

# TM012N02S

## N-Channel Enhancement Mosfet

### General Description

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

### Applications

- Load switch
- PWM

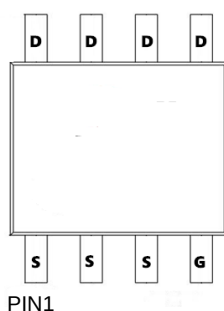
### General Features

$V_{DS} = 20V$   $I_D = 10A$

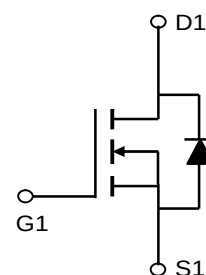
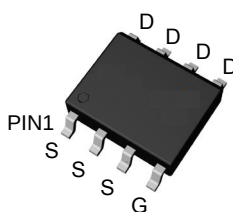
$R_{DS(ON)} = 12m\ \Omega$  (typ.) @  $V_{GS} = 10V$

100% UIS Tested

100%  $R_g$  Tested



S:SOP-8L



Marking: 10N02 OR 2010

### Absolute Maximum Rating ( $T_A = 25^\circ C$ unless otherwise noted)

| Parameter                                        |                    | Symbol         | Value      | Unit       |
|--------------------------------------------------|--------------------|----------------|------------|------------|
| Drain-Source Voltage                             |                    | $V_{DS}$       | 20         | V          |
| Gate-Source Voltage                              |                    | $V_{GS}$       | $\pm 12$   | V          |
| Continuous Drain Current                         | $T_A = 25^\circ C$ | $I_D$          | 10         | A          |
| Pulsed Drain Current <sup>1</sup>                |                    | $I_{DM}$       | 20         | A          |
| Power Dissipation                                | $T_A = 25^\circ C$ | $P_D$          | 2.25       | W          |
| Operating Junction and Storage Temperature Range |                    | $T_J, T_{STG}$ | -55 to 150 | $^\circ C$ |

### Thermal Characteristics

| Parameter                                                | Symbol          | Value | Unit         |
|----------------------------------------------------------|-----------------|-------|--------------|
| Thermal Resistance from Junction to Ambient <sup>2</sup> | $R_{\theta JA}$ | 90    | $^\circ C/W$ |

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**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

| Parameter                                     | Symbol              | Test Condition                                                                         | Min. | Typ. | Max. | Unit |
|-----------------------------------------------|---------------------|----------------------------------------------------------------------------------------|------|------|------|------|
| Static Characteristics                        |                     |                                                                                        |      |      |      |      |
| Drain-Source Breakdown Voltage                | BV <sub>DSS</sub>   | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250μA                                          | 20   | -    | -    | V    |
| Gate Leakage Current                          | I <sub>GSS</sub>    | V <sub>GS</sub> = ±12V, V <sub>DS</sub> = 0 V                                          | -    | -    | ±100 | nA   |
| Drain Cut-off Current                         | I <sub>DSS</sub>    | V <sub>DS</sub> = 20V, V <sub>GS</sub> = 0 V                                           | -    | -    | 1    | μA   |
| Gate Threshold Voltage                        | V <sub>GS(th)</sub> | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250μA                             | 0.45 | 0.7  | 1    | V    |
| Drain-Source On-State Resistance <sup>3</sup> | R <sub>DS(on)</sub> | V <sub>GS</sub> = 4.5V, I <sub>D</sub> =5A                                             | -    | 12   | 15   | mΩ   |
|                                               |                     | V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 4.7A                                          | -    | 17   | 21   |      |
|                                               |                     | V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 4.3A                                          | -    | 28   | 50   |      |
| Dynamic Characteristics <sup>4</sup>          |                     |                                                                                        |      |      |      |      |
| Input Capacitance                             | C <sub>iss</sub>    | V <sub>GS</sub> = 0V, V <sub>DS</sub> = 10V, f = 1MHz                                  | -    | 700  | -    | pF   |
| Output Capacitance                            | C <sub>oss</sub>    |                                                                                        | -    | 120  | -    |      |
| Reverse Transfer Capacitance                  | C <sub>rss</sub>    |                                                                                        | -    | 105  | -    |      |
| Switching Characteristics <sup>4</sup>        |                     |                                                                                        |      |      |      |      |
| Total Gate Charge                             | Q <sub>g</sub>      | V <sub>GS</sub> = 4.5V, V <sub>DS</sub> = 10V, I <sub>D</sub> = 5A                     | -    | 10.5 | -    | nC   |
| Gate-Source Charge                            | Q <sub>gs</sub>     |                                                                                        | -    | 2    | -    |      |
| Gate-Drain Charge                             | Q <sub>gd</sub>     |                                                                                        | -    | 2.5  | -    |      |
| Turn-On Time                                  | t <sub>d(on)</sub>  | V <sub>GEN</sub> = 5V, V <sub>DD</sub> = 10V, I <sub>D</sub> = 5A,R <sub>G</sub> = 3Ω, | -    | 10   | -    | ns   |
| Rise Time                                     | t <sub>r</sub>      |                                                                                        | -    | 20   | -    |      |
| Turn-Off Time                                 | t <sub>d(off)</sub> |                                                                                        | -    | 32   | -    |      |
| Fall Time                                     | t <sub>f</sub>      |                                                                                        | -    | 12   | -    |      |
| Source-Drain Diode Characteristics            |                     |                                                                                        |      |      |      |      |
| Body Diode Voltage <sup>3</sup>               | V <sub>SD</sub>     | I <sub>S</sub> =4A, V <sub>GS</sub> = 0V                                               | -    | -    | 1.2  | V    |
| Continuous Source Current                     | I <sub>S</sub>      |                                                                                        | -    | -    | 10   | A    |

**Notes:**

1. Repetitive rating, pulse width limited by junction temperature T<sub>J(MAX)</sub> = 150°C.
2. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper, The value in any given application depends on the user's specific board design.
3. Pulse Test: Pulse width ≤ 300μs, duty cycle ≤ 2%.
4. This value is guaranteed by design hence it is not included in the production test.

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## Typical Characteristics

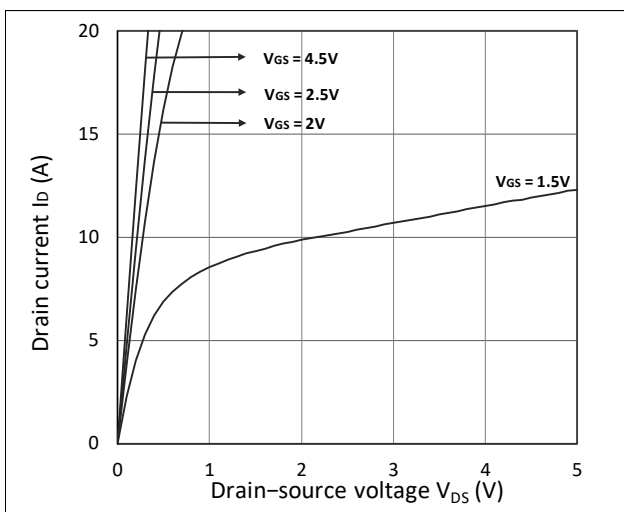


Figure 1. Output Characteristics

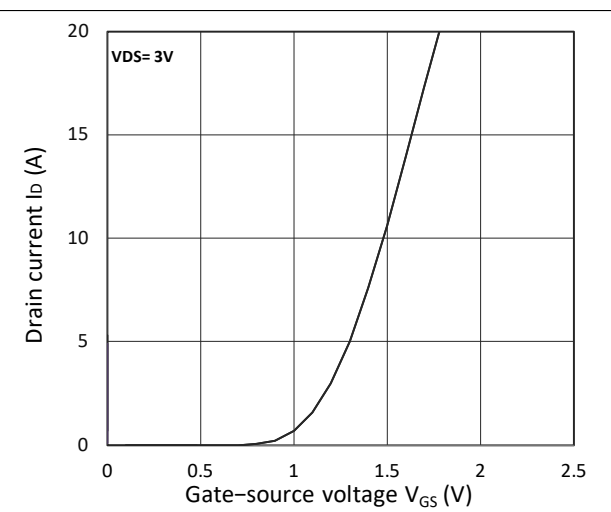


Figure 2. Transfer Characteristics

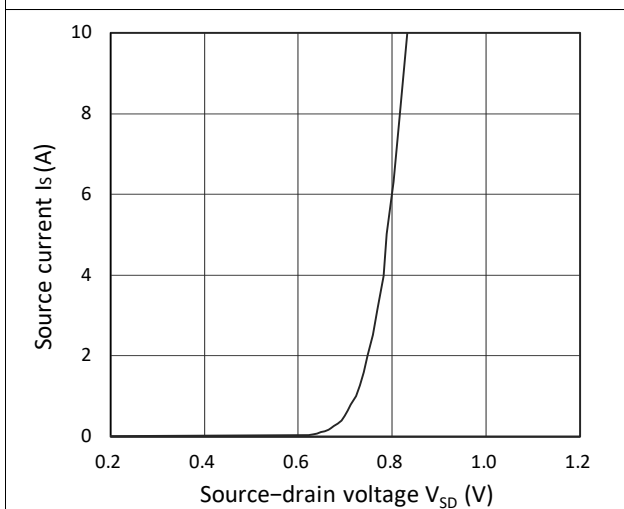


Figure 3. Forward Characteristics of Reverse

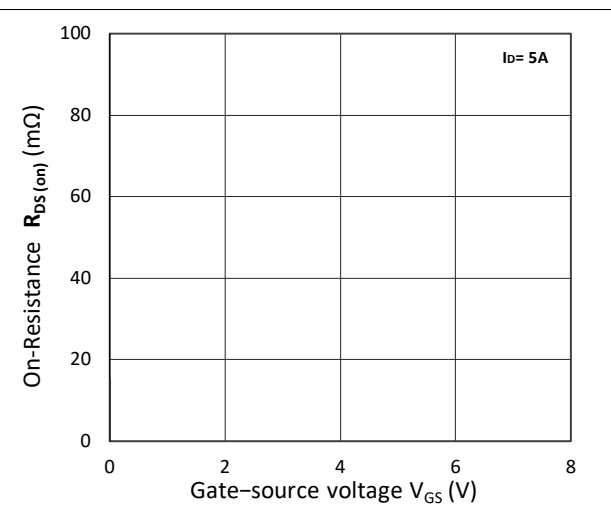


Figure 4.  $R_{DS(ON)}$  vs.  $V_{GS}$

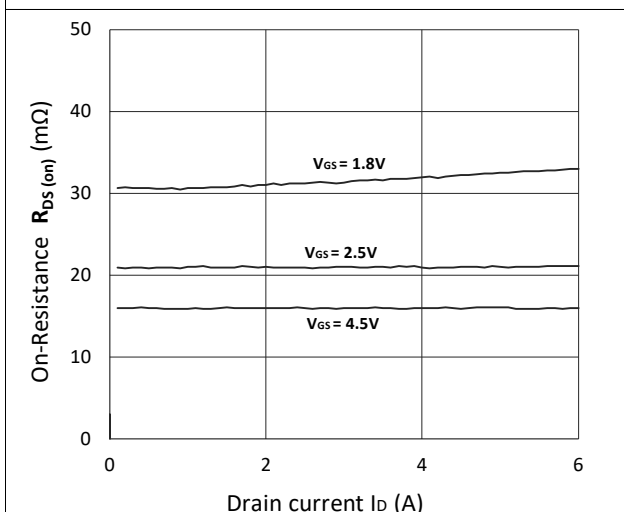


Figure 5.  $R_{DS(ON)}$  vs.  $I_D$

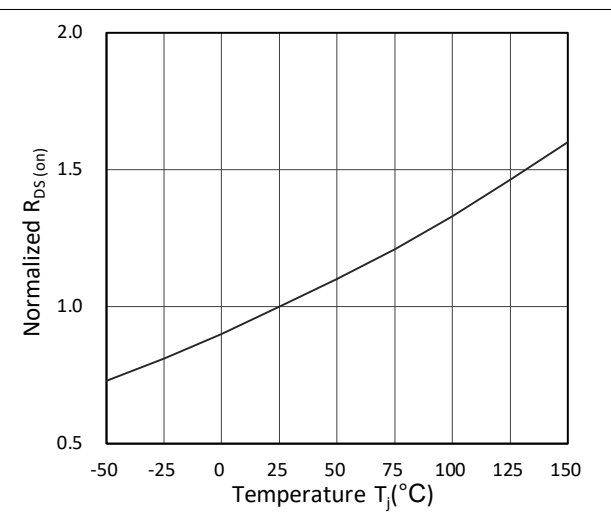


Figure 6. Normalized  $R_{DS(ON)}$  vs. Temperature

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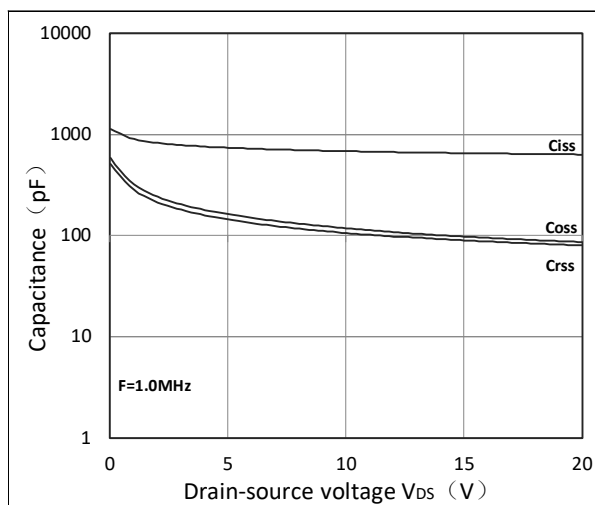


Figure 7. Capacitance Characteristics

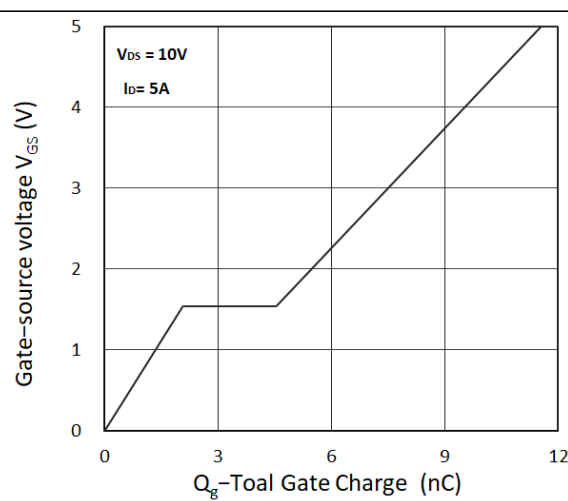
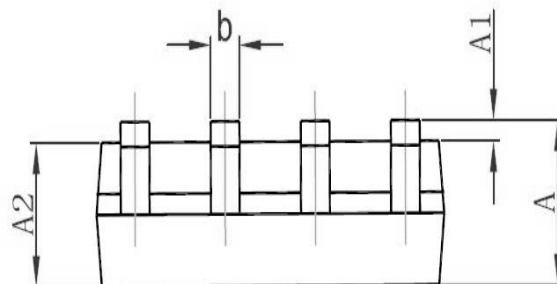
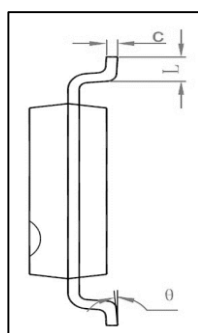
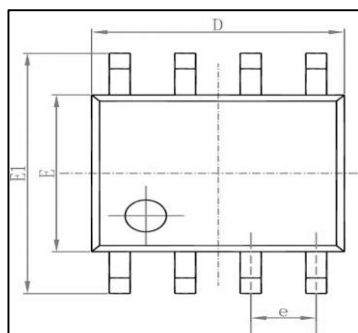


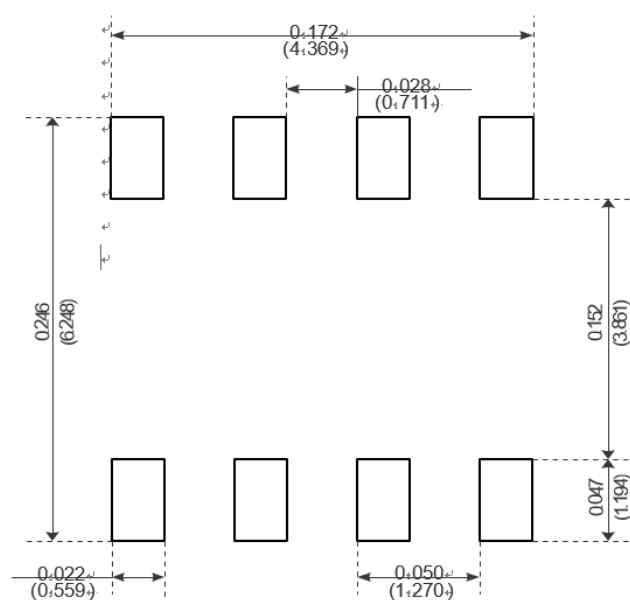
Figure 8. Gate Charge Characteristics



## Package Mechanical Data:SOP-8L



| Symbol   | Dimensions In Millimeters |       | Dimensions In Inches |       |
|----------|---------------------------|-------|----------------------|-------|
|          | Min                       | Max   | Min                  | Max   |
| A        | 1.350                     | 1.750 | 0.053                | 0.069 |
| A1       | 0.100                     | 0.250 | 0.004                | 0.010 |
| A2       | 1.350                     | 1.550 | 0.053                | 0.061 |
| b        | 0.330                     | 0.510 | 0.013                | 0.020 |
| c        | 0.170                     | 0.250 | 0.006                | 0.010 |
| D        | 4.700                     | 5.100 | 0.185                | 0.200 |
| E        | 3.800                     | 4.000 | 0.150                | 0.157 |
| E1       | 5.800                     | 6.200 | 0.228                | 0.244 |
| e        | 1.270 (BSC)               |       | 0.050 (BSC)          |       |
| L        | 0.400                     | 1.270 | 0.016                | 0.050 |
| $\theta$ | 0°                        | 8°    | 0°                   | 8°    |



Recommended Minimum Pads