



Microcontroller Interfacing

[Output Levels]

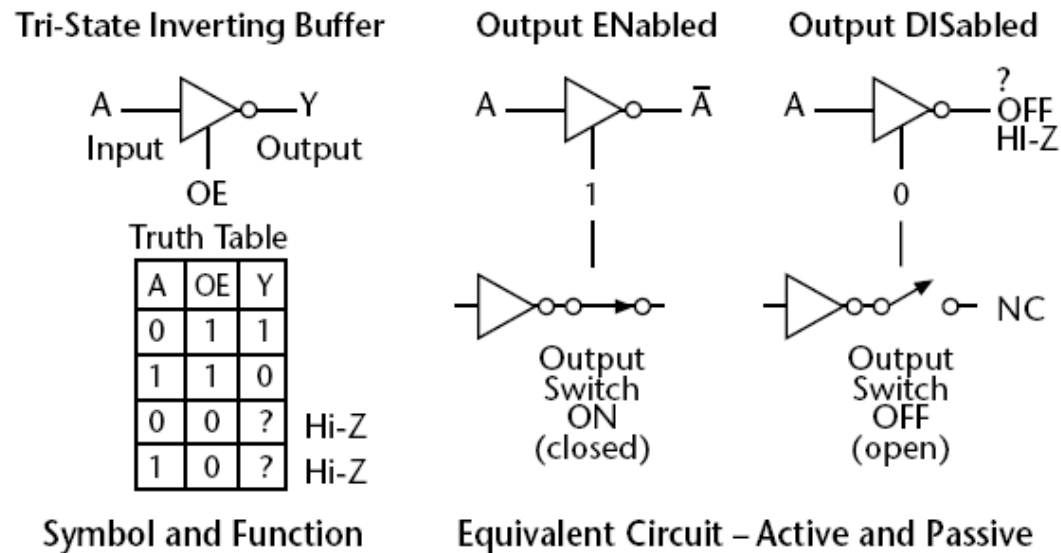


Figure 1-19: Active and passive states of a tri-state buffer.

Interpretation of Timing Diagrams

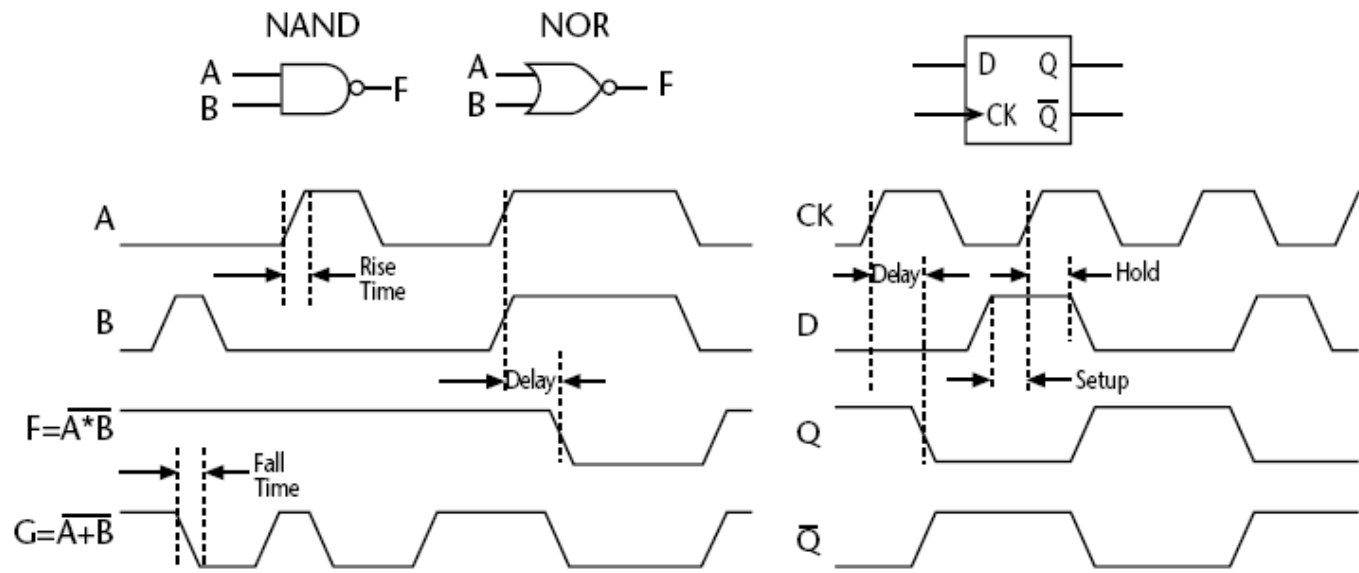


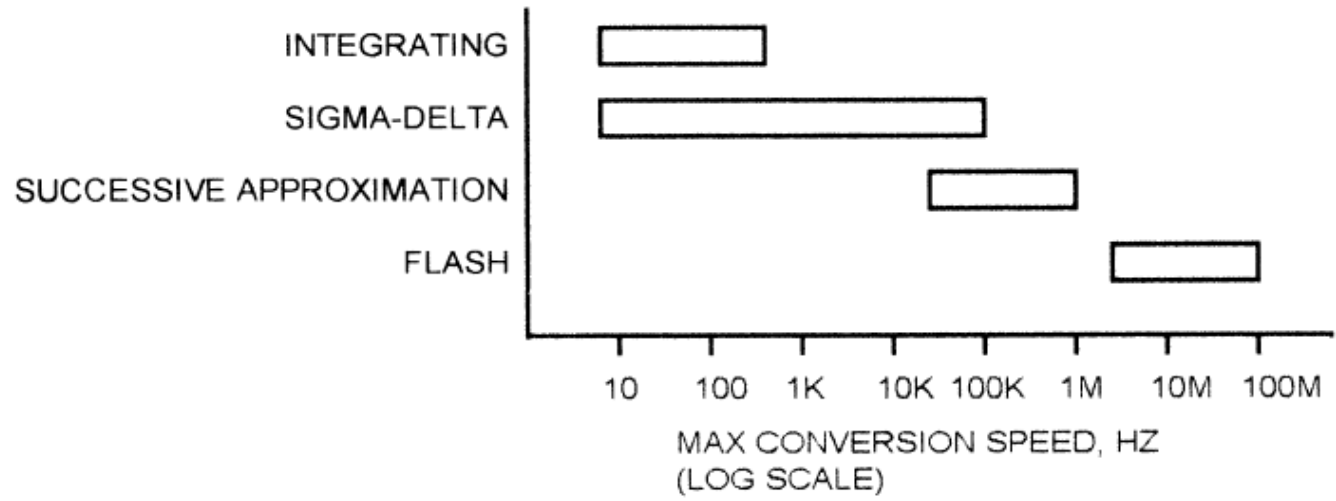
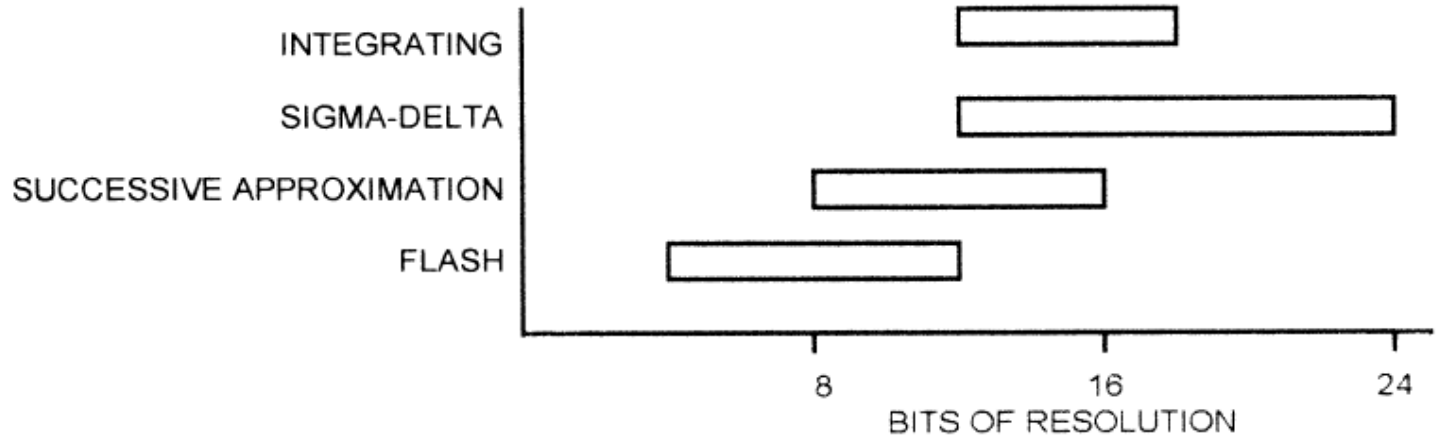
Figure 1-20: Timing diagram notation examples.

[Analog to Digital Converters]

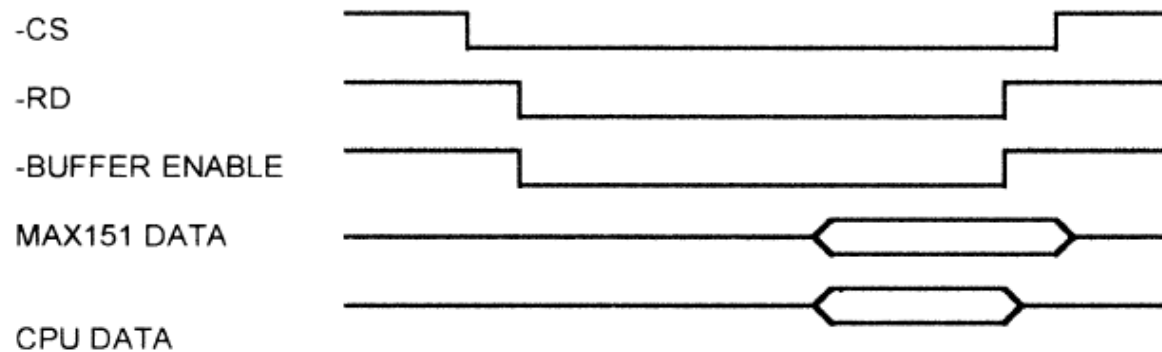
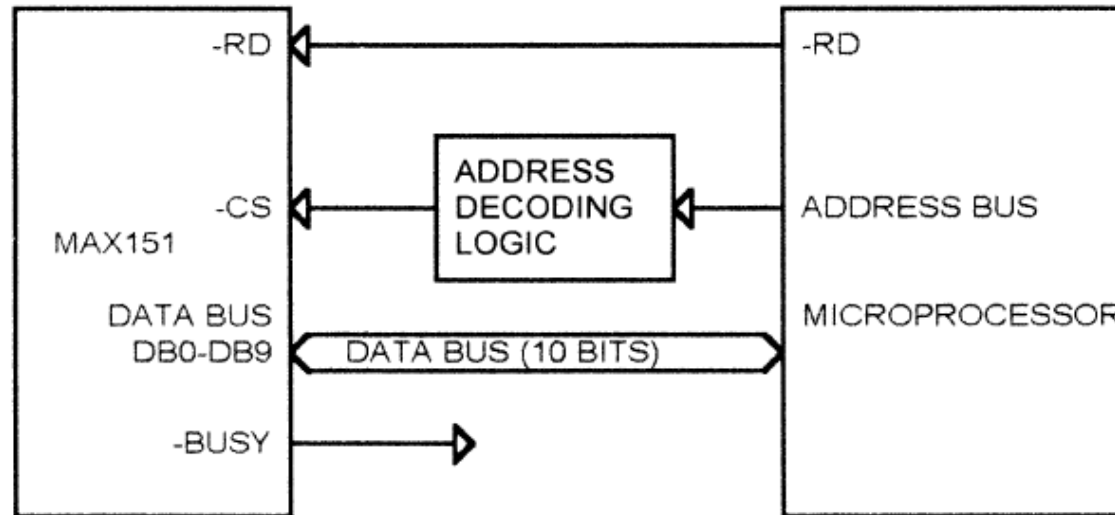
- Sampling rate (MHZ)
- Sampling resolution (bits)
- Interface type (parallel or serial)
- Reference voltage (volt)
- Input range (unipolar or bipolar)
- Sample-and-hold circuit usually inside chip

- Note: Analog antialiasing filter must be in place

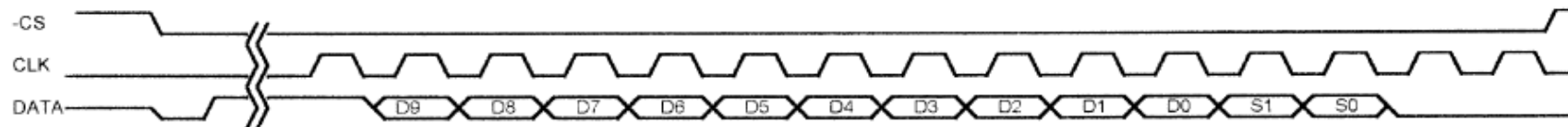
ADC Technologies



[Parallel Interface Example]

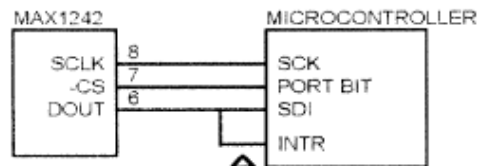
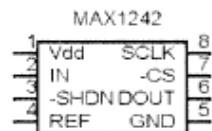


Serial Interface Example



↑ ↑
MAX1242 DRIVES DOUT
HIGH WHEN
CONVERSION IS
COMPLETE

↑
CONVERSION STARTS
WITH FALLING EDGE
OF -CS



↑
THIS CONNECTION PROVIDES
AN INTERRUPT WHEN
CONVERSION IS COMPLETE

[Memory]

- External interface possible in most cases
- Nonvolatile EPROM
- Volatile RAM (SRAM, DRAM, etc.)
- Nonvolatile EEPROM
- Nonvolatile FLASH
- Refer to timing diagram for each to know how to interface with microcontroller

Temperature Sensors

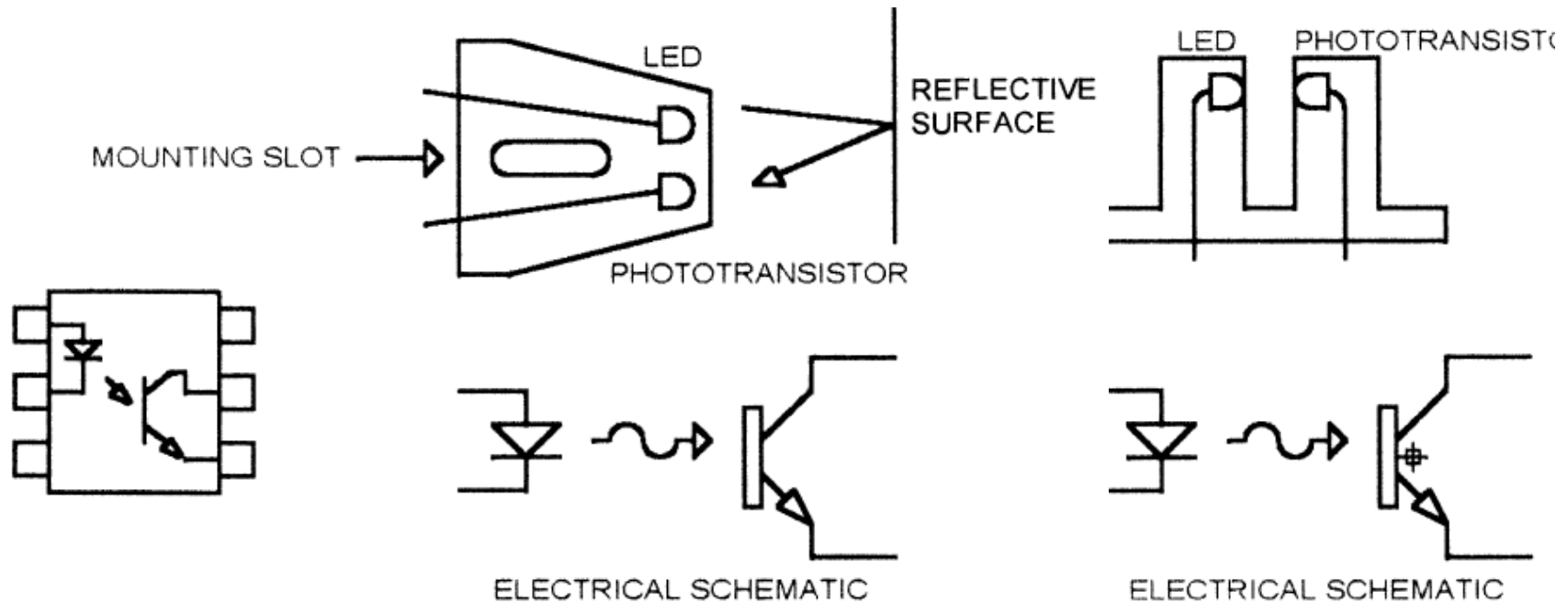
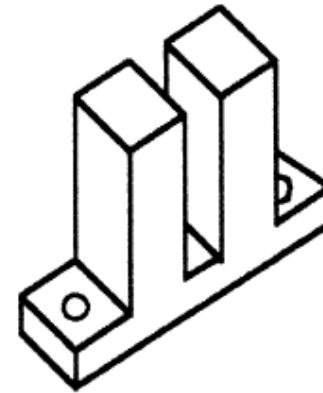
- Thermistors (PTC, NTC)

Typical NTC Thermistor Data

<i>Temp °C</i>	<i>R/R₂₅</i>	<i>Temp °C</i>	<i>R/R₂₅</i>
-50	39.03	30	.8276
-40	21.47	40	.6406
-30	12.28	50	.5758
-20	7.28	60	.4086
-10	4.46	70	.2954
0	2.81	80	.2172
10	1.82	90	.1622
20	1.21	100	.1229
25	1.00	110	.09446

[Optical Sensors

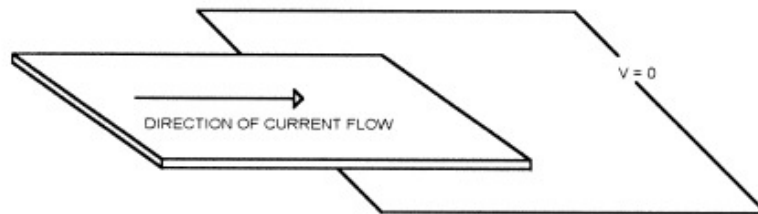
- Switches
- Isolators



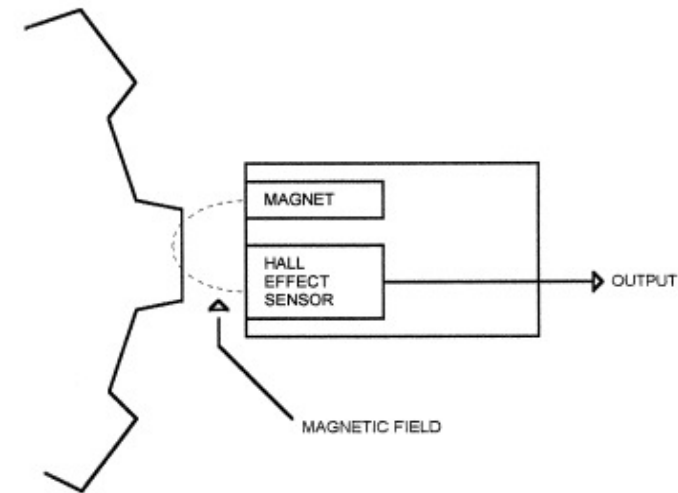
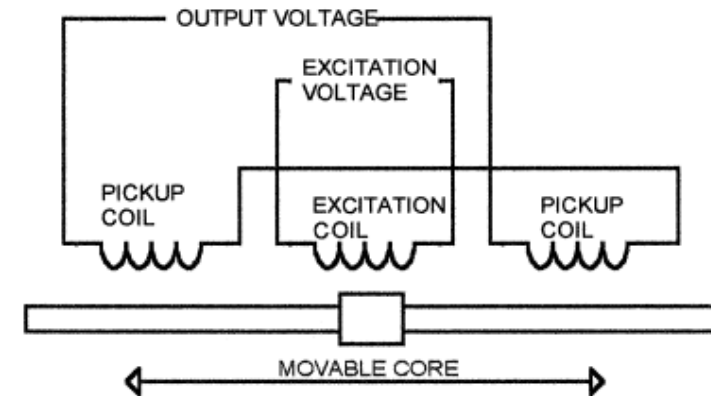
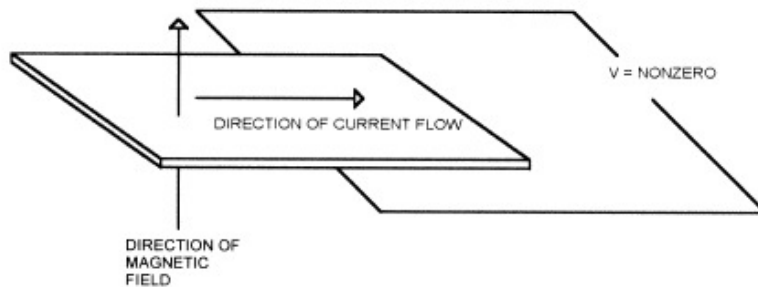
[Magnetic Sensors]

- LVDT
- Hall effect

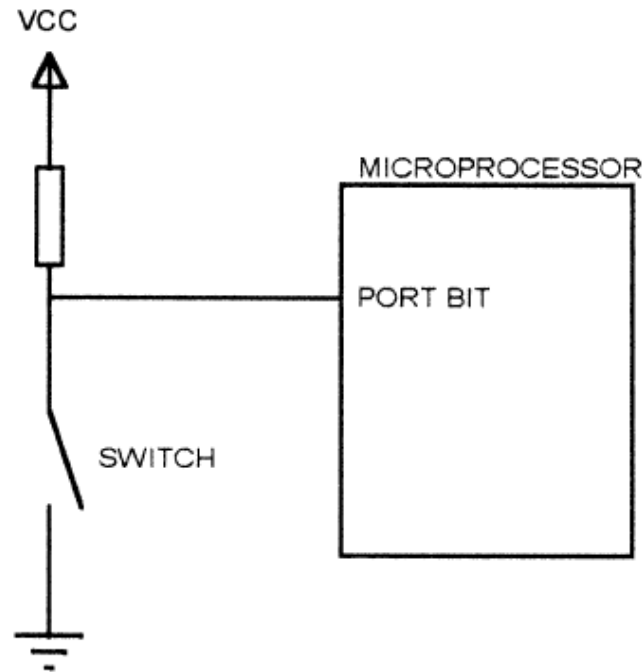
HALL EFFECT, NO MAGNETIC FIELD



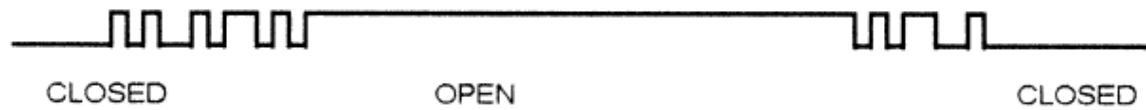
HALL EFFECT, MAGNETIC FIELD APPLIED



[Mechanical Switch]



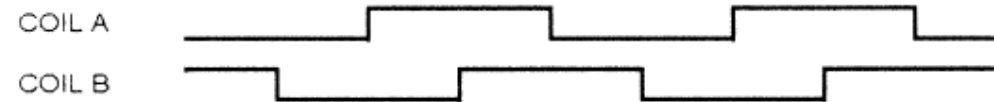
SWITCH OPEN/CLOSE WAVEFORM



[Motor Interfacing]

- Stepper motor

WAVEFORM
FORWARD ROTATION



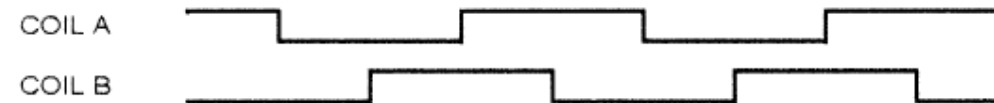
VOLTAGE A1	0V	+V	0V	+V	0V
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VOLTAGE A2	+V	0V	+V	0V	+V
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VOLTAGE B1	+V	0V	+V	0V	+V
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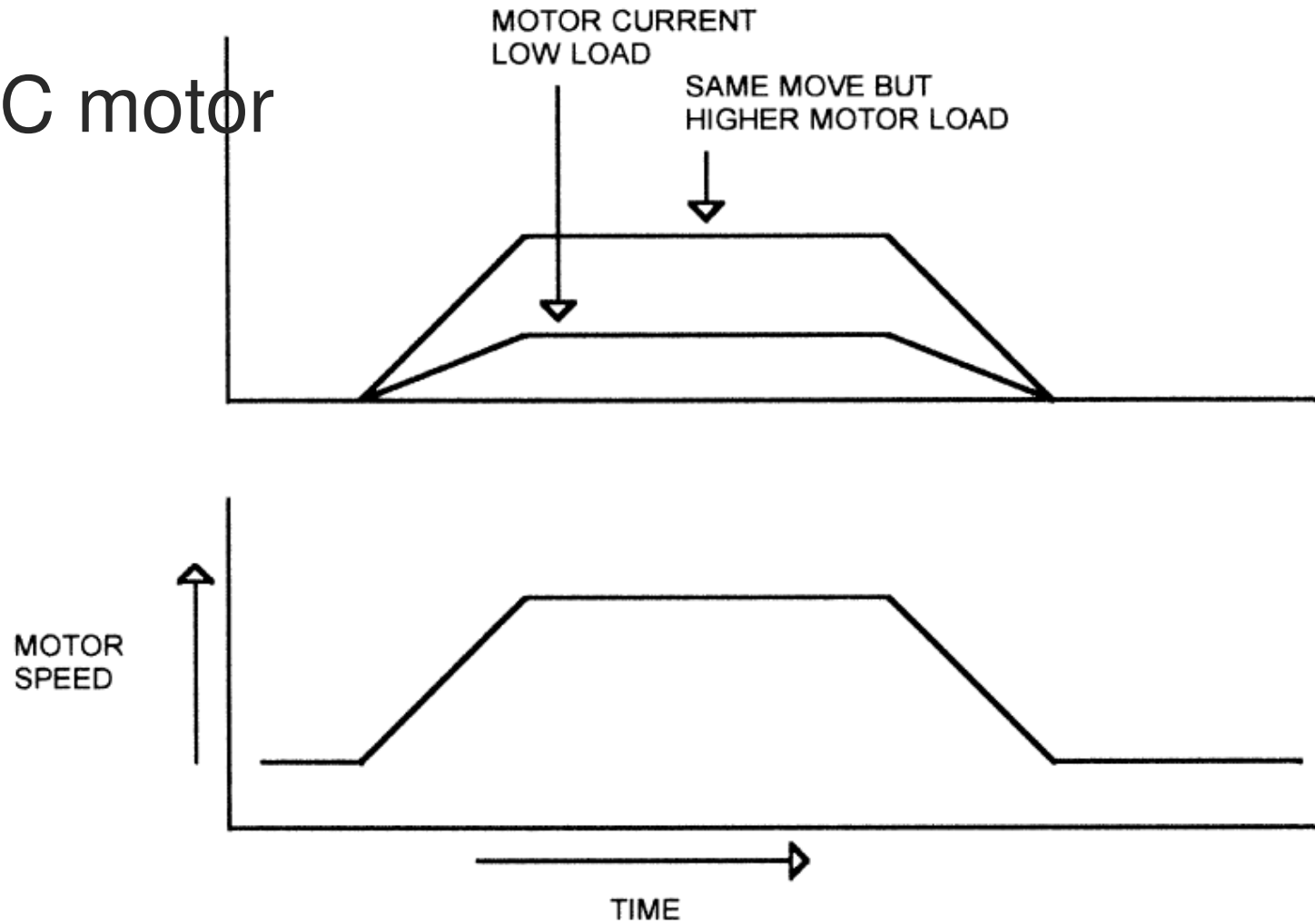
VOLTAGE B2	0V	+V	0V	+V	0V
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WAVEFORM
REVERSE ROTATION



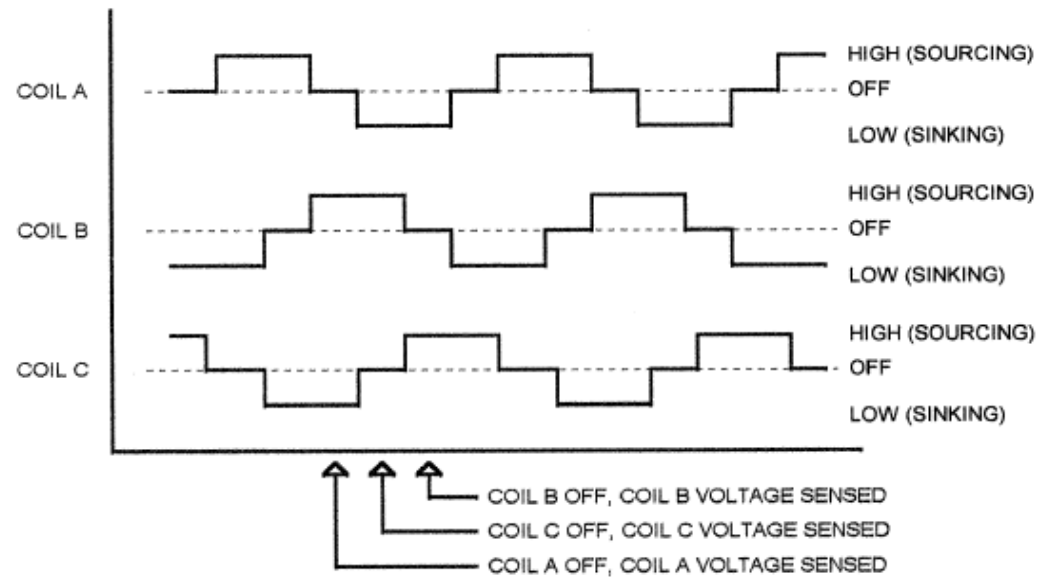
[Motors]

- DC motor

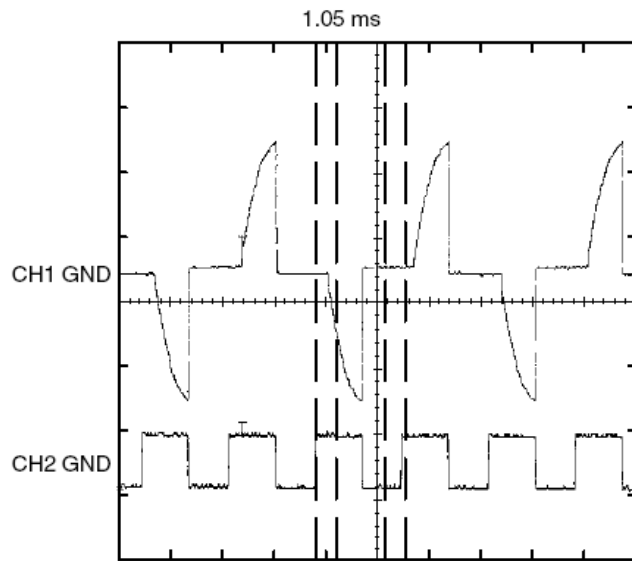
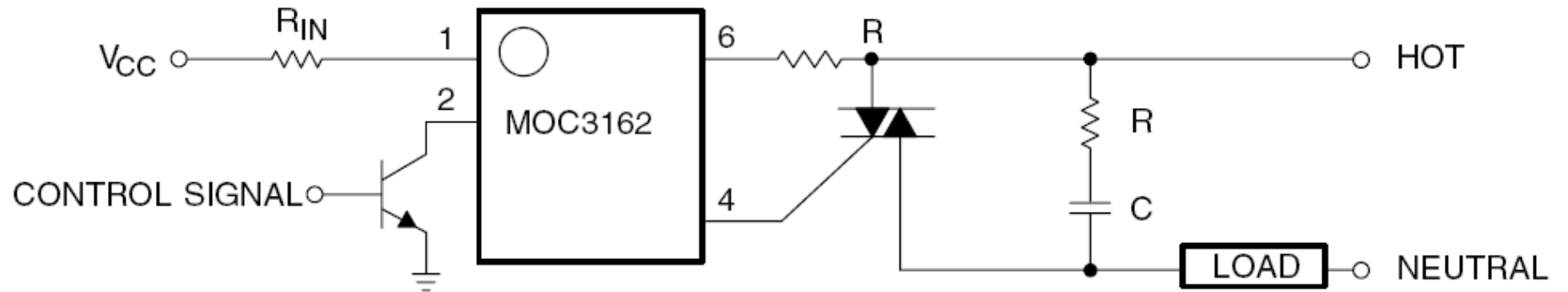


[Motors]

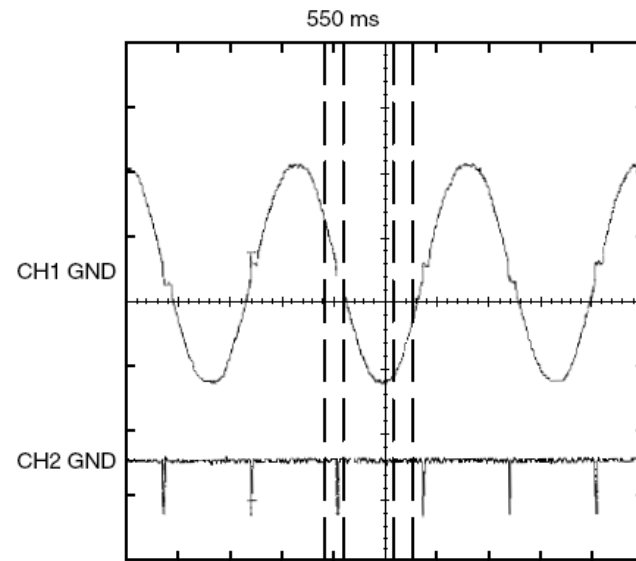
■ Brushless DC



TRIACs



Time: 5 ms/div



Time: 5 ms/div