

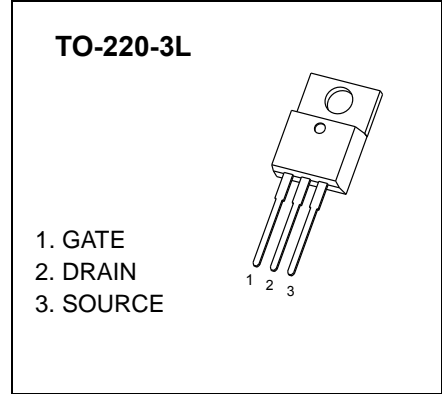


## TO-220-3L Plastic-Encapsulate MOSFETS

### CJP04N60

600V N-Channel Power MOSFET

|               |                 |       |
|---------------|-----------------|-------|
| $V_{(BR)DSS}$ | $R_{DS(on)MAX}$ | $I_D$ |
| 600V          | 3Ω@10V          | 4A    |



#### General Description

This advanced high voltage MOSFET is designed to withstand high energy in the avalanche mode and switch efficiently. This new high energy device also offers a drain-to-source diode with fast recovery time. Designed for high voltage, high speed switching applications such as power supplies, converters, power motor controls and bridge circuits.

#### FEATURE

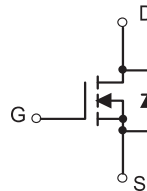
- High Current Rating
- Lower  $R_{ds(on)}$
- Lower Capacitance
- Lower Total Gate Charge
- Tighter VSD Specifications
- Avalanche Energy Specified

#### MARKING



CJP04N60= Device code  
 Solid dot = Green molding compound device,  
 if none, the normal device  
 XXX=Date Code

#### EQUIVALENT CIRCUIT



#### Maximum ratings ( $T_a=25^\circ\text{C}$ unless otherwise noted)

| Parameter   | Symbol          | Value     | Units |
|---|-----------------|-----------|-------|
| Drain-Source Voltage  | $V_{DS}$        | 600       | V     |
| Gate-Source Voltage   | $V_{GSS}$       | ±30       |       |
| Continuous Drain Current  | $I_D$           | 4.0       | A     |
| Continuous Drain-Source Diode Forward Current                                     | $I_S$           | 4.0       |       |
| Single Pulsed Avalanche Energy (note1)  | $E_{AS}$        | 260       | mJ    |
| Thermal Resistance from Junction to Ambient                                       | $R_{\theta JA}$ | 62.5      | °C/W  |
| Operating and Storage Temperature Range   | $T_J, T_{STG}$  | -55 ~+150 | °C    |
| Maximum lead temperature for soldering purposes ,<br>1/8" from case for 5 seconds | $T_L$           | 260       |       |

## MOSFET ELECTRICAL CHARACTERISTICS

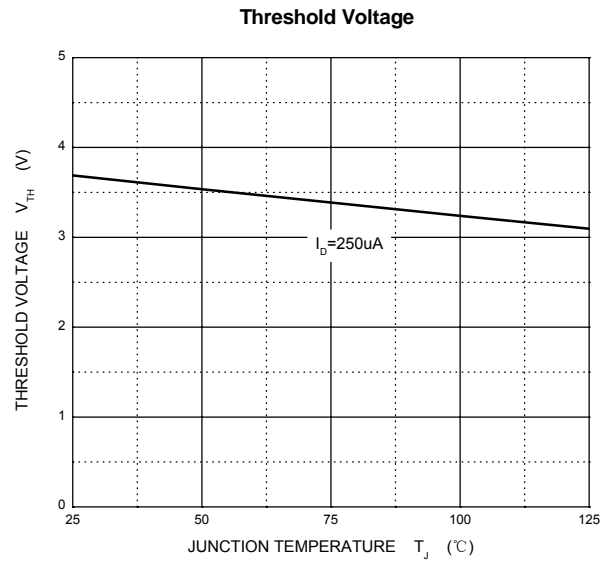
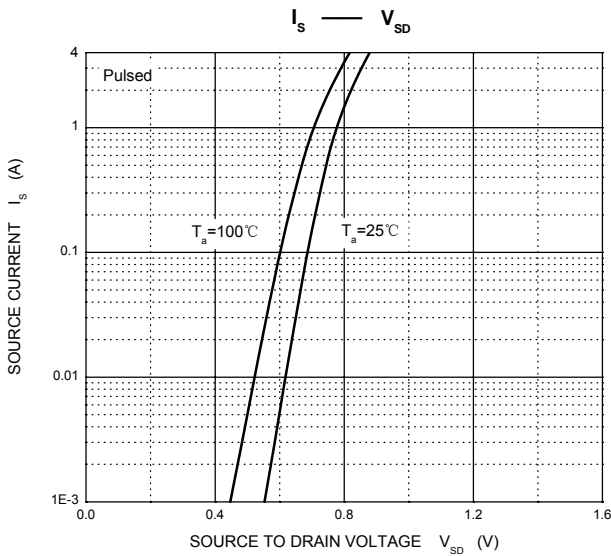
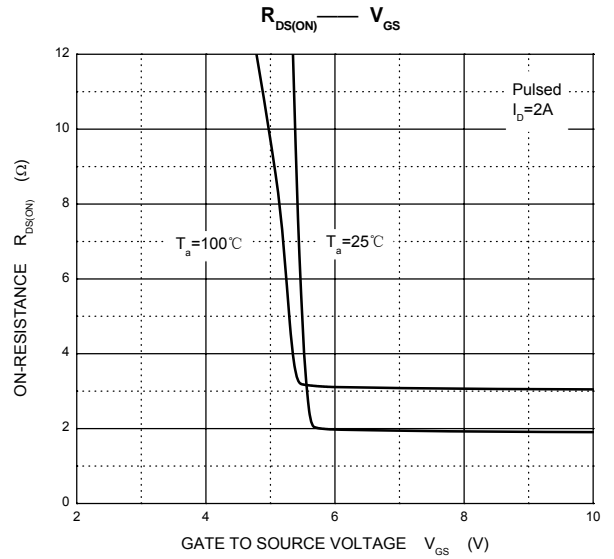
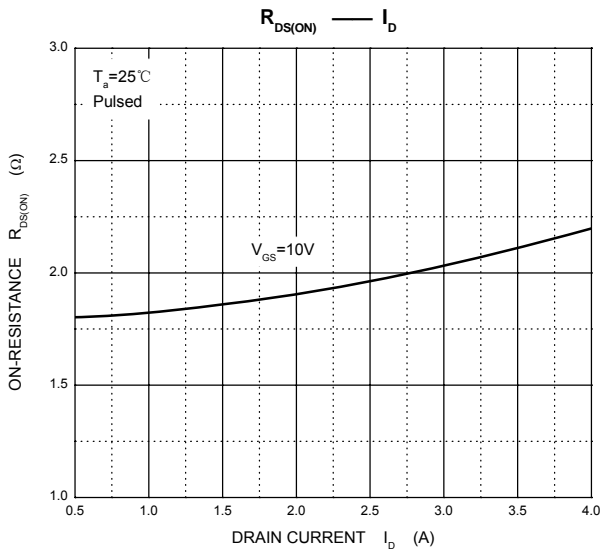
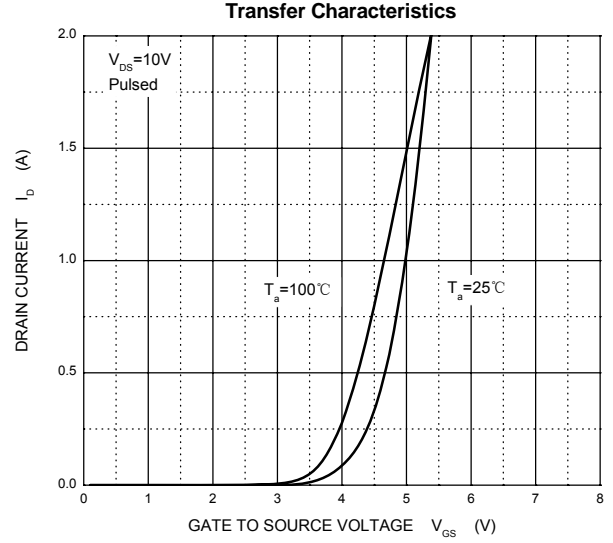
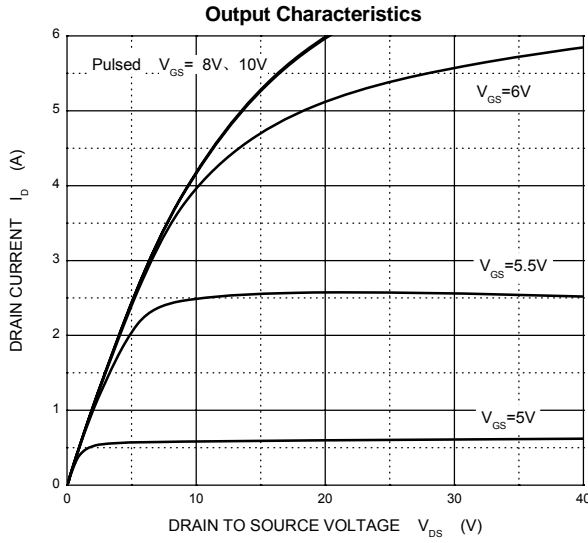
$T_a=25^\circ\text{C}$  unless otherwise specified

| Parameter                                 | Symbol        | Test Condition  | Min | Typ | Max  | Unit     |
|---|---------------|---|-----|-----|------|----------|
| <b>Off characteristics</b>                |               |   |     |     |      |          |
| Drain-source breakdown voltage            | $V_{(BR)DSS}$ | $V_{GS} = 0V, I_D = 250\mu A$                                   | 600 |     |      | V        |
| Drain-source diode forward voltage(note2) | $V_{SD}$      | $V_{GS} = 0V, I_S = 4.0A$                                       |     |     | 1.5  |          |
| Zero gate voltage drain current           | $I_{DSS}$     | $V_{DS} = 600V, V_{GS} = 0V$                                    |     |     | 25   | $\mu A$  |
| Gate-body leakage current, forward(note2) | $I_{GSSF}$    | $V_{DS} = 0V, V_{GS} = 30V$                                     |     |     | 100  | nA       |
| Gate-body leakage current, reverse(note2) | $I_{GSSR}$    | $V_{DS} = 0V, V_{GS} = -30V$                                    |     |     | -100 |          |
| <b>On characteristics (note2)</b>         |               |   |     |     |      |          |
| Gate-threshold voltage                    | $V_{GS(th)}$  | $V_{DS} = V_{GS}, I_D = 250\mu A$                               | 2.0 | 3.5 | 4.0  | V        |
| Static drain-source on-resistance         | $R_{DS(on)}$  | $V_{GS} = 10V, I_D = 2.0A$                                      |     | 1.8 | 3.0  | $\Omega$ |
| Forward transconductance                  | $g_{fs}$      | $V_{DS} = 50V, I_D = 2A$  | 2.0 | 2.6 |      | S        |
| <b>Dynamic characteristics (note 3)</b>   |               |   |     |     |      |          |
| Input capacitance                         | $C_{iss}$     | $V_{DS} = 25V, V_{GS} = 0V, f = 1MHz$                           |     | 540 | 760  | pF       |
| Output capacitance                        | $C_{oss}$     |   |     | 125 | 180  |          |
| Reverse transfer capacitance              | $C_{rss}$     |   |     | 8.0 | 20   |          |
| <b>Switching characteristics</b>          |               |   |     |     |      |          |
| Total gate charge                         | $Q_g$         | $V_{DS} = 480V, V_{GS} = 10V, I_D = 4.0A$                       |     | 5.0 | 10   | nC       |
| Gate-source charge                        | $Q_{gs}$      |   |     | 2.7 |      |          |
| Gate-drain charge                         | $Q_{gd}$      |   |     | 2.0 |      |          |
| Turn-on delay time (note3)                | $t_{d(on)}$   | $V_{DD} = 300V, V_{GS} = 10V,$<br>$R_G = 9.1\Omega, I_D = 4.0A$ |     | 12  | 20   | ns       |
| Turn-on rise time (note3)                 | $t_r$         |   |     | 7.0 | 10   |          |
| Turn-off delay time (note3)               | $t_{d(off)}$  |   |     | 19  | 40   |          |
| Turn-off fall time (note3)                | $t_f$         |   |     | 10  | 20   |          |

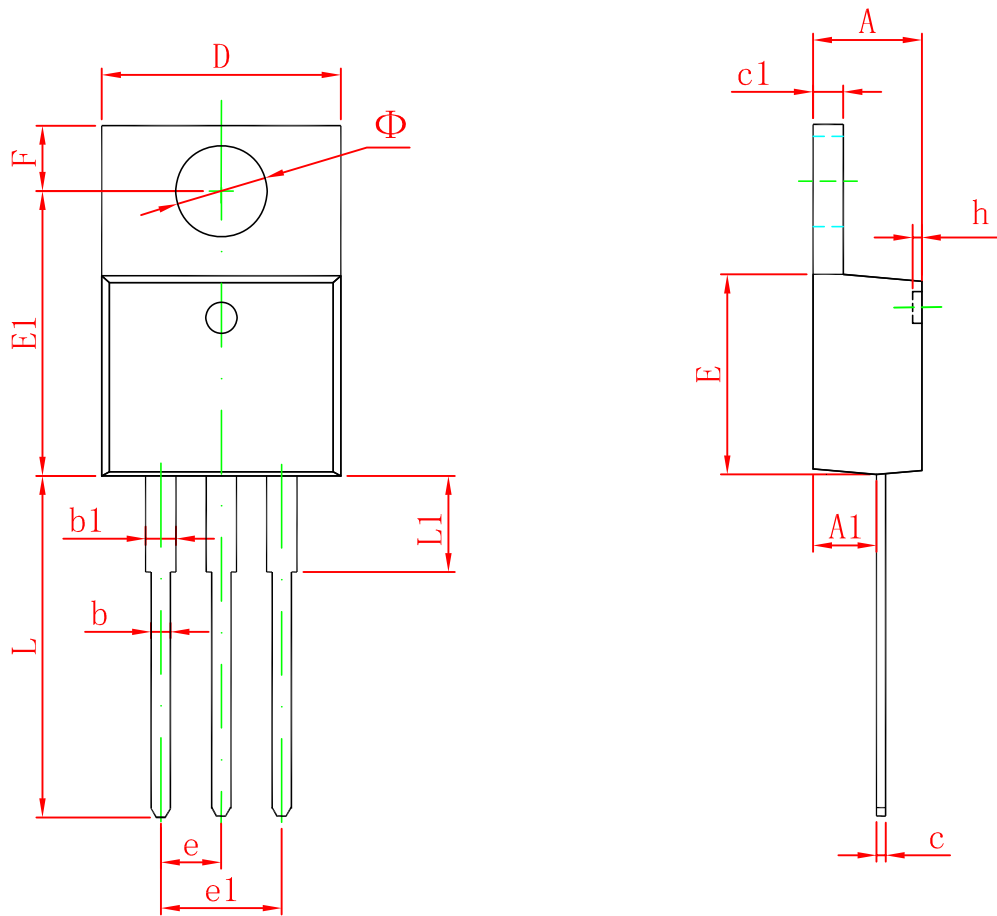
### Notes :

1.  $L=30mH, I_L=4A, V_{DD}=100V, V_{GS}=10V, R_G=25\Omega, \text{Starting } T_J=25^\circ\text{C}.$
2. Pulse Test : Pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
3. These parameters have no way to verify.

# Typical Characteristics



# TO-220-3L Package Outline Dimensions



| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min                       | Max    | Min                  | Max   |
| A      | 4.470                     | 4.670  | 0.176                | 0.184 |
| A1     | 2.520                     | 2.820  | 0.099                | 0.111 |
| b      | 0.710                     | 0.910  | 0.028                | 0.036 |
| b1     | 1.170                     | 1.370  | 0.046                | 0.054 |
| c      | 0.310                     | 0.530  | 0.012                | 0.021 |
| c1     | 1.170                     | 1.370  | 0.046                | 0.054 |
| D      | 10.010                    | 10.310 | 0.394                | 0.406 |
| E      | 8.500                     | 8.900  | 0.335                | 0.350 |
| E1     | 12.060                    | 12.460 | 0.475                | 0.491 |
| e      | 2.540 TYP                 |        | 0.100 TYP            |       |
| e1     | 4.980                     | 5.180  | 0.196                | 0.204 |
| F      | 2.590                     | 2.890  | 0.102                | 0.114 |
| h      | 0.000                     | 0.300  | 0.000                | 0.012 |
| L      | 13.400                    | 13.800 | 0.528                | 0.543 |
| L1     | 3.560                     | 3.960  | 0.140                | 0.156 |
| $\Phi$ | 3.735                     | 3.935  | 0.147                | 0.155 |