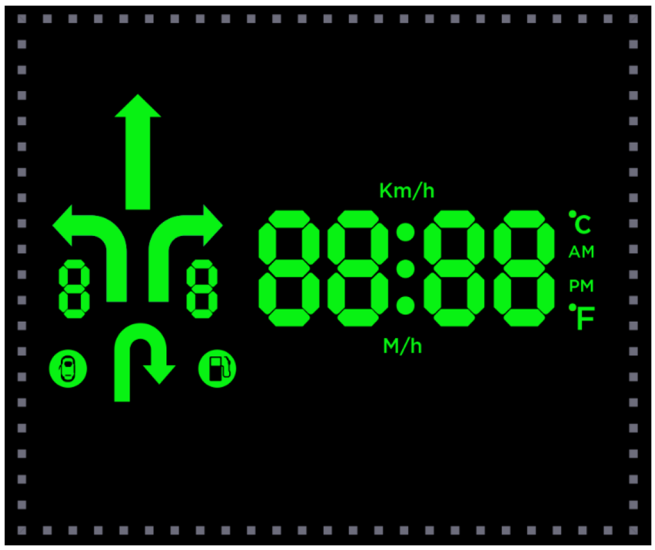
PD01xxx

Data-Vμ™ microLED Chip

Advance Product Datasheet



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Plessey's Data-Vμ™ chip uses GaN-on-silicon technology, optimized for high efficiency, to make displays consisting of pre-defined shapes that can be individually addressed and controlled. It is designed for a wide range of information display applications encompassing luminance values suitable for direct view through to projection. The high luminance / low power of these displays is ideally suited to AR applications with minimal attenuation of ambient light, even in sunlight.

Features

- Wide range of luminance
- GaN-on-Si die technology
- Native green, blue version
- High colour purity
- 3V forward voltage
- Lambertian emission
- RoHS compliant

Applications

- Direct view
- Augmented Reality
- Projection

Display Part Number	Colour	Dominant Wavelength (nm)	Orientation
PD01002	Green	500 - 555	Normal
PD01003	Green	500 - 555	Laterally Inverted
PD01004	Blue	455 - 480	Normal
PD01005	Blue	455 - 480	Laterally Inverted
PD01006(1)	Red	TBA	Normal
PD01007(1)	Red	TBA	Laterally Inverted
PD01008(1)	Coloured	N/A	Normal
PD01009(1)	Coloured	N/A	Laterally Inverted

Table 1: Part number for PD01xxx series Data-Vμ™ chips. (1) Denotes Part Currently in Development

Symbol Properties

Normal View Chip Layout

Note – Pads 5, 16, 26, 41, 51, 62, 72 and 87 are (common) anode pads for both normal and laterally inverted variants.

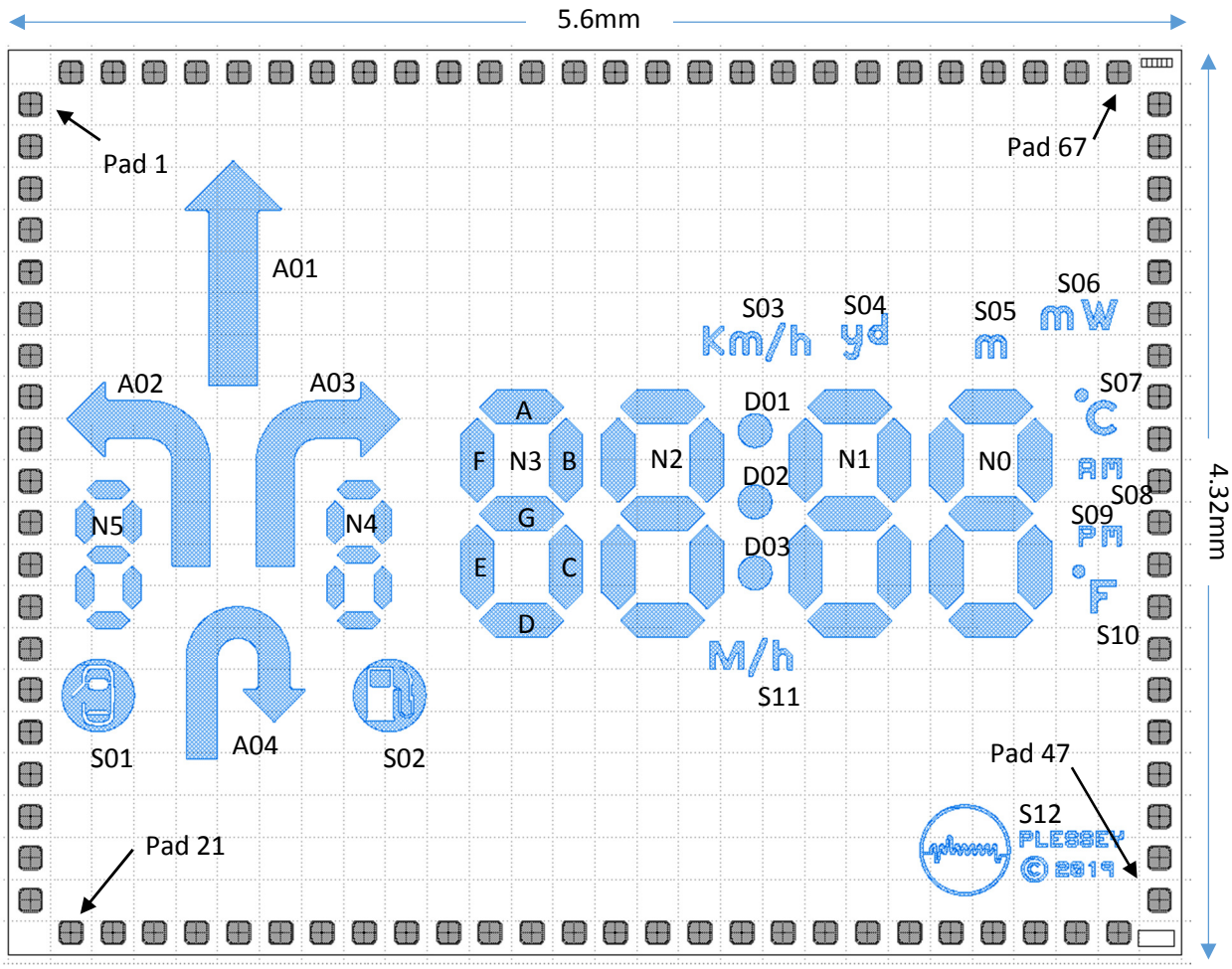


Figure 1: Layout and symbol identification of PD01xxx series Data-Vμ™ chip

Symbol	Pad Number by Chip Type		Light Emitting Area		UART Symbol Number
	Normal View	Laterally Inverted	Sq μm	Sq cm	
A01	4	63	251800	0.002518	0
A02	7	60	218200	0.002182	1
A03	88	71	218200	0.002182	2
A04	18	49	200400	0.002004	3
D01 to D03	77, 74, 39	82, 85, 28	20105	0.000201	46 to 48
S01	15	52	72815	0.000728	49
S02	29	38	63956	0.000640	50
S03	76	83	29391	0.000294	51
S04	70	89	15877	0.000159	52

Symbol	Pad Number by Chip Type		Light Emitting Area		UART Symbol Number
	Normal View	Laterally Inverted	Sq µm	Sq cm	
S05	63	4	9845	0.000098	53
S06	61	6	22310	0.000223	54
S07	59	8	13052	0.000131	55
S08	58	9	10409	0.000104	56
S09	56	11	9666	0.000097	57
S10	54	13	12240	0.000122	58
S11	38	29	25584	0.000256	59
S12	42, 44, 45, 47	20, 22, 23, 25	66934	0.000669	60
N3A to N3G	83, 82, 34, 33, 86, 84, 85	76, 77, 33, 34, 73, 75, 74	51106	0.000511	25 to 31
N2A to N2G	79, 78, 37, 36, 35, 80, 81	80, 81, 30, 31, 32, 79, 78	51106	0.000511	18 to 24
N1A to N1G	71, 69, 49, 48, 40, 73, 50	88, 90, 18, 19, 27, 86, 17	51106	0.000511	11 to 17
N0A to N0G	67, 60, 55, 53, 52, 68, 57	92, 7, 12, 14, 15, 91, 10	51106	0.000511	4 to 10
N5A to N5G	9, 17, 14, 13, 12, 10, 11	58, 50, 53, 54, 55, 57, 56	13357	0.000134	39 to 45
N4A to N4G	24, 32, 30, 28, 27, 25, 31	43, 35, 37, 39, 40, 42, 36	13357	0.000134	32 to 38

Table 2: Symbol properties of PD01xxx series Data-Vµ™ chip

Absolute Maximum Ratings

T_{amb} = +21°C unless otherwise stated

Parameter	Symbol	Minimum	Maximum	Unit
DC Forward Current Density	J_F	-	10	A/sq cm
Peak Pulsed Forward Current Density	J_{FP}	-	70	A/sq cm
Reverse Voltage*	V_R	-	5.0	V
Storage Temperature	T_{stg}	-40	+80	°C
Operating Solder Point Temperature	TSP	-20	+70	°C
Operating Junction Temperature	T_j	-20	+125	°C
ESD (Human Body Model)	V_{ESDF}	2000	-	V
	V_{ESDR}	2000	-	V

** The devices should not be operated in reverse bias.*

Table 3: Absolute maximum ratings

Optimum Current Density.

For optimum performance it is recommended the device is operated between 1A/sq cm and 10A/sq cm. If lower device intensity is required it is recommended to use 1 A/cm sq and dim the display via PWM.

Electro-optical Characteristics

T_{amb} = +21°C unless otherwise stated

Unless stated all measurements are made with a common anode and common cathode connection i.e. all symbols in parallel. This replicates driver operation *without* PWM symbol dimming.

Forward Voltage vs Current Density

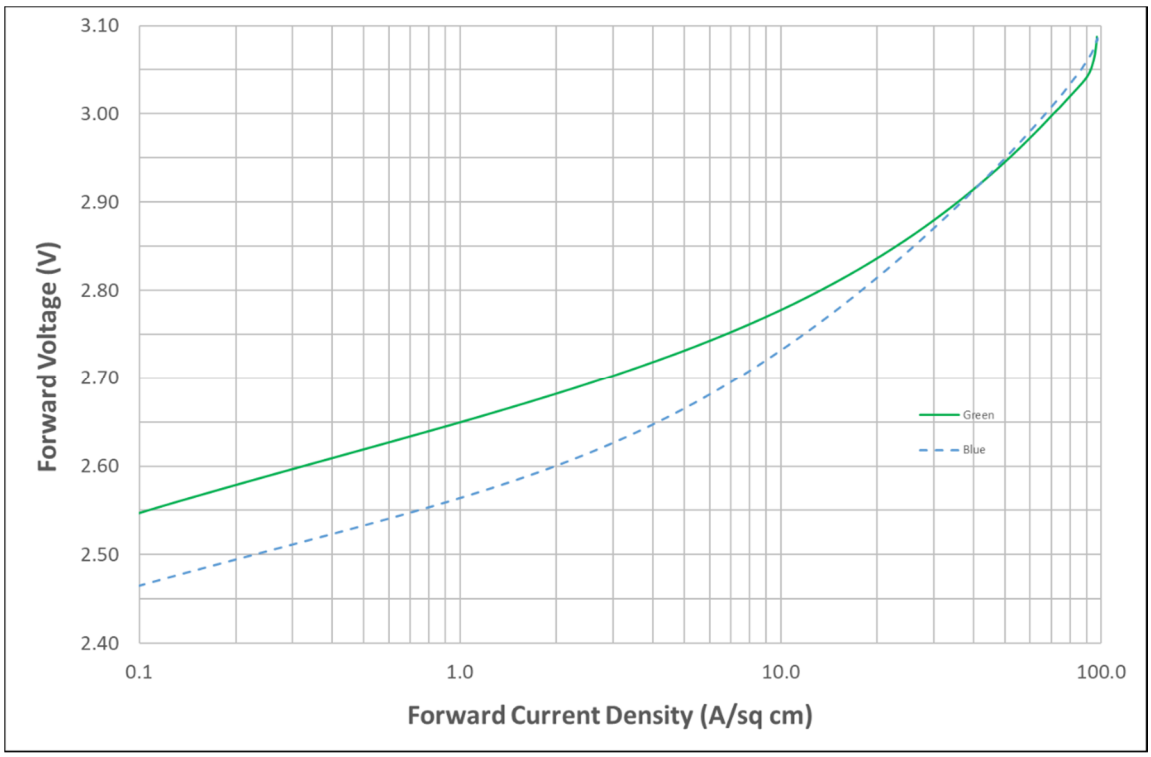


Figure 2: Forward voltage vs forward current density

Luminous Flux vs Current Density (A1 Element)

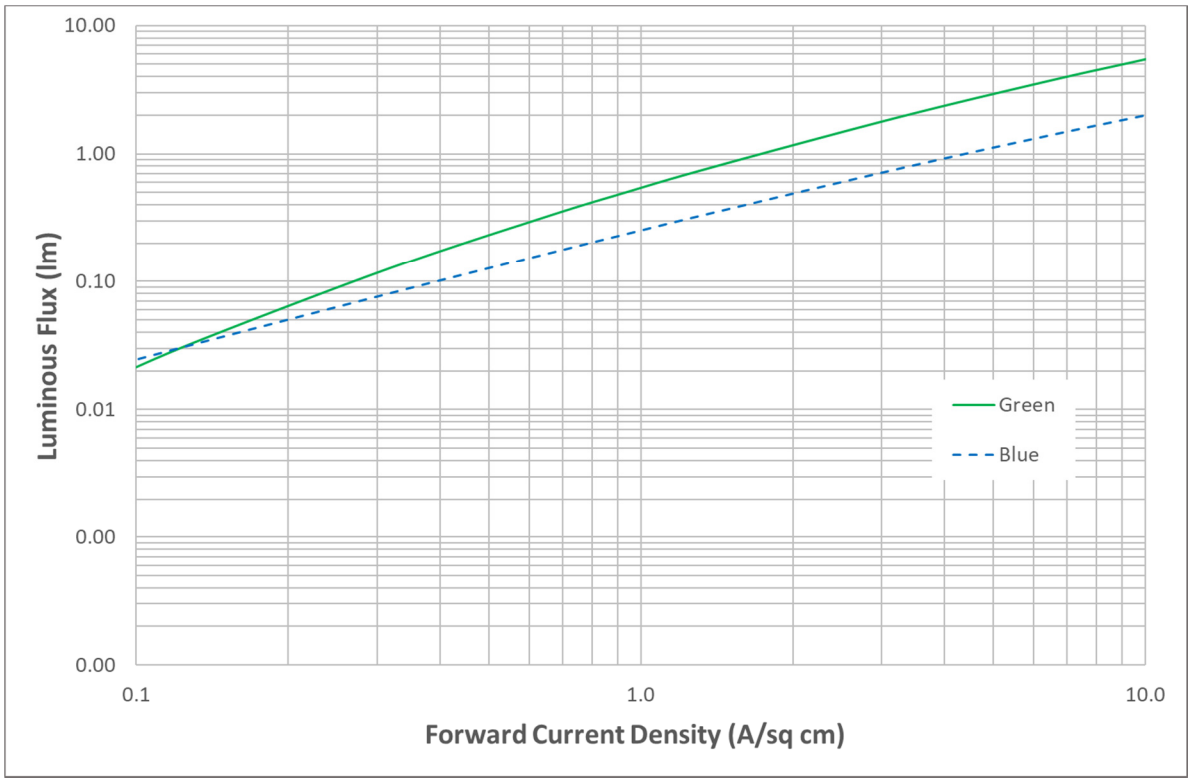


Figure 3: Relative Luminous flux vs current density

Luminance vs Current Density (Typical Element)

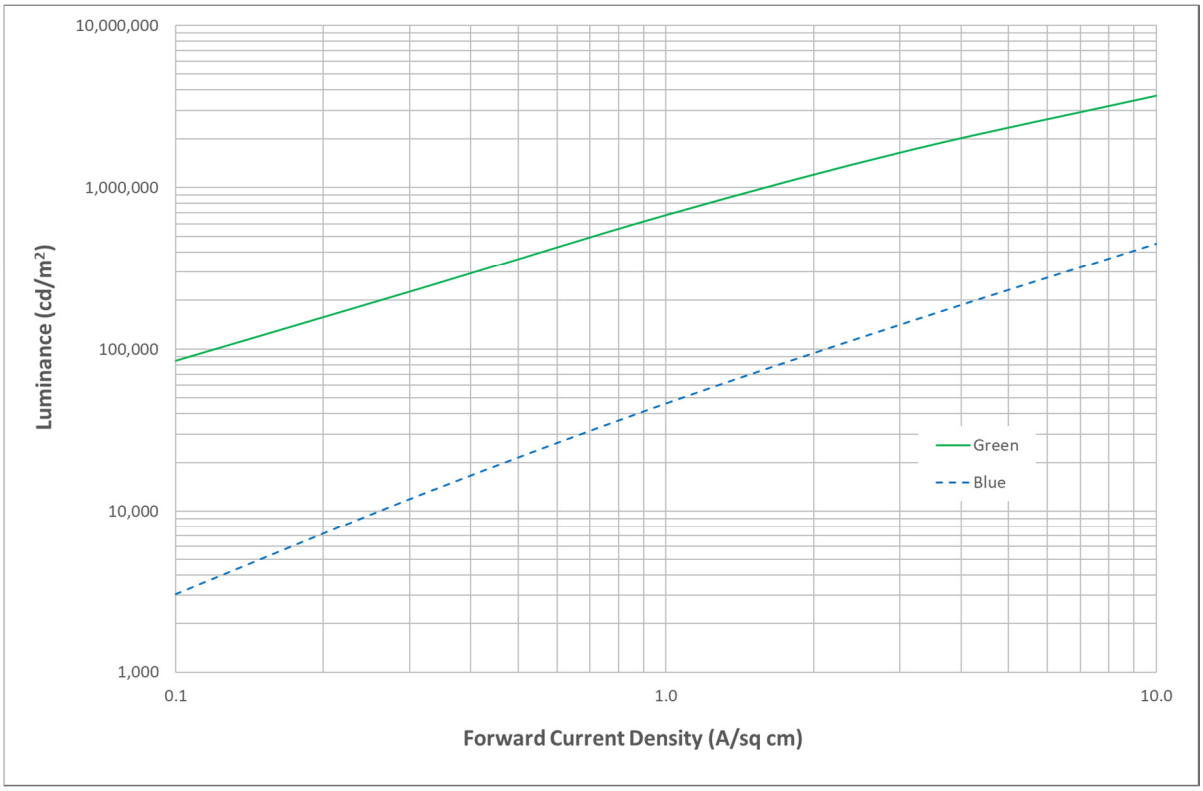


Figure 4: Luminance vs forward current density. Element average data are plotted.

Note on Luminance Uniformity

The uniformity of the luminance within a symbol and between symbols can vary with the exact design of the symbols. The PD01xxx series chip for the development kit has been designed with a range of shapes from very simple large shapes to small shapes with complex outlines and different interconnect lengths. When driving the display without individual symbol control we expect to see a range of luminance between symbols because of a combination of edge effects and voltage drops in the interconnect. The magnitude of these effects will also vary with current density.

The driver supplied with the kit has a PWM symbol dimming capability. Primarily this allows symbols to be individually dimmed to produce specific visual effects but can also be used to flatten out luminance differences resulting from size and shape effects.

Dominant Wavelength vs Current Density (Typical Element)

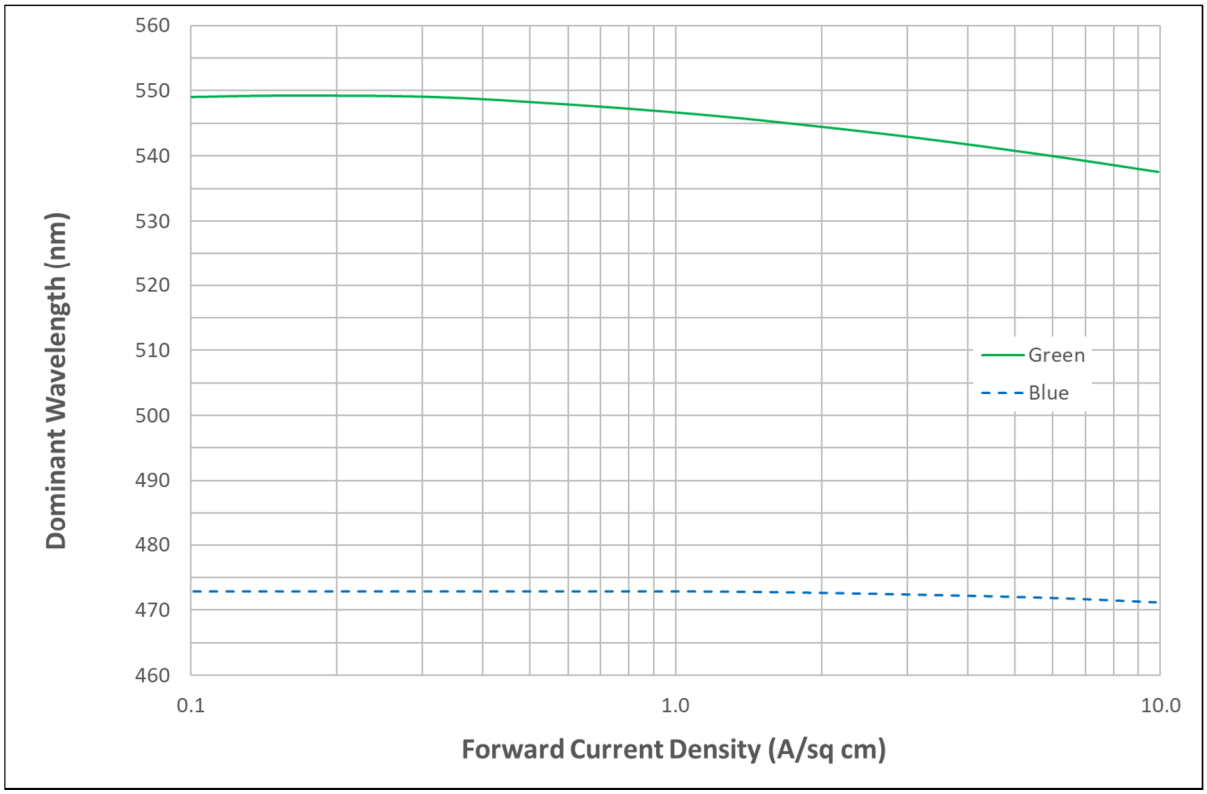


Figure 5: Dominant wavelength variation with current density for green and blue displays

Relative Spectral Power Distributions (Typical Element)

T_{amb} = +21°C unless otherwise stated

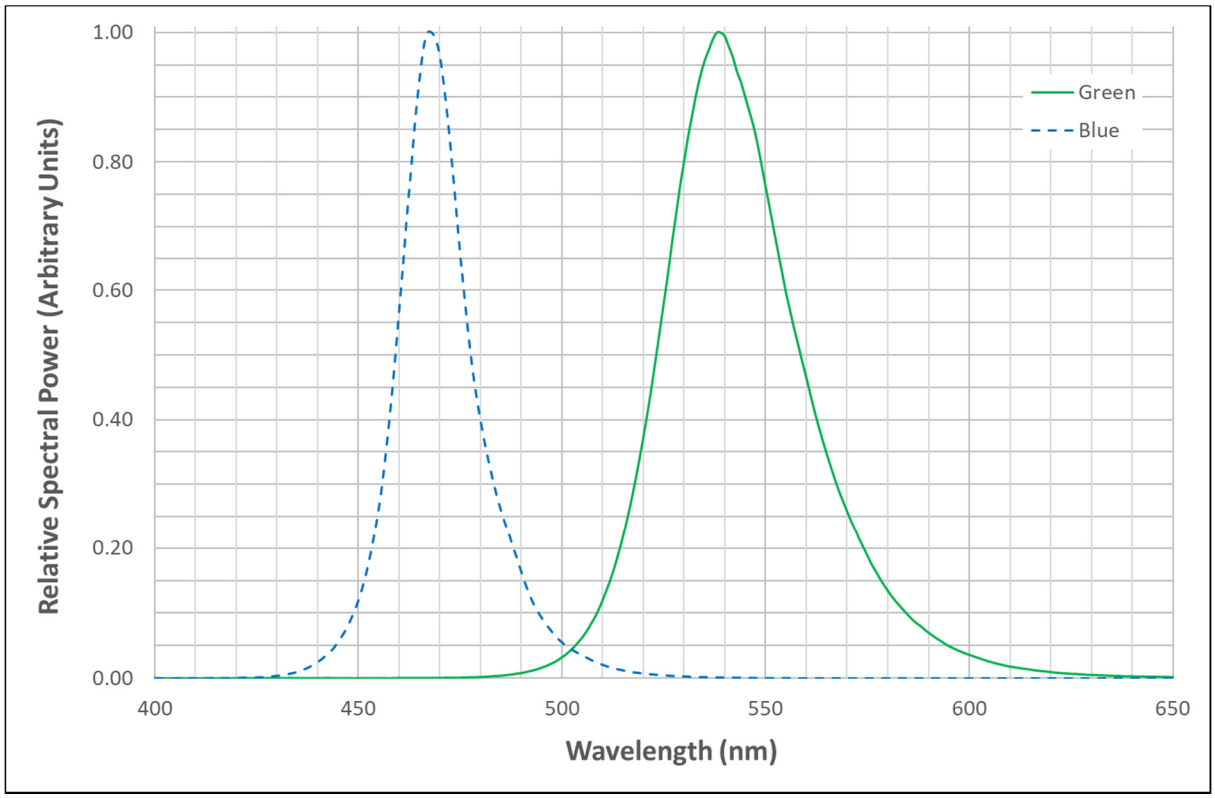


Figure 6: Relative spectral power distributions for green and blue displays at 0.1A / sq cm

CIE 1931 Chromaticity Diagram (Typical Element)

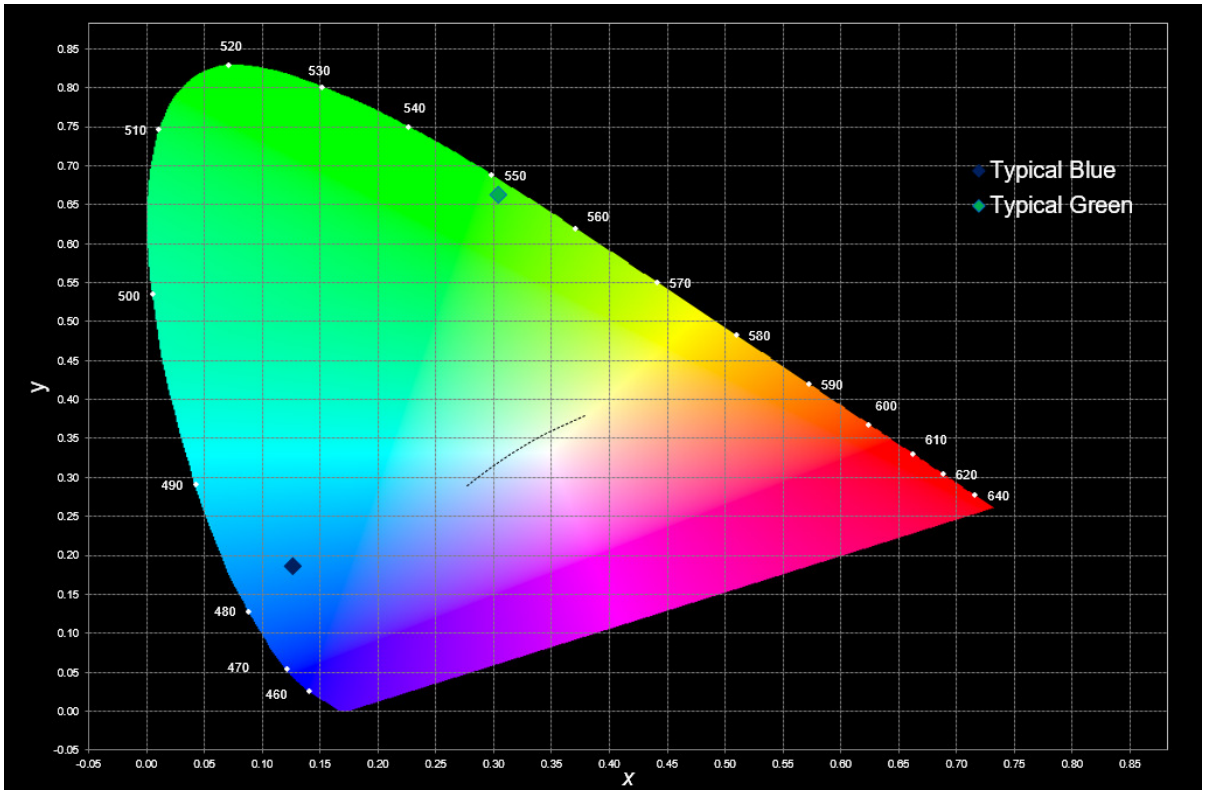


Figure 7:CIE 1931 Chromaticity Diagram for typical green and blue elements

Radiation Emission Pattern (Typical Element)

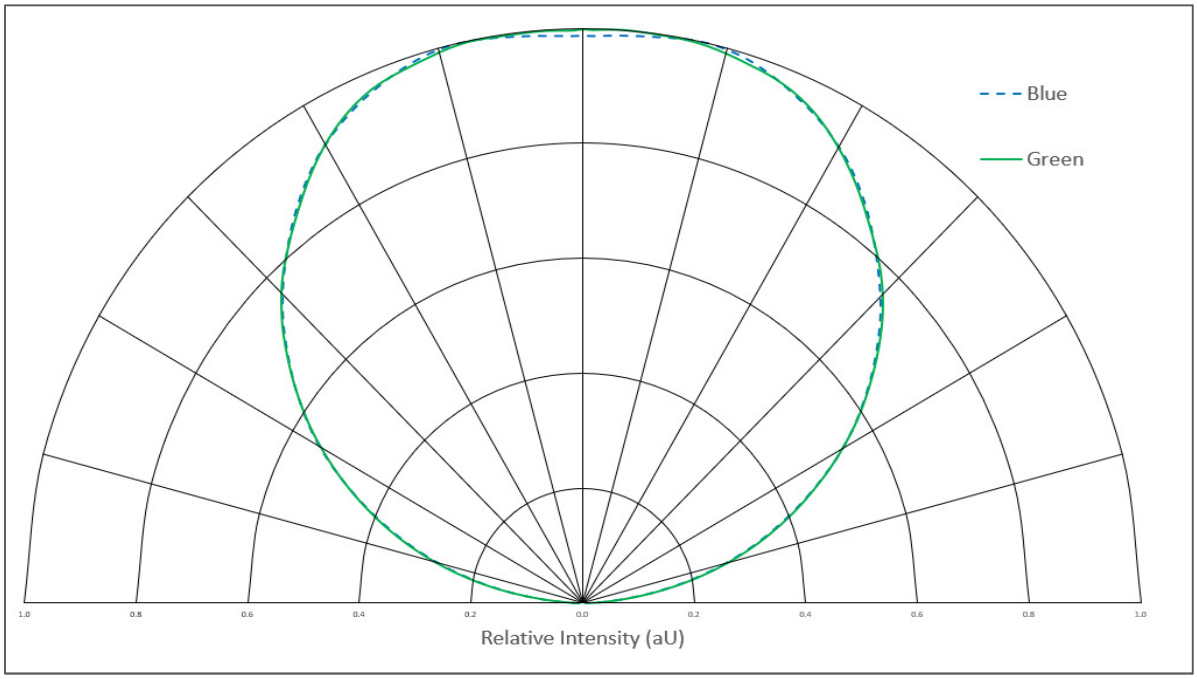


Figure 8:Radiation Emission Pattern for Green and Blue Displays at 1A / sq cm

Thermal Characteristics

Forward Voltage versus Temperature (Typical Element)

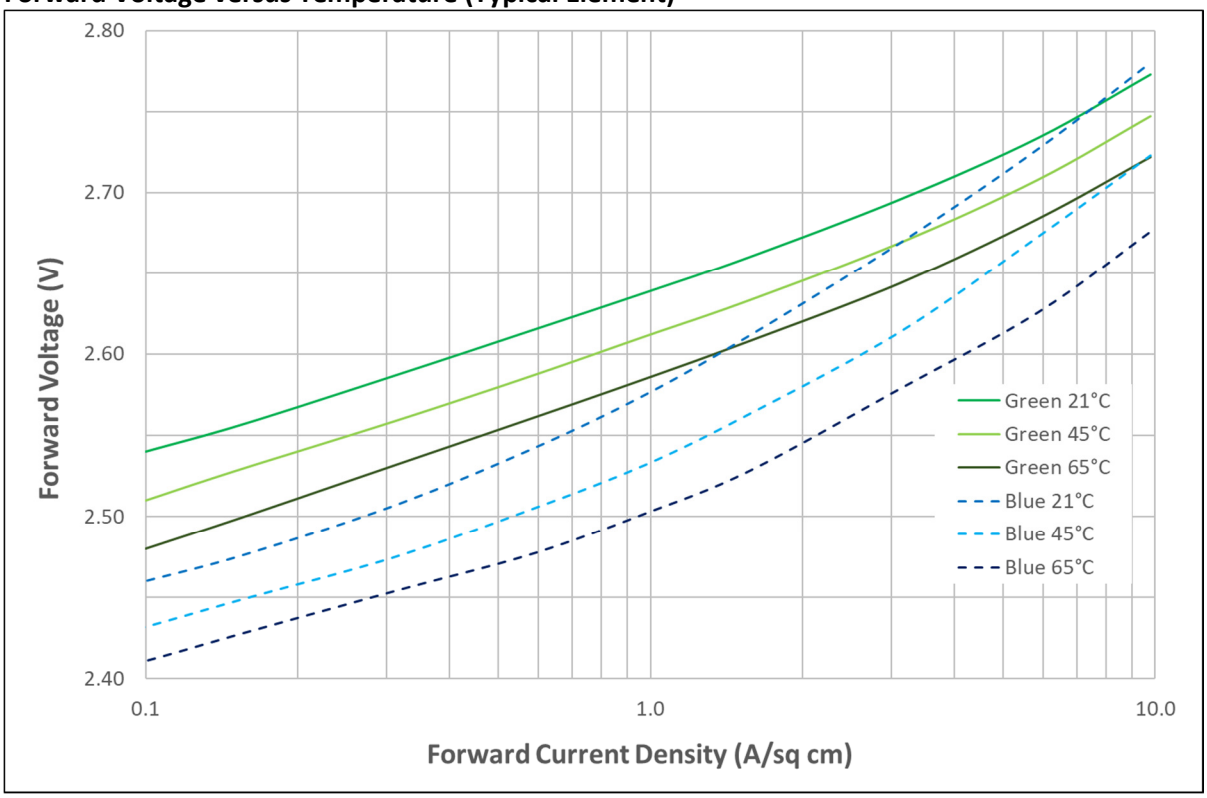


Figure 9: Forward Voltage vs Current Density at 21°C, 45°C and 65°C

Relative Luminous Flux versus Temperature (Typical Element)

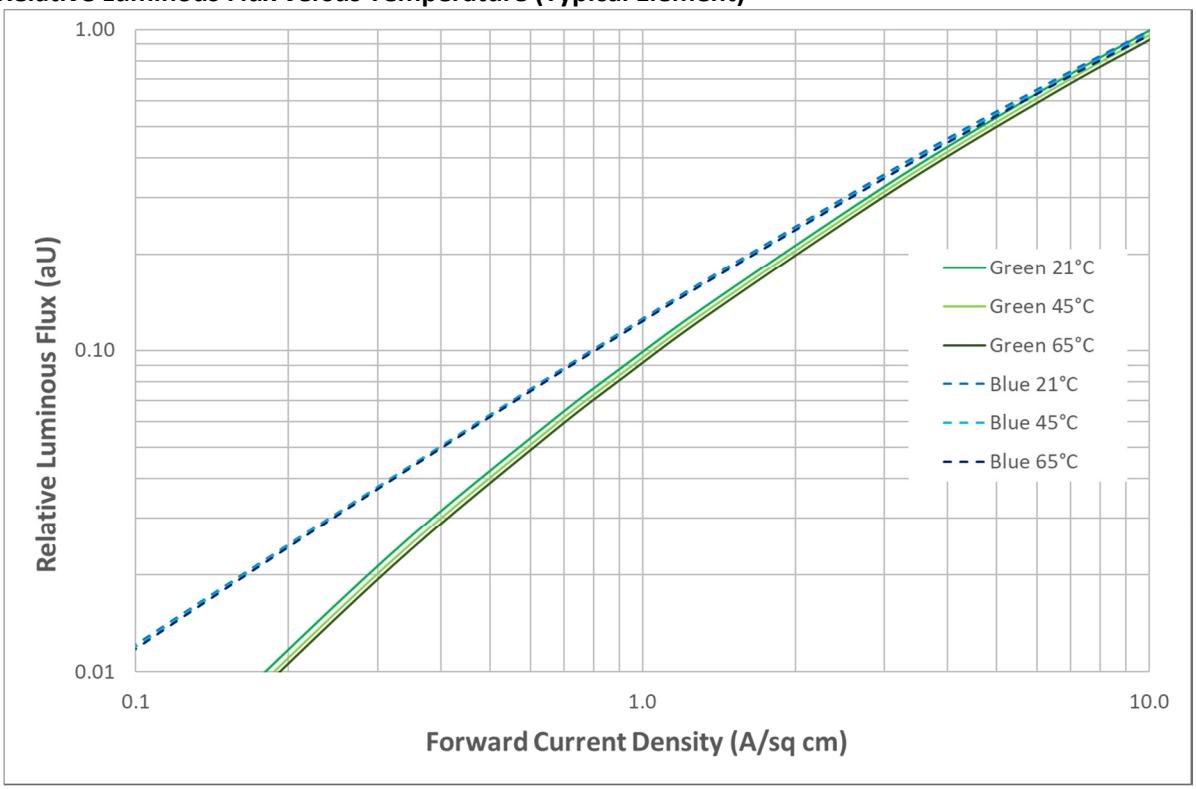


Figure 10: Relative Luminous Flux vs Current Density at 21°C, 45°C and 65°C

Luminance versus Temperature (Typical Element)

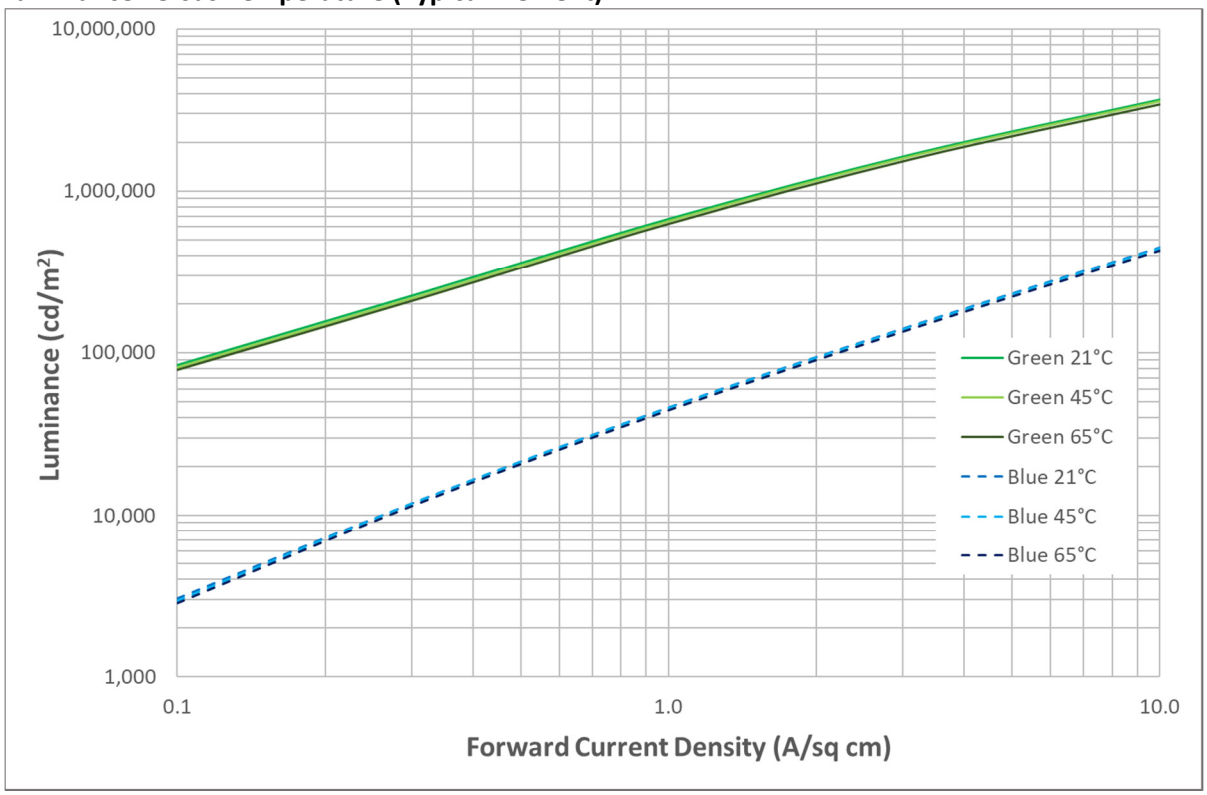


Figure 11: Luminance vs current density at 21C, 45C and 65C

Dominant Wavelength versus Temperature (Typical Element)

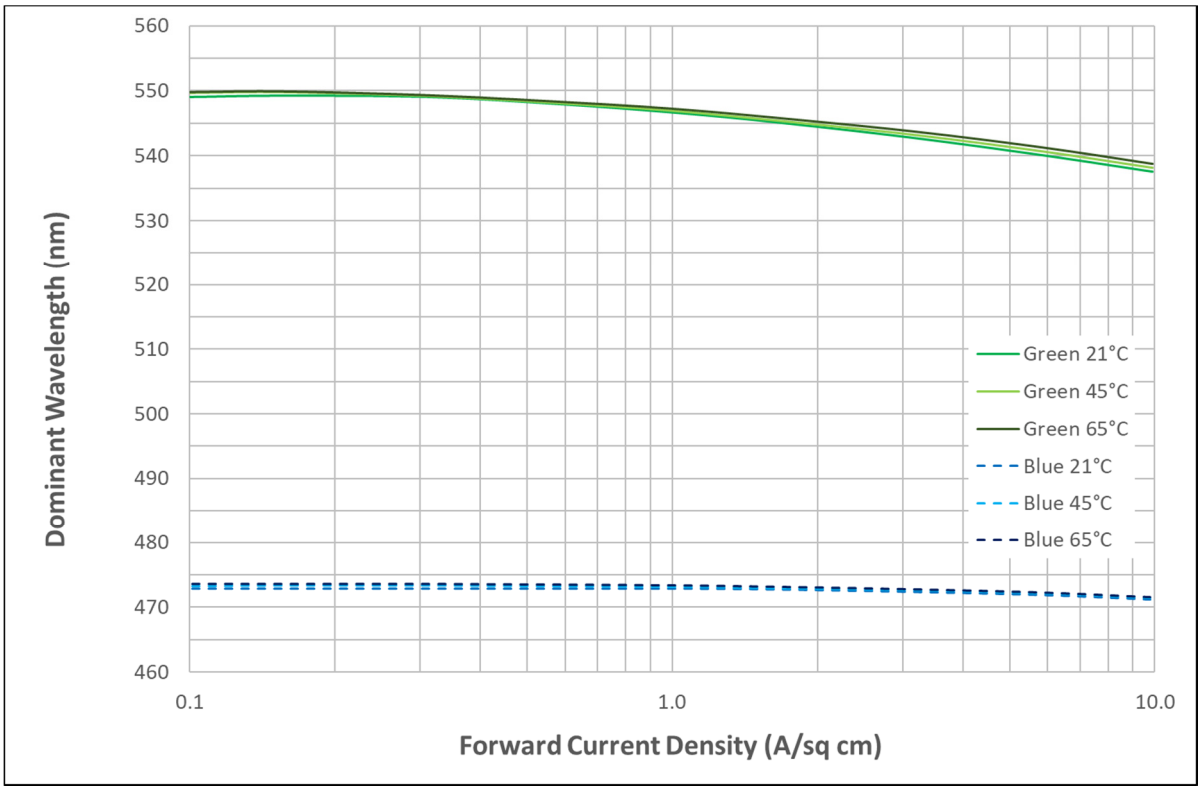


Figure 12:Dominant wavelength vs current density at 21°C, 45°C and 65°C

Relative Spectral Power Distributions versus Temperature (Typical Element)

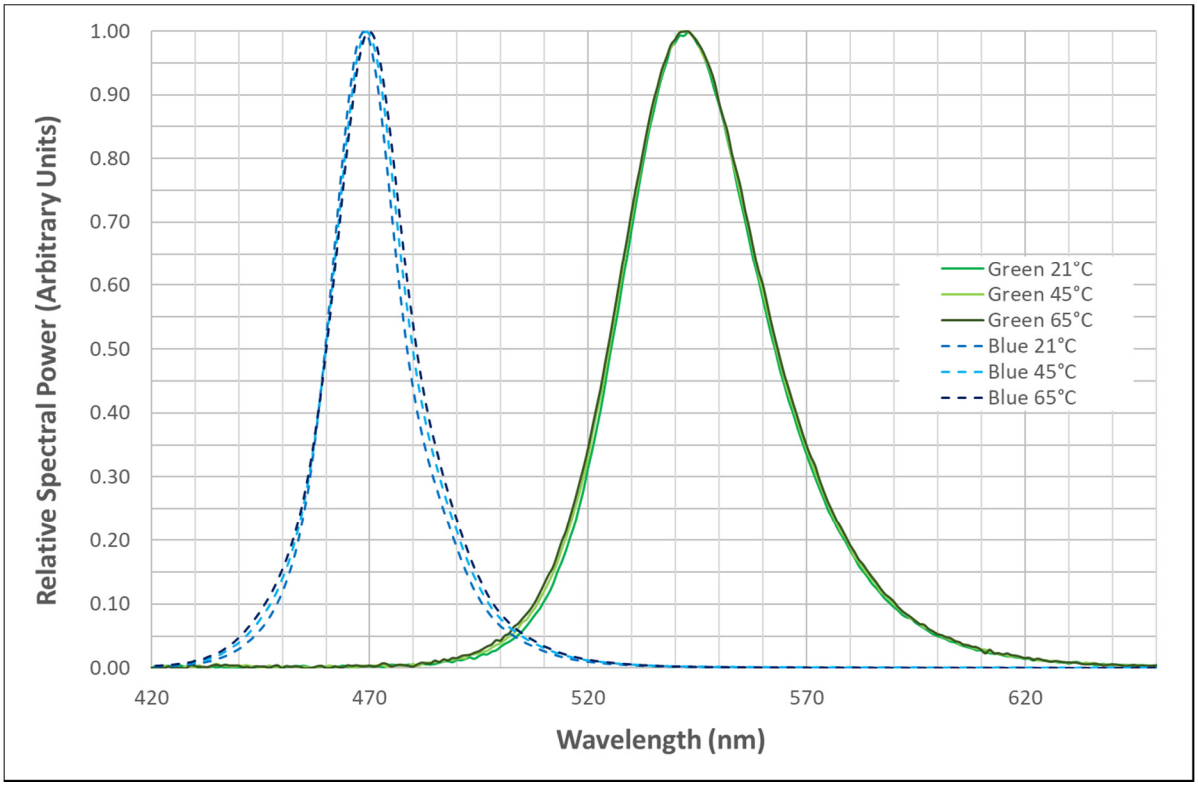


Figure 13:Relative spectral power distributions for 0.1A / sq cm at 21°C, 45°C and 65°C

Assembled Device Drawing

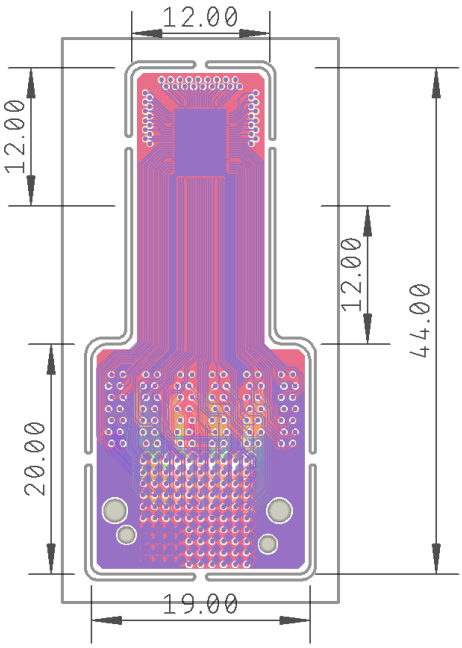
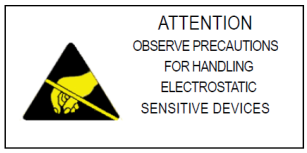


Figure 14: Dimensional drawing of the FR4 PCB. All dimensions in mm

Light Intensity Warning

The emitted light from these devices can be extremely intense. Ensure sufficient precautions are taken to protect against eye damage.

Handling Instructions



The devices must not be operated in reverse bias.

There is no ESD protection on individual symbol channels so all precautions for handling electrostatic sensitive devices must be observed.

Legal Notice

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