

## Product Description

The AirGlow technology combines advanced wireless outdoor lighting control with unique scalability and future IoT possibilities. The AirGlow module comes with the same feature set as the AirGlow device. It has a built in advanced wireless lighting control based on LumenRadio's reliable patented wireless MiraMesh technology.

MiraMesh is a self-contained self-healing wireless mesh without the need of a gateway or other specific hardware.

AirGlow embodies LumenRadio's many years of experience in wireless lighting control from high-stakes applications such as Film & Broadcasting Lighting and Architectural Lighting.

The AirGlow module is fully compliant with ETSI EN 300 328 (v2.2.2) is FCC/IC certified with a modular approval up to 100mW. Manufacturers can add AirGlow to their products easily with full OrCAD, Allegro and DXF symbol libraries available to simply drop onto existing layouts. AirGlow is fully DALI2 and D4i compliant and only a few extra external components are required for built in wireless DALI based light controls.

An [AirGlow development kit](#) is available for purchase and can be used to evaluate performance and is also good resource when integrating the module into a product.



## Features

- Based on LumenRadio's MiraMesh technology
- DALI2 and D4i type D compliant
- Compliant against ETSI EN 300 328 (v2.2.2)
- Modular approval FCC/IC certified
- Compact size with few external components required.
- Astronomical time triggering of scenes
- Time triggering of scenes
- Presence detection scene triggering through DALI2/D4i part subpart 303 occupancy sensors or LSI interface
- Smartphone app for commissioning and for lighting control setup.
- Up to 6ch DALI DT6: RGBA/W, CW, WW
- Sub second response time
- Firmware over the air upgrade through app.

## Specifications

- Range: up to 1500m free line of sight between two devices.
- Output (ERP): Max 20 dBm
- Sensitivity: -93dBm
- U.FL/IPEX external antenna connector
- Frequency band: 2.45 GHz, ISM band (2402-2480 MHz)
- Number of units: Up to 200 in one meshing network.
- Number of hops: 8 hops in the meshing network
- Dimensions: 33.5 x 18.5 x 3.77mm
- Supply voltage 3.0 - 3.6V
- Peak average current consumption 150mA in high power mode.

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## 1 Specifications

- Range: up to 1500m free line of sight between two meshing devices
- Bluetooth range: up to 35m free line of sight
- Output (ERP): Max 20 dBm
- Sensitivity: -93dBm
- U.FL/IPEX external antenna connector
- Frequency band: 2.45 GHz, ISM band (2402-2480 MHz)
- Number of units: Up to 200 in one meshing network.
- Number of hops: 8 hops in the meshing network
- Dimensions: 33.5 x 18.5 x 3.77mm
- Configuration data storage:  
Highly secured storage in cloud  
System access controlled by system owner  
All data encrypted for privacy and security

### 1.1 Absolute maximum ratings

Maximum ratings are the extreme limits to which the AirGlow module can be exposed for a limited amount of time without permanently damaging it. Exposure to absolute maximum ratings for prolonged periods of time may affect the reliability of the device.

Symbol	Parameter	Min.	Typ.	Max.	Unit
$V_{DD}$	Supply voltage	-0.3		3.9	V
$T_A$	Operating temperature	-30		75	°C
$V_{IO}$	IO Input voltage $V_{DD} \leq 3.6V$			$V_{DD} + 0.3$	V
$V_{IO}$	IO Input voltage $V_{DD} > 3.6V$			3.9	V
$V_{SS}$	Ground pad voltage			0.0	V
$T_S$	Storage temperature	-40		+125	°C
$RF_{in}$	RF input power			+10	dBm
<b>ESD</b>	ESD all pins, Human Body Model			1	kV

### 1.2 Operating temperature range

Symbol	Parameter	Min.	Typ.	Max.	Unit
$T_A$	Operating temperature	-30		75	°C

### 1.3 Power supply

Symbol	Parameter	Min.	Typ.	Max.	Unit
$V_{DD}$	Supply voltage	3.0	3.3	3.6	V
$I_{DD}$	Supply current		150	250	mA
$V_{RISE}$	Supply rise time (0 V to 3.7 V)			60	ms

## 1.4 Digital I/O pins

Symbol	Parameter	Min.	Typ.	Max.	Unit
$V_{IL}$	Input voltage logic low	0		$0.3 \cdot V_{DD}$	V
$V_{IH}$	Input voltage logic high	$0.7 \cdot V_{DD}$		$V_{DD}$	V
$V_{OL}$	Output voltage logic low	0		0.4	V
$V_{OH}$	Output voltage logic high	$V_{DD}-0.4$		$V_{DD}$	V

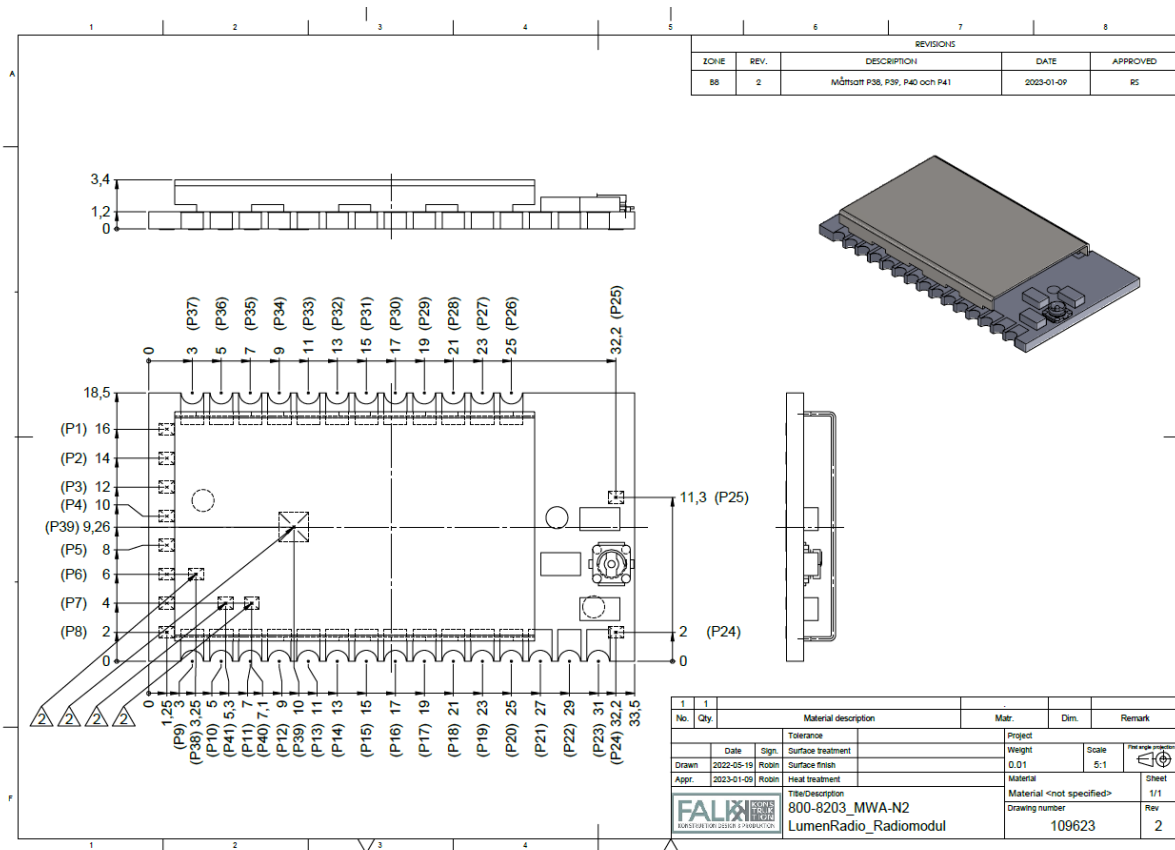
## 1.5 RF Performance

RF performance below is valid at an ambient temperature of 25°C and a supply voltage of 3.3 V.

Symbol	Parameter	Min.	Typ.	Max.	Unit
$f_{range}$	Operating frequency range	2402		2480	MHz
$RX_{sens}$	Receiver sensitivity (0.1% BER)		-93		dBm
$TX_{pout}$	TX output power		17		dBm

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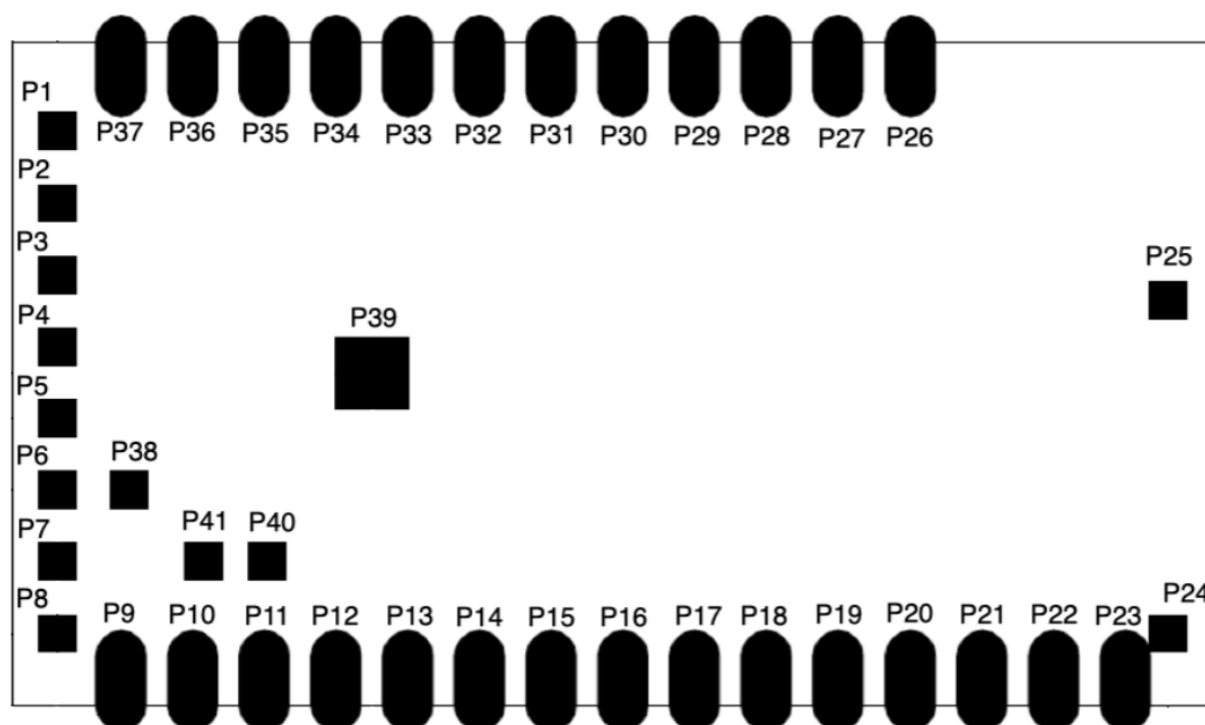
## 1.6 Mechanical specification



All dimensions in mm

Mechanical design files in .stp and .dxf format is available for download at the [LumenRadio online support page](#) for the AirGlow module.

## 2 Pin assignments



Module seen from the top

Pin	Name	Pin type	Description
1	VSS	Power	Ground (0V)
2	MOSI	Digital input	SPI Master Out, Slave In <b>(future use)</b>
3	N.C.	No connection	Do not connect
4	N.C.	No connection	Do not connect
5	N.C.	No connection	Do not connect
6	MISO	Digital output	SPI Master In, Slave Out <b>(future use)</b>
7	VSS	Power	Ground (0V)
8	N.C.	No connection	Do not connect
9	VSS	Power	Ground (0V)
10	SDA	Digital I/O	SDA for RTC
11	SCL	Digital I/O	SCL for RTC
12	N.C.	No connection	Do not connect
13	N.C.	No connection	Do not connect
14	LSI RX	Digital input	LSI input for presence scene trigger (active low)
15	N.C.	No connection	Do not connect
16	SCK	Digital output	SPI Clock <b>(future use)</b>
17	LSI TX	No connection	LSI output for relay control <b>(future use)</b>
18	N.C.	No connection	Do not connect
19	N.C.	No connection	Do not connect
20	N.C.	No connection	Do not connect

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<b>21</b>	N.C.	No connection	Do not connect
<b>22</b>	N.C.	No connection	Do not connect
<b>23</b>	VSS	Power	Ground (0V)
<b>24</b>	VSS	Power	Ground (0V)
<b>25</b>	VSS	Power	Ground (0V)
<b>26</b>	VSS	Power	Ground (0V)
<b>27</b>	VSS	Power	Ground (0V)
<b>28</b>	IRQ	Digital output	SPI Interrupt signal, active low <b>(future use)</b>
<b>29</b>	N.C.	No connection	Do not connect
<b>30</b>	N.C.	No connection	Do not connect
<b>31</b>	N.C.	No connection	Do not connect
<b>32</b>	DALI RX	Digital input	DALI RX, DALI master receiver
<b>33</b>	DALI TX	Digital output	DALI TX, DALI master transmitter
<b>34</b>	N.C.	No connection	Do not connect
<b>35</b>	N.C.	No connection	Do not connect
<b>36</b>	VDD	Power	Power supply (3.3V)
<b>37</b>	VSS	Power	Ground (0V)
<b>38</b>	N.C.	No connection	Do not connect
<b>39</b>	N.C.	No connection	Do not connect
<b>40</b>	N.C.	No connection	Do not connect
<b>41</b>	N.C.	No connection	Do not connect
<b>ANT</b>	RF ANT	RF	Antenna connector



## 3 Functional Description

AirGlow wireless connectivity for lighting control is based on LumenRadio’s MiraMesh technology which enables a large-scale and easy-to-install self-healing wireless mesh network. By using state of the art algorithms for meshing, over the air firmware updates, commissioning and reliability, unparalleled performance is achieved.

As every AirGlow automatically repeats the communication, range is extended well beyond the maximum range of a single AirGlow. Therefore, large geographical areas can easily be covered. Thanks to the MiraMesh connectivity, free line-of-sight range between AirGlow’s in clear conditions has been tested up to 1500m with 100% communication success. Up to 8 meshing jumps is possible and therefore the theoretical range for AirGlow could be 8 x 1500m.

Up to 200 AirGlow units can be used in a single standalone network. Latency in the network mainly depends on the number of meshing jumps and not the number of AirGlow devices. MiraMesh latency is designed to be very low and even in a network with 8 meshing jumps the introduced latency will be less than 1s.

MiraMesh provides a highly synchronize clock within the meshed network characterized in rapid response and synchronized triggering of scenes. The time synchronization master is by default the first unit being commissioned and it is recommended to start commissioning of a central positioned AirGlow for best performance.

### 3.1 Bluetooth connectivity and AirGlow app

The AirGlow module is Bluetooth compatible and all commissioning and maintenance can be done with a smartphone and the AirGlow app. The AirGlow app is freely available for download through [App Store](#) for Apple iOS devices or [Google Play](#) for Android devices. Please refer to the [AirGlow manual](#) for more information about the AirGlow app.



### 3.2 Firmware Update Over the Air

The AirGlow module can be firmware updated over the air with a smart phone and the AirGlow app. When the firmware has been uploaded from the smartphone it will automatically be distributed in the network. Distribution of FW typically takes a couple of hours as it is a background process in the Mira Mesh network. During the update the network will be functional, but the AirGlow units will be rebooted during the process which might result in unresponsiveness for a short time.

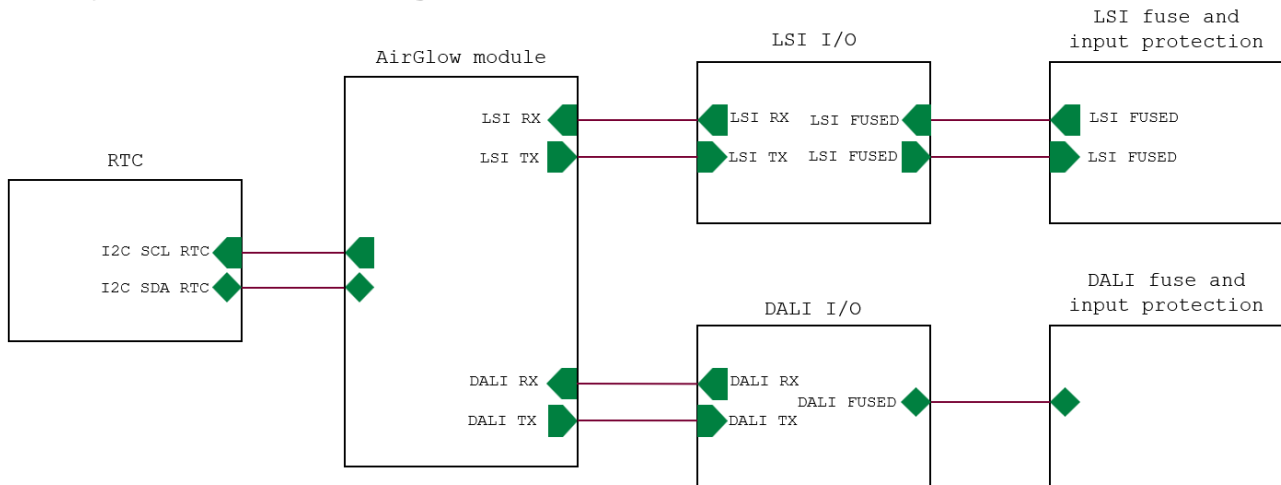
### 3.3 AirGlow Lighting controller

AirGlow is a DALI2 and D4i compatible device and can control up to 6 colour channels luminaries.

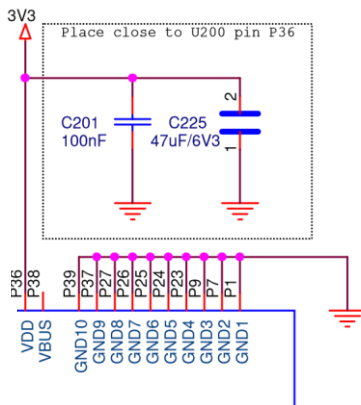
DALI Channels	Combination
1	Intensity only
2	Cold White (CW), Warm White (WW)
4	RGB (Red, Green Blue), Amber/White (A)
6	RGB (Red, Green Blue), Amber/White (A), Cold White (CW), Warm White (WW)

Scenes are setup in the AirGlow app. A Scene can be triggered by either an input signal on the LSI pin of an AirGlow (typically a presence sensor) or it could be triggered by a specific time on a specific day of the week. These triggers are called Input Units in the app and are always added to the Zone. This allows an Input Unit to trigger a Scene that includes an individual Group or multiple Groups.

## 4 Typical block diagram



## 5 Power supply recommendations



The AirGlow module is designed for 3.3V operation. All pins should not have any power applied to them before the +3.3V rail is applied.

To ensure reliable operation the supply pin should be decoupled with a 100nF ceramic capacitor located as close to the supply pins as possible. It is also recommended to add a high value capacitor ceramic close to the supply pin.

## 6 DALI Interface

The Module has a standard DALI interface that is compliant against the following DALI parts:

DALI standard	Version
IEC 62386-101	2.0
IEC 62386-103	2.0
DiiA DALI Part 351	1

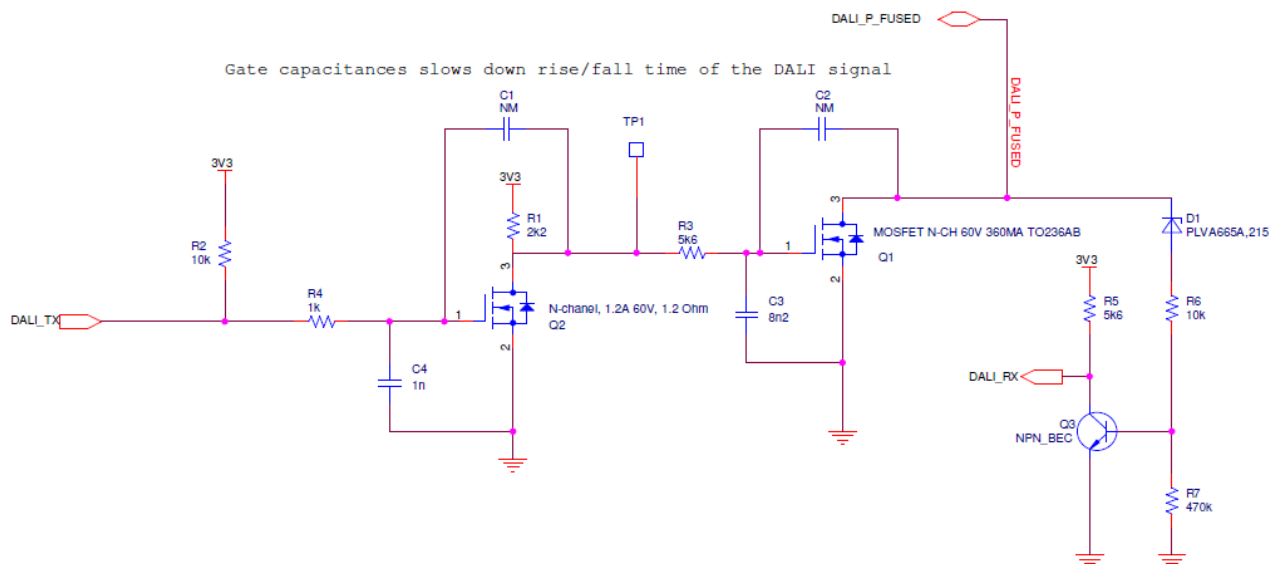
A separate DALI communication interface circuit is required for proper operation comprising a DALI data input and output and DALI PSU circuit. The DALI RX and DALI TX pin on the module is used for interfacing the DALI data input and output interface.

## 6.1 DALI data interface reference design

Below is the schematics and BOM of the DALI interface from the AirGlow shield included in the [AirGlow development kit](#). Please note that adjustments of components values might be needed in this circuit to meet the timing requirements of the DALI standard IEC 62386-101:

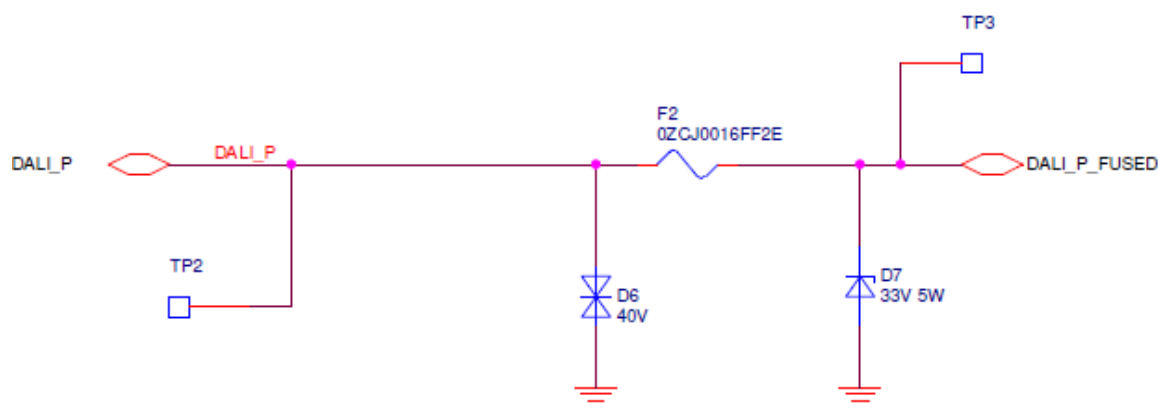
	Min	Max
Rise/Fall time	3 $\mu$ s	15 $\mu$ s

Please consult IEC 62386-101 for definition of rise and fall time.



Reference designator	Item name	Manufacturer	Part number
<b>C1, C2</b>	Not Mounted	Not Mounted	Not Mounted
<b>C3</b>	CAP CER 8200PF 50V X7R 0402	Yageo	CC0402KRX7R9BB822
<b>C4</b>	CAP CER 1000PF 50V NP0 0402	Yageo	CC0402KRX7R9BB102
<b>D1</b>	Zener 6.5V 250mW SOT-23	Nexperia USA Inc.	PLVA665A,215
<b>Q1</b>	BSS138BK MOSFET N-CH 60V 360MA TO236AB	Nexperia USA Inc.	BSS138BK,215
<b>Q2</b>	2N7002P MOSFET N-CH 60V 0.36A SOT-23	Nexperia USA Inc.	2N7002P,215
<b>Q3</b>	BC847B NPN 45V 100mA	Nexperia USA Inc.	BC847B
<b>R1</b>	RES 2k2 1% 1/16W 0402	Yageo	RC0402FR-072K2L
<b>R2, R6</b>	RES 10K 1% 1/16W 0402	Yageo	RC0402FR-1310KL
<b>R3, R5</b>	RES 5k6 1% 1/16W 0402	Yageo	RC0402FR-075K6L
<b>R4</b>	RES 1k 1% 1/16W 0402	Yageo	RC0402FR-071KL
<b>R7</b>	RES 470k 1% 1/16W 0402	Yageo	RC0402FR-13470KL

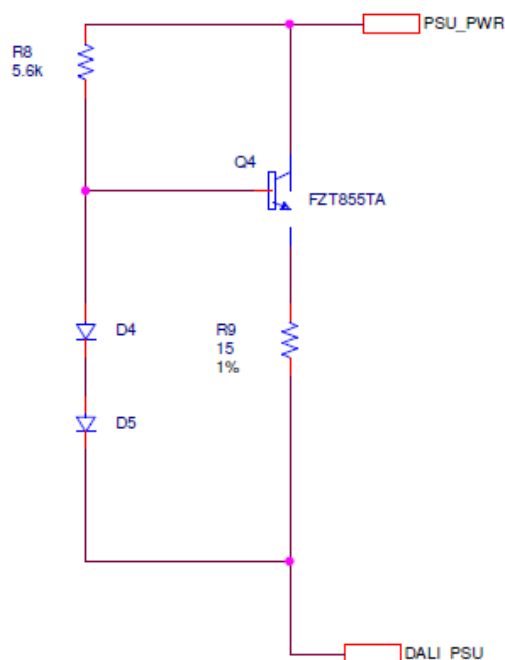
The DALI\_P\_FUSED signal shall be tied to DALI+ and an input protection circuit is recommended. Below is a schematic and BOM of the input protection circuit used on the AirGlow shield for overvoltage and short circuit protection.



Reference designator	Item name	Manufacturer	Part number
D6	TVS DIODE 40V 64.5VC SMA	Littelfuse Inc.	SMAJ40CA
D7	DIODE ZENER 33V 5W SMB	Comchip Technology	CZRB5364B-HF
F2	PTC RESET FUSE 60V 100MA 1206	Bel Fuse Inc.	0ZCJ0010FF2E

## 6.2 DALI PSU reference design

This is a simplistic but adequate low power DALI PSU circuit design. The minimum supply current for the DALI bus utilizing below circuit is 30mA with a short circuit current of approx. 50mA. This circuit is sufficient to power a driver and the suggested DALI data interface as the current consumption in idle state will be <2mA for the AirGlow interface and <2mA for the LED driver. If higher supply current capabilities are required for power of a sensor from the DALI bus a more advanced DALI PSU design is required.



In the circuit to the left the voltage drop of the base-emitter is matched by the voltage drop of diode D4. The voltage drop over D5 is therefore equal to the voltage drop of R9 which resistance will dimension the short circuit current.

When the short circuit current is reached the voltage drop over R9 becomes larger than the voltage drop over D5. When this happens the two diodes will start to conduct and the current will through the diodes and not to the base of Q4 which then turns off.

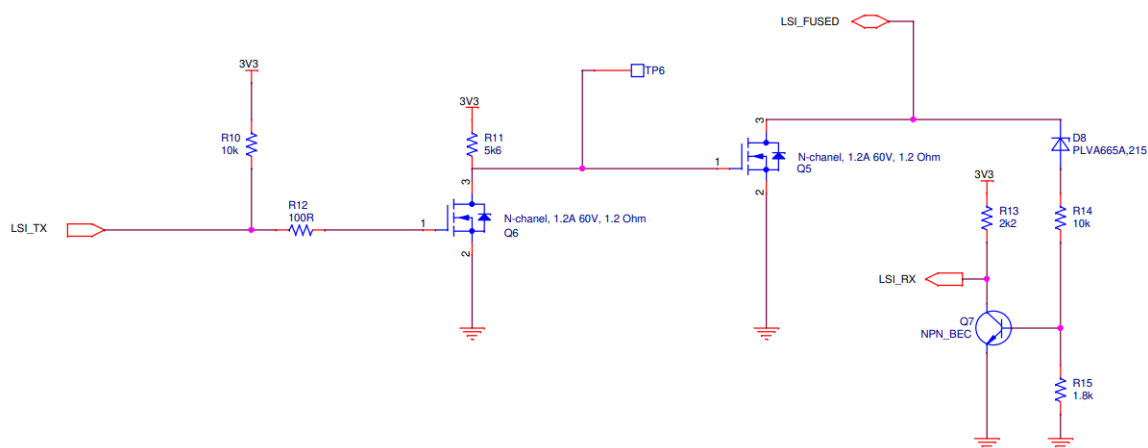
## 7 LSI interface

The LSI interface is a digital input trigger for presence scenes. The LSI interface is active low and is pulled up internally on the module.

It is typically used together with an occupancy / presence sensor but the interface can be used together with any kind of digital output external interface such as a push button or rocker switch.

### 7.1 LSI interface reference design

Below is the schematics and BOM of the LSI interface from the AirGlow shield included in the [AirGlow development kit](#).



Reference designator	Item name	Manufacturer	Part number
D8	Zener 6.5V 250mW SOT-23	Nexperia USA Inc.	PLVA665A,215
Q5, Q6	2N7002P MOSFET N-CH 60V 0.36A SOT-23	Nexperia USA Inc.	2N7002P,215
Q7	BC847B NPN 45V 100mA	Nexperia USA Inc.	BC847B
R13	RES 2k2 1% 1/16W 0402	Yageo	RC0402FR-072K2L
R10, R14	RES 10K 1% 1/16W 0402	Yageo	RC0402FR-1310KL
R11	RES 5k6 1% 1/16W 0402	Yageo	RC0402FR-075K6L
R12	RES 100R 1% 1/16W 0402	Yageo	RC0402FR-07100RL
R15	RES 1k8 1% 1/16W 0402	Yageo	RC0402FR-071K8L

## 8 RTC circuit

The AirGlow module relies on a RTC circuit for absolute time keeping primarily of time-based scenes but is also required for presence triggered scenes. A specific RTC battery backup is required if system power cannot be guaranteed at all times. Loss of power to the RTC circuit will result in loss of absolute time. If absolute time is lost it will automatically be set when the AirGlow app is used to connect to any powered AirGlow in the network.

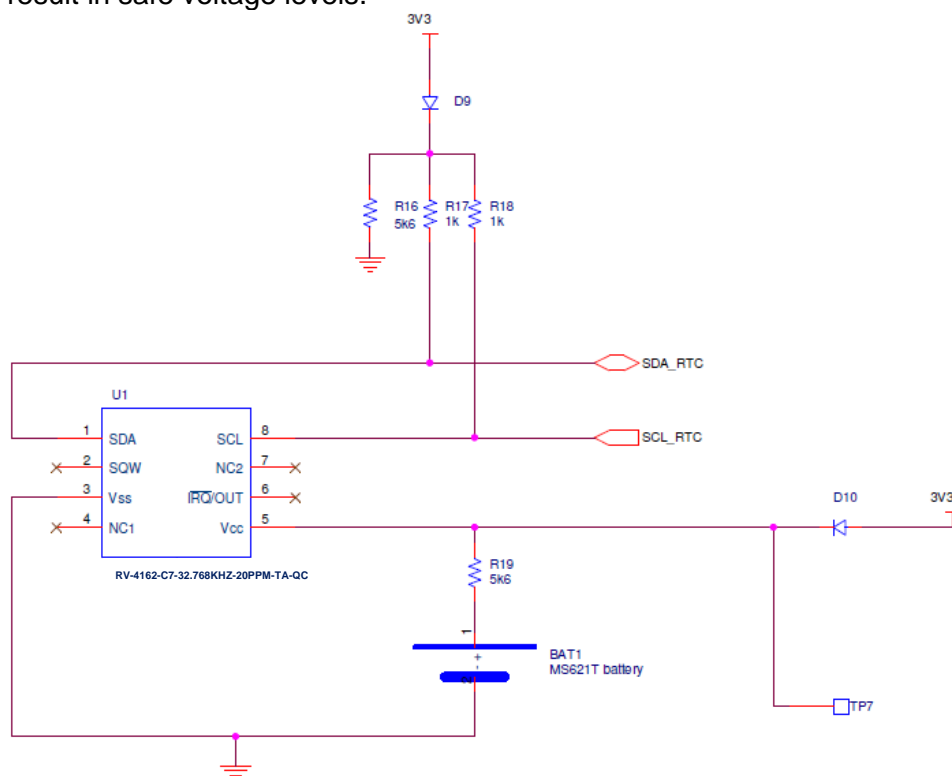
### 8.1 RTC reference design

Below is the design as used in AirGlow note that AirGlow module is only compatible with the Micro Crystal AG, RV-4162-C7-32.768KHZ-20PPM-TA-QC. The RTC is interfaced through the AirGlow module I2C pins.

A rechargeable battery backup type is recommended for absolute time keeping, this will allow the AirGlow module to keep calendar time even during longer power outs and the battery will be charged when power is restored.

The RTC battery diode D10 has two purposes. It will isolate the battery supply current from the rest of the circuit during a power outage but also lower the charging voltage to a safe level for the battery. The diode used in the design below has a low reverse current in the order of tens of nanoamps at the battery voltage level. The reverse leakage from the battery through the diode is therefore minimized.

The Battery used in the circuit has maximum charge voltage of 3.3V and the diode voltage drop will result in safe voltage levels.



Reference designator	Item name	Manufacturer	Part number
<b>BAT1</b>	BATTERY LITH 3V 3MAH COIN 6.8MM	Seiko Instruments	MS621T-FL11E
<b>D9, D10</b>	DIODE GEN PURP 100V 215MA SOD123	Nexperia USA Inc.	BAS16GWJ
<b>R16, R19</b>	RES SMD 5.6K OHM 1% 1/16W 0402	Yageo	RC0402FR-075K6L
<b>R17, R18</b>	RES SMD 1.00K OHM 1% 1/16W 0402	Yageo	RC0402FR-071KL
<b>U1</b>	IC RTC CLK/ALENDAR I2C 8LCC	STMicroelectronics	M41T62LC6F

## 8.2 Battery backup considerations

The battery used in the RTC circuit is of a rechargeable type which is recommended for time keeping during system power losses. Battery discharge time is highly dependent on ambient temperature. Low temperatures will have a significant impact on battery capacity.

Below is an example of discharge time for the Seiko Instruments battery MS621T-FL11E used in the RTC reference design.

<b>Consumption (RTC timekeeping mode)</b>	0,7	µA
<b>Capacity +25°C</b>	3,5	mAh
Time to discharge	5000	hours
	208	days
<b>Capacity -40°C</b>	1,2	mAh
Time to discharge	1714	hours
	71	days

If the battery is discharged absolute time will be lost but absolute time will be set once the AirGlow app is connected to any powered AirGlow module in the network.

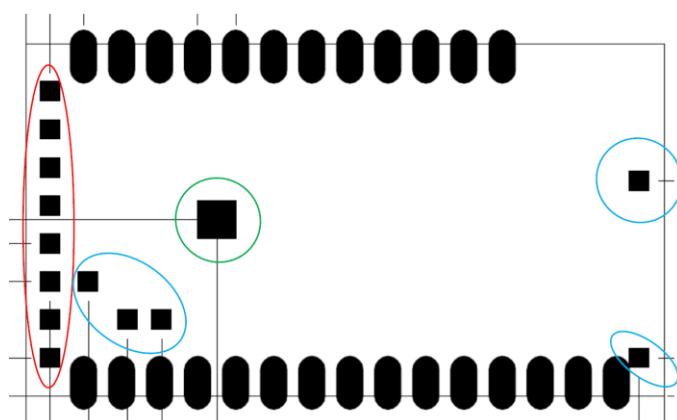
## 9 Layout considerations

Electrical and mechanical design files are available for download at the [LumenRadio online support page](#) for the AirGlow module.

### 9.1 Antenna

The antenna connector of the module is a u.FL type. The antenna shall have a characteristic impedance of 50 ohm at 2.45GHz. See section 10."Recommended antennas" for more information.

### 9.2 AirGlow module PAD dimensions



All units in mm

Refer to the picture above

Oblong 1.4 x 2.79 (oblong edge a half circle with diameter 1.4)

Small rectangles left edge 1.0 x 0.8 (red)

Small squares right edge 1.02 x 1.02 (blue)

Large square 2.0 x 2.0 (green)

### 9.3 Layout considerations for the main board

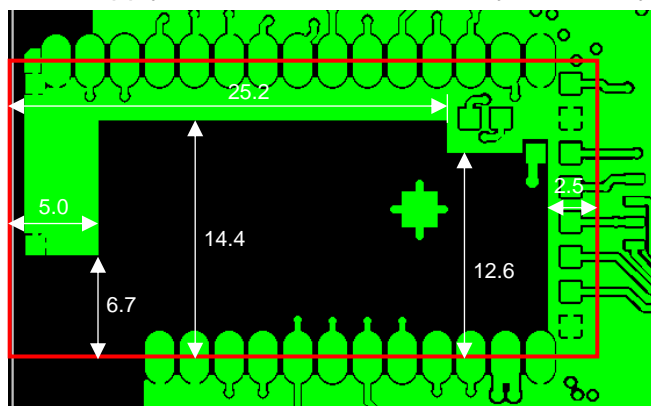
The AirGlow module has been specifically designed to achieve optimal RF performance. To maintain this, there are some important guidelines that is recommended to follow:

- The use of ground planes also on the carrier board for the AirGlow module cannot be emphasized enough. Good decoupling of any high-speed digital circuitry utilized on the carrier board is a must. Many embedded type microprocessors today have clock frequencies with clocks or overtones that reach well into the GHz range. It is possible for an embedded design to pass any EMC certification and still cause disturbances that will block the RF reception of the AirGlow module. The sensitivity of the AirGlow receiver is -96dBm therefore it is recommended to keep disturbances below -100dBm in the frequency range of operation.

A near field probe connected to a spectrum analyzer will show if there are any disturbances present on the 2.45 GHz band generated by the microprocessor or any other device that is placed on the main board. Pay special attention to readymade LAN-products "Server in a RJ connector". They pass EMC certifications, but some of them radiate badly on 2.45 GHz. If disturbances can be seen on a spectrum analyzer - then the AirGlow module will have impaired reception.



- AirGlow has a supply voltage decoupling on the circuit board. The supply voltage still needs to be adequately filtered. If any disturbance or intermittent communication failures occur, as one of the troubleshooting steps; check the supply voltage for drop-outs, switch supply ripple etc.
- The top layer inside the AirGlow module footprint must be free from copper as indicated in drawing below. There is a ground plane on the AirGlow module bottom layer, but there are also supply lines. It is an unnecessary risk to rely on solder mask lacquer for isolation.

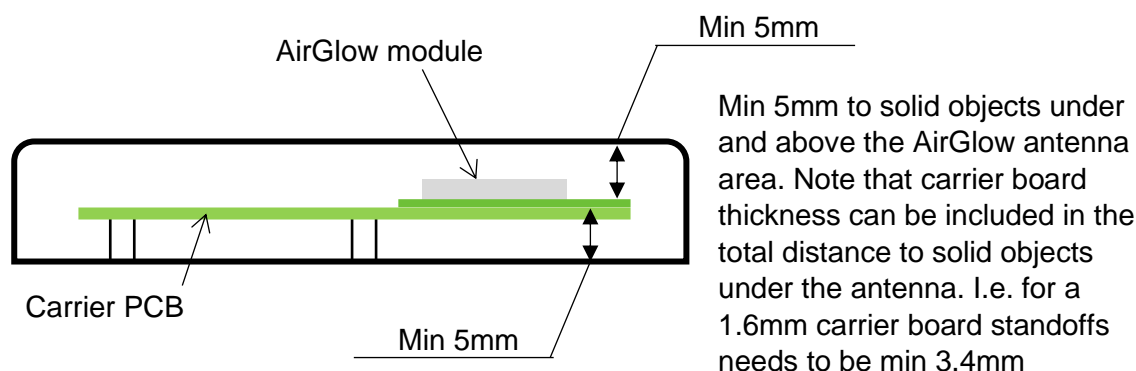


## 9.4 Guidelines for optimal performance for future optional internal antenna.

The AirGlow module has an external antenna connector option of U.FL. type and will have a future option for an internal antenna. If the internal antenna is planned to be used the following guidelines must be followed. Failure to do so may result in inferior performance.

The AirGlow module has been tested on 1.6mm carrier boards of the brands ITEQ IT180 and Isola 370HR. For optimal performance it is recommended to use those for the carrier board design or a PCB with similar specification.

Min 5mm to solid objects under and above the AirGlow module antenna area. Note that carrier board thickness can be included in the total distance to solid objects under the antenna. I.e. for a 1.6mm carrier board standoffs needs to be min 3.4mm

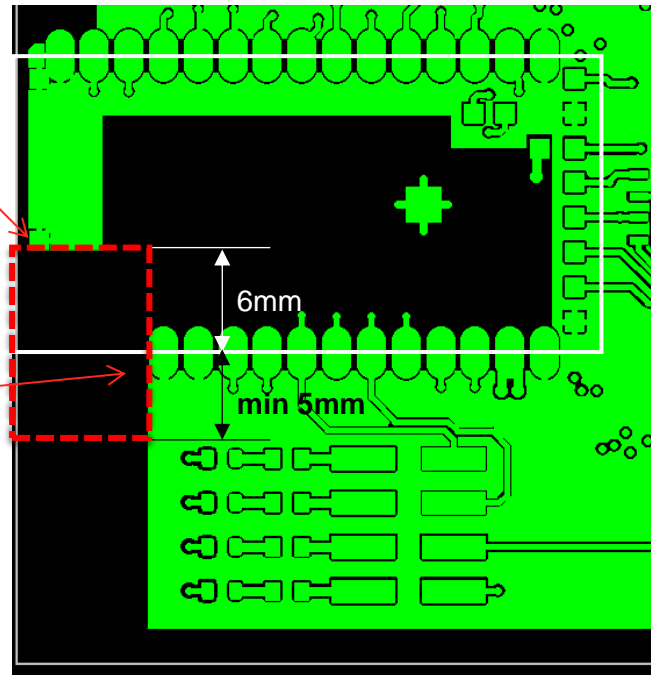


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Minimum dimensions for ground plane clearance for optimum antenna performance are shown below:

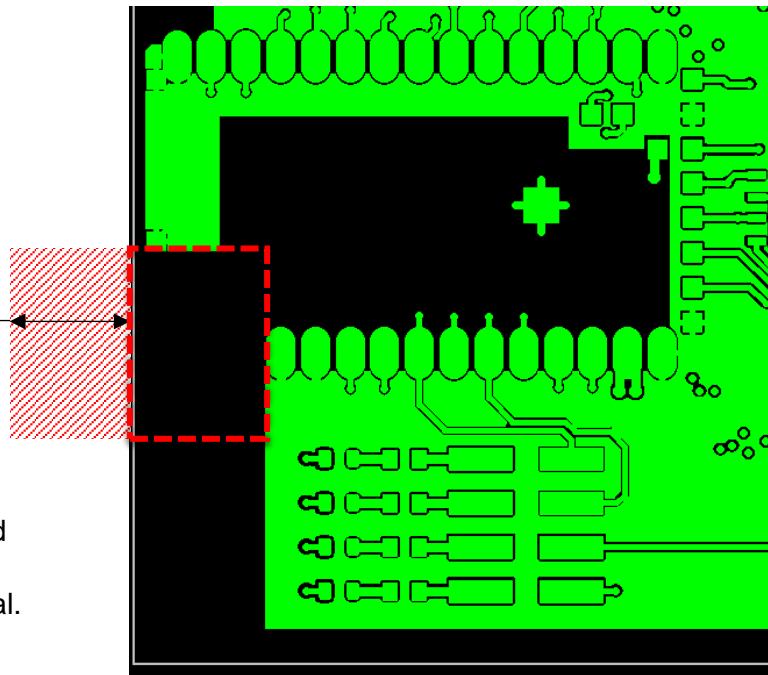
Carrier board clearance area. No components or traces/GND planes are allowed in this area. This area should be min 5mm from the board edge and 6mm under the AirGlow module to any solid object or ground plane.

Clearance area width starts from last PAD of AirGlow module



min 5mm

Red diagonal striped area is a keep out area "air gap" from any solid objects or carrier board PCB material.



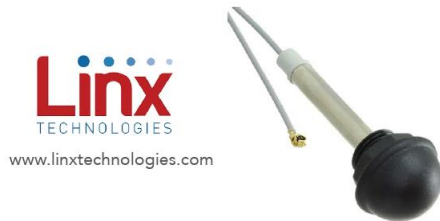
## AirGlow radio module integration guide

### 10 Recommended antennas

AirGlow has been tested with the following antennas with good results:

#### PANEL MOUNT DOME ANTENNA FOR OUTDOOR USE

A good performing antenna for use where the AirGlow module is embedded into a luminaire. The antenna is mounted through a punch out hole and is weatherproofed with the supplied gasket. Full range performance of up to 1500m line of sight can be expected using this antenna together with the AirGlow module.



Linx Technologies product number:  
ANT-DB1-WRT-UFL

Digi-Key order code:  
ANT-DB1-WRT-UFL-ND

#### PANEL MOUNT DOME ANTENNA FOR OUTDOOR USE

A similar antenna to the Linx ANT-DB1-WRT-UFL but with a larger dome and no counterpoise on the backside for more compact mounting. This antenna needs to be mounted on a grounded metal surface for best performance. Full range performance of up to 1500m line of sight can be expected using this antenna together with the AirGlow module.



Linx Technologies product number:  
ANT-DB1-WRT-MON-UFL

Digi-Key order code:  
ANT-DB1-WRT-MON-UFL-ND

#### MINIATURE INDOOR PUCK ANTENNA

This antenna has good performance and a small size. It is used by LumenRadio for AirGlow and is weather protected by the Zhaga enclosure. Full range performance of up to 1500m line of sight can be expected using this antenna together with the AirGlow module.



LumenRadio order code:  
104-1015



[www.molex.com](http://www.molex.com)



### **FLAT PATCH ADHESIVE MOUNT ANTENNA FOR ABS PLASTIC ENCLOSURE**

An indoor ultra-compact antenna that has a double-sided adhesive tape for easy “peel and stick” mounting. The antenna is design for mounting inside on a PC/ABS plastic enclosure of 1.5mm thickness. This antenna has a moderate performance compared to the other antennas and range would typically be limited to 500m line of sight together with AirGlow module.

Molex product number:  
1461530100

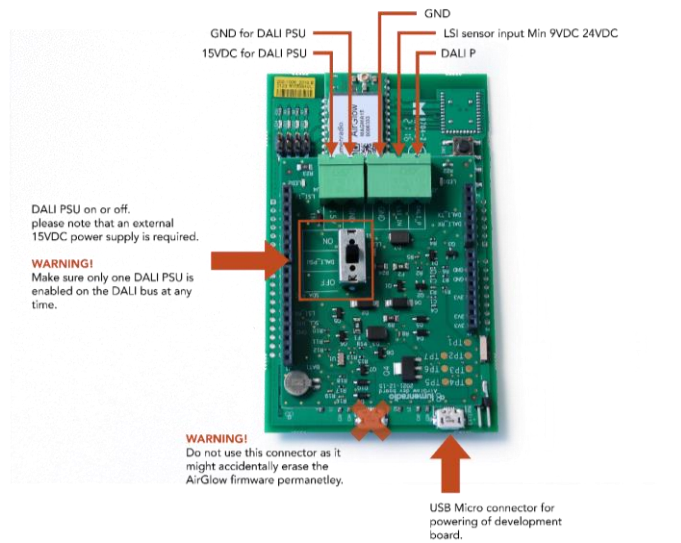
Digi-Key order code:  
WM12218-ND

# AirGlow radio module integration guide

## 11 AirGlow module development kit

An AirGlow development kit is available for purchase and can be used to evaluate performance and is also good resource when integrating the module into a product.

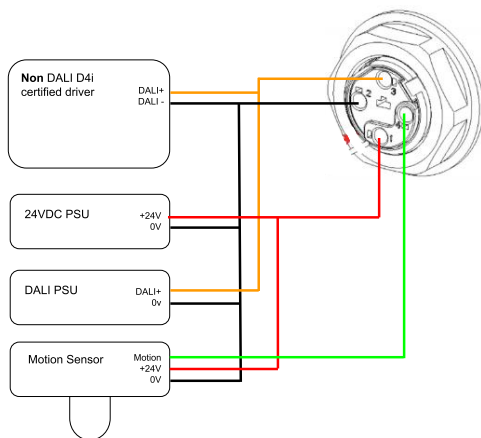
In the development kit a development board with the AirGlow module is included together with an Arduino compatible shield. The shield contains all required peripheral circuitry for controlling a DALI enabled LED driver. The shield also has an integrated low power DALI PSU.



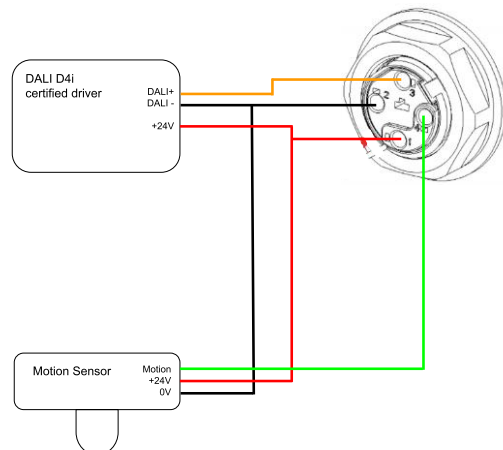
Schematics and BOM of the AirGlow Arduino compatible shield is available for download on the [AirGlow module support page](#).

### 11.1 Zhaga book 18 connector wiring diagram

In the development kit two Zhaga book 18 connectors and two AirGlow devices are included. These connectors can be used together with the AirGlow devices and below are two wiring diagrams for a D4i certified and a non D4i certified driver. It is fully possible to use a non D4i/DALI2 driver together with AirGlow as it is fully backwards compatible with legacy DALI standards. Using a non D4i compliant driver requires that a DALI PSU and a separate 24VDC supply is required for compliance against Zhaga book 18. Please refer to the [AirGlow manual](#) for more information.



Wiring diagram for a **non** D4i certified driver



Wiring diagram for a D4i certified driver

## AirGlow radio module integration guide

### 12 Product Verification and Testing

#### 12.1 Design Verification

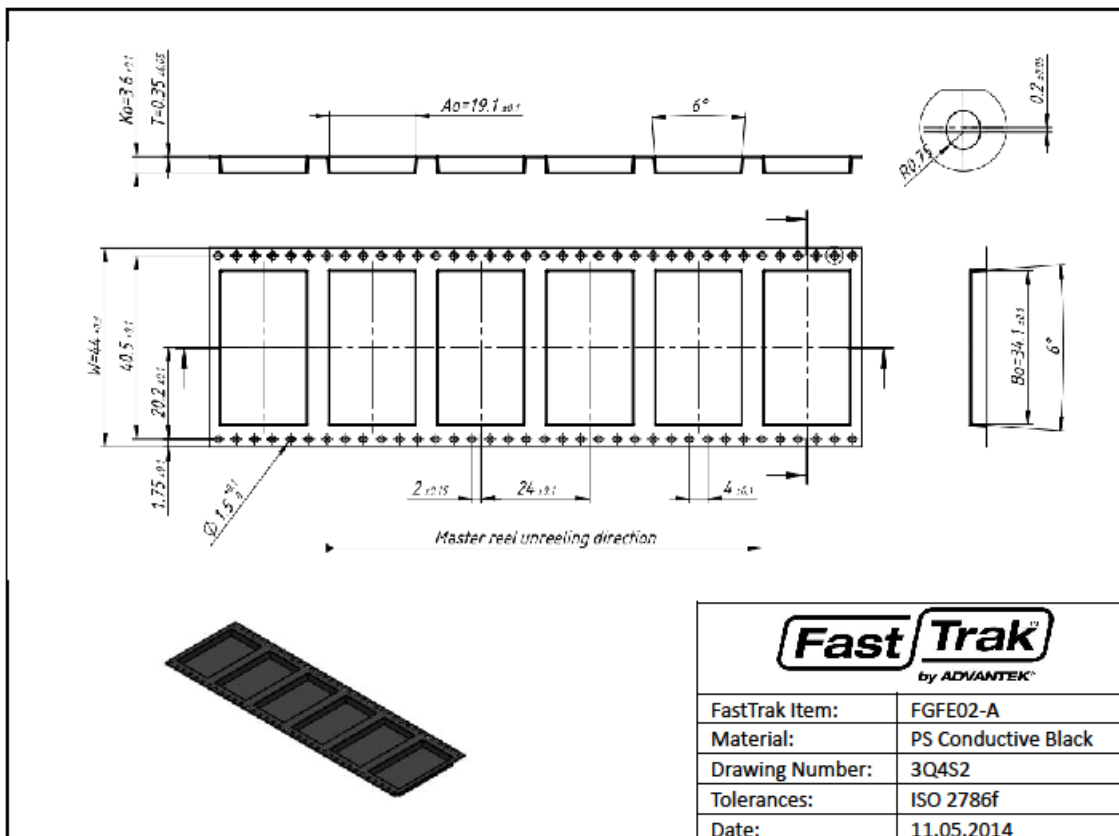
LumenRadio operates a full RF laboratory in Sweden and can offer design verification and testing services – please contact LumenRadio for advice (for contact information see section 17 “Contact and Ordering information”)

#### 12.2 Production Testing

All AirGlow modules are factory tested before being shipped. However, it is advised to perform some level of testing as part of your products overall test process. LumenRadio would be happy to advise on production testing – please contact LumenRadio for advice (for contact information see section 17 “Contact and Ordering information”).

### 13 AirGlow module Packaging

#### 13.1 Carrier tape dimensions




### 13.2 Reel marking

Every reel has an identifier sticker booth on the reel and the reel package.



The identifier sticker contains the following information:

PRODUCT <b>XXX-XXXX</b>	SOFTWARE VERS. <b>SW: XXXX</b>		
PACKED DATE <b>XXXX-XX-XX XX:XX:XX</b>		QUANTITY <b>XXX</b>	
<b>XXXXXX</b> (serial number)			
			



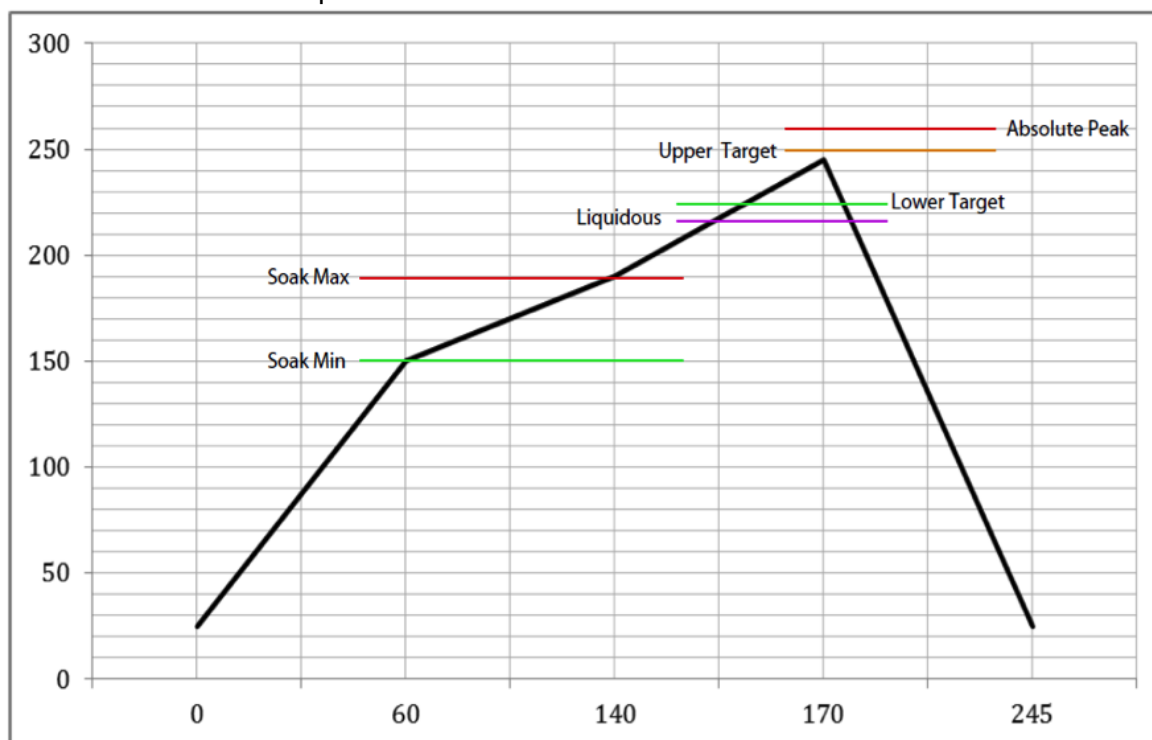
FCC ID: XRSTIMOMWAN201  
IC ID: 8879A-TIMOMWAN201





## 14 AirGlow reflow soldering specification

AirGlow is a surface mounted device (SMD) designed to be easily integrated into high-volume production lines including reflow soldering to a PCB. It is ultimately the responsibility of the customer to choose the appropriate solder paste and to ensure oven temperatures during reflow meet the requirements of the solder paste. The AirGlow module conforms to JSTD-020D1 standards for reflow temperatures.



Temperatures should not exceed the minimums or maximums presented in the table below.

Specification	Value	Unit
Temperature Inc./Dec. Rate (max)	3	°C / sec
Temperature Decrease rate (goal)	2-3	°C / sec
Soak Temp Increase rate (goal)	0.5 – 1.0	°C / sec
Flux Soak Period (min)	70	sec
Flux Soak Period (max)	120	sec
Flux Soak Temp (min)	150	°C
Flux Soak Temp (max)	190	°C
Time Above Liquidous (max)	70	sec
Time Above Liquidous (min)	50	sec
Time In Target Reflow Range (goal)	30	sec
Time At Absolute Peak (max)	5	sec
Liquidous Temperature (SAC305)	218	°C
Lower Target Reflow Temperature	225	°C
Upper Target Reflow Temperature	250	°C
Absolute Peak Temperature	260	°C



## ***AirGlow radio module integration guide***

# **15 Compliance information**

## **15.1 FCC information**

AirGlow radio module (820-8301) FCC ID identifier:  
**XRSTIMOWAN201**

### 15.1.1 FCC Information to User

This product does not contain any user serviceable components and is to be used with approved antennas only. Any product changes or modifications will invalidate all applicable regulatory certifications and approvals

### 15.1.2 FCC Guidelines for Human Exposure

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

### 15.1.3 FCC Declaration of Conformity

We LumenRadio AB Svangatan 2B, 41668 Gothenburg, Sweden, declare under our sole responsibility that 820-8301 AirGlow complies with Part 15 of FCC Rules. Operation is subject to the following two conditions:

This device may not cause harmful interference, and this device must accept any interference received, including interference that may cause undesired operation.

### 15.1.4 FCC Radio Frequency Interference Warnings & Instructions¶

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following methods:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and the receiver
- Connect the equipment into an electrical outlet on a circuit different from that which the radio receiver is connected
- Consult the dealer or an experienced radio/TV technician for help.

Modifications made to the product, unless expressly approved by LumenRadio AB., could void the user's right to operate the equipment.

## ***AirGlow radio module integration guide***

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### **15.2 Industry Canada statement**

AirGlow radio module (820-8301) Industry Canada identifier:

**8879A-TIMOMWAN201**

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le resant appareil numerique n'emet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe B prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

### **15.3 CE**

820-8301 AirGlow complies with the Essential Requirements of RED (Radio Equipment Directive) of the European Union (2014/53/EU). AirGlow meets the ETSI 300 328 V2.2.2 conformance standards for radio performance.

### **15.4 Compliance Marking for FCC & Industry Canada**

The AirGlow modules are certified for FCC as a single-modular transmitter.

AirGlow modules are FCC certified radio module that carries a “Modular” grant AirGlow radio modules complies to the “Intentional Radiator” portion (Part 15c) for FCC certification: Part 15.247 Transmitter tests.

An end product, incorporating a AirGlow module, does not require additional testing or authorization for the AirGlow transmitter (or transceiver, in the case of RDM or Flex products). Host end products can use the FCC ID of the certified module as the FCC ID of the host end product. A label displaying the AirGlow module's FCC ID must be affixed and visible on the host end product for approval

FCC IDs are required for host end products with radio transmitters.

### **15.5 Other Compliances**

For other local compliance regulations (CE, UL, CSA, SRRC, C-Tick, etc.) you are responsible as the product manufacturer to ensure all required compliance testing is completed. LumenRadio are happy to advise on compliance testing – please contact LumenRadio for details.

## **16 RoHS / REACH**

The AirGlow module complies with directive 2011/65/EU, 2015/863/EU (**RoHS**) of the European Parliament and the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

The AirGlow module modules do not contain the SVHC (Substance of Very High Concern), as defined by Directive EC/1907/2006 Article according to **REACH** Annex XVII.

## ***AirGlow radio module integration guide***

### **17 Contact and Ordering information**

LumenRadio AB  
Svangatan 2B  
SE-416 68 Gothenburg  
Sweden  
Phone: +46 31 301 03 70

[www.lumenradio.com](http://www.lumenradio.com)

[sales@lumenradio.com](mailto:sales@lumenradio.com)

The LumenRadio support team can be reached through our [support portal](#).

<b>Product</b>	<b>Order Code</b>
<b>AirGlow module 400pc reel</b>	820-8301
<b>AirGlow module development kit</b>	820-5001