



QLSP05RD
(3528 PLCC 4 LED)



Product Outline:

This is the small TOP LED with reflector type with single color led. This special package is ideal for customer's application in traffic signal and sign boards. With special binning technology, Quelighting is able to provide special binning for customer's needs

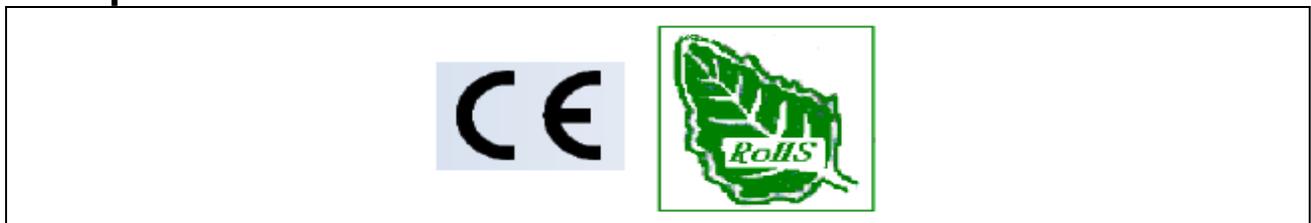
Features:

- **Red** color LED
- High brightness output @ 50mA,
- High driving current to 70mA.
- Package Dimension = 3.5mmX2.8mmX1.9mm
- MSL level 2
- RoHS compliant
- Custom Bin available upon special request
- View angel >110°
- AEC-Q101

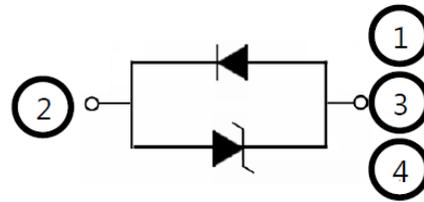
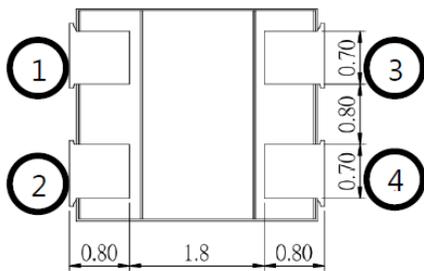
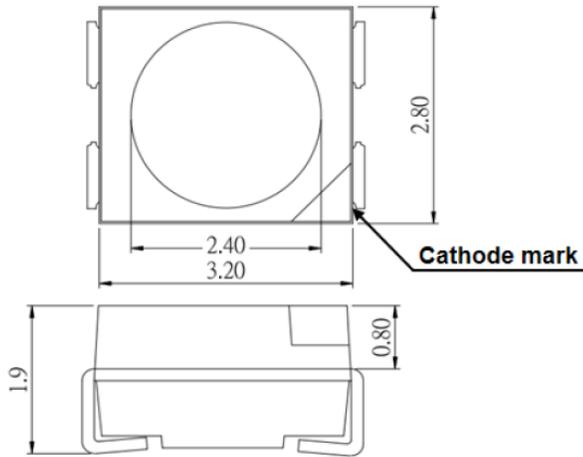
Application:

- Architecture Lighting
- Sign board backlighting
- Emergency vehicle lighting
- Traffic signal lighting
- Automotive lighting

Compliance and Certification:



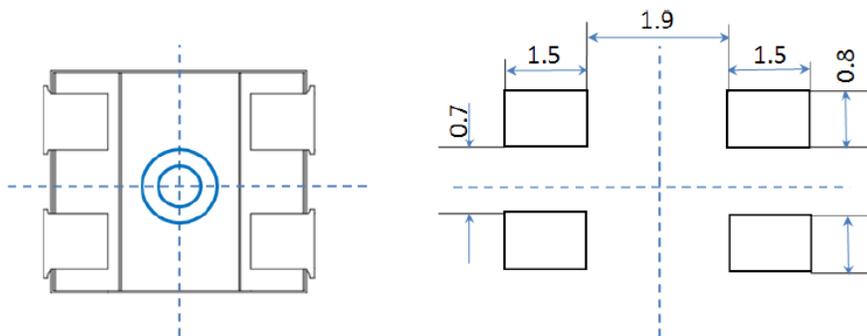
Mechanical Property: (Dimension)



Unit: mm, Tolerance: ± 0.1 mm

* All dimensions are in millimeters, * Tolerances are ± 0.10 mm.

Recommended Solder footprint:



- * All dimensions are in millimeters.
- * The LEDs is designed to be reflow soldered on to a PCB. IF dip soldered that QL cannot guarantee its reliability.
- * Reflow soldering must not be performed more than twice.



Characteristics

■ Absolute Maximum Ratings

(Ta=25°C)

| Parameter | Symbol | Rating | Unit |
|-----------------------|----------|--------------|------|
| DC Forward Current | If | 70 | mA |
| Power Dissipation | Pd | 0.12 | W |
| Pulse Forward Current | Ifp | 100 | mA |
| Storage Temperature | Tstg | -40 ~ 105 | °C |
| Operation Temperature | Topr | -30 ~ 105 | °C |
| Soldering Temperature | Tsol | 260 < 10 sec | °C |
| ESD (HBM) | ESD(HBM) | 2000 | V |

- (1) Proper current rating must be observed to maintain junction temperature below maximum at all time
 (2) IFP Condition: Duty 1/10, Pulse within 10msec

■ Electrical / Optical Characteristic

(Ta=25 oC)

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|-----------------|----------|-----------|------|------|------|------|
| Forward Voltage | Vf | 50mA | 1.9 | | 2.65 | V |
| View Angle | θ | | | 120 | | deg |

- (1) Tolerance of measurement: VF=+/- 0.1V

■ Specification

| Product | Color | Vf(V) IF=50mA | Dominant Wavelength (nm) | Luminous intensity IF=50mA (mcd) | |
|----------|-------|------------------|--------------------------------|-------------------------------------|------|
| | | | | Min. | Typ. |
| QLSP05RD | Red | 2.2 | 612~635 | 1400 | 2750 |

*Tolerance = +/- 10%



■ Groups

Dominate Wavelength (nm) Bin:

| Wd Rank (nm) @ 50mA | | | | Condition |
|---------------------|-----------|-----|------|-----------|
| Color | Code name | Low | High | Unit |
| Red | A1000 | 612 | 616 | nm |
| | A2000 | 616 | 620 | |
| | A3000 | 620 | 624 | |
| | A4000 | 624 | 630 | |
| | A5000 | 630 | 635 | |

Measurement tolerance is +/- 1nm

Forward Voltage (V_F) Bin:

| VF Rank (V) @ 50mA | | | | Condition |
|--------------------|-----------|------|------|-----------|
| Color | Code name | Low | High | unit |
| Red | A | 1.9 | 2.05 | V |
| | B | 2.05 | 2.2 | |
| | C | 2.2 | 2.35 | |
| | D | 2.35 | 2.5 | |
| | E | 2.5 | 2.65 | |

The forward voltage tolerance is $\pm 0.1V$

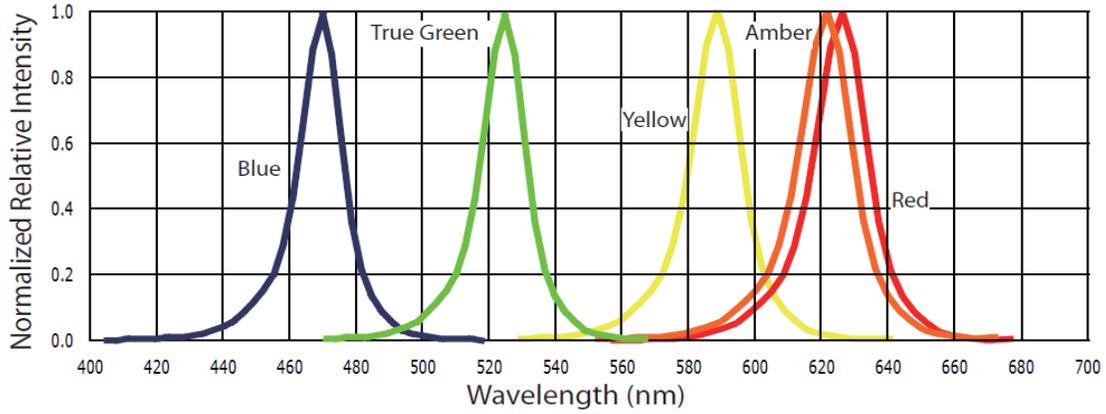
Luminous Intensity Bin:

| Intensity Rank (mcd) @ 50mA | | | |
|-----------------------------|------|------|-------|
| Code name | Min. | Max. | Units |
| S1 | 1400 | 1800 | mcd |
| S2 | 1800 | 2240 | |
| S3 | 2240 | 2800 | |
| S4 | 2800 | 3550 | |

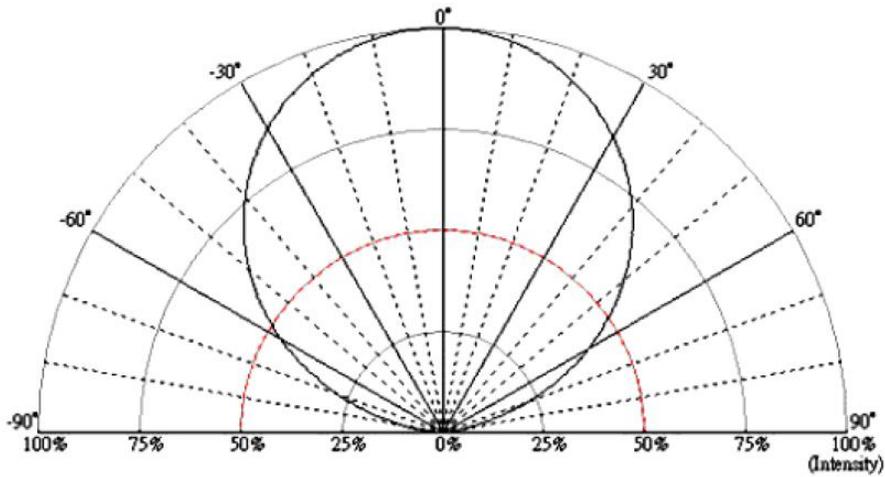
Luminous intensity tolerance is $\pm 7\%$



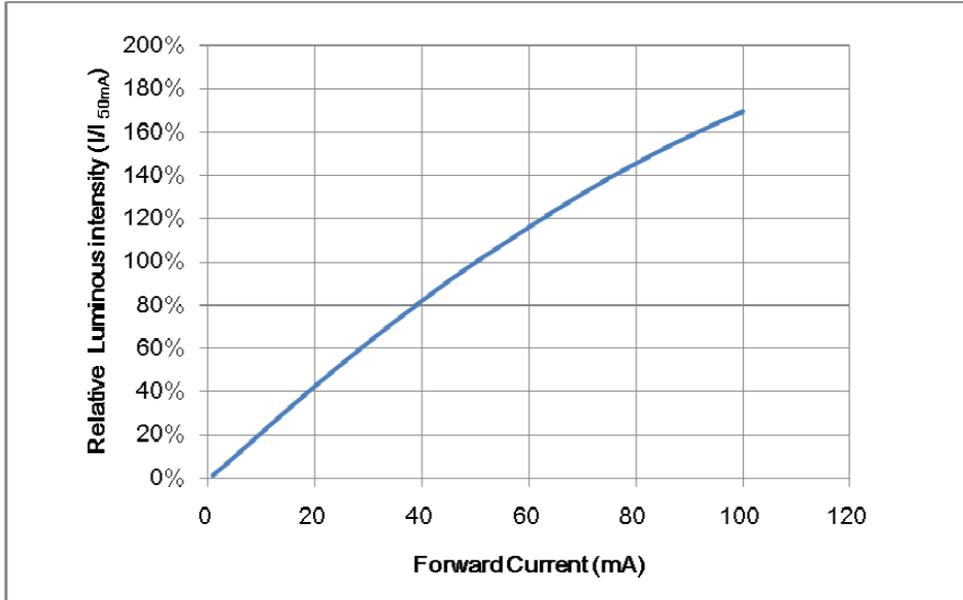
■ Characteristic Curves (1) Color Spectrum



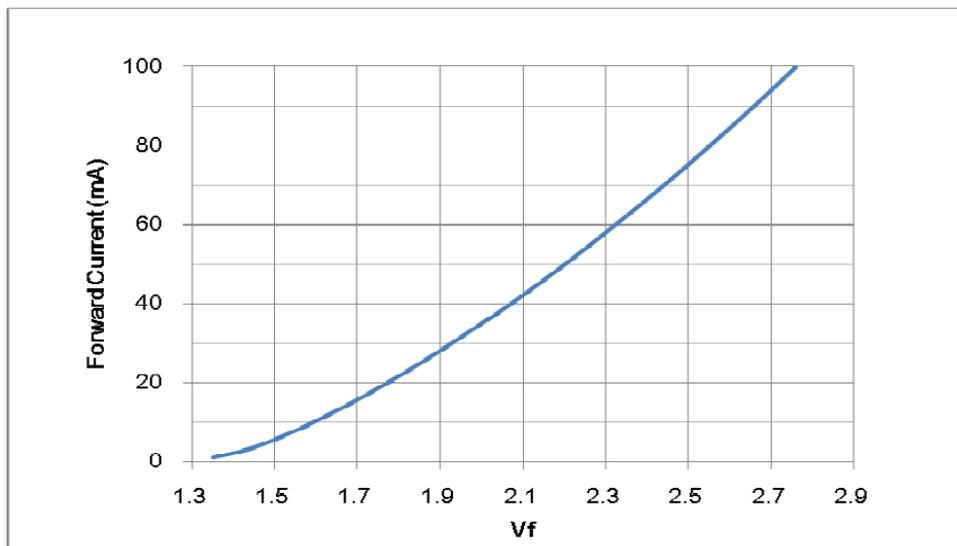
(2). Typical Representative Spatial Radiation Pattern



(3). Forward Current Characteristics



(4). Forward Current vs Forward Voltage



■ Reliability test:

| No | Item | Condition | Time/Cycle | Sample size |
|----|--|---|------------|-------------|
| 1 | Steady State Operating Life of Room Temperature | 25°C Operating | 1000 Hrs | 20 pcs |
| 2 | Steady State Operating Life of Low Temperature -40°C | -40°C Operating | 1000 Hrs | 20 pcs |
| 3 | Steady State Operating Life of Low Temperature 60°C | 60°C Operating | 1000 Hrs | 20 pcs |
| 4 | Steady State Operating Life of Low Temperature 85°C | 85°C Operating | 1000 Hrs | 20 pcs |
| 5 | Low temperature storage -40°C | -40°C Storage | 1000 Hrs | 20 pcs |
| 6 | High temperature storage 100°C | 100°C Storage | 1000 Hrs | 20 pcs |
| 7 | Steady State Operating Life of High Humidity Heat 60°C 90% | 60°C/90% Operating | 1000 Hrs | 20 pcs |
| 8 | Steady State Pulse Operating Life Condition | 25°C 10Hz duty=1/10 Operating | 200 Cycle | 20 pcs |
| 9 | Resistance to soldering heat on PCB (JEDEC MSL3) | pre-store@60°C, 60%RH for 52hrs T _{sld} max.=260 10sec | 3 Times | 20 pcs |
| 10 | Heat Cycle Test (JEDEC MRC) | 25°C~65°C~-10°C, 90%RH, 24hr/1cycle | 10 Cycle | 20 pcs |
| 11 | Thermal shock | -40°C/ 20minr~ 5minr~100°C /20min | 300 Cycle | 20 pcs |

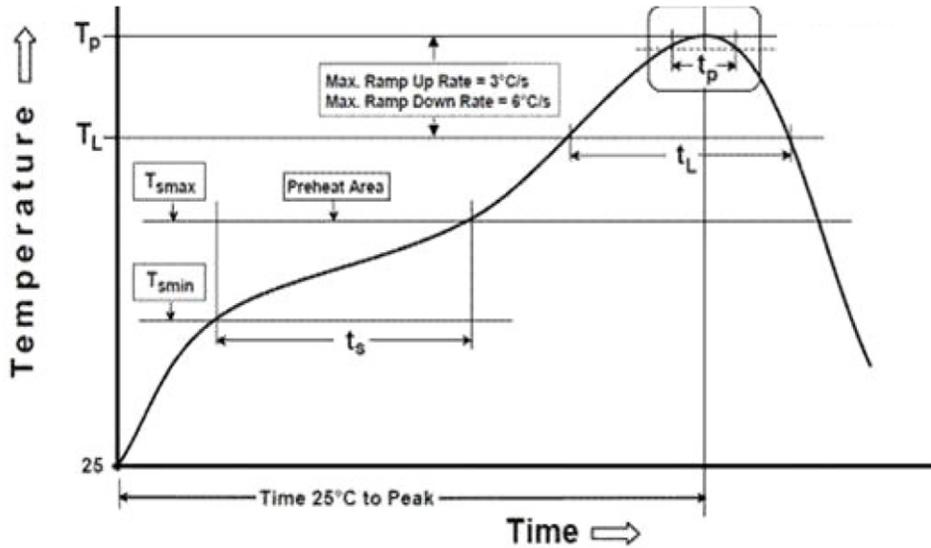
■ Judgment Criteria:

| Item | Symbol | Test Condition | Judgment Criteria |
|-----------------|----------------|----------------|-----------------------|
| Forward Voltage | V _f | 20 mA | ΔV _f < 10% |
| Luminous Flux | I _v | 20 mA | ΔI _v < 30% |



■ **Solder Profile:**

-The recommended reflow soldering profile is as follows (temperatures indicated are as measured on the surface of the LED resin):

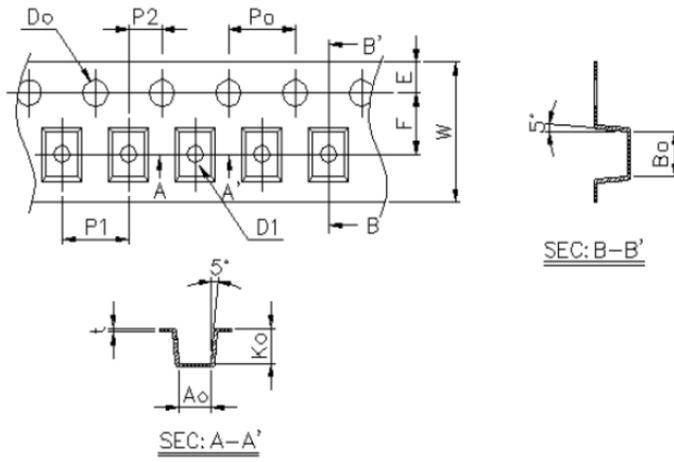


| Profile Feature | Sn-Pb Eutectic Assembly | Pb-Free Assembly |
|--|-------------------------|------------------|
| Temperature Min(T_{smin}) | 100°C | 150°C |
| Temperature Max(T_{smax}) | 150°C | 200°C |
| Time(t_a) from (T_{smin} to T_{smax}) | 60-120 seconds | 60-120 seconds |
| Ramp-up rate(T_L to T_p) | 3°C/second max. | 3°C/second max. |
| Liquidous Temperature(T_L) | 183°C | 217°C |
| Time(t_L) maintained above T_L | 60-150 seconds | 60-150 seconds |
| Peak package body temperature(T_p) | 235°C | 260°C |
| Time within 5°C of Actual Peak temperature (t_p) | 20seconds* | 30 seconds* |
| Ramp-down rate(T_p to T_L) | 6°C/second max. | 6°C/second max. |
| Time 25°C to peak temperature | 6 minutes max. | 8 minutes max. |

* Tolerance for peak profile temperature (T_p) is defined as a supplier minimum and a user maximum.



■ Taping & Packing:

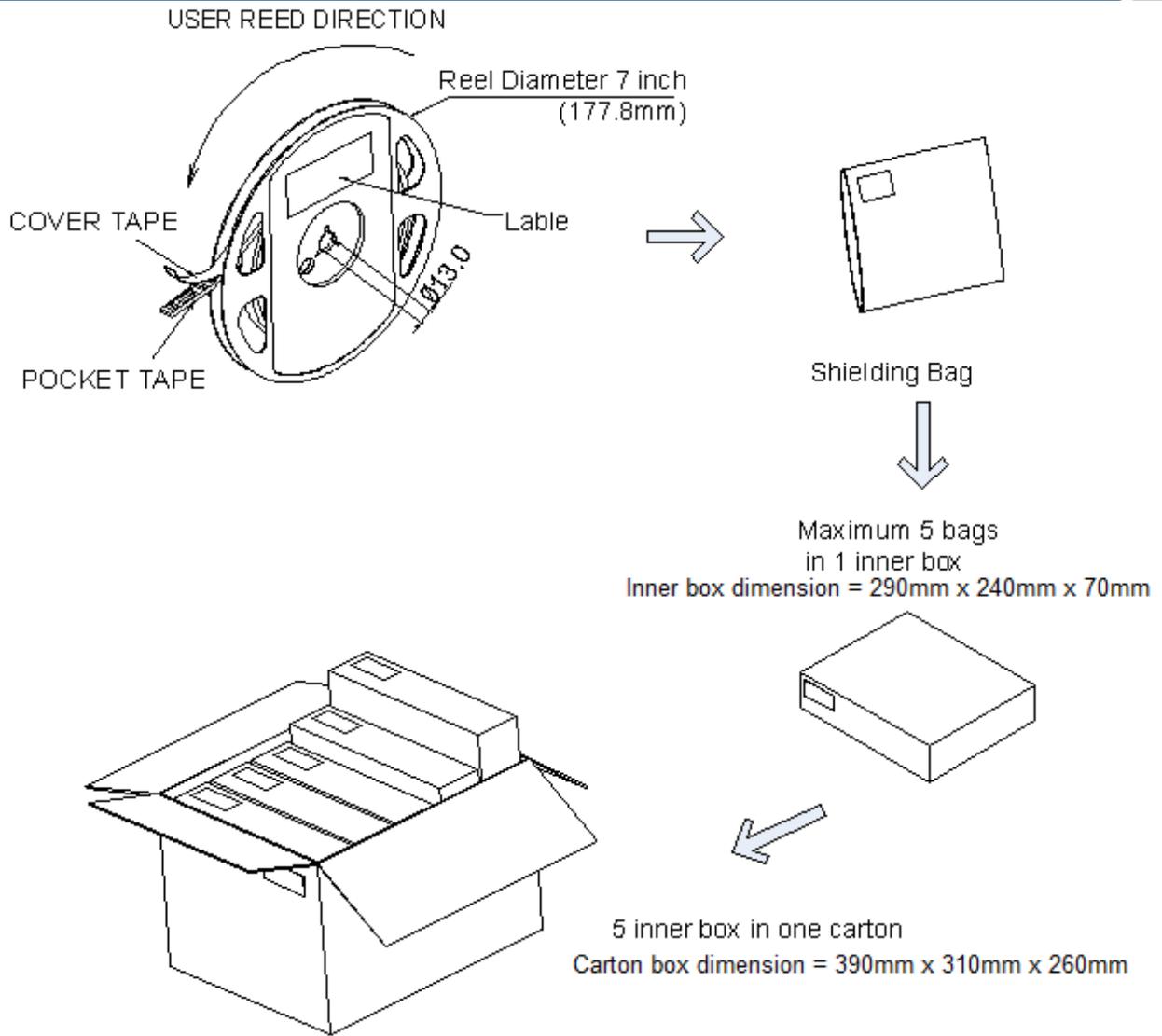


| Item | Specification | Tol. (+/-) |
|---------|---------------|------------|
| W | 8.00 | ± 0.20 |
| E | 1.75 | ± 0.10 |
| F | 3.50 | ± 0.05 |
| D0 | 1.50 | +0.10, -0 |
| D1 | 1.00 | ± 0.10 |
| P0 | 4.00 | ± 0.05 |
| P1 | 4.00 | ± 0.10 |
| P2 | 2.00 | ± 0.05 |
| P0 x 10 | 40.00 | ± 0.20 |

| | | |
|----|-------------|--------|
| t | 0.25 | ± 0.05 |
| A0 | 3.00 | ± 0.10 |
| B0 | 3.73 | ± 0.10 |
| K0 | 2.12 | ± 0.10 |
| A1 | | |
| B1 | | |
| K1 | | |
| | | |
| | | |

Unit : mm





■ Labeling



■ Ordering Information:

| Part # | Multiple Quantities | Quantity per Reel |
|-----------------|---------------------|---------------------|
| QLSP05RD PLCC 4 | | 500, 1000, 2000 pcs |
| | | |
| | | |
| | | |



■ **Revision History:**

| Revision Date: | Changes: | Version #: |
|-----------------------|-----------------|-------------------|
| 07-04-2020 | Initial release | 1.0 |
| | | |
| | | |
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