0-5V analogue output module

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This series of columns covers a project involving thirteen analogue input modules and seven analogue output modules for a 5V microcontroller's ADC/DAC channels. In this issue we'll focus on the first module, or 0-5V analogue output module that requires a +12V DC power supply; see Figures 1 and 2.

We assume that V_{IN} comes from the DAC output of a 5V microcontroller with a value of $0.00V \leq V_{IN} \leq 5.00V$; when $0.00V \leq V_{IN} \leq 5.00V$, $V_{OUT} = V_{IN}$. The input and output voltage range are the same, 0-5V; see the relationship between V_{OUT} and V_{IN} in Figure 3.

Due to the limited current drive capability, a buffer amplifier (a voltage follower) LM358P-A is used on the DAC output. Dual series Schottky barrier diodes D1 and D2 divert any overcurrent coming from terminal V_{OUT} to the power supply or ground. A ferrite bead is connected in series with the output path to add isolation and decoupling from high-frequency transient noises. A TVS (Transient Voltage Suppressor) is used to filter and suppress any transients coming from terminal V_{OUT}. This circuit is capable of supplying up to 20mA output current.

Table 1 provides some voltage value examples for this module (assuming $0.00V \leq V_{IN} \leq 5.00V$), with the prototype circuit board shown in Figure 4. **EW**
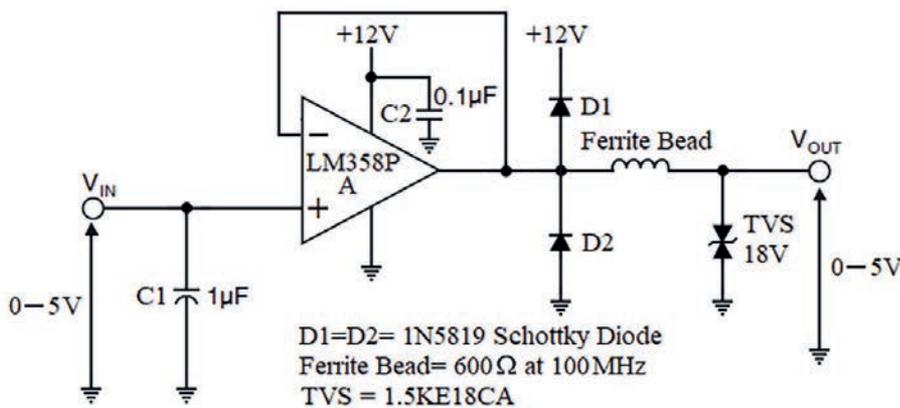

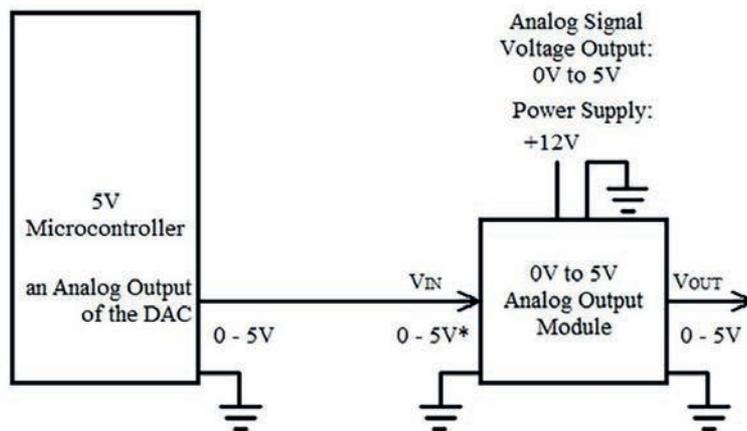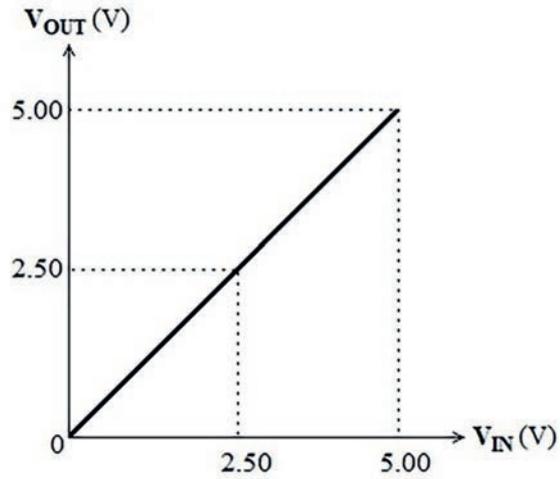Figure 1: The 0-5V analogue output module for use with the DAC output of a 5V microcontroller

Figure 2: Connection of the 0-5V analogue output module to a 5V microcontroller

Figure 3: V_OUT vs V_IN for the 0-5V analogue output module shown in Figure 1

V_{IN}(V)	V_{OUT}(V)
5.00	5.00
..	..
4.00	4.00
..	..
3.00	3.00
..	..
2.50	2.50
..	..
2.00	2.00
..	..
1.00	1.00
..	..
0.00	0.00

Table 1: Input and output voltage examples for the 0-5V analogue output module, assuming $0.00V \leq V_{IN} \leq 5.00V$
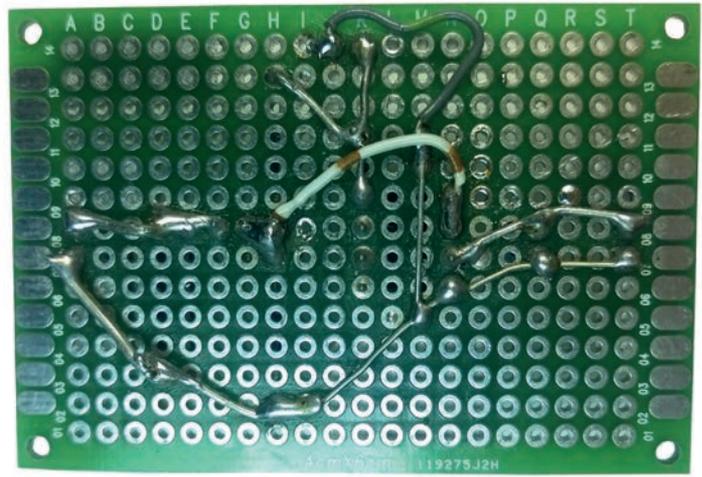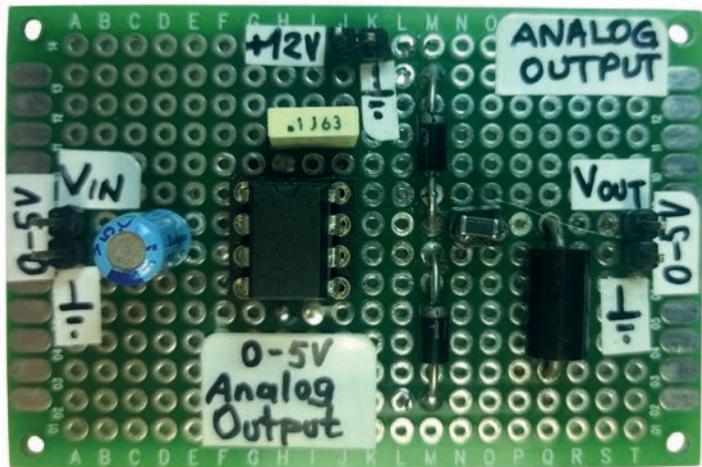

Figure 4: Prototype circuit board of the 0-5V analogue output module (top and bottom view)