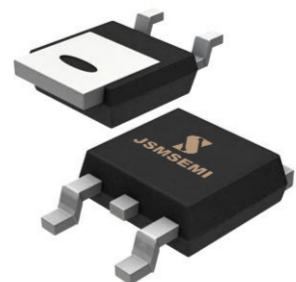


## Description:

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

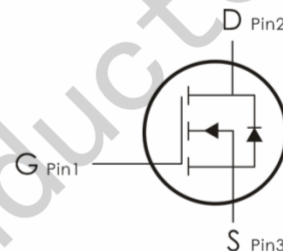
It can be used in a wide variety of applications.



TO-252

## Features:

- 1)  $V_{DS}=60V, I_D=20A, R_{DS(ON)} < 36m\Omega @ V_{GS}=10V$
- 2) Low gate charge.
- 3) Green device available.
- 4) Advanced high cell density trench technology for ultra  $R_{DS(ON)}$ .
- 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- $T_C=25^\circ C$       | 20          | A          |
|                | Continuous Drain Current- $T_C=100^\circ C$      | 13          |            |
| $I_{DM}$       | Pulsed Drain Current <sup>note1</sup>            | 80          |            |
| $E_{AS}$       | Single Pulse Avalanche Energy <sup>note2</sup>   | 40          | mJ         |
| $P_D$          | Power Dissipation, $T_C=25^\circ C$              | 31          | W          |
| $T_J, T_{STG}$ | 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 | 4   | $^\circ C/W$ |

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

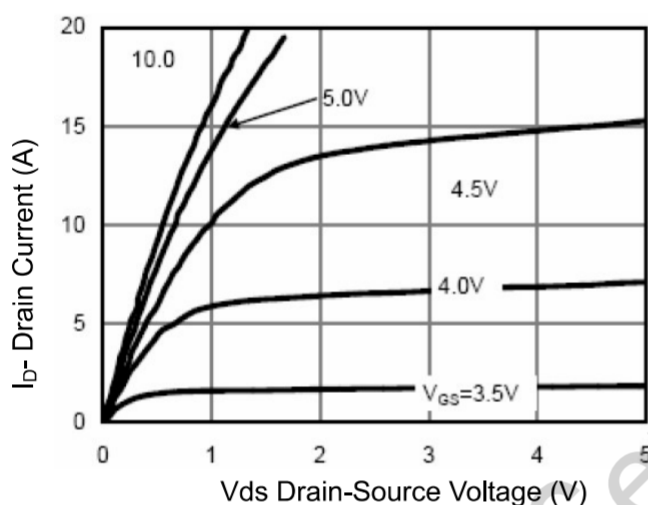
| Symbol                             | Parameter                                                | Conditions                                                                                 | Min | Typ  | Max   | Units |
|------------------------------------|----------------------------------------------------------|--------------------------------------------------------------------------------------------|-----|------|-------|-------|
| Off Characteristics                |                                                          |                                                                                            |     |      |       |       |
| BV <sub>DSS</sub>                  | Drain-Source Breakdown Voltage                           | V <sub>GS</sub> =0V, I <sub>D</sub> =250 μ A                                               | 60  | ---  | ---   | V     |
| I <sub>DSS</sub>                   | Zero Gate Voltage Drain Current                          | V <sub>GS</sub> =0V, V <sub>DS</sub> =60V                                                  | --- | ---  | 1     | μ A   |
| I <sub>GSS</sub>                   | Gate-Source Leakage Current                              | V <sub>GS</sub> =± 20V, 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   | 1.6  | 3     | V     |
| R <sub>DS(on)</sub>                | Drain-Source On Resistance <sup>note3</sup>              | V <sub>GS</sub> =10V, I <sub>D</sub> =10A                                                  | --- | 26   | 36    | m Ω   |
|                                    |                                                          | V <sub>GS</sub> =4.5V, I <sub>D</sub> =5A                                                  | --- | 36   | 45    | m Ω   |
| Dynamic Characteristics            |                                                          |                                                                                            |     |      |       |       |
| C <sub>iss</sub>                   | Input Capacitance                                        | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz                                          | --- | 1150 | ---   | pF    |
| C <sub>oss</sub>                   | Output Capacitance                                       |                                                                                            | --- | 55   | ---   |       |
| C <sub>rss</sub>                   | Reverse Transfer Capacitance                             |                                                                                            | --- | 45.3 | ---   |       |
| Switching Characteristics          |                                                          |                                                                                            |     |      |       |       |
| t <sub>d(on)</sub>                 | Turn-On Delay Time                                       | V <sub>DS</sub> =30V, I <sub>D</sub> =15A,<br>V <sub>GS</sub> =10V, R <sub>GEN</sub> =1.8Ω | --- | 7.6  | ---   | ns    |
| t <sub>r</sub>                     | Rise Time                                                |                                                                                            | --- | 20   | ---   | ns    |
| t <sub>d(off)</sub>                | Turn-Off Delay Time                                      |                                                                                            | --- | 15   | ---   | ns    |
| t <sub>f</sub>                     | Fall Time                                                |                                                                                            | --- | 24   | ---   | ns    |
| Q <sub>g</sub>                     | Total Gate Charge                                        | V <sub>GS</sub> =10V, V <sub>DS</sub> =30V,<br>I <sub>D</sub> =10A                         | --- | 20.3 | ---   | nC    |
| Q <sub>gs</sub>                    | Gate-Source Charge                                       |                                                                                            | --- | 3.7  | ---   | nC    |
| Q <sub>gd</sub>                    | Gate-Drain “Miller” Charge                               |                                                                                            | --- | 5.3  | ---   | nC    |
| Drain-Source Diode Characteristics |                                                          |                                                                                            |     |      |       |       |
| V <sub>SD</sub>                    | Source-Drain Diode Forward Voltage                       | V <sub>GS</sub> =0V, I <sub>S</sub> =20A                                                   | --- | ---  | 1.2   | V     |
| I <sub>S</sub>                     | Maximum Continuous Drain to Source Diode Forward Current |                                                                                            | --- | ---  | 20    | A     |
| I <sub>SM</sub>                    | Maximum Pulsed Drain to Source Diode Forward Current     |                                                                                            | --- | ---  | 80    | A     |

|            |                         |                           |     |    |     |    |
|------------|-------------------------|---------------------------|-----|----|-----|----|
| <b>trr</b> | Reverse Recovery Time   | IF = 10A, di/dt = 100A/μs | --- | 29 | --- | Ns |
| <b>qrr</b> | Reverse Recovery Charge |                           | --- | 43 | --- | nc |

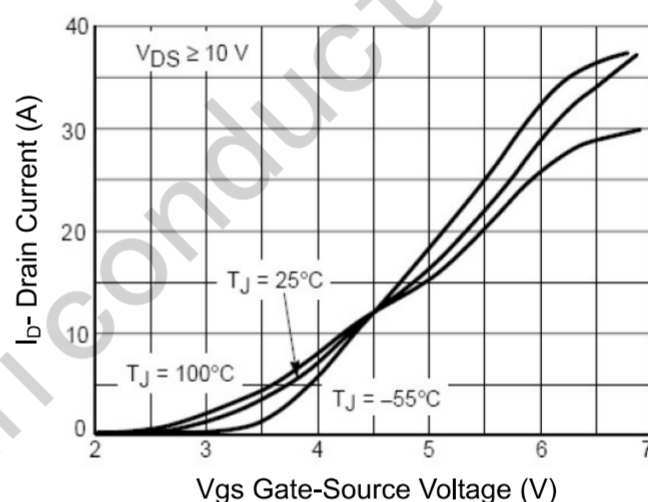
### Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
2. EAS condition :  $T_J=25^{\circ}\text{C}$ ,  $V_{DD}=30\text{V}$ ,  $V_G=10\text{V}$ ,  $L=0.5\text{mH}$ ,  $R_g=25\Omega$
3. Pulse Test: Pulse Width $\leq 300\mu\text{s}$ , Duty Cycle $\leq 0.5\%$

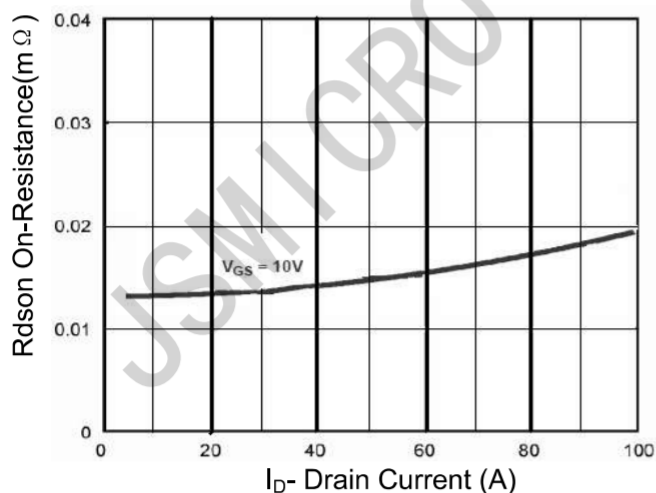
### Typical Characteristics: ( $T_C=25^{\circ}\text{C}$ unless otherwise noted)



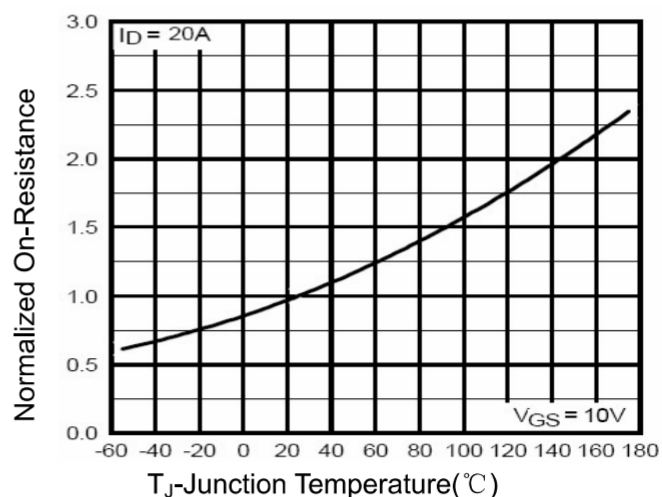
**Figure 1 Output Characteristics**



**Figure 2 Transfer Characteristics**



**Figure 3 Rdson- Drain Current**



**Figure 4 Rdson-Junction Temperature**

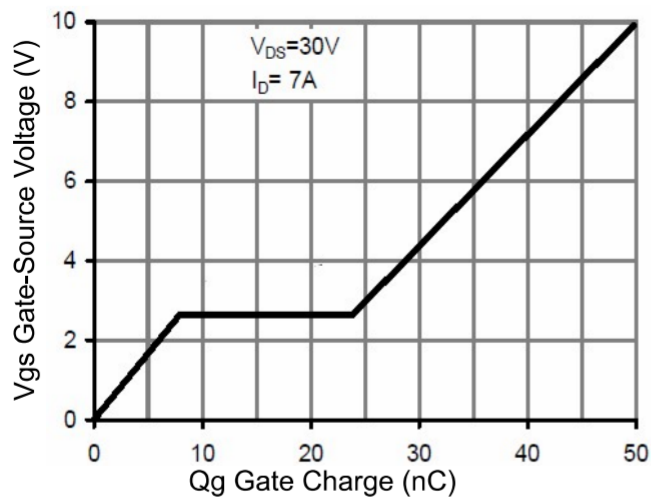


Figure 5 Gate Chare

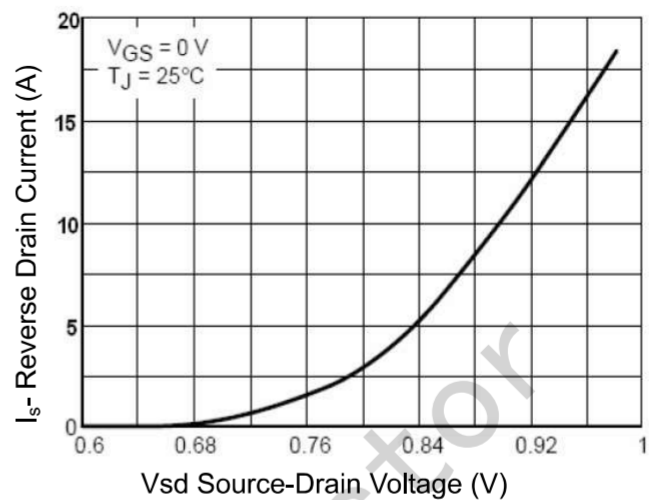


Figure 6 Source- Drain Diode Forward

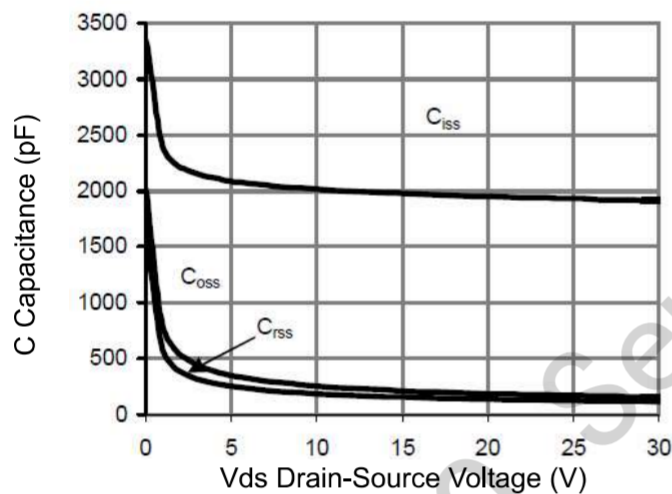


Figure 7 Capacitance vs Vds

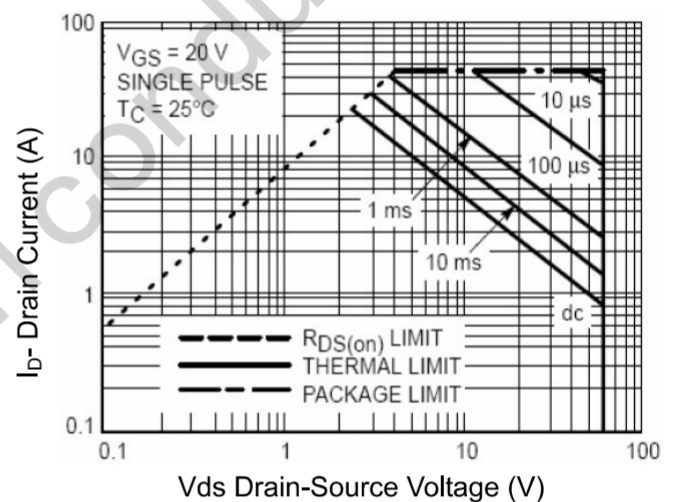


Figure 8 Safe Operation Area

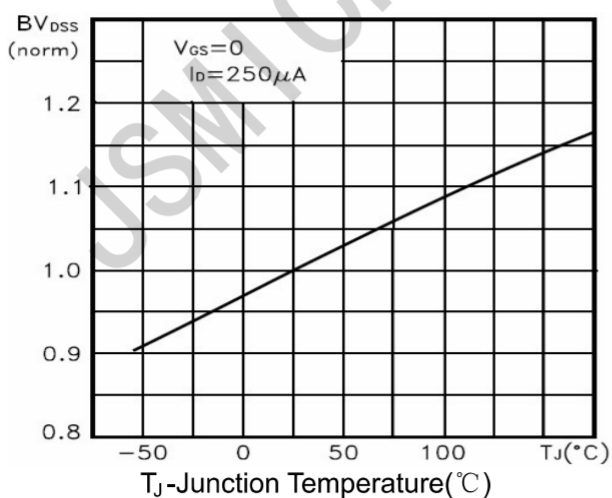


Figure 9 BV vs Junction Temperature

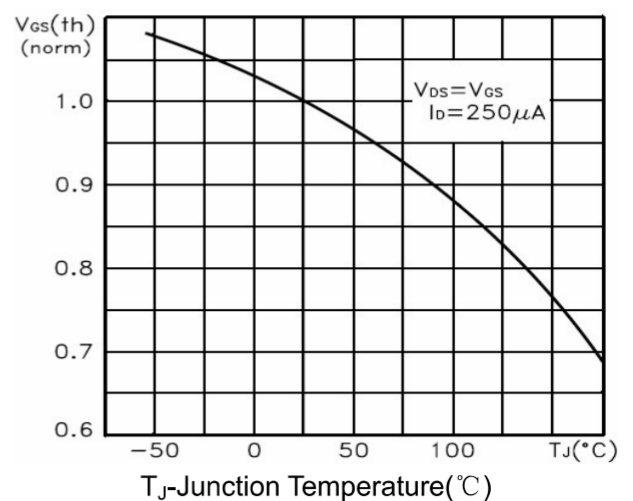
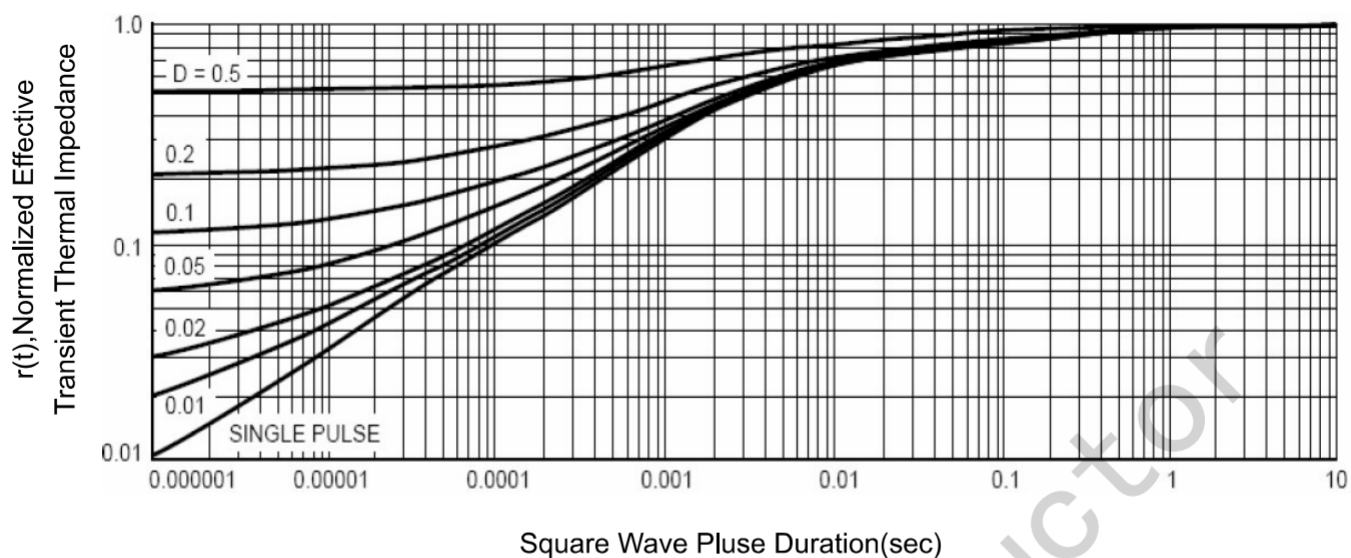


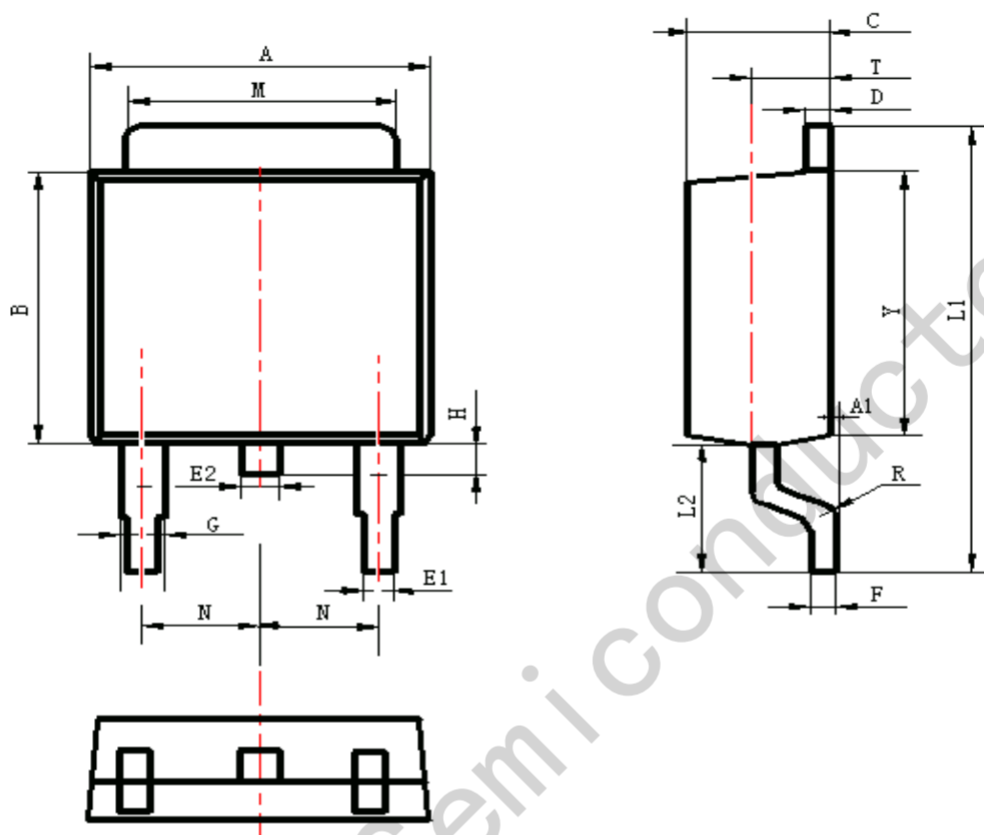
Figure 10  $V_{GS(th)}$  vs Junction Temperature



**Figure 11 Normalized Maximum Transient Thermal Impedance**

## 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 |