

DAB+ and DMB Stand-alone platform

Juliet is a low-cost ready-made DAB+/DMB Digital Radio platform, based on EtherWaves' ClearSignal proven solution and targeted to Consumer Electronics manufacturers. It enables to build DAB digital radio receivers or to add DAB capability to already existing products.

Juliet was specifically designed as a highly versatile slave mode platform, to produce a large variety of entertainment devices, such as kitchen & alarm clock radios, CD micro systems and low-cost remote controlled radios, while using a minimal number of external components, as exemplified in the illustrations below.

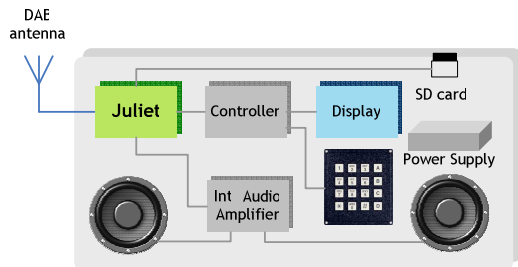


Figure 1- Typical DAB Radio & MP3 Player with Clock Alarm using Juliet

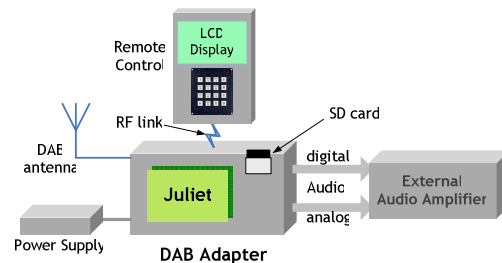


Figure 2- Typical Remote Controlled DAB Radio & MP3 Player with Clock Alarm using Juliet

Functioning as a DAB/DAB+/FM radio receiver, DMB baseband, MP3/WMA/AAC player and clock/alarm, Juliet contains the following main components:

- single-chip RF front-end unit
- baseband decoder and audio processor with all the supporting electronics
 - A/D
 - DSP
 - SDRAM¹
 - FLASH
- D/A converter
- slave-side communication
- power regulator

EtherWaves' customers are provided with a hardware reference that includes a host controller, LCD display, audio amplifier, keyboard, power supply and aerial, for demonstrating and/or facilitating the design of the DAB receiver end-product.

¹ the SDRAM can be ordered in several sizes, for various rewind storage time periods'

Juliet Main Features

- DAB/DAB+/DMB
 - Eureka-147 DAB compliant
 - DMB baseband with TS output
 - multi-mode Band III and L-Band
 - single interface for Band-III and L-band
 - DAB autotune
 - DLS output
 - rewind mode with continuous record for on-demand delayed replay²
 - high noise performance
 - 8 presets for DAB services (or service components)
- FM receiver
 - stereo
 - RDS support
 - 8 presets for FM stations
- playback of digital audio from SD card
 - MP3
 - WMA
 - AAC
 - ID tags output
- built-in sound engine
 - volume control
 - sound control bass and treble
- clock / alarm functionality
- sleep mode
 - variable sleep times
- slave configuration³
 - direct control, using either SPI, UART or I2C⁴
 - wireless control
- analog audio output
 - 600Ω / 0dBm
- digital audio output - choice between one of the following protocols⁵
 - S/PDIF 75 ohm coaxial (for connecting to an external amplifier)
 - I²S (for connecting to an internal audio amplifier)
 - TS output, when operating as DMB baseband
- on-board power regulator
- uses single 5-6VDC power source
 - power down for low power consumption
- compact size

² up to available SDRAM

³ the Master - Slave communication protocol is described in the separate "ClearSignal CSRC Remote Protocol" document

⁴ user's choice, field programmable

⁵ user's choice, field programmable

Juliet specifications

DAB/DMB Band III

Frequency Range	174÷240 MHz
Adjacent Channel Suppression (ACS)	≥ 50 dB
Fading - typical	-87 dB
Far-Off Selectivity - minimal (FOS)	≥ 60 dB
Sensitivity (typical) for BER ≤ 10 ⁻⁴	-98 dB(mW)
Maximum input power for BER ≤ 10 ⁻⁴	0 dB(mW)

DAB/DMB L-Band

Frequency Range	1452÷1492 MHz
Adjacent Ch. Suppression (ACS)	≥ 34.5 dB
Fading - typical	-82 dB
Far-Off Selectivity - minimal (FOS)	≥ 55 dB
Sensitivity (typical) for BER ≤ 10 ⁻⁴	-96 dB(mW)
Max. input power for BER ≤ 10 ⁻⁴	0 dB(mW)

Digital FM (Band II)

Frequency Range	87.5 - 108 MHz
Maximum frequency deviation	±75 KHz or ±50 KHz
Pre-emphasis time constant	50 μs or 75 μs
Usable/50 db Quieting Sensitivity	12.7 / 17.2 dBf
Frequency Increment between stations (settable according to the local standard)	100kHz / 200 KHz

Playback

Description	Value
Files' source	MMC/SD Card ClearSignal Internal (recording from DMB/DAB or FM)
Compression Format	MP3 (16 to 320 Kbps) - including VBR and the very low bitrates of the MPEG 2.5 extension (8 kb/s and 16 kb/s) WMA (standard) MP2 (MPEG Audio Layer 2) AAC
File System	FAT 12 / 16 / 32
Rewind time	typical 1 minute for every 1MB SDRAM / 4 minutes in standard module
Flash Card Protocol	SPI

Mechanical data

- Overall dimensions:
75 x 45 x 3.7 mm

Audio out

Description	Value	Conditions
Analogue line audio output	0 dBm	600Ω
Frequency Response	20 ÷ 20,000 Hz	+0/-3 dB
Line Audio Signal to Noise Ratio	>98 dB	
Headphones Audio Signal to Noise Ratio	>98 dB	
Channel Separation (line out)	>100 dB	1 KHz / 0 dBm
Harmonic Distortion Output (typical)	0.056% 0.56%	1 KHz / 32Ω load / -5 dBm 1 KHz / 32Ω load / -2 dBm

MMI - Man Machine Interface

The Man Machine Interface is implemented on the Master and communicated to the Slave Juliet unit, using CSRP (ClearSignal Remote Protocol), described in the separate "ClearSignal CSRC Protocol" document. The protocol enables to exchange data regarding the following I/O elements:

- keypad (in)
- rotary switch (in)
- LCD display (out)
- LED/buzzer (out)
- UART/SPI (in/out)

Applicable Standards

Functionality	Standard
DAB reception	Europe ETSI EN 300 401, South Korea TTAS.KO-07.0024
DMB TS decoding	Europe ETSI TS 102 427, South Korea TTAS.KO-07.0026
MOT decoding	ETSI EN 300 234
EPG decoding	ETSI TS 102 371
RDS decoding	CENELEC EN 500 067
MP3 decoding	ISO/IEC 11172-3 (MPEG Audio Layer 3)
WMA decoding	Standard version
AAC decoding	16 to 320 Kbps

Environmental data

- Operation Temperature Range
- 0° C to 70° C
- Storage Temperature Range
- 50° C to 150° C
- RoHS - 2002/95/EC compliant

Juliet and EtherWaves

Juliet is based upon EtherWaves' ClearSignal proven solution for DAB. It includes all the elements for DAB reception and MP3/WMA playback, all according to the relevant standards.

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