# HAT2168N

## Silicon N Channel Power MOS FET
## Power Switching

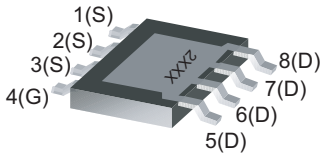
REJ03G1682-0200
Rev.2.00
May 27, 2008

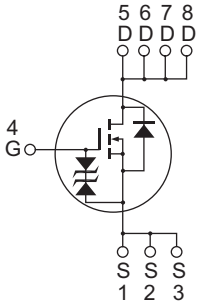
### Features

- High speed switching
- Capable of 4.5 V gate drive
- Low drive current
- High density mounting
- Low on-resistance
  $R_{DS(on)}$ = 6.3 mΩ typ. (at $V_{GS}$ = 10 V)
- Power Supply for Server and Telecom (Indoor use)

### Outline

RENESAS Package code: PTSP0008DC-A
(Package name: LFPAK-i)




| | |
|---|---|
| 1, 2, 3 | Source |
| 4 | Gate |
| 5, 6, 7, 8 | Drain |

### Absolute Maximum Ratings

(Ta = 25°C)

| Item | Symbol | Ratings | Unit |
|---|---|---|---|
| Drain to source voltage | $V_{DSS}$ | 30 | V |
| Gate to source voltage | $V_{GSS}$ | ±20 | V |
| Drain current | $I_D$ | 30 | A |
| Drain peak current | $I_{D(pulse)}$ Note1 | 120 | A |
| Body-drain diode reverse drain current | $I_{DR}$ | 30 | A |
| Avalanche current | $I_{AP}$ Note 2 | 15 | A |
| Avalanche energy | $E_{AR}$ Note 2 | 22 | mJ |
| Channel dissipation | Pch Note3 | 15 | W |
| Channel to case thermal resistance | θch-C | 8.33 | °C/W |
| Channel temperature | Tch | 150 | °C |
| Storage temperature | Tstg | – 55 to + 150 | °C |

Notes: 1. PW ≤ 10 µs, duty cycle ≤ 1%
2. Value at Tch = 25°C, Rg ≥ 50 Ω
3. Tc = 25°C

## Electrical Characteristics

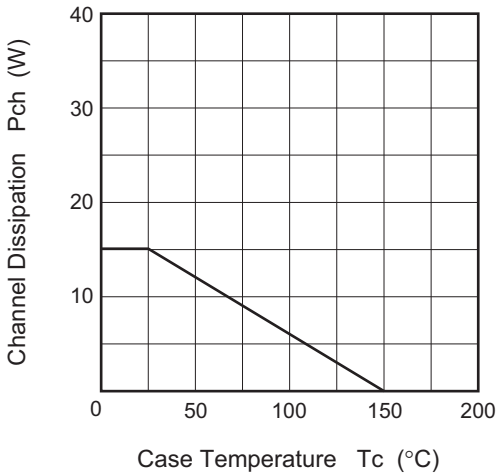
(Ta = 25°C)

| Item | Symbol | Min | Typ | Max | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| Drain to source breakdown voltage | $V_{(BR)DSS}$ | 30 | — | — | V | $I_D$ = 10 mA, $V_{GS}$ = 0 |
| Gate to source breakdown voltage | $V_{(BR)GSS}$ | ±20 | — | — | V | $I_G$ = ±100 µA, $V_{DS}$ = 0 |
| Gate to source leak current | $I_{GSS}$ | — | — | ±10 | µA | $V_{GS}$ = ±16 V, $V_{DS}$ = 0 |
| Zero gate voltage drain current | $I_{DSS}$ | — | — | 1 | µA | $V_{DS}$ = 30 V, $V_{GS}$ = 0 |
| Gate to source cutoff voltage | $V_{GS(off)}$ | 1.0 | — | 2.5 | V | $V_{DS}$ = 10 V, $I_D$ = 1 mA |
| Static drain to source on state resistance | $R_{DS(on)}$ | — | 6.3 | 8.2 | mΩ | $I_D$ = 15 A, $V_{GS}$ = 10 V Note4 |
| | $R_{DS(on)}$ | — | 9.1 | 13.8 | mΩ | $I_D$ = 15 A, $V_{GS}$ = 4.5 V Note4 |
| Forward transfer admittance | $\|y_{fs}\|$ | 30 | 50 | — | S | $I_D$ = 15 A, $V_{DS}$ = 10 V Note4 |
| Input capacitance | Ciss | — | 1730 | — | pF | $V_{DS}$ = 10 V<br>$V_{GS}$ = 0<br>f = 1 MHz |
| Output capacitance | Coss | — | 400 | — | pF | |
| Reverse transfer capacitance | Crss | — | 130 | — | pF | |
| Gate Resistance | Rg | — | 0.55 | — | Ω | |
| Total gate charge | Qg | — | 11 | — | nc | $V_{DD}$ = 10 V<br>$V_{GS}$ = 4.5 V<br>$I_D$ = 30 A |
| Gate to source charge | Qgs | — | 5 | — | nc | |
| Gate to drain charge | Qgd | — | 2.4 | — | nc | |
| Turn-on delay time | $t_{d(on)}$ | — | 8 | — | ns | $V_{GS}$ = 10 V, $I_D$ = 15 A<br>$V_{DD}$ ≅ 10 V<br>$R_L$ = 0.67 Ω<br>Rg = 4.7 Ω |
| Rise time | $t_r$ | — | 20 | — | ns | |
| Turn-off delay time | $t_{d(off)}$ | — | 40 | — | ns | |
| Fall time | $t_f$ | — | 4 | — | ns | |
| Body–drain diode forward voltage | $V_{DF}$ | — | 0.85 | 1.10 | V | $I_F$ = 30 A, $V_{GS}$ = 0 Note4 |
| Body–drain diode reverse recovery time | $t_{rr}$ | — | 25 | — | ns | $I_F$ = 30 A, $V_{GS}$ = 0<br>$di_F/dt$ = 100 A/ µs |

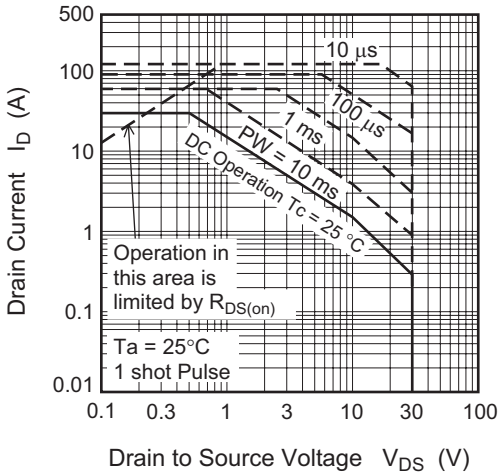
Notes: 4. Pulse test

## Main Characteristics

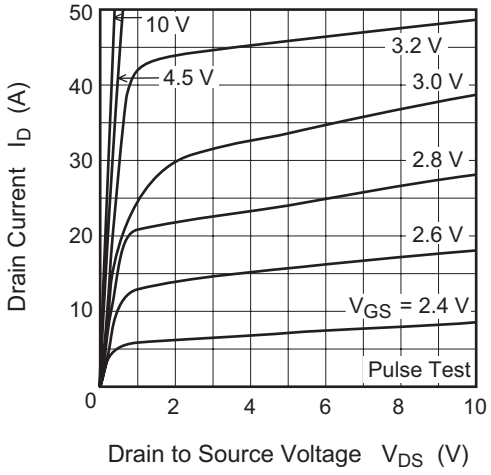
Power vs. Temperature Derating



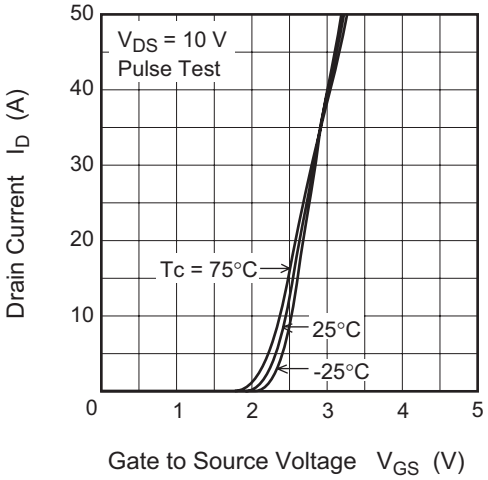

Maximum Safe Operation Area



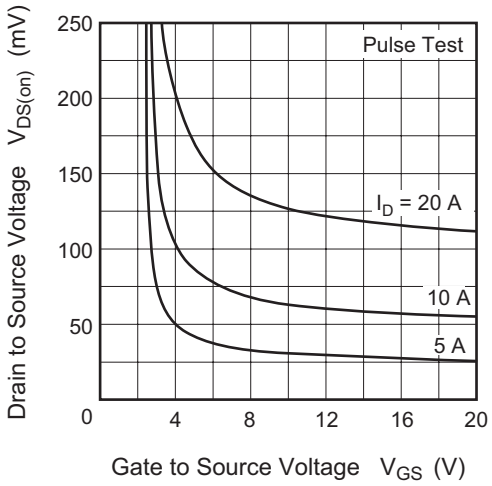

Typical Output Characteristics



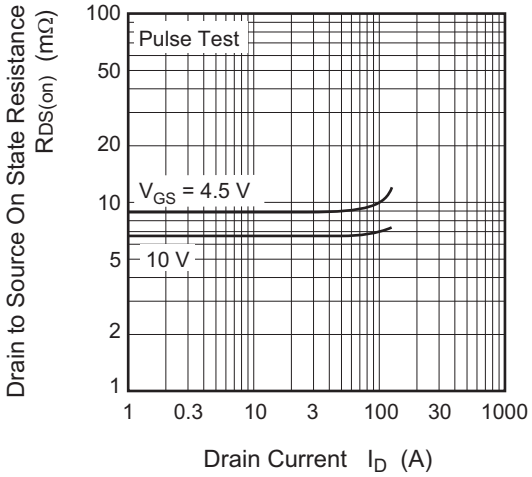

Typical Transfer Characteristics



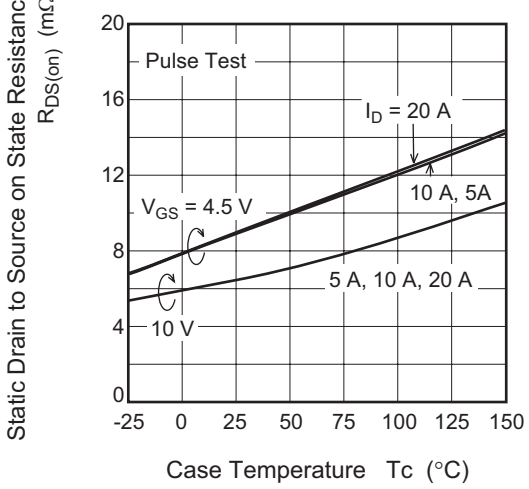

Drain to Source Saturation Voltage vs. Gate to Source Voltage



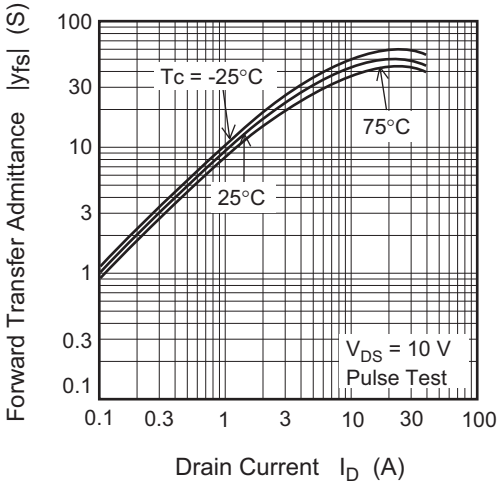

Static Drain to Source on State Resistance vs. Drain Current



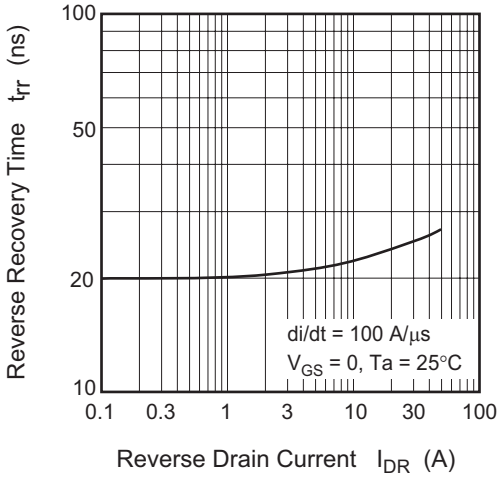
Static Drain to Source on State Resistance vs. Temperature



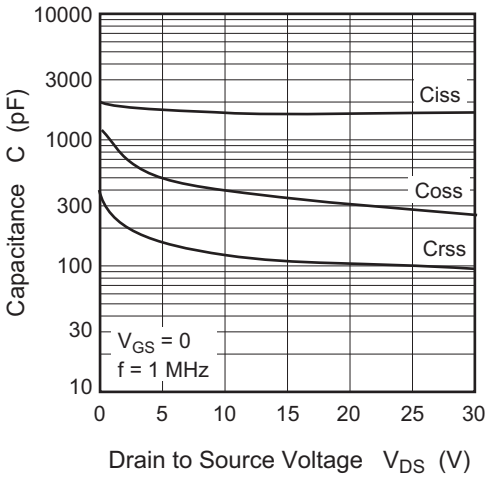

Forward Transfer Admittance vs. Drain Current



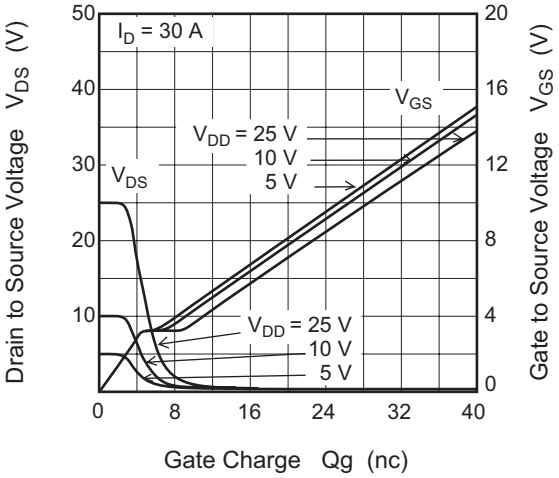

Body-Drain Diode Reverse Recovery Time



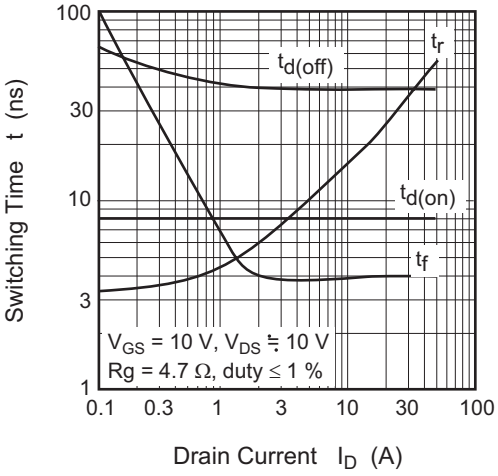

Typical Capacitance vs. Drain to Source Voltage



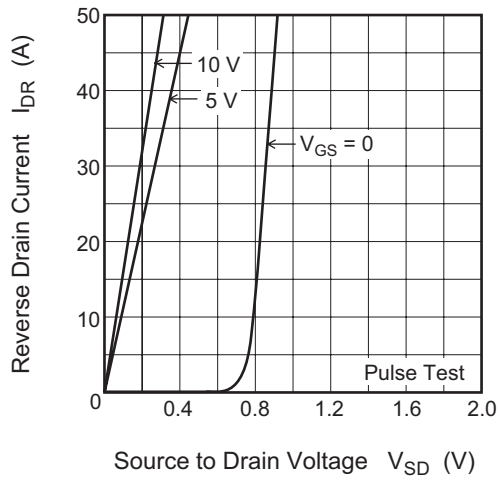

Dynamic Input Characteristics



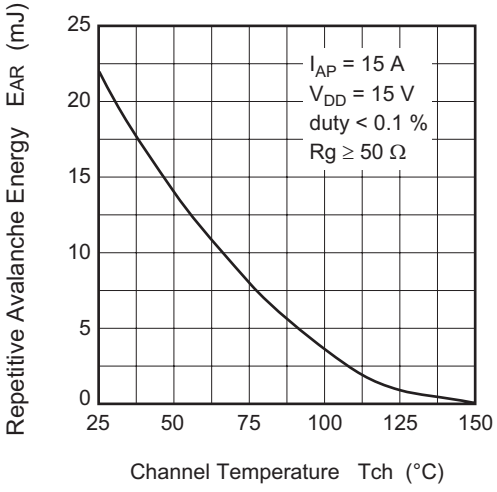

Switching Characteristics



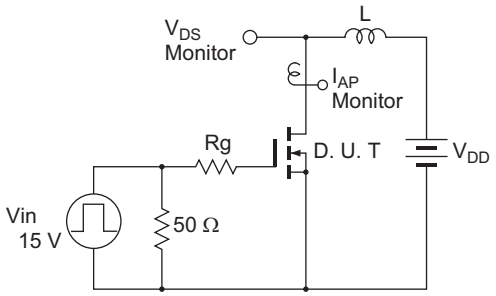
Reverse Drain Current vs.
Source to Drain Voltage




Maximum Avalanche Energy vs.
Channel Temperature Derating

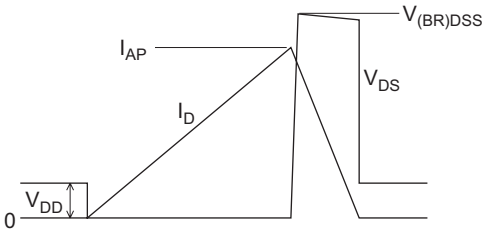



Avalanche Test Circuit

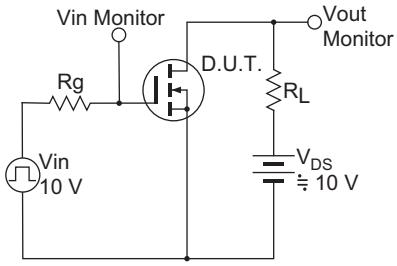



Avalanche Waveform

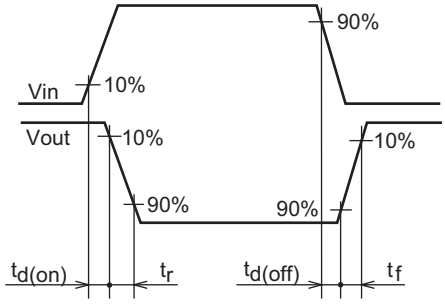
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$




Switching Time Test Circuit

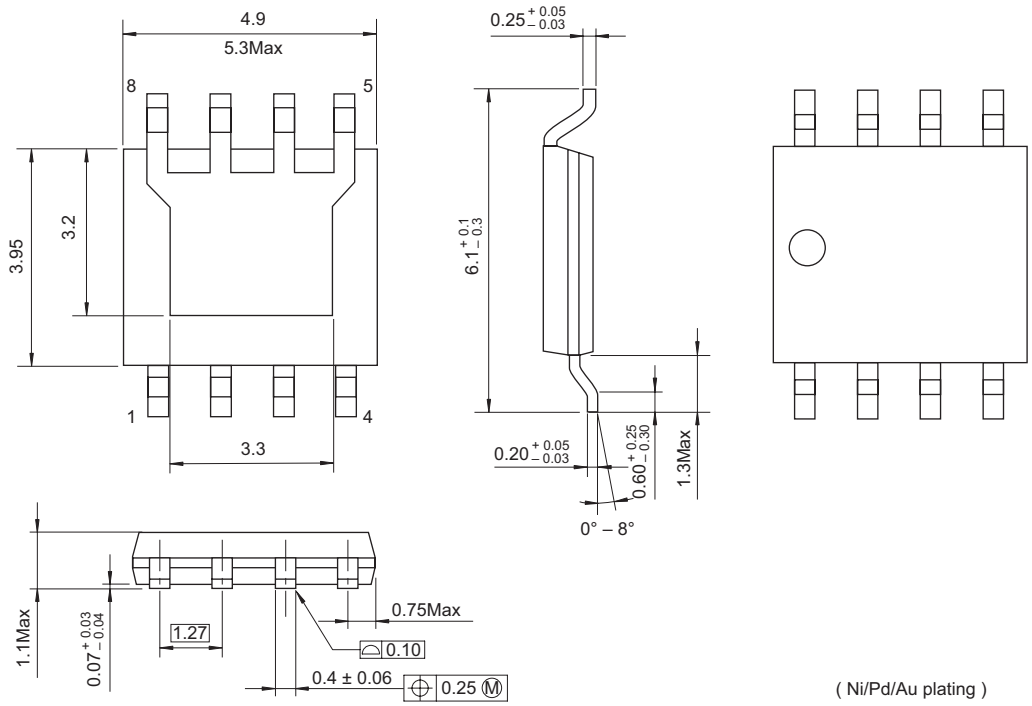



Switching Time Waveform



## Package Dimensions

| Package Name | JEITA Package Code | RENESAS Code | Previous Code | MASS[Typ.] |
|---|---|---|---|---|
| LFPAK-i | — | PTSP0008DC-A | LFPAK-iV | 0.080g |




## Ordering Information

| Part No. | Quantity | Shipping Container |
|---|---|---|
| HAT2168N-EL-E | 2500 pcs | Taping |

Renesas Technology Corp. Sales Strategic Planning Div. Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan



## RENESAS SALES OFFICES

http://www.renesas.com

Refer to "**http://www.renesas.com/en/network**" for the latest and detailed information.

**Renesas Technology America, Inc.**
450 Holger Way, San Jose, CA 95134-1368, U.S.A
Tel: <1> (408) 382-7500, Fax: <1> (408) 382-7501

**Renesas Technology Europe Limited**
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.
Tel: <44> (1628) 585-100, Fax: <44> (1628) 585-900

**Renesas Technology (Shanghai) Co., Ltd.**
Unit 204, 205, AZIACenter, No.1233 Lujiazui Ring Rd, Pudong District, Shanghai, China 200120
Tel: <86> (21) 5877-1818, Fax: <86> (21) 6887-7858/7898

**Renesas Technology Hong Kong Ltd.**
7th Floor, North Tower, World Finance Centre, Harbour City, Canton Road, Tsimshatsui, Kowloon, Hong Kong
Tel: <852> 2265-6688, Fax: <852> 2377-3473

**Renesas Technology Taiwan Co., Ltd.**
10th Floor, No.99, Fushing North Road, Taipei, Taiwan
Tel: <886> (2) 2715-2888, Fax: <886> (2) 3518-3399

**Renesas Technology Singapore Pte. Ltd.**
1 Harbour Front Avenue, #06-10, Keppel Bay Tower, Singapore 098632
Tel: <65> 6213-0200, Fax: <65> 6278-8001

**Renesas Technology Korea Co., Ltd.**
Kukje Center Bldg. 18th Fl., 191, 2-ka, Hangang-ro, Yongsan-ku, Seoul 140-702, Korea
Tel: <82> (2) 796-3115, Fax: <82> (2) 796-2145

**Renesas Technology Malaysia Sdn. Bhd**
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No.18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: <603> 7955-9390, Fax: <603> 7955-9510



Colophon .7.2