

# XP161A1355PR



## Power MOS FET

- ◆N-Channel Power MOS FET
- ◆DMOS Structure
- ◆Low On-State Resistance :  $0.05\Omega$  (max)
- ◆Ultra High-Speed Switching
- ◆SOT-89 Package
- ◆Gate Protect Diode Built-in

### General Description

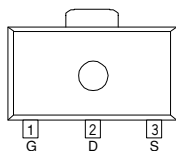
The XP161A1355PR is an N-Channel Power MOS FET with low on-state resistance and ultra high-speed switching characteristics.

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

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

The small SOT-89 package makes high density mounting possible.

### Pin Configuration



SOT-89  
(TOP VIEW)

### Applications

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

### Features

**Low on-state resistance:**  $R_{ds(on)} = 0.05\Omega$  ( $V_{gs} = 4.5V$ )  
 $R_{ds(on)} = 0.07\Omega$  ( $V_{gs} = 2.5V$ )  
 $R_{ds(on)} = 0.15\Omega$  ( $V_{gs} = 1.5V$ )

**Ultra high-speed switching**

**Gate protect diode built-in**

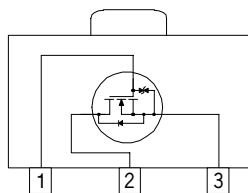
**Operational Voltage** : 1.5V

**High density mounting** : SOT-89

### Pin Assignment

| PIN NUMBER | PIN NAME | FUNCTION |
|------------|----------|----------|
| 1          | G        | Gate     |
| 2          | D        | Drain    |
| 3          | S        | Source   |

### Equivalent Circuit



N-Channel MOS FET  
( 1 device built-in )

### Absolute Maximum Ratings

| PARAMETER                                   | SYMBOL | Ta=25°C    |       |
|---|--------|------------|-------|
|   |        | RATINGS    | UNITS |
| Drain - Source Voltage                      | Vdss   | 20         | V     |
| Gate - Source Voltage                       | Vgss   | ± 8        | V     |
| Drain Current (DC)                          | Id     | 4          | A     |
| Drain Current (Pulse)                       | Idp    | 16         | A     |
| Reverse Drain Current                       | Idr    | 4          | A     |
| Continuous Channel Power Dissipation (note) | Pd     | 2          | W     |
| Channel Temperature                         | Tch    | 150        | °C    |
| Storage Temperature                         | Tstg   | - 55 ~ 150 | °C    |

( note ) : 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> = 20V , V <sub>gs</sub> = 0V   |     |      | 10   | μA    |
| Gate-Source Leakage Current                  | I <sub>gss</sub>       | V <sub>gs</sub> = ± 8V , V <sub>ds</sub> = 0V  |     |      | ± 10 | 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<br>( note ) | R <sub>ds ( on )</sub> | I <sub>d</sub> = 2A , V <sub>gs</sub> = 4.5V   |     | 0.37 | 0.05 | Ω     |
|  |                        | I <sub>d</sub> = 2A , V <sub>gs</sub> = 2.5V   |     | 0.05 | 0.07 | Ω     |
|  |                        | I <sub>d</sub> = 0.5A , V <sub>gs</sub> = 1.5V |     | 0.1  | 0.15 | Ω     |
| Forward Transfer Admittance<br>( note )      | Y <sub>fs</sub>        | I <sub>d</sub> = 2A , V <sub>ds</sub> = 10V    |     | 10   |      | S     |
| Body Drain Diode<br>Forward Voltage          | V <sub>f</sub>         | I <sub>f</sub> = 4A , V <sub>gs</sub> = 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    | C <sub>iss</sub> | V <sub>ds</sub> = 10V , V <sub>gs</sub> = 0V<br>f = 1 MHz |     | 390 |     | pF    |
| Output Capacitance   | C <sub>oss</sub> |   |     | 210 |     | pF    |
| Feedback Capacitance | C <sub>rss</sub> |   |     | 90  |     | pF    |

### Switching Characteristics

Ta=25°C

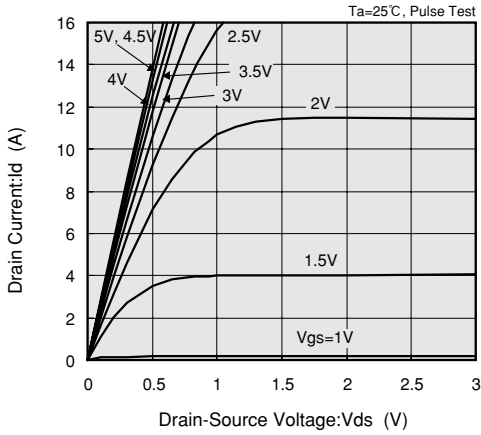
| PARAMETER           | SYMBOL                 | CONDITIONS  | MIN | TYP | MAX | UNITS |
|---------------------|------------------------|---|-----|-----|-----|-------|
| Turn-on Delay Time  | t <sub>d ( on )</sub>  | V <sub>gs</sub> = 5V , I <sub>d</sub> = 2A<br>V <sub>dd</sub> = 10V |     | 10  |     | ns    |
| Rise Time           | t <sub>r</sub>         |   |     | 15  |     | ns    |
| Turn-off Delay Time | t <sub>d ( off )</sub> |   |     | 85  |     | ns    |
| Fall Time           | t <sub>f</sub>         |   |     | 45  |     | ns    |

### Thermal Characteristics

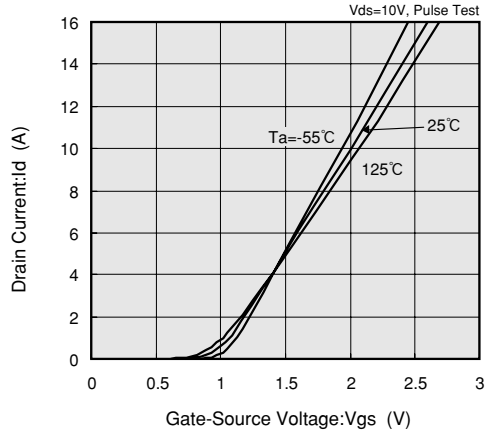
| PARAMETER                                  | SYMBOL                   | CONDITIONS                 | MIN | TYP  | MAX | UNITS  |
|--|--------------------------|----------------------------|-----|------|-----|--------|
| Thermal Resistance<br>( channel-ambience ) | R <sub>th ( ch-a )</sub> | Implement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

## Typical Performance Characteristics

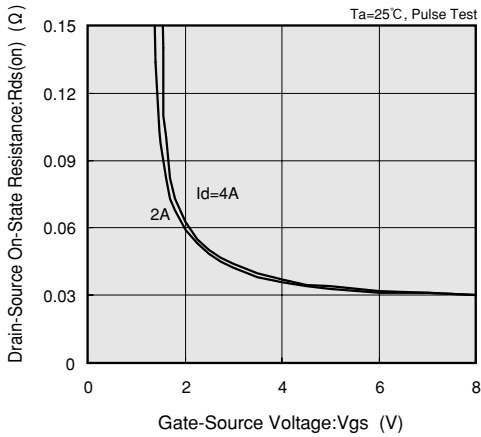
DRAIN CURRENT vs. DRAIN-SOURCE VOLTAGE



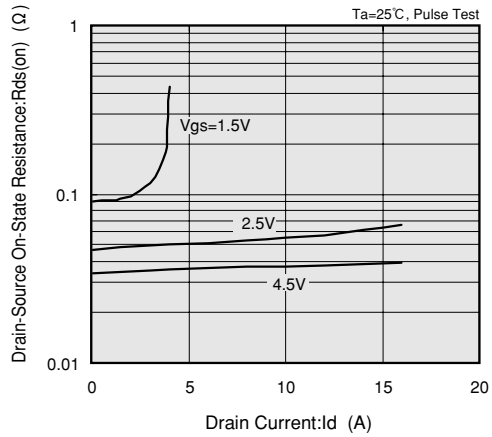
DRAIN CURRENT vs. GATE-SOURCE VOLTAGE



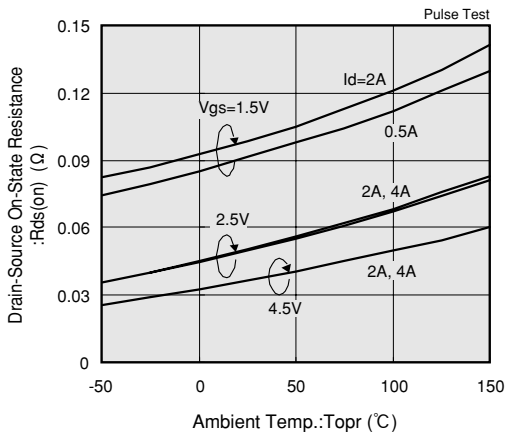
DRAIN-SOURCE ON-STATE RESISTANCE vs. GATE-SOURCE VOLTAGE



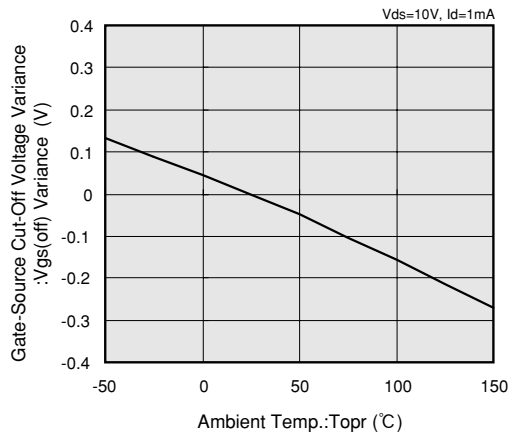
DRAIN-SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



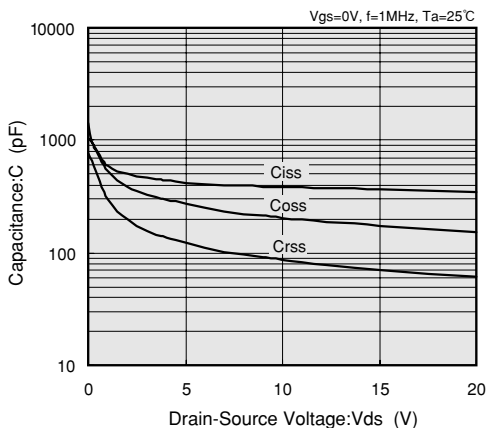
DRAIN-SOURCE ON-STATE RESISTANCE vs. AMBIENT TEMPERATURE



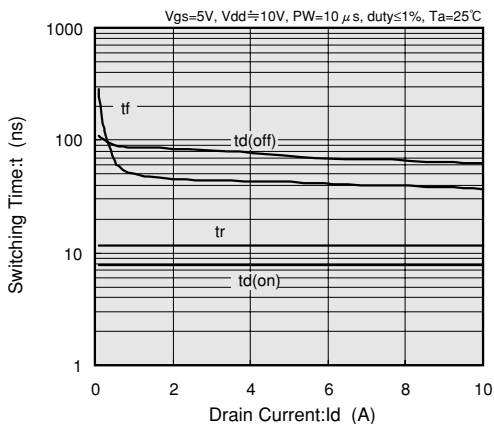
GATE-SOURCE CUT-OFF VOLTAGE VARIANCE vs. AMBIENT TEMPERATURE



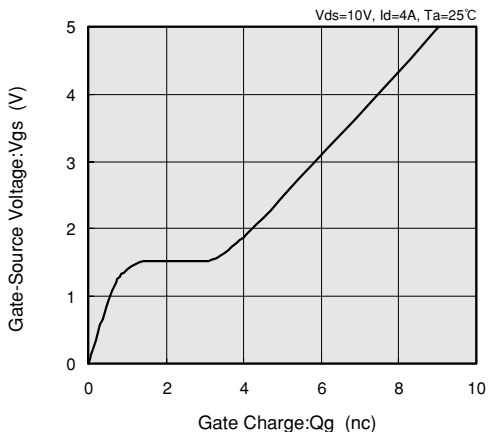
CAPACITANCE vs. DRAIN-SOURCE VOLTAGE



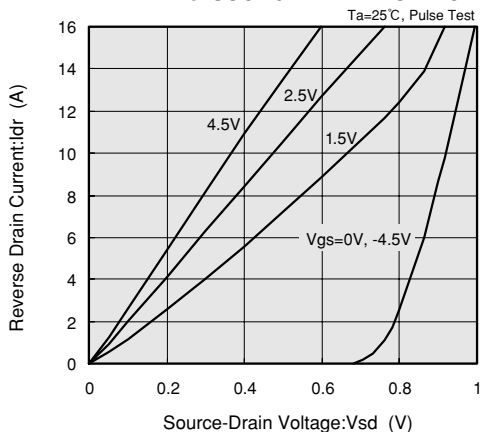
SWITCHING TIME vs. DRAIN CURRENT



GATE-SOURCE VOLTAGE vs. GATE CHARGE



REVERSE DRAIN CURRENT vs. SOURCE-DRAIN VOLTAGE



STANDARDIZED TRANSITION THERMAL RESISTANCE vs. PULSE WIDTH

