EM78F644N

8-Bit Microcontroller

Product Specification

DOC. VERSION 0.1

ELAN MICROELECTRONICS CORP.

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Specification Revision History

Doc. Version	Revision Description	Date
0.1	Preliminary version	2008/05/12

1 General Description

The EM78F644N is an 8-bit microprocessor designed and developed with low-power, high-speed CMOS technology and high noise immunity. It has an on-chip 4K×13-bit Electrical Flash Memory and 256×8-bit in system programmable EEPROM. It provides three protection bits to prevent intrusion of user's Flash memory code. Twelve Code option bits are also available to meet user's requirements.

With its enhanced Flash-ROM feature, the EM78F644N provides a convenient way of developing and verifying user's programs. Moreover, this Flash-ROM device offers the advantages of easy and effective program updates, using development and programming tools. User can avail of the ELAN Writer to easily program his development code.

2 Features

- CPU configuration
  - 4K×13 bits Flash memory
  - 144×8 bits on chip registers (SRAM)
  - 256 bytes in-system programmable EEPROM
    *Endurance: 100,000 write/erase cycles
  - More than 10 years data retention
  - 8-level stacks for subroutine nesting
  - Less than 2 mA at 5V/4MHz
  - Typically 20 μA, at 3V/32kHz
  - Typically 2 μA, during sleep mode
- I/O port configuration
  - 4 bidirectional I/O ports: P5, P6, P7, P8
  - 25 I/O pins
  - Wake-up port : P6
  - 14 programmable pull-high I/O pins
  - 14 programmable pull-down I/O pins
  - 8 programmable open-drain I/O pins
  - External interrupt with Wake-up : P60
- Operating voltage range:
  - Operating voltage: 2.4V~5.5V at -40°C ~85°C (Industrial)
  - Operating voltage: 2.2V~5.5V at 0°C ~70°C (Commercial)
- Operating frequency range (base on two clocks):
  - Crystal mode:
    DC ~ 16MHz @ 4.5V
    DC ~ 8MHz @ 3V
    DC ~ 4MHz @ 2.2V
  - ERC mode:
    DC ~ 16MHz @ 5V
    DC ~ 8MHz @ 3V
    DC ~ 4MHz @ 2.2V
  - IRC mode:
    DC ~ 16MHz @ 4.5V~5.5V
    DC ~ 4MHz @ 2.2V~5.5V
- Fourteen available interrupts:
  - Internal interrupt : 10
  - External interrupt : 3
- One set of comparator (offset voltage: smaller than 10 mV)
- Two channel Pulse Width Modulation (PWM) with 10-bit resolution
- Two 8-bit Timer/Counter
  - TC1 : Timer/Counter/Capture
  - TC3 : Timer/Counter/PDO (programmable divider output)/PWM (pulse width modulation)
- One 16-bit Timer/Counter
  - TC2 : Timer/Counter/Window
- Serial transmitter/receiver interface
  - Serial Peripheral Interface (SPI) : Three-wire synchronous communication
  - Universal Asynchronous Receiver / Transmitter (UART)
- Peripheral configuration
  - 8-bit real time clock/counter (TCC) with selective signal sources, trigger edges, and overflow interrupt
  - External interrupt input pin.
  - 2/4/8/16 clocks per instruction cycle selected by code option
  - Power down (Sleep) mode
  - High EFT immunity
- Single instruction cycle commands
- Programmable free running watchdog timer
- Package type:
  - 24-pin SKDIP 300mil :EM78F644NK24J/S
  - 24-pin SOP 300mil :EM78F644NSO24J/S
  - 28-pin SKDIP 300mil :EM78F644NK28J/S
  - 28-pin SOP 300mil :EM78F644NSO28J/S

Green products do not contain hazardous substances.

3 Pin Assignment

(1) 24-Pin SKDIP/SOP

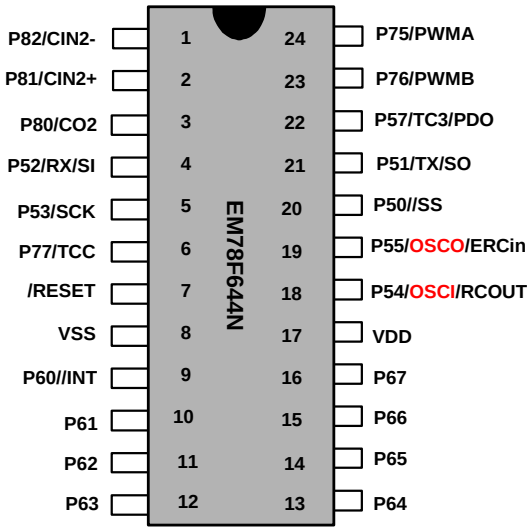

Fig. 3-1 24-pin EM78F644N

(2) 28-Pin SKDIP/SOP

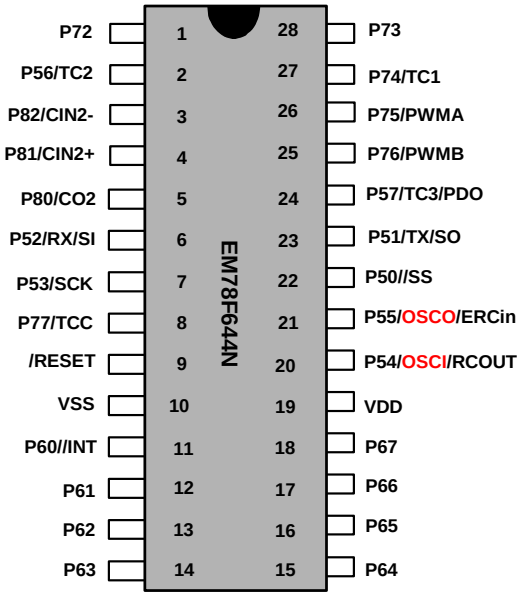

Fig. 3-2 28-pin EM78F644N

4 Pin Description

Table 1 EM78F644N -24Pin

Symbol	Pin No.	Type	Function
OSCO/ ERCin	19	I/O	Clock output from crystal oscillator. External RC oscillator clock input pin.
OSCI/ RCOUT	18	I/O	External clock crystal resonator oscillator input pin. Clock output from internal RC oscillator.
TCC	6	I	Real time clock/counter, Schmitt trigger input pin. Must be tied to VDD or VSS if not in use.
/RESET	7	I	Schmitt trigger input pin. If this pin remains logic low, the controller is reset.
P60~P64, P65~P67	9~16	I/O	Bidirectional 8-bit input/output ports. These can be used as pull-high or can be used as open drain by software programming. P60~63 can be used as pull-down by software programming. P60 can be used as external interrupt.
P80~P82	3~1	I/O	P80 ~ P82 are bi-directional I/O ports. P80 can be act as CO2. P81 can be act as CIN2+. P82 can be act as CIN2-.
P50~P55, P57	20,21, 4,5,18, 19,22	I/O	Bidirectional 8-bit input/output pins P50~P53 can be used as pull-down by software programming. P50 can be used as SPI slave select P51 can be used as SPI serial data output or UART TX output P52 can be used as SPI serial data input or UART RX input P53 can be used as SPI serial clock input/output P57 can be used as 8-bit timer/counter or programmable divider output (PDO).
P75,P76, P77	24,23,6	I/O	P75 ~ P77 are bidirectional I/O ports. P75~P76 can be used as pull-high or pull-down by software programming. P75,P76 can be used as PWMA/B output.
VDD	17	-	Power supply pin.
VSS	8	-	Ground.

Table 2 EM78F644N -28Pin

Symbol	Pin No.	Type	Function
OSCO/ ERCin	21	I/O	Clock output from crystal oscillator. External RC oscillator clock input pin.
OSCI/ RCOUT	20	I/O	External clock crystal resonator oscillator input pin. Clock output from internal RC oscillator.
TCC	8	I	Real time clock/counter, Schmitt trigger input pin. Must be tied to VDD or VSS if not in use.
/RESET	9	I	Schmitt trigger input pin. If this pin remains logic low, the controller is reset.
P60~P64, P65~P67	11~18	I/O	Bidirectional 8-bit input/output ports. These can be used as pull-high or can be used as open drain by software programming. P60~63 can be used as pull-down by software programming. P60 can be used as external interrupt.
P80~P82	5~3	I/O	P80 ~ P82 are bi-directional I/O ports. P80 can be act as CO2. P81 can be act as CIN2+. P82 can be act as CIN2-.
P50~P57	22,23,6,7 ,20, 21,2,24	I/O	Bidirectional 8-bit input/output pins P50~P53 can be used as pull-down by software programming. P50 can be used as SPI slave select P51 can be used as SPI serial data output or UART TX output P52 can be used as SPI serial data input or UART RX input P53 can be used as SPI serial clock input/output P56 can be used as 16-bit timer/counter(TC2). P57 can be used as 8-bit timer/counter or programmable divider output (PDO).
P72~P77	1, 28~25,8	I/O	P72 ~P77 are bidirectional I/O ports. P72~P76 can be used as pull-high or pull-down by software programming. P74 can be used as 8-bit timer/counter(TC1). P75,P76 can be used as PWMA/B output.
VDD	19	-	Power supply pin.
VSS	10	-	Ground.

5 Block Diagram

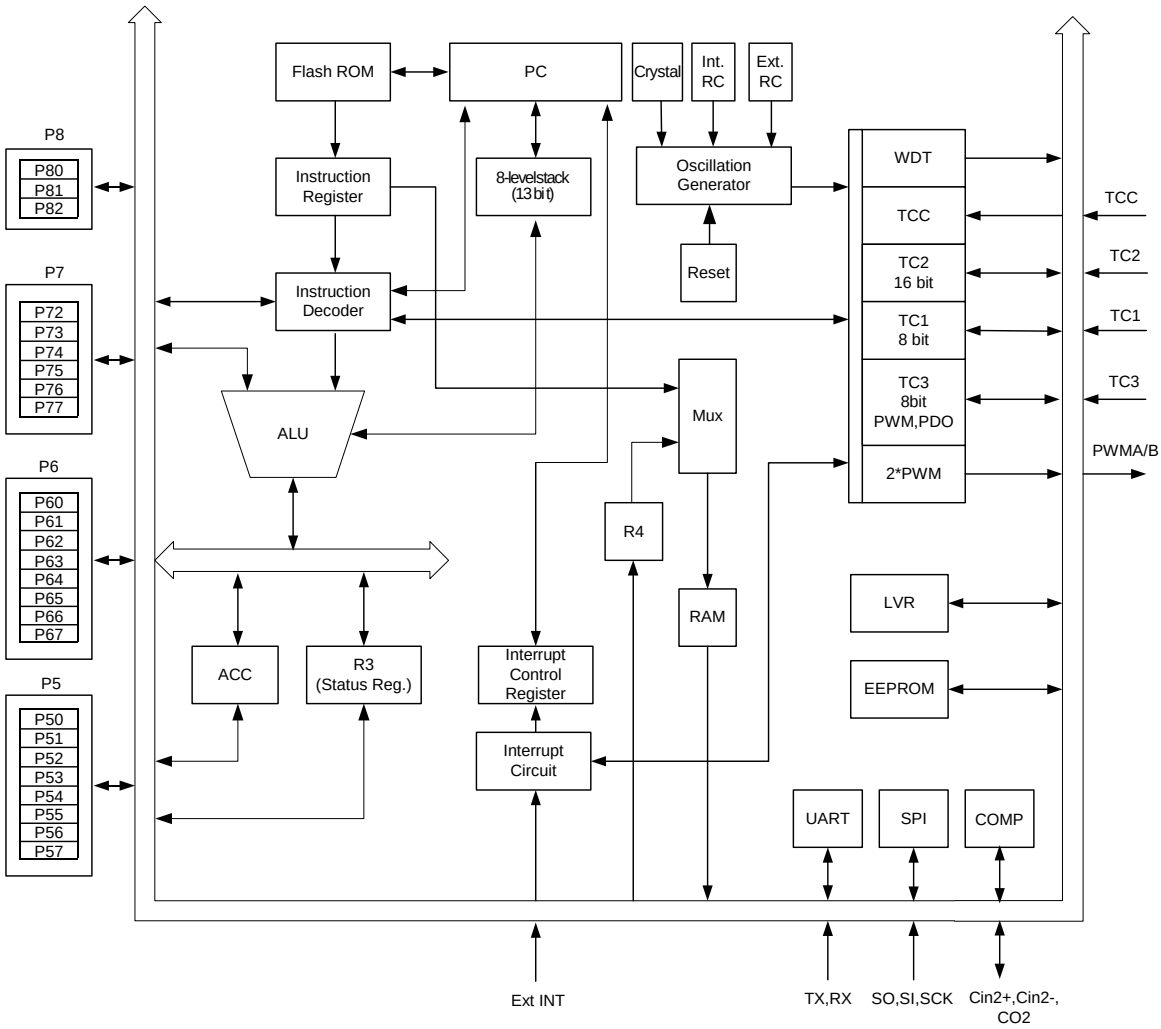

Fig. 5 Functional Block Diagram

APPENDIX

A Package Type

Flash MCU	Package Type	Pin Count	Package Size
EM78F644NK24J/S	Skinny DIP	24	300 mil
EM78F644NSO24J/S	SOP	24	300 mil
EM78F644NK28J/S	Skinny DIP	28	300 mil
EM78F644NSO28J/S	SOP	28	300 mil

Green products do not contain hazardous substances.

The third edition of Sony SS-00259 standard.

Pb contents should be less the 100ppm

Pb contents comply with Sony specs.

Part no.	EM78F644NxJ/xS
Electroplate type	Pure Tin
Ingredient (%)	Sn:100%
Melting point (°C)	232°C
Electrical resistivity (μΩ cm)	11.4
Hardness (hv)	8~10
Elongation (%)	>50%