HKPCA
Hong Kong Printed Circuit Association
香港綫路板協會

Paper Presentation

ELECTRICAL AND MECHANICAL RELIABILITY OF AN RF LAMINATE ARE KEY REQUIREMENTS FOR SELECTION IN 77/79 GHZ SAFETY AND RELIABILITY APPLICATIONS

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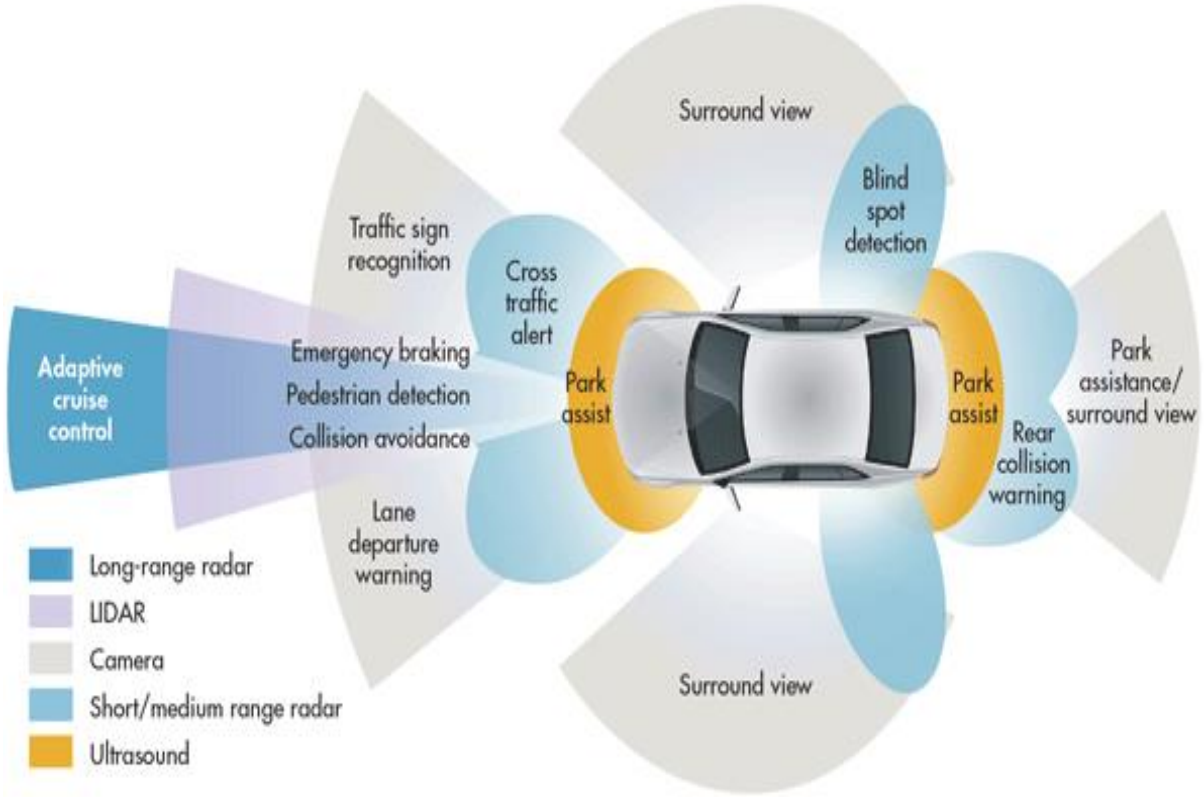
ADAS APPLICATIONS

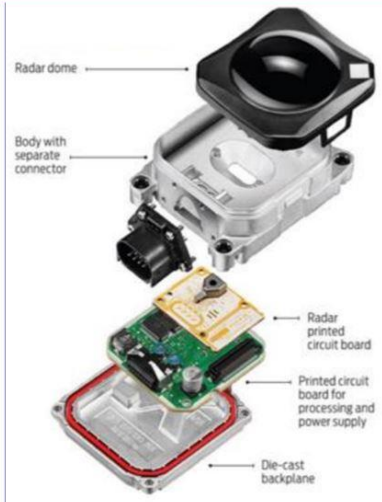
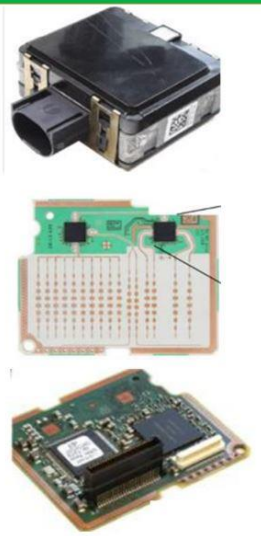
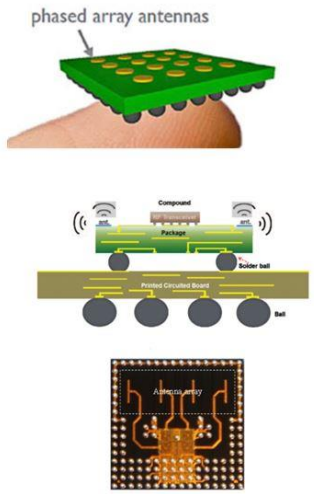
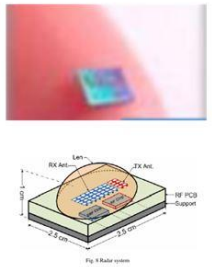
Advanced driver-assistance systems (ADAS) are electronic systems that assist drivers in driving and parking functions



77GHZ ADAS SENSOR

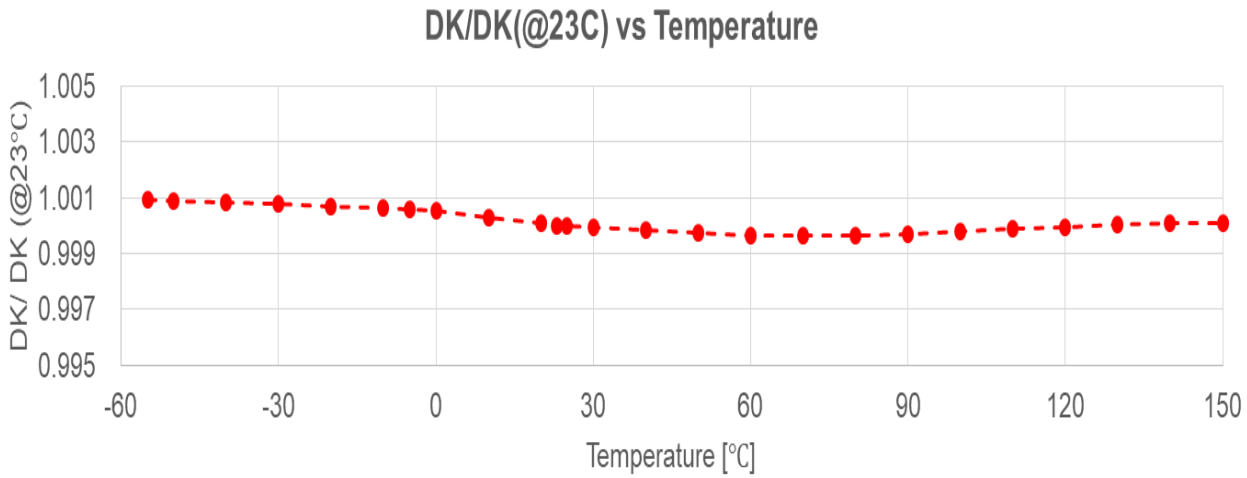
(courtesy of Robert Bosch GmbH)

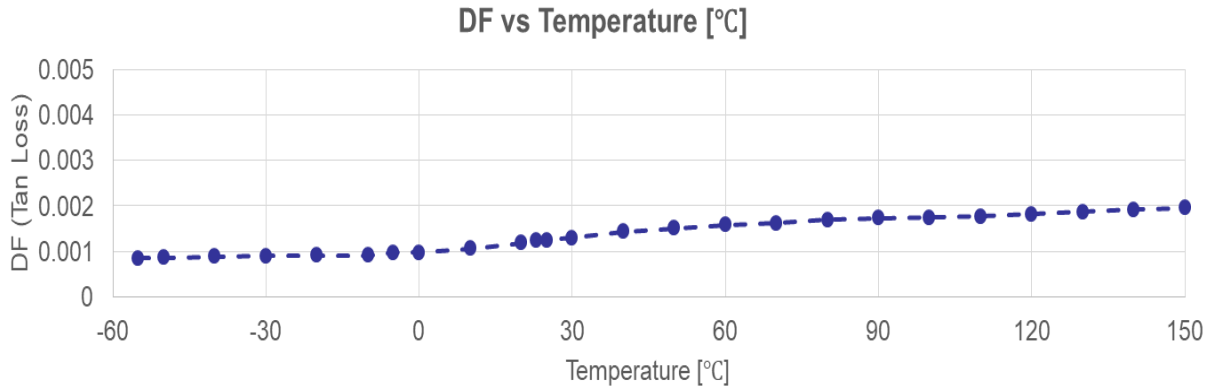
77GHZ ADAS SENSOR

1st Gen RF and digital board separate	2nd Gen Still separate but RF board becoming smaller	Current Hybrid RF/digital board	Future Antenna in Package	Longer Term Future Antenna on Chip at 140GHz?
				

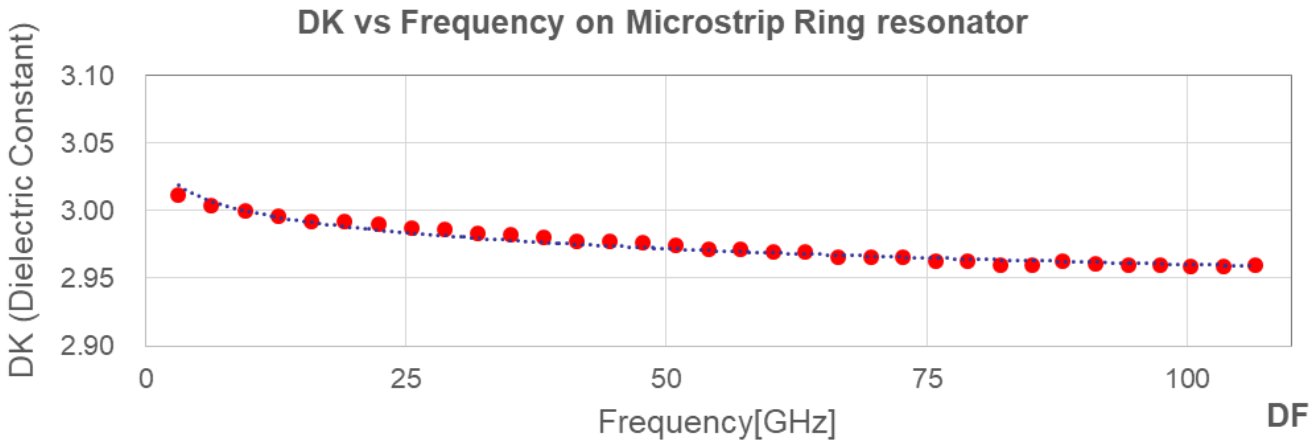
(courtesy of IDTechEx Research)

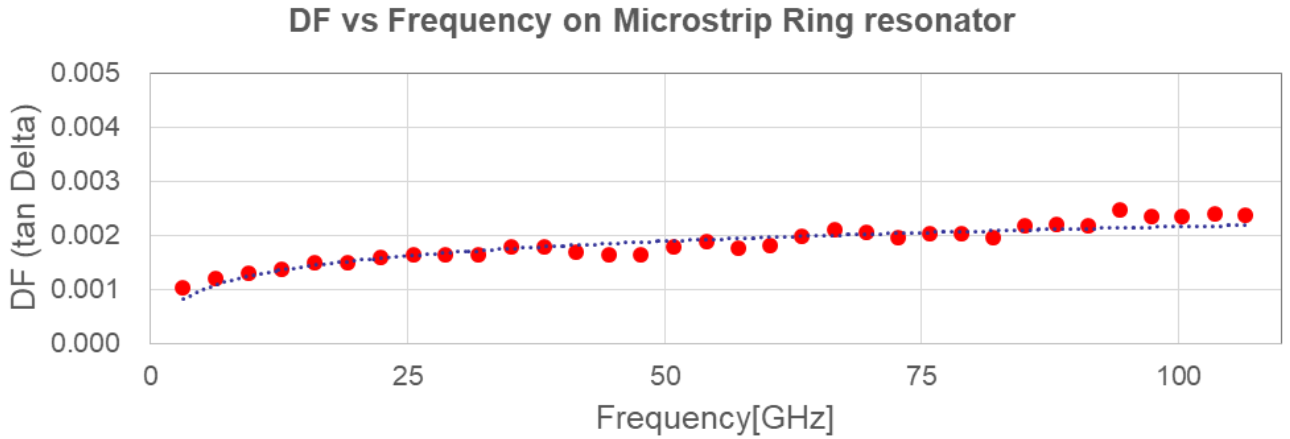
STABLE DK/DK AND DF FROM -60 TO +150 °C





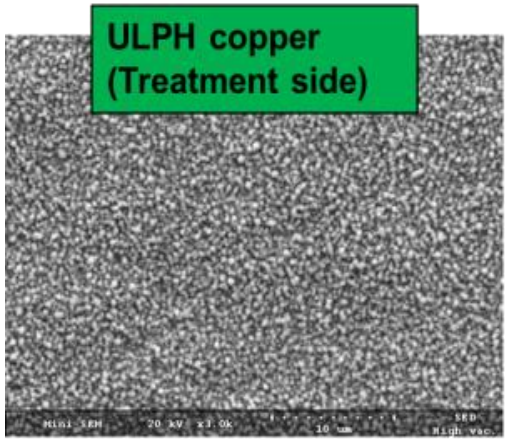
STABLE DK/DK AND DF UP TO 110 GHZ

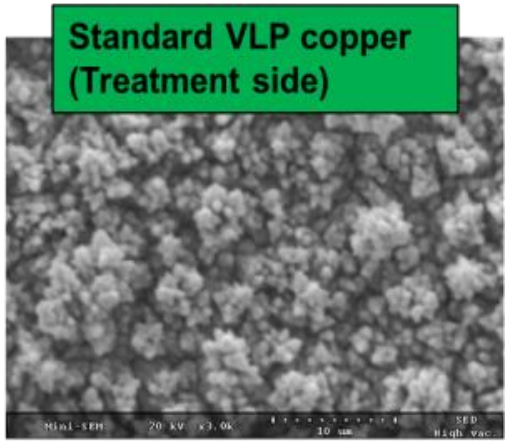


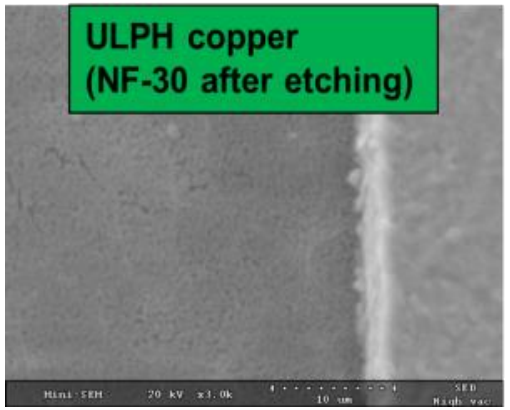


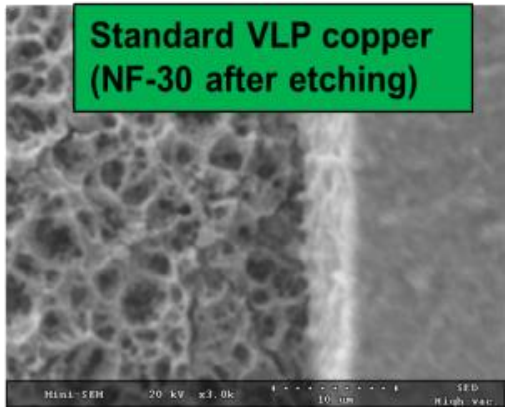
COPPER FOIL IS ALSO OF IMPORTANCE

ULPH copper foil vs. VLPH copper foil



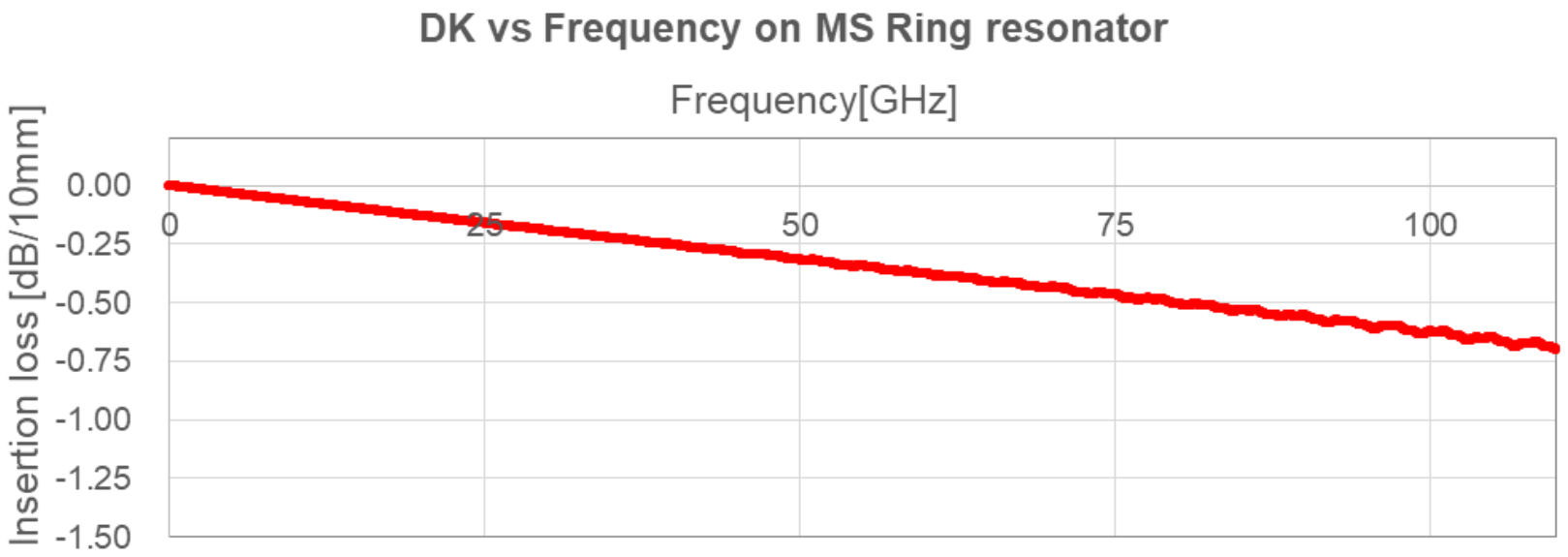




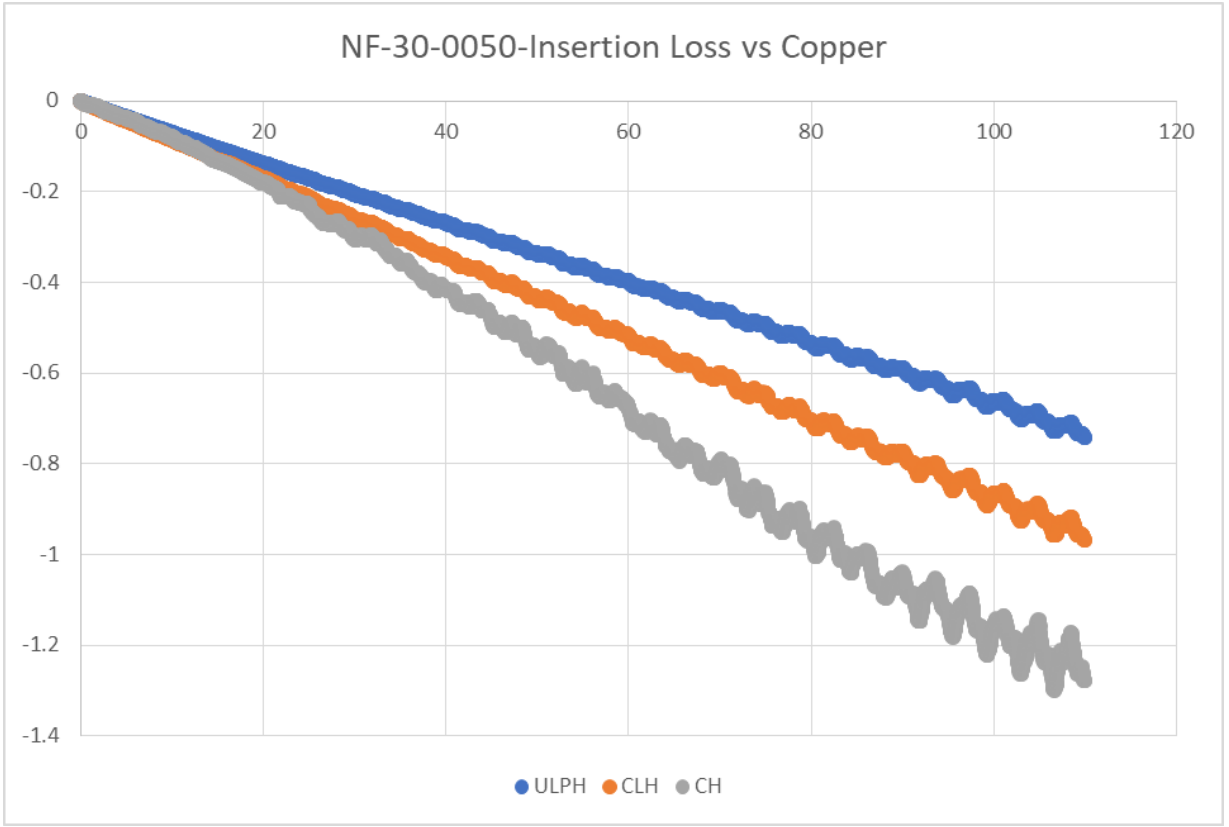


(courtesy of Circuit Foil Luxembourg Sàrl)

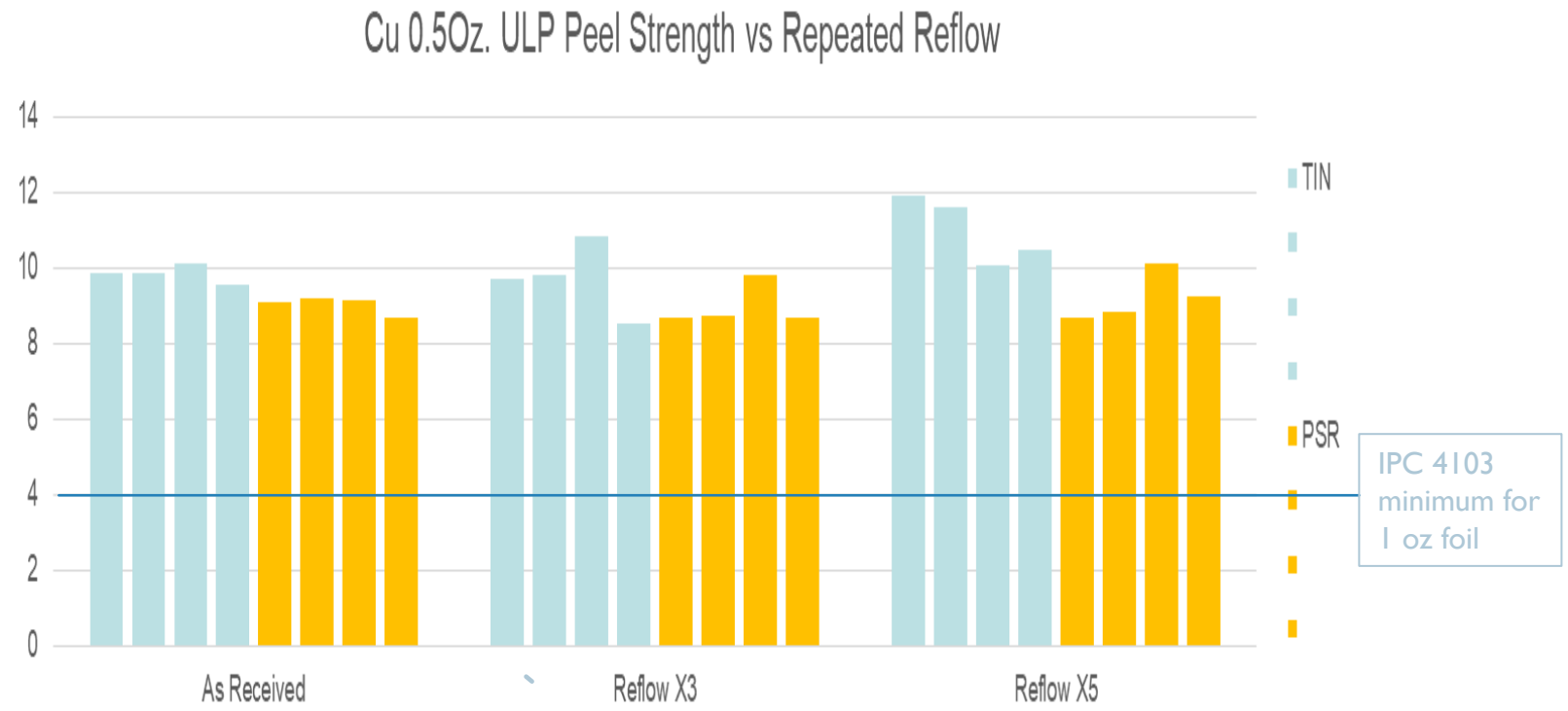
COPPER FOIL INFLUENCE ON INSERTION LOSS



COPPER FOIL INFLUENCE ON INSERTION LOSS



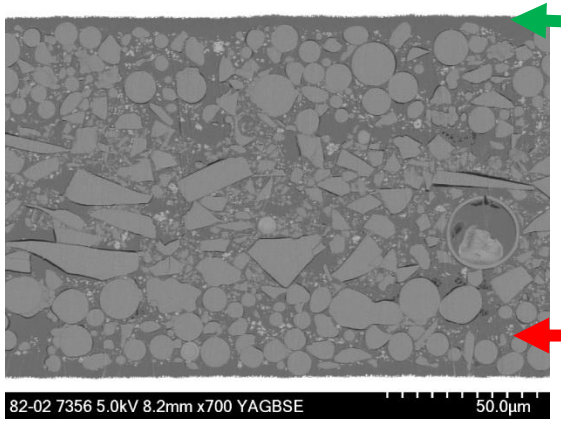
COPPER FOIL MECHANICAL RELIABILITY



ADVANCED FILLER SYSTEM + ULP COPPER FOIL

NF-30 uses small and round shape filler systems

- ✓ Smoother interface between copper foil and dielectric layer
- ✓ Much less chance for fillers to touch the copper foil area.
- ✓ Larger box type fillers touching copper foil treatment side could raise unexpected noise

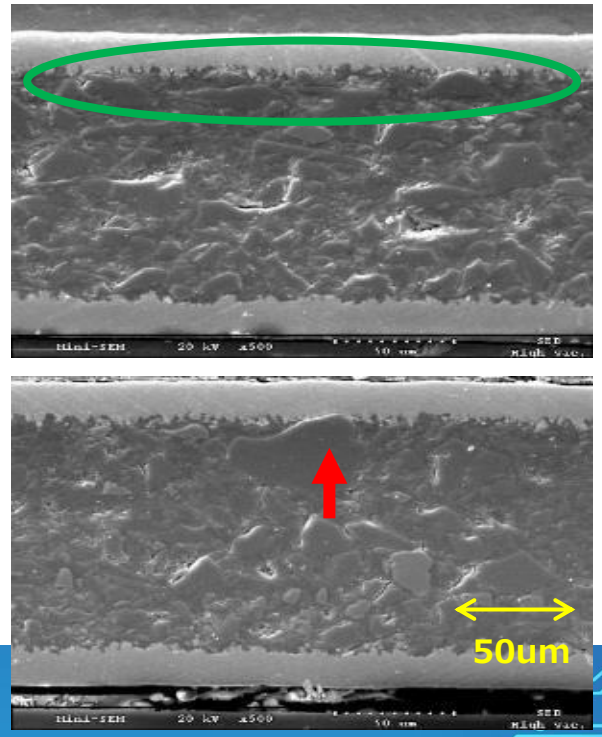


lower Cu roughness

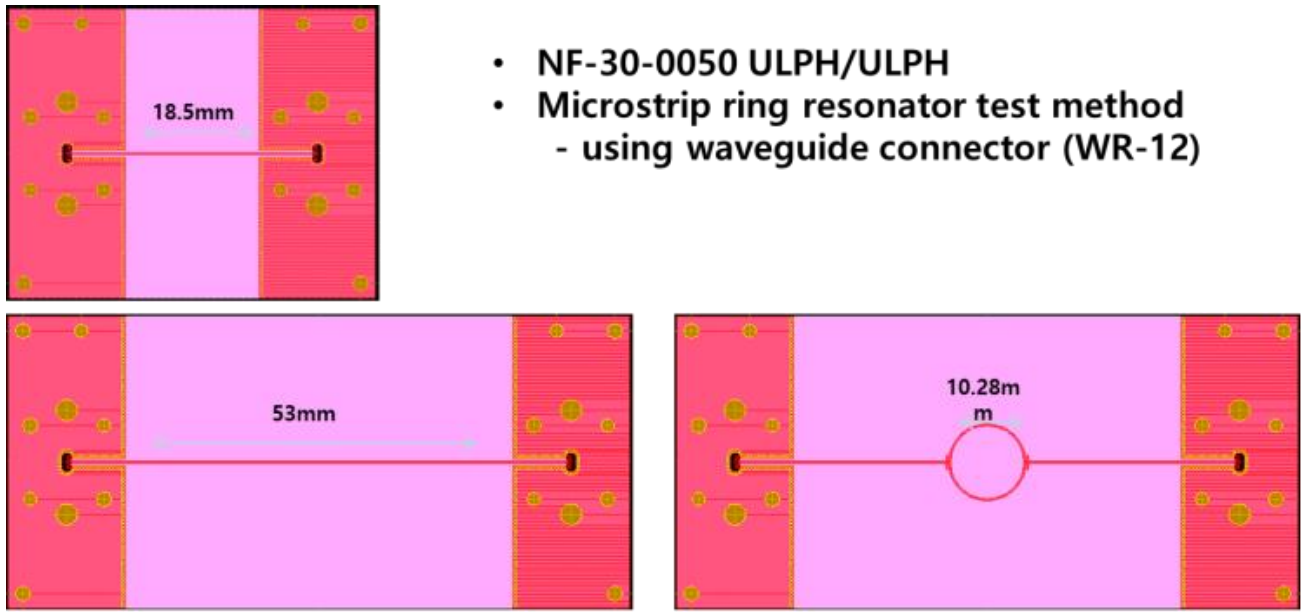
small & round filler

NF-30

competitor



MICROSTRIP RING RESONATOR TEST COUPONS



- NF-30-0050 ULPH/ULPH
- Microstrip ring resonator test method
  - using waveguide connector (WR-12)

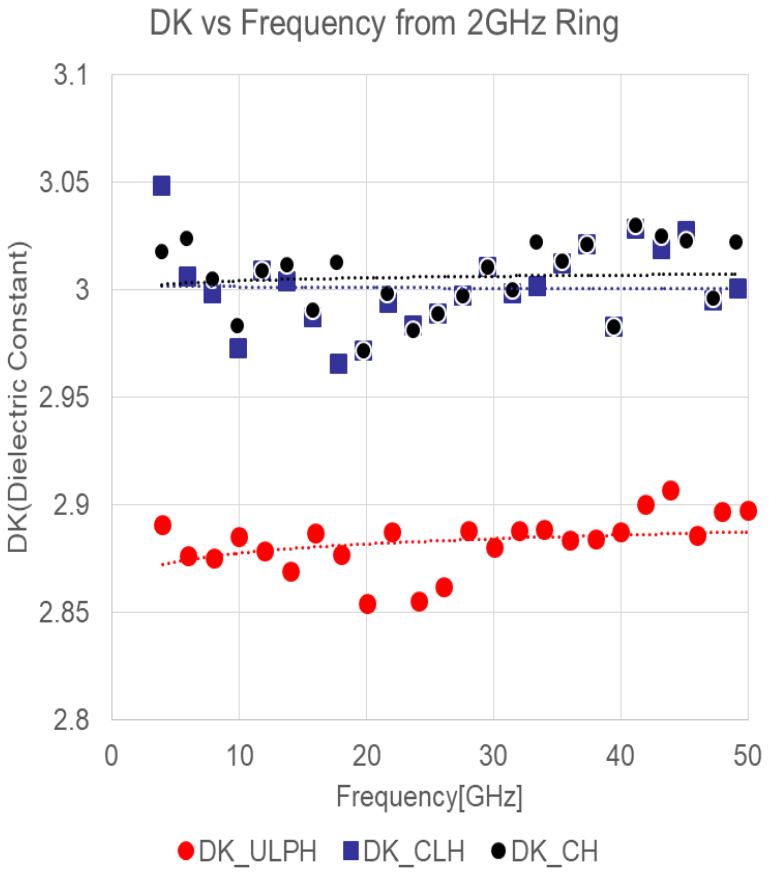
Coupon for Insertion Loss
(short: 18.5 mm, long: 53 mm)

Coupon for DK
(ring diameter: 10.28 mm)

NF-30 DK IS INFLUENCED BY COPPER FOIL TYPE

NF-30-0050					
Freq.	DK ULPH	Freq.	DK CLH	Freq.	DK CH
10.011	2.885	9.881	2.973	9.866	2.983
20.118	2.854	19.765	2.972	19.765	2.972
30.055	2.880	29.481	3.010	29.481	3.010
40.032	2.887	39.465	2.983	39.465	2.983
49.962	2.897	49.204	3.001	49.051	3.022

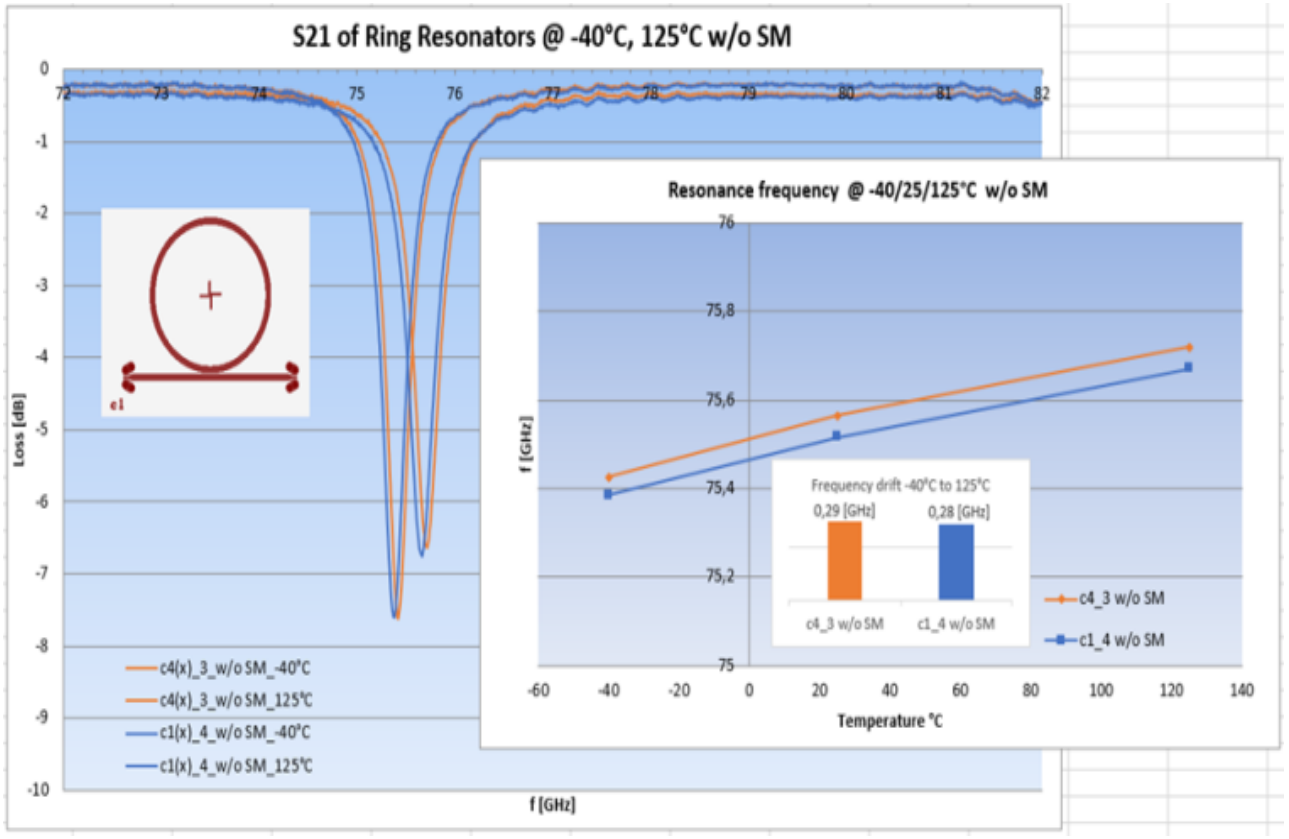
Product	Expected Frequency Shift near 77GHz [GHz]	
NF-30-0050-CH	0.460	0.000
NF-30-0050-CLH	0.696	0.236
NF-30-0050-ULPH	1.863	1.403



NF-30 ELECTRICAL STABILITY

S21 of ring resonators

show a quite small frequency drift

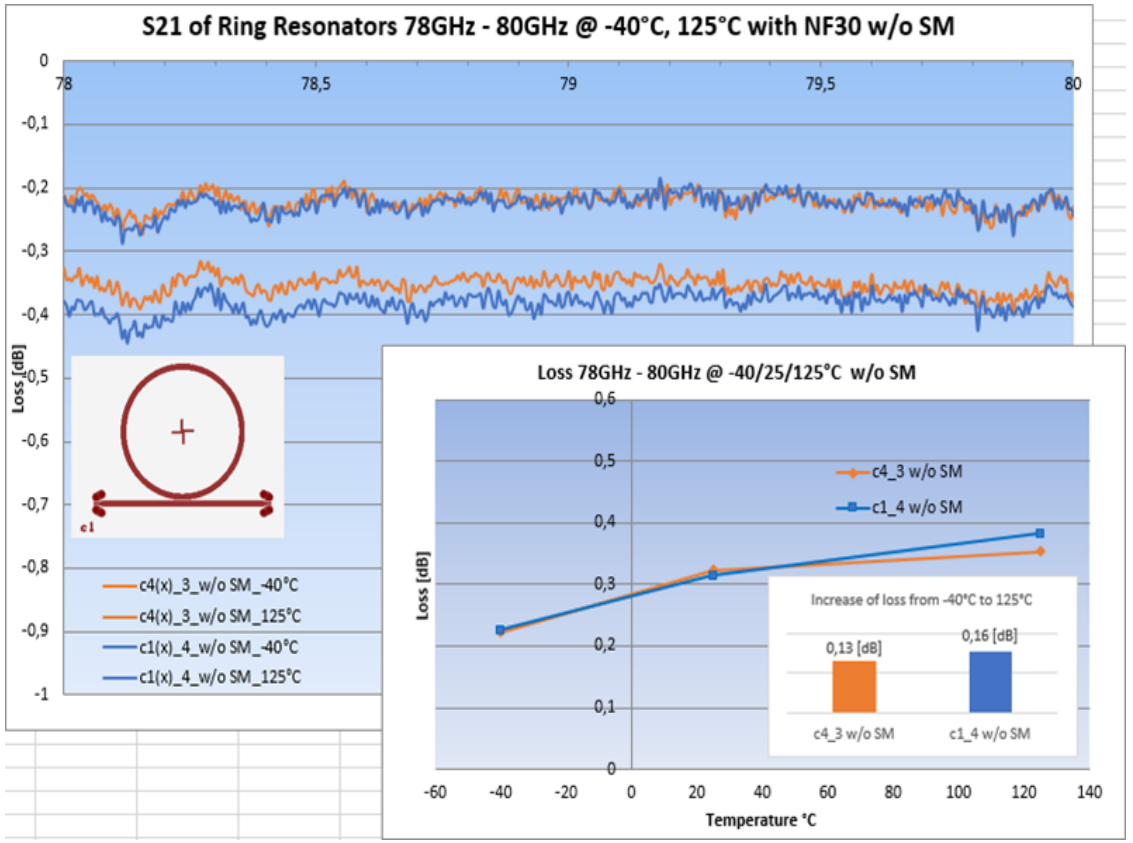


(courtesy of Robert Bosch GmbH)

NF-30 ELECTRICAL STABILITY

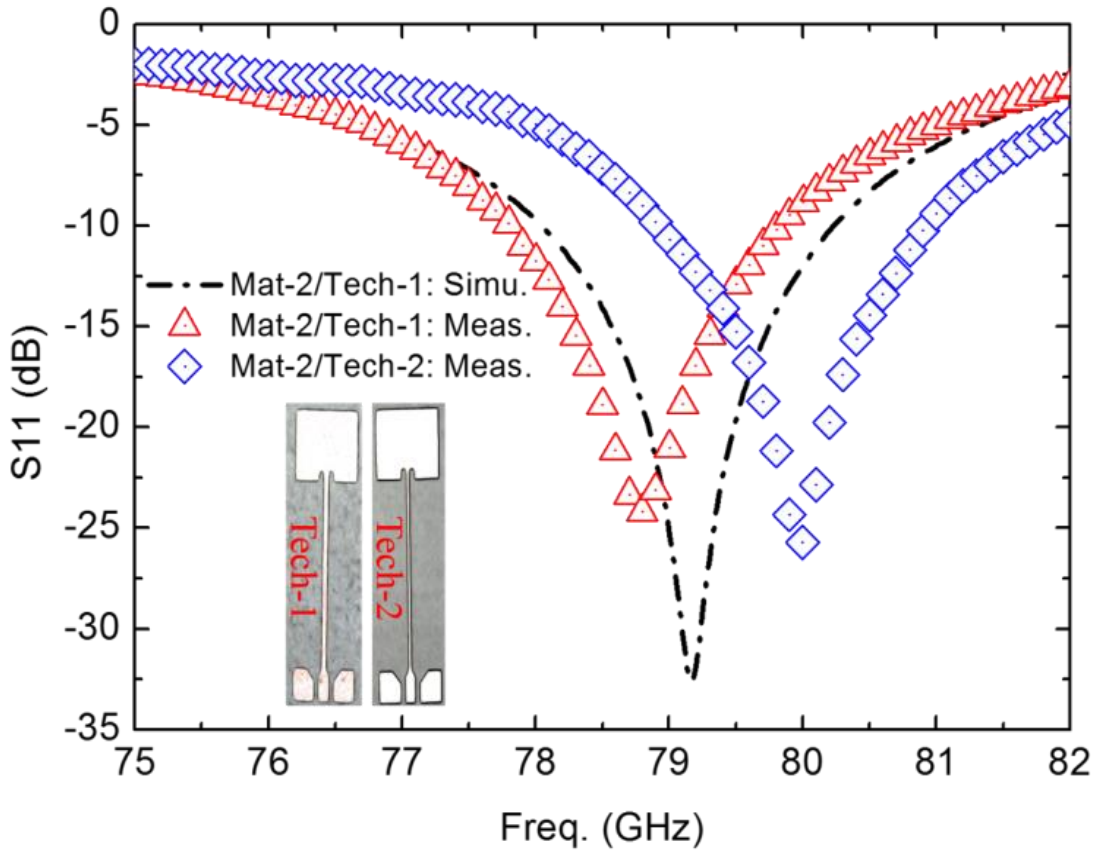
S21 of ring resonators

show an acceptable increase



(courtesy of Robert Bosch GmbH)

INFLUENCE OF PCB TECHNOLOGY ON S11



(courtesy of Nanjing Chuhang Technology)

NF-30 THERMAL RELIABILITY

NF-30: 288 °C
solder float

before

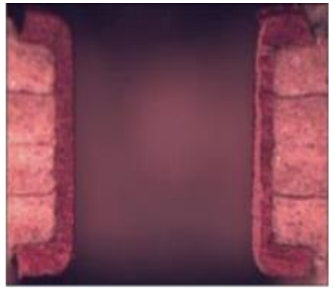
during

after 30 minutes!!

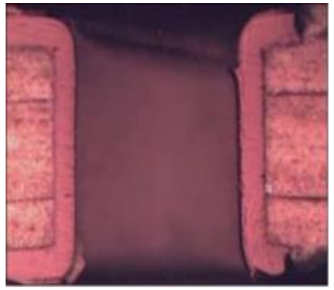
NF-30 EASY CONVERSION TO PCBS

Plated vias in 20 and 60 mil
NF-30
viewed from x and y direction

NF-30 20mil



Fill

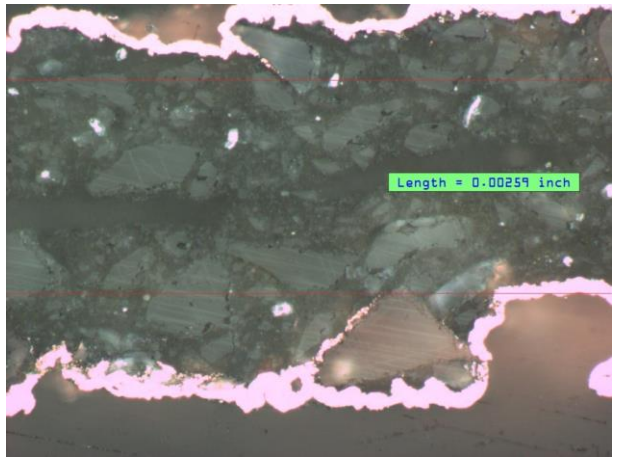


NF-30 60mil

Fill

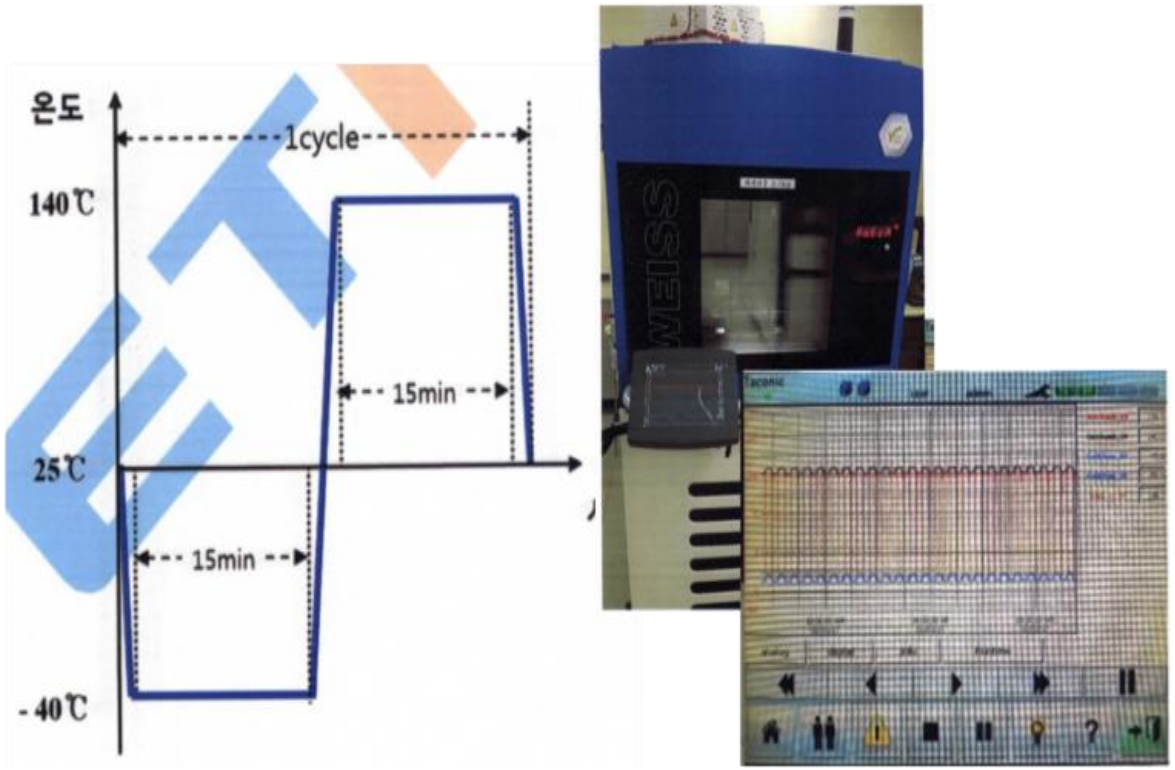
Warp

NF-30 HIGH CHEMICAL RESISTANCE



NF-30 THERMAL RELIABILITY IN MULTILAYER PCB

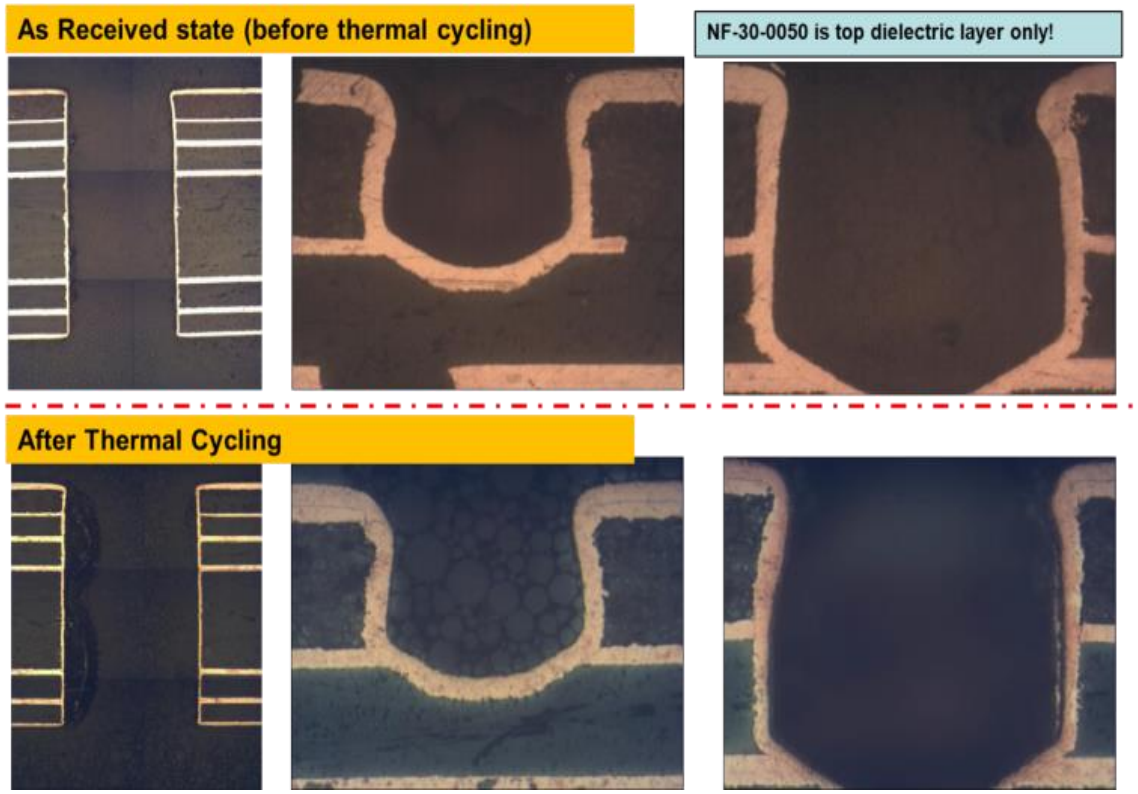
✓ Thermal Cycling test condition
[1000 cycles: -40℃ (15min) → (≤10sec) → 140℃ (15min)]



NF-30 THERMAL RELIABILITY IN MULTILAYER PCB

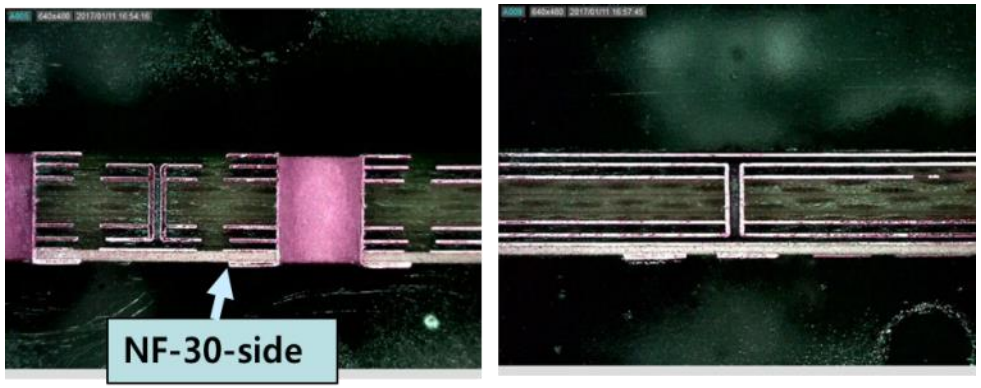
NF-30 hybrid multilayer
before and after thermal cycling

1,000 cycles from -40°C to + 140°C

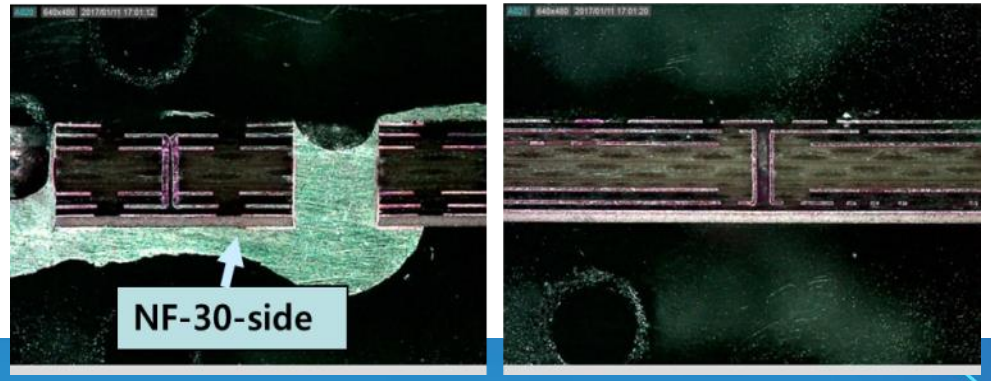


NF-30 THERMAL RELIABILITY IN MULTILAYER PCB

NF-30 hybrid multilayer after 50x solder float (10 s at 288 °C)



Solder Float (@288℃) 10s 50x



NF-30 – THE IDEAL PCB LAMINATE FOR ADAS

- Truly a high reliability RF base material
- Suitable for 77/79 GHz ADAS hybrid multilayer
- The combination of non-reinforced PTFE laminates with Almost No Profile copper foil is the ideal solution
- Provides the supply chain with a safe knowledge of long-term reliability in operation

NF-30 is already in mass production of several 77 GHz ADAS sensors – evidence of all the above said

YOU CAN CONTACT ME AT ANY TIME

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