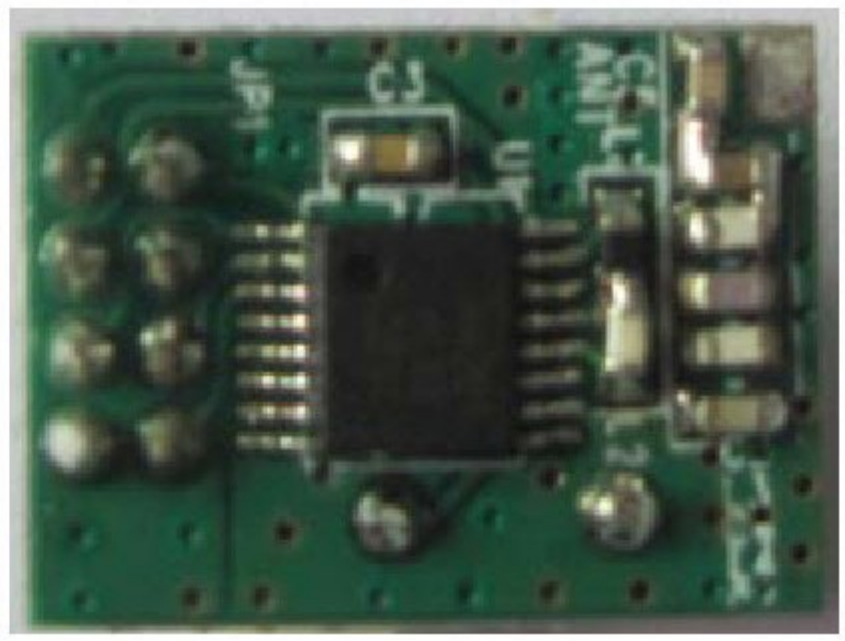
ISM BAND FSK TRANSMITTER MODULE

RCS-S09T

The purpose of this spec covers mainly for the physical characteristic of the module.

General Introduction

RCS-S09T is a low cost ISM band transmitter module implemented with unique PLL approach. It works with FSK modulated signal ranges from 433MHZ bands, comply with FCC, ETSI regulation. The SPI interface is used to communicate with microcontroller for parameter setting. **RCS-S09T** works with **RCS-S09S** receiver module.
At 433MHZ band, the pair of module can work up to 300m in the free open air.



Features:

- Low costing, high performance and price ratio
- Tuning free during production
- FSK transmission
- PLL employed
- Fast PLL lock time
- High resolution PLL with 2.5 KHz step
- Programmable frequency deviation (from 30 kHz to 210 kHz, step 30 kHz)
- Programmable output power
- High data rate (up to 115.2 kbps with FSK modulation)
- Differential antenna output
- Automatic antenna tuning
- SPI interface
- Clock and reset signal output for external MCU use
- 10MHz crystal for PLL reference
- Programmable crystal load capacitor bank
- Wakeup timer
- low battery detection
- 2.2V - 5.4V power supply
- Low power consumption
- stand by current less than 0.3μA

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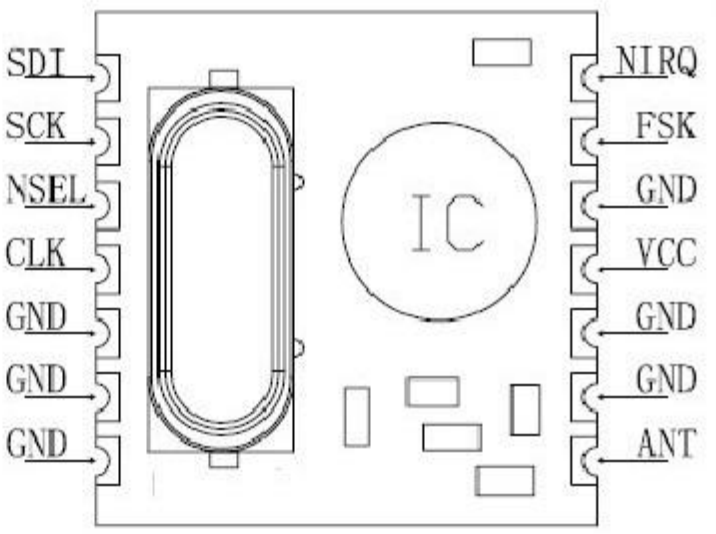
Typical Application:

- Remote control
- Remote sensor
- Wireless data collection
- Home security system
- Toys
- Tire pressure monitoring system

Pin Definition:

SMD



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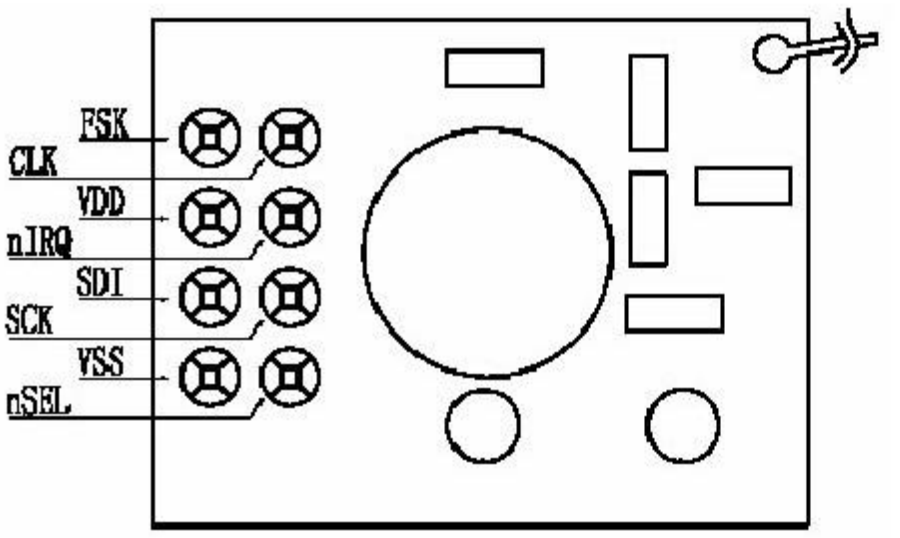

Definition	TYPE	function
FSK	DI	FSK data input
CLK	DO	clock out for MCU (1 MHz-10 MHz)
VDD	S	Positive power supply
nIRQ	DO	Interrupts request output（active low）
SDI	DI	SPI data input
SCK	DI	SPI clock input
VSS	S	negative power supply, GND
nSEL	DI	Chip select (active low)

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Electrical Specification:

Maximum（not at working mode）

symbol	parameter	min	max	unit
V_{dd}	Positive power supply	-0.5	6.0	V
V_{in}	All pin input level	-0.5	V_{dd}+0.5	V
I_{in}	Input current except power	-25	25	mA
ESD	Human body model		1000	V
T_{st}	Storage temperature	-55	125	℃
T_{ld}	Soldering temperature(10s)		260	℃

Recommended working range

symbol	parameter	min	max	unit
V_{dd}	Positive power supply	2.2	5.4	V
T_{op}	operation temperature	-40	85	℃

DC Characteristics:

symbol	parameter		conditions/note	min	typ	max	unit
$I_{dd\_TX\_0}$	current consumption	433 MHz band	0 dBm power output		12		mA
		868 MHz band			14		
		915 MHz band			15		
$I_{dd\_TX\_PMAX}$	current consumption	433 MHz band	max power output		23		mA
		868 MHz band			25		
		915 MHz band			26		
I_{pd}	sleep mode current		all blocks off		0.3		μA
I_{wt}	waek-up timer current consumption				1.5		μA
I_{lb}	low battery detector current consumption				0.5		μA
I_x	idle mode current		only crystal work		1.5		mA
V_{lba}	low battery detection accuracy				75		mV
V_{lb}	low battery detection range		0.1V step	2.2		5.3	V
V_{il}	Low level input					0.3*V_{dd}	V
V_{ih}	High level input			0.7*V_{dd}			V
I_{il}	Leakage current		Vil = 0 V	-1		1	μA
I_{ih}	Leakage current		V_{ih} = V_{dd}, V_{dd} = 5.4V	-1		1	μA
V_{ol}	Low level output		I_{ol} = 2 mA			0.4	V
V_{oh}	High level output		I_{oh} = -2 mA	V_{dd}-0.4			V

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DC Characteristics：

symbol	parameter	conditions/notes	min	typ	max	unit
f_{ref}	PLL reference frequency	Parallel fundamental	9	10	11	MHz
f_o	Output frequency（f_{ref}=10MHZ）	433MHz band,2.5kHz step 868MHz band,5.0kHz step 915MHz band,7.5kHz step	430.24 860.48 900.72		439.75 879.51 929.27	MHz
f_o	Output frequency（f_{ref}=9MHZ）	433MHz band,2.5kHz step 868MHz band,5.0kHz step 915MHz band,7.5kHz step	387.22 774.43 810.65		395.76 791.56 836.34	MHz
f_o	Output frequency（f_{ref}=11MHZ）	433MHz band,2.5kHz step 868MHz band,5.0kHz step 915MHz band,7.5kHz step	473.26 946.53 990.79		483.73 967.46 1022.2	MHz
t_{lock}	PLL lock time	After 10MHz step hopping, frequency error <10 kHz		20		μs
t_{sp}	PLL start time	After crystal stabilized			250	μs
P_{maxL}	available ouput power(315and433MHz band)			8		dBm
P_{maxH}	available ouput power(868and915MHz band)			5		dBm
C_o	output capacitance(set by antenna tuning circuit)	low bands high bands	1.5 1.6	2.3 2.2	3.1 2.8	pF
Q_o	Q factor of output capacitance		16	18	22	
BR_{FSK}	FSK data rate				115.2	kbps
df_{fsk}	FSK deviation	30KHz step	30KHz		210	kHz
C_{xl}	crystal load capacitance	0.5pF step, tolerance +/-10%	8.5		16	pF
t_{PBt}	period of wake-up timer clock	calibrated evry 30 seconds	0.95		1.05	ms
$t_{wake-up}$	wake-up time(programable)		1		2*10E9	ms
t_{POR}	internal POR time	after power reached 90% VDD			100	ms
t_{sx}	Crystal start time	ESR < 100 ohms			5	ms

Field testing range

operation band	condition	range
433MHz band	Bandwidth=134KHz, data rate=1.2kbps Frequency deviation=60KHZ（matches with **RCS-S09S**） in free open area	>300m
868MHz band	Bandwidth=134KHz, data rate=1.2kbps Frequency deviation=60KHZ（matches with **RCS-S09S**） in free open area	>200m
915MHz band	Bandwidth=134KHz, data rate=1.2kbps Frequency deviation=60KHZ（matches with **RCS-S09S**） in free open area	>200m

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Mechanical Dimension:

（all dimensions in mm）

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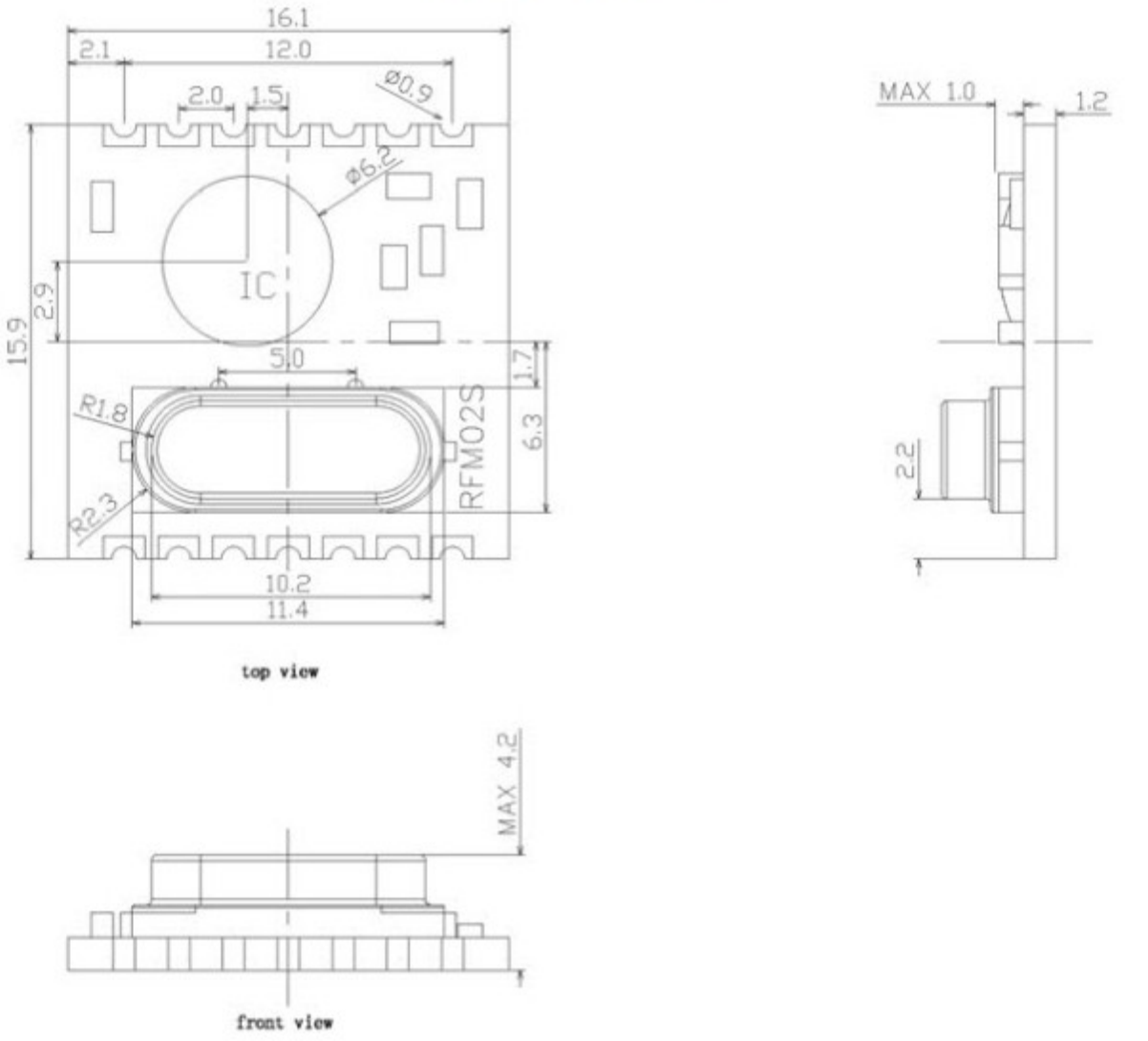

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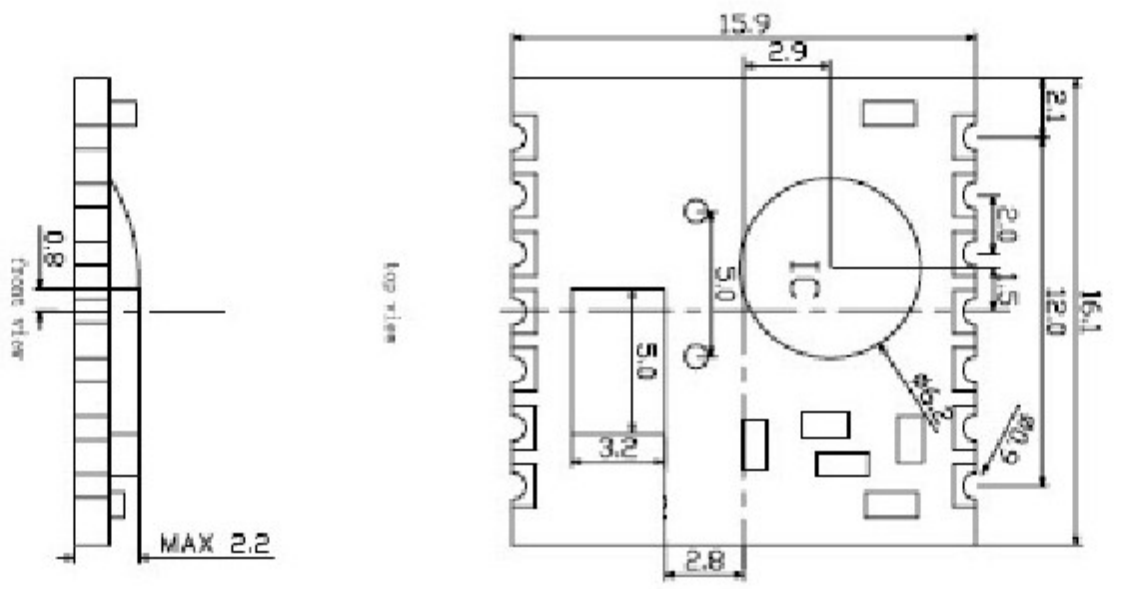

DIP PACKAGE（D）

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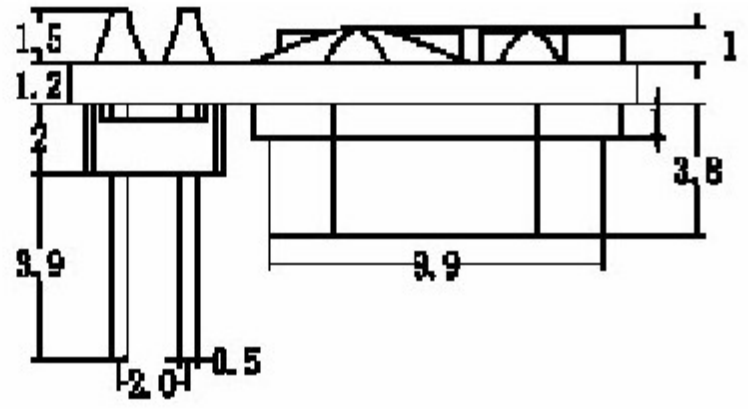

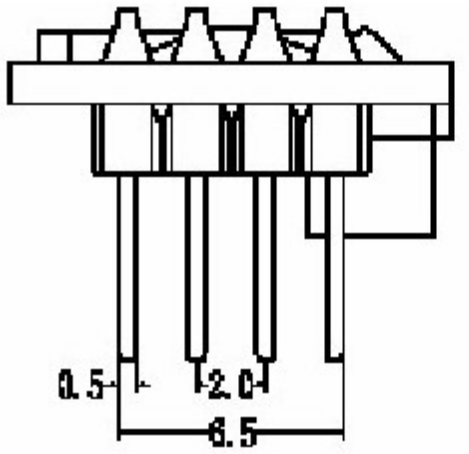

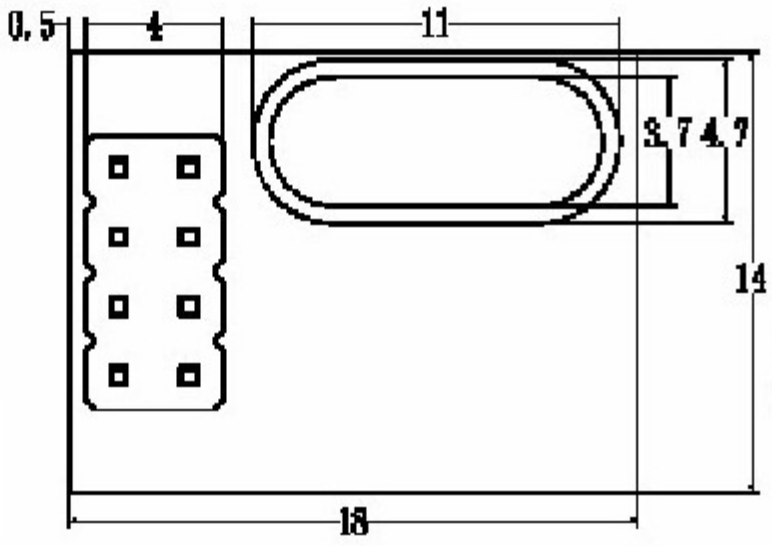

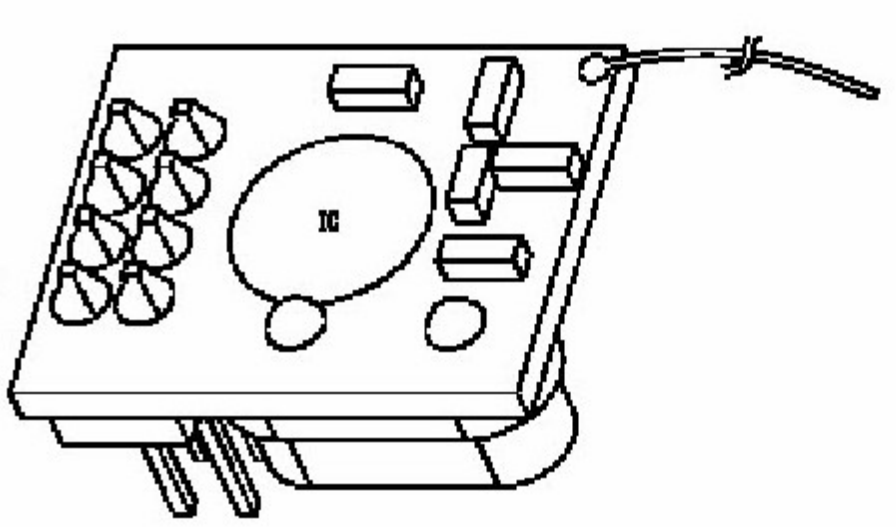

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