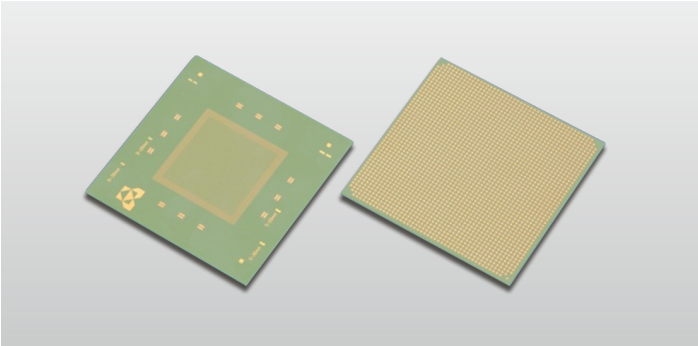
LTCC TECHNOLOGY FOR MMWAVE
ANTENNA IN PACKAGE AND MULTIPLEXER MODULE



APPLICATIONS

- Base station
- IoT
- Space
- Automotive
- Virtual reality

ADVANTAGE OF KYOCERA LTCC

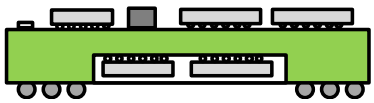
- **Excellent RF performance:** material properties and design flexibility
- **Filters and antenna** can be embedded for high frequency up to 60 GHz

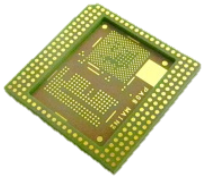
EXCELLENT MATERIALS FOR RF

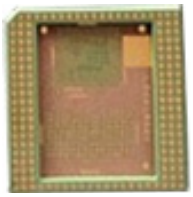
		GL330	GL580	GL771	GL773
Dielectric constant	2 GHz	7.7	6.1	5.2	5.8
	10 GHz	7.6	6.1	5.2	5.8
	60 GHz	7.6	-	5.3	5.7
Dielectric loss angle	2 GHz	5×10^{-4}	16×10^{-4}	36×10^{-4}	23×10^{-4}
	10 GHz	7×10^{-4}	19×10^{-4}	38×10^{-4}	25×10^{-4}
	60 GHz	12×10^{-4}	-	34×10^{-4}	33×10^{-4}
CTE (RT ~ 400 °C)	[10^{-6}/K]	8.2	10.4	12.3	11.7
Thermal conductivity	[W/mK]	4.3	2.0	2.0	1.9
Application		Filter		AiP (BGA)	

LPWA (LOW POWER WIDE AREA)

- Smaller system in package with cavity RF-IC, SW, SAW, Memory, etc.







KYOCERA Europe GmbH · Fritz-Müller-Strasse 27 · 73730 Esslingen / Germany
Tel: +49 711 93 93 4-0 · E-mail: info@kyocera.de · www.kyocera.eu

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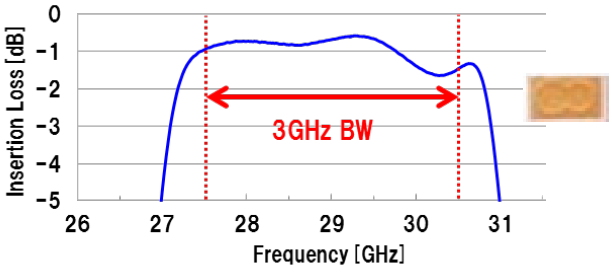
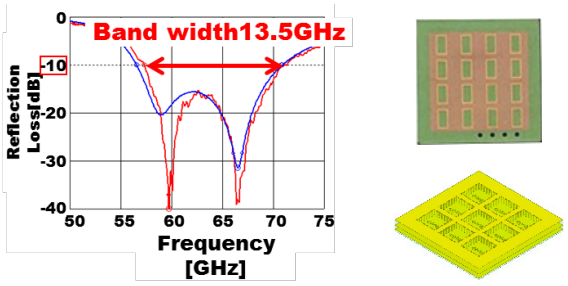
AiP (Antenna in Package) & Filter (28 GHz)

- High gain antenna and filter

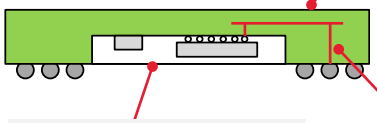
BPF for 28 GHz AiP



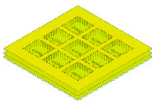
AiP with 60 GHz Dielectric Resonator Antenna (DRA)

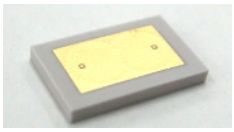


Band pass filter can be embedded into AiP

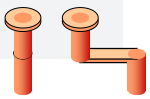


Array antenna
(Patch, DRA)
Dielectric Resonator Antenna





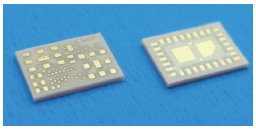
- Impedance matching by coaxial via
- Fine via design (ø50 µm)
- No capture pad (inner layer)



Design flexibility
- Cavity
- Flip chip
- BGA
- Filter can be embedded

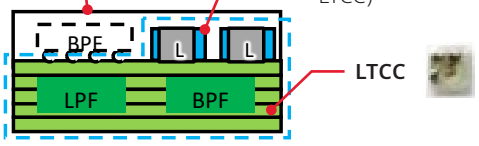
MULTIPLEXER MODULE

- High Q filter (LPF, and BPF) can be embedded into LTCC
- Miniaturization solution

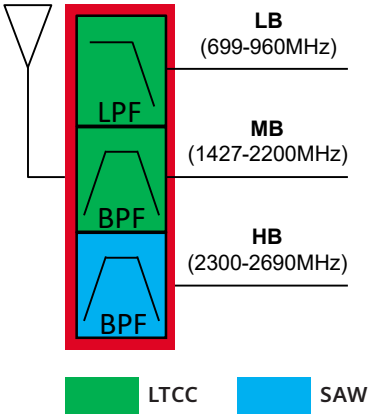


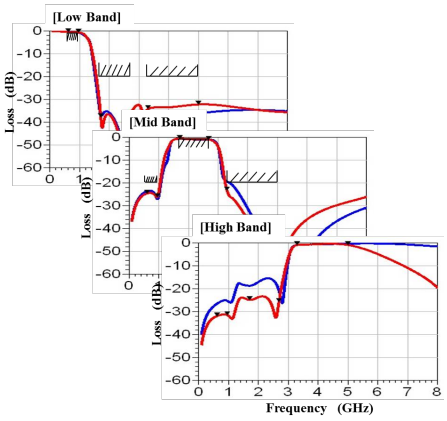
SAW can be eliminated

Inductor (Inductor complements Q value of LTCC)



LTCC





Simulation results (example)

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Tel: +49 711 93 93 4-0 · E-mail: info@kyocera.de · www.kyocera.eu