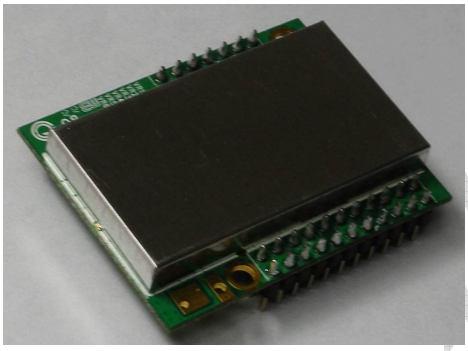
Revision history

Version	Action	Author	date
1.00	First version for Q8r	Ynien	2011/9/23
1.01	Modify dimension and pin assignments	Ynien	2011/9/26
1.02	Modify pin definition, and add pin function, module block diagram.	Ynien	2011/10/26
1.03		Jeff	2011/10/27
1.04	Modify pin function description, pin26,28,30	Ynien	2011/10/28
1.05	Modify pin definition, add start and stop number at module profile	Ynien	2011/10/31
1.06	Modify current consumption	RY Lee	2011/11/19
1.07	Modify outline drawing	Jeff	2011/12/30
1.08	Modify Audio Output numbers	Jeff	2012/3/6
1.09	1.Modify General description Q8r module picture 2. Add 7. RF input pad description	Ynien	2012/4/6
1.10	1. Modify Pin definition, Pin21, 22 2. Modify spec. of sensitivity 3. Modify current consumption	RY Lee	2013/01/29
1.11	Modify pin17, 18 description, adding I2C slave	Jeff	2013/6/10
1.12	Add RF input impedance	Jeff	2014/1/8

1. General description



The Q8r/Q8r+ module is the best price/performance DAB+/DAB/FM/RDS radio module in the current radio markets. The Q8r/Q8r+ 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 Q8r/Q8r+ as a radio block of an audio system.

Q8r/Q8r+ operates in master mode or slave mode with the control of an external MCU.
Note: Q8r functions DAB/FM/RDS receiving; while the Q8r+ functions DAB+/DAB/FM/RDS receiving.

2. Applications

- Clock radio
- Kitchen radio
- CD Microsystems
- iPhone docking
- Embedded audio systems

3. 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

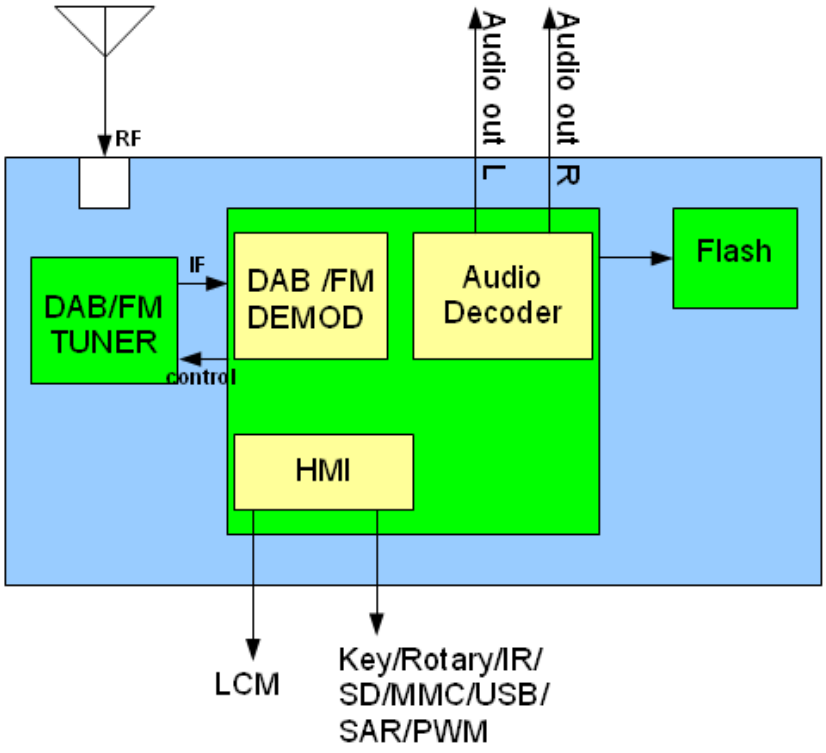
    Remote control encoder

- I2C controlling code in slave mode

4. Key features

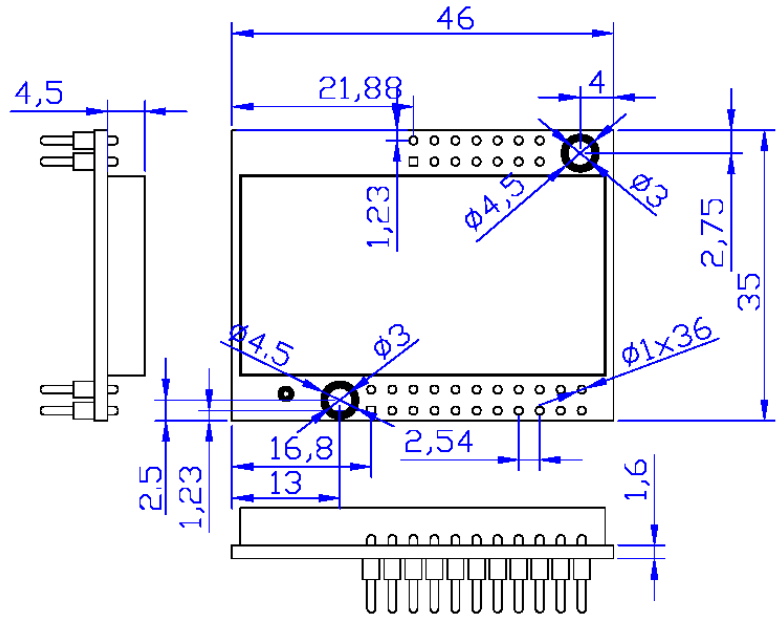
EUREKA-147 compliant
Ultra low-power consumption
DAB sensitivity to -99.0 dBm (typical)
On-board stereo DAC
Serial control interface (SPI)
2-wire interface (I2C-slave compatible)
Universal Serial Bus (USB) for firmware update
Combined antenna input for FM and Band III
RoHS/REACH-compliant

5. Module Block Diagram



6. Pin definition & mechanical information

- **Dimension**



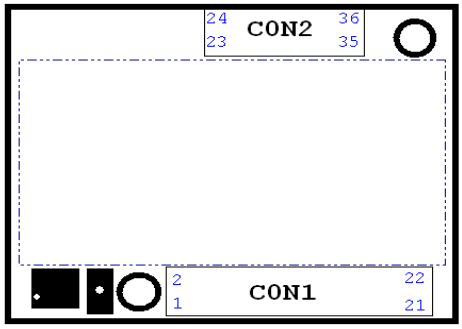
- **Pin definition**

CON2

24	26	28	30	32	34	36	PIN
GND	GP22/D6	GP20/D4	GP14/WE	GP27/CS /MUTE_EN	VHS (SAR)	GND	SIGNAL
GP23/D7	GP21/D5	GP15/EN	GP13/CD	GP12/IR	PWM2/BL	A_2 (SAR)	SIGNAL
23	25	27	29	31	33	35	PIN

CON1

2	4	6	8	10	12	14	16	18	20	22	PIN
NC	V_3V3	INT_HOST	AGND	AGND	RST_N	SPI_MISO	SPI_CLK	I2C_SDA	VDD_1V2	GP25/Tx1	SIGNAL
GND	HVP	HVM	R_OUT	L_OUT	GND	SPI_MOSI	SPI_SS	I2C_SCLK	GND	GP24/Rx1	SIGNAL
1	3	5	7	9	11	13	15	17	19	21	PIN



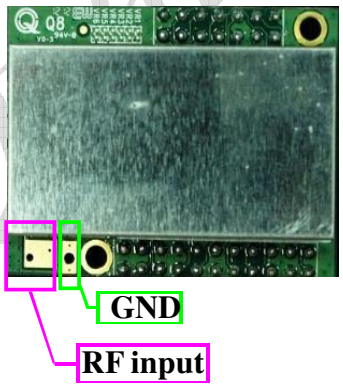
➢ **Pin function description**

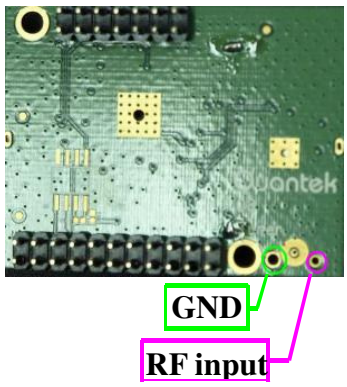
CON1		type	Description	CON1		type	Description
1	GND	P	Ground	2	NC	-	-
3	HVP	I/O	USB	4	V_3V3	P	3.3V supply for base band
5	HVM	I/O	USB	6	INT_HOST	I	for Engineer mode
7	R_OUT	O	Audio output R channel	8	AGND	P	Ground
9	L_OUT	O	Audio output L channel	10	AGND	P	Ground
11	GND	P	Ground	12	RST_N	I	Base band reset
13	SPI_MOSI		SD/MMC	14	SPI_MOSI		SD/MMC
15	SPI_SS		SD/MMC	16	SPI_CLK		SD/MMC
17	ROT_A (I2C_SCLK)	I	Rotary encoder line A (Slave mode I2C_SCLK)	18	ROT_B (I2C_SDA)	I	Rotary encoder line B (Slave mode I2C_SDA)
19	GND	P	Ground	20	VDD_1V2	P	1.2V supply for base band
21	GP24/Rx1		GPIO24/UART RX	22	GP25/Tx1		GPIO25/UART TX

CON2		type	Description	CON2		type	Description
23	GP23/D7		GPIO23/LCM data bit 7	24	GND	P	Ground
25	GP21/D5		GPIO21/LCM data bit 5	26	GP22/D6		GPIO21/LCM bit 6
27	GP15/EN		GPIO15/LCM enable bit	28	GP20/D4		GPIO20/LCM bit 4
29	GP13/CD		GPIO23/LCM reset line	30	GP14/WE		GPIO21/LCM WE line
31	GP12/IR		GPIO12/ IR input	32	GP27/MUTE_EN		GPIO27/mute indicator
33	PWM2/BL	O	PWM/LCM back light	34	VHS(SAR)		1st SAR in
35	A_2(SAR)	I	2nd SAR in	36	GND	P	Ground

7. RF Input Pad Description

Describe the layout of RF input pad:





8. DAB Performance

- Q8r/Q8r+ 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.

9. 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	37		43	dBc
Far-off selectivity	EN50248 RF input power: -70dBm	48		52	dBc
Sensitivity	EN50248	-98	-100	-101	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	37		43	dBc
Far-off selectivity	EN50248 RF input power: -70dBm	48		52	dBc
Sensitivity	EN50248	-99	-101	-102	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℃			27.00		mA
1.2V-BB input current @25℃			45.00		mA
3.3V Standby			10.00		mA
1.2V Standby			4.00		mA
DAB+ Operating Current					
3.3V input current @25℃			27.00		mA
1.2V-BB input current @25℃			45.00		mA
3.3V Standby			10.00		mA
1.2V Standby			4.00		mA

FM					
Dev: 22.5K / Tone 1KHz / 60dBuV,					
RF frequency range		76		108.1	MHz
RF sensitivity	SINAD = 40dB	11	12	13	dBuV e.m.f.
Separation	Dev: 53% / Pilot: 9%		40.5		dB
Selectivity	N+1 / N-1, SINAD = 40dB		35		
SNR			68		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℃			52.00		mA
1.2V input current @25℃	192Kbps / UEP3		35.00		mA
RF Input impedance			50		Ohm

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

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