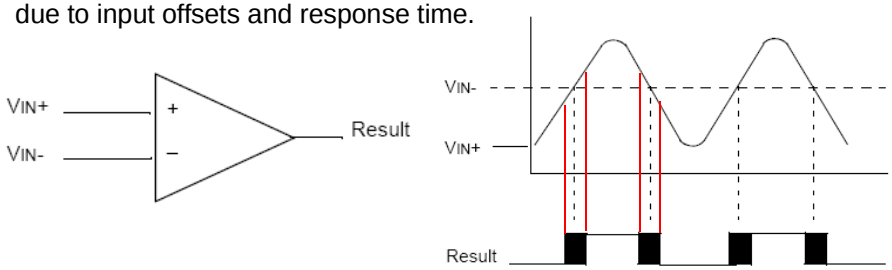
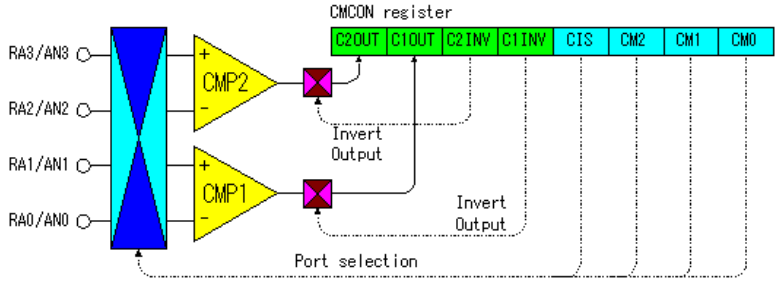
Analog Comparator Module

- The comparator module contains two analog comparators.
- Output of comparators indicates whether one input is (**>** or **<**) the other.
- When the analog input at $V_{IN+} < V_{IN-}$ **the output is "0"**
- When the analog input at $V_{IN+} > V_{IN-}$ **the output is "1"**
- The shaded areas of the output of the comparator represent the uncertainty due to input offsets and response time.



Analog Comparator Module

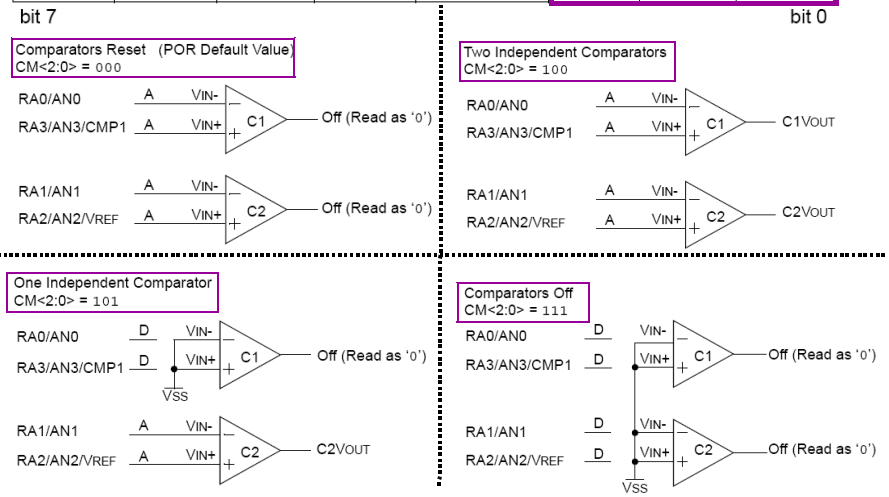
- The comparator module contains two analog comparators.
- Output of comparators indicates whether one input is (**>** or **<**) the other.
- The comparator inputs are multiplexed with the RA0 through RA3.
- Functions of the comparator can be set via **CMCON register**



Analog Comparator Module

CMCON – COMPARATOR CONFIGURATION REGISTER (ADDRESS: 01Fh)

R-0	R-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
C2OUT	C1OUT	C2INV	C1INV	CIS	CM2	CM1	CM0
bit 7							bit 0



See data sheet p.62

Analog Comparator Module

CMCON – COMPARATOR CONFIGURATION REGISTER (ADDRESS: 01Fh)

R-0	R-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
C2OUT	C1OUT	C2INV	C1INV	CIS	CM2	CM1	CM0
bit 7							bit 0

Input condition	C1INV	C1OUT
$V_{IN+} > V_{IN-}$	0	1
$V_{IN+} > V_{IN-}$	1	0
$V_{IN+} < V_{IN-}$	0	0
$V_{IN+} < V_{IN-}$	1	1

C2INV C2OUT

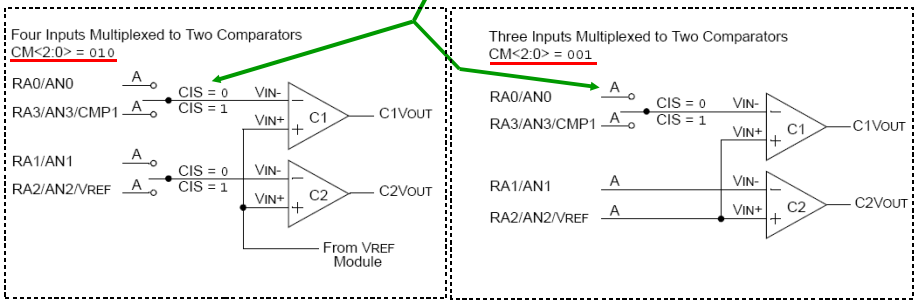
have identical function to that Of C1INV & C1OUT

Analog Comparator Module

CMCON – COMPARATOR CONFIGURATION REGISTER (ADDRESS: 01Fh)

R-0	R-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0
C2OUT	C1OUT	C2INV	C1INV	CIS	CM2	CM1	CM0

bit 7 bit 0



Analog Comparator Module

Comparator Interrupt

- Interruption can be generated when either comparator output is changed.
- Set CMIE bit of the PIE1 register to "1".
- Set PEIE bit and GIE bit of the OPTION register to "1".
- When the output of the comparator is changed, CMIF bit of the PIR1 register is set and the interruption occurs.
- In ISR, CMIF of the PIR1 register must be cleared.

INTCON – INTERRUPT CONTROL REGISTER (ADDRESS: 0Bh, 8Bh, 10Bh, 18Bh)

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-x
GIE	PEIE	T0IE	INTE	RBIE	T0IF	INTF	RBIF

bit 7 bit 0

PEIE: Peripheral Interrupt Enable bit
1 = Enables all un-masked peripheral interrupts
0 = Disables all peripheral interrupts

GIE: Global Interrupt Enable bit
1 = Enables all un-masked interrupts
0 = Disables all interrupts

Analog Comparator Module

Comparator Interrupt

PIE1 – PERIPHERAL INTERRUPT ENABLE REGISTER 1 (ADDRESS: 8Ch)

R/W-0	R/W-0	R/W-0	R/W-0	U-0	R/W-0	R/W-0	R/W-0
EEIE	CMIE	RCIE	TXIE	—	CCP1IE	TMR2IE	TMR1IE

bit 7 bit 0

CMIE: Comparator Interrupt Enable bit
1 = Enables the comparator interrupt
0 = Disables the comparator interrupt

PIR1 – PERIPHERAL INTERRUPT REGISTER 1 (ADDRESS: 0Ch)

R/W-0	R/W-0	R-0	R-0	U-0	R/W-0	R/W-0	R/W-0
EEIF	CMIF	RCIF	TXIF	—	CCP1IF	TMR2IF	TMR1IF

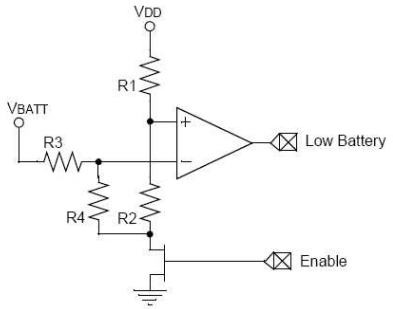
bit 7 bit 0

CMIF: Comparator Interrupt Flag bit
1 = Comparator output has changed
0 = Comparator output has not changed

Analog Comparator Module

Applications

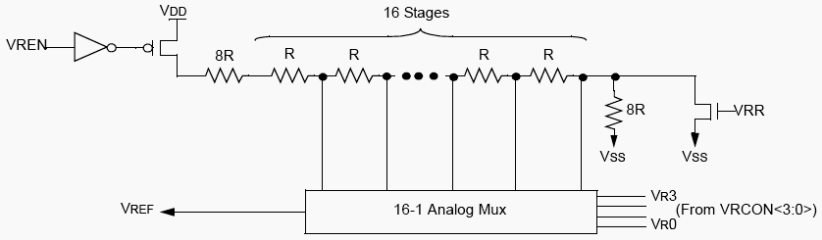
- Low-Battery detection



- Over/Under Temperature Detection
- Signal Conditioning

Voltage Reference Module

- The Voltage Reference module consists of a 16-tap resistor ladder network that provides a selectable voltage reference.
- There are two ranges of VREF values and has a power-down function to conserve power when the reference is not being used.
- The VRCON register controls the operation of the reference.



Voltage Reference Module

VRCON – VOLTAGE REFERENCE CONTROL REGISTER (ADDRESS: 9Fh)

R/W-0	R/W-0	R/W-0	U-0	R/W-0	R/W-0	R/W-0	R/W-0
VREN	VROE	VRR	—	VR3	VR2	VR1	VR0
bit 7							bit 0

VREN: VREF Enable bit
- 1 = VREF circuit powered on
- 0 = VREF circuit powered down, no IDD drain

VROE: VREF Output Enable bit
- 1 = VREF is output on RA2 pin
- 0 = VREF is disconnected from RA2 pin

VRR: VREF Range Selection bit
- 1 = Low range
- 0 = High range

VR<3:0>: VREF Value Selection bits 0 ≤ VR <3:0> ≤ 15

VRR = 1 $$V_{REF} = \frac{V_R<3:0>}{24} \times V_{DD}$$

VRR = 0 $$V_{REF} = \left(V_{DD} \times \frac{1}{4}\right) + \frac{V_R<3:0>}{32} \times V_{DD}$$

Voltage Reference Module

- RA2 pin can be used as a simple D/A output with limited drive capability.
- A buffer must be used in conjunction with the Voltage Reference module output for external connections to VREF.