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MAXIM

MAX1241 Evaluation System/Evaluation Kit

Evaluates: MAX1240/MAX1241

General Description

The MAX1241 evaluation kit (EV kit) is an assembled and tested PC board that demonstrates the 3V, 12-bit MAX1241 analog-to-digital converter.

The MAX1241 evaluation system (EV system) is a complete, low-cost, single-channel data-acquisition system consisting of a MAX1241 EV kit and a Maxim 3V microcontroller (µC) module. IBM PC-compatible software provides a handy user interface to exercise the MAX1241's features. Source code is provided.

Order the EV system for comprehensive evaluation of the MAX1241 using a personal computer. Order the EV kit if you have already purchased the 3V µC module with another Maxim EV system, or for custom use in other µC-based systems.

The MAX1241 EV kit evaluates both the MAX1241 and the MAX1240. To evaluate the MAX1240, order a free sample of the MAX1240BCPA along with the MAX1241 EV kit.

Features

♦ **Proven PC Board Layout**

♦ **Complete Evaluation System**

♦ **Convenient On-Board Test Points**

♦ **Data-Logging Software**

♦ **Source Code Provided**

♦ **Fully Assembled and Tested**

Ordering Information

PART	TEMP. RANGE	BOARD TYPE
MAX1241EVKIT-DIP	0°C to +70°C	Through-Hole
MAX1241EVL11-DIP	0°C to +70°C	Through-Hole

MAX1241 EV Kit Component List

DESIGNATION	QTY	DESCRIPTION
C1	1	0.01µF capacitor
C2, C3, C6	3	0.1µF capacitors
C4	1	4.7µF capacitor
C5	1	10µF capacitor
C7	1	0.047µF capacitor
J1	1	2x20 header
J7	1	6-pin header
JU1, JU2	2	2-pin headers
R1	1	1kΩ resistor
U1	1	MAX1241BCPA
U2	1	MAX872CPA
None	1	PC board

MAX1241 EVL11 Component List

QTY	DESCRIPTION
1	MAX1241EVKIT-DIP
1	68L11D µC Module (68L11D MODULE)

MAX1241 EV System Quick Start

The MAX1241 EV kit is fully assembled and tested. Follow these steps to verify board operation. **Do not turn on the power supply until all connections are completed.**

1) Copy the files from the distribution disk to your hard disk or to blank floppy disks. The MAX1241 EV kit software should be in its own directory. The necessary files are in the distribution disk's root directory, and the source code is in the SOURCE subdirectory. The SOURCE subdirectory is not required to operate the EV kit.

2) Make sure that jumper JU1 is open and JU2 is closed (Table 1).

3) Carefully connect the boards by aligning the MAX1241 EV kit's 40-pin header with the 68L11D module's 40-pin connector. Gently press them together. The two boards should be flush against one another.

4) Connect a 5V DC power source (16V max) to the µC module. This is located at the terminal block next to the on/off switch, in the upper-right corner of the µC module. Observe the polarity marked on the board.

For free samples & the latest literature: http://www.maxim-ic.com, or phone 1-800-998-8800.
For small orders, phone 408-737-7600 ext. 3468.

5) Connect a cable from the computer's serial port to the µC module. If using a 9-pin serial port, use a straight-through, 9-pin, female-to-male cable. If the only available serial port uses a 25-pin connector, a standard 25-pin to 9-pin adapter is required. The EV kit software checks the modem status lines (CTS, DSR, DCD) to confirm that the correct port has been selected.

6) Start the MAX1241 software on the IBM PC by setting the current directory to match the directory containing the Maxim programs, then type the program name "MAX1241". Do not turn off or disconnect the µC module while the program is running; if you do, you will have to restart the program.

7) The program will ask which port the µC module is connected to. Press the space bar until the correct PC serial port is highlighted, then press ENTER. The MAX1241 program will be in terminal-emulation mode.

8) Turn on the power for the µC module. The module will display its logon banner and test its RAM.

9) Download and run the RAM resident program on the µC module by pressing ALT+L (i.e., hold down the ALT key as you strike the L key). The program prompts you for the file name. Press the ENTER key to download and run the file.

10) Press ALT+C to switch to the control-panel screen after the RAM resident program has been successfully downloaded.

11) Apply input signals to AIN on the MAX1241 EV kit board. Observe the readout on the screen. Table 2 lists the commands that are available from the control-panel screen.

12) Before turning off power to the MAX1241 EV kit, exit the program by pressing ALT+X.

Detailed Description of Hardware

MAX1241 Stand-Alone EV Kit
The MAX1241 EV kit provides a proven PC board layout to facilitate evaluation of the MAX1241. It must be interfaced to appropriate timing signals for proper operation. Refer to the MAX1241 data sheet for timing requirements.

Evaluating the MAX1240
To evaluate the MAX1240, turn off power to the kit, remove the MAX1241, and replace it with a MAX1240BCPA. Select the internal reference by opening JU2 and closing JU1.

Systems Using 3V and 5V Logic
Systems that have both 3V and 5V logic must provide level translation for the MAX1241's data output. No level translation is necessary on the inputs.

Changing the Reference Voltage
The MAX872 is a 2.5V reference. To supply a different external reference, open JU2 and apply the reference voltage between VREF and GND. Refer to the MAX1241 data sheet for reference voltage requirements.

Table 1. Jumper Settings

JUMPER	STATE	FUNCTION
JU1	Closed	The µC module controls the state of $\overline{SHDN}$.
	Open (default)	Force $\overline{SHDN}$ to float. Disable internal reference (MAX1240).
JU2	Closed (default)	Drive VREF with on-board MAX872 reference.
	Open	Disconnect MAX872 reference. Use internal reference (MAX1240) or drive VREF pad with a user-supplied reference.

Detailed Description of Software

The software allows the user to control the throughput rate, power-up delay, and reference-range setting. It also provides for data logging. Refer to Table 2 for a complete listing of the available features.

The EV kit software program (*KIT1241.L11*) loaded into the 68L11D module operates at a 6.7ksps throughput.

For faster throughput, download the program *FAST1241.L11* at step 9 of the *MAX1241 EV System Quick Start* section. This program has a throughput rate of approximately 14ksps.

MAXIM

MAX1241 Evaluation System/Evaluation Kit

Table 2. Command Reference

KEY	FUNCTION
C	Display the input codes in decimal format.
D	Delay between samples. Delays longer than one second are handled by the IBM PC; otherwise, the µC module handles the delay. Timing is approximate and should be verified with an oscilloscope.
L	Enable or disable data logging. If the -L command-line option was not specified, the L command prompts for a log-file name.
O	Oscilloscope demo. Samples are collected and discarded as quickly as possible. Observe waveforms and timing with an oscilloscope.
P	Power-up delay. Timing is approximate and should be verified with an oscilloscope. When VREF = V$_{DD}$, power-up delay is not necessary and should be set to zero. Power-up delay is used regardless of which power-cycling mode is selected.
S	Sample the input at high speed. The sampling rate is controlled by the P and D delays. Due to program overhead, the O and S commands operate at different rates. Timing should be verified with an oscilloscope.
V	Display the input voltages.
F3	Write a marker into the data-log file.
F5	Change the assumed value of VREF.
↑, ↓	Select power-down mode.
ALT+T	Switch back to terminal mode.
ALT+X	Exit to DOS.

Table 3. Command-Line Options when Starting MAX1241 Software

COMMAND	FUNCTION
1	Default to COM1 PC serial port.
2	Default to COM2 PC serial port.
MONO	For use with LCD or monochrome display.
-L*filename*	Open file "filename" for data logging, and enable the data-logging commands.
VREF vvv	Specify the actual measured voltage at the REF pin (nominally 2.5V).
?	List command-line options.
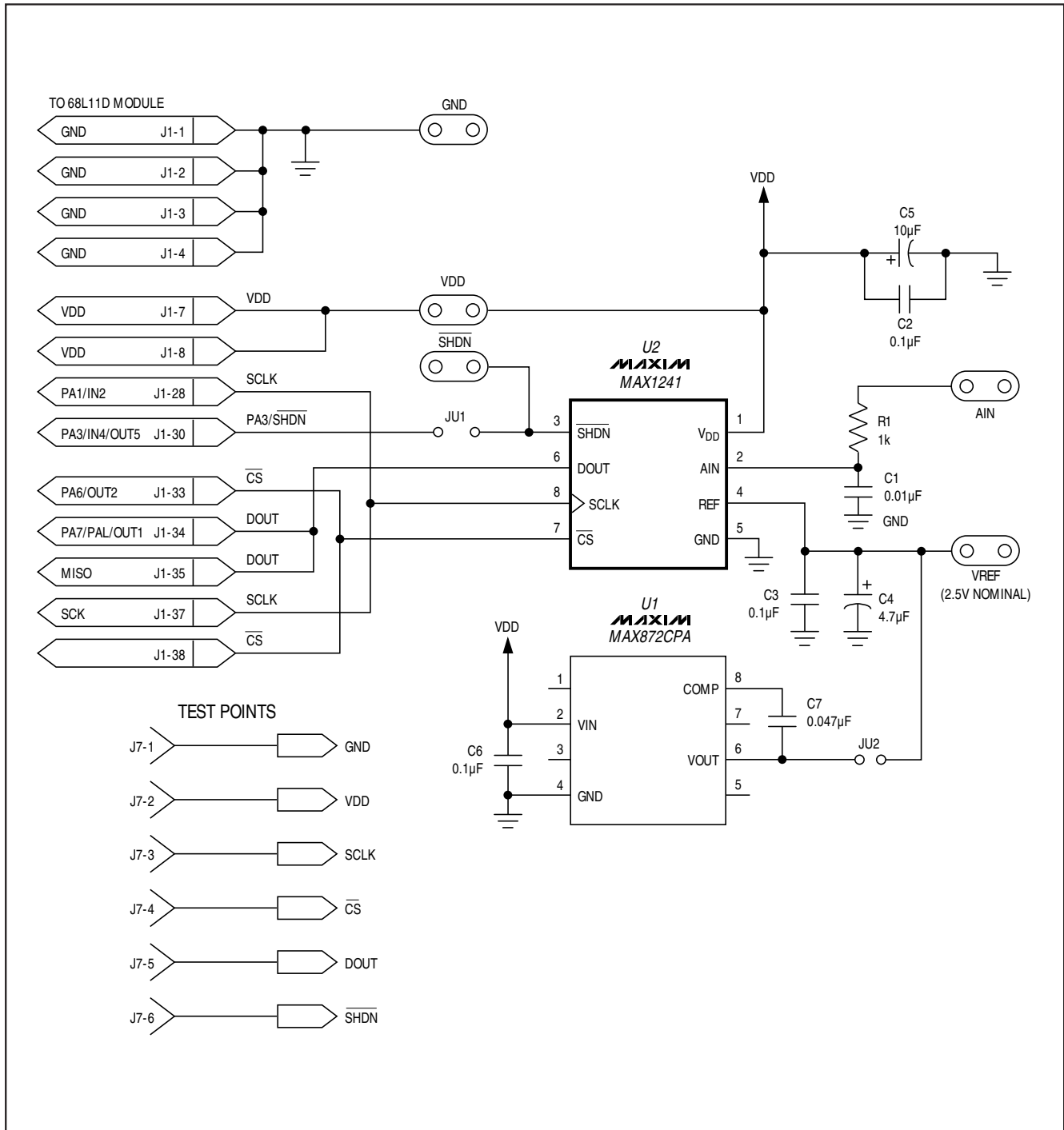
Figure 1. MAX1241 EV Kit Schematic
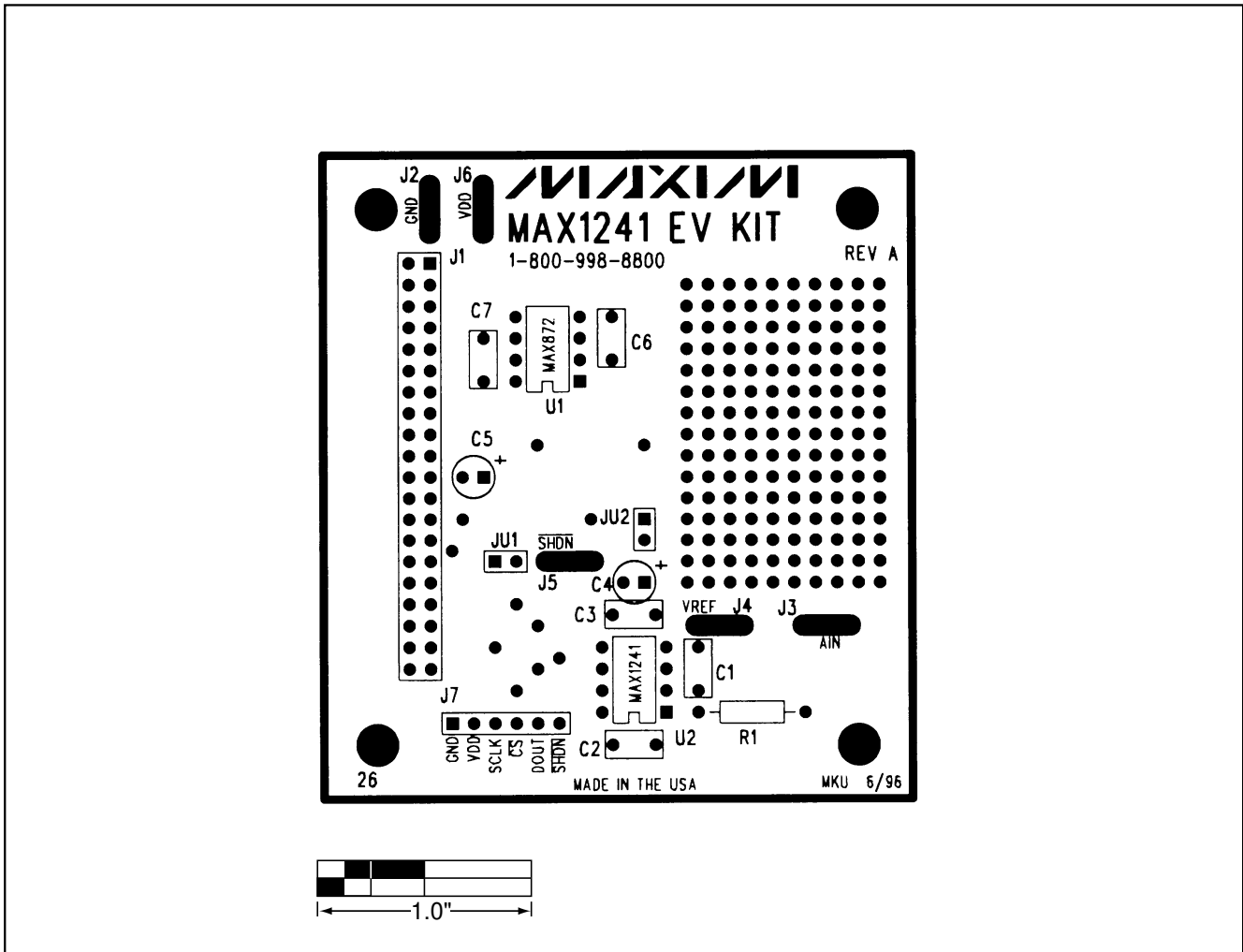
Figure 2. MAX1241 EV Kit Component Placement Guide

Evaluates: MAX1240/MAX1241
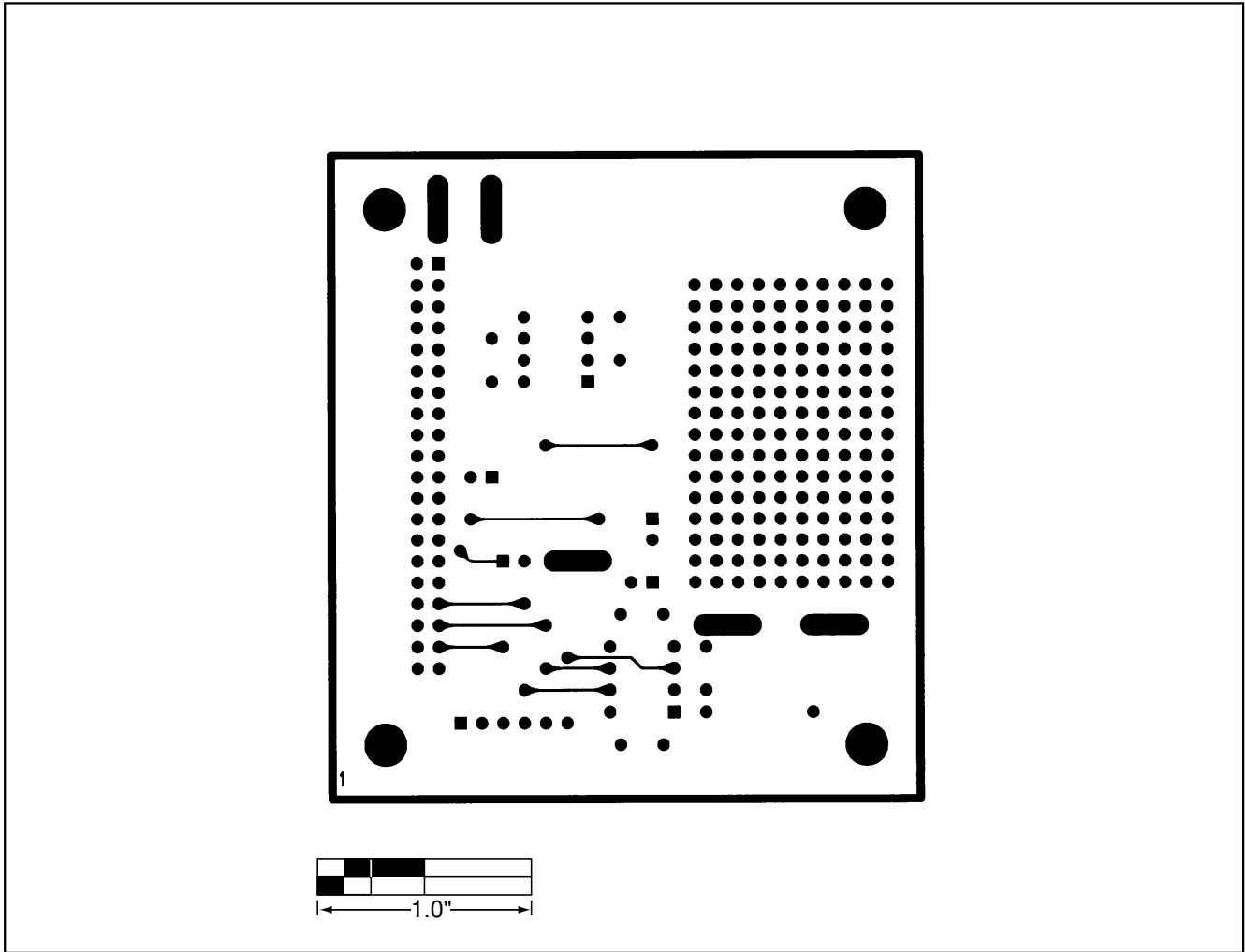
Figure 3. MAX1241 EV Kit PC Board Layout—Component Side

MAXIM
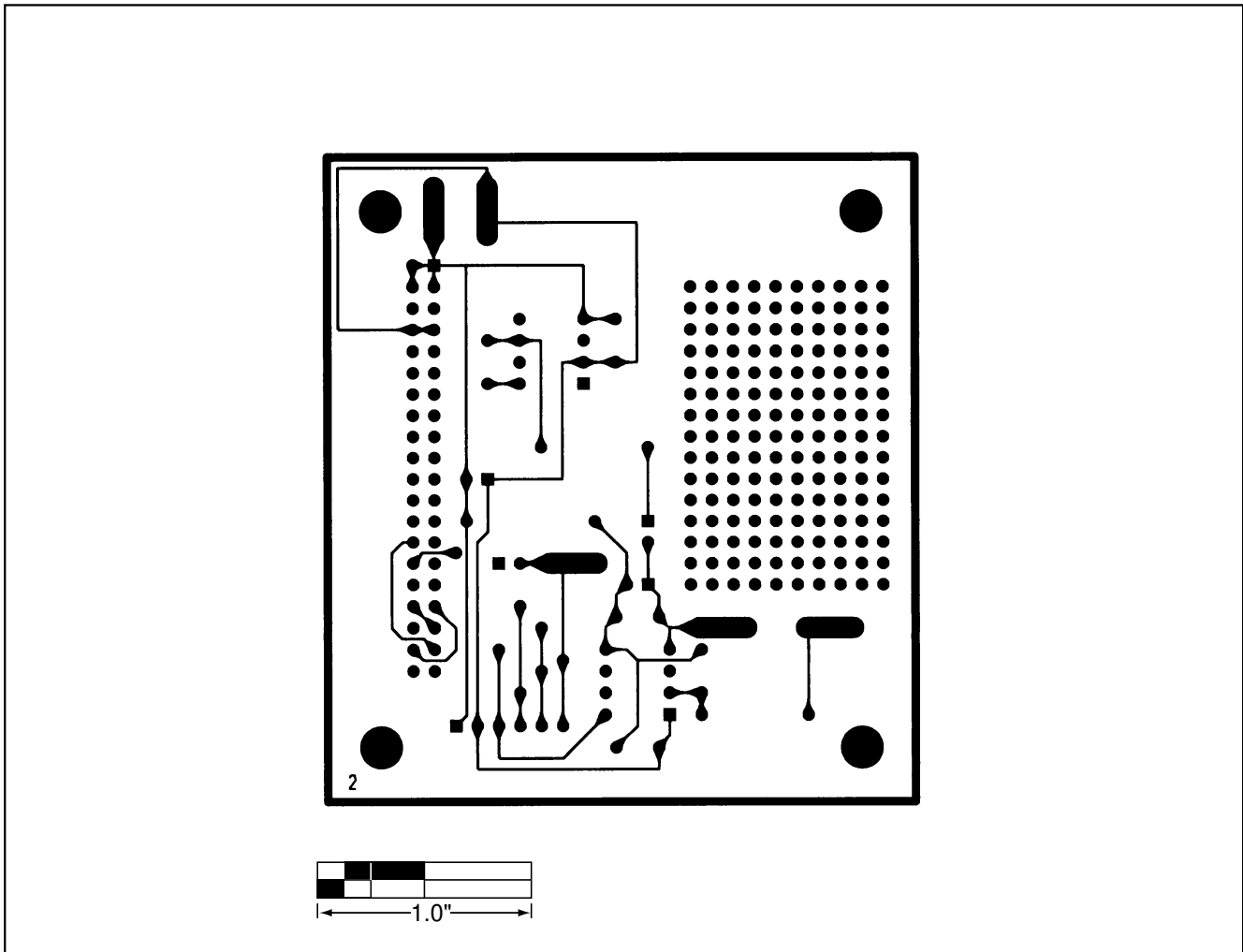
Figure 4. MAX1241 EV Kit PC Board Layout—Solder Side

NOTES

_____*General Description*

The 68L11D module is an assembled and tested PC board intended for use with Maxim's low-voltage data-acquisition evaluation kits (EV kits). The module uses Motorola's MC68L11D0FN2 microcontroller (µC) to collect data samples using the SPI interface. It requires an IBM PC computer and an external DC power supply of +5V to +16V, or as specified in the appropriate EV kit manual.

Maxim's 68L11D module allows customers to evaluate selected Maxim products. It is not intended to be a microprocessor development platform, and Maxim does not support such use.

_____*Getting Started*

All system components are guaranteed by their various manufacturers over the +3V to +3.6V power-supply range. Not all system components are guaranteed over the entire 2.5V to 5V V_{DD} power-supply adjustment range. Verify correct operation using the following procedures:

1) Connect a +5V DC power source (16V max) to the µC module at the terminal block located next to the on/off switch, in the upper-right corner of the µC module. Turn the power switch on.

2) Connect a cable from the computer's serial port to the µC module. If using a 9-pin serial port, use a straight-through, 9-pin, female-to-male cable. If the only available serial port uses a 25-pin connector, a standard 25-pin to 9-pin adapter is required.

3) Start the evaluation kit software on the IBM PC. When the program asks which port the µC module is connected to, press the space bar until the correct port is highlighted, and then press ENTER. The software will be in terminal-emulation mode. (If using a generic terminal-emulation program instead of Maxim EV kit software, select 1200 baud, eight-bit character, no parity, one stop bit. Send a space character to start the monitor program.)

4) Adjust trim potentiometer R2 for the desired V_{DD} supply voltage. Measure V_{DD} between test point TP1 and ground. The mounting hole next to R2 is grounded.

5) To verify correct system operation, press the ESC key, type a capital "T", and then select the countdown memory test. If the memory test fails or any other malfunction is reported, the V_{DD} voltage is too low; increase V_{DD} and repeat from step 4.

6) Turn the power switch off and connect the µC board to an appropriate Maxim EV kit board.

_____*Component List*

DESIGNATION	QTY	DESCRIPTION
C1, C2	2	22pF ceramic capacitors
C3	1	0.01µF ceramic capacitor
C4–C9, C12–C18	13	0.1µF ceramic capacitors
C10, C11	2	22µF, 20V tantalum capacitors
D1	1	1N4001 diode
J1	1	40-pin, right-angle header
J2	1	2-circuit terminal block
J3	1	DB9 right-angle socket
JU1, JU2	2	Open
LED1	1	Light-emitting diode
R1	1	10MΩ, 5% resistor
R2	1	100kΩ potentiometer
R3	1	274kΩ, 1% resistor
R4	1	133kΩ, 1% resistor
R5	1	200Ω, 5% resistor
R6	1	10kΩ SIP resistor pack, pin 1 common
SW1	1	Slide switch
SW2	1	Momentary push-button switch
U1	1	Motorola MC68L11D0FN2
U2	1	Maxim MAX3232CSE
U3	1	74HC00
U4	1	Maxim MAX667CSA
U5	1	32k x 8 static RAM 28-pin socket Motorola MCM6306DJ15
U10	1	28-pin socket
U6	1	74HCT245
U7	1	Maxim MAX708RCSA
U8	1	74HC573
U9	1	74HC139
U10	1	3V, 8k x 8 ROM
Y1	1	8MHz crystal

Detailed Description

Power Requirements

The 68L11D module draws its power from a user-supplied power source connected to terminal block J2. Note the positive and negative markings on the board. Nominal input voltages should be between +5V and +16V. The input current requirement for the 68L11D module is typically 20mA plus the current drawn by the evaluation kit (EV kit).

The V_{DD} supply is set by U4, a MAX667 low-dropout CMOS regulator. Trim potentiometer R2 sets the supply voltage, with an adjustment range of approximately 2.5V to 5V. Although the board is designed primarily for 3V applications, all of the circuitry is rated to withstand 5V levels.

68L11D Microcontroller (µC) Module Hardware

U1 is Motorola's 68L11D µC. Contact Motorola for µC information, development, and support.

A MAX708R supervisory circuit on the module monitors the V_{DD} logic supply, generates the power-on reset, and produces a reset pulse whenever the manual reset button (SW2) is pressed. Note that the MAX708R resets the CPU if the supply voltage falls below 2.66V.

The module provides 32kbytes of external CMOS static RAM (U5).

The 74HCT245 octal buffer (U6) provides access to an eight-bit port on the 40-pin interface connector. This memory-mapped port consists of Intel-compatible read and write strobes, four chip selects, four address LSB's, and eight data bits. Table 3 lists the address ranges for each of the memory-mapped elements on the 68L11D module.

The MAX3232 is a 3V-powered, RS-232 interface voltage-level shifter. Its built-in charge pump uses external capacitors to generate the output voltages necessary to drive RS-232 lines.

The 20 x 2-pin header (J1) connects the 68L11D module to a Maxim EV kit. Table 2 lists the function of each pin. Use the 68L11D module only with EV kits that are designed to support it, and download only code that is targeted for the Maxim 68L11D module. Downloading incorrect object code into the 68L11D module will produce unpredictable results.

The 8k x 8 boot ROM (U10) checks the system and waits for commands from the host. Refer to the EV kit manual for specific startup procedures.

Software

All software is supplied on a disk with the EV kit. Software operating instructions are included in the EV kit manual.

Serial Communications

J3 is an RS-232 serial port, designed to be compatible with the IBM PC 9-pin serial port. Use a straight-through DB9 male-to-female cable to connect J3 to the IBM PC serial port. If the only available serial port has a 25-pin connector, use a standard 25-pin to 9-pin adapter. Table 1 shows J3's pinout. The hardware-handshake lines are used by the evaluation software to confirm that the EV kit is connected to the correct serial port.

Table 1. Serial Communications Port J3

PIN	NAME	FUNCTION
1	DCD	Handshake; hard-wired to DTR and DSR
2	RXD	RS-232-compatible data output from 68L11D module
3	TXD	RS-232-compatible data input to 68L11D module
4	DTR	Handshake; hard-wired to DCD and DSR
5	GND	Signal ground connection
6	DSR	Handshake; hard-wired to DCD and DTR
7	RTS	Handshake; hard-wired to CTS
8	CTS	Handshake; hard-wired to RTS
9	None	Unused

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Table 2. 40-Pin Data-Connector Signals

PIN	NAME	FUNCTION
1–4	GND	Ground
5, 6	V++	Unregulated input voltage
7, 8	V$_{DD}$	V$_{DD}$ from on-board MAX667 regulator
9	$\overline{RD}$	Read strobe
10	$\overline{WR}$	Write strobe
11	$\overline{CS0}$	Chip select for 8000-8FFF
12	$\overline{CS1}$	Chip select for 9000-9FFF
13	$\overline{CS2}$	Chip select for A000-AFFF
14	$\overline{CS3}$	Chip select for B000-BFFF
15	ADDR0	Address bit 0 (LSB)
16	ADDR1	Address bit 1
17	ADDR2	Address bit 2
18	ADDR3	Address bit 3
19	DB0	Data bus bit 0 (LSB)
20–26	DB1–DB7	Data bus bits 1–7
27	PA0/IC3	General I/O port bit 0 (LSB)
28	PA1/IC2	General I/O port
29	PA2/IC1	General I/O port
30	PA3/IC4/OC5	General I/O port
31	PA4/OC4	General I/O port
32	PA5/OC3	General I/O port
33	PA6/OC2	General I/O port
34	PA7/OC1/PAI	General I/O port MSB
35	MISO	SPI master-in, slave-out
36	MOSI	SPI master-out, slave-in
37	SCK	SPI serial clock
38	RESERVED	Reserved for factory use
39	E	System E-clock output
40	$\overline{SS}$	SPI slave-select input

Table 3. 68L11D Module Memory Map

ADDRESS RANGE (HEX)	FUNCTION
0000-7FFF	User RAM area (U5)
8000-8FFF	External chip-select 0 (J1 pin 11)
9000-9FFF	External chip-select 1 (J1 pin 12)
A000-AFFF	External chip-select 2 (J1 pin 13)
B000-BFFF	External chip-select 3 (J1 pin 14)
C000-C03F	Unused
C040-C0FF	Internal RAM (U1)
C100-CFFF	Unused
D000-D03F	Internal register area (U1)
D040-DFFF	Unused
E000-FFFF	Boot ROM (U10)

J2

D1
1N4001

VPREREG

SW1

+ C10
22µF
20V

U4
MAXIM

1 DD MAX667 VIN 8

VDD 2 VOUT LBO 7

3 LBI VSET 6 1.255V

4 GND SHDN 5

VDD

R3
274k
1%

+ C11
22µF
20V

R2
100k

R4
133k
1%

VDD

C16
0.1µF

C14
0.1µF

C12
0.1µF

C13
0.1µF

16
Vcc

U2
MAXIM
MAX3232

1 C1+
3 C1-
4 C2+
5 C2-

V+ 2
V- 6

C15
0.1µF

J3-8
CTS

J3-7
RTS

VDD

C4
0.1µF

C3
0.01µF

TXD 11 T1 14 J3-2 RXD

10 T2 7 J3-3 TXD

VDD

Vcc

U7
MAXIM
MAX708R

RXD 12 R1 13 J3-4 DTR

9 R2 8 J3-6 DSR

J3-1
DCD

GND

SW2
RESET

1 MR PFO 5

NC 6

RESET 8

4 PFI RESET 7 RESET

GND 3

15 J3-5 GND

J3-9
RI

PA0/IN3 30 PA0 U1 PC0 3 D0
PA1/IN2 29 PA1 MC68L11D0FN2 PC1 4 D1
PA2/IN1 28 PA2 PC2 5 D2
PA3/IN4/OUT5 27 PA3 PC3 6 D3
PA4/OUT4 26 PA4 PC4 7 D4
PA5/OUT3 25 PA5 PC5 8 D5
PA6/OUT2 24 PA6 PC6 9 D6
PA7/OUT1/PULSE ACCIN 23 PA7 PC7 10 D7
PD6/AS 13 AS

POWER CONNECTIONS

	GND	VDD
U1	1, 2	22

C17
0.1µF

VDD

RXD 16 PD0/RXD
TXD 17 PD1/TXD
MISO 18 PD2/MISO PD7/R/W 12 R/W
MOSI 19 PD3/MOSI PB0 39 A8
SCK 20 PD4/SCK PB1 38 A9
SS 21 PD5/SS PB2 37 A10
PB3 36 A11
RESET 14 RESET PB4 35 A12
XIRQ 11 XIRQ/VPP PB5 34 A13
IRQ 15 IRQ/CE PB6 33 A14
PB7 32 A15
44 XTAL
43 EXTAL
MODA/LIR 41 MODA
E 42 E MODB/VSTBY 40 MODB

C2
22pF

Y1
8.00MHz

R1
10M

C1
22pF

Figure 1. 68L11D Module Schematic Diagram

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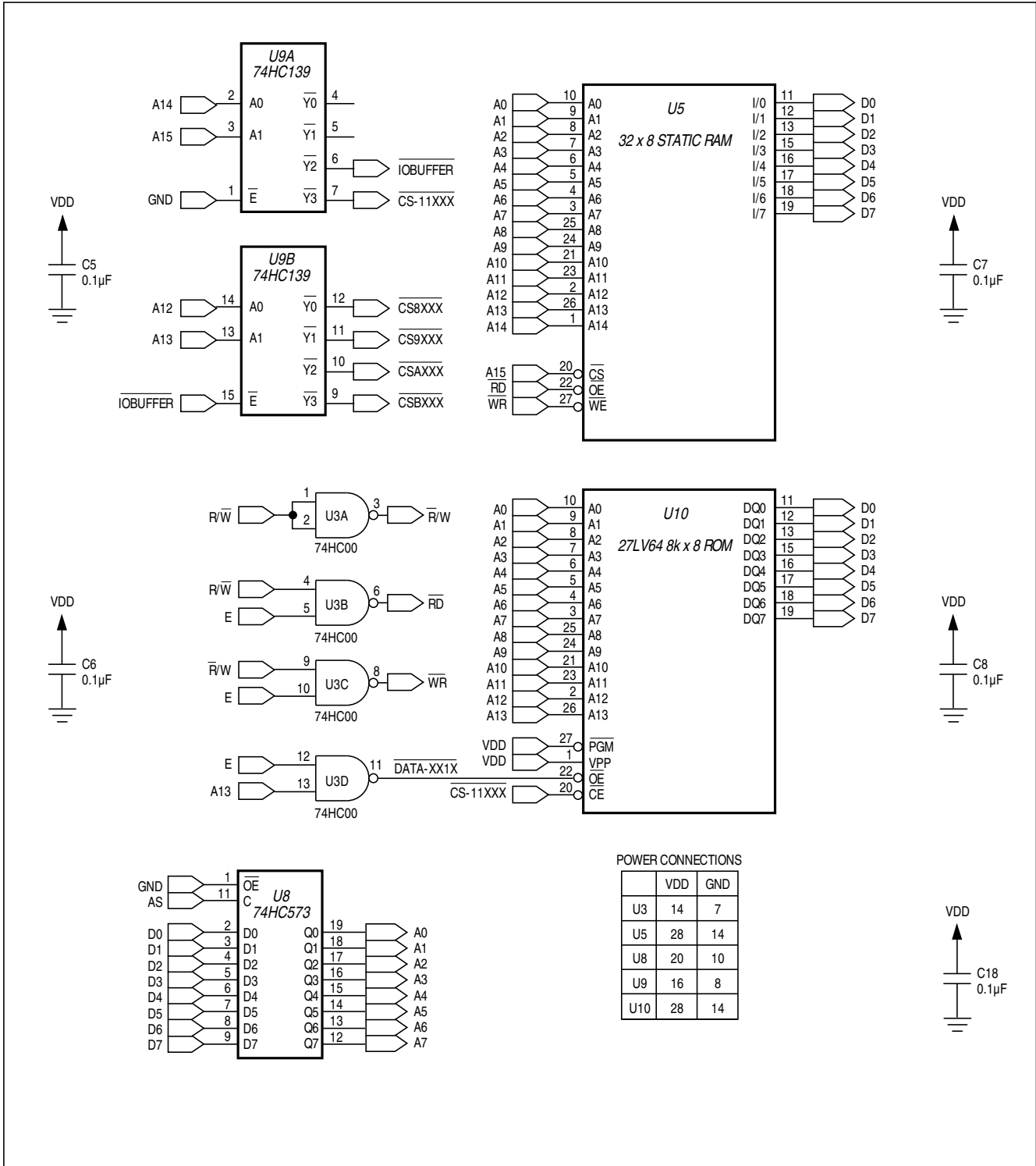*Figure 1. 68L11D Module Schematic Diagram (continued)*

68L11D Module
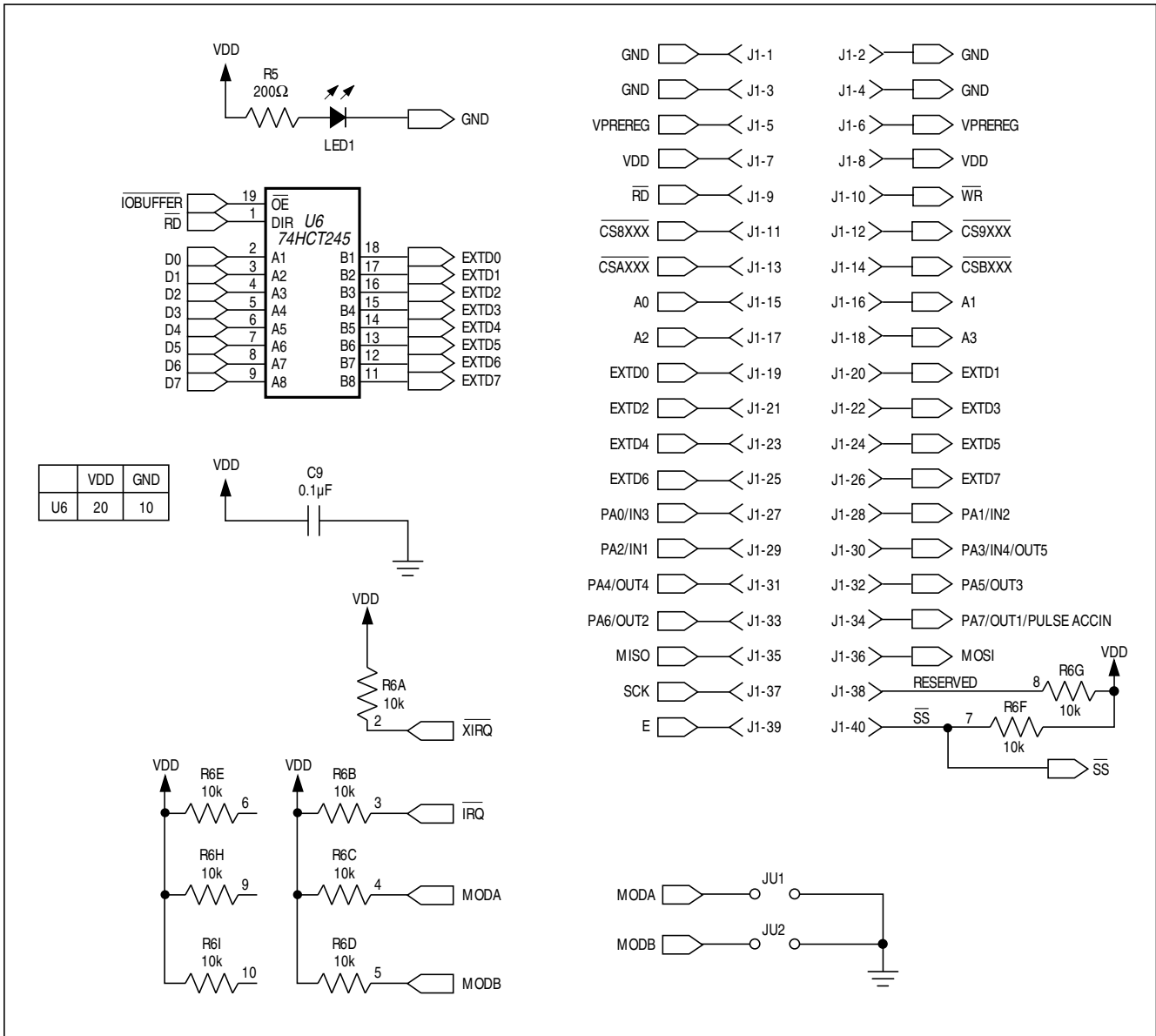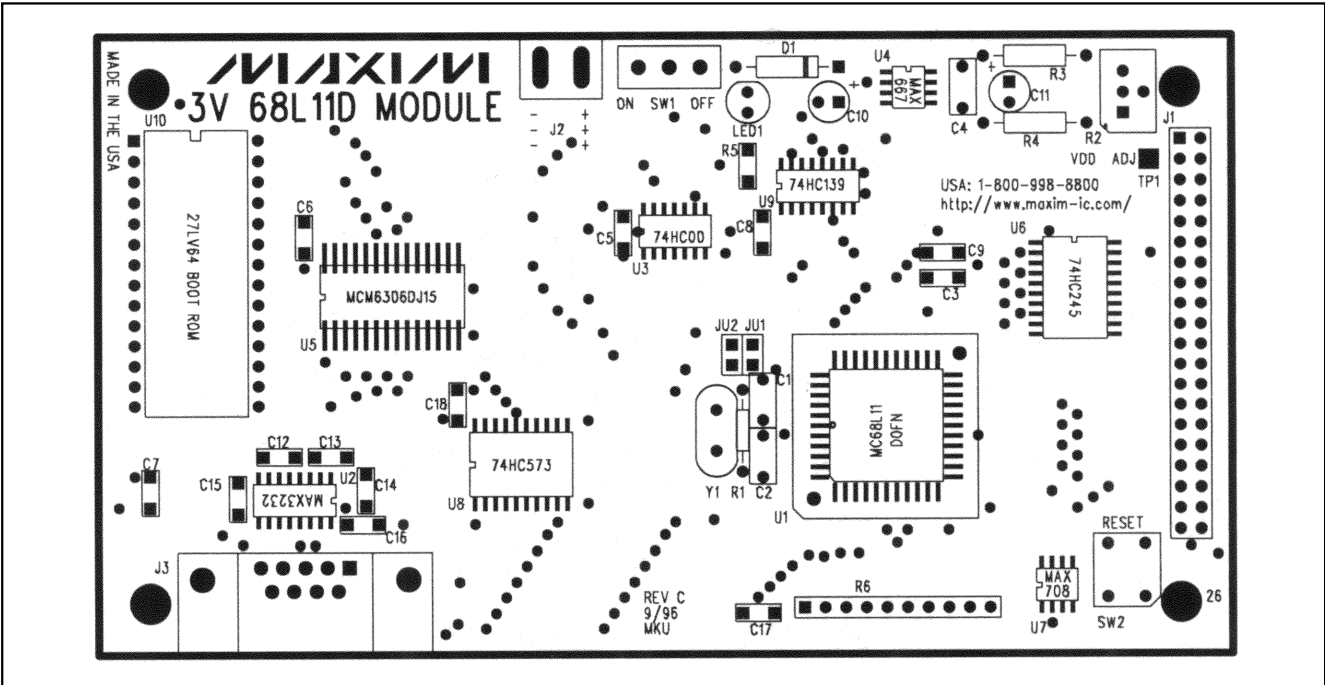
Figure 1. 68L11D Module Schematic Diagram (continued)

Figure 2. 68L11D Module Component Placement Guide

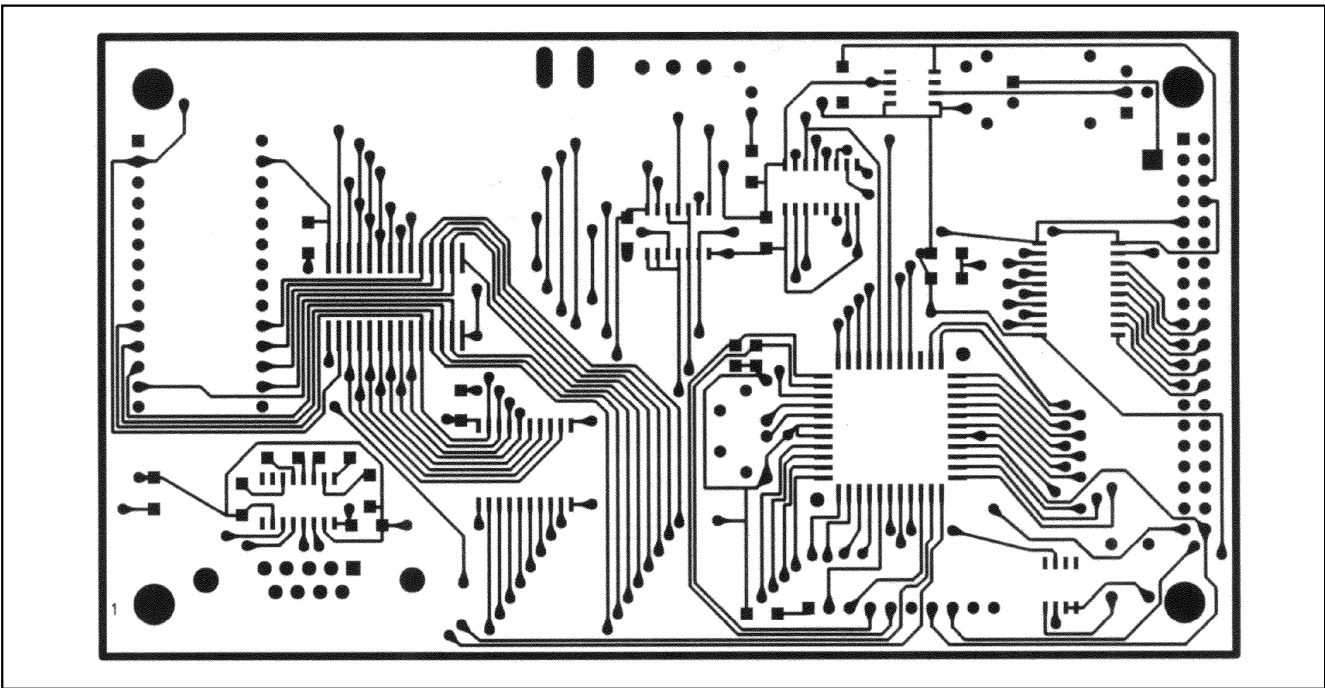Figure 3. 68L11D Module PC Board Layout—Component Side

68L11D Module

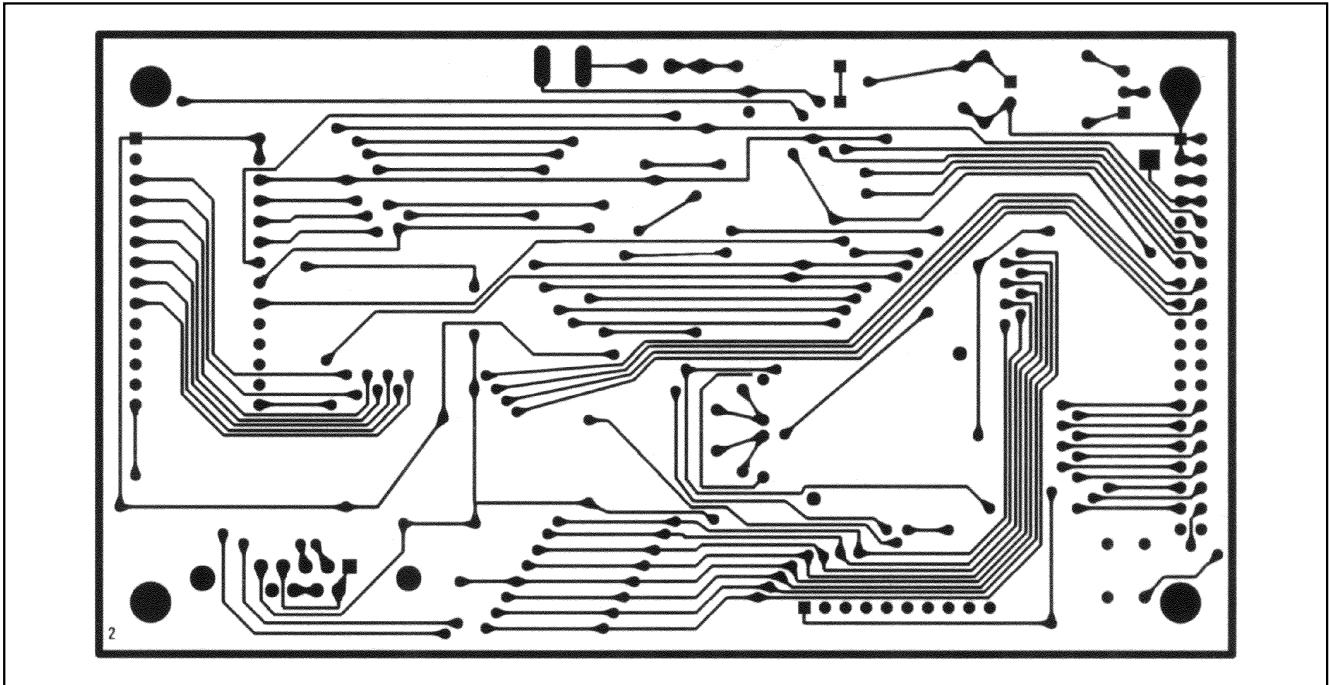Figure 4. 68L11D Module PC Board Layout—Solder Side

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