

SFT-20 LED Chipset in SMT and Starboard Configurations

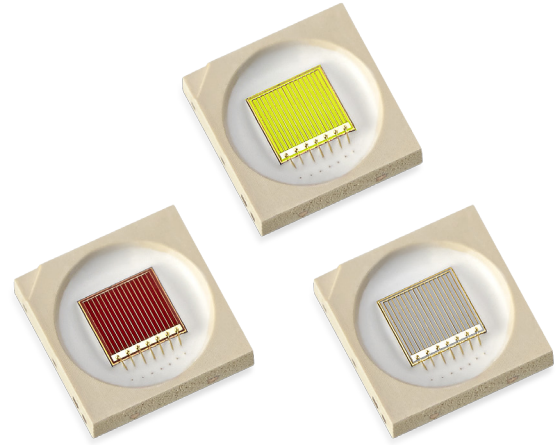


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Features:

- Matched R/CG/B chipset with 2.0mm² emitting area designed for high current density 0.2 / 0.3" Pico projection applications
- Thermally efficient Surface Mount (SMT) Package: $R_{th_{J-B}} = 1.0^{\circ}\text{C/W}$
- Available either in "Standard" (SMT) or Pre-Mounted "Starboard" Configurations.
- Available "Starboard" Packaging Configuration allows ease of evaluation and/or immediate system integration.
- 100% surface emission for high collection efficiency and low optical losses
- Wide color gamut with the most optimal dominant wavelengths: Red-Amber 613nm, Converted Green (filtered spectrum) 555nm, and Blue 455nm
- Single emitting area per color allows for efficiency of collection with simplified optics
- Environmentally friendly: RoHS and REACH compliant
- Characterized correlation available for Projection applications.

Applications

- Specifically engineered for stand alone, embedded, or battery-assisted projection display applications.
- Entertainment / Stage Lighting
- Medical / Life Science
- Industrial
- Emergency Lighting / Beacons / Obstruction Lighting.
- High Brightness General Lighting

Technology Overview

Luminus Devices' SFT series of illuminators is an innovative light source created for applications requiring high current density in a small area. With its thermally efficient package, the SFT-20 chipset allows the end-product to deliver all the benefits of small, high performing solid state light sources.

In Projection Display applications, The SFT series is environmentally friendly (Mercury-free), enables instant start and re-start with no wait time, high reliability, and long life requiring no end-user or field replacement. Response time is extremely fast to enable frame-by-frame color control in compatible systems.

Innovative Packaging Technology

Thermal management is critical in high power LED applications. With its low thermal resistance the SFT-20 can be driven at higher current densities while maintaining a low junction temperature. This results in brighter solutions and longer lifetimes.

Reliability

The SFT-20 has passed a rigorous suite of environmental and mechanical stress tests, including mechanical shock, vibration, temperature cycling and humidity. It is fully qualified for use in high power / small form factor / high current dispaly applications.

With very low failure rates and median lifetimes that typically exceed 60,000 hours, Luminus SFT-Series of LEDs are ready for even the most demanding applications. (Please refer to Luminus' Reliability application note for more information.)

Environmental Benefits

Luminus LEDs help reduce power consumption and the amount of hazardous waste entering the environment. All LED products manufactured by Luminus are RoHS and REACH compliant and contain no lead or mercury.

Understanding SMT Test Specifications

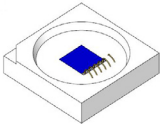
Every Luminus LED is tested to ensure that it meets the high quality standards expected from Luminus' products.

Testing of SMT LEDs


The Luminus SFT series of products are measured in such a way that allows high volume / fast paced production while providing an accurate measurement that correlates with real world operating conditions.

Luminus makes available corelation curves (page 8) that allows the designer to predict with a high-level of accuracy the performance that is to be expeted in a typical "Display" application.

Ordering Information (SMT Configuration)^{1,2}

| Ordering Part Number | Color | Min Flux Bin | Description | Configuration |
|----------------------|--------------------|--------------|--|---|
| SFT-20-RA-F35-MPZ | Red Amber | 1Z | Red-Amber LED consisting of a 2.0 mm ² die mounted on a small 3.5 x 3.5mm high-performance package with directional indicator. |  |
| SFT-20-RA-F35-MPA | | 1A | | |
| SFT-20-CG-F35-MPA | Converted Green | 2A | Converted Green consisting of a 2.0 mm ² die die mounted on a small 3.5 x 3.5mm high-performance package. Includes directional indicator. | |
| SFT-20-CG-F35-MPB | | 2B | | |
| SFT-20-CG-F35-MPC | | 2C | | |
| SFT-20-B-F35-EPA | Blue | 4A | Blue LED consisting of a 2.0 mm ² die mounted on a small 3.5 x 3.5mm high-performance package with directional indicator. | |
| SFT-20-B-F35-EPB | | 4B | | |
| SFT-20-B-F35-EPC | | 4C | | |

Ordering Information (Starboard Configuration)^{1,2,3}

| Ordering Part Number | Color | Min Flux Bin | Description | Configuration |
|----------------------|--------------------|--------------|---|---|
| SFT-20-RA-R35-MPZ | Red Amber | 1Z | Red-Amber LED consisting of a 2.0 mm ² die in a small 3.5 x 3.5mm package mounted on a thermally efficient and pedestal, common cathode designed starboard. |  |
| SFT-20-RA-R35-MPA | | 1A | | |
| SFT-20-CG-R35-MPA | Converted Green | 2A | Converted Green LED consisting of a 2.0 mm ² die with Green Phosphor Platelet in a small 3.5 x 3.5mm package mounted on a thermally efficient and pedestal, common cathode designed starboard. | |
| SFT-20-CG-R35-MPB | | 2B | | |
| SFT-20-CG-R35-MPC | | 2C | | |
| SFT-20-B-R35-EPA | Blue | 4A | Blue LED consisting of a 2.0 mm ² die in a small 3.5 x 3.5mm package mounted on a thermally efficient and pedestal, common cathode designed starboard. | |
| SFT-20-B-R35-EPB | | 4B | | |
| SFT-20-B-R35-EPC | | 4C | | |

Note 1: Ordering part numbers represent bin kits (group of bins that are shippable for a given ordering part number)

Note 2: Bin Kits are defined by a group of flux or power bins. Only one flux / power bin will be shipped in each individual pack or reel. Each shipment will contain reels of different allowed bins for a specific orderable part number (See page 5). Individual Flux or Power bins are not orderable.

Note 3: Starboard Configuration are available for sample quantity only. For additional quantity, contact Luminus representative.

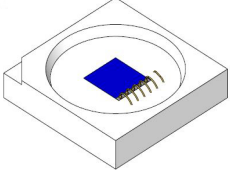
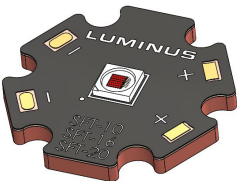
Ordering Part Number Nomenclature

SFT — **nn** — **XXXX** — **XXX** — **XYZ**

| Product Family | Chip Area | Color | Package Configuration | Bin Kit ¹ |
|--|-------------------------|--|---|-----------------------------------|
| SFT: Surfacemount Flat-Top Windowless | 20: 2.0 mm ² | RA = Red - Amber CG= Converted Green B= Blue | F35: 3.5mm x 3.5mm See Mechanical Drawing section R35: SFT-20 mounted on Starboard Starboard only in sample quantity | See page 5 for bin kit definition |

Note 1: A Bin Kit represents a group of individual flux or power bins that are shippable for a given ordering part number. Individual flux bins are not orderable.
 EXAMPLES: SFT-20-CG-F35-MPC is comprised of Converted Green Flux Bins 2C through 2F.
 Not all bins are populated by Luminus.

PACKAGE CONFIGURATIONS

| Package Configuration ¹ | Type | Picture | Description |
|------------------------------------|-----------|---|---|
| F35 | SMT |  | Standard configuration. A 2.0 mm ² die mounted on a small 3.5 x 3.5mm high-performance package with directional indicator. |
| R35 | STARBOARD |  | Pre-Mounted Configuration. The standard SFT-20 SMT Package pre-mounted on a Luminus thermally efficient and pedestal, common cathode designed copper 19.9 x 19.9mm starboard. See page 15. Starboard only in sample quantity. Contact Luminus representative for additional requirements. Starboard requires electrical isolation in most system designs. Starboard backside is connected to LED cathode. |

Note 1:

The packaging configuration must be specified within the orderable part number.
If not specified, or invalid, the order may be rejected or default to the "F35" (Standard) configuration.

Ordering Part Number Nomenclature

SFT — **nn** — **XXXX** — **XXX** — **XYZ**

| Product Family | Chip Area | Color | Package Configuration | Bin Kit ¹ |
|--|-------------------------|--|---|-----------------------------------|
| SFT: Surfacemount Flat-Top Windowless | 20: 2.0 mm ² | RA = Red - Amber CG= Converted Green B= Blue | F35: 3.5mm x 3.5mm See Mechanical Drawing section R35: SFT-20 mounted on Starboard Starboard only in sample quantity | See page 5 for bin kit definition |

Note 1: A Bin Kit represents a group of individual flux or power bins that are shippable for a given ordering part number. Individual flux bins are not orderable.
EXAMPLES: SFT-20-CG-F35-MPC is comprised of Converted Green Flux Bins 2C through 2F.
Not all bins are populated by Luminus.

SFT-20 Bin Kit¹ and Flux Bin^{3,4} Definitions

Note: The below table outlines what bins are allowed to be shipped under a particular orderable part number.

| Red -Amber Flux Bins | Bin 1Z | Bin 1A | Bin 1B | Bin 1C | Bin 1D | Bin 1E | Bin 1F | Bin 1G | Bin 1H | |
|--|-----------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--|
| Red -Amber Bin Flux Range (lm) | 160 - 180 | 180 - 200 | 200 - 220 | 220 - 240 | 240 - 260 | 260 - 285 | 285 - 310 | 310 - 340 | 340 - 370 | |
| SFT-20-RA-F35-MPA | | ☑ | ☑ | ☑ | ☑ | ☑ | | | | |
| Conv Green Flux Bins | | Bin 2A | Bin 2B | Bin 2C | Bin 2D | Bin 2E | Bin 2F | Bin 2G | Bin 2H | |
| Conv Green Bin Flux Range (lm) | | 400 - 430 | 430 - 480 | 480 - 520 | 520 - 570 | 570 - 610 | 610 - 650 | 650 - 700 | 700 - 760 | |
| SFT-20-CG-F35-MPB | | | ☑ | ☑ | ☑ | ☑ | | | | |
| SFT-20-CG-F35-MPC | | | | ☑ | ☑ | ☑ | ☑ | | | |
| Blue Power Bins | | Bin 4A | Bin 4B | Bin 4C | Bin 4D | Bin 4E | Bin 4F | Bin 4G | Bin 4H | |
| Blue Optical Power Range (Radiometric Watts) | | 1.30 - 1.40 | 1.40 - 1.55 | 1.55 - 1.70 | 1.70 - 1.90 | 1.90 - 2.10 | 2.10 - 2.30 | 2.30 - 2.50 | 2.50 - 2.75 | |
| SFT-20-B-F35-EPB | | | ☑ | ☑ | ☑ | ☑ | | | | |
| SFT-20-B-F35-EPC | | | | ☑ | ☑ | ☑ | ☑ | | | |

Wavelength Dominant Bin² Definitions

| Color | Bin | Minimum WLD (nm) | Maximum WLD (nm) |
|-----------|-----|------------------|------------------|
| Red-Amber | R1 | 609 | 615 |
| Red-Amber | R2 | 615 | 621 |
| Blue | B1 | 449 | 455 |
| Blue | B2 | 455 | 460 |

Note 1: Bin Kits are defined by a group of flux or power bins. Only one flux / power bin will be shipped in each individual pack or reel.
Each shipment will contain packs (or reels) of different allowed bins for a specific orderable part number.
Individual Flux or Power bins are not orderable.

Note 2: Wavelength bins are not orderable.
Wavelength bins are displayed in product label.

Note 3: SFT-20 LEDs are tested according to the process outlined on page 6.
Devices are sorted and packaged in reels by flux bin.
Not all flux bins are currently populated.

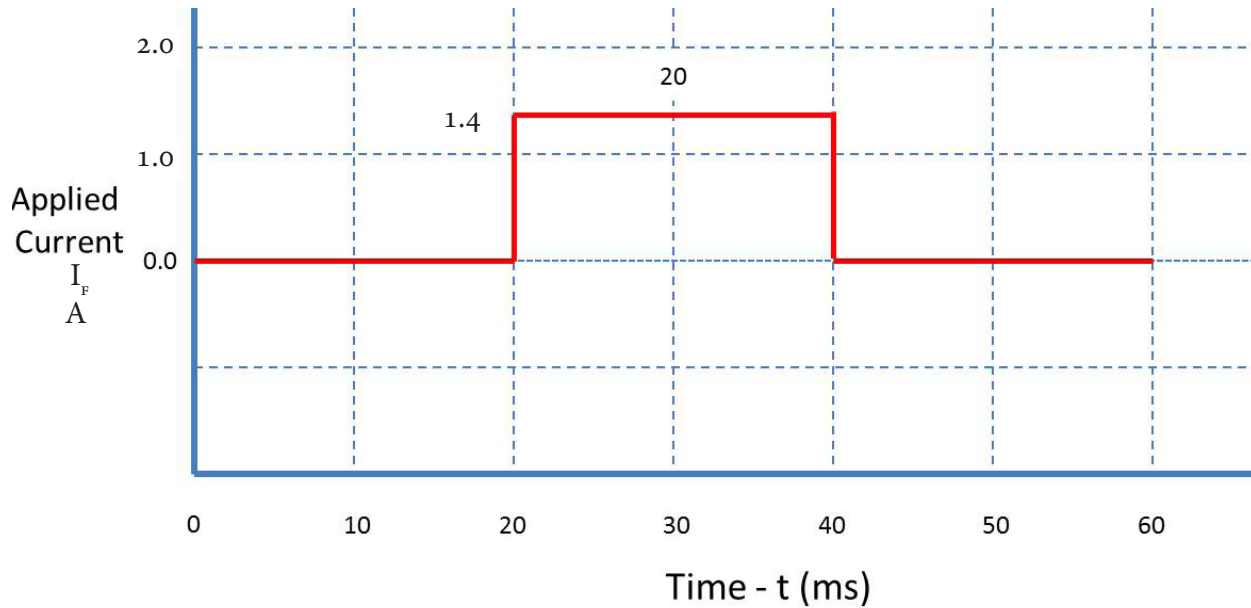
Note 4: Luminus maintains a test measurement accuracy for LED flux and power of +/- 6%.

STANDARD TEST CONDITION

All performance metrics of the SFT-Series of LED's are characterized from a single current "PULSE"^{1,2,3}

The typical pulse duration is 20ms, and the applied current is 1.4A.

Rise and Fall times of the signal are negligible.



Note 1: Environmental temperature is assumed to be Ambient. (25C typ)

Note 2: Due to the brief nature of this test, T_j (Junction Temperature) is assumed to be ambient or approx 25C.

Note 3: Luminus maintains a tolerance of +/- 6% on all flux or radiometric power measurements

Optical & Electrical Characteristics

| General Characteristics | | Symbol | Red -Amber | Converted Green | Blue | Unit |
|---|-----|--------------------|-------------|-----------------|-------------|---------|
| Emitting Area | | | 2.0 | 2.0 | 2.0 | mm² |
| Emitting Area Dimensions | | | 1.30 x 1.55 | 1.31 x 1.55 | 1.30 x 1.55 | mm x mm |
| Performance at Standard Test Conditions (See definition on p5) | | | | | | |
| Peak Luminuous Flux ^{1,6} | typ | Φ _v | 240 | 520 | 80 | lm |
| Peak Radiometric Flux ^{1,6} | typ | Φ _r | 0.80 | 1.0 | 1.7 | W |
| Dominant Wavelength | min | λ _{dmin} | 609 | 545 | 449 | nm |
| | typ | λ _d | 613 | 555 | 455 | |
| | max | λ _{dmax} | 621 | 565 | 461 | |
| FWHM- Spectral bandwidth at 50% of Φ _v | typ | | 16 | 98 | 19 | nm |
| Chromaticity Coordinates ^{4, 5} | typ | x | 0.66 | 0.33 | 0.14 | CIE x |
| | typ | y | 0.32 | 0.56 | 0.04 | CIE y |
| Forward Voltage | min | V _{F min} | 2.2 | 2.5 | 2.5 | V |
| | typ | V _F | 2.5 | 3.0 | 3.0 | |
| | max | V _{F max} | 3.0 | 3.6 | 3.6 | |
| Correlated Performance in Typical Display Application (5.0A @ 40C Heatsink Temp @ Specified Duty Cycle) [Reference Only]. | | | | | | |
| Reference Drive Current | typ | I _F | 5.0 | 5.0 | 5.0 | A |
| Reference Duty Cycle | typ | | 25 | 50 | 25 | % |
| Luminous Flux ^{1,6} | typ | Φ _v | 600 | 1350 | 200 | lm |
| Radiometric Flux ^{1,6} | typ | Φ _r | 2.2 | 2.8 | 4.2 | W |
| Dominant Wavelength | typ | λ _d | 613 | 555 | 453 | nm |
| FWHM -Spectral bandwidth at 50% of Φ _v | typ | | 15 | 99 | 19 | |
| Chromaticity Coordinates ⁴ | typ | x | 0.66 | 0.32 | 0.14 | |
| | | | 0.33 | 0.55 | 0.04 | CIE y |
| Forward Voltage | typ | V _F | 3.6 | 3.5 | 3.4 | V |

Note 1: Luminus maintains a tolerance of +/- 6% on flux measurements

Note 2: Duty Cycle used to specify device ratings under Pulsed operation. SFT-Series of LEDs can operate at duty cycles ranging from 1% to 100%. At higher duty cycles, drive current should be adjusted to maintain the junction temperature at desired levels to meet the application lifetime requirements.

Note 3: In pulsed operation, rise time from 10 to 90% of forward current should be larger than 0.5 microseconds.

Note 4: CIE 1931 chromaticity diagram coordinates, normalized to X+Y+Z=1.

Note 5: For Reference only.

Note 6: For Reference only, actual received performance will depend on customer's ordering part number.

Optical & Electrical Characteristics

Absolute Maximum Ratings

| | Symbol | Red - Amber | Converted Green | Blue | Unit |
|--|------------|----------------|--------------------|------------|------|
| Absolute Minimum Current (CW or Pulsed) ¹ | | 400 | 400 | 400 | mA |
| Absolute Maximum Current (CW) ² | | 5.0 | 6.0 | 6.0 | A |
| Absolute Maximum Current (Pulsed) ^{2,3} (Frequency > 240 Hz, duty cycle <70%) | | 6.0 | 8.0 | 8.0 | A |
| Absolute Maximum Surge Current ^{2,3} (Frequency > 240 Hz, duty cycle =10%, t= 1ms) | | 8.0 | 8.0 | 8.0 | A |
| Absolute Maximum Junction Temperature ⁴ | T_{jmax} | 110 | 150 | 150 | °C |
| Storage Temperature Range | | -40 / +100 | -40 / +100 | -40 / +100 | °C |

Note 1: Product performance and lifetime data is specified at recommended forward drive currents. Sustained operation at or near absolute minimum currents may result in a reduction of device performance and device lifetime compared to recommended forward drive currents.

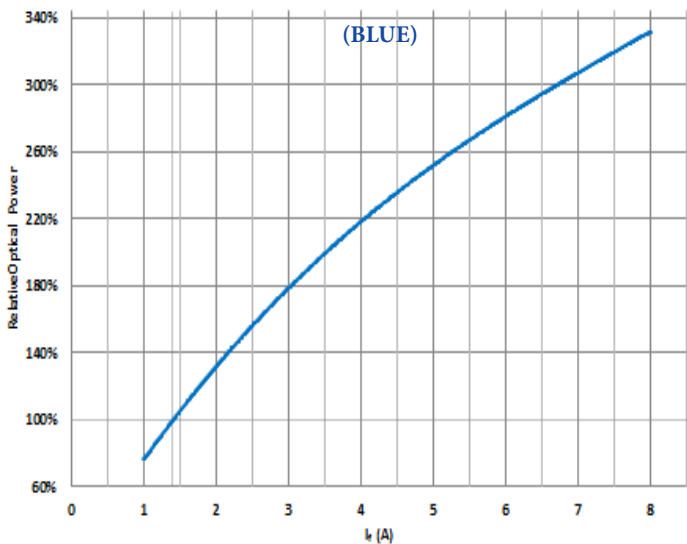
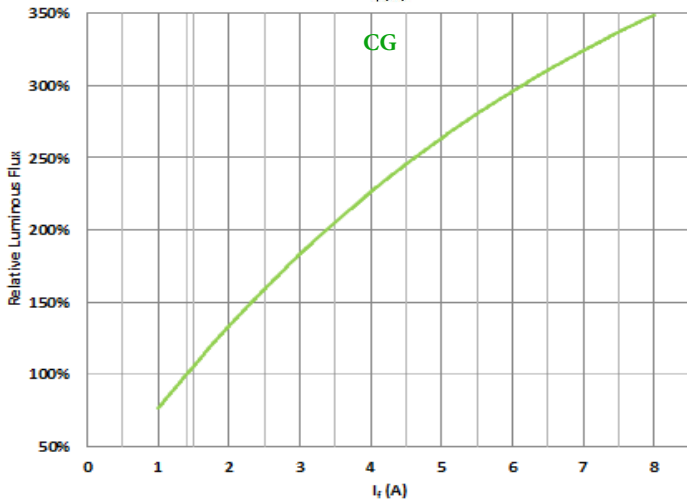
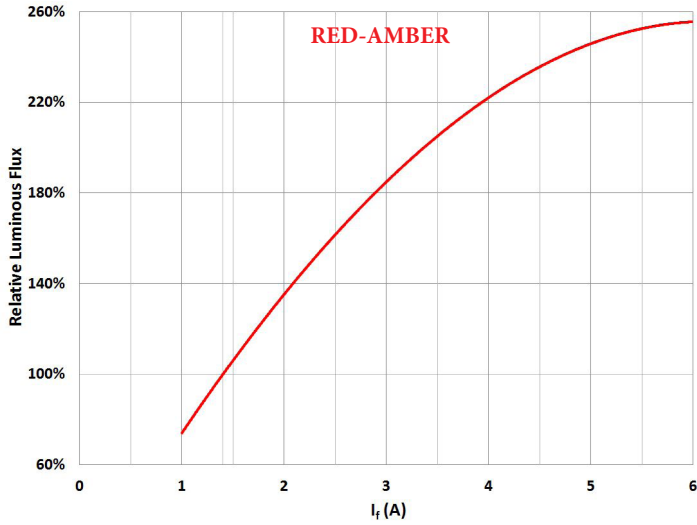
Note 2: Sustained operation at or above maximum currents is not recommended and will result in a reduction of device lifetime.
Device lifetimes will depend on junction temperature. (See Reliability Application Note, APN-001444 for product lifetimes as function of junction temperature.)
Please refer to lifetime de-rating curves (available from Luminus) for further information.

Note 3: In pulsed operation, rise time from 10 to 90% of forward current should be larger than 0.5 microseconds.

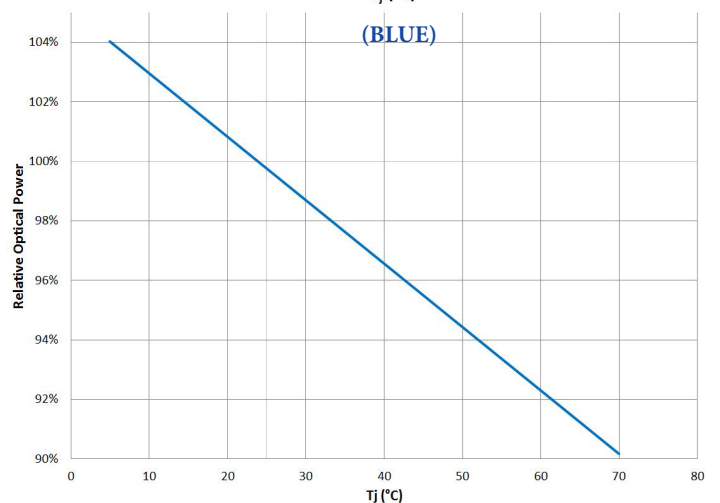
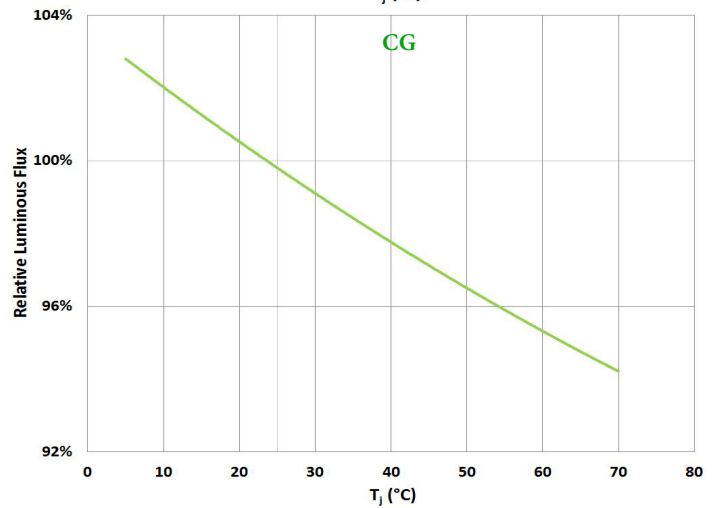
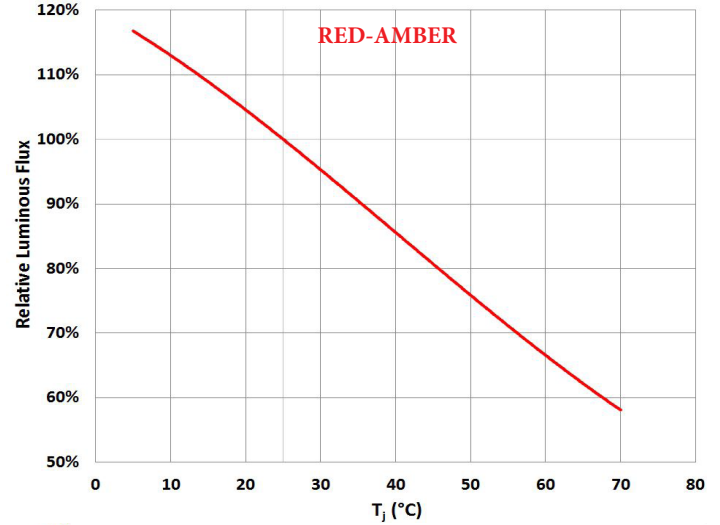
Note 4: Sustained operation at Absolute Maximum Operating Junction Temperature (T_{jmax}) will result in reduced device life time.

Normalized Luminous Flux (Blue: Radiometric Power)

vs. Forward Current ($T_{hs} = 25^{\circ}\text{C}$, $I_f = \text{Pulse}$)

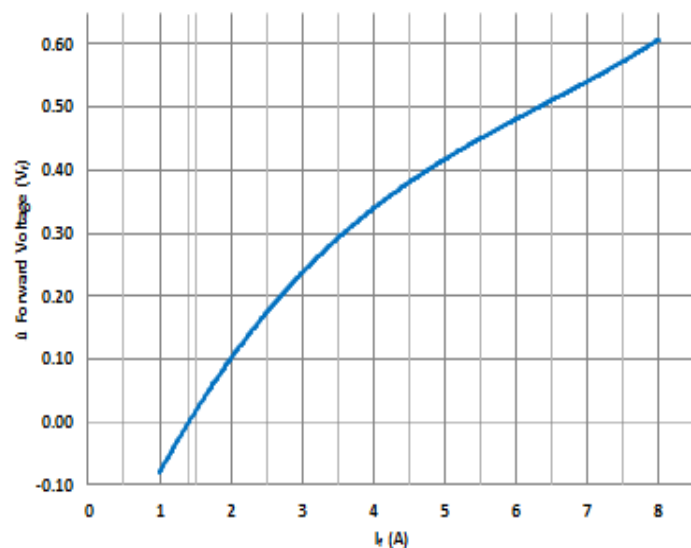
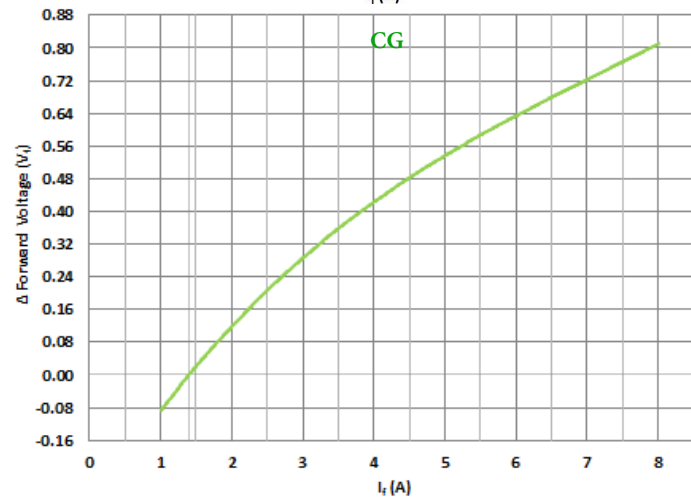
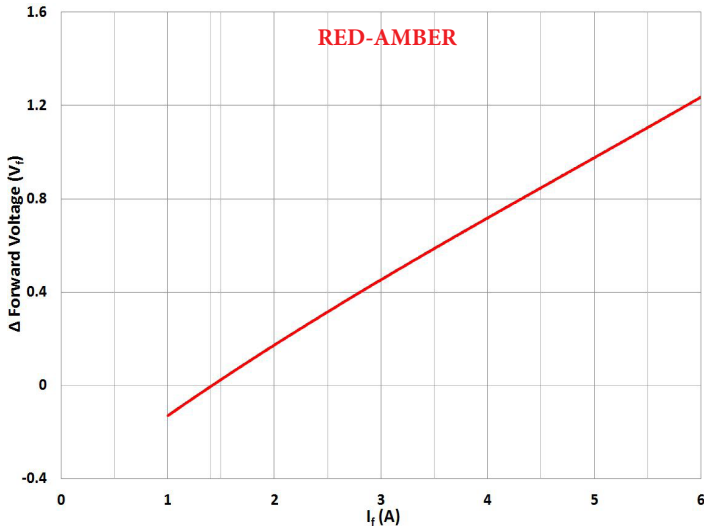


vs. T_j ($I_f = 1.4\text{A Pulse}$)

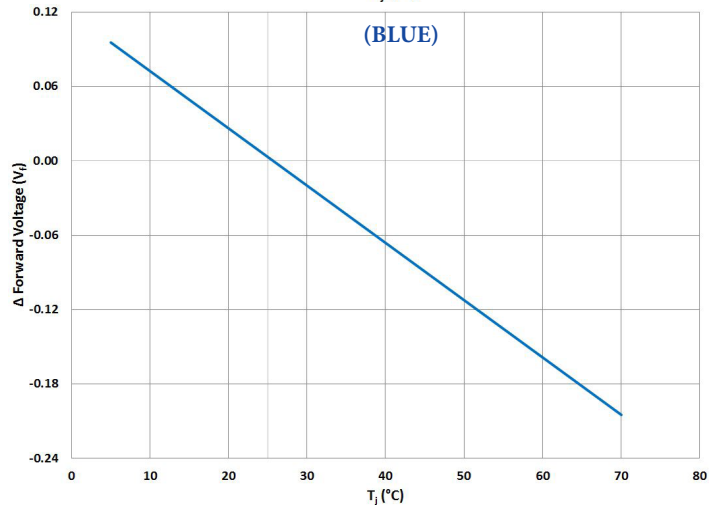
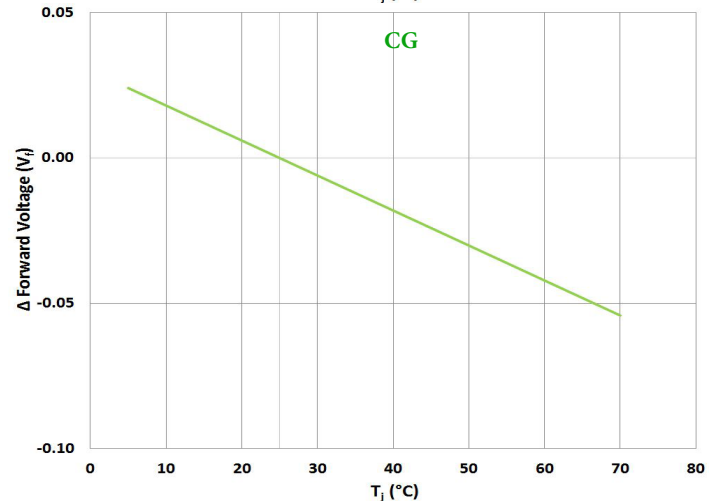
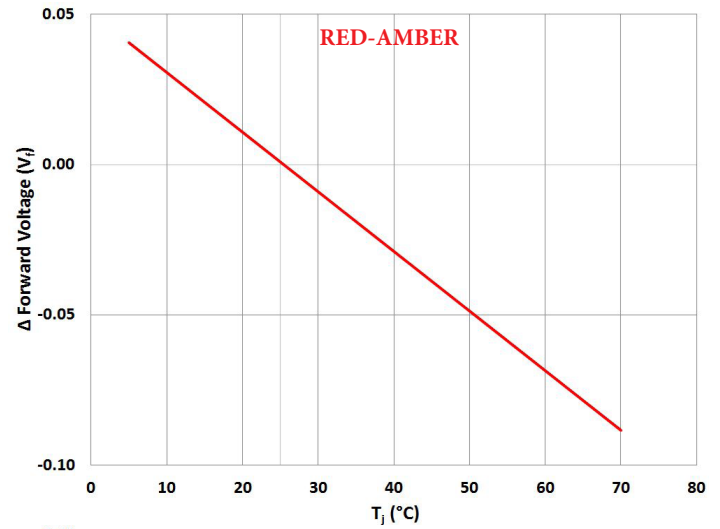


Relative Forward Voltage (V_f) variation

vs. Forward Current ($T_{hs} = 25^\circ\text{C}$, $I_f = \text{Pulse}$)

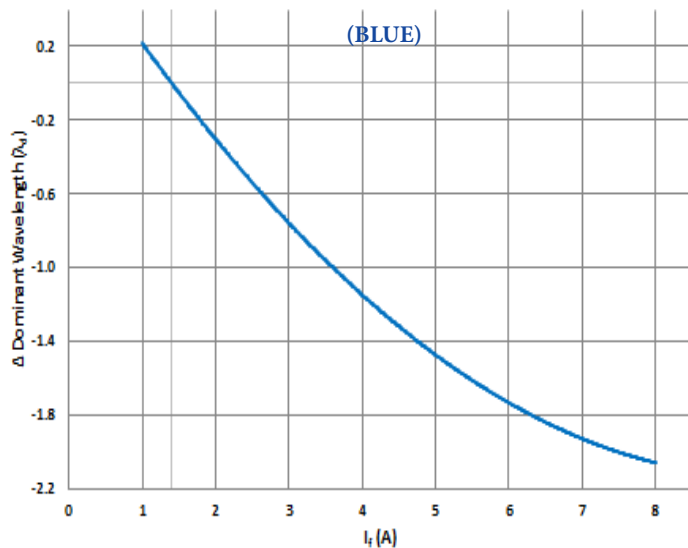
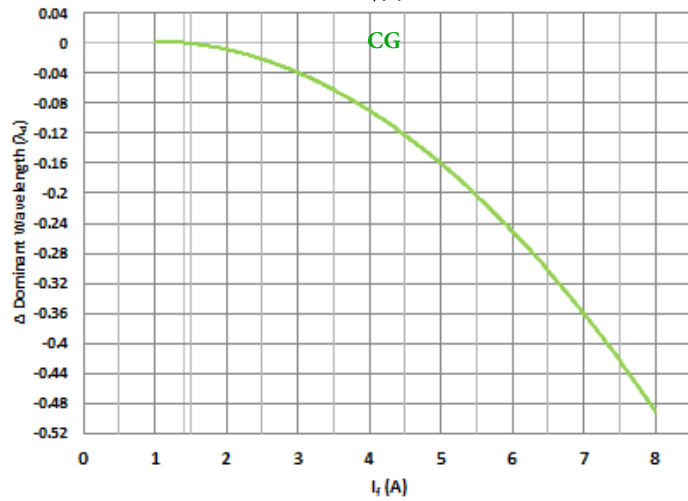
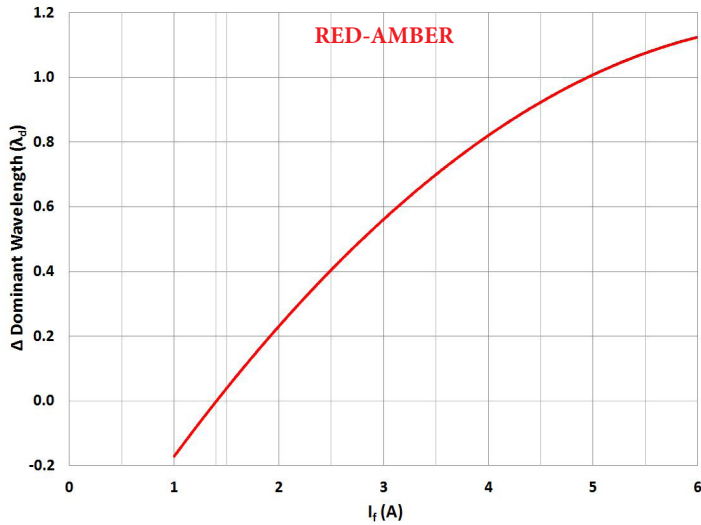


vs. T_j ($I_f = 1.4\text{A Pulse}$)

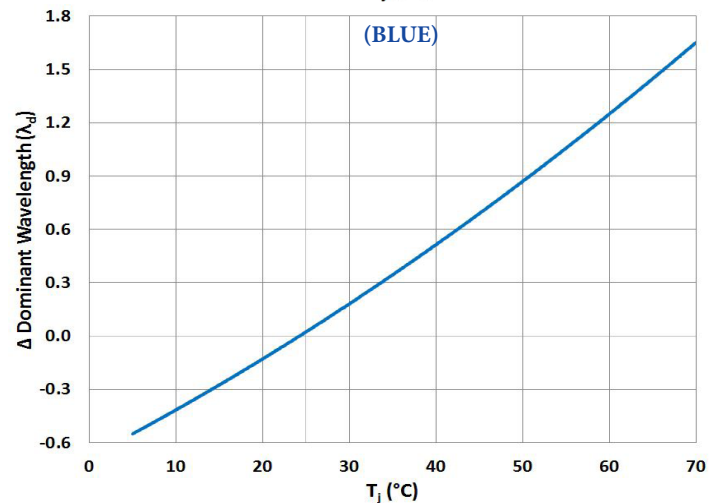
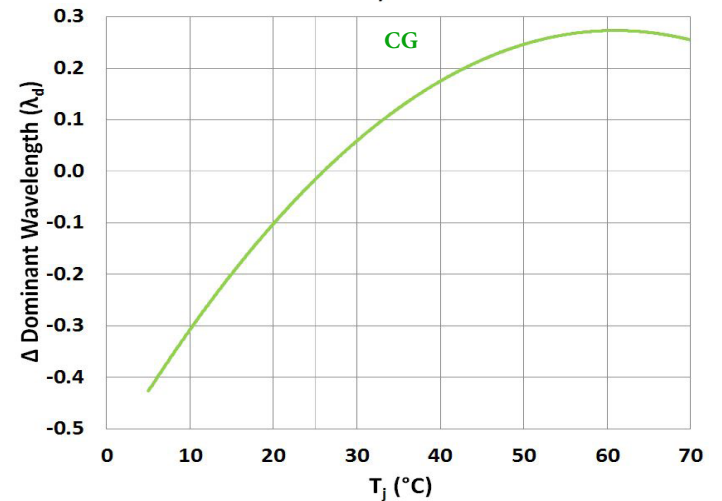
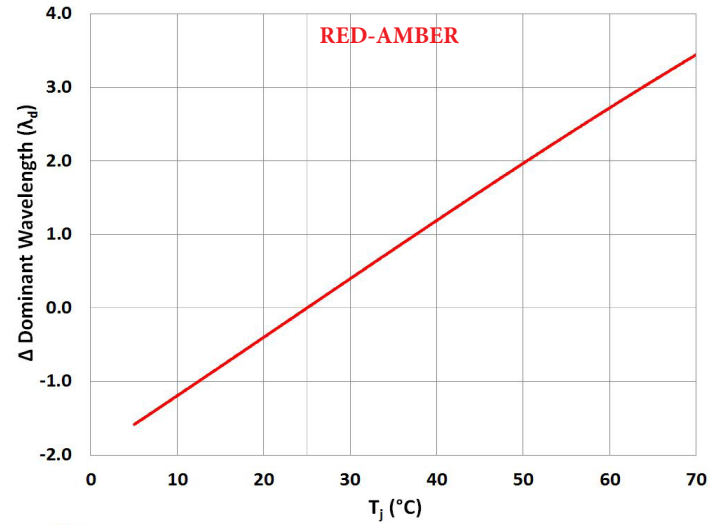


Relative Dominant Wavelength variation

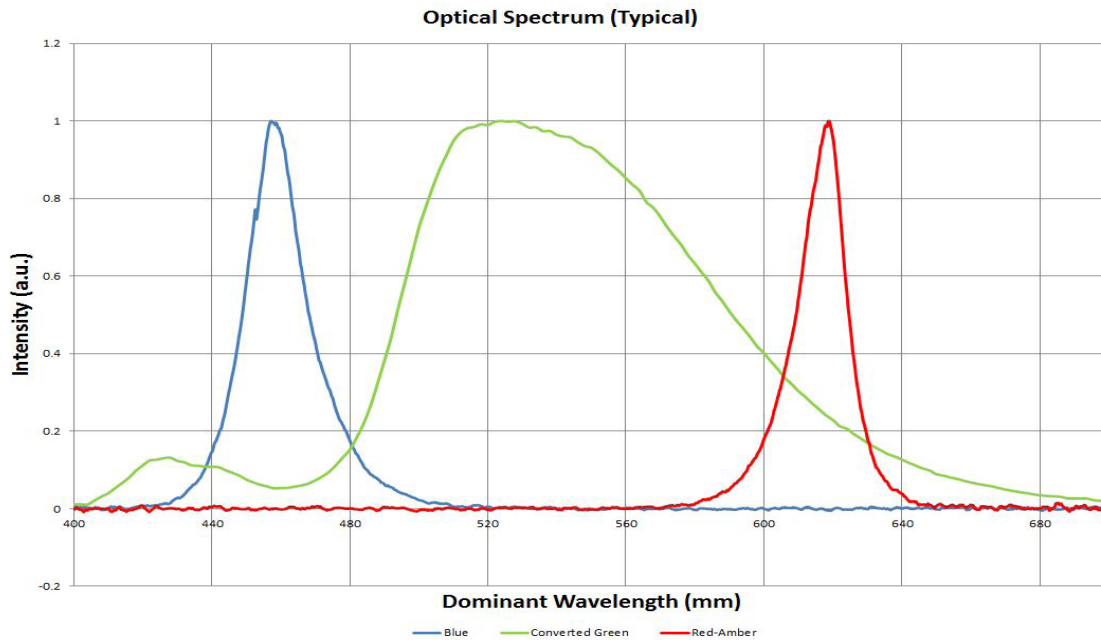
vs. Forward Current ($T_{hs} = 25^{\circ}\text{C}$, $I_f = \text{Pulse}$)



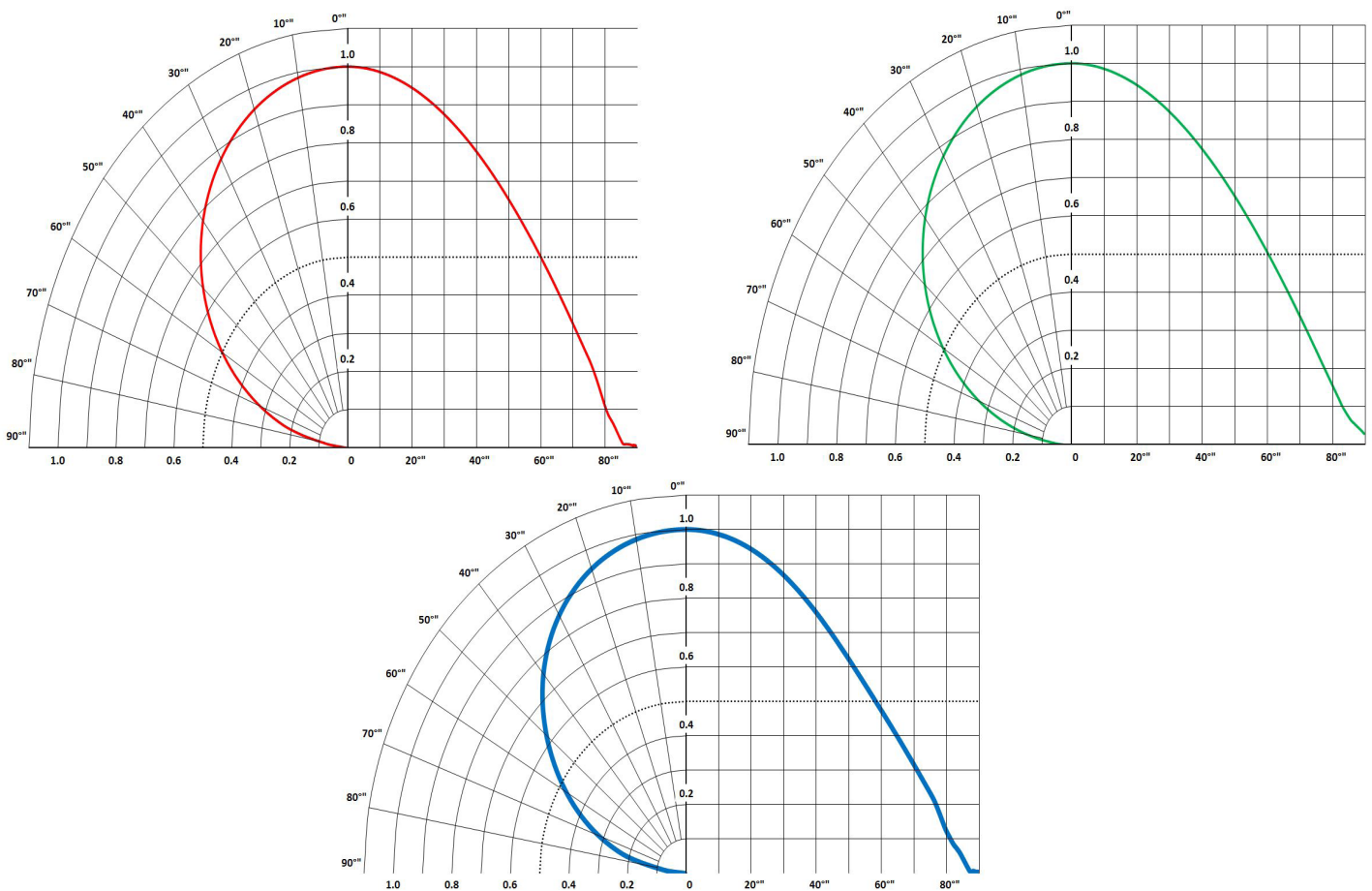
vs. T_j ($I_f = 1.4\text{A Pulse}$)



SFT-Series Optical Spectrum (Typical)¹

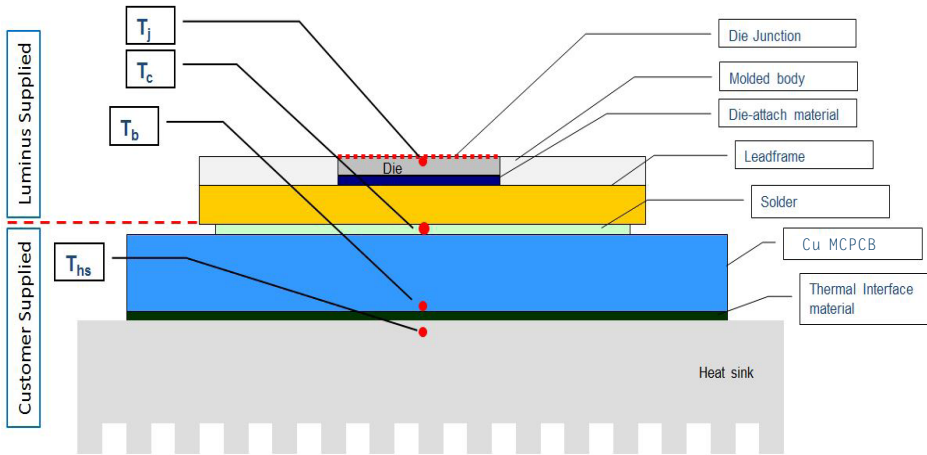


Angular Intensity Distribution (Typical)¹



Note 1: Data is recorded using standard test conditions and tolerances as described on page 6.

Thermal Resistance



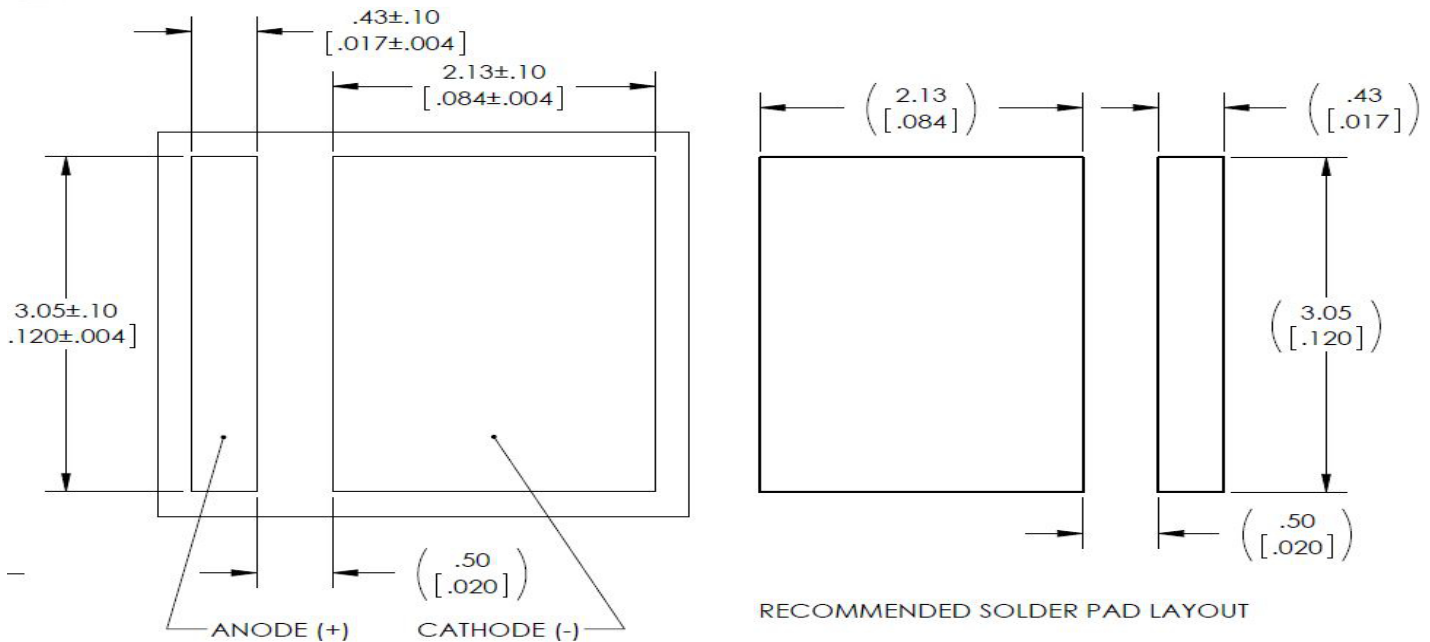
Typical Thermal Resistance

| | |
|----------------------|----------|
| $R_{th_{J-B}}^{1,2}$ | 1.7° C/W |
| $R_{th_{J-C}}^{1,2}$ | 1.0° C/W |

See Note 3.

- Note 1:** Thermal resistance values are based on FEA model results correlated to measured $R_{th_{J-HS}}$ data.
- Note 2:** Final thermal characteristics will be dependent on overall customer system thermal design.
- Note 3:** For optimal results, Luminus recommends customer PCB Design in accordance with suggested provided by the Luminus application note, "Design Guidelines for SFT Chipset Assembly".

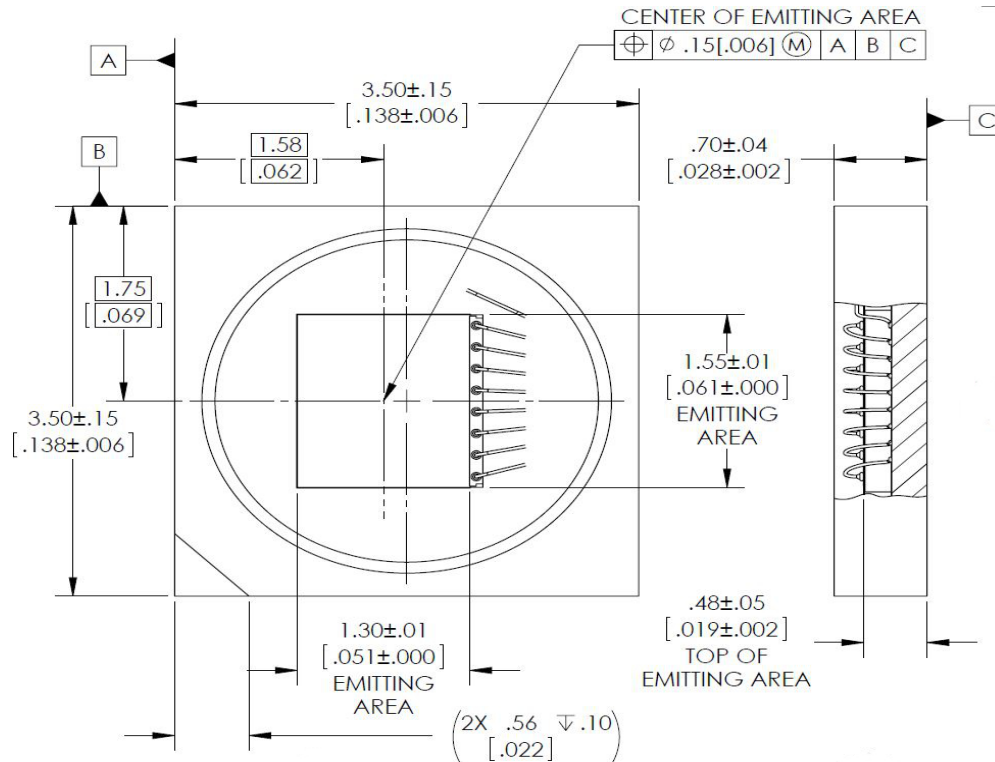
Electrical Pinout / Solder Pad Layout



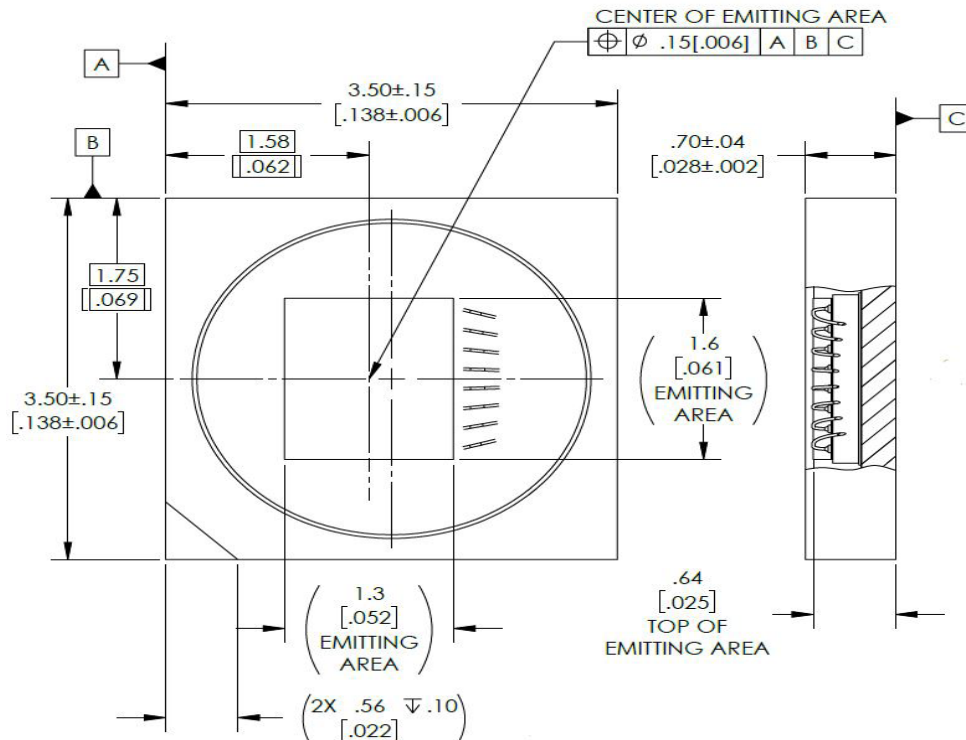
- Note:** Layout is common to all colors.
For Detail recommended solder profiles, see page 16

Optimal LED performance is dependent on a proper system design. Please review the Luminus application note, "Design Guidelines for SFT Chipset Assembly". Contact Luminus for more detail.

Mechanical Dimensions - SFT-20 [Red / Blue] in "F35" Package Configuration

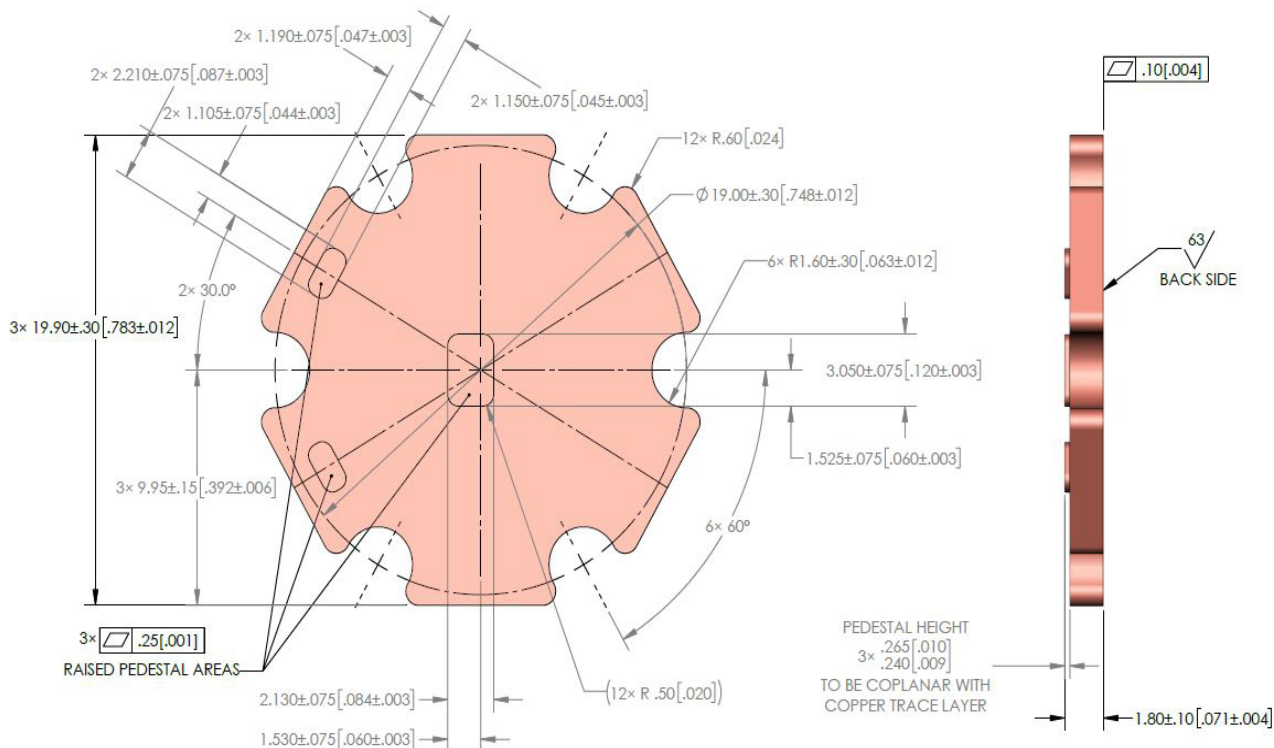
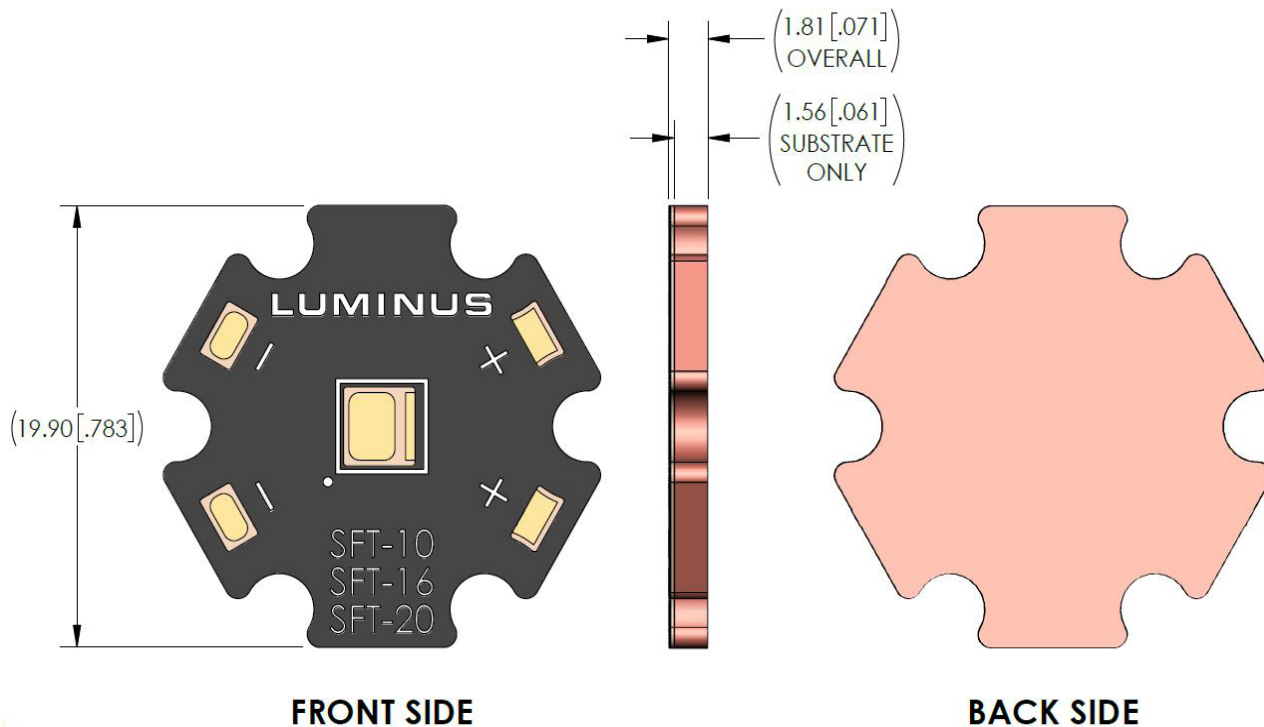


Mechanical Dimensions - SFT-20 [Converted Green] in "F35" Package Configuration



Notes: CONVERTED GREEN differs from RED/BLUE in only the emitting platelet is slightly larger and slightly higher than the underlying die.
 REFERTO DWG -002790/002792 for Full Dimensions.

Mechanical Dimensions - "Starboard" Package Configuration



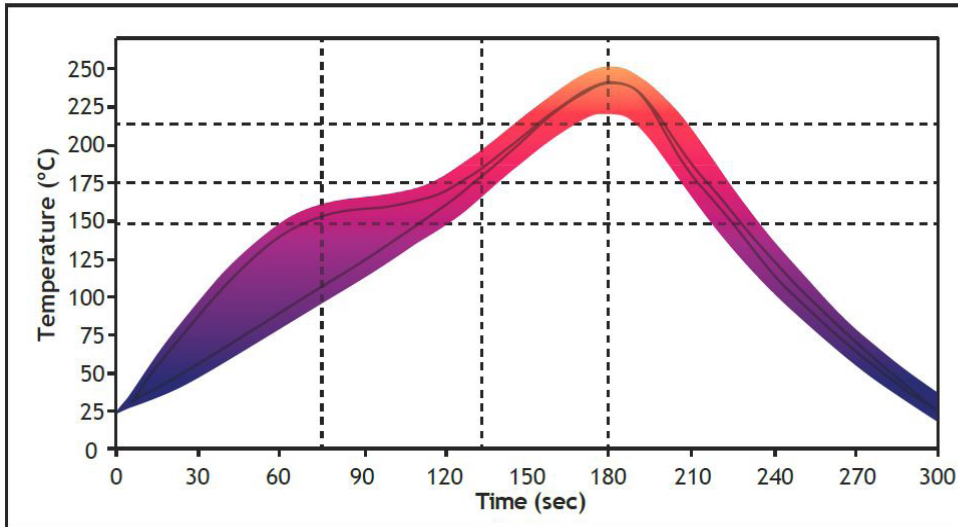
Notes:

Dimensions shown are of bare Starboard. For full detail, please see DWG 400845 available from your local Luminus representative or web site.

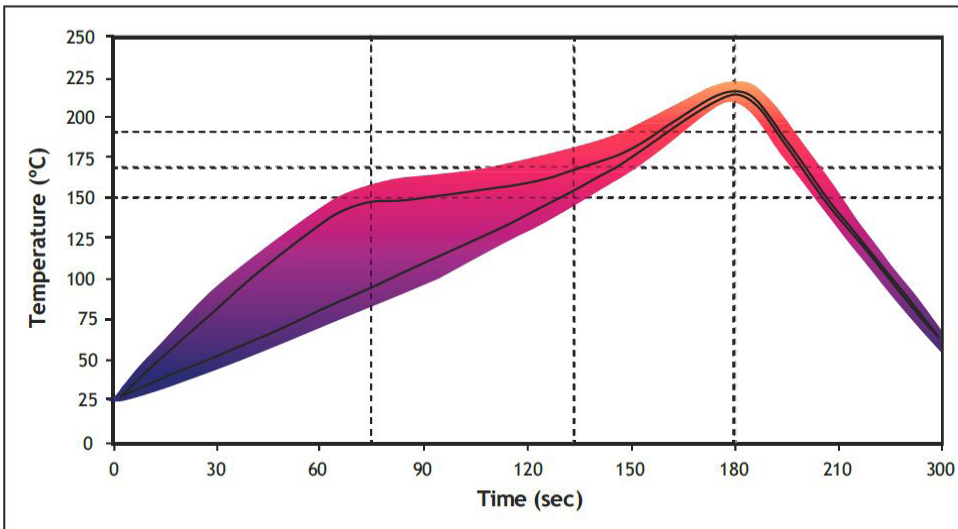
This Starboard is not electrically isolated. It is active and connected to the LED cathode.

Starboard requires electrical isolation in most customer designs. Please see application note APN

SOLDER PROFILE INFORMATION



SAC305 Solder Profile Graph

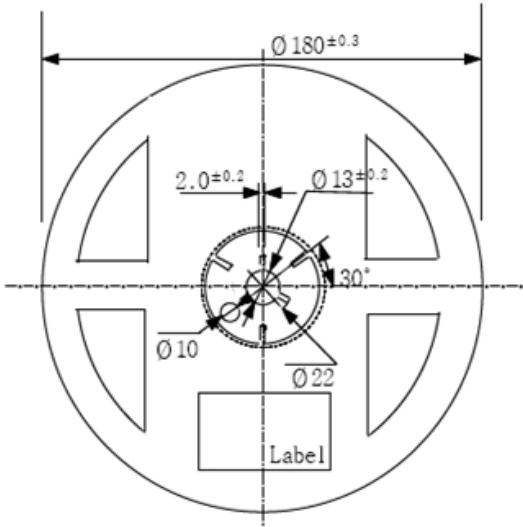


Sn63 & Sn62 Solder Profile Graph

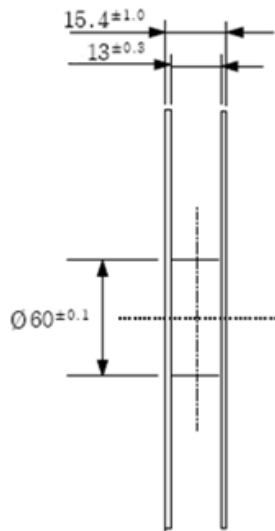
| SAC 305 and Sn63 & Sn62 Solder Profile | | | |
|--|---------|-------------|-----------------------------------|
| Feature | SAC 305 | Sn63 & Sn62 | Unit |
| Ramp Up Rate Ambient to Preheat (min) | 1.15 | 1 | Degrees Celsius Per Second (°C/s) |
| Preheat Temperature | 175 | 150 | Degrees Celsius (°C) |
| Profile Length (Preheat to Peak) | 165-210 | 165-210 | Seconds (s) |
| Ramp Up Rate Preheat to Peak (min) | 1.5 | 0.84 | Degrees Celsius Per Second (°C/s) |
| Liquid Temperature | 217 | 183 | Degrees Celsius (°C) |
| Peak Temperature | 235 | 225 | Degrees Celsius (°C) |
| Time Above Liquid Temperature | 30-60 | 30-60 | Seconds (s) |
| Time Within 5C of Peak | 20 | 10 | Seconds (s) |
| Cool down Rate | <4 | <4 | Degrees Celsius Per Second (°C/s) |
| Cool Down Duration | 30-60 | 30-60 | Seconds (s) |
| 25 C to peak Temperature | 180 | 180 | Seconds (s) |

SHIPPING / PACKAGING INFORMATION

| ITEM | REEL | Box | |
|-----------|----------------|---------------------------------------|------------------|
| | | PACKING SPEC | Box DIMENSION |
| PACKAGING | 250 PCS / REEL | 5 REELS PER BOX = 1250 PCS PER BOX | 225 X 245 X 65MM |



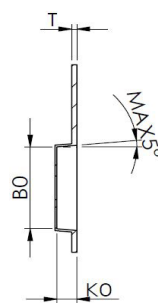
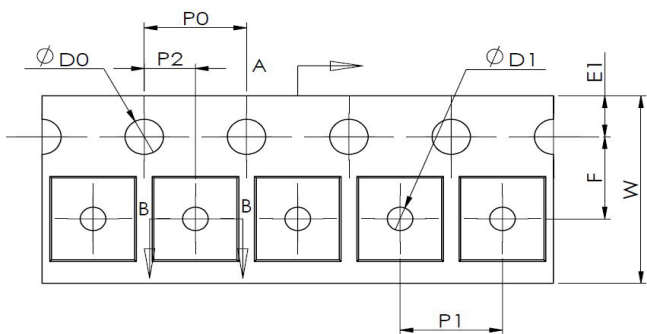
REEL DIAGRAM



TAPE DIMENSIONING DIAGRAM AND TABLE



BOX DIAGRAM

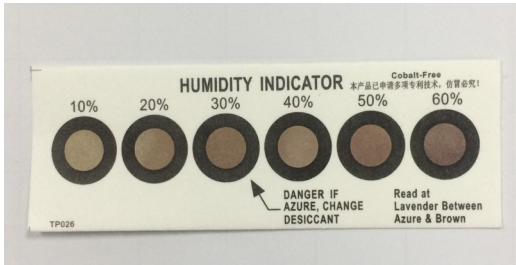
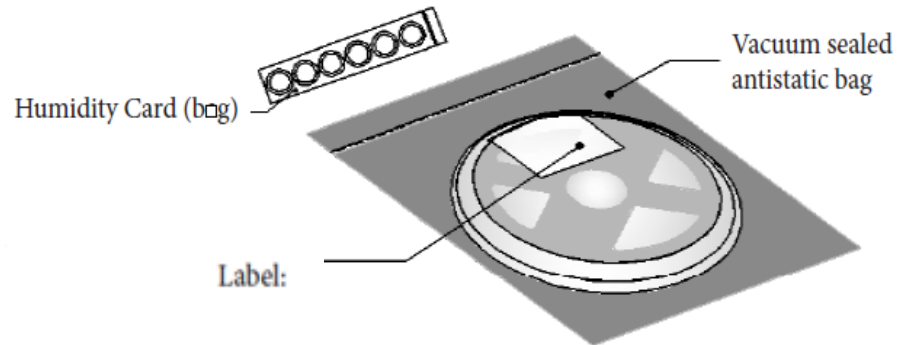


| DIMENSION | SPEC (MM) |
|-----------|----------------|
| A0 | 3.80 +/- 0.10 |
| B0 | 4.00 +/- 0.10 |
| K0 | 1.20 +/- 0.10 |
| P0 | 4.00 +/- 0.10 |
| P1 | 8.00 +/- 0.10 |
| P2 | 2.00 +/- 0.05 |
| T | 0.30 +/- 0.05 |
| E1 | 1.75 +/- 0.10 |
| F | 5.50 +/- 0.05 |
| D0 | 1.55 +/- 0.05 |
| D1 | 1.55 +/- 0.05 |
| W | 12.00 +/- 0.01 |

REEL PACKAGING



Desiccant (bag)




HUMIDITY CARD

THE HUMIDITY INDICATOR IS INCLUDED WITHIN EACH ANTI-STATIC BAG. IF HUMIDITY INDICATOR IS TRIGGERED REPLACE DESICCANT AND/OR PRE-BAKE PRIOR TO SYSTEM ASSEMBLY.

LDI RECOMMENDS ALL SFT-SERIES LED ARE STORED "SEALED" UNTIL TIME OF USE. SEE APPLICATION NOTE.



LABEL



CPN: SFT-20-B-F35

MPN: 113146

QTY: 250

| BIN INFO | |
|----------|----|
| Flux: | 4A |
| Voltage: | V1 |
| Color: | B |

| MFG INFO |
|-------------------|
| Rev: 01 |
| Lot#: TOR-1607034 |
| RoHS Compliant |

Label Fields:

- **CPN:** Customer orderable Part Number (as defined on P3)
- **MPN:** Manufacturer Part Number (Internal Luminus use)
- **QTY:** Quantity of Devices
- **Bin/Flux:** Flux Bin
- **Bin/Voltage:** Vf Bin (Internal Luminus use)
- **Bin/Color:** Color or Wavelength
- **MFG INFO:** Luminus Internal Use

History of Changes

| Rev | | Description of Change |
|-----|------------|--|
| 4 | 07/20/2017 | Released version -- SFT20 - Removed "Preliminary" - Updated bin-kit table - Added Wavelength (Dominate) Bins for Red and Blue |

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