

# RBE058N04R0SZN6

N-Channel Power [MOSFET](#)

40V - 50A - 5.8mΩ

## Description

The RBE058N04R0SZN6 is an N-channel power MOSFET featuring low RDS(on) and low input capacitance for high-speed switching and low power loss. It uses a Renesas SO8-FL 5 x 6 mm<sup>2</sup> flat-lead, copper-clip package, supporting high current with excellent thermal performance, durability, and reliability, making it ideal for industrial applications such as power management, motor drives, and e-fuse.

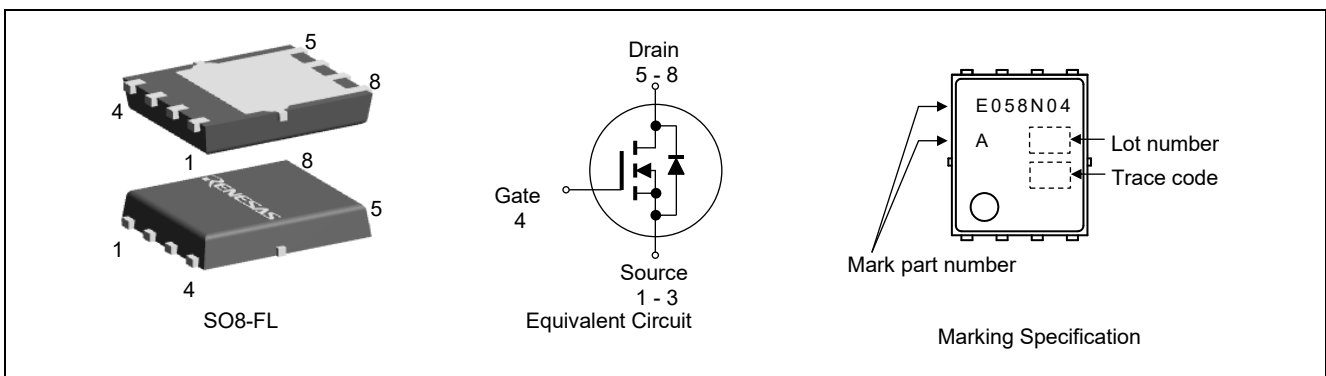
## Features

- Standard-level gate drive voltage:  $V_{GS(th)} = 2.0\sim 4.0V$
- Super low on-state resistance:  $R_{DS(on)} = 5.8m\Omega$  Max.
- Low input capacitance
- Low thermal resistance
- 100% Avalanche tested
- Pb-free lead plating: RoHS compliant
- MSL1 classified according to IPC/JEDEC J-STD-020

## Application

- Motor Control, Power Tool, Stepper Motor, BMS, Battery Powered Application, etc.

## Outline



## Absolute Maximum Ratings

( $T_j = 25\text{ }^\circ\text{C}$  unless otherwise notice.)

| Item                     | Symbol                                   | Ratings    | Unit             |
|--------------------------|--|------------|------------------|
| Drain to Source Voltage  | $V_{DSS}$                                | 40         | V                |
| Gate to Source Voltage   | $V_{GSS}$                                | $\pm 20$   | V                |
| Drain Current (DC)       | $I_{D(DC)}$ <small>Note 1,2,5</small>    | $\pm 50$   | A                |
| Drain Current (pulse)    | $I_{D(pulse)}$ <small>Note 1,3,5</small> | $\pm 150$  | A                |
| Power Dissipation        | $P_D$ <small>Note 1,5</small>            | 47         | W                |
| Junction Temperature     | $T_j$                                    | 175        | $^\circ\text{C}$ |
| Storage Temperature      | $T_{stg}$                                | -55 to 175 | $^\circ\text{C}$ |
| Single Avalanche Current | $I_{AS}$ <small>Note 4</small>           | 20         | A                |
| Single Avalanche Energy  | $E_{AS}$ <small>Note 4</small>           | 40         | mJ               |

## Thermal Resistance

| Item                                   | Symbol                            | Max. | Unit |
|--|-----------------------------------|------|------|
| Junction to Case Thermal Resistance    | $R_{th(j-c)}$ <sup>Note 5</sup>   | 3.2  | °C/W |
| Junction to Ambient Thermal Resistance | $R_{th(j-a)}$ <sup>Note 5,6</sup> | 50   | °C/W |

## Electrical Characteristics

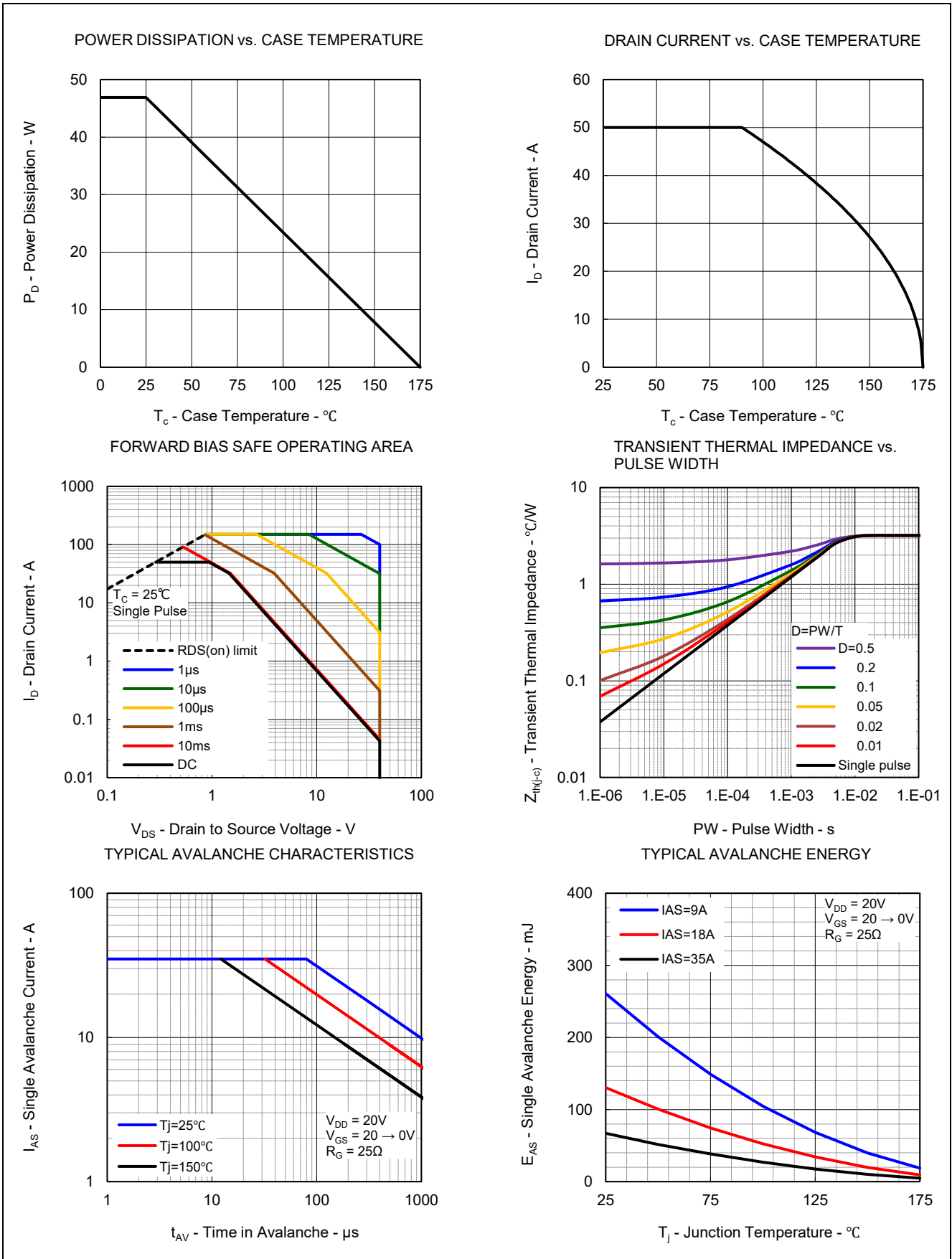
(T<sub>j</sub> = 25 °C unless otherwise notice.)

| Item                                | Symbol               | Min | Typ  | Max  | Unit | Test Conditions   |
|-------------------------------------|----------------------|-----|------|------|------|---|
| Zero Gate Voltage Drain Current     | I <sub>DSS</sub>     | —   | —    | 1    | μA   | V <sub>DS</sub> = 40 V, V <sub>GS</sub> = 0 V   |
| Gate Leakage Current                | I <sub>GSS</sub>     | —   | —    | ±100 | nA   | V <sub>GS</sub> = ± 20 V, V <sub>DS</sub> = 0 V   |
| Gate to Source Threshold Voltage    | V <sub>GS(th)</sub>  | 2.0 | —    | 4.0  | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA                                     |
| Drain to Source On-state Resistance | R <sub>DS(on)</sub>  | —   | 4.98 | 5.8  | mΩ   | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 25 A   |
| Input Capacitance                   | C <sub>iSS</sub>     | —   | 1200 | —    | pF   | V <sub>DS</sub> = 25 V<br>V <sub>GS</sub> = 0 V<br>f = 1 MHz                                    |
| Output Capacitance                  | C <sub>oss</sub>     | —   | 150  | —    | pF   |   |
| Reverse Transfer Capacitance        | C <sub>rSS</sub>     | —   | 95   | —    | pF   |   |
| Gate Resistance                     | R <sub>g</sub>       | —   | 1.8  | —    | Ω    |   |
| Turn-on Delay Time                  | t <sub>d(on)</sub>   | —   | 22   | —    | ns   | V <sub>DD</sub> = 20 V, I <sub>D</sub> = 25 A<br>V <sub>GS</sub> = 10 V<br>R <sub>G</sub> = 5 Ω |
| Rise Time                           | t <sub>r</sub>       | —   | 30   | —    | ns   |   |
| Turn-off Delay Time                 | t <sub>d(off)</sub>  | —   | 41   | —    | ns   |   |
| Fall Time                           | t <sub>f</sub>       | —   | 9    | —    | ns   |   |
| Total Gate Charge                   | Q <sub>g</sub>       | —   | 24   | —    | nC   | V <sub>DD</sub> = 20 V<br>V <sub>GS</sub> = 10 V<br>I <sub>D</sub> = 25 A                       |
| Gate to Source Charge               | Q <sub>gs</sub>      | —   | 7.2  | —    | nC   |   |
| Gate to Drain Charge                | Q <sub>gd</sub>      | —   | 6    | —    | nC   |   |
| Gate Plateau Voltage                | V <sub>plateau</sub> | —   | 4.5  | —    | V    |   |
| Output Charge                       | Q <sub>oss</sub>     | —   | 8    | —    | nC   | V <sub>DD</sub> = 20 V, V <sub>GS</sub> = 0 V   |
| Body Diode Forward Voltage          | V <sub>F(S-D)</sub>  | —   | 0.83 | 1.5  | V    | I <sub>F</sub> = 25 A, V <sub>GS</sub> = 0 V  |
| Reverse Recovery Time               | t <sub>rr</sub>      | —   | 32   | —    | ns   | I <sub>F</sub> = 25 A, V <sub>GS</sub> = 0 V  |
| Reverse Recovery Charge             | Q <sub>rr</sub>      | —   | 25   | —    | nC   | di/dt = 100 A/μs  |

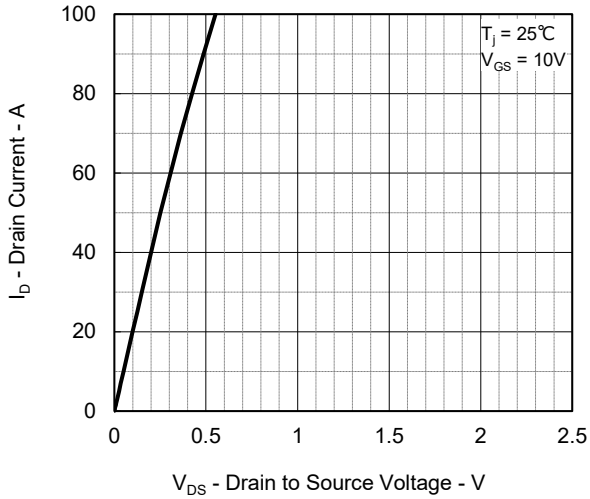
Note 1. T<sub>c</sub> = 25°C

2. Value is limited by overall system design including PCB.
3. PW ≤ 10 μs, Duty Cycle ≤ 1%
4. L = 100 μH, V<sub>DD</sub> = 20 V, V<sub>GS</sub> = 20 → 0 V, R<sub>G</sub> = 25 Ω
5. Defined by design. Not subject to production test.
6. Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4. (2 oz Cu pad.)

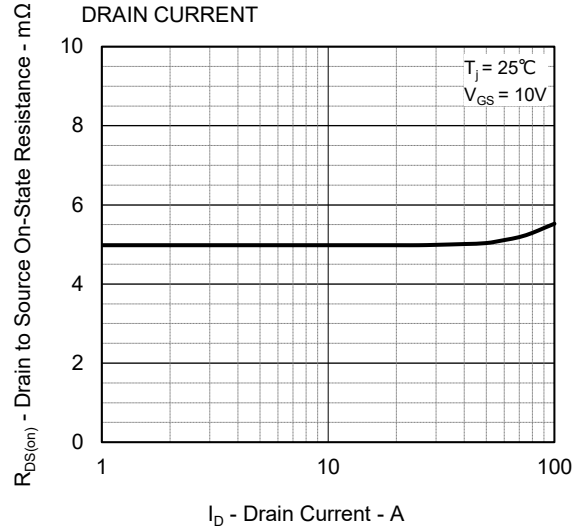
### Typical Characteristics



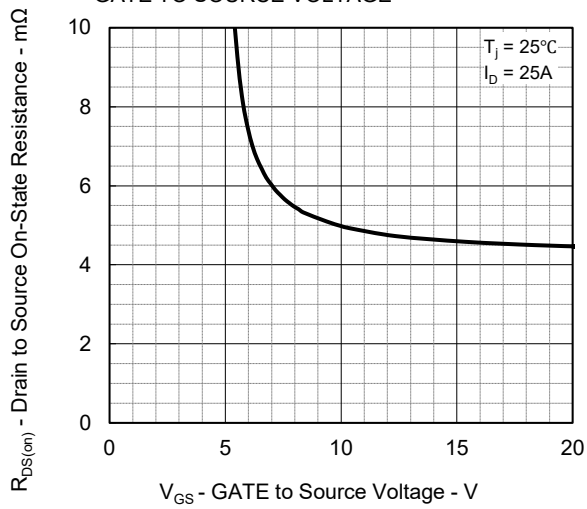
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



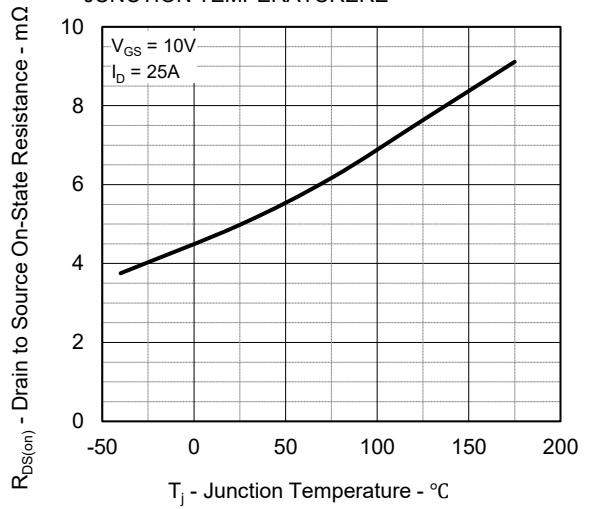
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



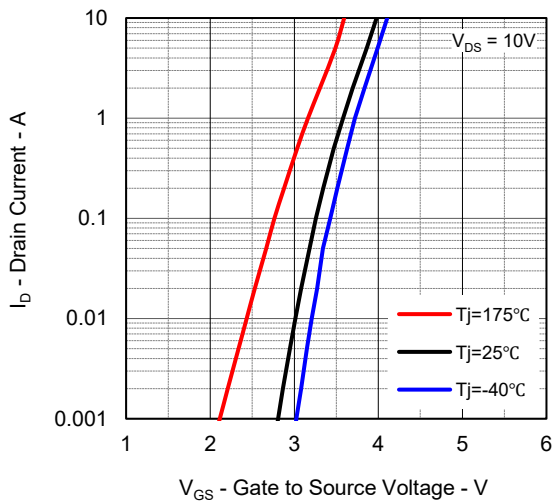
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



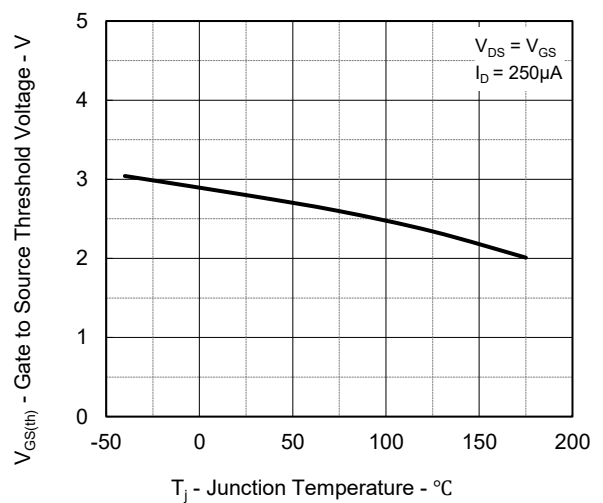
DRAIN TO SOURCE ON-STATE RESISTANCE vs. JUNCTION TEMPERATURE



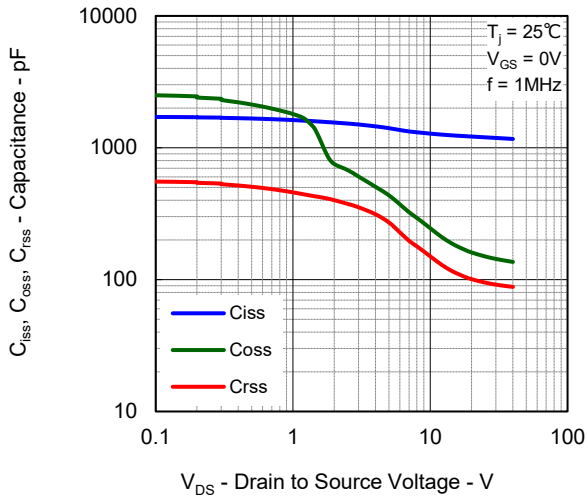
FORWARD TRANSFER CHARACTERISTICS



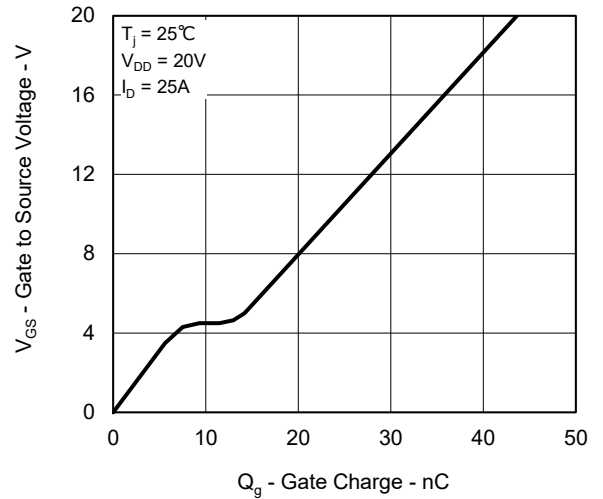
GATE TO SOURCE THRESHOLD VOLTAGE vs. JUNCTION TEMPERATURE



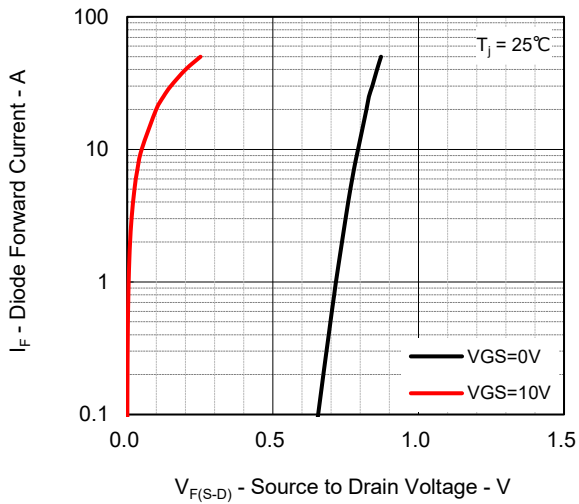
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



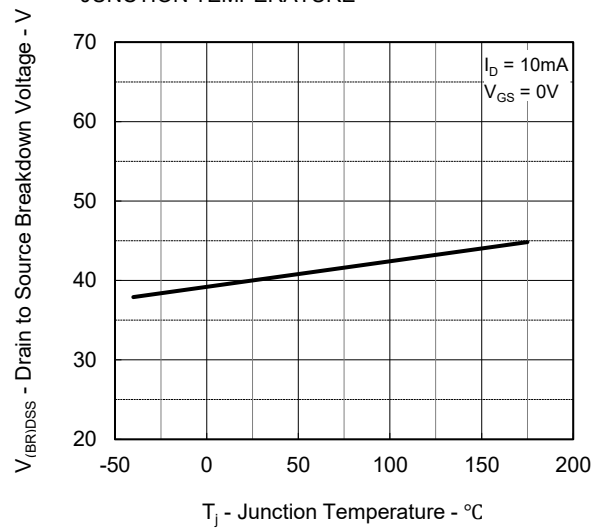
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE

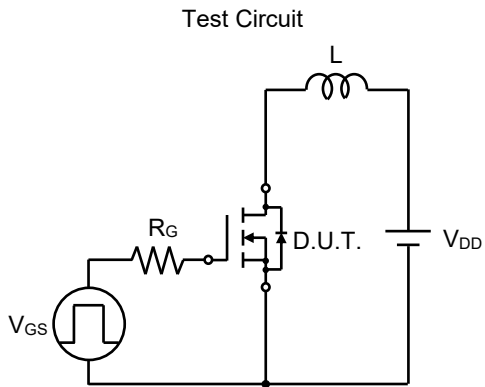


DRAIN TO SOURCE BREAKDOWN VOLTAGE vs. JUNCTION TEMPERATURE

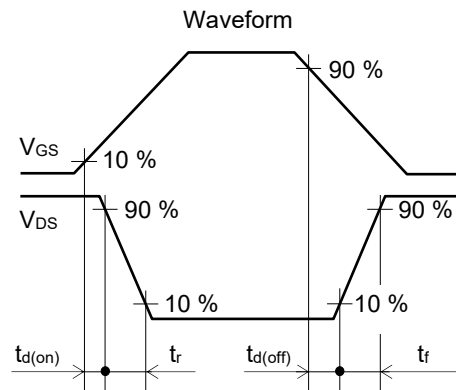
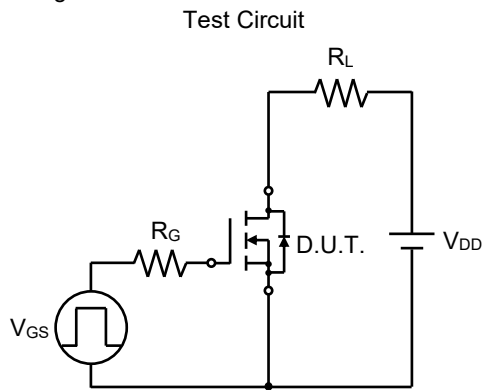


**Test Circuit**

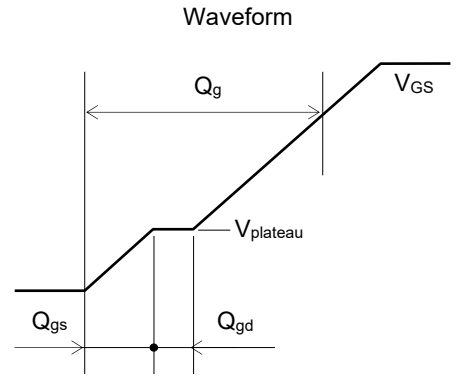
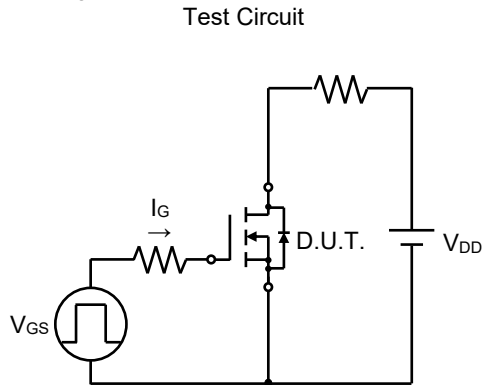
**Avalanche**



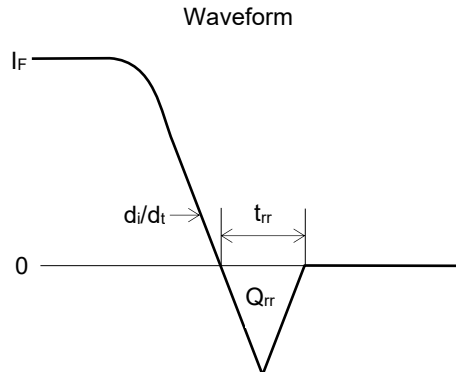
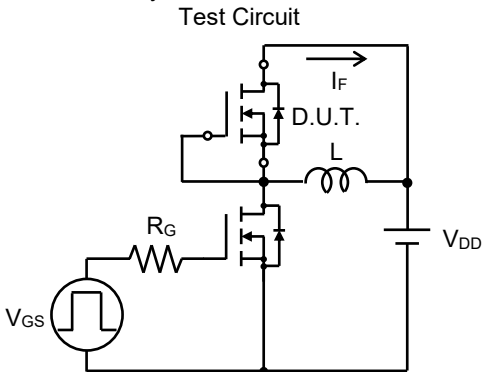
**Switching Time**



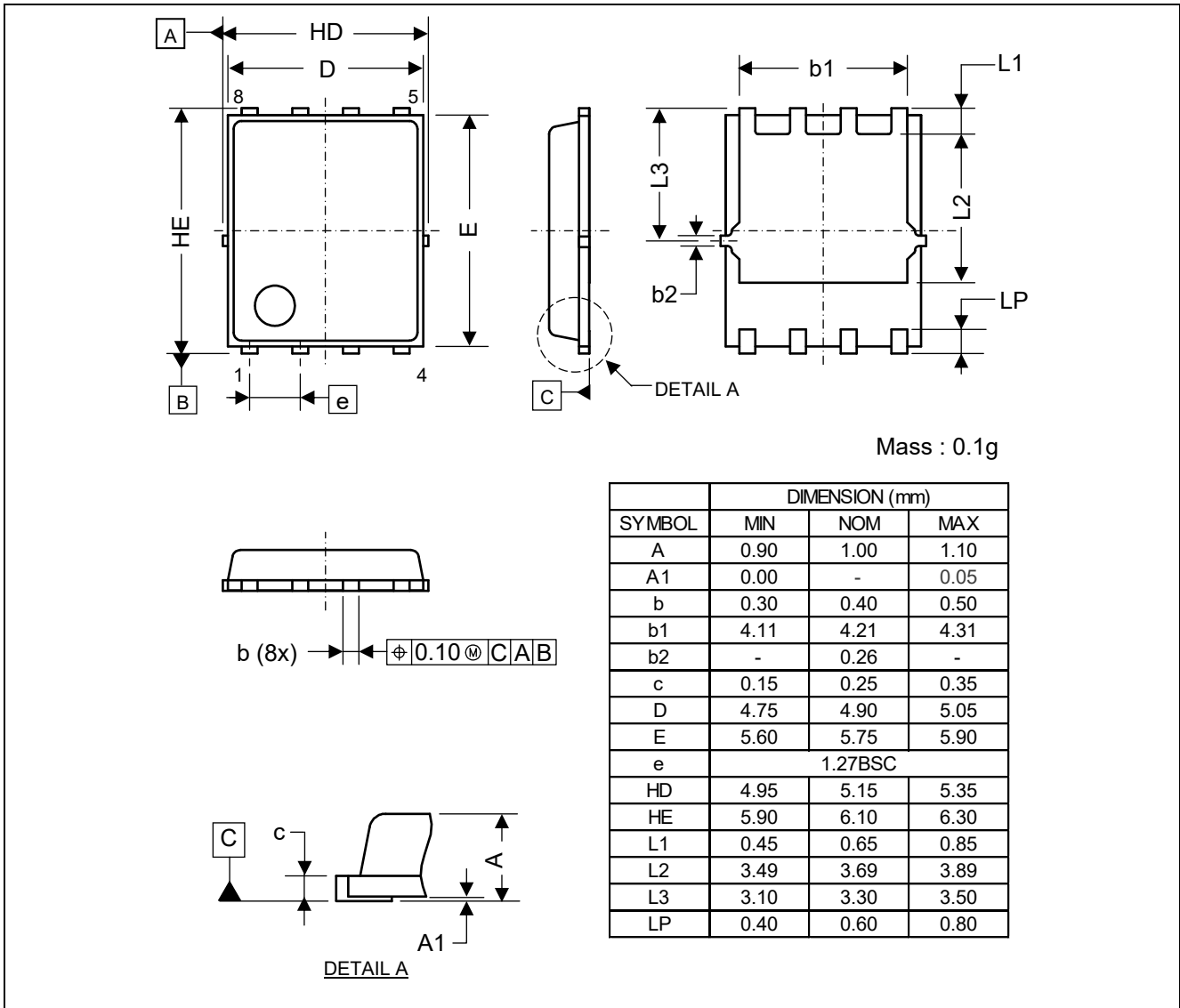
**Gate Charge**



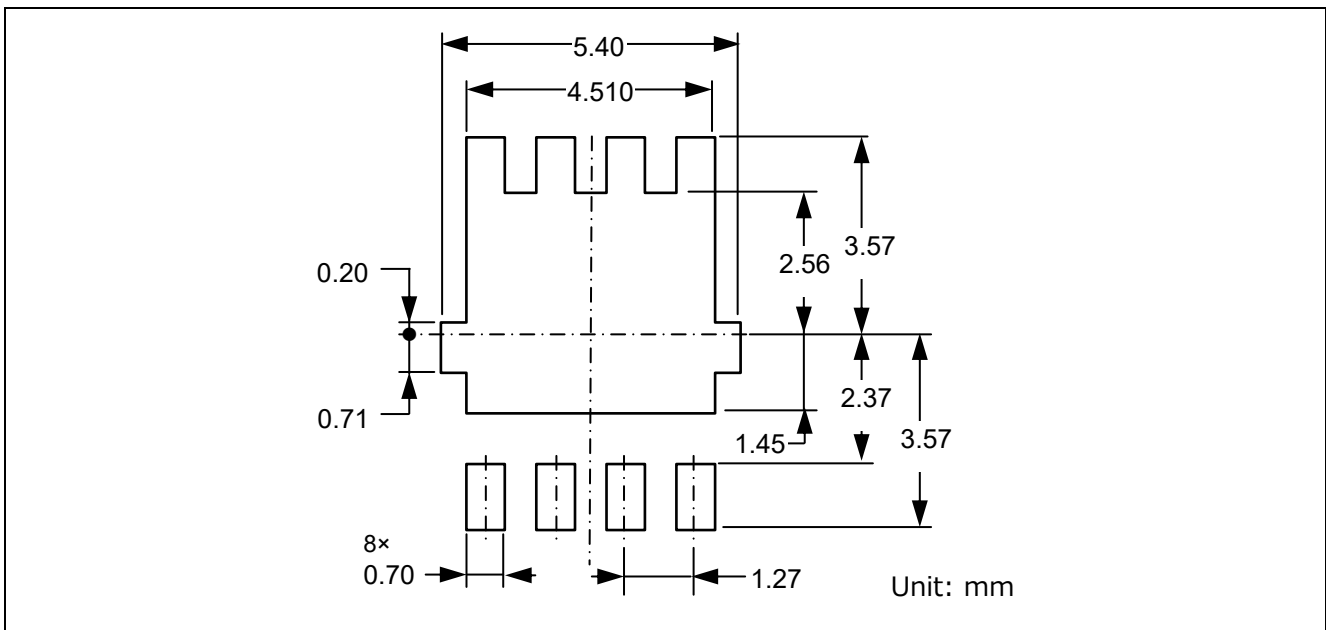
**Reverse Recovery**



### Package Dimensions



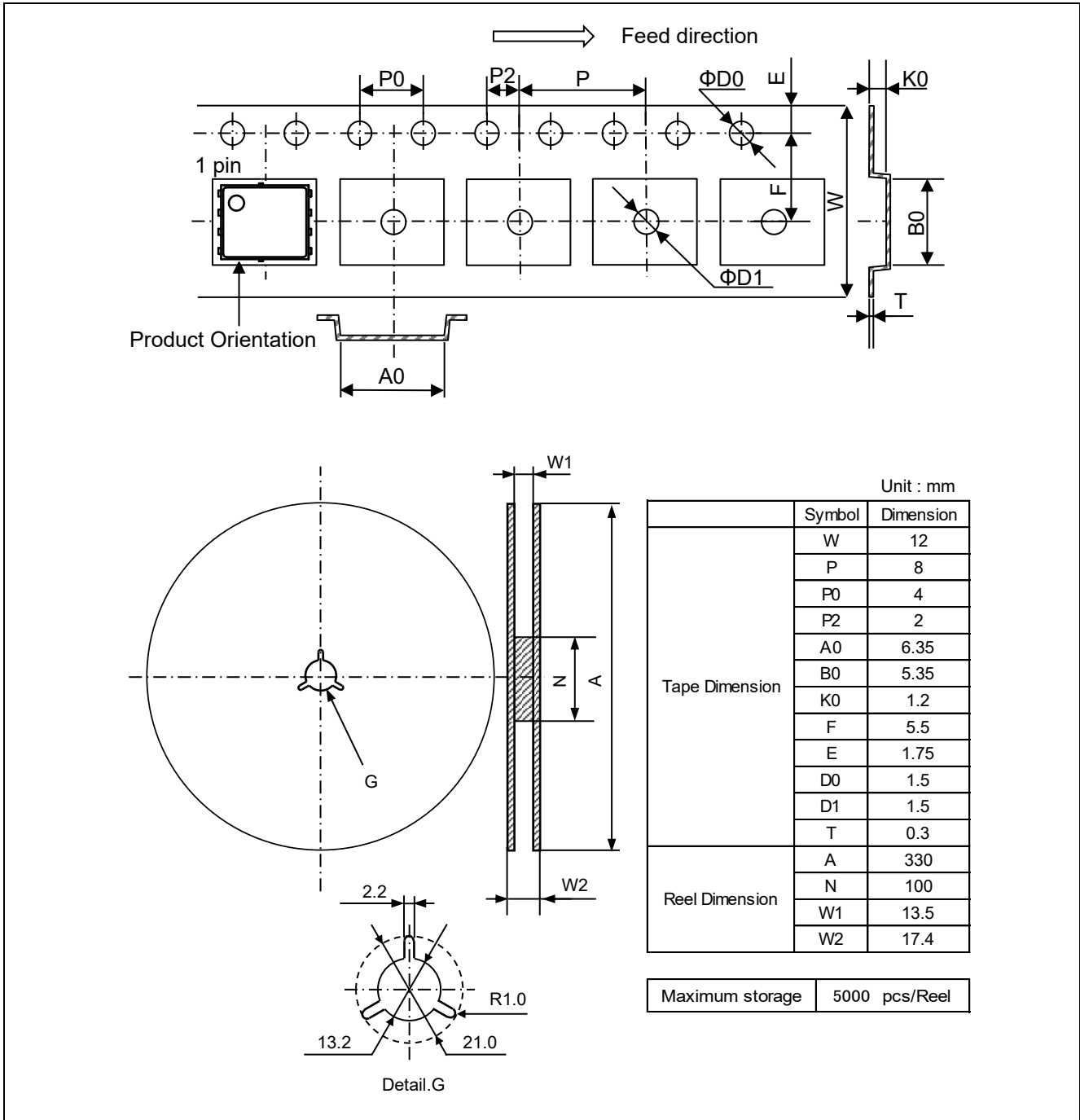
### Mount Pad



### Ordering Information

| Part No.            | Packing | Quantity     |
|---------------------|---------|--------------|
| RBE058N04R0SZN6#HB0 | Taping  | 5000pcs/reel |

### Packing Specification



Remark : Strong electric field, when exposed to this device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred. Continuous heavy condition (e.g. high temperature/voltage/current or high variation of temperature) may affect reliability even if it is within the absolute maximum ratings. Please consider derating condition for appropriate reliability in reference Renesas Semiconductor Reliability Handbook.

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