

# GSMDD6912

## 60V N-Channel MOSFETs

### Product Description

These N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode.

These devices are well suited for high efficiency fast switching applications.

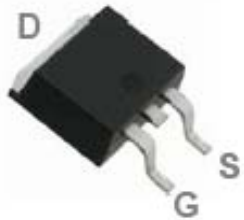
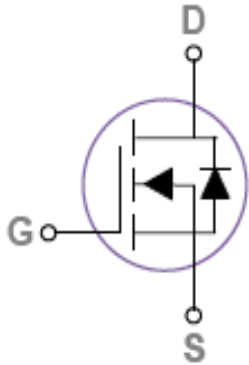
### Features

- 60V, 11A,  $R_{DS(ON)}=90m\Omega@V_{GS}=10V$
- Improved dv/dt capability
- Fast switching
- 100% EAS Guaranteed
- Green Device Available
- TO-252-2L package design

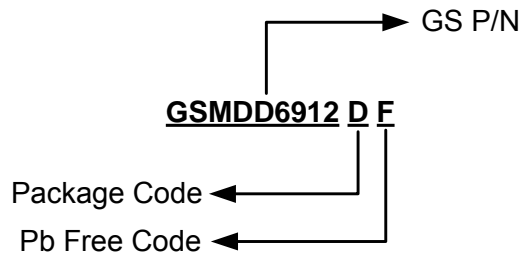
### Applications

- Motor Drive
- Power Tools
- LED Lighting

### Packages & Pin Assignments

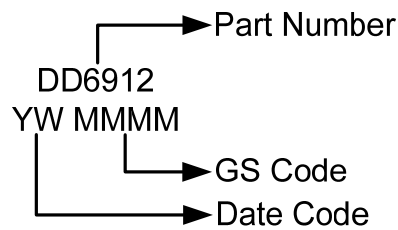
| GSMDD6912DF (TO-252-2L)   |   |
|---|---|
|  <p>Top View</p> |  |
| <b>Description</b>  |   |
| Gate  |   |
| Source  |   |
| Drain   |   |

## Ordering Information



| Part Number | Package   | Quantity Reel |
|-------------|-----------|---------------|
| GSMDD6912DF | TO-252-2L | 2500 PCS      |

## Marking Information



## Absolute Maximum Ratings

$T_C=25^{\circ}\text{C}$  Unless otherwise noted

| Symbol          | Parameter  | Typical                   | Unit                        |
|-----------------|--|---------------------------|-----------------------------|
| $V_{DS}$        | Drain-Source Voltage                                   | 60                        | V                           |
| $V_{GS}$        | Gate-Source Voltage                                    | $\pm 20$                  | V                           |
| $I_D$           | Continuous Drain Current                               | $T_C=25^{\circ}\text{C}$  | 11                          |
|                 |  | $T_C=100^{\circ}\text{C}$ | 7                           |
| $I_{DM}$        | Pulsed Drain Current                                   | 44                        | A                           |
| EAS             | Single Pulse Avalanche Energy                          | 25                        | mJ                          |
| IAS             | Single Pulse Avalanche Current                         | 7                         | A                           |
| $P_D$           | Power Dissipation ( $T_C=25^{\circ}\text{C}$ )         | 25                        | W                           |
|                 | Power Dissipation (Derate above $25^{\circ}\text{C}$ ) | 0.2                       | W/ $^{\circ}\text{C}$       |
| $T_J$           | Operating Junction Temperature Range                   | -50 to +150               | $^{\circ}\text{C}$          |
| $T_{STG}$       | Storage Temperature Range                              | -50 to +150               | $^{\circ}\text{C}$          |
| $R_{\theta JA}$ | Thermal Resistance-Junction to Ambient                 | 62                        | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JC}$ | Thermal Resistance-Junction to Case                    | 5                         | $^{\circ}\text{C}/\text{W}$ |

## Electrical Characteristics

T<sub>J</sub>=25°C Unless otherwise noted

| Symbol                              | Parameter                                   | Conditions  | Min   | Typ  | Max  | Unit  |
|-------------------------------------|---|---|---|------|------|-------|
| <b>Static</b>                       |   |   |   |      |      |       |
| V <sub>(BR)DSS</sub>                | Drain-Source Breakdown Voltage              | V <sub>GS</sub> =0V, I <sub>D</sub> =250uA  | 60  |      |      | V     |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | BV <sub>DSS</sub> Temperature Coefficient   | Reference to 25°C,<br>I <sub>D</sub> =1mA   |   | 0.05 |      | V/°C  |
| V <sub>GS(th)</sub>                 | Gate Threshold Voltage                      | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA                                | 1.2   | 1.8  | 2.5  | V     |
| ΔV <sub>GS(th)</sub>                | V <sub>GS(th)</sub> Temperature Coefficient |   |   | -5   |      | mV/°C |
| I <sub>GSS</sub>                    | Gate Leakage Current                        | V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V  |   |      | ±100 | nA    |
| I <sub>DSS</sub>                    | Zero Gate Voltage Drain Current             | V <sub>DS</sub> =60V, V <sub>GS</sub> =0V   |   |      | 1    | uA    |
|                                     |   | V <sub>DS</sub> =48V, V <sub>GS</sub> =0V,<br>T <sub>J</sub> =125°C                     |   |      | 10   |       |
| I <sub>S</sub>                      | Continuous Source Current                   | V <sub>G</sub> =V <sub>D</sub> =0V,<br>Force Current                                    |   |      | 11   | A     |
| I <sub>SM</sub>                     | Pulsed Source Current                       |   |   |      | 44   |       |
| R <sub>DS(on)</sub>                 | Drain-Source On-Resistance                  | V <sub>GS</sub> =10V, I <sub>D</sub> =6A  |   | 68   | 90   | mΩ    |
|                                     |   | V <sub>GS</sub> =4.5V, I <sub>D</sub> =3A   |   | 78   | 100  | mΩ    |
| g <sub>FS</sub>                     | Forward Transconductance                    | V <sub>DS</sub> =10V, I <sub>D</sub> =3A  |   | 4    |      | S     |
| V <sub>SD</sub>                     | Diode Forward Voltage                       | V <sub>GS</sub> =0V, I <sub>S</sub> =1A   |   |      | 1    | V     |
| t <sub>rr</sub>                     | Reverse Recovery Time                       | V <sub>GS</sub> =30V, I <sub>S</sub> =1A,<br>di/dt=100A/us                              |   | 23.2 |      | ns    |
| Q <sub>rr</sub>                     | Reverse Recovery Charge                     |   |   | 14.3 |      | nC    |
| <b>Dynamic</b>                      |   |   |   |      |      |       |
| Q <sub>g</sub>                      | Total Gate Charge                           | V <sub>DS</sub> =48V, V <sub>GS</sub> =10V,<br>I <sub>D</sub> =6A                       |   | 9.3  | 13   | nC    |
| Q <sub>gs</sub>                     | Gate-Source Charge                          |   |   | 2.1  | 3    |       |
| Q <sub>gd</sub>                     | Gate-Drain Charge                           |   |   | 1.8  | 4    |       |
| C <sub>iss</sub>                    | Input Capacitance                           | V <sub>DS</sub> =15V, V <sub>GS</sub> =0V,<br>f=1MHz                                    |   | 500  | 725  | pF    |
| C <sub>oss</sub>                    | Output Capacitance                          |   |   | 45   | 65   |       |
| C <sub>rss</sub>                    | Reverse Transfer Capacitance                |   |   | 16   | 30   |       |
| t <sub>d(on)</sub>                  | Turn-On Time                                | V <sub>DD</sub> =30V, I <sub>D</sub> =1A,<br>V <sub>GS</sub> =10V, R <sub>G</sub> =3.3Ω |   | 2.9  | 6    | ns    |
| t <sub>r</sub>                      |   |   |   | 9.5  | 18   |       |
| t <sub>d(off)</sub>                 | Turn-Off Time                               |   |   | 18.4 | 35   |       |
| t <sub>f</sub>                      |   |   |   | 5.3  | 10   |       |
| R <sub>g</sub>                      | Gate Resistance                             |   | V <sub>DS</sub> =0V, V <sub>GS</sub> =0V,<br>f=1MHz |      | 2    |       |

## Typical Performance Characteristics

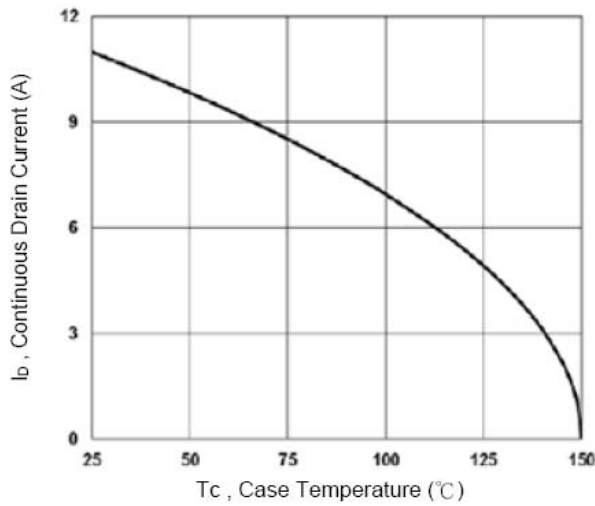


Fig.1 Continuous Drain Current vs.  $T_c$

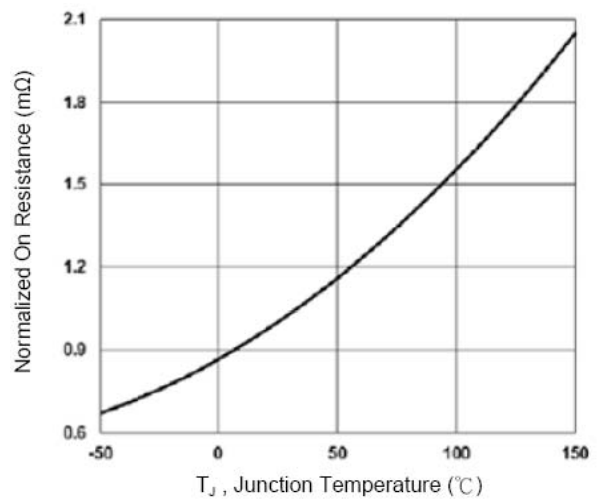


Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_J$

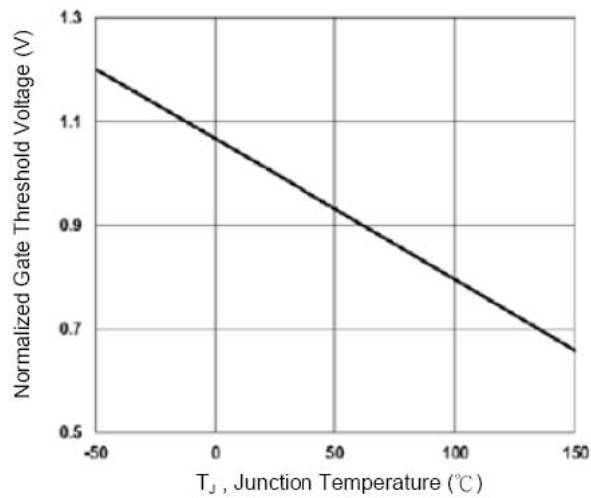


Fig.3 Normalized  $V_{th}$  vs.  $T_J$

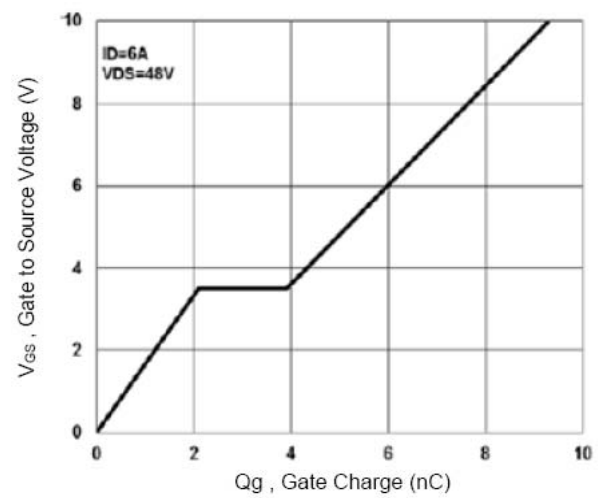


Fig.4 Gate Charge Characteristics

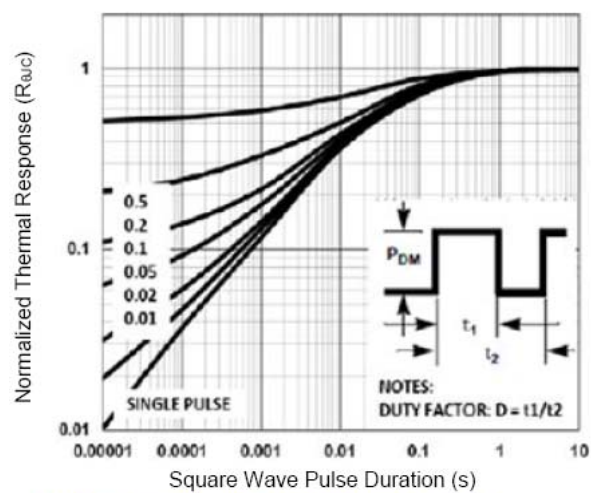


Fig.5 Normalized Transient Impedance

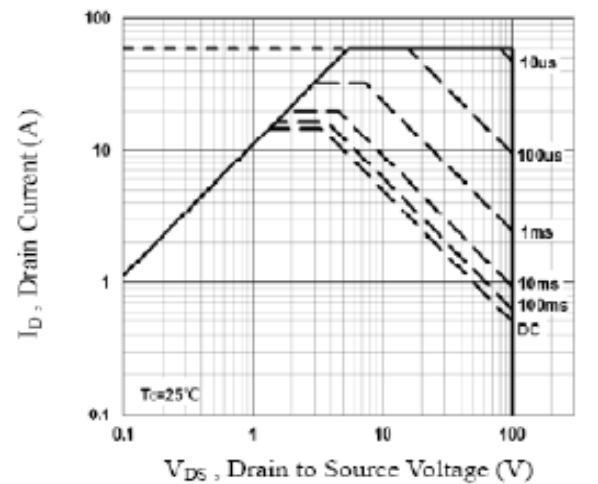
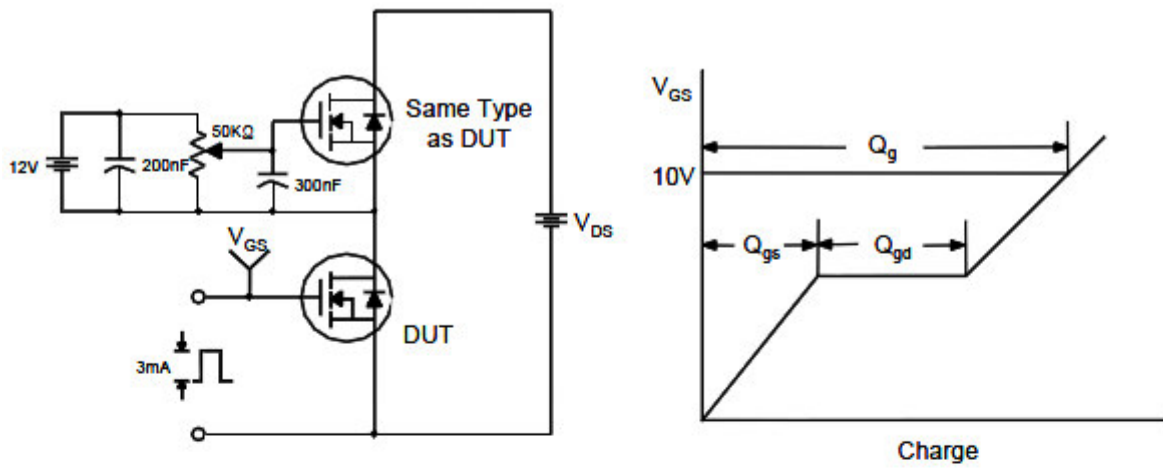


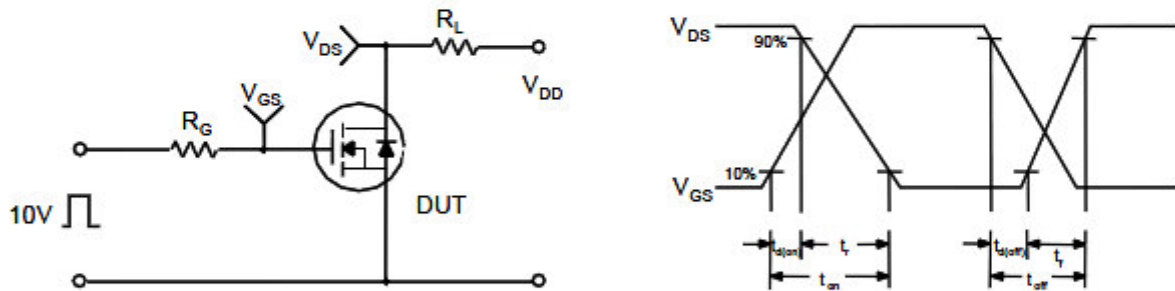
Fig.6 Maximum Safe Operation Area

## Typical Performance Characteristics (Continue)

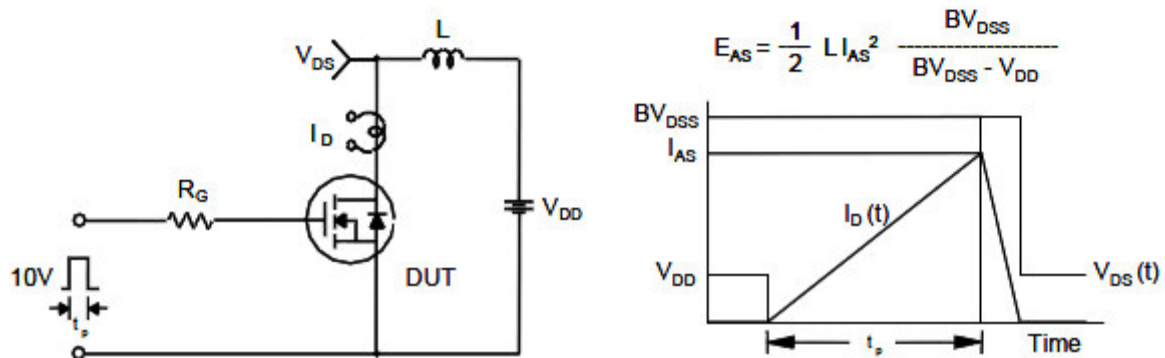
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms

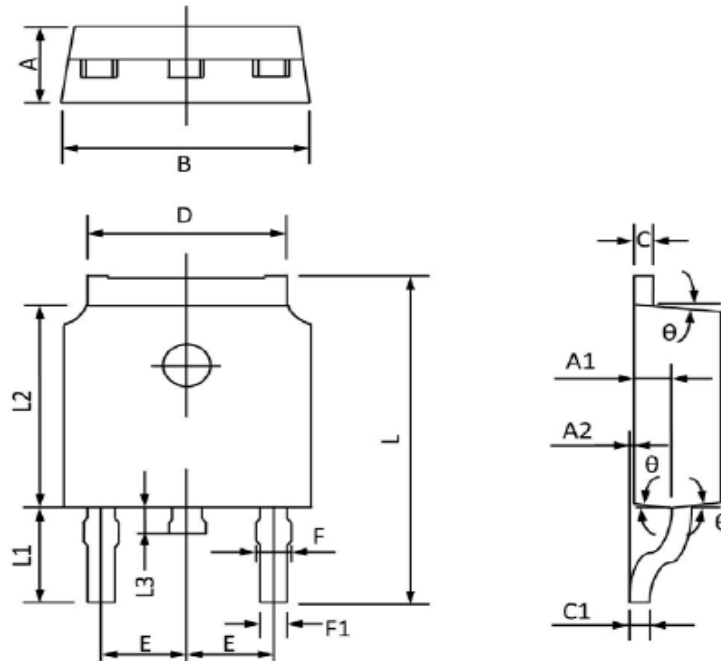


Unclamped Inductive Switching Test Circuit & Waveforms



## Package Dimension

### TO-252-2L










| Dimensions |             |       |             |       |
|------------|-------------|-------|-------------|-------|
| Symbol     | Millimeters |       | Inches      |       |
|            | Min         | Max   | Min         | Max   |
| A          | 2.20        | 2.40  | 0.087       | 0.094 |
| A1         | 0.91        | 1.11  | 0.036       | 0.044 |
| A2         | 0.00        | 0.15  | 0.000       | 0.006 |
| B          | 6.50        | 6.70  | 0.256       | 0.264 |
| C          | 0.46        | 0.58  | 0.018       | 0.030 |
| C1         | 0.46        | 0.58  | 0.018       | 0.030 |
| D          | 5.10        | 5.46  | 0.201       | 0.215 |
| E          | 2.186       | 2.386 | 0.086       | 0.094 |
| F          | 0.74        | 0.94  | 0.029       | 0.037 |
| F1         | 0.66        | 0.86  | 0.026       | 0.034 |
| L          | 9.80        | 10.40 | 0.386       | 0.409 |
| L1         | 2.9 (REF)   |       | 0.114 (REF) |       |
| L2         | 6.00        | 6.20  | 0.236       | 0.244 |
| L3         | 0.60        | 1.00  | 0.024       | 0.039 |
| $\theta$   | 3°          | 9°    | 3°          | 9°    |



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