SEOUL SEMICONDUCTOR

NewGen Solution Introduction

High Density, Compact High Power LED solution

Seoul Semiconductor

May, 2015

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3. Product Line-up
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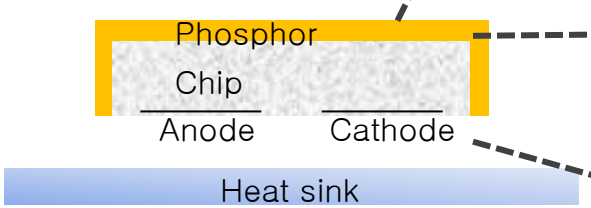
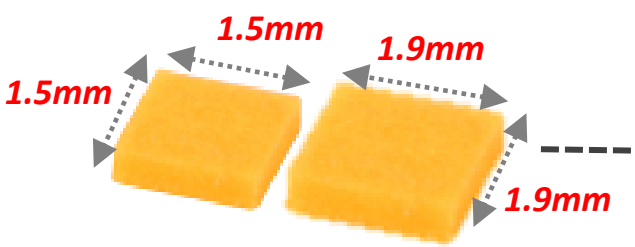
1. NewGen Introduction

NewGen will dominate in High Power and Mid Power

Schematic	Characteristics





1. **No Wire Bonding** for **higher reliability**
2. **Phosphor** directly attached to the chip. Less phosphor for **better color control**
3. **Direct SMT of Chip** – no package for higher **lm/$**
4. **NewGen Technology** enables **cost saving on system level**

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Unique Selling Points

1. Up to 2,500 lm/$

- 50% higher value compared to High Power 3535

2. High Lumen Density

- Significant cost savings at the fixture level - less space required

3. Excellent Reliability

- No wire-bonds – better resistance against vibrations
- Direct contact with surface for better heat transfer
- Higher robustness against H2S Gas (no silver present)

4. Market Leading Color Uniformity

- Phosphor film for better control over color variation

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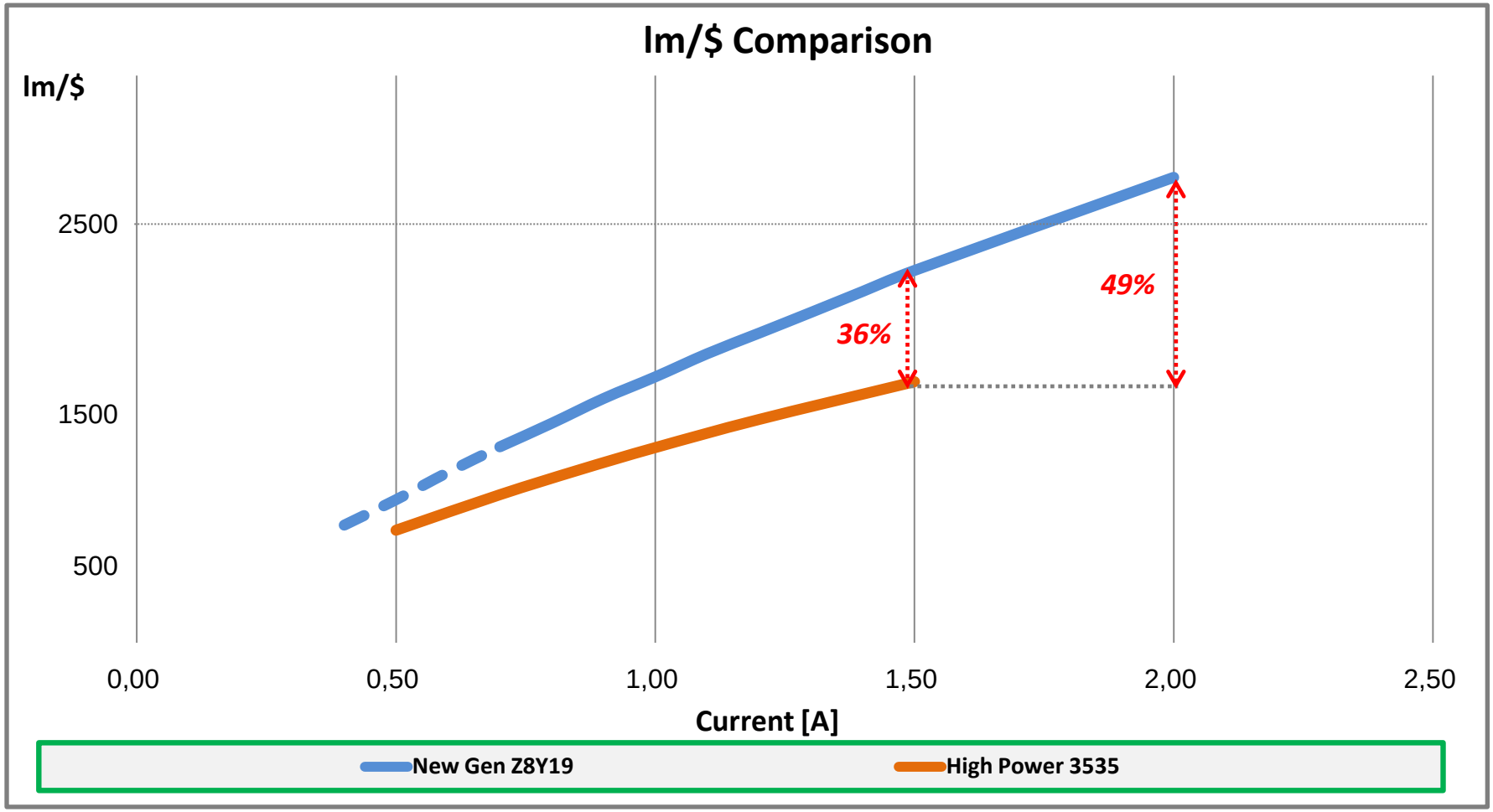
2.1 More than 2,500 lm/$

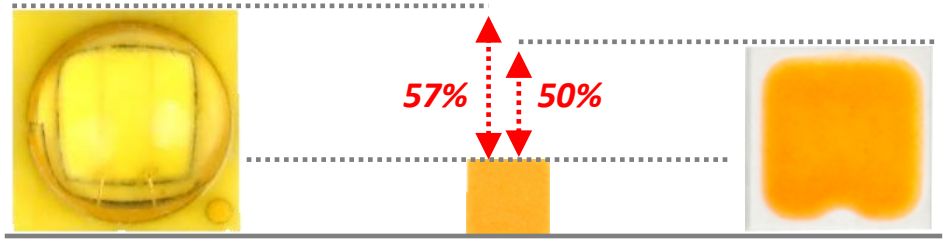
NewGen can provide more than 2,500 lm/$
49% higher lm/$ than HP3535 at Max.current



High Lumen Density : Small size enables Design Freedom

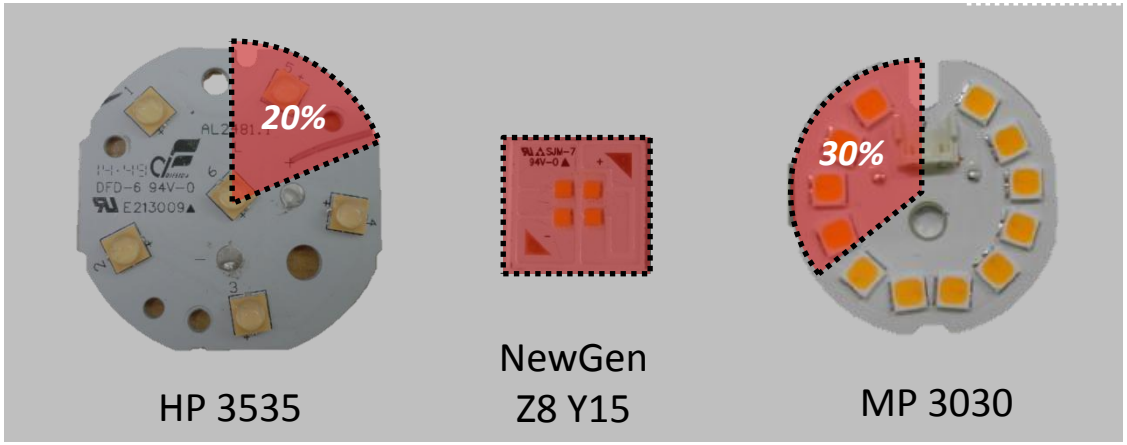
Number of LEDs and PCB size can be reduced
Small form factor enables more simple design

LED



HP 3535 | NewGen Z8 Y15 | MP 3030

Module



HP 3535 | NewGen Z8 Y15 | MP 3030

* 3 modules provide similar lumen output

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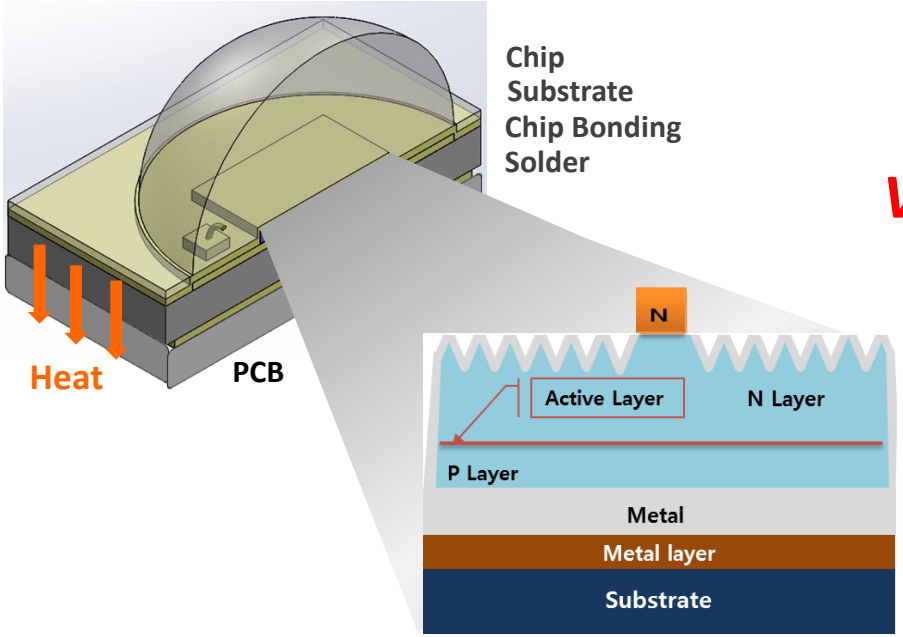
2.3 High Reliability

Excellent thermal characteristic provides longer Lifetime

Common chip for High/Mid-Power

Multiple thermal interfaces between chip, package and PCB – long thermal path

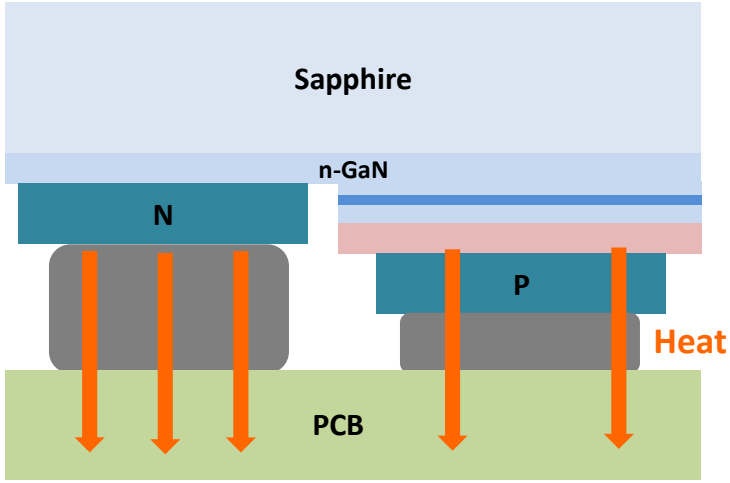


VS

NewGen – Flip Chip

Direct thermal path to PCB enables excellent thermal characteristics

Thermal Resistance $R_{th\ J\text{-}S}$: 3.0K/W



Ref) Applied Physics Express Volume 7 Number4

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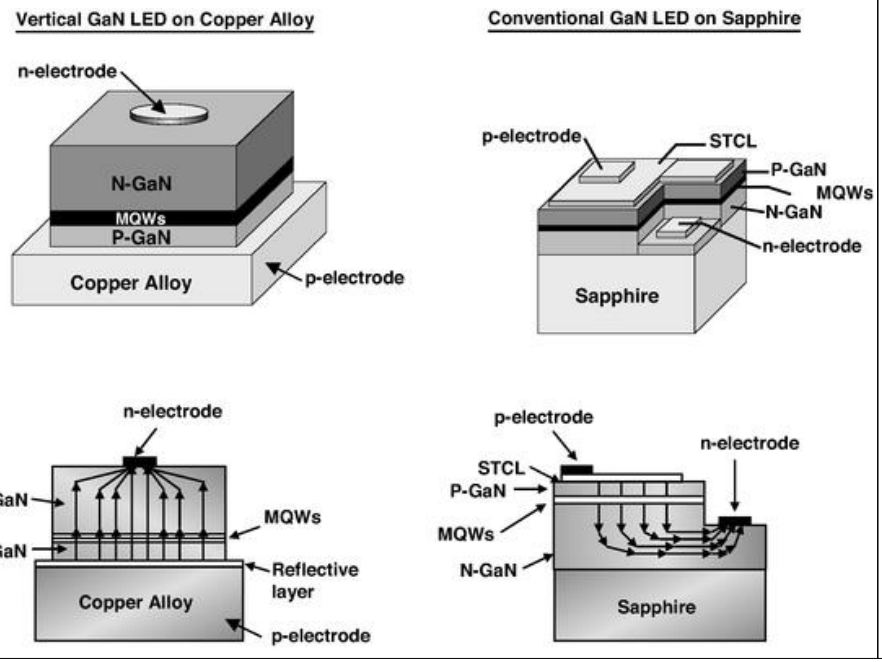
2.3 High Reliability

Excellent thermal characteristic provides longer Lifetime

High Power Chip – Vertical Chip

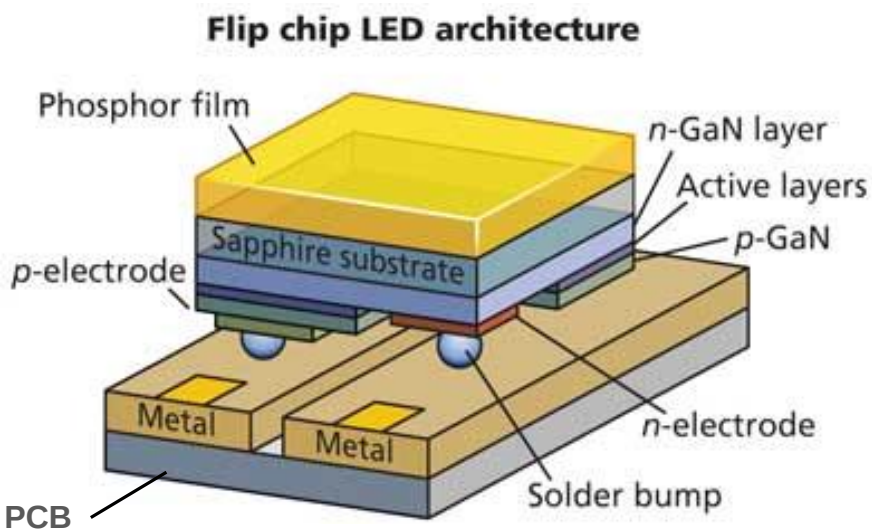
Mid Power Chip – Lateral Chip

Heat dissipates slowly because of long heat path



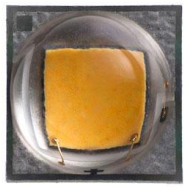
NewGen – Flip Chip *(Flipped Lateral Chip)*

Heat dissipates faster thanks to direct contact of the Chip with surface (PCB)



2.4 Good Color Uniformity

Good color uniformity with wide viewing angle

High Power		NewGen
- Complex manufacturing - High color variation	 VS	- Simple! Fast! - Good uniformity

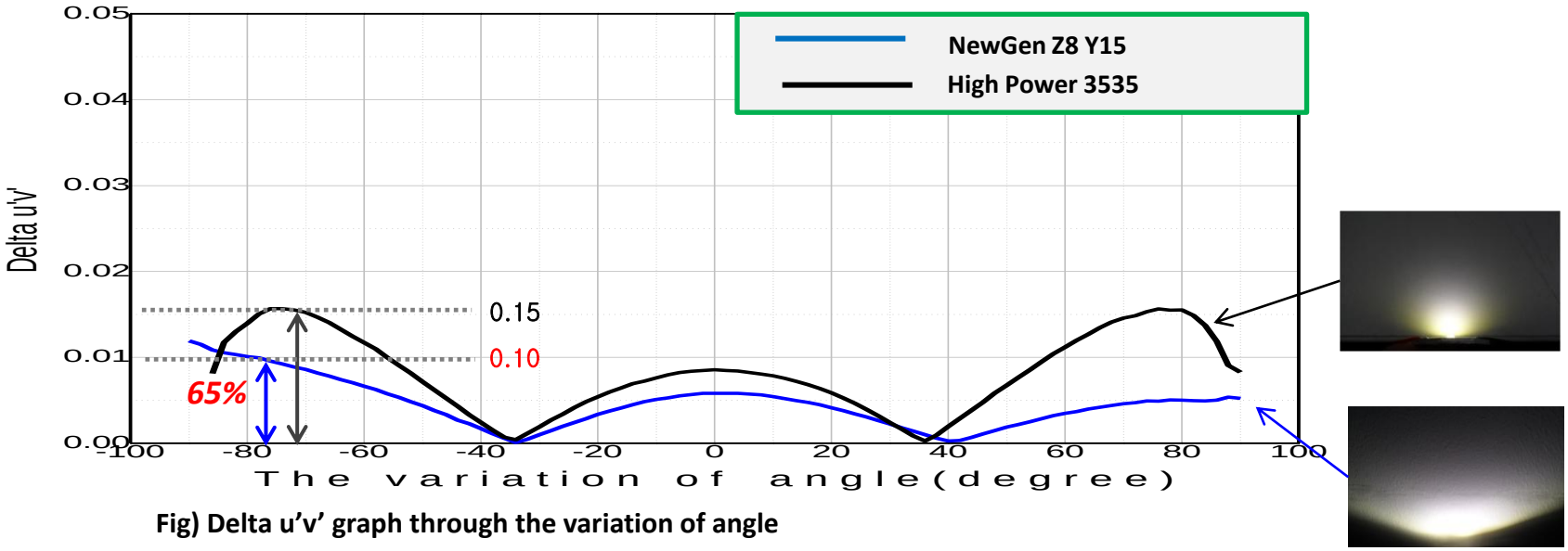


Fig) Delta u'v' graph through the variation of angle

2.5 Better performance from H_2S Gas

NewGen = No silver plating → Strong from H_2S gas

- Test condition: 40℃ / 80% / 15ppm

- NewGen / 5000K / CRI70
- Competitor's Product / 5000K / CRI70

Product	Competitor's High Power PKG	NewGen	Remark
Relative variation of Flux	92%	98%	More than 6% gap

Initial

After 336 hours

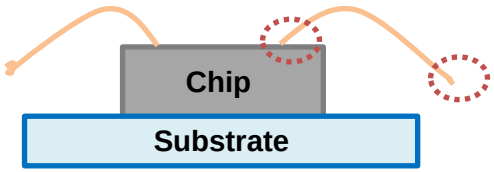
C-company (USA)

2.6 Better result from Wire Broken

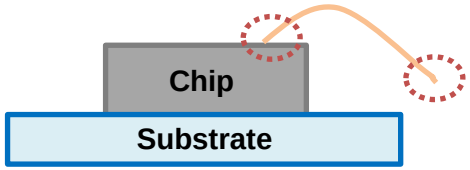
NewGen = No wire bonding → No disconnect gold wire

- ✓ faulty from external force or manufacturing process
- ✓ Faulty from Thermal Mismatch

Have a chance of occurring wire open through thermal shock



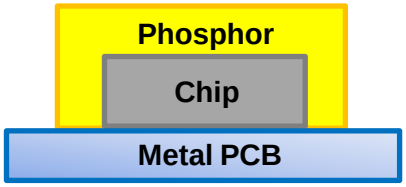
(Lateral Chip)



(Vertical Chip)

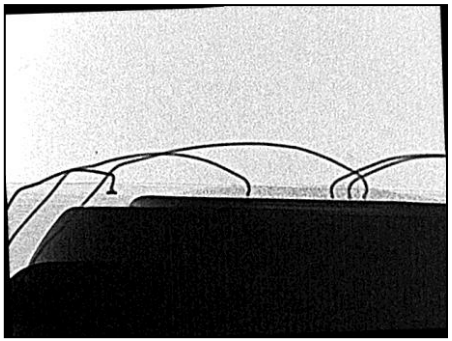
VS

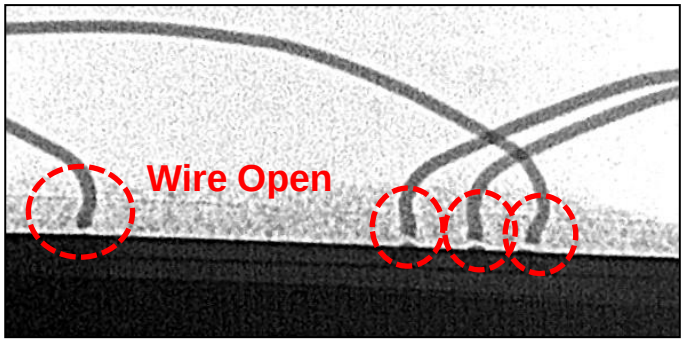
No Wire Bonding



(NewGen)

Thermal shock (-40~120℃ / 500Hr)

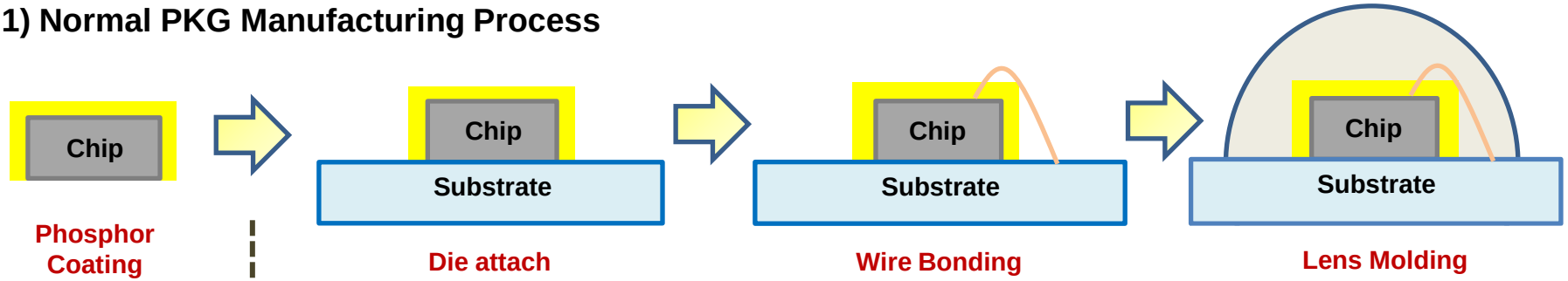




2.7 Short Lead Time

NewGen has simple manufacturing

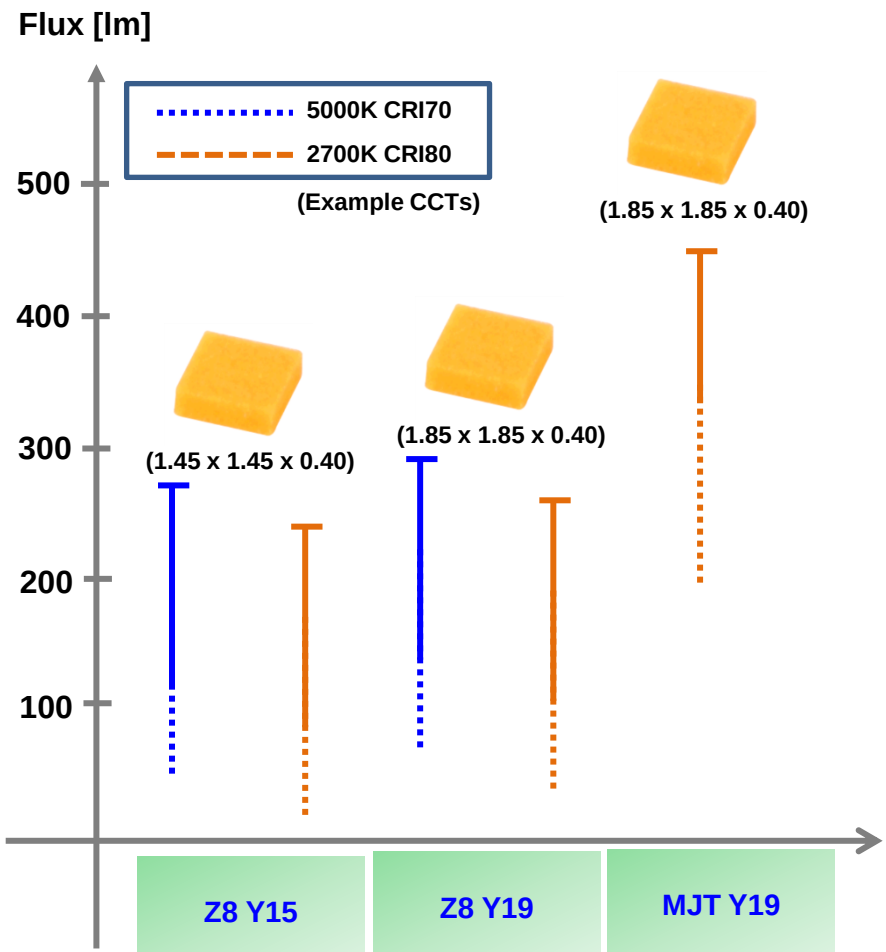
1) Normal PKG Manufacturing Process



2) NewGen Manufacturing Process

Simple Process !!

3. NewGen Package Lineup



Z8 Y15	Z8 Y19	MJT Y19
Spot Light Retrofit Lamp Area Light Bay Light Torch	Spot Light Retrofit Lamp Area Light Bay Light Torch	GU 5.3 Mini Krypton Retrofit Lamp Spot Light

NewGen Performance Summary

NewGen	Current [A]	VF [V]	CCT [K]	Lm [lm]	Lm/W	CRI	R_{thJ-S}
Z8 Y15	0.70	3.25	5000	275	120	70	6.0
			2700	235	100	80	
Z8 Y19	0.70	3.00	5000	300	140	70	3.0
			2700	245	115	80	
MJT Y19	0.54	10.50	5000	534	94	70	3.0
			2700	445	80	80	3.0

※ Tj=25℃ driving condition

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3.1 NewGen Package Lineup

(Newgen Z8Y15)

Advantages & Benefits

- Small Size Light Source
- High Reliability
- Low Thermal Resistance
- Competitive cent/lm
- Good Color Uniformity

Applications

- Area Light
- Stadium Light
- Torch
- High/Low bay Light
- Parking Light
- Retrofit Lamps (Bulb, Candle, GU10 and Par)

Electrical Optical Characteristics (Tj=25℃)

	5000K	2700K
Size [mm]	1.45 * 1.45 * 0.40	
Flux [lm]	275	235
Current [A]	0.7	0.7
VF [V]	3.25	3.25
Power [W]	2.2	2.2
Thermal Resistance R_{thJ-S} [K/W]	6.0	6.0
CRI	Min. 70	Min. 80
Viewing Angle [Degree]	140	140

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3.2 NewGen Package Lineup

(Newgen Z8Y19)

Advantages & Benefits

- Small Size Light Source
- High Reliability
- Low Thermal Resistance
- Competitive cent/lm
- Good Color Uniformity

Applications

- Area Light
- Stadium Light
- Torch
- High/Low bay Light
- Parking Light
- Retrofit Lamps (Bulb, Candle, GU10 and Par)

Electrical Optical Characteristics [Tj=25℃]

	5000K	2700K
Size [mm]	1.85 * 1.85 * 0.40	
Flux [lm]	300	245
Current [A]	0.7	0.7
VF [V]	3.00	3.00
Power [W]	2.1	2.1
Thermal Resistance R_{thJ-S} [K/W]	3.0	3.0
CRI	70	80
Viewing Angle [Degree]	140	140

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3.3 NewGen Package Lineup

(Newgen MJT Y19)

Advantages & Benefits

- Small Size Light Source
- High Reliability
- Low Thermal Resistance
- Competitive cent/lm
- Good Color Uniformity

Applications

- **GU5.3, Mini Krypton**
- Retrofit Lamps (Bulb, Candle, GU10 and Par)
- Spot Light (Architectural Lighting)

Electrical Optical Characteristics [Tj=25℃]

	5000K	2700K
Size [mm]	1.85 * 1.85 * 0.40	
Flux [lm]	534	445
Current [A]	0.54	0.54
VF [V]	10.5	10.5
Power [W]	5.7	5.7
Thermal Resistance R_{thJ-S} [K/W]	3.0	3.0
CRI	70	80
Viewing Angle [Degree]	140	140

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3.4 Product Line Up Summary

Total 3 Products Consist of NewGen Series : Z8 Y15, Z8 Y19, MJT Y19
Lumen Density of NewGen is much better than HP3535 (Normal 1W)

@Tj = 25°C

CCT	Product	Lumen output	Lumen Density	IF	VF	Power	Eff.	CRI	Viewing Angle	Rth J-S
		lm	lm/mm^2	A	V	W	lm/W	-	º	-
5000K	Z8 Y15	275	120	0.7	3.25	2.2	120	Min.70	140	6.0
	Z8 Y19	300	83	0.7	3.00	2.1	140	Min.70	140	3.0
	MJT Y19	534	150	0.54	10.5	5.7	95	Min.80	140	3.0
	HP3535	305	25	0.7	3.10	2.2	140	Min.70	120	4.0
2700K	Z8 Y15	235	105	0.7	3.25	2.2	100	Min.80	140	6.0
	Z8 Y19	245	65	0.7	3.00	2.1	115	Min.80	140	3.0
	MJT Y19	445	125	0.54	10.5	5.7	80	Min.80	140	3.0
	HP3535	245	20	0.7	3.10	2.2	110	Min.80	120	4.0

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The LM80 will be finished by the end of May.
Thermal Shock Test was finished.

1) LM80 Schedule

- Driving condition: 1.0A
- Ts 55℃, 85℃, 105℃

Product	Tem	1000	2000	3000	4000	5000	6000	7000	8000	9000
NewGen	55℃	Complete		Complete			Sep 2015			Jan 2016
	85℃									
	105℃									

2) Thermal Shock Test Result

- Test Condition: Tc=-40℃(30min) ~ 120℃(30min) / 1000 hours

Result:

→ All samples(20 pcs) → Pass

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4. Application

Target applications for NewGen includes from Flood light to Mini-krypton applications

Application	Flood Light	High-bay	Torch		GU5.3	Mini Krypton
Lumen output in Module	12,000lm @0.7A	11.000lm @0.7A	338lm@1A	530lm@1.5A	446lm @0.54A	350lm @0.4A
Advantages	•Save Cost •Light Weight •Better Color Deviation		•Better Color Deviation •No Chip Pattern •Thinner Head		•One Source •Small LES for Optic •Small Viewing Angle	

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Characteristics – lumen & Price/lm

Better lumen output and better price/lm at high current

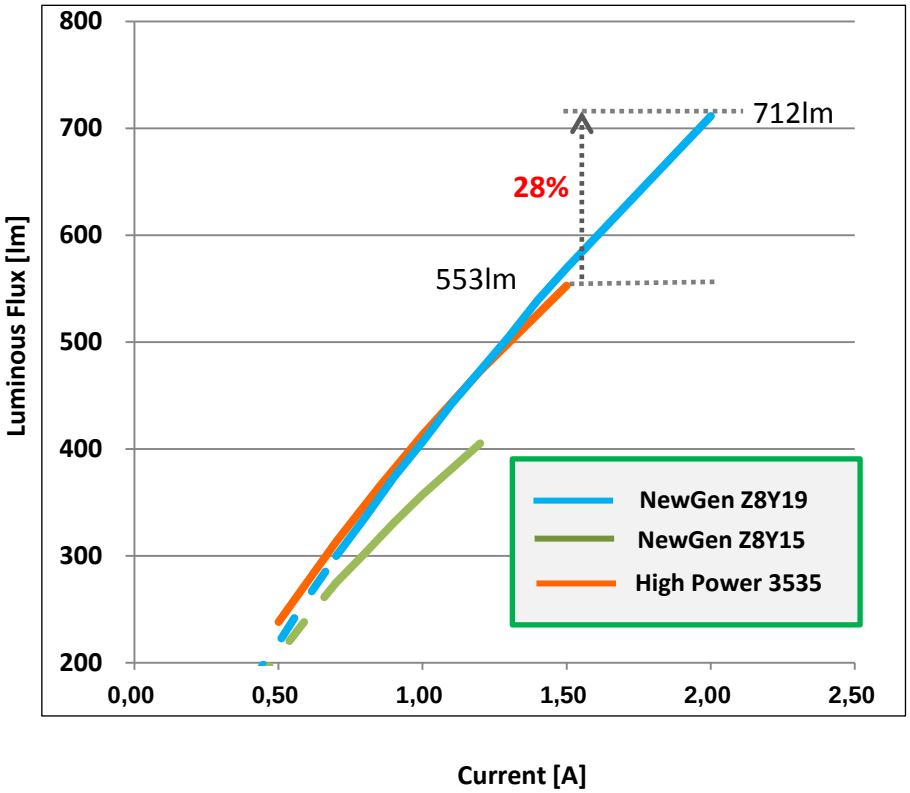

Fig) Luminous variation by changing current

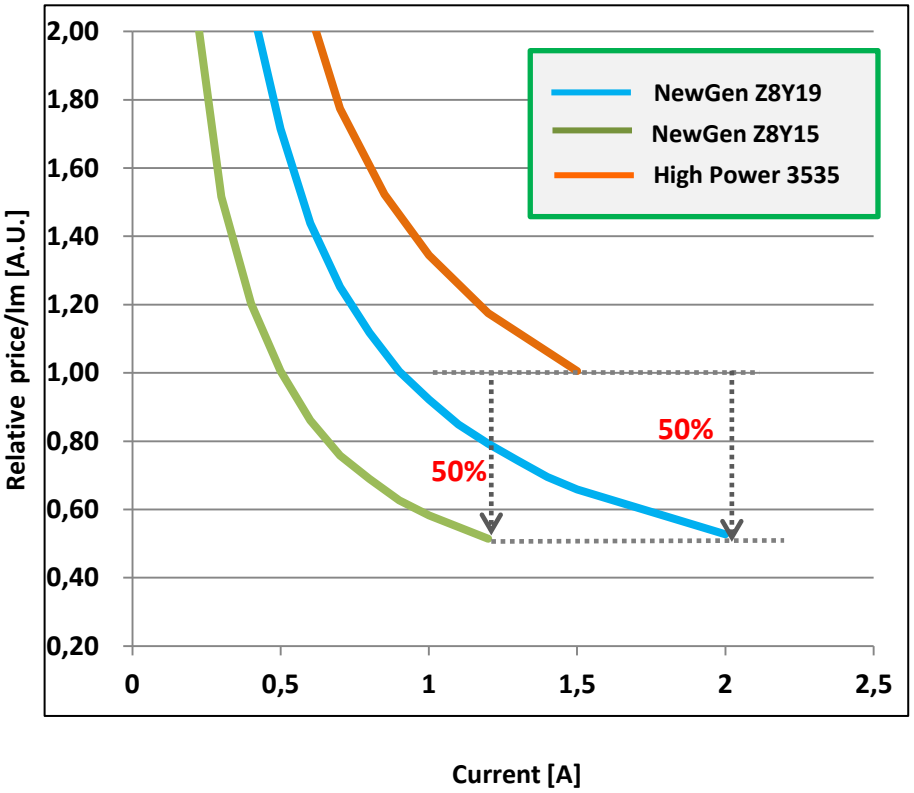

Fig) Relative price/lm variation by changing current

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Lens providers

Compatible with Z5M Lens Solutions

LedLink
Linking LEDs to The Real World

LEDiL

KHATOD®

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Lens provider - LedLink

Compatible with Z5M Lens Solutions

Part number	Z8Y15	Z8Y19
LL01OS-HG40L06	V	
LL01OS-HG60L06	V	
LL01CR-AAF25L02	V▲	V▲
LL01NI-AAF45L02	V▲	V▲
LL01NI-AAF60L02	V▲	V▲
LL01CR-BDF3070L06		V
LL01CR-BDF40L06	V▲	V▲
LL01CR-BDF60L06	V▲	V▲
LL01OS-BDF25L06	V▲	V▲
LL01CR-DF100L06	V▲	V▲
LL01CR-DF3065L06	V	V
LL01CR-DF80L06	V▲	V▲
LL01LU-AFC1035L06	V	V
LL01LU-AFC1530L06	V	V
LL01OS-AFC10L06	V▲	V▲
LL01OS-AFC15L06	V▲	V▲
LL01OS-AFC25L06	V▲	V▲
LL01OS-AFC30L06	V▲	V▲
LL01OS-AFC50L06	V	V
LL01NI-ANE10L02	V	V
LL01NI-ANE20L02	V	V
LL01NI-ANE30L02	V	V
LL01CR-NE1045L06	V	V
LL01CR-NE2545L06	V	V
LL01CR-NE25L06	V	V
LL01CR-NE40L06	V	V

Part number	Z8Y15	Z8Y19
LL01CR-NE60L06	V	V
LL01CR-NE80L06	V	V
LL01OS-BFV1040L06	V	V
LL01OS-BFV15L06	V	V
LL01OS-BFV25L06	V	V
LL01OS-BFV30L06	V	V
LL01CR-BEX25L06	V	V
LL01CR-BEX40L06	V	V
LL01CR-BEX60L06	V	V
LL01ZZ-EX25L06	V	V
LL01ZZ-EX3065L06	V	V
LL01ZZ-EX40L06	V	V
LL01ZZ-EX60L06	V	V
LL01ZZ-FL25L06	V	V
LL01ZZ-FL3065L06	V	V
LL01ZZ-FL40L06	V	V
LL01ZZ-FL60L06	V	V
LL01CR-BNE25L06		V
LL01CR-BNE3570L06		V
LL01CR-BNE40L06		V
LL01CR-BNE60L06		V
LL01CR-DG20L06		
LL01CR-DG30L06		
LL01CR-DG40L06		
LL01CR-DG50L06		
LL01CR-DG60L06		

V-compatible with LED
▲-IES file available

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4. Application

Seoul Semiconductor has been a leading innovator applying NewGen technology
In BLU, Mobile, Automotive applications

- ✓ BLU
- ✓ General lighting
- ✓ DRT BLU, Flat

- ✓ General lighting
- ✓ High lm/mm^2
- ✓ MR, DL, Bay

NewGen

- ✓ Mobile
- ✓ Flash module

- ✓ Automotive
- ✓ Mobile
- ✓ HL, DRL, flash

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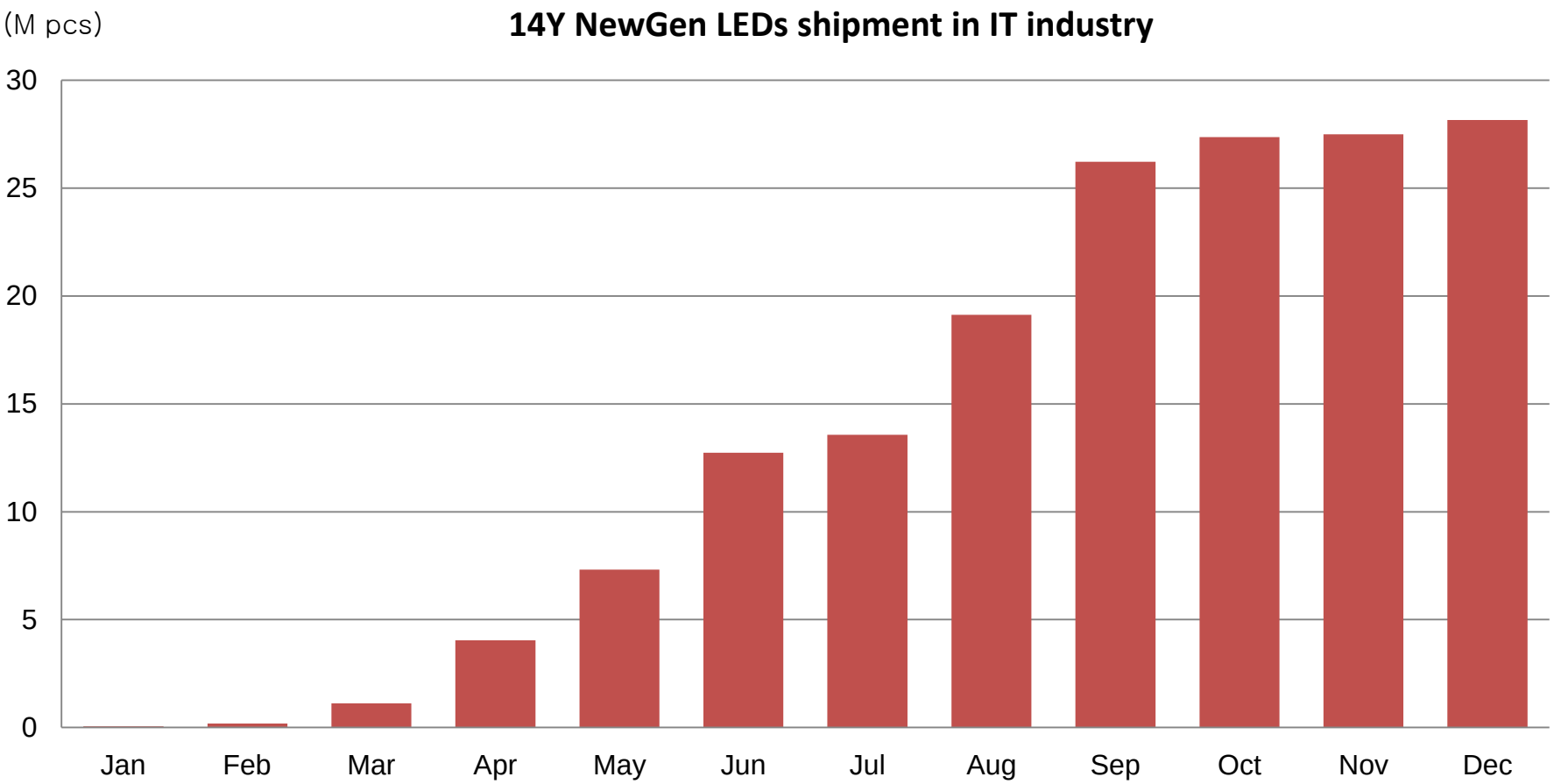
4. Application

We have knowhow for NewGen SMT Process
Seoul Semiconductor can also supply module product for lighting



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Q & A

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Appedix

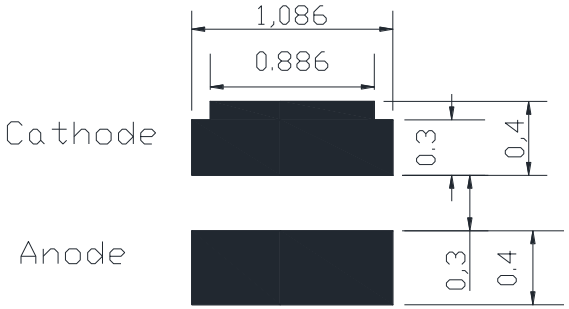
Solution for NewGen

SMT

❖ We have know-how and capability to do SMT Process with NewGen (SSC started mass production of NewGen technology in 2013)

❖ SSC can supply modules with NewGen

1. Solder pattern



2. Soldering Condition

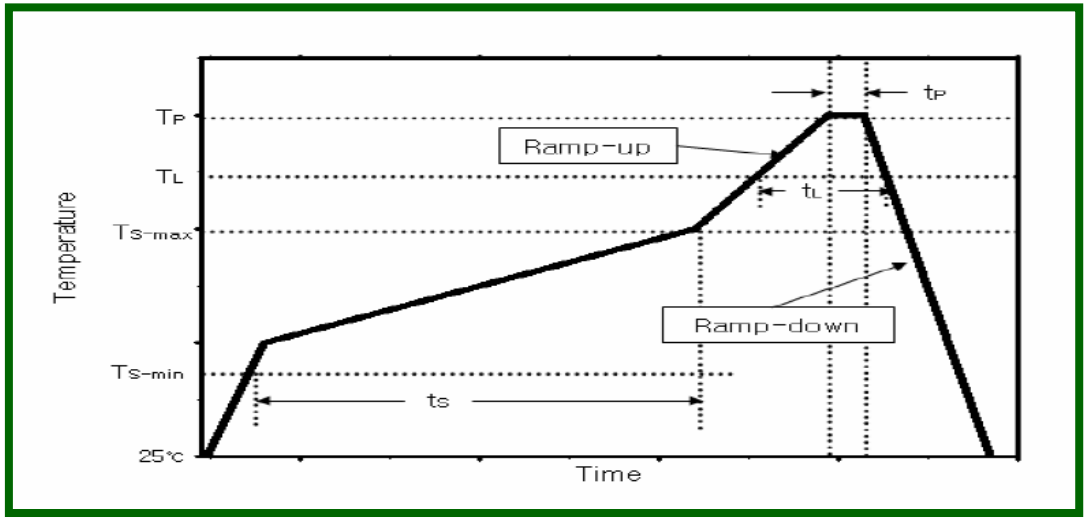
Items		Remark
Squeeze condition	Pressure	2.5-5.0Kgf/㎠
	Distance	2-4mm
	Velocity	20-100mm/sec
Mask	Thickness	**0.07~0.1**
Vacuum		0.5±0.05mpa
Solder Quantity SPEC (Volume)		70-150%

3. Nozzle Conditions

Outer diameter : 1.2 mm
Inner diameter : 0.5 mm
Material : Rubber

Solution for NewGen

Reflow



Reflow condition	Pb-Free assembly
Average ramp-up rate ($T_{S\text{-}max}$ to Peak)	2~3℃ / second
Preheat Temperature Min ($T_{S\text{-}min}$)	150℃
Preheat Temperature Max ($T_{S\text{-}max}$)	200℃
Time maintained above: : Liquidus Temperature (T_L)	217~220℃
Time maintained above: Time (t_L)	60~150 seconds
Peak Temperature (T_P)	250℃
Time within 5℃ of actual Peak Temperature (t_P)	20~40 seconds
ramp-down rate	4~6℃ / second
Time 25℃ to Peak Temperature	6 minutes max

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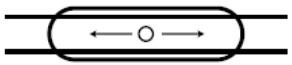
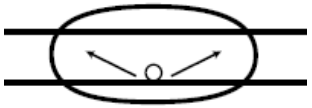
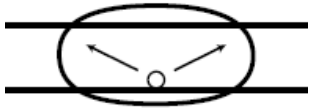
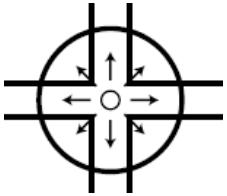
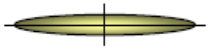
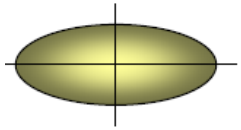
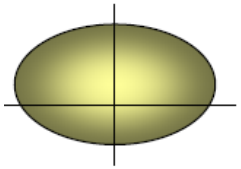
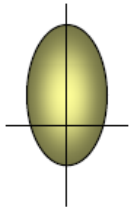
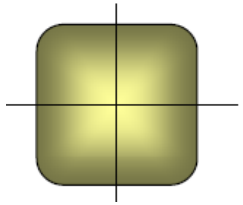
Solution for NewGen

Optics

IES type	TYPE I	TYPE II	TYPE III	TYPE IV	TYPE V
Distribution Pattern					
					
Usage	Narrow pedestrian, bicycle road	Wide pedestrian, bicycle road	General roadway, Parking lot, etc	Parking lot surrounding	Parking lot
Example	-				

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