Application Note

Rain Light Sensor system design with MLX75308

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1. Scope

This application note describes how to design a state of the art automatic Rain Light Sensor system using the Melexis MLX75308 Rain Light Sensor interface chip.

2. Introduction

The Rain Light Sensor module detects two driving conditions. One is the accumulation of moisture on the windscreen of a car. The second is the ambient light level ahead and above the car. The module provides data to adjust the wipe rate based on the rain or moisture and the driver's wiper sensitivity settings. The ambient light level is used to control the vehicle headlamps at nightfall or when entering tunnels and parking structures.

The Rain Light Sensor system started out as a comfort function. The driver of a car equipped with such a system is freed from the need to manually control the headlights or the wipers. Increasingly it is recognized as a safety system. Automatic wiper and light control maximizes driver visibility at all times by ensuring the headlights are on when there is insufficient ambient light and that the windshield is rain free.

As shown in Figure 1, the Rain Light Sensor module consists of three main components. The Rain Light Sensor interface chip, the MLX75308, is the heart of the module. It interfaces with all optical components and provides the rain and light data to the

ECU. The ECU is the decision maker. It uses the data received from the Rain Light Sensor interface chip to decide whether it is necessary to turn on the wipers or headlights. The LIN system basis chip connects the Rain Light Sensor module to the car's LIN network and regulates the battery voltage to supply the microcontroller, the MLX75308 and the other components on the module.

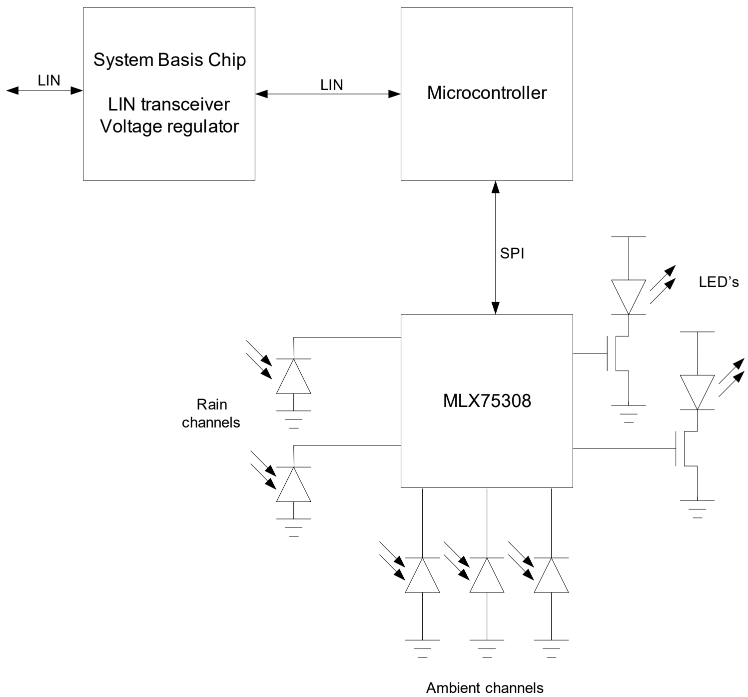

Figure 1: Rain Light Sensor system component overview

3. Working principle of a Rain Light Sensor module

Figure 2 shows the working principle of a Rain Light Sensor module. A near-infrared LED sends a high energy light pulse to the windshield. Dedicated optics within the module ensures total internal reflection of the transmitted light signal. This reflected light generates a current in the receiving photodiode. When there is rain on the windshield, some of the transmitted pulse is lost and the photodiode receives less light. Rain intensity can then be calculated from the difference in the amount of reflected light.
One of the functions of the MLX75308 is to control the LED drivers and convert the photodiode current into a digital form. This data is sent to the microcontroller which uses it to decide whether it is raining and how fast the wiper speed should be.

One of the biggest challenges for a Rain Light Sensor system is that the photodiode receives not just LED light, but sunlight too, which also induces a current. Changes in sunlight can be interpreted as a sudden burst of rain on the windshield, resulting in annoying false wipes. It is very difficult in a discrete solution to split the two types of stimulus. Special optics or a mechanical solution can be used to remove the sunlight variable. As the sunlight signal is much stronger than the rain signal, only a little bit of sunlight is enough to completely corrupt the analog signal. Complicated software can attempt to correct this. However, once there is a sun component in the rain signal, it is almost impossible for the two to be split.

The MLX75308 rejects sunlight from the rain signal in two highly effective ways. First, the MLX75308 suppresses the sun signal in the rain signal, resulting in a very precise rain signal. Secondly, the chip is capable of measuring the rain signal and the sun signal and presenting that information to the microcontroller as two separate values. Having these two separate signals makes the software considerably less complicated, while the sun signal data may be valuable to the automotive developer for other reasons besides rain sensing.

Low cost photodiodes have a less than perfect output characteristic. Expensive photodiodes (PDs) can perform much better than cheaper ones. The MLX75308 compensates for this imperfection, achieving good performance with less expensive photodiodes.

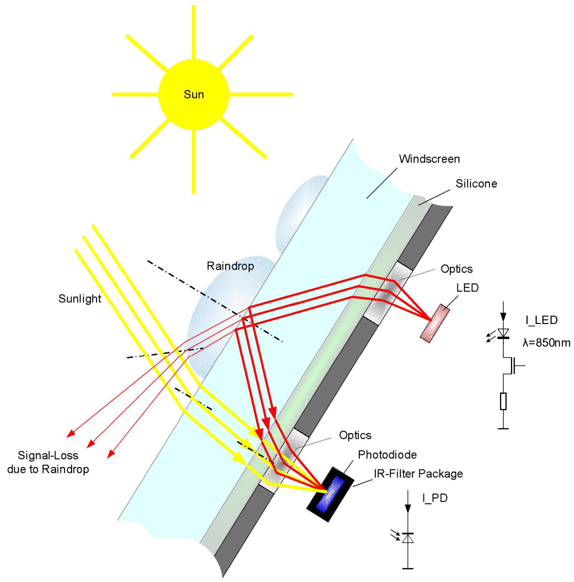

Figure 2: Windshield optics

4. MLX75308

The MLX75308 has two independent linear rain measurement channels. These can operate at the same time or separately. A typical rain current is between 1uA and 100uA, depending on the optics, windshield type, LEDs and PDs used. Normally one photodiode is connected to each channel, but more photodiodes can be connected to each channel to extend the sensing area on the windshield. Extending the sensing area improves rain detection.

Three logarithmic ambient channels are available on the sensor. A logarithmic output curve is used to cover a large dynamic range, from bright sun to dark night. Two channels have exactly the same output characteristic, while one has a lower sensitivity. In this way the user can choose between a broad range of photodiodes. In most applications two ambient channels are used for headlight control. One is directed at the sky, while the second is focused directly ahead, to detect upcoming tunnels for example. The third channel can be used to control the dash panel or head up display intensity.

Dynamic range is important when the system needs to support multiple usage scenarios. OEMs demand is for one Rain Light Sensor system that covers multiple car types with different windshield types - from dark tinted versions to crystal clear ones. Varying ageing effects, a large temperature range, changing weather conditions and a potential mechanical mismatch when the sensor is mounted; all these things add up to a challenging large dynamic range requirement for the system. The MLX75308 accommodates all these difficulties with its huge dynamic range. At its input stage the dynamic range is represented by a large programmable gain and bandwidth. The large output dynamic range is obtained by the big current range of the two LED drivers. Only one of the two can be used at a time. The LED current is fed back to the chip over a shunt resistor. LED currents up to 1A are supported.

A temperature sensor is included in the MLX75308. It can be used to protect the LEDs. It will not measure the absolute temperature of the LEDs itself, but is a good indication of the temperature inside the module. If the temperature gets too high, the output can be reduced to lower the LED current and prevent LED damage. When the temperature gets excessively high, the output current can be shut down to avoid destroying the LEDs.
When the temperature changes, so does the sensitivity of the photodiodes, resulting in an absolute measurement value change. The microcontroller can use the temperature to check if a change in the absolute value is related to a temperature change and take this into account.

The MLX75308 acts as a digital SPI slave. The microcontroller sends a command to begin measurements. Once the command is received, the MLX75308 will start its measurement cycle and perform the necessary analog to digital conversion. At completion, it will set its device ready pin high to inform the microcontroller data is available. The microcontroller can now read out the digital value of the requested measurements. Figure 3 shows a typical measurement cycle. The big advantage of working with this digital slave principle is that the microcontroller can perform other tasks while waiting on the MLX75308 to perform the measurements. In addition, as a digital value is sent to the microcontroller, no extra analog to digital conversion is required of the microcontroller, leaving it more time to run the software.

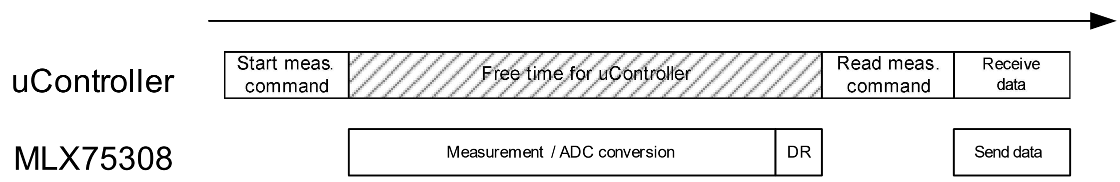

Figure 3: Measurement cycle

Very few components are needed to integrate the MLX75308 in a Rain Light Sensor system. Photodiodes are required for the rain measurements. A wide range of photodiodes with wavelengths from 500nm to 1000nm can be used with the MLX75308. Photodiodes sensitive to a narrow wavelength between 800 and 1000nm are typically used to suppress the sun as much as possible. The LEDs should match the photodiode's wavelength.

The photodiodes used for the ambient channels are sensitive to the complete visible spectrum. The intention of these photodiodes is to see what the human eye sees. For HUD and ambient light detection, a V-Lambda photodiode is a good choice. It corresponds more closely to the human eye's spectral response curve. For tunnel detection this is less important.

On the transmitting side of the system, FET's are required to drive the LED's. The MLX75308 can drive the FET's to achieve a current range of 1mA to 1A in the LED's. Such a big current span enables the use of different photodiodes and different windshields without needing to make any changes to the system. The system designer can choose from a wide variety of components. Small, less sensitive photodiodes can be used together with a high LED current. When large, more sensitive photodiodes are used, the output current can be smaller.

A new generation of the Melexis Rain Light Sensor interface chip is also being developed. The main difference between the forthcoming MLX75310 and the existing MLX75308 is the inclusion of an integrated LED driver in the MLX75310. No external FET's will be needed. This results in a lower BOM and space saving on the pcb. The maximum LED current (150mA) is limited to reduce the internal heating of the sensor due to the internal FET's. Due to this lower LED current, more sensitve photodiodes or better optics have to be used in combination with the MLX75310. While the MLX75308 is aimed for users that require a high LED current, the MLX75310 is aimed at designs where a lower LED current can be used and a smaller pcb footprint and BOM are more important. Samples will be available in the end of 2012.

5. Application information

Figure 4 shows a schematic with the components needed to create a Rain Light Sensor module using the MLX75308. First, there is the LIN transceiver/voltage regulator. This connects the Rain Light Sensor module to the LIN bus and converts the battery supply into 3.3V for the MLX75308 and microcontroller. A suitable LIN system basis IC can be used, Melexis offers several appropriate components. A second part is the microcontroller that takes care of the software. It needs to communicate with the MLX75308 and the LIN transceiver. Communication with the MLX75308 is realized through SPI. No special requirements are needed for the microcontroller, typical 16 bit automotive grade devices should be suitable. The MLX75308 controls the LED drivers and the PD's. The selection of the LED's and rain photodiodes depends on many factors. The MLX75308 has a specification called Optical Transfer Ratio. $OTR = \frac{I_{LED}}{I_{RainPD}}$. The MLX75308 supports a large OTR of 30 to 80000. It depends on the clarity of the windshield, the optics used to focus the LED light, the sensitivity of the PD, the radiant intensity of the LED and more. It is hard to give a list of PD's and LED's that should be used since the OTR is dependent on the windshield and optics used.

Table 1 lists components that are tested with the MLX75308. However, the MLX75308 is very flexible and can work with many different components.

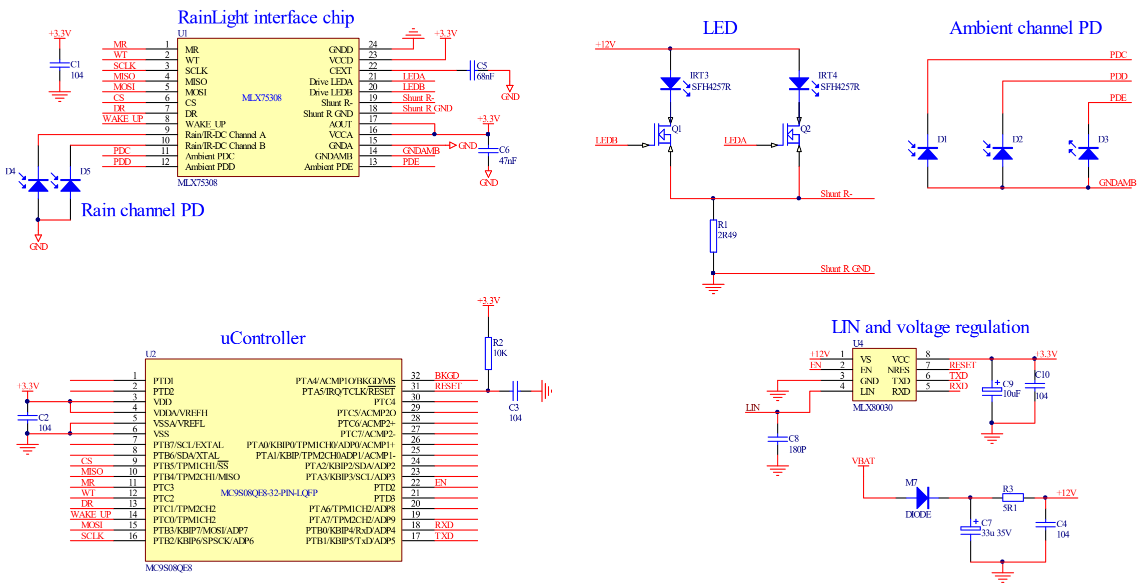

Figure 4: Application schematic

Ambient detector	Rain detector	LED driver	LED
SFH2270	SFH2500FA	NTR4501N	SFH4232
SFH3410	SFH2505FA	BSS670S2L	SFH4250
SFH3710	SFH2400FA		SFH4253
SFH5711	SFH2701		SFH4257
SFH2430	PDI-C172SMF		VSMY1850X01
BP104S	PDB-C160SM		VSMY3850
TEMD6010FX01			
TEMD6200FX02			
TEMT6000X01			
TEMT6200FX01			

Table 1: Components list

6. MLX75308 SPI interface

The MLX75308 is controlled through SPI. It is an SPI slave. Table 2 gives an overview of all available commands. It is not the intention of the application note to go into detail on all the possible commands. It will focus on the commands needed to get the Rain Light Sensor system running. Please refer to the datasheet for in depth information of all the commands and the SPI protocol. The following commands are used for performing rain and light measurements.

- Start Measurement
- Start Read-Out
- Write Register
- Read register

Symbol	Command Description	Control1 Byte	Control2 Byte	Control3 Byte
NOP	Idle Command	0000 0000	0000 0000	N/A

CR	Chip Reset	1111 0000	0000 0000	N/A
RSLP	Request Sleep	1110 0001	0000 0000	N/A
CSLP	Confirm Sleep	1010 0011	0000 0000	N/A
RSTBY	Request Standby	1110 0010	0000 0000	N/A
CSTBY	Confirm Standby	1010 0110	0000 0000	N/A
NRM	Normal Running Mode	1110 0100	0000 0000	N/A
SM	Start Measurement	1101 $R_2R_1R_0T$	$M_6..M_3$ $M_2M_1M_0P$	N/A
SD	Start Diagnostics	1011 0000	$M_6..M_3$ $M_2M_1M_0P$	N/A
RO	Start Read-Out	1100 0011	0000 0000	N/A
WR	Write Register	1000 0111	$D_7..D_0$	$A_3..A_0$ $P_1P_0$00
RR	Read Register	1000 1110	$A_3..A_0$ 0000	0000 0000

Table 2: MLX75308 instruction set

CS	Chip Select pin
DR	Device Ready pin
MISO	Master In Slave Out SPI pin
MOSI	Master Out Slave In SPI pin

Table 3: List of pin abbreviations

6.1. SM- Start Measurement

The SM command is used to start measurement cycles. Several types of measurements can be selected with the measurement selection bits $M_6..M_0$ in the Control2 Byte:

- M_6: setting this bit high enables the temperature measurement
- M_5: setting this bit high enables the read-out of the three ambient light channels
- M_4: setting this bit high enables the DC light measurement in the rain channel(s)
- M_3: setting this bit high fires LED A
- M_2: setting this bit high fires LED B
- M_1: setting this bit high enables the rain measurement in channel A
- M_0: setting this bit high enables the rain measurement in channel B

All above settings can be selected at the same time except for the LED firing. Only one LED can be fired at a time.

In the Control2 byte an even parity bit P is foreseen. The parity bit calculation is based on the measurement selection bits $M_6..M_0$. If the number of ones in the given data set [$M_6..M_0$] is odd, the even parity bit P shall be set to 1, making the total number of ones in the set [$M_6..M_0$, P] even. The SPI invalid flag will be set when the parity bit does not correspond to the calculated parity bit.

After uploading the SM command, the measurement cycle is started as soon as the *CS* pin is set high. The *DR* pin goes low and the ADC starts converting all the needed analog voltages and stores the digital values in registers. When the *DR* pin goes high again, the measurement cycle is completed and a Read-Out can be performed to read the measured data.

After upload of a SM command, no other commands will be accepted until *DR* is high. This is done to avoid too much disturbance in the analog part. Once *DR* is high, the next command will be accepted. An exception is the Chip Reset command, this will always be accepted.

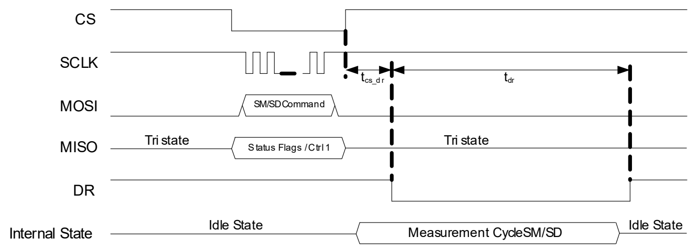

Figure 5: Timing diagram of a measurement cycle

6.2. RO- Read-Out

When the state of the *DR* pin changes into a high state, the measurement data is available for read-out. The RO command shall be uploaded to start a read-out cycle and to start reading out the data that was stored in the internal registers.

To make sure that no memory effects can occur, all data registers are cleared at the end of each read-out cycle.

A typical timing diagram is given in Figure 6.

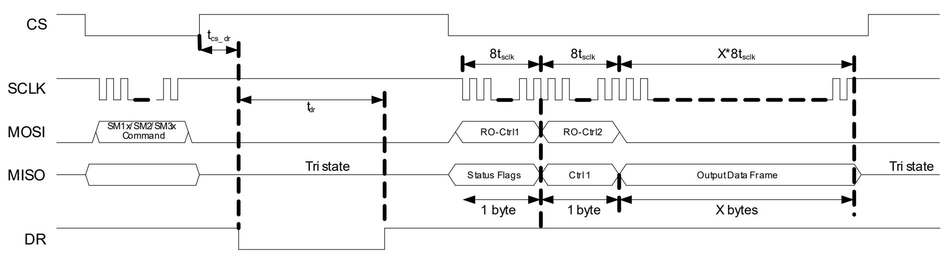

Figure 6: Timing diagram for Read-Out

The data that appears on the *MISO* pin depends on the type of measurement that was done (i.e. it depends on the command that was uploaded: SM and the selected measurement bits $M_6..M_0$).

Table 4 shows the Output Data Frame when all measurements are selected. When certain measurements are disabled, the corresponding data bytes are omitted from the Output Data Frame.

Data Byte Nr.	Output Data Frame Contents	Comments
Byte 3	Temperature (8 MSB)	Depends on M_6
Byte 4	Temperature (8 LSB)	Depends on M_6
Byte 5	Ambient light channel C measurement (8 MSB)	Depends on M_5 + on EN_CH_C
Byte 6	Ambient light channel C measurement (8 LSB)	Depends on M_5 + on EN_CH_C
Byte 7	Ambient light channel D measurement (8 MSB)	Depends on M_5 + on EN_CH_D
Byte 8	Ambient light channel D measurement (8 LSB)	Depends on M_5 + on EN_CH_D
Byte 9	Ambient light channel E measurement (8 MSB)	Depends on M_5 + on EN_CH_E

Data Byte Nr.	Output Data Frame Contents	Comments
Byte 10	Ambient light channel E measurement (8 LSB)	Depends on M_5 + on EN_CH_E
Byte 11	DC measurement of IR channel A, before the Rain burst measurement (8 MSB)	Depends on M_4
Byte 12	DC measurement of IR channel A, before the Rain burst measurement (8 LSB)	Depends on M_4
Byte 13	DC measurement of IR channel B, before the Rain burst measurement (8 MSB)	Depends on M_4
Byte 14	DC measurement of IR channel B, before the Rain burst measurement (8 LSB)	Depends on M_4
Byte 15	Rain burst measurement of IR channel A (8 MSB)	Depends on M_1 + LED selection depends on M_3/M_2
Byte 16	Rain burst measurement of IR channel A (8 LSB)	Depends on M_1 + LED selection depends on M_3/M_2
Byte 17	Rain burst measurement of IR channel B (8 MSB)	Depends on M_0 + LED selection depends on M_3/M_2
Byte 18	Rain burst measurement of IR channel B (8 LSB)	Depends on M_0 + LED selection depends on M_3/M_2
Byte 19	DC measurement of IR channel A, after the Rain burst measurement (8 MSB)	Depends on M_4
Byte 20	DC measurement of IR channel A, after the Rain burst measurement (8 LSB)	Depends on M_4
Byte 21	DC measurement of IR channel B, after the Rain burst measurement (8 MSB)	Depends on M_4
Byte 22	DC measurement of IR channel B, after the Rain burst measurement (8 LSB)	Depends on M_4
Byte 23	CRC (8 bit)	Output always

Table 4: Output data frame

Cyclic Redundancy Check calculation

In all Output Data Frames, a CRC byte is included as last byte. This byte provides a way to detect transmission errors between slave and master. An easy method to check if there were no transmission errors is to calculate the CRC of the whole read-out frame as defined in previous tables. When the calculated CRC results in 0x00, the transmission was error free. If the resulting CRC is not equal to zero, an error occurred in the transmission and all the data should be ignored.
For more information regarding the CRC calculation, please refer to the datasheet.

6.3. WR- Write Register

The MLX75308 contains several user registers that can be written by the master. The WR command is used for that purpose.

The WR command writes the contents of an 8-bit register addressed by bits $A_{3..0}$ with data $D_{7..0}$. Data is sent to the device over the *MOSI* pin. Control2 Byte contains the 8 bit data that shall be written into the target register. Control3 Byte contains the address of the target register.
The WR command is defined in the table below:

Control1 Byte	Control2 Byte	Control3 Byte
1000 0111	$D_7D_6D_5D_4$ $D_3D_2D_1D_0$	$A_3A_2A_1A_0$ $P_1P_0$00
$D_7D_6D_5D_4$ $D_3D_2D_1D_0$ $A_3A_2A_1A_0$ P_1P_0	Data contents of register to be written Address of target register Parity bits (P_1 = odd parity bit, P_0 = even parity bit)	

Table 5: Write Register command

In order to detect some transmission errors while writing data towards the slave device, the micro-controller has to compute an odd and an even parity bit of the Control2 and the 4 MSB's of the Control3 byte and send these parity bits to the slave. The slave will check if the parity bits are valid. The data will only be written into the registers if the parity bits are correct. If the parity bits are not correct, bit 7 of the internal Status Flag Byte will be set high, indicating that the command was invalid. This can be seen when uploading a NOP command (when one is only interested in reading back the internal status flags) or during upload of the next command. More information about the Status Flag Byte can be found in the datasheet.
In case the parity bits were not correct, the data of the registers will not be changed.

The parity bits calculation is based on the data $D_7..D_0$ and $A_3..A_0$. If the number of ones in the given data set [$D_7..D_0$, $A_3..A_0$] is odd, the even parity bit P_0 shall be set to 1, making the total number of ones in the set [$D_7..D_0$, $A_3..A_0$, P_0] even.
Similar: if the number of ones in the given data set [$D_7..D_0$, $A_3..A_0$] is even, the odd parity bit P_1 shall be set to 1, making the total number of ones in the set [$D_7..D_0$, $A_3..A_0$, P_1] odd.

Note that the parity bits can be generated with XOR instructions: P_1 = XNOR($D_7..D_0$, $A_3..A_0$) and P_0 = XOR($D_7..D_0$, $A_3..A_0$). The odd parity bit P_1 should always be the inverse of the even parity bit P_0.

6.4. RR- Read Register

The RR command returns the contents of an 8-bit register addressed by bits $A_{3..0}$. Data is read back over the *MISO* pin. The Data1 Byte contains the Internal Status Flag byte. Data2 Byte contains the copy of the Control1 Byte. Data3 Byte contains the 8 bits of the target register.
The RR command is defined in Table 6.

Control1 Byte	Control2 Byte	Control3 Byte
1000 1110	$A_3A_2A_1A_0$ 0000	0000 0000
$A_3A_2A_1A_0$	Address of target register	

Table 6: Read Register command

An overview of the registers that can be read and written are given in Table 7. Please refer to the datasheet for an in depth explanation of these registers.

Name	Address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
SetAna	0x0	Tdem3	Tdem2	Tdem1	Tdem0	LEDDRV_HG	Tdc_pulse1	Tdc_pulse0	Unity_Gain
SetAH	0x1	DACA7	DACA6	DACA5	DACA4	DACA3	DACA2	DACA1	DACA0
SetAL	0x2	GAIN_ADJ_AA_A2	GAIN_ADJ_AA_A1	GAIN_ADJ_AA_A0	BW_ADJ_AA_A2	BW_ADJ_AA_A1	BW_ADJ_AA_A0	BW_SEL_LP_A1	BW_SEL_LP_A0
SetBH	0x3	DACB7	DACB6	DACB5	DACB4	DACB3	DACB2	DACB1	DACB0
SetBL	0x4	GAIN_ADJ_AA_B2	GAIN_ADJ_AA_B1	GAIN_ADJ_AA_B0	BW_ADJ_AA_B2	BW_ADJ_AA_B1	BW_ADJ_AA_B0	BW_SEL_LP_B1	BW_SEL_LP_B0
SetPF	0x5	NP3	NP2	NP1	NP0	EN_DCCOMP	RPF2	RPF1	RPF0
Err	0x6	-	Err6	Err5	Err4	Err3	Err2	Err1	-
Rst	0x7	DC_COMP_IC13	DC_COMP_IC12	DC_COMP_IC11	DC_COMP_IC10	-	-	TO	POR
Version	0x8	Ver3	Ver2	Ver1	Ver0	DC_COMP_IC23	DC_COMP_IC22	DC_COMP_IC21	DC_COMP_IC20
DCComp	0x9	DC_COMP_IC33	DC_COMP_IC32	DC_COMP_IC31	DC_COMP_IC30	DC_COMP_IC43	DC_COMP_IC42	DC_COMP_IC41	DC_COMP_IC40
GainBuf	0xA	-	-	-	GAIN_BUF4	GAIN_BUF3	GAIN_BUF2	GAIN_BUF1	GAIN_BUF0
Calib1	0xB	TRIM_TC_BGI4	TRIM_TC_BGI3	TRIM_TC_BGI2	TRIM_TC_BGI1	TRIM_TC_BGI0	-	-	-
Calib2	0xC	-	-	TRIM_TEMP5	TRIM_TEMP4	TRIM_TEMP3	TRIM_TEMP2	TRIM_TEMP1	TRIM_TEMP0
EnChan	0xD	EN_TEMP	EN_DIAG_A	EN_DIAG_B	EN_CH_A	EN_CH_B	EN_CH_C	EN_CH_D	EN_CH_E
Tamb	0xE	DC_COMP_IC53	DC_COMP_IC52	DC_COMP_IC51	DC_COMP_IC50	-	-	Tamb1	Tamb0

Table 7: MLX75308 register map

7. Basic system configuration

Only a few steps and registers are needed to get a Rain Light Sensor system with the MLX75308 running. The MLX75308 is a very flexible chip. There are more registers that can be used to optimize the system for specific preferences. The following registers will be used to configure the system.

- Tdem: the demodulator delay time in the rain channel
- DACA/DACB: output driver strength

The procedure to set up a Rain Light Sensor system with the MLX75308 is as follows:

1. Set a DAC value to get a rain signal around 40000LSB
2. Sweep the Tdem parameter to get the highest demodulator output
3. Search for the DAC code that corresponds to a rain signal around 55000LSB

7.1. Set DAC

The strength of the light pulse must be set to configure the rain signal to be in the proper ADC range. The output DAC registers (DACA and DACB) control the strength of the pulse. The ADC range is between 32768 and 65535LSB. Lower values correspond to less received light in the photodiode. It is not needed to get an accurate rain signal at this time. The precise value will be configured later. A value, roughly around 40000LSB is good to start with.

7.2. Sweep Tdem

The Tdem parameter sets the demodulator delay time. Selecting the correct value, results in the highest output signal. Figure 7 shows a chart of the ADC output vs the demodulator delay time. It is important that the ADC does not clamp during the sweep of the Tdem parameter. When this occurs, a lower output strength must be selected to perform the sweep. Select the demodulator delay time that corresponds to the highest output value to get the best performance.

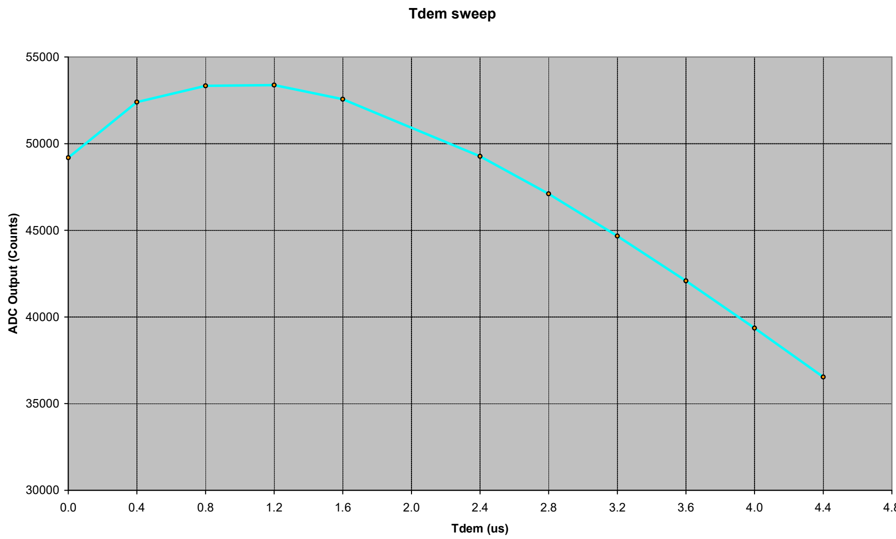

Figure 7: Tdem vs ADC output

7.3. Fine Tune DAC setting

Once the demodulator is set to have the highest output value, the strength of the light pulse needs to be configured to get a good ADC starting value to perform rain measurements. 55000LSB without rain on the windshield is a value one should aim to get. It is not too close to saturation and has a good resolution to detect small amounts of rain. The rain output value will decrease when there is rain on the windshield.

7.4. Commands used to set up the system

WR: Write Register DACA (0xC8 at address 0x1):
0x87 0xC8 0x14

Control2 Byte (0xC8) can be changed to change the output value
Note that the parity bits (bit 2..3 of Control3 Byte) also need to be changed when changing the data. See section:

WR - Write Register for information about the parity bits.

SM: Fire LEDA and measure rain channel A
0xD0   0x14

RO: Read out of the rain measurement
0xC3   0x00

WR: Write Register Tdem (0x35 at address 0x0)
0x87   0x35   0x04
Control2 Byte bits 7..4 can be changed to change the Tdem parameter.
Note that the parity bits (bit 2..3 of Control3 Byte) also need to be changed when changing the data. See section:

WR - Write Register

8. Advantages of the MLX75308

The MLX75308 is the best choise for use in a fully digital Rain Light Sensor system with extreme optical performance and a high integration. The main advantages of the MLX75308 over other Rain Light Sensor interface chips or discrete circuits are:

- The MLX75308 is designed specifically to interface to the highly demanding Rain Light Sensor module.
- The MLX75308 has a large and programmable dynamic range, allowing the part to cater to a wide range of input signals (variation of windshield shades, variation of external light influences, variation of LED & PD performances due to mechanical setup, ageing effects).
- The MLX75308 has a flexible and versatile digital SPI interface with large programmability and easy to use 16bit ADC readout.
- The MLX75308 has internal compensation for both large sunlight effects (static & dynamic) and for parasitic 2nd order effects of low-cost PD's. Both rain and sun signals are measured and compensated for at a 16bit level, allowing the user of the MLX75308 to create a Rain Light Sensor system with the highest possible performance in rain detection.
- The MLX75308 has an internal pre-driver to facilitate a large dynamic range, and the external FET's allow for intense current peaks to maximize SNR and allow for the use of low cost PD's.
- The MLX75308 has several diagnostic and internal watchdog features that enable system designers to design a fail-safe Rain Light Sensor system.
- The MLX75308 comes with 2 versatile rain channels and 3 versatile ambient channels, allowing the Rain Light Sensor system architect to connect to any PD required for best system performance or lowest cost.
- With the 3.3V power supply, sleep and standby modes, the MLX75308 offers a Rain Light Sensor system maximum flexibility, with low-power modes for different car-models.

The MLX75308 comes in a small QFN4x4 leadless package with minimal footprint, external components and ECU overhead for a Rain Light Sensor application.

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