

### Product Description

The TQP369184 is a general-purpose buffer amplifier that offers high dynamic range in a low-cost surface-mount package. At 1900 MHz, the amplifier typically provides 20.3 dB gain, +28.5 dBm OIP3, and 3.9 dB Noise Figure while drawing 45 mA current. The device combines dependable performance with consistent quality to maintain MTTF values exceeding 100 years at mounting temperatures of +85 °C. The device is housed in a lead-free/green/RoHS-compliant industry-standard SOT-363 package.

The TQP369184 consists of a Darlington-pair amplifier using the high reliability InGaP/GaAs HBT process technology. Only DC-blocking capacitors, a bias resistor, and an inductive RF choke are required for operation.

This broadband MMIC amplifier can be directly applied to various current and next generation wireless technologies such as CDMA, W-CDMA, and LTE. In addition, the TQP369184 will work for other applications within the DC to 6 GHz frequency range.

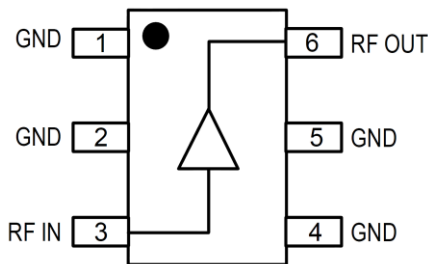


SOT-363 Package

### Product Features

- DC – 6000 MHz
- Flat, broadband frequency response
- 20.3 dB Gain at 1900 MHz
- 3.9 dB Noise Figure at 1900 MHz
- +28.5 dBm Output IP3 at 1900 MHz
- +15.5 dBm P1dB at 1900 MHz
- 50 Ohm Cascadable Gain Block
- Single Supply, 45 mA Current
- SOT-363 Package

### Functional Block Diagram



### Applications

- Wireless Infrastructure
- CATV / SATV / MoCA
- Point to Point
- Defense & Aerospace
- Test & Measurement Equipment
- General Purpose Wireless

### Ordering Information

Part No.	Description
TQP369184	InGaP/GaAs HBT Gain Block
TQP369184-PCB	500-6000 MHz Evaluation Board

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

## Absolute Maximum Ratings

Parameter	Rating
Storage Temperature	-55 to +150°C
RF Input Power, CW, 50 Ω, T=25 °C	+24 dBm
Device Voltage (V <sub>CC</sub> )	+4.5 V

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
T <sub>CASE</sub>	-40		+105	°C
T <sub>j</sub> for >10 <sup>6</sup> hours MTTF			+160	°C

Electrical specifications are measured under bias, signal and temperature conditions as specified. Specifications are not guaranteed over all recommended operating conditions.

## Electrical Specifications

Parameter	Conditions <sup>(1)</sup>	Min	Typ	Max	Units
Operational Frequency Range		DC		6000	MHz
Test Frequency			1900		MHz
Gain		18.8	20.3	21.8	dB
Input Return Loss			15		dB
Output Return Loss			24		dB
Output P1dB			+15.5		dBm
Output IP3	P <sub>out</sub> =0 dBm/tone, Δf= 1 MHz	+25.5	+28.5		dBm
Noise Figure			3.9		dB
Device Voltage, V <sub>CC</sub>		3.0	3.9	4.5	V
Device Current, I <sub>CC</sub>			45		mA
Thermal Resistance, θ <sub>Jc</sub>	Junction to case <sup>(2)</sup>			226	°C / W

Notes:

1. Test conditions unless otherwise noted: I<sub>CC</sub>=45 mA, Temp=+25 °C, 50 Ω system.
2. Thermal path is from the device junction through the package ground tab (pins 2,4) to the backside mounting surface.

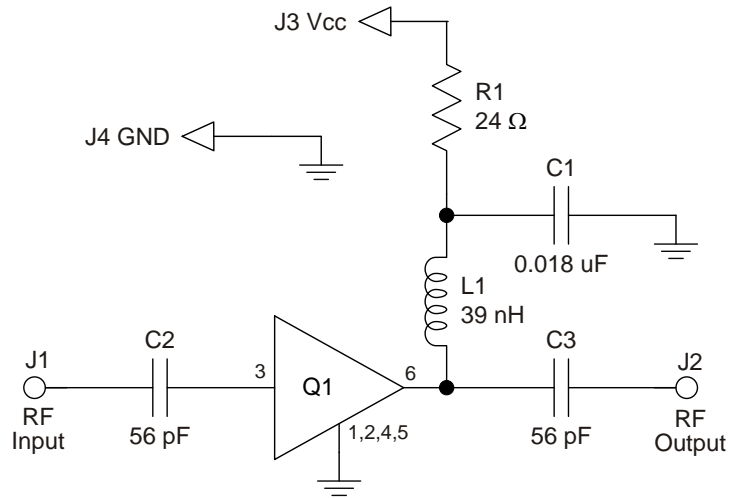
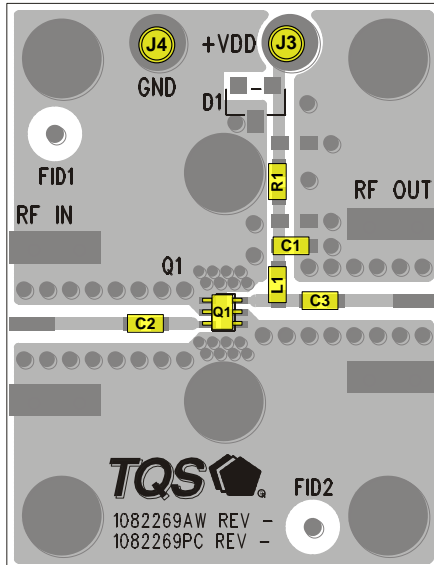
## S-Parameters

Freq (MHz)	S11 (dB)	S11 (ang)	S21 (dB)	S21 (ang)	S12 (dB)	S12 (ang)	S22 (dB)	S22 (ang)
10	-32.5	-177.9	22.6	179.6	-24.1	0.9	-35.7	85.5
20	-31.3	178.1	22.6	179.2	-24.0	0.4	-41.7	59.7
50	-30.7	168.6	22.6	178.0	-24.2	0.0	-58.8	111.5
100	-29.9	152.6	22.6	176.2	-24.1	-0.4	-54.6	-176.0
200	-27.9	131.8	22.5	172.5	-24.2	0.7	-60.3	133.2
500	-23.9	102.6	22.3	162.2	-24.2	1.7	-41.7	104.5
900	-20.3	77.3	21.9	149.2	-24.2	2.6	-45.1	135.2
1000	-19.9	73.3	21.8	145.9	-24.1	3.4	-52.6	109.9
1500	-17.2	47.4	21.1	131.1	-24.2	4.1	-39.7	-28.7
1900	-15.7	26.3	20.5	120.0	-24.2	5.1	-26.2	-35.1
2000	-15.1	21.0	20.3	117.4	-24.2	5.5	-24.6	-39.5
2500	-12.4	-5.3	19.4	105.2	-24.4	6.5	-18.2	-46.9
3000	-10.0	-17.9	18.5	94.3	-24.7	7.3	-14.6	-43.4
3500	-9.0	-24.3	17.6	85.2	-24.9	8.7	-12.9	-40.9
4000	-8.5	-27.4	16.9	77.1	-24.9	12.1	-12.9	-36.9
4500	-9.1	-27.6	16.5	69.6	-25.0	14.4	-14.7	-31.4
5000	-10.8	-26.9	16.2	61.0	-24.9	17.4	-20.0	-16.1
5500	-14.5	-28.1	16.1	51.2	-24.8	20.0	-25.7	73.4
6000	-22.4	-51.2	15.9	39.3	-24.9	20.7	-17.1	126.2

Notes:

1. Test Conditions:  $V_{CC}=+3.9\text{ V}$  (typ.),  $I_{CC}=45\text{ mA}$  (typ.),  $T_{CASE}=+25\text{ }^{\circ}\text{C}$ ,  $50\ \Omega$  system, calibrated to device leads.
2. Measured on TQP369184-PCB with L1 removed and C2, C3 replaced with  $0\ \Omega$  resistors.
3. Bias applied to device output via internal network analyzer wide-band bias tee.
4. SOLT Ecal at network analyzer test cable ends.
5. Input and output reference planes extended to the device leads.

TQP369184-PCB Evaluation Board



Notes:

1. See PC Board Layout, under Application Information section, for more information.
2. All components are of 0603 size unless otherwise stated.

Bill of Material – TQP369184-PCB

Reference Des.	Value	Description	Manuf.	Part Number
Q1	n/a	High Linearity LNA Gain Block	Qorvo	TQP369184
C1	0.018 uF	Cap, Chip, 0603, 16V, X7R, 10%	Various	
C2, C3	56 pF	Cap, Chip, 0603, 50V, NPO, 5%	Various	
L1	39 nH	Inductor, 0603, 5%, CS Series	Coilcraft	0603CS-39NXJL
R1	24 Ω	Res, Chip, 0805, 1/10W, 5%	Various	

Component Values for Specific Frequencies

Use the component values in this table for optimal operation at specific frequencies.

Reference Designator	Frequency (MHz)						
	50	500	900	1900	2200	2500	3500
L1	820 nH	220 nH	68 nH	27 nH	22 nH	18 nH	15 nH
C2, C3	.018 uF	1000 pF	100 pF	68 pF	68 pF	56 pF	39 pF

Bias Resistor Values for Various Supply Voltages

V <sub>SUPPLY</sub> (V)	5	6	7	8	9	10	12
R1	24 Ω	47 Ω	68 Ω	91 Ω	110 Ω	130 Ω	180 Ω
Component Size	0805	1206	1210	1210	1210	2010	2010

## Typical Performance – TQP369184-PCB

Test conditions unless otherwise noted:  $V_{SUPPLY} = +5\text{ V}$ ,  $R_1 = 24\ \Omega$ ,  $I_{CC} = 45\text{ mA}$ ,  $T_{CASE} = +25^\circ\text{C}$

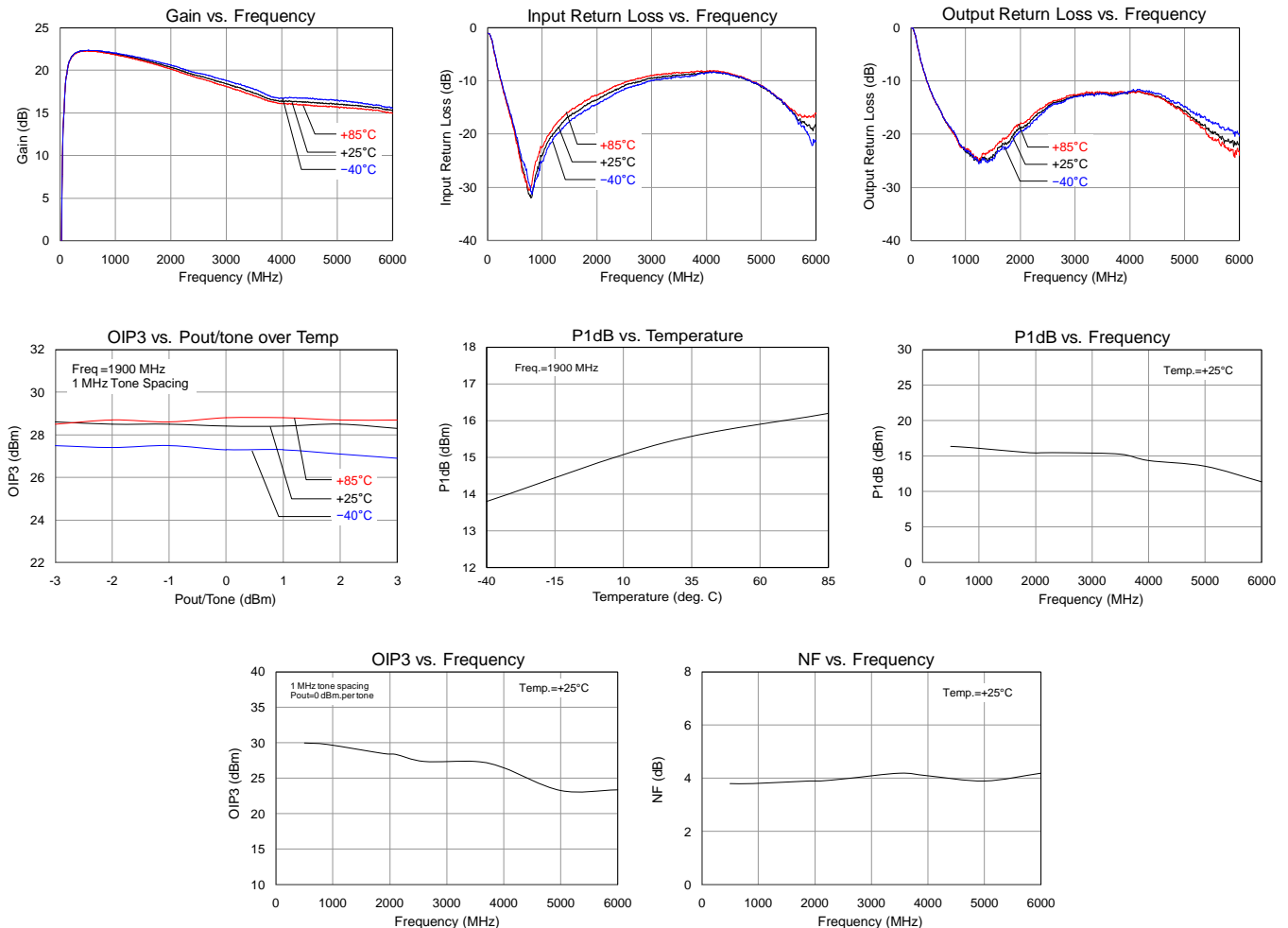
Parameter	Typical Value										Units
Frequency	500	900	1900	2100	2600	3500	4000	5000	6000		MHz
Gain	22.2	22.0	20.3	20.0	19.0	17.6	16.9	16.2	15.9		dB
Input Return Loss	20	32	15	13	10	9	9	11	22		dB
Output Return Loss	15	21	24	18	14	13	13	20	17		dB
Output P1dB	+16.4	+16.2	+15.5	+15.5	+15.5	+15.3	+14.4	+13.6	+11.4		dBm
OIP3	+30.0	+29.8	+28.5	+28.4	+27.4	+27.4	+26.5	+23.3	+23.4		dBm
Noise Figure	3.8	3.8	3.9	3.9	4.0	4.2	4.1	3.9	4.2		dB

Notes:

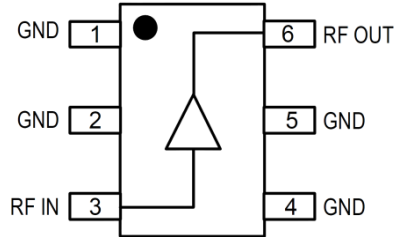
- OIP3 measured with two tones at an output power of 0 dBm / tone separated by 1 MHz.

## Performance Plots – TQP369184-PCB

Test conditions unless otherwise noted:  $V_{SUPPLY} = +5\text{ V}$ ,  $R_1 = 24\ \Omega$ ,  $I_{CC} = 45\text{ mA}$ ,  $T_{CASE} = +25^\circ\text{C}$



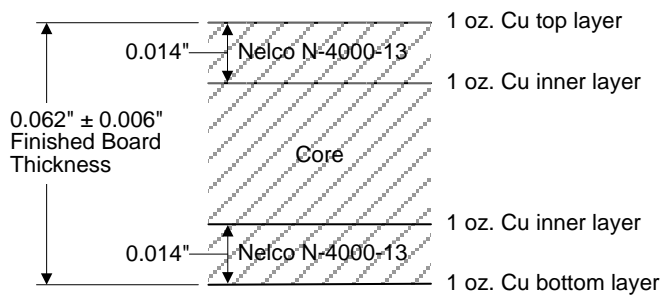
**Pin Configuration and Description**



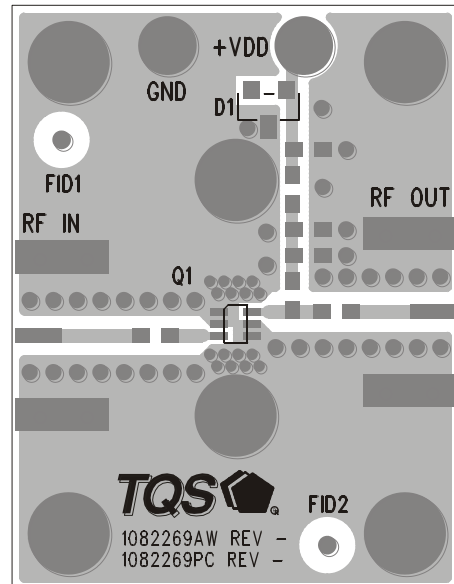
Pin No.	Label	Description
3	RF IN	RF input, matched to 50 Ohms. External DC Block is required.
6	RF OUT	RF output / DC supply, matched to 50 Ohms. External DC Block, bias choke, and dropping resistor is required.
1, 2, 4, 5	GND	RF/DC ground. Use recommended via pattern to minimize inductance and thermal resistance. See PCB Mounting Pattern for suggested footprint.

**Applications Information**

**Qorvo PCB 1082269 Material and Stack-up**



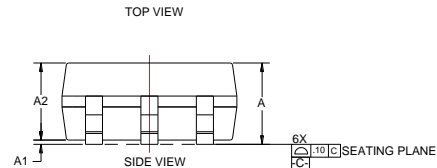
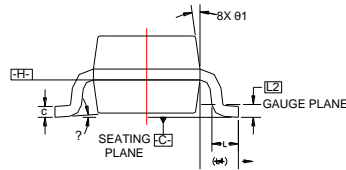
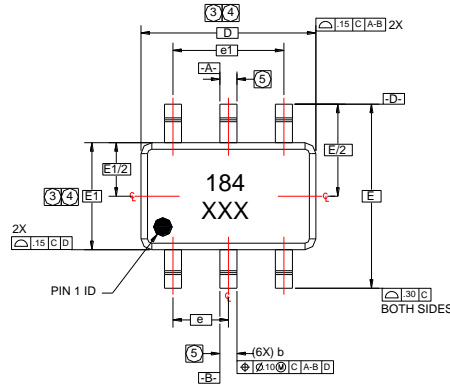
50 Ohm Line Dimensions: Width=0.029"  
 Spacing=0.035"



## Package Marking and Dimensions

Marking: Part number – 184  
Lot code – XXX

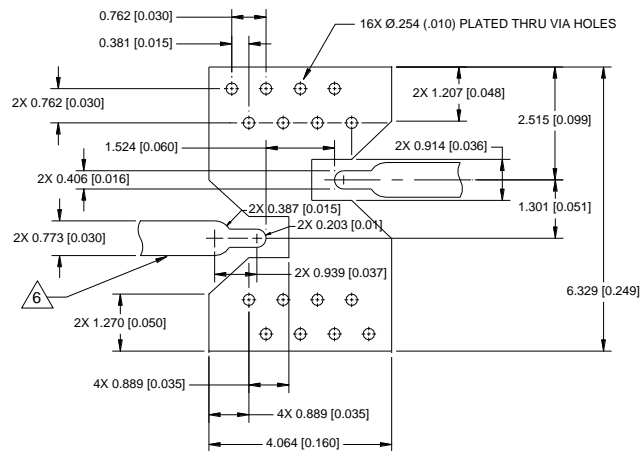
SYMBOL	MIN	MAX
A	-	1.10 (0.043)
A1	0	0.10 (0.004)
A2	0.70 (0.028)	1.00 (0.039)
D	2.00 (0.079)	BASIC
E	2.10 (0.083)	BASIC
E1	1.25 (0.049)	BASIC
L	0.21 (0.008)	0.41 (0.016)
L1	0.42 (0.017)	REF
L2	0.15 (0.006)	BASIC
?	0°	8°
?1	4°	12°
b	0.15 (0.006)	0.30 (0.012)
c	0.08 (0.003)	0.22 (0.009)
e	0.65 (0.026)	BASIC
e1	1.30 (0.051)	BASIC



### Notes:

1. All dimensions are in millimeters (inches). Angles are in degrees.
2. Dimension and tolerance formats conform to ASME Y14.5M-1194.
3. The terminal #1 identifier and terminal numbering conform to JEDEC MO-203, Issue B.
4. Contact plating: Matte Tin

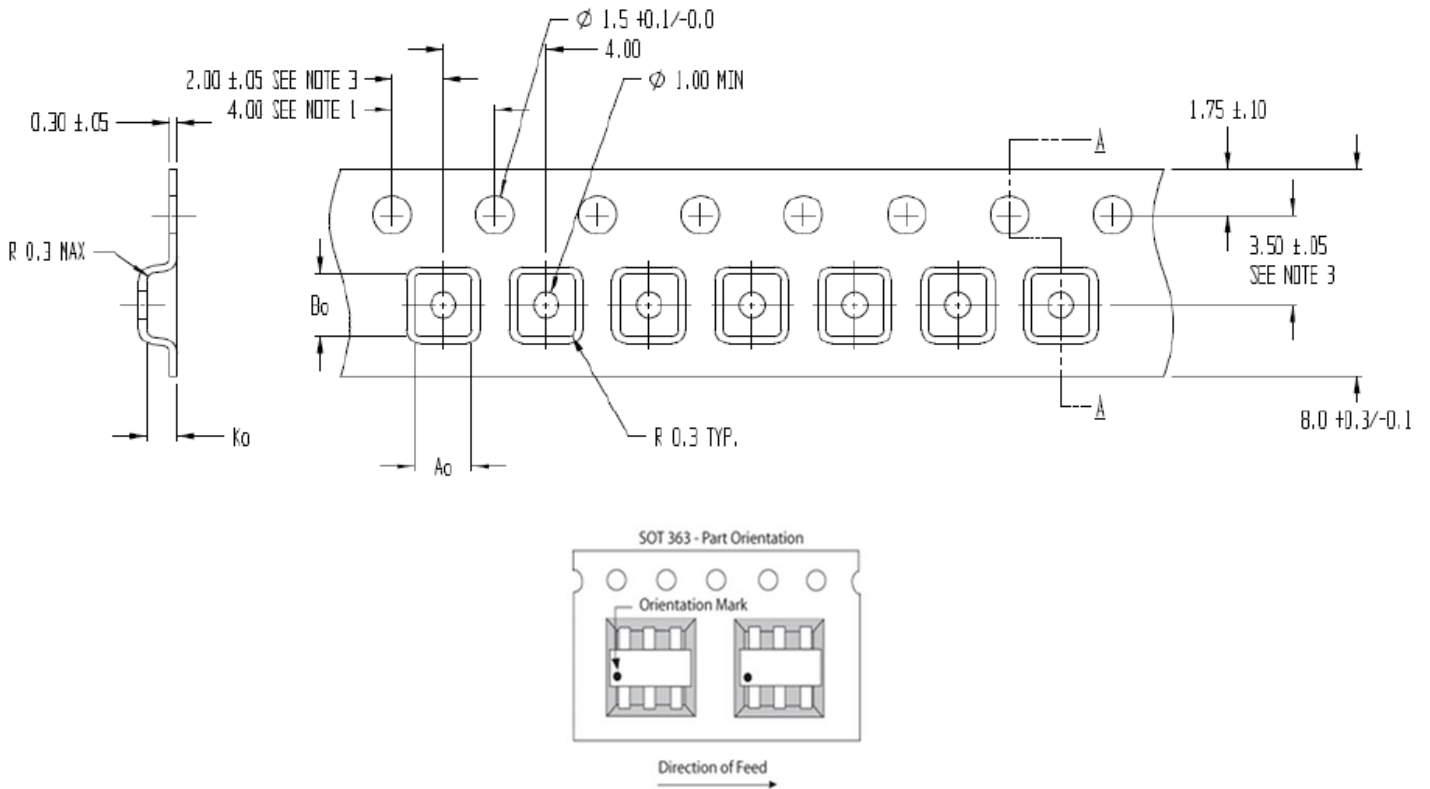
## PCB Mounting Pattern



### Notes:

1. All dimensions are in millimeters (inches). Angles are in degrees.
2. Use 1 oz. copper minimum for top and bottom layer metal.
3. Vias are required under the backside paddle of this device for proper RF/DC grounding and thermal dissipation.
4. Do not remove or minimize via hole structure in the PCB. Thermal and RF grounding is critical.
5. We recommend a 0.35mm (#80/.0135") diameter bit for drilling via holes and a final plated thru diameter of 0.25 mm (0.01").
6. The RF I/O trace transition shown is to a 30 mil wide line. Modify transition as required to interface with other line widths.
7. Ensure good package backside paddle solder attach for reliable operation and best electrical performance.

Tape and Reel Information – Carrier and Cover Tape Dimensions

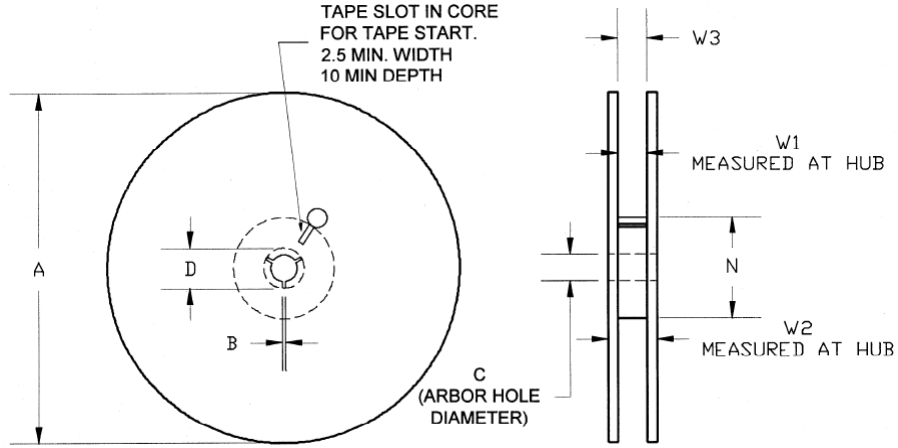


Feature	Measure	Symbol	Size (in)	Size (mm)
Cavity	Length	A0	0.089	2.25
	Width	B0	0.094	2.40
	Depth	K0	0.047	1.20
	Pitch	P1	0.157	4.00
Centerline Distance	Cavity to Perforation - Length Direction	P2	0.079	2.00
	Cavity to Perforation - Width Direction	F	0.138	3.50
Cover Tape	Width	C	0.213	5.40
Carrier Tape	Width	W	0.315	8.0



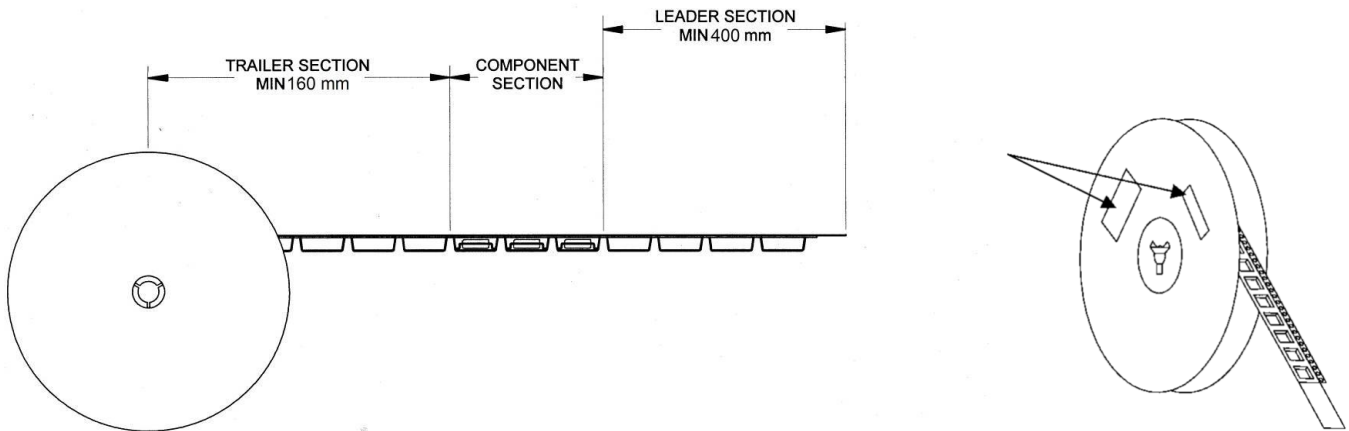
**Tape and Reel Information – Reel Dimensions**

Standard T/R size = 3,000 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.

## Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 1C	JEDEC Standard JS-001-2012
ESD – Charged Device Model (CDM)	Class C3	JEDEC Standard JESD22-C101F
MSL – Moisture Sensitivity Level	Level 1	IPC/JEDEC J-STD-020



Caution!  
ESD-Sensitive Device

## Solderability

Compatible with both lead-free (260°C max. reflow temp.) and tin/lead (245°C max. reflow temp.) soldering processes. Solder profiles available upon request.

Contact plating: Annealed Matte Tin

## RoHS Compliance

This part is compliant with the 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment), as amended by Directive 2015/863/EU.

This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A (C<sub>15</sub>H<sub>12</sub>Br<sub>4</sub>O<sub>2</sub>) Free
- PFOS Free
- SVHC Free



## Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

Web: [www.qorvo.com](http://www.qorvo.com)

Tel: 1-844-890-8163

Email: [customer.support@qorvo.com](mailto:customer.support@qorvo.com)

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