

## Features

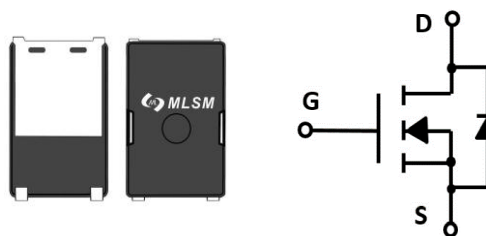
- Wide Bandgap SiC MOSFET Technology
- Low On-Resistance with High Blocking Voltage
- Low Capacitances with High-Speed Switching
- Low Reverse Recovery(Qrr)
- Easy to Parallel and Simple to Drive

## Product Summary

| $V_{DS}$ | $R_{DS(ON)}$ TYP | $I_D$ |
|----------|------------------|-------|
| 1200V    | 80mΩ@18V         | 40A   |

## Application

- Power Factor Correction Modules
- Switch Mode Power Supplies
- DC-AC Inverters
- High Voltage DC/DC Converters



TOLL-4L



Halogen-Free

| Absolute Maximum Ratings (TA=25°C unless otherwise noted) |                                                 |          |            |      |
|-----------------------------------------------------------|-------------------------------------------------|----------|------------|------|
| Symbol                                                    | Parameter                                       |          | Rating     | Unit |
| Common Ratings (TC=25°C Unless Otherwise Noted)           |                                                 |          |            |      |
| V <sub>DS</sub>                                           | Drain-Source Breakdown Voltage                  |          | 1200       | V    |
| V <sub>GS</sub>                                           | Gate-Source Voltage                             |          | -10/+22    | V    |
| V <sub>GSop</sub>                                         | Recommended Operation Voltage of Gate to Source |          | -4/+18     | V    |
| T <sub>J</sub> , T <sub>STG</sub>                         | Operating and Storage Temperature Range         |          | -55 to 175 | °C   |
| I <sub>S</sub>                                            | Diode Continuous Forward Current                | Tc=25°C  | 40         | A    |
| I <sub>DM</sub>                                           | Pulse Drain Current Tested                      | Tc=25°C  | 80         | A    |
|                                                           |                                                 | Tc=100°C | 50         | A    |
| I <sub>D</sub>                                            | Continuous Drain Current                        | Tc=25°C  | 40         | A    |
|                                                           |                                                 | Tc=100°C | 25         | A    |
| P <sub>D</sub>                                            | Maximum Power Dissipation                       | Tc=25°C  | 283        | W    |
| R <sub>th(j-c)</sub>                                      | Thermal Resistance from Junction-Case           |          | 0.529      | °C/W |

## Ordering Information (Example)

| Type     | Package | Marking  | Minimum Package(pcs) | Inner Box Quantity(pcs) | Outer Carton Quantity(pcs) | Delivery Mode |
|----------|---------|----------|----------------------|-------------------------|----------------------------|---------------|
| ML80C12A | TOLL-4L | ML80C12A | 2,500                | 5,000                   | 35,000                     | 13"reel       |

| Electrical Characteristics (TJ=25°C unless otherwise noted)              |                                  |                                                                                          |      |      |     |      |
|--------------------------------------------------------------------------|----------------------------------|------------------------------------------------------------------------------------------|------|------|-----|------|
| Symbol                                                                   | Parameter                        | Condition                                                                                | Min  | Typ  | Max | Unit |
| Static Electrical Characteristics @ TJ = 25°C (unless otherwise stated)  |                                  |                                                                                          |      |      |     |      |
| BV <sub>(BR)DSS</sub>                                                    | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>D</sub> =500μA                                               | 1200 | 1500 | --  | V    |
| I <sub>DSS</sub>                                                         | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =1200V, V <sub>GS</sub> =0V                                              | --   | --   | 10  | μA   |
| I <sub>GSS</sub>                                                         | Gate-Body Leakage Current        | V <sub>GS</sub> =18V, 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> =5mA                                   | 2.0  | --   | 4.0 | V    |
| R <sub>DS(on)</sub>                                                      | Drain-Source On-State Resistance | V <sub>GS</sub> =18V, I <sub>D</sub> =20A                                                | --   | 80   | 104 | mΩ   |
|                                                                          |                                  | V <sub>GS</sub> =18V, I <sub>D</sub> =20A, Tj=175°C                                      | --   | 122  | --  | mΩ   |
| Dynamic Electrical Characteristics @ TJ = 25°C (unless otherwise stated) |                                  |                                                                                          |      |      |     |      |
| C <sub>ISS</sub>                                                         | Input Capacitance                | V <sub>DS</sub> =800V, V <sub>GS</sub> =0V, f=1MHz                                       | --   | 944  | --  | pF   |
| C <sub>OSS</sub>                                                         | Output Capacitance               |                                                                                          | --   | 42.6 | --  | pF   |
| C <sub>RSS</sub>                                                         | Reverse Transfer Capacitance     |                                                                                          | --   | 4.1  | --  | pF   |
| Switching Characteristics                                                |                                  |                                                                                          |      |      |     |      |
| Q <sub>g</sub>                                                           | Total Gate Charge                | V <sub>DS</sub> =800V, I <sub>D</sub> =20A, V <sub>GS</sub> =0/15V                       | --   | 51   | --  | nC   |
| Q <sub>gs</sub>                                                          | Gate Source Charge               |                                                                                          | --   | 13   | --  | nC   |
| Q <sub>gd</sub>                                                          | Gate Drain Charge                |                                                                                          | --   | 25   | --  | nC   |
| t <sub>d(on)</sub>                                                       | Turn-on Delay Time               | V <sub>DD</sub> =800V, I <sub>D</sub> =20A, V <sub>GS</sub> =-4/18V, R <sub>G</sub> =10Ω | --   | 38   | --  | nS   |
| t <sub>r</sub>                                                           | Turn-on Rise Time                |                                                                                          | --   | 46   | --  | nS   |
| t <sub>d(off)</sub>                                                      | Turn-Off Delay Time              |                                                                                          | --   | 32   | --  | nS   |
| t <sub>f</sub>                                                           | Turn-Off Fall Time               |                                                                                          | --   | 41   | --  | nS   |
| R <sub>g</sub>                                                           | Gate Resistance                  | V <sub>AC</sub> =25mV, f=1MHz                                                            | --   | 4    | --  | Ω    |
| Source- Drain Diode Characteristics                                      |                                  |                                                                                          |      |      |     |      |
| V <sub>SD</sub>                                                          | Forward on voltage               | Tj=25°C, Is=10A                                                                          | --   | 4.5  | --  | V    |
| I <sub>S</sub>                                                           | Continuous Diode Forward Current | V <sub>GS</sub> =0V, Tj=25°C                                                             | --   | 36   | --  | A    |
| t <sub>rr</sub>                                                          | Reverse Recovery Time            | V <sub>GS</sub> = 4V, I <sub>SD</sub> =20A, V <sub>R</sub> =800V, di/dt=530A/us, Tj=25°C | --   | 17.5 | --  | ns   |
| Q <sub>rr</sub>                                                          | Reverse Recovery Charge          |                                                                                          | --   | 71.4 | --  | nC   |
| I <sub>rrm</sub>                                                         | Peak Reverse Recovery Current    |                                                                                          | --   | 6.8  | --  | A    |

## Typical Operating Characteristics

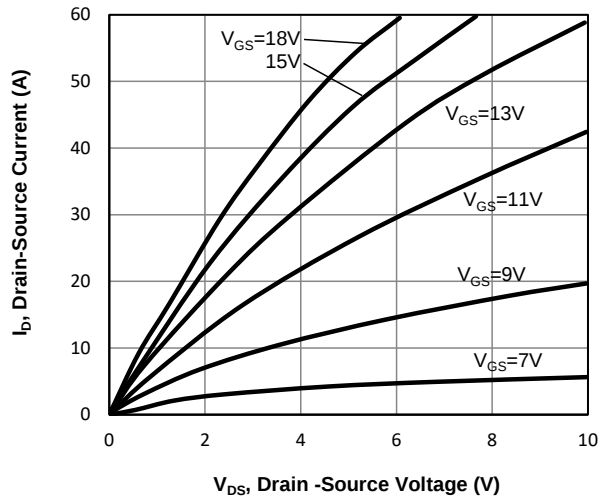


Fig1. Typical Output Characteristics

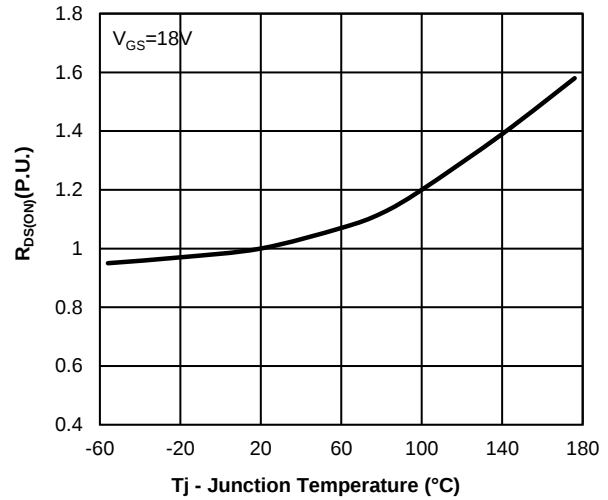


Fig2. Normalized On-Resistance Vs. Temperature

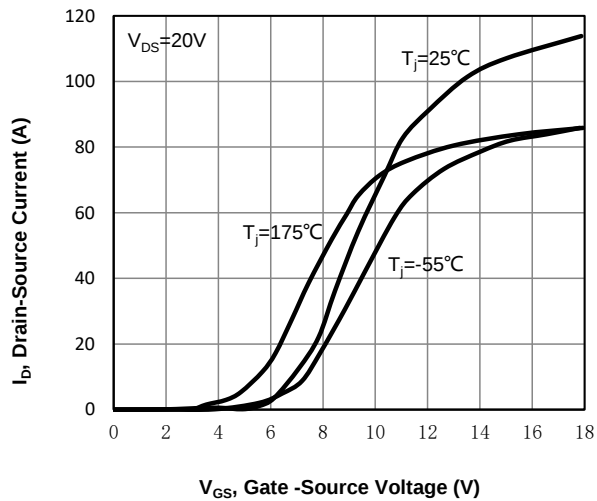


Fig3. Typical Transfer Characteristics

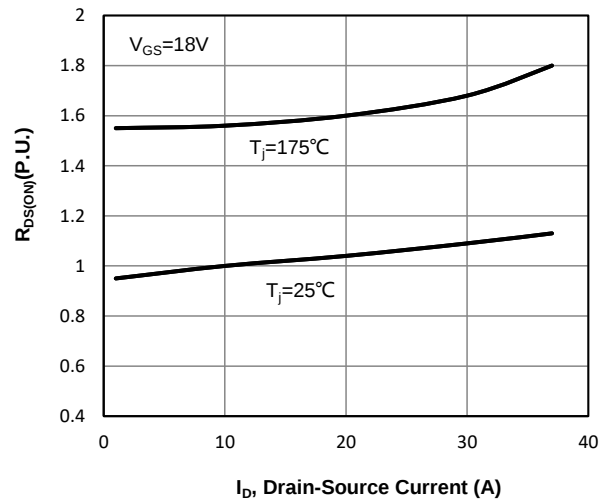


Fig4. On-Resistance Vs. Drain-Source Current

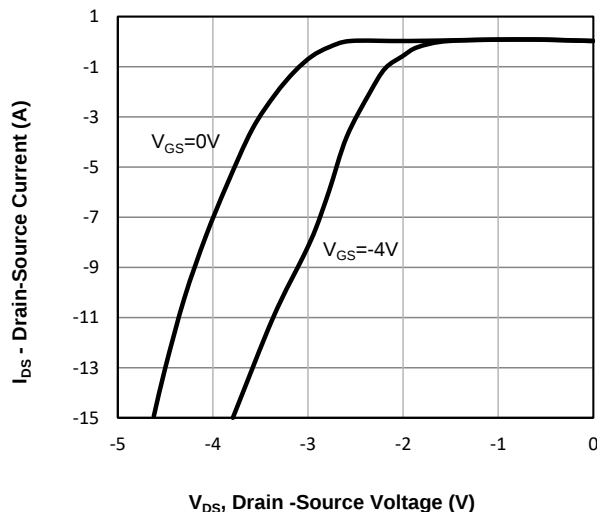


Fig5. Body Diode Characteristics

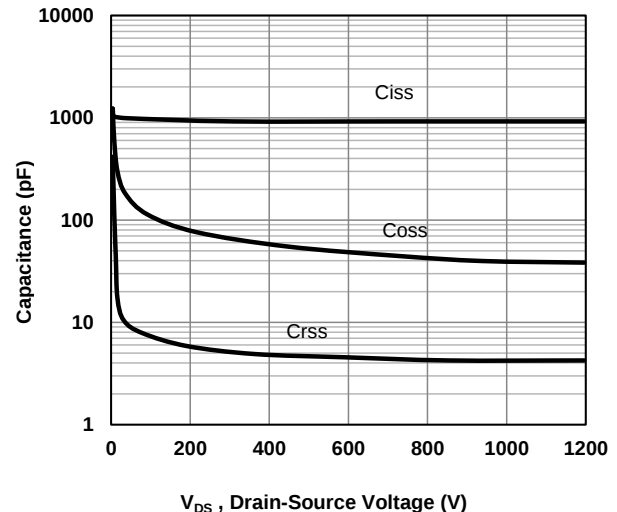
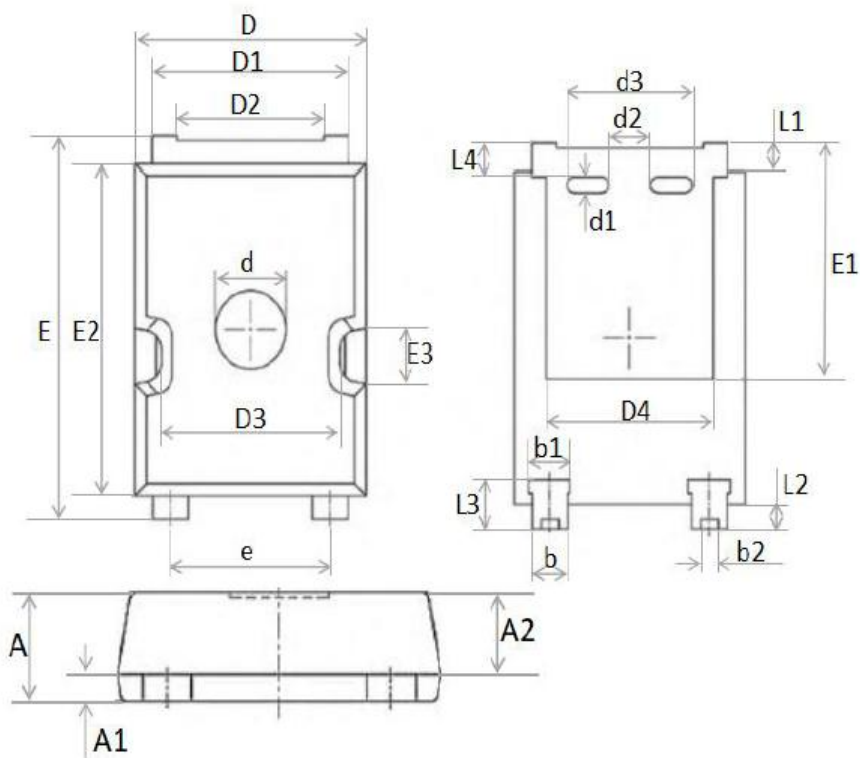


Fig6 Typical Capacitance Vs. Drain-Source

**TOLL-4L Package information**



| Symbol | Dimensions in Millimeters(mm) |        | Dimensions In Inches |       |
|--------|-------------------------------|--------|----------------------|-------|
|        | Min                           | Max    | Min                  | Max   |
| A      | 1.900                         | 2.100  | 0.074                | 0.082 |
| A1     | 0.400                         | 0.600  | 0.015                | 0.023 |
| A2     | 1.400                         | 1.600  | 0.055                | 0.062 |
| b      | 0.900                         | 1.100  | 0.035                | 0.043 |
| b1     | 1.090                         | 1.290  | 0.430                | 0.051 |
| b2     | 0.400                         | 0.600  | 0.016                | 0.024 |
| D      | 6.500                         | 6.700  | 0.256                | 0.264 |
| D1     | 5.500                         | 5.700  | 0.217                | 0.224 |
| D2     | 4.100                         | 4.300  | 0.161                | 0.169 |
| D3     | 5.000                         | 5.200  | 0.196                | 0.204 |
| D4     | 4.700                         | 4.900  | 0.185                | 0.192 |
| d      | 2.000REF                      |        | 0.07874REF           |       |
| d1     | 0.400                         | 0.600  | 0.016                | 0.024 |
| d2     | 1.000                         | 1.200  | 0.039                | 0.047 |
| d3     | 3.600                         | 3.800  | 0.141                | 0.149 |
| E      | 9.800                         | 10.000 | 0.385                | 0.393 |
| E1     | 5.900                         | 6.200  | 0.232                | 0.244 |
| E2     | 8.500                         | 8.700  | 0.335                | 0.343 |
| E3     | 1.400REF                      |        | 0.05511REF           |       |
| e      | 4.470                         | 4.670  | 0.176                | 0.184 |
| L1     | 0.600                         | 0.800  | 0.024                | 0.031 |
| L2     | 0.500                         | 0.700  | 0.020                | 0.028 |
| L3     | 1.100                         | 1.400  | 0.043                | 0.055 |
| L4     | 0.700                         | 0.900  | 0.028                | 0.035 |