

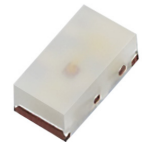
## SpiceLED

Like spice, its diminutive size is a stark contrast to its standout performance in terms of brightness, durability and reliability. Despite being the smallest in size yet the SpiceLED packs a powerful performance and is a highly reliable design device. Its versatility enables its application in automotive appliances, key-pad illumination, hand-held devices such as PDAs, notebooks, compact back-lighting applications, consumer appliances, office equipment, audio and video equipment.



## Features:

- > High brightness surface mount LED.
- > Super wide viewing angle of 160°.
- > Equivalent to 0603 package outline. Copper lead-frame construction.
- > Qualified according to JEDEC moisture sensitivity Level 2.
- > Compatible to IR reflow soldering.
- > Environmental friendly; RoHS compliance.
- > Compliance to automotive standard; AEC-Q102.
- > Superior Corrosion Resistant.



## Applications:

- > Automotive: interior applications, eg: switches, telematics, climate control system, dashboard, etc.
- > Consumer Appliances: LCD illumination as in PDAs, LCD TV.
- > Communication: indicator and backlight in mobilephone.
- > Industrial: white goods (eg: Oven, microwave, etc.).

### Optical Characteristics at Tj=25°C

Part Number	Color	Viewing Angle°	Luminous Intensity @ 2mA IV (mcd) <small>Appx. 1.1</small>		
			Min.	Typ.	Max.
SSS-CLD-HJ2-1-I2	Super Red, 632 nm	160	2.80	4.50	7.20
SSO-CLD-JK2-1-I2	Orange, 605 nm	160	4.50	7.20	11.20
SSY-CLD-JK2-1-I2	Yellow, 587 nm	160	4.50	7.20	11.20

### Electrical Characteristics at Tj=25°C

Part Number	Min. (V)	Vf @ If = 2mA <small>Appx. 3.1</small>			Vr @ Ir = 10uA <small>Appx. 6.1</small>
		Typ. (V)	Max. (V)	Min. (V)	
SSx-CLD	1.6	1.8	2.4	5	

### Absolute Maximum Ratings

	Maximum Value	Unit
DC forward current	30	mA
Peak pulse current; (Ts = 55°C, tp ≤ 100µs, Duty cycle = 0.03)	100	mA
Reverse voltage; Ir <sub>max</sub> = 10µA <small>Appx.6.1</small>	5	V
ESD threshold (HBM)	2000	V
LED junction temperature	110	°C
Operating temperature	-40 ... +105	°C
Storage temperature	-40 ... +110	°C
Power dissipation (at room temperature)	40	mW
Thermal resistance (Rated current = 2mA, Ts = 25 °C)		
- Junction / ambient, R <sub>th JA</sub>	450	K/W
- Junction / solder point, R <sub>th JS</sub>	250	K/W

**Wavelength Grouping at Tj=25°C**

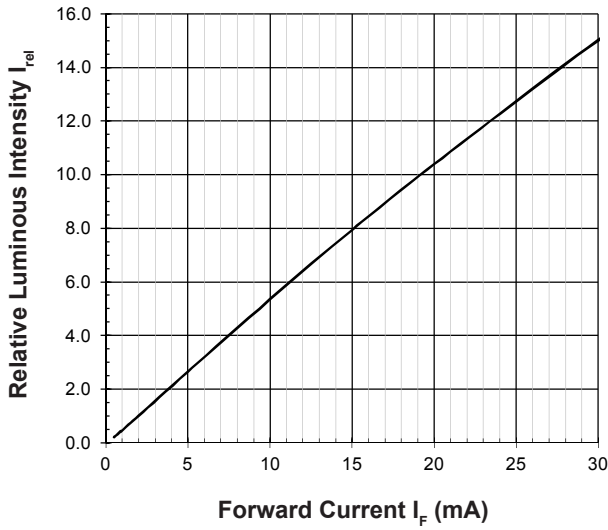
Color	Group	Wavelength distribution (nm) <i>Appx. 2.2</i>
SSS; Super Red	Full	625 - 640
SSO; Orange	Full	600 - 612
	W	600 - 603
	X	603 - 606
	Y	606 - 609
	Z	609 - 612
SSY; Yellow	Full	582 - 594
	W	582 - 585
	X	585 - 588
	Y	588 - 591
	Z	591 - 594

**Luminous Intensity Group at Tj=25°C**

Brightness Group	Luminous Intensity <i>Appx. 1.1</i> IV (mcd)
H1	2.80 ... 3.55
H2	3.55 ... 4.50
J1	4.50 ... 5.60
J2	5.60 ... 7.20
K1	7.20 ... 9.00
K2	9.00 ... 11.20

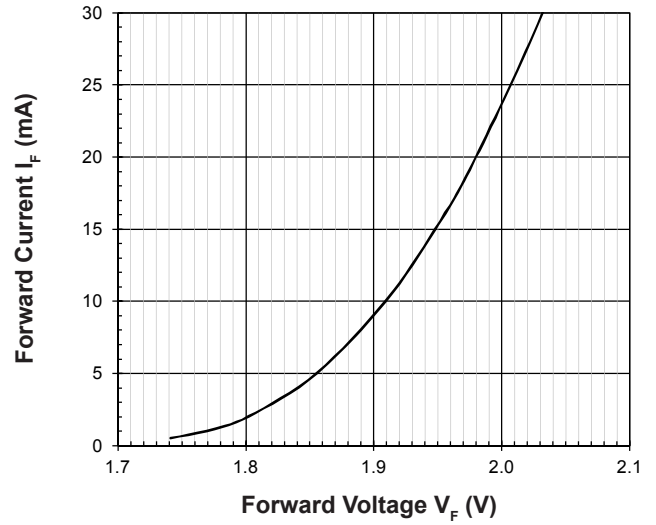
**Relative Luminous Intensity Vs Forward Current**

$I_v/I_v(2mA) = f(I_F); T_j = 25^\circ C$



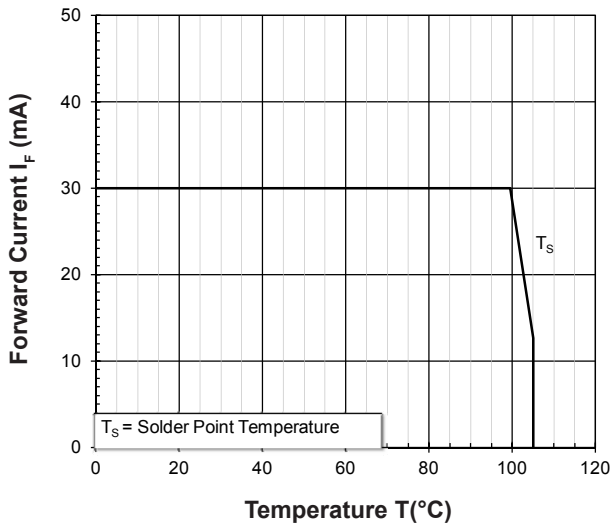
**Forward Current Vs Forward Voltage**

$I_F = f(V_F); T_j = 25^\circ C$



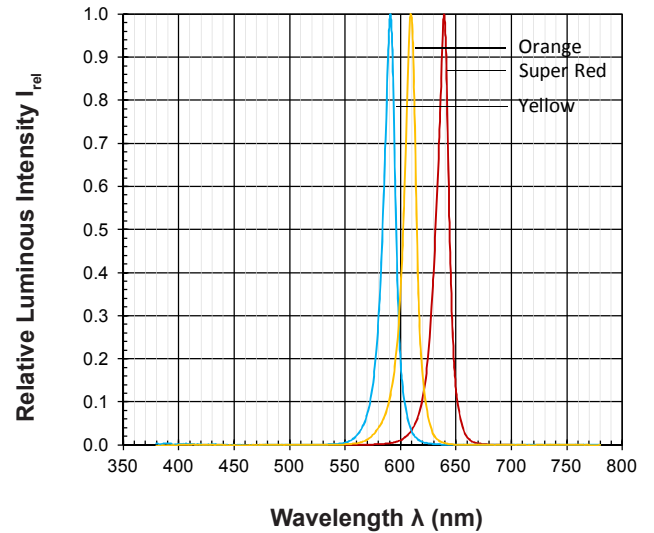
**Maximum Current Vs Temperature**

$I_F = f(T)$



**Relative Spectral Emission**

$I_{rel} = f(\lambda); T_j = 25^\circ C; I_F = 2mA$

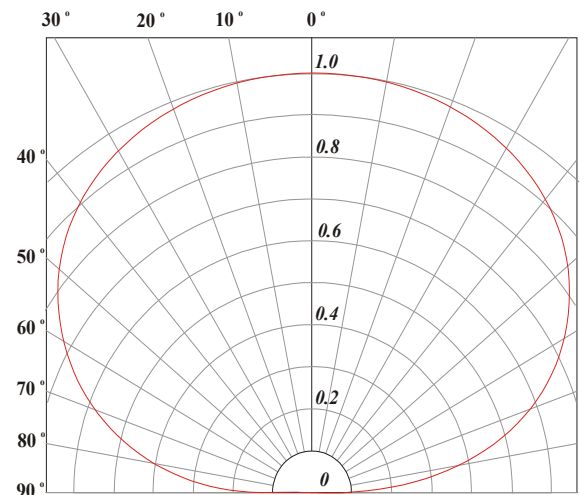


**Allowable Forward Current Vs Duty Ratio**

$(T_s = 55^\circ C; t_p \le 100\mu s)$

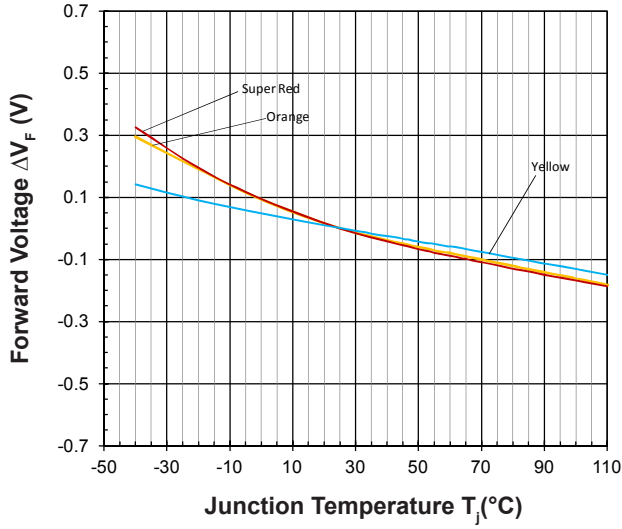


**Radiation Pattern**



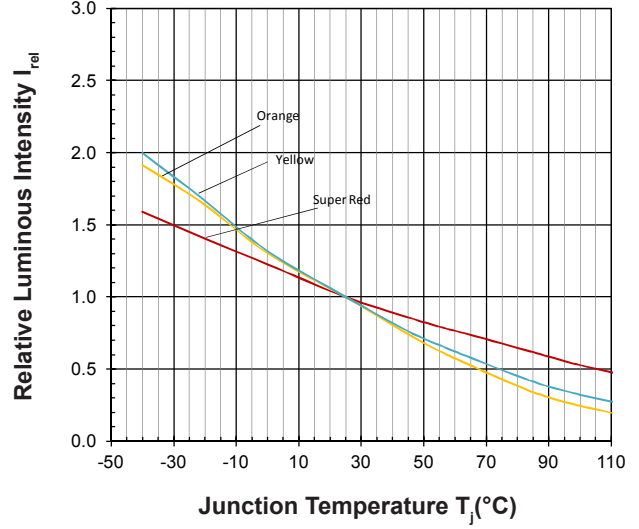
**Forward Voltage Vs Junction Temperature**

$$\Delta V_F = V_F - V_F(25^\circ\text{C}) = f(T_j); I_F = 2\text{mA}$$



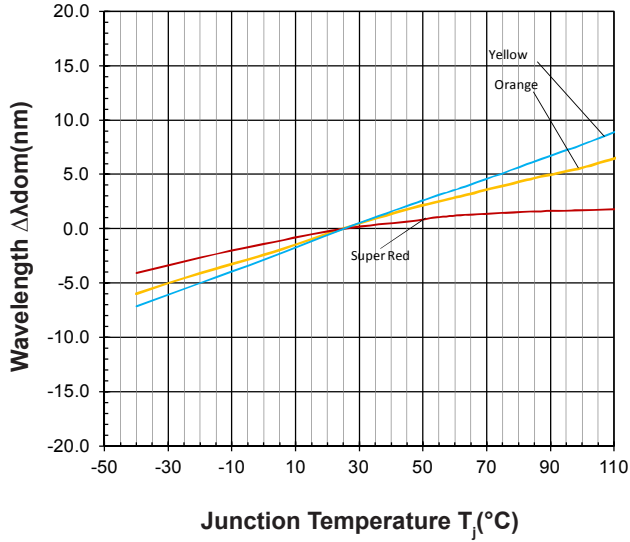
**Relative Luminous Intensity Vs Junction Temperature**

$$I_V/I_V(25^\circ\text{C}) = f(T_j); I_F = 2\text{mA}$$

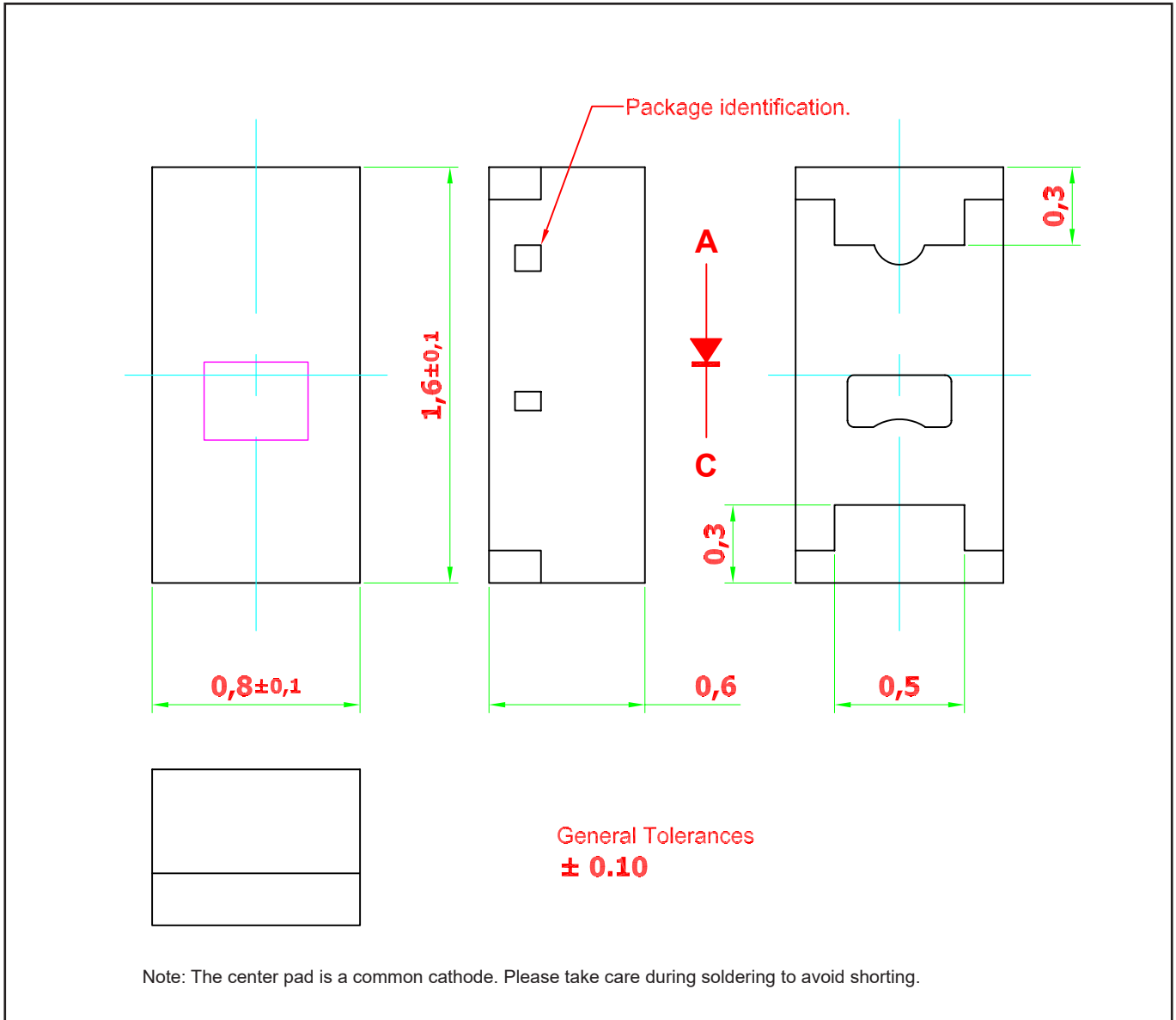


**Wavelength Vs Junction Temperature**

$$\Delta \lambda_{dom} = \lambda_{dom} - \lambda_{dom}(25^\circ\text{C}) = f(T_j); I_F = 2\text{mA}$$



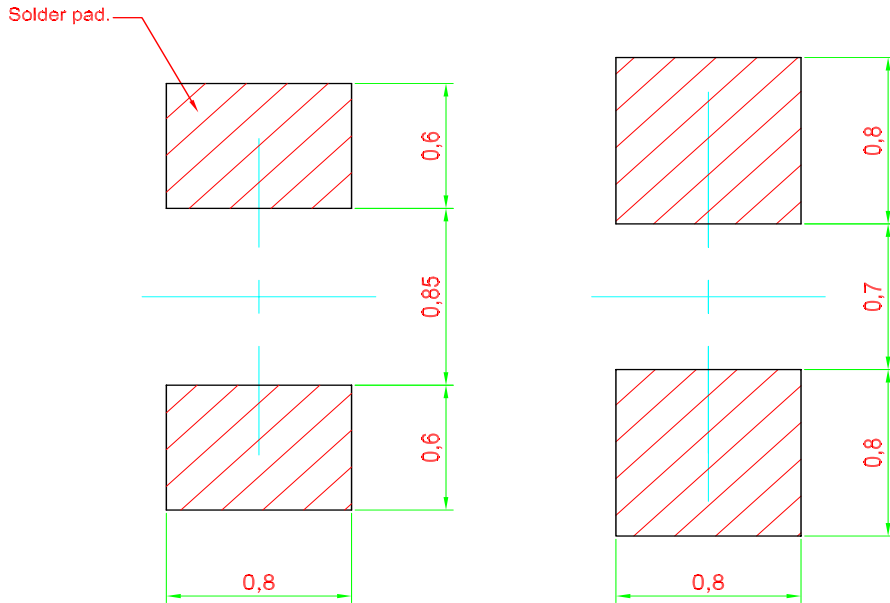
**SpiceLED • AllnGaP S-Spice : SSx-CLD-I2 Package Outlines**



**Material**

Material	
Lead-frame	Cu Alloy With Au Plating
Package	High Temperature Resistant Epoxy Resin

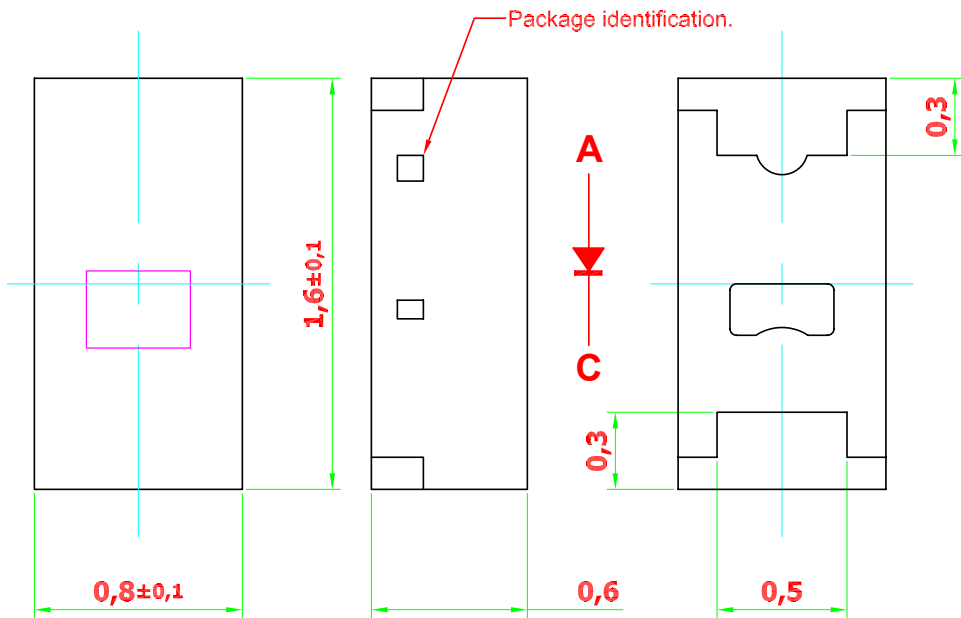
**Recommended Solder Pad**



Recommended Solder-pad

Alternative Solder-pad  
 Compatible to ChipLED 0603

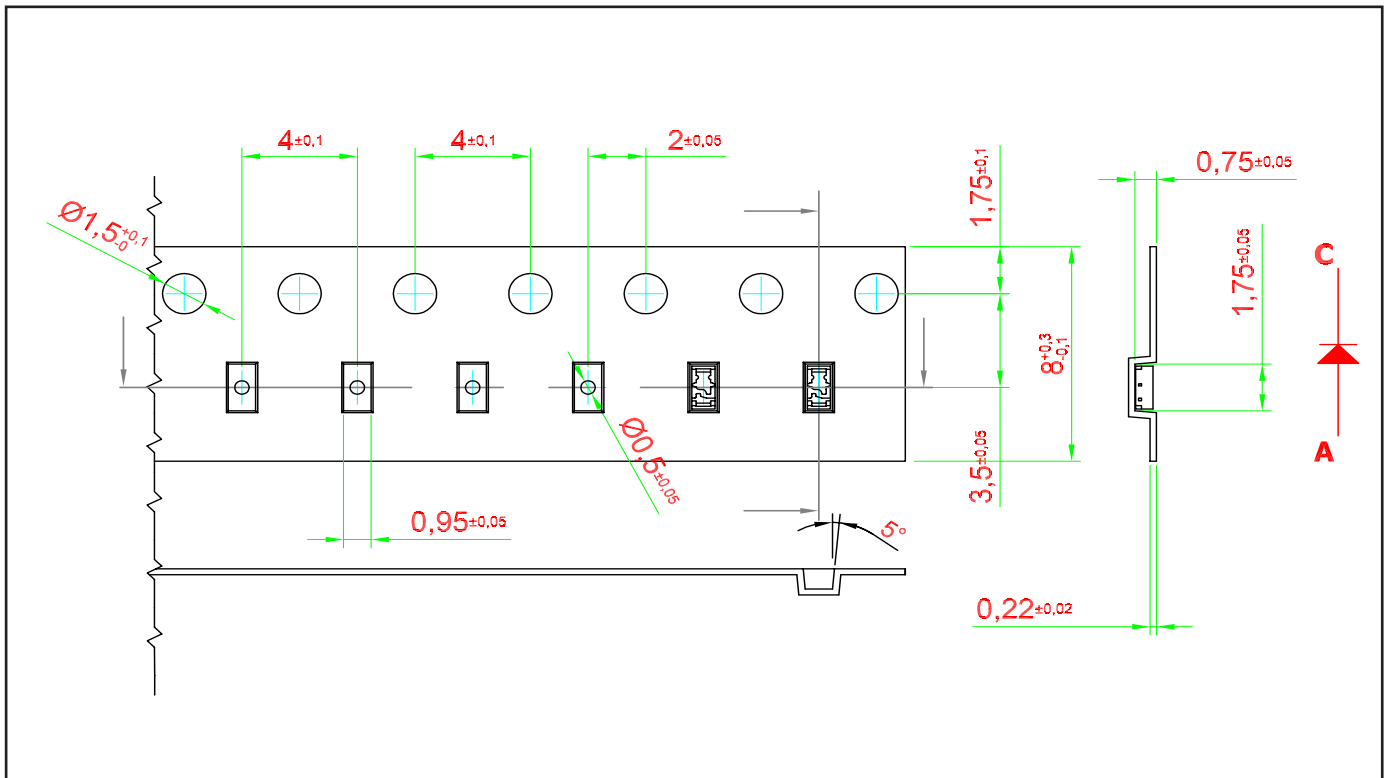
Note: Component is based on a new package platform, which features "Bottom Only Terminations". Solder joints are only formed at the bottom of the component and solder fillet will not be observable as the sides of the component.



Surface are not intended for soldering

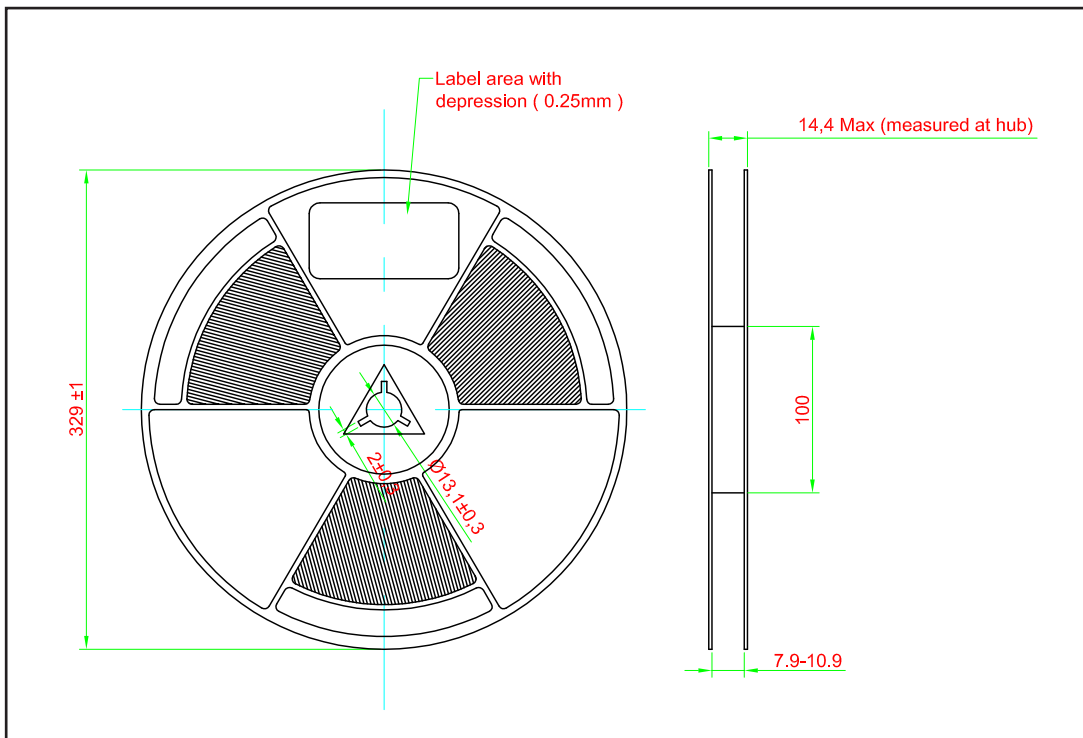
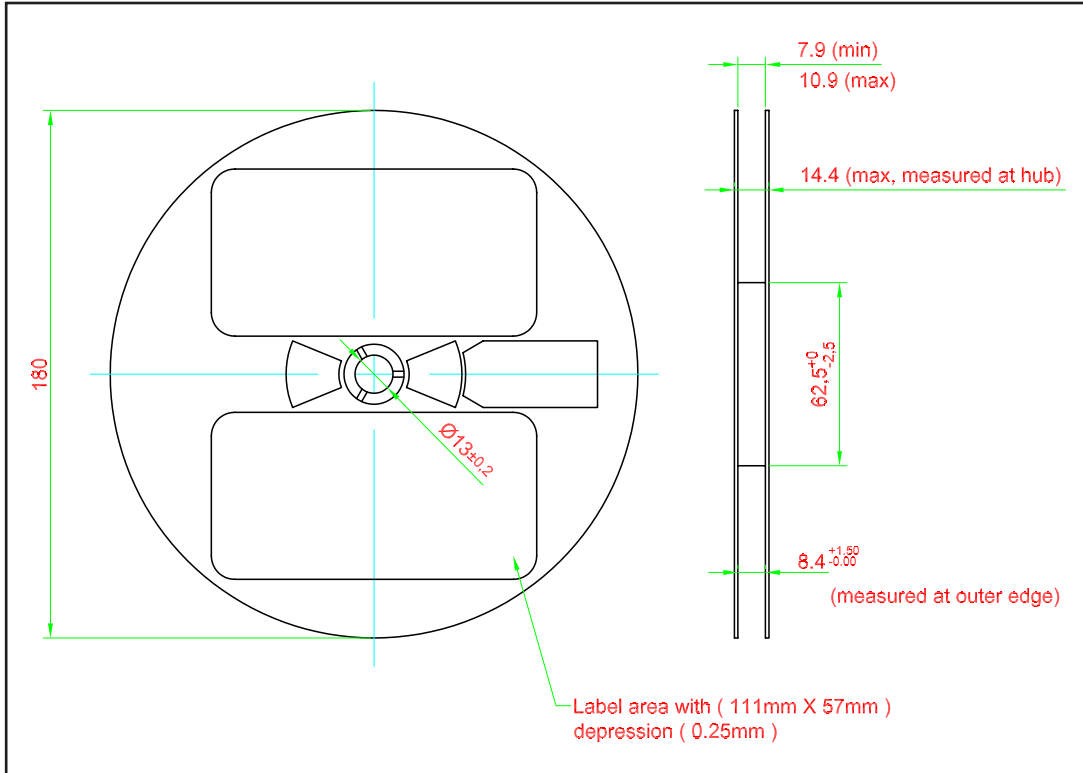
General Tolerances  
**± 0.10**

Taping and orientation





**Packaging Specification**

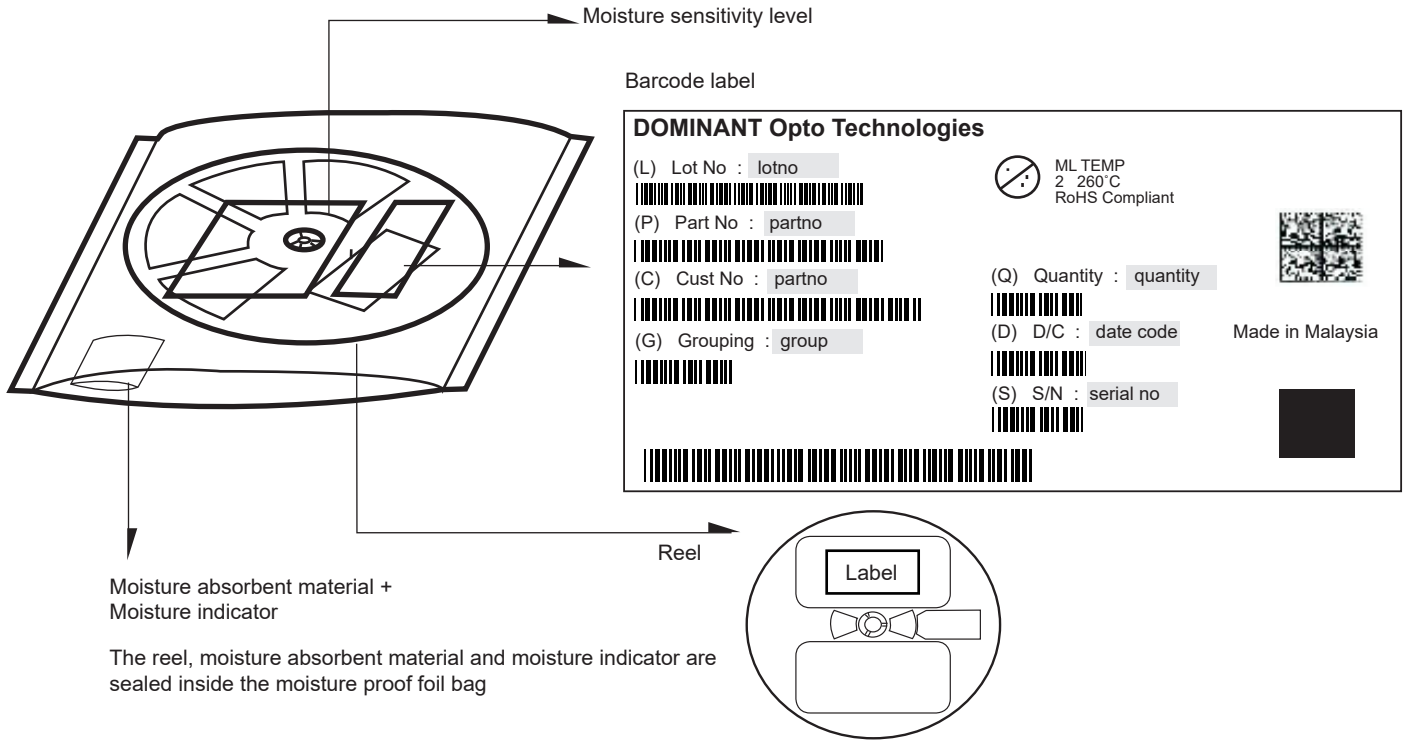


	Reel Diameter (mm)	Quantity (pcs)	*Ordering Number
Standard Packing	180	5000	SSx-CLD-xxx-x-I2
Optional Packing	329	18000	SSx-CLD-xxx-x-I2-M

Notes:

\* For ordering purpose only. Please consult sales and marketing for details.

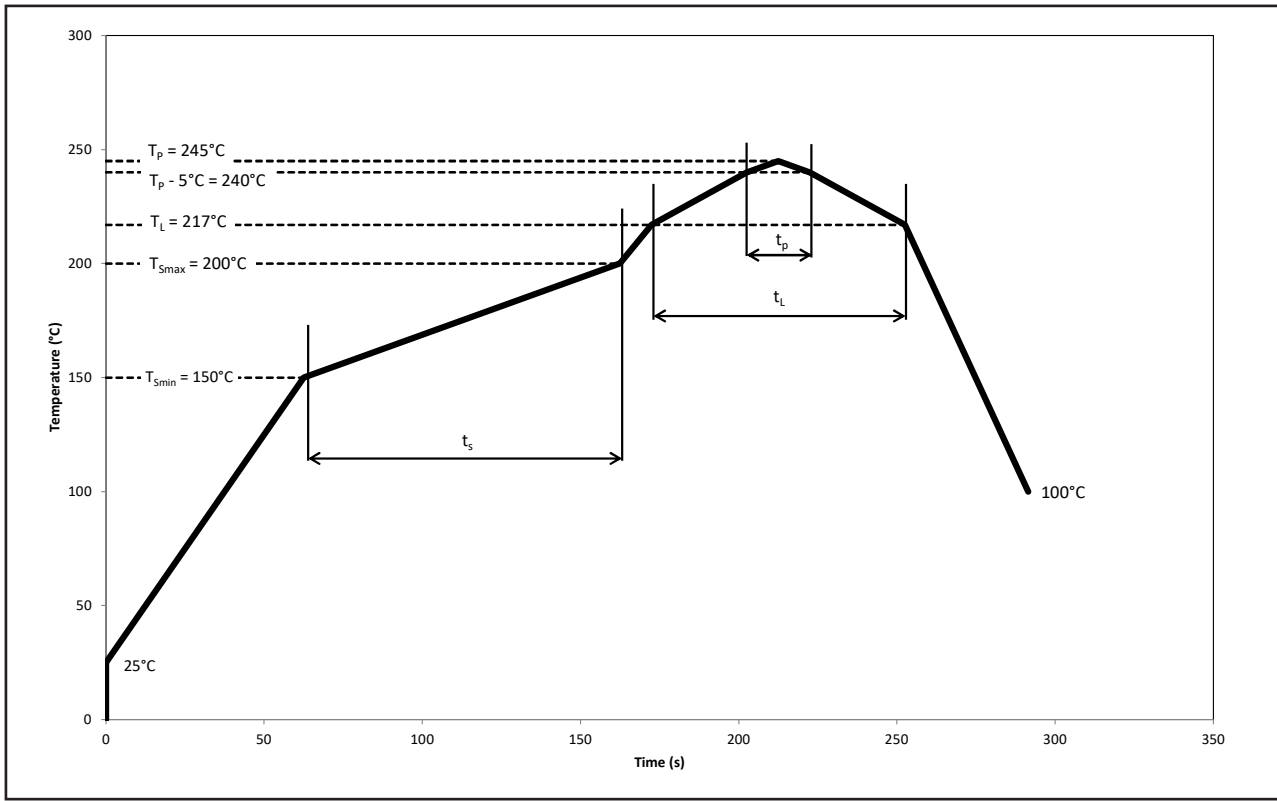
**Packaging Specification**



Quantity per bag (pcs)	Average 1pc SpiceLED (g)	1 completed bag (g)
5000	0.001	170 ± 10
18000	0.001	470 ± 10

## Recommended Pb-free Soldering Profile

Product complies to MSL Level 2 acc. to JEDEC J-STD-020E



Profile Feature	Symbol	Pb-Free Assembly			Unit
		Min.	Recommended	Max.	
Ramp-up rate to preheat 25°C to $T_{smin}$	-	-	2	3	°C/s
Time $t_s$ $T_{smin}$ to $T_{smax}$	$t_s$	60	100	120	s
Ramp-up rate to peak $T_L$ to $T_p$	-	-	2	3	°C/s
Liquidous temperature	$T_L$	-	217	-	°C
Time above liquidous temperature	$t_L$	60	80	150	s
Peak temperature	$T_p$	-	245	260	°C
Time within 5°C of the specified peak temperature $T_p - 5^\circ\text{C}$	$t_p$	10	20	30	s
Ramp-down rate $T_p$ to 100°C	-	-	3	6	°C/s
Time 25°C to $T_p$	-	-	-	480	s

## Appendix

### 1) **Brightness:**

- 1.1 Luminous intensity is measured at current pulse 25 ms(typ) with an internal reproducibility of  $\pm 8 \%$  and an expanded uncertainty of  $\pm 11 \%$  (according to GUM with a coverage factor of  $k=3$ ).
- 1.2 Luminous flux is measured at current pulse 25 ms(typ) with an internal reproducibility of  $\pm 8 \%$  and an expanded uncertainty of  $\pm 11 \%$  (according to GUM with a coverage factor of  $k=3$ ).
- 1.3 Radiant intensity is measured at current pulse 25 ms(typ) with an internal reproducibility of  $\pm 8 \%$  and an expanded uncertainty of  $\pm 11 \%$  (according to GUM with a coverage factor of  $k=3$ ).
- 1.4 Radiant flux is measured at current pulse 25 ms(typ) with an internal reproducibility of  $\pm 8 \%$  and an expanded uncertainty of  $\pm 11 \%$  (according to GUM with a coverage factor of  $k=3$ ).

### 2) **Color:**

- 2.1 Chromaticity coordinate groups are measured at current pulse 25 ms(typ) with an internal reproducibility of  $\pm 0.005$  and an expanded uncertainty of  $\pm 0.01$  (accordingly to GUM with a coverage factor of  $k=3$ ).
- 2.2 Dominant wavelength is measured at current pulse 25 ms(typ) with an internal reproducibility of  $\pm 0.5\text{nm}$  and an expanded uncertainty of  $\pm 1\text{nm}$  (accordingly to GUM with a coverage factor of  $k=3$ ).

### 3) **Voltage:**

- 3.1 Forward Voltage,  $V_f$  is measured when a current pulse of 8 ms(typ) with an internal reproducibility of  $\pm 0.05\text{V}$  and an expanded uncertainty of  $\pm 0.1\text{V}$  (accordingly to GUM with a coverage factor of  $k=3$ ).

### 4) **Typical Values:**

- 4.1 At special conditions of LED manufacturing processes, typical data or calculated correlations of technical parameters only reflect the statistical figures. But not necessarily correspond to the actual parameters of each single product, which could differ from the typical data or calculated correlations or the typical characteristic line. These typical data may change whenever technical improvements happen.

### 5) **Tolerance of Measure**

- 5.1 Unless otherwise noted in drawing, tolerances are specified with  $\pm 0.1$  and dimension are specific in mm.

### 6) **Reverse Voltage:**

- 6.1 Not designed for reverse operation. Continuous reverse voltage can cause migration and LED damage.

**Revision History**

<b>Page</b>	<b>Subjects</b>	<b>Date of Modification</b>
7	Update Carrier Tape	13 Feb 2014
3	Add Characteristics	24 Nov 2014
1, 8, 10, 12	Add Features Error on Taping and Orientation Update Package Specification Add Appendix	26 Oct 2016
1, 2, 4, 5, 9, 10, 11, 13	Add Features Update Operating Temperature Update Storage Temperature Update Graph Update Package Specification Update Appendix	20 Nov 2019
3, 11	Typo Error on Wavelength Naming Update Recommended Pb-free Soldering Profile	11 Mar 2022
9, 10	Update Quantity per Reel (180mm)	21 Feb 2023
6, 10	Update Polarity in Package Outline Update Packaging Specification	31 Jan 2024

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