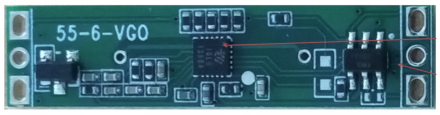

AIRTOUCH AT10L4LDB-3007 Radar Sensor Module User Manual

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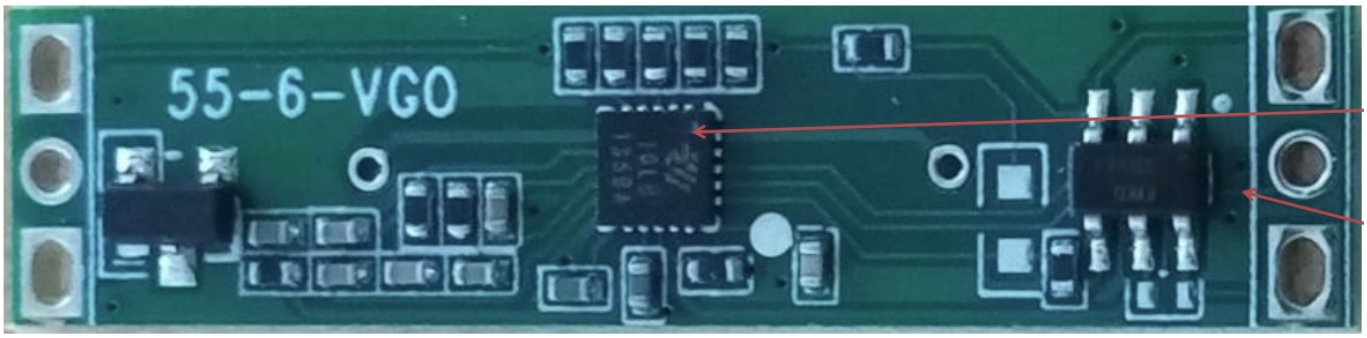

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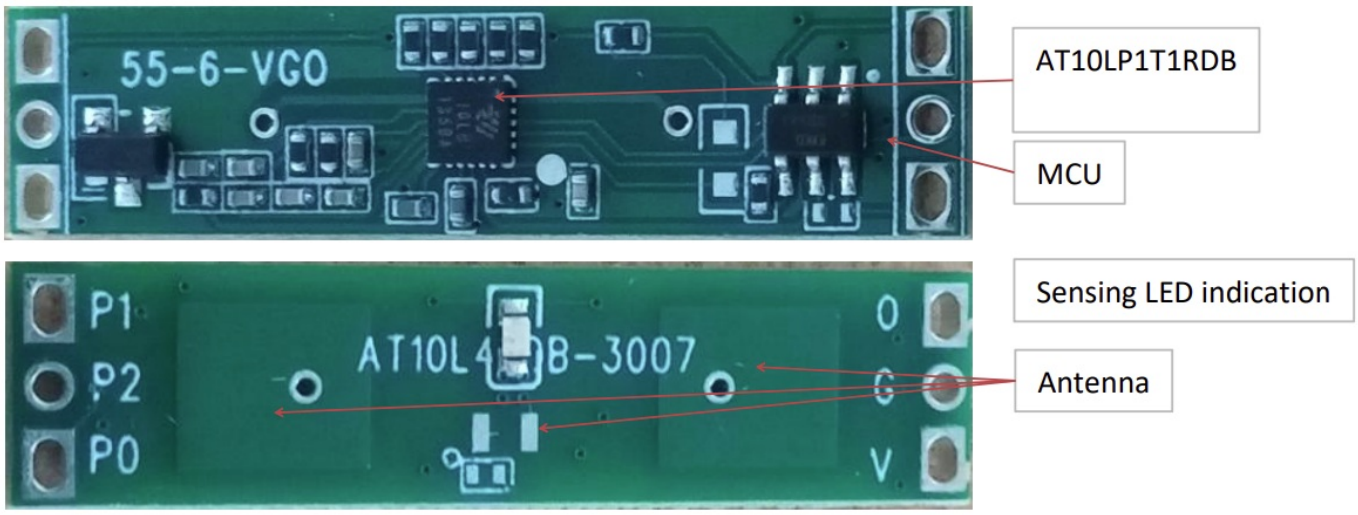
Abstract

AT10L4LDB-3007 is a radar sensor module in 10.525GHz with configurable power consumption. In normal mode the power consumption is about 26mA while 55uA in lower power mode. The module dimension is 30mm*7mm. The module adopts Airtouch's AT10LP1T1RDB which highly integrates the microwave ckt, IF amplifier and signal process unit, with embedded patch antenna which minimizes the overall module dimension with optimized performance and regulatory compliance. These features facilitates the applications in hand sweep induction switch, portable lighting and, camera wake-up fields.

Module illustration



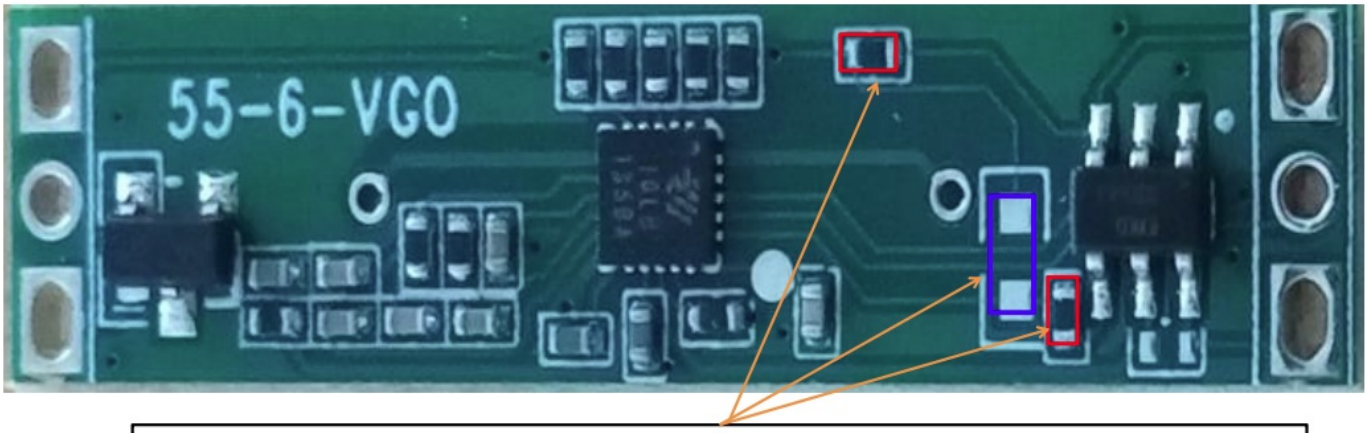
Plot. 1 AT10L4LDB-3007 module

Input output interface

The module interface is through the 6 pins: V, G, O, P0, P1 and P2 with pin pitch supports both 2mm and 2.54mm. The sensing distance and delay time are adjustable by programming the MCU through the interface. Further the serial port can be used for registers configuration. Below table is the pin definition:

Pin	Function	Remark
V	Power supply	Embedded LDO is on, supply voltage range is 3.5~12V If LDO is NC, supply voltage is 3.3V
G	GND	
O	Output signal	Output level (0V/3.3V)
P0	GPIO0	MCU programming port- ICSPCLK
P1	GPIO1	MCU programming port- ICSPDAT / serial port Tx (need to rework on resistor)
P2	GPIO2	Serial port Rx (need to rework on resistor)

The output can be controlled by MCU (default) or by AT10LP1T1RDB. In MCU control mode, the output is alternated between logic high and low for every sensing. In AT10LP1T1RDB control mode, the output will be logic high lasting for a period and go back to logic low for every sensing. The setting for the 2 modes are illustrated in Plot. 2.

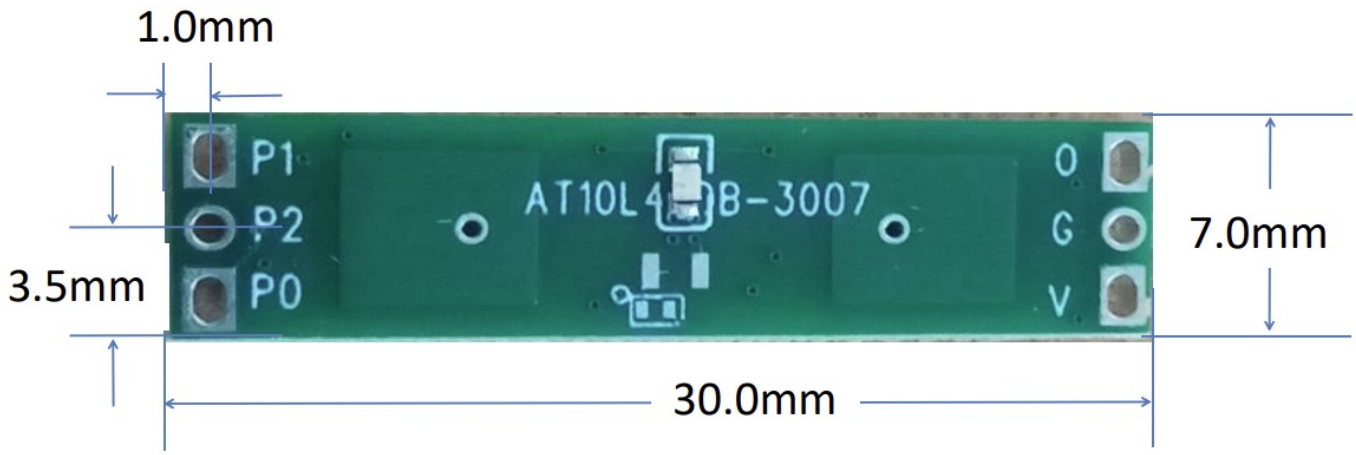


Compatible design:
When the 1K ohm resistors in red rectangles are pop'ed with part in blue rectangle removed, the output is controlled by MCU, serial port invalid;
When the 1K ohm resistor in blue rectangle is pop'ed with parts in red rectangles removed, the output is controlled by AT10LP1T1RDB, serial port P1,P2 can function.

Plot. 2 AT10L4LDB-3007 compatible design

Module dimension and pin location

Plot. 3 illustrates the module dimension and pin location, pin pitch is a compatible design for both 2mm and 2.54mm. PCB thickness is 1.6mm



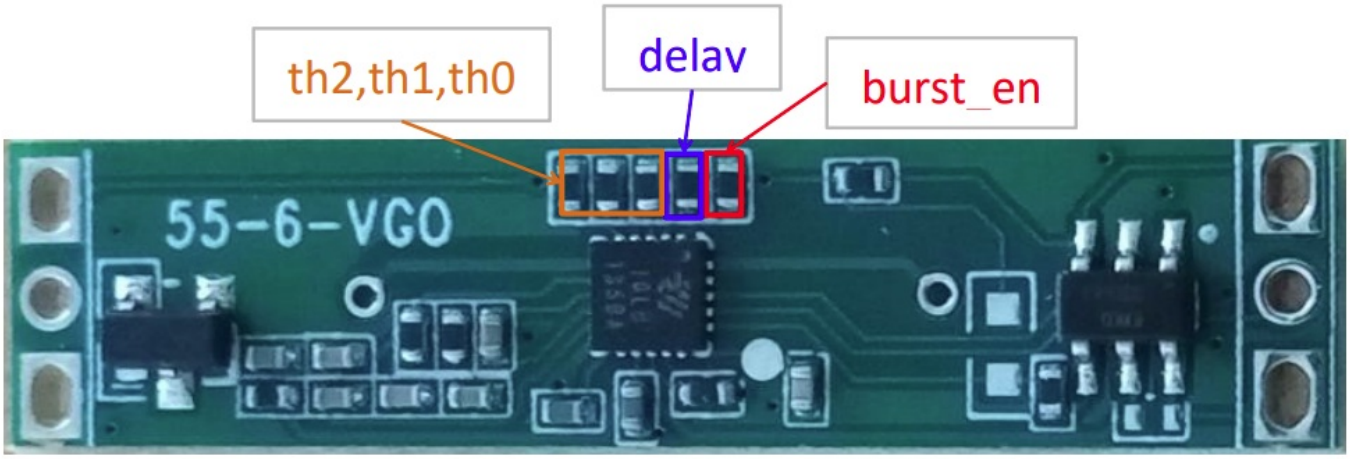
Plot. 3 AT10L4LDB-3007 module dimension and pin location

Electric parameters

Parameter	**Min.**	**Typ.**	**Max.**	**Unit**	**Remark**
Tx frequency	10.5		10.55	GHz	
Tx power		0.2	0.5	mW	
Supply voltage	3.5	5	12	V	LDO pop'ed
O/P high level		3.3		V	
O/P low level		0		V	
Current consumption		26		mA	Normal mode
	–	180		uA	Low power mode
Sensing		–	3	M	Hang-up in 3 meters
Delay time		2		S	Adjustable; In MCU control mode, no delay
PD threshold		10		Lux	adjustable
Operation temp.	-20		85	°C	

Operation mode, sensing time and sensing distance adjustments

AT10L4LDB-4007 register configuration can be set by MCU or by AT10LP1T1RDB. MCU control mode is by MCU programming. AT10LP1T1RDB control mode is by on-board resistors as below
In Plot. 4, when pop'ed with 0R in red rectangle, the module is in normal mode (about 26mA); if they are removed, the module is in low power mode (about 180uA).
Resistor in blue rectangle is for light-ON delay time setting. The resistor is NC, 0R and 2.4M ohm, the delay time is 30 seconds, 1.5 seconds and 63 seconds respectively. The delay time of a new sensing is prolonged accordingly during an existing trigger.
Resistors in yellow rectangle (th0, th1, th2) offers 8-shift sensing distances. The resistor NC is logic 1 resistor 0R is logic 0. The truth table of the 3 resistors is in Plot. 5.The smaller value of threshold results in longer sensing distance. (Note: when OTP threshold is configured, the 3 resistors setting is invalid.)



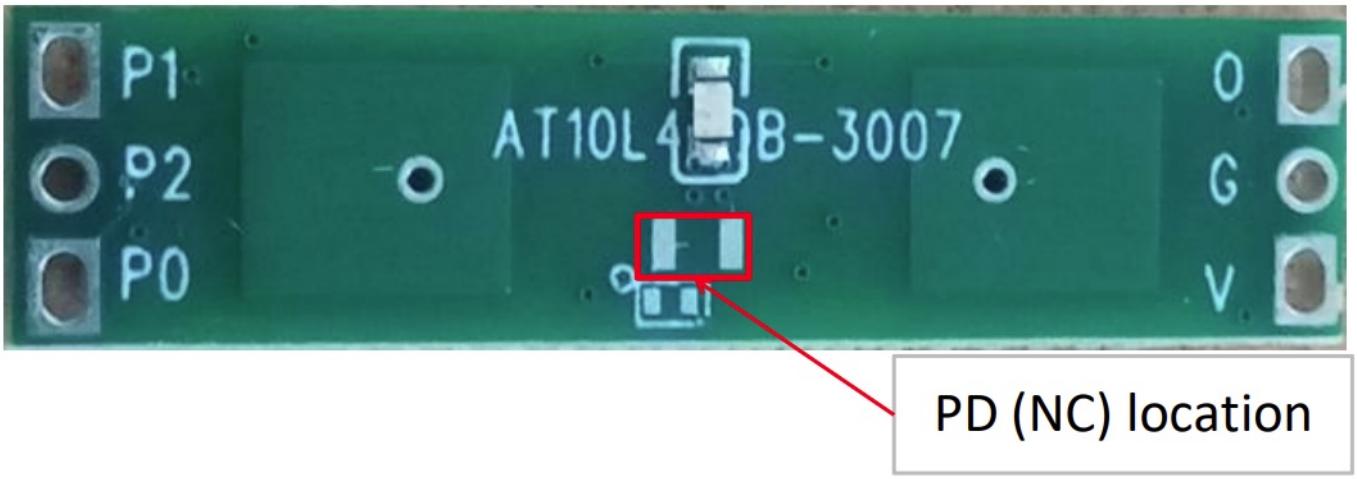
Plot. 4 on-board resistors setting illustration

th0	th1	th2	thr. value
0	0	0	36
1	0	0	27
0	1	0	21
1	1	0	16
0	0	1	12
1	0	1	9
0	1	1	7
1	1	1	6

Plot. 5 Truth table for sensing distance adjustment

PD detection

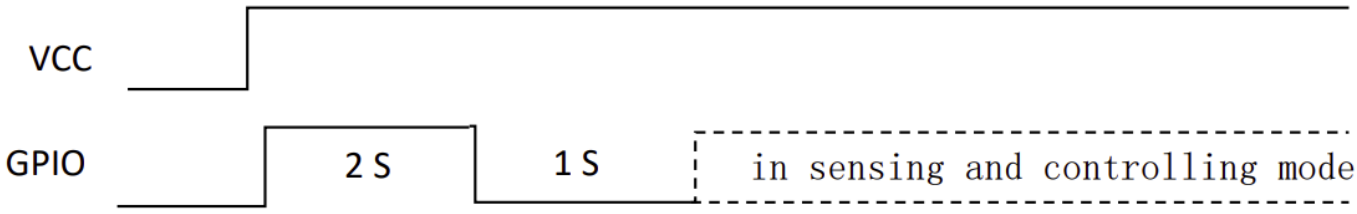
The PD (NC) detection is reserved In Plot. 6, the location of PD is shown. The PD threshold can be adjusted by either register configuration or resistor value adjustment in PD ckt. When the environment is bright that the sensing is above threshold, the module won't sense anything.



Plot. 6 PD location

Module power-up sequence

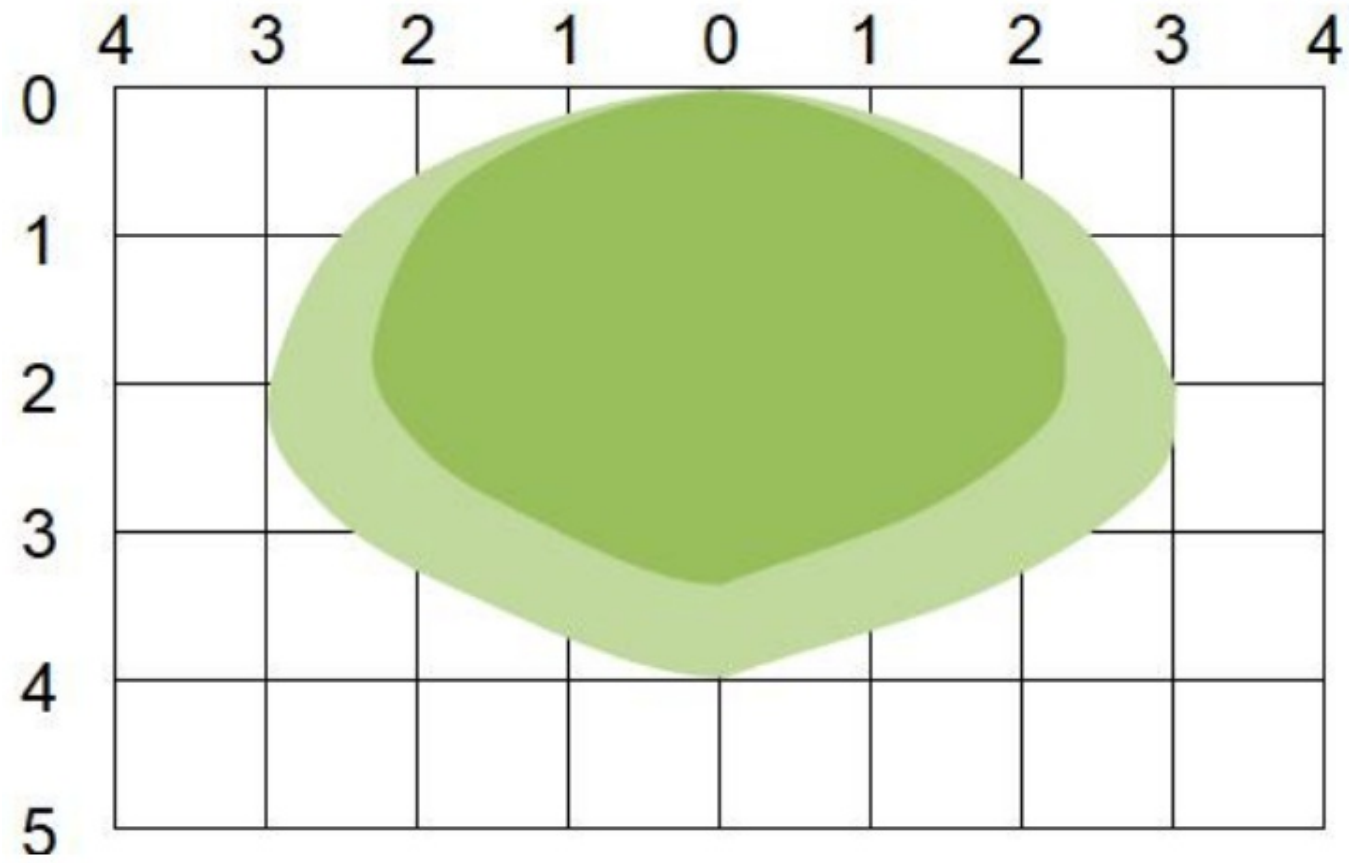
The module has a BIST. When powered up, GPIO output high for 2 seconds then switched to low for 1 second, then it enters normal sensing mode. Plot. 7 shows the power sequence:



Plot. 7 power-up sequence

Sensing distance

The module's detection sensitivity can be adjusted by resistors. The maximum distance is 5 m. Below plot illustrates a typical detection range. If the threshold is set high, the detection range will be larger. In Plot. 9, dark zone means high sensitive areas that an fully detect movements. Light zone means low sensitivity which basically can detect movements but not always guaranteed.



Plot. 9 detection range (Unit: m)

Attention

- Metal should be avoided on top of the antenna under installation which would result in signal shielding. Plastic or glass is acceptable while distancing on top of the antenna should be maintained.
- Large metallic instruments or infrastructures should be avoided right to the radar antenna.
- Parallel arrangement should be maintained under multiple radar modules installment. 1m distance should be kept between modules.
- The module is not suggested in applications near power switches under low-power mode.

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FCC Warning

Please take attention that changes or modification not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including interference that may cause undesired operation.

Note: 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 generates, 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 measures:

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

FCC rules

This module complies with part 15.245 of the FCC rule

Operational use conditions

Refers to above table of Electric parameters;

Limited module procedures

The module has not its own RF shielding, The host should provide the RF shielding to the modular, which belong to Limited module. Standard requires: Clear and specific instructions describing the conditions, limitations and procedures for third-parties to use and/or integrate the module into a host device (see Comprehensive integration instructions below). Resolve: Supply example as follows: Installation Notes:

1. 2AVK2AT10L4LDB-3007 module Power supply range is DC 3.5-12V, when you use 2AVK2AT10L4LDB-3007 module design product, the power supply cannot exceed this range.
2. When connect 2AVK2AT10L4LDB-3007 module to the host device, the host device must be power off.
3. Make sure the module pins correctly installed.
4. Make sure that the module does not allow users to replace or demolition.

Trace antenna designs information

Not applicable

Antenna used

Antenna Type	Brand/ manufacturer	Max. Antenna Gain
Patch antenna in pcb	Airtouching	5dbi

Label and compliance information

The final end product must be labeled in a visible area with the following “contains FCC ID: 2AVK2AT10L4LDB-3007”

Information on test modes and additional testing requirements:

When testing host product, the host manufacture should follow FCC KDB Publication 996369 D04 Module Integration Guide for testing the host products. The host manufacturer may operate their product during the measurements. In setting up the configurations, if the pairing and call box options for testing does not work, then the host product manufacturer should coordinate with the module manufacturer for access to test mode software.

Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for the specific rule parts (FCC Part 15.245) list on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed when contains digital circuity.
When testing host product, the host manufacture should follow FCC KDB Publication 996369 D04 Module Integration Guide for testing the host products. The host product shall work normally, all the transmitters installed must be operating, investigate the fundamental and unwanted/spurious emissions with the modular transmitter(s) operating in a normal mode. When testing for emissions from the unintentional radiator, the transmitter shall be placed in the receive mode or idle mode if possible, if receive mode only is not possible, test laboratories may need to add attenuation or filters depending on the signal strength of any active beacons (if applicable) from the enabled radio(s).

Documents / Resources

	AIRTOUCH AT10L4LDB-3007 Radar Sensor Module [pdf] User Manual AT10L4LDB-3007, AT10L4LDB3007, 2AVK2AT10L4LDB-3007, 2AVK2AT10L4LDB3007, AT10L 4LDB-3007 Radar Sensor Module, AT10L4LDB-3007, Radar Sensor Module, Sensor Module, Module

Manuals+.