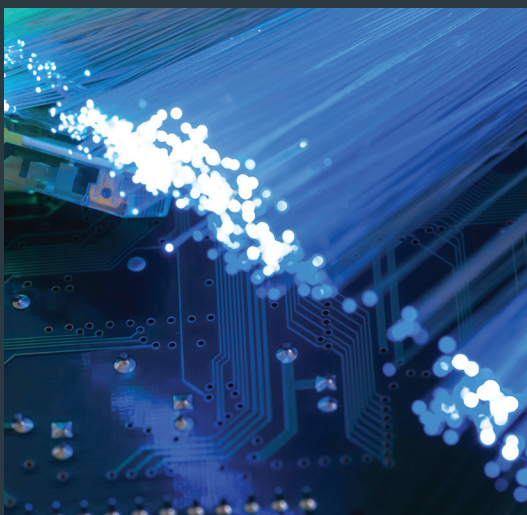
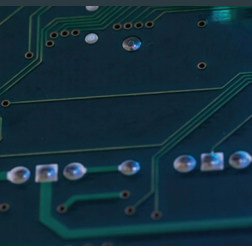
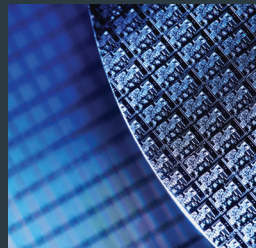


Gel-Pak®

Protecting the World's Valuable Devices



*Elastomers that improve
efficiency, productivity and yield*

MATERIAL TECHNOLOGY

Gel-Pak® carriers and films are made using proprietary elastomers that are customized for a wide range of industries and applications. Our technology library includes our traditional silicone-based products (**Gel**) as well as a variety of alternative non-silicone elastomers (**Vertec™**).



Gel

- High-Purity Silicones
- ESD Silicones
- High Temperature Silicones

Vertec™

- Thermoplastics (TPU/TPE)
- ESD Thermoplastics
- Polyurethanes
- ESD Polyurethanes

Our elastomers are engineered for the stringent demands of customer-specific applications. The highly purified Gel meets strict “space grade” standards. All of our materials are available in either a device carrier or a film sheet/roll format. The optimum elastomer technology for an application is determined by a number of factors including:

- Device Size/Thickness
 - Device Material/Surface Roughness
 - ESD Sensitivity
- Operating Temperature
 - Sensitivity To In-Process Chemistries



Elastomer “Tack” Levels

Over the years, Gel-Pak® has refined its chemistries to provide a wide range of tack levels.

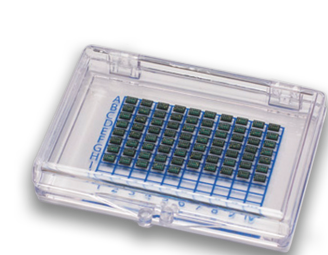
| Gel Tack Levels | | | |
|-----------------|--|--|-------------|
| <div></div> | <div><div></div><div></div><div></div></div> | <div><div></div><div></div><div></div><div></div><div></div></div> | <div></div> |
| ULTRA-LOW | LOW | MEDIUM | HIGH |

| Vertec™ Tack Levels | | | |
|---------------------|-------------|--|-------------|
| | <div></div> | <div><div></div><div></div><div></div></div> | <div></div> |
| ULTRA-LOW | LOW | MEDIUM | HIGH |

*EH, ER, EH07 and FE70 tack levels are static dissipative.

GEL-PAK®

For more than 35 years, Gel-Pak® has been an industry leader in creating innovative device handling and film products for a wide range of unique applications. The Gel-Pak® device carrier products are used to securely hold fragile components in place while the E-Film® products consist of extruded or coated elastomer materials that are customized to satisfy a diverse set of customer requirements.



GEL-PAK® DEVICE CARRIER APPLICATIONS

- Protecting Valuable Devices
- Shipping and Handling Components
- Device Storage
- In-Process Component Handling

GEL-FILM®/E-FILM® APPLICATIONS

- Surface Protection
 - Stretchable Electronics
 - Wearable Medical Devices
 - Wafer Backgrinding and Dicing
 - Inspection and Test
- Disk Drive Lapping
 - Universal Fixturing
 - High Temperature Processing
 - Fingerprint Recognition
 - Graphene Exfoliation

Industries

Gel-Pak® serves thousands of customers worldwide, ranging from Fortune 500 companies to small startups and universities. Key industries and market segments that have come to rely on Gel-Pak® solutions include:

- Semiconductor
- Photonics/Optoelectronics
- Compound Semi
- MEMs
- Medical Device
- Flexible Electronics
- Aerospace

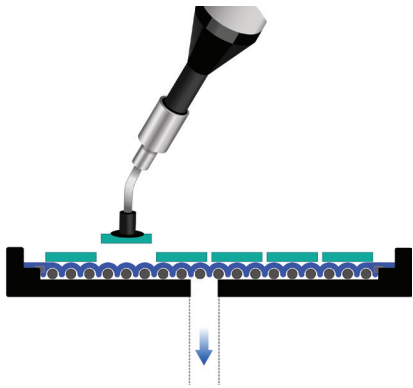


| | Vacuum Release (VR) | Gel-Box/Gel-Tray/Gel-Slide | Membrane Box | Gel-Film/E-Film |
|-----------------------------|---------------------|----------------------------|--------------|-----------------|
| Device Shipping | • | • | • | • |
| Automated Pick & Place | • | | | |
| Device Storage | • | • | • | |
| Wafer Shipping & Handling | • | | | |
| High Temperature Processing | | • | | • |
| Fixturing | • | • | | • |
| Inspection/Test | • | • | | • |
| Lapping/Backgrinding/Dicing | | | | • |
| Scribe & Break Coversheet | | | | • |
| Surface Protection | | | | • |
| Stretchable Electronics | | | | • |

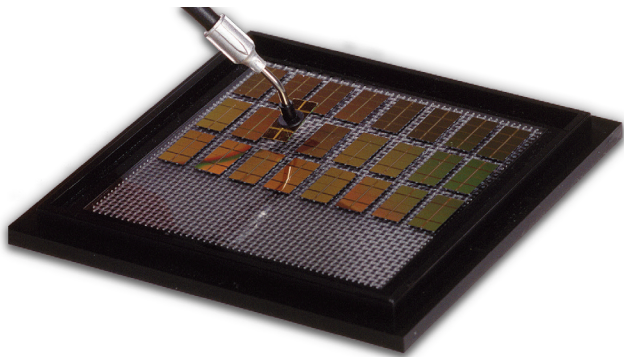
POCKETLESS TRAYS FOR AUTOMATED DEVICE HANDLING

How Does It Work?

Devices are released when vacuum is applied to underside of tray. The elastomer material conforms to the mesh layer beneath it reducing device contact area, allowing the device to easily be removed.



VR Trays™ (2" & 4")



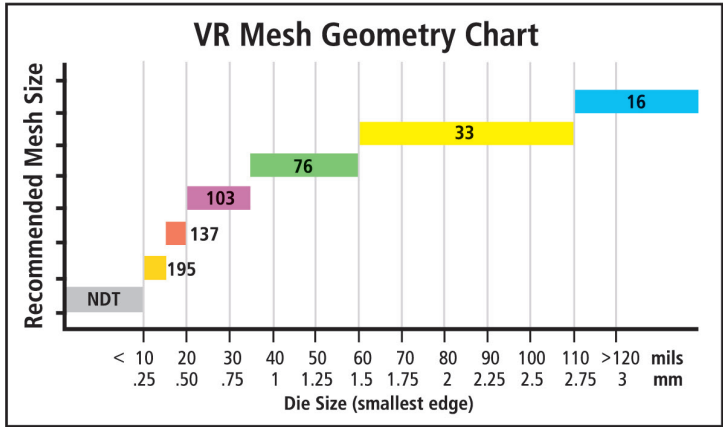
- Designed to handle components < 250µm to 75mm
- Immobilize and protect valuable devices from damage during shipping and handling
- Ideal for high-volume automated device pick & place applications
- Ideal for shipping thin die

CONFIGURATIONS

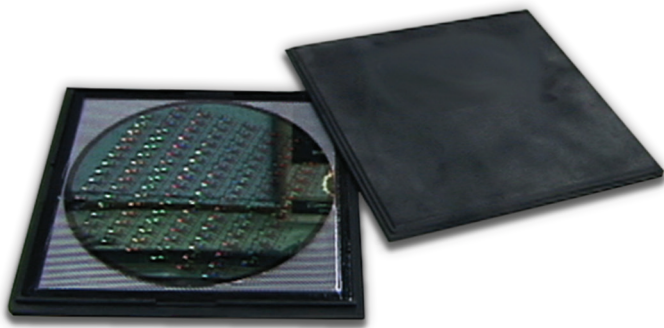
- Wide range of tack levels
- 2" & 4" tray size based on JEDEC standard
- Gel or Vertec™ film membrane
- Black conductive polycarbonate (C), antistatic (AS) and clear polystyrene (T) tray, box and lid
- Available in hinged box (-02) or lid/ clip (-00B)
- Can be customized with print or grid

Choosing the Optimum VR "Mesh" Geometry

Choosing the right VR carrier mesh depends on the X, Y size of your device. To optimize unloading performance, we provide a range of mesh geometries that can handle devices from < 250µm up to 300mm based on the vacuum release technology.



Large Substrate Vacuum Release Plates™



- Designed for handling high-value substrates from 75mm to 300mm
- Ideal for shipping thinned wafers

CONFIGURATIONS

- Wide range of tack levels
- Gel version only
- Plates available in phenolic or transparent acrylic material
- Black conductive (C) or transparent (T) storage boxes available
- Available in single and multi-wafer custom configurations

CARRIERS FOR MANUAL LOADING AND UNLOADING

The traditional Gel-Box™, Gel-Tray®, and Gel-Slide™ products are part of the company's pioneer product offering developed back in 1980. These versatile "pocketless" carriers immobilize devices during shipping, handling and processing.

Ideal for...

- Shipping, handling and storage of components
- Manual loading and unloading with tweezers or by fingers
- Multiple device sizes on same carrier (no pockets)
- Accommodates a wide range of device sizes from small components to large assembled modules

Available in variety of configurations...

- Wide variety of box sizes and material configurations
- Available in standard or static dissipative Gel or Vertec™
- Black conductive polycarbonate (C), transparent (T), and antistatic (AS) boxes
- Can be customized with print or grid



Gel-Box™

- Plastic hinged box coated with Gel or Vertec™
- Standard Gel-Box™ sizes from 1"x1" up to 7"x5"
- Custom sizes available on request or Gel-Pak® can apply elastomer in customer provided boxes



Gel-Tray®

- 2"x 2" plastic tray coated with Gel or Vertec™ inside a plastic hinged box
- Tray can be removed from box for use with holding fixture
- Compatible with device loading process in automated equipment



Gel-Slide™

- 2"x 2" glass slide coated with Gel inside a plastic hinged box
- Ideal for high temperature applications, glass slide can withstand temperatures up to 220°C
- Glass slides are ideal for backside inspection

E-FILM® SHEETS AND ROLLS

Gel-Pak’s E-Film® portfolio is based on a variety of highly engineered Gel and Vertec™ elastomer materials. These films are manufactured in a cleanroom environment and are available in standard (WFV, PFV) constructions and custom roll/sheet formats to meet the needs of existing and emerging applications in the semiconductor, medical and electronics industries.

Gel-Pak’s E-Film® products are customized to meet the needs of a wide variety of applications including:

APPLICATIONS

- Stretchable Electronics
- Wearable Medical Devices
- Surface Protection
- Electronic Displays
- Die Handling
- Wafer Dicing
- Lapping

E-Film® products can be made using a variety of elastomers or material combinations and constructions.

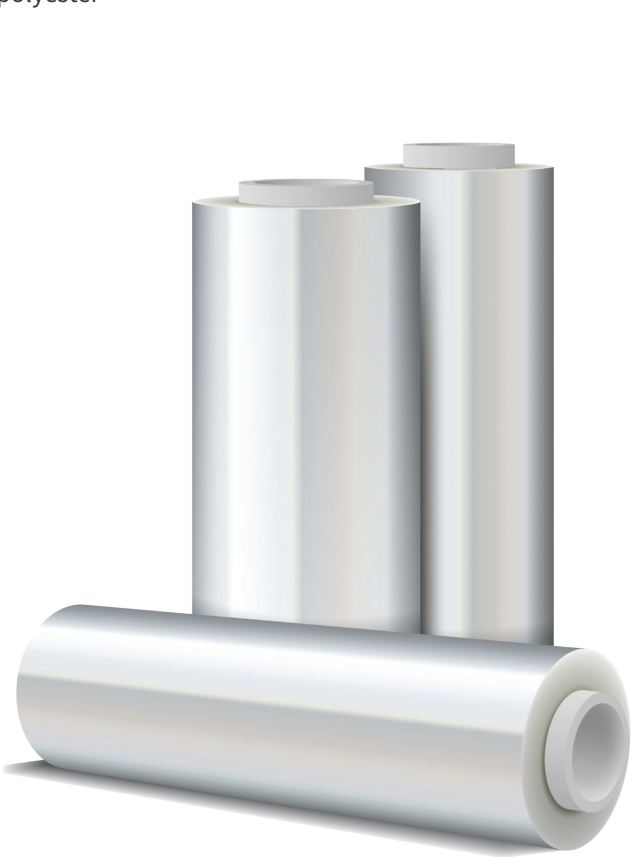
VERTEC™ MATERIAL LIBRARY

- TPE (WFV, PFV)
- TPU
- Polyurethane
- Co-polyester

Depending on the application, Gel-Pak can customize an E-Film® product by modifying its properties to achieve specific performance requirements.

VERTEC™ FILM PROPERTIES

- Low Hysteresis
- Modulus
- Optical Clarity
- Surface Texture
- Tight Thickness Control
- Adhesion Levels
- Low Transference
- Static Dissipative Surface
- Thermal Conductivity
- Biocompatibility
- Chemical Resistance
- Low Outgassing
- Color



GEL-FILM® SHEETS AND ROLLS

Gel-Pak’s Gel-Film® products are based on our proprietary silicone chemistries and manufactured in a cleanroom environment. Gel-Films are offered in both standard (WF, PF, DGL) and custom roll/sheet formats for semiconductor, medical, and aerospace applications.

Gel-Film® Products can be customized for specific applications including:

APPLICATIONS

- Die Handling
- Surface Protection
- Fixturing
- Lapping
- Scribe and Break Coversheet
- Particle Measurement
- Vacuum Coating
- Medical Patches
- Peel and Stick
- Graphene Exfoliation
- DNA Retrieval

Gel-Pak® can modify it’s Gel material properties to meet the performance requirements of specific applications:

GEL-FILM® PROPERTIES

- Adhesion Levels
- Low Outgassing
- Low Tranference
- Biocompatibility
- Tight Thickness Control
- Low Hysteresis
- Durometer

GEL MATERIAL LIBRARY

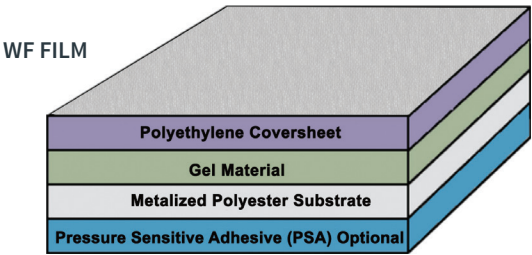
- Silicone
- High-Purity Silicone
- Fluorosilicone
- Reinforced Silicone

Standard Gel-Film® Constructions

Our standard WF, PF and DGL film constructions are offered in a variety of tack levels and thickness combinations.

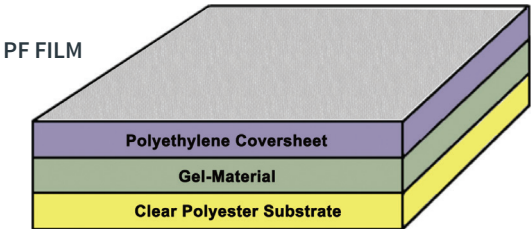
WF FILM

- Gel bonded to metalized polyester substrate
- Available with optional pressure sensitive adhesive backing (-A)
- Operating temperature up to 150°C
- Ideal for lapping, fixturing and surface protection



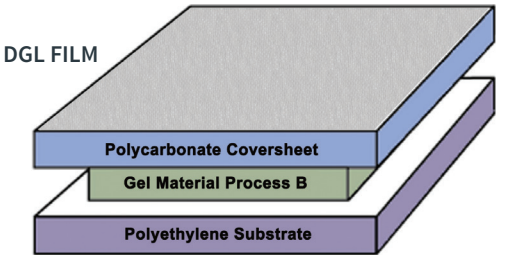
PF FILM

- Gel film coated on a clear removable polyester substrate also referred to as “Free-Gel”
- Free-Gel operating temperature up to 220°C
- Ideal for high temperature processes



DGL FILM

- Highly purified “Free-Gel” laminated onto a flexible polyethylene backing with easy-release polycarbonate coversheet
- Meets “Space-Grade” ASTM 595-E requirements for outgassing
- Withstands operating temperatures of 220°C
- Ideal for vacuum coating and temporary wafer bonding



*Similar film constructions are available in Vertec™ elastomer (WFV, PFV)

About Delphon

For more than 35 years, Delphon has developed breakthrough products that provide solutions for manufacturing processes in a wide range of industrial markets.

Delphon's high value brands have provided customers within the semiconductor, optoelectronics, data storage, medical, pharmaceutical, aerospace, defense and telecom industries with innovative solutions for a variety of process applications.

In addition to Gel-Pak®, Delphon also operates two other divisions, **TOUCHMARK** and **ULTRATAPE**.

ULTRATAPE manufactures high quality cleanroom tape and labels using the most advanced materials and adhesive technologies. The company also manufactures high-performance graphic overlays and nameplates for use in even the harshest environments.

TOUCHMARK provides high quality, precision pad printing services to the medical device, diagnostic and electronics industries.

GEL-PAK

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