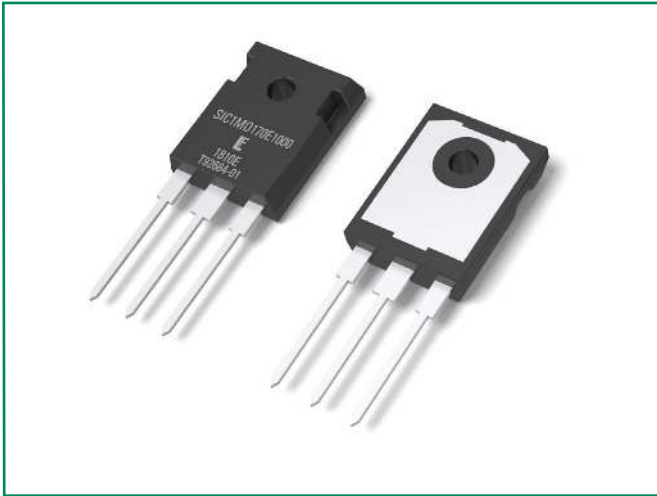


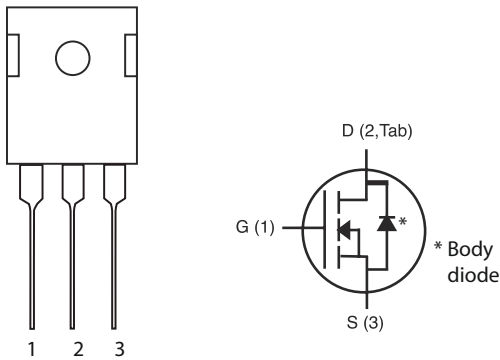
LSIC1MO170E1000 1700 V N-channel, Enhancement-mode SiC MOSFET **HF** **RoHS** **Pb**



**Product Summary**

Characteristics	Value	Unit
$V_{DS}$	1700	V
Typical $R_{DS(ON)}$	750	mΩ
$I_D$ ( $T_c \leq 100\text{ }^\circ\text{C}$ )	3.5	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

### Maximum Ratings

Characteristics	Symbol	Conditions	Value	Unit
Continuous Drain Current	$I_D$	$V_{GS} = 20\text{ V}, T_C = 25\text{ }^\circ\text{C}$	5.0	A
		$V_{GS} = 20\text{ V}, T_C = 100\text{ }^\circ\text{C}$	3.5	
Pulsed Drain Current <sup>1</sup>	$I_{D(pulse)}$	$T_C = 25\text{ }^\circ\text{C}$	15	A
Power Dissipation	$P_D$	$T_C = 25\text{ }^\circ\text{C}, T_J = 150\text{ }^\circ\text{C}$	54	W
Operating Junction Temperature	$T_J$		-55 to 150	$^\circ\text{C}$
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	$^\circ\text{C}$
Lead Temperature for Soldering	$T_{sold}$	-	260	$^\circ\text{C}$
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	max	Unit
Maximum Thermal Resistance, junction-to-case	$R_{\theta JC}$	2.3	$^\circ\text{C}/\text{W}$
Maximum Thermal Resistance, junction-to-ambient	$R_{\theta JA}$	40	$^\circ\text{C}/\text{W}$

### Electrical Characteristics ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)

Characteristics	Symbol	Conditions	Min	Typ	Max	Unit
<b>Static Characteristics</b>						
Drain-source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	1700	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 1700\text{ V}, V_{GS} = 0\text{ V}$	-	0.05	10	$\mu\text{A}$
		$V_{DS} = 1700\text{ V}, V_{GS} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$	-	0.10	-	
Gate Leakage Current	$I_{GSS,F}$	$V_{GS} = 22\text{ V}, V_{DS} = 0\text{ V}$	-	-	100	nA
	$I_{GSS,R}$	$V_{GS} = -6\text{ V}, V_{DS} = 0\text{ V}$	-	-	100	
Drain-source On-state Resistance	$R_{DS(ON)}$	$I_D = 2\text{ A}, V_{GS} = 20\text{ V}$	-	750	1000	m $\Omega$
		$I_D = 2\text{ A}, V_{GS} = 15\text{ V}$	-	1000	-	
		$I_D = 2\text{ A}, V_{GS} = 20\text{ V}, T_J = 150\text{ }^\circ\text{C}$	-	1450	-	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 1\text{ mA}$	1.8	2.5	4.0	V
		$V_{DS} = V_{GS}, I_D = 1\text{ mA}, T_J = 150\text{ }^\circ\text{C}$	-	1.6	-	
Gate Resistance	$R_G$	Resonance method, Drain-Source shorted	-	5.8	-	$\Omega$

### Electrical Characteristics ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)

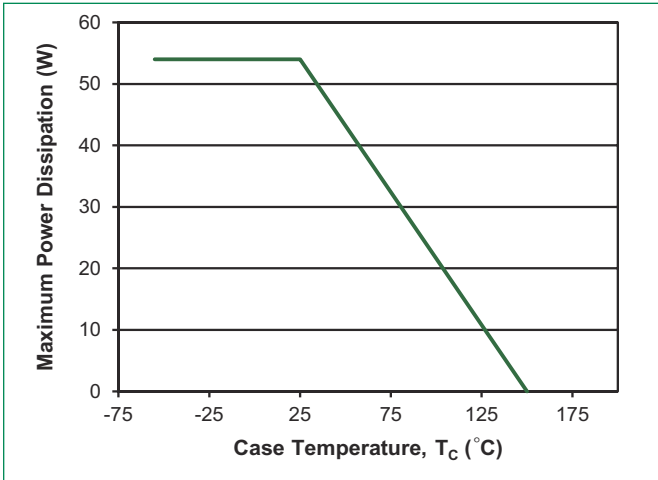
Characteristics	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
<b>Dynamic Characteristics</b>						
Turn-on Switching Energy	$E_{ON}$	$V_{DD} = 1200\text{ V}, I_D = 2\text{ A},$ $V_{GS} = -5/+20\text{ V}, R_{G,ext} = 20\ \Omega,$ $L = 1.4\text{mH}$	-	59	-	$\mu\text{J}$
Turn-off Switching Energy	$E_{OFF}$		-	25	-	
Total Per-cycle Switching Energy	$E_{TS}$		-	84	-	
Input Capacitance	$C_{ISS}$	$V_{DD} = 1000\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}, V_{AC} = 25\text{ mV}$	-	200	-	$\text{pF}$
Output Capacitance	$C_{OSS}$		-	11	-	
Reverse Transfer Capacitance	$C_{RSS}$		-	2	-	
$C_{OSS}$ Stored Energy	$E_{OSS}$		-	5.3	-	
Total Gate Charge	$Q_g$	$V_{DD} = 1200\text{ V}, I_D = 2\text{ A},$ $V_{GS} = -5/+20\text{ V}$	-	15	-	$\text{nC}$
Gate-source Charge	$Q_{gs}$		-	3	-	
Gate-drain Charge	$Q_{gd}$		-	7	-	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 1200\text{ V}, V_{GS} = -5/+20\text{ V},$ $I_D = 2\text{ A}, R_{G,ext} = 20\ \Omega,$ $R_L = 600\ \Omega,$ Timing relative to $V_{DS}$	-	9	-	$\text{ns}$
Rise Time	$t_r$		-	15	-	
Turn-off Delay Time	$t_{d(off)}$		-	17	-	
Fall Time	$t_f$		-	50	-	

### Reverse Diode Characteristics

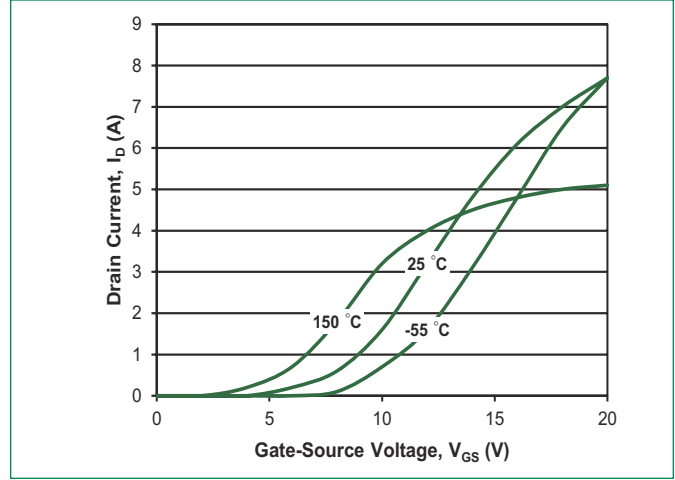
Characteristics	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Diode Forward Voltage	$V_{SD}$	$I_S = 1\text{ A}, V_{GS} = 0\text{ V}$	-	3.7	-	$\text{V}$
		$I_S = 1\text{ A}, V_{GS} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$	-	3.4	-	
Continuous Diode Forward Current	$I_S$	$V_{GS} = 0\text{ V}, T_C = 25\text{ }^\circ\text{C}$	-	-	8	$\text{A}$
Peak Diode Forward Current <sup>1</sup>	$I_{SP}$		-	-	15	

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

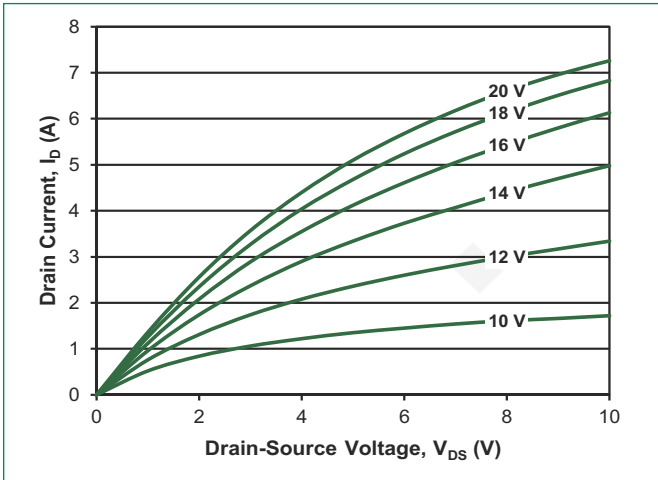
**Figure 1: Maximum Power Dissipation ( $T_J = 150^\circ\text{C}$ )**



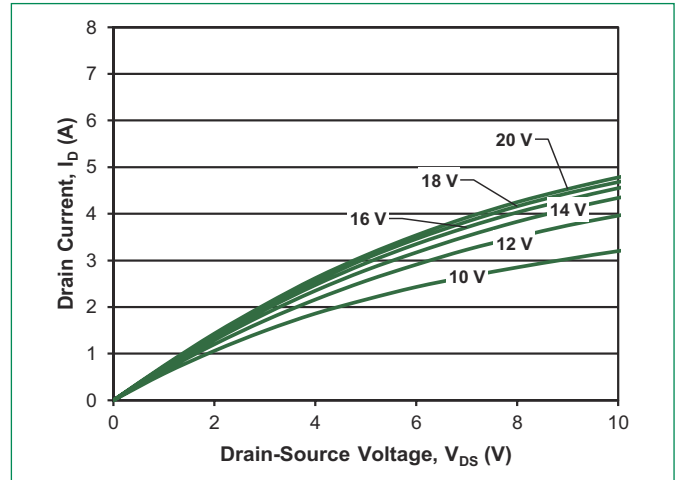
**Figure 2: Transfer Characteristics ( $V_{DS} = 10\text{ V}$ )**



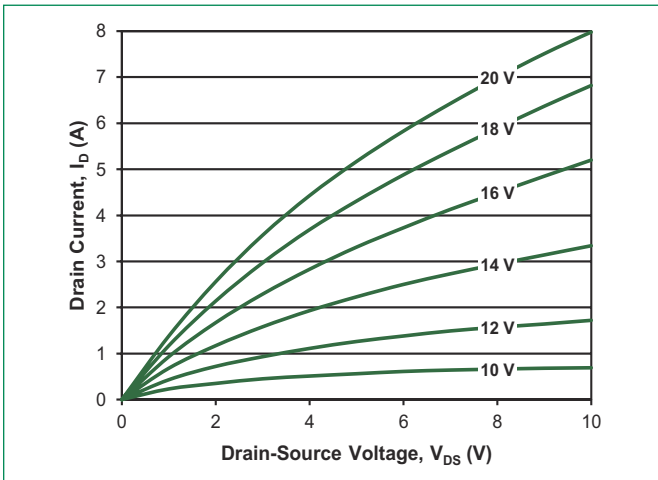
**Figure 3: Output Characteristics ( $T_J = 25^\circ\text{C}$ )**



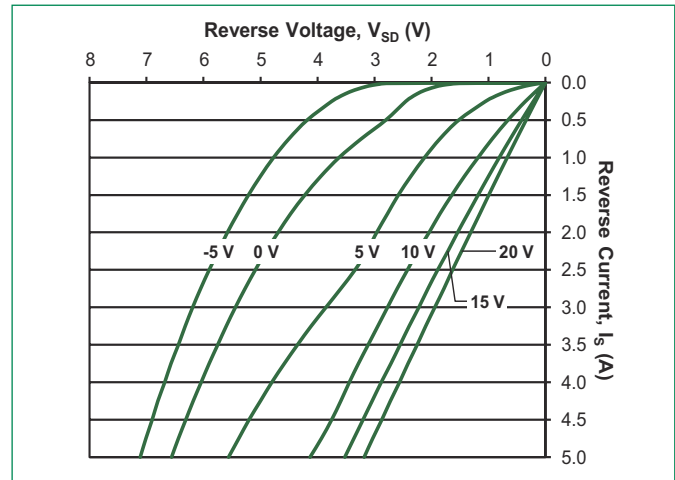
**Figure 4: Output Characteristics ( $T_J = 150^\circ\text{C}$ )**



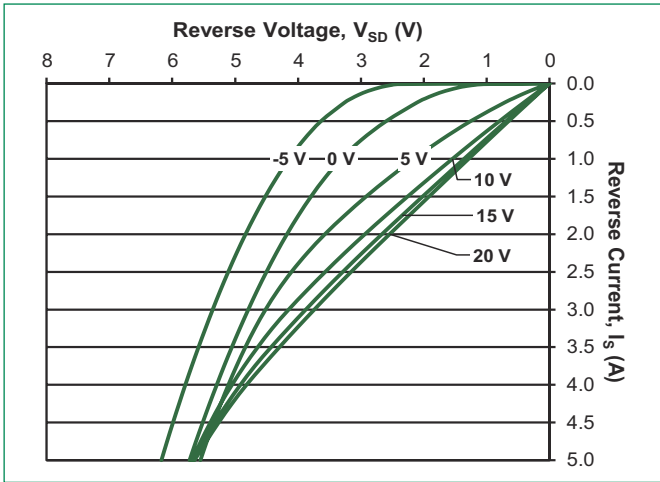
**Figure 5: Output Characteristics ( $T_J = -55^\circ\text{C}$ )**



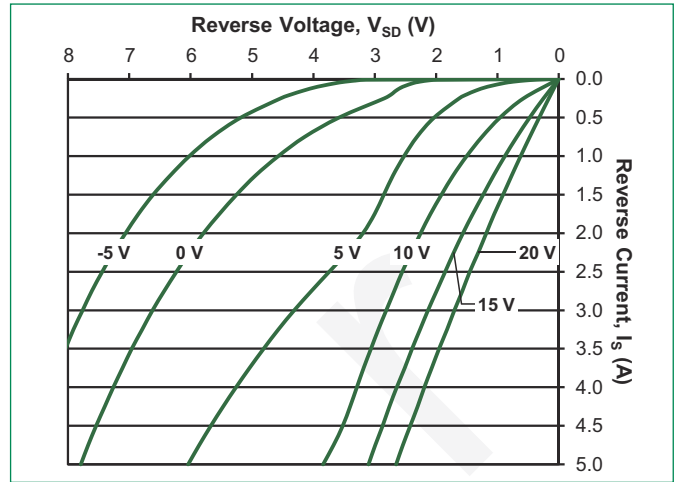
**Figure 6: Reverse Conduction Characteristics ( $T_J = 25^\circ\text{C}$ )**



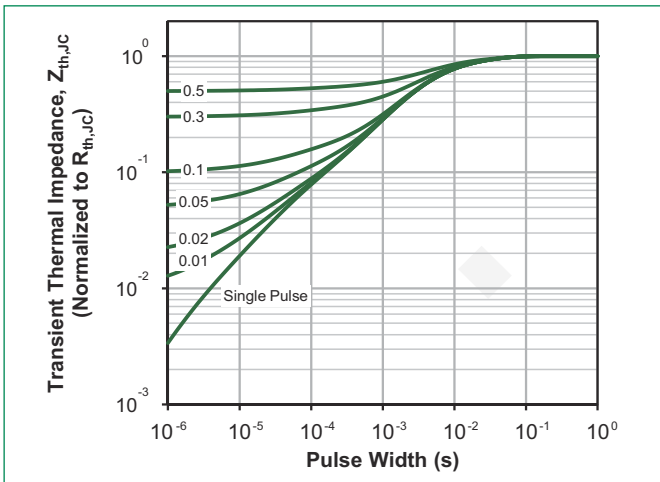
**Figure 7: Reverse Conduction Characteristics ( $T_J = 150\text{ }^\circ\text{C}$ )**



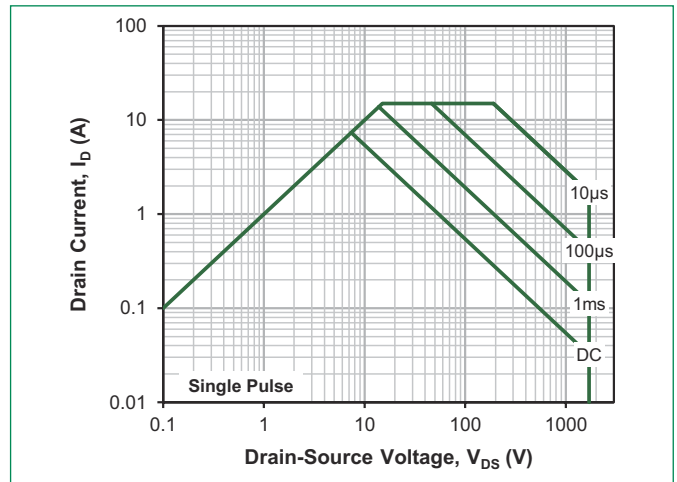
**Figure 8: Reverse Conduction Characteristics ( $T_J = -55\text{ }^\circ\text{C}$ )**



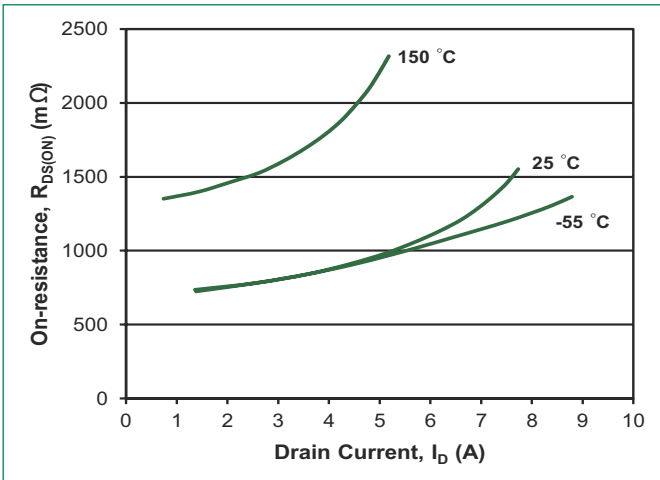
**Figure 9: Transient Thermal Impedance**



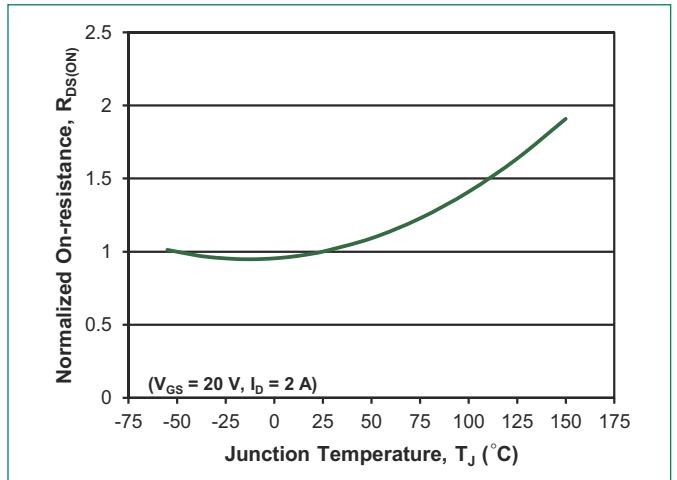
**Figure 10: Safe Operating Area ( $T_c = 25\text{ }^\circ\text{C}$ )**



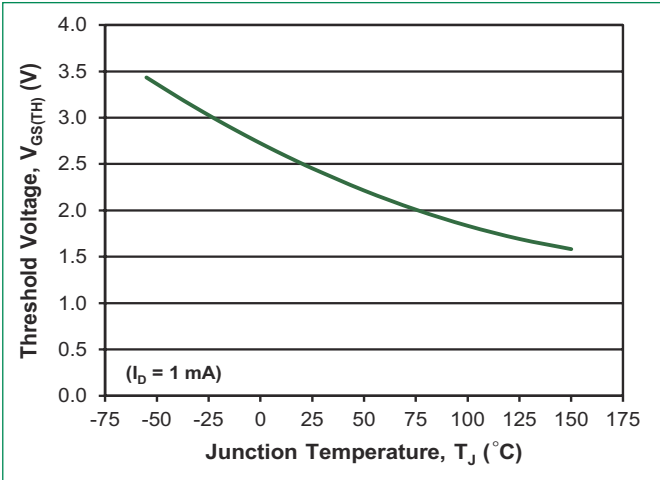
**Figure 11: On-resistance vs. Drain Current**



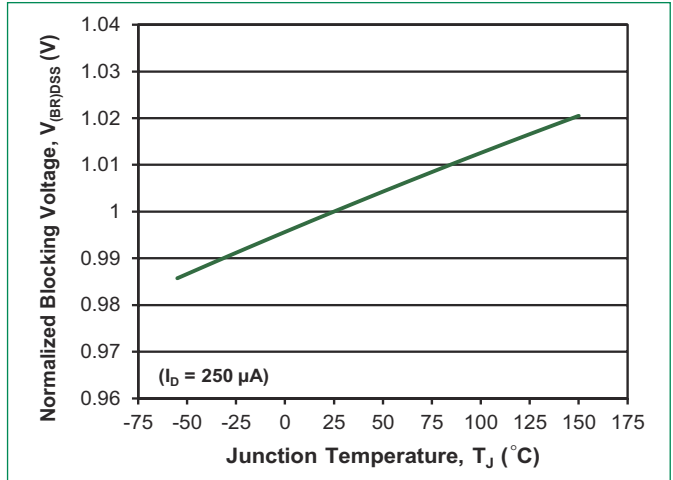
**Figure 12: Normalized On-resistance**



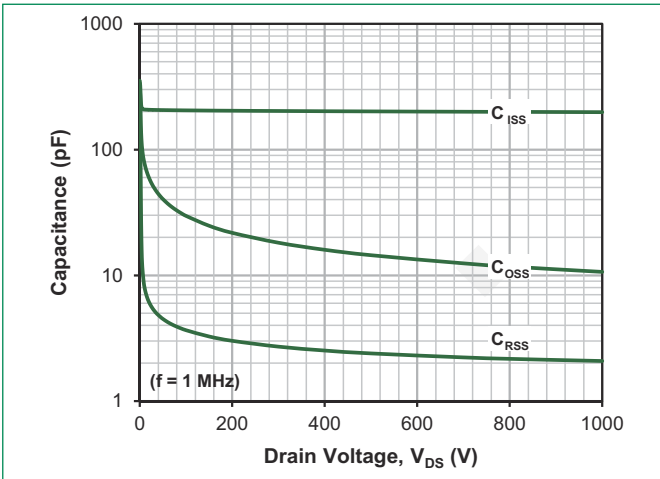
**Figure 13: Threshold Voltage**



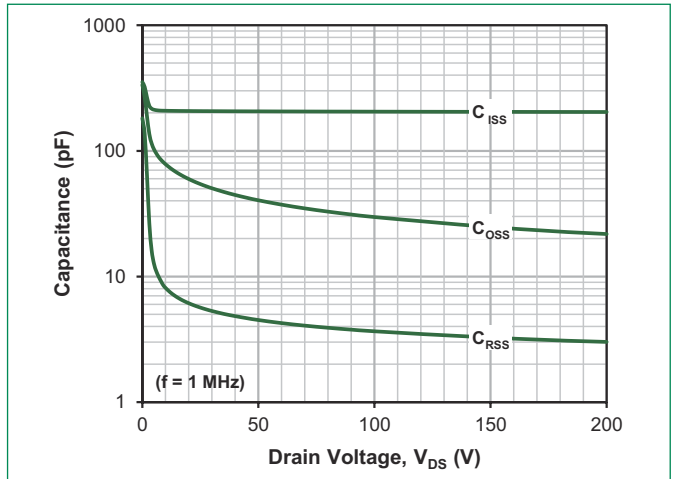
**Figure 14: Drain-Source Blocking Voltage**



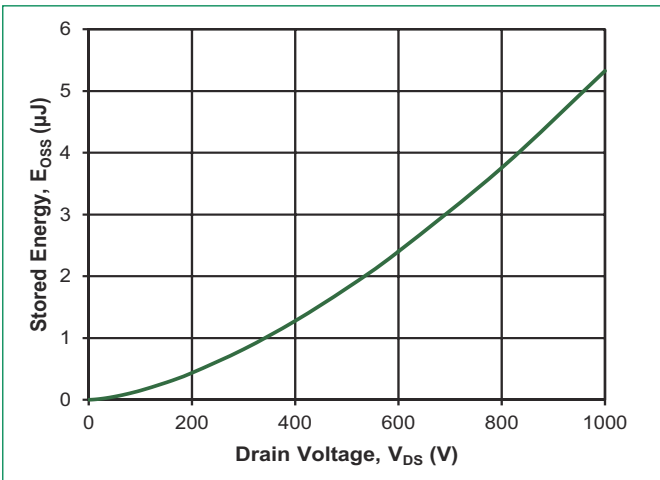
**Figure 15: Junction Capacitances**



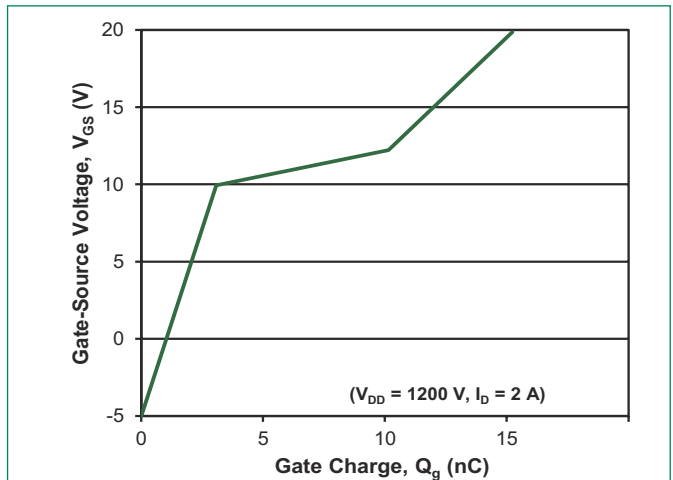
**Figure 16: Junction Capacitances**



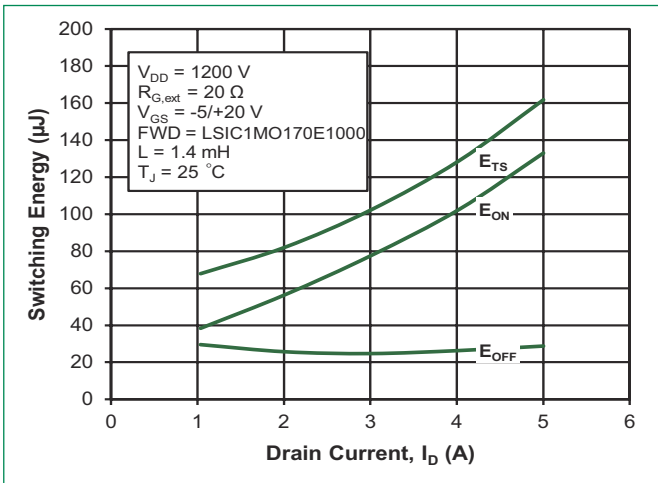
**Figure 17:  $C_{OSS}$  Stored Energy  $E_{OSS}$**



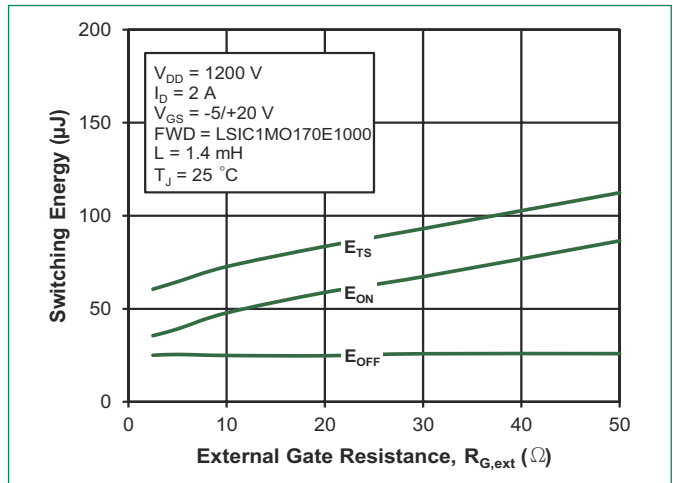
**Figure 18: Gate Charge**



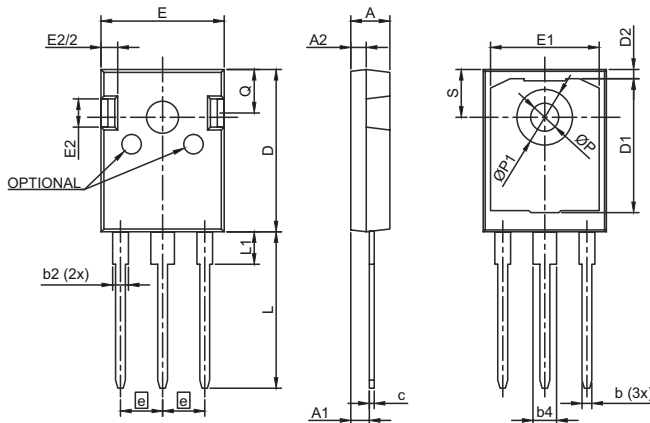
**Figure 19: Switching Energy vs. Drain Current**



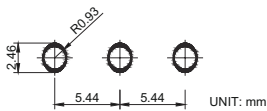
**Figure 20: Switching Energy vs. Gate Resistance**



**Package Dimensions TO-247-3L**



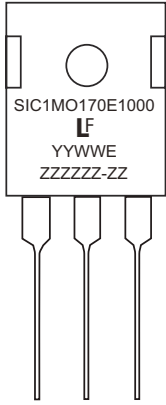
**Recommended Hole Pattern Layout**



- 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. These measured at the outermost extreme of plastic body.
  3. ØP to have a maximum draft angle of 1.5° to the top of the part with a maximum hole diameter of 0.154"

Symbol	Millimeters		
	Min	Nom	Max
A	4.80	5.03	5.20
A1	2.25	2.38	2.54
A2	1.85	1.98	2.11
b	0.99	-	1.40
b2	1.65	-	2.39
b4	2.59	-	3.43
c	0.38	0.64	0.89
D	20.80	20.96	21.34
D1	13.50	-	-
D2	0.51	1.19	1.35
e	5.44 BSC		
E	15.75	15.90	16.13
E1	13.06	14.02	14.15
E2	4.19	4.32	4.83
L	19.81	20.19	20.57
L1	3.81	4.19	4.45
ØP	3.55	3.61	3.66
ØP1	7.06	7.19	7.32
Q	5.49	5.61	6.20
S	6.05	6.17	6.30

**Part Numbering and Marking System**

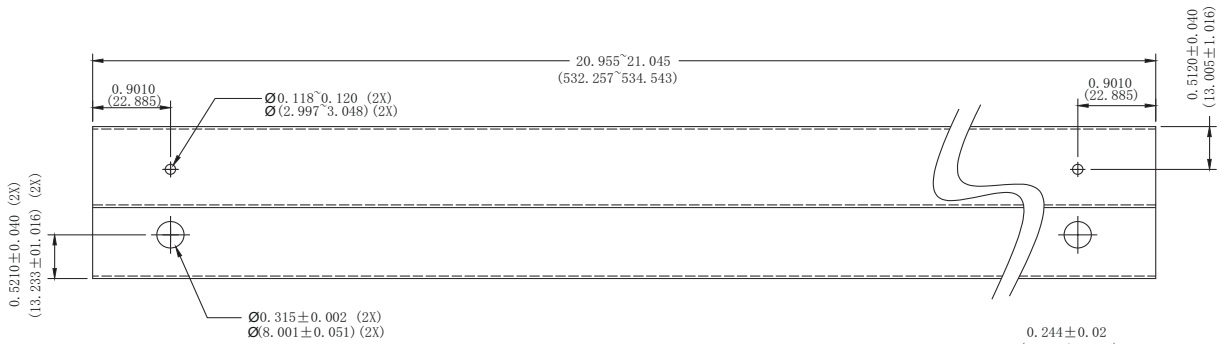


SIC = SiC  
 1 = Gen1  
 MO = MOSFET  
 170 = Voltage Rating (1700 V)  
 E = TO-247-3L  
 1000 =  $R_{DS(ON)}$  (1000 mOhm)  
 YY = Year  
 WW = Week  
 E = Special Code  
 ZZZZZZ-ZZ = Lot Number

**Packing Options**

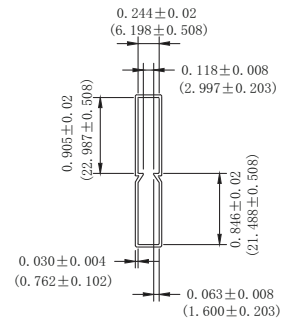
Part Number	Marking	Packing Mode	M.O.Q
LSIC1MO170E1000	SIC1MO170E1000	Tube (30pcs)	450

**Packing Specification TO-247-3L**



**NOTE:**

1. All pin plug holes are considered critical dimension
2. Tolerance is to be  $\pm 0.010$  unless otherwise specified
3. Dimension are in inches (and millimeters).



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