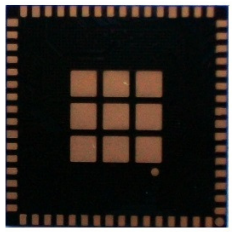
Q88 DAB+/DAB/FM/RDS Module

➢ General description

Q88 is a miniature, low power consumption and low cost DAB+/DAB/FM/RDS radio SiP(system in package) module. With cutting edge technology, Q88 integrates all the necessary interfaces to enable radio manufacturers easily and effectively to implement radios or embedded audio systems. The manufacturers only need a power supply, display, keypad, audio amplifiers and speakers to implement a fully functional DAB+/DAB/FM/RDS radio or using Q88 as a radio block of an audio system.



Q88 operates in master mode or slave mode with the control of an external MCU.

➢ Applications

- Clock radio
- Kitchen radio
- CD Microsystems
  iPhone docking
- Handheld DAB radios
- Other audio system

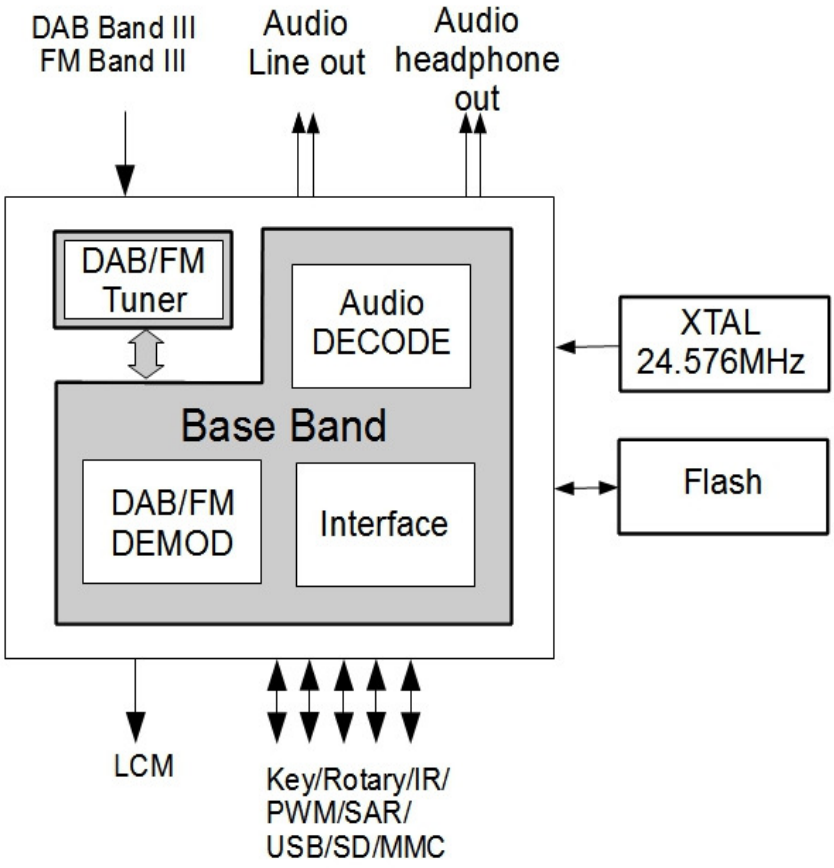
➢ Software

- Software configurations are requested by customers and are pre-load in the Flash memory on modules.
- Full suite of customized applications including:
  - RDS
  - Clocks
  - Multiple alarms/timers
  - Presets
  - Rotary encoders
  - 2-line, dot-matrix, segment LCMs
  - Remote control encoder

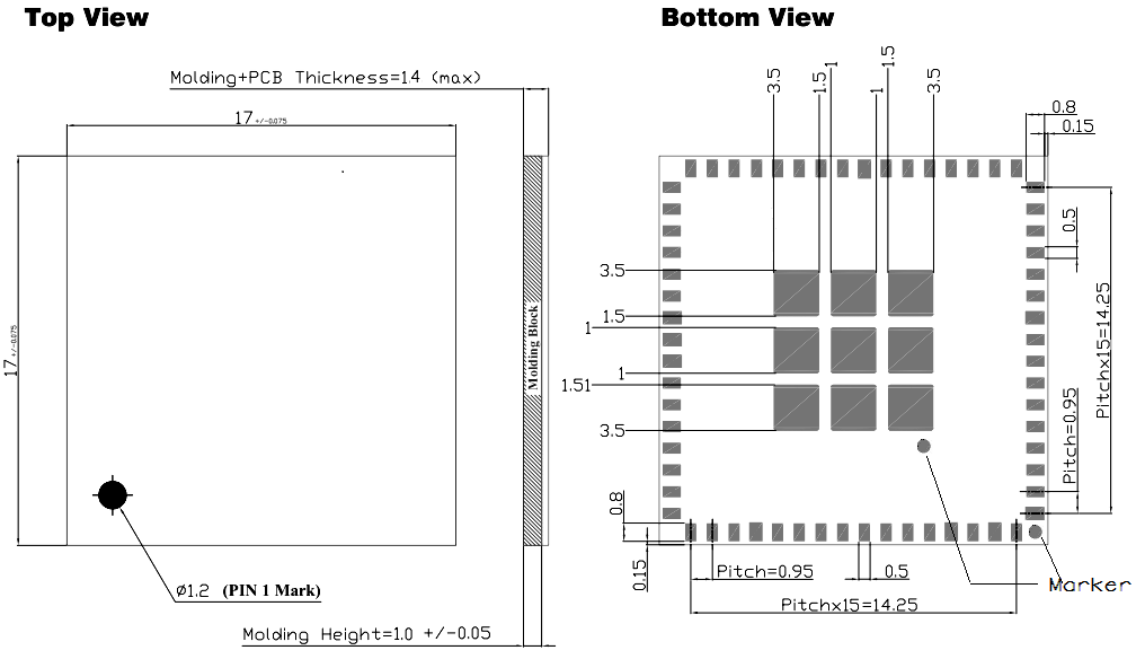
- **Key features**

  Low profile, small size
  EUREKA-147 compliant
  Ultra low-power consumption
  DAB sensitivity to -99.0 dBm (typical)
  On-board stereo DAC
  Serial control interface (SPI)
  2-wire interface (I2C-slave compatible)
  Universal Serial Bus(USB) for firmware update
  Combined antenna input for FM and Band III
  RoHS/REACH-compliant

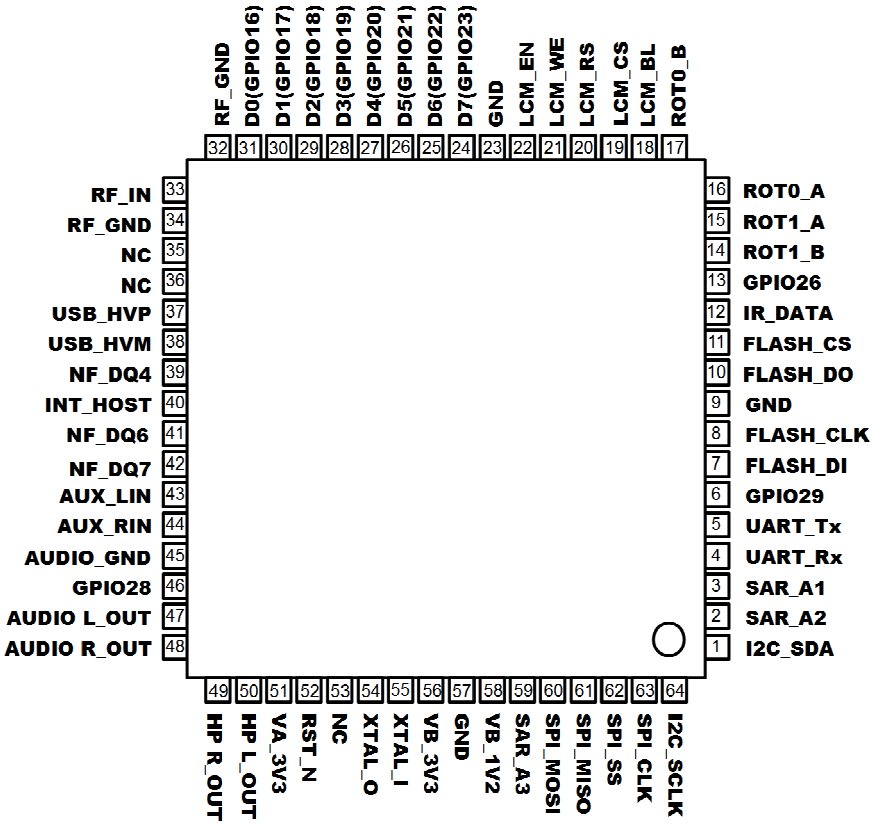
- **Module Block Diagram**
- **Pin definition & mechanical information**
  - **Dimension**



Top View



➢ **Pin definition**



➢ **Pin function description**

PIN	Name	Description	GPIO
1	I2C_SDA	slave mode I2C Data	
2	SAR_A2	2nd SAR A/D converter	
3	SAR_A1	1st SAR A/D converter	
4	UART_Rx	UART Rx	
5	UART_Tx	UART Tx	
6	GPIO29	GPIO29	29
7	FLASH_DI	Flash DI	
8	FLASH_CLK	Flash clock	
9	GND	Base band GND	
10	FLASH_DO	Flash DO	
11	FLASH_CS	Flash chip select	
12	IR_DATA	IR data input	12
13	GPIO26	GPIO26	26
14	ROT1_B	rotary encoder 1 line B	11
15	ROT1_A	rotary encoder 1 line A	10
16	ROT0_A	Rotary encoder 0 line A	8
17	ROT0_B	Rotary encoder 0 line B	9
18	LCM_BL	(1) LCM back light level control (2) PWM2	
19	LCM_CS	LCM chip select	27
20	LCM_RS	LCM reset line	13
21	LCM_WE	LCM write enable	14
22	LCM_EN	LCM enable bit	15
23	GND	Base band Ground	
24	D7(GPIO23)	(1)LCM data bit 7 (2)SPI_slave MISO	23
25	D6(GPIO22)	(1)LCM data bit6 (2)SPI_slave MOSI	22
26	D5(GPIO21)	(1)LCM data bit5 (2)SPI_slave SS	21
27	D4(GPIO20)	(1)LCM data bit4 (2)SPI_slave SS	20
28	D3(GPIO19)	LCM data bit3	19
29	D2(GPIO18)	LCM data bit2	18
30	D1(GPIO17)	LCM data bit1	17
31	D0(GPIO16)	LCM data bit0	16
32	RF_GND	RF Ground	

PIN	Name	Description	GPIO
33	RF_IN	RF input for Band II and Band III	
34	RF_GND	RF Ground	
35	NC	NC	
36	NC	NC	
37	USB_HVP	USB host D+	
38	USB_HVM	USB host D-	
39	NF_DQ4	external GPIO	
40	INT_HOST	INT_HOST for Engineering mode	
41	NF_DQ6	external GPIO	
42	NF_DQ7	external GPIO	
43	AUX_LIN	auxiliary left in	
44	AUX_RIN	auxiliary right in	
45	AUDIO_GND	Audio Ground	
46	GPIO28	GPIO28	28
47	AUDIO L_OUT	Audio line out left	
48	AUDIO R_OUT	Audio line out right	
49	HP R_OUT	Audio line out right	
50	HP L_OUT	Audio line out left	
51	VA_3V3	Audio power 3.3V	
52	RST_N	Base band reset	
53	NC	NC	
54	XTAL_I	24.576MHz xtal input	
55	XTAL_O	24.576MHz xtal output	
56	VB_3V3	Base band power 3.3V	
57	BB_GND	Base band Ground	
58	VB_1V2	Base band power 1.2V	
59	SAR_A3	3th SAR A/D converter	
60	SPI_MOSI	SPI_MOSI	
61	SPI_MISO	SPI_MISO	
62	SPI_SS	SPI_SS	
63	SPI_CLK	SPI_CLK	
64	I2C_SCLK	slave mode I2C Clock	

➢ DAB Performance

- Q88 is compliant to EN300.401 (Eureka 147)
- Typical performance is equal to or better than EN50248:2001.
- Capable of decoding up to 384kbit/s, UEP protection level 1 to 5, EEP protection levels 1a-4a and 1b-4b.

➢ RF & Audio Specification

Temperature: 25℃ / Relative Humidity: 75%					
Signal Generator: Leader VP-8194D, Audio Analyzer: Kenwood VA-2230A					
Parameter	Condition	Min	Typical	Max	Unit
DAB					
Mode 1 / UEP3/ Tone 1KHz /192Kbps, Criterion: No pop audio for 30 sec.					
RF frequency range		174		240	MHz
Adjacent Channel Selectivity	EN50248 / N+1 / N-1 RF input power: -70dBm	46	48	49	dBc
Far-off selectivity	EN50248 RF input power: -70dBm	48		52	dBc
Sensitivity	EN50248	-98	-99	-100	dBm
Maximum input power	EN50248		0		dBm
Audio output	Tone 1KHz, without loading		1		Vrms
RF Input impedance			50		Ohm
DAB+					
Mode 1 / UEP3/ Tone 1KHz /192Kbps, Criterion: No pop audio for 30 sec.					
RF frequency range		174		240	MHz
Adjacent Channel Selectivity	EN50248 / N+1 / N-1 RF input power: -70dBm	46	48	49	dBc
Far-off selectivity	EN50248 RF input power: -70dBm	48		52	dBc
Sensitivity	EN50248	-99	-100	-101	dBm
Maximum input power	EN50248		0		dBm
Audio output	Tone 1KHz, without loading		1		Vrms
RF Input impedance			50		Ohm
DAB Operating Current					
3.3V input current @25℃			32.0		mA
1.2V-BB input current @25℃			46.0		mA
3.3V Standby			10.0		mA
1.2V Standby			4.5		mA
DAB+ Operating Current					
3.3V input current @25℃			32.0		mA
1.2V-BB input current @25℃			46.0		mA
3.3V Standby			10.0		mA
1.2V Standby			4.5		mA

FM					
Dev: 22.5K / Tone 1KHz / 60dBuV,					
RF frequency range		87.5		108.1	MHz
RF sensitivity	SINAD = 40dB	11	12	13	dBuV e.m.f.
Separation	Dev: 53% / Pilot: 9%		41.5		dB
Selectivity	N+1 / N-1, SINAD = 40dB		35		
SNR			66		dB
THD+N	Dev. 75K / Tone 1KHz		0.22		%
SINAD			46		dB
Frequency grid			50		KHz
Audio output	Dev. 75K / Tone 1KHz without loading		0.75		Vrms
FM Operating Supply					
3.3V input current @25℃			52.0		mA
1.2V input current @25℃	192Kbps / UEP3		35.0		mA
RF Input impedance			50		Ohm

Environmental Condition					
Operating Temperature		-10		70	℃
Storage temperature		-40		105	℃
Relative Humidity		0		98	%

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