



Dual Lock™ Reclosable Fasteners

SJ3551 (Type 400)

SJ3552 (Type 170)

SJ3550 (Type 250)

Technical Data

August, 2005

Product Description

3M™ Dual Lock™ Reclosable Fasteners SJ3550, SJ3551 and SJ3552 consist of continuous strips of polyolefin stems with a mushroom shaped top protruding up from the backing. There are three types (170, 250 and 400) of these fasteners referring to the approximate number of stems per square inch.

These fasteners have a 37 mil white conformable acrylic foam adhesive providing good contact with substrates having a slight texture or surface irregularities. The adhesive is protected with a clear silicone treated liner allowing easy removal from the adhesive.

This product is also available in some widths with a fabricator splice which is sometimes called a functional splice. This consists of the Dual Lock adhesive and/or the adhesive side of the liner being spliced, thus providing product and liner continuity on the roll. These products are designated with a FS suffix, after the SJ product number.

This product is available in some widths with a colored 3M™ Scotchmate™ Reclosable Fastener loop splice. The Scotchmate reclosable fastener loop engaged to the Dual Lock reclosable fastener provides for a strong splice allowing the product to be pulled through automated converter equipment. These products are designated with a SM suffix after the SJ product number.

A version suitable for use in clean room conditions is designated with a V suffix after the SJ product number. This product is vacuumed to remove particles and surface contaminants before being sealed in plastic bag to reduce the chance for contamination before use.

These Dual Lock reclosable fasteners can be mated in the following combinations of increasing closure strength: Type 170 to Type 250, Type 250 to Type 250, Type 170 to Type 400 and Type 250 to Type 400. In some cases mating with 3M™ Scotchmate™ Reclosable Fasteners Loop provides a quick grab - low engagement force with a high closure strength, but reduced cycle life.

Product Construction

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

Product Number	3M™ Dual Lock™ Reclosable Fastener		
	SJ3552	SJ3550	SJ3551
Type: Approx. Stems/In ² (stems/cm ²)	170 (26)	250 (39)	400 (62)
Material of Construction			
Stem/Heads	Black Polypropylene		
Backing	Black Polypropylene		
Adhesive	White 3M™ Acrylic Foam Adhesive		
Thickness ^(a) Unmated ± 10%	0.14" (3.5 mm)		
Selvage Edges	None		
Liner	Clear 4.0 mil (0.10 mm) thick silicone treated polyolefin liner printed with 3M Dual Lock in red.		
Weight ^(a) ounces/in ² (grams/cm ²)	0.028 (0.123)	0.030 (0.132)	0.032 (0.142)

a) All thickness and weight values are with the liner removed.

Dual Lock™ Reclosable Fasteners

SJ3551 (Type 400) • SJ3552 (Type 170) • SJ3550 (Type 250)

Typical System Performance Characteristics and Properties

Note: The following technical information and data is intended as a guideline to assist customers in selecting 3M™ Reclosable Fasteners for further evaluation. This technical information is not product release specifications or standards. Unless stated differently, the typical system performance and product properties were obtained using specific test methods under controlled laboratory conditions of 72°F ± 5°F and 50% ± 10% relative humidity. The user is responsible for evaluating 3M reclosable fasteners under expected use conditions to ensure suitable performance for the intended application.

		System Performance ^(a)		
		3M™ Dual Lock™ Reclosable Fastener SJ3552 (Type 170) engaged to 3M™ Dual Lock™ Reclosable Fastener SJ3550 (Type 250) ^(b)	3M™ Dual Lock™ Reclosable Fastener SJ3550 (Type 250) engaged to 3M™ Dual Lock™ Reclosable Fastener SJ3551 (Type 400) ^(b)	3M™ Scotchmate™ SJ3571 (Loop) engaged to 3M™ Dual Lock™ Reclosable Fastener SJ3550 (Type 250) ^(c)
INITIAL TENSILE (Rigid to Rigid Substrates)		lbs _F /sq inch (kNewtons/m ²)		
Dynamic Tensile Engagement Strength ^(f)		15 (103)	40 (276)	<1 (<6.9)
Dynamic Tensile Disengagement ^{(d),(e),(g)}		33 (225)	57 (395)	35 (242)
Static Tensile Holding Power		Holds minimum 2.2 #/in ² (155 grams/cm ²) for indicated time and temperature		
	100°F/100% RH	10,000 minutes	10,000 minutes	10,000 minutes
	200°F	10,000 minutes	10,000 minutes	10,000 minutes
	220°F	10,000 minutes	10,000 minutes	10,000 minutes
	250°F	60 minutes	10,000 minutes	10,000 minutes
INITIAL SHEAR (Rigid to Rigid Substrates)		lbs _F /sq inch (kNewtons/m ²)		
Dynamic Shear (1" x 1" overlap) ^{(d),(h)}		16 (110)	43 (298)	124 (855)
Static Shear Holding Power (1" x 1" overlap)		Holds minimum 2.2 #/in ² (155 grams/cm ²) for indicated time and temperature		
	100°F/100% RH	7,200 minutes	10,000 minutes	10,000 minutes
	200°F	10,000 minutes	10,000 minutes	10,000 minutes
	220°F	45 minutes	10,000 minutes	10,000 minutes
	250°F	33 minutes	47 minutes	1,000 minutes
PEEL AND CLEAVAGE^(d)		Pounds/inch width (grams/cm width)		
Cleavage Strength (Rigid to Rigid)		12 (2,150)	32 (5,725)	18 (3,220)
Peel Strength ("T" Peel, Flexible to Flexible)		0.7 (125)	1.5 (268)	1.9 (340)
Peel Strength (90° Peel, Flexible to Rigid)		1.8 (322)	4.6 (823)	4.4 (787)
ENGAGED THICKNESS⁽ⁱ⁾		Inches (mm) ± Tolerance		
(Nominal without liner)		0.22 (5.7) ± 10%	0.22 (5.7) ± 10%	0.18 (4.6) ± 20%
CLOSURE CYCLE LIFE^(j)		1,000	1,000	50
SHELF LIFE^(k)		24 months	24 months	24 months

Note: Long Term Performance: Conditions such as engagement area, supported weight, forces on the closure, vibrations or side to side movement, as well as changes or prolonged exposure to environmental factors, such as temperature, ultraviolet light or humidity and other factors beyond the control of 3M can affect the closure strength and long term performance. Reclosable fasteners may slip or creep in the direction of the static load forces when subjected to static loads at temperatures, times or weights greater than indicated. The user is responsible for designing the amount of fastening area based upon the expected use conditions for the intended application. Four square inches of engaged fastening area per pound of static load is suggested as a starting point for such evaluations.

- a) System performance tests are determined by measuring the engaged system performance of the listed reclosable fasteners when used to join two 1/16" thick non-anodized aluminum plates.
- b) Dual Lock reclosable fastener type 250 (SJ3550) engaged to type 250 (SJ3550) and type 170 (SJ3552) engaged to type 400 (SJ3551) have approximately the same performance and are approximately midway between the performance of type 170 engaged to type 250 (the lowest performance recommended) and type 250 engaged to type 400 (the highest performance recommended). Type 170 engaged to type 170 as well as type 400 engaged to type 400 are not recommended as the former is too weak and the later may be too strong potentially causing part damage or ergonomic issues.
- c) 3M™ Scotchmate Reclosable Loop Fastener engaged to Dual Lock reclosable fastener may provide increased closure strength over standard Dual Lock reclosable fastener combinations, especially after movement or vibration of the closure system. Due to this increased strength, extra care should be given to ensure the maximum bond strength is obtained to the substrates being joined. Failure to obtain bond strengths to the substrate that are sufficiently high may cause the fastener to release from the substrate upon disengagement.
- d) The listed reclosable fastener combinations were engaged with firm pressure and disengaged at the rate of 12 inches (305 mm) per minute.
- e) Maximum tensile disengagement strength is dependent upon all of the stems disengaging at the same time with the two substrates parallel to and moving away from each other. If sections of the Dual Lock reclosable fastener lift during disengagement, the fastener will disengage in a peel or cleavage mode, reducing the observed strength.
- f) System dynamic tensile engagement strength of Dual Lock reclosable fastener SJ3552 (Type 170) to Dual Lock reclosable fastener SJ3551 (Type 400) is 29 lbs_F/sq inch (397 kNewtons/m²) and Dual Lock reclosable fastener SJ3550 (Type 250) to Dual Lock reclosable fastener SJ3550 (Type 250) is 29 lbs_F/sq inch (397 kNewtons/m²).
- g) System dynamic tensile disengagement strength of Dual Lock reclosable fastener SJ3552 (Type 170) to Dual Lock reclosable fastener SJ3551 (Type 400) is 50 lbs_F/sq inch (346 kNewtons/m²) and Dual Lock reclosable fastener SJ3550 (Type 250) to Dual Lock reclosable fastener SJ3550 (Type 250) is 44 lbs_F/sq inch (304 kNewtons/m²).
- h) System dynamic shear strength of Dual Lock reclosable fastener SJ3552 (Type 170) to Dual Lock reclosable fastener SJ3551 (Type 400) is 20 lbs_F/sq inch (138 kNewtons/m²) and Dual Lock reclosable fastener SJ3550 (Type 250) to Dual Lock reclosable fastener SJ3550 (Type 250) is 36 lbs_F/sq inch (249 kNewtons/m²).
- i) Engaged thickness is measured with a 1/2" diameter pressure foot with a 34 gram weight and will decrease if a load is applied or increase if a separation force is applied.
- j) Cycle Life is the number of cycles (openings and closings) that the fastener is subjected to while maintaining 50% or greater of the original peel values.
- k) Shelf life is from date of manufacture when stored in original packaging at 60° to 80°F (16° to 27°C) and 40 to 60% relative humidity.

Dual Lock™ Reclosable Fasteners

SJ3551 (Type 400) • SJ3552 (Type 170) • SJ3550 (Type 250)

Additional Performance Characteristics

Note: The following technical information and data is intended as a guideline to assist customers in selecting 3M™ Reclosable Fasteners for further evaluation. This technical information is not product release specifications or standards.

Solvent Resistance: The polypropylene backing, stems with mushroom top should resist attack by most common solvents and alkaline solutions. The adhesive on 3M™ Dual Lock™ Reclosable Fasteners SJ3551, SJ3552 and SJ3550 may be affected by some common laboratory solvents and transportation fluids (gasoline, motor oil, etc.) Tests should be conducted by the user to evaluate the solvents and exposure time expected for the actual application.

Plasticizer Resistance: The adhesive on Dual Lock reclosable fasteners SJ3551, SJ3552 and SJ3550 has reasonable resistance to plasticizers found in many common flexible vinyls or other materials containing high levels of plasticizing materials. Tests should be conducted by the user to evaluate the plasticizer resistance for the chosen application, environmental exposure and duration for the actual application. Other products to evaluate for plasticizer resistance is the family of 3M™ Dual Lock™ Reclosable Fasteners SJ3560, SJ3550CF or 3M™ Scotchmate™ Reclosable Fasteners SJ3522 and SJ3523.

Flammability Resistance: Dual Lock reclosable fasteners SJ3551, SJ3552 and SJ3550 pass FMVSS 302 flammability tests when attached to a thin metal panel. If you need reclosable fasteners that pass many of the other standard flammability tests (such as FAR 25.853, ASTM E-162, ASTM E-662, BSS-7239, etc.), it is suggested that you refer to 3M Scotchmate Flame Resistant Reclosable Fasteners Data Pages (70-0709-3976-7 and 70-0709-3978-3).

Environmental Effects: Temperatures between -20°F (-29°C) and 200°F (93°C) should have minimal affect on closure strength. To maintain performance when exposed for extended periods to sunlight or ultraviolet radiation these products should be placed between two opaque or UV resistant surfaces. Specific testing under the expected environmental conditions is recommended.

Water (Humidity) Resistance: Closure strength should not be affected by prolonged exposure to water or humidity. Once bonded to the substrate the adhesive has high resistance to moisture under typical use conditions. Exposure to elevated heat and chlorine or bromine may compromise the adhesive performance to the Dual Lock reclosable fastener backing.

Volatile Outgassing: Volatile outgassing, as per ASTM E595, is one important test in determining the suitability of materials for spacecraft. Generally products with acrylic or no adhesive have lower volatile outgassing values. Products tested at the Goddard Space Flight Center can be found at the following web site:
<http://epims.gsfc.nasa.gov/og-cgi/sectionb/sectionb.html.sh>.

Sterilization/Autoclaving: These Dual Lock reclosable fastener products have not been tested for performance after sterilization or autoclaving processes. It is recommended that the customer evaluate the suitability of the Dual Lock reclosable fastener product for these characteristics typical of what is expected for normal usage.

Washing and Dry Cleaning: The adhesive present on these Dual Lock reclosable fastener products may make them unsuitable to washing or dry cleaning processes.

Dual Lock™ Reclosable Fasteners

SJ3551 (Type 400) • SJ3552 (Type 170) • SJ3550 (Type 250)

Available Sizes	Standard Widths ^(a) ± 1/16" (1.6 mm)	Roll Length Yards (Meters)	3M™ Dual Lock™ Reclosable Fasteners						
			SJ3551	SJ3551V ^(b)	SJ3552	SJ3552V	SJ3550	SJ3550FS ^(c)	SJ3550SM ^(d)
1/2" (12.7 mm)		50 (45.7)	√	—	√	—	√ ^(e)	—	—
3/4" (19 mm)		50 (45.7)	√	—	√	—	√ ^(e)	—	—
1" (25.4 mm)		50 (45.7)	√	√	√	√	√	√	√
1 3/8" (31.8 mm)		50 (45.7)	√	—	√	√	√	—	—
1 1/2" (38.1 mm)		50 (45.7)	√	—	√	√	√	—	—
2" (50.8 mm)		50 (45.7)	√	—	√	√	√	√	—
3" (76.2 mm)		50 (45.7)	—	—	—	—	√	—	—
4" (101.6 mm)		50 (45.7)	√	—	√	—	√	—	—
6" (152.4 mm)		50 (45.7)	√	—	√	√	√	—	—
Fabricated Forms^(f)			Cut Pieces						

- a) All of the 3M™ Dual Lock™ Reclosable Fastener SJ3551, SJ3552 and SJ3550 products are supplied on 3" core with the liner to the edge of the adhesive. There are no extended liners or selvage edge with any of the standard products listed above.
- b) V is the identical SJ product construction except the product is vacuumed to remove debris and packaged in a plastic bag to reduce particle contamination. Useful for cleanroom applications.
- c) FS is the identical SJ product construction, except the liner and product are each spliced to provide a continuous product.
- d) SM is the identical SJ product construction except the Dual Lock reclosable fastener is spliced with a colored 3M™ Scotchmate™ Reclosable Fastener loop, providing a strong splice for pulling through automated converting equipment.
- e) It is not recommended to engage Dual Lock reclosable fastener type 250 to type 250 (Dual Lock reclosable fastener SJ3550 to SJ3550 for widths of 0.75" or narrower.
- f) Reclosable fasteners can be fabricated in many custom shapes and sizes to fit your product design and manufacturing process. Contact your local 3M authorized distributor, converter or 3M representative for additional options, configurations and ordering information.

Attachment Techniques

The following information is intended to assist the customer in selecting and using an appropriate attachment option for their application. Final product performance depends upon a number of factors, the substrate and its surface characteristics, including the fastener selected, the method in which the fastener is applied, the time and environmental conditions in which it is expected to perform. Because many of these factors are uniquely within the user's knowledge and control, it is required that the user evaluate the 3M product to determine whether it is fit for a particular purpose and suitable for the user's method of application and desired end use.

Design Considerations: As a general rule, four square inches of fastener area per pound of static tensile or shear load to be supported is suggested as a starting point for evaluation. More or less area may be needed depending on specific conditions or end use applications. Type 250 Dual Lock reclosable fastener less than 0.75" (19 mm) width should not be engaged to other type 250 Dual Lock reclosable fastener as low disengagement values may occur.

Rounding the corners, recessing the product into the substrate and providing raised edges around the Dual Lock reclosable fastener can reduce the possibility of edge lifting or catching that may cause the fastener to be torn from the substrate, while improving the overall appearance of the fastener on the finished product. Mechanically securing the corners of the Dual Lock reclosable fastener can also reduce the possibility of edge lifting, but may reduce the closure performance.

It is recommended that pieces of Dual Lock reclosable fastener be engaged to pieces or strips of Dual Lock reclosable fastener. Strips of Dual Lock reclosable fastener should not be engaged to strips of Dual Lock reclosable fastener as low disengagement may occur from incomplete engagement along the full strip. Pieces or strips of Dual Lock reclosable fastener can be engaged to pieces or strips of Scotchmate reclosable fastener loop.

Dual Lock™ Reclosable Fasteners

SJ3551 (Type 400) • SJ3552 (Type 170) • SJ3550 (Type 250)

Attachment Techniques (continued)

Attachment Methods: There are typically six different methods for attaching 3M™ Dual Lock™ Reclosable Fastener to various substrates. For complete details on techniques and options for attaching Dual Lock or Scotchmate reclosable fasteners, please see the technical bulletin on Attaching Scotchmate and Dual Lock reclosable fasteners (70-0709-3929-6). The most important technique for attaching Dual Lock reclosable fasteners SJ3551, SJ3552 and SJ3550 to various substrates is use of its pressure sensitive adhesive.

Pressure Sensitive Adhesive attachment: The fasteners and substrates should have equilibrated for a minimum of one hour at temperatures of 68° to 80°F (20° to 27°C) before application. Generally these adhesive backed fasteners should be applied to surfaces that are smooth, dry and free of oils, mold release agents or other surface contaminants.

The substrate surface should be cleaned to remove any surface contaminants with an appropriate cleaning method for the customer's substrate, type and quantity of surface contaminants that need to be removed. **Note:** When using solvents, extinguish all ignition sources, including pilot lights, and follow the manufacturer's precautions and directions for use.

After the substrate surface has been cleaned and dried, the liner is removed from the fastener adhesive and without touching the adhesive, the fastener's adhesive is applied to the surface using light finger pressure. The fastener must be rolled down, to increase contact of the adhesive with the substrate's surface. Extra care must be exercised when rolling down Dual Lock reclosable fasteners to prevent bending of the stems which can compromise the closure strength. The following two methods allow adequate pressure to be applied to the Dual Lock reclosable fastener without damaging the stems.

The first method uses a hand roller, with the roller wheel covered with a Dual Lock reclosable fastener type 170 such as 3M™ Dual Lock™ Reclosable Fastener SJ3542. The Dual Lock reclosable fastener covered roller is rolled over the Dual Lock reclosable fastener applied to the substrate, engaging and disengaging the two Dual Lock reclosable fastener pieces. The hand roller can be used for many applications.

The second method consists of engaging a strip of plainback Dual Lock reclosable fastener type 170 such as 3M™ Dual Lock™ Reclosable Fasteners SJ3442 or SJ3742 to the previously attached adhesive backed Dual Lock reclosable fastener. The backside of the plainback material can now be rolled down using a rubber roller, with no Dual Lock reclosable fastener on the roller, fully engaging the Dual Lock reclosable fastener. After rolling down three times in each direction, the strip of plainback Dual Lock reclosable fastener can be removed and used to roll down the next piece of Dual Lock reclosable fastener in a similar manner.

The pressure-sensitive adhesive bonds to the substrate on contact and parts can be handled immediately. Adhesive bond strength increases with time, pressure and temperature. A minimum of twenty four hours dwell time is recommended before applying a load or disengaging assembled parts. Recommended time at room temperature to achieve maximum bond strength is 72 hours.

Application Ideas

3M™ Dual Lock™ Reclosable Fasteners SJ3551, SJ3552 and SJ3550 can replace conventional mechanical fasteners in a wide range of assembly and attachment applications where reclosability is desired. They provide a firm adhesive bond to a wide variety of surfaces, including, but not limited to those listed below. Because product performance will depend on actual conditions within any specific application, it is essential that the user evaluate the 3M product to determine whether it is fit for a particular material purpose and suitable for the user's method of application.

Plastics

Glass	Sealed Wood	Acrylic	Rigid Vinyl
Bare Metal		Polycarbonate	Polystyrene

Not suitable for powder coated paints and low surface energy substrates such as polypropylene, unless surface modification, such as use of a primer, is made.

Dual Lock reclosable fasteners SJ3551, SJ3552 and SJ3550 have shown to be useful for:

Attaching window and door trim panels	Attaching accessories and equipment
Interior trim	Vibration and sound dampening control

Dual Lock™ Reclosable Fasteners

SJ3551 (Type 400) • SJ3552 (Type 170) • SJ3550 (Type 250)

Certification/ Recognition

MSDS: 3M has not prepared a MSDS for this product which is not subject to the MSDS requirements of the Occupational Safety and Health Administration's Hazard Communication Standard, 29 C.F.R. 1910.1200(b)(6)(v). When used under reasonable conditions or in accordance with the 3M directions for use, the product should not present a health and safety hazard. However, use or processing of the product in a manner not in accordance with the directions for use may affect its performance and present potential health and safety hazards.

TSCA: This product is defined as an article under the Toxic Substances Control Act and therefore, it is exempt from inventory listing requirements.

FMVSS 302: 3M™ Dual Lock Reclosable Fasteners SJ3551, SJ3552 and SJ3550 pass FMVSS 302 flammability tests when attached to a thin metal panel.

Product Use

All statements, technical information and recommendations contained in this document are based upon tests or experience that 3M believes are reliable. However, many factors beyond 3M's control can affect the use and performance of a 3M product in a particular application, including the conditions under which the product is used and the time and environmental conditions in which the product is expected to perform. Since these factors are uniquely within the user's knowledge and control, it is essential that the user evaluate the 3M product to determine whether it is fit for a particular purpose and suitable for the user's method of application.

Warranty and Limited Remedy

Unless stated otherwise in 3M's product literature, packaging inserts or product packaging for individual products, 3M warrants that each 3M product meets the applicable specifications at the time 3M ships the product. Individual products may have additional or different warranties as stated on product literature, package inserts or product packages. 3M MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY IMPLIED WARRANTY ARISING OUT OF A COURSE OF DEALING, CUSTOM OR USAGE OF TRADE. User is responsible for determining whether the 3M product is fit for a particular purpose and suitable for user's application. If the 3M product is defective within the warranty period, your exclusive remedy and 3M's and seller's sole obligation will be, at 3M's option, to replace the product or refund the purchase price.

Limitation of Liability

Except where prohibited by law, 3M and seller will not be liable for any loss or damage arising from the 3M product, whether direct, indirect, special, incidental or consequential, regardless of the legal theory asserted, including warranty, contract, negligence or strict liability.

ISO 9001:2000 - ISO/TS 16949:2002

This Industrial Adhesives and Tapes Division product was manufactured under a 3M quality system registered to ISO 9001:2000 and ISO/TS 16949:2002 standards.



Industrial Business Industrial Adhesives and Tapes Division

3M Center, Building 21-1W-10, 900 Bush Avenue
St. Paul, MN 55144-1000
800-362-3550 • 877-369-2923 (fax)
www.3M.com/industrial



Recycled Paper
40% pre-consumer
10% post-consumer

Printed in U.S.A.
©3M 2005 70-0709-3986-6 (8/05)

Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

Мы предлагаем:

- Конкурентоспособные цены и скидки постоянным клиентам.
- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



Тел: +7 (812) 336 43 04 (многоканальный)

Email: org@lifeelectronics.ru

www.lifeelectronics.ru