LUMISSIL Microsystems
A Division of ISSI

Microcontroller Solutions for Automotive, Industrial & Consumer Applications

IS31CS8974/IS32CS8974
IS31CS8975/IS32CS8975
Market ready solutions, complete development package, customer-focused support and customization ability.

In today's world Microcontrollers are widely used for variety of applications.

First – Automotive control and sensing solutions where MCUs will be used in areas like in-cabin entertainment, temperature control, comfort and safety systems, and car-exterior uses like Light animation, exterior environment sensing, access control etc.

Second - Industrial and office equipment, medical devices, machinery, power tools etc.

And third – Consumer market where applications like appliances, remote-controls, toys and many other use MCUs.

By integrating all peripherals with the CPU and creating a complete computing solution on a chip, Microcontrollers manage to save on physical size as well as cost. Often, a Microcontroller will utilize mixed signal elements, such are ADCs, DACs, Sensors interfaces etc. They will either be utilized to preform specific functions within a larger system under a host processor supervision, or as an edge/standalone device (IoT), typically implementing sensing, actuation, and/or data collection functions.

APPLICATIONS OF LUMISSIL'S MCUs

There are several focus areas (among others) where the value proposition of the Lumissil MCUs can create high value to the customer:

A. Large and Small Appliances in kitchen, bath and entertainment systems utilize the MCUs for control panels (buttons and display), actuation and motor control.

B. Using Lumissil MCUs in IoT edge devices, as well as standalone consumer devices, they will interface to sensors of different kind (including Cap-sense), control displays and indications, collect and process data and actuate external systems.

C. In the Automotive arena, first on areas such as car networking solutions (CAN/LIN) and exterior light animations coordinated control, Interior panels control, display and indicators and motors/actuation control.

D. Motor controllers are applicable for Consumer, industrial and automotive applications. Solutions for both brush and brushless DC motors at varying levels of complexity are available.

E. Last, the CS8974 & CS8975 are useful for System Diagnostics Functions – collecting, monitoring and reporting system indications and sensors such as voltage, power, temp, humidity, etc.

FIGURE 1A – MCU APPLICATIONS

FIGURE 1B – MCU APPLICATIONS

ARCHITECTURE AND KEY FEATURES

MCUs as a system building block, is architecturally designed as a CPU with surrounding peripherals that are together designed to preform combination of collecting information from the surrounding, preform manipulation and calculation on data and drive information and action to the system it is running in.

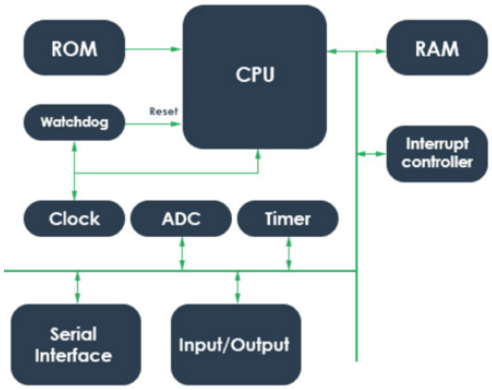


FIGURE 2 – MCU GENERAL BLOCK DIAGRAM

The CPU, central brain of the microprocessor and system, uses pipeline process to fetch and execute instructions from Flash memory. It accesses the e-Flash through program address read and through Flash Controller which can performs software read/write operations from the e-Flash. Both CS8974 and CS8975 have 1-Cycle 8051 CPU core running at speed up to 32MHz.

System Clock is implemented by a crystal oscillator that is driven to the CPU, with rates up to +/-2% 32Mhz (CS8974) and up to +/-2% 16Mhz (CS8975). For both products, options are available for spread-spectrum (to reduce impulse noise), Internal low-power oscillator (SOSC) 128Khz, and use of External oscillator.

Registers definitions are specified in the CS8974 and CS8975 datasheets The microcontrollers are equipped with various general purpose registers (system data) and peripheral registers (peripheral hardware) to configure and store data.

Multi-purpose Input/Output pins (GPIO) can also be used for other functions. They can connect external devices like Display interfaces (LED, LCD, and touch buttons), motors, input sensing and switching elements. Up to 20 GPIOs (CS8974) and 12 GPIOs (CS8975) are available.

RAM and ROM Memory is available to store programs and data and assist CPU in command execution. CS8974 employs 32KB code memory (organized as 32Kx16) of embedded-flash memory and 2KB (organized as 2Kx13) SRAM for data manipulations. CS8975 has 16KB e-Flash and 1KB RAM.

Timers can enable precise time delay, repeat a pre-defined task periodically etc. Examples of application that use timers can be motor control, on/off relay control, home appliance control etc. 5x16-bit Timers T0/T1/T2/T3/T4 and 1x24-bit T5 are available for the CS8974 and CS8975 devices.

3 Watchdog Timers are implemented in each of the devices - WDT1 by SYSCLK, WDT2/WDT3 by low-power oscillator (SOSC). The Watchdog Timers are 30-bit timers that can be used for system-state supervision or as event timers. This is done by generating an interrupt or to issuing a system reset, depending on the control settings.

Devices use serial communication to talk to each other. To achieve serial communication, Serial Interfaces like UART, I2C, and SPI etc. are used. The CS8974 & CS8975 each offers 2 UART interfaces (one of them LIN capable), Multiple I2C interfaces (Slave and master), One master/slave SPI interface.

6 Channels of PWM and Buzzer and melody waveform generator are also available.

Capacitance sense touch-key controller is implemented in the MCUs, using Sigma-Delta technology, up to 20-bit resolutions, low standby power with wake-on-touch and Shield output for moisture immunity. Cap-touch technology enables elegant and clean design of buttons, sliders touch rings and other for applications that utilize it. Up to 19 keys are available for CS8974 and up to 11 keys for CS8975.

CS8975 also features 11-Bit SAR ADC using a GPIO analog input. Examples of uses are temperature sensing and power-supply status measurement.

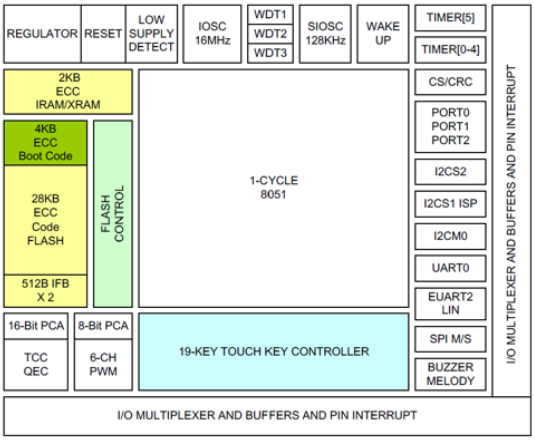


FIGURE 3 – CS8974 BLOCK DIAGRAM

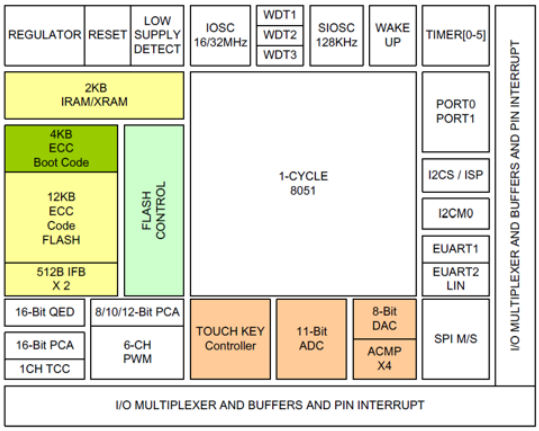


FIGURE 4 – CS8975 BLOCK DIAGRAM

INTEGRATED DEVELOPMENT ENVIRONMENT (IDE)

To streamline application development on a MCU platform, an integrated Development environment is introduced. This environment enables building the application utilizing the MCU resources and peripherals. It can be done with logical tools or by programing it. The IDE enables simulation and compilation of the program into target execution file, possibility to calibrate and configure for external elements (like Cap-Touch calibration) and programing tool to write code to target device flash memory.

Lumissil has established an IDE environment for its customers by implementing MCU solutions on products like CS8974 and CS8975. The IDE is based on open-source Eclipse IDE and SDCC compiler plug in. Kyle-C Compiler is available as well.

For each product, Lumissil provide a sample code library that with small projects that demonstrate operation of key system peripherals such as watchdog, different timers, SPI, I2C, UART, PWM, LVD, ISR, MDU etc. See figure 5.

Integrated into the IDE environment, the EzISP tool can be opened, and is used to write the executable HEX file to device Flash and for reading memory content. The EzISP tool is used in conjunction with the EzISP Board which is a USB-to-I2C interface between the computer and the target board.

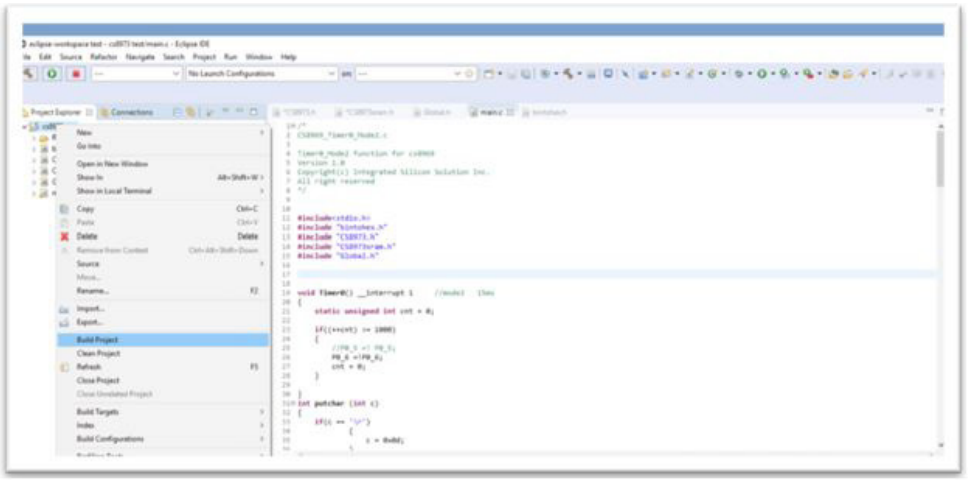


FIGURE 5 – SDCC IDE ENVIRONMENT FOR LUMISSIL MCUs

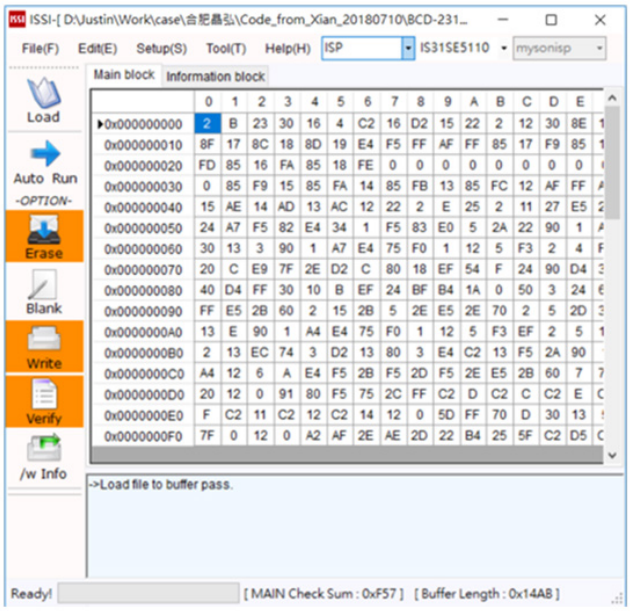


FIGURE 6 – EzISP PROGRAMING TOOL

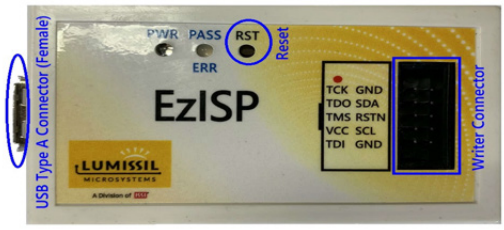


FIGURE 7 – EzISP BOARD

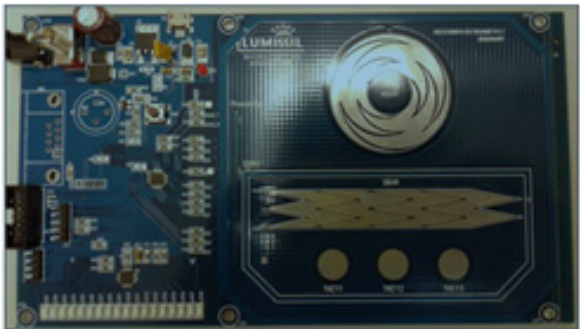
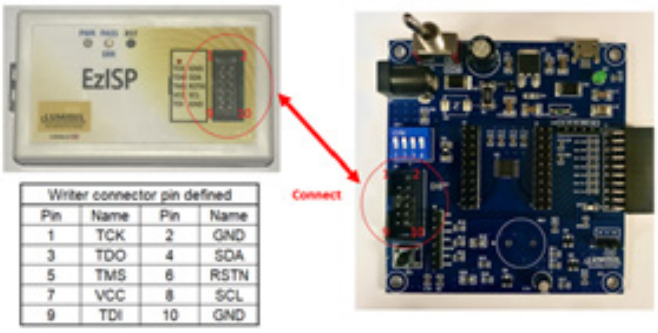


FIGURE 8 – CS8974 EVALUATION BOARD



Writer connector pin defined			
Pin	Name	Pin	Name
1	TCK	2	GND
3	TDO	4	SDA
5	TMS	6	RSTN
7	VCC	8	SCL
9	TDI	10	GND

FIGURE 9 – CS8975 EVALUATION BOARD AND EzISP

IS31CS8974/IS32CS8974 are available in 24 pin QFN-24 and TSSOP-24 packages. IS31CS8975/IS32CS8975 are available in 16 pin TSSOP-16 and 8 pin SOP-8 packages. They operate from 2.7V to 5.5V over a temperature range of -40°C to +125°C.

EVALUATION BOARDS

For each of the MCU solutions offered by Lumissil, a reference board is provided together with the Software development tools. A single similar reference board is offered for both Automotive and non-Auto version (i.e. for IS31CS8974/IS32CS8974, for IS31CS8975/IS32CS8975 etc.). The MCU evaluation boards are supplied with Canned demo firmware, showing some of the typical functions applied by the devices (Buzzer, Led control, capacitive touch sensing etc.). The evaluation board is also intended to present an example and provide guidelines for board design best known methods, especially in sensitive areas such mixed signal elements (Cap-sense electrodes and traces etc.) and noise reduction. Together with each MCU design Lumissil provides the EzISP board - USB-to-I2C interface to the computer. It is used for programing and debugging the board, both for the Lumissil evaluation boards and for the customer target design PCBs.

Production quantities are immediately available, and Samples can be ordered through Lumissil's global sales team and worldwide distribution partners.

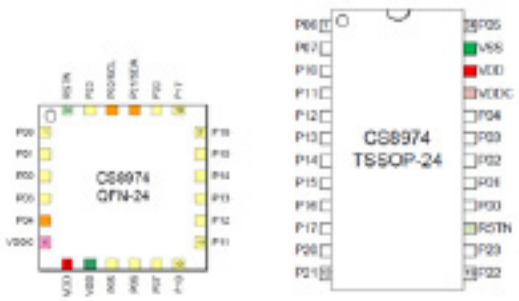


FIGURE 10 – CS8974 PACKAGING OPTIONS

FIGURE 11 – CS8975 PACKAGING OPTIONS

SUMMARY

MCUs that meet performance requirements and are easy to implements in variety of Automotive, Industrial and consumer applications are essential for product implementation. Combining such MCU solutions with Lumissil's LED-lighting, Cap-sense, and networking product lines creates a comprehensive and competitive technical and commercial offering.

Lumissil Microsystems offers a family of innovative MCU solutions that can be easily applied by product designers create solutions in application such as cars, IoT/Consumer products, appliances and other solutions.

Visit our website, www.lumissil.com to download datasheets, application notes, tools, example code and reference designs.

CONTACT:

Lior Broner
lior_broner@lumissil.com