



## Description

The SUD50N06-09L-E3 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.



TO-252-2L

## General Features

$V_{DS} = 60V$   $I_D = 80A$

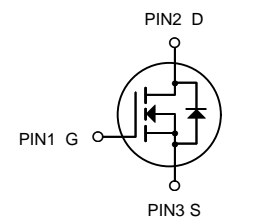
$R_{DS(ON)} < 8.3 m\Omega @ V_{GS}=10V$

## Application

Battery protection

Load switch

Uninterruptible power supply



N-Channel MOSFET

## Package Marking and Ordering Information

| Product ID      | Pack      | Brand      | Qty(PCS) |
|-----------------|-----------|------------|----------|
| SUD50N06-09L-E3 | TO-252-2L | HXY MOSFET | 2500     |

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

| Symbol                        | Parameter  | Rating     | Units              |
|-------------------------------|--|------------|--------------------|
| $V_{DS}$                      | Drain-Source Voltage                             | 60         | V                  |
| $V_{GS}$                      | Gate-Source Voltage                              | $\pm 20$   | V                  |
| $I_D @ T_C=25^\circ\text{C}$  | Continuous Drain Current, $V_{GS} @ 10V^1$       | 80         | A                  |
| $I_D @ T_C=100^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10V^1$       | 40         | A                  |
| $I_{DM}$                      | Pulsed Drain Current <sup>2</sup>                | 255        | A                  |
| $I_{AS}$                      | Avalanche Current                                | 23         | A                  |
| $P_D @ T_C=25^\circ\text{C}$  | Total Power Dissipation <sup>4</sup>             | 100        | W                  |
| $T_{STG}$                     | Storage Temperature Range                        | -55 to 150 | $^\circ\text{C}$   |
| $T_J$                         | Operating Junction Temperature Range             | -55 to 150 | $^\circ\text{C}$   |
| $R_{\theta JA}$               | Thermal Resistance Junction-Ambient <sup>1</sup> | 62.5       | $^\circ\text{C/W}$ |



**Electrical Characteristics@T<sub>j</sub>=25°C(unless otherwise specified)**

| Symbol              | Parameter  | Test Conditions  | Min. | Typ. | Max. | Units |
|---------------------|--|--|------|------|------|-------|
| BV <sub>DSS</sub>   | Drain-Source Breakdown Voltage                       | V <sub>GS</sub> =0V, I <sub>D</sub> =250uA                 | 60   | -    | -    | V     |
| R <sub>DS(ON)</sub> | Static Drain-Source On-Resistance <sup>2</sup>       | V <sub>GS</sub> =10V, I <sub>D</sub> =45A                  | -    | 6    | 8.3  | mΩ    |
|                     |  | V <sub>GS</sub> =6V, I <sub>D</sub> =30A                   | -    | 13   | 17   | mΩ    |
| V <sub>GS(th)</sub> | Gate Threshold Voltage                               | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA   | 1    | 1.4  | 3    | V     |
| g <sub>fs</sub>     | Forward Transconductance                             | V <sub>DS</sub> =10V, I <sub>D</sub> =30A                  | -    | 71   | -    | S     |
| I <sub>DSS</sub>    | Drain-Source Leakage Current                         | V <sub>DS</sub> =60V, V <sub>GS</sub> =0V                  | -    | -    | 10   | uA    |
|                     | Drain-Source Leakage Current (T <sub>j</sub> =125°C) | V <sub>DS</sub> =48V, V <sub>GS</sub> =0V                  | -    | -    | 250  | uA    |
| I <sub>GSS</sub>    | Gate-Source Leakage                                  | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                 | -    | -    | ±100 | nA    |
| Q <sub>g</sub>      | Total Gate Charge                                    | I <sub>D</sub> =30A  | -    | 33   | 45   | nC    |
| Q <sub>gs</sub>     | Gate-Source Charge                                   | V <sub>DS</sub> =48V                                       | -    | 5    | -    | nC    |
| Q <sub>gd</sub>     | Gate-Drain ("Miller") Charge                         | V <sub>GS</sub> =4.5V                                      | -    | 21   | -    | nC    |
| t <sub>d(on)</sub>  | Turn-on Delay Time                                   | V <sub>DS</sub> =30V                                       | -    | 10   | -    | ns    |
| t <sub>r</sub>      | Rise Time  | I <sub>D</sub> =30A  | -    | 43   | -    | ns    |
| t <sub>d(off)</sub> | Turn-off Delay Time                                  | R <sub>G</sub> =3.3Ω                                       | -    | 47   | -    | ns    |
| t <sub>f</sub>      | Fall Time  | V <sub>GS</sub> =10V                                       | -    | 80   | -    | ns    |
| C <sub>iss</sub>    | Input Capacitance                                    |  | -    | 2680 | 3300 | pF    |
| C <sub>oss</sub>    | Output Capacitance                                   | V <sub>GS</sub> =0V  | -    | 260  | -    | pF    |
| C <sub>rss</sub>    | Reverse Transfer Capacitance                         | V <sub>DS</sub> =25V<br>f=1.0MHz                           | -    | 180  | -    | pF    |
| V <sub>SD</sub>     | Forward On Voltage <sup>2</sup>                      | I <sub>S</sub> =45A, V <sub>GS</sub> =0V                   | -    | -    | 1.3  | V     |
| t <sub>rr</sub>     | Reverse Recovery Time                                | I <sub>S</sub> =10A, V <sub>GS</sub> =0V,<br>dI/dt=100A/μs | -    | 30   | -    | ns    |
| Q <sub>rr</sub>     | Reverse Recovery Charge                              |  | -    | 18   | -    | nC    |



## Typical Performance Characteristics

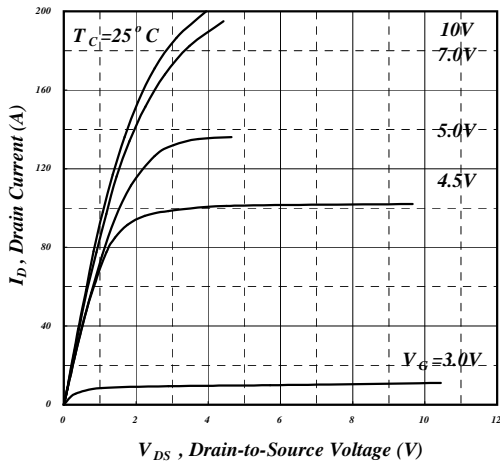


Fig 1. Typical Output Characteristics

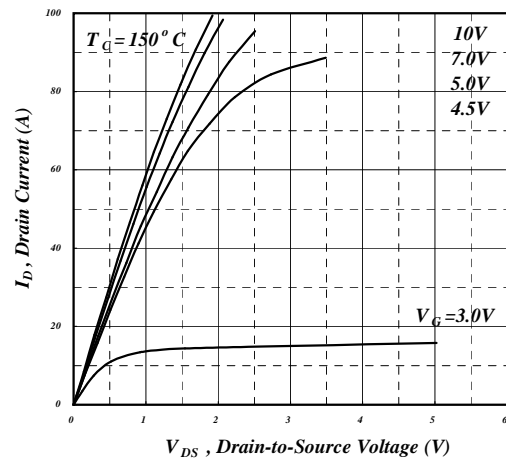


Fig 2. Typical Output Characteristics

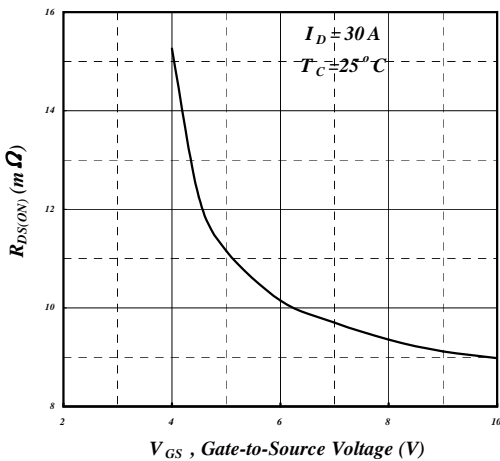


Fig 3. On-Resistance v.s. Gate Voltage

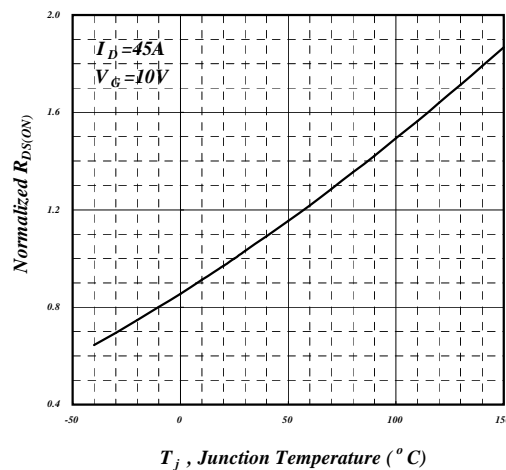


Fig 4. Normalized On-Resistance v.s. Junction Temperature

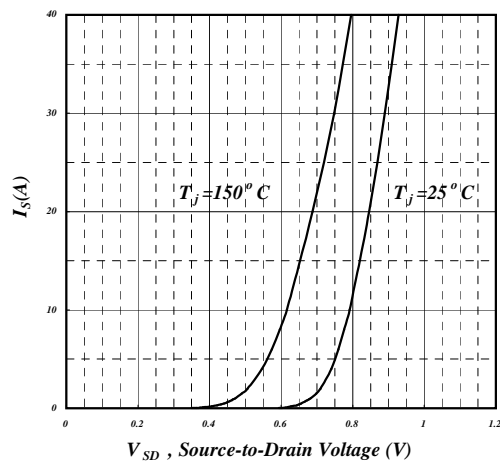


Fig 5. Forward Characteristic of Reverse Diode

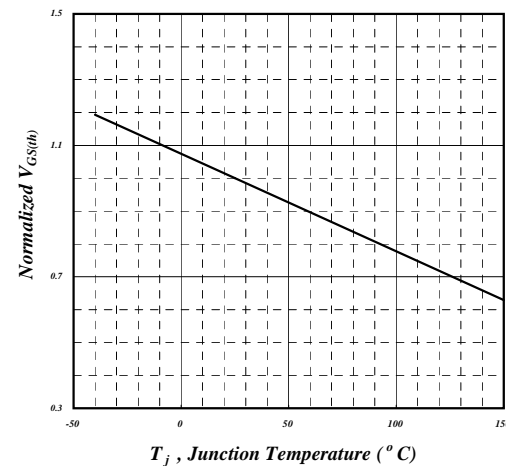


Fig 6. Gate Threshold Voltage v.s. Junction Temperature

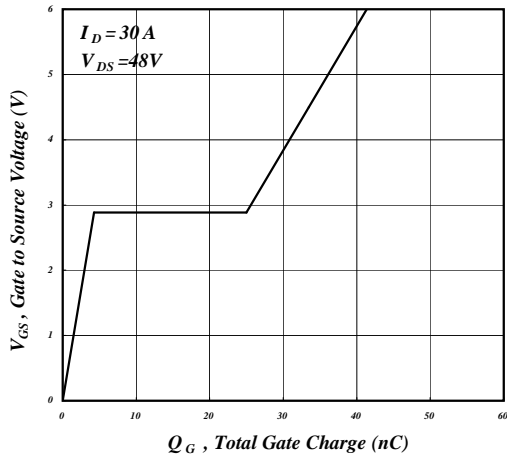


Fig 7. Gate Charge Characteristics

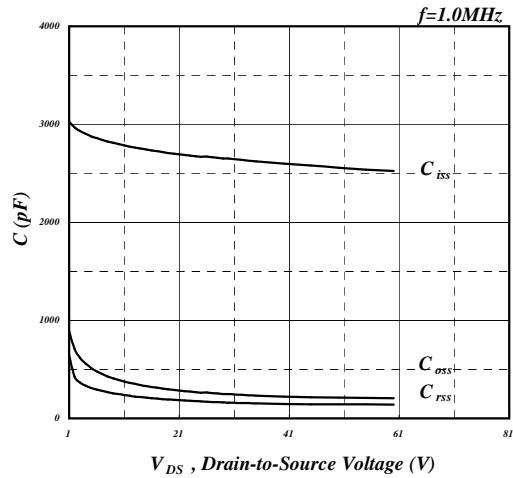


Fig 8. Typical Capacitance Characteristics

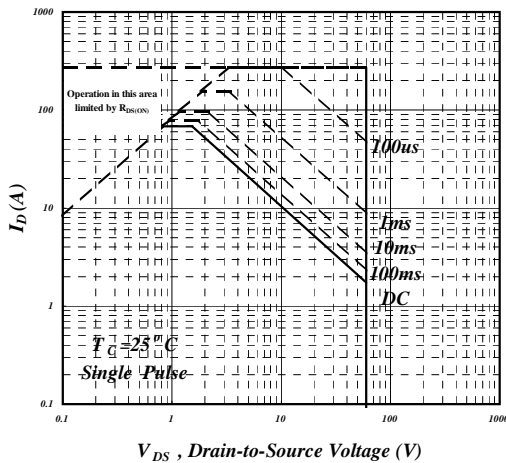


Fig 9. Maximum Safe Operating Area

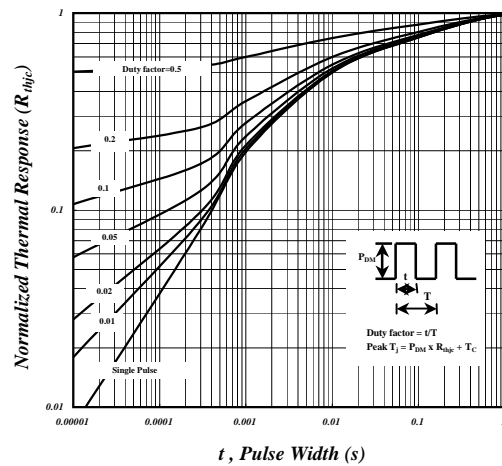


Fig 10. Effective Transient Thermal Impedance

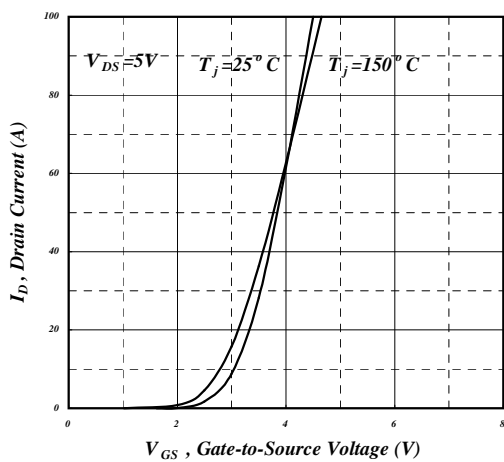


Fig 11. Transfer Characteristics

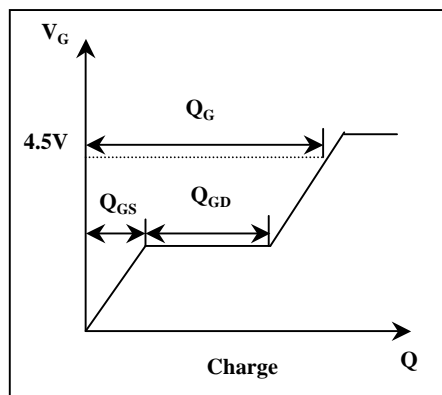
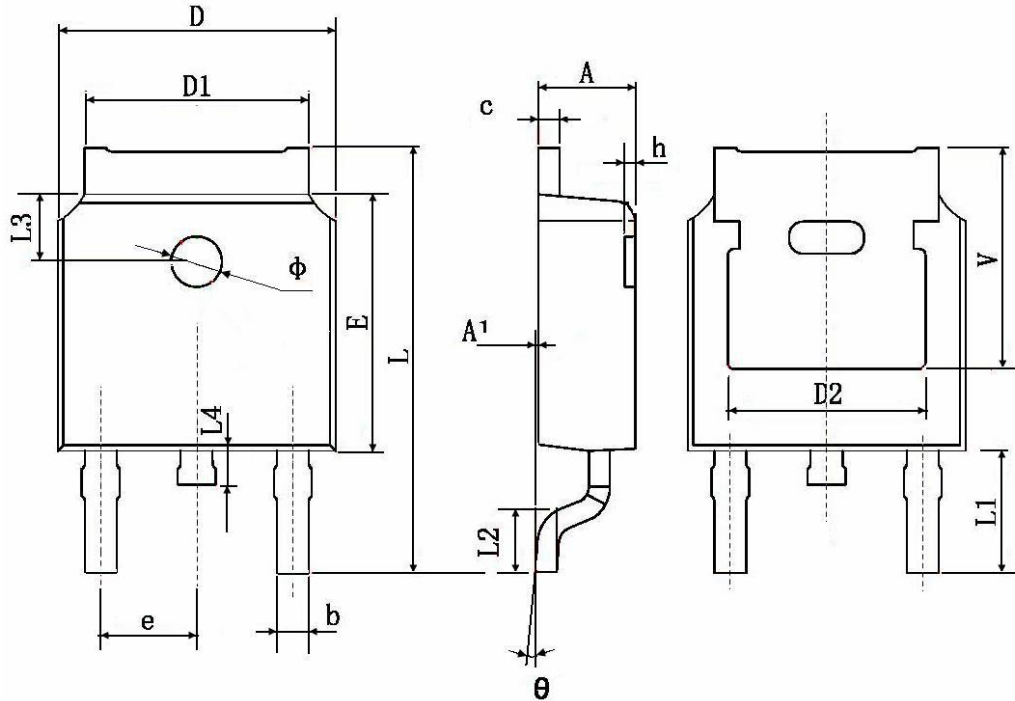


Fig 12. Gate Charge Waveform



### TO-252-2L Package Information



| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min.                      | Max.   | Min.                 | Max.  |
| A      | 2.200                     | 2.400  | 0.087                | 0.094 |
| A1     | 0.000                     | 0.127  | 0.000                | 0.005 |
| b      | 0.660                     | 0.860  | 0.026                | 0.034 |
| c      | 0.460                     | 0.580  | 0.018                | 0.023 |
| D      | 6.500                     | 6.700  | 0.256                | 0.264 |
| D1     | 5.100                     | 5.460  | 0.201                | 0.215 |
| D2     | 0.483 TYP.                |        | 0.190 TYP.           |       |
| E      | 6.000                     | 6.200  | 0.236                | 0.244 |
| e      | 2.186                     | 2.386  | 0.086                | 0.094 |
| L      | 9.800                     | 10.400 | 0.386                | 0.409 |
| L1     | 2.900 TYP.                |        | 0.114 TYP.           |       |
| L2     | 1.400                     | 1.700  | 0.055                | 0.067 |
| L3     | 1.600 TYP.                |        | 0.063 TYP.           |       |
| L4     | 0.600                     | 1.000  | 0.024                | 0.039 |
| phi    | 1.100                     | 1.300  | 0.043                | 0.051 |
| theta  | 0°                        | 8°     | 0°                   | 8°    |
| h      | 0.000                     | 0.300  | 0.000                | 0.012 |
| V      | 5.350 TYP.                |        | 0.211 TYP.           |       |



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