

CMOS 8-Bit Microcontroller

TMP87CM38N/F, TMP87CP38N/F, TMP87CS38N/F

The 87CM38/P38/S38 is the high speed and high performance 8-bit single chip microcomputer. This MCU contains CPU core, ROM, RAM, input/output ports, six multi-function timer / counter, serial bus interface, on-screen display, PWM, 8-bit A/D converter and remote control signal preprocessor on a chip.

Part No.	ROM	RAM	Package	OTP MCU
TMP87CM38N/F	32 Kbytes	1 Kbytes	P-SDIP42-600-1.78 P-QFP44-1414-0.80D	TMP87PS38N/F
TMP87CP38N/F	48 Kbytes	2 Kbytes		
TMP87CS38N/F	60 Kbytes	2 Kbytes		

Features

- ◆ 8-bit single chip microcomputer TLCS-870 Series
- ◆ Instruction execution time : 0.5 μ s (at 8 MHz)
- ◆ 412 basic instructions
 - Multiplication and Division (8bits \times 8bits , 16bits \div 8bits)
 - Bit manipulations(Set/Clear/Complement/Move/Test/Exclusive Or)
 - 16-bit data operations
 - 1-byte jump / subroutine-call (Short relative jump / Vector call)
- ◆ 14 interrupt sources (External : 5, Internal : 9)
 - All sources have independent latches each, and nested interrupt control is available.
 - 3 edge-selectable external interrupts with noise reject
 - High-speed task switching by register bank changeover
- ◆ ROM Corrective Function
- ◆ 6 Input / Output ports (33 pins)
 - High current output : 4 pins (typ. 20 mA)
- ◆ Two 16-bit Timer / Counters
 - Timer, Event counter, Pulse width measurement, External trigger timer, Window modes

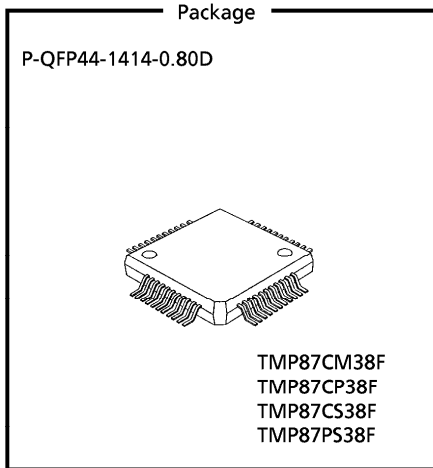
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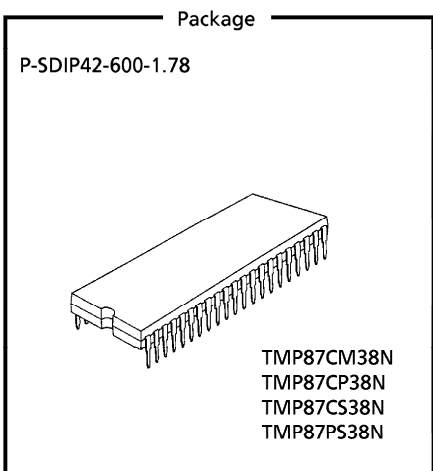
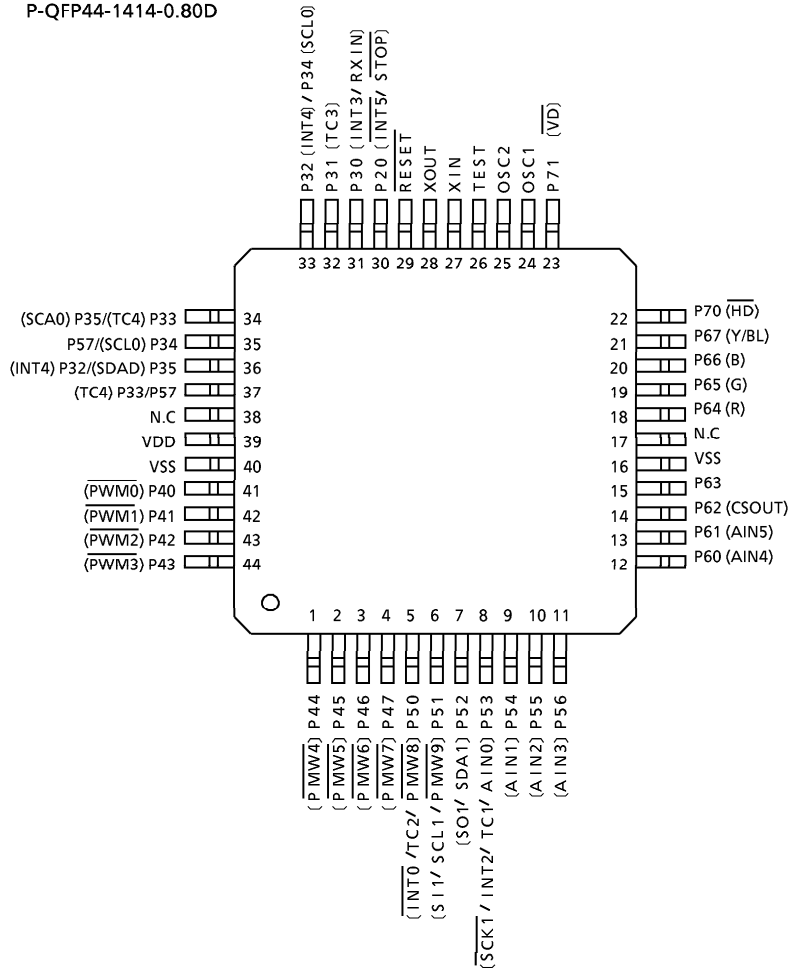
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- ◆ Two 8-bit Timer / Counters
 - Timer, Event counter, Capture (Pulse width / duty measurement) modes
- ◆ Time Base Timer (Interrupt frequency : 1 Hz to 16 kHz)
- ◆ Watchdog Timer
 - Interrupt source / reset output (programmable)
- ◆ Serial bus Interface
 - I²C-bus, 8-bit SIO modes
- ◆ On-screen display circuit
 - Character patterns : 256 characters
 - Characters displayed : 24 columns × 12 lines
 - Composition : 14 × 18 dots
 - Size of character : 3 kinds (line by line)
 - Color of character : 8 kinds (character by character)
 - Variable display position : Horizontal 128 steps, Vertical 256 steps
 - Fringing, Smoothing function
- ◆ D/A conversion (Pulse Width Modulation) outputs
 - 14-bit resolution (1 channel)
 - 7-bit resolution (9 channels)
- ◆ 8-bit successive approximate type A/D converter with sample and hold
- ◆ Remote control signal preprocessor
- ◆ Two Power saving operating modes
 - STOP mode : Oscillation stops. Battery / Capacitor back-up. Port output hold / high-impedance.
 - IDLE mode : CPU stops, and Peripherals operate. Release by interrupts.
- ◆ Jitter Elimination
- ◆ Emulation Pod : BM87CS38N0A



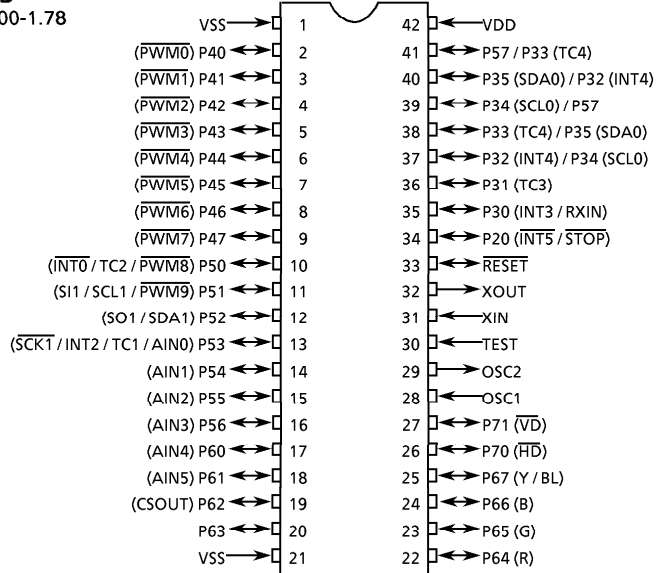
Pin Assignments

P-QFP44-1414-0.80D

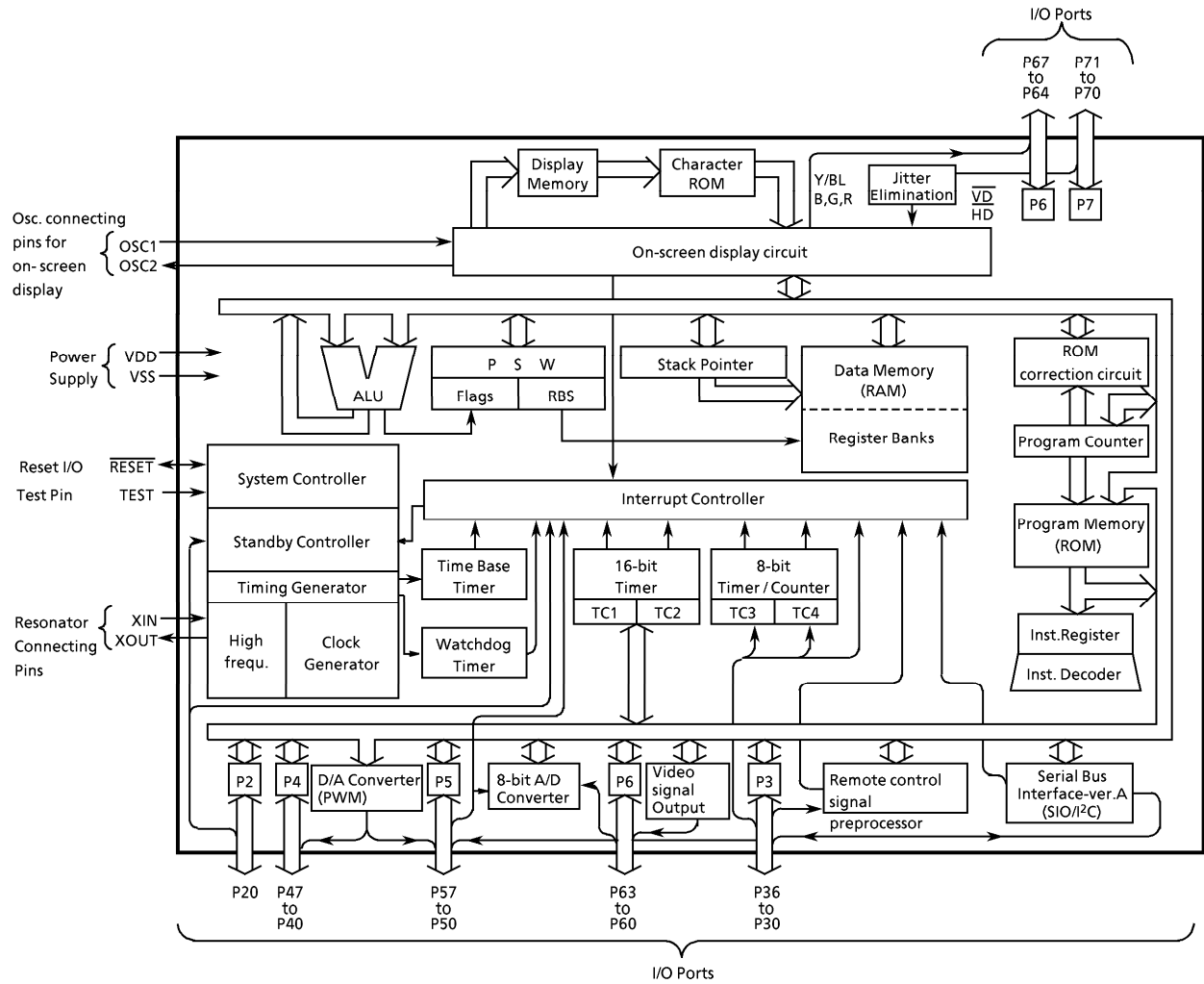


Pin Assignments

P-SDIP42-600-1.78



Block Diagram



Pin Function

Pin Name	Input / Output	Function			
P20 ($\overline{\text{INT5/STOP}}$)	I/O (Input)	1-bit input / output port with latch. When used as an input port, the latch must be set to "1".	External interrupt input 5 or STOP mode release signal input		
P35 (SDA0)	I/O (I/O)	6-bit input/output port with latch. When used as an input port, a serial bus interface input/output, a timer/counter input, a remote control signal preprocessor input, or an external interrupt input, the latch must be set to "1".	I ² Cbus serial data input/output		
P34 (SCL0)	I/O (I/O)		I ² Cbus serial clock input/output		
P33 (TC4)	I/O (Input)		Timer / Counter 4 input		
P32 (INT4)			External interrupt input 4		
P31 (TC3)			Timer / Counter 3 input		
P30 (INT3/RXIN)	I/O (Input/Input)	External interrupt input 3 or remote control signal preprocessor input			
P47 (PWM7) to P41 (PWM1)	I/O (Output)	8-bit programmable input/output port (tri-state). Each bit of this port can be individually configured as an input or an output under software control. During reset, all bits are configured as inputs. When used as a PWM output, the latch must be set to "1".	7-bit D/A conversion (PWM) outputs		
P40 (PWM0)			14-bit D/A conversion (PWM) output		
P57	I/O (Input)	8-bit input/output port with latch. When used as an input port, a analog input, a PWM output, or a pulse output, the latch must be set to "1".	8-bit A/D conversion inputs		
P56 (AIN3) to P53 (AIN0)			A/D conversion inputs or Timer / Counter 1 inputs or interrupt input 2 or SIO serial clock input/output		
P53 (AIN0 / TC1/ INT2 / SCK1)	I/O				
P52 (SDA1/SO1)	I/O (Input/Output)		I ² Cbus serial data input/output or SIO Serial data output		
P51 (PWM9 /SCL1/SI1)			7-bit D/A conversion (PWM) outputs	I ² Cbus serial data input / output or SIO Serial data input	
P50 (PWM8/TC2 /INT0)			Timer / Counter 2 input / External interrupt input 0		
P67 (Y/BL)	I/O(Output)	8-bit programmable input/output port (P67 to P64 : tri-state, P63 to P60 : High current output). Each bit of this port can be individually configured as an input or an output under software control. During reset, all bits are configured as inputs. When used as the R, G, B, Y / BL outputs of on-screen display circuit, each bit of the P6 port data selection register (bits 7 to 4 in address 0F91H) must be set to "1".	Focus signal output or Background blanking control signal output		
P66 (B)			RGB output		
P65 (G)					
P64 (R)					
P63			I/O		High current output.
P62 (CSOUT)					Test video signal output
P61 (AIN5)					A/D conversion inputs
P60 (AIN4)					
P71 ($\overline{\text{VD}}$)	I/O (Input)	2-bit input/output port with latch. When used as an input ports, or a vertical synchronous signal input and horizontal synchronous signal input, the latch must be set to "1".	Vertical synchronous signal input		
P70 ($\overline{\text{HD}}$)			Horizontal synchronous signal input		
OSC1, OSC2	Input, Output	Resonator connecting pins for on-screen display circuitry.			
XIN, XOUT		Resonator connecting pins. For inputting external clock, XIN is used and XOUT is opened.			
$\overline{\text{RESET}}$	I/O	Reset signal input or watchdog timer output/address-trap- reset output/system-clock-reset output.			
TEST	Input	Test pin for out-going test. Be tied to low.			
VDD, VSS	Power Supply	+ 5 V, 0 V (GND)			