# THE DATASHEET OF

# RBA250N10CHPF-4UA02#GB0

Data Sheet

# RBA250N10CHPF-4UA02

100V – 250A – N-channel Power MOS FET

Application : Automotive

R07DS1488EJ0100
Rev.1.00
Jul. 08, 2020

## Description

The RBA250N10CHPF-4UA02 is N-channel MOS Field Effect Transistor designed for high current switching applications.

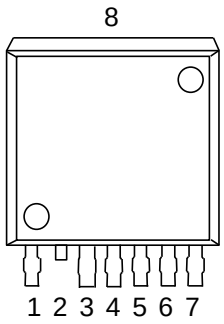
## Features

- Super low on-state resistance
  $R_{DS(on)}$ = 2.4 mΩ MAX. ( $V_{GS}$ = 10 V, $I_D$ = 125A )
- Low input capacitance
  Ciss = 9500pF TYP. ( $V_{DS}$ = 50 V )
- Designed for automotive application and AEC-Q101 qualified
- Pb-free (This product does not contain Pb in the external electrode)

## Ordering Information

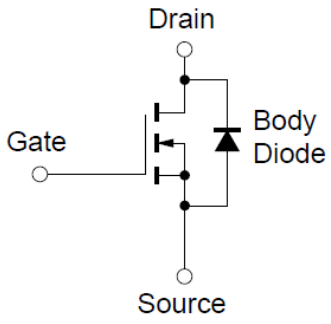
| Part No. | Quantity | Shipping container |
|---|---|---|
| RBA250N10CHPF-4UA02#GB0 | 800pcs/reel | Taping |

## Outline




1. Gate
2. Drain
3, 4, 5, 6, 7. Source
8. Drain (Fin)

TO-263-7pin-SHL* (MP-25ZU)
* Short Head & Lead




Equivalent circuit

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.

## Absolute Maximum Ratings

($T_A$=25°C)

| Item | Symbol | Ratings | Unit |
|---|---|---|---|
| Drain to Source Voltage ($V_{GS}$ = 0 V) | $V_{DSS}$ | 100 | V |
| Gate to Source Voltage ($V_{DS}$ = 0 V) | $V_{GSS}$ | ±20 | V |
| Drain Current (DC) ($T_C$ = 25 °C) | $I_{D(DC)}$ | ±250 | A |
| Drain Current (pulse) Note1 | $I_{D(pulse)}$ | ±500 | A |
| Total Power Dissipation ($T_C$ = 25 °C) | $P_{T1}$ | 348 | W |
| Total Power Dissipation ($T_A$ = 25 °C) | $P_{T2}$ | 1.8 | W |
| Channel Temperature | $T_{ch}$ | 175 | °C |
| Storage Temperature | $T_{stg}$ | -55 to 175 | °C |
| Avalanche Current Note2 | $I_{AS}$ | 64 | A |
| Avalanche Energy Note3 | $E_{AS}$ | 409 | mJ |

Note 1. $P_W \leq 10\ \mu s$, Duty Cycle ≤ 1%

2. $V_{GS}$ = 20 → 0V , $R_G$ = 25 Ω

3. L = 100μH , $V_{DD}$ = 20V , $V_{GS}$ = 20 → 0V, $R_G$ = 25 Ω

## Thermal Resistance

| | | | |
|---|---|---|---|
| Channel to Case Thermal Resistance | $R_{th(ch-C)}$ | 0.43 | °C/W |
| Channel to Ambient Thermal Resistance | $R_{th(ch-A)}$ | 83.3 | °C/W |

## Electrical Characteristics

($T_A$=25°C)

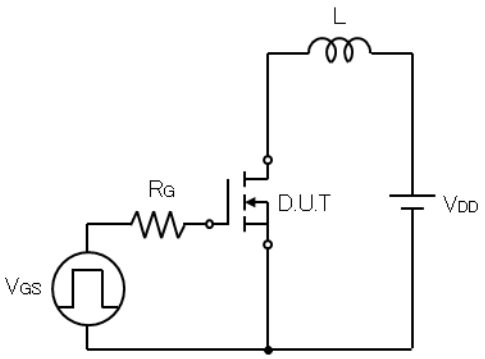
| Item | Symbol | Min | Typ | Max | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| Zero Gate Voltage Drain Current | $I_{DSS}$ | | | 10 | μA | $V_{DS}$ = 100 V, $V_{GS}$ = 0 V |
| Gate Leakage Current | $I_{GSS}$ | | | ±100 | nA | $V_{GS}$ = ± 20 V, $V_{DS}$ = 0 V |
| Gate to Source Threshold Voltage | $V_{GS(th)}$ | 1.8 | 2.8 | 3.8 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 μA |
| Drain to Source On-state Resistance | $R_{DS(on)}$ Note4 | | 1.9 | 2.4 | mΩ | $V_{GS}$ = 10 V, $I_D$ = 125 A |
| Input Capacitance | $C_{iss}$ | | 9500 | | pF | $V_{DS}$ = 50 V |
| Output Capacitance | $C_{oss}$ | | 460 | | pF | $V_{GS}$ = 0 V |
| Reverse Transfer Capacitance | $C_{rss}$ | | 190 | | pF | f = 1 MHz |
| Turn-on Delay Time | $t_{d(on)}$ | | 30 | | ns | $V_{DD}$ = 50 V, $I_D$ = 125 A |
| Rise Time | $t_r$ | | 30 | | ns | $V_{GS}$ = 10 V |
| Turn-off Delay Time | $t_{d(off)}$ | | 130 | | ns | $R_G$ = 0 Ω |
| Fall Time | $t_f$ | | 15 | | ns | |
| Total Gate Charge | $Q_G$ | | 190 | | nC | $V_{DD}$ = 80 V |
| Gate to Source Charge | $Q_{GS}$ | | 55 | | nC | $V_{GS}$ = 10 V |
| Gate to Drain Charge | $Q_{GD}$ | | 50 | | nC | $I_D$ = 250A |
| Body Diode Forward Voltage | $V_{F(S-D)}$ Note4 | | 0.9 | 1.5 | V | $I_F$ = 250 A, $V_{GS}$ = 0 V |
| Reverse Recovery Time | $t_{rr}$ | | 50 | | ns | $I_F$ = 250 A, $V_{GS}$ = 0 V |
| Reverse Recovery Charge | $Q_{rr}$ | | 85 | | nC | di/dt = 100 A/μs |

Note 4. Pulse test

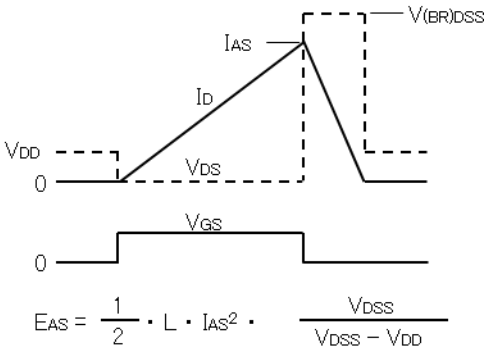
## Test Circuit

Avalanche

Test Circuit

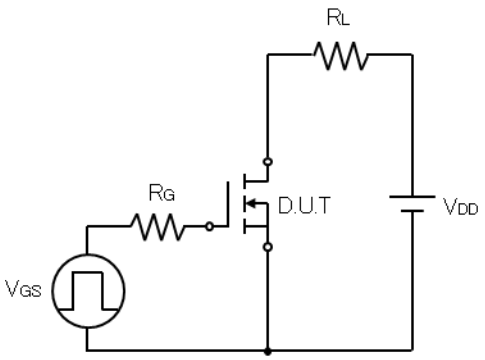



Waveform

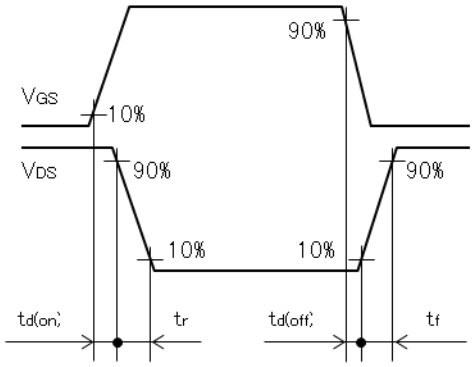



Switching Time

Test Circuit

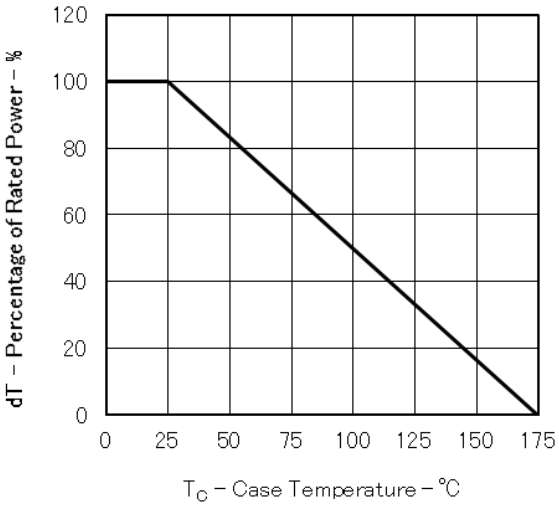



Waveform

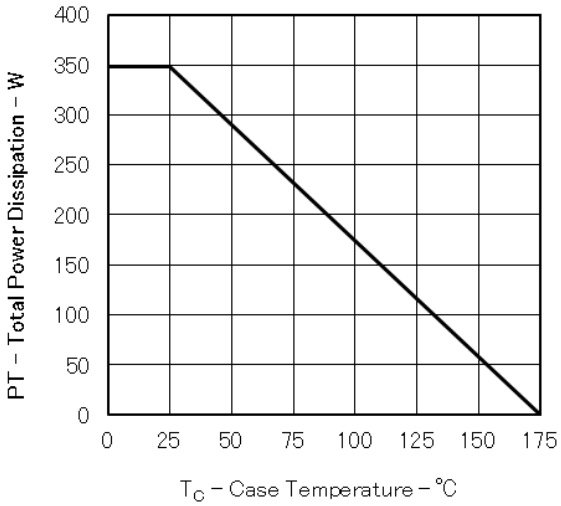


## Typical Characteristics

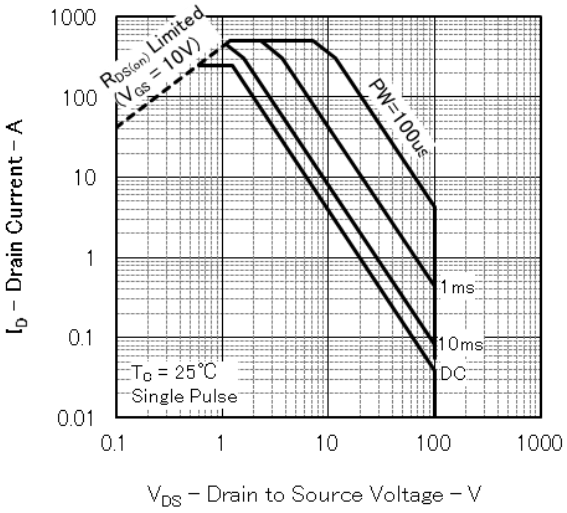
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



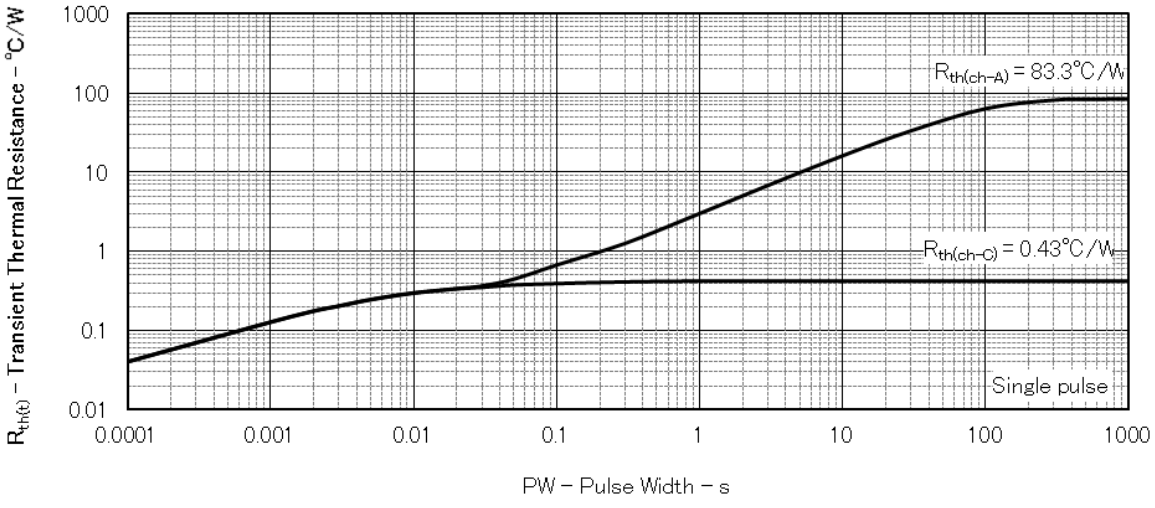

TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



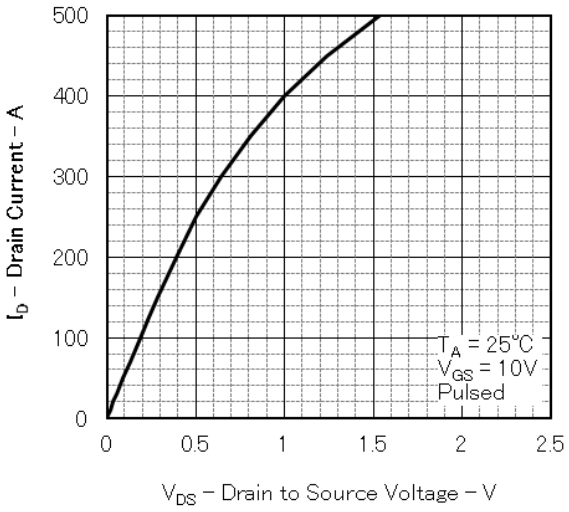

FORWARD BIAS SAFE OPERATING AREA



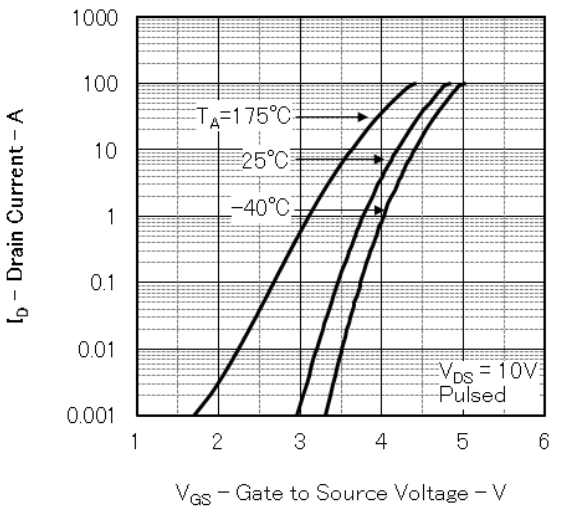

TRANSIENT THREMAL RESISTANCE vs. PULSE WIDTH



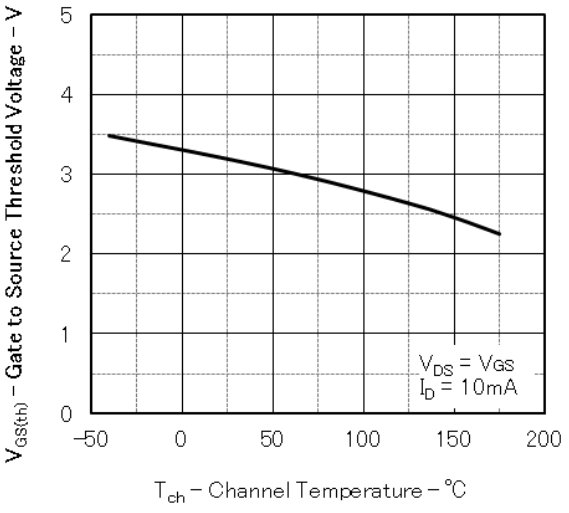
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



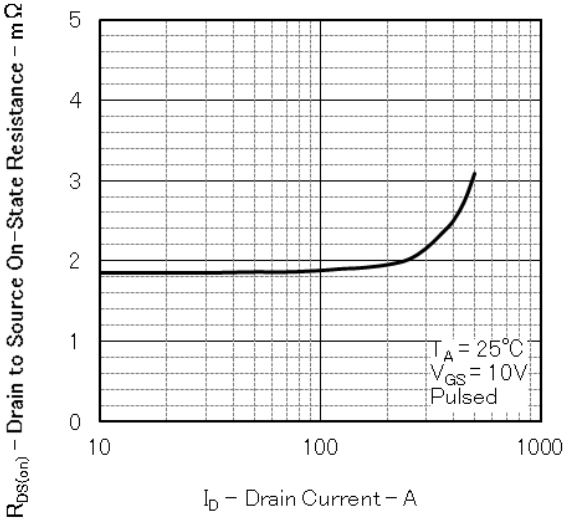

FORWARD TRANSFER CHARACTERISTICS



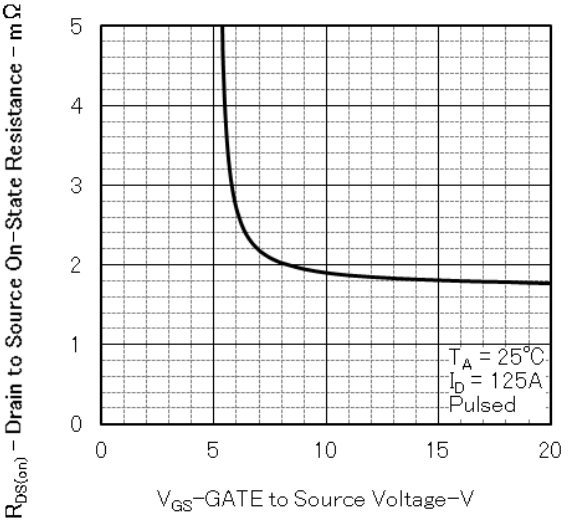

GATE TO SOURCE THRESHOLD VOLTAGE vs.
CHANNEL TEMPERATURE



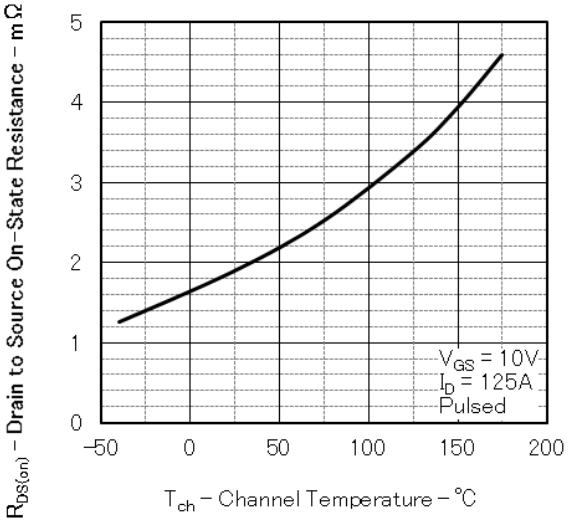

DRAIN TO SOURCE ON-STATE
RESISTANCE vs. DRAIN CURRENT



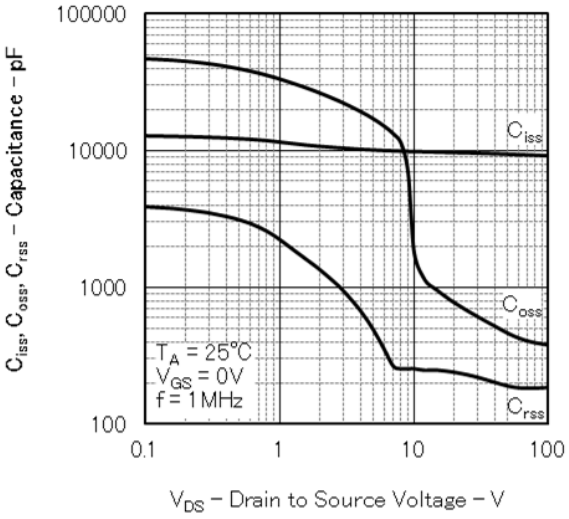

DRAIN TO SOURCE ON-STATERESISTANCE vs.
GATE TO SOURCE VOLTAGE



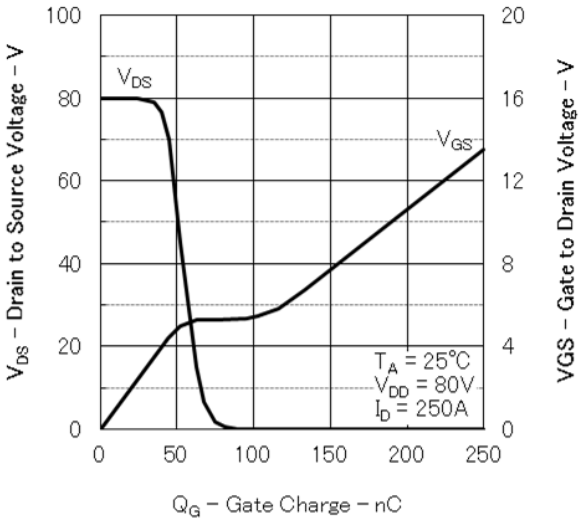

DRAIN TO SOURCE ON-STATE RESISTANCE vs.
CHANNEL TEMPERATURE



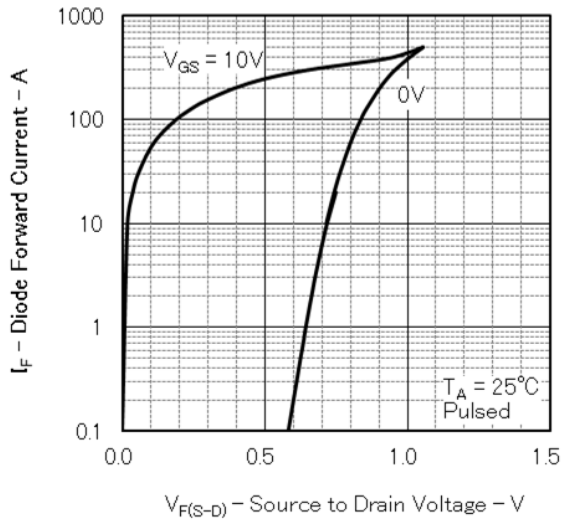
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE




DYNAMIC INPUT/OUTPUT CHARACTERISTICS



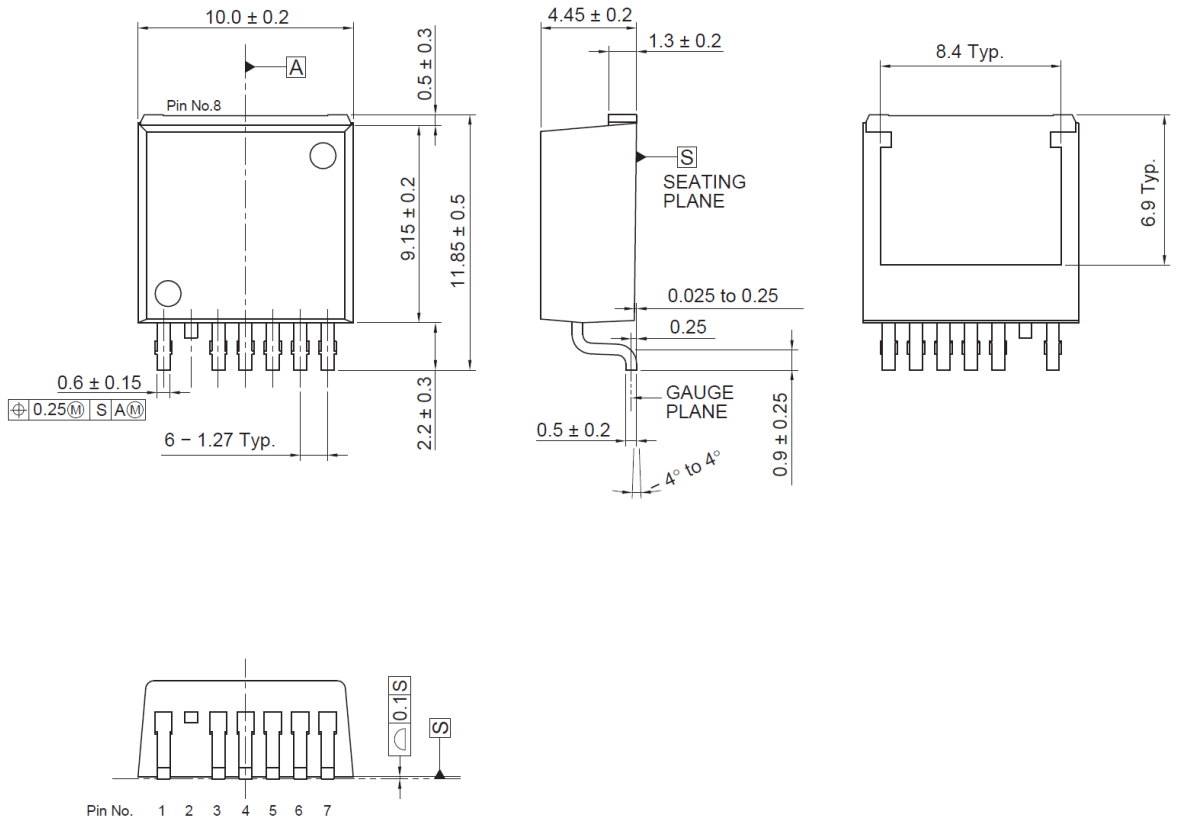

SOURCE TO DRAIN DIODE FORWARD VOLTAGE



## Package Dimensions

| JEITA Package Code | RENESAS Code | Previous Code | MASS (Typ) [g] | Package Name |
|---|---|---|---|---|
| — | PRSS0008DC-A | — | 1.39 | MP-25ZU |

Unit: mm



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