Click here to ask about the production status of specific part numbers.

MAX19792 Evaluation Kit

Evaluates: MAX19792

General Description

The MAX19792 evaluation kit (EV kit) simplifies the evaluation of the MAX19792. The MAX19792 dual general-purpose analog voltage variable attenuator (VVA) is designed to interface with 50Ω systems operating in the 500MHz to 4000MHz frequency range.

The MAX19792 is a monolithic VVA IC designed for broadband system applications, including wireless infrastructure digital and spread-spectrum communication systems WCDMA/LTE, TD-SCDMA/TD-LTE, WiMAX®, cdma2000®, GSM/EDGE, and MMDS Base Stations VSAT/Satellite Modems. The MAX19792 evaluation kit hosts a microcontroller (MCU) that uses a serial peripheral interface to configure internal registers and modes. Graphical User Interface (GUI) software running on a computer makes it simple to program registers and control the device operation. The evaluation kit is fully assembled and tested at the factory.

This document provides a component list, a list of equipment required to evaluate the device, a straightforward test procedure to verify functionality, a description of the EV kit circuit, the circuit schematic, and artwork for each layer of the printed circuit board (PCB).

Features

- Easy Evaluation of the MAX19792 IC
- On-Board DAC which Outputs 4V ± 5% to Control Attenuation
- On-Board Power Supply +3.3V and +5V from MAX32625PICO
- The Operating Frequency Range Extends from 500MHz to 4000MHz
- 50Ω SMA Connectors on the RF Ports
- All Critical Peripheral Components Included
- A Micro-USB Port to Interface with the PC
- PC Control Software (Available at www.maximintegrated.com/EVKitSoftware)

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

MAX19792 EV Kit Files

FILE	DESCRIPTION
MAX19792_EV KIT_B_MARKETING_SCH	Schematic
MAX19792_EV KIT_B_MARKETING_PCB	Layout
MARKETING_BOM_MAX19792_EV Kit_B	Bill of Materials

319-100678A; Rev 0; 2/21

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Quick Start

Required Equipment

This section lists the recommended test equipment to verify the operation of the MAX19792. It is intended as a guide only and some substitutions are possible.

- One RF signal generator capable of delivering minimum 0dBm up to 4.0GHz (Keysight N5182B or equivalent)
- An RF spectrum analyzer with a range of 100kHz to 4.0GHz (Keysight N9020A or equivalent)
- A dual-power supply capable of supplying 3V to 5V up to at least 100mA
- A digital multimeter to measure the supply current (Keysight 34461A or equivalent) (optional)
- 50Ω coaxial RF cables with SMA connectors
- A user-supplied Windows-10 based PC

Procedure

This section provides a step-by-step guide to operate the EV kit and test the device functions. The EV kit is fully assembled and tested. Follow the instructions in the connections and setup section for proper device evaluation.

CAUTION: Do not turn on the DC power or RF signal generators until all connections are completed.

Detailed Description of Hardware and Software

The EV kit hosts a microcontroller platform MAX32625PICO, MAX5805 2-wire serial 12-Bit DAC along with the MAX19792. The microcontroller programs the registers of the MAX19792 and DAC. The DAC is used to generate the on-board analog attenuation control voltage.

Download the MAX19792 EV Kit Software

- Download the MAX19792 EV kit software from the link, run the installation file, and install it.
- Run the MAX19792 EV kit software through the desktop icon to open the GUI.

Note that the GUI runs only on Windows 10 PCs.

Windows is a registered trademark and registered service mark of Microsoft Corporation.

Powering and Connecting the EV Kit

- Verify all jumpers are in place. Pins 2 to 3 of header J10 should be shorted. Pins 1 to 2 of J8, J4 should be shorted to use the on-board DAC to control the RF attenuation.
- With its output disabled, connect a 5V power supply to the TP8 and TP7 test points through an ammeter (apply +5V power supply to the VCC (TP8) and GND (TP7) test points). If available, set the current limit to 50mA.
- If using an external power supply to provide the RF attenuation control voltage, remove the jumper (if connected) from J8 and apply external control voltage at pin-2 of J8. Set the gain control voltage to 4V but leave the control supply powered off for now. See Figure 1.
- Connect the MAX19792 EV kit to the PC running the GUI through the USB cable and power on the EV kit. A green LED on the MCU module blinks once per second.
- Open the Digital VVA GUI.exe software. Click the Device tab and select MAX19792 from the dropdown (Figure 2). Click **Scan** in the COM adapter section and then select the appropriate COM port from the dropdown. Click **Connect**. **Connected** appears on the right bottom of the GUI (Figure 3).
- In the configuration panel, select the VCC voltage and reference for internal and external DACs.
- Enable the power supply(5V) and control supply (4V).
- The supply current from the 5V VCC supply should read approximately 19mA. The device current is 13mA and the LEDs consume 6mA.
- With its output disabled, set the RF signal generator to a 1500MHz frequency at 0dBm.
- Connect the output of the RF signal generator to the SMA connector labeled RF IN1 on the EV kit.
- Connect the output labeled RF OUT2 to a spectrum analyzer.
- Terminate the unused ports with a 50Ω SMA terminator.
- Enable the output of the RF signal generator.
- Observe the output at 1500MHz with a tone power of about -52 dBm on the spectrum analyzer. Total loss = PRFIn - PRFOut = 0dBm - (-52dBm) = 52dB. The cascaded attenuation is 46.8dB (at VCTRL = 4V) and insertion loss is 5.2dB.

Note 1:
Remove diodes D1, D2 for device current measurement.

Note 2:

The RF attenuation control voltage can be set either by an external power supply or by using a DAC on the EV kit. If the on-board DAC is selected, then set the voltage through the CTRL Pin Input widget. Type the desired voltage between 1V and 4V (based on the operating VCC) and click Enter. Probe the actual control voltage with a multimeter and make small adjustments to the programmed voltage to compensate for any existing offsets.

Use the on-board power supply by choosing 3.3V or 5V using J9, and shorting pins 1 to 2 pins of J10 (Figure 4).

Verifying the Different Modes

The MAX19792 EV kit has different methods to control the attenuation. Use the radio buttons for the desired control method.

Analog-Only Mode Control

The control voltage can be applied through an external DAC or a DC voltage source.

To use the external DAC, set jumper J8 to DACCTRL and enter the value (1V to 4V) in the CTRL Pin Input box. Click Write.

To use an external DC voltage source, remove jumper J8 and connect a voltage source to pin 2 of J8 (Figure 1).

DAC Mode Control

The control voltage can be controlled through an on-chip 10-bit DAC. Remove Jumper J8.

The DAC voltage is controlled by the DAC Control (0-1023) box or by dragging the knob on the slider. Click Write to update the value.

CAUTION: Do not apply any voltage on the control pin.

Register Mode Up/Down Operation

The control voltage can be stepped up and down in user-controlled increments through the on-chip 10-bit DAC. Remove Jumper J8.

To set the increment step, set the Up Step Size box to a value between 0 and 1023 and click Write.

To set the decrement step, set the Down Step Size box to a value between 0 and 1023 and click Write.

To increment the DAC voltage, click Up. To decrement the DAC voltage, click Down. To set the DAC back to the minimum value, click Reset.

To report the current DAC setting, click Log. It is reported in the Status Log pane.

Analog-Only Mode Control with Alarm Monitoring

In this mode, the attenuation control is achieved with the analog voltage applied on the CTRL pin. The on-chip switches are set to compare the DAC voltage to the CTRL voltage at the comparator input, and the output of the comparator (COMP_OUT) trips from high to low when VCTRL exceeds the on-chip DAC voltage. Approximate the voltage on the control pin by clicking on Approximate Automatically. For example, apply a voltage of 2.5V on the CTRL pin and click Approximate Automatically. Read the approximate voltage as 2.49V.

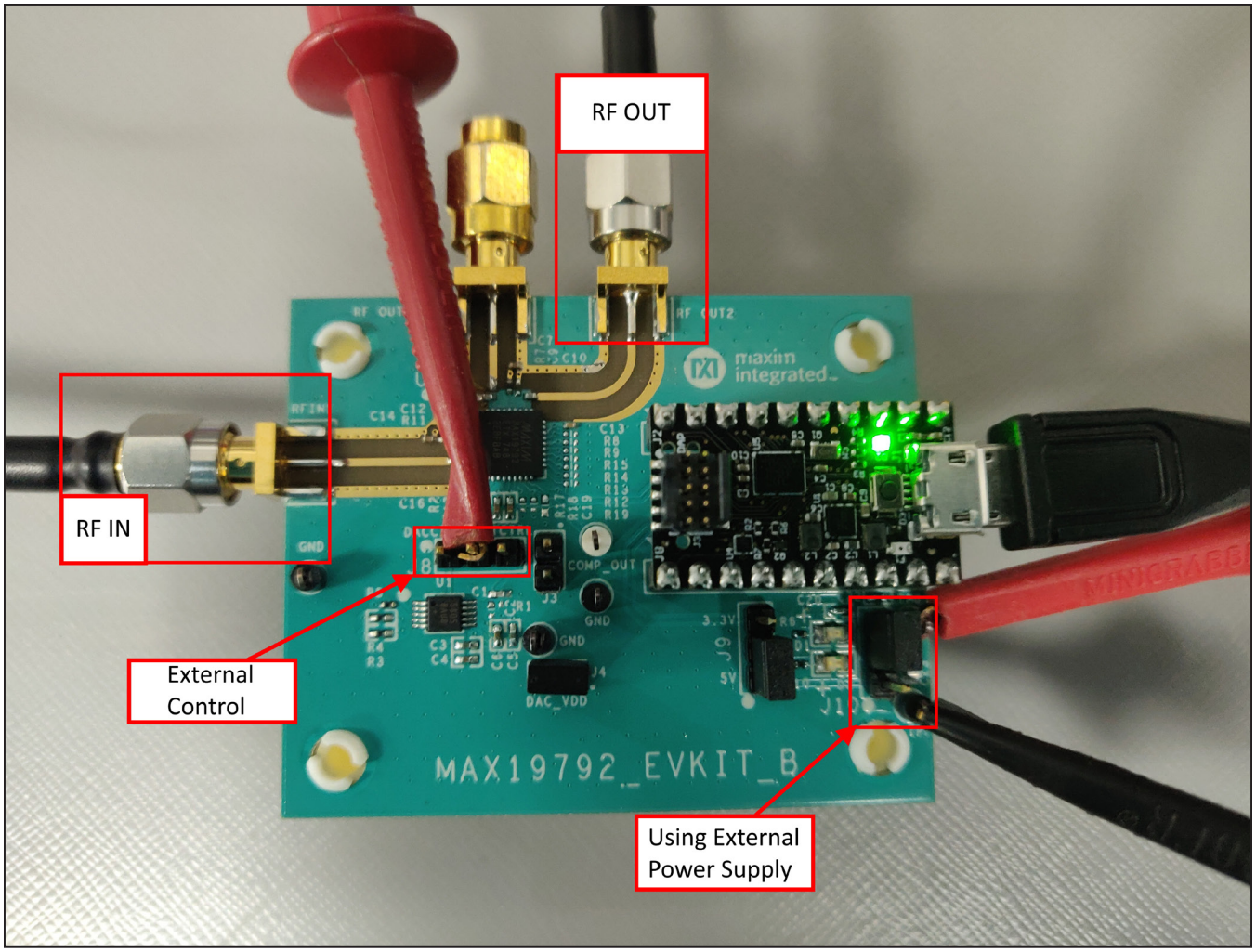


Figure 1. Connection Setup to Use the External Power Supply and Control Voltage

Figure 2. Part Selection in Common GUI

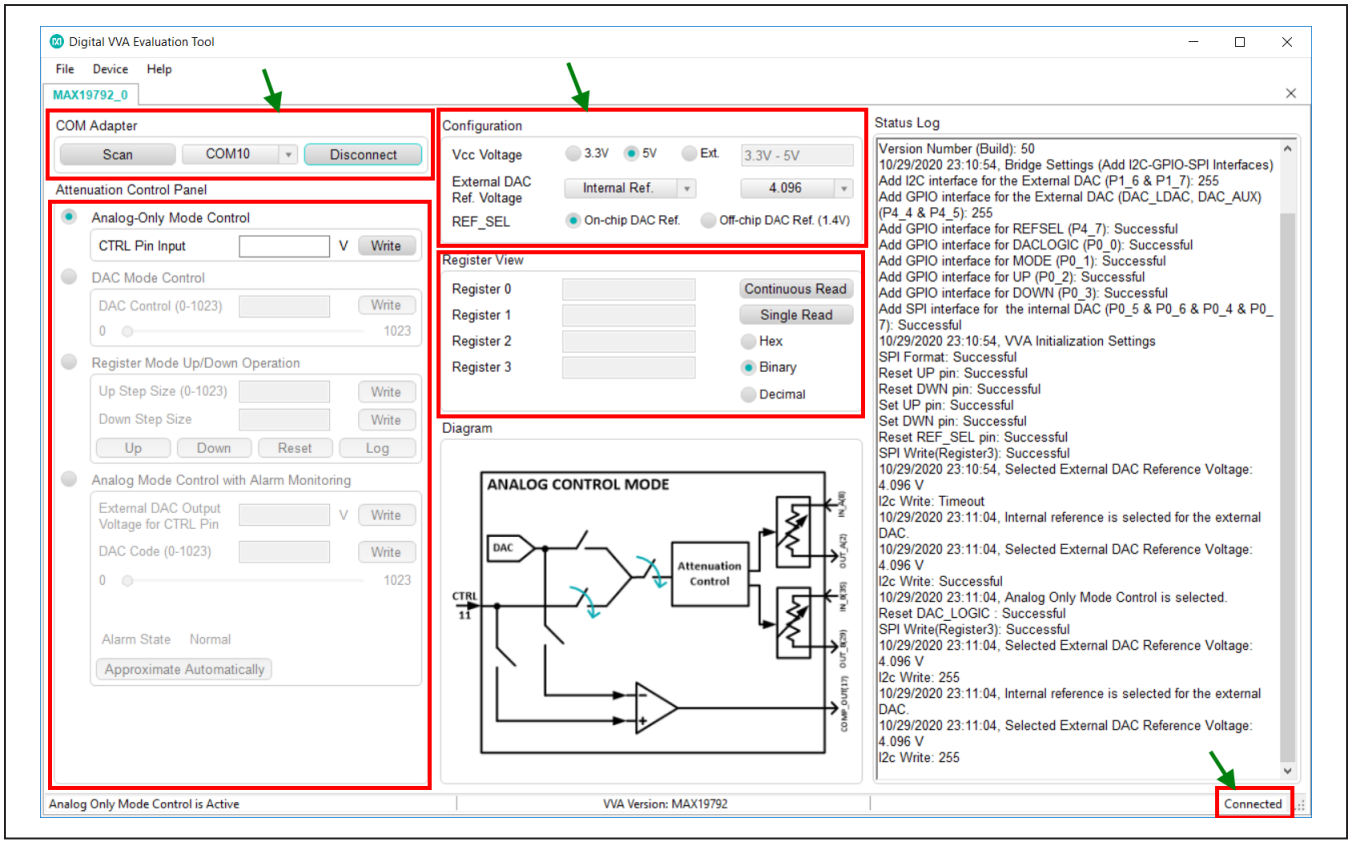


Figure 3. GUI View

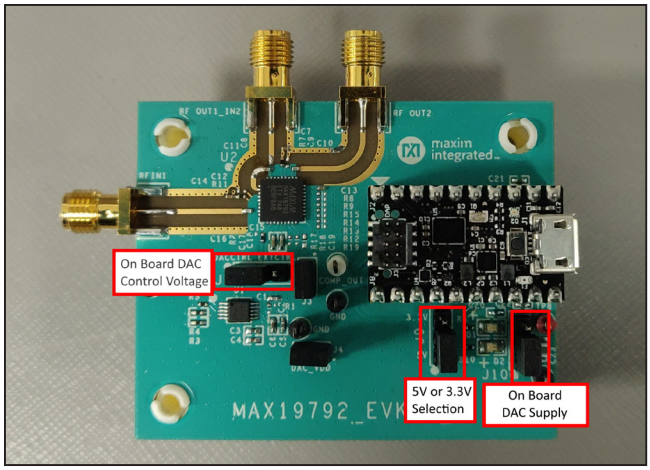


Figure 4. Connection Setup to Use the On-Board Power Supply and Control Voltage

Layout Considerations

A good PCB is an essential part of an RF circuit design. The EV kit PCB serves as a guide for laying out a board using the devices. Keep traces carrying RF signals as short as possible to minimize radiation and insertion loss. Use impedance control on all RF signal traces. The exposed paddle must be soldered evenly to the board's ground plane for proper operation. Use abundant through-puts beneath the exposed paddle and between RF traces to minimize undesired RF coupling. To minimize coupling between different sections of the IC, each VCC pin must have a bypass capacitor with low impedance to the closest ground at the frequency of interest. Do not share ground vias among multiple connections to the PCB ground plane. Refer to the layout considerations section of the MAX19792 IC data sheet for more information

Component List

SUPPLIER	WEBSITE
Murata Mfg. Co., Ltd.	www.murata.com
Kemet Electronics Pvt Ltd	www.kemet.com
Citizen America Corp.	www.citizencrystal.com
Keystone Electronics Corp	www.keyelco.com
Sullins Electronics Corp.	www.sullinselectronics.com
Maxim Integrated	www.maximintegrated.com

Note: *Indicate using the MAX19792 when contacting these component suppliers.*

Ordering Information

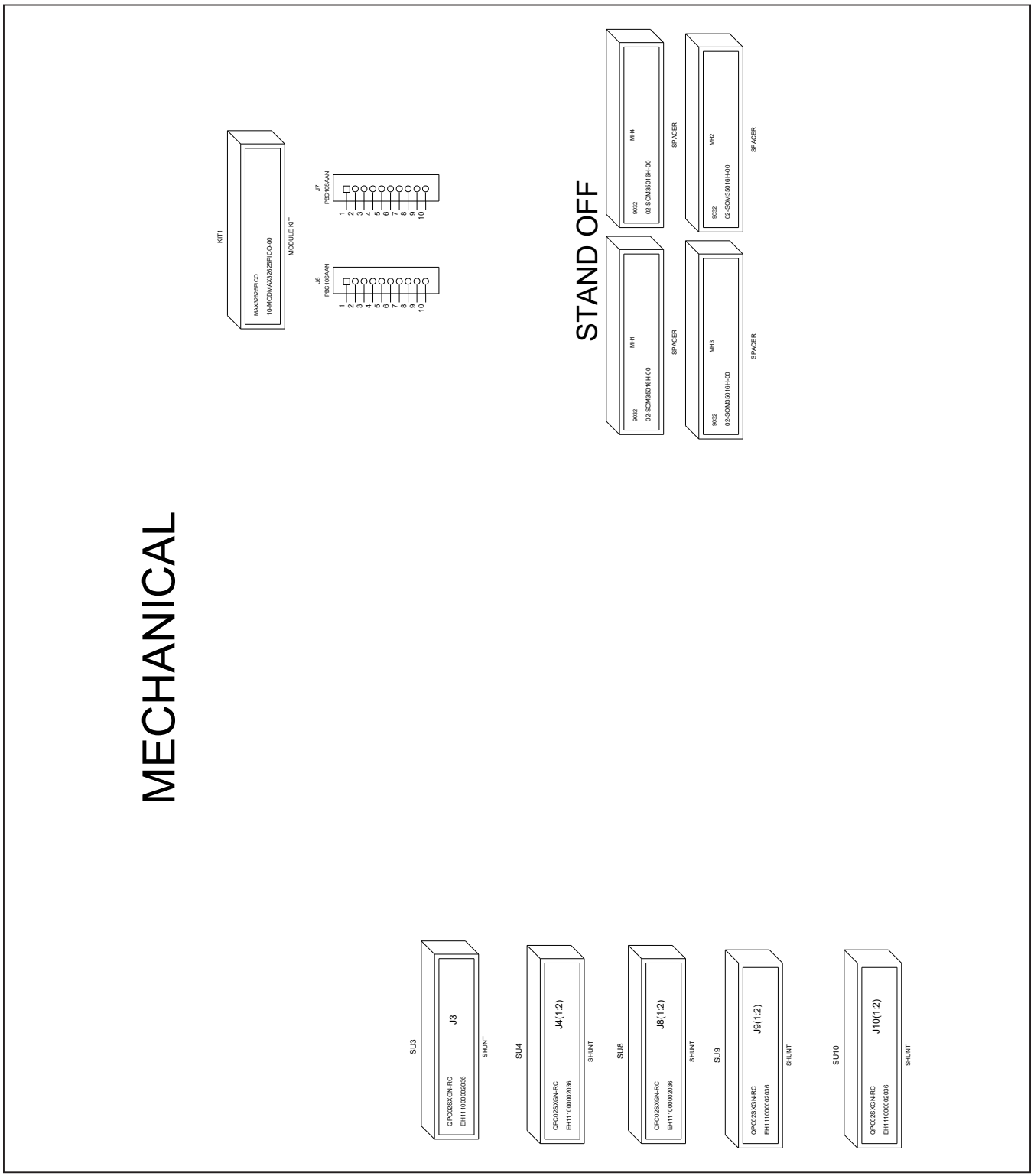
PART	TYPE
MAX19792EVKIT#	EV Kit

#Denotes RoHS compliance

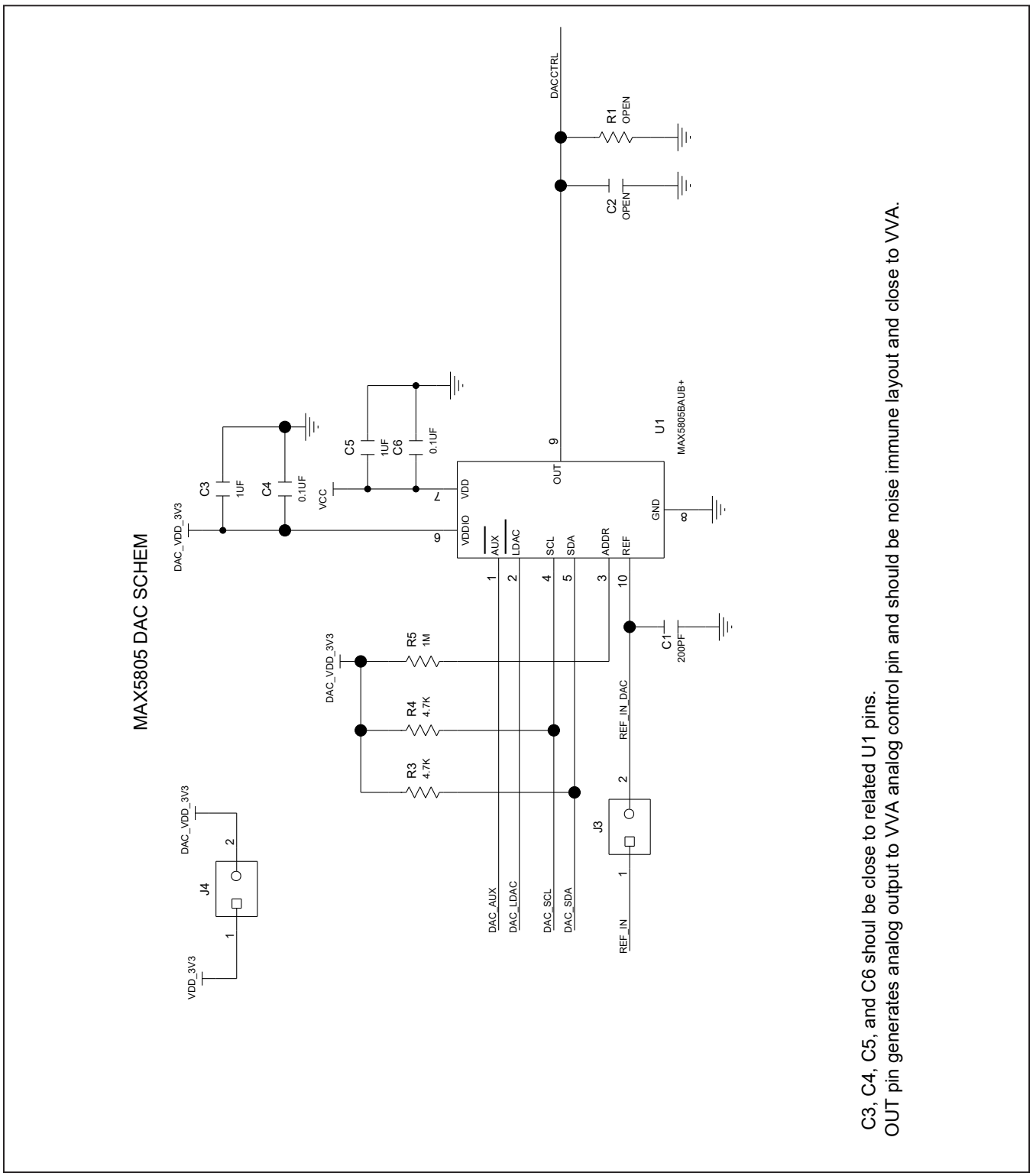
MAX19792 EV Kit Bill of Materials

NOTE: DNI --> DO NOT INSTALL(PACKOUT); DNP --> DO NOT PROCURE						
ITEM	**REF_DES**	**QTY**	**MFG PART #**	**MANUFACTURER**	**VALUE**	**DESCRIPTION**
1	C1	1	C0402C201J5GAC; GRM1555C1H201JA01	KEMET;MURATA	200PF	CAPACITOR; SMT (0402); CERAMIC CHIP; 200PF; 50V; TOL=5%; MODEL=; TG=-55 DEGC TO +125 DEGC; TC=C0G
2	C3, C5, C20-C22	5	EMK105BJ105KV	TAIYO YUDEN	1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 1UF; 16V; TOL=10%; TG=-55 DEGC TO +85 DEGC; TC=X5R ;
3	C4, C6	2	GRM155R61C104KA88	MURATA	0.1UF	CAPACITOR; SMT (0402); CERAMIC; 0.1UF; 16V; TOL=10%; MODEL=GRM SERIES; TG=-55 DEGC to +85 DEGC; TC=X5R
4	C7, C13, C14, C17, C18	5	GRM155R71H102JA01; GCM155R71H102JA37	MURATA;MURATA	1000PF	CAPACITOR; SMT (0402); CERAMIC CHIP; 1000PF; 50V; TOL=5%; MODEL=GRM SERIES; TG=-55 DEGC TO +125 DEGC; TC=X7R
5	C10, C11, C15	3	UMK105CG220JV; GRM1555C1H220JA01; GCM1555C1H220JA16	TAIYO YUDEN;MURATA; MURATA	22PF	CAPACITOR; SMT (0402); CERAMIC CHIP; 22PF; 50V; TOL=5%; TG=-55 DEGC TO +125 DEGC; TC=C0G
6	C23	1	JMK212BJ226KG	TAIYO YUDEN	22UF	CAPACITOR; SMT (0805); CERAMIC CHIP; 22UF; 6.3V; TOL=10%; MODEL=M SERIES; TG=-55 DEGC TO +85 DEGC; TC=X5R
7	COMP_OUT	1	5002	KEYSTONE	N/A	TEST POINT; PIN DIA=0.1IN; TOTAL LENGTH=0.3IN; BOARD HOLE=0.04IN; WHITE; PHOSPHOR BRONZE WIRE SILVER;
8	D1	1	LTST-C170EKT	LITE-ON ELECTRONICS INC	LTST-C170EKT	DIODE; LED; STANDARD; RED; SMT (0805); PIV=2.0V; IF=0.02A
9	D2	1	LTST-C170GKT	LITE-ON ELECTRONICS INC	LTST-C170GKT	DIODE; LED; STANDARD; GREEN; SMT (0805); PIV=2.1V; IF=0.01A
10	GND, TP2, TP5, TP7	4	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;
11	J1, J2, J5	3	132322	AMPHENOL	132322	CONNECTOR; FEMALE; BOARDMOUNT; SMA END LAUNCH RECEPT. JACK; 0.25IN SQUARE FLANGE; 0.062IN BOARD THICKNESS; STRAIGHT; 5PINS
12	J3, J4	2	PEC02SAAN	SULLINS	PEC02SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 2PINS
13	J6, J7	2	PBC10SAAN	SULLINS ELECTRONICS CORP.	PBC10SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 10PINS; -65 DEGC TO +125 DEGC
14	J8-J10	3	PEC03SAAN	SULLINS	PEC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 3PINS
15	KIT1	1	MAX32625PICO	MAXIM	MAX32625PICO	MODULE; BOARD; MAX32625PICO BOARD DESIGN FOR MAX32625 ARM CORTEX-M4F; BOARD; LAMINATED PLASTIC WITH COPPER CLAD;
16	MH1-MH4	4	9032	KEYSTONE	9032	MACHINE FABRICATED; ROUND-THRU HOLE SPACER; NO THREAD; M3.5; 5/8IN; NYLON
17	P8, P9	2	801-93-010-10-001000	MILL-MAX	801-93-010-10-001000	IC-SOCKET;SIP; STANDARD SOLDER TAIL; 801 SERIES; 0.024D/0.118L; 0.1IN GRID; STRAIGHT SOCKET; OPEN FRAME; 10PINS
18	R2	1	ERJ-2GEJ201	PANASONIC	200	RESISTOR; 0402; 200 OHM; 5%; 200PPM; 0.1W; THICK FILM
19	R3, R4	2	ERJ-2GEJ472	PANASONIC	4.7K	RESISTOR; 0402; 4.7K OHM; 5%; 200PPM; 0.10W; THICK FILM
20	R5	1	RC0402JR-071ML	YAGEO	1M	RES; SMT (0402); 1M; 5%; +/-100PPM/DEGC; 0.063W
21	R6, R10	2	ERJ-2GEJ102	PANASONIC	1K	RESISTOR; 0402; 1K OHM; 5%; 200PPM; 0.10W; THICK FILM
22	R7, R11	2	ERJ-2GEJ100	PANASONIC	10	RESISTOR; 0402; 10 OHM; 5%; 200PPM; 0.1W; THICK FILM
23	SU3, SU4, SU8-SU10	5	QPC02SXGN-RC	SULLINS ELECTRONICS CORP.	QPC02SXGN-RC	CONNECTOR; FEMALE; 0.100IN CC; OPEN TOP; JUMPER; STRAIGHT; 2PINS
24	TP8	1	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;
25	U1	1	MAX5805BAUB+	MAXIM	MAX5805BAUB+	IC; DAC; ULTRA-SMALL; SINGLE-CHANNEL; 12-BIT BUFFERED OUTPUT VOLTAGE DACS WITH INTERNAL REFERENCE AND I2C INTERFACE; UMAX10
26	U2	1	MAX19792ETX+	MAXIM	MAX19792ETX+	IC; ATTEN; 500 MHZ TO 4000 MHZ DUAL ANALOG VOLTAGE VARIABLE ATTENUATOR WITH ON-CHIP 10-BIT SPI-CONTROLLED DAC; TQFN36-EP
27	PCB	1	MAX19792	MAXIM	PCB	PCB:MAX19792
28	R1, R8, R9, R12-R15, R17-R19	0	N/A	N/A	OPEN	PACKAGE OUTLINE 0402 RESISTOR
29	C2, C8, C9, C12, C16, C19	0	N/A	N/A	OPEN	PACKAGE OUTLINE 0402 NON-POLAR CAPACITOR
TOTAL		**58**				

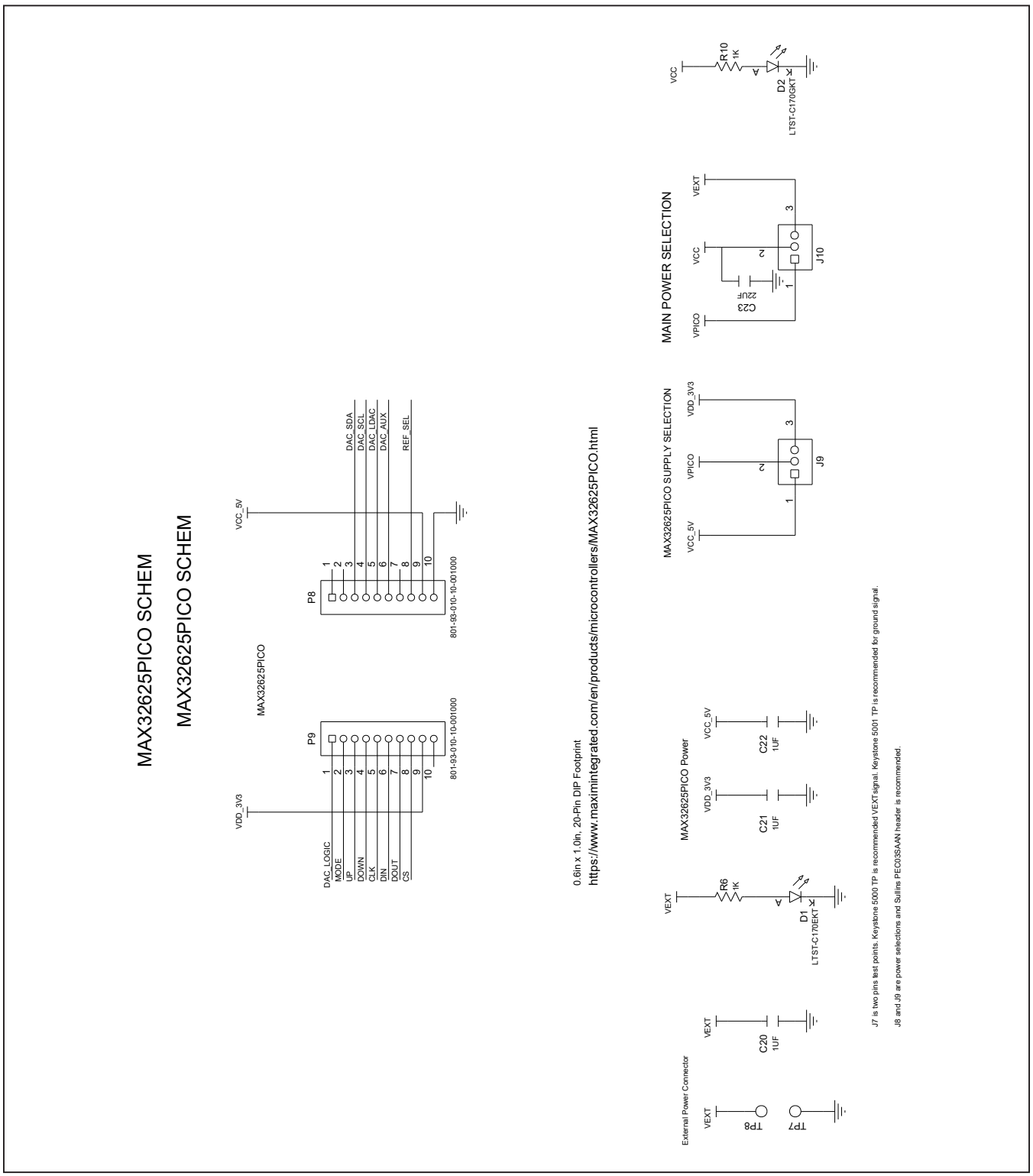
MAX19792 EV Kit Schematics



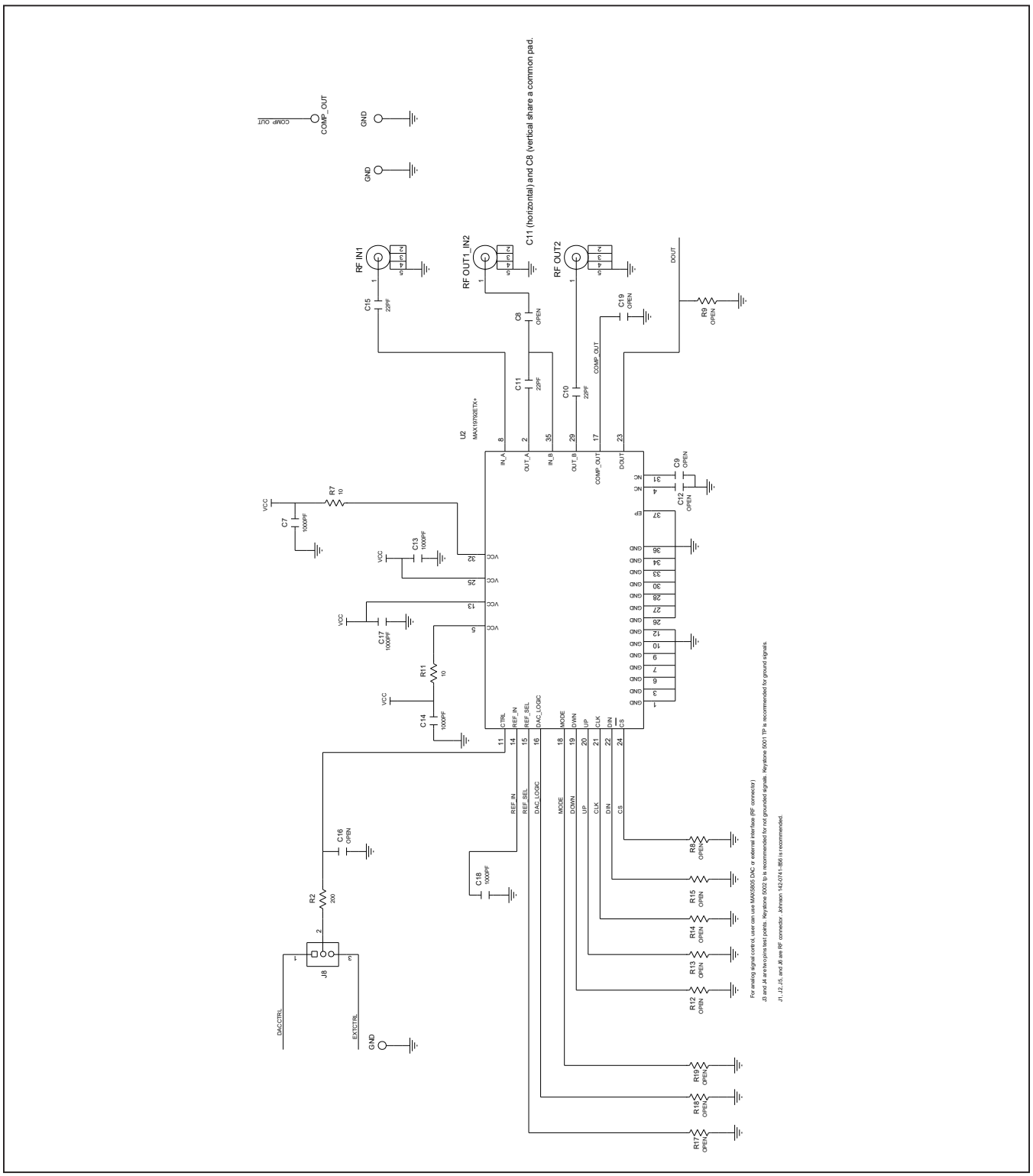
MAX19792 EV Kit Schematics (continued)



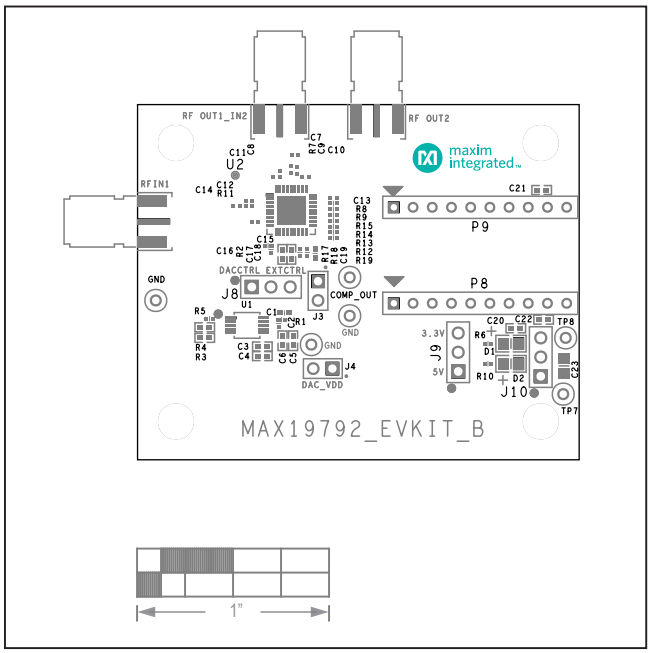
MAX19792 EV Kit Schematics (continued)



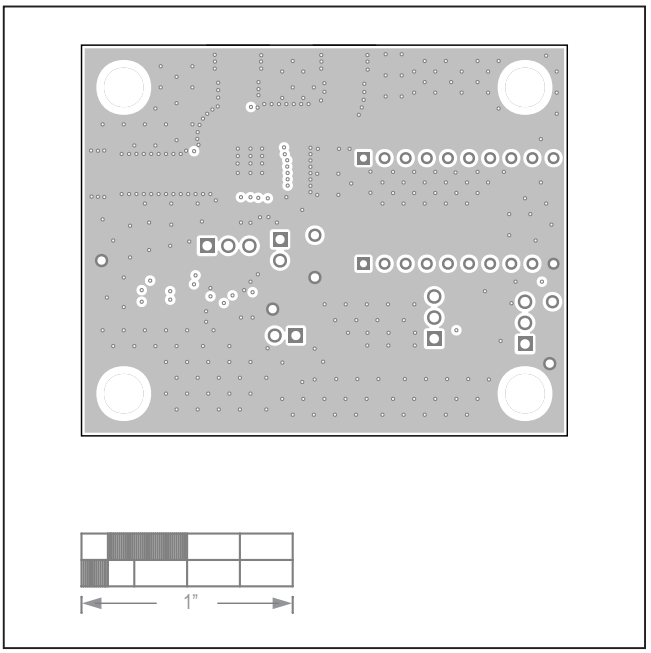
MAX19792 EV Kit Schematics (continued)



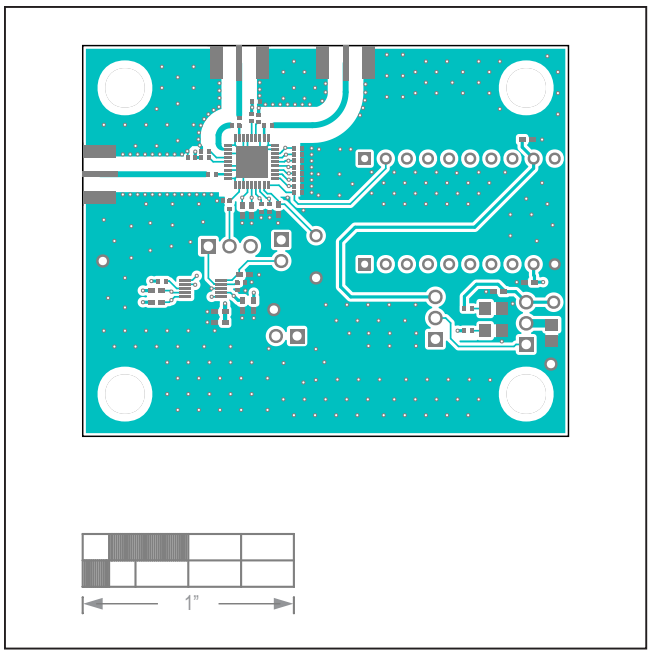
MAX19792 EV Kit PCB Layouts



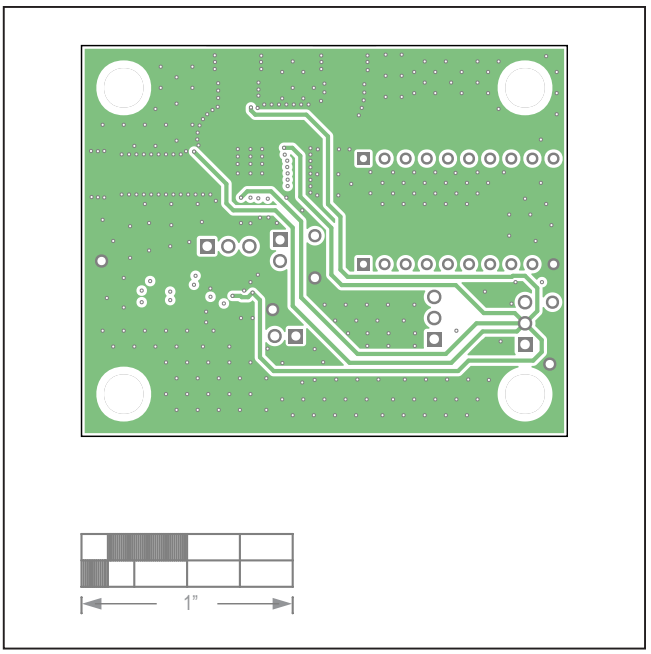
MAX19792 EV Kit PCB Layout—Silk Top



MAX19792 EV Kit PCB Layout—Internal2

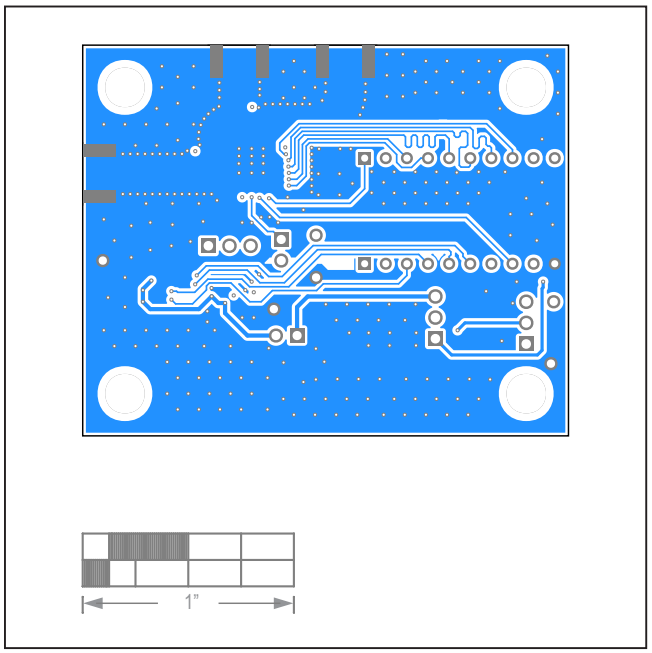


MAX19792 EV Kit PCB Layout—Top

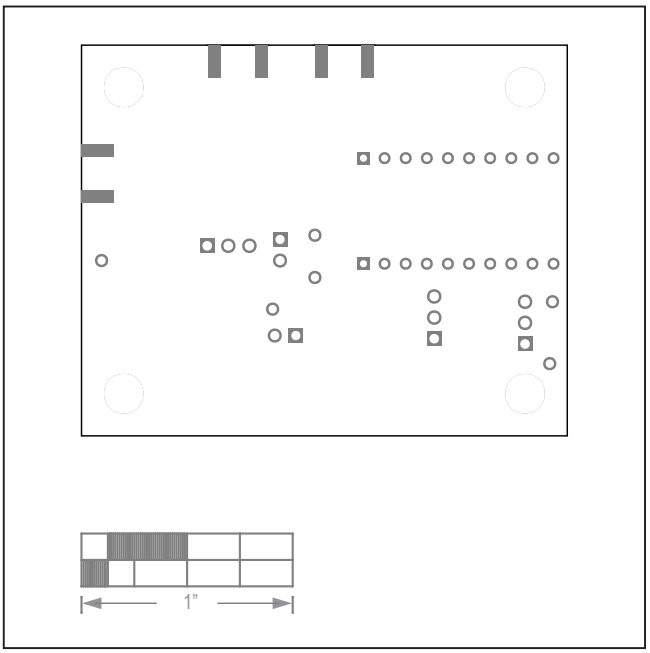


MAX19792 EV Kit PCB Layout—Internal3

MAX19792 EV Kit PCB Layouts (continued)



MAX19792 EV Kit PCB Layout—Bottom



MAX19792 EV Kit PCB Layout—Silk Bottom

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	2/21	Initial release	—

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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