3M™ Dual Lock™ Reclosable Fasteners

Agenda

- Features & Advantages
- Performance Characteristics
- Stem Densities
- Stem Combinations
- Products
- Design Considerations
- Key Design Parameters
- Roll Goods vs. Piece Parts
- Contact Us

Features and Advantages

3M™ Dual Lock™ Reclosable Fasteners offer the potential for:

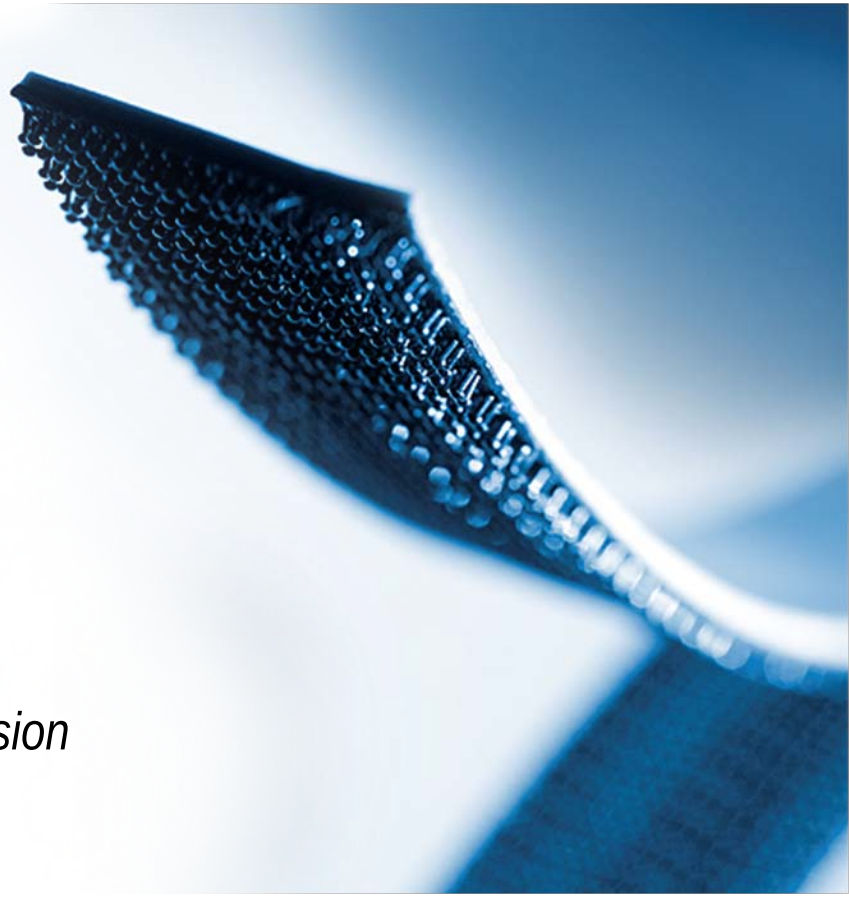
- *Blind attachment*
- *Audible engagement*
- *Ease of assembly & high productivity*

Dual Lock Reclosable Fasteners:

- *Are reclosable up to 1,000 times*
- *May be suitable for low energy surfaces*

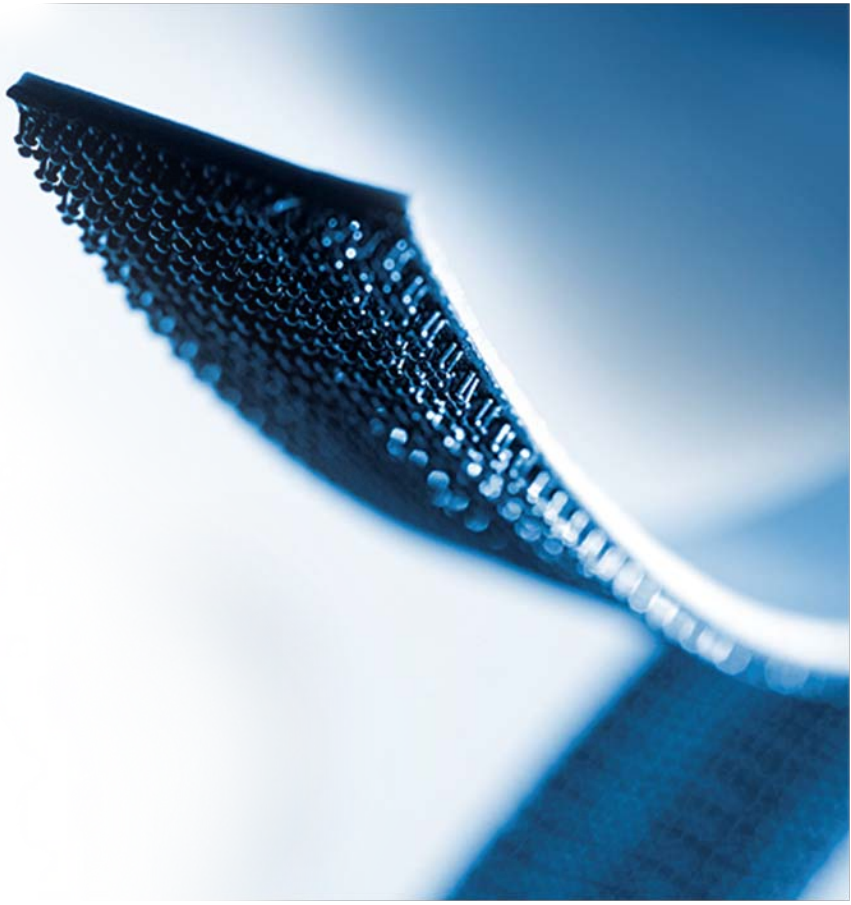
Dual Lock Reclosable Fasteners offer:

- *Sound isolation through reduced transmission of vibration*
- *Flexible usage*
  - *Individualization & design freedom*
  - *Late commercialization*



Performance Characteristics

- Environmental Effects:
  - *Recommended temperature range under static load conditions: -20°F (-29°C) to +200°F (+93°C)*
- Water (Humidity) Resistance
  - *Excellent moisture resistance once bonded to substrate*
- Solvent Resistance
  - *Backing resistance to most common solvents*
  - *Adhesive could be affected*
- Plasticizer Resistance
  - *Reasonable resistance to plasticizers*
  - *Should always perform testing to verify resistance to plasticizer*
- Flammability
  - *Meets FMVSS 302 flammability*



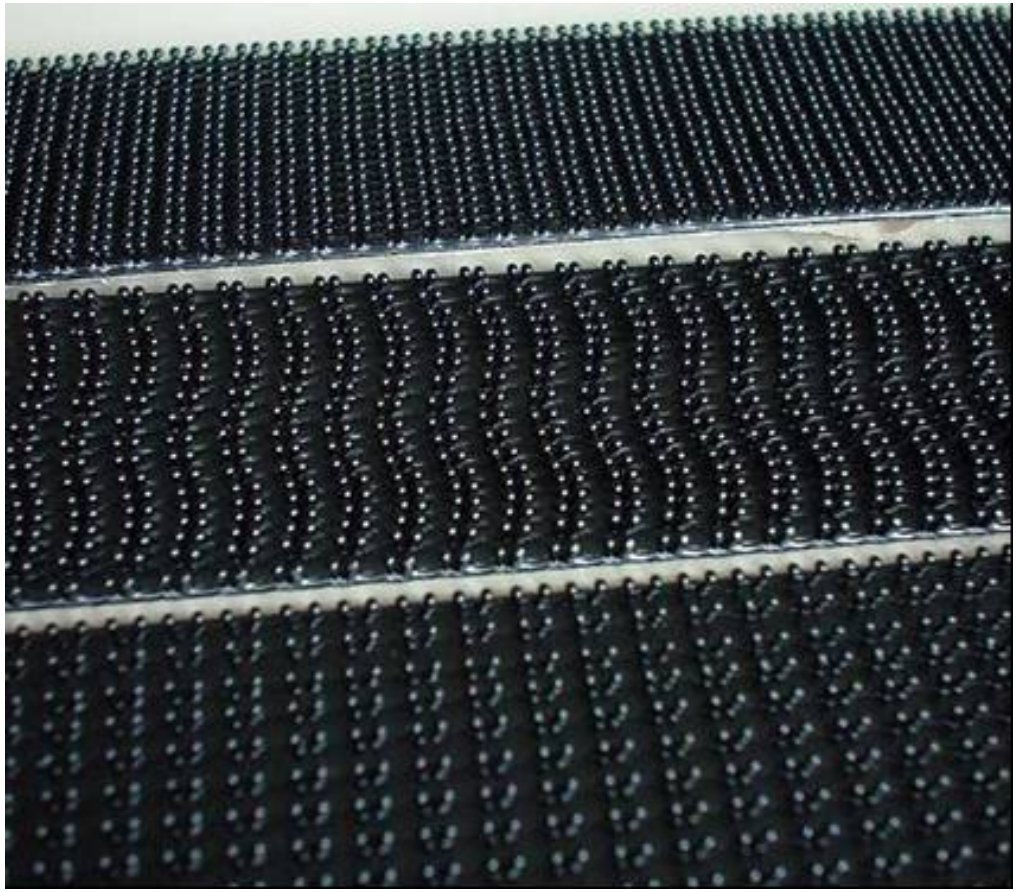
Stem Densities

3M™ Dual Lock™ Reclosable Fasteners are available in three stem densities:

Type 400 (400 stems/inch^2)

Type 250 (250 stems/inch^2)

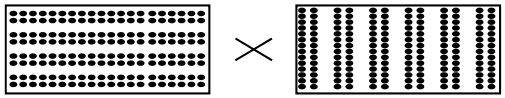
Type 170 (170 stems/inch^2)



Stem Combinations

Typical Initial System Dynamic Tensile Strength	3M™ Dual Lock™ Reclosable Fastener engaged to Dual Lock Reclosable Fastener			
	Type 170 to Type 250	**Type 250 to Type 250**	**Type 170 to Type 400**	**Type 250 to Type 400**
Initial Engagement lbf/sq. inch (N/cm^2)	13 (9.0)	22 (15.2)	21 (14.5)	31 (21.4)
Initial Disengagement lbf/sq. inch (N/cm^2)	27 (18.5)	43 (29.6)	43 (29.6)	60 (41.4)

- Stem combinations that are not recommended:
  - *Type 170 to Type 170 – Disengagement forces are too low to make it a viable reclosable fastening system.*
  - *Type 400 to Type 400 – Engagement force so high that it causes ergonomic issues and disengagement forces are too high that it damages mushroom heads and/or attachment system when disengaged (use only for permanent/non-reclosable applications).*
  - *Type 250 to Type 250 – Can experience "Mirror Imaging" when engaging two Type 250 pieces less 0.75 inches wide or less. Recommend that customer engages Dual Lock parts in perpendicular/cross direction.*



Engage Dual Lock parts in Perpendicular/Cross Direction

Product Availability

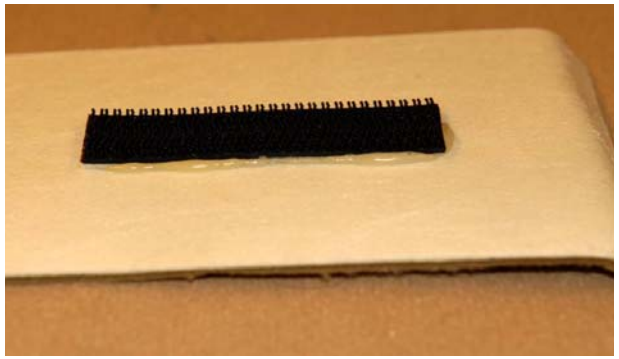
- 3M™ Dual Lock™ Reclosable Fasteners with Pressure Sensitive Adhesive (PSA)
- 3M™ Dual Lock™ Reclosable Fasteners with Non-woven Backing
- 3M™ Dual Lock™ Reclosable Fasteners Ultrasonic Bondable Parts
- 3M™ Dual Lock™ Reclosable Fasteners Piece Parts
  - *Slide-Ins*
  - *Button Style*
  - *Cantilever*
  - *Tree Stem*
  - *Rigid Backed*

3M™ Dual Lock™ Reclosable Fasteners with Pressure Sensitive Adhesive (PSA)

- Available in 3 stem densities (Types 170, 250 & 400)
- Conformable acrylic foam adhesive bonded to Dual Lock Fastener backing
- Adhesive comes in several thicknesses
- Sold as a roll good
- Able to be die-cut into various size parts

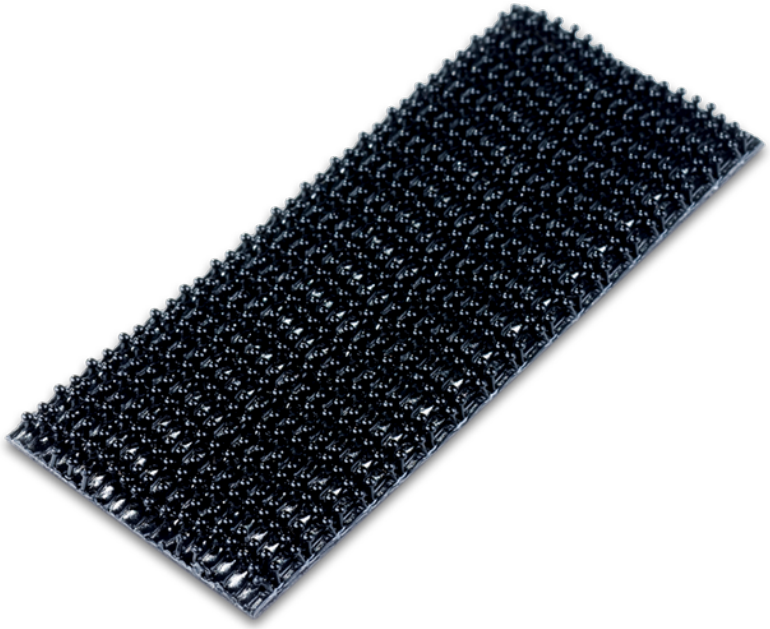
3M™ Dual Lock™ Reclosable Fasteners with Non-woven Backing

- Available in 3 stem densities (Types 170, 250 & 400)
- Conformable reinforced non-woven backing bond bonded to Dual Lock Fastener backing
- Attached to substrate with hot melt adhesive
- Sold as a roll good
- Able to be die-cut into various size parts



3M™ Dual Lock™ Reclosable Fasteners Ultrasonic Bondable Parts

- Nominally 0.130” (3.30 mm) thick
- Designed for ultrasonic bonding to PP & TPO substrates



3M™ Dual Lock™ Reclosable Fastener Piece Parts

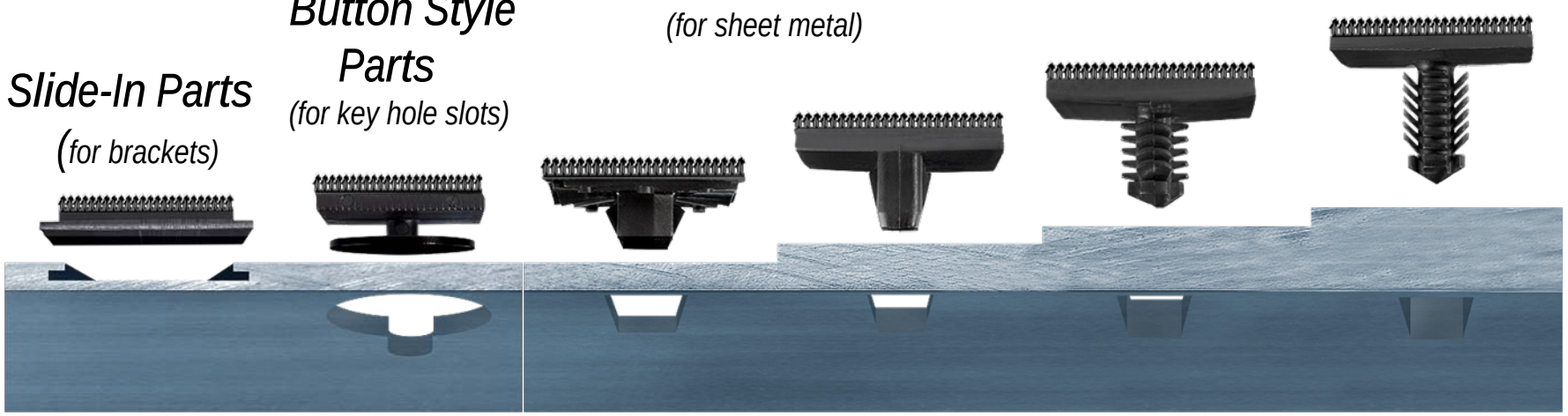
- Slide-Ins
- Button Style
- Cantilever
- Tree Stem

Slide-In Parts
(for brackets)

Button Style Parts
(for key hole slots)

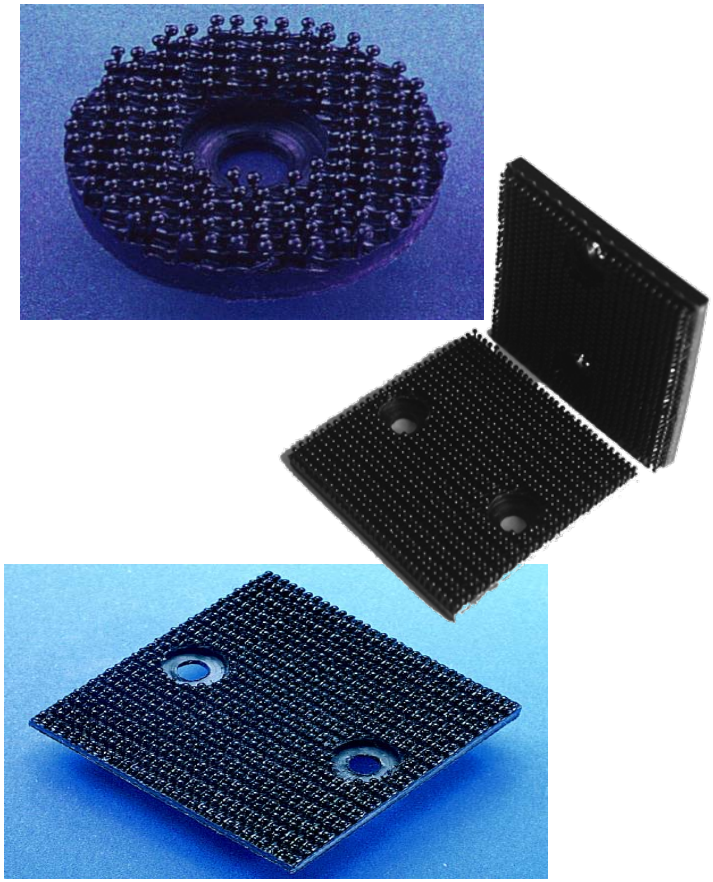
Cantilever Parts
(for sheet metal)

Tree Stem Parts
(for round holes)



3M™ Dual Lock™ Reclosable Fasteners Rigid Back Piece Parts

- Nominally 0.200” (5.08 mm) thick
- Designed for mechanical attachment using screws, rivets, etc.
- Available in limited shapes and sizes



Design Considerations

- Attachment Method
  - *Several different attachment methods to meet customer requirements*
- Engaged Stack-up (Gap)
  - *Overall thickness of 3M™ Dual Lock™ Fasteners when engaged*
- Relative Position of Dual Lock Fasteners (parallelism)
  - *Critical to have Dual Lock Fasteners parallel in installed position*

Assembly Requirements

- Application procedures
  - *Especially important for pressure sensitive adhesive applications*
- Ergonomics
  - *Predominately the force required to engage 3M™ Dual Lock™ Fasteners. Engagement force is:*
    - *Determined by stem density combinations*
    - *Directly proportional to the fastening area of the parts*
    - *Impacted by the rigidity of the mounting substrate, location where the force is applied and the direction of the force applied*

Key Design Parameters

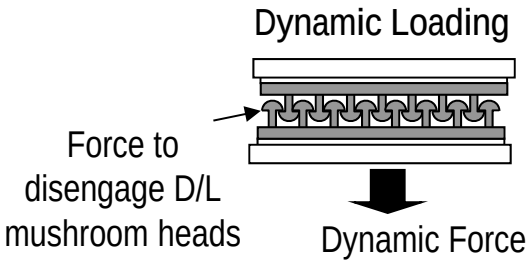
- Attachment Method
- Loading on 3M™ Dual Lock™ Reclosable Fasteners
- Engaged Stack-up (Gap)

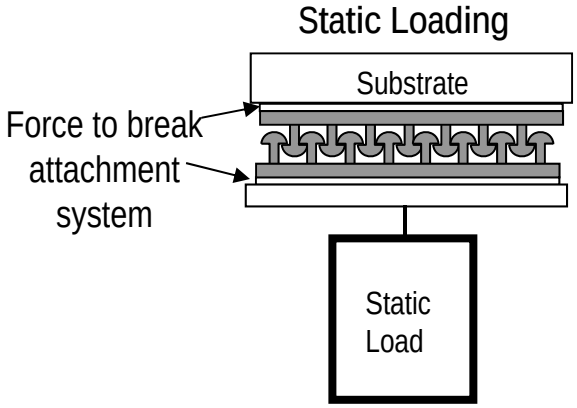
Attachment Methods

- 3M™ Dual Lock™ Reclosable Fasteners with Pressure Sensitive Adhesive
  - *Easy in concept to apply, but many times proves difficult for implementation*
  - *Loading characteristics adversely affected by environmental conditions*
  - *Need good application assembly process for success*
- 3M™ Dual Lock™ Reclosable Fasteners Non-Woven Backing
  - *Attached to substrate with hot melt adhesive*
  - *Works well on fibrous substrates (i.e., headliner materials)*
- 3M™ Dual Lock™ Reclosable Fastener Ultrasonic Bondable Parts
  - *Works with PP and TPO substrates*
  - *Robust attachment method (~ 10 - 11 lbs. force per weld)*
  - *Requires ultrasonic welding equipment*
- 3M™ Dual Lock™ Reclosable Fastener Piece Parts
  - *Robust attachment methods (not affected by environmental conditions…except for tree stem parts)*
  - *Easy to install (low insertion force)*
  - *No training or application process required*

Loading on 3M™ Dual Lock™ Parts

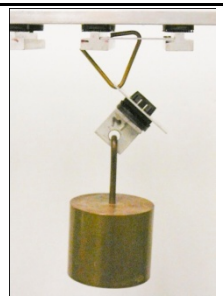
- 2 Types of Loading
  - *Dynamic Loading*
    - *The amount of force it takes to engage/disengage the mushroom heads*
    - *Listed in technical data sheets as "Dynamic Engagement/Disengagement Force"*
    - *Dynamic disengagement of mushroom heads vary slightly based on the Dual Lock attachment method used*
  - *Static Loading*
    - *The amount of constant force/load the Dual Lock attachment system can support before failing*
    - *Especially important for PSA, hot melt and tree stem attachments*
    - *Listed in technical data sheets as "Static Holding Power"*
    - *PSA and hot melt parts static loading capabilities are greatly limited by high temperature, substrate and the application process*





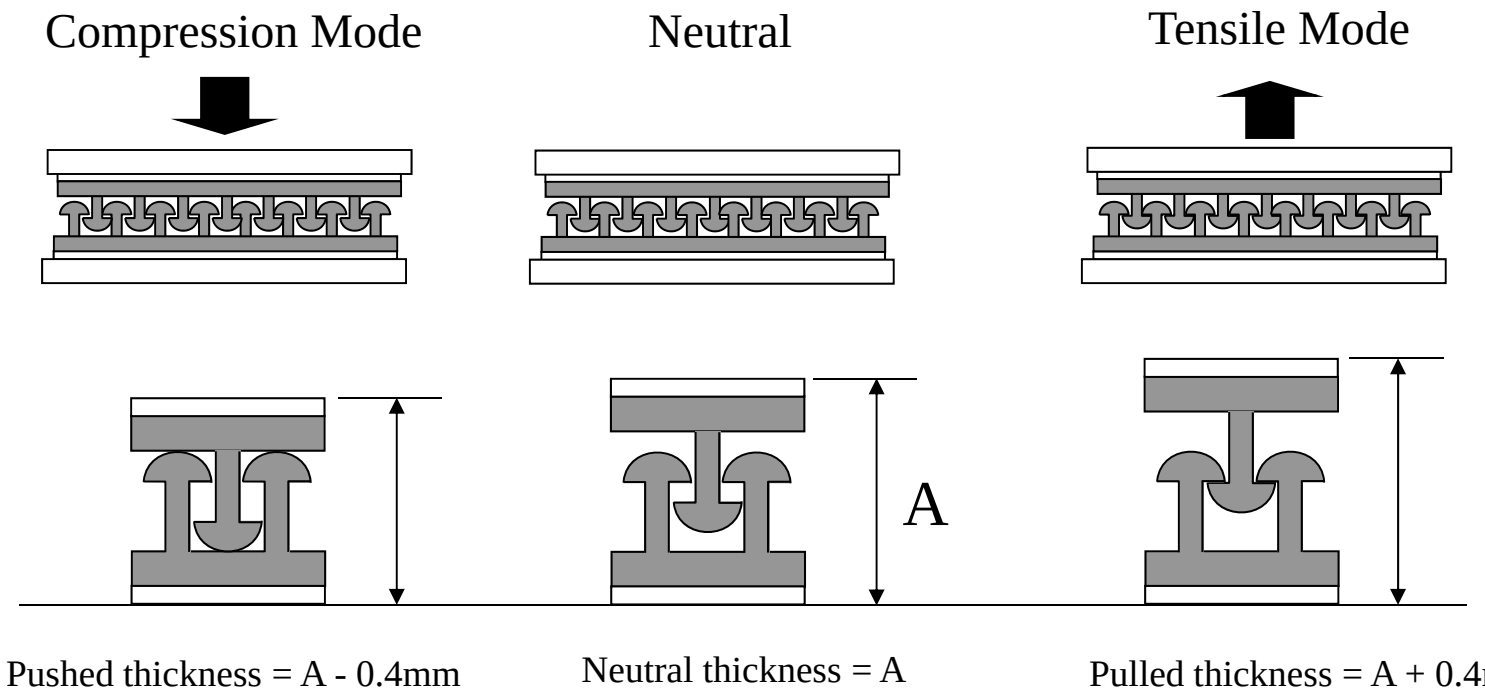
Suggested Maximum Static Loading
3M™ Dual Lock™ Fasteners with Pressure Sensitive Adhesive

Based on feedback from automotive customers and real-world factors not considered in 3M's lab testing, 3M suggested maximum static loadings are:

Static Force	Examples	Loading (Per 1 Sq. Inch of Dual Lock)
Tensile		500 grams (1.1 lbs)
Shear		333 grams (0.73 lbs)
Cleavage		250 grams (0.55 lbs)

Engaged Stack-up (Gap)

- Two types of force (Force Modes) for engaged stack-up:
  - *Compression*
  - *Tension*
- Consult the 3M™ Dual Lock™ Reclosable Fasteners Piece Parts Design Guide to calculate engaged stack-up



Choosing the appropriate 3M™ Dual Lock™ Reclosable Fastener for your application…

Roll Goods

- Advantages
  - *Decrease the amount of up-front engineering design for mounting system to substrate*
  - *Parts can be cut to size*
  - *Lower price/part than piece parts*
  - *A good option for running change fixes*
- Disadvantages
  - *Requires dwell time for the adhesive to build*
  - *Requires operator training and development of an application process*
  - *Attachment is affected by environmental conditions*

Piece Parts

- Advantages
  - *Easy to install (low insertion force) and easy to replace*
  - *Does not require dwell time*
  - *Training or development of an application process is not required*
  - *Robust attachment method*
- Disadvantages
  - *Requires up-front engineering design for mounting system to substrate*
  - *Limited availability of sizes*
  - *Higher price per part initially than roll goods*

Contact Us

For more information about 3M™ Dual Lock™ Reclosable Fasteners

- Contact your 3M sales representative
- Go to www.3M.com/autosolutions

Thank You!