

# HAT2020R

Silicon N Channel Power MOS FET  
High Speed Power Switching

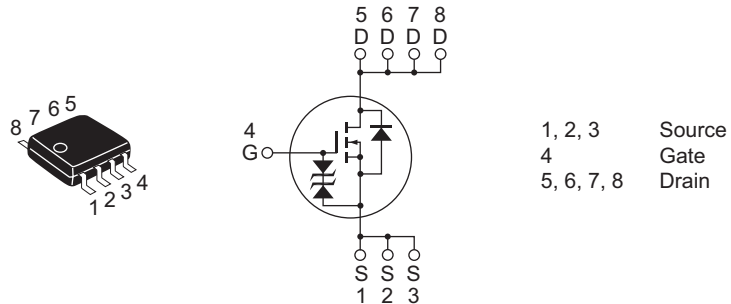
REJ03G1157-1200  
(Previous: ADE-208-439J)  
Rev.12.00  
Sep 07, 2005

## Features

- Low on-resistance
- Capable of 4 V gate drive
- Low drive current
- High density mounting

## Outline

RENESAS Package code: PRSP0008DD-D  
(Package name: SOP-8 <FP-8DAV> )



## Absolute Maximum Ratings

(Ta = 25°C)

| Item                                   | Symbol                           | Value       | Unit |
|----------------------------------------|----------------------------------|-------------|------|
| Drain to source voltage                | $V_{DS}$                         | 30          | V    |
| Gate to source voltage                 | $V_{GS}$                         | $\pm 20$    | V    |
| Drain current                          | $I_D$                            | 8           | A    |
| Drain peak current                     | $I_{D(pulse)}$ <sup>Note 1</sup> | 64          | A    |
| Body-drain diode reverse drain current | $I_{DR}$                         | 8           | A    |
| Channel dissipation                    | $P_{ch}$ <sup>Note 2</sup>       | 2.5         | W    |
| Channel temperature                    | $T_{ch}$                         | 150         | °C   |
| Storage temperature                    | $T_{stg}$                        | -55 to +150 | °C   |

Notes: 1.  $PW \leq 10 \mu s$ , duty cycle  $\leq 1\%$ 2. When using the glass epoxy board (FR4 40 × 40 × 1.6 mm),  $PW \leq 10 s$ 

## Electrical Characteristics

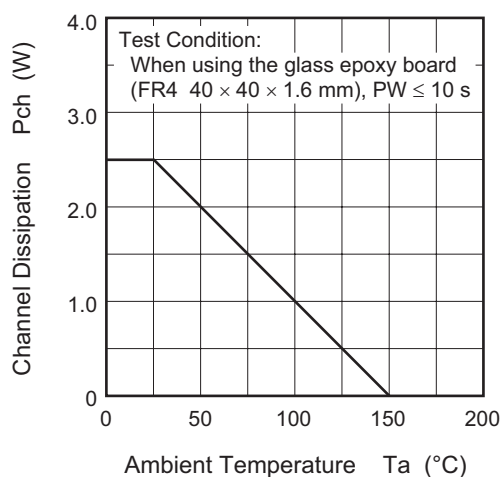
(Ta = 25°C)

| Item                                       | Symbol         | Min      | Typ   | Max      | Unit     | Test Conditions                                                               |
|--------------------------------------------|----------------|----------|-------|----------|----------|-------------------------------------------------------------------------------|
| Drain to source breakdown voltage          | $V_{(BR) DSS}$ | 30       | —     | —        | V        | $I_D = 10 \text{ mA}$ , $V_{GS} = 0$                                          |
| Gate to source breakdown voltage           | $V_{(BR) GSS}$ | $\pm 20$ | —     | —        | V        | $I_G = \pm 100 \mu A$ , $V_{DS} = 0$                                          |
| Gate to source leak current                | $I_{GSS}$      | —        | —     | $\pm 10$ | $\mu A$  | $V_{GS} = \pm 16 \text{ V}$ , $V_{DS} = 0$                                    |
| Zero gate voltage drain current            | $I_{DSS}$      | —        | —     | 10       | $\mu A$  | $V_{DS} = 30 \text{ V}$ , $V_{GS} = 0$                                        |
| Gate to source cutoff voltage              | $V_{GS(off)}$  | 1.0      | —     | 2.0      | V        | $V_{DS} = 10 \text{ V}$ , $I_D = 1 \text{ mA}$                                |
| Static drain to source on state resistance | $R_{DS(on)}$   | —        | 0.020 | 0.028    | $\Omega$ | $I_D = 4 \text{ A}$ , $V_{GS} = 10 \text{ V}$ <sup>Note 3</sup>               |
|                                            | $R_{DS(on)}$   | —        | 0.030 | 0.050    | $\Omega$ | $I_D = 4 \text{ A}$ , $V_{GS} = 4 \text{ V}$ <sup>Note 3</sup>                |
| Forward transfer admittance                | $ y_{fs} $     | 7        | 11    | —        | S        | $I_D = 4 \text{ A}$ , $V_{DS} = 10 \text{ V}$ <sup>Note 3</sup>               |
| Input capacitance                          | $C_{iss}$      | —        | 780   | —        | pF       | $V_{DS} = 10 \text{ V}$<br>$V_{GS} = 0$<br>$f = 1 \text{ MHz}$                |
| Output capacitance                         | $C_{oss}$      | —        | 560   | —        | pF       |                                                                               |
| Reverse transfer capacitance               | $C_{rss}$      | —        | 240   | —        | pF       |                                                                               |
| Turn-on delay time                         | $t_{d(on)}$    | —        | 35    | —        | ns       | $V_{GS} = 4 \text{ V}$ , $I_D = 4 \text{ A}$ ,<br>$V_{DD} \cong 10 \text{ V}$ |
| Rise time                                  | $t_r$          | —        | 240   | —        | ns       |                                                                               |
| Turn-off delay time                        | $t_{d(off)}$   | —        | 50    | —        | ns       |                                                                               |
| Fall time                                  | $t_f$          | —        | 100   | —        | ns       |                                                                               |
| Body-drain diode forward voltage           | $V_{DF}$       | —        | 0.8   | 1.3      | V        | $I_F = 8 \text{ A}$ , $V_{GS} = 0$ <sup>Note 3</sup>                          |
| Body-drain diode reverse recovery time     | $t_{rr}$       | —        | 55    | —        | ns       | $I_F = 8 \text{ A}$ , $V_{GS} = 0$<br>$di_F/dt = 20 \text{ A}/\mu s$          |

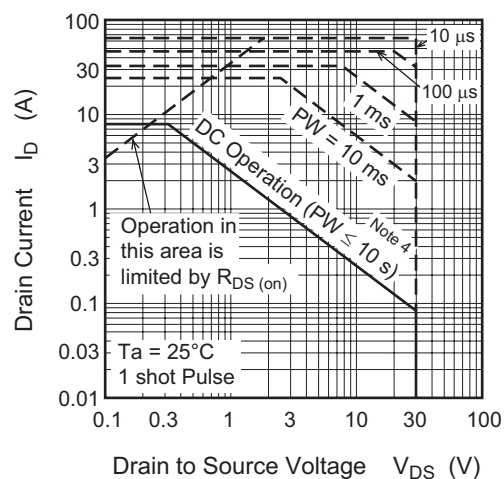
Note: 3. Pulse test

## Main Characteristics

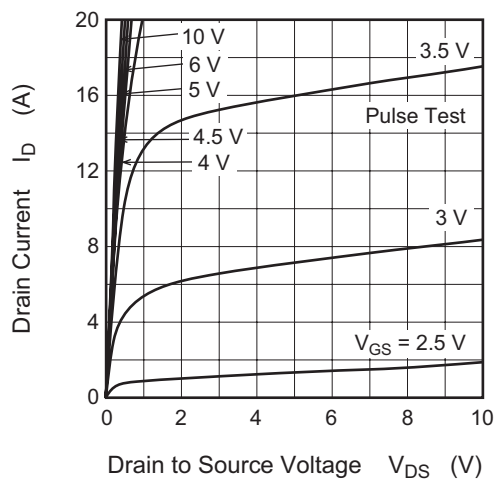
Power vs. Temperature Derating



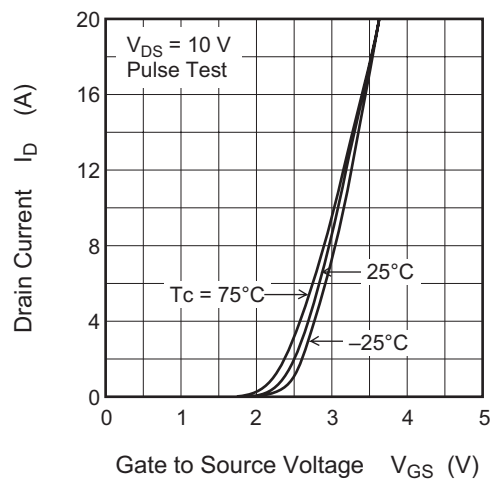
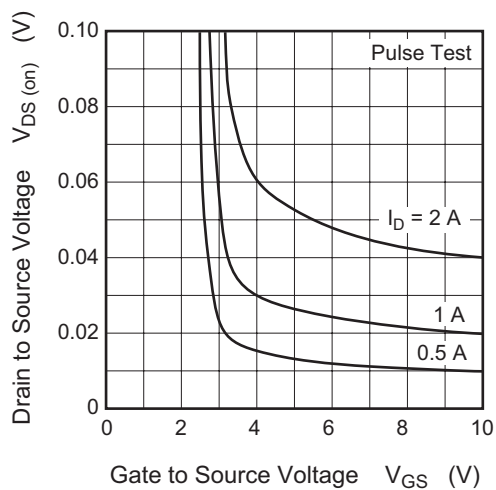
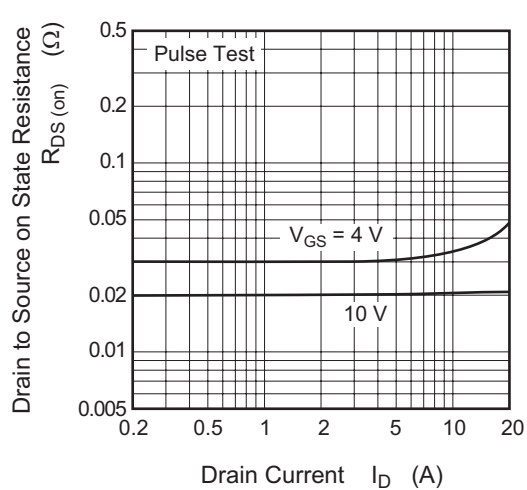
Maximum Safe Operation Area

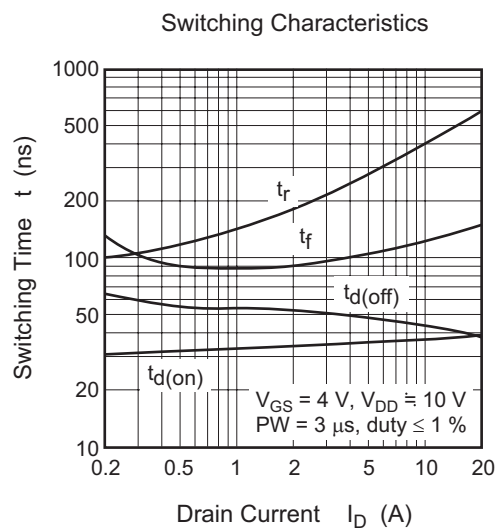
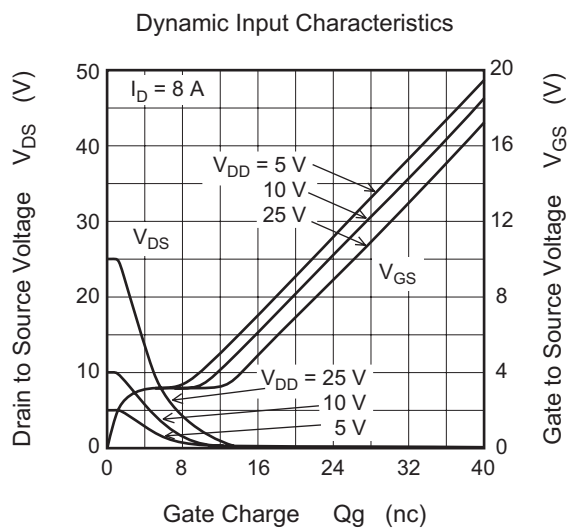
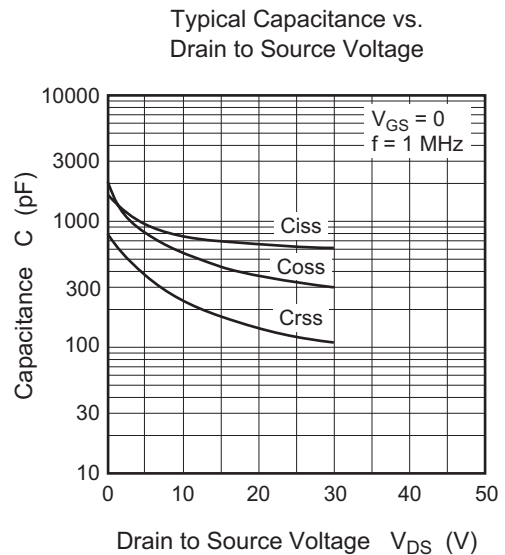
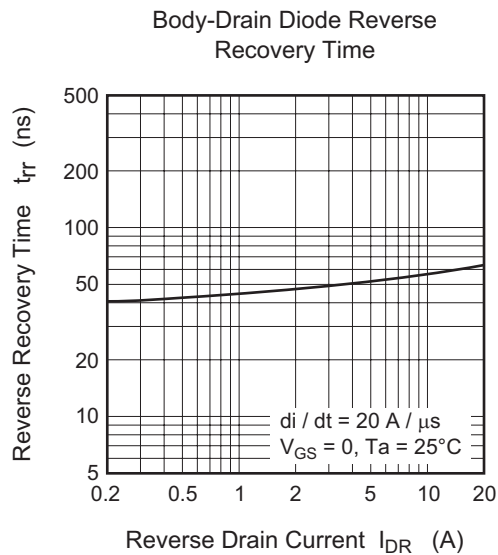
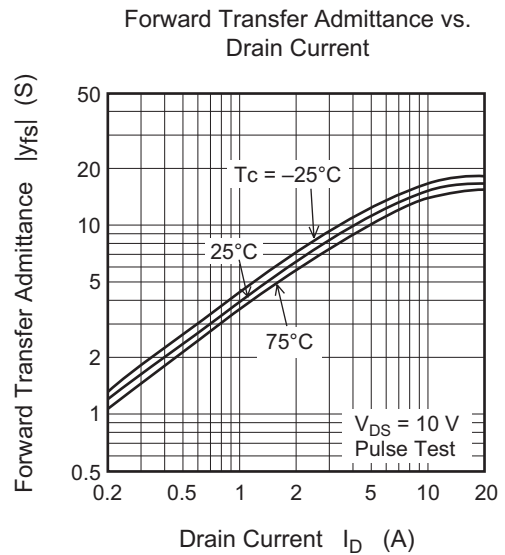
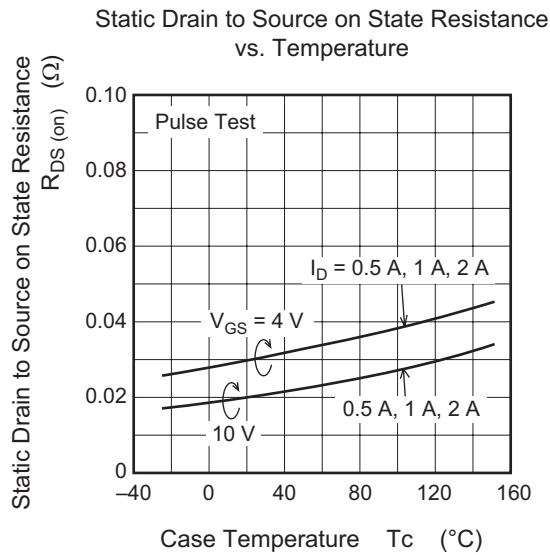


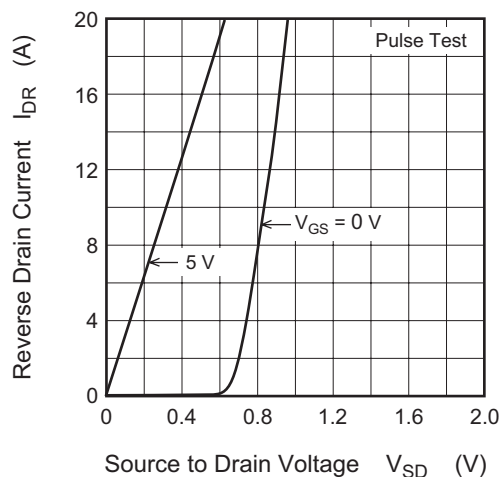
Typical Output Characteristics



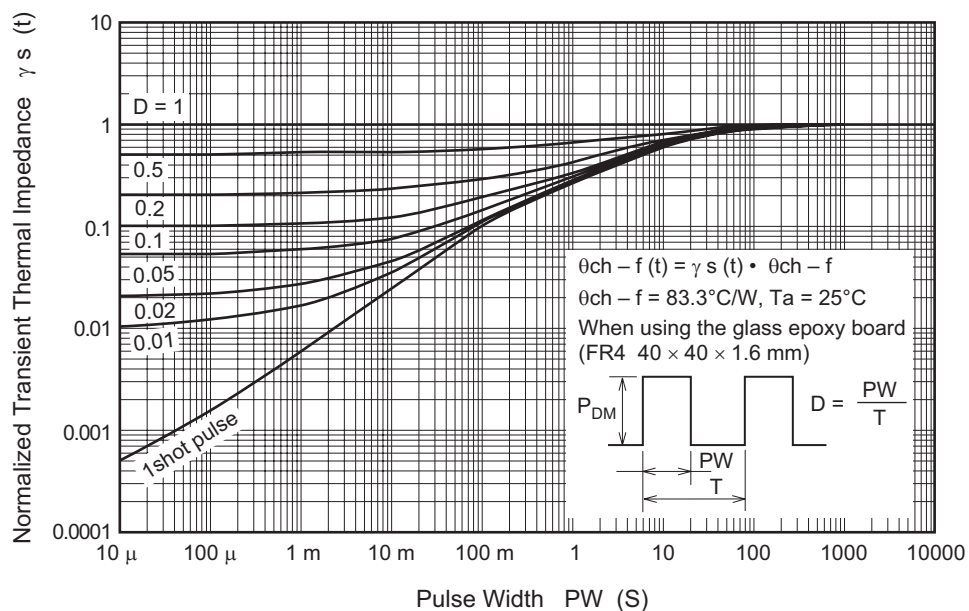
Typical Transfer Characteristics

Drain to Source Saturation Voltage vs.  
Gate to Source VoltageStatic Drain to Source on State Resistance  
vs. Drain Current

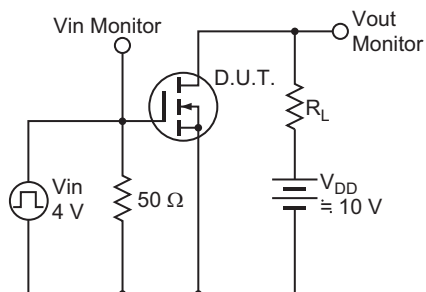


Reverse Drain Current vs.  
Source to Drain Voltage

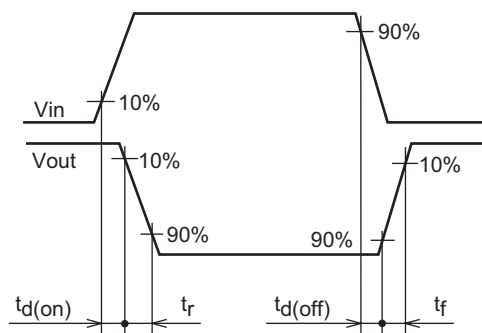
Normalized Transient Thermal Impedance vs. Pulse Width



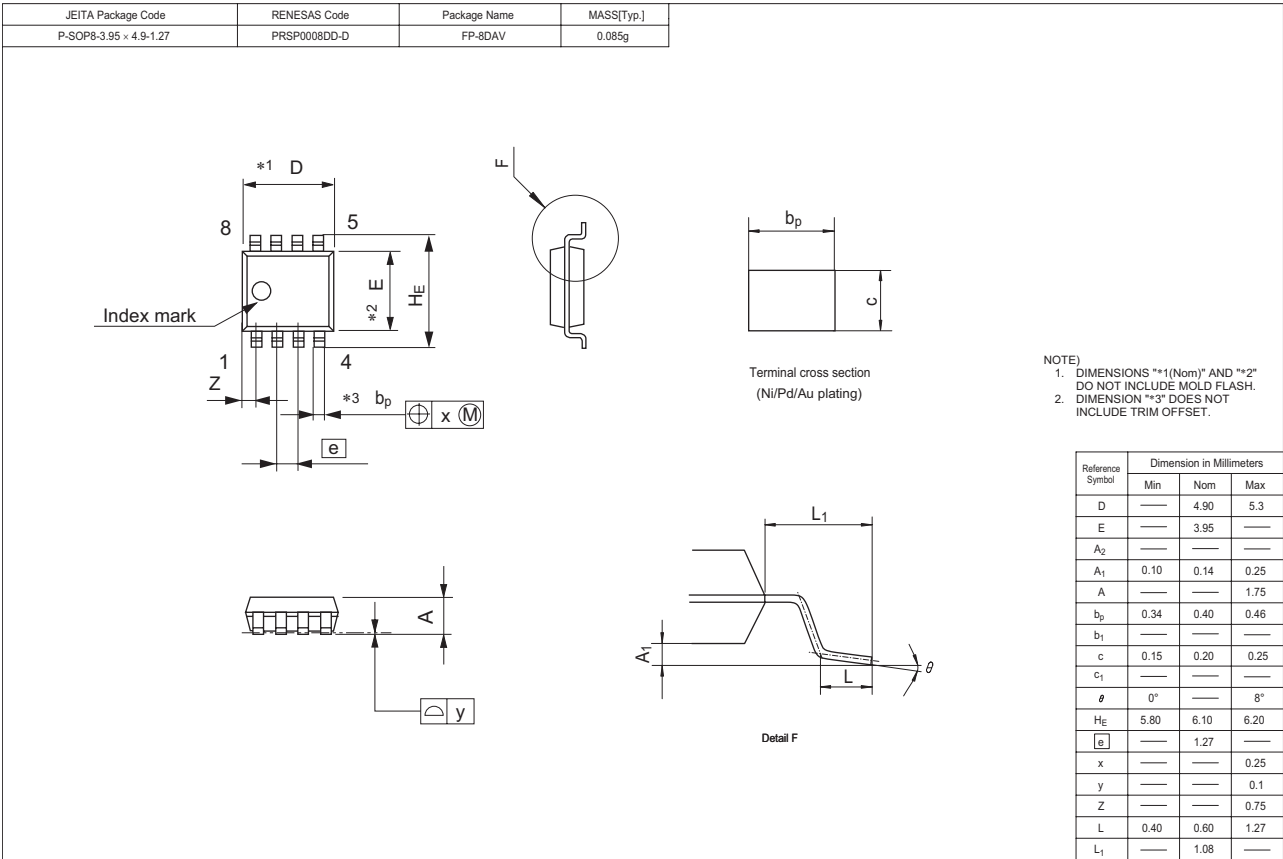
Switching Time Test Circuit



Switching Time Waveform



Package Dimensions



Ordering Information

| Part Name     | Quantity | Shipping Container |
|---------------|----------|--------------------|
| HAT2020R-EL-E | 2500 pcs | Taping             |

Note: For some grades, production may be terminated. Please contact the Renesas sales office to check the state of production before ordering the product.

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