Application Bulletin AB-10

Substituting the RC5051 for the RC5050

Summary

The RC5051 can be substituted for the RC5050 in all applications, provided that pin 9 has no trace attached to it; and pin 11 either has no trace attached, or is attached to power (not signal) ground.

Differences between the RC5050 and the RC5051

The RC5050 and the RC5051 are both programmable DC-DC controllers for low voltage microprocessors. Their only functional difference in an application is that the RC5051 is designed to run a synchronous rectifier in place of the RC5050's freewheeling diode (see Figure 1).

In the RC5050, pin 9 is not connected, whereas in the RC5051 it drives the gate of the synchronous MOSFET rectifier. In the RC5050, pin 11 is not connected, whereas in the RC5051 it is a power ground. Finally, in the RC5050, pin 7 powers the internal digital logic from +5V, whereas in the RC5051 it powers the synchronous MOSFET's gate driver.

Substituting the RC5051 into an RC5050 Circuit

As long as the board layout for the RC5050 circuit left the pins 9 and 11 unconnected, the RC5051 can be susbstituted in, as far as these pins are concerned, without any problem: since they are unconnected, the gate drive signal on pin 9 goes nowhere, and thus has no effect. The same holds for pin 11: the RC5051 has other power ground pins, and so its absence has no effect.

The other situation in which the RC5051 can be substituted for the RC5050 is one in which, again, the RC5050's pin 9 is unconnected; and pin 11 is attached to *power* ground, but NOT signal ground. Since pin 11 in the RC5051 goes to power ground, this clearly presents no problem. However, if pin 11 is attached to *signal* ground in the circuit, power ground currents will be mixed with signal ground, potentially causing circuit upset.

If neither pin 9 nor pin 11 has a trace going to it, the RC5051 may be substituted for the RC5050. If pin 9 has no trace going to it, and pin 11 is attached to power ground (NOT signal ground), the RC5051 may be substituted for the RC5050. Other than in these two cases, the the RC5051 should NOT be substituted for the RC5050.

The other remaining difference between the two ICs is the function of pin 7. Although for both circuits it is connected to +5V, in the RC5051 pin 7 runs the gate driver, and so the extra DC current drain might possibly be a concern; one might also be concerned about current spikes on this pin due to shoothrough.

As it turns out, since the gate driver is unused, the additional DC current drawn from pin 7 is minimal: typically less than 2mA, which will have no effect on the performance of the circuit. As for current spikes, they are typically less than 10mA for 20nsec and so also will have no effect on operation, due to the bypass capacitors on the +5V line. The connection on pin 7 thus requires no modification in a substitution of the RC5051 for the RC5050.

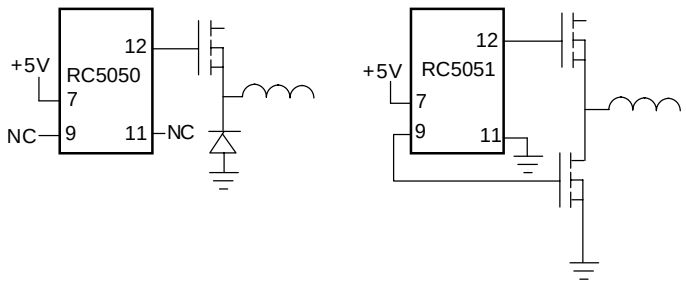

Figure 1. RC5050 and RC5051 Application Differences

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