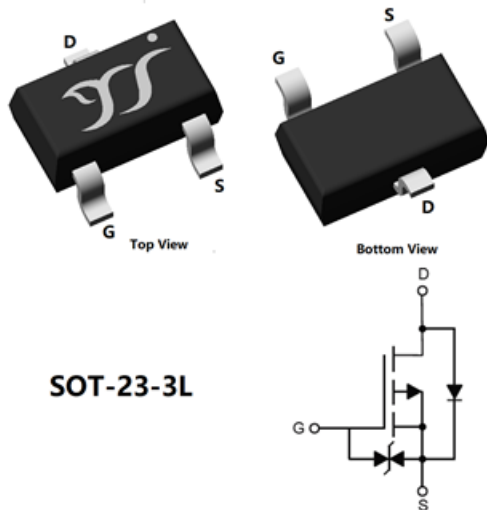




## P-Channel Enhancement Mode Field Effect Transistor



SOT-23-3L

## Product Summary

- $V_{DS}$  -60V
- $I_D$  -1.8A
- $R_{DS(ON)}$  (at  $V_{GS}=-10V$ ) <169m $\Omega$
- $R_{DS(ON)}$  (at  $V_{GS}=-4.5V$ ) <250m $\Omega$
- ESD Protected Up to 2KV (HBM)

## General Description

- Voltage controlled small signal switch
- Low input Capacitance
- Fast Switching Speed
- Moisture Sensitivity Level 1
- Epoxy Meets UL 94 V-0 Flammability Rating
- Halogen Free

## Applications

- Battery operated systems
- Solid-state relays
- Direct logic-level interface:TTL/CMOS

## ■ Limiting Values

| Parameter                              | Conditions                                |                                             | Symbol                           | Min | Max  | Unit |
|----------------------------------------|-------------------------------------------|---------------------------------------------|----------------------------------|-----|------|------|
| Drain-source Voltage                   |                                           |                                             | V <sub>DS</sub>                  | -   | -60  | V    |
| Gate-source Voltage                    |                                           |                                             | V <sub>GS</sub>                  | -20 | 20   |      |
| Continuous Drain Current (Note 1,2)    | Steady-State                              | T <sub>A</sub> =25°C,V <sub>GS</sub> =-10V  | I <sub>D</sub>                   | -   | -1.8 | A    |
|                                        |                                           | T <sub>A</sub> =100°C,V <sub>GS</sub> =-10V |                                  | -   | -1.1 |      |
| Pulsed Drain Current                   | T <sub>A</sub> =25°C,t <sub>p</sub> ≤10μs |                                             | I <sub>DM</sub>                  | -   | -15  |      |
| Maximum Body-Diode Continuous Current  | T <sub>A</sub> =25°C                      |                                             | I <sub>S</sub>                   |     | -1.2 |      |
| Total Power Dissipation (Note 1,2)     | Steady-State                              | T <sub>A</sub> =25°C                        | P <sub>D</sub>                   | -   | 1.08 | W    |
|                                        |                                           | T <sub>A</sub> =100°C                       |                                  | -   | 0.43 |      |
| Junction and Storage Temperature Range |                                           |                                             | T <sub>J</sub> ,T <sub>STG</sub> | -55 | 150  | °C   |

## ■ Thermal Resistance

| Parameter                                       |              | Symbol          | Typ | Max | Units         |
|-------------------------------------------------|--------------|-----------------|-----|-----|---------------|
| Thermal Resistance Junction-to-Ambient (Note 2) | Steady-State | $R_{\theta JA}$ | -   | 115 | $^{\circ}C/W$ |

## ■ Ordering Information (Example)

| PREFERRED P/N | PACKING CODE | Marking | MINIMUM PACKAGE(pcs) | INNER BOX QUANTITY(pcs) | OUTER CARTON QUANTITY(pcs) | DELIVERY MODE |
|---------------|--------------|---------|----------------------|-------------------------|----------------------------|---------------|
| YJL169P06ALK  | F2           | 169AL.  | 3000                 | 30000                   | 120000                     | 7" reel       |



# YJL169P06ALK

## ■ Electrical Characteristics

| Parameter                         | Symbol              | Conditions                                                                                                      | Min  | Typ   | Max  | Units |
|-----------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------|------|-------|------|-------|
| Static Parameter                  |                     |                                                                                                                 |      |       |      |       |
| Drain-Source Breakdown Voltage    | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V, I <sub>b</sub> =-250μA, T <sub>j</sub> =25°C                                               | -60  | -     | -    | V     |
| Zero Gate Voltage Drain Current   | I <sub>DSS</sub>    | V <sub>DS</sub> =-60V, V <sub>GS</sub> =0V, T <sub>j</sub> =25°C                                                | -    | -     | -1   | μA    |
|                                   |                     | V <sub>DS</sub> =-60V, V <sub>GS</sub> =0V, T <sub>j</sub> =150°C                                               | -    | -     | -100 |       |
| Gate-Source Leakage Current       | I <sub>GSS</sub>    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V, T <sub>j</sub> =25°C                                                | -    | -     | ±10  |       |
| Gate Threshold Voltage            | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA, T <sub>j</sub> =25°C                                 | -1.1 | -1.6  | -2.1 | V     |
| Static Drain-Source On-Resistance | R <sub>DS(on)</sub> | V <sub>GS</sub> =-10V, I <sub>D</sub> =-1.5A, T <sub>j</sub> =25°C                                              | -    | 130   | 169  | mΩ    |
|                                   |                     | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-0.7A, T <sub>j</sub> =25°C                                             | -    | 166   | 250  | mΩ    |
| Diode Forward Voltage             | V <sub>SD</sub>     | I <sub>S</sub> =-1.2A, V <sub>GS</sub> =0V, T <sub>j</sub> =25°C                                                | -    | -0.81 | -1.2 | V     |
| Gate Resistance                   | R <sub>G</sub>      | f=1MHz, T <sub>j</sub> =25°C                                                                                    | -    | 8     | -    | Ω     |
| Dynamic Parameters                |                     |                                                                                                                 |      |       |      |       |
| Input Capacitance                 | C <sub>iss</sub>    | V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V, f=1MHz, T <sub>j</sub> =25°C                                        | -    | 419   | -    | pF    |
| Output Capacitance                | C <sub>oss</sub>    |                                                                                                                 | -    | 31    | -    |       |
| Reverse Transfer Capacitance      | C <sub>rss</sub>    |                                                                                                                 | -    | 24    | -    |       |
| Switching Parameters              |                     |                                                                                                                 |      |       |      |       |
| Total Gate Charge                 | Q <sub>g</sub>      | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-30V, I <sub>D</sub> =-1.5A, T <sub>j</sub> =25°C                       | -    | 10.4  | -    | nC    |
| Gate-Source Charge                | Q <sub>gs</sub>     |                                                                                                                 | -    | 1.1   | -    |       |
| Gate-Drain Charge                 | Q <sub>gd</sub>     |                                                                                                                 | -    | 1.7   | -    |       |
| Reverse Recovery Charge           | Q <sub>rr</sub>     | I <sub>F</sub> =-1.5A, di/dt=100A/μs, V <sub>GS</sub> =0V, V <sub>R</sub> =-30V, T <sub>j</sub> =25°C           | -    | 19    | -    | nC    |
| Reverse Recovery Time             | t <sub>rr</sub>     |                                                                                                                 | -    | 19    | -    | ns    |
| Turn-on Delay Time                | t <sub>D(on)</sub>  | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-30V, I <sub>D</sub> =-1.5A, R <sub>GEN</sub> =3Ω, T <sub>j</sub> =25°C | -    | 6     | -    | ns    |
| Turn-on Rise Time                 | t <sub>r</sub>      |                                                                                                                 | -    | 3     | -    |       |
| Turn-off Delay Time               | t <sub>D(off)</sub> |                                                                                                                 | -    | 21    | -    |       |
| Turn-off Fall Time                | t <sub>f</sub>      |                                                                                                                 | -    | 5     | -    |       |

Note:

1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. The value of  $R_{\theta JA}$  is measured with the device mounted on the 40mm\*40mm\*1.1mm single layer FR-4 PCB board with 1 in<sup>2</sup> pad of 2oz. Copper, in the still air environment with  $T_A=25^{\circ}C$ . The maximum allowed junction temperature of  $150^{\circ}C$ . The value in any given application depends on the user's specific board design.



## ■ Typical Electrical and Thermal Characteristics Diagrams

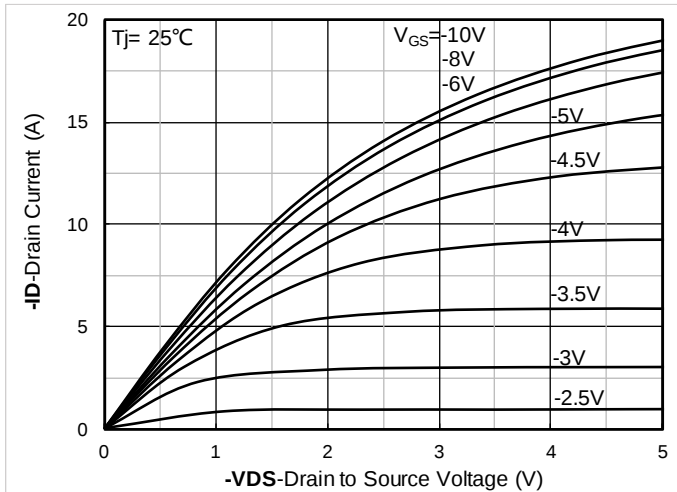


Figure 1. Output Characteristics; typical values

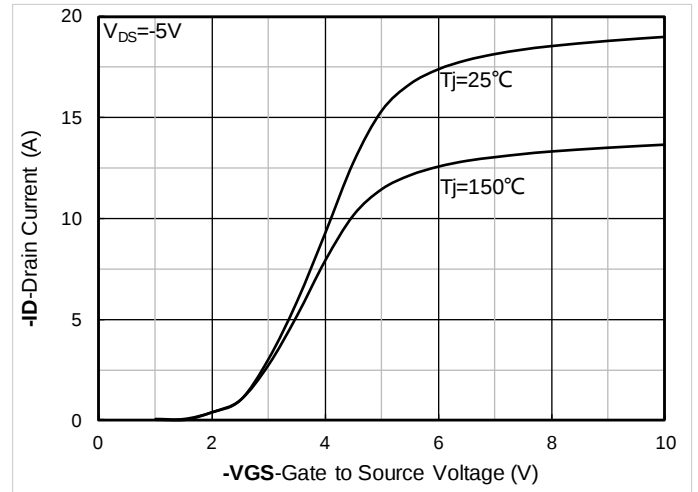


Figure 2. Transfer Characteristics; typical values

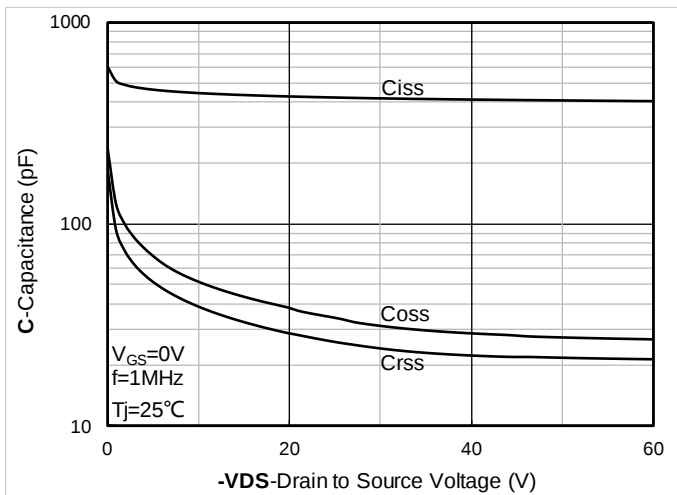


Figure 3. Capacitance Characteristics; typical values

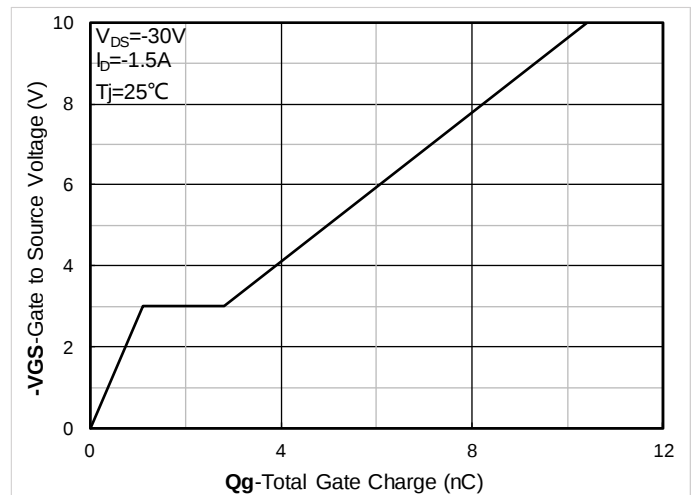


Figure 4. Gate Charge; typical values

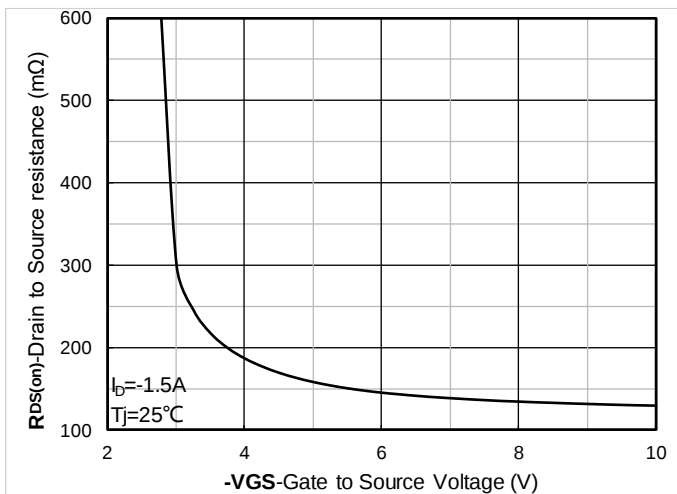


Figure 5. On-Resistance vs. Gate to Source Voltage; typical values

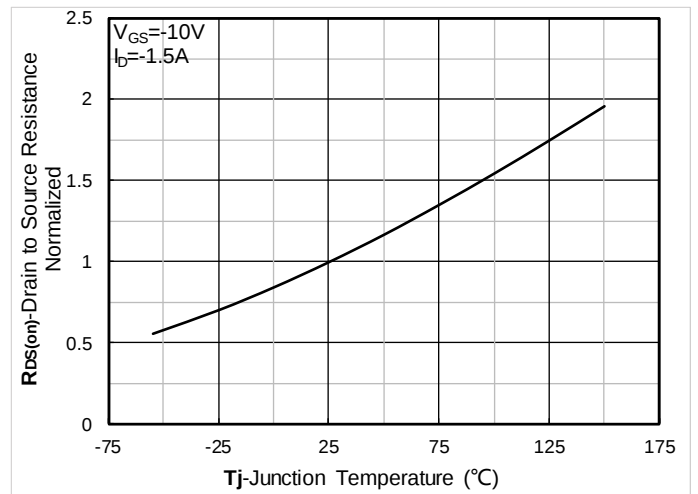


Figure 6. Normalized On-Resistance

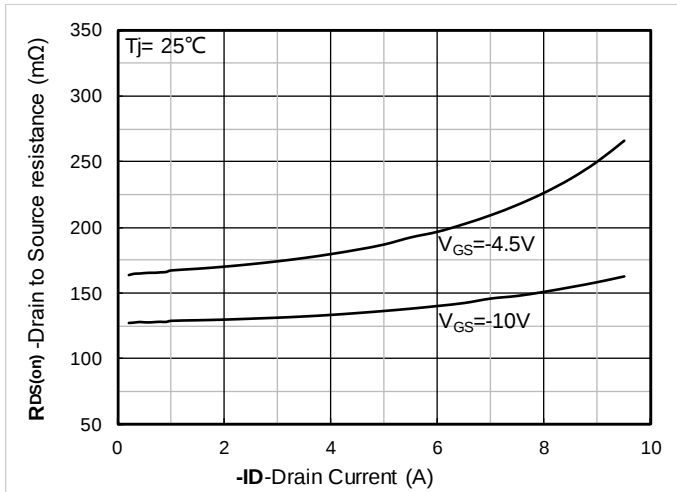


Figure 7.  $R_{DS(on)}$  vs. Drain Current; typical values

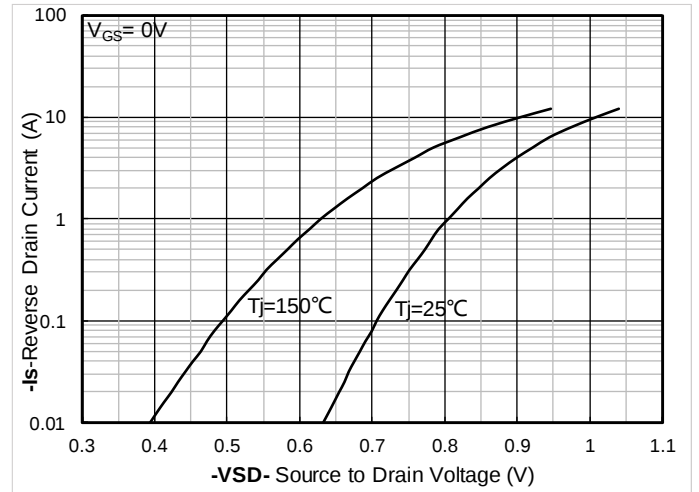


Figure 8. Forward characteristics of reverse diode; typical values

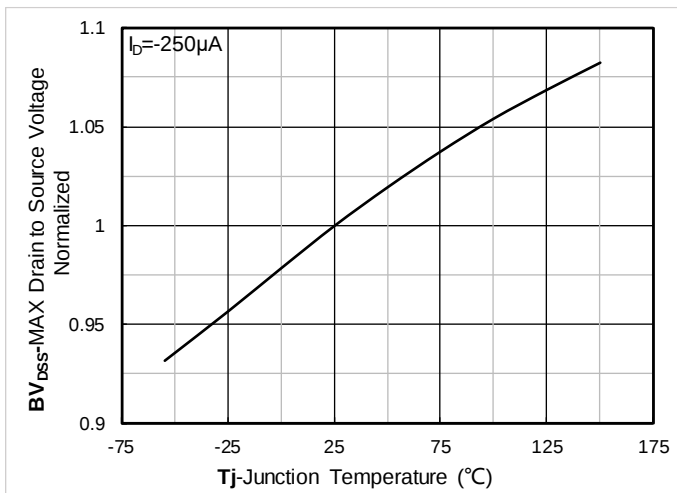


Figure 9. Normalized breakdown voltage

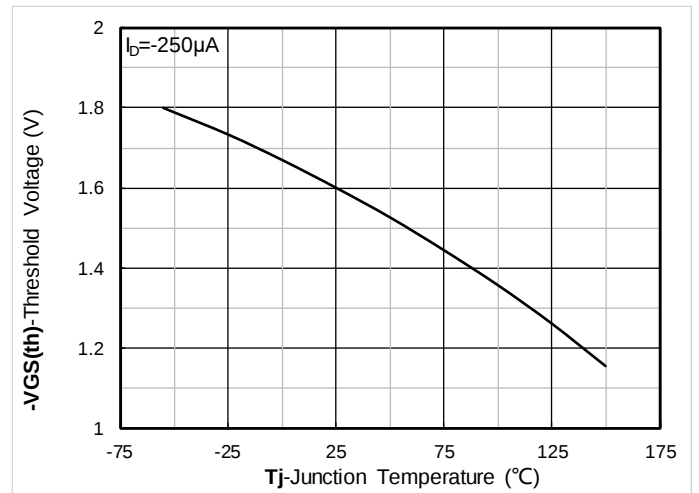


Figure 10. Gate Threshold voltage; typical values

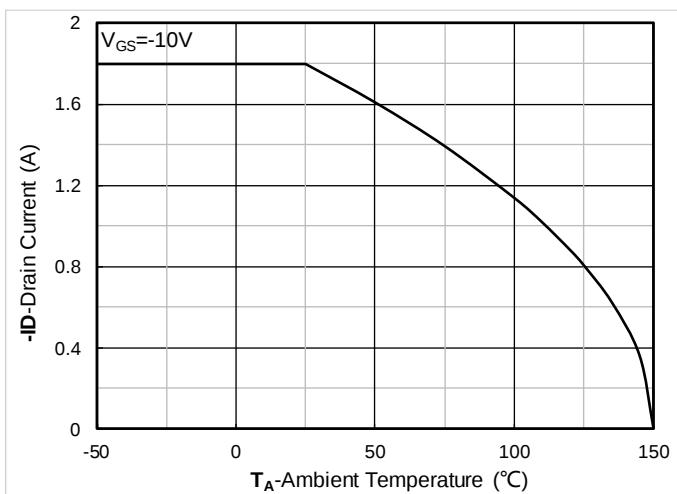


Figure 11. Current dissipation

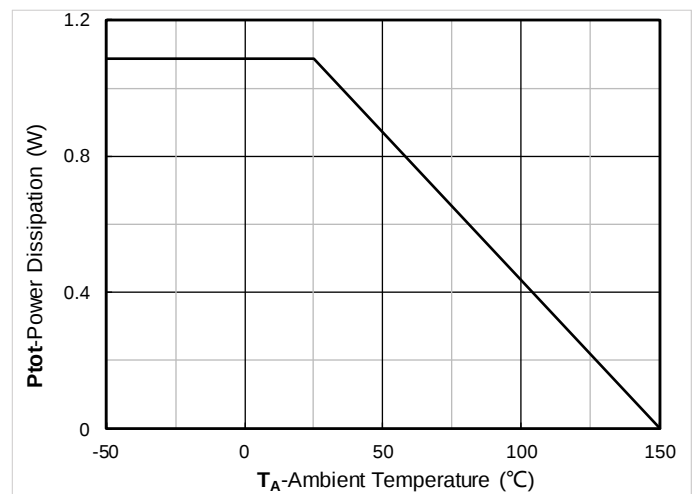


Figure 12. Power dissipation

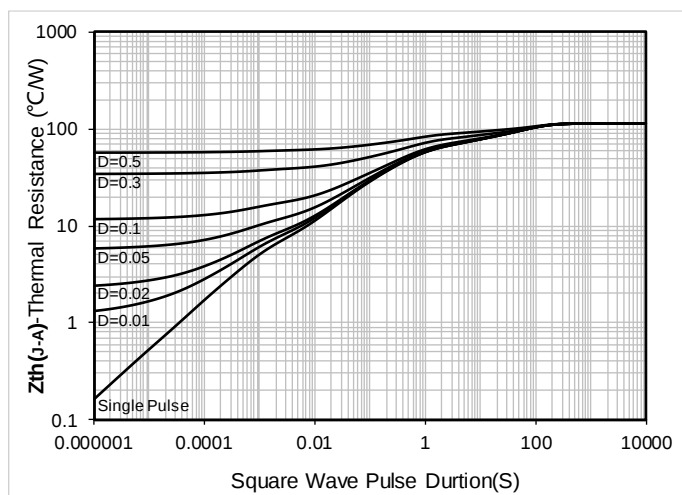


Figure 13. Maximum Transient Thermal Impedance

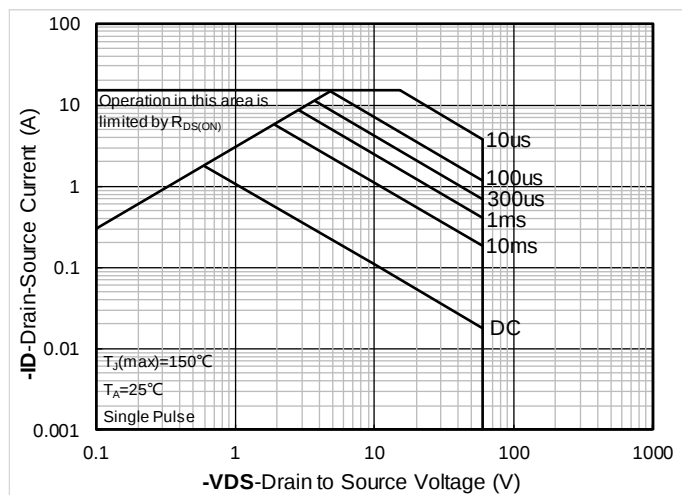
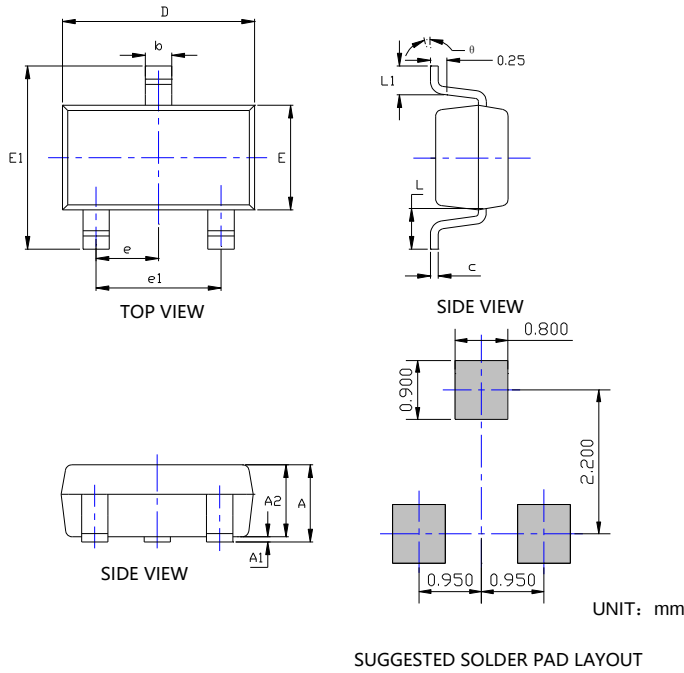


Figure 14. Safe Operation Area

## ■ SOT-23-3L Package Information



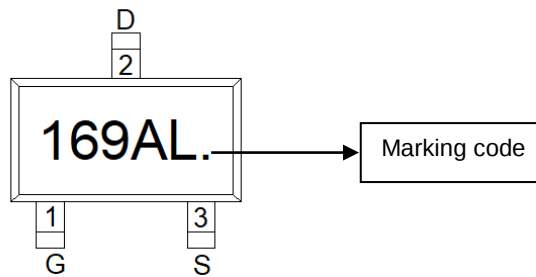
| SYMBOL | DIMENSIONS |       |       |            |       |       |
|--------|------------|-------|-------|------------|-------|-------|
|        | INCHES     |       |       | Millimeter |       |       |
|        | MIN.       | NOM.  | MAX.  | MIN.       | NOM.  | MAX.  |
| A      | 0.041      | ---   | 0.049 | 1.050      | ---   | 1.250 |
| A1     | 0.000      | ---   | 0.008 | 0.000      | ---   | 0.200 |
| A2     | 0.041      | 0.043 | 0.045 | 1.050      | 1.100 | 1.150 |
| b      | 0.012      | 0.016 | 0.020 | 0.300      | 0.400 | 0.500 |
| c      | 0.004      | ---   | 0.008 | 0.100      | ---   | 0.200 |
| D      | 0.111      | 0.115 | 0.119 | 2.820      | 2.920 | 3.020 |
| E      | 0.059      | 0.063 | 0.067 | 1.500      | 1.600 | 1.700 |
| E1     | 0.104      | 0.110 | 0.116 | 2.650      | 2.800 | 2.950 |
| e      | 0.037TYP   |       |       | 0.950TYP   |       |       |
| e1     | 0.071      | 0.075 | 0.079 | 1.800      | 1.900 | 2.000 |
| L      | 0.024REF   |       |       | 0.600REF   |       |       |
| L1     | 0.012      | 0.018 | 0.024 | 0.300      | 0.450 | 0.600 |
| θ      | 0°         | ---   | 8°    | 0°         | ---   | 8°    |

### NOTE:

- 1.PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
- 2.TOLERANCE 0.1mm UNLESS OTHERWISE SPECIFIED.
- 3.THE PAD LAYOUT IS FOR REFERENCE PURPOSES ONLY.



## ■ Marking Information



Note:

1. All marking is at middle of the product body
2. All marking is in laser printing
3. 169AL. is marking code
4. Body color: Black



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