

# GSMD3906

## 30V N-Channel MOSFETs

### Product Description

These N-Channel enhancement mode power field effect transistors are planar stripe, 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 switch mode power supply.

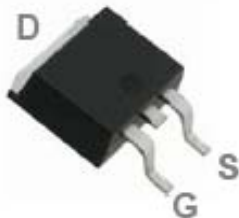
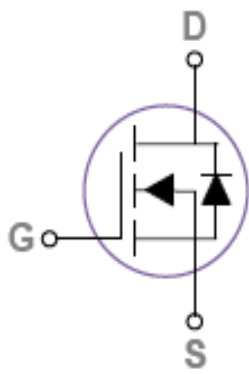
### Features

- 30V, 80A,  $R_{DS(ON)}=6m\Omega@V_{GS}=10V$
- Improved dv/dt capability
- Fast switching
- 100% EAS guaranteed
- Green Device Available
- TO-252-2L package design

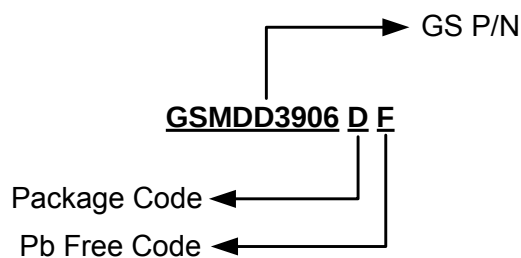
### Applications

- MB / VGA / Vcore
- POL Applications
- SMPS 2nd SR

### Packages & Pin Assignments

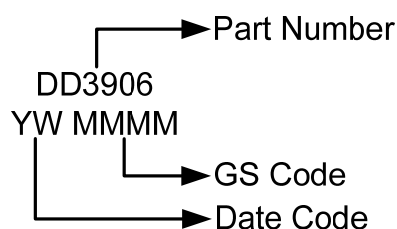
| GSMDD3906DF (TO-252-2L)                                                                             |                                                                                       |  |
|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--|
|  <p>Top View</p> |  |  |
| Description                                                                                         |                                                                                       |  |
| Gate                                                                                                |                                                                                       |  |
| Source                                                                                              |                                                                                       |  |
| Drain                                                                                               |                                                                                       |  |

## Ordering Information



| Part Number | Package   | Quantity Reel |
|-------------|-----------|---------------|
| GSMDD3906DF | TO-252-2L | 2500 PCS      |

## Marking Information



## Absolute Maximum Ratings

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

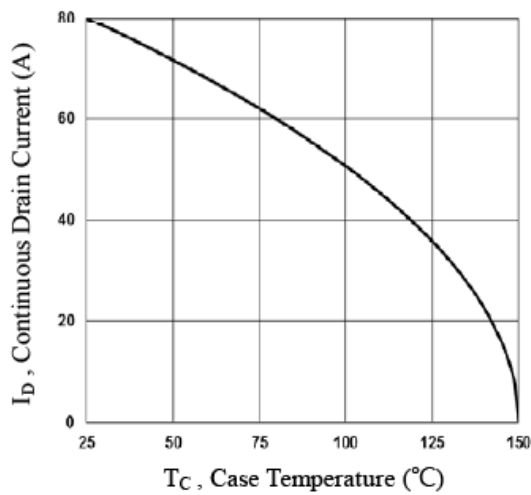
| Symbol           | Parameter                                |                       | Typical     | Unit |
|------------------|------------------------------------------|-----------------------|-------------|------|
| V <sub>DS</sub>  | Drain-Source Voltage                     |                       | 30          | V    |
| V <sub>GS</sub>  | Gate –Source Voltage                     |                       | ±20         | V    |
| I <sub>D</sub>   | Continuous Drain Current                 | T <sub>A</sub> =25°C  | 80          | A    |
|                  |                                          | T <sub>A</sub> =100°C | 51          |      |
| I <sub>DM</sub>  | Pulsed Drain Current                     |                       | 320         | A    |
| EAS              | Single Pulse Avalanche Energy            |                       | 88          | mJ   |
| IAS              | Single Pulse Avalanche Current           |                       | 42          | A    |
| P <sub>D</sub>   | Power Dissipation (T <sub>A</sub> =25°C) |                       | 54          | W    |
|                  | Power Dissipation (Derate above 25°C)    |                       | 0.43        | W/°C |
| T <sub>J</sub>   | Operating Junction Temperature Range     |                       | -55 to +150 | °C   |
| T <sub>STG</sub> | Storage Temperature Range                |                       | -55 to +150 | °C   |
| R <sub>θJA</sub> | Thermal Resistance-Junction to Ambient   |                       | 62          | °C/W |
| R <sub>θJC</sub> | Thermal Resistance-Junction to Case      |                       | 2.3         | °C/W |

## Electrical Characteristics

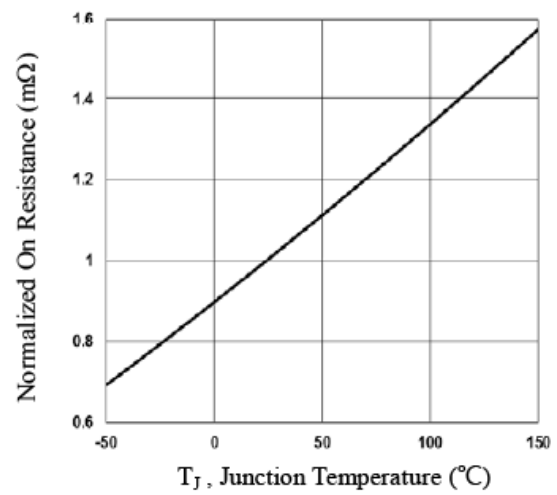
T<sub>A</sub>=25°C Unless otherwise noted

| Symbol                              | Parameter                                   | Conditions                                                                             | Min | Typ  | Max  | Unit  |
|-------------------------------------|---------------------------------------------|----------------------------------------------------------------------------------------|-----|------|------|-------|
| Static                              |                                             |                                                                                        |     |      |      |       |
| V <sub>(BR)DSS</sub>                | Drain-Source Breakdown Voltage              | V <sub>GS</sub> =0V,I <sub>D</sub> =250uA                                              | 30  |      |      | 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                                              |     | 0.04 |      | V/°C  |
| V <sub>GS(th)</sub>                 | Gate Threshold Voltage                      | V <sub>DS</sub> =V <sub>GS</sub> ,I <sub>D</sub> =250uA                                | 1.0 | 1.6  | 2.5  | V     |
| ΔV <sub>GS(th)</sub>                | V <sub>GS(th)</sub> Temperature Coefficient |                                                                                        |     | -4   |      | 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> =30V,V <sub>GS</sub> =0V                                               |     |      | 1    | uA    |
|                                     |                                             | V <sub>DS</sub> =24V,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                                   |     |      | 80   | A     |
| I <sub>SM</sub>                     | Pulsed Source Current                       |                                                                                        |     |      | 320  |       |
| R <sub>DS(on)</sub>                 | Drain-Source On-Resistance                  | V <sub>GS</sub> =10V,I <sub>D</sub> =20A                                               |     | 4.8  | 6    | mΩ    |
|                                     |                                             | V <sub>GS</sub> =4.5V,I <sub>D</sub> =10A                                              |     | 6.5  | 9    | mΩ    |
| g <sub>FS</sub>                     | Forward Transconductance                    | V <sub>DS</sub> =10V,I <sub>D</sub> =10A                                               |     | 18   |      | S     |
| V <sub>SD</sub>                     | Diode Forward Voltage                       | V <sub>GS</sub> =0V,I <sub>S</sub> =1A                                                 |     |      | 1    | V     |
| EAS                                 | Single Pulse Avalanche Energy               | V <sub>DD</sub> =25V,L=0.1mH,<br>I <sub>AS</sub> =20A                                  | 20  |      |      | mJ    |
| Dynamic                             |                                             |                                                                                        |     |      |      |       |
| Q <sub>g</sub>                      | Total Gate Charge                           | V <sub>DS</sub> =15V,V <sub>GS</sub> =4.5V,<br>I <sub>D</sub> =20A                     |     | 11.1 |      | nC    |
| Q <sub>gs</sub>                     | Gate-Source Charge                          |                                                                                        |     | 1.85 |      |       |
| Q <sub>gd</sub>                     | Gate-Drain Charge                           |                                                                                        |     | 6.8  |      |       |
| C <sub>iSS</sub>                    | Input Capacitance                           | V <sub>DS</sub> =25V,V <sub>GS</sub> =0V,<br>f=1MHz                                    |     | 1160 |      | pF    |
| C <sub>oSS</sub>                    | Output Capacitance                          |                                                                                        |     | 200  |      |       |
| C <sub>rSS</sub>                    | Reverse Transfer Capacitance                |                                                                                        |     | 180  |      |       |
| t <sub>d(on)</sub>                  | Turn-On Time                                | V <sub>DD</sub> =15V,I <sub>D</sub> =15A,<br>V <sub>GS</sub> =10V,R <sub>G</sub> =3.3Ω |     | 7.5  |      | ns    |
| t <sub>r</sub>                      |                                             |                                                                                        |     | 14.5 |      |       |
| t <sub>d(off)</sub>                 | Turn-Off Time                               |                                                                                        |     | 35.2 |      |       |
| t <sub>f</sub>                      |                                             |                                                                                        |     | 9.6  |      |       |
| R <sub>g</sub>                      | Gate Resistance                             | V <sub>DS</sub> =0V,V <sub>GS</sub> =0V,<br>f=1MHz                                     |     | 2.5  |      | Ω     |

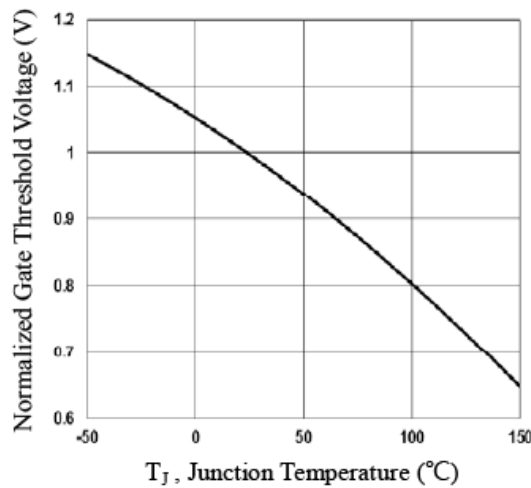
## Typical Performance Characteristics



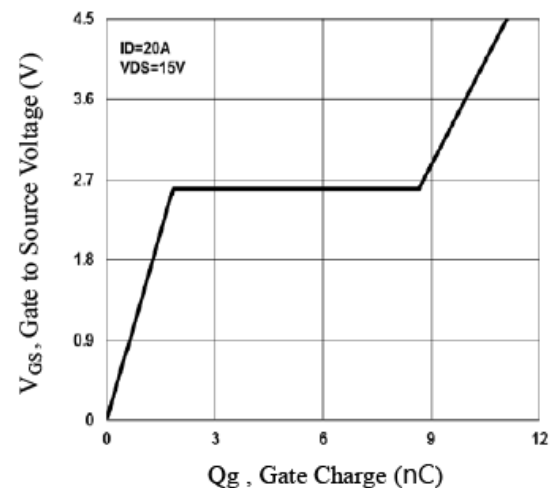
**Fig.1 Continuous Drain Current vs.  $T_C$**



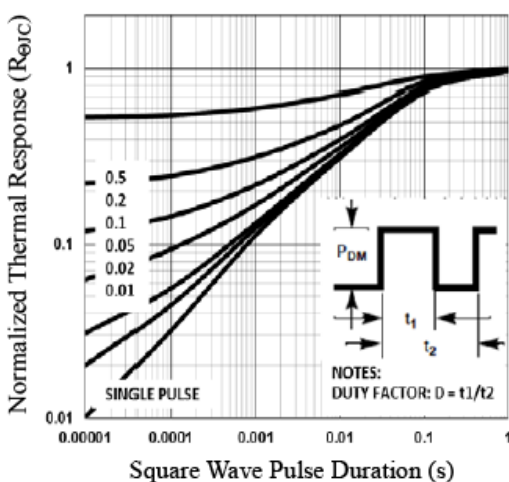
**Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_J$**



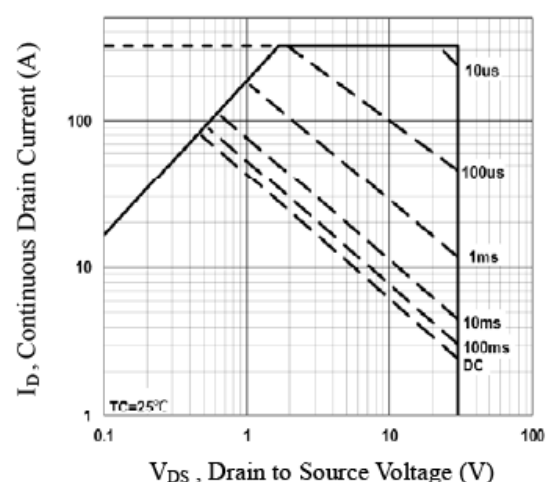
**Fig.3 Normalized  $V_{th}$  vs.  $T_J$**



**Fig.4 Gate Charge Waveform**



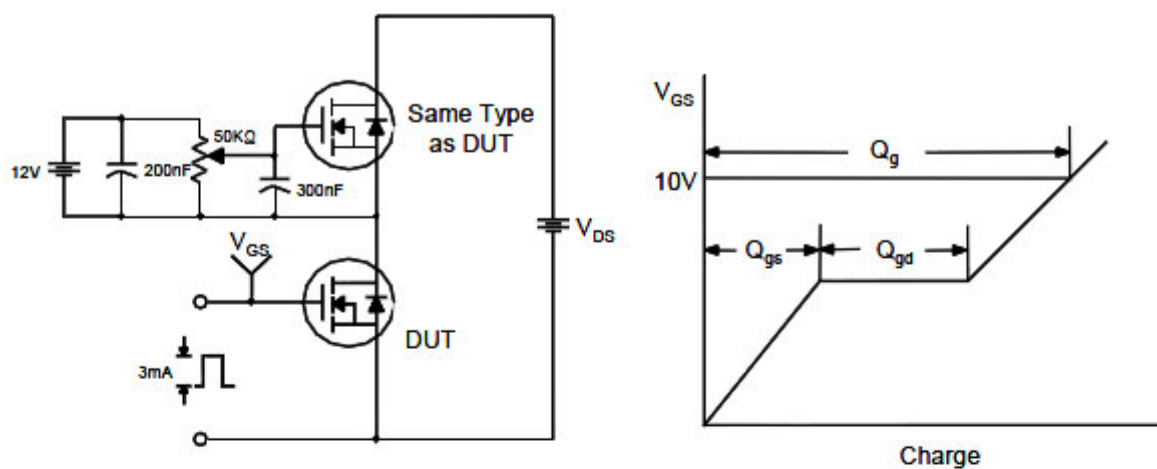
**Fig.5 Normalized Transient Impedance**



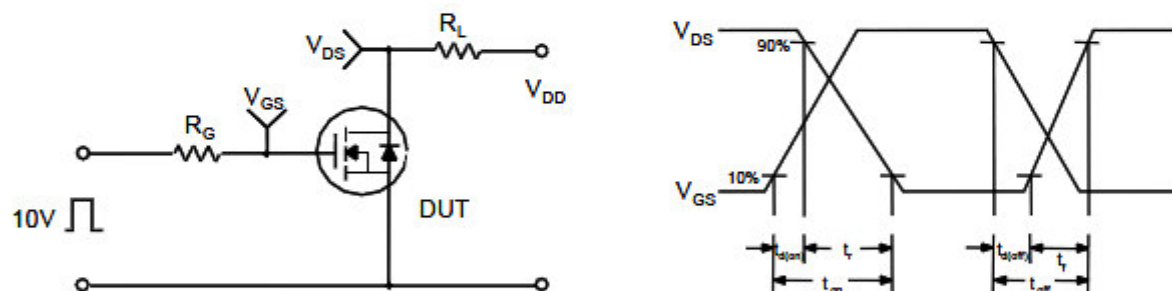
**Fig.6 Maximum Safe Operation Area**

## Typical Performance Characteristics (Continue)

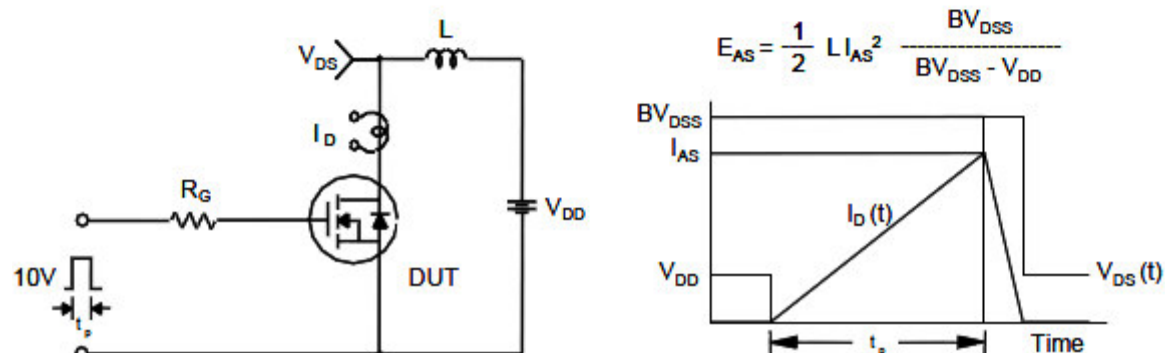
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms

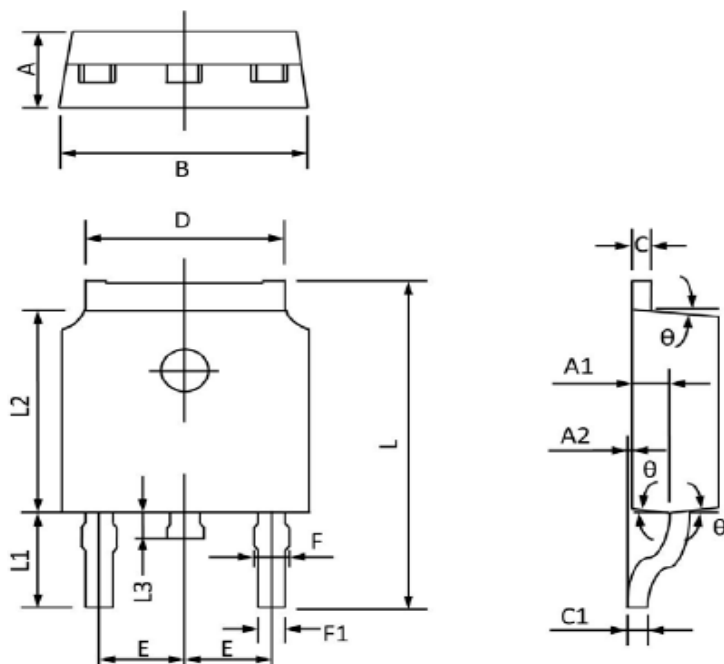


Unclamped Inductive Switching Test Circuit & Waveforms



## 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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