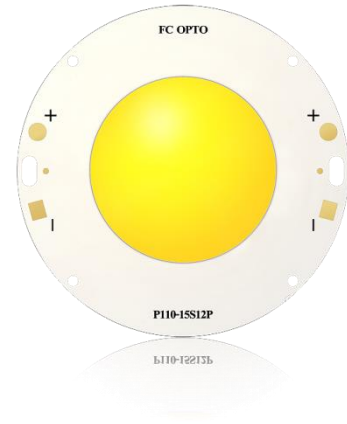
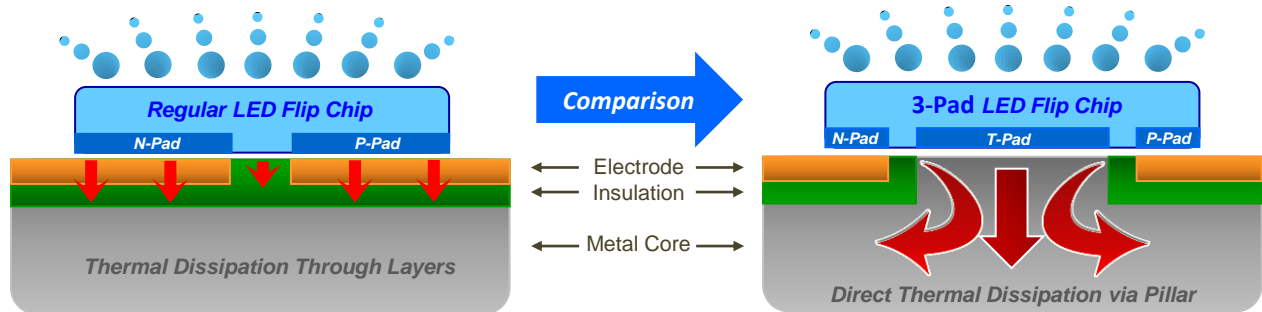
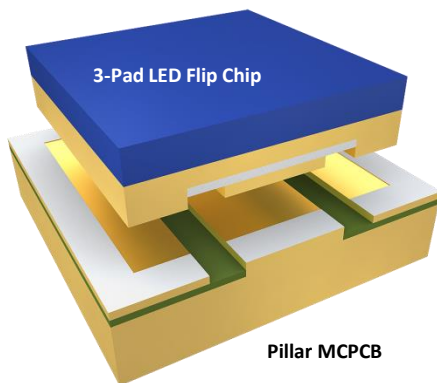


## Brighter and Cooler

Lower Thermal Resistance & Junction Temperature

**Apollo 600** Chip on Board is a high-performance LED module based on Flip Chip Opto's patented **3-Pad LED Flip Chip** and **Pillar MCPCB** technologies. Both junction temperature and thermal decay are minimized due to its extremely low thermal resistance, and therefore illumination designers are able to maximize the "lumen per dollar" value through solutions such as brightness booster, smaller heatsink and optics.



### Features:

- Patented COB Technologies
- 608.4W Maximum Power
- 0.008°C/W Thermal Resistance
- Available in 4000K, 5000K, 5700K CCT
- Available in 70-, 80-, 90- CRI Options
- 60mm Light Emitting Surface
- 45x45mil Flip Chips (Patented)
- Copper Based Pillar MCPCB (Patented)
- No Wire Bonding
- Low Temperature Bonding
- RoHS Compliant

**Absolute Maximum Ratings (Ta=25°C):**

Parameter	Symbol	Max. Rating	Conditions
Power Dissipation	$P_d$	608.4W	$T_j \leq 140^\circ\text{C}$
DC Forward Current	$I_F$	12,000mA	$T_j \leq 140^\circ\text{C}$
Junction Temperature	$T_j$	140°C	
Reverse Voltage	$V_r$	-5V	$T_{\text{ambient}} = 25^\circ\text{C}$
Reverse Current	$I_r$	$\leq 1\mu\text{A}$	$V_r = -5\text{V}$
Operating Case Temperature	$T_C$	-40°C to 105°C	
Storage Temperature	$T_{ST}$	-40°C to 120°C	
Soldering Conditions		280°C < 3.5 secs	

**Electro-Optical Characteristics (Ta=25°C):**

Viewing Angle  $2\theta_{1/2} = 140^\circ$

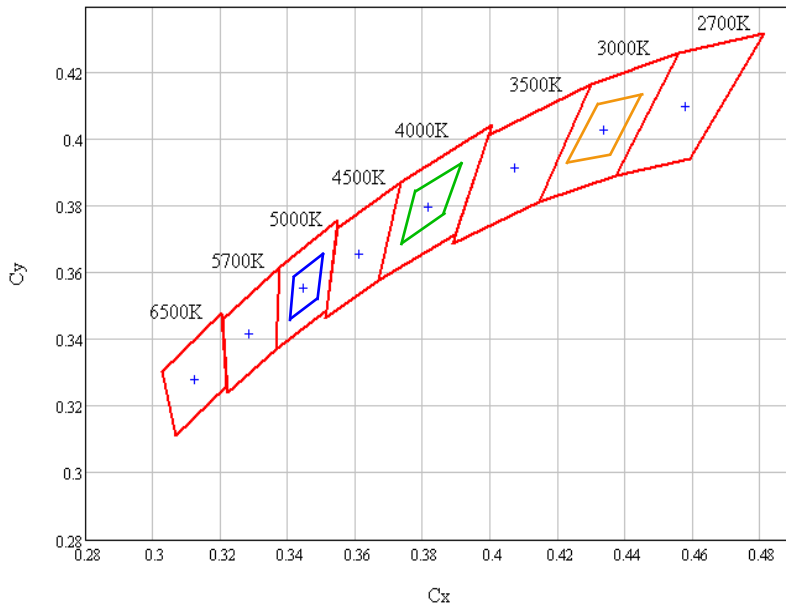
Nominal CCT	Apollo Part Number	CRI (min)	Luminous Flux (lm) @ $I_f = 12,000\text{mA}$	$V_f$ (V) @ $I_f = 12\text{A}$	LES (mm)
5000K	600-5070	70	60,840	50.7	60
5000K	600-5080	80	59,015	50.7	
4000K	600-4070	70	59,050	50.7	
3000K	600-3080	80	53,540	50.7	

**Thermal Characteristics:**

Parameter	Symbol	°C/W	Definition
Thermal Resistance	$R_{th(j-b)}$	0.008	Between LED Junction and COB Bottom Surface

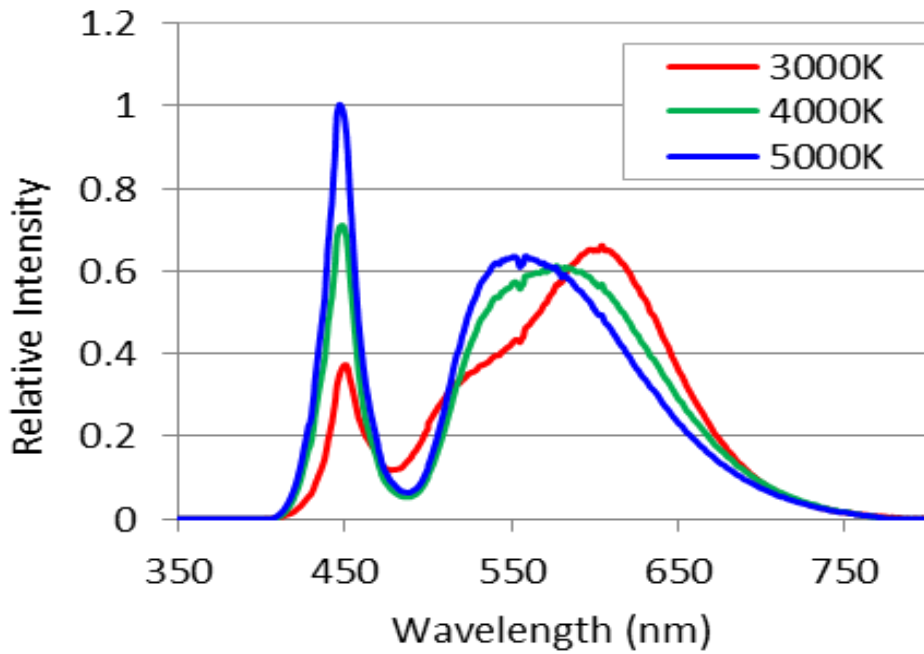
- Junction Temperature  $T_j = T_b + \text{Power(W)} \times R_{th(j-b)}$ , where  $T_b$  is the temperature at COB bottom surface.
- $T_{CM}$  Measurement point shown in the Mechanical Dimension is an extension of the COB metal core, and the temperature at  $T_{CM}$  is applied as a reference to  $T_b$ .

Bins on the ANSI C78 :



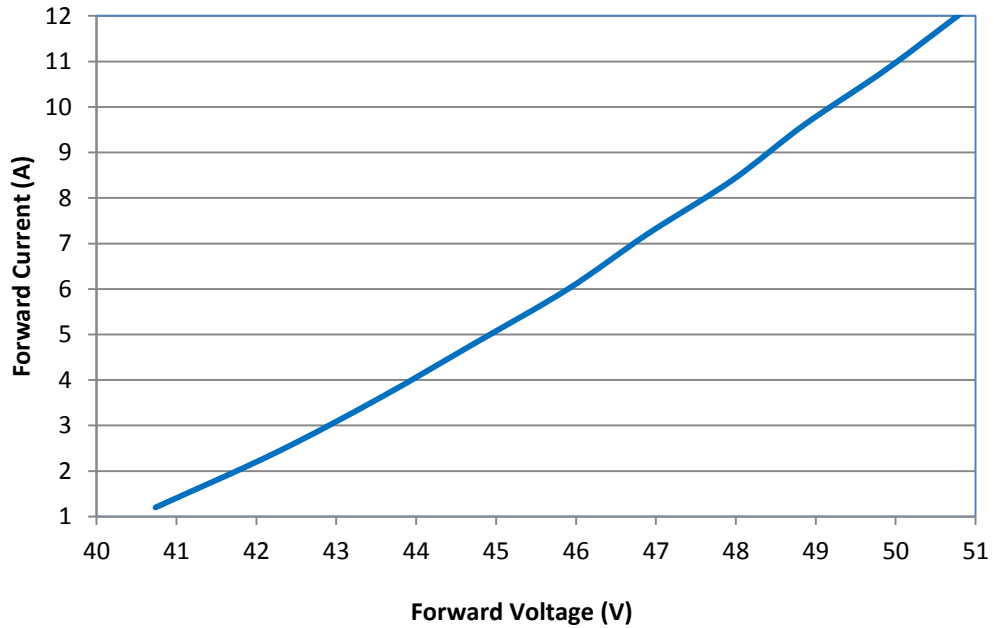
Nominal CCT	x	y
3000K	0.4242	0.3919
	0.4322	0.4096
	0.4449	0.4141
	0.4359	0.3960
4000K	0.3744	0.3685
	0.3782	0.3837
	0.3912	0.3917
	0.3863	0.3758
5000K	0.3407	0.3459
	0.3415	0.3586
	0.3499	0.3654
	0.3484	0.3521

Spectrum (Ta=25°C):

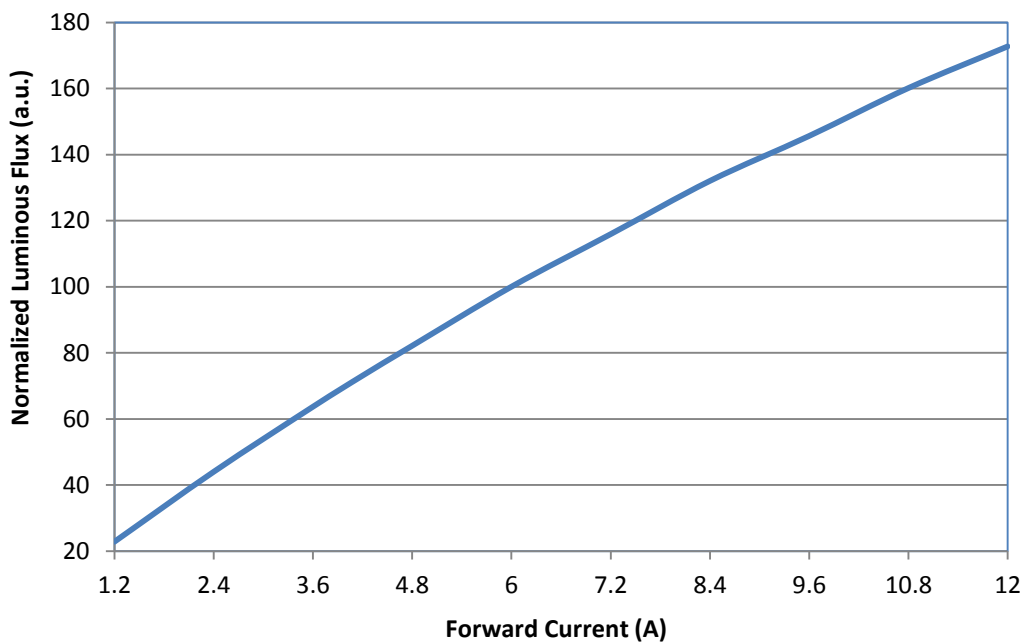


### Characteristic Graphs (Ta=25°C):

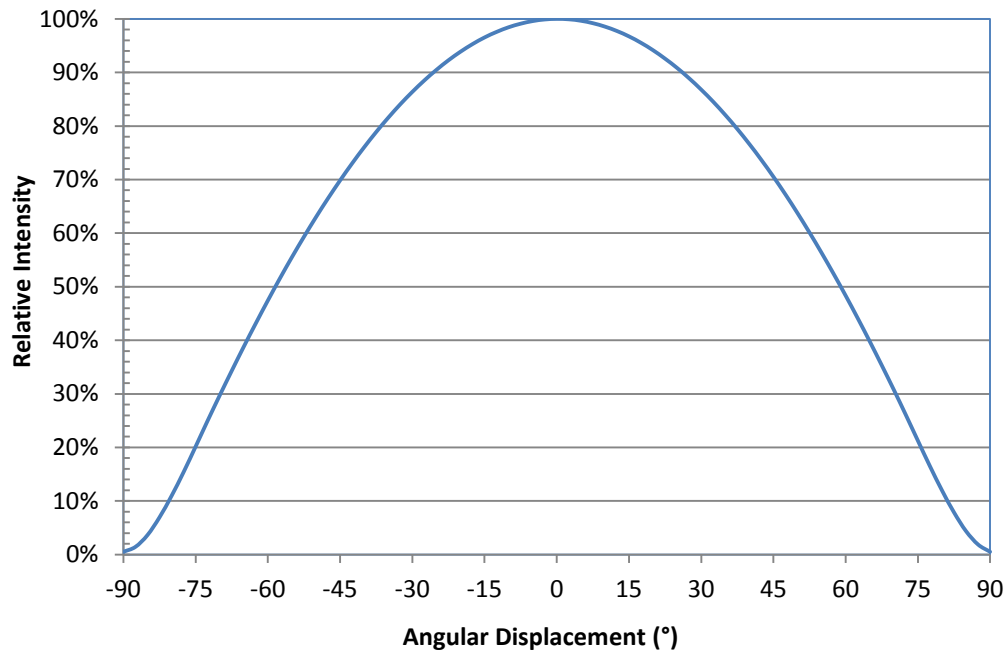
(i) Typical Forward Current ( $I_F$ ) vs. Forward Voltage ( $V_F$ )



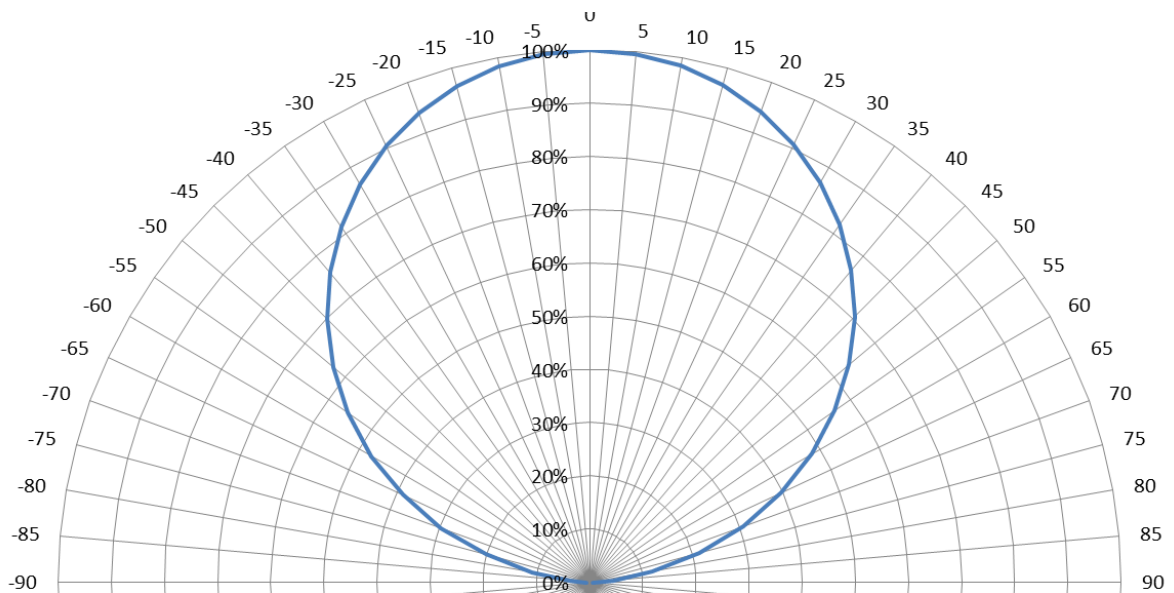
(ii) Typical Normalized Luminous Flux vs. Forward Current ( $I_F$ )



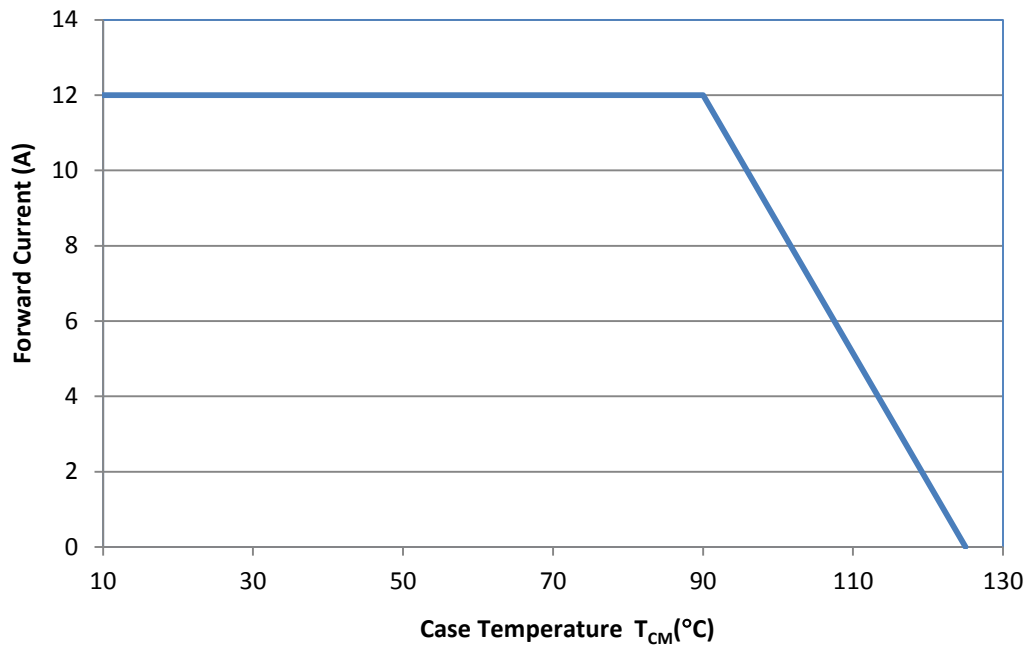
(iii) Typical Spatial Radiation Pattern



(iv) Typical Polar Radiation Pattern

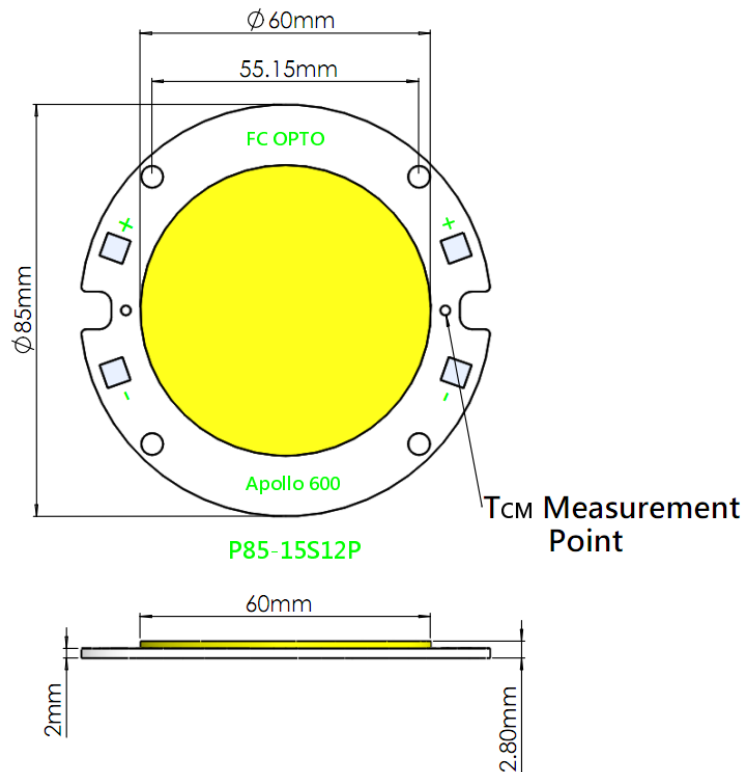


(v) Allowable Forward Current ( $I_F$ ) vs. Case Measurement Temperature ( $T_{CM}$ )

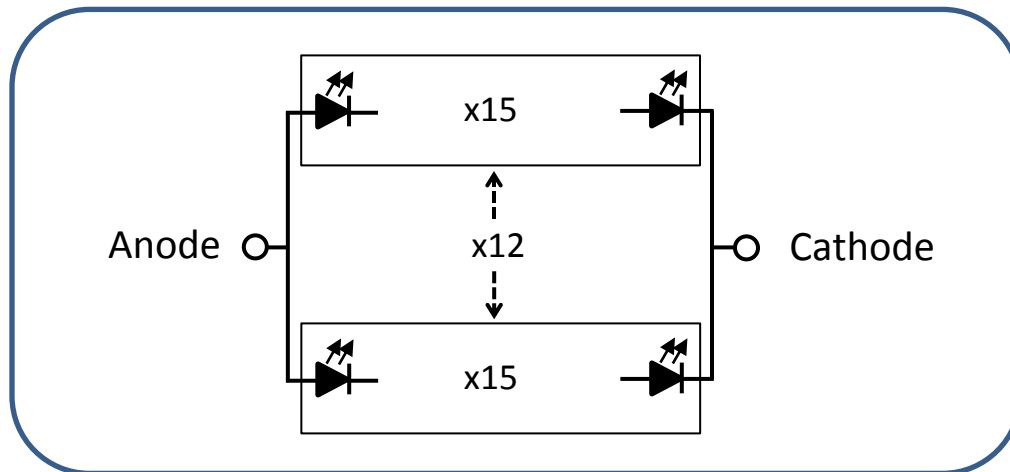


### Mechanical Dimensions:

- OD=85mm, LES=60mm
- Solder pads are labeled “+” and “-“ to denote positive and negative, respectively.
- Drawing dimensions are in millimeters, and are not to scale.
- Tolerance: ±0.2mm
- The optical center of the LED Array is defined by the mechanical center of the array.



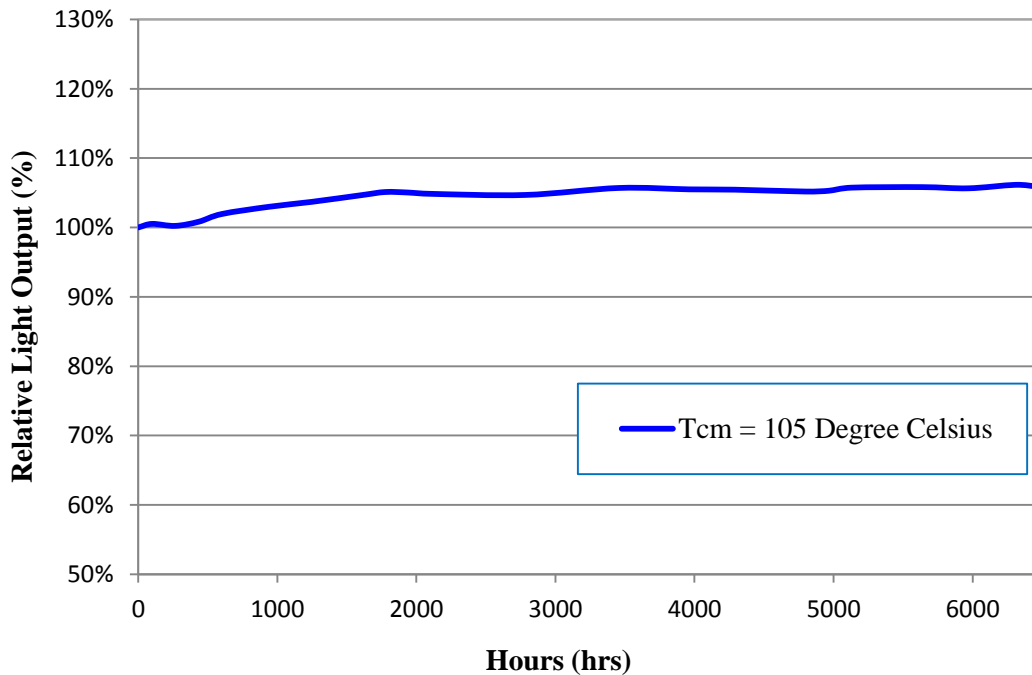
### Circuit Diagram:



**Reliability Tests:**

Item	Reference	Condition	Duration
Operating Endurance Test	Internal Reference	Ta=25°C, I <sub>F</sub> =9A	1,000 hrs
Accelerated Aging Testing	Internal Reference	85°C and 85 % Humidity	5,000 hrs
High Temperature Storage	Internal Reference	100°C	1,000 hrs
Low Temperature Storage	Internal Reference	-40°C	1,000 hrs

**3-Pad Technology Burn-In Test @ Case Temperature T<sub>CM</sub>=105°C  
Reference: Apollo 1820**



*After 6000 hours burn-in under T<sub>CM</sub>=105°C condition, Flip Chip Opto COB Apollo 1820 remains robust without performance degradation.*



## Cautions:

1. Circuit Protection is recommended during the assembly and operation.
  - i. MOV, TVS, current fuse, thermal fuse, capacitor, resistor are options to avoid unexpected circuit faults.
  
2. Storage Conditions
  - i. Moisture Controlled environment is recommended to avoid COB damages during storage. Moisture may cause circuit damages and result in brightness reduction or failure in circuit contacts.
  - ii. COB in moisture-proof sealed bags should be stored in ambient conditions of temperature less than 30°C and humidity less than 90%RH.
  - iii. COB in open air should be kept in ambient conditions of temperature less than 30°C and humidity less than 60%RH.
  - iv. COB should be restored in moisture-proof bag with moisture absorbent together.
  
3. Handling Light Emitting Surface (LES)
  - i. LES is a silicone lens and should not have direct contact with sharp tools and human fingers.
  
4. Recommendation on Assembly with Heat Sink
  - i. Apply thermal grease over the heatsink contact surface to seal the voids and roughness pre-existing on the contact surface.
  - ii. Attach COB onto heatsink contact surface with thermal grease in between. Thermal grease thickness is suggested less than 25um (1 mil)
  - iii. Apply sufficient pressure to secure the COB, and ensure (a) full contact between COB and heatsink, (b) no voids within thermal grease, (c) minimal thermal grease thickness.
  
5. Flip Chip Opto is not responsible to the damages caused by the operation under the parameters exceeding the values described in the specification.