ADVANCE

by signify

Reliable SR technology for connected LED applications

Bridge

Xitanium SR
Design-in Guide

Contents

Introduction to this guide

Figure 1. Advance Xitanium SR bridge.

Thank you for choosing the Advance Xitanium sensor ready bridge (SRB). In this guide you will find the information needed to integrate SRB devices into an LED luminaire or LED system.

Information or support

For further information or support please consult your local Advance office or visit:

- Xitanium SR bridges or SR drivers: www.signify.com/xitaniumsr
- OEM general info: www.signify.com/oemna
- EasySense: www.philips.com/easysense

Warnings and instructions

Warnings

- Avoid touching live parts!
- Do not use SR bridge and connected driver(s) with damaged housing and/or connectors!
- Do not use SR bridge and connected driver(s) with damaged wiring!

Safety warnings and installation instructions

- Do not use damaged products.
- Do not short SR bridge output wires.
- SR bridge output wire is a live mains part when switched on.
- The luminaire manufacturer is responsible for complete luminaire design and must comply with all relevant safety standards.
- The SR bridge is suitable for built-in use only and must not be exposed to the elements such as snow, water and ice or to any chemical agent that can be expected to have an adverse effect on the driver (e.g., corrosive environments). It is the responsibility of both luminaire manufacturer and installer to prevent exposure. The SR bridge specified for UL damp and dry locations.
- Do not service the SR bridge and connected driver(s) when the mains voltage is connected; this includes connecting or disconnecting the loads.
- SR bridge and connected driver(s) must be installed in accordance with national and local electrical codes.
- Proper earth and/or equipotential connections are required whenever possible or applicable.

Introduction to Advance
Advance Xitanium SR bridge

Figure 2. Advance Xitanium SR bridge.

Xitanium SR bridge

The Advance Xitanium SR bridge is designed to connect existing or new 0–10V dimming indoor lighting systems to SR (wireless) connected systems. Applications include offices, public buildings, industrial applications and retail environments.

With Xitanium SR functionality, flexibility in luminaire design is assured, and with the SR interface it is simpler than ever to connect to SR certified sensors.

Xitanium SR bridge versions

The Xitanium SR bridge described in this guide is available in two versions; a –BS version with mounting studs to mount the box to an existing (downlight) fixture mounting plate and a –LD version to be mounted inside luminaires.

Detailed specifications can be found in the Xitanium SR bridge datasheets, which can be downloaded at www.signify.com/xitaniumsr.

Configuration interface

Some features and parameters can be set via the SR Interface or SimpleSet technology using Advance MultiOne Configurator software.

SR bridge wiring diagram

A typical application for the Xitanium SR bridge is to connect the SR bridge to one or more 0–10V (LED) drivers and an SR-certified device (see Figure 3).

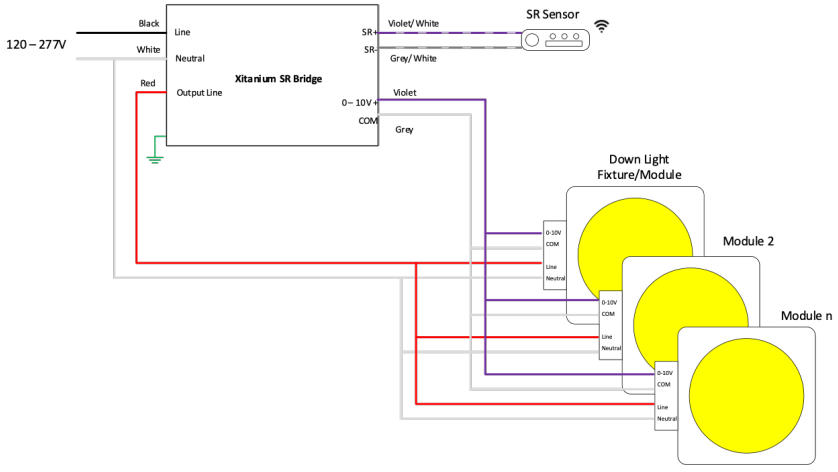

Figure 3. Xitanium SR bridge wiring diagram.

Features of Xitanium SR bridge

Wide mains input range

The Advance Xitanium SR bridge can operate on a wide range of mains input voltages from 120Vac – 347Vac.

Switchable output using zero crossing detection

The output of the Xitanium SR bridge can be switched on/off via integrated relay switching with advanced zero crossing technology. This allows for higher loads to be switched on/off with high reliability.

Sensor ready (SR) interface

The Xitanium SR bridge features a digital interface (SR interface) to enable direct connection to any suitable SR-certified RF sensor.

Energy metering

The Xitanium SR bridge has built-in energy/power measurement capability.

MultiOne/SimpleSet configurable features

Note: These features are only supported from MultiOne 3.12 onward. Please also refer to the “Advance MultiOne Configurator” user manual that can be accessed from the Help menu inside the MultiOne software, for more information.

Feature	Description of the feature	Notes and examples
0-10V / 1-10V	This feature gives the OEM the ability to match the 0-10V (or 1-10V) dimming curve of the connected driver to the correct translation of the DALI arc power commands on the SR Bus.	Four fixed curves (1-10V curved, 1-8V linear, 1-9V linear, 1-8V logarithm) or User specified can be selected. 1-8V linear is default to match most Advance Xitanium LED drivers.
LFIT	Load Fault Indicator Thresholds. This feature allows the OEM to set a threshold to indicate one (or more) lights have failed and set the DALI lamp failure detection properly.	Typical setting corresponds to maximum power of all drivers connected minus one so that if one driver fails it will be detected.
Luminaire Info	This feature allows the OEM to store a GTIN and identification number and some additional information that could be used for Traceability or Asset Management.	The GTIN and ID are part of standard DALI. The additional information can be up to 42 characters long.
Min dim level	Minimum dim level. This feature can be used to set the minimum (DALI) dim level of the SR Bridge to match the minimum dim level of the connected 0-10V driver(s).	Default setting is 1%. But if the connected driver can only dim down to 10%, the DALI dim level of the SR Bridge can be also set to 10% matching the DALI dim curve to the 1-8V dimming curve of the driver. Any DALI arc level command for < 10% will result in a 1V output on the 0-10V output of the SR Bridge.
OWP	OEM Write Protection (OWP) defines a password that will be set in the SR bridge so the data of OEM Write-protected features can only be written to the SR Bridge by providing the configured password.	When one or more of the OWP features check boxes are selected, a password containing 4 numbers between 0 and 255 needs to be entered. 0-0-0-0 and 255-255-255-255 are not allowed. Features that can be OEM Write-protected are indicated by a padlock icon in the Write screen.
RSO	Relay Switched Output. This feature can be used to enable/disable the relay of the SR Bridge.	In cases where the lights should not be turned off when the DALI Off command is used, the “Always stays closed” button should be checked.
DALI PSU	DALI Power Supply. This feature can turn on/off the build-in SR Power Supply	By default the SR DALI PSU is turned on (Enabled).

Table 1. SR bridge MultiOne/SimpleSet configurable features.

Sensor ready (SR) interface

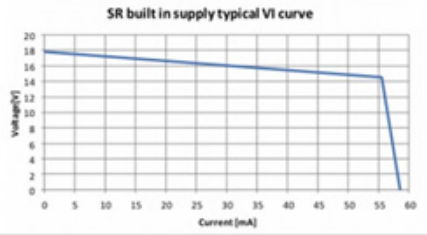

Figure 4. Typical VI-curve SR bus power supply.

Sensor ready interface

The Advance Xitanium LED SR bridge features a digital SR interface to enable direct connection to any suitable SR-certified RF sensor.

The simple two-wire SR interface supports these key functions:

- Switchable built-in SR bus power supply to provide power to the connected control device (e.g., an RF module or a CMS controller)
- Two-way digital communication between the SR bridge and control device, using standard DALI 2.0 protocol
- Standard DALI dimming, ON/OFF and control functions
- Power and energy reporting utilizing the power monitoring integrated in the SR bridge
- Diagnostic information

Built-in SR bus power supply

The SR bridge has the ability to supply the SR bus with a built-in power supply that can be turned ON/OFF. By default the power supply is turned on and ready to be used with an external control device (e.g., RF sensor).

This should in principle be turned off if used in DALI networks with multiple drivers to avoid incorrect polarity, which can lead to very high currents on the DALI bus. However, we do not recommend to use this SR bridge in a wired DALI network.

The internal power supply can be turned ON/OFF with the MultiOne configuration software using the SimpleSet tool or the SR interface (DALI) tool.

The built-in SR supply is capable of delivering a minimum current of 52 mA to the SR bus and the connected device(s).

The built-in SR supply will never supply more than 60mA.

The SR bus voltage will be between 12V and 20V depending on the connected device load and the amount of SR supplies put in parallel. See Figure 4 for the typical VI curve for one SR supply.

For more detailed information on how to use/design the SR supply see the SR Design-in guide that can be found at: www.signify.com/xitaniumsr.

Control device(s)

- Most control devices intended to be used in an SR system will be powered from the SR bus.
- When communication is present on the SR bus, the bus gets pulled down by the data packages. This reduces the average current available for the power consuming control device. When communicating the average available current can drop approximately 50%. This should be taken into account when designing the control device.
- The extracted peak current should be limited by the control device.

Rules for building an SR system

- Respect SR bus polarity when more than one SR supply is connected in parallel.
- The total maximum SR bus current must be ≤250 mA. A maximum of four SR supplies can be connected in parallel.

Caution

- When the above rules are not taken into account, communication cannot be guaranteed and damage to components may occur.

Digital communication

Dimming is possible through the standard digital interface based on DALI 2.0 (IEC 62386 101, 102 Ed2.0). Dimming range is 1%–100%. Dimming curves can be either logarithmic or linear (see Figures 5 and 6).

- Note that the output current at 1% and 100% level is not set directly by the SR bridge. The SR bridge sets a voltage on the 0–10V interface which gets translated in the connected driver to an actual output current.
- The SR bridge can report energy and actual power consumption. Accuracy of power measurement is +/– 4% of measured input power or +/– 0.5W whichever is the higher value.
- The SR bridge also supports many diagnostic features/parameters, which can be accessed via the SR interface, as per SR Certified specification.
- Although the SR interface supports DALI commands, it is not a DALI interface as such since the interface is polarity-sensitive. We do not advise use of the SR bridge in wired DALI networks.

Other considerations for SR interface

- Length of wiring: using 18AWG (0.8 mm2), the maximum length of the SR wiring, when used for DALI communication, should not exceed 50ft (15m).
- The SR control interface terminals are Class 2 as per UL.

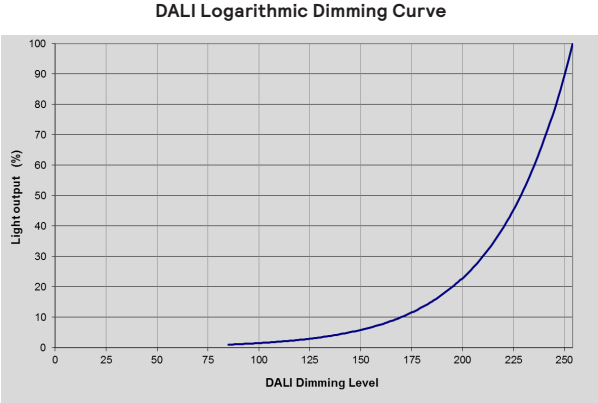

Figure 5. DALI logarithmic dimming curve.

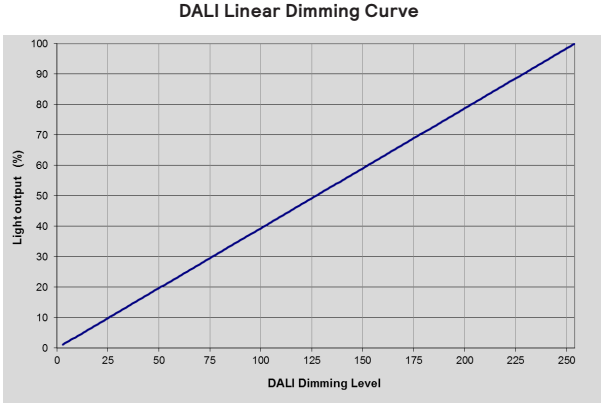

Figure 6. DALI linear dimming curve.

SR bridge use cases

Basic SR bridge use case

The basic use case for the SR bridge is to connect one or more 0–10V dimming drivers and an SR-certified device to the SR bridge as shown in Figure 7.

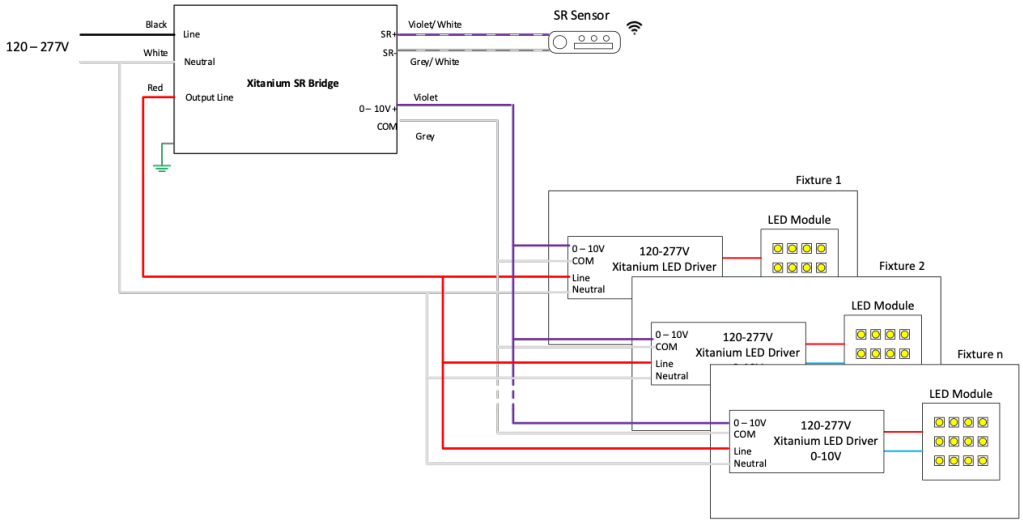

Figure 7. Basic Xitanium SR bridge use case.

By default, the SR bridge dimming curve is set to linear and the range is 1 – 8V and is meant to work with standard 0–10V drivers with linear dimming curve and 1–8V range. If other drivers are used it is possible that the dimming curves will not match.

The maximum load that the SR bridge can handle depends on the mains input voltage. The maximum allowed loads are given in the SR bridge datasheet.

347V SR bridge use case

The SR bridge can handle up to 347V mains input. For basic 347V operation the wiring diagram is similar as for 120/277V operation. Figure 8 shows how a SR bridge can be connected to a 347V 0-10V LED driver and an SR sensor.

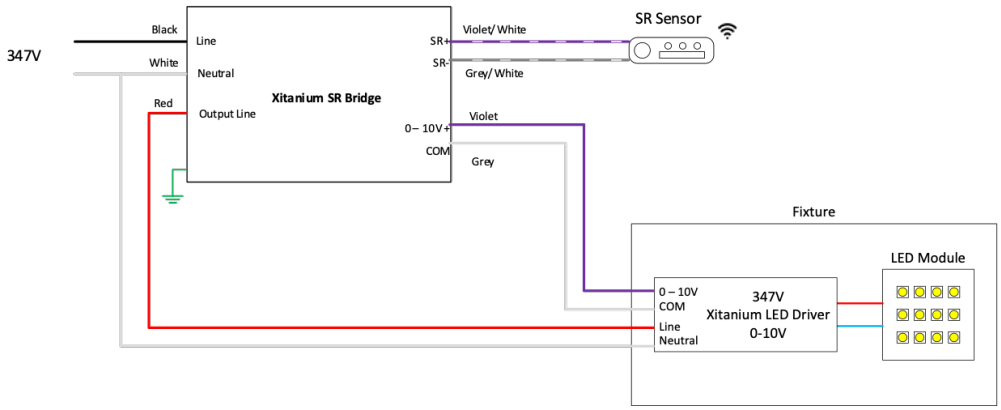

Figure 8. Basic Xitanium SR bridge 347V operation.

SR bridge dimming curve and dimming range

The SR bridge dimming curve and dimming range can be programmed using the MultiOne Configurator or SimpleSet. By default, the dimming curve is set for DALI linear and the dimming range is set at 1 – 8V.

The dimming curve can be programmed as either being (DALI) logarithmic or linear.

To meet the DALI logarithmic or linear curve, the physical minimum dimming level and dimming curve of the connected 0-10V driver should be configured correctly in the SR bridge using the MultiOne Configurator or SimpleSet.

If you are using an Advance 0-10V driver, you can select the dimming curve and physical minimum dimming level that are used in that driver. However, if you are using a driver from another manufacturer, you possibly have to customize/configure the dimming curve vs. dim percentage and physical minimum dimming level for that driver.

The SR bridge dimming range can be programmed in 19 steps. For each step a voltage value and dimming percentage need to be set.

The voltage values can be from 0 – 10. The dimming percentage values need to be within 1 – 100%.

SR bridge fault detection use case

The SR bridge is measuring the power/energy consumed of the connected loads constantly. This feature can be used to monitor the connected load and determine if a portion of the load has failed. During normal operation (at full output) the connected load/drivers draw a certain amount of power. If one or more connected loads fail, the power consumption will be reduced. The SR bridge has the capability to set the DALI Lamp Failure flag based on a threshold that can be programmed in the SR Bridge indicating that the load has been reduced. The fault detection accuracy depends on the trigger point and minimum detection dim level, which can be configured by MultiOne.

For example if (10) 50W drivers are connected a SR Bridge each with a max input power of 50W for a DALI Arc Power command of 254 (full output) then to be able to detect the failure of (1) driver/LED load, the threshold would be set at (9x50=) 450W. The SR Bridge would report/set DALI Lamp Failure when the power measured by the SR Bridge becomes less than 450W. Note, that this power level must be scaled by the SR Bridge if the Arc Power command is other than 254.

In this case with lights set at 50% Arc Power then the expected power would be 250W and the SR Bridge would report/set DALI Lamp Failure when the power is less than 225W.

SR bridge class room with occupancy/daylight harvesting use case

Existing class rooms using a 0–10V dimming system can easily be retrofitted with a SR bridge and certified SR sensors using occupancy/daylight harvesting to achieve maximum energy efficiency/savings and to create a connected lighting system. A typical (small) class room has several rows of dimmable lights controlled by a switch/dimmer near the entrance door.

For this use case we are going to assume a small class room with windows on one side having 4 rows of 5 lights each. All (0–10V dimmable) lights are controlled by a switch/dimmer near the entrance door (see Figure 9).

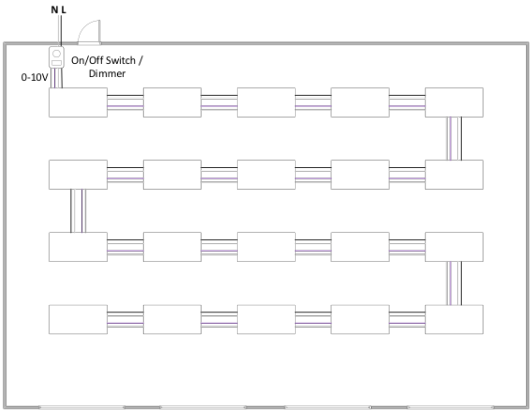

Figure 9. Typical small Class room with 0–10V dimming system.

To make it an occupancy/daylight harvesting connected lighting system we are going to use 2 SR bridges each with a SR certified sensor (like the Advance EasySense SNS series of sensors). The first SR bridge and sensor gets connected to the first 3 rows of the lights with the (occupancy) sensor placed near the entrance door. The second SR bridge and (daylight harvesting) sensor gets connected to the last row of lights closest to the windows (see Figure 10) with the (occupancy/daylight) sensor placed near the window. Retrofitting the existing 0–10V dimming system with the SR Bridge solution does not take much installation work. The SR Bridges get mounted in between the mains feed and the first driver in each section. The dimming wires get disconnected from the existing dimmer and rerouted to the SR Bridges. All other mains and dimming connections between the other drivers remain the same.

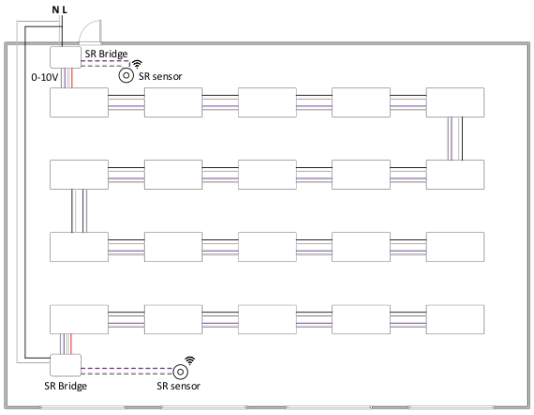

Figure 10. Small Class room retrofitted with SR Bridge solution.

SR bridge hallway use case

Hallways/long corridors are another area that can easily be retrofitted with SR Bridge and SR sensor to achieve maximum energy efficiency/savings and to create a connected lighting system. In a typical Hallway 0-10V dimming system the lights can usually be turned on/off at both ends (see Figure 11).

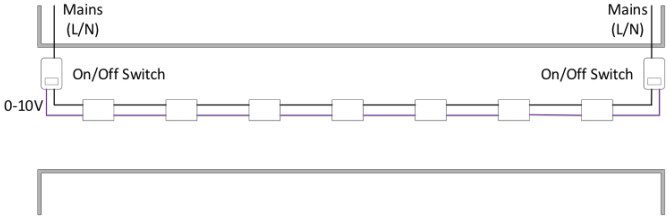

Figure 11. Typical Hallway 0-10V dimming system.

With the SR Bridge and SR sensor we can now add occupancy detection and create a connected lighting system that not only can dim up/down but turn on/off the lights where needed for maximum energy savings. In our use case example we are going to use 2 SR Bridges and 2 SR occupancy sensors since we assume the hallway is too long to be covered by one sensor only (contact the sensor manufacturer for more detailed information for coverage area/distance between sensors. For more detailed information on EasySense sensors see the EasySense link listed in the introduction section.)

In this example the Hallway lights are going to be divided into 2 sections (one 4 lights and one 3 lights). A SR bridge and SR (occupancy) sensor get connected to each section (see Figure 12).

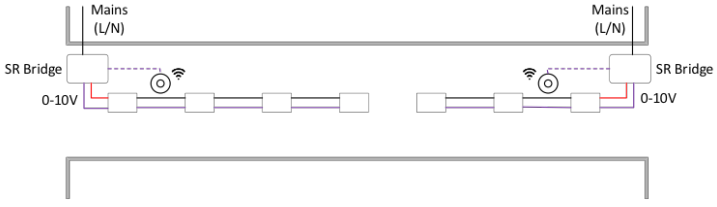

Figure 12. Hallway retrofitted with SR Bridge and SR sensors.

For this retrofit installation the mains to the existing 0-10V drivers (on each) end have to be re-routed to each SR bridge. And 2 sections of lights have to be created by cutting the mains and dimming wires between 2 of the lights.

OEM traceability/asset management/luminaire information MB1 use case

The Advance Xitanium SR bridge can be used to store additional OEM (luminaire) information. An OEM could use this to offer traceability or asset management to end users. The additional information can be luminaire-related data like ID/version numbers, optical data and electrical input data. MultiOne software using either the DALI interface or SimpleSet (NFC) can be used to program the information in the SR bridge.

Memory bank 1 is implemented according to the DALI standard. Mandatory information are the OEM GTIN (6 bytes address 3-8) and OEM ID (8 bytes address 9-16). The information can be read/written using the “luminaire Info” section in Device features of MultiOne (see Figure 14). The additional info can be any information up to 42 characters long.

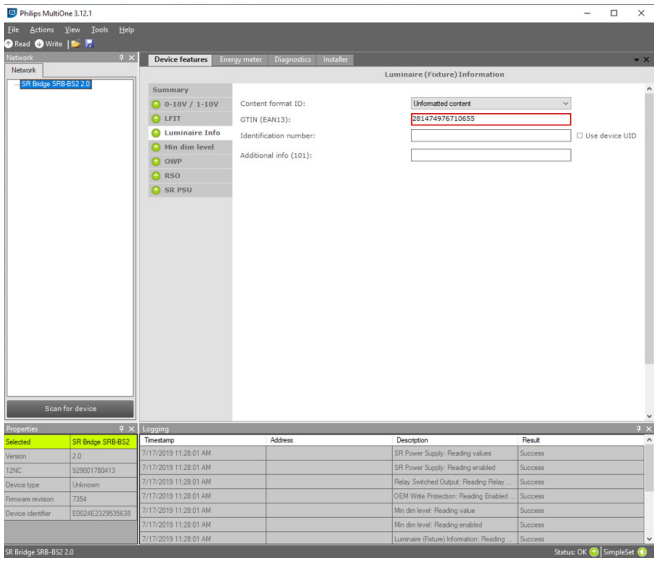

Figure 14. Luminaire Info information in MultiOne.

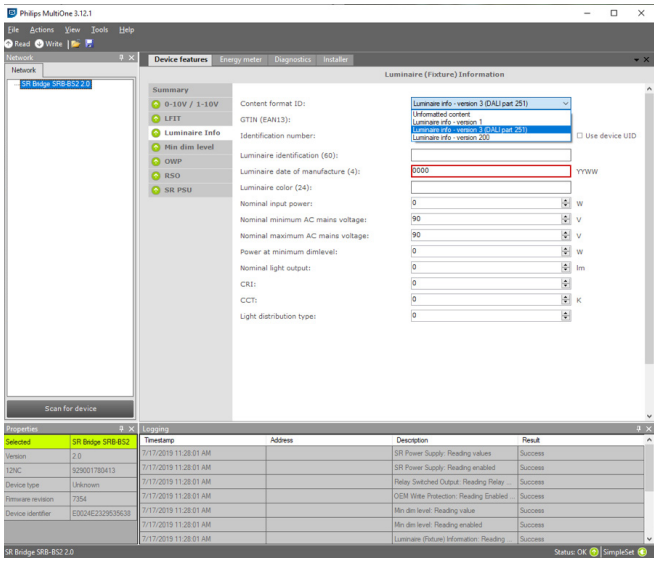

Figure 15.Luminaire info - version 3.

Max number of drivers can be tied together per SRB-Lite

Identify the input current spec of the product based on the nominal input voltage shown in the first page of the product data sheet. The maximum number of drivers tied together (N) can be calculated as follow:
N = 70% x {(I_SRB-lite) / (I_driver)}

where I_SRB-lite = SRB-LITE input current spec based on input voltage and I_driver = driver input current spec based on input voltage. If the N is not an integer number, select the closest integer to the N. However, if the selected number times input current is more than 75% of SRB-Lite input current, reduce the number of driver by 1.

For example, if one LED driver's input current is 0.3A and the SRB-LITE input current = 5A, the recommended maximum number N of this driver tied together is: N = 70% x(5A /0.3A)=11.67. The next closest integer number is 12. Thus, up to 12 drivers can be together to the SRB-Lite.

Memory bank 1 extension

Memory Bank 1 has been extended to enable asset management functionality. The standardized content is described in DiiA/ANSI C137.4 as Content Format 3.The parameters, as shown in Table 2, can be accessed by selecting "Luminaire info - version 3" from the "Content format ID" pull down menu in Device features of MultiOne (see Fig. 15). The parameters can then be changed and written/programmed to the SR bridge.

For legacy the original proposed parameters by Signify can be accessed by selecting "Luminaire info - version 1".

Address	Size (Bytes)	Functionality
0	1	Last accessible location
1	1	Indicator byte
2	1	Lock byte
3 - 8	6	OEM GTIN
9 - 16	8	OEM ID
17 - 18	2	Content Format
19 - 20	2	Luminaire date of manufacture (YYWW)
21 - 22	2	Nominal Input Power (W)
23 - 24	2	Power at minimum dim level (W)
25 - 26	2	Nominal Minimum AC mains voltage (V)
27 - 28	2	Nominal Maximum AC mains voltage (V)
29 - 31	3	Nominal light output (Lm)
32	1	CRI
33 - 34	2	CCT (K)
35	1	Light Distribution Type
36 - 59	24	Luminaire color
60 - 119	60	Luminaire identification

Table 2. Memory Bank 1 Extension Content Format 3.

Mechanical design-in

Form factors

The Advance Xitanium SR bridge is available in two different versions: model SRB-LD is for mounting inside luminaires (see Figure 13) and model SRB-BS includes studs to easily mount the SR bridge onto a mounting plate of a downlight fixture (see Figure 14).
The specific dimensions can be found in the SR bridge datasheet.

It is highly recommended to mount the SR bridge by using all available mounting feet/studs in order to achieve maximum mechanical robustness against shocks and vibration.

Mounting screw dimensions should be based on the specified fixing hole diameter in the SR bridge datasheet. Oversized and undersized screws should not be used in order to prevent damage to the mounting feet or loose mounting.

Please allow for sufficient free space around the SimpleSet antenna (blue areas as shown in Figure 16 and 17) if the SR bridge is to be configured after mounting in the luminaire. The minimum recommended space is dependent on the type of SimpleSet configuration tool. Using the tool as shown in Figure 18 (Feig Electronic Desktop Reader ID CPR30-USB), the minimum distance is 15 mm (+/-1mm).

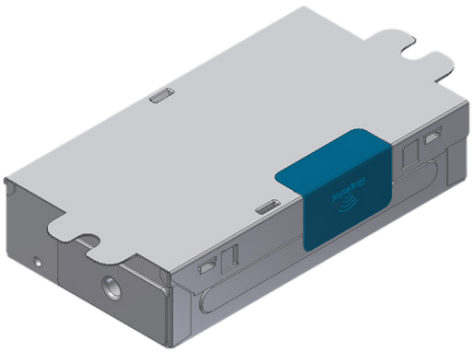

Figure 16. SRB-LD version for luminaire mounting.

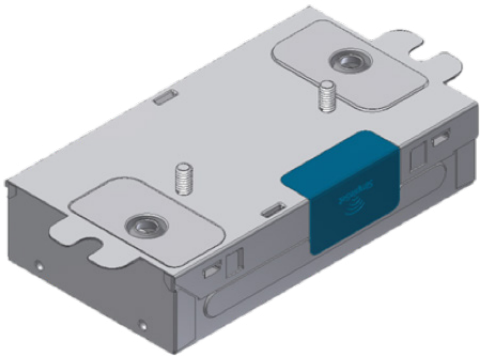

Figure 17. SRB-BS version to mount to (downlight) fixture mounting plate.

Figure 18. Feig Electronic ID CPR30-USB SimpleSet interface tool.

Thermal management

Introduction

The following section covers the critical thermal management point to facilitate design-in. Taking thermal considerations into account will ensure optimal performance and lifetime of the system. The maximum case temperature (Tc max) of the SR bridge should not be exceeded. It is mandatory to keep the SR bridge Tc max within specification to meet SR bridge lifetime and failure rate specifications. Please refer to the product datasheet for specific values. Advance Xitanium SR bridges are designed to provide a lifetime of up to 50,000 hours at the specified Tc max.

Temperature case point

To achieve optimal lifetime and reliability, it is critical that the temperature of the components in the SR bridge remains within their rating. During design, all precautions are taken to ensure that the internal components are at the lowest possible temperatures.

Initial thermal analysis is performed via IR scans at room temperature to identify the hottest components of the SR bridge. Subsequently, detailed temperature measurements of the critical components are performed under various input/output conditions at worst case operating temperatures.

The temperature measurements are then correlated to a Tcase (Tc) point on the SR bridge as shown in Figure 19. Tc temperature is a proxy for the temperatures of the critical internal SR bridge components.

The location of the Tc point is identified on the product label (Figure 20).

Note:

The specified Tc max of the SR bridge must NEVER be exceeded. In order to ensure accurate Tc test results, the case temperature should not vary by more than 1°C for a period of at least 30 minutes after a stable temperature has been achieved. Tc point should not be obstructed when mounted in the luminaire/enclosure.

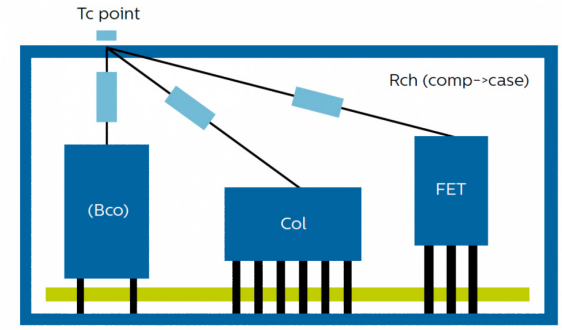

Figure 19. Schematic representation of internal thermal paths to the SR bridge Tc point.

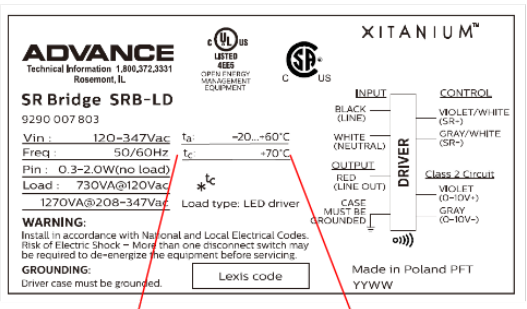

Figure 20. Product label indicating Tc point.

Electrical design-in

Inrush current

Inrush current refers to the brief high input current that flows into a device during the moment of connection to mains; see Figure 21. Typically, the amplitude is much greater than the steady-state input current.

Advance Xitanium products meet the inrush specification values per NEMA 410.

The SR bridge uses advanced “zero-crossing” technology by turning on the connected load only when the mains voltage is near the zero crossing. This reduces the inrush current of the connected load(s) to a minimum.

The peak and duration values are given in the individual product datasheet. It should be noted that the inrush current measurement given in the datasheet is the absolute worst case value.

What does inrush current do? High inrush currents can cause circuit breakers or fuses to open if not designed to handle this current. It can limit how many drivers can be connected to a circuit breaker (CB) or fuse. In case of the SR bridge, it limits how many drivers can be connected to the SR bridge.

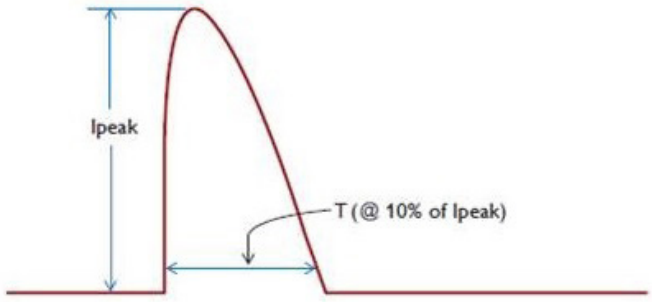

Figure 21. Graphical representation of inrush current.

Surge protection

The Advance Xitanium SR bridge has limited built-in surge protection (in accordance with IEEE/ANSI C62.41.2 Transient Surge Requirements). The datasheet gives the protection level of the SR bridge.

In case the SR bridge is used in an application other than indoor/office, additional surge protection should be build in the luminaire to meet the specific category for meeting ANSI requirements like 6kV/3kA surge rating for Industrial (High bay) applications that need to meet ANSI C82.77-5.

Leakage current

The Advance Xitanium SR bridge is designed to meet leakage current requirements per UL 916 standards. The specified maximum value is 0.75 mA RMS at 277V. The test is done with the SR bridge alone. In a luminaire, leakage current may be higher since the LED load introduces additional leakage capacitance. As such, precautions should be taken on the luminaire level.

Electromagnetic compatibility (EMC)

The Xitanium LED SR bridge meets EMC requirements per FCC Title 47 Part 15 Class A. These tests are conducted with a reference setup and the SR bridge mounted on a grounded metal plate. To maintain good EMC performance at the luminaire level, the input, output and dim wires should be kept as far apart as possible. The addition of ferrite beads in series with the wires or coupling the wires through ferrite cores within the luminaire may improve the overall EMC performance. However, selection of the type and characteristics of the additional filter depends on what frequency components have to be damped and by how much.

Consumer Information for Class A Compliance: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Electrical isolation

The Advance Xitanium SR bridge output is isolated from the primary (Class 2). Isolation is also provided between all the electronic circuits and the chassis.

Xitanium bridges meet UL 916, and the output terminals have been qualified as Class 2 circuit with UL1310 safety standards.

All of the wires in the Advance Xitanium SR bridges meet the UL1452 safety standards.

Disclaimer

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