

SILICON LABS Si826X Led Emulator Input Isodriver Evaluation Board User Guide

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Introduction

The Si826x evaluation board allows designers to evaluate Silicon Lab's Si826x family of CMOS based LED Emulator Input ISOdrivers. The Si826x ISOdrivers are pin-compatible, drop-in upgrades for popular opto-coupled gate drivers, such as 0.6 A ACPL-0302/3020, 2.5 A HCPL-3120/ACPL-3130, HCNW3120/3130, and similar optodrivs.

The devices are ideal for driving power MOSFETs and IGBTs used in a wide variety of inverter and motor control applications. The Si826x isolated gate drivers utilize Silicon Laboratories' proprietary silicon isolation technology, supporting up to 5.0 kVRMS withstand voltage per UL1577. This technology enables higher-

performance, reduced variation with temperature and age, tighter part-to-part matching, and superior common-mode rejection compared to opto-coupled gate drivers. While the input circuit mimics the characteristics of an LED, less drive current is required, resulting in higher efficiency. Propagation delay time is independent of input drive current, resulting in consistently short propagation times, tighter unit-to-unit variation, and greater input circuit design flexibility. As a result, the Si826x series offers longer service life and dramatically higher reliability compared to opto-coupled gate drivers. The evaluation kit consists of four separately orderable boards with each board featuring either the DIP8, SOIC8, SDIP6, or LGA8 package. For more information on configuring the ISOdriver itself, see the Si826x product data sheet and application note “AN677: Using the Si826x Family of Isolated Gate Drivers”.

1.1. Kit Contents

Each Si826x Evaluation Kit contains the following items:

- Si826x based evaluation board as shown in Figures 1 through 4.
- Si826x LED Emulator Input ISOdriver (installed on the evaluation board)
- Si8261 (DIP8, SOIC8, SDIP6, LGA8)

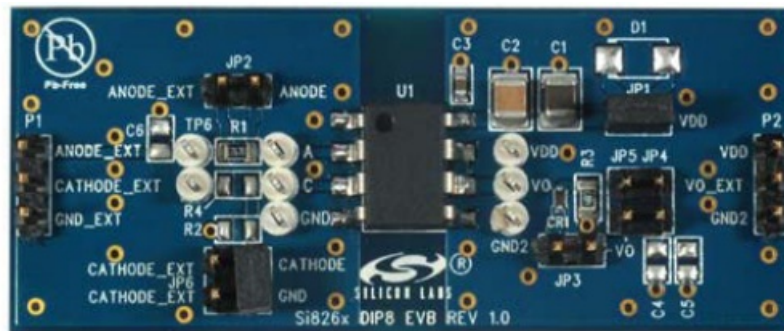


Figure 1. Si826x DIP8 Evaluation Board Overview



Figure 2. Si826x SOIC8 Evaluation Board Overview



Figure 3. Si826x SDIP6 Evaluation Board Overview



Figure 4. Si826x LGA8 Evaluation Board Overview

Required Equipment

The following equipment is required to demonstrate the evaluation board:

- 1 digital multimeter
- 2 multimeter test leads (red and black)
- 1 oscilloscope (Tektronix TDS 2024B or equivalent)
- 1 function generator (Agilent 33220A, 20 MHz or equivalent)
- 1 dc power supply (HP6024A, 30 V dc, 0–100 mA or equivalent)
- 1 BNC splitter
- 3 coaxial cables
- 2 BNC to clip converters (red and black)
- 2 Banana to clip wires (red and black)
- Si826x Evaluation Board (board under test)
- Si826x LED Emulator Input Evaluation Board User's Guide (this document)

Hardware Overview and Demo

Figure 5 illustrates the connection diagram to demonstrate the Si826x-DIP8 EVB. The other footprint boards demonstrate in a similar fashion. This demo transmits a 500 kHz (5 V peak, 50 percent duty cycle) square wave through the ISOdriver to its output (Vo). In this example, VDD is powered by a 15 V supply. Figure 6 shows a scope shot of CH1 (input) and CH2 (output). Note that if a user wants to evaluate an LED Emulator Input ISOdriver other than the ones pre-populated, this can be accomplished by removing the installed device and replacing it with the desired footprint-compatible ISOdriver device.



Figure 5. Summary Diagram and Test Setup

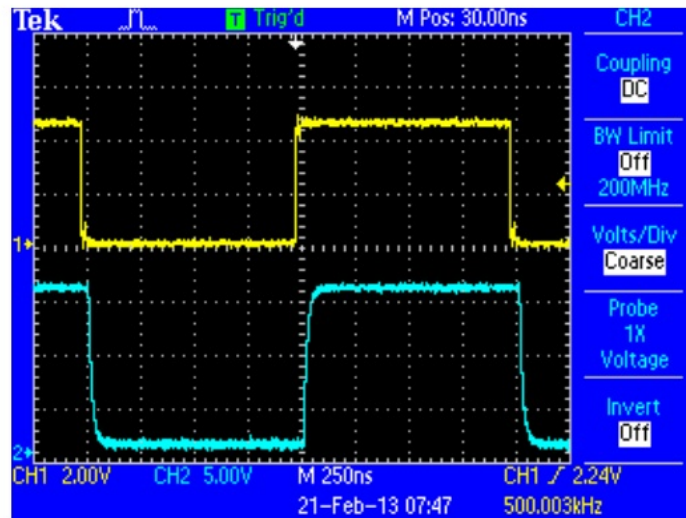


Figure 6. Oscilloscope Display of Input and Output

3.1. Board Jumper Settings

To run the demo, follow the instructions below. Review Figure 5 and Figures 11 through 14 if necessary.

1. Ensure that JP1 and JP6 are installed as shown in Figure 1, 2, 3, or 4.

3.2. DC Supply Configuration

1. Turn OFF the dc power supply and ensure that the output voltage is set to its lowest output voltage.
2. Connect the banana ends of the black and red banana to clip terminated wires to the outputs of the dc supply.
3. Then, connect the clip end of the red and black banana to clip wires to P2. The red wire goes to Pin1. The black wire goes to Pin3.
4. Turn ON the dc power supply.
5. Adjust the dc power supply to provide 15 V on its output.
6. Ensure that the current draw is less than 25 mA. If it is larger, this indicates that either the board or Si826x has been damaged or the supply is connected backwards.

3.3. Wave Form Generator

1. Turn ON the arbitrary waveform generator with the output disengaged.
2. Adjust its output to provide a 500 kHz, 0 to 5 V peak square wave (50 percent duty cycle) to its output.
3. Split the output of the generator with a BNC splitter.
4. From the BNC splitter, connect a coaxial cable to CH1 of the scope. This will be the input.
5. Connect a second coaxial cable to the BNC splitter, and connect a BNC-to-clip converter to the end of the

coaxial cable.

6. From here, connect the clip ends of the BNC-to-clip converter to P1, Pin1 (red wire here) and Pin3 (black wire here). The positive terminal is Pin1 on P1.
7. Connect one end of a third coaxial cable to a BNC-to-clip converter (note that a scope probe can be used here instead).
8. From here, connect the clip end of the BNC-to-clip converter to P2, Pin2 (red wire here) and Pin3 (black wire here). Vo is on P2 Pin2.
9. Connect the other end of the coaxial cable to CH2 of the oscilloscope. This will be the output.
10. Engage the output of the waveform generator.

3.4. Oscilloscope Setup

1. Turn ON the oscilloscope.
2. Set the scope to Trigger on CH1 and adjust the trigger level to 1 V minimum.
3. Set CH1 to 2 V per division. Set CH2 to 5 V per division.
4. Adjust the seconds/division setting to 250 ns/division.
5. Adjust the level indicator for all channels to properly view each channel as shown in Figure 6.

A 500 kHz square wave should display on Channel 1 of the scope for the input and a slightly delayed 5 V version of this square wave should display the output on Channel 2, as shown in Figure 6. This concludes the basic demo.

For more advanced demos, see the following section.

3.5. Adjusting Input Signal Frequency and VDD

Now is a good time to explore some additional functionality of the board. From here the user can do the following:

1. Slowly adjust VDD down to 13 V and up to 30 V. Then, take the VDD voltage below 12 V. Once below 12 V, it can be seen that the Si826x's UVLO turns on. In this condition, the output should turn off in which case the square wave disappears.
2. Next, adjust the supply back to 15 V.
3. Another dial the user can adjust is the frequency dial on the square wave generator. Turn this dial from tens of Hz up to several MHz and observe the scope output.

Open Loop POL Evaluation Board

The power and jumper connections descriptions are summarized here:

- P1 External input signal connections to drive the LED Emulator.
- P2 External output signal and VDD connections.
- JP1 Jumper when installed bypasses the external bootstrap circuitry.
- JP2 Jumper when installed used to accommodate common-anode drive.
- JP3 Jumper when installed can be used to enable the fast reverse recovery diode.
- JP4 Jumper when installed can be used to add additional load to output.
- JP5 Jumper when installed can be used to bypass the output gate resistor.
- JP6 Jumper when installed used to accommodate common-cathode drive.

4.1. Voltage and Current Sense Test Points

The Si826x evaluation board has several test points. These test points correspond to the respective pins on the Si826x integrated circuits as well as other useful inspection points. See Figures 7 through 10 for a silkscreen overview. See schematics in Figures 11 through 14 for more details as well.

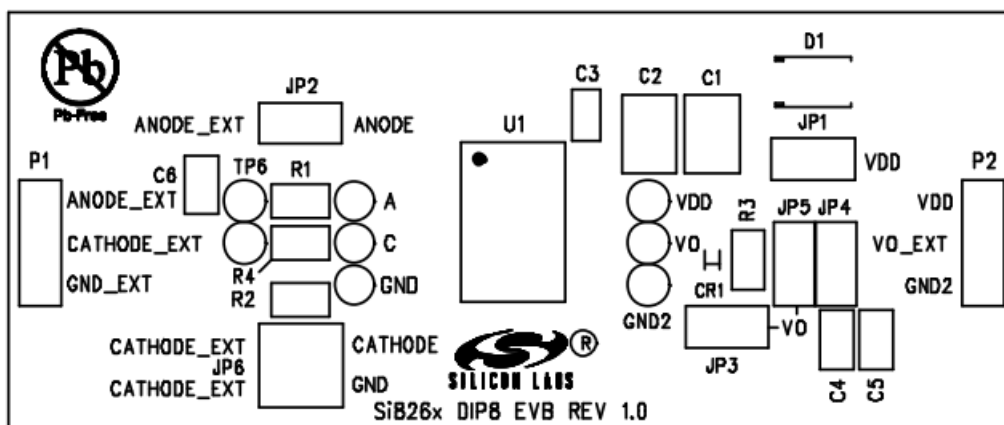


Figure 7. Si826x DIP8 Evaluation Board Silkscreen

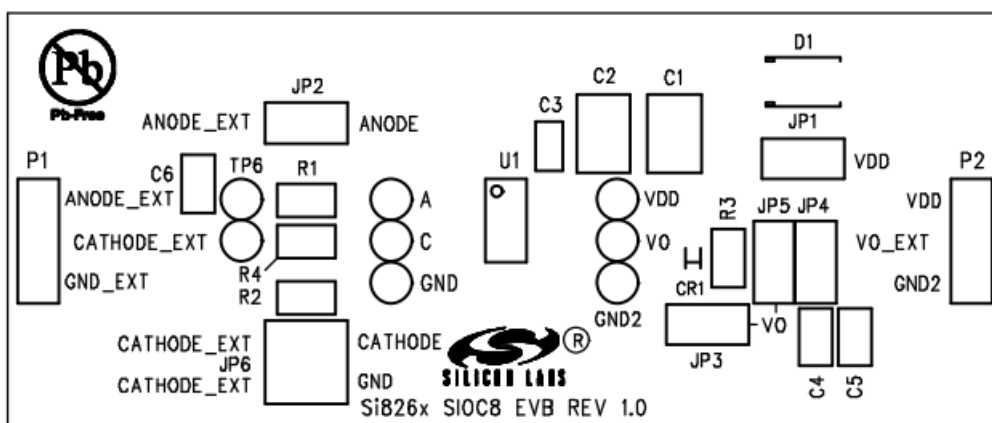


Figure 8. Si826x SOIC8 Evaluation Board Silkscreen

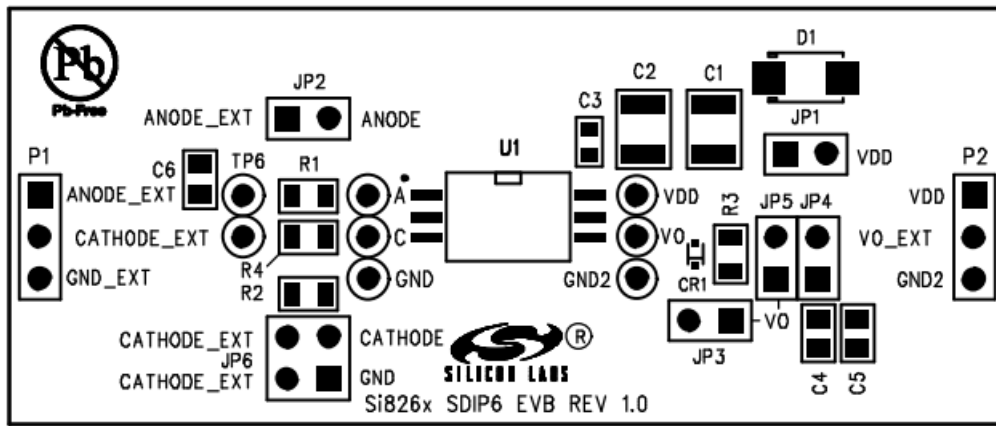


Figure 9. Si826x SDIP6 Evaluation Board Silkscreen

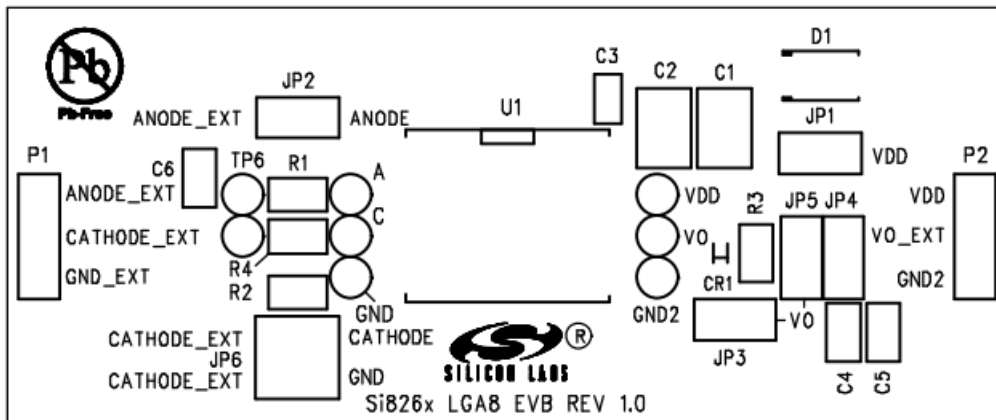


Figure 10. Si826x LGA8 Evaluation Board Silkscreen

Si826x Evaluation Board Schematics

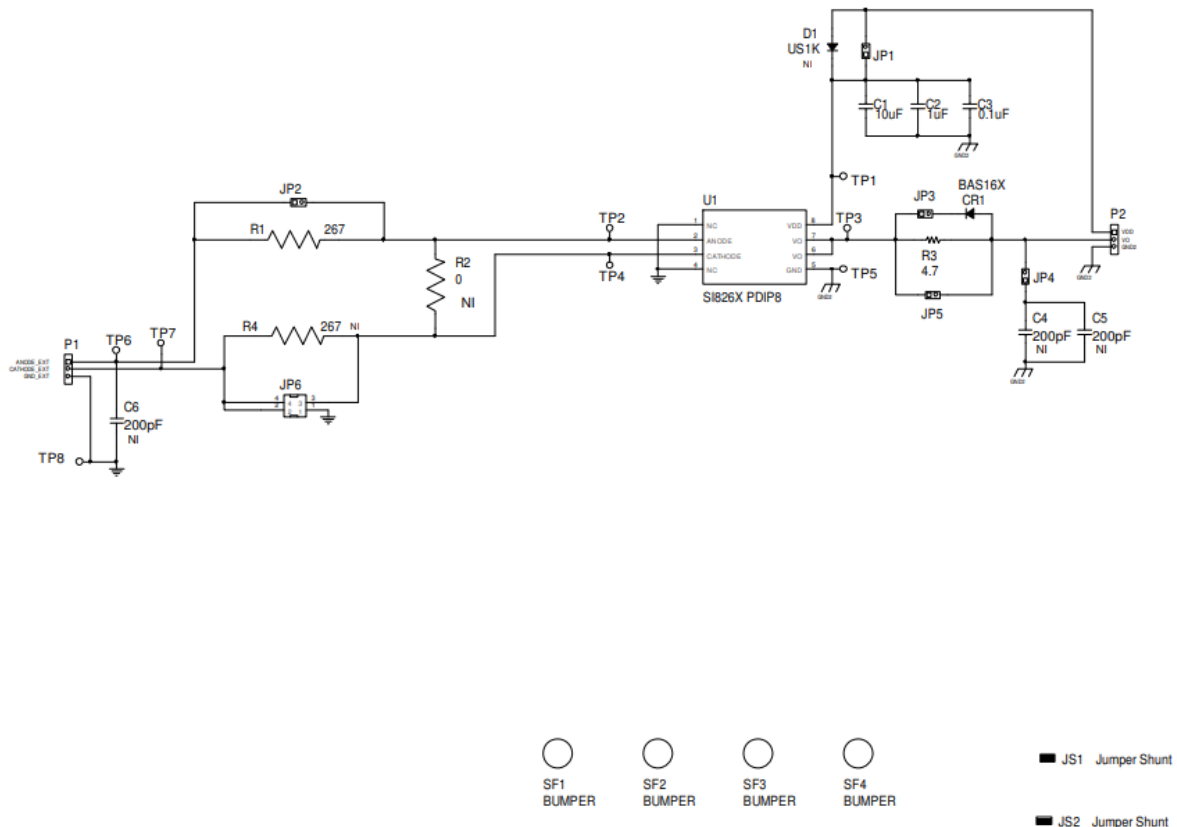


Figure 11. Si826x DIP8 Evaluation Board Schematic



Figure 13. Si826x SDIP6 Evaluation Board Schematic

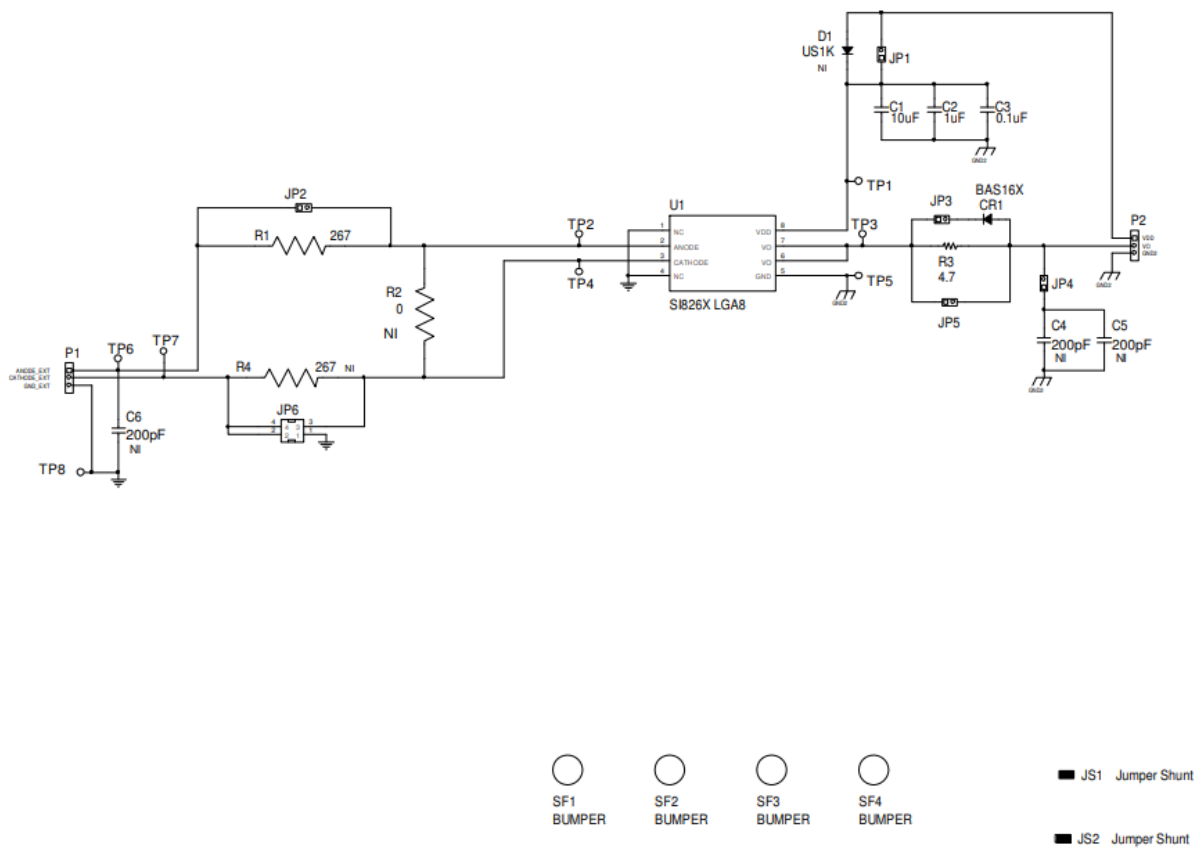


Figure 14. Si826x LGA8 Evaluation Board Schematic

Bill of Materials

Table 1. Si826x DIP8 Evaluation Board Bill of Materials

Item	Qty	Ref	Part #	Supplier	Description	Value
1	1	C1	GRM32DF51H106ZA01L	Murata Electronics North America	CAP, 10 μ F, 50 V, -20% to +80%, Y5V, 1210	10 μ F
2	1	C2	C1210X7R101-105K	Venkel	CAP, 1 μ F, 100 V, \pm 10%, X7R, 1210	1 μ F
3	1	C3	C0603X7R101-104M	Venkel	CAP, 0.1 μ F, 100 V, \pm 20%, X7R, 0603	0.1 μ F

4	3	C4, C5, C6	C0805C0G500-201K	Venkel	CAP, 200 pF, 50 V, $\pm 10\%$, C OG, 0805	200 pF
5	1	CR1	BAS16XV2T1G	On Semi	DIO, SWITCH, 200 mA, 75 V , SOD523	BAS16X
6	1	D1	US1K-13-F	Diodes Inc.	DIO, SWITCH, ULT FAST 1 A 800 V, SMA	US1K
7	5	JP1, JP2, JP3, JP4, JP5	TSW-102-07-T-S	Samtec	Header, 2x1, 0.1in pitch, Tin Plated	Jumper
8	1	JP6	TSW-102-07-T-D	Samtec	Header, 2x2, 0.1in pitch, Tin Plated	Header 2 x2
9	2	JS1, JS2	SNT-100-BK-T	Samtec	Shunt, 1x2, 0.1in pitch, Tin Plated	Jumper Shunt
10	2	P1, P2	TSW-103-07-T-S	Samtec	Header, 3x1, 0.1in pitch, Tin Plated	Header 1 x3
11	2	R1, R4	CR0805-10W-2670F	Venkel	Res, 267 W, 1/10 W, $\pm 1\%$, ThickFilm, 0805	267
12	1	R2	CR0805-10W-000	Venkel	Res, 0 W, 2 A, ThickFilm, 0805	0

13	1	R3	CR0805-10W-4R7J	Venkel	Res, 4.7 W, 1/10W, ±5%, ThickFilm, 0805	4.7
14	4	SF1, SF2, SF3, SF4	SJ61A6	3M	HDW, Bumpon Cylindrical.312X.215 BLK	Bumper
15	8	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8	151-201-RC	Kobiconn	Testpoint, White, PTH	White
16	1	U1	Si8261BCC-C-IP	Silicon Labs	ISOdriver 3.75 kV emulator input, DIP8, RoHS	Si826X DIP8

Table 2. Si826x SOIC8 Evaluation Board Bill of Materials

Item	Qty	Ref	Part #	Supplier	Description	Value
1	1	C1	GRM32DF51H106ZA01L	Murata Electronics North America	CAP, 10 µF, 50 V, -20% to +80%, Y5V, 1210	10 µF
2	1	C2	C1210X7R101-105K	Venkel	CAP, 1 µF, 100 V, ±10%, X7R, 1210	1 µF
3	1	C3	C0603X7R101-104M	Venkel	CAP, 0.1 µF, 100 V, ±20%, X7R, 0603	0.1 µF
4	3	C4, C5, C6	C0805C0G500-201K	Venkel	CAP, 200 pF, 50 V, ±10%, C0G, 0805	200 pF
5	1	CR1	BAS16XV2T1G	On Semi	DIO, SWITCH, 200 mA, 75 V, SOD523	BAS16X

6	1	D1	US1K-13-F	Diodes Inc.	DIO, SWITCH, ULT FAST 1 A 800 V, SMA	US1K
7	5	JP1, JP2, JP3, JP4, JP5	TSW-102-07-T-S	Samtec	Header, 2x1, 0.1in pitch, Tin Plated	Jumper
8	1	JP6	TSW-102-07-T-D	Samtec	Header, 2x2, 0.1in pitch, Tin Plated	Header 2 x2
9	2	JS1, JS2	SNT-100-BK-T	Samtec	Shunt, 1x2, 0.1in pitch, Tin Plated	Jumper Shunt
10	2	P1, P2	TSW-103-07-T-S	Samtec	Header, 3x1, 0.1in pitch, Tin Plated	Header 1 x3
11	2	R1, R4	CR0805-10W-2670F	Venkel	Res, 267 W, 1/10 W, $\pm 1\%$, ThickFilm, 0805	267
12	1	R2	CR0805-10W-000	Venkel	Res, 0 W, 2 A, ThickFilm, 0805	0
13	1	R3	CR0805-10W-4R7J	Venkel	Res, 4.7 W, 1/10W, $\pm 5\%$, ThickFilm, 0805	4.7
14	4	SF1, SF2, SF3, SF4	SJ61A6	3M	HDW, Bumpon Cylindrical .312X.215 BLK	Bumper
15	8	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8	151-201-RC	Kobiconn	Testpoint, White, PTH	White
16	1	U1	Si8261BCC-C-IS	Silicon Labs	ISOdriver 3.75 kV emulator input, SOIC8, RoHS	Si826X SOIC8

Table 3. Si826x SDIP6 Evaluation Board Bill of Materials

Item	Qty	Ref	Part #	Supplier	Description	Value
1	1	C1	GRM32DF51H106ZA01L	Murata Electronics North America	CAP, 10 μ F, 50 V, -20% to +80%, Y5V, 1210	10 μ F
2	1	C2	C1210X7R101-105K	Venkel	CAP, 1 μ F, 100 V, \pm 10%, X7R, 1210	1 μ F
3	1	C3	C0603X7R101-104M	Venkel	CAP, 0.1 μ F, 100 V, \pm 20%, X7R, 0603	0.1 μ F
4	3	C4, C5, C6	C0805C0G500-201K	Venkel	CAP, 200 pF, 50 V, \pm 10%, C0G, 0805	200 pF
5	1	CR1	BAS16XV2T1G	On Semi	DIO, SWITCH, 200 mA, 75 V, SOD523	BAS16X
6	1	D1	US1K-13-F	Diodes Inc.	DIO, SWITCH, ULT FAST 1 A 800 V, SMA	US1K
7	5	JP1, JP2, JP3, JP4, JP5	TSW-102-07-T-S	Samtec	Header, 2 \times 1, 0.1in pitch, Tin Plated	Jumper
8	1	JP6	TSW-102-07-T-D	Samtec	Header, 2 \times 2, 0.1in pitch, Tin Plated	Header 2 \times 2
9	2	JS1, JS2	SNT-100-BK-T	Samtec	Shunt, 1 \times 2, 0.1in pitch, Tin Plated	Jumper Shunt
10	2	P1, P2	TSW-103-07-T-S	Samtec	Header, 3 \times 1, 0.1in pitch, Tin Plated	Header 1 \times 3

11	2	R1, R4	CR0805-10W-2670F	Venkel	Res, 267 W, 1/10 W, $\pm 1\%$, ThickFilm, 0805	267
12	1	R2	CR0805-10W-000	Venkel	Res, 0 W, 2 A, ThickFilm, 0805	0
13	1	R3	CR0805-10W-4R7J	Venkel	Res, 4.7 W, 1/10W, $\pm 5\%$, ThickFilm, 0805	4.7
14	4	SF1, SF2, SF3, SF4	SJ61A6	3M	HDW, Bumpon Cylindrical .312X.215 BLK	Bumper
15	8	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8	151-201-RC	Kobiconn	Testpoint, White, PTH	White
16	1	U1	Si8261BCD-C-IS	Silicon Labs	ISOdriver 5 kV emulator input, SDIP6, RoHS	Si826X S DIP6

Table 4. Si826x LGA8 Evaluation Board Bill of Materials

Item	Qty	Ref	Part #	Supplier	Description	Value
1	1	C1	GRM32DF51H106ZA01L	Murata Electronics North America	CAP, 10 μ F, 50 V, -20% to $+80\%$, Y5V, 1210	10 μ F
2	1	C2	C1210X7R101-105K	Venkel	CAP, 1 μ F, 100 V, $\pm 10\%$, X7R, 1210	1 μ F
3	1	C3	C0603X7R101-104M	Venkel	CAP, 0.1 μ F, 100 V, $\pm 20\%$, X7R, 0603	0.1 μ F

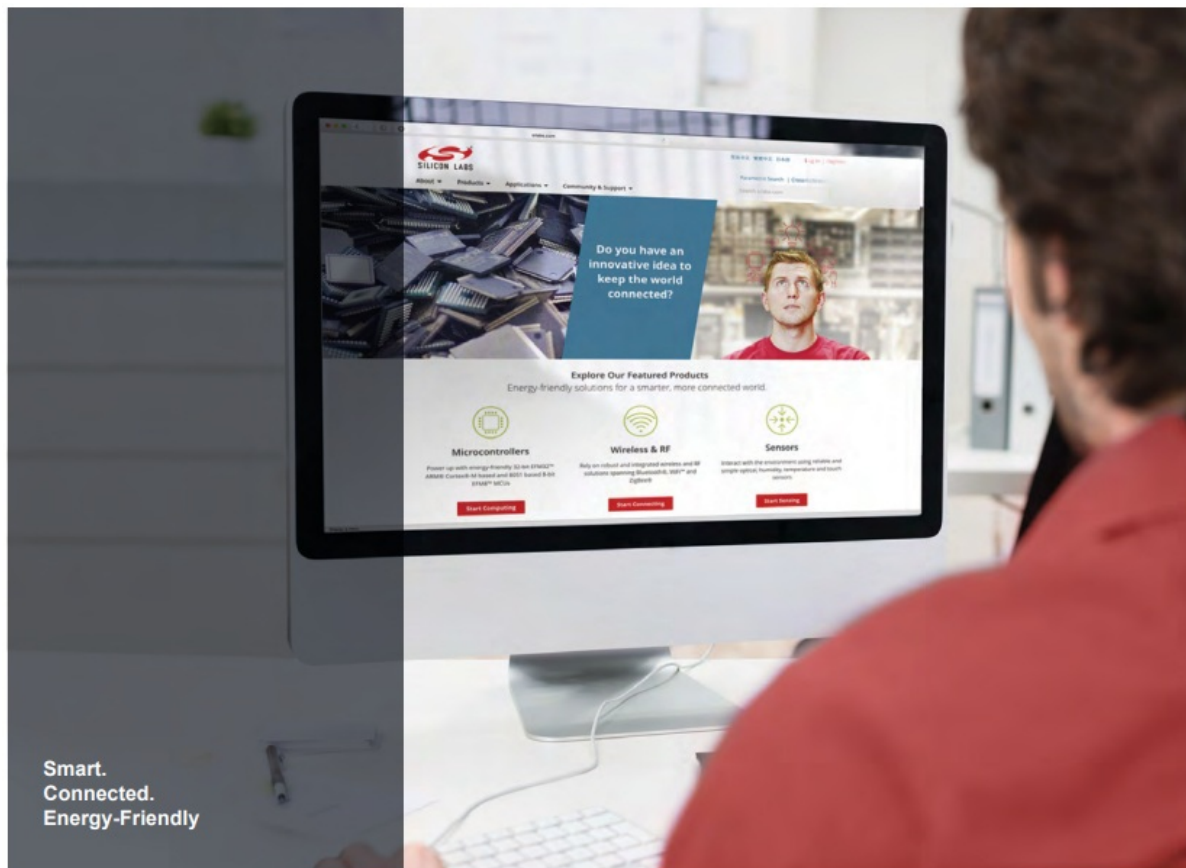
4	3	C4, C5, C6	C0805C0G500-201K	Venkel	CAP, 200 pF, 50 V, $\pm 10\%$, C0G, 0805	200 pF
5	1	CR1	BAS16XV2T1G	On Semi	DIO, SWITCH, 200 mA, 75 V, SOD523	BAS16X
6	1	D1	US1K-13-F	Diodes Inc.	DIO, SWITCH, ULT FAST 1 A 800 V, SMA	US1K
7	5	JP1, JP2, JP3, JP4, JP5	TSW-102-07-T-S	Samtec	Header, 2x1, 0.1in pitch, Tin Plated	Jumper
8	1	JP6	TSW-102-07-T-D	Samtec	Header, 2x2, 0.1in pitch, Tin Plated	Header 2 x2
9	2	JS1, JS2	SNT-100-BK-T	Samtec	Shunt, 1x2, 0.1in pitch, Tin Plated	Jumper Shunt
10	2	P1, P2	TSW-103-07-T-S	Samtec	Header, 3x1, 0.1in pitch, Tin Plated	Header 1 x3
11	2	R1, R4	CR0805-10W-2670F	Venkel	Res, 267 W, 1/10 W, $\pm 1\%$, ThickFilm, 0805	267
12	1	R2	CR0805-10W-000	Venkel	Res, 0 W, 2 A, ThickFilm, 0805	0
13	1	R3	CR0805-10W-4R7J	Venkel	Res, 4.7 W, 1/10W, $\pm 5\%$, ThickFilm, 0805	4.7
14	4	SF1, SF2, SF3, SF4	SJ61A6	3M	HDW, Bumpon Cylindrical .312X.215 BLK	Bumper

15	8	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8	151-201-RC	Kobiconn	Testpoint, White, PTH	White
16	1	U1	Si8261BCD-C-IM	Silicon Labs	ISOdriver 5 kV emulator input, LGA8, RoHS	Si826X LGA8

Ordering Guide

Table 5. Si826x Evaluation Board Ordering Guide

Ordering Part Number (OPN)	Description
Si826xDIP8-KIT	Si826x ISOdriver Evaluation Board Kit featuring DIP8 Package
Si826xSOIC8-KIT	Si826x ISOdriver Evaluation Board Kit featuring SOIC8 Package
Si826xSDIP6-KIT	Si826x ISOdriver Evaluation Board Kit featuring SDIP6 Package
Si826xLGA8-KIT	Si826x ISOdriver Evaluation Board Kit featuring LGA8 Package



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