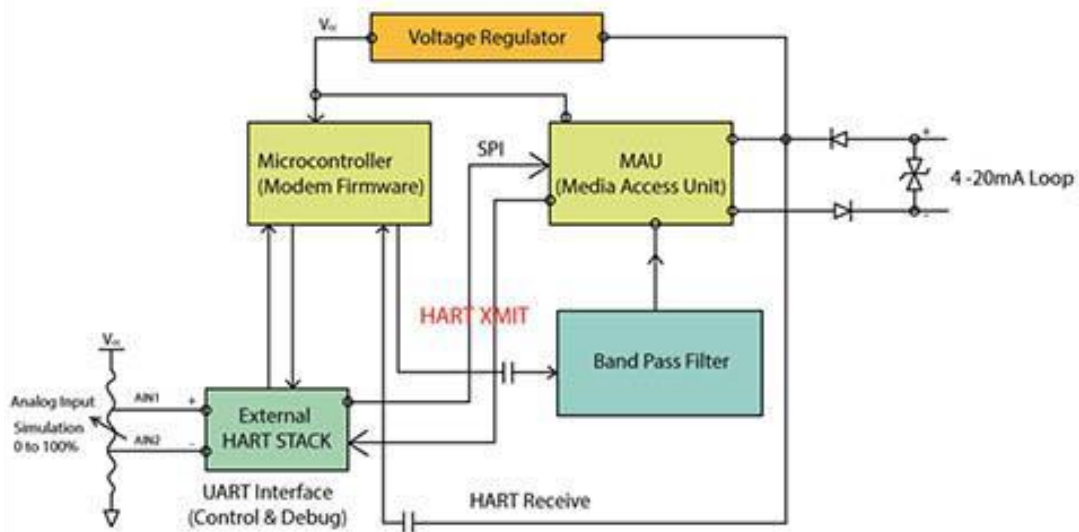


9600/1200 BPS HART-DS™ MODEM

Smart Embedded Systems (SES), Inc., Silicon Valley Company, is offering multispeed modem capability using System on a Chip (SoC) and SES is the first company for having developed a very compelling and cost effective Patented Soft Modem technology (strictly firmware based) solution for Industrial Automation applications. Our modem design enables compliance with HART® "C8PSK and FSK Physical Layer Specifications". With our 9600 bps modem, we support the Industry standard HART Communication Protocol (HART Stack 7.0) while offering at least 5 times the number of packets per second.

OUR SOLUTION:

System on a chip (SoC) Based 9600/1200 BPS (C8PSK/FSK)MODEM:



Our 9600/1200 BPS modem is firmware based; implemented with Texas Instruments (TI) MS430 microcontroller. Besides modem functionality, we also offer the following on the same microcontroller:

HART Soft Modem

Benefits

- Lower cost
- Lower power 400 uA FSK mode and 900 uA 9600 bps (C8PSK mode) at VCC of 2.7V
- Works with any third party HART stack
- Increased throughput
- Low power table lookup based modulator using SES patented methods
- Smart Phase and Timing detection of incoming signals using SES patented methods
- High reliability
- Flexibility and field upgradable with these options:
 - a. C8PSK & FSK modes
 - b. FSK mode; upgrade to C8PSK and FSK modes
 - c. FSK mode only
- Smaller footprint

System on a Chip (SOC) Based Solution

- Uses off-the-shelf microcontroller
- Uses Low voltage FRAM based microcontroller for low power
- SES HART 7.0 Stack can run on the same microcontroller
- Sensor Interface
- Capability to add security with MSP430 with H/W AES encryption

HART C8PSK (9600) Modem Characteristics

Coherent 8 Phase Shift Keying
 Bits per symbol : 3 bits
 8 Symbols per HART C8PSK Specifications

Carrier Frequency : 3200Hz. $\pm 1\%$
 Data Rate : 9600 Bits Per Second $\pm 1\%$
 Supports Normal Analog Wiring

HART FSK Modem Characteristics

Binary Frequency Shift Keying
 Bits per symbol : 1
 Mark = 1200Hz; Space = 2200Hz $\pm 1\%$

Carrier Frequency : 1700Hz.
 Data Rate : 1200 Bits Per Second $\pm 1\%$
 Supports Normal Analog Wiring

Modulator Characteristics

Carrier Startup : Less than 3 symbols
 Carrier Stop : Less than 3 symbols

Demodulator Characteristics

Receive Equalizer : Fractional Adaptive, Learning
 Carrier detect Threshold : Programmable
 Dynamic Range : 15 dB minimum
 (150mV – 900mV)
 PSK Assertion : Less than 10ms
 C8PSK to FSK : automatic
 Receive Filtering for Analog signal Interference rejection: 20 dB minimum

RX Signal CD On : 80mV - 120mV
 CD On time : 1ms - 4ms
 CD off time : 5ms - 10ms
 Rx Signal Level : 120mV - 1000mV

Applications:

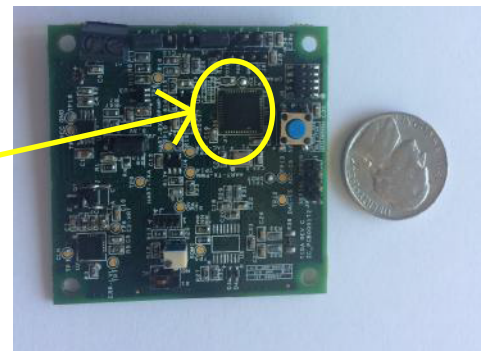
- A. Process control and factory automation
- B. Temperature sensors
- C. Flow transmitters
- D. Level transmitters
- E. Pressure transmitters

Board Support Package for Evaluation includes:

- A. Board
- B. Schematic
- C. BOM (Bill Of Materials)
- D. HART Stack Binary code
- E. SOFT Modem Binary code

SES has been awarded four patents related to its soft modem technology for HART devices: 9106488, 9184965, 9203665, 9281978 and additional patents pending.

Modem and/or
Stack circuitry



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