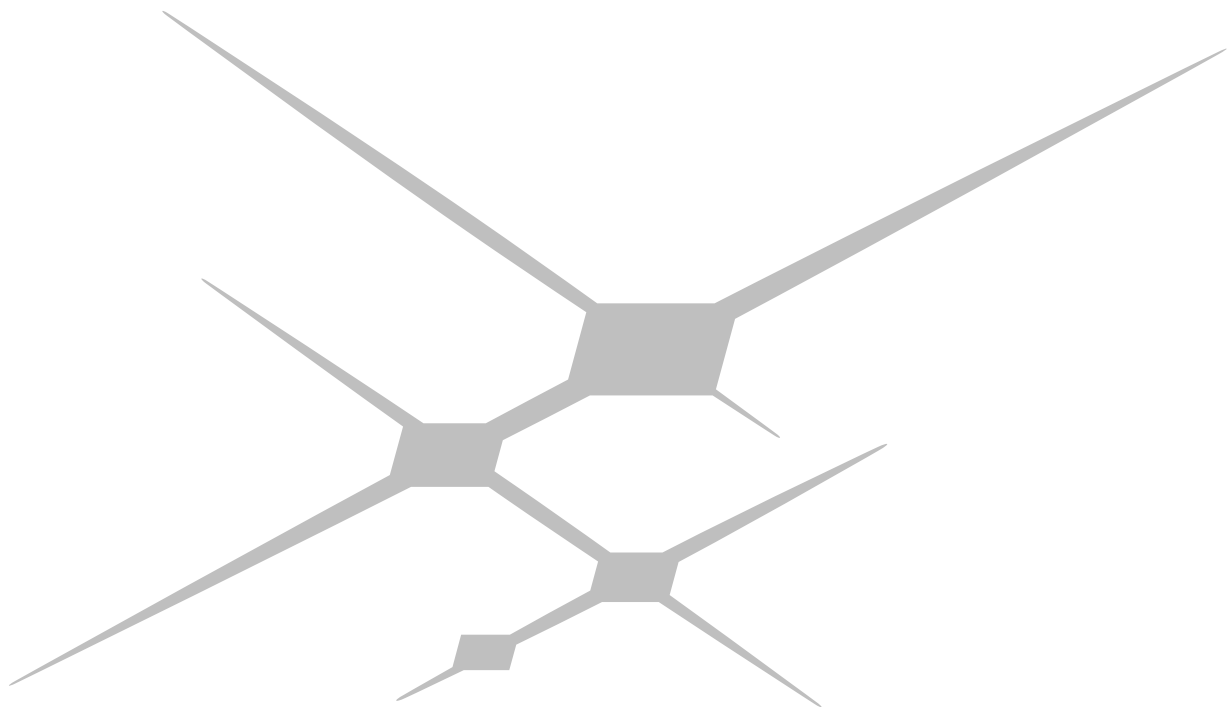




## **APPLICATION NOTE**

### **Tape and Reel Information – RF Modules**

---

Production quantities of Skyworks RF Modules are shipped in standard tape and reel format. The enclosed information provides the formats and dimensions for the popular sizes of current modules.

## Revision History

| Revision | Level | Date            | Description                                                                                                                                          |
|----------|-------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| A        |       | April 24, 2002  | Add: 4 x 4mm and 8 x 10 mm Tape and Reel Drawings                                                                                                    |
| B        |       | May 10, 2002    | Add: ESD information                                                                                                                                 |
| C        |       | July 12, 2002   | Add: Table 2                                                                                                                                         |
| D        |       | August 12, 2004 | Revise: Section 1.0; Figures 3, 5, 9, 11, 13, 15<br>Add: Section 2.0; Figures 1, 2, 4, 6, 7, 8, 10, 12, 14, 16, 17                                   |
| E        |       | October 6, 2004 | Delete: Shipping Tray information (Refer to Application Note: Shipping Tray Information - RF Modules_200079A)<br>Add: Figure 7 (9 x 10 mm Body Size) |

## References

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## 1.0 Carrier Tapes

Production quantities of Skyworks RF products can be delivered in standard tape-and-reel format for attachment in a production solder-reflow environment. The carrier tapes identified in this Application Note may be manufactured of either polycarbonate or polystyrene material. The material used for each individual carrier tape is identified on the tape and reel drawing under NOTES.

The diagrams within in this Application Note provide information on materials, dimensions, adherence to industry standards, and part numbers for placing orders. Carrier tape diagrams are arranged by size. For example, the sequence of part sizes in Figures 1 through 9 begin with the 3 x 3, followed by the 4 x 4, the 6 x 6, and so on through Figure 9 with the 10 x 14. Figure 10 illustrates the orientation of the carrier tape to the supply reel and the direction of the tape as it unreels. Any diagram within this document may be quickly located from the List of Figures on page 1.

### 2.1 Carrier Tapes – Black Conductive Polycarbonate

Black conductive polycarbonate carrier tapes possess electrical and triboelectrical properties that help protect static-sensitive components with an effective balance of the carrier's electrostatic shielding and electrostatic decay properties. The electrically conductive polycarbonate carrier shows a nominal surface resistivity in the pocket of  $\geq 10^4 \Omega/\text{square}$  and  $\leq 10^8 \Omega/\text{square}$ , which minimizes  $dV/dt$  to afford ESD protection to devices in Classes I through III. These properties make the black polycarbonate carrier appropriate for packaging electrostatically sensitive components.

### 2.2 Carrier Tapes – Black Conductive Polystyrene

Black conductive polystyrene carrier tapes possess electrical and triboelectrical properties that help protect static-sensitive components with an effective balance of the carrier's electrostatic shielding and electrostatic decay properties. The electrically static dissipative polystyrene carrier shows a nominal surface resistivity of  $10^{10} \Omega/\text{square}$ , which minimizes  $dV/dt$  to afford ESD protection to devices in Classes I through III. These properties make the black polystyrene carrier appropriate for packaging electrostatically sensitive components.

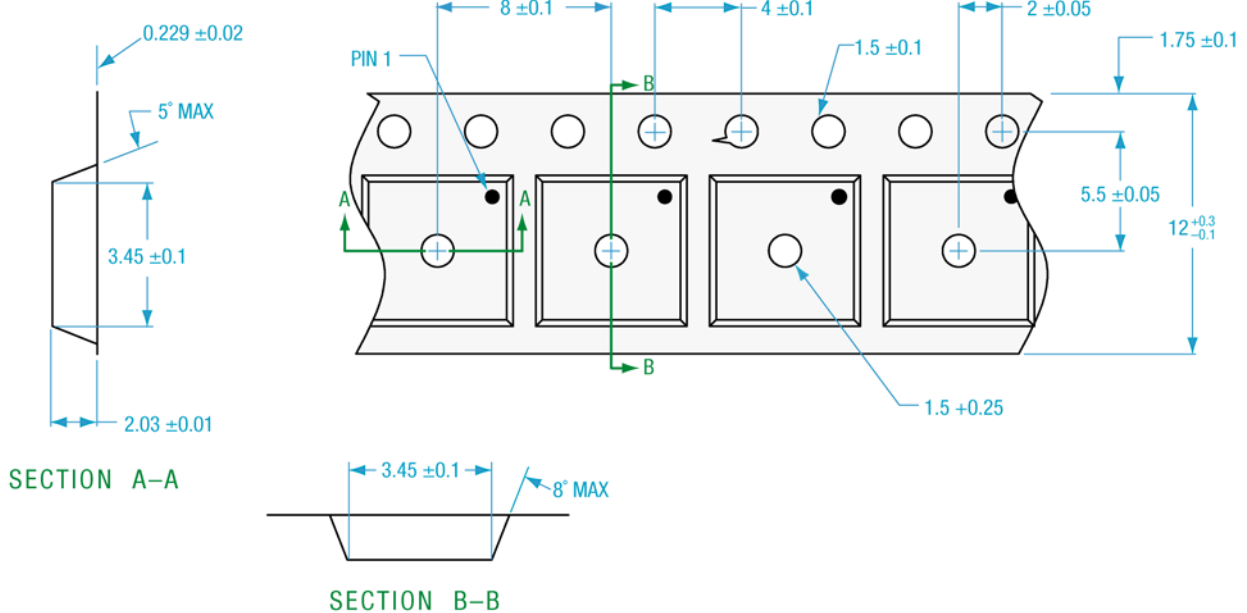
## 2.0 Electrostatic Discharge (ESD) Sensitivity

**Table 1. Classes of ESD Sensitive Parts**

| ESD Model | ESD Class | Voltage Range   |
|-----------|-----------|-----------------|
| HBM       | I         | > 0 V–1,999 V   |
|           | II        | 2,000 V–3,999 V |
|           | III       | 4000 V–15,999 V |

**Table 2. Static Shielding Foil Moisture Vapor Barrier Bag**

| Electrical Properties | Method                | Units       | Typical Value    |
|-----------------------|-----------------------|-------------|------------------|
| Surface Resistance    | EOS/ESD S11.11        | ohms        | In 1.0E+11       |
|                       |                       |             | Out 1.0E+11      |
| Static Decay          | FTMS 101C/METHOD 4046 | Sec.        | + 0.01<br>– 0.01 |
| Energy Test           | EOS/ESD S11.31        | nano-Joules | 10               |



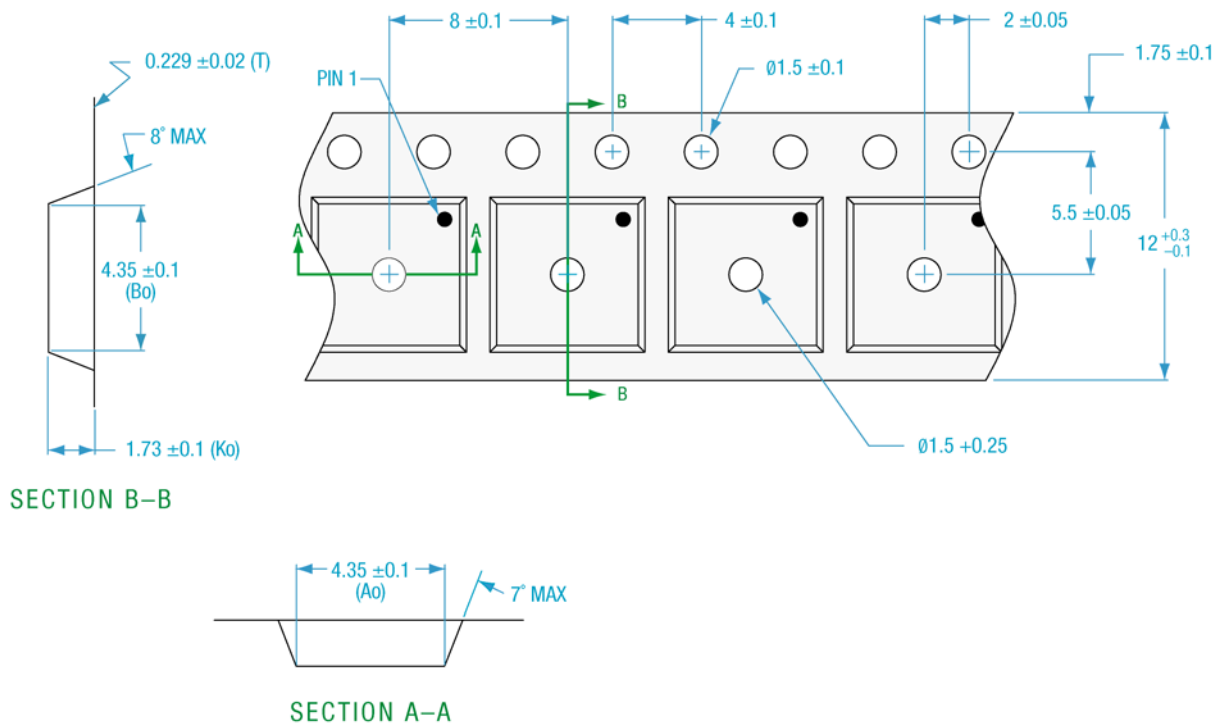
## NOTES:

1. CARRIER TAPES MUST MEET ALL REQUIREMENTS OF SKYWORKS GP01-D232 PROCUREMENT SPEC FOR TAPE AND REEL SHIPPING.
- ② CARRIER TAPE SHALL BE BLACK CONDUCTIVE POLYCARBONATE OR POLYSTYRENE.
3. COVER TAPE SHALL BE TRANSPARENT CONDUCTIVE PRESSURE-SENSITIVE ADHESIVE (PSA) MATERIAL W/ 9.3 mm WIDTH.
4. ESD-SURFACE RESISTIVITY SHALL BE  $\leq 1 \times 10^8$  OHMS/SQUARE PER EIA, JEDEC TNR SPECIFICATION.
5. ALL DIMENSIONS ARE IN MILLIMETERS.
6. TOLERANCES: .XX =  $\pm 0.10$
7. PART NO.: 3M051141 (PLEASE INDICATE ON PURCHASE ORDER).
8. NUMBER OF PARTS per 13 inch (DIAMETER) x 12 mm REEL: 2500.

## 3M CARRIER TAPE

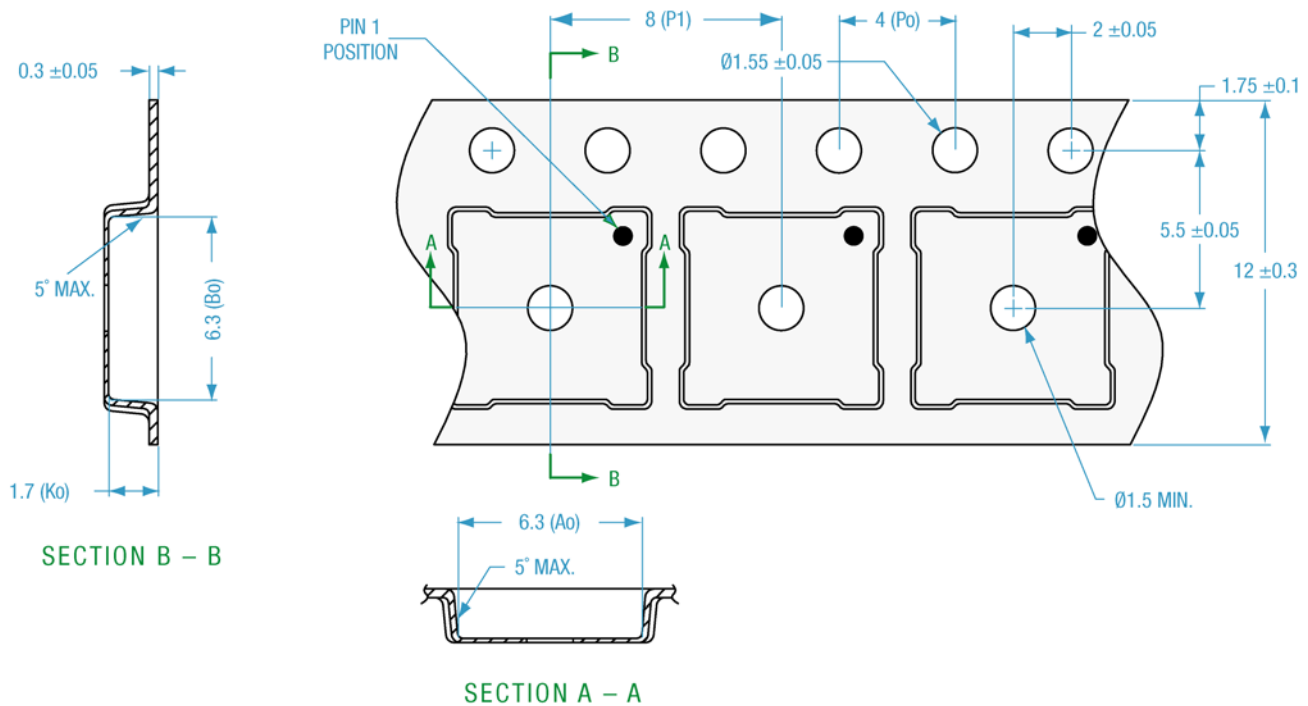
Figure 1. Carrier Tape Overmold MCM/RFLGA – 3.0 x 3.0 mm Body Size

3x3  
101568\_001

**NOTES:**

1. CARRIER TAPES MUST MEET ALL REQUIREMENTS OF SKYWORKS GP01-D232 PROCUREMENT SPEC FOR TAPE AND REEL SHIPPING.
- ② CARRIER TAPE SHALL BE BLACK CONDUCTIVE POLYCARBONATE OR POLYSTYRENE.
3. COVER TAPE SHALL BE TRANSPARENT CONDUCTIVE PRESSURE SENSITIVE ADHESIVE (PSA) MATERIAL W/ 9.3 mm WIDTH.
4. ESD-SURFACE RESISTIVITY SHALL BE  $\leq 1 \times 10^8$  OHMS/SQUARE PER EIA, JEDEC TNR SPECIFICATION.
5. TOLERANCE: .XX =  $\pm 0.10$ .
6. ALL DIMENSIONS ARE IN MILLIMETERS.
7. PART NO.: 3M060001 (PLEASE INDICATE ON PURCHASE ORDER.)
8. NUMBER OF PARTS per 13 inch (DIAMETER) x 12 mm REEL: 2500.

**3M CARRIER TAPE****Figure 2. Carrier Tape Overmold MCM / RFLGA / QFN – 4.0 x 4.0 mm Body Size**4x4  
101568\_002



## NOTES:

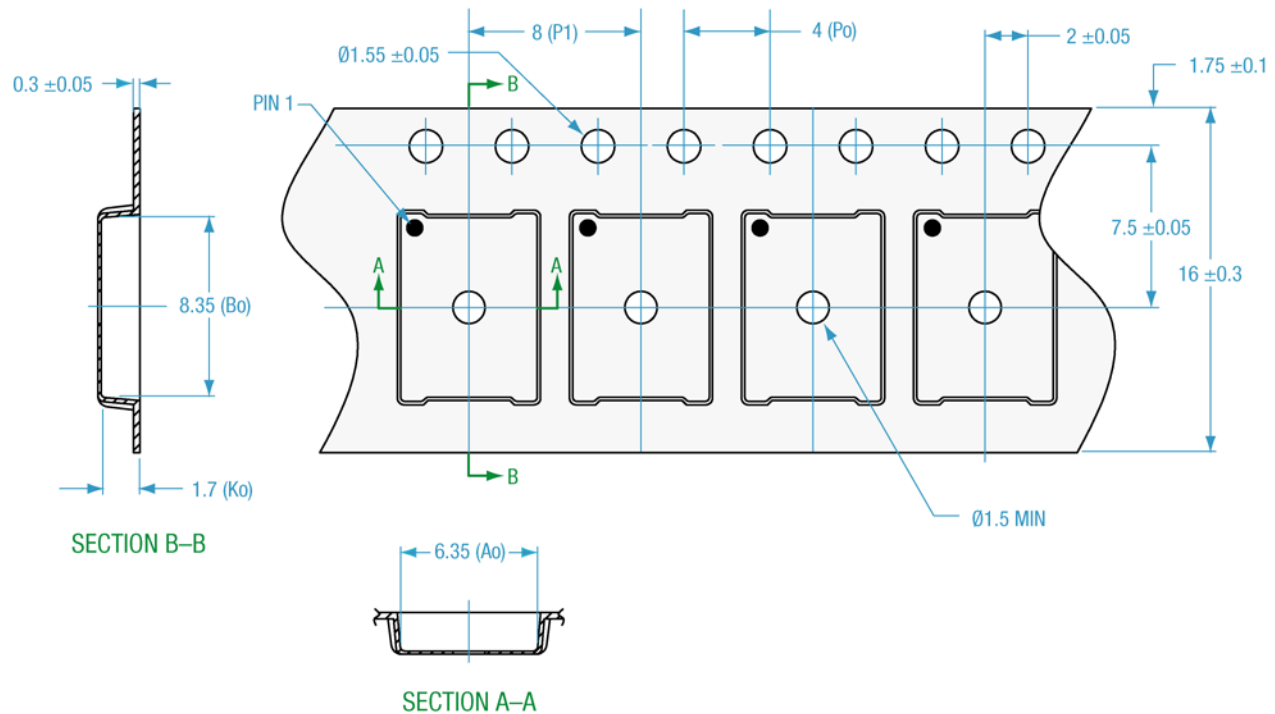
1. CARRIER TAPES MUST MEET ALL REQUIREMENTS OF SKYWORKS GP01-D232 PROCUREMENT SPEC FOR TAPE AND REEL SHIPPING.
2. CARRIER TAPE SHALL BE BLACK CONDUCTIVE POLYSTYRENE.
3. COVER TAPE SHALL BE TRANSPARENT CONDUCTIVE PRESSURE-SENSITIVE ADHESIVE (PSA) MATERIAL W/ 9.30 mm WIDTH.
4. ESD-SURFACE RESISTIVITY SHALL BE  $\leq 1 \times 10^{10}$  OHMS/SQUARE PER EIA, JEDEC TNR SPECIFICATION.
5. Po/P1 10 PITCHES CUMULATIVE TOLERANCE ON TAPE:  $\pm 0.2$  mm.
6. Ao & Bo MEASUREMENT POINT TO BE 0.3 mm FROM BOTTOM POCKET.
7. ALL DIMENSIONS ARE IN MILLIMETERS.
8. PART NO.: eC3-MCM0606-12-8-F1-L REV.0 (PLEASE INDICATE ON PURCHASE ORDER).
9. NUMBER OF PARTS per 13 inch (DIAMETER) X 12 mm REEL: 2500.

## ePAK CARRIER TAPE

6x6

101568\_003

Figure 3. Carrier Tape Overmold MCM / RFLGA – 6.0 x 6.0 mm Body Size



## NOTES:

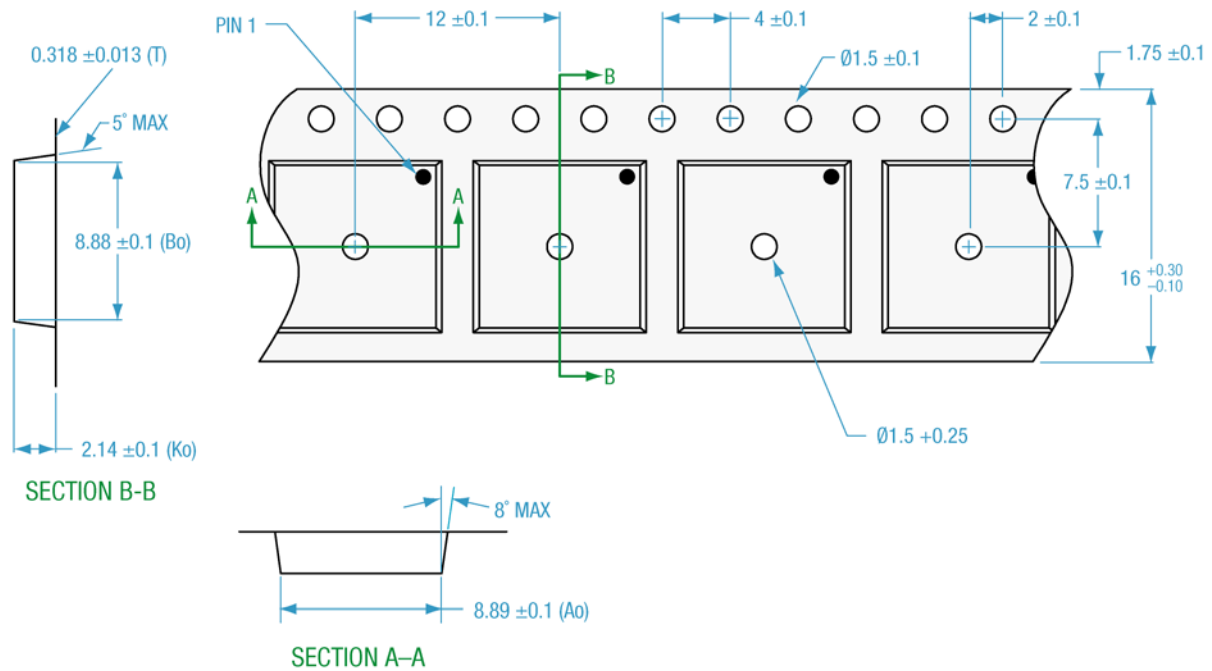
1. CARRIER TAPES MUST MEET ALL REQUIREMENTS OF SKYWORKS GP01-D232 PROCUREMENT SPEC FOR TAPE AND REEL SHIPPING.
- ② CARRIER TAPE SHALL BE BLACK CONDUCTIVE POLYSTYRENE.
3. COVER TAPE SHALL BE TRANSPARENT CONDUCTIVE PRESSURE SENSITIVE ADHESIVE (PSA) MATERIAL W/13.3 mm WIDTH.
4. ESD-SURFACE RESISTIVITY SHALL BE  $\leq 1 \times 10^{10}$  OHMS/SQUARE PER EIA, JEDEC TNR SPECIFICATION.
5. Po/P1, 10 PITCHES CUMULATIVE TOLERANCE ON TAPE:  $\pm 0.2$  mm.
6. Ao AND Bo MEASUREMENT POINT TO BE 0.3 mm FROM BOTTOM POCKET.
7. ALL DIMENSIONS ARE IN MILLIMETERS.
8. PART NO.: eC3-MCM0608-16-8-F1-L REV. 0. PLEASE INDICATE ON PURCHASE ORDER.
9. NUMBER OF PARTS per 13 inch (DIAMETER) x 16 mm wide REEL: 2500.

## ePAK CARRIER TAPE

608

101568\_004

Figure 4. Carrier Tape Overmold MCM – 6.0 x 8.0 mm Body Size



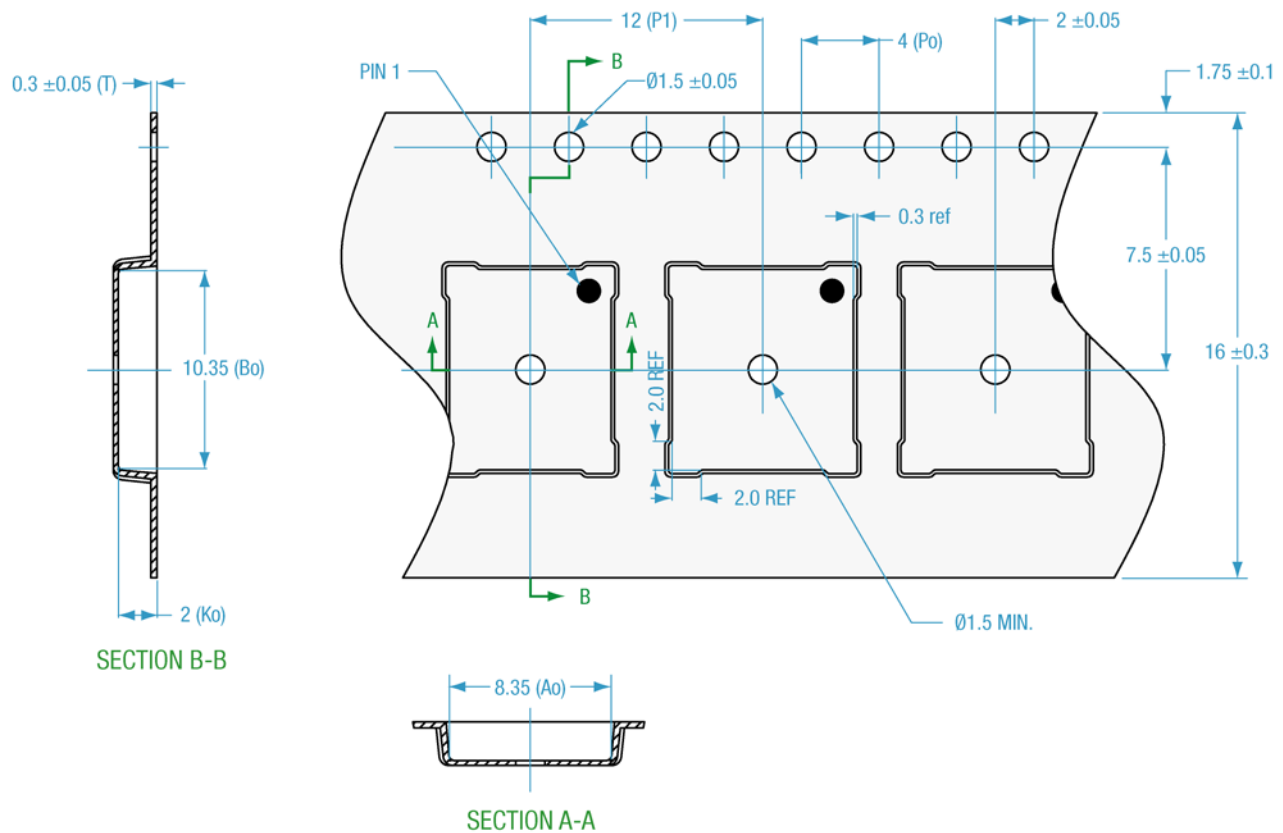
## NOTES:

1. CARRIER TAPES MUST MEET ALL REQUIREMENTS OF SKYWORKS GP01–D232 PROCUREMENT SPEC FOR TAPE AND REEL SHIPPING.
2. CARRIER TAPE SHALL BE BLACK CONDUCTIVE POLYCARBONATE OR POLYSTYRENE.
3. COVER TAPE SHALL BE TRANSPARENT CONDUCTIVE PRESSURE-SENSITIVE ADHESIVE (PSA) MATERIAL W/ 13.3 mm WIDTH.
4. ESD-SURFACE RESISTIVITY SHALL BE  $\leq 1 \times 10^8$  OHMS/SQUARE PER EIA, JEDEC TNR SPECIFICATION.
5. TOLERANCES: .XX =  $\pm 0.1$
6. ALL DIMENSIONS ARE IN MILLIMETERS.
7. PART NO.: US039321 (PLEASE INDICATE ON PURCHASE ORDER).
8. NUMBER OF PARTS per 13 inch (DIAMETER) x 16 mm REEL: 2000.

## 3M CARRIER TAPE

8.3x8.3  
101568\_005

Figure 5. Carrier Tape Ceramic MCM – 8.3 x 8.3 mm Body Size



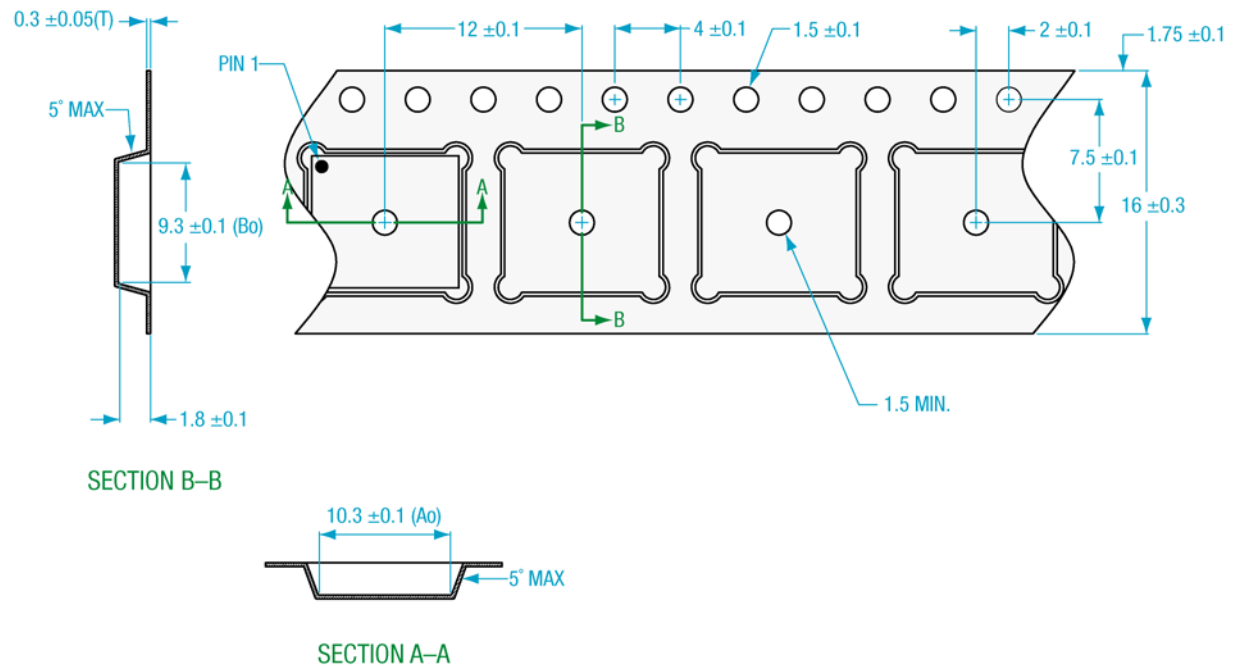
## NOTES:

1. CARRIER TAPES MUST MEET ALL REQUIREMENTS OF SKYWORKS GP01–D232 PROCUREMENT SPEC FOR TAPE AND REEL SHIPPING.
2. CARRIER TAPE SHALL BE BLACK CONDUCTIVE POLYSTYRENE.
3. COVER TAPE SHALL BE TRANSPARENT CONDUCTIVE PRESSURE-SENSITIVE ADHESIVE (PSA) MATERIAL W/ 13.3 mm WIDTH.
4. ESD-SURFACE RESISTIVITY SHALL BE  $\leq 1 \times 10^{10}$  OHMS/SQUARE PER EIA, JEDEC TNR SPECIFICATION.
5. Po/P1, 10 PITCHES CUMULATIVE TOLERANCE ON TAPE:  $\pm 0.20$  mm.
6. Ao and Bo MEASUREMENT POINT TO BE 0.3 mm FROM BOTTOM POCKET.
7. ALL DIMENSIONS ARE IN MILLIMETERS.
8. PART NO.: eC3-MCM10x8-16-12-f1-L (PLEASE INDICATE ON PURCHASE ORDER).
9. NUMBER OF PARTS per 13 inch (DIAMETER) x 16 mm REEL: 2000.

## ePAK CARRIER TAPE

8x10  
101568\_006

Figure 6. Carrier Tape Overmold MCM – 8.0 x 10.0 mm Body Size



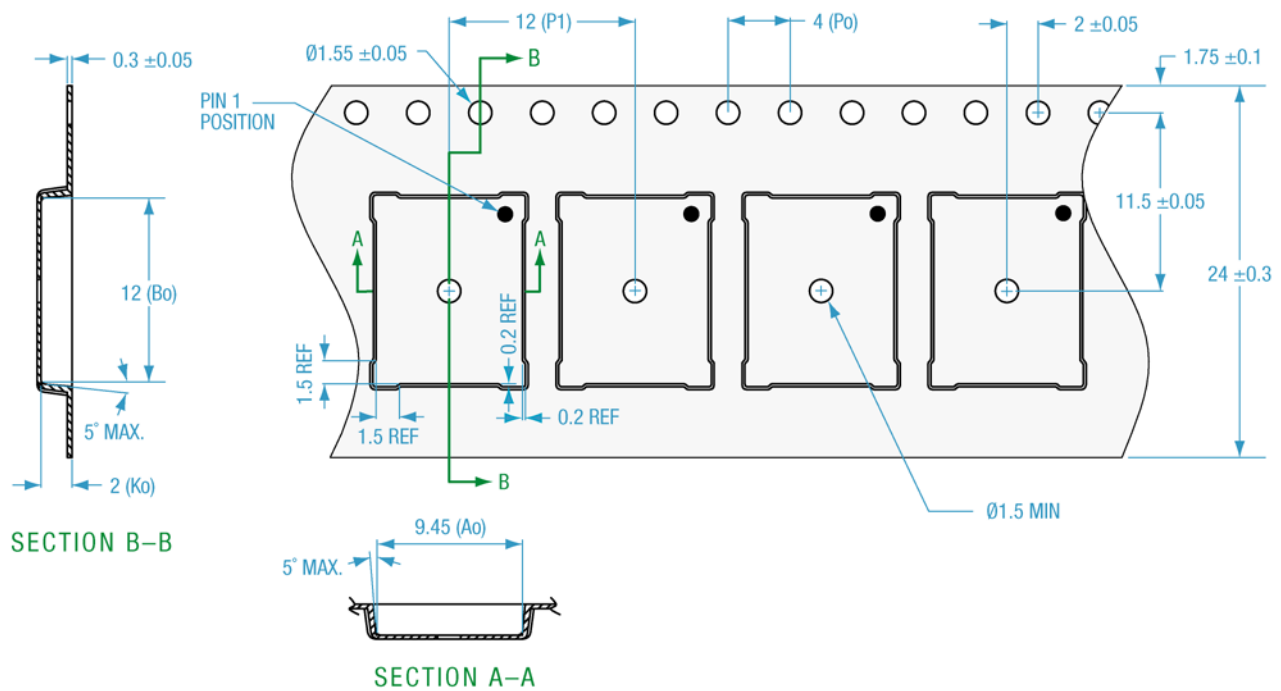
## NOTES:

1. CARRIER TAPES MUST MEET ALL REQUIREMENTS OF SKYWORKS GP01-D232 PROCUREMENT SPEC FOR TAPE AND REEL SHIPPING.
- ② CARRIER TAPE SHALL BE BLACK CONDUCTIVE POLYSTYRENE.
3. COVER TAPE SHALL BE TRANSPARENT CONDUCTIVE PRESSURE-SENSITIVE ADHESIVE (PSA) MATERIAL W/ 13.3 mm WIDTH.
4. ESD-SURFACE RESISTIVITY SHALL BE  $\leq 1 \times 10^{10}$  OHMS/SQUARE PER EIA, JEDEC TNR SPECIFICATION.
5. ALL DIMENSIONS ARE IN MILLIMETERS.
6. TOLERANCES: .XX =  $\pm 0.10$
7. PART NO.: KS1612-181 (PLEASE INDICATE ON PURCHASE ORDER).
8. NUMBER OF PARTS per 13 inch (DIAMETER) x 16 mm REEL: 2000.

## KOSTAT CARRIER TAPE

9X10  
101568\_007

Figure 7. Carrier Tape Overmold MCM – 9.0 x 10.0 mm Body Size



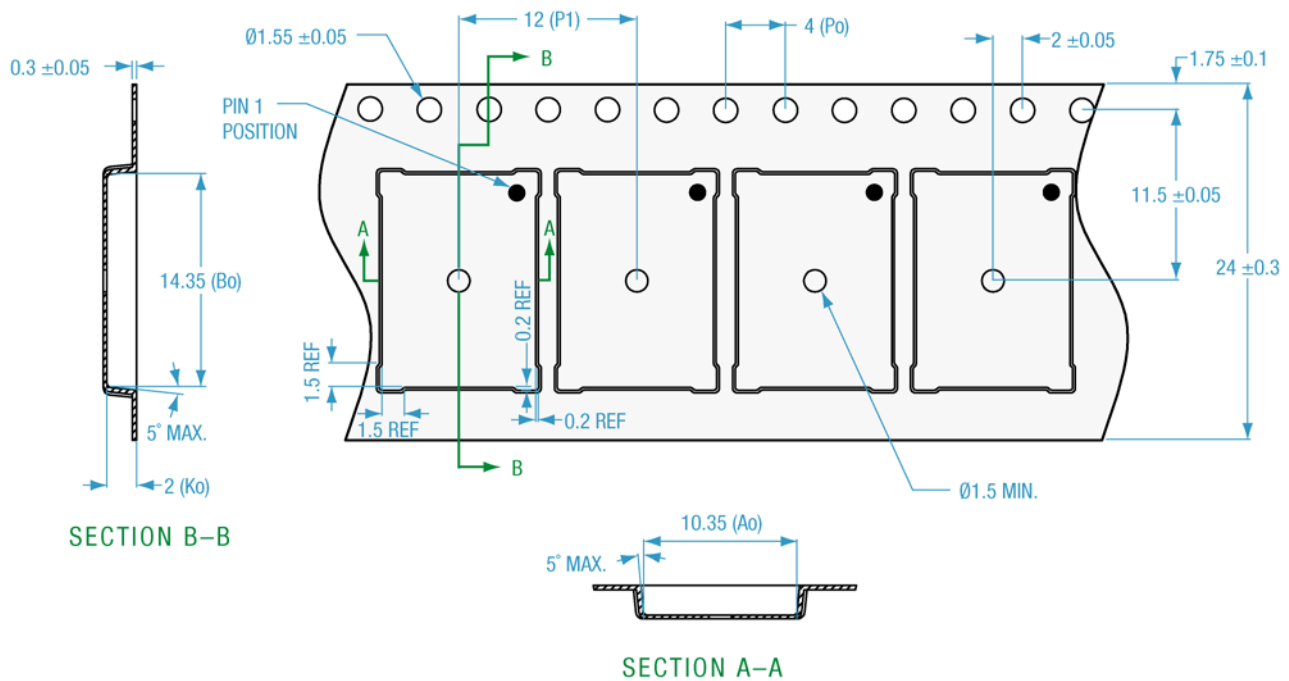
## NOTES:

1. CARRIER TAPES MUST MEET ALL REQUIREMENTS OF SKYWORKS GP01-D232 PROCUREMENT SPEC FOR TAPE AND REEL SHIPPING.
2. CARRIER TAPE SHALL BE BLACK CONDUCTIVE POLYSTYRENE.
3. COVER TAPE SHALL BE TRANSPARENT CONDUCTIVE PRESSURE-SENSITIVE ADHESIVE (PSA) MATERIAL W/ 21.3 mm WIDTH.
4. ESD-SURFACE RESISTIVITY SHALL BE  $\leq 1 \times 10^{10}$  OHMS/SQUARE PER EIA, JEDEC TNR SPECIFICATION.
5. Po/P1, 10 PITCHES CUMULATIVE TOLERANCE ON TAPE:  $\pm 0.2$  mm.
6. Ao & Bo MEASUREMENT POINT TO BE 0.3 mm FROM BOTTOM POCKET.
7. ALL DIMENSIONS ARE IN MILLIMETERS.
8. PART NO.: eC3-MCM11.6X9.1X1.4-24-12-F1-L REV. 0 (PLEASE INDICATE ON PURCHASE ORDER).
9. NUMBER OF PARTS per 13 inch (DIAMETER) x 24 mm REEL: 2000.

## ePAK CARRIER TAPE

9.1x11.6  
101568\_008

Figure 8. Carrier Tape Overmold MCM – 9.1 x 11.6 mm Body Size

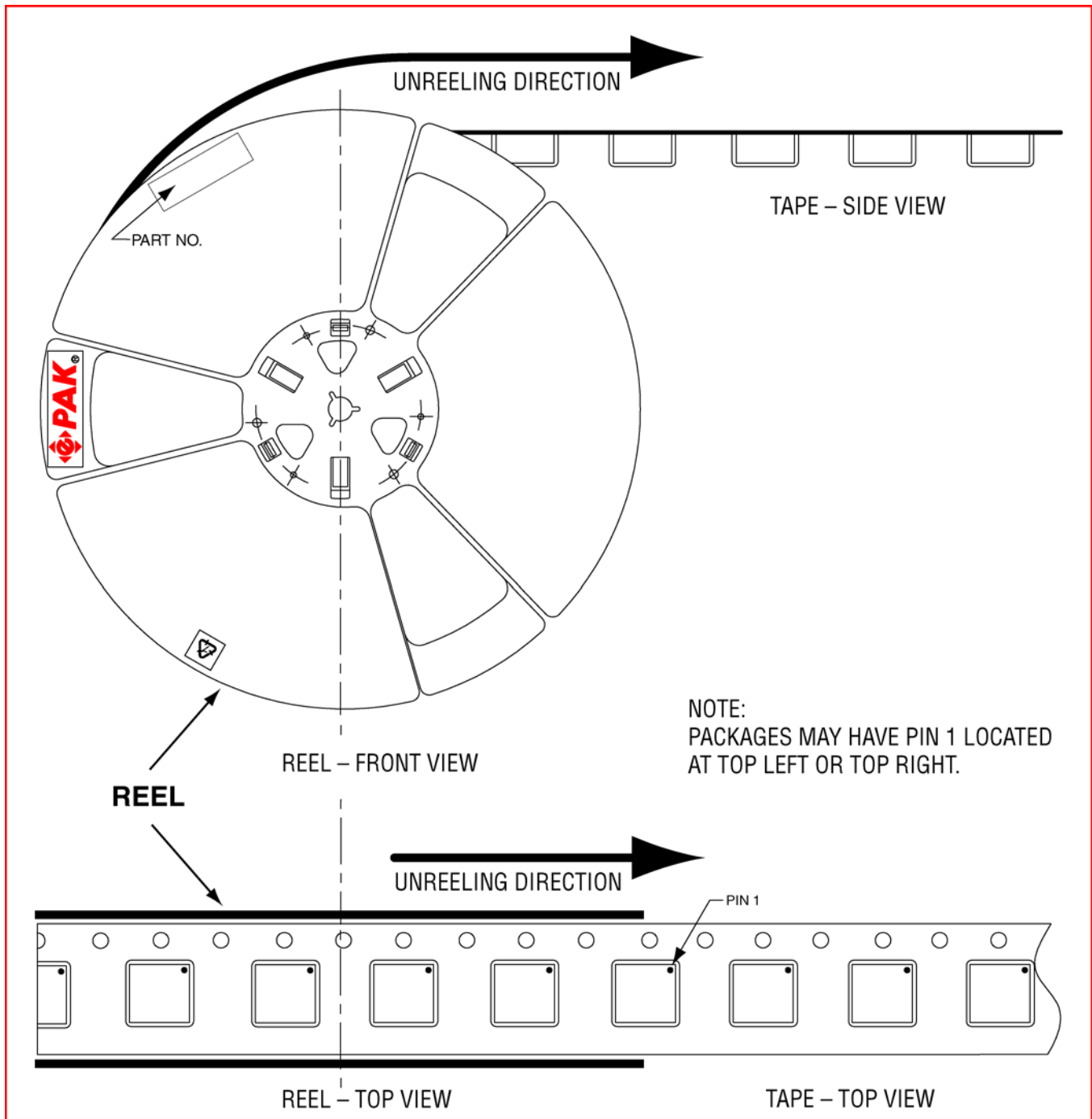


## ePAK CARRIER TAPE

NOTES:

1. CARRIER TAPES MUST MEET ALL REQUIREMENTS OF SKYWORKS GP01-D232 PROCUREMENT SPEC FOR TAPE AND REEL SHIPPING.
- ② CARRIER TAPE SHALL BE BLACK CONDUCTIVE POLYSTYRENE.
3. COVER TAPE SHALL BE TRANSPARENT CONDUCTIVE PRESSURE-SENSITIVE ADHESIVE (PSA) MATERIAL W/ 21.3 mm WIDTH.
4. ESD-SURFACE RESISTIVITY SHALL BE  $\leq 1 \times 10^{10}$  OHMS/SQUARE PER EIA, JEDEC TNR SPECIFICATION.
5. Po/P1, 10 PITCHES CUMULATIVE TOLERANCE ON TAPE:  $\pm 0.2$  mm.
6. Ao & Bo MEASUREMENT POINT TO BE 0.3 mm BOTTOM POCKET.
7. ALL DIMENSIONS ARE IN MILLIMETERS.
8. PART NO.: eC3-MCM10X14-24-12-F1-L REV. 0 (PLEASE INDICATE ON PURCHASE ORDER).
9. NUMBER OF PARTS per 13 inch (DIAMETER) x 24 mm REEL: 2000.

**Figure 9. Carrier Tape Overmold MCM – 10.0 x 14.0 mm Body Size**



101568\_010

Figure 10. Tape-to-Reel Orientation, Unreeling Direction

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Woburn, MA 01801  
[www.skyworksinc.com](http://www.skyworksinc.com)

