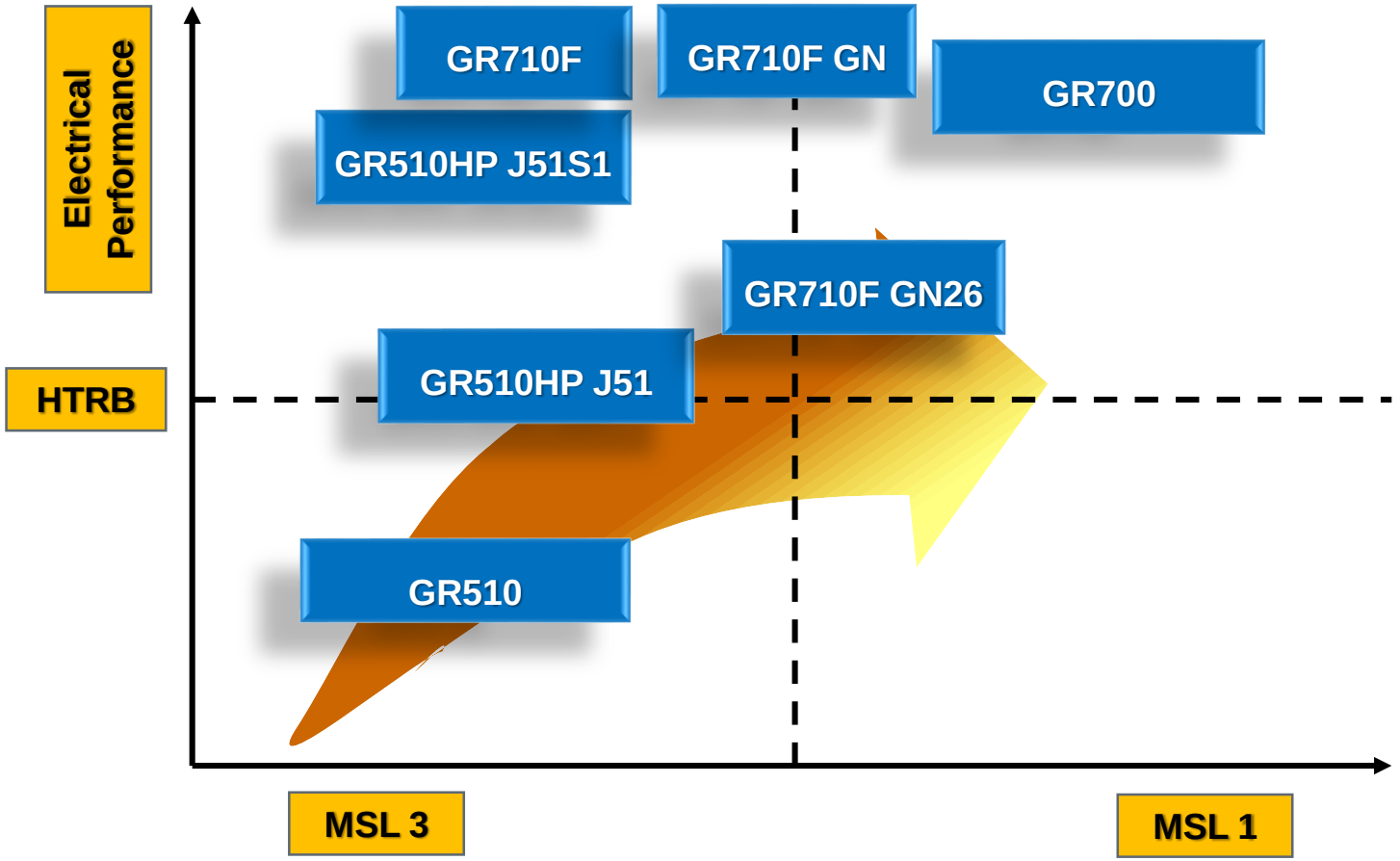
Introduction of Hysol EMC GR510/ GR700/ GR710/ GR920

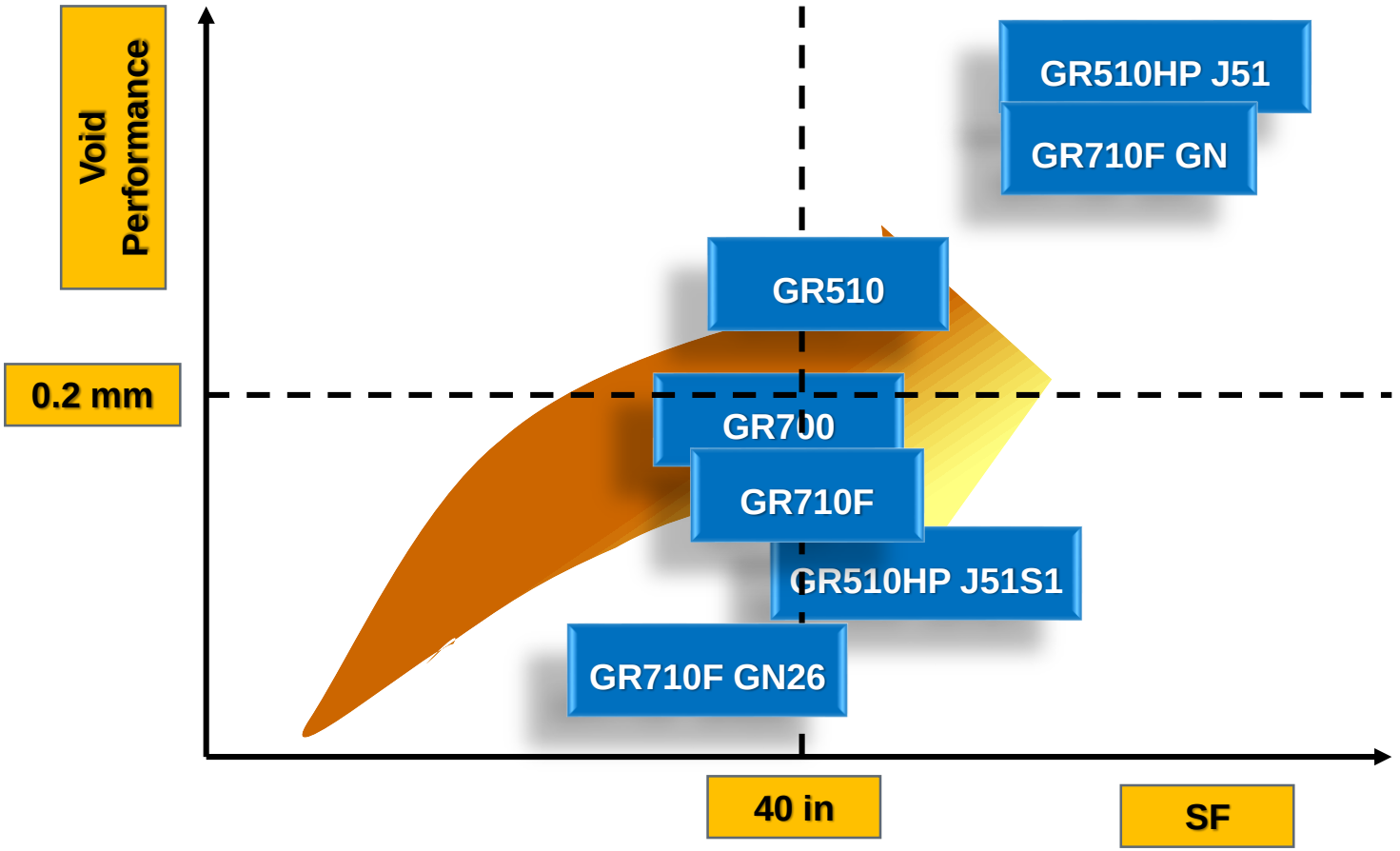
Hysol PD Group
May, 2023

EMC for SOP



Hysol

EMC for SOP



Hysol

Hysol Green EMC

GR510 Application Data Package

Key Features of GR510

Value Proposition

- Proven reliability performance on TO/DIP/SOT/SOP/QFP packages.
- Excellent electrical performance even with Copper wire.
- Meet MSL3 260℃ in Copper lead frame.
- Excellent workability with more than 400 shots continuous mold.
- Compatible with long wire device with wide process window.
- Meet UL94 V-0 flammability rate at 1/8 inch thickness.
- Green material without Br/Sb comply with ROHS.

Formulation & Properties

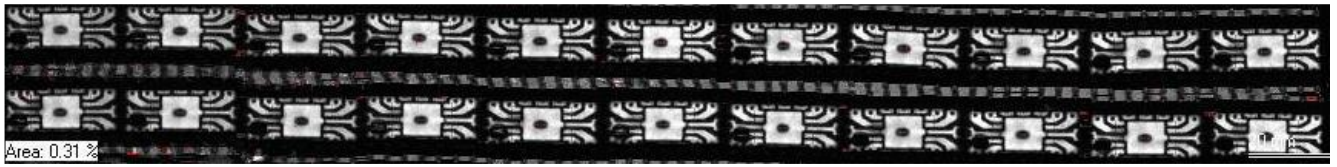
Item	Condition/ Method	Unit	GR510	GR510-HP J51	GR510-HPJ51S1
Epoxy Resin			MAR+EOCN	MAR+EOCN	MAR+EOCN
Hardener Resin			MAR	MAR	MAR
Filler content		**%**	88	86.5	87
Filler type			Spherical	Spherical	Spherical
Flame Retardant			MAR Resin	MAR Resin	MAR Resin
Filler cut size		**um**	75	75	75
Gel time	175℃	s	32	33	32
Spiral flow	175℃	inch	41	55	47
Modulus(RT)	DMA	MPa	24597	22797	21125
Modulus(175℃)	DMA	MPa	778	909	787
Modulus(260℃)	DMA	MPa	712	658	661
Moisture absorption	PCT 24hrs	%	0.2	0.24	0.28
Flexural strength	25℃	MPa	154	149	140
Flexural modulus	25℃	MPa	21462	20173	17782

Hysol

GR510 Beta Site Performance in HT*

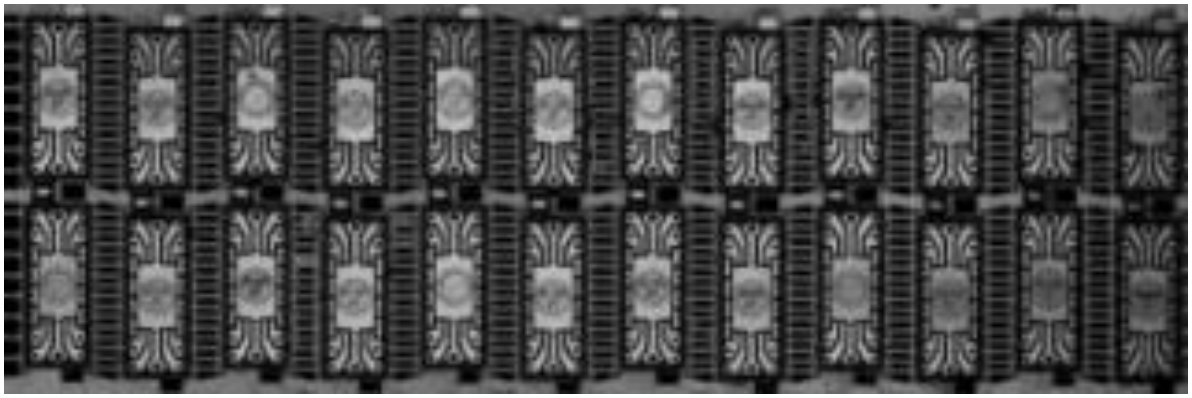
- Reliability Test Result on SOP-14L

Item	Condition	Sample Size	Result
SAT	MSL3, 260 ℃	22	**0/22**

	Focus on pad
After PMC	
After MSL3	

GR510-HP J51 Beta Site Performance in A

- Reliability Test Result on SOP-16

	Focus on pad
After PMC	
After MSL3	

Hysol Green EMC

GR700 Application Data Package

Key Features of GR700

Value Proposition

- Proven reliability performance on TO/SOP/DPAK/DFN packages.
- Excellent electrical performance even with Copper wire.
- Meet MSL1/260℃ in Copper lead frame.
- Meet the application requirement of high power device.
- Excellent workability with more than 400 shots continuous mold.
- Compatible with long wire device with wide process window.
- Meet UL94 V-0 flammability rate at 1/8 inch thickness.
- Green material without Br/Sb comply with ROHS.

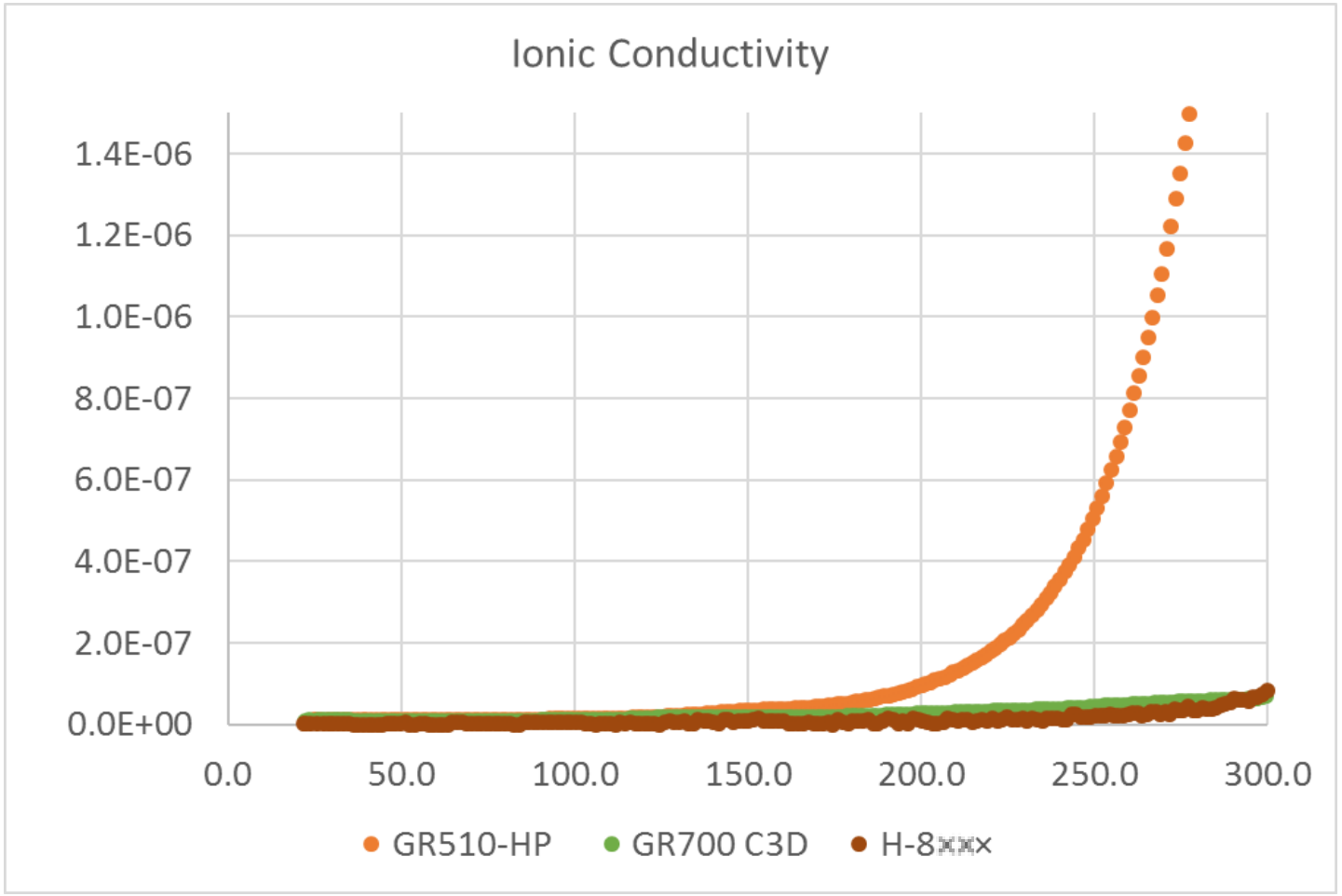
Formulation & Properties

Item	Condition /Method	Unit	GR700 C3D	GR700 C4C	GR700 C4C18
Epoxy Resin			MAR+LMW	MAR+LMW	MAR+LMW
Hardener Resin			MAR	MAR	MAR
Filler content		**%**	87	89	89
Filler type			Spherical	Spherical	Spherical
Flame Retardant			MAR Resin	MAR Resin	MAR Resin
Filler cut size		**um**	75	75	75
Gel time	175℃	s	27	31	27
Spiral flow	175℃	inch	42	43	38
Modulus(RT)	DMA	MPa	24388	28915	28400
Modulus(175℃)	DMA	MPa	755	740	630
Modulus(260℃)	DMA	MPa	658	620	570
Electronic conductivity	Extract 20hrs	us/cm	40	15	12
Moisture absorption	PCT 24hrs	%	0.28	0.15	0.15
Flexural strength	25℃	MPa	151	159	150
Flexural modulus	25℃	MPa	18871	25151	23700

Hysol

Beta Site Performance
Reliability

- DETA Curve

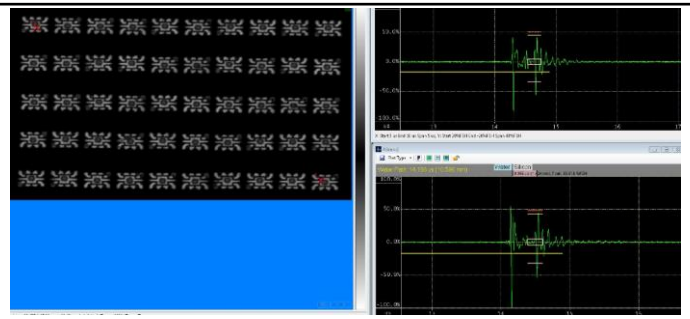
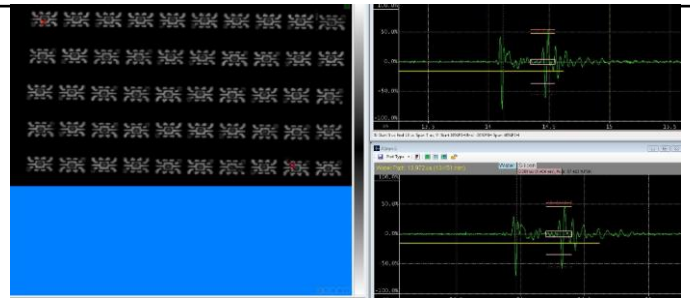


GR700 C3D Beta Site Performance in F*

- Device Information

Package Type	SOP8
Lead Frame Density	12 rows
Wire	Copper Wire 20 um, 17.5um
Mold Model	MGP

- Reliability Test Result on SOP8

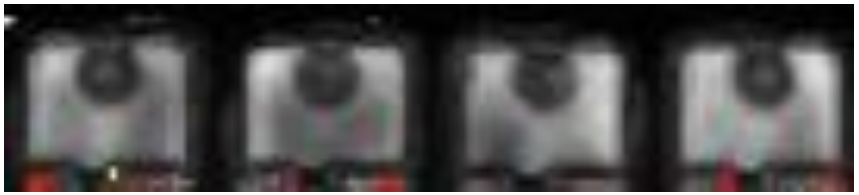
	Pad
Before MSL3	
After MSL3	

Hysol

GR700 C3D Beta Site Performance in J*

- Reliability Test Result on TO252

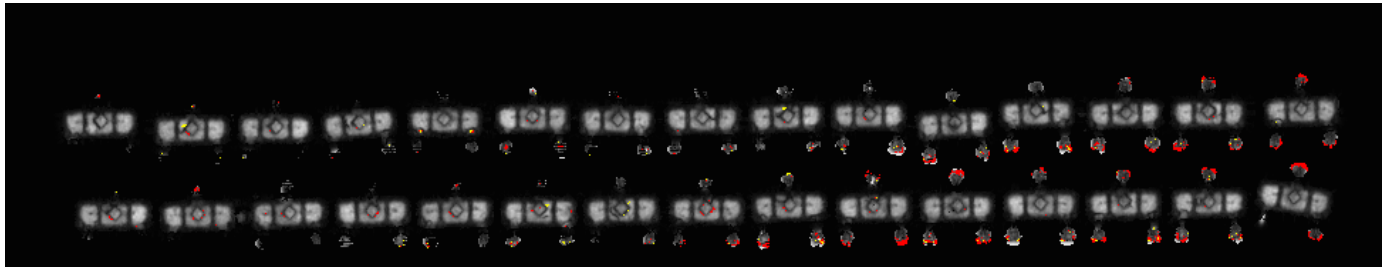
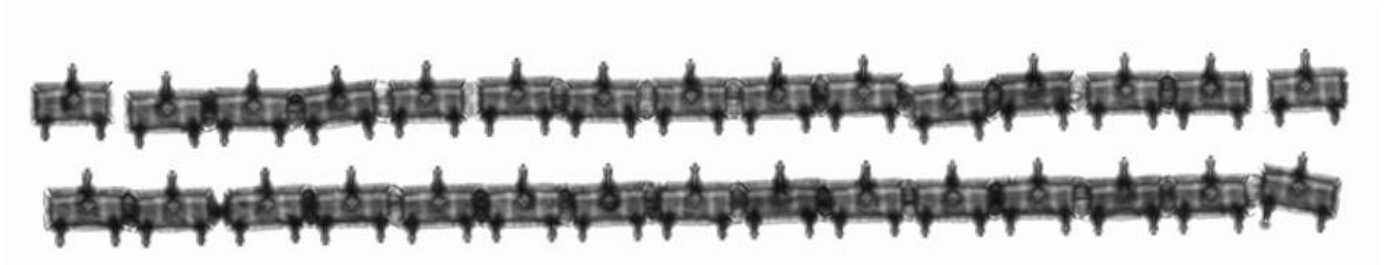
Item	Condition	Sample Size	Result
SAT	MSL3, 260 ℃	45	**0/45**

	After MSL3
Pad	
Lead	

Remark: L/F type: Cu with Ag plated

GR700 C3D Beta Site Performance in L*

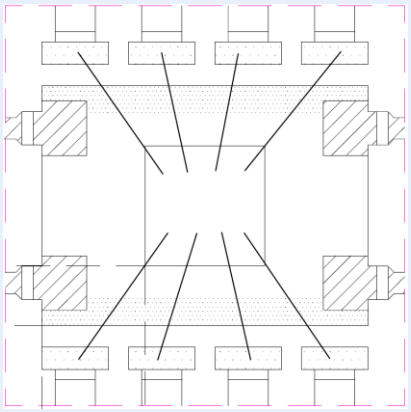
- Reliability Test Result on SOT 23

	After MSL1
C-Pad	
T-SCAN	

Remark: L/F type: Cu with Ag plated; Package type: SOT23

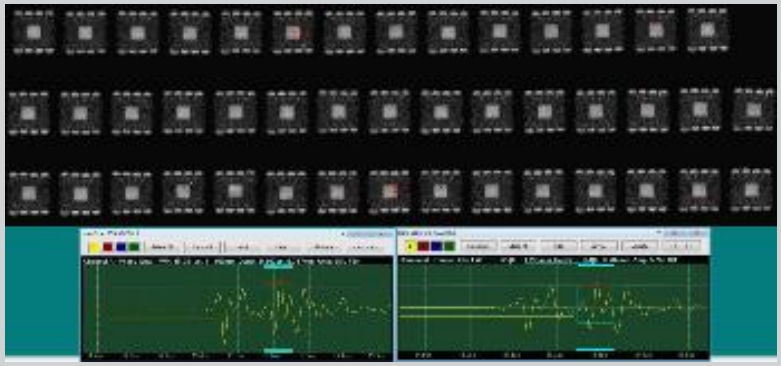
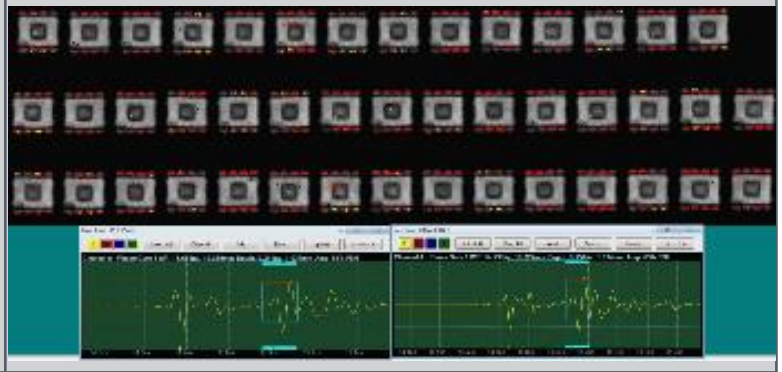
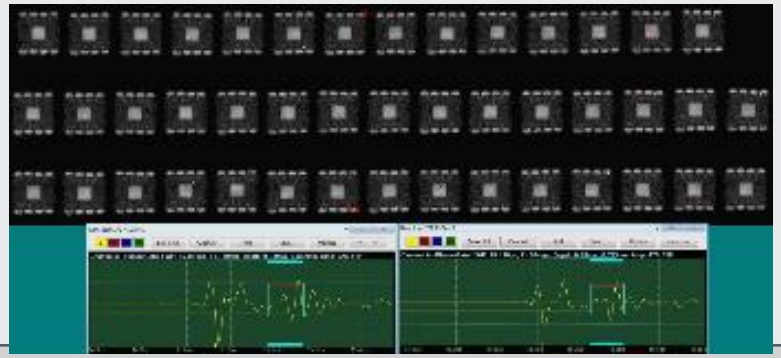
GR700 C4C Beta Site Performance in SQ*

- Reliability Test Result on MSOP8（8R）

Item	BOM
Die Size	0.9*0.9
胶水	EN-4900GC
框架	MSOP8(8R)-B(71×96mil)
焊丝	φ20 HA6 Au
塑封料	GR700C4C
BD	

GR700 C4C Beta Site Performance in SQ*

- Reliability Test Result on MSOP8（8R）

	MSL1		MSL1
Die		Pad	
Lead			
结论	GR700 C4C MSL1 Pass		

GR700 C4C Beta Site Performance in SQ*

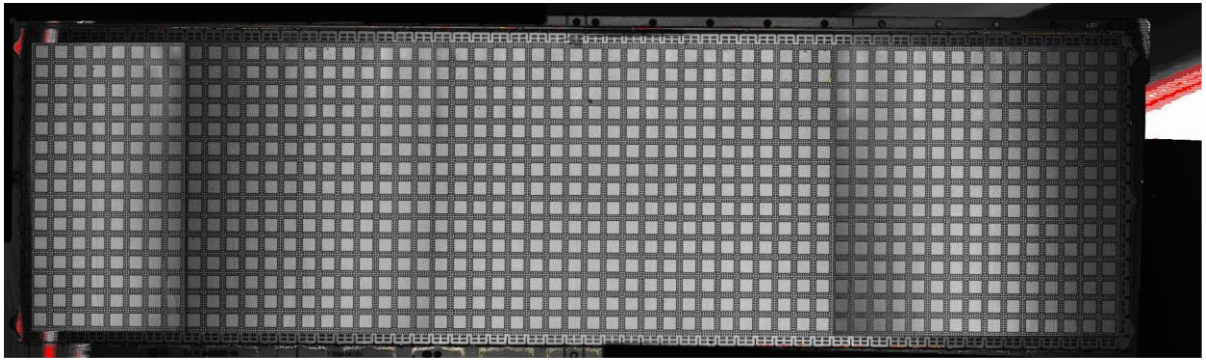
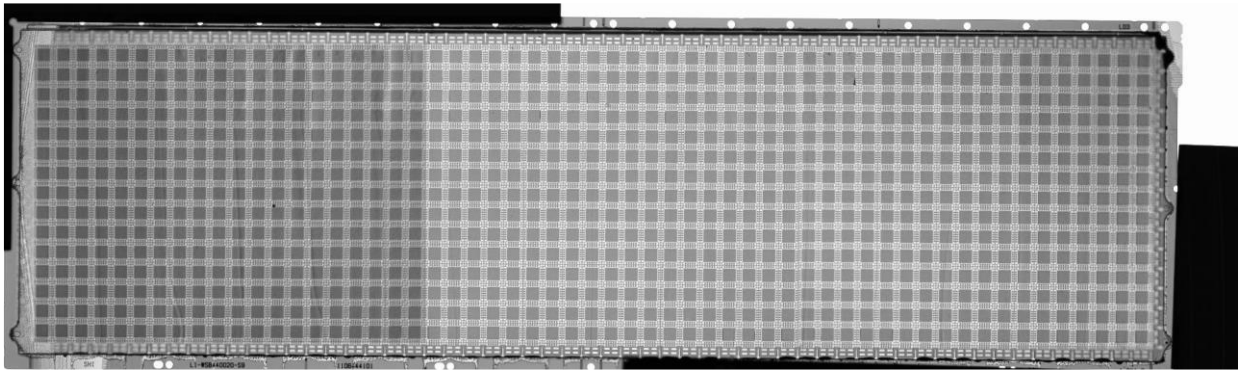
- Reliability Test Result on TSSOP16

	MSL1		MSL1
Die		Pad	
Lead			
结论	GR700 C4C MSL1 Pass		

Hysol

GR700 C4C Beta Site Performance in AT*

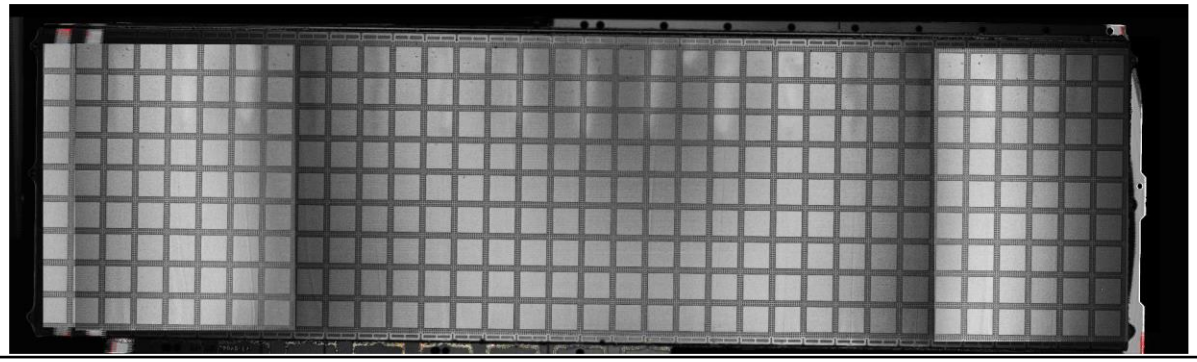
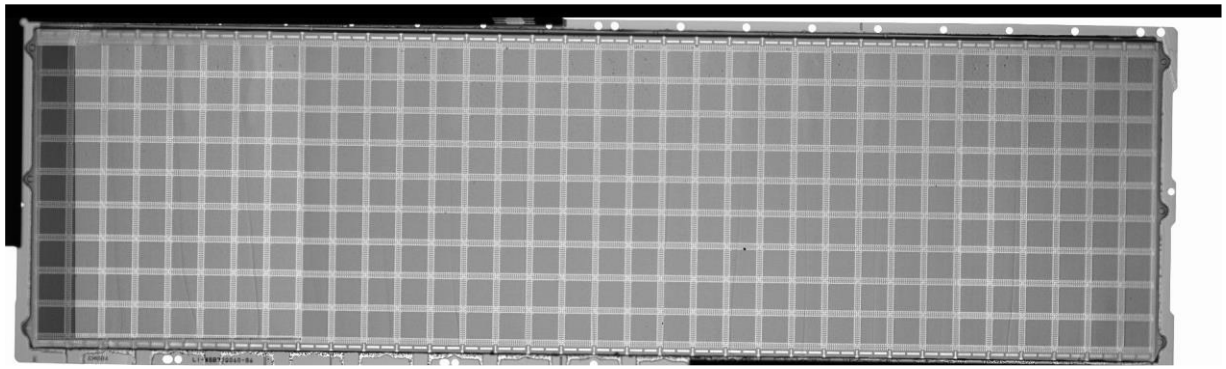
- Reliability Test Result on QFN 4*4

	After MSL3
C-scan	
T-scan	

Hysol

GR700 C4C Beta Site Performance in AT*

- Reliability Test Result on QFN 7*7

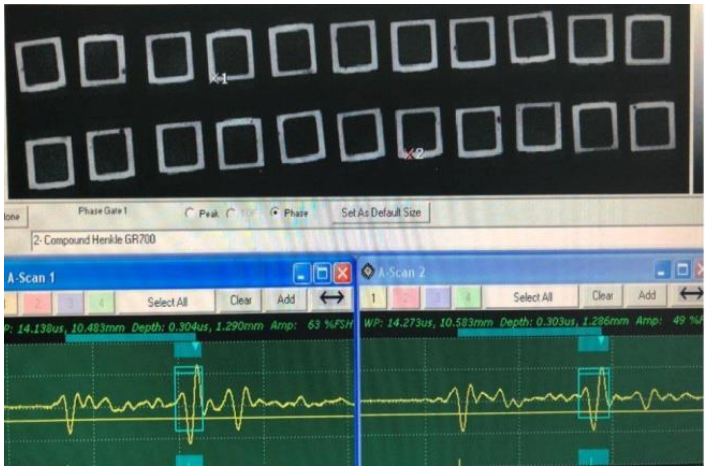
	After MSL3
C-scan	
T-scan	

Hysol

GR700 C4C Beta Site Performance in G*

- Reliability Test Result on SMC

Item	Condition	Sample Size	Result
SAT	MSL1, 260 ℃	22	**0/22**

	After MSL1
正面	

Hysol

Hysol Green EMC

GR710 Application Data Package

Key Features of GR710

Value Proposition

- Proven reliability performance on SOT/SOP/LQFP/DFN/QFN packages.
- Excellent electrical performance even with Copper wire.
- Meet MSL3-MSL1/260℃ in Copper lead frame.
- Meet the application requirement of high power device.
- Excellent workability with more than 400 shots continuous mold.
- Compatible with long wire device with wide process window.
- Meet UL94 V-0 flammability rate at 1/8 inch thickness.
- Green material without Br/Sb comply with ROHS.

Formulation & Properties

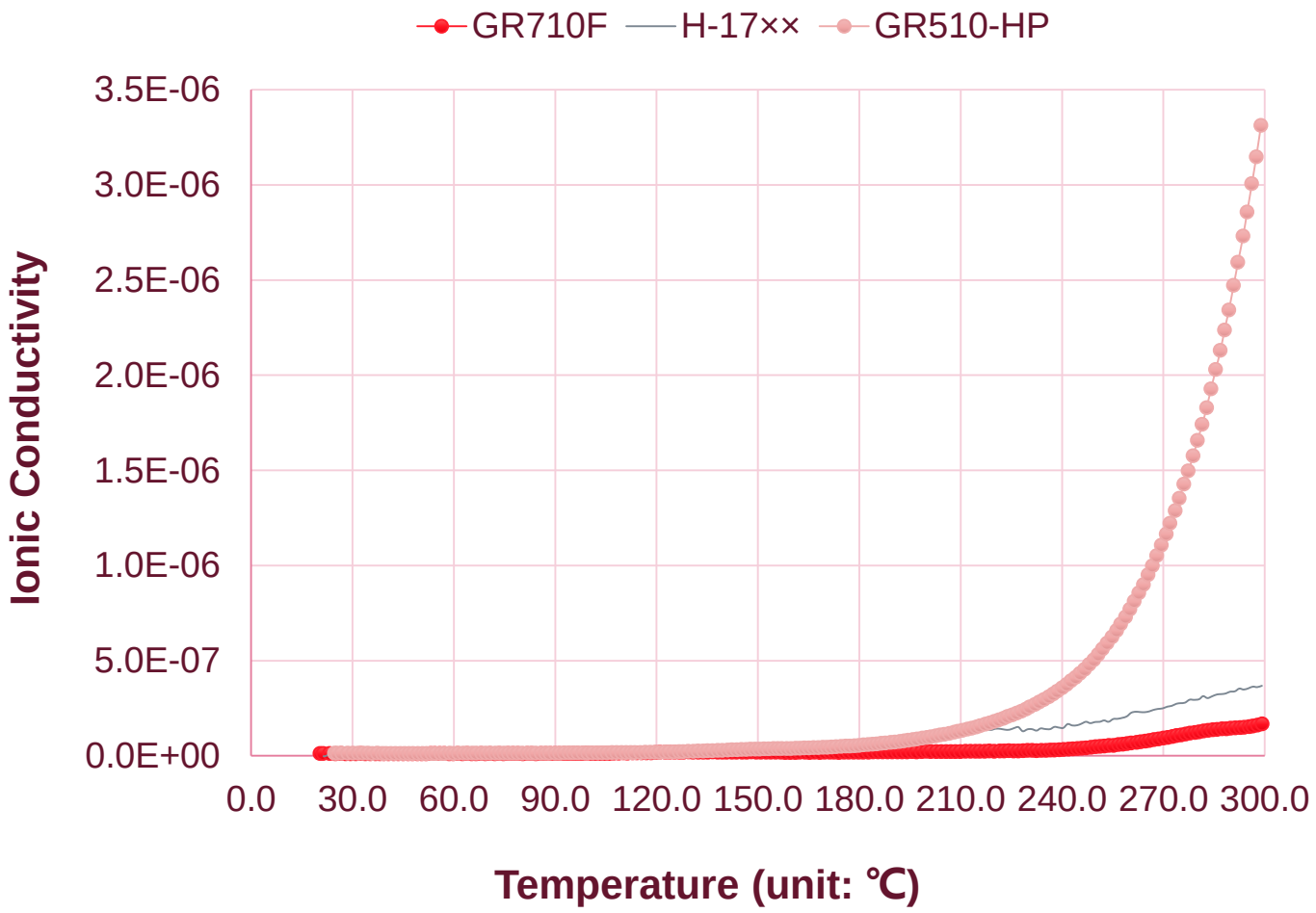
Item	Condition /Method	Unit	GR710F	GR710F GN	GR710F GN26
Epoxy Resin			MAR+LMW	MAR+LMW	MAR+LMW
Filler content		**%**	89	88	87
Filler type			Spherical	Spherical	Spherical
Filler cut size		**um**	75	75	75
Gel time	175℃	s	30	30	31
Spiral flow	175℃	inch	42	50	38
Modulus(RT)	DMA	MPa	28176	26451	26557
Modulus(175℃)	DMA	MPa	752	620	523
Modulus(260℃)	DMA	MPa	637	541	440
Moisture absorption	PCT 24hrs	%	0.2	0.25	0.25
Flexural strength	25℃	MPa	150	140	142
Flexural modulus	25℃	MPa	24489	23003	24300
Flammability	UL94, 1/8"		V-0	V-0	V-0
Volume resistivity		E+15Ω.cm	65	70	50

Hysol

Beta Site Performance

Reliability

- DETA Curve

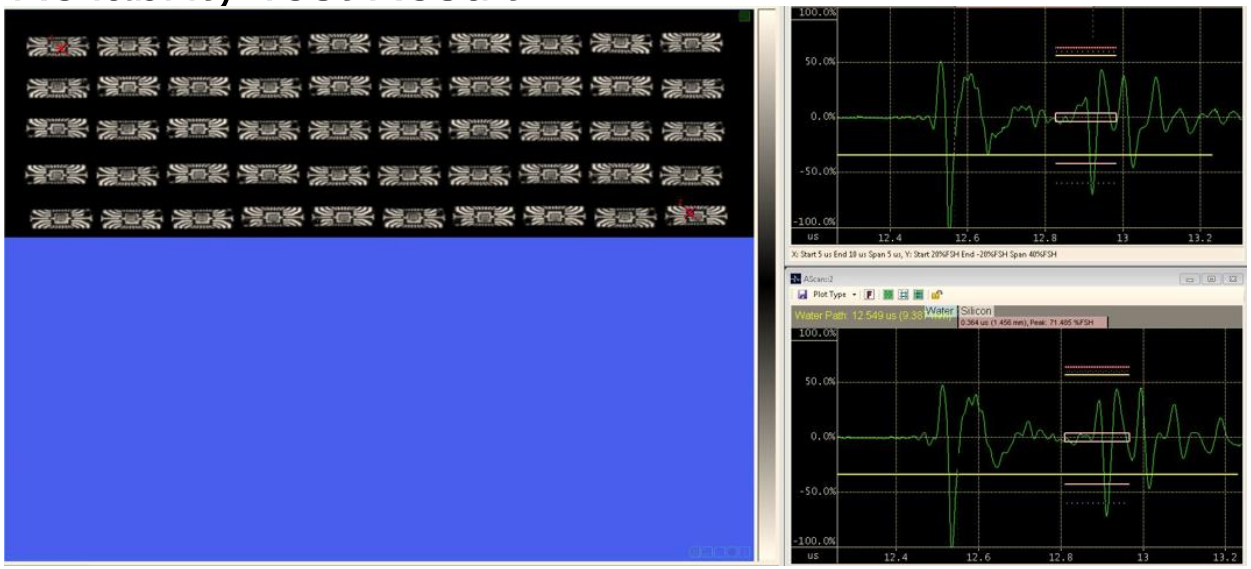


GR710F Beta Site Performance in SZF*

- Device Information

Package Type	SSOP24
Lead Frame Density	8 rows
Wire	Copper Wire 25 um
Mold Model	MGP
Workability	500 shots

- Reliability Test Result



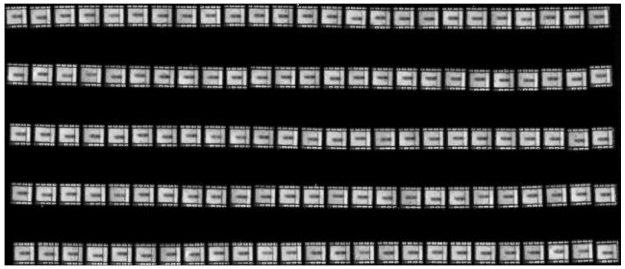
Remark: After MSL3 focus on pad.

GR710F GN Beta Site Performance in ZGH*

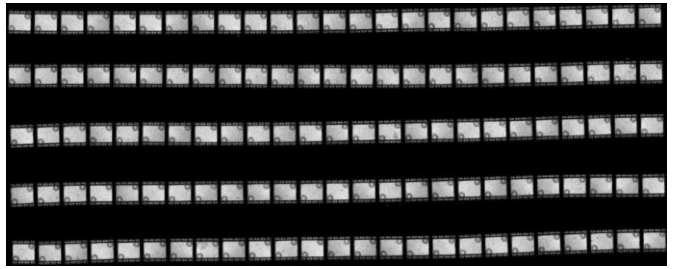
- Device Information

Package Type	SOP8
Lead Frame Density	4 rows
Wire	Copper Wire 25 um
Mold Model	Auto
Workability	600 shots

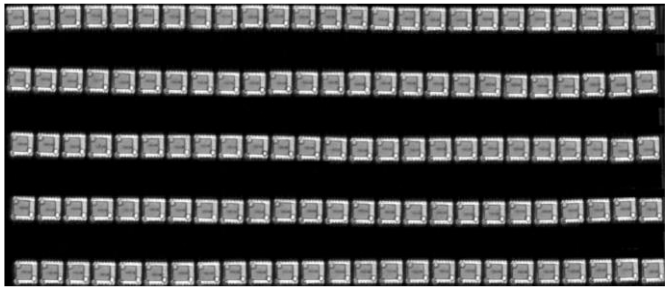
- Reliability Test Result on SOP8



After MSL3 focus on top.



After MSL3 focus on bottom.



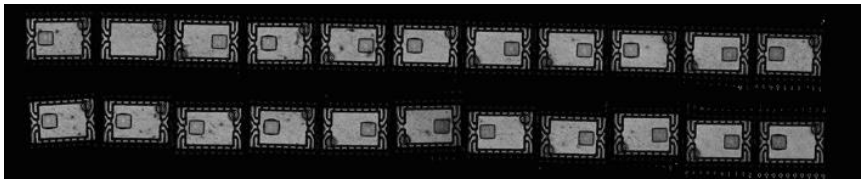
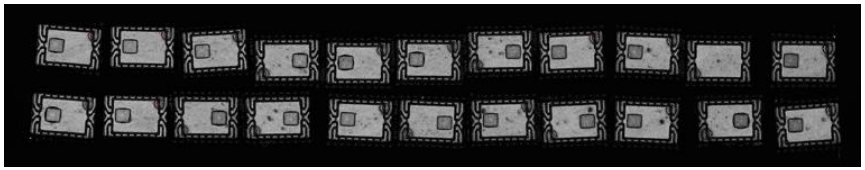
After MSL3 T-scan.

GR710F GN Beta Site Performance in YCX*

Device Information

Package Type	TSSOP20
Lead Frame Density	8 rows
Wire Type	Alloy Wire
Wire Diameter	20 um
Mold Model	Auto

Reliability Test Result

After MSL3	
After MSL1	

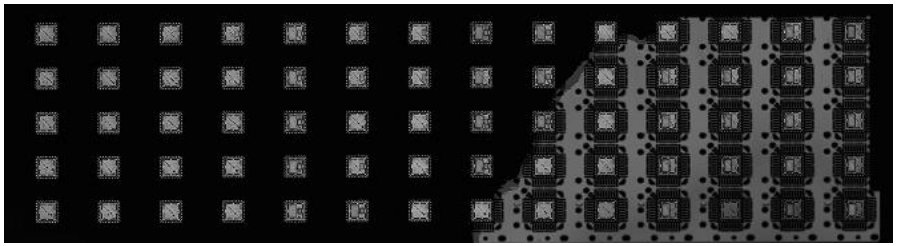
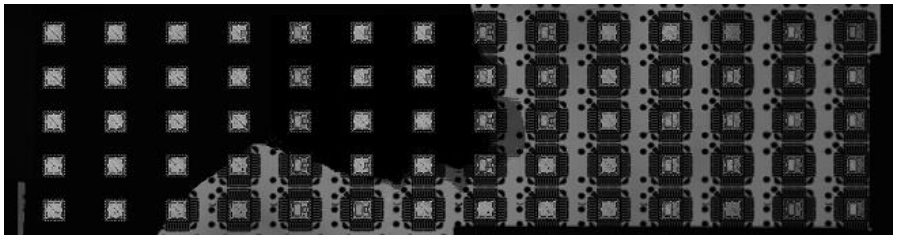
Hysol

GR710F GN Beta Site Performance in YCX*

Device Information

Package Type	LQFP
Lead Frame Density	5 rows
Wire Type	Alloy Wire
Wire Diameter	20 um
Mold Model	Auto

Reliability Test Result on LQFP

After PMC	
After MSL3	

Hysol

Formulation & Properties

Mold Compound Formulation			GR710 G1L18
Mold Compound Grade			Green
Filler	Filler Content (wt%)		88±1
	Shape (Spherical/Flake)		Spherical
	Filler sieved size		75
Epoxy Resin			MAR+LMW
Spiral Flow		inches	38
Gel Time		sec	22
Water Absorption,PCT24h		%	0.25
Flexural Strength	RT	N/mm^2	159
Flexural Modulus	RT	N/mm^2	27679
Electric Conductivity		umhos/cm	16
pH of Extract		-	5.6
Na^+		ppm	3
Cl^-		ppm	8
Volume resistivity@25℃		ohms-cm	22* E15

Hysol

GR710 G1L18 Beta Site Performance in Lit*

Reliability Test Result on MOSFET

Package Type	EMC		AP using?	Lot	H3TRB				TC -55~150C				UHAST		Precon.
					0H	168H	504H	1008H	0c	250c	500c	1000c	0H	96H	168H
TO247-4L	Hysol Huawei	GR710	Yes	U02849-03,04	0/50	/	0/50	0/50	0/80	/	0/80	0/80	0/80	0/80	0/210
TO247-4L	Hysol Huawei	GR710	Yes	U02849-04	/	/	/	/	0/50	/	0/50	0/50	/	/	0/50

Reliability Test Result on DIODE

Package Type	EMC		AP using?	Lot	HTRB 1360V @175C				H3TRB				Temp Cycling -55C to 150C				UHAST		IOL				Precon.
					0H	168H	504H	1008H	0H	168H	504H	1008H	0c	250c	500c	1000c	0H	96H	0H	168H	504H	1008H	168H
TO247-2L	Hysol Huawei	GR710	Yes	U11095-02	0/80	0/80	1/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/320
TO247-2L	Hysol Huawei	GR710	Yes	U11096-03, 04	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/320
TO247-2L	Hysol Huawei	GR710	Yes	U11097-04, 05, 07	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/320

Reliability Test Result on TO252

Package Type	EMC		AP using?	Lot	HTRB				H3TRB			
					0H	168H	504H	1008H	0H	168H	504H	1008H
TO252-2L	Hysol Huawei	GR710	Yes	U09062-03L	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80

Package Type	EMC		AP using?	Lot	TC				IOL				UHAST		Precon.
					0c	250c	500c	1000c	0/Jan	1260c	3750c	7500c	0H	96H	168H
TO252-2L	Hysol Huawei	GR710	Yes	U09062-03L	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/80	0/320

Hysol

GR710 G1L18 Beta Site Performance in O*

- Reliability Test Result on TO252 and TO263

					HTRB			TC			HAST	
Package type	OPN	AP coating	Wafer tech	EMC for EBR	168hr	504hr	1008 hrs	Precon	500C	1000C	Precon	96hr
TO252	FFSD08120A	Y	SIC Diode	GR710	0/40	0/40	0/40	0/40	0/40	0/40	0/40	0/40
	HGTD1N120BNS9A	Y	IGBT	GR710	0/80	0/79	0/79	0/80	0/80	0/79	0/80	0/80
TO263	AFGB40T65SQDN	Y	FS4 IGBT	GR710	0/40	0/40	0/40	0/40	0/40	0/40	0/40	0/40

Hysol Green EMC

GR920 Application Data Package

Key Features of GR920

Value Proposition

- Proven reliability performance on FCCSP/FCBGA packages.
- Meet MSL3/260℃ in Sbustrate.
- Meet the application requirement of Low/ Medium/ High warpage device.
- Excellent workability with more than 200 shots continuous mold.
- Meet UL94 V-0 flammability rate at 1/8 inch thickness.
- Green material without Br/Sb comply with ROHS.

Formulation & Properties

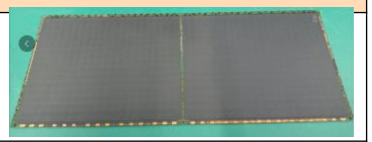
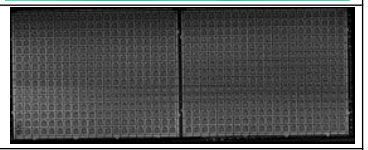
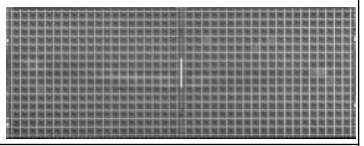
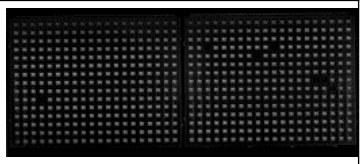
EMC Type			GR920 (H4)	GR920 (Q2)	GR920 (M12)	GR920 (L20)	GR920 (A1)
Formula info	Resin		MAR	MAR/MF	BP/MAR	MAR/MF	BP
	Hardener		MAR	MAR/MF	MAR	MAR/MF	PN/MF
	Filler ratio (%)		84	85	88.5	88	87.5
	Filler cut (μm)		20	20	20	20	20
	Filler type		Spherical	Spherical	Spherical	Spherical	Spherical
Spiral flow		inch	60	56	39	36	66
Gelation time		sec	34	39	37	34	46
Shore D Hardness		-	76	77	76	81	80
Tg (TMA)		℃	102	138	120	158	150
a1 (TMA)		10^{-6}/℃	14	12	10	9	9
a2 (TMA)		10^{-6}/℃	43	45	35	33	34
Flexural Modulus at RT		MPa	13500	15500	19500	17800	21000
Flexural Strengths at RT		MPa	125	146	120	154	138
Modulus by DMA	25℃	MPa	21000	20700	24000	25914	24000
	175℃	MPa	350	1200	950	2119	2000
	260℃	MPa	235	650	650	1203	1100
Tg (DMA, peak of tanδ)		℃	113	146	127	156	151
Shrinkage after PMC		%	0.36	0.26	0.13	0.2	0.19

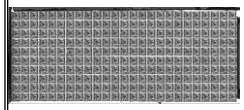
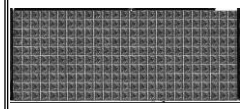
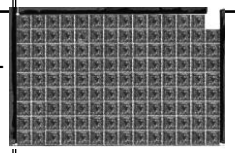
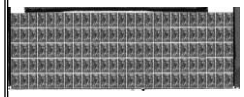
Hysol

GR920 L20 Beta Site Performance in HT**

➢ Device Information

FCCSP	Mold cap	Strip size	PKG	Die size	Bump height
	0.4mm	240.5*95*0.22mm	5.4*5.4mm	3.3*2.8*0.15mm	65um

Item	GR920L20
Appearance	
C-scan	
T-scan	
Bump-scan	
Warpage	short side 2.07mm long side 2.11mm
Marking	OK

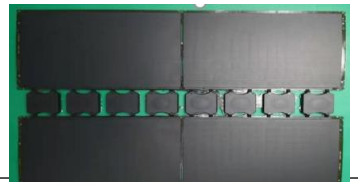
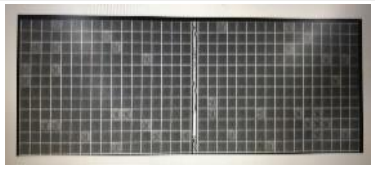
Test Item*	Qualification Test Condition	Test Result		
		results	criterion	SAT
Before Test	/	PASS	NA	
Pre-con	Baking:125，24 hrs Moisture Soak: 30℃/60%RH,192hrs Reflow@260 *3times	PASS	J-STD-020E	
uHAST	130℃, 85%RH 33.3psia,unbiased 192hrs	PASS	JESD22-A118B	
TCB	-55℃~125℃, 1000cycles	PASS	JESD22-A104E	

Hysol

GR920 L20 Beta Site Performance in JC**

➢ Device Information

FCCSP	Mold cap	Strip size	PKG	Die size	Bump height
	0.365mm	240*95*0.18mm	6.3*6.9mm	6.35*5.57*0.15mm	80um

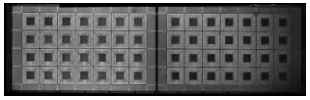
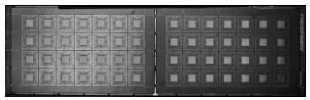
Item	GR920L20
Appearance	
C-scan	
T-scan	
Strip warpage	2~3mm
Marking	OK

Test Item*	Qualification Test Condition	Test Result	
		results	criterion
Before Test	/	PASS	NA
Pre-con	Baking:125，24 hrs Moisture Soak: 30℃/60 %RH,192hrs Reflow@260 *3times	PASS	J-STD-020E
uHAST	130℃, 85%RH 33.3psia,unbiased 192hrs	PASS	JESD22-A118B

GR920 A1 Beta Site Performance in HJ**

➢ Device Information

FCCSP	Mold cap	Strip	PKG	Die size	Bump height
	0.37mm	240*76.3*0.35mm	14*14mm	6*6*0.12mm	70um

Item	GR920A1
Appearance	
C-scan	
T-scan	
Warpage	2mm
Marking	OK

Test Item*	Qualification Test Condition	Test Result	
		results	criterion
Before Test	/	PASS	NA
Pre-con	Baking:125，24 hrs Moisture Soak: 30℃/60%RH,192hrs Reflow@260 *3times	PASS	J-STD-020E
uHAST	130℃, 85%RH 33.3psia,unbiased 192hrs	PASS	JESD22-A118B
TCB	-55℃~125℃, 1000cycles	PASS	JESD22-A104E

Hysol

Thank you!