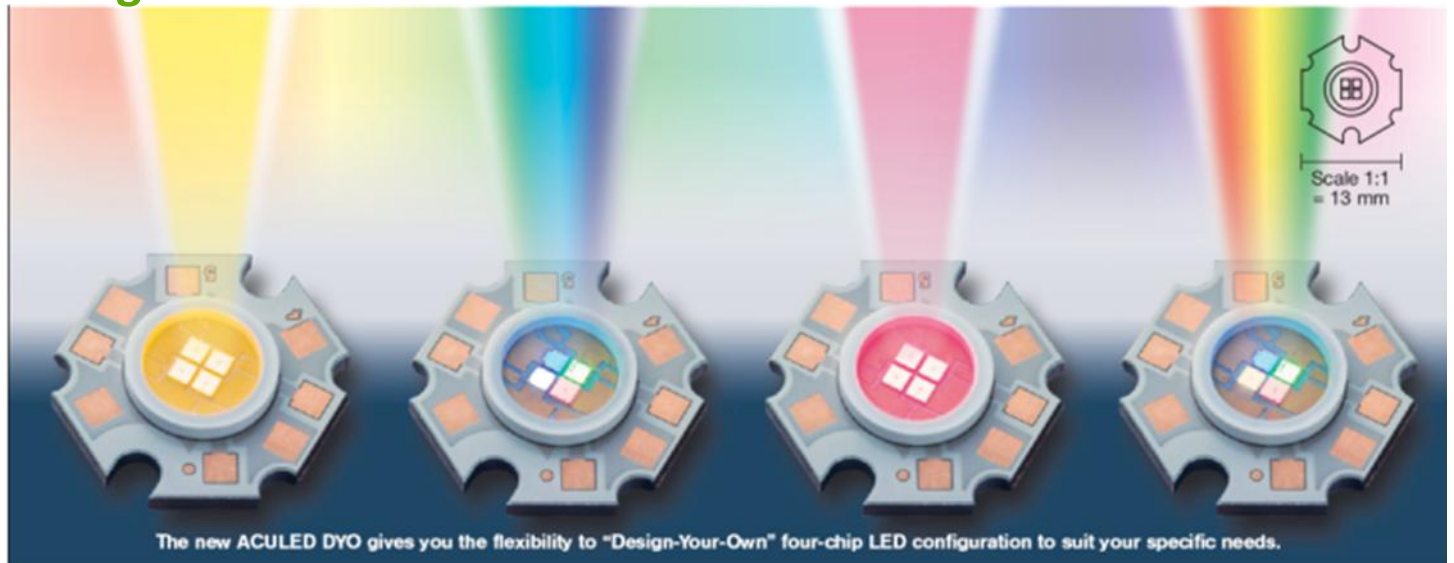


ACULED® DYO™

Design-Your-Own Guide



Overview

Excelitas' ACULED® DYO™ gives customers the flexibility to “Design-Your-Own” four-chip LED configuration to best suit specific lighting application needs. This custom design capability provides customers with a full range of custom LED solutions based on the ACULED platform.

The close placement of the chips (less than 200 μm) is ideal for optical designs where colour mixing is required. Due to the very low height between the chips and exit plane, it is easy to couple light into light guides or other optical elements. Whether four identical or four different chips are used, ACULED provides space-saving, helps reduce the size of your optics and protects you from routine off-the-shelf LED package obsolescence by creating your own part number.

ACULED helps saving total cost of ownership by:

- Easier obsolescence management
- Less components
- Efficient direct cooling on heat sink
- Compact size
- Excelitas technical support with application engineering

This Custom Design Guide explains how you can “Design-Your-Own” ACULED utilizing a list of chip options provided by Excelitas. The ACULED DYO product line gives you the flexibility to not only customize your own chip configuration, but also the encapsulation.

Key Features

- Design your own combination of 4 chips NUV, color, NIR and white
- Separate anode and cathode for each color and pad
- Perfect choice for color tuning
- 4-chip design with independent control of the drive current for each chip
- Good color mixing
- Excellent thermal properties, advantageous for high-performance applications
- Near-Lambertian emission
- Available with flat or dome encapsulation
- RoHS-compliant

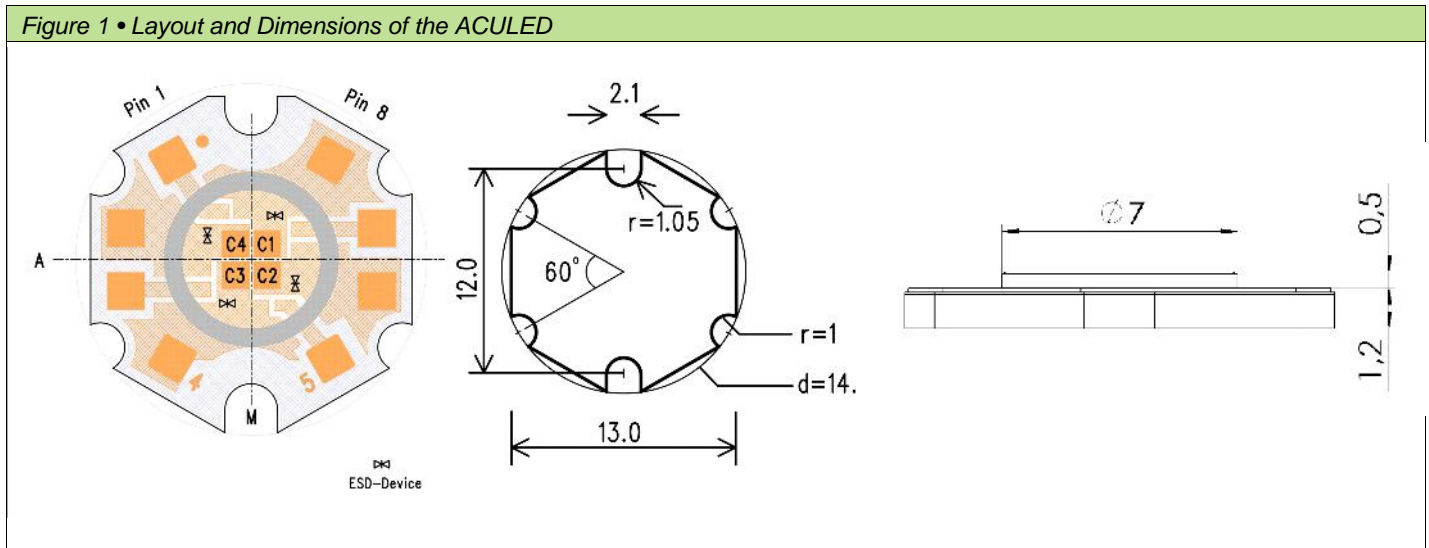
Applications

- Medical lighting (surgical, dental, examination lamps)
- Analytical light sources
- Vision systems
- Back lighting
- Entertainment lighting
- Retrofit

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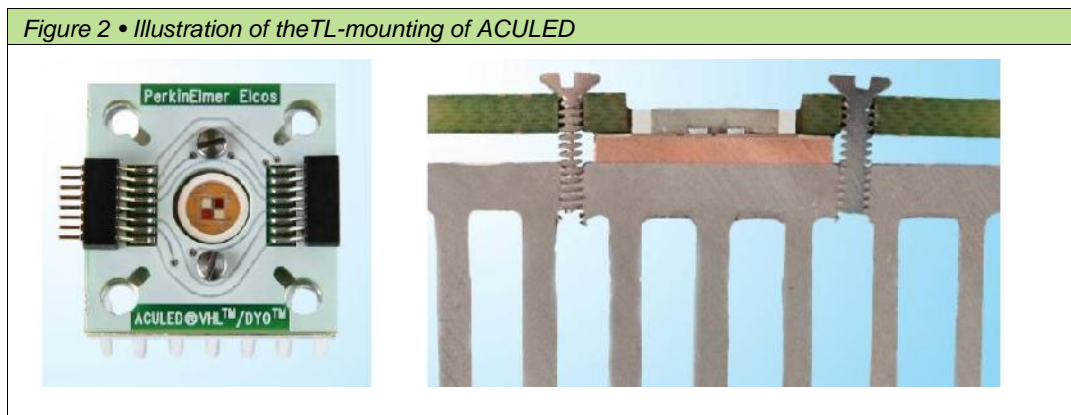
The ACULED Design Platform

The ACULED board is based on an Insulated Metal Core Substrate (IMS), also known as Metal Core PCB, to provide low thermal resistance. This package provides excellent heat dissipation and thermal management from the chip to the board's backside. The whole package has a low thermal resistance. Nevertheless, adequate cooling must always be provided to the ACULED, to avoid overheating of LED chips, even at low currents. Please refer to the application note "Thermal Management of the ACULED" for more information about this issue. Figure **Error! Reference source not found.** shows the principle layout of the ACULED.



The chips are placed in the middle of the board, protected by a ceramic ring and silicone rubber encapsulation. The latter is transparent and suitable for high power chips and a wide range of radiation from ultraviolet (UV) to infrared (IR). Due to its softness, pressure to the silicone area within the ring has to be avoided. Please refer to the application note "Handling of LED and Sensor Products Encapsulated by Silicone Resin" to learn more about handling silicone-based products like the ACULED.

The ACULED DYO is recommended to be mounted by TL (Through Looking)-Mounting. Figure 2 illustrates the TL-mounting principle, which has the advantage of directly cooling the LED without additional thermal barriers.



Please refer to the application note "Mounting of the ACULED" for more information concerning TL-Mounting.

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Maximum Rating and Available Configurations

For information on available chips, please refer to tables 2 and 3. For general information, please refer to Table 1 below:

Table 1. Absolute Maximum Ratings of Complete ACULED

Parameter	Symbol	Unit	Maximum rating
Max. drive current per chip	I_F	mA	700 (*)
Max. total power per ACULED	P_{max}	W	10
Operating temperature	T_{OP}	°C	- 20 to +85(**)
Storage temperature	T_{st}	°C	- 40 to +100
ESD sensitivity		kV	2

(*) for most chips - some exceptions with higher current (1000 mA) available

(**) Never exceed max. allowed junction temperature of LED (typically 125°C - exceptions possible, please refer to separate datasheet)

Table 2 - Non-white Options

Color designation	Abbreviation	Dominant wavelength (nm)	Peak wavelength (nm)	Typical optical power in mW (@350 mW)	Comments (6)
UV	U	-	390-410	850	(1),(5)
Deep Blue	D	445-455		525	(1)
Blue	B	455-470		525	(1)
Cyan	C	490-515		220	(1)
Green	G	515-540		220	(1), (2),(5)
Yellow	Y	585-605		55	(1), (2)
Amber	A	605-620		200	(1)
Red	R	615-635		250	(1)
Far Red	F	-	650-750	250	(1)
Infrared 1	I	-	830-880	250	(3)
Infrared 2	J	-	930-1050	200	(4)

Remarks:

- (1) Typically, available in a bin of 5 nm width
- (2) Also available as “phosphor” converted version, please inquire
- (3) Typical power @ 850 nm
- (4) Typical power @ 940 nm
- (5) Optical power @500 mA
- (6) More wavelengths available on request; only the most common ones are listed under table 2.

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Table 3 – High Color Rendering White Options

Parameter	Unit	Min	Typ (@350 mA)	Max	Comments (7),(10)
Max drive current	mA	100	-	700	Per chip
Forward voltage	V _F	2,8	3,0	3,5	Per chip
Thermal resistance (electr.)	K/W		3,6		Assuming 27% efficiency
CCT	K	2700	-	6500	
Luminus flux	lm	-	350		All chips together, (8)
CRI	-	-	92	98	(9)
R9	-	-	90	96	(9)
R13	-	-	90	95	(9)

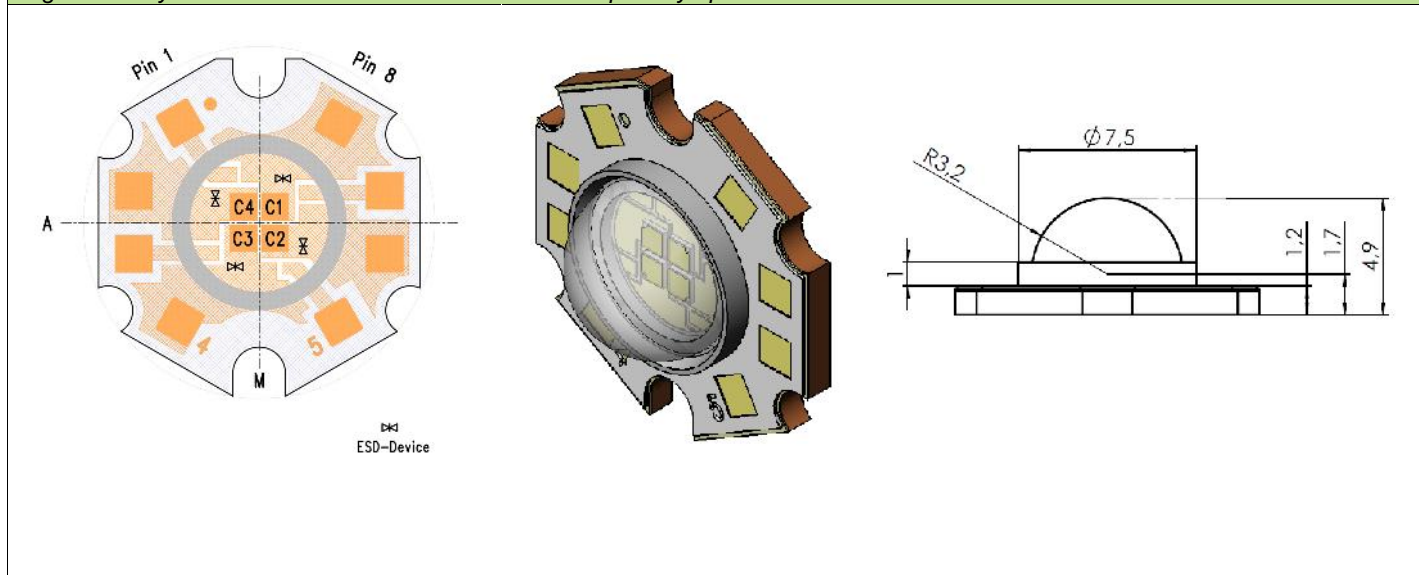
Remarks:

- (7) Excelitas offers customer specific white LED development capabilities targeting specific values. LEDs with lowering CRI have higher flux. Please consult Excelitas for specific needs.
- (8) Luminous flux [lm] and lumen per Watt [LPW] are strongly dependent on CRI and other color rendering indexes
- (9) Excelitas can measure these parameters 100% in production if needed, also at specific temperatures
- (10) All values specified at 350 mA, 25°C and after 2 ms ON. Values will differ at other temperatures and currents. Please consult Excelitas for specific requirements.

ACULED with Semispherical Lens

For high flux applications such as medical lighting, the ACULED is also available with a semispherical lens. In general, white LEDs with semispherical lens will have up to 30% higher flux. Please inquire for specific information.

Figure 3 • Layout and Dimensions of the ACULED with primary optic



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Thermal Properties

The real thermal resistance (R_{th}) of the package is 5 K/W from the LED junction to the backside of the package. To calculate the approximate LED junction temperature, please refer to following formulas:

Approximate temperature of the LED junction may be calculated by the following formula:

$$T_J = T_B + P_{th} \cdot R_{th}$$

T_B = temperature on the back side of the package

P_{el} = electrical power in the ACULED ($V_F \cdot I_F$)

P_{th} = P_{el} – measured optical power

T_J = resulting junction temperature

Since it is only possible to determine accurate optical power by means of a spectrometer with integrating sphere, a simplified formula can be used based on the “electrical” thermal resistance ($R_{th,el}$), assuming an efficiency of about 27%. Please note that efficiency of the LED is dependent on both temperature and current and this formula should be used carefully:

$$T_J = T_B + P_{el} \cdot R_{th,el}$$

P_{el} = electrical power in the ACULED ($V_F \cdot I_F$)

$R_{th,el} = 3,6$ K/W



RoHS Compliance

Each ACULED will be designed and built to be fully compliant with the European Union Directive 2002/95/EEC – Restriction of the use of certain hazardous substances in electrical and electronic equipment. Excelitas will provide a certificate upon request.

About Excelitas Technologies

Excelitas Technologies is a global technology leader focused on delivering innovative, customized solutions to meet the lighting, detection, and other high-performance technology needs of OEM customers.

From medical lighting to analytical instrumentation, clinical diagnostics, industrial, safety and security, and aerospace and defense applications, Excelitas Technologies is committed to enabling our customers' success in their specialty end-markets.

Excelitas Technologies has approximately 5,500 employees in North America, Europe and Asia, serving customers across the world.

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