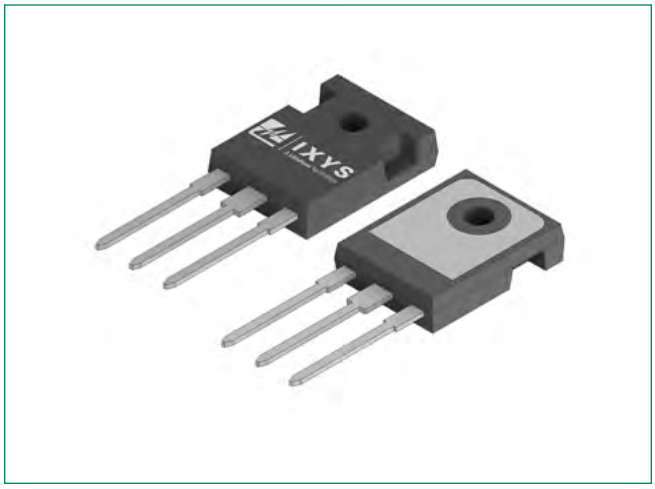
LSIC1MO120E0160

1200V 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

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
- Halogen-free, lead-free, and RoHS-compliant

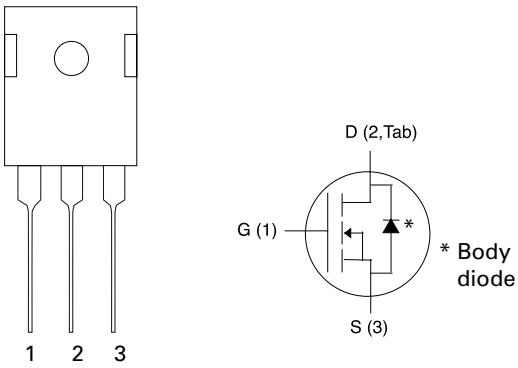
Additional Information

Resources | Accessories | Samples

Applications

- High-frequency applications
- Solar Inverters
- Switch Mode Power Supplies
- UPS
- Motor Drives
- High Voltage DC/DC Converters
- Battery Chargers
- Induction Heating

Circuit Diagram



Revised: TK. 04/05/22

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

Maximum Ratings

Characteristic	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DS}	V_{GS} = 0V	1200	V
Continuous Drain Current	I_D	V_{GS} = 20V, T_C = 25 °C	20	A
		V_{GS} = 20V, T_C = 100 °C	14	
Pulsed Drain Current[1]	$I_{D(pulse)}$	T_C = 25 °C	45	A
Power Dissipation	P_D	T_C = 25 °C, T_J = 175 °C	125	W
Gate-Source Voltage	$V_{GS, MAX}$	Absolute maximum values - Steady state	–6 to +22	V
	$V_{GS, OP, TR}$[2]	Transient, $t_{transient}$ < 300 nsec	–10 to +25	
	$V_{GS, OP}$[3]	Recommended DC operating values	–5 to +20	
Operating Junction Temperature	T_J	–	–55 to +175	°C
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	1.0	Nm
			8.8	in-lb
ESD Sensitivity Rating	HBM ESD	Maximum Withstand Voltage	750	V
	CDM ESD	Maximum Withstand Voltage	1000	

1. Pulse width limited by $T_{J,MAX}$
2. See Figure 21 for further information
3. MOSFET can operate with $V_{GS(OFF)}$ = 0 V. $V_{GS(OFF)}$ = -5 V provides added noise margin and faster turn-off speed

Thermal Characteristics

Characteristic	Symbol	Value	Unit
Maximum Thermal Resistance, junction–to–case	$R_{th, JC, MAX}$	1.2	°C/W
Maximum Thermal Resistance, junction–to–ambient	$R_{th, JA, MAX}$	40	°C/W

Electrical Characteristics - Static Characteristics (T_J = 25°C unless otherwise specified)

Characteristic	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 100 µA	1200	–	–	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 1200, V_{GS} = 0 V	–	<1	100	µA
		V_{DS} = 1200 V, V_{GS} = 0 V, T_J = 175 °C	–	<1	–	
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 = 175 °C	–	230	–	
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 = 175 °C	–	1.8	–	
Gate Resistance	R_G	Resonance method, Drain-Source shorted[1]	–	0.85	–	Ω

Footnote 1. For a description of the resonance method for measuring R_G, refer to the JEDEC Standard JESD24-11 test method.

Revised: TK. 04/05/22

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

Electrical Characteristics - Dynamic Characteristics (T_J = 25°C unless otherwise specified)

Characteristic	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
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 = 1.4 mH, FWD = LSIC2SD120A05	–	140	–	µJ
Turn-Off Switching Energy	E_{OFF}		–	22	–	
Total Per-Cycle Switching Energy	E_{TS}		–	162	–	
Input Capacitance	C_{ISS}	V_{DD} = 800 V, V_{GS} = 0 V, f = 1 MHz, V_{AC} = 25 mV	–	890	–	pF
Output Capacitance	C_{OSS}		–	45	–	
Reverse Transfer Capacitance	C_{RSS}		–	5	–	
COSS Stored Energy	E_{OSS}		–	14	–	µJ
Total Gate Charge	Q_g	V_{DD} = 800 V, I_D = 10 A, V_{GS} = -5 / +20 V	–	50	–	nC
Gate-Source Charge	Q_{gs}		–	15	–	
Gate-Drain Charge	Q_{gd}		–	17	–	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 800 V, I_D = 10 A, V_{GS} = -5 / +20 V, $R_{G,ext}$ = 5 Ω, R_L = 80 Ω, Timing relative to V_{DS}	–	12	–	ns
Rise Time	t_r		–	9	–	
Turn-Off Delay Time	$t_{d(off)}$		–	17	–	
Fall Time	t_f		–	9	–	

Reverse Diode Characteristics (T_J = 25°C unless otherwise specified)

Characteristic	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Diode Forward Voltage	V_{SD}	I_S = 5 A, V_{GS} = –5 V	–	4.2	–	V
		I_S = 5 A, V_{GS} = –5 V, T_J = 175 °C	–	3.7	–	
Continuous Diode Forward Current	I_S	V_{GS} = –5 V, T_C = 25 °C	–	–	21	A
Peak Diode Forward Current[1]	I_{SP}		–	–	45	
Reverse Recovery Time	t_{rr}	V_{GS} = –5 V, I_S = 10 A, V_R = 800 V, dI/dt = 3.4 A/ns	–	17	–	ns
Reverse Recovery Charge	Q_{rr}		–	87	–	nC
Peak Reverse Recovery Current	I_{rrm}		–	7	–	A

Footnote 1. Pulse width limited by $T_{J,MAX}$

Revised: TK. 04/05/22

LSIC1MO120E0160

1200V N-Channel, Enhancement-mode SiC MOSFET

Figure 1. Maximum Power Dissipation (T_J = 175°C)

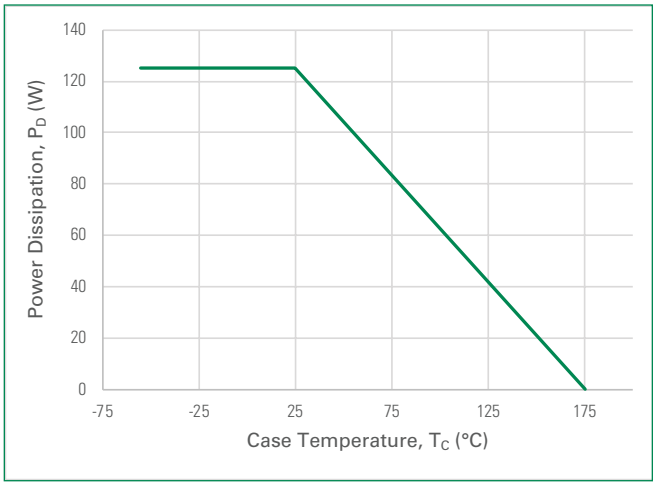


Figure 2. Typical Transfer Characteristics

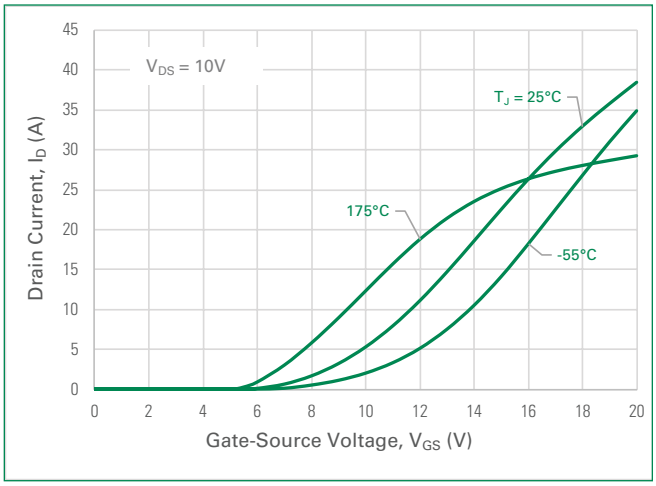


Figure 3. Typical Output Characteristics (T_J = 25°C)

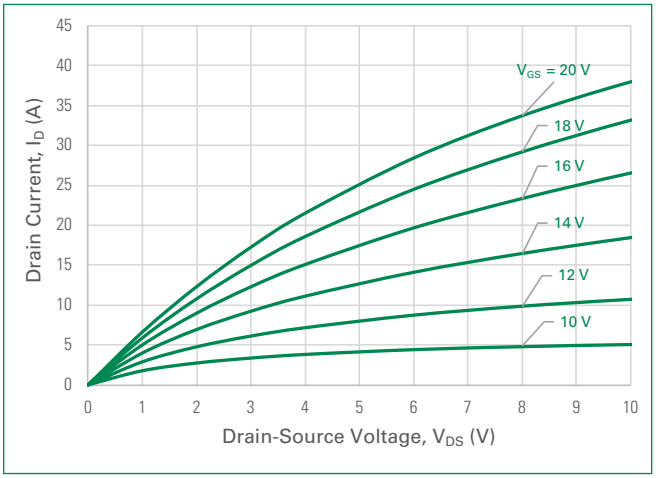


Figure 4. Typical Output Characteristics (T_J = 175°C)

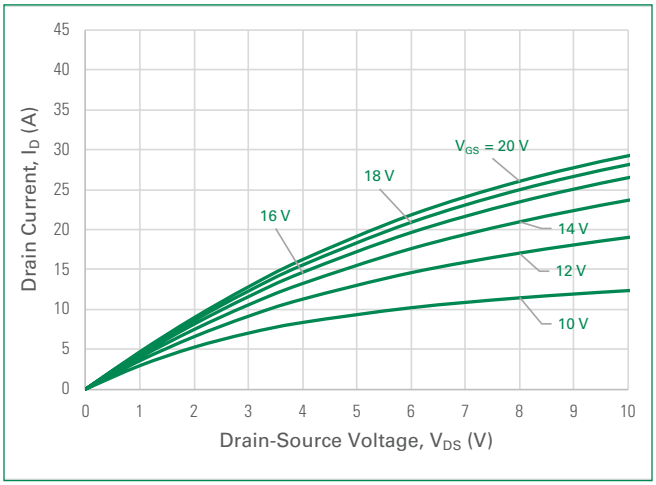


Figure 5. Typical Output Characteristics (T_J = -55°C)

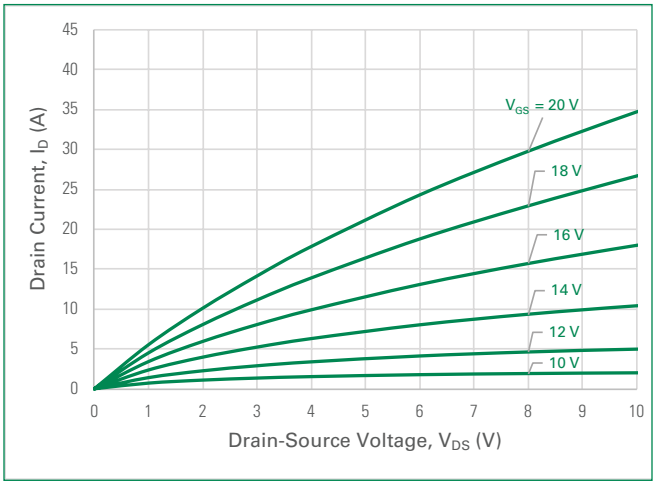
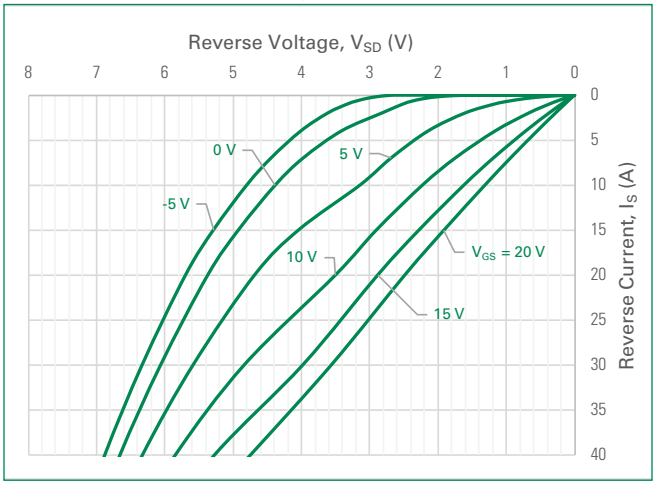


Figure 6. Typical Reverse Conduction Characteristics (T_J = 25°C)



Revised: TK. 04/05/22

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

Figure 7. Typical Reverse Conduction Characteristics (T_J = 175°C)

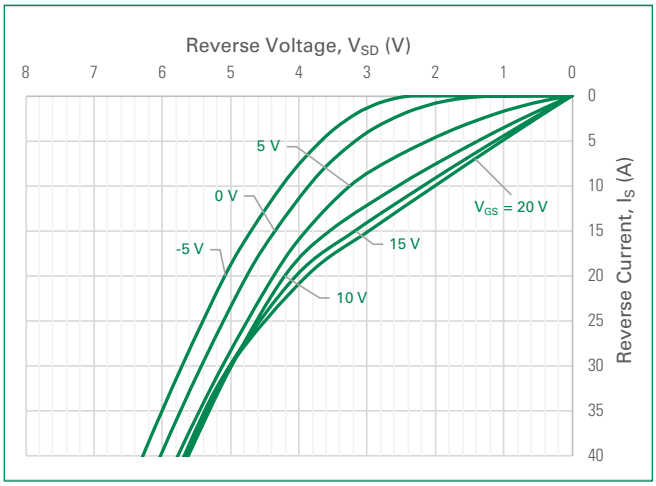


Figure 8. Typical Reverse Conduction Characteristics (T_J = -55°C)

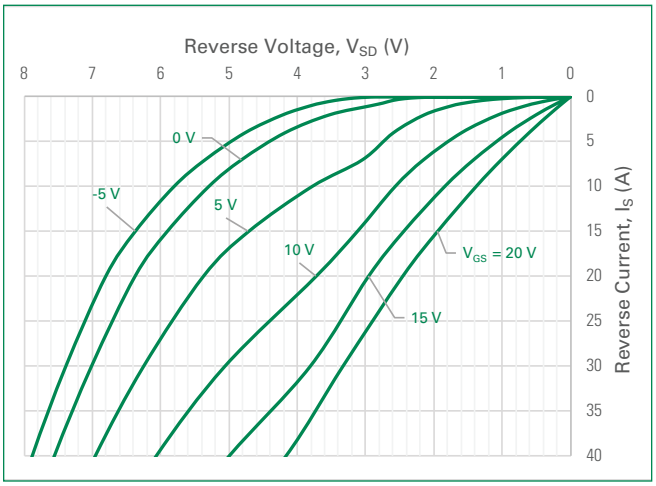


Figure 9. Transient Thermal Impedance

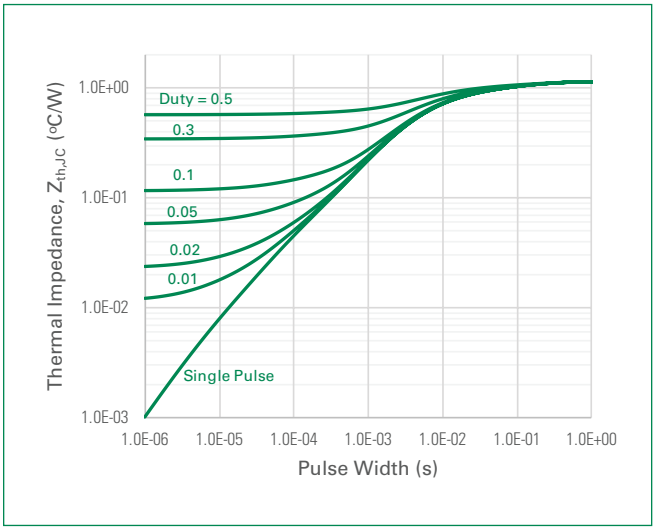


Figure 10. Maximum Safe Operating Area (T_C = 25°C)

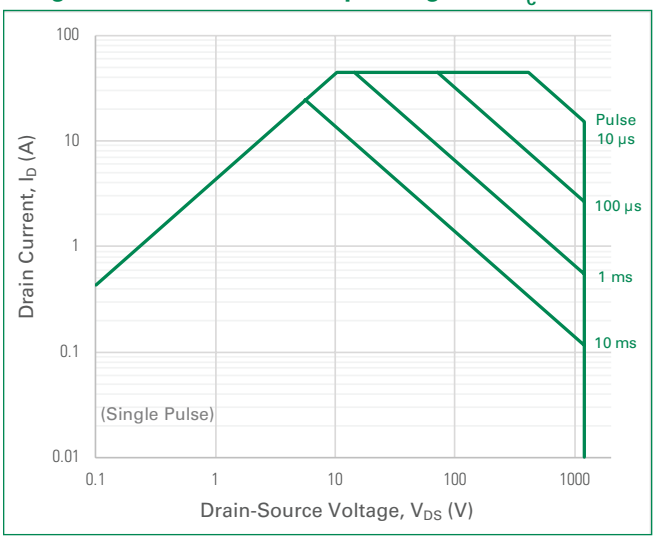


Figure 11. On-resistance vs. Drain Current

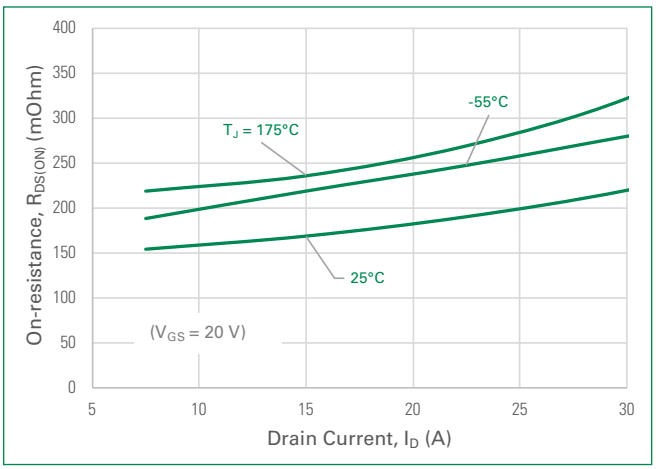
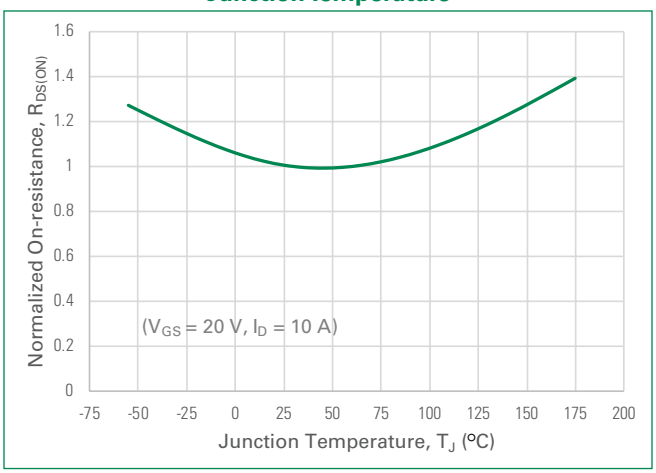


Figure 12. Normalized On-resistance vs Junction Temperature



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

Figure 13. Typical On-resistance vs Junction Temperature (Per V_{GS})

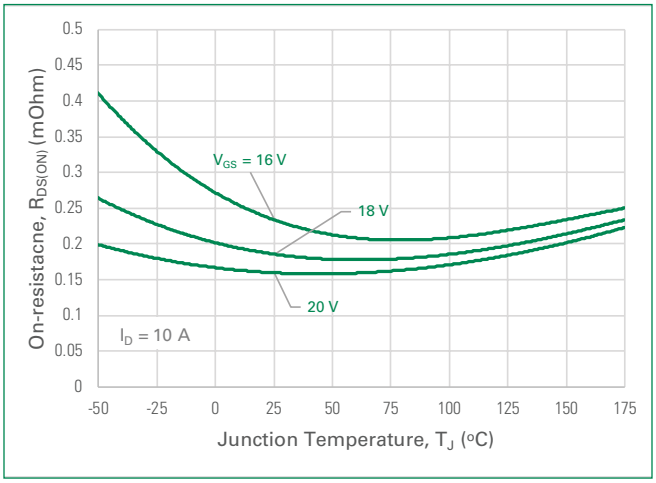


Figure 14. Typical Threshold Voltage

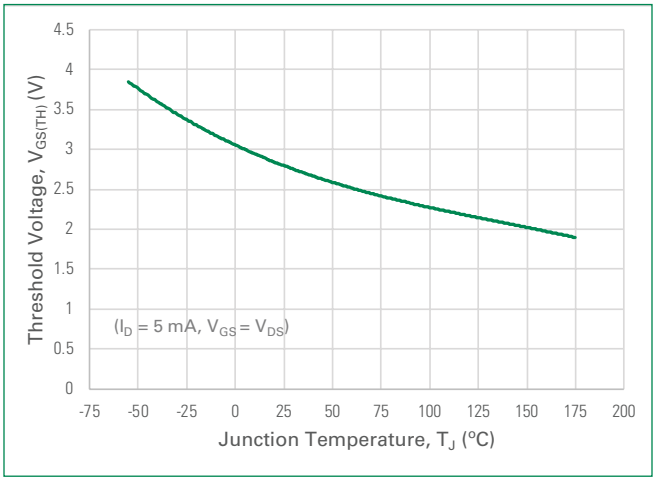


Figure 15. Typical Junction Capacitances up to 1000 V

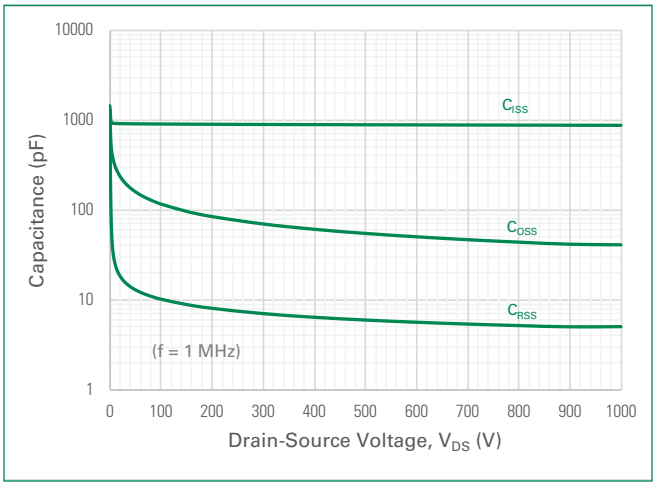


Figure 16. Typical Junction Capacitances up to 200 V

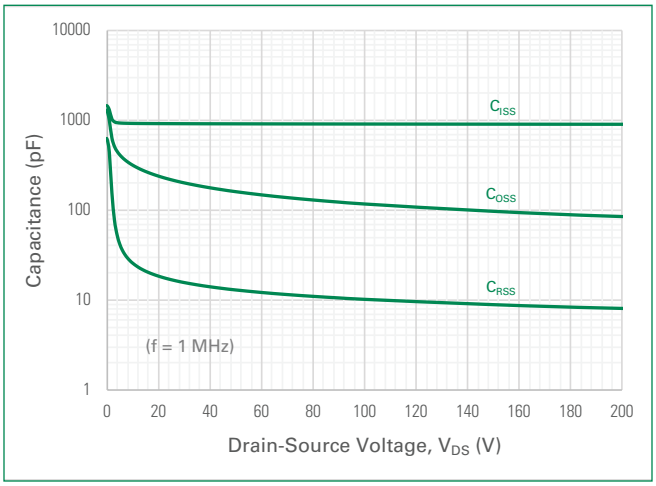


Figure 17. Typical C_{oss} Stored Energy E_{oss}

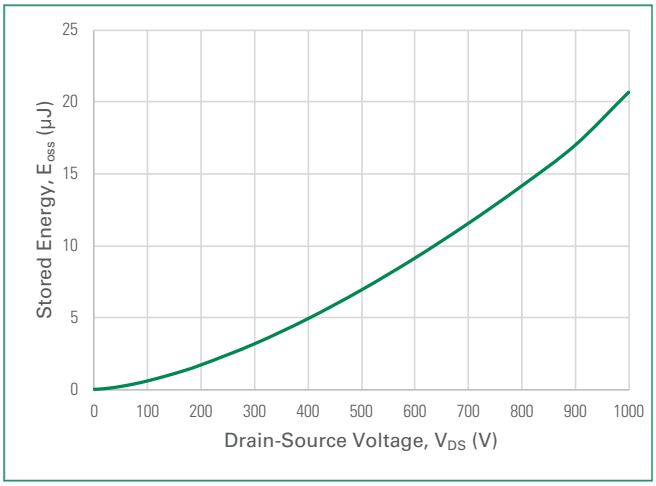
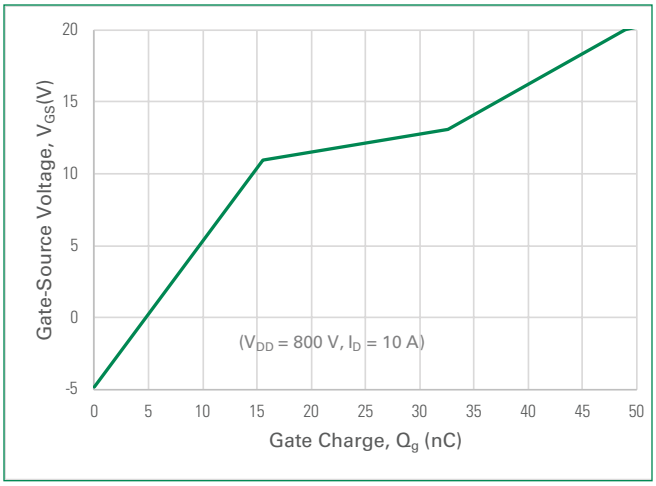


Figure 18. Typical Gate Charge



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

Figure 19. Typical Switching Energy vs Drain Current

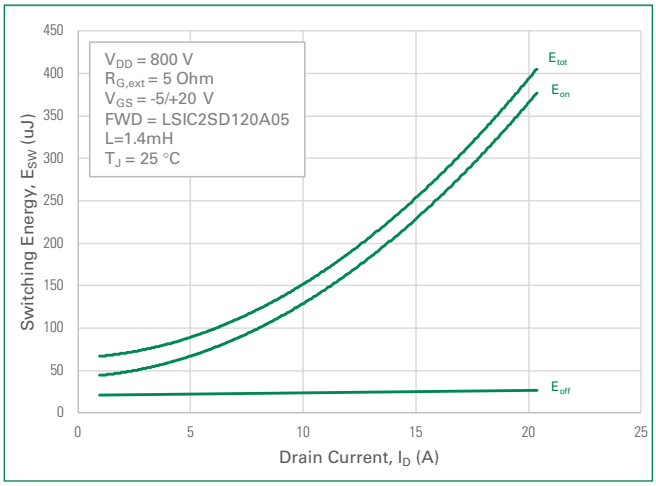


Figure 20. Typical Switching Energy vs External Gate Resistance

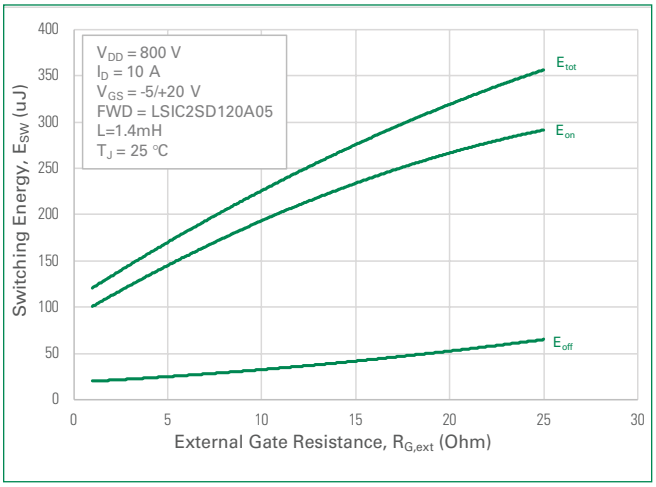
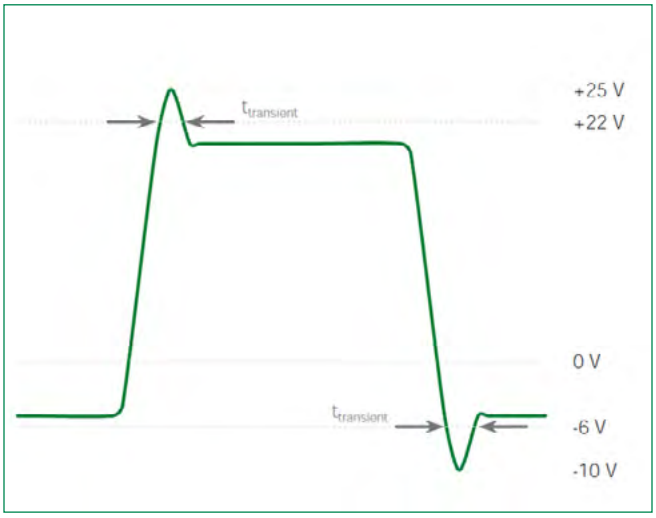


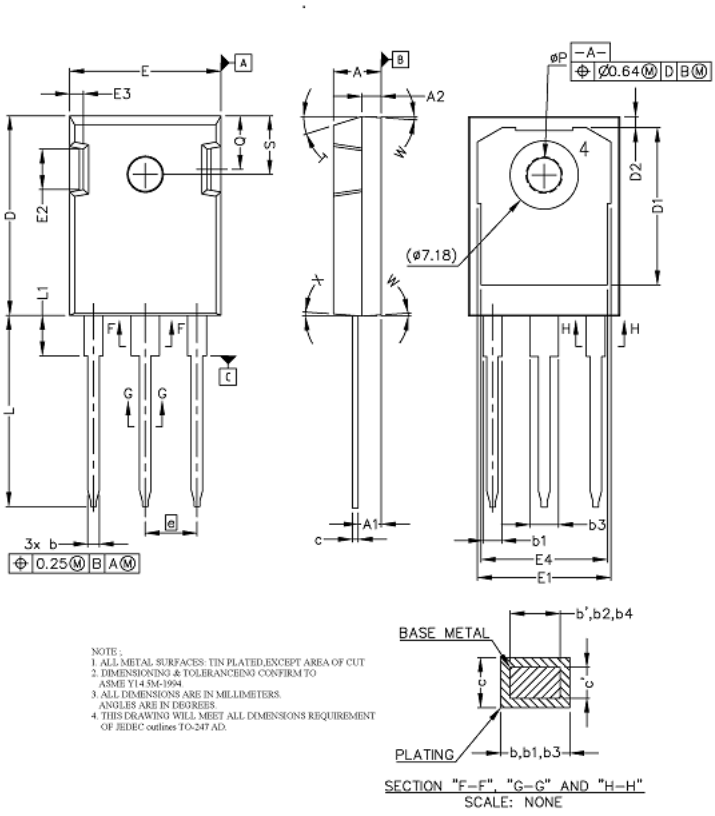
Figure 21. V_{GS} Waveform Definition



LSIC1MO120E0160

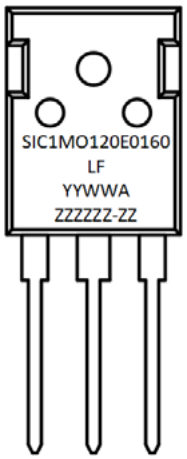
1200V N-Channel, Enhancement-mode SiC MOSFET

Package Dimensions



Symbol	Millimeters	
	Min	Max
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b'	1.07	1.28
b	1.07	1.33
b1	1.91	2.41
b2	1.91	2.16
b3	2.87	3.38
b4	2.87	3.13
c'	0.55	0.65
c	0.55	0.68
D	20.80	21.10
D1	16.25	17.65
D2	0.95	1.25
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
e	5.44 BSC	
N	3	
L	19.81	20.32
L1	4.10	4.40
øP	3.51	3.65
Q	5.49	6.00
S	6.04	6.30
T	17.5° REF.	
W	3.5° REF.	
X	4° REF.	

Part Numbering and Marking



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

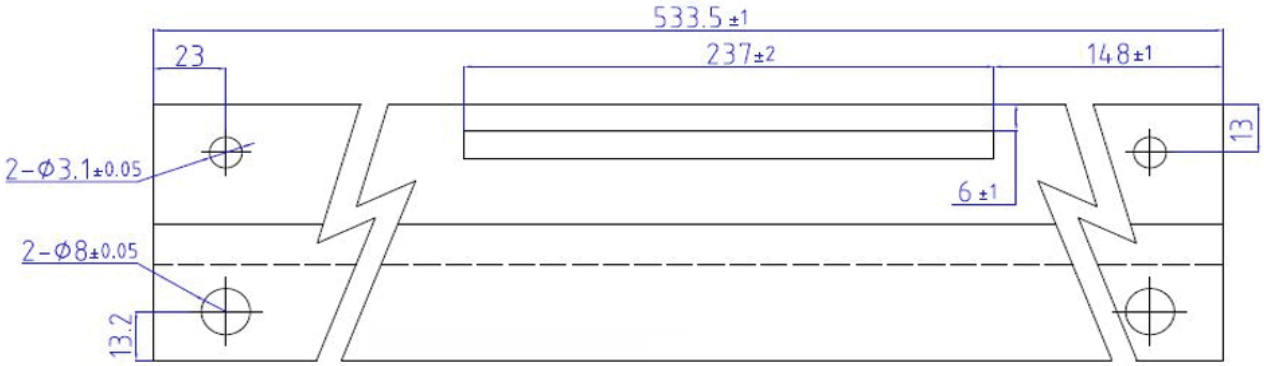
Packing Options

Part Number	Marking	Packing Mode	M.O.Q.
LSIC1MO120E0160	SIC1MO120E0160	Tube (30 Pcs)	450

LSIC1MO120E0160

1200V N-Channel, Enhancement-mode SiC MOSFET

Packing Specifications (Tube Dimensions)



Note: Dimensions in millimeters