Application Note 8

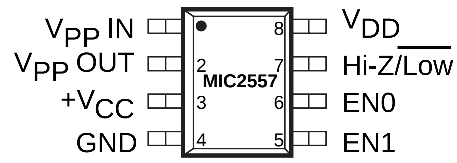
Interfacing the MIC2557/8 to PCMCIA Controllers

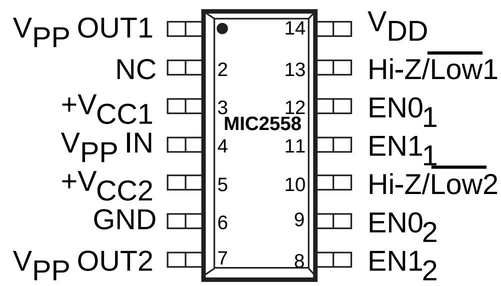
by Bob Wolbert

General Description

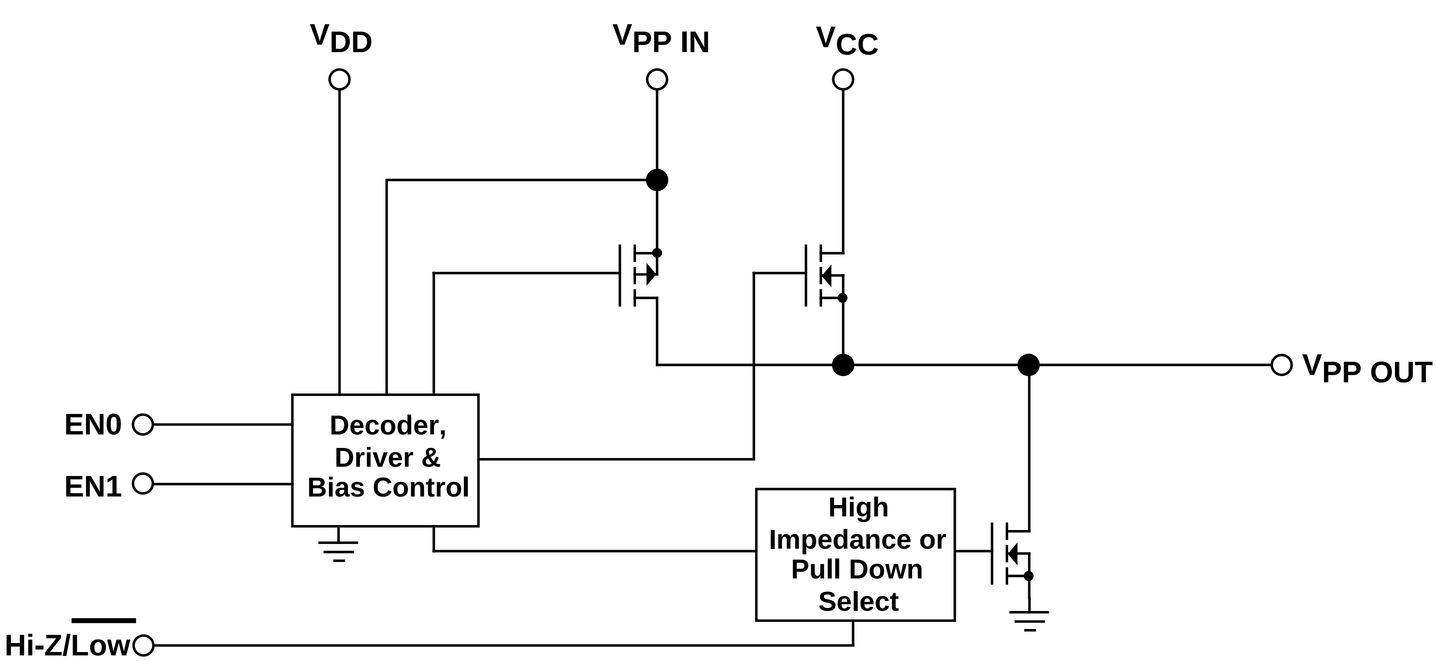
The MIC2557 and MIC2558 provide "Programming and Peripheral" voltage (V_{PP}) switching for PCMCIA card sockets. They have simple logic compatible inputs and easily interface with industry standard PCMCIA controllers. This note gives circuit examples for several PCMCIA controllers. For controllers supporting dual V_{CC} (3.3V and 5.0V), two simple high current V_{CC} switch matrices are shown.

Pin Configuration





MIC2557 (½ MIC2558) Block Diagram



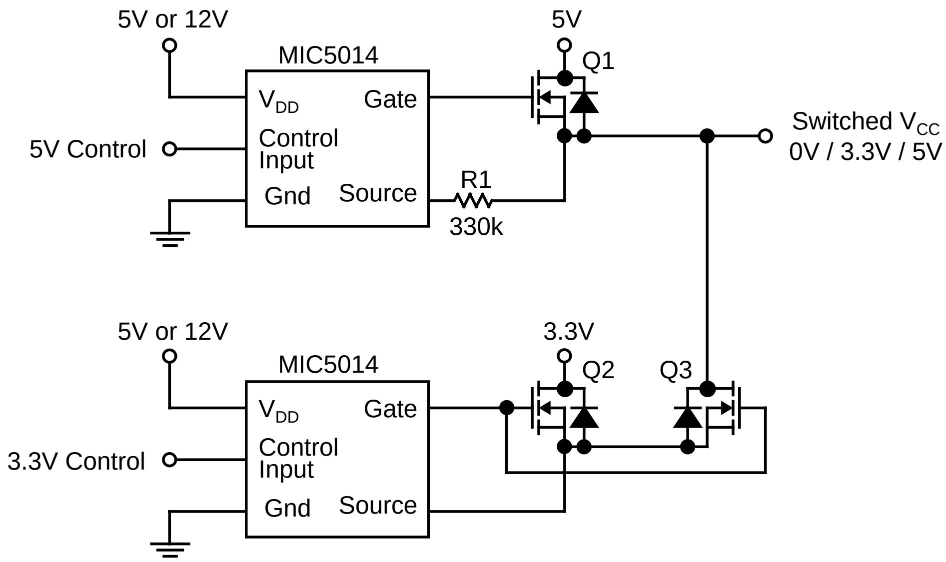


Figure 1. PCMCIA Compatible Dual V_{CC} Switch Matrix. This circuit uses power MOSFETs driven by two MIC5014 high side MOSFET drivers to select between 3.3V and 5V V_{CC}. MOSFET "body diodes" are shown for information.

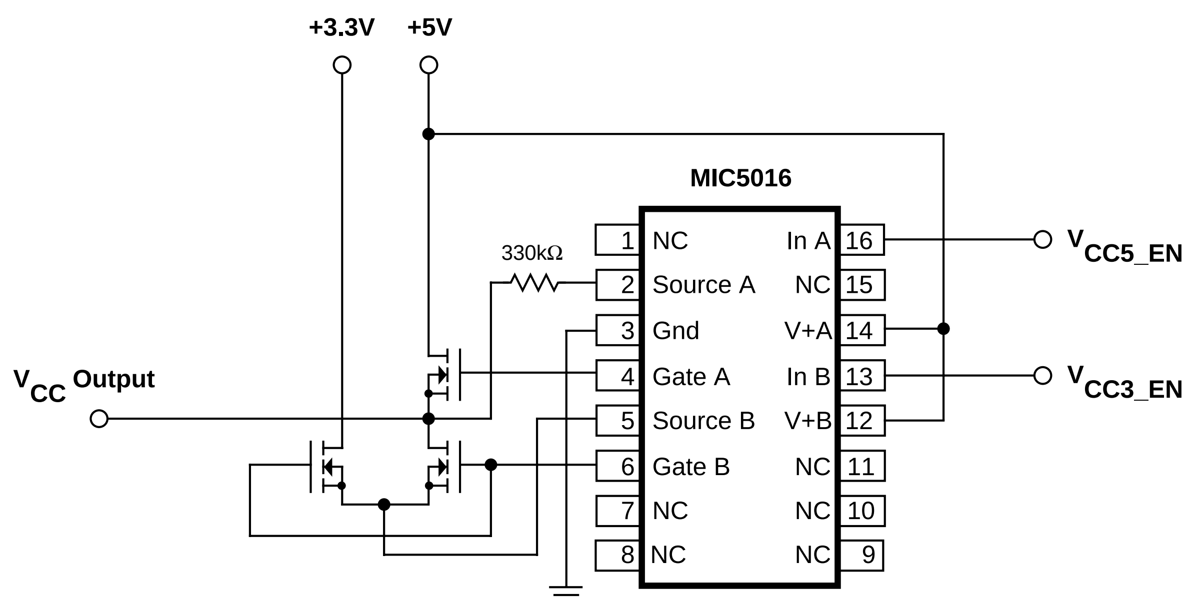


Figure 2. PCMCIA Compatible Dual V_{CC} Switch Matrix. This circuit uses power MOSFETs driven by a single MIC5016 high side MOSFET drivers to select between 3.3V and 5V V_{CC}.

V_{CC} Switching

Figures 1 and 2 show the MIC5014 and MIC5016 high side power MOSFET drivers configured as a V_{CC} select matrix. Both circuits operate identically; the MIC5016 is a dual MIC5014. For convenience, we will discuss the circuit operation referring to Figure 1. Initially, both MOSFET drivers are OFF and the MOSFET gates are clamped low, placing the V_{CC} output in the high impedance condition. A TTL High level on V_{CC5_EN} enables Q1, and 5V appears on $V_{CC\ OUT}$. Likewise, when V_{CC3_EN} is High, Q2 and Q3 are ON and 3.3V appears on the output. V_{CC5_EN} and V_{CC3_EN} are mutually exclusive: circuit damage might occur if both switches are commanded ON simultaneously.

The inherent "body diode" of the power MOSFET, shown in Figure 1, creates circuit problems that are dealt with by adding another MOSFET, Q3, connected in the reverse direction. Without Q3, whenever the 5V supply is enabled, current would flow from $V_{CC\ OUT}$ through the body diode of Q2 into the 3.3V supply, thereby contaminating the low voltage supply. Q3's reverse direction connects its body diode anode to anode with Q2 and eliminates reverse current. When V_{CC3_EN} is High and the MIC5014 enhances the MOSFET gates, both Q2 and Q3 are ON, and 3.3V appears on $V_{CC\ OUT}$. The enhanced channel shorts out the body diodes, so no diode forward voltage drop is evident. The ON resistance of Q3 is slightly higher in its reverse direction than in normal operation, but with reasonably sized MOSFETs, the voltage drop is small. Although a Schottky diode would provide the required protection, its forward voltage drop is much too large and would prevent the 3.3V switch from meeting its ±5% accuracy requirement.

Cirrus Logic CL-PD6710

The Cirrus Logic CL-PD6710 provides support for a single PCMCIA socket. Key features include full support for dual V_{CC} voltages (3.3V and 5.0V). The CL-PD6710 assumes V_{PP1} is tied to V_{PP2}. The MIC2557, in a small 8-pin surface mount package, provides V_{PP} power control for this single socket. V_{CC} switching is accomplished using the circuit of (either) Figure 1 or Figure 2. Note that no additional components are required, although filter capacitors are recommended for best performance.

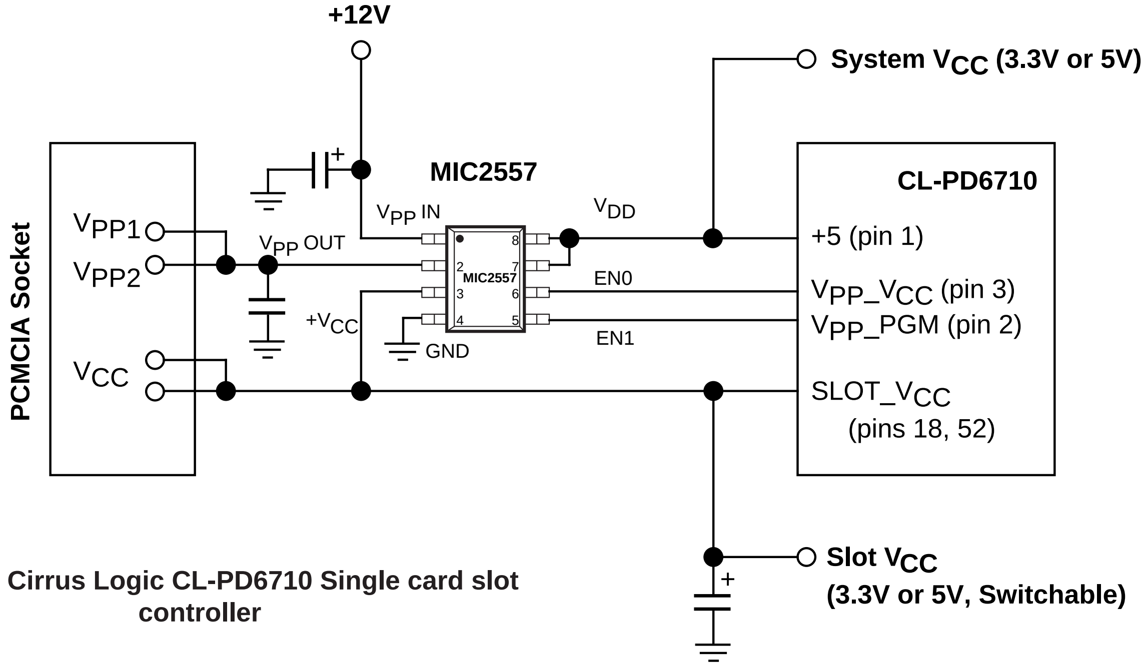


Figure 3. Cirrus Logic CL-PD6710 Single card slot controller

CL-PD6710 & CL-PD6720 Control Logic

V_{CC5_EN}	V_{CC3_EN}	V_{PP_PGM} (EN1)	V_{PP_VCC} (EN0)	$V_{CC\ OUT}$	$V_{PP\ OUT}$
0	0	0	0	High Z	Clamped to Ground
0	0	0	1	High Z	High Z
0	0	1	0	High Z	High Z
0	0	1	1	High Z	High Z
0	1	0	0	5	Clamped to Ground
0	1	0	1	5	5
0	1	1	0	5	12
0	1	1	1	5	High Z
1	0	0	0	3.3	Clamped to Ground
1	0	0	1	3.3	3.3
1	0	1	0	3.3	12
1	0	1	1	3.3	High Z
1	1	0	0	High Z	Clamped to Ground
1	1	0	1	High Z	High Z
1	1	1	0	High Z	High Z
1	1	1	1	High Z	High Z

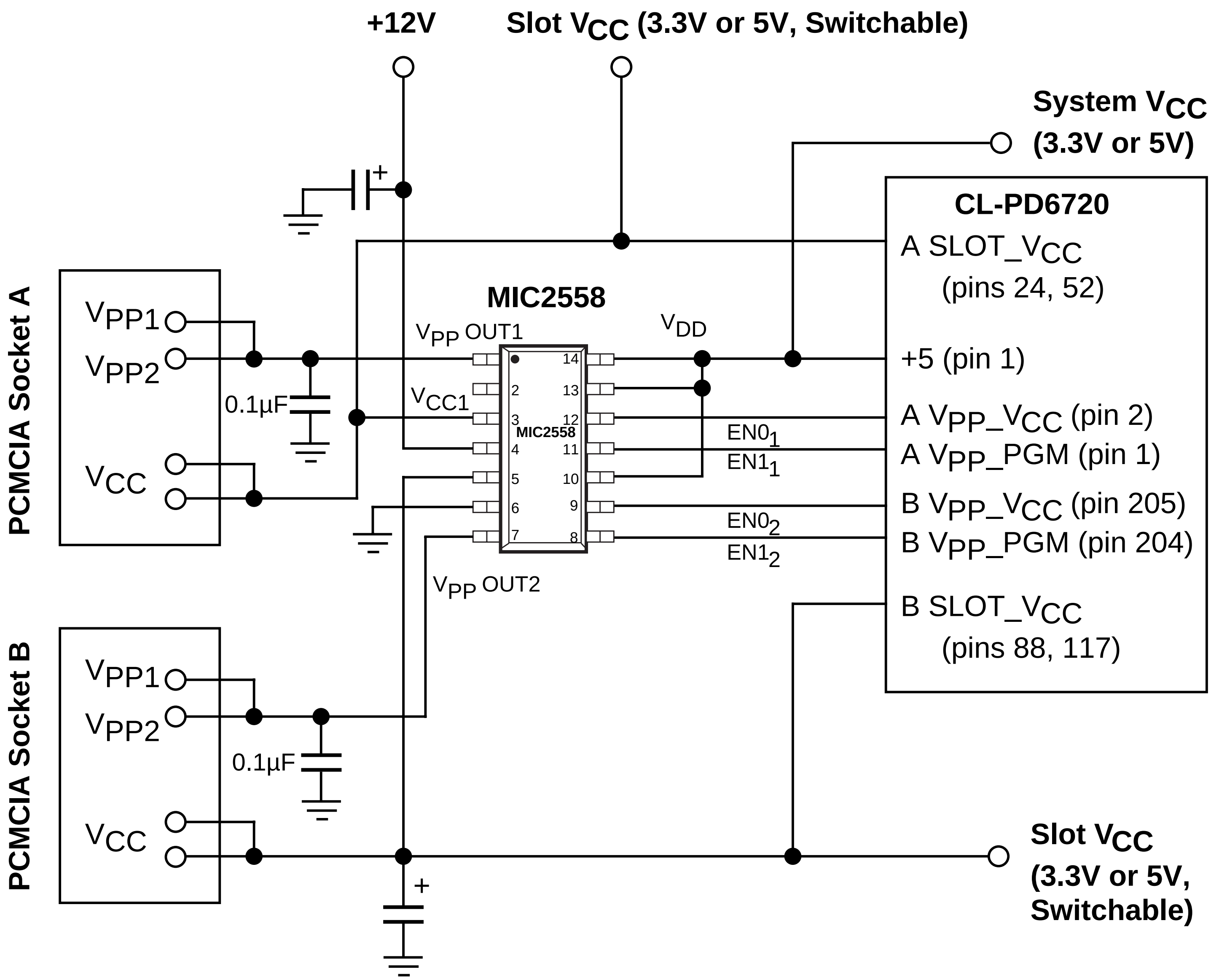
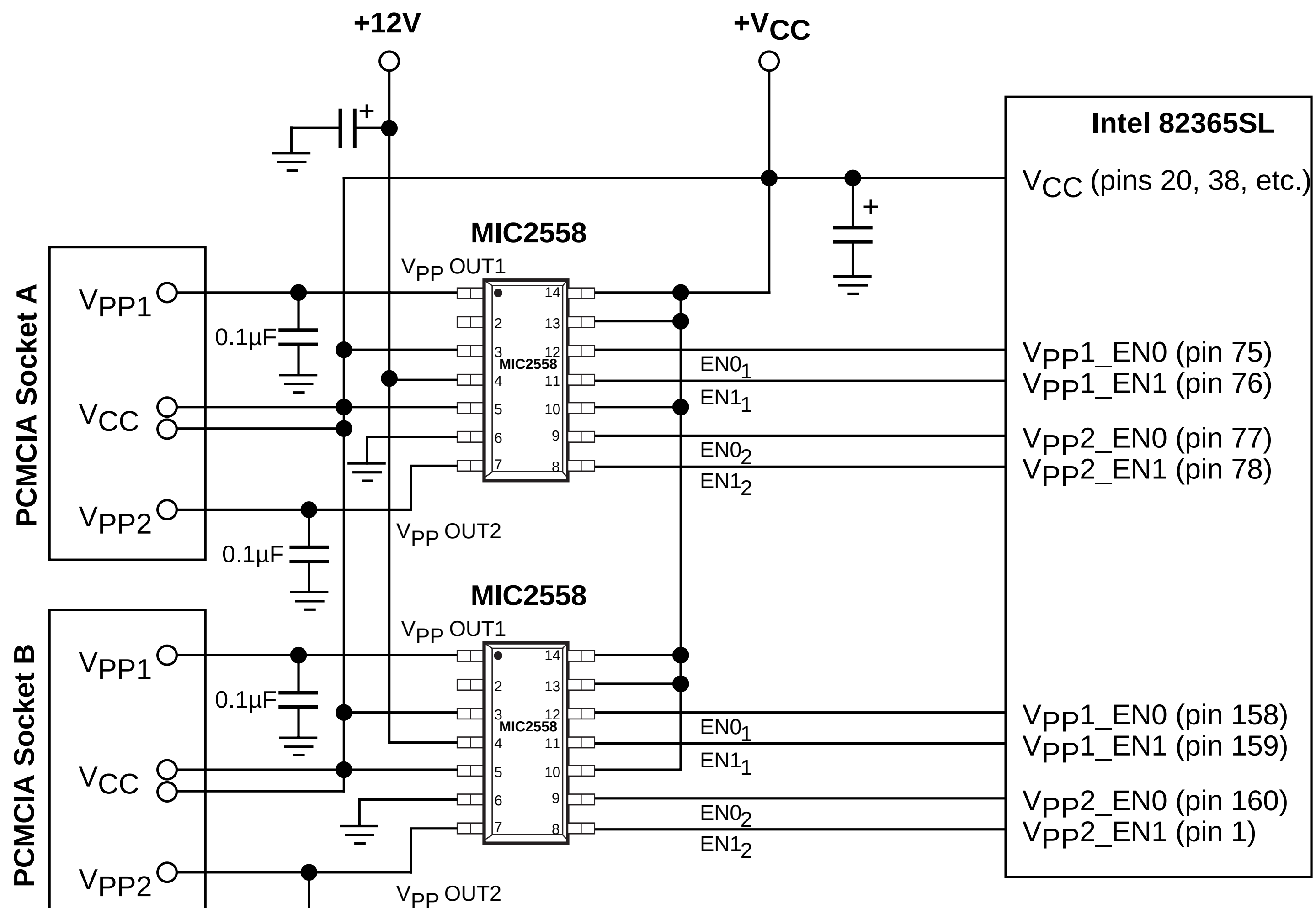


Figure 4. Cirrus Logic CL-PD6720 dual slot PCMCIA controller

Cirrus Logic CL-PD6720

As shown in Figure 4, the Cirrus Logic CL-PD6720 provides support for two PCMCIA sockets. Key features include full support for dual V_{CC} voltages. The CL-PD6720 assumes V_{PP1} is tied directly to V_{PP2}. The MIC2558, in a small 14-pin surface mount package, provides all necessary V_{PP} power control for both sockets. V_{CC} switching is accomplished using the circuit of (either) Figure 1 or Figure 2. No additional components are necessary, but filter capacitors are recommended for best performance.

A complete dual slot PCMCIA power control subsystem using this controller appears as Figure 8.



EN1	EN0	V_{PP} OUT
0	0	0
0	1	V_{CC}
1	0	V_{PP}
X	X	0 (reserved)

Figure 5. Intel 82365SL "PC Card Interface Controller (PCIC)" implementation

Intel 82365SL

The Intel 82365SL supports fully independent V_{PP1} and V_{PP2} for two PCMCIA slots. Two MIC2558 allow the necessary voltage combinations for all four V_{PP} pins. No additional components are necessary, although filter capacitors are recommended for best performance. The Intel 82365SL does not support dual V_{CC} selection, so no other power control is required. V_{CC} ON/OFF is supported, and may be implemented by a simple V_{CC} switch consisting of a MIC5014 and a single power MOSFET (per slot). Refer to Figure 6 for details on this ON/OFF V_{CC} switch.

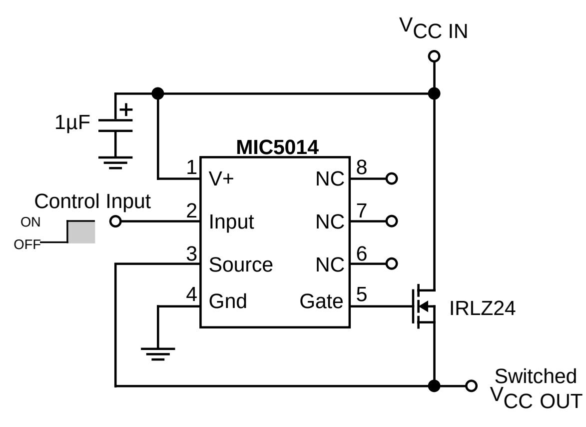


Figure 6. V_{CC} ON/OFF Switch for use with the Intel 82365SL.

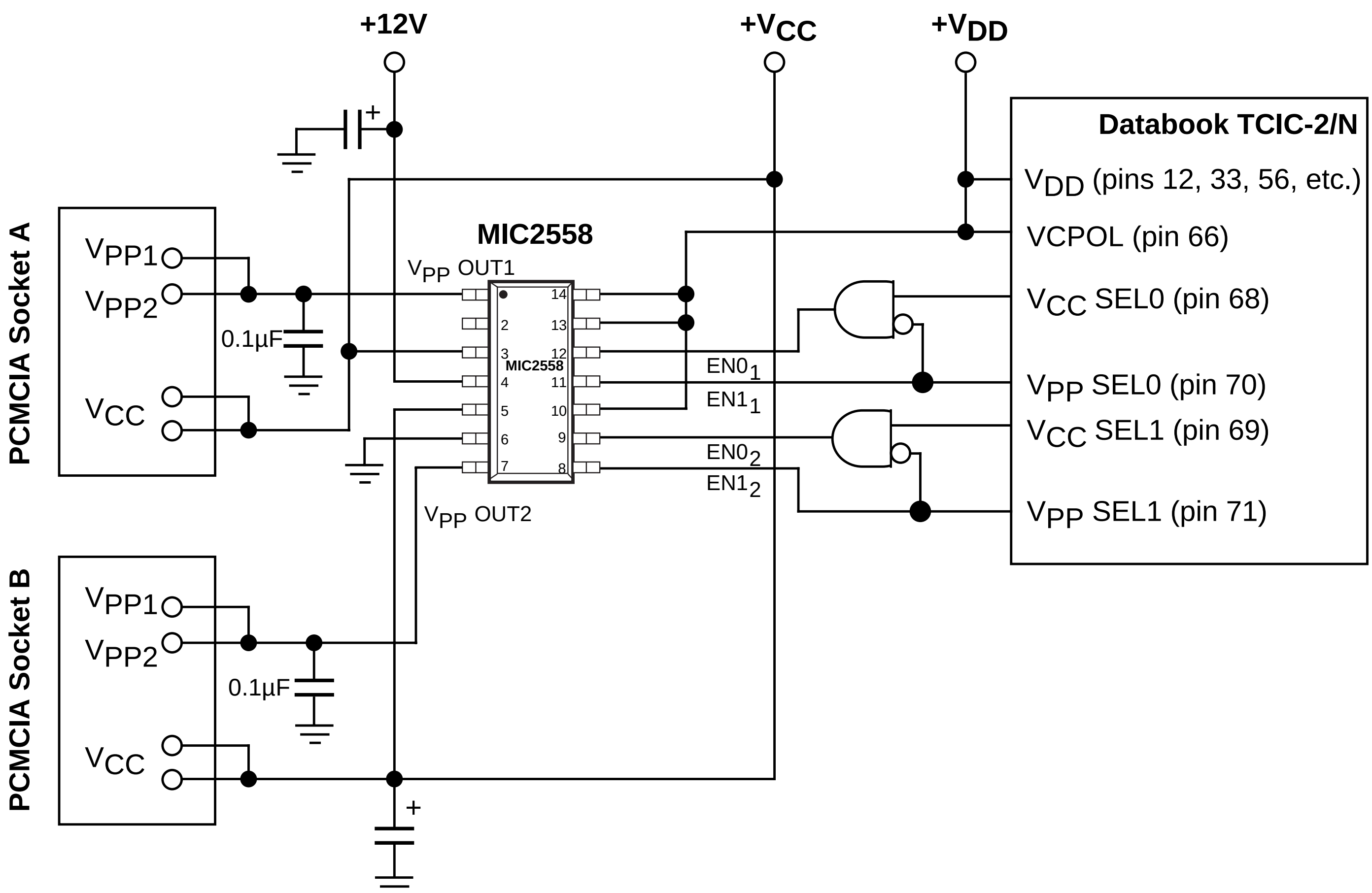


Figure 7. Databook TCIC-2/N family PCMCIA controller interfacing with the MIC2558.

V_{PP} SEL	V_{CC} SEL	EN1	EN0	V_{PP} OUT
0	0	0	0	0
0	1	0	1	V_{CC}
1	1	1	0	V_{PP}
1	0	X	X	0 (illegal)

Databook TCIC-2/N Control Logic

Databook TCIC-2/N Family

The Databook TCIC-2/N family of PCMCIA controllers has V_{PP} and V_{CC} voltage enable signals a bit different than provided by the other controllers. A logic gate is necessary to complete the interface between the TCIC-2/N and the MIC2558. The TCIC-2/N has a pin, VCPOL, which controls the polarity of the output enable signals. When VCPOL is tied to V_{DD}, the control signals are active high, and with VCPOL low, the control outputs are active low. The configuration shown uses the active high option.

Complete PCMCIA Power Control Circuitry Using MIC2558 and Cirrus Logic CL-PD6720

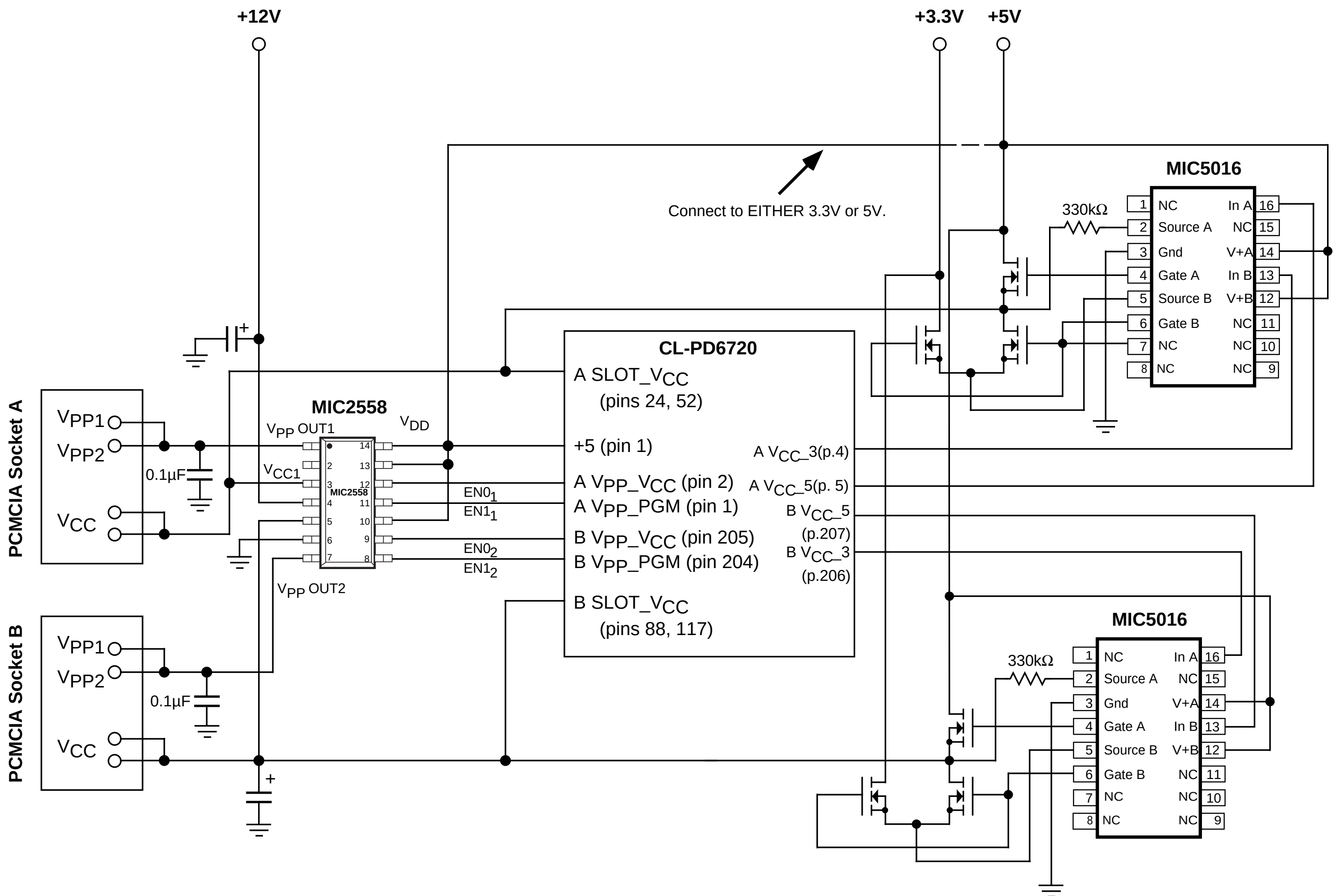


Figure 8. Complete dual slot PCMCIA power control system using MIC2558 and Cirrus Logic CL-PD6720

Figure 7 shows a complete dual slot PCMCIA power control implementation for dual V_{CC} systems. CL-PD6720 pin 1 ("+5V") is connected to 5V if available, and to 3.3V if the logic lines are powered from this voltage. This pin, and the MIC2558 V_{DD} pin (pin 14) set up reference levels for the logic input pins (and output pins on the CL-PD6720).

As of the time of this writing, the PCMCIA field is quite dynamic. Please contact Micrel for the latest information on PCMCIA controller compatibility and new Micrel devices designed for this application.