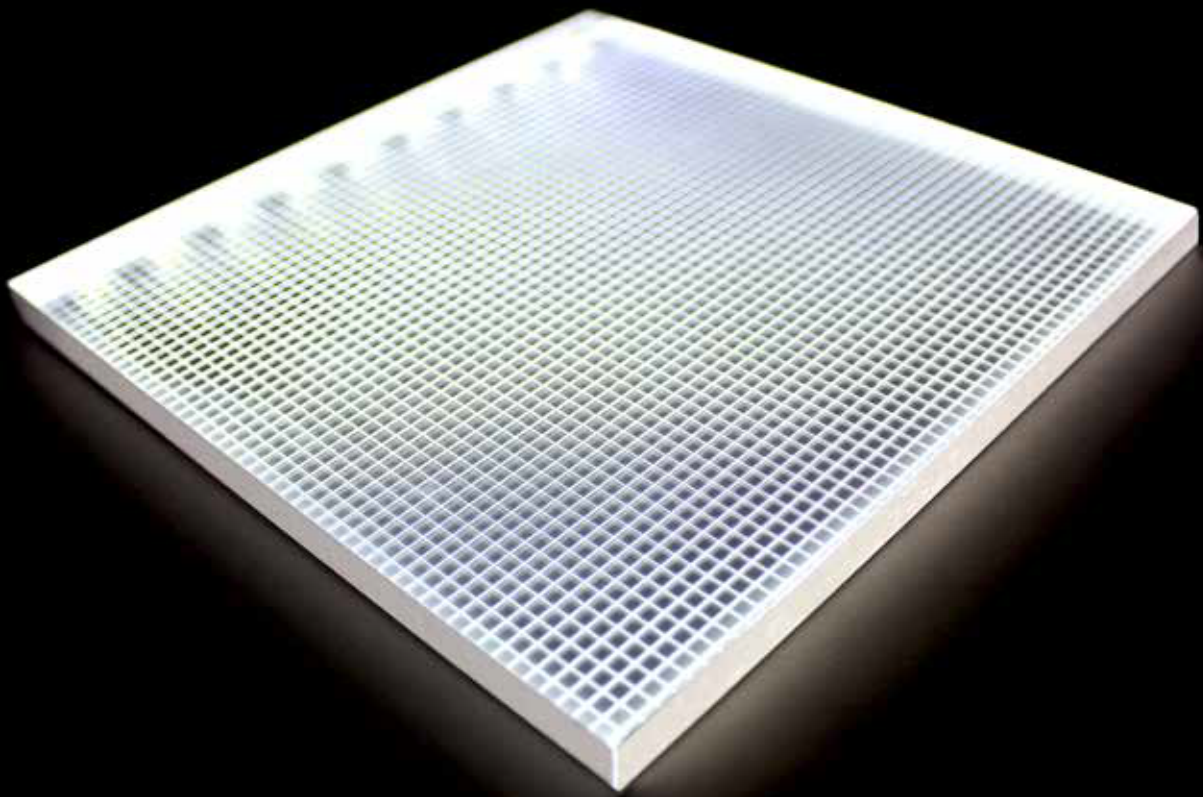


# LED LIGHT SHEET

A product from Applelec



**LED LIGHTSHEET**  
TECHNICAL MANUAL



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# INDEX

## 1. UNDERSTANDING LED LIGHT SHEET

- 1.1 Definition of LED Light Sheet
- 1.2 Features and benefits
- 1.3 General specifications for white LEDs
- 1.4 General specifications for RGB colour changing & dynamic/tuneable LEDs
- 1.5 2D & 3D illustration and list of components
- 1.6 Part list of 8mm LED Light Sheet, single sided

## 2. 3D V-CUTTING TECHNOLOGY

- 2.1 3D V-Cutting Technology

## 3. COMPONENTS

- 3.1 Light Guide Plate
  - 3.1.1 Specifications
  - 3.1.2 Properties
- 3.2 Standard CRI LEDs
  - 3.2.1 General information
  - 3.2.2 Outline and dimensions
  - 3.2.3 Specifications
  - 3.2.4 White CIE bin specifications
- 3.3 High CRI 90+ LEDs
  - 3.3.1 General information
  - 3.3.2 Outline and dimensions
  - 3.3.3 Specifications
- 3.4 LEDs for 3mm LED Light Sheet
  - 3.4.1 General information
  - 3.4.2 Outline and dimensions
  - 3.4.3 Specifications
- 3.5 RGB LEDs
  - 3.5.1 General information
  - 3.5.2 Outline and dimensions
  - 3.5.3 Specifications
- 3.6 DYNAMIC/TUNABLE LEDs (2700K-6500K)
  - 3.6.1 General information
  - 3.6.2 Outline and dimensions
  - 3.6.3 Specifications
- 3.7 LED MODULE
  - 3.7.1 Definition of model
  - 3.6.2 Specifications

## 4. TECHNICAL DATA

- 4.1 Centre surface brightness (LEDs on 1 side)
- 4.2 Centre surface brightness (LEDs on 2 sides)
- 4.3 IP67 Rating

## 5. POWER CORD

- 5.1 Option 1 - Connect
- 5.2 Option 2 - DC Power Cord
- 5.3 Spider Connectors
- 5.4 Wire exit options with Connect wire
- 5.5 Wire exit options with old style black wiring

## 6. GENERAL SAFETY INSTRUCTIONS

- 6.1 Guide
- 6.2 General instructions for LED Light Sheet
  - 6.2.1 Warnings
  - 6.2.2 Electric Wiring
  - 6.2.3 Protective Film
  - 6.2.4 Cleaning
  - 6.2.5 Moving
  - 6.2.6 Storage
  - 6.2.7 Opening the delivery

## 7. WARRANTY AND LIMITATION

- 7.1 Warranty Period
- 7.2 Operating Condition
- 7.3 Storage Conditions
- 7.4 Warranty Coverage
  - 7.4.1 What the warranty covers
  - 7.4.2 What the warranty does not cover

## 8. CERTIFICATES & TESTS

- 8.1 CE
- 8.2 RoHS
- 8.3 TUV
- 8.4 UL
- 8.5 Fire
- 8.6 IP67 dust testing
- 8.7 IP67 water testing
- 8.8 Accreditations glossary

# 1. UNDERSTANDING LED LIGHT SHEET

## 1.1 DEFINITION OF LED LIGHT SHEET

The unique construction of LED Light Sheet harnesses a number of patented processes which unite to create an innovative lighting unit. Produced by combining high intensity LEDs with a patented 3D V-Cutting system, this process allows light to be transmitted uniformly and evenly across the acrylic surface of the unit.

A unified backlighting unit, LED Light Sheet features thermally managed LEDs which are securely embedded inside an acrylic sheet. This second patented process delivers a unit which is robustly constructed and easily installed in comparison to traditional backlighting units in which LED modules are fixed externally to an acrylic sheet. Each LED Light Sheet unit is manufactured in the UK by Applelec to bespoke requirements.

## 1.2 FEATURES AND BENEFITS

- **Super slim:** The thickness of LED Light Sheet is 8mm
- **Long lifetime and maintenance free:** The longevity of LED Light Sheet is more than 50,000 hours/11years at 12 hours per day.
- **Low power consumption and cost saving:** LED Light Sheet consumes up to 70% less power than T5 fluorescent lamps and up to 30% less energy than CCFL.
- **Eco-friendly product:** LED Light Sheet contains NO mercury or other hazardous materials.
- **Water resistant:** LED Light Sheet is available with an IP67 rating.
- **Bespoke sizes and shapes:** LED Light Sheet can be made into any shape and size up to 3000mm x 1500mm.

## 1.3 GENERAL SPECIFICATIONS (WHITE LEDS)

ITEM	DESCRIPTION	
<b>Main Material</b>	Clear acrylic (PMMA)	
<b>Thickness</b>	6mm, 8mm, 10mm	3mm
<b>Power Supply</b>	AC / DC 12V / 24V Adaptor	
<b>Working Voltage</b>	DC 12V / DC 24V	DC 12V
<b>Input Voltage</b>	AC 100 ~ 240V 50/60Hz	
<b>Lighting Source</b>	5630 SMD top view LED	3014 SMD top view LED
<b>Luminous Efficacy (LED)</b>	110lm / W	90lm / W
<b>Power consumption. Per metre</b>	14W	18W
<b>Colour Temperature (CCT). Standard CRI 65</b>	2200K, 2700K, 3000K, 3700K, 4100K, 5300K, 6500K	5700K
<b>Colour Temperature (CCT). High CRI 90+</b>	2800K, 3100K, 4100K, 5200K	-
<b>IP Rating</b>	IP54 as standard, IP67 available	IP54 only
<b>Max Size</b>	3000mm x 1500mm	Dependent on application
<b>Weight</b>	Length (m) x width (m) x thickness (mm) x 1.2kg	
<b>Lifetime</b>	More than 50,000	
<b>IP Rating</b>	IP54 as standard, IP67 available	
<b>Warranty on LED Light Sheet</b>	3 years	
<b>Warranty on Acrylic</b>	5 years	

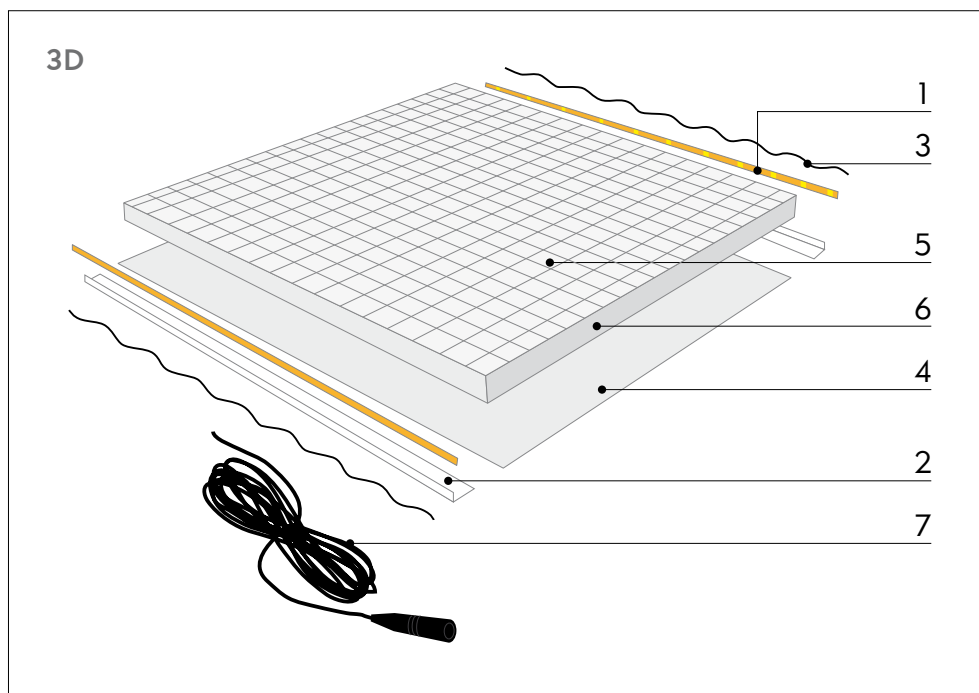
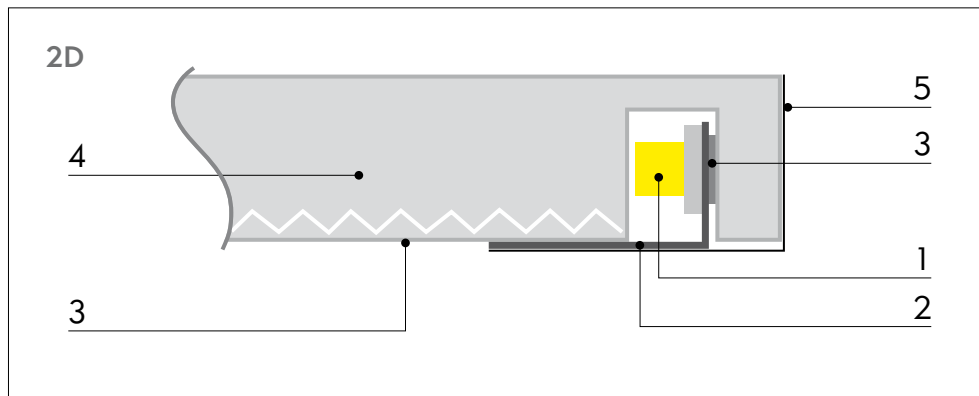
# 1. UNDERSTANDING LED LIGHT SHEET CONT

## 1.4 GENERAL SPECIFICATIONS (RGB COLOUR CHANGING & DYNAMIC/TUNEABLE WHITE)

ITEM	DESCRIPTION		
	RGB COLOUR CHANGING	DYNAMIC (TUNEABLE) WHITE	
Main Material	Acrylic (PMMA)		
Thickness	8mm		
Power Supply	AC / DC 12V / 24V Adaptor		
Working Voltage	DC 12V		
Input Voltage	AC 100 ~ 240V 50/60Hz		
Lighting Source	5050 SMD top view LED	3035 SMD top view LED	3035 SMD top view LED
Luminous Efficacy (LED)	35lm / W	92lm / W	121lm / W
Lumens per Metre	444lm / M	2310lm / M	1270lm / M
Power consumption. Per metre	13W	25W	25W
Colour Temperature (CCT)	RGB	2700K - 6500K	2200K - 4100K
CRI	-	83	80
IP Rating	IP54 as standard, IP67 available		
Max Size	3000mm x 800mm		
Weight	Length (m) x width (m) x thickness (mm) x 1.2kg		
Lifetime	> 50,000		
IP Rating	IP54 as standard, IP67 available		
Lifetime	More than 50,000 hours		
Warranty on LED Light Sheet	3 years		
Warranty on Acrylic	5 years		

# 1. UNDERSTANDING LED LIGHT SHEET CONT

## 1.5 2D AND 3D ILLUSTRATION










NO.	DESCRIPTION	REMARKS
1	High Intensity Flexible LED Module	110lm/W
2	Aluminium Heat Sink Plate	0.4mm
3	STS Zig Zag Tensioner	5630 only
4	Reflection Sheet	SW03G
5	3D V-Cut Light Guide Plate	PMMA
6	Reflection Tape	FASCAL 400
7	DC Power Cord (or 300mm Connect wire)	20 AWG

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# 1. UNDERSTANDING LED LIGHT SHEET CONT

## 1.6 PART LIST OF LED LIGHT SHEET

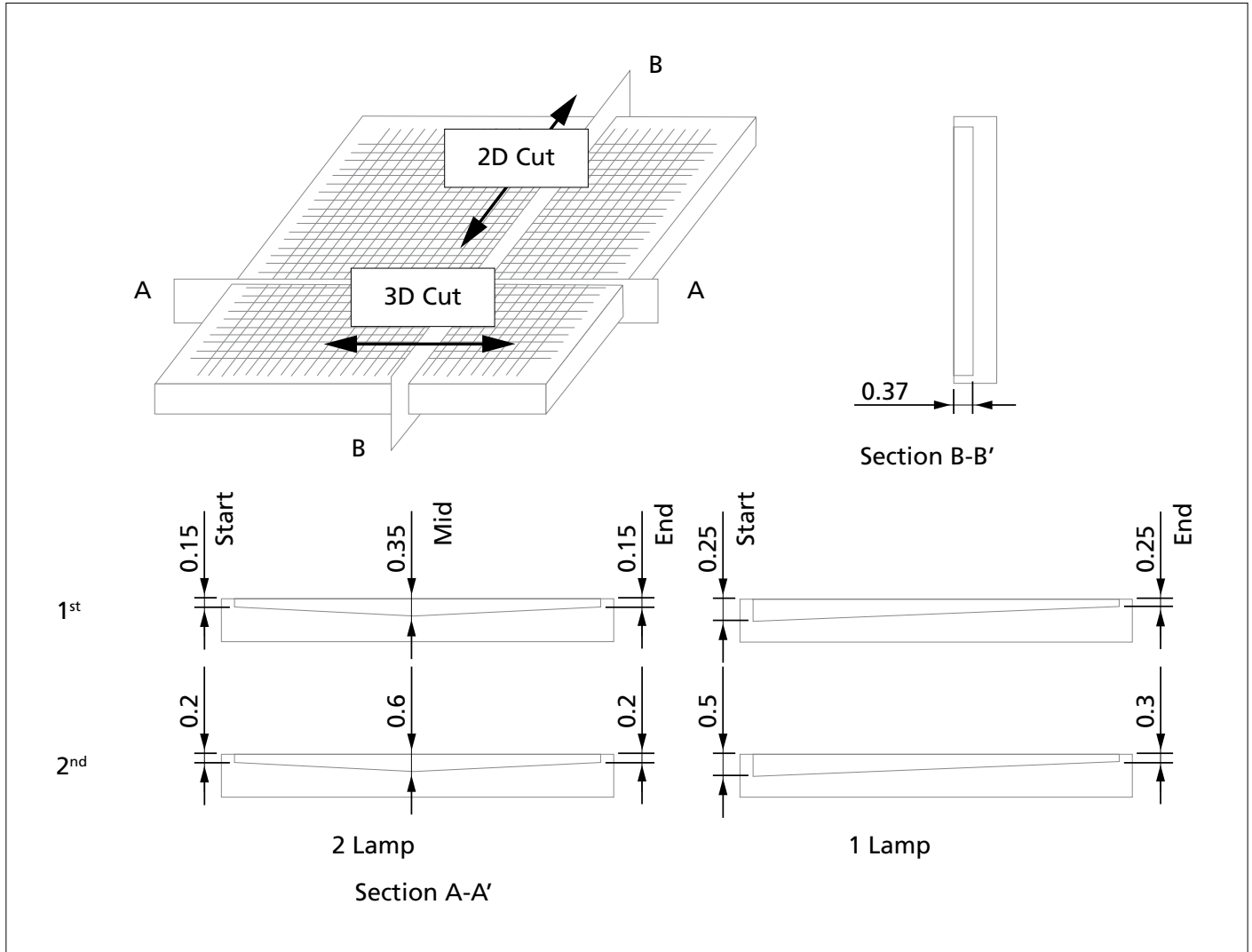
PART DESCRIPTION	
Acrylic (PMMA), 8mm	
Reflection Sheet	
Reflection Tape	
5630 SMD Top View LED	
DC Power Cord (20 AWG)	
Aluminium Heat Sink Plate	
Zig zag tensioner	

# 3D V-CUTTING TECHNOLOGY

## 2.1 3D V-CUTTING TECHNOLOGY

A significant advantage to LED Light Sheet lies in the production of the Light Guide Plate (LGP). Sourced for its rigidity and light transmission properties, a clear PMMA acrylic is etched with multiple grooves using patented 3D V-cutting technology to create a uniform matrix. This etched

matrix acts as a vehicle to transport light from the unit's embedded LEDs across the entire surface of the panel to deliver homogeneous illumination.



## 3. COMPONENTS

### 3.1 LIGHT GUIDE PLATE

#### 3.1.1 Specifications

A backlight unit including a light source for emitting light through a light guide plate made of light transmittable acrylic. The light source is located on one or multiple

sides of the light guide plate. The light guide plate is provided with a pattern of grooves to guide an optical path, scattering the light emitted from the light source.

#### 3.1.2 Properties

	TEST METHOD	UNIT	DATA
<b>General Properties</b>			
<b>Specific Gravity</b>	D-792		1.19
<b>Water Absorption</b>	D-570	%	0.30
<b>Optical Properties</b>			
<b>Refractive Index</b>	D-542		1.49
<b>Light Transmission</b>	D-1003	%	92.5
<b>Haze</b>	D-1003	%	0.2
<b>Mechanical Properties</b>			
<b>Tensile Strength</b>	D-638	Kg/cm <sup>2</sup>	760
<b>Elongation</b>	D-638	%	6
<b>Flexural Strength</b>	D-790	Kg/cm <sup>2</sup>	1.170
<b>Flexural Modulus</b>	D-790	Kg/cm <sup>2</sup>	32,000
<b>Zod Impact Strength</b>	D-256	Kg cm/cm	2.0
<b>Rockwell Hardness</b>	D-785	M scale	95
<b>Thermal Properties</b>			
<b>Heat Deflection Temperature</b>	D-648	°C	92-96
<b>Vicat Softening Point</b>	D-1525	°C	110
<b>Specific Heat</b>		Kcal/Kg.°C	0.35
<b>Thermal Conductivity</b>		Kcal/m.hr.°C	0.18
<b>Shrinkage after Heating</b>	D-177	%	+2-4
<b>Molding Temperature</b>	D-1547	°C	150~190
<b>Maximum Usable Temperature</b>		°C	70
<b>Electrical Properties</b>			
<b>Volume Resistivity</b>	D-257	Ω/sq	10 <sup>15</sup>
<b>Dielectric Constant</b>	D-150 (10 <sup>3</sup> Hz)		3.0


\* The above specification provides standard data from acrylic manufacturer.



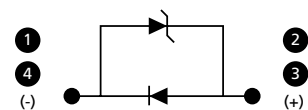
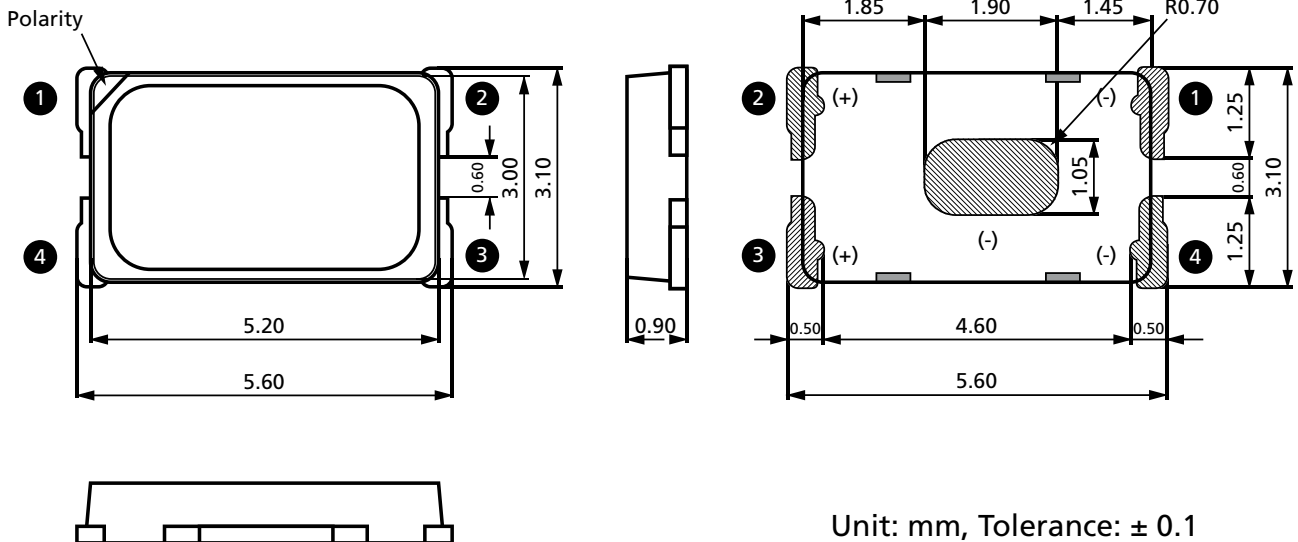
# 3. COMPONENTS CONT

## 3.2 STANDARD CRI LEDS

### 3.2.1 General Information

<b>GENERAL INFORMATION</b>		
<b>PRODUCER</b>	LUMIMICRO Ltd	NICHIA
<b>PRODUCT NAME</b>	6500K: LMMTP56216K5Z060-C00 5300K: LMMTP56215K3Z060-C00 4100K: LMMTP56214K1Z060-C00 3700K: LMMTP56213K7Z060-C00 3000K: LMMTP56213K0Z060-C00 2700K: LMMTP56212K7Z060-C00	2200K: NFSL757GT-V1
<b>DIMENSIONS</b>	5.6mm long x 3.0mm wide x 0.9mm deep	
<b>FEATURES</b>	1 chip LED	
<b>VIEWING ANGLE</b>	120°	

### 3.2.2 Outline and Dimensions



# 3. COMPONENTS CONT

## 3.2.3 SPECIFICATIONS

### Absolute Maximum Ratings

PARAMETER	SYMBOL	VALUE	UNIT
Forward Current	$I_F$	150	mA
Power Dissipation	$P_D$	500	mW
Storage Temperature	$T_{stg}$	-40 ~ +100	°C
Operating Temperature	$T_{opr}$	-30 ~ +85	°C
Soldering Temperature	$T_{sld}$	260 (for 10 sec)	°C
Junction Temperature	$T_j$	120	°C

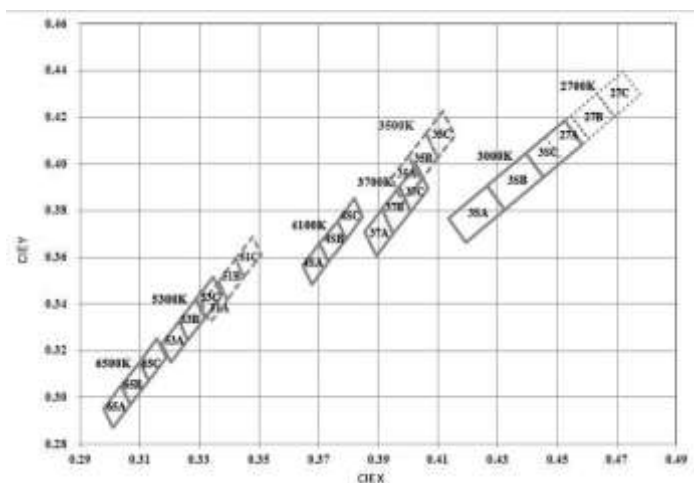
### Electrical / Optical Characteristics

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Forward Voltage	$V_F$	$I_F = 60\text{mA}$	2.8	-	3.2	V
Luminous Intensity	$I_V$	$I_F = 60\text{mA}$	6.0	-	-	cd
Colour Correlated Temperature	CCT	$I_F = 60\text{mA}$	2700	-	6500	K
Viewing Angle	$2\Theta_{1/2}$	$I_F = 60\text{mA}$	-	120	-	deg.
ESD			5	-	-	KV
Thermal Resistance <sup>[1]</sup>	$R_{th(j-s)}$	$I_F = 60\text{mA}$	-	-	30	°C/W

[1] Thermal Resistance: Rth (junction - Solder)

\* Tolerance:  $V_F = \pm 10\%$ ,  $I_V = \pm 10\%$ ,  $R_a = \pm 2$ , Chromacity Coordinate:  $\pm 0.005$

### Colour Coordinates Rank



# 3. COMPONENTS CONT


## 3.2.3 SPECIFICATIONS

<b>6500K</b>	<b>65A</b>		<b>65B</b>		<b>65C</b>	
	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>
	0.2979	0.2951	0.3039	0.3051	0.3099	0.3151
	0.3039	0.3051	0.3099	0.3151	0.3159	0.3251
	0.3069	0.2971	0.3129	0.3071	0.3189	0.3171
	0.3009	0.2871	0.3069	0.2971	0.3129	0.3071
<b>5300K</b>	<b>53A</b>		<b>53B</b>		<b>53C</b>	
	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>
	0.3173	0.3229	0.3231	0.3325	0.3289	0.3421
	0.3231	0.3325	0.3289	0.3421	0.3347	0.3517
	0.3261	0.3245	0.3318	0.3341	0.3375	0.3438
	0.3203	0.3149	0.3261	0.3245	0.3318	0.3341
<b>4100K</b>	<b>41A</b>		<b>41B</b>		<b>41C</b>	
	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>
	0.36765	0.3484	0.37335	0.358	0.37905	0.3677
	0.36455	0.3564	0.37035	0.366	0.37625	0.3756
	0.37035	0.366	0.37625	0.3756	0.38205	0.3851
	0.37335	0.358	0.37905	0.3677	0.38485	0.3774
<b>3700K</b>	<b>37A</b>		<b>37B</b>		<b>37C</b>	
	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>
	0.3854	0.3711	0.3912	0.3807	0.397	0.3904
	0.3912	0.3807	0.397	0.3904	0.4028	0.3998
	0.3951	0.37	0.4008	0.3797	0.4066	0.3894
	0.3894	0.3605	0.3951	0.37	0.4008	0.3797
<b>3000K</b>	<b>3SA</b>		<b>3SB</b>		<b>3SC</b>	
	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>
	0.4134	0.3765	0.4264	0.3905	0.4394	0.4045
	0.4264	0.3905	0.4394	0.4045	0.4524	0.4185
	0.4324	0.3805	0.4454	0.3945	0.4584	0.4085
	0.4194	0.3665	0.4324	0.3805	0.4454	0.3945
<b>2700K</b>	<b>27A</b>		<b>27B</b>		<b>27C</b>	
	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>
	0.4459	0.4115	0.4546	0.4208	0.4632	0.4302
	0.4546	0.4208	0.4632	0.4302	0.4719	0.4395
	0.4606	0.4108	0.4692	0.4202	0.4779	0.4295
	0.4519	0.4015	0.4606	0.4108	0.4692	0.4202

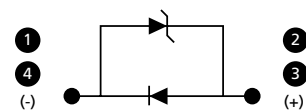
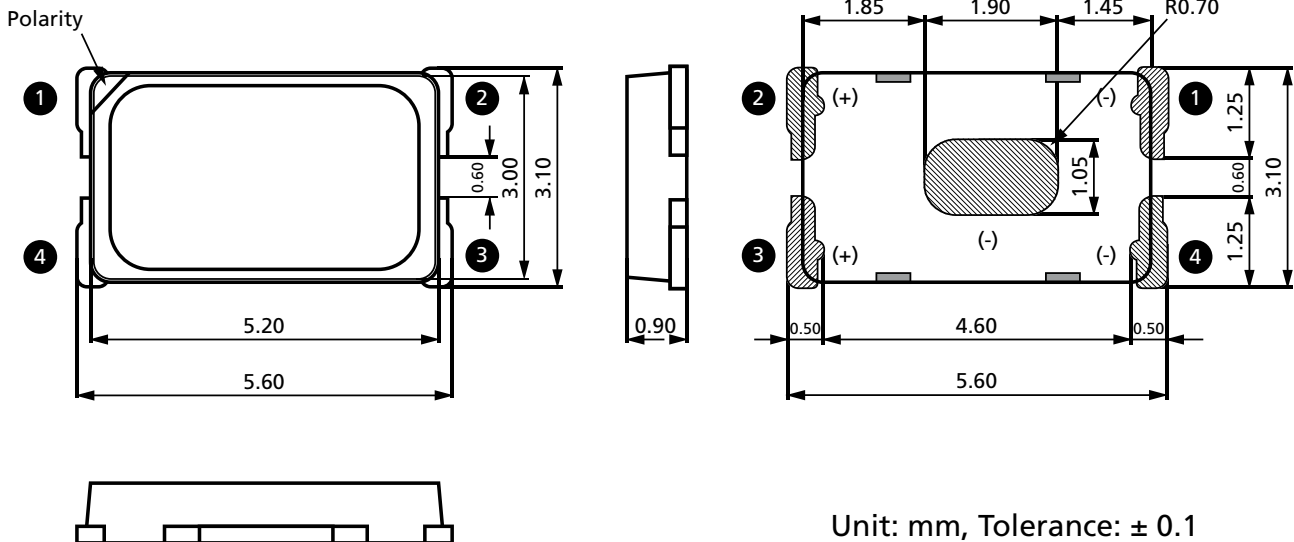
# 3. COMPONENTS CONT

## 3.3 HIGH CRI 90+ LEDS

### 3.3.1 General Information

<b>GENERAL INFORMATION</b>	
<b>PRODUCER</b>	LUMIMICRO Ltd
<b>PRODUCT NAME</b>	5200K: LMLTP5621C5K2Z060-C90 4100K: LMLTP5621C4K1Z060-C90 3100K: LMLTP5621C3K1Z060-C90 2800K: LMLTP5621C2K8Z060-C90
<b>DIMENSIONS</b>	5.6mm long x 3.0mm wide x 0.9mm deep
<b>FEATURES</b>	1 chip LED
<b>VIEWING ANGLE</b>	120°

### 3.3.2 Outline and Dimensions



## 3. COMPONENTS CONT

### 3.3.3 SPECIFICATIONS

#### Absolute Maximum Ratings

PARAMETER	SYMBOL	VALUE	UNIT
Forward Current	$I_F$	150	mA
Power Dissipation	$P_D$	500	mW
Storage Temperature	$T_{stg}$	-40 ~ +100	°C
Operating Temperature	$T_{opr}$	-30 ~ +85	°C
Soldering Temperature	$T_{sld}$	260 (for 10 sec)	°C
Junction Temperature	$T_j$	120	°C

#### Electrical / Optical Characteristics

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Forward Voltage	$V_F$	$I_F = 60\text{mA}$	2.8	-	3.2	V
Reverse Voltage	$I_R$	$V_R = 5\text{V}$			10	$\mu\text{A}$
Luminous Intensity	$I_V$	$I_F = 60\text{mA}$	6.5	-	-	cd
Colour Correlated Temperature	CCT	$I_F = 60\text{mA}$	2800	-	5200	K
Colour Rendering Index	Ra	$I_F = 60\text{mA}$	90			
Viewing Angle	$2\theta_{1/2}$	$I_F = 60\text{mA}$	-	120	-	deg.
ESD			5	-	-	KV
Thermal Resistance <sup>[1]</sup>	$R_{th(j-s)}$	$I_F = 60\text{mA}$	-	-	30	°C/W

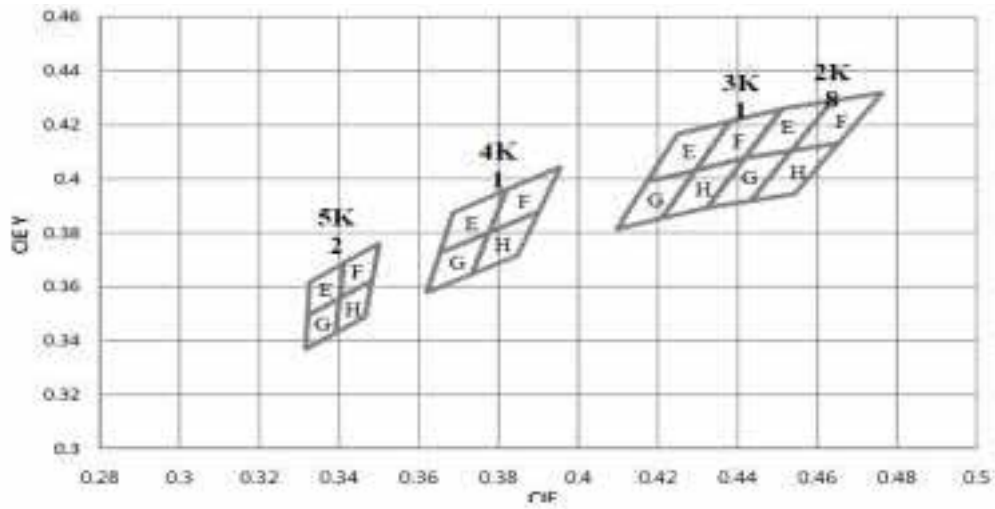
[1] Thermal Resistance: Rth (junction - Solder)

\* Tolerance:  $V_F = \pm 10\%$ ,  $I_V = \pm 10\%$ ,  $Ra = \pm 2$ , Chromacity Coordinate:  $\pm 0.005$

# 3. COMPONENTS CONT

## 3.3.3 SPECIFICATIONS

### Colour Coordinates Rank




<b>5200K</b>	<b>5K2E</b>		<b>5K2F</b>		<b>5K2G</b>		<b>5K2H</b>	
	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>
	0.3413	0.3688	0.3501	0.376	0.3402	0.3558	0.3483	0.3623
	0.3326	0.3616	0.3413	0.3688	0.3321	0.3492	0.3402	0.3558
	0.3321	0.3493	0.3402	0.3558	0.3316	0.3369	0.3391	0.3428
	0.3402	0.3558	0.3483	0.3623	0.3391	0.3428	0.3465	0.3487
<b>4100K</b>	<b>4K1E</b>		<b>4K1F</b>		<b>4K1G</b>		<b>4K1H</b>	
	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>
	0.3653	0.3726	0.3777	0.3801	0.362	0.3578	0.3734	0.3647
	0.3686	0.3874	0.3821	0.396	0.3653	0.3726	0.3777	0.3801
	0.3821	0.396	0.3956	0.4044	0.3777	0.3801	0.3902	0.388
	0.3777	0.3801	0.3902	0.388	0.3734	0.3647	0.3848	0.3716
<b>3100K</b>	<b>3K1E</b>		<b>3K1F</b>		<b>3K1G</b>		<b>3K1H</b>	
	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>
	0.4294	0.4031	0.4418	0.4077	0.421	0.3854	0.4323	0.3893
	0.4381	0.4213	0.4512	0.426	0.4294	0.4031	0.4418	0.4077
	0.4249	0.4165	0.4381	0.4213	0.4173	0.399	0.4294	0.4031
	0.4173	0.399	0.4294	0.4031	0.4097	0.3814	0.421	0.3854
<b>2800K</b>	<b>2K8E</b>		<b>2K8F</b>		<b>2K8G</b>		<b>2K8H</b>	
	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>	<b>X</b>	<b>Y</b>
	0.4417	0.4077	0.4535	0.4104	0.4323	0.3893	0.4433	0.3918
	0.4512	0.426	0.4638	0.429	0.4417	0.4077	0.4535	0.4104
	0.4638	0.429	0.4763	0.4319	0.4535	0.4104	0.4653	0.4132
	0.4535	0.4104	0.4653	0.4132	0.4433	0.3918	0.4543	0.3944

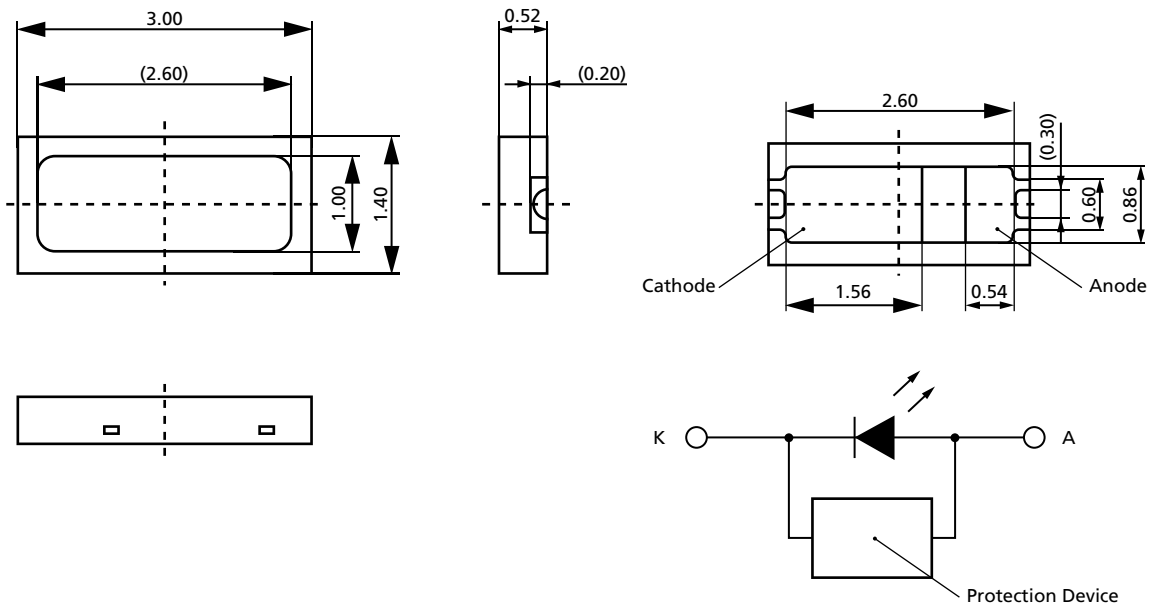
# 3. COMPONENTS CONT

## 3.4 LED FOR 3MM LED LIGHT SHEET

### 3.4.1 General Information

<b>GENERAL INFORMATION</b>	
<b>PRODUCER</b>	NICHIA
<b>PRODUCT NAME</b>	3014/5700K: NESW157BT
<b>DIMENSIONS</b>	3mm long x 1.4mm wide x 0.52mm deep
<b>FEATURES</b>	1 chip LED
<b>VIEWING ANGLE</b>	120°

### 3.4.2 Outline and Dimensions



## 3. COMPONENTS CONT

### 3.4.3 SPECIFICATIONS

#### Absolute Maximum Ratings

PARAMETER	SYMBOL	VALUE	UNIT
Forward Current	$I_F$	90	mA
Pulse Forward Current	$I_{FP}$	120	mA
Allowable Reverse Current	$I_R$	85	mA
Power Dissipation	$P_D$	270	mW
Storage Temperature	$T_{stg}$	-40 ~ +100	°C
Operating Temperature	$T_{opr}$	-40 ~ +100	°C
Soldering Temperature	$T_{sld}$	260 (for 10 sec)	°C
Junction Temperature	$T_j$	120	°C

\*Absolute maximum ratings at  $T_A=25\text{ °C}$

\* $I_{FP}$  conditions with pulse width  $\leq 10\text{ms}$  and duty cycle  $\leq 10\%$

#### Electrical / Optical Characteristics

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Forward Voltage	$V_F$	$I_F=50\text{mA}$	-	2.9	-	V
Luminous Intensity	$I_V$	$I_F=50\text{mA}$	-	6.87	-	cd
Colour Correlated Temperature	CCT	$I_F=50\text{mA}$	-	5700	-	K
Viewing Angle	$2\Theta_{1/2}$	$I_F=50\text{mA}$	-	120	-	deg.
Thermal Resistance <sup>[1]</sup>	$R_{\theta JS}$	$I_F=50\text{mA}$	-	22	32	°C/W

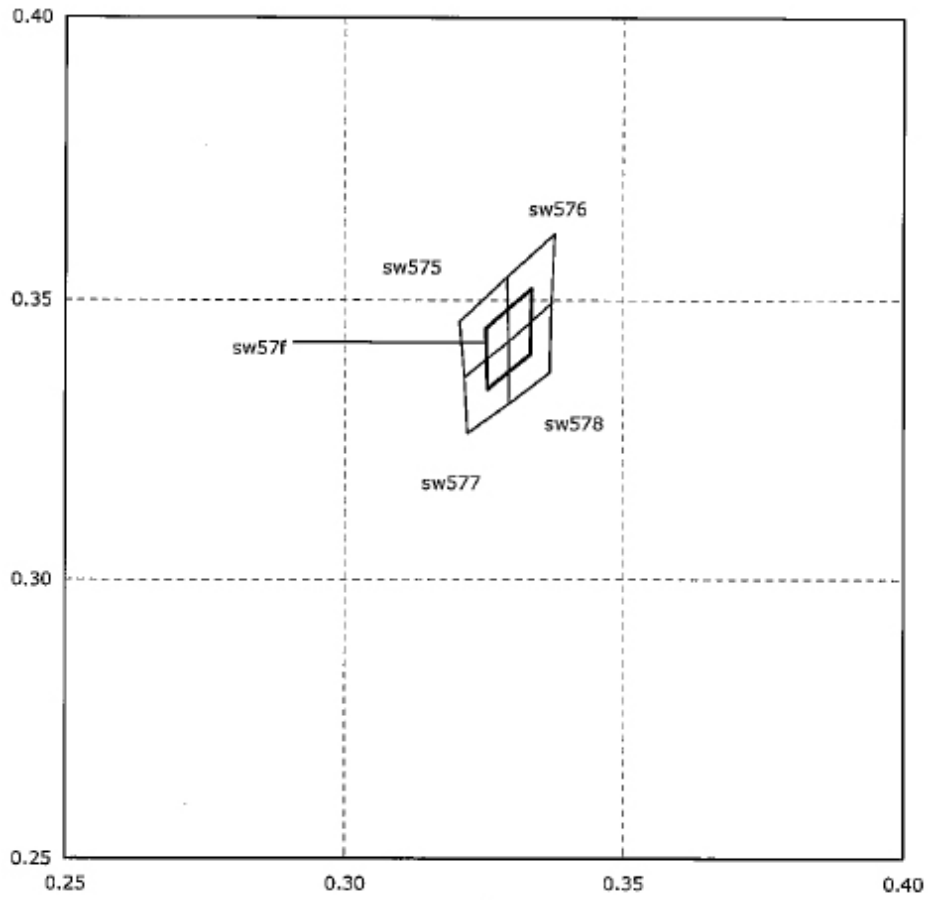
\*Characteristics at  $T_A=25\text{ °C}$

\* $R_{\theta JS}$  is thermal resistance from junction to  $T_S$  measuring point



# 3. COMPONENTS CONT

## 3.4.3 SPECIFICATIONS



RANK SW575		RANK SW576		RANK SW577	
X	Y	X	Y	X	Y
0.3214	0.3362	0.3293	0.3427	0.3221	0.3261
0.3207	0.3462	0.3293	0.3539	0.321	0.3362
0.3292	0.3539	0.3376	0.3616	0.3293	0.3427
0.3293	0.3427	0.3371	0.3493	0.3294	0.3315
RANK SW578		RANK SW57F			
X	Y	X	Y		
0.3294	0.3315	0.3256	0.3342		
0.3293	0.3427	0.3252	0.3448		
0.3371	0.3493	0.3334	0.3519		
0.3366	0.3369	0.3332	0.3401		

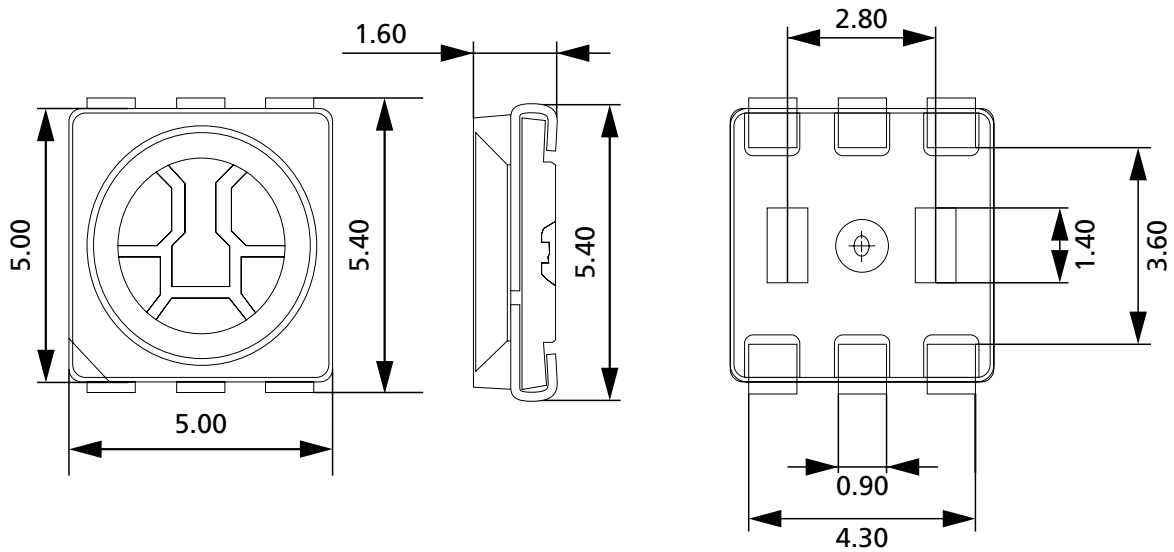
# 3. COMPONENTS CONT

## 3.5 LED FOR RGB LED LIGHT SHEET

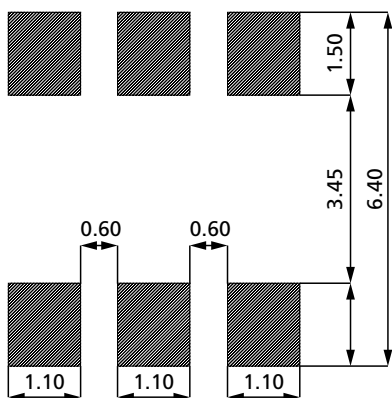
### 3.5.1 General Information

<b>GENERAL INFORMATION</b>	
<b>PRODUCER</b>	LUMIMICRO Ltd
<b>PRODUCT NAME</b>	LMTP50SPRGB-AS
<b>FEATURES</b>	3 chip LED
<b>VIEWING ANGLE</b>	120°
<b>LED DIMENSIONS</b>	5mm long x 5mm wide x 1.6mm deep
<b>LED STRIP DIMENSIONS</b>	520mm long x 6.4mm high
<b>LED BANK LENGTH</b>	50mm
<b>PITCH</b>	17mm

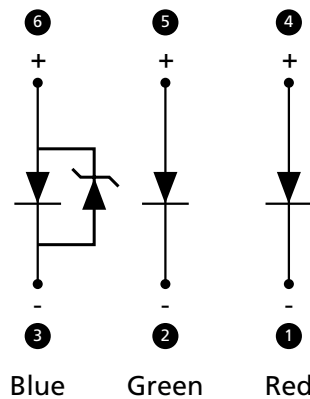
### 3.5.2 Outline & Dimensions



### Recommended solder pattern



### LED circuit diagram



Units in mm

## 3. COMPONENTS CONT

### 3.5.3 SPECIFICATIONS

#### Absolute Maximum Ratings

PARAMETER	COLOUR	SYMBOL	VALUE	UNIT
Forward Current	Red	I <sub>F</sub>	30	mA
	Green			
	Blue			
Power Dissipation	Red	P <sub>d</sub>	70	mW
	Green		80	
	Blue		80	
Forward Pulse Current <sup>[1]</sup>	Red	I <sub>PF</sub>	150	mA
	Green		60	
	Blue		80	
Reverse Voltage	Full Colour	V <sub>R</sub>	5	V
Storage Temperature	Full Colour	T <sub>stg</sub>	-40 ~ +100	°C
Operating Temperature	Full Colour	T <sub>opr</sub>	-30 ~ +85	°C
Soldering Temperature	Full Colour	T <sub>slid</sub>	260 (for 10 sec)	°C
ESD Classification	Red	Class 2 (JESD22-A114)		
	Green	Class 2 (JESD22-A114)		
	Blue	Class 3A (JESD22-A114)		

[1] Forward Pulse Current: Pulse Width < 10msec / Duty Ratio < 1/10

#### Electrical / Optical Characteristics

Electro/Optical Characteristics [Condition: 20mA / Chips - Ta = 25°C]

PARAMETER	SYMBOL	COLOUR	MIN.	TYP	MAX.	UNIT
Forward Voltage	V <sub>F</sub>	Red	1.8	-	2.4	V
		Green	2.8	-	3.6	
		Blue	2.8	-	3.6	
Dominant Wavelength	Dw	Red	618	-	628	nm
		Green	524	-	534	
		Blue	459	-	469	
Luminous Intensity	I <sub>v</sub>	R: IF 16mA (10.1mA) <sup>[1]</sup>	1500	2500	3500	mcd
		G: IF 25mA (13.3mA) <sup>[1]</sup>				
		B: IF 10mA (6.6mA) <sup>[1]</sup>				
Luminous Intensity	I <sub>v</sub>	Red	540	800	-	mcd
		Green	1100	1500	-	
		Blue	200	300	-	

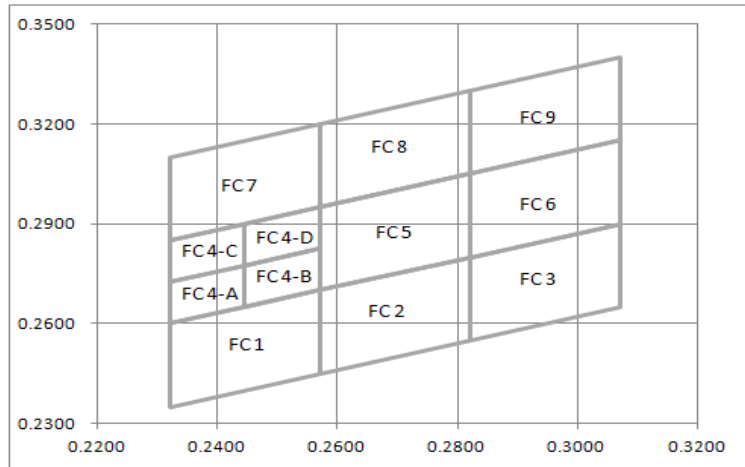
Tolerance: V<sub>F</sub>= ±0.01V, I<sub>v</sub>= ±10%, D<sub>w</sub>= ±2nm, chromacity coordinate = ±0.01

[1]: RGB White mixing 30mA Current Sum

# 3. COMPONENTS CONT

## 3.5.3 SPECIFICATIONS

### Colour Coordinates Rank



FC1		FC2		FC3	
X	Y	X	Y	X	Y
0.2320	0.2600	0.2570	0.2700	0.2820	0.2800
0.2570	0.2700	0.2820	0.2800	0.3070	0.2900
0.2570	0.2450	0.2820	0.2550	0.3070	0.2650
0.2320	0.2350	0.2570	0.2450	0.2820	0.2550
FC4-A		FC4-B		FC4-C	
X	Y	X	Y	X	Y
0.2320	0.2725	0.2445	0.2775	0.2320	0.2850
0.2445	0.2775	0.2570	0.2825	0.2445	0.2900
0.2445	0.2650	0.2570	0.2700	0.2445	0.2775
0.2320	0.2600	0.2445	0.2650	0.2320	0.2725
FC4-D		FC5		FC6	
X	Y	X	Y	X	Y
0.2445	0.2900	0.2570	0.2950	0.2820	0.3050
0.2570	0.2950	0.2820	0.3050	0.3070	0.3150
0.2570	0.2825	0.2820	0.2800	0.3070	0.2900
0.2445	0.2775	0.2570	0.2700	0.2820	0.2800
FC7		FC8		FC9	
X	Y	X	Y	X	Y
0.2320	0.3100	0.2570	0.3200	0.2820	0.3300
0.2570	0.3200	0.2820	0.3300	0.3070	0.3400
0.2570	0.2950	0.2820	0.3050	0.3070	0.3150
0.2320	0.2850	0.2570	0.2950	0.2820	0.3050

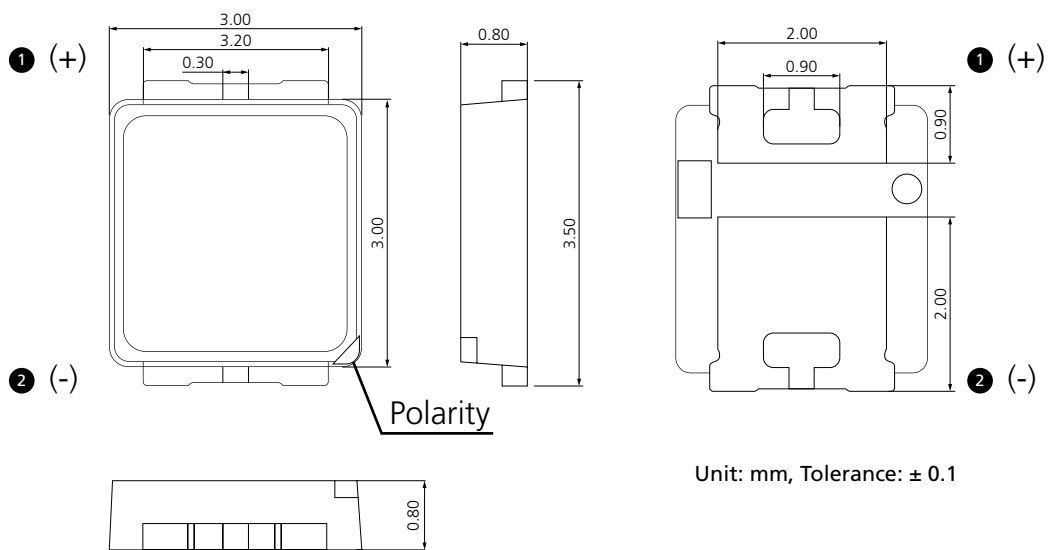
# 3. COMPONENTS CONT

## 3.6 LED FOR DYNAMIC/TUNEABLE LED LIGHT SHEET (2700K-6500K) 2200K - 4100K available on request

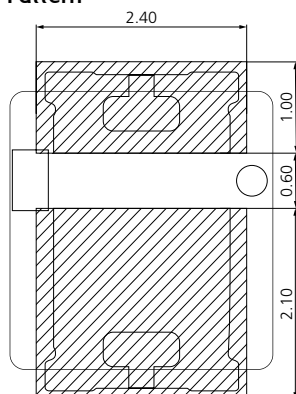
### 3.6.1 General Information

<b>GENERAL INFORMATION</b>	
<b>PRODUCER</b>	LUMIMICRO Ltd
<b>PRODUCT NAME</b>	LMLTP30B1CWHZ060-C80
<b>DIMENSIONS</b>	3mm wide x 3.5mm high x 0.8mm deep
<b>FEATURES</b>	Individual LED chips (warm & cool)
<b>VIEWING ANGLE</b>	120°

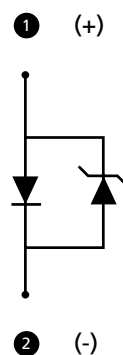
### 3.6.2 Outline & Dimensions



### 3.6.3 Recommend Solder Pattern



### 3.6.4 LED Circuit Diagram



# 3. COMPONENTS CONT

## 3.6.3 SPECIFICATIONS

### Absolute Maximum Ratings

PARAMETER	SYMBOL	VALUE	UNIT
Forward Current	$I_F$	150	mA
Power Dissipation	$P_d$	500	mW
Forward Pulse Current *1	$I_{PF-1}$	300	mA
Storage Temperature	$T_{stg}$	-40 ~ +100	°C
Operating Temperature	$T_{opr}$	-40 ~ +80	°C
Soldering Temperature	$T_{sld}$	260 (for 10 sec)	°C
Junction Temperature	$T_j$	120	°C

\*1 Forward pulse current: Pulse width <10msec / duty ratio <1/10

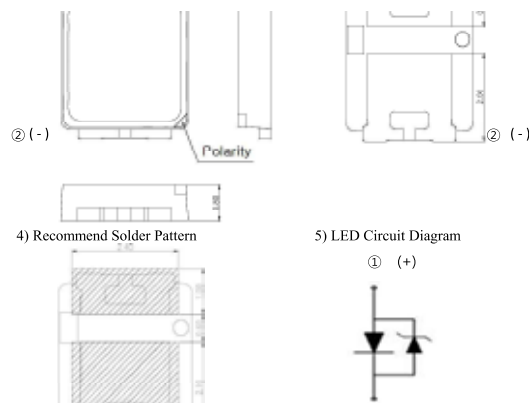
### Electrical / Optical Characteristics

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Forward Voltage	$V_F$	$I_F=60mA$	2.7	-	3.2	V
Reverse Voltage	$V_r$	$I_F=5mA$	0.5	-	1.2	V
Luminous Intensity	$I_v$	$I_F=60mA$	6.0	-	11.5	cd
Luminous Flux	$\Phi_v$	$I_F=60mA$	18.9	-	-	lm
Colour Correlated Temperature	CCT	$I_F=60mA$	2800	-	6700	K
Colour Rendering Index	Ra	$I_F=60mA$	80	-	-	-
Viewing Angle	$2\Theta_{1/2}$	$I_F=60mA$	-	120	-	deg.
ESD		1.5Ω, 100pF	5	-	-	KV
Thermal Resistance <sup>[1]</sup>	$R_{th(j-s)}$	$I_F=60mA$	-	-	30	°C/W

[1] Thermal resistance: Rth (junction - solder)

\* Tolerance:  $V_F=\pm 0.1V$ ,  $I_v=\pm 10\%$ , chromacity coordinate= $\pm 0.01$ , CRI= $\pm 2$

### Colour Coordinates Rank



### 3. COMPONENTS CONT

6K7E		6K7F		6K7G		6K7H		6K7M	
X	Y	X	Y	X	Y	X	Y	X	Y
0.2978	0.3304	0.3066	0.3392	0.2998	0.3209	0.3094	0.3187	0.3031	0.3297
0.2998	0.3209	0.3073	0.3339	0.3018	0.3113	0.3171	0.3261	0.3048	0.3198
0.3039	0.3247	0.3116	0.3382	0.3094	0.3187	0.3163	0.3371	0.3127	0.3275
0.3031	0.3297	0.3122	0.3328	0.3087	0.3237	0.3122	0.3328	0.3116	0.3382
0.3073	0.3339	0.3163	0.3371	0.3048	0.3198	0.3127	0.3275		
0.3066	0.3392	0.3155	0.3481	0.3039	0.3247	0.3087	0.3237		

5K9E		5K9F		5K9G		5K9H		5K9M	
X	Y	X	Y	X	Y	X	Y	X	Y
0.3157	0.3462	0.3241	0.3539	0.3165	0.3353	0.3244	0.3306	0.3201	0.3442
0.3165	0.3353	0.3326	0.3616	0.3172	0.3243	0.3316	0.3369	0.3206	0.3329
0.3204	0.3386	0.3321	0.3493	0.3244	0.3306	0.3321	0.3493	0.3281	0.3396
0.3201	0.3442	0.3282	0.3456	0.3243	0.3363	0.3282	0.3456	0.3283	0.3516
0.3242	0.3479	0.3283	0.3516	0.3206	0.3329	0.3281	0.3396		
0.3241	0.3539	0.3242	0.3479	0.3204	0.3386	0.3243	0.3363		

5K2E		5K2F		5K2G		5K2H		5K2M	
X	Y	X	Y	X	Y	X	Y	X	Y
0.3326	0.3616	0.3413	0.3688	0.3321	0.3493	0.3483	0.3623	0.3366	0.3589
0.3321	0.3493	0.3501	0.3760	0.3316	0.3369	0.3465	0.3487	0.3450	0.3657
0.3362	0.3525	0.3483	0.3623	0.3391	0.3428	0.3391	0.3428	0.3435	0.3524
0.3366	0.3589	0.3443	0.3591	0.3396	0.3493	0.3396	0.3493	0.3358	0.3462
0.3408	0.3623	0.3450	0.3657	0.3358	0.3462	0.3435	0.3524		
0.3413	0.3688	0.3408	0.3623	0.3362	0.3525	0.3443	0.3591		

4K6E		4K6F		4K6G		4K6H		4K6M	
X	Y	X	Y	X	Y	X	Y	X	Y
0.3498	0.3736	0.3592	0.3805	0.3480	0.3601	0.3611	0.3695	0.3535	0.3702
0.3592	0.3805	0.3686	0.3874	0.3524	0.3633	0.3655	0.3726	0.3625	0.3768
0.3580	0.3735	0.3655	0.3726	0.3513	0.3563	0.3620	0.3578	0.3596	0.3623
0.3535	0.3702	0.3611	0.3695	0.3554	0.3593	0.3541	0.3521	0.3513	0.3563
0.3524	0.3633	0.3625	0.3768	0.3541	0.3521	0.3554	0.3593		
0.3480	0.3601	0.3580	0.3735	0.3462	0.3462	0.3596	0.3623		

4K1E		4K1F		4K1G		4K1H		4K1M	
X	Y	X	Y	X	Y	X	Y	X	Y
0.3686	0.3874	0.3821	0.3960	0.3653	0.3726	0.3840	0.3841	0.3734	0.3840
0.3821	0.3960	0.3956	0.4044	0.3715	0.3764	0.3902	0.3880	0.3864	0.3921
0.3799	0.3881	0.3902	0.3880	0.3696	0.3688	0.3848	0.3716	0.3815	0.3761
0.3734	0.3840	0.3840	0.3841	0.3756	0.3725	0.3734	0.3647	0.3696	0.3688
0.3715	0.3764	0.3864	0.3921	0.3734	0.3647	0.3756	0.3725		
0.3653	0.3726	0.3799	0.3881	0.3620	0.3578	0.3815	0.3761		

3K6E		3K6F		3K6G		3K6H		3K6M	
X	Y	X	Y	X	Y	X	Y	X	Y
0.3946	0.4015	0.4098	0.4090	0.3892	0.3853	0.4103	0.3955	0.3992	0.3970
0.4098	0.4090	0.4249	0.4165	0.3963	0.3887	0.4173	0.3990	0.4138	0.4042
0.4065	0.4006	0.4173	0.3990	0.3933	0.3804	0.4097	0.3814	0.4068	0.3869
0.3992	0.3970	0.4103	0.3955	0.4000	0.3837	0.3968	0.3752	0.3933	0.3804
0.3963	0.3887	0.4138	0.4042	0.3968	0.3752	0.4000	0.3837		
0.3892	0.3853	0.4065	0.4006	0.3839	0.3690	0.4068	0.3869		

3K1E		3K1F		3K1G		3K1H		3K1M	
X	Y	X	Y	X	Y	X	Y	X	Y
0.4249	0.4165	0.4381	0.4213	0.4173	0.3990	0.4356	0.4055	0.4274	0.4100
0.4381	0.4213	0.4512	0.4260	0.4234	0.4011	0.4418	0.4077	0.4401	0.4145
0.4338	0.4123	0.4418	0.4077	0.4194	0.3922	0.4323	0.3893	0.4311	0.3964
0.4274	0.4100	0.4356	0.4055	0.4252	0.3943	0.4210	0.3854	0.4194	0.3922
0.4234	0.4011	0.4401	0.4145	0.4210	0.3854	0.4252	0.3943		
0.4173	0.3990	0.4338	0.4123	0.4097	0.3814	0.4311	0.3964		

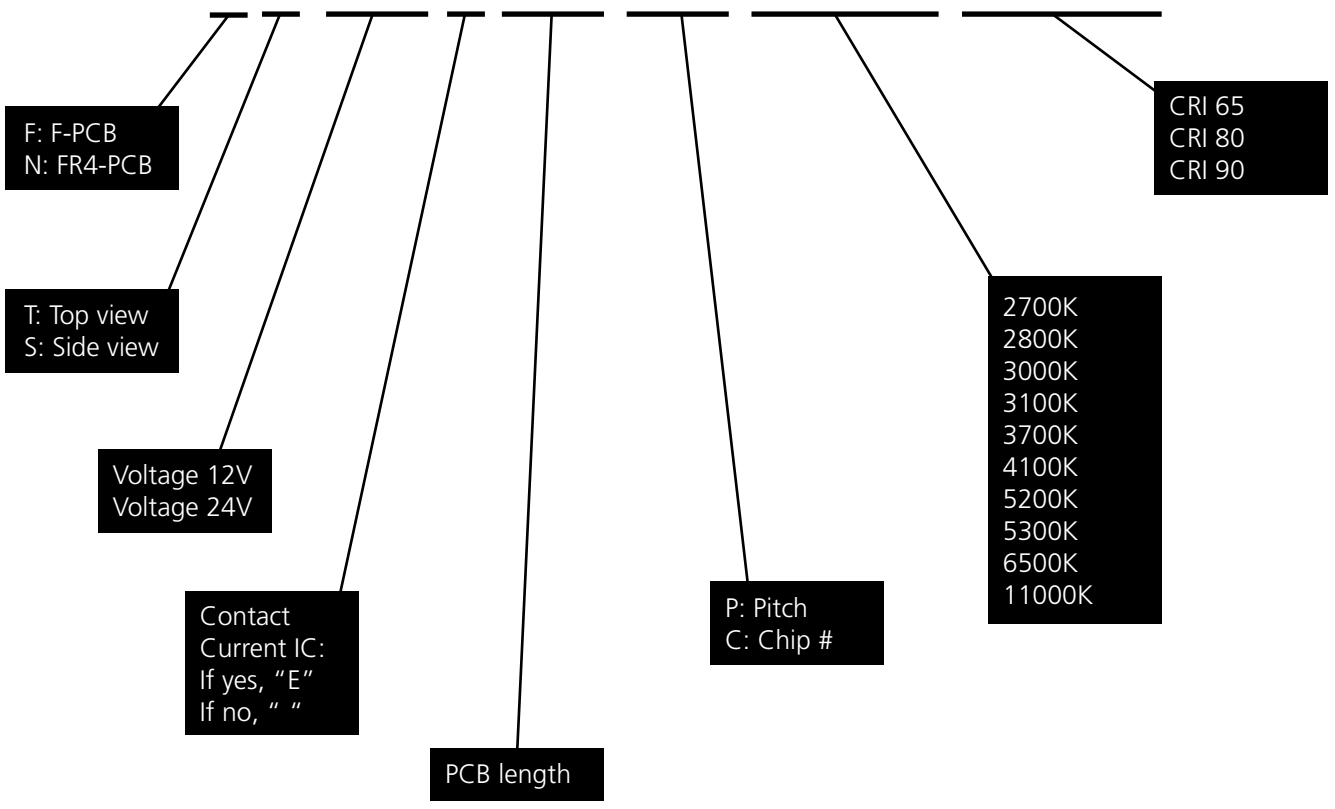
2K8E		2K8F		2K8G		2K8H		2K8M	
X	Y	X	Y	X	Y	X	Y	X	Y
0.4512	0.4260	0.4638	0.4290	0.4417	0.4077	0.4594	0.4118	0.4526	0.4183
0.4638	0.4290	0.4763	0.4319	0.4476	0.4090	0.4653	0.4132	0.4647	0.4211
0.4586	0.4197	0.4653	0.4132	0.4427	0.3998	0.4543	0.3944	0.4541	0.4025
0.4526	0.4183	0.4594	0.4118	0.4484	0.4011	0.4433	0.3918	0.4427	0.3998
0.4476	0.4090	0.4647	0.4211	0.4433	0.3918	0.4484	0.4011		
0.4417	0.4077	0.4586	0.4197	0.4323	0.3893	0.4541	0.4025		

# 3. COMPONENTS CONT

## 3.7 LED MODULE

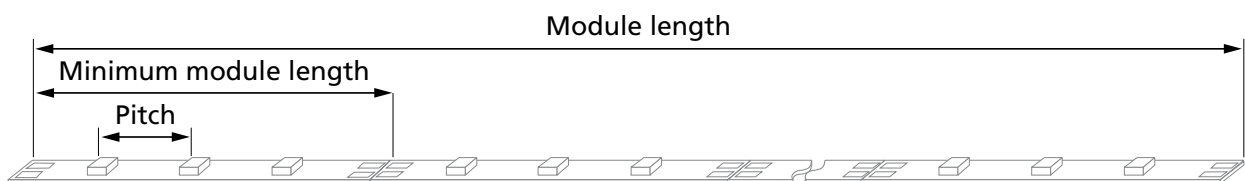
### 3.7.1 Definition of Model

**F T 12V E 280 P## 5300K (CRI65)**



### 3.7.2 Specifications

	LENGTH	LED PITCH	NO. OF LEDS	REMARK
FT12V280P16	46.7 x 6 = 280	15mm	18	5630 LED module used in 6, 8, 10mm panels. Standard Output
FT12V283C24	35 x 8 + 3 = 283	11mm	24	3014 LED module used in 4mm panel. Standard Output
FT12V500P16	50 x 10 = 500	16mm	30	5050 LED module RGB used in 10mm panel
FT12V500P8	25 x 20 = 500	8mm	60	3230 LED module 2in1 type used in 10mm panel





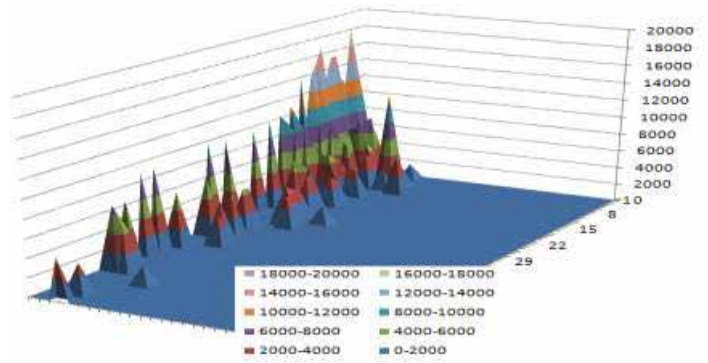
# 4. TECHNICAL DATA

## 4.1 CENTRE SURFACE BRIGHTNESS (8mm, LEDs on 1 side)

Below data was measured from Jan., 2013 to Jun., 2014 and based on 5630/ 5300K/ Standard LED pitch.

The below data shows the center surface brightness in lux

- Data may differ depending on measurement and production method.
- This data table is not a guaranteed lux level but can be used as reference brightness table.
- Coloured numbers below represent V-cut pitch of **1.4**, **2.8**, and **5.6**.



		WIDTH MM							
		50	100	150	200	250	300	350	400
LENGTH MM (LED SIDE)	50	7338							
	100	9780	6643	5225					
	150	14870	6351	5167					
	200	18090	7400	5758	4818		2836		
	250	11610		5457	7798				
	300	12550	6195	6691	4871				
	350	15280				3584			
	400	15280		6753		4064			
	450	12960		5427					
	500	16870	8149		5308				
	550	15120							
	600	13850	8495						
	650	8894			4731				
	700	13750			5056				
	750		8004			3747			
	800	10950					2837		
	850		8429				3300		
	900	10240			4442				
	950			5487		4175			
	1000	9960				3849			
	1050								
	1100								
	1150	9444							
	1200								
	1250						2941		
	1300						3017		
	1350							3062	
	1400	9274							
	1450		6764		4562				
1500				4649					
1550	9706								
1600				4453					
1650		6571							
1700				4136					
1750									
1800					3462				
1850									
1900		5932							
1950									
2000	9081								
2050									
2100	8731								
2150									
2200									
2250									
2300		6891							
2350			4085						
2400		6890	4690						
2450									
2500									
2550					2108				
2600									
2650									
2700									
2750									
2800				3238					
2850									
2900									
2950				4650					



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## 4. TECHNICAL DATA

### 4.3 IP67 RATINGS

LED Light Sheet has a resistance that achieves an Ingress Protection Test rating of IP54 as standard. An IP67 rating is available by request. LED Light Sheet can be completely protected from dust and sustain certain periods of immersion under pressure.

### UNDERSTANDING IP RATINGS

Example of rating: IP67

FIRST NUMBER (PROTECTION AGAINST SOLID OBJECTS)	DEFINITION	SECOND NUMBER (PROTECTION AGAINST LIQUIDS)	DEFINITION
0	No protection	0	No protection
1	Protected against solid objects over 50mm (e.g. accidental touch by hands)	1	Protection against vertically falling drops of water
2	Protected against solid objects over 12mm (e.g. fingers)	2	Protected against direct sprays up to 15° from the vertical
3	Protected against solid objects over 2.5mm (e.g. tools and wires)	3	Protected against direct sprays up to 60° from the vertical
4	Protect against solid objects over 1mm (e.g. tool, wires and small wires)	4	Protected against sprays from all directions - limited ingress permitted
5	Protected against dust - limited ingress (no harmful deposit)	5	Protected against low pressure jets of water from all directions - limited ingress permitted
6	Totally protected against dust	6	Protected against strong jets of water e.g. for use on shipdecks - limited ingress permitted
		7	Protected against the effects of temporary immersion between 15cm and 1m. Duration of test: 30 minutes
		8	Protected against long periods of immersion under pressure

---

## 5. POWER CORD

### 5.1 OPTION 1 - CONNECT

#### Supplied as standard



Connect is a small, power-to-luminaire system designed to meet the lighting industry's need for a compact, easy-to-install interconnecting solution.

The system can be used for simple or complex wiring solutions and features a range of white wires and component parts that connect and disconnect with ease. Robust yet incredibly slim, the standard 7.5mm male connector can easily fit through an 8mm opening compared to other connectors which require much larger spaces.

Each Applelec product, including LED Light Sheet, wired with the Connect system features a 300mm wire fitted with a male connector. This 300mm wire connects to a 1200mm wire with a female connector which is fitted to a power supply or supplied with a bare-end to create a standard length of 1500mm. Extension wires in a choice of 500mm, 1000mm, 1500mm and 2000mm lengths can be added between the product and its power supply to a maximum length of 5000mm (up to 5A). All cables are BASEC and UKAS approved.

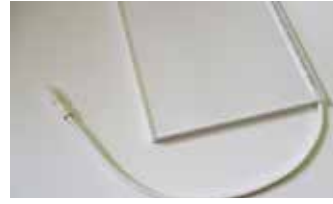
An inventive selection of splitters ensures the Connect wiring system is highly flexible and these include a T-splitter, 2-way splitter and 6-way splitter. Using a crimping tool, the versatile T-splitter can be attached to any wire, anywhere in the system (subject to calculated power travelling to existing wired lighting units) to create a 'branch' which feeds a newly added luminaire.

Using a simple plug and play principle, Connect from Applelec is easy to use, install and adjust.

#### Key Features

- BASEC and UKAS approved
- Compact 7.5mm connectors; fits through 8mm opening
- Plug-and-play principle; easy and quick to install
- Flexible, interconnecting solution
- White cables and connectors
- Four extension lengths: 500mm, 1000mm, 1500mm, 2000mm
- 5000mm lengths possible in one wiring run
- T-splitter, 2-way splitter and 6-way splitter
- 3 year warranty

#### Components



Male connector with 300mm wire to product



500mm, 1000mm, 1500mm, 2000mm & 3000mm extension wire



2-way splitter



6-way splitter



T-splitter



Female connector with 1200mm wire and power supply

---

## 5. POWER CORD CONT

### Plug-and-play wiring



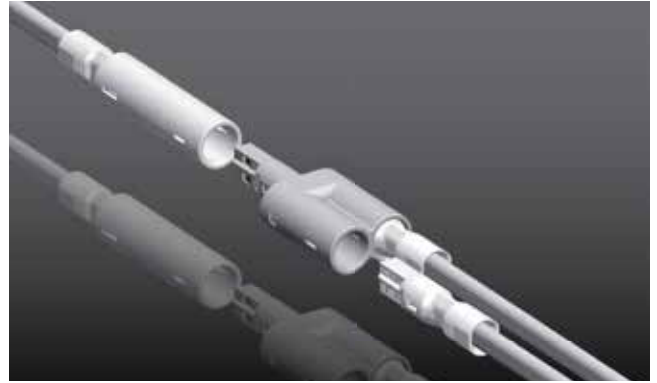
Male and female connectors fit together easily



Ensure the two ridges at the top of the male connector are inserted into the corresponding grooves within the female connector

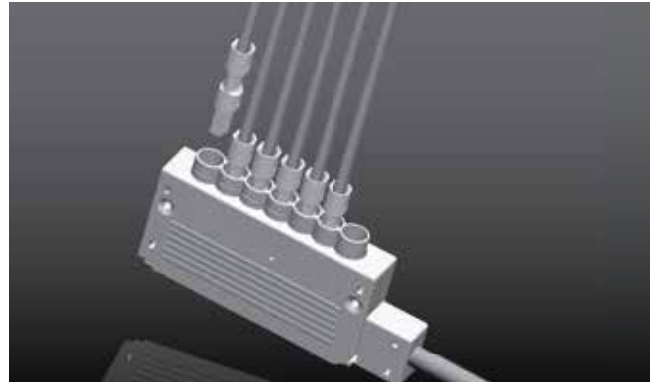


Interior detail of the female connector

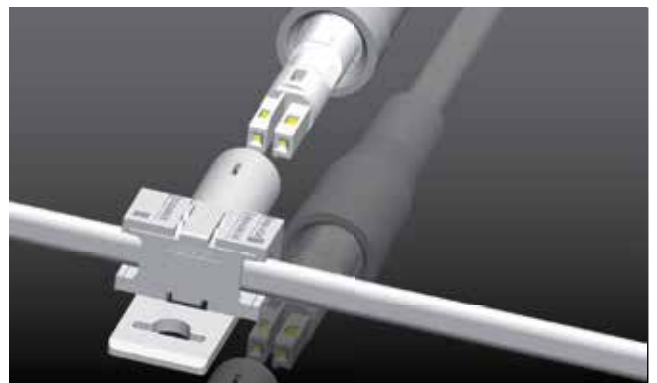


Connect and disconnect with ease

Expand the power system and easily split power for two lamps with the 2-way splitter



6-way splitter to power six lamps



The T-splitter can be placed anywhere on the cable  
Multiple T-splitters can be placed on the cable

# 5. POWER CORD CONT

## 5.1 OPTION 1 - CONNECT

**Conductor:** Class 5 flexible plain copper conductors to BS EN 60228:2005 (previously S6360)  
**Insulation:** PVC (Polyvinyl Chloride) T12 to BS7655  
**Sheath:** PVC (Polyvinyl Chloride) TM2 to BS7655  
**Sheath colour:** White  
**Voltage rating:** 300/300V  
**Temperature rating:** 0°C to +70°C  
**Minimum bending radius:** 6 x overall diameter  
**Standards:** BS6500



### Specification

ELAND PART NO.	NO. OF CORES X NOMINAL CROSS SECTIONAL AREA (MM <sup>2</sup> )	NOMINAL THICKNESS OF INSULATION (MM)	NOMINAL THICKNESS OF SHEATH (MM)	NOMINAL OVERALL DIAMETER (MM)	NOMINAL WEIGHT (KG/KM)
A3Y020075*FLAT	2 x 0.75	0.5	0.6	3.30 x 5.40	37

**Conductors.** Class 5 flexible Copper Conductors for Single Core and Multi-Core cables

Table in accordance with BS EN 60228:2005 (previously BS6360)

NOMINAL CROSS SECTIONAL AREA (MM <sup>2</sup> )	MAXIMUM DIAMETER OF WIRES IN CONDUCTOR (MM)	MAXIMUM RESISTANCE OF CONDUCTOR AT 20°C	
		PLAIN WIRES (OHMS/KM)	METAL-COATED WIRES (OHMS/KM)
0.75	0.21	26.00	26.70

**Electrical Characteristics.** Current Carrying Capacity (amperes): and Mass Supportable (kg)

Table in accordance with BS EN 60228:2005 (previously BS6360)

CONDUCTOR CROSS SECTIONAL AREA MM <sup>2</sup>	CURRENT CARRYING CAPACITY		MAXIMUM MASS SUPPORTABLE BY TWIN FLEXIBLE CORD (SEE REGULATIONS 522.7.2 AND 559.6.1.5) A
	SINGLE PHASE AC (AMPS)	THREE PHASE AC (AMPS)	
0.75	6	6	3

**Rating factor for ambient temperature.** 60°C thermoplastic or thermosetting insulated cords:

AMBIENT	35°C	40°C	45°C	50°C	55°C(AMPS)
Rating Factor	0.91	0.82	0.71	0.58	0.41

The above table is in accordance with Table 4F3A of the 17th Edition of IEE Wiring Regulations.

**Voltage Drop (per ampere per metre)**

Conductor operating temperature: 60°C\*. The below table is in accordance with Table 4F3B of the 17th Edition of IEE Wiring Regulations.

CONDUCTOR CROSS SECTIONAL AREA (MM <sup>2</sup> )	DC OR SINGLE PHASE AC (MV/A/M)	THREE PHASE AC (MV/A/M)
0.75	62	54

The information contained within this datasheet is for guidance only. When selecting accessories such as cleats, glands, etc please note that actual cable dimensions may vary due to manufacturing tolerances.

# 5. POWER CORD CONT.

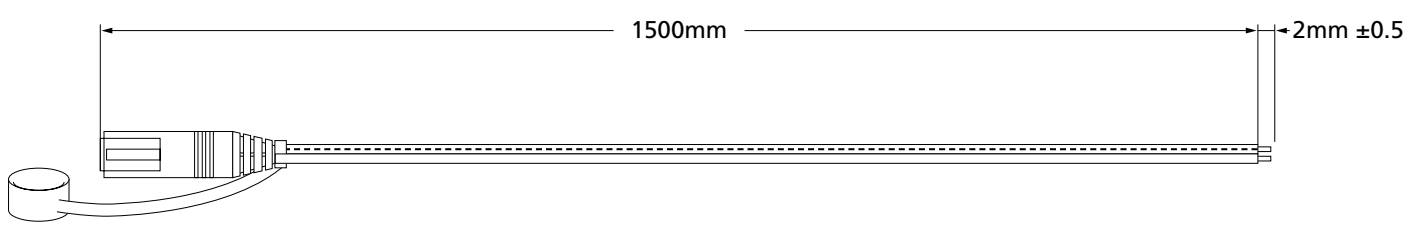
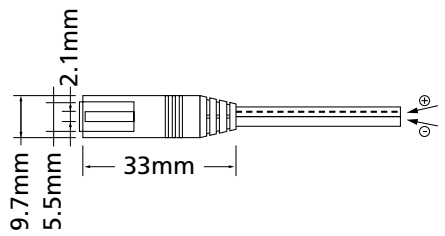
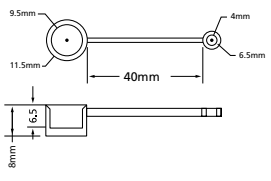
## 5.2 OPTION 2 - DC POWER CORD (available on request)

### Type 'Y' attachment:

If the external flexible cable or cord of this luminaire is damaged it shall be exclusively replaced by the manufacturer or their service agent or a similar qualified person in order to avoid a hazard.



ITEM/TYPE	PROPERTY	TYPICAL DATA
DC Cable	DC jack +, - pin	Bronze/nickel-plated
	Jack moulding	PVC
	Cable	PVC + copper
	DC jack +, - pin	5.5Ø * 2.1Ø
	Cable	20, 22, 24AWG
	Length	1.5m, 3m
	Colour	All black



## UL Certificate





## 5. POWER CORD CONT.

### 5.3 SPIDER CONNECTOR

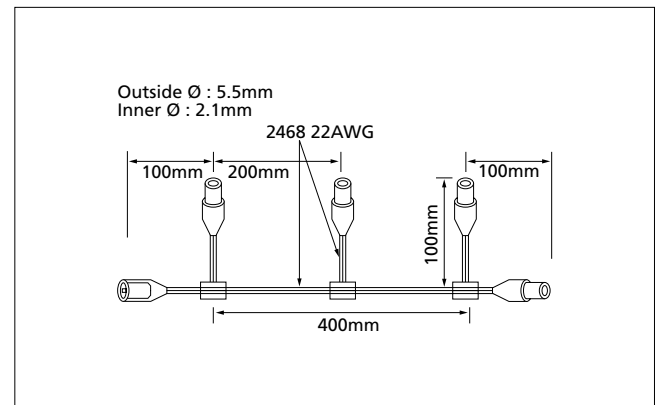


Allowing up to four LED Light Sheet panels to be linked together and run from a single power supply, spider connectors are available in two wire lengths. The short four-port spider links together panels positioned in close proximity, whilst the long spider features four-ports, each with a wiring range of 1500mm.

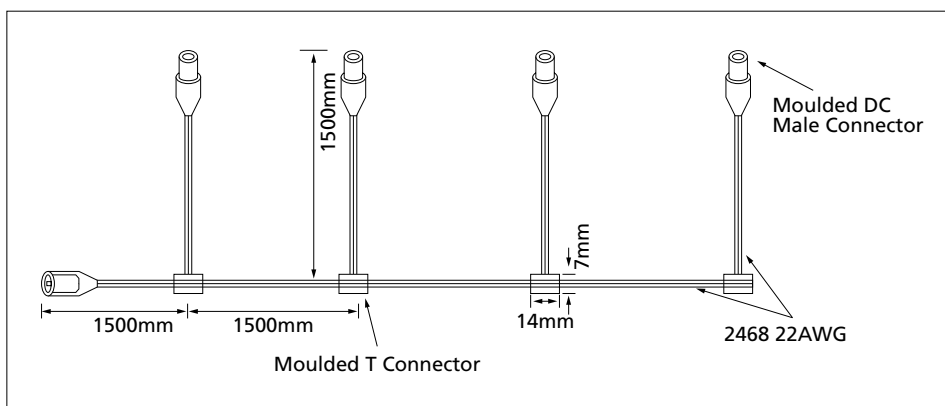
Energy efficiency is maximized by utilising the LED load on the driver, whilst reducing the number of driver units required overall. Testing has been completed to ensure voltage drops do not occur when using the spider connectors with LED Light Sheet and that even over distance the unit's brightness is not affected

Note: Not all ports can be used for every project, please refer to your quotation for the wattage of the panel(s) and the wattage of the power supply

#### 4 Way Short Spider Connector



#### 4 Way Long Spider Connector





---

## 5. POWER CORD CONT.

### 5.4 WIRE EXIT OPTIONS

#### Connect Wire

Out of the edge of the panel (as standard)



Out of the back of the panel



Out of the face of the panel



Notched panel wire exit available on request.

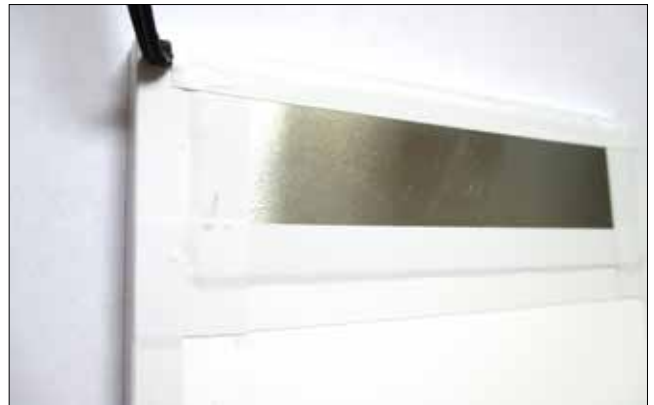
### 5.5 WIRE EXIT OPTIONS

#### Old Style Wiring

Out of the edge of the panel (as standard)



Out of the back of the panel



Out of the face of the panel



# 6. GENERAL SAFETY INSTRUCTIONS

## 6.1 GUIDE

Thank you for purchasing LED Light Sheet. This technical manual explains the necessary precautions and technical specifications of the product, and includes further information on warranty procedures. The information given in this technical manual should be sufficient for the end-user to handle LED Light Sheet safely.

Please be fully familiarised with the information included in this technical manual before beginning installation or use of LED Light Sheet. LED Light Sheet ("we", "LED Light Sheet") is not liable for any damages of any kind resulting from the purchase, use or misuse of, or inability to use the product or arising directly or indirectly from the use, or loss of use of the product, or from the original purchaser's ("you", "purchaser") lack of knowledge or comprehension, including incidental, special, consequential or similar damages, or loss of anticipated profits or benefits. Also be aware that LED Light Sheet is not liable for damages arising from any sort (including negligence or gross negligence) on the part of the purchaser or faults in this technical manual. If in doubt please contact Applelec.

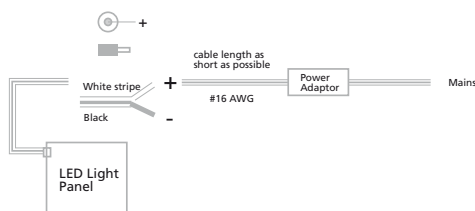
## 6.2 GENERAL INSTRUCTIONS FOR LED LIGHT SHEET

### 6.2.1 Warnings

1. **DO NOT** disassemble LED Light Sheet.
2. **DO NOT** apply AC power or any other DC power to LED Light Sheet which is described in the quotation paperwork.
3. **DO NOT** drop or bend LED Light Sheet.
4. **DO NOT** tamper with LED Light Sheet from its original form.
5. **DO NOT** pull on the power wire.
6. **DO NOT** adhere graphics directly to LED Light Sheet.
7. Make sure LED Light Sheet is functioning correctly prior to assembly with or without other products.
8. When handling LED Light Sheet or any of its components prior to assembly, always wear cotton gloves or the equivalent to prevent scratching or staining (e.g. fingerprints) on the LGP.
9. **DO NOT** use any form of alcohol or solvent to clean the LGP or any component in direct contact with the LGP.
10. **DO NOT** cover the metal heat sink. The exposed metal on the back of the LED Light Sheet panel allows the heat generated by the LED to be dissipated thus cooling the LED over time maximising longevity.
11. **DO NOT** remove the aluminium heat sink plate from the LED Light Sheet.

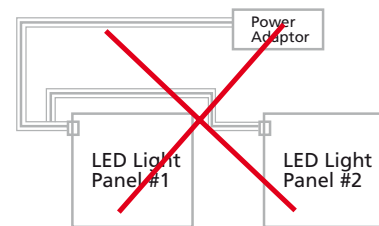
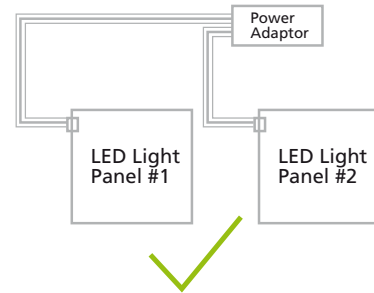
### 6.2.2 Electric Wiring

1. LED Light Sheet is powered by a DC 12V (constant voltage) adaptor. Warranty is void if any other adaptor that is not approved by LED Light Sheet is used. Some bespoke projects however, may operate on a different

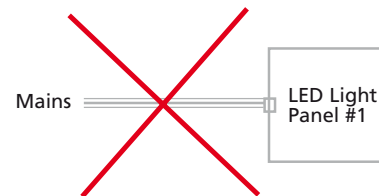


voltage which would be confirmed and advised at the quotation stage.

2. Any adjusted cord from the adaptor to LED Light Sheet should be kept as short as possible to avoid a voltage drop of LED Light Sheet, unless specified and supplied by Applelec.
3. One adaptor can supply power to multiple LED Light Sheet units providing the total wattage is less than the capacity of the adaptor. Multiple LED Light Sheet units may be connected by using a spider connector cable.



4. If multiple LED Light Sheet units are wired to one adaptor, connect them in "parallel" not as a "series" to avoid voltage drop and maximize light output.



5. Never apply AC power directly to LED Light Sheet as this will instantly damage or blow the LEDs.

### 6.2.3 Protective Film

Prior to installation of LED Light Sheet please ensure the clear protective film has been removed from the face of the unit. Failure to remove the protective film will affect the brightness, clarity and even illumination of LED Light Sheet.

### 6.2.4 Cleaning

1. White cotton gloves should be worn to prevent scratches or fingerprints on the acrylic surface.
2. If fingerprints or other substances are visible on the acrylic surface, gently wipe off with a non abrasive cloth soaked in a watered down thinner.
3. With the cross section cut by a laser, the acrylic surface may crack if excessively exposed to thinner or alcohol.

---

## 6. GENERAL SAFETY CONT

### 6.2.5 Moving

1. Please **DO NOT HANDLE** the acrylic plate as below when lifting up. The LED module embedded within the acrylic plate will be damaged, and the solder pads fractured.



2. LED Light Sheet should be placed on a clean and flat surface. (See picture below)



The longer side of LED Light Sheet should be lifted up slowly. **DO NOT** bend LED Light Sheet when lifting. Lift LED Light Sheet in a vertical position, keeping the unit straight and supporting each corner to maintain rigidity. (See picture below).



### 6.2.6 Storage

Store LED Light Sheet in a dry area on a plain surface. Always keep LED Light Sheet covered to protect it from moisture and dust. Keep LED Light Sheet away from children.

### 6.2.7 Opening the delivery

Please note that the product may be damaged if the packaging is opened with a craft knife or a sharp edged tool.

## 7. WARRANTY

### 7.1 WARRANTY PERIOD

(based on use within recommended operated conditions)

LED Light Sheet – 3 years (based on use within the appropriate operating conditions, see 7.2)

Light Guide Plate – 5 years

Power supplies – 2-5 years

(please see our warranty terms and conditions available on request or via our website).

### 7.2 OPERATING CONDITIONS

Operating temperature:

Indoor/IP54: -10~40°C

Outdoor/IP67: -20~50°C

Operating humidity: 5~95%.

Operating time: 12 hours/day.

### 7.3 STORAGE CONDITIONS

Storage temperature:

Indoor/IP54: -10~40°C

Outdoor/IP67: -20~50°C

Storage humidity: 5~95%.

### 7.4 WARRANTY COVERAGE

#### 7.4.1 What the warranty covers

LED Light Sheet and parts are warranted against defects in materials and workmanship from the date of purchase for the warranty period, provided it is used under normal conditions. During this period, defective products will be repaired or replaced without charge: the LED Light Sheet panel must be returned for this work to be carried out. Under no circumstance will liability be accepted for any special, indirect, incidental or consequential or damages loss owing to failure of the product.

#### 7.4.2 What the warranty does not cover

1. Defects in materials and workmanship after expiry of the warranty period
2. Damage caused by the following
  - Accident, abuse, misuse, misapplication, natural disaster
  - Repair or attempted repair by anyone not authorised by Applelec
  - Using improper power supply
  - Inappropriate use not in accordance with instruction
  - Heavy shock
  - Normal wear

# 8. CERTIFICATES & TESTS

## 8.1 CE



DONGBU LIGHTEC CO., LTD.  
14 Saneop-ro 104beon-gil Ojeong-gu Bucheon-si  
Gyeonggi-do 421-170 REPUBLIC OF KOREA

### EC Declaration of Conformity

Document No: DLD-CE-131018-1a

Applicant : DONGBU LIGHTEC CO., LTD.  
Address : 14 Saneop-ro 104beon-gil Ojeong-gu Bucheon-si  
Gyeonggi-do 421-170 REPUBLIC OF KOREA  
Manufacturer : Same As Applicant

Declares under sole responsibility that the product(s),

Type : LumiSheet  
Model Numbers  
- Model(s) : LumiSheet (XXXX \* YYYY)  
- Series : XXXX denote 30 to 3000(mm) for vertical length  
YYYY denote 30 to 1500(mm) for horizontal length

To which this declaration relates is in conformity with the following EC-directive(s):

- Electromagnetic compatibility.....2004/108/EC
- Directive Low Voltage.....2006/95/EC
- Restriction of Hazardous Substances Directive.....2011/65/EC

The Conformity of the product with the provisions of Low Voltage Directives, Electromagnetic Compatibility Directive and Restriction of Hazardous Substances Directive is stated by the compliance with the following standards:

- \* LVD : EN 62031:2008  
EN 62471:2008  
EN 62493: 2010 (EMF)
- \* EMC : EN 55015:2006/A2:2009  
EN 61547:2009  
EN 61000-3-2:2006/A2:2009  
EN 61000-3-3:2008
- \* RoHSII : EN 50581

Ref. Test Report : CPSA0136501, EMC-CE-S0978, EMC-CE-S0979  
CTK-2013-01041, EMC-CE-S0980, EMC-CE-S0981  
CEC2010-0315, CEC2010-0316, N13OR-021  
E112R-011, EMC-CE-4339, EMC-CE-4340  
DLD-RoHS-130625-1a



*Youngbok Ju*  
-----  
Youngbok, Ju  
Director of Research Institute  
Oct 26, 2013  
14 Saneop-ro 104beon-gil Ojeong-gu  
Bucheon-si Gyeonggi-do 421-170  
REPUBLIC OF KOREA

# 8. CERTIFICATES & TESTS CONT

## 8.2 RoHS



### Non-use Warranty for Chemical Substances Contained in Products

We guarantee that our distributed products do not contain the chemical substances listed below, including cases where their contents is below the maximum concentration value and they shall not be applied when they are used in the exempted applications of the RoHS Directive (2002/95/EC).

This warranty letter is applied to the following series

Company Name: Applelec / Dongbu

Object Product: LED Light Sheet / Lumi Sheet

Chemical Substances List:




Substances	Maximum concentration value
Cadium and its compounds	100 ppm
Lead and its compounds	1000 ppm
Mercury and its compounds	1000 ppm
Hexavalent chromium compounds	1000 ppm
PBB (Polybrominates Biphenyls)	1000 ppm
PBDE (Polybrominated Diphenylethers)	1000 ppm

Representative: Carl Eastwood


A handwritten signature in black ink that reads "C. Eastwood".

# 8. CERTIFICATES & TESTS CONT

## 8.3 TUV

ZERTIFIKAT ◆ CERTIFICATE ◆ 認証証書 ◆ CERTIFICADO ◆ CERTIFICAT	 Product Service
	<b>Attestation of Compliance</b> No. N5 11 11 46028 022
	<b>Holder of Certificate:</b> <b>DONGBU LIGHTEC Co., Ltd.</b> 739-8, Ojeong-dong, Ojeong-gu Bucheon, Gyeonggi-do 421-170 REPUBLIC OF KOREA
	<b>Product:</b> <b>Luminaires</b> <b>(LED Lighting Sheet)</b>
	This Attestation of Compliance is issued on a voluntary basis for electrical equipment below the voltage limits of Low Voltage Directive 2006/95/EC (previous 73/23/EEC). The essential requirements are fulfilled accordingly. It refers to the particular sample submitted for testing and certification only. See also notes overleaf.
	<b>Test report no.:</b> CPSA0136501
	 ( James Jeon )
	<b>Date,</b> 2011-11-02
	
	<b>CE</b> Other relevant European directives have to be observed. If they require CE marking it may be affixed on the product after preparation of the necessary technical documentation as well as the declaration of conformity.

Page 1 of 2

TÜV SÜD Product Service GmbH · Zertifizierstelle · Ridlerstraße 65 · 80339 München · Germany 

A1 / 04.11



## 8. CERTIFICATES & TESTS CONT

### 8.3 TUV CONT

<b>ZERTIFIKAT</b> ◆ <b>CERTIFICATE</b> ◆ 認証証書 ◆ <b>CERTIFICADO</b> ◆ <b>CERTIFICAT</b>		 Product Service
	<b>EC-Attestation of Conformity</b> No. N5 11 11 46028 022	
	<b>Model(s):</b>	LumiSheet (XXXX-YYYY) (XXXX can be 0001 to 3000 denoting width, YYYY can be 0001 to 1500 denoting height) ("Dongbu Lightec")
	<b>Parameters:</b>	Rated input: 12 V d.c., Max. 8 A Protection class: III  Remark: When installing, all requirement of below mentioned test standards must be fulfilled.
	<b>Tested according to:</b>	EN 62031:2008

AS / 04-11

Page 2 of 2

TÜV SÜD Product Service GmbH · Zertifizierstelle · Ridlerstraße 65 · 80339 München · Germany

TUV®

# 8. CERTIFICATES & TESTS CONT

## 8.4 UL

IFDR2.E325001 - Low-voltage Lighting Systems, Power Units, Luminaires and Fittin... Page 1 of 1



ONLINE CERTIFICATIONS DIRECTORY

**IFDR2.E325001**

**Low-voltage Lighting Systems, Power Units, Luminaires and Fittings - Component**

[Page Bottom](#)

**Low-voltage Lighting Systems, Power Units, Luminaires and Fittings - Component**

[See General Information for Low-voltage Lighting Systems, Power Units, Luminaires and Fittings - Component](#)

**FAWOO TECHNOLOGY**

2BL 6LT OJEONG-INDUSTRIAL COMPLEX

OJEONG-DONG OJEONG-GU

BUCHEON-SI, GYEONGGI-DO 421-170 REPUBLIC OF KOREA

E325001

**Low voltage lighting system - Component**, Model Lumisheet.



Marking: Company name or tradename/trademark "FAWOO",



, model designation and the Recognized Component Mark



[Last Updated](#) on 2009-09-18

[Questions?](#)

[Notice of Disclaimer](#)

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# 8. CERTIFICATES & TESTS CONT

## 8.4 UL CONT

UYMR2.E332576 - Sign Accessories - Component

Page 1 of 1



ONLINE CERTIFICATIONS DIRECTORY

### UYMR2.E332576 Sign Accessories - Component

[Page Bottom](#)

### Sign Accessories - Component

[See General Information for Sign Accessories - Component](#)

**FAWOO TECHNOLOGY**

739-8 OJEONG-DONG OJEONG-GU  
BUCHAEON-SI, GYEONGGI-DO 421-170 REPUBLIC OF KOREA

E332576

**Class 2 LED module**, Model Lumisheet.

Marking: Company name and model designation.

[Last Updated](#) on 2009-09-29

[Questions?](#)

[Notice of Disclaimer](#)

[Page Top](#)

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# 8. CERTIFICATES & TESTS CONT

## 8.5 FIRE

	<h1>Fire Data Sheet</h1>		
<p><b><u>Product.</u></b></p> <p>Light Guide Plate (LGP) as used in Applelec LED Lightsheet products.</p>		<p><b><u>Material Specification.</u></b></p> <p>PMMA cast acrylic. <b>Poly(methyl methacrylate)</b></p>	
<p>General Fire Assessment.</p>	<p>Both cast and extruded Acrylic burn more or less like hardwood with very little smoke generation. Its combustion gasses are non-toxic and non-corrosive.</p> <p><b>PMMA</b> burns with a bright flame, virtually without smoke. Under normal circumstances, combustion only gives rise to carbon dioxide and water. Due to the material's chemical composition (carbon, hydrogen and oxygen), no acutely toxic substances like phosgene, acid vapours and sulphur dioxide can form, even in a real fire. Since the material does not contain any halogens, no dioxins can form either.</p> <p>Typically <b>PMMA products</b> will comply with the Euro Class E which confirms the low smoke levels of acrylic materials.</p>		
<p>General Classification</p>	<p>Classification E, according to the 'Euro-Norm' (DIN EN SO 11925:2:2002-7)</p> <p>B2, with no burning droplets, according to DIN 4102 (Germany)</p> <p>M4 (no droplets) According to NF92500 + (France)</p> <p>The results of tests for fire propagation when tested to BS 476 Part 7 confirm that acrylic achieves a class 3 classification (UK)</p> <p>This material can thus be classified category TP (b) according to BS2782, method 508A for thermoplastics material defined by Building Regulations (UK)</p> <p>Its standard glow wire resistance is IIIa orBH3 to DIN VDE 0304, Part 3</p> <p>The UL Flammability is UL 94 HB</p>		
<p>General Note.</p> <p>It is strongly dependant on the individual countries fire regulations if acrylic can be used in buildings as walls, roofs or ground.</p> <p>The use of acrylic outside a building as facade elements or part of the store front is less critical. We recommend individual solutions and projects are discussed with your local authority.</p>			
<p>Page 1 of 1</p>			

# 8. CERTIFICATES & TESTS CONT

## 8.6 IP67 DUST TESTING

 Unit 10 Caddisdown Industrial Park Clovelly Road Bideford Devon EX39 3DX Telephone: +44(0)1237 421255 Facsimile: +44(0)1237 423541 Email: info@parcsw.co.uk Web site: www.parcsw.co.uk	<b>TEST REPORT</b>	Customer Confidential
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**ENVIRONMENTAL TEST  
 REPORT NO.3500-1**

**APPLELEC SIGN COMPONENTS  
 APPLEBY HOUSE  
 WALKER TERRACE  
 BRADFORD  
 YORKSHIRE  
 BD4 7HP**

**DATE : 15 JUNE 2011**




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Product Assessment and Reliability Centre Ltd. performs all of its product testing under a rigorous laboratory management system. We are accredited by UKAS to BS EN ISO/IEC 17025:2005, the "General requirements for the competence of testing and calibration laboratories". Details of our UKAS accredited tests and a copy of our UKAS Schedule of Accreditation are available upon request. Tests marked "non-UKAS" are currently not covered by our UKAS 17025:2005 accreditation. All testing, whether UKAS or non-UKAS, is performed within the same laboratory management system and to the same levels of calibration and traceability.

The results contained in this report relate only to the samples submitted.

Doc Ref: TR3\_Rev\_D

 Unit 10 Caddisdown Industrial Park Clovelly Road Bideford Devon EX39 3DX Telephone: +44(0)1237 421255 Facsimile: +44(0)1237 423541 Email: info@parcsw.co.uk Web site: www.parcsw.co.uk	<b>TEST REPORT</b>	Customer Confidential  Page 1 of 3
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<b>Report No</b> 3500-1	<b>Requested By</b> Ian Drinkwater	<b>Customer Details</b> Applelec Sign Components Appleby House Walker Terrace Bradford West Yorkshire BD4 7HP
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<b>Date Samples Received</b> 26/05/11	<b>Date Started</b> 01/06/11	<b>Date Finished</b> 02/06/11	<b>Date of Issue</b> 15/06/11
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**Product Description:**  
2 off LED Light Sheet units, denoted as samples 1 – 2 by PARC.

**Tests Performed and Test Specifications:**  
Process 1 – Dust Ingress in accordance with BS EN 60598:2008, IP6X

**Disposal of Samples:**  
Upon completion of testing the samples were returned to the customer.

**Report Summary:**  
Sample Nos 1 & 2 were subjected to a dust ingress test, no signs of ingress were noted and both samples functioned correctly after the test had been completed.



2379

Distribution: I.Drinkwater, PARC File

Approved: S.Wort (Senior Test Engineer)

Test Engineer: N.Edwards

Any opinions or interpretations expressed within this report, together with tests marked "Non UKAS" are not included in the UKAS Accreditation Schedule for this Laboratory.

**Report No. 3500  
 Page 2 of 3**



**1.0 Sample Content**  
2 off LED Light Sheet units, denoted as samples 1 – 2 by PARC.

**2.0 Equipment Used**





Equipment Used	PARC ID No	Calibration due date
Weiss ST1000 Dust Chamber	2	08/06/11
Fluke Thermometer	59	13/10/11
Thermocouple	502	20/04/12

**3.0 Initial Inspection**  
Upon receipt the samples were given a function check and both samples operated correctly. The samples were also given a visual inspection (Non UKAS), it was noted that sample no 2 had some scratches on the inside surface of the glass plate.

**4.0 Test Procedure**  
Process 1 – Dust Ingress in accordance with BS EN 60598:2008, IP6X. The samples were switched on and allowed to stabilise to their normal working temperature. Once stabilised 1 minute duration of exposure to dust is started followed by 3 hours with the samples unpowered.

**Report No. 3500  
 Page 3 of 3**

**Inspection photos**

**5.0 Report Summary**  
The samples were subjected to the test regime outlined in this report. No ingress of dust was noted on either sample and both samples functioned correctly after the test had been completed.

**End of Report.**

# 8. CERTIFICATES & TESTS CONT

## 8.7 IP67 WATER TESTING

 Unit 10 Caddisdown Industrial Park Clovelly Road Bideford Devon EX39 3DX Telephone: +44(0)1237 421255 Facsimile: +44(0)1237 423541 Email: info@parcsw.co.uk Web site: www.parcsw.co.uk	<b>TEST REPORT</b>	Customer Confidential
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**ENVIRONMENTAL TEST  
 REPORT NO. 3500-2**

**APPLELEC SIGN COMPONENTS  
 APPLBY HOUSE  
 WALKER TERRACE  
 BRADFORD  
 YORKSHIRE  
 BD4 7HP**

**DATE : 15 JUNE 2011**




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The results contained in this report relate only to the samples submitted.

Doc Ref: TR3\_Rev\_D

 Unit 10 Caddisdown Industrial Park Clovelly Road Bideford Devon EX39 3DX Telephone: +44 (0) 1237 421255 Facsimile: +44 (0) 1237 423541 e-mail: info@parcsw.co.uk Website: www.parcsw.co.uk	<b>TEST REPORT</b>	Customer Confidential  Page 1 of 3
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<b>Report No</b> 3500-2	<b>Requested By</b> Ian Drinkwater	<b>Customer Details</b> Applelec Sign Components Applby House Walker Terrace Bradford West Yorkshire BD4 7HP
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<b>Date Samples Received</b> 26/05/11	<b>Date Started</b> 01/06/11	<b>Date Finished</b> 02/06/11	<b>Date of Issue</b> 15/06/11
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**Product Description:**  
2 off LED Light Sheet units, denoted as samples 3 & 4 by PARC.

**Tests Performed and Test Specifications:**  
Process 1 – Water Ingress in accordance with BS EN 60598:2008, IPX7

**Disposal of Samples:**  
Upon completion of testing the samples were returned to the customer.

**Report Summary:**  
Sample Nos 3 & 4 were subjected to a water ingress test, no signs of ingress were noted and both samples functioned correctly after the test had been completed.

  
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Distribution: I.Drinkwater, PARC File  
  
 Approved: S. Wort (Senior Test Engineer)

Test Engineer: N. Edwards

Any opinions or interpretations expressed within this report, together with tests marked "Non UKAS" are not included in the UKAS Accreditation Schedule for this Laboratory.

**Report No. 3500  
 Page 2 of 3**


**1.0 Sample Content**  
2 off LED Light Sheet units, denoted as samples 3 – 4 by PARC.


**2.0 Equipment Used**

Equipment Used	PARC ID No	Calibration due date
Water immersion tank	282	N/A
Fluke Thermometer	59	13/10/11
Thermocouple	502	20/04/12
RS Timer	427	21/04/12




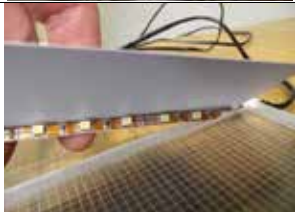
**3.0 Initial Inspection**  
Upon receipt the samples were given a function check and both samples operated correctly. The samples were also given a visual inspection (Non UKAS), no signs of wear or damage was noted.

**4.0 Test Procedure**  
Process 1 – Water Ingress in accordance with BS EN 60598:2008, IPX7. The sample was powered on and allowed to stabilise to normal working temperature. The sample was then turned off and submerged in the water tank to a depth of 1metre and for a duration of 30 minutes.

  
**Water test set up**

  
**Post test photo**

**Report No. 3500  
 Page 3 of 3**











**Inspection photos**

**5.0 Report Summary**  
The samples were subjected to the test regime outlined in this report.  
No ingress of water was noted on either sample and both samples functioned correctly after the test had been completed.

**End of Report.**

## 8. CERTIFICATES & TESTS CONT

### 8.8 ACCREDITATIONS GLOSSARY

MARK	MEANING
	<b>CE.</b> Meets the standard of conformity for products sold within the European Economic Area.
	<b>UL.</b> Conforms to the UL's safety requirements.
	<b>RoHS.</b> Conforms to the Restriction of Hazardous Substances Directive.
	<b>TÜV Rheinland certification.</b> Meets TÜV Rheinland's safety requirements and quality standards.
	<b>SASO COC.</b> Mark to certify that the product complies with the relevant Saudi Arabian technical regulations and national standards.
	<b>Recycling.</b> Is a recyclable material.
	<b>Energy Efficiency grading.</b> Holds the most efficient energy rating.
	<b>KC.</b> Meets Korea's product safety requirements.
	<b>PSE.</b> Meets Japan's product safety requirements.
	<b>PCT.</b> Meets Russian safety requirements.



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