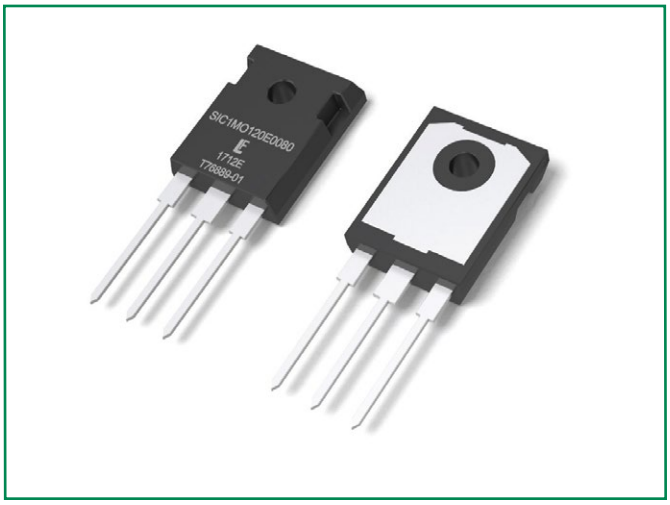
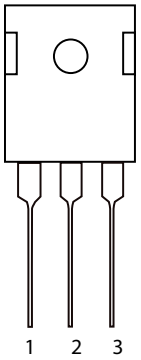
LSIC1MO120E0080 1200 V N-channel, Enhancement-mode SiC MOSFET HF RoHS Pb

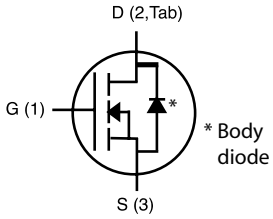


Product Summary

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 0.2, Revised: 10/12/18

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 0.2, Revised: 10/12/18

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} = 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: 10/12/18

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

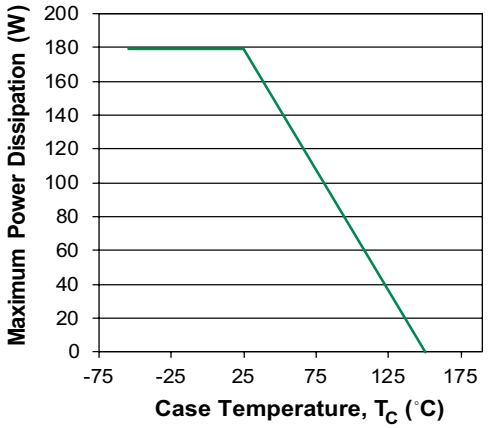


Figure 2: Transfer Characteristics (V_{DS} = 10 V)

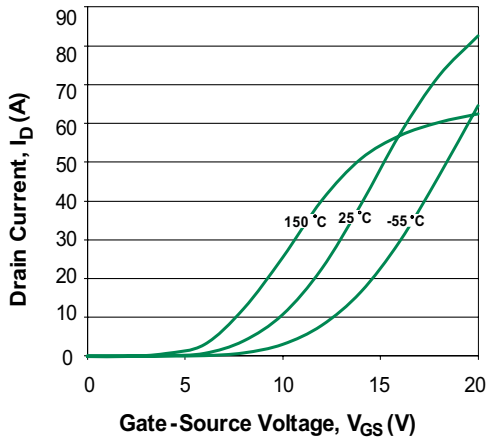


Figure 3: Output Characteristics (T_J = 25 °C)

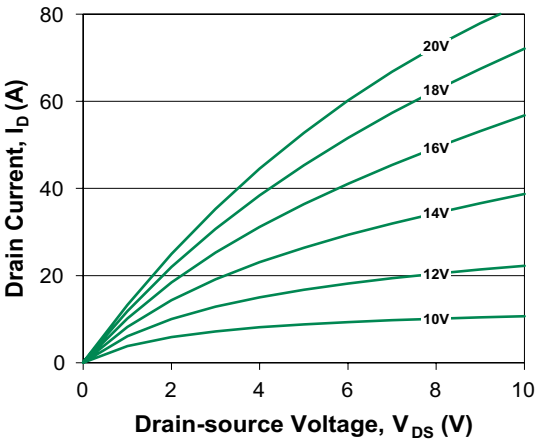


Figure 4: Output Characteristics (T_J = 150 °C)

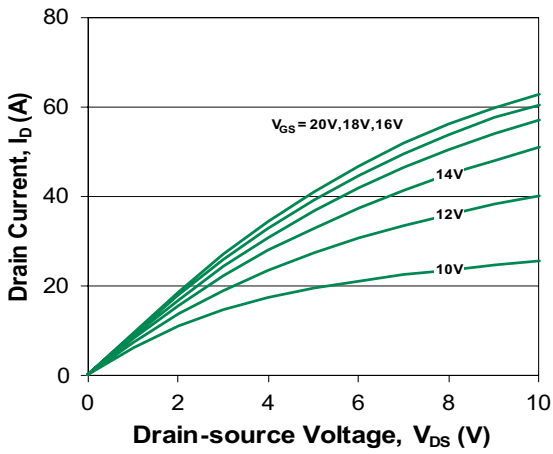


Figure 5: Output Characteristics (T_J = -55 °C)

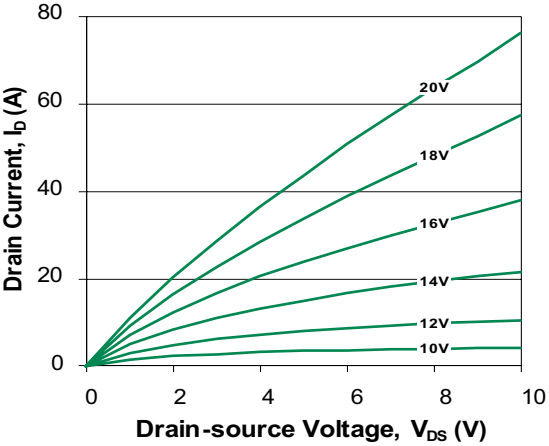


Figure 6: Reverse Conduction Characteristics (T_J = 25 °C)

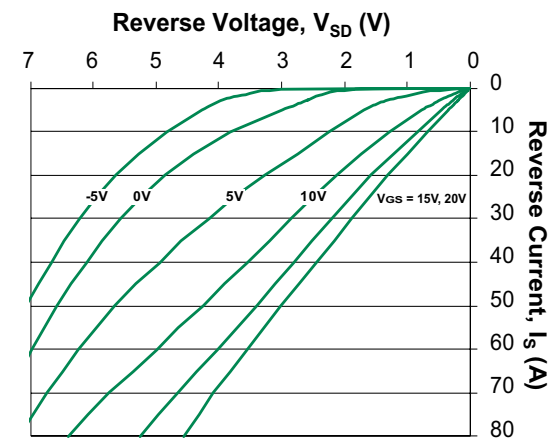


Figure 7: Reverse Conduction Characteristics (T_J = 150 °C)

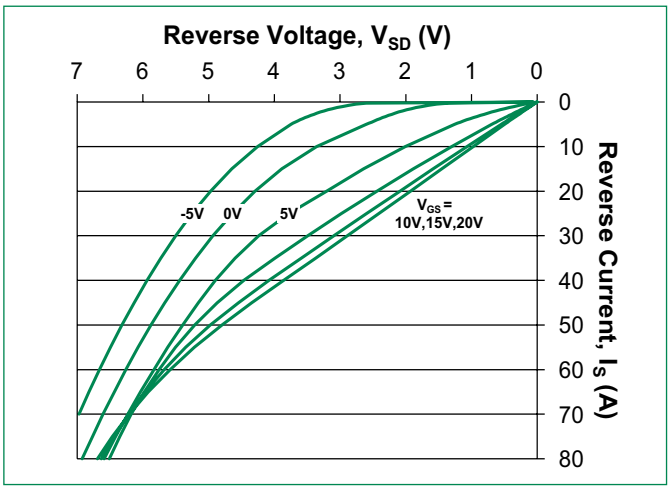


Figure 8: Reverse Conduction Characteristics (T_J = -55 °C)

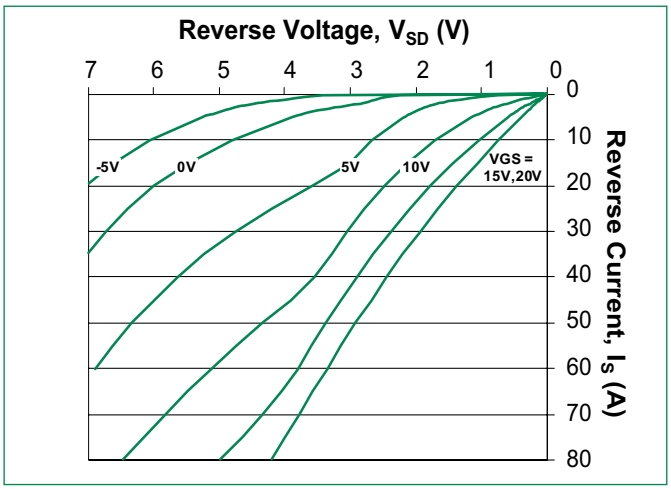


Figure 9: Transient Thermal Impedance

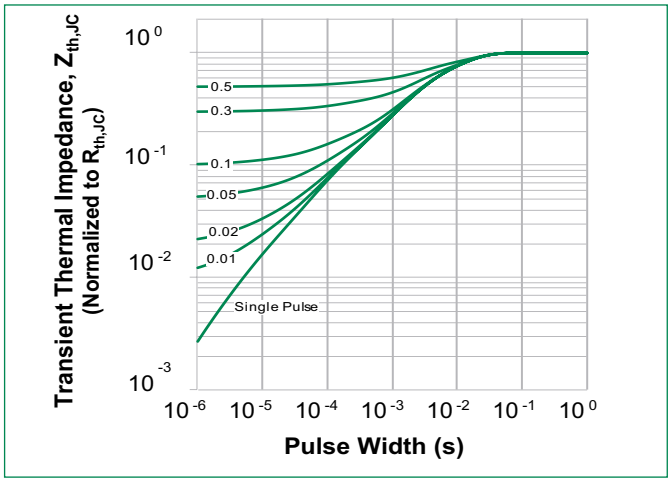


Figure 10: Safe Operating Area (T_C = 25 °C)

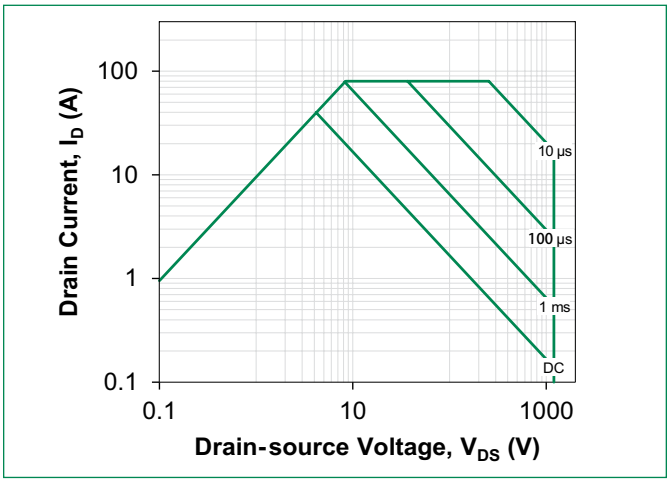


Figure 11: On-resistance vs. Drain Current

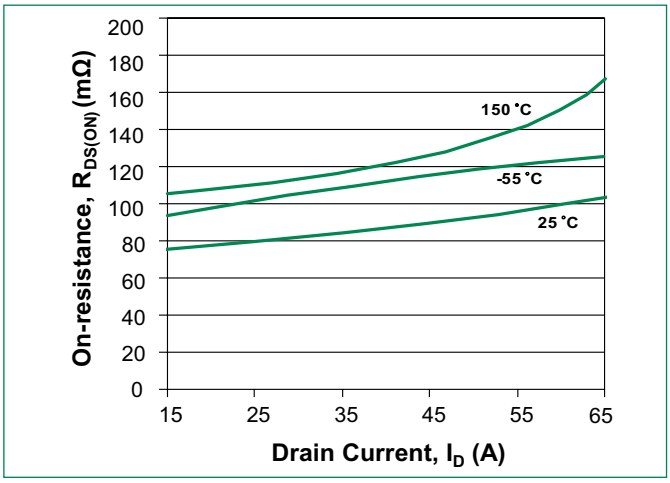
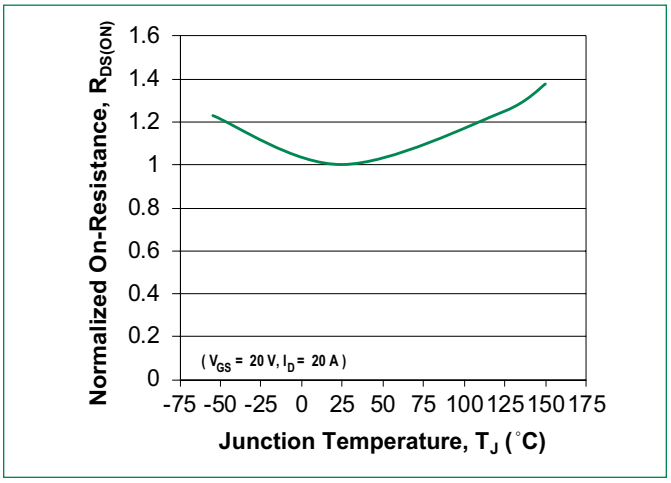


Figure 12: Normalized On-resistance



Revised: 10/12/18

Figure 13: Threshold Voltage

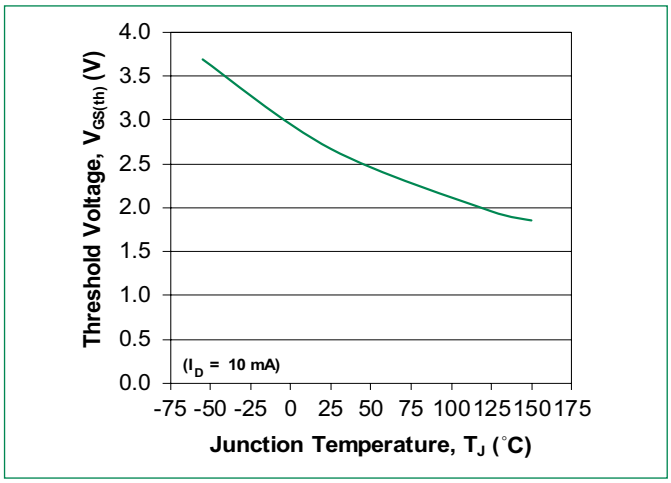


Figure 14: Drain-source Blocking Voltage

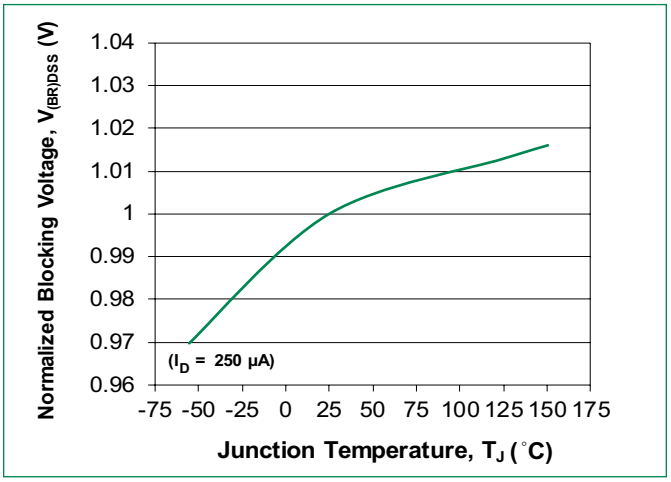


Figure 15: Junction Capacitances

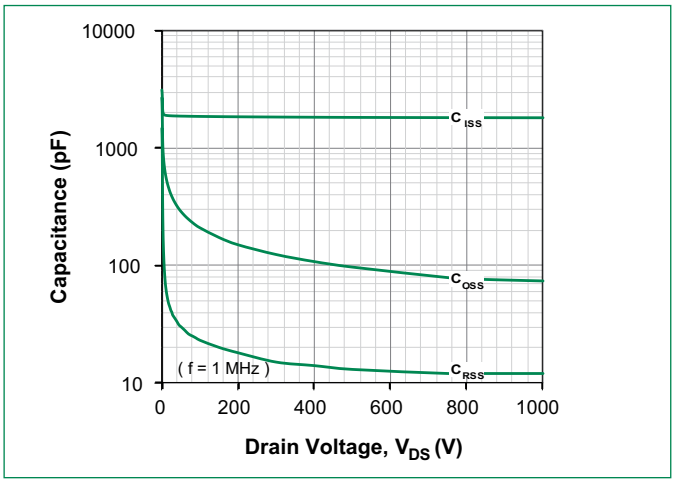


Figure 16: Junction Capacitances

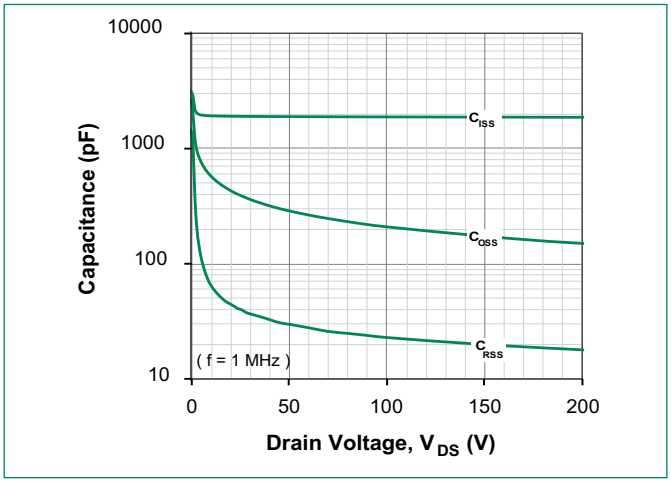


Figure 17: C_{OSS} Stored Energy E_{OSS}

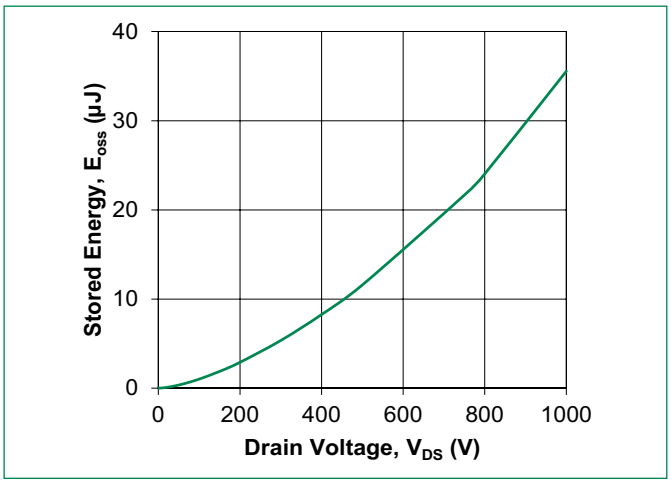


Figure 18: Gate Charge

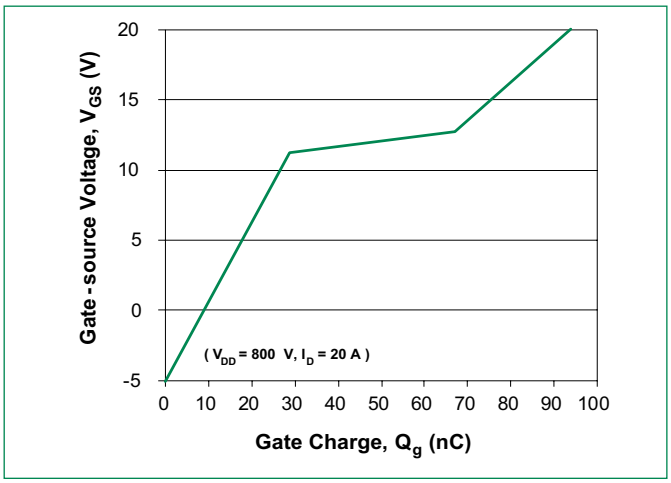


Figure 19: Switching Energy vs. Drain Current

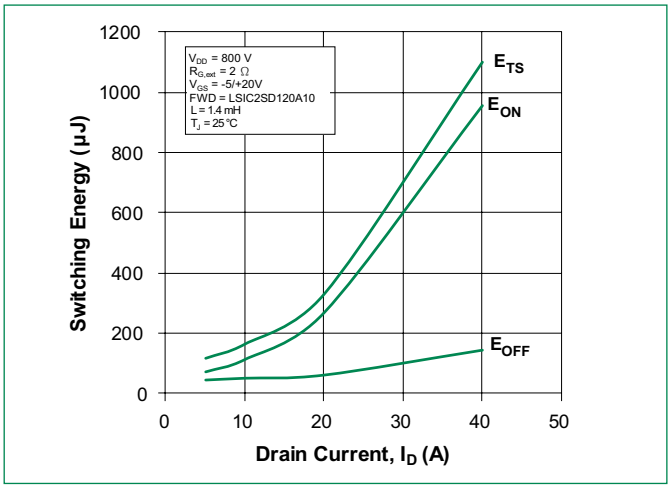
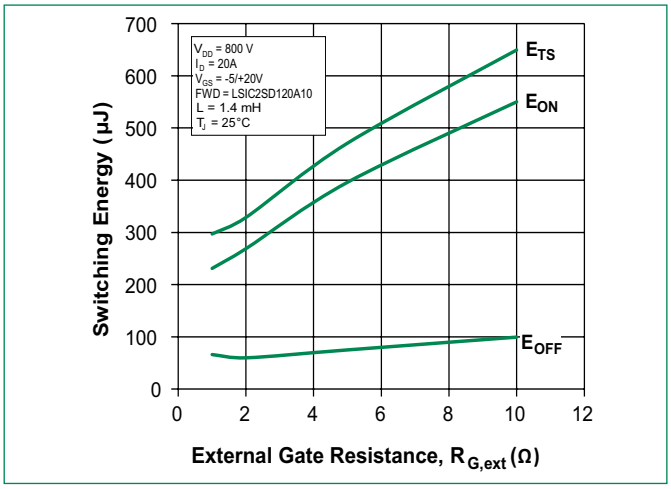
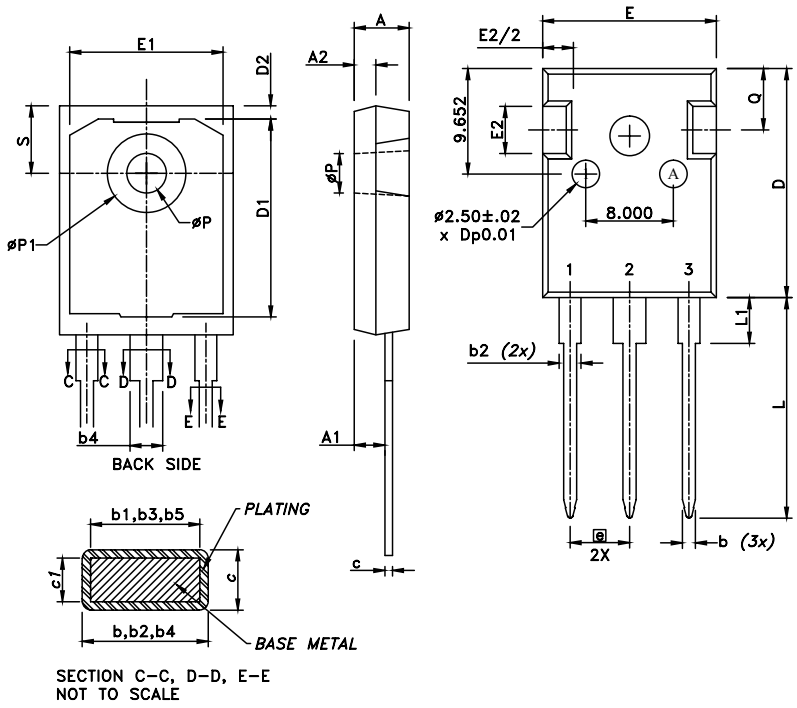


Figure 20: Switching Energy vs. Gate Resistance

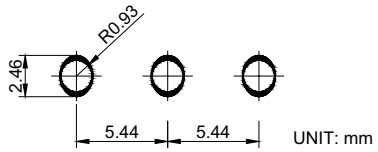


Package Dimensions TO-247-3L



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



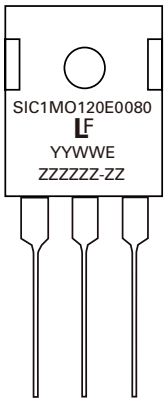
Notes:
1. Dimensions are in millimeters
2. Dimension D, E do not include mold flash. Mold flash shall not exceed 0.127 mm per side measured at outer most extreme of plastic body.
3. øP to have a maximum draft angle of 38.1 mm to the top of the part with a maximum hole diameter of 3.912 mm.

Revised: 10/12/18

SiC MOSFET

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

Part Numbering and Marking System

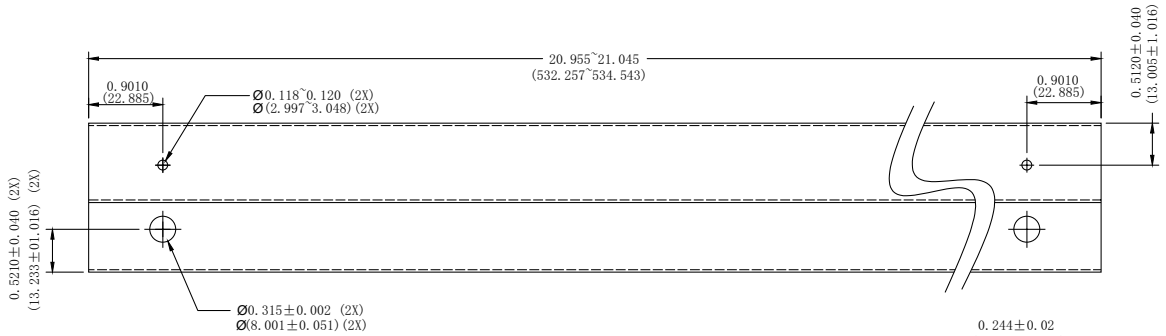


SIC	= SiC
1	= Gen1
MO	= MOSFET
120	= Voltage Rating (1200 V)
E	= TO-247-3L
0080	= $R_{DS(ON)}$ (80 mOhm)
YY	= Year
WW	= Week
E	= Special Code
ZZZZZZ-ZZ	= Lot Number

Packing Options

Part Number	Marking	Packing Mode	M.O.Q
LSIC1MO120E0080	SIC1MO120E0080	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 inch (and millimeters).