

## Power MOSFET

### ■ GENERAL DESCRIPTION

The XP161A11A1PR-G 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.

A gate protect diode is built-in to prevent static damage.

The small SOT-89 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** :  $R_{ds(on)}=0.065\Omega$  @  $V_{gs}=10V$   
 :  $R_{ds(on)}=0.105\Omega$  @  $V_{gs}=4.5V$

**Ultra High-Speed Switching**

**Gate Protect Diode Built-in**

**Driving Voltage** : 4.5V

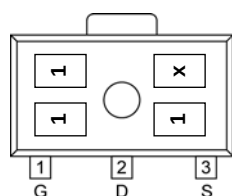
**N-Channel Power MOSFET**

**DMOS Structure**

**Small Package** : SOT-89

**Environmentally Friendly** : EU RoHS Compliant, Pb Free

### ■ PIN CONFIGURATION/ MARKING

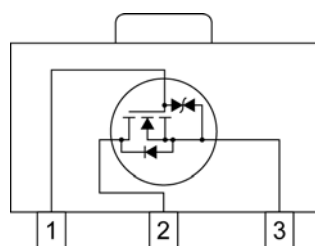


G : Gate  
S : Source  
D : Drain

SOT-89  
(TOP VIEW)

\* x represents production lot number.

### ■ EQUIVALENT CIRCUIT



N-channel MOSFET  
(1 device built-in)

### ■ PRODUCT NAME

| PRODUCTS                      | PACKAGE | ORDER UNIT |
|-------------------------------|---------|------------|
| XP161A11A1PR                  | SOT-89  | 1,000/Reel |
| XP161A11A1PR-G <sup>(*)</sup> | SOT-89  | 1,000/Reel |

<sup>(\*)</sup> The "-G" suffix denotes Halogen and Antimony free as well as being fully RoHS compliant.

### ■ ABSOLUTE MAXIMUM RATINGS

Ta = 25°C

| PARAMETER                   | SYMBOL           | RATINGS | UNITS |
|-----------------------------|------------------|---------|-------|
| Drain - Source Voltage      | V <sub>dss</sub> | 30      | V     |
| Gate - Source Voltage       | V <sub>gss</sub> | ±20     | V     |
| Drain Current (DC)          | I <sub>d</sub>   | 4       | A     |
| Drain Current (Pulse)       | I <sub>dp</sub>  | 16      | A     |
| Reverse Drain Current       | I <sub>dr</sub>  | 4       | A     |
| Channel Power Dissipation * | P <sub>d</sub>   | 2       | W     |
| Channel Temperature         | T <sub>ch</sub>  | 150     | °C    |
| Storage Temperature         | T <sub>stg</sub> | -55~150 | °C    |

\* When implemented on a ceramic 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> =30V, V <sub>gs</sub> = 0V   | -    | -     | 10    | μ A   |
| Gate-Source Leak Current           | I <sub>gss</sub>     | V <sub>gs</sub> = ±20V, V <sub>ds</sub> = 0V | -    | -     | ±10   | μ A   |
| Gate-Source Cut-Off Voltage        | V <sub>gs(off)</sub> | I <sub>d</sub> = 1mA, V <sub>ds</sub> = 10V  | 1.0  | -     | 2.5   | V     |
| Drain-Source On-State Resistance*1 | R <sub>ds(on)</sub>  | I <sub>d</sub> = 2A, V <sub>gs</sub> = 10V   | -    | 0.05  | 0.065 | Ω     |
|                                    |                      | I <sub>d</sub> = 2A, V <sub>gs</sub> = 4.5V  | -    | 0.075 | 0.105 | Ω     |
| Forward Transfer Admittance *1     | Y <sub>fs</sub>      | I <sub>d</sub> = 2A, V <sub>ds</sub> = 10V   | -    | 5.5   | -     | S     |
| Body Drain Diode Forward Voltage   | V <sub>f</sub>       | I <sub>f</sub> = 4A, V <sub>gs</sub> = 0V    | -    | 0.85  | 1.1   | V     |

\*1 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 | -    | 270  | -    | pF    |
| Output Capacitance   | C <sub>oss</sub> |                                                       | -    | 150  | -    | pF    |
| Feedback Capacitance | C <sub>rss</sub> |                                                       | -    | 55   | -    | pF    |

### Switching Characteristics

Ta = 25°C

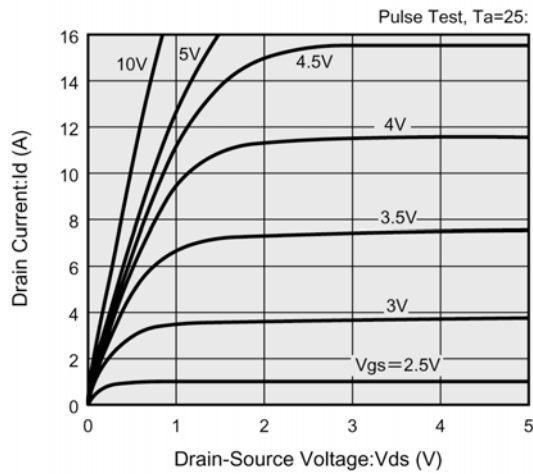
| PARAMETER           | SYMBOL               | CONDITIONS                                                        | MIN. | TYP. | MAX. | UNITS |
|---------------------|----------------------|-------------------------------------------------------------------|------|------|------|-------|
| Turn-On Delay Time  | t <sub>d (on)</sub>  | V <sub>gs</sub> = 5V, I <sub>d</sub> =2A<br>V <sub>dd</sub> = 10V | -    | 10   | -    | ns    |
| Rise Time           | t <sub>r</sub>       |                                                                   | -    | 15   | -    | ns    |
| Turn-Off Delay Time | t <sub>d (off)</sub> |                                                                   | -    | 35   | -    | ns    |
| Fall Time           | t <sub>f</sub>       |                                                                   | -    | 15   | -    | ns    |

### Thermal Characteristics

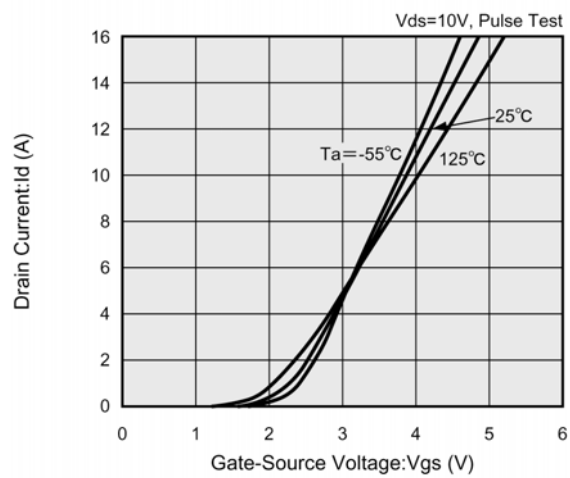
| PARAMETER                             | SYMBOL                 | CONDITIONS                 | MIN. | TYP. | MAX. | UNITS |
|---------------------------------------|------------------------|----------------------------|------|------|------|-------|
| Thermal Resistance (Channel-Ambience) | R <sub>th (ch-a)</sub> | Implement on a ceramic PCB | -    | 62.5 | -    | °C/W  |

## TYPICAL PERFORMANCE CHARACTERISTICS

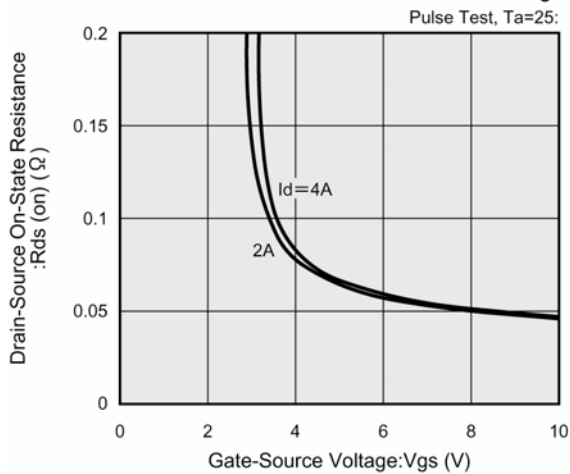
(1) Drain Current vs. Drain-Source Voltage



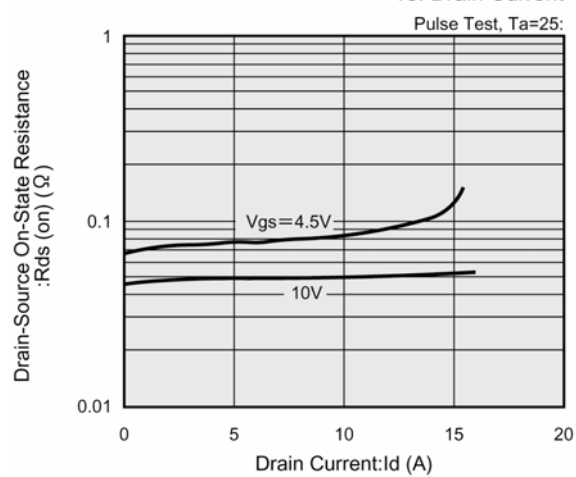
(2) Drain Current vs. Gate-Source Voltage



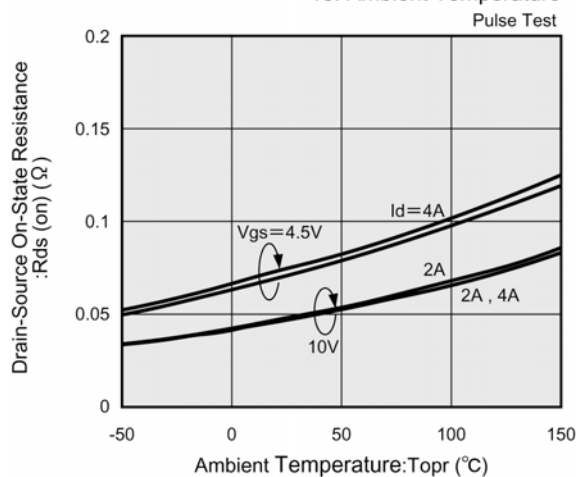
(3) Drain-Source On-State Resistance vs. Gate-Source Voltage



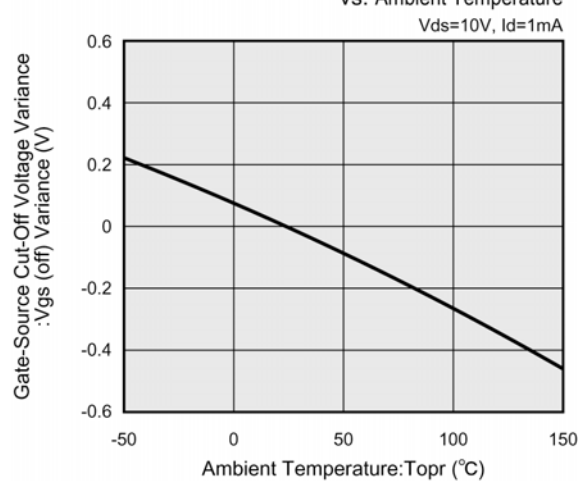
(4) Drain-Source On-State Resistance vs. Drain Current



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

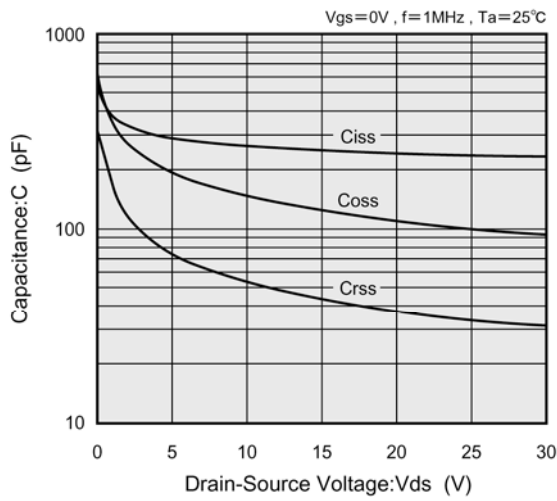


(6) Gate-Source Cut-Off Voltage Variance vs. Ambient Temperature

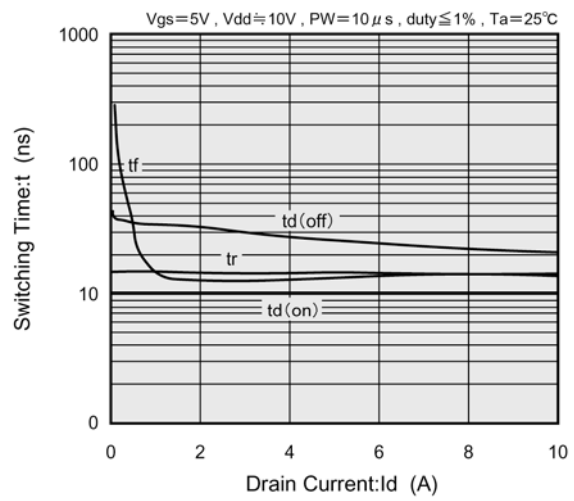


## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

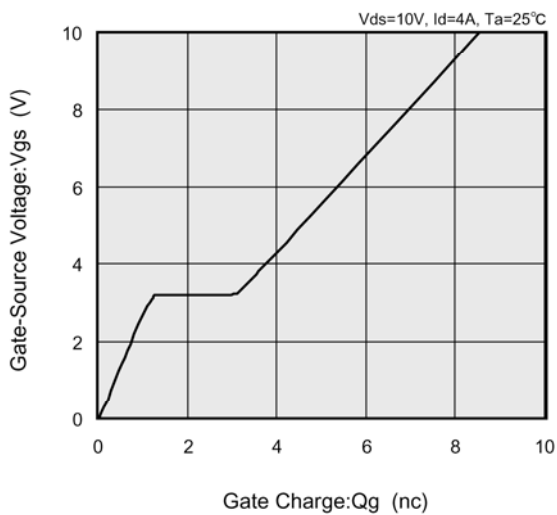
(7) Capacitance vs. Drain-Source Voltage



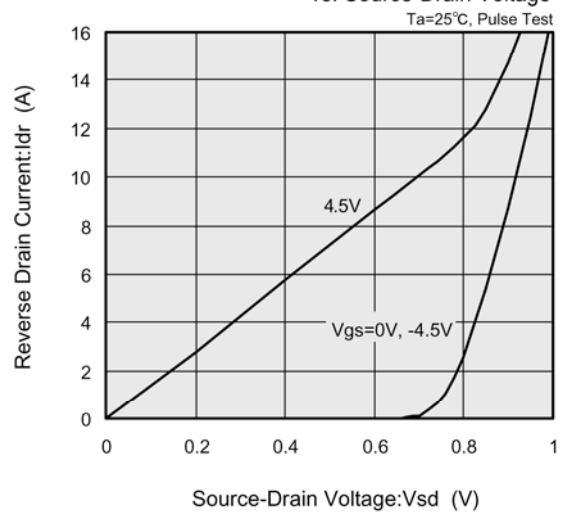
(8) Switching Time vs. Drain Current



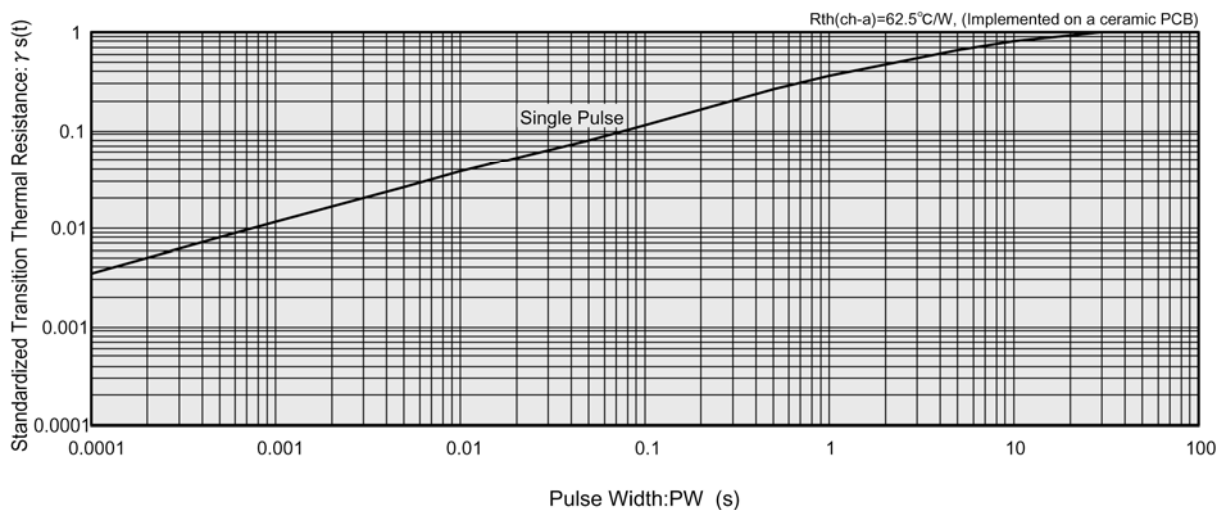
(9) Gate-Source Voltage vs. Gate Charge



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



(11) Standardized transition Thermal Resistance vs. Pulse Width



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