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# ScioSense

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Demo Kit Manual

# AS3935

## Standard Board

### AS3935 DK

## Table of Contents

# 1 Features

- Fully operational Lightning Sensor
- Supplied by a 3V CR2032 battery with long battery life time >1000 hours
- Buzzer alarm for early warning of storm
- 128x32 display with blue backlight for detail information about storm warning
- Automatic antenna and RCO tuning implemented
- USB connection for adjusting AS3935 detail settings
- Handheld Lightning Emulator
- Emulation of lightning with different distance (far, close, closest) and noise generation

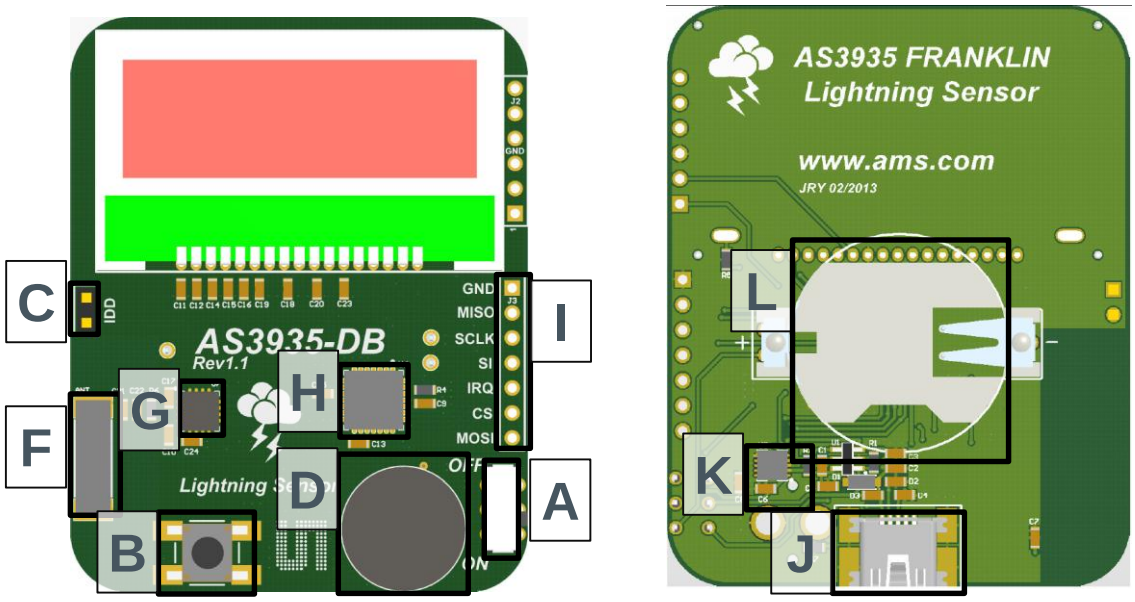
## 1.1 Programmable Lightning Sensor AS3935 Key Features

- Lightning Sensor warns of lightning storm activity within a radius of 40km
- Distance estimation to the head of the storm down to 1km
- Detects both cloud-to-ground and intra-cloud (cloud-to-cloud) flashes
- Embedded man-made disturber rejection algorithm
- Programmable detection levels enable threshold setting for optimal controls
- SPI and I²C interface is used for control and register reading
- Antenna tuning to compensate variations of the external components
- Supply voltage range 2.4V to 5.5V
- Power-down, listening, and active mode

# 2 Franklin Lightning Sensor Description

## 2.1 Board Description

**Figure 1: Lightning Sensor – Top and Bottom view**




## 2.2 Component Description Top

| Label | Name | Info |
|---|---|---|
| A | ON/OFF | Power on/off the Demo Board. |
| B | BUTTON | Short Press: The actual time of the RTC is shown.<br>Long Press (>1s): The statistics of the AS3935 is cleared |
| C | IDD | IDD Jumper for current measurement of AS3935 |
| D | BUZZER | Audio Information for Lightning and Disturber |
| E | LCD | 128x32 Display, blue backlight |
| F | 500kHz | 100uH LF Antenna for AS3935 |
| G | AS3935 | Lightning Sensor |
| H | MCU | Microcontroller PIC24FJ64GB002 |
| I | AS3935 Interface | SPI Interface to AS3935 |

## 2.3 Component Description Bottom

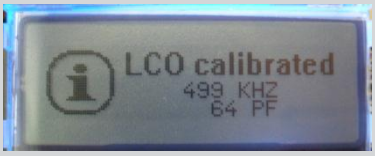
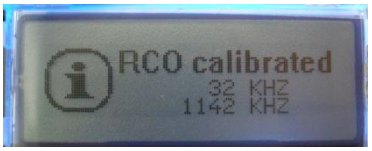
| Label | Name | Info |
|---|---|---|
| J | USB-CONNECTOR | USB Interface for the GUI |
| K | AS1362, AS1746 | Power Management; Analog Switch |
| L | CR2032 Battery | Insert CR2032 Coin Cell here |

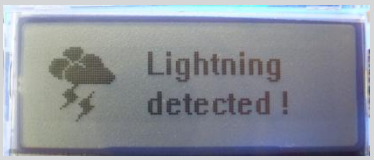
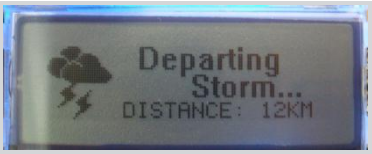
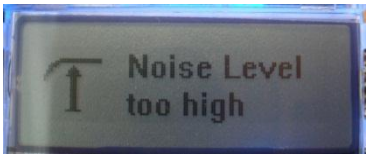
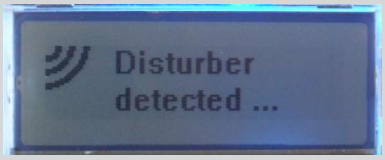
## 2.4 Buzzer

| Label | Modulation | Info |
|---|---|---|
| D | 1x500ms ON | Lightning detected |
| | 2x150ms ON | Lightning detected: Distance to the previous lightning has changed |
| | 4x50ms ON | Disturber detected |

**Note:** The buzzer alarm can be modified or turned off via the GUI

## 2.5 LCD

| Label | Description | Sign |
|---|---|---|
| Booting | After power on of the demo board, the austriamicrosystems logo and the firmware version will be displayed. |  |
| Antenna Tuning | After start-up the antenna of the AS3935 is automatically tuned. The tuning uses the internal array of capacitors to achieve 500kHz as resonance frequency. The resonance frequency and the internal capacitance are shown on the LCD. |  |
| RCOs Calibration | After the antenna tuning the internal RC-Oscillators are calibrated. The SRCO is calibrated to 32kHz and the TRCO is calibrated to 1.1MHz. Both frequencies are displayed. |  |
| USB connected | The demo board can be connected via USB. As soon as the USB bus is connected the sensor is turned off and all settings of the AS3935 can be saved in the GUI. If the demo board is power cycled when the USB plug is already connected, the LCO and RCO calibration is not executed, in order to allow the user to do those calibrations via the GUI. |  |
| Listening Mode | After the calibration, the Lightning sensor is set in listening mode. No storm is within detection range. |  |

| Label | Description | Sign |
|---|---|---|
| Lightning  This symbol indicates a lightning – the text give further information. | Lightning has been detected. The distance estimation and movement of the head of the storm is shown afterwards. |   |
| | The distance to the head of the storm decreases. |   |
| | The distance to the head of the storm increases. |   |
| Noise Floor Detected | Continuous noise is jamming the AS3935 AFE; during this time the sensor cannot detect the presence of lightning activities. |   |
| Disturber Detected | Disturbers have been received by the AS3935 and rejected by the disturber rejection embedded algorithm. |   |

## 2.6 Real Time Clock (RTC)

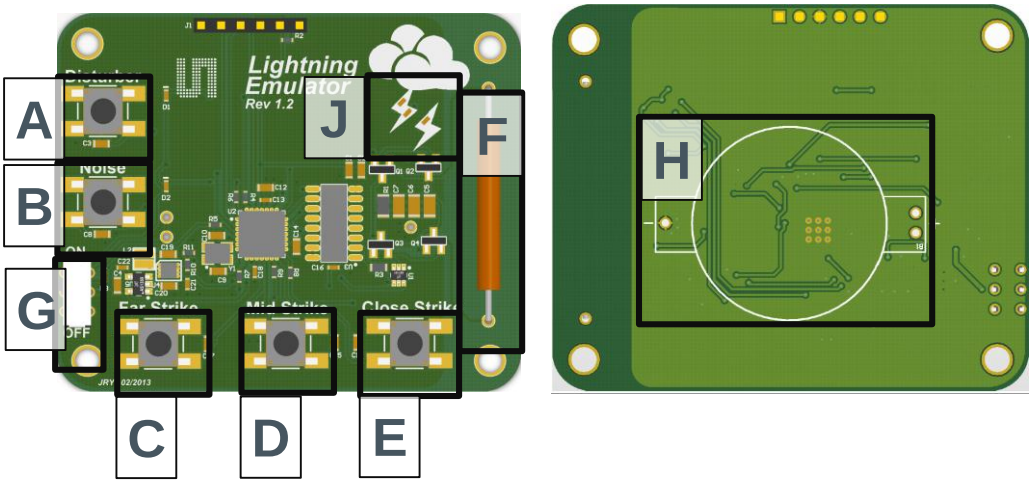
The demo board has a built in RTC that must be synchronized with a PC. Once the RTC is set to the current time, it is possible to create timestamps for detected lightning events. The synchronization via the GUI is explained in section **Error! Reference source not found.**.

**Note:** The RTC is reset to midnight of 1. January 2012 and the history is cleared when the demo board is switched off and on again.

# 3 Lightning Emulator

## 3.1 Board Description

**Figure 1: Lightning Emulator – Top and Bottom View**




## 3.2 Lightning Emulator Description

| Label | Name | Info |
|---|---|---|
| A | Disturber | Emulates a disturber on the antenna; red LED is flashing up |
| B | Noise | Emulates noise on the antenna; red LED keeps flashing as long as noise signals are emulated (3s) |
| C | Far Strike | Emulates a pattern of a lightning with far distance |
| D | Mid Strike | Emulates a pattern of a lightning with closer distance |
| E | Close Strike | Emulates a pattern of a lightning with the closest distance |
| F | Antenna | The different patterns are modulated on the 500kHz carrier that is transmitted via the LF antenna. |
| G | On/Off Switch | Turn both switches to ON to supply the lightning emulator; As soon as the demo board is switched on, the ON LED flashes up once a second to indicate being turned on. |
| H | Battery holder CR2450 | The Lightning Emulator board is supplied with a CR2450 Coin Cell. |

## 3.3 LEDs

| Label | Name | Info |
|---|---|---|
| G | ON | Blue LED flashes up once a second |
| A | Disturber | Red LED flashes up in case a disturber is emulated |
| B | Noise | Red LED flashes up for 3s in case noise is emulated |
| J | Strike | Yellow LED flashes up in case far strike is emulated |
| | | Orange LED flashes up in case mid strike is emulated |

| Label | Name | Info |
|---|---|---|
| | | Red LED flashes up in case close strike is emulated |

## 4 How to get started with Franklin Lightning Sensor Demo Kit

**Due to the sensitive nature of the sensor towards noise and disturbers a separate application note is provided. It explains the operational environment and board placement for which the demonstration will work as intended. This information is given in the application note "AS3935_AppNote_AN03_DemoKit_Setup_EN_v1.pdf".**

- Insert the 3V battery (CR2032) in the battery holder **"C"** on the AS3935 demo board.
- Insert a 3V battery in the battery holder **"G"** on the Lightning Emulator.
- Position the lightning emulator and the AS3935 demo board in such a way that both antennas are in parallel to each other. Keep a distance of 10-15 cm between both boards.
- Turn on the AS3935 Lightning Sensor via the ON/OFF – switch **"A"**. When you switch on the board you will see on the LCD the austriamicrosystems logo followed by the LCO and the RCO calibration. After successful calibration the AS3935 goes into sense mode awaiting a lightning.
  **Note:** The LCO should be tuned to 500 kHz, the TRCO to 1.1 MHz and the SRCO to 32 kHz. To manually execute the tuning procedures connect the USB plug before turning the demo board on via switch **"A"**.
- Turn on the Lightning Emulator via the ON/OFF – switch **"F"**. When turned on, the blue LED will be continuously flashing.
  **Note:** Make sure the battery of the Lightning Emulator is full. Otherwise lightning might not be emulated correctly.
- Now you can start to press the switches "Far Strike", "Mid Strike" and "Close Strike" (button "**B**", "**C**", and "**D**") on the Emulator, simulating lightning events that will be detected by the sensor. The display will flash up showing the signs described above and the buzzer will trigger an alarm.
- If a disturber is emulated (button **"A"**) the AS3935 demo board will show "Disturber detected".

# 5 GUI Description

Install the GUI and start the software. As soon as the demo board is connected the USB and AS3935 Symbol in the corner becomes green.

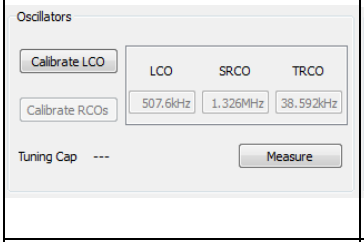
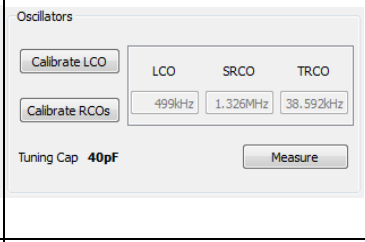
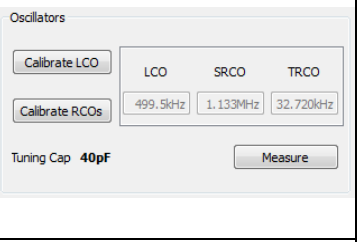
The LCD will show the USB connection and the sensor is turned off.

**Figure 2: GUI of the AS3935 Lightning Sensor**


The following parameters can be defined on the AS3935 Lightning Sensor:

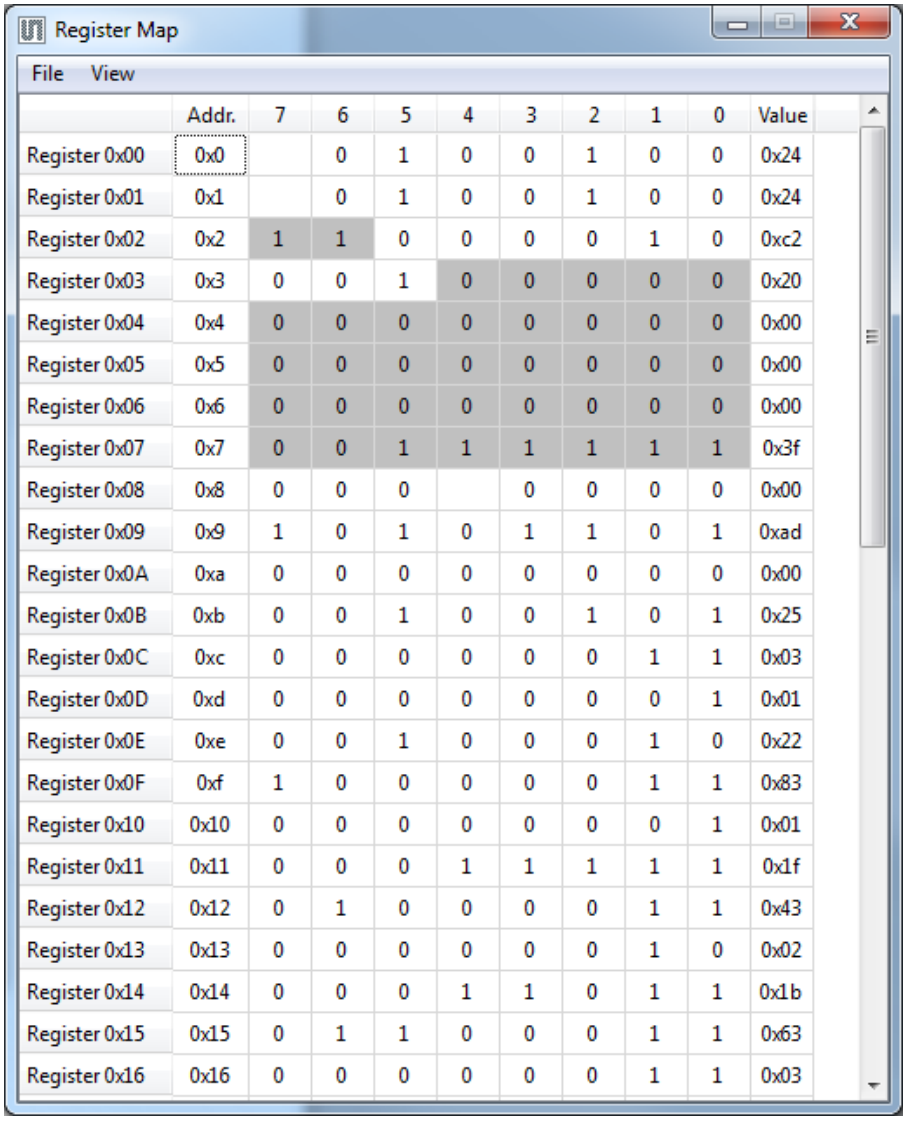
- **Power Down**
  In power down mode (R0<0>=1), the entire AS3935 is switched off. The typical current consumption is 800nA. After power up, the TRCO is not calibrated. The calibration must be done by the user pressing the button “Calibrate RCOs”, and respectively “Calibrate LCO” if needed.
- **LNA Settings**
  The LNA settings have to be changed according to the location of the lightning sensor (outdoor vs. indoor) as described in the AS3935 datasheet.
- **Noise Floor**
  The threshold for the trigger of the noise floor interrupt can be selected via this drop down menu. A bigger value sets the threshold higher.

- **Disturber**
  If the disturbers are masked, no interrupts will occur if a disturber is detected.
- **Disturber Rejection Settings**
  With the watchdog threshold level WDTH (R1<3:0>) it is possible to increase the robustness to disturbers. The AS3935 is also capable of rejecting impulse signals, like spikes, picked up by the antenna. The spike rejection can be improved via the SREJ Level defined in R2<3:0>. By default, R2<3:0> = 0x2. Larger values of SREJ correspond to more robust spike rejection.
- **Minimum Number of Strikes**
  It is possible to program the AS3935 to only issue lightning interrupts if a minimum number of lightning events are detected in a 15 minute time frame. This field allows setting it to 1, 5, 9 or 16 minimum numbers of lightning events. Once this threshold is reached the Lightning Sensor will display every further detected lightning event.
- **Oscillators**
  In case the AS3935 demo board is connected to the GUI via USB before powering up the demo board, the oscillators will not be calibrated. The calibration procedure can be executed manually via the GUI. The first step is to measure the default resonance frequency of the oscillators by pressing “Measure”. The oscillators will show inaccurate values. Pressing “Calibrate LCO” will tune the antenna to 500 kHz, which will then allow the user to calibrate the RCOs by pressing “Calibrate RCOs”. The added tuning caps will be shown below. See the tuning sequence below:

| | | |
|---|---|---|
|  |  |  |
| Measure default values | Calibrate LCO | Calibrate RCOs |

- **Buzzer Control**
  The buzzer alarm can be modified for lightning only or can be completely turned off. The buzzer settings can be saved.
- **Save Settings / Restore Default Settings**
  All settings of the AS3935 and the buzzer can be saved by pressing “Save Settings”. To reset the values to the factory settings press “Restore Default Settings”.
- **Firmware Update**
  In order to update the firmware, open Help → Firmware Update (Ctrl+F) and select the new firmware revision.
- **Show History**
  The history of the occurred strikes can be read out via the GUI and saved to a log file.
- **Register Map**
  The entire register map can be readout via View→Register Map (Ctrl+M) and can be modified by clicking on the register entries.

**Figure 3: Register Map**

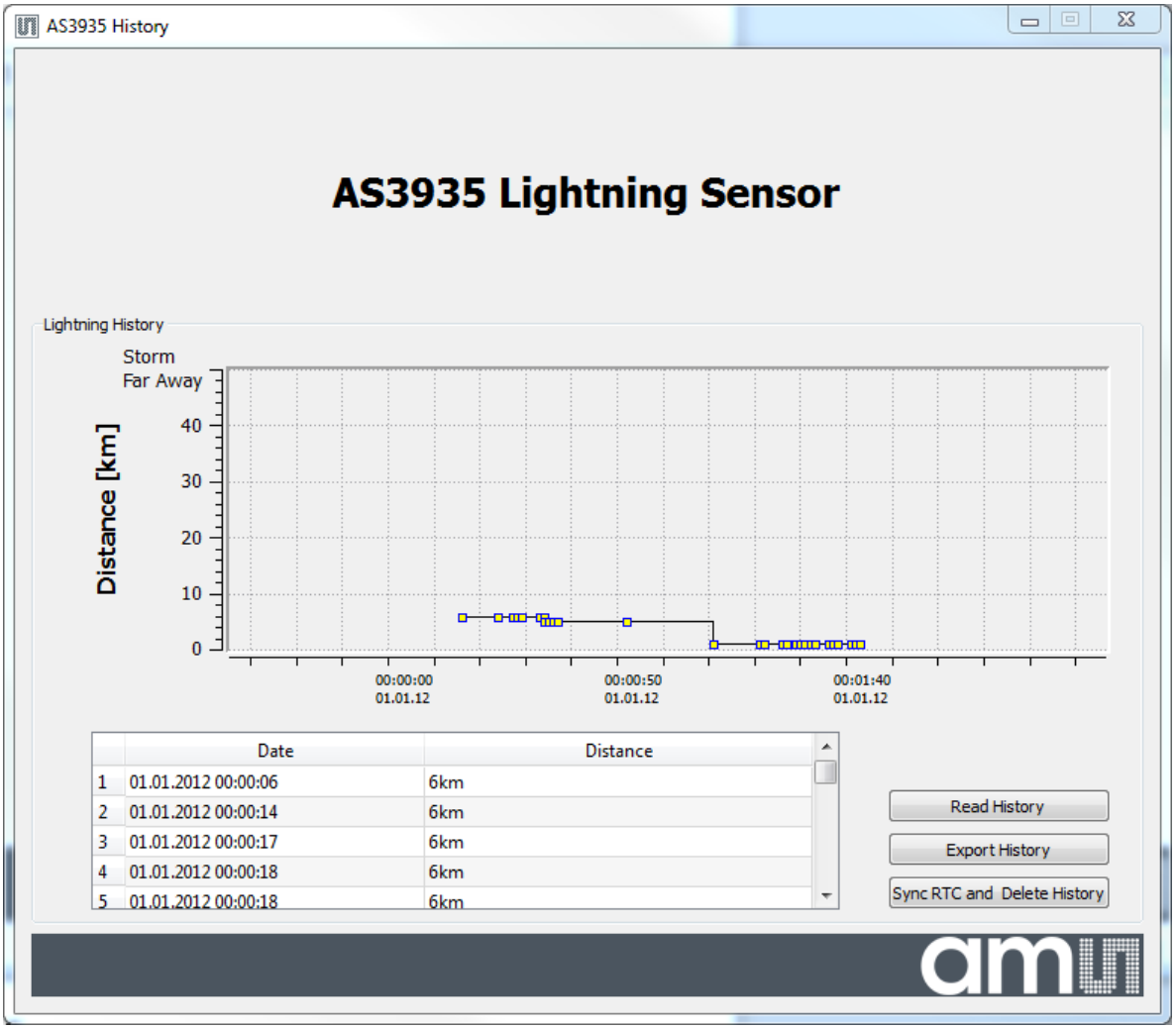



| | Addr. | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | Value |
|---|---|---|---|---|---|---|---|---|---|---|
| Register 0x00 | 0x0 | | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0x24 |
| Register 0x01 | 0x1 | | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0x24 |
| Register 0x02 | 0x2 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0xc2 |
| Register 0x03 | 0x3 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0x20 |
| Register 0x04 | 0x4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0x00 |
| Register 0x05 | 0x5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0x00 |
| Register 0x06 | 0x6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0x00 |
| Register 0x07 | 0x7 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0x3f |
| Register 0x08 | 0x8 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0x00 |
| Register 0x09 | 0x9 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0xad |
| Register 0x0A | 0xa | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0x00 |
| Register 0x0B | 0xb | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0x25 |
| Register 0x0C | 0xc | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0x03 |
| Register 0x0D | 0xd | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0x01 |
| Register 0x0E | 0xe | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0x22 |
| Register 0x0F | 0xf | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0x83 |
| Register 0x10 | 0x10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0x01 |
| Register 0x11 | 0x11 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0x1f |
| Register 0x12 | 0x12 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0x43 |
| Register 0x13 | 0x13 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0x02 |
| Register 0x14 | 0x14 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0x1b |
| Register 0x15 | 0x15 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0x63 |
| Register 0x16 | 0x16 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0x03 |

# 6 History Description

The demo board offers a volatile history that can be read out and its data can be saved into a log file.

**Figure 4: Lightning History Window**




The history works as follows:

- It is possible to synchronize the RTC of the board with the time of your PC pressing **"Sync RTC and Delete History"**. The existing history in the memory is automatically deleted. A short pressing of the button "**B**" on the Lightning Sensor demo board shows the actual time on the LCD display.

  **Note**: Right after every power up of the board the RTC is set to midnight of 1.January 2012. The history is deleted when the board is turned off.
- Each event detected by the Lightning Sensor is saved into the memory. It is possible to read out the history by connecting to the GUI and pressing the button **"Read History"**. The graph shows the estimated distance to the head of the storm over time.
- ***Zoom into*** the history by holding your left mouse button pressed.
- ***Zoom out*** of the history by pressing the right mouse button.
- Select some strikes in the graph and the details will be highlighted in the table below.

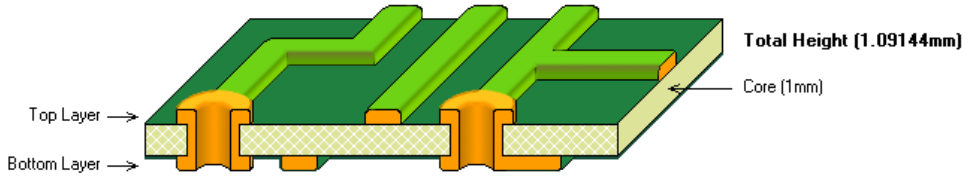
- All data can be exported into a log file by pressing **“Export History”**.

| | A | B | C | D |
|---|---|---|---|---|
| 1 | AS3935 Lightning Sensor History | | | |
| 2 | Date [dd.mm.yyyy] | time [hh:mm:ss] | distance [km] | |
| 3 | 25.04.2012 | 10:36:55 | 27 | |
| 4 | 25.04.2012 | 10:36:57 | 27 | |
| 5 | 25.04.2012 | 10:36:58 | 24 | |
| 6 | 25.04.2012 | 10:37:02 | 12 | |
| 7 | 25.04.2012 | 10:37:03 | 12 | |
| 8 | 25.04.2012 | 10:37:04 | 12 | |
| 9 | 25.04.2012 | 10:37:05 | 12 | |
| 10 | 25.04.2012 | 10:37:06 | 12 | |
| 11 | 25.04.2012 | 10:37:14 | 10 | |
| 12 | 25.04.2012 | 10:37:14 | 10 | |
| 13 | 25.04.2012 | 10:37:15 | 8 | |
| 14 | 25.04.2012 | 10:37:18 | 1 | |
| 15 | | | | |

- It is possible to save a maximum of 190 lightning events in the memory. If the memory is full a notice will be displayed on the LCD to read out and delete the history. Please apply then **“Read History”**, **“Export History”** and **“Sync RTC and Delete History”**.

# 7 Layer Stack of Lightning Sensor

**Figure 5: Layer Stack of PCB**




- PCB Material: FR4 1mm for Active Tag. FR4 1.6mm for base station
- 2 layer board
- Solder surface: chemical - tin
- Width of copper: 35µm
- Silk screen top/bottom: white

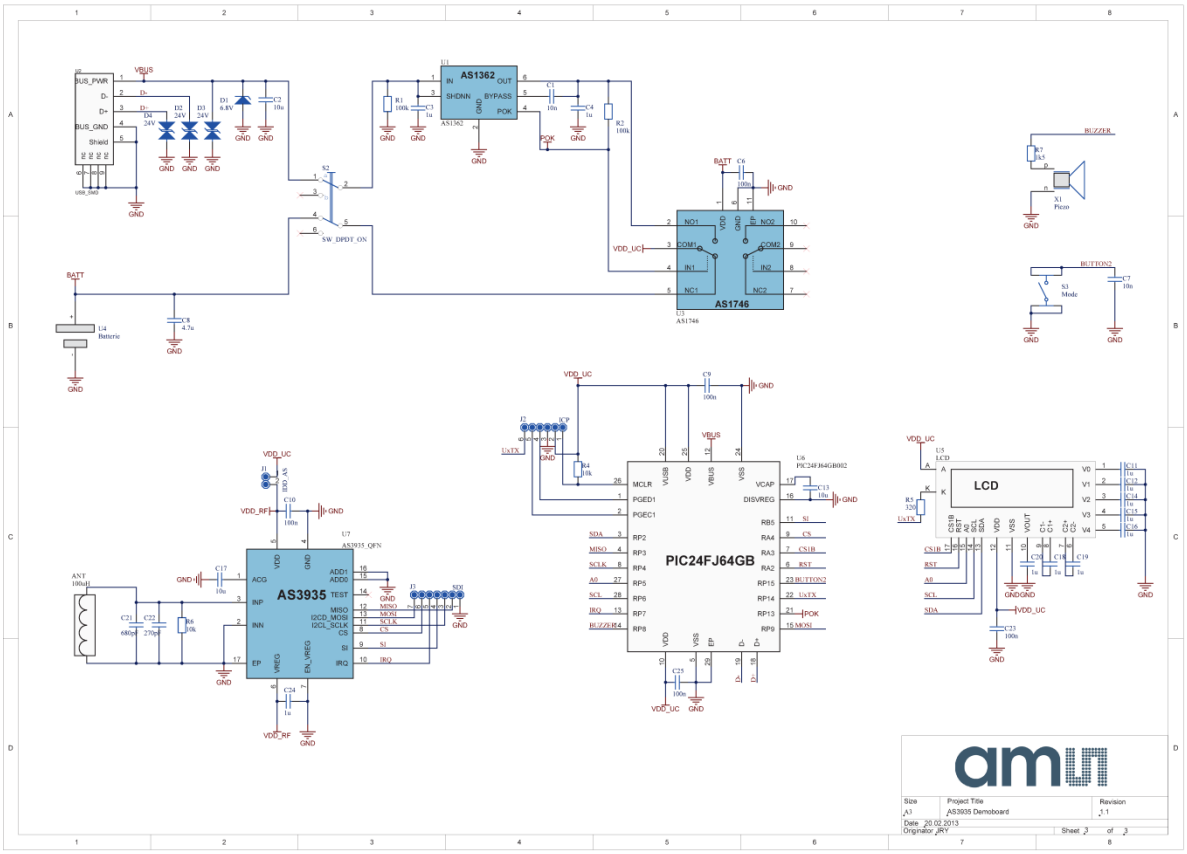
# 8 Layout Recommendations

- Do not cross the SPI lines with the sensitive inputs of the antenna.
- Below the 500 kHz LF antenna there should not be a GND plane.
- Make sure that the GND plane is routed carefully.
- Do not run SPI or any other interface on 500 kHz clock speed, in order to avoid cross-coupling.

# 9 Schematic, Layout and BOM of Lightning Sensor

## 9.1 Schematic of Lightning Sensor Demo Board

**Figure 6: Board Schematics of Lightning Sensor Demo Board**



## 9.2 Board Layout of Lightning Sensor Demo Board

**Figure 7: Top Layer**

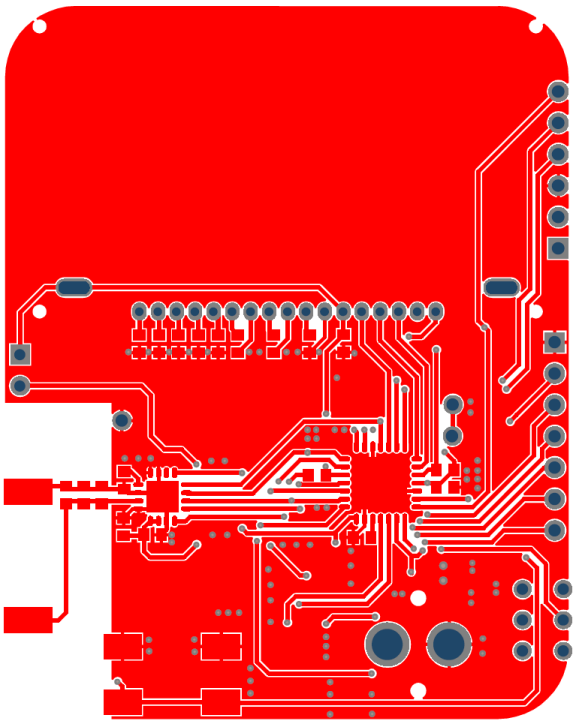
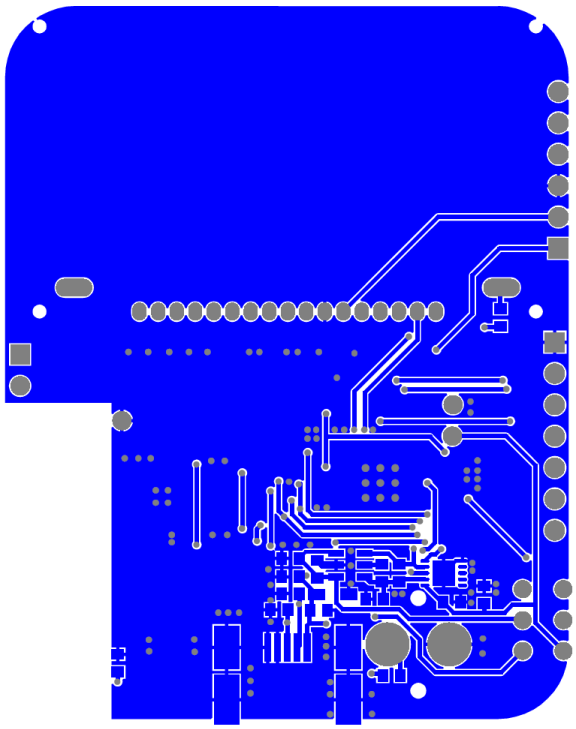


**Figure 8: Bottom Layer**



## 9.3 Bill of Material of Lightning Sensor Demo Board

# Bill of Materials

AS3935 Demoboard

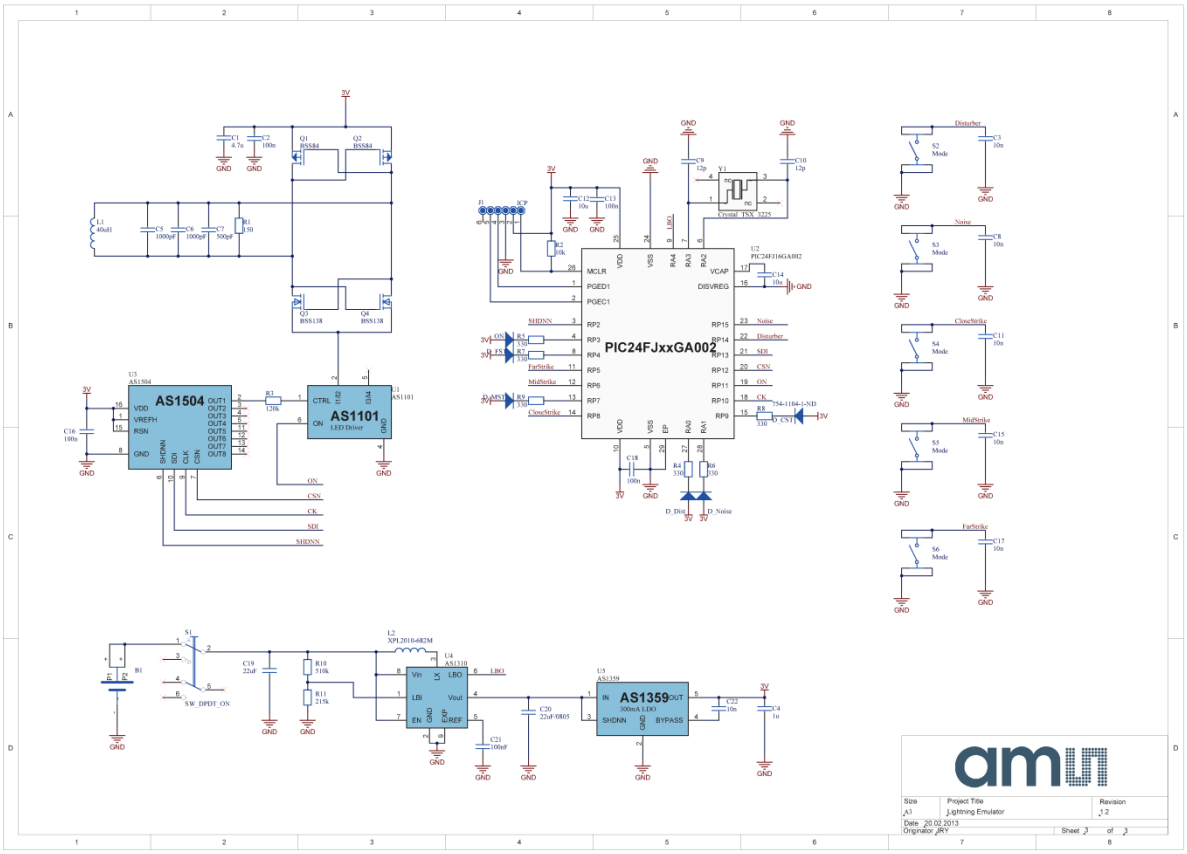
| | |
|---|---|
| Company: | ams AG |
| Originator: | JRY |
| PCB Name: | AS3935 Demoboard |
| PCB Version: | 1.1 |
| Report Date: | 20.02.2013 |

| # | Designator | Comment | Component_Description | Manufacturer | Manufacturer Part Number | Quantity |
|---|---|---|---|---|---|---|
| 1 | ANT | 100uH | 100uH, Q=34 | Coilcraft | MA5532-AE | 1 |
| 2 | C1, C7 | 10n | 0603 | AVX | 06033C103KAT2A | 2 |
| 3 | C2, C13, C17 | 10u | TDK - C1608X5R0J106M - | TDK | C1608X5R0J106M | 3 |
| 4 | C3, C4, C11, C12, C14, C15, | 1u | KEMET - | KEMET | C0603C105K9RACTU | 11 |
| 5 | C6, C9, C10, C23, C25 | 100n | 0603 | AVX | 0603YC104KAT2A | 5 |
| 6 | C8 | 4.7u | CAP CER 4.7UF 6.3V X5R | Taiyo Yuden | JMK107BJ475MA-T | 1 |
| 7 | C21 | 680pF | MULTICOMP - MCCA000975 | MULTICOMP | MCCA000975 | 1 |
| 8 | C22 | 270pF | CAP CER 270PF 25V 1% | AVX Corporation | 06033A271FAT2A | 1 |
| 9 | D1 | 6.8V | ON SEMICONDUCTOR - | ON SEMICONDUCTOR | MM3Z6V8T1G | 1 |
| 10 | D2, D3, D4 | 24V | COOPER BUSSMANN - | COOPER BUSSMANN | 0603ESDA-TR1 | 3 |
| 11 | J1 | IDD_AS | 2 pole pin header | | | 1 |
| 12 | J2 | ICP | not assembled | | | 1 |
| 13 | J3 | SDI | not assembled | | | 1 |
| 14 | R1, R2 | 100k | 0603 | VISHAY DRALORIC | CRCW0603100KFKEA | 2 |
| 15 | R4, R6 | 10k | 0603 | VISHAY DRALORIC | CRCW060310K0FKEA | 2 |
| 16 | R5 | 320 | 0603 | Vishay Thin Film | PAT0603E3200BST1 | 1 |
| 17 | R7 | 1k5 | 0603 | MULTICOMP | MC 0.063W 0603 5% 1K5 | 1 |
| 18 | S2 | SW_DPDT_ON | SW SLIDE DPDT 6VDC 0.3A | C&K Components | JS202011AQN | 1 |
| 19 | S3 | Mode | TE CONNECTIVITY / | TE CONNECTIVITY / | FSM2JSMA | 1 |
| 20 | U1 | AS1362 | IC Reg LDO 3.0V 0.3A | ams | AS1362-BTTT-30 | 1 |
| 21 | U2 | USB_SMD | CONN RECEPT USB 5POS | Molex Connector | 56579-0576 | 1 |
| 22 | U3 | AS1746 | IC Switch Dual SPDT 10- | ams | AS1746-BTDR | 1 |
| 23 | U4 | Batterie | RENATA - HU2032-LF - THT | RENATA | HU2032-LF | 1 |
| 24 | U5 | LCD | LCD COG GRAPH 128X32 | Newhaven Display Intl | NHD-C12832A1Z-FSB-FBW-3V3 | 1 |
| 25 | U6 | PIC24FJ64GB002 | MICROCHIP - | MICROCHIP | PIC24FJ64GB002-I/ML | 1 |
| 26 | U7 | AS3935_QFN | IC Sensor Lightning | ams | AS3935-BQFT | 1 |
| 27 | X1 | Piezo | BUZZER PIEZO 30VP-P | Murata Electronics North | PKM13EPYH4002-B0 | 1 |
| Approved | | | Notes | | | 48 |

# 10 Schematic, Layout and BOM of Lightning Emulator

## 10.1 Schematic of Lightning Emulator

**Figure 9: Board Schematics of Lightning Emulator**



## 10.2 Board Layout of Lightning Emulator

**Figure 10: Top Layer**

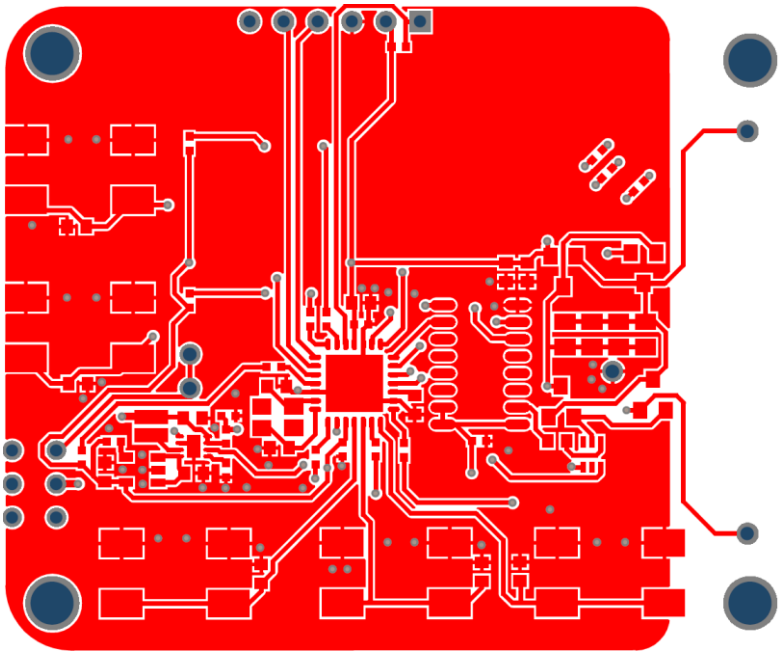
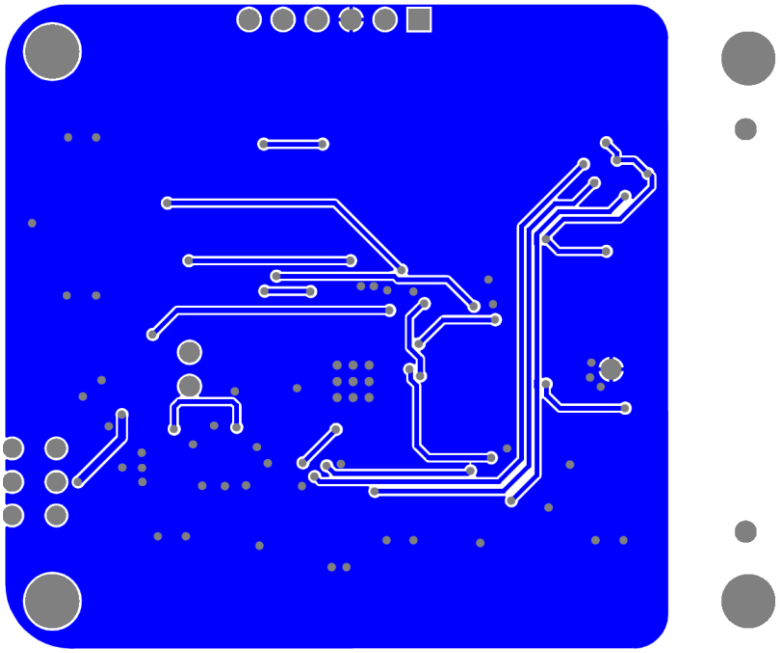


**Figure 11: Bottom Layer**



## 10.3 Bill of Material of Lightning Emulator

# Bill of Materials

Lightning Emulator

| | |
|---|---|
| Company: | ams AG |
| Originator: | JRY |
| PCB Name: | Lightning Emulator |
| PCB Version: | 1.2 |
| Report Date: | 20.02.2013 |

| # | Designator | Comment | Component_Description | Manufacturer | Manufacturer Part Number | Quantity |
|---|---|---|---|---|---|---|
| 1 | B1 | Battery_Holder_3pin_THMD | | Renata | HU2450N-LF | 1 |
| 2 | C1 | 4.7u | 0603 | | | 1 |
| 3 | C2, C13, C16, C18 | 100n | 0402, 0603 | | | 4 |
| 4 | C3, C8, C11, C15, C17, C22 | 10n | 0603, MURATA - | MURATA | GRM188R71C104KA01D | 6 |
| 5 | C4 | 1u | CAP CER 4.7UF 6.3V X5R | Taiyo Yuden | JMK107BJ475MA-T | 1 |
| 6 | C5, C6 | 1000pF | VISHAY VITRAMON - | VISHAY VITRAMON | VJ0805A102JXBMT | 2 |
| 7 | C7 | 500pF | AVX - 08055A511JAT2A - | AVX | 08055A511JAT2A | 1 |
| 8 | C9, C10 | 12p | 0603 | | | 2 |
| 9 | C12, C14 | 10u | 0603 | | | 2 |
| 10 | C19 | 22uF | MURATA - | MURATA | GRM21BR60J226ME39L | 1 |
| 11 | C20 | 22uF/0805 | MURATA - | MURATA | GRM21BR60J226ME39L | 1 |
| 12 | C21 | 100nF | MURATA - | MURATA | GRM188R71C104KA01D | 1 |
| 13 | D1 | D_Dist | LED 1X0.5MM 630NM RD | Kingbright Corp | APHHS1005SURCK | 1 |
| 14 | D2 | D_Noise | LED 1X0.5MM 630NM RD | Kingbright Corp | APHHS1005SURCK | 1 |
| 15 | D3 | ON | LED 1X0.5MM 470NM BL | Kingbright Corp | APHHS1005PBC/A | 1 |
| 16 | D4 | D_FST | LED 1X0.5MM 590NM YW | Kingbright Corp | APHHS1005SYCK | 1 |
| 17 | D5 | D_MST | LED 1X0.5MM 601NM ORN | Kingbright Corp | APHHS1005SECK | 1 |
| 18 | D6 | D_CST | LED 1X0.5MM 630NM RD | Kingbright Corp | APHHS1005SURCK | 1 |
| 19 | J1 | ICP | not assembled | | | 1 |
| 20 | L1 | 40uH | EPCOS - B82111EC23 - | EPCOS | B82111EC23 | 1 |
| 21 | L2 | XPL2010-682M | COILCRAFT- XPL2010- | Coilcraft | XPL2010-682M | 1 |
| 22 | Q1, Q2 | BSS84 | FAIRCHILD | FAIRCHILD | BSS84 | 2 |
| 23 | Q3, Q4 | BSS138 | FAIRCHILD | FAIRCHILD | BSS138 | 2 |
| 24 | R1 | 150 | 0805 | | | 1 |
| 25 | R2 | 10k | 0402 | | | 1 |
| 26 | R3 | 120k | 0603 | | | 1 |
| 27 | R4, R5, R6, R7, R8, R9 | 330 | PANASONIC - | PANASONIC | ERJ2GEJ331X | 6 |
| 28 | S1 | SW_DPDT_ON | SW SLIDE DPDT 6VDC 0.3A | C&K Components | JS202011AQN | 1 |
| 29 | S2, S3, S4, S5, S6 | Mode | TE CONNECTIVITY / | TE CONNECTIVITY / | FSM2JSMA | 5 |
| 30 | U1 | AS1101 | Dual LED driver with enable; | ams | AS1101-T | 1 |
| 31 | U2 | PIC24FJ16GA002 | IC PIC MCU FLASH 16K 28- | Microchip Technology | PIC24FJ16GA002-I/ML | 1 |
| 32 | U3 | AS1504 | Octal 8-bit DAC, Mid-Scale | ams | AS1504-T | 1 |
| 33 | U4 | AS1310 | Ultra Low Quiescent | ams | AS1310_BTDT-33 | 1 |
| 34 | U5 | AS1359 | Ultra Low-Noise 300mA | ams | AS1395-BTTT-31 | 1 |
| 35 | Y1 | Crystal_TSX_3225 | | EPSON TOYOCOM | TSX-3225, 16MHZ, 10PPM, 9PF | 1 |
| Approved | | | Notes | | | 57 |

# 11 Ordering & Contact Information

| Ordering Code | Description |
|---|---|
| AS3935 DK | AS3935 Demo Kit Standard Board |

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***Note: This product is intended to be used as an early warning indicator for lightning related storms. It does not guarantee accuracy or predict exact strike locations. By using the part, the user shall be aware that he cannot just rely on the indication in order to prevent accidents caused by lightning strikes. ams expressly states that the user must follow the generally known and recommended instructions how to behave in the event of lightning strikes.*** **In no event shall ams or its suppliers be liable for any direct, indirect, incidental, special, exemplary or consequential damages (including, but not limited to procurement of substitute goods or services, loss of use, data or profits, or business interruption) arising out of user´s disregarding of such warnings and instructions.**

## 13 Revision Information

| Changes from 1-02 (2013-Mar-11) to current revision 1-03 (2014-Jul-08) | Page |
|---|---|
| Update to corporate format | 1-21 |

**Note:** Page numbers for the previous version may differ from page numbers in the current revision.