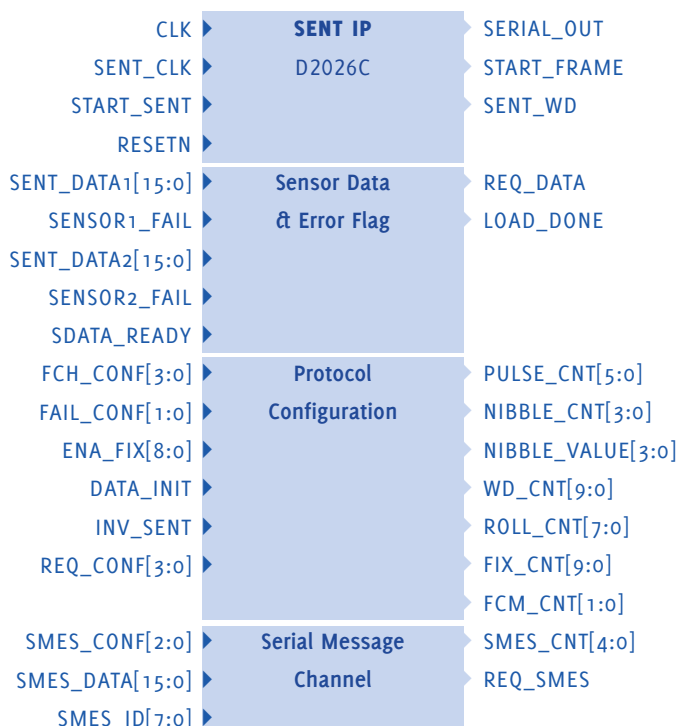# IMMS



## SENT Transmitter IP

The soft IP module D2026C is a silicon-proven Verilog implementation of a flexible configurable SENT transmitter according to SAE standard J2716 JAN2010 "SENT – Single Edge Nibble Transmission for Automotive Applications". The SENT protocol constitutes a low-cost alternative to the LIN and CAN communication standards for digital point-to-point transmission of sensor data. The IP module is provided in a technology-independent Verilog RTL format for implementation in FPGAs or ASICs.

### DELIVERABLES

- RTL description in Verilog HDL (IEEE Standard 1364-2001 LRM)
- Testbenches in Verilog HDL including simulation setup & log files
- Coverage and linting report
- Synthesis example including setup, reports & resultant netlist
- Comprehensive documentation

### KEY FEATURES

- Transmission of up to 16-bit data from two independent sensors
- Supports inverted SENT protocol
- Supports fast-channel multiplexing
- Supports programmable fixed message length
- Supports short and enhanced serial message format
- Internal checksum calculation
- Configurable during operation

### PIN DIAGRAM

```
        CLK  ▶   SENT IP      SERIAL_OUT
   SENT_CLK  ▶   D2026C       START_FRAME
 START_SENT  ▶                SENT_WD
     RESETN  ▶
SENT_DATA1[15:0] ▶  Sensor Data   REQ_DATA
SENSOR1_FAIL ▶  & Error Flag   LOAD_DONE
SENT_DATA2[15:0] ▶
SENSOR2_FAIL ▶
 SDATA_READY ▶
  FCH_CONF[3:0] ▶  Protocol      PULSE_CNT[5:0]
  FAIL_CONF[1:0] ▶ Configuration NIBBLE_CNT[3:0]
   ENA_FIX[8:0] ▶                NIBBLE_VALUE[3:0]
   DATA_INIT  ▶                  WD_CNT[9:0]
   INV_SENT   ▶                  ROLL_CNT[7:0]
  REQ_CONF[3:0] ▶                FIX_CNT[9:0]
                                 FCM_CNT[1:0]
 SMES_CONF[2:0] ▶ Serial Message SMES_CNT[4:0]
 SMES_DATA[15:0] ▶  Channel      REQ_SMES
   SMES_ID[7:0] ▶
```

### MAIN I/O SIGNALS

| Name | I/O | Description |
|---|---|---|
| CLK | Input | Main system clock |
| SENT_CLK | Input | Clock tick rate |
| RESETN | Input | System reset (active low) |
| START_SENT | Input | Trigger SENT message transmission |
| SERIAL_OUT | Output | Digital SENT output |
| START_FRAME | Output | SENT frame transmission started |
| SENT_DATA1[15:0] | Input | Sensor 1 data |
| SENSOR1_FAIL | Input | Sensor 1 error |
| SENT_DATA2[15:0] | Input | Sensor 2 data |
| SENSOR2_FAIL | Input | Sensor 2 error |
| REQ_DATA | Output | Request new fast-channel data |
| SDATA_READY | Input | Valid sensor data available |
| LOAD_DONE | Output | Input data received |
| FCH_CONF[3:0] | Input | Configuration of fast-channel data allocation |
| FAIL_CONF[1:0] | Input | Configuration of error treatment |
| ENA_FIX[8:0] | Input | Configuration of fixed SENT message length |
| DATA_INIT | Input | Data initialization during fast-channel multiplexing |
| INV_SENT | Input | Enable inverted SENT protocol |
| REQ_CONF[3:0] | Input | Configuration of data request |
| SMES_CONF[2:0] | Input | Configuration of Serial Message Channel |
| SMES_DATA[15:0] | Input | Serial Message Channel data |
| SMES_ID[7:0] | Input | Serial Message Channel ID |
| REQ_SMES | Output | Request new serial message data |