Discontinued Product

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OKI Semiconductor

ML63293

Preliminary

4-Bit Microcontroller with Built-in LCD Driver (68SEG. × 32COM.) and Melody Circuit

GENERAL DESCRIPTION

The ML63293 is a CMOS 4-bit microcontroller with built-in LCD driver and Melody circuit.
The ML63293 is an M63xxx series mask ROM-version product of OLMS-63K family, which employs Oki's original CPU core nX-4/250.
The ML63293 contains 64K-word program memory, 3K-nibble data memory, 4-bit input port, 16-bit output ports, 24-bit input/output port, LCD driver for up to 2176 segments, and melody circuit.

The ML63Q290 is the flash EEPROM version of ML63293.
The ML63Q290 is used to evaluate the software development.

APPLICATION

The ML63293 is suitable for applications such as games, toys, watches, etc. which are provided with an LCD display and Melody output.

FEATURES

· Extensive instruction set
  408 instructions
    Transfer, rotate, increment,/decrement, arithmetic operations, comparison, logic operations, mask operations, bit operations, ROM table reference, external memory transfer, stack operations, flag operations, jump, conditional branch, call / return, control.

· Wide variety of addressing modes
  Indirect addressing of four data memory types, with current bank register, extra bank register, HL register and XY register.
  Data memory bank internal direct addressing mode.

· Processing speed
  2 clocks per machine cycle, with most instructions executed in 1 machine cycle.
  Minimum instruction execution time : 61µs (@32.768kHz system clock)
  1µs (@2MHz system clock)

· Clock generation circuit
  Low-speed clock : Crystal oscillation or RC oscillation selected with mask option (30k to 80kHz)
  High-speed clock : Ceramic oscillation or RC oscillation selected with software (2MHz max.)

· Program memory space
64K words
Basic instruction length is 16 bits / 1 word

· Data memory space
3K nibbles

· External data memory space
64K bytes (expandable by using an I/O port)

· Stack level
Call stack level : 16 levels
Register stack level : 16 levels

· I/O ports
Input ports : Selectable as input with pull-up resistance/ input with pull-down resistance / high-impedance input
Output ports : Selectable as P-channel open drain output / N-channel open drain output / CMOS output / high-impedance output
Input-output ports : Selectable as input with pull-up resistance / input with pull-down resistance / high-impedance input
Selectable as P-channel open drain output / N-channel open drain output / CMOS output / high-impedance output
Can be interfaced to external devices having different power supplies.
Number of ports:
Input ports : 4bits (1port × 4bits)
Output ports : 16bits (4ports × 4bits)
Input-output ports : 24bits (6ports × 4bits)

· Melody output function
Melody sound frequency : 529 to 2979Hz
Tone length : 63 varieties
Tempo : 15 varieties
Melody data : Stored in program memory
Buzzer driver signal output : 4kHz

· LCD driver
Number of segments : 2176 segments max. (68seg. × 32com.)
Duty : Selectable as 1/2,1/4,1/6,1/8,1/10,1/12,1/14.1/16,1/18,1/20, 1/22,1/24,1/26,1/28,1/30, 1/32
Bias : Selectable as 1/5 or 1/6 (internal Voltage regulator)
Frame frequency : 64 Hz
Contrast : 8 levels
Display modes : Selectable as all-ON mode, all-OFF mode, power down mode, and normal display mode

· Multiplier / divider circuits

Multiplier : (8 bits) × (8 bits) → Product (16bits)
Divider : (16 bits) / (8 bits) → Quotient (16bits), Remainder (8 bits)

· System reset function

System reset by RESET pin
System reset by power-on detection
System reset by detection that low-speed clock has stopped oscillation

· Battery check

Function that detects battery low voltage
Selection of judgment voltage by software (LD1 and LD0 bit settings of BLDCON)

LD1	LD0	Judgement voltage (V)	Comments
1	0	1.80 ± 0.10	Ta=25°C
1	1	2.40 ± 0.10	Ta=25°C

· Timers and Counter

8-bit timer : 4 channels
Selectable as auto-reload mode, capture mode, clock frequency measurement mode
Watchdog timer : 1 channel
100Hz timer : 1 channels
1/100 sec. Measurement possible
15-bit time-base counter signals : 1Hz, 2Hz, 4Hz, 8Hz, 16Hz, 32Hz, 64Hz, and 128Hz can be read

· Serial port

Mode : Selectable as UART mode, synchronous mode
UART communication speed : 1200 bps, 2400 bps, 4800 bps, 9600bps
Clock frequency in synchronous mode :
Internal clock mode (32.768kHz), External clock frequency
Data length : 5 to 8 bits

· Shift register

Shift clock : System clock × 1, × 1/2,
Timer 1 overflow (16-bit timer mode), External clock
Data length : 8 bits

· Interrupt sources

External interrupt : 5
Internal interrupt : 14

· Operating temperature
- 20 to +70 °C

· Operating voltage
1.8 to 3.5V

· Shipping products
Chip (169 pads) : (Product name: ML63293 - xxx)
176-pin flat package (176LQFP)
LQFP176-P-2424-0.50-BK : (Product name: ML63293 - xxxUA)
xxx indicates a ROM code number.

BLOCK DIAGRAM

An asterisk (*) indicates the port secondary function.