

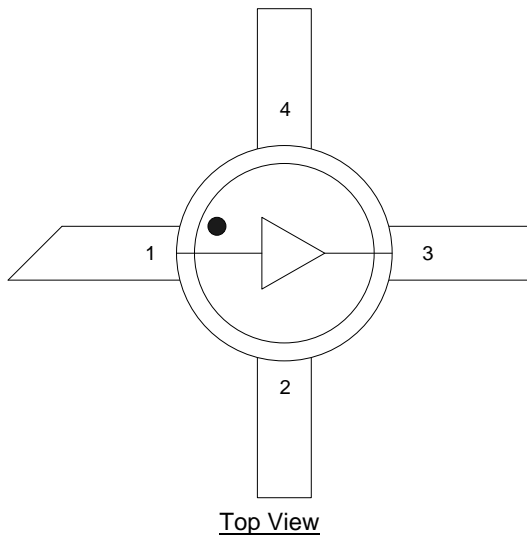
### General Description

The QPA4586A is a high performance SiGe HBT MMIC Amplifier. A Darlington configuration provides high  $F_T$  and excellent thermal performance. The heterojunction increases breakdown voltage and minimizes leakage current between junctions. Cancellation of emitter junction non-linearities results in higher suppression of intermodulation products. Only two DC-blocking capacitors, a bias resistor, and an optional RF choke are required for operation.



4 Lead SOT-86 Package

### Functional Block Diagram



### Product Features

- High Gain: 19.9 dB at 1950 MHz
- Cascadable 50  $\Omega$
- Operates from Single Supply
- Low Thermal Resistance Package

### Applications

- Instrumentation
- Repeaters
- Boosters
- PA Driver Amplifier
- Cellular, PCS, GSM, UMTS
- IF Amplifier
- Wireless Data, Satellite

### Ordering Information

Part No.	Description
QPA4586ATR13	3000 pieces on a 13" reel (standard)
QPA4586APCK401	850 MHz, +5V EVB with 5 Piece Sample Bag

## Absolute Maximum Ratings

Parameter	Rating
Storage Temp	-55 to +150 °C
Device Voltage (V <sub>D</sub> )	+5 V
Device Current (I <sub>D</sub> )	90 mA
RF Input Power	+18 dBm

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability.

## Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
Operating Temperature	-55		+105	°C
Junction Temperature (T <sub>J</sub> )			+125	°C
Device Operating Voltage	+3.2	+3.5	+3.8	V

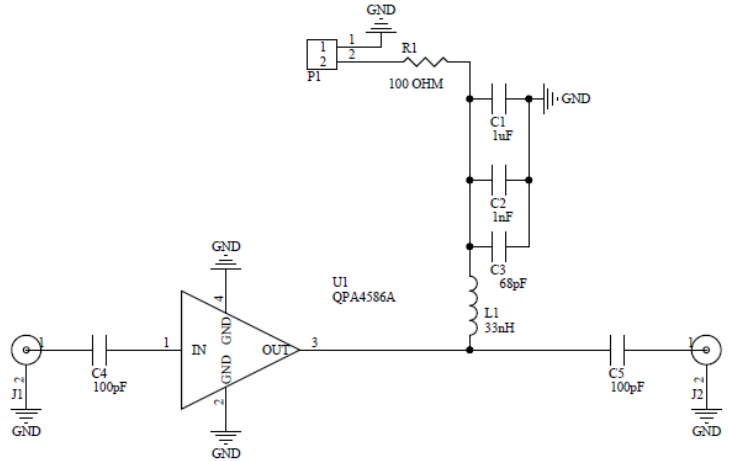
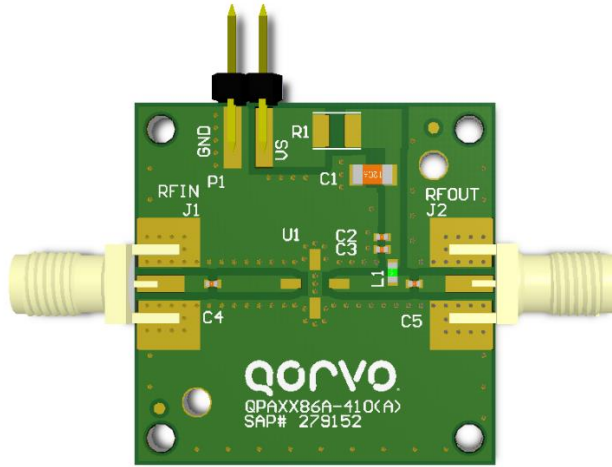
Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

## Electrical Specifications

Parameter	Conditions	Min	Typ	Max	Units
Small Signal Gain	850 MHz		23.3		dB
	1950 MHz		19.9		dB
	2400 MHz		18.6		dB
Output Power at 1dB Compression	850 MHz		+15.7		dBm
	1950 MHz		+16.3		dBm
Output Third Intercept Point	850 MHz		+29.7		dBm
	1950 MHz		+30.1		dBm
Input Return Loss	1950 MHz		16.3		dB
Output Return Loss	1950 MHz		24.2		dB
Noise Figure	1950 MHz		2.7		dB
Device Operating Current			45		mA
Thermal Resistance, $\theta_{jc}$			86		°C/W

Notes:  
 1. Test conditions unless otherwise noted: V<sub>S</sub> = +8 V, I<sub>D</sub> = 45 mA Typ., OIP3 Tone Spacing=1 MHz, P<sub>OUT</sub> per tone = 0 dBm, R1 = 100Ω, 50Ω system, Temp = +25 °C

## Evaluation Board and Schematic – 850 MHz Application Circuit



## Bill of Material – 850 MHz Application Circuit

Reference	Value	Description	Manufacturer	Part Number
n/a	n/a	PCB, QPA4586A	Qorvo	QPAXX86A-410(A)
C1	1 $\mu$ F	CAP, 10%, 25V, X7R, 1206	Murata Electronics	GRM31MR71E105KA01L
C2	1000 pF	CAP, 10%, 50V, X7R, 0402	Murata Electronics	GRM155R71H102KA01D
C3	68 pF	CAP, 5%, 50V, C0G, 0402	Murata Electronics	GRM1555C1H680JA01D
C4, C5	100 pF	CAP, 5%, 50V, C0G, 0402	Murata Electronics	GRM1555C1H101JA01D
R1	100 $\Omega$	RES, 5%, 1/2W, 1210	Panasonic Industrial Co	ERJ-14NF1400U
L1	33 nH	IND, 5%, M/L, 0603	Murata Electronics	LL1608-FSL33NJ
J1, J2	n/a	CONN, SMA, EL, FLT, 0.068" SPE-000318	Amphenol RF Asia Corp	901-10426
U1	n/a	HBT MMIC Amplifier	Qorvo	QPA4586A
J3, J4	n/a	CONN, HDR, ST, 1x2, 0.100", Hi-temp, T/H	Samtec Inc	HTSW-102-07-G-S

## Component Values for Specific Frequencies

Frequency	500 MHz	850 MHz	1950 MHz	2400 MHz	3500 MHz
C4, C5	220 pF	100 pF	68 pF	56 pF	39 pF
C3	100 pF	68 pF	22 pF	22 pF	15 pF
L1	68 nH	33 nH	22 nH	18 nH	15 nH

## Recommended Bias Resistor Values for Various Supply Voltages

Vsupply	+6 V	+8 V	+10 V	+12 V
R1	51 $\Omega$	100 $\Omega$	150 $\Omega$	180 $\Omega$

## Typical Performance – 850 MHz Application Circuit

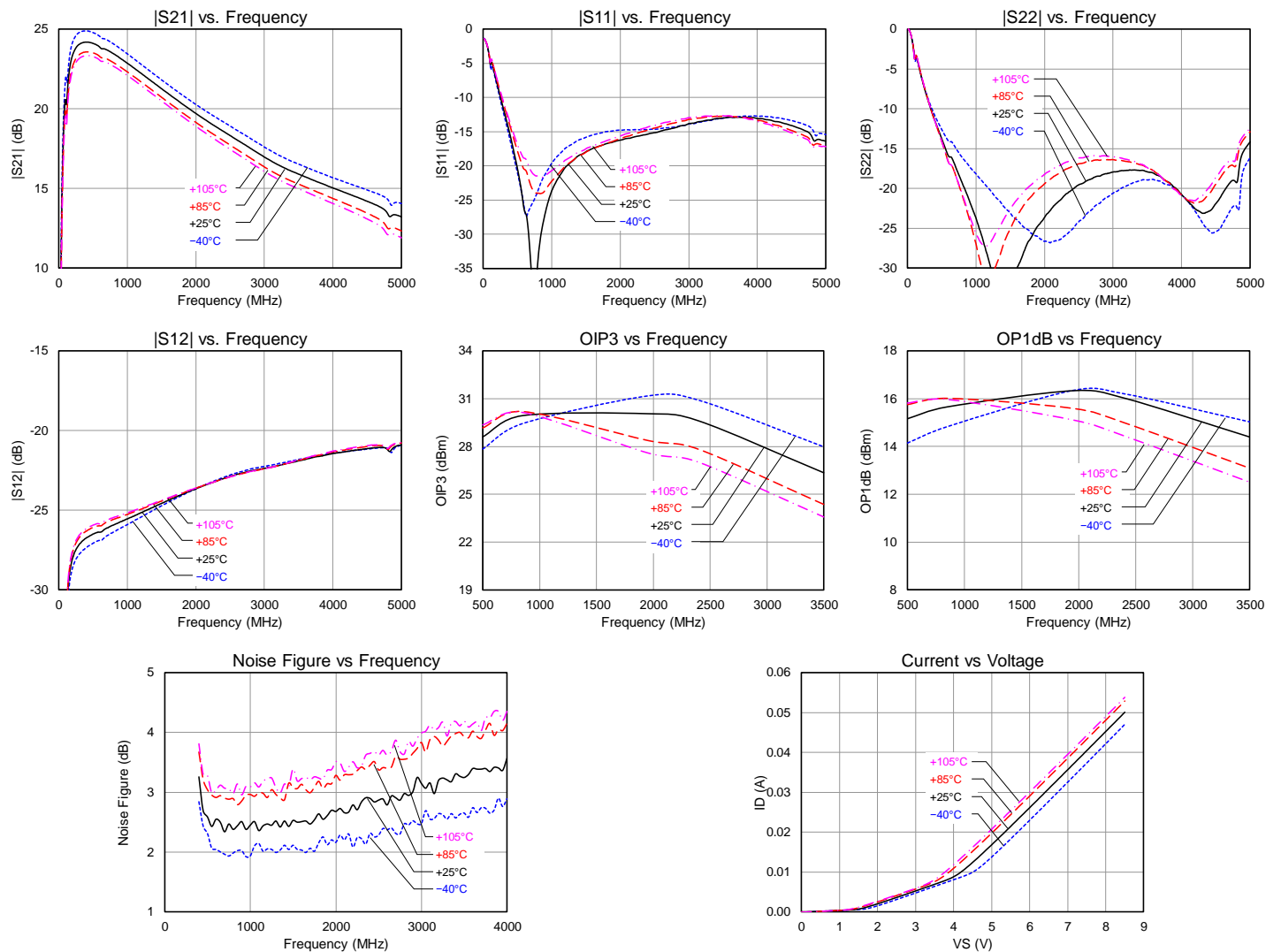
Parameter	Typical Value					Units
Frequency	500	850	1950	2400	3500	MHz
Small Signal Gain	24.1	23.3	19.9	18.6	15.9	dB
Output Third Intercept Point	+28.6	+29.9	+30.1	+29.6	+26.4	dBm
Output Power at 1dB Compression	+15.2	+15.7	+16.3	+16.0	+14.4	dBm
Input Return Loss	20.5	30.0	16.3	15.4	13.0	dB
Output Return Loss	13.4	20.4	24.2	20.2	17.9	dB
Reverse Isolation	26.5	25.8	23.7	23.0	21.9	dB
Noise Figure	2.6	2.4	2.7	2.9	3.2	dB

**Notes:**

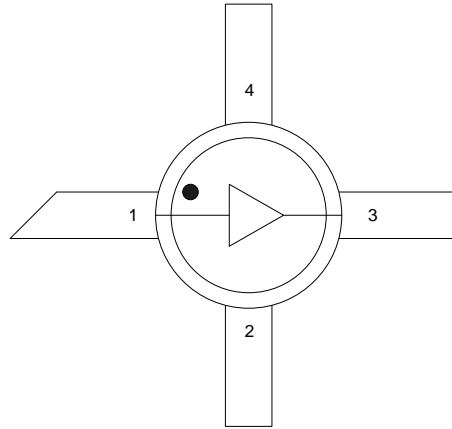
- Test conditions:  $V_S = +8\text{ V}$ ,  $I_D = 45\text{ mA Typ.}$ , OIP3 Tone Spacing=1 MHz,  $P_{OUT}$  per tone = 0 dBm,  $R_1 = 100\ \Omega$ ,  $50\ \Omega$  system, Temp = +25 °C

## Performance Plots – 850 MHz Application Circuit

Test conditions unless otherwise noted:  $V_S = +8.0\text{ V}$ ,  $I_D = 45\text{ mA}$ , Temp. = +25 °C



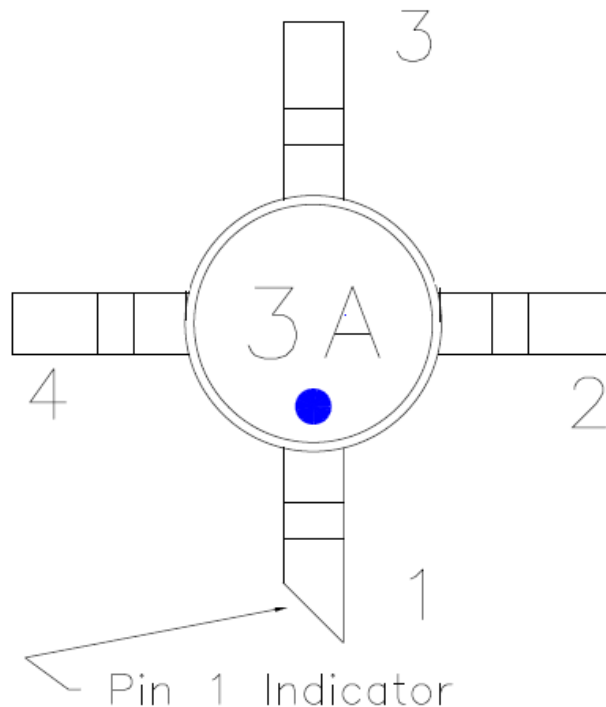
Pin Configuration and Description



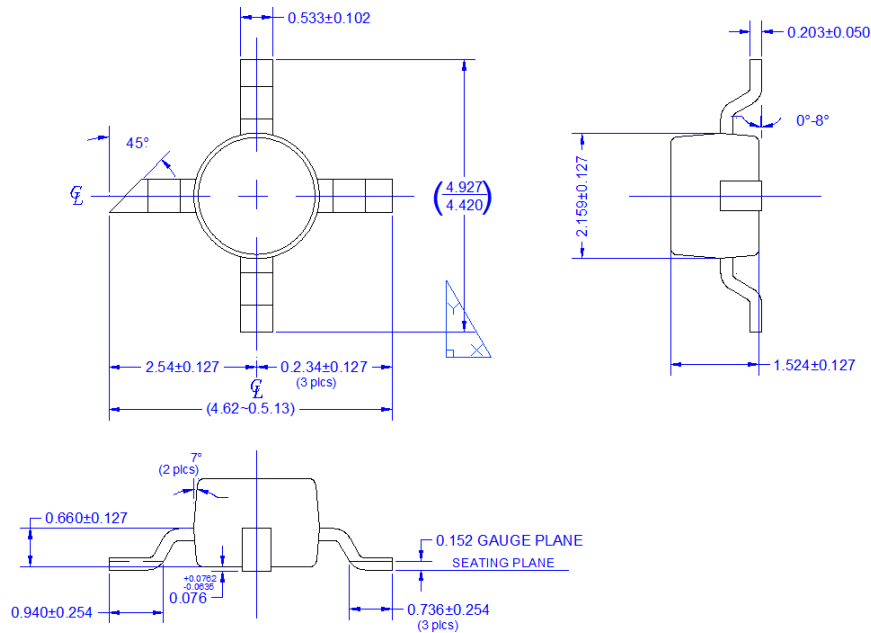
Top View

Pad No.	Label	Description
1	RF <sub>IN</sub>	RF Input Pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.
2, 4	GND	Connection to ground. Use via holes in PCB for best performance to reduce lead inductance as close to ground leads as possible
3	RF <sub>OUT</sub>	RF Output and Bias Input Pin. DC voltage is present on this pin; therefore a DC blocking capacitor is necessary for proper operation.

Package Marking

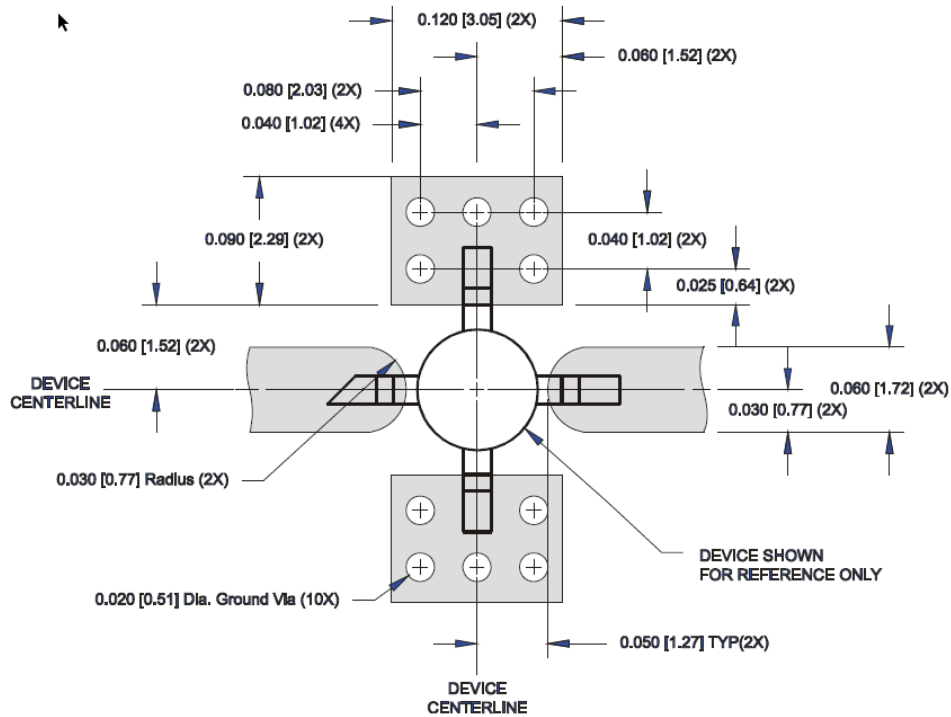


**Package Dimensions**



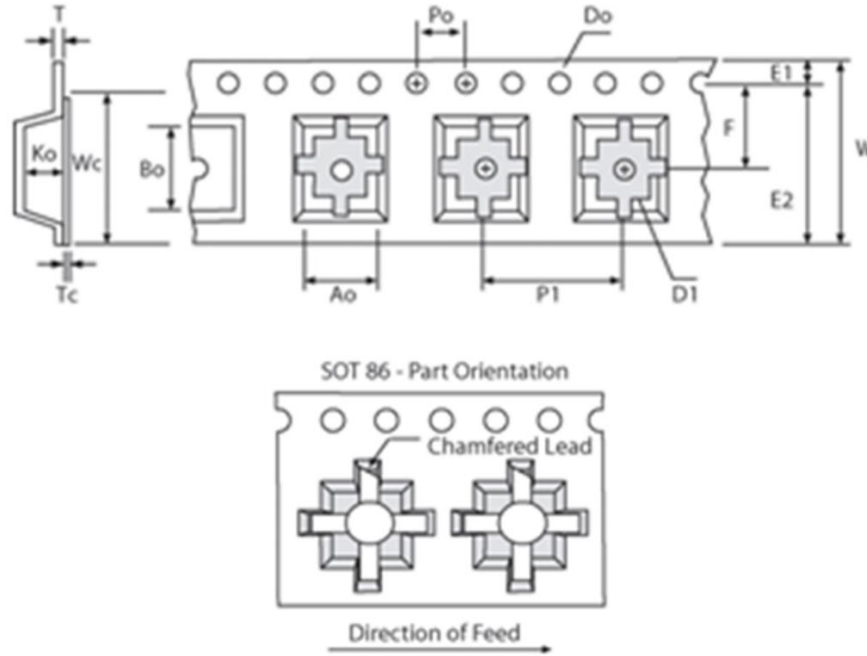
- Notes:
1. All dimensions are in millimeters. Angles are in degrees.
  2. Dimension and tolerance formats conform to ASME Y15.5-2009.

**PCB Mounting Pattern**



- Notes:
1. All dimensions are in inches (millimeters). Angles are in degrees.

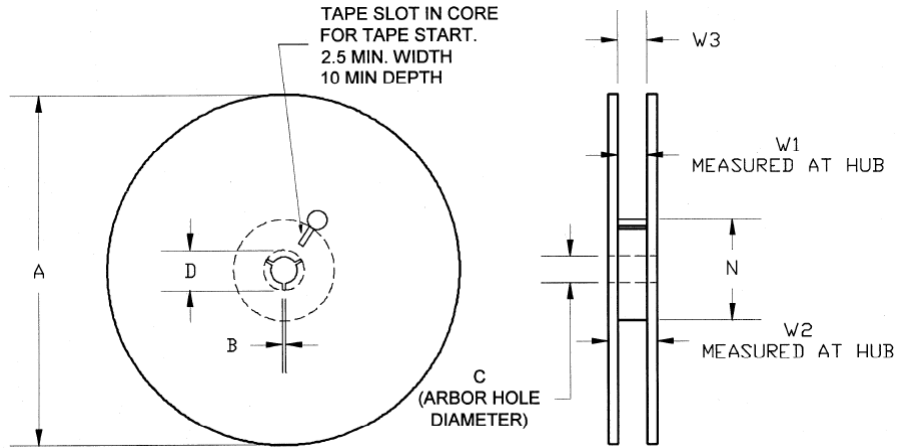
## Tape and Reel Information – Carrier and Cover Tape Dimensions



Feature	Measure	Symbol	Size (in)	Size (mm)
Cavity	Length	A0	0.257	6.53
	Width	B0	0.247	6.27
	Depth	K0	0.073	1.85
	Pitch	P1	0.314	8.00
Centerline Distance	Cavity to Perforation - Length Direction	P2	0.079	2.00
	Cavity to Perforation - Width Direction	F	0.217	5.50
Cover Tape	Width	C	0.366	9.30
Carrier Tape	Width	W	0.472	12.00

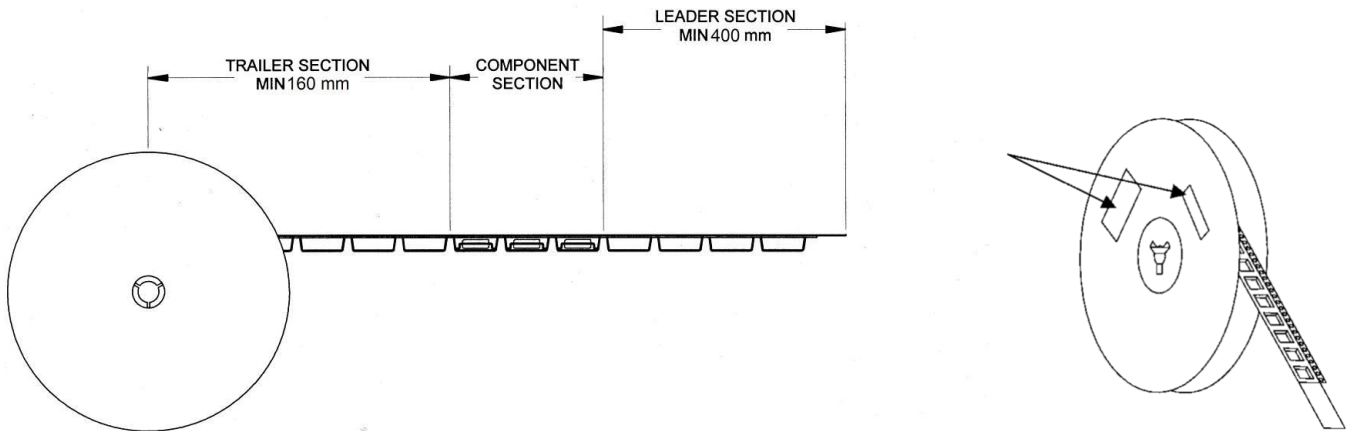
**Tape and Reel Information – Reel Dimensions (13")**

Standard T/R size = 3,000 pieces on a 13" reel.



Feature	Measure	Symbol	Size (in)	Size (mm)
Flange	Diameter	A	12.992	330.0
	Thickness	W2	0.717	18.2
	Space Between Flange	W1	0.504	12.8
Hub	Outer Diameter	N	4.016	102.0
	Arbor Hole Diameter	C	0.512	13.0
	Key Slit Width	B	0.079	2.0
	Key Slit Diameter	D	0.795	20.2

**Tape and Reel Information – Tape Length and Label Placement**



- Notes:
1. Empty part cavities at the trailing and leading ends are sealed with cover tape. See EIA 481-1-A.
  2. Labels are placed on the flange opposite the sprockets in the carrier tape.