

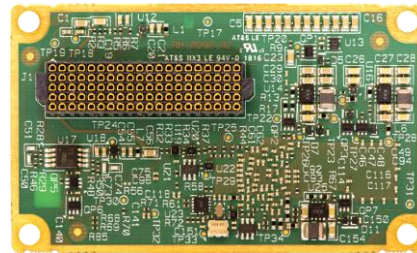
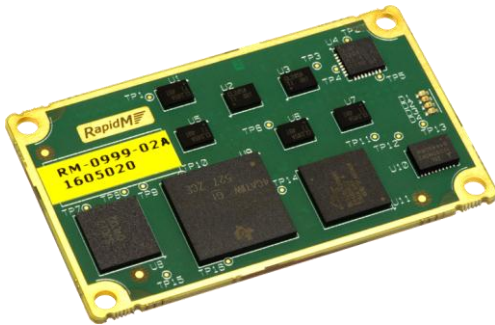
HF Modem

2G ALE

3G ALE

V/UHF Modem

56b, 2400 Vocoder



(Actual Size)

FEATURES & BENEFITS:

- **3G ALE:** STANAG 4538
- **FLSU:** Fast Link Setup
- **xDL Packet Modem:** Built-in ARQ
- **Radio Control:** Transceiver Protocol
- **Low Cost:** Hardware Installation
- **Activation Keys:** Unlock Functionality
- **Low Power:** 600 mW (typical)
- **Compact Size:** 33 x 55 x 6 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
- **Digital Voice:** 2400 bps Vocoder
- **Encryption:** 56-bit for Data/Voice
- **VHF / UHF Modem:** Up to 64 000 bps (15 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 Modem
 - Extended Range, const. amplitude modulation

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

** MELPe for US customers only

3RD GENERATION HF

The TC4-LP is ideal for radio makers who have previously integrated the older TC4 module into their designs. The TC4-LP adds new functionality, uses less power and offers extended product availability.

The STANAG 4538 Fast Link Setup (FLSU) and Packet Data (xDL) is available as software options for the TC4-LP module. It is intended for integration into HF transceivers and other communication devices. 3G ALE is the best choice for interoperating advanced HF data and voice services, especially in adverse channel conditions. The TC4-LP is optimized for low power consumption.

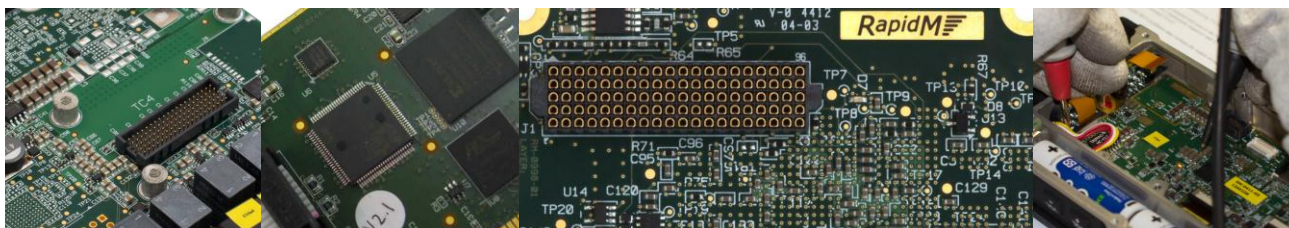
FAST LINK SETUP

In a single channel environment, 3G ALE offers very robust selective calling in support of data applications and voice. In a multi-channel environment, the effective bandwidth is also increased.

3G ALE offers more robust link setup compared with 2G ALE.

PACKET DATA

The xDL option offers a adaptive robust packet data modem with very effective ARQ, especially for penetration of noisy and congested channels.



TC4-LP HARDWARE		
SIZE	33 x 55 x 6 mm (w x d x h)	
WEIGHT	9.1 g	
POWER	3.3 VDC, (Hunt < 650 mW), (Deep-Sleep < 50 mW), (Off < 2 mW)	
TEMPERATURE	-40°C to +85°C (operating); -40°C to +85°C (storage)	
CONNECTOR	Single 100-way fine pitch connector (Samtec YFT-20-xx-H-05-SB)	
PRIMARY INTERFACES	USE	DETAILS
UART A	Data, Config, Control, or Raw Data (build option)	Default Rate: 115200 bps (4800 - 115200) Electrical: 3.3V LVTTL Flow Ctrl (Raw Data): CTS/RTS, XON/XOFF
UART B	Radio Control, or Config, Control (build option)	Rate: 4800 to 115200 bps Electrical: 3.3V LVTTL Flow Ctrl: None
AUDIO 1	Baseband Audio SSB/USB (Analogue)	Tx (output): < 10 Ω unbalanced 2.0 V p-p Rx (input): ~ 20 kΩ unbalanced 2.2 V p-p
AUDIO 2	Baseband Audio LSB (Analogue), or Ear & Mic Audio (Analogue)	Tx (output): < 10 Ω unbalanced 2.0 V p-p Rx (input): ~ 20 kΩ unbalanced 2.2 V p-p
MCBSP 0	Data, Config, Control (build option)	Synchronous serial I/F McBSP port
MCBSP 1	Digital Baseband Audio (build option), or Digital Ear & Mic Audio (build option)	Synchronous serial I/F McBSP port
DISCRETE OUTPUT	Radio Keyline	Active high
DISCRETE INPUTS	PTT Sense Input	Active low
	PPS (GPS Time Sync.)	Rising edge
	Reset / Power Down	Active low
SPEED SELECT	Power Saving (Optional)	Active low, 4 pin input

STANAG 4538 FAST LINK SETUP (FLSU)	
FLSU PROTOCOL	Excellent performance in degraded HF channels by means of robust burst waveforms. Automatic channel selection. Synchronous and asynchronous link set up. Point-to-point, multicast and broadcast calls. Combined or separate calling and traffic channels. Combined and simultaneous link set up and traffic set up. Channel quality estimation by means of LQA sounds and LQA exchanges. Handover to circuit data waveform or voice.
LINKING PROTECTION	SoDark 3 and 6 Time-of-day distribution by HF means, as a backup to GPS time-of-day distribution.
WAVEFORMS	BW1, BW2, BW3, BW4 & BW5 according to STANAG 4538. Doppler lock and track (capture range up to +/- 100 Hz, configurable) Adaptive multi-path tracking (up to 10 ms spread, for FLSU & LDL) Linking probability performance 2-3dB better than MIL-STD-188-141C specification
OCCUPANCY DETECTION	Occupancy detection (listen before transmit) in accordance with STANAG 4538 MS 110A/B, STANAG 4539 / MS 110B, MS 110A, S4415 S4285, FSK, ALE 2G (8-FSK), SSB voice

STANAG 4538 xDL PACKET MODEM	
GENERAL	Integrated with STANAG 4538 FLSU (Required)
LDL	Low-Latency Data Link, reliable packet transfer LDL-32, LDL-64, LDL-96, LDL-128, LDL-160, LDL-192, LDL-224, LDL-256, LDL-288, LDL-320, LDL-352, LDL-384, LDL-416, LDL-448, LDL-480, LDL-512.
HDL	High-rate Data Link, reliable packet transfer HDL-3, HDL-6, HDL-12, HDL-24.

GENERAL	
STANDARD	STANAG 4538 Compliant
INTEROPERABILITY	Tested
CONFIGURATION & CONTROL	Protocol: RAP1/RIPC (RapidM Proprietary). Persistent configuration (via EEPROM (last MIB), via FLASH (MIB presets)).

RADIO CONTROL	
PROTOCOL	RAP1/RIPC, or Transceiver Protocol (custom implementation possible)

ORDERING INFORMATION	STOCK NUMBER	DESCRIPTION
TC4-LP (Hardware only)	T4L-02-M-M0-V06	Module: TC4-LP V2 SDM M0 (H/W) V06
Hardware Activation (Required)	T4L-02-HWAC-KEY	Key: TC4-LP H/W Activation (required)
3G ALE Fast Link Setup	TC4-SW-O-3G-V06	SW MDL-3G ALE 4538 FLSU, Rad. Ctrl V06
3G ALE xDL Packet Data	TC4-SW-O-3D-V06	SW MDL-3G ALE 4538 xDL Pckt Modem V06

OTHER SOFTWARE OPTIONS*	STOCK NUMBER	DESCRIPTION
HF Modem M1 Software Option	TC4-SW-O-M1-V06	SW MDL-M1 (HF 110B, F ISB 2x9600) V06
HF Modem M2 Software Option	TC4-SW-O-M2-V06	SW MDL-M2 (HF S4285, S4539 9600) V06
HF Modem M3 Software Option	TC4-SW-O-M3-V06	SW MDL-M3 (HF 110A, 4415 2400) V06
HF Modem M4 Software Option	TC4-SW-O-M4-V06	SW MDL-M4 (HF MdM S4539 9600 bps) V06
2G ALE	TC4-SW-O-2G-V06	SW MDL-2G ALE / MS 141B, App. A, B V06
Digital Voice 2400 bps	TC4-SW-O-DH-V06	SW MDL-SDVS 2400bps Vocoder, Modem V06
Encryption 56-bit	TC4-SW-O-ED-V06	SW MDL-COMSEC 56bt HVM/xDL/Voc V06
V/UHF Modem L1 (Wideband)	TC4-SW-O-L1-V06	SW MDL-L1 (VHF B≤24kHz ≤128kbps) V06
V/UHF Modem L4 (Narrowband)	TC4-SW-O-L4-V06	SW MDL-L4 (VHF B≤3kHz ≤16kbps) V06

EVALUATION KIT*	STOCK NUMBER	DESCRIPTION
TC4-LP Eval. Kit (Carrier Card, Break-out Cable, PSU)	TC4-EV-0000-SPC	Bundle: TC4 Eval Kit (TC4 excl.) V02

* Contact RapidM for Datasheets

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