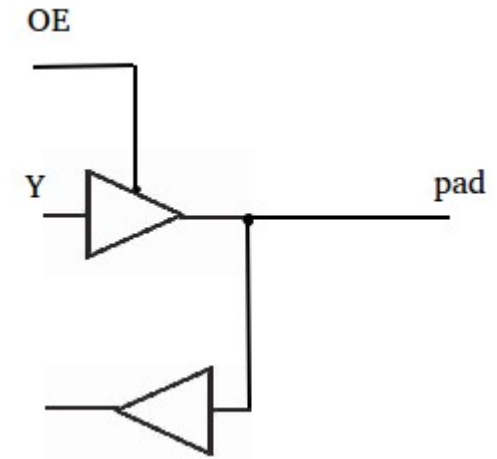
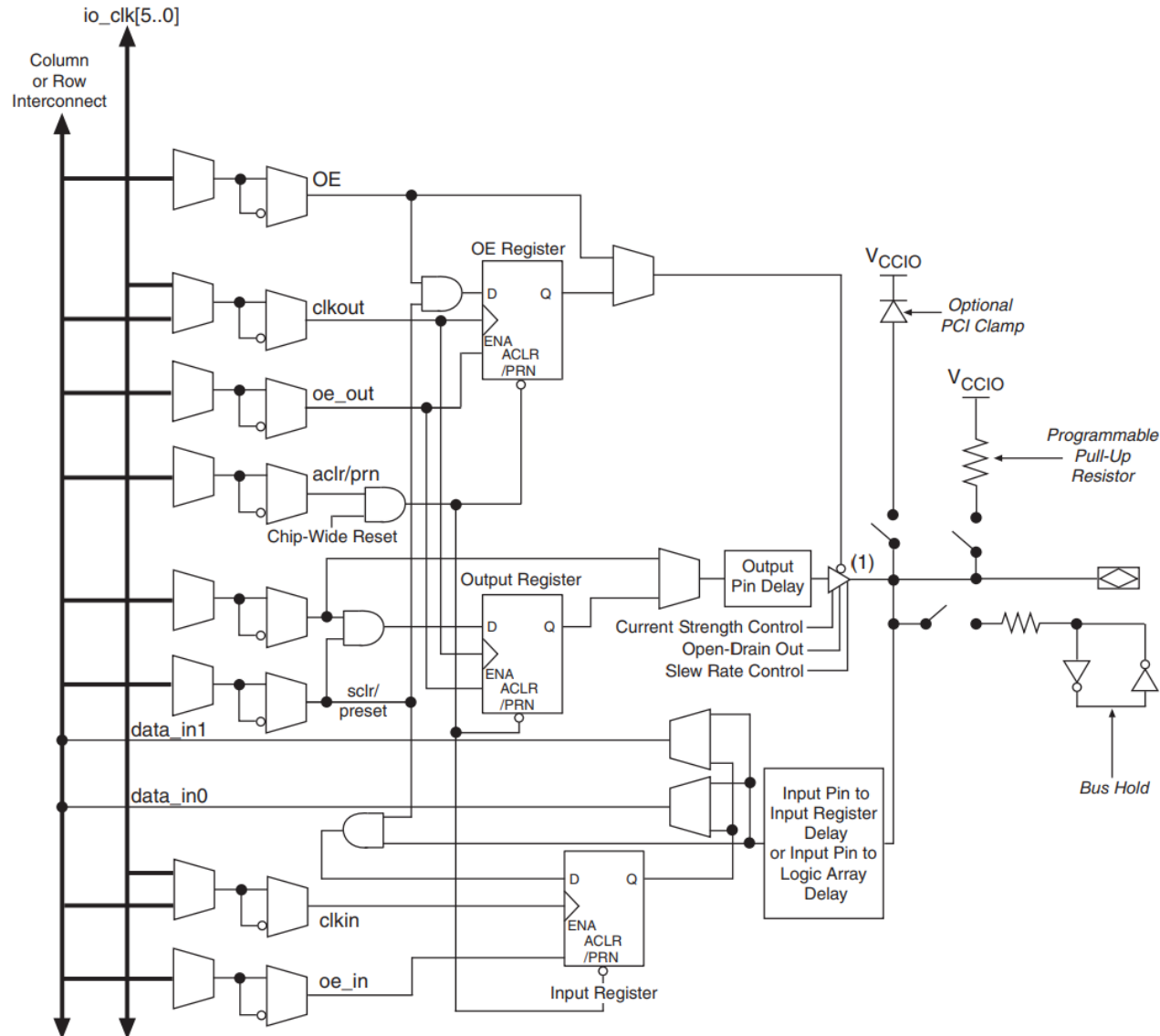
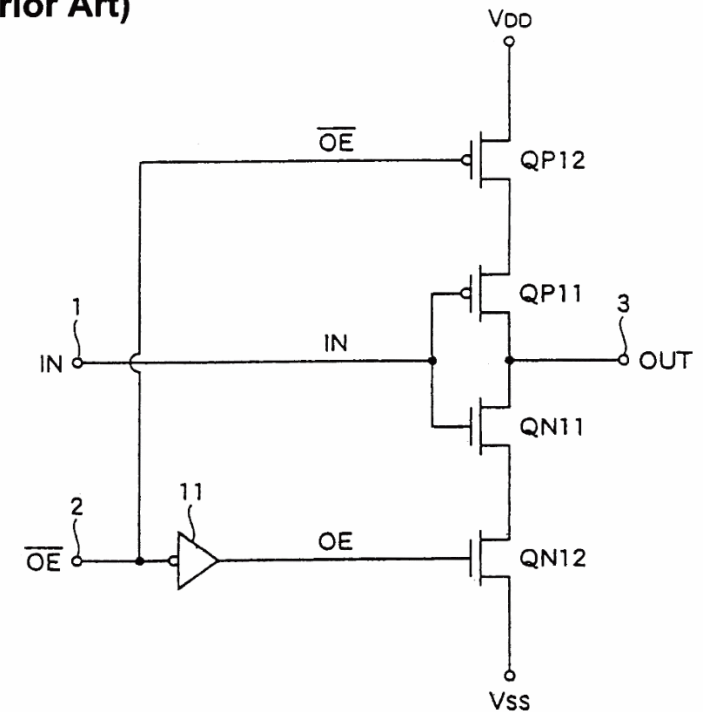


GPIO, Quartus, JTAG,

# Cyclone IV GPIO

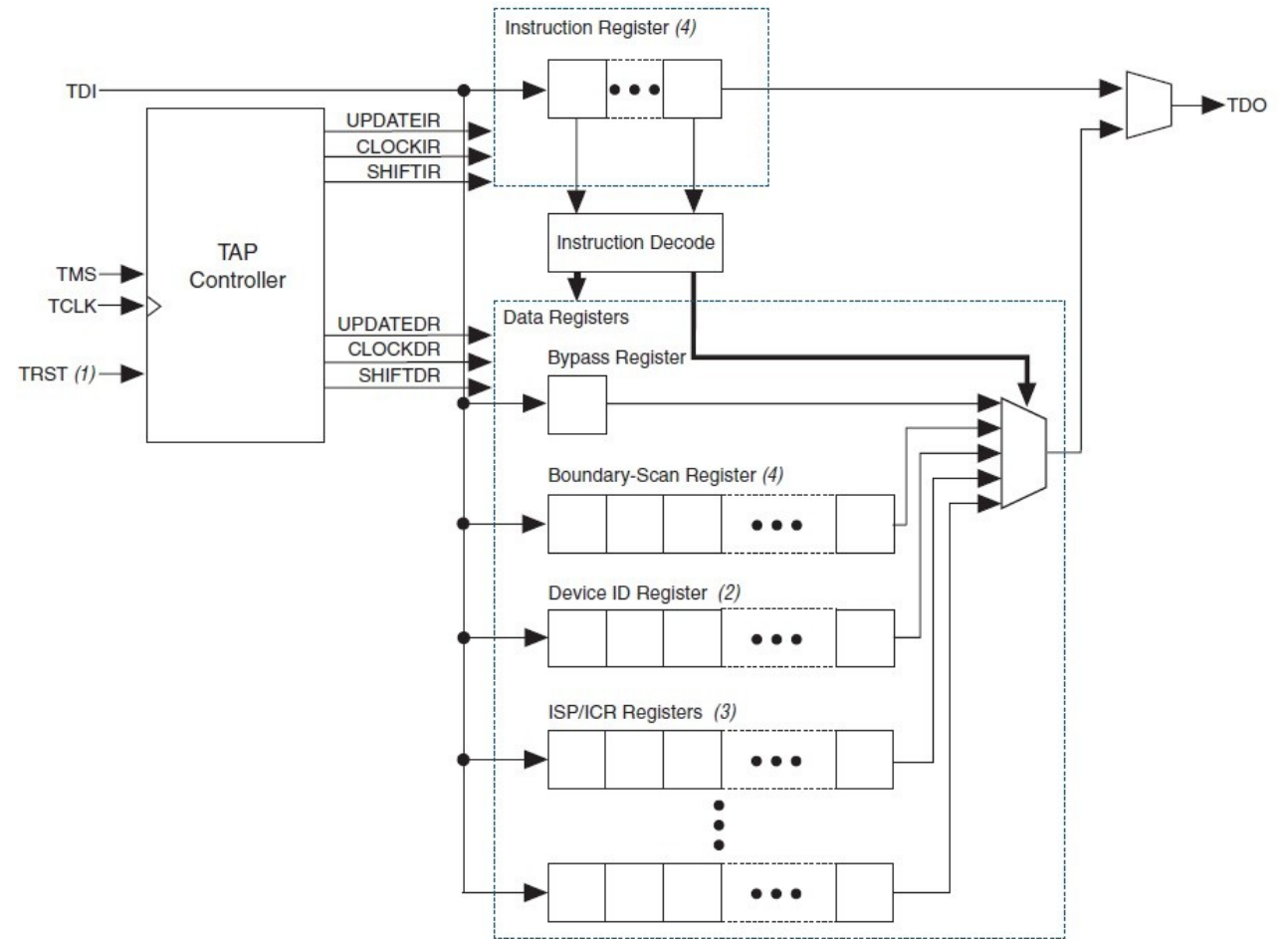


**Fig. 4**  
(Prior Art)

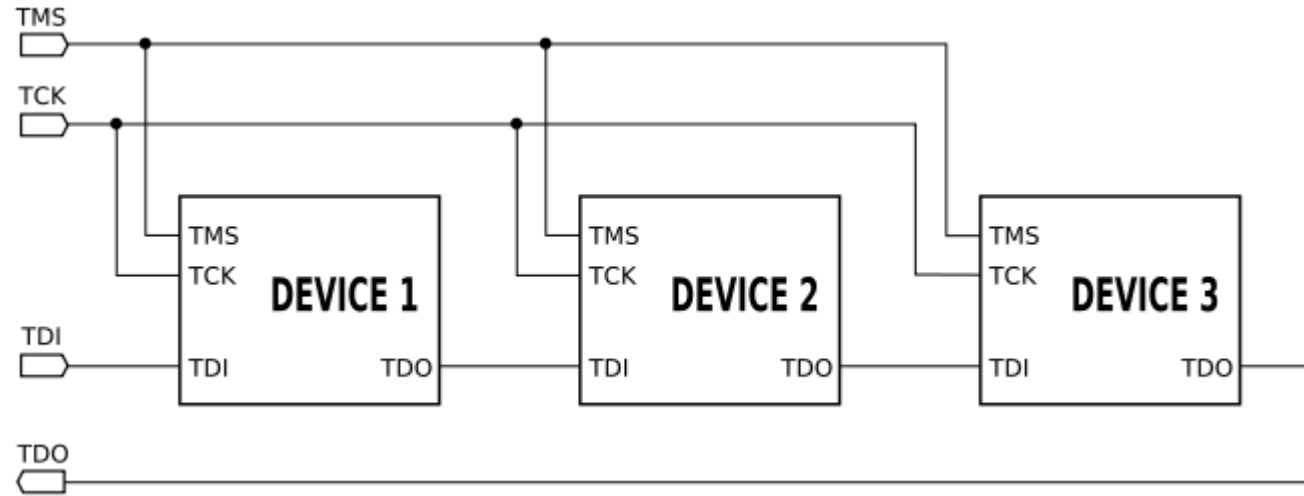


# JTAG

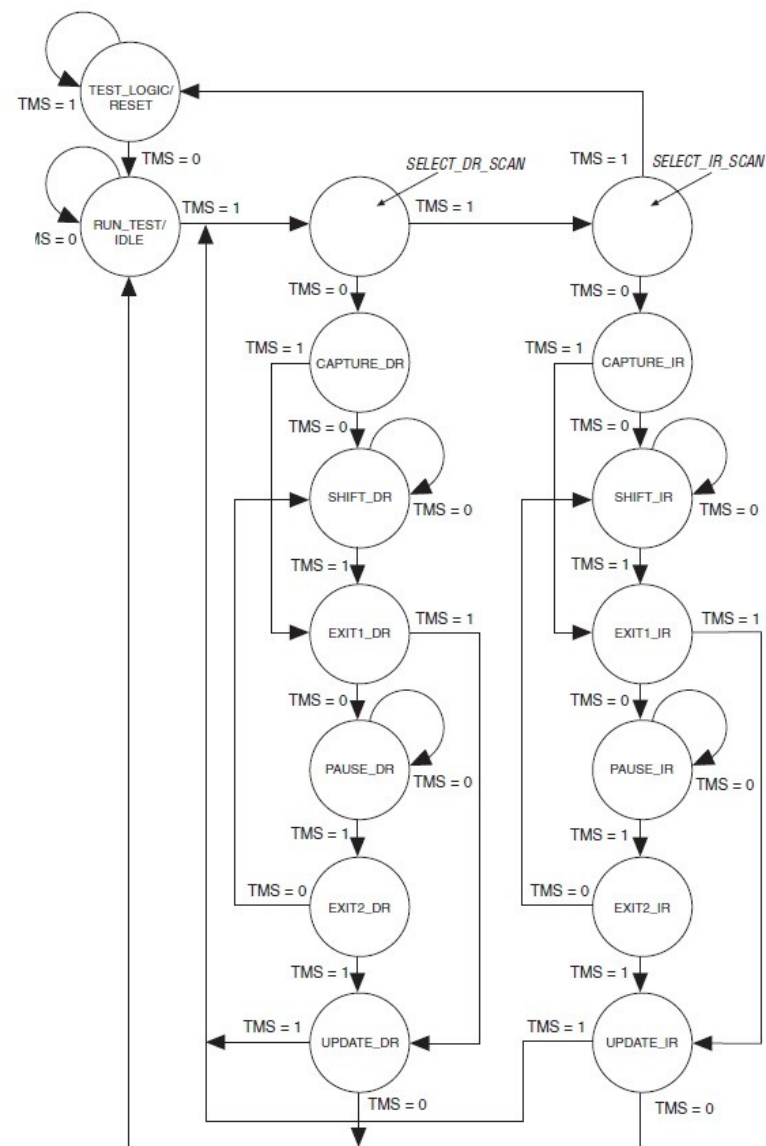
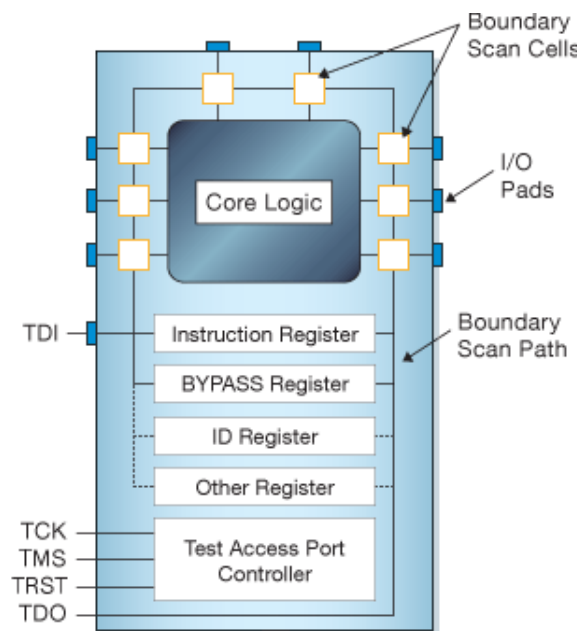
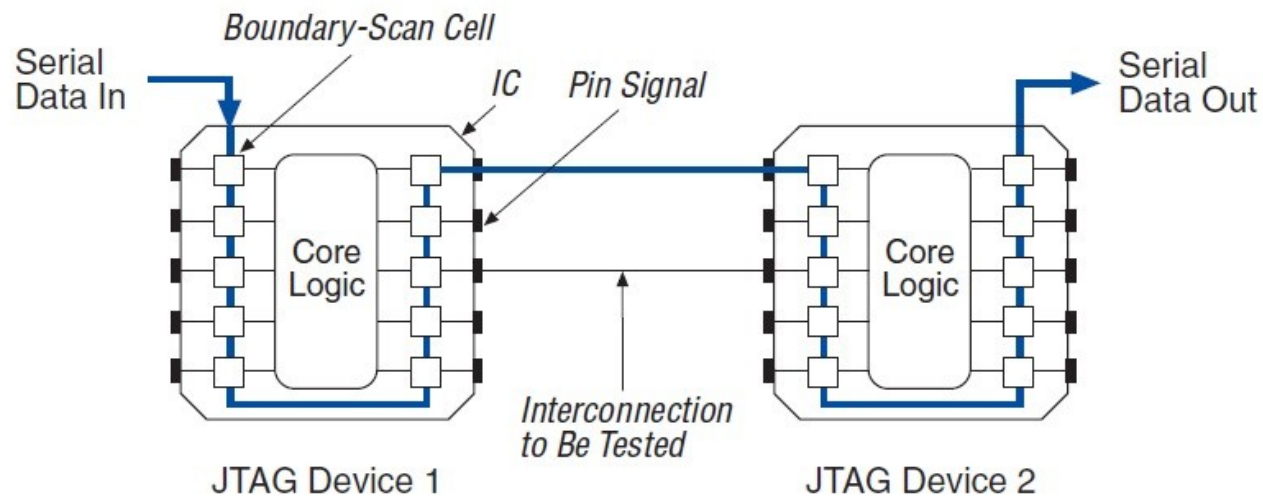
- JTAG – join test action group
- IEEE 1149.1
- Граничное тестирование
- Регистр данных и регистр инструкций



# JTAG chain



# JTAG



# Mandatory instructions

- EXTEST
- SAMPLE\_PRELOAD
- BYPASS
- IDCODE

