

## 3D-MID simplifies toy manufacturing

### Technology innovation – a vertical integration

The advantages of the 3D-MID (Molded Interconnect Device) technology are well known in high volume cellular phones antennas and show market penetration in the automotive industry, watches, medical, consumer electronics, and more. What about the toy industry?

In the toy industry, strategic merchandising relationships, like with Disney's Princess and Frozen properties, are common. Cost competition and the fight for distinctive designs and shelf space are also dominating the toy business. Today, the horizontal expansion with merchandising, diverse toy themes, and new business models has been increasingly in the foreground. Despite such innovations, the **actual electrification** of toys is still realized in a very traditional way: **one or more simple printed circuit boards, a lot of wires, soldering points, glued-on components, screws, and complex tools for the plastic injection molding process. The result of using yesterday's approach means lots of handwork in the assembly stage of the toys, significant quality costs due to the variety of production steps, and -- it's important to note -- high expenses in logistics.** A true total cost analysis confirms the sum of expenses. Tie in seasonal challenges in the ramp-up of the production timing. Time-to-market and product launch risks emerge as tier suppliers must hire enough trained labor to be ready with toys for delivery in quantity and quality for Christmas sales.

Why not solve challenges with vertical integration of the production process?

The 3D-MID solution: **Plastic meets electronics!** The electronic circuits and every component including LEDs, motors, and battery holders is **directly** connected to the plastic of your toy. The outward form of the toy remains free for the designer to envision. The limitations of traditional 2-dimensional printed circuit boards are eliminated, as are the assembly steps to fix these PCB somewhere within the toy.

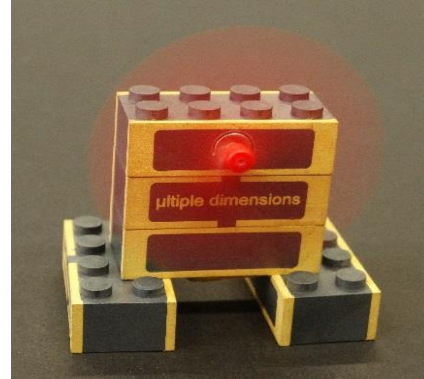
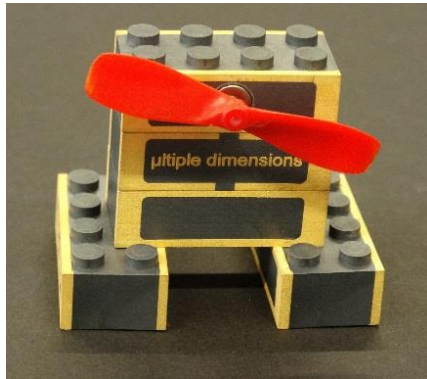


**3D-MID demonstrator:** Left picture shows illumination, mechanical and capacitive touch switches (front view). The right picture illustrates the electronic circuit integrated directly onto the plastic (rear view).

The smart electrification of circuits on plastic gives toy manufacturers advantages to design modules, even compact internal modules, for modularity in different figures, cars, boats, robots etc. to illuminate, to drive, or to control via antenna communication. Easy fixation and labeling are further benefits of 3D-MID technology.

Imagine your toy helicopter rotor turning easily in a more modular and compact direct drive unit; your princess has all communication functions on just one simple MID device within her body and your precision LED control device creatively lights up trains to delight the enthusiast. Multiple Dimensions AG is the leading 3D-MID provider; any form is possible.

Multiple Dimensions recognized that the classic interlocking bricks from well-known OEMs are perfectly suited for electrification with direct structured circuits applied to the plastic. We call these <sup>®</sup>multiplebricks. Current is conducted by snapping 3D-MID bricks together, from the battery brick to the...switch brick...to the propeller brick!



**3D-MID bricks demonstrator:** As simple set up (bottom up): battery brick, switch brick, and propeller brick (no cables).

### Multiple Dimensions AG

The Multiple Dimension AG was founded by four entrepreneurs, each with ~ 30 years or more international industrial experience on all continents and with prior global market success. Multiple Dimensions AG is a high-performance and creative producer and developer of 3D-MID applications. The aim of the founders is to facilitate 3D-MID technology with its benefits to its partners/customers for their customers. In short, to serve the customer with the benefits of miniaturization, cost savings, and spatial optimization. The name "Multiple Dimensions" further reflects the goals of weight savings, freedom in positioning components, novel labeling, and greater design potential -- each of these benefits adds additional dimensions. Our modern production facility is located in Bruegg close to Biel in Switzerland married to a global technology and distribution network. The customer base of Multiple Dimensions AG includes recognized Multi-National-Enterprises (MNEs) in industrial, medical, automotive, instrumentation, communication, and consumer electronics sectors.

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