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Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
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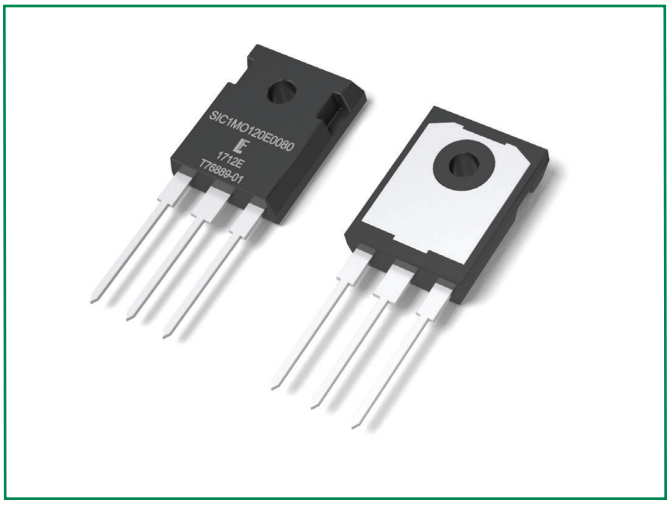
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

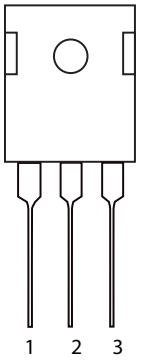
# LSIC1MO120E0080 1200 V N-channel, Enhancement-mode SiC MOSFET HF RoHS Pb

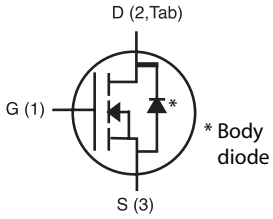



## Product Summary

| Characteristics | Value | Unit |
|---|---|---|
| $V_{DS}$ | 1200 | V |
| Typical $R_{DS(ON)}$ | 80 | mΩ |
| $I_D$ ($T_C \leq 100$ °C) | 25 | A |

## Circuit Diagram TO-247-3L




## Features

- Optimized for high-frequency, high-efficiency applications
- Extremely low gate charge and output capacitance
- Low gate resistance for high-frequency switching
- Normally-off operation at all temperatures
- Ultra-low on-resistance

## Environmental

- Littelfuse "RoHS" logo = RoHS
  RoHS conform
- Littelfuse "HF" logo = HF
  Halogen Free
- Littelfuse "Pb-free" logo = Pb
  Pb-free lead plating

## Applications

- High-frequency applications
- Solar Inverters
- Switch Mode Power Supplies
- UPS
- Motor Drives
- High Voltage DC/DC Converters
- Battery Chargers
- Induction Heating


Rev /,. , Revised: 10/31/17

# SiC MOSFET

## LSIC1MO120E0080, 1200 V, 80 mOhm, TO-247-3L

### Maximum Ratings

| Characteristics | Symbol | Conditions | Value | Unit |
|---|---|---|---|---|
| Continuous Drain Current | $I_D$ | $V_{GS}$ = 20 V, $T_C$ = 25 °C | 39 | A |
| | | $V_{GS}$ = 20 V, $T_C$ = 100 °C | 25 | |
| Pulsed Drain Current [1] | $I_{D(pulse)}$ | $T_C$ = 25 °C | 80 | A |
| Power Dissipation | $P_D$ | $T_C$ = 25 °C, $T_J$ = 150 °C | 179 | W |
| Operating Junction Temperature | $T_J$ | | -55 to 150 | °C |
| Gate-source Voltage | $V_{GS,MAX}$ | Absolute maximum values | -6 to 22 | V |
| | $V_{GS,OPTR}$ | Transient, <1% duty cycle | -10 to 25 | |
| | $V_{GS,OP}$ | Recommended DC operating values | -5 to 20 | |
| Storage Temperature | $T_{STG}$ | - | -55 to 150 | °C |
| Lead Temperature for Soldering | $T_{sold}$ | - | 260 | °C |
| Mounting Torque | $M_D$ | M3 or 6-32 screw | 0.6 | Nm |
| | | | 5.3 | in-lb |

Footnote 1: Pulse width limited by $T_{J,max}$

### Thermal Characteristics

| Characteristics | Symbol | Value | Unit |
|---|---|---|---|
| Maximum Thermal Resistance, junction-to-case | $R_{th,JC,max}$ | 0.7 | °C/W |
| Maximum Thermal Resistance, junction-to-ambient | $R_{th,JA,max}$ | 40 | °C/W |

### Electrical Characteristics ($T_J$ = 25 °C unless otherwise specified)

| Characteristics | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Static Characteristics** | | | | | | |
| Drain-source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0 V, $I_D$ = 250 µA | 1200 | - | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 1200 V, $V_{GS}$ = 0 V | - | 1 | 100 | µA |
| | | $V_{DS}$ = 1200 V, $V_{GS}$ = 0 V, $T_J$ = 150 °C | - | 2 | - | |
| Gate Leakage Current | $I_{GSS,F}$ | $V_{GS}$ = 20 V, $V_{DS}$ = 0 V | - | - | 100 | nA |
| | $I_{GSS,R}$ | $V_{GS}$ = -10 V, $V_{DS}$ = 0 V | - | - | 100 | |
| Drain-source On-state Resistance | $R_{DS(ON)}$ | $I_D$ = 20 A, $V_{GS}$ = 20 V | - | 80 | 100 | mΩ |
| | | $I_D$ = 20 A, $V_{GS}$ = 20 V, $T_J$ = 150 °C | - | 105 | - | |
| Gate Threshold Voltage | $V_{GS,(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 10 mA | 1.8 | 2.8 | 4.0 | V |
| | | $V_{DS}$ = $V_{GS}$, $I_D$ = 10 mA, $T_J$ = 150 °C | - | 1.9 | - | |
| Gate Resistance | $R_G$ | f = 1 MHz, $V_{AC}$ = 25 mV | - | 1.0 | - | Ω |


Rev /,. , Revised: 10/31/17

## Electrical Characteristics ($T_J$ = 25 °C unless otherwise specified)

| Characteristics | Symbol | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| Dynamic Characteristics | | | | | | |
| Turn-on Switching Energy | $E_{ON}$ | $V_{DD}$ = 800 V, $I_D$ = 20 A, $V_{GS}$ = -5/+20 V, $R_{G,ext}$ = 2 Ω, L = 1.4 mH | - | 270 | - | µJ |
| Turn-off Switching Energy | $E_{OFF}$ | | - | 60 | - | |
| Total Per-cycle Switching Energy | $E_{TS}$ | | - | 330 | - | |
| Input Capacitance | $C_{ISS}$ | $V_{DD}$ = 800 V, $V_{GS}$ = 0 V, f = 1 MHz, $V_{AC}$ = 25 mV | - | 1825 | - | pF |
| Output Capacitance | $C_{OSS}$ | | - | 75 | - | |
| Reverse Transfer Capacitance | $C_{RSS}$ | | - | 15 | - | |
| $C_{OSS}$ Stored Energy | $E_{OSS}$ | | - | 25 | - | µJ |
| Total Gate Charge | $Q_g$ | $V_{DD}$ = 800 V, $I_D$ = 20 A, $V_{GS}$ = -5/+20 V | - | 95 | - | nC |
| Gate-source Charge | $Q_{gs}$ | | - | 29 | - | |
| Gate-drain Charge | $Q_{gd}$ | | - | 39 | - | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$ = 800 V, $V_{GS}$ = -5/+20 V, $I_D$ = 20 A, $R_{G,ext}$ = 2 Ω, $R_L$ = 40 Ω, Timing relative to $V_{DS}$ | - | 10 | - | ns |
| Rise Time | $t_r$ | | - | 10 | - | |
| Turn-off Delay Time | $t_{d(off)}$ | | - | 16 | - | |
| Fall Time | $t_f$ | | - | 6 | - | |

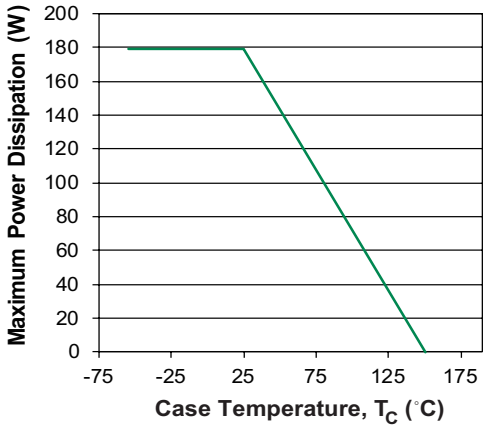
## Reverse Diode Characteristics

| Characteristics | Symbol | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| Diode Forward Voltage | $V_{SD}$ | $I_S$ = 10 A, $V_{GS}$ = 0 V | - | 3.8 | - | V |
| | | $I_S$ = 10 A, $V_{GS}$ = 0 V, $T_J$ = 150 °C | - | 3.4 | - | |
| Continuous Diode Forward Current | $I_S$ | $V_{GS}$ = 0 V, $T_C$ = 25 °C | - | - | 35 | A |
| Peak Diode Forward Current [1] | $I_{SP}$ | | - | - | 85 | |
| Reverse Recovery Time | $t_{rr}$ | $V_{GS}$ = -5 V, $I_S$ = 20 A, $V_R$ = 800 V, dI/dt = 5.3 A/ns | - | 25 | - | ns |
| Reverse Recovery Charge | $Q_{rr}$ | | - | 185 | - | nC |
| Peak Reverse Recovery Current | $I_{rrm}$ | | - | 16 | - | A |

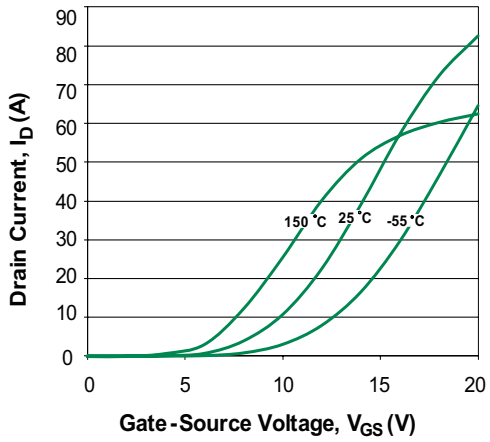
Footnote 1: Pulse width limited by $T_{J,max}$


Revised: 10/31/17

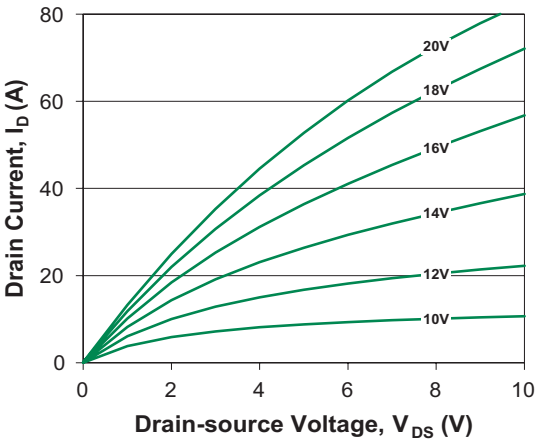
## Figure 1: Maximum Power Dissipation ( $T_J$ = 150 °C )



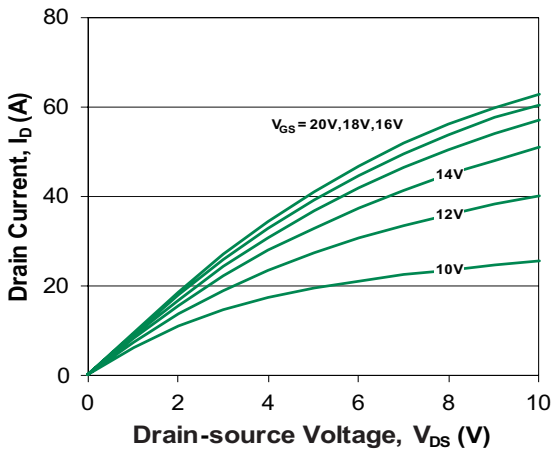

## Figure 2: Transfer Characteristics ( $V_{DS}$ = 10 V )



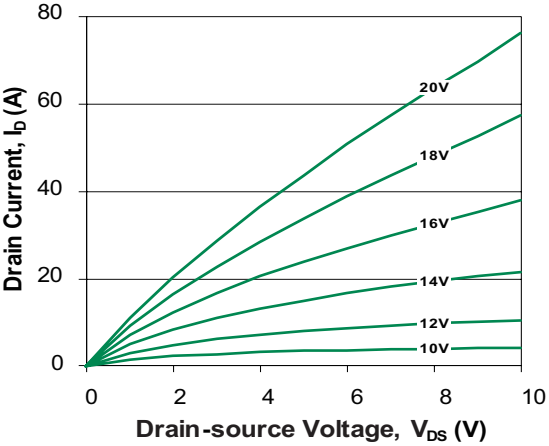

## Figure 3: Output Characteristics ( $T_J$ = 25 °C )



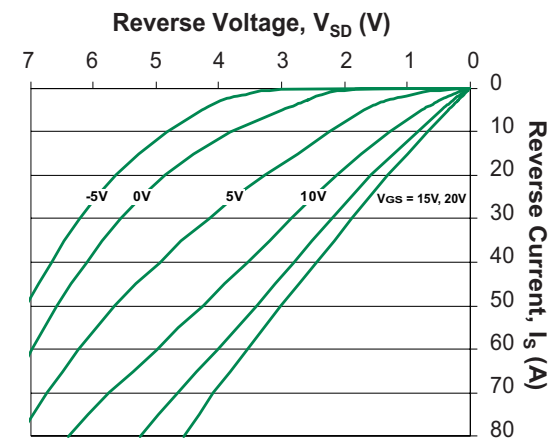

## Figure 4: Output Characteristics ( $T_J$ = 150 °C )



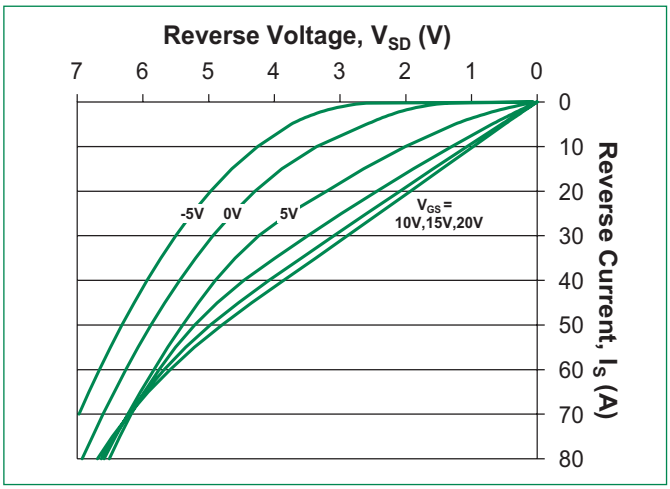

## Figure 5: Output Characteristics ( $T_J$ = -55 °C )



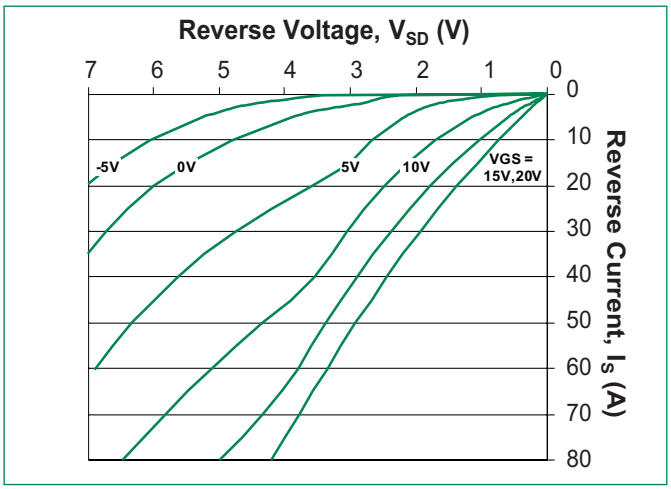

## Figure 6: Reverse Conduction Characteristics ( $T_J$ = 25 °C )



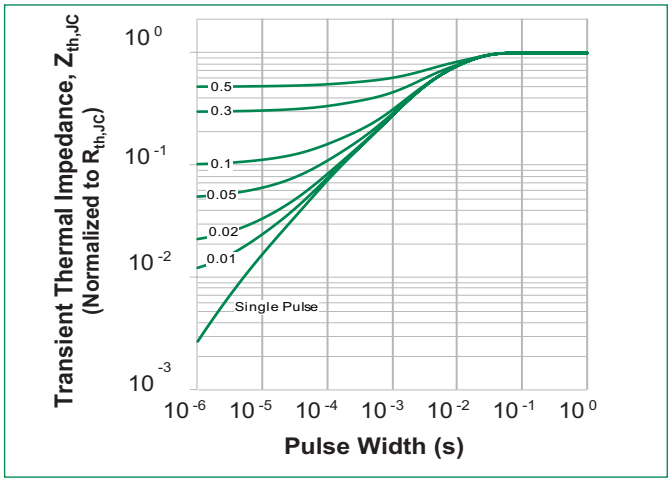
## Figure 7: Reverse Conduction Characteristics ($T_J$ = 150 °C )



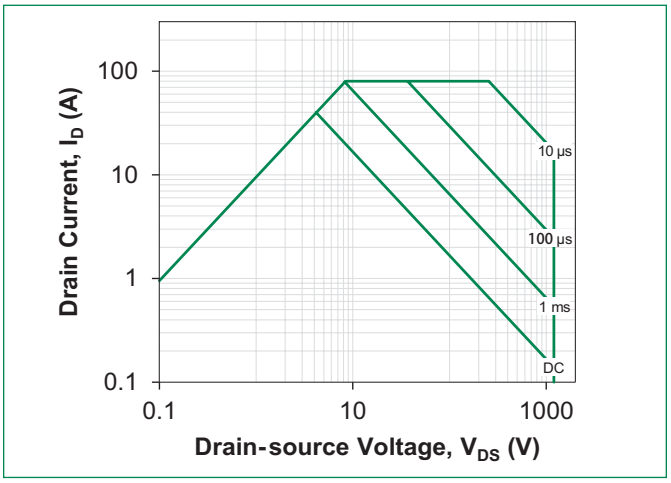

## Figure 8: Reverse Conduction Characteristics ($T_J$ = -55 °C )



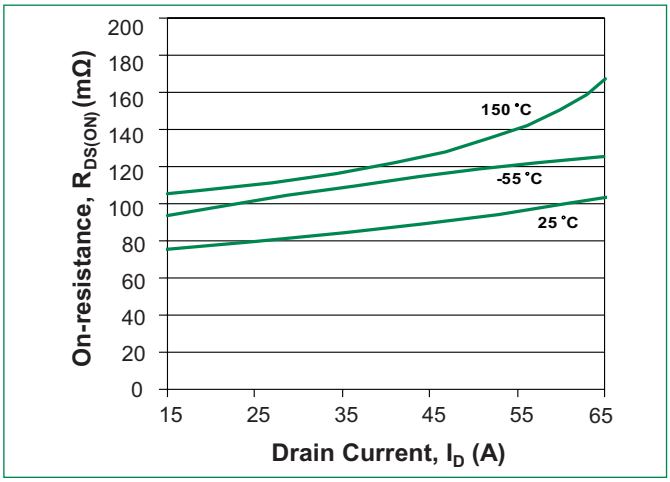

## Figure 9: Transient Thermal Impedance



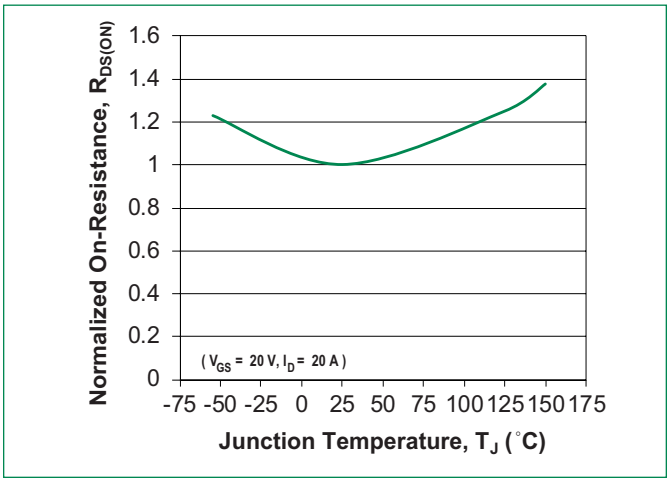

## Figure 10: Safe Operating Area ($T_C$ = 25 °C )




## Figure 11: On-resistance vs. Drain Current



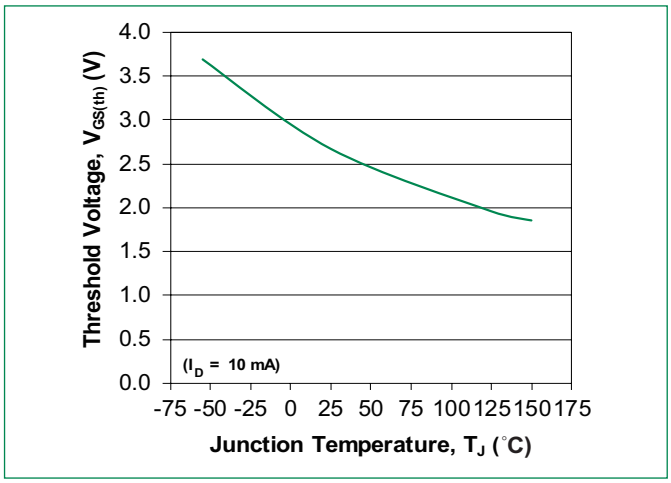

## Figure 12: Normalized On-resistance



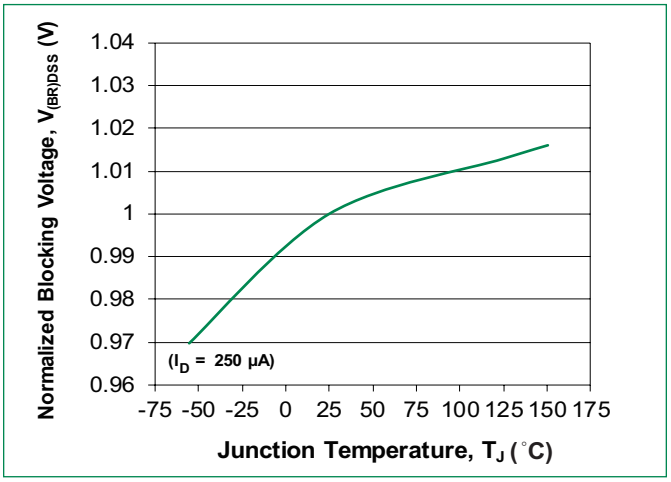


Revised: 10/31/17

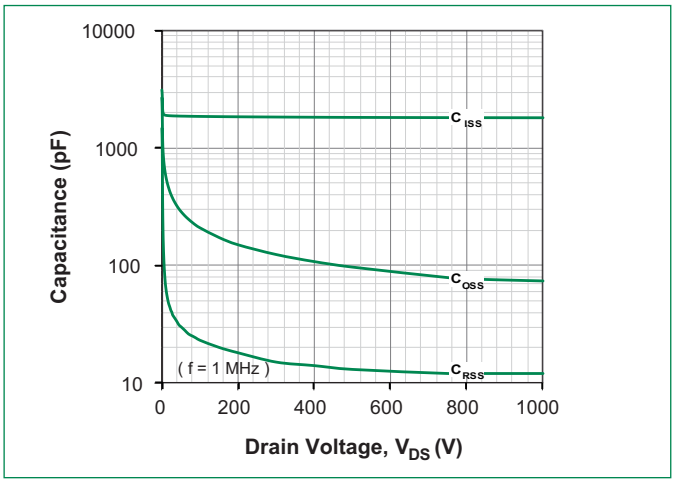
## Figure 13: Threshold Voltage



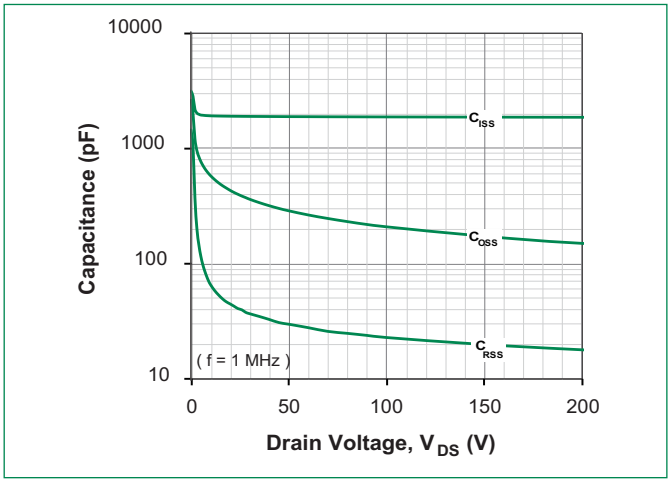

## Figure 14: Drain-source Blocking Voltage



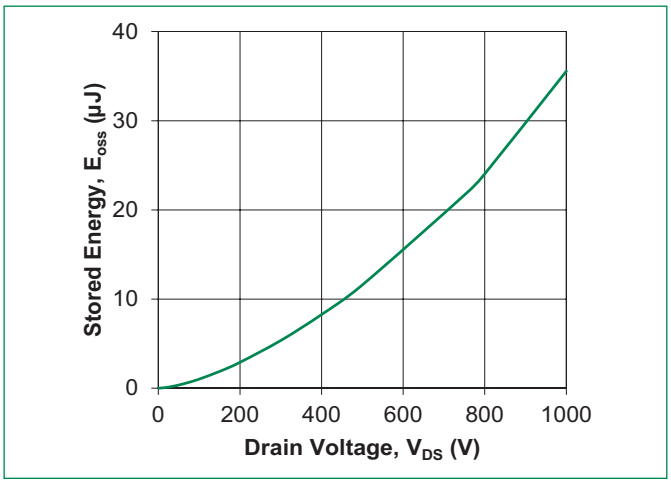

## Figure 15: Junction Capacitances



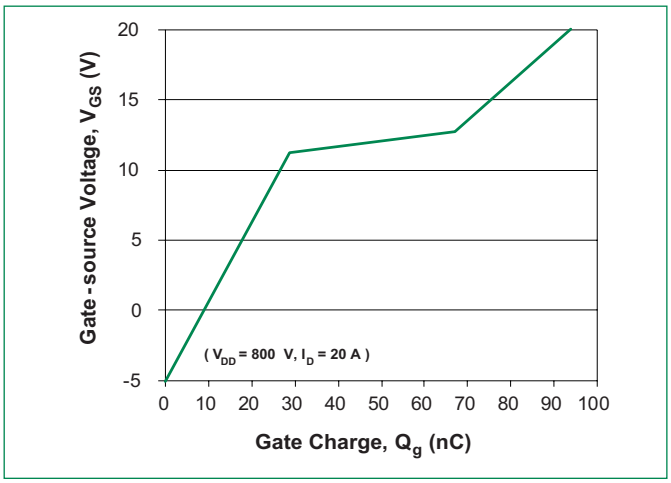

## Figure 16: Junction Capacitances



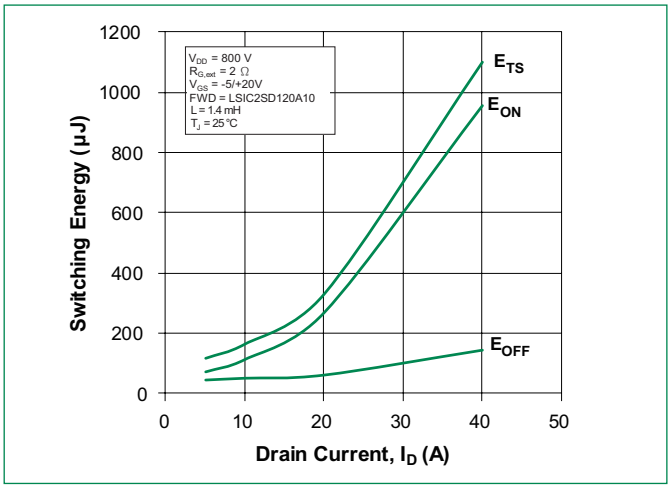

## Figure 17: $C_{OSS}$ Stored Energy $E_{OSS}$



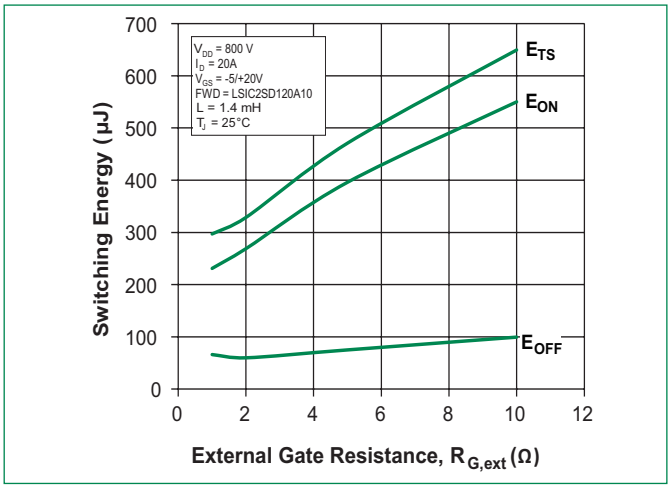

## Figure 18: Gate Charge



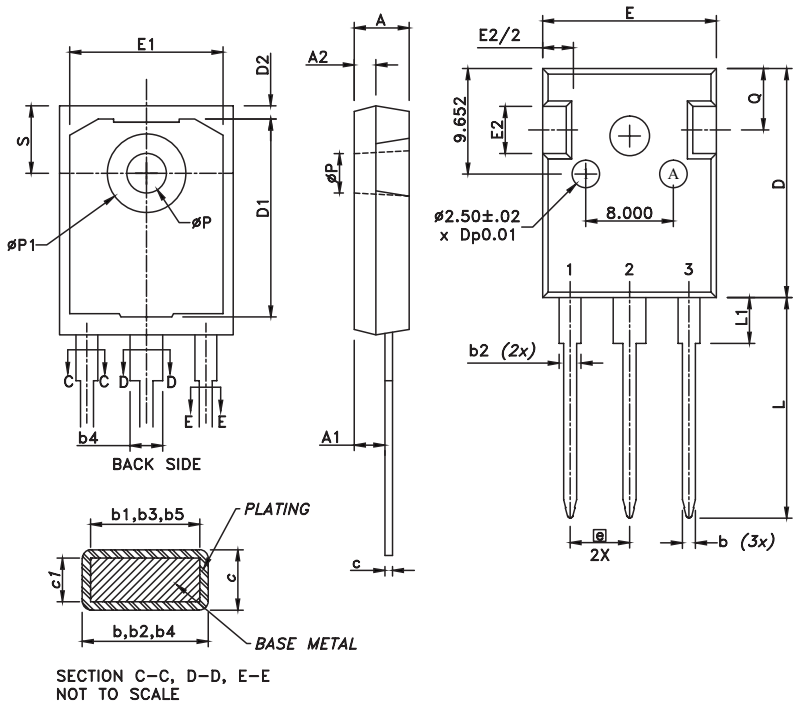
## Figure 19: Switching Energy vs. Drain Current




## Figure 20: Switching Energy vs. Gate Resistance

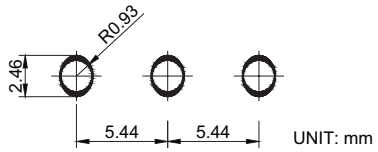



## Package Dimensions TO-247-3L




| Symbol | Millimeters | | |
|---|---|---|---|
| | Min | Nom | Max |
| A | 4.902 | 5.029 | 5.156 |
| A1 | 2.253 | 2.380 | 2.507 |
| A2 | 1.854 | 1.981 | 2.108 |
| D | 20.828 | 20.955 | 21.082 |
| E | 15.773 | 15.900 | 16.027 |
| E2 | 4.191 | 4.318 | 4.445 |
| E2/2 | 1.473 | 1.524 | 1.575 |
| e | | 5.436 | |
| L | 20.066 | 20.193 | 20.320 |
| L1 | 3.937 | 4.191 | 4.445 |
| øP | 3.556 | 3.067 | 3.658 |
| Q | 5.486 | 5.613 | 5.740 |
| S | 6.045 | 6.172 | 6.299 |
| b | 0.991 | - | 1.397 |
| b1 | 0.991 | 1.199 | 1.346 |
| b2 | 1.651 | - | 2.387 |
| b3 | 1.651 | 1.999 | 2.336 |
| b4 | 2.591 | - | 3.429 |
| b5 | 2.591 | 3.000 | 3.378 |
| c | 0.381 | 0.635 | 0.889 |
| c1 | 0.381 | 0.610 | 0.838 |
| D1 | 17.399 | 17.526 | 17.653 |
| D2 | 1.067 | 1.194 | 1.321 |
| E1 | 13.894 | 14.021 | 14.148 |
| øP1 | 7.061 | 7.188 | 7.315 |

### Recommended Hole Pattern Layout



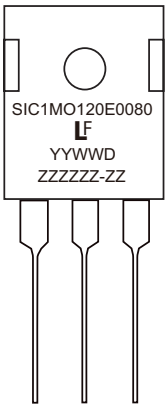

Notes:
1. Dimensions are in millimeters
2. Dimension D, E do not include mold flash. Mold flash shall not exceed 0.127 mm per side measured at outer most extreme of plastic body.
3. øP to have a maximum draft angle of 38.1 mm to the top of the part with a maximum hole diameter of 3.912 mm.


Revised: 10/31/17

# SiC MOSFET

## LSIC1MO120E0080, 1200 V, 80 mOhm, TO-247-3L

## Part Numbering and Marking System

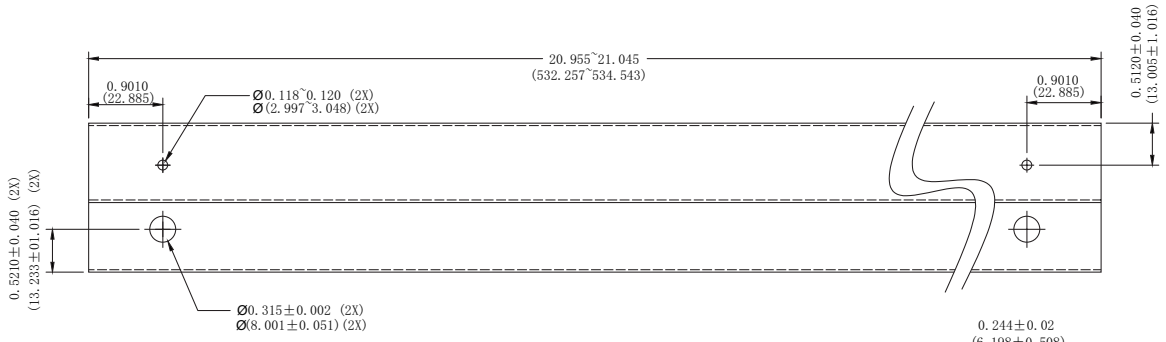


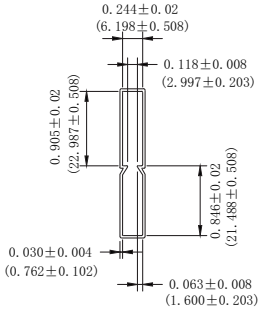

| | |
|---|---|
| SIC | = SiC |
| 1 | = Gen1 |
| MO | = MOSFET |
| 120 | = Voltage Rating (1200 V) |
| E | = TO-247-3L |
| 0080 | = $R_{DS(ON)}$ (80 mOhm) |
| YY | = Year |
| WW | = Week |
| D | = Special Code |
| ZZZZZZ-ZZ | = Lot Number |

## Packing Options

| Part Number | Marking | Packing Mode | M.O.Q |
|---|---|---|---|
| LSIC1MO120E0080 | SIC1MO120E0080 | Tube | 450 |

## Packing Specification TO-247-3L




**NOTE:**

***1. All pin plug holes are considered critical dimension***
**2. Tolerance is to be ±0.010 unless otherwise specified**
**3. Dimension are in inch (and millimeters).**


Rev /, , Revised: 10/31/17