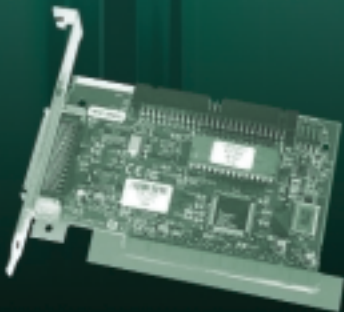


3M™ Electrical, Electronic and EMI Shielding Tapes Selection Guide



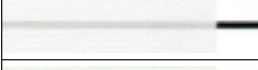
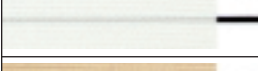
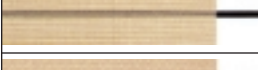
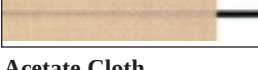
3M *Innovation*



An electrical grade tape should always be used in the manufacture of electrical components. The correct tape will have the necessary balance of electrical and mechanical properties along with good handling characteristics that will contribute to overall productivity by reducing waste of time and materials. The simple appearance of a roll of pressure-sensitive adhesive (PSA) tape does not reveal the complex nature of the material science, technology and advanced production processes that are involved. 3M™ Electrical Tapes are made from a broad range of backings and adhesives to meet the requirements of different applications and environments. Extensive quality control and testing, combined with accurate process controls, ensure that customers get high quality electrical grade products.

3M™ Electrical Tapes

Glass Cloth

	Number	Features	Backing Description	Adhesive	Operating Temperature (°C) †	Total Thickness (mils)/(mm)	Dielectric Breakdown (Volts)	Insulation Resistance (megohms)	Breaking Strength (lb/in)/(N/10 mm)	Elongation (% at Break)	Electrolytic Corrosion Factor	Adhesion to Steel (oz/in)/(N/10 mm)	UL 510 Flame Retardant	CTI Material Group
	27	Edge-tear resistant, conformable, abrasion resistant; for use as coil cover, anchor, banding and core, layer and crossover insulation; PRINTABLE.	Glass Cloth	RT	150	7.0/0.177	3,000	4.5 x 10 ⁴	150/262	5	0.9	30/3.3	–	I
	68	Edge-tear resistant, conformable, high-temperature, flame-retardant; for use as coil cover, coil banding, and crossover insulation.	Saturated Glass Cloth	ST	180	7.0/0.177	2,500	–	170/298	8	–	40/4.4	YES	–
	69	Edge-tear resistant, conformable, high-temperature flame-retardant adhesive; for use as coil cover, anchor, for banding and core, layer and crossover insulation; PRINTABLE.	Glass Cloth	ST	200	7.0/0.177	3,000	4.8 x 10 ⁴	180/314	5	0.9	40/4.4	Yes	I
	79	Edge-tear resistant, conformable, solvent-resistant; for use as coil cover, anchor, and as core, layer and crossover insulation; PRINTABLE.	Glass Cloth	A	150	7.0/0.177	3,000	2.7 x 10 ³	150/262	5	0.9	30/3.3	–	I
	89	Edge-tear resistant, conformable, for use as coil cover, anchor, banding, and crossover insulation.	Saturated Glass Cloth	RT	130	7.0/0.177	2,000	4.5/0.11	170/298	8	–	40/4.4	–	–
	5151	An easy unwind glass cloth tape impregnated with PTFE and coated with a silicone adhesive for high temperature resistance and abrasion resistance.	Glass Cloth	ST	204	4.5/0.11	–	–	100/176	–	–	30/3.3	–	–
	5153	An easy unwind glass cloth tape impregnated with PTFE and coated with a silicone adhesive for high temperature resistance and abrasion resistance.	Glass Cloth	ST	204	6.8/0.17	–	–	150/260	–	–	35/3.8	–	–

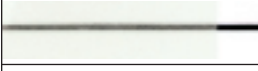
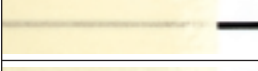
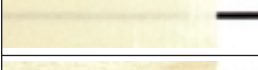
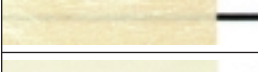
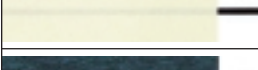
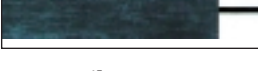
Acetate Cloth

	11	Conformable; for use as coil cover, black; . PRINTABLE	Acetate Cloth	RT	105	7.0/0.178	2,000	2 x 10 ⁴	35/62	10	1.0	40/4.4	–	I
	28	Similar to 11 Tape, white; PRINTABLE.	Acetate Cloth	RT	105	8.0/0.203	2,500	2 x 10 ⁴	40/70	10	1.0	40/4.4	–	I
	1554K	Conformable and PRINTABLE. Good for anchoring ferrite strips on deflection yokes and for insulating and holding coil applications where flame retardancy is needed. Available in black and white.	Acetate Cloth	A	105	9.7/0.245	2,000	2 x 10 ⁴	40/70	15	0.9	31.5/3.43	Yes	–

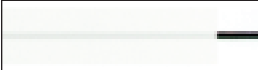
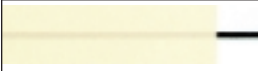
Cotton Cloth

	65	Conformable. Cushioning around TV tube necks, stick-wound coils and lead anchors.	Cotton Cloth	R	105	9.0/0.05	1,000	–	35/62	5	–	25/2.7	–	–
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Composite Film

	44	Puncture resistant; excellent electrical properties; tough, conformable; for insulating, anchoring and banding in motors and transformers.	Polyester Film/Mat	RT	130	5.5/0.139	5,500	>1 x 10 ⁶	40/70	50	1.0	60/6.6	–	I
	44A	Puncture resistant; excellent electrical properties; tough, conformable; for insulating, anchoring and banding in motors and transformers.	Polyester Film/Mat	A	130	5.5/0.139	5,500	>1 x 10 ⁶	40/70	50	1.0	20/2.2	–	I
	44D-A	Reinforced tape with greater thickness that offers efficiency and effectiveness in building coil margin barriers. (Suitable for 44D tape applications.)	Polyester Film/Mat	A	130	12/0.304	6,000	>1 x 10 ⁶	40/70	20	1.0	35/3.8	–	I
	44T-A	Reinforced tape with greater thickness that offers efficiency and effectiveness in building coil margin barriers. (Suitable for 44T tape applications.)	Polyester Film/Mat	A	130	18/0.455	8,500	>1 x 10 ⁶	80/141	20	1.0	45/4.9	–	I
	55	Edge-tear, puncture and abrasion resistant; for use as coil cover, lead pad and core, layer and crossover insulation.	Polyester Film/Mat	RT	130	7.5/0.190	6,000	>1 x 10 ⁶	35/62	30	1.0	80/8.7	–	I
	MR94	Excellent electrical properties; conformable; for insulating, anchoring, banding and protecting start lead wires, terminal strips, end turns and connections on motors and transformers.	Polyester Film/Mat	RT	130	4.0/0.101	5,000	>1 x 10 ⁶	30/53	50	1.0	60/6.6	–	I
	MR94B	Excellent electrical properties; conformable; for insulating, anchoring, banding and protecting start lead wires, terminal strips, end turns and connections on motors and transformers.	Polyester Film/Mat	RT	130	4.0/0.101	5,000	>1 x 10 ⁶	30/53	50	1.0	60/6.6	–	IIla

Epoxy Film

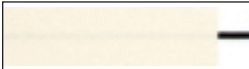
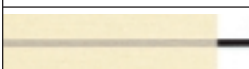
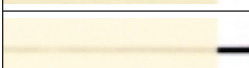
	1	2.2-mil flame-retardant backing; excellent handling properties, high dielectric strength, solvent and flagging resistant; for use as an outer wrap on wrap and fill capacitors, coil cover, interlayer insulation and wire harness; PRINTABLE.	Epoxy Film	A	130	3.5/0.088	6,500	>1 x 10 ⁶	30/53	120	1.0	40/4.4	Yes	I
	Super 10	Tough, conformable, resistant to solder damage, puncture resistant, good electrical properties, good handling properties; for use as coil cover, anchor, harnessing, banding and as core, layer and crossover insulation.	Epoxy Film	RT	155	5.0/0.127	8,000	>1 x 10 ⁶	45/79	120	1.0	45/4.9	Yes	I
	Super 20	Tough, conformable, resistant to puncture and solder damage, good electrical and handling properties; excellent flagging, solvent resistance; good high-temperature shear strength; for use as coil cover, anchor, harnessing, banding and as core, layer and crossover insulation; PRINTABLE.	Epoxy Film	A	155	5.0/0.127	8,000	>1 x 10 ⁶	45/79	120	1.0	30/3.3	Yes	I

† Operating Temperature is equivalent to UL Recognition Temperature where applicable (see page 10).

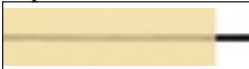
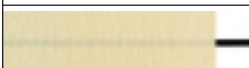
3M™ Electrical Tapes

Number	Features	Backing Description	Adhesive	Operating Temperature (°C) †	Total Thickness (mils)/(mm)	Dielectric Breakdown (Volts)	Insulation Resistance (megohms)	Breaking Strength (lb/in)/(N/10 mm)	Elongation (% at Break)	Electrolytic Corrosion Factor	Adhesion to Steel (oz/in)/(N/10 mm)	UL 510 Flame Retardant	CTI Material Group
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Filament Reinforced

	 46	Good tensile strength and edge-tear resistance; for use in end-turn taping.	Polyester Film/Glass Filament	RT	130	7.0/0.177	5,500	3 x 10 ⁶	275/481	5	1.0	50/5,5	—	II
	 1139	Solvent-resistant, high tensile strength; for use in heavy-duty bundling, holding, reinforcing application, and air and oil-filled transformer transfer.	Polyester Film/Glass Filament	A	155	6.5/0.165	5,500	—	225/394	6	—	35/3,8	—	—
	 1146	Good tensile strength and edge-tear resistance; for use in end-turn taping.	Polyester Film/Glass Filament	RT	130	6.5/0.165	5,500	—	300/525	5	—	55/6.05	—	—
	1276	Solvent-resistant, high shear strength adhesive; good tensile strength for holding in oil-filled transformer applications.	Paper/Glass Filament	A	105	9.0/0.228	3,500	—	275/481	5	1.0	40/4,4	—	—
	 1339	Solvent-resistant, high shear strength adhesive; good tensile strength and edge-tear resistance; for holding applications.	Polyester Film/Glass Filament	A	130	6.5/0.165	5,500	1 x 10 ⁶	275/481	5	1.0	35/3,8	—	I

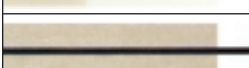
Paper

	12	For banding coils and for cover on bobbin-wound coils.	Flatback	RT	105	5.5/0.14	2,000	>1 x 10 ⁶	30/53	—	—	45/4,9	—	I
	16	Conformable; for use as coil cover on bobbin-wound coils.	Crepe	RT	105	9.0/0.228	2,500	>1 x 10 ⁶	25/44	10	—	50/5,5	—	I

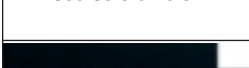
Polyimide Film

	 92	1-mil film; tough, thin, designed for high-temperature applications; used on coils, capacitors and harnesses; PRINTABLE.	Film	ST	180	3.0/0.076	7,500	>1 x 10 ⁶	30/53	55	1.0	25/2,8	Yes	IIIb
	 1093	1-mil film; tough, thin, puncture resistant; for use in high-temperature masking and DC/fractional motor applications.	Film	ST	180	2.5/0.063	7,500	—	35/62	50	—	20/2,2	Yes	—
	 1205	1-mil film; solvent-resistant version of 92 Tape.	Film	A	155	3.0/0.076	7,500	>1 x 10 ⁶	30/53	55	1.0	35/3,8	Yes	IIIb
	 1206	1-mil film; tough, thin, solvent resistant version of 1093 Tape.	Film	A	155	2.2/0.055	7,500	—	30/53	35	—	35/3,8	—	—

PTFE Film

	 60	2-mil film; consistent physical and electrical properties over a broad temperature range; for use on high-temperature coils, capacitors and wire harnesses.	Film	ST	180	4.0/0.102	9,500	>1 x 10 ⁶	20/35	200	1.0	30/3,2	Yes	I
	 61	5-mil film; suitable for applications similar to 60 Tape where high dielectric and breaking strength are required.	Film	ST	180	7.0/0.178	15,000	>1 x 10 ⁶	45/79	300	1.0	35/3,8	Yes	I
	 62	2-mil film; bondable backside for higher adhesion to its own backing and better bonding of resins and varnishes; suitable for applications similar to 60 Tape; PRINTABLE	Bondable Film on liner	ST	180	4.0/0.102	9,500	>1 x 10 ⁶	20/35	200	1.0	30/3,2	Yes	I
	 63	2-mil film; similar to 60 Tape; solvent-resistant adhesive; for use where chemical properties are more important than temperature resistance.	Film	A	155	3.5/0.088	9,500	>1 x 10 ⁶	20/35	200	1.0	35/3,8	Yes	I

Vinyl

	 22	Heavy-duty insulation designed for general purpose use where greater mechanical strength and abrasion resistance are required.	PVC	RN	80	10.0/0.254	12,000	>1 x 10 ⁶	20/35	200	1.0	25/2,7	Yes	—
	 33	Provides moisture-tight electrical and mechanical protection; good resistance to abrasion, moisture, alkalies, acids and varying weather conditions (including ultraviolet exposure).	PVC	RN	80	7.0/0.177	7,000	>1 x 10 ⁶	17/30	200	1.0	24/2,6	Yes	—
	 Super 33+	All-weather vinyl insulating tape; conformable for cold weather applications; excellent resistance to abrasion, moisture, alkalies, acids, UV rays and weather. Thicker for quicker build-up.	PVC	RN	80/105	7.0/0.177	8,750	>1 x 10 ⁶	15/26	250	—	28/3,0	Yes	—
	 See Colors Below 35	Color coding tape available in 9 fade-resistant colors (see below); abrasion and weather resistant; for use in phase identification, color coding leads and piping systems, and for marking safety areas; resistant to moisture, alkalies, acids and copper corrosion.	PVC	RN	80/105	7.0/0.177	8,750	>1 x 10 ⁶	17/30	225	—	20/2,2	Yes	—
	 Super 88	All-weather vinyl insulating tape; conformable for cold weather applications; excellent resistance to abrasion, moisture, alkalies, acids, and copper corrosion.	PVC	RN	80/105	8.5/0.215	10,000	>1 x 10 ⁶	20/35	250	—	25/2,7	Yes	—
	 1710	Good quality, economical general purpose insulating tape; good resistance to abrasion, moisture, alkalies, acid, copper corrosion and varying weather conditions (including ultraviolet).	PVC	RN	80	7.0/0.177	7,500	>1 x 10 ⁶	17/30	200	—	24/2,6	Yes	—

† Operating Temperature is equivalent to UL Recognition Temperature where applicable (see page 9).



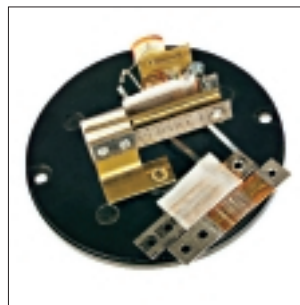
3M™ Electrical Tapes

Polyester Film

Number	Features	Backing Description	Adhesive	Operating Temperature (°C) †	Total Thickness (mils)/(mm)	Dielectric Breakdown (Volts)	Insulation Resistance (megohms)	Breaking Strength (lb/in)/(N/10 mm)	Elongation (% at Break)	Electrolytic Corrosion Factor	Adhesion to Steel (oz/in)/(N/10 mm)	UL 510 Flame Retardant	CTI Material Group
5	1-mil film; solvent-resistant; for use in coil and capacitor holding applications.	Film	A	130	2.5/0.063	5,500	>1 x 10 ⁶	25/44	100	1.0	35/3,8	---	I
54	1-mil film; for use in fine wire coils where magnet wire serves to color code.	Film	RT	130	2.5/0.063	5,500	>1 x 10 ⁶	25/44	100	1.0	45/4,9	---	I
56	1-mil film; for use as layer insulation and coil cover in 130°C applications.	Film	RT	130	2.3/0.058	5,500	>1 x 10 ⁶	25/44	100	1.0	50/5,5	---	I
57	2-mil film; for use as a coil cover, layer insulation and capacitor wrap where higher electrical strength is desirable.	Film	RT	130	3.3/0.083	7,000	>1 x 10 ⁶	50/88	110	1.0	60/6,5	---	I
58	2-mil film; for use as a coil cover, layer insulation and capacitor wrap where higher electrical strength is desirable.	Film	RT	130	3.3/0.083	7,000	>1 x 10 ⁶	50/88	110	1.0	60/6,5	---	I
74	0.5-mil film; conformable; provides good electrical strength for coil applications where space is at a premium.	Film	RT	130	0.8/0.020	3,500	>1 x 10 ⁶	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.	Coated Film	RT	130	3.8/0.096	6,500	>1 x 10 ⁶	25/44	100	1.0	45/4,9	---	I
1136	1-mil film; for use in coil banding and coil wrapping where conformability is desirable.	Film	RT	130	2.5/0.063	5,000	---	23/40	100		40/4,4	---	---
1298	1-mil film with flame-retardant adhesive; excellent flagging and solvent resistance; for use as an outer wrap on capacitors and coils; PRINTABLE.	Film	A	130	2.5/0.063	5,500	>1 x 10 ⁶	25/44	100	1.0	40/4,4	Yes	II
1318-1	1-mil film; excellent flagging and solvent resistance; for use as an outer wrap on capacitors and coils; PRINTABLE. Available in yellow, white and black.	Film	A	130	2.5/0.063	5,500	>1 x 10 ⁶	25/44	100	1.0	30/3,3	---	see chart below
1318-2	2-mil film; excellent flagging and solvent resistance; for use as an outer wrap on capacitors and coils; PRINTABLE. Available in yellow, white and black.	Film	A	130	3.3/0.083	7,000	>1 x 10 ⁶	50/88	110	1.0	30/3,3	---	see chart below
1350-1	1-mil film with flame-retardant adhesive; excellent flagging and solvent resistance; for use as an outer wrap on capacitors and coils; PRINTABLE. Available in yellow, white and black.	Film	A	130	2.5/0.063	5,500	>1 x 10 ⁶	25/44	100	1.0	30/3,3	Yes	see chart below
1350-2	2-mil film with flame-retardant adhesive; excellent flagging and solvent resistance; for use as an outer wrap on capacitors and coils; PRINTABLE. Available in yellow, white and black.	Film	A	130	3.3/0.083	7,000	>1 x 10 ⁶	50/88	110	1.0	30/3,3	Yes	see chart below
1350T-1	1.5-mil, triple-layer, polyester film with flame-retardant acrylic adhesive. Excellent flagging and solvent resistance, with good wet grab and smooth, even unwind for use on automated equipment.	Film	A	130	3.0/0.08	6,500	>1 x 10 ⁶	44/77	50	1.0	25/2,7	Yes	II
1351-1	1-mil, film with flame-retardant acrylic adhesive, excellent flagging and solvent resistance. For use as inner layer and outer wrap insulation on coils. Smooth, even unwind for use on automatic equipment. Available in yellow and white.	Film	A	130	2.5/0.063	5,500	>1 x 10 ⁶	25/44	100	1.0	30/3,3	Yes	I
1351-2	2-mil film with flame-retardant acrylic adhesive, excellent flagging and solvent resistance. Use as inner layer and outer wrap insulation on coils. Smooth, even unwind for use on automatic equipment. Available in yellow and white.	Film	A	130	3.0/0.088	7,500	>1 x 10 ⁶	50/88	110	1.0	30/3,3	Yes	I
1351T-1	1.5-mil, triple-layer, polyester film with flame-retardant acrylic adhesive. Excellent flagging and solvent resistance, with good wet grab and smooth, even unwind for use on automated equipment. Available in yellow and white.	Film	A	130	3.0/0.08	6,500	>1 x 10 ⁶	44/77	50	1.0	25/2,7	Yes	I

† Operating Temperature is equivalent to UL Recognition Temperature where applicable (see page 9).

CTI Material Group for select polyester tapes by color			
Tape No.	CTI Group I	CTI Group II	CTI Group IIIa
1318-1	Yellow	White	Black
1318-2	Yellow	White	Black
1350-1		Yellow	Black, White
1350-2			Black, White, Yellow
1350T-1		Yellow, White	
1351-1	Yellow, White		
1351-2	Yellow, White		
1351T-1	Yellow, White		





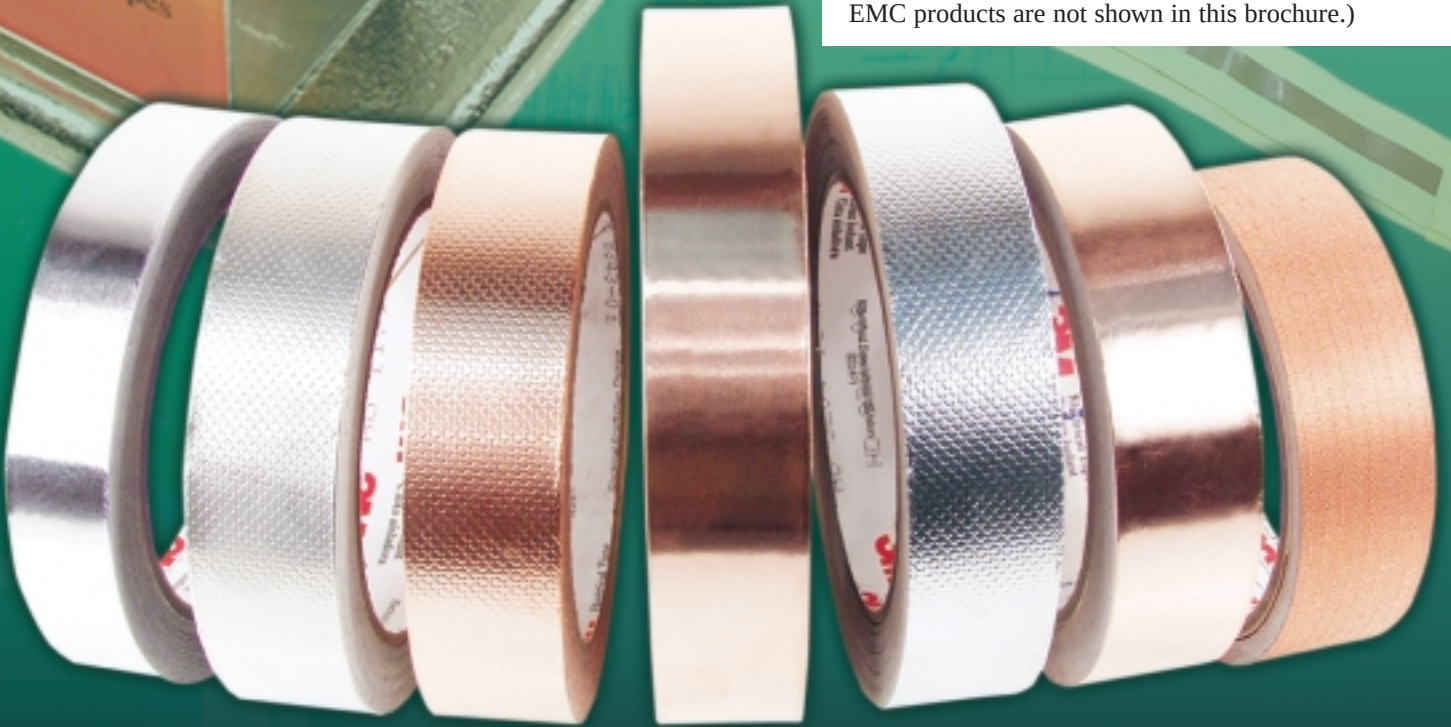
3M™ EMI Shielding Tapes

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 have a multitude of uses in electronic design and test laboratories for prototyping, design and troubleshooting.

3M™ Antistatic Tapes and EMC Products

With 3M™ Antistatic Tapes, you can now enjoy the convenience of tape without fear of electrostatic damage to sensitive components. At the heart of all 3M antistatic tapes is a unique, conductive polymer adhesive developed by 3M. A patent has been granted for this revolutionary adhesive, which can be applied to any number of items. Nowhere else will you find it except on 3M™ products.

3M also offers electromagnetic compatible products for meeting electromagnetic and radio frequency interference specifications, protecting against electrostatic discharge and complying with product certification requirements around the world. Ask your 3M sales representative about how you can protect sensitive electronic components and printed circuit boards with 3M™ EMC Products. (Many of these new EMC products are not shown in this brochure.)



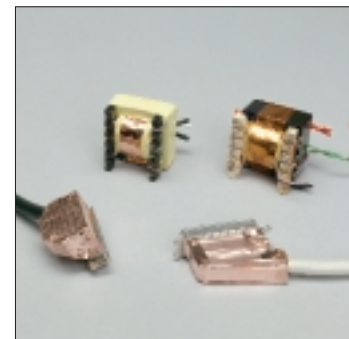
3M™ EMI Shielding Tapes

EMI Shielding

Number	Features	Backing Description	Adhesive	Total Thickness (mils)/(mm)	Shielding Effectiveness ¹ at 1GHz (dB)	Electrical Resistance (ohms)	Breaking Strength (lb/in)/(N/10 mm)	Elongation (% at Break)	Electrical Resistance ² (ohm)	Adhesion to Steel (oz/in)/(N/10 mm)	UL 510 Flame Retardant	Thermal Resistance (°F/°C) ²
425	A versatile aluminum foil tape with acrylic adhesive; , meets UL 723, Class L File R 7311.	Aluminum	A	4.6/.116	–	N/A	30/35	5	–	49/5.4	–	–
1120	2-mil foil; conductive-adhesive system; for EMI shielding, static charge draining, grounding; easily die-cut.	Aluminum	AC	4.0/0.100	–	0.009	16/25	–	–	36/3.9	Yes	>300/149
1125	1.4-mil foil; nonconductive-adhesive system; for EMI shielding, static charge draining, grounding; easily die-cut.	Copper	A	3.5/0.088	–	N/A	25/44	–	–	40/4.4	Yes	>300/149
1126	1.4-mil foil; conductive-adhesive system; for EMI shielding, static charge draining when grounded, easily die-cut.	Copper	AC	3.5/0.088	–	0.003	25/44	–	–	36/3.9	Yes	>300/149
1170	2-mil foil; conductive-adhesive system; for EMI shielding, static charge draining, grounding; easily die-cut.	Aluminum	AC	3.2/0.081	75	0.010	20/35	–	.010	35/3.8	Yes	190/88
1181	1.4-mil foil; conductive-adhesive system; for EMI shielding, static charge draining, grounding; easily die-cut.	Copper	AC	2.6/0.066	80	0.005	25/44	–	.005	35/3.8	Yes	200/93
1182	1.4-mil foil; coated on both sides with conductive adhesive; for EMI shielding, static charge draining, grounding; solderable; easily die cut.	Copper (Double-Coated)	AC	3.5/0.088	70	0.010	25/44	–	.010	35/3.8	Yes	–
1183	1.4-mil foil; conductive-adhesive system; oxidation resistant for excellent long-term EMI shielding, static charge draining, grounding; solderable; easily die cut.	Tin-Plated Copper	AC	2.6/0.066	85	0.005	25/44	–	.005	35/3.8	Yes	170/77
1190	4.5 mil metallized fabric; conductive adhesive; lightweight; conformable; high strength; for EMI shielding, grounding.	Copper-Plated Polyester Ripstop Fabric	AC	6.0/0.153	70	0.005	70/123	–	.005	30/3.2	No	–
1194	1.4-mil foil; nonconductive adhesive; for EMI shielding; static charge draining when grounded; easily die cut.	Copper	A	2.6/0.066	60	N/A	25/44	–	N/A	40/4.4	Yes	>300/149
1245	1.4-mil foil; conductive through adhesive; for EMI shielding; static charge draining, grounding; solderable; easily die cut.	Embossed Copper	A	4.0/0.101	85	0.001	25/44	–	.001	35/3.8	Yes	–
1267	2-mil foil; conductive through adhesive; for EMI shielding; static charge draining, grounding; easily die cut.	Embossed Aluminum	A	5.0/0.127	80	0.005	20/35	–	.005	35/3.8	Yes	–
1345	1.4-mil foil; conductive through adhesive; oxidation resistant for excellent long-term EMI shielding, static charge draining, grounding; solderable; easily die cut.	Embossed Tin-Plated Copper	A	4.0/0.101	95	0.001	25/44	–	.001	45/4.9	Yes	160/71

¹ MIL-STD-202 Method 307 maintained at 5 PSI (3,4 N/sq cm) measured over 1 sq. in. surface area.

² 3M Internal Test Method



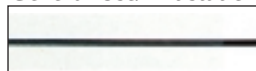
The images of tapes in this brochure are as accurate as photographic and printing technology allow, but may vary in appearance from the actual tapes.

3M™ Electronic Tapes



Number	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)	Remove from stainless Steel (volts)

General Use/Antistatic

	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 polyester film backing, anti-static conductive polymer adhesive. With preprinted static symbol.	Film	20/35	15/1,7	5	5

High Temp Antistatic Masking

	42	A 1.0-mil polyimide film tape for PC Board solder masking with high-temperature polyimide backing and anti-static acrylic polymer adhesive.	Polyimide Film	28/49	15/1,7	5	5
	5419	A 1.0-mil polyimide film tape with a low-static silicone adhesive, for wave solder and reflow applications.	Polyimide Film	33/58	20/2.2	<150	—
	5433	A 1.0-mil polyimide film tape with a low-static silicone adhesive, for wave solder applications, supplied on a liner.	Polyimide Film	33/58	20/2.2	<100	—



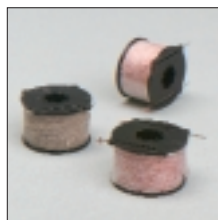
Number	Features	Backing Description	Breaking Strength (lb/in)/(N/10 mm)	Adhesion to Steel (oz/in)/(N/10 mm)	Elongation	Temperature	Total Tape Thickness (mils)/(mm)
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Electronic

	5413	A 1.0-mil polyimide film tape with silicone adhesive; high-temperature industrial-use tape.	Polyimide Film	33/58	22/2.4	62	260	2.7/.07
	5414	A 1.3-mil clear polyvinyl alcohol (PVA) backing (water-soluble) and a synthetic, water-soluble adhesive for masking gold fingers on printed circuit boards during wave soldering.	PVA	6/10.5	4/0.44	334	—	2.1/.05
	9703	A solvent-free conductive-adhesive transfer on liner featuring anisotropic electrical conductivity with consistent caliper and high ultimate bond strength with moderate high-temperature performance.	Acrylic Adhesive	—	50/5.5	—	—	—

Conformal Coat Masking

	8901	High-temperature tape with a silicone adhesive for use in composite bonding operations or to remove flashing after bonding. Excellent for use as a masking tape in PCB conformal coating applications.	Film	28/49	32/3,6	100	2.5/.06
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Number	Features	Features	Adhesive	Operating Temperature (°C)*	Total Tape Thickness (mils)/(mm)
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Miscellaneous

	9755	High Performance Adhesive Transfer Tape	F-9752PC and F-9755PC utilize the A-35 high-performance adhesive system which offers the ability to make adhesive bonds at temperatures as low as 32°F(0°C).	Acrylic	149	5.0/0.127
	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

Vinyl Tape

UL Listed in UL File E129200, Product Category OANZ

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

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

Specification	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

UL Recognized Components in UL File E17385, Product Category OANZ2

Specification	Number	Type
For use at temperatures not to exceed 105°C	 65	Cotton Cloth
For use at temperatures not to exceed 130°C	 1  44, 44A, 44D-A, 44T-A, 55, MR94, MR94B  5, 54, 56, 57, 58, 74, 75, 1136, 1298, 1318-1, 1318-2, 1350-1, 1350-2, 1350T-1, 1351T-1, 1351-1, 1351-2  46, 1146, 1339  89	Epoxy Film Composite Film Polyester Film Filament Reinforced Glass Cloth
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  1206	Epoxy Film Filament Reinforced Polyimide Film
For use at temperatures not to exceed 180°C	 68  1093	Glass Cloth Polyimide Film
For use at temperatures not to exceed 200°C	 69	Glass Cloth
Flame Retardancy The following tapes meet the flame retardancy requirements of UL 510	 1, Super 10, Super 20  1298, 1350-1, 1350-2, 1350T-1, 1351-1, 1351-2, 1351T-1  68, 69  92, 1093, 1205  60, 61, 62, 63  1120, 1125, 1126, 1170, 1181, 1182, 1183, 1194, 1245, 1267, 1345  1554K	Epoxy Film Polyester Film Glass Cloth Polyimide Film PTFE Film Foil Acetate

Industry Specifications

Military

Specification	Number	Type
MIL-I-15126F (Type MFT 2.5)	54, 56, 1136	Polyester Film
MIL-I-15126F (Type MFT 3.5)	57, 58,	Polyester Film
MIL-I-15126F (Type MF 2.5)	5, 1298, 1318-1, 1350-1, 1351-1	Polyester Film
MIL-I-15126F (Type ACT)	11, 28	Acetate Cloth
MIL-I-15126F (Type GFT)	89	Glass Cloth
MIL-I-19166C	68, 69	Glass Cloth
MIL-I-23594C, Type 1, Class 1	60	PTFE Film
MIL-I-23594C, Type 1, Class 4	61	PTFE Film
MIL-I-23594C, Type 2, Class 1	62	Bondable PTFE Film
MIL-T-47012	1125, 1126	Copper Foil

Tape Dimensions

Standard Lengths*	Number
16 meters (18 yards)	1170, 1181, 1182, 1183, 1190, 1245, 1267, 1345
18 meters (20 yards)	1710
20 meters (22 yards)	22, 33, S33+, 35, 88
33 meters (36 yards)	22, 33, S33+, 42, 60, 61, 62, 63, 68, 69, 75, S88, 92, 1120, 1125, 1126, 1194, 1205, 1710, 9703, 44T-A
45 meters (49 yards)	44D-A
55 meters (60 yards)	12, 16, Super 10, Super 20, 27, 46, 65, 79, 89, 1139, 1276, 1339, 9755
66 meters (72 yards)	1, 5, 11, 28, 40, 54, 55, 56, 57, 58, 74, 1136, 1157R, 1554K, 1298, 1318-1, 1318-2, 1350-1, 1350-2, 1350T-1, 8901, 1351T-1, 1351-1, 1351-2
82 meters (90 yards)	44, 44A, MR94, MR94B

*Other tape lengths are available; contact your 3M sales representative or Customer Service for information.

Slitting

Specification	Number	Type
Precision Slitting 3M will provide a special slitting tolerance $\pm 0.005"$ on selected tapes. The minimum width for this service is 0.125" and the maximum width is 2.000". Contact your 3M sales representative for precision slitting prices on the following tapes:	1 55, MR94, MR94B 5, 54, 56, 57, 58, 74, 1298, 1318, 1350, 1350T-1, 1351T-1, 1351-1, 1351-2 12 92, 1205 60, 61, 62, 63	Epoxy Film Composite Film Polyester Film Paper Polyimide Film PTFE Film
Standard Slitting Slitting tolerances are dependent on the type of backing. All tapes have a width tolerance of $\pm 1/64"$ with the exception of vinyl, acetate and glass cloth which have a tolerance of $\pm 1/32"$.		

Printing Options

Specification	Number	Type
Printability* There are five available methods for imprinting tapes: InkJet Hand Stamping/Hot Stamping/Letterpress/Flexographic/Offset.	1, Super 20 1298, 1318, 1350 27, 68, 69, 79 11, 28	Epoxy Film Polyester Film Glass Cloth Acetate Cloth
All 3M™ Electrical Tapes are printable by hot stamping. Some tapes in the 3M line are more suited for the other methods.	62 92	PTFE Film Polyimide Film

* Printer converters who print with flexography should contact their 3M sales representative to determine the tapes that are suitable for this printing method.

† This tape chart is a comparative guide 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 D 1000, 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 Electrical, Electronic and Specialty Tapes

Tape Adhesives

Thermosetting Rubber (RT): Thermosetting adhesives have high initial adhesion and electrical purity. When properly thermoset, a rubber-resin adhesive system will cross-link into a three-dimension matrix molecular form providing greater adhesion and bonding, higher solvent resistance and higher heat resistance.

Acrylic (A): Acrylic adhesives are synthetic polymers specifically formulated to meet application requirements. Acrylic adhesives are compounded to resist heat, oxidation, solvents and oils, and exhibit acceptable performance in many applications without a cure cycle.

Silicone (ST): Silicone adhesives require considerably higher temperatures for the thermosetting reaction. Silicone adhesive systems have exceptional heat resistance, are inorganic and, if burned, leave a nonconductive residue.

Adhesives for Special Applications: Developed exclusively by 3M, the remarkable adhesive used only for 3M™ Antistatic Tapes uses a special polymer configuration to neutralize triboelectrically generated charges which could damage sensitive electronic components upon unwind or removal.

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.)

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

Tape Backings

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

Composite Film: These combine the high dielectric strength and edge-tear resistance of polyester film and nonwoven polyester mat.

Epoxy Film: These offer solder and puncture resistance, high dielectric strength, conformability and UL recognition for flame retardancy and use at temperatures up to 155° C. Their versatility can help reduce your tape inventory.

Filament-Reinforced: Many of these 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. More cost effective than glass cloth tapes, they are excellent for anchoring lead wires to banding coils. A special paper-backed filament tape is available for high-voltage oil-filled distribution transformer use.

Glass Cloth: 3M offers the most flexible and conformable glass cloth backings on the market with the highest temperature resistance and tensile strength. With excellent absorption of resins and varnishes, they are unsurpassed for holding and strapping applications up to 200°C.

Non-Woven: Permeable to gas and liquids, the design of this tape allows thorough penetration of varnishes during vacuum impregnation.

Paper: These provide good cushioning, puncture resistance and toughness.

Polyester Film: These are specified for insulating applications requiring a thin, durable tape with high dielectric strength. They can withstand higher temperature conditions than tapes with acetate backing. They also are conformable, exhibit excellent chemical, solvent and moisture resistance and resist cut-through and abrasion.

Polyimide Film: The physical and electrical properties of polyimide remain stable when used in such applications as coils, harnesses and capacitors, that experience extreme temperatures.

PTFE Film: These are high-temperature tapes 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 and are free of carbonizing materials.

Vinyl: Scotch™ 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, alkalis 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, television degaussing coils and high-voltage cables.

Other 3M™ Tape Solutions

3M™ EMI Shielding Tapes Engineering Kit: Get nine different 3M EMI Shielding Tapes in a handy compact dispenser box (4"x4"x8.3"). The box features technical information about each tape and makes it easy to manage multiple rolls and dispense small lengths of tape. Excellent for specifying, prototyping, troubleshooting and testing and repairing.

Tape Dispensers for any Application: 3M offers a wide range of tape dispensers that can help reduce labor costs, increase output, improve product consistency and diminish material waste.

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.

Ask about innovative 3M™ Electromagnetic Compatible Products for protecting sensitive electronic components and printed circuit boards.

ISO 9002 Registration

The 3M facilities which manufacture the electrical, electronic and EMI shielding 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.

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-D-1000 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 heat shrink tubing and molded shapes, liquid resins, powder resins, and wire management products for electrical and electronic applications. For complete information, go to www.3M.com/electrical/oem.

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