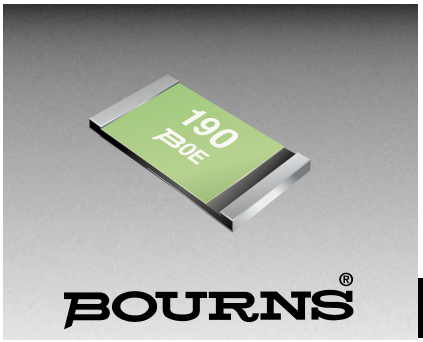


Features

- Fast tripping resettable circuit protection
- Surface mount packaging for automated assembly
- Very low internal resistance
- Patents pending
- 100°C trip temperature
- Agency recognition:

Applications

- Battery cell protection

MF-ESMD Series - PTC Resettable Fuses

Electrical Characteristics

Model	V max. Volts	I max. Amps	I_{hold}	I_{trip}	Initial Resistance		Max. Time To Trip		Tripped Power Dissipation
			Amperes at 23°C		Ohms at 23°C		Amperes at 23°C	Seconds at 23°C	Watts at 23°C
			Hold	Trip	Min.	R_1 Max.	Max.		
MF-ESMD190	16	100	1.9	3.8	0.017	0.08	10	2.0	1.5
NEW MF-ESMD450	16	100	4.5	9.0	0.016	0.029	22.5	10.0	0.8

Environmental Characteristics

Operating/Storage Temperature .....-40°C to +85°C
Maximum Device Surface Temperature in Tripped State .....125°C
Passive Aging.....+85°C, 1000 hours .....±5% typical resistance change
Humidity Aging.....+85°C, 85% R.H. 1000 hours.....±5% typical resistance change
Thermal Shock .....+85°C to -40°C, 20 times.....±10% typical resistance change
Solvent Resistance .....MIL-STD-202, Method 215 .....No change
Vibration .....MIL-STD-883C, Method 2007.1, Condition A .....No change
Stocking Recommendations .....Six months with prepackaged desiccant

Test Procedures And Requirements For Model MF-ESMD Series

Test	Test Conditions	Accept/Reject Criteria
Visual/Mech.	Verify dimensions and materials	Per MF physical description
Resistance	In still air @ 23°C	Rmin ≤ R ≤ Rmax
Time to Trip	At specified current, Vmax, 23°C	T ≤ max. time to trip (seconds)
Hold Current	30 min. at Ihold	No trip
Trip Cycle Life	Vmax, Imax, 100 cycles	No arcing or burning
Trip Endurance	Vmax, 48 hours	No arcing or burning

UL File Number .....E 174545S
CSA File Number .....CA 110338
TÜV File Number R2057213

Thermal Derating Chart - I_{hold} (Amps)

Model	Ambient Operating Temperature								
	-40°C	-20°C	0°C	23°C	40°C	50°C	60°C	70°C	85°C
MF-ESMD190	3.04	2.7	2.2	1.9	1.44	1.23	1.00	0.78	0.49
MF-ESMD450	8.55	7.2	5.85	4.50	3.90	3.30	2.70	2.10	1.80

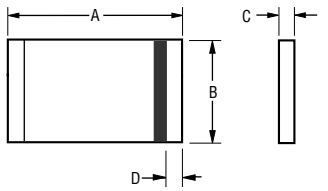
Product Dimensions

Model	A		B		C		D	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
MF-ESMD190	11.15 (0.439)	11.51 (0.453)	4.83 (0.190)	5.33 (0.210)	0.33 (0.013)	0.63 (0.025)	0.53 (0.021)	1.02 (0.040)
MF-ESMD450	11.15 (0.439)	11.51 (0.453)	4.83 (0.190)	5.33 (0.210)	0.90 (0.035)	1.10 (0.043)	0.51 (0.020)	1.02 (0.040)

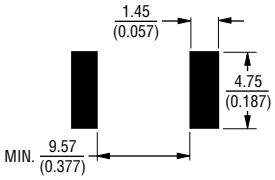
Packaging: 1500 pcs. per reel.

DIMENSIONS = MM / (INCHES)

Top and Bottom View ***Side View***

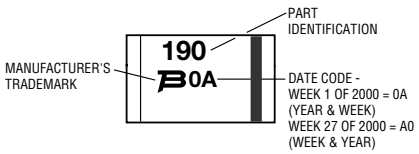


Recommended Pad Layout



Typical Part Marking

Represents total content. Layout may vary.



How to Order

MF - ESMD 190 - 2

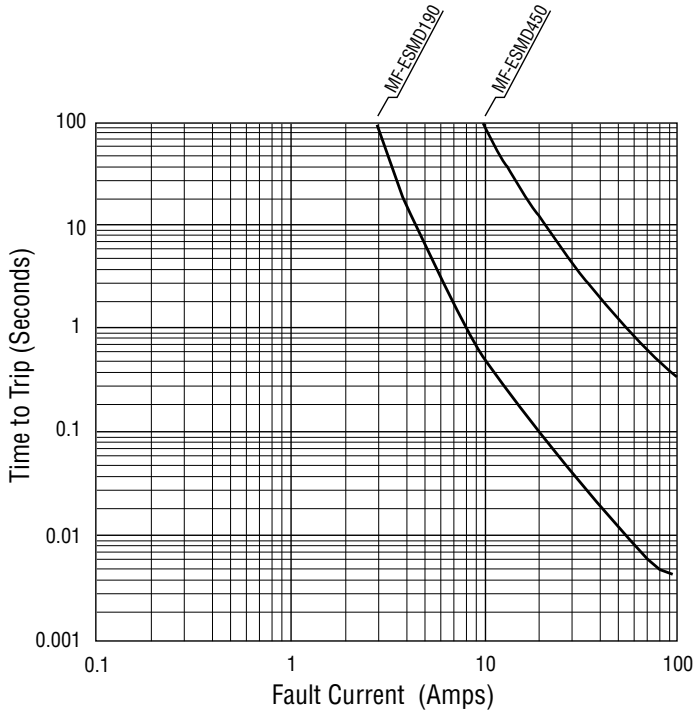
Multifuse® Product Designator

Series
ESMD = 11.5mm Surface Mount Component

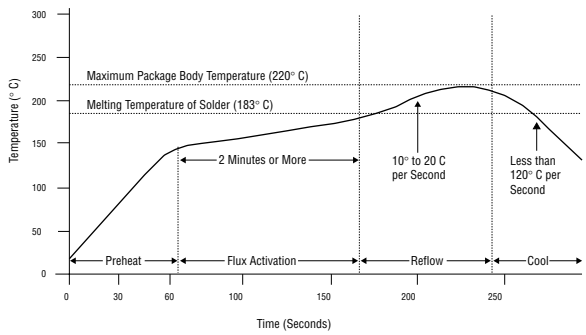
Hold Current, I_{hold}
190-450 (1.9 Amps - 4.5 Amps)

Packaging
Packaged per EIA 481-1
-2 = Tape and Reel

Typical Time to Trip at 23°C



Solder Reflow Recommendations



Note:

- MF-ESMD models can be wave soldered and reworked.
- If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.

MF-ESMD, REV. G, 12/00

MF-R, MF-RX, MF-RG & MF-R/250 Series Tape and Reel Specs

BOURNS®

Devices taped using EIA468–B/IEC286-2 standards. See table below and Figures 1 and 2 for details.

Dimension Description	IEC Mark	EIA Mark	Dimensions	
			Dimensions	Tolerance
Carrier tape width	*W*	*W*	18 (.709)	-0.5/+1.0 (-0.02/+.039)
Hold down tape width		*W4*	5 (.197)	min.
Hold down tape	*W0*		No protrusion	
Top distance between tape edges	*W2*	*W6*	3 (.118)	max.
Sprocket hole position	*W1*	*W5*	9 (.354)	-0.5/+0.75 (-0.02/+0.03)
Sprocket hole diameter	*D0*	*D0*	4 (.157)	±0.2 (±.0078)
Abscissa to plane (straight lead)	*H*	*H*	18.5 (.728)	±3.0 (±.118)
Abscissa to plane (kinked lead)	*H0*	*H0*	16 (.63)	±0.5 (±.02)
Abscissa to top	*H1*	*H1*	32.2 (1.268)	max.
Overall width w/lead protrusion		*C1*	43.2 (1.7)	max.
Overall width w/o lead protrusion		*C2*	42.5 (1.673)	max.
Lead protrusion	*I1*	*L1*	1.0 (.039)	max.
Protrusion of cutout	*L*	*L*	11 (.433)	max.
Protrusion beyond hold tape	*I2*	*I2*	Not specified	
Sprocket hole pitch	*P0*	*P0*	12.7 (0.5)	±0.3 (±.012)
Pitch tolerance			20 seconds	± 1 second
Device pitch: MF-R010 – MF-R160			12.7 (0.5)	
Device pitch: MF-R185 – MF-R400			25.4 (1.0)	
Device pitch: MF-RX110 – MF-RX160			12.7 (0.5)	
Device pitch: MF-RX185 – MF-RX375			12.7 (0.5)	
Device pitch: MF-RG300, MF-RG500			12.7 (0.5)	
Device pitch: MF-RG700, MF-RG900, MF-RG1100			25.4 (1.0)	
Device pitch: MF-R012/250			25.4 (1.0)	
Tape thickness	*t*	*t*	0.9 (.035)	max.
Tape thickness with splice		*t1*	2.0 (.079)	max.
Splice sprocket hole alignment			0	±0.3 (±.012)
Body lateral deviation	Δ*h*	Δ*h*	0	±1.0 (±.039)
Body tape plane deviation	Δ*p*	Δ*p*	0	±1.3 (±.051)
Lead seating plane deviation	Δ*P1*	*P1*	0	±0.7 (±.028)
Lead spacing	*F*	*F*	5.08 (0.2)	±0.8 (±.035)
Reel width	*w*	*w*	56 (2.205)	max.
Reel diameter	*d*	*a*	370 (14.57)	max.
Space between flanges less device			4.75 (.187)	±3.25 (±.128)

DIMENSIONS = MM (INCHES)

Dimension Description	IEC Mark	EIA Mark	Dimensions	Tolerance
Space between flanges less device			4.75 (.187)	±3.25 (±.128)
Arbor hole diameter	*f*	*c*	26 (1.024)	±12.0 (±.472)
Core diameter	*h*	*n*	80 (3.15)	max.
Box			56 (2.2) 372 (14.6) 372 (14.6)	max.
Consecutive missing places			3 maximum	
Empty places per reel			Not specified	

DIMENSIONS = MM (INCHES)

Taped Component Dimensions

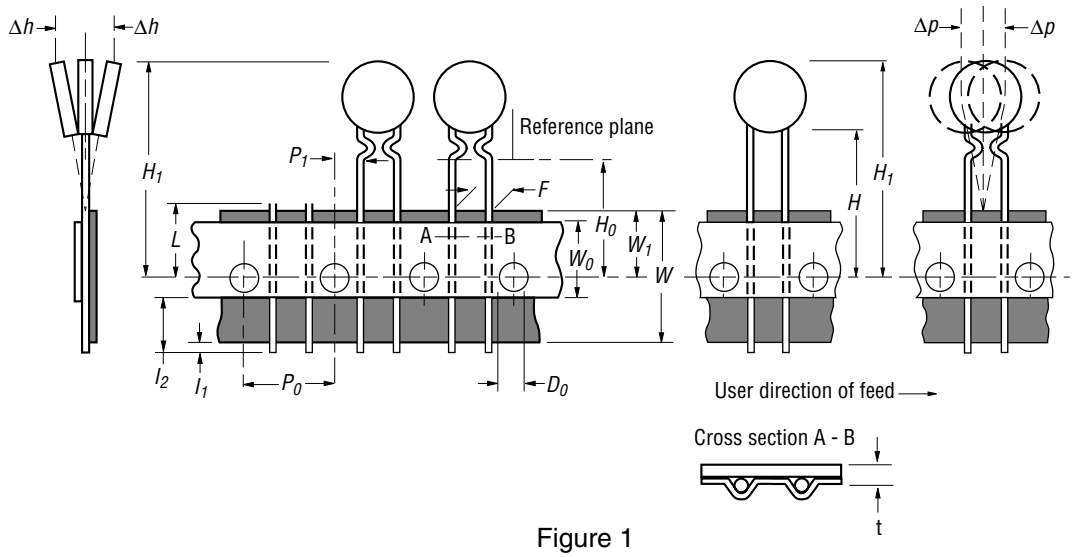


Figure 1

Reel Dimensions

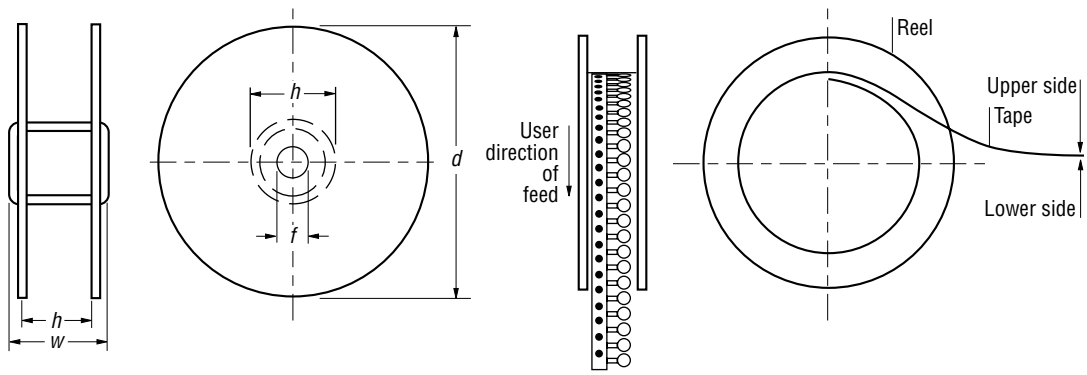


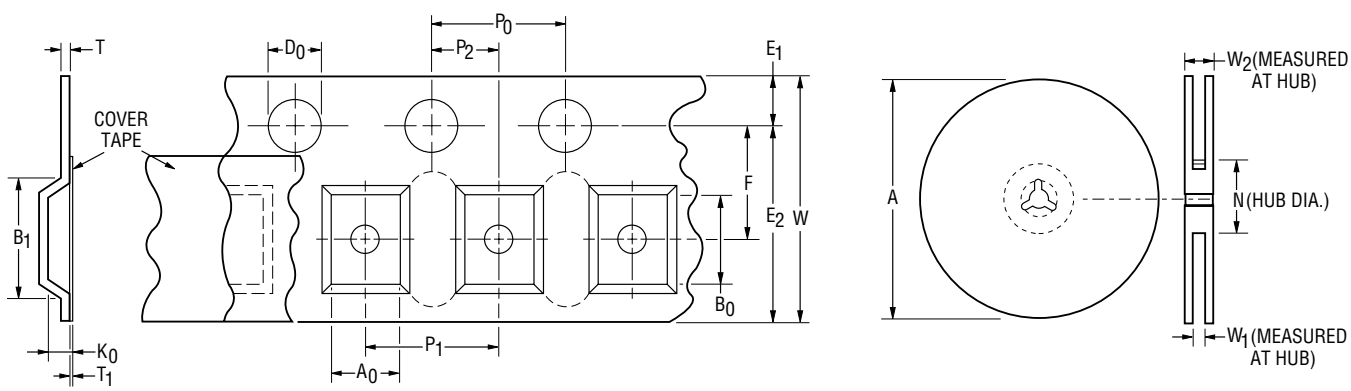
Figure 2

MF-SM Series Tape and Reel Specifications

BOURNS®

Tape Dimension Identifiers	MF-SM030, 050, 075, 100, 125 per EIA-481-2	MF-SM150, 200, 250, 260 per EIA 481-2
W	16 ± 0.3 (63 ± .012)	16 ± 0.3 (63 ± .012)
P_0	4.0 ± 0.10 (.157 ± .004)	4.0 ± 0.10 (.157 ± .004)
P_1	8.0 ± 0.10 (.315 ± .004)	12.0 ± 0.10 (.472 ± .004)
P_2	8.0 ± 0.10 (.315 ± .004)	12.0 ± 0.10 (.472 ± .004)
A_0	2.0 ± 0.10 (.079 ± .004)	2.0 ± 0.10 (.079 ± .004)
B_0	5.7 ± 0.10 (.224 ± .004)	6.9 ± 0.10 (.272 ± .004)
B_1 max.	8.1 ± 0.15 (.319 ± .006)	9.6 ± 0.10 (.378 ± .004)
D_0	9.1 (.358)	11.0 (.433)
F	1.5 + 0.1/ -0 (.059 + .004/-0)	1.5 + 0.1/ -0 (.059 + .004/-0)
E_1	7.5 ± 0.10 (.295 ± .004)	7.5 ± 0.10 (.295 ± .004)
E_2 min.	1.75 ± 0.10 (.069 ± .004)	1.75 ± 0.10 (.069 ± .004)
T max.	14.25 (.561)	14.25 (.561)
T_1 max.	0.4 (.016)	0.4 (.016)
K_0	0.1 (.004)	0.1 (.004)
Leader min.	3.4 ± 0.15 (.134 ± .006)	3.5 ± 0.15 (.138 ± .006)
Trailer min.	390 (15.35)	390 (15.35)
Reel Dimension Identifiers	160 (6.30)	160 (6.30)
A max.	360 (14.17)	360 (14.17)
N min.	50 (1.97)	50 (1.97)
W_1	16.4 + 2.0/ -0 (.65 + .079/-0)	16.4 + 2.0/ -0 (.65 + .079/-0)
W_2 max.	22.4 (.882)	22.4 (.882)

DIMENSIONS = MM / (INCHES)

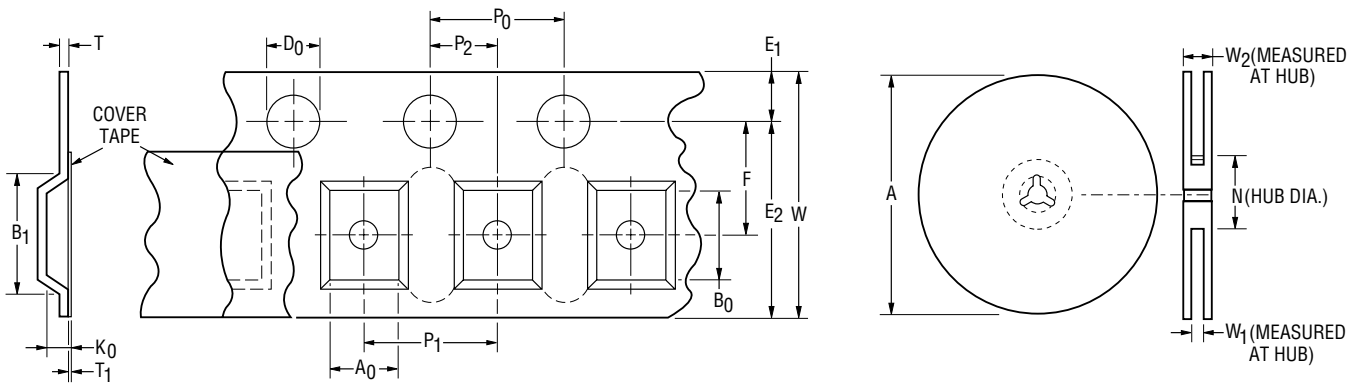


MF-MSMD, MF-USMD & MF-ESMD Series Tape and Reel Specs

BOURNS®

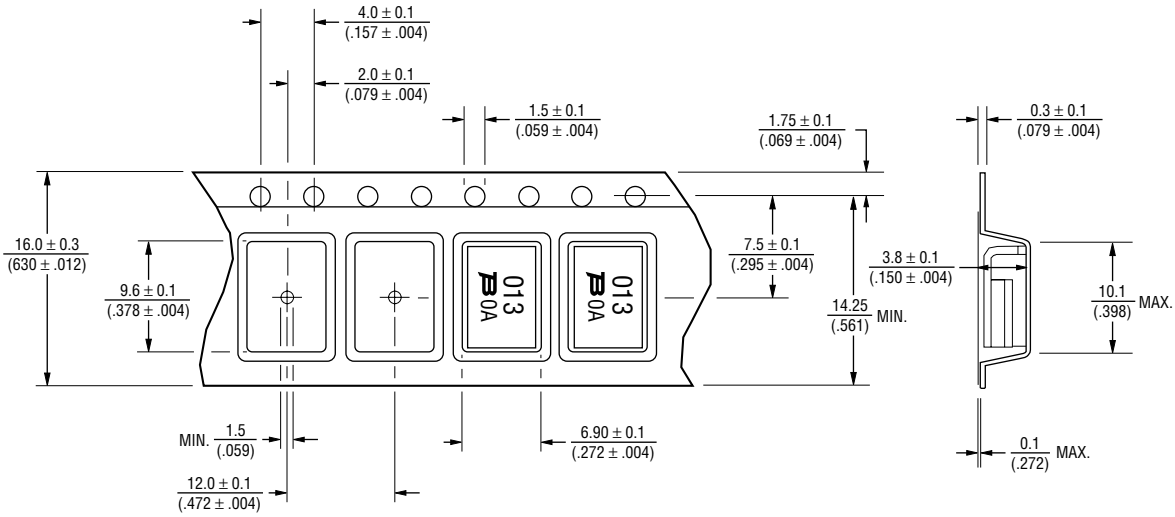
Tape Dimension Identifiers	MF-MSMD Series per EIA-481-1	MF-USMD Series per EIA 481-1	MF-ESMD Series per EIA 481-1
W	12 ± 0.3 (.472 ± .012)	8 ± 0.3 (.040 ± .012)	8 ± 0.3 (.040 ± .012)
P_0	4.0 ± 0.10 (.157 ± .004)	4.0 ± 0.10 (.157 ± .004)	4.0 ± 0.10 (.157 ± .004)
P_1	8.0 ± 0.10 (.315 ± .004)	4.0 ± 0.10 (.157 ± .004)	4.0 ± 0.10 (.157 ± .004)
P_2	2.0 ± 0.05 (.079 ± .039)	2.0 ± 0.05 (.079 ± .039)	2.0 ± 0.05 (.079 ± .039)
A_0	3.5 ± 0.23 (.134 ± .009)	2.8 ± 0.1 (.110 ± .004)	2.8 ± 0.1 (.110 ± .004)
B_0	5.1 ± 0.15 (.201 ± .006)	3.5 ± 0.1 (.138 ± .004)	3.5 ± 0.1 (.138 ± .004)
B_1 max.	5.9 (.232)	4.35 (.171)	4.35 (.171)
D_0	1.5 + 0.1/ -0 (.059 + .004/-0)	1.5 + 0.1/ -0 (.059 + .004/-0)	1.5 + 0.1/ -0 (.059 + .004/-0)
F	5.5 ± 0.05 (2.165 ± .002)	3.5 ± 0.05 (.138 ± .002)	3.5 ± 0.05 (.138 ± .002)
E_1	1.75 ± 0.10 (.069 ± .004)	1.75 ± 0.10 (.069 ± .004)	1.75 ± 0.10 (.069 ± .004)
E_2 min.	10.25 (.404)	6.25 (.246)	6.25 (.246)
T max.	0.6 (.024)	0.6 (.024)	0.6 (.024)
T_1 max.	0.1 (.004)	0.1 (.004)	0.1 (.004)
K_0	0.9 ± 0.15 (.035 ± .006)	1.1 ± 0.05 (.043 ± .002)	0.8 ± 0.1 (.031 ± .004)
Leader min.	390 (15.35)	390 (15.35)	390 (15.35)
Trailer min.	160 (6.30)	160 (6.30)	160 (6.30)
Reel Dimension Identifiers			
A max.	185 (7.283)	185 (7.283)	185 (7.283)
N min.	50 (1.97)	50 (1.97)	50 (1.97)
W_1	12.4 + 2.0/ -0 (.488 + .075/-0)	8.4 + 1.5/ -0 (.331 + .059/-0)	8.4 + 1.5/ -0 (.331 + .059/-0)
W_2 max.	18.4 (.724)	14.4 (.567)	14.4 (.567)

DIMENSIONS = MM (INCHES)

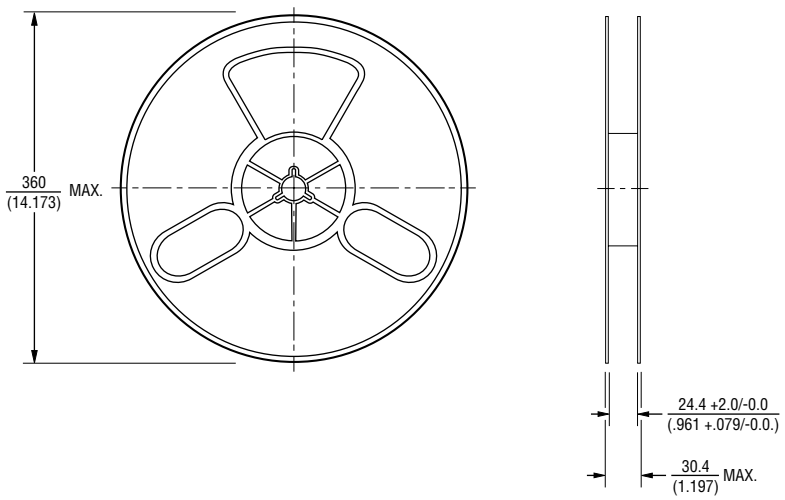


Specifications are subject to change without notice.

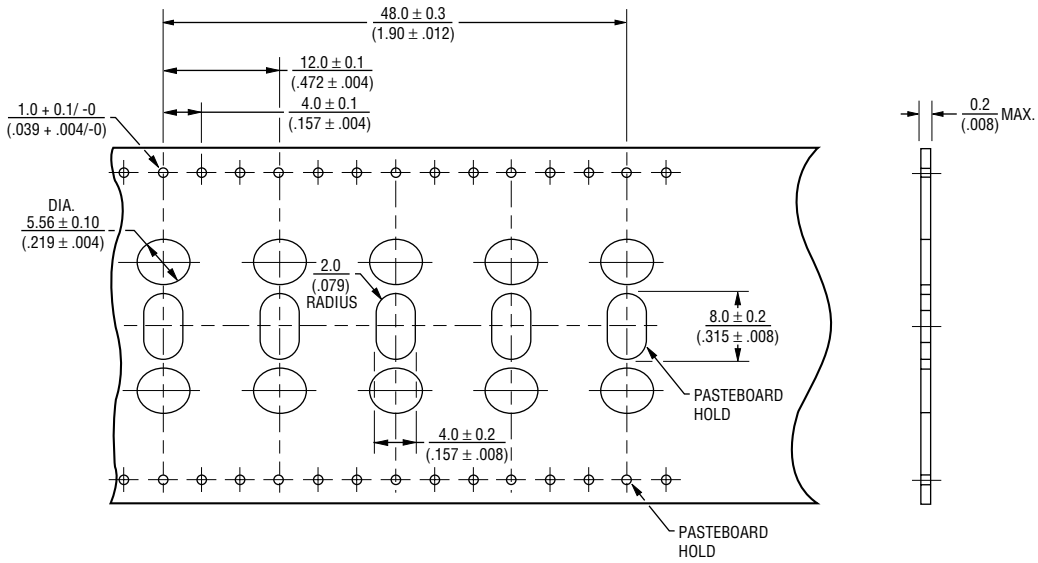
Taped Component Dimensions



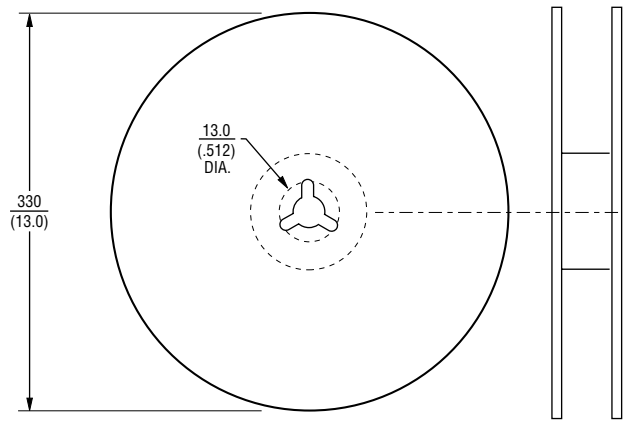
Reel Dimensions



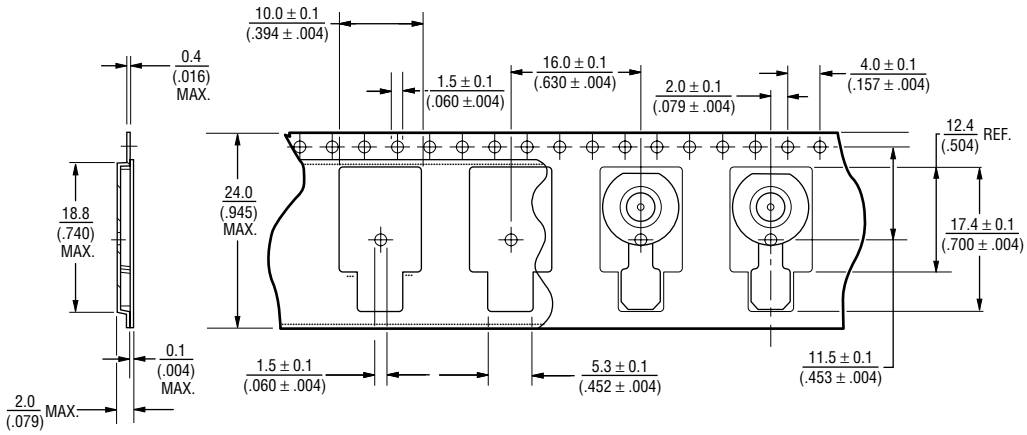
Taped Component Dimensions



Reel Dimensions



Taped Component Dimensions



Reel Dimensions