AMOLEDS
High Power LED

Lighting Application

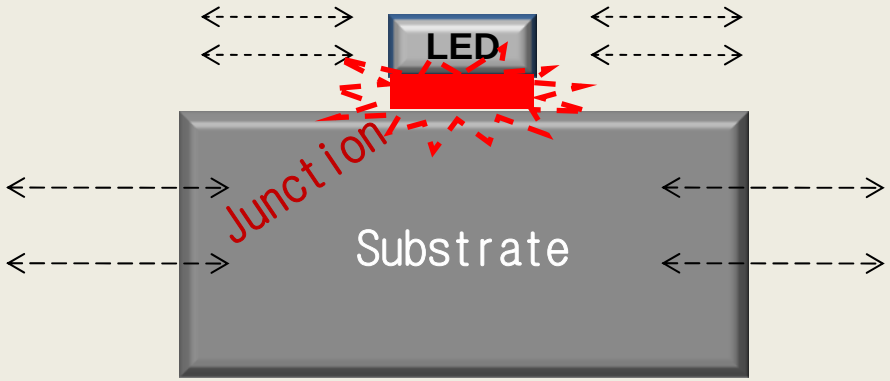
Ceramic

- Robust material against harsh environment
- High Reliability due to thermal stability
- TCE matching with LED die
- The best material for high power LED
- Ceramic LED should be the best option

  for reliable lighting application

Why TCE ?

- TCE (Thermal Coefficient of Expansion)
- TCE mismatch causes most defects in Junction area when it's heated and cooled.
- Ceramic is perfectly matched to LED die
- No defects in Junction area
- It guarantees long life time



Material	CTE (ppm/℃)
Plastic	66
Cu	16.4
HTCC	7.00
LTCC	7.2

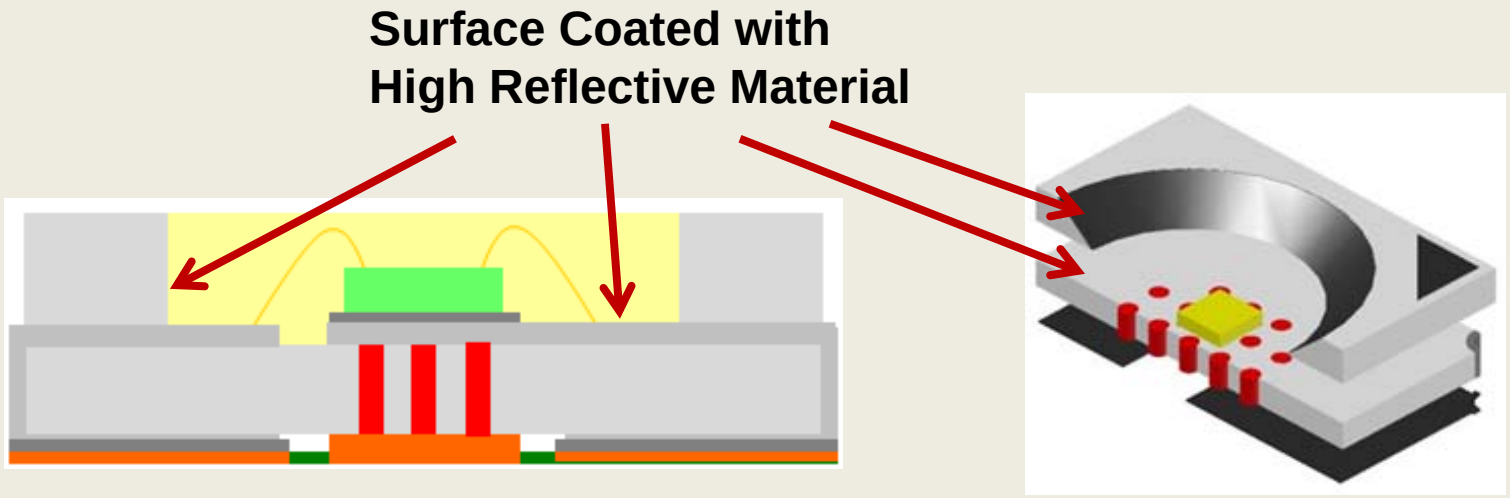
AMOLEDS High Power LED

Advantage

- Design for High lumen output, efficacy
- Thermal management
  - Specially designed structures
- Various distribution beam angle
  - 30 ~ 160 degree without additional optics
  - Design flexibility
- Long life time with lumen maintenance
- High Power Multichip package
  - Optimized material & structure

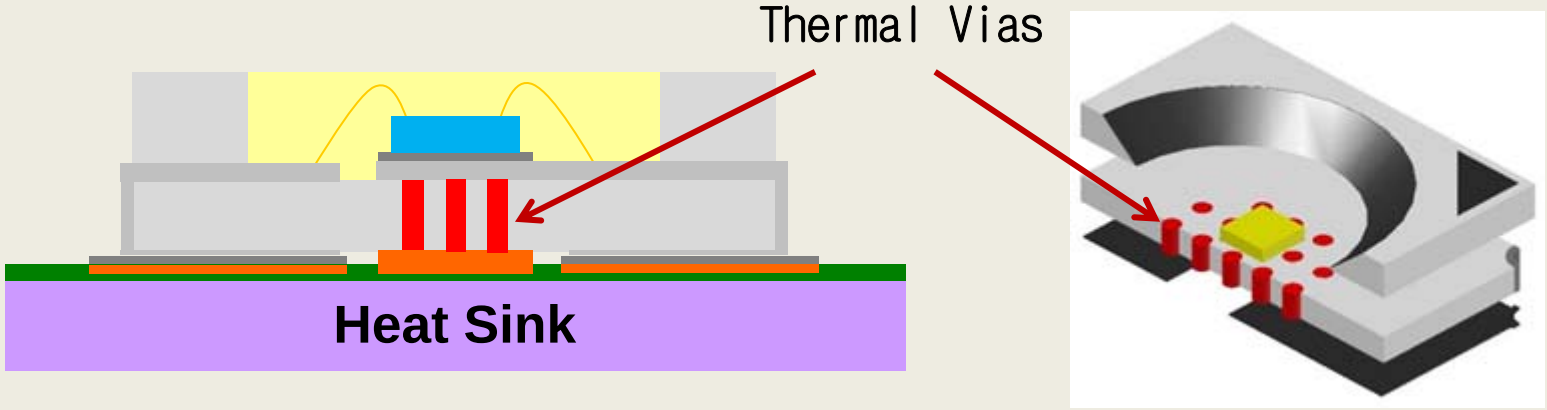
Package Structure

- Higher Lumen Output Design
  - Surface coated with special material
  - Efficacy : > 90 lm/W
  - Excellent Lumen Maintenance



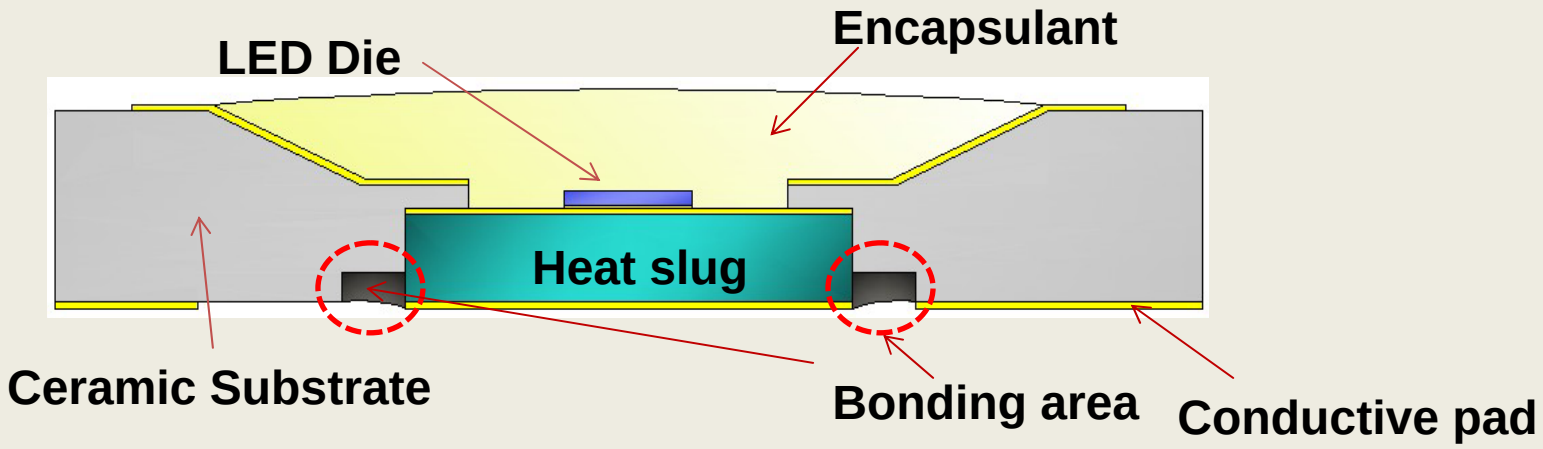
Package Structure

- Thermal Management I
- Thermal Via Structure
  - Several Vias filled with conductor material
  - Heat flows down to heat sink through Vias
  - Thermal Resistance : 10 ℃/W



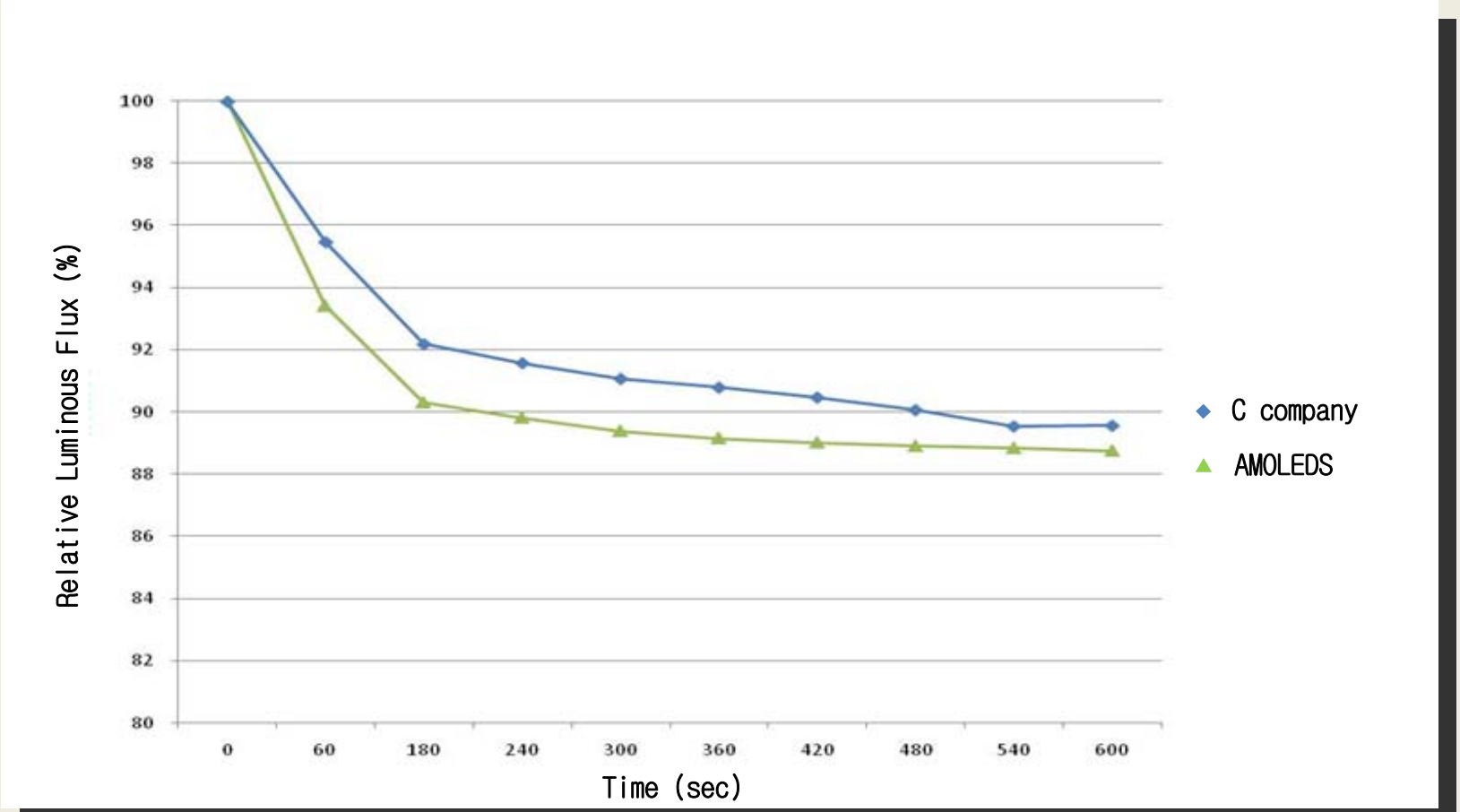
Package Structure

- Thermal Management II
- Heat Slug Structure
  - **The best option for high power LED**
  - **TCE matched heat slug material**
  - **Thermal Resistance : 8 ℃/W**



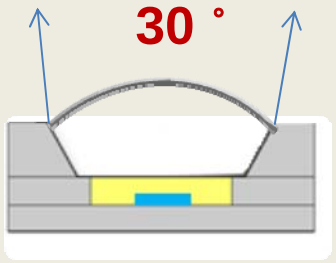
Saturation Curve

• Condition : 350 mA, on Star MCPCB (20ø)

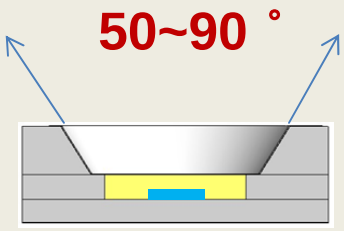


Package Structure

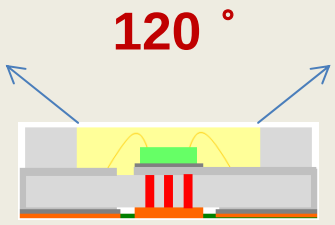
- Various Beam Angle Structures
  - Reflector Embedded
  - Reflector angle, depth, reflectivity control
  - 30 ~ 160 degree without additional lens
- Several options for light design



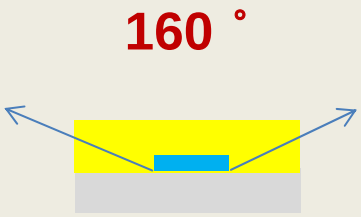
New Product



Embedded Reflector



Standard



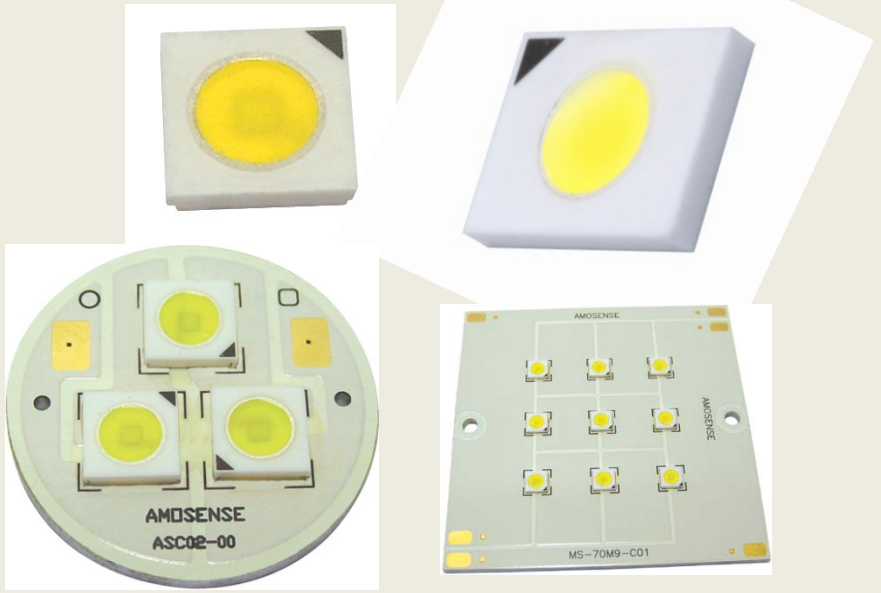
Wide Beam

Standard Product

Model	Power (W)	Current (mA)	Luminous flux (lm)	CCT (K)	Beam angle (Degree)
AL-3030	0.5	150	45	2750~10,000	120
AL-5050	1	350	90	2750~10,000	120
AL-7090	1~3	350~700	90~160	2750~10,000	120

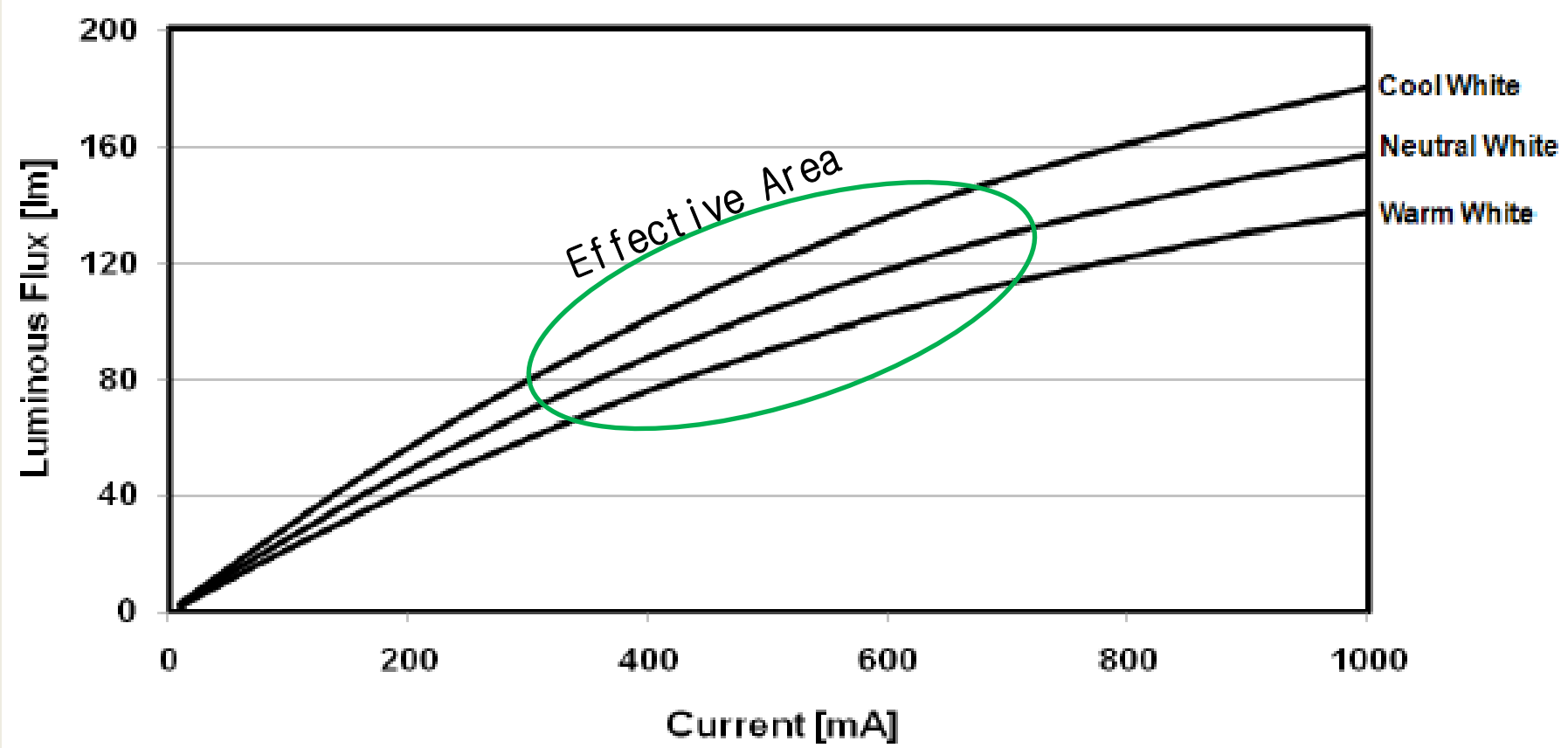
Advantage

- High Efficacy
- Thermal Stability
- Long life time
- Easy to array



Efficacy Diagram

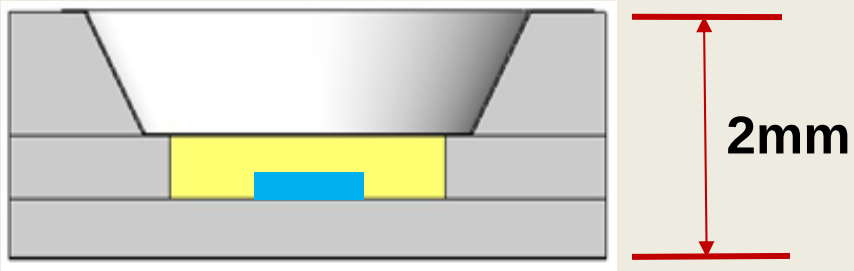
- Model : AL-7090
- Luminous Flux according to current up to 1000 mA

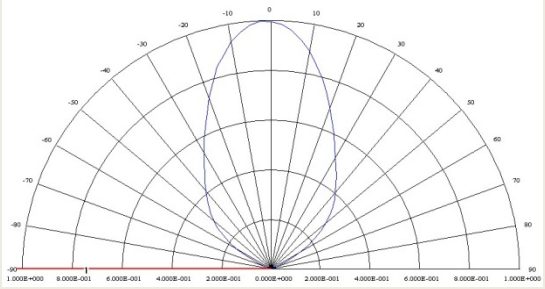


Narrow Beam Angle Product

- Beam Angle
  - 50 ~ 90 degree without lens
  - Compact 2 mm thickness
  - Patented structure
- Design Flexibility due to low profile
- Spot light, Street light without lens

AL-WH505020





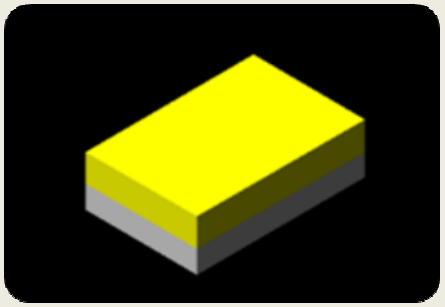
View angle : 60 degrees

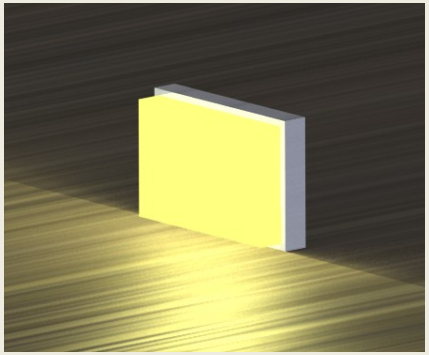
Wide Beam Angle Product

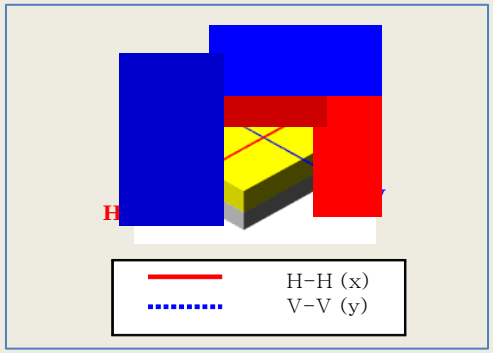
- Beam Angle

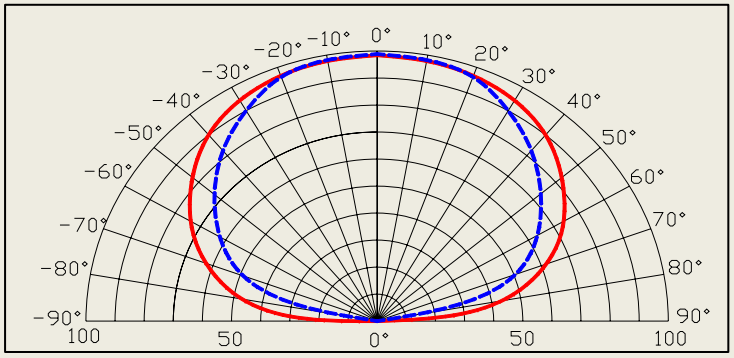
  160 degree without lens
- Patented Structure
- Ultra compact profile ; 0.9 mm
- Uniform wide distribution beam angle
- Very suitable for Flat Light device, Back Light

AL-WH3020



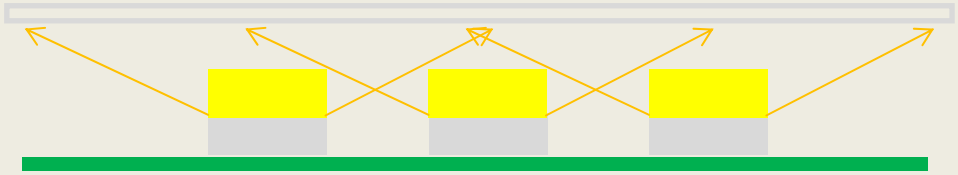


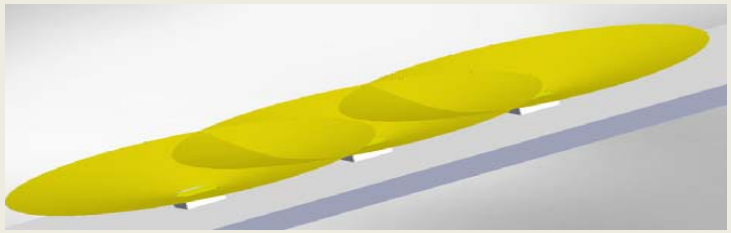




Application

- Application
  - Flat Panel Light Device
  - Light Bar
- Advantage
  - Hot Spot free due to wide viewing angle
  - Easy to design due to low profile

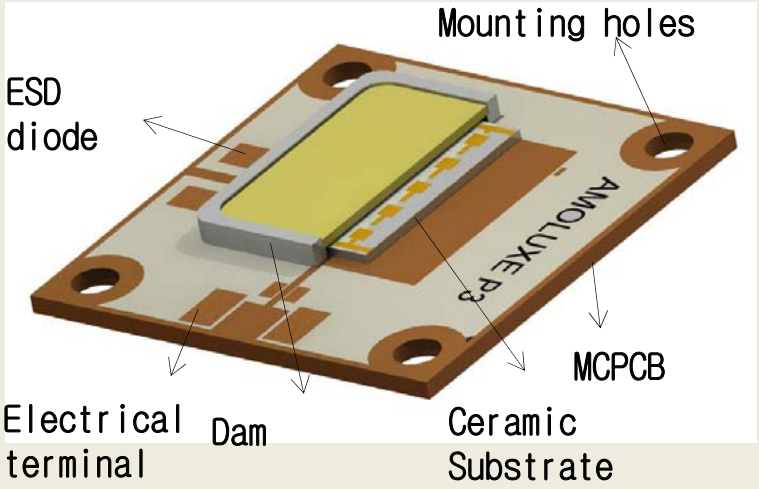




Multichip Package

- High Power & Thermal Management
  - 5 ~ 20 W with Specially Designed Material & Structure
  - Thermal Resistance : 3 ℃/W
  - Cost effective assembly process
  - Application ; Very high luminous flux area

    Flood light, Street light

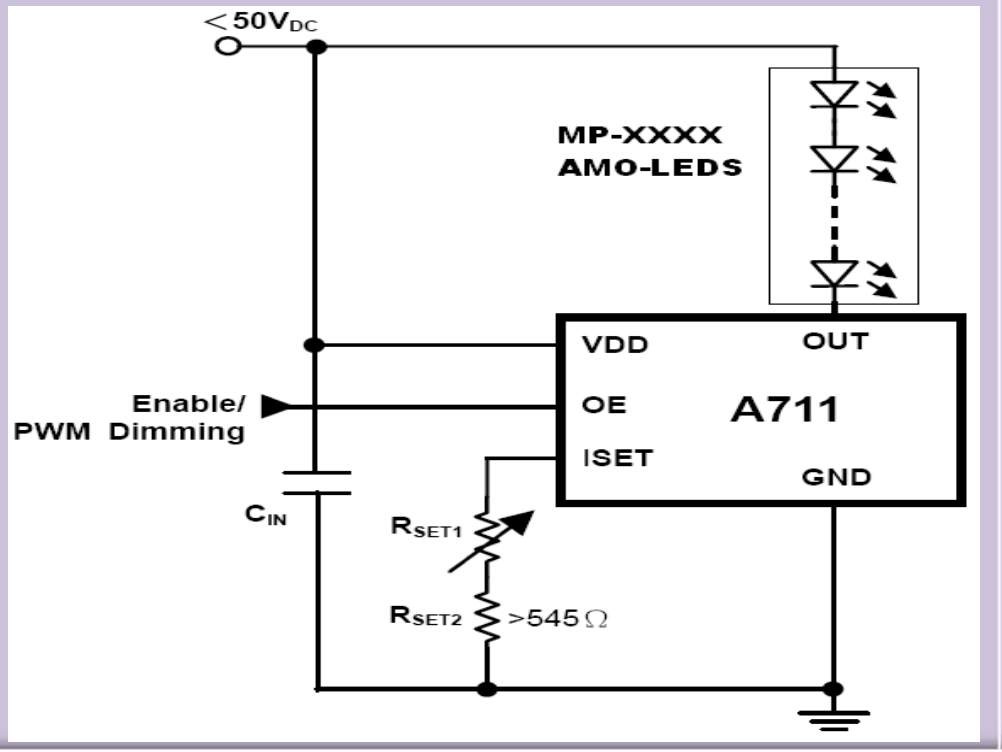


	MP-2216	MP-2822
Power Dissipation(W)	8	15
Forward Voltage(V)	11.3	17.9
Forward Current(mA)	700	1050
Junction Temp.(℃)	125	125
Thermal	3	3
Luminous Flux(lm)	720	1200

Circuit Guide

Ex) MP-2216 (8W)

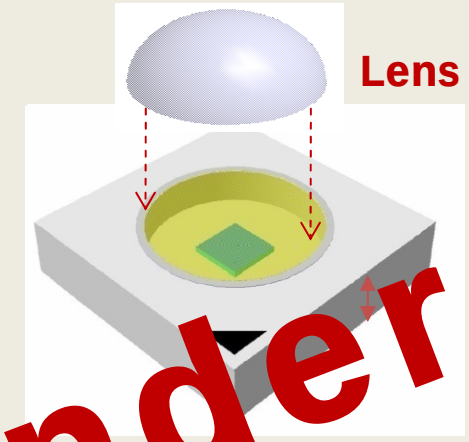
Constant Current Module



- More effective circuit Example)
- Constant Current IC
- Recommendation Design as $V_{IN}-V_{LEDf}$ = < 1V
- Easy control of constant current with Rset value

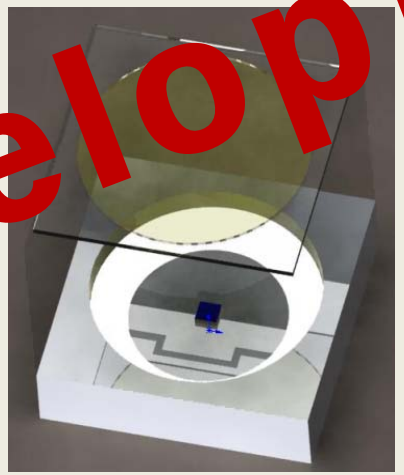
Very Narrow Beam Angle Product

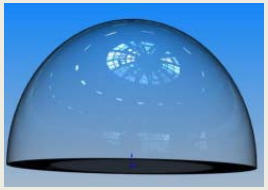
- Reflector/Lens Combined Structure
- 30° beam angle with compact structure

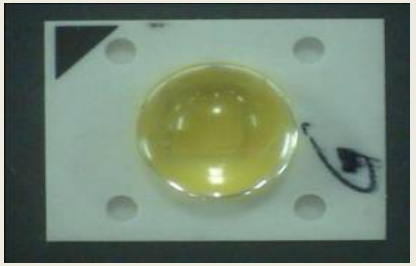


Lens attached into Cavity

Overall thickness
2 ~ 2.5mm



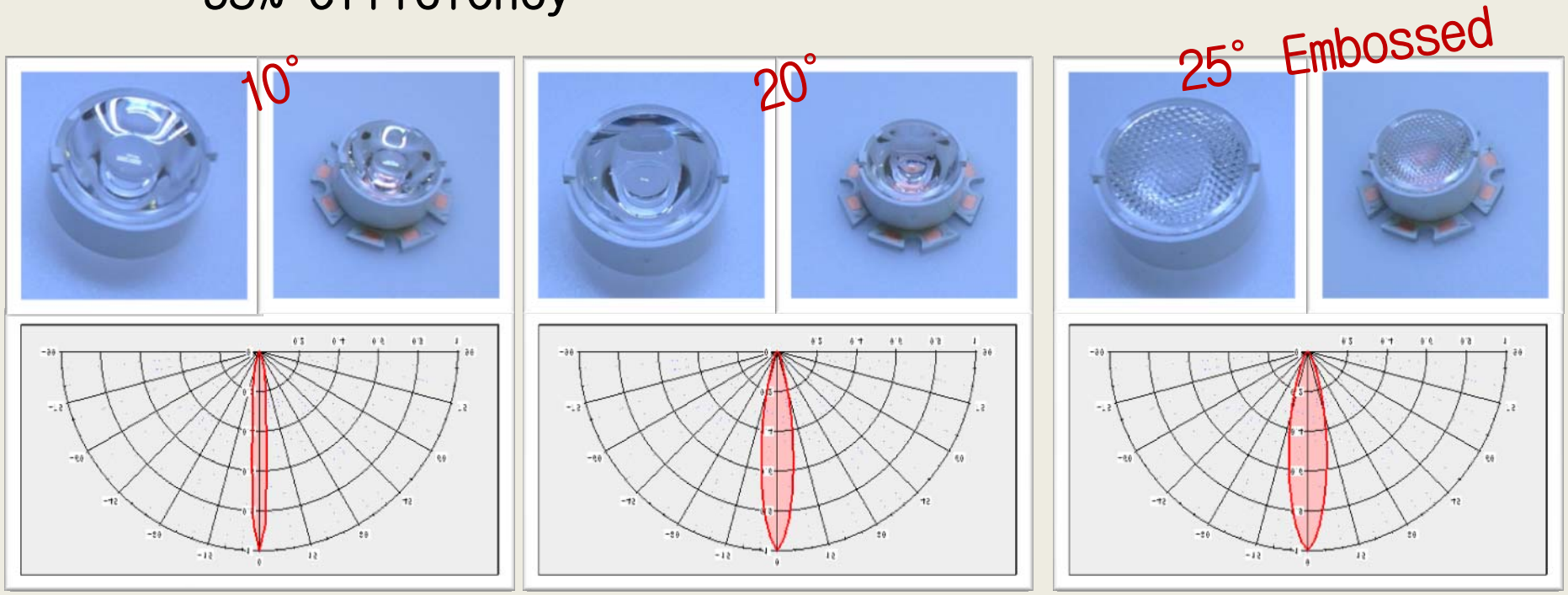




Under Development

Optic

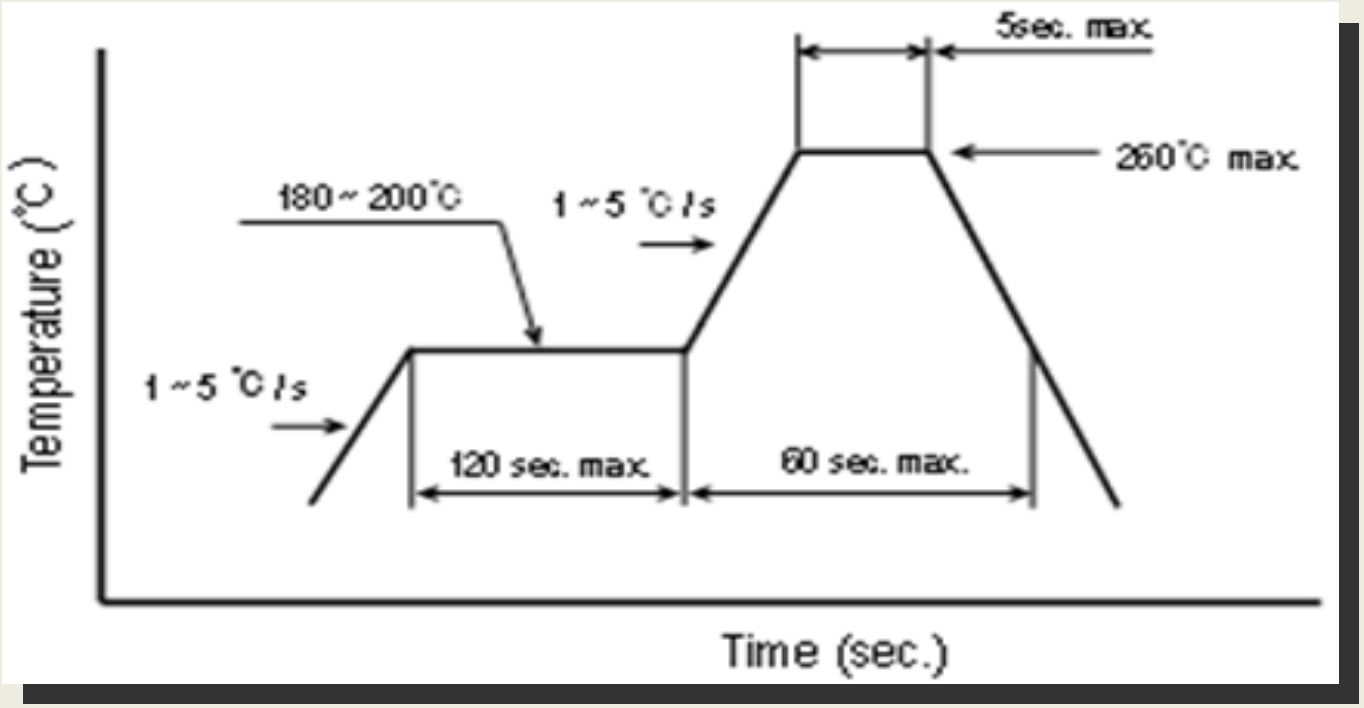
- Secondary Lens : Narrow angle for light devices
  - 10, 15, 20, 25, 30, 40 degree Distribution angle
  - Compact Size (Φ 21.0 x 10.0 mm)
  - 95% efficiency



Handling Guide

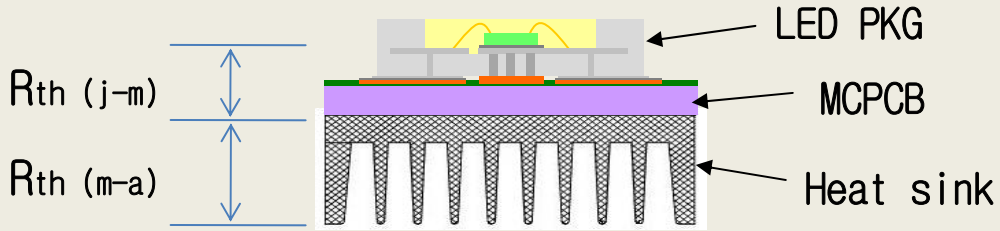
- **SMD Soldering**

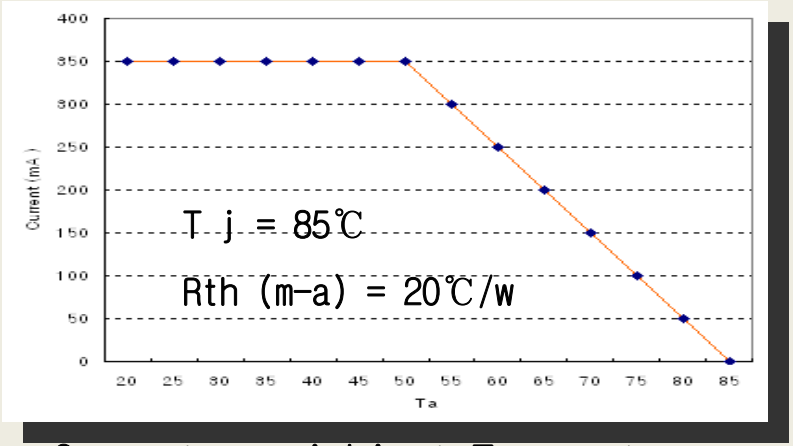
  This ceramic LED should be reflow soldered to MCPCB or other board with the following condition.



Handling Guide

- Heat Sink Selection Guide
  - T j = Ta + ((Vf* I) * Rth(m-a)) + ((Vf*I) * Rth(j-m))





Current vs Ambient Temperature

Example)

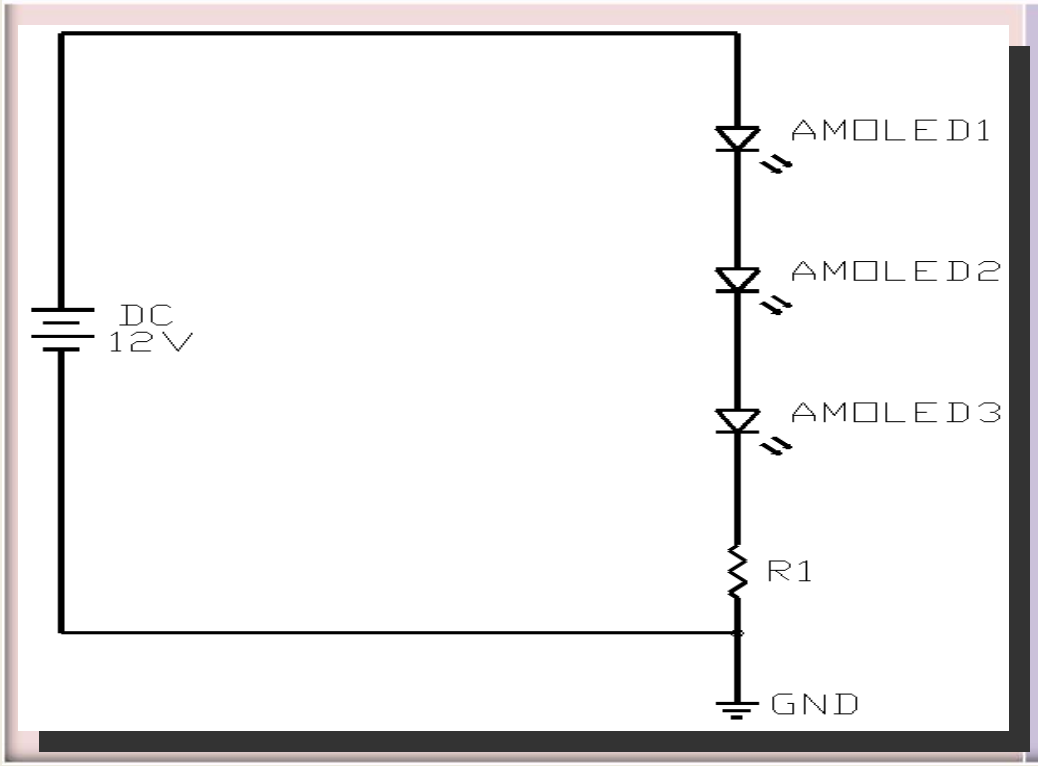
- AL-WH9070 (Rth : 10 ℃/W)
- Rth of MCPCB + Heat sink : 20 ℃/W

- To keep Tj below 85 ℃,
  Refer to the current curve

Handling Guide

- Circuit Recommendation

1) DC with resistor (Serial)



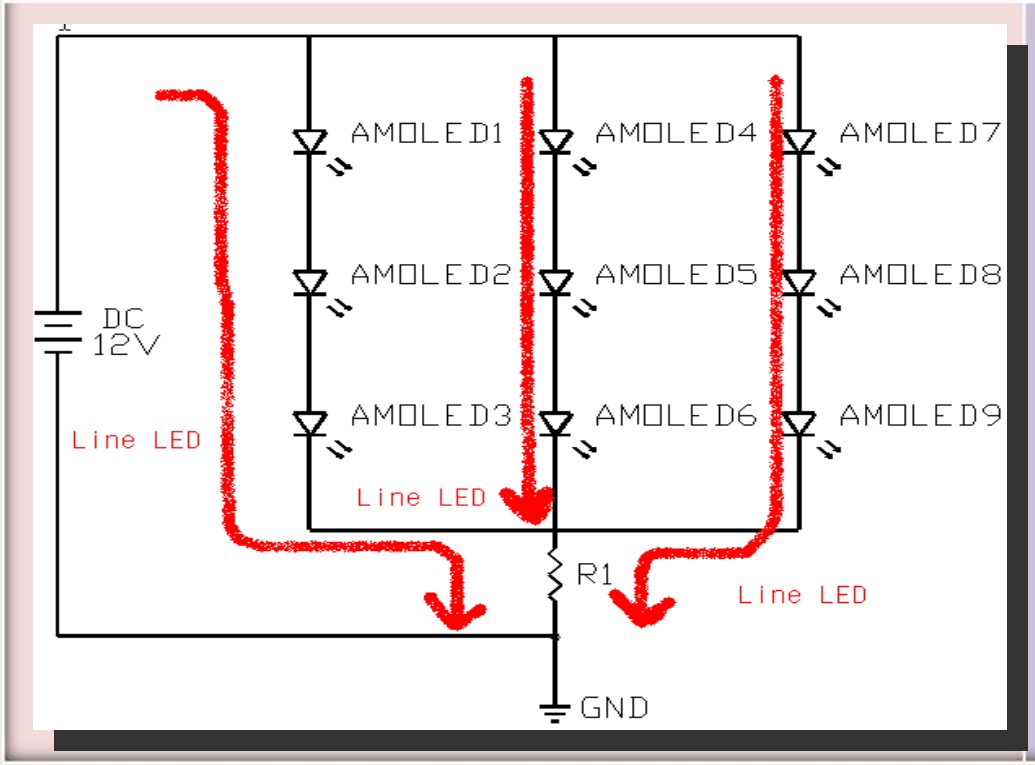
Example)

- V_{IN} = DC 12V
- I_{LED} = 100mA
- V_{LEDf} = 3.4V X 3 = 10.2V
- I_{LED} = (12V – 10.2V)/R1
- R1 = 18Ω

Handling Guide

- Circuit Recommendation

2) DC with resistor (Serial + Parallel)



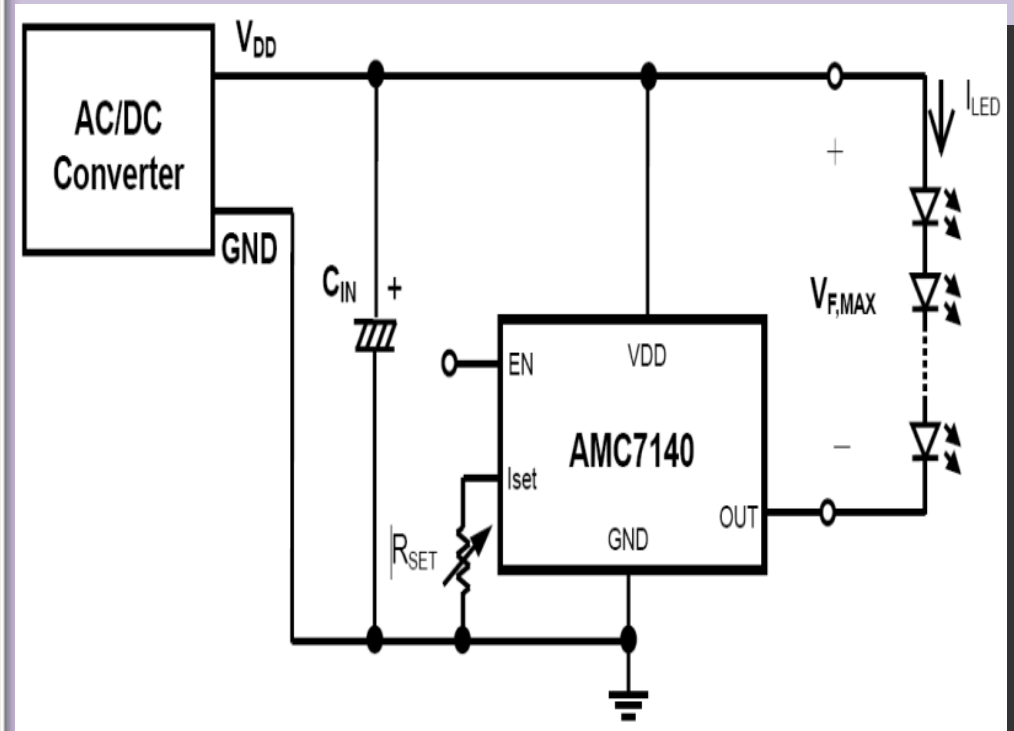
Example)

- V_{IN} = DC 12V
- I_{LED} = 30mA / line
- V_{LEDf} = 3.4V X 3 = 10.2V
- I_{LED} = (12V – 10.2V)/R1
- R1 = 20 Ω

Handling Guide

- Circuit Recommendation

3) Constant Current Module

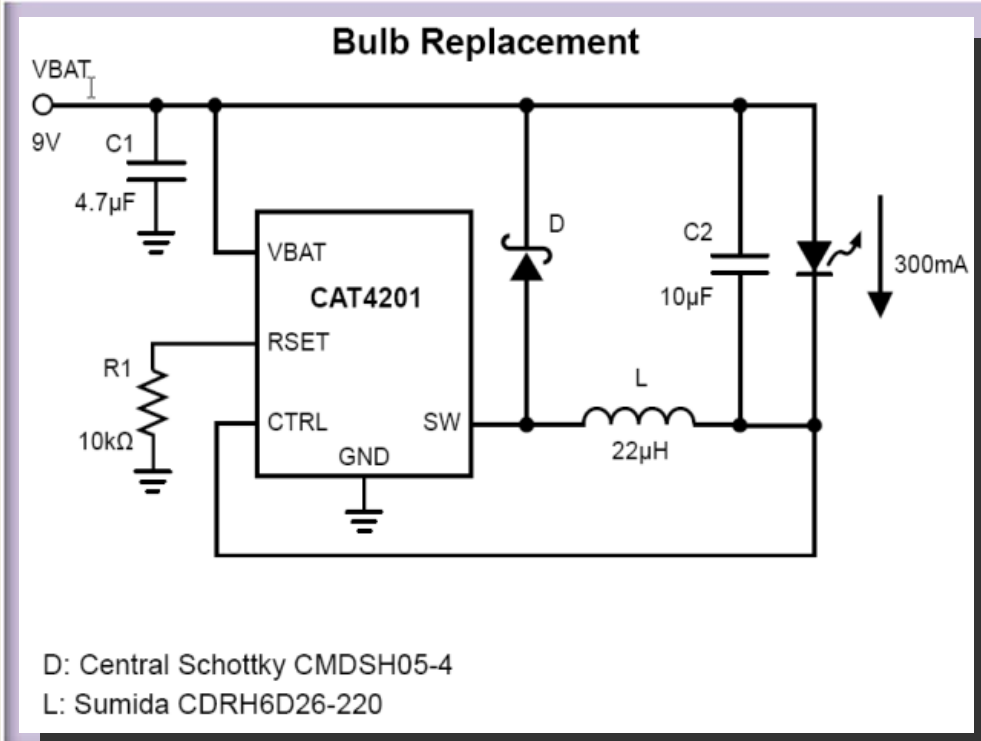


- More effective circuit Example)
- Constant Current IC
- Recommendation Design as V_{IN}–V_{LEDf} = < 1V
- Easy control of constant current with R_{set} value

Handling Guide

- Circuit Recommendation

4) DC/DC Converter #1



In case of VIN > V_{LEDf}

[Step down(Buck) Converter]

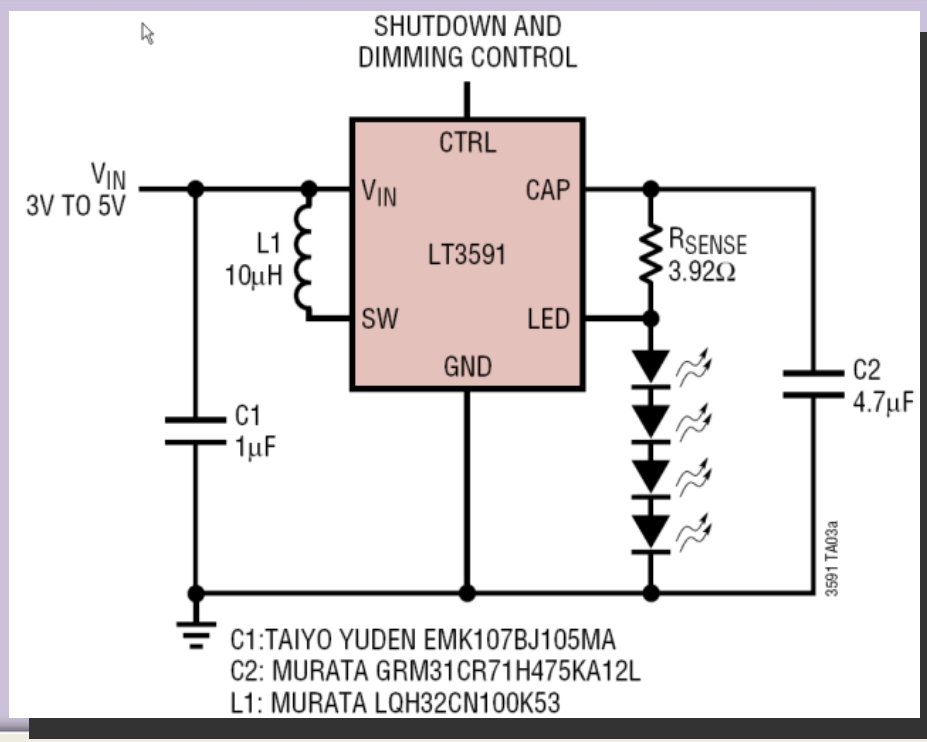
Example)

- **Input Voltage = 9V**
- **Output Voltage = 3.4V_{LEDf}**
- **Output Current = 300mA**

Handling Guide

- Circuit Recommendation

5) DC/DC Converter #2



In case of VIN < V_{LEDf}

[Step up(Boost) Converter]

Example)

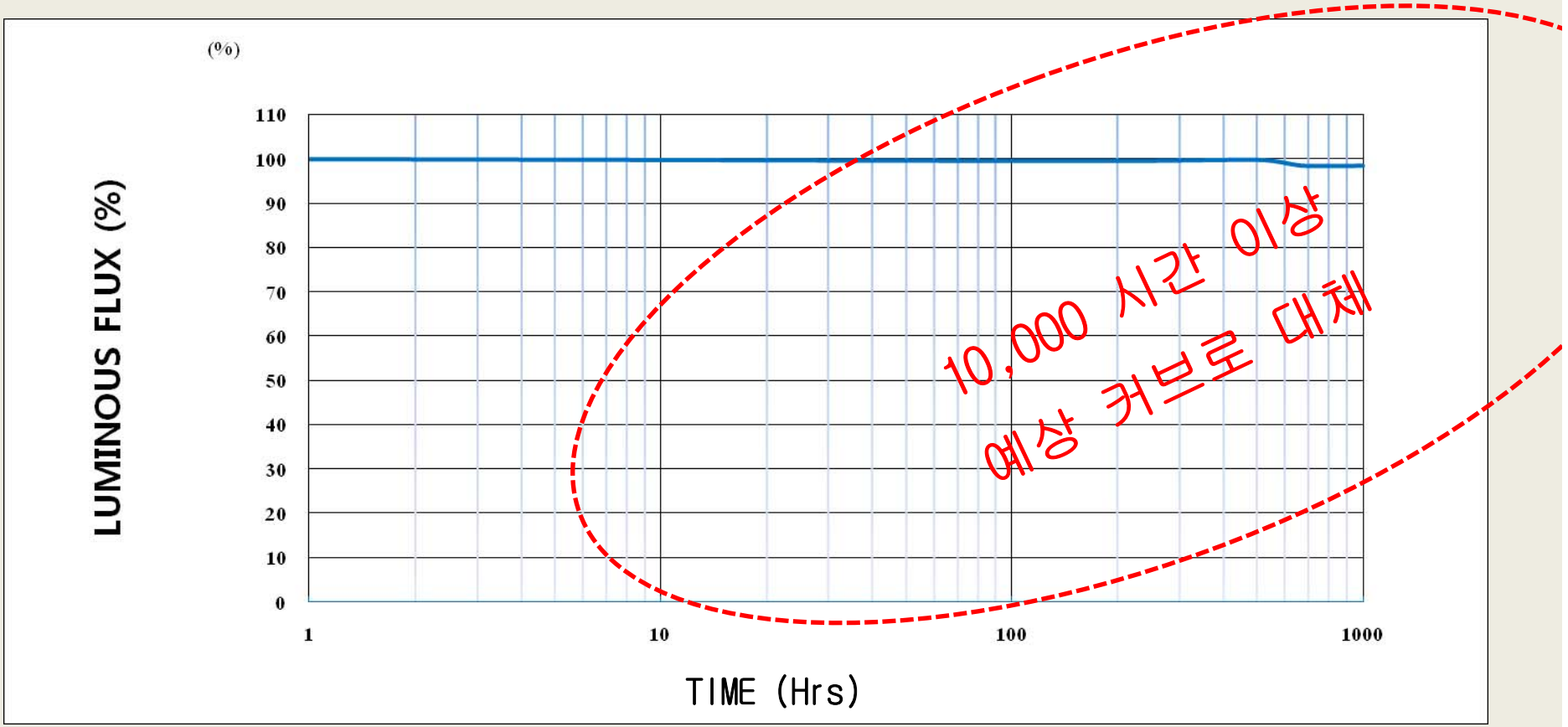
- Input Voltage = 3V~5V
- Output Voltage = 13.6V_{LEDf}
- Output Current = 50mA

Reliability Test

Test Item	Test Condition
Life time	T amb= 25℃ , I_F=700mA, 1000Hrs
Temperature Humidity Bios	T amb= 60℃ /RH=90%, I_F=500mA, 1000Hrs
High Temp. Operating Life	T amb= 85℃ , I_F=400mA, 1000Hrs
High Temp. Storage	T amb= 100℃ , 1000Hrs
Low Temp. Storage	T amb= -40℃ , 1000Hrs
Thermal Shock	T amb= -40℃ ~ 110℃, 200 cycles (dwell : 20min, temp. transition : 20sec)
ESD	1,2,3,4,5,6KV discharge (3time/3sec : forward/reverse)

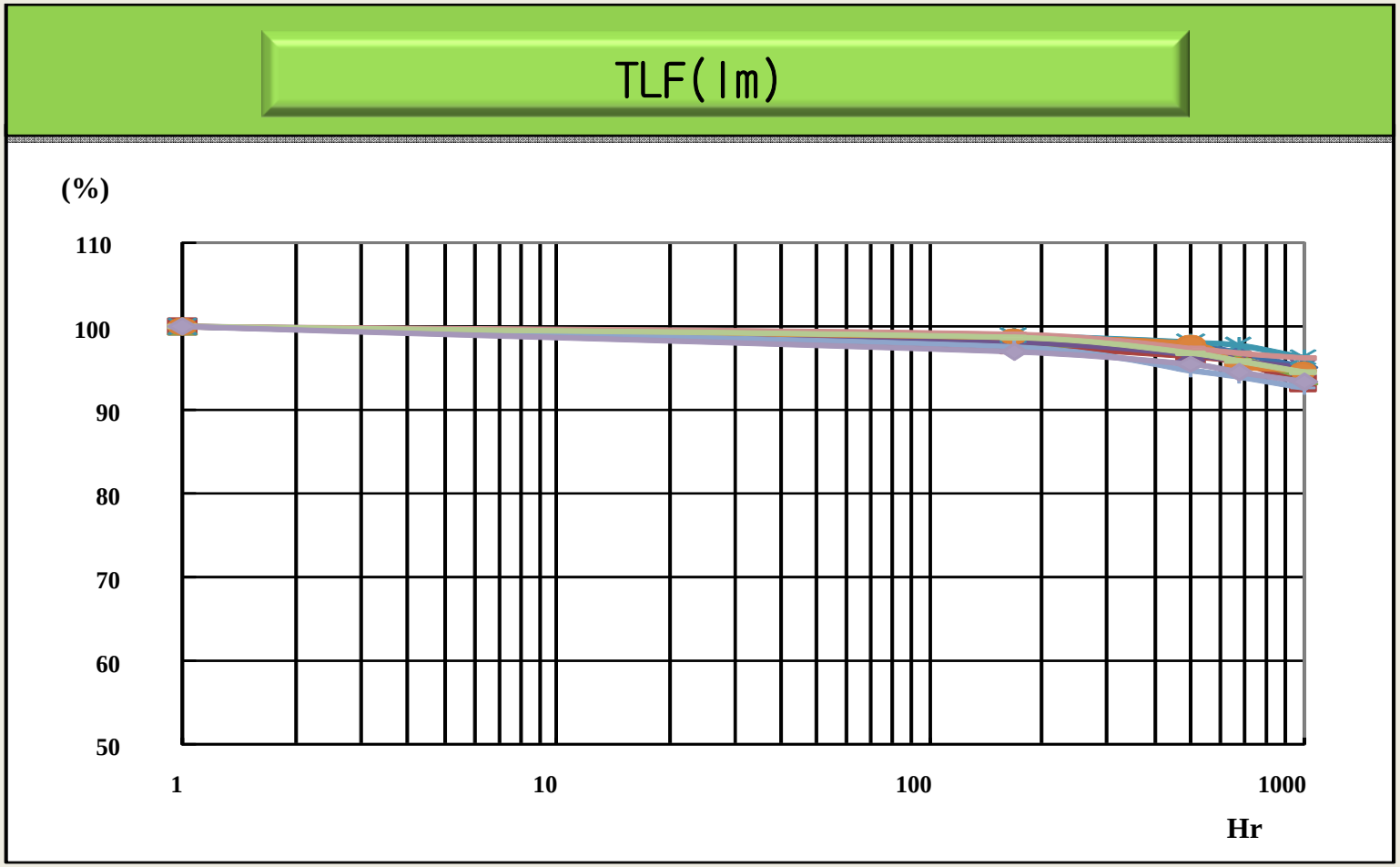
Life Time

- Room Temperature Operating Life Time Test Condition



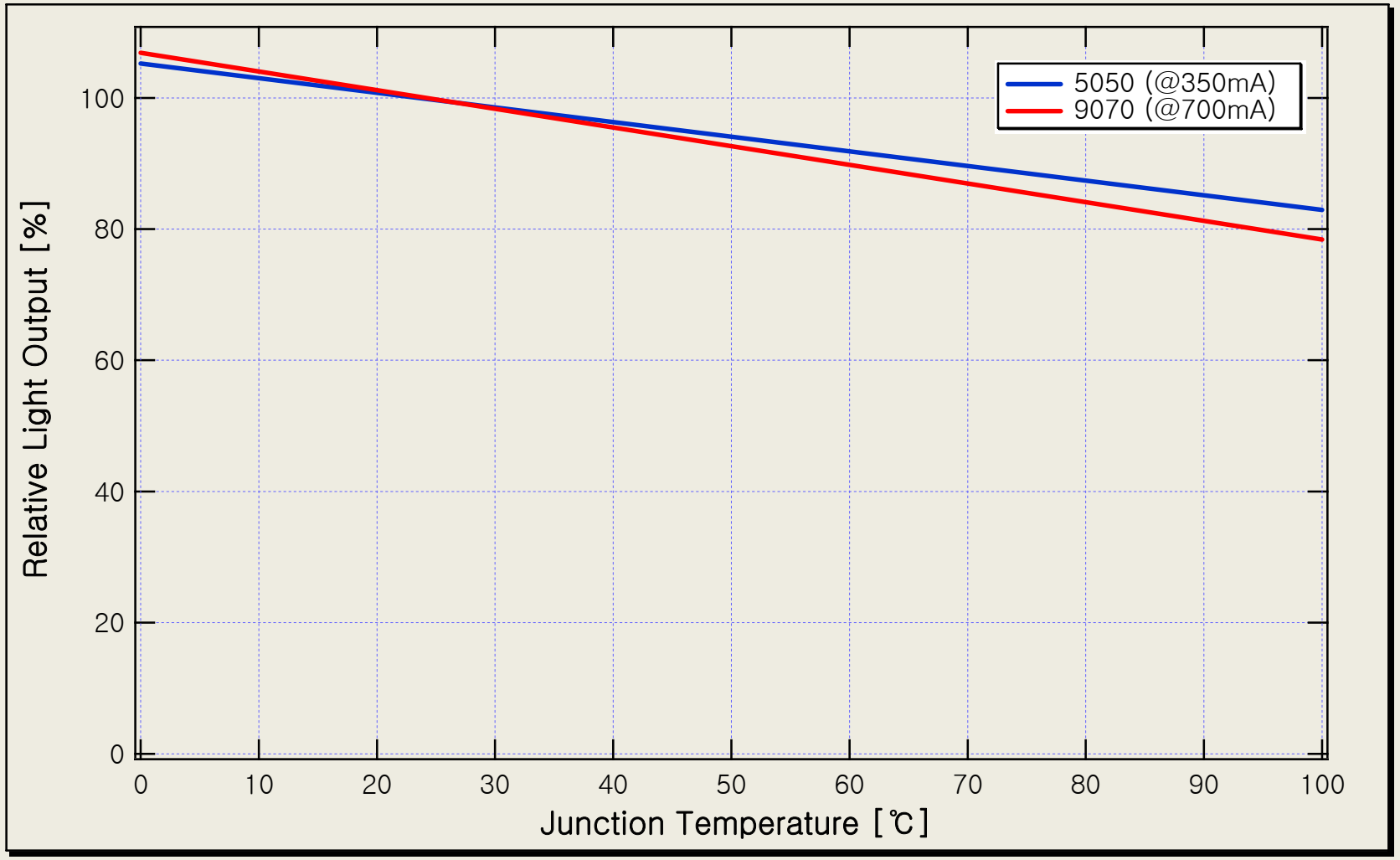
Ambient Temp. : 25 ℃, Operating Current : 700mA

Temperature/Humidity



Bios T amb= 60℃ /RH= 90%, I_F=500mA, 1000Hrs

Degradation with Junction Temperature



Current with Ambient Temperature