

Tape and Reel Packaging for Semiconductor Devices



Technical Data

Description

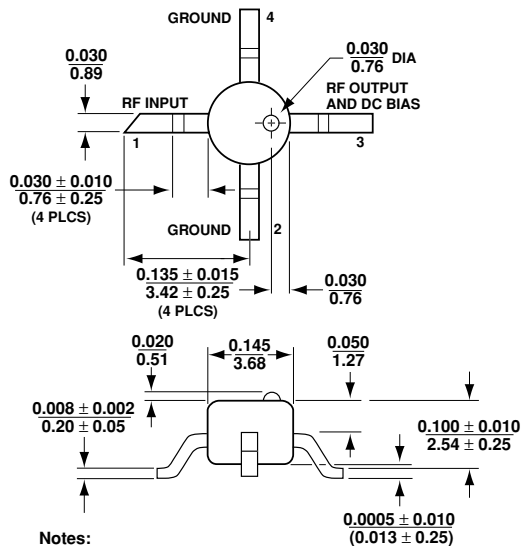
This data sheet is intended to cover standards on tape and reel packaging for Avago Technologies's semiconductor devices. This type of tape and reel packaging is designed to be compatible with available automated pick and place machines.

Related Standard

EIA RS481, "Taping of Leadless Components for Automatic Placement." In case of conflict regarding MSD product, this data sheet will govern.

1. Package Outlines

05: 145 mil Surface Mount Plastic (B)



Notes:

(unless otherwise specified)

1. Dimensions are in mm

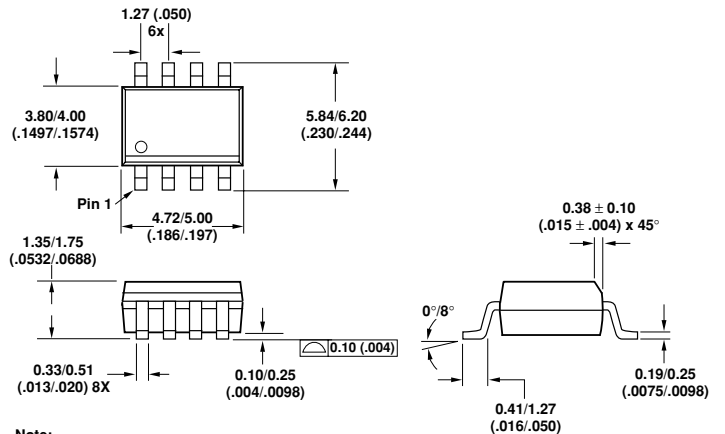
2. Tolerances

in .xxx = ± 0.005

mm .xx = ± 0.13

3. Date code character on bottom of package

08A: Plastic SO-8

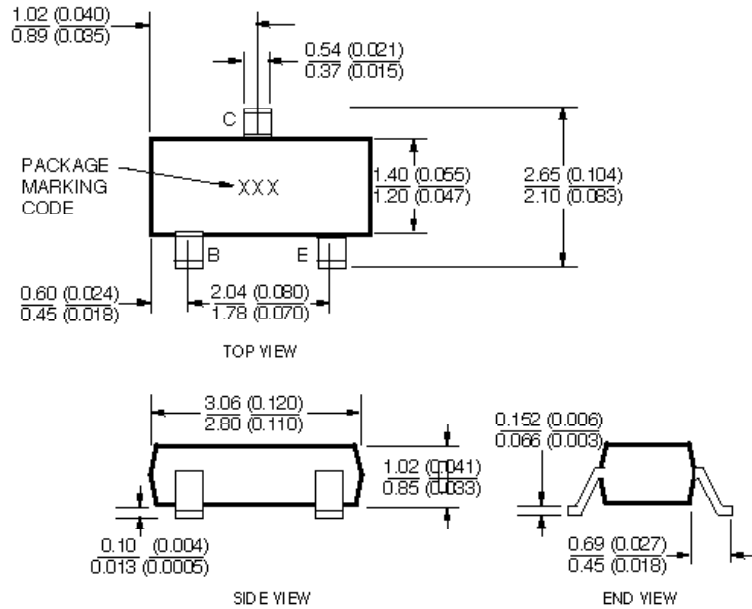


Note:

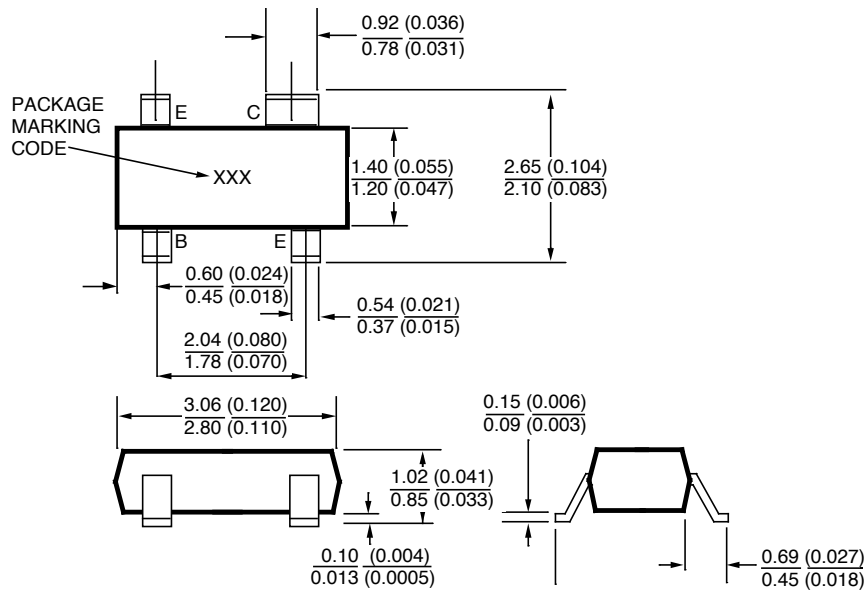
1. Dimensions are shown in millimeters (inches).

1. Package Outlines, continued

Outline SOT-23



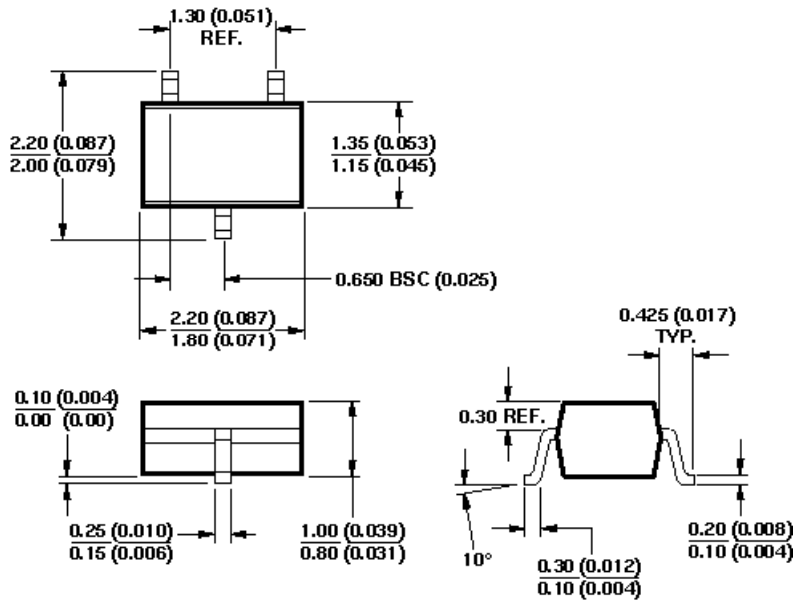
Outline SOT-143



DIMENSIONS ARE IN MILLIMETERS (INCHES)

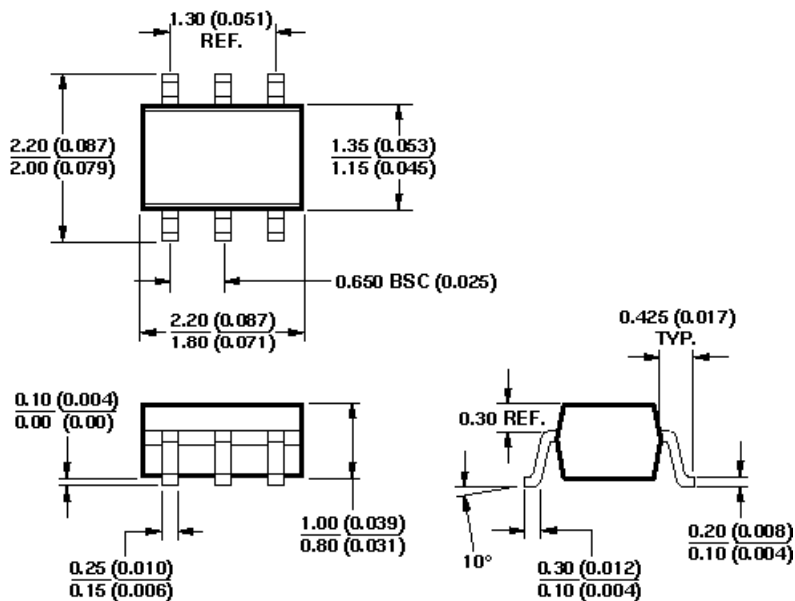
1. Package Outlines, continued

Outline SOT-323 (SC-70 3 Lead)



DIMENSIONS ARE IN MILLIMETERS (INCHES)

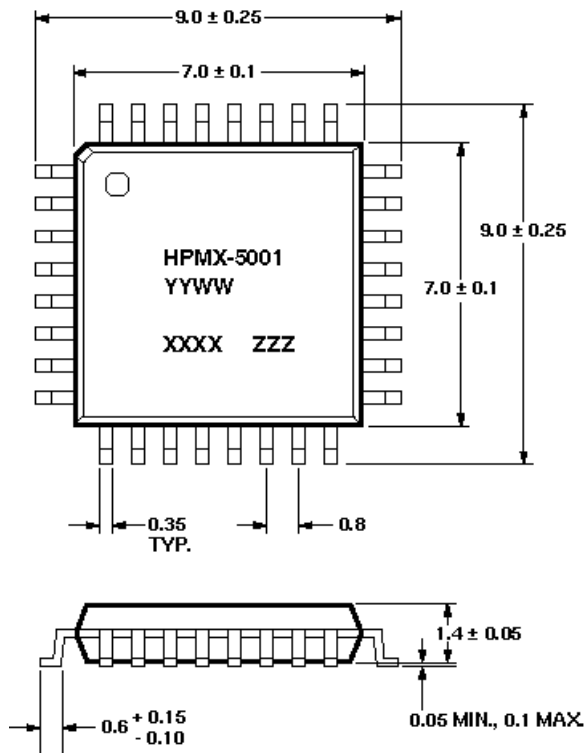
Outline 63 (SOT-363/SC-70)



DIMENSIONS ARE IN MILLIMETERS (INCHES)

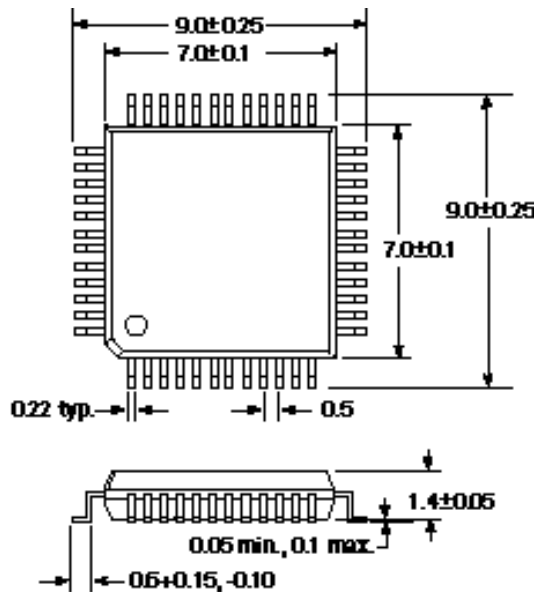
1. Package Outlines, continued

Outline TQFP-32 (32 Pin Thin Quad Flat Package)



ALL DIMENSIONS SHOWN IN mm

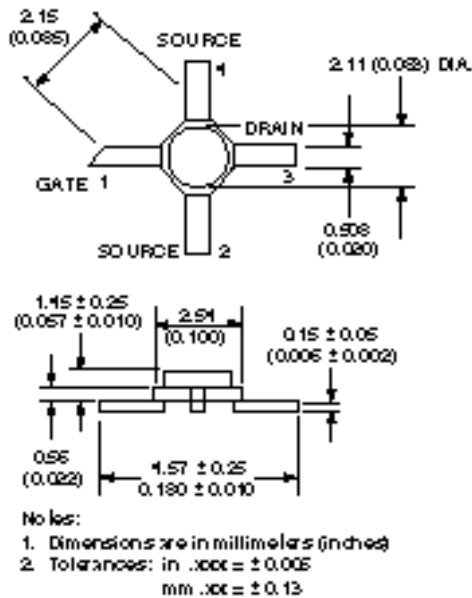
Outline TQFP-48 (48 Pin Thin Quad Flat Package)



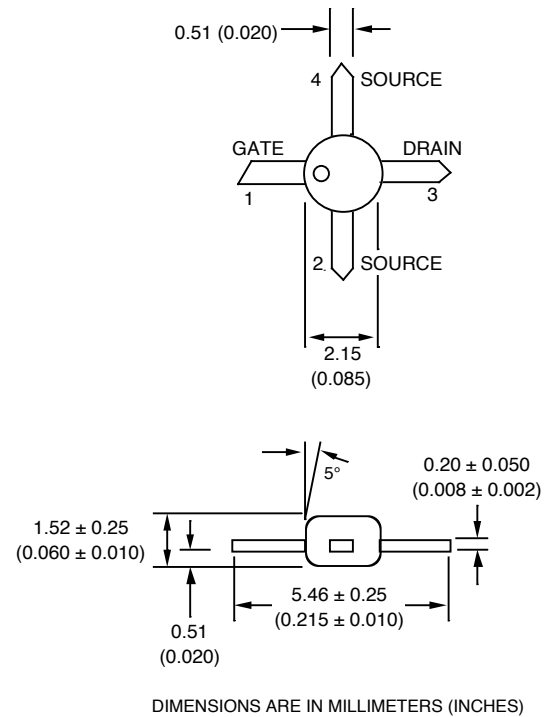
ALL DIMENSIONS SHOWN IN mm

1. Package Outlines, continued

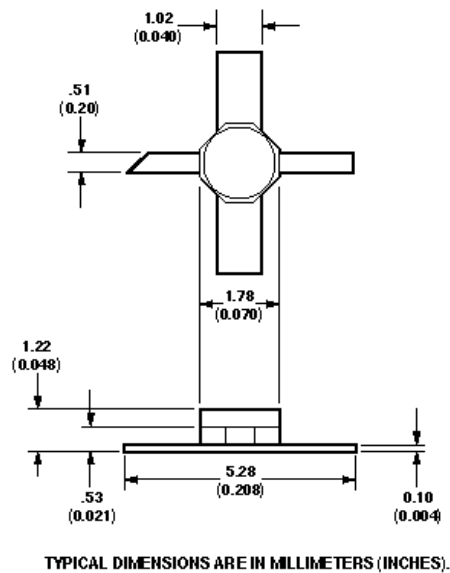
36: Short Lead micro-X (B, D)



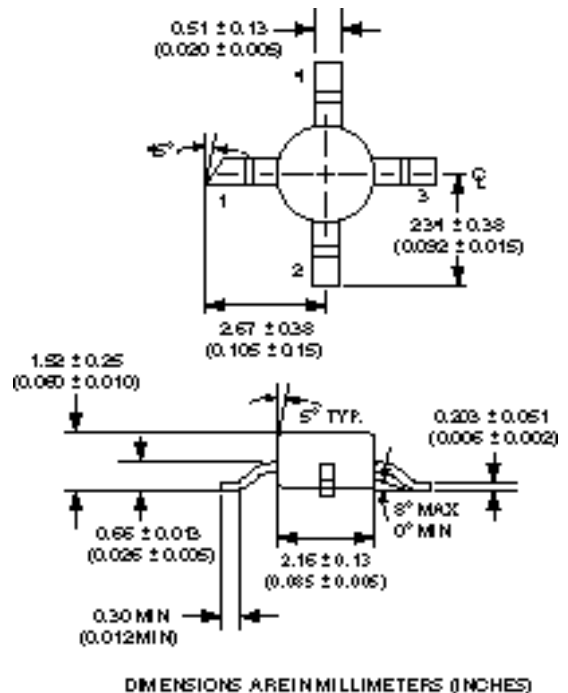
84: Short Lead 85 mil Plastic (D)



76: 70 mil Ceramic

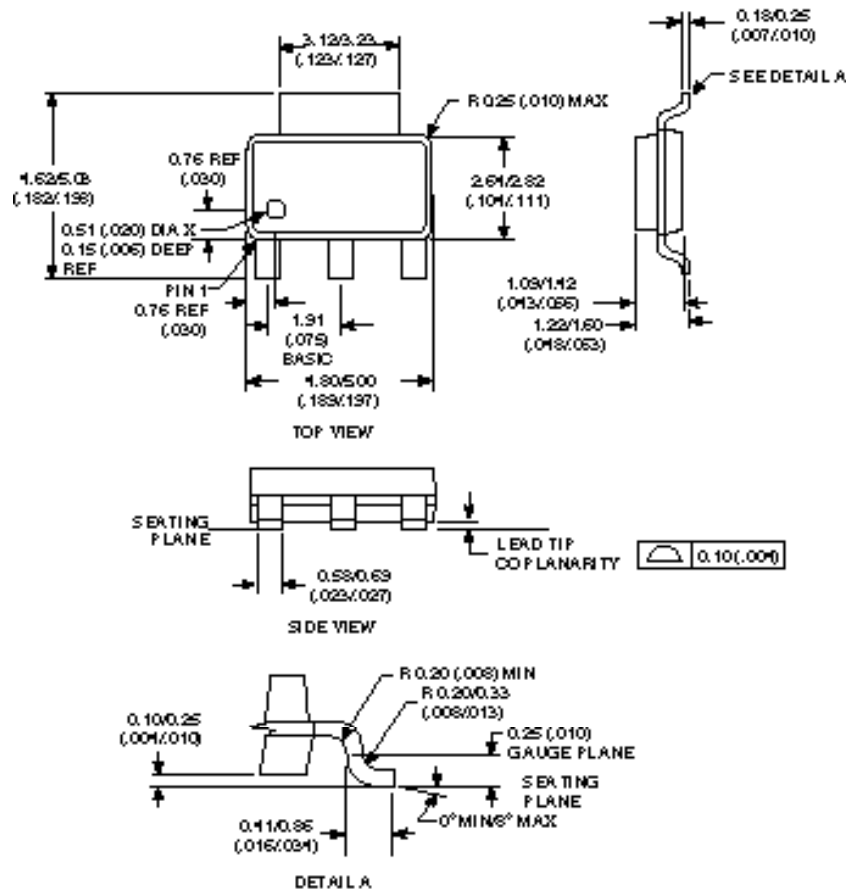


Outline 86



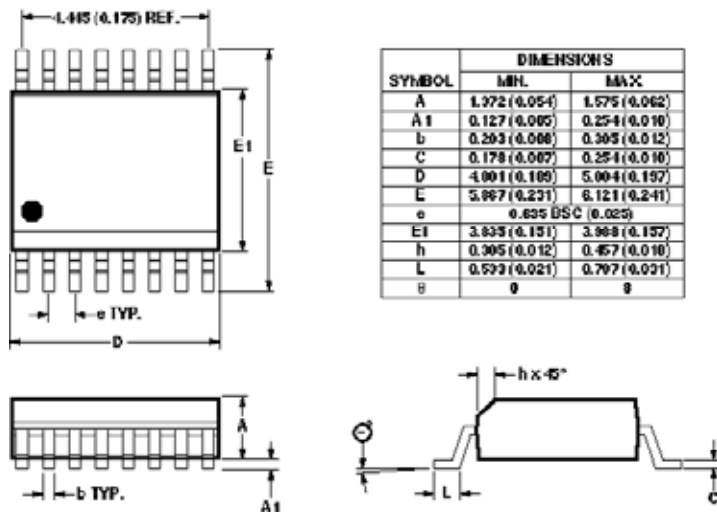
1. Package Outlines, continued

MSOP-3 Surface Mount Plastic Package



NOTE:
DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES)

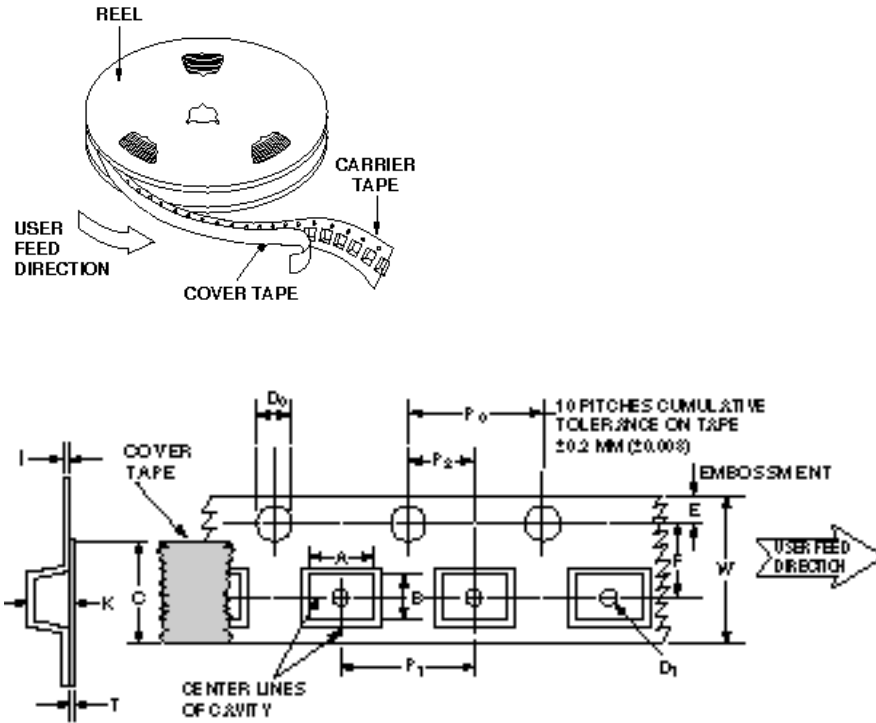
SSOP-16



DIMENSIONS IN MILLIMETERS AND (INCHES).

2. Tape Dimensions and Product Orientation

For Outlines SOT-23, SOT-143, and 08A (SOIC-8)



SOT-23 and SOT-143 Dimensions

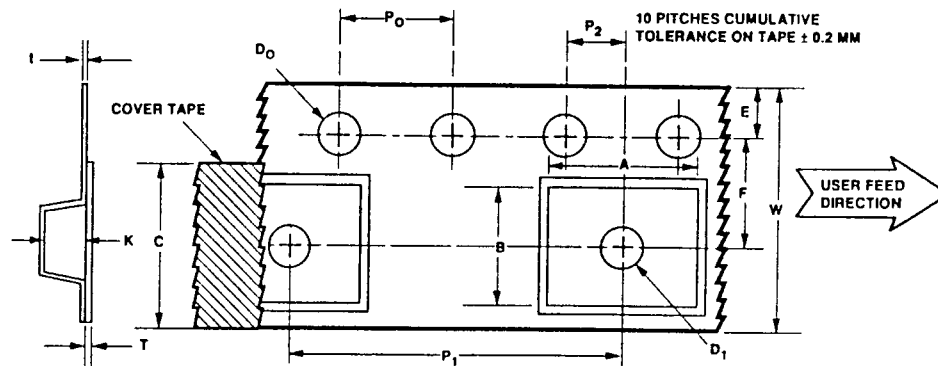
DESCRIPTION		SYMBOL	SIZE(mm)	SIZE (INCHES)
CAVITY	LENGTH	A	3.15 ± 0.15	0.124 ± 0.006
	WIDTH	B	2.65 ± 0.25	0.104 ± 0.010
	DEPTH	K	1.30 ± 0.10	0.051 ± 0.004
	PITCH	P ₁	4.00 ± 0.10	0.157 ± 0.004
	BOTTOM HOLE DIAMETER	D ₁	1.00 min.	0.04 min.
PERFORATION	DIAMETER	D ₀	$1.95 \pm 0.10 \pm 0$	$0.061 \pm 0.004 \pm 0$
	PITCH	P ₀	4.00 ± 0.10	0.157 ± 0.004
	POSITION	E	1.75 ± 0.10	0.069 ± 0.004
CARRIER TAPE	WIDTH	W	8.00 ± 0.2	0.315 ± 0.008
	THICKNESS	I	0.30 ± 0.05	0.012 ± 0.002
COVER TAPE	WIDTH	C	5.40 ± 0.25	0.205 ± 0.010
	TAPE THICKNESS	T	0.064 ± 0.01	0.003 ± 0.0004
DISTANCE BETWEEN CENTER LINE	CAVITY TO PERFORATION (WIDTH DIRECTION)	F	3.50 ± 0.10	0.138 ± 0.004
	CAVITY TO PERFORATION (LENGTH DIRECTION)	P ₂	2.00 ± 0.05	0.079 ± 0.002

2. Tape Dimensions and Product Orientation, continued

For Outline 08A (SOIC-8)

DESCRIPTION		SYMBOL	SIZE (mm)	SIZE (INCHES)
CAVITY	LENGTH	λ	6.45 ± 0.10	0.254 ± 0.004
	WIDTH	B	5.73 ± 0.10	0.202 ± 0.004
	DEPTH	K	2.11 ± 0.10	0.083 ± 0.004
	PITCH	P_1	8.00 ± 0.10	0.315 ± 0.004
	BOTTOM HOLE DIAMETER	D_1	1.50 min.	0.059 min.
PERFORATION	DIAMETER	D_0	$1.50 + 0.10/-0$	$0.059 + 0.004/-0$
	PITCH	P_0	4.00 ± 0.10	0.157 ± 0.004
	POSITION	E	1.75 ± 0.10	0.069 ± 0.004
CARRIER TAPE	WIDTH	W	8.00 ± 0.30	0.315 ± 0.012
	THICKNESS	I	0.255 ± 0.013	0.0100 ± 0.0005
COVER TAPE	WIDTH	C	9.73 ± 0.10	0.382 ± 0.004
	TAPE THICKNESS	T	0.051 ± 0.010	0.0020 ± 0.0004
DISTANCE BETWEEN CENTERLINE	CAVITY TO PERFORATION (WIDTH DIRECTION)	F	5.51 ± 0.05	0.217 ± 0.002
	CAVITY TO PERFORATION (LENGTH DIRECTION)	P_2	2.00 ± 0.05	0.079 ± 0.002

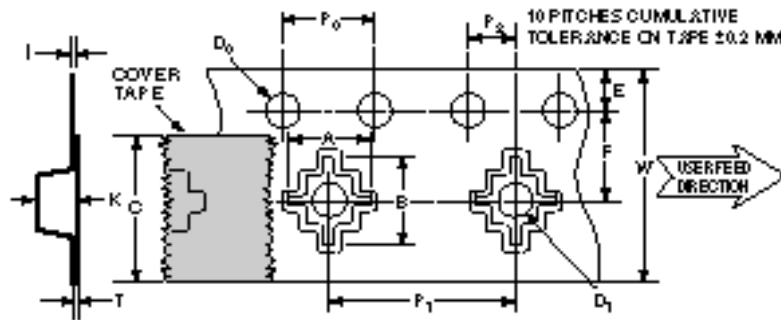
For Outline 05



DESCRIPTION		SYMBOL	SIZE (mm)	SIZE (INCHES)
CAVITY	LENGTH	λ	6.70 ± 0.10	0.240 ± 0.004
	WIDTH	B	6.70 ± 0.10	0.240 ± 0.010
	DEPTH	K	3.78 ± 0.10	0.125 ± 0.004
	PITCH	P_1	12.00 ± 0.10	0.472 ± 0.004
	BOTTOM HOLE DIAMETER	D_1	1.50 min.	0.059 min.
PERFORATION	DIAMETER	D_0	$1.50 + 0.10/-0.05$	$0.059 + 0.004/-0.002$
	PITCH	P_0	4.00 ± 0.10	0.157 ± 0.004
	POSITION	E	1.75 ± 0.10	0.069 ± 0.004
CARRIER TAPE	WIDTH	W	12.00 ± 0.20	0.472 ± 0.008
	THICKNESS	I	0.30 ± 0.05	0.012 ± 0.002
COVER TAPE	WIDTH	C	9.30 ± 0.10	0.366 ± 0.004
	TAPE THICKNESS	T	0.065 ± 0.01	0.003 ± 0.0004
DISTANCE BETWEEN CENTERLINE	CAVITY TO PERFORATION (WIDTH DIRECTION)	F	5.50 ± 0.05	0.217 ± 0.002
	CAVITY TO PERFORATION (LENGTH DIRECTION)	P_2	2.00 ± 0.05	0.079 ± 0.002

2. Tape Dimensions and Product Orientation, continued

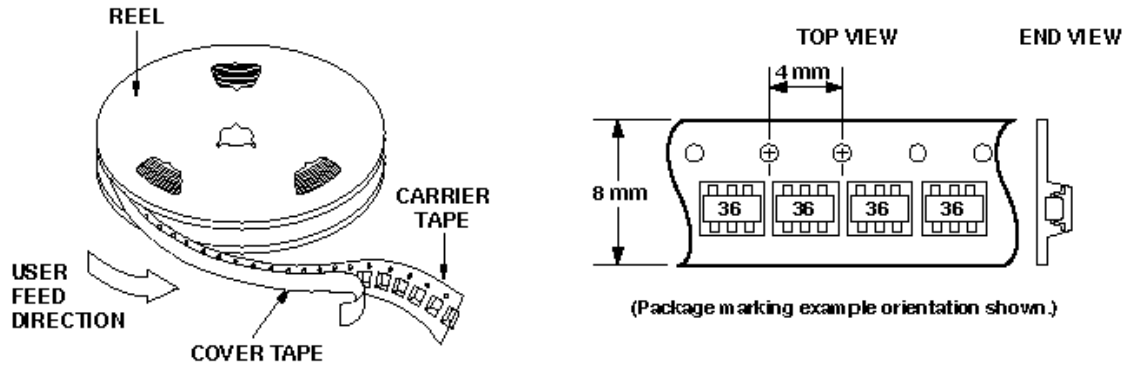
For Outlines 36, 76, 84, and 86



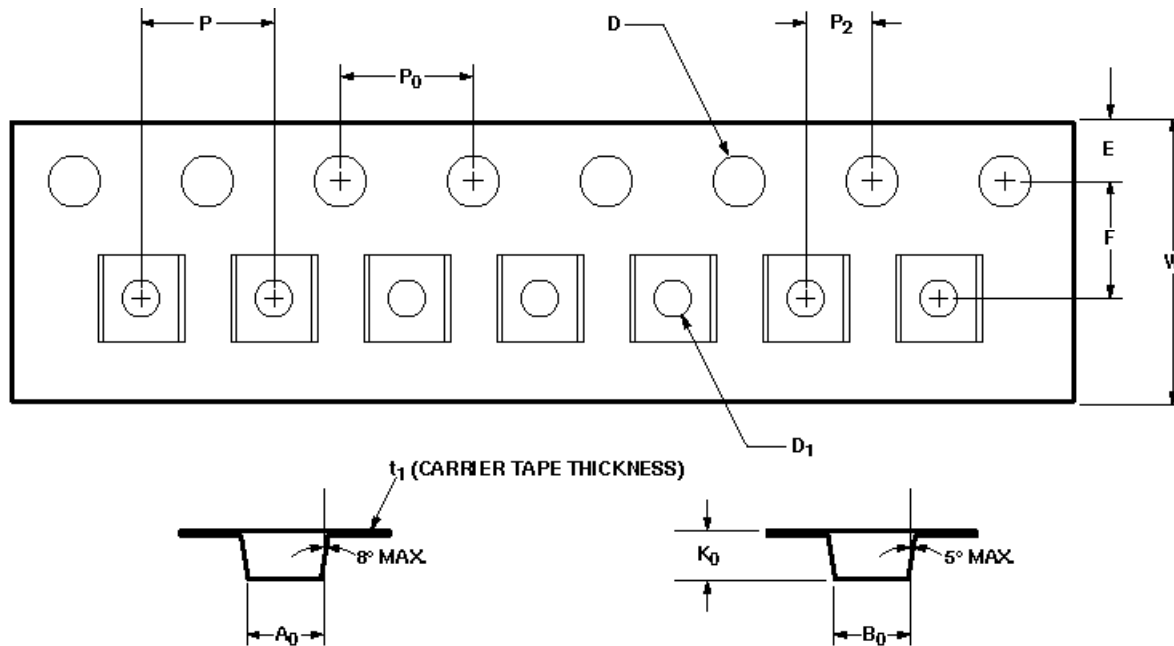
DESCRIPTION		SYMBOL	SIZE (mm.)	SIZE (INCHES)
OR UT V	LENGTH	A	5.11 ± 0.10	0.221 ± 0.004
	WIDTH	B	6.10 ± 0.10	0.240 ± 0.004
	DEPTH	K	1.70 ± 0.10	0.067 ± 0.004
	PITCH	P ₁	6.00 ± 0.10	0.234 ± 0.004
	BOTTOM HOLE DIAMETER	D ₁	1.50 min.	0.059 min.
PERFORATION	DIAMETER	D ₀	$1.50 \pm 0.10 \pm 0.05$	$0.059 \pm 0.004 \pm 0.002$
	PITCH	P ₀	4.00 ± 0.10	0.157 ± 0.004
	POSITION	E	1.75 ± 0.10	0.069 ± 0.004
CARRIER TAPE	WIDTH	W	12.00 ± 0.20	0.472 ± 0.008
	THICKNESS	I	0.30 ± 0.05	0.012 ± 0.002
COVER TAPE	WIDTH	O	9.30 ± 0.10	0.366 ± 0.004
	TAPE THICKNESS	T	0.065 ± 0.010	0.0026 ± 0.0004
DISTANCE BETWEEN CENTER LINE	OR AUTY TO PERFORATION (WIDTH DIRECTION)	F	5.50 ± 0.05	0.217 ± 0.002
	OR AUTY TO PERFORATION (LENGTH DIRECTION)	F ₂	2.00 ± 0.05	0.079 ± 0.002

2. Tape Dimensions and Product Orientation, continued

Device Orientation



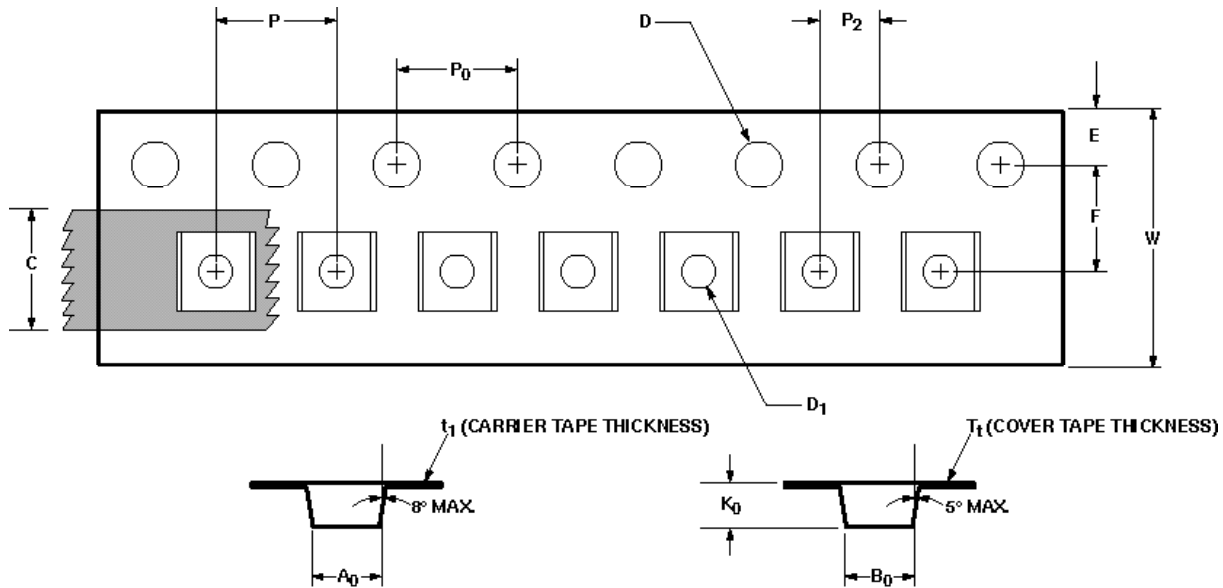
For Outline 63



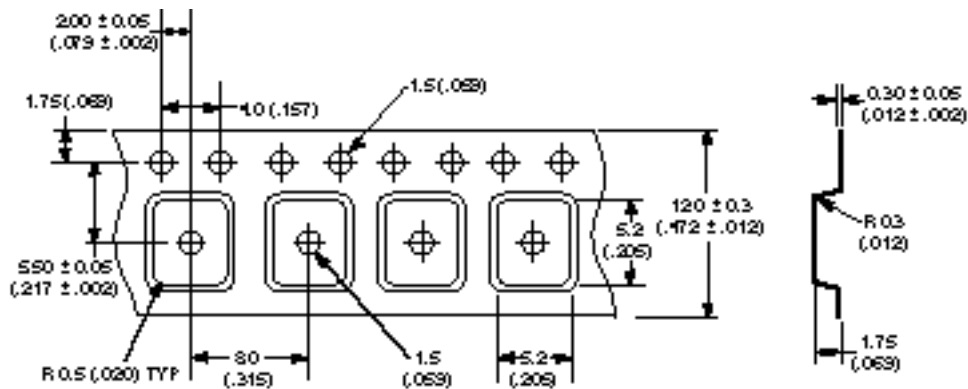
DESCRIPTION		SYMBOL	SIZE (mm)	SIZE (INCHES)
CAVITY	LENGTH	A ₀	2.24 ± 0.10	0.088 ± 0.004
	WIDTH	B ₀	2.34 ± 0.10	0.092 ± 0.004
	DEPTH	K ₀	1.22 ± 0.10	0.048 ± 0.004
	PITCH	P	4.00 ± 0.10	0.157 ± 0.004
	BOTTOM HOLE DIAMETER	D ₁	1.00 ± 0.25	0.039 ± 0.010
PERFORATION	DIAMETER	D	1.55 ± 0.05	0.061 ± 0.002
	PITCH	P ₀	4.00 ± 0.10	0.157 ± 0.004
	POSITION	E	1.75 ± 0.10	0.069 ± 0.004
CARRIER TAPE	WIDTH	W	8.00 ± 0.30	0.315 ± 0.012
	THICKNESS	t ₁	0.255 ± 0.013	0.010 ± 0.0005
DISTANCE	CAVITY TO PERFORATION (WIDTH DIRECTION)	F	3.50 ± 0.05	0.138 ± 0.002
	CAVITY TO PERFORATION (LENGTH DIRECTION)	P ₂	2.00 ± 0.05	0.079 ± 0.002

2. Tape Dimensions and Product Orientation, continued

For Outline SOT-323 (SC-70 3 Lead)



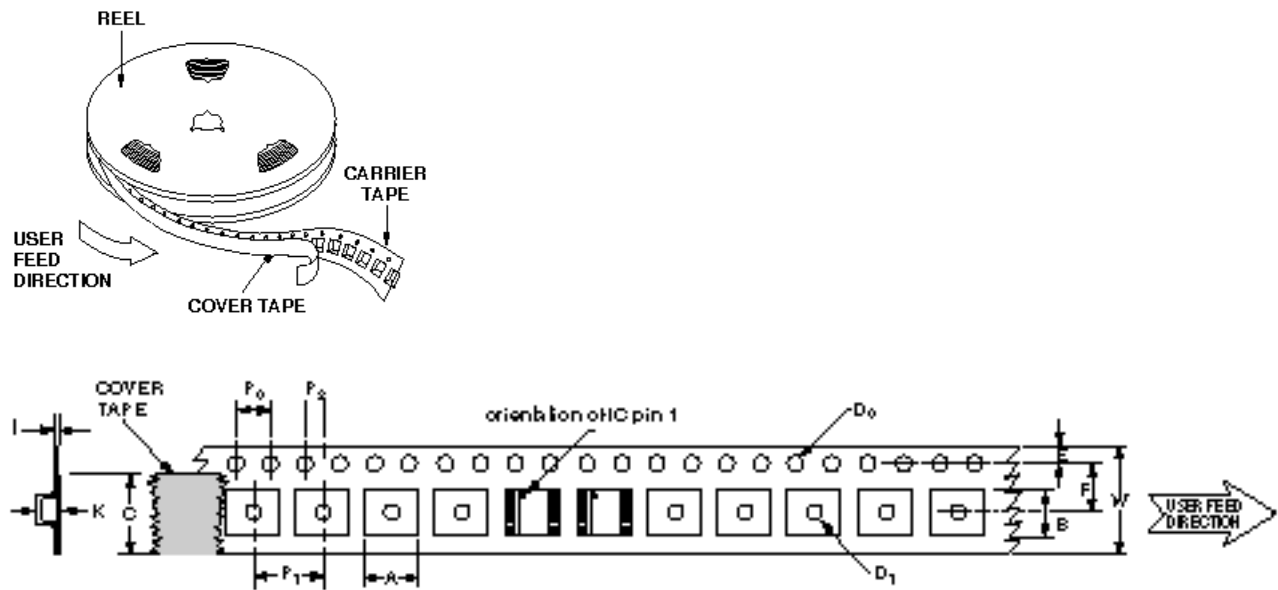
DESCRIPTION		SYMBOL	SIZE (mm)	SIZE (INCHES)
CAVITY	LENGTH	A_0	2.24 ± 0.10	0.088 ± 0.004
	WIDTH	B_0	2.34 ± 0.10	0.092 ± 0.004
	DEPTH	K_0	1.22 ± 0.10	0.048 ± 0.004
	PITCH	P	4.00 ± 0.10	0.157 ± 0.004
	BOTTOM HOLE DIAMETER	D_1	1.00 ± 0.25	0.039 ± 0.010
PERFORATION	DIAMETER	D	1.55 ± 0.05	0.061 ± 0.002
	PITCH	P_0	4.00 ± 0.10	0.157 ± 0.004
	POSITION	E	1.75 ± 0.10	0.069 ± 0.004
CARRIER TAPE	WIDTH	W	8.00 ± 0.30	0.315 ± 0.012
	THICKNESS	t_1	0.255 ± 0.013	0.010 ± 0.0005
COVER TAPE	WIDTH	C	5.4 ± 0.10	0.205 ± 0.004
	TAPE THICKNESS	T_t	0.062 ± 0.001	0.0025 ± 0.00004
DISTANCE	CAVITY TO PERFORATION (WIDTH DIRECTION)	F	3.50 ± 0.05	0.138 ± 0.002
	CAVITY TO PERFORATION (LENGTH DIRECTION)	P_2	2.00 ± 0.05	0.079 ± 0.002

For Package MSOP-3

NOTES:
1. DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES)
2. TOLERANCES: $X \pm 0.1$ ($XXX \pm 0.004$)

2. Tape Dimensions and Product Orientation, continued

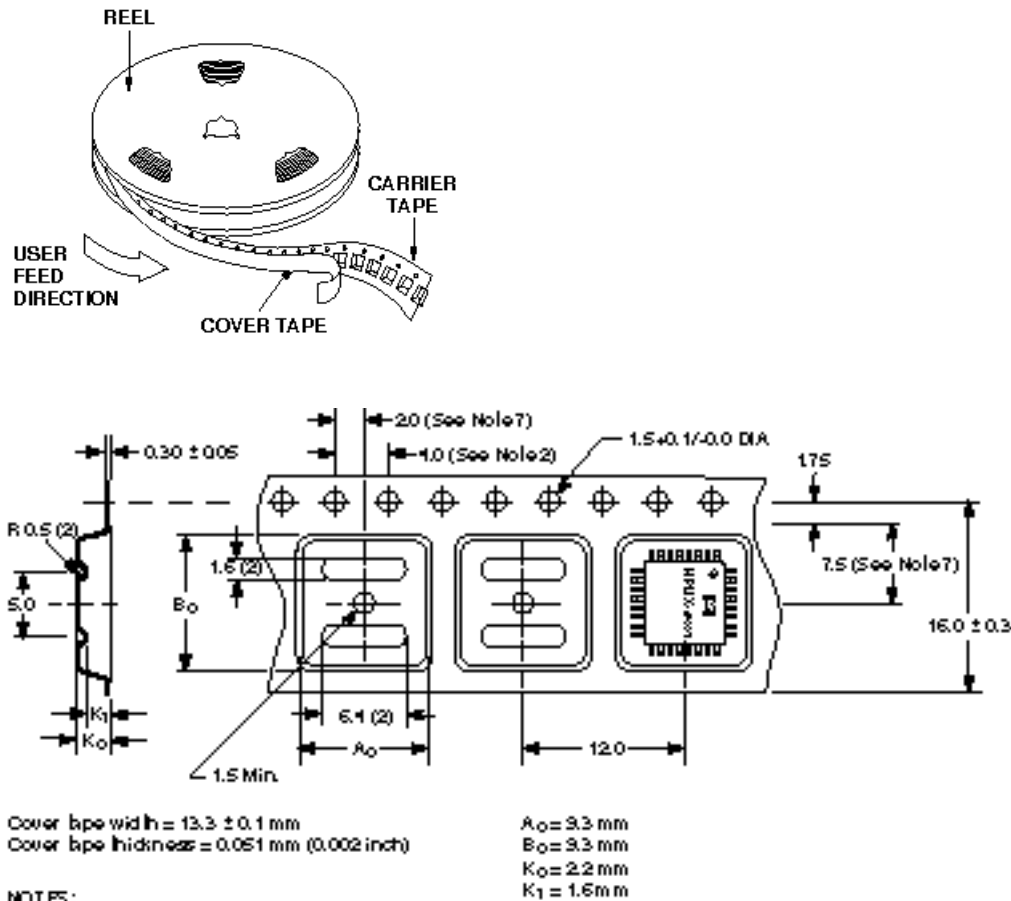
For Package SSOP-16



DESCRIPTION		SYMBOL	SIZE (mm)
CAVITY	LENGTH	A	64 ± 0.1
	WIDTH	B	5.2 ± 0.1
	DEPTH	K	2.1 ± 0.1
	PITCH	P_1	8.0 ± 0.1
	BOTTOM HOLE DIAMETER	D_1	16
PERFORATION	DIAMETER	D_0	15
	PITCH	P_0	4.0
	POSITION	E	18
CARRIER TAPE	WIDTH	W	12.0
	THICKNESS	I	0.3
COVER TAPE	WIDTH TAPE THICKNESS	C T	3.2 ± 0.1
DISTANCE BETWEEN CENTER LINE	CAVITY TO PERFORATION (WIDTH DIRECTION)	F	5.5
	CAVITY TO PERFORATION (LENGTH DIRECTION)	P_2	2.0

2. Tape Dimensions and Product Orientation, continued

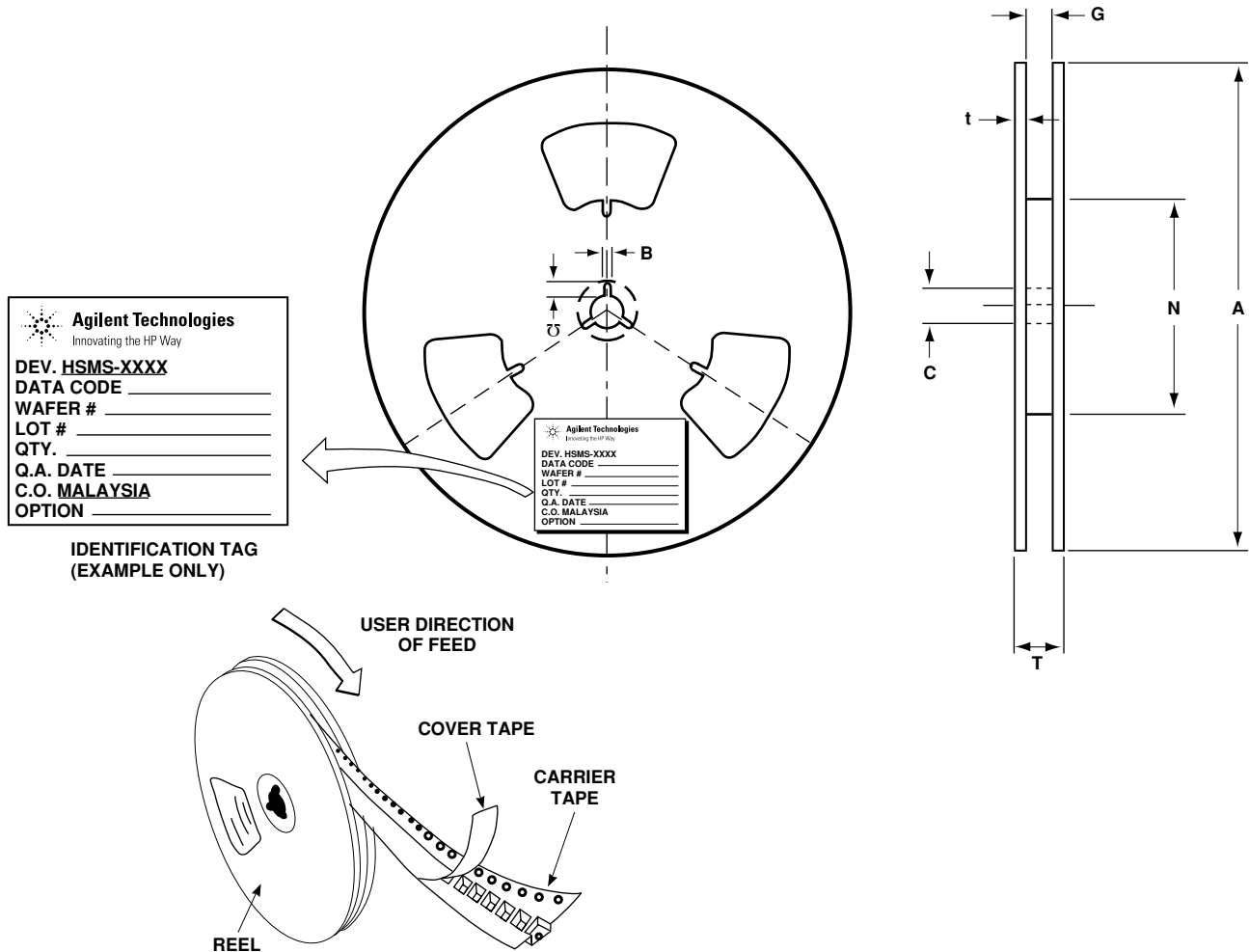
For Outlines TQFP-32 and TQFP-48



- NOTES:
1. Dimensions are in millimeters
 2. 10 sprocket hole pitch cumulative tolerance ± 0.2
 3. Chamber not to exceed 1 mm in 100 mm
 4. Material: black conductive Advanlex™ polystyrene
 5. A_0 and B_0 measured on a plane 0.3 mm above the bottom of the pocket
 6. K_0 measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
 7. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.
- $K_1 = 1.6 \text{ mm}$

3. Reel Dimensions

For Outlines SOT-23 and SOT-143



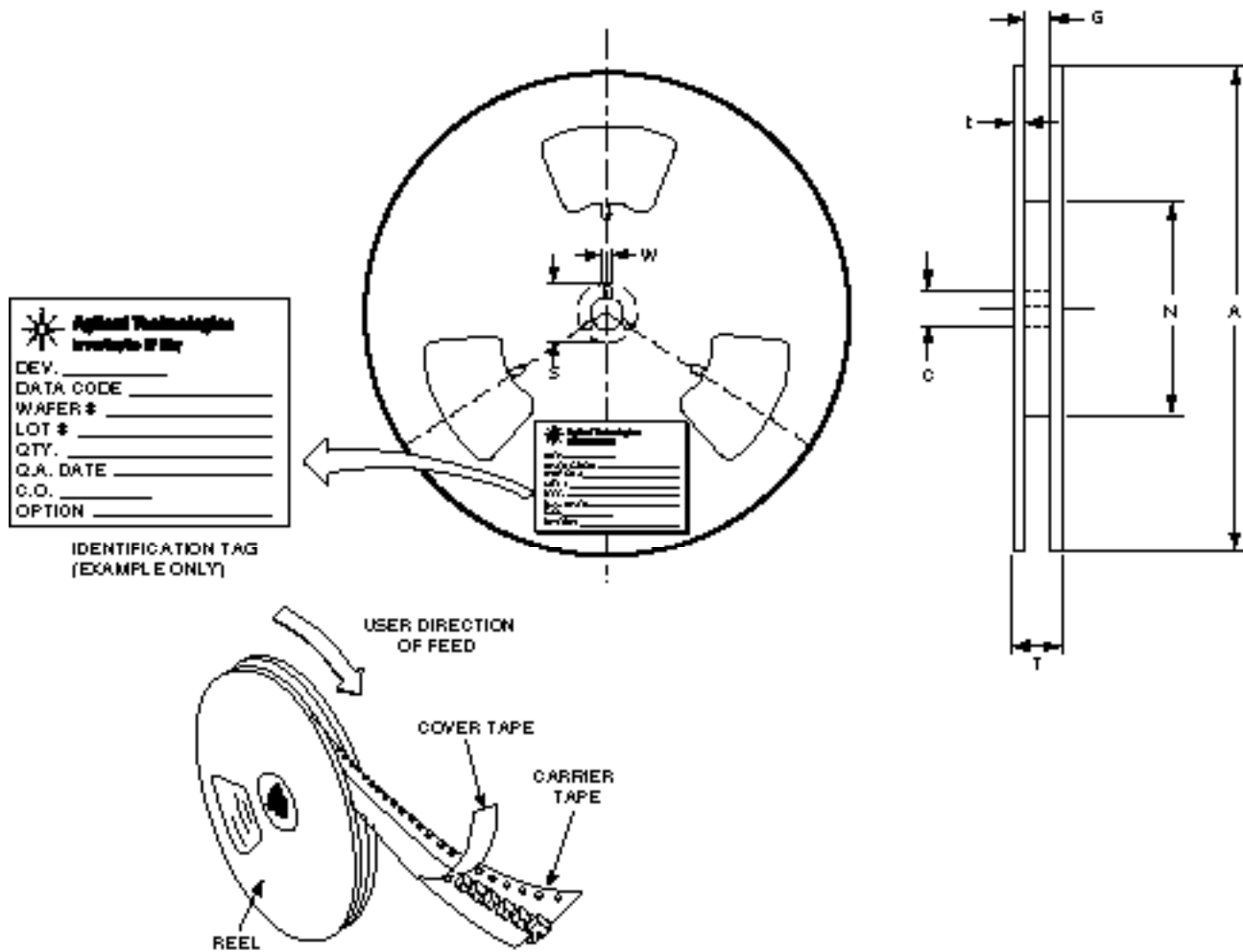
			7" REEL		13" REEL	
DESCRIPTION		SYMBOL	SIZE (mm)	SIZE (INCHES)	SIZE (mm)	SIZE (INCHES)
FLANGE	DIAMETER	A	178 ± 2.0	7.00 ± 0.079	330 ± 2.0	13.0 ± 0.079
	THICKNESS, MAXIMUM	T	14.4	0.570	14.4	0.570
	SPACE BETWEEN FLANGE	G	9.50 ± 1.0	0.374 ± 0.040	9.15 ± 0.75	0.361 ± 0.03
HUB	OUTER DIAMETER	N	66 ± 1.0	2.598 ± 0.040	55 min	12.16 min
	SPINDLE HOLE DIAMETER	C	13.0 ± 0.5	0.512 ± 0.020	13.0 ± 0.5	0.512 ± 0.02
	KEY SLIT WIDTH	B	2.0 ± 0.5	0.079 + 0.020	1.5 min	0.059 min
	DEPTH	ϕ	4.0 ± 0.5	0.16 ± 0.020	4.0 ± 0.5	0.16 ± 0.020
	LOCATION	θ	120° ± 5°		120° ± 5°	

Notes:

1. Metric dimensions will govern.
2. Drawing is not to scale.
3. Diodes available on 7" reels only.
4. Monolithic amplifiers and transistors available on 7" (-TR1) and 13" (-TR2) reels.

3. Reel Dimensions, continued

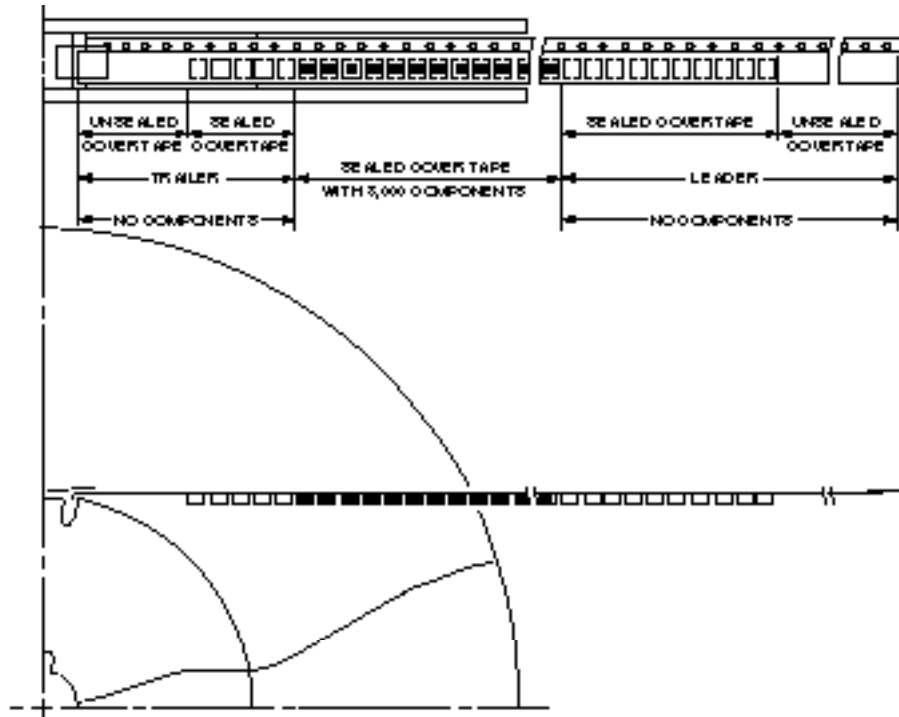
For Outlines 05, 08A, 36, 76, 84, and 86



			7" REEL		13" REEL	
DESCRIPTION		SYMBOL	SIZE (mm)	SIZE (INCHES)	SIZE (mm)	SIZE (INCHES)
FLANGE	DIAMETER	A	178 ± 2.0	7.0 ± 0.079	330 ± 2.0	13.0 ± 0.079
	THICKNESS, MAX	T	18.4	0.724	18.4	0.724
	SPACE BETWEEN FLANGE	G	12.4 + 2.0 - 0	0.488 + 0.08 - 0	12.4 + 2.0 - 0	0.488 + 0.08 - 0
HUB	OUTER DIAMETER, MIN	N	SS	2.16	63 min	2.48
	SPINDLE HOLE DIAMETER	C	13.0 ± 0.2	0.512 ± 0.008	13.0 ± 0.2	0.512 ± 0.008
	KEY SLIT WIDTH, MIN	W	1.5	0.063	1.5	0.063 min
	DIAMETER, MIN	S	20.2	0.795	20.2	0.795

4. Packing—Leader and Trailer

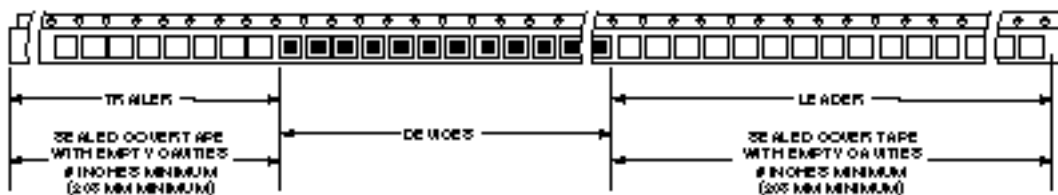
For Outlines SOT-23 and SOT-143



ITEM		SPECIFICATION (inches) (minimum)	SPECIFICATION (inches) (minimum)
LEADER	UNSEALED COVER TAPE	20	0.79
	SEALED COVER TAPE WITH EMPTY CAVITIES	160	630
TRAILER	UNSEALED COVER TAPE	20	0.79
	SEALED COVER TAPE WITH EMPTY CAVITIES	120	472

Packing

For Outlines 05, 08A, 36, 76, 84, and 86



5. Materials

For Outlines 23 and 143

- A. Carrier Tape: Static dissipative polystyrene
Surface resistivity: $10^7 \Omega/\text{square}$ maximum
- B. Cover Tape: Antistatic semi-transparent polyester
- C. Reel: Cardboard (7")

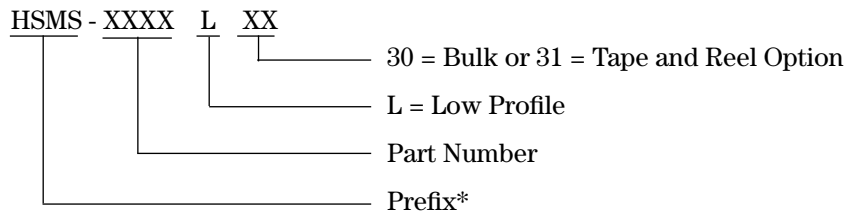
For Outlines 05, 08A, 36, 76, 84, and 86

- A. Carrier Tape: Conductive PVC
Surface resistivity: $1.8 \times 10^3 \Omega/\text{square}$
- B. Cover Tape: Semi-transparent polyester
- C. Reel: Plastic

6. Device Orientation and Ordering Information for Diodes

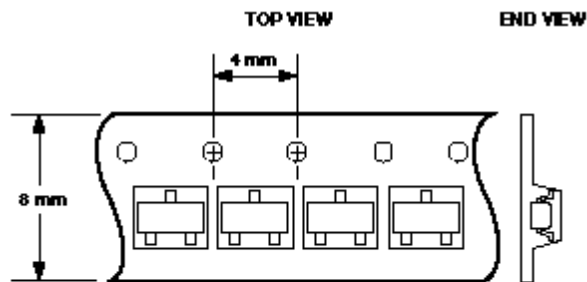
For Outlines 23 and 143

Specify part number followed by option. For example:

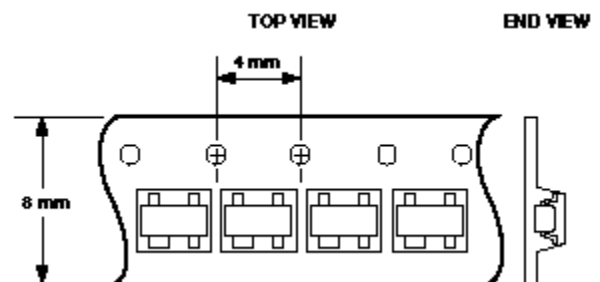


- * AT = Transistor
- MSA = Monolithic Silicon Amplifier
- HSMS = Surface Mount Schottky SOT-23/143
- HSMP = Surface Mount PIN SOT-23/143

Conforms to Electronic Industries Standard RS-481 "Taping of Surface Mounted Components for Automated Placement." Standard Quantity is 3,000 Devices/Reel for SOT-23/143.



Option L31 for SOT-23 Packages.



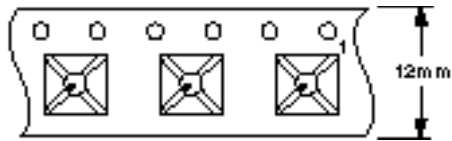
Option L31 for SOT-143 Packages.

6. Device Orientation and Ordering Information for Diodes

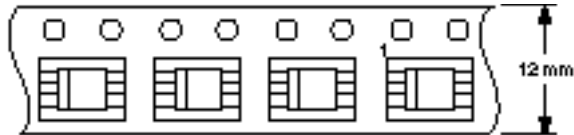
For Outlines 05, 08A, 36, 76, 84, and 86

Tape and Reel Options

Package 05

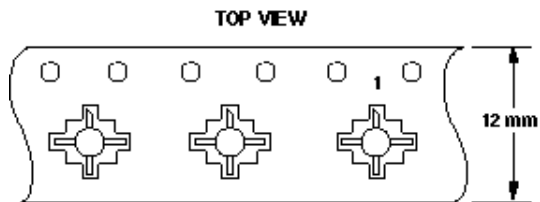


Package 08A



Packages

36, 76, 84, and 86



NOTE 1. INDICATES PIN 1 ORIENTATION.

Part Number Ordering Information

Package Style	Tape Width (mm)	Reel Size	Devices per Reel	Part Number Suffix
05	12	7"	500	-TR1
08A, 36, 74, 84, 86	12	7"	1,000	-TR1
SOT-143	8	7"	3,000	-TR1

Notes:

1. Minimum order quantity is one (1) reel.
2. Orders are required to be in increments of the single reel quantity.
3. To order, specify the device part number followed by the appropriate suffix.

Example:

ATF-13136-TR1

Package 36

7" reel

1,000 devices/reel

For product information and a complete list of distributors, please go to our web site: **www.avagotech.com**

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5966-3702E - November 1, 2007

