MICROCHIP

PIC18F87K90 Family Data Sheet

64/80-Pin, High-Performance Microcontrollers with LCD Driver and nanoWatt XLP Technology

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MICROCHIP

PIC18F87K90 FAMILY

64/80-Pin, High-Performance Microcontrollers with LCD Driver and nanoWatt XLP Technology

Low-Power Features:

- Power-Managed modes:
  - Run: CPU on, peripherals on
  - Idle: CPU off, peripherals on
  - Sleep: CPU off, peripherals off
- Two-Speed Oscillator Start-up
- Fail-Safe Clock Monitor
- Power-Saving Peripheral Module Disable (PMD)
- Ultra Low-Power Wake-up
- Fast Wake-up, 2 μs Typical
- Low-Power WDT, 300 nA Typical
- Ultra Low 50 nA Input Leakage
- Run mode Currents Down to very low 5.5 μA, Typical
- Idle mode Currents Down to very low 2.2 μA, Typical
- Sleep mode Current Down to very low 20 nA, Typical
- RTCC Current Down to very low 700 nA, Typical
- LCD Current Down to very low 300 nA, Typical

LCD Driver and Keypad Features:

- Direct LCD Panel Drive Capability:
  - Can drive LCD panel while in Sleep mode
- Up to 48 Segments and 192 Pixels, Software-Selectable
- Programmable LCD Timing module:
  - Multiple LCD timing sources available
  - Up to four commons: static, 1/2, 1/3 or 1/4 multiplex
  - Bias configuration: Static, 1/2 or 1/3
- Low-Power Resistor Bias Network for LCD

Peripheral Highlights:

- Ten or eight CCP/ECCP modules:
  - Seven Capture/Compare/PWM (CCP) modules
  - Three Enhanced Capture/Compare/PWM (ECCP) modules
- Eleven 8/16-Bit Timer/Counter modules:
  - Timer0 – 8/16-bit timer/counter with 8-bit programmable prescaler
  - Timer1,3,5,7 – 16-bit timer/counter
  - Timer2,4,6,8,10,12 – 8-bit timer/counter
- Three Analog Comparators
- Configurable Reference Clock Output
- Hardware Real-Time Clock and Calendar (RTCC) module with Clock, Calendar and Alarm Functions
  - Time-out from 0.5s to 1 year
- Charge Time Measurement Unit (CTMU):
  - Capacitance measurement for mTouch™ Sensing
  - Time measurement with 1 ns typical resolution
- High-Current Sink/Source 25 mA/25 mA (PORTB and PORTC)
- Up to Four External Interrupts
- Two Master Synchronous Serial Port (MSSP) modules:
  - 3/4-wire SPI (supports all four SPI modes)
  - I²C™ Master and Slave mode

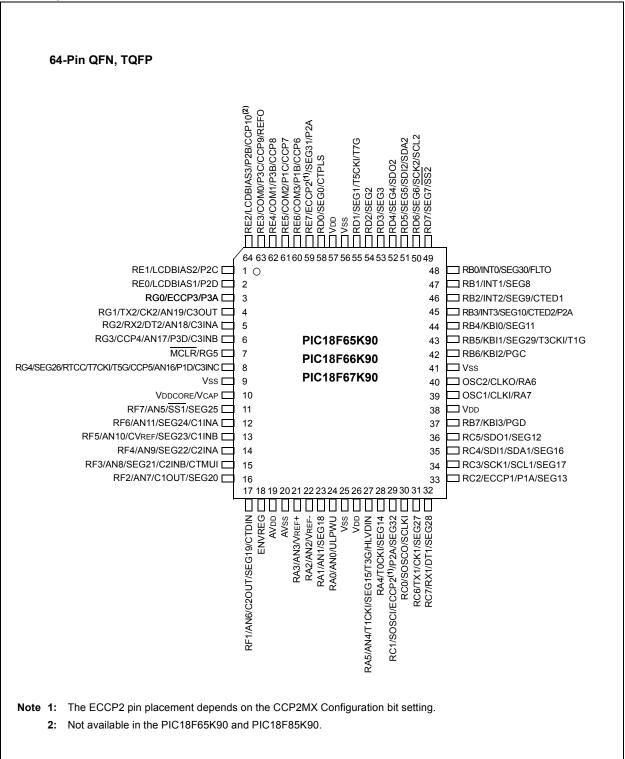| Device	Flash Program Memory (Bytes)	SRAM Data Memory (Bytes)	EEPROM (Bytes)	I/O	LCD Pixels	Timers 8/16-Bit	CCP/ECCP	SPI	I²C™	EUSART	12-Bit A/D (Channels)	Comparators	CTMU	RTCC
PIC18F65K90	32K	2K	1K	53	132	4/4	5/3	Yes	Yes	2	16	3	Y	Y
PIC18F66K90	64K	4K	1K	53	132	6/5	7/3	Yes	Yes	2	16	3	Y	Y
PIC18F67K90	128K	4K	1K	53	132	6/5	7/3	Yes	Yes	2	16	3	Y	Y
PIC18F85K90	32K	2K	1K	69	192	4/4	5/3	Yes	Yes	2	24	3	Y	Y
PIC18F86K90	64K	4K	1K	69	192	6/5	7/3	Yes	Yes	2	24	3	Y	Y
PIC18F87K90	128K	4K	1K	69	192	6/5	7/3	Yes	Yes	2	24	3	Y	Y

PIC18F87K90 FAMILY

Special Microcontroller Features:

- Operating Voltage Range: 1.8V to 5.5V
- On-Chip 3.3V Regulator
- Operating Speed up to 64 MHz
- Up to 128 Kbytes On-Chip Flash Program Memory
- Data EEPROM of 1,024 Bytes
- 4K x 8 General Purpose Registers (SRAM)
- 10,000 Erase/Write Cycle Flash Program Memory, Typical
- 1,000,000 Erase/write Cycle Data EEPROM Memory, Typical
- Flash Retention 40 Years, Minimum
- Three Internal Oscillators: LF-INTRC (31 kHz), MF-INTOSC (500 kHz) and HF-INTOSC (16 MHz)
- Self-Programmable under Software Control

- Priority Levels for Interrupts
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
  - Programmable period from 4 ms to 4,194s (about 70 minutes)
- In-Circuit Serial Programming™ (ICSP™) via Two Pins
- In-Circuit Debug via Two Pins
- Programmable:
  - BOR
  - LVD
- Two Enhanced Addressable USART modules:
  - LIN/J2602 support
  - Auto-Baud Detect (ABD)
- 12-Bit A/D Converter with up to 24 Channels:
  - Auto-acquisition and Sleep operation
  - Differential Input mode of operation

Preliminary

Pin Diagrams – PIC18F6XK90

64-Pin QFN, TQFP

Top edge pins (64 down to 49):
- 64 RE2/LCDBIAS3/P2B/CCP10(2)
- 63 RE3/COM0/P3C/CCP9/REFO
- 62 RE4/COM1/P3B/CCP8
- 61 RE5/COM2/P1C/CCP7
- 60 RE6/COM3/P1B/CCP6
- 59 RE7/ECCP2(1)/SEG31/P2A
- 58 RD0/SEG0/CTPLS
- 57 VDD
- 56 VSS
- 55 RD1/SEG1/T5CKI/T7G
- 54 RD2/SEG2
- 53 RD3/SEG3
- 52 RD4/SEG4/SDO2
- 51 RD5/SEG5/SDI2/SDA2
- 50 RD6/SEG6/SCK2/SCL2
- 49 RD7/SEG7/SS2

Left side pins (1 to 16):
- 1 RE1/LCDBIAS2/P2C
- 2 RE0/LCDBIAS1/P2D
- 3 **RG0/ECCP3/P3A**
- 4 RG1/TX2/CK2/AN19/C3OUT
- 5 RG2/RX2/DT2/AN18/C3INA
- 6 RG3/CCP4/AN17/P3D/C3INB
- 7 MCLR/RG5
- 8 RG4/SEG26/RTCC/T7CKI/T5G/CCP5/AN16/P1D/C3INC
- 9 VSS
- 10 VDDCORE/VCAP
- 11 RF7/AN5/SS1/SEG25
- 12 RF6/AN11/SEG24/C1INA
- 13 RF5/AN10/CVREF/SEG23/C1INB
- 14 RF4/AN9/SEG22/C2INA
- 15 RF3/AN8/SEG21/C2INB/CTMUI
- 16 RF2/AN7/C1OUT/SEG20

Center labels:
PIC18F65K90
PIC18F66K90
PIC18F67K90

Right side pins (48 to 33):
- 48 RB0/INT0/SEG30/FLTO
- 47 RB1/INT1/SEG8
- 46 RB2/INT2/SEG9/CTED1
- 45 RB3/INT3/SEG10/CTED2/P2A
- 44 RB4/KBI0/SEG11
- 43 RB5/KBI1/SEG29/T3CKI/T1G
- 42 RB6/KBI2/PGC
- 41 VSS
- 40 OSC2/CLKO/RA6
- 39 OSC1/CLKI/RA7
- 38 VDD
- 37 RB7/KBI3/PGD
- 36 RC5/SDO1/SEG12
- 35 RC4/SDI1/SDA1/SEG16
- 34 RC3/SCK1/SCL1/SEG17
- 33 RC2/ECCP1/P1A/SEG13

Bottom edge pins (17 to 32):
- 17 RF1/AN6/C2OUT/SEG19/CTDIN
- 18 ENVREG
- 19 AVDD
- 20 AVSS
- 21 RA3/AN3/VREF+
- 22 RA2/AN2/VREF-
- 23 RA1/AN1/SEG18
- 24 RA0/AN0/ULPWU
- 25 VSS
- 26 VDD
- 27 RA5/AN4/T1CKI/SEG15/T3G/HLVDIN
- 28 RA4/T0CKI/SEG14
- 29 RC1/SOSCI/ECCP2(1)/P2A/SEG32
- 30 RC0/SOSCO/SCLKI
- 31 RC6/TX1/CK1/SEG27
- 32 RC7/RX1/DT1/SEG28

Note 1: The ECCP2 pin placement depends on the CCP2MX Configuration bit setting.

2: Not available in the PIC18F65K90 and PIC18F85K90.

Pin Diagrams – PIC18F8XK90

80-Pin TQFP

Top side (pins 61-80):
- 80 RH1/SEG46/AN22
- 79 RH0/SEG47/AN23
- 78 RE2/LCDBIAS3/P2B/CCP10**(2)**
- 77 RE3/COM0/P3C/CCP9**(3)**/REFO
- 76 RE4/COM1/P3B/CCP8**(3)**
- 75 RE5/COM2/P1C/CCP7**(3)**
- 74 RE6/COM3/P1B/CCP6**(3)**
- 73 RE7/ECCP2**(1)**/P2A/SEG31
- 72 RD0/SEG0/CTPLS
- 71 VDD
- 70 VSS
- 69 RD1/SEG1/T5CKI/T7G
- 68 RD2/SEG2
- 67 RD3/SEG3
- 66 RD4/SEG4/SDO2
- 65 RD5/SEG5/SDI2/SDA2
- 64 RD6/SEG6/SCK2/SCL2
- 63 RD7/SEG7/SS2
- 62 RJ0
- 61 RJ1/SEG33

Left side (pins 1-20):
- 1 RH2/SEG45/AN21
- 2 RH3/SEG44/AN20
- 3 RE1/LCDBIAS2/P2C
- 4 RE0/LCDBIAS1/P2D
- 5 RG0/ECCP3/P3A
- 6 RG1/TX2/CK2/AN19/C3OUT
- 7 RG2/RX2/DT2/AN18/C3INA
- 8 RG3/CCP4/AN17/P3D/C3INB
- 9 MCLR/RG5
- 10 RG4/SEG26/RTCC/T7CKI/T5G/CCP5/AN16/P1D/C3INC
- 11 VSS
- 12 VDDCORE/VCAP
- 13 RF7/AN5/SS1/SEG25
- 14 RF6/AN11/SEG24/C1INA
- 15 RF5/AN10/CVREF/SEG23/C1INB
- 16 RF4/AN9/SEG22/C2INA
- 17 RF3/AN8/SEG21/C2INB/CTMUI
- 18 RF2/AN7/C1OUT/SEG20
- 19 RH7/SEG43/CCP6**(3)**/P1B/AN15
- 20 RH6/SEG42/CCP7**(3)**/P1C/AN14/C1INC

PIC18F85K90
PIC18F86K90
PIC18F87K90

Right side (pins 41-60):
- 60 RJ2/SEG34
- 59 RJ3/SEG35
- 58 RB0/INT0/SEG30/FLT0
- 57 RB1/INT1/SEG8
- 56 RB2/INT2/SEG9/CTED1
- 55 RB3/INT3/SEG10/CTED2/P2A
- 54 RB4/KBI0/SEG11
- 53 RB5/KBI1/SEG29/T3CKI/T1G
- 52 RB6/KBI2/PGC
- 51 VSS
- 50 OSC2/CLKO/RA6
- 49 OSC1/CLKI/RA7
- 48 VDD
- 47 RB7/KBI3/PGD
- 46 RC5/SDO1/SEG12
- 45 RC4/SDI1/SDA1/SEG16
- 44 RC3/SCK1/SCL1/SEG17
- 43 RC2/ECCP1/P1A/SEG13
- 42 RJ7/SEG36
- 41 RJ6/SEG37

Bottom side (pins 21-40):
- 21 RH5/SEG41/CCP8**(3)**/P3B/AN13/C2IND
- 22 RH4/SEG40/CCP9**(3)**/P3C/AN12/C2INC
- 23 RF1/AN6/C2OUT/SEG19/CTDIN
- 24 ENVREG
- 25 AVDD
- 26 AVSS
- 27 RA3/AN3/VREF+
- 28 RA2/AN2/VREF-
- 29 RA1/AN1/SEG18
- 30 RA0/AN0/ULPWU
- 31 VDD
- 32 VSS
- 33 RA5/AN4/T1CKI/SEG15/T3G/HLVDIN
- 34 RA4/T0CKI/SEG14
- 35 RC1/SOSCI/ECCP2**(1)**/SEG32/P2A
- 36 RC0/SOSCO/SCKLI
- 37 RC6/TX1/CK1/SEG27
- 38 RC7/RX1/DT1/SEG28
- 39 RJ4/SEG39
- 40 RJ5/SEG38

Note 1: The ECCP2 pin placement depends on the CCP2MX Configuration bit setting.

2: Not available in the PIC18F65K90 and PIC18F85K90.

3: The CCP6, CCP7, CCP8 and CCP9 pin placement depends on the ECCPMX Configuration bit setting