# RBA300N10EANS-3UA02

## REXFET-1 N-Channel Power MOSFET

## 100 V - 340 A - 1.5 mΩ - TOLL for Automotive

### Description

The RBA300N10EANS-3UA02 N-channel power MOSFET features REXFET-1 split-gate technology and is offered in a TOLL package. The TOLL package features top-side cooling for ultra-compact and optimal thermal performance. Renesas' REXFET-1 split gate technology is suitable for applications requiring low RDS(on) and switching capability for high-power and high-frequency applications.

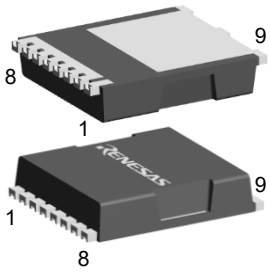
### Features

- Standard level gate drive voltage: $V_{GS(th)}$ = 2.0 to 4.0 V
- Super low on-state resistance: $R_{DS(on)}$ = 1.5 mΩ Max.
- Low input capacitance
- Low thermal resistance
- 100% Avalanche tested
- AEC-Q101 qualified, PPAP capable
- Pb-free lead plating: RoHS compliant
- MSL1 classified according to IPC/JEDEC J-STD-020

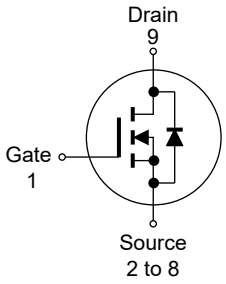
### Application

Small Traction (2-wheel, 3-wheel vehicle), 48 V load, Onboard charger, Charging station, Low voltage DC/DC

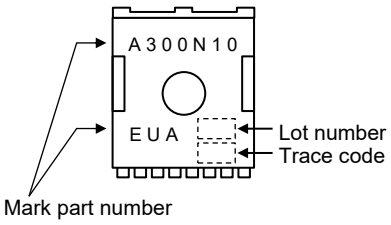
### Outline



TOLL



Equivalent Circuit



Marking Specification

### Absolute Maximum Ratings

(Tj = 25 °C unless otherwise notice.)

| Item | Symbol | Ratings | Unit |
|---|---|---|---|
| Drain to Source Voltage | $V_{DSS}$ | 100 | V |
| Gate to Source Voltage | $V_{GSS}$ | ±20 | V |
| Drain Current (DC) | $I_{D(DC)}$ Tc=25°C Note 2,6 | ±340 | A |
| | $I_{D(DC)}$ Tc=100°C Note 2,6 | ±272 | A |
| Drain Current (Chip limitation) | $I_{D(DC)}$ Tc=25°C Notes2,6 | ±380 | A |
| Drain Current (pulse) | $I_{D(pulse)}$ Notes1,3,6 | ±1360 | A |
| Power Dissipation | $P_D$ Note 1,6 | 468 | W |
| Operating Junction Temperature | $T_j$ | -55 to 175 | °C |
| Storage Temperature | $T_{stg}$ | -55 to 175 | °C |
| Single Avalanche Current | $I_{AS}$ Note 4 | 64 | A |
| Single Avalanche Energy | $E_{AS}$ Note 4 | 409 | mJ |

## Thermal Resistance

| Item | Symbol | Max. | Unit |
|---|---|---|---|
| Junction to Case Thermal Resistance | $R_{th(j-c)}$ Note 6 | 0.32 | °C/W |
| Junction to Ambient Thermal Resistance | $R_{th(j-a)}$ Note 5,6 | 40 | °C/W |

## Electrical Characteristics

($T_j$ = 25 °C unless otherwise notice.)

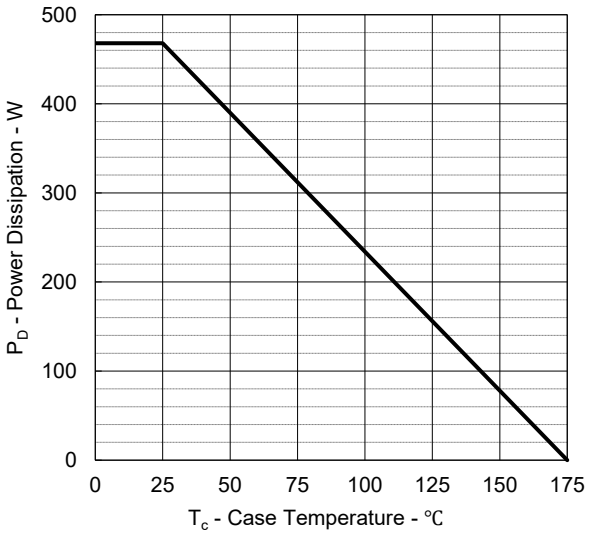
| Item | Symbol | Min | Typ | Max | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| Zero Gate Voltage Drain Current | $I_{DSS}$ | — | — | 10 | $\mu$A | $V_{DS}$ = 100 V, $V_{GS}$ = 0 V |
| Gate Leakage Current | $I_{GSS}$ | — | — | ±100 | nA | $V_{GS}$ = ± 20 V, $V_{DS}$ = 0 V |
| Gate to Source Threshold Voltage | $V_{GS(th)}$ | 2.0 | — | 4.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 $\mu$A |
| Drain to Source On-state Resistance | $R_{DS(on)}$ | — | 1.3 | 1.5 | mΩ | $V_{GS}$ = 10 V, $I_D$ = 100 A |
| Input Capacitance | $C_{iss}$ | — | 13000 | — | pF | $V_{DS}$ = 50 V |
| Output Capacitance | $C_{oss}$ | — | 3300 | — | pF | $V_{GS}$ = 0 V |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 80 | — | pF | f = 100 kHz |
| Gate resistance | $R_g$ | — | 1.8 | — | Ω | — |
| Turn-on Delay Time | $t_{d(on)}$ | — | 75 | — | ns | $V_{DD}$ = 50 V |
| Rise Time | $t_r$ | — | 60 | — | ns | $I_D$ = 100 A |
| Turn-off Delay Time | $t_{d(off)}$ | — | 130 | — | ns | $V_{GS}$ = 10 V |
| Fall Time | $t_f$ | — | 55 | — | ns | $R_G$ = 5 Ω |
| Total Gate Charge | $Q_g$ | — | 170 | — | nC | $V_{DD}$ = 50 V |
| Gate to Source Charge | $Q_{gs}$ | — | 75 | — | nC | $V_{GS}$ = 10 V |
| Gate to Drain Charge | $Q_{gd}$ | — | 30 | — | nC | $I_D$ = 100 A |
| Gate plateau voltage | $V_{plateau}$ | — | 5.4 | — | V | |
| Output Charge | $Q_{oss}$ | — | 280 | — | nC | $V_{DD}$ = 50 V, $V_{GS}$ = 0 V |
| Body Diode Forward Voltage | $V_{F(S-D)}$ | — | 0.85 | 1.5 | V | $I_F$ = 100 A, $V_{GS}$ = 0 V |
| Reverse Recovery Time | $t_{rr}$ | — | 110 | — | ns | $I_F$ = 100 A, $V_{GS}$ = 0 V |
| Reverse Recovery Charge | $Q_{rr}$ | — | 300 | — | nC | di/dt = 100 A/$\mu$s |

Note 1. $T_c$ = 25 °C

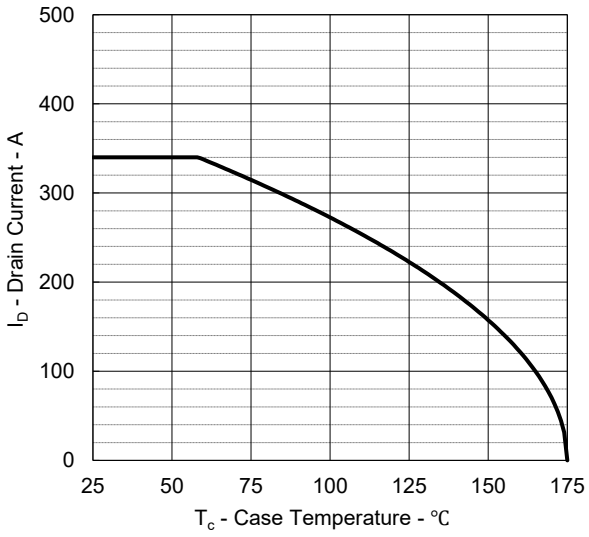
2. Value is limited by overall system design including PCB.
3. PW ≤ 10 $\mu$s
4. L = 100 μH, $V_{DD}$ = 50 V, $R_G$ = 25 Ω
5. Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4. (2 oz Cu pad.)
6. Defined by design. Not subject to production test.

## Typical Characteristics

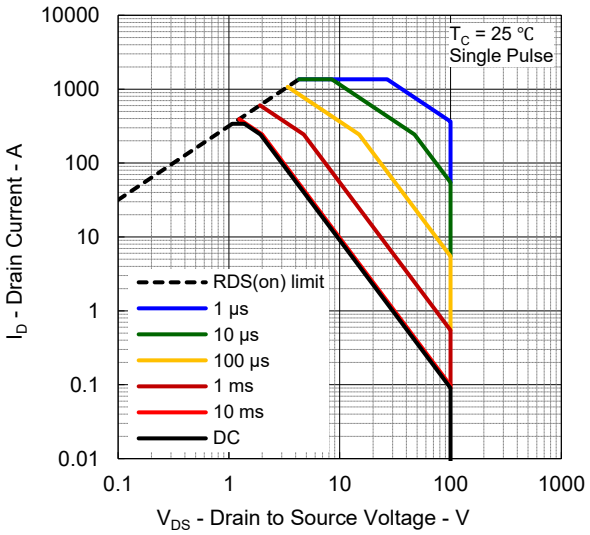
POWER DISSIPATION vs. CASE TEMPERATURE



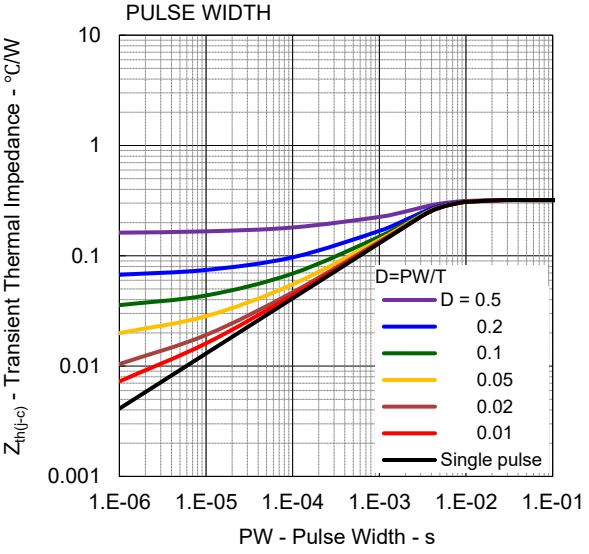

DRAIN CURRENT vs. CASE TEMPERATURE



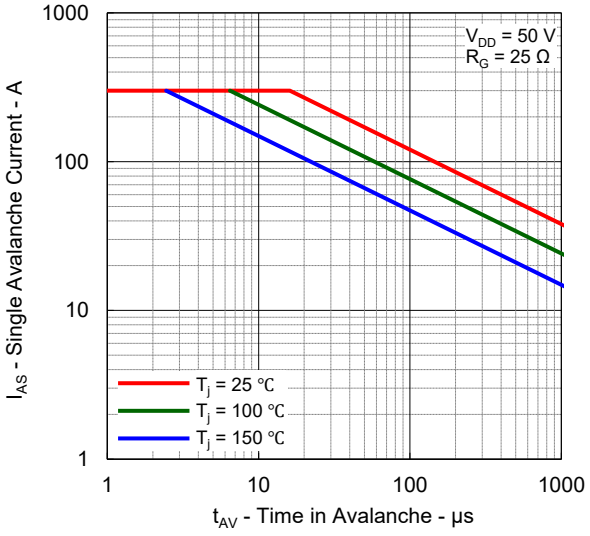

FORWARD BIAS SAFE OPERATING AREA



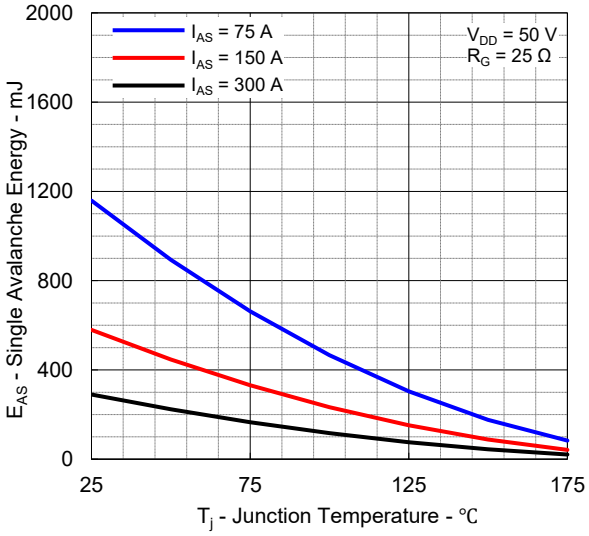

TRANSIENT THERMAL IMPEDANCE vs. PULSE WIDTH



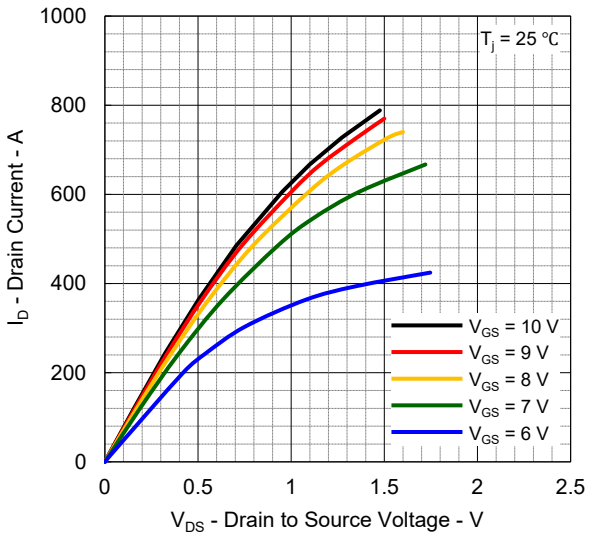

TYPICAL AVALANCHE CHARACTERISTICS



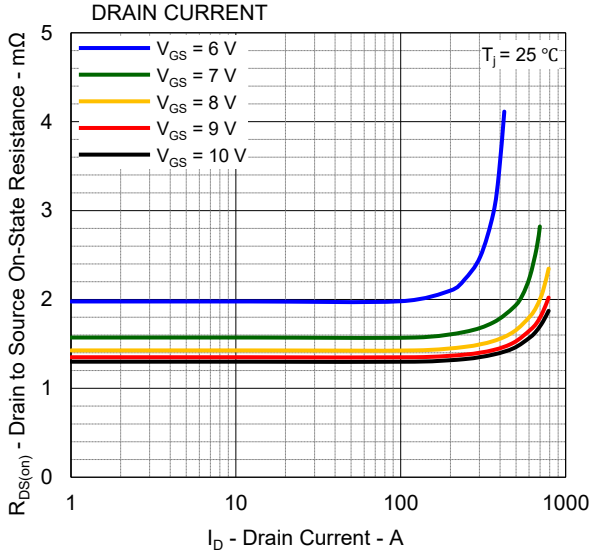

TYPICAL AVALANCHE ENERGY



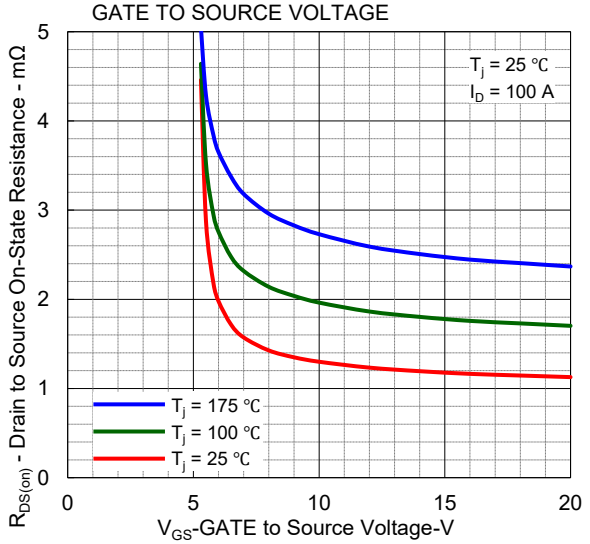
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



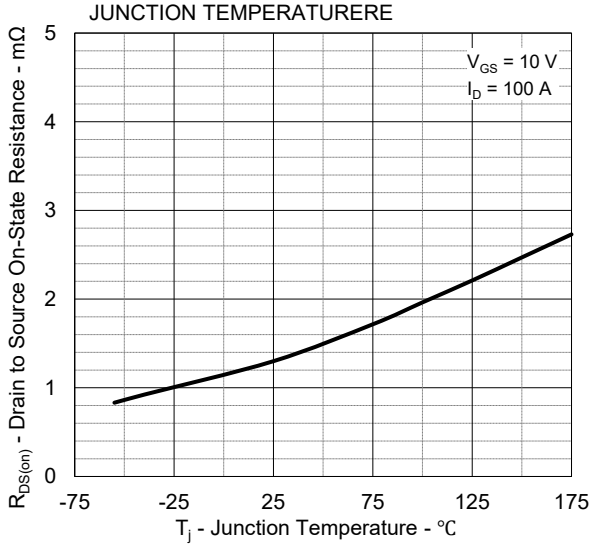

DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



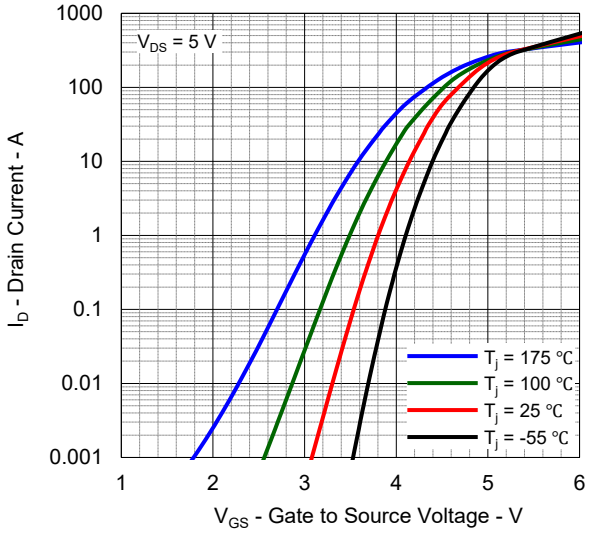

DRAIN TO SOURCE ON-STATERESISTANCE vs. GATE TO SOURCE VOLTAGE



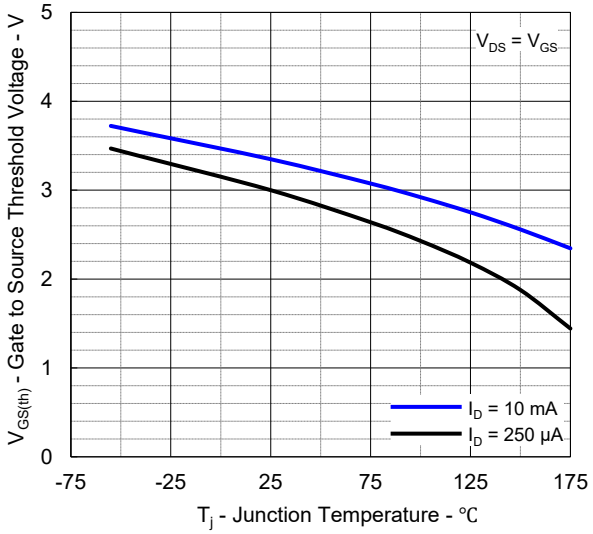

DRAIN TO SOURCE ON-STATE RESISTANCE vs JUNCTION TEMPERATURERE



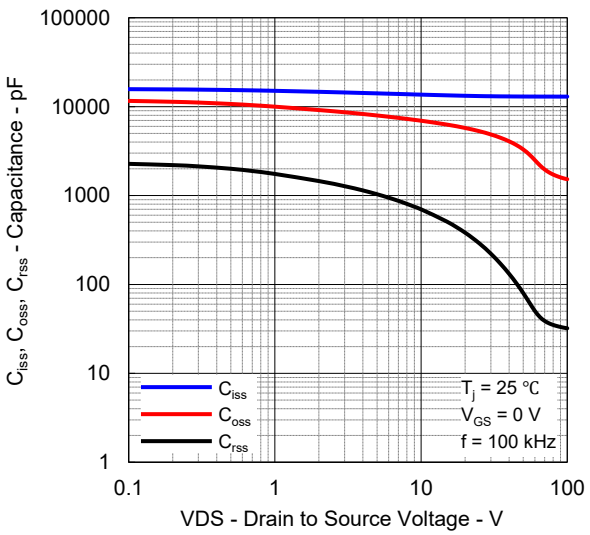

FORWARD TRANSFER CHARACTERISTICS



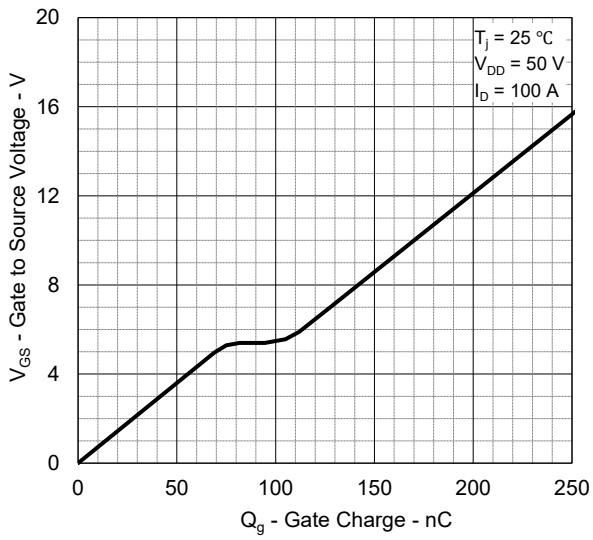

GATE TO SOURCE THRESHOLD VOLTAGE vs. JUNCTION TEMPERATURE



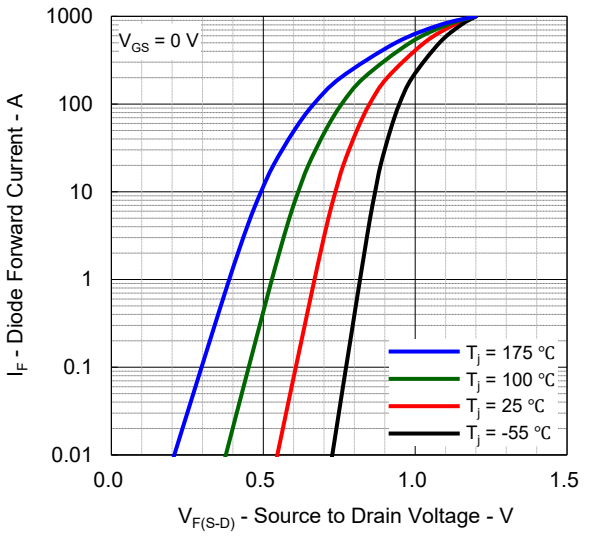
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



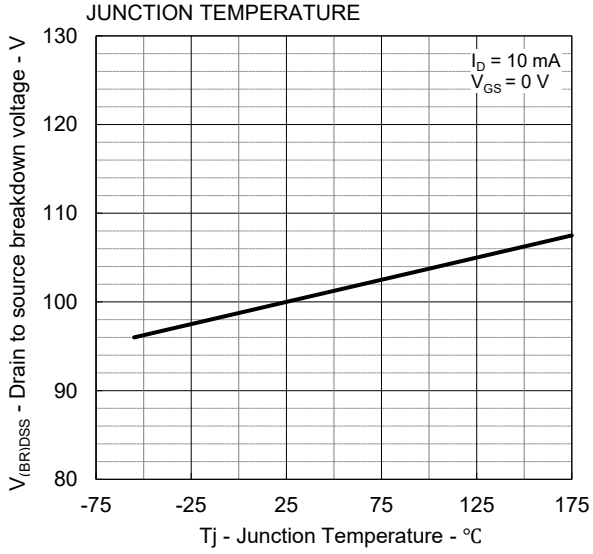

DYNAMIC INPUT/OUTPUT CHARACTERISTICS




SOURCE TO DRAIN DIODE FORWARD VOLTAGE



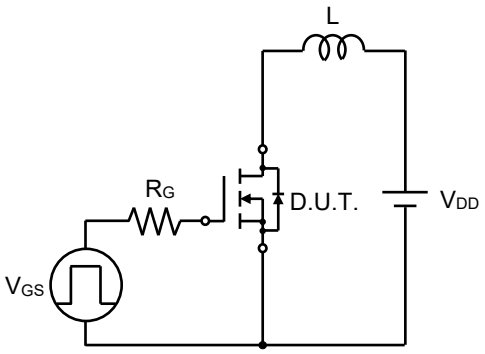

DRAIN TO SOURCE BREAKDOWN VOLTAGE vs. JUNCTION TEMPERATURE



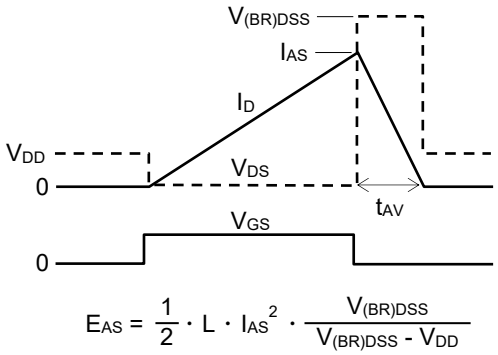
## Test Circuit

Avalanche

Test Circuit



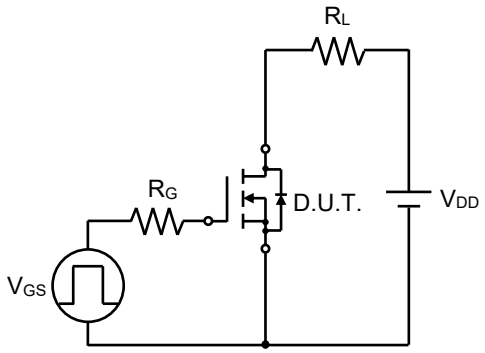

Waveform



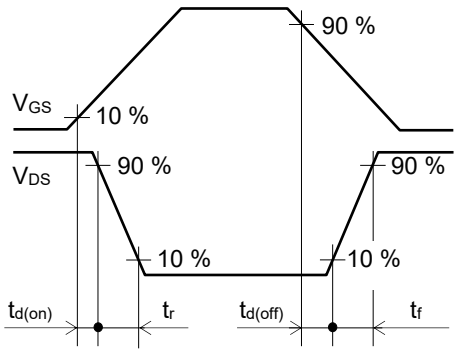

$$E_{AS} = \frac{1}{2} \cdot L \cdot I_{AS}^{2} \cdot \frac{V_{(BR)DSS}}{V_{(BR)DSS} - V_{DD}}$$

Switching Time

Test Circuit

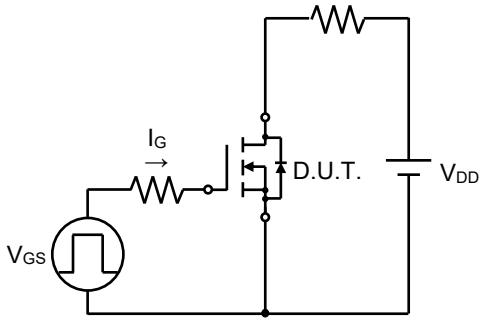



Waveform

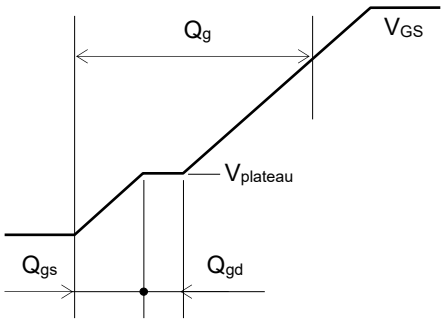



Gate Charge

Test Circuit

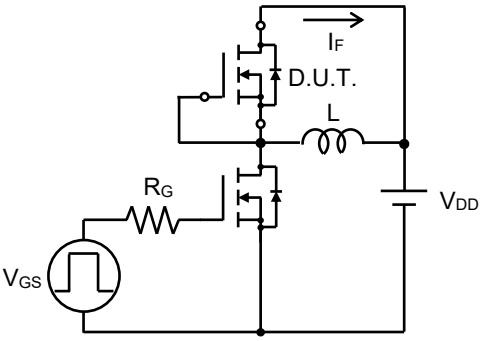



Waveform

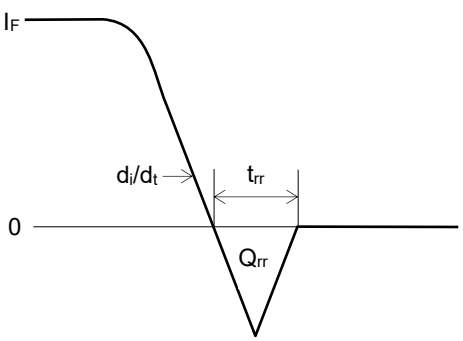



Reverse Recovery

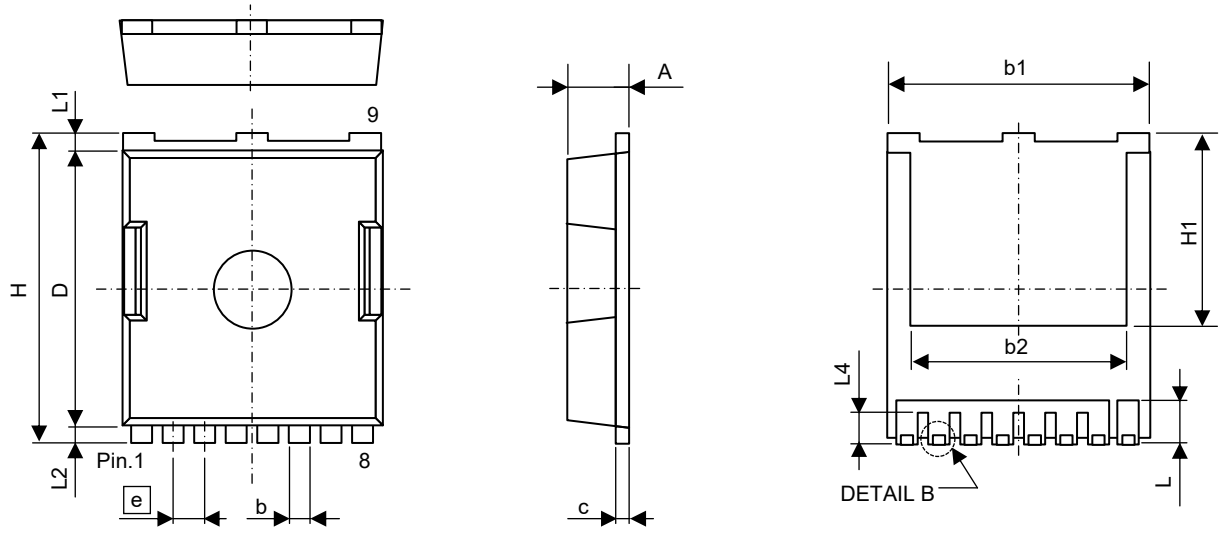
Test Circuit



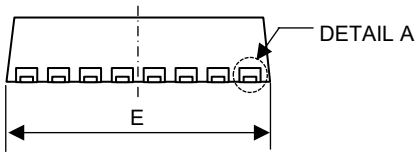

Waveform



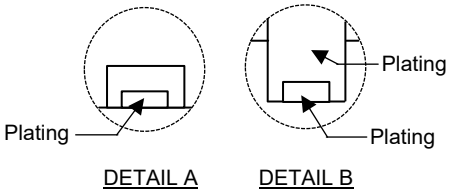
## Package Dimensions




Mass : 0.76 g

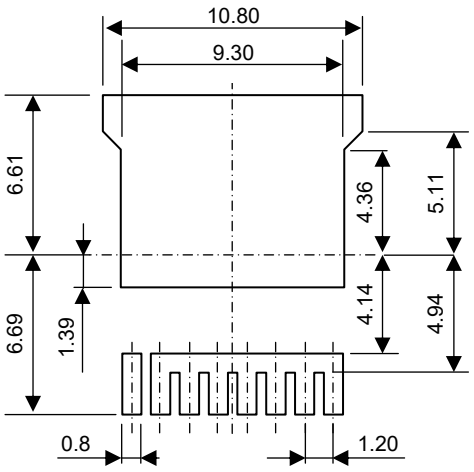



| | DIMENSION (mm) | | |
|---|---|---|---|
| SYMBOL | MIN | NOM | MAX |
| A | 2.20 | 2.30 | 2.40 |
| b | 0.65 | 0.80 | 0.95 |
| b1 | 9.65 | 9.80 | 9.95 |
| b2 | 8.00 | 8.20 | 8.40 |
| c | 0.40 | 0.50 | 0.60 |
| D | 10.18 | 10.38 | 10.58 |
| E | 9.70 | 9.90 | 10.10 |
| e | | 1.20BSC | |
| H | 11.48 | 11.68 | 11.88 |
| H1 | 6.65 | 6.95 | 7.25 |
| L | 1.40 | 1.60 | 1.80 |
| L1 | 0.60 | 0.70 | 0.80 |
| L2 | 0.45 | 0.60 | 0.75 |
| L4 | 1.00 | 1.15 | 1.30 |




Wettable flank structure

## Mount pad

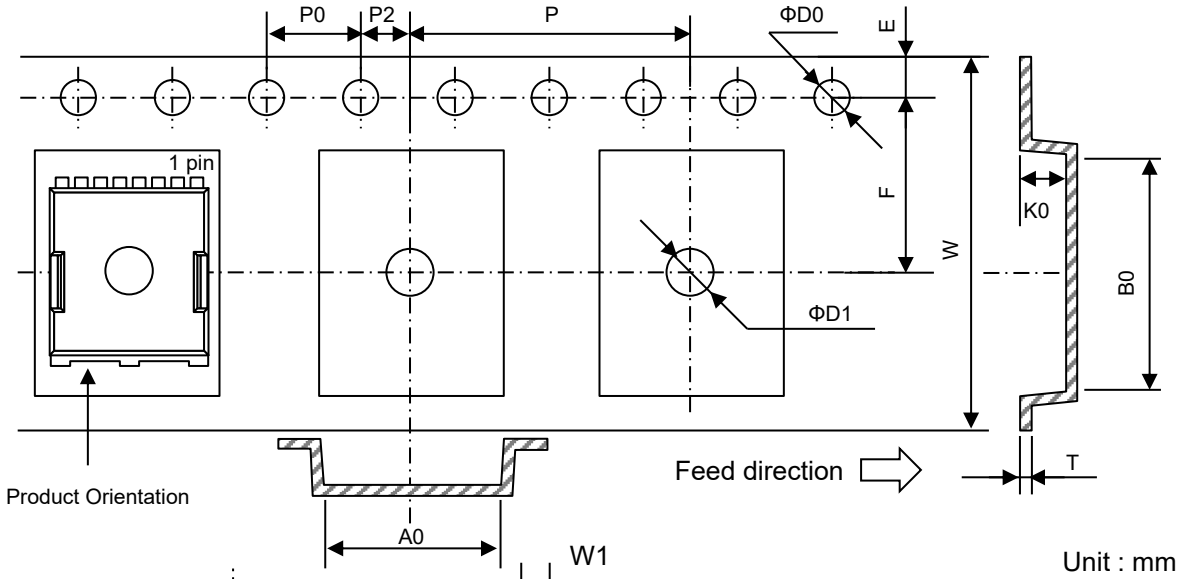


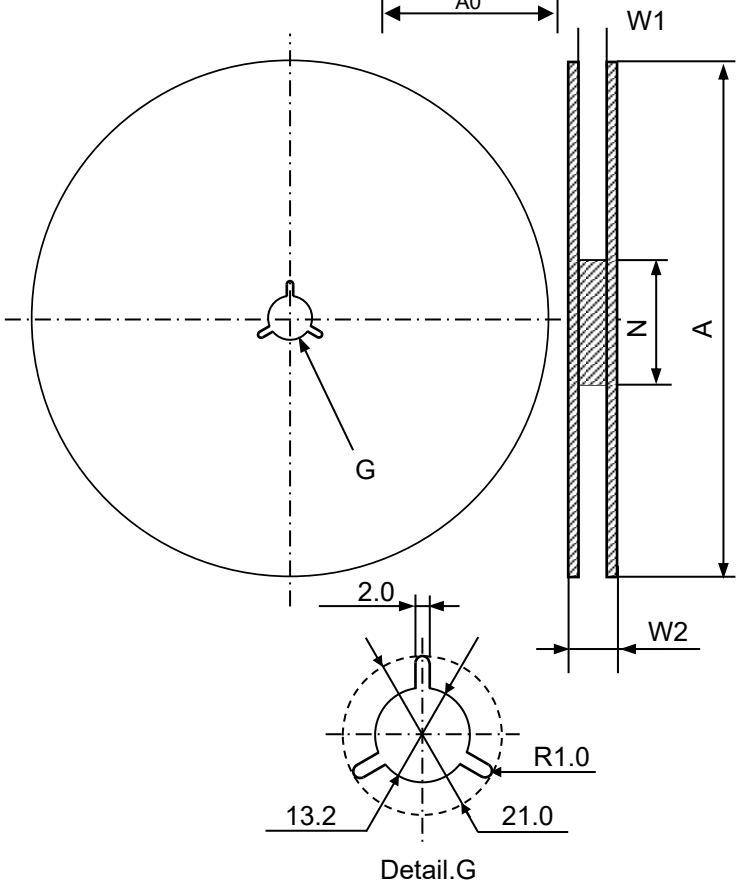

Unit : mm

## Ordering Information

| Part No. | Packing | Quantity |
|---|---|---|
| RBA300N10EANS-3UA02#GB0 | Taping | 2000pcs/reel |

## Packing Specification




Unit : mm

| | Symbol | Dimension |
|---|---|---|
| Tape Dimension | W | 24 |
| | P | 12 |
| | P0 | 4 |
| | P2 | 2 |
| | A0 | 10.3 |
| | B0 | 12.1 |
| | K0 | 2.7 |
| | F | 11.5 |
| | E | 1.75 |
| | D0 | 1.5 |
| | D1 | 1.5 |
| | T | 0.3 |
| Reel Dimension | A | 330 |
| | N | 100 |
| | W1 | 25.4 |
| | W2 | 29.4 |

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.

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