ADNK-5033-FS27
Optical Mouse Designer's Kit

Avago TECHNOLOGIES

Product Overview

Description

Avago Technologies and Freescale Semiconductor have joined forces to produce a new generation of wireless optical mouse reference design kit. Based on the new Avago Technologies ADNS-5030 small form yet low power optical mouse sensor and the powerful Freescale MC68HC908QY4A / MC68HC908JB12 USB microcontroller, this reference design kit provides a power efficient and feature-rich solution.

The Avago Technologies ADNS-5030 optical mouse sensor, an 8-pin staggered dual inline package (DIP), is based on innovative low power management architecture with relatively good navigation performance. It is able to measure changes in position by optically acquiring sequential surface images at SmartSpeed frame rate and mathematically determining the direction and magnitude of movement.

The ADNS-5030 along with the ADNS-5100 lens, ADNS-5200 clip and HLMP-ED80-XX000 form a complete, compact optical mouse tracking system. There are no mechanical parts, which means high reliability and less maintenance for the end user. In addition, precision optical alignment is not required, facilitating high volume assembly. The sensor is programmed via registers through a four-wire serial port.

The Freescale MC68HC908QY4A / MC68HC908JB12 are members of the low-cost, high-performance M68HC08 Family of 8-bit microcontroller units (MCUs). The MC68HC08 Family is Complex Instruction Set Computer (CISC) with Von Neumann architecture. All MCUs in the family use the enhanced M68HC08 central processor unit (CPU08) and are available with a variety of modules, memory sizes and types, and package type.

Features of ADNK-5033-FS27

- Windows® 98SE, Windows 2000, and Windows XP compatibility
- USB 2.0 low-speed compliance
- User identity code to avoid conflict with other devices
- High reliability
- Precise wireless optical navigation technology
- No mechanical moving parts
- Smooth surface navigation
- Auto mouse sensor frame speed
- Accurate motion up to 14ips
- 500/1000cpi resolution selection
- A high data rate 27-MHz RF link
- 4.8 kbps transmission data rate
- 2 meter communication distance
- 3361 compatible device for RF receiver design
- Power conversation mode during times of no movement

The Avago Technologies ADNS-5030 optical sensor is used in this reference design as the primary navigation engine. This Optical Navigation Technology contains an Image Acquisition System, a Digital Signal Processor, and a four-wire serial port. ADNS-5030 has a built-in LED driver as well as an internal oscillator, which means less components are needed for assembly.

The MC68HC908QY4A has an internal oscillator circuit which can generate a clock of 12.8 MHz with no external components needed. The auto wakeup module generates a periodic interrupt during stop mode to wake the part up without requiring an external signal. These features make the MC68HC908QY4A MCU suited for wireless optical mouse application.

The MC68HC908JB12 includes a universal serial bus (USB) module, which makes this MCU suited for personal computer human interface devices (HID) applications, such as mice. The enhanced timer function allows capturing and decoding data more easily, especially suitable for high data rate wireless HID applications.

This kit is connected to a PC via the USB port. A 27-MHz RF link is established for the communication between the mouse transmitter and the USB dongle. In the mouse side, the data for the XY displacement, Z-wheel motion or update button status will be encoded with a pre-defined serial format by the MCU firmware. These digitally encoded data will then be transmitted by the RF circuit with FSK modulation. In the receiver side, the RF packet will be captured and decoded. The decoded data will be sent to the host PC through the USB interface.
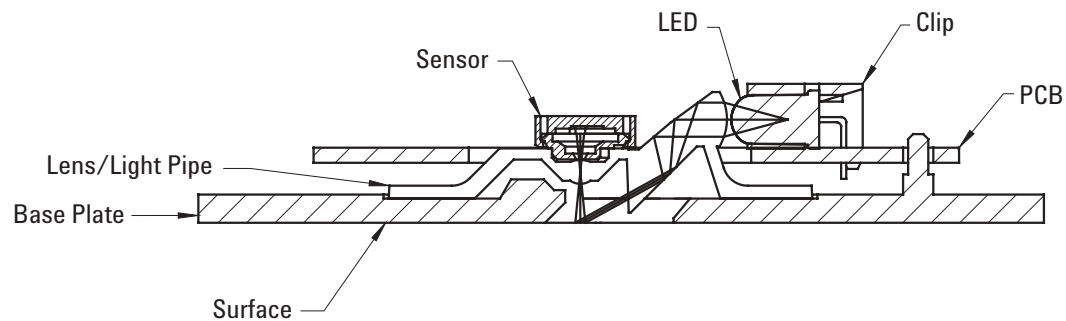

Figure 1. Sectional view of PCB assembly highlighting all optical mouse components (optical mouse sensor, clip, lens, LED, PCB, and base plate) in the mouse.
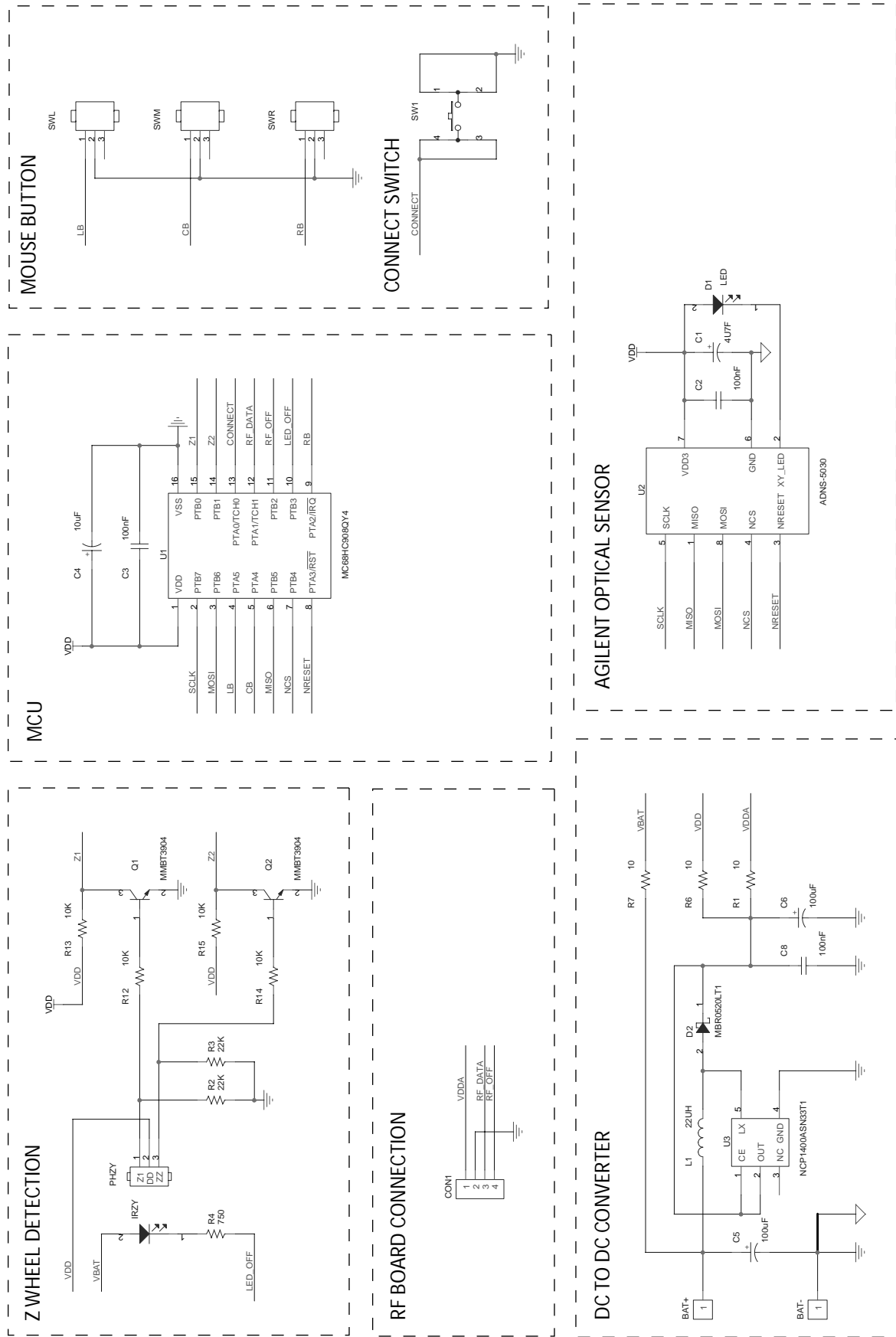
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MOUSE BUTTON

SWL
SWM
SWR

LB
CB
RB

CONNECT SWITCH

SW1
CONNECT

MCU

C4 10uF
C3 100nF
VDD

U1
MC68HC908QY4

1 VDD
2 PTB7
3 PTB6
4 PTA5
5 PTA4
6 PTB5
7 PTB4
8 PTA3/RST

VSS 16
PTB0 15
PTB1 14
PTA0/TCH0 13
PTA1/TCH1 12
PTB2 11
PTB3 10
PTA2/IRQ 9

Z1
Z2
CONNECT
RF_DATA
RF_OFF
LED_OFF
RB

SCLK
MOSI
LB
CB
MISO
NCS
NRESET

AGILENT OPTICAL SENSOR

VDD
C1 4U7F
C2 100nF
D1 LED

U2
ADNS-5030

5 SCLK
1 MISO
8 MOSI
4 NCS
3 NRESET

VDD3 7
MISO
MOSI
GND 6
XY_LED 2

SCLK
MISO
MOSI
NCS
NRESET

Z WHEEL DETECTION

VDD
VBAT
LED_OFF

IRZY
R4 750
PHZY
Z1 1
DO 2
ZZ 3

R2 22K
R3 22K

R12 10K
VDD
R13 10K
Z1
Q1
MMBT3904

R14 10K
VDD
R15 10K
Z2
Q2
MMBT3904

RF BOARD CONNECTION

CON1
1
2
3
4

VDDA
RF_DATA
RF_OFF

DC TO DC CONVERTER

BAT+ 1
BAT- 1

L1 22UH
C5 100uF
D2 MBR0520LT1

U3
NCP1400ASN33T1

1 CE
2 OUT
3 NC

LX 5
GND 4

R7 10 VBAT
R6 10 VDD
R1 10 VDDA
C6 100uF
C8 100nF

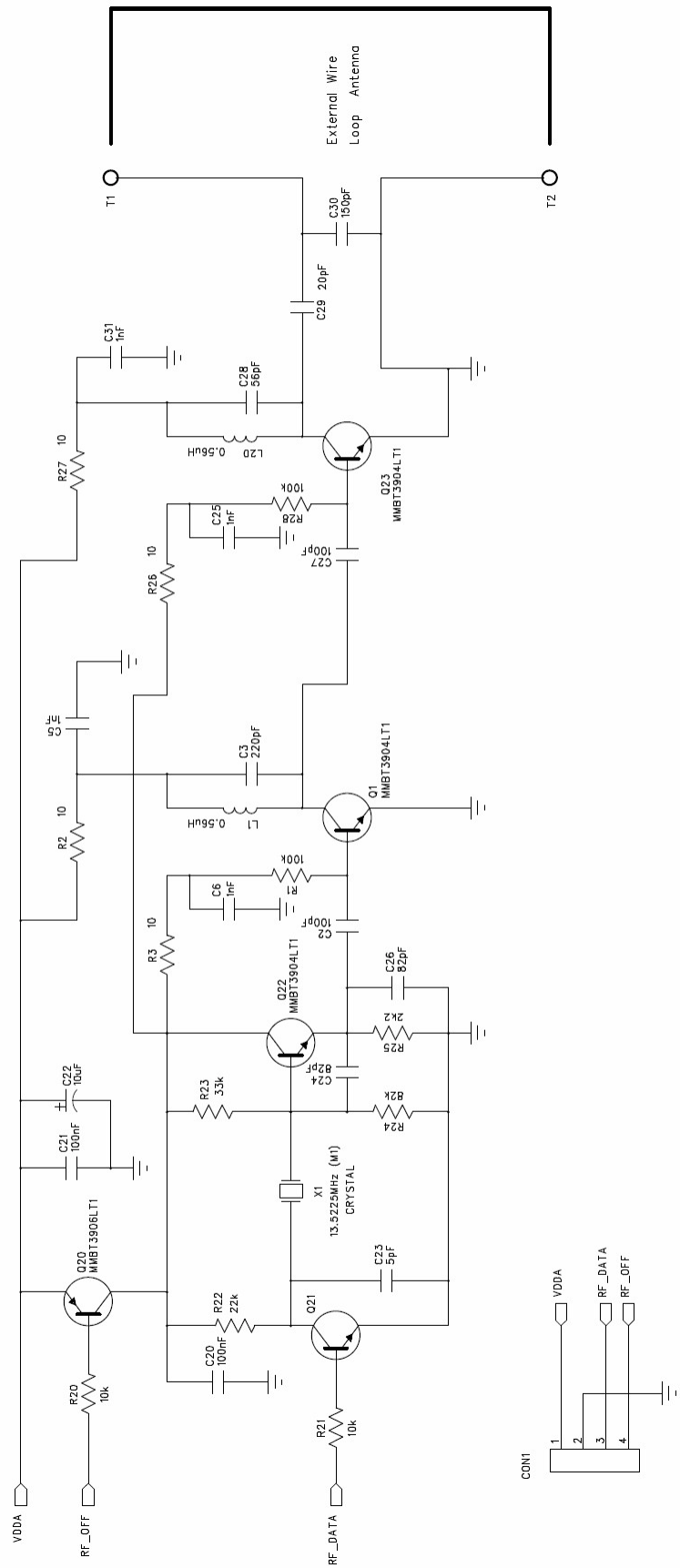**Figure 2. Schematics of the MCU and Optical Sensor PCB Board**

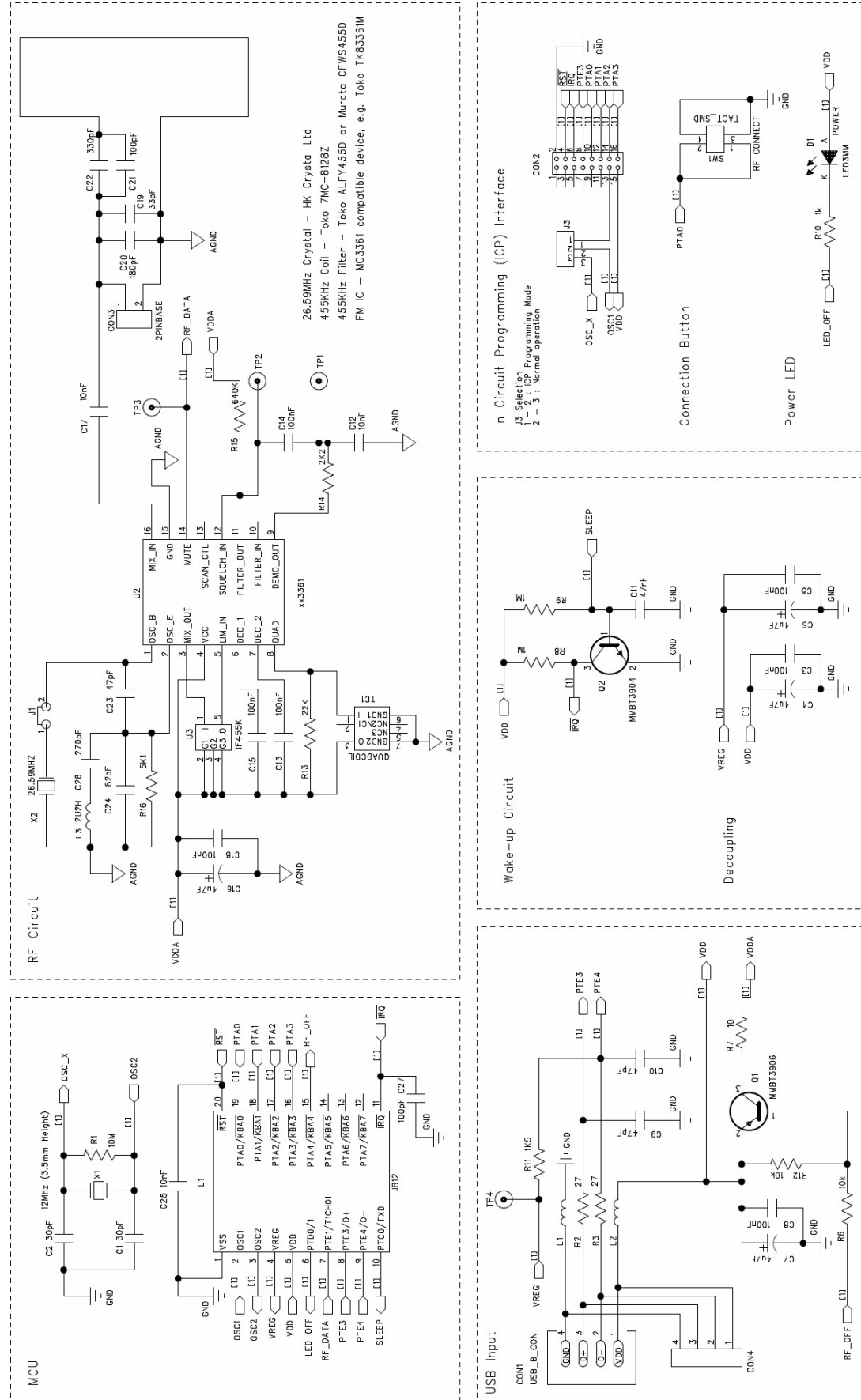**Figure 3. Schematics of Optica Mouse RF PCB**

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Figure 4. Schematics of USB Receiver Board

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Kit Components

The designer's kit contains components as follows:

Part Number	Description	Name	Quantity
ADNK-5033-FS27 Mouse Set	Optical Mouse Reference Design Unit includes: - RF Wireless mouse - USB Receiver Board	 Reference Design Unit	1
ADNS-5030	Solid-State Optical Mouse Sensor	Sensor	5
MC68HC908JB12	Freescale USB Microcontroller	USB Microcontroller	3
MC68HC908QY4A	Freescale low-cost Microcontroller	Microcontroller	3
ADNS-5100	Round Lens Plate	Lens	5
ADNS-5100-001	Trim Lens Plate	Lens	5
ADNS-5200	LED Assembly Clip (Black)	LED Clip	5
HLMP-ED80-XX000	639 nm T 1 ¾ (5 mm) Diameter LED	LED	5
ADNK-5033-FS27 CD	Includes Documentation and Support Files for ADNK-5033-FS27 Documentation a. ADNS-5030 Data Sheet b. MC68HC908JB12 & MC68HC908QY4A Data Sheet c. ADNS-5100 Data Sheet d. ADNS-5200 Data Sheet e. HLMP-ED80-XX000 LED Data Sheet Hardware Support Files a. ADNK-5033-FS27 BOM List b. ADNK-5033-FS27 Schematic c. IGES Base Plate Feature File d. Gerber File Software Support Files a. Microcontroller Firmware		
CodeWarrior CD	Includes Software Development Studio for Freescale MC68HC08 Microcontroller a. CodeWarrior Debugger Software b. CodeWarrior Assembler / Compiler Software c. Code Examples d. User Manual		1

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