

# RJK0381DPA

30V, 40A, 4.5mΩ max.

Built in SBD N Channel Power MOS FET

High Speed Power Switching

R07DS0939EJ0400

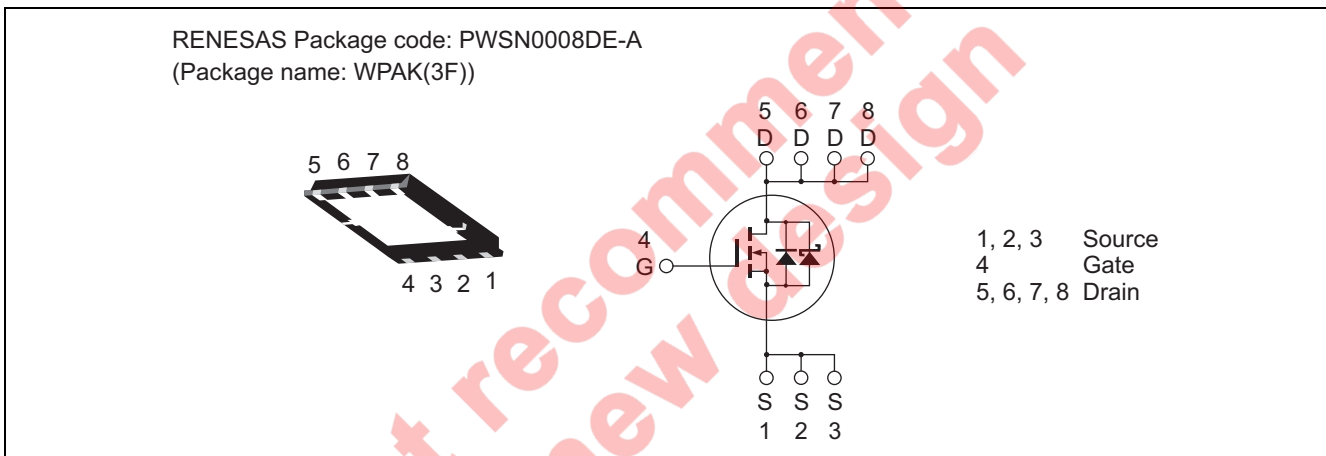
Rev.4.00

Mar 21, 2013

## Features

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

## Outline



## Absolute Maximum Ratings

(Ta = 25°C)

| Item                                   | Symbol                                  | Ratings     | Unit |
|--|---|-------------|------|
| Drain to source voltage                | V <sub>DSS</sub>                        | 30          | V    |
| Gate to source voltage                 | V <sub>GSS</sub>                        | ±20         | V    |
| Drain current                          | I <sub>D</sub>                          | 40          | A    |
| Drain peak current                     | I <sub>D(pulse)</sub> <sup>Note 1</sup> | 160         | A    |
| Body-drain diode reverse drain current | I <sub>DR</sub>                         | 40          | A    |
| Avalanche current                      | I <sub>AP</sub> <sup>Note 2</sup>       | 17          | A    |
| Avalanche energy                       | E <sub>AR</sub> <sup>Note 2</sup>       | 28.9        | mJ   |
| Channel dissipation                    | P <sub>ch</sub> <sup>Note 3</sup>       | 45          | W    |
| Channel to Case Thermal Resistance     | θ <sub>ch-C</sub>                       | 2.78        | °C/W |
| Channel temperature                    | T <sub>ch</sub>                         | 150         | °C   |
| Storage temperature                    | T <sub>stg</sub>                        | -55 to +150 | °C   |

- Notes: 1. PW ≤ 10 μs, duty cycle ≤ 1%  
 2. Value at T<sub>ch</sub> = 25°C, R<sub>g</sub> ≥ 50 Ω  
 3. T<sub>c</sub> = 25°C

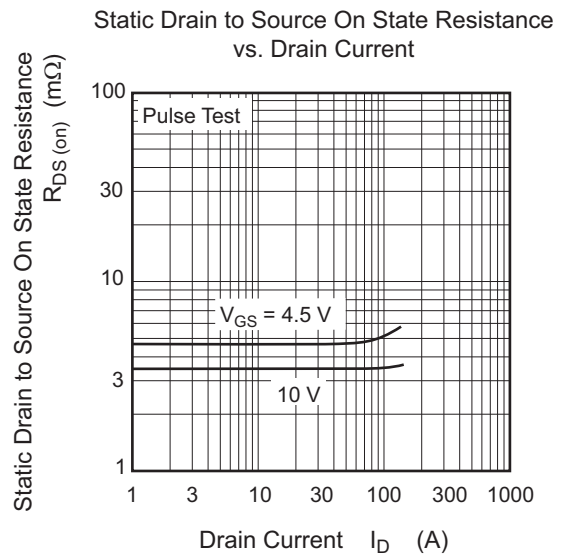
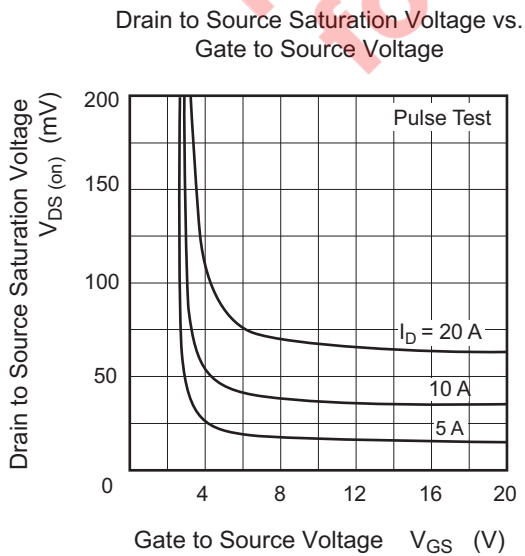
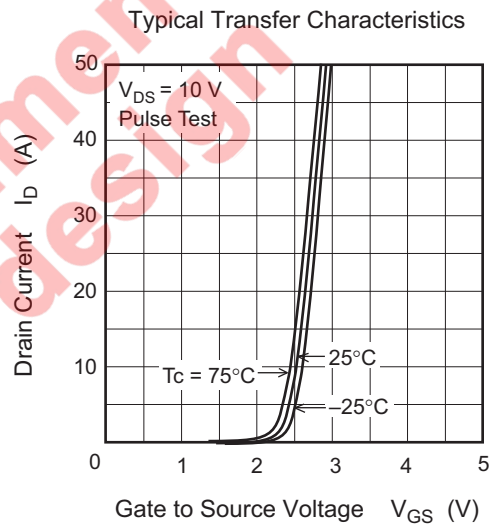
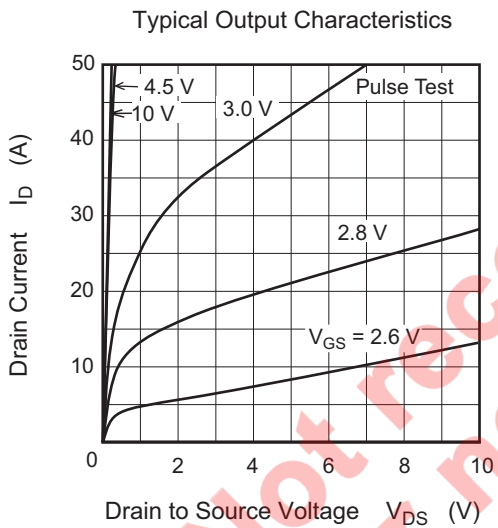
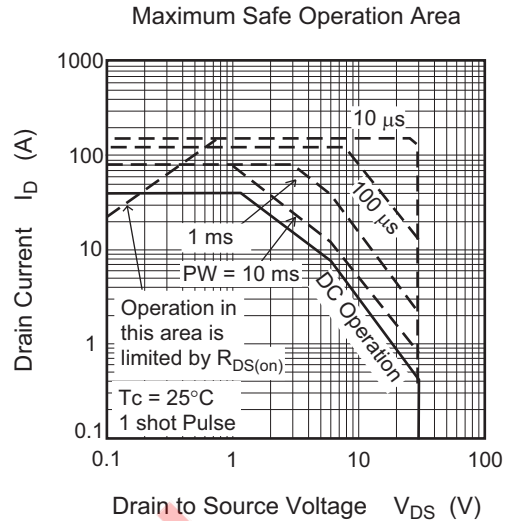
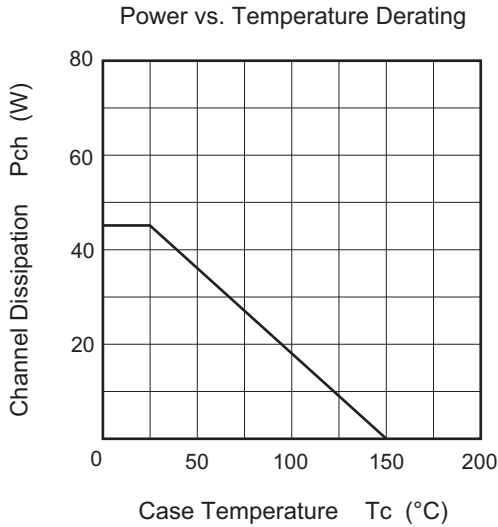
## Electrical Characteristics

(Ta = 25°C)

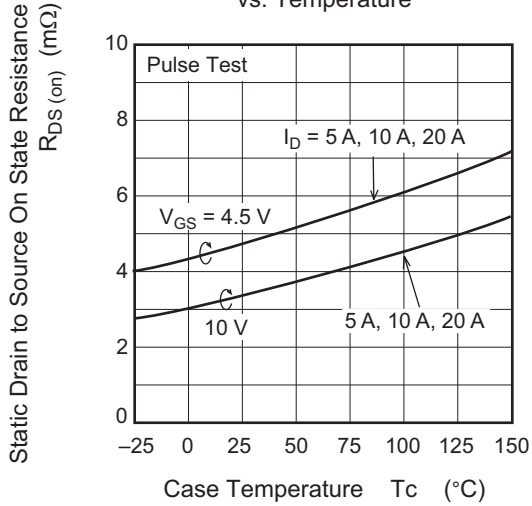
| Item                                       | Symbol        | Min | Typ  | Max       | Unit             | Test Conditions  |
|--|---------------|-----|------|-----------|------------------|--|
| Drain to source breakdown voltage          | $V_{(BR)DSS}$ | 30  | —    | —         | V                | $I_D = 10 \text{ mA}$ , $V_{GS} = 0$   |
| 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         | m A              | $V_{DS} = 30 \text{ V}$ , $V_{GS} = 0$   |
| 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 | $R_{DS(on)}$  | —   | 3.4  | 4.5       | $\text{m}\Omega$ | $I_D = 20 \text{ A}$ , $V_{GS} = 10 \text{ V}$ <sup>Note4</sup>  |
|  | $R_{DS(on)}$  | —   | 4.7  | 6.6       | $\text{m}\Omega$ | $I_D = 20 \text{ A}$ , $V_{GS} = 4.5 \text{ V}$ <sup>Note4</sup>   |
| Forward transfer admittance                | $ y_{fs} $    | —   | 78   | —         | S                | $I_D = 20 \text{ A}$ , $V_{DS} = 10 \text{ V}$ <sup>Note4</sup>  |
| Input capacitance                          | $C_{iss}$     | —   | 2200 | —         | pF               | $V_{DS} = 10 \text{ V}$ , $V_{GS} = 0$ ,<br>$f = 1 \text{ MHz}$  |
| Output capacitance                         | $C_{oss}$     | —   | 490  | —         | pF               |  |
| Reverse transfer capacitance               | $C_{rss}$     | —   | 225  | —         | pF               |  |
| Gate Resistance                            | $R_g$         | —   | 2.3  | —         | $\Omega$         |  |
| Total gate charge                          | $Q_g$         | —   | 15   | —         | nC               | $V_{DD} = 10 \text{ V}$ , $V_{GS} = 4.5 \text{ V}$ ,<br>$I_D = 40 \text{ A}$   |
| Gate to source charge                      | $Q_{gs}$      | —   | 6.2  | —         | nC               |  |
| Gate to drain charge                       | $Q_{gd}$      | —   | 4.3  | —         | nC               |  |
| Turn-on delay time                         | $t_{d(on)}$   | —   | 11   | —         | ns               | $V_{GS} = 10 \text{ V}$ , $I_D = 20 \text{ A}$ ,<br>$V_{DD} \cong 10 \text{ V}$ , $R_L = 0.5 \Omega$ ,<br>$R_g = 4.7 \Omega$ |
| Rise time                                  | $t_r$         | —   | 15   | —         | ns               |  |
| Turn-off delay time                        | $t_{d(off)}$  | —   | 49   | —         | ns               |  |
| Fall time                                  | $t_f$         | —   | 10   | —         | ns               |  |
| Body–drain diode forward voltage           | $V_{DF}$      | —   | 0.40 | —         | V                | $I_F = 2 \text{ A}$ , $V_{GS} = 0$ <sup>Note4</sup>  |
| Body–drain diode reverse recovery time     | $t_{rr}$      | —   | 21   | —         | ns               | $I_F = 40 \text{ A}$ , $V_{GS} = 0$<br>$di_F/dt = 100 \text{ A}/\mu\text{s}$   |

Notes: 4. Pulse test

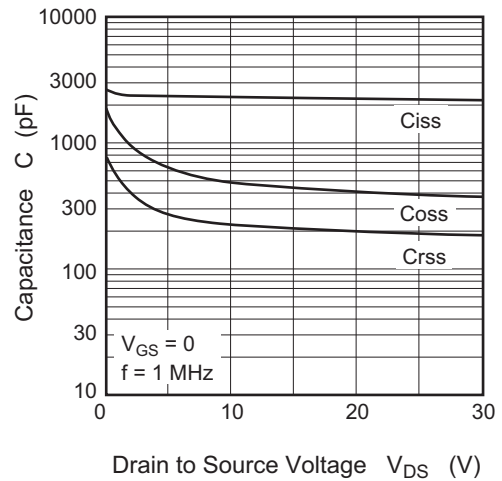
Main Characteristics



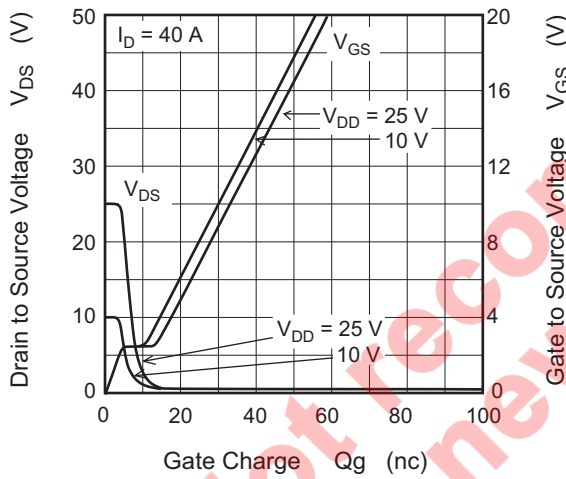
Static Drain to Source On State Resistance vs. Temperature



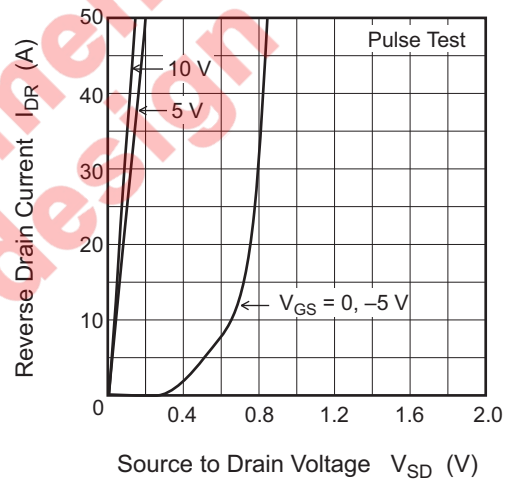
Typical Capacitance vs. Drain to Source Voltage



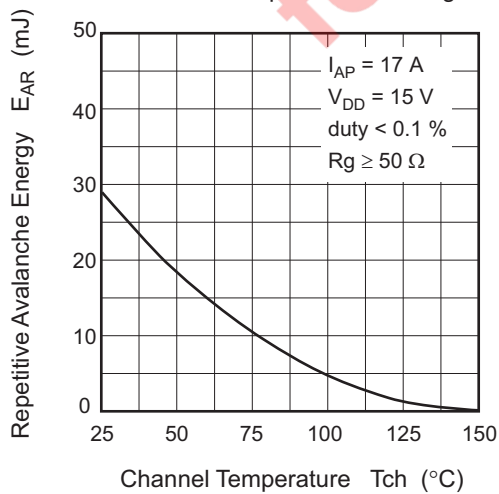
Dynamic Input Characteristics



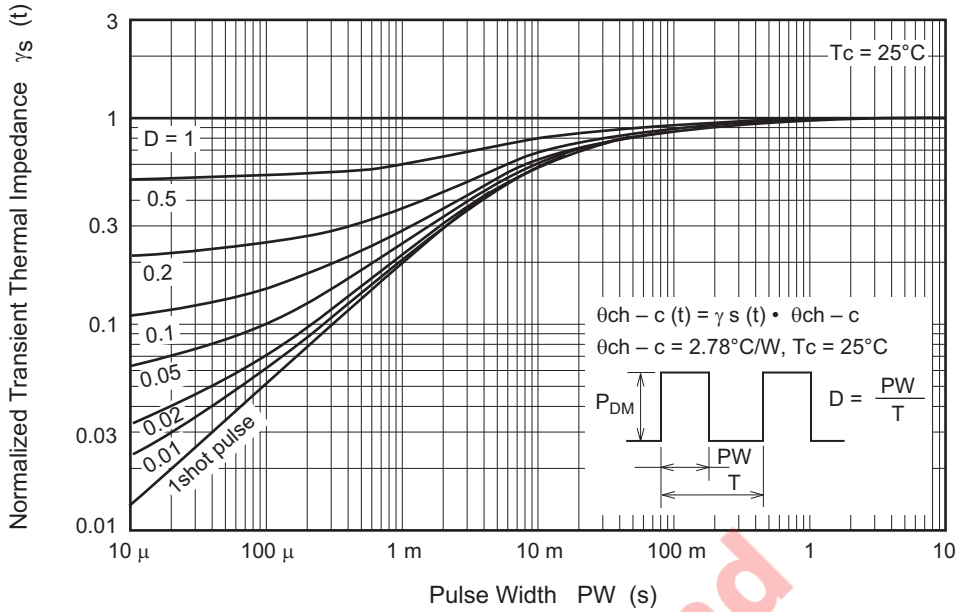
Reverse Drain Current vs. Source to Drain Voltage



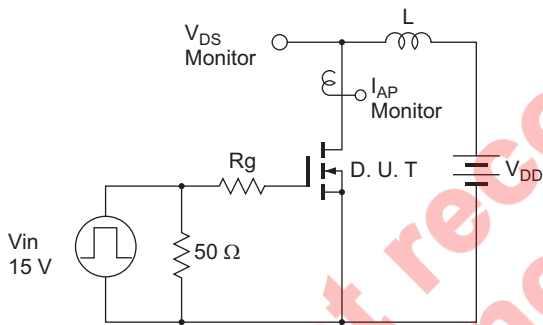
Maximum Avalanche Energy vs. Channel Temperature Derating



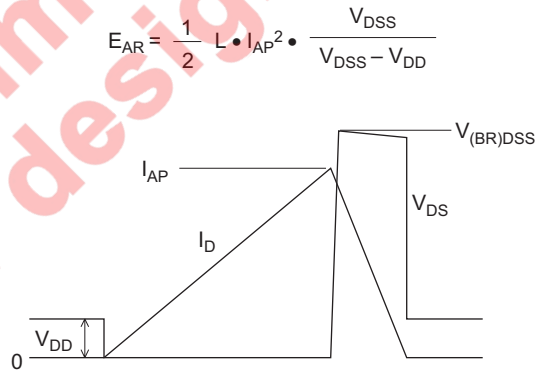
Normalized Transient Thermal Impedance vs. Pulse Width



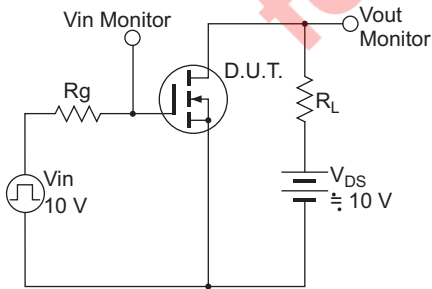
Avalanche Test Circuit



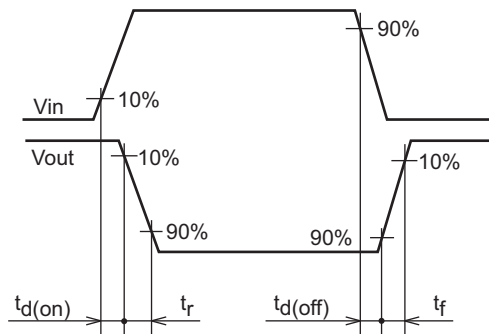
Avalanche Waveform



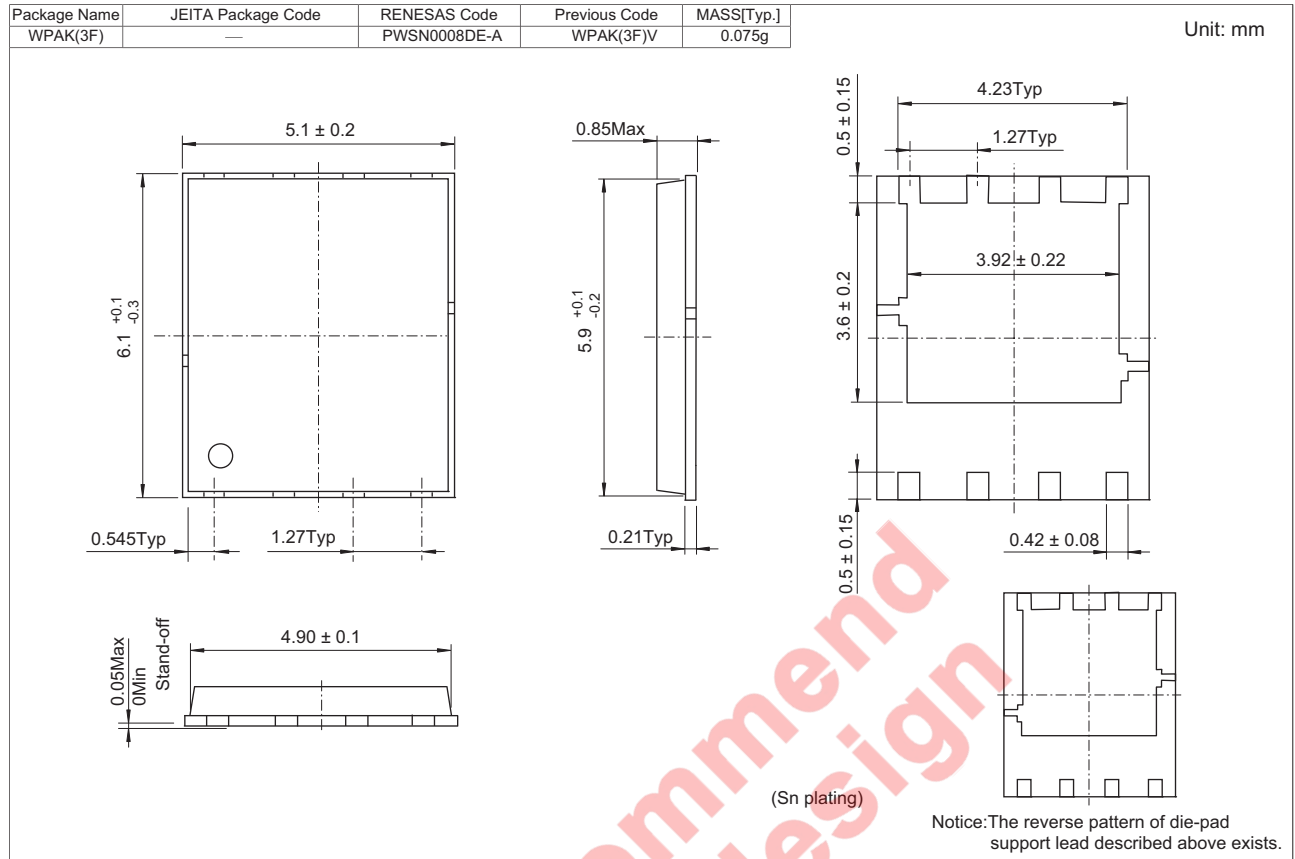
Switching Time Test Circuit



Switching Time Waveform



### Package Dimensions



### Ordering Information

| Orderable Part Number | Quantity | Shipping Container |
|-----------------------|----------|--------------------|
| RJK0381DPA-00-J5A     | 3000 pcs | Taping             |

Note: The symbol of 2nd "-" is occasionally presented as "#".

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