## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)TYP}$ | $I_D$ |
|---|---|---|
| 150V | 13mΩ@10V | 60A |

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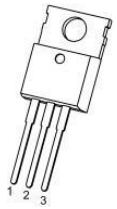
## Feature

- Low RDS(on) & FOM
- Extremely low switching loss
- Excellent stability and uniformity
- Fast switching and soft recovery

## Applications

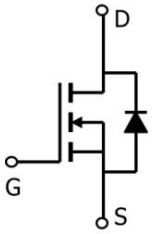
- Consumer electronic power supply
- Motor control Synchronous rectification
- Isolated DC/DC convertor
- Invertors

## Package

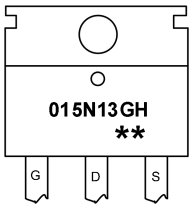



**TO-220-3L-C(1:G 2:D 3:S)**

## Circuit diagram




## Marking




015N13GH : Product code
* : Month code

## Order Information

| Device | Package | Unite/Tube |
|---|---|---|
| SP015N13GHTQ | TO-220-3L | 50 |

## Absolute maximum ratings (Ta=25℃ unless otherwise noted)

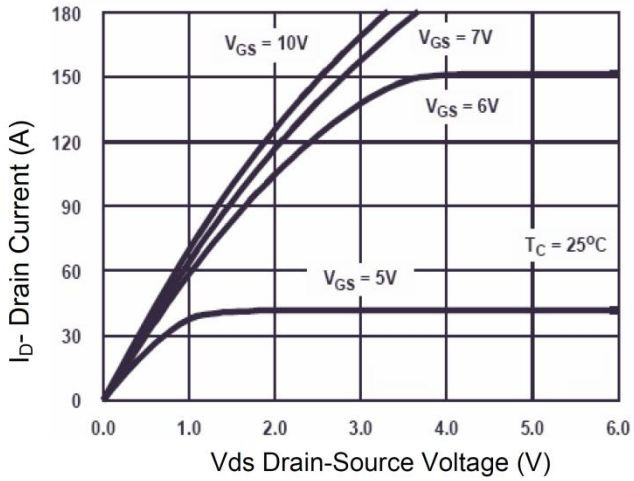
| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain source voltage | $V_{DS}$ | 150 | V |
| Gate source voltage | $V_{GS}$ | ±20 | V |
| Continuous drain current[1], TC=25 ℃ | $I_D$ | 60 | A |
| Pulsed drain current[2], TC=25 ℃ | $I_{DM}$ | 240 | A |
| Power dissipation[3], TC=25 ℃ | $P_D$ | 170 | W |
| Single pulsed avalanche energy[4] | $E_{AS}$ | 480 | mJ |
| Thermal resistance, junction-case | $R_{\theta JC}$ | 0.74 | ℃/W |
| Operation and storage temperature | $T_{stg}$, $T_j$ | -55 to 150 | ℃ |

## Electrical characteristics (Ta=25℃, unless otherwise noted)

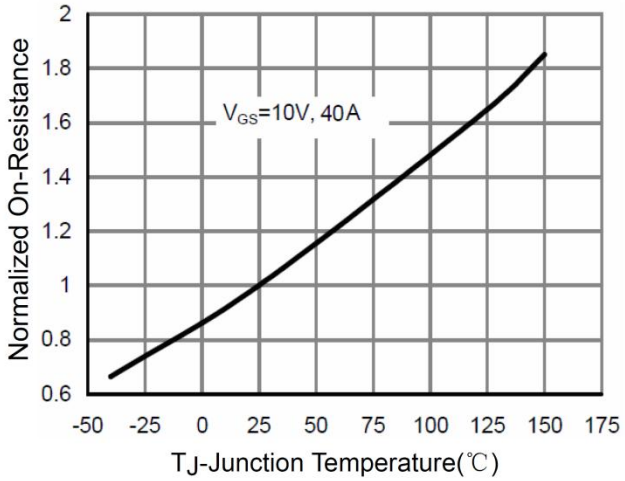
| Parameter | Symbol | Test condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Static Characteristics** | | | | | | |
| Drain-source breakdown voltage | $BV_{DSS}$ | VGS=0 V, ID=250 μA | 150 | | | V |
| Drain-source leakage current | $I_{DSS}$ | VDS=120 V, VGS=0 V | | | 1 | μA |
| Gate-source leakage current | $I_{GSS}$ | VGS=±20 V | | | ±100 | nA |
| Gate threshold voltage | $V_{GS(th)}$ | VDS=VGS, ID=250 μA | 2 | 3 | 4 | V |
| Drain-source on-state resistance | $R_{DS(ON)}$ | VGS=10 V, ID=20 A | | 13 | 16 | mΩ |
| **Dynamic Characteristics** | | | | | | |
| Input capacitance | $C_{iss}$ | VGS=0 V, VDS=25 V, $f$=1 MHz | | 6998 | | pF |
| Output capacitance | $C_{oss}$ | | | 422 | | pF |
| Reverse transfer capacitance | $C_{rss}$ | | | 22 | | pF |
| **Switching Characteristics** | | | | | | |
| Turn-on delay time | $t_{d(on)}$ | VGS=10 V, VDS=30 V, RG=2.5 Ω, ID=2 A | | 22.1 | | ns |
| Rise time | $t_r$ | | | 5.2 | | ns |
| Turn-off delay time | $t_{d(off)}$ | | | 44 | | ns |
| Fall time | $t_f$ | | | 8.4 | | ns |
| Total gate charge | $Q_g$ | ID=30 A, VDS=30 V, VGS=10 V | | 160 | | nC |
| Gate-source charge | $Q_{gs}$ | | | 36 | | nC |
| Gate-drain charge | $Q_{gd}$ | | | 68 | | nC |
| **Drain-Source Diode Characteristics** | | | | | | |
| Diode forward voltage | $V_{SD}$ | IS=1 A, VGS=0 V | | | 1.2 | V |
| Reverse recovery time | $t_{rr}$ | IS=12 A,di/dt=100 A/μs | | 102.9 | | ns |
| Reverse recovery charge | $Q_{rr}$ | | | 379 | | nC |
| Peak reverse recovery current | $I_{rrm}$ | | | 6.4 | | A |

**Notes:**
1) Calculated continuous current based on maximum allowable junction temperature.
2) Repetitive rating; pulse width limited by max. junction temperature.
3) Pd is based on max. junction temperature, using junction-case thermal resistance.
4) VDD=50 V,VG=10V, RG=25Ω, L=0.5 mH, starting Tj=25 °C.

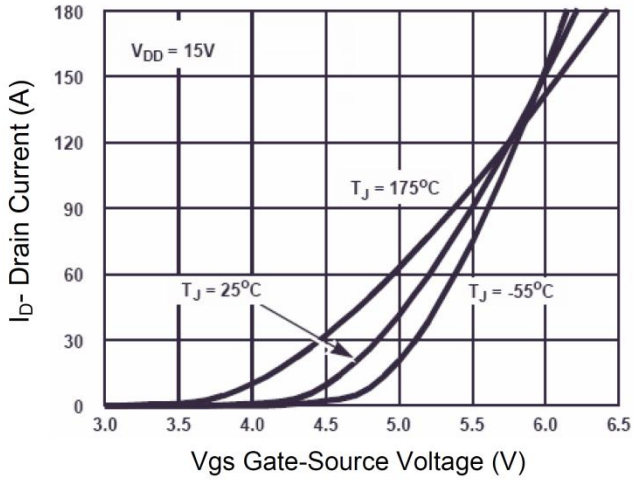
## Typical Characteristics



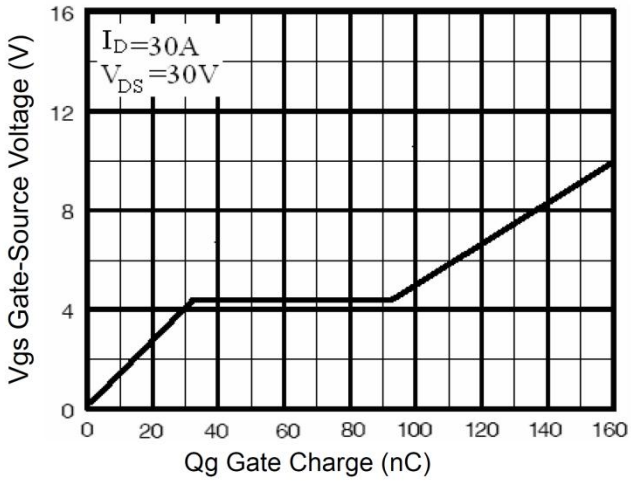

**Output Characteristics**



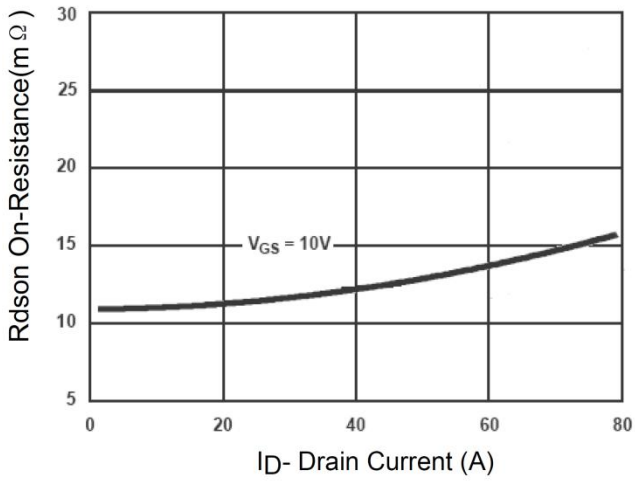

**Rdson-JunctionTemperature**



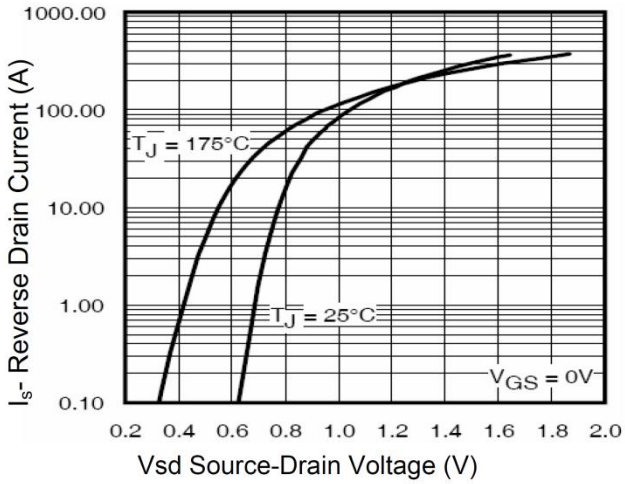

**Transfer Characteristics**



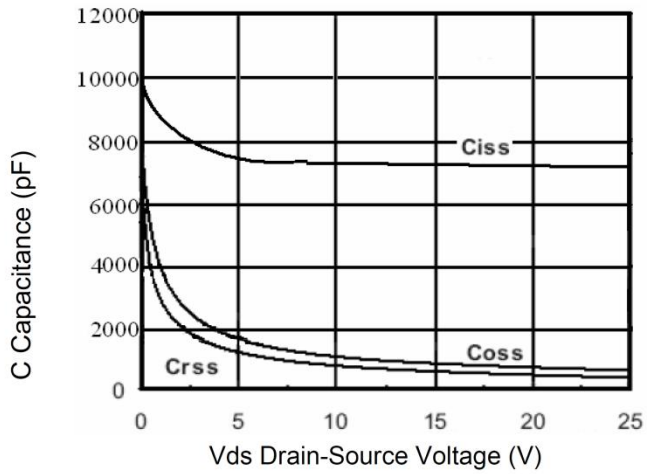

**Gate Charge**



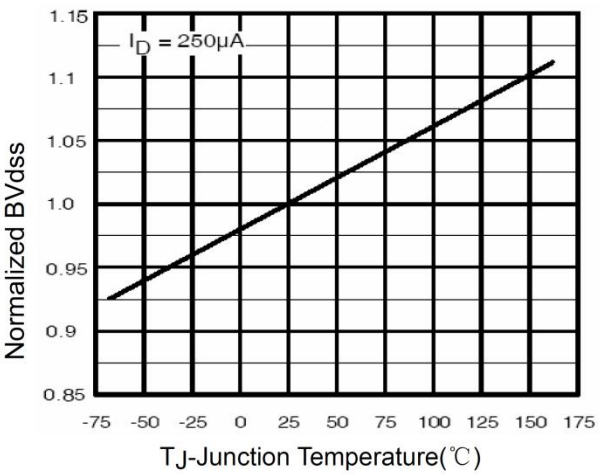

**Rdson- Drain Current**



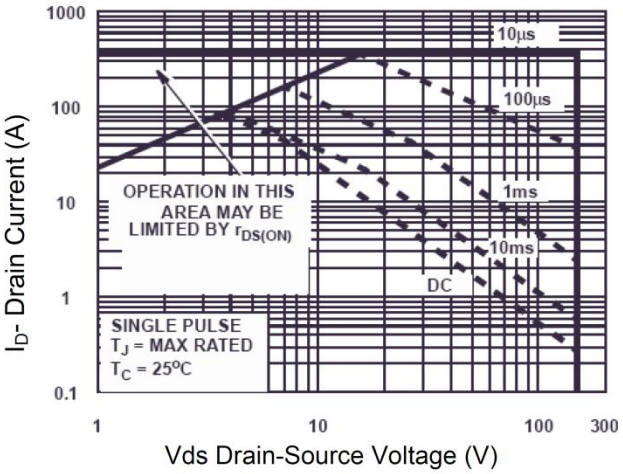

**Source- Drain Diode Forward**



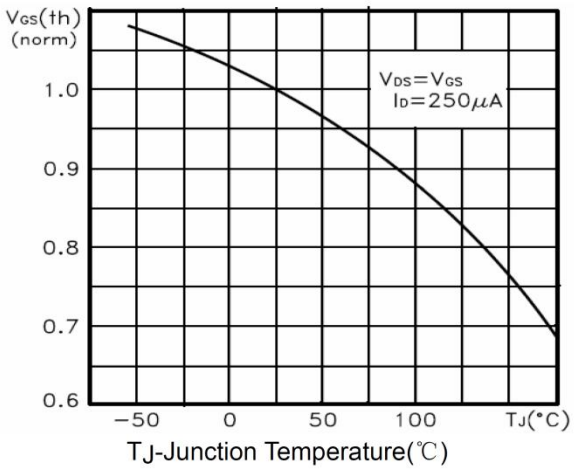

**Capacitance vs Vds**



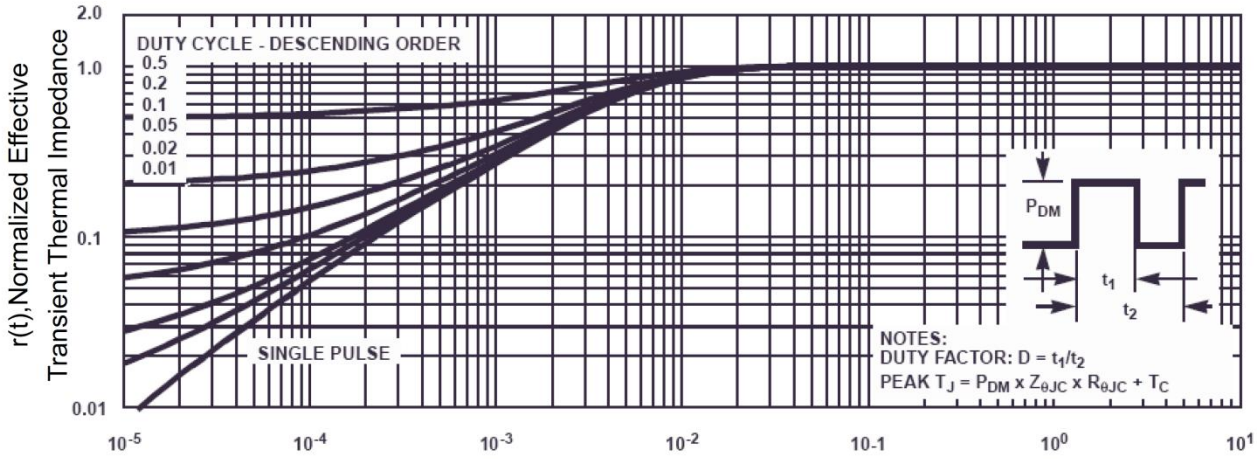

**BVDSS vs Junction Temperature**




**Safe Operation Area**

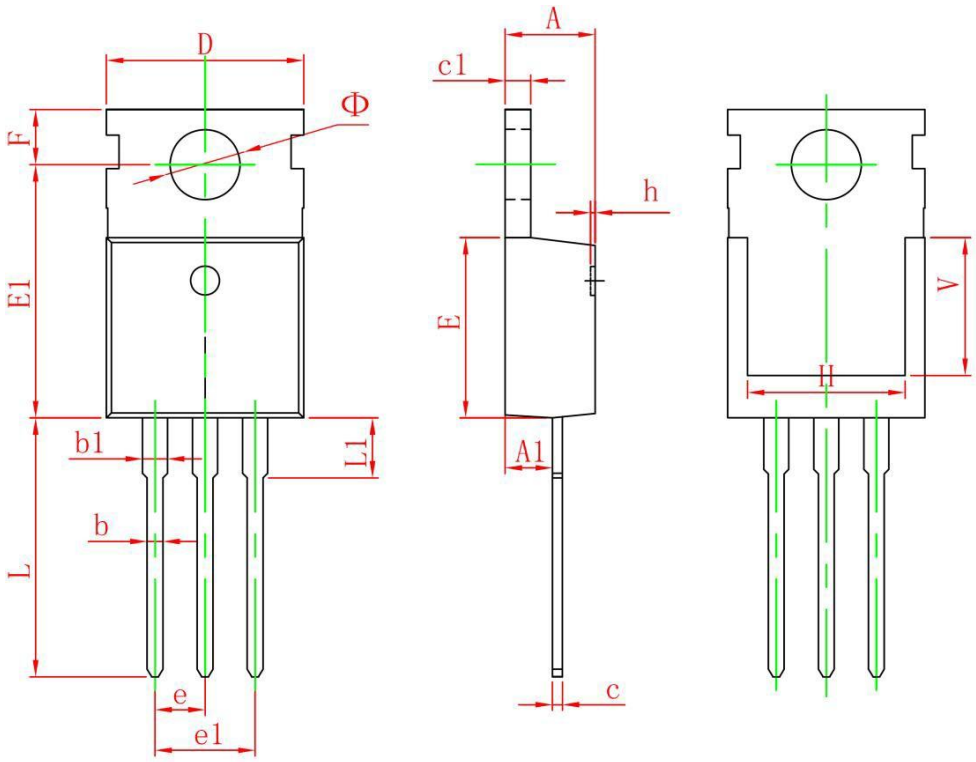



**VGS(th) vs Junction Temperature**




**Normalized Maximum Transient Thermal Impedance**

## 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 |

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