

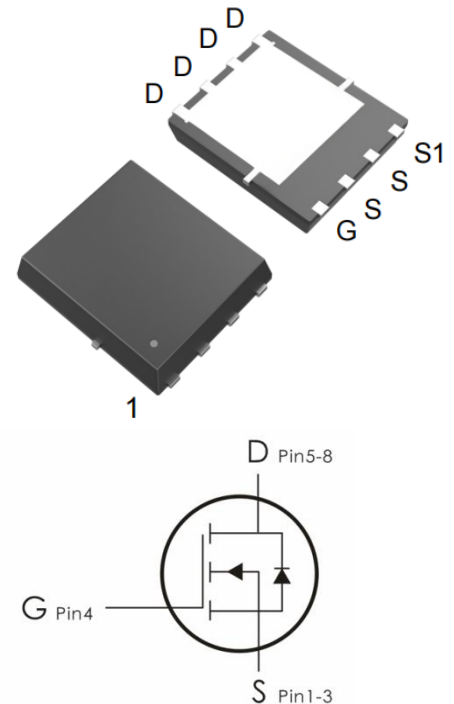
## Description:

This N-Channel MOSFET uses advanced trench technology and design to provide excellent  $R_{DS(on)}$  with low gate charge.

It can be used in a wide variety of applications.

## Features:

- 1)  $V_{DS}=40V, I_D=90A, R_{DS(on)} < 4.5m\Omega @ V_{GS}=10V$
- 2) Low gate charge.
- 3) Green device available.
- 4) Advanced high cell density trench technology for ultra low  $R_{DS(on)}$ .
- 5) Excellent package for good heat dissipation.



## Package Marking and Ordering Information:

| Part NO. | Marking | Package  | Packing       |
|----------|---------|----------|---------------|
| DON90N04 | 90N04   | DFN5*6-8 | 5000 pcs/Reel |

## Absolute Maximum Ratings: ( $T_C=25^\circ C$ unless otherwise noted)

| Symbol         | Parameter                                        | Ratings  | Units      |
|----------------|--------------------------------------------------|----------|------------|
| $V_{DS}$       | Drain-Source Voltage                             | 40       | V          |
| $V_{GS}$       | Gate-Source Voltage                              | $\pm 20$ | V          |
| $I_D$          | Continuous Drain Current                         | 90       | A          |
|                | Continuous Drain Current- $T_C=100^\circ C$      | 56       |            |
| $I_{DM}$       | Pulsed Drain Current                             | 280      |            |
| $P_D$          | Power Dissipation <sup>1</sup>                   | 50       | W          |
| $E_{AS}$       | Single pulse avalanche energy <sup>2</sup>       | 121      | mJ         |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range | -55-+150 | $^\circ C$ |

## Thermal Characteristics:

| Symbol          | Parameter                            | Max | Units        |
|-----------------|--------------------------------------|-----|--------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 2.5 | $^\circ C/W$ |

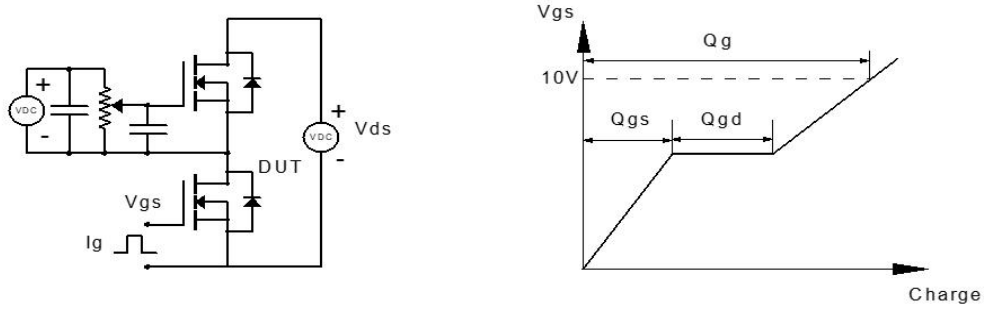
## Electrical Characteristics: ( $T_C=25^{\circ}\text{C}$ unless otherwise noted)

| Symbol                                    | Parameter                               | Conditions                                                                               | Min | Typ  | Max   | Units |
|-------------------------------------------|-----------------------------------------|------------------------------------------------------------------------------------------|-----|------|-------|-------|
| Off Characteristics                       |                                         |                                                                                          |     |      |       |       |
| BV <sub>DSS</sub>                         | Drain-Sourctce Breakdown Voltage        | V <sub>GS</sub> =0V, I <sub>D</sub> =250 μ A                                             | 40  | ---  | ---   | V     |
| I <sub>DSS</sub>                          | Zero Gate Voltage Drain Current         | V <sub>GS</sub> =0V, V <sub>DS</sub> =40V                                                | --- | ---  | 1     | μ A   |
| I <sub>GSS</sub>                          | Gate-Source Leakage Current             | V <sub>GS</sub> =± 20V, V <sub>DS</sub> =0A                                              | --- | ---  | ± 100 | nA    |
| On Characteristics <small>(Note3)</small> |                                         |                                                                                          |     |      |       |       |
| V <sub>GS(th)</sub>                       | Gate-Source Threshold Voltage           | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250 μ A                               | 1.1 | 1.6  | 2.5   | V     |
| R <sub>DS(ON)</sub>                       | Drain-Source On Resistance <sup>3</sup> | V <sub>GS</sub> =10V, I <sub>D</sub> =20A                                                | --- | 3.5  | 4.5   | m Ω   |
|                                           |                                         | V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A                                               | --- | 5.5  | 7     |       |
| Dynamic Characteristics                   |                                         |                                                                                          |     |      |       |       |
| C <sub>iss</sub>                          | Input Capacitance                       | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, f=1MHz                                        | --- | 3023 | ---   | pF    |
| C <sub>OSS</sub>                          | Output Capacitance                      |                                                                                          | --- | 236  | --    |       |
| C <sub>rss</sub>                          | Reverse Transfer Capacitance            |                                                                                          | --- | 201  | ---   |       |
| Switching Characteristics                 |                                         |                                                                                          |     |      |       |       |
| t <sub>d(on)</sub>                        | Turn-On Delay Time                      | V <sub>DS</sub> =20V, I <sub>D</sub> =30A,<br>R <sub>G</sub> =3 Ω , V <sub>GS</sub> =10V | --- | 11.5 | ---   | ns    |
| t <sub>r</sub>                            | Rise Time                               |                                                                                          | --- | 33.6 | ---   | ns    |
| t <sub>d(off)</sub>                       | Turn-Off Delay Time                     |                                                                                          | --- | 54.6 | ---   | ns    |
| t <sub>f</sub>                            | Fall Time                               |                                                                                          | --- | 13.6 | ---   | ns    |
| Q <sub>g</sub>                            | Total Gate Charge                       | V <sub>GS</sub> =10V, V <sub>DS</sub> =20V,<br>I <sub>D</sub> =30A                       | --- | 61   | ---   | nc    |
| Q <sub>gs</sub>                           | Gate-Source Charge                      |                                                                                          | --- | 12.6 | ---   | nc    |
| Q <sub>gd</sub>                           | Gate-Drain “Miller” Charge              |                                                                                          | --- | 12.6 | ---   | nc    |
| Drain-Source Diode Characteristics        |                                         |                                                                                          |     |      |       |       |
| V <sub>SD</sub>                           | Diode Forward Voltage                   | V <sub>GS</sub> =0V, I <sub>SD</sub> =10A                                                | --- | ---  | 1.2   | V     |
| I <sub>S</sub>                            | Continuous Drain Curren                 | V <sub>D</sub> =V <sub>G</sub> =0V                                                       | --- | ---  | 90    | A     |
| I <sub>SM</sub>                           | Pulsed Drain Current                    |                                                                                          | --- | ---  | 280   | A     |
| T <sub>rr</sub>                           | Reverse Recovery Time                   | I <sub>F</sub> =20A, T <sub>J</sub> =25 °C                                               | --- | 13   | ---   | ns    |
| Q <sub>rr</sub>                           | Reverse Recovery Charge                 | dI/dt=100A/us                                                                            | --- | 7    | ---   | nc    |

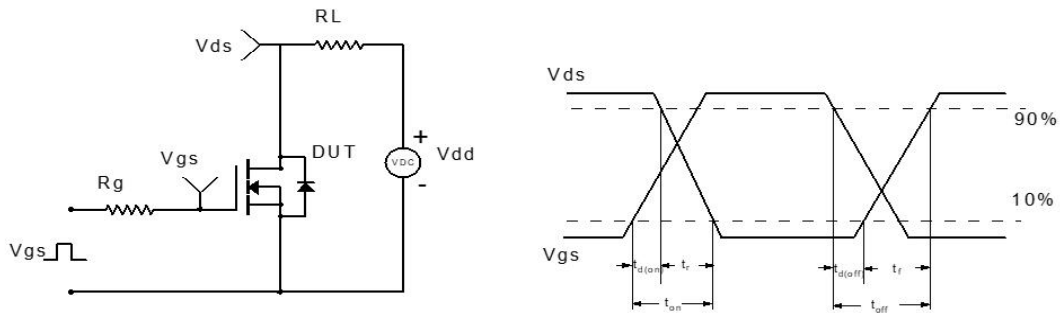
### Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
2. EAS condition:  $T_J=25^{\circ}\text{C}$ ,  $V_{DD}=20\text{V}$ ,  $V_G=10\text{V}$ ,  $L=0.5\text{mH}$
3. Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 0.5\%$

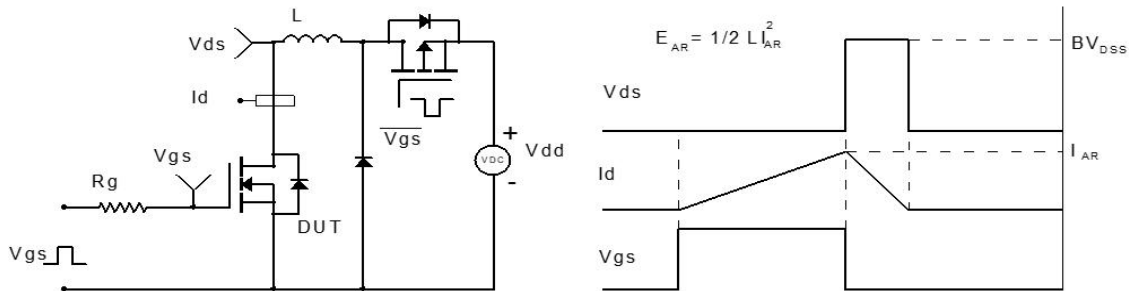
### Test Circuit



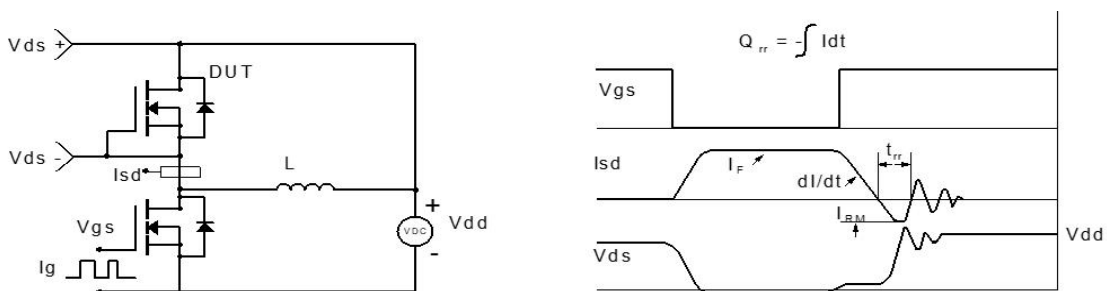
**Figure 1: Gate Charge Test Circuit & Waveform**



**Figure 2: Resistive Switching Test Circuit & Waveform**

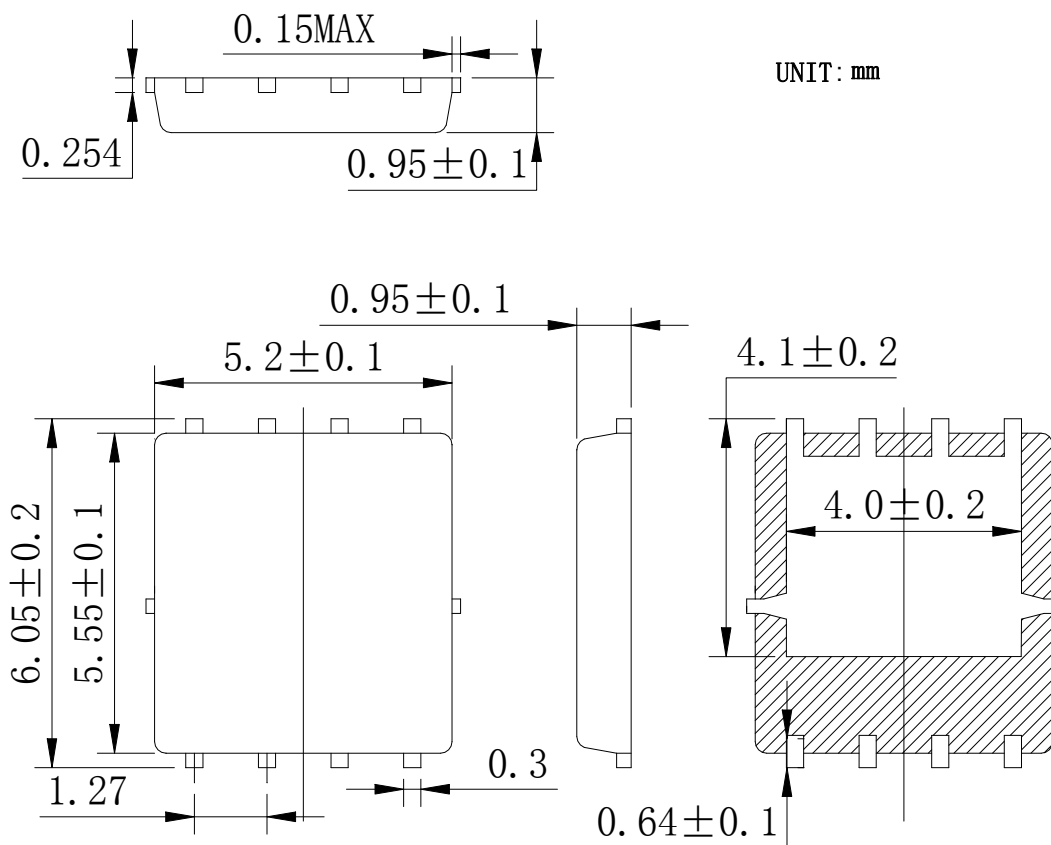


**Figure 3: Unclamped Inductive Switching Test Circuit & Waveform**



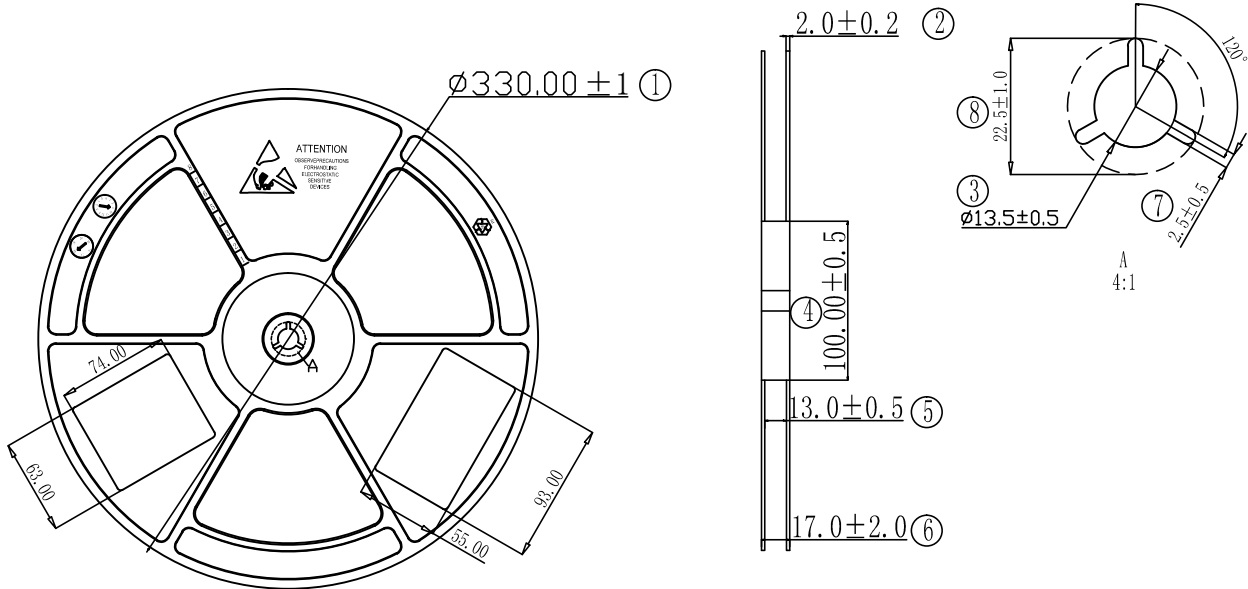
**Figure 4: Diode Recovery Test Circuit & Waveform**

# DFN5×6-8 Package Information:

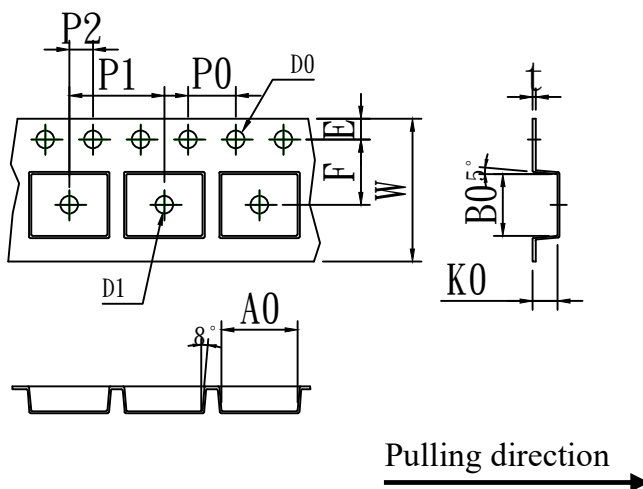


## Tape & Reel Information

Dimensions in mm



|        |                  |                 |                 |                 |                 |                 |                 |                  |
|--------|------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|
| Symbol | A0               | B0              | K0              | D0              | D1              | P0              | P1              | 10*P0            |
| Spec   | 6.15 $\pm$ 0.10  | 5.40 $\pm$ 0.10 | 1.30 $\pm$ 0.10 | 1.55 $\pm$ 0.10 | 1.55 $\pm$ 0.10 | 4.00 $\pm$ 0.10 | 8.00 $\pm$ 0.10 | 40.00 $\pm$ 0.10 |
| Symbol | W                | E               | F               | P2              | t               |                 |                 |                  |
| Spec   | 12.00 $\pm$ 0.10 | 1.75 $\pm$ 0.10 | 5.50 $\pm$ 0.10 | 2.00 $\pm$ 0.10 | 0.20 $\pm$ 0.05 |                 |                 |                  |



## Marking Information:

①. Doingter LOGO

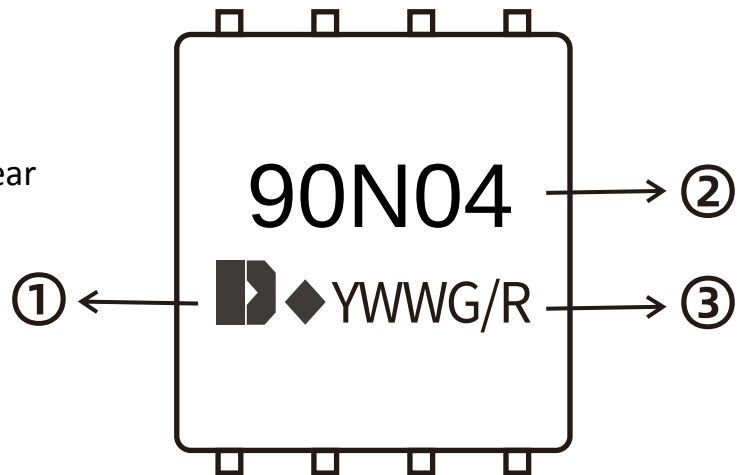
②. Part NO.

③. Date Code(YWWG / R)

Y : Year Code , last digit of the year

WW : Week Code(01-53)

G/R : G(Green) /R(Lead Free)



## Previous Version

| Version | Date       | Subjects (major changes since last revision) |
|---------|------------|----------------------------------------------|
| 1.0     | 2024-08-29 | Release of final version                     |

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