Click here to ask an associate for production status of specific part numbers.

Evaluates: MAX20335

MAX20335 Evaluation System

General Description

The MAX20335 evaluation system (EV system) is a fully assembled and tested circuit board that demonstrates the MAX20335 low-power wearable power management integrated circuit (PMIC). The MAX20335 features two bucks, three linear regulators, and a battery charger.

The EV system comes with the MAX20335 board, the MAXPICO2PMB# board, and two USB micro-B cables. The EV system comes with the MAX20335BEWX+ installed. The MAX20335 is configurable through an I^2C interface that allows for programming various functions and reading the device status. The EV system GUI application sends commands to the MAXPICO2PMB# adapter board to configure the device.

Features

- USB Power Option
- Flexible Configuration
- On-Board LED Indicator and Battery Simulation
- Sense Test Point for Output-Voltage Measurement
- Windows® 8/10-Compatible GUI Software
- Fully Assembled and Tested

EV System Contents

- MAX20335 EV system
- MAXPICO2PMB# board
- Two USB A-to-USB micro-B cables

EV System Contents

PART	TYPE
MAX20335EVKitSetupVxxx.exe	PC GUI Program

***Ordering Information* appears at end of data sheet.**

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Quick Start

Required Equipment

Note: In the following sections, software-related items are identified by bold text. Text in **bold** refers to items directly from the EV system software installation.

- MAX20335 EV system
- Windows PC with USB ports
- One USB A-to-USB micro-B cable and MAXPICO2PMB# adapter board
- One USB A-to-USB micro-B cable or power supply (for battery simulation or battery voltage)
- Optional one USB A-to-USB micro-B cable or power supply (for charger input CHGIN)
- Voltmeter

Procedure

The EV system is fully assembled and tested. Follow the steps below to verify board operation:

1) Visit **https://www.maximintegrated.com** to download the latest version of the EV system software, MAX20335EVKitSetupVxxx.zip located on the MAX20335 EV system web page. Download the EV system software to a temporary folder and unzip the zip file.
2) Install the EV system software on the computer by running the MAX20335EVKitSetupVxxx.exe program inside the temporary folder.
3) Verify that all jumpers are in their default positions, as shown in Table 1.
4) Connect the type-A end of a cable to the PC and micro-USB end of a cable to MAXPICO2PMB# board, and connect the MAXPICO2PMB# to J13 located on lower left of the EV system board.
5) Connect a USB A-to-micro-B cable from the computer to J21 on upper-right corner of the EV system board to use VBUS to power the battery simulation circuits on the board, or to power the battery simulation circuits from the VHC test point. (The user can also use a Li-ion battery or power source to evaluate the device if not using the battery simulation circuits. Connect the battery or power source to J2 on the EV system board. Skip step 6 if not using the battery simulation.)

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6) Use a voltmeter to check that VHC is about 5V and BATSIM test point is about 3.7V. To adjust the BATSIM voltage, turn the R58 BATSIM potentiometer.
7) On the computer, open the MAX20335 GUI. It should look like Figure 1; the status bar on the bottom displays **MAX20335 Not Found**.
8) Place a shunt on J15, then confirm that TP BAT is set to BATSIM voltage. The GUI status bar on the bottom displays **Connected**.
9) Check the SYS, B1OUT, and B2OUT test points have no voltage.
10) A CHGIN insertion turns on the device. Connect a USB A-to-micro-B cable from the computer to J1 on lower-right corner of the EV system board to use VBUS to power CHGIN and shunt J3 jumper, the device then enters **ON** mode. When the device is ON, SYS is about 4.4V if CHGIN voltage is still present, SYS is about 3.7V (BAT voltage) if CHGIN voltage is removed, B1OUT is about 1.8V, and B2OUT is about 1.2V.
11) The EV system is now ready for additional evaluation.
12) To evaluate the battery charger, the user can shunt J3 and plug in a USB micro-B cable to J1 of the EV system to use USB VBUS power, or externally supply the charging power on TP CHGIN.

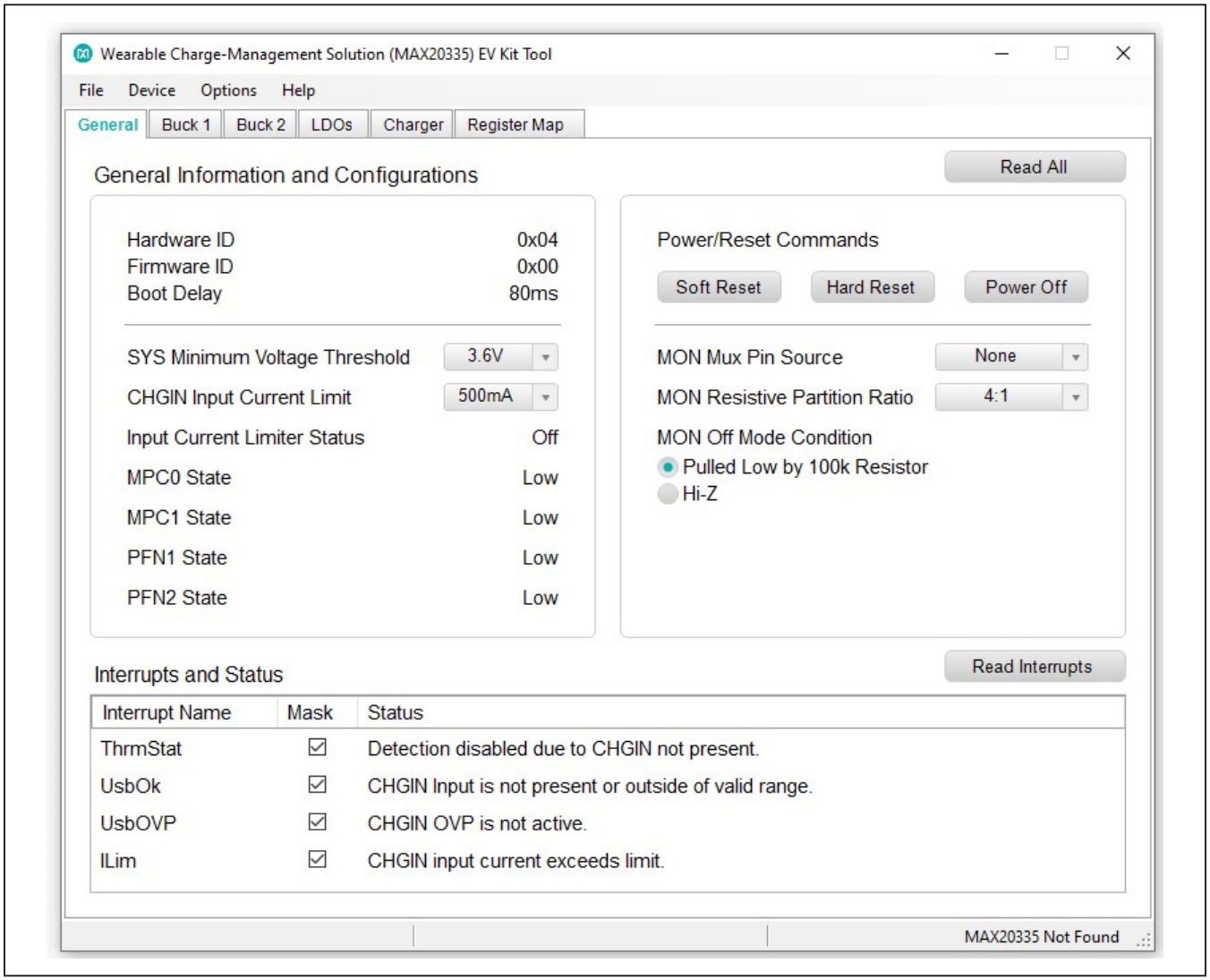


Figure 1. MAX20335 Not Found Status

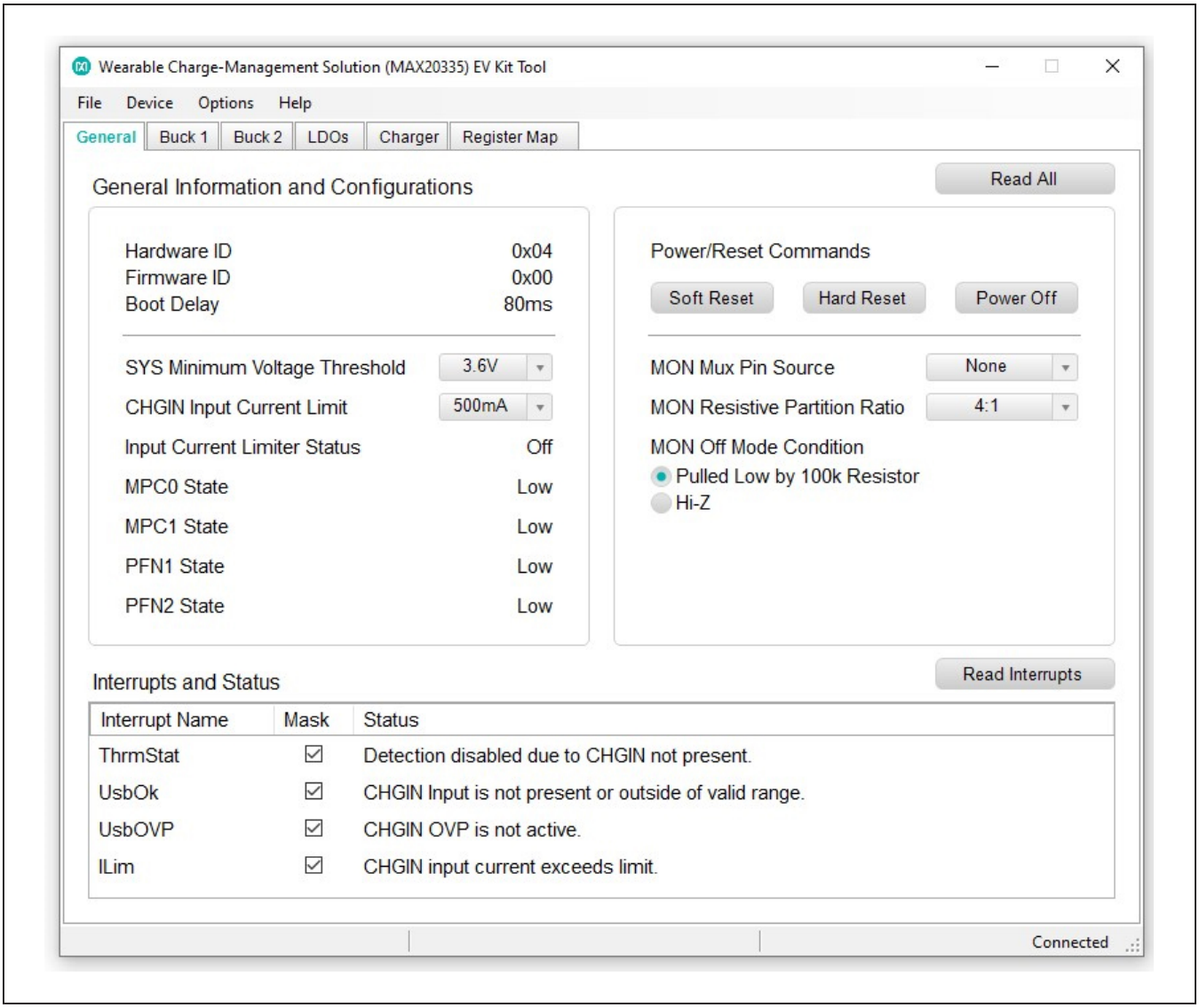


Figure 2. Connected Status

Detailed Description of Software

Software Startup

Upon starting the program, the EV system software automatically searches for the USB interface circuit and then for the IC device addresses. The EV system enters normal operating mode when the connection is established and addresses are found. If the USB connection is not detected, the status bar displays **Not Connected**. If the USB connection is detected, but the MAX20335 is not found, the status bar shows **MAX20335 Not Found**.

ToolStrip Menu Bar

The **ToolStrip** menu bar (Figure 3) is located at the top of the GUI window. This bar comprises **File**, **Device**, **Options**, and **Help** menus whose functions are detailed in the following sections.

File Menu

The **File** menu contains the option to exit out of the GUI program.

Device Menu

The **Device** menu provides the ability to connect or disconnect the EV system to the GUI. The **Advanced → I²C Read/Write** menu allows to read from or write to a selected register with a specified slave address.

Options Menu

In the **Options** menu, the **Disable Polling** option lets the user read the registers manually instead of getting automatically frequent register updates from the IC. The **Use USB2PMB2#** option should be checked if using with the USB2PMB2# adapter board.

Help Menu

The **Help** menu contains the **About** option, which displays the GUI splash screen indicative of the GUI version being used.

Tab Controls

The MAX20335 EV system software GUI provides a convenient way to test the features of the MAX20335. Each tab contains controls relevant to various blocks of the device. Changing these interactive controls triggers a write operation to the MAX20335 to update the register contents. The **Read All** button reads all the configuration registers that are visible on the current tab page. All statuses are polled continuously. The polling feature can be disabled in the **Options** section of the menu bar by selecting **Disable Polling**.

General Tab

The **General** tab (Figure 4) provides information on device info, set power reset command, SYS minimum voltage threshold, CHGIN input current limit, input current limiter status, MON setting, PFNs, and MPCs status.

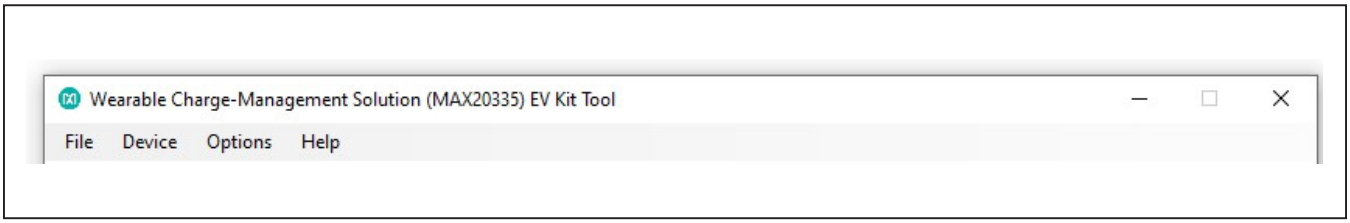


Figure 3. The ToolStrip Menu Items

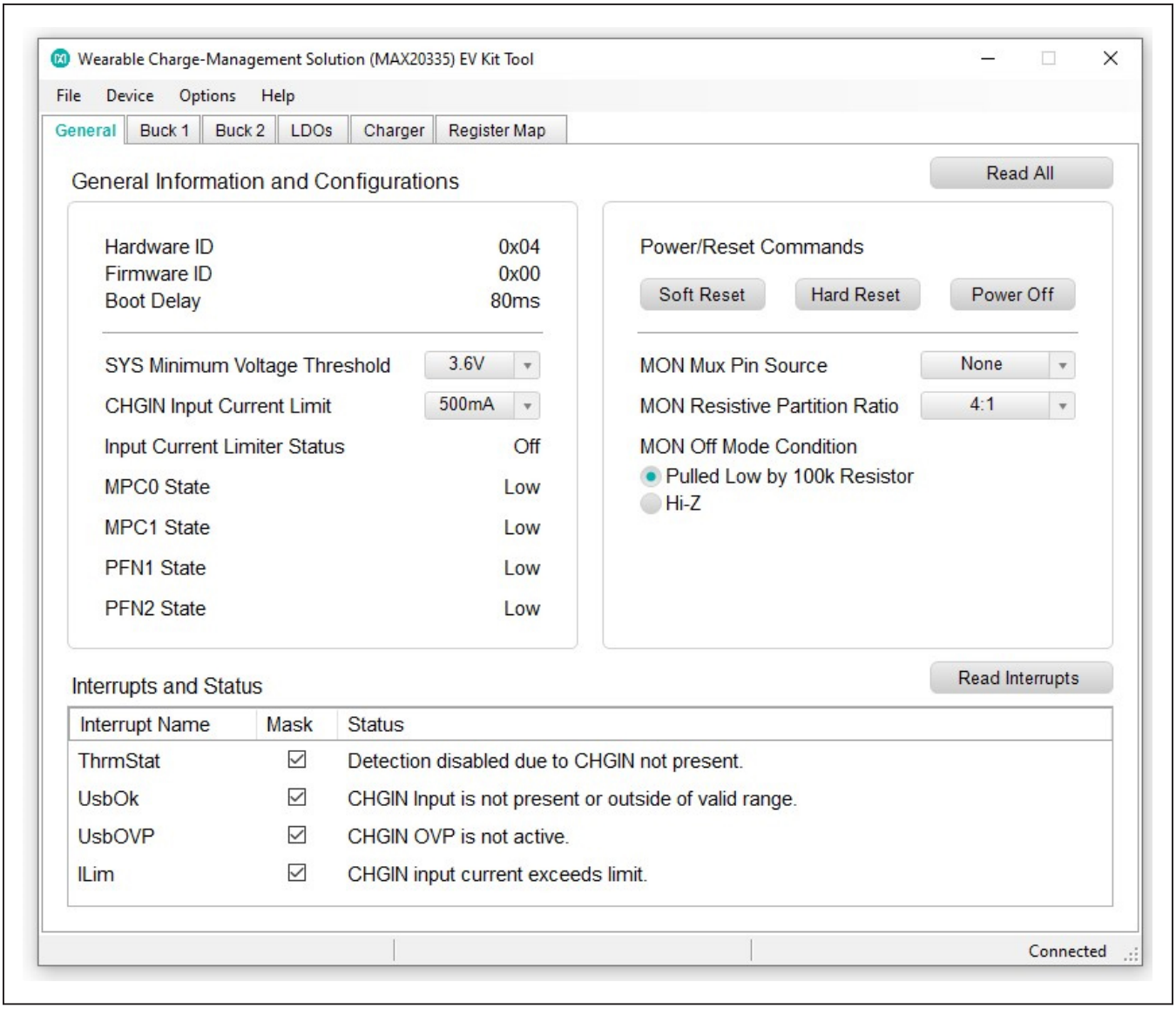


Figure 4. General Tab

Buck1/2 Tab

In the **Buck1** and **Buck2** tabs (Figure 5 and Figure 6), the user can enable bucks, set buck voltages, inductor current settings, and some additional settings.

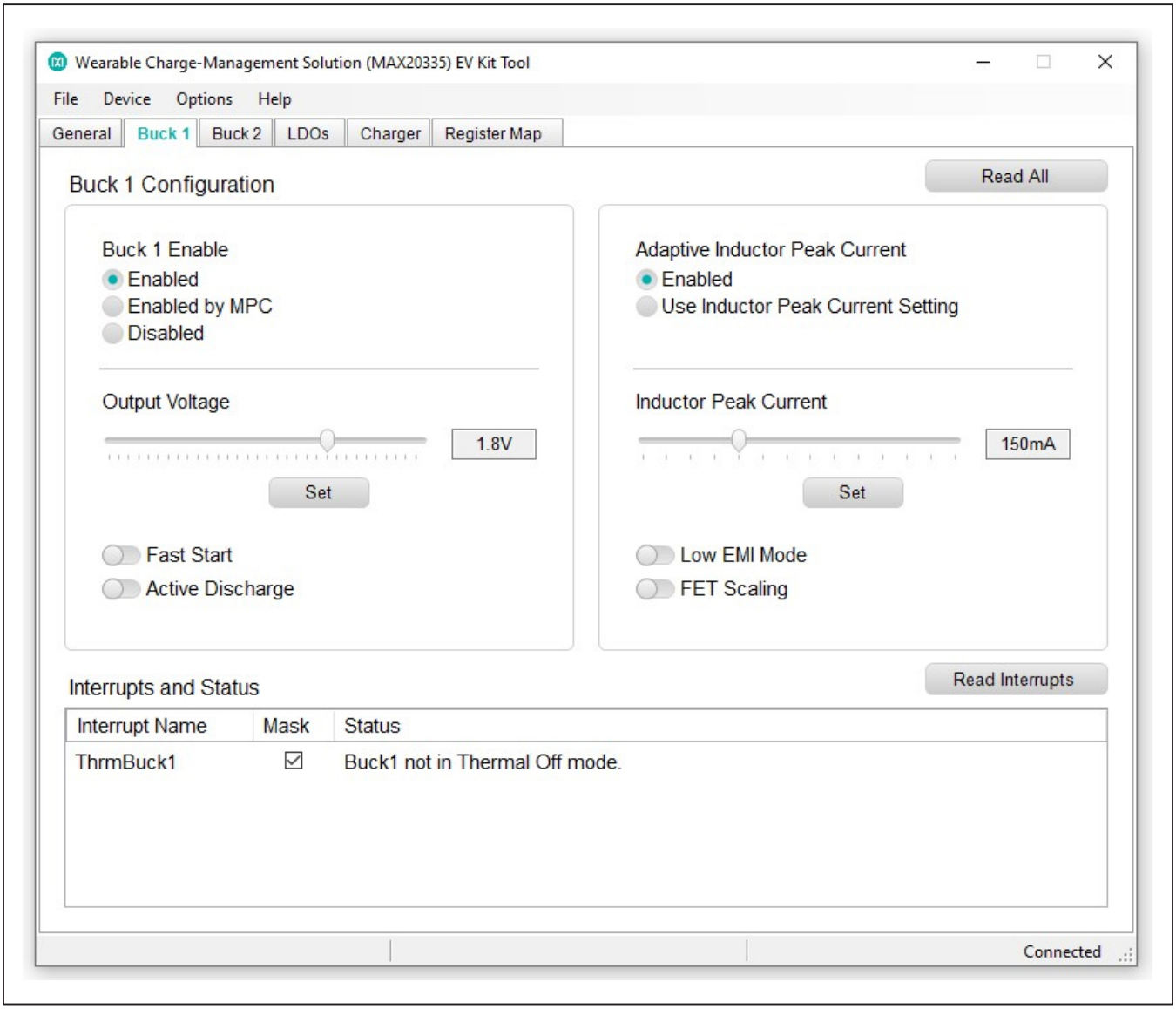


Figure 5. Buck1 Tab

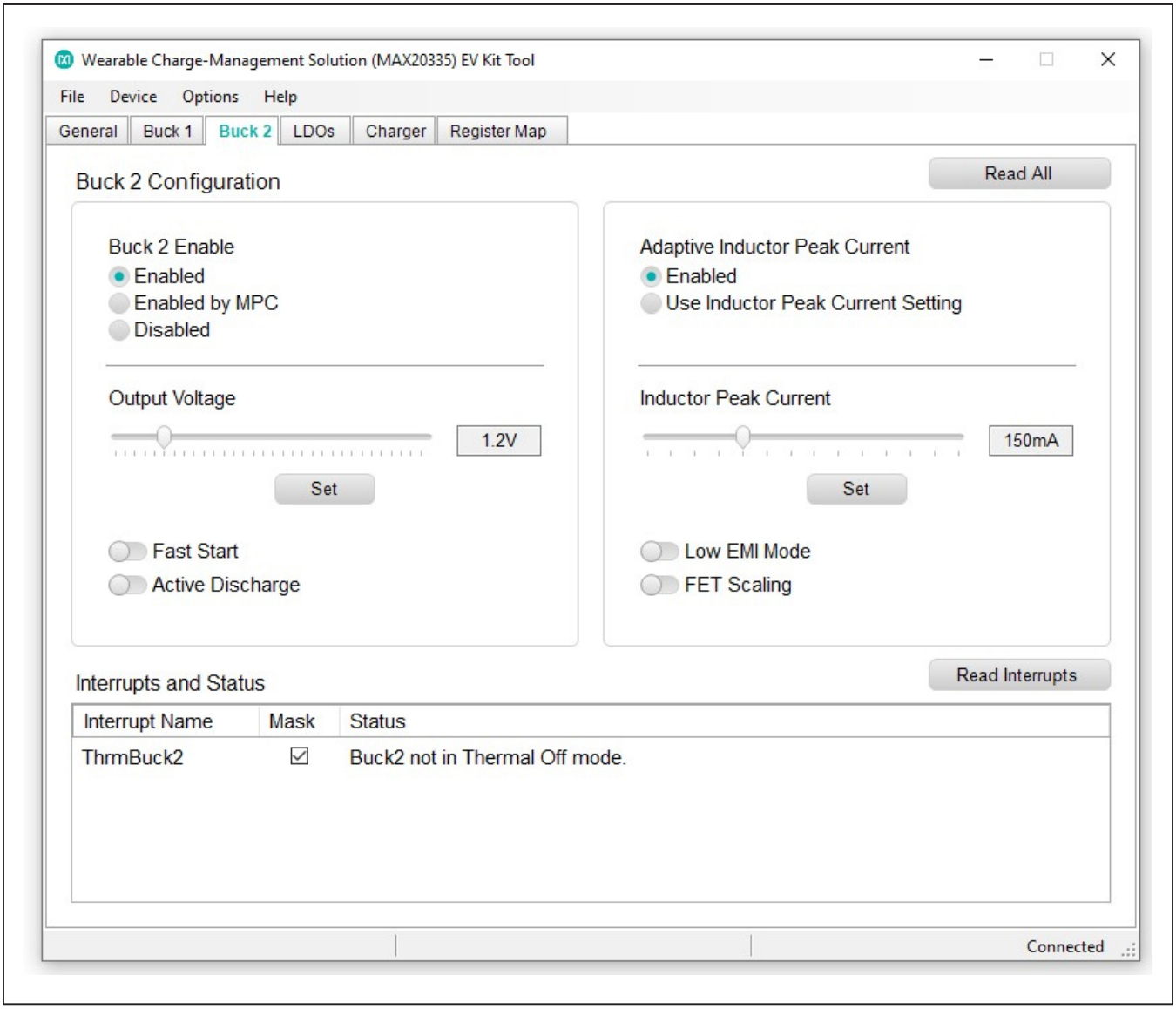


Figure 6. Buck2 Tab

LDOs Tab

The **LDOs** tab (Figure 7) lets the user enable LDOs, set LDO voltages, change to load switch mode.

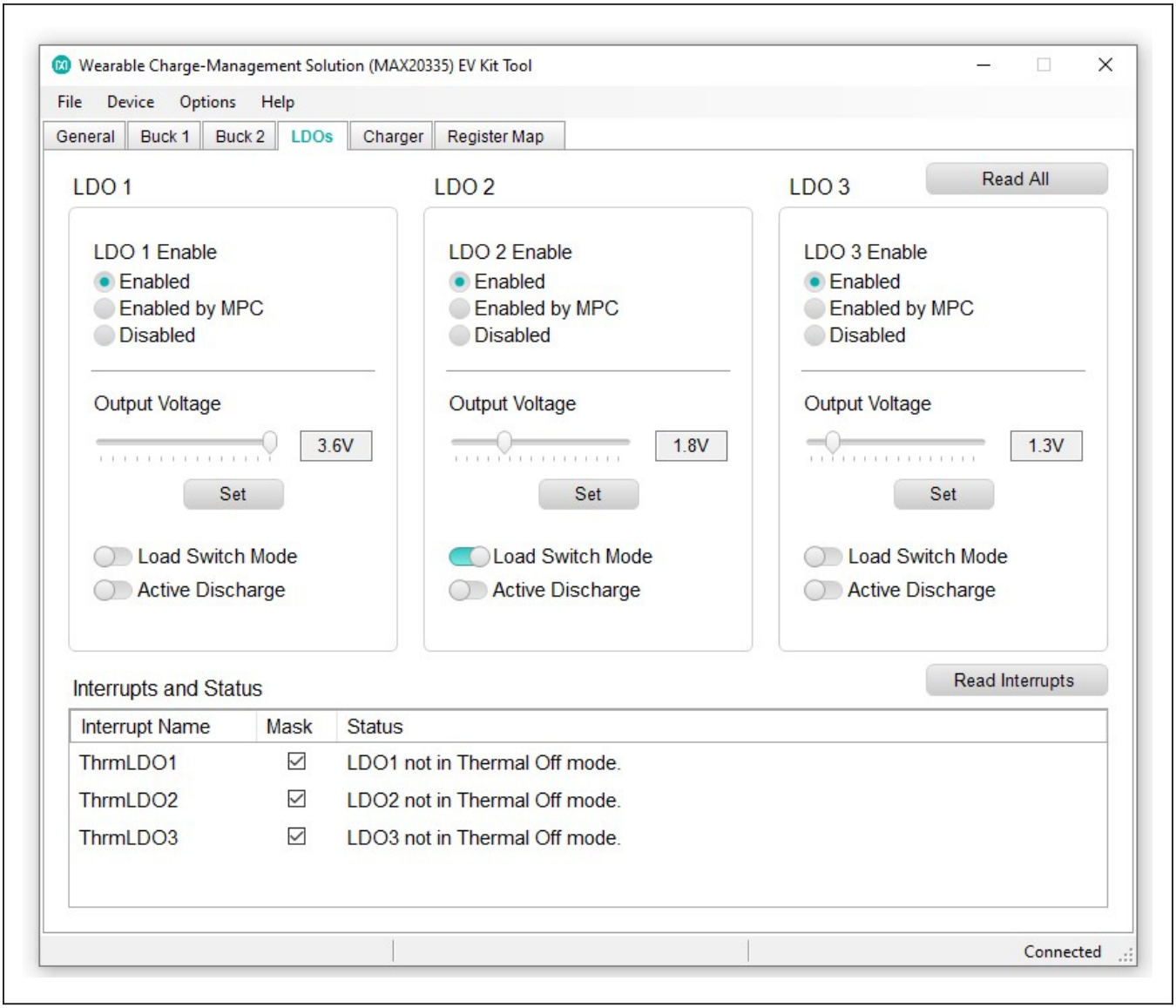


Figure 7. LDOs Tab

Charger Tab

The **Charger** tab (Figure 8) lets the user set charger and thermistor monitor configurations. The charger and thermistor status section constantly polls the charger and thermistor status and displays any changes. The polling happens even when the **Charger** tab is not selected. The polling can be disabled by selecting **Disable Polling** in the **Options** menu at the top of the application.

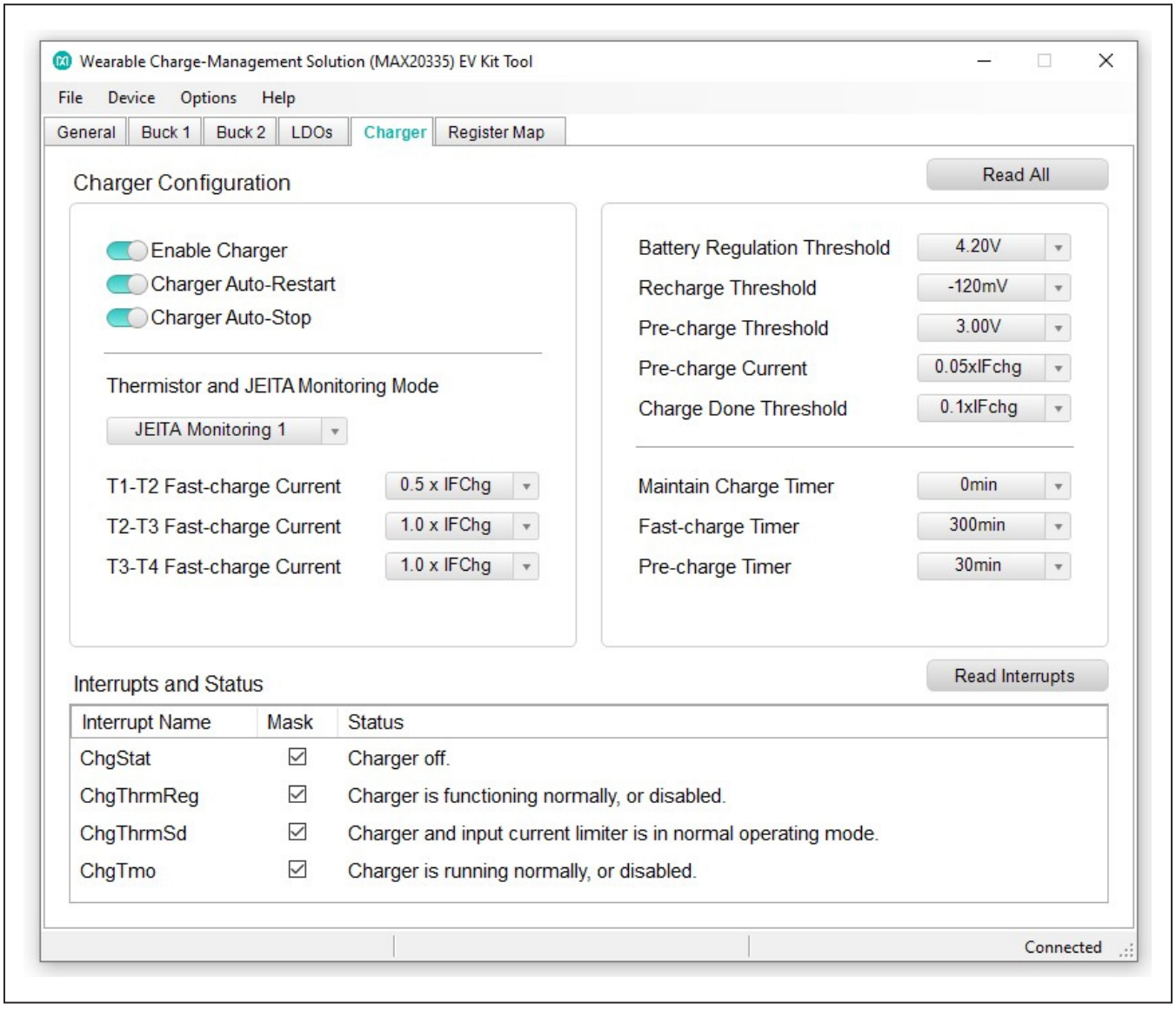


Figure 8. Charger Tab

Register Map Tab

The **Register Map** tab allows for the configuration of all I2C registers, including those not configurable in other tabs. The register to be read from or written to can be selected in the left table. The right table contains descriptions for each register field of the selected 8-bit register. All bits, along with their field names, are displayed at the bottom of the page.

To set a bit, click the bit label. **Bold** text represents logic 1 and regular text represents logic 0. To configure the changes to the device, click the **Write** button at the bottom right.

The user can click **Read All** to perform a burst read of all registers.

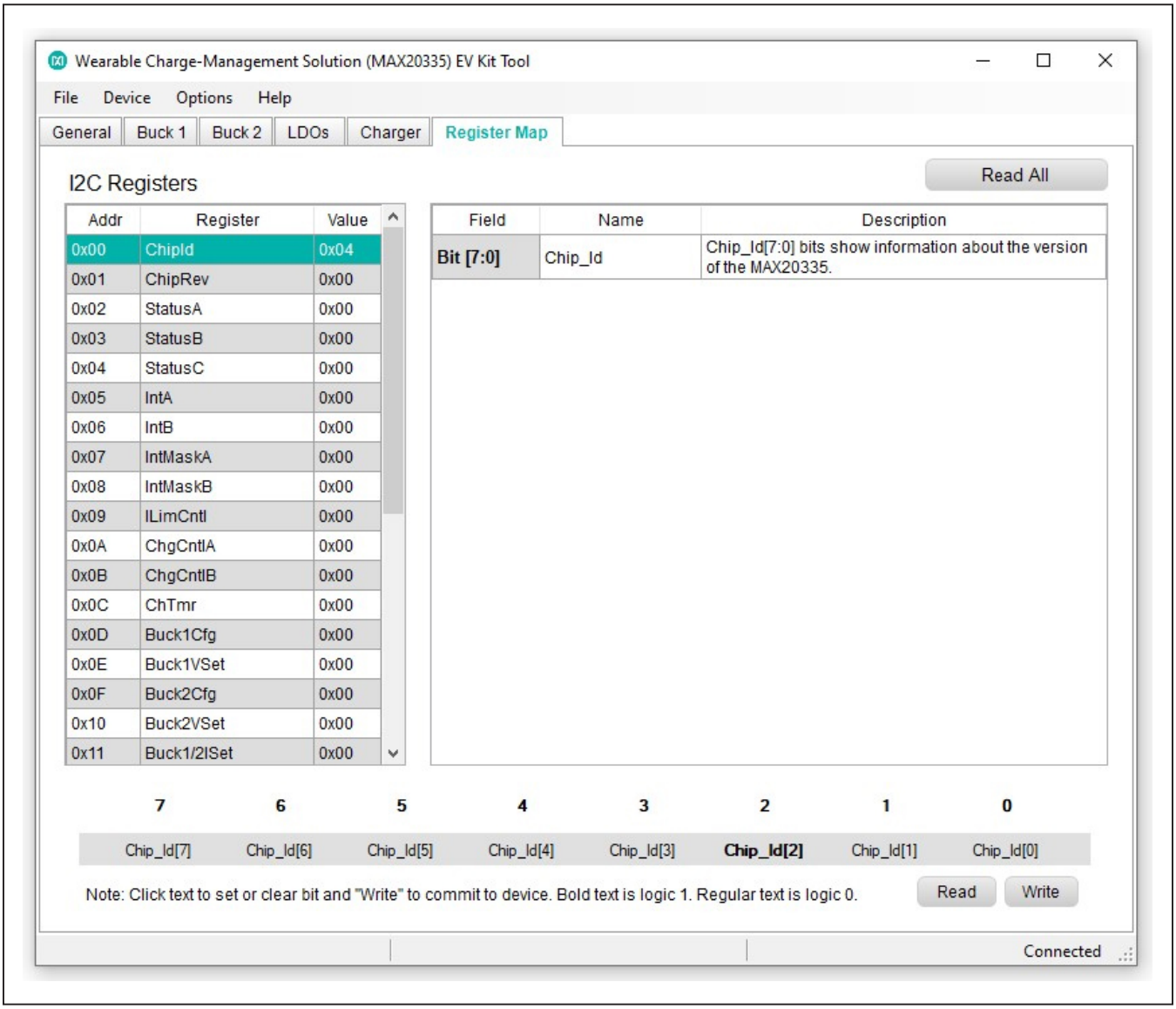


Figure 9. Register Map Tab

Detailed Description of Hardware

The MAX20335 EV system evaluates the MAX20335 low-power wearable PMIC, which communicates over the I2C interface. The EV system demonstrates the IC features such as bucks, linear regulators, LED indicator, and battery charger. The EV system uses the IC in a 36-bump wafer-level package on a proven, four-layer PCB design.

The EV system can use USB VBUS +5V DC for battery and charger input-power source. Alternatively, the EV system can be powered from an external power supply. Figure 10 and Figure 11 show the EV system and block annotated pictures.

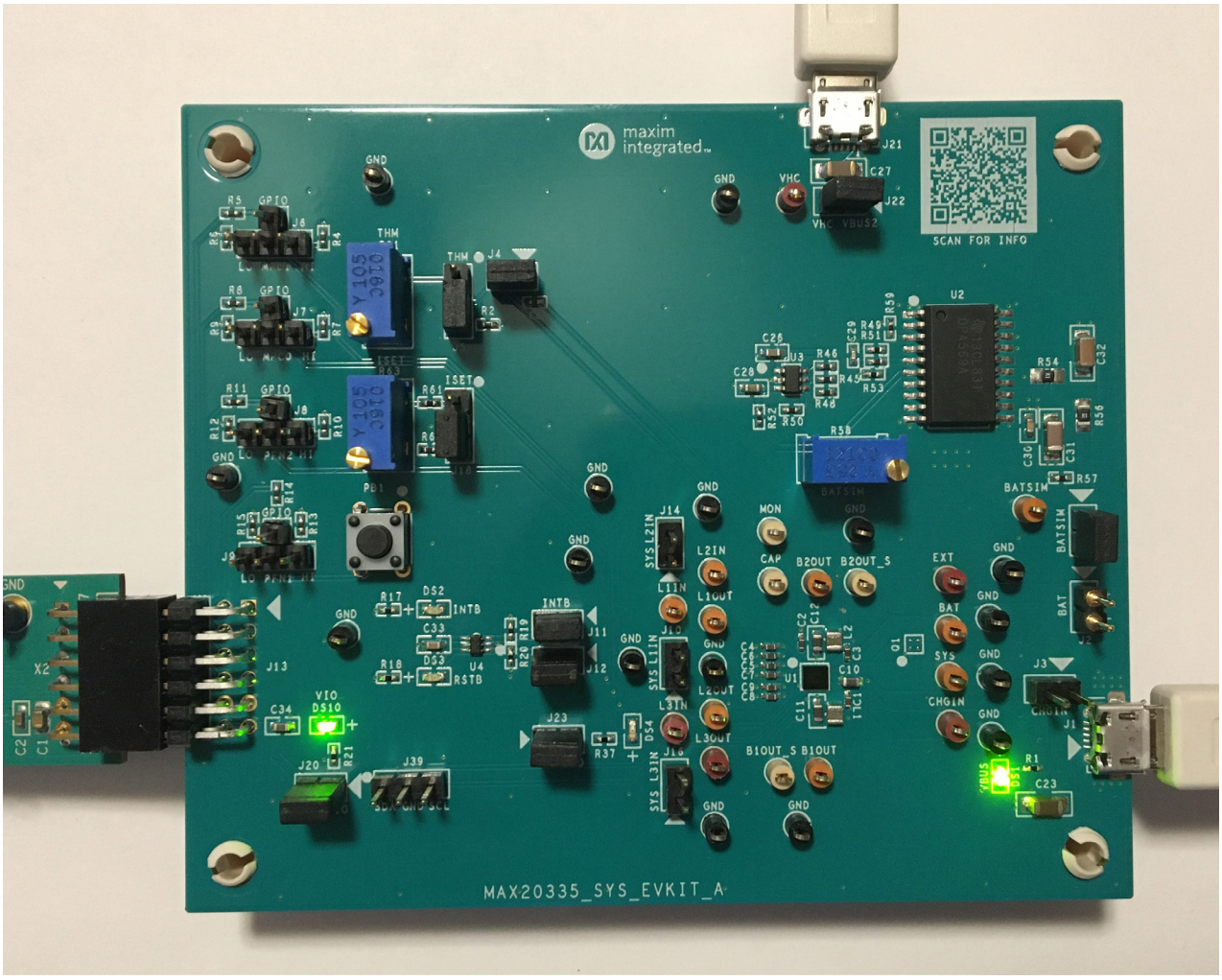


Figure 10. MAX20335 EV System Board Picture

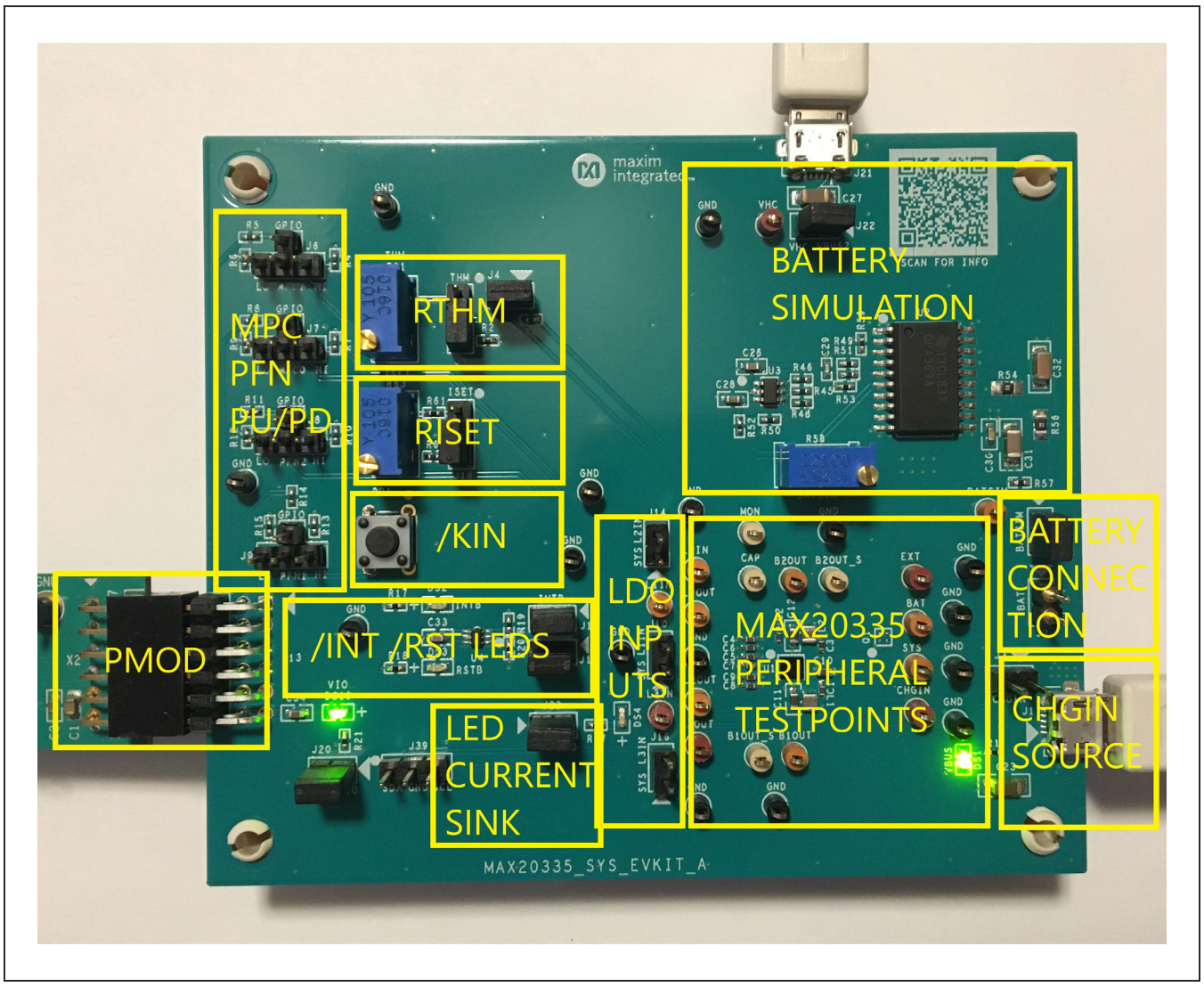


Figure 11. MAX20335 EV System Block Annotated Picture

Hardware Setup

To use the EV system with GUI, connect the MAXPICO2PMB# to the PMOD connector in the bottom left corner of the board. The MAXPICO2PMB# also provides 3.3V to the logic voltage VIO of the EV system when shunting J20. The user can use J21 USB VBUS to power the battery simulation circuits on the EV system to supply BAT of the IC. Turning the R58 potentiometer can change the BATSIM voltage. Connect BATSIM to BAT of the IC with a shunt on J15. Alternatively, instead of using battery simulation circuits on board, the user can connect their Li-ion battery on the J2 connector. The user can use J1 USB VBUS as CHGIN source and place a shunt on J3.

PFNs and MPCs States

The PFNs and MPCs can be pulled up to VIO or connected to ground through a 100kΩ resistor.

Regulators and Peripherals

All regulator outputs are made available on test points. The inputs to the LDO1, LDO2, and LDO3 must be supplied externally, or use J10, J14, J16 to power LDO1, 2, 3 from SYS voltage. The buck1 and buck2 outputs have sense test points which provide easy voltage measuring.

Thermistor and SET Adjustment

When the J4 shunt is installed, THM is pulled up to TPU through a 10kΩ resistor. Header J5 is used to select the pulldown resistor for THM. When pin 1 and 2 is shunted, potentiometer R31 is used to simulate a thermistor at THM. When pin 2 and 3 is shunted, a fixed 15kΩ resistor is connected between THM and ground.

Header J18 is used to select the resistor for R_{ISET} which sets the fast charge current I_{FCHG}. Shunting pin 1 and 2 selects potentiometer R63 and the user can change R_{ISET} to change I_{FCHG}. Shunting pin 2 and 3 selects a fixed 39kΩ resistor, which sets the fast charge current to 51mA.

$\overline{INT}$ and $\overline{RST}$ LED Indicators

Shunts can be installed on J11 and J12 to show the status of $\overline{INT}$ and $\overline{RST}$ as LED indicators, DS2 and DS3. When the corresponding LED luminates, it means the active-low output is pulled low.

LED Charger State Indicator

The LED current sink (DS4) is an indicator of the charger state. The LED is on, off, or blink, depends on the charger state. Refer to the *Charger State Diagram* in the MAX20335 IC data sheet.

Jumper Setting

Table 1 shows the detailed jumper setting, and Table 2 shows the connector description.

Table 1. Jumper Setting

JUMPER	SHUNT POSITION	DESCRIPTION
J3	1-2	CHGIN connect to USB VBUS from J1
J4	1-2*	THM connect to CAP for thermistor monitoring
J5	1-2	THM connect to potentiometer
	2-3*	THM connect to 15kΩ (60%/room zone)
J6	1-2	MPC1 pulldown to ground
	1-3	MPC1 connect to GPIO4
	1-4	MPC1 pullup to VIO
J7	1-2	MPC0 pulldown to ground
	1-3	MPC0 connect to GPIO3
	1-4	MPC0 pullup to VIO
J8	1-2	PFN2 pulldown to ground
	1-3	PFN2 connect to GPIO2
	1-4	PFN2 pullup to VIO

Table 1. Jumper Setting (continued)

JUMPER	SHUNT POSITION	DESCRIPTION
J9	1-2	PFN1 pulldown to ground
	1-3	PFN1 connect to GPIO1
	1-4	PFN1 pullup to VIO
J10	1-2	L1IN connects to SYS
J11	1-2*	$\overline{INT}$ connect to pullup VIO and DS2.
J12	1-2*	$\overline{RST}$ connect to pullup VIO and DS3.
J14	1-2	L2IN connect to SYS
J15	1-2	BATSIM connect to BAT
J16	1-2	L3IN connect to SYS
J18	1-2	ISET connect to potentiometer
	2-3*	ISET connect to 39kΩ (fast charge current 0.05A)
J20	1-2*	VIO connect to 3.3V from PMOD
J22	1-2*	VHC connect to USB VBUS from J21
J23	1-2*	LED supply from VIO
J39	1-2	SDA connect to ground
	2-3	SCL connect to ground

**Default position.*

Table 2. Connectors Description

CONNECTOR	DESCRIPTION
J1	Connect to the USB cable for CHGIN voltage
J2	Connect to Battery
J13	Connect to the MAXPICO2PMB#
J21	Connect to the USB cable for battery simulation

Ordering Information

PART	TYPE
MAX20335EVSYS#	EV Kit

#Denotes RoHS compliance.

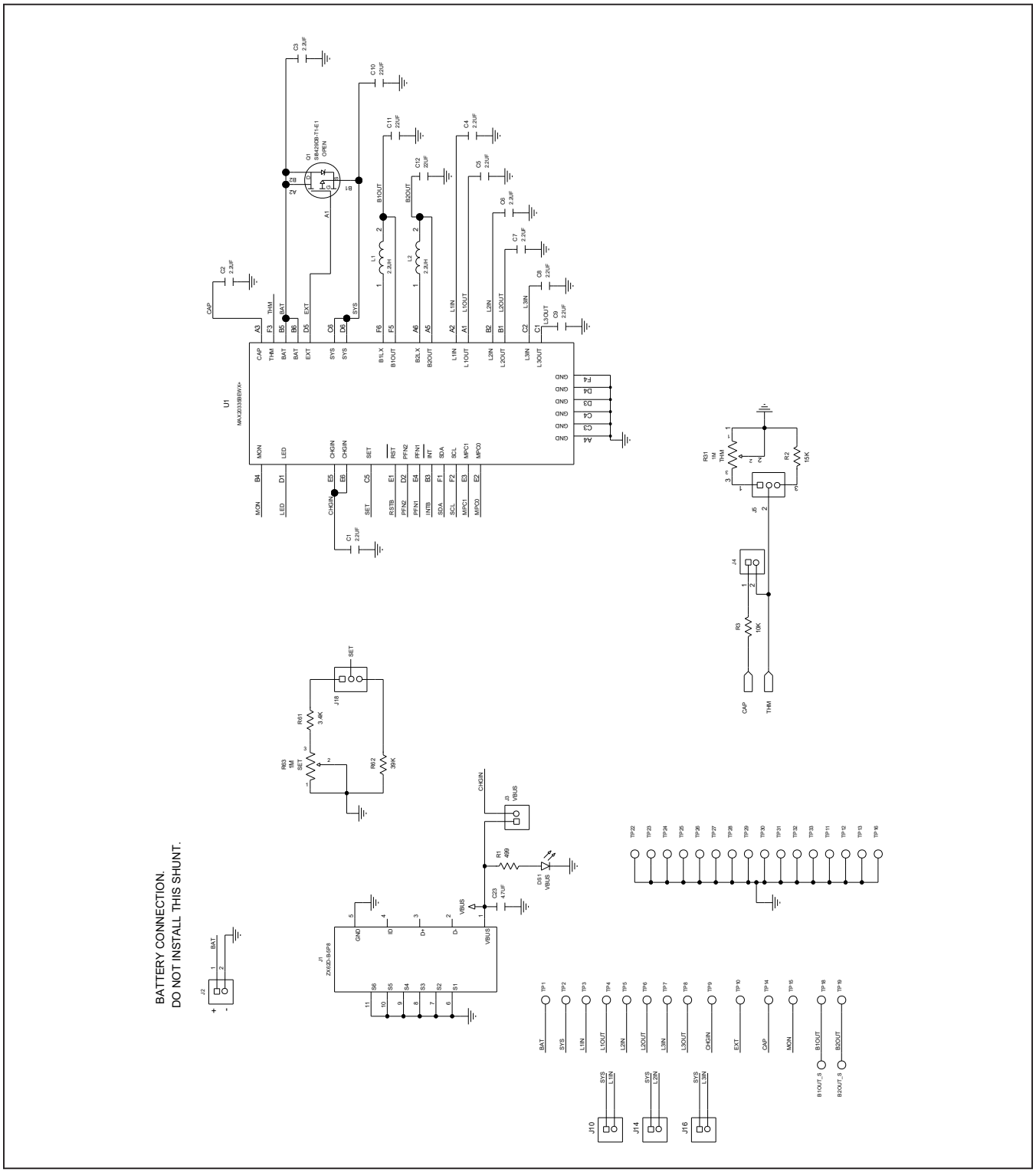
MAX20335 EV System Bill of Materials

ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION	COMMENTS
1	B1OUT_S, B2OUT_S, TP14, TP15	-	4	5002	KEYSTONE	N/A	TEST POINT; PIN DIA=0.1IN; TOTAL LENGTH=0.3IN; BOARD HOLE=0.04IN; WHITE; PHOSPHOR BRONZE WIRE SILVER;	
2	BATSIM, TP1-TP6, TP18, TP19	-	9	5003	KEYSTONE	N/A	TEST POINT; PIN DIA=0.1IN; TOTAL LENGTH=0.3IN; BOARD HOLE=0.04IN; ORANGE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;	
3	C1-C9	-	9	C1005X5R1V225K050BC	TDK	2.2UF	CAP; SMT (0402); 2.2UF; 10%; 35V; X5R; CERAMIC	
4	C10-C12	-	3	GRM188R60J226ME15	MURATA	22UF	CAP; SMT (0603); 22UF; 20%; 6.3V; X5R; CERAMIC;	
5	C23, C27	-	2	GRM31CR71H475KA12; GRJ31CR71H475KE11; GXM31CR71H475KA10; UMK316AB7475KL; GRM31CR71H475KA12L	MURATA;MURATA; MURATA; TAIYO YUDEN;MURATA	4.7UF	CAP; SMT (1206); 4.7UF; 10%; 50V; X7R; CERAMIC	
6	C26	-	1	C0603C225K9PAC; GRM188R60J225KE01; C1608X5R0J225K080AB	KEMET; MURATA;TDK	2.2UF	CAP; SMT (0603); 2.2UF; 10%; 6.3V; X5R; CERAMIC;	
7	C28	-	1	C0603C475K9PAC	KEMET	4.7UF	CAP; SMT (0603); 4.7UF; 10%; 6.3V; X5R; CERAMIC;	
8	C29	-	1	C0402X7R500-222KNE; GRM155R71H222KA01; C1005X7R1H222K050BA	VENKEL LTD.; MURATA;TDK	2200PF	CAP; SMT (0402); 2200PF; 10%; 50V; X7R; CERAMIC	
9	C30	-	1	C0603C104K8RAC	KEMET	0.1UF	CAP; SMT (0603); 0.1UF; 10%; 10V; X7R; CERAMIC	
10	C31	-	1	C3216X5R1C476M160AB; GRM31CR61C476ME44	TDK;MURATA	47UF	CAP; SMT (1206); 47UF; 20%; 16V; X5R; CERAMIC	
11	C32	-	1	C3216X5R1H106K160AB; GRM31CR61H106KA12	TDK;MURATA	10UF	CAP; SMT (1206); 10UF; 10%; 50V; X5R; CERAMIC	
12	C33	-	1	C1608X5R1H104K080AA	TDK	0.1UF	CAP; SMT (0603); 0.1UF; 10%; 50V; X5R; CERAMIC	
13	C34	-	1	GRM188R60J105KA01	MURATA	1UF	CAP; SMT (0603); 1UF; 10%; 6.3V; X5R; CERAMIC;	
14	DS1-DS4, DS10	-	5	LG L29K-G2J1-24	OSRAM	LG L29K-G2J1-24	DIODE; LED; SMT (0603); Vf=1.7V; If(test)=0.002A; -40 DEGC TO +100 DEGC	
15	J1, J21	-	2	ZX62D-B-5P8	HIROSE ELECTRIC CO LTD.	ZX62D-B-5P8	CONNECTOR; MALE; SMT; MICRO UNIVERSAL SERIES BUS B-TYPE CONNECTOR; RIGHT ANGLE; 5PINS	
16	J2	-	1	800-10-002-10-001000	MILLMAX	800-10-002-10-001000	CONNECTOR; MALE; TH; SINGLE ROW; STRAIGHT; 2PINS	
17	J3, J4, J10-J12, J14-J16, J20, J22, J23	-	11	PBC02SAAN	SULLINS ELECTRONICS CORP.	PBC02SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 2PINS	
18	J5, J18, J39	-	3	PBC03SAAN	SULLINS	PBC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 3PINS; -65 DEGC TO +125 DEGC	
19	J6-J9	-	4	TSW-104-07-L-S	SAMTEC	TSW-104-07-L-S	EVKIT PART-CONNECTOR; MALE; THROUGH HOLE; TSW SERIES; SINGLE ROW; STRAIGHT; 4PINS	
20	J13	-	1	PBC06DBAN	SULLINS ELECTRONICS CORP.	PBC06DBAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; RIGHT ANGLE; 12PINS; 12PINS - ALTERNATE PIN NUMBERING	
21	L1, L2	-	2	DFE201610E-2R2M	TOKO	2.2UH	INDUCTOR; SMT (2016); METAL ALLOY CHIP; 2.2UH; TOL=+/-20%; 2.6A	
22	MH1-MH4	-	4	9032	KEYSTONE	9032	MACHINE FABRICATED; ROUND-THRU HOLE SPACER; NO THREAD; M3.5; 5/8IN; NYLON	
23	PB1	-	1	1825910-6	TE CONNECTIVITY	1825910-6	SWITCH; SPST; THROUGH HOLE; 24V; 0.05A; TACTILE SWITCH; RCOIL=0 OHM; RINSULATION=100M OHM; TE CONNECTIVITY	
24	R1, R17, R18, R21, R37	-	5	CRCW0402499RFK	VISHAY DALE	499	RES; SMT (0402); 499; 1%; +/-100PPM/DEGC; 0.0630W	
25	R2	-	1	CRCW040215K0FK	VISHAY DALE	15K	RES; SMT (0402); 15K; 1%; +/-100PPM/DEGC; 0.0630W	
26	R3, R19, R20, R49, R53	-	5	RC0402FR-0710KL	YAGEO PHICOMP	10K	RES; SMT (0402); 10K; 1%; +/-100PPM/DEGC; 0.0630W	
27	R4, R6, R7, R9, R10, R12, R13, R15, R45, R46, R48, R50, R57	-	13	ERJ-2GEJ104	PANASONIC	100K	RES; SMT (0402); 100K; 5%; +/-200PPM/DEGC; 0.1000W	
28	R5, R8, R11, R14	-	4	ERJ-2RKF1001	PANASONIC	1K	RES; SMT (0402); 1K; 1%; +/-100PPM/DEGC; 0.1000W	
29	R31, R63	-	2	PV36Y105C01B00	MURATA	1M	RESISTOR; THROUGH-HOLE-RADIAL LEAD; PV36 SERIES; 1M OHM; 10%; 100PPM; 0.5W; TRIMMER POTENTIOMETER; 25 TURNS; MOLDER CERAMIC OVER METAL FILM	
30	R51	-	1	ERJ-2GE0R00	PANASONIC	0	RES; SMT (0402); 0; JUMPER; JUMPER; 0.1000W	

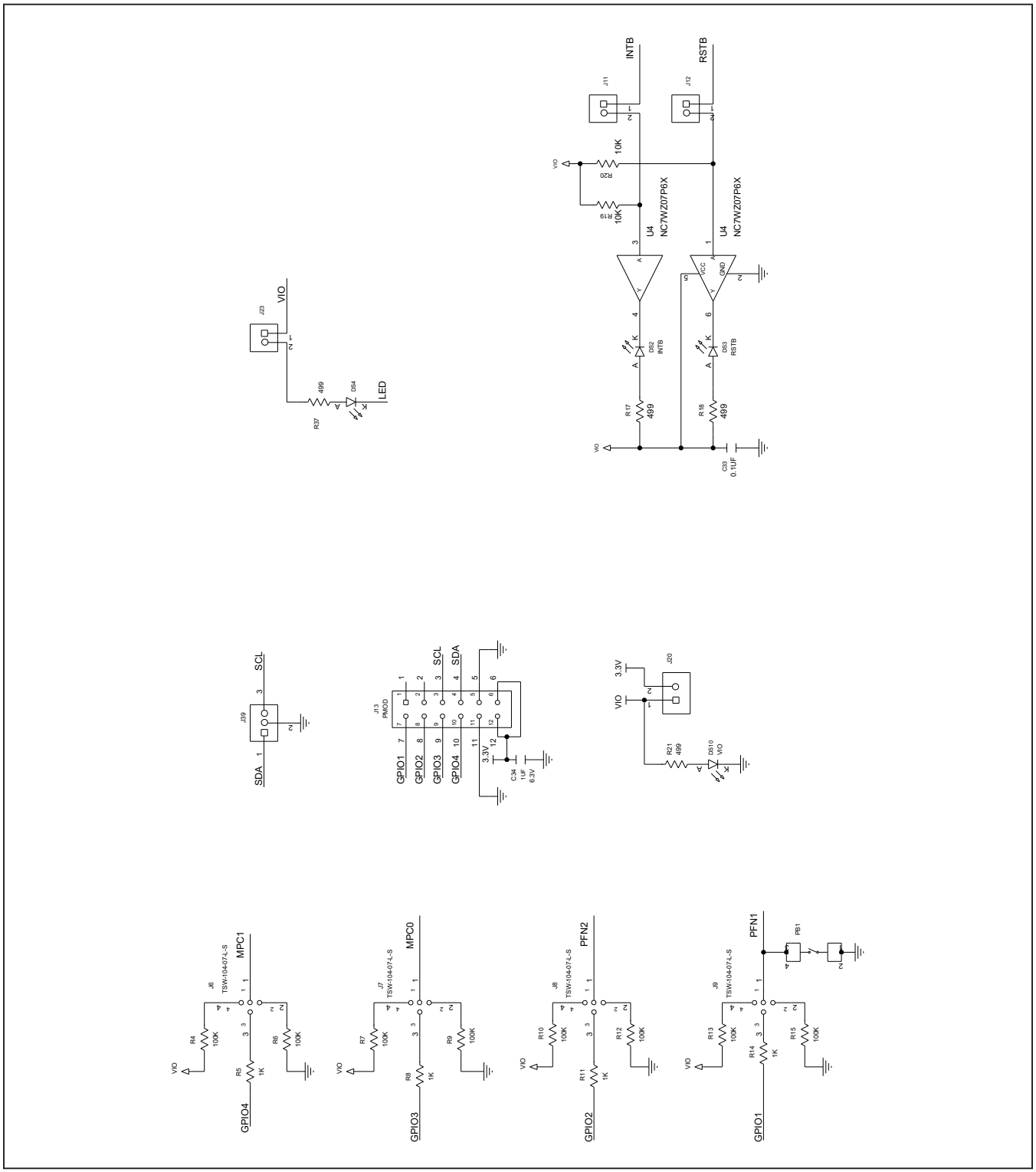
MAX20335 EV System Bill of Materials (continued)

ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION	COMMENTS
31	R52	-	1	ERJ-2RKF5100	PANASONIC	510	RES; SMT (0402); 510; 1%; +/-100PPM/DEGC; 0.1000W	
32	R54, R56	-	2	WSL0805R1000FEA18	VISHAY DALE	0.1	RES; SMT (0805); 0.1; 1%; +/-75PPM/DEGC; 0.1250W	
33	R58	-	1	3296Y-1-253LF	BOURNS	25K	RESISTOR; THROUGH-HOLE-RADIAL LEAD; 3296 SERIES; 25K OHM; 10%; 100PPM; 0.5W; SQUARE TRIMMING POTENTIOMETER; 25 TURNS; MOLDER CERAMIC OVER METAL FILM	
34	R59	-	1	ERJ-2RKF1152	PANASONIC	11.5K	RES; SMT (0402); 11.5K; 1%; +/-100PPM/DEGC; 0.1000W	
35	R61	-	1	CRCW04023K40FK	VISHAY DALE	3.4K	RES; SMT (0402); 3.4K; 1%; +/-100PPM/DEGC; 0.0630W	
36	R62	-	1	ERJ-2RKF3902X; CRCW040239K0FK	PANASONIC; VISHAY DALE	39K	RES; SMT (0402); 39K; 1%; +/-100PPM/DEGC; 0.0630W	
37	TP7-TP10, VHC	-	5	5000	KEYSTONE	N/A	TEST POINT; PIN DIA=0.1IN; TOTAL LENGTH=0.3IN; BOARD HOLE=0.04IN; RED; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;	
38	TP11-TP13, TP16, TP22-TP33	-	16	5001	KEYSTONE	N/A	TEST POINT; PIN DIA=0.1IN; TOTAL LENGTH=0.3IN; BOARD HOLE=0.04IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;	
39	U1	-	1	MAX20335BEWX+	MAXIM	MAX20335BEWX+	IC; PWRM; PMIC WITH ULTRA-LOW IQ VOLTAGE REGULATORS AND BATTERY CHARGERS FOR SMALL LITHIUM ION SYSTEMS; WLP36	
40	U2	-	1	OPA569AIDWPR	TEXAS INSTRUMENTS	OPA569AIDWPR	IC; AMP; RAIL-TO-RAIL I/O; POWER AMPLIFIER; WSOIC20-EP 300MIL	
41	U3	-	1	MAX8880EUT+	MAXIM	MAX8880EUT+	IC; VREG; ULTRA-LOW-IQ LOW-DROPOUT LINEAR REGULATOR WITH POK; SOT23-6	
42	U4	-	1	NC7WZ07P6X	FAIRCHILD SEMICONDUCTOR	NC7WZ07P6X	IC; BUF; TINY LOGIC ULTRA-HIGH SPEED DUAL BUFFER; SC70-6	
43	PCB	-	1	MAX20335SYS	MAXIM	PCB	PCB:MAX20335SYS	-
44	MAXPICO	DNI	1	MAXPICO2PMB#	MAXIM	MAXPICO2PMB#	ACCESSORY; BRD; PACKOUT; MAXPICO2PMB ADAPTER BOARD	
45	USBCABLE1, USBCABLE2	DNI	2	3025010-03	QUALTEK ELECTRONICS CORP	3025010-03	CONNECTOR; MALE; USB-A_MINI-B; USB 4P(A)/M - USB MINI 5P(B)/M; STRAIGHT; 36IN	
46	Q1	DNP	0	SI8429DB-T1-E1	VISHAY	SI8429DB-T1-E1	TRAN; P-CHANNEL 8V (D-S) MOSFET; PCH; SMT; PD-(6.25W); I-(-11.7A); V-(-8V)	OPEN
TOTAL			136					

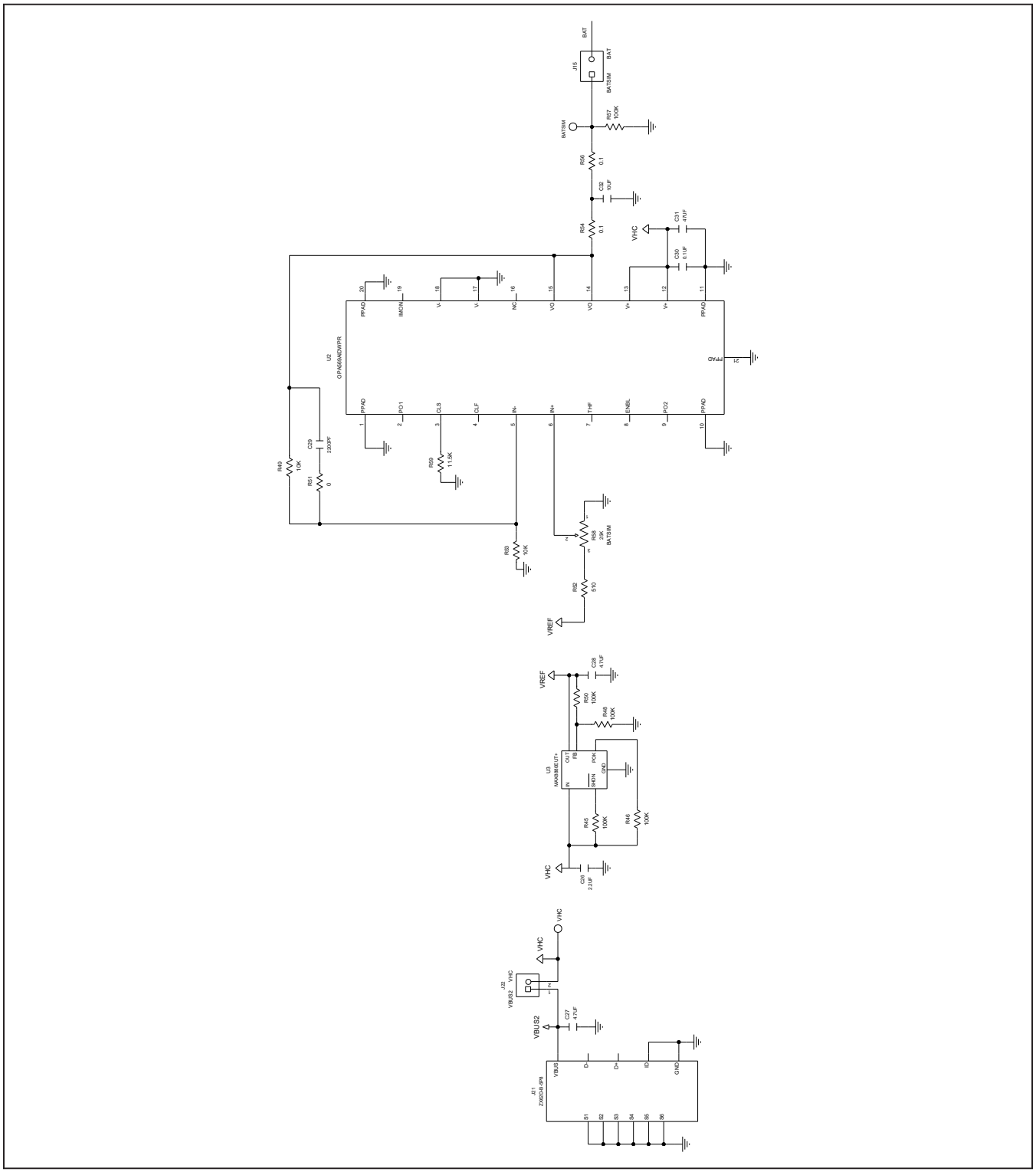
MAX20335 EV System Schematics



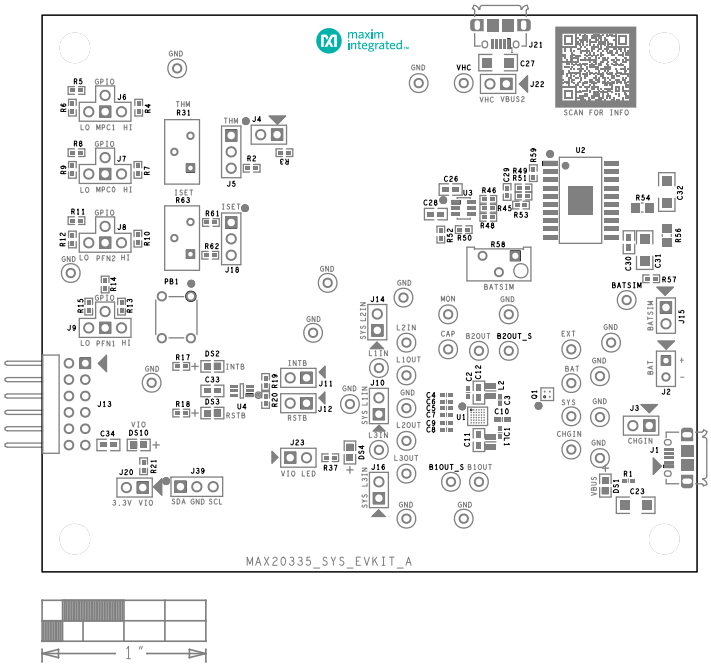
MAX20335 EV System Schematics (continued)



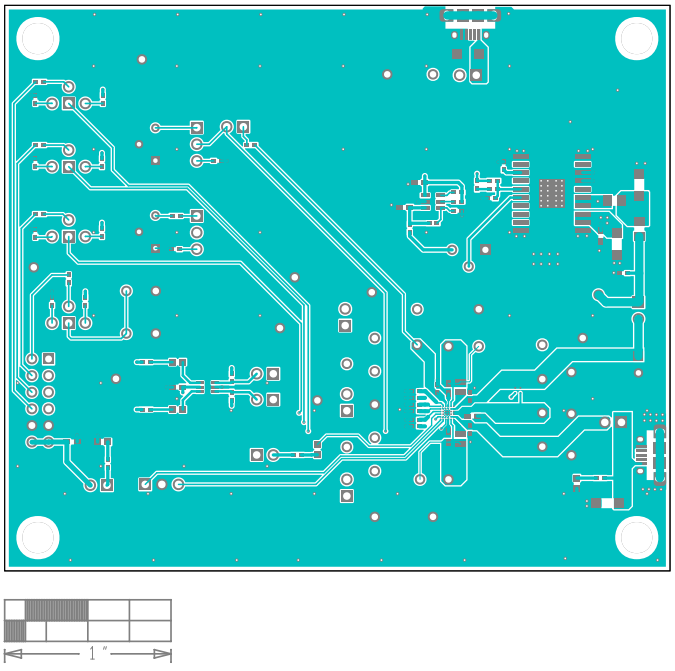
MAX20335 EV System Schematics (continued)



MAX20335 EV System PCB Layouts

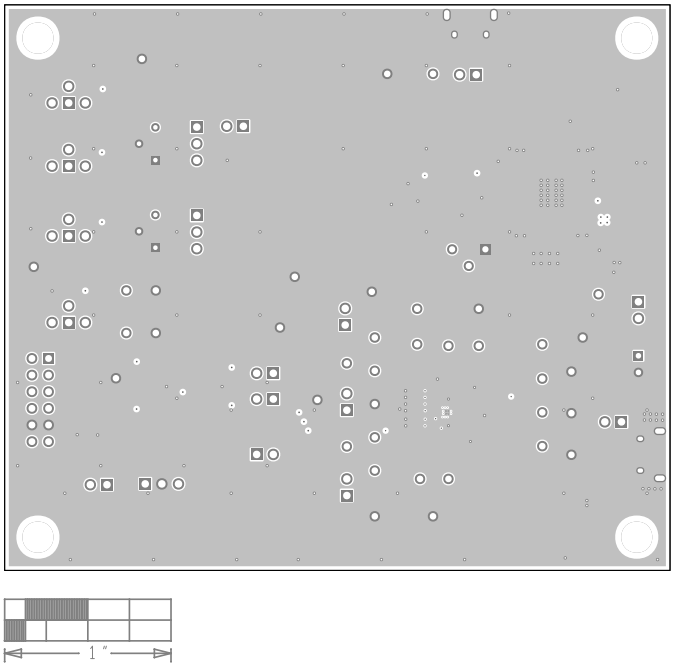


MAX20335 EV System Component Placement Guide—Top Silkscreen

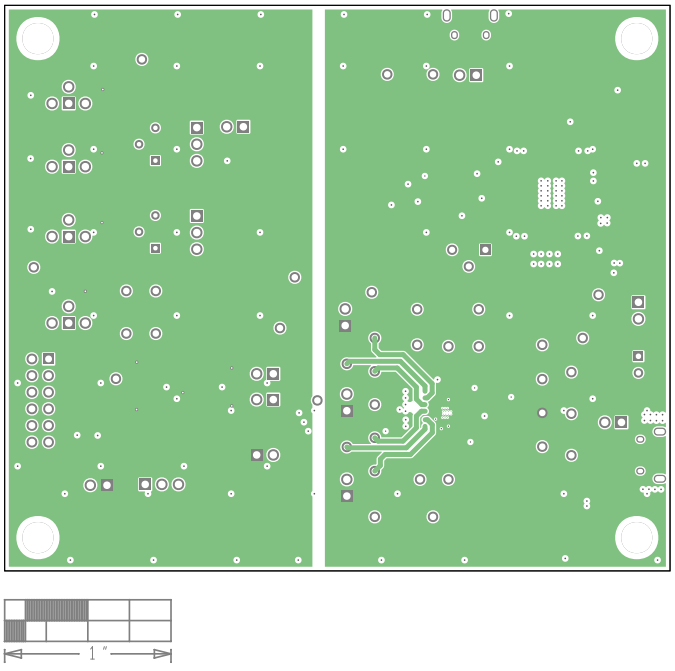


MAX20335 EV System PCB Layout—Top

MAX20335 EV System PCB Layouts (continued)

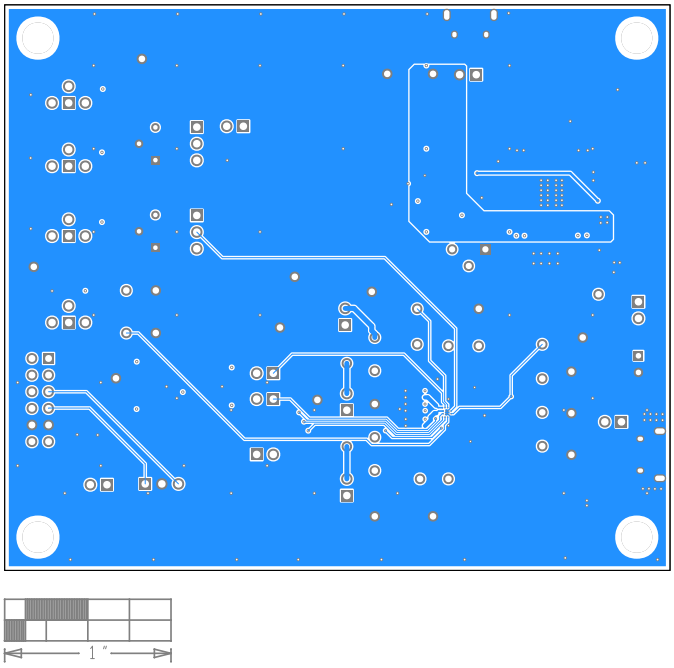


MAX20335 EV System Component Placement Guide—GND



MAX20335 EV System PCB Layout—SYS

MAX20335 EV System PCB Layouts (continued)



MAX20335 EV System PCB Layout— Bottom

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	12/21	Initial release	—