

Aspects of nano-manufacturing

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Three areas of research related to the low-cost manufacture of nanoscale device elements are described.

- (1) We have succeeded in achieving a high level of wafer-scale uniformity and inter-wafer reproducibility of current-voltage characteristics from single-barrier tunnel devices for microwave detection. This will permit high-volume, low-cost, pick-and-place manufacture of discrete devices for hybrid circulators for millimetre-wave electronics.
- (2) We have made 16×16 arrays of split-gate transistors (quantum point contacts) each element of which can be addressed with a total of only 17 leads. The initial results in terms of yield, uniformity and reproducibility are reported, along with an algorithm for zeroing every transistor so that all are simultaneously at the threshold voltage before beginning any experiment. We also suggest a modified design so that all devices can be aligned to have identical transfer characteristics.
- (3) As LEGO® bricks are scaled down in each dimension by a factor of 10^N , where $N = 1-6$, we discuss the issues of one-off fabrication, many-off volume manufacturing, and the ability to use the bricks for making structures and then dismantling them. They form an interesting paradigm for discussing nano-manufacture of products with nanometre-scale dimensions.