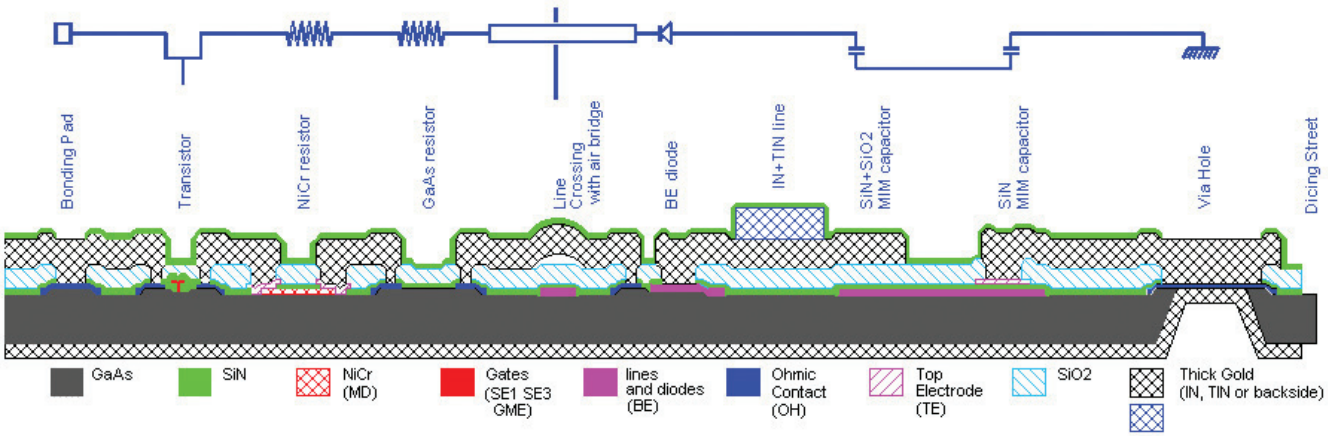
D01PHS: Fabrication Technology



The D01PHS process is a very good multipurpose process for power amplifiers up to 60 GHz, excellent low noise amplifiers with good input power robustness, or multi-function LNA+PA +Switch T/R Chips up to 40 GHz. It is also used for very wide band distributed amplifiers up to 50 GHz. It is included in the ESA European Preferred Part List for space applications, and has proven robustness to Single Event Effect and heavy ions.

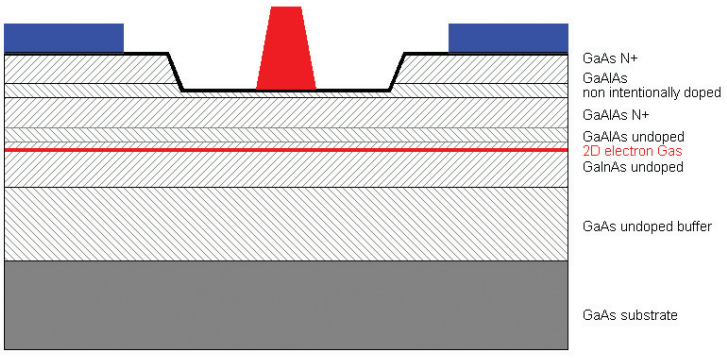
The Technology Readiness Level (TRL from ISO-16290:2013 or ECSS-E-AS-11C) of this process is eight.

D: Depletion mode transistor

01: 0.13 µm gate length

PH: Pseudomorphic Hemt active layer

S: Etch-stop active layer



D01PHS active layer profile

FEATURES

- Hetero-epitaxy with a double channel (GaAlAs)-(GaInAs)-GaAs active layer
- Depletion mode recessed transistors: Vt = -0.85 V
- 130 nm T-gates with gate recess extended towards the drain
- Extremely low contact resistance
- Two types of diodes (130 nm "GM" and 3 µm "BE") for mixing, level shifting, or varactors
- Resistors, using the GaAs active layer, non 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 or 70 µm substrate to reduce parasitic inductances to ground

D01PHS: Fabrication Technology (continued)

KEY PROCESS PARAMETERS

Parameter	Description	Value
Ft	Frequency Cutoff	100 GHz
MSG30	Maximum Stable Gain @ 30 GHz	14.5 dB
Gm	Transconductance	700 mS/mm
IMax	Maximum Drain Source Current (Vgs = +0.7 V)	650 mA/mm
Vt	Threshold Voltage	-0.85 V
NF	Minimum Noise Figure	1 dB @ 30 GHz
Pout	RF Power Density	600 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	100 Ω²
RKMD	Metal Resistor Sheet Resistance	40 Ω²