

## A Point-to-Point Transceiver Module in LTCC Multilayer Technology for 27.5 to 29.5 GHz

a result of



Multifunctional Micro- & MM-Wave Modules  
a German VDI / VDE Project

# Multifunctional Tx/Rx-Module

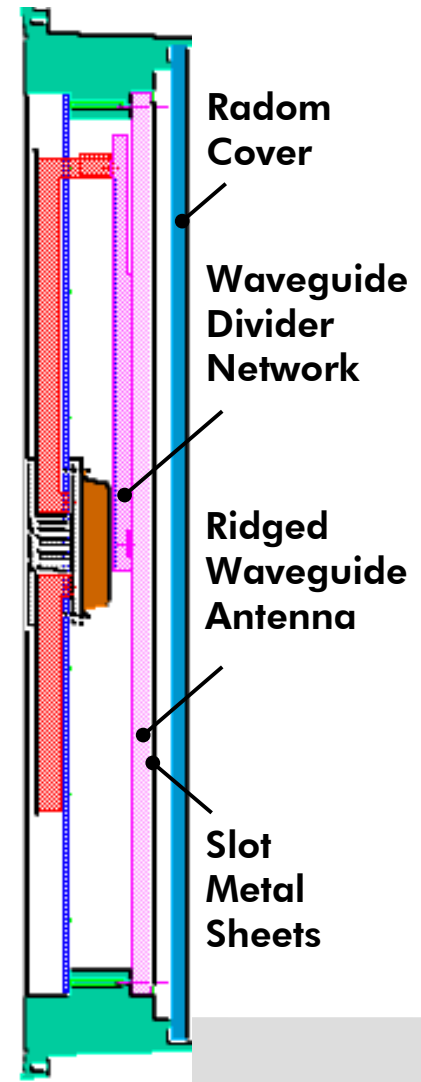
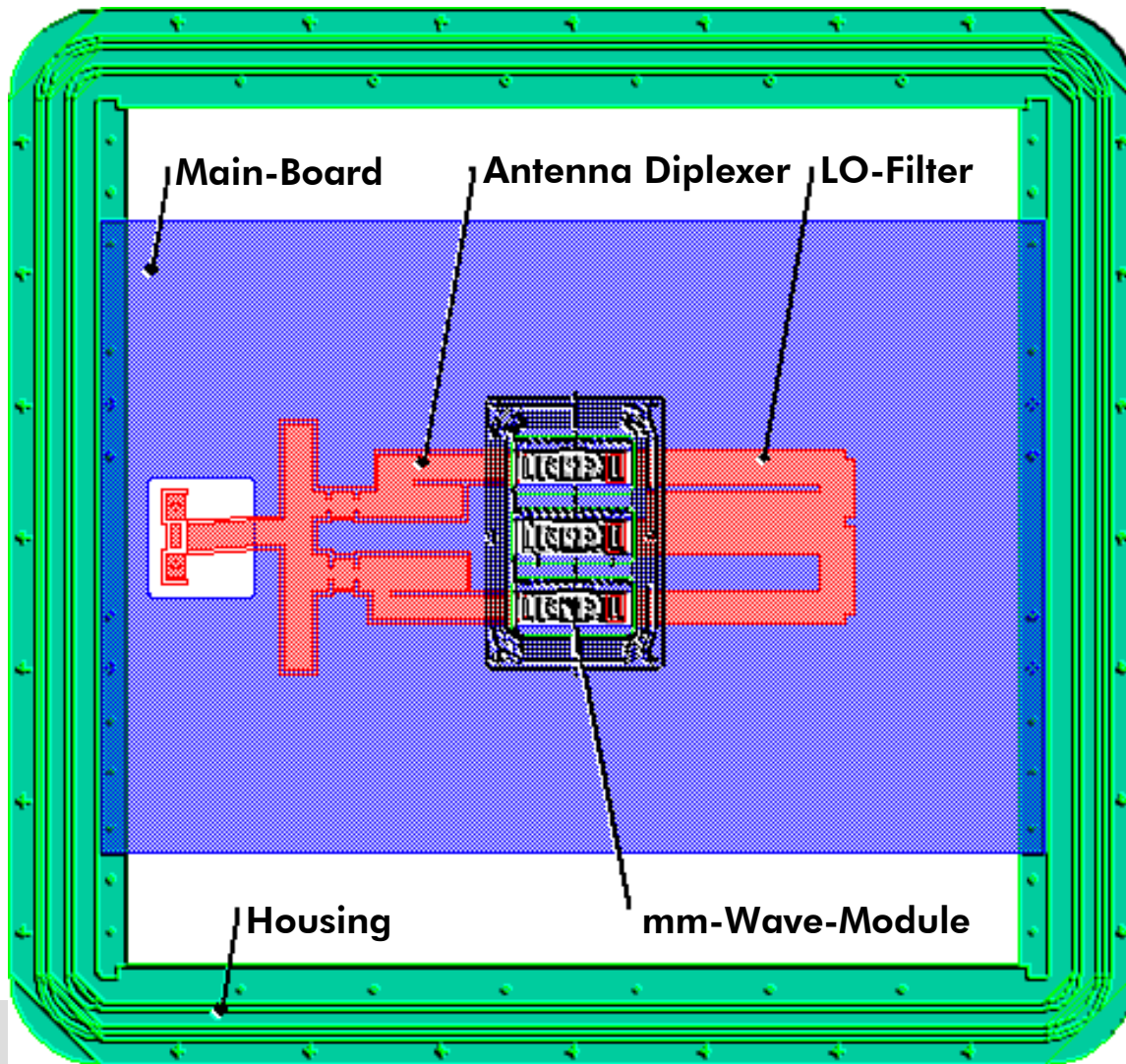


- Advanced Plastic Technology
- 27.5 - 29.5 GHz
- Full Duplex
- Slotted Single Ridged Waveguides
- LTCC Multilayer Circuits



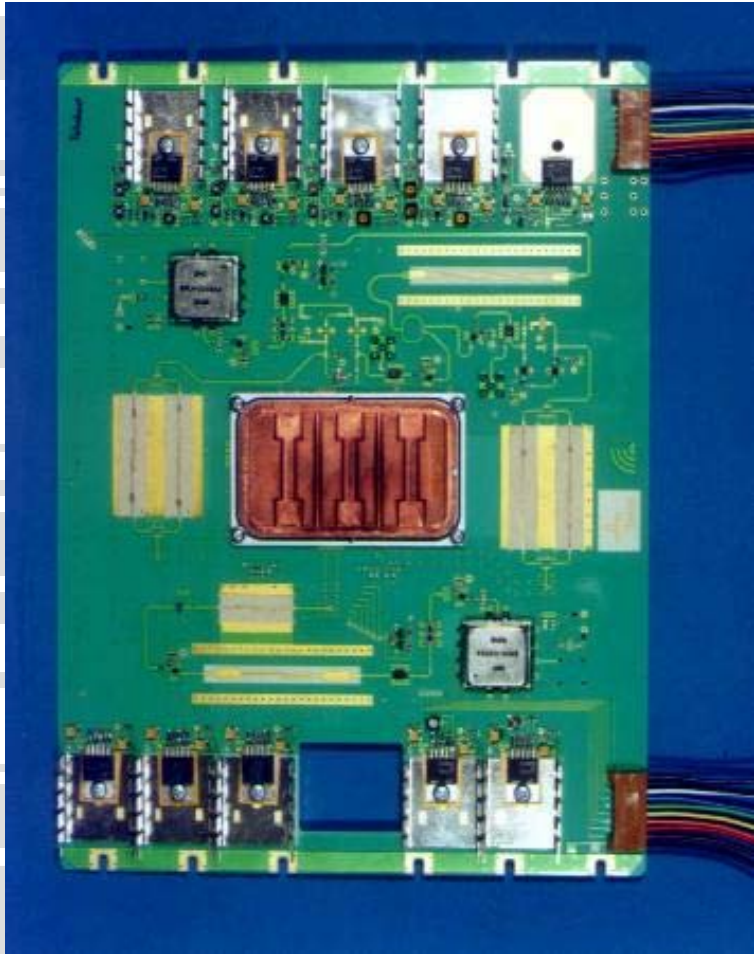
**Multifunctional  
Micro- & MM-Wave Module  
German VDI / VDE Project**

# Module Schematic

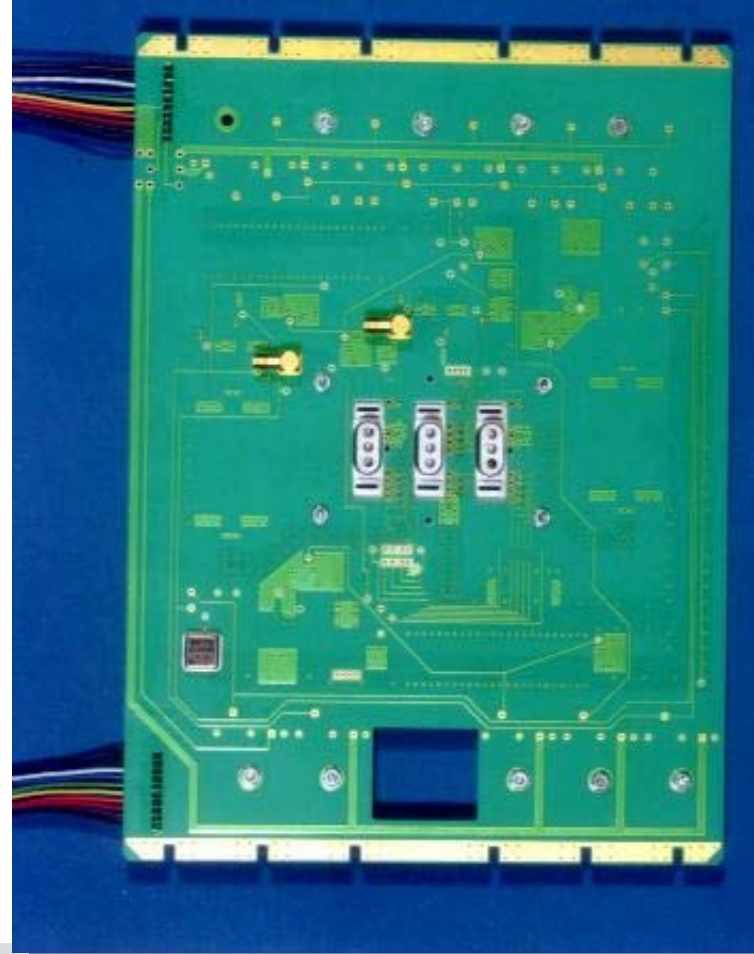


# Main Board

Front View



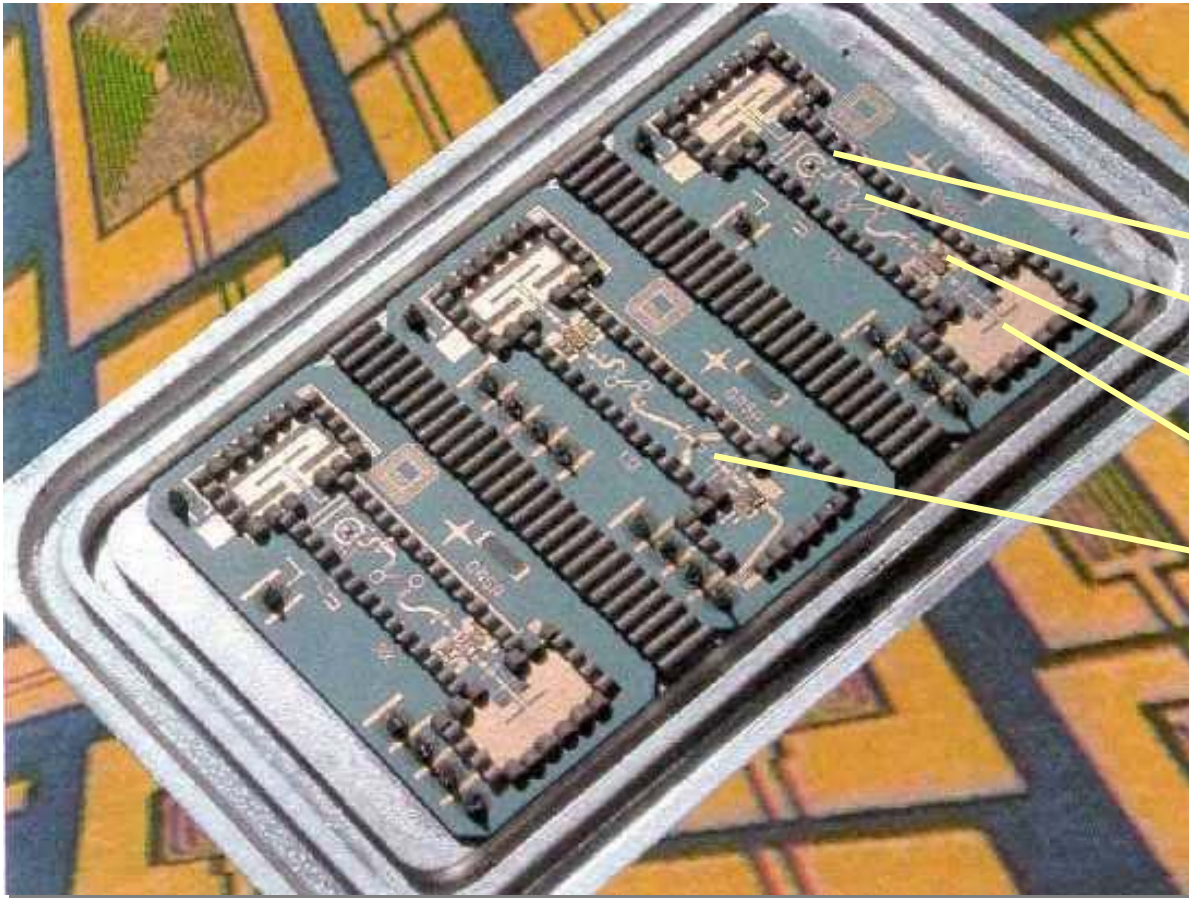
Back View



## Cross Section of Main Board

RO4003: 0.5 mm
RO4403: 0.1 mm
RO4403: 0.1 mm
RO4003: 0.5 mm
RO4403: 0.1 mm
RO4403: 0.1 mm
RO4003: 0.5 mm
PGFN: 0.1 mm
PGFN: 0.1 mm
FR4: 0.1 mm

# Point-to-Point T/R-Modul



27.5 ... 29.5 GHz

Mixer

Filter

Amplifier

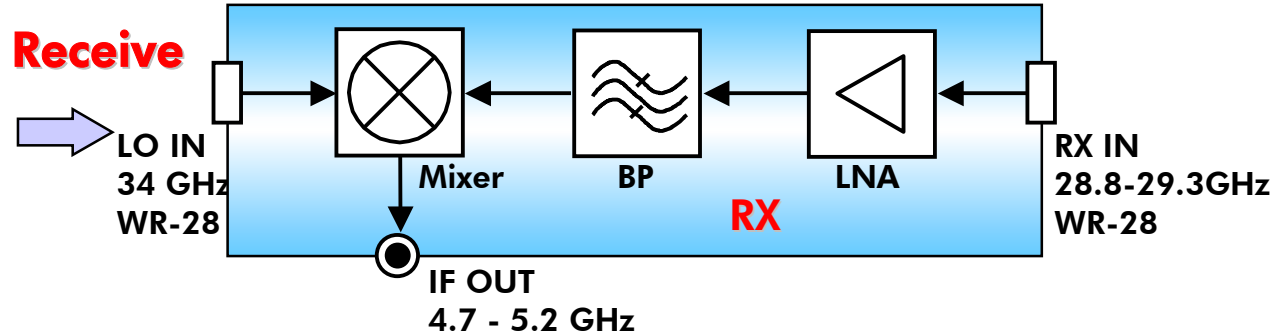
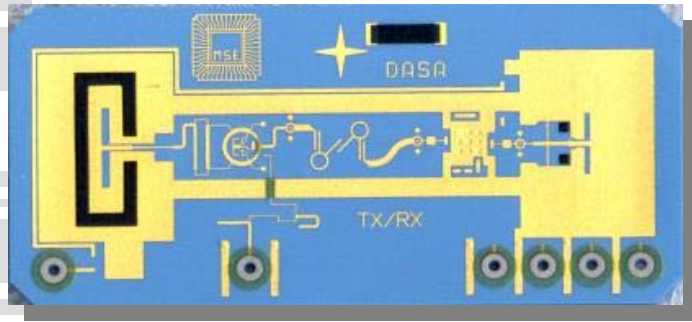
Waveguide

Tripler

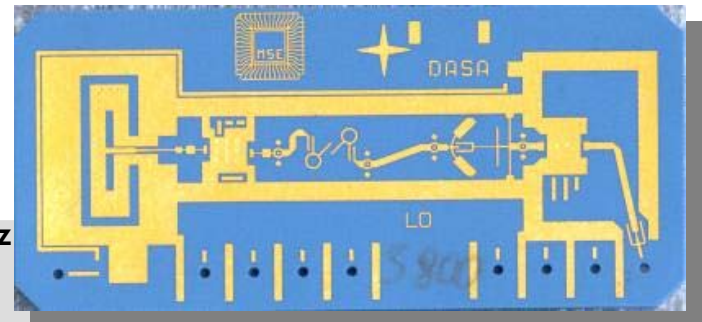
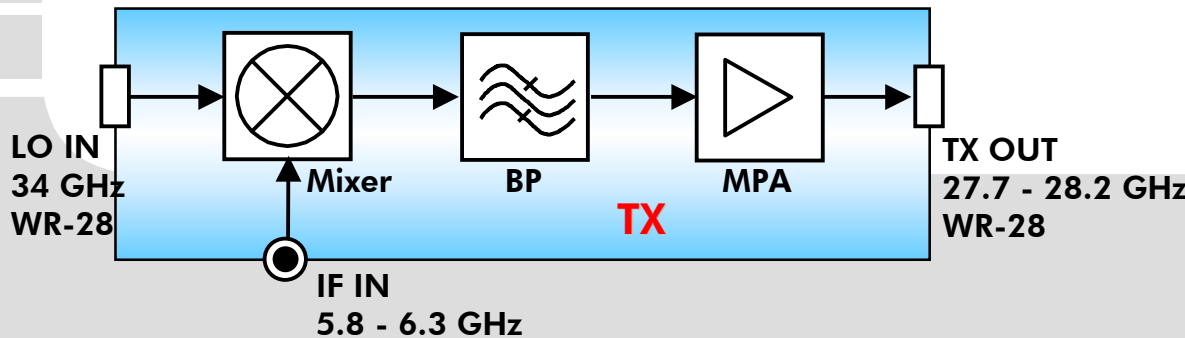
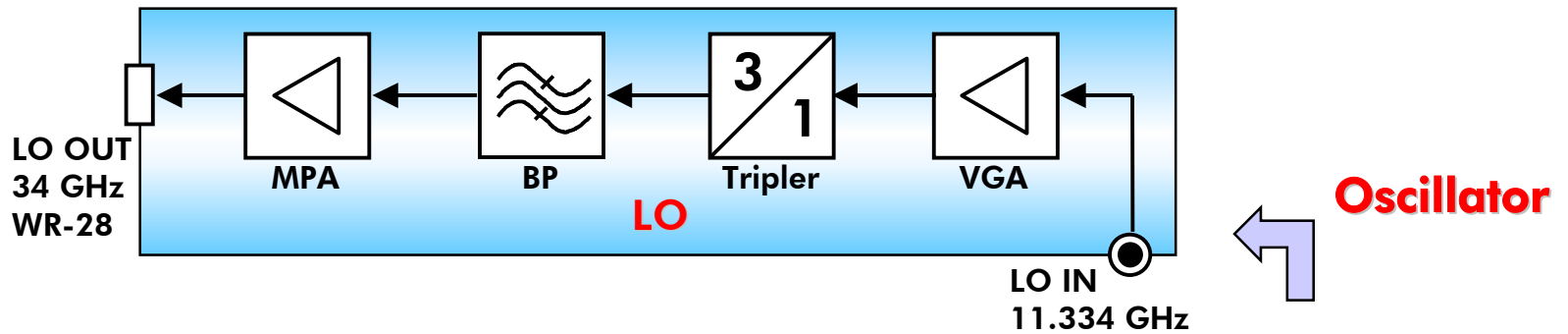
Photo: EADS, Ulm

Material: DuPont 951, Gold  
LTCC Foundry: MSE, Germany

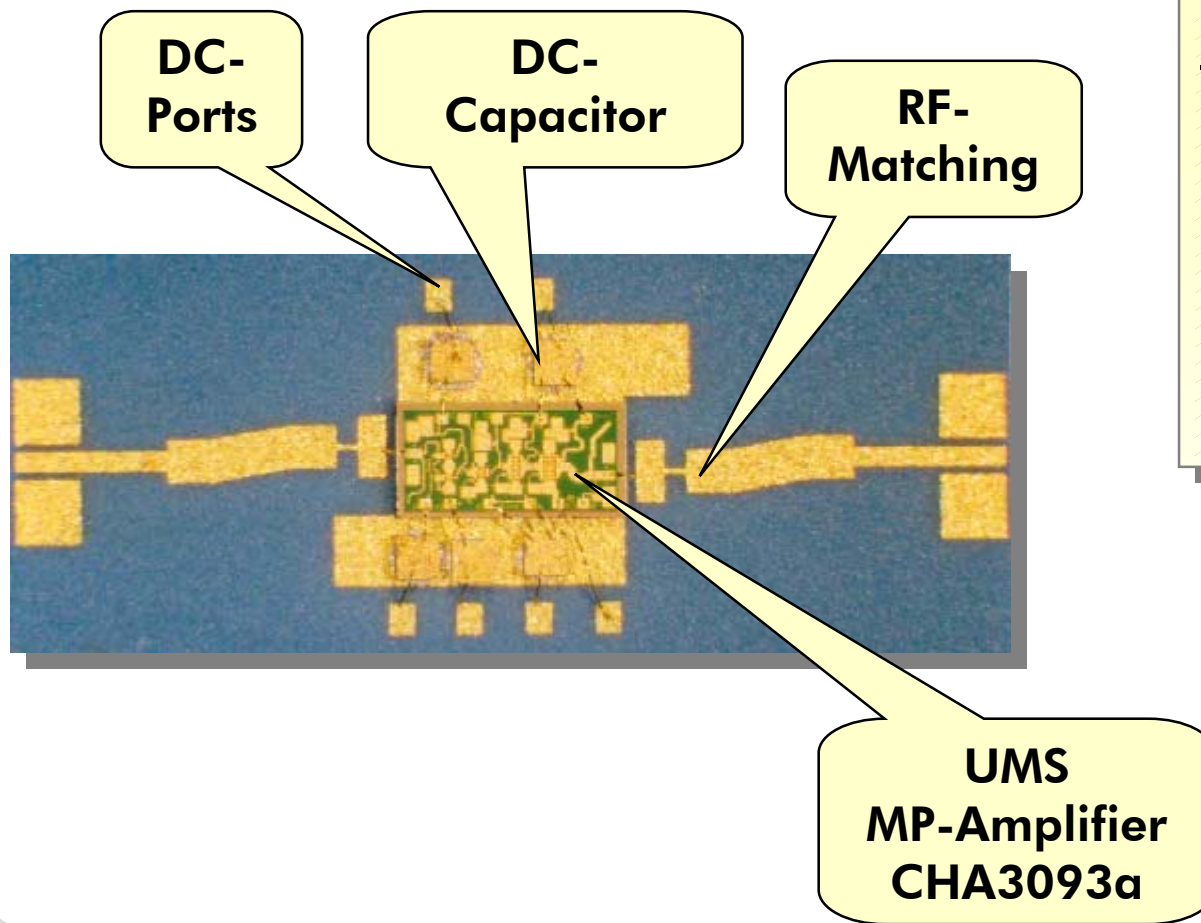
# mm-Wave Module in LTCC



**Transmit**



# Medium PA in MS: 20 ... 40 GHz



## Medium Power Amplifier (20 ... 40 GHz)

SS-Gain = 20 dB

$|S_{11}|$  = -20 dB

$|S_{22}|$  = -10 dB

$P_{\text{OUT-3dB}}$  = 23 dBm

$I_D$  = 300 mA

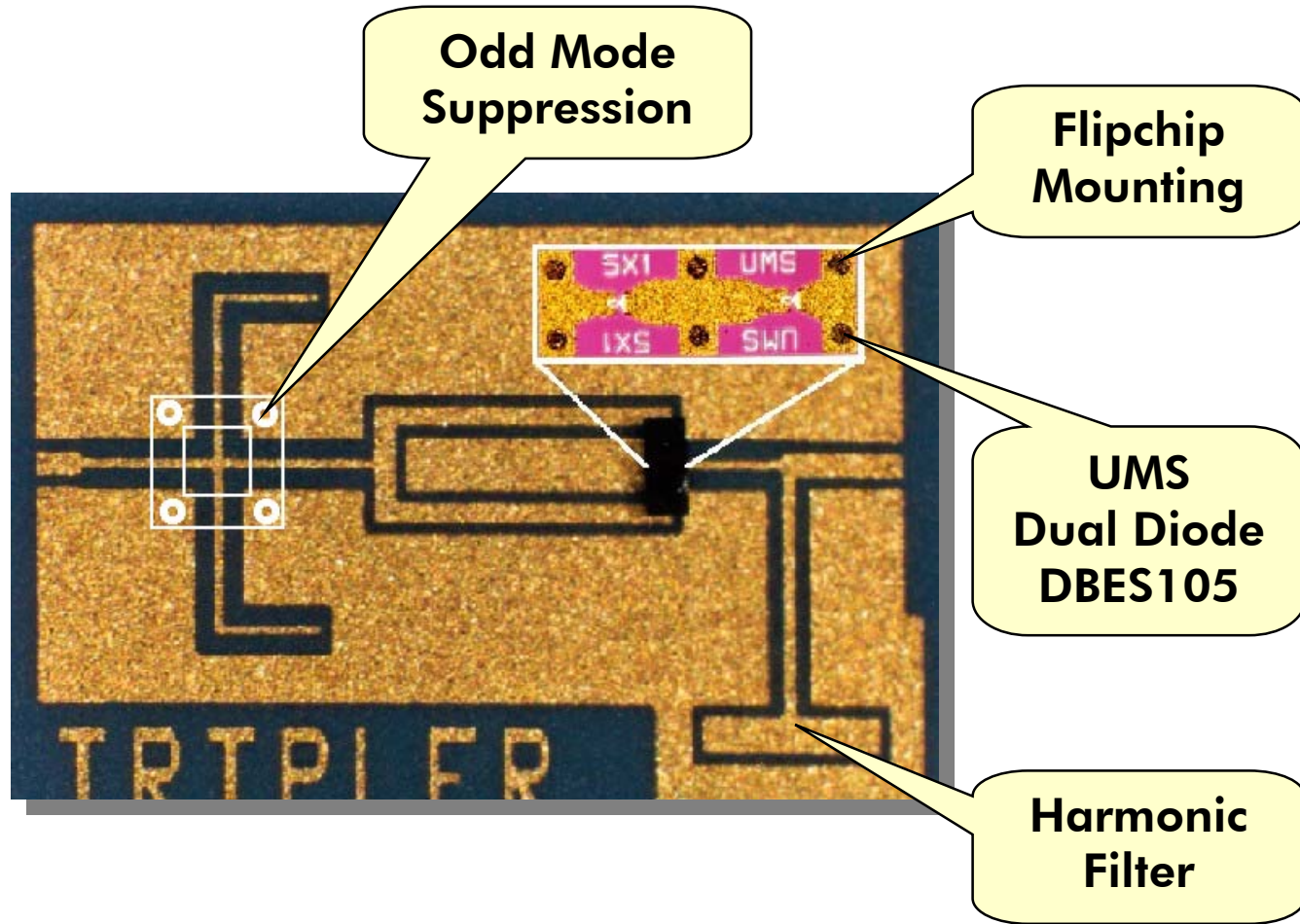
Material DuPont 951, Fodel Au  
LTCC Foundry: Via-Electronic, Germany  
DuPont, Bristol, GB

# Tripler: 11 to 33 GHz

**Times 3 Multiplier**  
**(11 to 33 GHz)**

$P_{IN} = 13 \text{ dBm}$

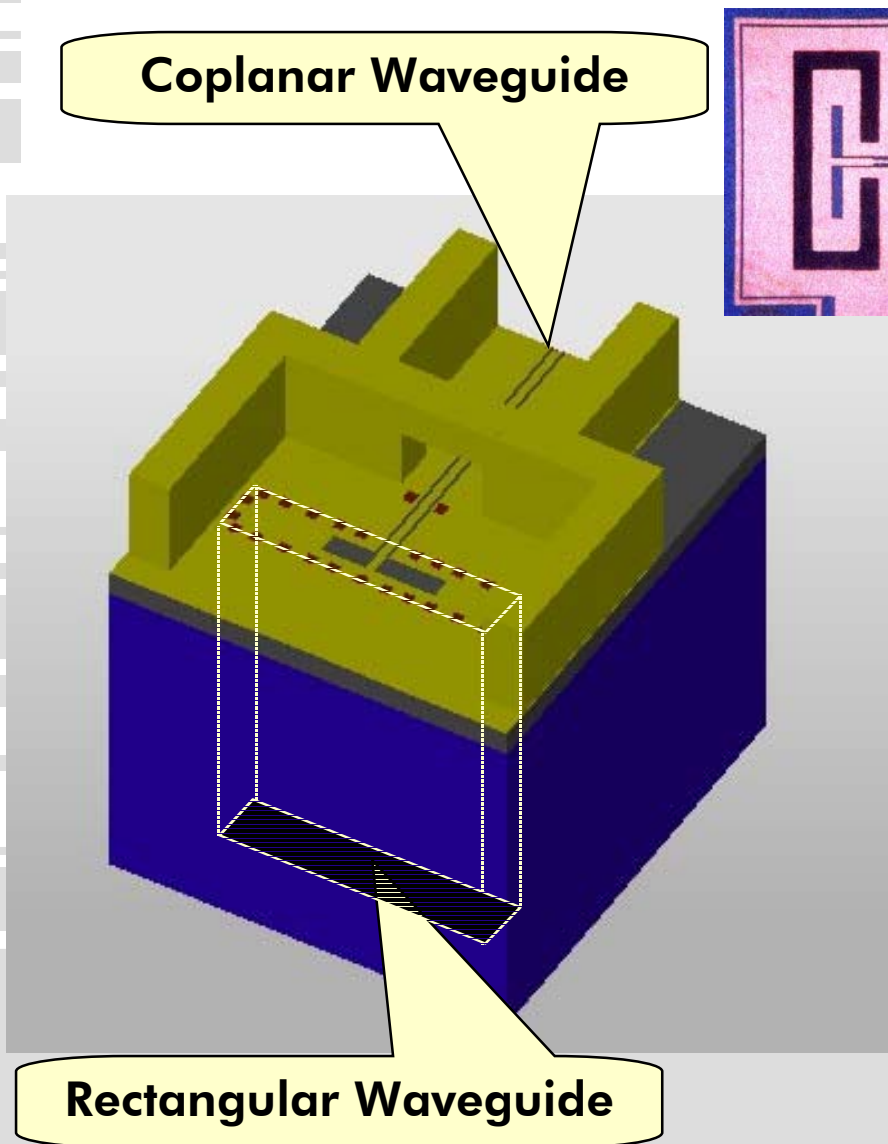
$L_C = 18 \text{ dB}$



Material DuPont 951, Fodel Au  
LTCC Processor: Via-Electronic, GER  
DuPont, Bristol, UK



# LTCC Waveguide Transition



$f_{LO} = 34 \text{ GHz}$

