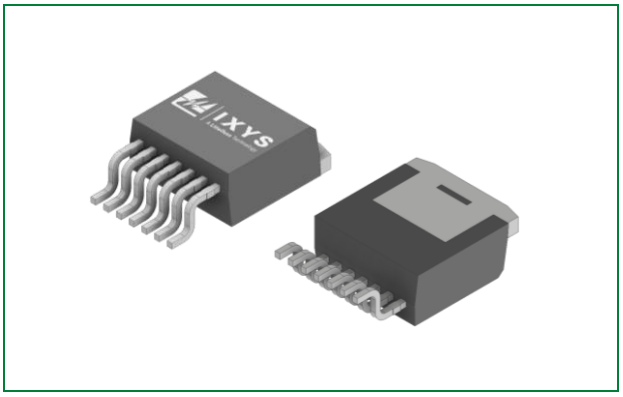
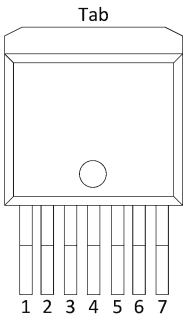
# LSIC1MO170T0750
# 1700 V, 750 mOhm N-Channel SiC MOSFET

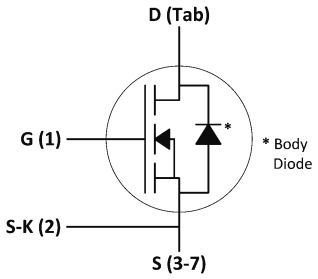


## Agency Approvals and Environmental

| Environmental Approvals |
|---|
| RoHS HF |

## Pinout Diagram




## Product Summary

| Characteristic | Value | Unit |
|---|---|---|
| $V_{DS}$ | 1700 | V |
| Typical $R_{DS(ON)}$ | 750 | mOhm |
| $I_D$ ($T_C \leq 100$ °C) | 4.5 | A |

## Features

- Optimized for high-frequency, high-efficiency applications
- Extremely low gate charge and output capacitance
- Low gate resistance for high-frequency switching
- Normally-off operations at all temperatures
- Ultra-low on-resistance
- Optimized package with separate driver source pin
- MSL 1 Rated

## Applications

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

## 1. Maximum Ratings

| Characteristic | Symbol | Conditions | Value | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | $V_{GS}$ = 0 V | 1700 | V |
| Continuous Drain Current | $I_D$ | $V_{GS}$ = 20 V, $T_C$ = 25 °C | 6.4 | A |
| | | $V_{GS}$ = 20 V, $T_C$ = 100 °C | 4.5 | |
| Pulsed Drain Current [1] | $I_{D(pulse)}$ | $T_C$ = 25 °C | 11 | A |
| Power Dissipation | $P_D$ | $T_C$ = 25 °C, $T_J$ = 175 °C | 65 | W |
| Gate-Source Voltage | $V_{GS,MAX}$ | Absolute maximum values – Steady state | –6 to +22 | V |
| | $V_{GS,OP,TR}$ [2] | Transient, $t_{transient}$ < 300 nsec | –10 to +25 | |
| | $V_{GS,OP}$ [3] | Recommended DC operating values | –5 to +20 | |
| Operating Junction Temperature | $T_J$ | - | –55 to +175 | °C |
| Storage Temperature | $T_{STG}$ | - | –55 to +150 | °C |
| Lead Temperature for Soldering (MSL 1 Rated) | $T_{SOLD}$ | - | 260 | °C |

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

Footnote 2: See Figure 21 for further information

Footnote 3: MOSFET can operate with $V_{GS(OFF)}$ = 0 V – dependent upon PCB layout. $V_{GS(OFF)}$ = –5 V provides added noise margin and faster turn-off speed

## 2. Thermal Characteristics

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Maximum Thermal Resistance, junction-to-case | $R_{th,JC,MAX}$ | 2.3 | °C/W |
| Maximum Thermal Resistance, junction-to-ambient | $R_{th,JA,MAX}$ | 40 | °C/W |

## 3. Electrical Characteristics

### 3.1. Static Characteristics ($T_J$ = 25 °C unless otherwise specified)

| Characteristic | Symbol | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0 V, $I_D$ = 100 µA | 1700 | - | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 1700, $V_{GS}$ = 0 V | - | 0.05 | 10 | µA |
| | | $V_{DS}$ = 1700 V, $V_{GS}$ = 0 V, $T_J$ = 175 °C | - | 0.1 | - | |
| Gate Leakage Current | $I_{GSS,F}$ | $V_{GS}$ = 22 V, $V_{DS}$ = 0 V | - | - | 100 | nA |
| | $I_{GSS,R}$ | $V_{GS}$ = –6 V, $V_{DS}$ = 0 V | - | - | 100 | |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $I_D$ = 2 A, $V_{GS}$ = 20 V | - | 750 | 1000 | mΩ |
| | | $I_D$ = 2 A, $V_{GS}$ = 20 V, $T_J$ = 175 °C | - | 1550 | - | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 1 mA | 1.8 | 2.8 | 4.0 | V |
| | | $V_{DS}$ = $V_{GS}$, $I_D$ = 1 mA, $T_J$ = 175 °C | - | 1.9 | - | |
| Gate Resistance | $R_G$ | Resonance method, Drain-Source shorted[1] | - | 29 | - | Ω |

Footnote 1: For a description of the resonance method for measuring $R_G$, refer to the JEDEC Standard JESD24-11 test method

## 3.2. Dynamic Characteristics ($T_J$ = 25 °C unless otherwise specified)

| Characteristic | Symbol | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| Turn-On Switching Energy | $E_{ON}$ | $V_{DD}$ = 1200 V, $I_D$ = 2 A, $V_{GS}$ = -5 / +20 V, $R_{G,ext}$ = 2 Ω, L = 1.4 mH, FWD = LSIC1MO170T0750 | - | 80 | - | mJ |
| Turn-Off Switching Energy | $E_{OFF}$ | | - | 43 | - | |
| Total Per-Cycle Switching Energy | $E_{TS}$ | | - | 123 | - | |
| Input Capacitance | $C_{ISS}$ | $V_{DD}$ = 1000 V, $V_{GS}$ = 0 V, f = 1 MHz, $V_{AC}$ = 25 mV | - | 200 | - | pF |
| Output Capacitance | $C_{OSS}$ | | - | 11.5 | - | |
| Reverse Transfer Capacitance | $C_{RSS}$ | | - | 1.7 | - | |
| COSS Stored Energy | $E_{OSS}$ | | - | 5.7 | - | µJ |
| Total Gate Charge | $Q_g$ | $V_{DD}$ = 1200 V, $I_D$ = 2 A, $V_{GS}$ = -5 / +20 V | - | 11 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 4 | - | |
| Gate-Drain Charge | $Q_{gd}$ | | - | 5 | - | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD}$ = 1200 V, $V_{GS}$ = -5 / +20 V, $I_D$ = 2 A, $R_{G,ext}$ = 2 Ω, $R_L$ = 600 Ω, Timing relative to $V_{DS}$ | - | 8 | - | ns |
| Rise Time | $t_r$ | | - | 15 | - | |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 27 | - | |
| Fall Time | $t_f$ | | - | 173 | - | |

## 4. Reverse Diode Characteristics

| Characteristic | Symbol | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| Diode Forward Voltage | $V_{SD}$ | $I_S$ = 1 A, $V_{GS}$ = 0 V | - | 3.6 | - | V |
| | | $I_S$ = 1 A, $V_{GS}$ = 0 V, $T_J$ = 175 °C | - | 3.2 | - | |
| Continuous Diode Forward Current | $I_S$ | $V_{GS}$ = 0 V, $T_C$ = 25 °C | - | - | 10 | A |
| Peak Diode Forward Current [1] | $I_{SP}$ | | - | - | 15 | |

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

## 5. Figure Data

Figure 1. Maximum Power Dissipation ($T_J$ = 175 °C)

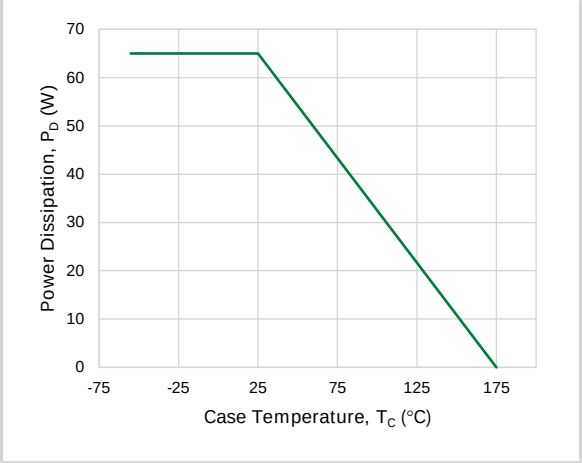



Figure 2. Typical Transfer Characteristics

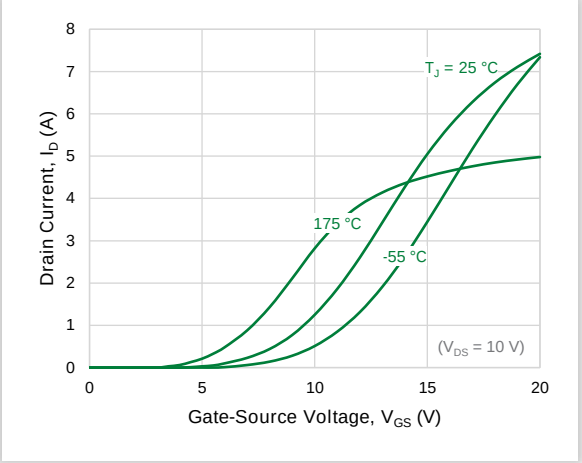



Figure 3. Typical Output Characteristics ($T_J$ = 25 °C)

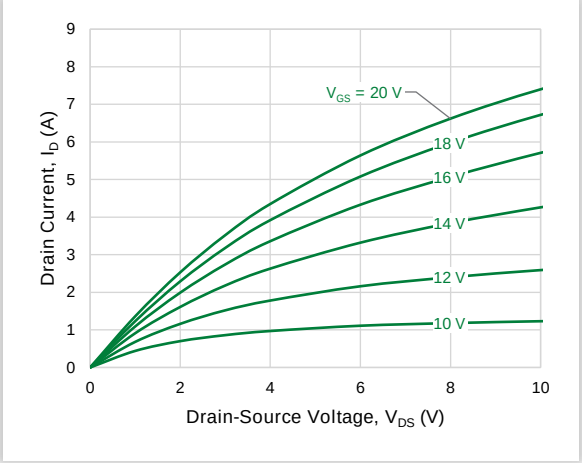



Figure 4. Typical Output Characteristics ($T_J$ = 175 °C)

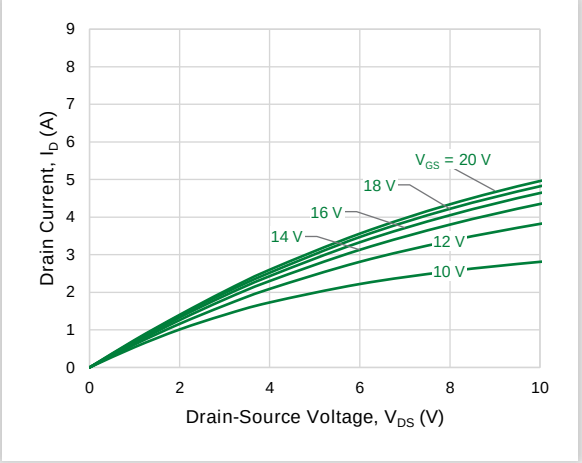



Figure 5. Typical Output Characteristics ($T_J$ = -55 °C)

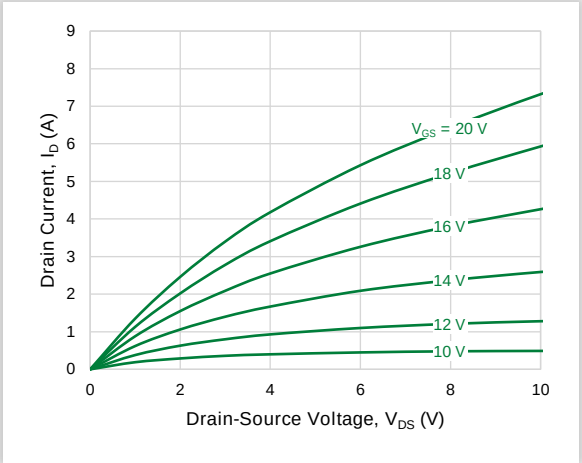



Figure 6. Typical Reverse Conduction Characteristics ($T_J$ = 25 °C)

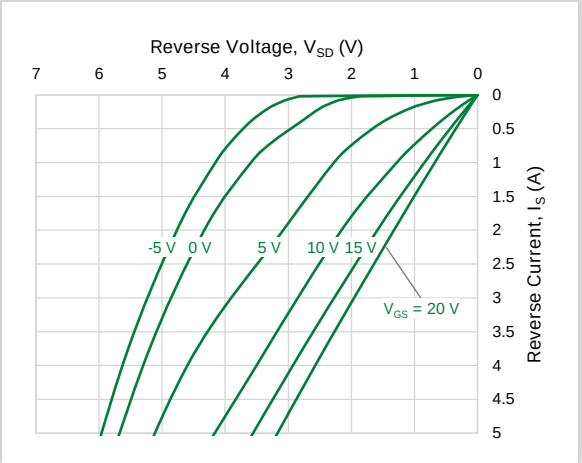


Figure 7. Typical Reverse Conduction Characteristics ($T_J$ = 175 °C)

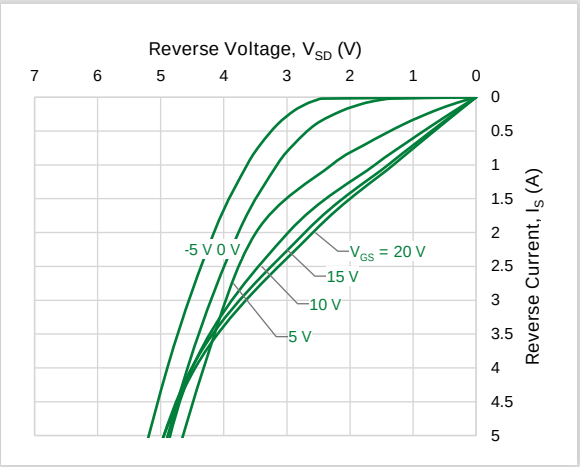



Figure 8. Typical Reverse Conduction Characteristics ($T_J$ = -55 °C)

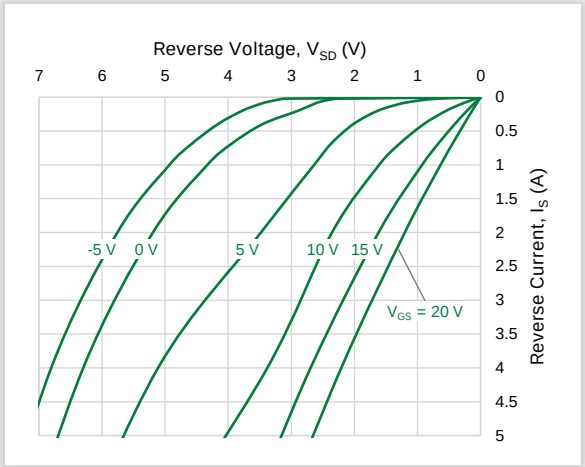



Figure 9. Normalized Transient Thermal Impedance

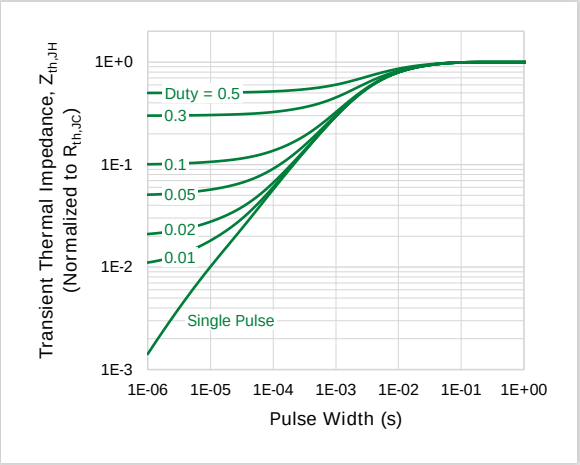



Figure 10. Maximum Safe Operating Area ($T_C$ = 25 °C)

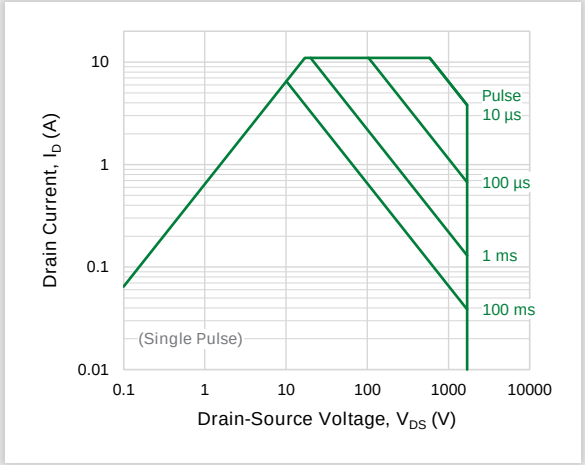



Figure 11. Typical On-resistance vs. Drain Current

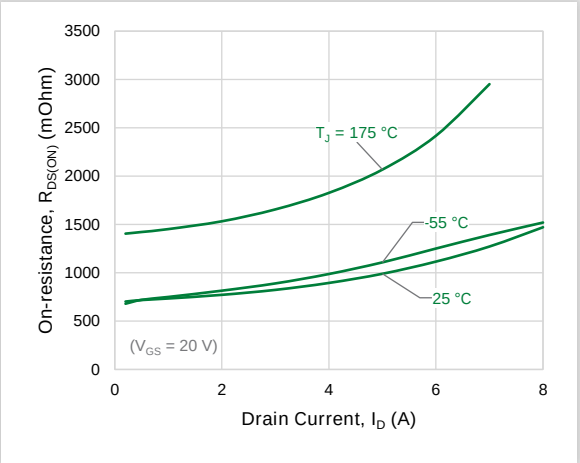



Figure 12. Normalized On-resistance vs. Junction Temperature

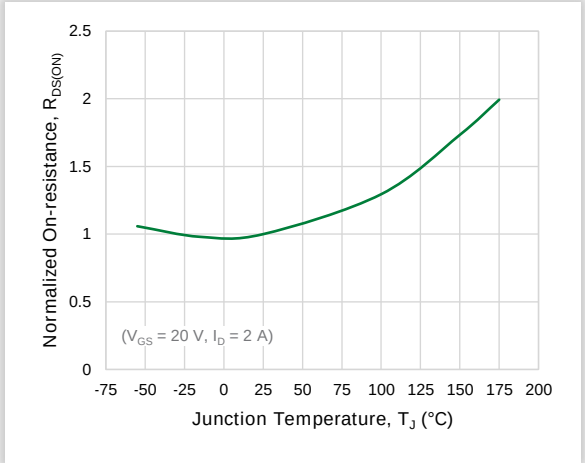


Figure 13. Typical On-resistance vs. Junction Temperature

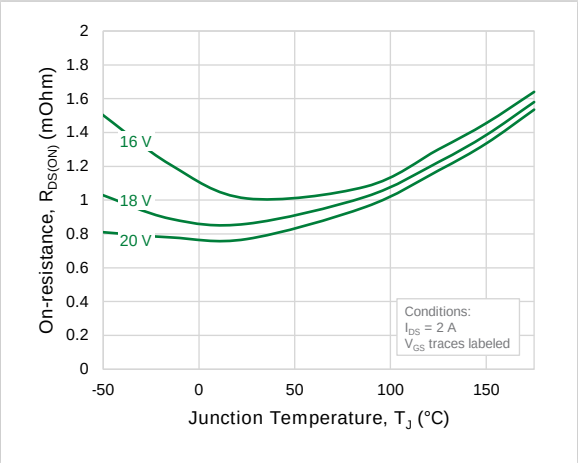



Figure 14. Typical Threshold Voltage

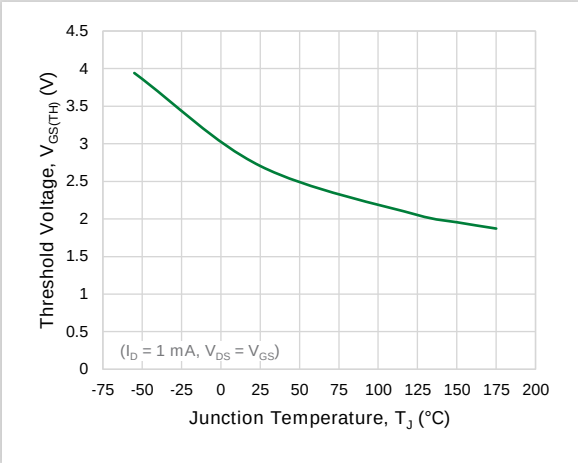



Figure 15. Typical Junction Capacitances up to 1000 V

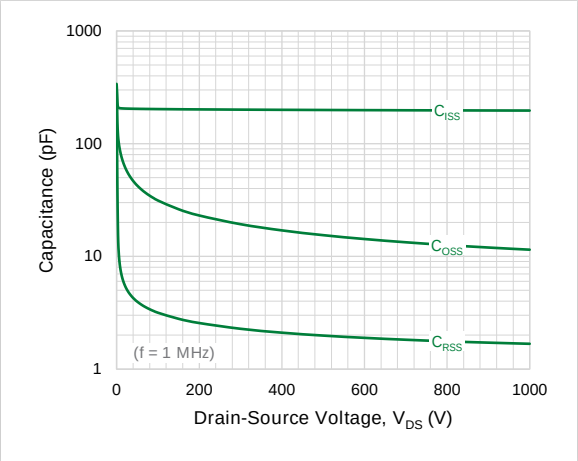



Figure 16. Typical Junction Capacitances up to 200 V

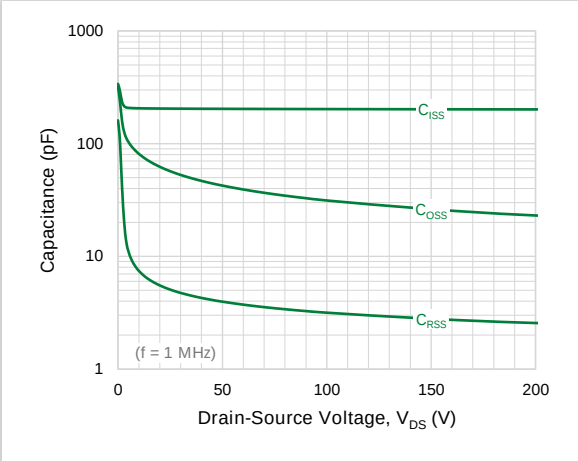



Figure 17. Typical $C_{OSS}$ Stored Energy $E_{OSS}$

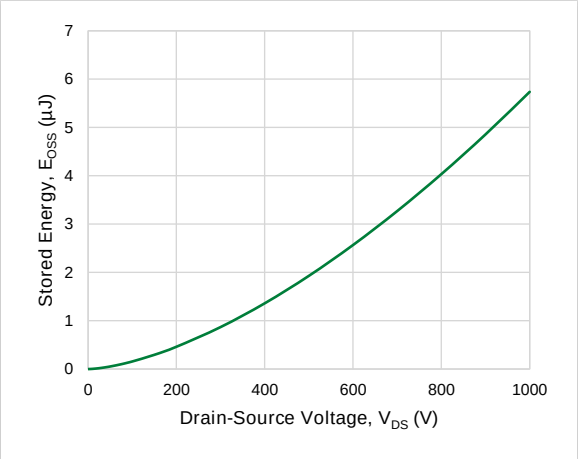



Figure 18. Typical Gate Charge

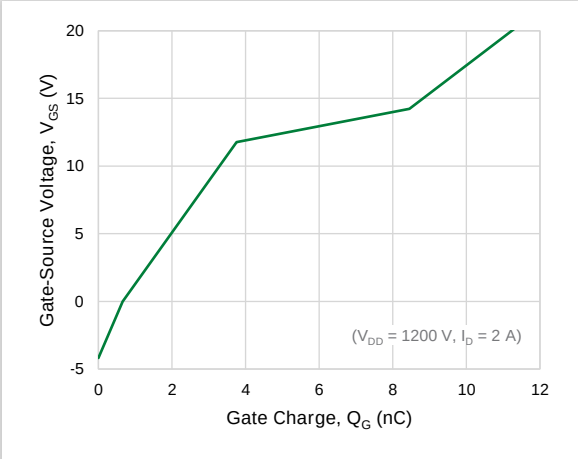


Figure 19. Typical Switching Energy vs. Drain Current

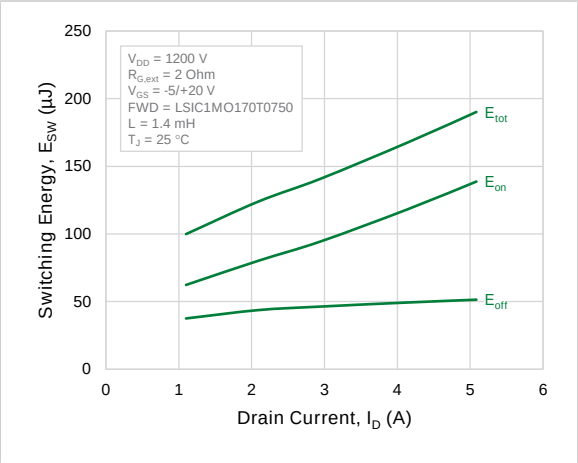



Figure 20. Typical Switching Energy vs. External Gate Resistance

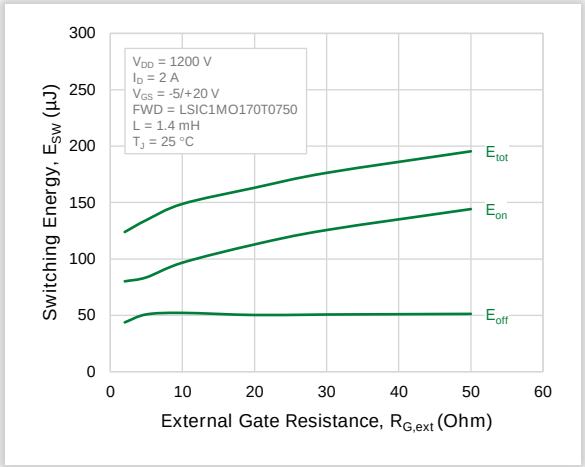
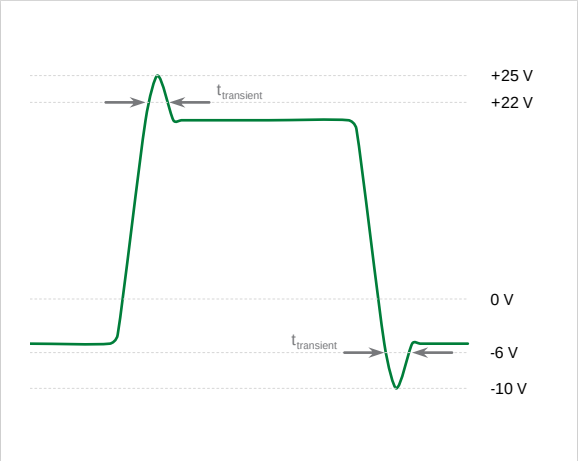
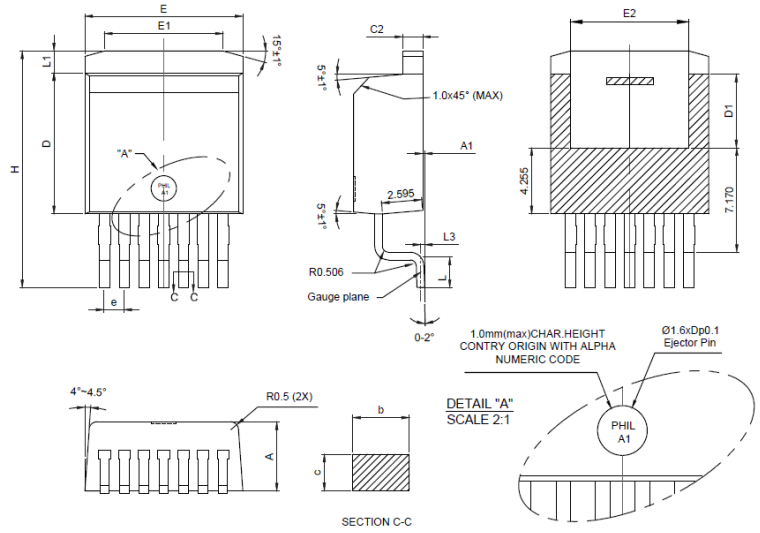



Figure 21. $V_{GS}$ Waveform Definitions



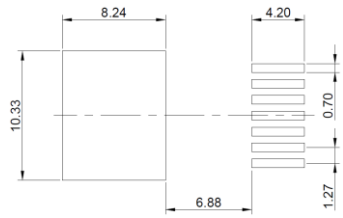
## 6. Package Dimensions




| Symbol | Millimeters | | |
|---|---|---|---|
| | Min | Nom | Max |
| A | 4.300 | 4.435 | 4.570 |
| A1 | 0.000 | 0.125 | 0.250 |
| b | 0.500 | 0.600 | 0.700 |
| c | 0.330 | 0.490 | 0.650 |
| C2 | 1.170 | 1.285 | 1.400 |
| D | 9.025 | 9.075 | 9.125 |
| D1 | 4.656 | 4.733 | 4.810 |
| E | 10.130 | 10.180 | 10.230 |
| E1 | 6.500 | 7.550 | 8.600 |
| E2 | 6.778 | 7.223 | 7.665 |
| e | 1.220 | 1.270 | 1.320 |
| H | 15.043 | 16.178 | 17.121 |
| L | 2.324 | 2.512 | 2.700 |
| L1 | 1.160 | 1.418 | 1.676 |
| L3 | | 0.254 | |

Recommended Solder Pad Layout:

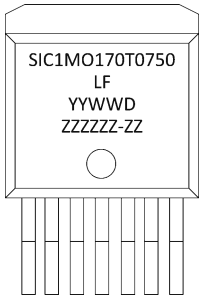
UNIT: mm




Notes:

1. Dimensions D & E do not include mold flash. Mold flash shall not exceed 0.127 mm per side. These dimensions are measured at the outermost extreme of the plastic body.
2. Package is designed for high voltage and does not conform to JEDEC std.
3. Top package/marking surface finish: 16-18 VDI.

## 7. Part Numbering and Marking

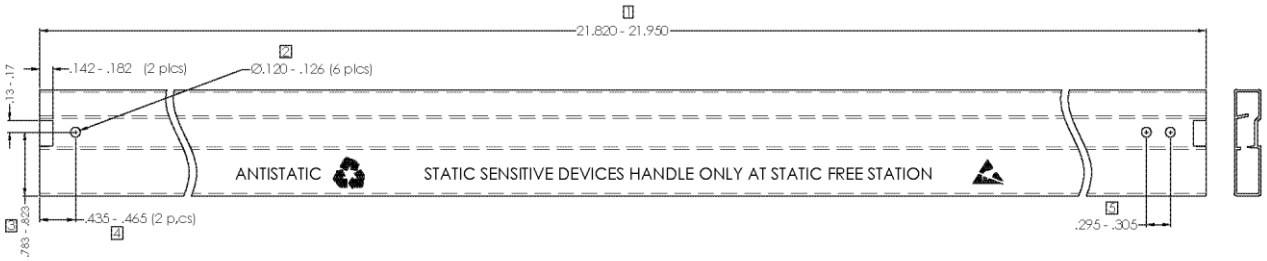



| | |
|---|---|
| SiC | = SiC |
| 1 | = Gen 1 |
| MO | = MOSFET |
| 170 | = Voltage Rating (1700 V) |
| T | = TO-263-7L |
| 0750 | = $R_{DS(ON)}$ (750 mOhm) |
| YY | = Year |
| WW | = Week |
| D | = Special Code |
| ZZZZZZ-ZZ | = Lot Number |

## 8. Packing Options

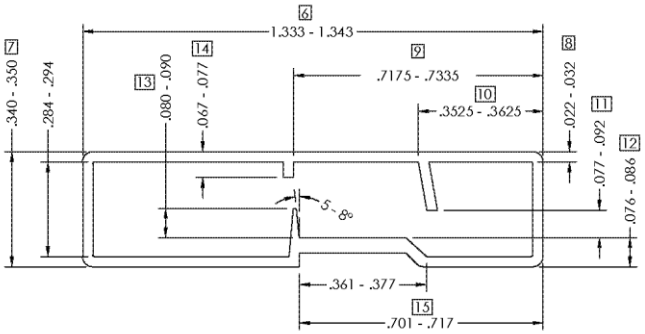
| Part Number | Marking | Packing Mode | M.O.Q. |
|---|---|---|---|
| LSIC1MO170T0750 | SIC1MO170T0750 | Tube (50 Pcs) | 400 |

## 9. Packing Specifications




**Notes:**

1. Clear PVC material with anti-static coating
2. Radius is a maximum of 0.5 unless otherwise specified
3. Critical areas are labeled in box
4. All pin plug holes are considered critical dimension
5. Material thickness is 0.75 ±0.10
6. Tolerance unless otherwise specified is : Decimal ±0.05 Angle ±1°
7. Dimensions are in inches

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