LUMILEDS

GENERAL ILLUMINATION

LUXEON XF-3535L

Turnkey solution on a flexible substrate with optimized performance and uniform light distribution

LUXEON XF-3535L is a fully integrated solution optimized for lighting applications requiring flexible linear LED arrays that can easily fit into any luminaire housing form factor. The turnkey solution minimizes time to market and simplifies supply chain by reducing optical and mechanical design efforts. Combined with LUXEON 3535L, LUXEON XF-3535L provides the same powerful optical performance guaranteed by LUXEON LEDs.

FEATURES AND BENEFITS

- 1000–5000 lumen strips enabling efficacies of up to 157 lm/W
- A full range of CCT/CRI offerings: 2200–5700K with 70–90CRI minimums
- Complete integrated solution guarantees simplified supply chain and faster time to market
- Backside adhesive for attachment to heat sink allows for ease of mounting and assembly
- Available with solder terminals or push-in wire connectors for easy electrical connection
- UL-recognized component [E335118]

PRIMARY APPLICATIONS

- Downlights
- Indoor Area Lighting
- Specialty Lighting

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Table of Contents

General Product Information 2
- Test Conditions 2
- Part Number Nomenclature 2
- Lumen Maintenance 2
- Environmental Compliance 2

Performance Characteristics 3
- Product Selection Guide 3
- Configurations 4
- Electrical and Thermal Characteristics 4

Absolute Maximum Ratings 5

Characteristic Curves 6
- Spectral Power Distribution Characteristics 6
- Radiation Pattern Characteristics 6
- Color Bin Definition 7

Mechanical Dimensions 8
- L235-xxyyAHLGBAAC0 8
- L235-xxyyAHLGBBAC0 9
- L235-xxyyAHLCBAAC0 10
- L235-xxyyAHLCBBAC0 11
- L235-xxyyAMLF5WAD0 12
- L235-xxyyAULM5JAI0 13

IDC Connector 14

Assembly Precautions 14

Packaging Information 15
- Reel Dimensions 15

Appendix 16
- Flexible Substrate Material 16
- TIM/PSA Material 16
- Connectors 16

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General Product Information

Test Conditions

The nominal current for LUXEON XF-3535L is 100mA x the number of parallel LED strings. A LUXEON XF-3535L configuration with 6 parallel strings has a nominal drive current of 600mA.

The LEDs on LUXEON XR-3535L are tested and specified individually at a junction temperature of 25°C with a drive current of 100mA and pulse duration of 20ms. The minimum, typical, and maximum performance numbers for LUXEON XF-3535L in this datasheet are derived from the individual LED measurements. The confidence level on all minimum and maximum performance parameters in this datasheet is 99% to within individual LED tolerance.

Part Number Nomenclature

Part numbers for LUXEON XF-3535L follow the convention below:

L 2 3 5 – **A A B B** A **C** L **D E F** A **G** 0

Where:

- **A A** – designates nominal ANSI CCT (27=2700K, 30=3000K, etc...)
- **B B** – designates minimum CRI (80=80CRI)
- **C** – designates number of LEDs per board (H=36, M=56, U=108)
- **D** – designates strip length (C=300mm, F=525mm, G=600mm, M=1150mm)
- **E** – designates strip width (5=5.25mm, B=10mm)
- **F** – designates electrical connectivity (A=tin contacts at same end (36-up), B=two connectors at the same end (36-up), W=two connectors at opposite ends (56-up), J=two connectors at opposite ends (108-up))
- **G** – designates typical forward voltage (C=18V, D=21V, I=36V)

Therefore, the following part number is used for a LUXEON XF-3535L 3000K 80CRI, 56 LEDs per board, 525mm length, 5.25mm width, two connectors at opposite ends and forward voltage of 21V:

L 2 3 5 – **3 0 8 0** A **M** L **F 5 W** A **D** 0

Lumen Maintenance

Please contact your local Sales Representative or Lumileds Technical Solutions Manager for more information about the long-term performance of this product.

Environmental Compliance

Lumileds LLC is committed to providing environmentally friendly products to the solid-state lighting market. LUXEON XF-3535L is compliant to the European Union directives on the restriction of hazardous substances in electronic equipment, namely the RoHS Directive 2011/65/EU and REACH Regulation (EC) 1907/2006. Lumileds LLC will not intentionally add the following restricted materials to its products: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).

Performance Characteristics

Product Selection Guide

Table 1. Product performance of LUXEON XF-3535L at 100mA/LED[1], T_j=25°C.

NOMINAL CCT	MINIMUM CRI [2]	LUMINOUS FLUX[3, 5] (lm)		TYPICAL LUMINOUS EFFICACY (lm/W)	TYPICAL FORWARD VOLTAGE (V)	TEST CURRENT (mA)	PART NUMBER [4]
		MINIMUM	TYPICAL				
2200K	80	1080	1206	112	18	600	L235-2280AHLxByAC0
		1680	1876	112	21	800	L235-2280AMLF5WAD0
		3240	3618	112	36	900	L235-2280AULM5JAI0
2700K	80	1368	1476	137	18	600	L235-2780AHLxByAC0
		2128	2296	137	21	800	L235-2780AMLF5WAD0
		4104	4428	137	36	900	L235-2780AULM5JAI0
	85	1080	1224	113	18	600	L235-2790AHLxByAC0
		1680	1904	113	21	800	L235-2790AMLF5WAD0
		3240	3672	113	36	900	L235-2790AULM5JAI0
3000K	80	1368	1512	140	18	600	L235-3080AHLxByAC0
		2128	2352	140	21	800	L235-3080AMLF5WAD0
		4104	4536	140	36	900	L235-3080AULM5JAI0
3500K	80	1512	1548	143	18	600	L235-3580AHLxByAC0
		2352	2408	143	21	800	L235-3580AMLF5WAD0
		4536	4644	143	36	900	L235-3580AULM5JAI0
4000K	80	1512	1584	147	18	600	L235-4080AHLxByAC0
		2352	2464	147	21	800	L235-4080AMLF5WAD0
		4536	4752	147	36	900	L235-4080AULM5JAI0
	85	1224	1368	127	18	600	L235-4090AHLxByAC0
		1904	2128	127	21	800	L235-4090AMLF5WAD0
		3672	4104	127	36	900	L235-4090AULM5JAI0
5000K	80	1512	1692	157	18	600	L235-5080AHLxByAC0
		2352	2632	157	21	800	L235-5080AMLF5WAD0
		4536	5076	157	36	900	L235-5080AULM5JAI0
5700K	80	1512	1548	143	18	600	L235-5780AHLxByAC0
		2352	2408	143	21	800	L235-5780AMLF5WAD0
		4536	4644	143	36	900	L235-5780AULM5JAI0
	70	1584	1692	157	18	600	L235-5770AHLxByAC0
		2464	2632	157	21	800	L235-5770AMLF5WAD0
		4752	5076	157	36	900	L235-5770AULM5JAI0

Notes for Table 1:
1. The nominal drive current is 100 mA x the number of parallel strings in LUXEON XF-3535L. See table 2 for physical configurations.
2. Lumileds maintains a tolerance of ±2 on CRI measurements for individual LUXEON 3535L LEDs.
3. Lumileds maintains a tolerance of ±7.5% on luminous flux measurements for individual LUXEON 3535L LEDs.
4. "x" and "y" are part number attributes as described in the Part Number Nomenclature section: here x/y = G/A, G/B, C/A, or C/B.
5. Maximum luminous flux non-uniformity (i.e. LED to LED luminous flux variation) = 15 %.

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Configurations

Table 2. Configurations for LUXEON XF-3535L.

PART NUMBER [1]	LED COUNT	FLEX STRIP LENGTH (MM)	FLEX STRIP WIDTH (MM)	LED PITCH [2, 3] (MM)	ELECTRICAL CONFIGURATION	ELECTRICAL CONNECTION
L235-xxyyAHLGBAAC0	36	600	10	16.67	6 Parallel x 6 Series LEDs	Tin Contacts
L235-xxyyAHLGBBAC0	36	600	10	16.67	6 Parallel x 6 Series LEDs	IDC Connectors
L235-xxyyAHLCBAAC0	36	300	10	8	6 Parallel x 6 Series LEDs	Tin Contacts
L235-xxyyAHLCBBAC0	36	300	10	8	6 Parallel x 6 Series LEDs	IDC Connectors
L235-xxyyAMLF5WAD0	56	525	5.25	8.45	8 Parallel x 7 Series LEDs	IDC Connectors
L235-xxyyAULM5JAI0	108	1150	5.25	10	9 Parallel x 12 Series LEDs	IDC Connectors

Notes for Table 2:
1. "x" and "y" are part number attributes as described in the Part Number Nomenclature section.
2. LED pitch is measured from optical center to optical center of neighboring LED packages.
3. LED pitch varies for 300mm and 600mm length flex strips. See mechanical drawings for details.
4. See Appendix for details on electrical connectors.

Electrical and Thermal Characteristics

Table 3. Electrical and thermal characteristics for LUXEON XF-3535L at 100mA/LED, T_j=25°C.

PART NUMBER [1]	FORWARD VOLTAGE (V) [2]			TYPICAL TEMPERATURE COEFFICIENT OF FORWARD VOLTAGE (mV/°C) [3]	TYPICAL THERMAL RESISTANCE JUNCTION TO SOLDER PAD (°C/W) [4, 5]	
	MINIMUM	TYPICAL	MAXIMUM		$R\Theta_{J-S}$	$R\Theta_{S-B}$
L235-xxyyAHLGBzAC0	17.4	18	18.6	-9	0.69	0.69
L235-xxyyAHLCBzAC0	17.4	18	18.6	-9	0.69	0.83
L235-xxyyAMLF5WAD0	20.3	21	21.7	-10.5	0.45	0.54
L235-xxyyAULM5JAI0	34.8	36	37.2	-18	0.23	0.28

Notes for Table 3:
1. "x," "y" and "z" are part number attributes as described in the Part Number Nomenclature section.
1. Lumileds maintains a tolerance of ±0.1V on forward voltage measurements.
2. Measured between 25°C and 85°C.
3. LED $\Delta V_z/\Delta T_j$ measured between T_j = 25°C and T_j = 85°C.
4. $R\Theta_{J-S}$ specified from peak LED junction to T_S (thermal contact point) next to LED. See Application Brief AB203 for details.
5. $R\Theta_{S-B}$ specified from TS (thermal contact point) next to LED, to bottom of flexible adhesive (heat sink).

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Absolute Maximum Ratings

Table 4. Absolute maximum ratings for LUXEON XF-3535L.

PARAMETER	MAXIMUM PERFORMANCE
DC Forward Current [1]	200mA x Number of parallel strings
Peak Pulsed Forward Current [2]	240mA x Number of parallel strings
LED Junction Temperature [3] (DC & Pulse)	125°C
ESD Sensitivity	IEC 61000 4-2 Level 1 (±2kV contact/air discharge)
Operating Case Temperature [4]	-40°C to 85°C
Flex Substrate [5]	105°C
Storage Temperature	<30°C <65%RH for ≤1year
Reverse Voltage ($V_{reverse}$) [6, 7]	-5V x Number of series LEDs
UL Recognition	LUXEON XF-3535L UL recognized for Class 2 drivers. Substrate and white reflective coating UL94 V0 flammability rated.
LED Shear Force	≥5kgF

Notes for 4:
1. Ripple current with a frequency of 50–150Hz is allowed, as long as the average of the current waveform is below 200mA/LED, and the maximum of the current waveform is lower than 240mA/LED.
2. At 10% duty cycle and pulse width 10ms.
3. Proper current de-rating must be observed to maintain junction temperature below the maximum.
4. T_s thermal contact point as defined in Application Brief AB203.
5. As per UL746 rating.
6. LUXEON 3535L LEDs are not designed to be driven in reverse bias.
7. At maximum reverse current of 10µA/LED.

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Characteristic Curves

Spectral Power Distribution Characteristics

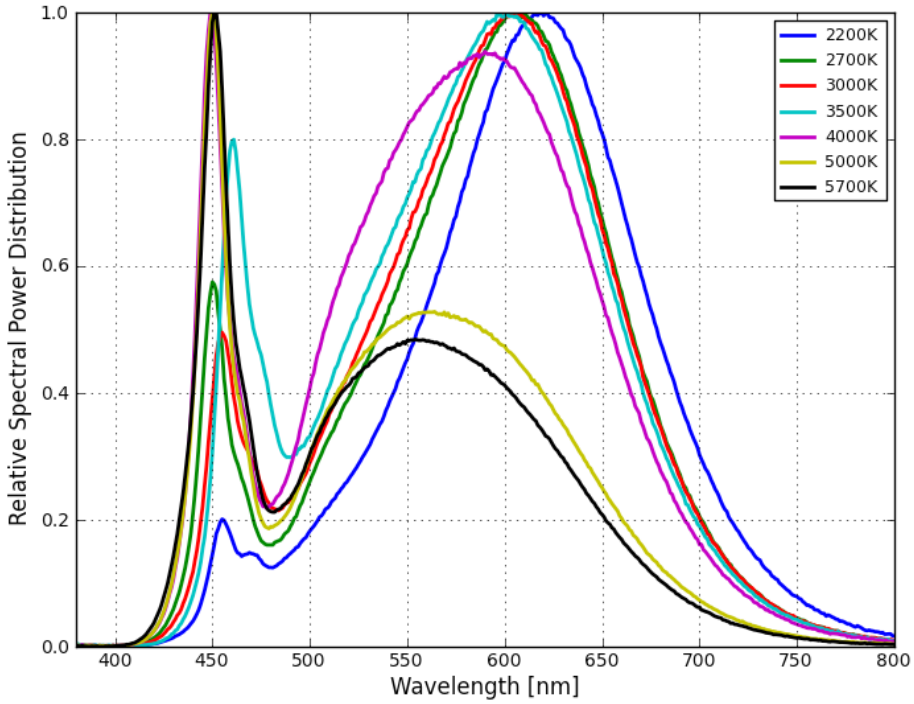

Figure 1: Typical relative intensity vs. wavelength for LUXEON 3535L color spectrum 80CRI at 100mA, T_j=25ºC.

Radiation Pattern Characteristics

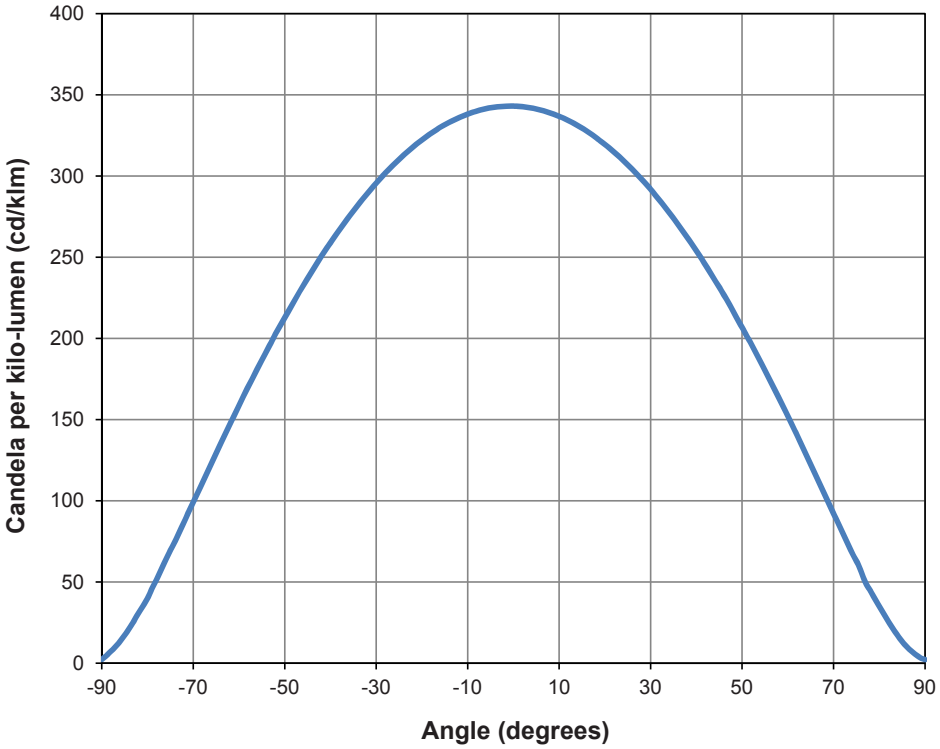

Figure 2: Typical radiation pattern for LUXEON XF-3535L at 100mA/LED, T_j=25ºC.

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Color Bin Definition

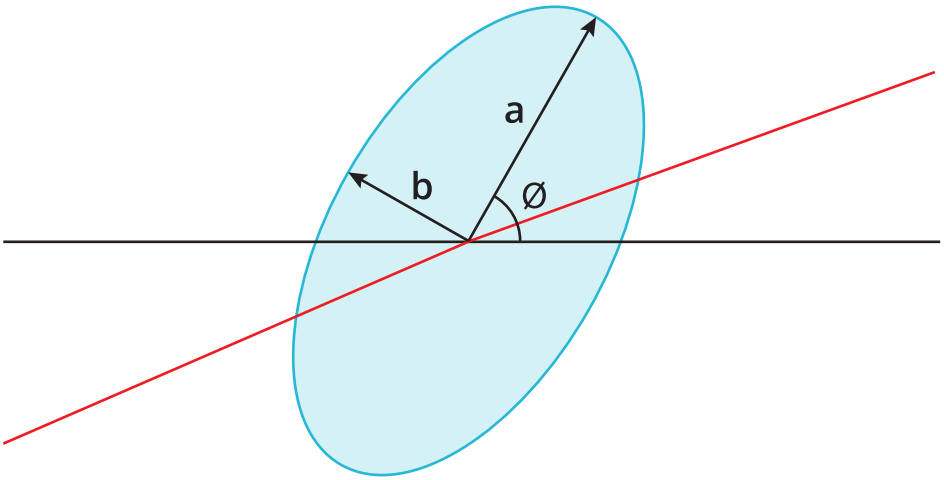

Figure 3: 3-step MacAdam ellipse illustration for Table 5.

Table 5. 3-step MacAdam ellipse color bin definitions for LUXEON XF-3535L.

NOMINAL CCT	COLOR SPACE	CENTER POINT (cx, cy)	MAJOR AXIS, a	MAJOR AXIS, b	ELLIPSE ROTATION ANGLE, Θ
2200	Single 3-step MacAdam ellipse	(0.5056, 0.4152)	0.00727	0.00400	50.8°
2700	Single 3-step MacAdam ellipse	(0.4578, 0.4101)	0.00810	0.00420	53.7°
3000	Single 3-step MacAdam ellipse	(0.4338, 0.4030)	0.00834	0.00408	53.2°
3500	Single 3-step MacAdam ellipse	(0.4073, 0.3917)	0.00927	0.00414	54.0°
4000	Single 3-step MacAdam ellipse	(0.3818, 0.3797)	0.00939	0.00402	53.7°
5000	Single 3-step MacAdam ellipse	(0.3447, 0.3553)	0.00822	0.00354	59.6°
5700	Single 3-step MacAdam ellipse	(0.3287, 0.3417)	0.00746	0.00320	59.1°

Notes for Table 5:
1. Lumileds maintains a tolerance of ±0.01 on x and y color coordinates.

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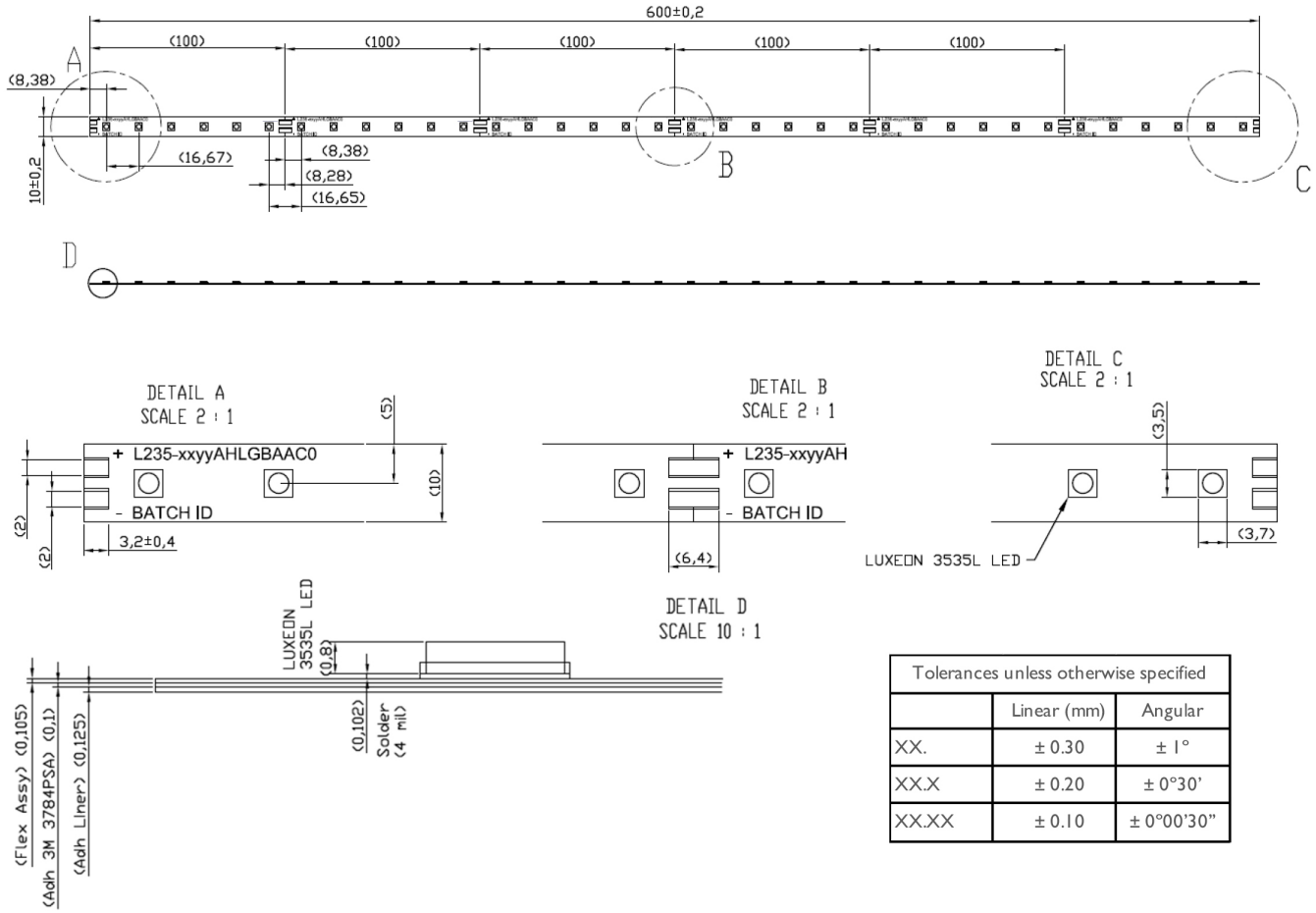
Mechanical Dimensions

L235-xxyyAHLGBAAC0



Tolerances unless otherwise specified		
	Linear (mm)	Angular
XX.	± 0.30	± 1°
XX.X	± 0.20	± 0°30'
XX.XX	± 0.10	± 0°00'30"

Figure 4: Mechanical dimensions for L235-xxyyAHLGBAAC0.

Notes for Figure 4:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

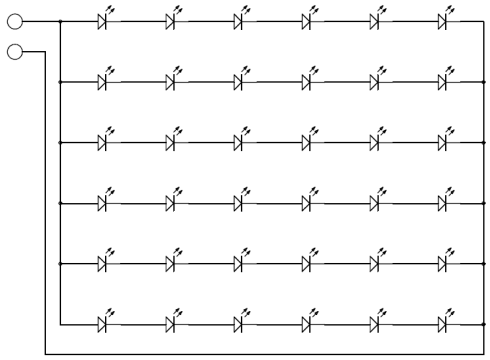


Figure 5: Electrical circuit diagram for L235-xxyyAHLGBAAC0.

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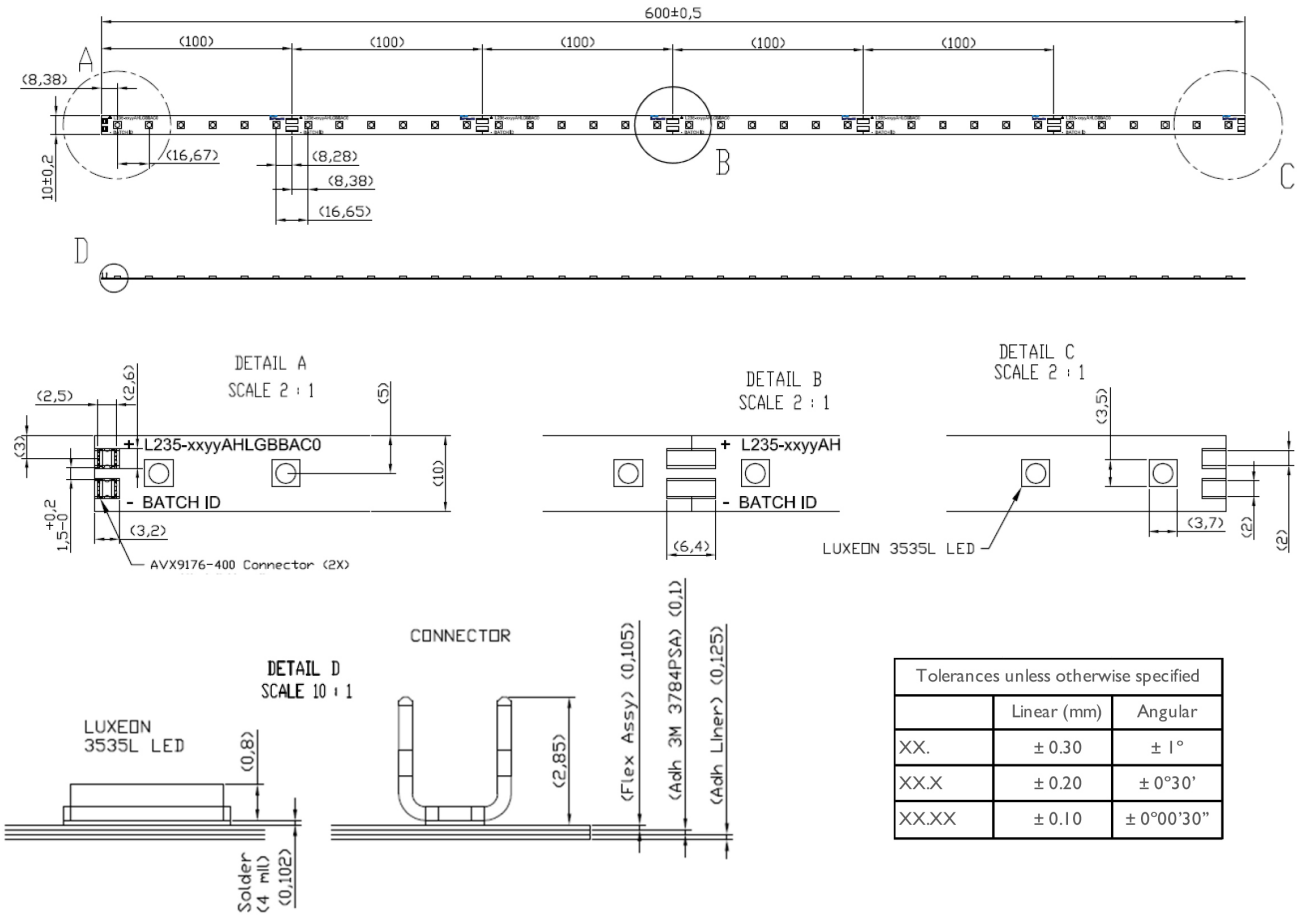
L235-xxyyAHLGBBAC0



Tolerances unless otherwise specified		
	Linear (mm)	Angular
XX.	± 0.30	± 1°
XX.X	± 0.20	± 0°30'
XX.XX	± 0.10	± 0°00'30"

Figure 6: Mechanical dimensions for L235-xxyyAHLGBBAC0.

Notes for Figure 6:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

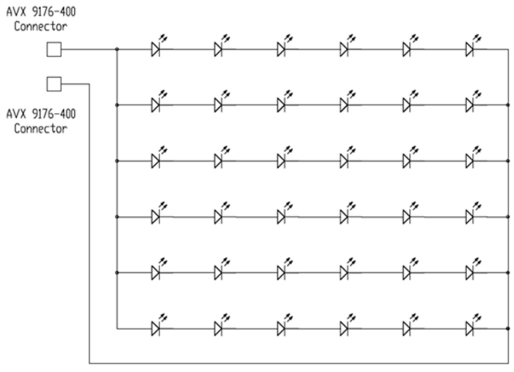
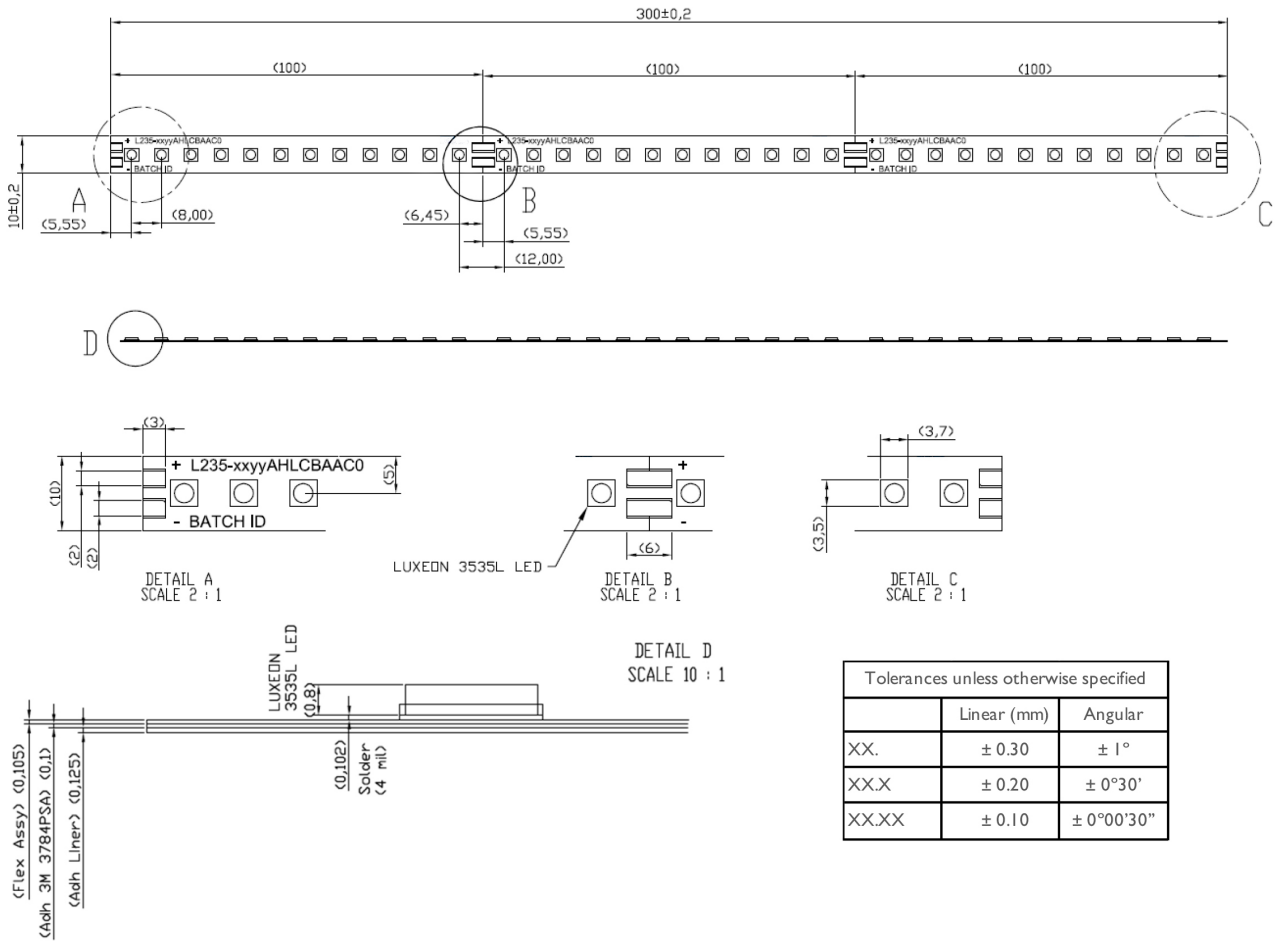


Figure 7: Electrical circuit diagram for L235-xxyyAHLGBBAC0.

L235-xxyyAHLCBAAC0



Tolerances unless otherwise specified		
	Linear (mm)	Angular
XX.	± 0.30	± 1°
XX.X	± 0.20	± 0°30'
XX.XX	± 0.10	± 0°00'30"

Figure 8: Mechanical dimensions for L235-xxyyAHLCBAAC0.

Notes for Figure 8:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

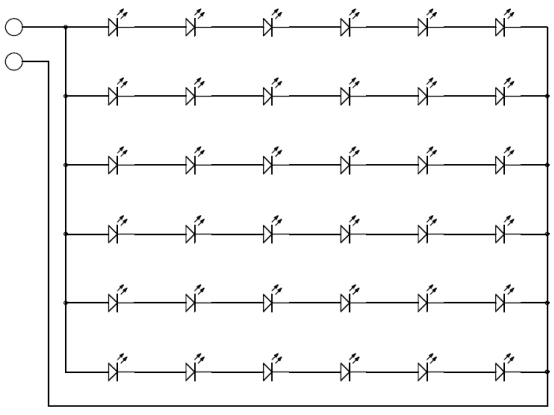
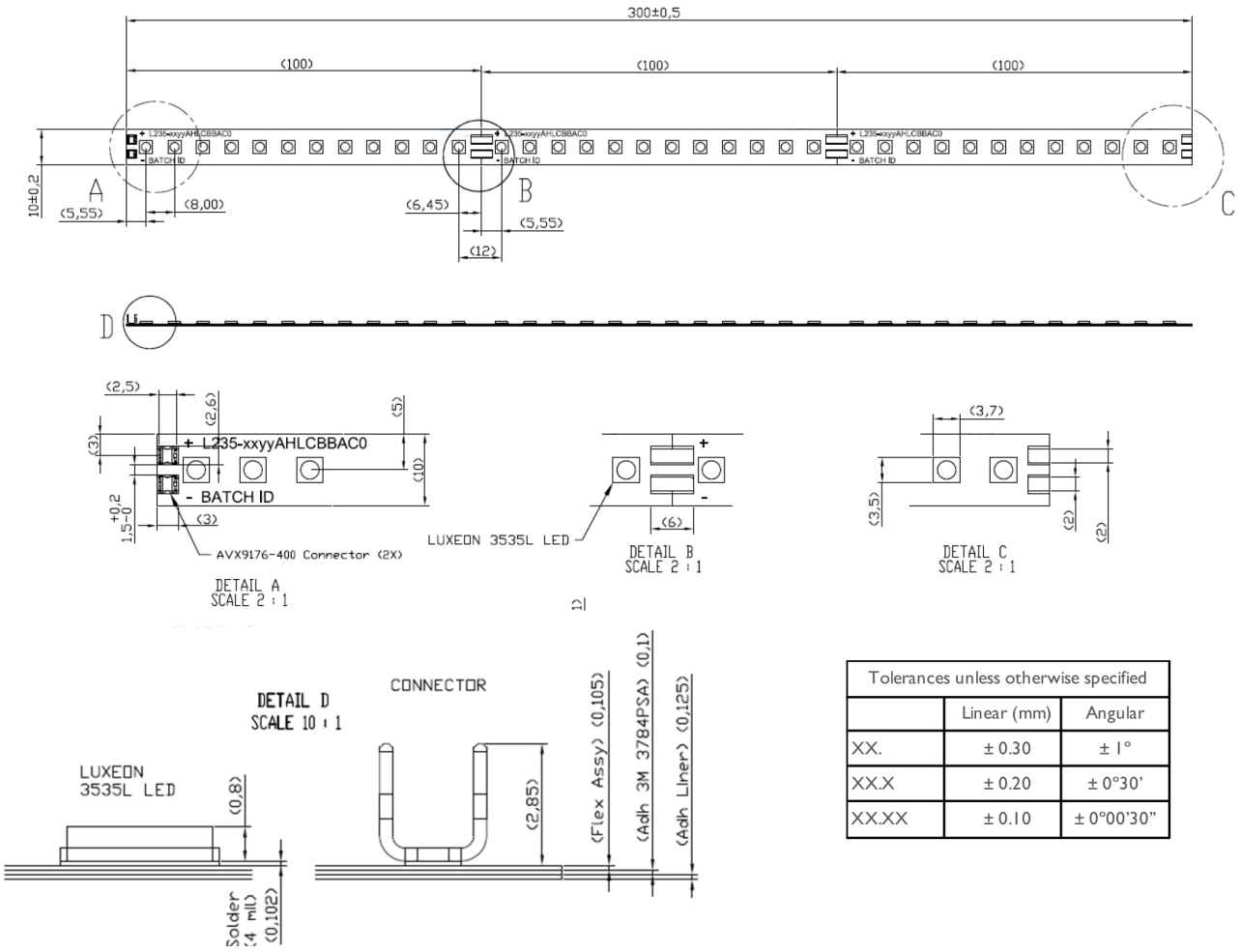


Figure 9: Electrical circuit diagram for L235-xxyyAHLCBAAC0..

L235-xxyyAHLCBBAC0



Tolerances unless otherwise specified		
	Linear (mm)	Angular
XX.	± 0.30	± 1°
XX.X	± 0.20	± 0°30'
XX.XX	± 0.10	± 0°00'30"

Figure 10: Mechanical dimensions for L235-xxyyAHLCBBAC0.

Notes for Figure 10:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

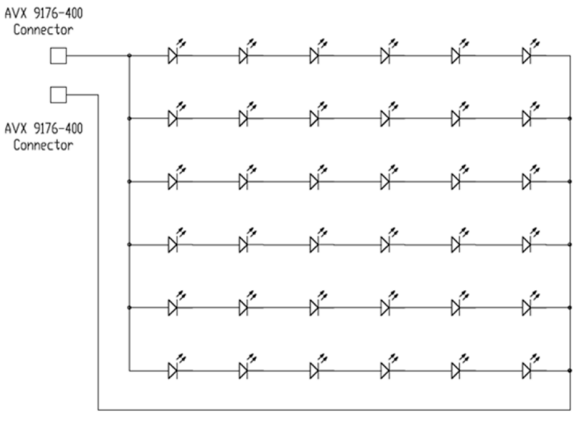
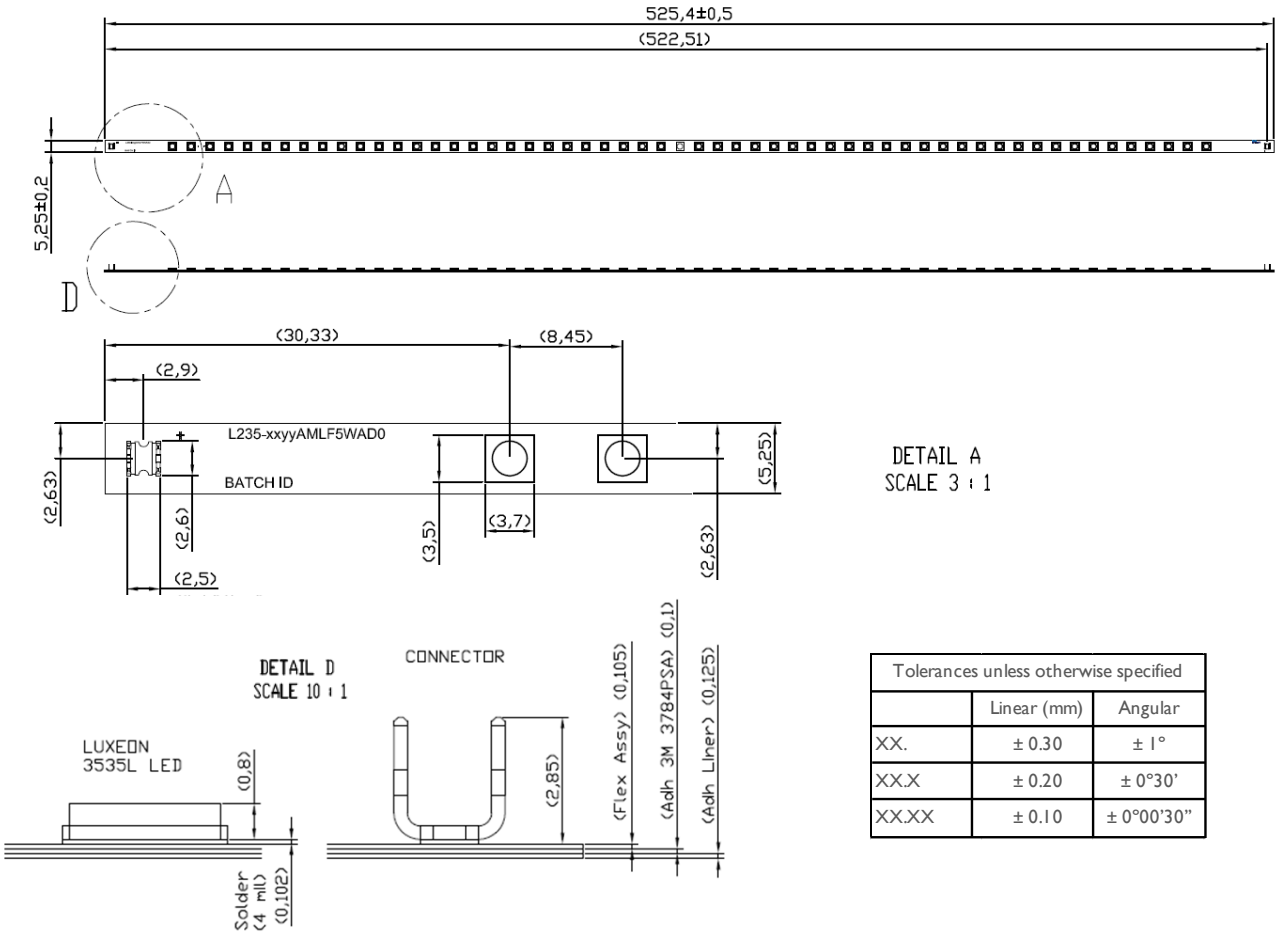


Figure 11. Electrical circuit diagram for L235-xxyyAHLCBBAC0.

L235-xxyyAMLF5WAD0



Tolerances unless otherwise specified		
	Linear (mm)	Angular
XX.	± 0.30	± 1°
XX.X	± 0.20	± 0°30'
XX.XX	± 0.10	± 0°00'30"

Figure 12: Mechanical dimensions for L235-xxyyAMLF5WAD0.

Notes for Figure 12:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

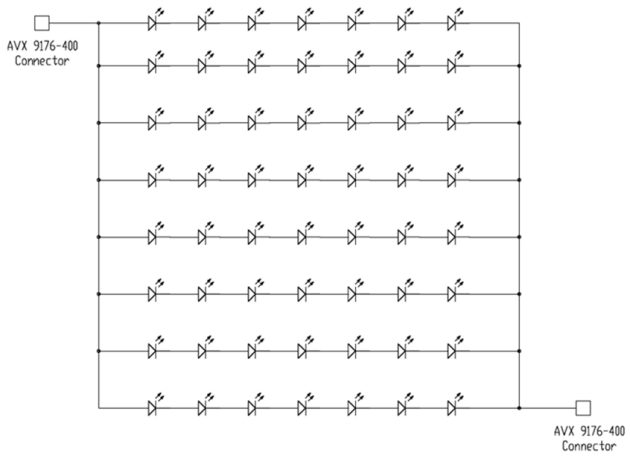
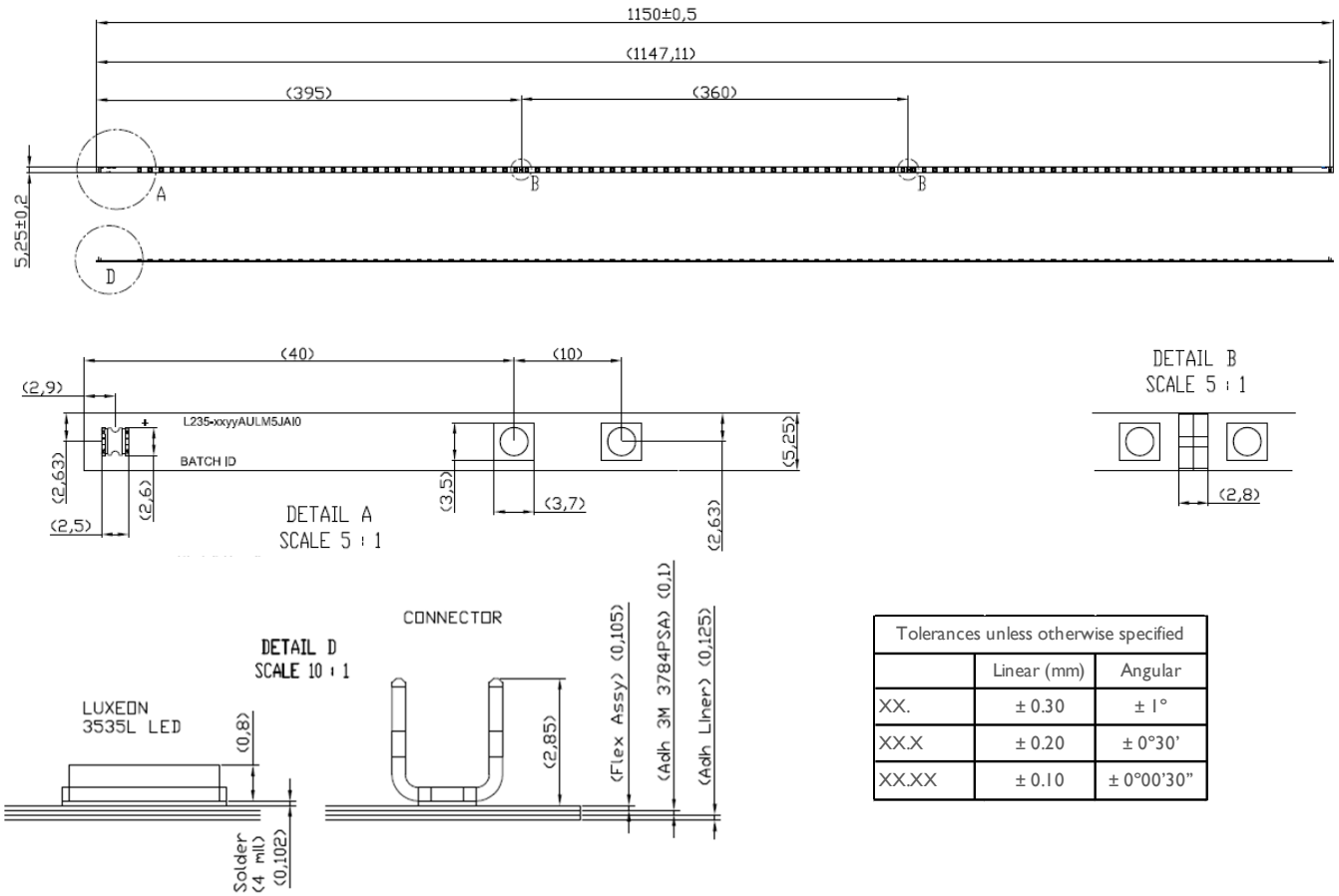


Figure 13. Electrical circuit diagram for L235-xxyyAMLF5WAD0.

L235-xxyyAULM5JAI0



Tolerances unless otherwise specified		
	Linear (mm)	Angular
XX.	± 0.30	± 1°
XX.X	± 0.20	± 0°30'
XX.XX	± 0.10	± 0°00'30"

Figure 14: Mechanical dimensions for L235-xxyyAULM5JAI0.

Notes for Figure 14:
1. Drawings are not to scale.
2. All dimensions are in millimeters.

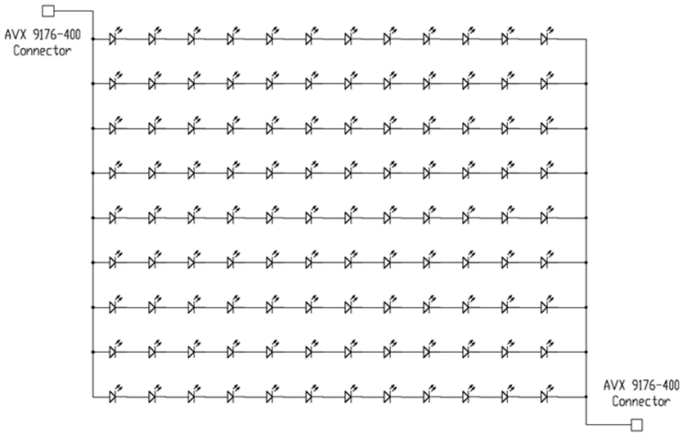


Figure 15. Electrical circuit diagram for L235-xxyyAMLF5WAD0.

IDC Connector

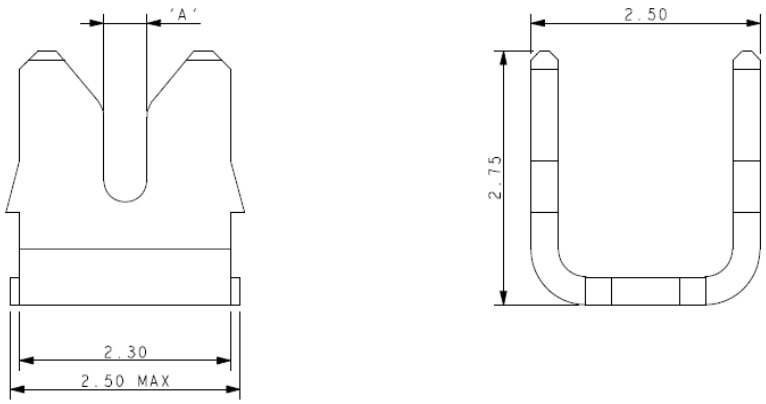


Figure 16: AVX Series 9176-400 IDC Connector for LUXEON XF-3535L.

Notes for Figure 16:
1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Contact material: Phosphor Bronze. Contact Plating: Pure Tin.
4. Accepted Wire Gauge: 24 Gauge Solid or Stranded. Dimension A=0.37.

Assembly Precautions

LUXEON XF-3535L emitter package contains a silicone overcoat to protect the LED chip and extract the maximum amount of light. As with most silicones used in LED optics, care must be taken to prevent any incompatible chemicals from directly or indirectly reacting with the silicone.

The silicone overcoat used in the LUXEON emitter is gas permeable. Consequently, oxygen and volatile organic compound (VOC) gas molecules can diffuse into the silicone overcoat. VOCs may originate from adhesives, solder fluxes, conformal coating materials, potting materials and even some of the inks that are used to print the PCBs.

Some VOCs and chemicals react with silicone and produce discoloration and surface damage. Other VOCs do not chemically react with the silicone material directly but diffuse into the silicone and oxidize during the presence of heat or light. Regardless of the physical mechanism, both cases may affect the total LED light output. Since silicone permeability increases with temperature, more VOCs may diffuse into and/or evaporate out from the silicone.

Please refer to Application Brief AB203 for more details on VOCs and other incompatible chemicals.

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Packaging Information

Reel Dimensions

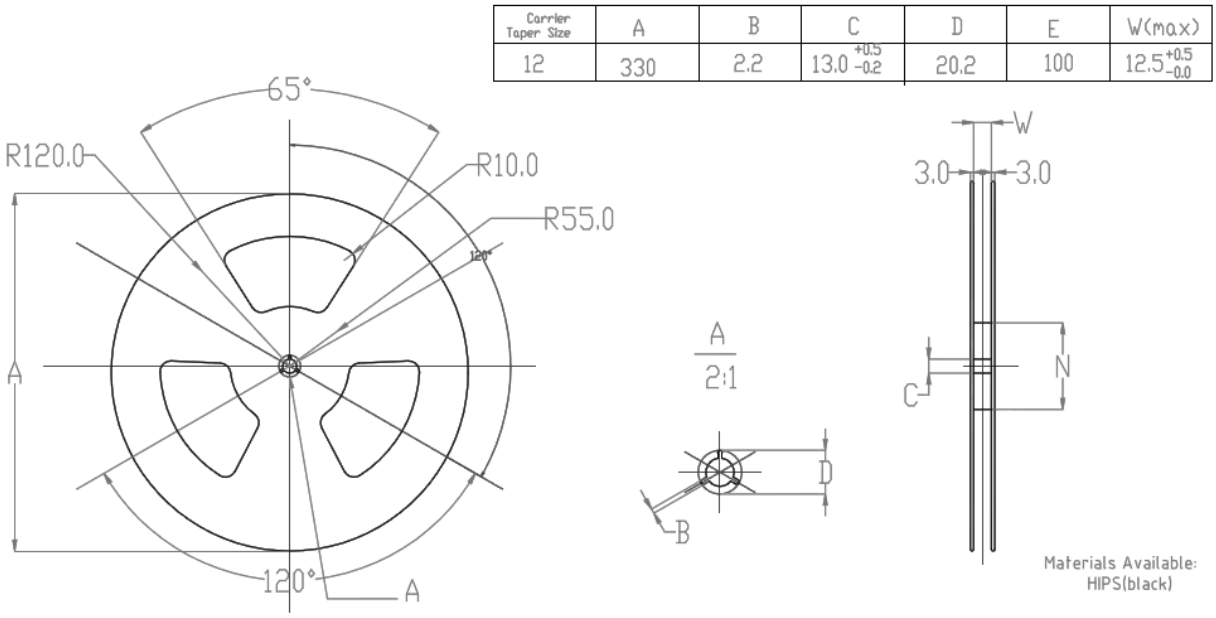

Figure 17: Reel dimensions for LUXEON XF-3535L.

Notes for Figure 17:
1. Drawings are not to scale.
2. All dimensions are in millimeters.
3. Pre-cut individual units delivered mechanically in tape and reel. Units joined together by small Kapton tape for easy separation.

Table 6. Number of units per reel for LUXEON XF-3535L.

PART NUMBER [1]	MAXIMUM UNITS PER REEL (SPI)	UNIT DESCRIPTION
L235-xxyyAHLGBAAC0	100	600mm length, without IDC connectors
L235-xxyyAHLCBAAC0	200	300mm length, without IDC connectors
L235-xxyyAHLGBBAC0	25	600mm length, with IDC connectors
L235-xxyyAHLCBBAC0	50	300mm length, with IDC connectors
L235-xxyyAMLF5WAD0	25	525mm length
L235-xxyyAULM5JAI0	13	1150mm length

Notes for Table 6:
1. All part numbers use the same reel size.

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Appendix

Flexible Substrate Material

The polyimide-based copper-clad laminate flexible substrate has very good bending stability. Recommended usage: bending radius >10mm. The base dielectric is a 1-mil-thick polyimide layer with typical dielectric strength of 5.75 kVDC/mil. A high-reflectivity high-reliability white coating with reflectivity of about 90% in the visible light wavelength range is applied over the flexible substrate. This coating has a typical dielectric strength of 2.85kV$_{DC}$/mil.

TIM/PSA Material

LUXEON XF-3535L is included with a backside thermally conductive PSA (pressure sensitive adhesive). The backside PSA is designed to provide an improved thermal interface to the heat-sink.

LUXEON XF-3535L adhesive has a typical 4kV dielectric strength (for this 0.1mm thick-layer).

Recommended application process (Flex with backside PSA). See Application Brief for more details:

1. Use a new, lint-free swab and 50:50 mix of IPA and water to clean the mounting surface.
2. Remove the liner on the PSA.
3. Apply the tape to substrate with use of a squeegee, hand roller or finger pressure to help reduce the potential for air entrapment under the tape during its application.
4. The adhesion of the PSA to the mounting surface will reach 90% of its peak strength after 1 day. Heat and pressure can be used to accelerate the curing cycle. For example, good adhesion has been achieved by storing LUXEON XF-3535L for one hour at 80°C. Results may vary with different heat sink materials. Lumileds recommends that customers always perform their own testing.

Connectors

The LUXEON XF-3535L is available with optional electrical connectors. See Table 2 for standard options.

There are two connectors positioned at the same end for the 10mm-wide Flex strips and two connectors at opposite ends for the 5.25-wide Flex strips.

The AVX 9176-400 Series of connectors are Insulation-Displacement Connectors that allow direct wire to board electrical connection.

The connectors allow the use of unstripped (insulated) wires, without soldering and can handle very high drive currents (up to 6000mA at Ta=105°C).

Accepted Wire Gauge Size is: 24 Gauge Solid or Stranded.

Optional white mating cap to cover the wire can be acquired from AVX (MPN: 609176001415100).

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For 100 years, Lumileds commitment to innovation has helped customers pioneer breakthrough products in the automotive, consumer and illumination markets.

Lumileds is shaping the future of light with our LEDs and automotive lamps, and helping our customers illuminate how people see the world around them.

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