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## Data Sheet

CUSTOMER \_\_\_\_\_

PRODUCT 2.4GHz Wireless Digital Audio Module

MODEL NO. DIO-T008L/U

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## **Features**

1. SNR: 90dB
2. THD: < 0.1%
3. Frequency Response: -1dB @20 Hz ~ 20 kHz
4. Linear PCM format: 44.1K sampling rate and 16-bits representation.
5. Non-compression to perform high audio quality with only 0.5ms delay time.
6. POP noise prevention during power-on period.
7. 4-bits ID function.
8. One transmitter and multi-receivers application.
9. FSK design to ensure Low power consumption for portable application.
10. Embedded antenna for cost-effect and quick development.
11. Operating at 2.4GHz ISM band with 8 selectable channels.
12. Application distance up to 30 meter (L.O.S.) with perfect reception.
13. USB interface compliant to:
  - Win98 SE/ WinME/ Win2000/ WinXP and MacOS 9.2.1/MacOS10.2
  - USB specification v1.1
  - USB audio device class specification v1.0
  - USB HID class specification v1.1

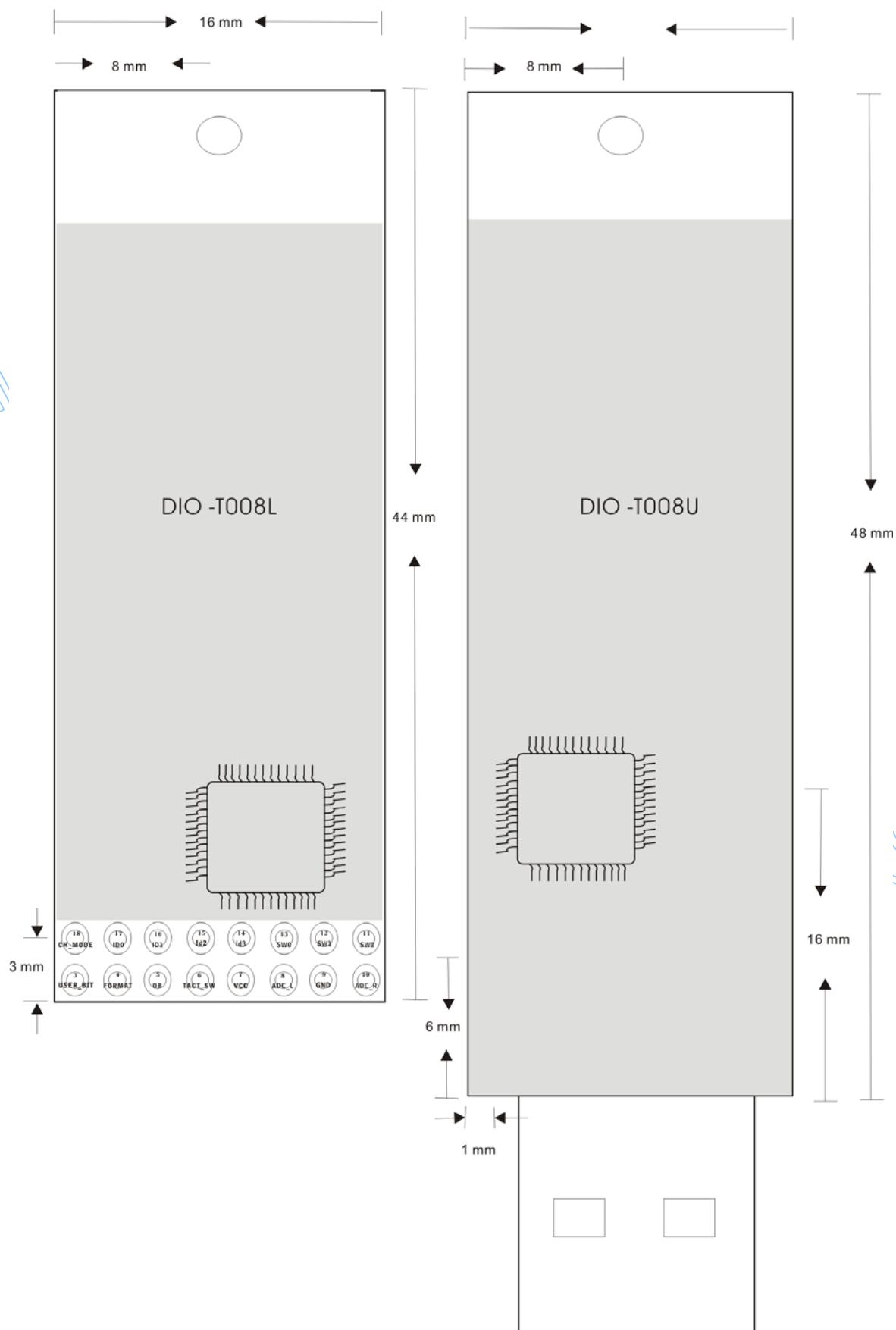
## **Applications**

- Wireless headphone
- Wireless speakers
- Home theater rear speakers
- MP3, CD player and DVD player
- USB and PC applications

## Specification

Model Name	DIO-T008L	DIO-T008U
Description	Line-in	USB Interface
Application	Speaker	PC Audio
Power supply		
Supply Voltage	$3.3 \pm 0.1$ VDC	USB Power supply
Current Consumption	68 mA @ 3.3 VDC (Typical)	68 mA @ 5 VDC (Typical)
Audio Section ( tested with 1KHz tone)		
Frequency Response	20 ~ 20 KHz, -1dB	20 ~ 20 KHz, -1dB
Dynamic range	90 dB (Typical)	83 dB (Typical)
Separation	80 dB (Typical)	80 dB (Typical)
SNR	90 dB (Typical)	90 dB (Typical)
THD	-75dB (Typical)	-75dB (Typical)
Input level	2 Vpp (Max)	-
Input impedance	>10 KOhm	-
RF Section		
Frequency Range	2400 ~ 2483.5 MHz	2400 ~ 2483.5 MHz
Demodulation	FSK	FSK
Channel Number	8	8
Channel Spacing	9 MHz	9 MHz
Channel Frequency	2410, 2419 ~ 2473 MHz	2410, 2419~ 2473 MHz
Frequency Stability	$\pm 100$ KHz	$\pm 100$ KHz
TX Power	8 ~ 10 dBm (Typical)	8 ~ 10dBm (Typical)
Operation		
Operating Temperature	-10 ~ +60 (degrees Celsius)	-10 ~ +60 (degrees Celsius)

## Pin Configuration and Mechanical Information



## Pin Description (for DIO-T008L)

No.		Function
3	USER_BIT	The data stream input, which will be transmitted to USER_BIT of RX Module. (Maximum data rate is 5Kbps)
4	FORMAT	Pull up for scrambling with "01" pattern. Pull down for scrambling with random pattern. (internal pull high)
5	OB	Pull down to enable out-band channel for testing purpose. (internal pull high)
6	TACT_SW	Impulse low to scan channel for TACT mode. (internal pull high) (see table for channel mode setting)
7	VCC	3.3 VDC input for DIO-T008L.
8	ADC_L	L channel of audio input to ADC directly. A DC blocking capacitor (>1uF) should be added.
9	GND	Grounding
10	ADC_R	R channel of audio out from DAC directly. A DC blocking capacitor (>1uF) should be added.
11	SW2	Pull low for DIP mode channel selection (internal pull high)
12	SW1	
13	SW0	
14	ID3	Pull low for ID selection (internal pull high)
15	ID2	
16	ID1	
17	ID0	
18	CH_MODE	<b>See "channel mode setting table" for detail</b> Pull high for TACT mode and low for DIP mode. (internal pull high)

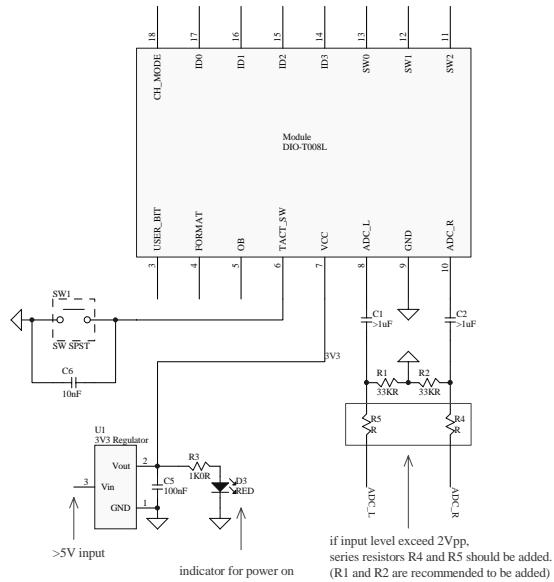
## Channel Mode Setting Table (for DIO-T008L)

Channel Mode	CH_MODE (Pin 18)	Function
DIP	<b>GND</b>	Set SW0, SW1 and SW2 to change channel.
TACT	X	Switch channel by channel when each impulse-low is applied to TACT_SW (Pin 6)

\* "X" means floating.

## Application Circuits (for DIO-T008L)

## DIO-T008L Application Circuits



## PCB layout guideline

Any metal (including PCB track and holding screw) around the antenna will result in changing impedance and radiation pattern of the antenna. These two parameters are the most important for antenna performance. Keep in mind that reserve as much as space around the antenna if possible.

Connect all parts as close as possible to the pins of module and reduce the length of routing

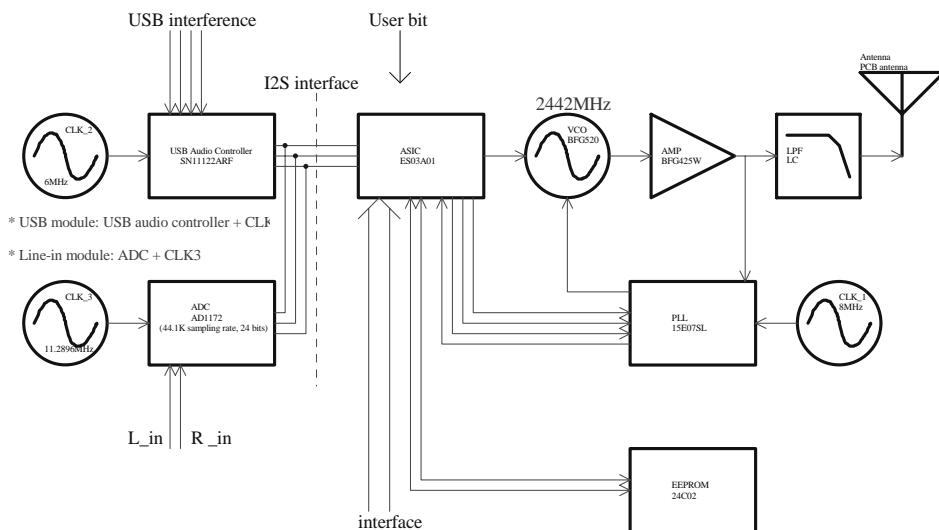
traces, to help on good audio performance, proper antenna pattern and EMC.

When designing the receiver module in wireless speakers and headphones, the important design considerations are as follows:

1. Keep metal object away from the antenna with 3 cm distance at least to avoid degradation on the antenna. For example, speaker unit, transformer, adaptor, wire, cable and other big metal object beside antenna will degrade the antenna performance.
2. Use regulated DC-power-supply to DIO-T008L. It's recommended to separate the DC-power-supply for module from the other ones, which are for other purposes.
3. If following above notices and still get problem on performance, please email to [alex@elansat.com](mailto:alex@elansat.com).

## Operation of DIO-T008

DIO-T008\_Block Diagram



At DIO-T008L, Audio L and R are sampling at 44.1K rate and are represented with 16-bits respectively by A/D converter, which produces the I<sup>2</sup>S data. At DIO-T008U, the audio stream from the PC is converted to I<sup>2</sup>S data by USB audio controller. The I<sup>2</sup>S data then is encoded by ASIC to a bit sequence with data rate approximately 2.8Mbps.

The encoded data stream (passing a LPF) modulates the 2.4GHz carrier frequency directly with a 700KHz frequency deviation. The modulated carrier is amplified and filtered by a LC-LPF, then emitted via the inverted-F PCB antenna.

As to the FCC regulation, digital modulation with minimum 6-dB bandwidth greater than 500KHz can have output power up to 30dBm. DIO-T008 series can meet the requirement. Please refer FCC part 15.247 for detail.

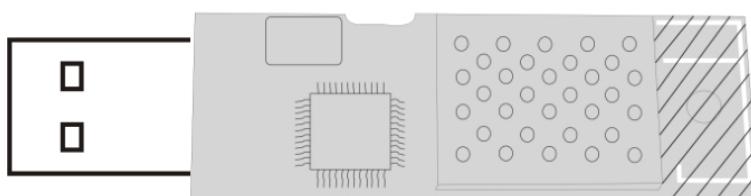
## **Application information**

### **Transmitter module**

When you design the transmitter module in wireless speakers and headphones, the important design considerations are as follows:

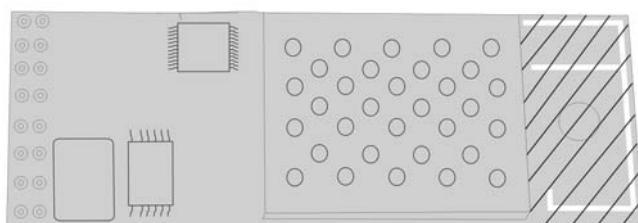
1. Do not bend down or up the antenna frequently to avoid breaking.
2. Do not let any metal components too close to antenna.
3. Transmitter module must keep away from speaker over 3 cm, to avoid magnetic interference.
4. Transmitter module must keep away from adaptor over 3 cm.
5. Power supplying to transmitter module must be independent, different from the power of amplifier.
6. No circuit through or cable under or above the antenna of 1 to 2 cm can avoid affecting the antenna performance.

Antenna area marked by diagonal lines



DIO-T008U

Antenna area marked by diagonal lines



DIO-T008L

\* If there are performance problems after design-in module following above notice, please contact ELANSat Technologies Inc. We will provide solution for your reference, thank you.