芯海科技
CHIPSEA

CSM84F12 IOT Module

Data Sheet

V1.0

June.2018

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1. Introduction

1.1 General Description

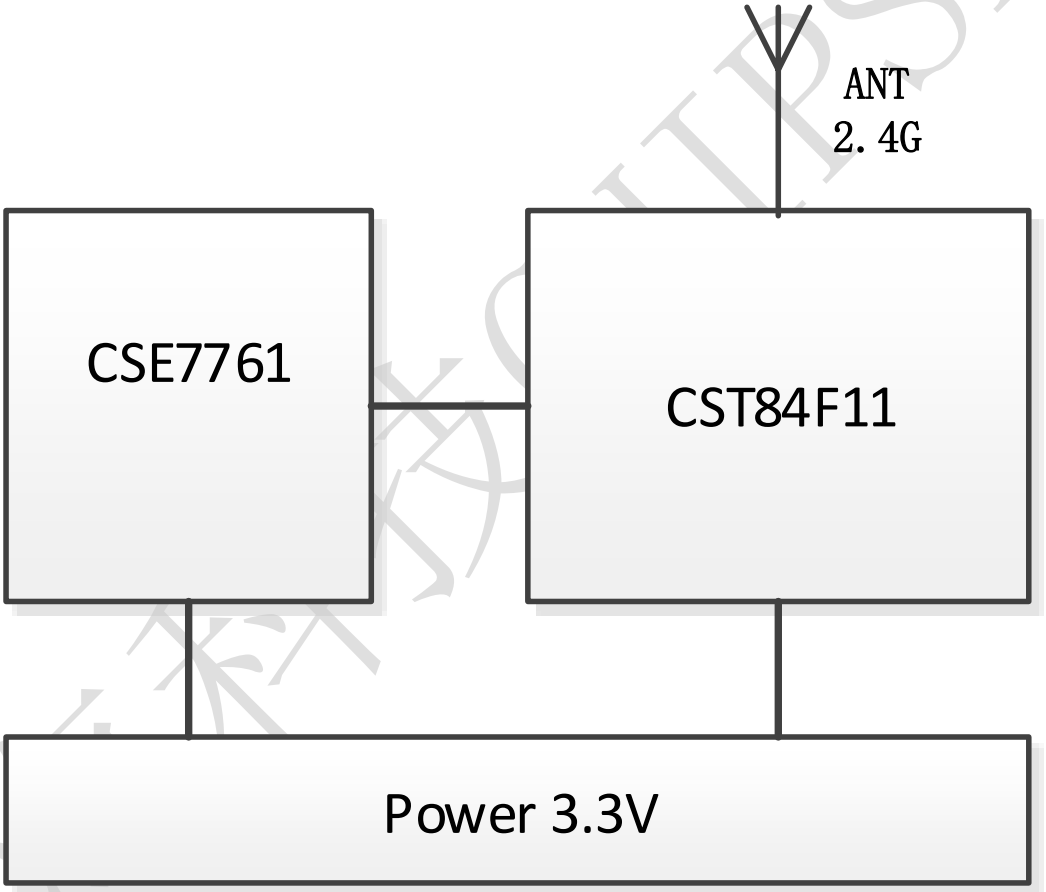
The CSM84F12 module is an intelligent Internet of Everything platform enables customers to add Wi-Fi to a wide variety of products with minimal development effort and cost.

1.2 Hardware Description

- CST84F11+CSE7761
- Size: 18 x 18 x 3.5mm±0.1mm
- Operating voltage: 3.3 V ± 5%
- 16Mbit flash
- 192KB SRAM
- Support FlyOS FlyLink
- RF interface
- Internal PIFA antenna
- Operating temperature range:
  Commercial: -20°C ~ +85°C
- Power consumption
  Transmit: 290 mA @18dBm
  Receive: TBD
  Standby mode (Sleep): TBD
  Deep sleep: TBD
- Package:
  Golden Finger: 18 PADs
- Host interface: GPIO X 12,UART, SPI,UART, PWM
- WiFi mode support:
  Station
  Soft AP
  Station + Soft AP
- Active Power Accuracy: ±0.1% error of Reading over 8000:1 Dynamic Range.
- Voltage and Current Active Power Accuracy: ±0.1% error of Reading over 1000:1 Dynamic Range.

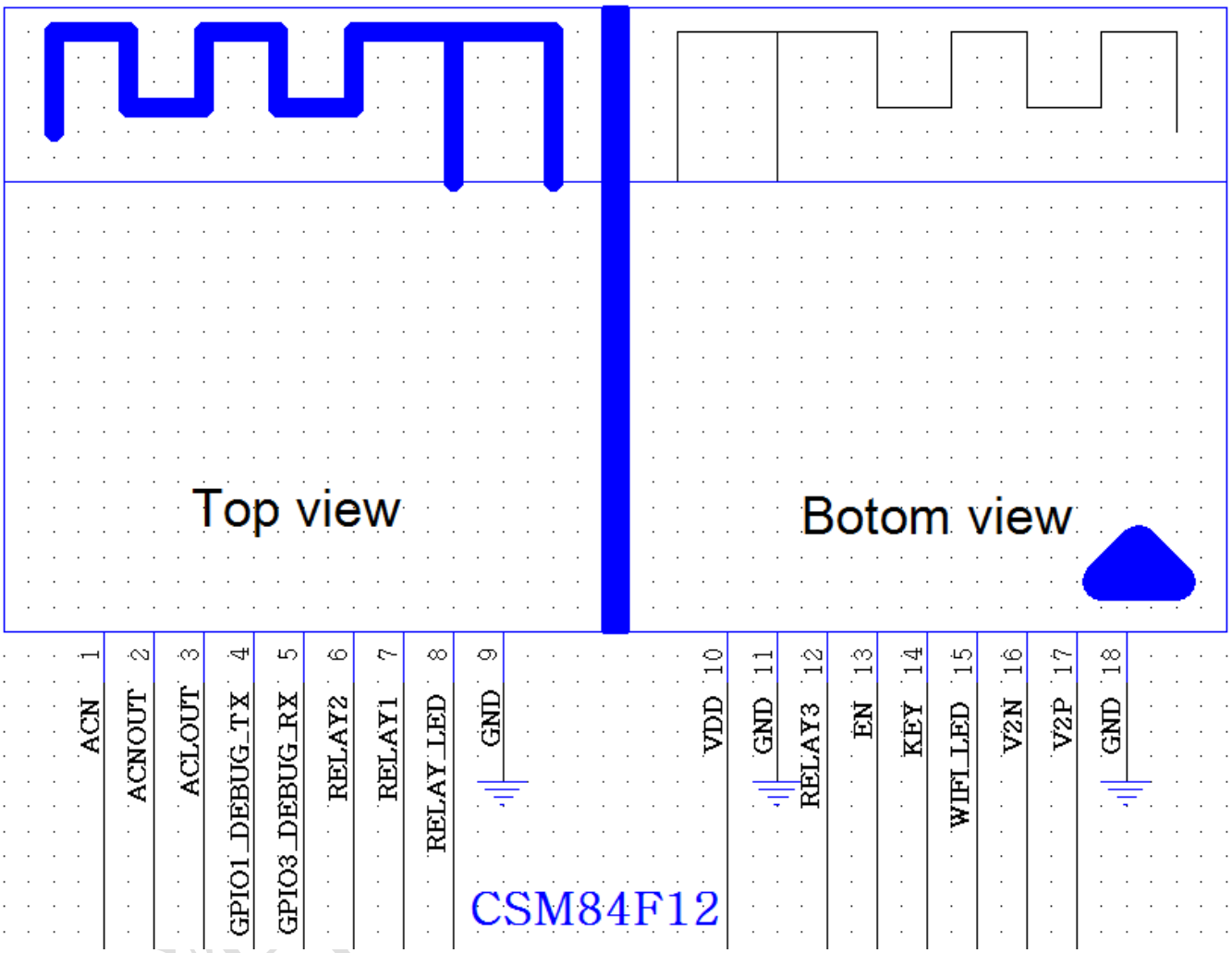
- Active value Accuracy: ±0.1% error of Reading over 1000:1 Dynamic Range.
- On-chip 1.25 V Reference (5ppm/°C typ, <20 ppm/°C max).
- Leakage Function: Leakage current 30mA, < 30ms reaction time.
- System Calibrations Function: ±100% Calib Range
- Phase Compensation Funciton: ±2.56°Compensate Range, 0.02° minimum Compensating value.

2. System Block Diagram



3. CSM84F12 Pin-out

3.1 Pin-out view



3.2 CSM84F12 Pin Assignment and Descriptions

Symbol	Type	Pin	Description
ACN	I/O	1	IIN1+ Differential analog input pins for the current channel
ACNOUT	I/O	2	IIN1- Differential analog input pins for the current channel

Symbol	Type	Pin	Description
ACLOUT	I/O	3	VIN- Differential analog input pins for the voltage channel
GPIO1_DEBUG_TX	I/O	4	TXD
GPIO3_DEBUG_RX	I/O	5	RXD
RELAY2	I/O	6	GPIO controller for relay1
RELAY1	I/O	7	GPIO controller for relay2
RELAY_LED	I/O	8	LED for RELAY
VDD	-	10	3.3V supply for whole module
RELAY3	I/O	12	GPIO controller for relay3
EN	I/O	13	Enable chip. 1: enable chip; 0: Shutdown Chip
KEY	I/O	14	key
WIFI_LED	I/O	15	LED to indicator statues of WIFI
V2N	I/O	16	IIN2+ Differential analog input pins for the current channel
V2P	I/O	17	IIN2- Differential analog input pins for the current channel
GND	-	9	Ground
	-	11	
	-	18	

4. Electrical Specifications

4.1 Absolute Maximum Ratings

The absolute maximum ratings in Table 4-1 indicate levels where permanent damage to the device can occur, even if these limits are exceeded for only a brief duration. Functional operation is not guaranteed under these conditions. Operation at absolute maximum conditions for extended periods can adversely affect long-term reliability of the device.

Table 4-1: Absolute Maximum Ratings

Symbol (domain)	Description	Max Rating	Unit
EFUSE_VDD	VDD input for EFUSE burn-in. Pull low when read mode	-0.3 to 2.75	V
VBAT	VDD input	-0.3 to 3.6	V
ACLOUT , ACNOUT , V2P, V2N		-1 to 6	V

4.2 Environmental Ratings

The environmental ratings are shown in Table 4-2

Table 4-2 Environmental Ratings

Characteristic	Conditions/Comments	Value	Units
Ambient Temperature (T_A)	Functional operation	-20 to +85	°C

4.2.1 Storage Condition

The calculated shelf life in sealed bag is 12 months if stored between 0°C and 40°C at less than 90% relative humidity (RH). After the bag is opened, devices that are subjected to solder reflow or other high temperature processes must be handled in the following manner:

a) Mounted within 168-hours of factory conditions < 30 °C /60%RH

b) Storage humidity needs to maintained at <10% RH

c) Baking is necessary if customer exposes the component to air over 168 hours, Baking condition: 125°C / 8hrs

4.3 Thermal Characteristics

Table 4-3: the thermal characteristics of the CSM84F12.

Thermal characteristics without external heat sink in still air condition

Symbol	Description	Typ.	Unit
T_J	Maximum Junction Temperature (Plastic Package)	125	°C
θ_{JA}	Thermal Resistance θ_{JA} (°C /W) for JEDEC 4L system PCB	57.7	°C/W
θ_{JC}	Thermal Resistance θ_{JC} (°C /W) for JEDEC 4L system PCB	TBD	°C/W
Ψ_{Jt}	Thermal Characterization parameter Ψ_{Jt} (°C /W) for JEDEC 4L system PCB	7.9	°C/W
	Maximum Lead Temperature (Soldering 10s)	260	°C

Notes: * Thermal characteristics without external heat sink in still air condition

4.4 PMU Under Voltage Lock-out (UVLO) Characteristics

Table 4-4 PMU UVLO characteristics

Symbol (domain)	Description	Min.	Typ.	Max.	Unit
Under Voltage Lock-Out (UVLO)					
Under voltage rising threshold of VBAT	VDD33: ball *VBAT*		2.95		V
Under voltage falling threshold of VBAT	VDD33: ball *VBAT*		2.85		V

4.5 Electrostatic Discharge Specifications

This is an ESD sensitive product! Observe precaution and handle with care. Extreme caution must be exercised to prevent electrostatic discharge (ESD) damage. Proper use of wrist and heel grounding straps to discharge static electricity is required when handling these devices.

Table 4-5: ESD Specifications

Pin Type	Test Condition	ESD Rating	Unit
Human Body Mode (HBM)	refers to MIL-STD-883G Method 3015.7	Pass ±2.5	KV
Machine Mode (MM)	refers to JEDEC EIA/JESD22-A115	Pass ±250	V

4.6 Recommended Operating Conditions and DC Characteristics

Table 4-6: Recommended Operating Conditions and DC Characteristics

Domain (Symbol)	Description	Min.	Typ.	Max.	Unit
VDD16_DCDC_OUT	LDO/Buck converter 1.6V output		1.7		V
EFUSE_VDD	VDD input for EFUSE burn-in. Pull low when read mode	2.25	2.5	2.75	V
DVDD12	VDD output for internal digital circuit		1.3		V
VDD12_RTC_OUT	VDD output for internal RTC circuit		1.3		V
VBAT	3.3V supply	3.14	3.3	3.46	V
(V_{IL})	Input Low voltage when	-0.3		0.8	V

	VBAT=3.3V				
(V_{IH})	Input High voltage when VBAT=3.3V	2		3.6	V
(V_{T+})	Schmitt trigger low to high threshold voltage when VBAT=3.3V	1.6	1.74	1.89	V
(V_{T-})	Schmitt trigger high to low threshold voltage when VBAT=3.3V	1.27	1.4	1.56	V
(V_{OL})	Output low voltage when VBAT=3.3V			0.4	V
(V_{OH})	Output high voltage when VBAT=3.3V	2.4			V
(R_{PD})	Input weakly pull-down resistance when VBAT=3.3V. All GPIO pins have internal weakly pull- down option except that GPIO_5 has internal weakly pull-up option	35	51	84	KΩ
(I_{OL})	Low level output current @ V_{OL}(max), 8mA setting	11.9	17.7	23.4	mA
	Low level output current @ V_{OL}(max), 12mA setting	15.8	23.5	31.1	mA
(I_{OH})	High level output current @ V_{OH}(min), 8mA setting	17.2	34.1	58.8	mA
	High level output current @ V_{OH}(min), 12mA setting	23.9	47.2	81.5	mA

5. Electrical Specifications

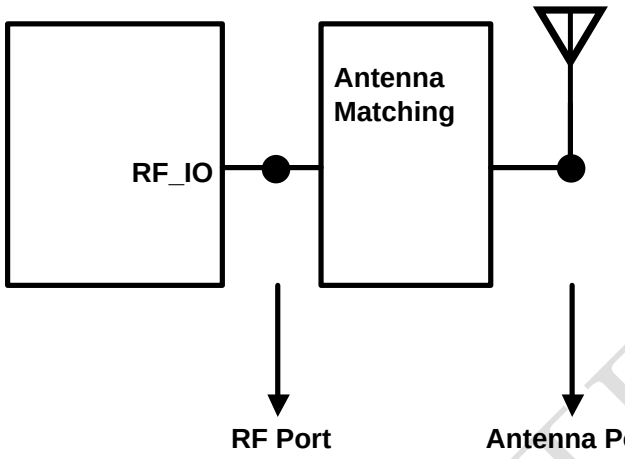


Figure 5-1: RF Front-End Reference Topology for RF Performance

Note: All specifications are measured at the Antenna Port unless otherwise specified.

5.1 Transmitter Characteristics for 2.4GHz Operation

Table 5-1 summarizes the transmitter characteristics for the CSM84F12.

Table 5-1 transmitter characteristics

Parameter	Condition/Notes	Min.	Typ.	Max.	Unit
Frequency Range		2412	-	2484	MHz
Rx Sensitivity (CCK)	CCK, 1 Mbps		-94.0		dBm
	CCK, 11 Mbps		-87.0		dBm
Rx Sensitivity (OFDM)	OFDM, 6 Mbps		-91.0		dBm
	OFDM, 54 Mbps		-72.0		dBm
Rx Sensitivity (HT20) Greenfield 800nS GI Non-STBC	HT20, MCS0		-91.0		dBm
	HT20, MCS7		-68.0		dBm

5.2 Receiver Characteristics for 2.4GHz Operation

Table 5-2 summarizes the receiver characteristics for the CSM84F12. Notice that transmitter and especially receiver characteristics must be test under test guider.

Table 5-2 receiver characteristics

Parameter	Condition/Notes	Min.	Typ.	Max.	Unit
TX Output Power	CCK, 1-11 Mbps		17.5		dBm
	OFDM, 54 Mbps		14.0		dBm
	HT20, MCS7		14.0		dBm

6. System Power Consumption

Note: All results are measured at the condition that VBAT are 3.3V.

Table 6-1: Power Consumption

WLAN Operational Modes	Typ.	Unit
Rx, CCK, 1 Mbps(Continuous)	91	mA
Rx, OFDM, 54 Mbps(Continuous)	101	mA
Rx, HT20, MCS7(Continuous)	103	mA
Tx, CCK, 1 Mbps, 19dBm(Continuous)	292	mA
Tx, OFDM, 54 Mbps, 16dBm(Continuous)	237	mA
Tx, HT20, MCS7, 15dBm(Continuous)	239	mA
Normal work(Avg)	30	mA
Tx&Rx (Avg for DCDC mode, normal usage)	80	mA
Tx&Rx (Avg for LDO mode, normal usage)	100	mA

7. Soldering Recommendations

The CSM84F12 module can be SMT on the board following the temperature curve graph:

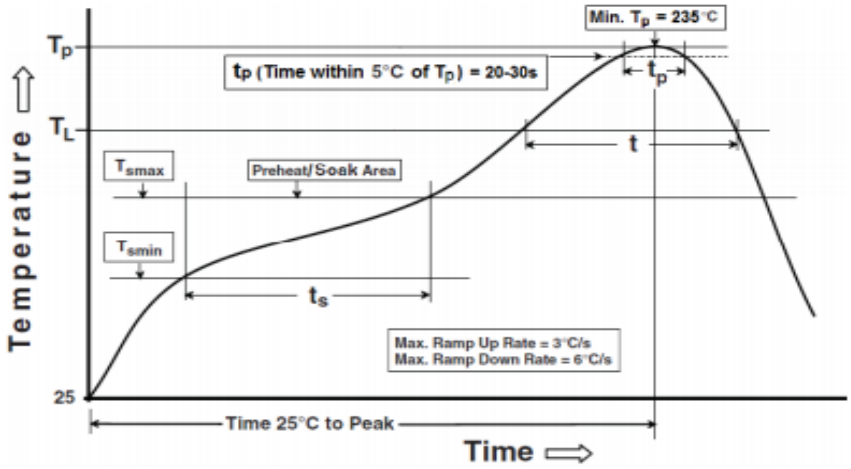


Figure 7-1: CSM84F12 temperature curve graph

Table 7-1: Solder Profile Section

Profile Section	Profile Feature	Pb-free Package
1	Preheat - Temperature min (Tsmin) - Temperature max.(Tsmax) - Time (min. to max.)	 150°C 200°C 60 ~ 180 seconds
2	Tsmax ro TL - Ramp-up rate	3°C /second max.
3	Time maintained above: - Temperature (TL) - Time	 217°C 60 ~ 150 seconds
	Average ramp-up rate (TL to Tp)	3°C /second max.
4	Peak Temperature (Tp)	250±5°C
	Time within 5℃ of actual peak temperature (tp)	20 ~ 40 seconds
5	Ramp-down rate	6°C /second max.
	Time 25°C to peak temperature	8 minutes max.

Appendix A: HW Reference Design