1 gives examples of 12-bit resolution digital output data and the corresponding temperatures.

Figure 2. Temperature, T_H, and T_L Register Format

	bit 15	bit 14	bit 13	bit 12	bit 11	bit 10	bit 9	bit 8
MS Byte	S	2^6	2^5	2^4	2^3	2^2	2^1	2^0
	bit 7	**bit 6**	**bit 5**	**bit 4**	**bit 3**	**bit 2**	**bit 1**	**bit 0**
LS Byte	2^{-1}	2^{-2}	2^{-3}	2^{-4}	0	0	0	0

Table 1. 12-Bit Resolution Temperature/Data Relationship

TEMPERATURE (°C)	DIGITAL OUTPUT (BINARY)	DIGITAL OUTPUT (HEX)
+125	0111 1101 0000 0000	7D00h
+25.0625	0001 1001 0001 0000	1910h
+10.125	0000 1010 0010 0000	0A20h
+0.5	0000 0000 1000 0000	0080h
0	0000 0000 0000 0000	0000h
-0.5	1111 1111 1000 0000	FF80h
-10.125	1111 0101 1110 0000	F5E0h
-25.0625	1110 0110 1111 0000	E6F0h
-55	1100 1001 0000 0000	C900h

Shutdown Mode

For power-sensitive applications, the DS75LX offers a low-power shutdown mode. The SD bit in the configuration register controls shutdown mode. When SD is changed to 1, the conversion in progress is completed and the result is stored in the temperature register after which the DS75LX goes into a low-power standby state. The O.S. output is cleared if the thermostat is operating in interrupt mode, and O.S remains unchanged in comparator mode. The 2-wire interface remains operational in shutdown mode, and writing a 0 to the SD bit returns the DS75LX to normal operation.

OPERATION—THERMOSTAT

The DS75LX thermostat has two operating modes, comparator mode and interrupt mode, which activate and deactivate the open-drain thermostat output (O.S.) based on user-programmable trip-points (T_{OS} and T_{HYST}). The DS75LX powers up with the thermostat in comparator mode with active-low O.S. polarity and with the overtemperature trip-point (T_{OS}) register set to +80°C and the hysteresis trip-point (T_{HYST}) register set to +75°C. If these power-up settings are compatible with the application, the DS75LX can be used as a stand-alone thermostat (i.e., no 2-wire communication required). If interrupt mode operation, active-high O.S. polarity, or different T_{OS} and T_{HYST} values are desired, they must be programmed after power-up, so stand-alone operation is not possible.

In both operating modes, the user can program the thermostat fault tolerance, which sets how many consecutive temperature readings (1, 2, 4, or 6) must fall outside of the thermostat limits before the thermostat output is triggered. The fault tolerance is set by the F1 and F0 bits in the configuration register and at power-up the fault tolerance is 1.

The data format of the T_{OS} and T_{HYST} registers is identical to that of the temperature register (see Figure 2), i.e., a 2-byte two's complement representation of the trip-point temperature in degrees celcius with bits 3 through 0 hardwired to 0. After every temperature conversion, the measured temperature is compared to the values in the T_{OS} and T_{HYST} registers, and then O.S. is updated based on the result of the comparison and the operating mode. The number of T_{OS} and T_{HYST} bits used during the thermostat comparison is equal to the conversion resolution set by the R1 and R0 bits in the configuration register. For example, if the resolution is 9 bits, only the 9 MSbs of T_{OS} and T_{HYST} will be used by the thermostat comparator.

The active state of the O.S. output can be changed by the POL bit in the configuration register. The power-up default is active low.

If the user does not wish to use the thermostat capabilities of the DS75LX, the O.S. output should be left floating. Note that if the thermostat is not used, the T_{OS} and T_{HYST} registers can be used for general storage of system data.

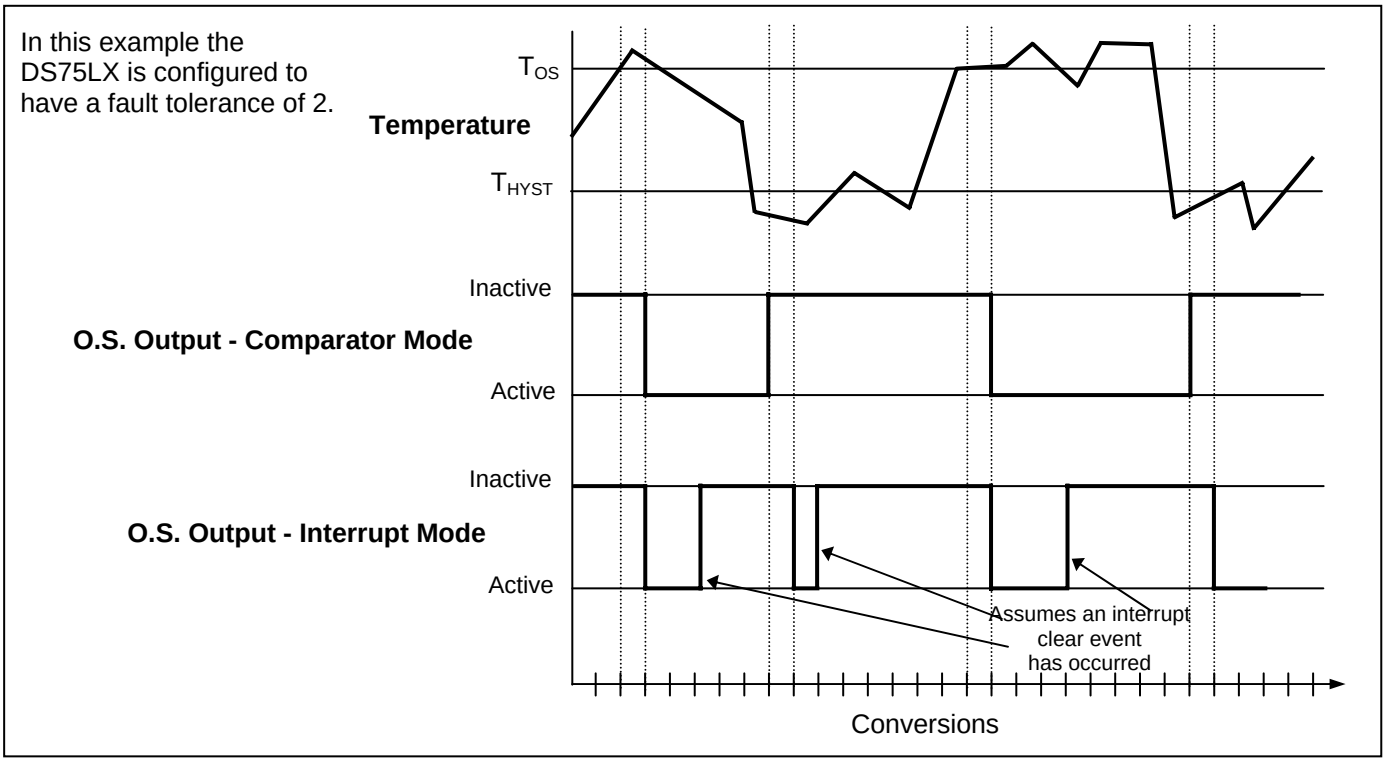
Comparator Mode

When the thermostat is in comparator mode, O.S. can be programmed to operate with any amount of hysteresis. The O.S. output becomes active when the measured temperature exceeds the T_{OS} value a consecutive number of times as defined by the F1 and F0 fault tolerance (FT) bits in the configuration register. O.S. then stays active until the first time the temperature falls below the value stored in T_{HYST}. Putting the device into shutdown mode does not clear O.S. in comparator mode. Thermostat comparator mode operation with FT = 2 is illustrated in Figure 3.

Interrupt Mode

In interrupt mode, the O.S. output first becomes active when the measured temperature exceeds the T_{OS} value a consecutive number of times equal to the FT value in the configuration register. Once activated, O.S. can only be cleared by either putting the DS75LX into shutdown mode or by reading from any register (temperature, configuration, T_{OS}, or T_{HYST}) on the device. Once O.S. has been deactivated, it will only be reactivated when the measured temperature falls below the T_{HYST} value a consecutive number of times equal to the FT value. Again, O.S can only be cleared by putting the device into shutdown mode or reading any register. Thus, this interrupt/clear process is cyclical between T_{OS} and T_{HYST} events (i.e, T_{OS}, clear, T_{HYST}, clear, T_{OS}, clear, T_{HYST}, clear, etc.). Thermostat interrupt mode operation with FT = 2 is illustrated in Figure 3.

Figure 3. O.S. Output Operation Example



Configuration Register

The configuration register allows the user to program various DS75LX options such as conversion resolution, thermostat fault tolerance, thermostat polarity, thermostat operating mode, and shutdown mode. The configuration register is arranged as shown in Figure 4 and detailed descriptions of each bit are provided in Table 2. The user has read/write access to all bits in the configuration register except the MSb, which is a reserved read-only bit. The entire register is volatile, and thus powers up in its default state.

Figure 4. Configuration Register

MSb	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	LSb
0	R1	R0	F1	F0	POL	TM	SD

Table 2. Configuration Register Bit Descriptions

BIT NAME	DESCRIPTION
0 Reserved	Power-Up State = 0 The master can write to this bit, but it always reads out as a 0.
R1 Conversion Resolution Bit 1	Power-Up State = 0 Sets conversion resolution (see Table 3).
R0 Conversion Resolution Bit 0	Power-Up State = 0 Sets conversion resolution (see Table 3).
F1 Thermostat Fault Tolerance Bit 1	Power-Up State = 0 Sets the thermostat fault tolerance (see Table 4).
F0 Thermostat Fault Tolerance Bit 0	Power-Up State = 0 Sets the thermostat fault tolerance (see Table 4).
POL Thermostat Output (O.S.) Polarity	Power-Up State = 0 POL = 0 — O.S. is active low. POL = 1 — O.S. is active high.
TM Thermostat Operating Mode	Power-Up State = 0 TM = 0 — Comparator mode. TM = 1 — Interrupt mode. See the *Operation—Thermostat* section for a detailed description of these modes.
SD Shutdown	Power-Up State = 0 SD = 0 — Active conversion and thermostat operation. SD = 1 — Shutdown mode. See the *Shutdown Mode* section for a detailed description of this mode.

Table 3. Resolution Configuration

R1	R0	THERMOMETER RESOLUTION (BITS)	MAX CONVERSION TIME (ms)
0	0	9	25
0	1	10	50
1	0	11	100
1	1	12	200

Table 4. Fault Tolerance Configuration

F1	F0	CONSECUTIVE OUT-OF-LIMITS CONVERSIONS TO TRIGGER O.S.
0	0	1
0	1	2
1	0	4
1	1	6

REGISTER POINTER

The four DS75LX registers each have a unique two-bit pointer designation, which is defined in Table 5. When reading from or writing to the DS75LX, the user must “point” the DS75LX to the register that is to be accessed. When reading from the DS75LX, once the pointer is set it remains pointed at the same register until it is changed. For example, if the user wants to perform consecutive reads from the temperature register, the pointer only has to be set to the temperature register one time, after which all reads will automatically be from the temperature register until the pointer value is changed. On the other hand, when writing to the DS75LX, the pointer value must be refreshed each time a write is performed, even if the same register is being written to twice in a row.

At power-up, the default pointer value is the temperature register so the temperature register can be read immediately without resetting the pointer.

Changes to the pointer setting are accomplished as described in the *2-Wire Serial Data Bus.*

Table 5. Pointer Definition

REGISTER	P1	P0
Temperature	0	0
Configuration	0	1
T_{HYST}	1	0
T_{OS}	1	1

2-WIRE SERIAL DATA BUS

The DS75LX communicates over a standard bidirectional, 2-wire serial data bus that consists of a serial clock (SCL) signal and serial data (SDA) signal. The DS75LX interfaces to the bus through the SCL input pin and open-drain SDA I/O pin. All communication is MSb first.

The following terminology is used to describe 2-wire communication:

Master Device: Microprocessor/microcontroller that controls the slave devices on the bus. The master device generates the SCL signal and START and STOP conditions.

Slave: All devices on the bus other than the master. The DS75LX always functions as a slave.

Bus Idle or Not Busy: Both SDA and SCL remain high. SDA is held high by a pullup resistor when the bus is idle, and SCL must either be forced high by the master (if the SCL output is push-pull) or pulled high by a pullup resistor (if the SCL output is open drain).

Transmitter: A device (master or slave) that is sending data on the bus.

Receiver: A device (master or slave) that is receiving data from the bus.

START Condition: Signal generated by the master to indicate the beginning of a data transfer on the bus. The master generates a START condition by pulling SDA from high to low while SCL is high (see Figure 5). A “repeated” START is sometimes used at the end of a data transfer (instead of a STOP) to indicate that the master will perform another operation.

STOP Condition: Signal generated by the master to indicate the end of a data transfer on the bus. The master generates a STOP condition by transitioning SDA from low to high while SCL is high (see Figure 5). After the STOP is issued, the master releases the bus to its idle state.

Acknowledge (ACK): When a device (either master or slave) is acting as a receiver, it must generate an acknowledge (ACK) on the SDA line after receiving every byte of data. The receiving device performs an ACK by pulling the SDA line low for an entire SCL period (see Figure 5). During the ACK clock cycle, the transmitting device must release SDA. A variation on the ACK signal is the “not acknowledge” (NACK). When the master device is acting as a receiver, it uses a NACK instead of an ACK after the last data byte to indicate that it is finished receiving data. The master indicates a NACK by leaving the SDA line high during the ACK clock cycle.

Slave Address: Every slave device on the bus has a unique 7-bit address that allows the master to access that device. The DS75LX’s 7-bit bus address depends on the state of the external address pins A0–A2. See Table 6. The three address pins allow up to 27 DS75LXs to be multidropped on the same bus. When tying an address line high or low, connect the address line directly to V_{DD} or GND. Do not use series resistors on these pins.

Address Byte: The address byte is transmitted by the master and consists of the 7-bit slave address plus a read/write (R/$\overline{W}$) bit (see Figure 6). If the master is going to read data from the slave device then R/$\overline{W}$ = 1, and if the master is going to write data to the slave device then R/$\overline{W}$ = 0.

Pointer Byte: The pointer byte is used by the master to tell the DS75LX which register is going to be accessed during communication. The six MSbs of the pointer byte (see Figure 7) are always 0 and the two LSbs correspond to the desired register as shown in Table 6.

Figure 5. Start, Stop, and ACK Signals

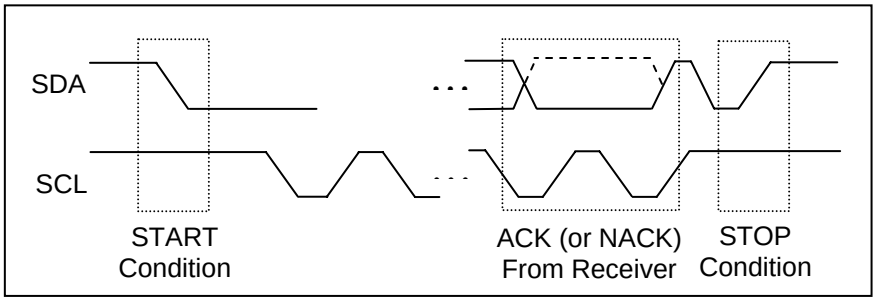


Figure 6. Address Byte

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
a_6	a_5	a_4	a_3	a_2	a_1	a_0	R/$\overline{W}$

The Address Pins A0–A2 are tri-state inputs. These can be low, high, or floating in any combination, resulting in 27 address possibilities. These map into the address byte according to Table 6.

Figure 7. Pointer Byte

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
0	0	0	0	0	0	P1	P0

GENERAL 2-WIRE INFORMATION

- All data is transmitted MSb first over the 2-wire bus.
- One bit of data is transmitted on the 2-wire bus each SCL period.
- A pullup resistor is required on the SDA line and, when the bus is idle, both SDA and SCL must remain in a logic-high state.
- All bus communication must be initiated with a START condition and terminated with a STOP condition. During a START or STOP is the only time SDA is allowed to change states while SCL is high. At all other times, changes on the SDA line can only occur when SCL is low: SDA must remain stable when SCL is high.
- After every 8-bit (1-byte) transfer, the receiving device must answer with an ACK (or NACK), which takes one SCL period. Therefore, nine clocks are required for every 1-byte data transfer.

Table 6. Address Configuration

A2	A1	A0	ADDRESS
0	0	0	1001000
0	0	1	1001001
0	1	0	1001010
0	1	1	1001011
0	0	FLOAT	0101100
0	FLOAT	0	0101000
0	1	FLOAT	0101101
0	FLOAT	1	0101001
0	FLOAT	FLOAT	0110101
1	0	0	1001100
1	0	1	1001101
1	1	0	1001110
1	1	1	1001111
1	0	FLOAT	0101110
1	FLOAT	0	0101010
1	1	FLOAT	0101111
1	FLOAT	1	0101011
1	FLOAT	FLOAT	0110110
FLOAT	0	0	1110000
FLOAT	0	1	1110010
FLOAT	1	0	1110011
FLOAT	1	1	1110101
FLOAT	0	FLOAT	1110001
FLOAT	FLOAT	0	1110110
FLOAT	1	FLOAT	1110100
FLOAT	FLOAT	1	1110111
FLOAT	FLOAT	FLOAT	0110111

Writing to the DS75LX

To write to the DS75LX, the master must generate a START followed by an address byte containing the DS75LX bus address. The value of the R/$\overline{W}$ bit must be a 0, which indicates that a write is about to take place. The DS75LX responds with an ACK after receiving the address byte. This must be followed by a pointer byte from the master, which tells the DS75LX which register is being written to. The DS75LX again responds with an ACK after receiving the pointer byte. Following this ACK the master device must immediately begin transmitting data to the DS75LX. When writing to the configuration register, the master must send one byte of data (see Figure 8a), and when writing to the T_{OS} or T_{HYST} registers the master must send two bytes of data (see Figure 8b). After receiving each data byte, the DS75LX responds with an ACK, and the transaction is finished with a STOP from the master.

Software POR

The soft POR command is hex 54. Issue a write command to the DS75LX. It responds with an ACK. If the next byte is a 0x54, the DS75LX will reset as if power had been cycled. No ACK is sent by the IC after the POR command is received.

Reading from the DS75LX

When reading from the DS75LX, if the pointer was already pointed to the desired register during a previous transaction, the read can be performed immediately without changing the pointer setting. In this case the master sends a START followed by an address byte containing the DS75LX bus address. The R/$\overline{W}$ bit must be a 1, which tells the DS75LX that a read is being performed. After the DS75LX sends an ACK in response to the address byte, the DS75LX begins transmitting the requested data on the next clock cycle. When reading from the configuration register, the DS75LX transmits one byte of data, after which the master must respond with a NACK followed by a STOP (see Figure 8c). For 2-byte reads (i.e., from the temperature, T_{OS}, or T_{HYST} register), the DS75LX transmits two bytes of data, and the master must respond to the first data byte with an ACK and to the second byte with a NACK followed by a STOP (see Figure 8d). If only the most significant byte of data is needed, the master can issue a NACK followed by a STOP after reading the first data byte, in which case the transaction will be the same as for a read from the configuration register.

If the pointer is not already pointing to the desired register, the pointer must first be updated as shown in Figure 8e, which shows a pointer update followed by a single-byte read. The value of the R/$\overline{W}$ bit in the initial address byte is a 0 (“write”) since the master is going to write a pointer byte to the DS75LX. After the DS75LX responds to the address byte with an ACK, the master sends a pointer byte that corresponds to the desired register. The master must then perform a repeated START followed by a standard 1- or 2-byte read sequence (with R/$\overline{W}$ = 1) as described in the previous paragraph.

PACKAGE INFORMATION

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to **www.maxim-ic.com/DallasPackInfo**.)

PACKAGE	DOCUMENT NO.
8-Pin SO	56-G2008-001
8-Pin µSOP/µMAX	21-0036

Figure 8. 2-Wire Interface Timing

