

## Data Chart with the used variable

Variable Name	Description
CLOCK_50	Input: 50 MHz clock signal.
ultrasonic_trigger	Output: Signal used to trigger the ultrasonic sensor.
ultrasonic_echo	Input: Echo signal from the ultrasonic sensor (3.3V level).
LEDs[7:0]	Output: Array of 8 LEDs for indicating distance and measurement timeout.
start_measurement	Input: Signal that initiates distance measurement.
new_measurement_ready	Output: Signal indicating when a new measurement is ready.
measurement_timeout_occurred	Output: Signal indicating when a timeout has occurred during measurement.
measured_distance[20:0]	Wire: 21-bit storage for the measured distance.
ping_counter[24:0]	Register: 25-bit counter for triggering distance measurements.
CLOCK_FREQ_MHZ	Local Parameter: Defines the clock frequency as 50 MHz.
PING_PERIOD_MS	Local Parameter: Sets the period of ping measurements in ms.
MAX_PING_COUNTER	Local Parameter: Computes the maximum ping counter value based on clock frequency and period.
DISTANCE_FACTOR	Local Parameter: Constant conversion factor for distance measurements.

## ultrasonic Module Variables:

Variable Name	Description
clk	Input: Clock signal.
start_measurement	Input: Signal that initiates a distance measurement.
sensor_trigger	Output: Signal used to trigger the ultrasonic sensor.
sensor_echo	Input: Echo signal from the ultrasonic sensor (3.3V level).
raw_distance[20:0]	Output: Represents the raw distance measurement.
measurement_ready	Output: Indicates when a new measurement is ready.
timeout_occurred	Output: Indicates when a timeout has occurred during measurement.
counter[20:0]	Register: 21-bit counter for counting clock cycles.
counter_capture[20:0]	Register: 21-bit storage for capturing the counter value during measurement.
state[2:0]	Register: 3-bit state variable defining the current state.
next_state[2:0]	Register: 3-bit state variable defining the next state.
COUNT_TRIGGER_PULSE	Local Parameter: Calculates the number of clock cycles for the trigger pulse.
COUNT_TIMEOUT	Local Parameter: Calculates the number of clock cycles for the timeout duration.
measurement	Wire: Indicates when in the measurement state.
counter_timeout	Wire: Indicates when a timeout occurs during measurement.
sensor_trigger	Output: Signal used to trigger the ultrasonic sensor.

enable_counter	Wire: Enables the counter based on sensor-trigger or sensor-echo conditions.
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