

## N-Channel Enhancement Mode Power MOSFET

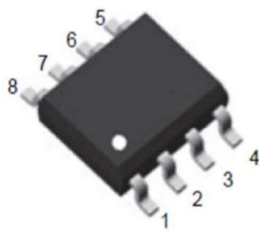
### Features

- $V_{DS} = 40V$ ,  $I_D = 14 A$   
 $R_{DS(ON)} < 10 m\Omega$  @  $V_{GS} = 10V$   
 $R_{DS(ON)} < 17 m\Omega$  @  $V_{GS} = 4.5V$

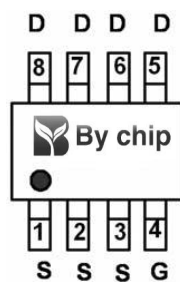
### General Features

- Advanced Trench Technology
- Provide Excellent  $R_{DS(ON)}$  and Low Gate Charge
- Lead Free and Green Available

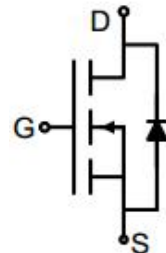
100% UIS TESTED!  
100%  $\Delta V_{ds}$  TESTED!



SOP-8



pin assignment



Schematic diagram

### Maximum ratings, at $T_A = 25^\circ C$ , unless otherwise specified

| Symbol                            | Parameter                                      |                       | Rating     | Unit |
|-----------------------------------|------------------------------------------------|-----------------------|------------|------|
| V <sub>(BR)DSS</sub>              | Drain-Source breakdown voltage                 |                       | 40         | V    |
| V <sub>GS</sub>                   | Gate-Source voltage                            |                       | ±20        | V    |
| I <sub>S</sub>                    | Diode continuous forward current               | T <sub>A</sub> =25°C  | 3.8        | A    |
| I <sub>D</sub>                    | Continuous drain current @V <sub>GS</sub> =10V | T <sub>A</sub> =25°C  | 14         | A    |
|                                   |                                                | T <sub>A</sub> =100°C | 9          | A    |
| I <sub>DM</sub>                   | Pulse drain current tested ①                   | T <sub>A</sub> =25°C  | 56         | A    |
| P <sub>D</sub>                    | Maximum power dissipation                      | T <sub>A</sub> =25°C  | 3.1        | W    |
| MSL                               |                                                |                       | Level 3    |      |
| T <sub>STG</sub> , T <sub>J</sub> | Storage and junction temperature range         |                       | -55 to 150 | °C   |

### Thermal Characteristics

| Symbol          | Parameter                               | Typical | Unit         |
|-----------------|-----------------------------------------|---------|--------------|
| $R_{\theta JL}$ | Thermal Resistance, Junction-to-Lead    | 24      | $^\circ C/W$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | 40      | $^\circ C/W$ |

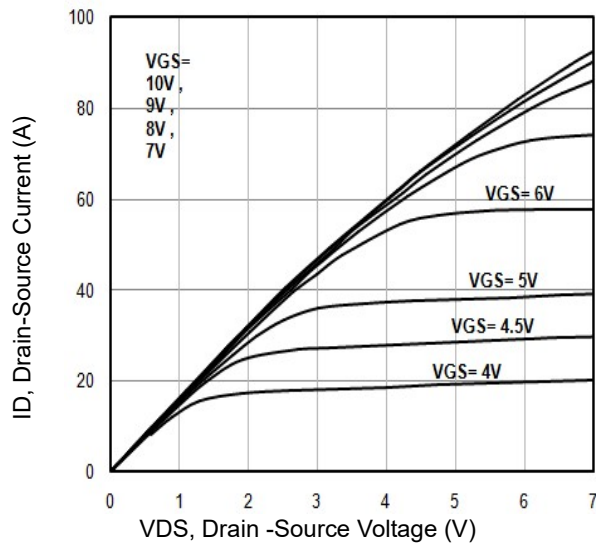
## Electrical Characteristics

| Symbol                                                                               | Parameter                                              | Condition                                                                                      | Min. | Typ. | Max. | Unit |
|--------------------------------------------------------------------------------------|--------------------------------------------------------|------------------------------------------------------------------------------------------------|------|------|------|------|
| Static Electrical Characteristics @ T <sub>j</sub> =25°C (unless otherwise stated)   |                                                        |                                                                                                |      |      |      |      |
| V <sub>(BR)DSS</sub>                                                                 | Drain-Source Breakdown Voltage                         | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                                                     | 40   | --   | --   | V    |
| I <sub>DSS</sub>                                                                     | Zero Gate Voltage Drain Current                        | V <sub>DS</sub> =40V, V <sub>GS</sub> =0V                                                      | --   | --   | 1    | uA   |
|                                                                                      | Zero Gate Voltage Drain Current(T <sub>j</sub> =125°C) | V <sub>DS</sub> =40V, V <sub>GS</sub> =0V                                                      | --   | --   | 100  | uA   |
| I <sub>GSS</sub>                                                                     | Gate-Body Leakage Current                              | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                                     | --   | --   | ±100 | nA   |
| V <sub>GS(TH)</sub>                                                                  | Gate Threshold Voltage                                 | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                       | 1.0  |      | 3.0  | V    |
| R <sub>DS(ON)</sub>                                                                  | Drain-Source On-State Resistance②                      | V <sub>GS</sub> =10V, I <sub>D</sub> =10A                                                      | --   |      | 10   | mΩ   |
| R <sub>DS(ON)</sub>                                                                  | Drain-Source On-State Resistance②                      | V <sub>GS</sub> =4.5V, I <sub>D</sub> =6A                                                      | --   |      | 17   | mΩ   |
| Dynamic Electrical Characteristics @ T <sub>j</sub> = 25°C (unless otherwise stated) |                                                        |                                                                                                |      |      |      |      |
| C <sub>iss</sub>                                                                     | Input Capacitance                                      | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V,<br>f=1MHz                                           | 1115 | 1315 | 1515 | pF   |
| C <sub>oss</sub>                                                                     | Output Capacitance                                     |                                                                                                | 85   | 100  | 115  | pF   |
| C <sub>rss</sub>                                                                     | Reverse Transfer Capacitance                           |                                                                                                | 65   | 80   | 95   | pF   |
| R <sub>g</sub>                                                                       | Gate Resistance                                        | f=1MHz                                                                                         | --   | 1.7  | --   | Ω    |
| Q <sub>g</sub> (10V)                                                                 | Total Gate Charge                                      | V <sub>DS</sub> =20V, I <sub>D</sub> =10A,<br>V <sub>GS</sub> =10V                             | --   | 22   | --   | nC   |
| Q <sub>g</sub> (4.5V)                                                                | Total Gate Charge                                      |                                                                                                | --   | 12   | --   | nC   |
| Q <sub>gs</sub>                                                                      | Gate-Source Charge                                     |                                                                                                | --   | 4.5  | --   | nC   |
| Q <sub>gd</sub>                                                                      | Gate-Drain Charge                                      |                                                                                                | --   | 4.2  | --   | nC   |
| Switching Characteristics                                                            |                                                        |                                                                                                |      |      |      |      |
| t <sub>d(on)</sub>                                                                   | Turn-on Delay Time                                     | V <sub>DD</sub> =20V,<br>I <sub>D</sub> =10A,<br>R <sub>G</sub> =3.0Ω,<br>V <sub>GS</sub> =10V | --   | 7.5  | --   | ns   |
| t <sub>r</sub>                                                                       | Turn-on Rise Time                                      |                                                                                                | --   | 3.8  | --   | ns   |
| t <sub>d(off)</sub>                                                                  | Turn-Off Delay Time                                    |                                                                                                | --   | 24   | --   | ns   |
| t <sub>f</sub>                                                                       | Turn-Off Fall Time                                     |                                                                                                | --   | 5.5  | --   | ns   |
| Source- Drain Diode Characteristics@ T <sub>j</sub> = 25°C (unless otherwise stated) |                                                        |                                                                                                |      |      |      |      |
| V <sub>SD</sub>                                                                      | Forward on voltage                                     | I <sub>SD</sub> =10A, V <sub>GS</sub> =0V                                                      | --   | 0.8  | 1.2  | V    |
| t <sub>rr</sub>                                                                      | Reverse Recovery Time                                  | T <sub>j</sub> =25°C , I <sub>sd</sub> =10A,<br>V <sub>GS</sub> =0V                            | --   | 8.5  | --   | ns   |
| Q <sub>rr</sub>                                                                      | Reverse Recovery Charge                                | di/dt=500A/μs                                                                                  | --   | 8    | --   | nC   |

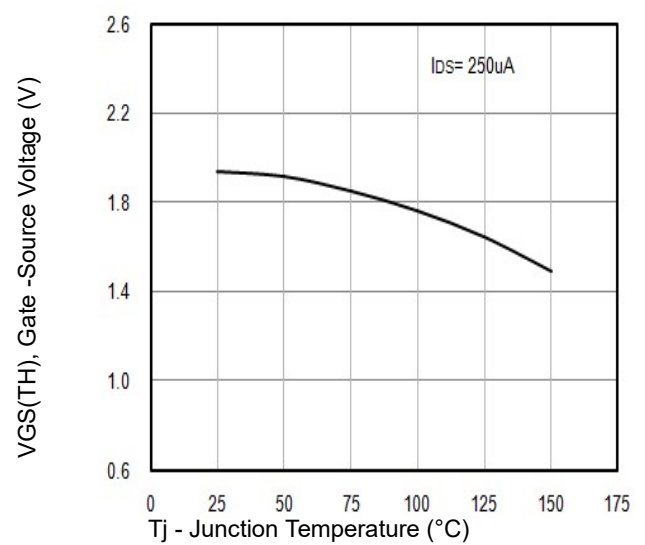
NOTE:

- ① Repetitive rating; pulse width limited by max junction temperature.  
 ② Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .

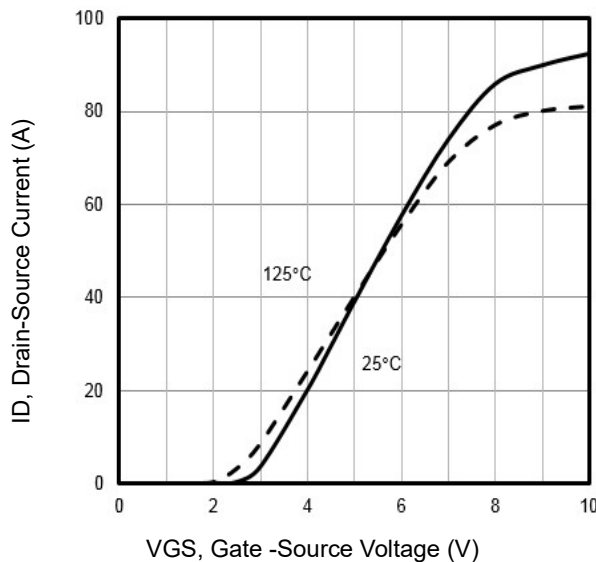
## Typical Characteristics



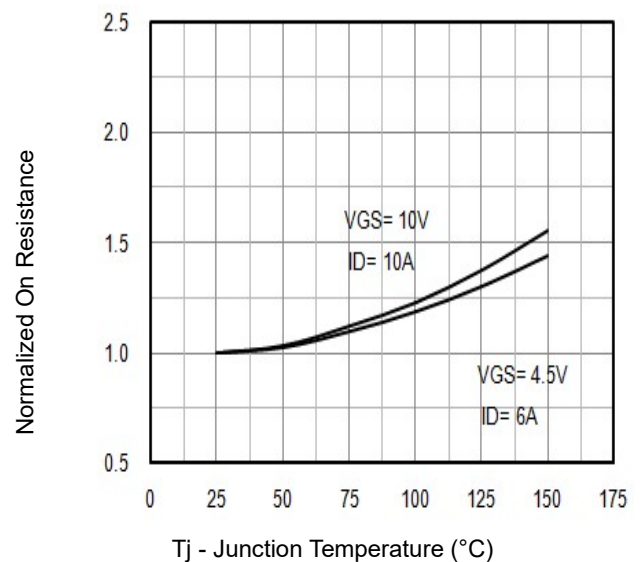
**Fig1.** Typical Output Characteristics



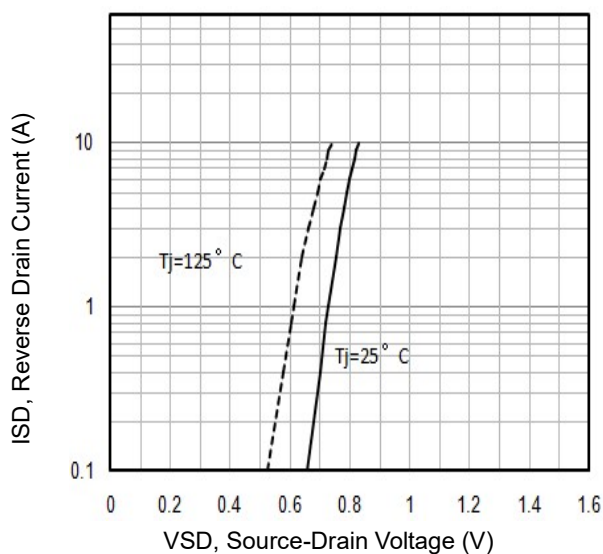
**Fig2.**  $V_{GS(TH)}$  Gate -Source Voltage Vs.  $T_J$



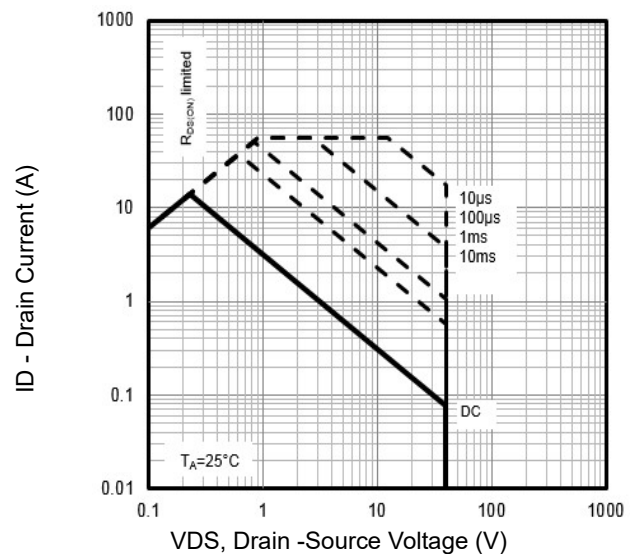
**Fig3.** Typical Transfer Characteristics



**Fig4.** Normalized On-Resistance Vs.  $T_J$



**Fig5.** Typical Source-Drain Diode Forward Voltage



**Fig6.** Maximum Safe Operating Area

## Typical Characteristics

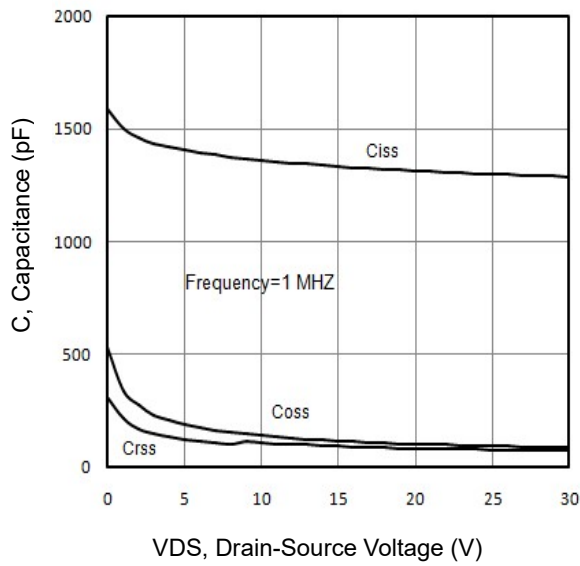


Fig7. Typical Capacitance Vs. Drain-Source Voltage

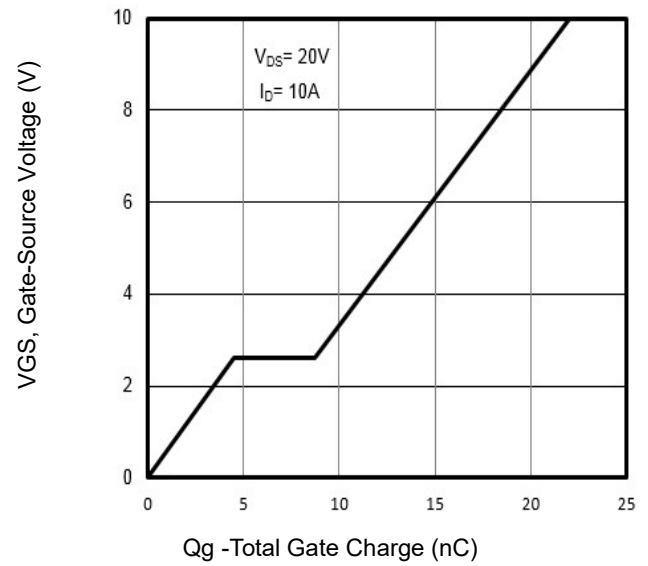


Fig8. Typical Gate Charge Vs. Gate-Source Voltage

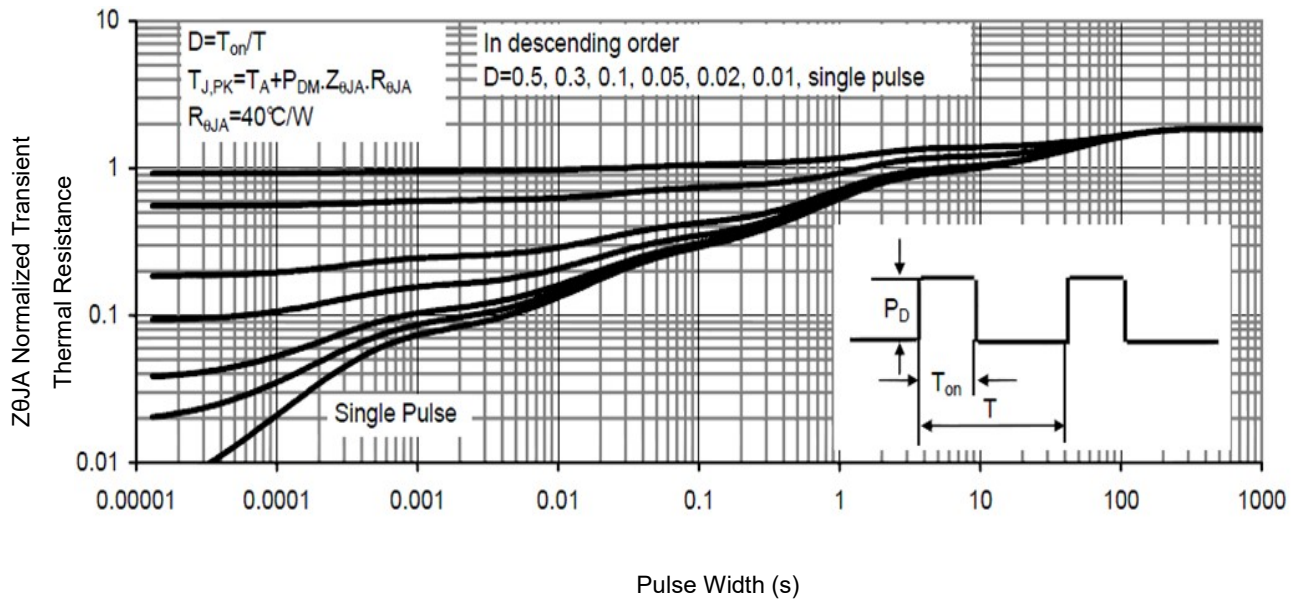


Fig9. Normalized Maximum Transient Thermal Impedance

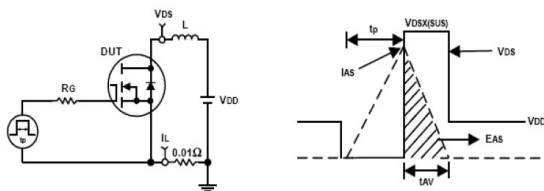


Fig10. Unclamped Inductive Test Circuit and waveforms

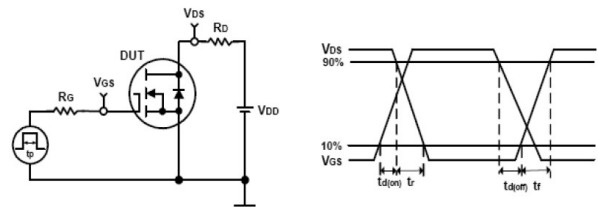


Fig11. Switching Time Test Circuit and waveforms