SMART EMBEDDED SYSTEMS

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

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**HART C8PSK (9600) Modem Characteristics**

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

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

**HART FSK Modem Characteristics**

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

Carrier Frequency : 1700Hz.  
Data Rate : 1200 Bits Per Second ±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

**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

**Contact**

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The HART Communications Protocol is the global standard for smart process instrumentation. HART® is a registered trademark and HART-DS® a trademark of FieldComm Group. (www.fieldcommgroup.org)

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

[Image of a circuit board and a coin]