MAX77932 Evaluation Kit

Evaluates: MAX77932C

General Description

The MAX77932 evaluation kit (EV kit) is a fully assembled and tested surface-mount PCB that evaluates the 8A dual-phase switched-capacitor converter MAX77932C.

The MAX77932 EV kit includes the IC evaluation board with an integrated I²C communication interface and a USB micro-B cable. Windows® based graphical-user interface (GUI) software is available for use with the EV kit and can be downloaded from Maxim's website at **www.maximintegrated.com/products/MAX77932C** (under the *Design Resources* tab). Windows 7 or newer Windows operating system is required to use the EV kit software.

Features and Benefits

- 8A Switched-Capacitor Converter
- 2S to 1S Battery Voltage Conversion
- Integrated Power Switch
- Soft-Start
- Programmable Protection Thresholds
- Thermal Alarm and Protection
- Chip Enabled
- I²C Interface with Interrupt Feature
- On-Board I²C Communication Interface
- Windows 7 or Newer Compatible Software
- Proven PCB Layout
- Fully Assembled and Tested

MAX77932 EV Kit Files

FILE	DESCRIPTION
MAX77932GUISetupX.X.X.exe	Installs EV kit files onto computer

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

Quick Start

Required Equipment

- MAX77932 EV kit
- Bench power supply or 2-series cell battery pack with protector
- Calibrated load box or system load for testing
- Calibrated 6½ digit or higher accuracy multimeter (optional for efficiency measurement)
- Lab cables with appropriate current rating
- 2-Pin jumper headers (included on the EV kit board)
- USB micro-B cable (included with the EV kit)
- PC with Windows 7 or newer operating system and USB port

Note: In the following sections, software-related items are identified by bolding. Text in **bold** refers to items directly from the EV kit software. Text in **bold and underlined** refers to items from the Windows operating system.

Procedure

The EV kit is fully assembled and tested. Follow the steps to install the EV kit software, make required hardware connections, and start operation of the kit. The EV kit software can be run without hardware attached. Note that after communication is established, the IC must still be configured correctly for desired operation mode. Make sure the PC is connected to the internet throughout the process so that the USB driver can be automatically installed.

1) Visit **www.maximintegrated.com/products/MAX77932C** under the *Design Resources* tab to download the latest version of the MAX77932 EV kit software. Save the software to a temporary folder and unpack the zip file.
2) Install the EV kit software on the computer by running the **MAX77932GUISetupX.X.X.exe** program inside the temporary folder. This copies the program files and creates an icon in the Windows **Start** menu. The software requires the .NET Framework 4.5 or later. If connected to the internet, Windows automatically updates the .NET Framework as needed.
3) The EV kit software launches automatically after install, and it can be launched by clicking on its icon in the Windows **Start** menu.

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4) Make jumper connections based on the Default Connection column in Table 1. This can be changed later when evaluating other features.
5) Make connections to the EV kit board as shown in Figure 1. Set the power supply voltage between 5V and 9V and power on. Make sure the load box is in the off state.
6) Connect the EV kit to a USB port on the PC using the USB cable.
7) Open the software and click **Device** > **Connect**. Next, a window pops up showing that a slave address corresponding to MAX77932C has been found. If not, check the connection.
8) Enable the part through the EN pin by clicking the **SW1** button or follow the *Detailed Description of Software* section to enable the part through the software. The multimeter at the output should show about ½ VIN. Apply system load to start evaluation.

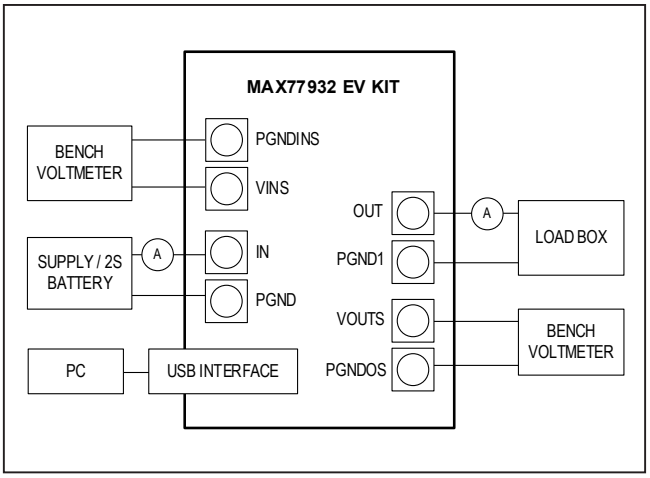


Figure 1. MAX77932 EV Kit Board Connections

Table 1. Jumper Connection Guide

JUMPER	DEFAULT CONNECTION	FEATURE
J1	Open	**Open: Disable power VIO from IN through U2 LDO. VIO power from USB through U5 LDO** Closed: Enable power VIO from IN through U2 LDO. Need to depopulate R21 beforehand to disable VIO power through USB
J2	Pin 1 and 2	Open: Disconnect VIO from any power source **Pin 1 and 2: VIO power from USB or IN, depending on J1, R21** Pin 2 and 3: VIO power from external power supply
J3	Pin 1 and 2	Open: Disable EN button feature **Pin 1 and 2: Default** Pin 2 and 3: Do not configure
J4	Open	**Open: Disable power good LED indication** Closed: Enable power good LED indication
J6	Open	**Open: Default** Closed: Do not configure
J9	Closed	Open: Disconnect IC SCL from on-board I^2C interface to allow communication with host device through SCL and SDA test points **Closed: Connect IC SCL with on-board I^2C interface to allow communication with the software**
J10	Closed	Open: Disconnect IC SDA from on-board I^2C interface to allow communication with host device through SCL and SDA test points **Closed: Connect IC SDA with on-board I^2C interface to allow communication with the software**
J11	Open	Open: Does not matter Closed: Does not matter
J13	Open	**Open: Disable fault interrupt LED indication** Closed: Enable fault interrupt LED indication

*Default options are **bold***

Detailed Description of Software

The MAX77932 EV kit software gives the user complete control of all functions of the MAX77932C and provides ease of use.

Software Installation

Double click the **MAX77932GUISetupX.X.X.exe** icon to begin the installation and follow the prompts to complete the process. The evaluation software can be uninstalled in the **Add/Remove** programs tool in the **Control Panel**. After the installation is complete, open the Maxim Integrated/MAX77932 folder and run **MAX77932.exe** or select it from the program menu. A splash screen showing information about the EV kit appears while the program is loading, as shown in Figure 2.

Establish Communication

Install default jumper setting, power the device by applying VIN voltage above 4.9V and below 9.5V, then click **Device** > **Connect** to communicate to the IC.

Figure 2. EV Kit Splash Screen

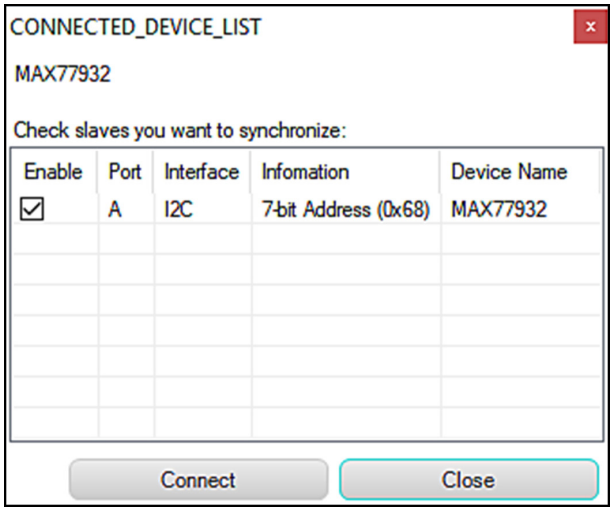


Figure 3. Connect Device Window

Control Tab

The **Control** tab displays the important configuration settings for the IC as shown in Figure 4. Information is grouped by function and is detailed separately. Before configuring, click **Read Once** to make sure all the displayed configurations are in sync with the IC configuration state. Alternatively, click **Start Auto Read** and set corresponding read frequency to keep this page up to date all the time. Follow the guidance on the *MAX77932C* IC data sheet for the usage of each register.

Device Status

The **Device Status** tab shows the status of the IC. It shows all the interrupt information of the IC and the user can configure the Interrupt Mask to enable/disable the physical interrupt pin. The masked interrupt feature is reflected in the IRQB pin output. The unmasked interrupt feature only triggers software interrupt bit change and does not reflect on the IRQB pin output.

Load or Save Register Dump

When a device is connected, click **File** > **Save Register Map** to save the current register data into a .rmap file and click **File** > **Load Register Map** to load a saved register map into the IC. This function can be used to quickly save and resume evaluation with the same settings.

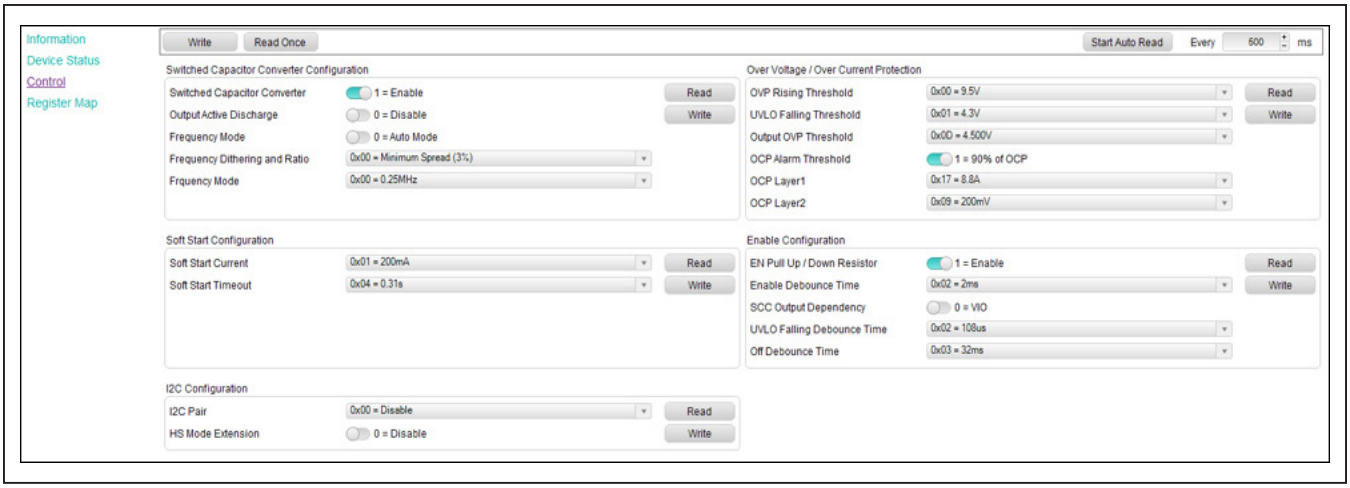


Figure 4. Control Tab

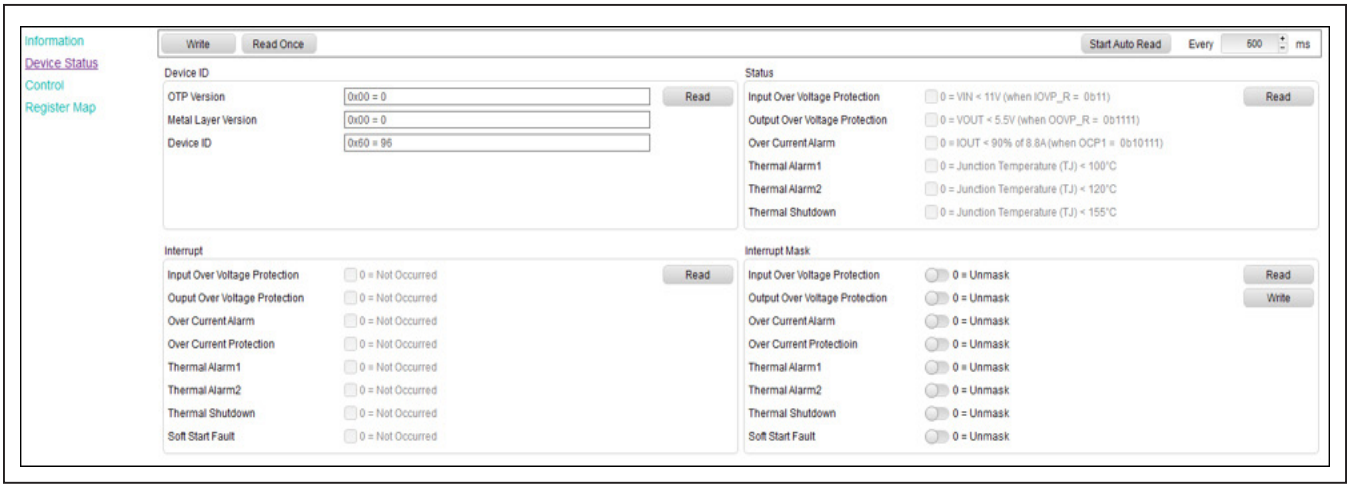


Figure 5. Device Status Tab

Script Automation

A Python-based script system is embedded in the software to allow automating or configuring multiple registers sequentially with ease. To evaluate with Python-based commands, click **Tools** > **Run Script File**. A script window pops up, as shown in Figure 6. The first tab consists of a script editor and an embedded Python terminal interface. The second tab provides the Python I/O console. The third tab provides a coding tutorial for this script window. Click the **Run** button to execute the script. The script feature helps with testing a sequence of configurations automatically.

Optional Tools

For I²C-communication debugging, more tools are available at **Tools** > **Direct Access and Tools** > **Advanced UI**. With the proper test set-up procedure described in this document, these tools do not need to be used to evaluate the MAX77932C. However, other slave devices can be tested with the I²C debugging tools and the MAX77932C software when connected to the MAX77932C with the SDA and SCL pins. If successful, you can automate multiple slave devices through the script window.

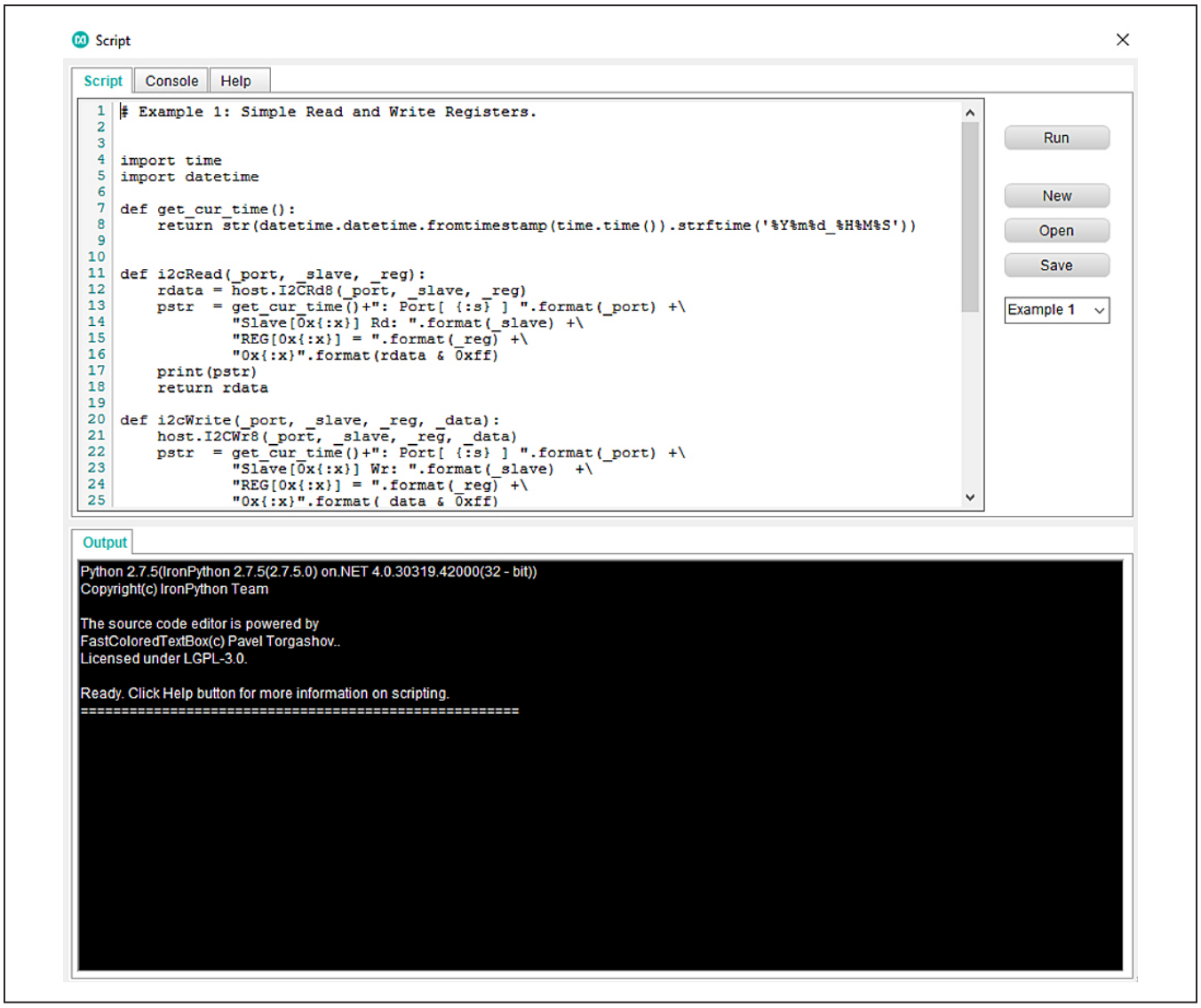


Figure 6. Script Tool Window

Ordering Information

PART	TYPE
MAX77932EVKIT#	EV Kit

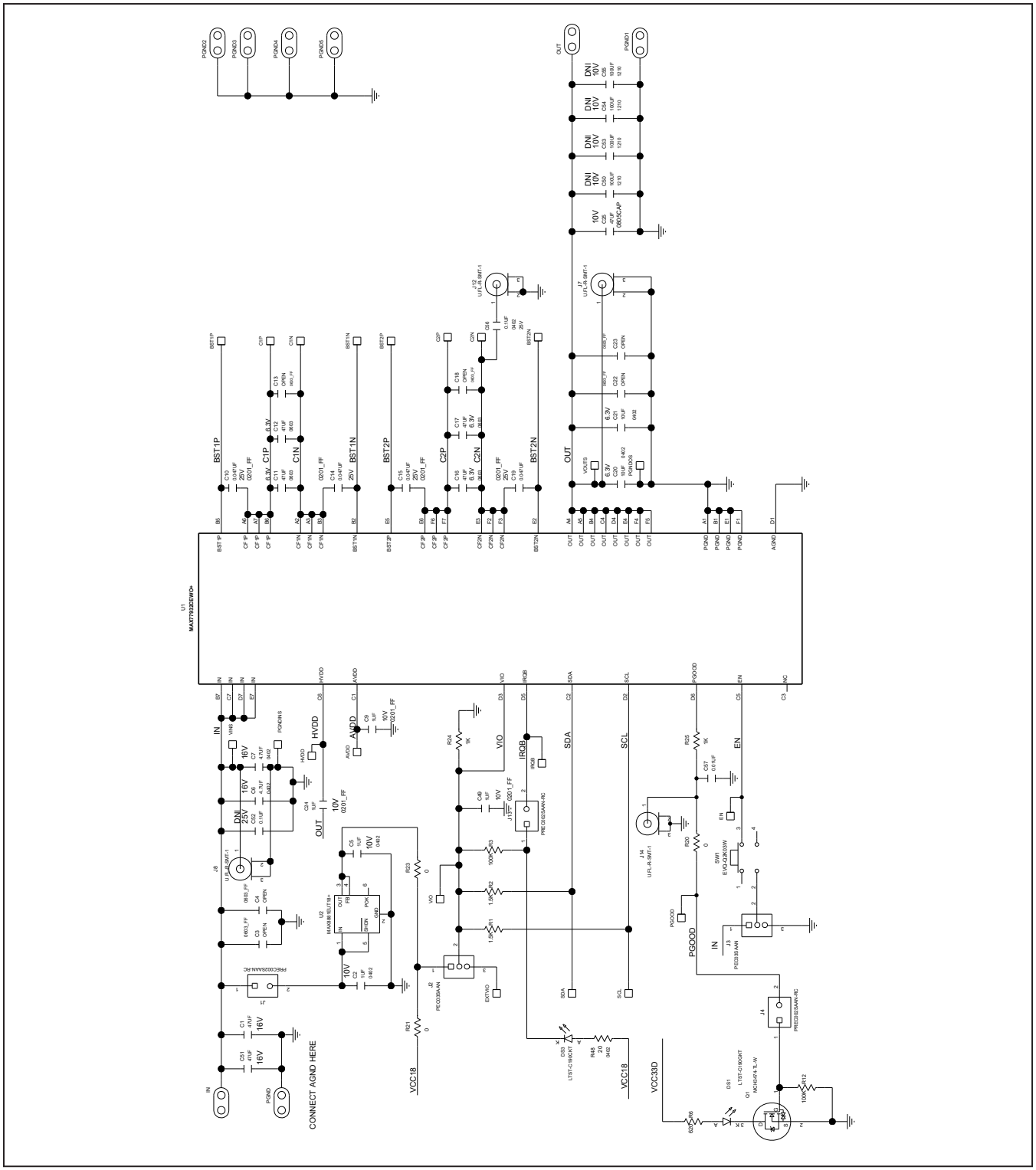
#Denotes RoHS compliant.

MAX77932 EV Kit Bill of Materials

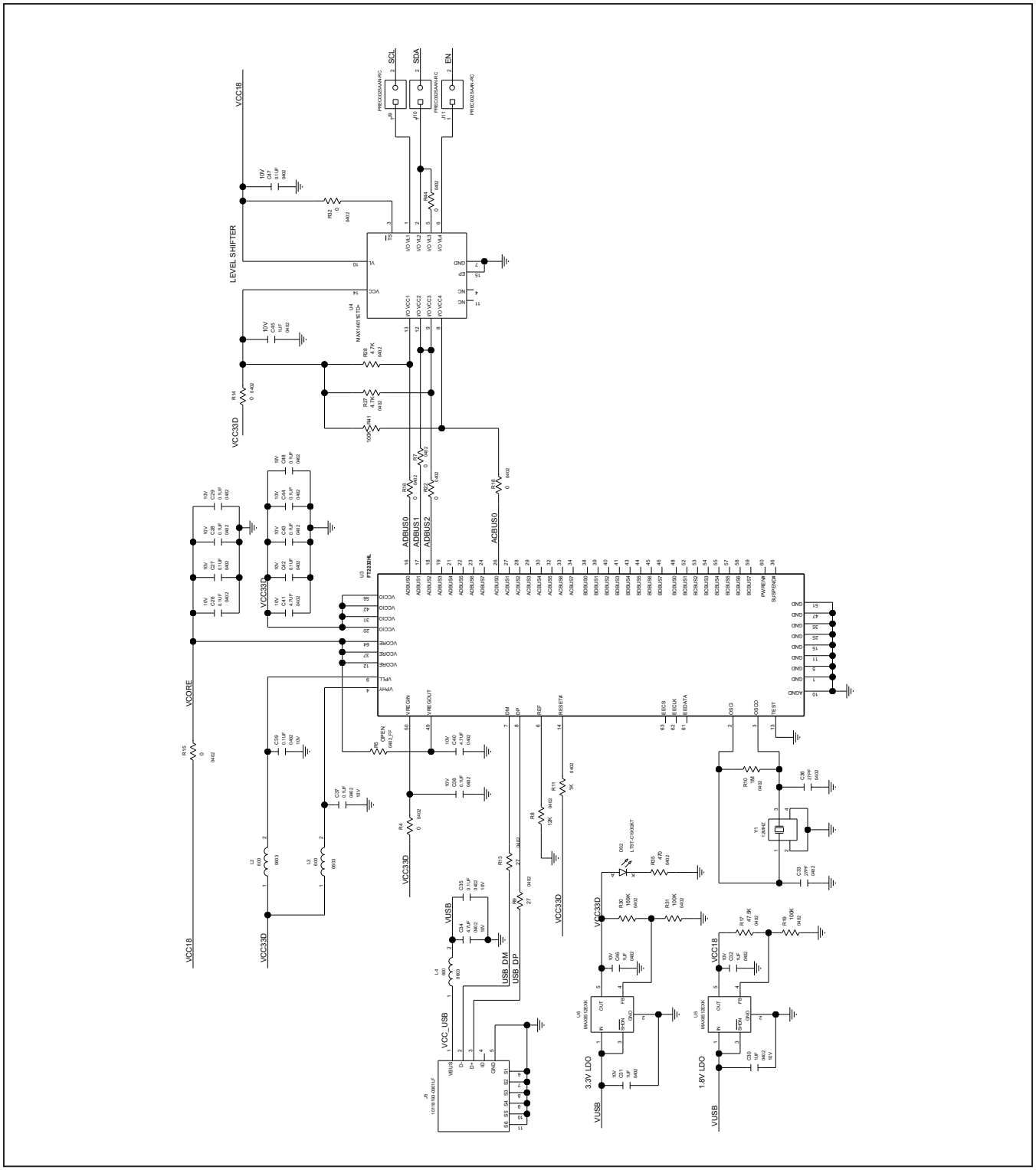
REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
AVDD, BST1N, BST1P, BST2N, BST2P, C1N, C1P, C2N, C2P, EN, EXTVIO, HVDD, IRQB, PGNDINS, PGNDOS, PGOOD, SCL, SDA, VINS, VIO, VOUTS		21	5000	KEYSTONE	N/A	TEST POINT; PIN DIA=0.1IN; TOTAL LENGTH=0.3IN; BOARD HOLE=0.04IN; RED; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
C1, C51		2	GRM32EC81C476KE15	MURATA	47UF	CAP; SMT (1210); 47UF; 10%; 16V; X6S; CERAMIC CHIP
C2, C5		2	C0402X5R100-105KNE; GRM155R61A105KE15	VENKEL LTD.;MURATA	1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 1UF; 10V; TOL=10%; MODEL=; TG=-55 DEGC TO +85 DEGC; TC=X5R
C6, C7		2	CL05A475MO5NUN	SAMSUNG ELECTRO-MECHANICS	4.7UF	CAP; SMT (0402); 4.7UF; 20%; 16V; X5R; CERAMIC CHIP
C9, C24, C49		3	ANY	ANY	1UF	CAPACITOR; SMT (0201); CERAMIC CHIP; 1UF; 10V; TOL=20%; MODEL=CL SERIES; TG=-55 DEGC TO +85 DEGC; TC=X5R; FORMFACTOR
C10, C14, C15, C19		4	ANY	ANY	0.047UF	CAPACITOR; SMT (0201); CERAMIC CHIP; 0.047UF; 25V; TOL=10%; MODEL=C SERIES; TG=-55 DEGC TO +85 DEGC; TC=X5R; FORMFACTOR
C11, C12, C16, C17		4	GRM188R60J476ME15	MURATA	47UF	CAPACITOR; SMT (0603); CERAMIC CHIP; 47UF; 6.3V; TOL=20%; TG=-55 DEGC TO +85 DEGC; TC=X5R
C20, C21		2	GRM155R60J106ME44; GRM155R60J106ME47; C1005X5R0J106M050BC; CL05A106MQ5NUN; C0402C106M9PAC	MURATA;MURATA;TDK;SAMSUNG ELECTRONICS;KEMET	10UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 10UF; 6.3V; TOL=20%; TG=-55 DEGC TO +85 DEGC; TC=X5R
C25		1	GRM21BR61A476ME15	MURATA	47UF	CAP; SMT (0805); 47UF; 20%; 10V; X5R; CERAMIC CHIP
C26-C29, C35, C37-C39, C42-C44, C47, C48		13	GRM155R71A104JA01	MURATA	0.1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.1UF; 10V; TOL=5%; TG=-55 DEGC TO +125 DEGC; TC=X7R
C30-C32, C45, C46		5	C0402C105K8PAC;CC0402KRX5R6BB105	KEMET;YAGEO	1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 1UF; 10V; TOL=10%; TG=-55 DEGC TO +85 DEGC; TC=X5R
C33, C36		2	C0402C0G500270JNP; GRM1555C1H270JA01	VENKEL LTD.;MURATA	27PF	CAPACITOR; SMT; 0402; CERAMIC; 27pF; 50V; 5%; C0G; -55degC to +125degC; 0 +/-30PPM/degC
C34, C40, C41		3	C1005X5R1A475K050	TDK	4.7UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 4.7UF; 10V; TOL=10%; TG=-55 DEGC TO +85 DEGC; TC=X5R
C56		1	GRM155R71E104KE14;C1005X7R1E104K050BB;TMK105B7104KVH;CGJ2B3X7R1E104K050BB	MURATA;TDK;TAIYO YUDEN;TDK	0.1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.1UF; 25V; TOL=10%; MODEL=GRM SERIES; TG=-55 DEGC TO +125 DEGC; TC=X7R
C57		1	NMC0402X7R103K16TRP; GRM155R71C103KA01; CC0402KRX7R7BB103	NIC COMPONENTS CORP.;MURATA;YAGEO	0.01UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.01UF; 16V; TOL=10%; MODEL=; TG=-55 DEGC TO +125 DEGC; TC=X7R
DS1, DS2		2	LTST-C190GKT	LITE-ON ELECTRONICS INC.	LTST-C190GKT	DIODE; LED; WATER CLEAR GREEN; SMT (0603); VF=2.1V; IF=0.03A; -55 DEGC TO +85 DEGC
DS3		1	LTST-C190CKT	LITE-ON ELECTRONICS INC.	LTST-C190CKT	DIODE; LED; STANDARD; RED; SMT (0603); PIV=5.0V; IF=0.04A; -55 DEGC TO +85 DEGC
IN, OUT, PGND, PGND1-PGND5		8	9020 BUSS	WEICO WIRE	MAXIMPAD	EVK KIT PARTS; MAXIM PAD; WIRE; NATURAL; SOLID; WEICO WIRE; SOFT DRAWN BUS TYPE-S; 20AWG
J1, J4, J9-J11, J13		6	PREC002SAAN-RC	SULLINS	PREC002SAAN-RC	CONNECTOR; MALE; THROUGH HOLE; HEADER; STRAIGHT; 2PINS
J2, J3		2	PEC03SAAN	SULLINS	PEC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 3PINS
J5		1	10118193-0001LF	FCI CONNECT	10118193-0001LF	CONNECTOR; FEMALE; SMT; MICRO USB B TYPE RECEPTACLE; RIGHT ANGLE; 5PINS
J7, J8, J12, J14		4	U.FL-R-SMT-1	HIROSE ELECTRIC CO LTD.	U.FL-R-SMT-1	CONNECTOR; MALE; SMT; ULTRA SMALL SURFACE MOUNT COAXIAL CONNECTOR; STRAIGHT; 2PINS
L2-L4		3	BLM18AG601SN1	MURATA	600	INDUCTOR; SMT (0603); FERRITE-BEAD; 600; TOL=+/-; 0.5A
Q1		1	MCH3474-TL-W	ON SEMICONDUCTOR	MCH3474-TL-W	TRAN; POWER MOSFET; SINGLE N-CHANNEL; NCH; SC70; PD-(1W); I-(4A); V-(30V)
R1, R2		2	CRCW04021K50JN	VISHAY DALE	1.5K	RESISTOR; 0402; 1.5K OHM; 5%; 200PPM; 0.063W; METAL FILM
R3, R12		2	CRCW0402100KJN	VISHAY DALE	100K	RESISTOR; 0402; 100K OHM; 5%; 200PPM; 0.063W; THICK FILM
R4, R7, R14-R16, R18, R20-R23, R32, R44		12	ERJ-2GE0R00	PANASONIC	0	RESISTOR; 0402; 0 OHM; 0%; JUMPER; 0.10W; THICK FILM
R6		1	CRCW0402620RFK; RC0402FR-07620RL	VISHAY DALE;YAGEO PHICOMP	620	RESISTOR; 0402; 620 OHM; 1%; 100PPM; 0.063W; THICK FILM
R8		1	CRCW040212K0FK;MCR01MZPF1202	VISHAY DALE;ROHM SEMICONDUCTOR	12K	RESISTOR, 0402, 12K OHM, 1%, 100PPM, 0.0625W, THICK FILM
R9, R13		2	ERJ-2RKF27R0X;RC0402FR-0727RL;CRCW040227R0FK	PANASONIC;YAGEO PHICOMP;VISHAY DALE	27	RESISTOR, 0402, 27 OHM, 1%, 100PPM, 0.0625W, THICK FILM
R10		1	CRCW04021M00FK	VISHAY DALE	1M	RESISTOR; 0402; 1M; 1%; 100PPM; 0.0625W; THICK FILM
R11, R24		2	CRCW04021K00FK; RC0402FR-071KL;MCR01MZPF1001	VISHAY DALE;YAGEO PHICOMP;ROHM SEMI	1K	RESISTOR; 0402; 1K; 1%; 100PPM; 0.0625W; THICK FILM
R17		1	CRCW04024752FK; 9C04021A4752FLHF3; CRCW040247K5FK	VISHAY DALE;YAGEO;VISHAY DALE	47.5K	RESISTOR; 0402; 47.5K; 1%; 100PPM; 0.0625W; THICK FILM
R19, R31, R41		3	CRCW0402100KFK;RC0402FR-07100KL	VISHAY;YAGEO	100K	RESISTOR; 0402; 100K; 1%; 100PPM; 0.0625W; THICK FILM
R25		1	RCC-0402PW1001F	INTERNATIONAL MANUFACTURING SERVICE	1K	RESISTOR; 0402; 1K OHM; 1%; 100PPM; 0.080W; THICK FILM
R27, R28		2	CRCW04024K70FK;MCR01MZPF4701	VISHAY DALE;ROHM SEMICONDUCTOR	4.7K	RESISTOR, 0402, 4.7K OHM, 1%, 100PPM, 0.0625W, THICK FILM
R30		1	CRCW0402169KFK	VISHAY DALE	169K	RESISTOR; 0402; 169K OHM; 1%; 100PPM; 0.063W; THICK FILM
R35		1	CRCW0402470RFK	VISHAY DALE	470	RESISTOR, 0402, 470 OHM, 1%, 100PPM, 0.0625W, THICK FILM
R48		1	CRCW040220R0FK	VISHAY DALE	20	RESISTOR; 0402; 20 OHM; 1%; 100PPM; 0.063W; THICK FILM
SW1		1	EVQ-Q2K03W	PANASONIC	EVQ-Q2K03W	SWITCH; SPST; SMT; 15V; 0.02A; LIGHT TOUCH SWITCH; RCOIL= OHM; RINSULATION= OHM; PANASONIC
U1		1	MAX77932CEWO+	MAXIM	MAX77932CEWO+	EVKIT PART - IC; MAX77932C; 8A DUAL-PHASE SWITCHED CAPACITOR CONVERTER WITH INTEGRATED PROTECTION; PACKAGE OUTLINE DRAWING: 21-100293; PACKAGE CODE: W422D2+1; 0.4MM PITCH; WLP42
U2		1	MAX8881EUT18+	MAXIM	MAX8881EUT18+	IC; VREG; ULTRA-LOW-IQ, LOW-DROPOUT LINEAR REGULATORS WITH POK; SOT23-6
U3		1	FT2232HL	FUTURE TECHNOLOGY DEVICES INTL LTD.	FT2232HL	IC; MMRY; DUAL HIGH SPEED USB TO MULTIPURPOSE UART/FIFO; LQFP64
U4		1	MAX14611ETD+	MAXIM	MAX14611ETD+	IC; TRANS; QUAD BIDIRECTIONAL LOW-VOLTAGE LOGIC LEVEL TRANSLATOR; TDFN14-EP
U5, U6		2	MAX8512EXK+	MAXIM	MAX8512EXK	IC, VREG, Ultra-Low-Noise, High PSRR, Adjustable Vout, SC70-5
Y1		1	7M-12.000MAAJ	TXC CORPORATION	12MHZ	CRYSTAL; SMT; 18PF; 12MHZ; +/-30PPM; +/-30PPM
PCB		1	MAX77932	MAXIM	PCB	PCB:MAX77932
C50, C53-C55	DNP	0	CL32A107MPVNNN;C1210C107M8PAC;LMK325BJ107MM	SAMSUNG ELECTRONICS;KEMET;TAIYO YUDEN	100UF	CAPACITOR; SMT (1210); CERAMIC CHIP; 100UF; 10V; TOL=20%; TG=-55 DEGC TO +85 DEGC; TC=X5R
C52	DNP	0	GRM033C81E104KE14	MURATA	0.1UF	CAPACITOR; SMT (0201); CERAMIC CHIP; 0.1UF; 25V; TOL=10%; TG=-55 DEGC TO +105 DEGC; TC=X6S
C3, C4, C13, C18, C22, C23	DNP	0	N/A	N/A	OPEN	CAPACITOR; SMT (0603); OPEN; FORMFACTOR
R5	DNP	0	N/A	N/A	OPEN	RESISTOR; 0402; OPEN; FORMFACTOR

NOTE: DNI--> DO NOT INSTALL(PACKOUT); DNP--> DO NOT PROCURE

MAX77932 EV Kit Schematic



MAX77932 EV Kit Schematic Diagram



MAX77932 EV Kit Schematic Diagram

MECHANICAL

MOUNTING HOLE

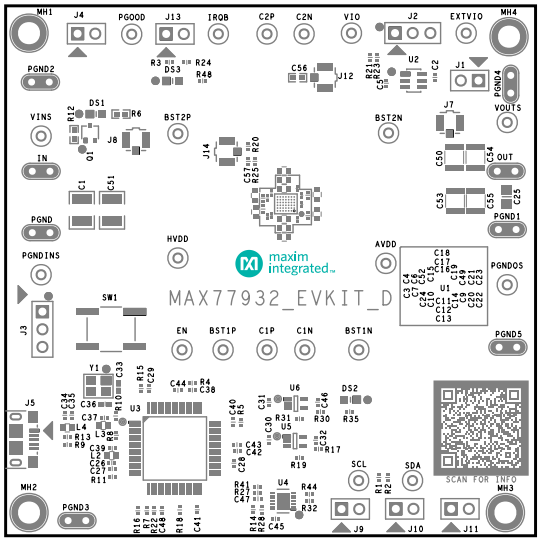
MH1 1 MTHOLE

MH2 1 MTHOLE

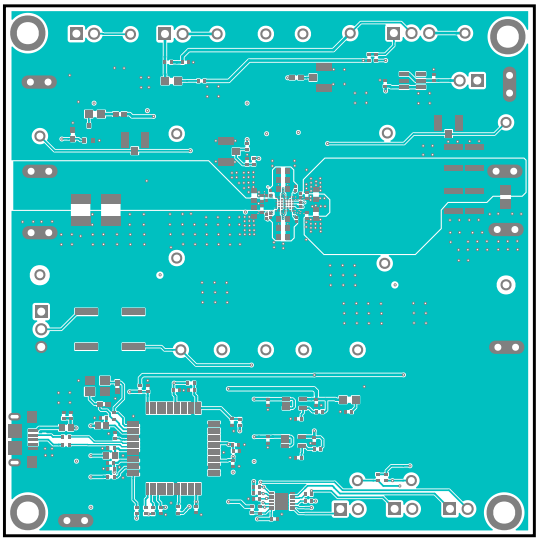
MH3 1 MTHOLE

MH4 1 MTHOLE

MAX77932 EV Kit PCB Layouts

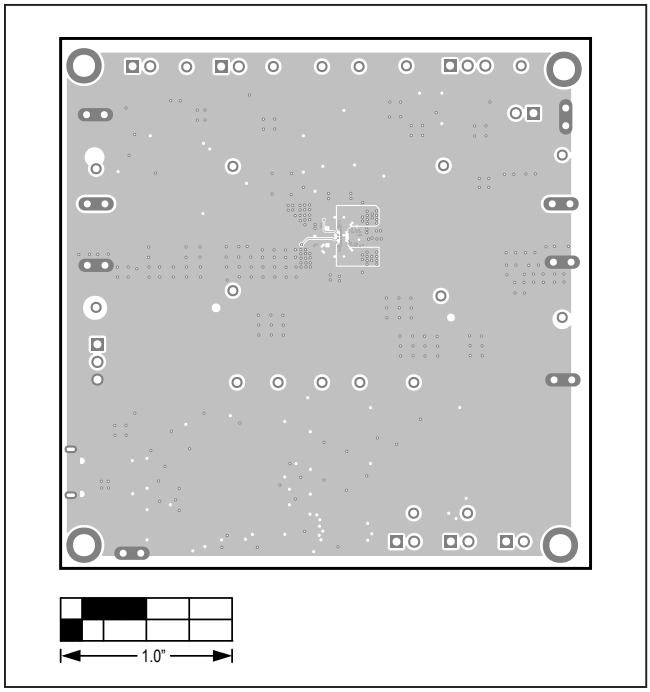


MAX77932 EV Kit Component Placement Guide—Top Silkscreen

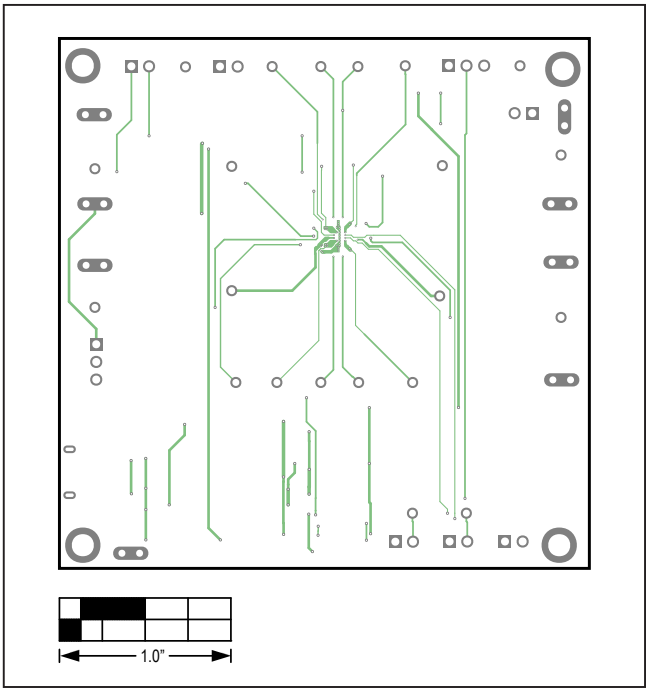


MAX77932 EV Kit PCB Layout—Top

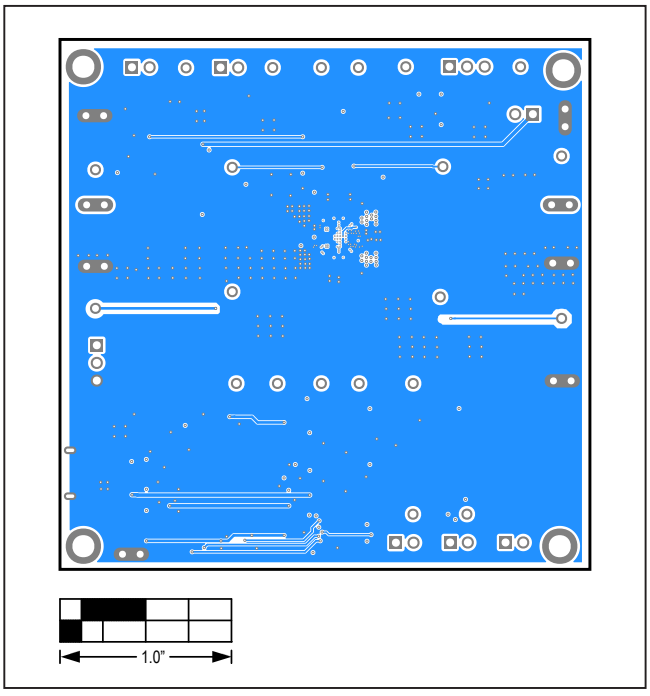
MAX77932 EV Kit PCB Layouts (continued)



MAX77932 EV Kit PCB Layout—Layer 2



MAX77932 EV Kit PCB Layout—Layer 3



MAX77932 EV Kit PCB Layout—Bottom View

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	6/20	Initial release	—
1	6/20	Corrected typo in part number	2, 7, 8

For pricing, delivery, and ordering information, please visit Maxim Integrated's online storefront at https://www.maximintegrated.com/en/storefront/storefront.html.

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