

# TM0052N04AD

## N-Channel Enhancement Mosfet

### General Description

- Low  $R_{DS(ON)}$
- RoHS and Halogen-Free Compliant

### Applications

- Load switch
- PWM

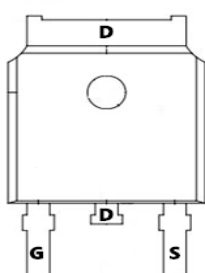
### General Features

$V_{DS} = 40V$   $I_D = 100A$

$R_{DS(ON)} = 5.2 m\Omega$  (Typ.) @  $V_{GS} = 10V$

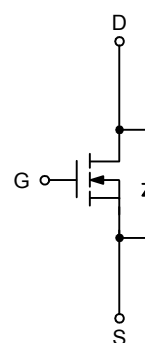
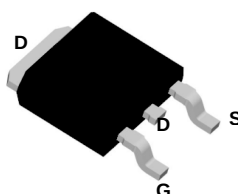
100% UIS Tested

100%  $R_g$  Tested



Marking 100N04A

D:TO-252-3L



### Absolute Maximum Ratings ( $T_C = 25^\circ C$ unless otherwise noted)

| Symbol         | Parameter                                           | Ratings     | Units      |
|----------------|-----------------------------------------------------|-------------|------------|
| $V_{DS}$       | Drain-Source Voltage                                | 40          | V          |
| $V_{GS}$       | Gate-Source Voltage                                 | $\pm 20$    | V          |
| $I_D$          | Continuous Drain Current- $T_C = 25^\circ C$        | 100         | A          |
|                | Continuous Drain Current- $T_C = 100^\circ C$       | 39          | A          |
| $I_{DM}$       | Pulse Drain Current Tested <small>note1</small>     | 240         | A          |
| $E_{AS}$       | Single Pulsed Avalanche Energy <small>note2</small> | 81          | mJ         |
| $P_D$          | Power Dissipation $T_C = 25^\circ C$                | 47          | W          |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range    | -55 to +150 | $^\circ C$ |

### Thermal Data

| Symbol | Parameter                                        | Max | Units        |
|--------|--------------------------------------------------|-----|--------------|
| $R$    | Thermal Resistance Junction to Case <sup>1</sup> | 3 2 | $^\circ C/W$ |

**TM0052N04AD****N-Channel Enhancement Mosfet**

Electrical Characteristics: (Tc=25°C unless otherwise noted)

| Symbol                             | Parameter                                 | Conditions                                                         | Min | Typ  | Max   | Units |
|------------------------------------|-------------------------------------------|--------------------------------------------------------------------|-----|------|-------|-------|
| Off Characteristics                |                                           |                                                                    |     |      |       |       |
| BV <sub>DSS</sub>                  | Drain-Sourctce Breakdown Voltage          | V <sub>GS</sub> =0V,I <sub>D</sub> =250 μ A                        | 40  | ---  | ---   | V     |
| I <sub>DSS</sub>                   | Zero Gate Voltage Drain Current           | V <sub>DS</sub> =40V, V <sub>GS</sub> =0V                          | --- | ---  | 1.0   | μ A   |
| I <sub>GSS</sub>                   | Gate-Source Leakage Current               | V <sub>GS</sub> = ± 20V, V <sub>DS</sub> =0A                       | --- | ---  | ± 100 | nA    |
| On Characteristics                 |                                           |                                                                    |     |      |       |       |
| V <sub>GS(th)</sub>                | GATE-Source Threshold Voltage             | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250 μ A         | 1.0 | 1.7  | 2.5   | V     |
| R <sub>DS(ON)</sub>                | Drain-Source On Resistanc <sup>2</sup>    | V <sub>GS</sub> =10V,I <sub>D</sub> =30A                           | --- | 5.2  | 6.6   | m Ω   |
|                                    |                                           | V <sub>GS</sub> =4.5V,I <sub>D</sub> =20A                          | --- | 6.7  | 9.8   | m Ω   |
| Dynamic Characteristics            |                                           |                                                                    |     |      |       |       |
| C <sub>iss</sub>                   | Input Capacitance                         | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, f=1MHz                  | --- | 2380 | ---   | pF    |
| C <sub>Oss</sub>                   | Output Capacitance                        |                                                                    | --- | 188  | ---   |       |
| C <sub>rss</sub>                   | Reverse Transfer Capacitance              |                                                                    | --- | 160  | ---   |       |
| Switching Characteristics          |                                           |                                                                    |     |      |       |       |
| t <sub>d(on)</sub>                 | Turn-On Delay Time                        | VDD=20V , VGS=10V ,<br>RG=3Ω , I <sub>D</sub> =30A                 | --- | 10   | ---   | ns    |
| t <sub>r</sub>                     | Rise Time                                 |                                                                    | --- | 10   | ---   | ns    |
| t <sub>d(off)</sub>                | Turn-Off Delay Time                       |                                                                    | --- | 35   | ---   | ns    |
| t <sub>f</sub>                     | Fall Time                                 |                                                                    | --- | 7    | ---   | ns    |
| Q <sub>g</sub>                     | Total Gate Charge                         | V <sub>GS</sub> =10V, V <sub>DS</sub> =20V,<br>I <sub>D</sub> =30A | --- | 35   | ---   | nC    |
| Q <sub>gs</sub>                    | Gate-Source Charge                        |                                                                    | --- | 5    | ---   | nC    |
| Q <sub>gd</sub>                    | Gate-Drain “Miller” Charge                |                                                                    | --- | 6    | ---   | nC    |
| Drain-Source Diode Characteristics |                                           |                                                                    |     |      |       |       |
| I <sub>S</sub>                     | Continuous Source Current <sup>1, 4</sup> | V <sub>G</sub> =V <sub>D</sub> =0V ,                               | --- | ---  | 100   | A     |
| I <sub>SM</sub>                    | Pulsed Source Current <sup>2, 4</sup>     | Force Current                                                      | --- | ---  | 240   | A     |
| V <sub>SD</sub>                    | Diode Forward Voltage <sup>2</sup>        | V <sub>GS</sub> =0V , I <sub>S</sub> =30A                          | --- | ---  | 1.2   | V     |
| T <sub>rr</sub>                    | Reverse Recovery Time                     | IF=20A , dI/dt=100A/μs ,                                           | --- | 22   | ---   | ns    |
| Q <sub>rr</sub>                    | Reverse Recovery Charge                   | T <sub>J</sub> =25℃                                                | --- | 11   | ---   | nC    |

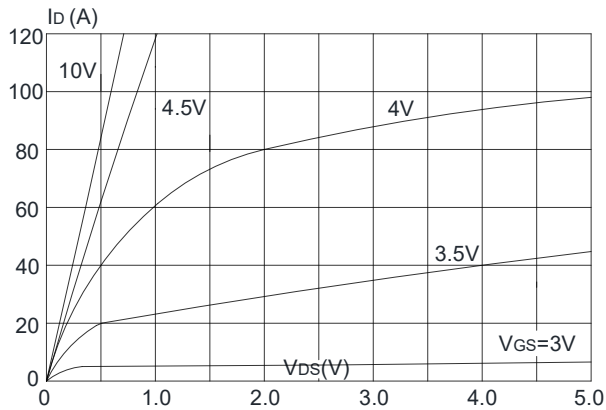
**Notes:**

1.Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

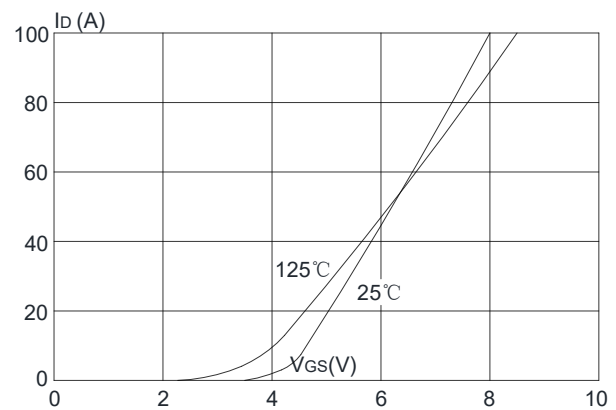
2.EAS condition: T<sub>J</sub>=25°C, V<sub>DD</sub>=20V, V<sub>G</sub>=10V, R<sub>G</sub>=25Ω, L=0.5mH, I<sub>AS</sub>=18A

3.Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%

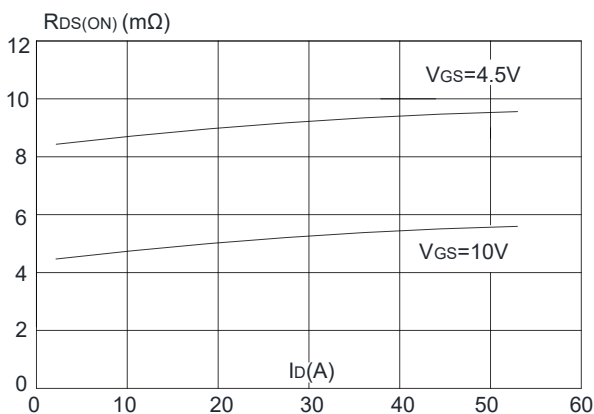
## Typical Characteristics:



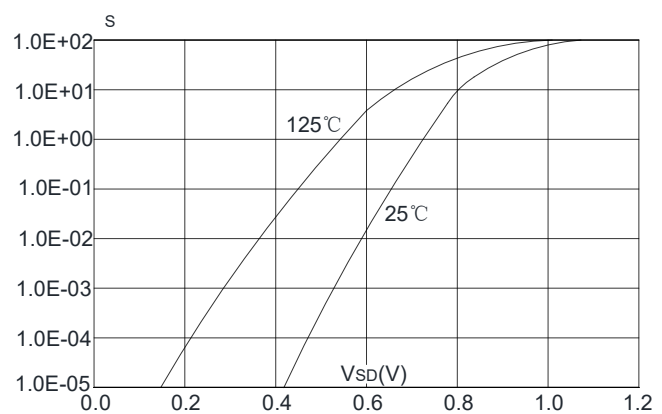
**Figure1:** Output Characteristics



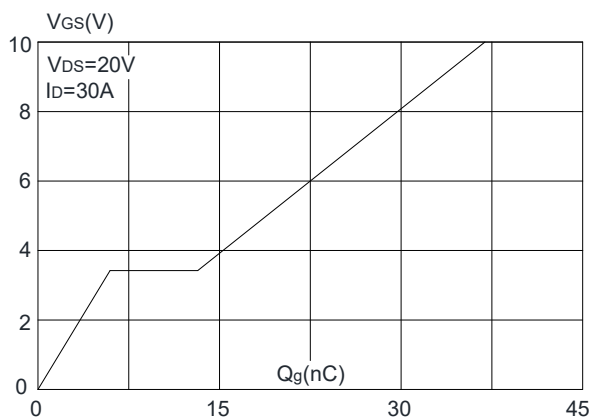
**Figure 2:** Typical Transfer Characteristics



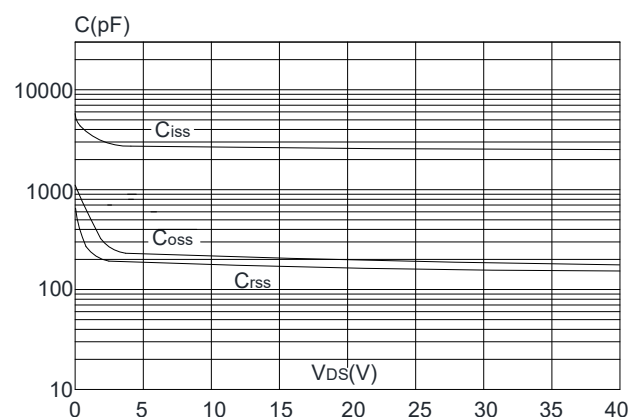
**Figure 3:** On-resistance vs. Drain Current



**Figure 4:** Body Diode Characteristics



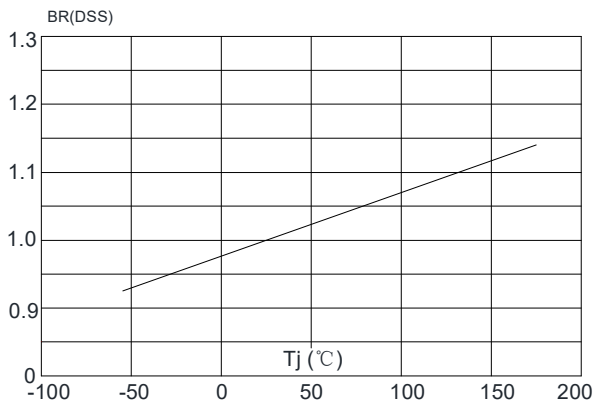
**Figure 5:** Gate Charge Characteristics



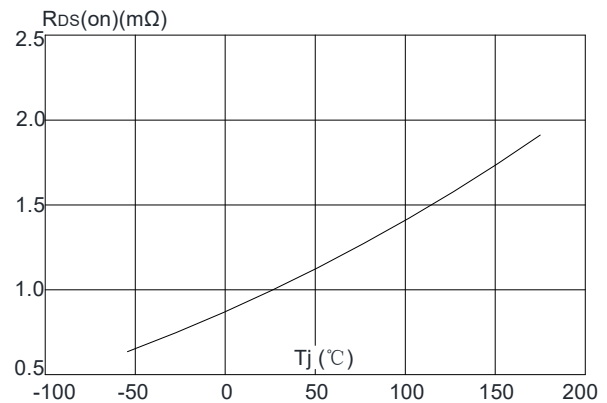
**Figure 6:** Capacitance Characteristics

**TM0052N04AD**

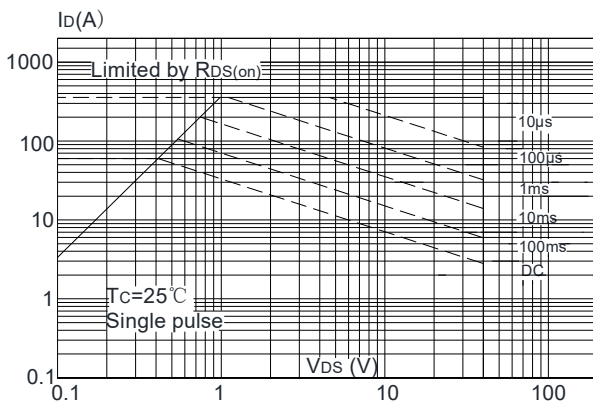
**N-Channel Enhancement Mosfet**



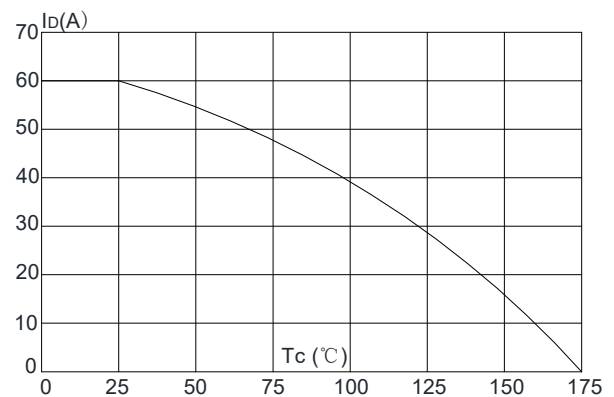
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



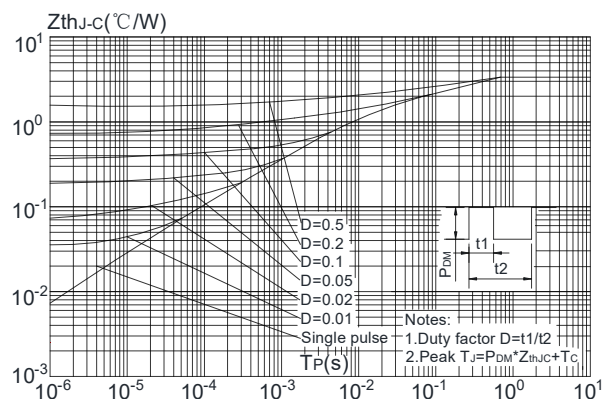
**Figure 8:** Normalized on Resistance vs. Junction Temperature



**Figure 9:** Maximum Safe Operating Area

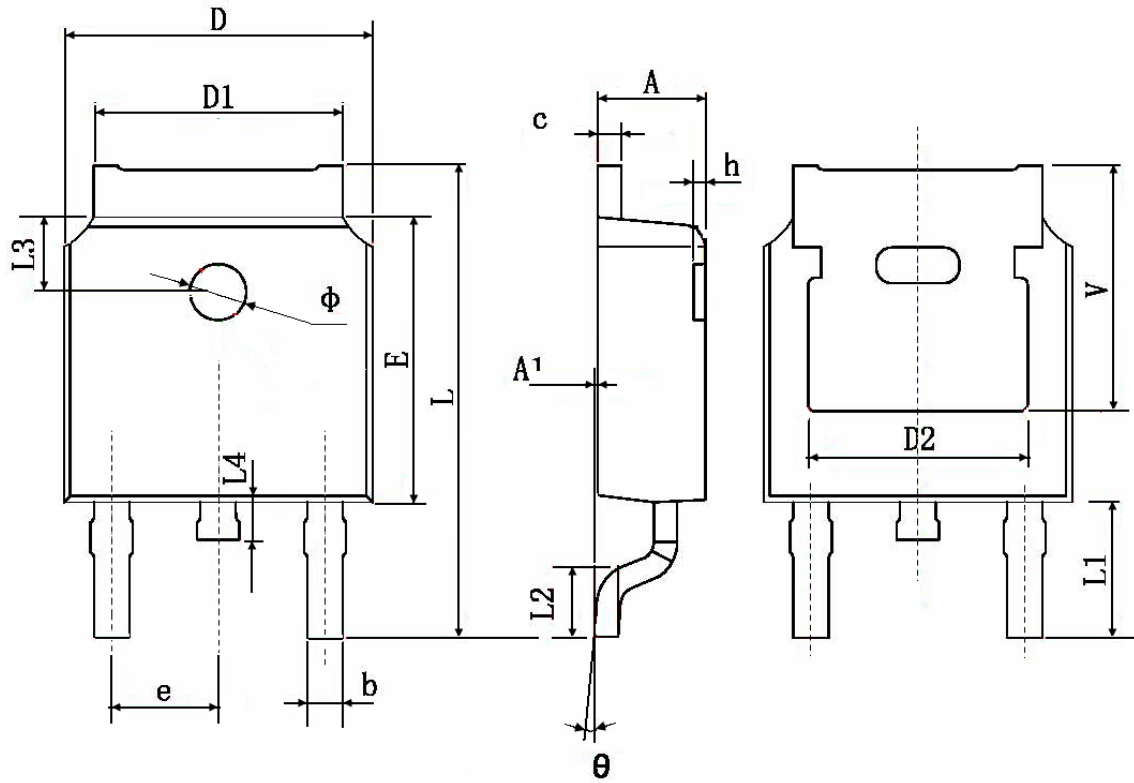


**Figure 10:** Maximum Continuous Drain Current vs. Case Temperature



**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Case

## Package Information:TO-252-3L



| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min.                      | Max.   | Min.                 | Max.  |
| A      | 2.200                     | 2.400  | 0.087                | 0.094 |
| A1     | 0.000                     | 0.127  | 0.000                | 0.005 |
| b      | 0.660                     | 0.860  | 0.026                | 0.034 |
| c      | 0.460                     | 0.580  | 0.018                | 0.023 |
| D      | 6.500                     | 6.700  | 0.256                | 0.264 |
| D1     | 5.100                     | 5.460  | 0.201                | 0.215 |
| D2     | 4.830 TYP.                |        | 0.190 TYP.           |       |
| E      | 6.000                     | 6.200  | 0.236                | 0.244 |
| e      | 2.186                     | 2.386  | 0.086                | 0.094 |
| L      | 9.800                     | 10.400 | 0.386                | 0.409 |
| L1     | 2.900 TYP.                |        | 0.114 TYP.           |       |
| L2     | 1.400                     | 1.700  | 0.055                | 0.067 |
| L3     | 1.600 TYP.                |        | 0.063 TYP.           |       |
| L4     | 0.600                     | 1.000  | 0.024                | 0.039 |
| Φ      | 1.100                     | 1.300  | 0.043                | 0.051 |
| θ      | 0°                        | 8°     | 0°                   | 8°    |
| h      | 0.000                     | 0.300  | 0.000                | 0.012 |
| V      | 5.350 TYP.                |        | 0.211 TYP.           |       |