Electronics
MCP 3008 Communication

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- The Python examples of code to communicate with the MCP3008 can be confusing.
- Looking at the code and the appropriate timing diagram helps.

```
adc=spi.xfer2([1,(8+adc_channel)<<4,0])
```

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```

This transfers 3 bytes;

```
adc=spi.xfer2([1,(8+adc_channel)<<4,0])
```

This transfers 3 bytes; the first is simply '1', and the last is simply '0'

```
(8+adc_channel)<<4
```

```
(8+adc_channel)<<4
```

The channel is a 3 bit value, so adding 8 gives a single hex digit;

```
(8+adc_channel)<<4
```

The channel is a 3 bit value, so adding 8 gives a single hex digit; this value then is shifted 4 bits to the left

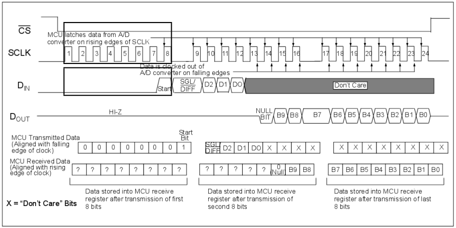
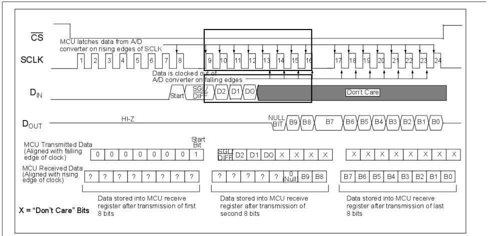


FIGURE 6-1: *SPI Communication with the MCP3004/3008 using 8-bit segments (Mode 0,0: SCLK idles low).*

```
adc=spi.xfer2([1,(8+adc_channel)<<4,0])
```

First byte (first non-zero bit is start)



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```
adc=spi.xfer2([1,(8+adc_channel)<<4,0])
```

Second byte (1st bit indicates single or double; next 3 indicate channel)

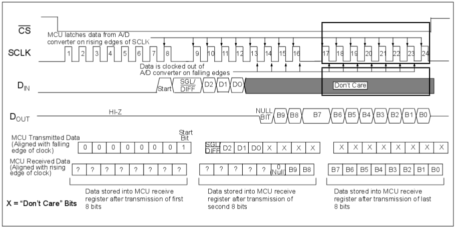

FIGURE 6-1: *SPI Communication with the MCP3004/3008 using 8-bit segments (Mode 0,0: SCLK idles low).*

```
adc=spi.xfer2([1,(8+adc_channel)<<4,0])
```

Third byte (don't care)

```
data=((adc[1]&3)<<8) +adc[2]
```

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```

The response is also a 3 byte transfer;

```
data=((adc[1]&3)<<8) +adc[2]
```

The response is also a 3 byte transfer; the first byte will be '0', and the last two contain data

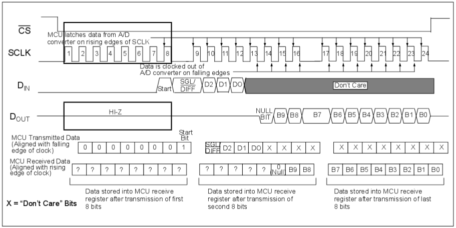
```
(adc[1]&3)<<8
```

```
(adc[1]&3)<<8
```

Anding with 3 gets the bottom two bits of the second byte;

```
(adc[1]&3)<<8
```

Anding with 3 gets the bottom two bits of the second byte; it is then shifted left 8 bits so it will be bits 8 and 9



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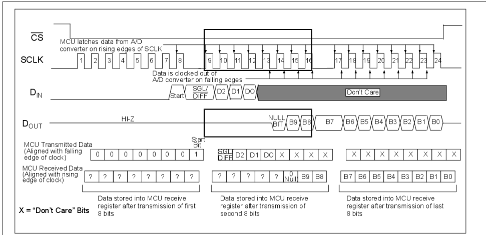
```
data=((adc[1]&3)<<8) +adc[2]
```

First byte (adc[0]) (discard)



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```
data=((adc[1]&3)<<8) +adc[2]
```

Second byte (adc[1]) (last two bits matter)

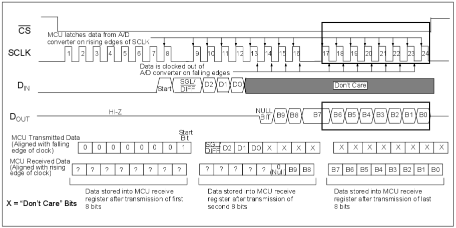

FIGURE 6-1: *SPI Communication with the MCP3004/3008 using 8-bit segments (Mode 0,0: SCLK idles low).*

```
data=((adc[1]&3)<<8) +adc[2]
```

Third byte (adc[2]) (bottom 8 bits of 10 bit value)