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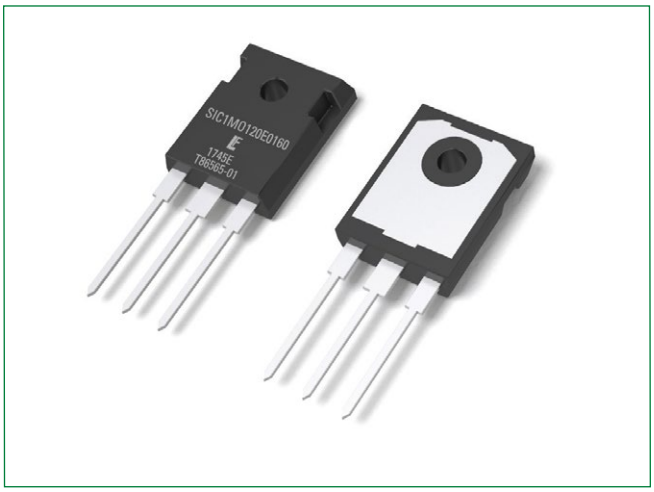
Expertise Applied | Answers Delivered

SiC MOSFET

LSIC1MO120E0160, 1200 V, 160 mOhm, TO-247-3L

LSIC1MO120E0160 1200 V N-channel, Enhancement-mode SiC MOSFET

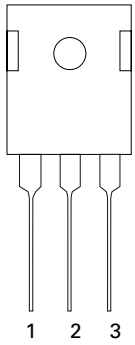
HF RoHS Pb

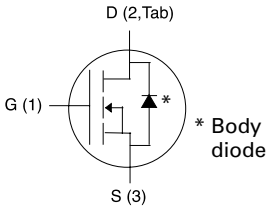


Product Summary

Characteristics	Value	Unit
V_{DS}	1200	V
Typical $R_{DS(ON)}$	160	mΩ
I_D ($T_C \leq 100$ °C)	14	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
- Halogen-free, RoHS compliant and lead-free

Environmental

- Littelfuse "RoHS" logo = RoHS conform
- Littelfuse "HF" logo = HF Halogen Free
- Littelfuse "Pb-free" logo = 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

Revised: 02/05/19

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Maximum Ratings

Characteristics	Symbol	Conditions	Value	Unit
Continuous Drain Current	I_D	V_{GS} = 20 V, T_C = 25 °C	22	A
		V_{GS} = 20 V, T_C = 100 °C	14	
Pulsed Drain Current [1]	$I_{D(pulse)}$	T_C = 25 °C	44	A
Power Dissipation	P_D	T_C = 25 °C, T_J = 150 °C	125	W
Operating Junction Temperature	T_J		-55 to 150	°C
Gate-source Voltage	$V_{GS,MAX}$	Absolute maximum values	-6 to 22	V
	$V_{GS,OP,TR}$	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	$R_{th,JC,max}$	1.0	°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} = 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 = 10 A, V_{GS} = 20 V	-	160	200	mΩ
		I_D = 10 A, V_{GS} = 20 V, T_J = 150 °C	-	210	-	
Gate Threshold Voltage	$V_{GS,(th)}$	V_{DS} = V_{GS}, I_D = 5 mA	1.8	2.8	4.0	V
		V_{DS} = V_{GS}, I_D = 5 mA, T_J = 150 °C	-	1.9	-	
Gate Resistance	R_G	Resonance method, Drain-Source shorted	-	0.95	-	Ω

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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 = 10 A, V_{GS} = -5/+20 V, $R_{G,ext}$ = 5 Ω, L = 1.4mH, FWD=LSIC2SD120A05	-	77	-	µJ
Turn-off Switching Energy	E_{OFF}		-	59	-	
Total Per-cycle Switching Energy	E_{TS}		-	136	-	
Input Capacitance	C_{ISS}	V_{DD} = 800 V, V_{GS} = 0 V, f = 1 MHz, V_{AC} = 25 mV	-	870	-	pF
Output Capacitance	C_{OSS}		-	45	-	
Reverse Transfer Capacitance	C_{RSS}		-	7	-	
C_{OSS} Stored Energy	E_{OSS}		-	14	-	µJ
Total Gate Charge	Q_g	V_{DD} = 800 V, I_D = 10 A, V_{GS} = -5/+20 V	-	57	-	nC
Gate-source Charge	Q_{gs}		-	14	-	
Gate-drain Charge	Q_{gd}		-	20	-	
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 800 V, V_{GS} = -5/+20 V, I_D = 10 A, $R_{G,ext}$ = 5 Ω, R_L = 80 Ω, Timing relative to V_{DS}	-	12	-	ns
Rise Time	t_r		-	8	-	
Turn-off Delay Time	$t_{d(off)}$		-	19	-	
Fall Time	t_f		-	14	-	

Reverse Diode Characteristics

Characteristics	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Diode Forward Voltage	V_{SD}	I_S = 5 A, V_{GS} = 0 V	-	3.8	-	V
		I_S = 5 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	-	-	24	A
Peak Diode Forward Current [1]	I_{SP}		-	-	44	

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

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

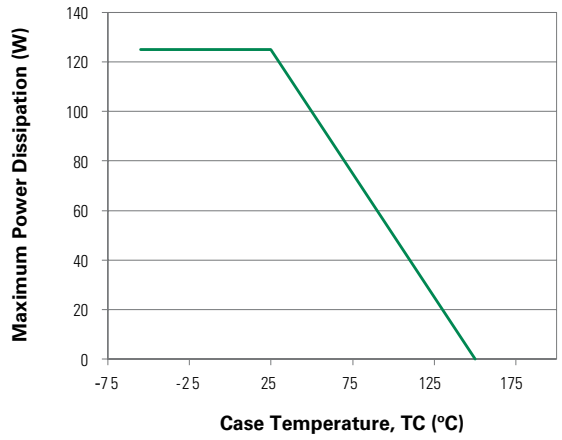

Figure 2: Transfer Characteristics (V_{DS} = 10 V)

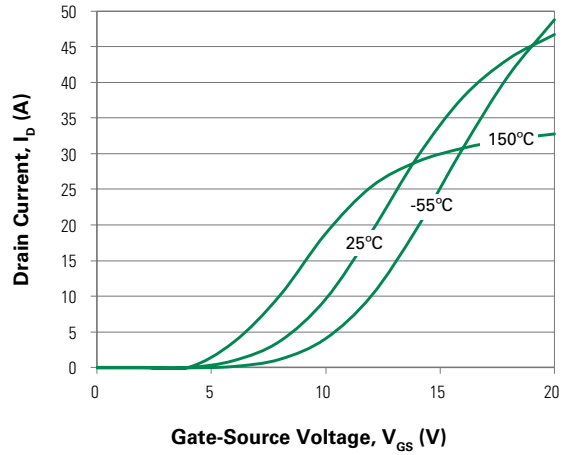

Figure 3: Output Characteristics (T_J = 25 °C)

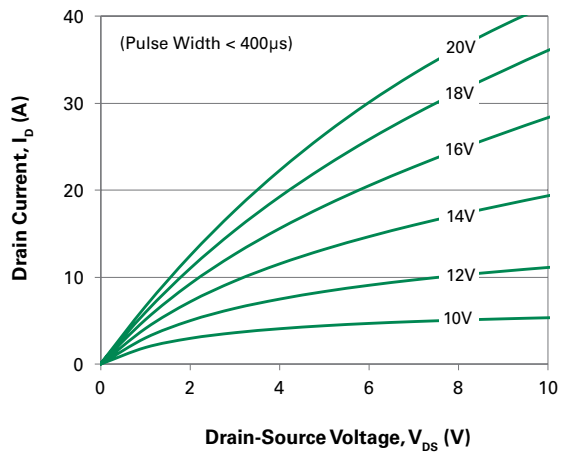

Figure 4: Output Characteristics (T_J = 150 °C)

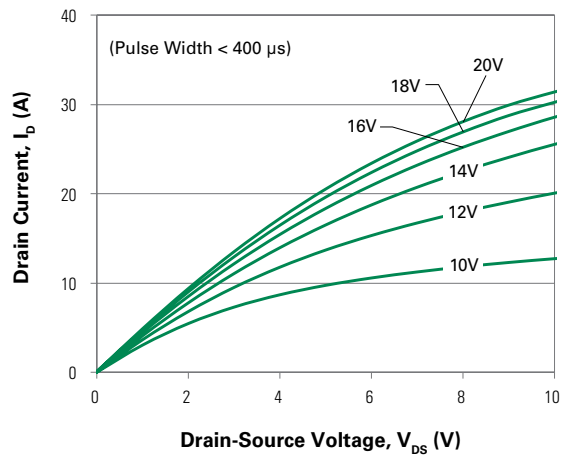

Figure 5: Output Characteristics (T_J = -55 °C)

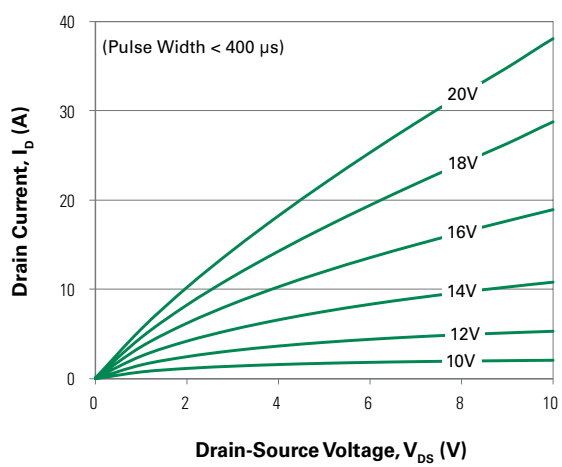

Figure 6: Reverse Conduction Characteristics (T_J = 25 °C)

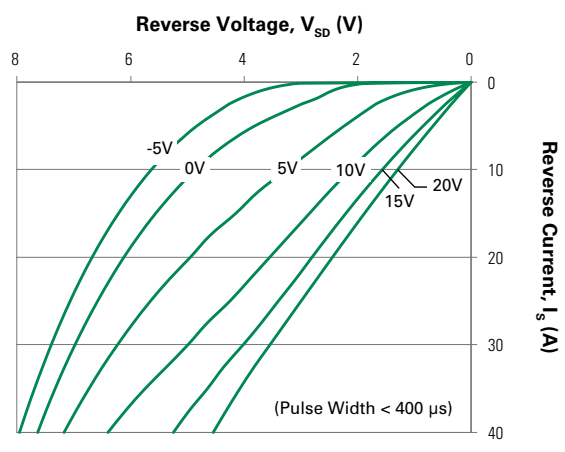

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Figure 7: Reverse Conduction Characteristics (T_J = 150 °C)

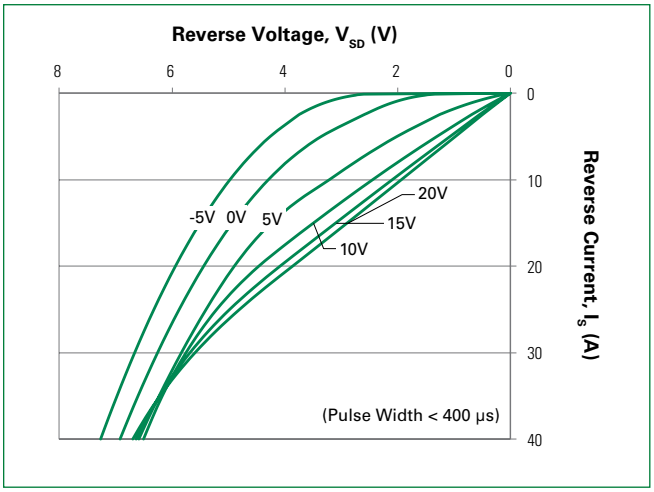

Figure 8: Reverse Conduction Characteristics (T_J = -55 °C)

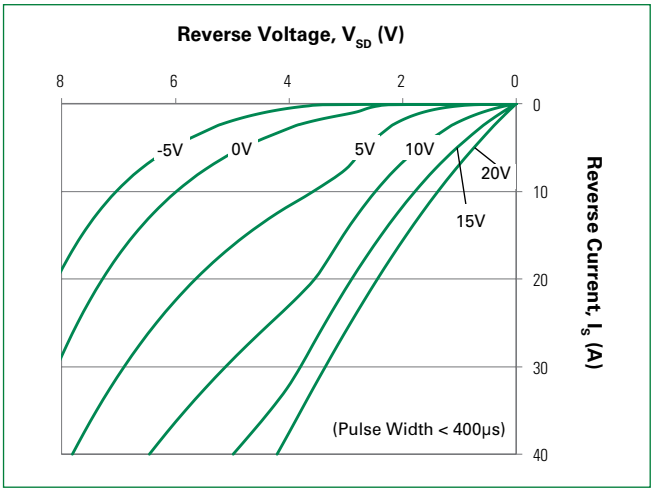

Figure 9: Transient Thermal Impedance

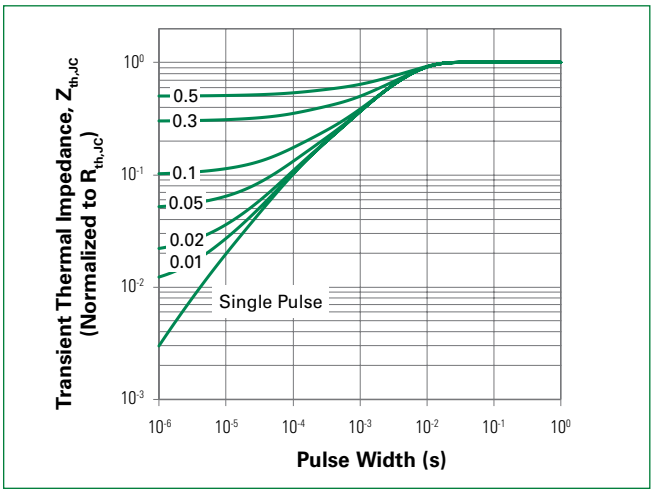

Figure 10: Safe Operating Area (T_C = 25 °C)

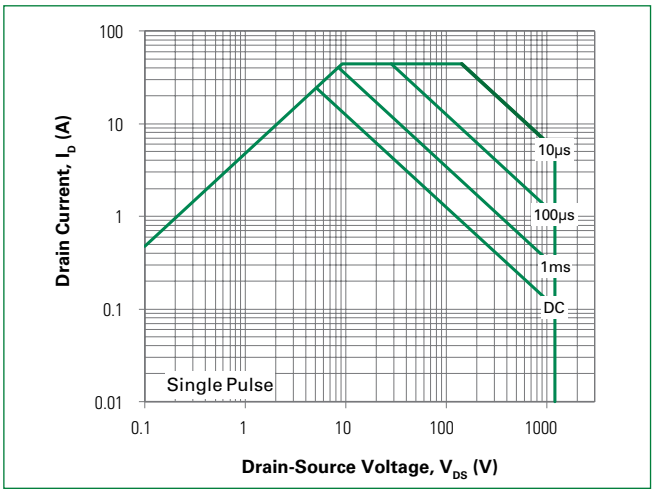

Figure 11: On-resistance vs. Drain Current

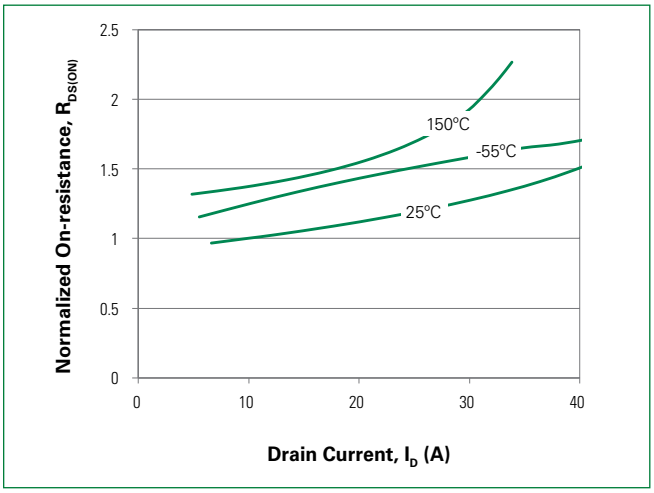

Figure 12: Normalized On-resistance

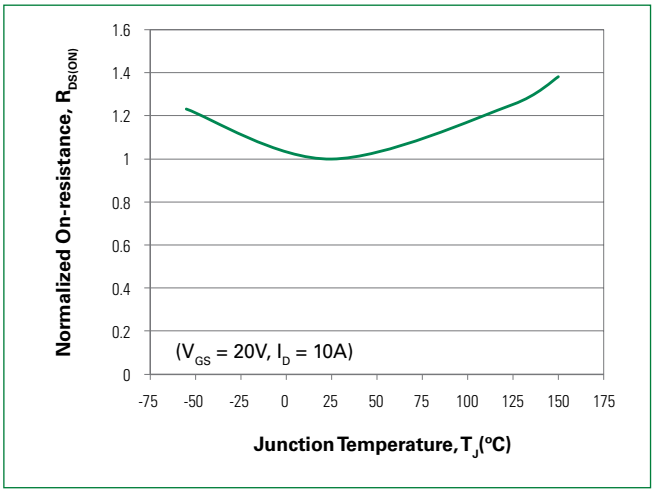

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Figure 13: Threshold Voltage

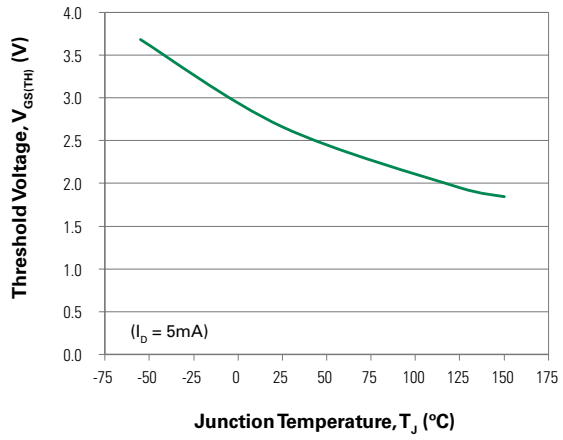


Figure 14: Drain-Source Blocking Voltage

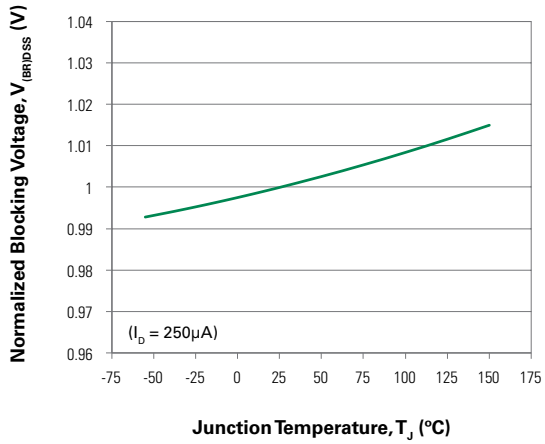


Figure 15: Junction Capacitances

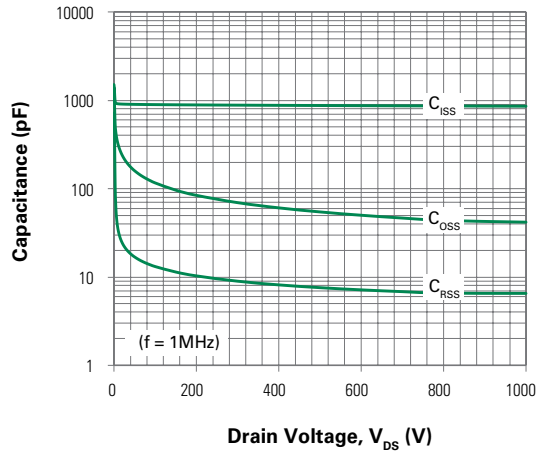


Figure 16: Junction Capacitances

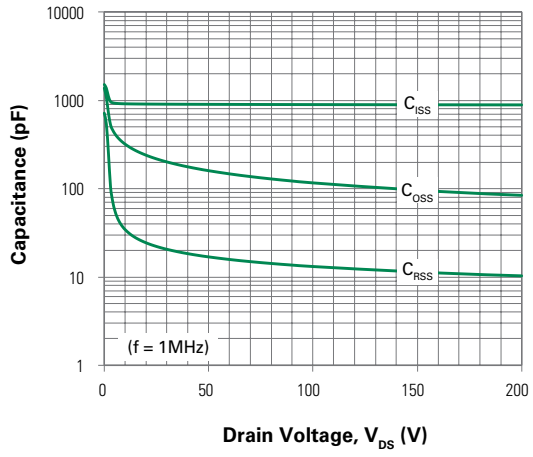


Figure 17: C_{OSS} Stored Energy E_{OSS}

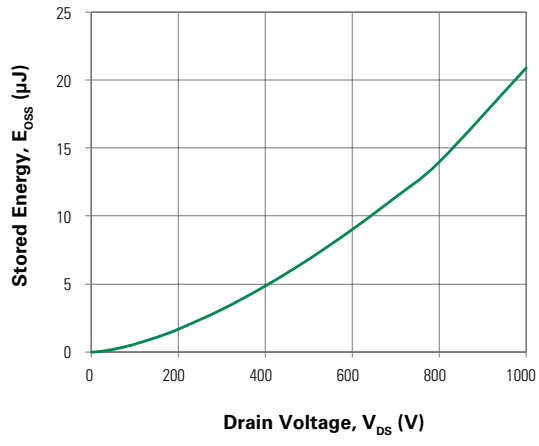


Figure 18: Gate Charge

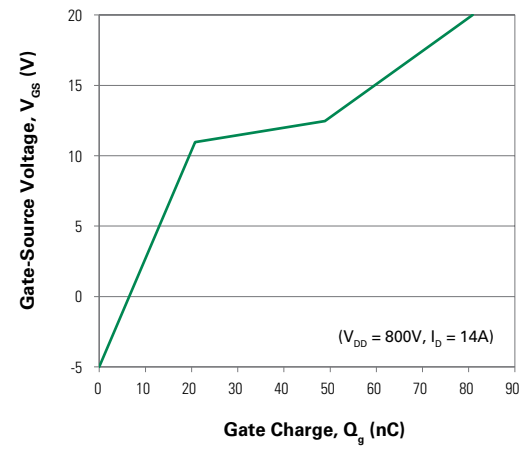


Figure 19: Switching Energy vs. Drain Current

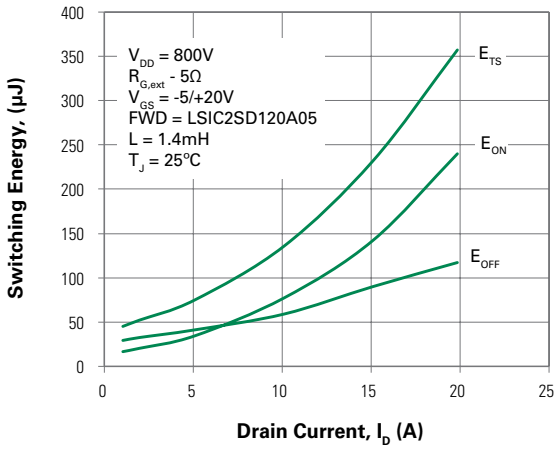
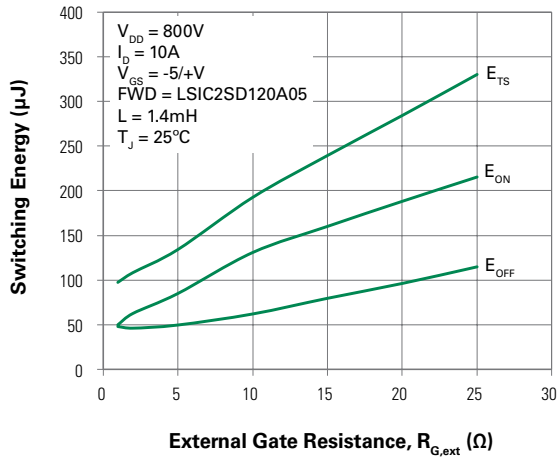
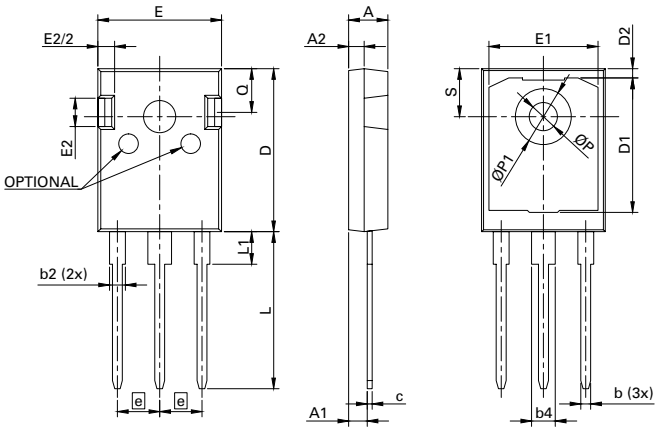


Figure 20: Switching Energy vs. Gate Resistance



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 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	4.80	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

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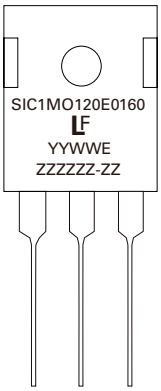
Part Numbering and Marking System

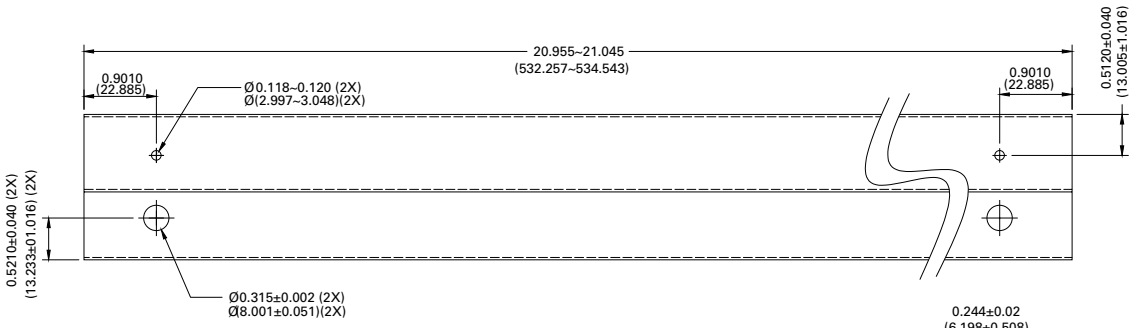


SIC	= SiC
1	= Gen1
MO	= MOSFET
120	= Voltage Rating (1200 V)
E	= TO-247-3L
0160	= $R_{DS(ON)}$ (160 mOhm)
YY	= Year
WW	= Week
E	= Special Code
ZZZZZZ-ZZ	= Lot Number

Packing Options

Part Number	Marking	Packing Mode	M.O.Q
LSIC1MO120E0160	SIC1MO120E0160	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).**