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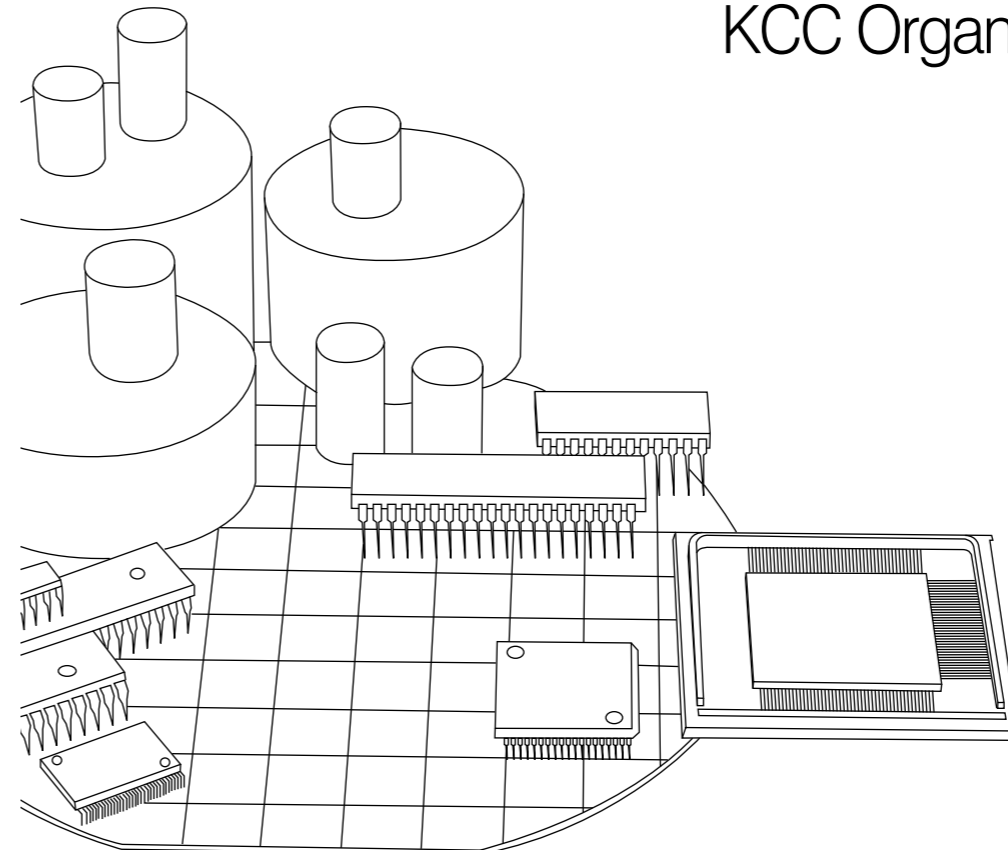
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KCC Organic Material EMC



KCC Organic Material EMC

- KTMC Series Classification
 - KTMC for Memory PKG
 - KTMC for IC PKG
 - KTMC for Discrete PKG
- KTMC Selection Guide



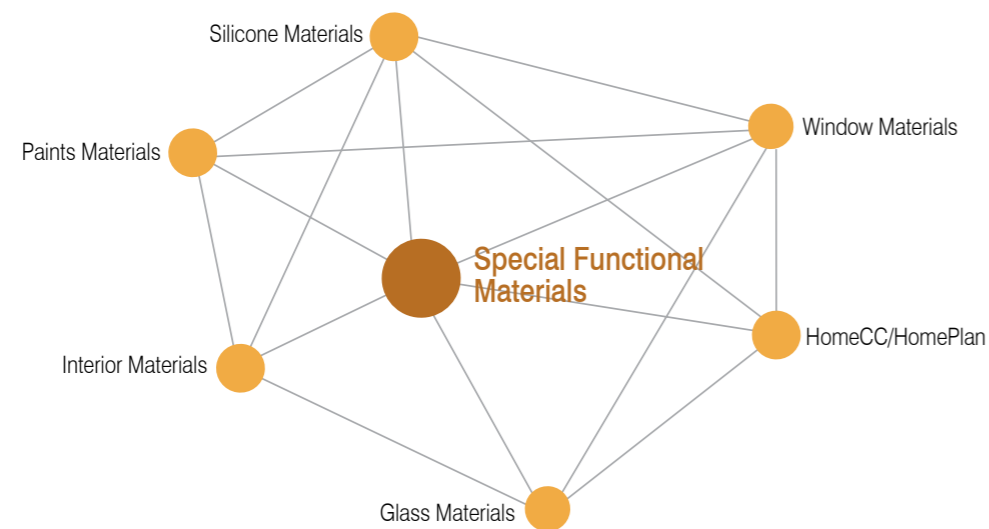
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We are reaching out to the world with quality and technology

With state-of-the-art technology and ultra-modern production facilities, KCC seeks for perfection in the quality of its products and customer services. Each and every product that it introduces to its customers on the marketplace is always the result of creative and intensive R&D activities satisfying the diversified customer needs.

KCC always remains deeply committed to ever upgrading the living environment by leading the building and industrial materials industry through continued research and development precisely reflecting the market trends and user-wishes.



KCC History

- | | | | |
|------|--|------|--|
| 1958 | Kumgang Slate Industries established | 2001 | Obtained the best credit rating of BBB-from S&P |
| 1973 | Kumgang listed stocks | | Obtained the best credit rating of Baa3 from Moody's |
| 1974 | Korea Chemical established. Paint production started | 2003 | The best company among the listing (for profit / Korea Listed Companies Association) |
| 1985 | Korea Chemical listed stocks | 2004 | Silicone production started (1st factory : 2004, 2nd factory : 2007) |
| 1985 | Gypsum board production started | 2005 | Company name changed to KCC Corporation |
| 1987 | Float Glass production started | 2008 | KAM(Korea Advanced Material) established by J/V between KCC and Hyundai Heavy Industries. Polysilicon pilot production started |
| 1989 | Kumgang Construction Co. established | 2009 | KCC and KAM polysilicon plants under construction |
| 2000 | Kumgang and Korea Chemical Co. merged into Kumgang Korea Chemical Company. | 2010 | Mass production of polysilicon to be started |
| | Korea Auto Glass(JV with Asahi Glass) established | | |



KCC Organic Material EMC (Epoxy Molding Compound)

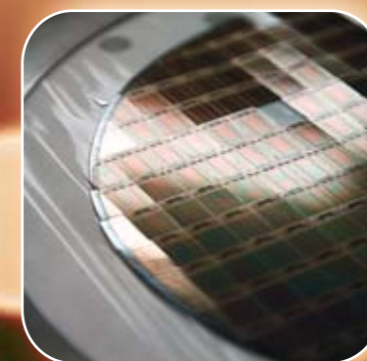
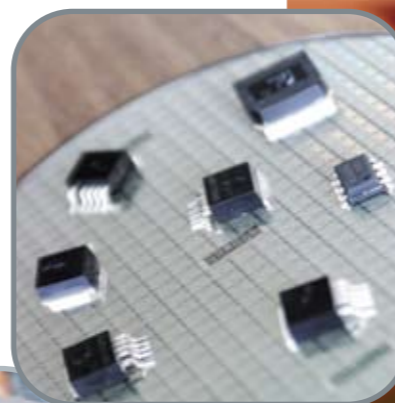
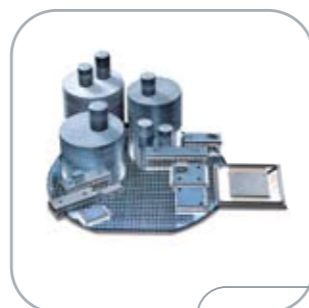
KTMC Introduction

KTMC is a very high level of epoxy encapsulation material which can apply to extremely small transistors and high speed stacked CPUs which require high reliability and workability. KTMC is specialized for encapsulating high density memory devices and high voltage discrete devices with KCC advanced formulation technology.

Now, KCC challenge to future technology in combination with KCC fine organic chemistry technology.

KTMC History

- 1985 Commence the Development KTMC
- 1987 Commercialized KTMC for TO-92
Commercialized KTMC for 128M Dram
One of the best quality supplier (KEC)
- 2000 One of the best supplier (Hynix)
- 2001 One of the best supplier (Bronze Awards)
(Fairchild)
- 2003 Certified ISO14001
Certified Sony Green Partner
Mold compound supplier of the year (Fairchild)
- 2005 Certified ISO/TS 16949



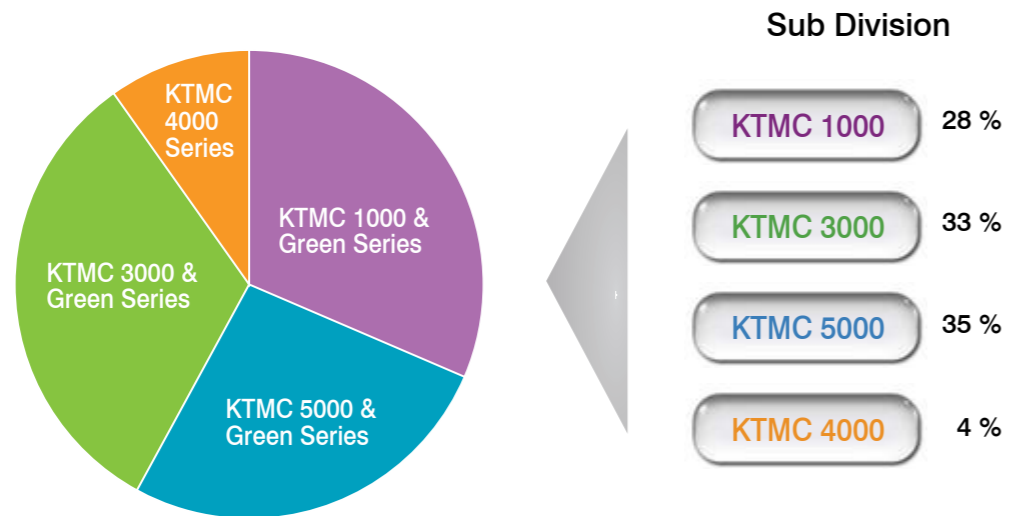
The Best Fine Chemical Company
in the World - **KCC**





KTMC Series Classification

KTMC Line-up

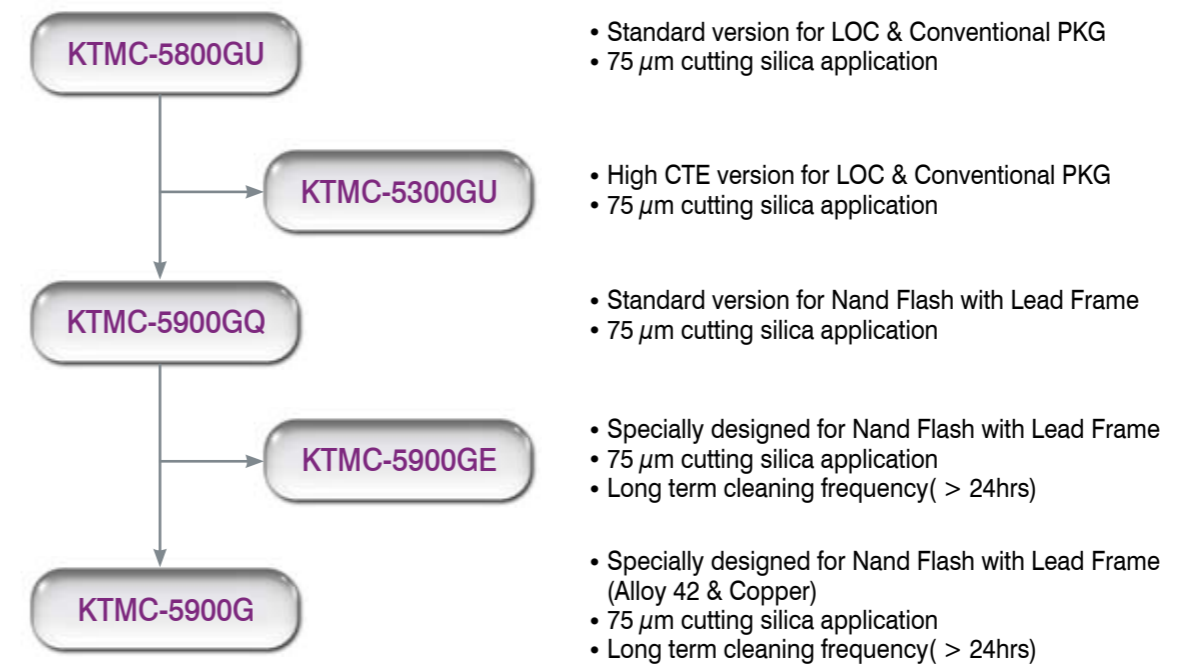


Grade	Feature	Application
KTMC-1000 Series	Low stress	- General Discrete - Low Density IC
KTMC-3000 Series	High thermal Conductivity	- Power Discrete - Power Module (Full pack)
KTMC-5000 Series	Ultra low stress	- Surface Mounted Device - High Density IC - Memory Device - Power Module (Heat sink)
KTMC-4000 Series	Conditioning Wax	-

Memory application

KTMC for Main Memory (TSOP)

KTMC for Main memory(TSOP) are specially designed for TSOP type of package Green EMC which do not use flame retardants such as bromine and antimony. It shows high reliability due to lower C.T.E, moisture absorption and flexural modulus. Specially, low C.T.E. by high filler loading indicates superior properties concerning warpage in spite of low Tg.



KTMC for Main Memory (TSOP)

Items		5300GU	5800GU	5900GQ	5900GE	5900G
Properties						
Spiral flow	inch	50	42	44	43	42
Gel time	sec	20	25	27	28	28
Thermal expansion α1	ppm/°C	9	10	9	9.3	9.5
Thermal expansion α2	ppm/°C	37	37	36	36	37
Tg	°C	125	108	121	120	120
Flexural Strength	Kgf/mm ²	16	15	15	15	16
Flexural Modulus	Kgf/mm ²	2,380	2,200	2,200	2,250	2,350



Memory application

KTMC for Main Memory (FBGA)

KTMC for Main memory (FBGA) are specially designed for FBGA type of main memory packages. They show excellent workability and reliability of package. Therefore, technologies are mainly focused on the control of filler cutting size and resin system according to various circuit line width of memory chips.



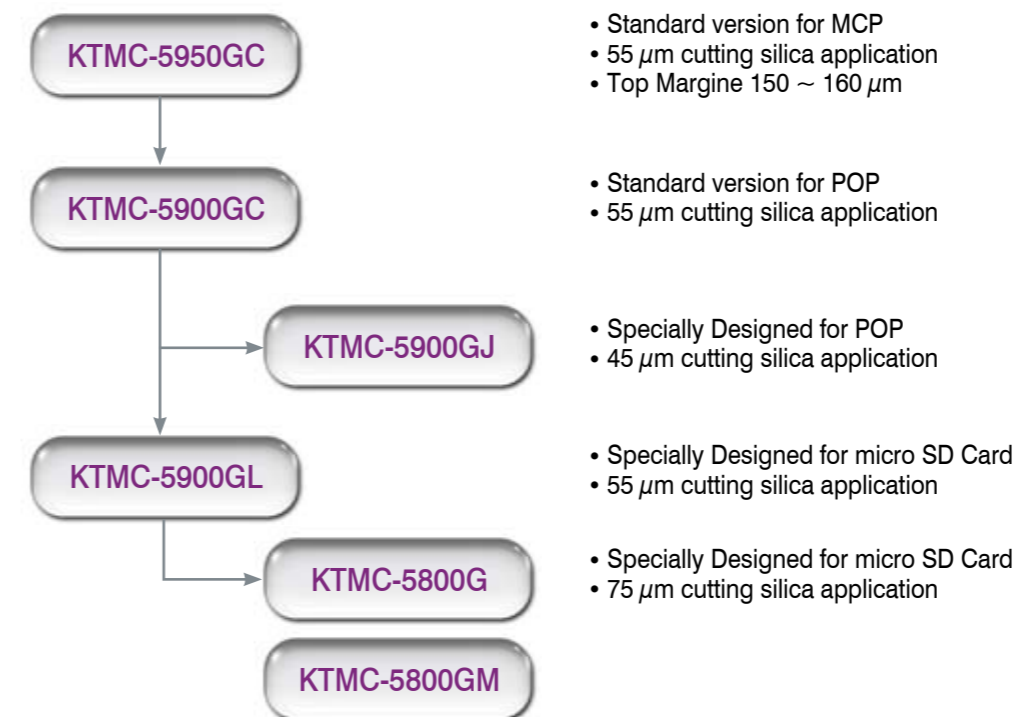
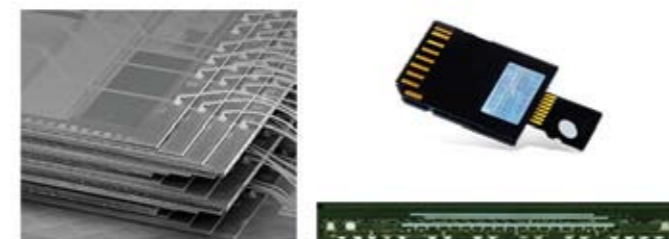
KTMC for Main Memory (FBGA)

Items		5300GF	5500GF	5700GF	5900GF	5900GU
Properties						
Spiral flow	inch	40	40	38	47	38
Gel time	sec	20	23	21	34	30
Thermal expansion α_1	ppm/ $^{\circ}\text{C}$	13	11	10	9	10
Thermal expansion α_2	ppm/ $^{\circ}\text{C}$	48	39	36	34	34
Tg	$^{\circ}\text{C}$	125	121	120	122	121
Flexural Strength	Kgf/mm ²	15	15	15	16	14
Flexural Modulus	Kgf/mm ²	2,000	2,150	2,200	2,400	2,350

Memory application

KTMC for Function Memory

KTMC for Function memory are environment-friendly version epoxy mold compounds (Green Compound), specially designed for ultra thin & large package, stacked chip package etc., They show good flowability, storage time, cleaning property & period and good performance for Warpage. This is demonstrated successfully in special functional memory devices such as MCP, PoP, Micro SD Card, etc.



KTMC for Function Memory

Items		5950GC	5900GC	5900GJ	5900GL	5800G	5800GM
Properties							
Spiral flow	inch	40	40	52	42	60	55
Gel time	sec	30	29	40	32	26	28
Thermal expansion α_1	ppm/ $^{\circ}\text{C}$	9	10	10	10	11	11
Thermal expansion α_2	ppm/ $^{\circ}\text{C}$	33	35	40	35	38	37
Tg	$^{\circ}\text{C}$	120	120	118	147	115	115
Flexural Strength	Kgf/mm ²	16	15	16	15	15	15
Flexural Modulus	Kgf/mm ²	2,400	2,350	2,150	2,400	2,000	2,050



Memory application

KTMC for Next Generation

KTMC for Next Generation of Memory are specially designed for the advanced package trend in the future such as Flip Chip, Warpage Free Low-K, Cu & Au material and Compression molding, etc., They show high performance as per the needs of next generation packages.



KTMC-5900CM

- Standard version for Compression Mold
- Narrow Gap Filling application
- 70 ~ 90 % Ultra fine silica, Low CTE, Excellent warpage property
- Granule type

KTMC-5600MUF

- Standard version for Molded Underfill
- Narrow Gap Filling application
- 80 ~ 88 % Ultra fine silica, Low CTE, Excellent warpage property

KTMC-5900GP(W)

- Standard version for low warpage PKG
- CTE, Modulus, Tg property

KTMC-5900GI

- Standard version for Cu, Ag wire
- Low Corrosion

KTMC-5700GL

- Standard version for Low K wafer
- Low Modulus

KTMC for Next Generation

Items		5300CM	5600MUF	5900GP(W)	5900GI	5700GL
Properties						
Spiral flow	inch	65	39	45	42	50
Gel time	sec	55	48	31	26	35
Thermal expansion α1	ppm/°C	10	11	7	9	7.5
Thermal expansion α2	ppm/°C	34	39	25	34	32
Tg	°C	118	116	140	122	150
Flexural Strength	Kgf/mm ²	15	15	15	15	14
Flexural Modulus	Kgf/mm ²	2,300	2,050	2,850	2,350	1,800

IC application

KTMC Green compound for SOIC

SOIC (Small-outline integrated circuit) is a surface mount integrated circuit. KTMC-5200 Series are specially designed for SOIC packages. It provides low moisture absorption and superior physical, mechanical strength characteristics which result in excellent MRT performance. It features typical mold-ability and work-ability performance.



KTMC-5200GM

- Standard version of SOIC (Low cost)
- Good performance reliability (Narrow SOIC : MSL1 , Wide SOIC : MSL3)

KTMC-5200GT

- High reliability (MSL1)
- Ultra low stress
- High adhesion to lead frame(Cu, Ni, Ag)

KTMC for Green compound (SOIC)

Items		5200GM	5200GT
Properties			
Spiral flow	inch	34	40
Gel time	sec	26	24
Thermal expansion	ppm/°C	15	13
Tg	°C	125	120
Water absorption	% (PCT 24hrs)	0.40	0.30



IC application

KTMC Green compound for QFP (TQ/MQ/LQ)

QFP(Quad Flat Package) is an integrated circuit package with leads extending from each of the four sides. **KTMC for QFP** package are low stress type molding compounds. In order to decrease internal stress of package, they have low thermal expansion, low absorption & good adhesion properties.



KTMC-5600GT

- Standard version of MQFP (low cost)
- Good moldability and workability

KTMC-5800GT

- Low modulus version
- Good performance on LQFP and MQFP (MSL-3)

KTMC-5850GL

- Lower water absorption
- Good performance on TQFP (MSL-2)
- Better workability and long-term cleaning frequency

KTMC for Green compound (QFP_TQ/MQ/LQ)

Items		5600GT	5800GT	5850GL
Properties				
Spiral flow	inch	32	31	44
Gel time	sec	26	24	27
Thermal expansion	ppm/°C	11	8	8
Tg	°C	120	125	115
Water absorption	% (PCT 24hrs)	0.29	0.25	0.21

※ F.R.R (Flame Retardant Resin)

IC application

KTMC Green compound for QFN & PLCC

QFN (Quad Flat No leads) physically and electrically connects integrated circuits to printed circuit boards. **KTMC for QFN** packages are mainly focused on low Warpage, high reliability and green technology as per the customers' requirements.



KTMC-5400G

- Standard version of PLCC
- Good moldability and workability

KTMC-5850G

- Standard version of QFN (low cost)
- Ultra low stress (low modulus)
- Excellent performance on QFN (MSL3)

KTMC-5850GM

- Advanced version of QFN
- High reliability (MSL1) - Low water absorption.
- Good performance of warpage or wire-sweep

KTMC for Green compound (QFN & PLCC)

Items		5400G	5850G	5850GM
Properties				
Spiral flow	inch	28	40	44
Gel time	sec	23	25	29
Thermal expansion	ppm/°C	12	10	8
Tg	°C	130	120	115
Water absorption	% (PCT 24hrs)	0.33	0.28	0.23

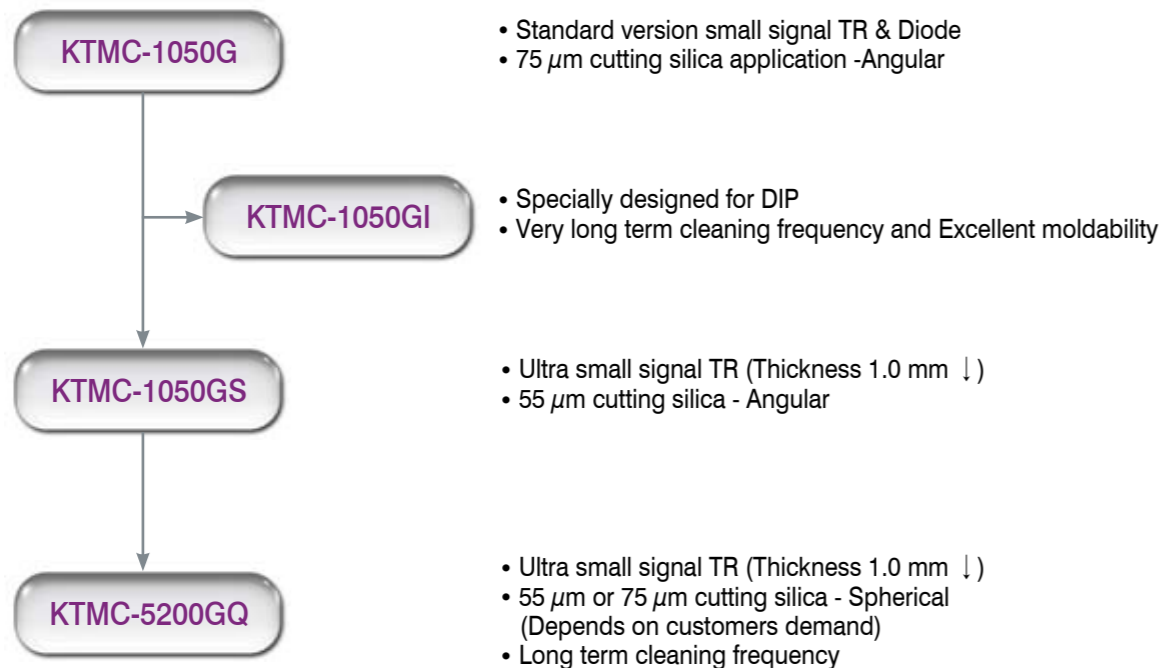
※ F.R.R (Flame Retardant Resin)



Discrete application

KTMC Green compound for SSTR & DIP

KTMC for small signal transistor are Epoxy Molding Compounds which are specially designed for extremely small packages. They show excellent workability and reliability of package. Therefore, technologies are mainly focused on the filler particle size distribution, optimized additives and modifier systems according to package structures such as body, gate size.



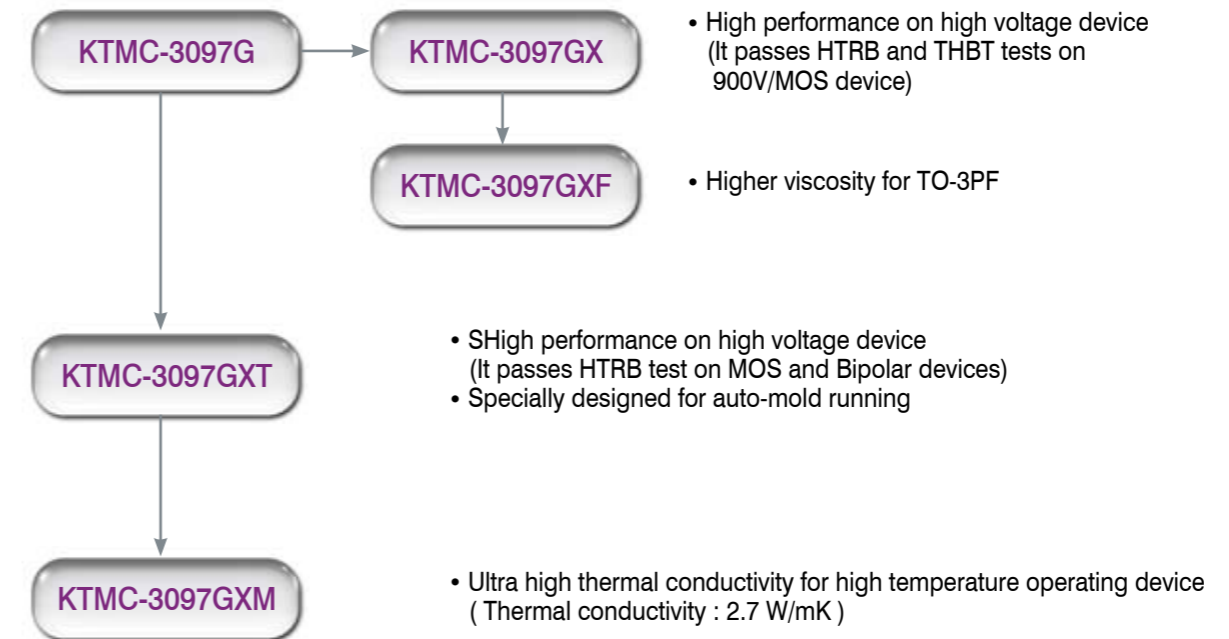
KTMC for Green compound (SSTR & DIP)

Items		1050G	1050GI	1050GS	5200GQ
Properties					
Spiral flow	inch	25	32	25	30
Gel time	sec	25	21	25	21
Thermal expansion	ppm/ $^{\circ}\text{C}$	15	15	16	13
Tg	$^{\circ}\text{C}$	160	155	155	155
Volume resistivity	175 $^{\circ}\text{C}/1500\text{V}(X 10\text{E}11)$	0.5	3.0	0.5	3.5
Water absorption	% (PCT 24hrs)	0.38	0.38	0.39	0.35

Discrete application

KTMC Green compound for Power TR (Full pack)

KTMC-3097G Series are specially designed for Power discrete packaging application with high thermal conductivity. This material is specifically recommended for isolated Power Transistors, which require high heat dissipation, This is demonstrated successfully in insulated transistors such as TO220F, TO3PF, etc.



KTMC for Green compound (TR_Full pack)

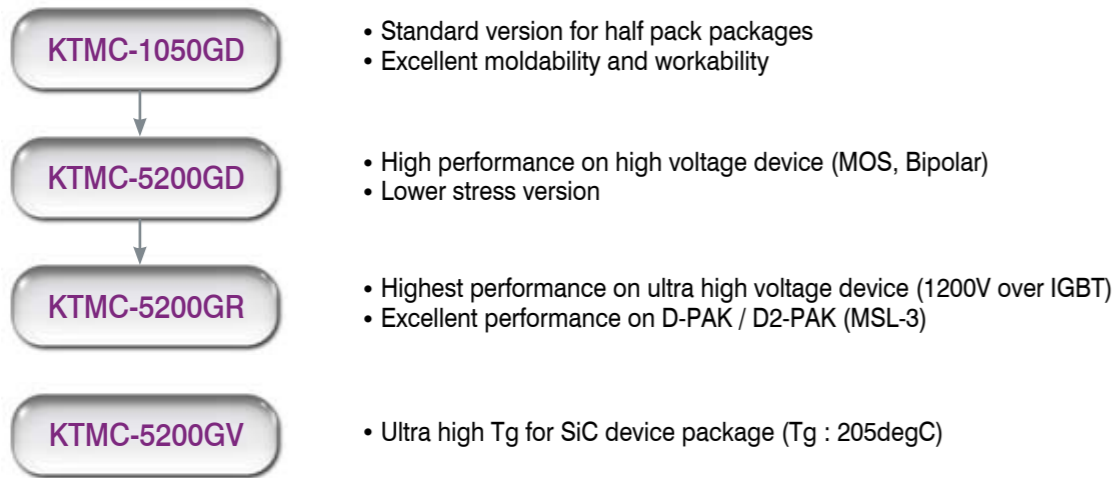
Items		3097GX	3097GXF	3097GXT	3097GXM
Properties					
Spiral flow	inch	22	18	18	20
Gel time	sec	32	40	25	40
Thermal conductivity	W/mk	2.3	2.3	2.1	2.7
Thermal expansion	ppm/ $^{\circ}\text{C}$	20	20	23	21
Tg	$^{\circ}\text{C}$	150	145	155	160
Volume resistivity	175 $^{\circ}\text{C}/1500\text{V}(X 10\text{E}11)$	22	15	8.0	2.5
Water absorption	% (PCT 24hrs)	0.32	0.32	0.36	0.34



Discrete application

KTMC Green compound for Power TR (Half pack)

KTMC for general TR featuring a high productivity, are epoxy molding compound designed for encapsulating of discrete semiconductor devices. (TO-220, TO-126, TO-3P, TO-264, TO-247 etc..) These series are formulated to provide good reliability at affordable prices. In addition, they show high performances on power discrete devices which have ultra high voltage.



Reliability level (focused on HTRB performance)

	Voltage regulator	Rectifier	BIPOLAR	Low-voltage MOSFET	High-voltage MOSFET	IGBT
1050GD	○	○	○	○		
5200GD	○	○	○	○	○	
5200GR	○	○	○	○	○	○

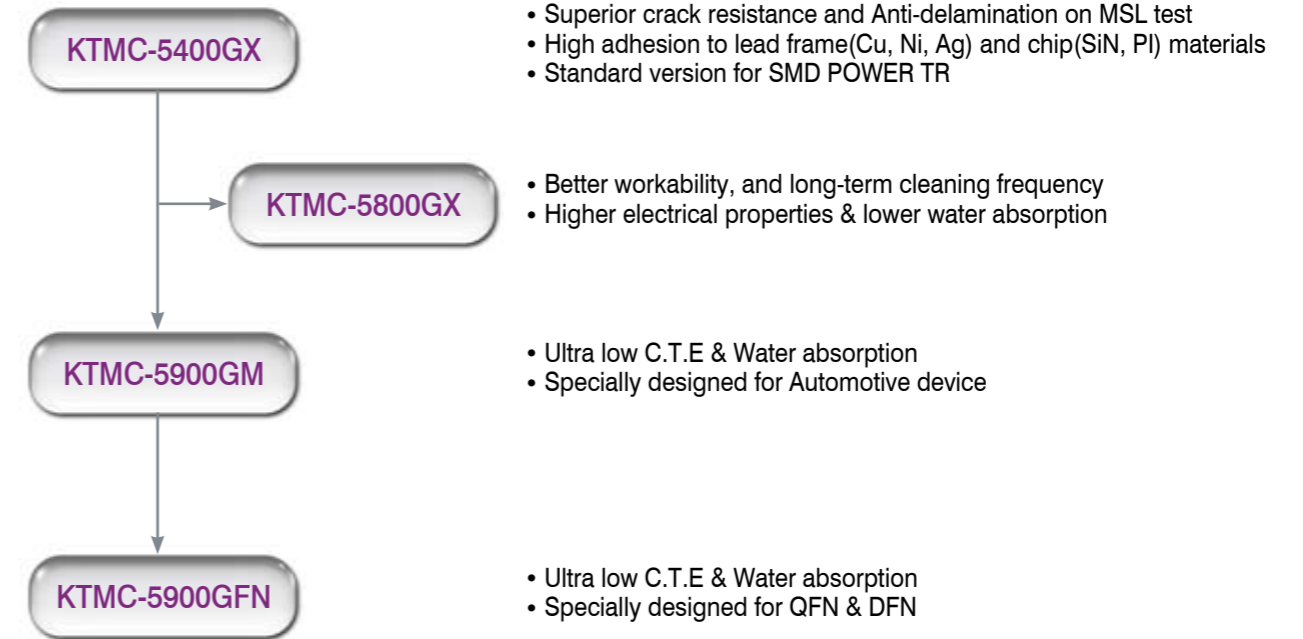
KTMC for Green compound (TR_Half pack)

Items		1050GD	5200GD	5200GR	5200GV
Properties					
Spiral flow	inch	28	28	28	22
Gel time	sec	22	25	25	28
Thermal expansion	ppm/°C	14	12	11	13
Tg	°C	155	140	135	205
Volume resistivity	175 °C/1500V(X 10E11)	6.5	12.5	15	25
Water absorption	% (PCT 24hrs)	0.38	0.32	0.28	0.37

Discrete application

KTMC Green compound for Power TR (SMD)

KTMC for SMD(Surface Mounted Device) are specially designed for surface mount packaging application with high reliability. They provide low moisture absorption and superior physical, mechanical strength characteristics which result in excellent MRT performance even at high solder reflow temperature, 260degrees, for Pb-free process.



KTMC for Green compound (TR_SMD)

Items		3097GX	3097GXF	3097GXT	3097GXM
Properties					
Spiral flow	inch	35	30	28	40
Gel time	sec	25	25	22	28
Thermal expansion	ppm/°C	9.5	8.5	8.5	8.0
Tg	°C	130	125	120	120
Volume resistivity	175 °C/1500V(X 10E11)	3.5	12	2.0	6.0
Water absorption	% (PCT 24hrs)	0.30	0.24	0.26	0.23



Memory application

KTMC Selection Guide for Memory

	TSOP I	TSOP II (LOC)	TSOP II (Conv.)	FBGA (Face up)	FBGA (BOC)	MCP	POP	Card	LGA
5300GU	○	○	○						
5800GU	○	●	●						
5900GQ	○	○	○						
5900GE	●	○	○						
5900G	●	○	○						
5300GF				○	●				
5500GF				○	○				
5700GF				○	●				
5900GF				○	○				
5900GU				○	●				
5950GC					○	●	○	○	●
5900GC					■	■	●		○
5900GJ							●		■
5900GL							●	●	■
5800G								●	
5800GM								●	■
5900CM									
5600MUF					●				
5900GP(W)							●	●	●
5900GI					●				
5700GL					●				

- : Normal application
- : High performance application
- : Specially demanded application
- : The compound model that KCC strongly recommends

IC application

KTMC Selection Guide For Non-Memory

	SOIC	MQFP	LQFP	TQFP	PLCC	QFN
5200GM	○					
5200GT	●					
5600GT		●	○			
5800GT		○	●	○		
5850GL		○	○	●		
5400G		○	○		●	
5850G					○	●
5850GM					■	●

- : Normal application
- : High performance application
- : Specially demanded application
- : The compound model that KCC strongly recommends

Discrete application

KTMC Selection Guide for Discrete

	TO-92	SOT-23	ULTRA SSTR	DIP	TO-220	TO-220FP	TO-3P	TO-3PF	TO-247	TO-264	D-PAK	D2-PAK	DFN
1050G	○	○											
1050GI	○			●									
1050GS		○	○										
1050GD	●				○		○						
5200GQ		●	●										
5200GD					●		●		○				
5200GR							●		●	●	■	■	
5200GV									■	■			
3097GX						●							
3097GXF								●					
3097GXM						■							
5400GX											○	○	
5800GX										●	●	●	
5900GM											■	■	
5900GFN													●

- : Normal application
- : High performance application
- : Specially demanded application
- : The compound model that KCC strongly recommends