SP14808 Bluetooth Module User's Guide

An Integrated 2.4GHz Bluetooth SMART Compliant Transceiver Module

TDK Corporation
Thin Film Device Center
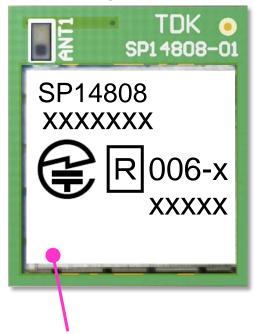SESUB BU
Revision FC
2015.1.1

All specifications are subject to change without notice.

SP14808 Bluetooth Module

SP14808 is a Bluetooth Smart compliant Module which is composed by world smallest size of TDK module SESUB-PAN-D14580 and Chip Antenna.
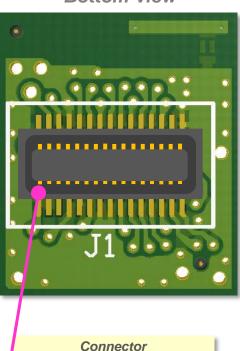
SP14808 equips a 2.4GHz band chip antenna, a 32.768kHz sleep clock resonator.
It is covered with a metal shield case on top.

Top View

Bottom View

Inside View
(Under Metal shield case)

Metal shield case

Connector
DF23C-30DS-0.5V(92) [Hirose]

SP14808

14.0

12.0

Covered with a metal shield case
Ready for radio certification

SESUB-PAN-D14580

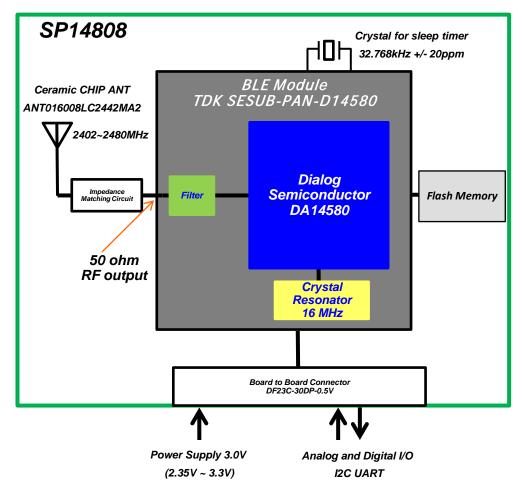*All specifications are subject to change without notice.*

SP14808 Bluetooth Module

SP14808 is composed by BLE Module (SESUB-PAN-D14580), Flash Memory, Antenna, Crystal, and some more passive components (Capacitors, Inductors, Connector).

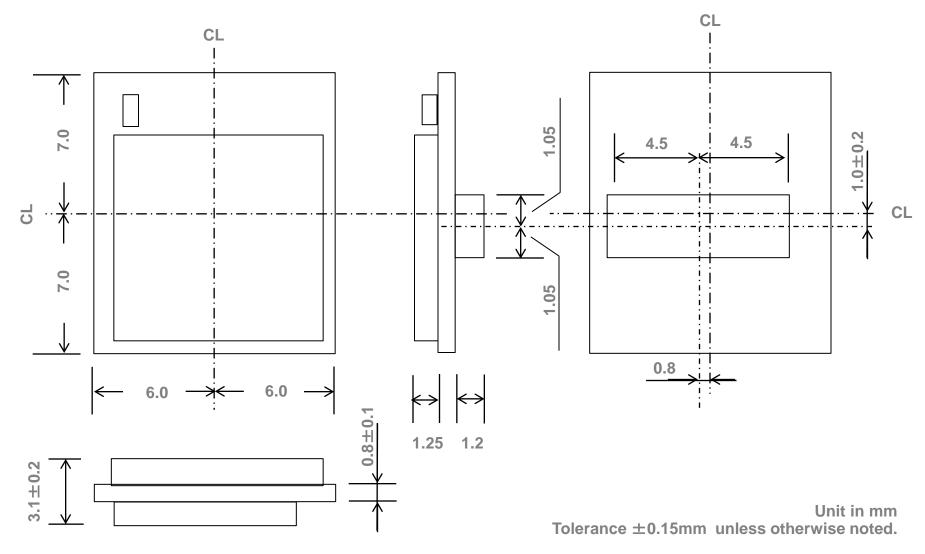SESUB-PAN-D14580 is BLE Module from TDK and it contains Dialog Semiconductor BLE IC (DA14580) inside.

SESUB-PAN-D14580 has a 50 ohm RF output. On the SP14808, this RF output is connected to a Ceramic CHIP antenna.

System Block Diagram

SP14808

Crystal for sleep timer
32.768kHz +/- 20ppm

Ceramic CHIP ANT
ANT016008LC2442MA2

2402~2480MHz

Impedance Matching Circuit

Filter

BLE Module TDK SESUB-PAN-D14580

Dialog Semiconductor DA14580

Flash Memory

50 ohm RF output

Crystal Resonator 16 MHz

Board to Board Connector DF23C-30DP-0.5V

Power Supply 3.0V
(2.35V ~ 3.3V)

Analog and Digital I/O
I2C UART

All specifications are subject to change without notice.

SP14808 Mechanical Dimensions

Unit in mm
Tolerance ±0.15mm unless otherwise noted.

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General Requirement under Operation

Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted)

Item	Min	Max	Unit
Supply voltage range	-0.1	3.6	V
Storage temperature range	-40	+85	℃
ESD (charged Device Model)	-	500	V
ESD (Human Body Model)	-	1000	V

Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted)

Nr	Item	Min	Max	Unit
1	Operating supply voltage range	2.35	3.3	V
2	Operating ambient temperature range, Ta	-20	+70	℃

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General Performance

Electrical Characteristics

Measured on SP14801 EM board with the condition of Ta=25℃+/-10℃ and VBAT = 3.0V

Item	Condition	Value			Unit
		Min	Typ	Max	
Rx mode Current	DCDC converter assumed ideal		5.0		mA
Tx mode Current	DCDC converter assumed ideal		5.0		mA
Deep sleep current	8kB retention RAM active		0.9		µA

General RF Characteristics

Measured on SP14801 EM board with the condition of Ta=25℃+/-10℃ and VBAT = 3.0V

Item	Condition	Value			Unit
		Min	Typ	Max	
Operational frequency range		2402		2480	MHz
Channel spacing			2		MHz
Number of RF Channels			40		Ch
RF Port impedance			50		Ohm

General Performance

RF Characteristics

Measured on SP14801 EM board with the condition of Ta=25℃+/-10℃ and VDD = 3.0V, fc=2440MHz

Item	Condition	Value			Unit
		Min	Typ	Max	
Tx Output power	Maximum output power setting		0	-	dBm
Tx Frequency accuracy	Maximum output power setting	-150	0	+150	kHz
Tx modulation characteristics					
Delta F1		225		275	kHz
Receiver sensitivity level [measured by Packet Error Rate]	Packet error rate : ≦30.8%			-70	dBm

SP14808 PCB Connector Pin Assignment

Pin #	Description	Pin #	Descpription
A01	VBAT3V	B01	GND
A02	VCC M	B02	P0_7
A03	P0_1	B03	WP#
A04	P0_2	B04	P0_5
A05	GND	B05	GND
A06	P0_6	B06	P0_3
A07	HOLD#	B07	GND
A08	P0_0	B08	GND
A09	P0_4	B09	SW CLK
A10	VPP	B10	SWDIO
A11	GND	B11	P1_1
A12	GND	B12	P1_0
A13	GND	B13	RST
A14	P1_2	B14	VDCDC
A15	P1_3	B15	VBAT1V

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SP14808 SESUB-PAN-D14580 EM Schematic

SP14808 Bill Of Materials

SMD	Side	Remarks	Description	Designator	Quantity
Mount	Top	1608 Size Chip Antenna/0.15mm min pitch land	ANT016008LCS2442MA2	ANT1	1
Mount	Top	0603 Size Ceramic Capacitor 1uF	Ceramic Capacitor 1uF 0603/C0603X5R0J105M030BC	C7	1
Mount	Bottom	30pins 0.5mm pich Hirose Connector/DF23 2x15	DF23C-30DP-0.5V	J1	1
Mount	Top	1005 Size Inductor 1.6nH	1005 Size 1.6nH Inductor MHQ1005P1N6BT	L1, L2	2
Mount	Top	0603 Size Resistor 10K	10K:RK73B1HTTC103J	R1, R2	2
Mount	Top	0603 Size Resistor 10K	10K:RK73B1HTTC103J	R3	1
Mount	Bottom	1005 Size Resistor 0	0:RK73Z1ETTP	R7	1
Mount	Bottom	1005 Size Resistor 0	0:RK73Z1ETTP	R8	1
Mount	Top	2x3mm Size 8pin MXIC IC/MO-252 USON 8L 0.5mm pitch	Flash Memory : MX25V1006E-USON	U2	1
Mount	Top	3.5x3.5mm Size Module/0.4mm pad pitch,0.2mm pad	SESUB-PAN-D14580	U1	1
Mount	Top	2012 Size 2pin Epson Toyocom Xtal/2.05x1.2mm	FC-12M 32.768KHZ 7.0 +20.0/-20.0	X1	1
Mount	Top	P01C-1111-06 SHIELD CASE	P01C-1111-06 SHIELD CASE	S1	1

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Reference Information

1. **Bluetooth Core Technical Specification document, version 4.1**
   https://www.bluetooth.org/en-us/specification/adopted-specifications
   https://www.bluetooth.org/DocMan/handlers/DownloadDoc.ashx?doc_id=282159

2. **Dialog Semiconductor DA14580 Low Power Bluetooth Smart System-on-Chip Datasheet**

3. **Dialog Semiconductor DA14580 Software Development Guide (UM-B-003)**

4. **Dialog Semiconductor DA14580 Peripheral Drivers User manual (UM-B-004)**

5. **Dialog Semiconductor DA14580 Bluetooth Low Energy Software Development Kit (SDK)**

6. **Dialog Semiconductor DA14580 End product testing and programming guidelines (AN-B-020)**

7. **Dialog Semiconductor DA14580 supply current measurements (AN-B-015)**

8. **Keil Embedded Workbench for ARM Cortex-M series devices programming**
   http://www.keil.com

9. **For all other related technical documents, visit Texas Instruments Low-Power RF web site.**
   http://support.dialog-semiconductor.com/

Certain Instructions.

User shall operate SP14808 within TDK's recommended specifications and environmental considerations per the user's guide, accompanying documentation, and any other applicable requirements. Exceeding the specified ratings (including but not limited to input and output voltage, current, power, and environmental ranges) for SP14808 may cause property damage, personal injury or death.

If there are questions concerning these ratings, user should contact a TDK field representative prior to connecting interface electronics including input power and intended loads.
Any loads applied outside of the specified output range may result in unintended and/or inaccurate operation and/or possible permanent damage to the SP14808 and/or interface electronics.

Please consult the applicable user's guide prior to connecting any load to the SP14808 output. If there is uncertainty as to the load specification, please contact a TDK field representative.

Agreement to Defend, Indemnify and Hold Harmless.
User agrees to defend, indemnify, and hold TDK, its directors, officers, employees, agents, representatives, affiliates, licensors and their representatives harmless from and against any and all claims, damages, losses, expenses, costs and liabilities (collectively, "Claims") arising out of, or in connection with, any handling and/or use of SP14808.
User's indemnity shall apply whether Claims arise under law of tort or contract or any other legal theory, and even if SP14808 fail to perform as described or expected.

Safety-Critical or Life-Critical Applications.
User agrees that SP14808 shall not be used as, or incorporated into, all or any part of safety critical applications (such as life support), and a failure of a TDK product considered for purchase by user for use in user's product would reasonably be expected to cause severe personal injury or death such as devices which are classified as FDA Class III or similar classification.

REGULATORY COMPLIANCE INFORMATION

Caution
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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Radio-Frequency Exposure and Approval Conditions:
1. This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. The antenna(s) used for this transmitter must not be collocated or operating in conjunction with any other antenna or transmitter within a host device, except in accordance with FCC multi-transmitter product procedures..

2. The regulatory label on the final system must include the statement: "Contains FCC ID:2ACNB14808" or using electronic labeling method as documented in KDB784748.

3. The final system integrator must ensure there is no instruction provided in the user manual or customer documentation indicating how to install or remove the transmitter module except such device has implemented two-ways authentication between module and the host system.