

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:

- **Narrowband Data Modem:** Up to 16000 bps
- **Wideband Data Modem:** Up to 128000 bps
- **Forward Error Correction:** Coded modems
- **SWAP-C:** Optimal size, weight, power and cost
- **Activation Keys:** Unlock Functionality
- **Low Power:** N/B: 150 mW, W/B: 600 mW (typ.)
- **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
- **2G ALE:** MIL-STD-188-141B/C App A & B
- **3G ALE:** STANAG 4538 FLSU
- **Packet Modem:** STANAG 4538 xDL
- **Digital Voice:** 2400 bps Vocoder
- **Encryption:** 56-bit for Data/Voice

RELATED PRODUCTS (DATASHEETS AVAILABLE):

- **EF-256 Embedded Functions for Secure Voice & Data:**
 - AES-256 Encryption
 - Vocoder (600 – 4800 bps) TWELP* or MELPe**
 - AUTO Data Rate Change
 - Extended Range

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

** MELPe for US customers only

V/UHF VOICE & DATA MODEM

Radio Makers are faced with ever-expanding functional and performance demands when developing V/UHF radios.

The TC2 is a voice and data modem for narrowband and wideband V/UHF radios. The TC2 has very low power consumption. The module has DC coupled A/D inputs which are suitable to detect squelch break whilst the processor clock rate is very low.

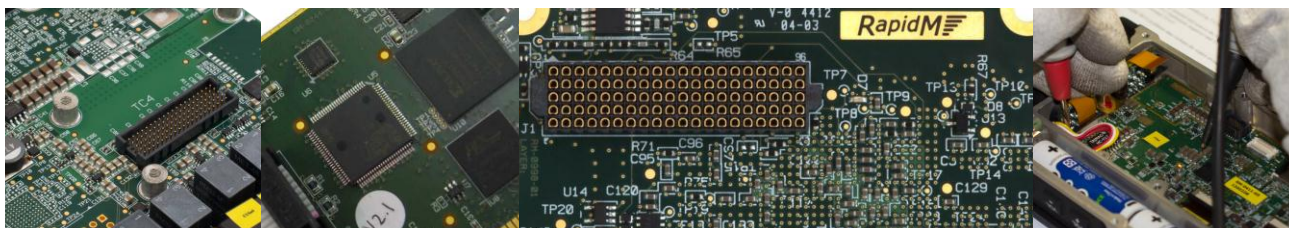
The modem features a high performance adaptive equalizer to deal with dynamic multi-path distortion associated with mobile communications. Doppler tracking capability ensures operation at relative speeds up to 250 km/h.

NARROWBAND DATA MODEM – OPTION

The TC2's narrowband modem option has a maximum coded data transfer rate of 16000 bps in a 3 kHz V/UHF channel. The power consumption for V/UHF (FM) receive is then as low as 150mW and as low as 50mW (deepsleep / standby). The modem is suitable for messaging, data and position transfer applications.

WIDEBAND DATA MODEM – OPTION

The TC2's wideband modem option can scale to the required bandwidth. The maximum coded rate is 128 000 bps in a 24 kHz channel. These modes are intended for integration into high-capacity V/UHF radios.



L1 TO L4: V/UHF DATA MODEM OPTIONS – FEATURES AND BENEFITS

The TC2 can host either narrowband or a wideband V/UHF data modem. The narrowband modem has a fixed 3 kHz bandwidth. The wideband modem offers a number of bandwidths (3, 6, 9, 12, 18 or 24 kHz). The low data rates (non-QAM) are suitable for use with a non-linear power amplifier (PA). Higher rates require a linear PA or can work with wideband FM or AM radios. FEC up to CL-9 is included, depending on the bandwidth and modulation used. All modes support AUTOBAUD. The *Ultra Short* interleaver is intended for IP traffic and *Medium* is for video streaming; *Long* is for high-capacity data traffic at low vehicle speeds (slow fading channels). The maximum Interleaver data block in each bandwidth corresponding to the highest data rate is indicated in the table below.

TC2 WAVEFORM SPECIFICATIONS

BANDWIDTH	DATA RATE [bps] (CODED)										INTERLEAVER [ms]			SOFTWARE OPTION			
	MODULATION										ULTRA SHORT	MEDIUM	LONG	L1	L2	L3	L4
	256-QAM	128-QAM	64-QAM	32-QAM	32-QAM	16-QAM	8-PSK	Q-PSK	BPSK	BPSK							
24 kHz	128000	96000	76800	64000	32000	25600	19200	9600	4800	2400	20	960	4800	✓			
18 kHz	96000	76800	57600	48000	25600	19200	9600	4800	2400	1200	40	960	4800	✓			
12 kHz	64000	51200	38400	32000	16000	12800	9600	4800	2400	1200	40	960	4800	✓	✓		
9 kHz	48000	38400	28800	24000	12800	9600	4800	2400	1200	600	80	960	4800	✓	✓		
6 kHz	32000	25600	19200	16000	8000	6400	4800	2400	1200	600	80	960	4800	✓	✓	✓	
3 kHz	16000	12800	9600	8000	4800	3200	2400	1200	600	300	160	960	4800	✓	✓	✓	✓

CL-3	CL-4	CL-5	CL-6	CL-7	CL-8	CL-9	LOS CHANNEL	MOBILE CHANNEL
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HARDWARE SPECIFICATIONS

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	Input: 1.4 Vp-p, ~ 20 kΩ input impedance
	Voice Headphone-Out (independent volume control)	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	Zeroise PPS (GPS Time Sync.) Reset Hold-up Battery (RTC, Mem)
DISCRETE OUTPUTS	Radio Keyline	Ready

ORDERING INFORMATION	STOCK NUMBER	DESCRIPTION
TC2 (Hardware only)	TC2-04-M-M0-V06	Module: TC2 V4 SDM M0 (H/W) V06
Hardware Activation (Required)	TC2-04-HWAC-KEY	Key: TC2 H/W Activation (required)
V/UHF Modem L1 (Wideband)	TC2-SW-O-L1-V06	SW MDL-L1 (VHF B≤24kHz ≤128kbps) V06
V/UHF Modem L2	TC2-SW-O-L2-V06	SW MDL-L2 (VHF B≤12kHz ≤64kbps) V06
V/UHF Modem L3	TC2-SW-O-L3-V06	SW MDL-L3 (VHF B≤6kHz ≤32kbps) V06
V/UHF Modem L4 (Narrowband)	TC2-SW-O-L4-V06	SW MDL-L4 (VHF B≤3kHz ≤16kbps) V06
OTHER SOFTWARE OPTIONS*	STOCK NUMBER	DESCRIPTION
HF Modem M1 Software Option	TC2-SW-O-M1-V06	SW MDL-M1 (HF 110B, ISB, 110C 6kHz) V06
HF Modem M2 Software Option	TC2-SW-O-M2-V06	SW MDL-M2 (HF S4285, S4539 9600) V06
HF Modem M3 Software Option	TC2-SW-O-M3-V06	SW MDL-M3 (HF 110A, 4415 2400) V06
HF Modem M4 Software Option	TC2-SW-O-M4-V06	SW MDL-M4 (HF MdM S4539 9600 bps) V06
2G ALE	TC2-SW-O-2G-V06	SW MDL-2G ALE / MS 141B, App. A, B V06
3G ALE Fast Link Setup	TC2-SW-O-3G-V06	SW MDL-3G ALE 4538 FLSU, Rad. Ctrl V06
3G ALE xDL Packet Data	TC2-SW-O-3D-V06	SW MDL-3G ALE 4538 xDL Pckt Modem V06
Digital Voice 2400 bps	TC2-SW-O-DH-V06	SW MDL-SDVS 2400bps Vocoder, Modem V06
Encryption 56-bit	TC2-SW-O-ED-V06	SW MDL-COMSEC 56bt HVM/xDL/Voc V06
EVALUATION KIT*	STOCK NUMBER	DESCRIPTION
TC2 EVAL. KIT (CARRIER CARD, BREAK-OUT CABLE, PSU)	TC2-EV-0011-SPC	Bundle: TC2 Eval Kit (TC2 excl.) V01

* Contact RapidM for Datasheets

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