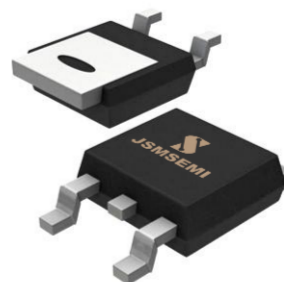


## Description:

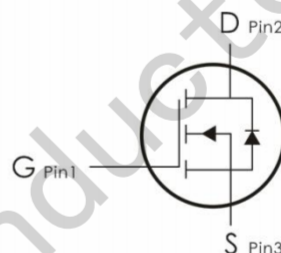
This N-Channel MOSFET uses advanced trench technology and design to provide excellent  $R_{DS(on)}$  with low gate charge.

It can be used in a wide variety of applications.



## Features:

- 1)  $V_{DS}=60V, I_D=30A, R_{DS(on)} < 30m\Omega @ V_{GS}=10V$
- 2) Low gate charge.
- 3) Green device available.
- 4) Advanced high cell density trench technology for ultra low  $R_{DS(on)}$ .
- 5) Excellent package for good heat dissipation.



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

| Symbol         | Parameter                                        | Ratings     | Units         |
|----------------|--------------------------------------------------|-------------|---------------|
| $V_{DS}$       | Drain-Source Voltage                             | 60          | V             |
| $V_{GS}$       | Gate-Source Voltage                              | $\pm 20$    | V             |
| $I_D$          | Continuous Drain Current- $T_C=25^\circ C$       | 30          | A             |
|                | Continuous Drain Current- $T_C=100^\circ C$      | 16          |               |
| $I_{DM}$       | Drain Current - Pulsed1                          | 100         | A             |
| $E_{AS}$       | Single Pulse Avalanche Energy (note1)            | 24          | mJ            |
| $I_{AS}$       | Avalanche Current (note2)                        | 22          | A             |
| $P_D$          | Power Dissipation                                | 40          | W             |
|                | Power Dissipation - Derate above $25^\circ C$    | 0.32        | W/ $^\circ C$ |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range | -55 to +150 | $^\circ C$    |

**Thermal Characteristics:**

| Symbol          | Parameter                               | Max | Units                       |
|-----------------|-----------------------------------------|-----|-----------------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case    | 3.1 | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 62  |                             |

**Electrical Characteristics:** ( $T_c=25^{\circ}\text{C}$  unless otherwise noted)

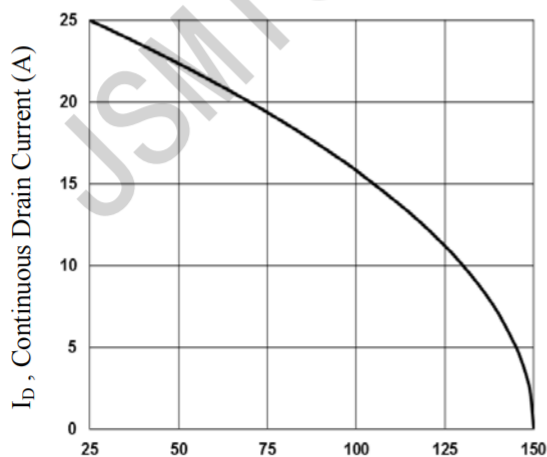
| Symbol                              | Parameter                          | Conditions                                                                  | Min | Typ  | Max  | Units |
|-------------------------------------|------------------------------------|-----------------------------------------------------------------------------|-----|------|------|-------|
| Off Characteristics                 |                                    |                                                                             |     |      |      |       |
| BV <sub>DSS</sub>                   | Drain-Source Breakdown Voltage     | V <sub>GS</sub> =0V, I <sub>D</sub> =250 μ A                                | 60  | ---  | ---  | V     |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | BVDSS Temperature Coefficient      | Reference to 25 °C , I <sub>D</sub> =1mA                                    | --- | 0.07 | ---  | V/°C  |
| I <sub>DSS</sub>                    | Zero Gate Voltage Drain Current    | V <sub>GS</sub> =0V, V <sub>DS</sub> =650V                                  | --- | ---  | 1    | μ A   |
|                                     |                                    | V <sub>GS</sub> =0V, V <sub>DS</sub> =480V, T <sub>J</sub> =125 °C          | --- | ---  | 10   | μ A   |
| I <sub>GSS</sub>                    | Gate-Source Leakage Current        | V <sub>GS</sub> = ±30V, 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                  | 1.2 | 1.7  | 2.5  | V     |
| R <sub>DS(ON)</sub>                 | Drain-Source On Resistance         | V <sub>GS</sub> =10V, I <sub>D</sub> =15A                                   | --- | 25   | 30   | m Ω   |
|                                     |                                    | V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A                                  | --- | 31   | 40   | m Ω   |
| Dynamic Characteristics             |                                    |                                                                             |     |      |      |       |
| C <sub>iss</sub>                    | Input Capacitance                  | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz                           | --- | 1150 | 1700 | pF    |
| C <sub>oss</sub>                    | Output Capacitance                 |                                                                             | --- | 60   | 90   |       |
| C <sub>rss</sub>                    | Reverse Transfer Capacitance       |                                                                             | --- | 43   | 65   |       |
| Switching Characteristics           |                                    |                                                                             |     |      |      |       |
| t <sub>d(on)</sub>                  | Turn-On Delay Time <sup>2,3</sup>  | V <sub>DD</sub> =30V, I <sub>D</sub> =1A,<br>R <sub>G</sub> =6 Ω (Note 3,4) | --- | 15   | 40   | ns    |
| t <sub>r</sub>                      | Rise Time <sup>2,3</sup>           |                                                                             | --- | 4.5  | 8    | ns    |
| t <sub>d(off)</sub>                 | Turn-Off Delay Time <sup>2,3</sup> |                                                                             | --- | 27   | 50   | ns    |

|                                    |                                           |                                                                              |     |     |     |    |
|------------------------------------|-------------------------------------------|------------------------------------------------------------------------------|-----|-----|-----|----|
| <b>t<sub>f</sub></b>               | Fall Time <sup>2,3</sup>                  | V <sub>GS</sub> =30V, V <sub>DS</sub> =10V,<br>I <sub>D</sub> =20A(Note 3,4) | --- | 7.5 | 13  | ns |
| <b>Q<sub>g</sub></b>               | Total Gate Charge <sup>2,3</sup>          |                                                                              | --- | 16  | 20  | nC |
| <b>Q<sub>gs</sub></b>              | Gate-Source Charge <sup>2,3</sup>         |                                                                              | --- | 2   | 4   | nC |
| <b>Q<sub>gd</sub></b>              | Gate-Drain “Miller” Charge <sup>2,3</sup> |                                                                              | --- | 3.5 | 7   | nC |
| Drain-Source Diode Characteristics |                                           |                                                                              |     |     |     |    |
| <b>V<sub>SD</sub></b>              | Diode Forward Voltage                     | V <sub>GS</sub> =0V,I <sub>S</sub> =1A,                                      | --- | --- | 1   | V  |
| <b>I<sub>S</sub></b>               | Continuous Source Current                 | ---                                                                          | --- | --- | 25  | A  |
| <b>I<sub>SM</sub></b>              | Pulsed Source Current                     | ---                                                                          | --- | --- | 100 | A  |
| <b>T<sub>rr</sub></b>              | Reverse Recovery Time                     | V <sub>GS</sub> =0V,I <sub>S</sub> =1A ,                                     | --- | 17  | --- | ns |
| <b>Q<sub>rr</sub></b>              | Reverse Recovery Charge                   | dI/dt=100A/μs(Note 3)                                                        | --- | 12  | --- | nC |

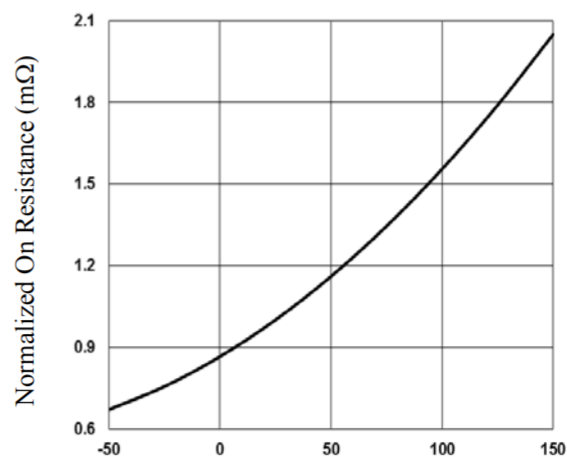
#### Notes:

- 1.Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. $V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=22A, R_G=25$  ,Starting  $T_J=25^\circ C$
- 3.The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$ .
- 4.Essentially independent of operating temperature.

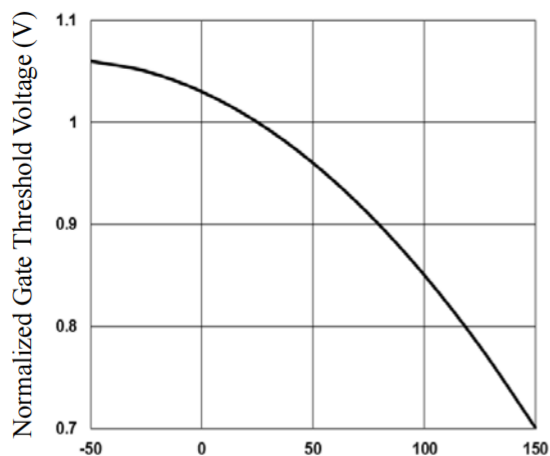
#### Typical Characteristics: ( $T_c=25^\circ C$ unless otherwise noted)



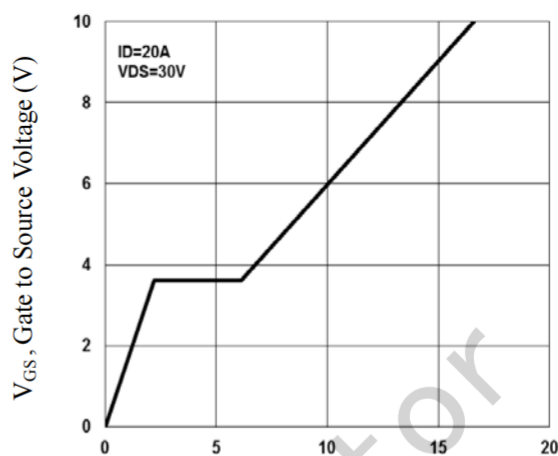
**Fig.1 Continuous Drain Current vs.  $T_c$**



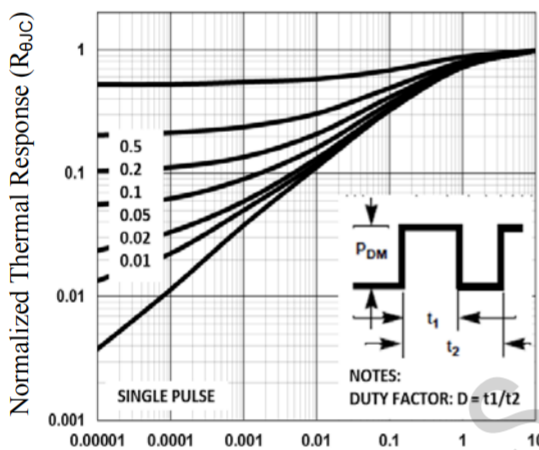
**Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_J$**



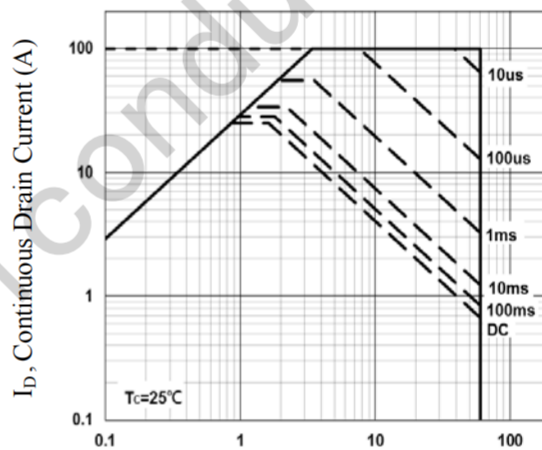
**Fig.3 Normalized  $V_{th}$  vs.  $T_J$**



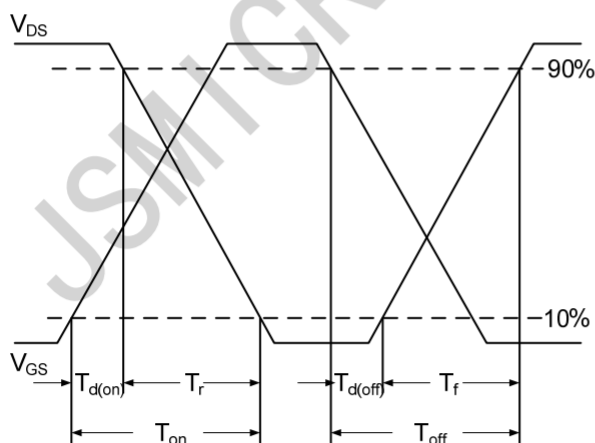
**Fig.4 Gate Charge Waveform**



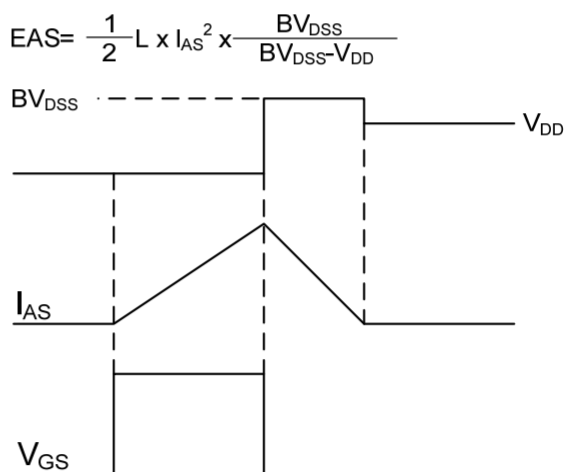
**Fig.5 Normalized Transient Impedance**



**Fig.6 Maximum Safe Operation Area**



**Fig.7 Switching Time Waveform**

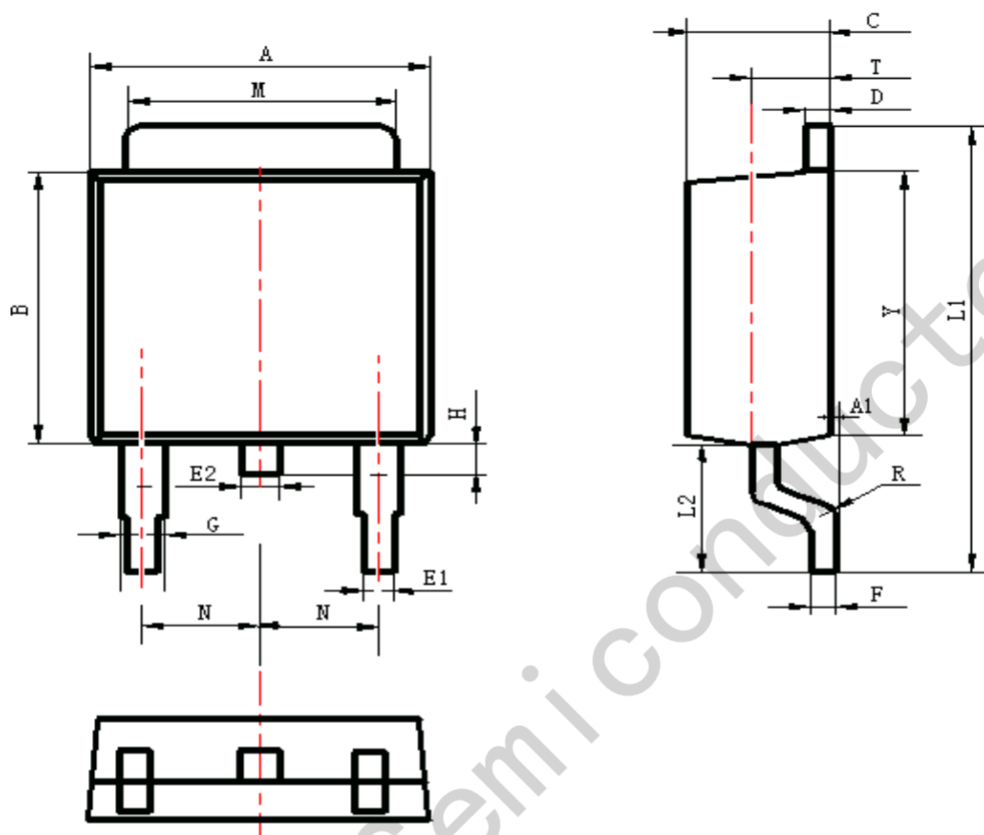


**Fig.8 EAS Waveform**

$$EAS = \frac{1}{2} L \times I_{AS}^2 \times \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$

## Package Information

TO-252



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| A      | 6.30                      | 6.90  | 0.248                | 0.272 |
| A1     | 0.00                      | 0.16  | 0.000                | 0.006 |
| B      | 5.70                      | 6.30  | 0.224                | 0.248 |
| C      | 2.10                      | 2.50  | 0.083                | 0.098 |
| D      | 0.30                      | 0.70  | 0.012                | 0.028 |
| E1     | 0.60                      | 0.90  | 0.024                | 0.035 |
| E2     | 0.70                      | 1.00  | 0.028                | 0.039 |
| F      | 0.30                      | 0.60  | 0.012                | 0.024 |
| G      | 0.70                      | 1.20  | 0.028                | 0.047 |
| L1     | 9.60                      | 10.50 | 0.378                | 0.413 |
| L2     | 2.70                      | 3.10  | 0.106                | 0.122 |
| H      | 0.40                      | 1.00  | 0.016                | 0.039 |
| M      | 5.10                      | 5.50  | 0.201                | 0.217 |
| N      | 2.09                      | 2.49  | 0.082                | 0.098 |
| R      | 0.30                      |       | 0.012                |       |
| T      | 1.40                      | 1.60  | 0.055                | 0.063 |
| Y      | 5.10                      | 6.30  | 0.201                | 0.248 |