### Features
- Low on-state resistance: \( \text{RDS} \text{(on)} = 3.7 \, \text{mΩ} \, \text{MAX.} \) \((\text{VGS} = 10 \, \text{V}, \text{ID} = 50 \, \text{A})\)
- Low \( \text{Ciss} \) : \( \text{Ciss} = 5550 \, \text{pF} \, \text{TYP.} \) \((\text{VDS} = 25 \, \text{V}, \text{VGS} = 0 \, \text{V})\)
- High current: \( \text{ID(DC)} = \pm 100 \, \text{A} \)
- RoHS Compliant
- Quality Grade: Standard
- Applications: For high current switching

### Ordering Information

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Package</th>
<th>Packing</th>
</tr>
</thead>
<tbody>
<tr>
<td>N0434N-S23-AY</td>
<td>TO-262, Pb-free Note1</td>
<td>50 pcs / Magazine (Tube)</td>
</tr>
</tbody>
</table>

Note: 1. Pb-free means that this product does not contain lead in the external electrode.

### Absolute Maximum Ratings (\( \text{TA} = 25^\circ \text{C} \))

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Ratings</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain to Source Voltage (( \text{VGS} = 0 , \text{V} ))</td>
<td>( \text{VDS} )</td>
<td>40</td>
<td>V</td>
</tr>
<tr>
<td>Gate to Source Voltage (( \text{VDS} = 0 , \text{V} ))</td>
<td>( \text{VGS} )</td>
<td>( \pm 20 )</td>
<td>V</td>
</tr>
<tr>
<td>Drain Current (DC) (( \text{Tc} = 25^\circ \text{C} ))</td>
<td>( \text{ID(DC)} )</td>
<td>( \pm 100 )</td>
<td>A</td>
</tr>
<tr>
<td>Drain Current (pulse) Note2</td>
<td>( \text{ID(pulse)} )</td>
<td>( \pm 400 )</td>
<td>A</td>
</tr>
<tr>
<td>Total Power Dissipation (( \text{Tc} = 25^\circ \text{C} ))</td>
<td>( \text{PT1} )</td>
<td>119</td>
<td>W</td>
</tr>
<tr>
<td>Total Power Dissipation (( \text{TA} = 25^\circ \text{C} ))</td>
<td>( \text{PT2} )</td>
<td>1.5</td>
<td>W</td>
</tr>
<tr>
<td>Channel Temperature</td>
<td>( \text{Tch} )</td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>( \text{Tstg} )</td>
<td>−55 to +150</td>
<td>°C</td>
</tr>
<tr>
<td>Single Avalanche Current Note3</td>
<td>( \text{I}_{\text{AS}} )</td>
<td>55</td>
<td>A</td>
</tr>
<tr>
<td>Single Avalanche Energy Note3</td>
<td>( \text{E}_{\text{AS}} )</td>
<td>300</td>
<td>mJ</td>
</tr>
</tbody>
</table>

Note: Continuous heavy condition (e.g. high temperature/voltage/current or high variation of temperature) may affect a reliability even if it is within the absolute maximum ratings. Please consider derating condition for appropriate reliability in reference Renesas Semiconductor Reliability Handbook (Recommendation for Handling and Usage of Semiconductor Devices) and individual reliability data.

Notes: 2. \( \text{PW} \leq 10 \, \mu \text{s}, \text{Duty Cycle} \leq 1% \)
3. Starting \( \text{Tch} = 25^\circ \text{C}, \text{RG} = 25 \, \Omega, \text{VDD} = 25 \, \text{V}, \text{VGS} = 20 \rightarrow 0 \, \text{V}, \text{L} = 100 \, \mu \text{H} \)

### Thermal Resistance

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Max. Value Note4</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel to Case Thermal Resistance</td>
<td>( \text{R}_{\text{th(ch-C)}} )</td>
<td>1.05</td>
<td>°C/W</td>
</tr>
<tr>
<td>Channel to Ambient Thermal Resistance</td>
<td>( \text{R}_{\text{th(ch-A)}} )</td>
<td>83.3</td>
<td>°C/W</td>
</tr>
</tbody>
</table>

Notes: 4. This data is the designed target maximum value on Renesas’s measurement condition. (Not tested)
### Electrical Characteristics (\(T_A = 25^\circ C\))

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>Unit</th>
<th>Test Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero Gate Voltage Drain Current</td>
<td>(I_{DSS})</td>
<td>1</td>
<td>(\mu A)</td>
<td>&lt;100</td>
<td>(nA)</td>
<td>(V_{DS} = 40, V, V_{GS} = 0, V)</td>
</tr>
<tr>
<td>Gate Leakage Current</td>
<td>(I_{GSS})</td>
<td>±100</td>
<td>(nA)</td>
<td>400</td>
<td>(\mu A)</td>
<td>(V_{GS} = \pm 20, V, V_{DS} = 0, V)</td>
</tr>
<tr>
<td>Gate to Source Cut-off Voltage</td>
<td>(V_{GS(off)})</td>
<td>2.0</td>
<td>4.0</td>
<td>(V)</td>
<td>(V)</td>
<td>(V_{DS} = 10, V, I_{D} = 1, mA)</td>
</tr>
<tr>
<td>Forward Transfer Admittance (\text{Note}) (5)</td>
<td>(</td>
<td>\gamma_s</td>
<td>)</td>
<td>26</td>
<td>3.7</td>
<td>(m\Omega)</td>
</tr>
<tr>
<td>Drain to Source On-state Resistance (\text{Note}) (5)</td>
<td>(R_{DS(on)})</td>
<td>2.7</td>
<td>3.7</td>
<td>(m\Omega)</td>
<td></td>
<td>(V_{GS} = 10, V, I_{D} = 50, A)</td>
</tr>
</tbody>
</table>

- **Input Capacitance**: \(C_{iss}\) 5550 \(pF\)
- **Output Capacitance**: \(C_{oss}\) 580 \(pF\)
- **Reverse Transfer Capacitance**: \(C_{rss}\) 320 \(pF\)
- **Turn-on Delay Time**: \(t_{d(on)}\) 29.0 \(ns\)
- **Rise Time**: \(t_r\) 15.0 \(ns\)
- **Turn-off Delay Time**: \(t_{d(off)}\) 64.0 \(ns\)
- **Fall Time**: \(t_f\) 13.0 \(ns\)
- **Total Gate Charge**: \(Q_G\) 100 \(nC\)
- **Gate to Source Charge**: \(Q_{GS}\) 26 \(nC\)
- **Gate to Drain Charge**: \(Q_{GD}\) 32 \(nC\)
- **Body Diode Forward Voltage \(\text{Note}\) \(5\)**: \(V_{F(S-D)}\) 1.5 \(V\)
- **Reverse Recovery Time**: \(t_{rr}\) 40 \(ns\)
- **Reverse Recovery Charge**: \(Q_{rr}\) 44 \(nC\)

**Notes**: 5. Pulsed test

---

**TEST CIRCUIT 1 AVALANCHE CAPABILITY**

**TEST CIRCUIT 2 SWITCHING TIME**

**TEST CIRCUIT 3 GATE CHARGE**
Typical Characteristics

**DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA**

<table>
<thead>
<tr>
<th>Percentage of Rated Power - %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

**TOTAL POWER DISSIPATION vs. CASE TEMPERATURE**

<table>
<thead>
<tr>
<th>Case Temperature - °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

**FORWARD BIAS SAFE OPERATING AREA**

<table>
<thead>
<tr>
<th>Drain Current - A</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
</tr>
</tbody>
</table>

**TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH**

<table>
<thead>
<tr>
<th>Transient Thermal Resistance - °C/W</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.01</td>
</tr>
</tbody>
</table>

Notes:
6. Designed target value on Renesas measurement condition. (\(T_C = 25\)°C, unless otherwise specified)
7. This data is the designed value on Renesas’s measurement condition. Renesas recommends that operating conditions are designed according to a document “Power MOSFET/IGBT Attention of Handling Semiconductor Devices (R07ZZ0010)”. 
8. This data is the designed target maximum value on Renesas’s measurement condition.
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE

FORWARD TRANSFER CHARACTERISTICS

GATE TO SOURCE CUT-OFF VOLTAGE
vs. CHANNEL TEMPERATURE

FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT

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. CHANNEL TEMPERATURE

\[ R_{DS(on)} = \text{Drain to Source On-state Resistance} - \Omega \]

\[ T_{ch} - \text{Channel Temperature} - ^\circ C \]

CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE

\[ C_{iss}, C_{oss}, C_{rss} - \text{Capacitance} - pF \]

SWITCHING CHARACTERISTICS

\[ I_{d} - \text{Drain Current} - A \]

\[ t_{on}, t_{off}, t_{on}, t_{off} - \text{Switching Time} - ns \]

DYNAMIC INPUT CHARACTERISTICS

\[ V_{GS} = 10 V \]
\[ I_{d} = 50 A \]

SOURCE TO DRAIN DIODE FORWARD VOLTAGE

\[ V_{F(S-D)} - \text{Source to Drain Voltage} - V \]

\[ I_{r} - \text{Diode Forward Current} - A \]

REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT

\[ I_{r} - \text{Diode Forward Current} - A \]

\[ V_{GS} = 0 V \]
\[ di/dt = 100 A/\mu s \]
Package Drawing (Unit: mm)

<table>
<thead>
<tr>
<th>Package Name</th>
<th>JEITA Package Code</th>
<th>RENESAS Code</th>
<th>Previous Code</th>
<th>MASS (Typ) [g]</th>
</tr>
</thead>
<tbody>
<tr>
<td>TO-262</td>
<td>—</td>
<td>PRSS0004AR-A</td>
<td>TO-262A</td>
<td>1.4</td>
</tr>
</tbody>
</table>

Unit: mm

Equivalent Circuit
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Renesas Electronics Corporation

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Renesas Electronics Hong Kong Limited

Unit 1911-1111, 19/F, Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2250-6868, Fax: +852-2886-9222

Renesas Electronics Taiwan Co., Ltd.

Unit 602 & 603, 6F, No. 130, Sec. 3, Xinyi Rd., Daan Dist., Taipei City 110, Taiwan
Tel: +886-2-2599-6055, Fax: +886-2-2599-6057

Renesas Electronics Korea Co., Ltd.

1001 Murphy Ranch Road, Milpitas, CA 95035, U.S.A.
Tel: +1-905-237-2004, 9251 Yonge Street, Suite 8309 Richmond Hill, Ontario Canada L4C 9T3

Renesas Electronics Singapore Pte. Ltd.

Unit 1601-1611, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2250-6868, Fax: +852-2886-9022

Renesas Electronics Hong Kong Limited

17F, KAMCO Yangjae Tower, 262, Gangnam-daero, Gangnam-gu, Seoul, 06265 Korea
Tel: +82-2-590-2000, Fax: +82-2-590-2001

Renesas Electronics Malaysia Sdn.Bhd.

Unit No 3A-1 Level 3A Tower 8 UOA Business Park, No 1 Jalan Pengaturcara U1/51A, Seksyen U1, 40150, Selangor, Malaysia
Tel: +60-3-5022-1288, Fax: +60-3-5022-1290

Renesas Electronics China Co., Ltd.

Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai 200333, China
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

Renesas Electronics Americas Inc.

2-4-2 Topps, Kobe, Tokyo 135-0061, Japan
Tel: +81-3-3761-8111, Fax: +81-3-3761-8112

Renesas Electronics America Inc.

15530 San Pedro Ave., Suite 100, San Antonio, TX 78217, USA
Tel: +1-210-756-3000, Fax: +1-210-756-3069

Renesas Electronics Europe GmbH

Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

Renesas Electronics Singapore Pte. Ltd.

7, Shing Ta Road, Tai Po, New Territories, Hong Kong
Tel: +852-2150-2888, Fax: +852-2150-2889

Renesas Electronics Hong Kong Limited

970-01, 25th Floor, Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2250-6868, Fax: +852-2886-9222

Renesas Electronics Malaysia Sdn.Bhd.

Unit No 3A-1 Level 3A Tower 8 UOA Business Park, No 1 Jalan Pengaturcara U1/51A, Seksyen U1, 40150, Selangor, Malaysia
Tel: +60-3-5022-1288, Fax: +60-3-5022-1290

Renesas Electronics Korea Co., Ltd.

1001 Murphy Ranch Road, Milpitas, CA 95035, U.S.A.
Tel: +1-905-237-2004, 9251 Yonge Street, Suite 8309 Richmond Hill, Ontario Canada L4C 9T3

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