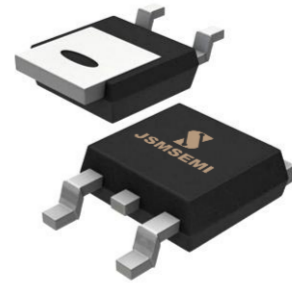


## Description:

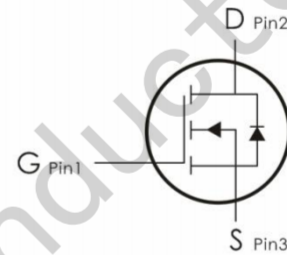
This N-Channel MOSFET uses advanced trench technology and design to provide excellent  $R_{DS(on)}$  with low gate charge.

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 | °C/W  |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 62  |       |

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

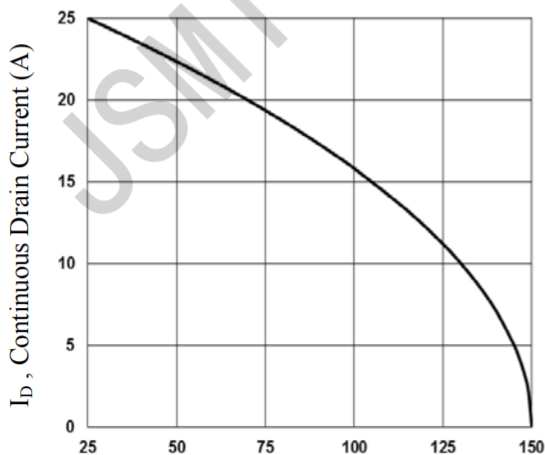
| Symbol                           | Parameter                          | Conditions   | Min | Typ  | Max       | Units      |
|----------------------------------|------------------------------------|--|-----|------|-----------|------------|
| <b>Off Characteristics</b>       |                                    |  |     |      |           |            |
| $BV_{DSS}$                       | Drain-Source Breakdown Voltage     | $V_{GS}=0V, I_D=250 \mu A$                         | 60  | ---  | ---       | V          |
| $\Delta BV_{DSS}/\Delta T_J$     | BVDSS Temperature Coefficient      | Reference to $25^\circ\text{C}$ , $I_D=1mA$        | --- | 0.07 | ---       | V/°C       |
| $I_{DSS}$                        | Zero Gate Voltage Drain Current    | $V_{GS}=0V, V_{DS}=650V$                           | --- | ---  | 1         | $\mu A$    |
|                                  |                                    | $V_{GS}=0V, V_{DS}=480V, T_J=125^\circ\text{C}$    | --- | ---  | 10        | $\mu A$    |
| $I_{GSS}$                        | Gate-Source Leakage Current        | $V_{GS}=\pm 30V, V_{DS}=0A$                        | --- | ---  | $\pm 100$ | nA         |
| <b>On Characteristics</b>        |                                    |  |     |      |           |            |
| $V_{GS(th)}$                     | GATE-Source Threshold Voltage      | $V_{GS}=V_{DS}, I_D=250 \mu A$                     | 1.2 | 1.7  | 2.5       | V          |
| $R_{DS(on)}$                     | Drain-Source On Resistance         | $V_{GS}=10V, I_D=15A$                              | --- | 25   | 30        | m $\Omega$ |
|                                  |                                    | $V_{GS}=4.5V, I_D=10A$                             | --- | 31   | 40        | m $\Omega$ |
| <b>Dynamic Characteristics</b>   |                                    |  |     |      |           |            |
| $C_{iss}$                        | Input Capacitance                  | $V_{DS}=25V, V_{GS}=0V, f=1MHz$                    | --- | 1150 | 1700      | pF         |
| $C_{oss}$                        | Output Capacitance                 |  | --- | 60   | 90        |            |
| $C_{rss}$                        | Reverse Transfer Capacitance       |  | --- | 43   | 65        |            |
| <b>Switching Characteristics</b> |                                    |  |     |      |           |            |
| $t_{d(on)}$                      | Turn-On Delay Time <sup>2,3</sup>  | $V_{DD}=30V, I_D=1A,$<br>$R_G=6 \Omega$ (Note 3,4) | --- | 15   | 40        | ns         |
| $t_r$                            | Rise Time <sup>2,3</sup>           |  | --- | 4.5  | 8         | ns         |
| $t_{d(off)}$                     | Turn-Off Delay Time <sup>2,3</sup> |  | --- | 27   | 50        | ns         |

|   |   |  |     |     |     |    |
|---|---|--|-----|-----|-----|----|
| $t_f$                                     | Fall Time <sup>2,3</sup>                  |  | --- | 7.5 | 13  | ns |
| $Q_g$                                     | Total Gate Charge <sup>2,3</sup>          | $V_{GS}=30V, V_{DS}=10V,$<br>$I_D=20A(\text{Note } 3,4)$   | --- | 16  | 20  | nC |
| $Q_{gs}$                                  | Gate-Source Charge <sup>2,3</sup>         |  | --- | 2   | 4   | nC |
| $Q_{gd}$                                  | Gate-Drain "Miller" Charge <sup>2,3</sup> |  | --- | 3.5 | 7   | nC |
| <b>Drain-Source Diode Characteristics</b> |   |  |     |     |     |    |
| $V_{SD}$                                  | Diode Forward Voltage                     | $V_{GS}=0V, I_S=1A,$                                       | --- | --- | 1   | V  |
| $I_S$                                     | Continuous Source Current                 | ---  | --- | --- | 25  | A  |
| $I_{SM}$                                  | Pulsed Source Current                     | ---  | --- | --- | 100 | A  |
| $T_{rr}$                                  | Reverse Recovery Time                     | $V_{GS}=0V, I_S=1A,$<br>$dI/dt=100A/\mu s(\text{Note } 3)$ | --- | 17  | --- | ns |
| $Q_{rr}$                                  | Reverse Recovery Charge                   |  | --- | 12  | --- | nC |

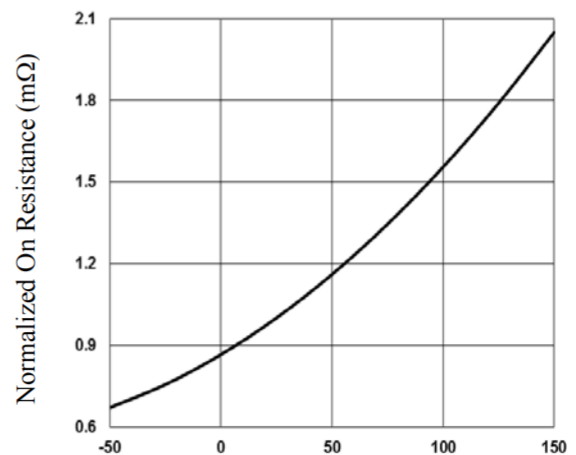
### Notes:

- 1.Repetitive Rating : Pulsed width limited by maximum junction temperature.
- 2.VDD=25V,VGS=10V,L=0.1mH,IAS=22A.,RG=25 ,Starting TJ=25°C
- 3.The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$ .
- 4.Essentially independent of operating temperature.

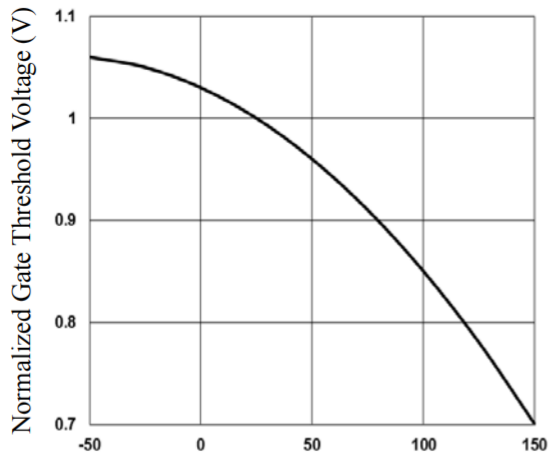
### Typical Characteristics: (T<sub>c</sub>=25°C unless otherwise noted)



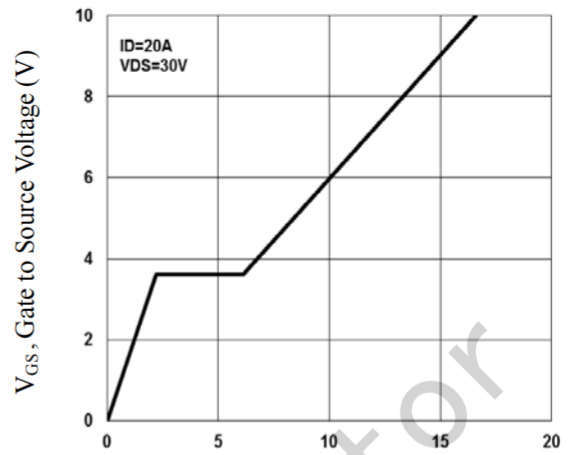
**Fig.1 Continuous Drain Current vs. T<sub>c</sub>**



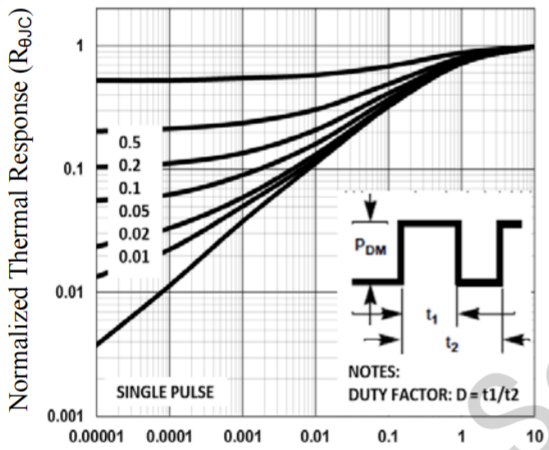
**Fig.2 Normalized R<sub>DS(on)</sub> vs. T<sub>j</sub>**



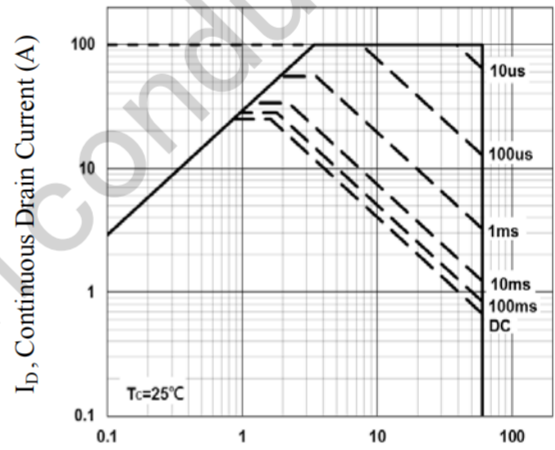
**Fig.3 Normalized  $V_{th}$  vs.  $T_J$**



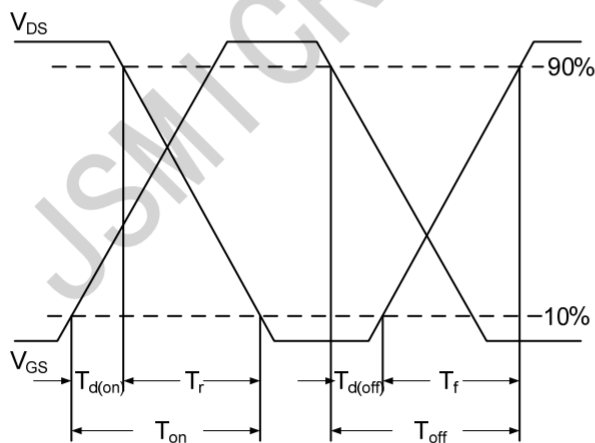
**Fig.4 Gate Charge Waveform**



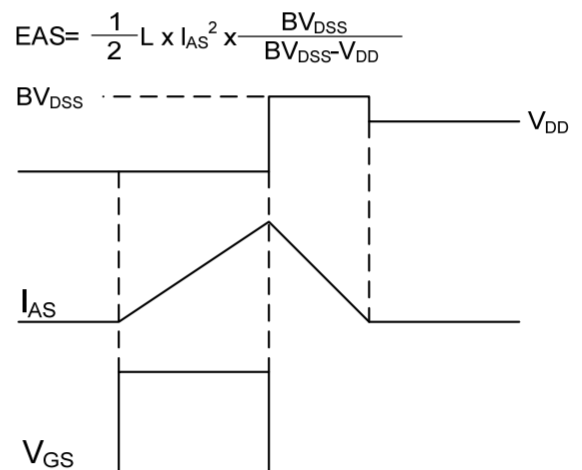
**Fig.5 Normalized Transient Impedance**



**Fig.6 Maximum Safe Operation Area**



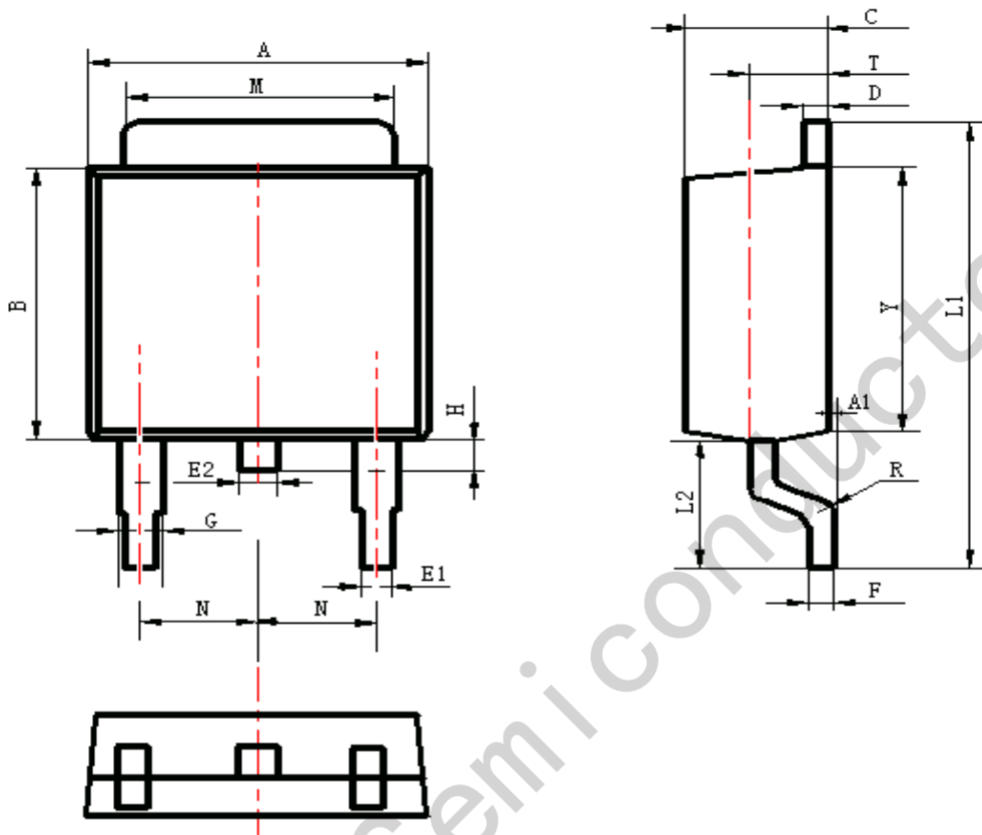
**Fig.7 Switching Time Waveform**



**Fig.8 EAS Waveform**

## 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 |