



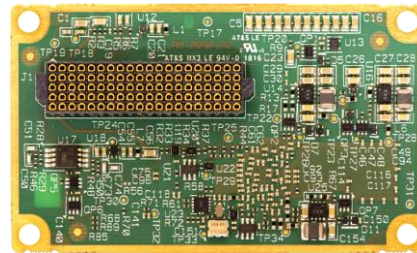
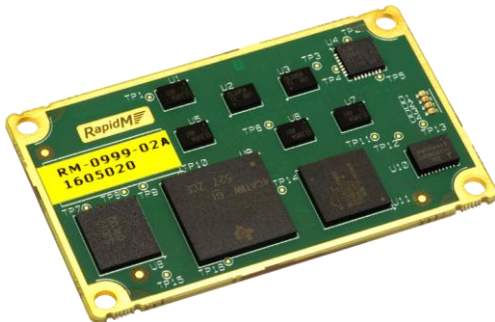
HF Modem

2G ALE

3G ALE

V/UHF Modem

56b, 2400 Vocoder



(Actual Size)

FEATURES & BENEFITS:

- **Digital Voice:** 2400 bps MELPe/TWELP Vocoder
- **Encryption:** 56-bit for Data/Voice
- **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
- **2G ALE:** MIL-STD-188-141B/C App A & B
- **3G ALE:** STANAG 4538 FLSU
- **Packet Modem:** STANAG 4538 xDL
- **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

HIGH-SPEED MODEM MODULE

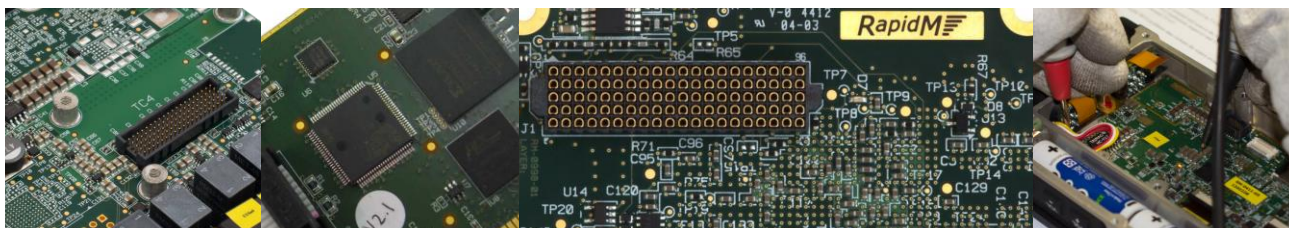
The 2400 bps MELPe/TWELP Vocoder and 56-bit encryption is available as software options for the TC4-LP. The TC4-LP is optimized for low power consumption. It is intended for integration into HF & V/UHF transceivers and other communication devices.

DIGITAL VOICE

The 2400 bps digital MELPe/TWELP vocoder offers the ability to digitally encrypt voice communications. Sound quality is improved on noisy channels.

ENCRYPTION

The 56-bit encryption offers an appropriate level of security for HF & V/UHF communication. Voice and data traffic is encrypted.



| 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 |

| ENCRYPTION | |
|-------------------|---|
| KEY LENGTH | 56-bit |
| KEY STORAGE | Up to 256 keys Keys are securely stored (encrypted). Zeroize function to permanently erase all stored keys. |
| KEY FILL | Key Management System 56-bit (PC Application) or RAP1 control protocol |
| ENCRYPTED TRAFFIC | Digital Voice, HF Modem Data, 3G Packet Data |

| DIGITAL VOICE | | | | | | | | | |
|------------------|--|--------------|-------|-------------|-----------------|---------------------|-----------------------------|-----------------------------------|------|
| VOCODER | MELPe*: Mixed Excitation Linear Prediction enhanced TWELP**: RapidM Low Rate Vocoder & Modem | | | | | | | | |
| VOCODER RATES | 2400 bps | | | | | | | | |
| MODEM | RapidM proprietary digital voice modem. Insures tight coupling between vocoder, encryption and modem. | | | | | | | | |
| PERFORMANCE | VOCODER RATE [bps] | LATENCY [ms] | PESQ | CHANNEL USE | SPEECH QUALITY | | | UNDERSTAND-ABILITY LIMIT SNR [dB] | |
| | | | | | INTELLIGIBILITY | SPEAKER RECOGNITION | LATENCY & EMOTIONAL CONTENT | CCIR POOR | AWGN |
| | 2 400 | 450 | 3.1 | Gnd/W | Very Good | Good | Acceptable | 6.5 | 0.5 |
| 2 400, robust*** | 1400 | 3.0 | Sky/W | Good | Acceptable | Acceptable | 5.0 | -0.5 | |

* TWELP voice coding by DSP Innovations Inc.(www.dspini.com)
** MELPe US & NATO end-users (subject to approval)
*** Future feature

| 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) |
| 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 |
| 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 |
| 2G ALE | TC4-SW-O-2G-6.5 | SW MDL-2G ALE / MS 141B, App. A, B 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 Pckt Modem 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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Rapid Mobile Pty (Ltd)
Tel: +27 12 349 0000
Fax: +27 12 349 0010
Email: info@rapidm.com
Web: www.rapidm.com

Apex Corporate Park
Quintin Brand Street
Perseuor Park
Pretoria, South Africa
0020



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Revision: T4L_56B_EN_02A