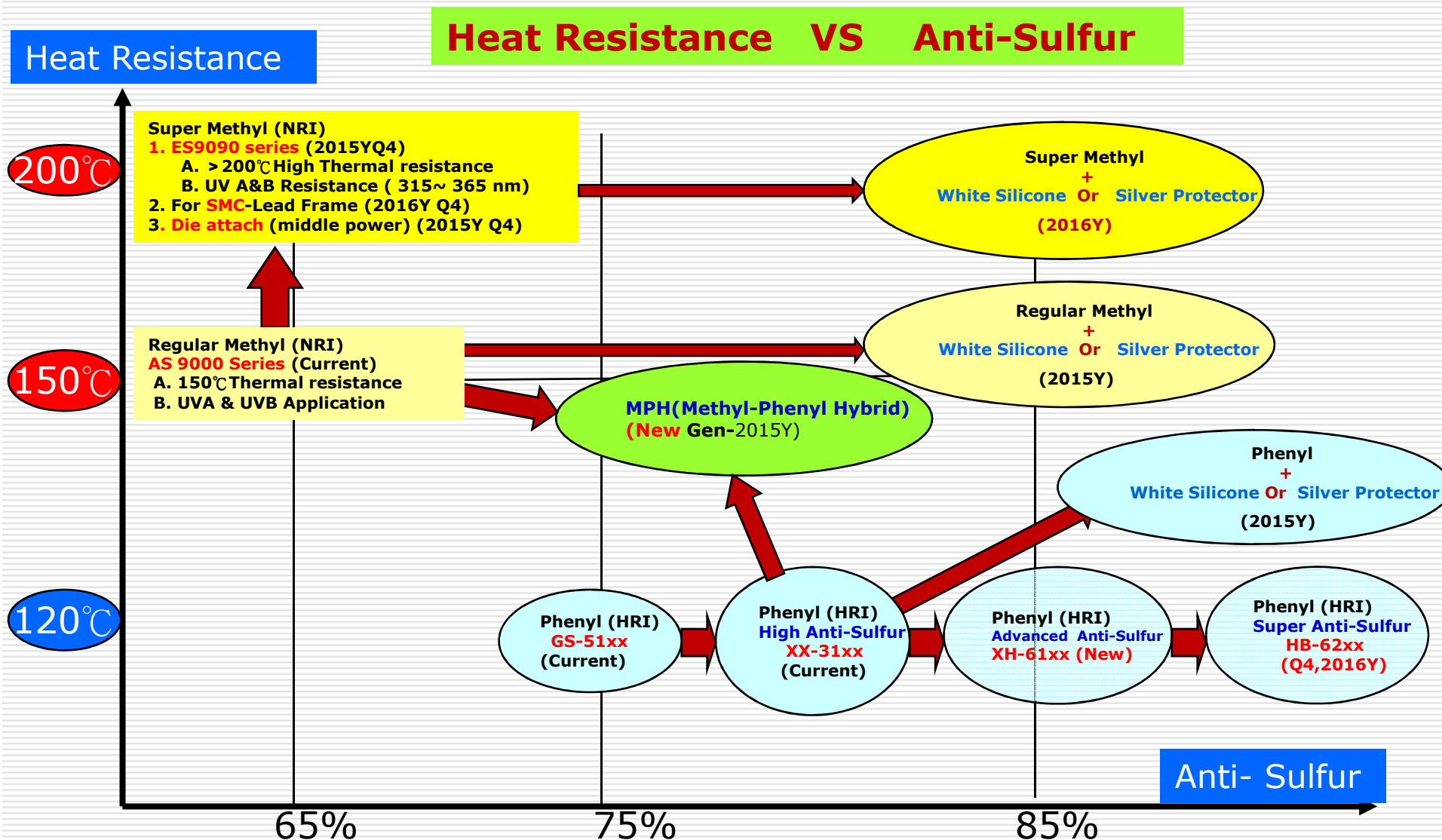
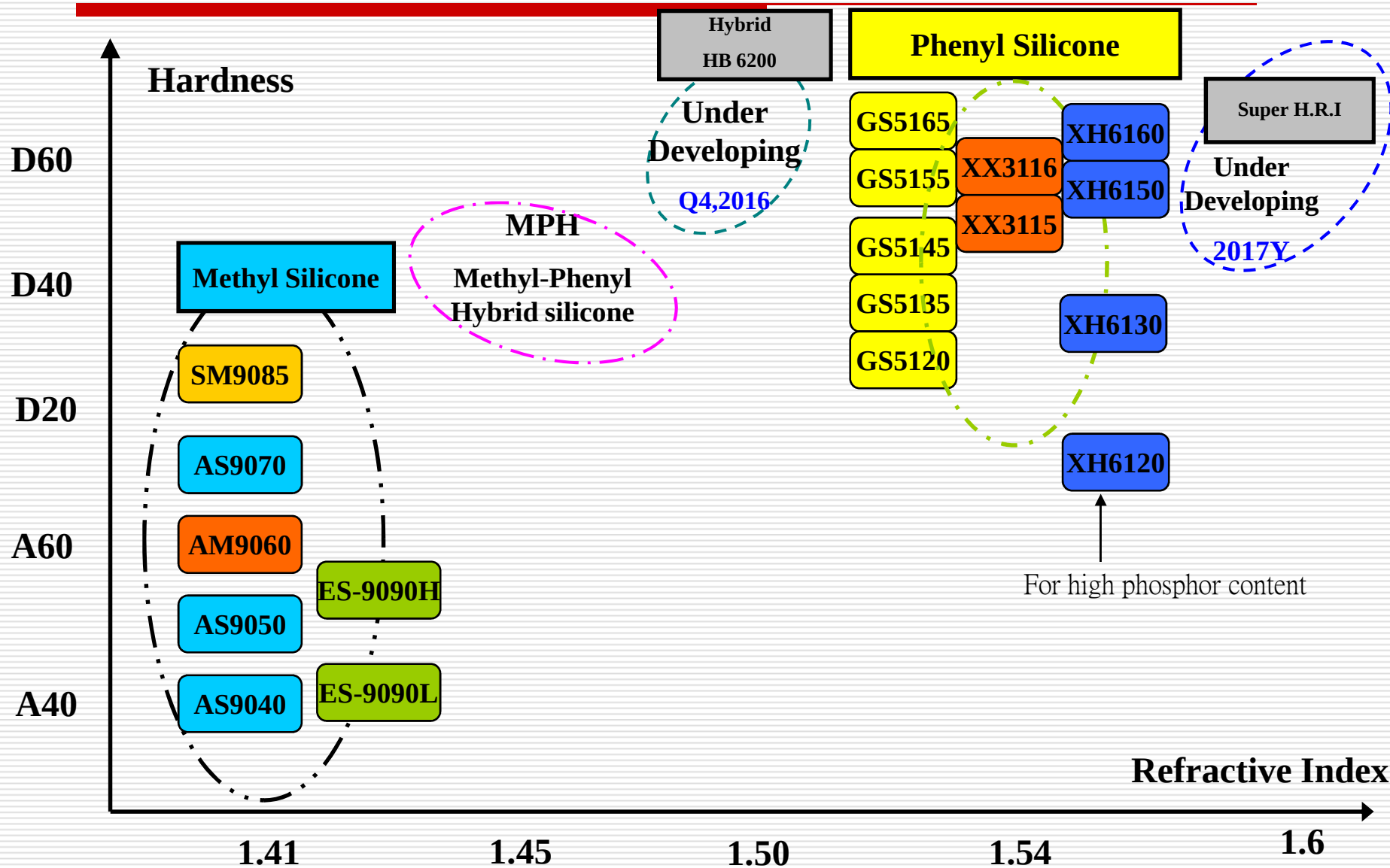


Silicone Encapsulant Technical Roadmap





Eternal Silicone Product Series





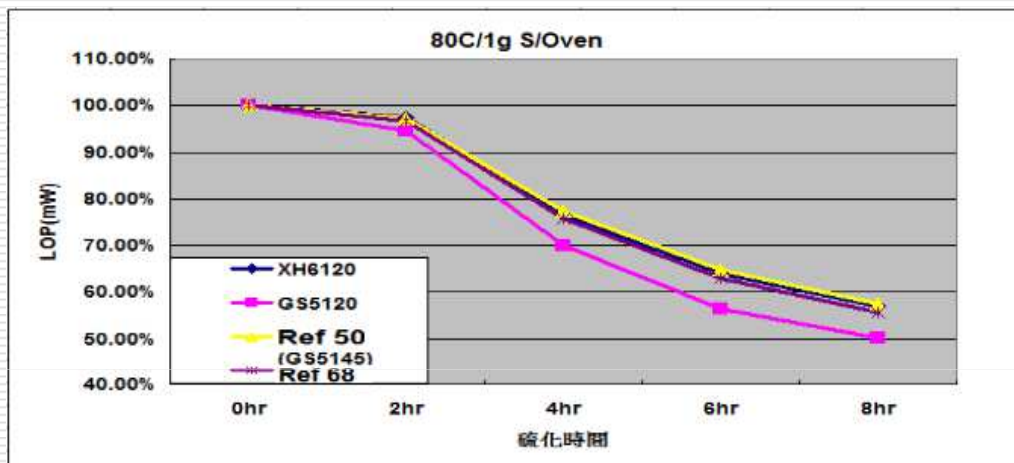
New Advanced Anti-Sulfur Phenyl Silicone (XH series)

Glue		ETERLED				Remark
		XH6120	XH6130	XH6150	XH6160	
Before-Cure	Appearance	Colorless Liquid				Visual Check
	Mix ratio	1:3	1:4	1:6	1:8	--
	Mixed Vis.	3600	3000	3000	2900	HBDVII/ CP51/30rpm
	Mixed R.I.	1.53~1.54				589 nm
	Curing Cond.	60C/1hr + 80C/1hr + 150C/4hrs				Programming Oven
After-Cure	Appearance	Transparent				Visual Check
	Hardness	A60	D35	D47	D57	Shore D Durometer
	Tensile Str. (Mpa)	1.5	4.0	6.0	11	Eternal 拉力機 (JIS K 6251-3)
	Elongation (%)	160	145	135	90	
	CTE2 (ppm/C)	240	220	220	210	TMA (PE)
	Tg (C)	40	48	55	60	DMA(TA)
	%T (T0)	>90%	>90%	>90%	>90%	450nm (T=2mm)
Application		backlight (dispensing)	Lighting/BL (dispensing/ Molding)	Lighting/BL (Dispensing/ Molding)	Lighting/Flash (Dispensing/ Molding)	--



New Advanced Anti-Sulfur Phenyl Silicone (XH series; Upgrade of XX series)

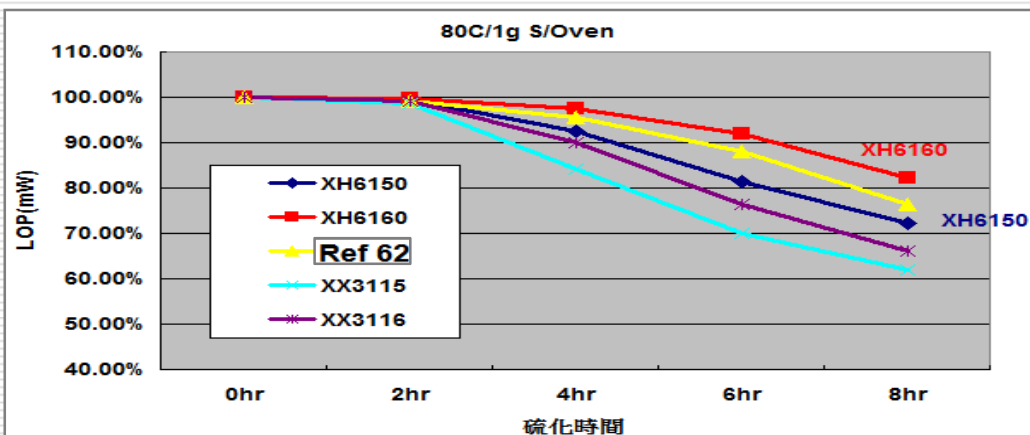
- Test Cond.: 1g Sulfur powder、80°C oven、250ml beaker
- Lumen measured : 150mA、PCT 5630 lead-frame



➤ **Anti-Sulfur Result : XH6120 equal to GS5145/Ref 50, higher than Ref 68**

Condition		IV (%)			
Times	Pcs	XH6120	GS5120	Ref 50 (GS5145)	Ref 68
0hr	#1	100.00%	100.00%	100.00%	100.00%
2hr		97.49%	94.57%	97.20%	96.70%
4hr		76.52%	70.12%	77.46%	75.80%
6hr		63.98%	56.52%	64.72%	62.99%
8hr		57.05%	50.14%	57.55%	55.70%

- Test Cond.: 1g Sulfur powder、80°C oven、250ml beaker
- Lumen measured : 150mA、EMC3030 lead-frame (1W)



➤ **Anti-Sulfur Result :
XH6150, XH6160 better than XX3115, XX3116**

Condition		XH6150	Ref 62	XX3115	XX3116	XH6160
Times	Pcs	IV (%)	IV (%)	IV (%)	IV (%)	IV (%)
0hr	#1	100.00%	100.00%	100.00%	100.00%	100.00%
2hr		99.34%	99.12%	98.63%	99.08%	99.60%
4hr		92.40%	95.42%	84.06%	90.05%	97.60%
6hr		81.44%	87.92%	69.98%	76.38%	91.88%
8hr		72.11%	76.28%	61.94%	66.03%	82.25%



High CIE Control Phenyl Silicone

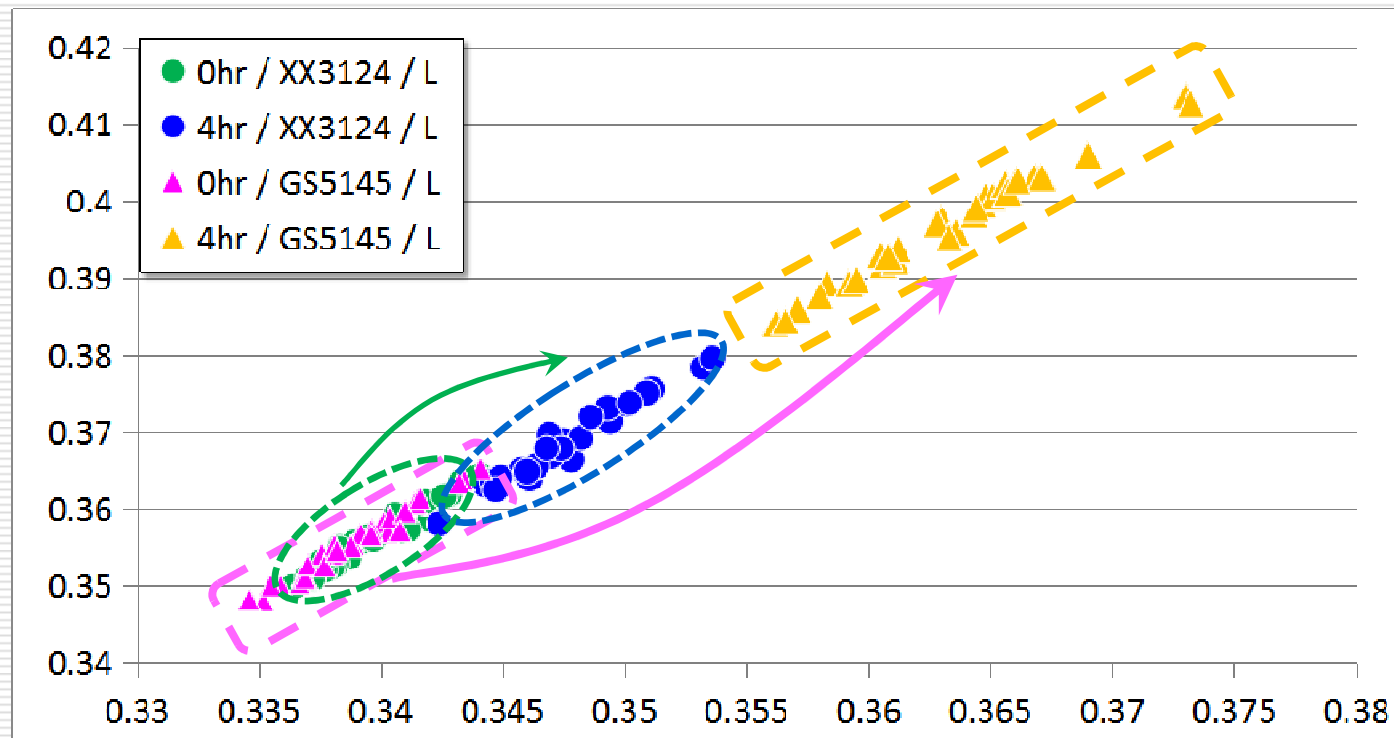
(XX-312X series)

Glue		High CIE control version		New Generation		General Prod.	Remark
		XX3124	XX3125	XX3115	XX3116	GS5145	
Before-Cure	Appearance	Colorless Liquid		Colorless Liquid			Eyes Check
	Mix ratio	1:4	1:4	1:5	1:6	1:4	--
	Mixed Vis.	6400	6800	6100	6500	5100	HBDVII/ CP51/30rpm
	Mixed R.I.	1.53~1.54		1.53~1.54			589 nm
	Curing Cond.	40C/1hr + 80C/1hr + 150C/4hrs		60C/1hr + 80C/1hr + 150C/4hrs			Program Oven
After-Cure	Appearance	Transparent		Transparent		Transparent	Eyes Check
	Hardness	D43	D48	D50	D55	D40	Shore D Durometer
	Tensile Str. (Mpa)	6.0	6.5	7.0	9.5	4.0	Eternal 拉力機 (JIS K 6251-3)
	Elongation (%)	150	150	140	110	175	
	CTE2 (ppm/C)	220	220	220	220	240	TMA (PE)
	Tg (C)	53	55	55	60	47	DMA(TA)
	Transparency T=2mm (T0)	>90%	>90%	>90%	>90%	>90%	450nm (T=2mm)
Application		Lighting/BL (Dispensing)	Lighting/BL (Dispensing)	Lighting/BL (Dispensing)	Lighting/BL (Dispensing)	Lighting/BL (Dispensing/ Molding)	--



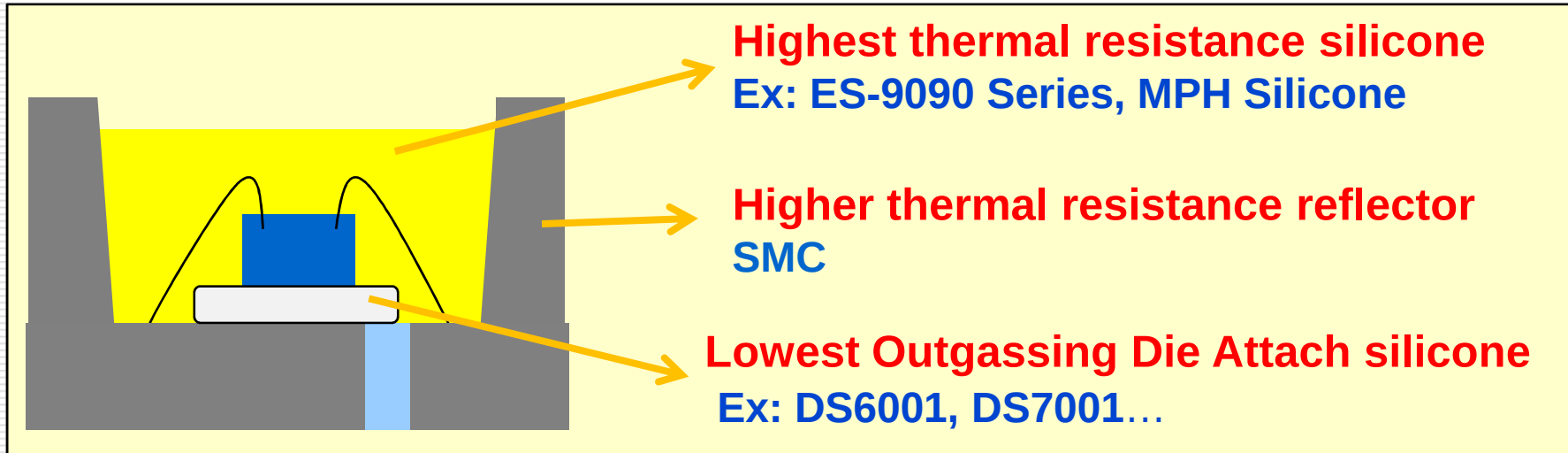
High CIE Control Phenyl Silicone (XX-312X series)

- Smaller distribution of CIE after curing
(Higher yield of CIE in-bin ratio in curing process)
- Smaller distribution of CIE in period dispensing process
(Higher yield of CIE in-bin ratio in dispensing process)





High thermal resistance solutions



Applications: **Bulb, COB, UV LEDs...**



UV LEDs Purifier



MPH(Methyl-Phenyl Hybrid) silicone

Higher thermal reistance than Phenyl & better sulfur resistance than Methyl

Condition	Glue	GSDH01		GSDH03		GSDH05	
		GSDH01A	GSDH01B	GSDH03A	GSDH03B	GSDH05A	GSDH05B
Condition	Appearance	Transparent Liquid		Transparent Liquid		Transparent Liquid	
	R.I.	1.479	1.492	1.478	1.474	1.478	1.486
	Viscosity (cps)	6835	3224	6780	1671	6780	1767
Before Curing	Mix ratio	1:4		1:4		1:4	
	Mixed Vis(cps)	4060		2396		2693	
	gel time(120°C)	40-60 sec		35-41 sec		35-45 sec	
	Mixed R.I.	1.489		1.476		1.484	
	Curing Cond.	60C/1hr + 100C/1hr +150C/4hrs		60C/1hr + 100C/1hr +150C/4hrs		60C/1hr + 100C/1hr +150C/4hrs	
	Apperance	Transparent Rubber		Transparent Rubber		Transparent Rubber	
After Curing	Transmittance T=3mm (450 nm)	91.07 %		91.45 %		91.19 %	
	Hardness(23°C)	D40		D32		D30	
	Tensile Str. (Kgf)	2.8-3.9		2.4-2.5		1.9-2.7	
	Elong. (%)	90-120		95-100		85-110	
	CTE2 (ppm/C)	316		342		313	
	Tg (C)	47.68		45.44		40.67	

(※ Actual data will according to the main TDS of deliver sample.)



High thermal resistance Methyl Silicone

High transmittance and anti-crack under heat and UV aging

Glue		AS9040	AS9050	AS9070	SM9085	AM9060 (High Ti)	Remark
Before-Cure	Appearance	A: Colorless B: Hazy				A: Hazy B: Hazy	Eyes check
	Mix ratio	1:1	1:1	1:1	1:1	1:1	--
	Mixed Vis.	3300 ±500	3400 ±500	3500 ± 500	5000 ±600	8500 ± 800	HBDVII CP51/ 30rpm
	Mixed R.I.	1.41					589 nm
	Curing Cond.	100C/1hr + 150C/3hrs					--
After-Cure	Appearance	Transparent	Transparent	Transparent	Transparent	Hazy	Eyes check
	Hardness	A30~45	A45~60	A65-80	D20-35	A50-65	Shore Durometer
	Tensile Str.(Mpa)	1-3	4-6	6-8	6-8	1-3	Eternal (JIS K 6251-3)
	Elongation(%)	330-370	220-260	180-230	60-100	100-140	
	CTE2 (ppm/C)	250-290	250-290	250-290	250-290	250-290	TMA
	Tg (C)	< -100	< -100	< -100	< -100	< -100	DMA
	Transmittance T=3.5mm	>90%	>90%	>90%	>90%	>90%	450nm
Application		UV High power COB	UV Automotive/COB	UV Automotive/COB	UV (for molding)	Filament / Screen Printing	-

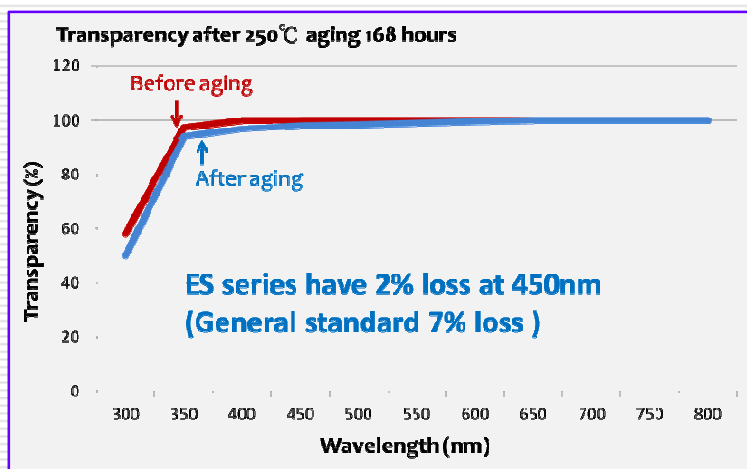
(※ Actual data will according to the main TDS of deliver sample.)



Super thermal resistance Methyl silicone

High transmittance and lowest outgassing (Under 200/250 °C)

Glue	ES-9090H	ES-9090L
Appearance	Colorless liquid	Colorless liquid
Mixture viscosity(mPa.s)	3600	4000
Hardness (shore A)	55	40
Tensile strength	7.8	5.5
Tensile elongation	120	170
Cure condition	100°C/1h + 150°C/3h	
Refractive Index	1.41	
Storage condition	5~30°C/ 6 months	



(※ Actual data will according to the main TDS of deliver sample.)



Die Attach Silicone

Lowest outgassing

Before Curing	Glue	DS6001	DS7001
	Appearance	Transparent Liquid	White Liquid
	Mix ratio	One part	One part
	Mixed Vis(cps)	13000	6000
	gel time(120°C)	45-65	55-75
	Storage condition	-5C~5C	-5C~5C
	Curing Cond.	150C/2hrs	150C/2hrs
After Curing	Apperance	Transparent Rubber	White Rubber
	Hardness(23°C)	D50	D60
	CTE2 (ppm/C)	223	180
	Volatile % (150°C , 2hrs)	0.4%	0.4%
	Thermal- Conductivity (W/mK)	0.2	0.6
Characteristics		High adhesion & Lower outgassing	High adhesion & Lowest outgassing Higher thermal conductivity
Application		Low power LED DA	Low/ Mid power LED DA

(※ Actual data will according to the main TDS of deliver sample.)



Silicone Molding Compound (SMC)

(Lower water absorption, higher thermal resistance)

ITEM	Unit	EMC	Eternal SMC
Resin		Epoxy	Silicone
Filler Content	wt%	80~85%	80~85%
Filler Shape		All spherical	All spherical
Filler Type		Silica / Titanium dioxide	Silica / Titanium dioxide
Cut size	um	105	75~105
Specific Gravity		1.75	~2.2
initial reflect index (450nm)		>92	>92
Spiral Flow (175C)	inch	55	50
Gelation Time (180C)	sec	30	20~40
Tg	C	150	130
CTE 1	ppm/°C	12	14
CTE 2	ppm/°C	32	45
Hardness	Shore D	90	85
Water Absorption, PCT (boiling/24hrs)	Wt %	2.55%	0.52%

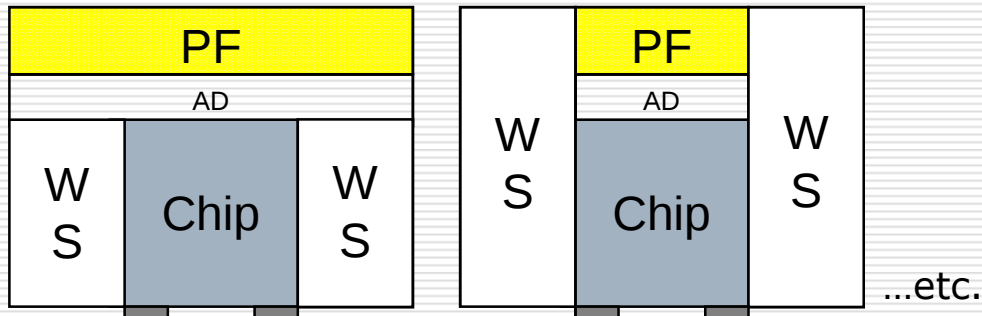
(※ Actual data will according to the main TDS of deliver sample.)



CSP Process Total Solution

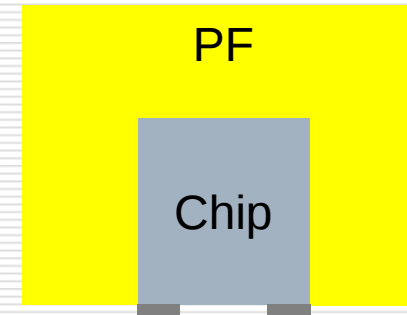
CSP type

One Side



PF → Phosphor Film
WS → White Silicone
AD → Adhesive

5 Sides

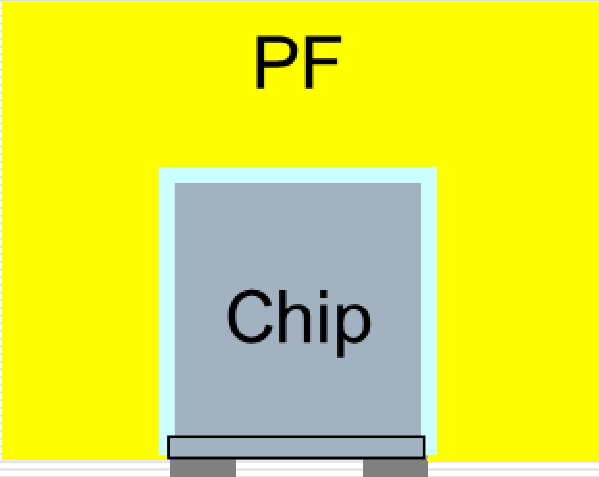


Need
NM Vacuum Laminator
NM (Nikko Materials)

- ❑ **PF(Phosphor Film)→made by Spray or pre-made by coating or Marven's coating**
- ❑ **WS(White Silicone)→ Dispensing / Molding / Printing**
- ❑ **AD(Adhesive)→ Dispensing/Spray/Film pre-made by coating**

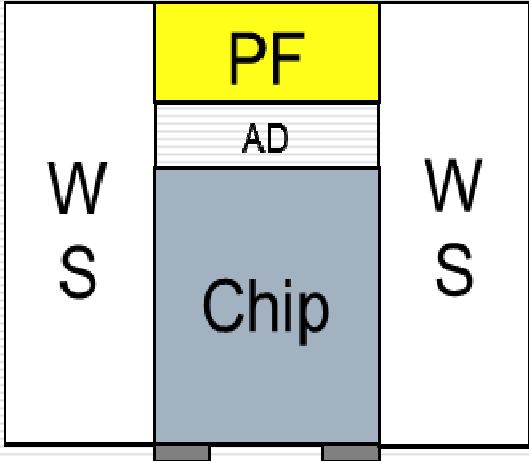


For CSP materials (5 Sides)

CSP process Solution & Materials			
Process	5 Sides		
Layer	Adhesive Film	Phosphor Film	CSP type demo
A51	EDS901F	SF-5140	
A52	EDS901F	SF-5141	
A53	EDS902F	SF-5141	
A54	EDS902F	SF-5150	



For CSP materials (One Side)

CSP process Solution & Materials				
Process	One Side			
Layer	AD	PF	WS(Reflection)	CSP type demo
A11	EDS901F	SF-5140	EDS901W SD5075	
A12	EDS901F	SF-5141		
A13	EDS902F	SF-5141		
A14	EDS902F	SF-5150		



For CSP process application – Film Type

For CSP process Application (All Film Type)							
Process	5 Sides			Process	One Side (Top Side)		
Layer	AD Film	PF	Diffuser or Clear Film	Layer	AD Film	PF	Diffuser or Clear Film
M1	B	C	C	S1	-	C	-
M2	B	C	-	S2	B	C	-
M3	-	B	C	S3	B	C	C
M4	-	B	-	S4	-	C	C
-	-	-	-	S5	-	-	C

AD Film → 15 ~ 25 μ m

Phosphor Film → 80 ~ 150 μ m

Diffuser or Clear Film → 100 ~ 200 μ m

B: B stage formation (Partial cured)

C: C stage formation (Full Cured)



Eternal's Silicone For CSP Process

Eternal's Silicone For CSP Process							
Application	ADF (Adhesion Film)		PF (Phosphor Film)			WS (White Silicone)	
Glue	EDS901F	EDS902F	SF5140	SF-5141	SF-5150	EDS901W	SD5075
Silicone Type	Phenyl	M-Phenyl	Phenyl	M-Phenyl	M-Phenyl	Phenyl	
Mix ratio	1:3	1:4	1:5	1:4	1:4	2:3	1:2
Mixed Vis.(cps)	4200	2700	6300	4900	5000	7000	7000
Mixed R.I.	1.54	1.48	1.54	1.49	1.49	--	--
Hardness	D25	D30	D42	D40	D40	D40	D40
Tensile Str. (Mpa)	3	-	7	3.5	-	5	5
Elongation (%)	190	-	135	105	-	150	150
CTE2 (ppm/°C)	240	-	220	260	-	207	200
Tg (°C)	40	-	55	48	-	49	52

(※ Actual data will according to the main TDS of deliver sample.)