

Transparent Capacitive Switches: ITO



Description

Transparent Capacitive Switches (TCS) have become common place in many products from hand-held consumer products to appliances and automotive applications.

Multek offers a number of technological choices to match the many challenging requirements of each application:

- ✓ Selectively Printed PEDOT ink.
- ✓ Micro Printed Silver (MPS).
- ✓ Patterned Indium Tin Oxide (ITO) on films

Features: Patterned ITO

Multek offers value-added processes to compliment its Sheldahl™ brand Indium Tin Oxide (ITO) coated polyester film products. This includes the ability to pattern ITO and print ink circuitry which is done in a highly efficient, hands-off roll to roll format.

Typical applications for Multek's patterned and printed ITO film include: projected capacitive touch sensors, flexible displays, and flexible photovoltaic solar cells.

Benefits

- Fine ITO patterned features.
- ITO pattern hiding through index matching.
- Specialty protection films, adhesive, and hard coats available as custom options.

Base Film

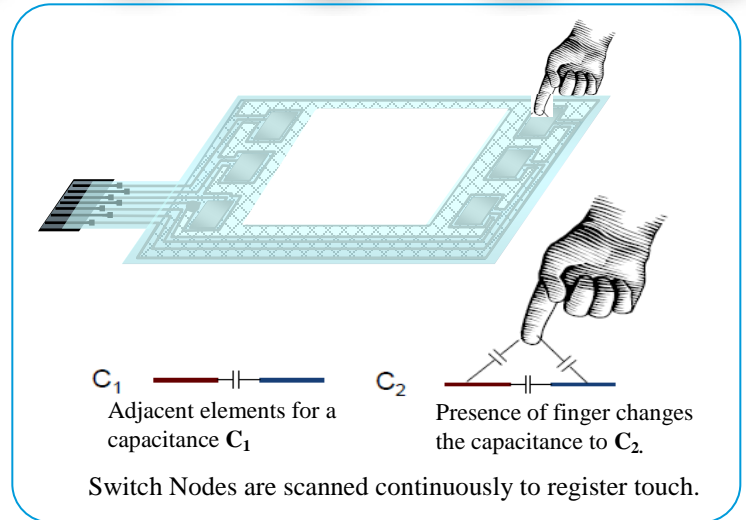
- **Thickness:** 50, 125, 175, & 188µm (2, 5, 7, & 7.5mil) optically clear PET films.
 - **ITO Resistance:** 60, 100, 200, 270*, & 300 Ω □ standard.
 - **Patterned and Printed Widths:** 330mm or 435mm (13" or 17.125").
- (* Index Matched.)

ITO Patterning

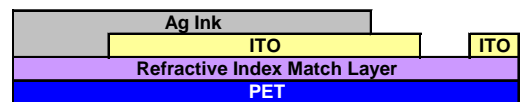
- **Process:** Roll to Roll Photolithography
- **Minimum ITO feature size:** 50µm
- **Max pattern size:** 415mm x 600mm
- **Resistance uniformity:** <±10%

Quality:

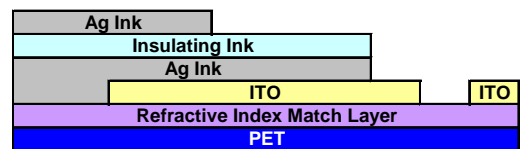
Multek is an industry leader in the coating of flexible films and high volume production of Flexible Circuits for over 50 years. Multek products are manufactured using quality systems that conform to ISO9001 and TS-16949 quality standards. Key product characteristic are tested and monitored in accordance to applicable industry and strict internal standards. Certifications are available with product shipments.



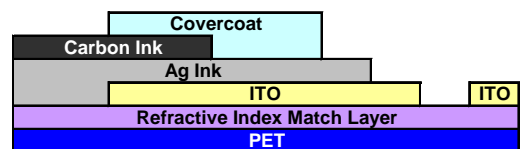
Patterned ITO with one silver ink printing pass



Patterned ITO with two silver ink printing passes separated by UV curable insulating ink (covercoat)



Patterned ITO with silver and carbon inks and a covercoat.



Printed Circuitry

- **Process:** Roll to Roll Screen Printing
- **Inks:** Silver, Carbon, UV curable Mask.
- **Minimum silver trace pitch:** 200µm
- PSA application.
- Lamination of multiple layers.
- Excising of parts.

Each capacitive touch switch application is unique. The optical, mechanical and electrical requirements can vary widely depending on the desired function, style and environment. The following table shows a quick comparison between the three technologies offered by Multek for a variety of applications.

Properties	Test Method	Typical Results		
		PEDOT	MPS	Patterned ITO
Optical:				
Transmittance	ASTM D1003 D1044 HB-4726 Haze-Guard Plus Illuminant CIE-A C-2276, Or Q000842	75-80%	75-90% Tailored by pattern density.	> 84% Based on 300 ohm/sq ITO coating
Haze	ASTM D1003 D1044 HB-4726 Haze-Guard Plus Illuminant CIE-A C-2276 Or Q000842	3% w/ PET Coverfilm 75% w/ Printed Mask	<1% w/ PET Coverfilm <10% w/ Printed Mask	≤ 2.0 Based on 300 ohm/sq ITO
Color Shift (CIE L*, a*, b*)	ULTRASCAN XE Spectrophotometer, Hunter Lab, Illuminant D65 Or Q000842	L* = >85 a* = < -1.0 and ≥ -2.0 b* = < -1.0 and ≥ -2.0 slight blue/green shift	L* = >85 a* = < 0.0 and ≥ -0.2 b* = < +3.0 and ≥ +1.0 slight yellow shift	L* = >92.0 a* = < 3.3 and ≥ 0 b* = ≤ 0.0 and ≥ -1.0
Mechanical:				
Adhesion	IPC-TM-650, 2.4.1.6 Class 1-5 (cross-hatch) Or ASTM D 3359 Method B	< 15% Removal	< 15% Removal	No Removal
Flexibility	180° bend, 4mm mandrel, 10 cycles, Or Q000787	< 10% change in conductivity	< 10% change in conductivity	1000 cycles
Node Feature Resolution	N/A	1mm for PEDOT 0.5 mm spaces between features	50 μm for MPS; 100 μm spaces between features	50 μm for ITO; 35 μm spaces between features
Electrical:				
Surface resistance (initial)	IPC-TM-650, 2.5.17 Or Q000785 (ohms/square)	500	< 6.0	300
Surface resistance (after aging)	1000 hrs at 85°C/85RH	< 2000	< 20	± 10%
Layer count	N/A	Single sided, or Double sided with printed vias	Single sided, or Double sided with printed vias	Single sided, Stackable for multiple layers
Applications:				
Additive PEDOT	Ideal for Self-Capacitance switch nodes with backlighting graphics. Lowest cost option for larger circuits with low node counts. Shielding achieved with double sided design and printed silver vias.			
Micro Printed Silver (MPS)	Ideal for Mutual-Capacitance switch nodes with backlighting graphics. Double sided with printed vias allows routing space for high switch node counts. Shielding also available.			
Patterned ITO	Ideal for Multi-Touch or extremely high node densities. Preferred for applications where maximum clarity is desired. Commonly used with LCD display applications.			

Multek – A Global One-Stop Solution for Flexible Circuits

Multek is the largest volume producer of flexible interconnects in the U.S. with volume manufacturing capability in China and Philippines. Multek offers customers a one-Stop total solution that begins with design concept, and follows through with high volume production and component assembly.