

## Product Summary

|               |                 |       |
|---------------|-----------------|-------|
| $V_{(BR)DSS}$ | $R_{DS(on)TYP}$ | $I_D$ |
| 650V          | $0.6\Omega@10V$ | 12A   |



**合肥矽普半导体**

Siliup Semiconductor Technology Co., Ltd

技术 品质 服务

[www.siliup.com](http://www.siliup.com)

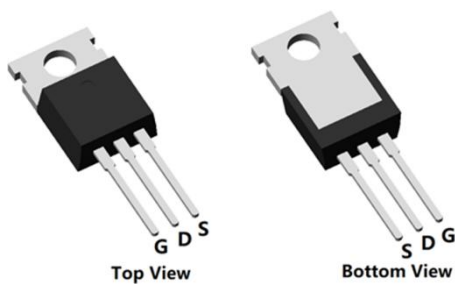
## Feature

- Fast Switching
- Low Gate Charge and  $R_{DS(on)}$
- 100% Single Pulse avalanche energy Test

## Applications

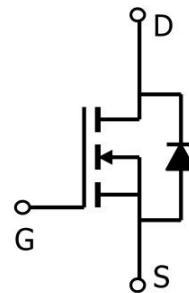
- DC-DC Converter
- Ideal for high-frequency switching and synchronous rectification

## Package

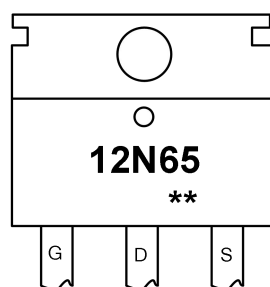


TO-220-3L(1:G 2:D 3:S)

## Circuit diagram



## Marking



12N65  
\*\*

:Device Code  
:Week Code

## Order Information

| Device    | Package   | Unit/Tube |
|-----------|-----------|-----------|
| SP12N65TQ | TO-220-3L | 50        |

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

| Parameter                                  | Symbol          | Rating     | Unit |
|--------------------------------------------|-----------------|------------|------|
| Drain-Source Voltage                       | $V_{DS}$        | 650        | V    |
| Gate-Source Voltage                        | $V_{GS}$        | $\pm 30$   | V    |
| Continuous Drain Current (Tc=25°C)         | $I_D$           | 12         | A    |
| Continuous Drain Current (Tc=100°C)        | $I_D$           | 8          | A    |
| Pulsed Drain Current                       | $I_{DM}$        | 48         | A    |
| Single Pulse Avalanche Energy <sup>1</sup> | $E_{AS}$        | 605        | mJ   |
| Power Dissipation (Tc=25°C)                | $P_D$           | 145        | W    |
| Thermal Resistance Junction-to-Case        | $R_{\theta JC}$ | 0.86       | °C/W |
| Storage Temperature Range                  | $T_{STG}$       | -55 to 150 | °C   |
| Operating Junction Temperature Range       | $T_J$           | -55 to 150 | °C   |

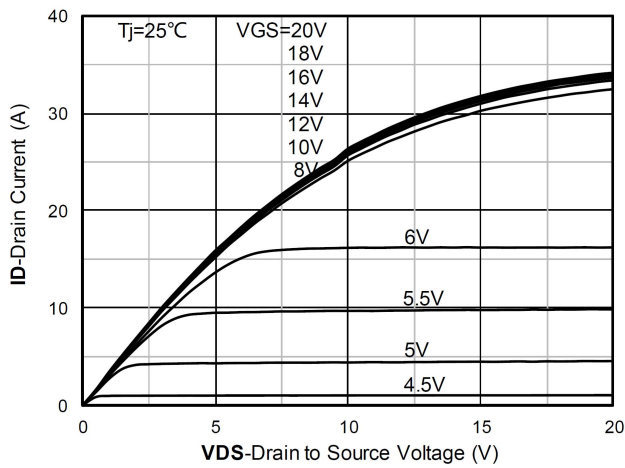
**Electrical characteristics (Ta=25°C, unless otherwise noted)**

| Characteristics                         | Symbol     | Test Condition                                   | Min | Typ  | Max       | Unit     |
|-----------------------------------------|------------|--------------------------------------------------|-----|------|-----------|----------|
| Static Characteristics                  |            |                                                  |     |      |           |          |
| Drain-Source Breakdown Voltage          | $BV_{DSS}$ | $ID = 250\mu A, VGS = 0V$                        | 650 | -    | -         | V        |
| Drain Cut-Off Current                   | $IDSS$     | $VDS = 520V, VGS = 0V$                           | -   | -    | 1         | $\mu A$  |
| Gate Leakage Current                    | $IGSS$     | $VGS = \pm 30V, VDS = 0V$                        | -   | -    | $\pm 100$ | nA       |
| Gate Threshold Voltage                  | $VGS(th)$  | $VDS = VGS, ID = 250\mu A$                       | 2.0 | 3.0  | 4.0       | V        |
| Drain-Source ON Resistance              | $RDS(ON)$  | $VGS = 10V, ID = 6A$                             | -   | 0.6  | 0.75      | $\Omega$ |
| Dynamic Characteristics                 |            |                                                  |     |      |           |          |
| Input Capacitance                       | $Ciss$     | $VDS = 25V, VGS = 0V, f = 1.0MHz$                | -   | 1905 | -         | pF       |
| Output Capacitance                      | $Coss$     |                                                  | -   | 139  | -         |          |
| Reverse Transfer Capacitance            | $Crss$     |                                                  | -   | 9    | -         |          |
| Total Gate Charge                       | $Qg$       | $VDS = 500V, VGS = 10V, ID = 12A$                | -   | 43   | -         | nC       |
| Gate-Source Charge                      | $Qgs$      |                                                  | -   | 9    | -         |          |
| Gate-Drain Charge                       | $Qgd$      |                                                  | -   | 15   | -         |          |
| Switching Characteristics               |            |                                                  |     |      |           |          |
| Turn-On Delay Time                      | $td(on)$   | $VDD = 325V, VGS = 10V, RG = 10\Omega, ID = 10A$ | -   | 25   | -         | nS       |
| Rise Time                               | $tr$       |                                                  | -   | 39   | -         |          |
| Turn-Off Delay Time                     | $td(off)$  |                                                  | -   | 52   | -         |          |
| Fall Time                               | $tf$       |                                                  | -   | 41   | -         |          |
| Drain-Source Body Diode Characteristics |            |                                                  |     |      |           |          |
| Source-Drain Diode Forward Voltage      | $VSD$      | $IS = 1A, VGS = 0V$                              | -   | -    | 1.2       | V        |
| Maximum Body-Diode Continuous Current   | $IS$       |                                                  | -   | -    | 12        | A        |
| Body Diode Reverse Recovery Time        | $Trr$      | $IS = 12A, dIF/dt = 100A/us$                     | -   | 116  | -         | nS       |
| Body Diode Reverse Recovery Charge      | $Qrr$      |                                                  | -   | 10.4 | -         | $\mu C$  |

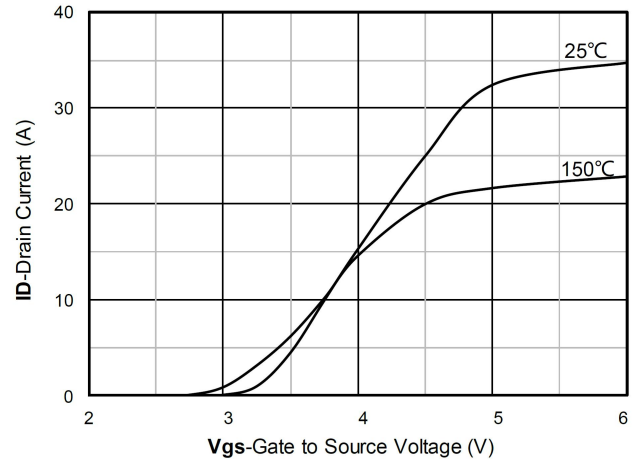
**Note :**

- The test condition is  $V_{DD} = 50V, V_{GS} = 10V, L = 10mH, R_G = 30\Omega$ ;

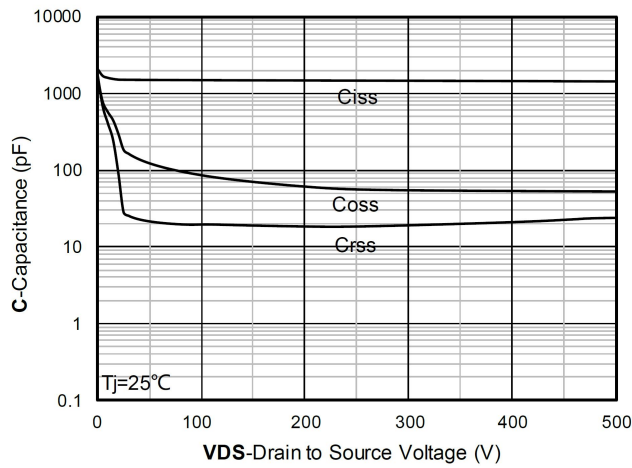
## Typical Characteristics



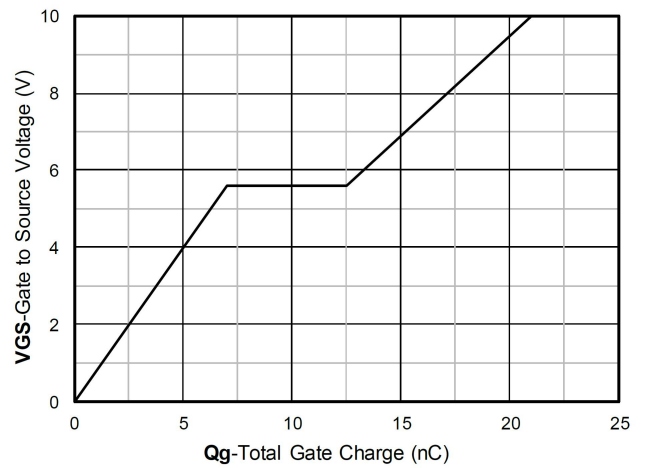
Output Characteristics



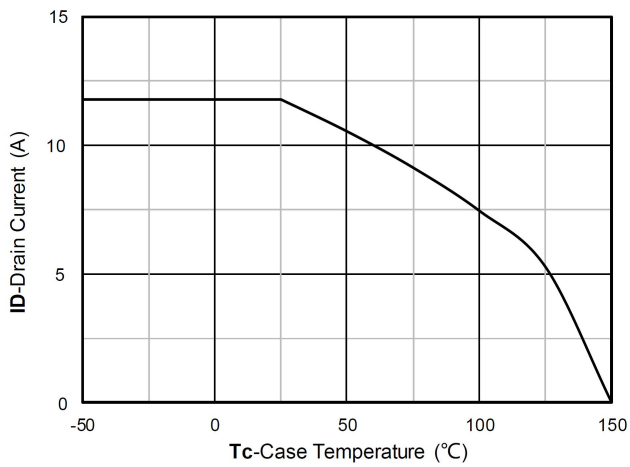
Transfer Characteristics



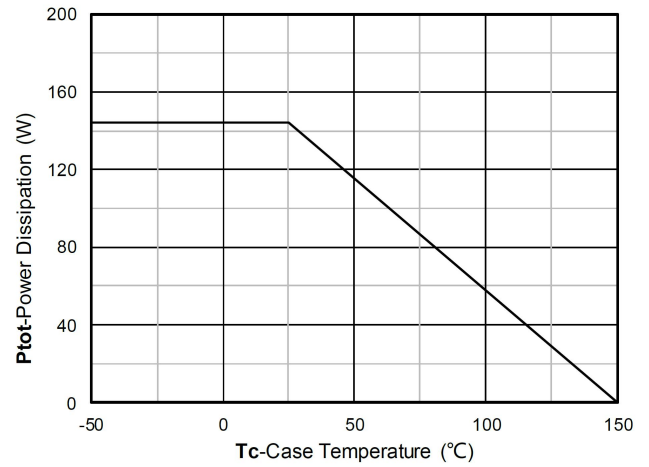
Capacitance Characteristics



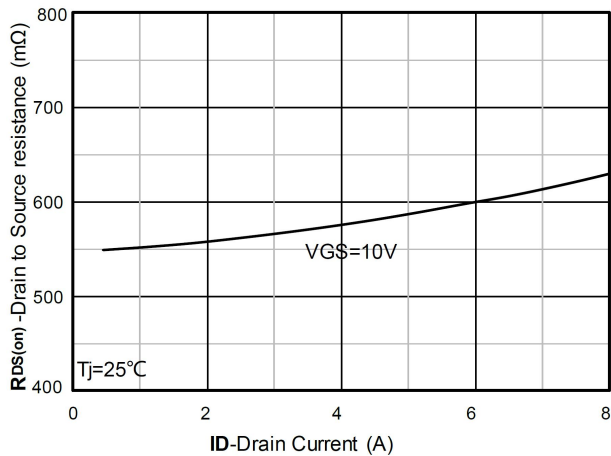
Gate Charge



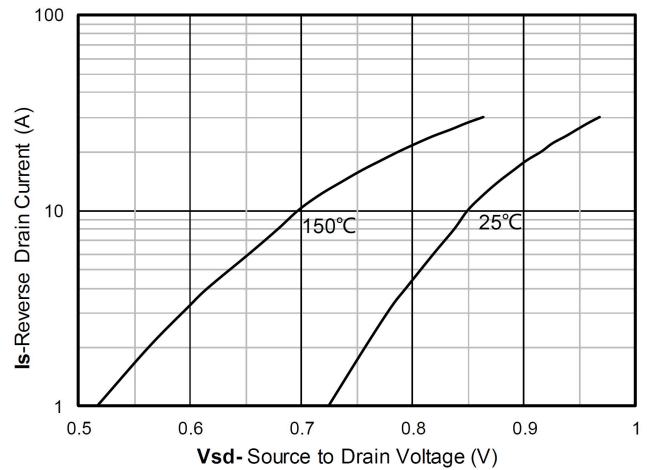
Current dissipation



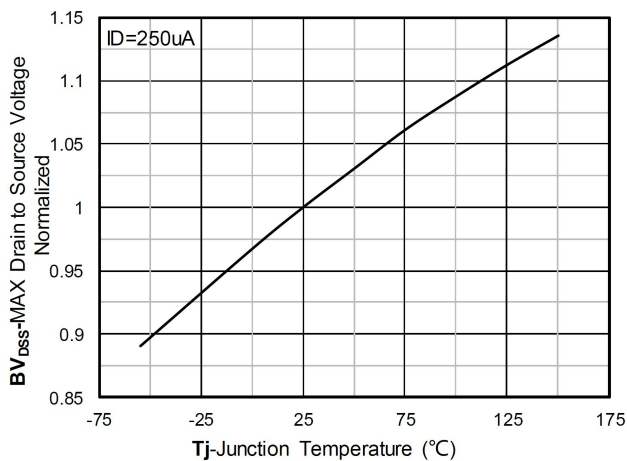
Power dissipation



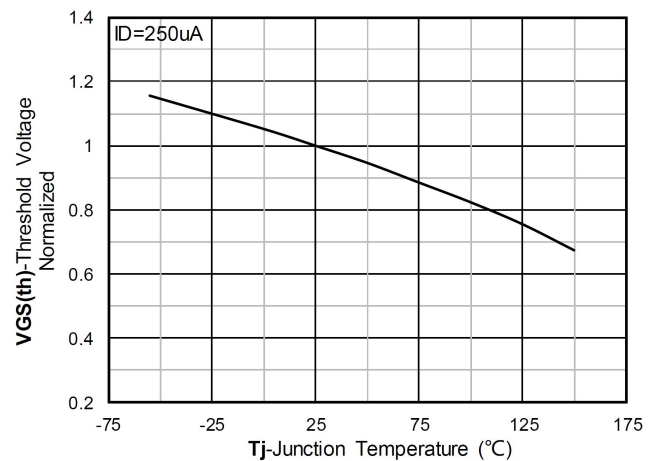
RDS(on) VS Drain Current



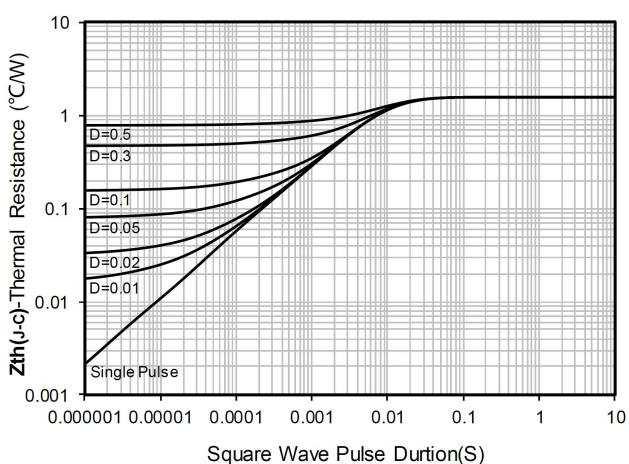
Forward characteristics of reverse diode



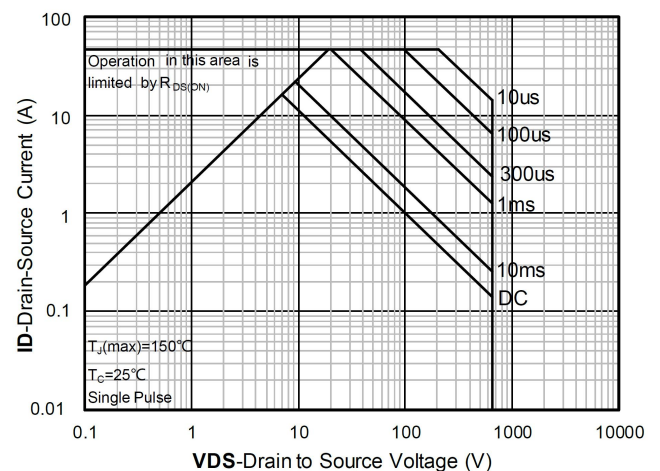
Normalized breakdown voltage



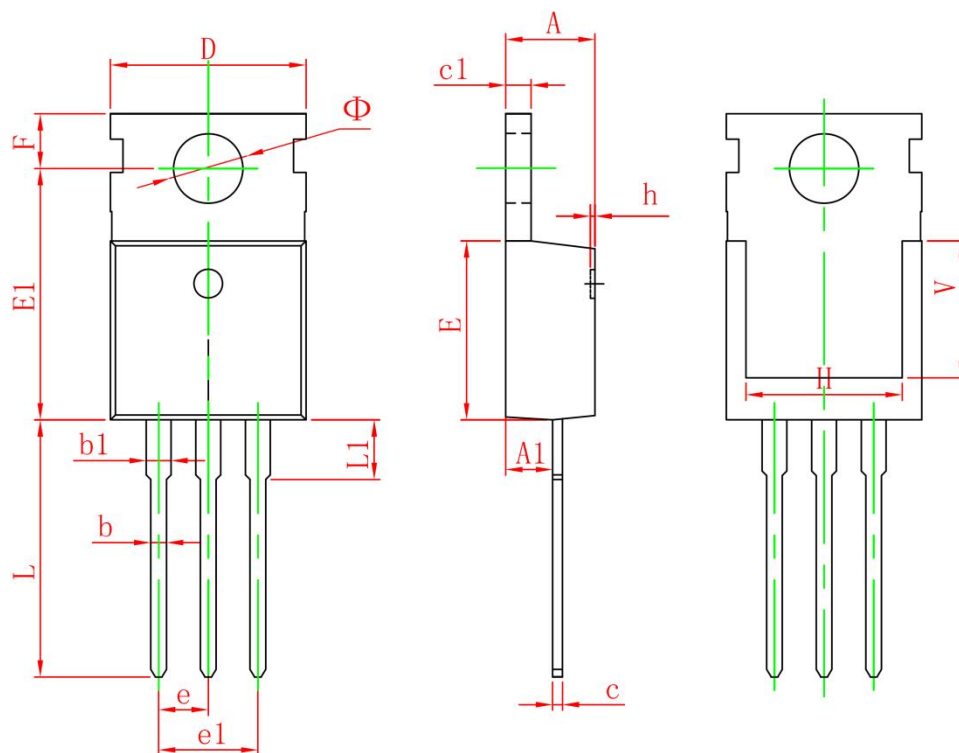
Normalized Threshold voltage



Maximum Transient Thermal Impedance



Safe Operation Area

**TO-220-3L-C Package Information**


| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min.                      | Max.   | Min.                 | Max.  |
| A      | 4.400                     | 4.600  | 0.173                | 0.181 |
| A1     | 2.250                     | 2.550  | 0.089                | 0.100 |
| b      | 0.710                     | 0.910  | 0.028                | 0.036 |
| b1     | 1.170                     | 1.370  | 0.046                | 0.054 |
| c      | 0.330                     | 0.650  | 0.013                | 0.026 |
| c1     | 1.200                     | 1.400  | 0.047                | 0.055 |
| D      | 9.910                     | 10.250 | 0.390                | 0.404 |
| E      | 8.950                     | 9.750  | 0.352                | 0.384 |
| E1     | 12.650                    | 13.050 | 0.498                | 0.514 |
| e      | 2.540 TYP.                |        | 0.100 TYP.           |       |
| e1     | 4.980                     | 5.180  | 0.196                | 0.204 |
| F      | 2.650                     | 2.950  | 0.104                | 0.116 |
| H      | 7.900                     | 8.100  | 0.311                | 0.319 |
| h      | 0.000                     | 0.300  | 0.000                | 0.012 |
| L      | 12.900                    | 13.400 | 0.508                | 0.528 |
| L1     | 2.850                     | 3.250  | 0.112                | 0.128 |
| V      | 6.900 REF.                |        | 0.276 REF.           |       |
| Φ      | 3.400                     | 3.800  | 0.134                | 0.150 |