3M™ Electrical, Electron

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
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	3.5/0,09	5,000	>1 x 106	25/44	75	1.0	30/3,3	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	5.5	8,000	>1 x 106	40/70	100	1.0	60/6,5	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	5.5/0,14	8,000	>1 x 106	40/70	100	1.0	35/3,8	Yes	I
Polyimide Film													
92	1-mil film; tough, thin, designed for high temperature applications; used on coils, capacitors and harnesses; **PRINTABLE**.	Film	ST	180	3.0/0,8	7,500	>1 x 106	30/53	55	1.0	20/2,2	Yes	IIIb
1205	1-mil film; solvent-resistant version of 92 Tape.	Film	A	155	3.0/0,08	7,500	>1 x 106	30/53	55	1.0	35/3	Yes	IIIb
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	4.0/0,10	9,500	>1 x 106	20/35	200	1.0	25/2,7	Yes	I
61	5-mil film; suitable for applications similar to 60 Tape where high dielectric and breaking strength are required.	Film	ST	180	6.5/0,16	15,000	>1 x 106	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	ST	180	3/5/0,9	9,500	>1 x 106	20/35	200	1.0	25/2,7	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	3.5/0,09	9,500	>1 x 106	20/35	200	1.0	40/4,4	Yes	I
Vinyl													
22	Heavy-duty insulation designed for general purpose use where greater mechanical strength and abrasion resistance are required.	PVC	RN	80	10.0/0,25	12,000	>1 x 106	30/53	225	1.0	25/2,7	Yes	–
33	Provides moisture-tight electrical and mechanical protection; excellent resistance to abrasion, moisture, alkalies, acids and varying weather conditions (including ultraviolet exposure).	PVC	RN	80	7.0/0,18	8,500	>1 x 106	18/32	150	1.0	22/2,4	Yes	–
Super 33+	All weather vinyl insulating tape; conformable for cold weather applications; excellent resistance to abrasion, moisture, alkalies, acids, and copper corrosion.	PVC	RN	80/105	7.0/0,18	8,000	>1 x 106	15/26	250	–	28/3,0	Yes	–
35	Color coding tape available in 9 fade-resistant colors; 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.	Coloured PVC	RN	80/105	7.0/0,18	8,500	>1 x 106	17/30	225	–	20/2,2	Yes	–
66R	Provides moisture-tight electrical and mechanical protection; excellent resistance to abrasion, moisture, alkalies, acids and varying weather conditions (including ultraviolet exposure).	PVC	RN	105	10.0/0,25	12,000	>1 x 106	25/44	250	–	20/2,2	Yes	–
Super 88	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	8.5/0,22	10,000	>1 x 106	20/35	250	–	25/2,7	Yes	–
1510	Good quality and economical general purpose insulating tape; high dielectric strength, conformable and mechanical protection.	PVC	RN	80	5.0/0,13	5,000	–	14/25	150	–	18/2,0	–	–
1710	Good quality, economical general purpose insulating tape; excellent resistance to abrasion, moisture, alkalies, acid, copper corrosion and varying weather conditions (including ultraviolet).	PVC	RN	80	7.0/0,18	8,500	>1 x 10^6	17/30	200	–	24/2,6	Yes	–

ic and Specialty 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
Composite Film													
44	Puncture resistant; excellent electrical properties; tough, conformable; for insulating, anchoring and banding in motors and transformers.	Polyester Film/Mat	RT	130	5.5/0,14	5,500	>1 x 10^6	40/70	30	1.0	40/4,4	–	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	7.5/0,19	5,000	>1 x 10^6	35/62	30	1.0	80/8,7	–	I
44-18 Mil	Thick tape with highest CTI rating for barrior or margin applications.	Polyester Film/Mat	RT	130	18.0/0,45	6,000	>1 x 10^6	100/170	20	1.0	35/3,2	–	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	4.0/0,10	5,000	>1 x 10^6	25/44	75	1.0	40/4,4	–	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	4.0/0,10	5,000	>1 x 10^6	25/44	75	1.0	40/4,4	–	IIIA
Glass Cloth													
27	Edge-tear resistant, conformable, abrasion resistant; for use as coil cover, anchor, banding and core, layer and crossover insulation; **PRINTABLE**.	Glass Cloth	RT	130	7.0/0,18	3,000	2.5/10^2	150/262	5	0.9	40/4,4	–	I
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	180	7.0/0,18	3,500	1.5 x 10^2	150/262	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	155	7.0/0,18	3,000	2.5 x 10^2	150/262	5	0.9	30/3,3	–	I
90	Edge-tear resistant, conformable, abrasion and fray resistant; for use as coil cover, anchor, banding and core, layer and crossover insulation; **PRINTABLE**.	Saturated Glass Cloth	RT	130	7.0/0,18	3,000	2.5 x 10^2	150/262	5	–	40/4,4	–	I
Acetate Cloth													
11	Conformable; for use as coil cover; **PRINTABLE**.	Acetate Cloth	RT	105	8.0/0,20	3,500	2 x 104	45/79	10	0.9	45/4,9	–	I
28	Similar to 11 Tape, except in color; **PRINTABLE**.	Acetate Cloth	RT	105	8.0/0,20	3,500	2 x 104	45/79	10	0.9	45/4,9	–	I
Filament Reinforced													
46	Good tensile strength and edge-tear resistance; for use in end-turn taping.	Polyester Film/ Glass Filament	RT	130	7.0/0,18	7,000	3 x 10^3	275/481	5	1.0	60/6,5	–	II
1276	Solvent-resistant, high shear strength adhesive; good tensile strength for holding in oil-filled transformer applications.	Paper/ Glass Filament	A	105	8.5/0,22	4,000	–	290/507	5	1.0	60/6,5	–	–
1312	Edge-tear resistant, good tensile strength; NOT to be used above 105°C. Temperatures higher than 105°C cause shrinkage of synthetic filaments.	Polyester Film/ Synthetic Filament	RN	105	7.5/0,19	5,500	2 x 10^4	225/394	5	1.0	55/6,0	–	I
1339	Solvent-resistant, high shear strength adhesive; good tensile strength and edge-tear resistance; for holding applications.	Polyester Film/ Glass Filament	A	130	6.5/0,17	5,500	1 x 10^5	275/481	5	1.0	35/3,8	–	I
Paper													
3	For banding coils and for cover on bobbin-wound coils.	Flatback	RT	105	4.4/0,11	2,000	1 x 10^1	45/79	–	–	60/6,5	–	I
38	Conformable; for use as coil cover and end-turn taping.	Crepe	RT	105	9.5/0,24	2,000	2 x10^1	20/35	5	–	40/4,4	–	I

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	2.5/0,06	5,500	>1 x106	25/44	100	1.0	50/5,5	–	I
54	1-mil film; for use in fine wire coils where magnet wire serves to color code.	Film	RT	130	2.5/0,6	5,500	>1 x 106	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	2.3/0,06	5,500	>1 x 106	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	3.3/0,08	7,000	>1 x 106	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	3.3/0,08	7,000	>1 x 106	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	0.8/0,02	3,500	>1 x 106	12/21	80	1.0	20/2,2	–	I
75	1-mil film; coated on both sides; for use in bonding applications requiring a positive insulation barrier.	Double-Coated Film	RT	130	3.8/0,10	6,500	>1 x 106	25/44	70	1.0	45/4,9	–	I
1169	1-mil film; with black adhesive; for use as an outer wrap on capacitors and coils.	Film	RT	130	2.3/0,6	5,500	>1 x 106	25/44	100	1.0	45/4,9	–	IIIA
1291	2-mil film; solvent-resistant; yellow color provides good hiding power; for use as coil cover and capacitor wrap; **PRINTABLE**.	Film	A	130	3.3/0,08	7,000	>1 x 106	50/88	110	1.0	50/5,5	–	I
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	2.5/0,06	5,500	>1 x 106	25/44	100	1.0	40/4,4	Yes	II
1318	1-mil film with flame-retardant adhesive; excellent flagging and solvent resistance; for use as an outer wrap on capacitors and coils; available in yellow and white (black, red, green and blue in late 1996) **PRINTABLE**.	Film	A	130	2.5/0,06	5,500	>1 x 106	25/44	100	1.0	35/3,8	–	Y-I
1318	2-mil film with flame-retardant adhesive; excellent flagging and solvent resistance; for use as an outer wrap on capacitors and coils; available in yellow and white (black, red, green and blue in late 1996) **PRINTABLE**.	Film	A	130	3.3/0,08	7,000	>1 x 106	50/88	110	1.0	30/3,3	Yes	wIIIA
1350	1-mil film with flame-retardant adhesive; excellent flagging and solvent resistance; for use as an outer wrap on capacitors and coils; available in yellow and white (black, red, green and blue in late 1996) **PRINTABLE**.	Film	A	130	2.5/0,06	5,500	>1 x 106	20/35	75	1.0	30/3,3	Yes	wIIIA
1350	2-mil film with flame-retardant adhesive; excellent flagging and solvent resistance; for use as an outer wrap on capacitors and coils; available in yellow and white (black, red, green and blue in late 1996) **PRINTABLE**.	Film	A	130	3.3/0,08	7,000	>1 x 106	50/88	110	1.0	30/3,3	Yes	wIIIA

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.

*Operating temperatures listed are 3M suggested temperature classifications for continuous long-term operation; for UL classifications

(A) Acrylic, (AC) Conductive Acrylic, (RT) Rubber Thermosetting, (RN) Nonthermosetting Rubber, (ST) Silicone

Tape Dimensions

Specification	Number
Standard Lengths*	
16.5 m (18 yards)	1170, 1181, 1182, 1183, 1190, 1245, 1267, 1345
18 m (20 yards)	1710
20 m (22 yards)	22, 33, S33+, 35, 88, 1510
33 m (36 yards)	22, 33, S33+, 42, 60, 61, 62, 63, 66R, 69, 75, S88, 92, 1194, 1205, 1710
55 m (60 yards)	3, Super 10, Super 20, 27, 38, 46, 79, 90, 1276, 1312, 1339
66 m (72 yards)	1, 5, 11, 28, 40, 54, 55, 56, 57, 58, 74, 1169, 1291, 1298, 1318, 1350
82 m (90 yards)	44, MR94, MR94B
30 m (32.8 yards)	44-18mil

EMI Shielding

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
1170	2-mil foil; conductive adhesive system; for EMI shielding, static charge draining, grounding; easily die cut.	Aluminum	AC	–	3.2/0,08	–	0.010	20/35	–	–	35/3,8	Yes
1181	1.4-mil foil; conductive adhesive system; for EMI shielding, static charge draining, grounding; solderable; easily die cut.	Copper	AC	–	2.6/0,07	–	0.005	25/44	–	–	35/3,8	Yes
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	–	3.5/0,09	–	0.010	25/44	–	–	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	–	2.6/0,07	–	0.005	25/44	–	–	35/3,8	Yes
1190	4 to 5 mil metallized fabric; conductive adhesive; lightweight; conformable; high strength; for EMI shielding, grounding.	Copper-Plated Polyester Ripstop Fabric	AC	–	5.0-6.0/ 0.13-0.15	–	0.005	60/ 106	–	–	25/2,7	No
1194	1.4-mil foil; nonconductive adhesive; for EMI shielding; static charge draining when grounded; easily die cut.	Copper	A	–	3.0/0,08	–	N/A	25/44	–	–	40/4,4	Yes
1245	1.4-mil foil; conductive through adhesive; for EMI shielding; static charge draining, grounding; solderable; easily die cut.	Embossed Copper	A	–	4.0/0,10	–	0.001	25/44	–	–	35/3,8	Yes
1267	2-mil foil; conductive through adhesive; for EMI shielding; static charge draining, grounding; easily die cut.	Embossed Aluminum	A	–	5.0/0,13	–	0.005	20/35	–	–	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	–	4.0/0,10	–	0.001	25/44	–	–	35/3,8	Yes

Anti-Static

Number	Features	Backing Description	Backing Thickness	Total Thickness (mils) (mm)	Static Charge Generation-Unwind @ 10% RH/50%RH	Static Charge-Removal from Stainless Steel @ 10% RH/50% RH	Surface Resistance Adhesive @ 10% RH/Ohms ESD Association S11.1	Breaking Strength (lb/in)/(N/10mm)	Elongation (% at Break)	Adhesion to Steel (oz/in)(N/10mm)
40	General-use utility tape, 1-mil polyester film backing, anti-static conductive polymer adhesive. Available with or without preprinted static symbol.	Polyester Film	1mil	2.2/0,05	20/5	50/5	>1 x 10^6 to <1 x 10^{11}	20/35	100	15/1,7
42	Solder mask tape, high-temperature Kapton polyimide backing, anti-static conductive polymer adhesive.	Polyimide Film	1mil	2.3/0,06	5/5	50/5	>1 x 10^6 to <1 x 10^{11}	28/49	55	10/1,1

Miscellaneous

	Backing Description	Features	Adhesive	Operating Temperature (°C)*	Total Thickness (mils)
	9755 High Performance Adhesive Transfer Tape	F-9752PC and F-9755PC tapes 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	
	1157 Porous Polyester MAT	1157 Porous Polyester Mat Tape is specifically designed to allow thorough penetration of the impregnating resin inside bobbin wound coils.	Thermosetting (pressure sensitive)	130	5

Industry Specifications

UL Recognized Components in UL File E17385, Product Category OANZ2

Specification	Number	Type
For use at temperatures not to exceed 200°C	69	Glass Cloth
For use at temperatures not to exceed 155°C	90 Super 10, Super 20	Glass Cloth Epoxy Film
For use at temperatures not to exceed 150°C	27, 79	Glass Cloth
For use at temperatures not to exceed 130°C	1 44, 44-18 mil, 55, MR94, MR 94B 5, 54, 56, 57, 58, 74, 75, 1169, 1291, 1298, 1318, 1350 46, 1312, 1339	Epoxy Film Composite Film Polyester Film Filament Reinforced
Flame Retardancy The following tapes meet the flame retardancy requirements of UL 510	1, Super 10, Super 20 1298, 1350 69 92, 1205 60, 61, 62, 63 1170, 1181, 1182, 1183, 1194, 1245, 1267, 1345 66R	Epoxy Film Polyester Film Glass Cloth Polyimide Film PTFE Film Foil Vinyl Film

Military

Specification	Number	Type
MIL-I-15126F (Type MFT 2.5)	54, 56,	Polyester Film
MIL-I-15126F (Type MFT 3.5)	57, 58, 1291	Polyester Film
MIL-I-15126F (Type MF 2.5)	5, 1298, 1318 1 mil, 1350 1 mil	Polyester Film
MIL-I-15126F (Type ACT)	11, 28	Acetate Cloth
MIL-I-15126F (Type PCT)	38	Paper
MIL-I-19166C	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

CTI Performance Level–as tested by ULCSA

Specification	Number
Group I > 600V	1, Super 10, Super 20, 27, 28, 44, 44-18mil, 60, 61, 62, 63, 56, 69, 90, 1312, 1318
Group II > 400V < 600V	46, 1298,1350 (yellow)
Group IIIa > 175V < 400V	1169,1350 (white), MR94B
Group IIIb > 100V < 400V	92,1205

CTI rating refers to value obtained in accordance with method A of IEC 112

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

Printing Options

Specification	Number	Type
Printability**		
There are five available methods for imprinting tapes: Hand Stamping/Hot Stamping/Letterpress/Flexographic/Offset.	1, Super 20 1291, 1298, 1318, 1350 27, 69, 79, 90 11, 28	Epoxy Film Polyester Film Glass Cloth Acetate Cloth
All 3M brand electrical tapes are printable by hot stamping. Some tapes in the 3M line are more suited for the other methods. They are:	62 92	PTFE Film Polyimide Film

* Other tape lengths are available; contact your 3M sales representative or Customer Service for information.
** Printer converters who print with flexography should contact their 3M sales representative to determine the tapes that are suitable for this printing method.