



## PRODUCT DATA SHEET



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**Datasheet**



**Resources**



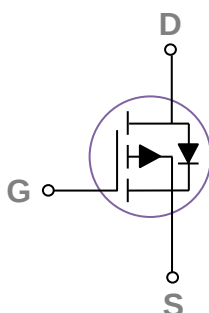
**Samples**

Please note: Please check the JINGAO Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at [www.jg-semi.cn](http://www.jg-semi.cn). Please email any questions regarding the system integration to [JINGAO\\_questions@jgsemi.com](mailto:JINGAO_questions@jgsemi.com).

### General Description

These P-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.

### PPAK3X3



| BVDSS | RDSON | ID   |
|-------|-------|------|
| -20V  | 8mΩ   | -60A |

### Features

- -20V, -60A,  $R_{DS(ON)} = 8m\Omega @ V_{GS} = -4.5V$
- Improved  $dv/dt$  capability
- Fast switching
- Green Device Available
- Suit for -1.8V Gate Drive Applications

### Applications

- Notebook
- Load Switch
- Networking
- Hand-Held Instruments

### Absolute Maximum Ratings $T_c=25^\circ\text{C}$ unless otherwise noted

| Symbol    | Parameter                                              | Rating     | Units               |
|-----------|--------------------------------------------------------|------------|---------------------|
| $V_{DS}$  | Drain-Source Voltage                                   | -20        | V                   |
| $V_{GS}$  | Gate-Source Voltage                                    | $\pm 12$   | V                   |
| $I_D$     | Drain Current – Continuous ( $T_c=25^\circ\text{C}$ )  | -60        | A                   |
|           | Drain Current – Continuous ( $T_c=100^\circ\text{C}$ ) | -38        | A                   |
| $I_{DM}$  | Drain Current – Pulsed <sup>1</sup>                    | -240       | A                   |
| $P_D$     | Power Dissipation ( $T_c=25^\circ\text{C}$ )           | 62.5       | W                   |
|           | Power Dissipation – Derate above $25^\circ\text{C}$    | 0.5        | W/ $^\circ\text{C}$ |
| $T_{STG}$ | Storage Temperature Range                              | -55 to 150 | $^\circ\text{C}$    |
| $T_J$     | Operating Junction Temperature Range                   | -55 to 150 | $^\circ\text{C}$    |

### Thermal Characteristics

| Symbol          | Parameter                              | Typ. | Max. | Unit               |
|-----------------|----------------------------------------|------|------|--------------------|
| $R_{\theta JA}$ | Thermal Resistance Junction to ambient | ---  | 62   | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance Junction to Case    | ---  | 2    | $^\circ\text{C/W}$ |

**Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**
**Off Characteristics**

| Symbol                              | Parameter                                 | Conditions                                                        | Min. | Typ.  | Max. | Unit |
|-------------------------------------|-------------------------------------------|-------------------------------------------------------------------|------|-------|------|------|
| BV <sub>DSS</sub>                   | Drain-Source Breakdown Voltage            | V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA                       | -20  | ---   | ---  | V    |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | BV <sub>DSS</sub> Temperature Coefficient | Reference to 25°C, I <sub>D</sub> =-1mA                           | ---  | -0.01 | ---  | V/°C |
| I <sub>DSS</sub>                    | Drain-Source Leakage Current              | V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C  | ---  | ---   | -1   | uA   |
|                                     |                                           | V <sub>DS</sub> =-16V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C | ---  | ---   | -10  | uA   |
| I <sub>GSS</sub>                    | Gate-Source Leakage Current               | V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V                        | ---  | ---   | ±100 | nA   |

**On Characteristics**

|                     |                                   |                                                           |      |      |      |    |
|---------------------|-----------------------------------|-----------------------------------------------------------|------|------|------|----|
| R <sub>DS(ON)</sub> | Static Drain-Source On-Resistance | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-8A               | ---  | 6    | 8    | mΩ |
|                     |                                   | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-5A               | ---  | 8    | 11   |    |
|                     |                                   | V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-3A               | ---  | 11   | 16   |    |
| V <sub>GS(th)</sub> | Gate Threshold Voltage            | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA | -0.3 | -0.6 | -1.0 | V  |
| g <sub>fs</sub>     | Forward Transconductance          | V <sub>DS</sub> =-10V, I <sub>S</sub> =-5A                | ---  | 20   | ---  | S  |

**Dynamic and switching Characteristics**

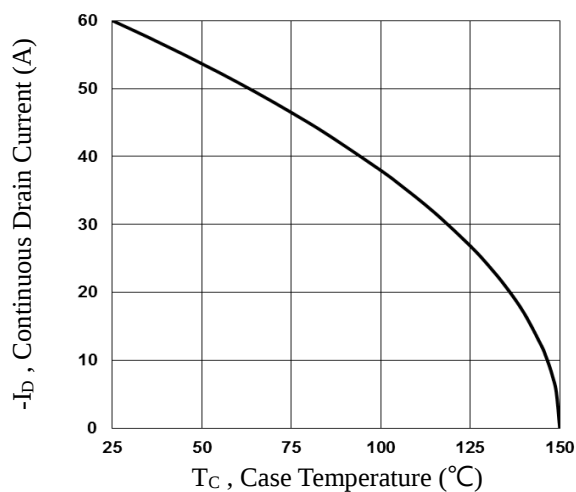
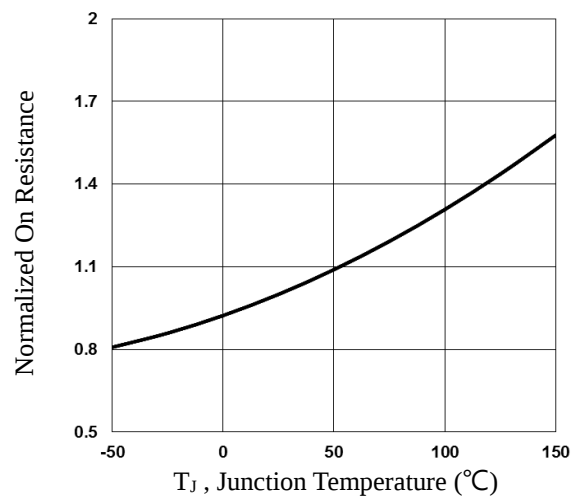
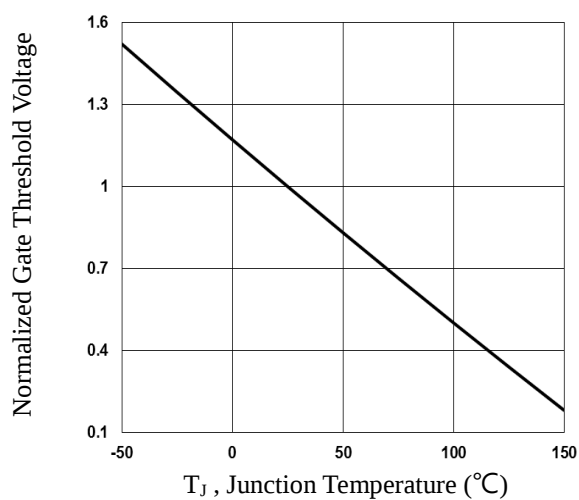
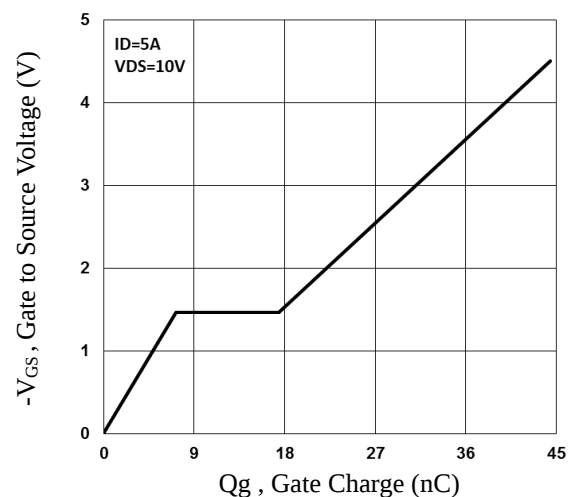
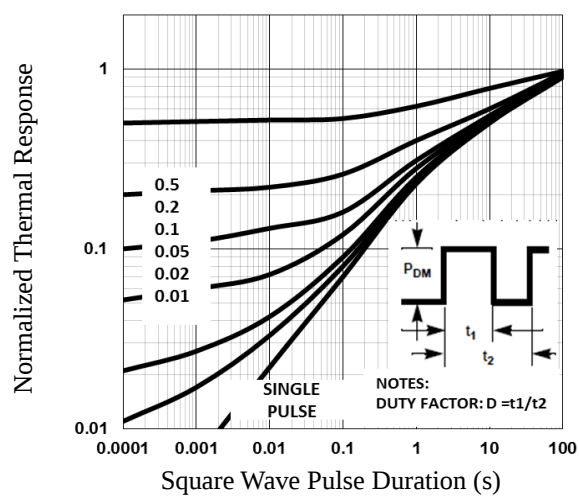
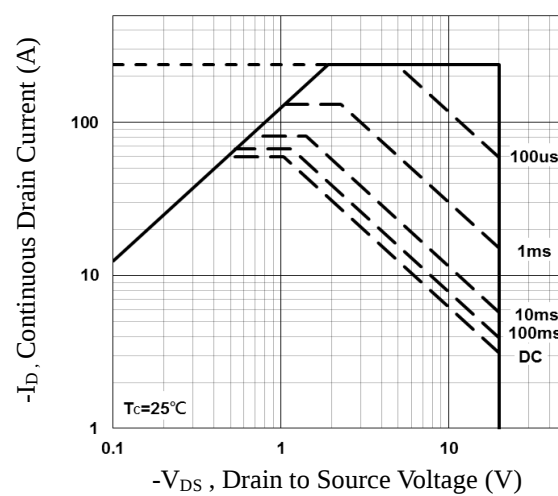
|                     |                                     |                                                                                           |     |      |      |    |
|---------------------|-------------------------------------|-------------------------------------------------------------------------------------------|-----|------|------|----|
| Q <sub>g</sub>      | Total Gate Charge <sup>2, 3</sup>   | V <sub>DS</sub> =-10V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-5A                        | --- | 44.4 | 80   | nC |
| Q <sub>gs</sub>     | Gate-Source Charge <sup>2, 3</sup>  |                                                                                           | --- | 7.2  | 14   |    |
| Q <sub>gd</sub>     | Gate-Drain Charge <sup>2, 3</sup>   |                                                                                           | --- | 10.2 | 20   |    |
| T <sub>d(on)</sub>  | Turn-On Delay Time <sup>2, 3</sup>  | V <sub>DD</sub> =-10V, V <sub>GS</sub> =-4.5V, R <sub>G</sub> =25Ω<br>I <sub>D</sub> =-1A | --- | 13.2 | 26   | nS |
| T <sub>r</sub>      | Rise Time <sup>2, 3</sup>           |                                                                                           | --- | 68   | 120  |    |
| T <sub>d(off)</sub> | Turn-Off Delay Time <sup>2, 3</sup> |                                                                                           | --- | 160  | 320  |    |
| T <sub>f</sub>      | Fall Time <sup>2, 3</sup>           |                                                                                           | --- | 154  | 300  |    |
| C <sub>iss</sub>    | Input Capacitance                   | V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, F=1MHz                                        | --- | 4060 | 8000 | pF |
| C <sub>oss</sub>    | Output Capacitance                  |                                                                                           | --- | 520  | 1000 |    |
| C <sub>rss</sub>    | Reverse Transfer Capacitance        |                                                                                           | --- | 400  | 800  |    |

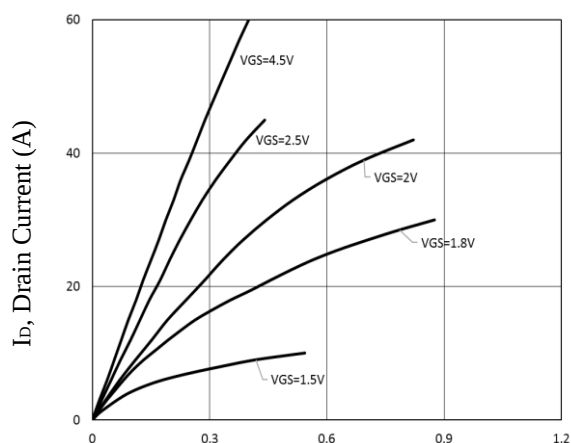
**Drain-Source Diode Characteristics and Maximum Ratings**

| Symbol          | Parameter                 | Conditions                                                     | Min. | Typ. | Max. | Unit |
|-----------------|---------------------------|----------------------------------------------------------------|------|------|------|------|
| I <sub>S</sub>  | Continuous Source Current | V <sub>G</sub> =V <sub>D</sub> =0V, Force Current              | ---  | ---  | -60  | A    |
| I <sub>SM</sub> | Pulsed Source Current     |                                                                | ---  | ---  | -120 | A    |
| V <sub>SD</sub> | Diode Forward Voltage     | V <sub>GS</sub> =0V, I <sub>S</sub> =-1A, T <sub>J</sub> =25°C | ---  | ---  | -1   | V    |

Note :

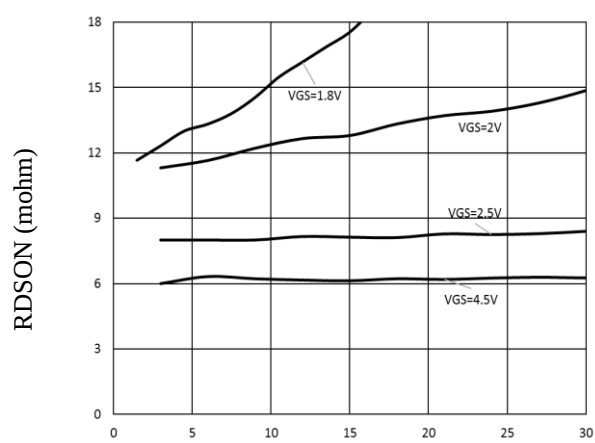
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
3. Essentially independent of operating temperature.


**Fig.1 Continuous Drain Current vs.  $T_c$** 

**Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_J$** 

**Fig.3 Normalized  $V_{th}$  vs.  $T_J$** 

**Fig.4 Gate Charge Waveform**

**Fig.5 Normalized Transient Response**

**Fig.6 Maximum Safe Operation Area**



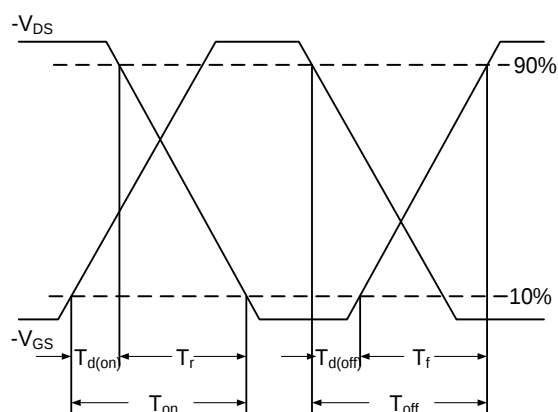
$V_{DS}$ , Drain to Source Voltage

**Fig.7 Typical Output Characteristics**

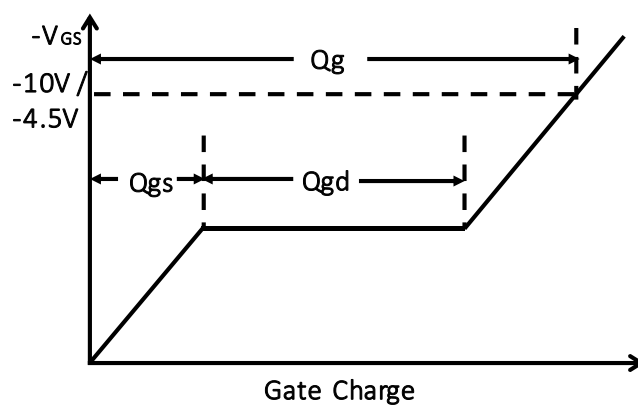


$I_D$ , Drain Current (A)

**Fig.8 RDSON vs. Drain Current**

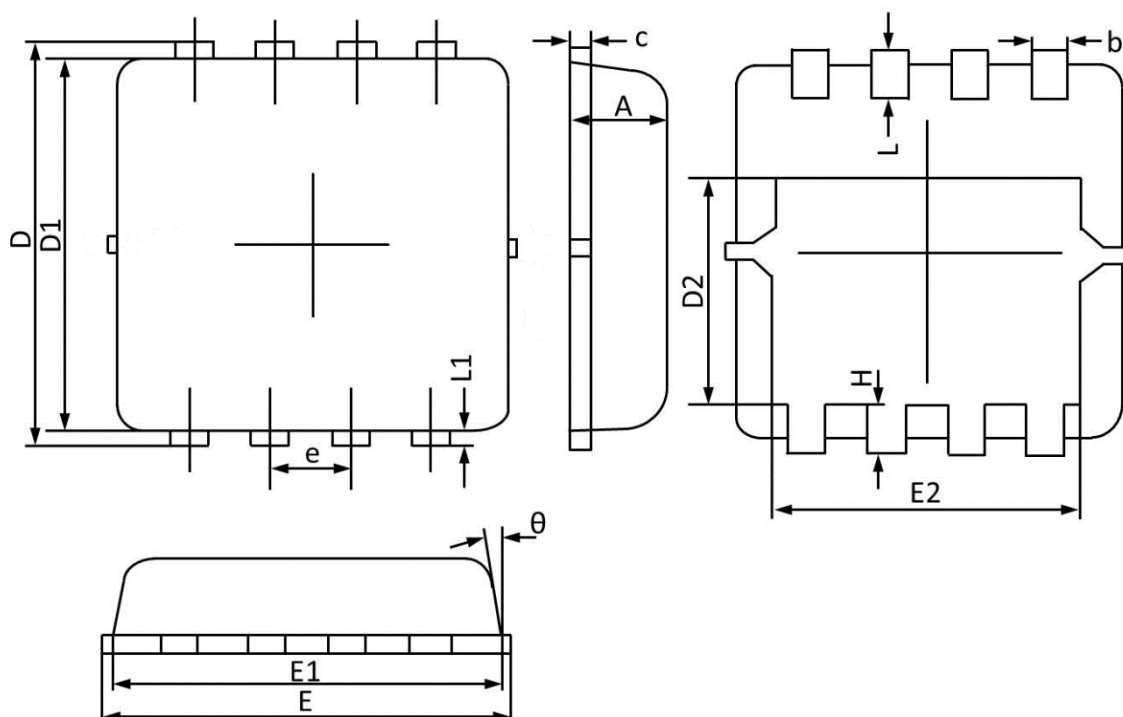


**Fig.9 Switching Time Waveform**



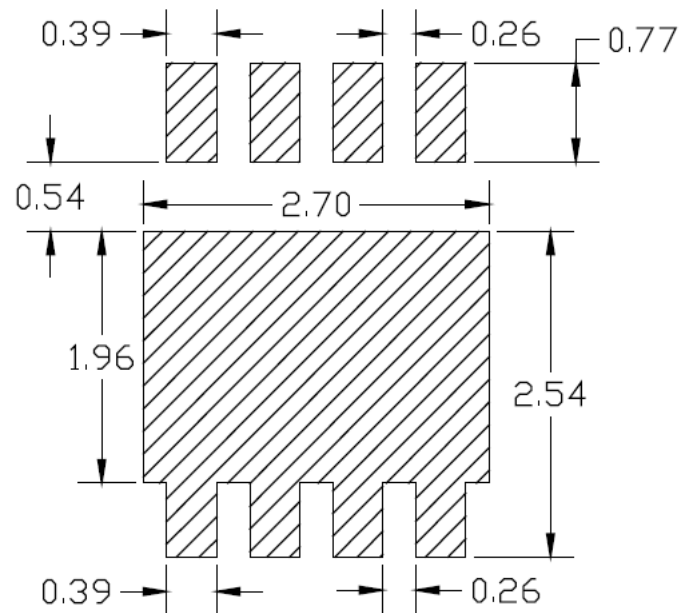
**Fig.10 Gate Charge Waveform**

## PPAK3x3 PACKAGE INFORMATION



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | MAX                       | MIN   | MAX                  | MIN   |
| A      | 0.900                     | 0.700 | 0.035                | 0.028 |
| b      | 0.350                     | 0.250 | 0.014                | 0.010 |
| c      | 0.250                     | 0.100 | 0.010                | 0.004 |
| D      | 3.500                     | 3.050 | 0.138                | 0.120 |
| D1     | 3.200                     | 2.900 | 0.126                | 0.114 |
| D2     | 1.950                     | 1.350 | 0.077                | 0.053 |
| E      | 3.400                     | 3.000 | 0.134                | 0.118 |
| E1     | 3.300                     | 2.900 | 0.130                | 0.114 |
| E2     | 2.600                     | 2.350 | 0.102                | 0.093 |
| e      | 0.65BSC                   |       | 0.026BSC             |       |
| H      | 0.750                     | 0.300 | 0.030                | 0.012 |
| L      | 0.600                     | 0.300 | 0.024                | 0.012 |
| L1     | 0.200                     | 0.060 | 0.008                | 0.002 |
| θ      | 14°                       | 6°    | 14°                  | 6°    |

## PPAK3X3 RECOMMENDED LAND PATTERN



unit : mm

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