

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)TYP}$ | $I_D$ |
|---------------|-----------------|-------|
| -40V          | 4.8mΩ@10V       | -100A |
|               | 6.5mΩ@4.5V      |       |



**合肥矽普半导体**

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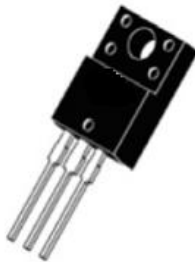
## Feature

- Fast Switching
- Low Gate Charge and Rdson
- 100% Single Pulse avalanche energy Test

## Applications

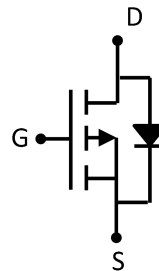
- Power switching application
- DC-DC Converter
- Power Management

## Package

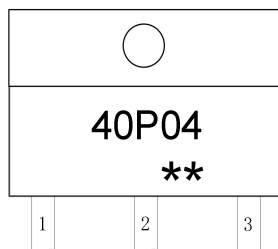


TO-220F(1:G 2:D 3:S)

## Circuit diagram



## Marking



40P04  
\*\*

:Product code  
:Week code

## Order Information

| Device    | Package | Unit/Tube |
|-----------|---------|-----------|
| SP40P04TG | TO-220F | 50        |

**Absolute maximum ratings (Ta=25°C, unless otherwise noted)**

| Parameter                                  | Symbol          | Rating     | Units |
|--------------------------------------------|-----------------|------------|-------|
| Drain-Source Voltage                       | $V_{DS}$        | -40        | V     |
| Gate-Source Voltage                        | $V_{GS}$        | $\pm 20$   | V     |
| Continuous Drain Current (Tc=25°C)         | $I_D$           | -100       | A     |
| Continuous Drain Current (Tc=100°C)        | $I_D$           | -67        | A     |
| Pulsed Drain Current                       | $I_{DM}$        | -400       | A     |
| Single Pulse Avalanche Energy <sup>1</sup> | $E_{AS}$        | 576        | mJ    |
| Power Dissipation (Tc=25°C)                | $P_D$           | 150        | W     |
| Thermal Resistance Junction-to-Case        | $R_{\theta JC}$ | 0.83       | °C/W  |
| Storage Temperature Range                  | $T_{STG}$       | -55 to 150 | °C    |
| Operating Junction Temperature Range       | $T_J$           | -55 to 150 | °C    |

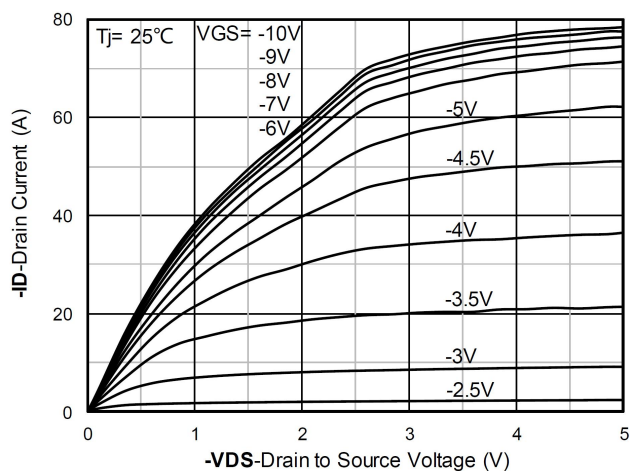
**Electrical characteristics (Ta=25°C, unless otherwise noted)**

| Characteristics                         | Symbol              | Test Condition                                 | Min  | Typ  | Max  | Unit |
|-----------------------------------------|---------------------|------------------------------------------------|------|------|------|------|
| Static Characteristics                  |                     |                                                |      |      |      |      |
| Drain-Source Breakdown Voltage          | BV <sub>DSS</sub>   | VGS=0V , ID=-250uA                             | -40  | -    | -    | V    |
| Drain Cut-Off Current                   | I <sub>DSS</sub>    | VDS=-32V , VGS=0V , TJ=25℃                     | -    | -    | -1   | μA   |
| Gate Leakage Current                    | I <sub>GSS</sub>    | VGS=±20V , VDS=0V                              | -    | -    | ±100 | nA   |
| Gate Threshold Voltage                  | V <sub>GS(th)</sub> | VGS=VDS , ID =-250uA                           | -1.0 | -1.7 | -2.5 | V    |
| Static Drain-Source On-Resistance       | R <sub>DS(ON)</sub> | VGS=-10V , ID=-20A                             | -    | 4.8  | 6    | mΩ   |
|                                         |                     | VGS=-4.5V , ID=-20A                            | -    | 6.5  | 8.6  |      |
| Dynamic Characteristics                 |                     |                                                |      |      |      |      |
| Input Capacitance                       | C <sub>iss</sub>    | VDS=-20V,VGS=0V,f=1MHz                         | -    | 6456 | -    | pF   |
| Output Capacitance                      | C <sub>oss</sub>    |                                                | -    | 508  | -    |      |
| Reverse Transfer Capacitance            | C <sub>rss</sub>    |                                                | -    | 441  | -    |      |
| Total Gate Charge                       | Q <sub>g</sub>      | VDS=-20V,VGS=-10V,ID=-20A                      | -    | 74   | -    | nC   |
| Gate-Source Charge                      | Q <sub>gs</sub>     |                                                | -    | 22   | -    |      |
| Gate-Drain Charge                       | Q <sub>gd</sub>     |                                                | -    | 18   | -    |      |
| Switching Characteristics               |                     |                                                |      |      |      |      |
| Turn-On Delay Time                      | t <sub>d(on)</sub>  | VDD=-20V,ID=-20A,VGS=-10V,R <sub>G</sub> =2.4Ω | -    | 10   | -    | nS   |
| Rise Time                               | t <sub>r</sub>      |                                                | -    | 15   | -    |      |
| Turn-Off Delay Time                     | t <sub>d(off)</sub> |                                                | -    | 93   | -    |      |
| Fall Time                               | t <sub>f</sub>      |                                                | -    | 20   | -    |      |
| Drain-Source Body Diode Characteristics |                     |                                                |      |      |      |      |
| Source-Drain Diode Forward Voltage      | V <sub>SD</sub>     | I <sub>S</sub> = -1A, VGS = 0V                 | -    | -    | -1.2 | V    |
| Maximum Body-Diode Continuous Current   | I <sub>S</sub>      |                                                | -    | -    | -100 | A    |
| Reverse Recovery Time                   | T <sub>rr</sub>     | I <sub>S</sub> =-20A,di/dt=100A/us,TJ=25℃      | -    | 30   | -    | nS   |
| Reverse Recovery Charge                 | Q <sub>rr</sub>     |                                                | -    | 21   | -    | nC   |

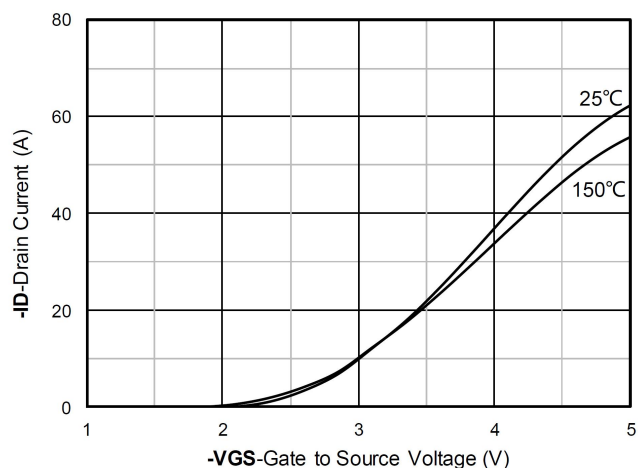
**Note :**

1. The test condition is  $V_{DD}=-25V, V_{GS}=-10V, L=0.5mH, R_G=25\Omega$

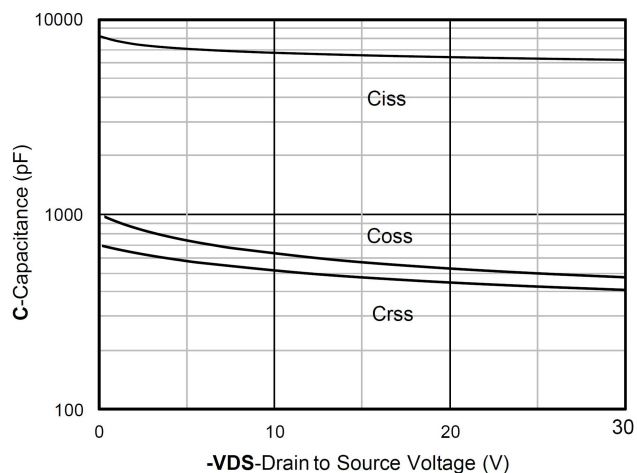
## Typical Characteristics



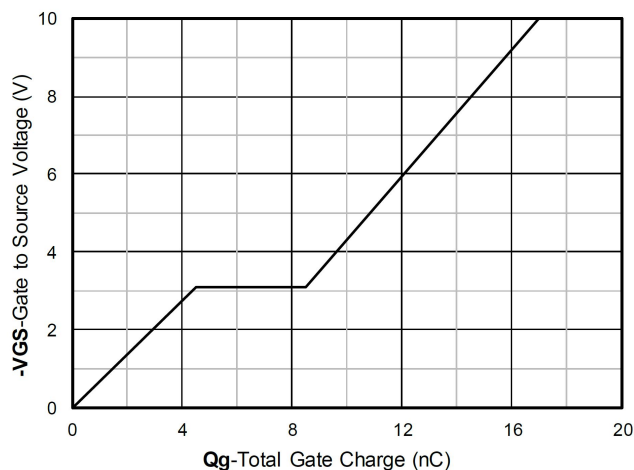
Output Characteristics



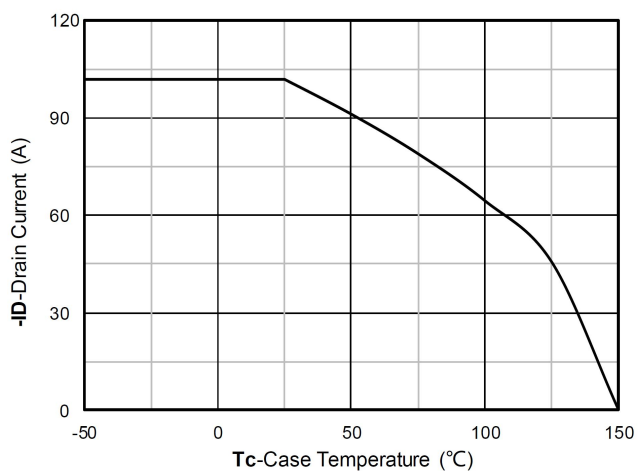
Transfer Characteristics



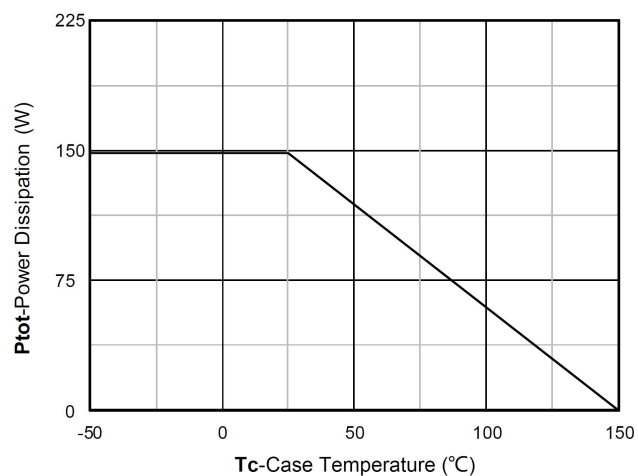
Capacitance Characteristics



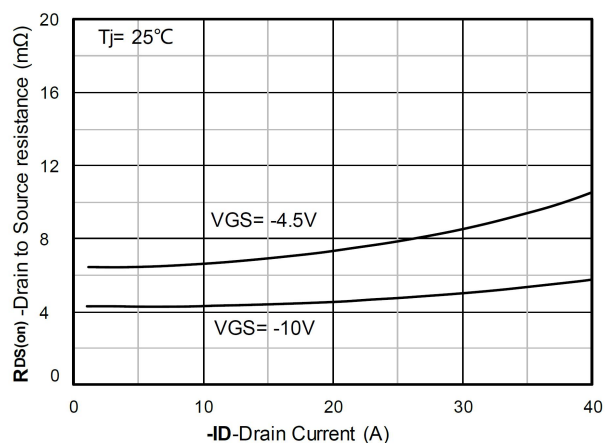
Gate Charge



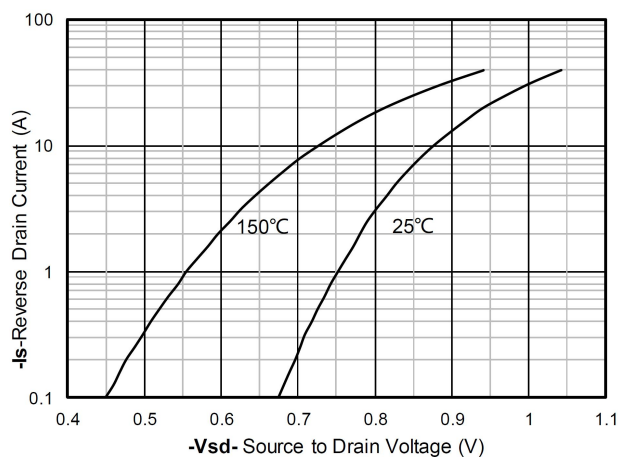
Current dissipation



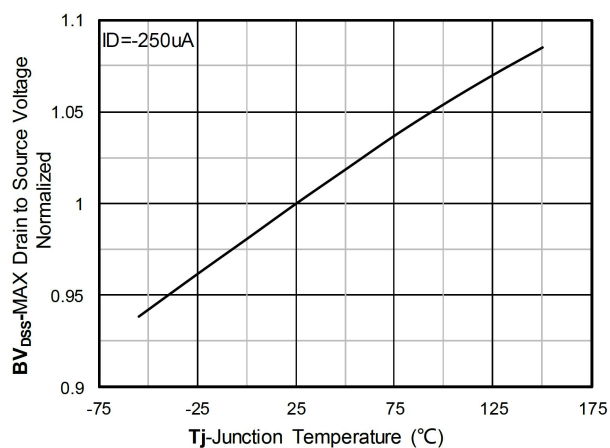
Power dissipation



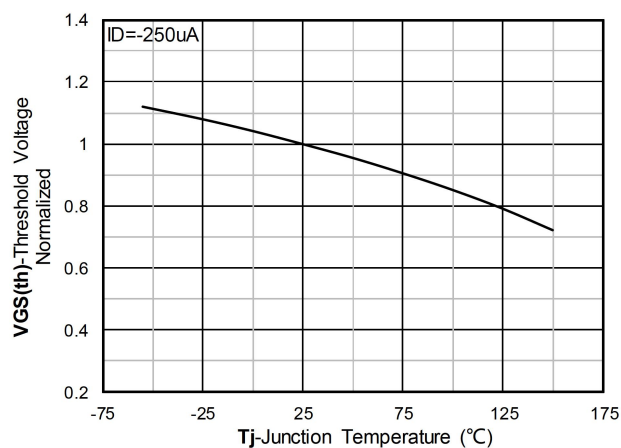
$R_{DS(on)}$  VS Drain Current



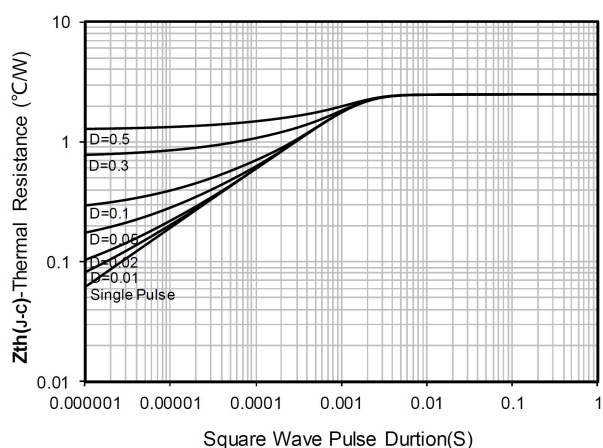
Forward characteristics of reverse diode



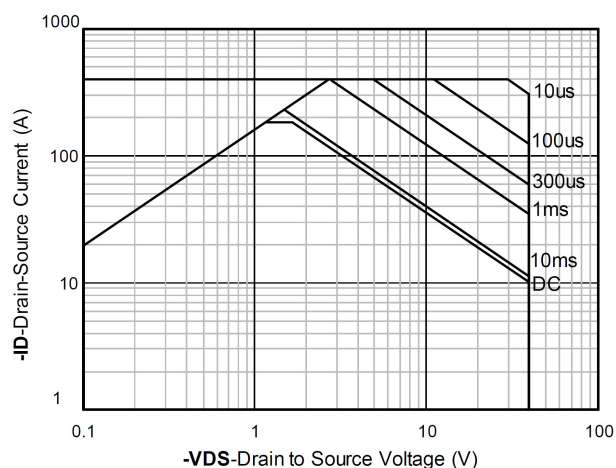
Normalized breakdown voltage



Normalized Threshold voltage

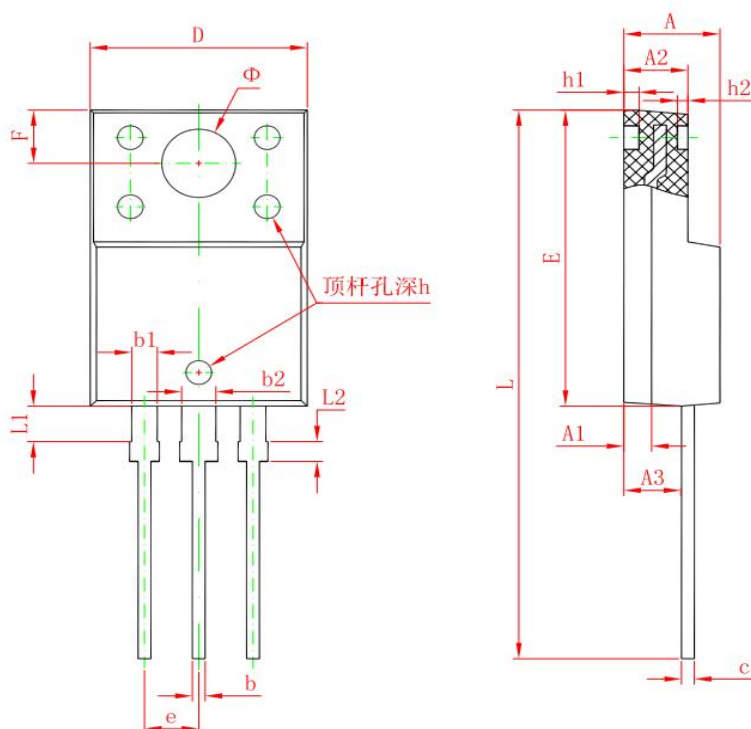


Maximum Transient Thermal Impedance



Safe Operation Area

## TO-220F Package Information



| Symbol | Dimensions In Millimeters |        |
|--------|---------------------------|--------|
|        | Min.                      | Max.   |
| A      | 4.300                     | 4.700  |
| A1     | 1.300 REF.                |        |
| A2     | 2.800                     | 3.200  |
| A3     | 2.500                     | 2.900  |
| b      | 0.500                     | 0.750  |
| b1     | 1.100                     | 1.350  |
| b2     | 1.500                     | 1.750  |
| c      | 0.500                     | 0.750  |
| D      | 9.960                     | 10.360 |
| E      | 14.800                    | 15.200 |
| e      | 2.540 TYP.                |        |
| F      | 2.700 REF.                |        |
| $\Phi$ | 3.500 REF.                |        |
| h      | 0.000                     | 0.300  |
| h1     | 0.800 REF.                |        |
| h2     | 0.500 REF.                |        |
| L      | 28.000                    | 28.400 |
| L1     | 1.700                     | 1.900  |
| L2     | 0.900                     | 1.100  |