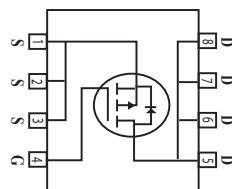


## Surface Mount P-Channel Enhancement Mode MOSFET

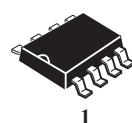
**(Pb)** Lead(Pb)-Free

### Features:

- \* Super high dense
- \* Cell design for low  $R_{DS(ON)}$
- \*  $R_{DS(ON)} < 130m\Omega @ V_{GS} = -4.5V$
- \*  $R_{DS(ON)} < 180m\Omega @ V_{GS} = -2.5V$
- \* Simple Drive Requirement
- \* Lower On-resistance
- \* Fast Switching



**DRAIN CURRENT**  
**-3.5 AMPERES**  
**DRAIN SOURCE VOLTAGE**  
**-20 VOLTAGE**



**SOP-8**

### Description:

The WTK9431 provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The SOP-8 package is universally preferred for all commercial-industrial surface mount applications and suited for low voltage applications such as DC/DC converters.

### Maximum Ratings ( $T_A = 25^\circ C$ Unless Otherwise Specified)

| Rating                                                                                                                        | Symbol          | Value        | Unite        |
|-------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------|--------------|
| Drain-Source Voltage                                                                                                          | $V_{DS}$        | -20          | V            |
| Gate-Source Voltage                                                                                                           | $V_{GS}$        | $\pm 8$      | V            |
| Continuous Drain Current <sup>(3)</sup><br><small>(<math>T_A = 25^\circ C</math>)<br/>(<math>T_A = 70^\circ C</math>)</small> | $I_D$           | -3.5<br>-2.8 | A            |
| Pulsed Drain Current <sup>(1,2)</sup>                                                                                         | $I_{DM}$        | -18          | A            |
| Power Dissipation                                                                                                             | $P_D$           | 2.5          | W            |
| Maximax Junction-to-Ambient                                                                                                   | $R_{\theta JA}$ | 50           | $^\circ C/W$ |
| Operating Junction Temperature Range                                                                                          | $T_J$           | +150         | $^\circ C$   |
| Storage Temperature Range                                                                                                     | $T_{stg}$       | -55 to +150  | $^\circ C$   |

### Device Marking

WTK9431=9431SC

**Electrical Characteristics** ( $T_A = 25^\circ\text{C}$  Unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

**Static**

|                                                                                                    |               |        |        |            |            |
|----------------------------------------------------------------------------------------------------|---------------|--------|--------|------------|------------|
| Drain-Source Breakdown Voltage<br>$V_{GS}=0V, I_D=-250\ \mu A$                                     | $V_{(BR)DSS}$ | -20    | -      | -          | V          |
| Gate-Source Threshold Voltage<br>$V_{DS}=V_{GS}, I_D=-250\ \mu A$                                  | $V_{GS(th)}$  | -0.4   | -      | -1.0       | V          |
| Gate-Source Leakage Current<br>$V_{DS}=0V, V_{GS}=\pm 8V$                                          | $I_{GSS}$     | -      | -      | $\pm 100$  | nA         |
| Zero Gate Voltage Drain Current<br>$V_{DS}=-16V, V_{GS}=0V$<br>$V_{DS}=-12V, V_{GS}=0V$            | $I_{DSS}$     | -      | -      | -1<br>-25  | $\mu A$    |
| Drain-Source On-Resistance <sup>(2)</sup><br>$V_{GS}=-10V, I_D=-5.3A$<br>$V_{GS}=-4.5V, I_D=-4.2A$ | $R_{DS(on)}$  | -<br>- | -<br>- | 130<br>180 | m $\Omega$ |
| Forward Transconductance <sup>(2)</sup><br>$V_{DS}=-5V, I_D=-3.5A$                                 | $g_{fs}$      | -      | 6.5    | -          | S          |

**Dynamic**

|                                                                         |           |   |     |   |    |
|-------------------------------------------------------------------------|-----------|---|-----|---|----|
| Input Capacitance<br>$V_{DS}=-10V, V_{GS}=0V, f=1\text{MHz}$            | $C_{iss}$ | - | 405 | - | pF |
| Output Capacitance<br>$V_{DS}=-10V, V_{GS}=0V, f=1\text{MHz}$           | $C_{oss}$ | - | 170 | - |    |
| Reverse Transfer Capacitance<br>$V_{DS}=-10V, V_{GS}=0V, f=1\text{MHz}$ | $C_{rss}$ | - | 45  | - |    |

**Switching**

|                                                                                       |              |   |     |      |    |
|---------------------------------------------------------------------------------------|--------------|---|-----|------|----|
| Turn-On Delay Time <sup>(2)</sup><br>$V_{DD}=-5V, I_D=-1A, V_{GS}=-4.5V, R_G=6\Omega$ | $t_{d(on)}$  | - | 6.5 | -    | nS |
| Rise Time<br>$V_{DD}=-5V, I_D=-1A, V_{GS}=-4.5V, R_G=6\Omega$                         | $t_r$        | - | 20  | -    | nS |
| Turn-Off Time<br>$V_{DD}=-5V, I_D=-1A, V_{GS}=-4.5V, R_G=6\Omega$                     | $t_{d(off)}$ | - | 31  | -    | nS |
| Fall Time<br>$V_{DD}=-5V, I_D=-1A, V_{GS}=-4.5V, R_G=6\Omega$                         | $t_f$        | - | 21  | -    | nS |
| Total Gate Charge <sup>(2)</sup><br>$V_{DS}=-5V, I_D=-5.3A, V_{GS}=-4.5V$             | $Q_g$        | - | 6   | 8.5  | nC |
| Gate-Source Charge<br>$V_{DS}=-5V, I_D=-5.3A, V_{GS}=-4.5V$                           | $Q_{gs}$     | - | 0.8 | -    | nC |
| Gate-Drain Charge<br>$V_{DS}=-5V, I_D=-5.3A, V_{GS}=-4.5V$                            | $Q_{gd}$     | - | 1.3 | -    | nC |
| Drain-Source Diode Forward Voltage <sup>(2)</sup><br>$V_{GS}=0V, I_S=-2.1A$           | $V_{SD}$     | - | -   | -1.2 | V  |
| Continuous Source Current (Body Diode)<br>$V_D=V_G=0V, V_S=-1.2V$                     | $I_S$        | - | -   | -2.1 | A  |

Notes: 1. Pulse width limited by Max. junction temperature.

2. Pulse width 300 $\mu s$ , duty cycle  $\leq 2\%$ .

3. Surface mounted on 1 in<sup>2</sup> copper pad of FR4 board; 125 $^\circ\text{C}/W$  when mounted on Min. copper pad.

## Characteristics Curve

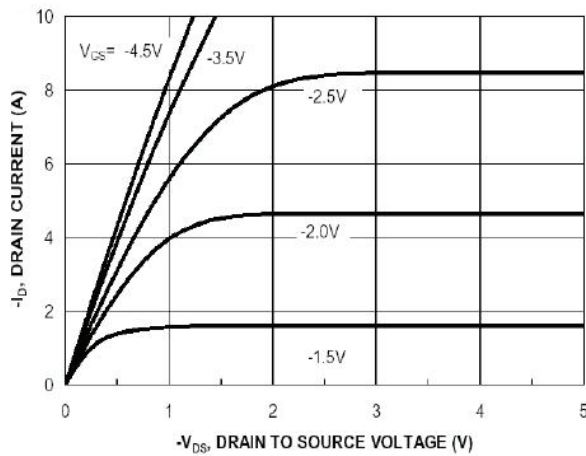


Fig 1. Typical Output Characteristics

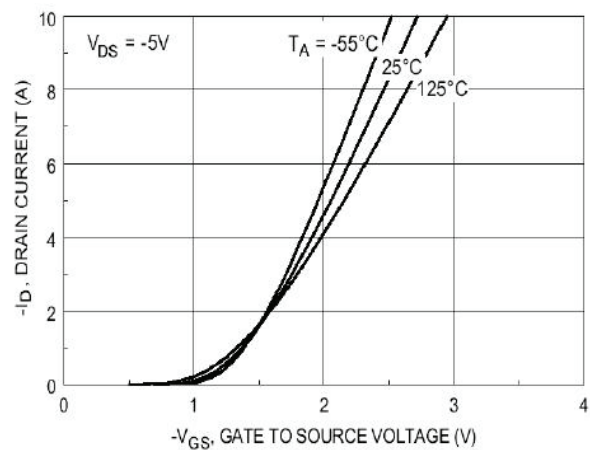


Fig 2. Transfer Characteristics

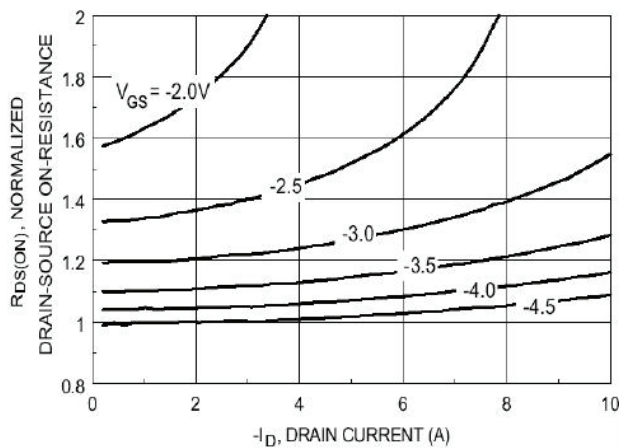


Fig 3. On-Resistance v.s. Drain Current and Gate Voltage

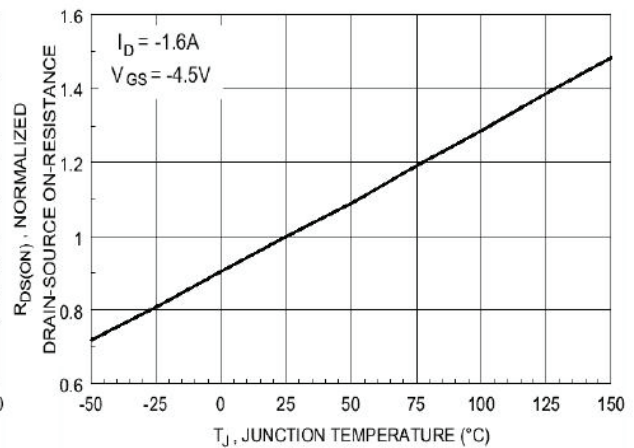


Fig 4. On-Resistance v.s. Junction Temperature

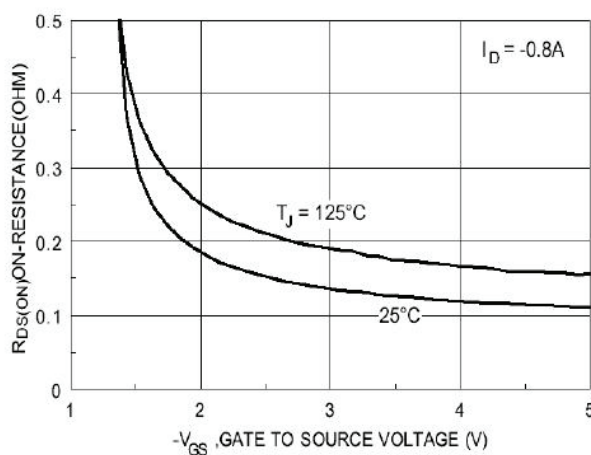


Fig 5. On-Resistance v.s. Gate-Source Voltage

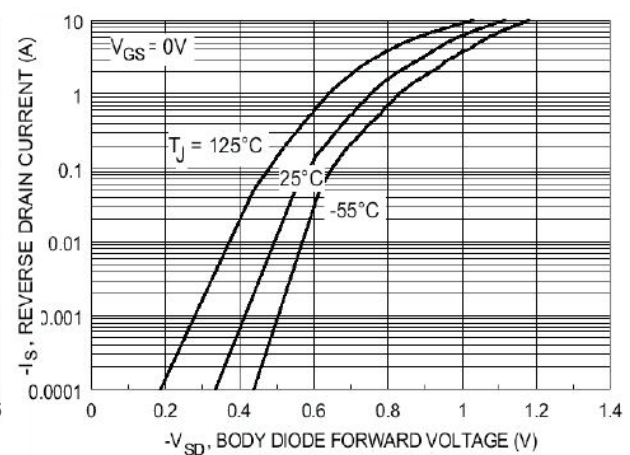


Fig 6. Body Diode Characteristics

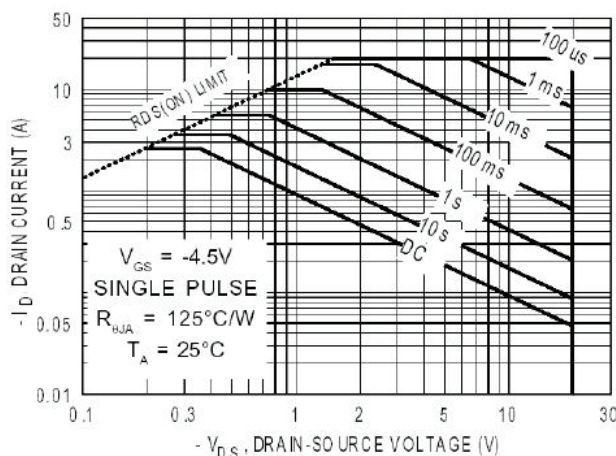


Fig 7. Maximum Safe Operating Area

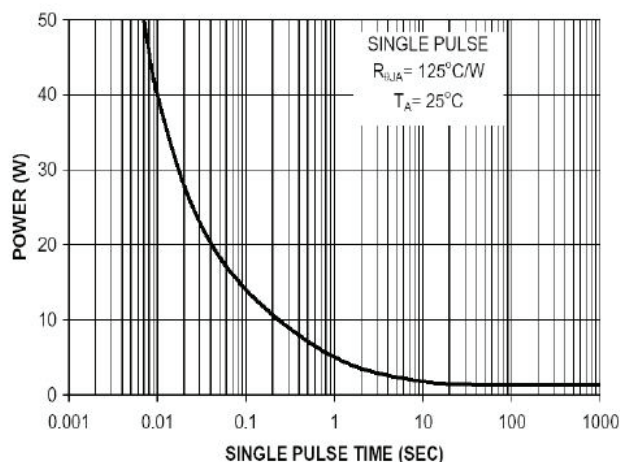


Fig 8. Single Pulse Maximum Power Dissipation

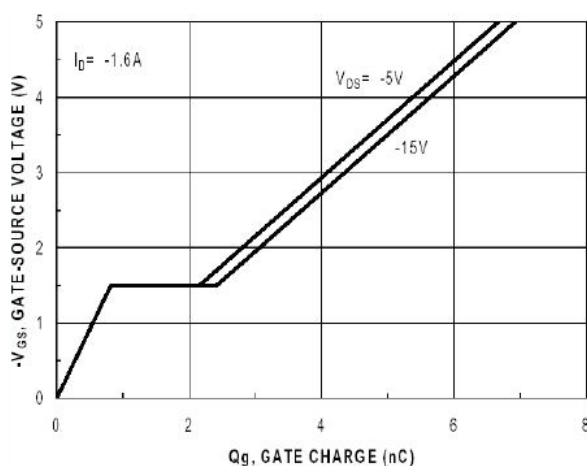


Fig 9. Gate Charge Characteristics

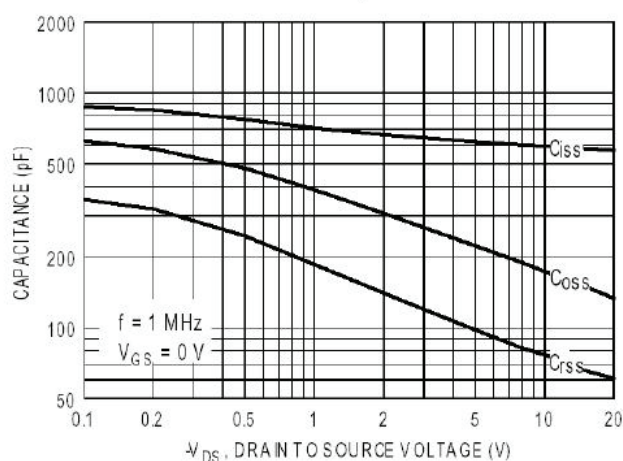


Fig 10. Typical Capacitance Characteristics

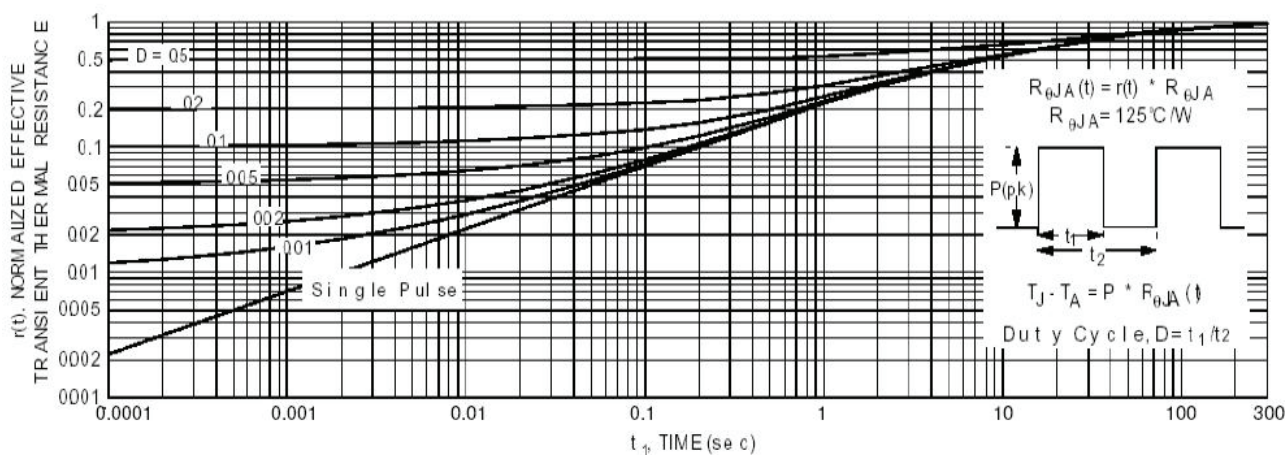
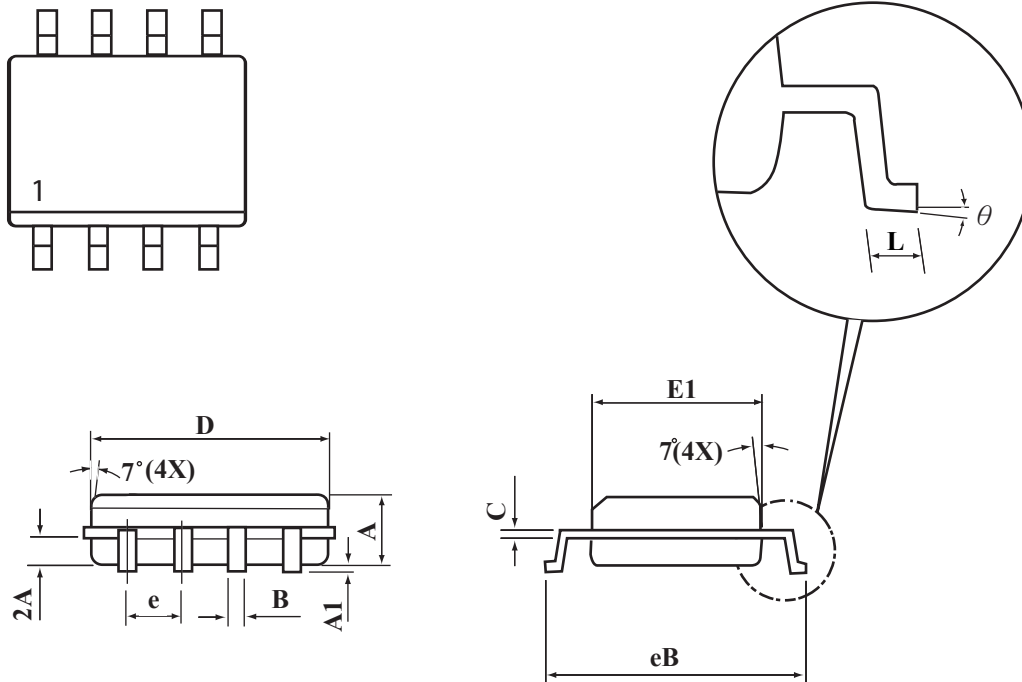


Fig 11. Transient Thermal Response Curve

## SOP-8 Package Outline Dimensions

Unit:mm



| SYMBOLS  | MILLIMETERS |      |
|----------|-------------|------|
|          | MIN         | MAX  |
| A        | 1.35        | 1.75 |
| A1       | 0.10        | 0.20 |
| B        | 0.35        | 0.45 |
| C        | 0.18        | 0.23 |
| D        | 4.69        | 4.98 |
| E1       | 3.56        | 4.06 |
| Be       | 5.70        | 6.30 |
| e        | 1.27 BSC    |      |
| L        | 0.60        | 0.80 |
| $\theta$ | 0°          | 8°   |