# QPD3800

## 85 W, 48 V 3.4 – 3.8 GHz GaN RF Power Transistor

## Product Description

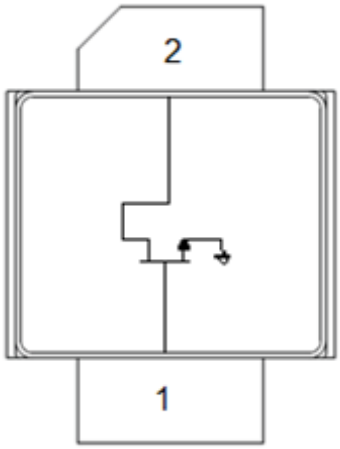
The QPD3800 is a discrete GaN on SiC HEMT which operates from 3.4 – 3.8 GHz. The device is a single stage matched power amplifier transistor.

The QPD3800 can be used in Doherty architecture for the final stage of a base station power amplifier for small cell, microcell, macrocell, and active antenna systems. The QPD3800 can also be used as a driver in a macrocell base station power amplifier.

QPD3800 can deliver $P_{SAT}$ of 85 W at +48 V operation.

ROHS compliant.

## Functional Block Diagram





2 Lead NI400 Package

## Product Features

- Operating Frequency Range: 3.4 – 3.8 GHz
- Operating Drain Voltage: +48 V
- Maximum Output Power ($P_{SAT}$): 85 W
- Maximum Drain Efficiency: 70%
- Efficiency-Tuned P3dB Gain: 19 dB
- 2-lead, earless, ceramic flange NI400 package

## Applications

- W-CDMA / LTE
- Macrocell Base Station
- Microcell Base Station Final Stage
- Small Cell Final Stage
- Active Antenna
- General Purpose Applications

## Ordering Information

| Part No. | ECCN | Description |
|---|---|---|
| QPD3800TR13 | 3A001.b.3.a.4 | 13” reel with 250 pieces |

## Absolute Maximum Ratings

| Parameter | Range / Value | Units |
|---|---|---|
| Gate Voltage ($V_G$) | −10 | V |
| Drain Voltage ($V_D$) | +55 | V |
| Peak RF Input Power | 38 | dBm |
| VSWR Mismatch, P1dB Pulse (20 % duty cycle, 100 µs width), T = 25 °C | 10:1 | – |
| Storage Temperature | −65 to +150 | °C |

Operation of this device outside the parameter ranges given above may cause permanent damage.

## Recommended Operating Conditions

| Parameter | Min | Typ | Max | Units |
|---|---|---|---|---|
| Operating Temperature | −40 | – | – | °C |
| Gate Current ($I_G$) | – | – | – | mA |
| Gate Voltage ($V_G$) | – | −2.7 | – | V |
| Drain Voltage ($V_D$) | – | 48 | – | V |
| Quiescent Current ($I_{DQ}$) | – | 180 | – | mA |
| $T_{CH}$ for >$10^6$ hours MTTF | – | – | 225 | °C |

Electrical performance is measured under conditions noted in the electrical specifications table. Specifications are not guaranteed over all recommended operating conditions.

## RF Characterization – Power-Tuned Load Pull Performance

| Frequency (MHz) | Source Impedance | Load Impedance | Gain @ P3dB (dB) | P3dB (dBm) | Drain Efficiency (%) |
|---|---|---|---|---|---|
| 3400 | 15.39 – j20.22 | 10.75 – j4.28 | 16.8 | 49.2 | 58.7 |
| 3600 | 28.35 – j15.62 | 13.32 – j2.24 | 17.1 | 49.2 | 59.7 |
| 3800 | 25.46 + j7.46 | 12.78 + j0.92 | 16.9 | 49.1 | 58.5 |

Test conditions unless otherwise noted: $V_D$ = +48 V, $I_{DQ}$ = 180 mA, T = 25°C, Pulsed 10% duty cycle, 100 µs width)

## RF Characterization – Efficiency-Tuned Load Pull Performance

| Frequency (MHz) | Source Impedance | Load Impedance | Gain @ P3dB (dB) | P3dB (dBm) | Drain Efficiency (%) |
|---|---|---|---|---|---|
| 3400 | 15.39 – j20.22 | 6.21 – j8.85 | 17.9 | 48.0 | 70.4 |
| 3600 | 28.35 – j15.62 | 9.78 – j9.27 | 19.0 | 48.0 | 70.5 |
| 3800 | 25.46 + j7.46 | 14.80 – j10.94 | 18.9 | 47.3 | 68.5 |

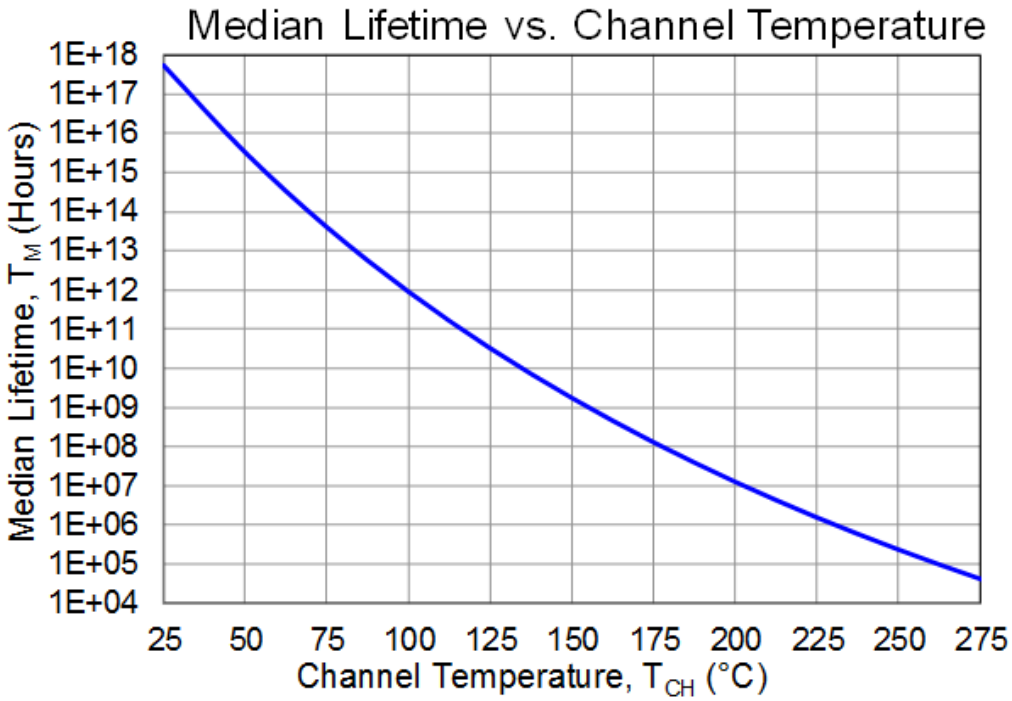
Test conditions unless otherwise noted: $V_D$ = +48 V, $I_{DQ}$ = 180 mA, T = 25°C, Pulsed 10% duty cycle, 100 µs width)

## Thermal and Reliability Information

| Parameter | Test Conditions | Value | Units |
|---|---|---|---|
| Thermal Resistance at Average Power ($\theta_{JC}$) | $T_{CASE}$ = 105°C, $T_{CH}$ = 171°C<br>CW: $P_{DISS}$ = 24 W, $P_{OUT}$ = 28 W | 2.71 | °C/W |

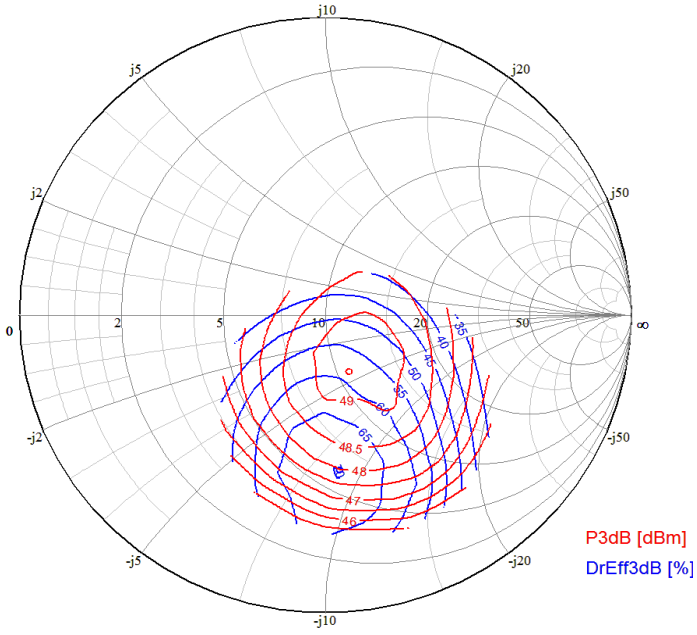
Notes:
1. Thermal resistance measured to package backside.
2. Based on expected carrier amplifier efficiency of Doherty.
3. $P_{OUT}$ assumes 20% peaking amplifier contribution of total average Doherty rated power.

## Median Lifetime

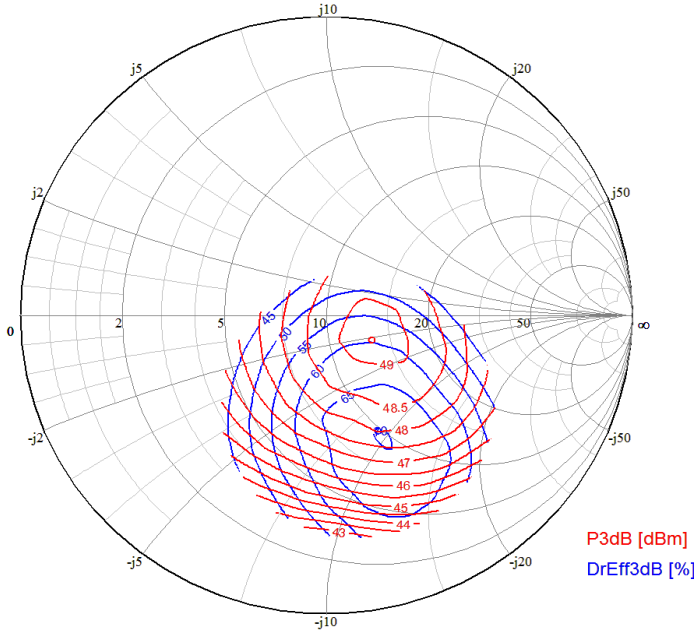


## Load Pull Plots

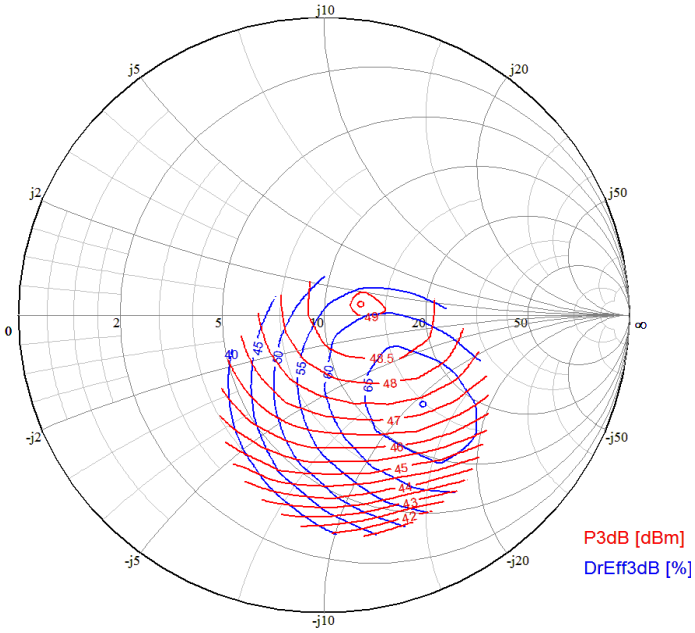
Load Pull at 3.4 GHz




Load Pull at 3.6 GHz

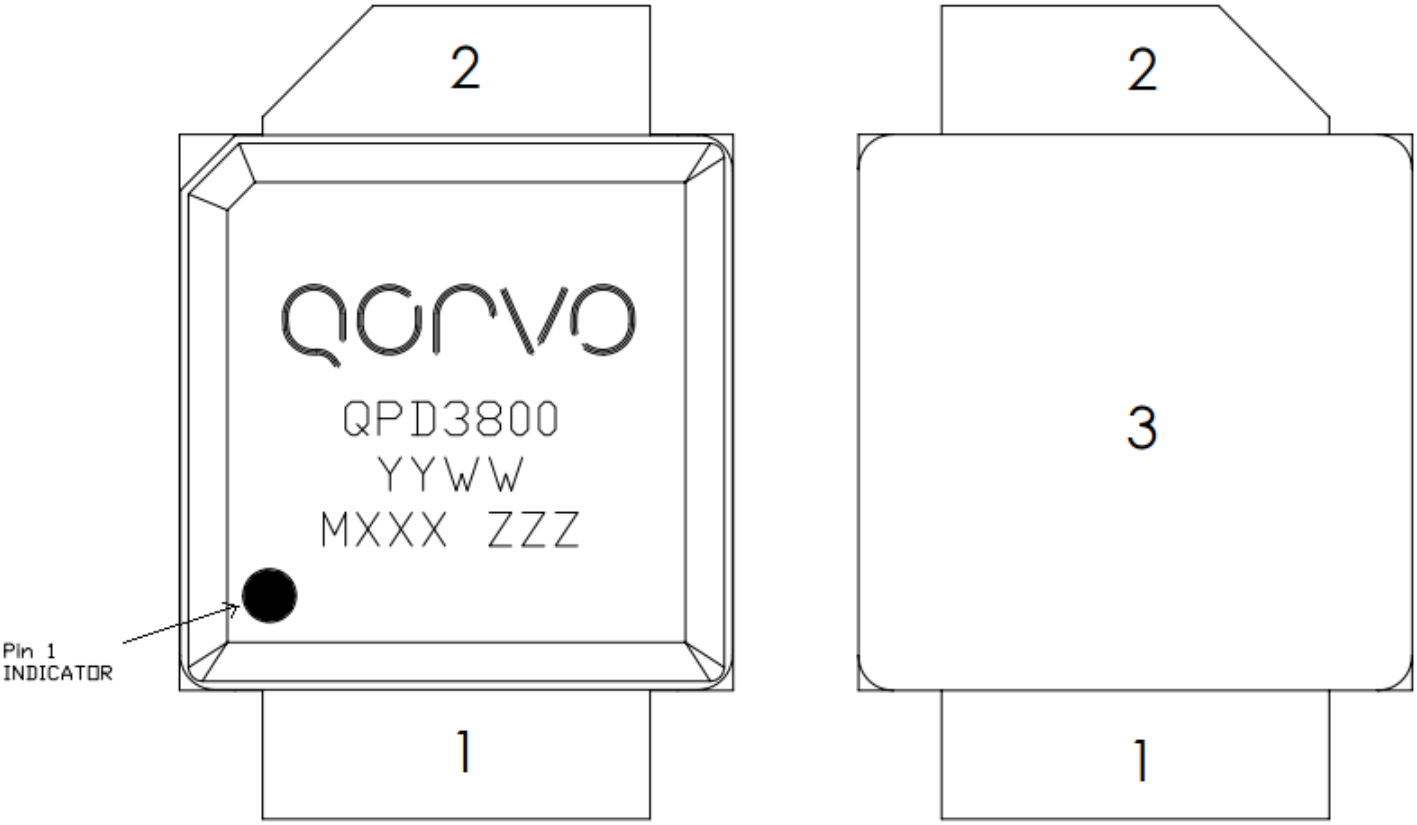



Load Pull at 3.8 GHz




Test conditions unless otherwise noted: $V_D$ = +48 V, $I_{DQ}$ = 180 mA, T = 25°C, Pulsed 10% duty cycle, 100 µs width)

## Pin Configuration

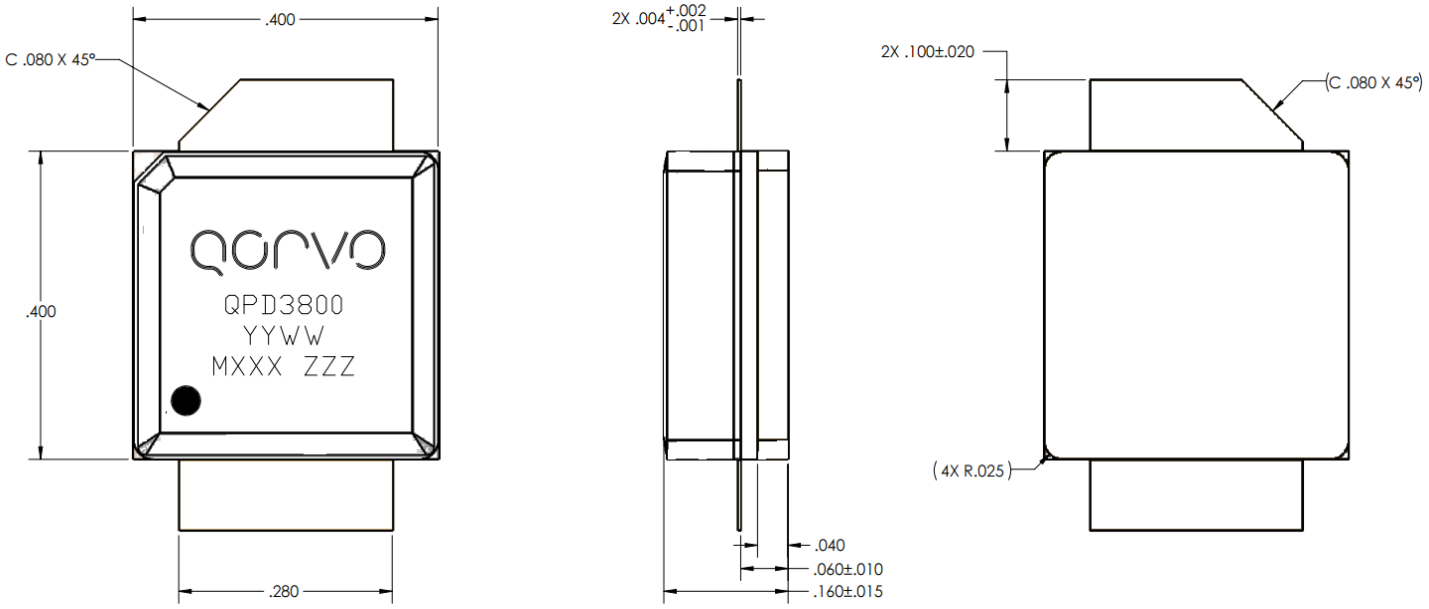



## Pin Description

| Pin No. | Label | Description |
|---|---|---|
| 1 | RF IN, $V_G$ | RF Input, Gate Bias |
| 2 | RF OUT, $V_D$ | RF Output, Drain Bias |
| 3 (Backside Paddle) | RF/DC GND | RF/DC Ground |

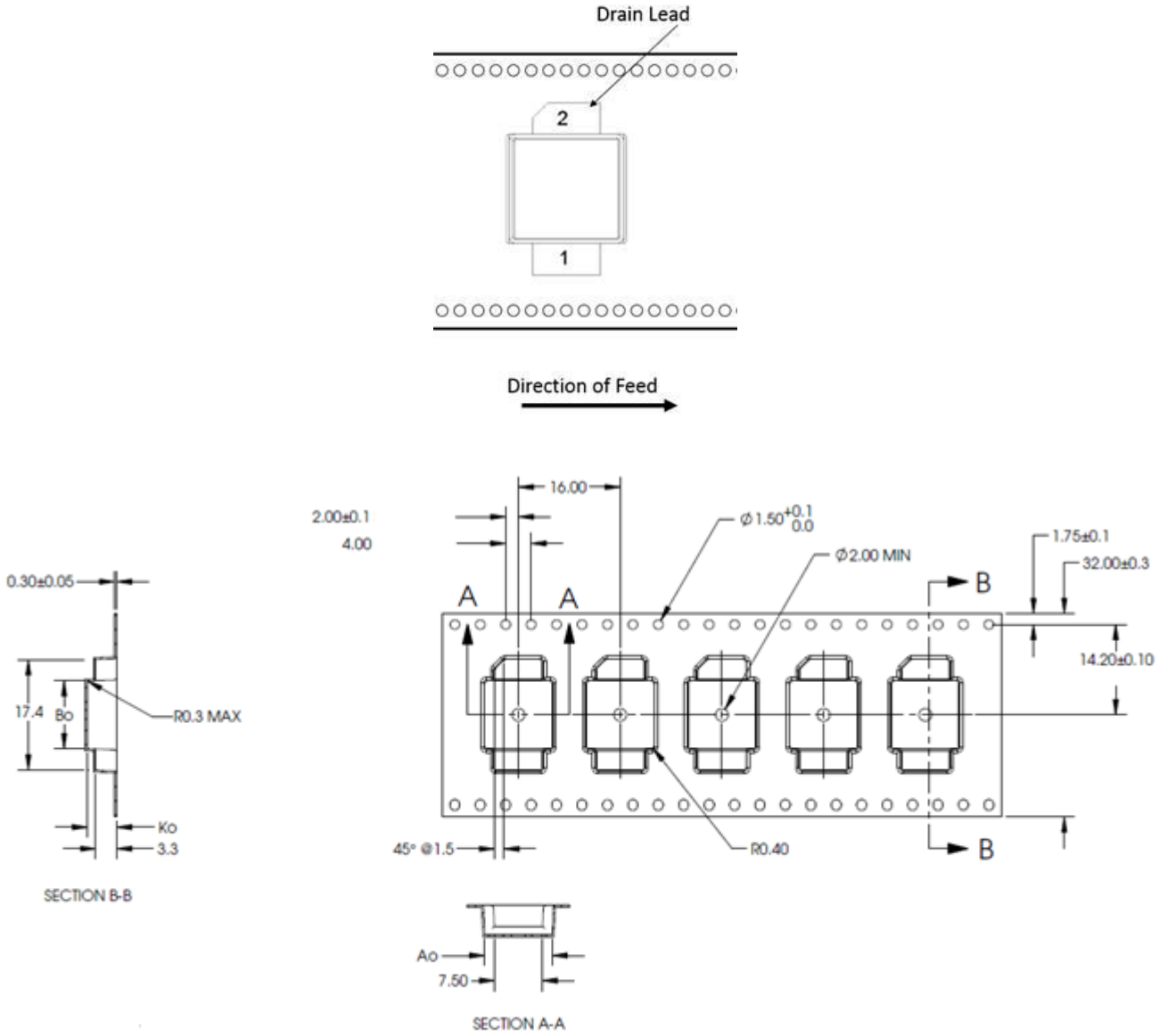
## Package Marking and Dimensions

Marking: Qorvo Logo
Part Number and Package Version – QPD3800
Date Code – YYWW
Production Lot Number – MXXX
Serial Number – ZZZ




Notes:
1. All dimensions are in inches. Angles are in degrees.
2. Exposed metallization is NiAu plated.

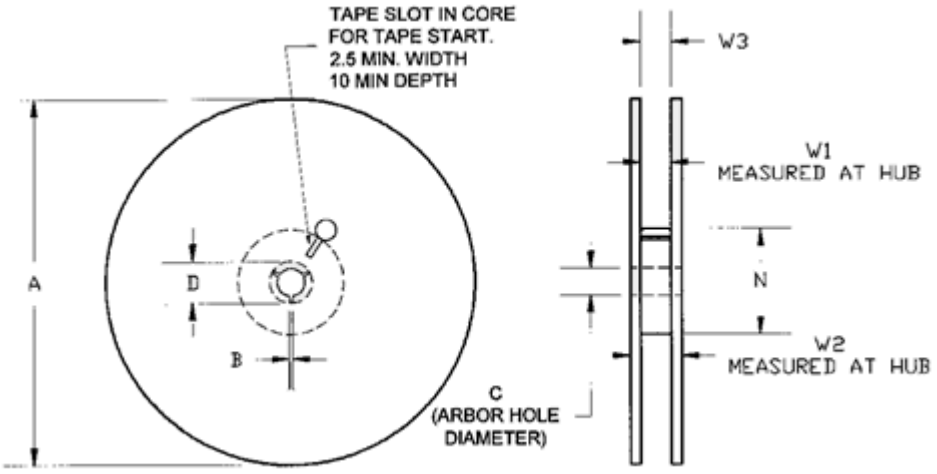
## Tape and Reel Information – Carrier and Cover Tape Dimensions




| Feature | Measure | Symbol | Size (in) | Size (mm) |
|---|---|---|---|---|
| Cavity | Length | A0 | 0.417 | 10.60 |
| | Width | B0 | 0.419 | 10.65 |
| | Depth | K0 | 0.181 | 4.60 |
| | Pitch | P1 | 0.630 | 16 |
| Centerline Distance | Cavity to Perforation – Length Direction | P2 | 0.079 | 2.00 |
| | Cavity to Perforation – Width Direction | F | 0.559 | 14.20 |
| Cover Tape | Width | C | 1.004 | 25.50 |
| Carrier Tape | Width | W | 1.260 | 32 |

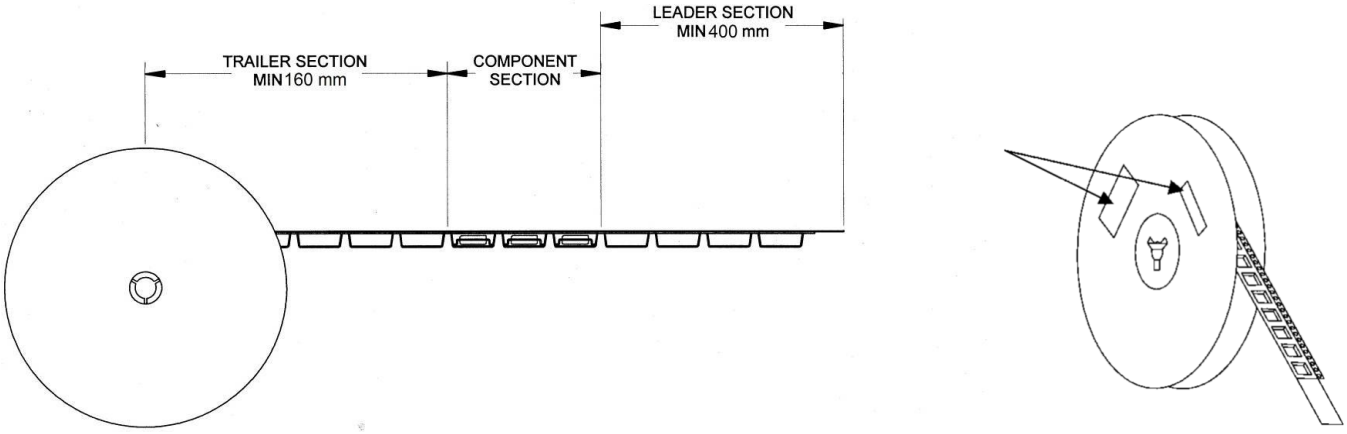
## Tape and Reel Information – Reel Dimensions

Standard T/R size = 250 pieces on a 13” reel.




| Feature | Measure | Symbol | Size (in) | Size (mm) |
|---|---|---|---|---|
| Flange | Diameter | A | 12.992 | 330.0 |
| | Thickness | W2 | 1.504 | 38.2 |
| | Space Between Flange | W1 | 1.291 | 32.8 |
| 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 | 0.787 | 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) | TBD | JEDEC Standard JS-001-2012 |
| ESD – Charged Device Model (CDM) | TBD | JEDEC Standard JESD22-C101F |
| MSL – 260 °C Convection Reflow | MSL3 | JEDEC standard IPC/JEDEC J-STD-020. |

Caution!
ESD-Sensitive Device

## Solderability

Compatible with both lead-free (260 °C maximum reflow temperature) and tin/lead (245 °C maximum reflow temperature) soldering processes.

Contact plating: NiAu

## RoHS Compliance

This product 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:

- Antimony Free
- TBBP-A ($C_{15}H_{12}Br_4O_2$) Free
- PFOS Free
- SVHC Free

## Contact Information

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