

MAX22505 Evaluation Kit

Evaluates: MAX22505

General Description

The MAX22505 evaluation kit (EV kit) is a fully assembled and tested circuit board that evaluates the MAX22505 $\pm 40\text{V}$ USB port protector.

The EV kit consists of 3 independent sections: A high-power peripheral section, a low-power peripheral section, and a high-power host section. Each section demonstrates protecting a USB bus from overvoltage conditions on the USB lines.

The high-power peripheral section adds external MOSFET switches to the low-power peripheral circuit, reducing losses to power delivered to the peripheral.

The EV kit powers completely from the USB host, such as a laptop, and requires no other power source. For peripheral applications, an isolated supply is offered for convenience but is not necessary in customer applications. Test access points are provided to optionally power each circuit section externally.

Features

- Derives Power From a USB Host
- Proven PCB Layout
- Fully Assembled and Tested

Ordering Information appears at end of data sheet.

Quick Start

Recommended Equipment

- MAX22505 EV kit
- Laptop with USB port
- Standard USB cable (A to B)
- High-speed USB peripheral, such as a thumb drive

Procedure

The EV kit is fully assembled and tested. Follow the steps below to verify board operation before exercising the full features of the device:

- 1) Verify that all the jumpers are in their default positions, as shown in [Table 1](#).
- 2) Using a USB cable, connect a laptop USB port to P1.
- 3) Connect a thumb drive to P2.
- 4) Verify that the laptop detects the thumb drive. Transfer a file to or from the thumb drive.
- 5) Repeat steps 2 through 4, connecting the laptop to P101 and the thumb drive to P102.
- 6) Repeat steps 2 through 4, connecting the laptop to P202 and the thumb drive to P201.

Detailed Description

The MAX22505 EV kit is a fully tested circuit board demonstrating the capabilities of the MAX22505 $\pm 40V$ USB port protector.

On-Board Isolated Power

The supply power for the MAX22505 shares the same power domain as the protected side signals. For this reason, to obtain supply power from the host side, an isolated supply circuit must be used in the case of the protected peripherals.

A MAX258 (U2, U102) transformer driver feeds power to an isolation transformer (T1, T101), through to a MAX8719 (U3, U103) LDO, providing an isolated 5 volts for the MAX22505.

An indicator (LED2, LED102, LED202) illuminates green when power is supplied to the corresponding MAX22505 EV kit section.

To provide external power to the high power peripheral section, move jumper JU3 to the 1-2 position, and provide isolated 5 volts between TP6 (EXT 5V) and TP7 (GND).

To provide external power to the low power peripheral section, move jumper JU103 to the 1-2 position, and provide isolated 5 volts between TP106 (EXT 5V) and TP107 (GND).

To provide external power to the protected host section, move jumper JU202 to the 2-3 position, and provide 5 volts between TP208 (EXT 5V) and TP203 (GND).

Fault Indicator LED

The FLTB open-drain output asserts active low when any overvoltage could be presented to the protected side (PVBUS, PDP, PDN, GND).

Should this occur, a FAULT indicator illuminates red (LED3, LED103, LED203) until the overvoltage is removed.

High Common Mode Indicator LED

The HCMB open-drain output asserts active-low when a high common mode voltage is present which has caused the MAX22505 to force USB traffic to full-speed mode.

Should this occur, an HCMB indicator illuminates red (LED1, LED101, LED201).

The MAX22505 EV kit defaults to high-speed fallback enabled. To disable this feature, short the appropriate jumper (JU1, JU101, JU201) before power-up for the MAX22505 EV kit. In this case, the corresponding HCMB LED will remain illuminated until the jumper short is removed.

Table 1. Jumper Descriptions

JUMPER	SHUNT POSITON	DESCRIPTION
JU1	Open*	High power peripheral section full-speed fallback enable
	Closed	High power peripheral section full-speed fallback disable
JU2	Open	High power peripheral section isolated power disable
	Closed*	High power peripheral section isolated power enable
JU3	1-2	High power peripheral section uses external power from TP6
	2-3*	High power peripheral section uses built-in isolated power
JU101	Open*	Low power peripheral section full-speed fallback enable
	Closed	Low power peripheral section full-speed fallback disable
JU102	Open	Low power peripheral section isolated power disable
	Closed*	Low power peripheral section isolated power enable
JU103	1-2	Low power peripheral section uses external power from TP106
	2-3*	Low power peripheral section uses built-in isolated power
JU201	Open*	Protected host section full-speed fallback enable
	Closed	Protected host section full-speed fallback disable
JU202	1-2*	Protected host section uses power from USB host via P202
	2-3	Protected host section uses external power from TP208

*Default position.

Table 2. Test Point Description

TEST POINT	DESCRIPTION
TP1 (GRN)	UGND, high power peripheral section; potentially unsafe ground from USB host
TP2 (BLK)	GND, high power peripheral section; protected ground to USB peripheral
TP3 (BLK)	GND, high power peripheral section; protected ground to USB peripheral
TP4 (YEL)	HCMB output, high power peripheral section
TP5 (YEL)	FLTB ouput, high power peripheral section
TP6 (RED)	External 5V input, high power peripheral section (see JU3 description above)
TP7 (BLK)	GND, high power peripheral section; protected ground to USB peripheral
TP101 (GRN)	UGND, low power peripheral section; potentially unsafe ground from USB host
TP102 (BLK)	GND, low power peripheral section; protected ground to USB peripheral
TP103 (BLK)	GND, low power peripheral section; protected ground to USB peripheral
TP104 (YEL)	HCMB output, low power peripheral section
TP105 (YEL)	FLTB ouput, low power peripheral section
TP106 (RED)	External 5V input, low power peripheral section (see JU103 description above)
TP107 (BLK)	GND, low power peripheral section; protected ground to USB peripheral
TP201 (GRN)	UGND, protected host section; potentially unsafe ground from USB peripheral
TP202 (BLK)	GND, protected host section; protected ground to USB host
TP203 (BLK)	GND, protected host section; protected ground to USB host
TP204 (YEL)	HCMB output, protected host section
TP205 (YEL)	FLTB ouput, protected host section
TP208 (ORG)	External 5V input, Protected host section (see JU202 description above)

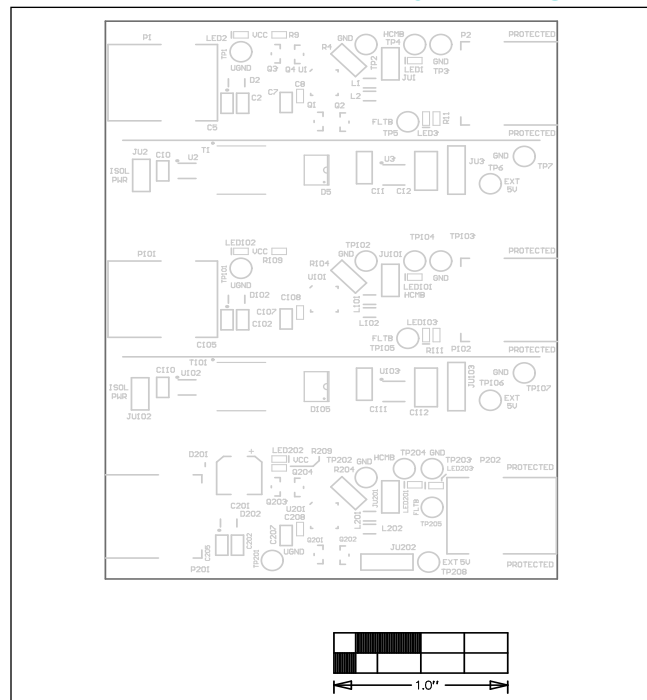
MAX22505 EV Kit Bill of Materials

ITEM	REF_DES	DNI/ DNP	QTY	MFG PART #	MFG	VALUE	DESCRIPTION
1	C1, C7, C10, C101, C107, C109, C110, C207	-	8	CL10B10 5KP8NN NC	Samsung	1UF	CAPACITOR; SMT (0603); CERAMIC CHIP; 1UF; 10V; TC=X7R
2	C2, C5, C102, C105, C202, C205	-	6	R71H104 KA57D	Murata	0.1UF	CAPACITOR; SMT (0603); CERAMIC CHIP; 0.1UF; 50V; TC=X7R
3	C4, C104	-	2	R71H472 KA01D	Murata	4700PF	CAPACITOR; SMT (0603); CERAMIC CHIP; 4700PF; 50V; TC=C0G
4	C6, C106, C206	-	3	R71H475 KA12L	Murata	4.7UF	CAPACITOR; SMT; 1206; CERAMIC; 4.7uF; 50V; X7R
5	C8, C108, C208	-	3	04K8RA CTU	Kemet	0.1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.1UF; 10V; TC=X7R
6	C9, C209	-	2	R71C475 KA73L	Murata	4.7UF	CAPACITOR; SMT (0805); CERAMIC CHIP; 4.7UF; 16V; TC=X7R
7	C11, C111	-	2	R71H105 KA88L	Murata	1UF	CAPACITOR; SMT (1206); CERAMIC CHIP; 1UF; 50V; TC=X7R
8	C12, C13, C112, C113	-	4	R71C106 KA01L	Murata	10UF	CAPACITOR; SMT (1210); CERAMIC CHIP; 10UF; 16V; MODEL=X7R
9	C201	-	1	FK1E101 XP	Panasonic	100UF	CAPACITOR; SMT (XXXX); ALUM; 100UF; 25V
10	D1, D3, D101, D103, D201, D203	-	6	D5V0M1 U2S9-7	Diodes Inc	5.5V	DIODE; TVS; SOD923; VWM=5.5V; VC=11V
11	D2, D102, D202	-	3	7	Diodes Inc	85V	DIODE; TVS; SOT363; VWM=85V
12	D5, D105	-	2	MB1S	Fairchild	100V	IP=0.5A
13	D6, D106, D206	-	3	SMAJ40 CA-13-F	Diodes Inc	40V	DIODE; TVS; SMA; VWM=40V
14	JU1, JU2, JU101, JU102, JU201	-	5	2.2E+07	Molex	22284363	CONN HDR; 100<IL; PINS=2
15	JU3, JU103, JU202	-	3	2.2E+07	Molex	22284363	CONN HDR; 100<IL; PINS=3
16	L1, L2, L101, L102, L201, L202	-	6	N20NJ00 D	Murata	20nH	INDUCTOR; SMT (0603); FERRITE; 20NH; 160MOHM; 550MA
17	LED1, LED3, LED101, LED103, LED201, LED203	-	6	SML- P12UTT8 6	Rohm	SML- P12UTT86	LED; 0402; RED CLEAR; 10MA
18	LED2, LED102, LED202	-	3	P12PT18 6	Rohm	SML- P12PTT86	LED; 0402; GRN CLEAR; 10MA
19	P1, P101, P202	-	3	004-90- 000000	Mill-Max	897-43-004 90-000000	CONNECTOR; THROUGH HOLE; USB YYPE B; RECEPTACLE; RIGHT ANGLE; 4PINS
20	P2, P102, P201	-	3	004-00- 000000	Mill-Max	896-43-004 00-000000	CONNECTOR; SMT; USB YYPE A; RECEPTACLE; RIGHT ANGLE; 4PINS
21	Q1-Q4, Q201-Q204	-	8	NH6327X TSA1	Infineon	H6327XTS A1	TRAN; MOSFET; NCH; SC59; I-(-2.3A); V-(-60V)
22	R1, R101	-	2	8ENF100 2V	Panasonic	10K OHM	RESISTOR; 1206; 10K OHM; 1%; 0.25W
23	R3, R103, R203	-	3	AS12J1R 00ET	Ohmite	1 OHM	RESISTOR, 1206, 1 OHM,5%, 0.5W; SURGE
24	R4	-	1	8CWFR0 50V	Panasonic	0.05 OHM	RESISTOR; 1206; 0.05OHM; 1%; 1W
25	R5, R105	-	2	2RKFF309 2X	Panasonic	30.9K OHM	RESISTOR, 0402, 30.9K OHM, 1%, 0.1W
26	R6, R106	-	2	2RKFF102 2X	Panasonic	10.2K OHM	RESISTOR, 0402, 10.2K OHM, 1%, 0.10W
27	R7, R10, R107, R110, R207, R210	-	6	2RKFF100 2X	Panasonic	10K OHM	RESISTOR; 0402; 10.0K; 1%; 0.10W
28	R8, R9, R11, R108, R109, R111, R208, R209, R211	-	9	ERJ- 2RKFF301 1X	Panasonic	3.01K OHM	RESISTOR; 0402; 3.01K OHM; 1%; 0.10W
29	R104	-	1	06R200F KEA	Vishay	0.2 OHM	RESISTOR; 1206; 0.20OHM; 1%; 0.5W
30	R204	-	1	8CWFR0 25V	Panasonic	0.025 OHM	RESISTOR; 1206; 0.025 OHM; 1%; 1W

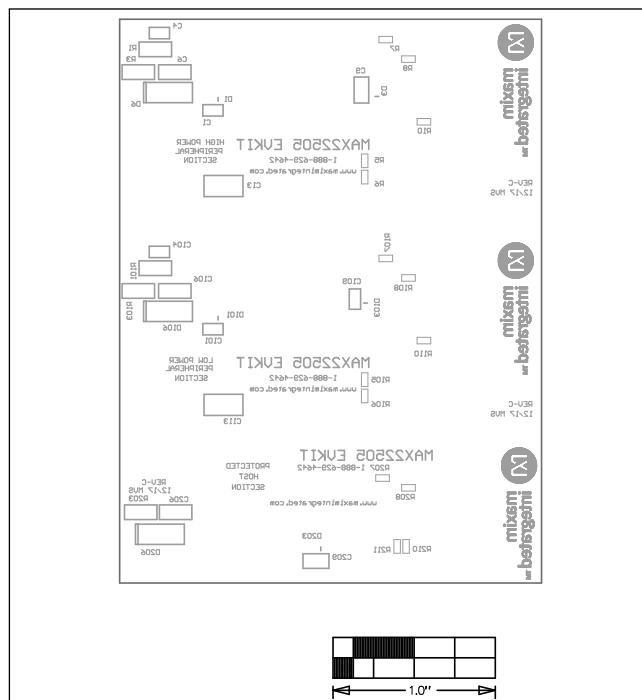
MAX22505 EV Kit Bill of Materials (continued)

ITEM	REF_DES	DNI/ DNP	QTY	MFG PART #	MFG	VALUE	DESCRIPTION
31	T1, T101	-	2	TGM-030P3RL	Halo Electronics	TGM-030P3RL	TRANSFORMER; 1:1:1.5; ISOL=600V
32	TP1, TP101, TP201	-	3	5121	Keystone	5121	TEST POINT; JUMPER; STR; GREEN
33	TP2, TP3, TP7, TP102, TP103, TP107, TP202, TP203	-	8	5011	Keystone	5011	TEST POINT; JUMPER; STR; BLACK
34	TP4, TP5, TP104, TP105, TP204, TP205	-	6	5009	Keystone	5009	TEST POINT; JUMPER; STR; YELLOW
35	TP6, TP106	-	2	5010	Keystone	5010	TEST POINT; JUMPER; STR; RED
36	TP208	-	1	5008	Keystone	5008	TEST POINT; JUMPER; STR; ORANGE
37	U1, U101, U201	-	3	5	Maxim	MAX22505	IC; ANALOG SW; USB PROTECTOR; TQFN4X4L24
38	U2, U102	-	2	MAX258ATA+	Maxim	MAX258ATA+	IC; XFMR DRV; TDFN2X3L8
39	U3, U103	-	2	MAX8719ETA+	Maxim	MAX8719ETA+	IC; VRM LDO; TDFN3X3L8
40	JU2, JU3, JU102, JU103, JU202	-	5	QPC02SXGN-RC	Sullins	QPC02SXGN-RC	JUMPER SHUNTS
41	PCB	-	1	5	MAXIM	PCB	PCB:MAX22505
TOTAL			144				
NOTE: DNI--> DO NOT INSTALL(PACKOUT) ; DNP--> DO NOT PROCURE							

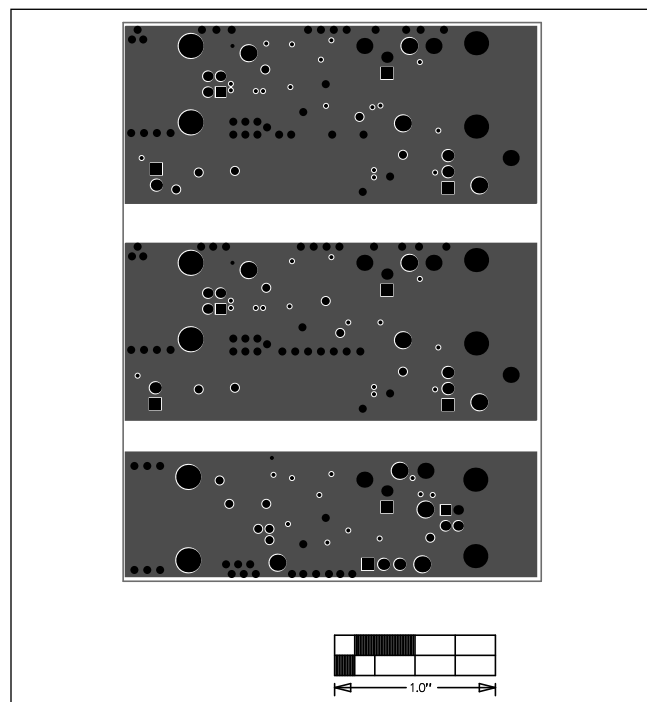
MAX22505 EV Kit PCB Layout Diagrams



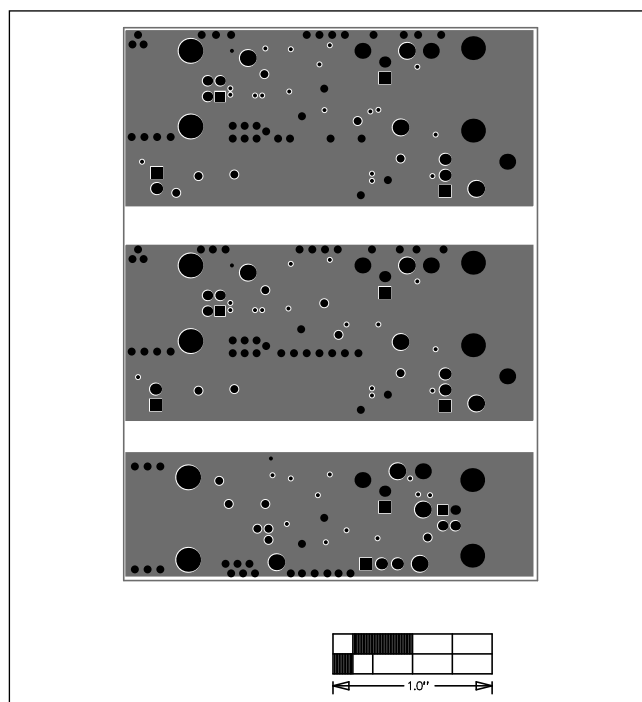
MAX22505 EV Kit—Component Placement Top



MAX22505 EV Kit—Component Placement Bottom

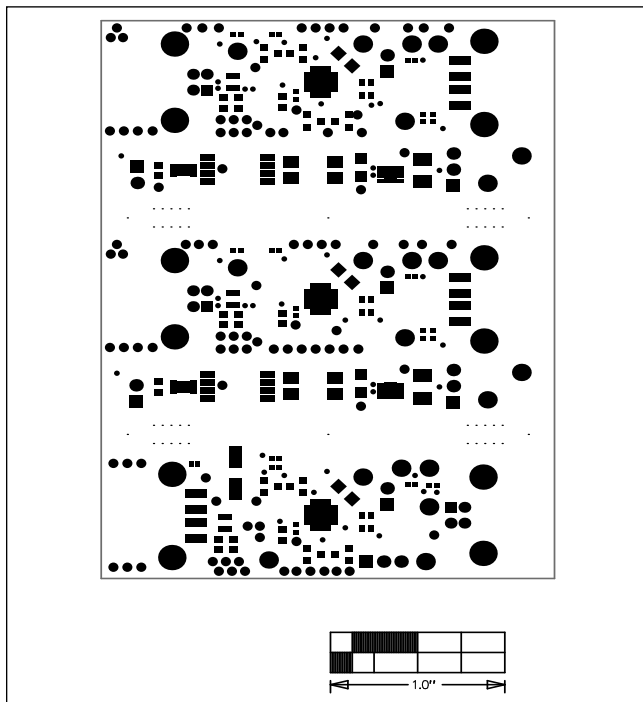


MAX22505 EV Kit—Middle Layer 1

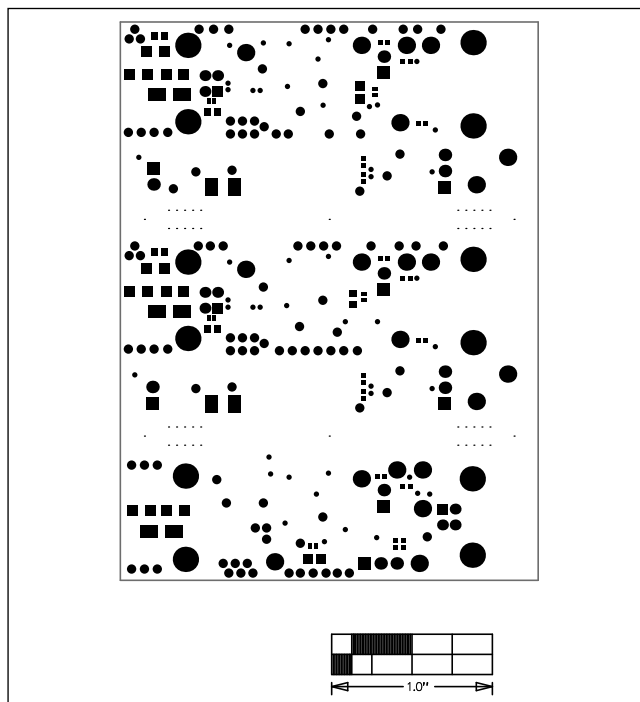


MAX22505 EV Kit—Middle Layer 2

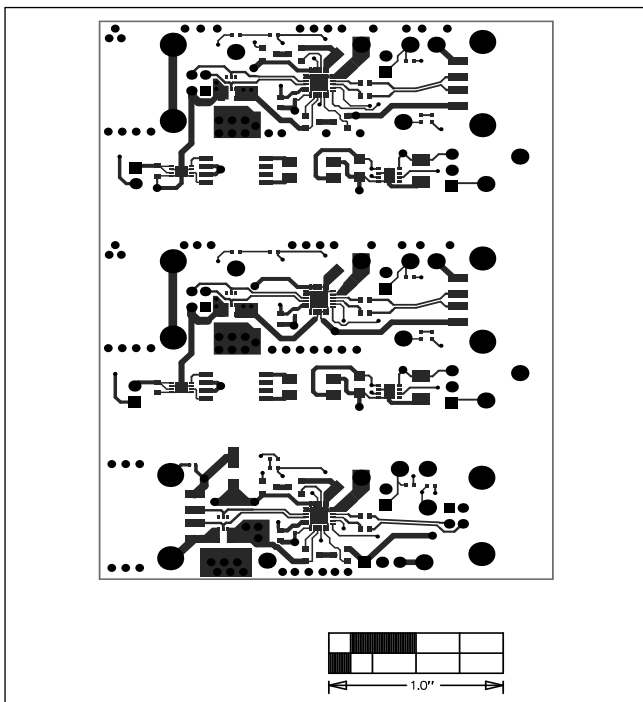
MAX22505 EV Kit PCB Layout Diagrams (continued)



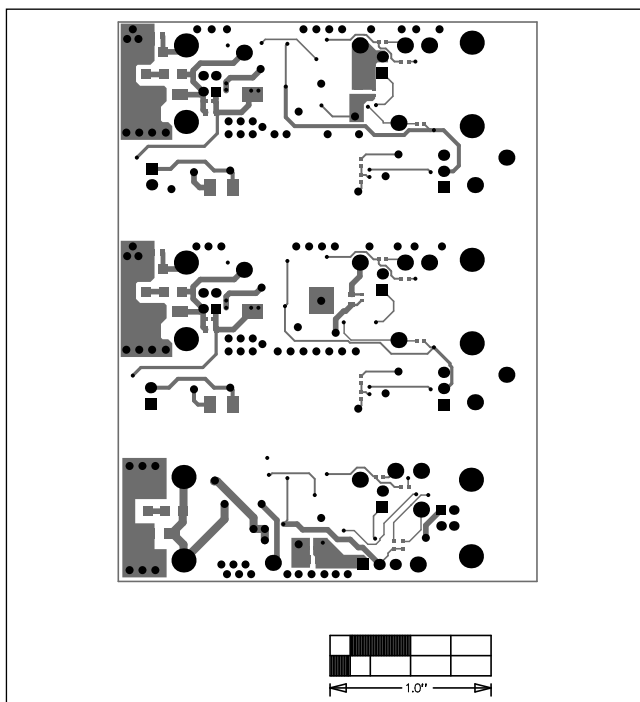
MAX22505 EV Kit—Top Solder Mask



MAX22505 EV Kit—Bottom Solder Mask

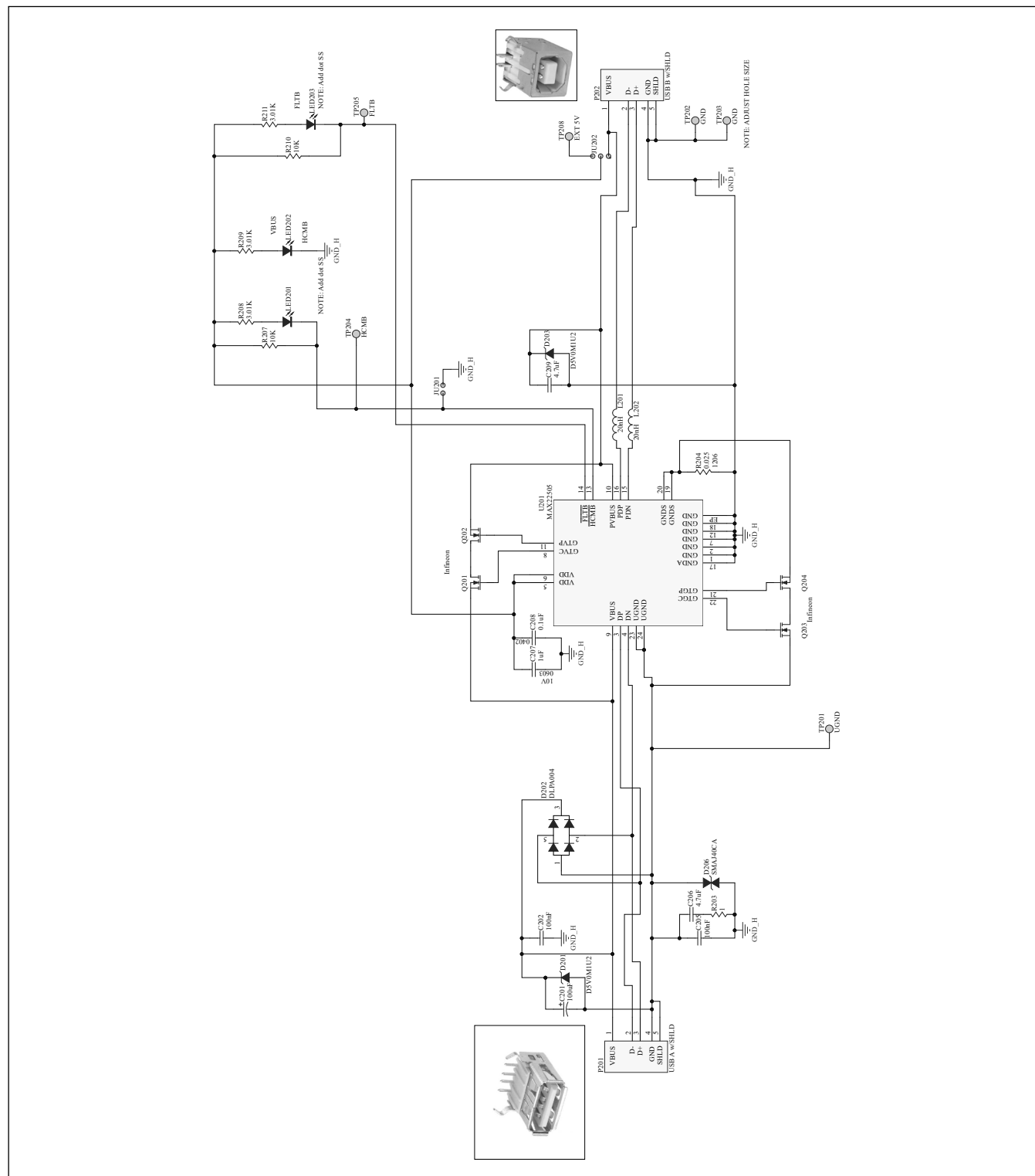


MAX22505 EV Kit—Top Copper

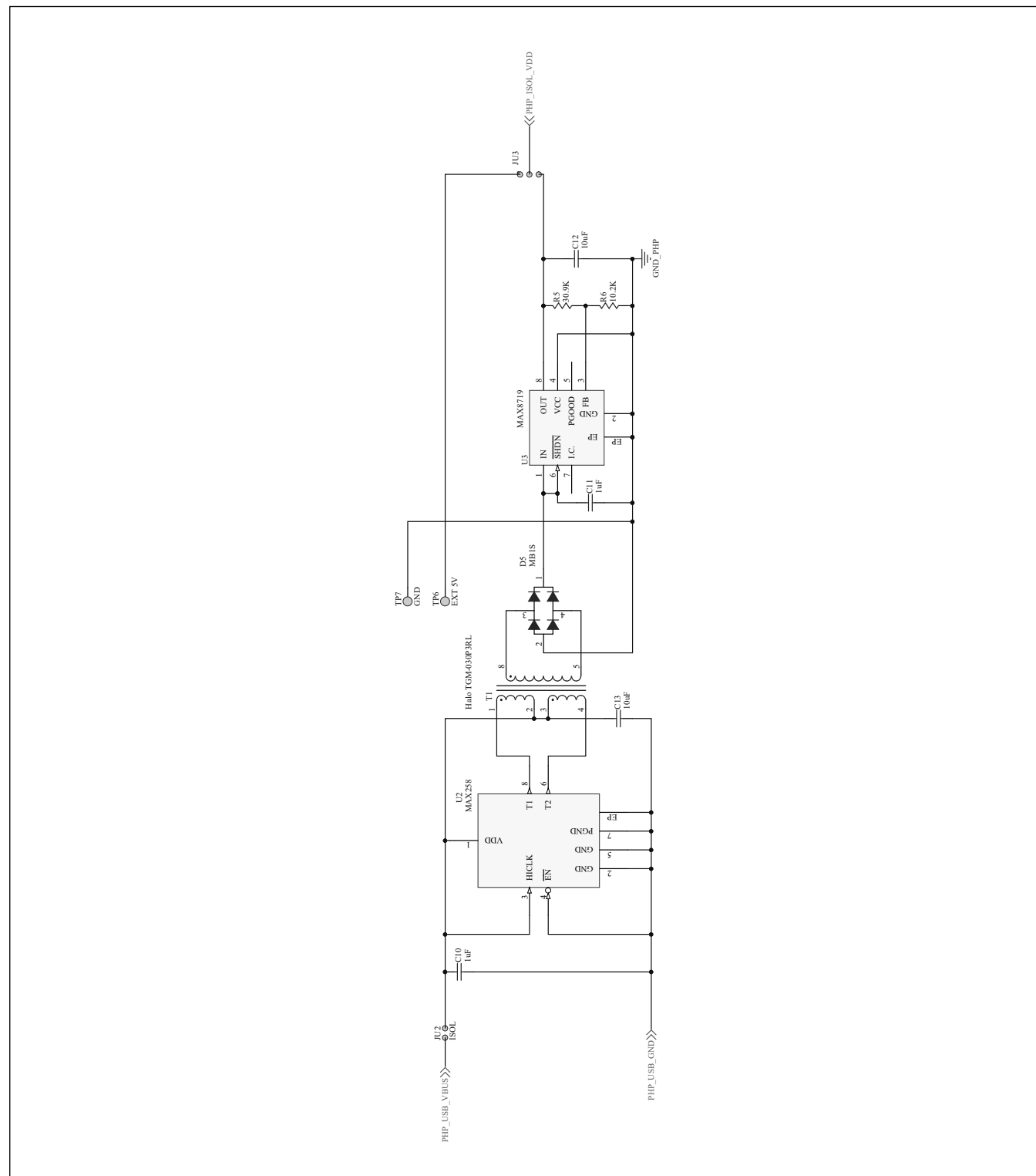


MAX22505 EV Kit—Bottom Copper

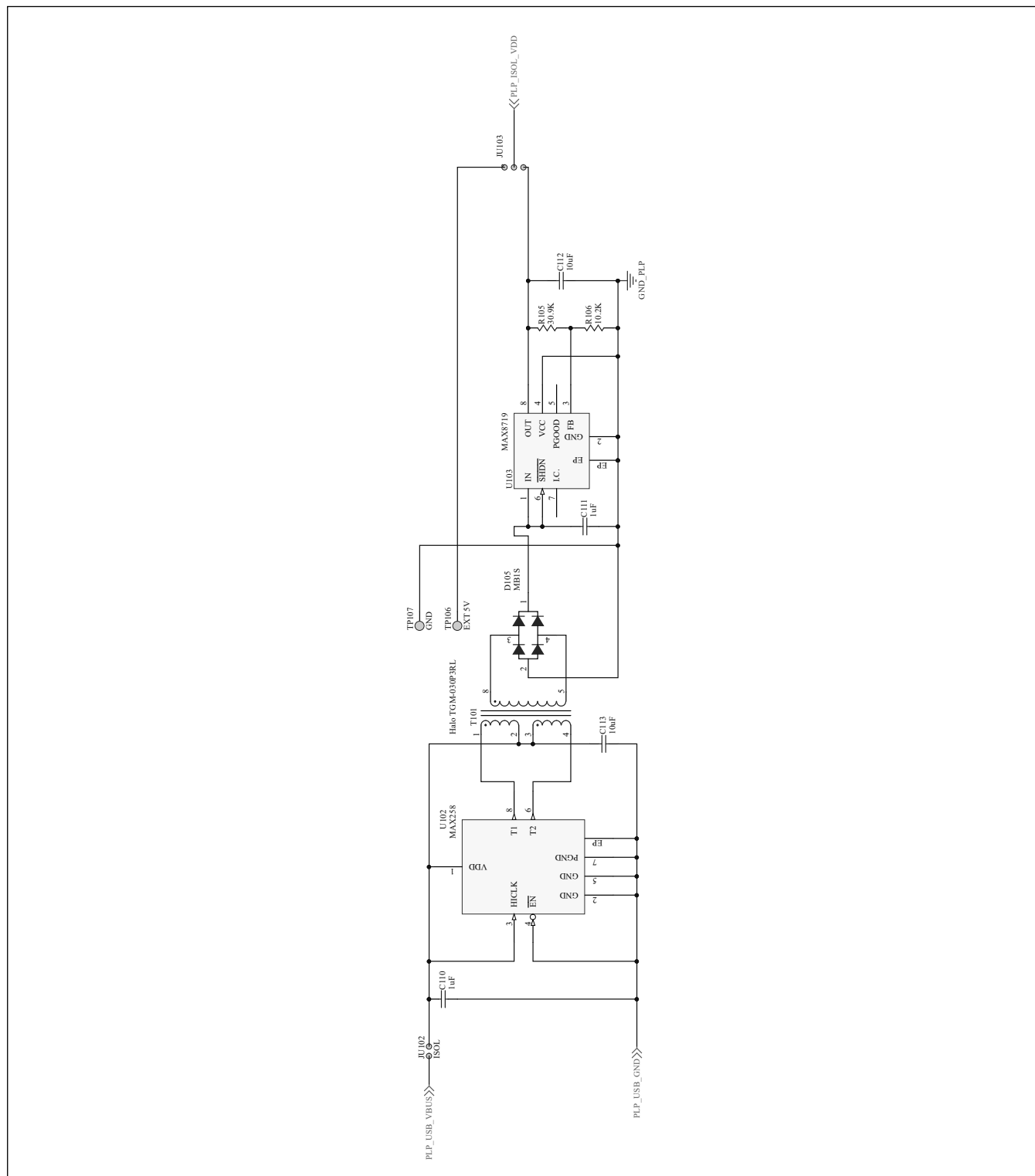
MAX22505 EV Kit Schematic



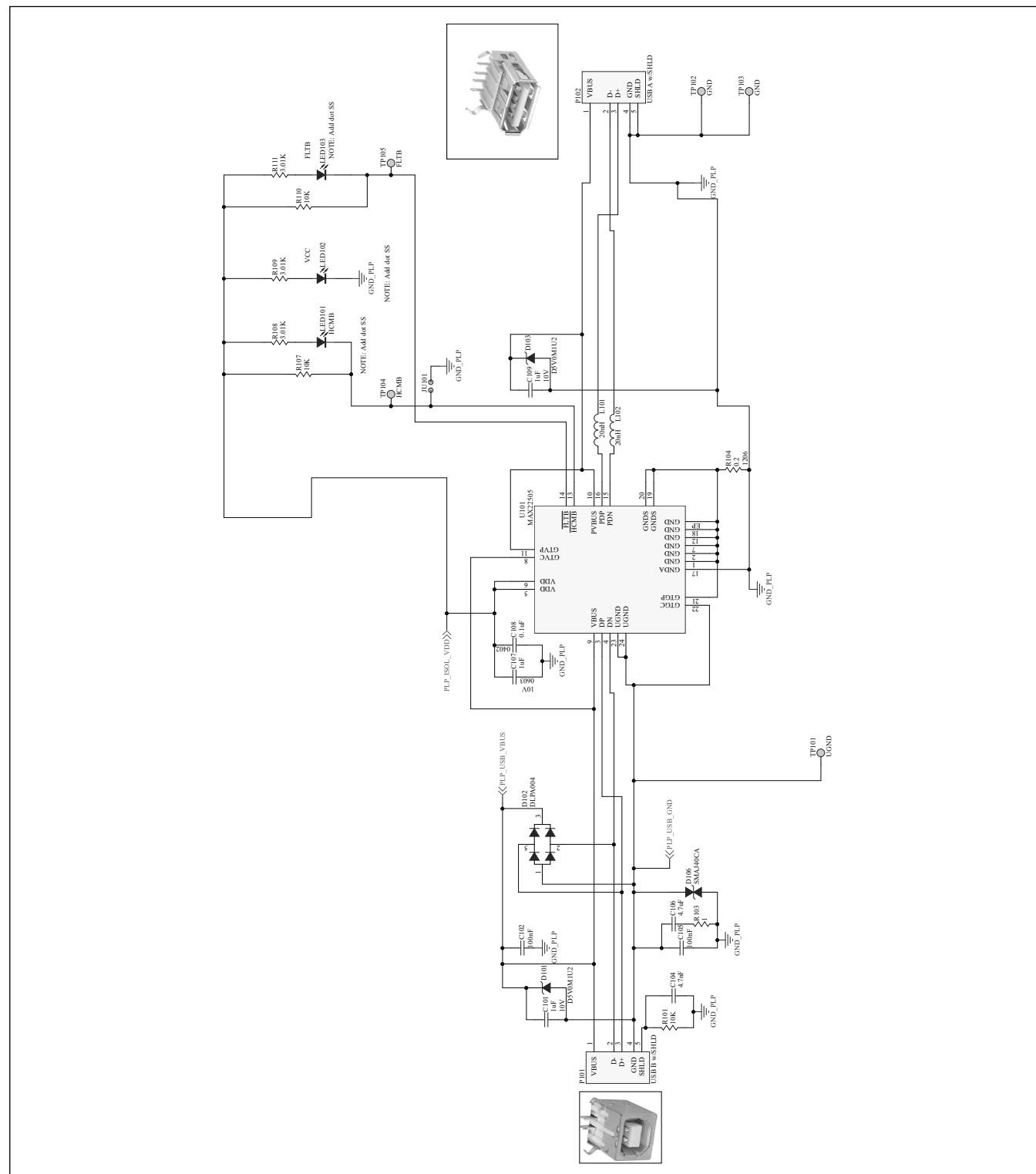
MAX22505 EV Kit Schematic (continued)



MAX22505 EV Kit Schematic (continued)



MAX22505 EV Kit Schematic (continued)



Ordering Information

PART	TYPE
MAX22505EVKIT#	EV Kit

#Denotes RoHS compliant.

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	4/18	Initial release	—

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim Integrated's website at www.maximintegrated.com.

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