

RJK0389DPA

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

REJ03G1722-0410

Rev.4.10

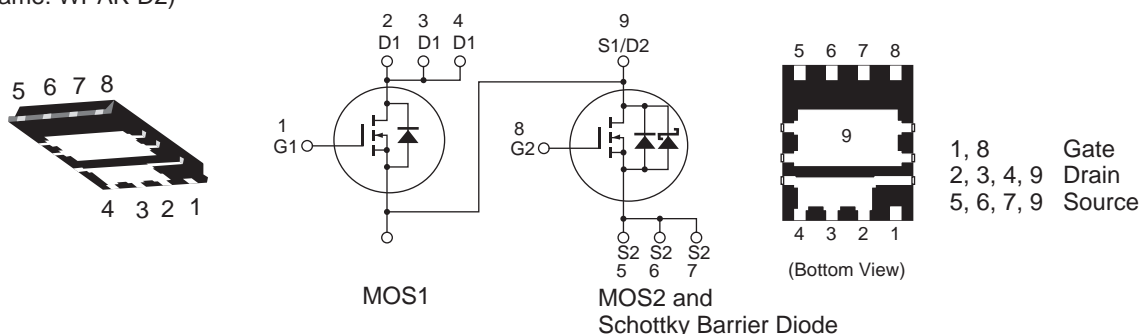
May 13, 2010

Features

- Low on-resistance
- Capable of 4.5 V gate drive
- High density mounting
- Pb-free
- Halogen-free

Outline

RENESAS Package code: PWSN0008DD-A
(Package name: WPAK-D2)



Absolute Maximum Ratings

(Ta = 25°C)

| Item | Symbol | Ratings | | Unit |
|-------------------------|----------------------------------|-------------|-------------|------|
| | | MOS1 | MOS2 | |
| Drain to source voltage | V_{DSS} | 30 | 30 | V |
| Gate to source voltage | V_{GSS} | ± 20 | ± 20 | V |
| Drain current | I_D | 15 | 20 | A |
| Drain peak current | $I_{D(pulse)}$ ^{Note 1} | 60 | 80 | A |
| Reverse drain current | I_{DR} | 15 | 20 | A |
| Avalanche current | I_{AP} ^{Note 2} | 8 | 11 | A |
| Avalanche energy | E_{AR} ^{Note 2} | 6.4 | 12.1 | mJ |
| Channel dissipation | P_{ch} ^{Note 3} | 10 | 10 | 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. Value at $T_{ch} = 25^\circ C$, $R_g \geq 50 \Omega$

3. $T_c = 25^\circ C$

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} | — | — | ± 0.1 | μA | $V_{GS} = \pm 20 \text{ V}, V_{DS} = 0$ |
| Zero gate voltage drain current | I_{DSS} | — | — | 1 | μA | $V_{DS} = 30 \text{ V}, V_{GS} = 0$ |
| Gate to source cutoff voltage | $V_{GS(off)}$ | 1.2 | — | 2.5 | V | $V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$ |
| Static drain to source on state resistance | $R_{DS(on)}$ | — | 8.2 | 10.7 | $\text{m}\Omega$ | $I_D = 7.5 \text{ A}, V_{GS} = 10 \text{ V}$ ^{Note4} |
| | $R_{DS(on)}$ | — | 11.8 | 16.5 | $\text{m}\Omega$ | $I_D = 7.5 \text{ A}, V_{GS} = 4.5 \text{ V}$ ^{Note4} |
| Forward transfer admittance | $ y_{fs} $ | — | 32 | — | S | $I_D = 7.5 \text{ A}, V_{DS} = 10 \text{ V}$ ^{Note4} |
| Input capacitance | C_{iss} | — | 860 | — | pF | $V_{DS} = 10 \text{ V}$ |
| Output capacitance | C_{oss} | — | 165 | — | pF | $V_{GS} = 0$ |
| Reverse transfer capacitance | C_{rss} | — | 53 | — | pF | $f = 1 \text{ MHz}$ |
| Gate Resistance | R_g | — | 4.2 | — | Ω | |
| Total gate charge | Q_g | — | 6.3 | — | nC | $V_{DD} = 10 \text{ V}$ |
| Gate to source charge | Q_{gs} | — | 2.3 | — | nC | $V_{GS} = 4.5 \text{ V}$ |
| Gate to drain charge | Q_{gd} | — | 1.4 | — | nC | $I_D = 15 \text{ A}$ |
| Turn-on delay time | $t_{d(on)}$ | — | 6.9 | — | ns | $V_{GS} = 10 \text{ V}, I_D = 7.5 \text{ A}$ |
| Rise time | t_r | — | 4.1 | — | ns | $V_{DD} \cong 10 \text{ V}$ |
| Turn-off delay time | $t_{d(off)}$ | — | 40.8 | — | ns | $R_L = 1.33 \Omega$ |
| Fall time | t_f | — | 5.6 | — | ns | $R_g = 4.7 \Omega$ |
| Body-drain diode forward voltage | V_{DF} | — | 0.84 | 1.10 | V | $I_F = 15 \text{ A}, V_{GS} = 0$ ^{Note4} |
| Body-drain diode reverse recovery time | t_{rr} | — | 20 | — | ns | $I_F = 15 \text{ A}, V_{GS} = 0$ $di_F/dt = 100 \text{ A}/\mu\text{s}$ |

Notes: 4. Pulse test

• MOS2

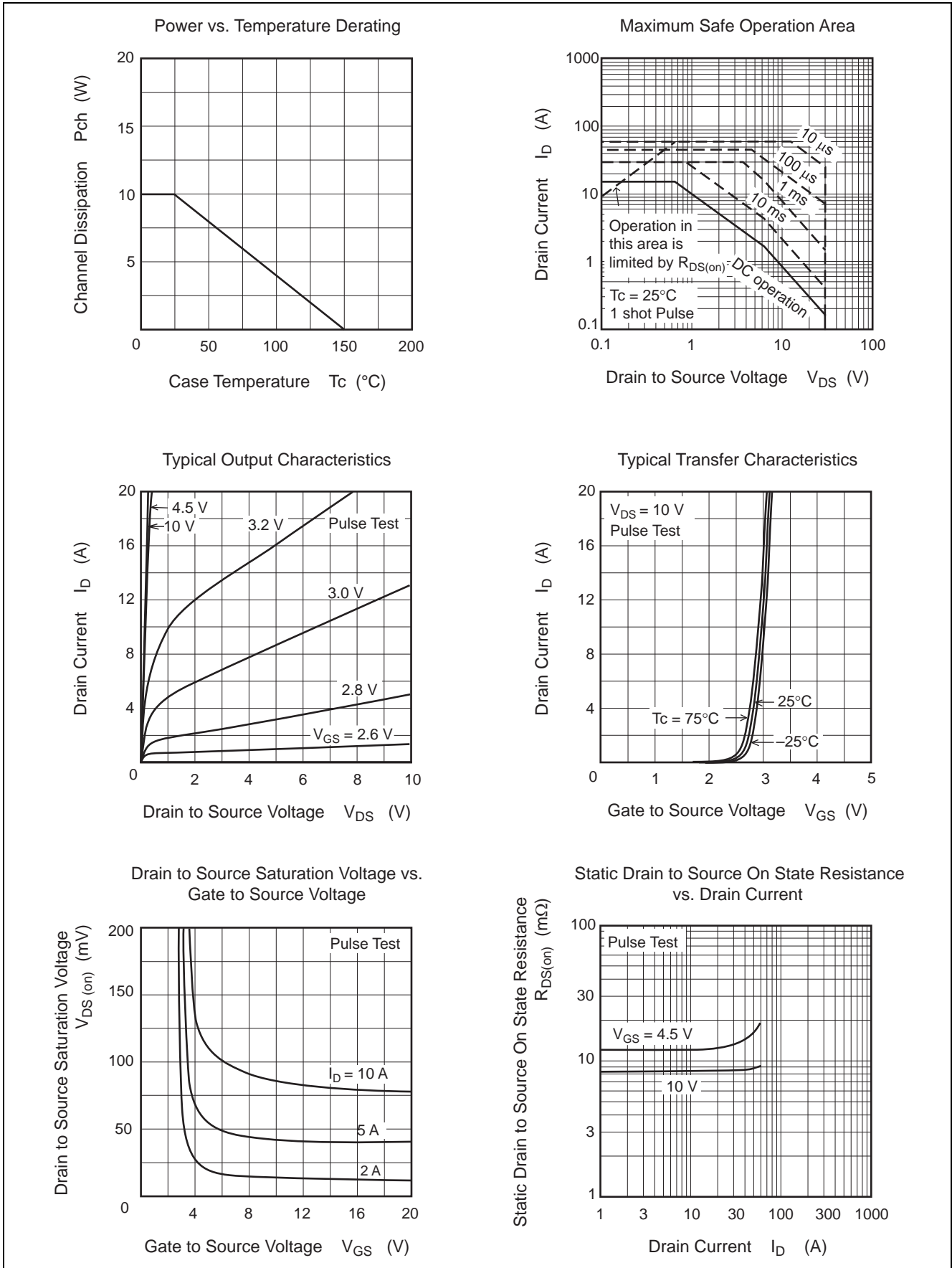
(Ta = 25°C)

| 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} | — | — | ± 0.1 | μA | $V_{GS} = \pm 20 \text{ V}, V_{DS} = 0$ |
| Zero gate voltage drain current | I_{DSS} | — | — | 1 | mA | $V_{DS} = 30 \text{ V}, V_{GS} = 0$ |
| Gate to source cutoff voltage | $V_{GS(off)}$ | 1.2 | — | 2.5 | V | $V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$ |
| Static drain to source on state resistance | $R_{DS(on)}$ | — | 6.8 | 8.9 | m Ω | $I_D = 10 \text{ A}, V_{GS} = 10 \text{ V}$ ^{Note4} |
| | $R_{DS(on)}$ | — | 10.5 | 14.7 | m Ω | $I_D = 10 \text{ A}, V_{GS} = 4.5 \text{ V}$ ^{Note4} |
| Forward transfer admittance | $ y_{fs} $ | — | 38 | — | S | $I_D = 10 \text{ A}, V_{DS} = 10 \text{ V}$ ^{Note4} |
| Input capacitance | C_{iss} | — | 1000 | — | pF | $V_{DS} = 10 \text{ V}$ |
| Output capacitance | C_{oss} | — | 240 | — | pF | $V_{GS} = 0$ |
| Reverse transfer capacitance | C_{rss} | — | 100 | — | pF | $f = 1 \text{ MHz}$ |
| Gate Resistance | R_g | — | 4.5 | — | Ω | |
| Total gate charge | Q_g | — | 7.2 | — | nC | $V_{DD} = 10 \text{ V}$ |
| Gate to source charge | Q_{gs} | — | 2.9 | — | nC | $V_{GS} = 4.5 \text{ V}$ |
| Gate to drain charge | Q_{gd} | — | 2.2 | — | nC | $I_D = 20 \text{ A}$ |
| Turn-on delay time | $t_{d(on)}$ | — | 8.5 | — | ns | $V_{GS} = 10 \text{ V}, I_D = 10 \text{ A}$ |
| Rise time | t_r | — | 4.0 | — | ns | $V_{DD} \cong 10 \text{ V}$ |
| Turn-off delay time | $t_{d(off)}$ | — | 39 | — | ns | $R_L = 1.0 \Omega$ |
| Fall time | t_f | — | 6.6 | — | ns | $R_g = 4.7 \Omega$ |
| Schottky Barrier diode forward voltage | V_F | — | 0.44 | — | V | $I_F = 2 \text{ A}, V_{GS} = 0$ ^{Note4} |
| Body-drain diode reverse recovery time | t_{rr} | — | 12 | — | ns | $I_F = 20 \text{ A}, V_{GS} = 0$ $di_F/dt = 100 \text{ A}/\mu\text{s}$ |

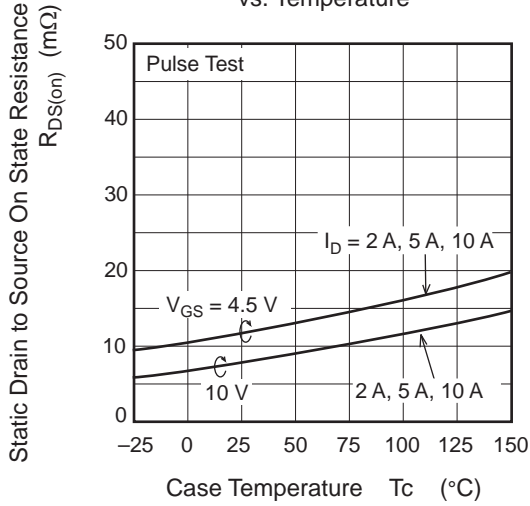
Notes: 4. Pulse test

Main Characteristics

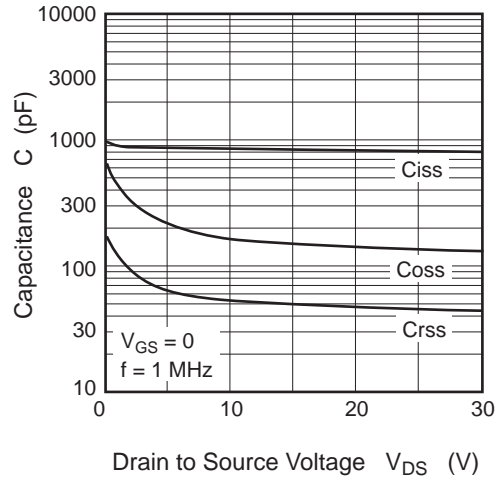
• MOS1



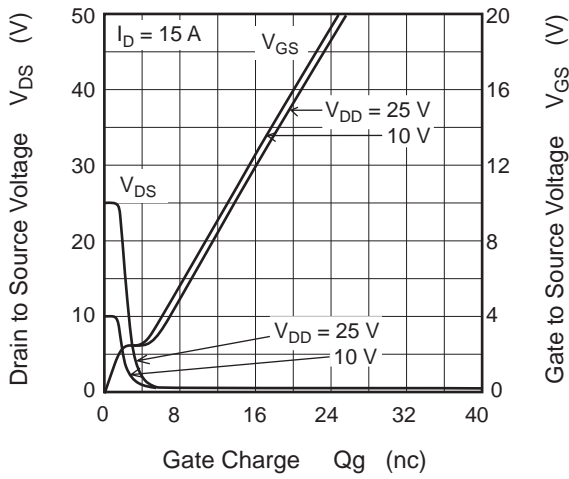
Static Drain to Source On State Resistance vs. Temperature



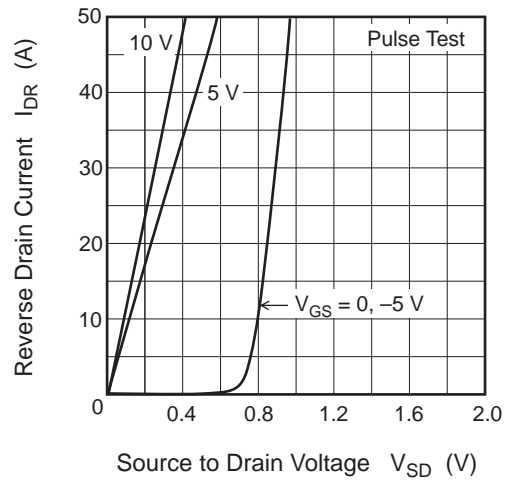
Typical Capacitance vs. Drain to Source Voltage



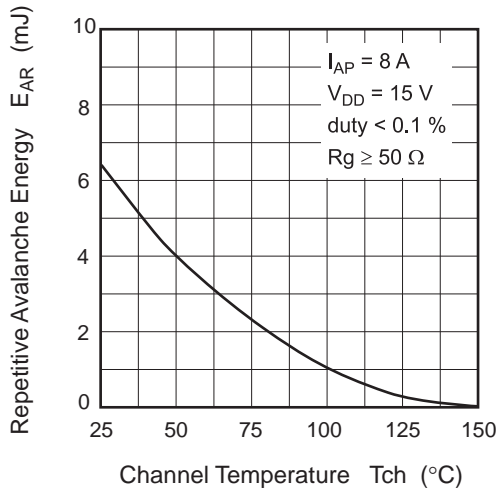
Dynamic Input Characteristics

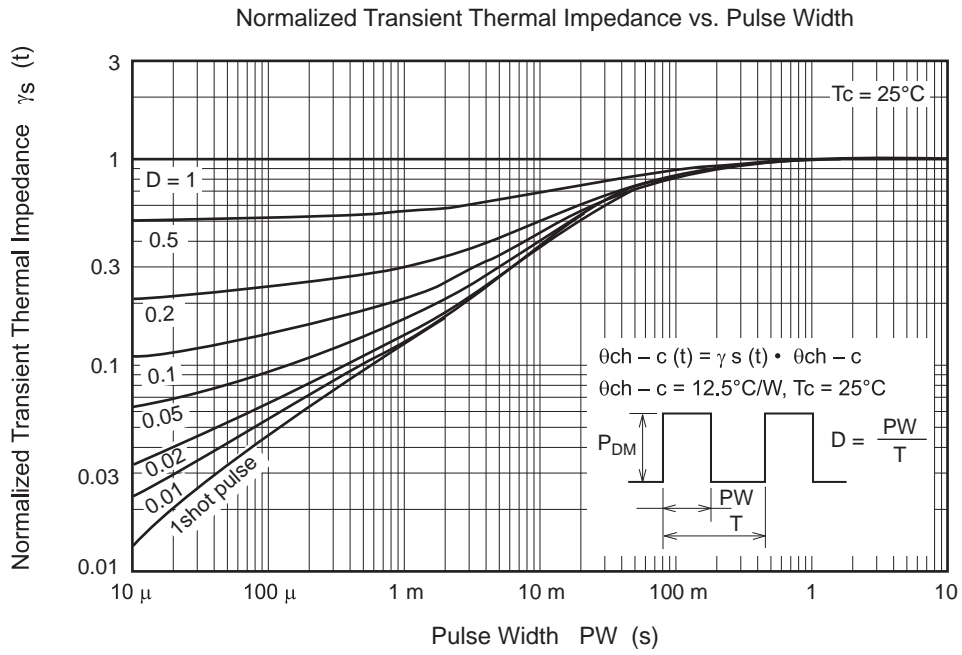


Reverse Drain Current vs. Source to Drain Voltage

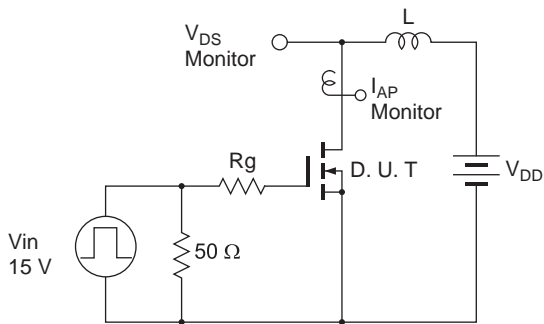


Maximum Avalanche Energy vs. Channel Temperature Derating

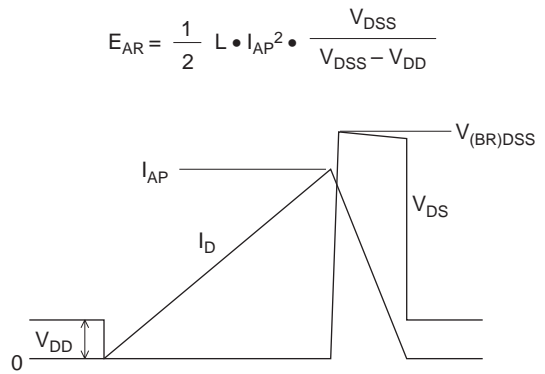




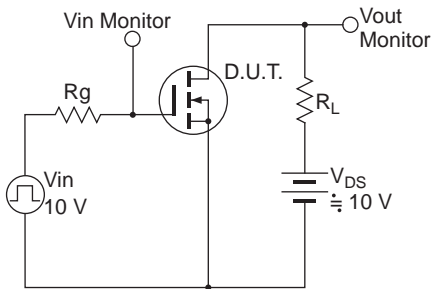
Avalanche Test Circuit



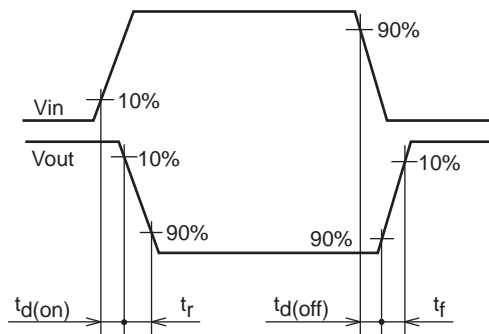
Avalanche Waveform



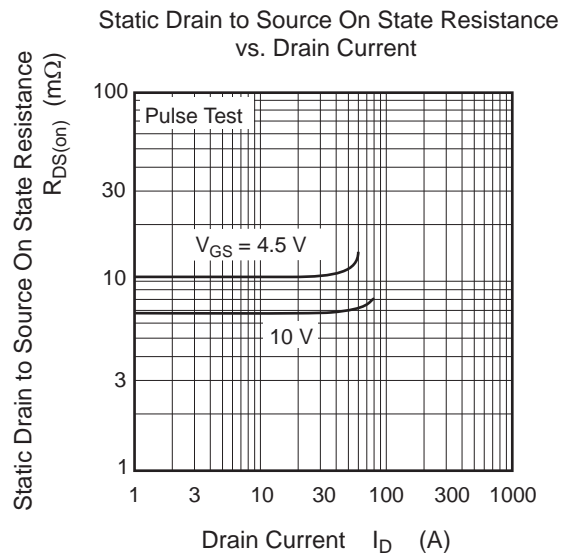
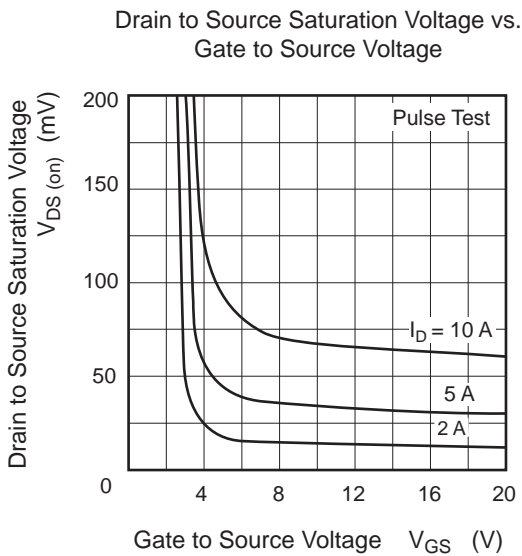
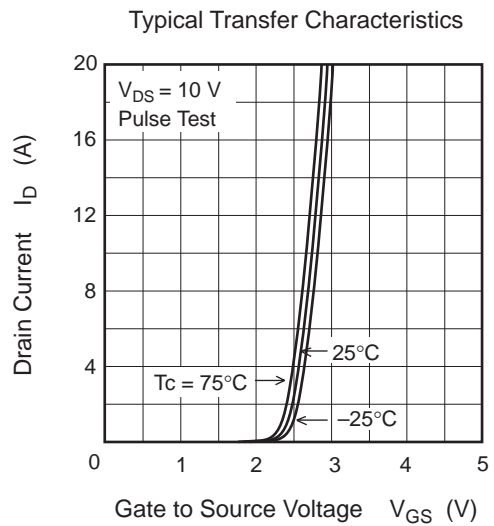
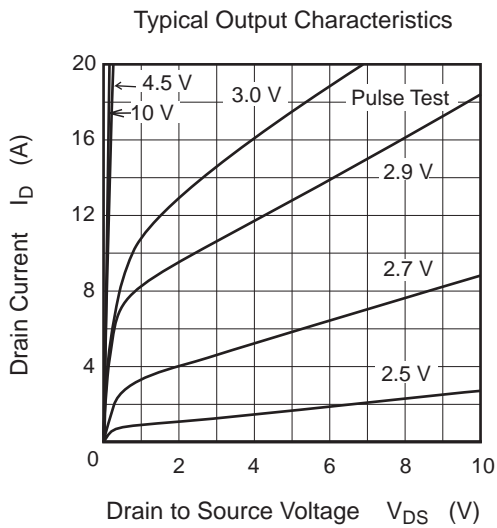
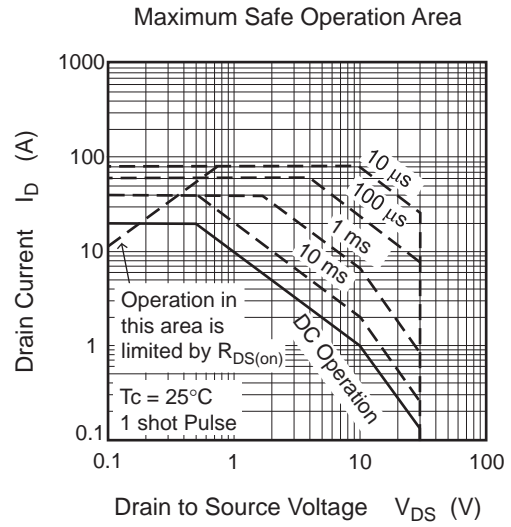
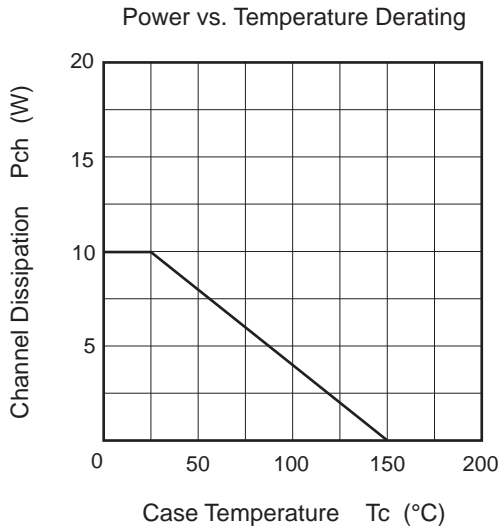
Switching Time Test Circuit



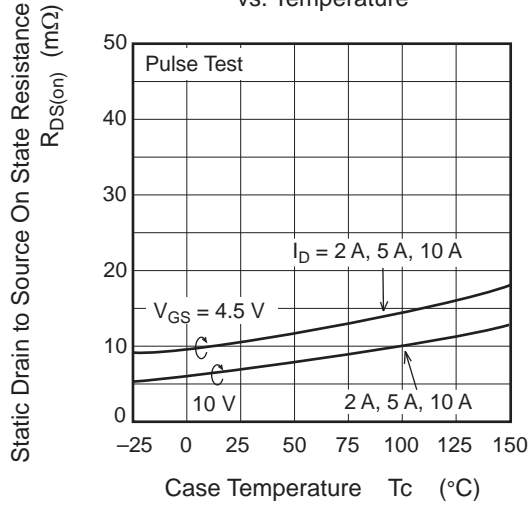
Switching Time Waveform



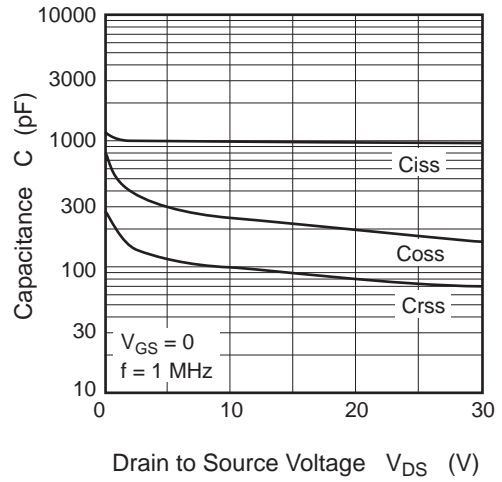
• MOS2 and Schottky Barrier Diode



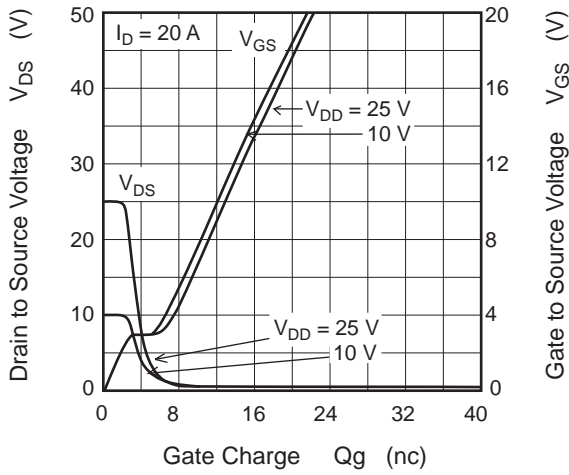
Static Drain to Source On State Resistance vs. Temperature



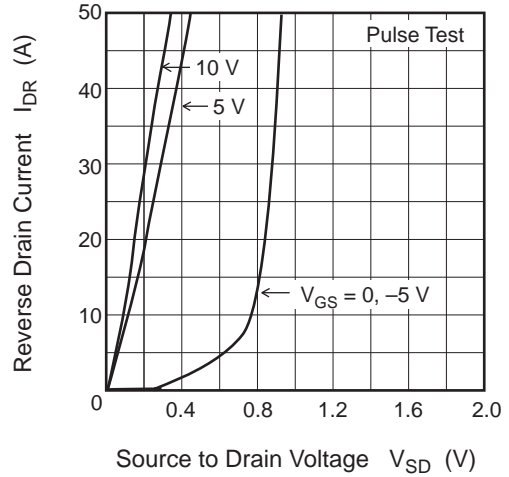
Typical Capacitance vs. Drain to Source Voltage



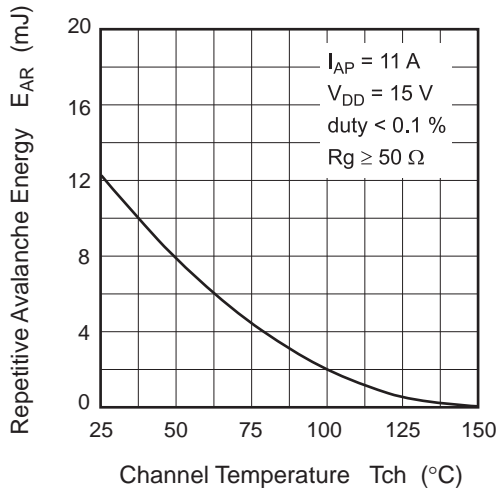
Dynamic Input Characteristics

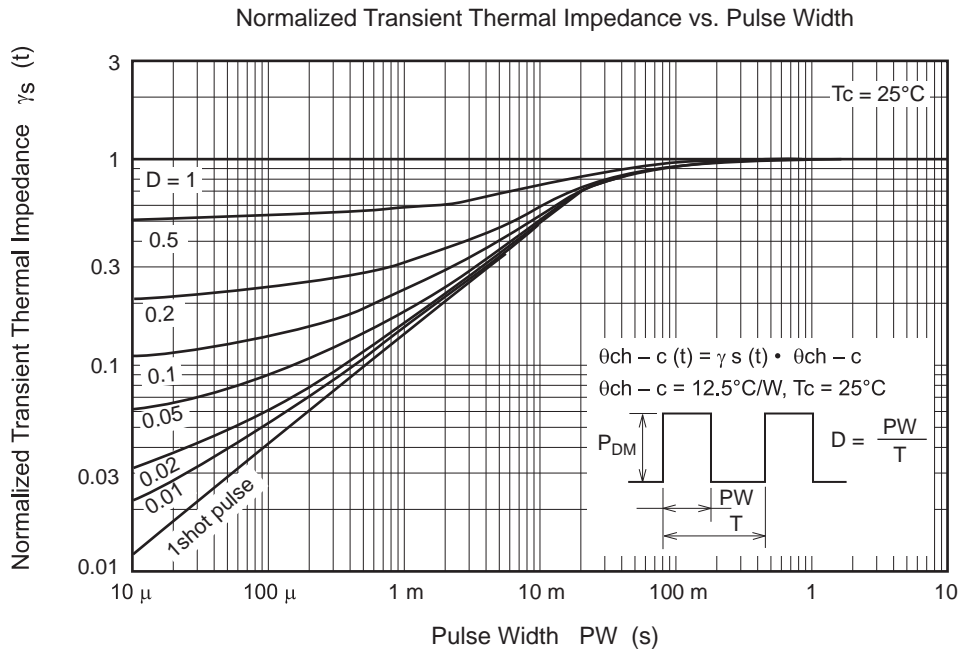


Reverse Drain Current vs. Source to Drain Voltage

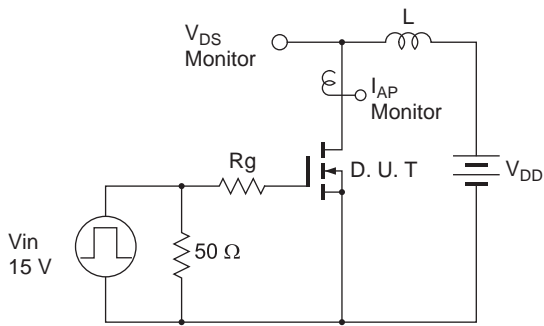


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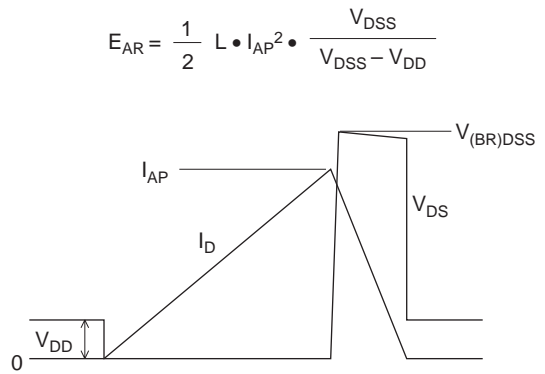




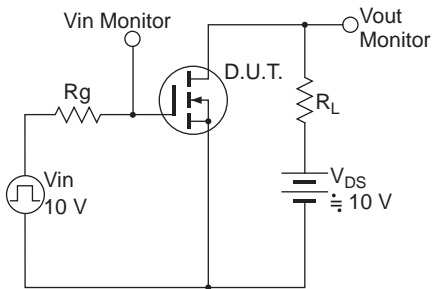
Avalanche Test Circuit



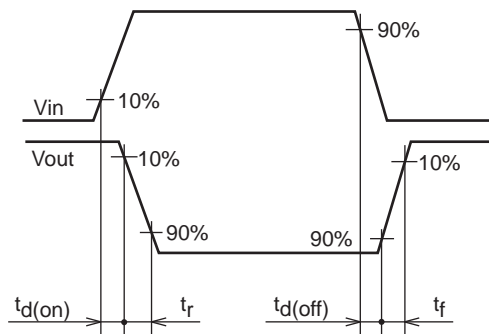
Avalanche Waveform



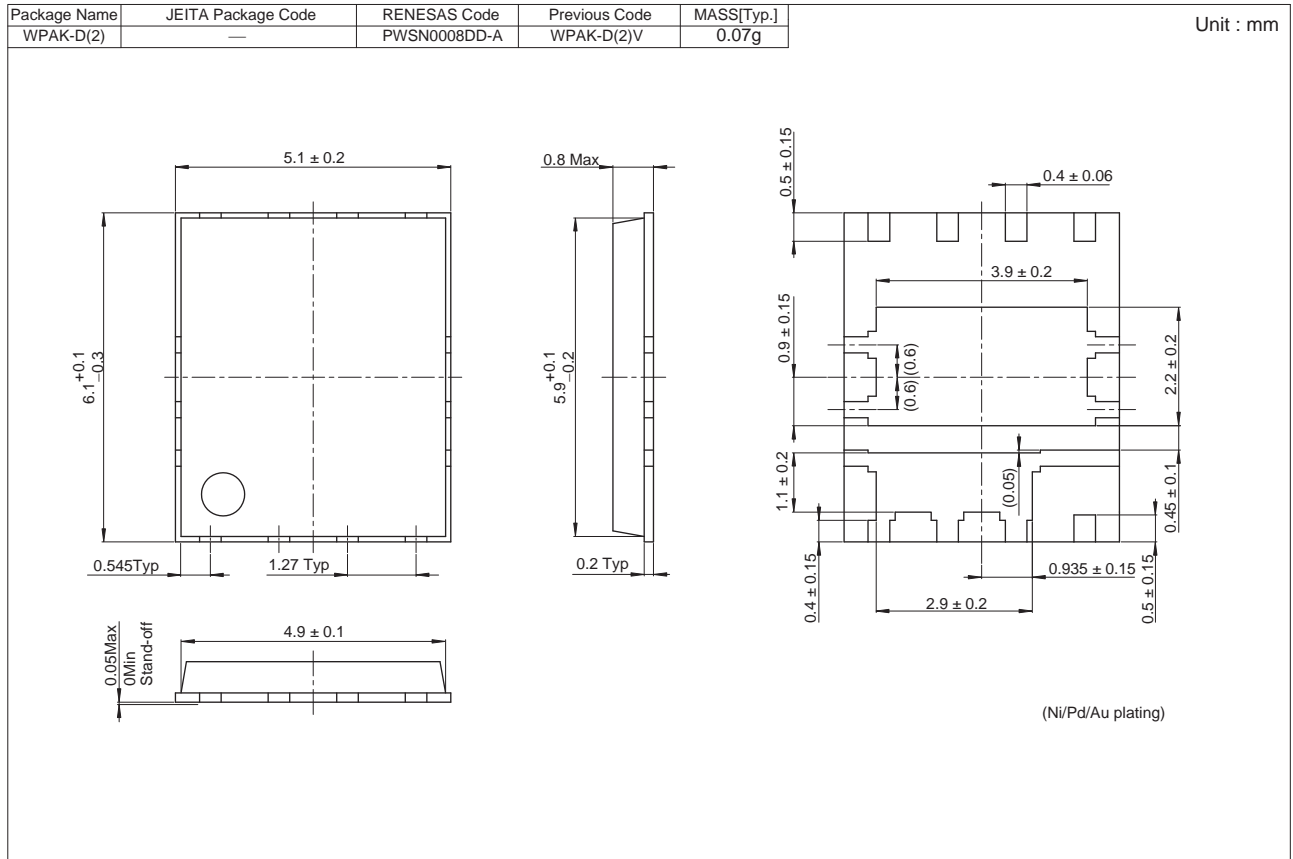
Switching Time Test Circuit



Switching Time Waveform



Package Dimensions



Ordering Information

| Part No. | Quantity | Shipping Container |
|-------------------|----------|--------------------|
| RJK0389DPA-00-J53 | 3000 pcs | Taping |

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