P2X-X-X LED
APPLICATION NOTE

This application note is for P2 series products: P2X-X-X

This application note describes the handling, measurement, and testing methods for P2-X-A LED products.

Table of Content

RoHS Compliant

SemiLEDs Corporation
http://www.semileds.com
sales@semileds.com

Recommended Solder Pad Design

The heat sink of the P2-X-A LED is positive polarity. Don't connect it to the cathode lead.

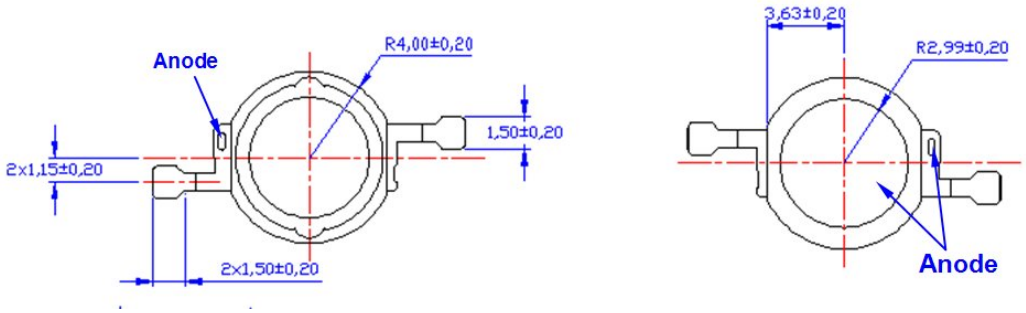


Figure 1. The Lead Polarity of the P2 LED

The heat sink of the P2-X-A should be isolated from the metal substrate of the MCPCB. The recommend solder pad design can be found below in Figure 2A:

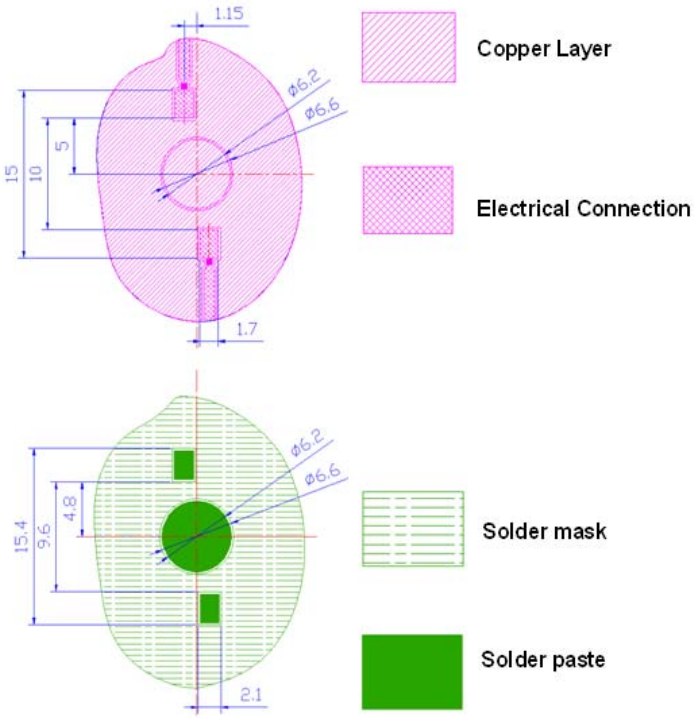


Figure2A. Recommended Solder Pad Design

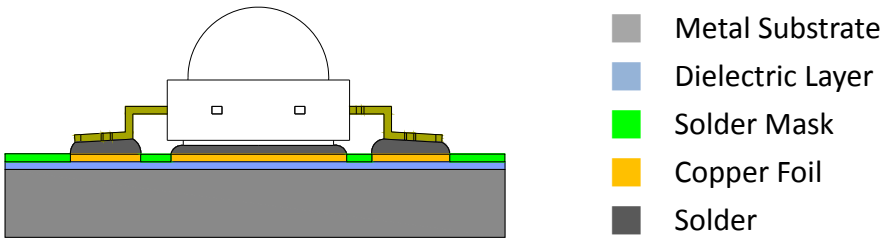


Figure 2B. Cross Section of MCPCB with P2

Cleaning and Storage

Cleaning P2-X-A LEDs

1. Keeping the lens of the P2 clean is very important. Excessive dust may cause a dramatic decrease in optical output.
2. If an emitter requires cleaning, first try a gentle swabbing with a lint-free swab.
3. If needed, the gentle use of a lint-free swab and isopropyl alcohol can remove dirt from the lens.
4. Don't press or screw the lens.

Storage of P2-X-A LEDs

Please store P2-X-A LEDs in a dry box. The recommended storage conditions are: 5~30℃，RH<50%。

After opening the package:

1. The LEDs should be soldered within one day.
2. If unused LEDs remain, they should be stored in moisture proof packages or in a dry box. The storage conditions are: 5~40℃，RH<30%。
3. If unused LEDs are stored for more than one week, baking treatment should be performed with the following conditions:
   Baking condition: more than 4 hours at 60±5℃

Handling

Recommended handling

P2 Emitter is a SMT type device and is strongly recommended to do the pick and place onto the PCB by auto-machines. The material of pickup head is better to be plastic or silicone to avoid damage the emitters during pick and place.

●Recommended pickup head dimensions

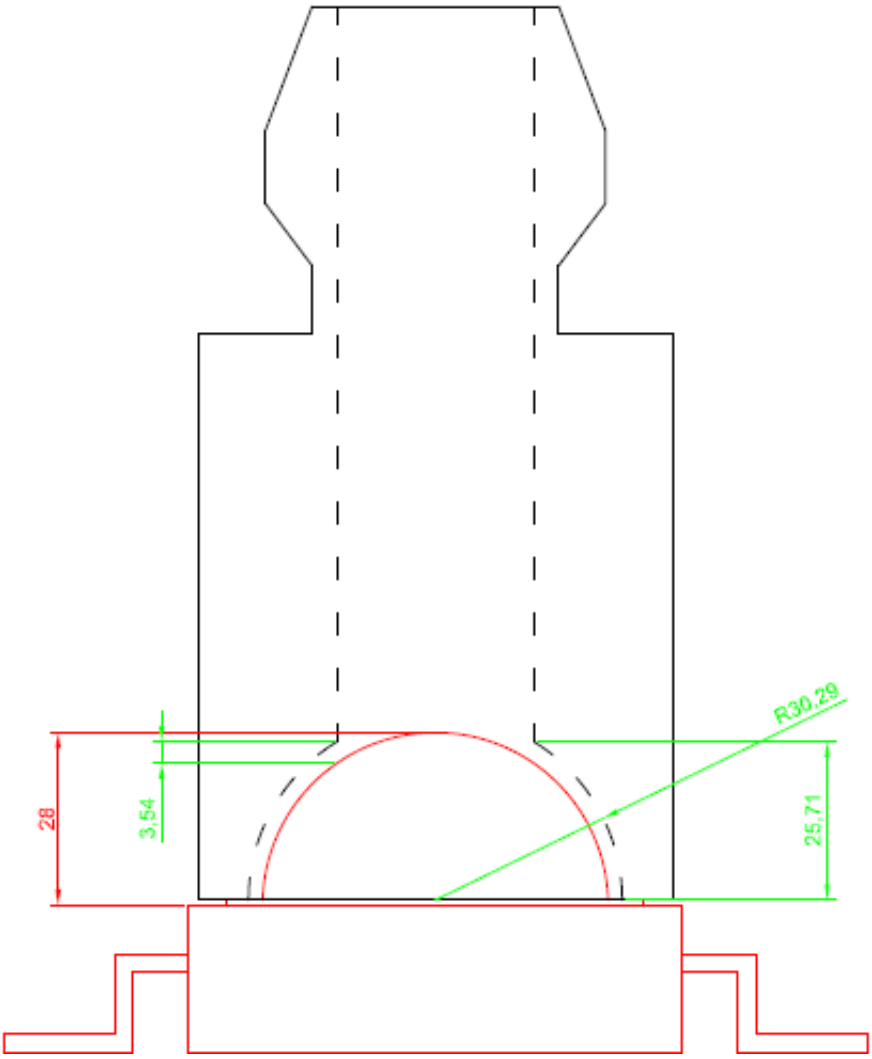


Figure 3. Recommended pickup tooling dimensions

Pick up the LED by gripping the white plastic body (as shown in Figure 3A). Avoid pressing or puncturing the silicone lens. When stress is applied on the silicone lens, it may damage optical properties and the wire bond.

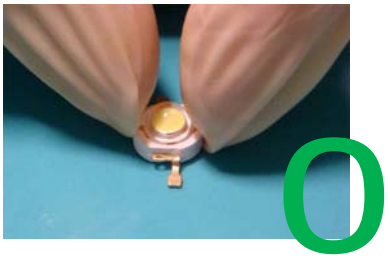


Figure 4A. Grip the white plastic body

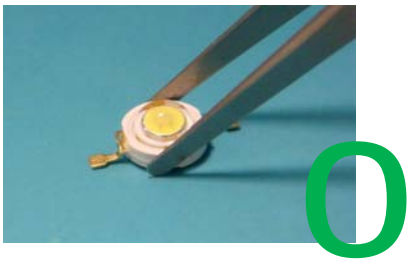


Figure 4B. Grip the white plastic body with tweezers

When manually mounting the P2-X-A LED onto the MCPCB, gently press the white plastic body or the lead.

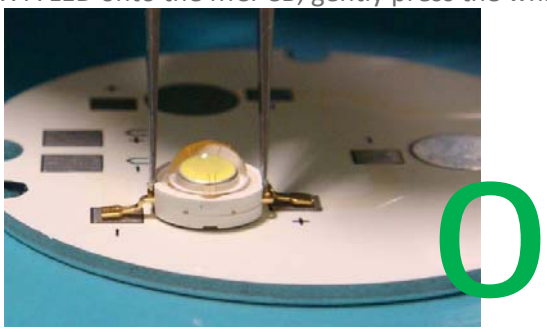


Figure 5. Grip the white plastic body and press the lead with tweezers

Mishandling

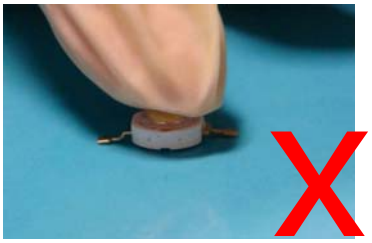


Figure 6A. Press on the lens

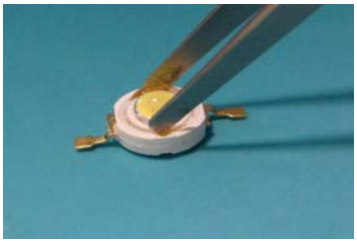


Figure 6B. Grip the lens

Avoid striking the lens of the LEDs with tools used in the assembly process. This may damage the emitters.

Figure 7. The screw driver strikes the LED

Assembly Storage and Handling

Recommendations

Do not stack PCBs or assemblies containing P2 emitters.

Figure 8. Correct Storage Method

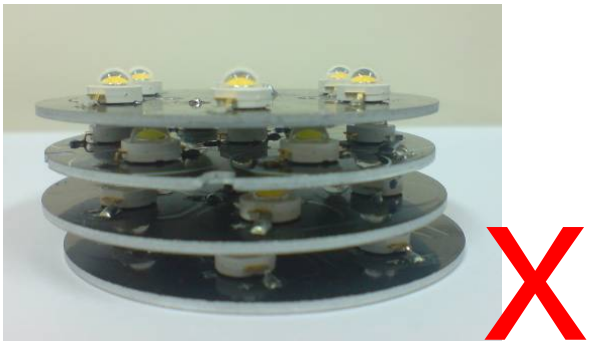
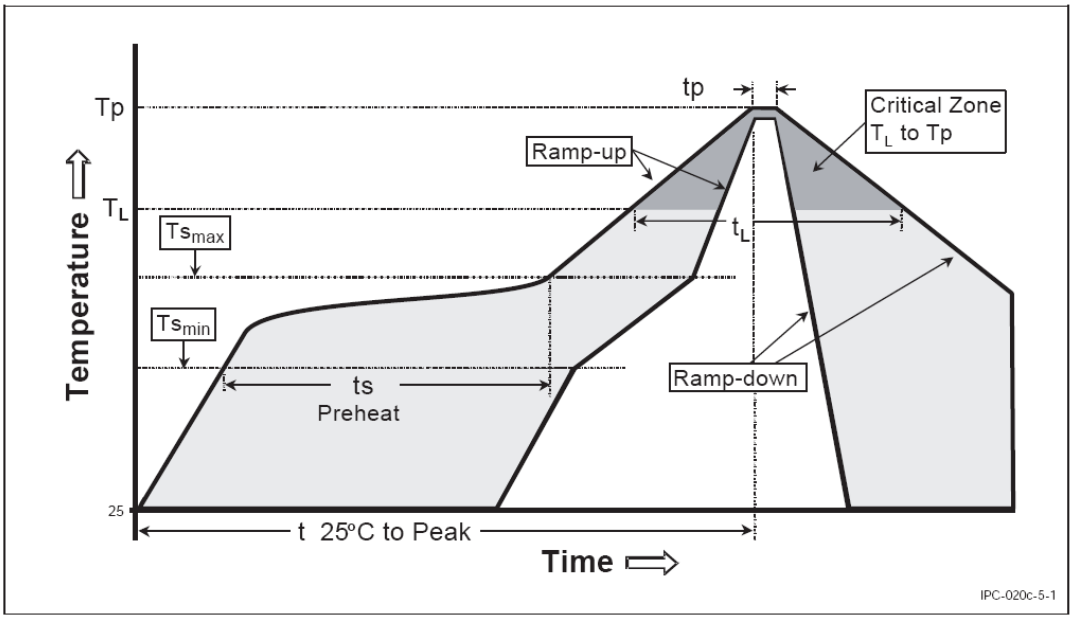


Figure 9. Incorrect Storage Method: Stacking the PCB with P2 LEDs.

Recommended Soldering Profile

The LEDs can be soldered using the parameter listed below. As a general guideline, the users are suggested to follow the recommended soldering profile provided by the manufacturer of the solder paste. Although the recommended soldering conditions are specified in the list, reflow soldering at the lowest possible temperature is preferred for the LEDs.



Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average Ramp-up Rate (Ts_{max} to Tp)	3℃/second max.	3℃/second max.
Preheat - Temperature Min(Ts_{min}) - Temperature Max(Ts_{max}) - Time(ts_{min} to ts_{max})	 100℃ 150℃ 60-120 seconds	 150℃ 200℃ 60-180 seconds
Time maintained above: - Temperature(T_L) - Time(t_L)	 183℃ 60-150 seconds	 217℃ 60-150 seconds
Peak/classification Temperature(Tp)	215℃	240℃
Time within 5℃ of actual Peak Temperature(tp)	10-30 seconds	20-40 seconds
Ramp-Down Rate	6℃/second max.	6℃/second max.
Time 25℃ to Peak Temperature	6 minutes max.	8 minutes max.

Light Up Test

1. When using a power supply to light up the LEDs, the voltage should be limited. The voltage can't exceed 4V for each LED. When the voltage is 4V, the current will be in excess of 1500mA. This will damage the emitter.
   Example：If there is a module with 3 LEDs in series, the maximum voltage of the power supply should be lower than 12V.

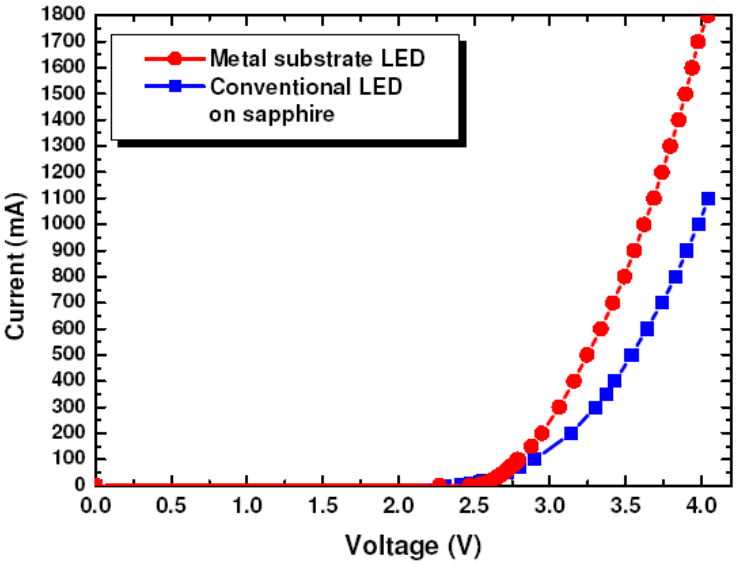
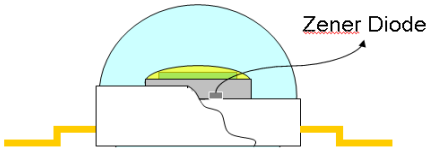


Figure 10. The I-V Curve Comparing Metal Substrate LEDs and Conventional LEDs

2. Check the polarity of the emitter. Applied reverse voltage and current may damage the emitter.



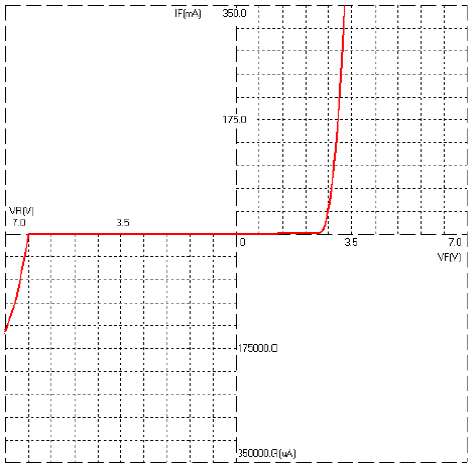


Figure 11.P2 LEDI-V curve

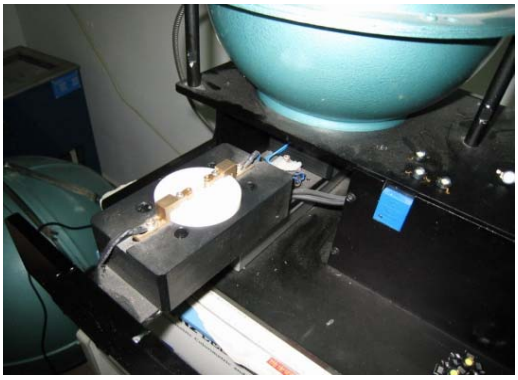
3. If using a constant current limited voltage driver to light up the LED module, please connect the power supply and the LED module before plugging the power supply into the AC power cord. This can reduce the probability of surge current damaging the LED modules.

Measurement and Calibration

There are two causes which can result in LED measurement errors.

Types of Integrated Sphere

In non-standard LED measurements, the emitter is measured at the bottom and not the inside of the integrated sphere. Part of the light emitting from the LED transmits into the integrated sphere from the bottom glass window. The light pattern of the emitter affects the measurement results. There is a huge measurement error when the tester is not calibrated with the correct golden samples.



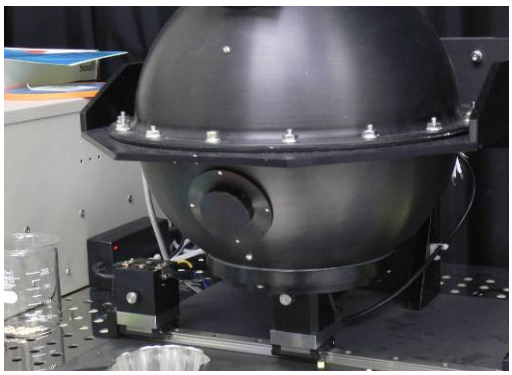


Figure 12: Non-standard LED Measurement

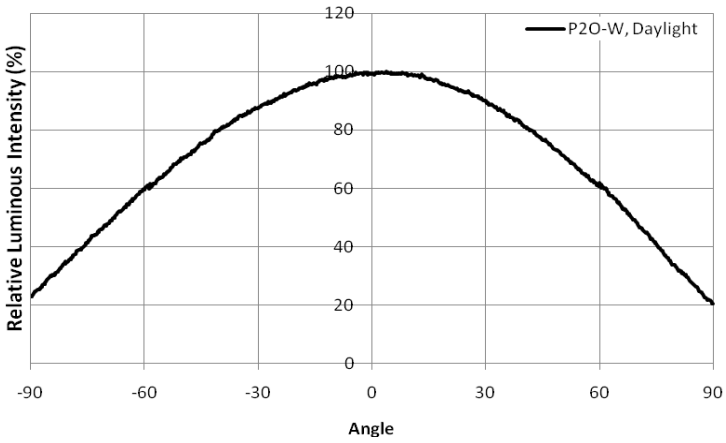
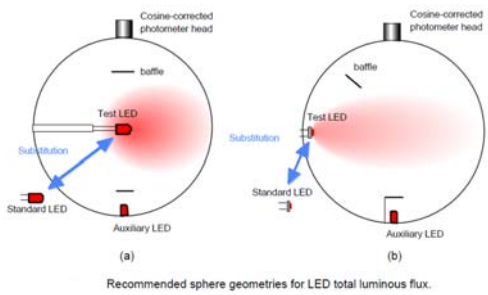


Figure 13A: P2O Light Pattern

Recommended LED measurement.



Recommended sphere geometries for LED total luminous flux.

Integration Time

A long integration time will induce thermal issues in LED measurements. Figure 14 shows the plot of Tj vs. Relative Intensity. If the integration time is 1 sec, the Tj may reach 50℃, which results in the light output dropping 5%. It is recommended that the integration time is shorter than 25ms in high power LED measurements.

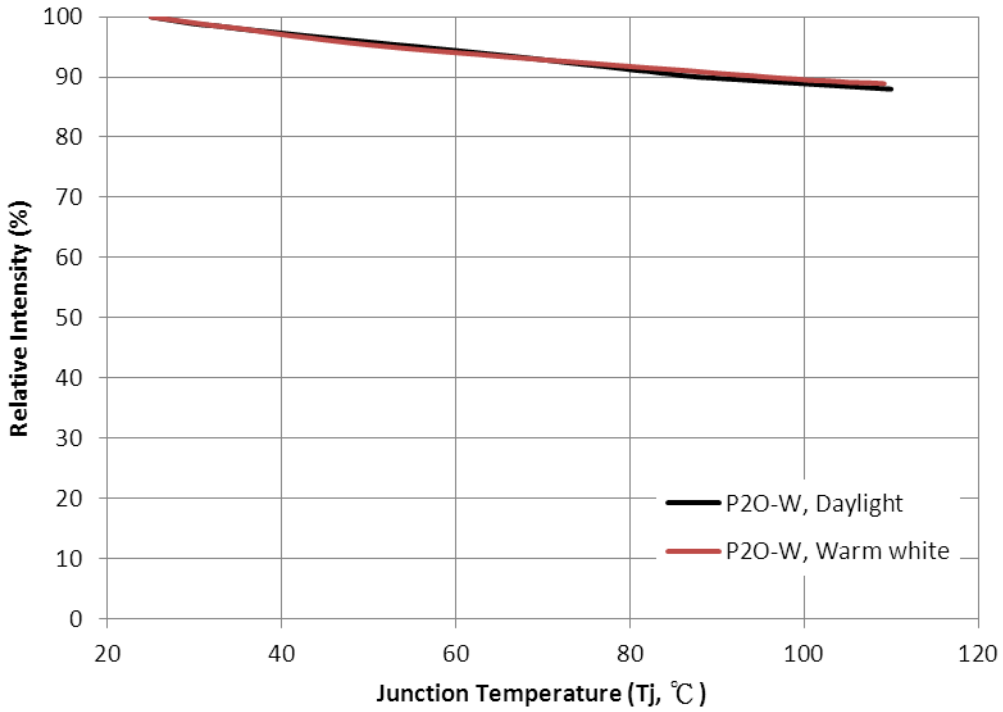


Figure 14: Tj vs. Relative Intensity

Recommended Method

1. Use measurement instruments which follow CIE 127 standards. The integration time should be shorter than 15ms.
2. If the operator uses non-standard testers, calibrate the tester with the golden sample before measurement. The golden sample should be measured by the instrument following CIE 127 standards (Example: IS CAS 140B).

About Us

SemiLEDs Corporation is a US based manufacturer of ultra-high brightness LED chips with state of the art fabrication facilities in Hsinchu Science Park, Taiwan. SemiLEDs specializes in the development and manufacturing of vertical LED chips in blue (white), green, and UV using a patented copper alloy base. This unique design allows for higher performance and longer lumen maintenance. In December 2008, The World Economic Forum recognized SemiLEDs innovations with the 2009 Technology Pioneer Award. SemiLEDs is fully ISO 9001:2008 Certified

SemiLEDs is a publicly traded company on NASDAQ Global Select Market (stock symbol "LEDS"). For investor information, please contact us at **investors@semileds.com.**

For further company or product information, please visit us at **www.semileds.com** or please contact **sales@ semileds.com.**

www.semileds.com

ASIA PACIFIC
3F, No. 11, KeJung Rd.
Chu-Nan Site
Hsinchu Science Park
Chu-Nan 350, Miao-Li County
Taiwan, ROC

Tel: +886-37-586788
Fax: +886-37-582688
sales@semileds.com