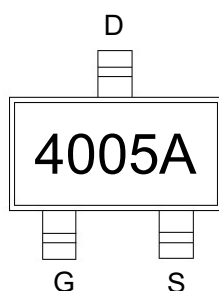


## Features

- Trench Power LV MOSFET technology
- High Density Cell Design for Low  $R_{DS(ON)}$
- High Speed switching

## Application

- CoBattery protection
- Load switch
- Power management

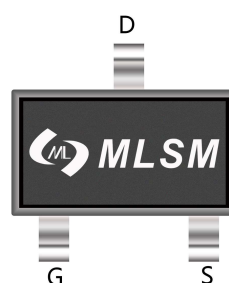


4005A: Device code

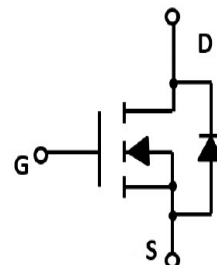
Marking and pin assignment

## Product Summary

| $V_{DS}$ | $R_{DS(ON)}$ MAX | $I_D$ MAX |
|----------|------------------|-----------|
| 40V      | 65mΩ@10V         | 5A        |
|          | 95mΩ@4.5V        |           |



SOT-23-3L top view



Schematic diagram



Pb-Free



Halogen-Free

## Absolute Maximum Ratings (TA=25°C unless otherwise noted)

| Symbol                                                 | Parameter                        | Rating                      | Unit |
|--------------------------------------------------------|----------------------------------|-----------------------------|------|
| <b>Common Ratings (TC=25°C Unless Otherwise Noted)</b> |                                  |                             |      |
| $V_{DS}$                                               | Drain-Source Breakdown Voltage   | 40                          | V    |
| $V_{GS}$                                               | Gate-Source Voltage              | ±20                         | V    |
| $T_J$                                                  | Maximum Junction Temperature     | 150                         | °C   |
| $T_{STG}$                                              | Storage Temperature Range        | -50 to 155                  | °C   |
| $I_S$                                                  | Diode Continuous Forward Current | $T_C=25^\circ\text{C}$<br>5 | A    |

## Mounted on Large Heat Sink

|                 |                                     |                               |      |
|-----------------|-------------------------------------|-------------------------------|------|
| $I_{DM}$        | Pulse Drain Current Tested          | $T_C=25^\circ\text{C}$<br>20  | A    |
| $I_D$           | Continuous Drain Current            | $T_C=25^\circ\text{C}$<br>5   | A    |
| $P_D$           | Maximum Power Dissipation           | $T_C=25^\circ\text{C}$<br>0.3 | W    |
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient | 150                           | °C/W |

## Ordering Information (Example)

| Type      | Package   | Marking | Minimum Package(pcs) | Inner Box Quantity(pcs) | Outer Carton Quantity(pcs) | Delivery Mode |
|-----------|-----------|---------|----------------------|-------------------------|----------------------------|---------------|
| MLSK4005A | SOT-23-3L | 4005A   | 3,000                | 45,000                  | 180,000                    | 7"reel        |

| Electrical Characteristics (T <sub>J</sub> =25°C unless otherwise noted)            |                                  |                                                                                    |     |      |      |      |
|-------------------------------------------------------------------------------------|----------------------------------|------------------------------------------------------------------------------------|-----|------|------|------|
| Symbol                                                                              | Parameter                        | Condition                                                                          | Min | Typ  | Max  | Unit |
| Static Electrical Characteristics @ T <sub>J</sub> = 25°C (unless otherwise stated) |                                  |                                                                                    |     |      |      |      |
| B <sub>V(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    | μA   |
| 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 | 1.5  | 2.5  | V    |
| R <sub>DS(on)</sub>                                                                 | Drain-Source On-State Resistance | V <sub>GS</sub> =10V, I <sub>D</sub> =5A                                           | --  | 50   | 65   | mΩ   |
|                                                                                     |                                  | V <sub>GS</sub> =4.5V, I <sub>D</sub> =2A                                          | --  | 70   | 95   | mΩ   |
| 3                                                                                   |                                  |                                                                                    |     |      |      |      |
| C <sub>ISS</sub>                                                                    | Input Capacitance                | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, f=1MHz                                  | --  | 233  | --   | pF   |
| C <sub>OSS</sub>                                                                    | Output Capacitance               |                                                                                    | --  | 26   | --   | pF   |
| C <sub>RSS</sub>                                                                    | Reverse Transfer Capacitance     |                                                                                    | --  | 16   | --   | pF   |
| Switching Characteristics                                                           |                                  |                                                                                    |     |      |      |      |
| Q <sub>g</sub>                                                                      | Total Gate Charge                | V <sub>DS</sub> =10V, I <sub>D</sub> =3A, V <sub>GS</sub> =24V                     | --  | 5.5  | --   | nC   |
| Q <sub>gs</sub>                                                                     | Gate Source Charge               |                                                                                    | --  | 1.2  | --   | nC   |
| Q <sub>gd</sub>                                                                     | Gate Drain Charge                |                                                                                    | --  | 0.9  | --   | nC   |
| t <sub>d(on)</sub>                                                                  | Turn-on Delay Time               | V <sub>DS</sub> =24V, I <sub>D</sub> =2A, V <sub>GS</sub> =10V, R <sub>G</sub> =3Ω | --  | 4.2  | --   | nS   |
| t <sub>r</sub>                                                                      | Turn-on Rise Time                |                                                                                    | --  | 18.3 | --   | nS   |
| t <sub>d(off)</sub>                                                                 | Turn-Off Delay Time              |                                                                                    | --  | 7.9  | --   | nS   |
| t <sub>f</sub>                                                                      | Turn-Off Fall Time               |                                                                                    | --  | 18.8 | --   | nS   |
| Source- Drain Diode Characteristics                                                 |                                  |                                                                                    |     |      |      |      |
| V <sub>SD</sub>                                                                     | Forward on voltage               | T <sub>j</sub> =25°C, I <sub>s</sub> =5A                                           | --  | --   | 1.2  | V    |

## Typical Operating Characteristics

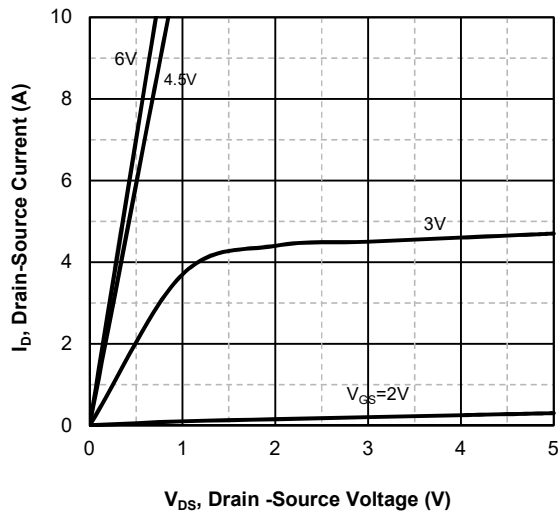


Fig1. Typical Output Characteristics

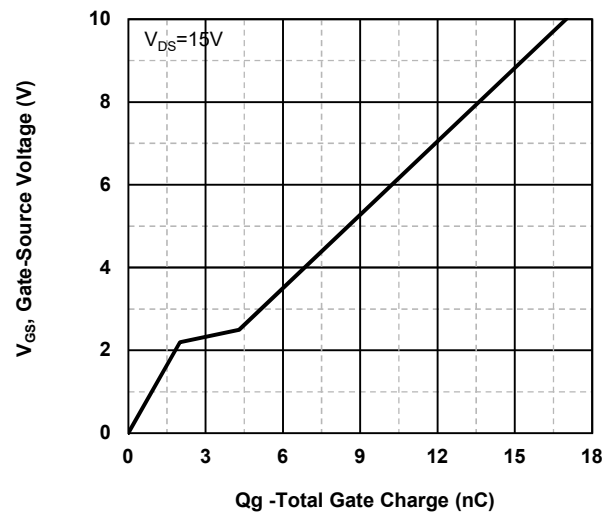


Fig2. Typical Gate Charge Vs. Gate-Source Voltage

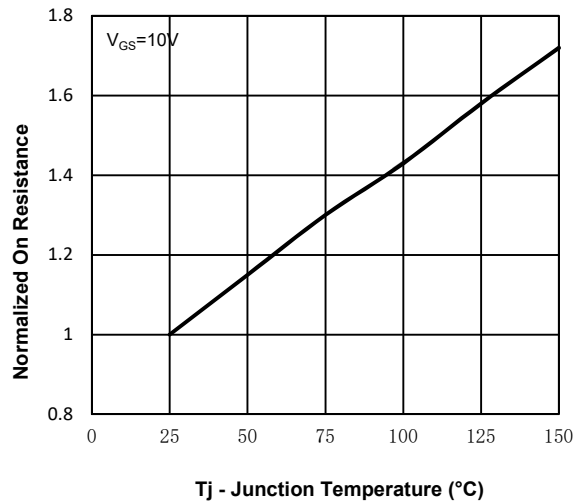


Fig3. Normalized On-Resistance Vs. Temperature

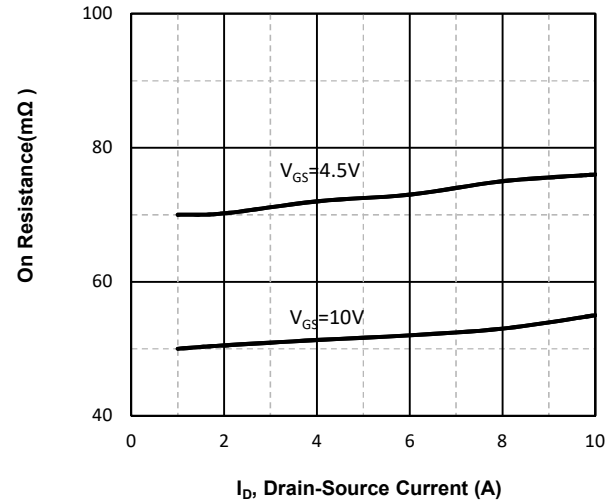


Fig4. On-Resistance Vs. Drain-Source Current

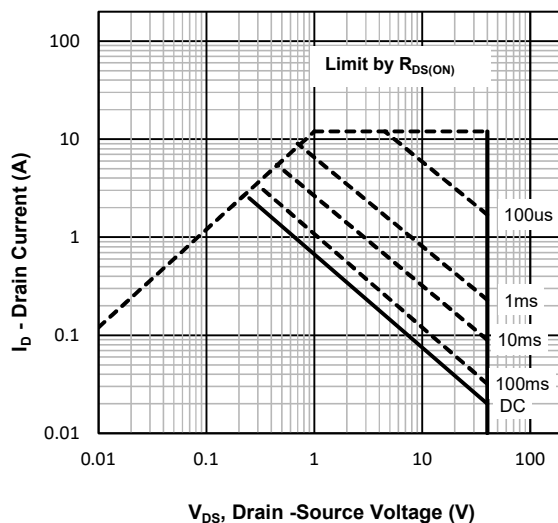


Fig5. Maximum Safe Operating Area

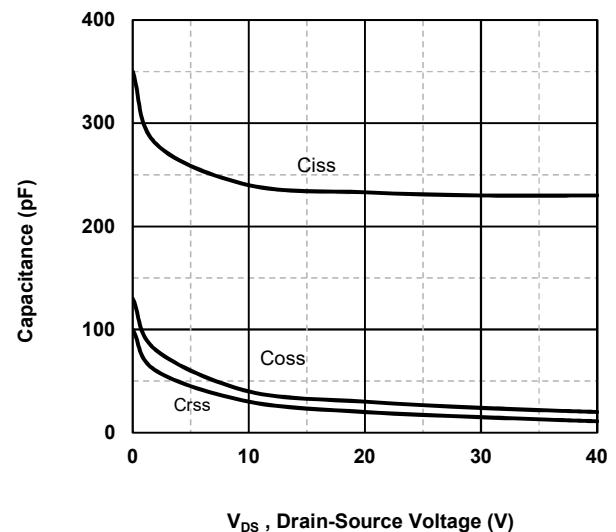
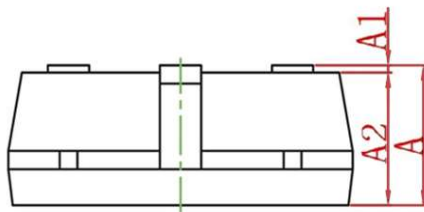
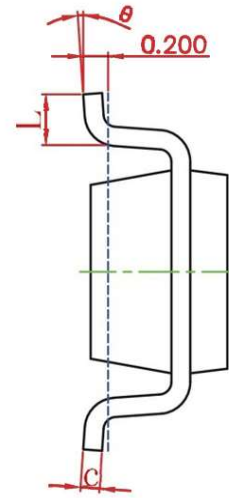
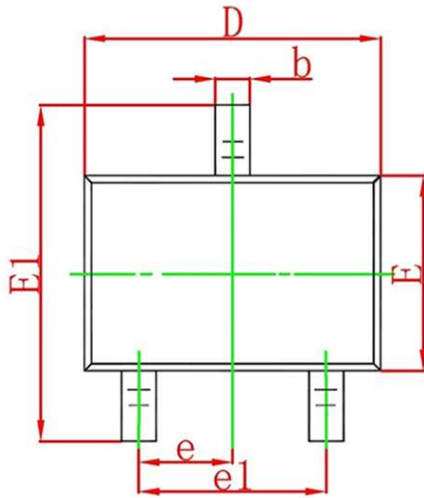


Fig6 Typical Capacitance Vs. Drain-Source Voltage

SOT-23-3L Package information



| Symbol   | Dimensions in Millimeters(mm) |       | Dimensions In Inches |       |
|----------|-------------------------------|-------|----------------------|-------|
|          | Min                           | Max   | Min                  | Max   |
| A        | 1.050                         | 1.250 | 0.042                | 0.050 |
| A1       | 0.000                         | 0.100 | 0.000                | 0.004 |
| A2       | 1.050                         | 1.150 | 0.042                | 0.046 |
| b        | 0.300                         | 0.500 | 0.012                | 0.020 |
| c        | 0.100                         | 0.200 | 0.004                | 0.008 |
| D        | 2.820                         | 3.020 | 0.112                | 0.120 |
| E        | 1.500                         | 1.700 | 0.060                | 0.068 |
| E1       | 2.650                         | 2.950 | 0.106                | 0.118 |
| e        | 0.950TYP                      |       | 0.037TYP             |       |
| e1       | 1.800                         | 2.000 | 0.071                | 0.079 |
| L        | 0.300                         | 0.600 | 0.012                | 0.024 |
| $\theta$ | 0°                            | 8°    | 0°                   | 8°    |