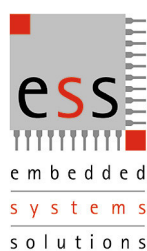


# User Manual

# CANgine

## FMSIA-CC Chip

Edition 4  
Jan 2007





The information given in this document was compiled and checked carefully. Nevertheless ESS assumes no liability for any mistakes. ESS also assumes no liability for any damage resulting from use of this manual or products described herein.

ESS reserves the right to make changes on information given in this document and on features of products described herein without prior notification.

Publication and reproduction of this document or parts of it only with written agreement of ESS.

Edition	Date	State
E4	Jan 2007	Chapters Configuration and Operating Mode removed (now referred to CANgine FMS user manual)
E3	Dec 2005	PLCC case / pictures added
E2	Nov 2005	Bootloading prepared
E1	Oct 2005	preliminary edition

© Copyright 2005 - 2007

ESS Embedded Systems Solutions GmbH

Industriestr. 15

D-76829 Landau

(49) 6341 3487-0

(49) 6341 3487-29

[info@ESSolutions.de](mailto:info@ESSolutions.de)

[www.ESSolutions.de](http://www.ESSolutions.de)

[www.CANgine.com](http://www.CANgine.com)

## Related Documents

Atmel AT89C51CC03 Data Sheet  
CANgine FMS User Manual  
SAE J1939 / 71      Vehicle Application Layer      Clarification of FMS data

## Notation of special characters and notofications

[CR]            character code carriage return (0x0D)  
[LF]            character code linefeed (0x0A)

/SIGNAL        means inverted logic



## Contents

1. Introduction .....	5
2. CANgine FMSIA-CC Chip .....	5
2.1 Design Rules.....	5
2.1.1 Clock.....	5
2.1.2 Special Pins .....	6
2.1.3 CAN Terminating Resistor.....	6
2.2 Design Recommendations .....	6
2.2.1 Reset .....	6
2.2.2 LED Ports.....	6
2.2.3 Bootloading .....	6
2.3 Design Example .....	6
3. Connecting to CAN Bus.....	6
4. UART commands and outputs.....	6
5. Technical data .....	7
Appendix 1 .....	8

## 1. Introduction

Thank you for choosing a product of our CANgine product family. The CANgine family is based on high performance 8 bit microcontrollers with integrated full CAN interface and flash memory. With these products you are able to build extremely small but powerful CAN based units.

CANgine FMS (fleet management standard) products have fixed parameters at the CAN side of the unit due to the FMS standard which defines the CAN bit rate at 250 kbps and also all CAN identifiers used by the FMS standard.

At the serial (RS232) side CANgine FMS products "speaks" pure ASCII code and the parameters can be set appropriate to your hardware and your application.

CANgine FMSIA-CC is the smallest sized product of our CANgine FMS product family. It is a micro controller programmed to receive the FMS standard frames and translate the data to ASCII streams as described in the CANgine FMS User Manual.



The serial link of the CANgine FMSIA-CC chip supports baud rates from 2.400 up to 115.200 baud.

Two ports of the chip provide signals to support signalization of status and errors with a green and a red LED.

## 2. CANgine FMSIA-CC Chip

The chip is based on Atmel's T89C51CC03CA-RLTUM. For exact specification of electrical and dynamical characteristics please refer to the actual data sheet on [www.atmel.com](http://www.atmel.com).

The chip can be used in 3.3 V and in 5.0 V designs. You only have to choose an appropriate CAN transceiver and if necessary an appropriate RS232 transceiver.

FMSIA-CC is available in VQFP44 package with industrial temperature range (-40..+85 °C).

For prototyping FMSIA-CC is also available in PLCC44 case which can be mounted in a socket.

### 2.1 Design Rules

The following rules must be regarded to obtain a working design.

#### 2.1.1 Clock

The external processor clock must be 20.000000 MHz. You can use an external oscillator (50% duty cycle) or a crystal. Refer to Atmel's data sheet for details. As the serial baud rate and the CAN baud rate are derived from the clock frequency you can't use other clock frequencies than 20.0 MHz.

### 2.1.2 Special Pins

- Pin /EA must be tied to Vcc.
- Pins VAREF and VAGND must be tied to Vss.
- Pin ALE must be left open.
- The following pins must be left open: All port 0 pins, all port 1 pins, port 2.2 to port 2.7, port 3.2 to port 3.7.

### 2.1.3 CAN Terminating Resistor

If your hardware is the last node on the CAN bus – normally that will be the fact – you have to terminate the bus with a 120 Ohm resistor. We recommend connecting the resistor externally between the two bus lines. Nevertheless we implemented a configurable resistor in our design example.

## 2.2 Design Recommendations

### 2.2.1 Reset

Use a micro processor reset circuit with push-pull reset output to drive the RST pin of the T89C51CC03. Voltage threshold should be greater than  $V_{cc} \times 0.9$ , e.g. for a 5.0 V design the threshold voltage should be greater than 4.5 V.

### 2.2.2 LED Ports

To signal status and error information of the FMSIA-CC chip port 2.0 should be connected to a red LED (error information) while port 2.1 should be connected to a green LED (status information). Dimensioning of LED and resistance should be done in a way that the current does not exceed 3 mA.

### 2.2.3 Bootloading

To be able to update the firmware of the FMSIA-CC the controller must be set in bootloading mode. This is possible by tying pin PSEN to ground, applying a reset and releasing PSEN to the open state.

Versions 1.x of FMSIA-CC will not support bootloading.

This feature will be added starting with FMSIA-CC version 2.0.

## 2.3 Design Example

See appendix 1 for a design example which implements all features of the CANgine FMSIA-CC chip.

## 3. Connecting to CAN Bus

When connecting your hardware to the CAN bus pay attention to the terminating resistors (120 Ohm) at both ends of the bus.

## 4. UART commands and outputs

As CANgine FMSIA chips is driven by the same firmware as CANgine FMS refer to the latest CANgine FMS user manual available at [www.cangine.com](http://www.cangine.com).

## 5. Technical data

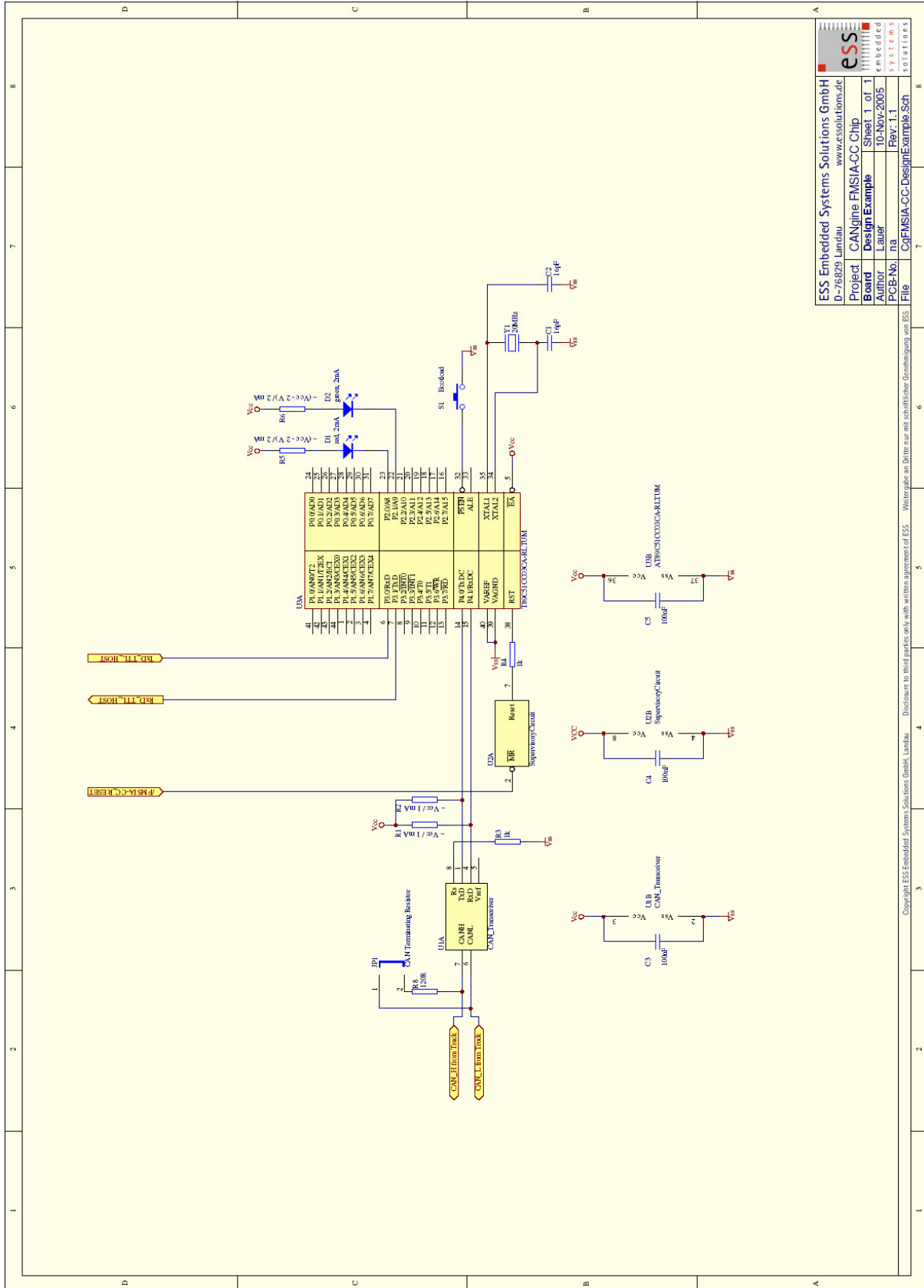
Also refer to Atmel's data sheet AT89C51CC03.

Package	VQFP44	
Power supply	3.3 or 5.0	VDC
Power consumption	15 (typ.)	mA
Serial baudrate	2400 .. 115200	bps
Temperature range	-40 .. +85	°C



## **Appendix 1**

Full featured Design Example on next page



ESS Embedded Systems Solutions GmbH	ESS Embedded Systems Solutions GmbH
D-76829 Landau	www.essolutions.de
Project CANgine FMSIA-CC Chip	
Board Design-Example	Sheet 1 of 1
Author L.auer	10-Nov-2005
PCB-No. 08	Rev. 1.1
File ChFMSIA-CC-Design-Example.Sch	



Notes:



Notes:

## **Disclaimers**

### **Life support**

These products are not designed for use in life support appliances, devices or systems where malfunction of these products can reasonably be expected to result in personal injury. ESS Embedded Systems Solutions GmbH customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify ESS Embedded Systems Solutions GmbH for any damages resulting from such application.

### **Right to make changes**

ESS Embedded Systems Solutions GmbH reserves the right to make changes, without notice, in the products, and/or software, described or contained herein in order to improve design and/or performance. ESS Embedded Systems Solutions GmbH assumes no responsibility or liability for use of any of these products, conveys no license or title under any patent, copyright, or mask work to right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified.

**ESS Embedded Systems Solutions GmbH**  
**Industriestrasse 15**  
**D-76829 Landau**  
**Germany**  
**Phone +49 (0) 6341 34870**  
**info@ESSolutions.de**

Copyright 2005 ESS Embedded Systems Solutions GmbH  
All rights reserved. Printed in Germany