

## Power MOSFET

### ■ GENERAL DESCRIPTION

The XP131A1235SR is an N-channel Power MOSFET with low on-state resistance and ultra high-speed switching characteristics.

Because high-speed switching is possible, the IC can be efficiently set thereby saving energy.

The small SOP-8 package makes high density mounting possible.

### ■ APPLICATIONS

- Notebook PCs
- Cellular and portable phones
- On-board power supplies
- Li-ion battery systems

### ■ FEATURES

**Low On-State Resistance** :  $R_{ds(on)}=0.035\ \Omega$  ( $V_{gs}=4.5V$ )  
 :  $R_{ds(on)}=0.048\ \Omega$  ( $V_{gs}=2.5V$ )

**Ultra High-Speed Switching**

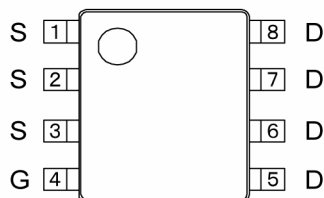
**Driving Voltage** : 2.5V

**N-Channel Power MOSFET**

**DMOS Structure**

**Package** : SOP-8

### ■ PIN CONFIGURATION

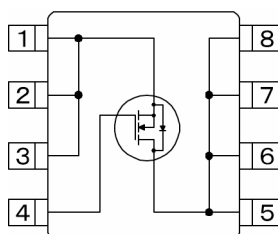


SOP-8  
(TOP VIEW)

### ■ PIN ASSIGNMENT

| PIN NUMBER | PIN NAME | FUNCTION |
|------------|----------|----------|
| 1~3        | S        | Source   |
| 4          | G        | Gate     |
| 5~8        | D        | Drain    |

### ■ EQUIVALENT CIRCUIT



N-channel MOSFET  
( 1 device built-in )

### ■ ABSOLUTE MAXIMUM RATINGS

$T_a = 25^\circ\text{C}$

| PARAMETER                   | SYMBOL    | RATINGS  | UNITS            |
|-----------------------------|-----------|----------|------------------|
| Drain-Source Voltage        | $V_{dss}$ | 20       | V                |
| Gate-Source Voltage         | $V_{gss}$ | $\pm 12$ | V                |
| Drain Current (DC)          | $I_d$     | 7        | A                |
| Drain Current (Pulse)       | $I_{dp}$  | 30       | A                |
| Reverse Drain Current       | $I_{dr}$  | 7        | A                |
| Channel Power Dissipation * | $P_d$     | 2.5      | W                |
| Channel Temperature         | $T_{ch}$  | 150      | $^\circ\text{C}$ |
| Storage Temperature Range   | $T_{stg}$ | -55~150  | $^\circ\text{C}$ |

\* When implemented on a glass epoxy PCB

## ELECTRICAL CHARACTERISTICS

### DC Characteristics

Ta = 25°C

| PARAMETER                          | SYMBOL               | CONDITIONS                                 | MIN. | TYP.  | MAX.  | UNITS |
|------------------------------------|----------------------|--|------|-------|-------|-------|
| Drain Cut-Off Current              | I <sub>dss</sub>     | V <sub>ds</sub> =20V, V <sub>gs</sub> =0V  | -    | -     | 10    | μA    |
| Gate-Source Leak Current           | I <sub>gss</sub>     | V <sub>gs</sub> =±12V, V <sub>ds</sub> =0V | -    | -     | ±1    | μA    |
| Gate-Source Cut-Off Voltage        | V <sub>gs(off)</sub> | I <sub>d</sub> =1mA, V <sub>ds</sub> =10V  | 0.5  | -     | 1.2   | V     |
| Drain-Source On-State Resistance * | R <sub>ds(on)</sub>  | I <sub>d</sub> =4A, V <sub>ds</sub> =4.5V  | -    | 0.025 | 0.035 | Ω     |
|                                    |                      | I <sub>d</sub> =4A, V <sub>gs</sub> =2.5V  | -    | 0.035 | 0.048 | Ω     |
| Forward Transfer Admittance *      | Y <sub>fs</sub>      | I <sub>d</sub> =4A, V <sub>ds</sub> =10V   | -    | 16    | -     | S     |
| Body Drain Diode Forward Voltage   | V <sub>f</sub>       | I <sub>f</sub> =7A, V <sub>gs</sub> =0V    | -    | 0.85  | 1.1   | V     |

\* Effective during pulse test.

### Dynamic Characteristics

Ta = 25°C

| PARAMETER            | SYMBOL           | CONDITIONS  | MIN. | TYP. | MAX. | UNITS |
|----------------------|------------------|---|------|------|------|-------|
| Input Capacitance    | C <sub>iss</sub> | V <sub>ds</sub> = 10V, V <sub>gs</sub> = 0V<br>f = 1MHz | -    | 760  | -    | pF    |
| Output Capacitance   | C <sub>oss</sub> |   | -    | 430  | -    | pF    |
| Feedback Capacitance | C <sub>rss</sub> |   | -    | 200  | -    | pF    |

### Switching Characteristics

Ta = 25°C

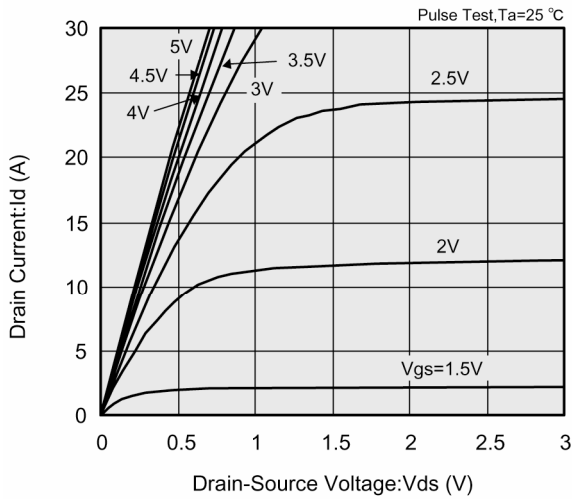
| PARAMETER           | SYMBOL               | CONDITIONS   | MIN. | TYP. | MAX. | UNITS |
|---------------------|----------------------|--|------|------|------|-------|
| Turn-On Delay Time  | t <sub>d (on)</sub>  | V <sub>gs</sub> = 5V, I <sub>d</sub> = 4A<br>V <sub>dd</sub> = 10V | -    | 10   | -    | ns    |
| Rise Time           | t <sub>r</sub>       |  | -    | 20   | -    | ns    |
| Turn-Off Delay Time | t <sub>d (off)</sub> |  | -    | 55   | -    | ns    |
| Fall Time           | t <sub>f</sub>       |  | -    | 15   | -    | ns    |

### Thermal Characteristics

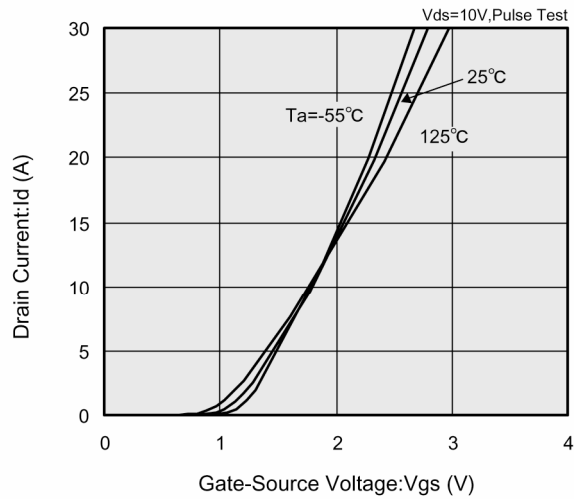
| PARAMETER                             | SYMBOL                 | CONDITIONS                           | MIN. | TYP. | MAX. | UNITS |
|---------------------------------------|------------------------|--------------------------------------|------|------|------|-------|
| Thermal Resistance (channel-ambience) | R <sub>th (ch-a)</sub> | Implement on a glass epoxy resin PCB | -    | 50   | -    | °C/W  |

## TYPICAL PERFORMANCE CHARACTERISTICS

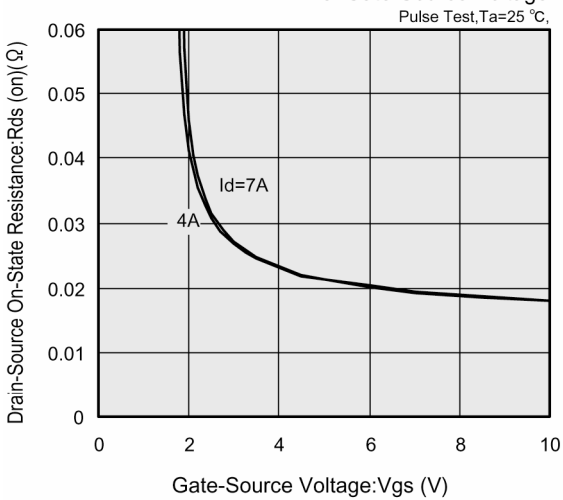
(1) Drain Current vs. Drain-Source Voltage



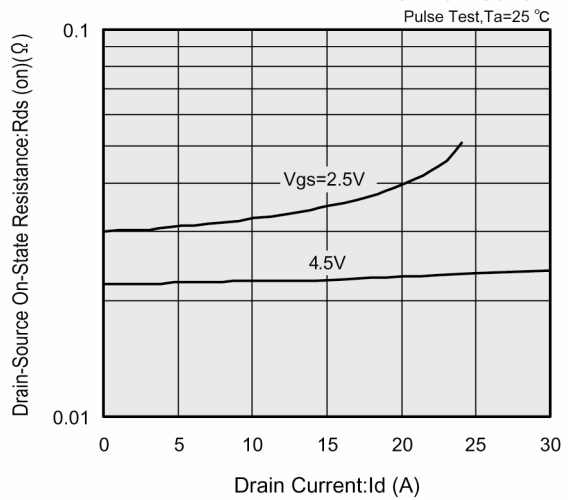
(2) Drain Current vs. Gate-Source Voltage



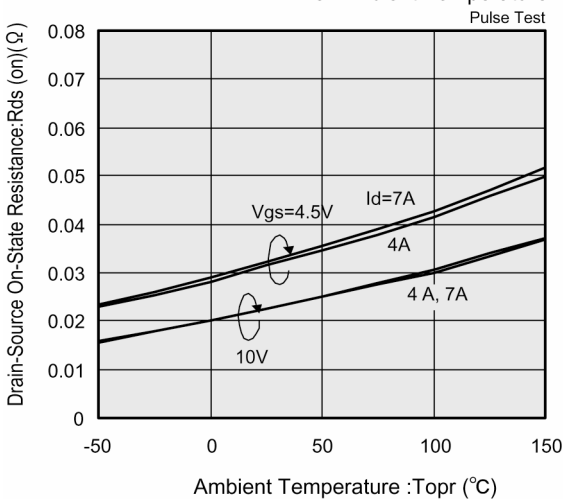
(3) Drain-Source On-State Resistance vs. Gate-Source Voltage



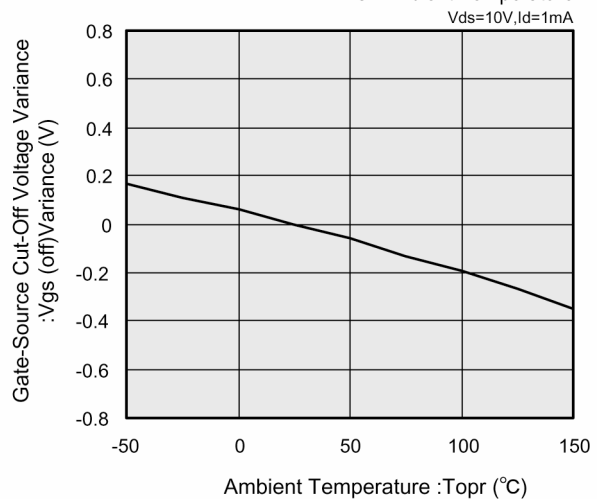
(4) Drain-Source On-State Resistance vs. Drain Current



(5) Drain-Source On-State Resistance vs. Ambient Temperature

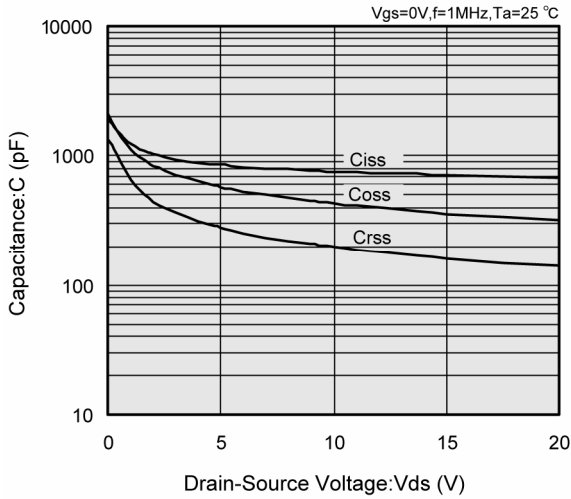


(6) Gate-Source Cut-Off Voltage Variance vs. Ambient Temperature

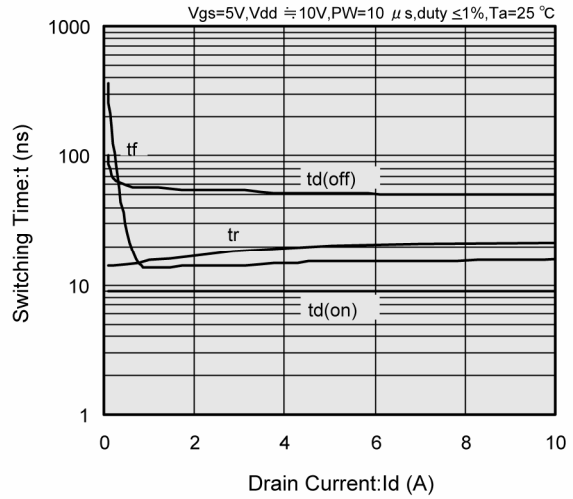


## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

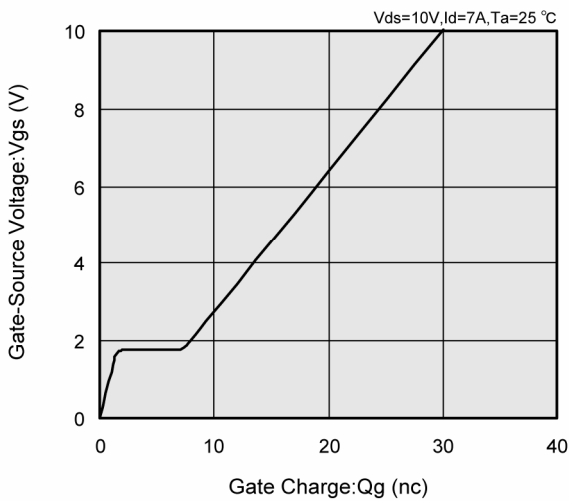
(7) Capacitance vs. Drain Source Voltage



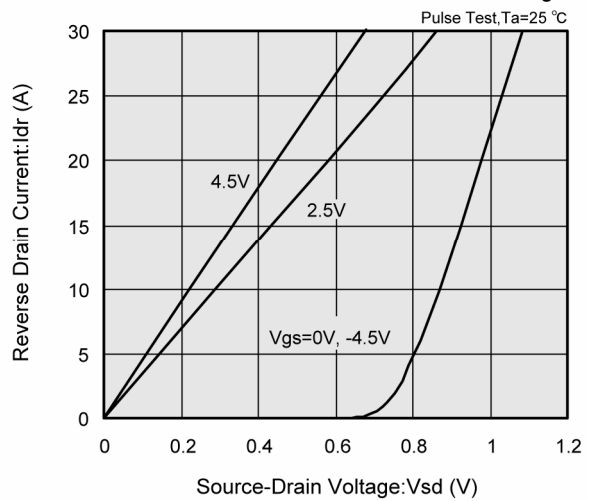
(8) Switching Time vs. Drain Current



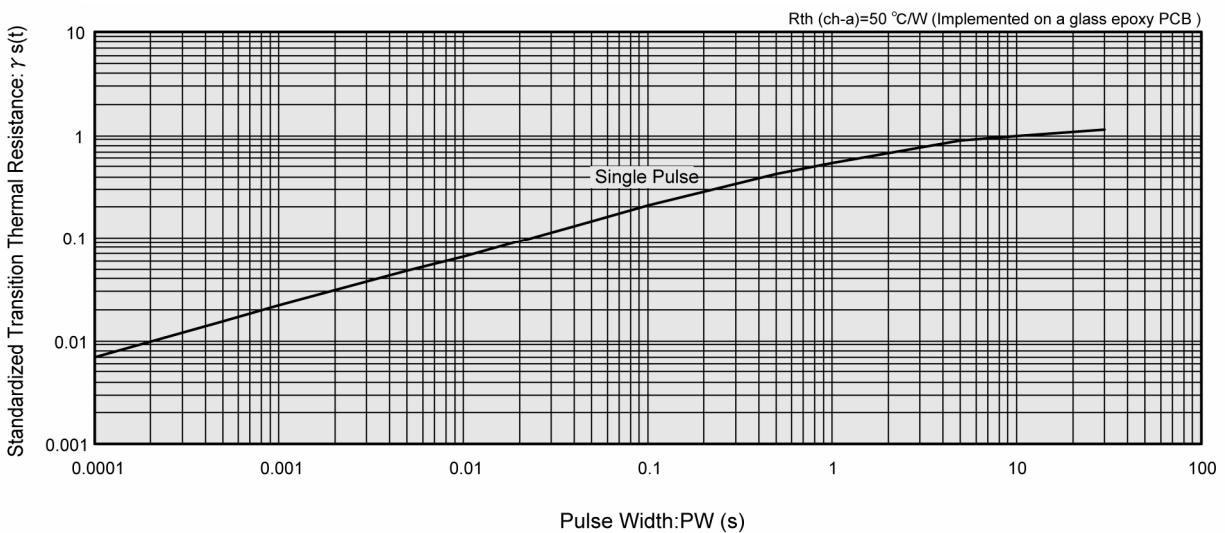
(9) Gate-Source Voltage vs. Gate Charge



(10) Reverse Drain Current vs. Source-Drain Voltage



(11) Standardized transition Thermal Resistance vs. Pulse Width



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