

# PJP4N60 / PJF4N60

## 600V N-Channel Enhancement Mode MOSFET

### FEATURES

- 4A , 600V,  $R_{DS(ON)}=2.4\Omega@V_{GS}=10V, I_D=2.0A$
- Low ON Resistance
- Fast Switching
- Low Gate Charge
- Fully Characterized Avalanche Voltage and Current
- Specially Designed for AC Adapter, Battery Charge and SMPS
- In compliance with EU RoHs 2002/95/EC Directives

### MECHANICAL DATA

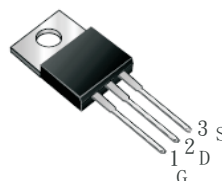
- Case: TO-220AB / ITO-220AB Molded Plastic
- Terminals : Solderable per MIL-STD-750,Method 2026

### ORDERING INFORMATION

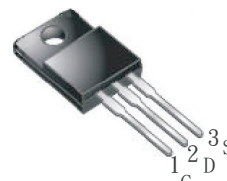
| TYPE    | MARKING | PACKAGE   | PACKING    |
|---------|---------|-----------|------------|
| PJP4N60 | P4N60   | TO-220AB  | 50PCS/TUBE |
| PJF4N60 | F4N60   | ITO-220AB | 50PCS/TUBE |

## TO-220AB / ITO-220AB

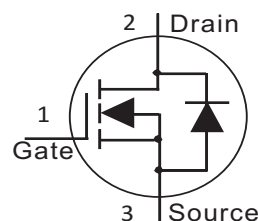
TO-220AB



ITO-220AB



### INTERNAL SCHEMATIC DIAGRAM



### Maximum RATINGS and Thermal Characteristics ( $T_A=25^{\circ}\text{C}$ unless otherwise noted )

| PARAMETER                                                               | Symbol          | PJP4N60     | PJF4N60   | Units                |
|-------------------------------------------------------------------------|-----------------|-------------|-----------|----------------------|
| Drain-Source Voltage                                                    | $V_{DS}$        | 600         |           | V                    |
| Gate-Source Voltage                                                     | $V_{GS}$        | $\pm 30$    |           | V                    |
| Continuous Drain Current                                                | $I_D$           | 4           | 4         | A                    |
| Pulsed Drain Current <sup>1)</sup>                                      | $I_{DM}$        | 16          | 16        | A                    |
| Maximum Power Dissipation<br>Derating Factor                            | $P_D$           | 70<br>0.56  | 26<br>0.2 | W                    |
| Operating Junction and Storage Temperature Range                        | $T_J, T_{STG}$  | -55 to +150 |           | $^{\circ}\text{C}$   |
| Avalanche Energy with Single Pulse<br>$I_{AS}=4.4A, V_{DD}=85V, L=30mH$ | $E_{AS}$        | 330         |           | mJ                   |
| Junction-to-Case Thermal Resistance                                     | $R_{\theta JC}$ | 1.75        | 4.8       | $^{\circ}\text{C/W}$ |
| Junction-to Ambient Thermal Resistance(PCB mounted) <sup>2</sup>        | $R_{\theta JA}$ | 62.5        | 100       | $^{\circ}\text{C/W}$ |

**Note :** 1. Maximum DC current limited by the package

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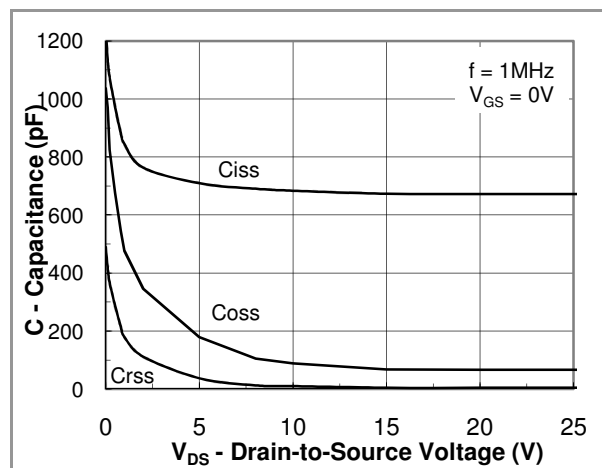
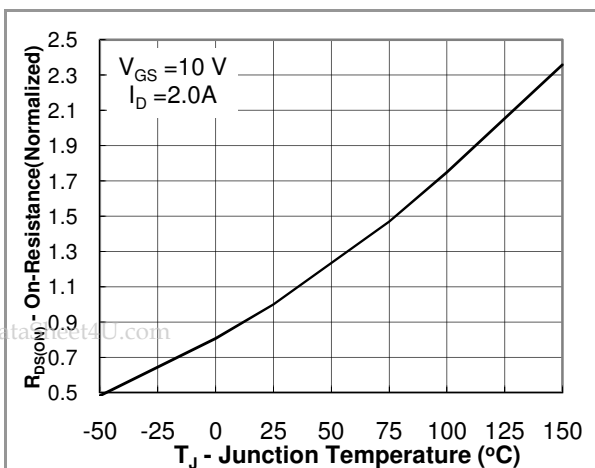
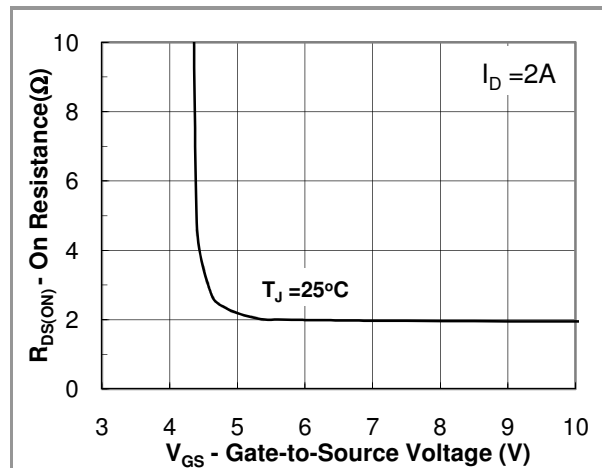
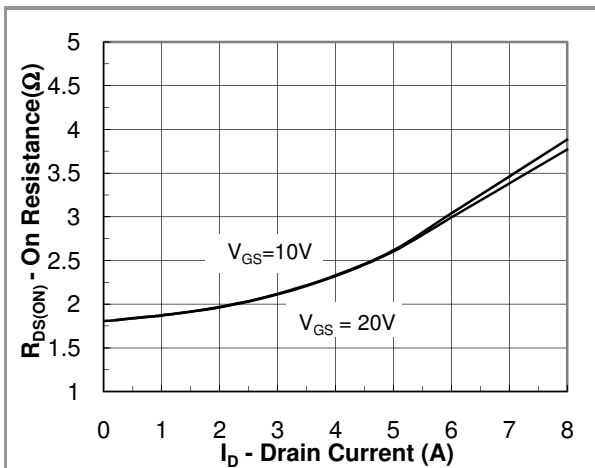
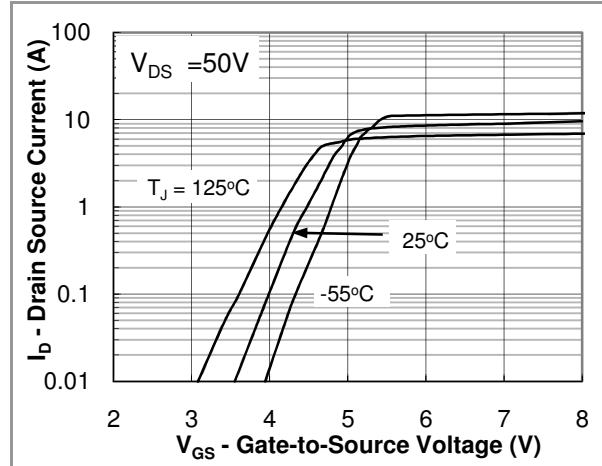
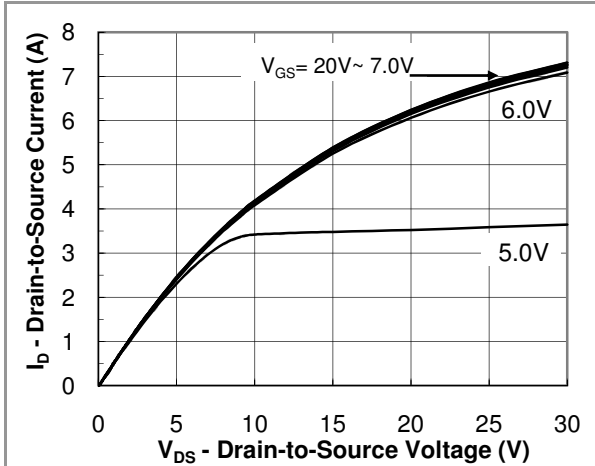
## ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C unless otherwise noted)

| Parameter                        | Symbol       | Test Condition                                      | Min. | Typ. | Max.      | Units    |
|----------------------------------|--------------|-----------------------------------------------------|------|------|-----------|----------|
| Static                           |              |                                                     |      |      |           |          |
| Drain-Source Breakdown Voltage   | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$                           | 600  | -    | -         | V        |
| Gate Threshold Voltage           | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$                       | 2.0  | -    | 4.0       | V        |
| Drain-Source On-State Resistance | $R_{DS(on)}$ | $V_{GS}=10V, I_D=2.0A$                              | -    | 2.0  | 2.4       | $\Omega$ |
| Zero Gate Voltage Drain Current  | $I_{DSS}$    | $V_{DS}=600V, V_{GS}=0V$                            | -    | -    | 10        | $\mu A$  |
| Gate Body Leakage                | $I_{GSS}$    | $V_{GS}=\pm 30V, V_{DS}=0V$                         | -    | -    | $\pm 100$ | nA       |
| Dynamic                          |              |                                                     |      |      |           |          |
| Total Gate Charge                | $Q_g$        | $V_{DS}=480V, I_D=4A$<br>$V_{GS}=10V$               | -    | 17.2 | -         | nC       |
| Gate-Source Charge               | $Q_{gs}$     |                                                     | -    | 4.6  | -         |          |
| Gate-Drain Charge                | $Q_{gd}$     |                                                     | -    | 5.2  | -         |          |
| Turn-On Delay Time               | $t_{d(on)}$  | $V_{DD}=300V, I_D=4A$<br>$V_{GS}=10V, R_G=25\Omega$ | -    | 11.6 | 16.8      | ns       |
| Turn-On Rise Time                | $t_r$        |                                                     | -    | 10.6 | 15.2      |          |
| Turn-Off Delay Time              | $t_{d(off)}$ |                                                     | -    | 25.8 | 36.8      |          |
| Turn-Off Fall Time               | $t_f$        |                                                     | -    | 9.2  | 14.2      |          |
| Input Capacitance                | $C_{iss}$    | $V_{DS}=25V, V_{GS}=0V$<br>$f=1.0MHz$               | -    | 560  | 680       | pF       |
| Output Capacitance               | $C_{oss}$    |                                                     | -    | 55   | 66        |          |
| Reverse Transfer Capacitance     | $C_{rss}$    |                                                     | -    | 5.2  | 9.6       |          |
| Source-Drain Diode               |              |                                                     |      |      |           |          |
| Max. Diode Forward Current       | $I_S$        | -                                                   | -    | -    | 4.0       | A        |
| Max.Pulsed Source Current        | $I_{SM}$     | -                                                   | -    | -    | 16        | A        |
| Diode Forward Voltage            | $V_{SD}$     | $I_S=4A, V_{GS}=0V$                                 | -    | -    | 1.4       | V        |
| Reverse Recovery Time            | $t_{rr}$     | $V_{GS}=0V, I_F=4A$<br>$di/dt=100A/\mu s$           | -    | 300  | -         | ns       |
| Reverse Recovery Charge          | $Q_{rr}$     |                                                     | -    | 2.2  | -         | $\mu C$  |

**NOTE** : Plus Test : Pluse Width ≤ 300us, Duty Cycle ≤ 2%.

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Typical Characteristics Curves (  $T_a=25^\circ\text{C}$ , unless otherwise noted)



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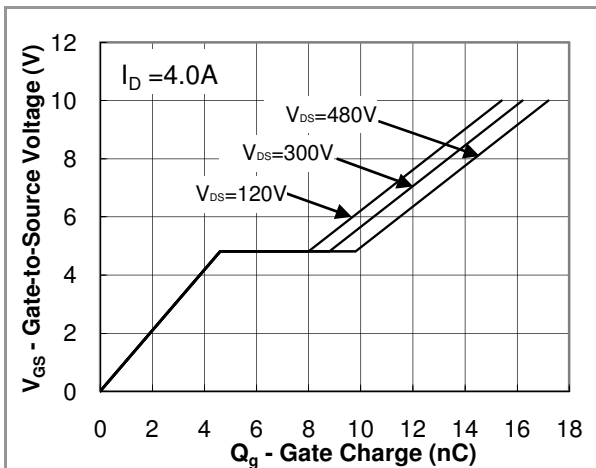


Fig. 7 Gate Charge Waveform

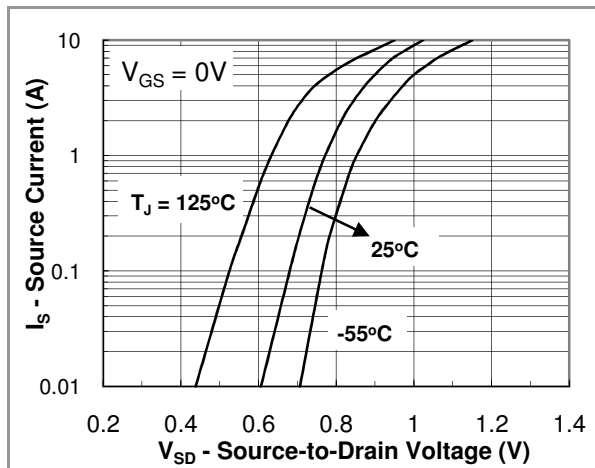


Fig. 8 Source-Drain Diode Forward Voltage

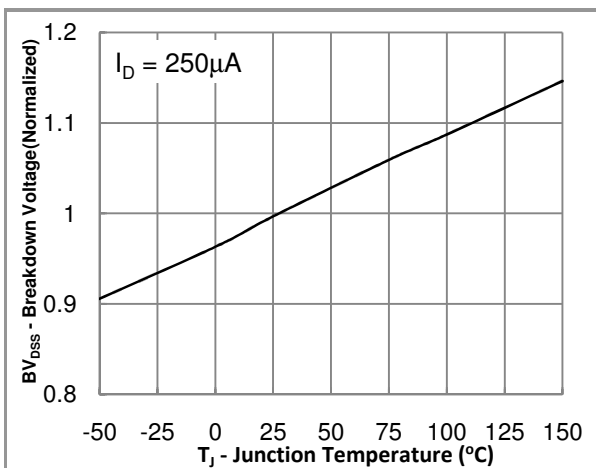


Fig. 9 Breakdown Voltage vs Junction Temperature



## PJP4N60 / PJF4N60

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