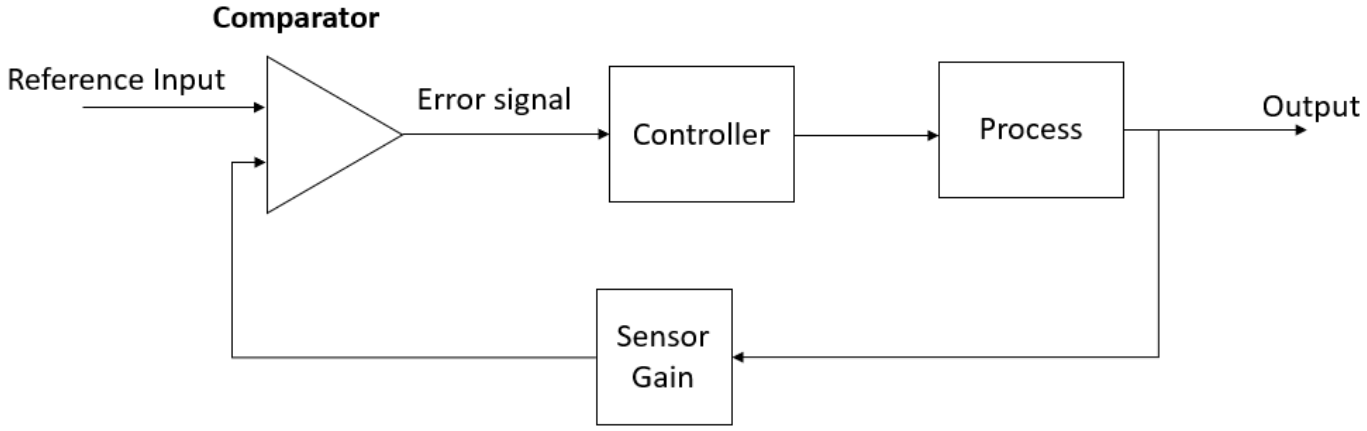
UT32M0R500 Comparators

PRODUCT NAME	MANUFACTURER PART NUMBER	SMD #	DEVICE TYPE
Arm Cortex M0+	UT32M0R500	5962-17212	01, 02

Table 1: Cross Reference of Applicable Products

1.0 Introduction

The UT32M0R500 analog Comparator compares two analog voltages and outputs a digital output. The comparator has two inputs: positive (+) and negative (-). The positive input (CMP0A) gets the external signal to be measured against different references on the negative input, which are either DAC0, DAC1, CMP0B or VREF. If CMP0A is greater than the negative (-) input, the comparator output will be logic one, logic zero otherwise. The comparator output is directly read by software. In a feedback loop approach, the comparator is used to compare the feedback signal against a reference input and output an error signal, see example block diagram below.



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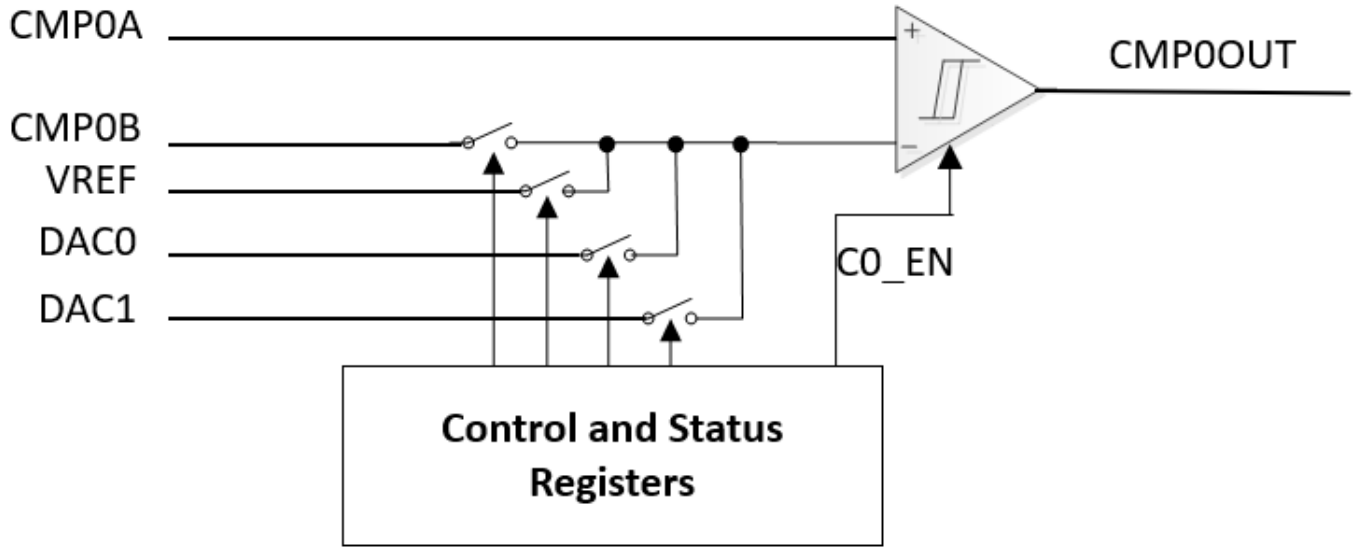
2.0 UT32M0R500 Comparator

The figure below shows the UT32M0R500 Comparator peripheral. The comparator has the following key features:

- Two High-speed Analog Comparators
- Hysteresis on Inputs
- Rail-to-Rail Input Common-Mode Range
- Four selectable inputs to the negative input of each comparator
- Low Power Shutdown Mode



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2.1 UT32M0R500 Comparator Hardware

There are two Comparators within the UT32M0R500 Comparator module. The Comparator module is mapped to the memory region from 0x4000_E000 to 0x4000_EFFF. It has 2 registers. For more information on each register, refer to Chapter 16 of the UT32M0R500 Functional Manual.

2.2 Comparator Control Register

The Control Register (**CTRL**) enables and selects the reference input. The reference input is selected to be either COMP0B, VREF, DAC0 or DAC1, bits [2:1], for Comparator 0. Comparator enable (C0_EN), bit [0], enables the Comparator 0 unit. Comparator 1 uses the same Control register with similar configurations, see register below.

Table 16.2: Description of the Control Register

BIT NUMBER(S)	BIT NAME	RESET STATE	DESCRIPTION
31-7	RESERVED	[00...0]	
6-5	C1_NEG_SEL	00	Comparator #1 negative input selector: 11: Input from DAC1 10: Input from DAC0 01: Input from pin CMP1B 00: Input from voltage reference ~VREF
4	C1_EN	0	Comparator #1 enable selector 1: Comparator #1 enabled 0: Power down Comparator #1; CMP1OUT will be driven to '0'
3	RESERVED	0	
2-1	C0_NEG_SEL	00	Comparator #0 negative input selector 11: Input from DAC1 10: Input from DAC0 01: Input from pin CMP0B 00: Input from voltage reference ~VREF
0	C0_EN	0	Comparator #0 enable selector 1: Comparator #0 enabled 0: Power down Comparator #0; CMP0OUT will be driven to '0'

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2.3 Comparator Initialization

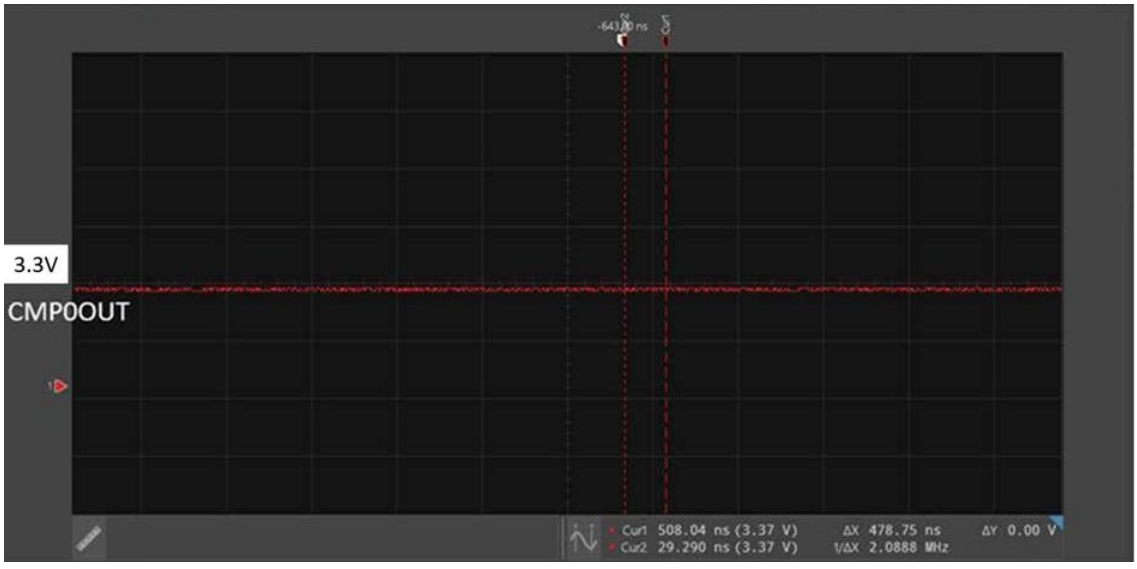
The code below initializes Comparator 0.

```
89      // init the COMPs
90    DUAL_CMPR_StructInit (&DUAL_CMPR_InitStruct);
91
92    DUAL_CMPR_InitStruct.DUAL_CMPR_0.CX_NEG_SEL = VREF;
93    DUAL_CMPR_InitStruct.DUAL_CMPR_1.CX_NEG_SEL = VREF;
94
95    DUAL_CMPR_Init (DUAL_CMPR, &DUAL_CMPR_InitStruct);
96
97    DUAL_CMPR_Cmd (DUAL_CMPR, DUAL_CMPR0, CMPR_ENABLE);
98    DUAL_CMPR_Cmd (DUAL_CMPR, DUAL_CMPR1, CMPR_ENABLE);
```

2.4 Reading Comparator 0

The code below reads Comparator 0 value and outputs it to the terminal; the figure below shows CMP0OUT going high when the positive input is higher than VREF (1.2 V).

```
102     if(TimerTickExpired)
103       {
104
105
106         cmpr_value = DUAL_CMPR_GetValue (DUAL_CMPR, DUAL_CMPR0);
107         //RetVal = DUAL_CMPR_GetValue (DUAL_CMPR, DUAL_CMPR1);
108
109         printf ("%08X", cmpr_value);
110
```



3.0 Conclusion

Many applications use a feedback loop approach and the comparator is used to compare the feedback signal against a reference input and outputs an error signal. With two High-speed Analog Comparators, hysteresis on Inputs and Rail-to-Rail Input Common-Mode Range, the UT32M0R500 comparators are key to controlling the system in the feedback loop.

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Revision History

Date	Revision	Author	Change Description
05/31/2022	1.0.0	JA	Initial Release

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