

HF Modem

2G ALE

3G ALE

V/UHF Modem

56b, 2400 Vocoder



Fig 1.a:
TC2 Top view

Size:
22 x 33 mm x 3.5 mm



Fig 1.b:
TC2 Bottom view

(Actual Size)

FEATURES & BENEFITS:

- **2G ALE:** MIL-STD-188-141B/C App A & B
- **Linking Protection:** MIL-STD-188-141B/C App B
- **Link Quality Assessment:** LQA
- **Radio Control:** Transceiver Protocol
- **Low Cost:** Hardware Installation
- **Activation Keys:** Unlock Functionality
- **Low Power:** 600 mW (typical)
- **Very Compact Size:** 22 x 33 x 3.5 mm

OTHER SOFTWARE OPTIONS (DATASHEETS AVAILABLE):

- **HF Modem:** Up to 9 600 bps SSB, 19 200 bps ISB
- **MIL-STD 110C Modes:** 32,000 bps in 6 kHz
- **3G ALE:** STANAG 4538 FLSU & xDL Packet Data
- **Digital Voice:** 2400 bps Vocoder
- **Encryption:** 56-bit for Data/Voice
- **VHF / UHF Modem:** Up to 128 000 bps (24 kHz)

RELATED PRODUCTS (DATASHEETS AVAILABLE):

- **EF-256 Embedded Functions for Secure Voice & Data:**
 - AES-256 Encryption
 - Vocoder (600 – 2400 bps) TWELP* or MELPe**
 - AUTO Data Rate Change
 - Best-in-class Voice Modem
 - Extended Range, const. amplitude modulation

* TWELP voice coding by DSP Innovations Inc.(www.dspini.com)

** MELPe for US customers only

TC2 MODULE HARDWARE

The TC2 is optimized for size and provides very low power consumption. It is intended for integration into HF & V/UHF transceivers. This hardware platform can host a number of S/W functions, for example 2G ALE (Automatic Link Establishment).

AUTOMATIC LINK ESTABLISHMENT

The 2G ALE controller is available as a software option for the TC2. It is intended for integration into HF transceivers and other communication devices. The TC2 is optimized for low power consumption.

NO OPERATOR INTERVENTION

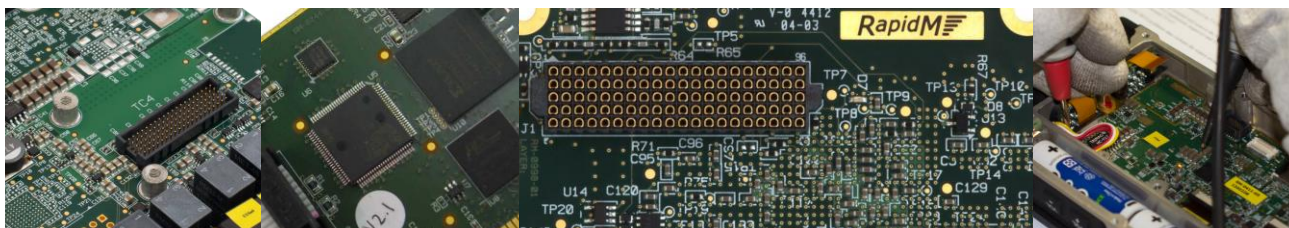
Embedded 2G ALE allows linking with other HF stations without operator intervention. A number of frequencies can be used to overcome variable HF propagation conditions.

INTEROPERABILITY STANDARD

2G ALE is the de facto interoperability standard for link setup.

RADIO CONTROL

2G ALE has an integrated *Radio Control Manager (RCM)* which can provide control for a large number of radios. Please contact *RapidM* for more details.



TC2 HARDWARE MODULE

TC2 HARDWARE		
SIZE	22 x 33 x 3.5 mm (w x d x h)	
POWER	3.3 VDC, (Hunt < 650 mW), (Deep-Sleep < 50 mW), (Off < 1 mW)	
TEMPERATURE	-40°C to +85°C (operating); -40°C to +85°C (storage)	
CONNECTORS	3x40-way fine pitch connector, Module Side: Hirose DF40C-40DP-0.4V(51), Host Side: DF40C-40DS-0.4V(51)	
PRIMARY INTERFACES	NOMINAL USE	DETAILS
UART A	Data, Config, Control	Default Rate: 115200 bps (300 to 921600 bps) Electrical: 3.3V LVCMOS
UART B	Radio Control	Rate: 50 to 921600 bps, Electrical: 3.3V LVCMOS
UART C	Spare (Customisable)	Rate: 50 to 921600 bps, Electrical: 3.3V LVCMOS
USART	DTE (TX, RX, RTS, CTS, DTR, DSR, DCD, TCLK, RCLK, RTCLK)	Rate: 128 000 to 300 bps in sync with modem Electrical: 3.3V LVCMOS (for external EIA-530-A)
ETHERNET	Data, Config, Control (optional)	On-board PHY, only requires external connector with integrated magnetics for full 10/100 Base T solution
ANALOGUE AUDIO	Baseband Audio In	Input: 1.4 Vp-p, ~ 20 kΩ input impedance
	Baseband Audio Out	Output: 2.2 Vp-p, ~ 16 Ω min. output load impedance
	Voice Microphone-In Voice Headphone-Out (independent volume control)	Input: 1.4 Vp-p, ~ 20 kΩ input impedance Output: 2.2 Vp-p, ~ 16 Ω min. output load impedance
	Voice Line-Out	Output: 2.2 Vp-p, ~ 600 Ω min. output load impedance
	Microphone Bias	Analogue Input
MCBSP 0	Data, Config, Control (build option)	Synchronous serial I/F McBSP port
MCBSP 1	Digital Baseband Audio (build option), and/or Digital Ear & Mic Audio (build option)	Synchronous serial I/F McBSP port
DISCRETES INPUTS	PTT Sense Deep Sleep Reset	Zeroise PPS (GPS Time Sync.) Hold-up Battery (RTC, Mem)
DISCRETE OUTPUTS	Radio Keyline	Ready

2G ALE - OPTION

AUTOMATIC LINK ESTABLISHMENT	
STANDARD	MIL-STD-188-141C App A, App B Compliant
WAVEFORMS	8-FSK according to MIL-STD-188-141C App A. & FED-STD 1045 Doppler lock and track (capture range up to ± 100 Hz, configurable) Adaptive multi-path tracking, Soft Golay decoding Adaptive triple word-phase synchronization, lock and track Linking probability performance 2-3 dB better than MIL-STD-188-141C specification No LP mode degradation Concurrent operation with other RM waveforms
PROTOCOL	Calling (IND, GRP, NET, All, Any, Wildcard Call), UUF, AMD, DTM(with or without CRC), (excluding: DBM, AQC-ALE) Calling POLLING, INLINK, RELINK (ALM support commands) Link Quality Analysis (LQA), Scanning (2 or 5 channels per second), Auto Sounding Automatic Hand-Off to Internal Modem
OCCUPANCY DETECTION	Traffic: MS 110A/B, S4539, S4285, S4415, S4529, S4481, 8-FSK, SSB Voice Duration: Variable
LINKING PROTECTION	
STANDARD	MIL-STD-188-141C App B FED-STD 1049
PROTECTION LEVEL	AL-0 (Clear) AL-1 AL-2
TIME SYNCHRONISATION	GPS as Time Source Time Exchange Protocol (Over the Air)
KEY STORAGE	2 x 32 LP Keys
KEY SELECTION	Manual Auto Advance (Daily)
RADIO CONTROL	
PROTOCOL	RAP1/RIPC, or Transceiver Protocol (custom implementation possible)

ORDERING INFORMATION	STOCK NUMBER	DESCRIPTION
TC2 (Hardware only)	TC2-1A-M-M0-6.5	Module: TC2 V1A SDM M0 (H/W) V6.5
Hardware Activation (Required)	TC2-02-HWAC-KEY	Key: TC2 H/W Activation (required)
2G ALE	TC2-SW-O-2G-6.5	SW MDL-2G ALE / MS 141B, App. A, B V6.5
OTHER SOFTWARE OPTIONS*	STOCK NUMBER	DESCRIPTION
HF Modem M1 Software Option	TC2-SW-O-M1-6.5	SW MDL-M1 (HF 110B, ISB, 110C 6kHz) V6.5
HF Modem M2 Software Option	TC2-SW-O-M2-6.5	SW MDL-M2 (HF S4285, S4539 9600) V6.5
HF Modem M3 Software Option	TC2-SW-O-M3-6.5	SW MDL-M3 (HF 110A, 4415 2400) V6.5
HF Modem M4 Software Option	TC2-SW-O-M4-6.5	SW MDL-M4 (HF MdM S4539 9600 bps) V6.5
3G ALE Fast Link Setup	TC2-SW-O-3G-6.5	SW MDL-3G ALE 4538 FLSU, Rad. Ctrl V6.5
3G ALE xDL Packet Data	TC2-SW-O-3D-6.5	SW MDL-3G ALE 4538 xDL Pckt Modem V6.5
Digital Voice 2400 bps	TC2-SW-O-DH-6.5	SW MDL-SDVS 2400bps Vocoder, Modem V6.5
Encryption 56-bit	TC2-SW-O-ED-6.5	SW MDL-COMSEC 56bt HVM/xDL/Voc V6.5
V/UHF Modem L1 (Wideband)	TC2-SW-O-L1-6.5	SW MDL-L1 (VHF B≤24kHz ≤128kbps) V6.5
V/UHF Modem L4 (Narrowband)	TC2-SW-O-L4-6.5	SW MDL-L4 (VHF B≤3kHz ≤16kbps) V6.5
EVALUATION KIT*	STOCK NUMBER	DESCRIPTION
TC2 Eval. Kit (Carrier Card, Break-out Cable, PSU)	TC2-EV-0011-SPC	Bundle: TC2 Eval Kit (TC2 excl.) V02

* Contact RapidM for Datasheets

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