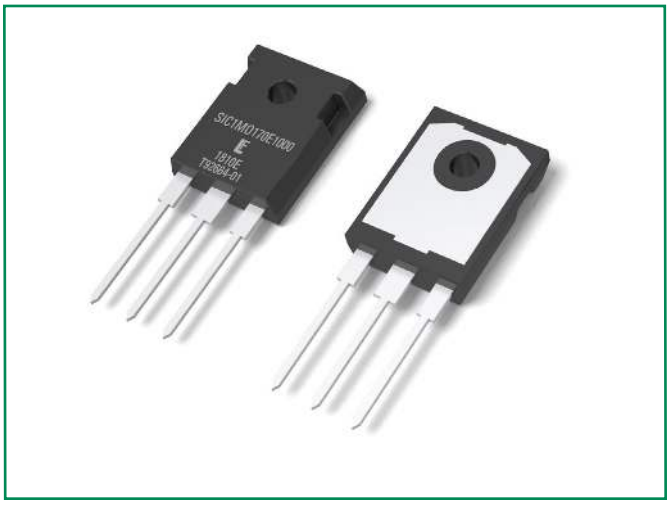
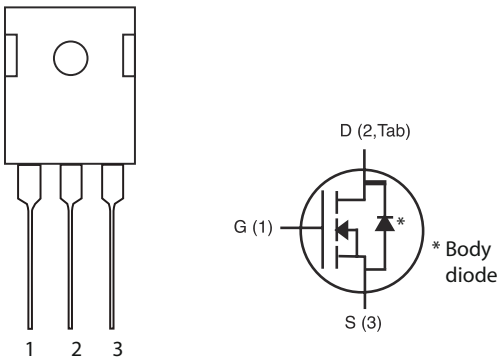
LSIC1MO170E1000 1700 V N-channel, Enhancement-mode SiC MOSFET HF RoHS Pb



Product Summary

Characteristics	Value	Unit
V_{DS}	1700	V
Typical $R_{DS(ON)}$	750	mΩ
I_D ($T_C \leq 100$ °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

Rev 0.3, Revised: 07/16/18

SiC MOSFET

LSIC1MO170E1000, 1700 V, 1000 mOhm, TO-247-3L

Maximum Ratings

Characteristics	Symbol	Conditions	Value	Unit
Continuous Drain Current	I_D	V_{GS} = 20 V, T_C = 25 °C	5.0	A
		V_{GS} = 20 V, T_C = 100 °C	3.5	
Pulsed Drain Current [1]	$I_{D(pulse)}$	T_C = 25 °C	15	A
Power Dissipation	P_D	T_C = 25 °C, T_J = 150 °C	54	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	max	Unit
Maximum Thermal Resistance, junction-to-case	$R_{\theta JC}$	2.3	°C/W
Maximum Thermal Resistance, junction-to-ambient	$R_{\theta JA}$	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	1700	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 1700 V, V_{GS} = 0 V	-	0.05	10	µA
		V_{DS} = 1700 V, V_{GS} = 0 V, T_J = 150 °C	-	0.10	-	
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} = 15 V	-	1000	-	
		I_D = 2 A, V_{GS} = 20 V, T_J = 150 °C	-	1450	-	
Gate Threshold Voltage	$V_{GS,(th)}$	V_{DS} = V_{GS}, I_D = 1 mA	1.8	2.5	4.0	V
		V_{DS} = V_{GS}, I_D = 1 mA, T_J = 150 °C	-	1.6	-	
Gate Resistance	R_G	Resonance method, Drain-Source shorted	-	5.8	-	Ω

Rev 0.3, Revised: 07/16/18

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} = 1200 V, I_D = 2 A, V_{GS} = -5/+20 V, $R_{G,ext}$ = 20 Ω, L = 1.4mH	-	59	-	µJ
Turn-off Switching Energy	E_{OFF}		-	25	-	
Total Per-cycle Switching Energy	E_{TS}		-	84	-	
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	-	
Reverse Transfer Capacitance	C_{RSS}		-	2	-	
C_{OSS} Stored Energy	E_{OSS}		-	5.3	-	µJ
Total Gate Charge	Q_g	V_{DD} = 1200 V, I_D = 2 A, V_{GS} = -5/+20 V	-	15	-	nC
Gate-source Charge	Q_{gs}		-	3	-	
Gate-drain Charge	Q_{gd}		-	7	-	
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 1200 V, V_{GS} = -5/+20 V, I_D = 2 A, $R_{G,ext}$ = 20 Ω, R_L = 600 Ω, Timing relative to V_{DS}	-	9	-	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 A, V_{GS} = 0 V	-	3.7	-	V
		I_S = 1 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	-	-	8	A
Peak Diode Forward Current [1]	I_{SP}		-	-	15	

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

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

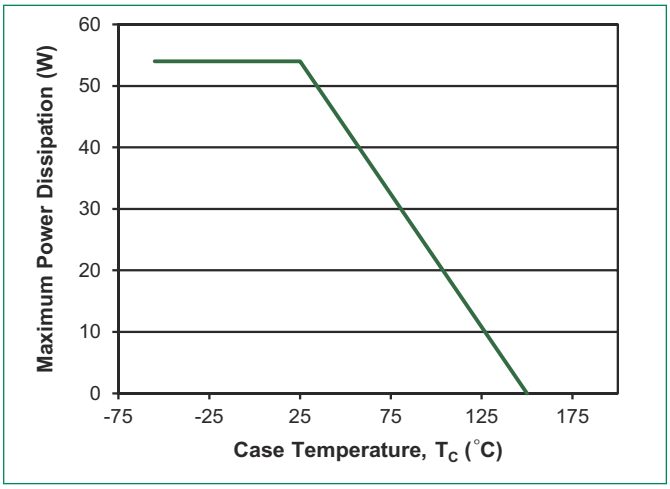


Figure 2: Transfer Characteristics (V_{DS} = 10 V)

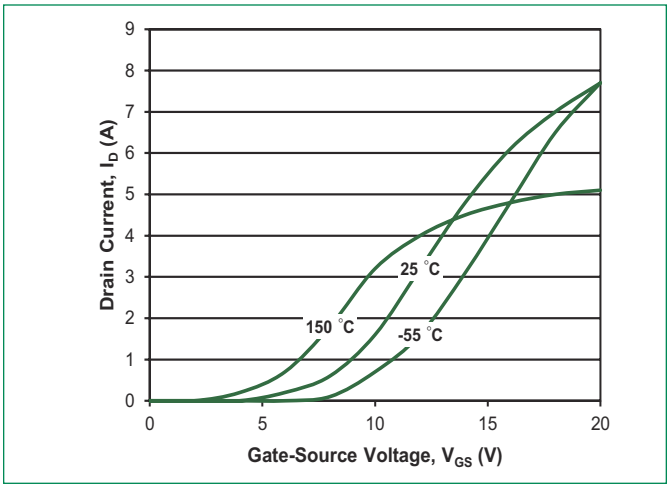


Figure 3: Output Characteristics (T_J = 25 °C)

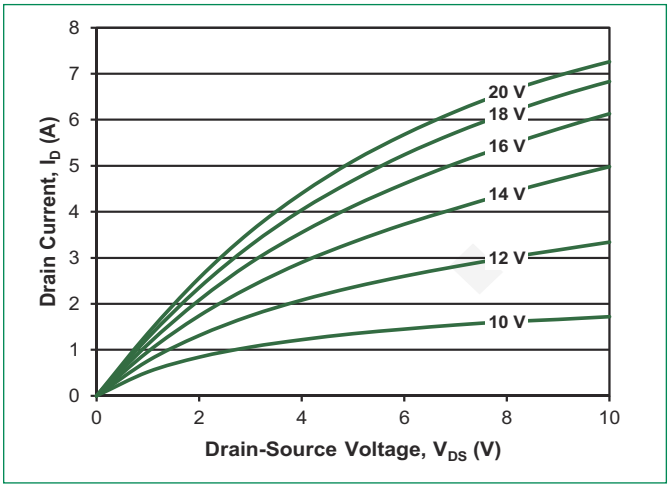


Figure 4: Output Characteristics (T_J = 150 °C)

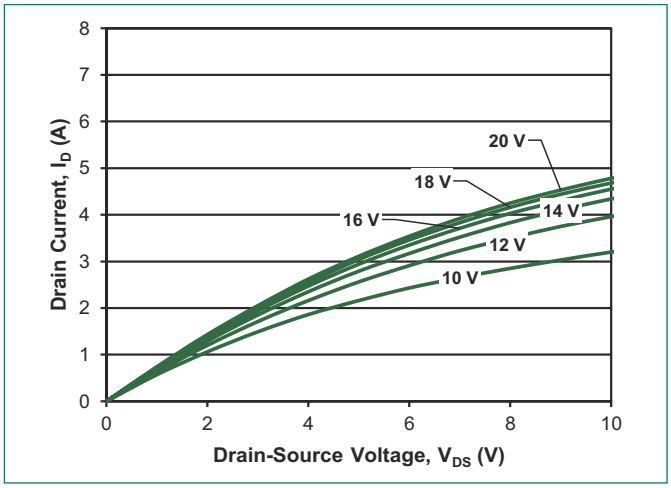


Figure 5: Output Characteristics (T_J = -55 °C)

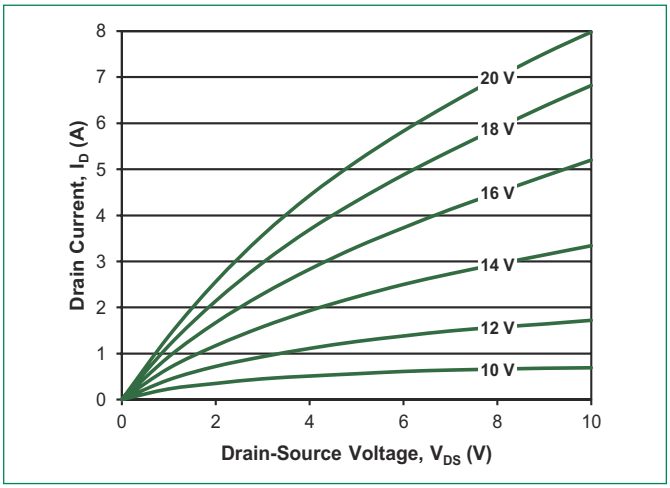


Figure 6: Reverse Conduction Characteristics (T_J = 25 °C)

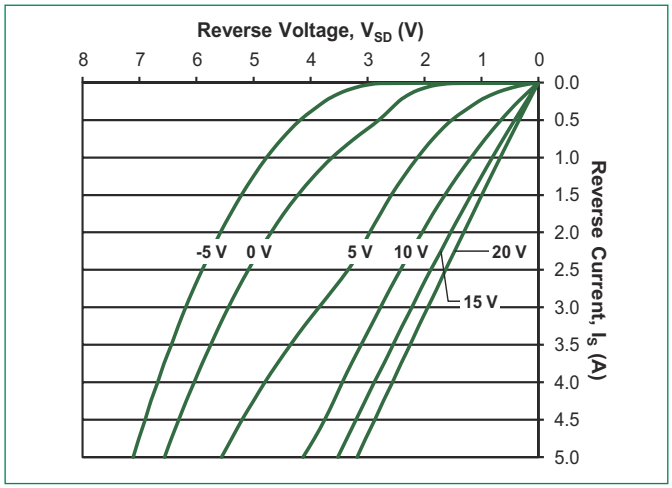


Figure 7: Reverse Conduction Characteristics (T_J = 150 °C)

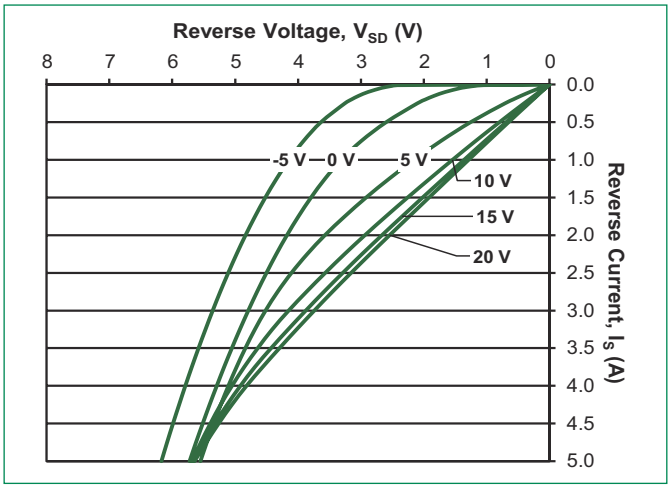


Figure 8: Reverse Conduction Characteristics (T_J = -55 °C)

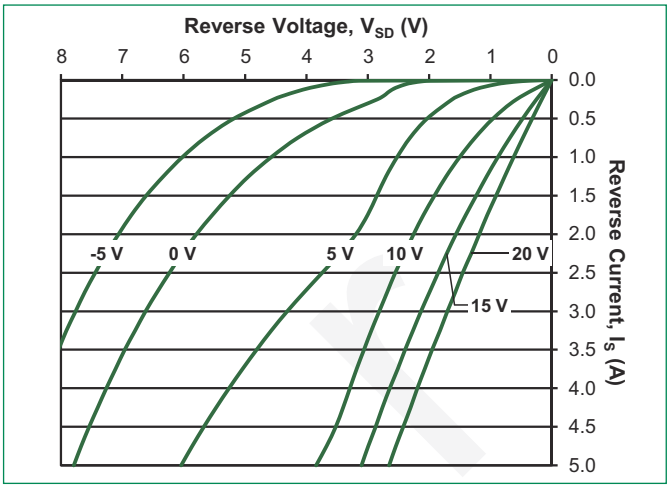


Figure 9: Transient Thermal Impedance

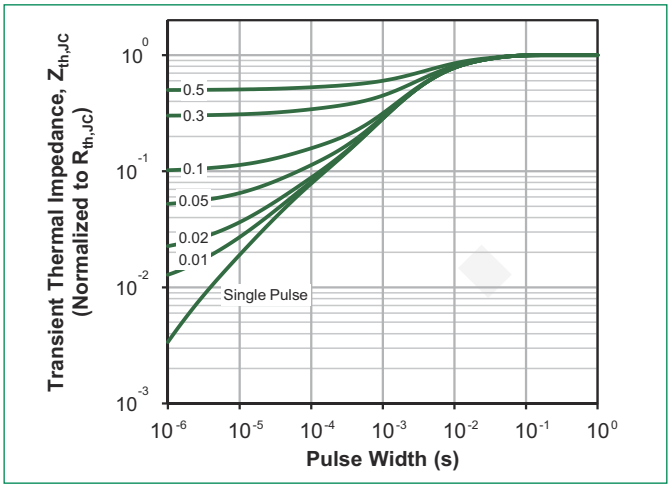


Figure 10: Safe Operating Area (T_C = 25 °C)

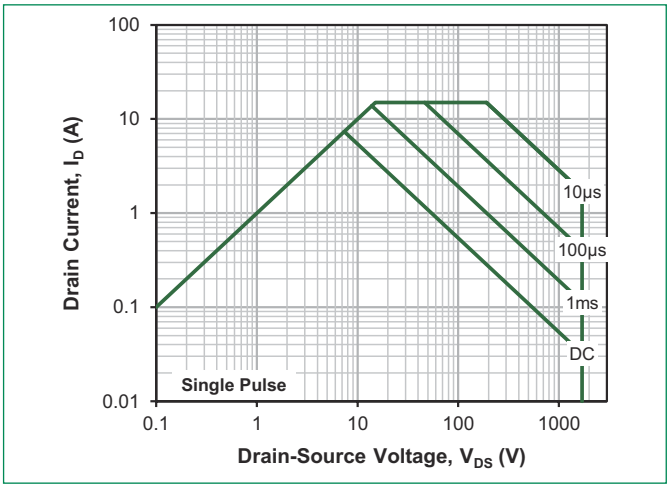


Figure 11: On-resistance vs. Drain Current

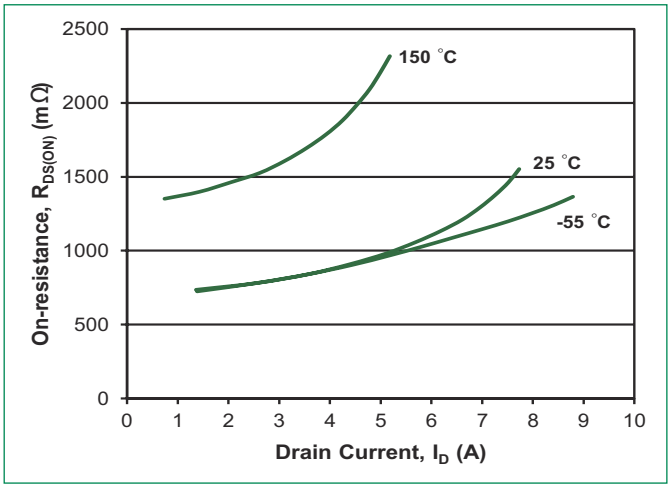


Figure 12: Normalized On-resistance

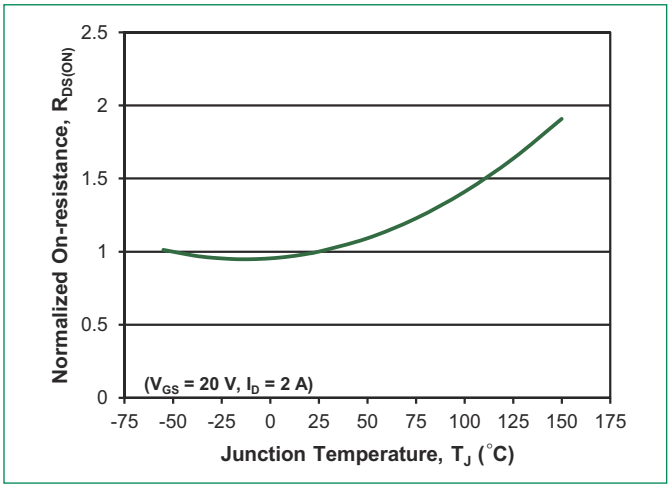


Figure 13: Threshold Voltage

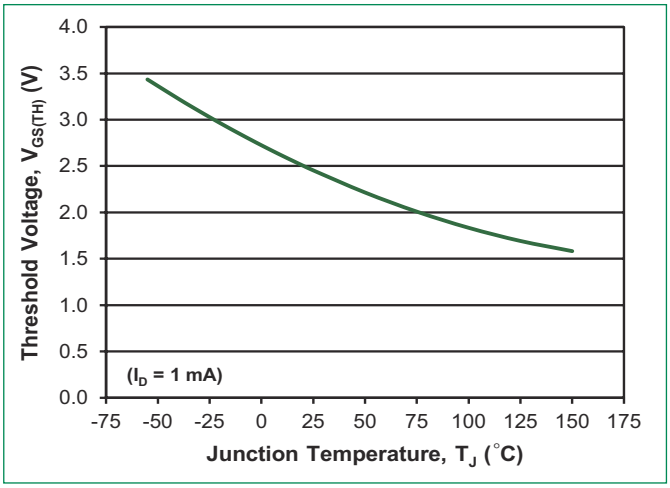


Figure 14: Drain-Source Blocking Voltage

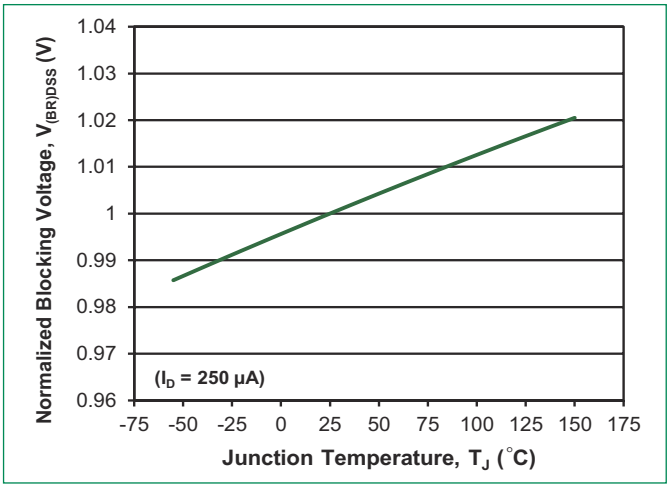


Figure 15: Junction Capacitances

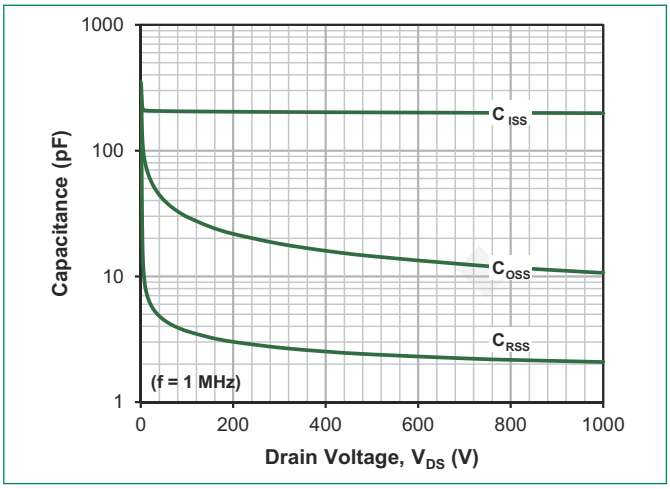


Figure 16: Junction Capacitances

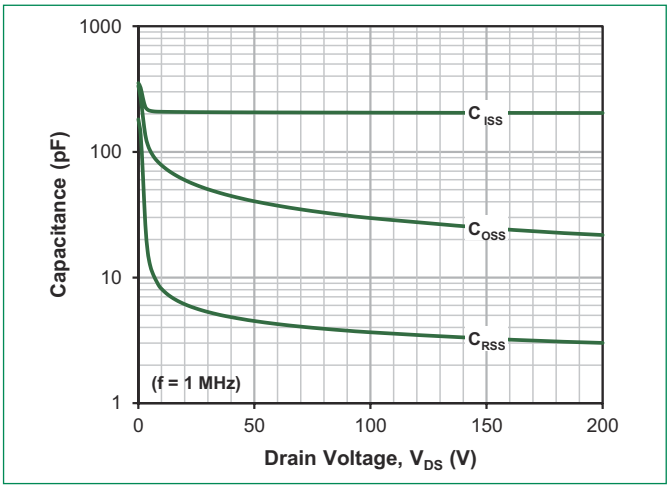


Figure 17: C_{oss} Stored Energy E_{oss}

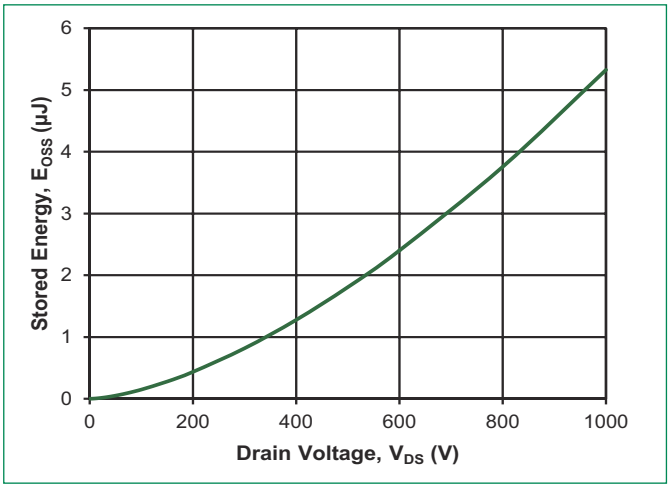


Figure 18: Gate Charge

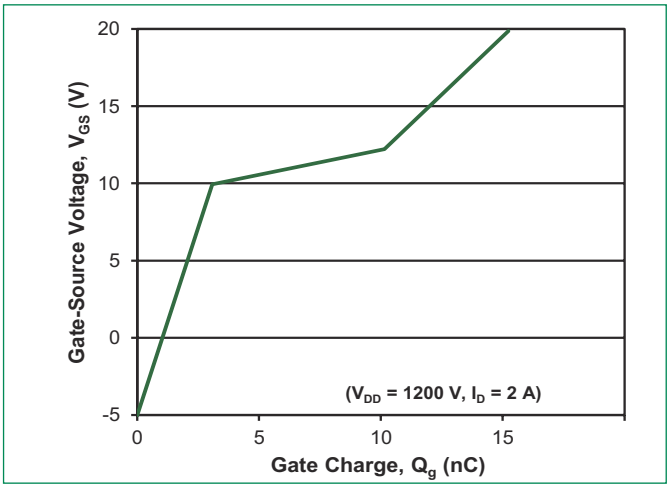


Figure 19: Switching Energy vs. Drain Current

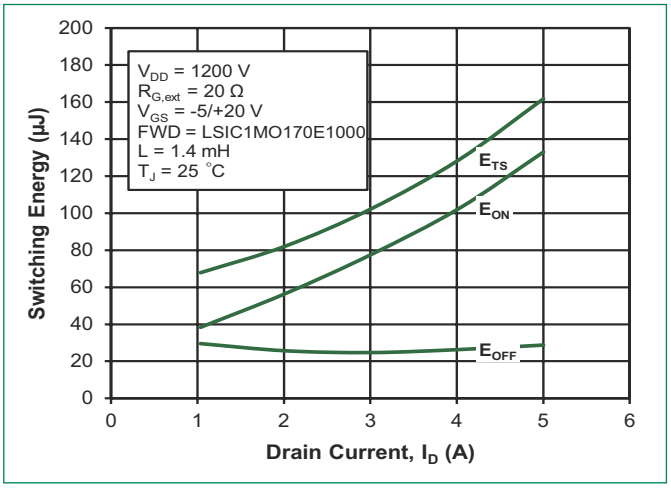
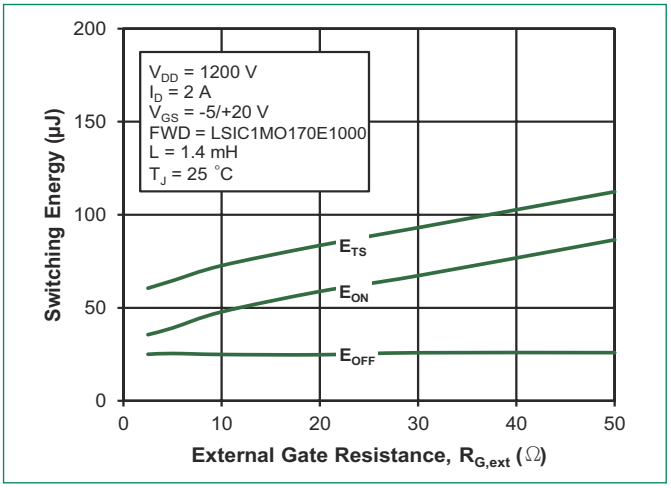
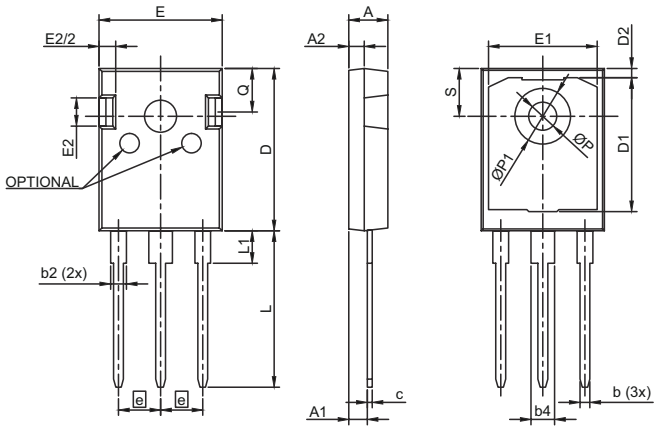


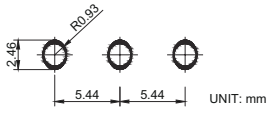
Figure 20: Switching Energy vs. Gate Resistance



Package Dimensions TO-247-3L



Recommended Hole Pattern Layout



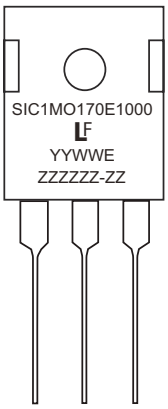
Notes:
1. Dimensions are in millimeters
2. Dimension D, E do not include mold flash. Mold flash shall not exceed 0.127 mm per side. These measured at the outermost extreme of plastic body.
3. øP to have a maximum draft angle of 1.5° to the top of the part with a maximum hole diameter of 0.154"

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

SiC MOSFET

LSIC1MO170E1000, 1700 V, 1000 mOhm, TO-247-3L

Part Numbering and Marking System

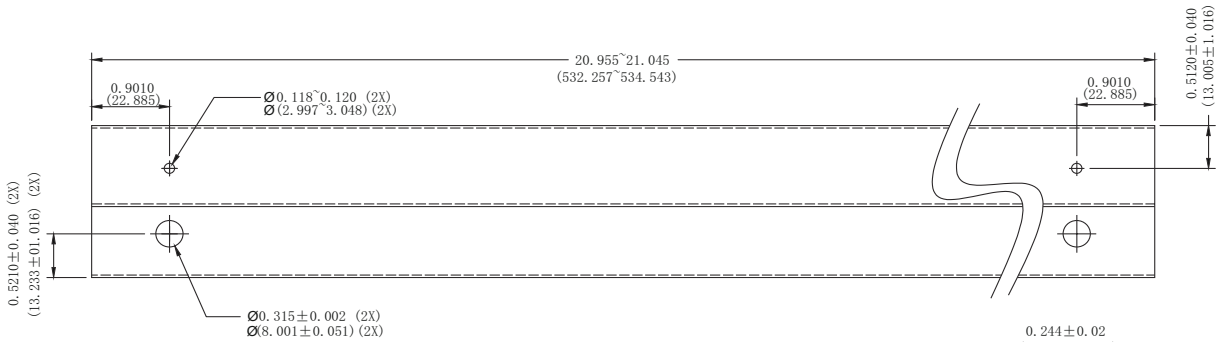


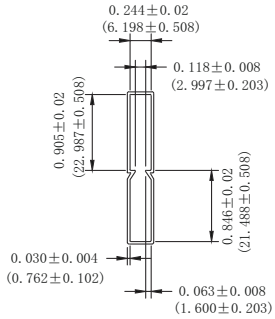
SIC	= SiC
1	= Gen1
MO	= MOSFET
170	= Voltage Rating (1700 V)
E	= TO-247-3L
1000	= $R_{DS(ON)}$ (1000 mOhm)
YY	= Year
WW	= Week
E	= Special Code
ZZZZZZ-ZZ	= Lot Number

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 ±0.010 unless otherwise specified**
3. **Dimension are in inches (and millimeters).**