Tiny MSOP Dual Switch Driver is SMBus Controlled

by Peter Guan

Introduction

The LTC1623 SMBus™ switch controller offers an inexpensive, space-saving alternative for controlling peripherals in today's complex portable computer systems. Pin-to-pin connections between the system controller and each peripheral device not only result in complicated wiring, but also limit the number and type of peripheral devices connected to the system controller. Using the SMBus architecture, the LTC1623 eliminates these problems by requiring only two bus wires and allowing easy upgrades and additions of new peripherals.

The SMBus

The SMBus is a low power serial bus developed by Intel and Duracell. Only two bus lines, DATA and CLK, are needed to establish a set of protocols for communication between the bus master and slaves. Using the SEND BYTE protocol of the SMBus to receive and execute commands from the bus master, each LTC1623 controls the operation of two independent external switches. To identify itself on the SMBus, the LTC1623 has two three-state address pins. In other words, up to eight LTC1623s can be programmed to control up to sixteen different switches.

LTC1623 Design Information

A timing diagram of the SEND BYTE protocol is shown in Figure 1. After detecting the Start signal from the bus master (a high-to-low transition on the DATA line while CLK is high), the LTC1623 shifts in the address byte, which consists of seven address bits and one read/write bit. If the address byte matches, the LTC1623 acknowledges the master and then shifts in the command byte whose two LSBs are the controlling signals for the two external switches. Afterwards, the LTC1623 again acknowledges the master so that the master can terminate the transaction by sending a Stop signal (a DATA transition from low to high while CLK is high).

The LTC1623 adheres strictly to the SMBus specification of 0.6V V_{IL} and 1.4V V_{IH} over the entire operating range of 2.7V to 5.5V. The two built-in charge pump triplers with micropower feedback networks guarantee full enhancement of the two external logic-level MOSFET switches without excess gate overdrive. The output gate-drive voltage is regulated to a maximum of 6V above V_{IN}.

Applications

The main application of the LTC1623 is to control two external high-side N-channel switches (Figure 2). As seen in the figure, a 0.1µF capacitor and a 1k resistor are placed on each gate-drive output to respectively slow down the turn-on time of the external switch and to eliminate any oscillations caused by the parasitic capacitance of the external switch and the parasitic inductance of the connecting wires.

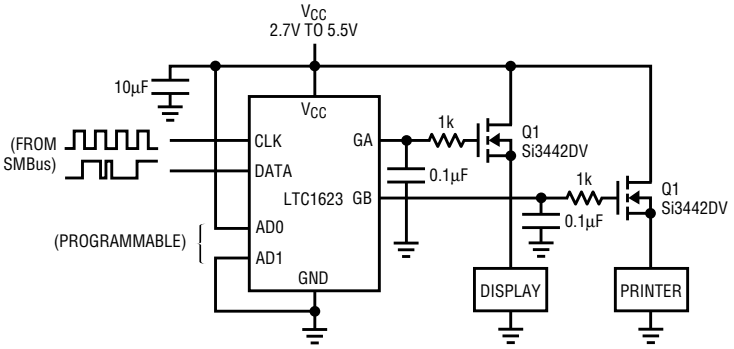

Figure 2. LTC1623 controlling two high-side switches

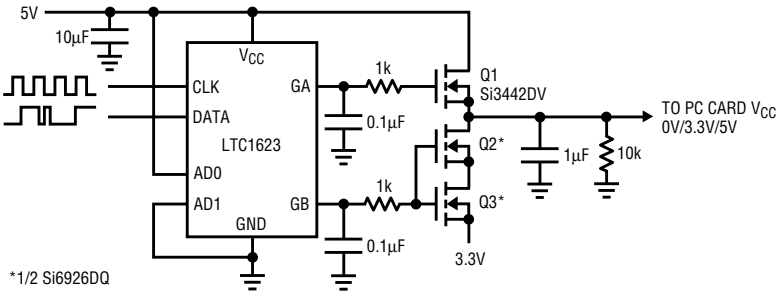

Figure 3. PC Card 3.3V/5V switch matrix.

SMBus is a trademark of Intel Corp.

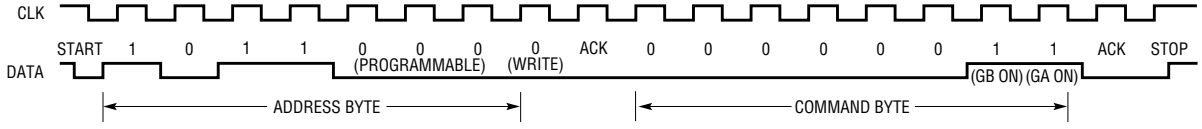

Figure 1. SMBus SEND BYTE protocol timing diagram

Tracking the growing popularity of portable communication systems, the LTC1623 makes a very handy single-slot 3.3V/5V PC Card switch matrix. As shown in Figure 3, this circuit enables a system controller to switch either a 3.3V or a 5V supply to any of its SMBus-addressed peripherals. Besides N-channel switches, the LTC1623 can also be used to control a P-channel switch, as shown in Figure 4. As a result, the load connected to the P-channel switch will be turned on upon power-up of the LTC1623, whereas the other load must wait for a valid address and command to be powered.

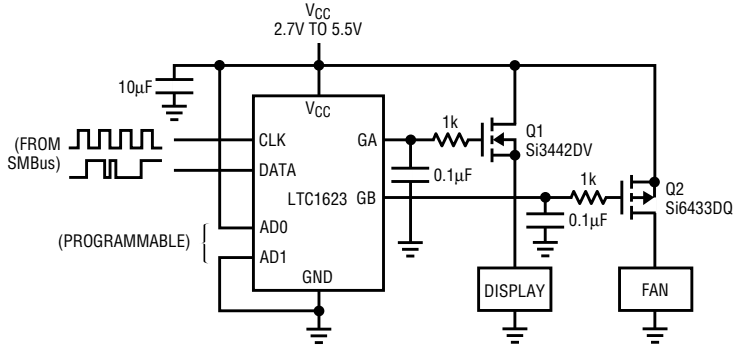

Figure 4. LTC1623 controlling a P-channel switch (Q2)

Conclusion

With a standby current of only 17µA and a tiny 8-lead MSOP (or SO) footprint, the LTC1623 offers a simple and efficient solution for managing system peripherals using the SMBus architecture.