



## Description

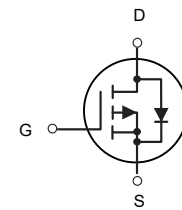
The SUD45P03-09-GE3 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.



## General Features

$V_{DS} = -30V$   $I_D = -70A$

$R_{DS(ON)} < 11m\Omega$  @  $V_{GS} = -10V$



P-Channel MOSFET

## Application

Battery protection

Load switch

Uninterruptible power supply

## Package Marking and Ordering Information

| Product ID      | Pack                      | Brand      | Qty(PCS) |
|-----------------|---------------------------|------------|----------|
| SUD45P03-09-GE3 | TO-252-2L(TO-252-2(DPAK)) | HXY MOSFET | 2500     |

## Absolute Maximum Ratings (TC=25°C unless otherwise specified)

| Symbol                | Parameter                                                         | Rating     | Units |
|-----------------------|-------------------------------------------------------------------|------------|-------|
| $V_{DS}$              | Drain-Source Voltage                                              | -30        | V     |
| $V_{GS}$              | Gate-Source Voltage                                               | $\pm 20$   | V     |
| $I_D@T_C=25^\circ C$  | Continuous Drain Current, $V_{GS}$ @ -10V <sup>1,6</sup>          | -70        | A     |
| $I_D@T_C=100^\circ C$ | Continuous Drain Current, $V_{GS}$ @ -10V <sup>1,6</sup>          | -50        | A     |
| $I_{DM}$              | Pulsed Drain Current <sup>2</sup>                                 | -200       | A     |
| EAS                   | Single Pulse Avalanche Energy <sup>3</sup>                        | 80         | mJ    |
| $I_{AS}$              | Avalanche Current                                                 | -40        | A     |
| $P_D@T_C=25^\circ C$  | Total Power Dissipation <sup>4</sup>                              | 90         | W     |
| $T_{STG}$             | Storage Temperature Range                                         | -55 to 175 | °C    |
| $T_J$                 | Operating Junction Temperature Range                              | -55 to 175 | °C    |
| $R_{\theta JA}$       | Thermal Resistance Junction-ambient <sup>1</sup> ( $t \leq 10S$ ) | 20         | °C/W  |
|                       | Thermal Resistance Junction-ambient <sup>1</sup> (Steady State)   | 50         | °C/W  |
| $R_{\theta JC}$       | Thermal Resistance Junction-case <sup>1</sup>                     | 1.6        | °C/W  |



Electrical Characteristics ( $T_J=25\text{ }^{\circ}\text{C}$ , unless otherwise noted)

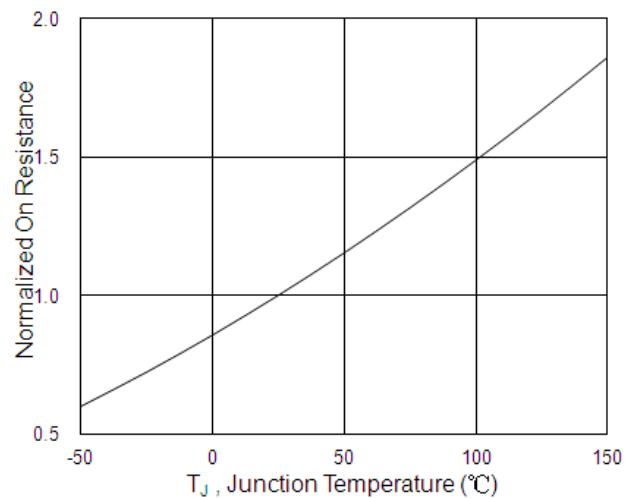
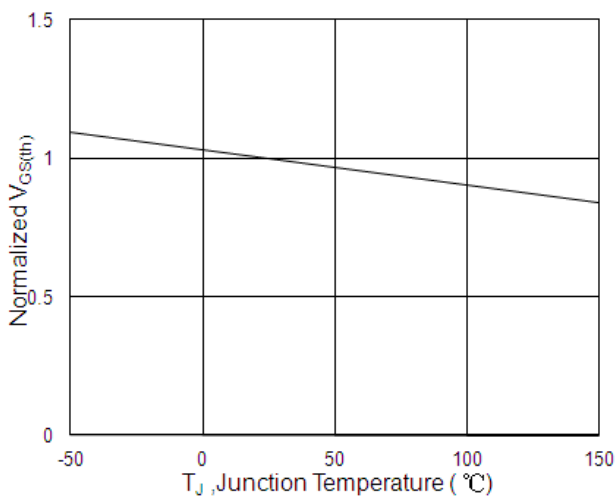
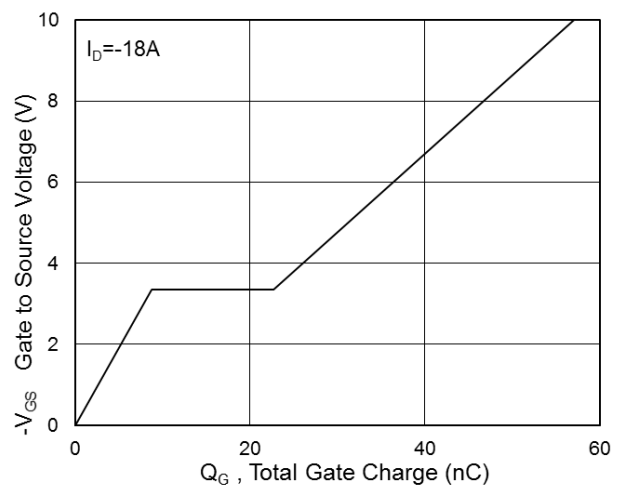
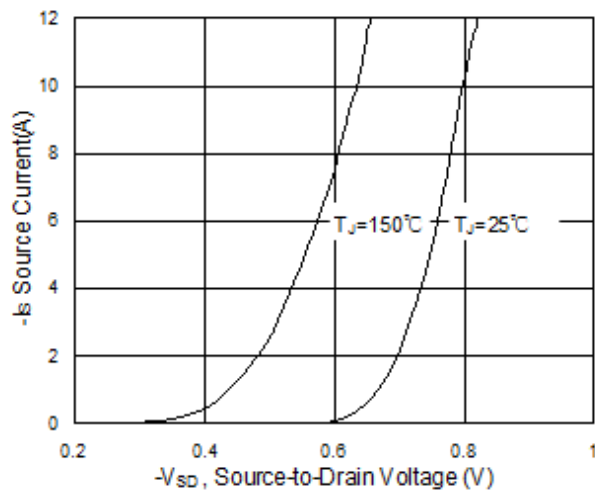
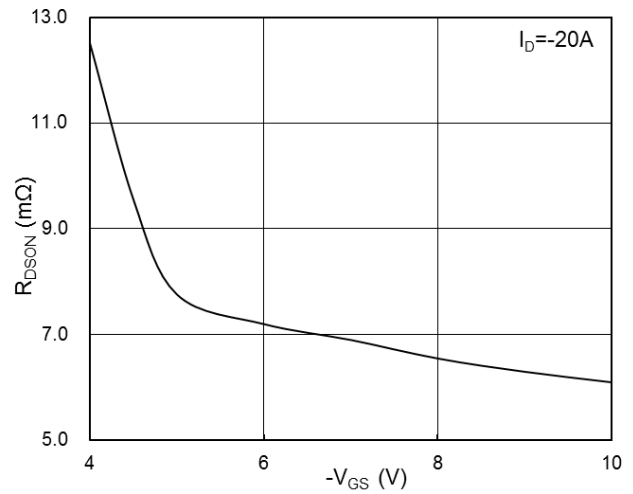
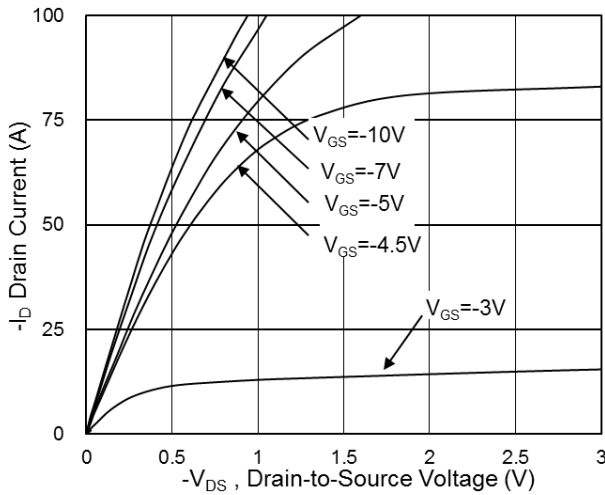
| Symbol       | Parameter                                      | Conditions                                                        | Min. | Typ. | Max.      | Unit       |
|--------------|------------------------------------------------|-------------------------------------------------------------------|------|------|-----------|------------|
| $BV_{DSS}$   | Drain-Source Breakdown Voltage                 | $V_{GS}=0V$ , $I_D=-250\mu A$                                     | -30  | ---  | ---       | V          |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=-10V$ , $I_D=-20A$                                        | ---  | 8    | 11        | m $\Omega$ |
|              |                                                | $V_{GS}=-4.5V$ , $I_D=-15A$                                       | ---  | 12   | 19        | m $\Omega$ |
| $V_{GS(th)}$ | Gate Threshold Voltage                         | $V_{GS}=V_{DS}$ , $I_D=-250\mu A$                                 | -1.2 | ---  | -2.5      | V          |
| $I_{DSS}$    | Drain-Source Leakage Current                   | $V_{DS}=-24V$ , $V_{GS}=0V$ , $T_J=25^{\circ}\text{C}$            | ---  | ---  | -1        | uA         |
|              |                                                | $V_{DS}=-24V$ , $V_{GS}=0V$ , $T_J=55^{\circ}\text{C}$            | ---  | ---  | -5        |            |
| $I_{GSS}$    | Gate-Source Leakage Current                    | $V_{GS}=\pm 20V$ , $V_{DS}=0V$                                    | ---  | ---  | $\pm 100$ | nA         |
| $R_g$        | Gate Resistance                                | $V_{DS}=0V$ , $V_{GS}=0V$ , $f=1\text{MHz}$                       | ---  | 1.2  | ---       | $\Omega$   |
| $Q_g$        | Total Gate Charge (-10V)                       | $V_{DS}=-15V$ ,<br>$V_{GS}=-10V$<br>$I_D=-18A$                    | ---  | 60   | ---       | nC         |
| $Q_{gs}$     | Gate-Source Charge                             |                                                                   | ---  | 9    | ---       |            |
| $Q_{gd}$     | Gate-Drain Charge                              |                                                                   | ---  | 15   | ---       |            |
| $T_{d(on)}$  | Turn-On Delay Time                             | $V_{DD}=-15V$<br>$V_{GS}=-10V$<br>$R_G=3.3\Omega$ ,<br>$I_D=-20A$ | ---  | 17   | ---       | ns         |
| $T_r$        | Rise Time                                      |                                                                   | ---  | 40   | ---       |            |
| $T_{d(off)}$ | Turn-Off Delay Time                            |                                                                   | ---  | 55   | ---       |            |
| $T_f$        | Fall Time                                      |                                                                   | ---  | 13   | ---       |            |
| $C_{iss}$    | Input Capacitance                              | $V_{DS}=-25V$ , $V_{GS}=0V$ , $f=1\text{MHz}$                     | ---  | 3110 | ---       | pF         |
| $C_{oss}$    | Output Capacitance                             |                                                                   | ---  | 255  | ---       |            |
| $C_{rss}$    | Reverse Transfer Capacitance                   |                                                                   | ---  | 140  | ---       |            |
| $I_S$        | Continuous Source Current <sup>1,5</sup>       | $V_G=V_D=0V$ , Force Current                                      | ---  | ---  | -70       | A          |
| $V_{SD}$     | Diode Forward Voltage <sup>2</sup>             | $V_{GS}=0V$ , $I_S=-1A$ , $T_J=25^{\circ}\text{C}$                | ---  | ---  | -1.2      | V          |
| $t_{rr}$     | Reverse Recovery Time                          | $I_F=-20A$ , $di/dt=100A/\mu s$ ,<br>$T_J=25^{\circ}\text{C}$     | ---  | 22   | ---       | nS         |
| $Q_{rr}$     | Reverse Recovery Charge                        |                                                                   | ---  | 72   | ---       | nC         |

Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper.
- 2.The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$
- 3.The EAS data shows Max. rating . The test condition is  $V_{DD}=-50V$ ,  $V_{GS}=-10V$ ,  $L=0.1mH$ ,  $I_{AS}=-40A$
- 4.The power dissipation is limited by  $150^{\circ}\text{C}$  junction temperature
- 5.The data is theoretically the same as  $I_D$  and  $I_{DM}$  , in real applications , should be limited by total power dissipation
- 6.The maximum current rating is package limited.



## Typical Characteristics



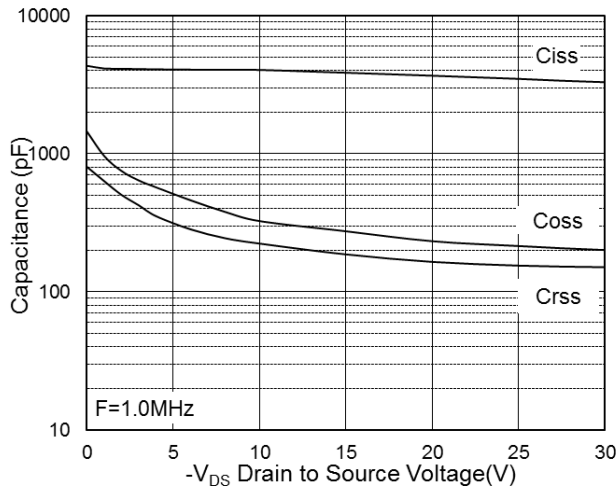


Fig.7 Capacitance

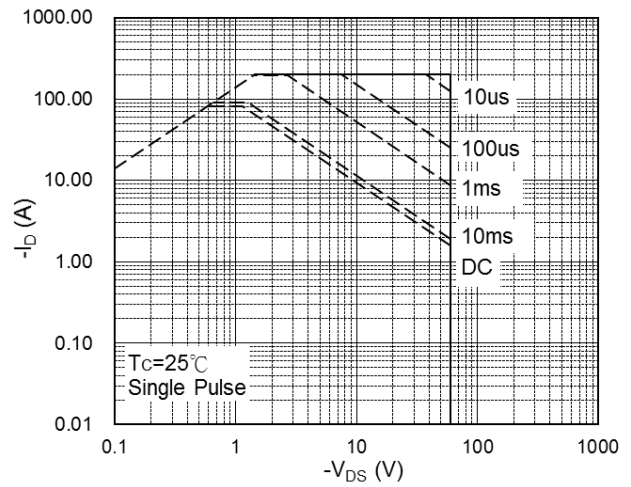


Fig.8 Safe Operating Area

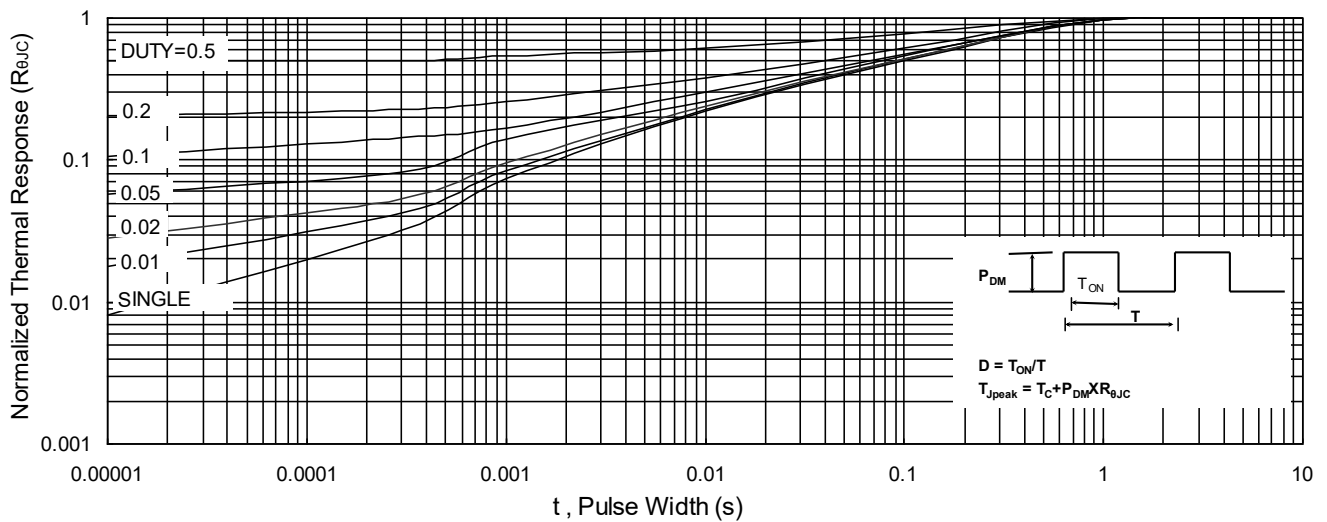


Fig.9 Normalized Maximum Transient Thermal Impedance

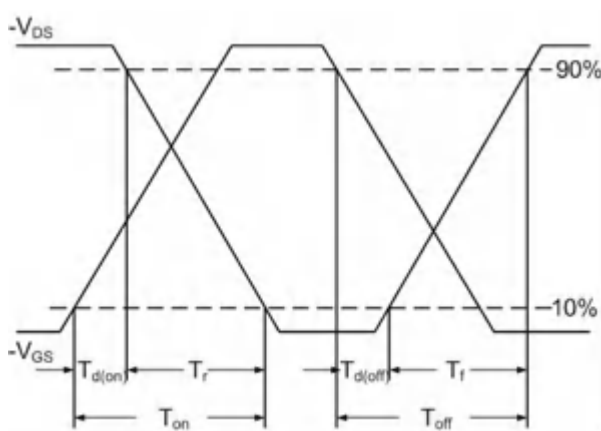


Fig.10 Switching Time Waveform

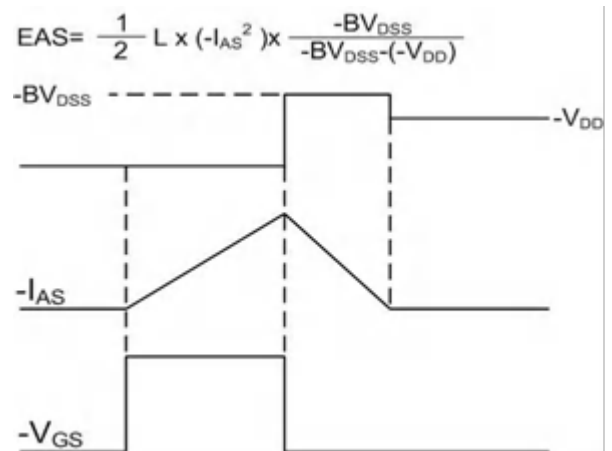
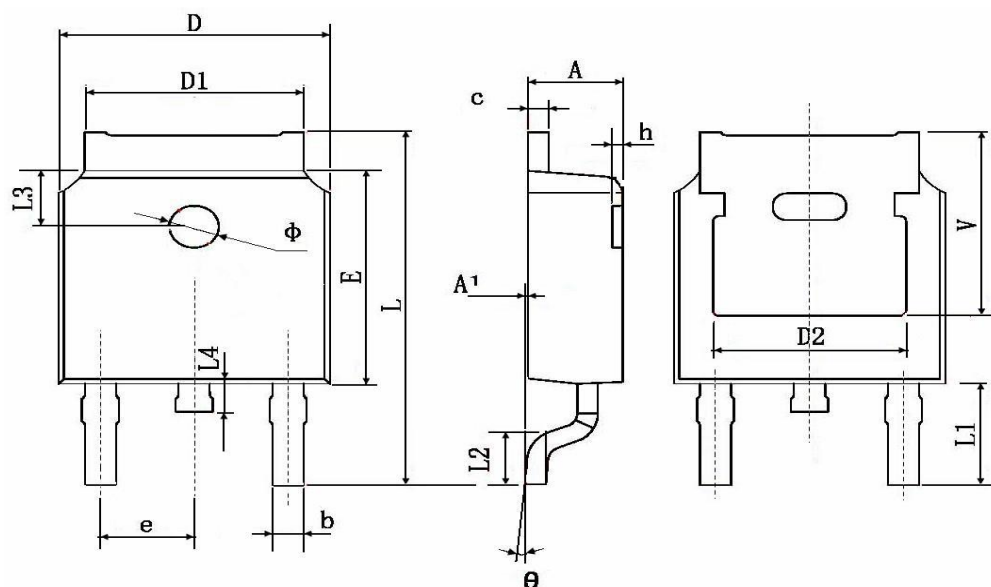


Fig.11 Unclamped Inductive Switching Waveform



## TO-252-2L(TO-252-2(DPAK)) 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     | 4.830 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 |
| Φ      | 1.100                     | 1.300  | 0.043                | 0.051 |
| θ      | 0°                        | 8°     | 0°                   | 8°    |
| h      | 0.000                     | 0.300  | 0.000                | 0.012 |
| V      | 5.350 TYP.                |        | 0.211 TYP.           |       |



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