

MAX25400 Evaluation Kit

Evaluates: MAX25400

General Description

The MAX25400 evaluation kit (EV kit) demonstrates the MAX25400 automotive Hi-Speed USB 2.0 protector switch IC, featuring overvoltage protection (OVP), electrostatic discharge (ESD) protection, and undervoltage lockout (UVLO) for automotive USB applications.

The device protects the D+ and D- data lines from overvoltage conditions, such as a short-to-battery and ESD events. All faults can be monitored using the FAULT output signal.

The device can pass high-speed USB differential (D+ and D-) signals up to 480Mbps using low 3.3Ω R_{ON} (typ) data switches. The EV kit is powered by the USB BUS. An on-board MAX15007A automotive regulator provides the IN reference voltage.

Features

- Protects D+ and D- Signals from Overvoltages Up to 18V and ESD Events
- USB BUS Undervoltage Lockout
- Passes 480Mbps USB Data Signals
- Low On-Resistance
 - D+ and D-: 3.3Ω (typ)
- FAULT Output Signal
- USB Powered
- Fully Assembled and Tested
- Evaluates the MAX25400 IC in a 12-Pin TQFN Package

Ordering Information appears at end of data sheet.

Quick Start

Required Equipment

- MAX25400 EV kit
- 5V, 2A DC power supply (Supply A)
- 18V, 2A DC power supply (Supply B)
- Logic function generator
- Oscilloscope

Procedure

The EV kit is fully assembled and tested. Use the following steps to verify board operation. **Caution: Do not turn on the power supplies until all connections are completed.**

- 1) Verify that the following shunt is installed:
 - J1: Pins 1-2 (IN connected to on-board 3.3V reference)
- 2) Set the Supply A output to 5V and disable the output.
- 3) Set the logic function generator as follows: 3V_{P-P}, 1.5V DC offset square wave, 500kHz, and disable the output.
- 4) Connect the Supply A positive output to the VBUS test point on the EV kit and connect the supply ground to the GND wire loop.
- 5) Using a Type A USB receptacle inserted into J3, connect the logic function generator to D+ and GND.
- 6) Enable the power-supply.
- 7) Enable the function generator output.
- 8) Use the oscilloscope to probe the HVD+ test point.
- 9) Verify that the part is powered and that the waveform on HVD+ is a 500kHz square wave and is approximately 3V_{P-P}.
- 10) Momentarily touch the HVD+ or HVD- test point on the EV kit with the voltage probe from the Supply B positive output. The FAULT signal asserts a logic-low while the fault is present.

Detailed Description of Hardware

The MAX25400 EV kit demonstrates the MAX25400 automotive Hi-Speed USB 2.0 protector switch IC, featuring OVP, ESD protection, and UVLO protection for automotive USB applications.

The IC protects the D+ and D- data lines from overvoltage conditions, such as a short-to-battery up to 18V and ESD events up to 25kV (air) and 8kV (contact). The OVP feature protects the D+ and D- lines against high-voltage conditions such as a short-to-BUS. The UVLO feature insures the externally powered VBUS is valid before turning the data switches on. All faults can be monitored using the $\overline{\text{FAULT}}$ PCB pad, pulled up to IN through resistor R1.

The device can pass high-speed USB differential (D+ and D-) signals up to 480Mbps, and a 3.3Ω R_{ON} (typ) for the D+ and D- data lines. The EV kit is powered by the USB BUS. The 3.3V automotive regulator (U2, MAX15007A) provides an on-board IN reference voltage. A user can provide a 3V to 3.6V IN reference voltage across the VIN and GND PCB pads. The MAX25400 (U1) IC's automotive operating temperature range is from -40°C to $+105^{\circ}\text{C}$.

Jumper Settings

IN Reference Voltage Selection (J1)

Jumper JU1 on the EV kit selects the reference voltage for the device's IN pin. IN can either be supplied by the USB BUS through the on-board automotive 3.3V regulator (U2, MAX15007A), or by a user-supplied reference voltage. Test points EXT_IN and GND are provided to supply the device with an external 3V to 3.6V reference voltage. See [Table 1](#) for proper J1 jumper settings.

Table 1. MAX25400 IN Reference Voltage Selection (J1)

SHUNT POSITION	IN PIN
1-2	Connected to on-board LDO
2-3	Connected to IN test point
Not installed	Unconnected

Ordering Information

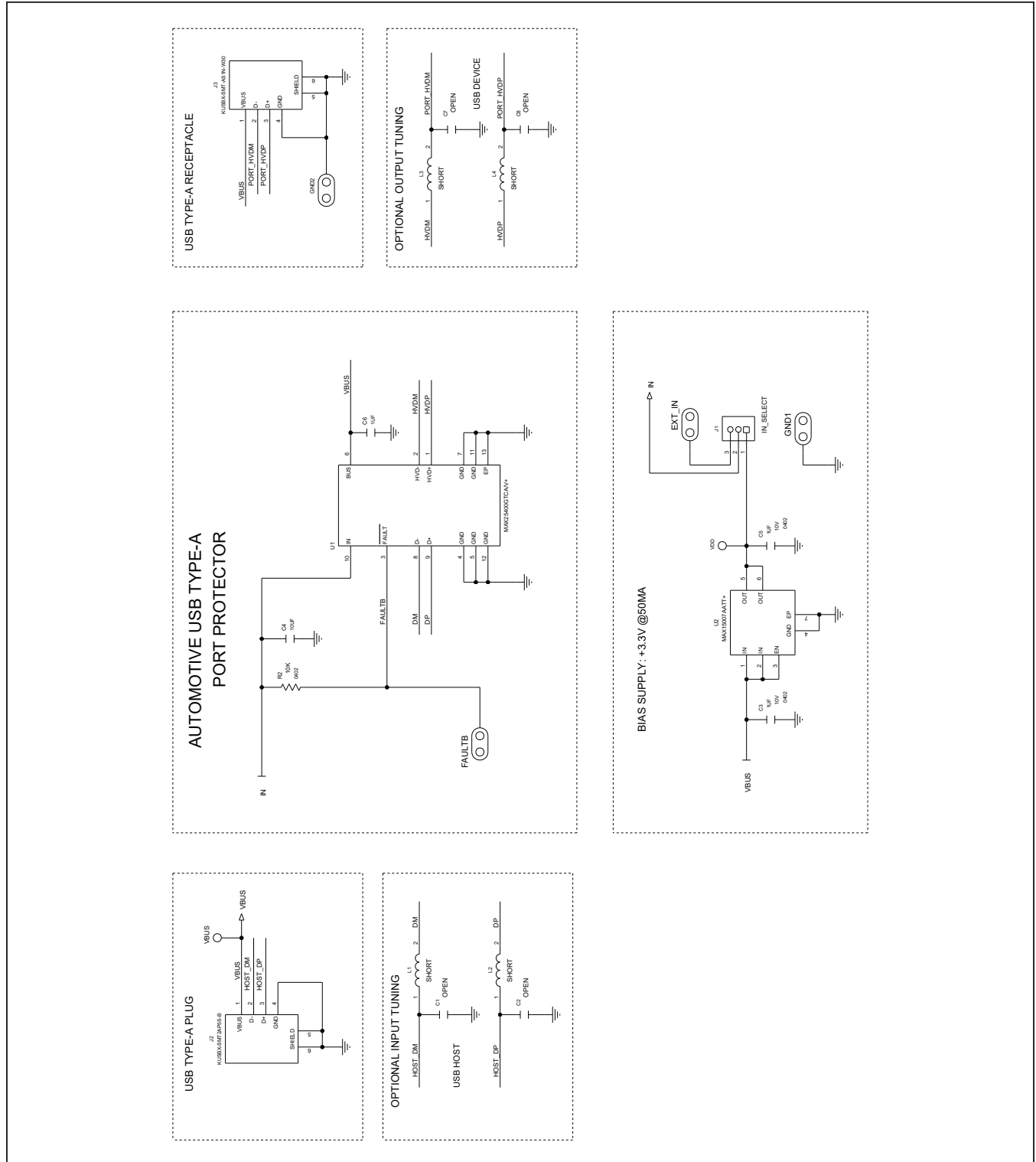
PART	TYPE
MAX25400EVKIT#	EV Kit

#Denotes RoHS compliance.

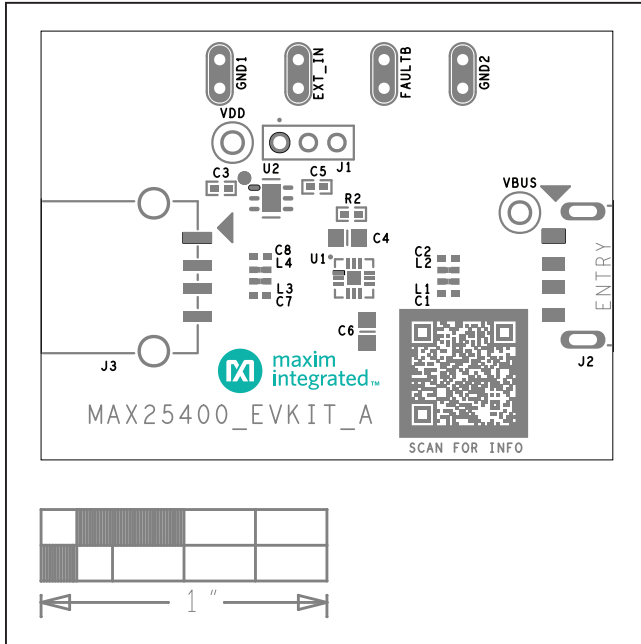
MAX25400 EV Bill of Materials

REF DES	MFG PART #	MANUFACTURER	DESCRIPTION
BUMPER1-BUMPER4	SJ-5306(CLEAR)	3M ELECTRONIC SOLUTIONS DIVISION	BUMPER; CLEAR-HEMISPHERICAL SHAPE EVKIT EH0875; 0.375D/0.15BH; RESILIENT ELASTOMER POLYURETHANE
C3, C5	CC0402KRX5R6BB105	YAGEO	CAPACITOR; SMT (0402); CERAMIC CHIP; 1UF; 10V; TOL=10%; TG=-55 DEGC TO +85 DEGC; TC=X5R
C4	GCM21BC71C106KE35	MURATA	CAPACITOR; SMT (0805); CERAMIC CHIP; 10UF; 16V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7S; AUTO
C6	GCM219R71C105KA37	MURATA	CAPACITOR; SMT (0805); CERAMIC CHIP; 1UF; 16V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R
EXT_IN, FAULTB, GND1, GND2	5020	KEYSTONE	EVKIT PART - MAXIM PAD; TEST POINT; PIN DIA=0.094IN; TOTAL LENGTH=0.350IN; BOARD HOLE=0.040IN; NONE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH; RECOMMENDED FOR BOARD THICKNESS=0.062IN
J1	TSW-103-23-G-S	SAMTEC	CONNECTOR; THROUGH HOLE; SINGLE ROW; STRAIGHT; 3PINS; -55 DEGC TO +125 DEGC
J2	KUSBX-SMT2AP5S-B	KYCON	CONNECTOR; MALE; SMT; USB A-TYPE PLUG; RIGHT ANGLE; 4PINS
J3	KUSBX-SMT-AS1N-W30	KYCON	CONNECTOR; FEMALE; SMT; USB A-TYPE RECEPTACLE; RIGHT ANGLE; 4PINS
R2	ERJ-2RKF1002	PANASONIC	RESISTOR; 0402; 10K OHM; 1%; 100PPM; 0.10W; THICK FILM
SHUNT_J1	QPC02SXGN-RC	SULLINS ELECTRONICS CORP.	CONNECTOR; FEMALE; 0.100IN CC; OPEN TOP; JUMPER; STRAIGHT; 2PINS
U1	MAX25400GTCA/V+	MAXIM	EVKIT PART - IC; AUTOMOTIVE HI-SPEED USB 2.0 PROTECTOR; PACKAGE OUTLINE DRAWING: 21-0136; LAND PATTERN NUMBER: 90-0019; PACKAGE CODE: T1233+5C
U2	MAX15007AATT+	MAXIM	IC; VREG; ULTRA-LOW QUIESCENT-CURRENT LINEAR REGULATOR; TDFN6-EP 3X3
VBUS	5008	KEYSTONE	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.35IN; BOARD HOLE=0.063IN; ORANGE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH; RECOMMENDED FOR BOARD THICKNESS=0.062IN; NOT FOR COLD TEST
VDD	5005	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.35IN; BOARD HOLE=0.063IN; RED; PHOSPHOR BRONZE WIRE SILVER PLATE FINISHED

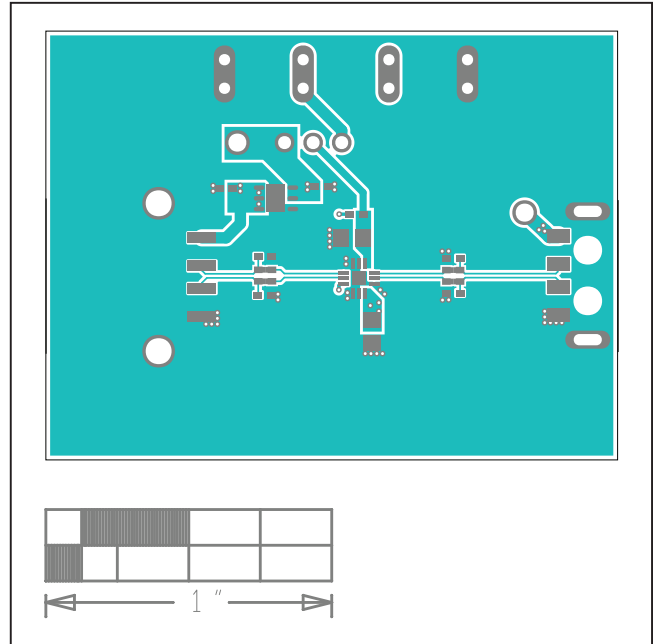
MAX25400 EV Kit Schematic



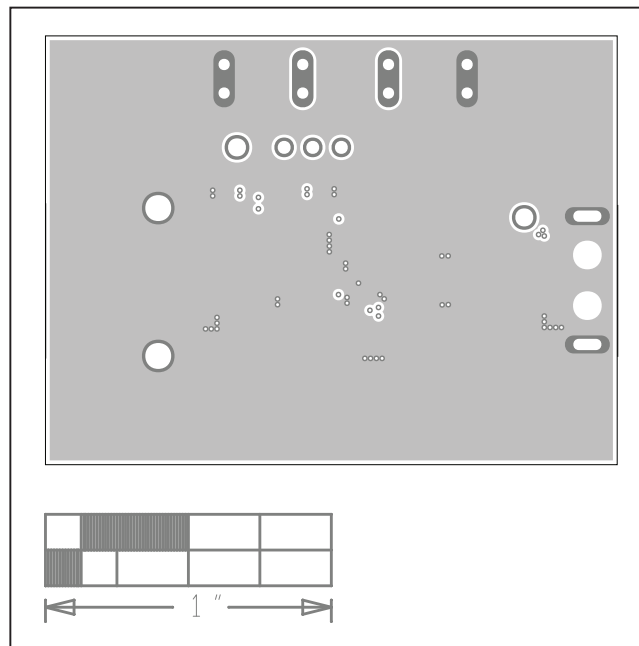
MAX25400 EV Kit PCB Layouts



MAX25400 EV Kit Component Placement Guide—Top Silkscreen

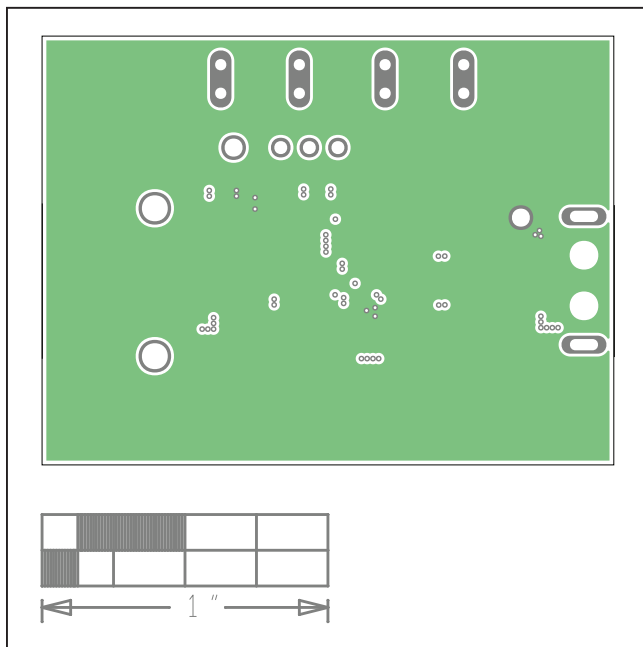


MAX25400 EV Kit PCB Layout—Top

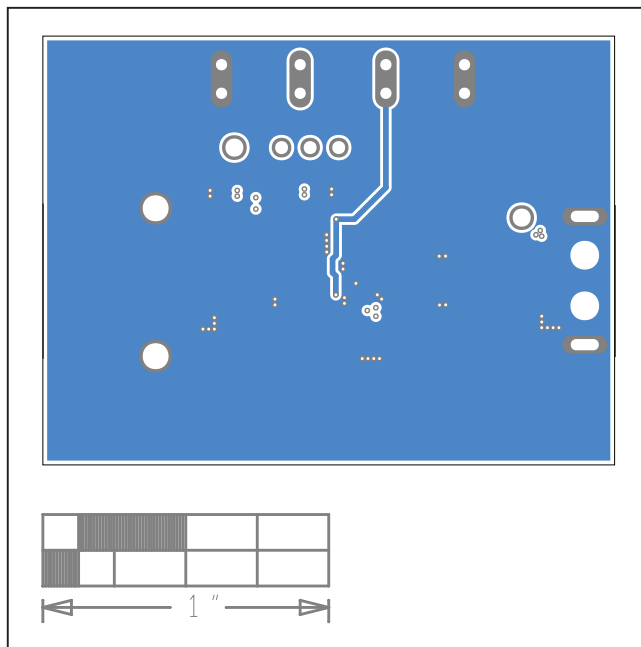


MAX25400 EV Kit PCB Layout—GND_SIG1

MAX25400 EV Kit PCB Layouts (continued)



MAX25400 EV Kit PCB Layout—PWR



MAX25400 EV Kit PCB Layout—Bottom

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	6/20	Initial release	—

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