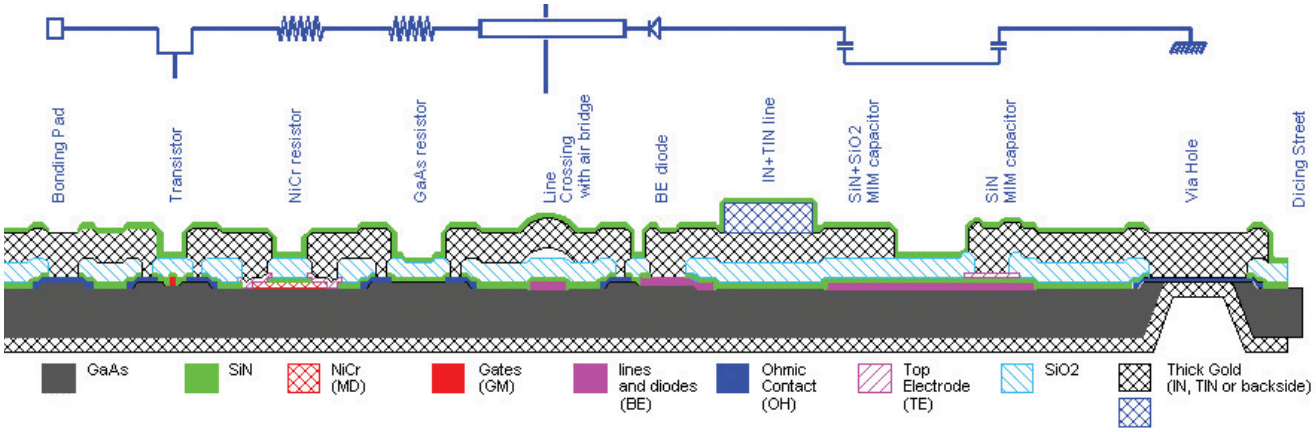
ED02AH: Fabrication Technology



ED02AH process cross section

The ED02AH process was developed specifically for RF applications up to the millimeter wave, and for high rate digital circuits for optical links. It features low noise, medium power and high integration capability including digital control using the Enhancement/Depletion mode transistors. It is included in the ESA European Preferred Part List for space applications, with long term proven mission history in a very large number of satellites. The Technology Readiness Level (TRL from ISO-16290:2013 or ECSS-E-AS-11C) of this process is nine.

E: Enhancement mode transistor

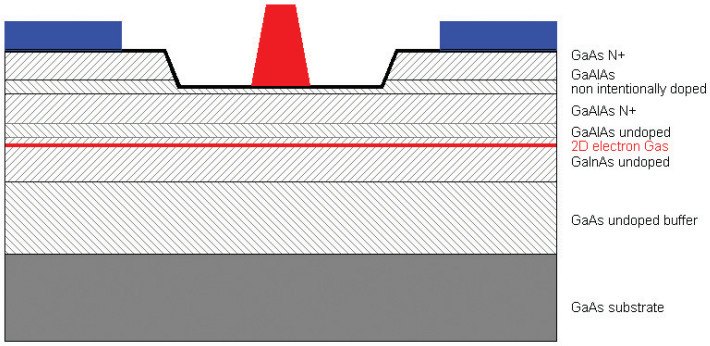
D: Depletion mode transistor

02: "0.2" µm gate length (in fact, 0.18 µm)

A: "A" type process

H: Pseudomorphic HEMT Layer

ACTIVE LAYER



ED02AH active layer profile

FEATURES

- Hetero-epitaxy with a pseudomorphic (GaAlAs)-(GaInAs) active layer
- Depletion and enhancement mode recessed transistors: Vt = 0.225 V or -0.9 V
- 0.2 µm Delta gates
- Two types of diodes (0.18 µm "GM" and 3 µm "BE") for mixing, level shifting, or varactors
- Resistors, using the GaAs active layer, non etched
- Resistors, using the GaAs active layer, etched
- Resistors, using a thin film metal layer (NiCr)
- Full Si_3N_4 protection ensuring high reliability
- Two types of MIM capacitors, using the Si_3N_4 layer and the Si_3N_4 + SiO_2 layer
- SiO_2/Si_3N_4 + air bridge isolation between layers to reduce the parasitic capacitances.
- High yield 1.25 µm thick gold metallisation for interconnections and spiral inductors
- Possibility of 2.5 µm thick lines to reduce series resistances or allow more DC current
- VIA holes through the 100 µm substrate to reduce parasitic inductances to ground

ED02AH: Fabrication Technology (continued)

KEY PROCESS PARAMETERS

Parameter	Description	Value for D-mode	Value for E-mode
Ft	Frequency Cutoff	57 GHz	63 GHz
Gm	Transconductance	440 mS/mm	520 mS/mm
Idss	Drain Source Current	250 mA/mm @ Vgs = 0 V	160 mA/mm @ Vgs = 0.7 V
Vt	Threshold Voltage	-0.75 V	+0.225 V
NF	Minimum Noise Figure	1.2 dB @ 30 GHz	1.2 dB @ 30 GHz
Pout	RF Power Density	400 mW/mm	100 mW/mm
CMIM_SiN	SiN MIM Capacitors	400 pF/mm²	
CMIM_SiO_2	SiO_2 MIM Capacitors	50 pF/mm²	
RKN	Semiconductor Resistor Sheet Resistance	195 Ω²	
RKMD	Metal Resistor Sheet Resistance	40 Ω²	