

## Integrated in-mold electronic components for human-computer interaction systems



### 1. Product Overview

- VMANX IME In-mould electronics technology integration (In-Mold Electronics)
- IMD With capacitive touch sensing, printed on PET film In-mould injection moulding and PEDOT transparent electrode integration, Achieve ultra-thin integrated decorative touch panels.
- Suitable for high-end applications such as home appliances, automotive control centres, industrial control and medical equipment.



### 2. Core structure

Tiers	Materials/Process	Features
Surface layer	Customized PET film	Scratch resistant ( $\geq 3H$ hardness), UV cured coating anti-aging
Graphics Layer	High precision screen printing	Symbol/window light-transmitting design, supporting Pantone color gamut
Circuit Layer	PEDOT transparent conductive ink	Capacitive touch sensing, square resistance $\leq 500\Omega/\square$
Adhesive layer	Optical-grade OCA double-sided adhesive tape	Light transmittance $> 92\%$ , bubble-free adhesion
Base layer	Engineering plastics (PC/ABS/PMMA)	Secondary injection moulding, thickness adjustable from 0.8 to 2.0 mm

### 3. Key Performance Advantages

#### 3.1 Excellent weather resistance

- Passed ISO 4892-2 UV ageing test (1000 hours  $\Delta E < 1.5$ )
- Operating temperature :  $-30^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  (suitable for automotive use)
- Chemical corrosion resistance : Resistant to everyday solvents such as alcohol and cleaning agents.

#### 3.2 Aesthetics and Flexible Design

- Curved surface support : minimum bending radius  $R=15\text{mm}$
- Transparent display area : Transmittance  $\geq 88\%$  (wavelength 450-650 nm)
- Customisation flexibility : Supports 3D shaping, irregular cutting, and hidden LED light guides.

#### 3.3 Touch performance

- Induction type : Selectable self-capacitance/mutual capacitance
- Sensitivity : Finger detection distance  $\leq 5\text{mm}$
- Response time :  $< 15\text{ms}$
- EMC compatible : conform to EN 55032 Class B

#### 3.4 Extremely long service life

- Touch life :  $> 500,000$  Secondary cycle (IEC 61000-4-2)
- Environmental durability : IP54 Protection level (Optional IP67/IP68)

**4. Electrical parameters**

Parameter	Standard value	Test conditions
Operating voltage	3.3V/5VDC±10%	
Quiescent Current	< 10µA	Standby mode
Touch signal-to-noise ratio (SNR)	> 50:1	EMC Interference environment
Dielectric strength	> 15kV/mm	IEC 60243-1

**5. Reliability Verification**

Test Items	Standard Value	Result
High temperature and high humidity storage	85°C/85%RH 1000h	No delamination, normal function
Hot and cold shock (-40°C↔85°C)	500 cycles	ΔR < 5%
Mechanical vibration	10-500Hz 3Axis	No structural damage
Salt spray test	ASTM B117 96h	No corrosion

**6. Design support**

- Rapid Prototyping : 3 weeks to deliver functional samples
- Document Package : Provide DFM reports, 3D STEP files, ECAD interface definitions
- Certification Assistance : CE/FCC/REACH/RoHS full support

**7. Application Scenario**

- Car center console | Medical device UI | Smart Home Appliance Control | Industrial dashboard
- Typical Cases: Curved air conditioner touch panel, In-vehicle HMI integrated system, Waterproof interface of medical devices, Commercial appliances,

**8. Brand Promise**

- **VMANX** IME Passed IATF16949 quality system certification, Provide 5-year product performance guarantee, Support global logistics delivery.

**9. IMD Manufacturing process diagram**

