### 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  $\overline{FAULT}$ output signal.

The device can pass high-speed USB differential (D+ and D-) signals up to 480Mbps using low  $3.3\Omega$  R<sub>ON</sub> (typ) data switches. The EV kit is powered by the USB BUS. An onboard 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.
- Set the logic function generator as follows: 3V<sub>P-P</sub>, 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.
- Verify that the part is powered and that the waveform on HVD+ is a 500kHz square wave and is approximately 3V<sub>P-P</sub>.
- 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 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  $3.3\Omega R_{ON}$  (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°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 VoltageSelection (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.

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# MAX25400 EV Bill of Materials

REF DES	MFG PART #	MANUFACTURER	DESCRIPTION	
		3M ELECTRONIC	BUMPER; CLEAR-HEMISPHERICAL SHAPE EVKIT EH0875;	
BOIVIPER1-BOIVIPER4	SJ-S306(CLEAR)	SOLUTIONS DIVISION	0.375D/0.15BH; RESILIENT ELASTOMER POLYURETHANE	
C3, C5		VACEO	CAPACITOR; SMT (0402); CERAMIC CHIP; 1UF; 10V;	
	CC0402KKX5K6BB105	YAGEO	TOL=10%; TG=-55 DEGC TO +85 DEGC; TC=X5R	
	GCM21BC71C106KE35		CAPACITOR; SMT (0805); CERAMIC CHIP; 10UF; 16V;	
C4		MORATA	TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7S; AUTO	
	GCM219R71C105KA37	MURATA	CAPACITOR; SMT (0805); CERAMIC CHIP; 1UF; 16V;	
Co			TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R	
		KEYSTONE	EVKIT PART - MAXIM PAD; TEST POINT; PIN DIA=0.094IN;	
EXT_IN, FAULTB,	5020		TOTAL LENGTH=0.350IN; BOARD HOLE=0.040IN; NONE;	
GND1, GND2	5020		PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;	
			RECOMMENDED FOR BOARD THICKNESS=0.062IN	
		CANATEC	CONNECTOR; THROUGH HOLE; SINGLE ROW; STRAIGHT;	
JI	15W-103-23-G-5	SAMIEC	3PINS; -55 DEGC TO +125 DEGC	
12		INCON	CONNECTOR; MALE; SMT; USB A-TYPE PLUG;	
JZ	KUSBX-SIVITZAP55-B	KYCON	RIGHT ANGLE; 4PINS	
		10/0001	CONNECTOR; FEMALE; SMT; USB A-TYPE RECEPTACLE;	
13	KO2RX-2M11-A21N-M30	KYCON	RIGHT ANGLE; 4PINS	
R2	ERJ-2RKF1002	PANASONIC	RESISTOR; 0402; 10K OHM; 1%; 100PPM; 0.10W;	
			THICK FILM	
	QPC02SXGN-RC		CONNECTOR; FEMALE; 0.100IN CC; OPEN TOP; JUMPER;	
SHOW1_J1		SULLINS ELECTRONICS CORP.	STRAIGHT; 2PINS	
U1	MAX25400GTCA/V+		EVKIT PART - IC; AUTOMOTIVE HI-SPEED USB 2.0 PROTECTOR;	
		MAXIM	PACKAGE OUTLINE DRAWING: 21-0136; LAND PATTERN	
			NUMBER: 90-0019; PACKAGE CODE: T1233+5C	
112	MAX15007AATT+		IC; VREG; ULTRA-LOW QUIESCENT-CURRENT LINEAR	
02		MAXIM	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		TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.35IN;	
		N/A	BOARD HOLE=0.063IN; RED; PHOSPHOR BRONZE	
			WIRE SILVER PLATE FINISHED	

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### MAX25400 EV Kit Schematic



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# Image: Second second

### 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

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# MAX25400 EV Kit PCB Layouts (continued)



MAX25400 EV Kit PCB Layout—Bottom

MAX25400 EV Kit PCB Layout—PWR

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### **Revision History**

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

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