

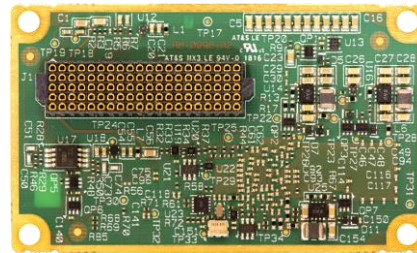
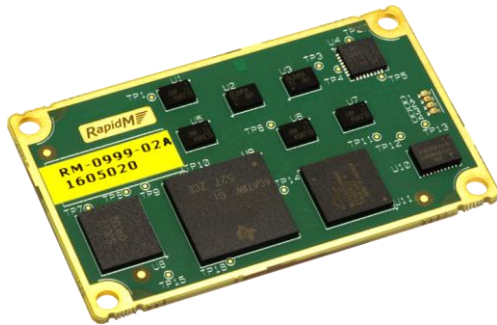
HF Modem

2G ALE

3G ALE

V/UHF Modem

56b, 2400 Vocoder



(Actual Size)

FEATURES & BENEFITS:

- **SSB Data Modem:** 9600 bps in 3 kHz
- **ISB Data Modem:** 19200 bps in 2 x 3 kHz
- **MIL-STD 110C Modes:** 32,000 bps in 6 kHz
- **Standards Compliance:** MIL-STD & STANAG
- **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):

- **3G ALE:** STANAG 4538 FLSU
- **Packet Modem:** STANAG 4538 xDL
- **Digital Voice:** 2400 bps Vocoder
- **Encryption:** 56-bit for Data/Voice
- **VHF / UHF Modem:** Up to 128 000 bps (24 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 PERFORMANCE – LOW POWER

The TC4-LP can host high-performance SSB, ISB and wideband HF data modems. It is intended for integration into LF & HF radio transceivers.

The TC4-LP is optimized for low power consumption. The module has DC coupled A/D inputs which are suitable to detect squelch break whilst the processor is clock rate is very low.

SSB & ISB DATA MODEM OPTIONS

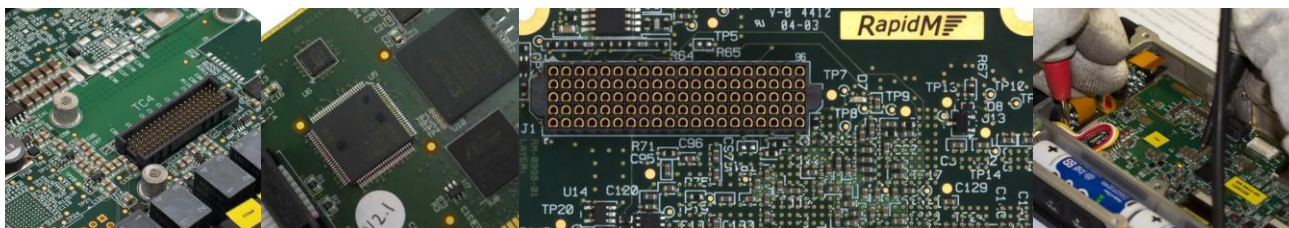
The waveforms that are included in the TC4-LP can be customised by choosing the appropriate software option (M1 – M4). Please see the reverse page for more details and ordering information.

MIL-STD 110C DATA MODEM MODES

The wideband MIL-STD-188-110C modem modes for 3 kHz and 6 kHz bandwidth can be hosted on the TC4-LP. The maximum coded data rate is 32,000 bps in a 6 kHz channel. These modes offer a performance advantage over 110A and 110B modems.

DATA MODEM FUNCTION

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.



TC4-LP HARDWARE MODULE

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

TC4-LP W/FORMS

GENERAL	
CHARACTERISTICS	Carrier capture range ±100 Hz. Sync-on-Data Frequency tracking of up to 3.5 Hz per second (triangular sweep)
AUTOBAUD	All MIL-STD waveforms, STANAG 4539 and STANAG 4415
TONE EXCISION	Narrowband Interference cancellation of up to 4 tones for data rates < 300 bps, FSK cancellation, CW cancellation
PRESET	Factory and Custom Presets

SSB & ISB - OPTIONS

WAVEFORM STANDARDS	MODULATION	DATA RATES & CHARACTERISTICS	SOFTWARE OPTIONS			
			M1	M2	M3	M4
MIL-STD-188-110C App D	PSK/QAM	3 kHz: [75,150, 300, 600, 1200, 1600, 2400, 3200, 4800, 6400, 8000, 9600, 12000, 16000 bps] (Coded) 6 kHz: [150, 300, 600, 1200, 2400, 3200, 6400, 9600, 12800, 16000, 19200, 24000, 32000 bps] (Coded)	✓	-	-	-
MIL-STD-188-110B App C	PSK/QAM	[3200, 4800, 6400, 8000, 9600 bps] (Coded)	✓	✓	-	✓
STANAG 4539	PSK/QAM	[75, 150, 300, 600, 1200, 2400, 3200, 4800, 6400, 8000, 9600 bps] (Coded)	✓	✓	-	✓
MIL-STD-188-110B	PSK/QAM	[75, 150, 300, 600, 1200, 2400, 3200, 4800, 6400, 8000, 9600 bps] (Coded)	✓	✓	-	✓
MIL-STD-188-110B App F	PSK/QAM	ISB: [9600, 12800, 16000, 19200 bps] (Coded)	✓	-	-	-
MIL-STD-188-110A § 5.3	PSK	[75, 150, 300, 600, 1200, 2400 bps] (Coded), 4800 bps	✓	✓	✓	✓
STANAG 4415	PSK	NATO robust: 75 bps (Coded)	✓	✓	✓	✓
STANAG 4285	PSK	[75, 150, 300, 600, 1200, 2400 bps] (Coded), 1200, 2400, 3600 bps	✓	✓	✓	-
STANAG 4529	PSK	[75, 150, 300, 600, 1200 bps] (Coded), 600, 1200, 1800 bps	✓	✓	✓	-
STANAG 4481 PSK	PSK	300 bps (Coded)	✓	✓	✓	-
STANAG 5065 LF	FSK MSK	75 bps (FSK) 300 bps (MSK) (Coded)	✓	-	-	-
STANAG 4481 FSK	FSK	75 bps; (single channel / multi-channel, selectable carrier)	✓	✓	✓	-
FSK VARIABLE	FSK	50, 75, 100, 150, 200, 300, 400, 600, 1200 bps; Mark & Space Frequency: 350 to 3000 Hz	✓	✓	✓	-

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)
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

OTHER SOFTWARE OPTIONS*	STOCK NUMBER	DESCRIPTION
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 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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