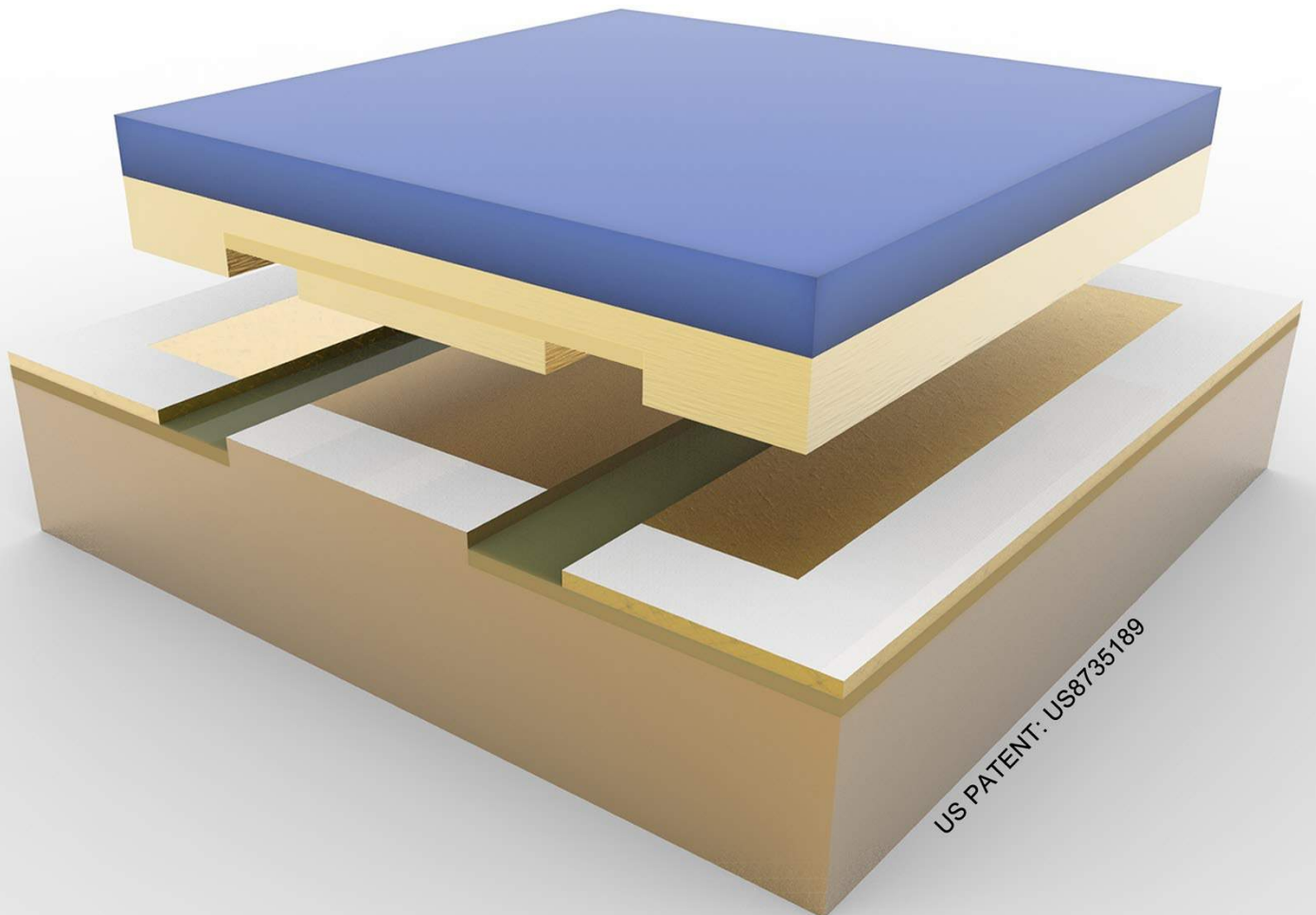




FLIP CHIP OPTO

2015
APOLLO & LUNA SERIES
3-PAD TECHNOLOGY





FLIP CHIP OPTO

**“EXTREMELY LOW THERMAL RESISTANCE”
UNPARALLELED APPLICATIONS**

3-PAD INNOVATION

Flip Chip Opto is a **US Engineered** LED lighting technology company with its focus from chip design to chip on board (COB) products. With its research and development center located in the Silicon Valley, Flip Chip Opto is devoted to its vision of inspiration, advancement, and affordability. “Inspiring the world with better and affordable lights”, says Chang Han, CEO of Flip Chip Opto.

Flip Chip Opto leads the industry in research, comprising of a broad band of talents with expertise in semiconductors, opto-electronics, materials science, bonding engineering, and luminaire systems.

With such inventing power, Flip Chip Opto developed **the patented 3-PAD design** exhibiting **extremely low thermal resistance**. With numerous application patents surrounding the 3-PAD design, Flip Chip Opto dedicates its development into high power, high wattage LED modules such, with its incredibly low thermal resistance, allows unparalleled applications due to the **reduced size of heatsinks**.

Furthermore, as a member of Cofan Group, Flip Chip Opto is able to allocate corporate resources and use a decade’s worth of research of mechanical designs, system integration, electrical engineering, MCPCB development, and many more.

3-PAD INNOVATION

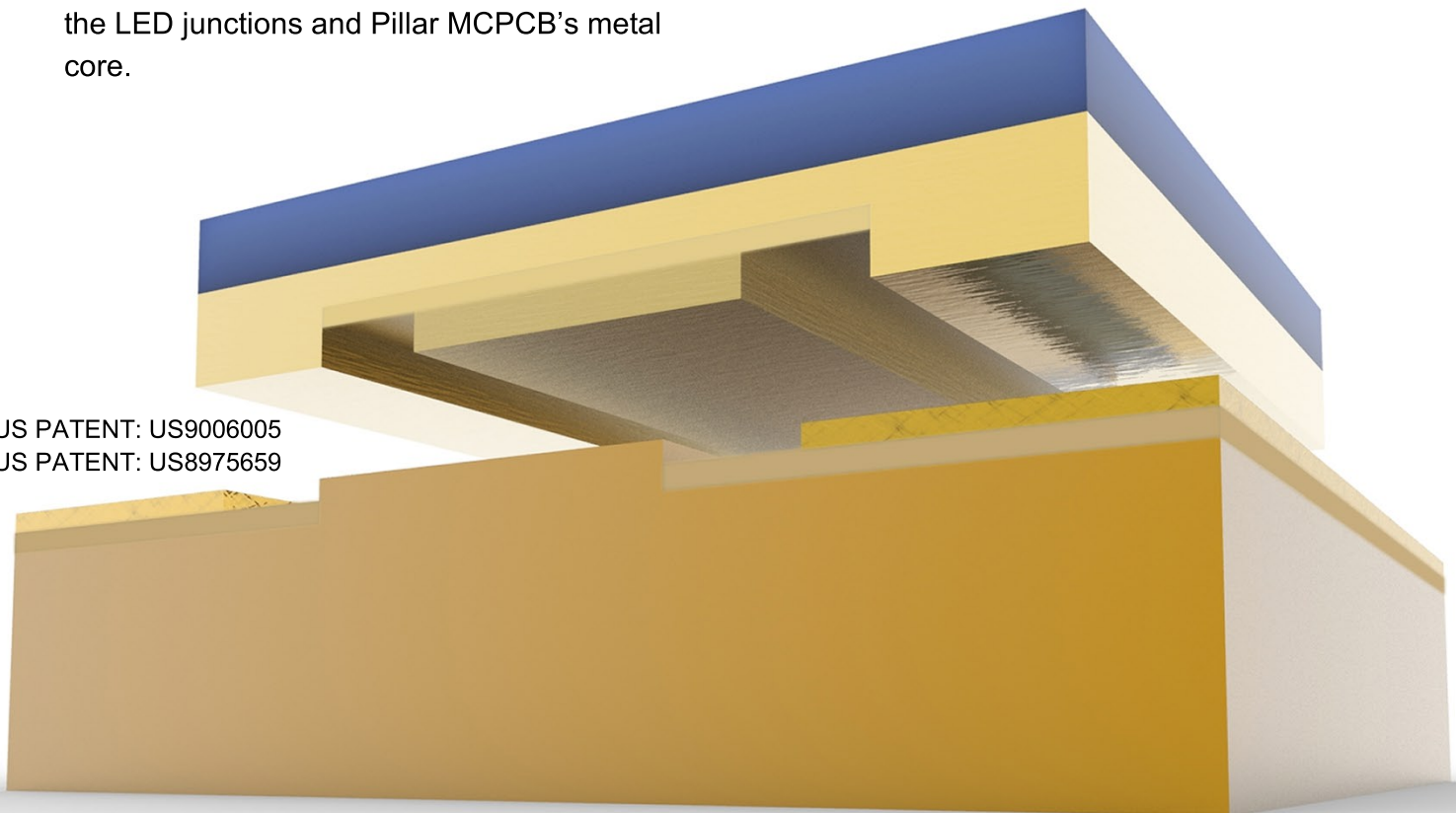
Flip Chip Opto's core technologies, the **patented 3-PAD Flip Chip LED** and Pillar MCPCB, are both invented and developed in the Silicon Valley. They are designed to coordinate with each other as a Chip on Board (COB) module, in order to optimize the thermal dissipation through its unique thermal structures, and therefore minimizes the thermal resistance between the 3-Pad Flip Chip LED junctions and the bottom of the Pillar MCPCB.

With proprietary Low Temperature Bonding Technology (LTBT), Flip Chip Opto manufactures Flip Chip LED COBs via bonding the patented 3-Pad Flip Chip LED onto the Pillar MCPCB surface where the N- and P- Pads are electrically coupled with the Pillar MCPCB's Cathode and Anode, respectively, and the T-Pad is thermally coupled to the metal core of the Pillar MCPCB through the Pillar structure.

'exhibits extremely low thermal resistance...'

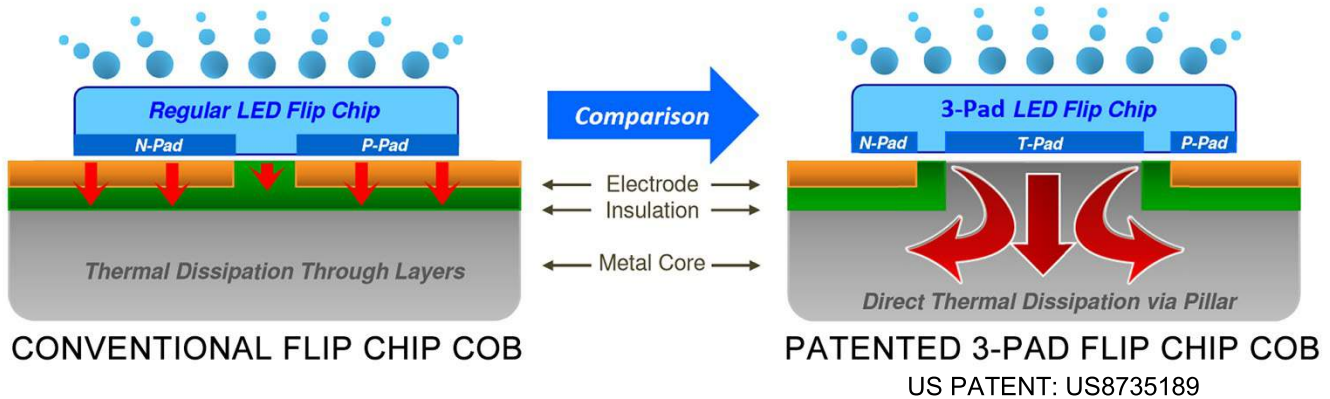
Consequently, the COB module exhibits extremely low thermal resistance between the LED junctions and Pillar MCPCB's metal core.

US PATENT: US9006005
US PATENT: US8975659

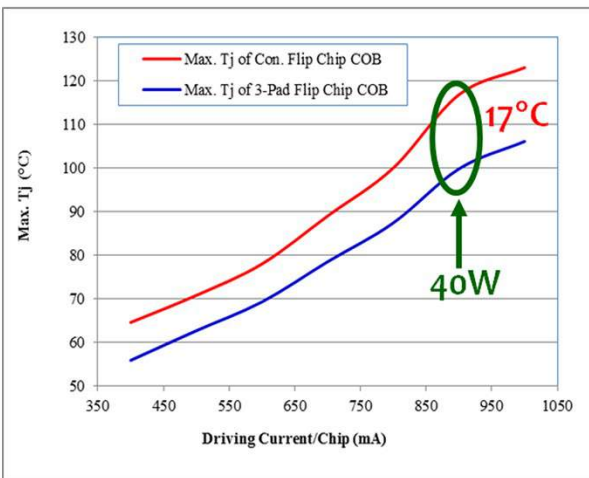


3-PAD INNOVATION

Structural diagrams of a Flip Chip Opto's patented 3-PAD Flip Chip LED COB and a conventional flip chip COB are illustrated below for comparison. Flip Chip Opto's COB enables direct thermal dissipation from the Flip Chip LEDs to the metal core through the pillar structure, while the conventional COB must diffuse its thermal energy through the thermal resistant insulation layer between the Flip Chip LED and the metal core.



'reduces the thermal decay while driving current is increased...'



Thermal decay is a natural characteristic for LED, as the junction temperature (T_j) rises due to the increase of the driving current which results in the decrease of the efficacy (lm/w). Flip Chip Opto's patented technology minimizes the T_j increase because of its efficient thermal dissipation, and therefore efficiently reduces the thermal decay and enables increases in the driving current. Longer lifespan in the same product class achieved through reduced thermal decay.

'longer lifespan in same product class...'

3-PAD / 2-PAD Comparison Chart - 3-PAD FCOPTO
Chips under the same conditions perform **17°C**
LOWER than 2-PAD chips.

APOLLO SERIES

Apollo series is a fleet of high-performance LED modules based on Flip Chip Opto's **patented 3-PAD Flip Chip LED** and Pillar MCPCB technologies. Both junction temperature and thermal decay are minimized due to its extremely low thermal resistance, and therefore illumination designers benefit from the **maximized "lumen per dollar"** value through solutions such as brightness booster, smaller heatsinks, and optics.

FEATURES

- Maximum Operating Power up to **2400W**
- Thermal Resistance as-low-as **0.003C°/W** *min in 2400W COB*
- Available in 2700K – 5600K CCT
- Available in 70-95 CRI
- ROHS Compliant

LOWER THERMAL RESISTANCE

- Increases Photonic Density Due to Smaller LES
- Decreases Thermal Management Costs
- Enables Increased Nominal Current
- Extends Life Span
- Smaller Heatsink Increases Application Types
- Lowers Overall System Cost

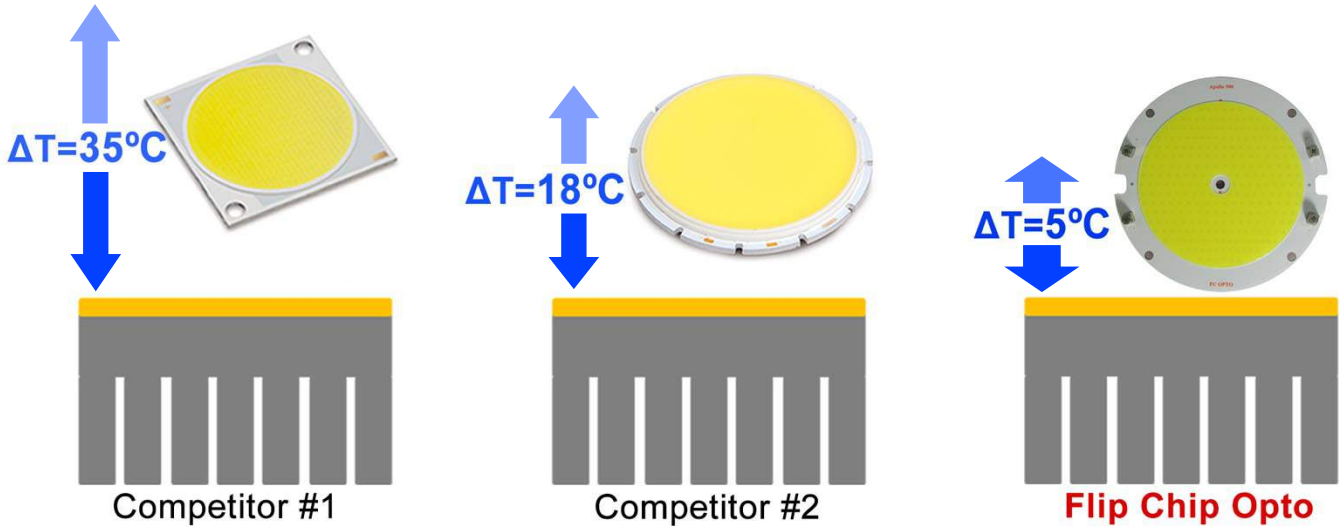
Whether your goal is lowering power consumption, reducing heat output, increasing lifetime, or adhering to tough regulatory requirements - or all of these objectives - Flip Chip Opto's solutions will solve your unique lighting challenges.

APOLLO SERIES

APOLLO > HIGH WATTAGE SERIES

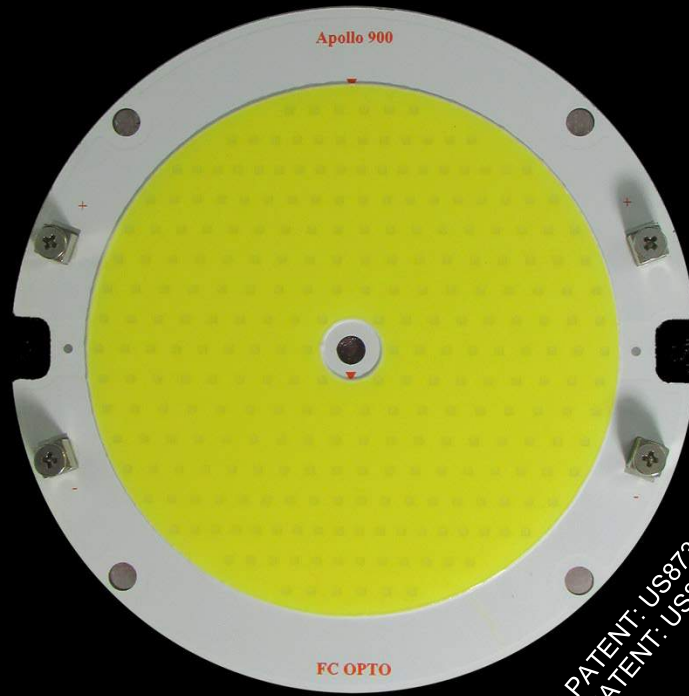
Apollo Series	Array Configuration	Dimensions [mm]	LES [mm]	CRI (Ra)	CCT (K)	Forward Current (mA)	Watts (W)	Luminous Flux (lm)	Luminous Efficacy (lm/W)	Forward Voltage	Thermal Resistance
Apollo 300	12S8P	D=65/H=2.8	40	80	5000	8000	324.8	31500	96.9	40.6	0.010
					4000	8000	324.8	30559	94.1	40.6	
					3000	8000	324.8	28580	87.9	40.6	
Apollo 400	15S8P	D=75/H=2.8	50	80	5000	8000	405.6	39340	97.0	50.7	0.010
					4000	8000	405.6	38189	94.1	50.7	
					3000	8000	405.6	35690	87.9	50.7	
Apollo 600	15S12P	D=85/H=2.8	60	80	5000	12000	608.4	59015	97.0	50.7	0.008
					4000	12000	608.4	57279	94.1	50.7	
					3000	12000	608.4	53540	88.0	50.7	
Apollo 900	15S18P	D=110/H=2.8	85	80	5000	18000	912.6	88520	97.0	50.7	0.007
					4000	18000	912.6	85893	94.1	50.7	
					3000	18000	912.6	80310	88.0	50.7	
Apollo 1200	15S12Px2	D=130/H=2.8	90	80	5000	24000	1216.8	118030	97.0	50.7	0.006
					4000	24000	1216.8	114557	94.1	50.7	
					3000	24000	1216.8	107080	88.0	50.7	
Apollo 2400	15S12PX4	D=140/H=2.8	106	80	5000	48000	2433.6	236060	97.0	50.7	0.003
					4000	48000	2433.6	229017	94.1	50.7	
					3000	48000	2433.6	214160	88.0	50.7	

Lowest Thermal Resistance (Lower Temperatures)*



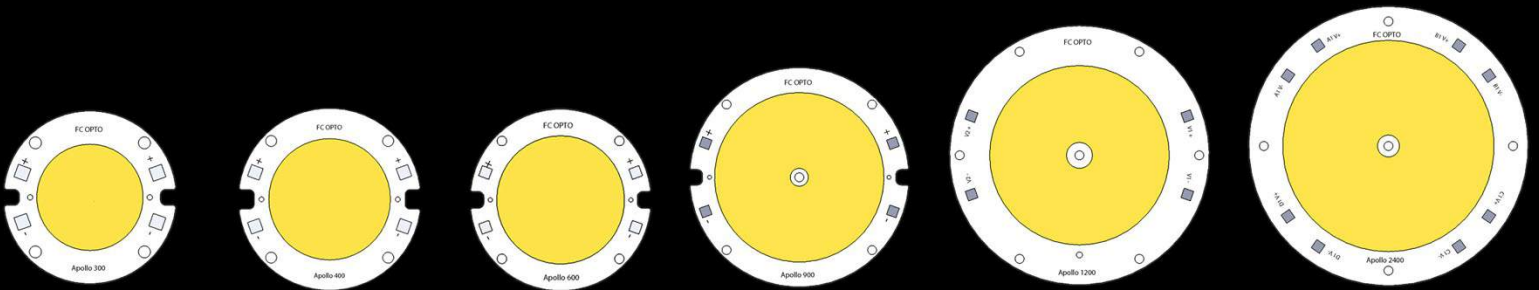
*based on the same 30 wattage output and the same heatsink size

'exhibits EXTREMELY LOW thermal resistance...'

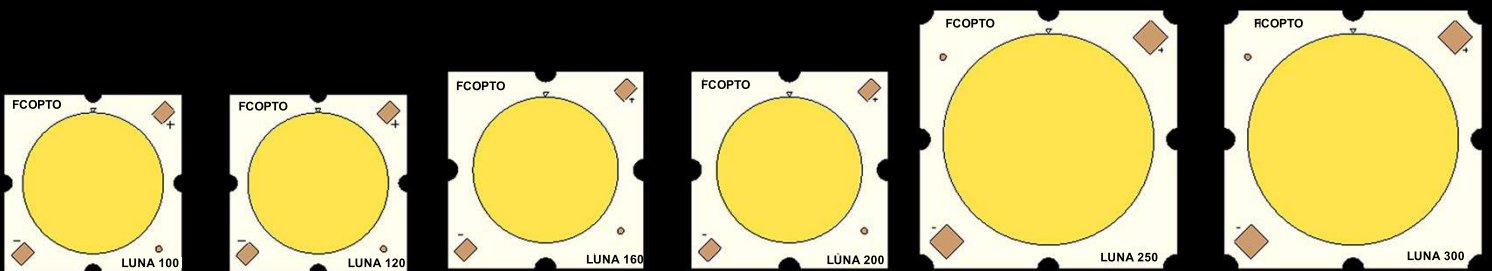


US PATENT: US8735189
US PATENT: US8698186

APOLLO SERIES



LUNA SERIES

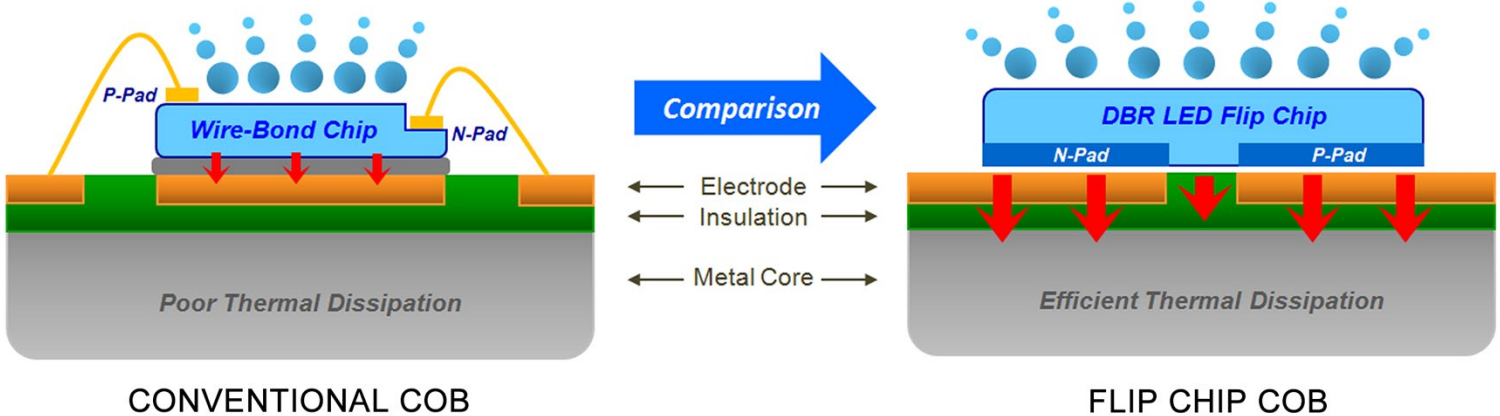


LUNA SERIES

Luna Series Chip On Board is a high-performance LED module based on the patented Flip Chip and proprietary **low temperature bonding technology**. The magnitude of the LED illumination is enhanced by the DBR structure to further increase the lighting efficacy. Additionally, the embedment between LED Flip Chips and the Metal PCB lowers the thermal resistance.

FEATURES

- Maximum Operating Power up to **300W**
- Thermal Resistance as-low-as **0.1C°/W min in 300W COB**
- Available in 2700K – 5600K CCT
- Available in 70 – 95 CRI
- Low Temperature Bonding
- ROHS Compliant



LUNA SERIES

Luna Series	Array Configuration	Dimensions [mm]	LES [mm]	CRI (Ra)	CCT (K)	Forward Current (mA)	Watts (W)	Luminous Flux (lm)	Luminous Efficacy (lm/W)	Forward Voltage	Thermal Resistance
Luna 10	5S2P	15.85x15.85x1.9	9	80	5000	700	10.7	1390	129.8	15.3	0.55
						1400	23.0	2245	97.8	16.4	
					4000	700	10.7	1353	126.3	15.3	
						1400	23.0	2183	95.1	16.4	
					3000	700	10.7	1260	117.6	15.3	
						1400	23.0	2035	88.6	16.4	
Luna 20	12S2P	23.85x23.85x1.9	19	80	5000	700	25.6	3338	130.4	36.6	0.40
						1400	54.4	5361	98.5	38.9	
					4000	700	25.6	3240	126.6	36.6	
						1400	54.4	5203	95.6	38.9	
					3000	700	25.6	3030	118.4	36.6	
						1400	54.4	4866	89.4	38.9	
Luna 50	12S4P	27.35x27.35x1.9	22	80	5000	1400	51.2	6677	130.4	36.6	0.30
						2800	108.9	10722	98.5	38.9	
					4000	1400	51.2	6480	126.6	36.6	
						2800	108.9	10406	95.6	38.9	
					3000	1400	51.2	6059	118.4	36.6	
						2800	108.9	9733	89.4	38.9	
Luna 60	12S5P	27.35x27.35x1.9	22	80	5000	1750	64.0	8346	130.4	36.6	0.30
						3500	136.1	13403	98.5	38.9	
					4000	1750	64.0	8100	126.6	36.6	
						3500	136.1	13007	95.6	38.9	
					3000	1750	64.0	7574	118.4	36.6	
						3800	136.1	12166	89.4	38.9	
Luna 80	12S7P	34.85x34.85x1.9	28	80	5000	2450	89.6	11685	130.4	36.6	0.25
						4900	190.5	18764	98.5	38.9	
					4000	2450	89.6	11340	126.6	36.6	
						4900	190.5	18210	95.6	38.9	
					3000	2450	89.6	10603	118.4	36.6	
						4900	190.5	17033	89.4	38.9	
Luna 100	12S8P	38x38x2.9	30	80	5000	2800	102.4	13354	130.4	36.6	0.18
						5600	217.7	21445	98.5	38.9	
					4000	2800	102.4	12960	126.6	36.6	
						5600	217.7	20811	95.6	38.9	
					3000	2800	102.4	12118	118.4	36.6	
						5600	217.7	19466	89.4	38.9	

LUNA SERIES

Luna Series	Array Configuration	Dimensions [mm]	LES [mm]	CRI (Ra)	CCT (K)	Forward Current (mA)	Watts (W)	Luminous Flux (lm)	Luminous Efficacy (lm/W)	Forward Voltage	Thermal Resistance
Luna 120	12S10P	38x38x2.9	30	80	5000	3500	128.0	16692	130.4	36.6	0.18
						7000	272.2	26806	98.5	38.9	
					4000	3500	128.0	16201	126.6	36.6	
						7000	272.2	26014	95.6	38.9	
					3000	3500	128.0	15148	118.4	36.6	
						7000	340.2	30415	89.4	48.6	
Luna 160	15S10P	42x42x2.9	32	80	5000	3500	160.0	20865	130.4	45.7	0.15
						7000	340.2	33508	98.5	48.6	
					4000	3500	160.0	20251	126.6	45.7	
						7000	340.2	32518	95.6	48.6	
					3000	3500	160.0	18935	118.4	45.7	
						7000	340.2	30415	89.4	48.6	
Luna 200	15S13P	42x42x2.9	32	80	5000	4550	207.9	27970	130.4	45.7	0.12
						9100	442.3	43560	98.5	48.6	
					4000	4550	207.9	26326	126.6	45.7	
						9100	442.3	42273	95.6	48.6	
					3000	4550	207.9	24615	118.4	45.7	
						9100	442.3	39540	89.4	48.6	
Luna 250	15S16P	55x55x2.9	45	80	5000	5600	255.9	33385	130.4	45.7	0.11
						11200	544.3	53612	98.5	48.6	
					4000	5600	255.9	32401	126.6	45.7	
						11200	544.3	52028	95.6	48.6	
					3000	5600	255.9	30295	118.4	45.7	
						11200	544.3	48665	89.4	48.6	
Luna 300	15S19P	55x55x2.9	45	80	5000	6650	303.9	39644	130.4	45.7	0.1
						13300	646.4	63665	98.5	48.6	
					4000	6650	303.9	38476	126.6	45.7	
						13300	646.4	61784	95.6	48.6	
					3000	6650	303.9	35976	118.4	45.7	
						13300	646.4	57789	89.4	48.6	



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