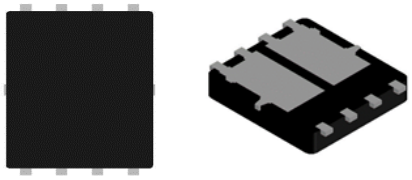
## FEATURES

- Drain-Source Withstand Voltage: 40V
- Max. $R_{DS(on)}$ : 8.9mΩ @ $V_{GS}$=10V
  13.5mΩ @ $V_{GS}$=4.5V
- Automotive applications
- AEC-Q101 Qualified
- Excellent ON resistance
- General footprint package PDFN5×6-8L
- 100% Rg and Avalanche tested
- MSL1

## PRODUCT APPEARANCE



PDFN5×6-8L

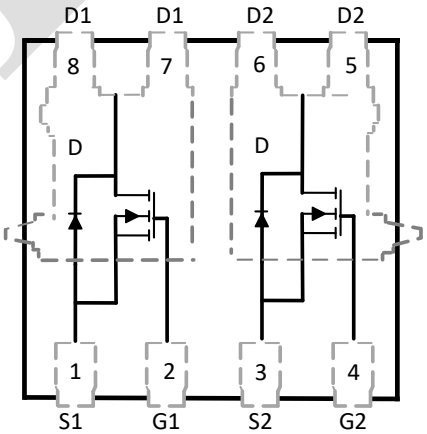
## DESCRIPTION

The SND048R9DNAQ is N-Channel enhancement MOS Field Effect Transistor. Uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This device is suitable for use in high performance automotive DC-DC conversion, power switch and charging circuit. Standard Product SND048R9DNAQ is in compliance with RoHS.

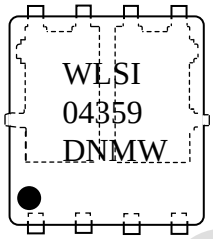
**Applications:**

- Automotive systems
- DC/DC converters
- Power supply converters circuit
- Load/Power Switching for portable device

## PIN CONFIGURATION



## MARKING




WLSI = Company (Group) Code
04359 = Device Code
DN = Special Code
M = Month
W = Week

## LIMITING VALUES

| Parameter | Symbol | Condition | Value | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | | 40 | V |
| Gate-Source Voltage | $V_{GS}$ | | ±20 | V |
| Continuous Drain Current (4) | $I_D$ | $T_C$=25°C | 48 | A |
| | | $T_C$=100°C | 34 | A |
| Pulsed Drain Current (3) | $I_{DM}$ | | 114 | A |
| Continuous Drain Current | $I_D$ | $T_A$=25°C | 12 | A |
| | | $T_A$=100°C | 9 | A |
| Avalanche Energy L=0.3mH | $E_{AS}$ | | 43.3 | mJ |
| Power Dissipation (2) | $P_D$ | $T_C$=25°C | 37 | W |
| | | $T_C$=100°C | 18 | W |
| Power Dissipation (1) | $P_D$ | $T_A$=25°C | 2.5 | W |
| | | $T_A$=100°C | 1.3 | W |
| Operating Junction Temperature | $T_J$ | | -55 to 175 | °C |
| Storage Temperature Range | $T_{STG}$ | | -55 to 175 | °C |

## THERMAL RESISTANCE RATINGS

| Single Operation | | | | | |
|---|---|---|---|---|---|
| **Parameter** | | **Symbol** | **Typical** | **Maximum** | **Unit** |
| Junction-to-Ambient Thermal Resistance (1) | Steady State | $R_{\theta JA}$ | 49.8 | 59.8 | °C/W |
| Junction-to-Case Thermal Resistance (2) | Steady State | $R_{\theta JC}$ | 2.9 | 4.1 | |

## ELECTRONICS CHARACTERISTICS

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Drain-to-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0 V, $I_D$ = 250μA | 40 | | | V |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $BV_{DSS}/T_J$ | | | 18.2 | | mV/°C |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=40V, $V_{GS}$= 0V, $T_J$=25°C | | | 1 | μA |
| | | $V_{DS}$=40V, $V_{GS}$= 0V, $T_J$=125°C | | | 100 | μA |
| Gate-to-source Leakage Current | $I_{GSS}$ | $V_{DS}$=0 V, $V_{GS}$= ±20V | | | ±100 | nA |
| **ON CHARACTERISTICS** | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS}$=$V_{DS}$, $I_D$= 250μA | 1.3 | 1.7 | 2.1 | V |
| Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | | | -4.7 | | mV/°C |
| Drain-to-source On-resistance (4) | $R_{DS(on)}$ | $V_{GS}$ =10V, $I_D$ =10A | | 7.4 | 8.9 | mΩ |
| | | $V_{GS}$ =4.5V, $I_D$ =10A | | 10.5 | 13.5 | |
| **CHARGES, CAPACITANCES AND GATE RESISTANCE** | | | | | | |
| Input Capacitance | $C_{ISS}$ | $V_{GS}$ = 0V, f = 1.0MHz, $V_{DS}$=20 V | | 660 | | pF |
| Output Capacitance | $C_{OSS}$ | | | 197 | | |
| Reverse Transfer Capacitance | $C_{RSS}$ | | | 11.6 | | |
| Total Gate Charge (5) | $Q_{G(TOT)}$ | $V_{GS}$=10V, $V_{DS}$= 20V, $I_D$ =10A | | 9.5 | | nC |
| Gate-to-Source Charge (5) | $Q_{GS}$ | | | 1.8 | | |
| Gate-to-Drain Charge (5) | $Q_{GD}$ | | | 1.2 | | |

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Gate Resistance | Rg | f = 1MHz | | 2.6 | | Ω |
| **SWITCHING CHARACTERISTICS (5)** | | | | | | |
| Turn-On Delay Time | td(ON) | $V_{GS}$=10V, $V_{DS}$= 32V, $I_D$=10A, $R_G$=5Ω | | 3.0 | | ns |
| Rise Time | tr | | | 24.0 | | |
| Turn-Off Delay Time | td(OFF) | | | 11.4 | | |
| Fall Time | tf | | | 16.2 | | |
| Body Diode Reverse Recovery Time | trr | $I_F$=10A, dI/dt= 100A/μs | | 17.6 | | ns |
| Body Diode Reverse Recovery Charge | Qrr | $I_F$=10A, dI/dt= 100A/μs | | 7.2 | | nC |
| **BODY DIODE CHARACTERISTICS** | | | | | | |
| Forward Voltage (4) | $V_{SD}$ | $V_{GS}$=0V, $I_S$=10A | 0.5 | 0.8 | 1.2 | V |

($T_J$=25℃, unless otherwise noted.)

**Note:**

(1) FR-4 board (38mm×38mm×t1.6mm, 70μm Copper) partially covered with copper (645mm² area). The power dissipation $P_{DSM}$ is based on Junction-to-Ambient thermal resistance value and the $T_{J(MAX)}$=175℃. The value is only for reference, any application depends on the user's specific board design.

(2) The power dissipation $P_D$ is based on $T_{J(MAX)}$=175℃, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heat sinking is used.

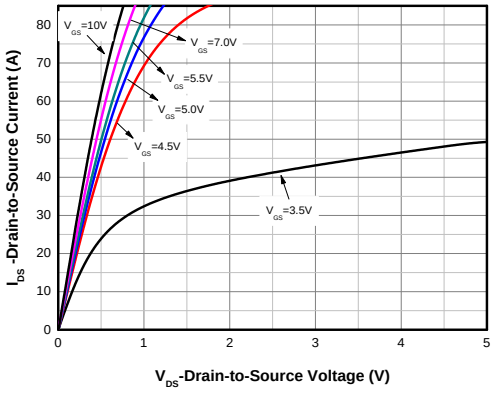
(3) Repetitive rating, pulsed, duty cycle ~1%, keep initial $T_J$=25℃, the maximum allowed junction temperature of 175℃.

(4) The static characteristics are obtained using ~380μs pulse, duty cycle ~1%.

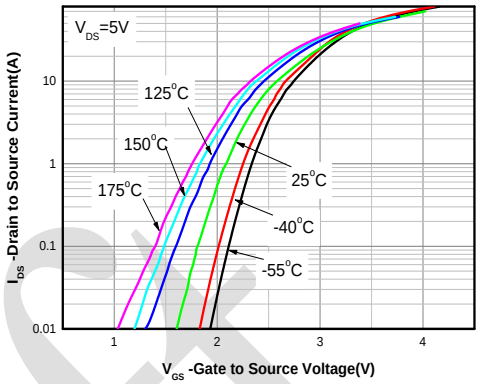
(5) The parameter is not subject to production test – verified by design / characterization.

## TYPICAL CHARACTERISTICS

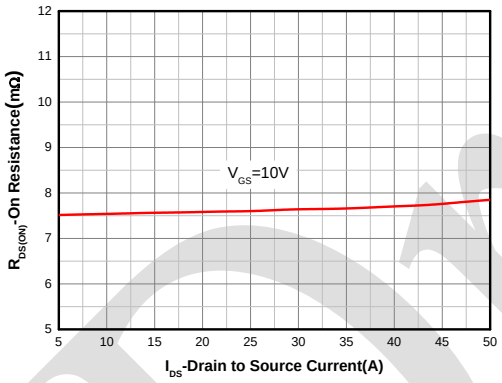
Ta=25℃, unless otherwise noted.



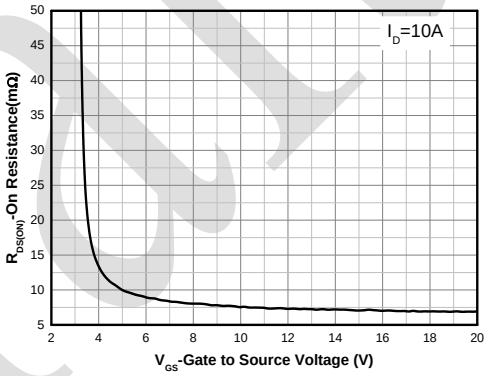

**Output Characteristics (4)**



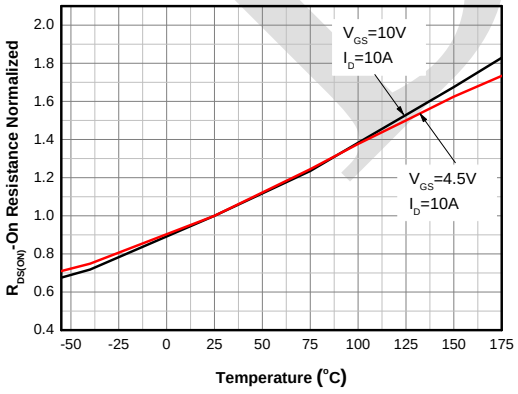

**Transfer Characteristics (4)**



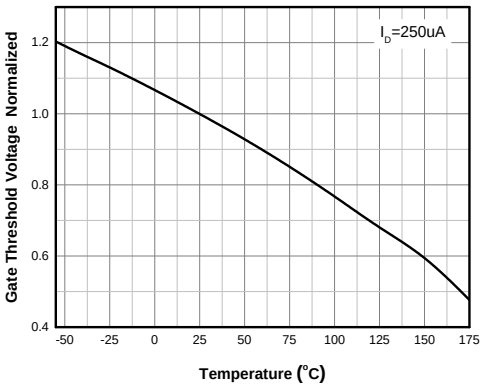

**On-Resistance vs. Drain Current (4)**



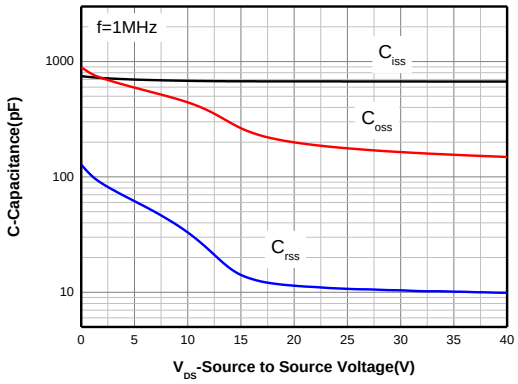

**On-Resistance vs. Gate-to-Source Voltage (4)**



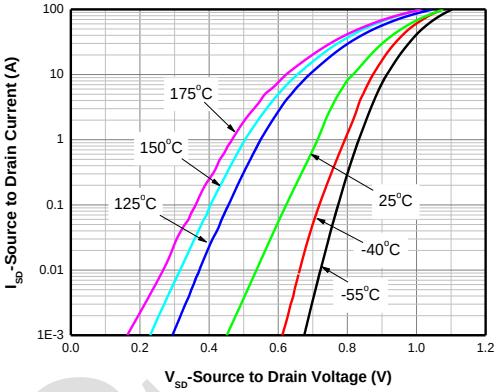

**On-Resistance vs. Junction Temperature (4)**



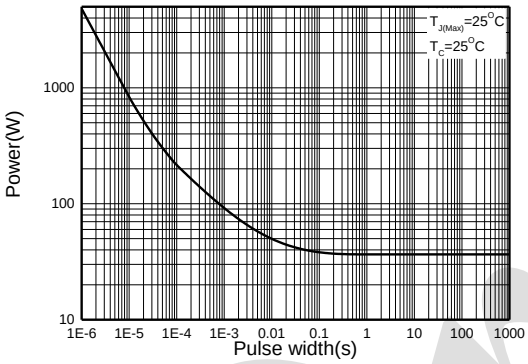

**Threshold Voltage vs. Temperature**



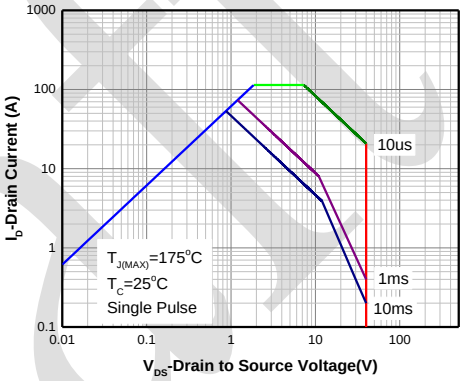

**Capacitance**



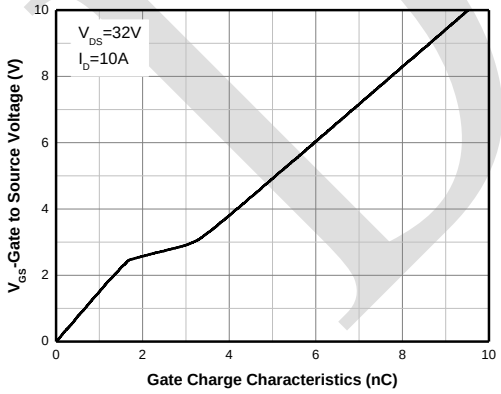

**Body Diode Forward Voltage (4)**



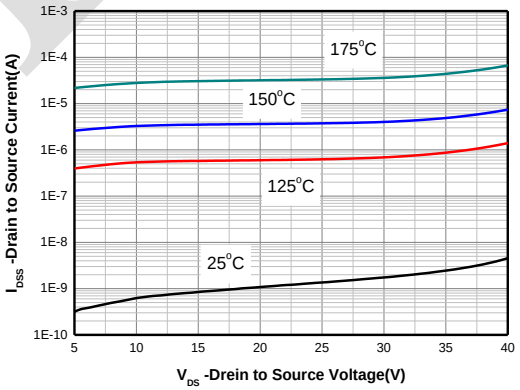

**Single Pulse power**



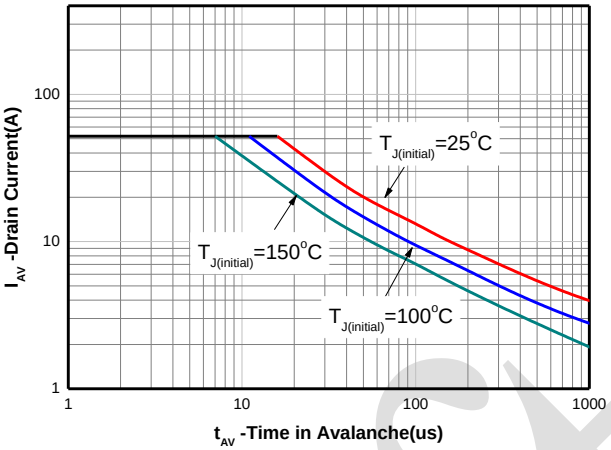

**Safe Operating Area**



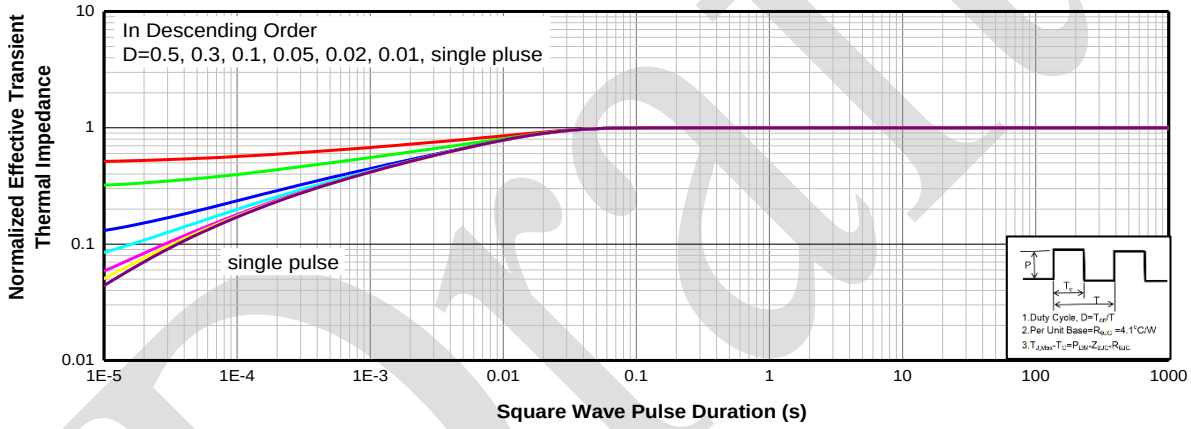

**Gate Charge Characteristics**



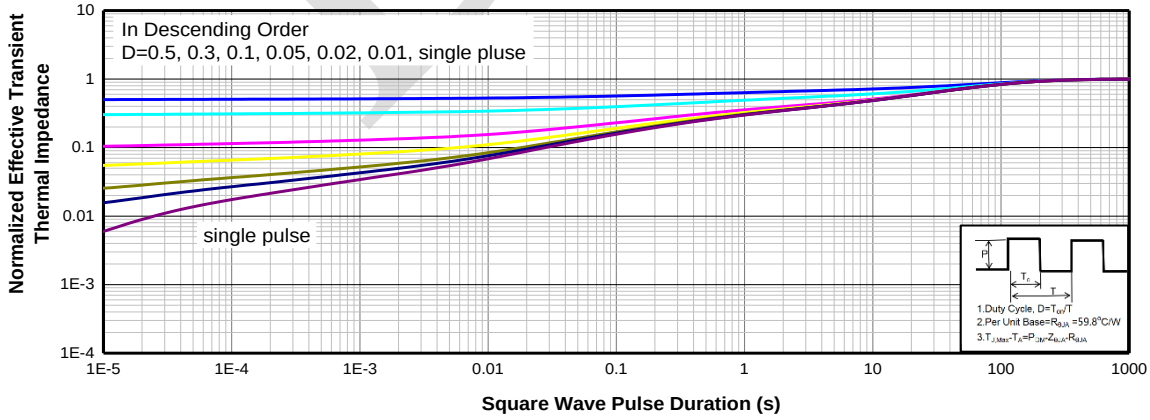

**Drain Current vs. Drain Voltage**




**Avalanche characteristics**




**Transient Thermal Response (Junction-to-Case)**

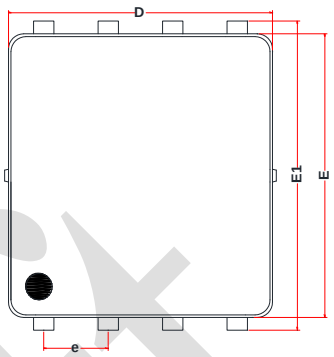



**Transient Thermal Response (Junction-to-Ambient)**

## PDFN5×6-8L DIMENSIONS

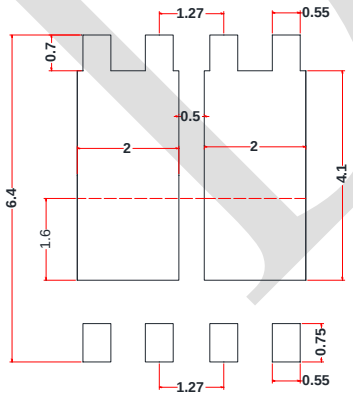
**PACKAGE SIZE**

| Symbol | Min. | Typ. | Max. |
|---|---|---|---|
| A | 0.85 | 0.95 | 1.00 |
| A1 | 0.00 | --- | 0.05 |
| A3 | --- | 0.2 Ref | --- |
| b | 0.30 | 0.40 | 0.50 |
| D | 5.20 BSC | | |
| E | 5.55 BSC | | |
| e | 1.27 BSC | | |
| D1 | 1.85 | 1.95 | 2.05 |
| E1 | 5.95 | 6.05 | 6.15 |
| E2 | 3.375 | 3.475 | 3.575 |
| E3 | 1.025 | 1.125 | 1.225 |
| L | 0.45 | 0.55 | 0.65 |
| L1 | 0 | --- | 0.15 |
| L2 | 0.675 Ref | | |
| M | 1.830Ref | | |

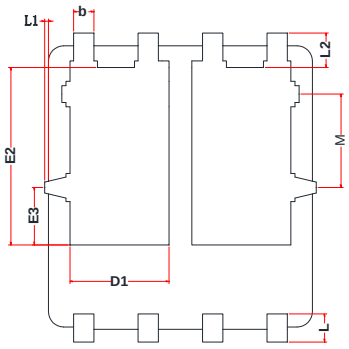


TOP VIEW

SIDE VIEW



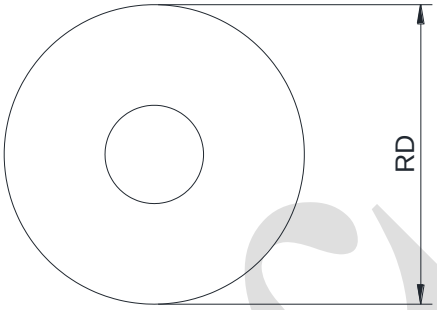
RECOMMENDED LAND
PATTERN (Unit：mm）



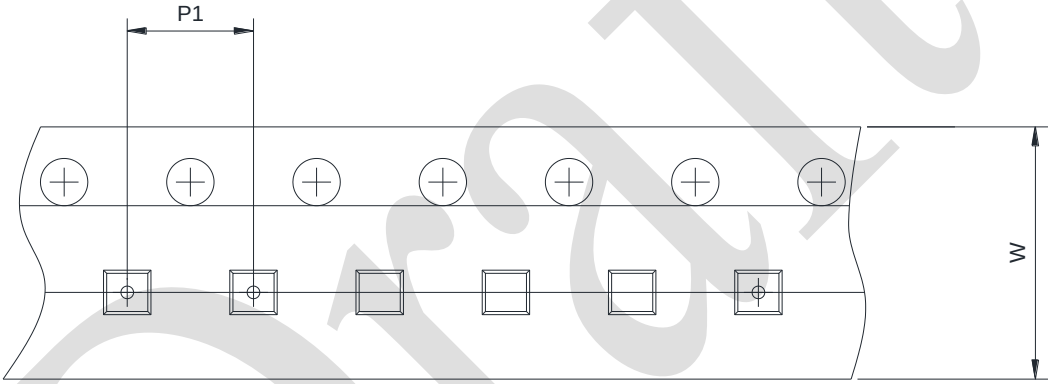
BOTTOM VIEW

# TAPE AND REEL INFORMATION

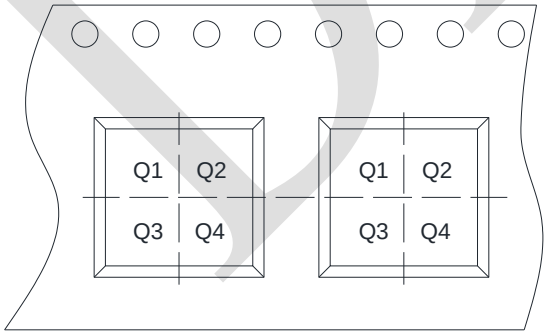
**Reel Dimensions**




**Tape Dimensions**




**Quadrant Assignments For PIN1 Orientation In Tape**




User Direction of Feed

| | | | | | |
|---|---|---|---|---|---|
| RD | Reel Dimension | ☐ 7inch | ☑ 13inch | | |
| W | Overall width of the carrier tape | ☐ 8mm | ☑ 12mm | ☐ 16mm | |
| P1 | Pitch between successive cavity centers | ☐ 2mm | ☐ 4mm | ☑ 8mm | |
| Pin1 | Pin1 Quadrant | ☑ Q1 | ☐ Q2 | ☐ Q3 | ☐ Q4 |

## ORDERING INFORMATION

| TYPE NUMBER | PACKAGE | PACKING |
|---|---|---|
| SND048R9DNAQ-8/TR | PDFN5×6-8L | Tape and reel |

PDFN5×6-8L is packed with 5000 pieces/disc in braided packaging.

**Important statement**

SIT reserves the right to change the above-mentioned information without prior notice.

## REVISION HISTORY

| Version number | Datasheet status | Revision date |
|---|---|---|
| V0.2 | Draft version. | May 2024 |