ALT5801

5.8 GHz +20 dBm Transceiver Module

FEATURES

- **5.8 GHz ISM Band Operation**
- **+20 dBm or +3 dBm Transmit Power**
- **Mesh Network Topology**
- **O-QPSK, DSSS Modulation**
- **32 Radio Channels**
- **250 kbps Data Rate**
- **Range Up To 2700 ft**
- **Sleep Current < 3 µA**
- **Compact Size**
- **Network Security**
- **Multiple Antenna Options**
- **Supports Texas Instruments Z-Stack™, SimpleAPI™**
- **I/O Control and ADC Measurement**
- **Application Customization Available**

APPLICATIONS

- **Robotics**
- **Defense Applications**
- **Telemetry**
- **Industrial Monitoring**
- **Home, Building Automation**
- **Security and Access**
- **Asset Management**

DESCRIPTION

The ALT5801 is a compact 5.8 GHz ISM band wireless transceiver module for OEMs who wish to quickly and easily add a robust 5.8 GHz wireless link to their product.

With the integration of the Texas Instruments Z-Stack™ full-featured networking protocol and accompanying SimpleAPI™ application programming interface, this module is optimized for low power applications requiring minimal sleep current. Point-to-point, point-to-multipoint and mesh network typologies are supported, with optional network security. Analog and digital I/O interfaces are provided for easy sensor integration.

The ALT5801 module can be mounted using a header-style connection or directly mounted to the surface of a printed circuit board. With optional power amplifier providing a maximum transmit power level of +20 dBm, this module can be used for extended range applications. There are several antenna options available, including PCB antenna, RP-SMA antenna connector and surface mount antenna connection.

Altan Technologies provides full customization services for the ALT5801, allowing OEMs to obtain a tailored module with features meeting their own specific requirements.

ORDERING INFORMATION

Device	Transmit Power (dBm)	Antenna Option	Mounting Option
ALT5801-1A1-1	+3	PCB trace	Header
ALT5801-1A2-1	+3	PCB trace	Surface
ALT5801-1B1-1	+3	RP-SMA connector	Header
ALT5801-1B2-1	+3	RP-SMA connector	Surface
ALT5801-1C2-1	+3	PCB solder connection	Surface
ALT5801-2A1-1	+20	PCB trace	Header
ALT5801-2A2-1	+20	PCB trace	Surface
ALT5801-2B1-1	+20	RP-SMA connector	Header
ALT5801-2B2-1	+20	RP-SMA connector	Surface
ALT5801-2C2-1	+20	PCB solder connection	Surface

EXAMPLE

The ALT5801-2B1-1 is shown below, featuring +20 dBm transmit power, RP-SMA antenna connector and header style mounting.

ALTAN TECHNOLOGIES

ABSOLUTE MAXIMUM RATINGS

Parameter	Min	Max	Unit	Condition
Supply voltage		3.6	V	All supply pins must have the same voltage.
Voltage on any input pin	-0.3	V_{DD}+0.3, Max 3.6	V	
Input RF level		+13	dBm	
Storage temperature range	-50	150	°C	
Soldering temperature		260	°C	

OPERATING CONDITIONS

Parameter	Min	Max	Unit	Condition
Operating ambient temperature range	-10[1]	60	°C	
Operating supply voltage, V_{DD}	3.0	3.6	V	
Logic input low voltage, V_{IL}		0.3* V_{DD}	V	
Logic input high voltage, V_{IH}	0.7* V_{DD}		V	
Logic output low voltage, V_{OL}		0.25	V	
Logic output high voltage, V_{OH}	V_{DD}-0.25		V	

ELECTRICAL SPECIFICATIONS (TA = 25°C and VDD = 3.0 V, unless otherwise specified)

Parameter	Min	Typ	Max	Unit	Condition
Current Consumption					
Transmit Operation		550		mA	High power transmit option.[2] Transmitter output power level +20 dBm.
		150		mA	Low power transmit option.[3] Transmitter output power level +3 dBm.
Receive Operation		90		mA	High sensitivity receive mode. Receiver sensitivity level -92 dBm.
Idle Mode		4.3		mA	Transmitter and receiver disabled. Host communications interface operational.
Sleep Mode		3		µA	Transmitter and receiver disabled. Microcontroller sleep enabled. Low power clock operational. Contents of microcontroller RAM retained. Sleep timer enabled.

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[1] Contact Altan Technologies for extended temperature range qualified units, -40 °C to +85 °C.
[2] Models ALT5801-2**-*.
[3] Models ALT5801-1**-*.

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ALT5801

GENERAL CHARACTERISTICS (TA = 25°C and VDD = 3.0 V, unless otherwise specified)

Parameter	Min	Typ	Max	Unit	Condition
Radio link					
RF Frequency Range	5725		5875[4]	MHz	
Bit rate		250		kbps	
Chip rate		2.0		MChip/s	
Host interface					
Serial data rate	1.2		115.2	kbps	UART interface.
		2		Mbps	SPI interface.
Wake-up and timing					
Radio enable		18		ms	

RF RECEIVE PARAMETERS (TA = 25°C and VDD = 3.0 V, unless otherwise specified)

Parameter	Min	Typ	Max	Unit	Condition
Receiver sensitivity		-92		dBm	High sensitivity receive mode, 1% PER.
Saturation (maximum input level)		-10		dBm	High sensitivity receive mode, 1% PER.

RF TRANSMIT PARAMETERS (TA = 25°C and VDD = 3.0 V, unless otherwise specified)

Parameter	Min	Typ	Max	Unit	Condition
Maximum transmit power		+20		dBm	High power transmit option.[5]
		+3		dBm	Low power transmit option.[6]

AGENCY COMPLIANCE
- FCC (USA)
- IC (Canada)

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[4] For FCC Part 15 compliance, transmit power limited to 0 dBm for frequencies greater than 5850 MHz.
[5] Models ALT5801-2**-*.
[6] Models ALT5801-1**-*.

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ALT5801

PIN ASSIGNMENTS

Pin	Name	Type	Primary Functions	Alternative Functions[7]
1	GND	Ground	Power supply ground.	
2	GND	Ground	Power supply ground.	
3	GND	Ground	Power supply ground.	
4	NC	Reserved	Reserved. Do not connect.	
5	NC	Reserved	Reserved. Do not connect.	
6	NC	Reserved	Reserved. Do not connect.	
7	NC	Reserved	Reserved. Do not connect.	
8	GPIO3	Digital IO	Digital input, output.	Digital input, output. SPI master out slave in. UART transmit.
9	GPIO2	Digital IO	Digital input, output.	Digital input, output. Timer output. SPI master in slave out. UART receive.
10	SRDY	Digital IO	Slave ready. Mandatory for SPI, optional for UART.	Digital input, output. Timer output. SPI clock. UART request to send.
11	MRDY	Digital IO	Master ready. Optional for SPI and UART.	Digital input, output. Timer input, output. SPI slave select. UART clear to send.
12	GPIO1	Digital IO	Digital input, high current output.	Digital input, high current output. Timer input, output.
13	GPIO0	Digital IO	Digital input, high current output.	Digital input, high current output. Timer input, output.
14	GND	Ground	Power supply ground.	
15	VDD	Power	Power supply input.	
16	VDD	Power	Power supply input.	
17	RESET	Digital Input	Reset, active low.	
18	GPIO4	Digital IO	Digital input, output.	Digital input, output. Analog input.
19	CFG1	Digital Input	Configuration input 1.	Digital input, output. Analog input.
20	SO/RX	Digital IO	SPI slave output. UART receive.	Digital input, output. Analog input. Timer input, output. SPI master in slave out, slave select. UART receive, clear to send.
21	SI/TX	Digital IO	SPI slave input. UART transmit.	Digital input, output. Analog input. Timer input, output. SPI master out slave in, clock. UART transmit, request to send.
22	SS/CT	Digital IO	SPI slave select. UART clear to send.	Digital input, output. Analog input. Timer input, output. SPI master out slave in, slave select. UART transmit, clear to send.
23	C/RT	Digital IO	SPI clock. UART request to send.	Digital input, output. Analog input. SPI master in slave out, clock. UART receive, request to send.
24	A0	Analog Input	Analog input.	Digital input, output. Analog input.
25	A1	Analog Input	Analog input.	Digital input, output. Analog input.
26	GND	Ground	Power supply ground.	
27	GND	Ground	Power supply ground.	
28	GND	Ground	Power supply ground.	
29	RFGND2	RF Ground	RF ground connection. For surface mount option, only.	
30	RFGND1	RF Ground	RF ground connection. For surface mount option, only.	
31	RFSIG	RF Signal	RF input / output signal connection. For surface mount option, only.	
32	RFGND3	RF Ground	RF ground connection. For surface mount option, only.	
33	RFGND4	RF Ground	RF ground connection. For surface mount option, only.	

[7] Available with customization provided by Altan.

OVERVIEW

The ALT5801 wireless transceiver module allows OEMs to add a 5.8 GHz ISM band wireless link to their product quickly and easily. Utilizing the license-free 5.8 GHz ISM band enhances wireless link reliability by avoiding crowding and unique sources of interference present in 915 MHz and 2.45 GHz ISM bands. Microwave oven emissions are an example of a problematic interference source present in the 2.45 GHz ISM band that can be avoided by using the ALT5801 module. In addition, by utilizing channels above the U-NII upper band limit of 5.825 GHz, interference from IEEE 802.11a and IEEE 802.11n Wi-Fi devices can be avoided, further improving link reliability.

The ALT5801 module emulates the functionality of the Texas Instruments CC2480 Z-Accel™ processor. See Texas Instruments CC2480 Interface Specification, SWRA175A, and CC2480 Developer's Guide, SWRA176, for interface and applications programming information.

The network protocol stack utilized in the ALT5801 is the Texas Instruments Z-Stack™, supporting point-to-point, point-to-multipoint and mesh network typologies. For further information, see the Texas Instruments Z-Stack Developer's Guide, F8W-2006-0022. The application programming interface utilized, SimpleAPI™, is documented in Texas Instruments Simple API for Z-Stack, F8W-2007-0021. Z-Stack™ supports optional network security.

An application processor communicates with the ALT5801 via SPI or UART serial interface using the SimpleAPI™ interface, which allows the application processor to initialize and configure the ALT5801 radio, send and receive wireless messages, and obtain wireless network information. The ALT5801's application programming interface also provides the ability to configure several ALT5801 pins for digital input and output control, as well as analog signal measurement.

Optimized for low power applications, the ALT5801 features a low power sleep mode, with current reduced to less than 3 µA. This permits the use of the ALT5801 module in battery powered applications. In addition, the module's compact form factor permits its use in applications where small size is important.

There are several order options available, including maximum output power, mounting method and antenna configuration. For short range applications, a +3 dB output power option is available, while for extended range needs, a +20 dBm power amplifier option is provided. The module can be mounted to the main printed circuit board via header strips or via a solder-pad surface mount configuration. There are several antenna / antenna connection options available. For compactness and simplicity, a PCB antenna is available. In situations where an external antenna is required, two options are available. First, an RP-SMA connector is provided for direct antenna or antenna cable connection. Second, for surface mount module applications, the antenna connection can be routed through the main printed circuit board.

In situations where OEMs require additional features to meet their specific product needs, Altan Technologies provides full customization services for the ALT5801. For example, module firmware can be customized to include application-specific firmware, eliminating the need for a dedicated applications processor, reducing overall system cost. In addition, customization permits use of additional digital input and output signals, as well as analog input signals, available on the module through customization.

API EXTENSIONS

The ALT5801 implements the Texas Instruments Simple API for Z-Stack and Texas Instruments CC2480 Interface Specification, with the following extension.

SYS_GPIO

The SYS_GPIO command has been modified as follows to include access to GPIO4. See section 6.1.11 of Texas Instruments CC2480 Interface Specification, SWRA175A, for detailed information about SYS_GPIO.

SREQ:

1	1	1	1	1	1
Length = 3	Cmd0 = 0x21	Cmd1 = 0x0E	Operation	Value1	Value0

Value1

GPIO	Bit position
0	0
1	1

ALTAN TECHNOLOGIES

| 2 | 4 |
| 3 | 5 |

Value0

GPIO	Bit position
4	0

SRSP:

| 1	1	1	1	1
Length = 2	Cmd0 = 0x61	Cmd1 = 0x0E	Value1	Value0

CHANNEL UTILIZATION

For FCC and IC compliance, only channels 1 through 25 may be utilized for ALT5801 models with high power output option (ALT5801-2**-*).

For ALT5801 models with low power output option (ALT5801-1**-*), use of channels 26 through 32 is permitted when output power is set to 0 dBm or less.

APPLICATION

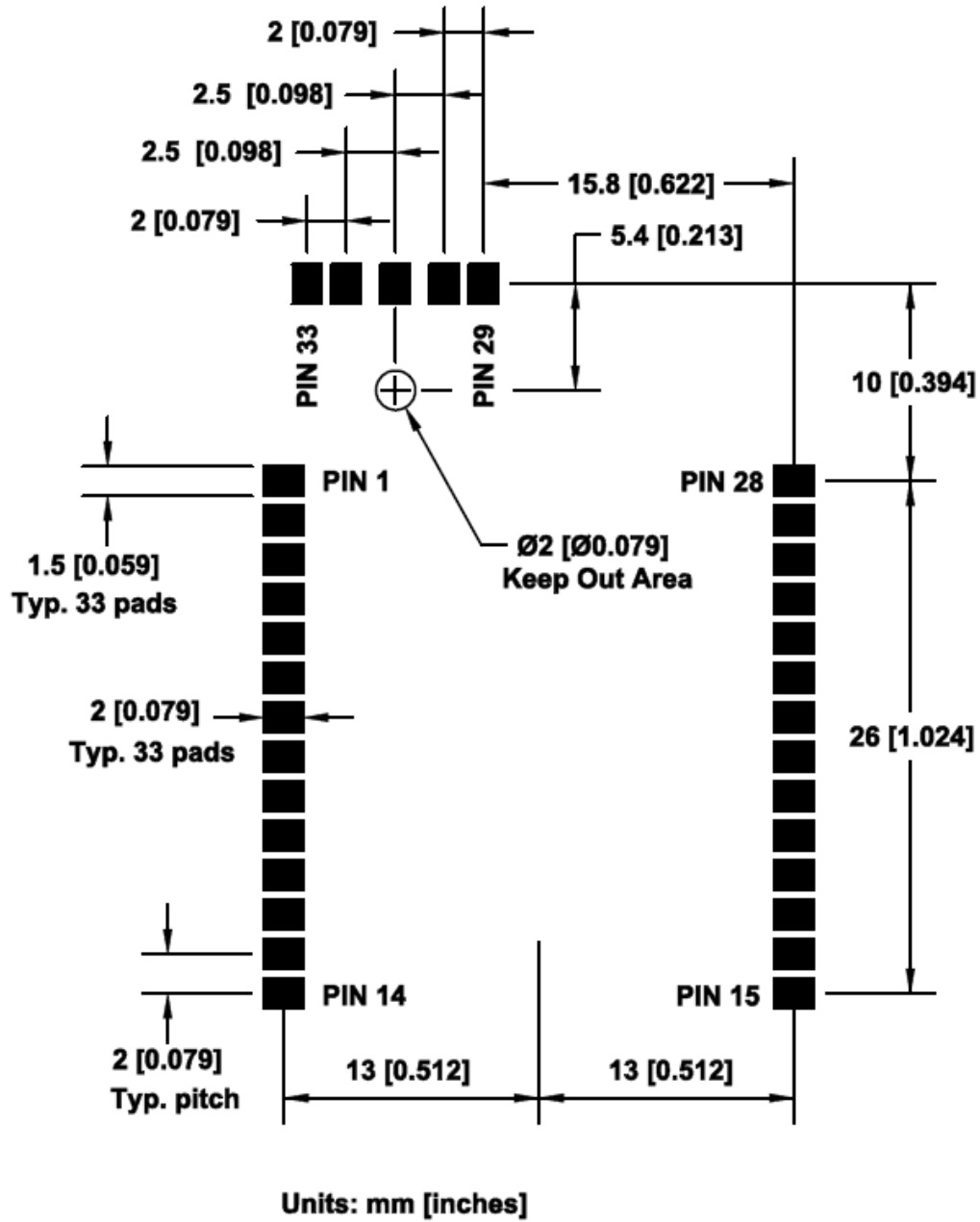**FIGURE 1: RS232 INTERFACE**

FIGURE 2: SPI INTERFACE

MECHANICAL INFORMATION

FIGURE 3: PIN LOCATIONS – HEADER MOUNT[8]

Units: mm [inches]

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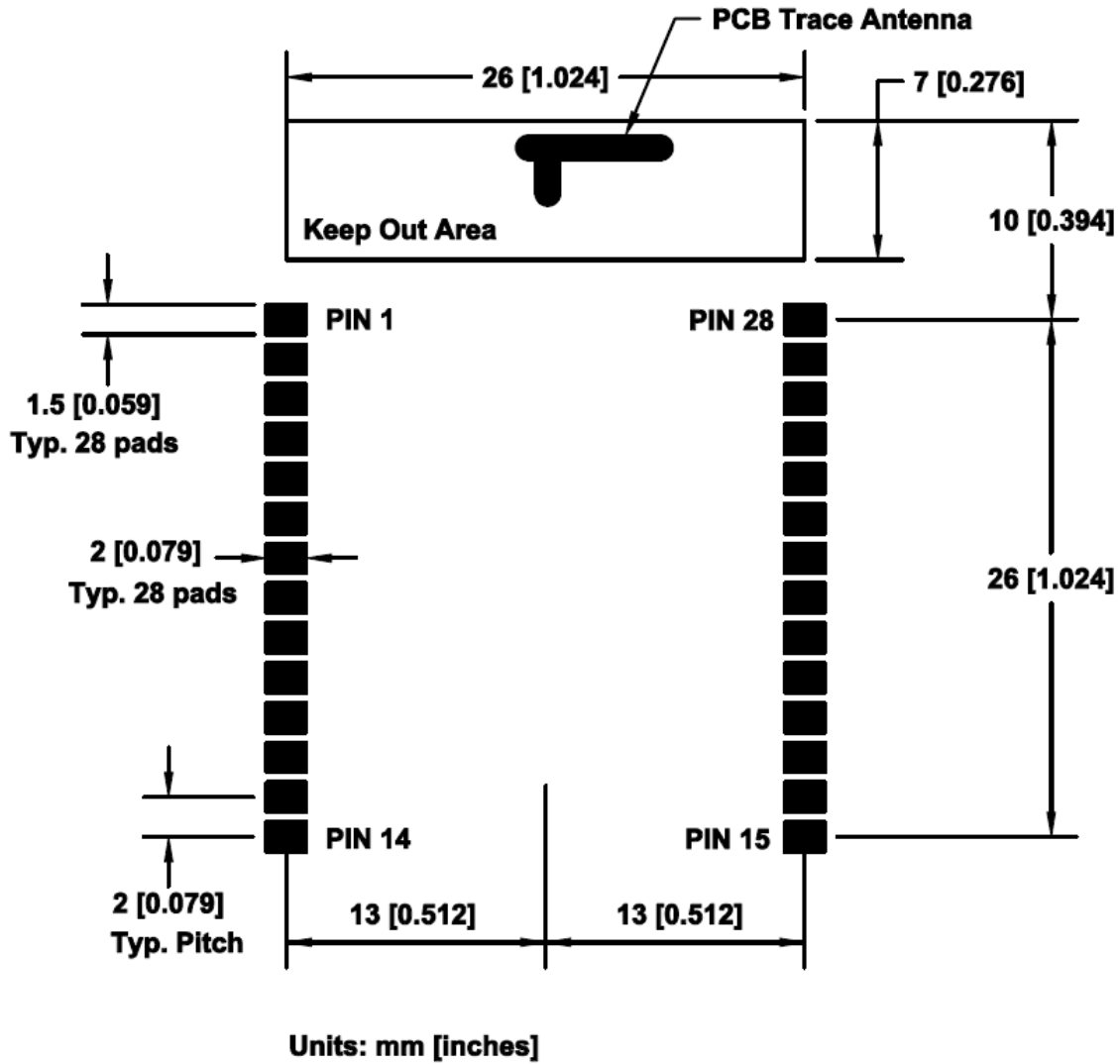
[8] Models ALT5801-**1-*.

FIGURE 4: PAD LOCATIONS – SURFACE MOUNT[9]

Units: mm [inches]

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[9] Models ALT5801-**2-*.

FIGURE 5: DIMENSIONS - HEADER MOUNT

Units: mm [inches]