課題番号	:F-13-IT-0006
利用形態	:共同研究
利用課題名（日本語）	:量子井戸 MOSFETs の DC/RF 特性に対するエピタキシャル構造の効果
Program Title (English)	:Effect of Epitaxial Structure on the DC and RF Performance of InAs Quantum Well MOSFETs
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1. 概要（Summary）

The influence of epitaxial structures on device DC & RF performance was investigated. We found that optimized composite channel thickness and sub-channel indium (In) composition are beneficial to the drive current and the suppression of short channel effects.

2. 実験（Experimental）

The devices with three kinds of InGaAs/InAs/InGaAs composite channel were fabricated following the gate-last process with 5-nm Al_2O_3 and fine gate exposures by e-beam lithography (JBX-6300 at Tokyo Tech).

3. 結果と考察（Results and Discussion）

The device with thin InAs and InGaAs layers as well as inverted modulation doping exhibits both good DC & RF performance at low V_D bias of 0.5 V (I_D of 505 μA/μm, peak g_m of 412μS/μm, SS of 312 mV/decade,; extrinsic f_T and f_{max} of 70 and 82 GHz, respectively). The improvement was attributed to the reduction in parasitic resistance and the increase in gate capacitance.

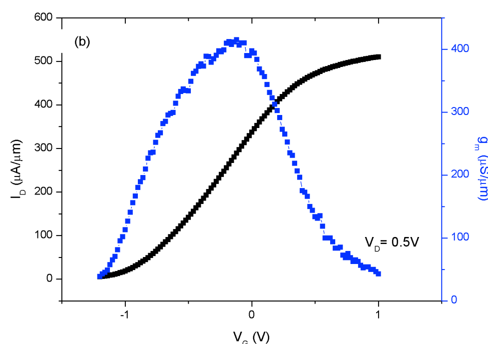

Fig. 1 Transfer characteristics of ITC QW-MOSFET.

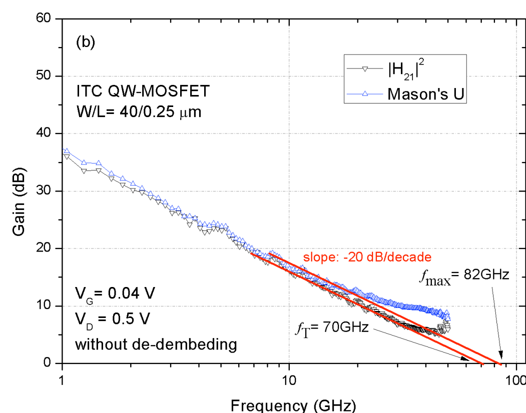

Fig. 2 Microwave characteristics of ITC QW-MOSFET.

The results indicate that the ITC QW-MOSFET is suitable for emerging sub-10-nm low-power and high-performance logic and microwave applications. The improvement in device performance is attributable to the use of a thin InP layer, a thin InAs composite channel, and an inverted type modulation doping.

4. その他・特記事項（Others）

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5. 論文・学会発表（Publication/Presentation）

None

6. 関連特許（Patent）

None