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Bridging Light and Life™

Bridgelux Vesta® Flex

June 2020

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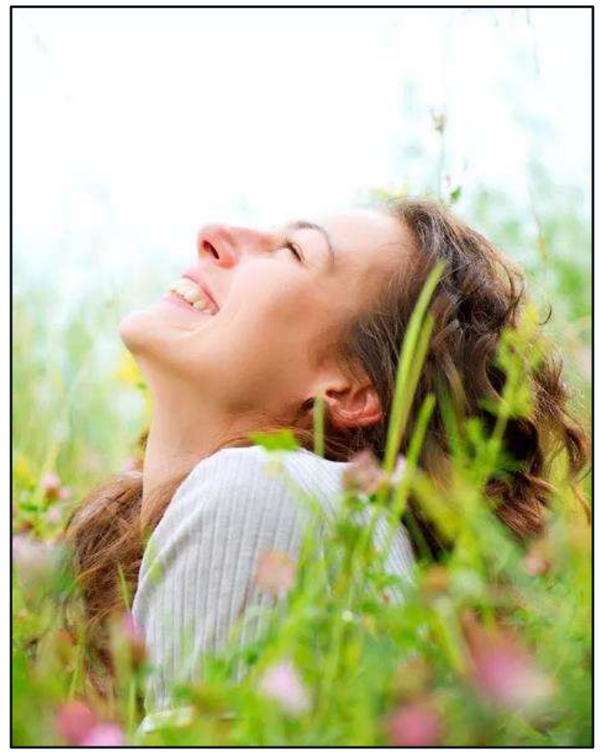
Human Centric Lighting

- Definition: Lighting that can benefit the biological, emotional, health, or wellbeing of people

- Key product development strategies:
  - Ensuring the light delivered is as close to that provided by nature
    - Emulating the spectrum of the sun under which humans have evolved for over 200,000 years; sunlight during the day and firelight at night
    - Avoiding deviations from natural light that may disrupt the circadian rhythm
  - Enabling personalization and control
    - Supporting individual preferences for lighting intensities, colors and styles
    - Circadian adjustable to mimic the levels of sunlight throughout the day
  - Providing high quality light sources for visual appeal
    - Full spectrum emission over the visual range with high CRI and TM-30 metrics

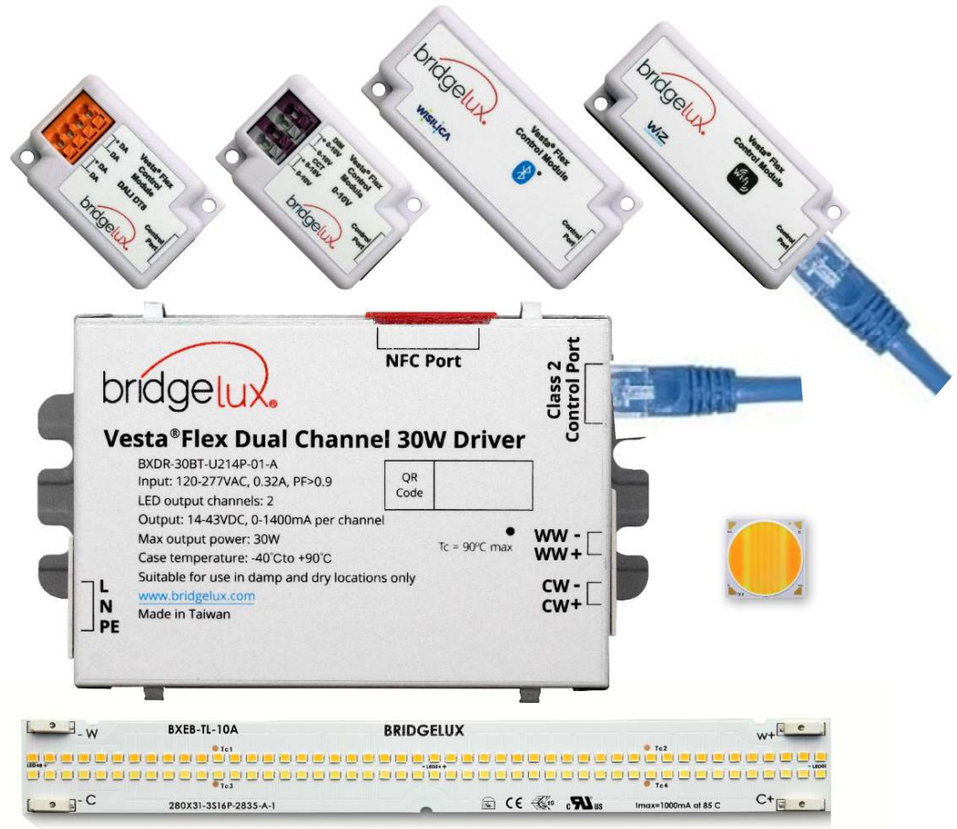


Lighting Market: Dynamics And Challenges

- The lighting market is in the early stages of human-centric lighting adoption
  - Tunable white lighting systems are an important part of this evolution with strong growth potential
- The lighting component market is siloed
  - This forces luminaire manufacturers to source building blocks (LEDs, drivers, and controls) from multiple suppliers
  - Unfortunately, this often results in challenges as the sourced components may not work together out of the box
- Most tunable white opportunities are project based
  - The control system decisions may be made outside of the luminaire manufacturers control, driven by the installation
- To accelerate the adoption of tunable white lighting a flexible, future ready solution is needed
  - Enabling lighting manufacturers to quickly react to projects with a solution that works together, seamlessly and reliably

Vesta® Flex: Dual Channel LED Driver and Control Module Family

- Bundled system from one manufacturer guaranteed to work together out of the box
- Control module and driver family enables application flexibility and interoperability with third party systems
  - Includes WiZ Wi-Fi, WiSilica BLE mesh, DALI2 DT8 and 0-10V
  - Casambi and Silvair BLE modules under development
  - Flexible, future-proof solution
- 30W and 60W Brick and 60W Linear options
  - Strain relief options
  - Stud mounting options
  - Poke in terminal connection from either side or the back
- RJ45 control port interface
  - 2 channel PWM communication
  - Simple, standard, keyed, and robust solution



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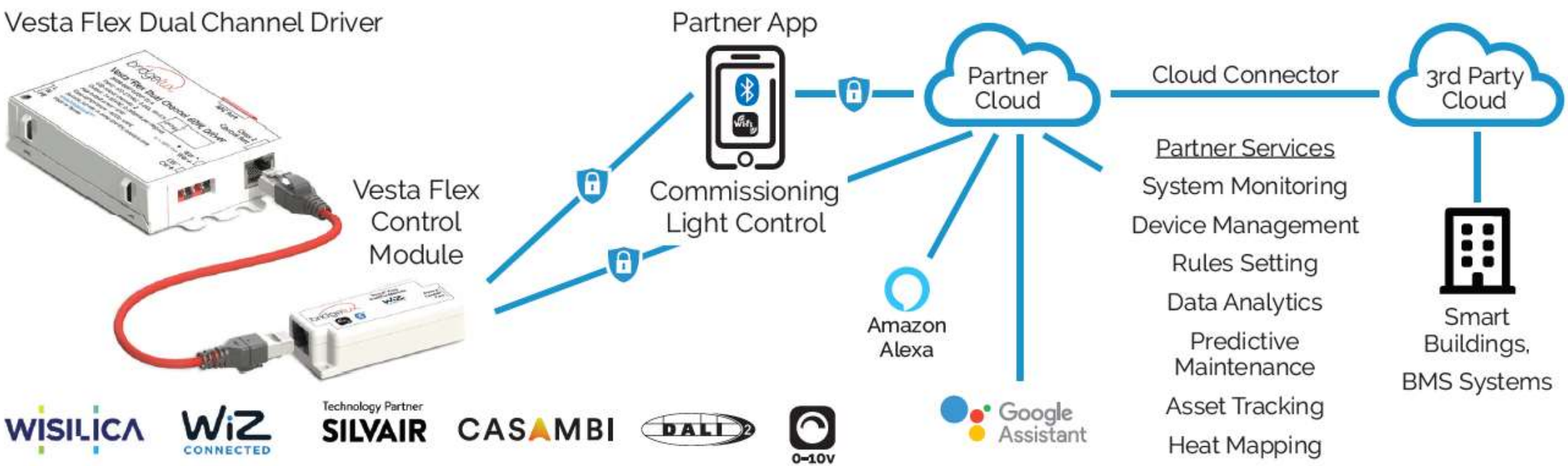
Vesta® Flex: Architecture And Ecosystem

Vesta Flex enables you and your customers to connect to third party data management, control systems, and ecosystems smart lighting management



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Vesta® Flex Drivers: Features and Specifications

- Smooth, flicker free CCT tuning and dimming to 0.1% with dim-to-dark
- High resolution linear, square and logarithmic dimming curves
- Built-in overvoltage, over-temperature and short circuit protection
- NFC programmable features including dimming curves, maximum output currents, minimum dim levels, fade times, and OTP overwrite
- Control port autodetects and powers control module, adjusting behavior accordingly
- Compatible with Bridgelux Vesta® Series tunable white light sources
- 88% efficiency at full load
- Flicker free per IEEE P1789, CEC Title 24
- Universal input voltage range of 120V – 277V
- UL Class2, Class P SELV

130mm x 77mm x 30mm (L x W x H)

130mm x 77mm x 30mm (L x W x H)

320mm x 32mm x 28mm (L x W x H)

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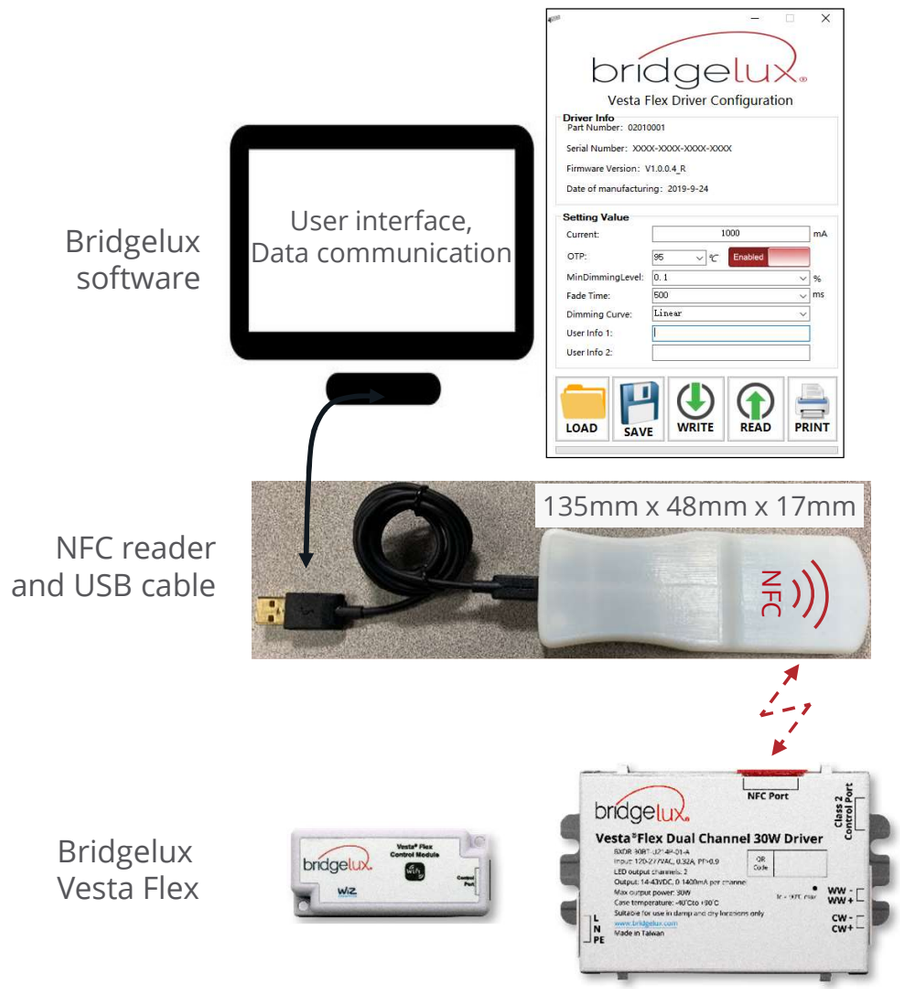
Vesta® Flex: Wireless NFC Programming Tool

- NFC Programming of Vesta Flex
  - Vesta Flex Driver NFC port requires BLX NFC programming tool
  - Vesta Flex Driver NFC port may not be compatible with 3rd party NFC programming tools
- Vesta flex programming tool kit includes:
  - Bridgelux NFC Reader with micro USB connector, USB cable
  - Bridgelux proprietary software
- NFC programmable settings include
  - Linear, square, or logarithmic dimming curves
  - Maximum output currents
  - Over temperature protection overwrite
  - Minimum dim levels (0.1%, 1%, 5%, 10%)
  - Fade time
- Samples available now



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Vesta® Flex: Wireless Control Modules

WiSilica Enabled BLE Control

75mm x 32mm x 20mm (L x W x H)

- Connect lighting fixtures to an intelligent non-flooding BLE mesh network
- Commission and manage lighting fixtures via iOS and Android apps or web portal
- Interoperated with beacons and sensors via BLE
- Large ecosystem of compatible sensors, switches, gateways, and 3rd party clouds
- Cloud services such as system monitoring, device management, predictive maintenance, asset tracking, and data analytics

WiZ Enabled Wi-Fi Control

75mm x 32mm x 20mm (L x W x H)

- Connect lighting fixtures to the internet via Wi-Fi, no hub needed
- Interoperates with sensors via BLE
- Commission and manage lighting fixtures via iOS and Android apps or web portal
- Large ecosystem of compatible sensors, switches, gateways, and cloud platform
- Cloud services such as system monitoring, device management, predictive maintenance, asset tracking, and data analytics

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Vesta® Flex: Wireless Control Modules

Casambi Enabled BLE Control

75mm x 32mm x 20mm (L x W x H)

- Connect lighting fixtures and accessories to Casambi's proprietary BLE mesh network
- Commission and manage lighting fixtures via iOS and Android apps or a web portal
- Build-in iBeacon technology enabling location awareness
- Large ecosystem of compatible, sensors, switches, and DALI or 0-10V compatible controllers
- Cloud services for device configuration and access management, system monitoring, and connecting to 3rd party cloud systems for services such as data analytics

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Silvair Enabled BLE Control

75mm x 32mm x 20mm (L x W x H)

- Connect lighting components to Silvair's open BLE SIG compatible mesh network
- Commission and manage lighting fixtures via an iOS app or a web portal
- Interoperable with any 3rd party BLE SIG compatible device
- Large ecosystem of compatible sensors, switches, and DALI or 0-10V compatible controllers
- System services for device, configuration and access management, system monitoring, and optimization of energy consumption

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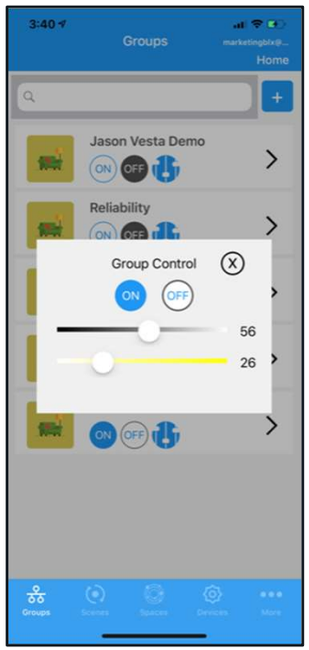
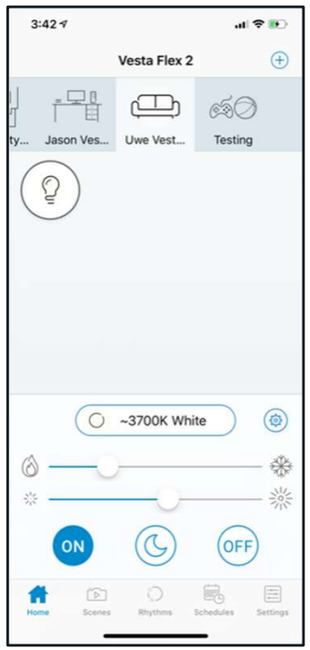
Vesta® Flex: Wireless Application User Interfaces

WiSilica

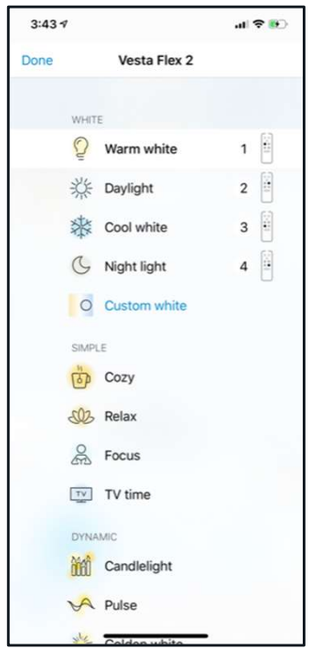


Dimming
CCT tuning
Commissioning
Groups, Scenes

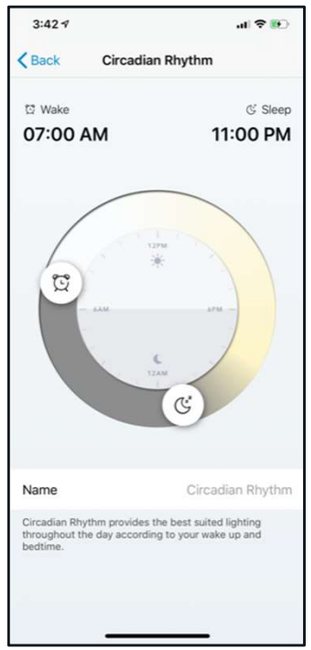
WiZ



Dimming
CCT tuning
Commissioning
Groups



Pre-Sets
Scenes



Circadian
Rhythm
Programmability

Casambi

Dimming
CCT tuning
Commissioning
Groups, Scenes

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Vesta® Flex: Wired Control Modules

DALI2 DT8 Control Module

50mm x 32mm x 20mm (L x W x H)

- DALI2 DT8 certified
- Two-channel control of color temperature and intensity
- Compatible with industry standard DALI2 DT8 devices
- Commission and manage lighting fixtures via any DALI2 certified controller

0-10V Control Module

50mm x 32mm x 20mm (L x W x H)

- 0-10V control protocol
- Two-channel control of color temperature and intensity
- Compatible with industry standard 0-10V current sourcing of current sinking wired control devices
- Dim-to-off hysteresis with turn off at 0.6V and turn on at 0.8V

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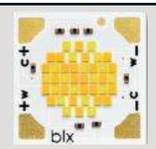
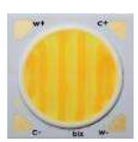
Bridgelux Vesta® COB Portfolio: Tunable White and Dim-To-Warm

Vesta Product	Technology	Sample Image	Part Numbers	LES / Dimensions	Tunable / Dimming CCT Range	CRI	Typ. Flux (lm) at coolest CCT (25°C)	Drive Current (mA)	Voltage (V) (25°C)	Efficacy (lm/W) (25°C)	Application Highlights
Dim-To-Warm Arrays	Dispensed phosphor		BXRV-DR-18xxG-0600-A-13	6mm (7W)	1800K-2700/3000K[1]	90	660	350	17.0	111	Residential, Hospitality, Lowest system cost
			BXRV-DR-18xxx-1000-G-13 BXRV-DR-18xxx-1000-A-13 BXRV-DR-18xxx-1000-B-13 BXRV-DR-18xxx-2000-A-13 BXRV-DR-18xxx-3000-A-13	9 mm (4W) 9 mm (6W) 9 mm (12W) 13 mm (21W) 15 mm (33W)		90, 95	490 684 1360 2312 3725	250 350 350 600 950	17.0 17.0 33.8 33.5 34.1	115 115 115 115 115	
			BXRV-DR-18xxG-4000-A-13 BXRV-DR-18xxG-1K00-A-13	18mm (47W) 29mm (113W)		90	5350 13000	1300 2350	36.0 48.0	115 115	
Tunable White Arrays	CSP		BXRV-TR-2750G-1000-A-2x BXRV-TR-2750G-2000-A-2x	9 mm (12W) 13 mm (25W)	2700K-5000K[2]	90	1385 2750	700 700	18.1 36.0	106 106	High color angular uniformity (CAU) optical performance
Tunable White Arrays	Dispensed phosphor		BXRV-TR-27xxG-06A0-A-23	6mm (5.5W)	2700K-5000/6500K[2]	90	600	150	36.0	110	Higher efficacy, Higher lm/$ options
			BXRV-TR-xxxxG-10A0-x-23 BXRV-TR-xxxxG-20A0-A-23	9 mm (9W) 13mm (18W)	2700K-5000/6500K[2] 1800K-3000/4000K[2]	90 Thrive	1190 2250	500 / 250 500	18.0 / 34.8 36.3	137 124	
			BXRV-TR-2750G-30A0-A-23 BXRV-TR-2750G-40A0-A-23 BXRV-TR-2750G-65A0-A-23 BXRV-TR-2750G-1KA0-A-23	15mm (21W) 18mm (25W) 22mm (44W) 29mm (54W)	2700K-5000/6500K[2]	90	2884 4026 6106 7043	650 900 900 1050	35.5 35.3 53.0 52.4	125 127 128 128	

Notes:
1. Tc = 25°C;
2. Tc = 85°C

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Bridgelux Vesta® Linear Portfolio: Tunable White Solutions

Vesta Product	Sample Image	Part Numbers	Dimensions	Tunable CCT Range	CRI	Typical Flux (lm)	Drive Current (mA)	Voltage (V)	Peak Efficacy (lm/W)	Application Highlights
TL Gen 3 1 SMD Row		BXEB-TL-L0280Z-xxxxy1000-B-C3 BXEB-TL-L0560Z-xxxxy2000-B-C3 BXEB-TL-L1120Z-xxxxy4000-B-C3	280 mm x 24 mm 560 mm x 24 mm 1120 mm x 24 mm	1800K-3000K 1800K-4000K 2700K-5000K 2700K-6500K	80 90 Thrive	1360 2725 5450	375 750 750	19.7 19.7 39.4	184	Same form factor as standard EB modules
TL Gen 3 2 SMD Rows		BXEB-TL-L0280Z-27xxy1000-A-C3 BXEB-TL-L0560Z-27xxy2000-A-C3 BXEB-TL-L1120Z-27xxy4000-A-C3	280 mm x 31 mm 560 mm x 31 mm 1120 mm x 31 mm	2700K-5000K 2700K-6500K	80 90 Thrive	1835 3670 7340	500 1000 1000	19.7 19.7 39.4	189	Highest flux and highest efficacy
Edge		BXEB-TL-L0570A-2750G-2000-E-A3	570 mm x 6 mm	2700K-5000K	90	2730	600	34.6	132	Ideal for edge lit panel lighting
TL 2 SMD Rows		BXEB-TL-2750G-1000-A-13 BXEB-TL-2750G-3000-A-13	280 mm x 31 mm 560 mm x 31 mm	2700K-5000K	90	1680 3350	500 1000	24.8	135	Original Vesta TL

Note: Performance data measured at 5000K, 80 CRI, and 25C (90 CRI for bottom two products)

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Bridgelux Roadmap: Vesta® Flex

Vesta Flex Drivers

Vesta Flex Controls

Vesta Flex 30W Brick Driver

Vesta Flex 60W Brick Driver

Vesta Flex 60W Linear Driver

Vesta Flex 20W Compact / Stick Driver

Vesta Flex 40W Compact / Stick Driver

Vesta Flex 100W Linear Driver

Vesta Flex Casambi BLE Control Modules

Vesta Flex Silvair BLE Control Modules

Vesta Flex 0-10V Control Module

Vesta Flex DALI2 DT8 Control Module

Vesta Flex Wisilica BLE Control Module

Vesta Flex Wiz WiFi Control Module

Q4.2019 Q1.2020 Q2.2020 Q3.2020 Q4.2020 Q1.2021 Q2.2021 Q3.2021

Unless otherwise specified point of arrow indicates target market launch date.

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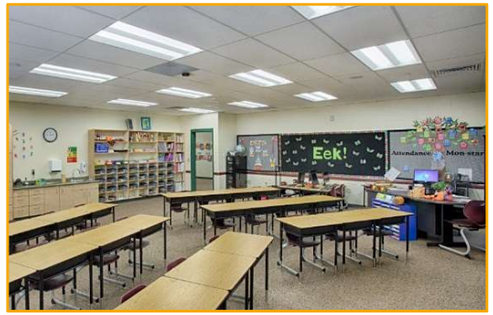
Market Applications Vesta® Flex

- Retail & Hospitality
- Office & Education
- Residential
- Healthcare
- Architectural
- Museums
- Entertainment









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Review: Vesta Flex Key Features, Benefits and Products

Features / Differentiation	Benefits
Specification grade two-channel drivers with dimming to 0.1% and dim-to-dark	High resolution CCT tuning and dimming
Compatible with multiple control protocols including 0-10V, DALI2 DT8, Wi-Fi, and multiple Bluetooth mesh control options	Future-ready flexible solution to support project-based requirements without recertification
Bundled light source, driver and controls solutions from one supplier	Guaranteed to work together seamlessly out of the box
NFC programmable output parameters	Adjustability to support a wide range of applications and installations

Production samples Available Now

Vesta® Flex
60W Brick Driver

Vesta® Flex
30W Brick Driver

Vesta® Flex
WiSilica BLE Control
WiZ Wi-Fi Control

Vesta® Flex
0-10V Control
DALI2 Control

Pre-production samples available now

Vesta® Flex 60W Linear Driver

Vesta® Flex
Casambi BLE Control

Vesta® Flex
Silvair BLE Control

Note: Images not shown to scale

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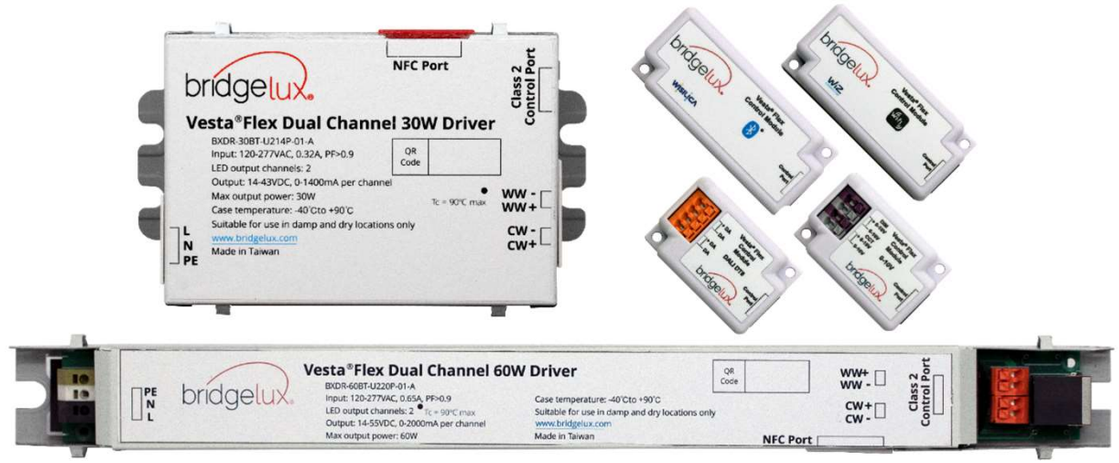
Summary: The Vesta® Flex Advantage

- With Vesta® Flex, Bridgelux delivers a bundled tunable white solution guaranteed to work together out of the box
  - Plug and play compatibility
- The flexibility to work with up to 6 different control systems supports the ability to respond to project- based control system requirements
  - 0-10V, DALI2 DT8, WiSilica BLE, WiZ Wi-Fi available now
  - Casambi and Silvair BLE available by end of Q2
- Vesta® Flex is a future ready solution, able to quickly adapt to new control systems without requiring luminaire recertification
  - New control modules can be developed as new control protocols emerge



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