



# QPA2463C

50 MHz – 4000 MHz Active Bias Cascadable SiGe HBT

## General Description

Qorvo's QPA2463C is a high performance SiGe HBT MMIC amplifier utilizing a Darlington configuration with a patented active bias network. The active bias network provides stable current over temperature and process  $\beta$  variations. Designed to run directly from a 3V supply, the QPA2463C does not require a dropping resistor as compared to typical Darlington amplifiers. The QPA2463C is designed for high linearity 3V gain block applications that require small size and minimal external components. It is internally matched to 50  $\Omega$ .

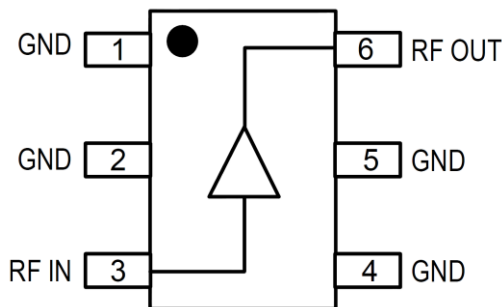


6 Lead SOT-363 Package

## Product Features

- Single Fixed 3V Supply
- No Dropping Resistor Required
- Patented Self-Bias Circuitry
- P1dB=+10.8dBm at 1950MHz
- OIP3=+22.2dBm at 1950MHz
- Robust 1000V ESD, Class 1C HBM

## Functional Block Diagram



Top View

## Applications

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

## Ordering Information

Part No.	Description
QPA2463CTR7	3000 pieces on a 7" reel (standard)
QPA2463CPCCK401	850 MHz, EVB with 5 Piece Sample Bag

## Absolute Maximum Ratings

Parameter	Rating
Storage Temp	-55 to +150 °C
Device Voltage (V <sub>D</sub> )	+4 V
Device Current (I <sub>D</sub> )	55 mA
RF Input Power <sup>(1)</sup>	+12 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		+3.0		V

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

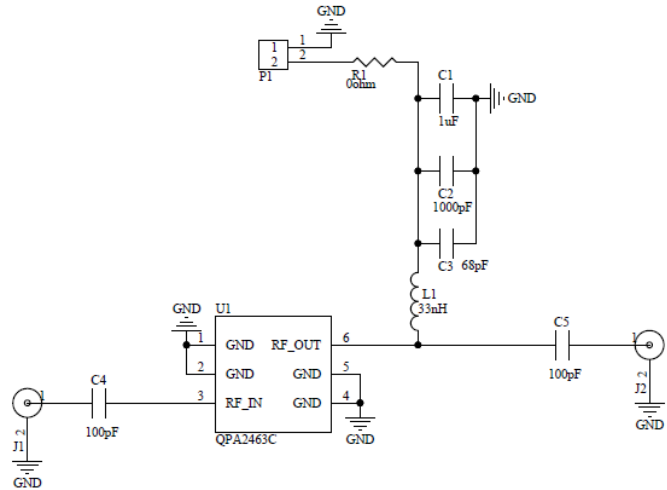
## Electrical Specifications

Parameter	Conditions	Min	Typ	Max	Units
Small Signal Gain	850 MHz		19.5		dB
	1950 MHz		15.0		dB
	2400 MHz		13.4		dB
Output Power at 1dB Compression	850 MHz		+12.4		dBm
	1950 MHz		+10.8		dBm
	2400 MHz		+9.6		dBm
Output Third Intercept Point	850 MHz <sup>(1)</sup>		+22.8		dBm
	1950 MHz <sup>(2)</sup>		+22.2		dBm
	2400 MHz <sup>(1)</sup>		+21.0		dBm
Input Return Loss	1950 MHz		16.4		dB
Output Return Loss	1950 MHz		20.9		dB
Noise Figure	1950 MHz		4.0		dB
Device Operating Current			25		mA
Thermal Resistance, $\theta_{jc}$			122		°C/W

Notes:

1. Test conditions unless otherwise noted: V<sub>S</sub> = +3 V, I<sub>D</sub> = 25 mA Typ., OIP3 Tone Spacing=1 MHz, P<sub>OUT</sub> per tone = -6 dBm, 50 Ω system, Temp = +25 °C.
2. Test conditions unless otherwise noted: V<sub>S</sub> = +3 V, I<sub>D</sub> = 25 mA Typ., OIP3 Tone Spacing=1 MHz, P<sub>OUT</sub> per tone = -5 dBm, 50 Ω 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, QPA2463C	Qorvo	QPAXX63X-410(A)
C1	1 uF	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	0 Ω	RES, 0 Ω, 1210	KOA Speer Electronics	RK73Z2ETTD
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	QPA2463C
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

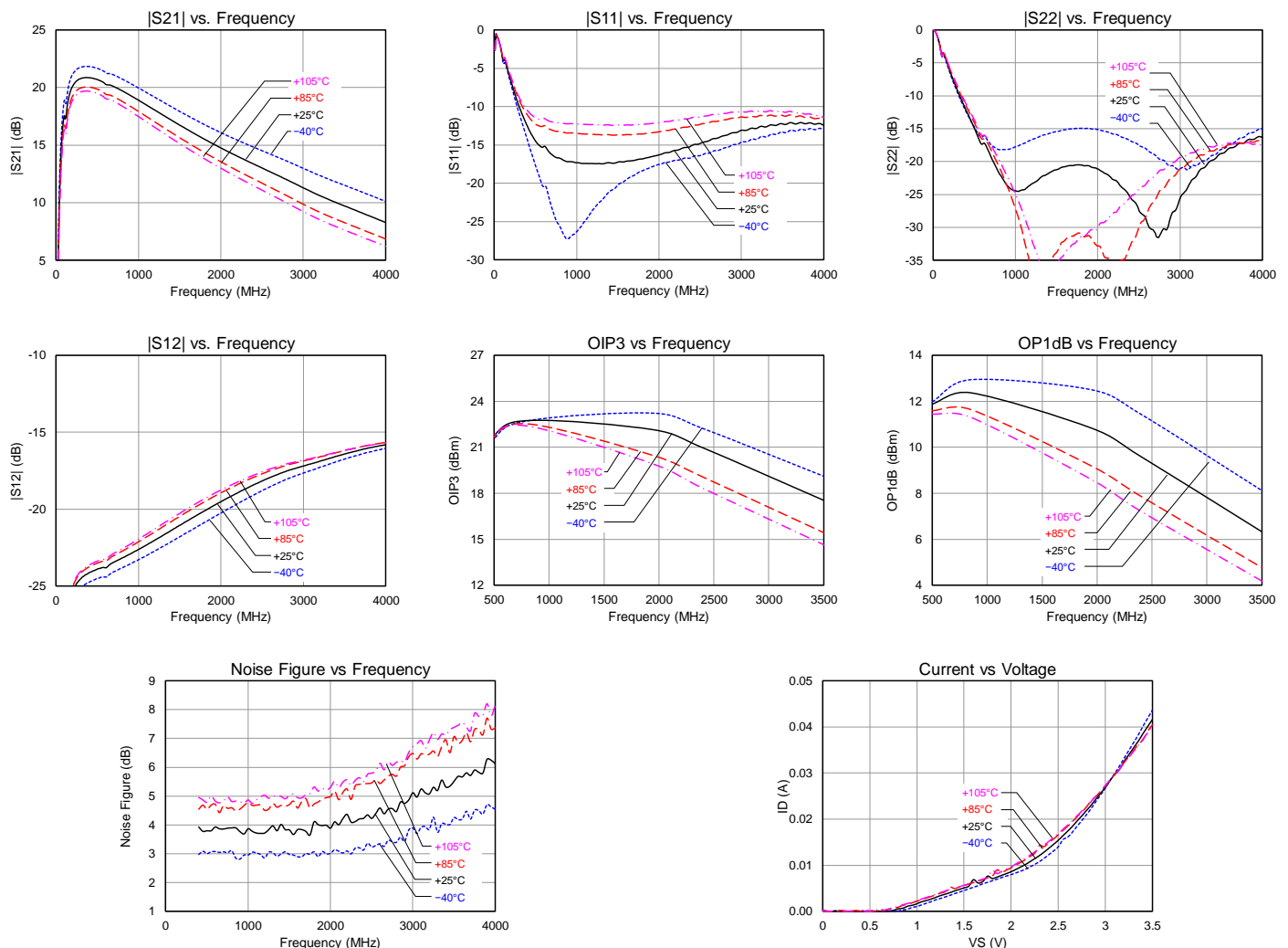
## Typical Performance – 850 MHz Application Circuit

Parameter	Typical Value					Units
Frequency	500	850	1950	2400	3500	MHz
Small Signal Gain	20.7	19.5	15.0	13.4	9.7	dB
Output Third Intercept Point	+21.7	+22.8	+22.2	+21.0	+17.5	dBm
Output Power at 1dB Compression	+11.9	+12.4	+10.8	+9.6	+6.3	dBm
Input Return Loss	14.5	17.1	16.4	15.1	12.3	dB
Output Return Loss	14.8	22.6	20.9	25.5	18.8	dB
Reverse Isolation	23.9	23.1	19.7	18.4	16.4	dB
Noise Figure	3.8	3.9	4.0	4.2	5.5	dB

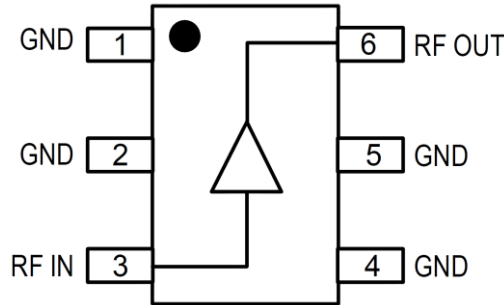
**Notes:**

1. Test conditions:  $V_s = +3\text{ V}$ ,  $I_D = 25\text{ mA Typ.}$ , OIP3 Tone Spacing=1 MHz,  $P_{OUT}$  per tone = -6 dBm,  $50\ \Omega$  system, Temp = +25 °C

## Performance Plots – 850 MHz Application Circuit

 Test conditions unless otherwise noted:  $V_s = +3.0\text{ V}$ ,  $I_D = 25\text{ mA}$ , Temp. = +25 °C


Pin Configuration and Description

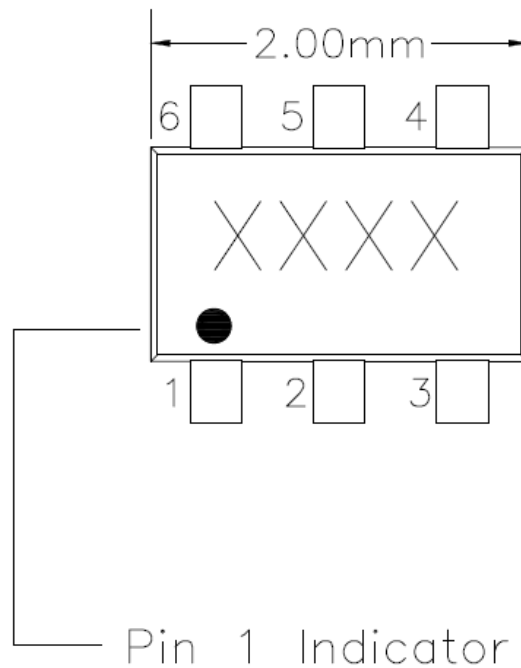


Top View

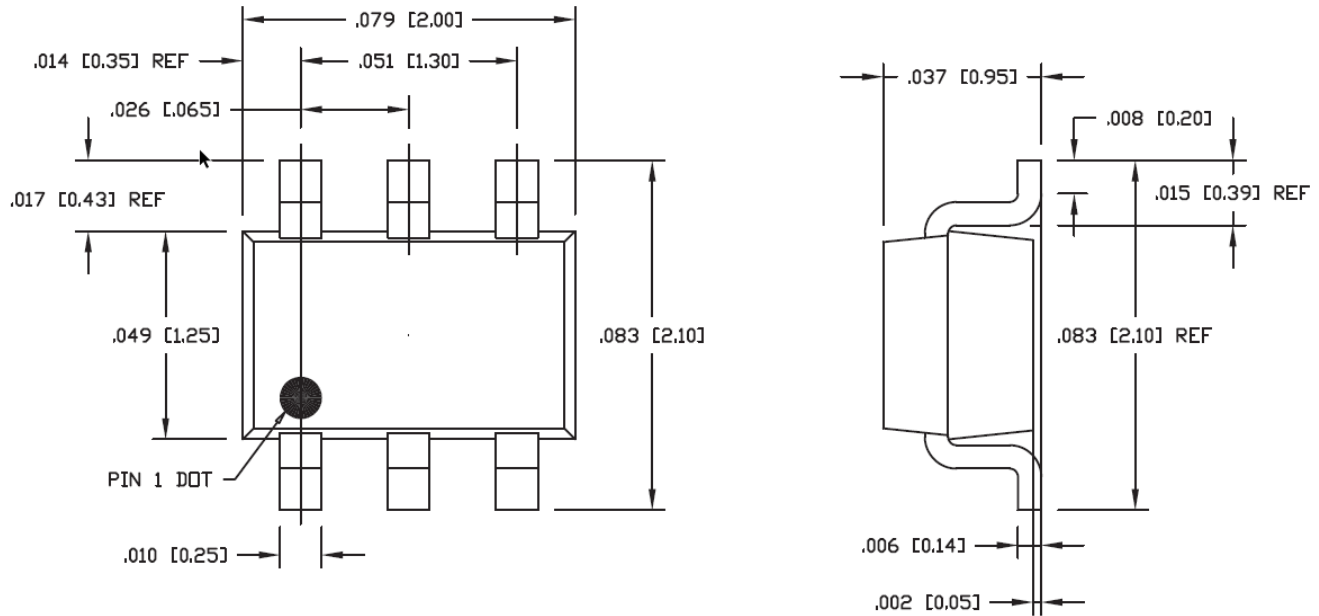
Pad No.	Label	Description
1, 2, 4, 5	GND	Connection to ground. Use via holes in PCB for best performance to reduce lead inductance as close to ground leads as possible
3	RF <sub>IN</sub>	RF Input Pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.
6	RF <sub>OUT</sub>	RF Output and Bias Pin. DC voltage is present on this pin, therefore a DC blocking capacitor is necessary for proper operation.

Package Marking

Trace Code - XXXX

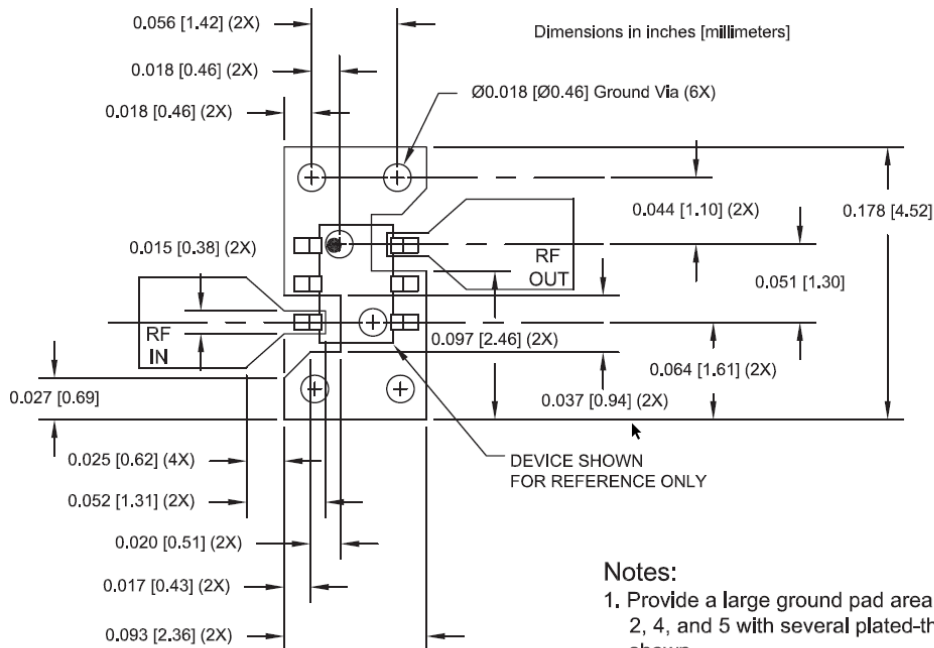


## Package Dimensions



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

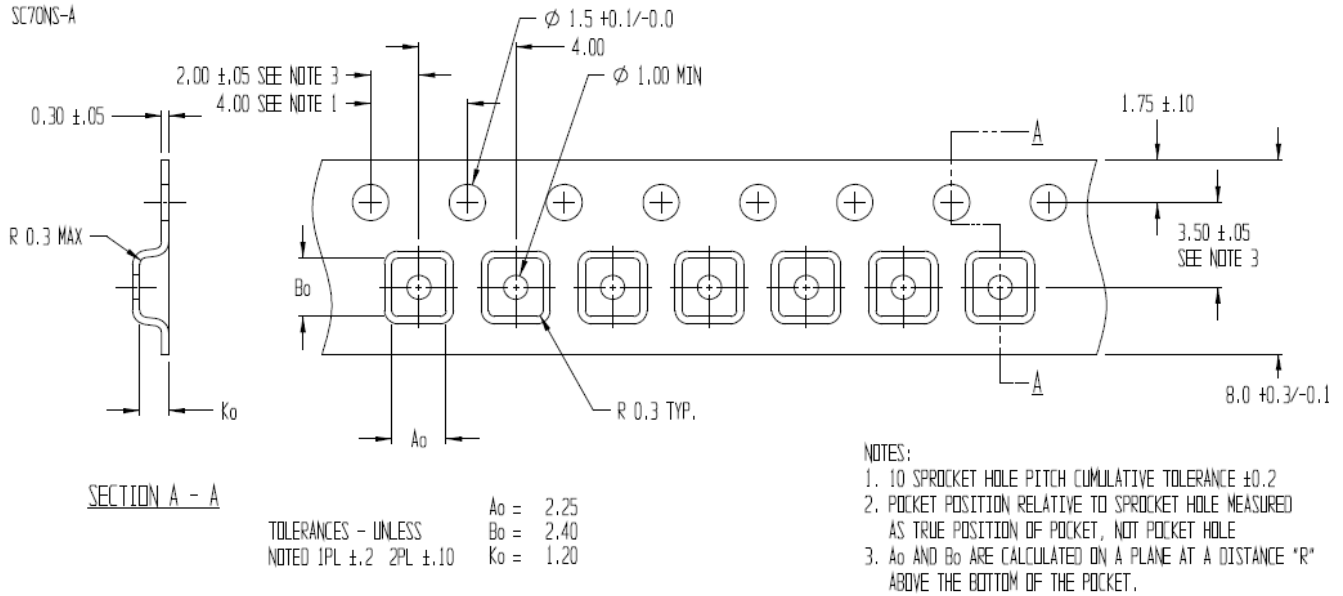
## PCB Mounting Pattern



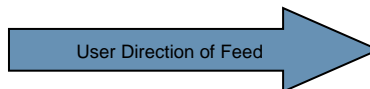
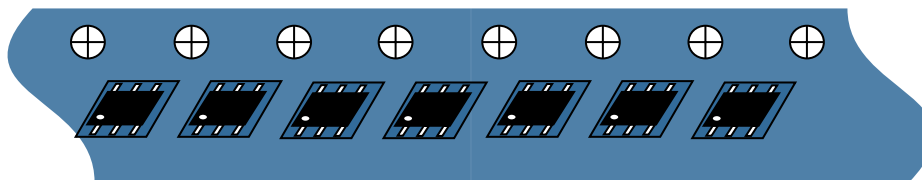
- Notes:
1. Provide a large ground pad area under device pins 1, 2, 4, and 5 with several plated-through holes placed as shown.
  2. 1/2 ounce finished copper thickness is recommended.
  3. RF I/O lines are 50Ω

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

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

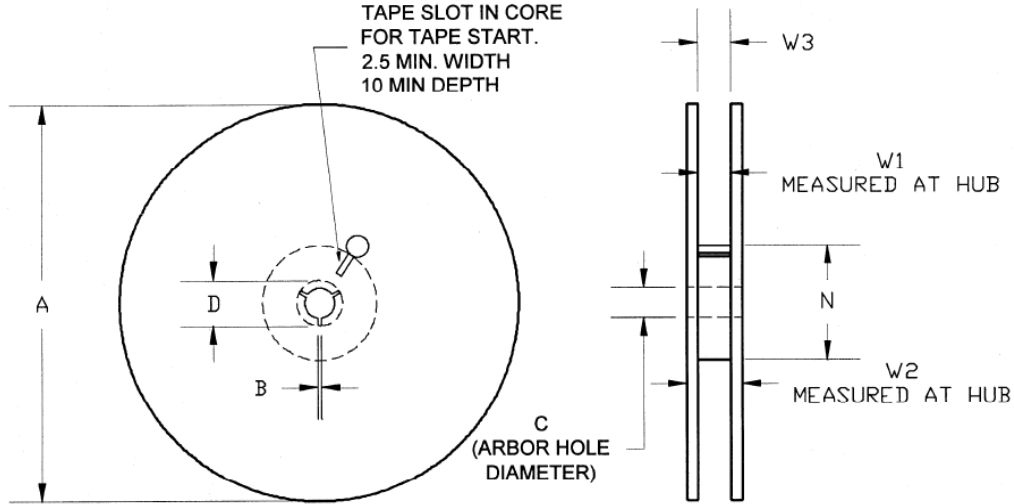


Feature	Measure	Symbol	Size (in)	Size (mm)
Cavity	Length	A0	0.089	2.25
	Width	B0	0.094	2.40
	Depth	K0	0.047	1.20
	Pitch	P1	0.157	4.00
Centerline Distance	Cavity to Perforation - Length Direction	P2	0.079	2.00
	Cavity to Perforation - Width Direction	F	0.138	3.50
Cover Tape	Width	C	0.213	5.40
Carrier Tape	Width	W	0.315	8.00



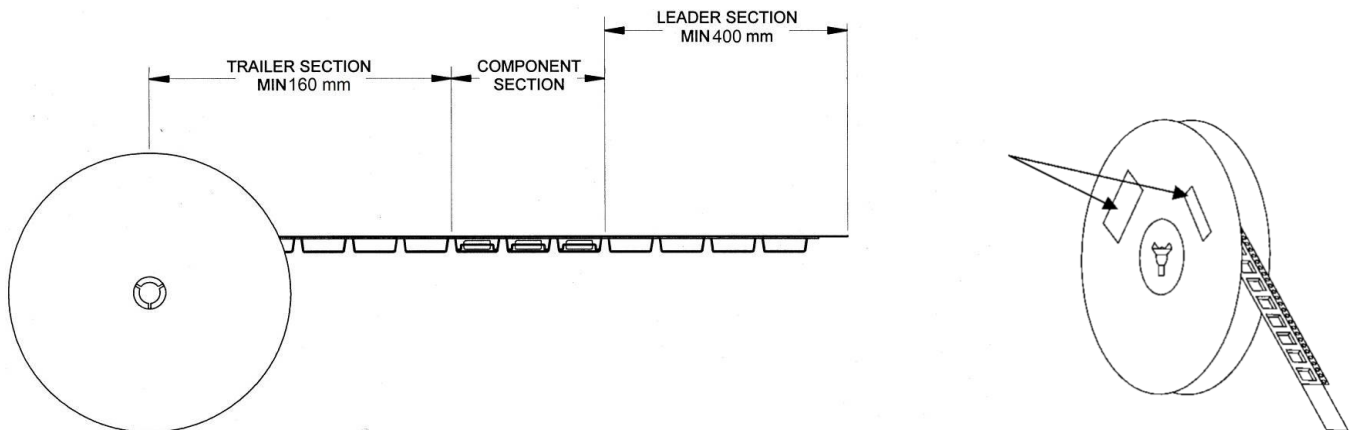
**Tape and Reel Information – Reel Dimensions**

Standard T/R size = 3000 pieces on a 7" reel.



Feature	Measure	Symbol	Size (in)	Size (mm)
Flange	Diameter	A	6.969	177.0
	Thickness	W2	0.559	14.2
	Space Between Flange	W1	0.346	8.8
Hub	Outer Diameter	N	2.283	58.0
	Arbor Hole Diameter	C	0.512	13.0
	Key Slit Width	B	0.079	2.0
	Key Slit Diameter	D	0.787	20.0

**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.