3M Insulating and Conductive Tapes
Product Selection Guide

Trusted Performance from the Tape Experts


INSULATING
CONDUCTIVE
ELECTRICAL

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3M™ Insulating and Conductive Tapes are made from a broad range of backings and adhesives to meet the demanding requirements of different applications and environments. Extensive quality control and testing, combined with accurate process controls, are just part of the reason that 3M consistently provides high quality products.

Electrical Tapes

The images of tapes in this brochure are as accurate as photographic and printing technology allow, but may vary in appearance from the actual tapes.

3M™ Electrical Tapes

Glass Cloth

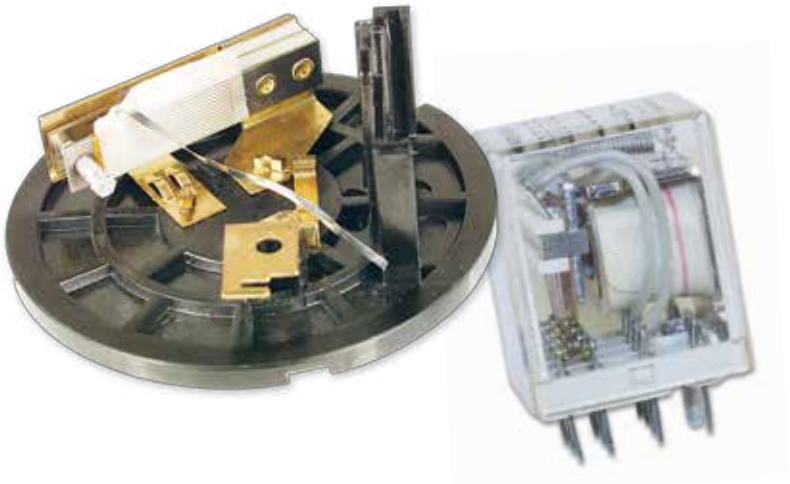
3M offers exceptionally flexible and conformable glass cloth backings on the market with high-temperature resistance and tensile strength. With excellent absorption of resins and varnishes plus cut-through and edge-tear resistance, they are ideal for holding and strapping applications up to 200°C.

Available with three (3) adhesive systems: aggressive thermosetting rubber resin, solvent-resistant acrylic and high-temperature silicone.

	Features	Operating Temp (°C)†	Total Thickness (mils)/(mm)	Dielectric Breakdown (V)	Insulation Resistance (megaohms)	Breaking Strength (lb/in)/(N/10 mm)	Elongation (% at break)	Electrolytic Corrosion	Adhesion to Steel (oz/in)/(N/10 mm)	CTI Material Group
Thermosetting Rubber										
27	High-performance glass cloth tape that is tough and conformable.	150	7.0/0,177	3000	$4.8x10^4$	150/252	5	0.9	30/3,3	I
90	Stiffer, saturated backing. Provides different handling.	155	7.5/0,19	3000	$1x10^2$	175/306	5	0.9	50/5,5	–
Acrylic										
79	Solvent-resistant version of 27 Tape. Printable. Listed in many Class B systems.	150	7.0/0,177	3000	$2.7x10^2$	150/262	5	0.9	30/3,3	I
Silicone										
69	High-temperature (200° C) glass cloth tape. UL 510 flame retardant. Printable.	200	7.0/0,177	3000	$4.8x10^4$	180/314	5	0.9	40/4,4	I

† Operating temperature is equivalent to UL Recognition temperature where applicable (See page 14).

= Flame retardant. See page 14 for product specifications.



Filament Reinforced

Filament tapes are designed for applications needing both the dielectric strength of polyester film and the high mechanical strength of glass fibers. They offer the ultimate in low stretch, high tensile and edge-tear resistance for a more cost-effective solution to glass cloth tapes. Excellent for anchoring lead wires to banding coils and end-turn taping. A special paper-backed filament tape is available for high-voltage oil-filled distribution transformer use.

Available with two (2) adhesive systems: aggressive thermosetting rubber resin and solvent-resistant acrylic.

Thermosetting Rubber	Features	Operating Temp (°C) †	Total Thickness (mils)/(mm)	Dielectric Breakdown (V)	Insulation Resistance (megaohms)	Breaking Strength (lb/in)/(N/10 mm)	Elongation (% at break)	Electrolytic Corrosion	Adhesion to Steel (oz/in)/(N/10 mm)	CTI Material Group
46	Tough, durable filament tape.	130	7.0/0,177	5500	$3x10^3$	275/481	5	1.0	50/5,4	II
1046	Tough, durable filament tape	130	7.0/0,177	5500	$3x10^3$	275/481	5	1.0	50/5,4	–
Acrylic	**Features**									
1139	Solvent-resistant, high-temperature filament tape.	155	6.5/0,165	5500	–	225/394	6	–	35/3,8	–
1076	Paper/glass filament backing designed for oil-filled transformer applications.	105	10.0/0,253	3500	–	275/481	5	1.0	40/4,4	–
1339	Solvent-resistant filament tape. More conformable.	130	6.5/0,165	5500	$1x10^5$	275/481	5	1.0	35/3,8	I
1039	Solvent-resistant filament tape. More conformable.	130	7.0/0,177	5500	$1x10^5$	275/481	5	1.0	35/3,8	I

† Operating temperature is equivalent to UL Recognition temperature where applicable (See page 14).

3M™ Electrical Tapes

Acetate Cloth

These aesthetically pleasing acetate cloth tapes offer excellent conformability in coil-wrapping applications up to 105°C plus excellent absorption of electrical insulating resins and varnishes.

Available with one (1) adhesive system: aggressive rubber resin.

Thermosetting Rubber	Features	Operating Temp (°C)[1]	Total Thickness (mils)/(mm)	Dielectric Breakdown (V)	Insulation Resistance (megaohms)	Breaking Strength (lb/in)/(N/10 mm)	Elongation (% at break)	Electrolytic Corrosion	Adhesion to Steel (oz/in)/(N/10 mm)	CTI Material Group
11	Black. Printable.	105	8.0/0,203	2000	$2x10^4$	35/62	10	1	40/4,4	I
28		105	8.0/0,203	2500	$2x10^4$	40/70	10	1	40/4,4	I

Composite Film

3M Composite Film Tapes are excellent for general purpose insulation, anchoring, and banding in motors and transformers. They combine the high dielectric strength and edge-tear resistance of polyester film and nonwoven polyester mat for a conformable product with great puncture resistant and electrical properties.

Available in a variety of thicknesses and with two (2) adhesive systems: aggressive rubber resin and solvent-resistant acrylic.

Thermosetting Rubber	Features									
44	Economical, general purpose composite film tape. For general purpose electrical applications. Longer-length rolls.	130	5.5/0,139	5500	$>1x10^6$	40/70	50	1.0	65/7,1	I
44HT	Composite film tape with aggressive adhesive designed for motor applications.	130	5.5/0,139	5500	$>1x10^6$	40/70	50	1.0	80/8,8	I
55	Thicker composite film tape for better puncture resistance and higher dielectric applications.	130	7.5/0,190	6000	$>1x10^6$	35/62	30	1.0	80/8 ,8	IIIa
Acrylic	**Features**									
44D-A	A version of 44 Tape with twice the backing thickness for greater dielectric strength.	130	12/0,304	6000	$>1x10^6$	40/70	20	1.0	35/3,8	I
44T-A	A version of 44 Tape with three times the thickness for greater dielectric strength.	130	18/0,455	8500	$>1x10^6$	80/141	20	1.0	45/4,9	I

[1] Operating temperature is equivalent to UL Recognition temperature where applicable (See page 14).

Epoxy Film

3M has been vital to the development of epoxy film tapes. These offer solder and puncture resistance, high dielectric strength, conformability and UL recognition for flame retardancy at temperatures up to 155° C. 3M Epoxy Film tapes are designed to require fewer wraps to meet dielectric requirements, compared to typical glass cloth tapes. Their versatility can help reduce your tape inventory.

Available with two (2) adhesive system: aggressive thermosetting rubber resin and solvent-resistant acrylic.

Acrylic	Features	Operating Temp (°C) †	Total Thickness (mils)/(mm)	Dielectric Breakdown (V)	Insulation Resistance (megaohms)	Breaking Strength (lb/in)/(N/10 mm)	Elongation (% at break)	Electrolytic Corrosion	Adhesion to Steel (oz/in)/(N/10 mm)	CTI Material Group
1	High-performance epoxy tape. Thin. Printable UL 510 Flame retardant.	130	3.5/0,088	6500	>1 x 10^6	30/53	120	1.0	40/4,4	I
Super 20	Thicker, double-sided epoxy for higher temperature and dielectric. Printable. UL 510 Flame retardant.	155	5.0/0,127	8000	>1x10^6	45/79	120	1.0	30/3,3	I
Thermosetting Rubber	**Features**									
Super 10	Thicker, double-sided epoxy for higher temperature and dielectric. Rubber adhesive. UL 510 Flame retardant.	155	5.0/0,127	8000	>1x10^6	45/79	120	1.0	45/4,9	I

Paper

Paper tapes provide good cushioning, puncture resistance and toughness. Great for use as coil cover on bobbin-wound coils.

Available with one (1) adhesive system: aggressive rubber resin.

Thermosetting Rubber	Features	Operating Temp (°C) †	Total Thickness (mils)/(mm)	Dielectric Breakdown (V)	Insulation Resistance (megaohms)	Breaking Strength (lb/in)/(N/10 mm)	Elongation (% at break)	Electrolytic Corrosion	Adhesion to Steel (oz/in)/(N/10 mm)	CTI Material Group
12	Flatback backing.	105	5.5/0,14	2000	> 1x10^6	22/38,5	–	–	40/4,4	I
16	Thicker, crepe backing.	105	9.0/0,228	2500	> 1x10^6	25/44	10	–	50/5,5	I

† Operating temperature is equivalent to UL Recognition temperature where applicable (See page 14).

= Flame retardant. See page 14 for product specifications.

3M™ Electrical Tapes

Polyester Film

3M offers a variety of polyester tapes for insulating applications requiring a thin, durable tape with high dielectric strength. They can withstand higher-temperature conditions than tapes with acetate cloth backings. They are also conformable, exhibit excellent chemical, solvent and moisture resistance and resist cut-through and abrasion.

Available in flame retardant and non-flame retardant versions and with two (2) adhesive systems: aggressive rubber resin and solvent-resistant acrylic.

Acrylic	Features	Operating Temp (°C) †	Total Thickness (mils)/(mm)	Dielectric Breakdown (V)	Insulation Resistance (megaohms)	Breaking Strength (lb/in)/N/10 mm)	Elongation (% at break)	Electrolytic Corrosion	Adhesion to Steel (oz/in)/N/10 mm)	CTI Material Group
5	1-mil film. General purpose polyester tape. Clear.	130	2.5/0,063	5500	>1x10⁶	25/44	100	1.0	35/3,8	–
1318-1	1-mil film. Printable. Black or yellow.	130	2.5/0,063	5500	>1x10⁶	25/44	100	1.0	30/3,3	I
1350F-1	1-mil film. UL 510 Flame retardant. Black, white, or yellow.	130	2.5/0,063	5500	>1x10⁶	25/44	100	1.0	30/3,3	II
1350F-2	2-mil film. UL 510 Flame retardant. Thicker version of 1350F-1. Black, white, or yellow.	130	3.3/0,083	7000	>1x10⁶	50/88	110	1.0	30/3,3	IIIa
1351-1	1-mil film. UL 510 Flame retardant. Smooth, even unwind for use on automatic equipment. White.	130	2.5/0,063	5500	>1x10⁶	25/44	100	1.0	30/3,3	I
Thermosetting Rubber	**Features**									
54	1-mil film. General purpose polyester tape. Clear.	130	2.5/0,063	5000	>1x10⁶	25/44	100	1.0	45/4,9	I
56	1-mil film. General purpose polyester tape. Yellow.	130	2.3/0,058	5000	>1x10⁶			1.0		I
57	2-mil film version of 56. Thicker, higher dielectric. Yellow.	130	3.3/0,083	7000	>1x10⁶	50/88	110	1.0	60/6,5	I
58	2-mil film version of 54. Thicker, higher dielectric. Clear.	130	3.3/0,083	7000	>1x10⁶	50/88	110	1.0	60/6,5	I
74	0.5-mil film. Thin for coil applications where space is at a premium.	130	0.8/0,020	3500	>1x10⁶	12/21	100	1.0	20/2,2	I
75	1-mil film. Coated on both sides. For use in bonding applications requiring a double positive insulation barrier.	130	3.8/0,096	6500	>1x10⁶	25/44	100	1.0	45/4,9	–

† Operating temperature is equivalent to UL Recognition temperature where applicable (See page 14). = Flame retardant. See page 14 for product specifications.

Polyimide Film

3M polyimide film tapes are specially designed for high-temperature applications requiring a thin puncture-resistant backing. The physical and electrical properties of polyimide remain stable when used in such applications as coils, harnesses and capacitors, that are subjected to extreme temperatures.

Available with two (2) adhesive systems: solvent-resistant acrylic and high-temperature silicone.

	Features	Operating Temp (°C) †	Total Thickness (mils)/(mm)	Dielectric Breakdown (V)	Insulation Resistance (megaohms)	Breaking Strength (lb/in)/(N/10 mm)	Elongation (% at break)	Electrolytic Corrosion	Adhesion to Steel (oz/in)/(N/10 mm)	CTI Material Group
Silicone										
92	1-mil film. High-performance polyimide tape. High-temperature. Printable. UL 510 Flame retardant.	180	3.0/0,076		>1x10^6	30/53	55	1.0	25/2,8	IIIb
1093	1-mil film. High-temperature masking applications. UL 510 Flame retardant.	180	2.5/0,063	7500	–	35/62	50	–	20/2,2	–
Acrylic	**Features**									
1205	1-mil film. Solvent-resistant version of 92 Tape. UL 510 Flame retardant.	155	3.0/0,076	7500	>1x10^6	30/53	55	1.0	35/3,8	IIIb
1218	1-mil film. High-temperature and solvent-resistant. UL 510 Flame retardant.	180	3.0/0,076	6000	>1x10^6	30/53	55	1.0	19/2,1	IIIb

† Operating temperature is equivalent to UL Recognition temperature where applicable (See page 14).

= Flame retardant. See page 14 for product specifications.

3M™ Electrical Tapes

PTFE Film

Thin high-temperature PTFE tapes are used in applications requiring consistent performance and minimum shrinkage across a wide range of temperatures. They are extremely resistant to chemicals, have high arc resistance, are free of carbonizing materials and are great for non-stick applications. Great for use on high-temperature coils, capacitors, and wire harnesses.

Available with two (2) adhesive systems: solvent-resistant acrylic and high-temperature silicone.

Silicone	Features	Operating Temp (°C) †	Total Thickness (mils)/(mm)	Dielectric Breakdown (V)	Insulation Resistance (megaohms)	Breaking Strength (lb/in)/(N/10 mm)	Elongation (% at break)	Electrolytic Corrosion	Adhesion to Steel (oz/in)/(N/10 mm)	CTI Material Group
60	2-mil film. UL 510 Flame retardant.	180	4.0/0,102	9500	>1x10⁶	20/35	200	1.0	30/3,2	I
61	5-mil film. Thicker for higher dielectric and breaking strength. UL 510 Flame retardant.	180	7.0/0,178	15000	>1x10⁶	45/79	300	1.0	35/3,8	I
62	2-mil film. Printable. Bondable backside on liner for higher adhesion to its own backing, resins and varnishes. UL 510 Flame retardant.	180	4.0/0,102	9500	>1x10⁶	20/35	200	1.0	30/3,2	I
Acrylic	**Features**									
63	2-mil film. Solvent-resistant version of 60 Tape. UL 510 Flame retardant.	155	3.5/0,088	9500	>1x10⁶	20/35	200	1.0	35/3,8	I

† Operating temperature is equivalent to UL Recognition temperature where applicable (See page 14).

= Flame retardant. See page 14 for product specifications.

Vinyl

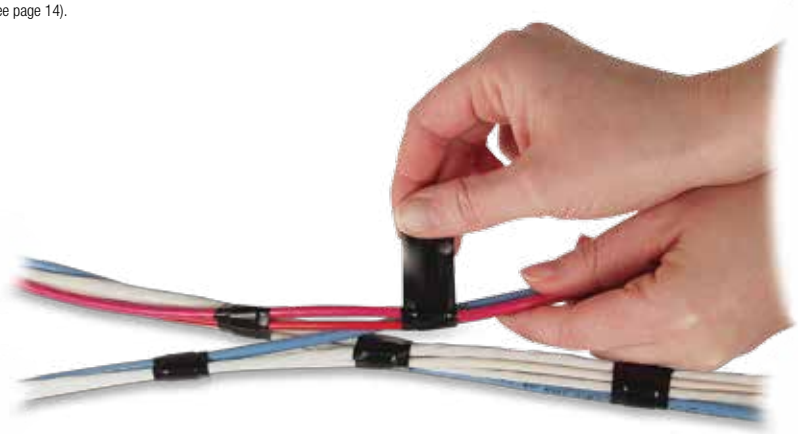
Scotch®, 3M™ Tartan™ and Temflex™ Vinyl Electrical Tapes combine the flexibility of a PVC backing with excellent electrical insulating properties, high dielectric strength, and resistance to moisture, UV rays, abrasion, corrosion, alkalies and acids. (Their rubber-based adhesive performs well over a range of temperatures).

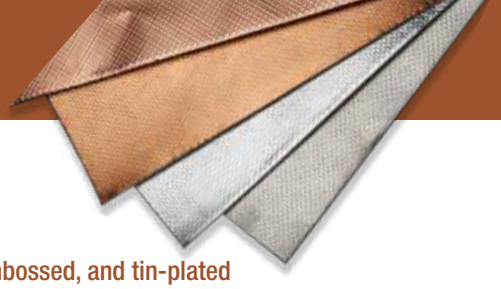
Fade-resistant vinyl comes in a range of colors for marking. For primary electrical insulation up to 600 volts, including wire harnessing, degaussing coils and high-voltage cables.

Rubber Non-thermosetting	Features	Operating Temp (°C) †	Total Thickness (mils)/(mm)	Dielectric Breakdown (V)	Insulation Resistance (megaohms)	Breaking Strength (lb/in)/(N/10 mm)	Elongation (% at break)	Electrolytic Corrosion	Adhesion to Steel (oz/in)/(N/10 mm)	CTI Material Group
Scotch® 22	10-mil heavy-duty black vinyl tape. Offers great mechanical strength and abrasion resistance. UL 510 Flame retardant.	80	10.0/0,254	12000	>1x10^6	20/35	200	1.0	25/2,7	–
Scotch® 33	7-mil general purpose black vinyl electrical tape. Good mechanical strength and abrasion resistance. UL 510 Flame retardant.	80	7.0/0,177	7000	>1x10^6	17/30	200	1.0	24/2,6	–
Scotch® Super 33+™	7-mil premium black vinyl electrical tape. Offers excellent adhesion and cold weather performance. UL 510 Flame retardant.	80/ 105	7.0/0,177	8750	>1x10^6	15/26	250	–	28/3,0	–
Scotch® 35	7-mil premium vinyl tape for color coding. Available in 9 fade- and weather-resistant colors. UL 510 Flame retardant.	80/ 105	7.0/0,177	8750	>1x10^6	17/30	225	–	20/2,2	–
Scotch® Super 88	8.5-mil premium black vinyl electrical tape. Offers excellent adhesion and cold weather performance. UL 510 Flame retardant.	80/ 105	8.5/0,215	10000	>1x10^6	20/35	250	–	25/2,7	–
3M™ Tartan™ 1710	7-mil general purpose black vinyl electrical tape. Good mechanical strength and abrasion resistance. UL 510 Flame retardant.	80	7.0/0,177	7500	>1x10^6	17/30	200	–	18/1,9	–
3M™ Temflex™ 1700	7-mil general purpose black vinyl electrical tape. Good mechanical strength and abrasion resistance. UL 510 Flame retardant.	80	7.0/0,177	7000	>1x10^6	17/30	200	–	24/2,6	–

† Operating temperature is equivalent to UL Recognition temperature where applicable (See page 14).

= Flame retardant. See page 14 for product specifications.





3M™ EMI Shielding Tapes

3M™ EMI Shielding Tapes are designed for applications requiring reliable point-to-point electrical contact, particularly EMI/RFI shielding, grounding and static charge draining. The tapes are easily die-cut and have a multitude of uses in electrical design and test laboratories for prototyping, design and troubleshooting.

Available in copper, aluminum, embossed, and tin-plated materials and with two (2) adhesive systems: solvent-resistant acrylic and conductive acrylic.

Conductive adhesive	Features	Roll Length[3]	Backing Thickness (mils)/(mm)	Total Thickness (mils)/(mm)	(lb/in)/(N/10 mm)	Adhesion to Steel[4] (oz/in)/(N/10 mm)		Electrical Resistance[6] (Ohms)
1115B	Aluminum foil, acrylic adhesive.	60 yds	4.5 mil (0,114 mm)	6.0 mil (0,152 mm)	40 lb/in (70 N/10 mm)	52 oz/in (5.6 N/10 mm)	N/A	0.0065
1120	Aluminum foil, acrylic adhesive.	36 yds	2.0 mil (0,05 mm)	4.0 mil (0,10 mm)	16 lbs/in (28 N/10 mm)	36 oz/in (3.9N/10 mm)	®	0.009
1126	Copper foil, acrylic adhesive.	36 yds	1.4 mil (0,04 mm)	3.5 mil (0,088 mm)	25 lb/in (44 N/10 mm)	36 oz/in (3.9N/10 mm)	®	0.003
1170	Aluminum foil, acrylic adhesive.	18 yds	2.0 mil (0,05 mm)	3.2 mil (0,08 mm)	20 lb/in (35 N/10 mm)	35 oz/in (3,8 N/10 mm)	®	0.010
1181	Copper foil, acrylic adhesive.[1]	18 yds	1.4 (0,04 mm)	2.6 mil (0,07 mm)	25 lb/in (44 N/10 mm)	35 oz/in (3,8 N/10 mm)	®	0.005
1182	Copper foil, acrylic adhesive[1] on both sides.	18 yds	1.4 mil (0,05 mm)	3.5 mil (0,09 mm)	25 lb/in (44 N/10 mm)	35 oz/in (3,8 N/10 mm)	®	0.010
1183	Tin-plated copper foil, acrylic adhesive.[1]	18 yds	1.4 mil (0,04 mm)	2.6 mil (0,07 mm)	25 lb/in (44 N/10 mm)	35 oz/in (3,8 N/10 mm)	®	0.005
Nonconductive adhesive	**Features**							
425	Aluminum foil, acrylic adhesive.	60 yds	2.8 mil (0,07 mm)	4.6 mil (0,12 mm)	30 lb/in (52 N/10 mm)		N/A	–
1125	Copper foil, acrylic adhesive.	36 yds	2.8 mil (0,07 mm)	3.5 mil (0,088 mm)	25 lb/in (44 N/10 mm)	47oz/in (5.1N/10 mm)	®	N/A
1194	Copper foil, nonconductive adhesive.	36 yds	2.8 mil (0,07 mm)	3.0 mil (0,08 mm)	25 lb/in (44 N/10 mm)	47oz/in (5.1N/10 mm)	®	N/A

[1] Conductive particles in the adhesive provide the electrically conductive path between the substrate and the backing.
[2] The embossed pattern provides the electrically conductive path through the adhesive.
[3] Multiple-length rolls and custom slit widths are available by special order.

Test methods:
[4] ASTM D1000
[5] Most 3M foil shielding tapes are UL Recognized ( )for flame retardancy per UL 510, Product Category OANZ 2, File E17385.
[6] Resistance measured through the adhesive. MIL-STD-202 Method 307 maintained at 5 PSI (3,4 N/sq cm) measured over 1 sq in. surface area.

= Flame retardant. See page 14 for product specifications.

3M™ EMI Shielding Tapes

Conductive-through-adhesive	Features	Roll Length[3]	Backing Thickness (mils)/(mm)	Total Thickness (mils)/(mm)	Breaking Strength[4] (lb/in)/(N/10 mm)	Adhesion to Steel[4] (oz/in)/(N/10 mm)	Flame Retardant[5]	Electrical Resistance[6] (Ohms)
1245	Embossed copper foil, acrylic adhesive.[2]	18 yds	1.4 mil (0,04 mm)	4.0 mil (0,10 mm)	25 lb/in (44 N/10 mm)	35 oz/in (3,8 N/10 mm)	®	0.001
1267	Embossed aluminum foil, acrylic adhesive.[2]	18 yds	2.0 mil (0,05 mm)	5.0 mil (0,13 mm)	20 lb/in (35 N/10 mm)	35 oz/in (3,8 N/10 mm)	®	0.005
1345	Embossed tin-plated foil, acrylic adhesive.[2]	18 yds	1.4 mil (0,04 mm)	4.0 mil (0,10 mm)	25 lb/in (44 N/10 mm)	35 oz/in (3,8 N/10 mm)	®	0.001
Conductive adhesive	**Features**							
CN-3190	Anti-corrosion metallized polyester rip-stop fabric, acrylic adhesive.	54.5 yds	3.5 mil (0,09 mm)	4.1 mil (0,10 mm)	40 lb/in (70 N/10 mm)	30 oz/in (3.3 N/10 mm)	N/A	0.005
CN-3490	Anti-corrosion, metallized nonwoven fabric, acrylic adhesive.	54.5 yds	2.0 mil (0,05 mm)	2.6 mil (0,07 mm)	35 lbs/in (61 N/10 mm)	30 oz/in (3.3 N/10 mm)	N/A	0.005
CN-4190	Anti-corrosion, metallized polyester rep-stop fabric, acrylic adhesive both sides.	54.5 yds	3.5 mil (0,09 mm)	4.7 mil (0,12 mm)	40 lbs/in (70 N/10 mm)	40 oz/in (4.4 N/10 mm)	N/A	0.005
CN-4490	Anti-corrosion, metallized nonwoven fabric, acrylic adhesive both sides.	109.3 yds	1.2 mil (0,03 mm)	2.5 mil (0,06 mm)	35 lbs/in (61 N/10 mm)	40 oz/in (4.4 N/10 mm)	N/A	0.005
X-7001	Anti-corrosion, metallized polyester fabric, acrylic adhesive both sides.	10.9 yds	2.0 mil (0,05 mm)	5.0 mil (0,13 mm)	35 lbs/in (61 N/10 mm)	60 oz/in (16.6 N/10 mm)	N/A	0.015 (over a 25x25 mm area)
2191FR	Anti-corrosion, metallized nonwoven fabric, acrylic adhesive.	–	5.2 mil (0,13 mm)	5.6 mil (0,14 mm)	60 lbs/in 105 N/ 10 mm	20 oz/in 2.2 N/10 mm	®	0.015 (over a 25x25 mm area)

[1] Conductive particles in the adhesive provide the electrically conductive path between the substrate and the backing.
[2] The embossed pattern provides the electrically conductive path through the adhesive.
[3] Multiple-length rolls and custom slit widths are available by special order.

Test methods:
[4] ASTM D 1000
[5] Most 3M foil shielding tapes are UL Recognized (®)for flame retardancy per UL 510, Product Category OANZ 2, File E17385.
[6] Resistance measured through the adhesive. MIL-STD-202 Method 307 maintained at 5 PSI (3,4 N/sq cm) measured over 1 sq in. surface area.

= Flame retardant. See page 14 for product specifications.

Tape Construction

Smooth foil backings with conductive adhesive

3M™ EMI Shielding Tapes 1170 (aluminum), 1181 (copper) and 1183 (tin-plated copper) are smooth-backed foil tapes that establish secure electrical contact with the application surface by means of a unique adhesive. Broadly distributed conductive particles in the adhesive provide a multitude of low-resistance paths between the backing and the substrate. (Figure 1)

Embossed foil backings

The backings of 3M™ Shielding Tapes 1245 (copper), 1267 (aluminum) and 1345 (tin-plated copper) are impressed with an embossed pattern (Figure 2) that protrudes through the acrylic adhesive to make direct electrical contact with the application surface. This reliable "through-the-adhesive" conductivity system provides stable contact resistance and a high level of shielding effectiveness.

Tin-plated foil backings

The copper used in 3M EMI Shielding Tapes 1183 (smooth backing) and 1345 (embossed backing) is plated on both sides with tin to provide exceptional solderability and resistance to corrosion and oxidation. The tapes are designed to remain conductive even after oxidation.

Conductive adhesive on both sides

3M Shielding Tape 1182 is a copper foil tape coated on both sides with conductive acrylic adhesive. This unique construction offers an excellent method of grounding and bonding conductive surfaces. It also exhibits low thermal resistance. Tape 1182 is supplied with a removable liner on each side for ease of handling.

Smooth foil backing with nonconductive adhesive

3M Shielding Tape 1194 is a smooth-backed copper tape that features the same high quality solvent-resistant, acrylic adhesive as other 3M foil tapes. Good solderability makes it an economical choice for applications like connector and cable shielding, grounding, electrostatic shielding between transformer windings, outer wrap for coils, and attachment of connector tabs on rolled film-and-foil capacitors.

Conductive fabric tape

3M Fabric Tape CN-3190 is an anti-corrosion polyester ripstop fabric backing with an electrically conductive acrylic adhesive. It provides effective copper-nickel shielding with excellent flexibility and conformability as well as light weight and high strength.

Adhesive

Both the conductive and nonconductive versions use the same acid-free, corrosion-resistant acrylic resin.

Figure 1 Smooth Backing with Conductive Adhesive

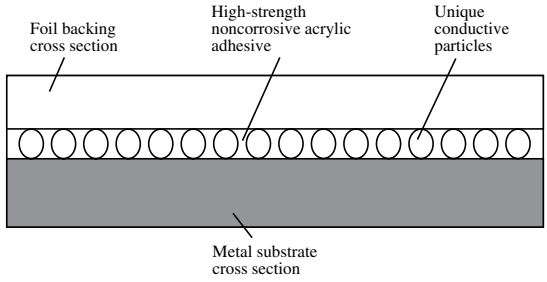
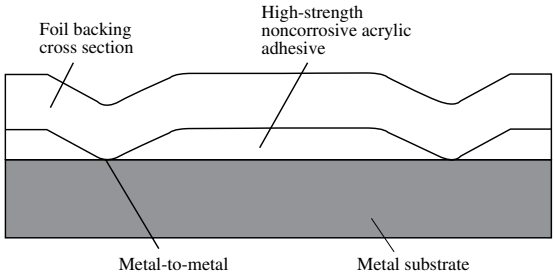
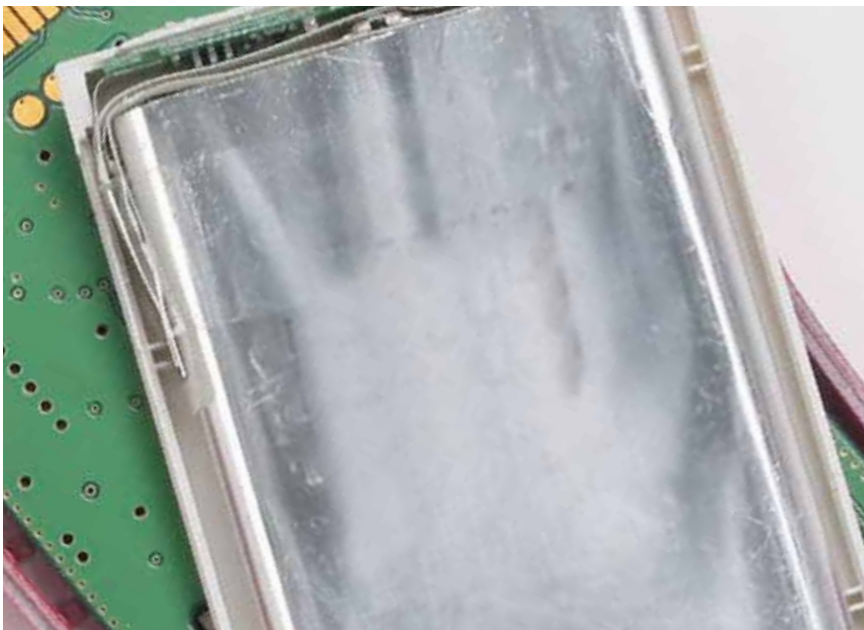


Figure 2 Embossed Backing with "Through-the-Adhesive" Contact



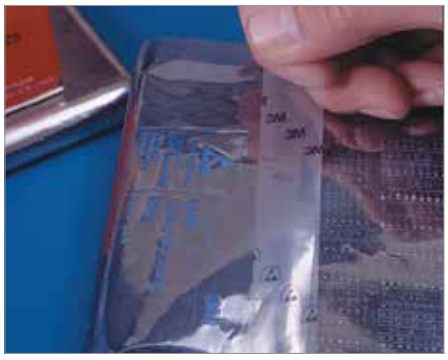


3M™ Specialty Tapes

These tapes have a multitude of uses in component design and manufacturing as well as to support the insulation of components.

General Use/Antistatic		Features	Backing Description	Breaking Strength (lb/in)/(N/10 mm)	Adhesion to Steel (oz/in)/(N/10 mm)	Static Charge Generation at 50% RH: Remove from roll (volts)	Static Charge Generation at 50% RH: Remove from stainless steel (volts)
	40	General-use utility tape, 1-mil clear polyester film backing, anti-static conductive polymer adhesive.	Film	20/35	15/1,7	5	5
	40PR	General-use utility tape, 1-mil clear polyester film backing, anti-static conductive polymer adhesive. With preprinted static symbol.	Film	20/35	15/1,7	5	5

Miscellaneous		Features	Adhesive	Operating Temperature (°C)	Total Thickness (mils)/(mm)
	1157R	Porous Rayon Non-Woven. 1157R tape is specifically designed to allow thorough penetration of the impregnating resin inside bobbin-wound coils.	Acrylic	130	4.0/0,102



Industry Specifications

Scotch® Vinyl Electrical Tapes / 3M™ Tartan™ and Temflex™ Vinyl Electrical Tapes

UL Listed in UL File E129200, Product Category OANZ

Specification	Tape Number	Type
UL 510 – For use as electrical insulation up to 600 volts and 80°C	22, 33, Super 33+™, 35, Super 88, 1700, 1710	PVC Insulating Tape
Flame Retardancy – The following tapes meet the flame retardancy requirements of UL 510	22, 33, Super 33+™, 35, Super 88, 1700, 1710	PVC Insulating Tape

CSA Certified in CSA File LR48769, Product Class 9052-02

Specification	Tape Number	Type
CSA 22.2 No. 197 – For use as electrical insulation up to 1000 volts at temperatures not to exceed 80°C	22, 1710	PVC Insulating Tape
For use as electrical insulation up to 1000 volts at temperatures not to exceed 105°C	Super 33+™, 35, Super 88	PVC Insulating Tape

3M Electrical Insulating Tapes for Electrical Device Applications

UL Recognized components in UL File E17385, product Category OANZ2

Specification	Tape Number	Type
For use at temperatures not to exceed 130°C	44, 44D-A, 44HT, 44T-A, 55 1 5, 54, 56, 57, 58, 74, 75, 1098-1, 1318-1, 1350F-1, 1350F-2, 1351-1 46, 1039, 1046, 1339	Composite Film Epoxy Film Polyester Film Filament Reinforced
For use at temperatures not to exceed 150°C	27, 79	Glass Cloth
For use at temperatures not to exceed 155°C	Super 10, Super 20 1139 1205	Epoxy Film Filament Reinforced Polyimide Film
For use at temperatures not to exceed 180°C	92, 92-2, 1093, 1218	Polyimide Film
For use at temperatures not to exceed 200°C	69	Glass Cloth

Product Shelf Life

All 3M™ Electrical Tapes have a 5-year shelf life (excluding 40 Tape) following the date of manufacture. It is 3M's standard procedure to ship any product with at least two years of its shelf life remaining. Any special request for a specific shelf life requirement may require a larger-than-stated minimum order quantity (MOQ) that justifies a non-scheduled product run. Contact your 3M sales representative for specific shelf life and minimum order quantity requirements. (No product returns will be accepted on special shelf life request orders.)

3M™ Electrical Tapes

Military

Specification	Previously Known As	Tape Number	Type
A-A-59770A (Type MFT 2.5)	MIL-15126F	54, 56	Polyester Film
A-A-59770A (Type MFT 3.5)	MIL-15126F	57, 58	Polyester Film
A-A-59770A (Type MF 2.5)	MIL-15126F	5, 1318-1, 1350F-1, 1351-1	Polyester Film
A-A-59770A (Type ACT)	MIL-15126F	11, 28	Acetate Cloth
A-A-59770A (Type GFT)	MIL-15126F	90	Glass Cloth
MIL-I-19166C		69	Glass Cloth
A-A-59474C, Type 1, Class 1	MIL-23594C	60	PTFE Film
A-A-59474C, Type 2, Class 1	MIL-23594C	62 Bondable	PTFE Film
A-A-55809		15, 22, Super 33+™, 35, Super 88	Vinyl

Tape Dimensions

Standard Lengths*	Tape Number
16 meters (18 yards)	1170, 1181, 1182, 1183, 1245, 1267, 1345
18 meters (20 yards)	1710
20 meters (22 yards)	22, 33, Super 33+™, 35, Super 88
33 meters (36 yards)	22, 33, Super 33+™, 44T-A, 60, 61, 62, 63, 69, 75, Super 88, 92, 92-2, 1093, 1115B, 1120, 1125, 1126, 1194, 1205, 1218, 1700, 1710
45 meters (49 yards)	44D-A
55 meters (60 yards)	12, 16, Super 10, Super 20, 27, 46, 79, 90, 425, 1039, 1046, 1076, 1139, 1339, 9755
66 meters (72 yards)	1, 5, 11, 28, 40, 54, 55, 56, 57, 58, 74, 1098-1, 1318-1, 1350F-1, 1350F-2, 1351-1
82 meters (90 yards)	44, 44HT

Slitting

Precision slitting ± 0.005" (0.127 mm) may be available for some tapes upon request. The minimum width for this service is 0.125" and the maximum width is 2.000". Standard slitting tolerances are dependent on the type of backing. All tapes have a width tolerance of ± 1/64", with the exception of some polyesters, vinyl, acetate and glass cloth which have a tolerance of ± 1/32".

Printing Options

There are five available methods for imprinting tapes: Ink Jet, Hand Stamping/Hot Stamping, Letterpress, Flexographic, and Offset. All 3M™ Electrical Tapes are printable by hot stamping. Some tapes in the 3M line are more suited for the other methods. Printer converters who print with flexography should contact their 3M sales representative to determine the tapes that are suitable for this printing method.

* Other tape lengths may be available; contact your 3M sales representative or Customer Service for information.
† These tape charts are intended to serve as comparative guides for tape selection purposes. All property values shown are typical and are not intended for specification purposes. They are based on tests performed in accordance with ASTM D1000, except Electrolytic Corrosion Factor, which is a 3M test method available on request. Proposed specifications detailing maximum and minimum values are also available on request.

About 3M™ Insulating and Conductive Tapes

Tape Adhesives

Thermosetting Rubber (RT): Thermosetting rubber adhesives have high initial adhesion and electrical purity. When properly thermoset, a rubber-resin adhesive system is designed to provide more aggressive adhesion and bonding, higher solvent resistance and higher heat resistance.

Acrylic (A): Acrylic adhesives have high solvent resistance and do not require pre-baking or thermosetting because they are made from synthetic polymers specifically formulated to resist heat, oxidation, solvents and oils, and exhibit acceptable performance in many applications without a cure cycle.

Silicone (ST): Silicone adhesive systems are perfect for high temperature applications because they have exceptional heat resistance, are inorganic, require higher temperatures for the thermosetting reaction, and, if burned, leave a nonconductive residue.

Important Note: Before using any 3M products, you should review the product label and/or Safety Data Sheet.

Recommended Thermosetting Time & Temperatures for Adhesive Systems			
Time	Rubber-Resin	Acrylic	Silicon
1 hour	150°C (300°F)	150°C (300°F)	–
2 hours	135°C (275°F)	135°C (275°F)	–
3 hours	120°C (250°F)	120°C (250°F)	260°C (500°F)
24 hours	–	–	260°C (500°F) (for maximum solvent resistance)

Other 3M™ Tape Solutions

Customer Plant Survey: 3M will provide a technically trained sales professional who can survey your plant, manufacturing procedures, equipment and tapes, and suggest ways to improve your product cost effectiveness and make your plant more efficient – all at no cost to you. Ask your 3M representative for more details.

ISO 9002 Registration

The 3M facilities which manufacture the insulating and conductive tapes in this publication have been registered by Underwriters Laboratories, Inc. to the International Standards Organization (ISO) 9002 quality management system standard. For the customer, registration provides proof of the quality of suppliers' systems. For companies with numerous manufacturing sites, such as 3M, ISO registration provides a consistent and efficient method of standardization. Prior to actual use, the product label and/or Material Safety Data Sheet should be reviewed.

Log Only Products

The following 3M™ Tapes are not available in slit rolls: 12, 16, 44D-A, 44T-A, 55, 92-2, 1093, 1157R, 1206, 1318, 1350F, 1350T and 1351. These products must be purchased through an authorized slitter/distributor.

Industry Standard Test Methods

This publication is a comparative guide for tape selection purposes. All property values shown are typical and are not intended for specification purposes. With the exception of Electrolytic Corrosion Factor, which is a 3M Test Method available on request, the properties are based on tests performed in accordance with recognized industry standard procedures:

- IEC 60454 Specification for pressure-sensitive adhesive tapes for electrical purposes Part 2: Methods of Test
- ASTM-D1000 Test methods for pressure-sensitive adhesive-coated tapes used for electrical and electronic applications

Proposed specifications detailing maximum and minimum values are also available.

Other Quality 3M Electrical Products

3M makes exceptional high-temperature flexible insulation products, heat shrink tubing and molded shapes, liquid resins and wire management products for electrical and electronic applications. For complete information, go to www.3M.com/electrical/oem.

3M™ Flexible Insulation Products

3M™ Flexible Insulation is recommended for:

- Ground, phase and interwinding insulation for dry-type transformers
- Slot, phase and wedge insulation for electric motors and generators
- Flame barrier insulation for appliances
- Collars for voice coils used in loudspeakers
- Lens wrap cushioning for eye glass lens production
- Wire and cable wrap
- Specialty paper base for tamper-proof labels

3M ThermaVolt Calendared Inorganic Insulating Paper

3M ThermaVolt Calendared Insulating Paper is an inorganic-based paper developed to meet the high performance required for use in high-temperature, dry-type transformers. It offers good dielectric characteristics and thermal conductivity – making it especially suitable for use as interwinding insulation in strip-wound coils. It also has been designed for use as major ground insulation in electrical insulation systems up to Class N (200˚ C).

3M CeQUIN I and II Inorganic Insulating Paper, Laminates and Boards

3M CeQUIN Inorganic Insulating Paper is 3M's highest inorganic-content paper; comprised primarily of glass fibers and microfibers, inorganic fillers, and less than 10% organic materials. It is capable of performance at temperature peaks up to 250°C and is a highly flexible paper. This paper has found a wide variety of uses over the years including use as interwinding insulation for foil wound dry-type transformers.

3M TufQUIN 110 Hybrid Insulating Paper

3M TufQUIN 110 Hybrid Insulating Paper is a flexible, conformable paper which has physical toughness in the form of high tensile strength and excellent tear resistance. TufQUIN 110 paper offers good dielectric characteristics and thermal conductivity in conjunction with high-temperature performance.

3M Thermal Shield PPS Non-Woven Insulating Paper

3M Thermal Shield PPS Non-Woven Insulating Paper is designed for use in applications requiring long-term exposure to high temperatures. The paper is resistant to some chemicals including oils, solvents, and most acids and bases. Thermal Shield paper can be used in a variety of applications without drying. Thermal Shield paper may be laminated to polyester film or resin coated to help enhance its performance.

3M Flexible Insulation Products also are available in laminate form, as two-ply and three-ply using polyester film. Ask your 3M sales representative or authorized distributor for details.

Voltage Endurance

3M Inorganic Insulating Materials retain a high percentage of dielectric strength even after extended exposure to high operating temperatures. They also will exhibit greater voltage endurance under continuous electrical stress than many other electrical insulation materials, helping improve equipment reliability.

Thermal Conductivity

The high thermal conductivity of inorganic papers helps achieve the heat dissipation required in today's high-efficiency electrical apparatus, allowing the design of smaller, more cost-effective equipment.

Varnish Absorption

The good varnish absorption characteristics of inorganic paper can enhance its already high thermal conductivity, allowing equipment to run cooler, quieter, and last longer.

Low Moisture Absorption

Manufactured with less than 1% moisture content, inorganic papers exhibit low moisture absorption even in humid environments. This gives them dimensional stability and reduces the need for extended drying cycles.

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Before using these products, you must evaluate them and determine if they are suitable for your intended application. You assume all risks and liability associated with such use.

Warranty; Limited Remedy; Limited Liability.

3M's product warranty is stated in its Product Literature available upon request. **3M MAKES NO OTHER WARRANTIES INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.** If these products are defective within the warranty period stated above, your exclusive remedy shall be, at 3M's option, to replace or repair the 3M product or refund the purchase price of the 3M product. **Except where prohibited by law, 3M will not be liable for any indirect, special, incidental or consequential loss or damage arising from these 3M products, regardless of the legal theory asserted.**

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