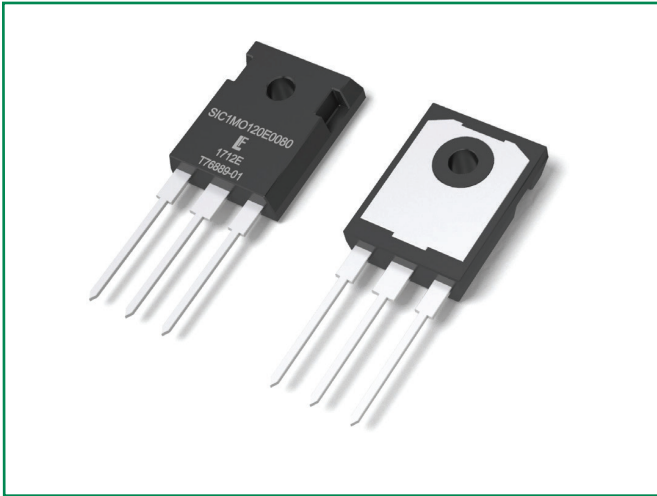


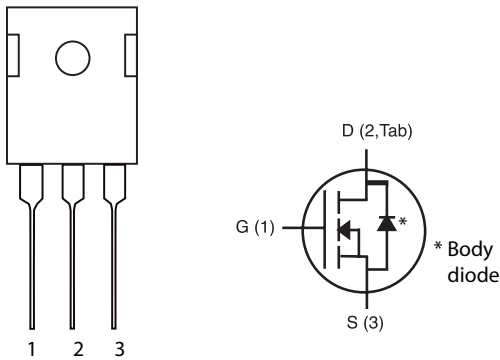
LSIC1MO120E0080 1200 V N-channel, Enhancement-mode SiC MOSFET **HF** **RoHS** **Pb**



Product Summary

Characteristics	Value	Unit
V_{DS}	1200	V
Typical $R_{DS(ON)}$	80	mΩ
I_D ($T_C \leq 100^\circ\text{C}$)	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

Maximum Ratings

Characteristics	Symbol	Conditions	Value	Unit
Continuous Drain Current	I_D	$V_{GS} = 20\text{ V}, T_C = 25\text{ }^\circ\text{C}$	39	A
		$V_{GS} = 20\text{ V}, T_C = 100\text{ }^\circ\text{C}$	25	
Pulsed Drain Current ¹	$I_{D(pulse)}$	$T_C = 25\text{ }^\circ\text{C}$	80	A
Power Dissipation	P_D	$T_C = 25\text{ }^\circ\text{C}, T_J = 150\text{ }^\circ\text{C}$	179	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_{solder}	-	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	Value	Unit
Maximum Thermal Resistance, junction-to-case	$R_{thJC,max}$	0.7	$^\circ\text{C/W}$
Maximum Thermal Resistance, junction-to-ambient	$R_{thJA,max}$	40	$^\circ\text{C/W}$

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

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

Electrical Characteristics ($T_J = 25\text{ }^{\circ}\text{C}$ 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}	$I_S = 10\text{ A}, V_{GS} = 0\text{ V}$	-	3.8	-	V
		$I_S = 10\text{ A}, V_{GS} = 0\text{ V}, T_J = 150\text{ }^{\circ}\text{C}$	-	3.4	-	
Continuous Diode Forward Current	I_S	$V_{GS} = 0\text{ V}, T_C = 25\text{ }^{\circ}\text{C}$	-	-	35	A
Peak Diode Forward Current ¹	I_{SP}		-	-	85	
Reverse Recovery Time	t_{rr}	$V_{GS} = -5\text{ V}, I_S = 20\text{ A},$ $V_R = 800\text{ V},$ $di/dt = 5.3\text{ A/ns}$	-	25	-	ns
Reverse Recovery Charge	Q_{rr}		-	185	-	nC
Peak Reverse Recovery Current	I_{rrm}		-	16	-	A

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

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

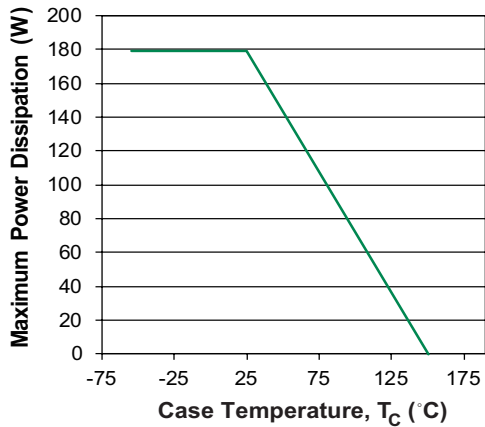


Figure 2: Transfer Characteristics ($V_{DS} = 10\text{ V}$)

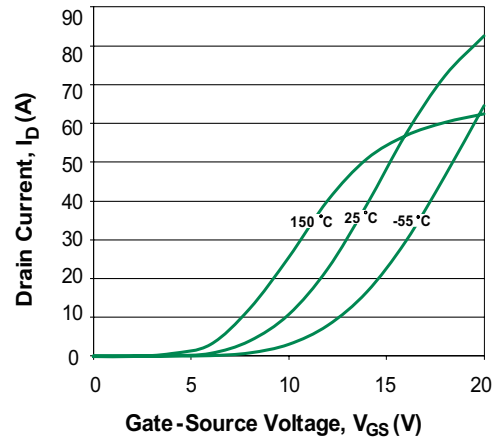


Figure 3: Output Characteristics ($T_J = 25^\circ\text{C}$)

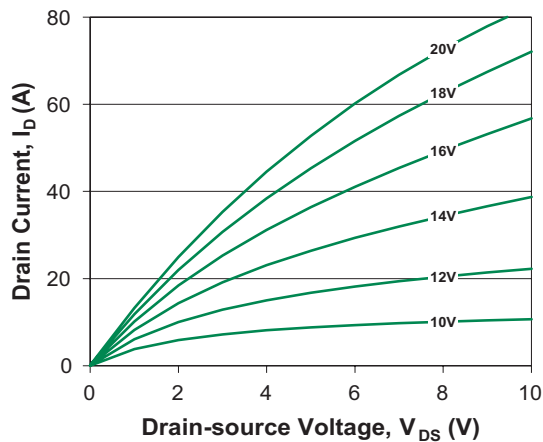


Figure 4: Output Characteristics ($T_J = 150^\circ\text{C}$)

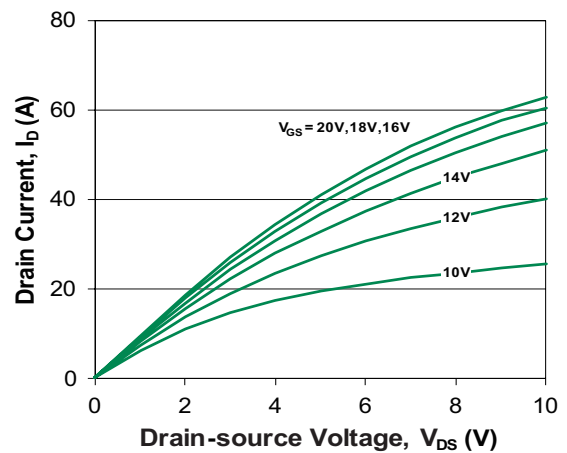


Figure 5: Output Characteristics ($T_J = -55^\circ\text{C}$)

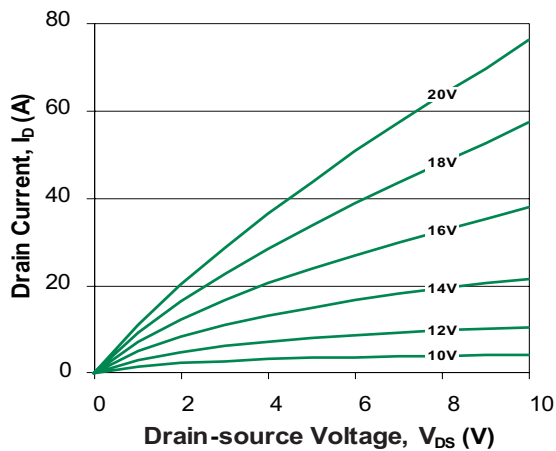


Figure 6: Reverse Conduction Characteristics ($T_J = 25^\circ\text{C}$)

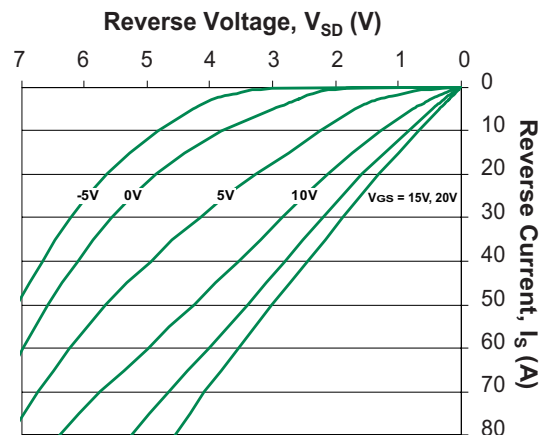


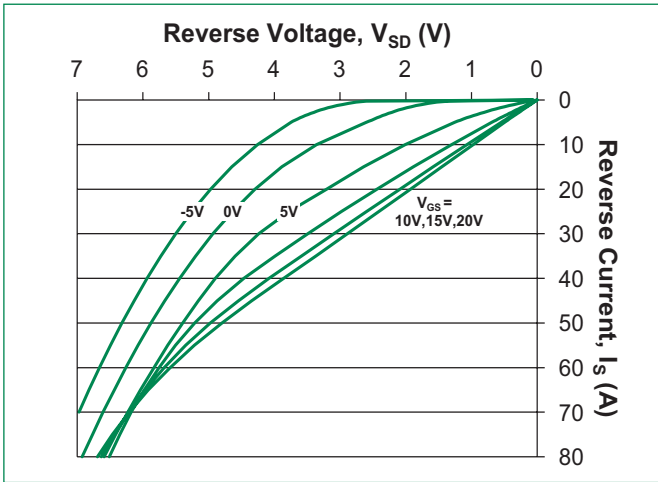
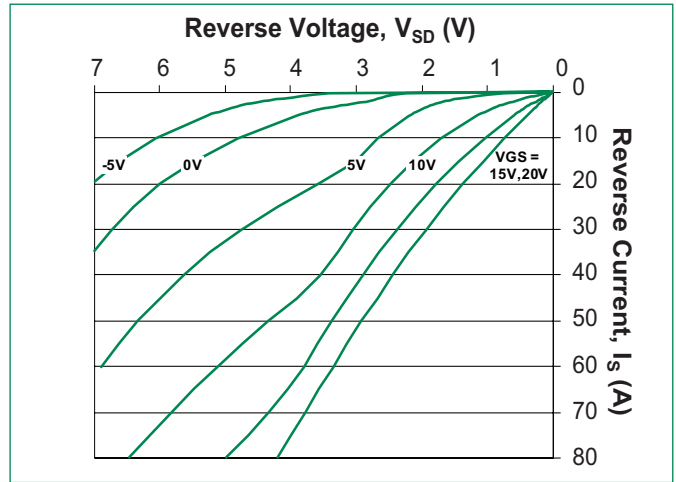
Figure 7: Reverse Conduction Characteristics ($T_J = 150^\circ\text{C}$)Figure 8: Reverse Conduction Characteristics ($T_J = -55^\circ\text{C}$)

Figure 9: Transient Thermal Impedance

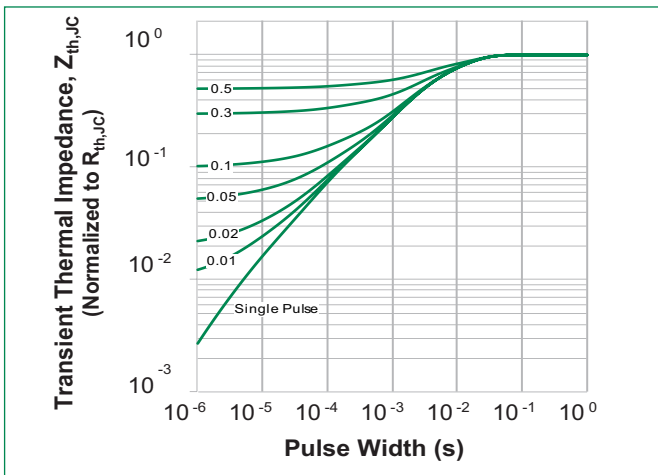
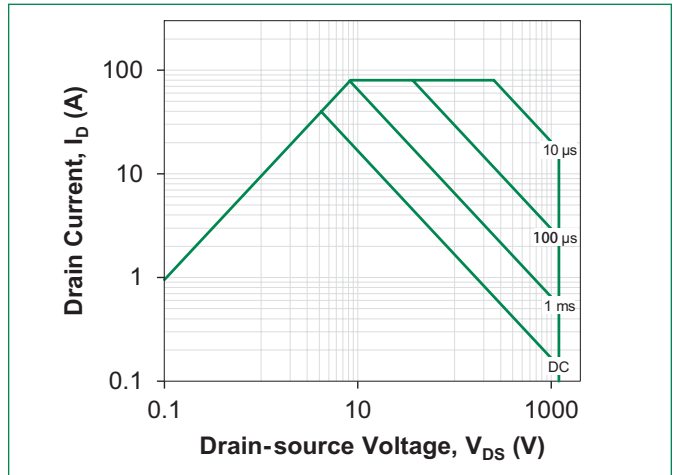
Figure 10: Safe Operating Area ($T_C = 25^\circ\text{C}$)

Figure 11: On-resistance vs. Drain Current

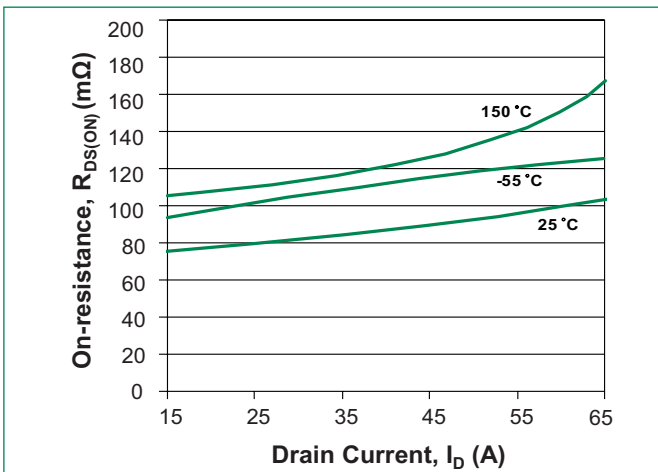


Figure 12: Normalized On-resistance

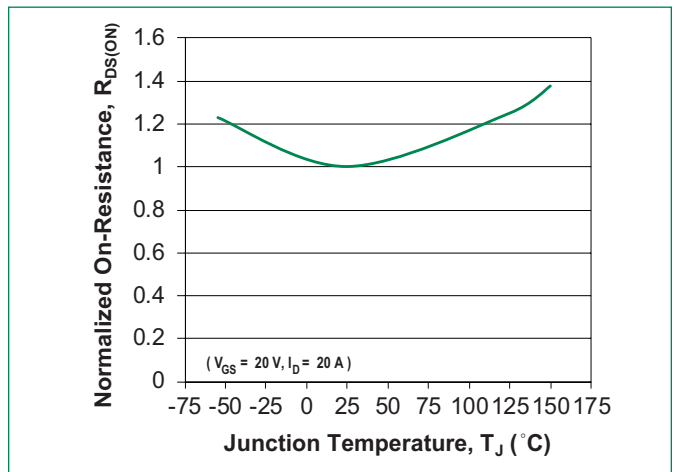


Figure 13: Threshold Voltage

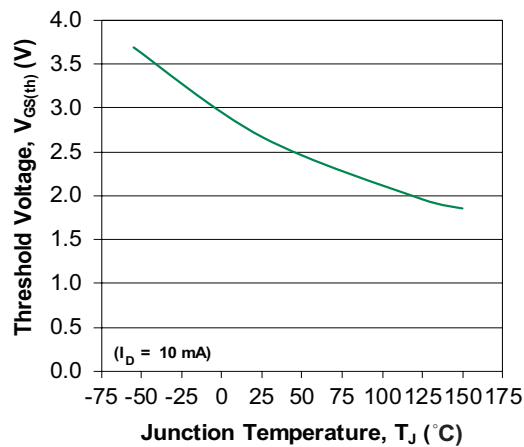


Figure 14: Drain-source Blocking Voltage

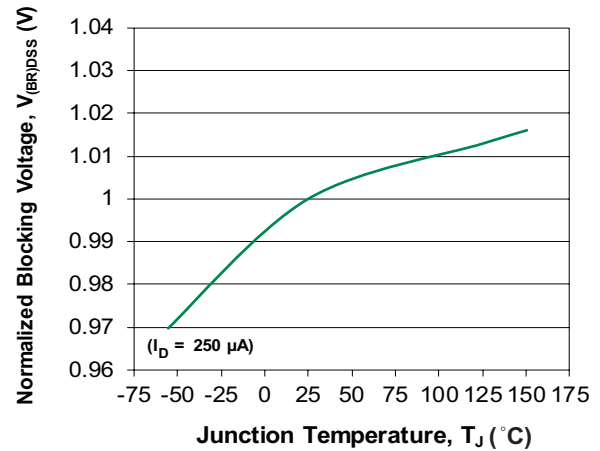


Figure 15: Junction Capacitances

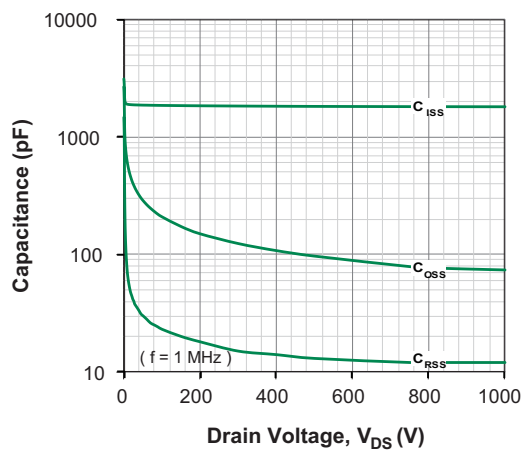


Figure 16: Junction Capacitances

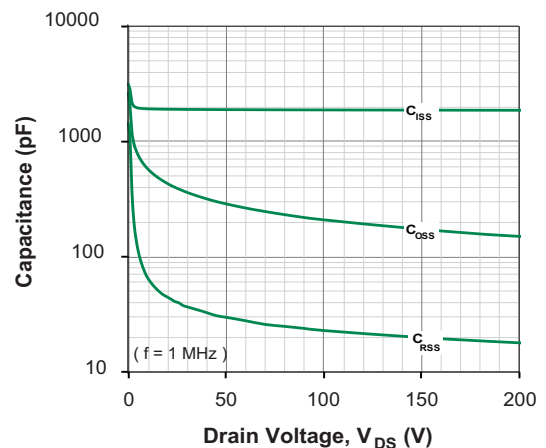


Figure 17: C_{OSS} Stored Energy E_{OSS}

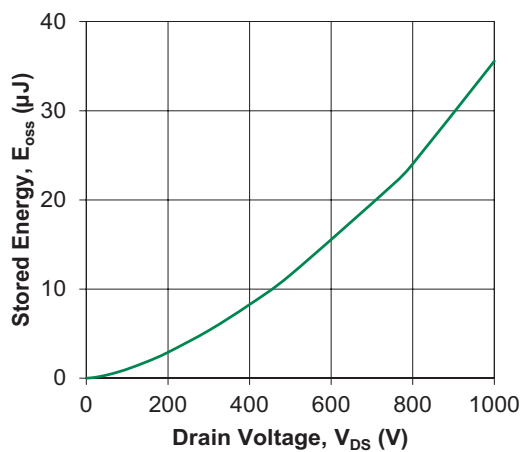


Figure 18: Gate Charge

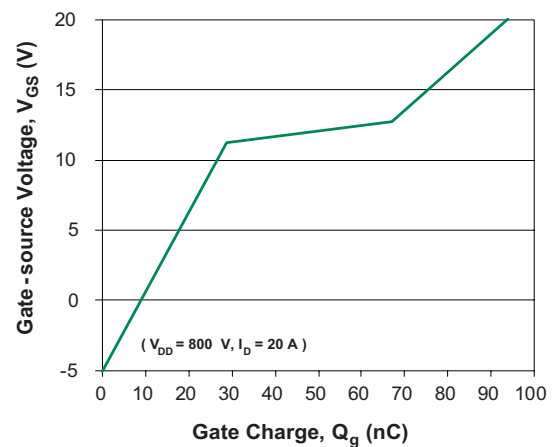


Figure 19: Switching Energy vs. Drain Current

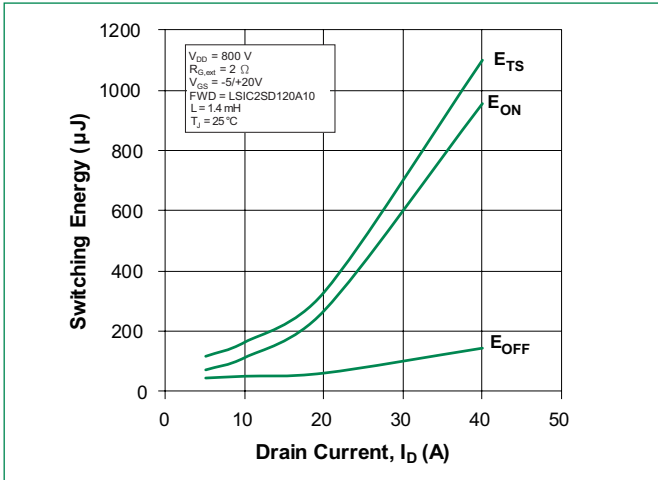
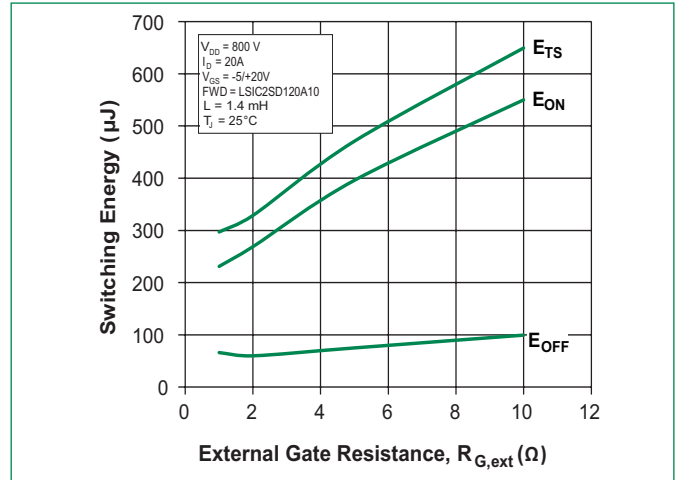
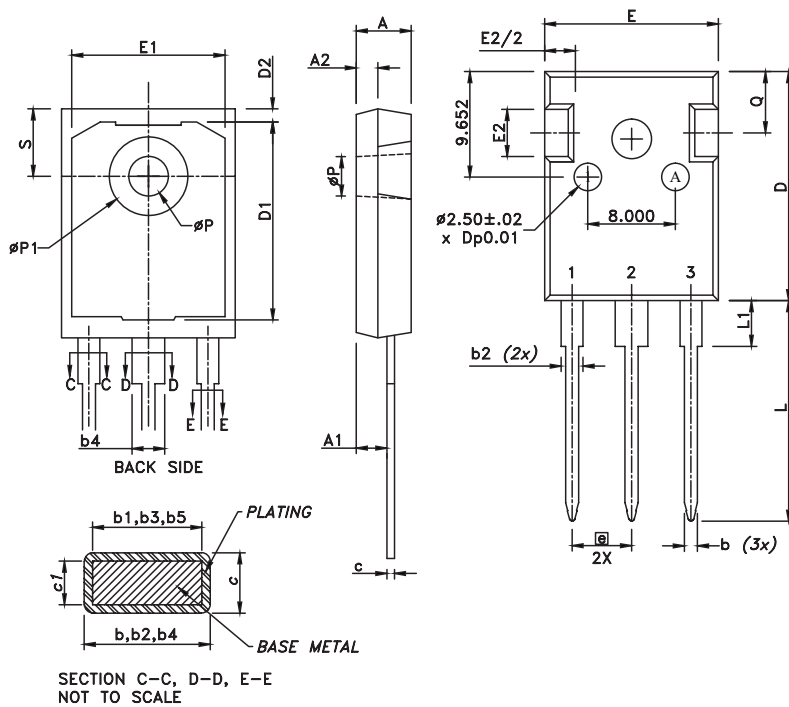


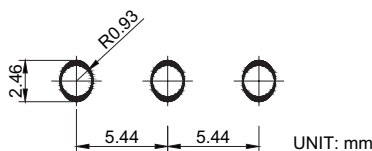
Figure 20: Switching Energy vs. Gate Resistance



Package Dimensions TO-247-3L



Recommended Hole Pattern Layout

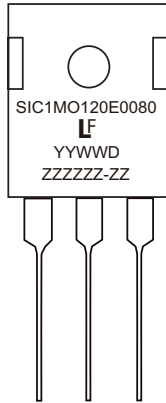


Notes:

- Dimensions are in millimeters
- 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.
- ϕP 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.

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
ϕP	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
ϕP1	7.061	7.188	7.315

Part Numbering and Marking System

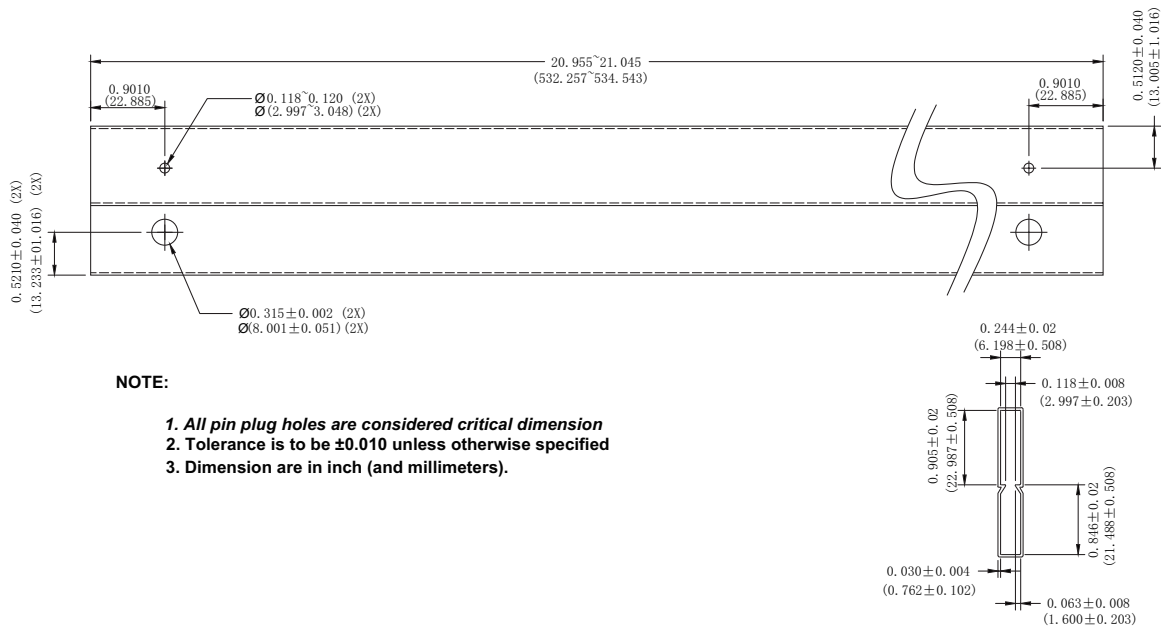


SIC = SiC
 1 = Gen1
 MO = MOSFET
 120 = Voltage Rating (1200 V)
 E = TO-247-3L
 0080 = $R_{DS(ON)}$ (80 mOhm)
 YY = Year
 WW = Week
 D = Special Code
 ZZZZZZ-ZZ = Lot Number

Packing Options

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

Packing Specification TO-247-3L



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