

## 25V Complementary Enhancement-Mode MOSFET

### General Description

- Low gate charge.
- Use as a load switch.
- Use in PWM applications

### Product Summary

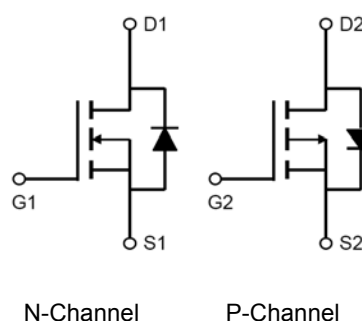
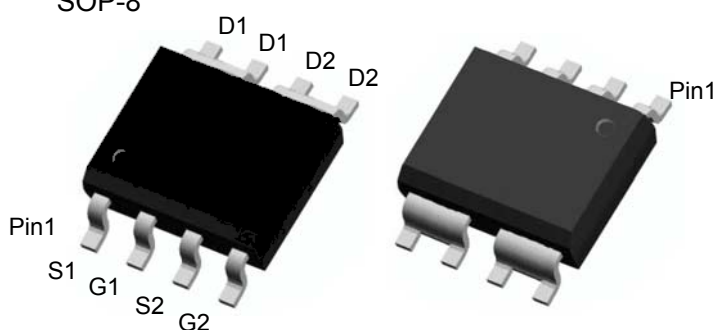
#### N-Channel

- $BV_{DSS} = 25V$
- $R_{DS(on)} (@V_{GS} = 10V) < 35m\Omega$
- $R_{DS(on)} (@V_{GS} = 4.5V) < 38m\Omega$

#### P-Channel

- $BV_{DSS} = -25V$
- $R_{DS(on)} (@V_{GS} = -10V) < 60m\Omega$
- $R_{DS(on)} (@V_{GS} = -4.5V) < 78m\Omega$

SOP-8



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

| Parameter                                             | Symbol         | Maximum    |            | Units      |
|-------------------------------------------------------|----------------|------------|------------|------------|
|                                                       |                | N-Channel  | P-Channel  |            |
| Drain-Source Voltage                                  | $V_{DS}$       | 25         | -25        | V          |
| Gate-Source Voltage                                   | $V_{GS}$       | $\pm 12$   | $\pm 12$   | V          |
| Drain Current ( $T_A=25^\circ C, t<10s, V_{GS}=10V$ ) | $I_D$          | 4.0        | -3.5       | A          |
| Drain Current ( $T_A=75^\circ C, t<10s, V_{GS}=10V$ ) |                | 2.5        | -1.8       | A          |
| Pulsed Drain Current <sup>a</sup>                     | $I_{DM}$       | 20         | -20        | A          |
| Power Dissipation <sup>b</sup> ( $T_A=25^\circ C$ )   | $P_D$          | 1.4        | 1.4        | W          |
| Power Dissipation <sup>b</sup> ( $T_A=75^\circ C$ )   |                | 1.0        | 0.9        | W          |
| Junction and Storage Temperature Range                | $T_J, T_{STG}$ | -55 ~ +150 | -55 ~ +150 | $^\circ C$ |

### Thermal Characteristics

| Parameter                                         | Symbol          | Maximum   |           | Units        |
|---------------------------------------------------|-----------------|-----------|-----------|--------------|
|                                                   |                 | N-Channel | P-Channel |              |
| Junction-to-Ambient <sup>a</sup> ( $t \leq 10s$ ) | $R_{\theta JA}$ | 100       | 100       | $^\circ C/W$ |
| Junction-to-Ambient <sup>a,d</sup> (Steady-State) |                 | 130       | 130       | $^\circ C/W$ |
| Junction-to-Lead (Steady-State)                   | $R_{\theta JL}$ | 90        | 90        | $^\circ C/W$ |

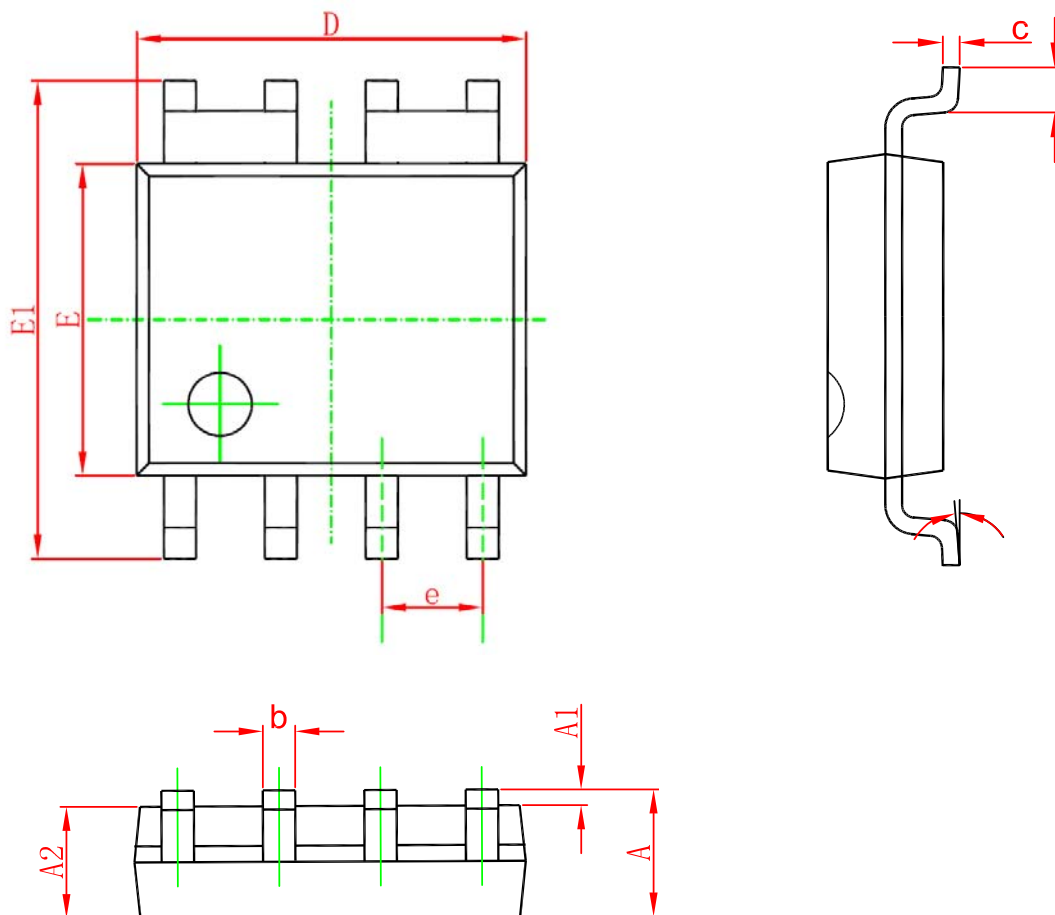
| N-Channel Electrical Characteristics (T <sub>A</sub> = 25°C unless otherwise noted) |                                       |                                                                                      |     |     |      |       |
|-------------------------------------------------------------------------------------|---------------------------------------|--------------------------------------------------------------------------------------|-----|-----|------|-------|
| 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> = 250uA                                        | 25  |     |      | V     |
| I <sub>DSS</sub>                                                                    | Zero Gate Voltage Drain Current       | V <sub>DS</sub> = 25V , V <sub>GS</sub> = 0V                                         |     |     | 1    | uA    |
| I <sub>GSS</sub>                                                                    | Gate-Body Leakage Current             | V <sub>GS</sub> = ±12V, V <sub>DS</sub> = 0V                                         |     |     | ±100 | nA    |
| On Characteristics                                                                  |                                       |                                                                                      |     |     |      |       |
| V <sub>GS(th)</sub>                                                                 | Gate Threshold Voltage                | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250uA                           | 0.6 |     | 1.2  | V     |
| R <sub>DS(ON)</sub>                                                                 | Drain-Source On-State Resistance      | V <sub>GS</sub> = 10V , I <sub>D</sub> = 4.0A                                        |     | 26  | 35   | mΩ    |
|                                                                                     |                                       | V <sub>GS</sub> = 4.5V , I <sub>D</sub> = 3.5A                                       |     | 32  | 38   | mΩ    |
| g <sub>FS</sub>                                                                     | Forward Transconductance              | V <sub>DS</sub> = 5V , I <sub>D</sub> = 4.5A                                         |     | 20  |      | S     |
| Drain-Source Diode Characteristics                                                  |                                       |                                                                                      |     |     |      |       |
| V <sub>SD</sub>                                                                     | Diode Forward Voltage                 | V <sub>GS</sub> = 0V , I <sub>S</sub> = 1.0A                                         |     |     | 1.2  | V     |
| I <sub>S</sub>                                                                      | Maximum Body-Diode Continuous Current |                                                                                      |     |     | 2.0  | A     |
| Dynamic Characteristics                                                             |                                       |                                                                                      |     |     |      |       |
| C <sub>iss</sub>                                                                    | Input Capacitance                     | V <sub>DS</sub> = 15V , V <sub>GS</sub> = 0V<br>f = 1.0MHz                           |     | 760 |      | pF    |
| C <sub>oss</sub>                                                                    | Output Capacitance                    |                                                                                      |     | 83  |      | pF    |
| C <sub>rss</sub>                                                                    | Reverse Transfer Capacitance          |                                                                                      |     | 64  |      | pF    |
| Switching Characteristics                                                           |                                       |                                                                                      |     |     |      |       |
| Q <sub>g</sub>                                                                      | Total Gate Charge                     | V <sub>DS</sub> = 15V , I <sub>D</sub> = 5.8A<br>V <sub>GS</sub> = 6V                |     | 8.5 |      | nC    |
| Q <sub>gs</sub>                                                                     | Gate-Source Charge                    |                                                                                      |     | 2.1 |      | nC    |
| Q <sub>gd</sub>                                                                     | Gate-Drain Charge                     |                                                                                      |     | 2.6 |      | nC    |
| t <sub>D(ON)</sub>                                                                  | Turn-On Delay Time                    | V <sub>DD</sub> = 15V , ID = 1A<br>V <sub>GS</sub> = 6 V<br>R <sub>GEN</sub> = 6 ohm |     | 4   |      | ns    |
| t <sub>r</sub>                                                                      | Turn-On Rise Time                     |                                                                                      |     | 3.2 |      | ns    |
| t <sub>D(OFF)</sub>                                                                 | Turn-Off Delay Time                   |                                                                                      |     | 28  |      | ns    |
| t <sub>f</sub>                                                                      | Turn-Off Fall Time                    |                                                                                      |     | 6   |      | ns    |

- Repetitive rating, Pulse width limited by junction temperature T<sub>J(MAX)</sub>=150 °C. Ratings are based on low frequency and duty cycles to keep initial T<sub>J</sub>=25 °C
- The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=150 °C , using ≤10s junction-to-ambient thermal resistance.
- The value of R<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub> = 25°C. The value in any given application depends on the user's specific board design.
- The R<sub>θJA</sub> is the sum of the thermal impedance from junction to lead R<sub>θJL</sub> and lead to ambient.

| P-Channel Electrical Characteristics (T <sub>A</sub> = 25°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> = -250uA                                          | -25  |      |      | V     |
| I <sub>DSS</sub>                                                                    | Zero Gate Voltage Drain Current       | V <sub>DS</sub> = -25V , V <sub>GS</sub> = 0V                                           |      |      | -1   | uA    |
| I <sub>GSS</sub>                                                                    | Gate-Body Leakage Current             | V <sub>GS</sub> = ±12V, V <sub>DS</sub> = 0V                                            |      |      | ±100 | nA    |
| On Characteristics                                                                  |                                       |                                                                                         |      |      |      |       |
| V <sub>GS(th)</sub>                                                                 | Gate Threshold Voltage                | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250uA                             | -0.5 |      | -1.2 | V     |
| R <sub>DS(ON)</sub>                                                                 | Drain-Source On-State Resistance      | V <sub>GS</sub> = -10V , I <sub>D</sub> = -3.0A                                         |      | 55   | 60   | mΩ    |
|                                                                                     |                                       | V <sub>GS</sub> = -4.5V , I <sub>D</sub> = -2.5A                                        |      | 65   | 78   | mΩ    |
| g <sub>FS</sub>                                                                     | Forward Transconductance              | V <sub>DS</sub> = -10V , I <sub>D</sub> = -4.0A                                         |      | 15   |      | S     |
| Drain-Source Diode Characteristics                                                  |                                       |                                                                                         |      |      |      |       |
| V <sub>SD</sub>                                                                     | Diode Forward Voltage                 | V <sub>GS</sub> = 0V , I <sub>S</sub> = -1.0A                                           |      |      | -1.2 | V     |
| I <sub>S</sub>                                                                      | Maximum Body-Diode Continuous Current |                                                                                         |      |      | -2.0 | A     |
| Dynamic Characteristics                                                             |                                       |                                                                                         |      |      |      |       |
| C <sub>iss</sub>                                                                    | Input Capacitance                     | V <sub>DS</sub> = -15V , V <sub>GS</sub> = 0V<br>f = 1.0MHz                             |      | 1020 |      | pF    |
| C <sub>oss</sub>                                                                    | Output Capacitance                    |                                                                                         |      | 125  |      | pF    |
| C <sub>rss</sub>                                                                    | Reverse Transfer Capacitance          |                                                                                         |      | 85   |      | pF    |
| Switching Characteristics                                                           |                                       |                                                                                         |      |      |      |       |
| Q <sub>g</sub>                                                                      | Total Gate Charge                     | V <sub>DS</sub> = -15V , I <sub>D</sub> = -5.2A<br>V <sub>GS</sub> = -6V                |      | 10.5 |      | nC    |
| Q <sub>gs</sub>                                                                     | Gate-Source Charge                    |                                                                                         |      | 3.5  |      | nC    |
| Q <sub>gd</sub>                                                                     | Gate-Drain Charge                     |                                                                                         |      | 4.0  |      | nC    |
| t <sub>D(ON)</sub>                                                                  | Turn-On Delay Time                    | V <sub>DD</sub> = -15V , ID = -1A<br>V <sub>GS</sub> = -6 V<br>R <sub>GEN</sub> = 6 ohm |      | 7.5  |      | ns    |
| t <sub>r</sub>                                                                      | Turn-On Rise Time                     |                                                                                         |      | 4.5  |      | ns    |
| t <sub>D(OFF)</sub>                                                                 | Turn-Off Delay Time                   |                                                                                         |      | 45.5 |      | ns    |
| t <sub>f</sub>                                                                      | Turn-Off Fall Time                    |                                                                                         |      | 15   |      | ns    |

- Repetitive rating, Pulse width limited by junction temperature  $T_{J(MAX)}=150^\circ\text{C}$ . Ratings are based on low frequency and duty cycles to keep initial  $T_J=25^\circ\text{C}$
- The power dissipation  $P_D$  is based on  $T_{J(MAX)}=150^\circ\text{C}$ , using  $\leq 10s$  junction-to-ambient thermal resistance.
- The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A = 25^\circ\text{C}$ . The value in any given application depends on the user's specific board design.
- The  $R_{\theta JA}$  is the sum of the thermal impedance from junction to lead  $R_{\theta JL}$  and lead to ambient.

## SOP-8 Package Outline



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| A      | 1.350                     | 1.750 | 0.053                | 0.069 |
| A1     | 0.100                     | 0.250 | 0.004                | 0.010 |
| A2     | 1.350                     | 1.550 | 0.053                | 0.061 |
| b      | 0.330                     | 0.510 | 0.013                | 0.020 |
| c      | 0.170                     | 0.250 | 0.006                | 0.010 |
| D      | 4.700                     | 5.100 | 0.185                | 0.200 |
| E      | 3.800                     | 4.000 | 0.150                | 0.157 |
| E1     | 5.800                     | 6.200 | 0.228                | 0.244 |
| e      | 1.270(BSC)                |       | 0.050(BSC)           |       |
| L      | 0.400                     | 1.270 | 0.016                | 0.050 |
| θ      | 0°                        | 8°    | 0°                   | 8°    |