

### Features

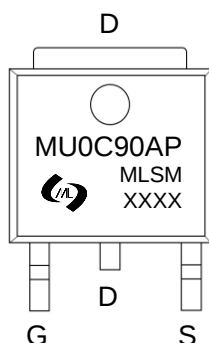
- High density cell design for ultra low  $R_{DS(ON)}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high EAS

### Product Summary

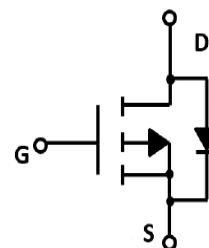
| $V_{DS}$ | $R_{DS(ON)}$ TYP     | $I_D$ |
|----------|----------------------|-------|
| -20V     | 3.0m $\Omega$ @-4.5V | -90A  |
|          | 4.5m $\Omega$ @-2.5V |       |

### Application

- Battery and loading switching
- Excellent package for good heat dissipation



MU0C90AP: Device code  
XXXX: Code



Schematic diagram

Marking and pin assignment



Halogen-Free

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

| Symbol | Parameter | Rating | Unit |
|--------|-----------|--------|------|
|--------|-----------|--------|------|

### Common Ratings (TC=25°C Unless Otherwise Noted)

|                |                                  |                               |    |
|----------------|----------------------------------|-------------------------------|----|
| $V_{DS}$       | Drain-Source Breakdown Voltage   | -20                           | V  |
| $V_{GS}$       | Gate-Source Voltage              | ±12                           | V  |
| $T_J, T_{STG}$ | Storage Temperature Range        | -55 to 175                    | °C |
| $I_S$          | Diode Continuous Forward Current | $T_C=25^\circ\text{C}$<br>-90 | A  |

### Mounted on Large Heat Sink

|                 |                                     |                                |      |
|-----------------|-------------------------------------|--------------------------------|------|
| $I_{DM}$        | Pulse Drain Current Tested          | $T_C=25^\circ\text{C}$<br>-310 | A    |
| $I_D$           | Continuous Drain Current            | $T_C=25^\circ\text{C}$<br>-90  | A    |
| $P_D$           | Maximum Power Dissipation           | $T_C=25^\circ\text{C}$<br>156  | W    |
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient | 25                             | °C/W |

### Ordering Information (Example)

| Type     | Package | Marking  | Minimum Package(pcs) | Inner Box Quantity(pcs) | Outer Carton Quantity(pcs) | Delivery Mode |
|----------|---------|----------|----------------------|-------------------------|----------------------------|---------------|
| MU0C90AP | TO-252  | MU0C90AP | 2,500                | 5,000                   | 35,000                     | 13"reel       |

| Electrical Characteristics (TJ=25℃ unless otherwise noted)              |                                  |                                                                                        |      |       |      |      |
|-------------------------------------------------------------------------|----------------------------------|----------------------------------------------------------------------------------------|------|-------|------|------|
| Symbol                                                                  | Parameter                        | Condition                                                                              | Min  | Typ   | Max  | Unit |
| Static Electrical Characteristics @ TJ = 25℃ (unless otherwise stated)  |                                  |                                                                                        |      |       |      |      |
| BV <sub>(BR)DSS</sub>                                                   | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA                                            | -20  | --    | --   | V    |
| I <sub>DSS</sub>                                                        | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V                                             | --   | --    | -1.0 | μA   |
| I <sub>GSS</sub>                                                        | Gate-Body Leakage Current        | V <sub>GS</sub> =±12V, 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                              | -0.4 | -0.7  | -1.0 | V    |
| R <sub>DS(on)</sub>                                                     | Drain-Source On-State Resistance | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-20A                                           | --   | 3.0   | 4.5  | mΩ   |
|                                                                         |                                  | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-15A                                           | --   | 4.5   | 6.5  | mΩ   |
| Dynamic Electrical Characteristics @ TJ = 25℃ (unless otherwise stated) |                                  |                                                                                        |      |       |      |      |
| C <sub>ISS</sub>                                                        | Input Capacitance                | V <sub>DS</sub> =-10V, V <sub>GS</sub> =0V, f=1MHz                                     | --   | 14250 | --   | pF   |
| C <sub>OSS</sub>                                                        | Output Capacitance               |                                                                                        | --   | 1810  | --   | pF   |
| C <sub>RSS</sub>                                                        | Reverse Transfer Capacitance     |                                                                                        | --   | 1765  | --   | pF   |
| Switching Characteristics                                               |                                  |                                                                                        |      |       |      |      |
| Q <sub>g</sub>                                                          | Total Gate Charge                | V <sub>DD</sub> =-10V, I <sub>D</sub> =-20A, V <sub>GS</sub> =-4.5V                    | --   | 310   | --   | nC   |
| Q <sub>gs</sub>                                                         | Gate Source Charge               |                                                                                        | --   | 24    | --   | nC   |
| Q <sub>gd</sub>                                                         | Gate Drain Charge                |                                                                                        | --   | 75.3  | --   | nC   |
| t <sub>d(on)</sub>                                                      | Turn-on Delay Time               | V <sub>DD</sub> =-10V, I <sub>D</sub> =-20A, V <sub>GS</sub> =-10V, R <sub>G</sub> =3Ω | --   | 11    | --   | nS   |
| t <sub>r</sub>                                                          | Turn-on Rise Time                |                                                                                        | --   | 27    | --   | nS   |
| t <sub>d(off)</sub>                                                     | Turn-Off Delay Time              |                                                                                        | --   | 340   | --   | nS   |
| t <sub>f</sub>                                                          | Turn-Off Fall Time               |                                                                                        | --   | 130   | --   | nS   |
| Source- Drain Diode Characteristics                                     |                                  |                                                                                        |      |       |      |      |
| V <sub>SD</sub>                                                         | Forward on voltage               | Tj=25℃, Is=-10A                                                                        | --   | --    | -1.2 | V    |

## Typical Operating Characteristics

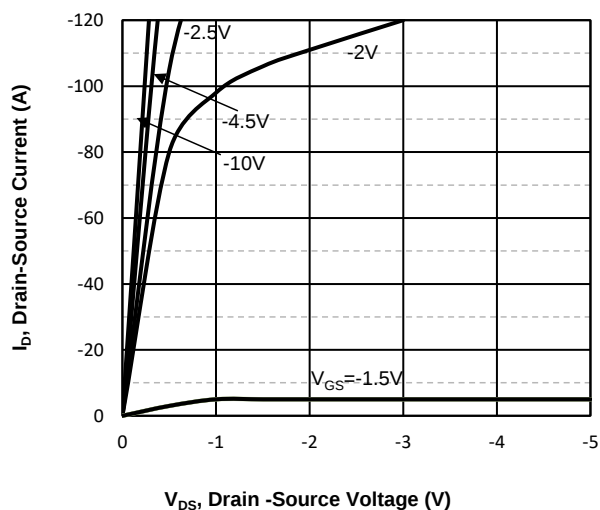


Fig1. Typical Output Characteristics

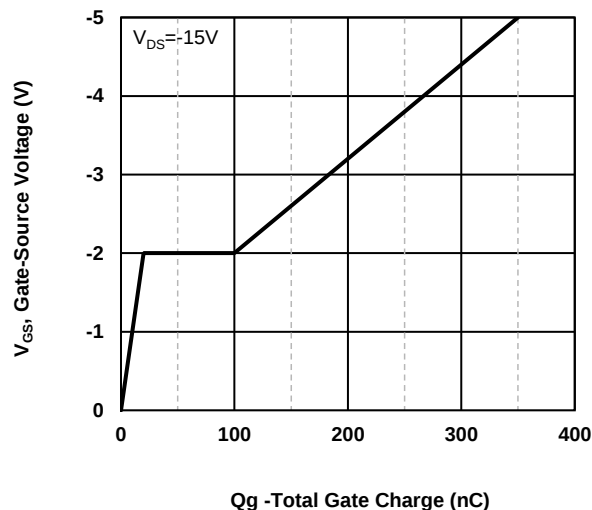


Fig2. Typical Gate Charge Vs. Gate-Source Voltage

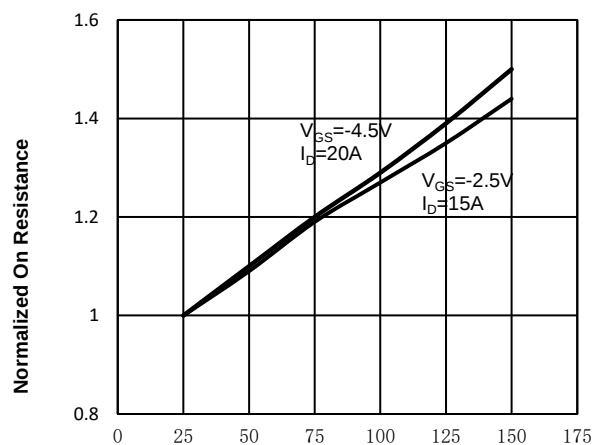


Fig3. Normalized On-Resistance Vs. Temperature

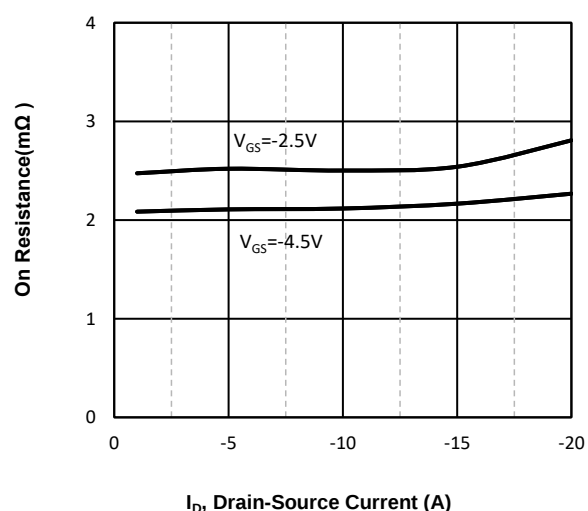


Fig4. On-Resistance Vs. Drain-Source Current

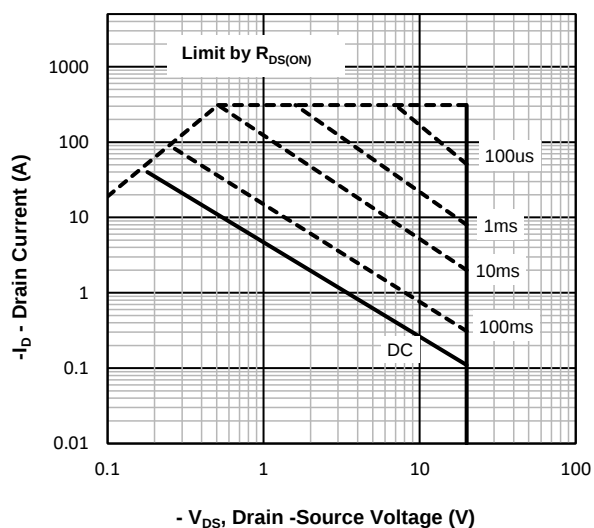


Fig5. Maximum Safe Operating Area

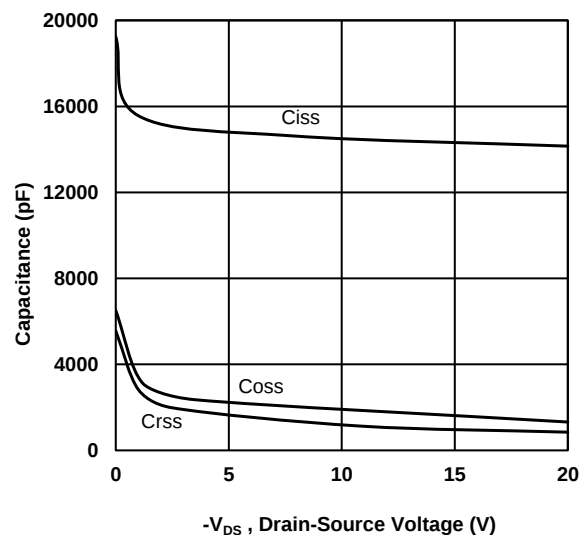
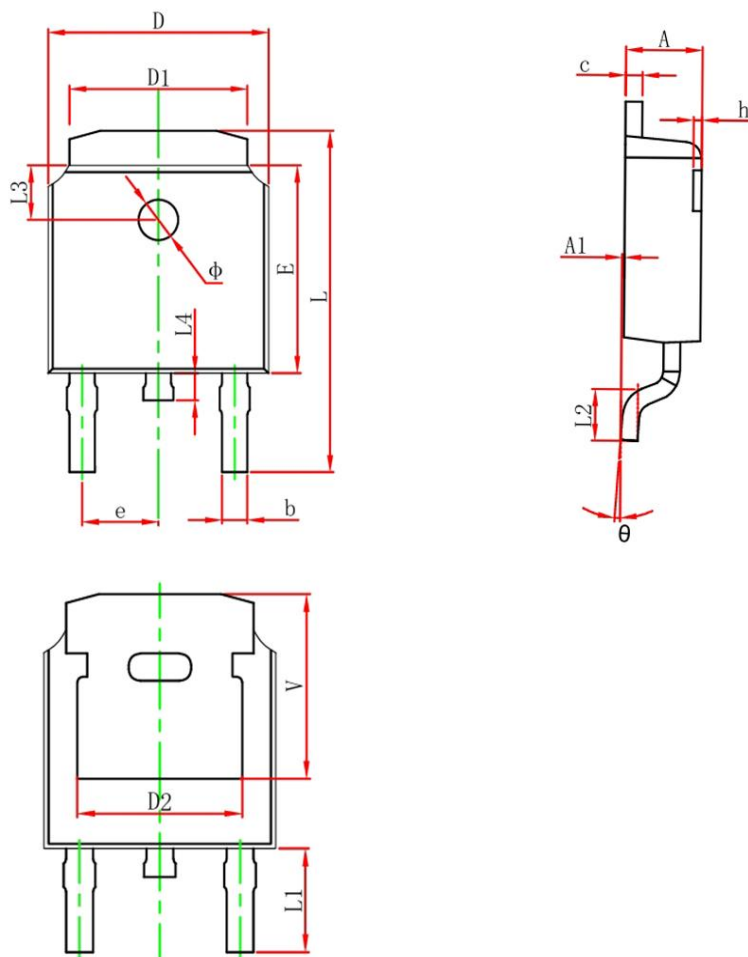


Fig6 Typical Capacitance Vs. Drain-Source Voltage

TO-252 Package information



| Symbol   | Dimensions in Millimeters(mm) |        | 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        | 0.635                         | 0.770  | 0.025                | 0.030 |
| c        | 0.450                         | 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 REF.                    |        | 0.190 REF.           |       |
| E        | 6.000                         | 6.200  | 0.236                | 0.244 |
| e        | 2.186                         | 2.386  | 0.086                | 0.094 |
| L        | 9.712                         | 10.312 | 0.386                | 0.406 |
| L1       | 2.900 REF.                    |        | 0.114 REF.           |       |
| L2       | 1.400                         | 1.700  | 0.055                | 0.067 |
| L3       | 1.600 REF.                    |        | 0.063 REF.           |       |
| 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        | 5.250 REF.                    |        | 0.207 REF.           |       |