

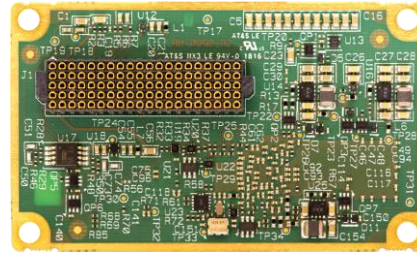
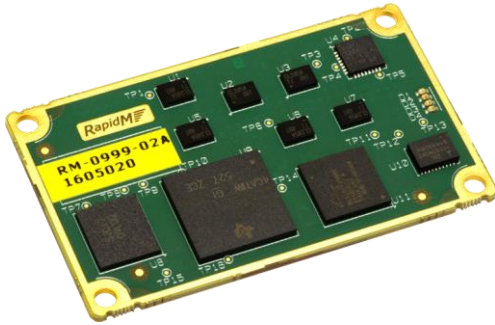
HF Modem

2G ALE

3G ALE

V/UHF Modem

56b, 2400 Vocoder



(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)
- **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
- **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 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

### AUTOMATIC LINK ESTABLISHMENT

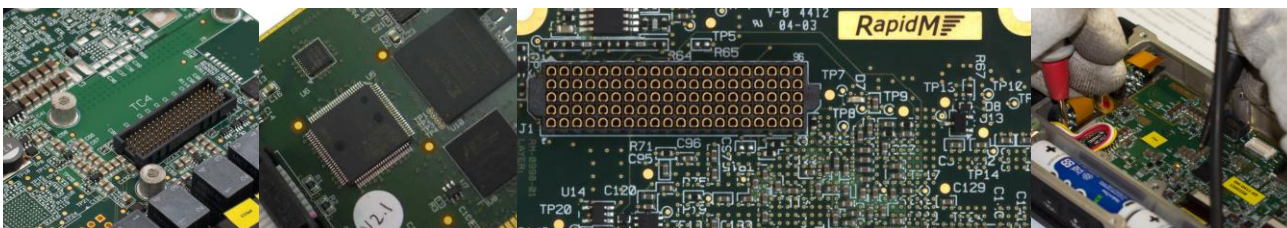
The 2G ALE controller is available as a software option for the TC4-LP. It is intended for integration into HF transceivers and other communication devices. The TC4-LP is optimized for low power consumption.

### NO OPERATOR INTERVENTION

Embedded 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.



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 LVTTTL 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 LVTTTL 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

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
TC4-LP (Hardware only)	T4L-02-M-M0-6.5	Module: TC4-LP V2 SDM M0 (H/W) V6.5
Hardware Activation (Required)	T4L-02-HWAC-KEY	Key: TC4-LP H/W Activation (required)
2G ALE	TC4-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	TC4-SW-O-M1-6.5	SW MDL-M1 (HF 110B, ISB, 110C 6kHz) V6.5
HF Modem M2 Software Option	TC4-SW-O-M2-6.5	SW MDL-M2 (HF S4285, S4539 9600) V6.5
HF Modem M3 Software Option	TC4-SW-O-M3-6.5	SW MDL-M3 (HF 110A, 4415 2400 ) V6.5
HF Modem M4 Software Option	TC4-SW-O-M4-6.5	SW MDL-M4 (HF Mdm S4539 9600 bps) V6.5
3G ALE Fast Link Setup	TC4-SW-O-3G-6.5	SW MDL-3G ALE 4538 FLSU, Rad. Ctrl V6.5
3G ALE xDL Packet Data	TC4-SW-O-3D-6.5	SW MDL-3G ALE 4538 xDL Pcktd Modem V6.5
Digital Voice 2400 bps	TC4-SW-O-DH-6.5	SW MDL-SDVS 2400bps Vocoder, Modem V6.5
Encryption 56-bit	TC4-SW-O-ED-6.5	SW MDL-COMSEC 56bt HVM/xDL/Voc V6.5
V/UHF Modem L1 (Wideband)	TC4-SW-O-L1-6.5	SW MDL-L1 (VHF B≤24kHz ≤128kbps) V6.5
V/UHF Modem L4 (Narrowband)	TC4-SW-O-L4-6.5	SW MDL-L4 (VHF B≤3kHz ≤16kbps) V6.5
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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