

F²MC-8FX/16LX/16FX/FR, All Series, Lin Conformance Test

This application note describes the procedure for LIN conformance tests to get a LIN certification for a product.

Contents

1	Introduction.....	1	3	Appendix A.....	4
2	LIN Conformance Test Procedure	1	3.1	C&S Group	4
2.1	Overall Information	1	3.2	Ihr GmbH	5
2.2	Test Items.....	2	3.3	MBtech Group	6
2.3	German Test Houses.....	2	3.4	LIN Administration	7
2.4	Test Types	2		Document History.....	8
2.5	LIN Compliance Test of 16FX MB96300 Series	3			

1 Introduction

This application note describes the procedure for LIN conformance tests to get a LIN certification for a product.

2 LIN Conformance Test Procedure

How LIN conformance tests are done

2.1 Overall Information

Up-to-date information about LIN compliance test can be found on the official LIN web page:

<http://www.lin-subbus.org> → COMPLIANCE

In summary the conformance test is used to verify the functionality of a LIN device according to the current LIN specification. The current version is 2.1 (July 2008).

A conformance test specification is currently under development. Only LIN 2.0 physical layer conformance test should be applied according LIN 2.0 physical layer specification, which did not change in version 2.1.

It is important to know, that a compliance test only can be performed for a complete system. The test cannot be done for LIN software drivers or ECUs without application. This means also, that an MCU without on-chip LIN line driver/physical transceiver has to be tested together with a selected external LIN line driver IC.

Any changes or modifications in hard or software lead to the need of a new conformance test qualification.

Please note that because of these reasons the LIN certification is different from CAN certification.

2.2 Test Items

The following items can be tested for LIN compliance.

- LIN component
- LIN device
- LIN implementation
- ECU

2.3 German Test Houses

LIN conformance tests are offered currently by three German test houses, which are specialized for these tests. All houses offer tests for the LIN OSI layer 1 (Physical layer) and LIN OSI layer 2 (Data link layer). The contact persons and addresses can be found in the appendix A (→3). These test houses are:

- Communication & Systems group GmbH (C&S group), Wolfenbuettel
- Ihr GmbH, Rheinmünster
- MBtech group GmbH & Co. KGaA, Sindelfingen

All these three test houses have acquired the “Testhouse Accreditation Certificate” from the LIN steering group.

2.4 Test Types

There are two basic conformance tests for

- Physical Layer
- Data Link Layer

Additionally some test houses also offer tests for EMC and/or SAE-J2602 conformance. All tests are appropriate for LIN master and LIN slave systems.

Please refer to test house documentation for exact test cases and concept.

2.4.1 Physical Layer Tests

The physical layer tests contain mostly the electrical and timing characteristics of the item under test (IUT). This implies for example signal threshold voltages, propagation delays, duty cycle of the signals, V_{BAT} shifts, internal resistance and capacity, etc.

2.4.2 Data Link Layer Tests

The data link layer tests contain tests for the LIN protocol itself. This implies for example synch break length measurement, oscillator tolerance, message frame length, slave response frame investigation, bit error tests, etc.

For Node Configuration / Network Management there are tests for error in frames, wake-up behavior, sleep mode tests, frame ID assignment, NAD (Node Address for Diagnostic) assignment tests, etc.

2.4.3 EMC Tests

Some test houses offer also EMC tests for electrical immunity to external disturbance such as transients or ESD and emission of the IUT.

2.4.4 SAE-J2602 Tests

Some test houses also offer tests for SAE-J2602 standard, which is generally used by US American OEMs. SAE-J2602 is based on LIN 2.0 specification with some differences. Please refer SAE-J2602 specification for more details.

2.5 LIN Compliance Test of 16FX MB96300 Series

Cypress has done a LIN compliance test with 16FX MB96300 devices at one of the above mentioned certified test houses using a commercial LIN driver, Cypress Starter kits and example applications. Both tests for LIN master and LIN slave were performed successfully.

The certificate and test report can be requested under NDA from Cypress.

3 Appendix A

Contact data of test houses

3.1 C&S Group

Address:

Administration
C&S group GmbH
Am Exer 19c
D-38302 Wolfenbuettel

E-Mail:

info@cs-group.de
LIN@cs-group.de

Phone:

+49 (0) 5331 90555 0

Fax:

+49 (0) 5331 90555 110

Webpage:

<http://www.cs-group.de/>

LIN conformance:

<http://www.cs-group.de/index.php?id=64>

3.2 Ihr GmbH

Address:

ihr GmbH

Airpark Business Center

Airport Boulevard B210

D-77836 Rheinmünster

E-Mail:

info@ihr.de

Phone:

+49(0)7229 18475 0

Fax:

+49(0)7229 18475 11

Webpage:

<http://www.ihr.de/index.php?lang=en>

LIN conformance:

<http://www.ihr.de/ihr/index.php?lang=en&Itemid=555>

3.3 MBtech Group

Address:

MBtech Group GmbH & Co. KGaA

Kolumbusstraße 19+21

D-71063 Sindelfingen

E-Mail:

info@mbtech-group.com

Phone:

+49 (0) 7031 686 3000

Fax:

+49 (0) 7031 686 4500

Webpage:

<http://www.mbtech-group.com/start.html>

Conformance Tests:

http://www.mbtech-group.com/eu-en/electronics_solutions/xil_test_operations/databus_validation_center.html

3.4 LIN Administration

Address:

LIN Administration
c/o Altran GmbH & Co. KG
Bernhard-Wicki-Straße 3
D-80636 München

E-Mail:

info@lin-subbus.org

Phone:

+49 (0) 711 220 611-515

Webpage:

https://vector.com/vi_local_interconnect_network_en.html

Document History

Document Title: AN205432 - F²MC-8FX/16LX/16FX/FR, All Series, Lin Conformance Test

Document Number: 002-05432

Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	-	MKEA	08/28/2008	V1.0; 1 st version; MWi/HWe
			05/27/2010	V1.1; 16FX Conformance test note added, Test Houses contacts updated; MWi
*A	5068245	MKEA	01/06/2016	Converted Spansion Application Note "MCU-AN-300106-E-V11" to Cypress format
*B	5868024	AESATMP9	08/30/2017	Updated logo and copyright.

Worldwide Sales and Design Support

Cypress maintains a worldwide network of offices, solution centers, manufacturer's representatives, and distributors. To find the office closest to you, visit us at [Cypress Locations](#).

Products

ARM® Cortex® Microcontrollers	cypress.com/arm
Automotive	cypress.com/automotive
Clocks & Buffers	cypress.com/clocks
Interface	cypress.com/interface
Internet of Things	cypress.com/iot
Memory	cypress.com/memory
Microcontrollers	cypress.com/mcu
PSoC	cypress.com/psoc
Power Management ICs	cypress.com/pmic
Touch Sensing	cypress.com/touch
USB Controllers	cypress.com/usb
Wireless Connectivity	cypress.com/wireless

PSoC® Solutions

[PSoC 1](#) | [PSoC 3](#) | [PSoC 4](#) | [PSoC 5LP](#) | [PSoC 6](#)

Cypress Developer Community

[Forums](#) | [WICED IOT Forums](#) | [Projects](#) | [Videos](#) | [Blogs](#) | [Training](#) | [Components](#)

Technical Support

cypress.com/support

All other trademarks or registered trademarks referenced herein are the property of their respective owners.



Cypress Semiconductor
198 Champion Court
San Jose, CA 95134-1709

© Cypress Semiconductor Corporation, 2008-2017. This document is the property of Cypress Semiconductor Corporation and its subsidiaries, including Spanion LLC ("Cypress"). This document, including any software or firmware included or referenced in this document ("Software"), is owned by Cypress under the intellectual property laws and treaties of the United States and other countries worldwide. Cypress reserves all rights under such laws and treaties and does not, except as specifically stated in this paragraph, grant any license under its patents, copyrights, trademarks, or other intellectual property rights. If the Software is not accompanied by a license agreement and you do not otherwise have a written agreement with Cypress governing the use of the Software, then Cypress hereby grants you a personal, non-exclusive, nontransferable license (without the right to sublicense) (1) under its copyright rights in the Software (a) for Software provided in source code form, to modify and reproduce the Software solely for use with Cypress hardware products, only internally within your organization, and (b) to distribute the Software in binary code form externally to end users (either directly or indirectly through resellers and distributors), solely for use on Cypress hardware product units, and (2) under those claims of Cypress's patents that are infringed by the Software (as provided by Cypress, unmodified) to make, use, distribute, and import the Software solely for use with Cypress hardware products. Any other use, reproduction, modification, translation, or compilation of the Software is prohibited.

TO THE EXTENT PERMITTED BY APPLICABLE LAW, CYPRESS MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARD TO THIS DOCUMENT OR ANY SOFTWARE OR ACCOMPANYING HARDWARE, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. To the extent permitted by applicable law, Cypress reserves the right to make changes to this document without further notice. Cypress does not assume any liability arising out of the application or use of any product or circuit described in this document. Any information provided in this document, including any sample design information or programming code, is provided only for reference purposes. It is the responsibility of the user of this document to properly design, program, and test the functionality and safety of any application made of this information and any resulting product. Cypress products are not designed, intended, or authorized for use as critical components in systems designed or intended for the operation of weapons, weapons systems, nuclear installations, life-support devices or systems, other medical devices or systems (including resuscitation equipment and surgical implants), pollution control or hazardous substances management, or other uses where the failure of the device or system could cause personal injury, death, or property damage ("Unintended Uses"). A critical component is any component of a device or system whose failure to perform can be reasonably expected to cause the failure of the device or system, or to affect its safety or effectiveness. Cypress is not liable, in whole or in part, and you shall and hereby do release Cypress from any claim, damage, or other liability arising from or related to all Unintended Uses of Cypress products. You shall indemnify and hold Cypress harmless from and against all claims, costs, damages, and other liabilities, including claims for personal injury or death, arising from or related to any Unintended Uses of Cypress products.

Cypress, the Cypress logo, Spanion, the Spanion logo, and combinations thereof, WICED, PSoC, CapSense, EZ-USB, F-RAM, and Traveo are trademarks or registered trademarks of Cypress in the United States and other countries. For a more complete list of Cypress trademarks, visit cypress.com. Other names and brands may be claimed as property of their respective owners.