# LM 3822/24 Current Meter

ICs for measuring currents usually employ external sense resistors with values of a few tens of milliohms. Not only are such resistors difficult to obtain, the circuit board layout can have a disturbing effect on the accuracy of the measurement. This problem is eliminated by the LM3822 and LM3824 ICs from National Semiconductor (www.national.com), which have built-in sense resistors with a value of only 3 mW. A delta-sigma modulator converts the measured value into a digital value. A digital filter takes the average value of the current every 50 ms (LM 3822) or every 6 ms (LM 3824). A pulse-width modulated signal (PWM) that is proportional to the current level is generated by comparing this to a digital ramp signal. According to the manufacturer, the LM3822/24 provide the highest measurement accuracy of any currently available high-side current measurement IC. In the case of the LM3824, the accuracy is ± 2%.

On the output side, the LM3822/24 deliver a pulse-width modulated signal (PWM) whose duty cycle D indicates the measured value of the current, including its sign. If the current is equal to zero, D is exactly 50 %. Positive currents yield duty cycle values ranging from 50 % to 95.5 %, and negative currents yield duty cycle values ranging from 50 % to 4.5 %. A value of 95.5 % thus corresponds to + 1 A (or + 2 A), while a value of 4.5 % corresponds to –1 A (or –2 A). The current is considered to be positive when it flows from SENSE to SENSE–. The LM3822/24 ICs work with a supply voltage between 2.0 V and 5.5 V and have an internal current consumption of less than 150 µA. For operation at voltages greater than



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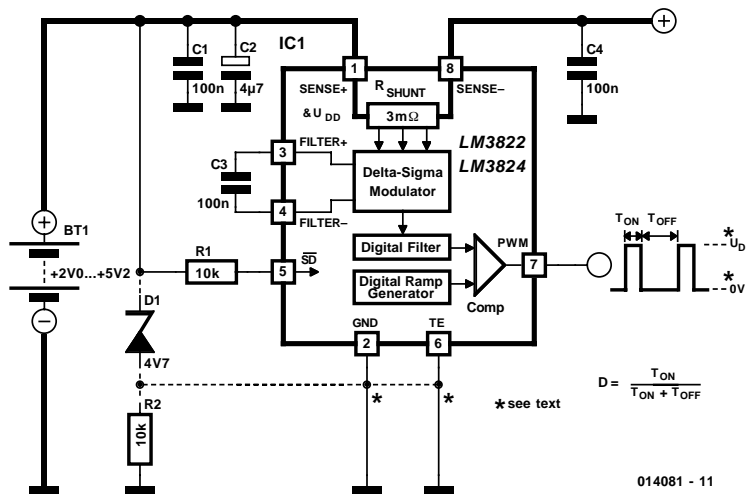
| Type | Measurement range | Error | Sampling interval | PWM resolution |
|------|------------------|-------|-------------------|----------------|
| LM3822-1.0 | –1.0...+1.0 A | ±2 % | 50 ms | 0.1 % |
| LM3822-2.0 | –2.0...+2.0 A | ±2 % | 50 ms | 0.1 % |
| LM3824-1.0 | –1.0...+1.0 A | ±3 % | 6 ms | 0.8 % |
| LM3824-2.0 | –2.0...+2.0 A | ±3 % | 6 ms | 0.8 % |

5.5 V, the Zener diode shown in dashed outline in the schematic diagram can be use with a 10-kΩ series resistor. The Zener diode limits the operating voltage across the LM3822/24 to a safe 4.7 V. Note however that in this case, the output signal is not longer referenced to ground, but swings between the supply voltage level and 4.7 V below this level. A level converter is thus needed for signal processing. The GND and Test (TE) pins should be connected to the zener diode.

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