



MICROCHIP

PIC16(L)F1934/6/7
Data Sheet

28/40/44-Pin Flash-Based, 8-Bit
CMOS Microcontrollers with
LCD Driver and nanoWatt XLP Technology

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

Information contained in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION, INCLUDING BUT NOT LIMITED TO ITS CONDITION, QUALITY, PERFORMANCE, MERCHANTABILITY OR FITNESS FOR PURPOSE. Microchip disclaims all liability arising from this information and its use. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights.

Trademarks

The Microchip name and logo, the Microchip logo, dsPIC, KeilLog, KeilLog logo, MPLAB, PIC, PICmicro, PICSTART, PIC¹² logo, RISC and UNO are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

FiberLab, Hampshire, Hi-TECH C, Linear Active Transistor, MICRO, MPLAB, SEEVAL and The Embedded Control Solutions Company are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Analog-for-the-Digital Age, Application Maestro, CodeGuard, dsPICDEM, dsPICDEM.net, dsPICworks, dsSPEAK, ECAN, ECONOMONITOR, FunSense, Hi-TIDE, In-Circuit Serial Programming, ICSP Master, MPLAB, MPLAB Certified logo, MPLAB, MPLINK, reTouch, Connected Code Generation, PICC, PICC-18, PICDEM, PICDEM.net, PICKit, PICul, REAL ICE, rLAB, Select Mode, Total Endurance, TSHARC, UniWinDriver, WiperLock and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SDTP is a service mark of Microchip Technology Incorporated in the U.S.A.

All other trademarks mentioned herein are property of their respective companies.

© 2008-2011, Microchip Technology Incorporated. Printed in the U.S.A.. All Rights Reserved.

 Printed on recycled paper.

ISBN: 978-1-61341-013-4

Microchip received ISO/TS-16949:2002 certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona; Gresham, Oregon and design centers in California and India. The Company's quality system processes and procedures are for its PIC[®] MCUs and dsPIC[®] DSCs, KeilLog[®] code hopping devices, Serial EEPROMs, microperipherals, nonvolatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001:2000 certified.

QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
== ISO/TS 16949:2002 ==



PIC16(L)F1934/6/7

28/40/44-Pin Flash-Based, 8-Bit CMOS Microcontrollers with LCD Driver with nanoWatt XLP Technology

Devices Included in This Data Sheet:

- PIC16F1934
- PIC16LF1934
- PIC16F1936
- PIC16LF1936
- PIC16F1937
- PIC16LF1937

Other PIC16(L)F193X Devices Available:

- PIC16(L)F1933 (DS41575)
- PIC16(L)F1935/9 (DS41574)

Note: PIC16(L)F193X devices referred to in this data sheet apply to PIC16(L)F1934/6/7.

High-Performance RISC CPU:

- Only 49 Instructions to Learn
 - All single-cycle instructions except branches
- Operating Speed:
 - DC – 32 MHz oscillator/clock input
 - DC – 125 ns instruction cycle
- Up to 16K x 14 Words of Flash Program Memory
- Up to 1024 Bytes of Data Memory (RAM)
- Interrupt Capability with Automatic Context Saving
- 16-Level Deep Hardware Stack
- Direct, Indirect and Relative Addressing modes
- Processor Read Access to Program Memory
- Pinout Compatible to other 28/40/44-pin PIC16CXXX and PIC16FXXX Microcontrollers

Special Microcontroller Features:

- Precision Internal Oscillator:
 - Factory calibrated to $\pm 1\%$, typical
 - Software-selectable frequency range from 32 kHz to 31 kHz
- Power-Saving Sleep mode
- Power-on Reset (POR)
- Power-up Timer (PWRT) and Oscillator Start-up Timer (OST)
- Brown-out Reset (BOR)
 - Selectable between two trip points
 - Disable in Sleep option
- Multiplexed Master Clear with Pull-up/Input Pin
- Programmable Code Protection
- High Endurance Flash/EEPROM cell:
 - 100,000 write Flash endurance
 - 1,000,000 write EEPROM endurance
 - Flash/Data EEPROM retention: > 40 years
- Wide Operating Voltage Range
 - 1.8V-5.5V (PIC16F193X)
 - 1.8V-3.6V (PIC16LF193X)

PIC16LF193X Low-Power Features:

- Standby Current
 - 60 nA @ 1.8V, typical
- Operating Current:
 - 7.0 μ A @ 32 kHz, 1.8V, typical (PIC16LF193X)
 - 150 μ A @ 1 MHz, 1.8V, typical (PIC16LF193X)
- Timer1 Oscillator Current:
 - 600 nA @ 32 kHz, 1.8V, typical
- Low-Power Watchdog Timer Current:
 - 500 nA @ 1.8V, typical (PIC16LF193X)

Peripheral Features:

- Up to 35 I/O Pins and 1 Input-only Pin:
 - High-current source/sink for direct LED drive
 - Individually programmable interrupt-on-pin change pins
 - Individually programmable weak pull-ups
- Integrated LCD Controller:
 - Up to 96 segments
 - Variable clock input
 - Contrast control
 - Internal voltage reference selections
- Capacitive Sensing module (mTouch™)
 - Up to 16 selectable channels
- A/D Converter:
 - 10-bit resolution and up to 14 channels
 - Selectable 1.024/2.048/4.096V voltage reference
- Timer0: 8-Bit Timer/Counter with 5-Bit Programmable Prescaler
- Enhanced Timer1
 - Dedicated low-power 32 kHz oscillator driver
 - 16-bit timer/counter with prescaler
 - External Gate Input mode with toggle and single shot modes
 - Interrupt-on-gate completion
- Timer2, 4, 6: 8-Bit Timer/Counter with 5-Bit Period Register, Prescaler and Postscaler
- Two Capture, Compare, PWM modules (CCP)
 - 16-bit Capture, max. resolution 125 ns
 - 16-bit Compare, max. resolution 125 ns
 - 16-bit PWM, max. frequency 31.25 kHz
- Three Enhanced Capture, Compare, PWM modules (ECCP)
 - 3 PWM time-base options
 - Auto-shutdown and auto-restart
 - PWM steering
 - Programmable dead-band delay

PIC16(L)F1934/6/7

Peripheral Features (Continued):

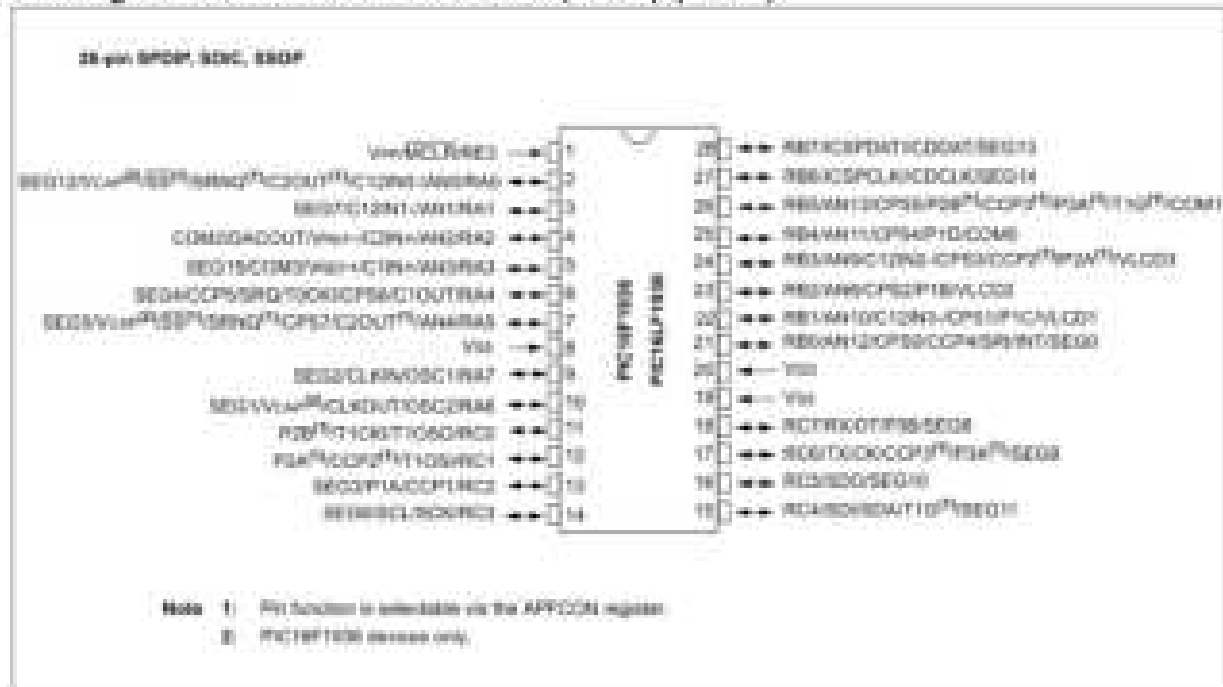
- Master Synchronous Serial Port (MSSP) with SPI and I²C™ with:
 - 7-bit address masking
 - SMBus/PMBus™ compatibility
 - Auto-wake-up on start
- Enhanced Universal Synchronous Asynchronous Receiver Transmitter (EUSART)
 - RS-232, RS-485 and LIN compatible
 - Auto-Baud Detect
- SR Latch (555 Timer)
 - Multiple Set/Reset input options
 - Emulates 555 Timer applications
- 2 Comparators:
 - Rail-to-rail inputs/outputs
 - Power mode control
 - Software enable hysteresis
- Voltage Reference module:
 - Fixed Voltage Reference (FVR) with 1.024V, 2.048V and 4.096V output levels
 - 5-bit rail-to-rail resistive DAC with positive and negative reference selection

PIC16(L)F193X Family Types

Device	Program Memory Flash (words)	Data EEPROM (bytes)	SRAM (bytes)	I/O's	10-bit A/D (bits)	Capacitors (nF)	Comparators	Timers (8/16-bit)	EUSART	I ² C™/SPI	EDCP	CCP	LCD
PIC16F1934 PIC16LF1934	4096	256	256	36	14	16	2	4/1	Yes	Yes	3	2	24/4
PIC16F1936 PIC16LF1936	8192	256	512	25	11	8	2	4/1	Yes	Yes	3	2	16 ¹ /4
PIC16F1937 PIC16LF1937	8192	256	512	36	14	16	2	4/1	Yes	Yes	3	2	24/4

Note 1: COM0 and SEG15 share the same physical pin on PIC16(L)F1936, therefore, SEG15 is not available when using 14 multiplex displays.

Pin Diagram – 28-Pin SPDIP/SOIC/SSOP (PIC16(L)F1936)



PIC16(L)F1934/6/7

Pin Diagram – 28-Pin QFN/UQFN (PIC16(L)F1936)

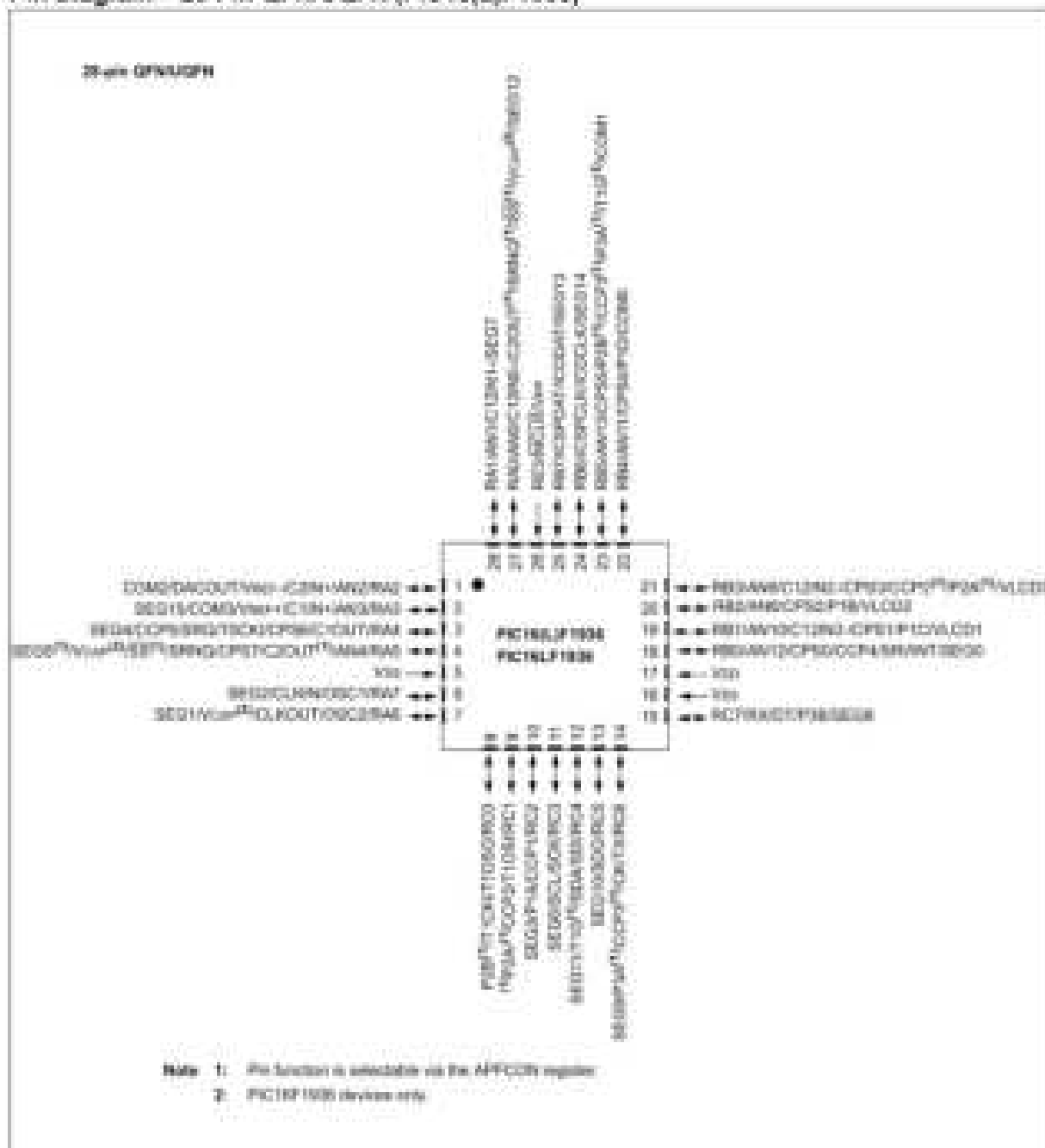


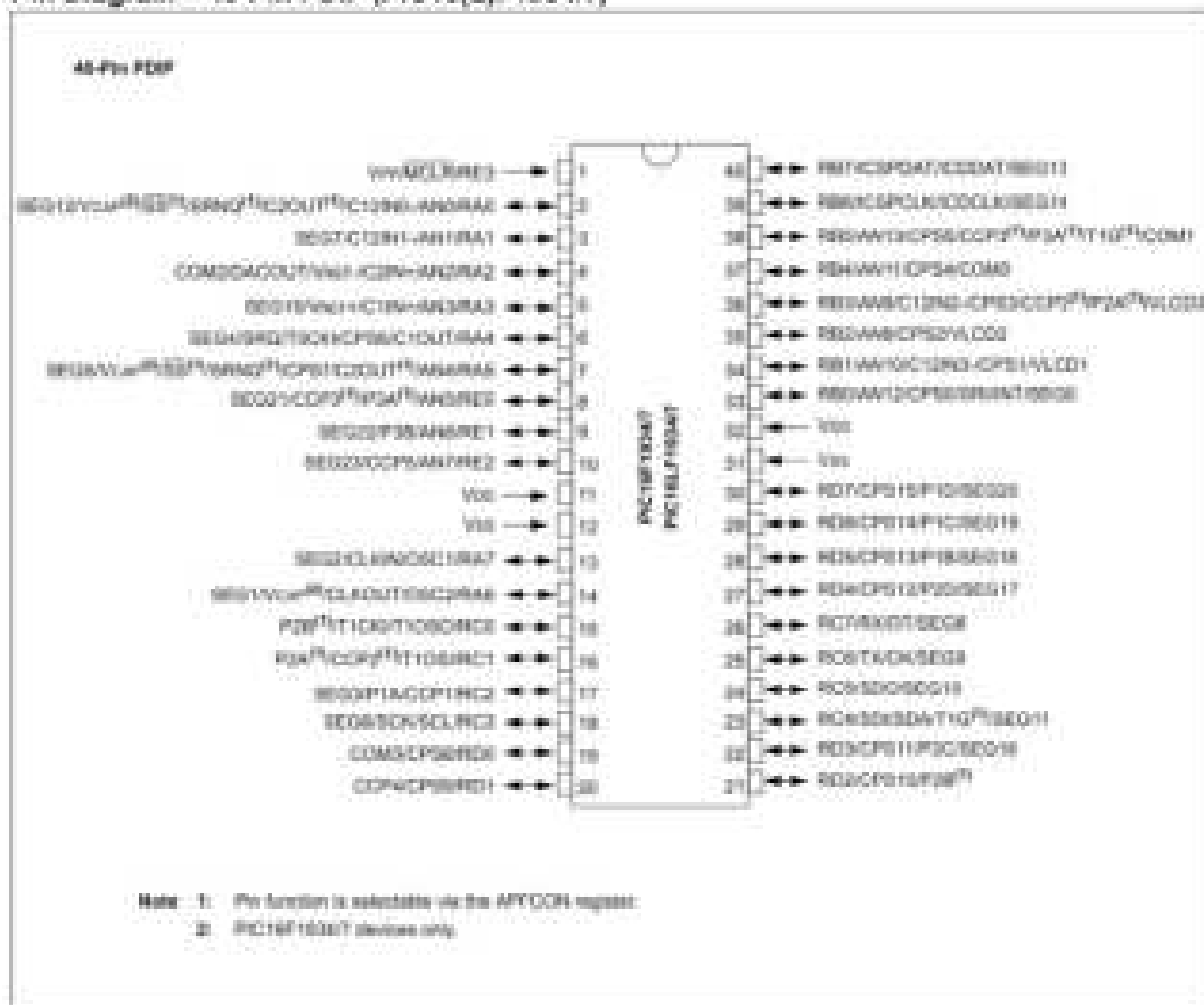
TABLE 1: 28-PIN SUMMARY (PIC16(L)F1936)

IO	28-Pin SPIF ¹	28-Pin QFN	ANAL.	A/D	Cap Sense	Comparator	SR Latch	Timers	CCP	USART	EEPROM	LOC	Interrupt	Pull-up	Serial
RA0	2	2	Y	AN0	—	DT2BBL/COMP1 ²	SR02 ²	—	—	—	EEP ²	SEC12	—	—	VLM ²
RA1	3	3	Y	AN1	—	C12BBL	—	—	—	—	—	SEC17	—	—	—
RA2	4	4	Y	AN2/SSM ²	—	C2BBL/COMP2	—	—	—	—	—	COM2	—	—	—
RA3	5	5	Y	AN3/VREF+	—	C1BBL	—	—	—	—	—	SEC19/COM3	—	—	—
RA4	6	6	Y	—	CP1B	C12A07	SR03	TR04	CCP5	—	—	SEC4	—	—	—
RA5	7	7	Y	AN5	CP07	COMP1 ²	SR02 ²	—	—	—	EEP ²	SEC6	—	—	VLM ²
RA6	16	7	—	—	—	—	—	—	—	—	—	SR01	—	—	COMP/CLKOUT/VLM ²
RA7	8	8	—	—	—	—	—	—	—	—	—	SEC2	—	—	COMP/CLKIN
RB0	23	16	Y	AN12	CP00	—	SR05	—	CCP4	—	—	SEC00	INT1/IOC	Y	—
RB1	22	15	Y	AN10	CP01	C12BBL	—	—	P1C	—	—	VLM21	IOC	Y	—
RB2	23	16	Y	AN9	CP02	—	—	—	P1B	—	—	VLM22	IOC	Y	—
RB3	24	17	Y	AN8	CP03	C12BBL	—	—	CCP2 ² /P2A ²	—	—	VLM23	IOC	Y	—
RB4	25	18	Y	AN11	CP04	—	—	—	P1D	—	—	COM0	IOC	Y	—
RB5	26	19	Y	AN13	CP05	—	—	T10 ²	P2B ² /CCP2 ² /P2A ²	—	—	COM1	IOC	Y	—
RB6	27	20	—	—	—	—	—	—	—	—	—	SEC14	IOC	Y	ICSPCLK/ICDCLK
RB7	28	21	—	—	—	—	—	—	—	—	—	SEC13	IOC	Y	ICSPDAT1/ICDOUT
RC0	11	8	—	—	—	—	T10B0/T10B1	—	P2B ²	—	—	—	—	—	—
RC1	12	9	—	—	—	—	T10B4	—	CCP2 ² /P2A ²	—	—	—	—	—	—
RC2	13	10	—	—	—	—	—	—	CCP1/P1A	—	—	SEC3	—	—	—
RC3	14	11	—	—	—	—	—	—	—	—	SCA/SC1	SEC6	—	—	—
RC4	15	12	—	—	—	—	T10 ²	—	—	—	SEC04	SEC11	—	—	—
RC5	16	13	—	—	—	—	—	—	—	—	SEC0	SEC10	—	—	—
RC6	17	14	—	—	—	—	—	—	CCP2 ² /P2A ²	TR06	—	SEC00	—	—	—
RC7	18	15	—	—	—	—	—	—	P1B	TR07	—	SEC08	—	—	—
RC8	1	26	—	—	—	—	—	—	—	—	—	—	—	Y	SC1A/VLM
VREF	28	17	—	—	—	—	—	—	—	—	—	—	—	—	VREF
VDD	8	5	—	—	—	—	—	—	—	—	—	—	—	—	VDD
GND	19	18	—	—	—	—	—	—	—	—	—	—	—	—	GND

Note 1: Pin functions can be moved using the APFCON register.
2: PIC16(L)F1936 devices only.

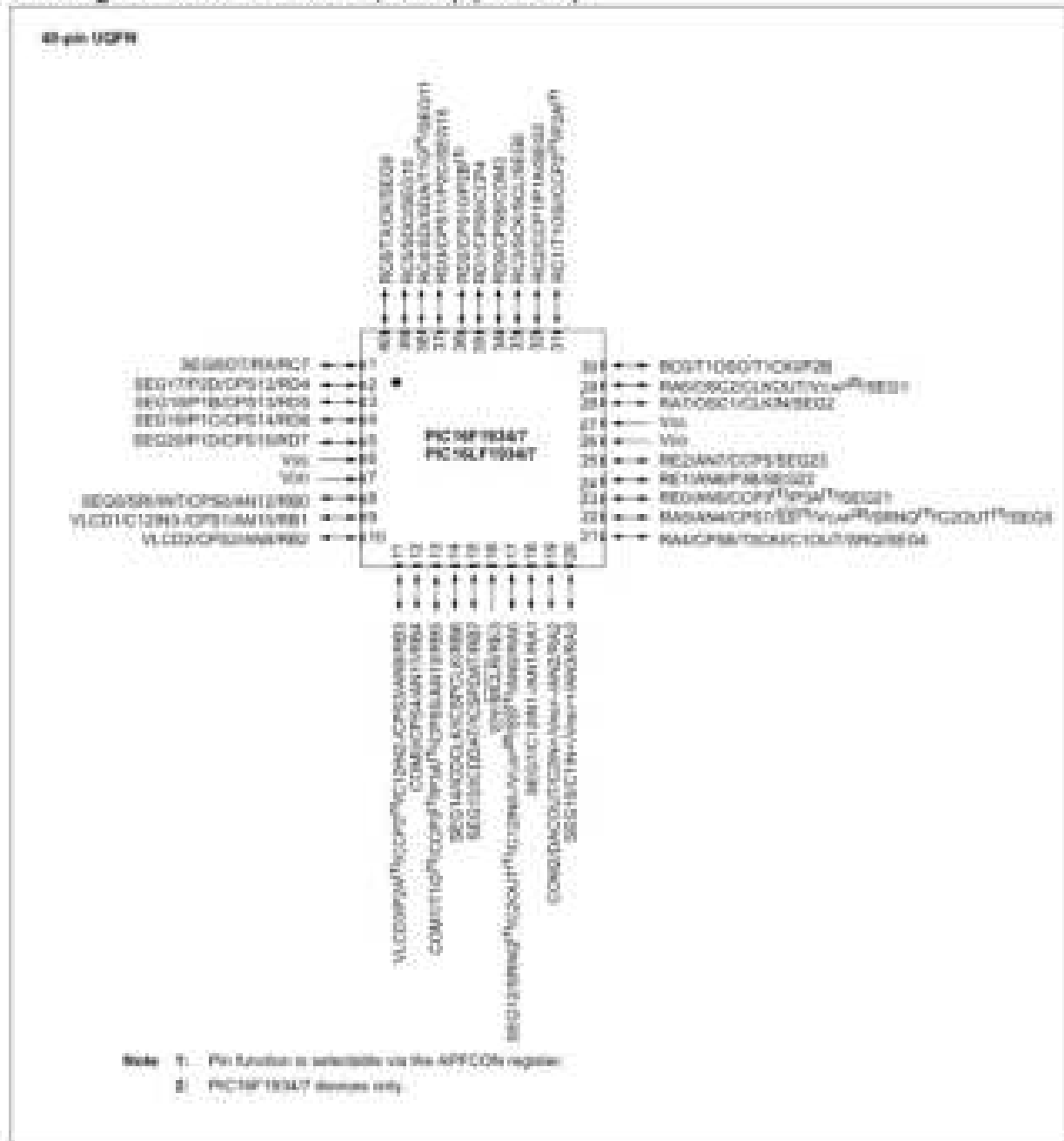
PIC16(L)F1934/6/7

Pin Diagram – 40-Pin PDIP (PIC16(L)F1934/7)



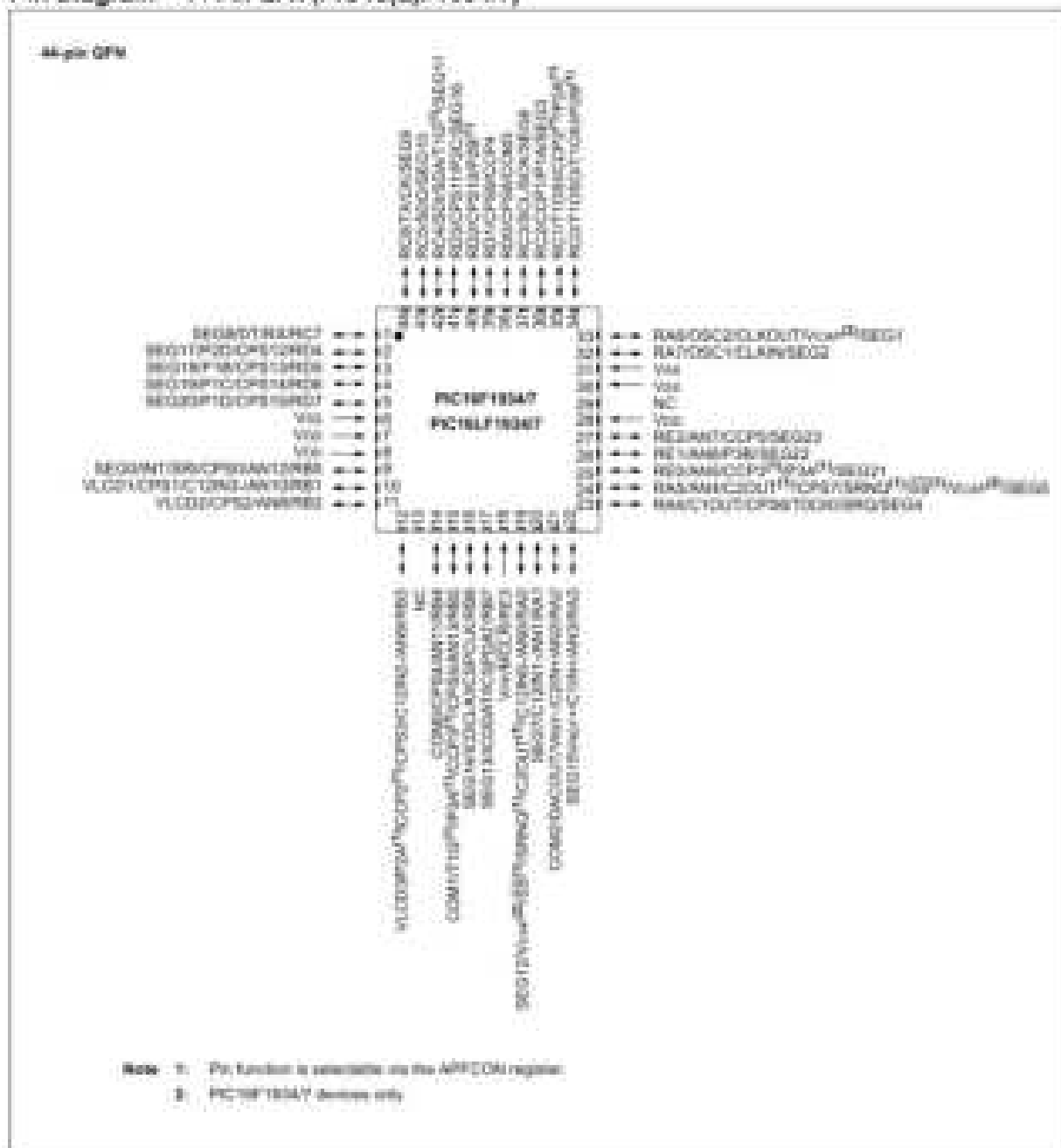
PIC16(L)F1934/6/7

Pin Diagram – 40-Pin UQFN 5X5 (PIC16(L)F1934/7)



PIC16(L)F1934/6/7

Pin Diagram – 44-Pin QFN (PIC16(L)F1934/7)



Pin Diagram – 44-Pin TQFP (PIC16(L)F1934/7)

