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 with electrical connectors, and backside adhesive for easy attachment to a heat sink. Combined with LUXEON 3535L LEDs, LUXEON XF-3535L provides the same powerful optical performance guaranteed by LUXEON LEDs.

FEATURES AND BENEFITS

- 1100-4530 lumen offerings gives you a range of options
- Kitting delivers consistent performance
- Complete integrated solution to simplify supply chain and faster time to market
- Backside adhesive for attachment to heat sink allows for ease of mounting and assembly
- Features LUXEON 3535L full range of CCTs and CRI configurations
- Supports ENERGY STAR lumen maintenance certification

PRIMARY APPLICATIONS

- Indoor Area Lighting
- Specialty Lighting

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General Information

Part Number Nomenclature

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 XF-3535L are tested and specified individually at a junction temperature of 25°C with a drive current of 100 mA and pulse duration of 20 ms. 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.

The part number designation for the L235 series is explained as follows:

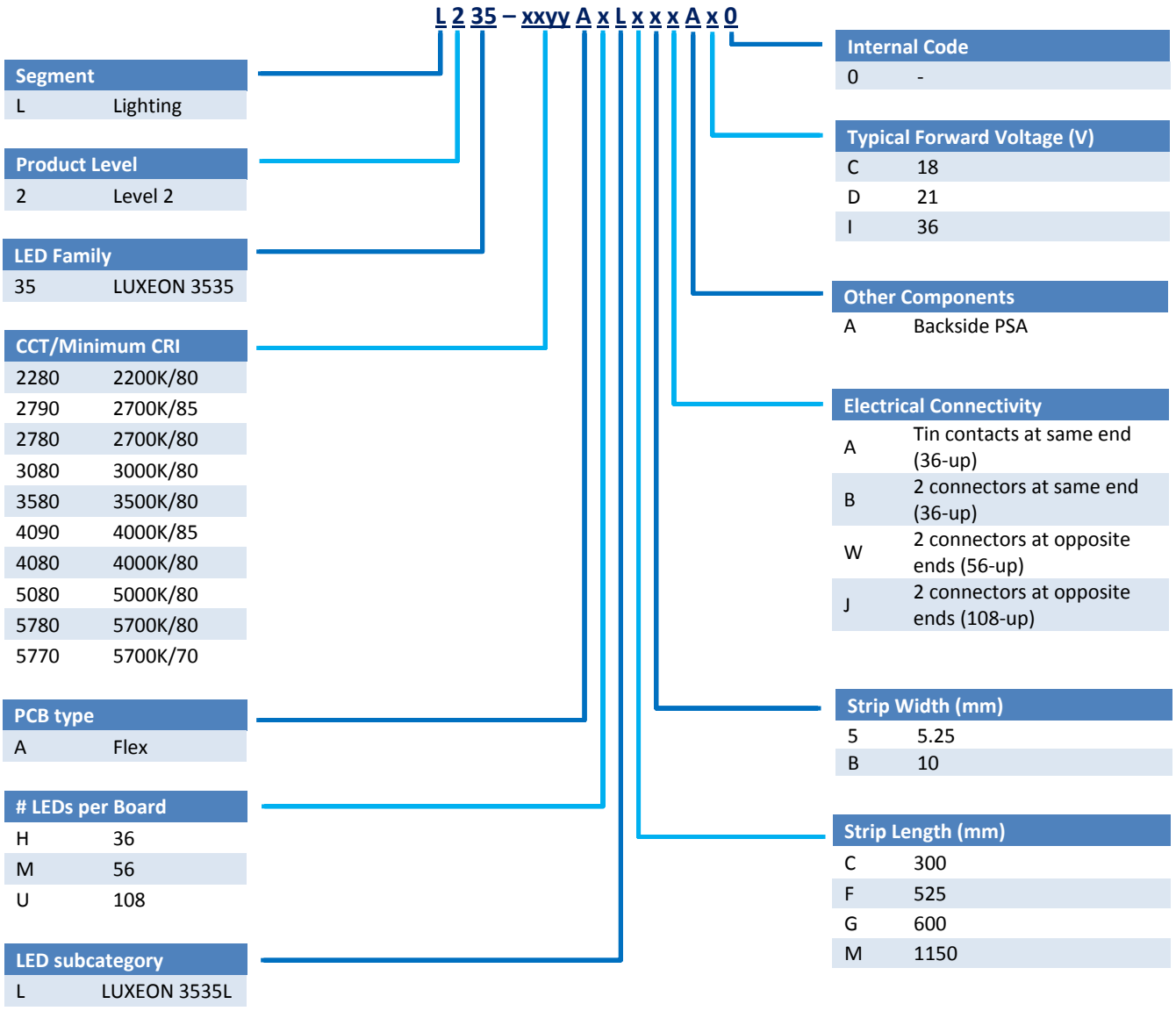


Figure 1.

Average Lumen Maintenance Characteristics

LUXEON 3535L LEDs are tested in accordance with LM-80-08. Please contact your Lumileds sales person for more detailed information or visit the Lumileds website at www.lumileds.com.

Environmental Compliance

Lumileds 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. Lumileds will not intentionally add the following restricted material to LUXEON XF-3535L: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).

Product Performance and Characterization Guide

Table 1. Product Selection Guide

Typical Performance Characteristics at 100mA/LED with a Junction Temperature = 25°C [1]							
Nominal CCT	Minimum CRI	Luminious Flux (lm) [3]		Typical Forward Voltage (V_f)	Typical Efficacy (lm/W)	Drive Current (mA)	Part Number [4]
		Minimum	Typical				
2200K	80	1080 1680 3240	1206 1876 3618	18 21 36	112	600 800 900	L235-2280AHLxByAC0 L235-2280AMLF5WAD0 L235-2280AULM5JAI0
2700K	85	1080 1680 3240	1224 1904 3672	18 21 36	113	600 800 900	L235-2790AHLxByAC0 L235-2790AMLF5WAD0 L235-2790AULM5JAI0
2700K	80	1368 2128 4104	1476 2296 4428	18 21 36	137	600 800 900	L235-2780AHLxByAC0 L235-2780AMLF5WAD0 L235-2780AULM5JAI0
3000K	80	1368 2128 4104	1512 2352 4536	18 21 36	140	600 800 900	L235-3080AHLxByAC0 L235-3080AMLF5WAD0 L235-3080AULM5JAI0
3500K	80	1512 2352 4536	1548 2408 4644	18 21 36	143	600 800 900	L235-3580AHLxByAC0 L235-3580AMLF5WAD0 L235-3580AULM5JAI0
4000K	85	1224 1904 3672	1368 2128 4104	18 21 36	127	600 800 900	L235-4090AHLxByAC0 L235-4090AMLF5WAD0 L235-4090AULM5JAI0
4000K	80	1512 2352 4536	1584 2464 4752	18 21 36	147	600 800 900	L235-4080AHLxByAC0 L235-4080AMLF5WAD0 L235-4080AULM5JAI0
5000K	80	1512 2352 4536	1692 2632 5076	18 21 36	157	600 800 900	L235-5080AHLxByAC0 L235-5080AMLF5WAD0 L235-5080AULM5JAI0
5700K	80	1512 2352 4536	1548 2408 4644	18 21 36	143	600 800 900	L235-5780AHLxByAC0 L235-5780AMLF5WAD0 L235-5780AULM5JAI0
5700K	70	1584 2464 4752	1692 2632 5076	18 21 36	157	600 800 900	L235-5770AHLxByAC0 L235-5770AMLF5WAD0 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 Product 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 %.

Physical Dimensions and Configurations

Table 2 shows the physical parameters for the L235 series of products.

Table 2.

Part Number [1]	LED Count	Flex Strip Length (mm)	Flex Strip Width (mm)	LED Pitch [2,3] (mm)	Electrical Configuration	Electrical Connection [4]
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 Product Nomenclature section (Figure 1).
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 I for details on electrical connectors.

Electrical Characteristics

Table 3.

Typical Performance Characteristics at 100mA/LED, Junction Temperature = 25°C						
Part Number [1]	Forward Voltage (V) [2]			Typical Temperature Coefficient of Forward Voltage [3] (mV/°C) $\Delta V_F / \Delta T_J$	Typical Thermal Resistance (°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. "xxyy" and "z" are part number attributes as described in the Product Nomenclature section (Figure 1).
2. Lumileds maintains a tolerance of ± 0.1 V on forward voltage measurements for individual LUXEON 3535L LEDs.
3. LED $\Delta V_F/\Delta T_J$ 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 T_S (thermal contact point) next to LED, to bottom of flexible adhesive (heat sink).

Absolute Maximum Ratings

Table 4.

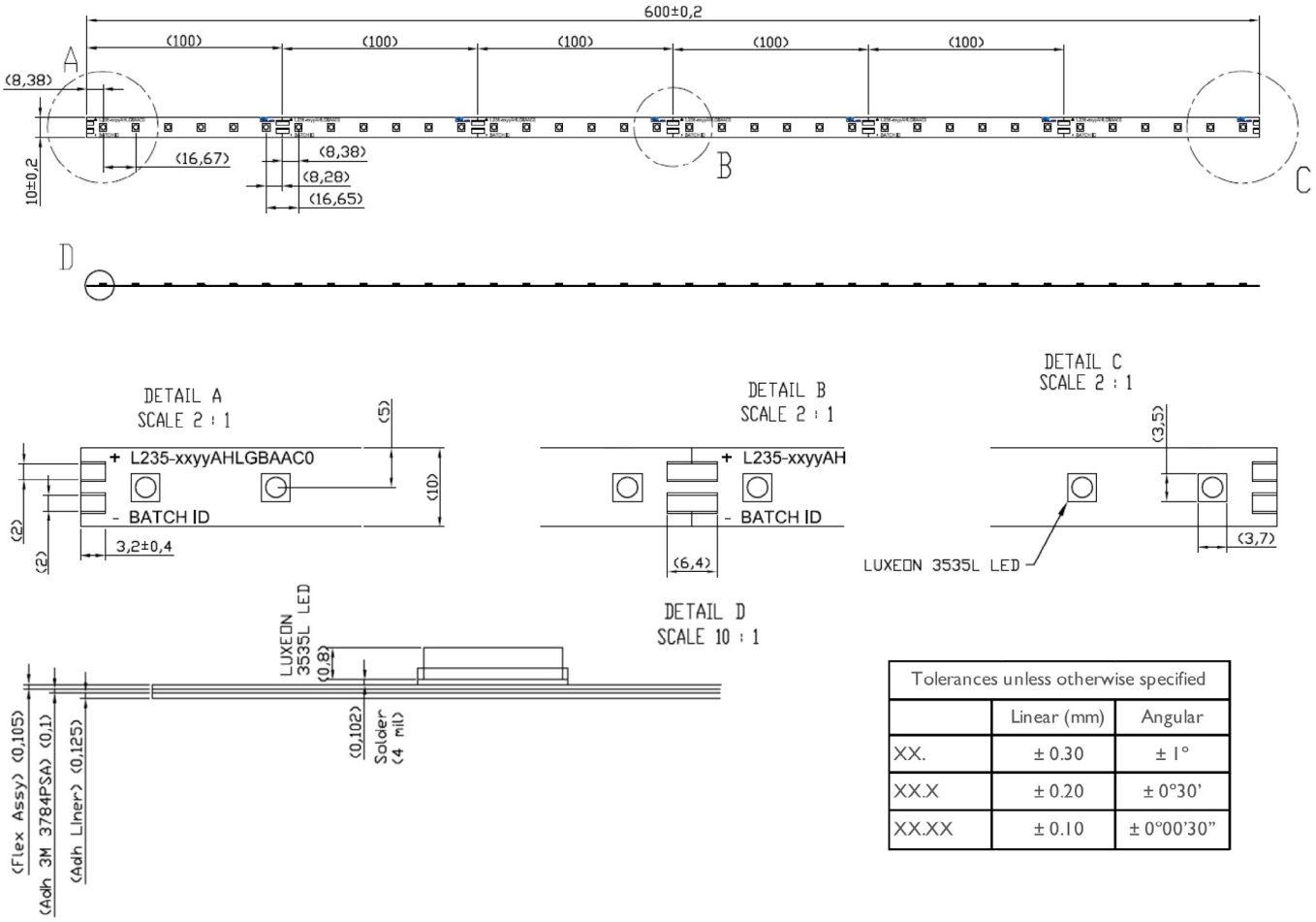
Parameter	Maximum Performance
DC Forward Current [1]	200mA x Number of parallel strings
Peak Pulsed Forward Current [2]	240mA x Number of parallel strings
ESD Sensitivity	IEC 61000 4-2 Level 1 (±2kV contact/air discharge)
LED Junction Temperature [3]	125°C
Operating Temperature [4]	-40°C – 85°C
Flex Substrate [5]	105°C
Storage Temperature	<30°C <65%RH for ≤1 year
Reverse Voltage [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	≥ 5 kgF

Notes for Table 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.

Mechanical Drawings and Electrical Circuit Diagrams

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 2. Mechanical drawing for L235-xxyyAHLGBAAC0.

Notes for Figure 2:
1. All dimensions in millimeters.

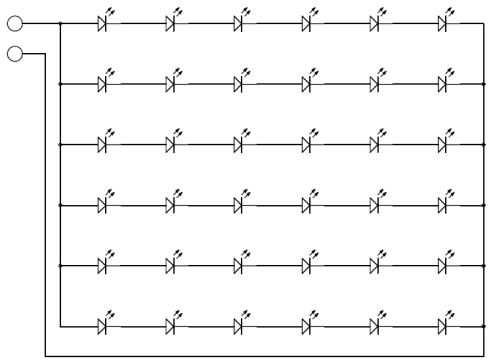
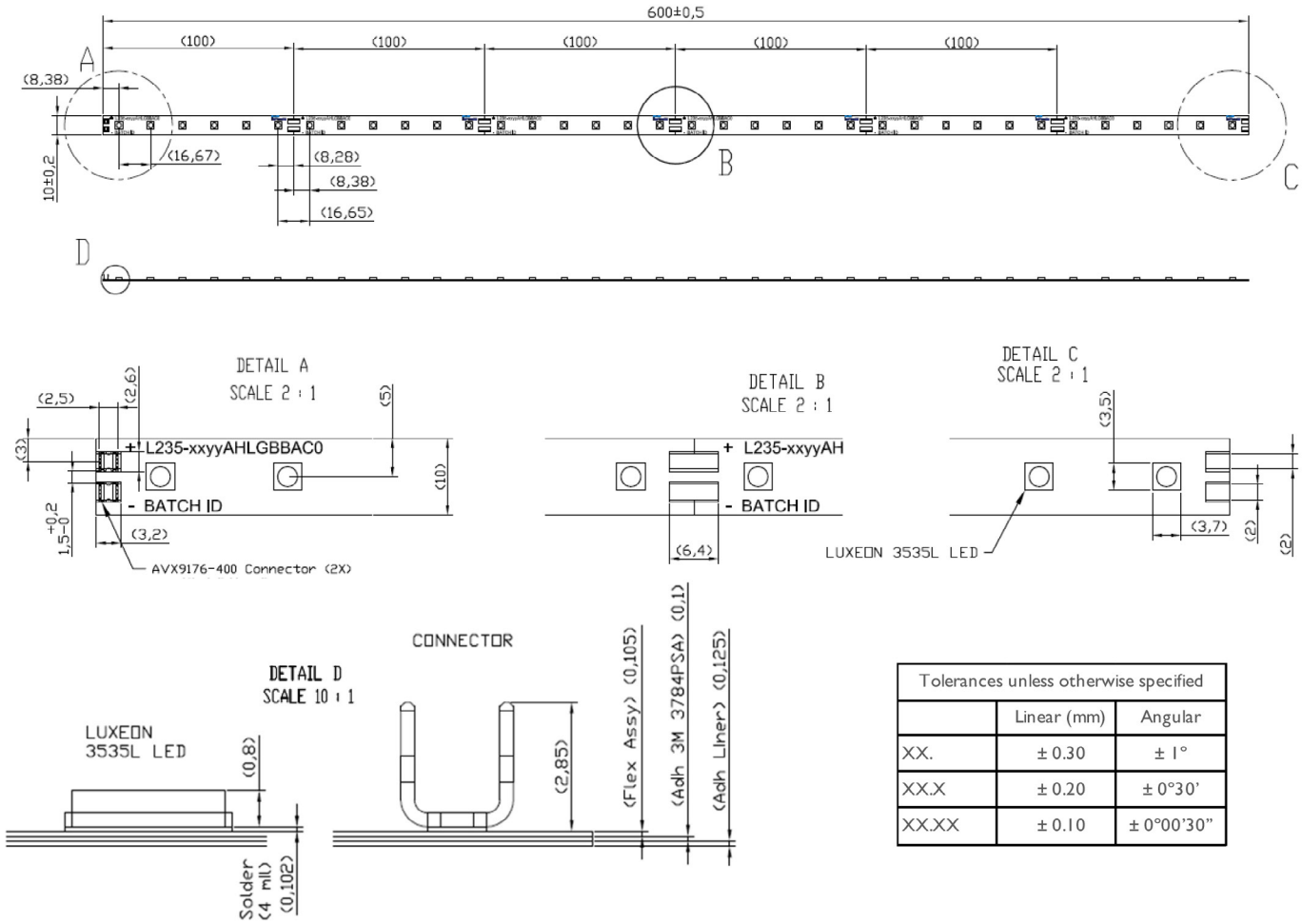


Figure 3. Electrical circuit diagram for L235-xxyyAHLGBAAC0.



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 drawing for L235-xxyyAHLGBBAC0.

Notes for Figure 4:
1. All dimensions in millimeters.
2. For connector detail, refer to Figure 14.

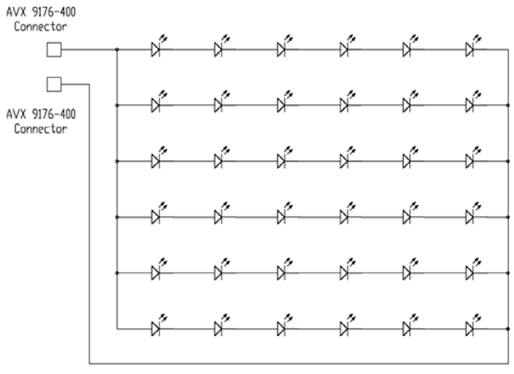
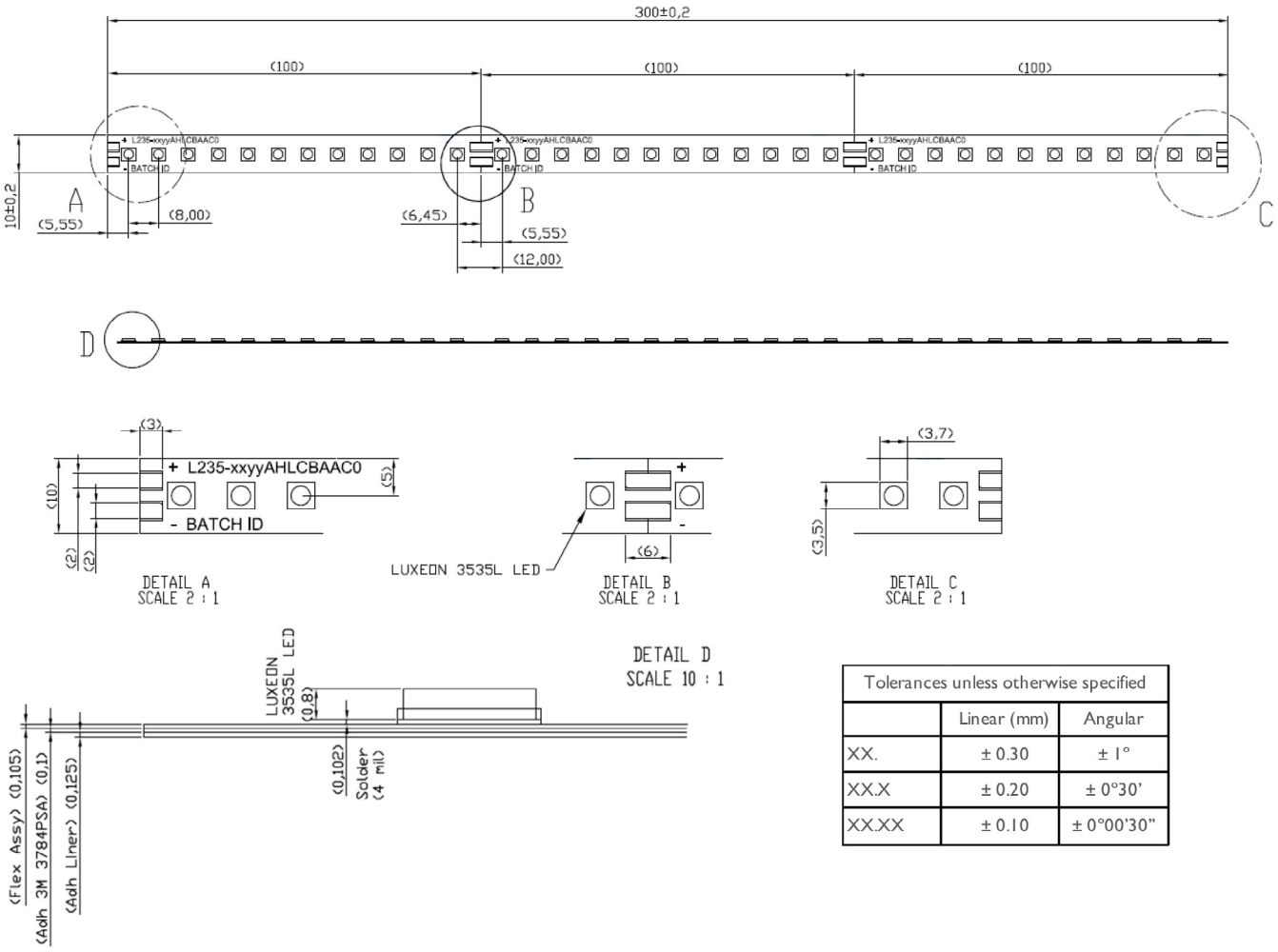


Figure 5. Electrical circuit diagram for L235-xxyyAHLGBBAC0.



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 drawing for L235-xxyyAHLCBAAC0.

Notes for Figure 6:
1. All dimensions in millimeters.

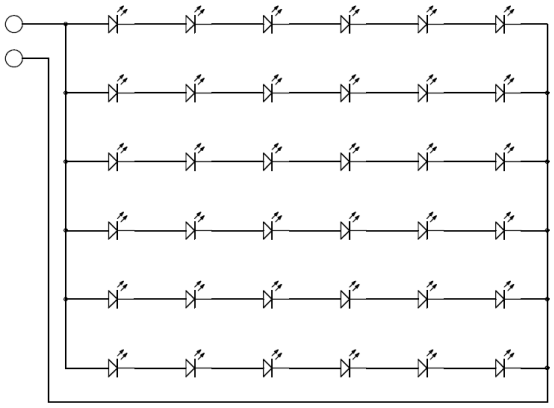
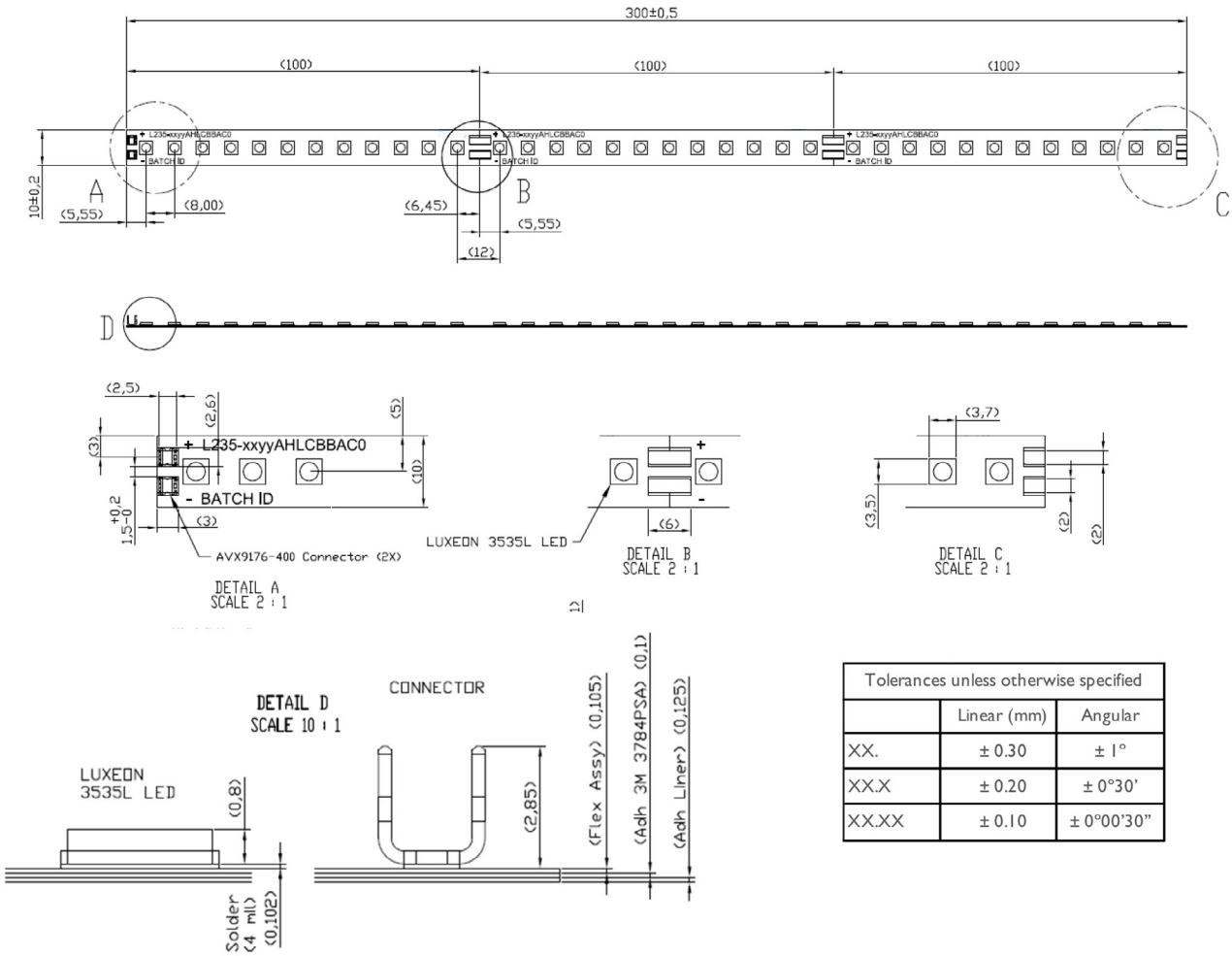


Figure 7. Electrical circuit diagram for L235-xxyyAHLCBAAC0.



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 drawing for L235-xxyyAHLCBBAC0.

Notes for Figure 8:
1. All dimensions in millimeters.
2. For connector detail, refer to Figure 14.

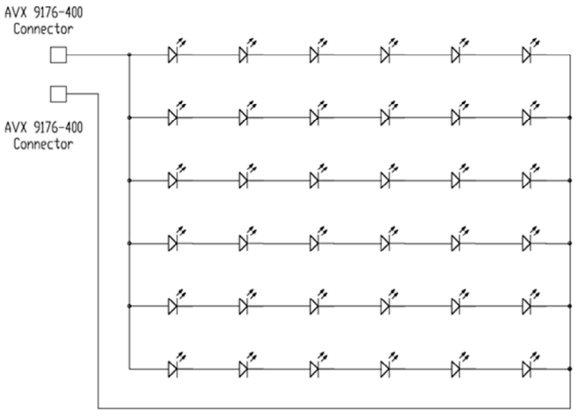
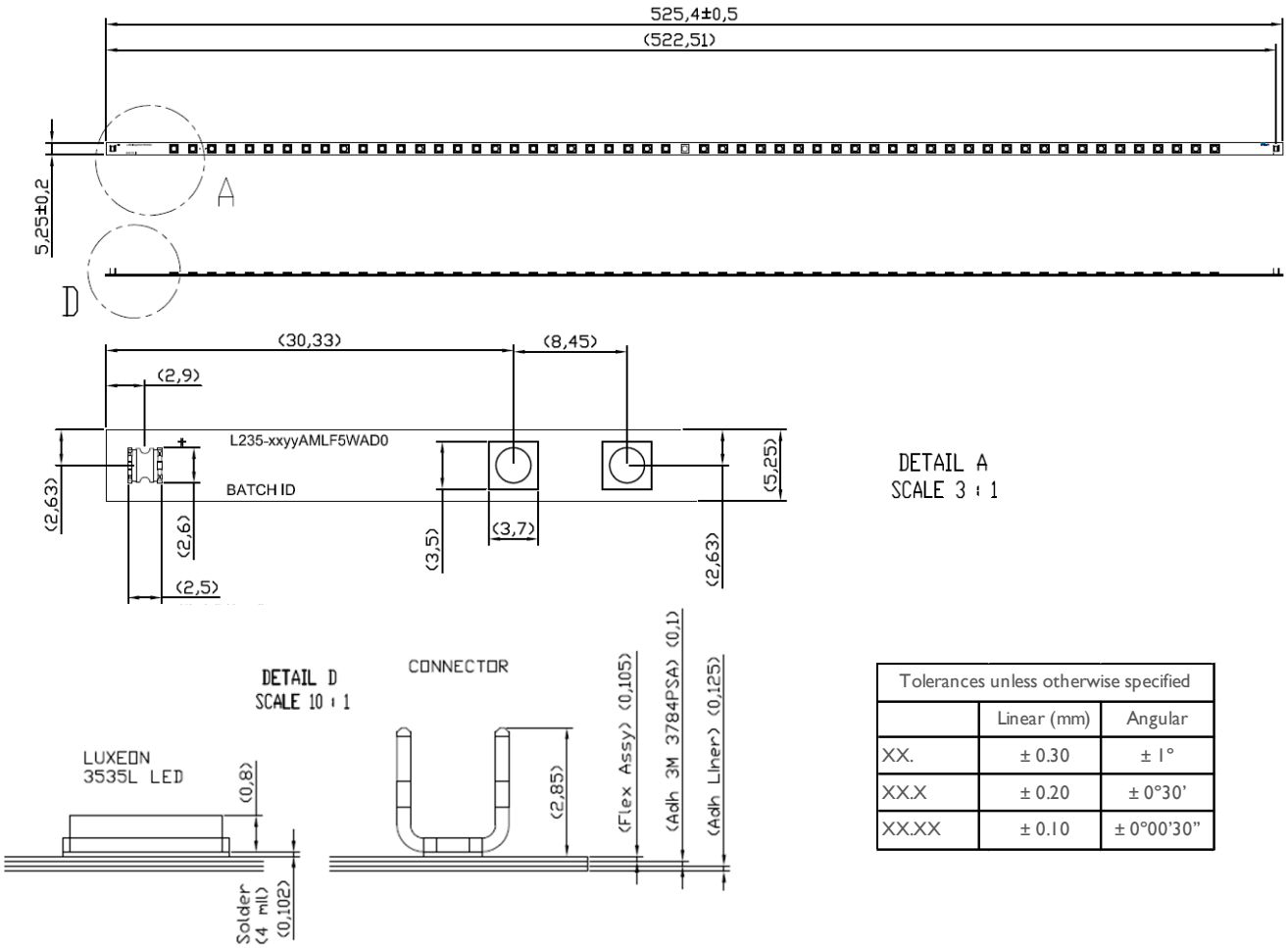


Figure 9. Electrical circuit diagram for L235-xxyyAHLCBBAC0.



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 drawing for L235-xxyyAMLF5WAD0.

Notes for Figure 10:
1. All dimensions in millimeters.
2. For connector detail, refer to Figure 14.

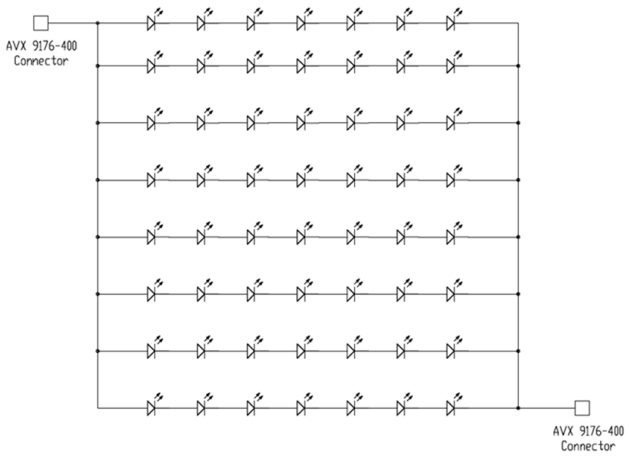
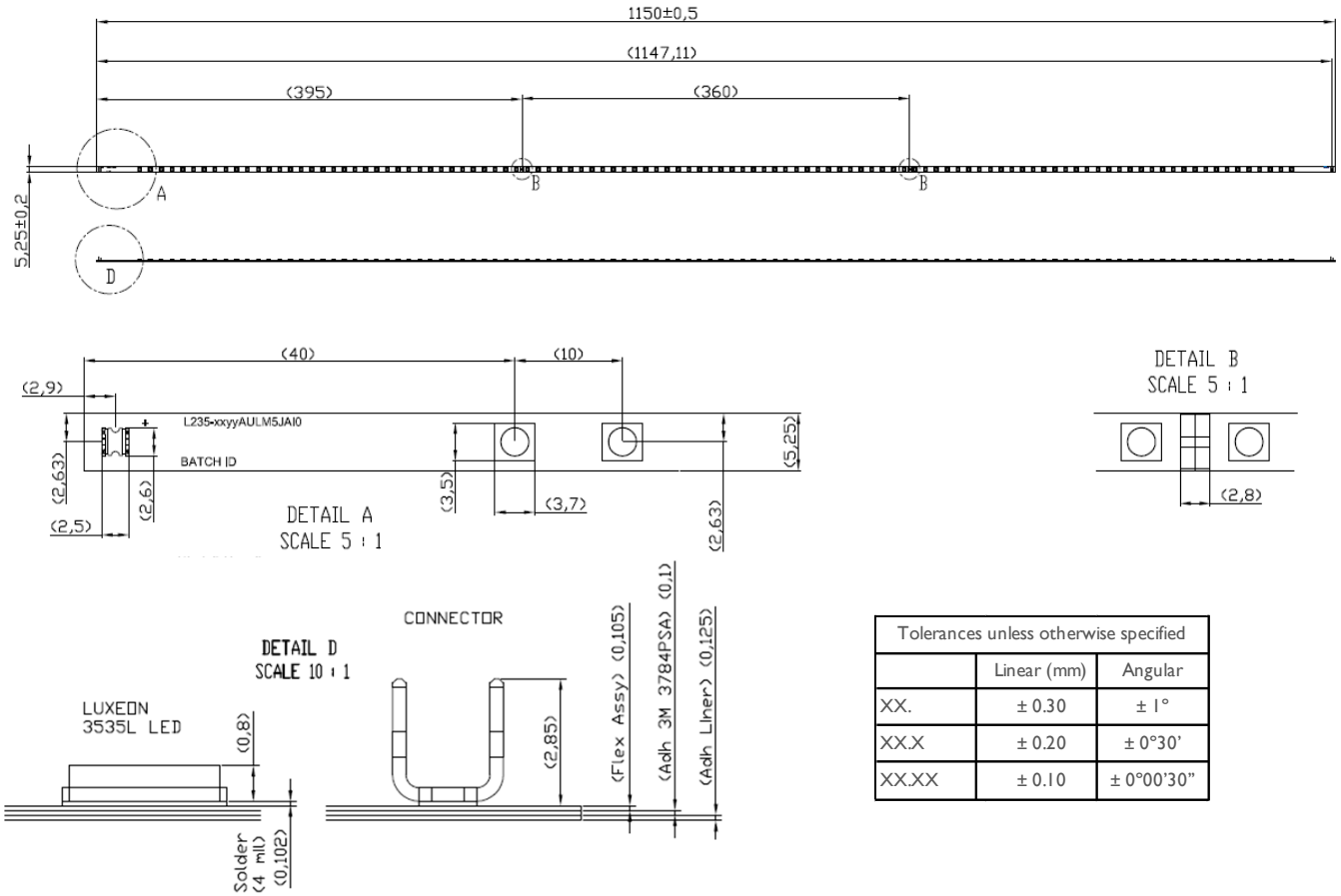


Figure 11. Electrical circuit diagram for L235-xxyyAMLF5WAD0.



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 drawing for L235-xxyyAULM5JAI0.

Notes for Figure 12:
1. All dimensions in millimeters.
2. For connector detail, refer to Figure 14.

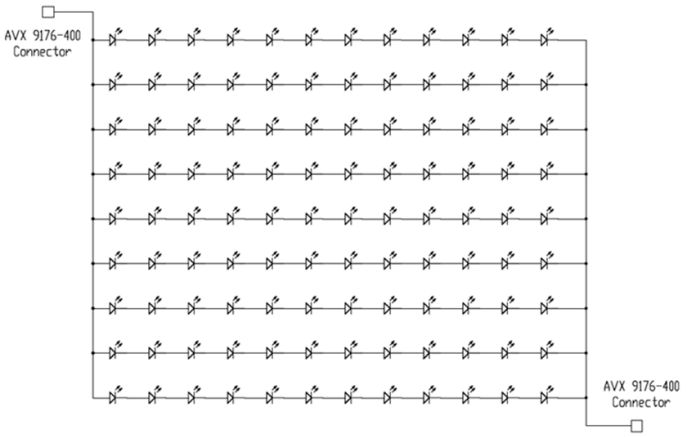


Figure 13. Electrical circuit diagram for L235-xxyyAULM5JAI0.

IDC Connector

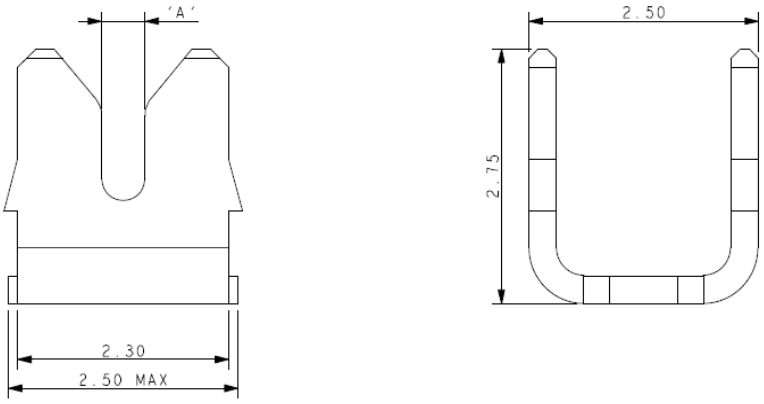


Figure 14. AVX Series 9176-400 IDC Connector.

Notes for Figure 14:
1. All dimensions in millimeters
2. Contact material: Phosphor Bronze. Contact Plating: Pure Tin.
3. Accepted Wire Gauge: 24 Gauge Solid or Stranded. Dimension 'A' = 0.37.

Assembly Precautions

The LUXEON 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.

Tape and Reel Packaging

Pre-cut individual units delivered mechanically in tape and reel. Units joined together by small Kapton tape for easy separation.

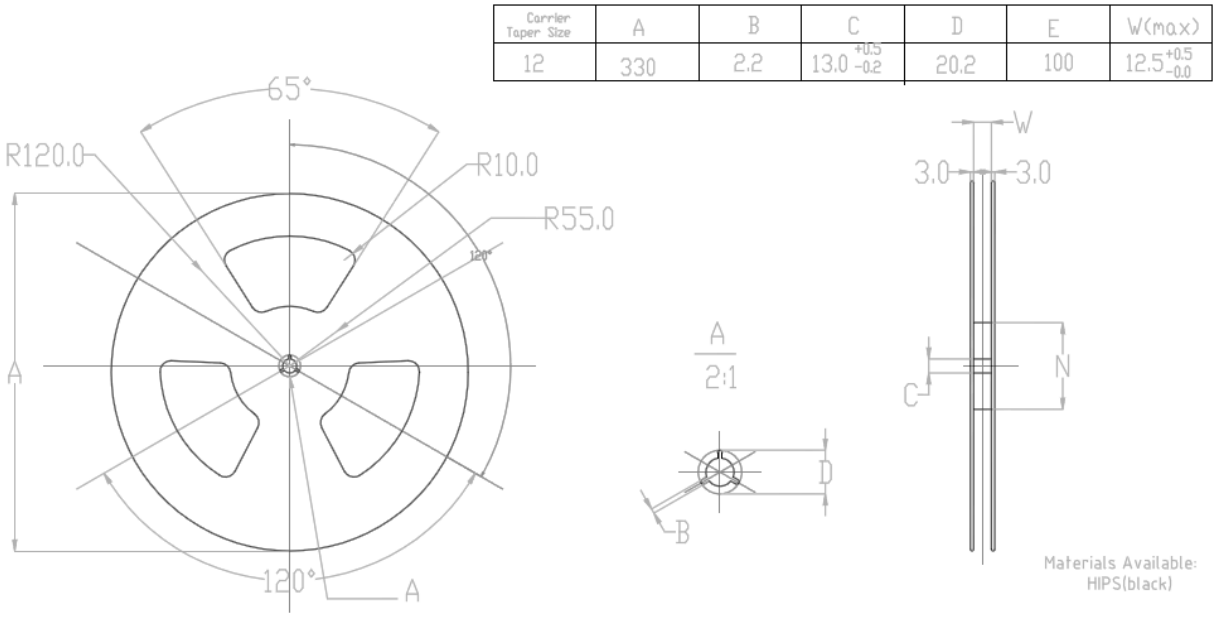


Figure 15.

All part numbers use the same reel size. The following table specifies the maximum number of units per reel for the various part numbers:

Table 5.

Part Number	Max. Units per Reel (SPI)	Unit Description
L235-xxyyAHLGBAAC0 L235-xxyyAHLCBAAC0	100 200	600mm length, without IDC connectors 300mm length, without IDC connectors
L235-xxyyAHLGBBAC0 L235-xxyyAHLCBBAC0	25 50	600mm length, with IDC connectors 300mm length, with IDC connectors
L235-xxyyAMLF5WAD0 L235-xxyyAULM5JAI0	25 13	525mm length 1150mm length

LUXEON XF 3535L 3-Step MacAdam Ellipse Color Definition

Tested at 100mA/LED, Junction Temperature = 25°C

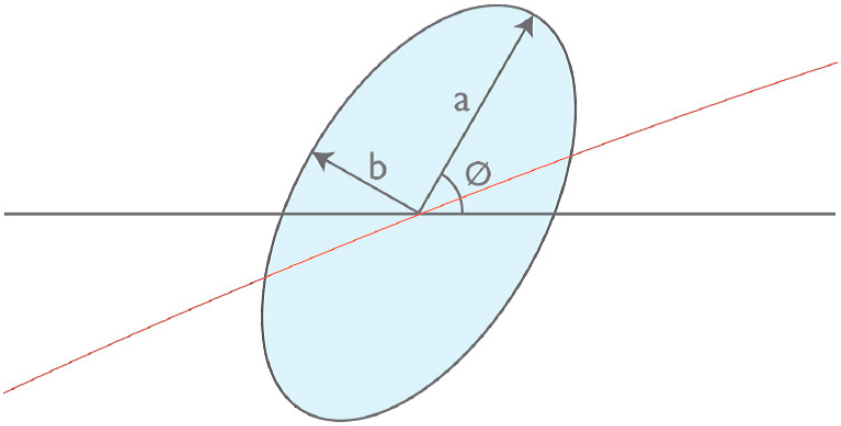


Table 6.

Nominal ANSI CCT (K)	Color Space	Center Point (cx, cy)	Major Axis, a	Minor Axis, b	Ellipse Rotation Angle
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 6:

1. Lumileds maintains a tolerance of ±0.01 on color point measurements for individual LUXEON 3535L LEDs.
2. Individual LUXEON 3535L LEDs are tested at T_J = 25°C and I_F = 100mA, 20ms pulse conditions.

LUXEON XF-3535L Typical Radiation Pattern

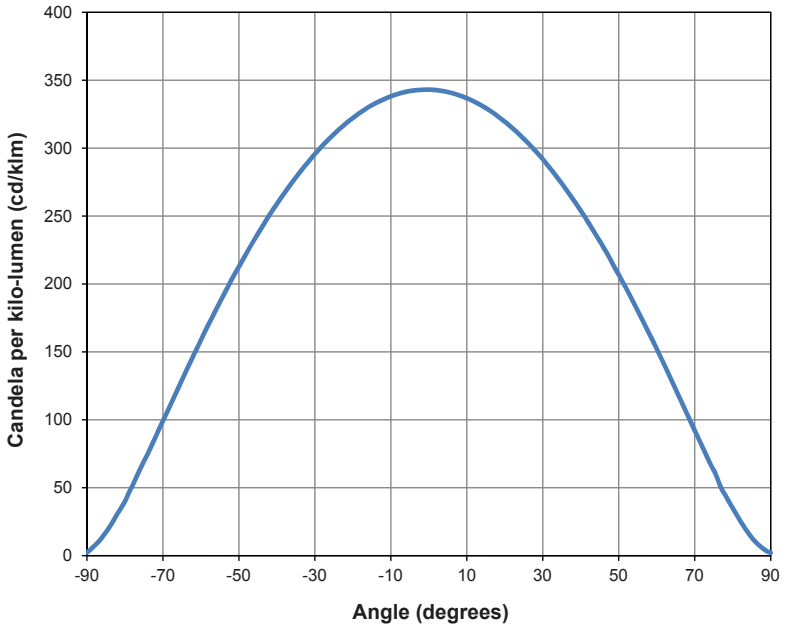


Figure 16.

LUXEON 3535L LED Color Spectrum (80 CRI)

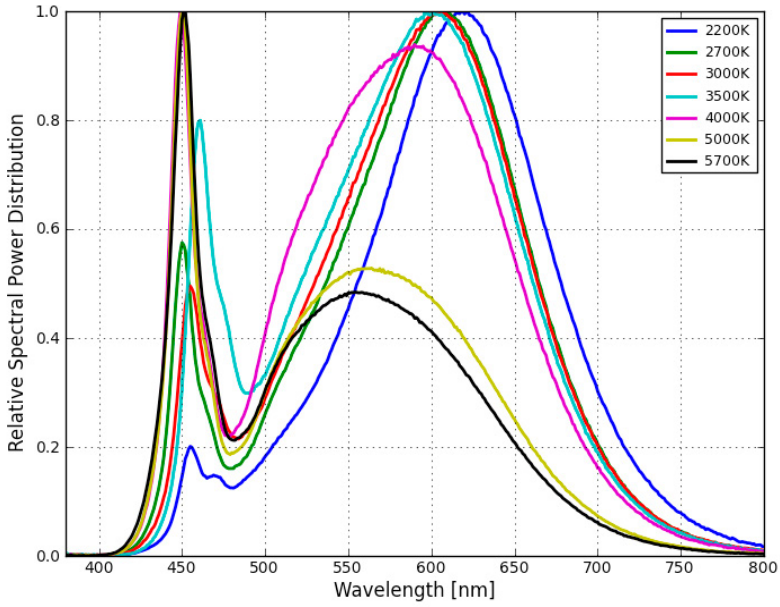


Figure 17. Typical relative intensity vs. wavelength .

Notes for Figure 17:

1. Individual LUXEON 3535L LEDs are tested at T_J = 25°C and I_F = 100mA, 20ms pulse conditions.

Appendix I

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 kV_{DC}/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. Manufacturer Part Number: 709176001432006.

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). See ELCO Product Test Report: 202-01-034.

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).

About Lumileds

Lumileds is the light engine leader, delivering innovation, quality, and reliability.

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.

To learn more about our portfolio of light engines visit www.lumileds.com.

www.lumileds.com