ISL28022 Digital Power Monitor 8 Site Evaluation Kit

Introduction

The Digital Power Monitor (DPM) 8 site evaluation board demonstrates the functionality and performance of the ISL28022. By design, the ISL28022 is considered a digital helper for a variety of applications ranging from energy optimization to diagnostics of complex systems. The design of the DPM evaluation board is generic such that the customer can embed the monitor into their specific application.

The DPM Evaluation kit is accompanied by a graphical user interface (GUI) that allows the user to configure the ISL28022 for monitoring bus voltage and current in a specific application. The GUI has a data save feature allowing the transfer of measurement data to another software application for analysis.

The ISL28022EV1Z evaluation board has 8 sites/channels with one microcontroller that is responsible for the data transaction and configuration for each DPM. The ISL28022 is a slave to the microcontroller via a single I²C/SMBus interface. The ISL28022 has two address pins that allow for 16 individual DPMs to be connected on a single I²C bus. The evaluation board utilizes 8 of the available 16 addresses of the ISL28022.

The DPM evaluation board GUI operates on any Windows based PC. The software communicates with the evaluation board through the universal serial bus (USB) port. The microcontroller translates the USB communication to an I²C command.

The evaluation kit is powered directly from the USB or from a single-supply voltage ranging from 3V to 5.5V.

Each site of the ISL28022 can be configured uniquely. All analog inputs accept input voltages 60V and lower. The shunt analog inputs, VINP and VINN, accept common mode input voltages of 60V and less. The maximum measurable differential magnitude, ±(VINP-VINN), for the shunt inputs is 300mV. The shunt inputs can withstand a maximum of 60V differentially allowing for the debug of catastrophic events.

Evaluation Package (Online Order)

The Digital Power Monitor 8 Site Evaluation Kit contains the following items:

- Evaluation Board (DUT Board)
- Evaluation Software (Online)
- User Guide
- ISL28022 Data sheet

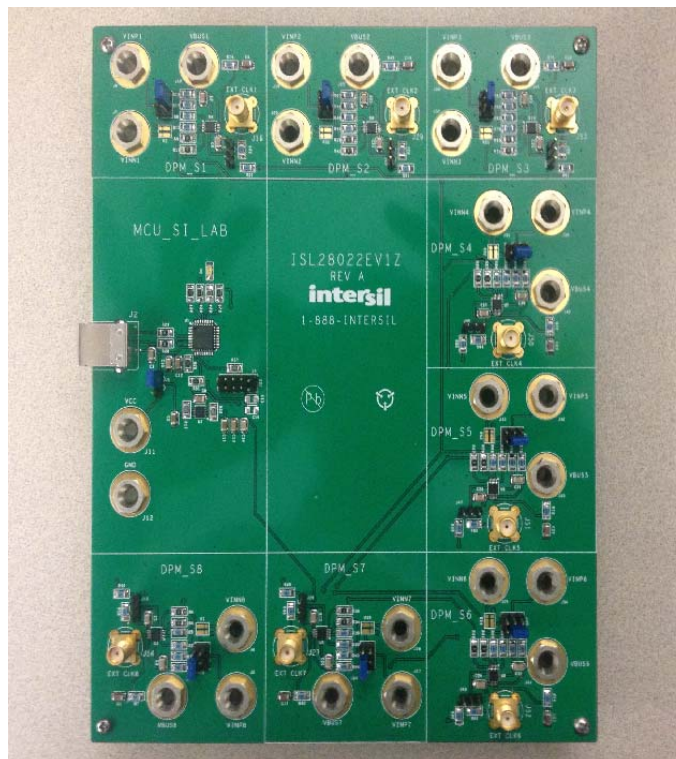Documentation for the individual device can be found in the following link:

http://www.intersil.com//products/ISL28022#documents

Evaluation Board

FIGURE 1. ISL28022 DIGITAL POWER MONITOR 8 SITE EVALUATION BOARD

System Requirements

• Windows 98/NT/2000/XP/VISTA/WIN7

• Available USB Port

Software Installation

Download the latest Evaluation Board GUI (Graphical User Interface) from the following link:

http://www.intersil.com//products/ISL28022#documents

Installing the Software

From the link supplied in the previous section, download and run the *executable file* to start installing the GUI. The user will be greeted by the screen shown in Figure 2. Continue through the installer and read the instructions. The PC and PCB should *not* be connected via the USB port until after the installation has completed.
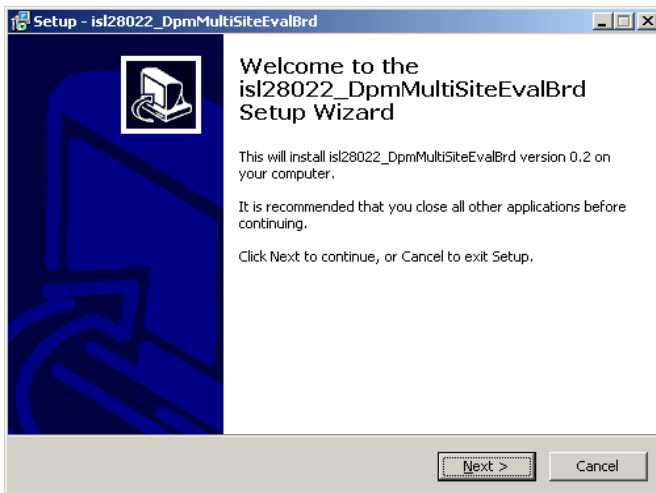

FIGURE 2. INSTALLATION WELCOME SCREEN

Hardware Setup

• Connect the USB 2.0 Cable to the PC first, and then to the Evaluation Board

• The computer may ask about installing software for new found hardware; select "Yes, this time only"

• On the following screen, it will ask about how to install hardware. Select the recommended option (Installing from CD) and follow the directions

• The USB is the only connector needed

Running the Program for DPM Multi-Site Software

• To run the program, go to the "Start" menu and choose the isl28022_DpmMultiSiteEvalBrd folder, and then choose the isl28022_DpmMultiSiteEvalBrd icon. Once clicked, the demo software window should appear as illustrated in Figure 3.

   - Enable communication between the evaluation board and the computer by pressing the "Connect to Device" button at the bottom center of the software window. If connection is successful, the text on the button will be red and read "Disconnect Device". Otherwise, the button text will not change.

   - The evaluation program controls and measures 8 individual ISL28022 devices on a single I²C/SMBus. The main software window displays all sites/channels in one window. The reading and setup displayed on Channel 1 of the software window represents the measurements from the DPM_S1 block of the evaluation board. The pairings between software output and evaluation board location continue in a logical manor such that Channel 2 mates to DPM_S2, Channel 3 mates to DPM_S3, etc.

• Data Collecting

   - To start collecting data, press the "Start Data Collecting" button located to the left of the "Connect to Device" button at the bottom of the screen. Once pressed, the color of the text and verbiage of the button will change to "Stop Data Collecting". The default state of the software reads each DPM for shunt and bus voltages. To change the read settings of the DPM, toggle the check box/label next to each numerical read out. The backlight of the display will toggle between yellow and gray. A backlight of yellow means a channel is enabled. A change in the functionality of the DPM will change the mode value for the respective channel. The mode of each DPM is displayed in the lower left hand corner of each channel's display. Figure 4 represents a zoomed in view of a single DPM interface.
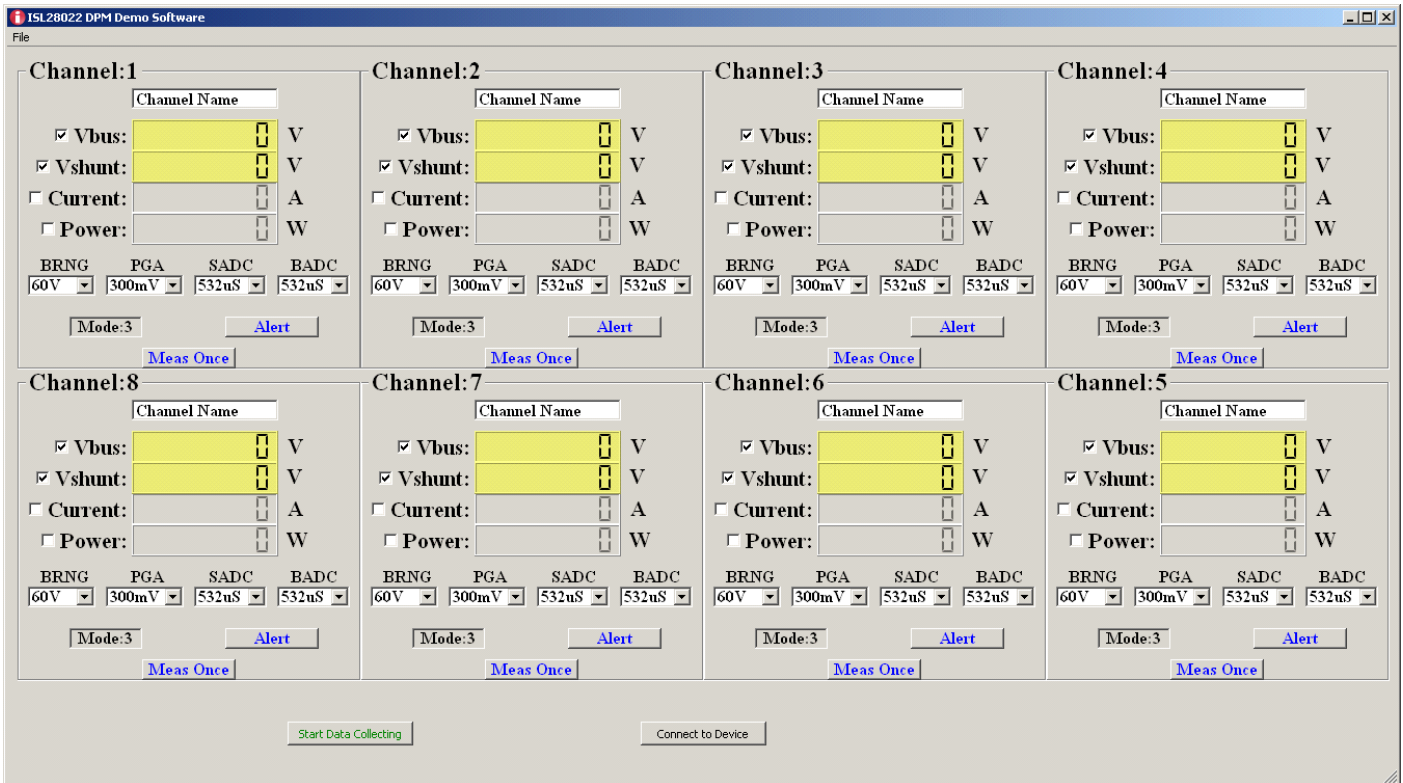
intersil

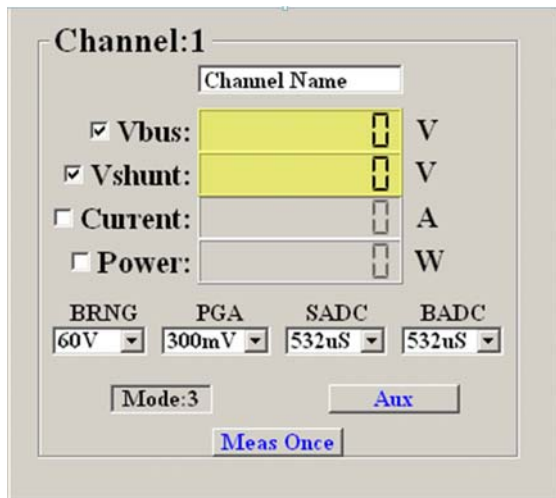FIGURE 3. ISL28022 DPM DEMO SOFTWARE WINDOW

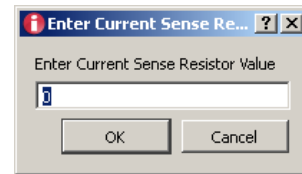FIGURE 4. SINGLE DPM INTERFACE

FIGURE 5. CURRENT SENSE DIALOG BOX

- **DPM Measurement Functionality**
  - Enabling the current functional block on the DPM interface requires the user to enter a shunt resistor value. The entered value is stored in the DPM calibration register and is used to calculate the current or power depending on the enabled check box. Figure 5 illustrates the dialog box that request the shunt resistor value when current functionality is enabled.

- **ADC Range and Timing Controls**
  - The BRNG (Bus Voltage Range) and PGA (Shunt Voltage Range) combo boxes control the full-scale measurement range setting of the DPM. The BRNG range spans from 60V to 16V. The PGA has full scale ranges from ±300mV to ±40mV.

  - The SADC (shunt acquisition time) and BADC (Bus acquisition time) change the speed at which the DPM measures either the bus or shunt channels. Faster acquisition times reduce the resolution of the measurement. ADC acquisition times equal to 532µs and greater have 15 bits of resolution while 84µs of acquisition time represents 12 bits of resolution.

- **Threshold and Auxiliary Controls**

  - Pressing the Alert button invokes an Auxiliary Control dialog box. The dialog box allows the user to configure the threshold detectors of the DPM chip as well as force a power-on reset. Figure 6 shows the Auxiliary Controls Dialog Box.
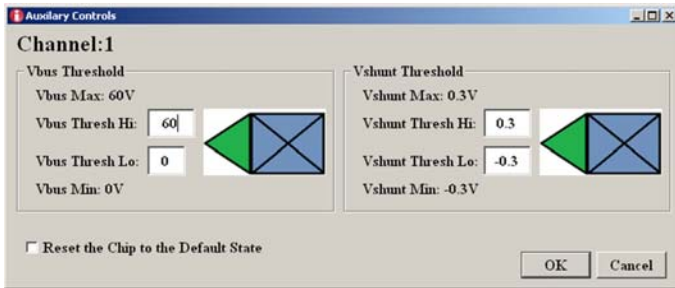

FIGURE 6. AUXILIARY CONTROL DIALOG BOX

  - The Vbus thresholds can be set between 0V and 60V. Vshunt thresholds range between ±300mV. The Vbus and Vshunt thresholds do not scale versus BRNG and PGA settings. Once an input is set and the measured signal violates a threshold level, the backlight of the measured signal will turn from yellow to orange for a measured value above the upper threshold. Measured signals below the lower threshold results in a backlight changing from yellow to blue.

  - The Reset the Chip to the Default State check box works independently to the threshold detectors. Checking the box will reset the chip to the default power-up state. The action performs an auto calibration on the V_{OS}.

- **Single Measurement Control**

  - Pressing the Meas Once button on the main panel measures the individual channel once that is associated with Meas Once button.

- **Saving Data**

  - The DPM software allows the user to store a set number of points of data. Go to the menu bar of the ISL28022 DPM Demo Software window and choose File –> Save Data. Choosing the Save Data option will open a dialog box asking for the filename and directory of the save path. Figure 7 is an illustration of the dialog box.
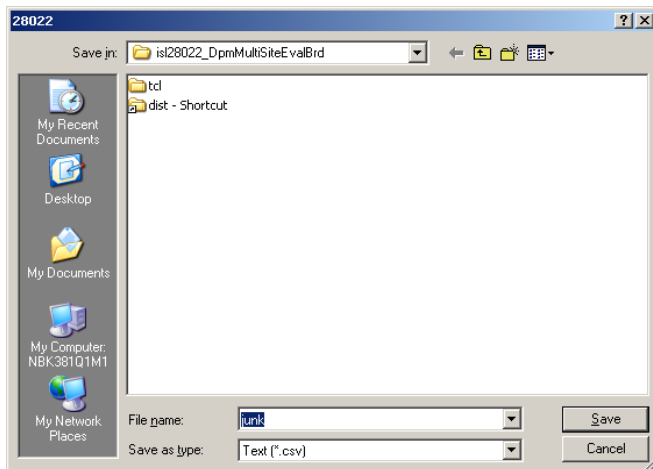

FIGURE 7. FILE NAME AND DIRECTORY SAVE DIALOG BOX

The file name entered in the dialog box is the base name for all files saved. A unique named file is generated for each measured parameter (Vbus, Vshunt, Current, Power) across 8 channels. The software only saves data to a file for each measured parameter selected. If a measured parameter is not selected across 8 channels, then a file with the non-selected measured parameter is not generated. For example, power and current files would not be generated for the configuration of the DPM window shown in Figure 3.

All saved files are tab delimited. The naming convention of the file is <base name>_<measured parameter>_dataset. The base name is the file name entered in the save dialog box. The measured parameter names are vbus, vshunt, current and power.

  - Upon completion of the save dialog box, an input box (Figure 8) asks for the number of points to be saved per channel.
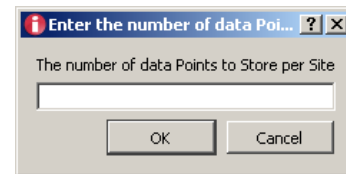

FIGURE 8. NUMBER OF POINTS PER CHANNEL INPUT BOX

Pressing the OK button with a valid numerical entry will begin data collection. The numerical values change on the main window while the data is being recorded. The completion of data collection will commence when all of the active measurement numbers cease to change.

  - The settings of all channels should be finalized prior to invoking the Save Data feature. The user has the option of uniquely naming each channel and having the channel name be passed to the column name of each respective data file. Changing the field named "Channel Name" in Figure 4 will change the name of the column data.

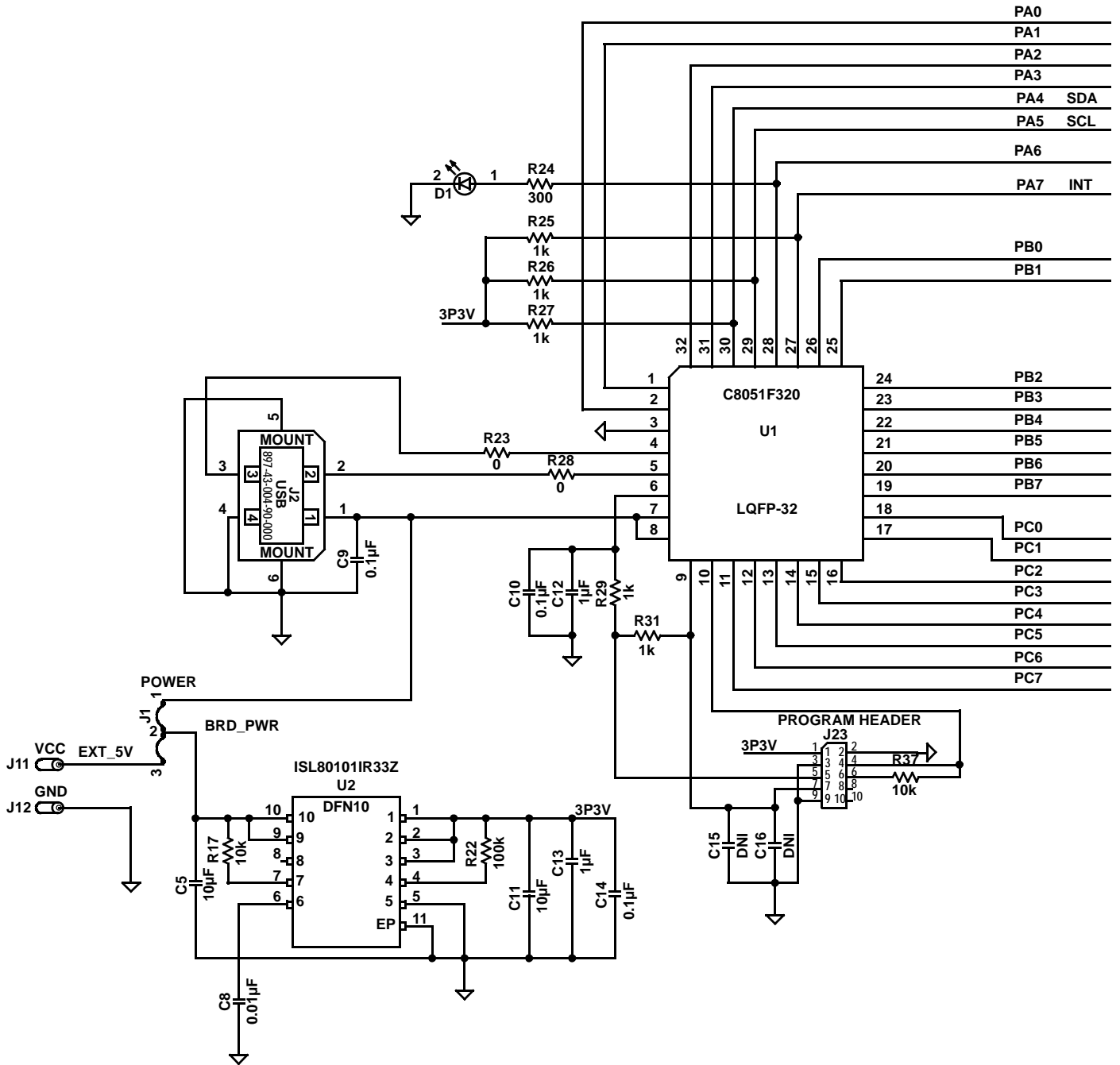# Schematics of the ISL28022 DPM 8 Site Evaluation Board

FIGURE 9. MICROCONTROLLER PORTION OF THE EVALUATION BOARD

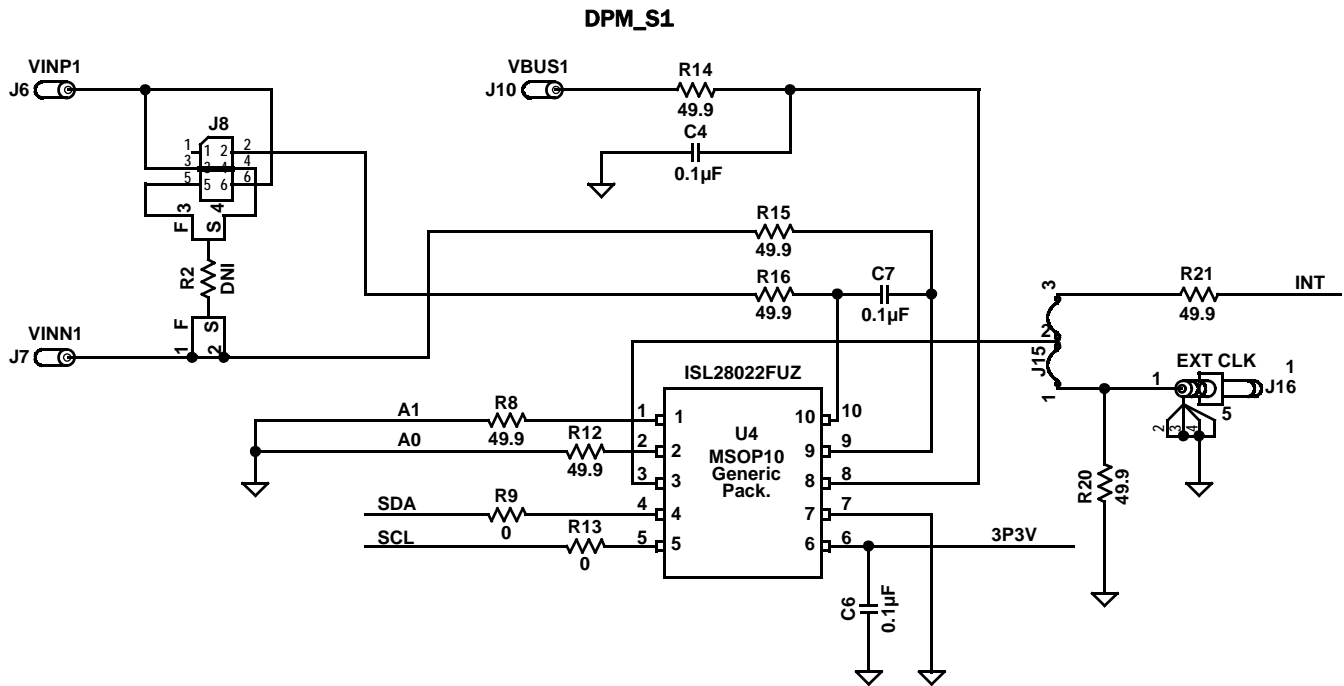# Schematics of the ISL28022 DPM 8 Site Evaluation Board (Continued)

FIGURE 10. ONE DPM SITE

TABLE 1. ISL28022EV1Z DPM 8 SITE EVALUATION BOARD BILL OF MATERIAL

ITEM#	QTY	PART NAME	PART VALUE	FOOTPRINT	REFERENCE DESIGNATOR	VENDOR NAME	VENDOR P/N	MFR. NAME	MFR. P/N
1	1	USB Micro Controller	C8051F320 - LQFP32	QUAD32	U1	Digi-Key	336-1259-ND	Silicon Labs	C8051F320LQFP32
2	1	Linear Regulator	ISL801y01 - 3.3V	DFN10	U2	Digi-Key	ISL80101IR33Z-T-ND	Intersil Corp	ISL80101IR33Z-T
3	1	LED	Red	1206	D1			Dialight	597-3111-402
2	8	Capacitor	0.1µF/100V	1206	C4, C18, C26, C23, C24, C25, C17, C1	Digi-Key	445-4467-1-ND	TDK Corp	C3216X7R2A105k
4	19	Capacitor	0.1µF	1206	C2, C6, C9, C10, C14, C19, C21, C27-C29, C33, C7, C22, C34, C30, C31, C32, C20, C3	Generic		Generic	
5	1	Capacitor	0.01µF	1206	C8	Generic		Generic	
6	2	Capacitor	1µF	1206	C12, C13	Generic		Generic	
7	2	Capacitor	10µF	1206	C11, C5	Generic		Generic	
8	18	Resistor	0Ω	1206	R4, R6, R9, R13, R23, R28, R34, R36, R39, R42, R57, R59, R61, R63, R65, R67, R69, R71	Generic		Generic	
9	5	Resistor	1kΩ	1206	R25-R27, R29, R31	Generic		Generic	
10	2	Resistor	10kΩ	1206	R17, R37	Generic		Generic	
11	2	Resistor	100kΩ	1206	R22	Generic		Generic	

TABLE 1. ISL28022EV1Z DPM 8 SITE EVALUATION BOARD BILL OF MATERIAL (Continued)

ITEM#	QTY	PART NAME	PART VALUE	FOOTPRINT	REFERENCE DESIGNATOR	VENDOR NAME	VENDOR P/N	MFR. NAME	MFR. P/N
12	2	Resistor	300Ω	1206	R24	Generic		Generic	
13	56	Resistor	49.9Ω	1206	R3, R5, R8, R10-R12, R15, R16, R18-R21, R33, R35, R38, R41, R43, R44, R46-R51, R56, R58, R60, R62, R64, R66, R68, R70, R76-R91, R7, R14, R40, R45, R72-R75	Generic		Generic	
14	8	SMA	SMA RF Connector	SMA-142	J14, J16, J27, J29, J50-J53	Digi-Key	142-0701-211		
15	1	USB Connector	USB Connector	USB A	J2	Digi-Key	WM3983TR-ND	MOLEX	0480372200
16	1	Banana Jack	Banana Jack	BAN-JACK	J3, J4, J6, J7, J9-J12, J17-J20, J24, J25, J30-J37, J42-J45	Digi-Key	108-0740-001		
17	9	3 pin Jumper	3 pin 0.1 spacing jumper	THOLE	J3, J4, J6, J7, J9-J12, J17-J20, J24, J25, J30-J37, J42-J45	Generic		Generic	
18	8	6 pin Jumper	3X2 pin 0.1 spacing jumper	CONN6	J5, J8, J21, J22, J38-J41	Generic		Generic	
19	1	10 pin Jumper	5X2 pin 0.1 spacing jumper	CON10	J23	Generic		Generic	
20	8	ISL28022FUZ	ISL28022	MSOP10	U3-U10				

For information regarding Intersil Corporation and its products, see www.intersil.com