The product described in this document has not been fully tested to ensure conformance to the requirements outlined below. Therefore, TE Connectivity (TE) makes no representation or warranty, express or implied, that the product will comply with these requirements. Further, TE may change these requirements based on the results of additional testing and evaluation. Contact TE Engineering for further details.

AmbiMate Sensor Module

1. SCOPE

1.1. Content

This specification covers performances, tests and quality requirements of the AmbiMate Sensor Module (ASM) with part numbers Base Part Numbers 2316851, 2316852, 2314277, and 2314291, applied according application specification 114-133092. See part number list in paragraph 3.7.

The AmbiMate Sensor Module is a PCB subsystem that includes temperature, humidity, occupancy(motion), light level, optional CO2 (VOC) gas sensor, and optional audio (microphone) that can be connected to an external system via an I2C bus. Applications include:

- Smart Home / Office
- Thermostat
- Indoor Lighting Control

1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 1 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

1.3. Qualification Test Results

Successful qualification testing on the subject product line has not been completed. The Qualification Test Report number will be issued upon successful qualification testing.

2. APPLICABLE DOCUMENTS AND FORMS

The following documents and forms constitute a part of this specification to the extent specified herein. Unless otherwise indicated, the latest edition of the document applies.

2.1. TE Documents

- C-2316851: Customer Drawing, AmbiMate MSM4 Sensor Module, Castellation, with or without microphone
- C-2316852: Customer Drawing, AmbiMate MSM4 Sensor Module, Castellation, with CO2, with or without microphone
- C-2314277: Customer Drawing, AmbiMate MSM4 Sensor Module, Thru Hole, with or without microphone
- C-2314291: Customer Drawing, AmbiMate MSM4 Sensor Module, Thru Hole, with CO2, with or without microphone
- 114-133092: Application Specification
- 114-133115: Application Specification: Application software development kit
- 501- 19264: Qualification Test Report
- 501- 19257: EMC Test Report
- 502-XXX: AmbiMate: Motion Sensor Test Report
- 502-XXX: AmbiMate: VOC/eCO2 Test Report

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For latest revision and Regional Customer Service, visit our website at www.te.com
PRODUCT INFORMATION 1-800-522-6752

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2.2.   Industry Documents

- EN 50491-5-2   General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) - Part 5-2: EMC requirements for HBES/BACS used in residential, commercial and light industry environment
- EN 50491-5-1   General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) - Part 5-1: EMC requirements, conditions and test set-up
- EIA-364:   Electrical Connector/Socket Test Procedures Including Environmental Classifications
- I2C: Inter-Integrated Circuit bus protocol. Multi-master, multi-slave, single-ended, serial computer bus (AN10216-01, NXP)

3.   REQUIREMENTS

3.1.   Design and Construction

Product shall be of the design, construction, materials and physical dimensions specified on the applicable product drawing.
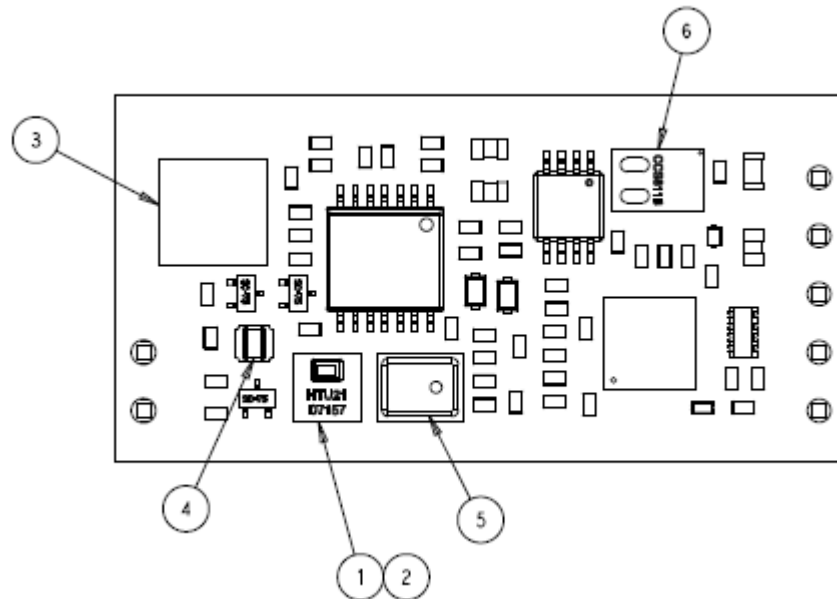
1: Temperature, 2: Humidity, 3: Motion, 4: Light, 5: Audio, 6: eCO$_2$/VOC

3.2.   AmbiMate Configuration

The AmbiMate is a 3.3 V dc device, therefore the I2C communication is at 3.3 V dc. This ensures compatibility with 3.3 V dc devices, but require a logic level shifter for compatibility with 5 V I2C devices. The AmbiMate ensures clock stretching, which enables the device to hold the SCL down when it transmits data. Please make sure the I2C master is capable of clock stretching to ensure valid data.

The AmbiMate works in optimal conditions when the baudrate is set at 10kbaud to ensure data is valid. This will not have any influence on the functionality of the AmbiMate.

3.3.   Software design guidance

1.   I2C address of the AmbiMate is fixed at 0x2A

2.   Before every read out, register 0xC0 must be initialized to scan the desired register set. 0xFF indicates a scan of the complete register set

3. Data of Temperature and Humidity have a 0.1-degree/percent resolution

4. Data of Light, Audio, eCO_2 and VOC are in Lux, Decibels, PPM and PPB

5. Data of Battery Voltage uses a conversion: (Data / 1024.0) * (3.3 / 0.330)

6. eCO_2/VOC sensor does have an internal sample rate of 60 seconds

7. All other sensors do have a selectable sample rate of 0.5 seconds or more

8. Registers 0x00 to 0x0E provide sensor data on a detailed level

3.4. Ratings

The product must be stored in a temperature range of -40 °C to 85 °C.
Operating temperature: -5 °C to +50 °C.

3.5. Test Requirements and Procedures Summary

Unless otherwise specified, all tests shall be performed at ambient environmental conditions.

TEST DESCRIPTION	REQUIREMENT	PROCEDURE
Examination of product	Meets requirements of product drawing.	Visual, dimensional, and functional inspection per quality inspection plan and EIA-364-18B/IEC 60512-1-1
ELECTRICAL		
Current draw	Maximum current draw in normal operation mode should not exceed 33 mA.	Unit shall be powered with 3.1 V dc, 3.3 V dc and 3.5 V dc using a DC voltage source. Sensors are configured and initialized for communication by writing 0xFF to register 0xC0. Voltage is measured over Vdd and GND. Initial inrush current draw, current draw during initialization, current draw during read-out and current draw in normal operation mode are captured. Every minute registers are read out, 10 times.
Input Safety	Product should fail safe when 230 V ac is applied. No fire is allowed.	Unit shall be powered with 230 V ac.
Sensor testing		
Light sensor	Acquisition rate of unit must be no more than 1 second. Deviation of average light output should be within 4 %.	The unit is powered on typical 3.3 V dc. Light is applied in steps of 10 Lux. Test range is from 0 to 1020 Lux, every step will be applied for 2 seconds (or two times the measurement

		speed of the test setup -data bus-).
		Test is verified with calibrated Light meter from Admesy.
		Light source must be white LED (3000 K).
		Operating temperature around DUT should be stabilized around room temperature ± 20 °C.
Temperature sensor	Acquisition rate of unit must be no more than 1 second. Deviation of average temperature should not be more than ± 1.0 °C	The unit is powered on typical 3.3 V dc. Temperature is applied in steps of 0.5 °C. Test range is from -5 to 55 °C, every step will be applied for 2 seconds (or two time the measurement speed of the test setup -data bus-). Temperature of temperature chamber will be referenced with a temperature meter.
Humidity sensor	Acquisition rate of unit must be no more than 1 second. Deviation of average humidity should not be more than ± 3 %.	The unit is powered on typical 3.3 V dc. Humidity is applied in steps of 0.5 % RH. Test range is from 5 % to 95 %, every step will be applied for 2 seconds (or two time the measurement speed of the test setup -data bus-). Test temperature: 25 ± 2 °C.
Microphone	Response time of microphone must be no more than 0.5 second. • Below 72 dB: Product response as a course level meter • Up to 80 dB: 2 dB accuracy • Above 80 dB: > 2 dB accuracy	The unit is powered on typical 3.3 V dc. Audio is applied in steps of 1 dB. Test range is from 20 dB to 100 dB, every step will be applied for 2 seconds (or two time the measurement speed of the test setup -data bus-). Both digital and analog pin are measured. Digital level above 70 dB is used for test. The DUT will be placed in an anechoic chamber for surrounding noise damping.

		Noise floor will be measured using audio meter.
Data logging	Temperature and humidity from logged data must not differ more than 5 % from previous 2 measurements.	The unit is powered on typical 3.3 V dc. EMC and mechanical tests are performed in parallel with data logging test. Data of all sensors is logged as reference in csv format.

EMC

TEST DESCRIPTION	REQUIREMENT	PROCEDURE
ESD immunity	Tests per 50491-5-2 Air discharge level: 8 kV Contact discharge level: 4 kV Pass Criteria: B	IEC61000-4-2 10 discharges per location for each polarity.
Radiated Immunity	Test level per 50491-5-2 Field Strength: 3 V/m Field Strength: 10 V/m (additional test) Freq. Range: 80-1000 MHz Modulation: 1 kHz, 80 % AM, sine wave Pass Criteria: A	IEC 61000-4-3 The DUT including supporting equipment is placed 0.8 m above ground within an anechoic test chamber. Distance from antenna to DUT: 3 m. Front face only with vertical and horizontal polarization.
Radiated Emission	Test level per 50491-5-1. This test shall be performed according to EN 55022, taking into account the general standard test conditions defined in 6.1. | Frequency range MHz	Quasi-peak limits dB(μV/m)
---	---
30 to 230	40
230 to 1 000	47 | NOTE 1 The lower limit shall apply at the transition frequency. NOTE 2 Additional provisions may be required for cases where interference occurs.	EN 55022/CISPR 22
Conducted Emission	Test level per 50491-5-1. This test shall be performed according to EN 55022, taking into account the general standard test conditions defined in 6.1. **Table 2 – Limits for conducted disturbance at the mains ports of class B ITE** | Frequency range MHz	Limits dB(μV)	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50 | NOTE 1 The lower limit shall apply at the transition frequencies. NOTE 2 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.	EN 55022/CISPR 22.

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Table 4 – Limits of conducted common mode (asymmetric mode) disturbance
at telecommunication ports in the frequency range 0,15 MHz to 30 MHz
for class B equipment

Frequency range MHz	Voltage limits dB(μV)		Current limits dB(μA)	
	Quasi-peak	Average	Quasi-peak	Average
0,15 to 0,5	84 to 74	74 to 64	40 to 30	30 to 20
0,5 to 30	74	64	30	20

NOTE 1   The limits decrease linearly with the logarithm of the frequency in the range 0,15 MHz to 0,5 MHz.
NOTE 2   The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150 Ω to the telecommunication port under test (conversion factor is 20 $\log_{10}$ 150 / I = 44 dB).

MECHANICAL

TEST DESCRIPTION	REQUIREMENT	PROCEDURE
Vibration	Module must meet functionality requirements before and after exposure.	EIA 364-28 / IEC 60512-6-4/-5 Test condition VII, Condition Letter D. Specimen powered (3.10 G RMS, 20 to 500 Hz, 15 minutes in each of 3 mutually perpendicular planes). Test will be performed in enclosed fixture for possible magnetic fields.
Mechanical Shock	Module must meet functionality requirements before and after exposure.	EIA-365-27, Method A. Specimen unpowered (30 G, half sine shock pulses of 11milliseconds duration, 3 shock in each direction applied along 3 mutually perpendicular planes, 18 total shocks).
Damp heat cycling	Module must meet functionality requirements before and after exposure.	EIA-364-31, Method III Subject specimens to 10 cycles (10 days) between 25 °C and 65 °C at 80 to 100 % RH.

ENVIRONMENTAL

TEST DESCRIPTION	REQUIREMENT	PROCEDURE
Thermal shock	Module must meet functionality requirements before and after exposure.	EIA-364-32, Test Condition I. Subject unpowered unit to 50 (after measurement, 100) cycles between -40 and 85°C with 30 minute dwells at temperature extremes and 1 minute transition between temperatures.

NOTE
Shall meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Requalification Test Sequence shown in Figure 2.

Figure 1 end

3.6.   Product Qualification and Requalification Test Sequence

TEST OR EXAMINATION	TEST GROUP (a)			
	A	**B**	**C**	**D**
	TEST SEQUENCE			
Examination of product	1, 4	1, 6	1, 8	1, 6
Current draw	2			
Input Safety	3			
Light sensor		2		
Temperature sensor		3		
Humidity sensor		4		
Microphone		5		
Data logging			(b)	(b)
ESD immunity			2	
Fast transient/Burst immunity			3	
Injected currents			4	
Radiated Immunity			5	
Radiated Emission			6	
Conducted Emission			7	
Vibration				2
Mechanical Shock				3
Damp heat cycling				4
Thermal shock				5*

NOTE

Figure 2

(a) Test group A shall contain 3 samples from part-numbers: 2316851-1 (or x-2314277-1), 2316851-2 (or x-2314277-2), 2316852-1 (or x-2314291-1), 2316852-2 (or x-2314291-2)

Test group B and D shall contain 3 samples 2316852-2 (or x-2314291-2)

Test group C shall contain 3 samples 2316852-2 (or x-2314291-2).

(b) Test group C and D shall perform data logging test in parallel with all tests.

* Thermal Shock chamber cannot have data logging in parallel due to length of cables in test setup.

Yellow text: to be updated.

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3.7.   Part number list

Part Number	Description
2316851-1	AmbiMate Module, MS4, Cast
2316851-2	AmbiMate Module, MS4, Cast, with Mic
2316852-1	AmbiMate Module, MS4, Cast, with CO_2
2316852-2	AmbiMate Module, MS4, Cast, with CO_2/Mic
2314277-1	AmbiMate Module, MS4, TH
2314277-2	AmbiMate Module, MS4, TH, with Mic
2314291-1	AmbiMate Module, MS4, TH, with CO_2
2314291-2	AmbiMate Module, MS4, TH, with CO_2/Mic
1-2314277-1	AmbiMate Module, MS4, PTH
1-2314277-2	AmbiMate Module, MS4, PTH, with Mic
1-2314291-1	AmbiMate Module, MS4, PTH, with CO_2
1-2314291-2	AmbiMate Module, MS4, PTH, with CO_2/Mic

单击下面可查看定价，库存，交付和生命周期等信息

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