

# HAT2285WP

Silicon N Channel Power MOS FET with Schottky Barrier Diode  
High Speed Power Switching

REJ03G1371-0310

Rev.3.10

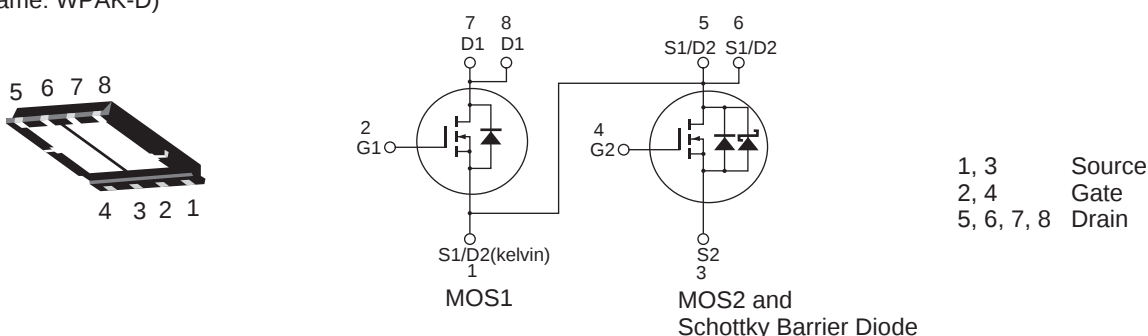
May 13, 2010

## Features

- Low on-resistance
- Capable of 4.5 V gate drive
- High density mounting
- Built-in Schottky Barrier Diode

## Outline

RENESAS Package code: PWSN0008DB-A  
(Package name: WPAK-D)



## Absolute Maximum Ratings

(Ta = 25°C)

| Item                    | Symbol                          | Ratings     |             | Unit |
|-------------------------|---------------------------------|-------------|-------------|------|
|                         |                                 | MOS1        | MOS2 & SBD  |      |
| Drain to source voltage | $V_{DSS}$                       | 30          | 30          | V    |
| Gate to source voltage  | $V_{GSS}$                       | $\pm 20$    | $\pm 12$    | V    |
| Drain current           | $I_D$                           | 14          | 22          | A    |
| Drain peak current      | $I_{D(pulse)}$ <sup>Note1</sup> | 56          | 88          | A    |
| Reverse drain current   | $I_{DR}$                        | 14          | 22          | A    |
| Channel dissipation     | $P_{ch}$ <sup>Note2</sup>       | 8           | 15          | W    |
| Channel temperature     | $T_{ch}$                        | 150         | 150         | °C   |
| Storage temperature     | $T_{stg}$                       | -55 to +150 | -55 to +150 | °C   |

Notes: 1.  $PW \leq 10 \mu s$ , duty cycle  $\leq 1 \%$

2.  $T_c = 25^\circ C$

## Electrical Characteristics

## • MOS1

(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 leak current                | $I_{GSS}$     | —   | —    | $\pm 0.1$ | $\mu\text{A}$    | $V_{GS} = \pm 20 \text{ V}$ , $V_{DS} = 0$                                                                                   |
| Zero gate voltage drain current            | $I_{DSS}$     | —   | —    | 1         | $\mu\text{A}$    | $V_{DS} = 30 \text{ V}$ , $V_{GS} = 0$                                                                                       |
| Gate to source cutoff voltage              | $V_{GS(off)}$ | 1.0 | —    | 2.5       | V                | $V_{DS} = 10 \text{ V}$ , $I_D = 1 \text{ mA}$                                                                               |
| Static drain to source on state resistance | $R_{DS(on)}$  | —   | 19   | 24        | $\text{m}\Omega$ | $I_D = 7 \text{ A}$ , $V_{GS} = 10 \text{ V}$ <sup>Note3</sup>                                                               |
|                                            | $R_{DS(on)}$  | —   | 27   | 40        | $\text{m}\Omega$ | $I_D = 7 \text{ A}$ , $V_{GS} = 4.5 \text{ V}$ <sup>Note3</sup>                                                              |
| Forward transfer admittance                | $ y_{fs} $    | 10  | 18   | —         | S                | $I_D = 7 \text{ A}$ , $V_{DS} = 10 \text{ V}$ <sup>Note3</sup>                                                               |
| Input capacitance                          | $C_{iss}$     | —   | 630  | —         | pF               | $V_{DS} = 10 \text{ V}$ , $V_{GS} = 0$ ,<br>$f = 1 \text{ MHz}$                                                              |
| Output capacitance                         | $C_{oss}$     | —   | 155  | —         | pF               |                                                                                                                              |
| Reverse transfer capacitance               | $C_{rss}$     | —   | 57   | —         | pF               |                                                                                                                              |
| Total gate charge                          | $Q_g$         | —   | 4.6  | —         | nC               | $V_{DD} = 10 \text{ V}$ , $V_{GS} = 4.5 \text{ V}$ ,<br>$I_D = 14 \text{ A}$                                                 |
| Gate to source charge                      | $Q_{gs}$      | —   | 2.2  | —         | nC               |                                                                                                                              |
| Gate to drain charge                       | $Q_{gd}$      | —   | 1.2  | —         | nC               |                                                                                                                              |
| Turn-on delay time                         | $t_{d(on)}$   | —   | 7    | —         | ns               | $V_{GS} = 10 \text{ V}$ , $I_D = 7 \text{ A}$ ,<br>$V_{DD} \cong 10 \text{ V}$ , $R_L = 1.42 \Omega$ ,<br>$R_g = 4.7 \Omega$ |
| Rise time                                  | $t_r$         | —   | 30   | —         | ns               |                                                                                                                              |
| Turn-off delay time                        | $t_{d(off)}$  | —   | 35   | —         | ns               |                                                                                                                              |
| Fall time                                  | $t_f$         | —   | 3.6  | —         | ns               |                                                                                                                              |
| Body-drain diode forward voltage           | $V_{DF}$      | —   | 0.91 | 1.19      | V                | $I_F = 14 \text{ A}$ , $V_{GS} = 0$ <sup>Note3</sup>                                                                         |
| Body-drain diode reverse recovery time     | $t_{rr}$      | —   | 18   | —         | ns               | $I_F = 14 \text{ A}$ , $V_{GS} = 0$<br>$di_F/dt = 100 \text{ A}/\mu\text{s}$                                                 |

Notes: 3. Pulse test

## • MOS2 &amp; Schottky Barrier Diode

(Ta = 25°C)

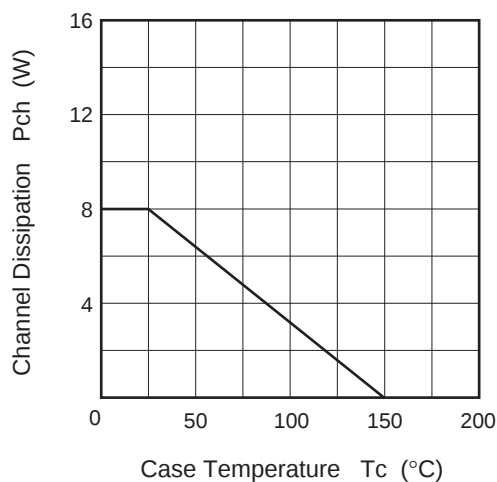
| Item                                       | Symbol        | Min | Typ  | Max       | Unit             | Test Conditions                                                                                                               |
|--------------------------------------------|---------------|-----|------|-----------|------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Drain to source breakdown voltage          | $V_{(BR)DSS}$ | 30  | —    | —         | V                | $I_D = 10 \text{ mA}$ , $V_{GS} = 0$                                                                                          |
| Gate to source leak current                | $I_{GSS}$     | —   | —    | $\pm 0.1$ | $\mu\text{A}$    | $V_{GS} = \pm 12 \text{ V}$ , $V_{DS} = 0$                                                                                    |
| Zero gate voltage drain current            | $I_{DSS}$     | —   | —    | 1         | $\text{mA}$      | $V_{DS} = 30 \text{ V}$ , $V_{GS} = 0$                                                                                        |
| Gate to source cutoff voltage              | $V_{GS(off)}$ | 1.4 | —    | 2.5       | V                | $V_{DS} = 10 \text{ V}$ , $I_D = 1 \text{ mA}$                                                                                |
| Static drain to source on state resistance | $R_{DS(on)}$  | —   | 14   | 18        | $\text{m}\Omega$ | $I_D = 11 \text{ A}$ , $V_{GS} = 10 \text{ V}$ <sup>Note3</sup>                                                               |
|                                            | $R_{DS(on)}$  | —   | 15   | 23        | $\text{m}\Omega$ | $I_D = 11 \text{ A}$ , $V_{GS} = 4.5 \text{ V}$ <sup>Note3</sup>                                                              |
| Forward transfer admittance                | $ y_{fs} $    | 24  | 40   | —         | S                | $I_D = 11 \text{ A}$ , $V_{DS} = 10 \text{ V}$ <sup>Note3</sup>                                                               |
| Input capacitance                          | $C_{iss}$     | —   | 1930 | —         | pF               | $V_{DS} = 10 \text{ V}$ , $V_{GS} = 0$ ,<br>$f = 1 \text{ MHz}$                                                               |
| Output capacitance                         | $C_{oss}$     | —   | 300  | —         | pF               |                                                                                                                               |
| Reverse transfer capacitance               | $C_{rss}$     | —   | 130  | —         | pF               |                                                                                                                               |
| Total gate charge                          | $Q_g$         | —   | 18   | —         | nC               | $V_{DD} = 10 \text{ V}$ , $V_{GS} = 4.5 \text{ V}$ ,<br>$I_D = 22 \text{ A}$                                                  |
| Gate to source charge                      | $Q_{gs}$      | —   | 5.8  | —         | nC               |                                                                                                                               |
| Gate to drain charge                       | $Q_{gd}$      | —   | 4.5  | —         | nC               |                                                                                                                               |
| Turn-on delay time                         | $t_{d(on)}$   | —   | 10   | —         | ns               | $V_{GS} = 10 \text{ V}$ , $I_D = 11 \text{ A}$ ,<br>$V_{DD} \cong 10 \text{ V}$ , $R_L = 0.91 \Omega$ ,<br>$R_g = 4.7 \Omega$ |
| Rise time                                  | $t_r$         | —   | 20   | —         | ns               |                                                                                                                               |
| Turn-off delay time                        | $t_{d(off)}$  | —   | 45   | —         | ns               |                                                                                                                               |
| Fall time                                  | $t_f$         | —   | 4.0  | —         | ns               |                                                                                                                               |
| Schottky Barrier diode forward voltage     | $V_F$         | —   | 0.5  | —         | V                | $I_F = 3.5 \text{ A}$ , $V_{GS} = 0$ <sup>Note3</sup>                                                                         |
| Body-drain diode reverse recovery time     | $t_{rr}$      | —   | 16   | —         | ns               | $I_F = 22 \text{ A}$ , $V_{GS} = 0$<br>$di_F/dt = 100 \text{ A}/\mu\text{s}$                                                  |

Notes: 3. Pulse test

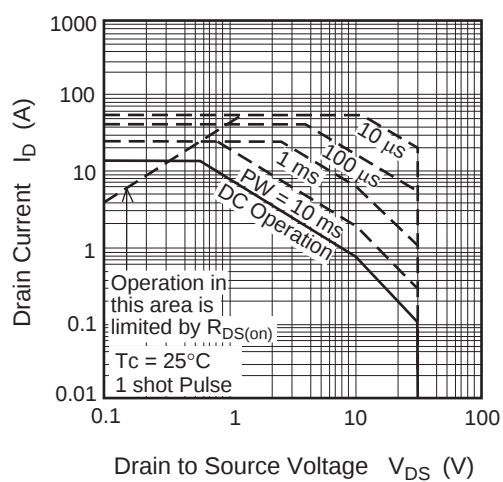
## Electrical Characteristics

## • MOS1

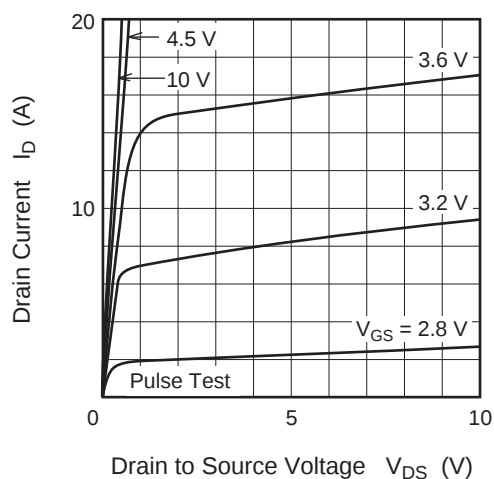
Power vs. Temperature Derating



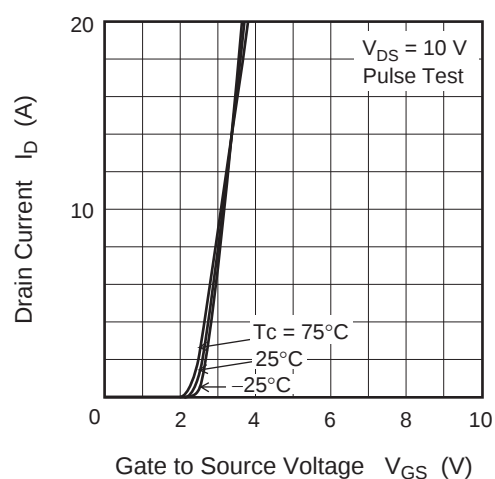
Maximum Safe Operation Area



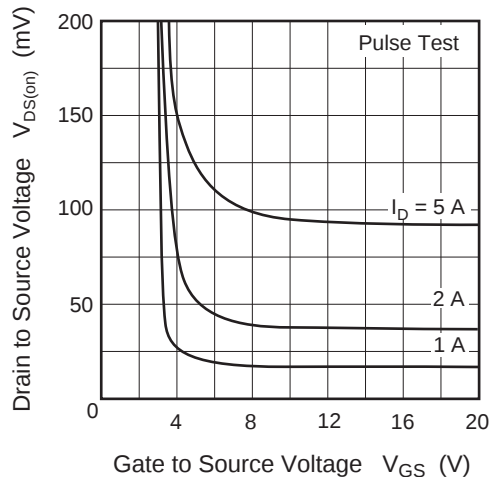
Typical Output Characteristics



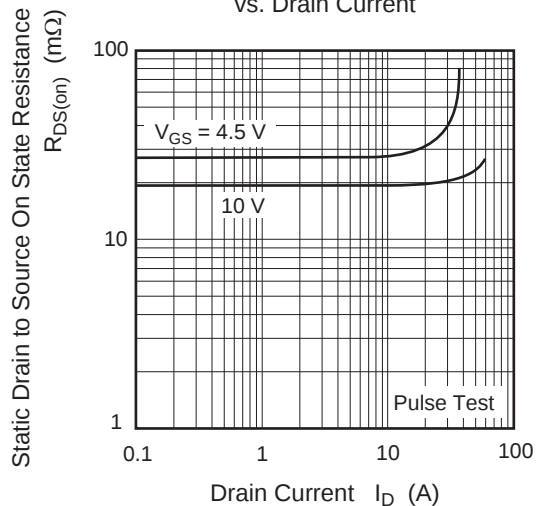
Typical Transfer Characteristics



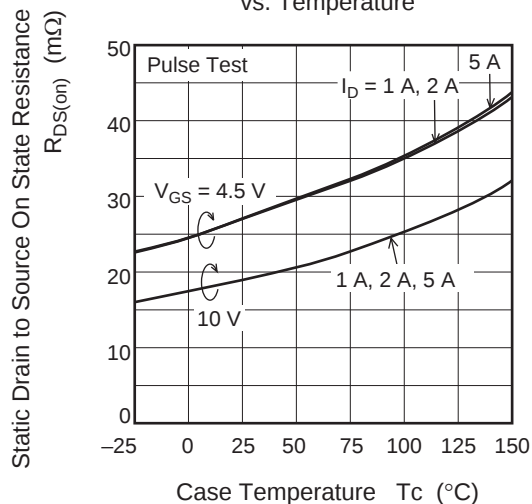
Drain to Source Saturation Voltage vs Gate to Source Voltage



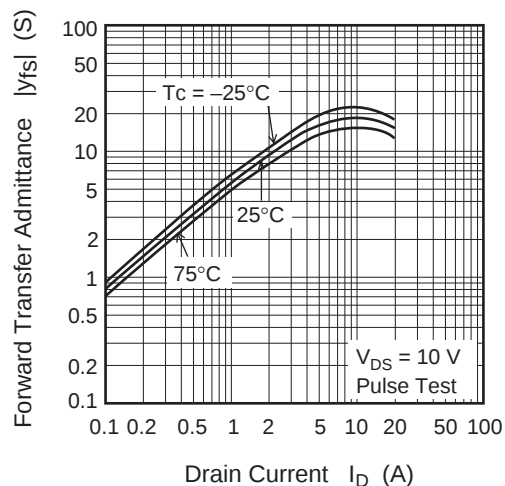
Static Drain to Source On State Resistance vs. Drain Current



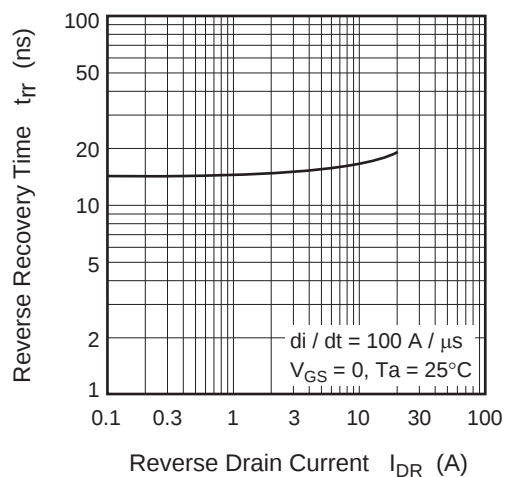
Static Drain to Source On State Resistance vs. Temperature



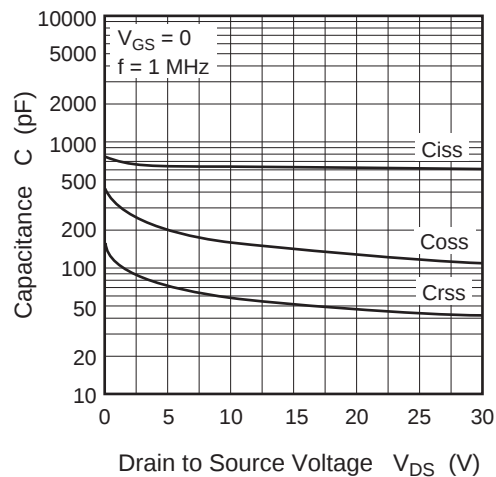
Forward Transfer Admittance vs. Drain Current



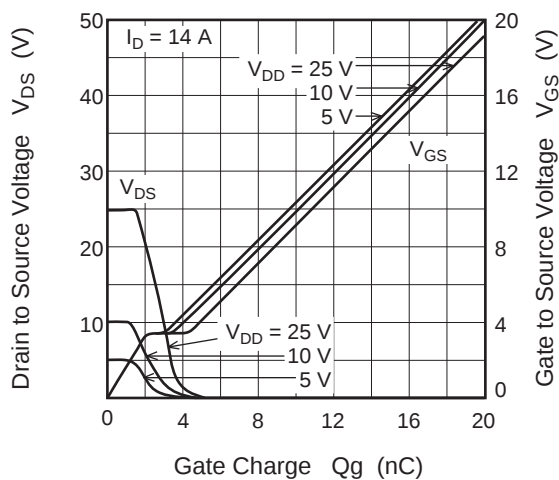
Body-Drain Diode Reverse Recovery Time



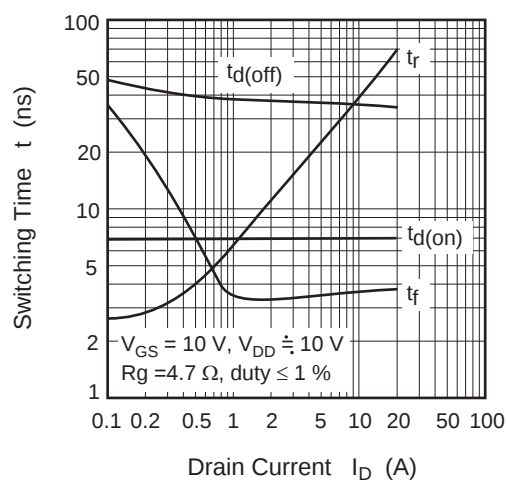
Typical Capacitance vs. Drain to Source Voltage

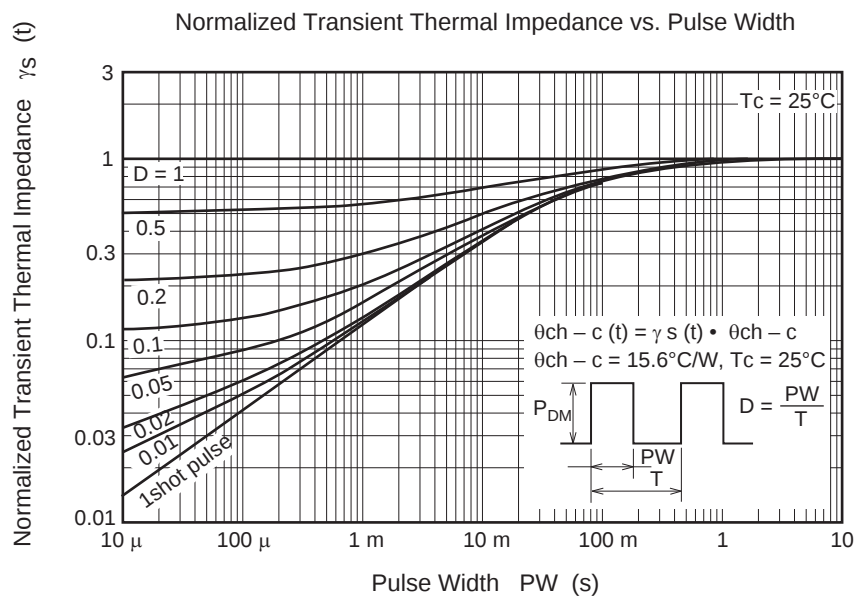
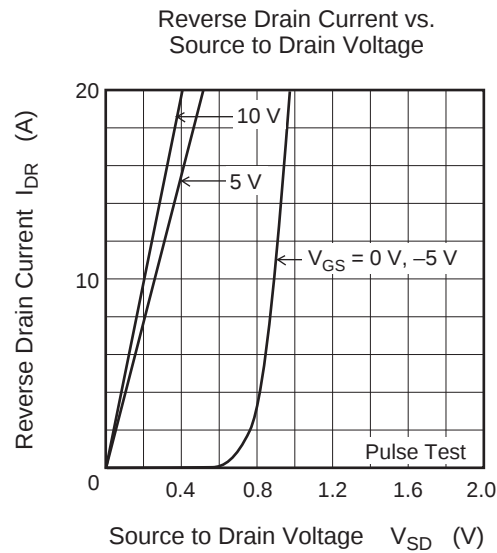


Dynamic Input Characteristics

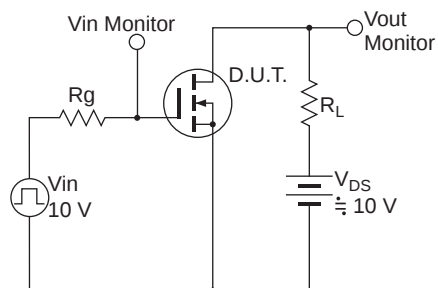


Switching Characteristics

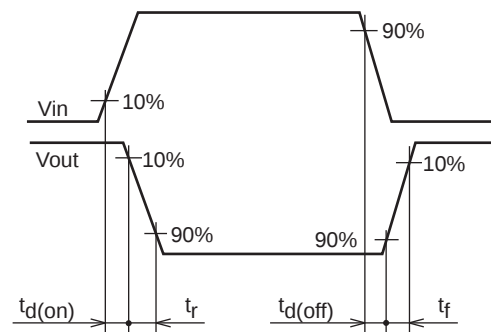




Switching Time Test Circuit

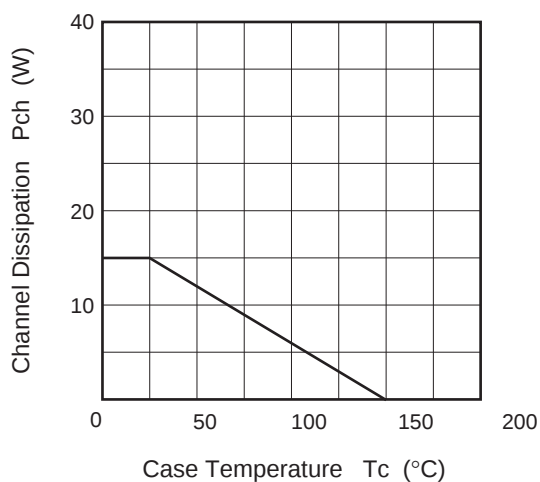


Switching Time Waveform

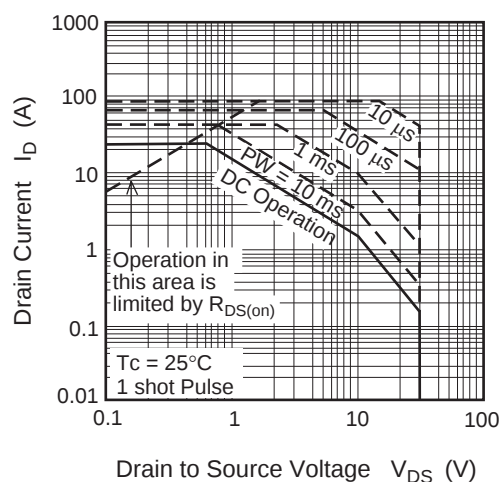


# • MOS2 & Schottky Barrier Diode

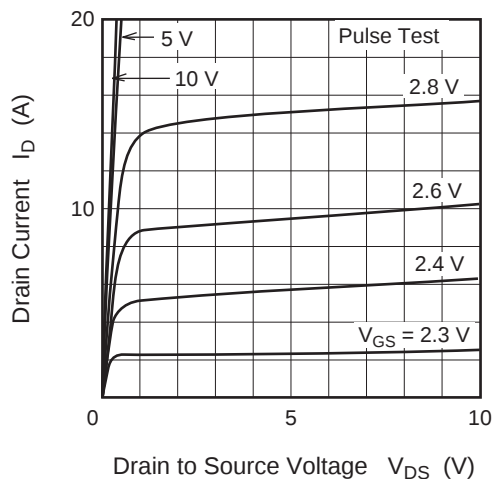
Power vs. Temperature Derating



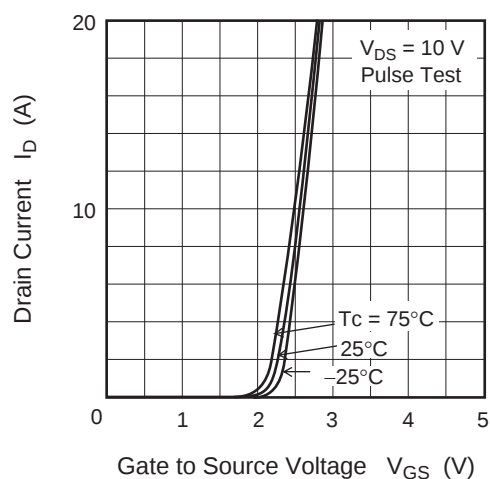
Maximum Safe Operation Area



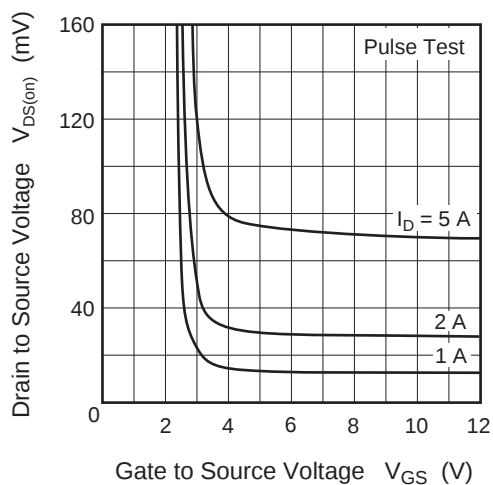
Typical Output Characteristics



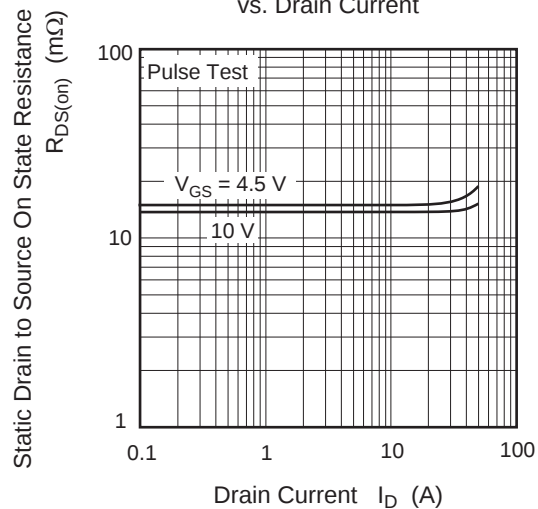
Typical Transfer Characteristics



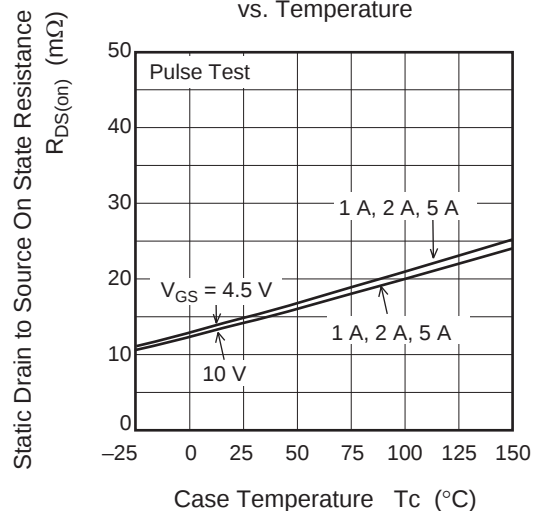
Drain to Source Saturation Voltage vs Gate to Source Voltage



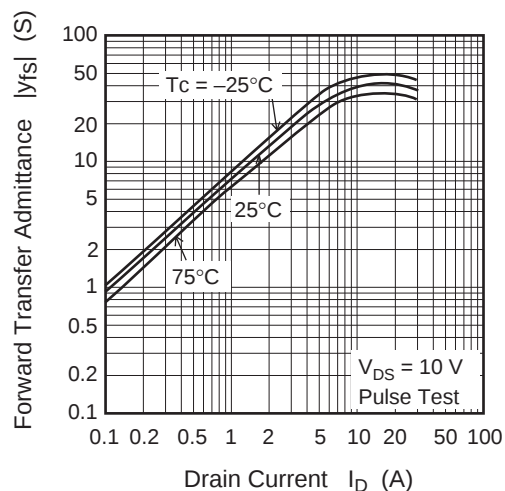
Static Drain to Source On State Resistance vs. Drain Current



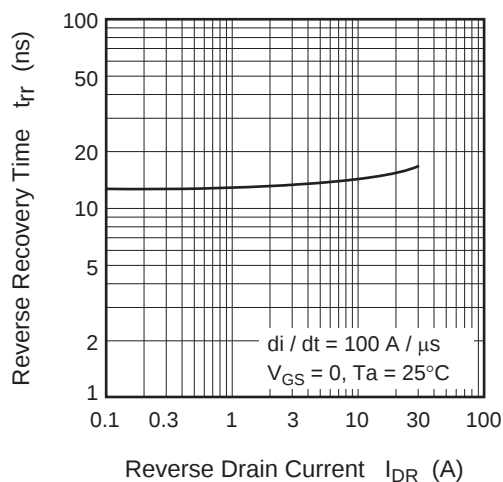
Static Drain to Source On State Resistance vs. Temperature



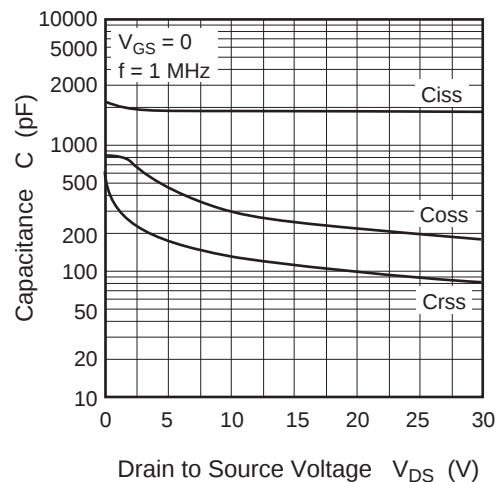
Forward Transfer Admittance vs. Drain Current



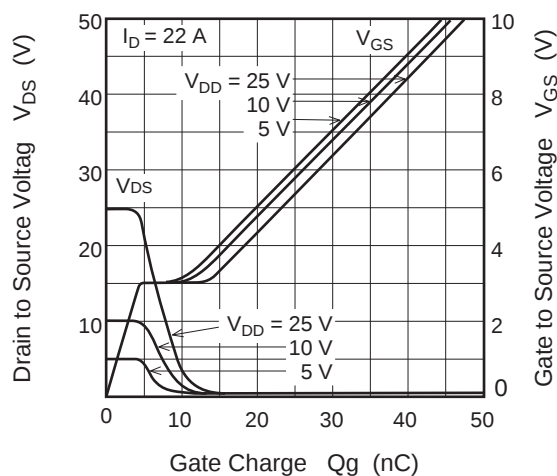
Body-Drain Diode Reverse Recovery Time



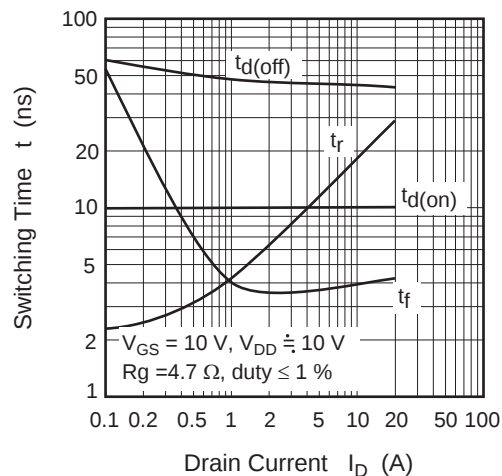
Typical Capacitance vs. Drain to Source Voltage

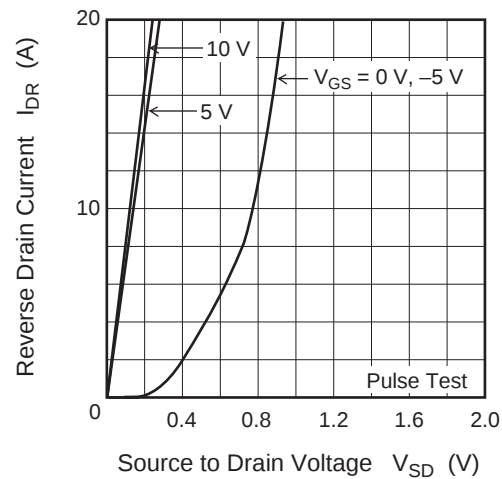


Dynamic Input Characteristics

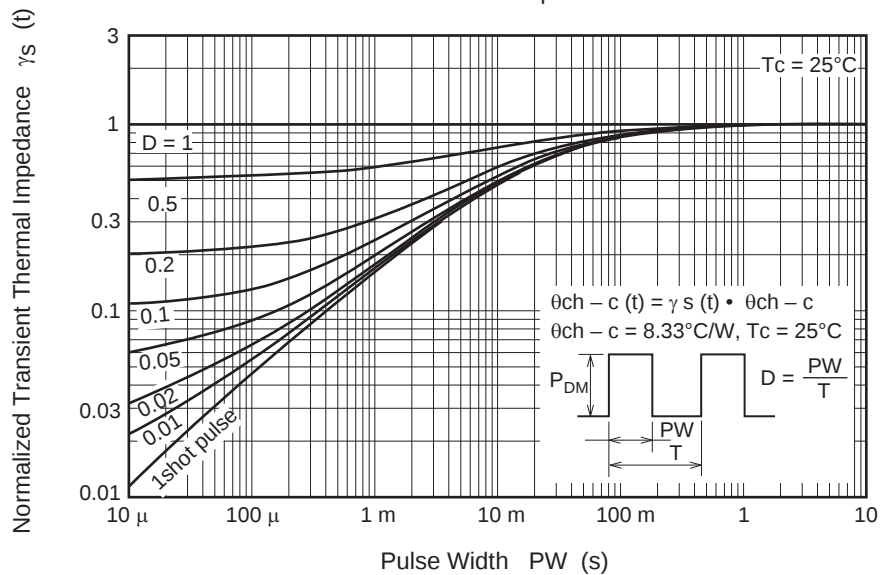


Switching Characteristics

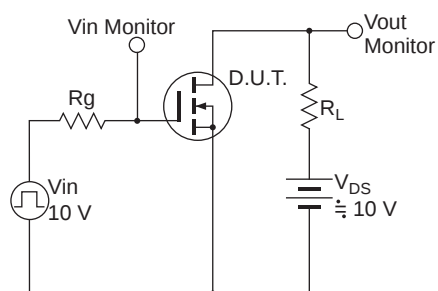


Reverse Drain Current vs.  
Source to Drain Voltage

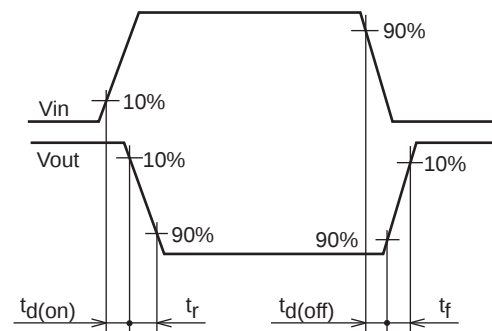
Normalized Transient Thermal Impedance vs. Pulse Width



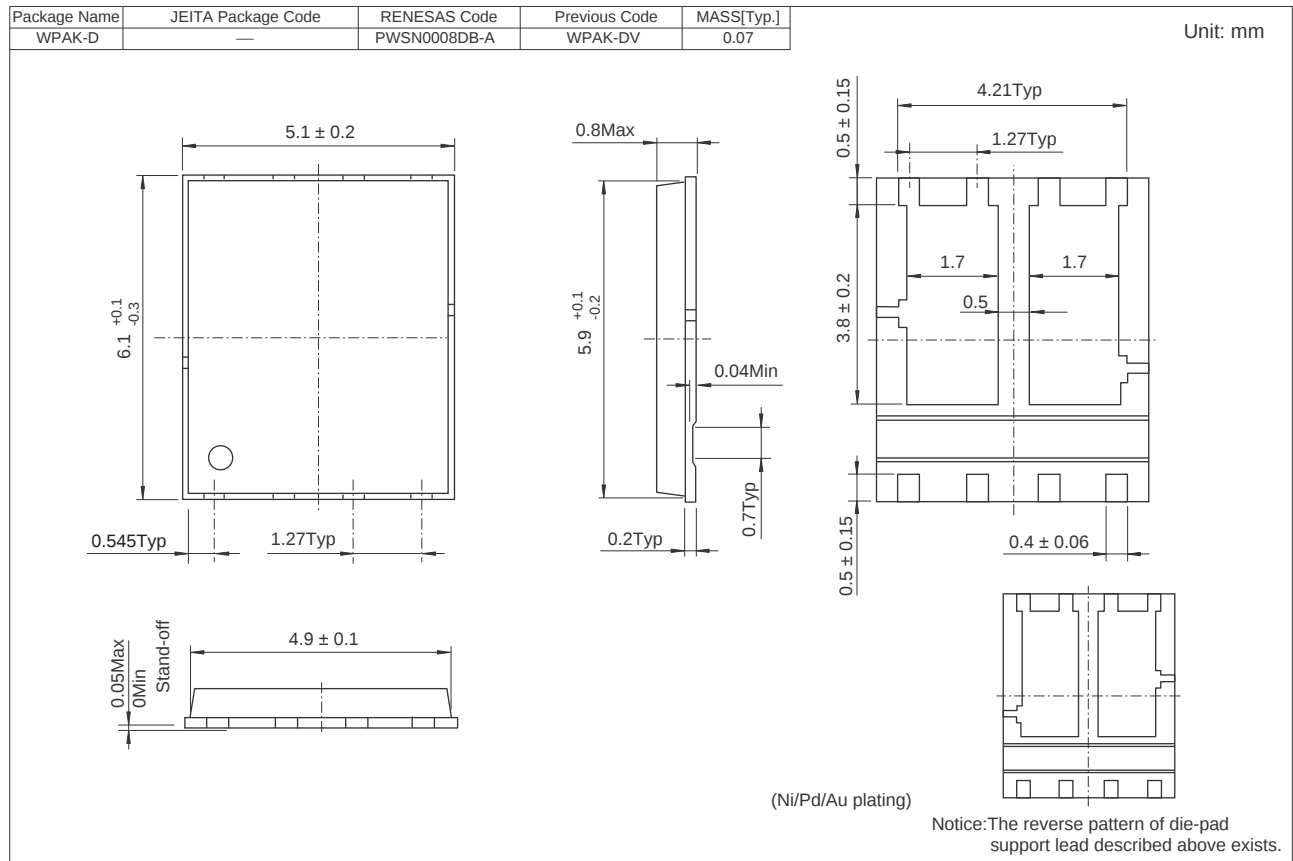
Switching Time Test Circuit



Switching Time Waveform



## Package Dimensions



## Ordering Information

| Part Name      | Quantity | Shipping Container |
|----------------|----------|--------------------|
| HAT2285WP-EL-E | 2500 pcs | Taping             |

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