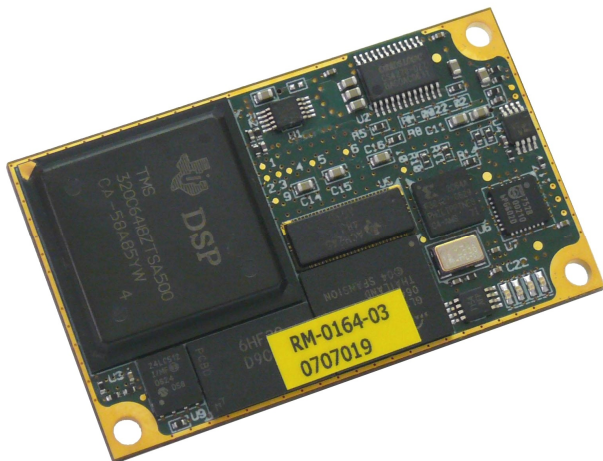


TC4: LF & HF Modem Module

High-speed LF & HF Modem Module

The **TC4** is a very compact high-performance LF & HF data modem module. It is intended for integration into LF & HF radio transceivers.



Key Features & Benefits

- 9600 bps in a 3 kHz SSB channel
- 19200 bps in 2-ISB channel
- MIL-STD-188-110A
- MIL-STD-188-110B
- STANAG 4539 (QAM)
- STANAG 4285 (PSK)
- STANAG 4529 (NB PSK)
- STANAG 4415 (robust)
- STANAG 4481 (P/FSK)
- STANAG 5065 MSK (MF)
- STANAG 5066 compliant
- Low power consumption (< 1.3 W)
- Compact size: 33 x 55 x 8 mm
- Easy system integration

Data Modem Function

Data is transferred at rates of up to 9600 bps full-duplex over a standard 3 kHz HF radio link and up to 19200 bps over a 2-ISB radio link. The **TC4** unit provides two independent audio ports to support this mode.

MIL-STD-188-110 A/B, STANAG 4539, 4285, 4529, 4415 & 4481 waveforms are supported.

Adaptive equalization mitigates the effects of channel multi-path. Convolutional encoding and soft-decision Viterbi decoding provides forward error correction.

Cancellation of narrowband co-channel interference is accomplished via adaptive tone excision capable of eliminating up to four signals.

Modem Software Packs

The waveforms that are included in the **TC4** can be customised by choosing from four software packs. Please see the reverse page for more details.

Control Protocol

The **TC4** uses a sub-set of the RAP1/RIPC Control Protocol (available at RapidM). This covers the following:

- General Hardware commands
- Audio commands
- Waveform commands

The **TC4** Control Protocol also enables the user to log key communication parameters:

- Signal to noise ratio
- Bit Error rate (for STANAG 5066 DRC decisions)
- Channel parameters (Doppler offset, Doppler spread, multi-path spread, number of paths etc.)

Interfaces

The **TC4** has the following interfaces on a single 100-way connector.

- **Data** Serial 3.3V LVTTTL, (for user data, flow ctrl.: CTS/RTS XON/XOFF)
- **Control** Serial 3.3V LVTTTL (for control of module & radio)
- **[Aux. Control]** Synchronous serial I/F McBSP port
- **Audio in** 10 k Ω unbalanced 1.5 V p-p
- **Audio out** 40 Ω unbalanced 2.0 V p-p
- **[Digital Audio]** Synchronous serial I/F McBSP port
- **Keyline** 3.3V LVTTTL
- **PTT Sense** 3.3V LVTTTL
- **PPS** Pulse-Per-Second (for ALE LP)
- **Speed select** Man-pack mode or other
- **Reset/P Down** Power down and/or H/W reset
- **Supply** 3.3VDC

STANDARD	CODING MODULATION		DATA RATES & CHARACTERISTICS	MILITARY MODEM SOFTWARE PACK			
				M1	M2	M3	M4
MIL-STD-188-110B APPENDIX C	C	PSK/ QAM	3200, 4800, 6400, 8000, 9600 bps	•	•	-	•
	U		12800 bps	•	•	-	•
STANAG 4539	C	PSK/ QAM	75, 150, 300, 600, 1200, 2400, 3200, 4800, 6400, 8000, 9600 bps	•	•	-	•
	U		12800 bps	•	•	-	•
MIL-STD-188-110B	C	PSK/ QAM	75, 150, 300, 600, 1200, 2400, 3200, 4800, 6400, 8000, bps	•	•	-	•
MIL-STD-188-110B APPENDIX F	C	PSK/ QAM	ISB: 9600, 12800, 16000, 19200 bps	•	-	-	-
MIL-STD-188-110A § 5.3	C	PSK	75, 150, 300, 600, 1200, 2400 bps	•	•	•	•
	U		4800 bps	•	•	•	•
STANAG 4415	C	PSK	NATO robust: 75 bps	•	•	•	•
STANAG 4285	C	PSK	75, 150, 300, 600, 1200, 2400 bps	•	•	•	-
	U		1200, 2400, 3600 bps	•	•	•	-
STANAG 4529	C	PSK	75, 150, 300, 600, 1200 bps	•	•	•	-
	U		600, 1200, 1800 bps	•	•	•	-
STANAG 4481 PSK	C	PSK	300 bps	•	•	•	-
STANAG 5065	C	FSK MSK	75 bps (FSK) 300 bps (MSK)	•	-	-	-
STANAG 4481 FSK	U	FSK	Single channel: 75 bps	•	•	•	-
			Multi-channel: 75 bps selectable carrier	•	•	•	-
FSK VARIABLE	U	FSK	Data Rates: 50, 75, 100, 150, 200, 300, 400, 600, 1200 bps Mark & Space Frequency: 350 to 3000 Hz	•	•	•	-

GENERAL	
ALL WAVEFORMS	Carrier capture range ± 200 Hz. Sync-on-Data Frequency tracking of up to 75 Hz changing at 3.5 Hz per second (triangular sweep)
BIT	Comprehensive BIT (Built-In-Test), Continuous error detection
PRESETS	20 Factory Presets, 20 Custom Presets
AGC CONTROL	Transceiver AGC control is necessary for optimum performance of QAM W/Fs
REMOTE CONTROL	All W/Fs and 2G/3G ALE settings are remote controllable via Remote Control Port
AUTOBAUD	All PSK waveforms except for STANAG 4285 & 4529. Sync-on-Data capability.
TONE EXCISION	Narrowband Interference cancellation of up to 4 signals

INTERFACES*	
SERIAL DATA PORT	Raw data modem port. Data Rate: 38400 to 115200 bps, async Flow ctrl: CTS/RTS, XON/XOFF. Electrical 3.3V LVTTTL
SERIAL CONTROL PORT	1) Control Port of TC4 (for configuration of modem parameters). Uses RAP1/RIPC or a simple ASCII protocol, OR 2) Radio Control port (ACS): Required for Automatic Channel Select function Data Rate: 4800 to 115200 bps, async.
AUX. CONTROL PORT	3) Control Port of TC4 (for configuration of modem parameters). Alternative to Serial Control Port. Supports encapsulated (user) data over RAP1/RIPC (available from <i>RapidM</i>) Synchronous serial I/F McBSP port.
DIG. BASEBAND AUDIO PORT	Synchronous serial I/F McBSP port. (please refer to TC4 modem module user manual for details)
AUDIO PORTS	Signal carrier = 12500 Hz, bandwidth = 5000 – 20000 Hz, -3dB. Analog Audio Input : Rx line: 10 k Ω unbalanced 1.5 V p-p. PTT sense line: 3.3V LVTTTL. Analog Audio Output : Tx line: 40 Ω unbalanced 2.0 V p-p. Keyline: 3.3V LVTTTL.
DISCRETE LINES	PPS Pulse-Per-Second (for ALE LP) Speed select Man-pack mode or other Reset/P Down Power down and/or H/W reset Supply 3.3VDC

* All **TC4** interfaces via a single 100-way fine pitch connector (Samtec YFT-20-xx-H-05-SB).

INSTALLATION		ENVIRONMENTAL	
SIZE	33 x 55 x 8mm (w x d x h)	TEMPERATURE	-40°C to +85°C (operating); -40°C to +90°C (storage)
POWER	3.3V DC, 0.83 Watt low-speed (man-pack) 1.27 Watt high-speed (vehicle & base)		

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