NAVAL RESEARCH LABORATORY

TECHNOLOGY LICENSING OPPORTUNITY

AlSb/InAs High Electron Mobility Transistors

Advantages/Features

High Speed: Microwave and millimeter wave performance

Low Power Consumption: 3-10x lower than InP or GaAs HEMTs

Manufacturable: Metamorphic growth and process demonstrated on 3 inch GaAs substrates

MMIC compatible: Record low-power MMICs demonstrated at L-, X-, Ka-, and W-band

Reliable: Demonstrated excellent MTTF reliability

Radiation Tolerant: Most radiation-tolerant transistors tested(100x less sensitive than GaAs FETs)

Applications

Space-based, large-scale, active phased-array radar and communications

Imaging/Sensing/Identification

Micro unmanned air vehicles

Wireless and other portable systems

Complementary logic technology

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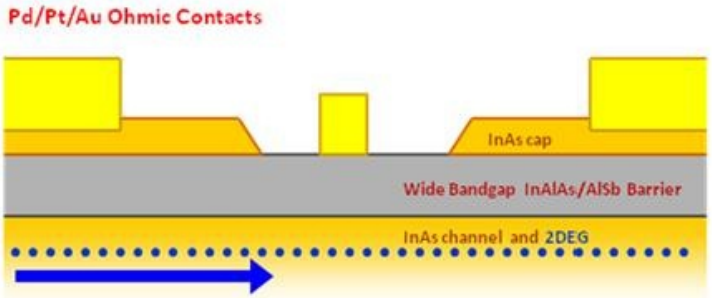
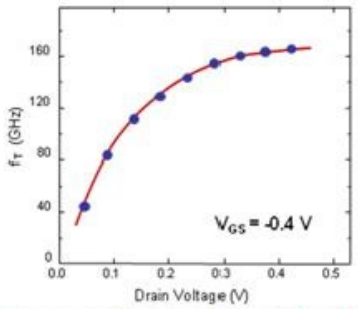
Identification Number:

ELE08





Highest reported f_T for any FET at V_{DS} = 100 mV

The Naval Research Laboratory (NRL) has developed materials growth and fabrication technology for the manufacture of high-speed, low power AlSb/InAs high electron mobility transistors (HEMTs) that exhibit state-of-the-art low-power performance. This technology includes the use of an InAlAs/AlSb barrier layer to reduce gate leakage current and a Pd/Pt/Au ohmic contact metallization, which enables ultra-low contact resistance. There has been extensive effort in the military and commercial sectors to reduce the power consumed by microwave and millimeter-wave low-noise solid-state amplifiers without compromising electrical performance. Low power consumption is essential to prolong battery life and to achieve high performance in a small package. Examples of platforms where size and/or weight matter include autonomous sensors, unmanned air vehicles, satellites, and man-portable systems. The NRL HEMTs exhibit excellent high speed performance at ultra-low drain voltages (100-200 mV) and an order of magnitude less power consumption than HEMTs based on competitive semiconductor material systems. An S-band, two-stage amplifier with 20 dB of gain dissipates a total power of only 365 µW, which is the lowest power dissipation of any microwave amplifier reported.

References

"Antimonide-based compound semiconductors for electronic devices: A review," Solid State Electronics, 49 (2005) 1875-1895.

"Materials growth for InAs high electron mobility transistors and circuits," Journal of Vacuum Science and Technology B, 22 (2004) 688-694.

Available for License: US Patent Nos. 5,798,540; 6,316,124; 6,448,648; and 7,388,235