

- ◆ N-Channel Power MOS FET
- ◆ DMOS Structure
- ◆ Low On-State Resistance :  $0.035\Omega$  (max)
- ◆ Ultra High-Speed Switching
- ◆ SOP - 8 Package

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

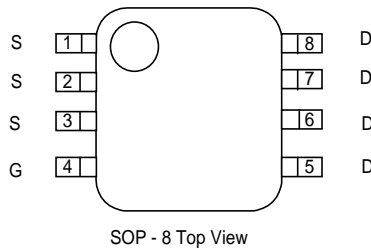
### ■ General Description

The XP131A1235SR is a N-Channel Power MOS FET 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.

### ■ 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**
- Operational Voltage** : 2.5V
- High density mounting** : SOP - 8

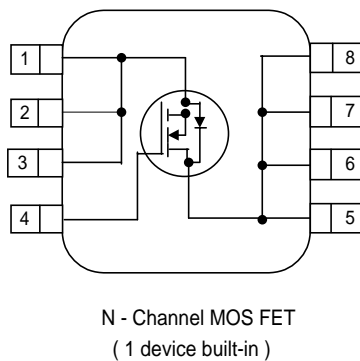
### ■ Pin Configuration



### ■ Pin Assignment

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

### ■ Equivalent Circuit



### ■ 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                |
| Continuous Channel Power Dissipation (note) | $P_d$     | 2.5        | W                |
| Channel Temperature                         | $T_{ch}$  | 150        | $^\circ\text{C}$ |
| Storage Temperature                         | $T_{stg}$ | -55 to 150 | $^\circ\text{C}$ |

( note ) : 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                        | Idss        | Vds = 20 , Vgs = 0V   |     |       | 10    | μA    |
| Gate-Source Leakage Current                  | Igss        | Vgs = ± 12 , Vds = 0V |     |       | ± 1   | μA    |
| Gate-Source Cut-off Voltage                  | Vgs ( off ) | Id = 1mA , Vds = 10V  | 0.5 |       | 1.2   | V     |
| Drain-Source On-state Resistance<br>( note ) | Rds ( on )  | Id = 4A , Vgs = 4.5V  |     | 0.025 | 0.035 | Ω     |
|  |             | Id = 4A , Vgs = 2.5V  |     | 0.035 | 0.048 | Ω     |
| Forward Transfer Admittance<br>( note )      | Yfs         | Id = 4A , Vds = 10V   |     | 16    |       | S     |
| Body Drain Diode<br>Forward Voltage          | Vf          | If = 7A , Vgs = 0V    |     | 0.85  | 1.1   | V     |

( note ) : Effective during pulse test.

#### Dynamic characteristics

Ta=25°C

| PARAMETER            | SYMBOL | CONDITIONS                        | MIN | TYP | MAX | UNITS |
|----------------------|--------|-----------------------------------|-----|-----|-----|-------|
| Input Capacitance    | Ciss   | Vds = 10V , Vgs = 0V<br>f = 1 MHz |     | 760 |     | pF    |
| Output Capacitance   | Coss   |                                   |     | 430 |     | pF    |
| Feedback Capacitance | Crss   |                                   |     | 200 |     | pF    |

#### Switching characteristics

Ta=25°C

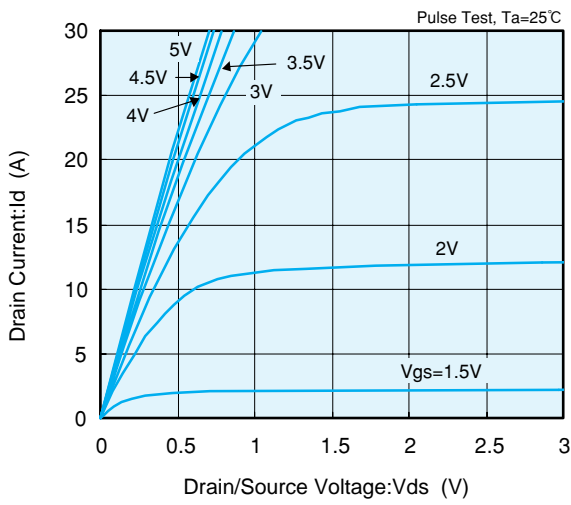
| PARAMETER           | SYMBOL     | CONDITIONS                      | MIN | TYP | MAX | UNITS |
|---------------------|------------|---------------------------------|-----|-----|-----|-------|
| Turn-on Delay Time  | td ( on )  | Vgs = 5V , Id = 4A<br>Vdd = 10V |     | 10  |     | ns    |
| Rise Time           | tr         |                                 |     | 20  |     | ns    |
| Turn-off Delay Time | td ( off ) |                                 |     |     | 55  | ns    |
| Fall Time           | tf         |                                 |     |     | 15  | ns    |

#### Thermal characteristics

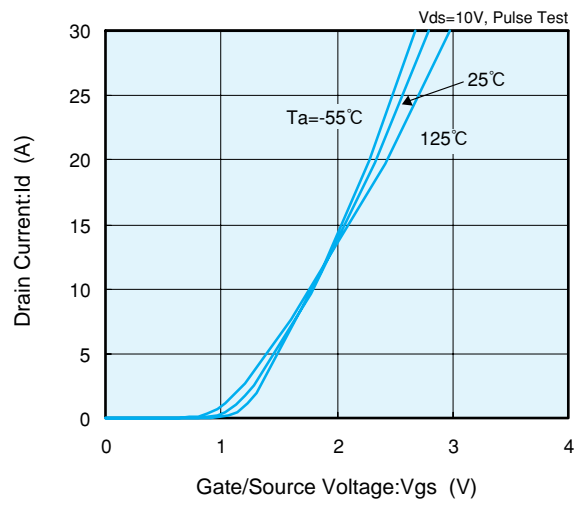
| PARAMETER  | SYMBOL         | CONDITIONS                              | MIN | TYP | MAX | UNITS  |
|--|----------------|---|-----|-----|-----|--------|
| Thermal Resistance<br>( channel - surroundings ) | Rth ( ch - a ) | Implement on a glass epoxy<br>resin PCB |     | 50  |     | °C / W |

## Electrical Characteristics

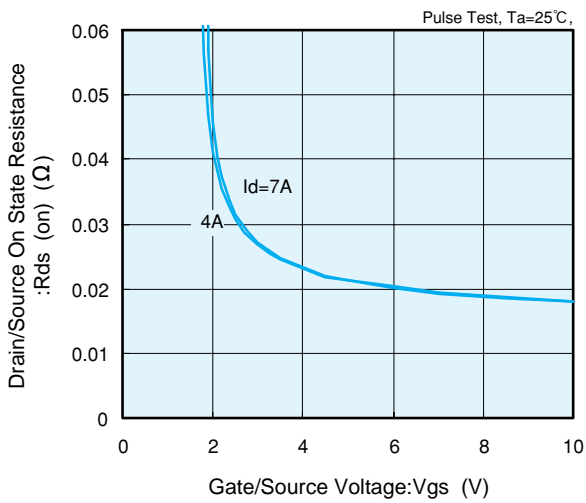
Drain Current vs. Drain/Source Voltage



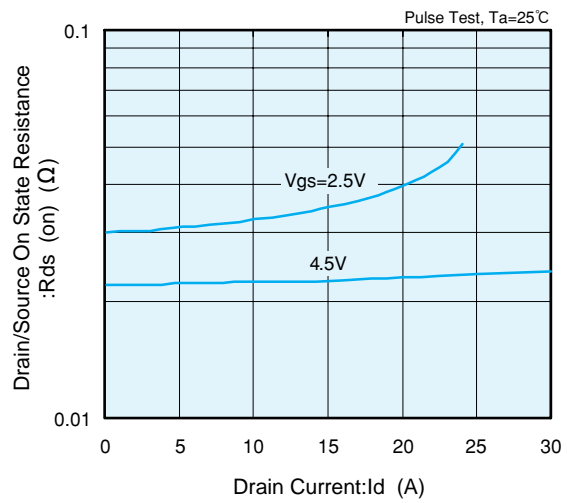
Drain Current vs. Gate/Source Voltage



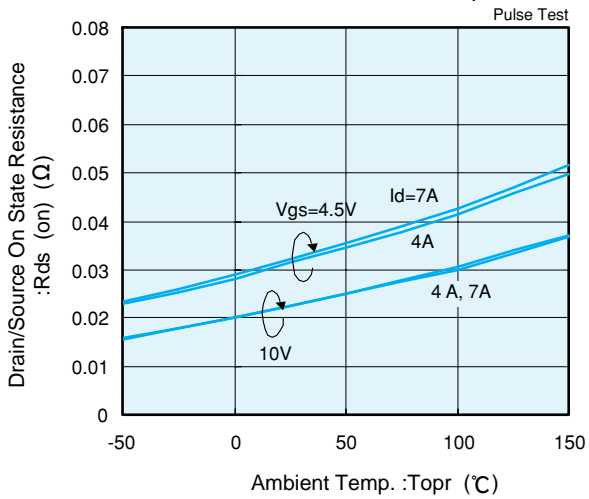
Drain/Source On-State Resistance



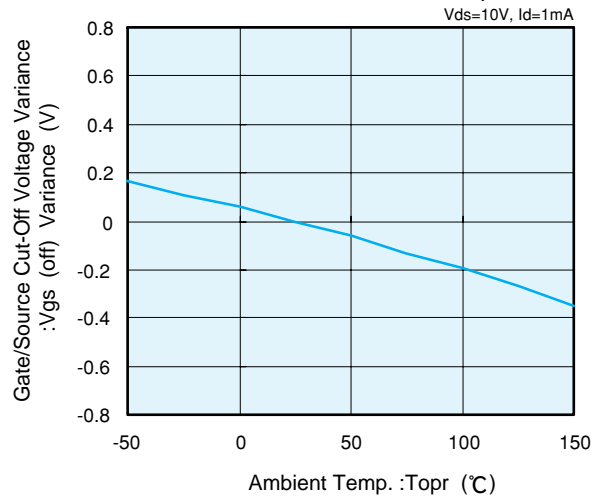
Drain/Source On-State Resistance



Drain/Source On-State Resistance vs. Ambient Temperature

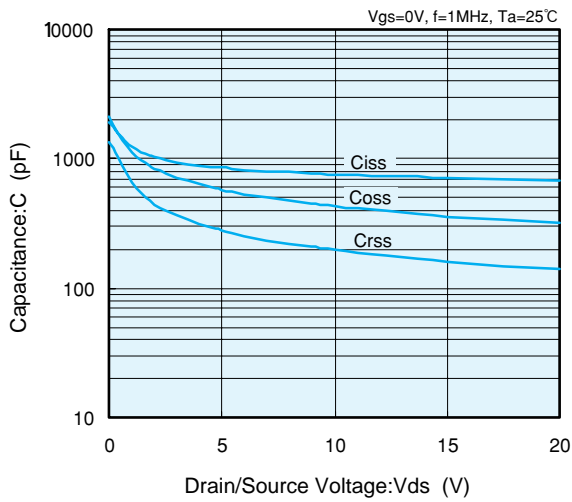


Gate/Source Cut-Off Voltage Variance vs. Ambient Temperature

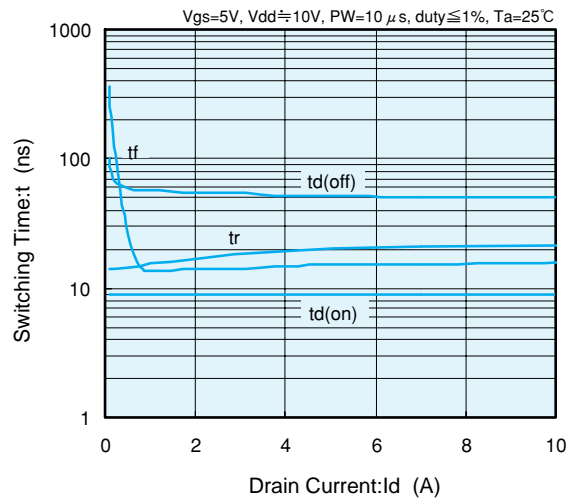


### Electrical Characteristics

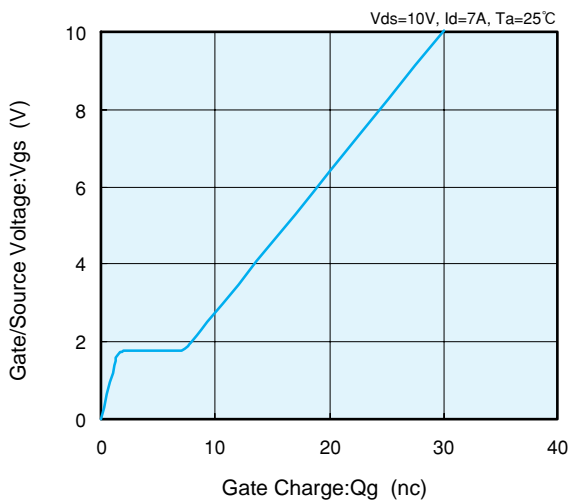
Drain/Source Voltage vs. Capacitance



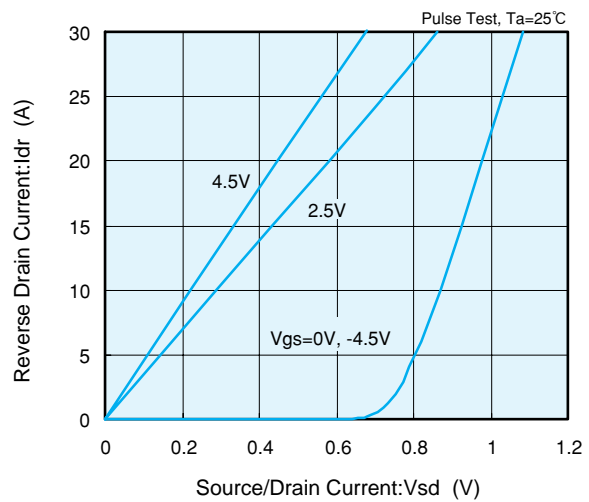
Switching Time vs. Drain Current



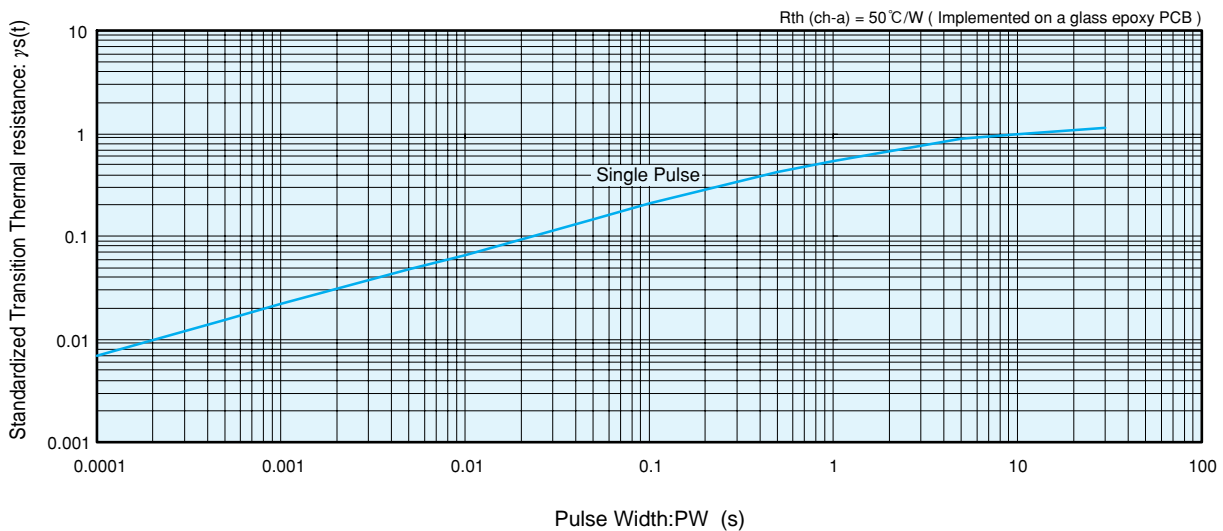
Gate/Source Voltage vs. Gate Charge



Reverse Drain Current vs. Source/Drain Voltage



Standardized Transition Thermal Resistance vs. Pulse Width



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