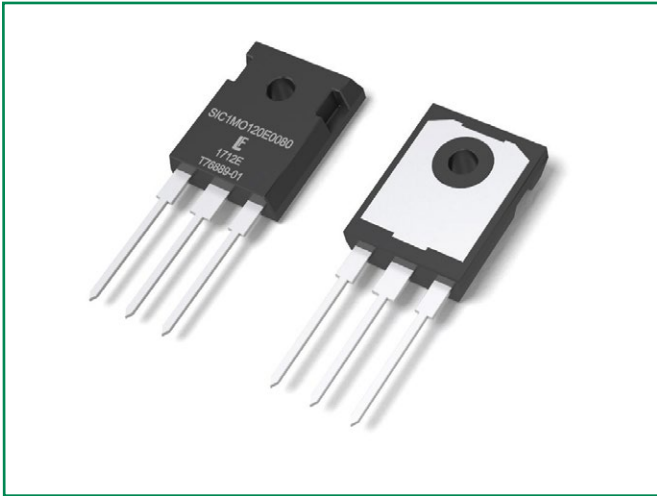


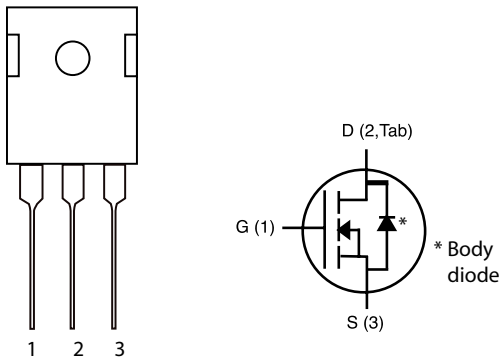
**LSIC1MO120E0080 1200 V N-channel, Enhancement-mode SiC MOSFET** **HF** **RoHS** **Pb**



**Product Summary**

Characteristics	Value	Unit
$V_{DS}$	1200	V
Typical $R_{DS(ON)}$	80	mΩ
$I_D$ ( $T_C \leq 100\text{ }^\circ\text{C}$ )	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 <sup>1</sup>	$I_{D(pulse)}$	$T_C = 25\text{ }^\circ\text{C}$	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	$T_{sold}$	-	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	Value	Unit
Maximum Thermal Resistance, junction-to-case	$R_{th,Jc,max}$	0.7	$^\circ\text{C/W}$
Maximum Thermal Resistance, junction-to-ambient	$R_{th,JA,max}$	40	$^\circ\text{C/W}$

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

Characteristics	Symbol	Conditions	Min	Typ	Max	Unit
<b>Static Characteristics</b>						
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	$\mu\text{A}$
		$V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$	-	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 $\Omega$
		$I_D = 20\text{ A}, V_{GS} = 20\text{ V}, T_J = 150\text{ }^\circ\text{C}$	-	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	-	$\Omega$

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

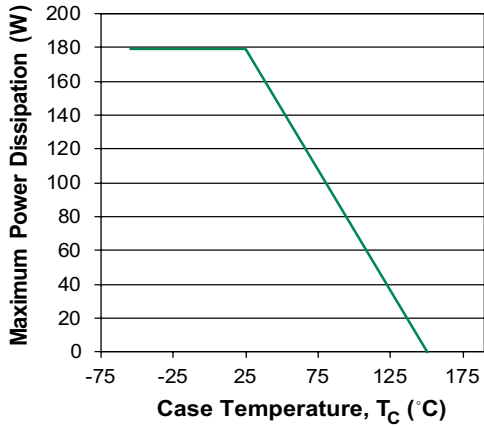
Characteristics	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
<b>Dynamic Characteristics</b>						
Turn-on Switching Energy	$E_{ON}$	$V_{DD} = 800\text{ V}, I_D = 20\text{ A},$ $V_{GS} = -5/+20\text{ V},$ $R_{G,ext} = 2\ \Omega, L = 1.4\text{ mH}$	-	270	-	$\mu\text{J}$
Turn-off Switching Energy	$E_{OFF}$		-	60	-	
Total Per-cycle Switching Energy	$E_{TS}$		-	330	-	
Input Capacitance	$C_{ISS}$	$V_{DD} = 800\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}, V_{AC} = 25\text{ mV}$	-	1825	-	$\text{pF}$
Output Capacitance	$C_{OSS}$		-	75	-	
Reverse Transfer Capacitance	$C_{RSS}$		-	15	-	
$C_{OSS}$ Stored Energy	$E_{OSS}$		-	25	-	
Total Gate Charge	$Q_g$	$V_{DD} = 800\text{ V}, I_D = 20\text{ A},$ $V_{GS} = -5/+20\text{ V}$	-	95	-	$\text{nC}$
Gate-source Charge	$Q_{gs}$		-	29	-	
Gate-drain Charge	$Q_{gd}$		-	39	-	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 800\text{ V}, V_{GS} = -5/+20\text{ V},$ $I_D = 20\text{ A}, R_{G,ext} = 2\ \Omega,$ $R_L = 40\ \Omega,$ Timing relative to $V_{DS}$	-	10	-	$\text{ns}$
Rise Time	$t_r$		-	10	-	
Turn-off Delay Time	$t_{d(off)}$		-	16	-	
Fall Time	$t_f$		-	6	-	

**Reverse Diode Characteristics**

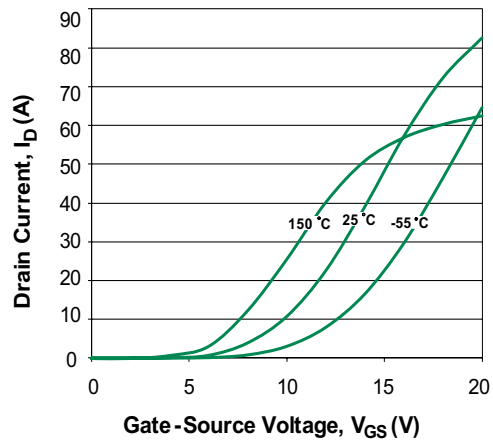
Characteristics	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Diode Forward Voltage	$V_{SD}$	$I_S = 10\text{ A}, V_{GS} = 0\text{ V}$	-	3.8	-	$\text{V}$
		$I_S = 10\text{ A}, V_{GS} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$	-	3.4	-	
Continuous Diode Forward Current	$I_S$	$V_{GS} = 0\text{ V}, T_C = 25\text{ }^\circ\text{C}$	-	-	35	$\text{A}$
Peak Diode Forward Current <sup>1</sup>	$I_{SP}$		-	-	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	-	$\text{ns}$
Reverse Recovery Charge	$Q_{rr}$		-	185	-	$\text{nC}$
Peak Reverse Recovery Current	$I_{rrm}$		-	16	-	$\text{A}$

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

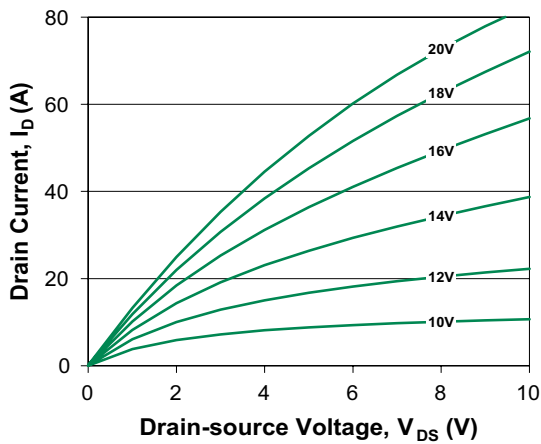
**Figure 1: Maximum Power Dissipation ( $T_j = 150^\circ\text{C}$ )**



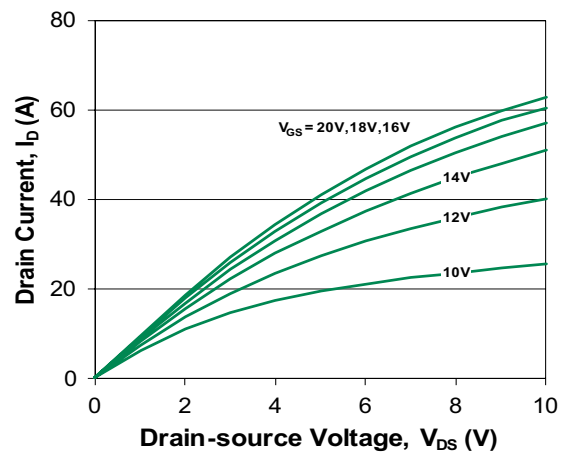
**Figure 2: Transfer Characteristics ( $V_{DS} = 10\text{V}$ )**



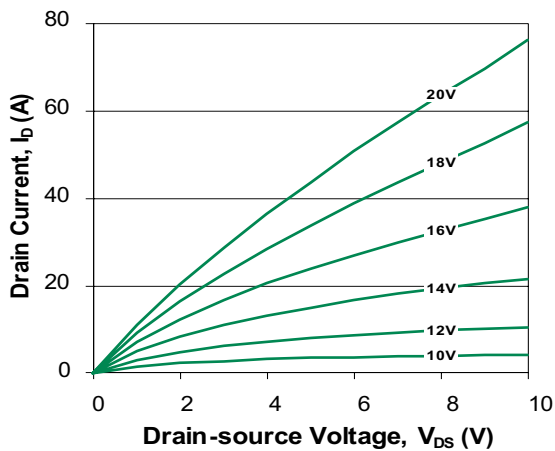
**Figure 3: Output Characteristics ( $T_j = 25^\circ\text{C}$ )**



**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 ( $T_j = 25^\circ\text{C}$ )**

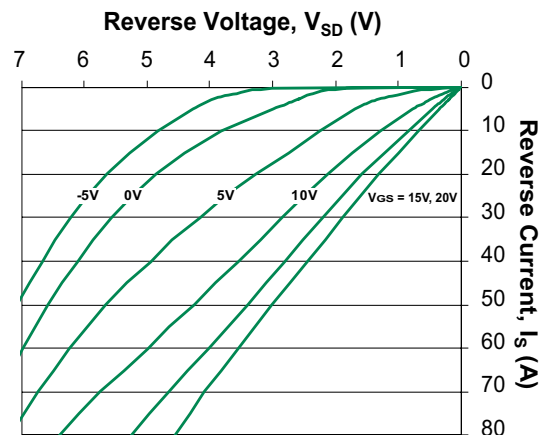


Figure 7: Reverse Conduction Characteristics ( $T_J = 150^\circ\text{C}$ )

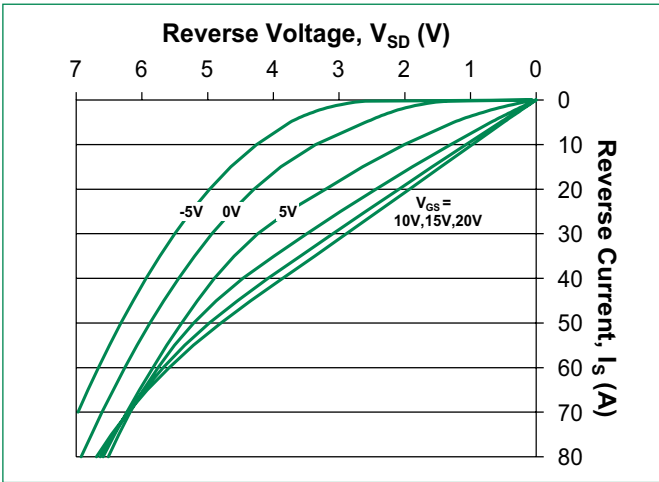


Figure 8: Reverse Conduction Characteristics ( $T_J = -55^\circ\text{C}$ )

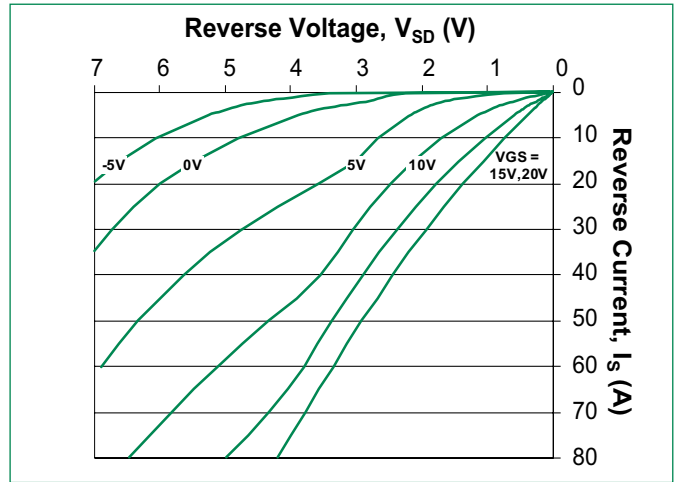


Figure 9: Transient Thermal Impedance

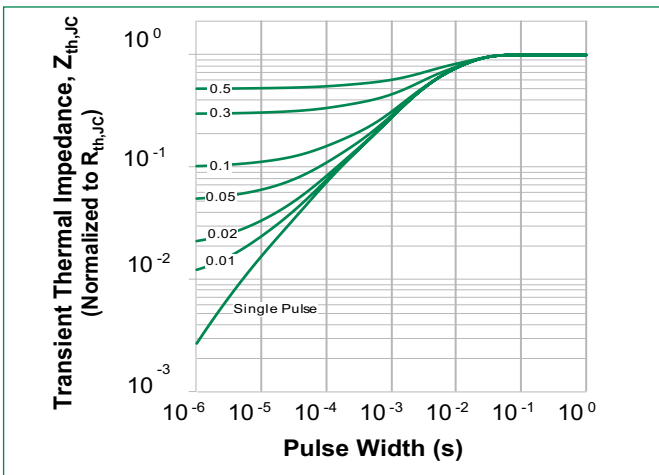


Figure 10: Safe Operating Area ( $T_C = 25^\circ\text{C}$ )

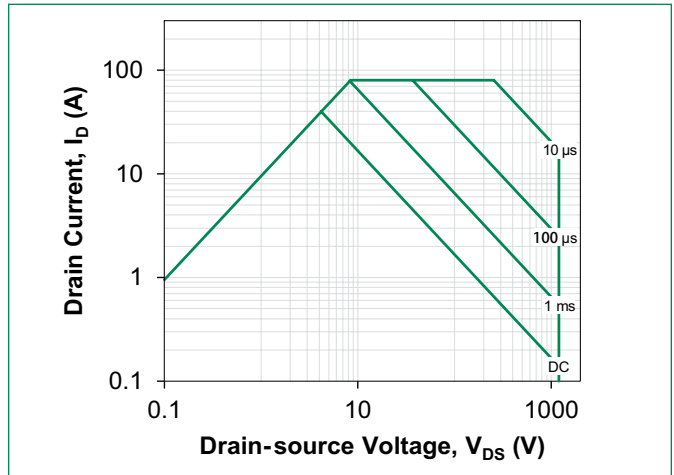


Figure 11: On-resistance vs. Drain Current

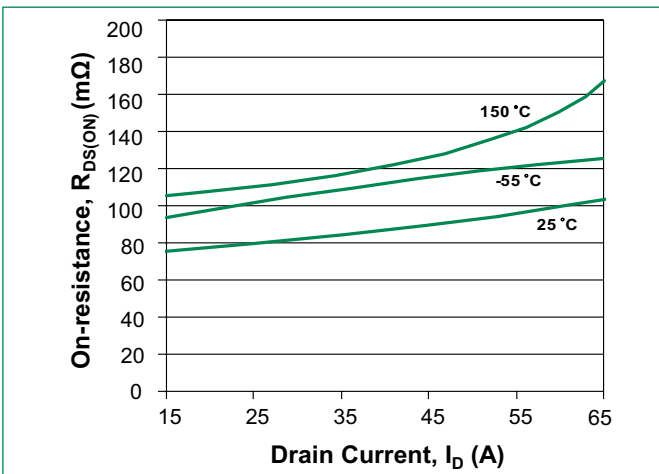
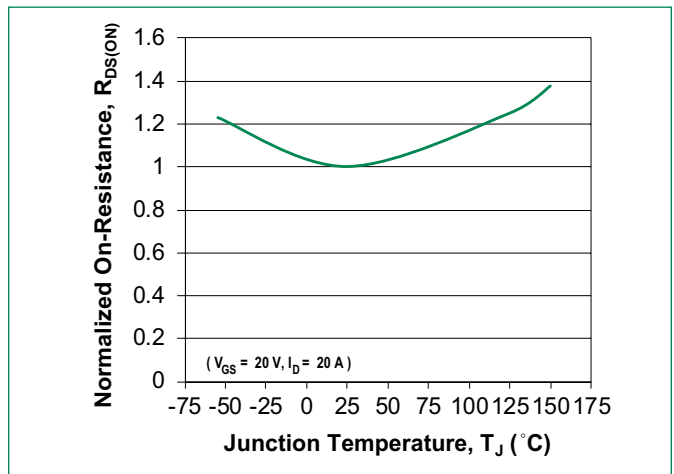
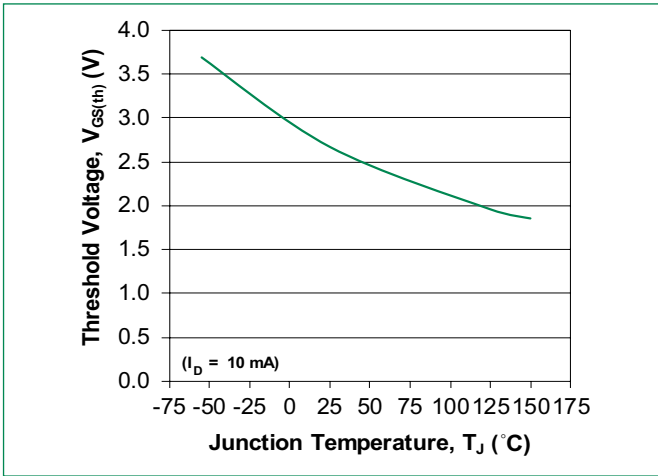


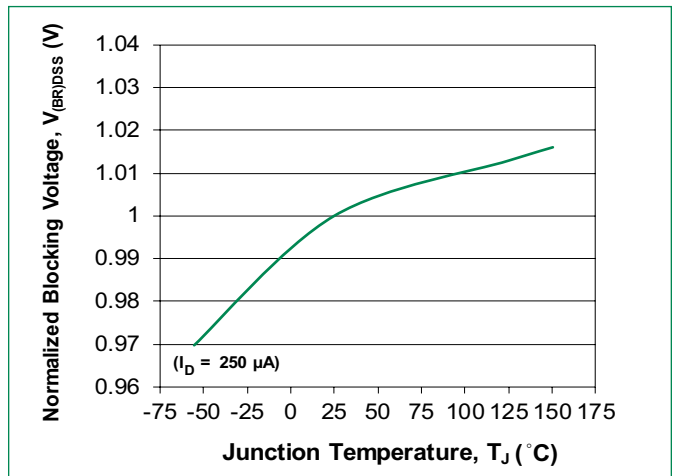
Figure 12: Normalized On-resistance



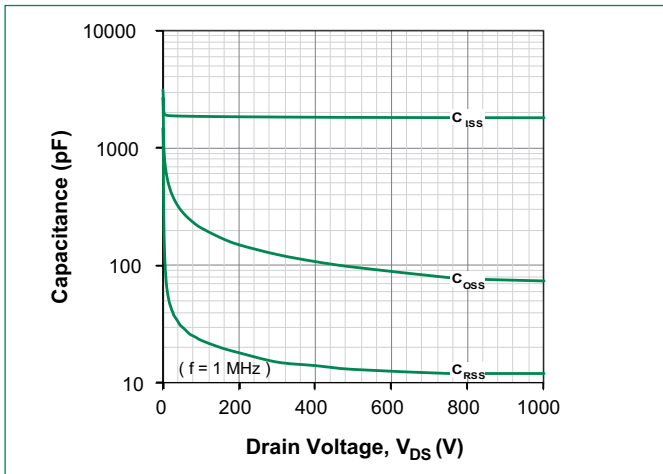
**Figure 13: Threshold Voltage**



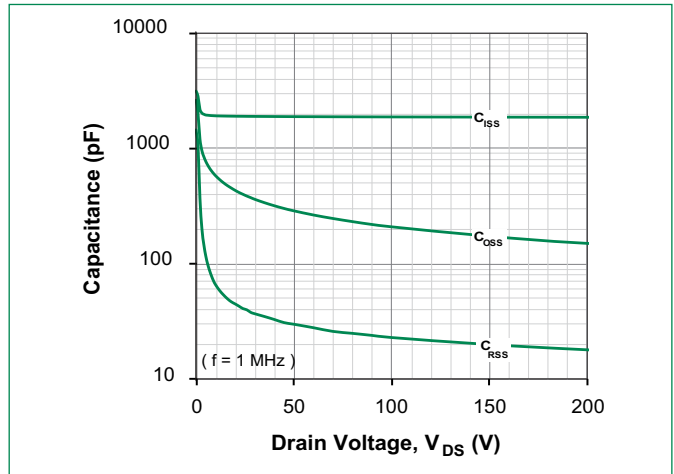
**Figure 14: Drain-source Blocking Voltage**



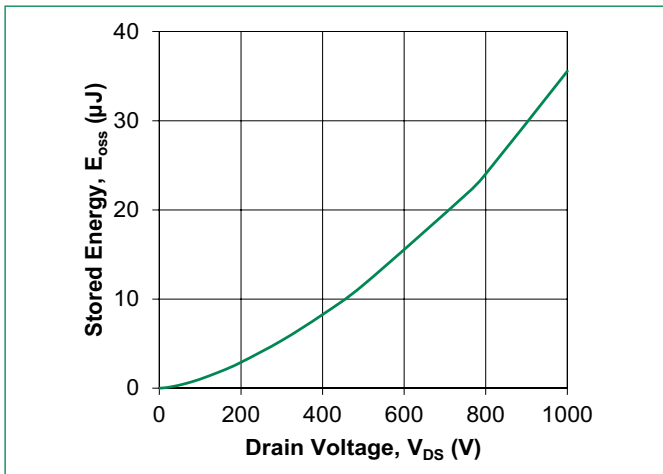
**Figure 15: Junction Capacitances**



**Figure 16: Junction Capacitances**



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



**Figure 18: Gate Charge**

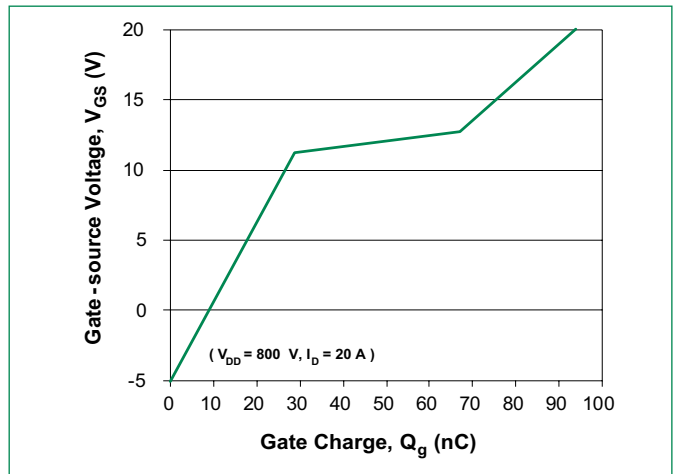


Figure 19: Switching Energy vs. Drain Current

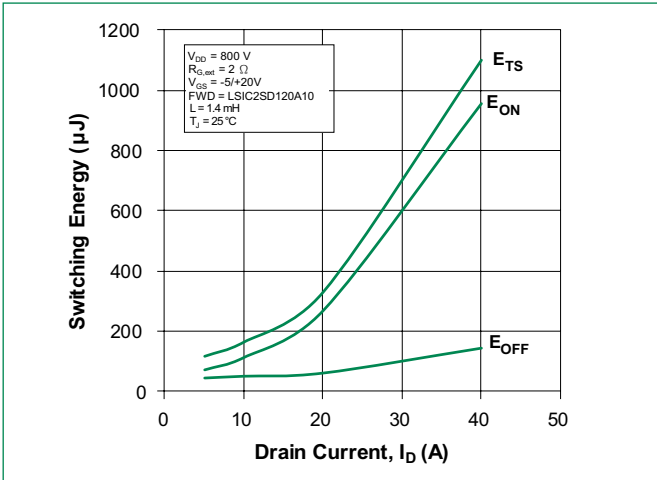
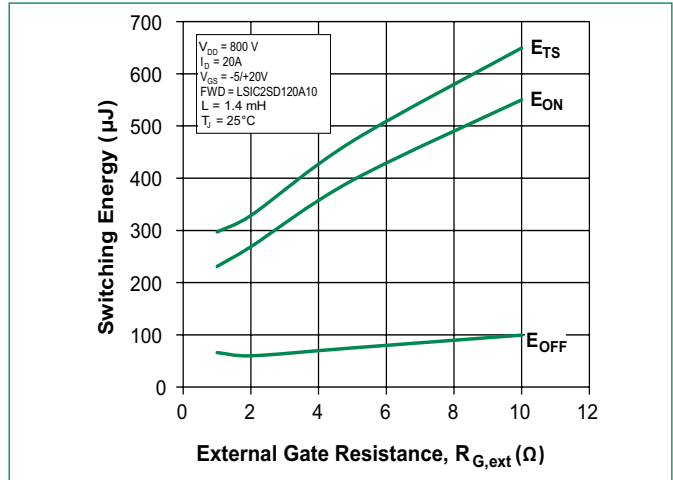
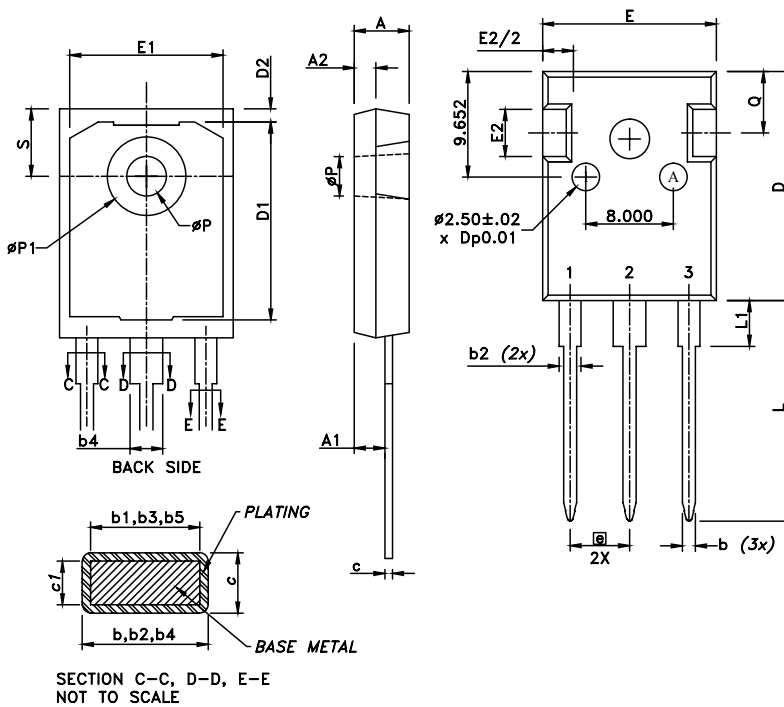


Figure 20: Switching Energy vs. Gate Resistance

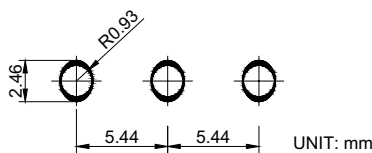


Package Dimensions TO-247-3L



SECTION C-C, D-D, E-E  
NOT TO SCALE

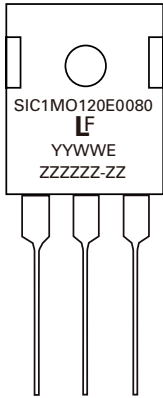
Recommended Hole Pattern Layout



- 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.

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

**Part Numbering and Marking System**

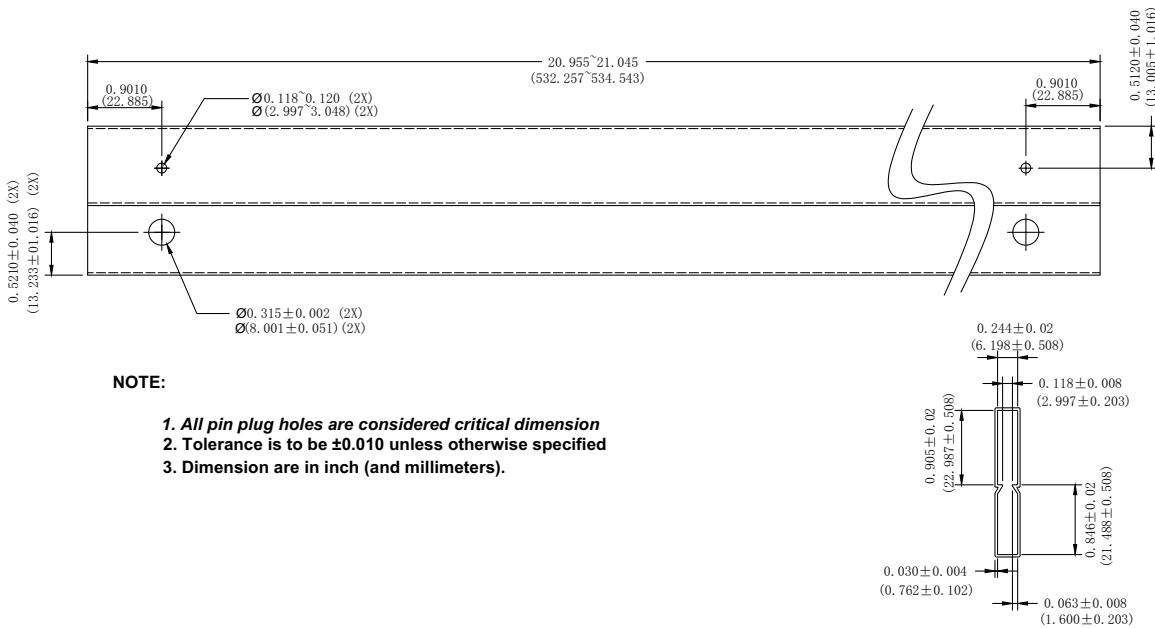


**SIC** = SiC  
**1** = Gen1  
**MO** = MOSFET  
**120** = Voltage Rating (1200 V)  
**E** = TO-247-3L  
**0080** =  $R_{DS(ON)}$  (80 mOhm)  
**YY** = Year  
**WW** = Week  
**E** = Special Code  
**ZZZZZZ-ZZ** = Lot Number

**Packing Options**

Part Number	Marking	Packing Mode	M.O.Q
LSIC1MO120E0080	SIC1MO120E0080	Tube(30pcs)	450

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



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