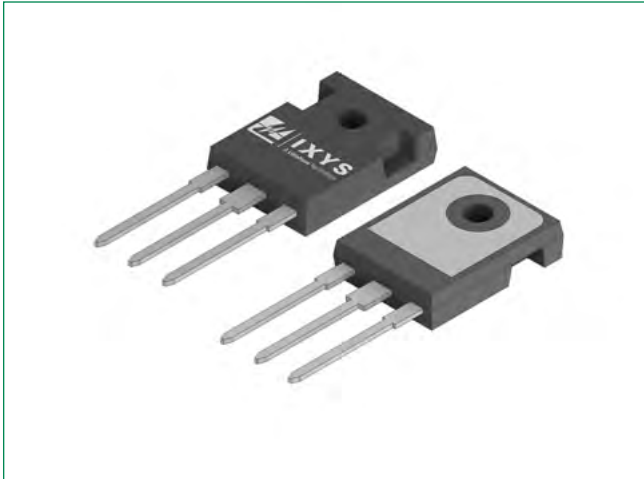


LSIC1M0120E0160

1200V N-Channel, Enhancement-mode SiC MOSFET

HF **RoHS** **Pb****Product Summary**

Characteristics	Value	Unit
V_{DS}	1200	V
Typical $R_{DS(ON)}$	160	m Ω
I_D ($T_C \leq 100^\circ\text{C}$)	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



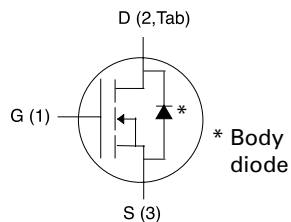
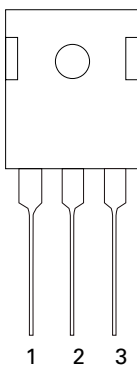
Accessories



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

LSIC1M0120E0160**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	$V_{GS} = 20V, T_C = 25^\circ C$	20	A
		$V_{GS} = 20V, T_C = 100^\circ C$	14	
Pulsed Drain Current ¹	$I_{D(pulse)}$	$T_C = 25^\circ C$	45	A
Power Dissipation	P_D	$T_C = 25^\circ C, T_J = 175^\circ C$	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	$^\circ C$
Storage Temperature	T_{STG}	-	-55 to +150	$^\circ C$
Lead Temperature for Soldering	T_{solder}	-	260	$^\circ C$
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 $V_{GS(OFF)} = 0V, V_{GS(ON)} = -5V$ 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	$^\circ C/W$
Maximum Thermal Resistance, junction-to-ambient	$R_{th, JA, MAX}$	40	$^\circ C/W$

Electrical Characteristics - Static Characteristics ($T_J = 25^\circ C$ unless otherwise specified)

Characteristic	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 100 \mu A$	1200	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 1200V, V_{GS} = 0V$	-	<1	100	μA
		$V_{DS} = 1200V, V_{GS} = 0V, T_J = 175^\circ C$	-	<1	-	
Gate Leakage Current	$I_{GSS, F}$	$V_{GS} = 22V, V_{DS} = 0V$	-	-	100	nA
	$I_{GSS, R}$	$V_{GS} = -6V, V_{DS} = 0V$	-	-	100	
Drain-Source On-State Resistance	$R_{DS(ON)}$	$I_D = 10A, V_{GS} = 20V$	-	160	200	m Ω
		$I_D = 10A, V_{GS} = 20V, T_J = 175^\circ C$	-	230	-	
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 5mA$	1.8	2.8	4.0	V
		$V_{DS} = V_{GS}, I_D = 5mA, T_J = 175^\circ C$	-	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.

LSIC1M0120E0160**1200V N-Channel, Enhancement-mode SiC MOSFET****Electrical Characteristics - Dynamic Characteristics ($T_J = 25^\circ\text{C}$ unless otherwise specified)**

Characteristic	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Turn-On Switching Energy	E_{ON}	$V_{DD} = 800\text{ V}, I_D = 10\text{ A},$ $V_{GS} = -5 / +20\text{ V},$ $R_{G,ext} = 5\ \Omega, L = 1.4\text{ mH},$ FWD = LSIC2SD120A05	–	140	–	μJ
Turn-Off Switching Energy	E_{OFF}		–	22	–	
Total Per-Cycle Switching Energy	E_{TS}		–	162	–	
Input Capacitance	C_{ISS}	$V_{DD} = 800\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}, V_{AC} = 25\text{ mV}$	–	890	–	pF
Output Capacitance	C_{OSS}		–	45	–	
Reverse Transfer Capacitance	C_{RSS}		–	5	–	
COSS Stored Energy	E_{OSS}		–	14	–	
Total Gate Charge	Q_g	$V_{DD} = 800\text{ V}, I_D = 10\text{ A},$ $V_{GS} = -5 / +20\text{ V}$	–	50	–	nC
Gate-Source Charge	Q_{gs}		–	15	–	
Gate-Drain Charge	Q_{gd}		–	17	–	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 800\text{ V}, I_D = 10\text{ A},$ $V_{GS} = -5 / +20\text{ V},$ $R_{G,ext} = 5\ \Omega, R_L = 80\ \Omega,$ 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 ($T_J = 25^\circ\text{C}$ unless otherwise specified)

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

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

LSIC1M0120E0160

1200V N-Channel, Enhancement-mode SiC MOSFET

Figure 1. Maximum Power Dissipation ($T_J = 175^\circ\text{C}$)

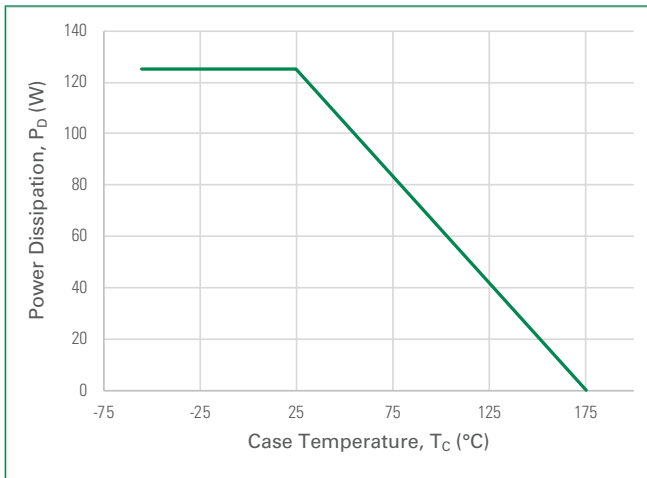


Figure 2. Typical Transfer Characteristics

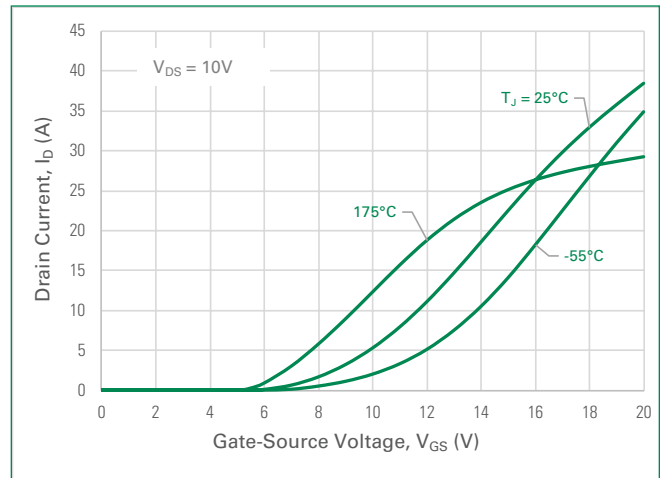


Figure 3. Typical Output Characteristics ($T_J = 25^\circ\text{C}$)

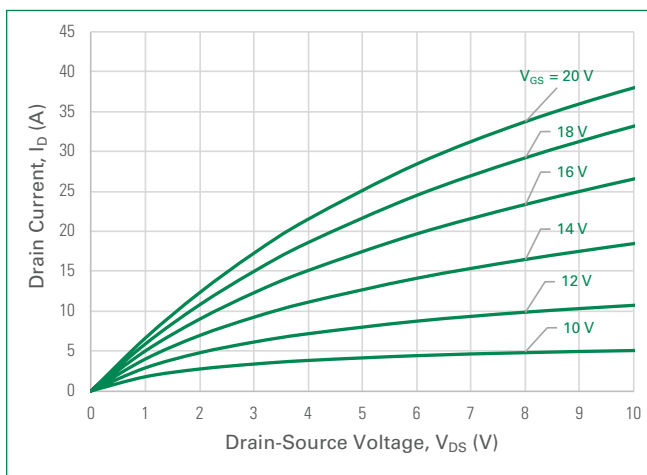


Figure 4. Typical Output Characteristics ($T_J = 175^\circ\text{C}$)

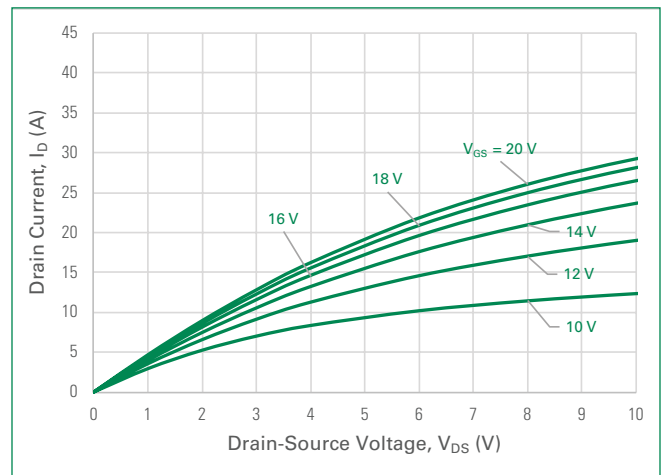


Figure 5. Typical Output Characteristics ($T_J = -55^\circ\text{C}$)

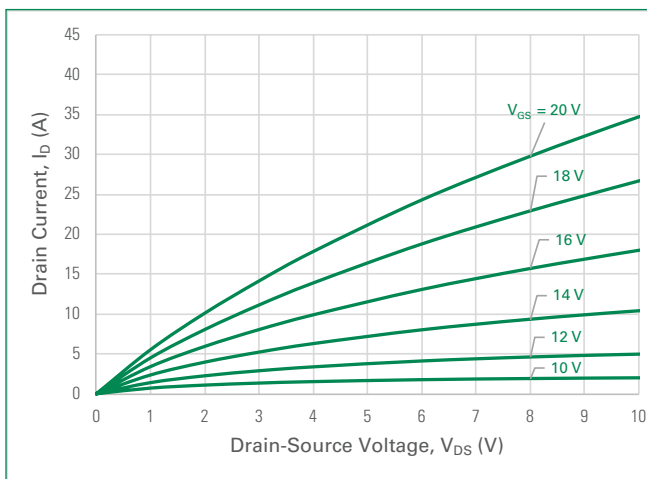
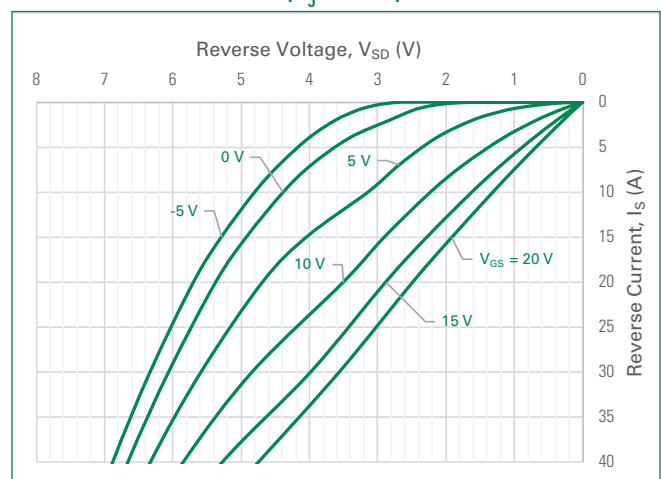


Figure 6. Typical Reverse Conduction Characteristics ($T_J = 25^\circ\text{C}$)



LSIC1M0120E0160

1200V N-Channel, Enhancement-mode SiC MOSFET

Figure 7. Typical Reverse Conduction Characteristics ($T_J = 175^\circ\text{C}$)

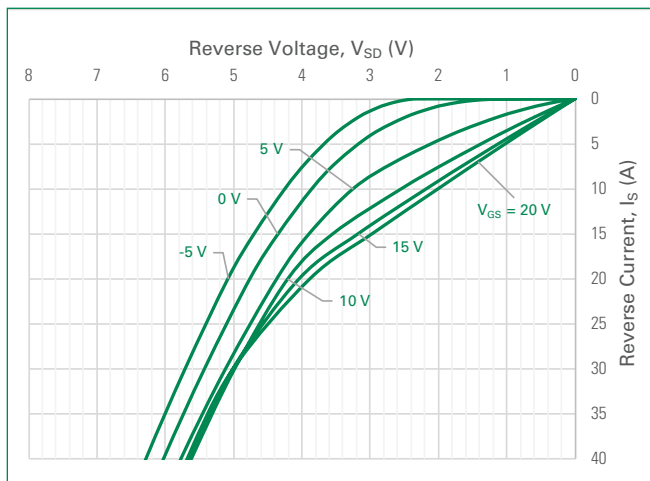


Figure 8. Typical Reverse Conduction Characteristics ($T_J = -55^\circ\text{C}$)

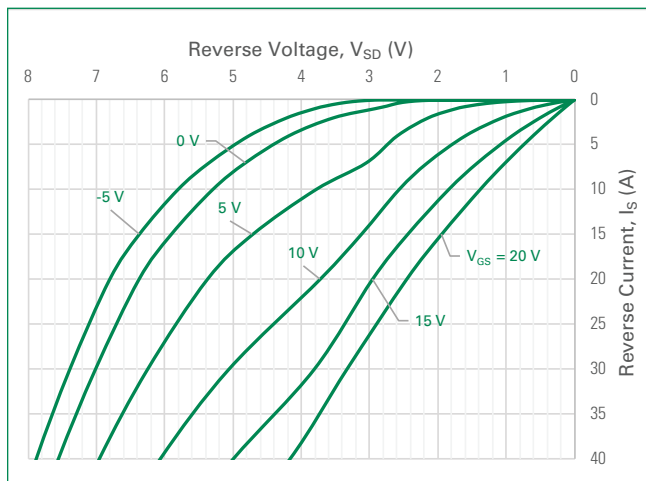


Figure 9. Transient Thermal Impedance

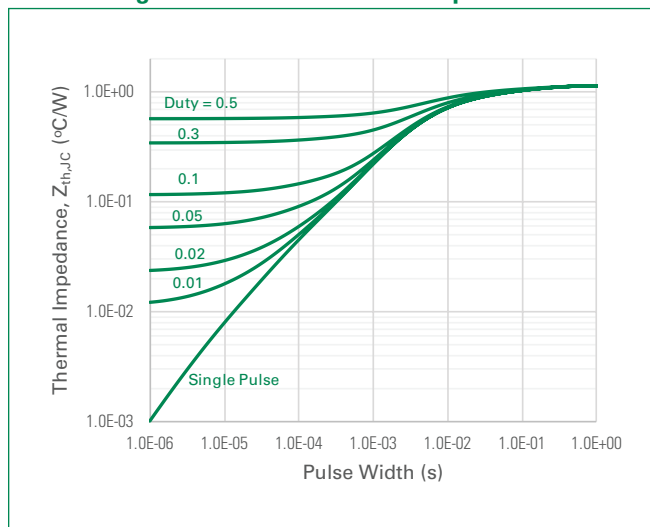


Figure 10. Maximum Safe Operating Area ($T_c = 25^\circ\text{C}$)

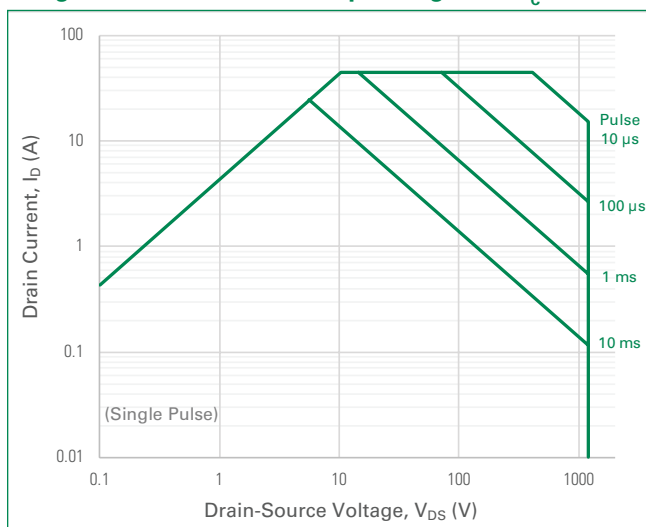


Figure 11. On-resistance vs. Drain Current

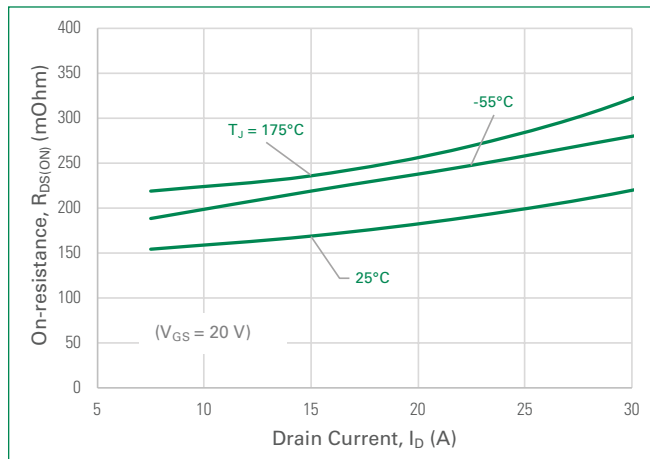
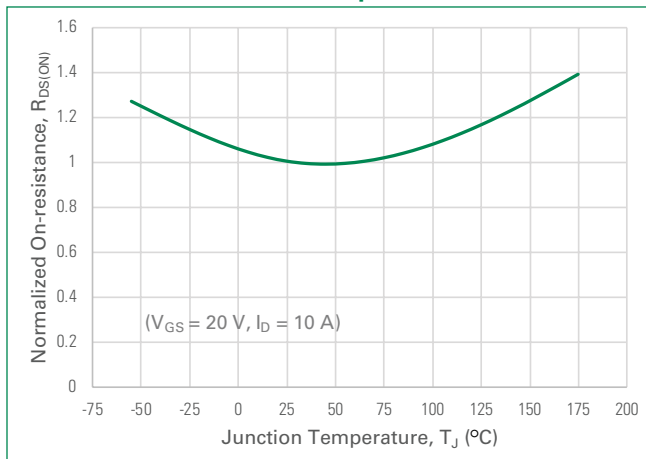


Figure 12. Normalized On-resistance vs Junction Temperature



LSIC1M0120E0160

1200V N-Channel, Enhancement-mode SiC MOSFET

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

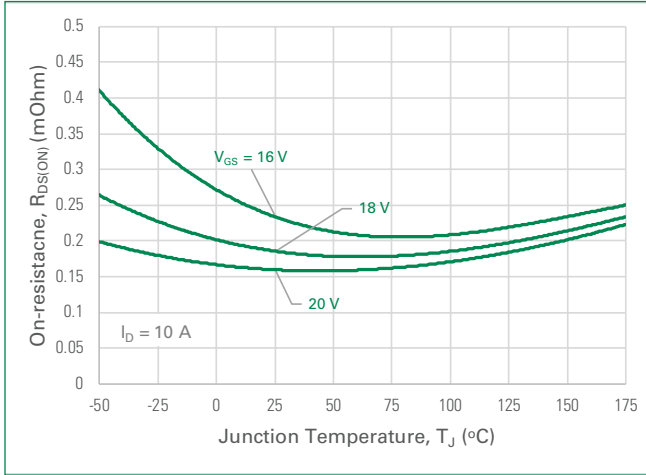


Figure 14. Typical Threshold Voltage

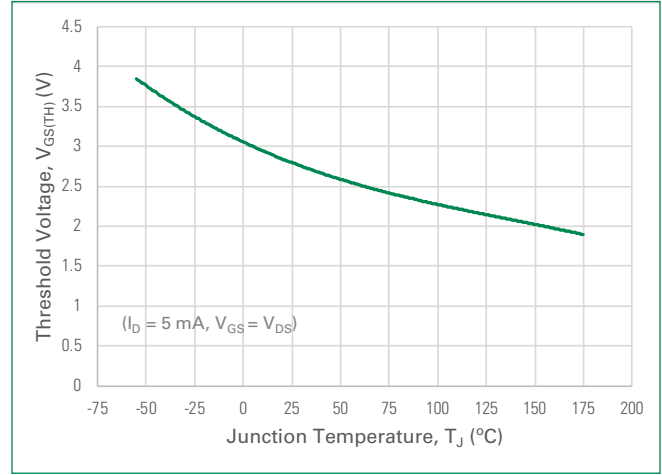


Figure 15. Typical Junction Capacitances up to 1000 V

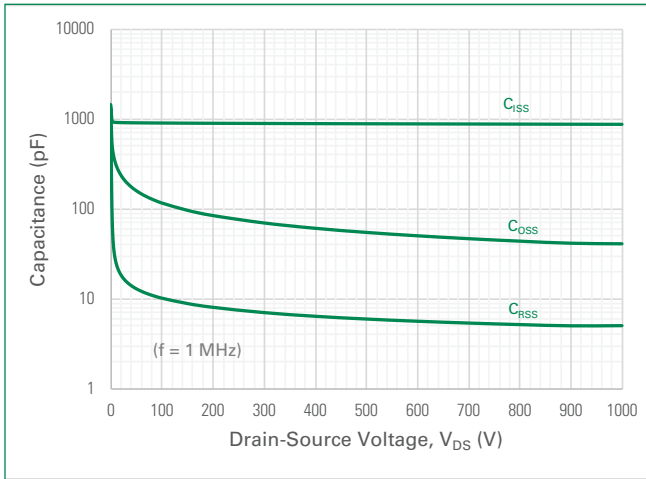


Figure 16. Typical Junction Capacitances up to 200 V

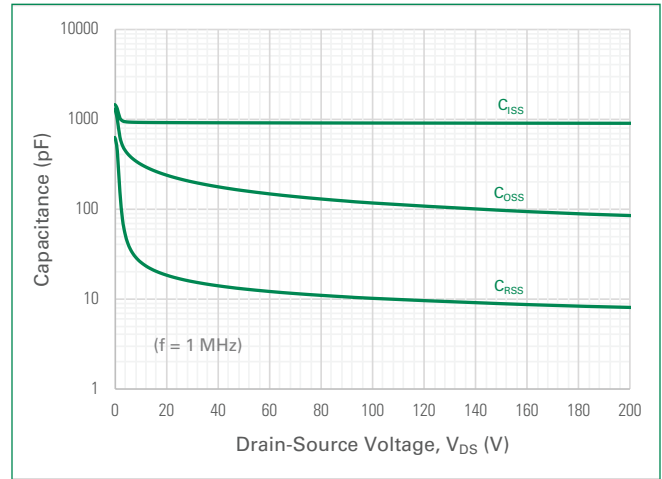


Figure 17. Typical C_{OSS} Stored Energy E_{OSS}

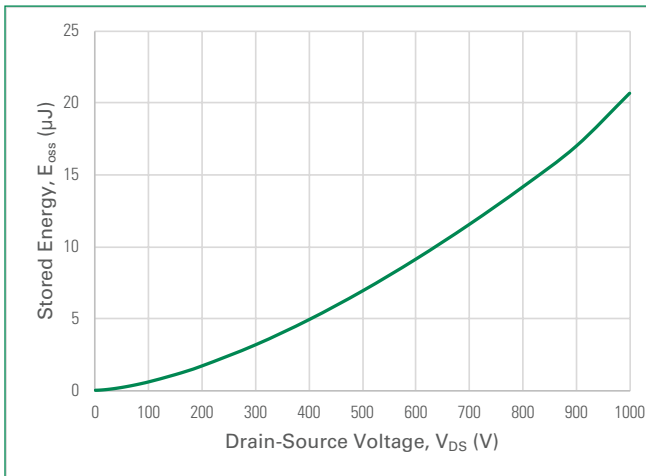
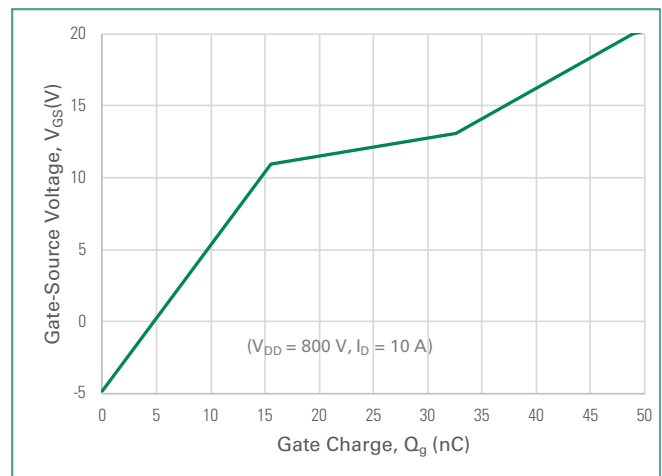


Figure 18. Typical Gate Charge



LSIC1M0120E0160

1200V N-Channel, Enhancement-mode SiC MOSFET

Figure 19. Typical Switching Energy vs Drain Current

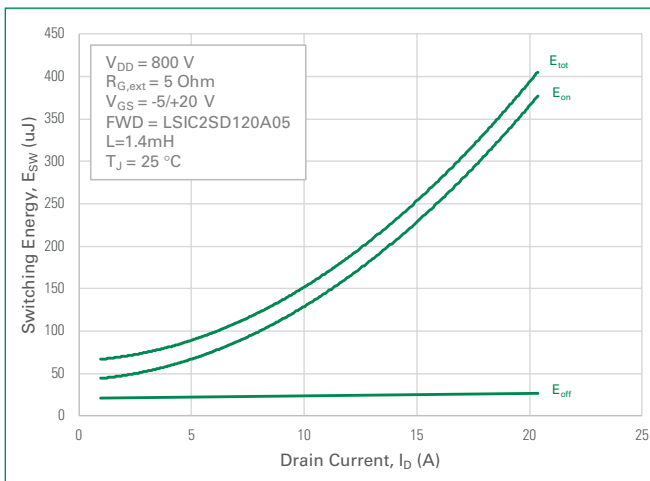


Figure 20. Typical Switching Energy vs External Gate Resistance

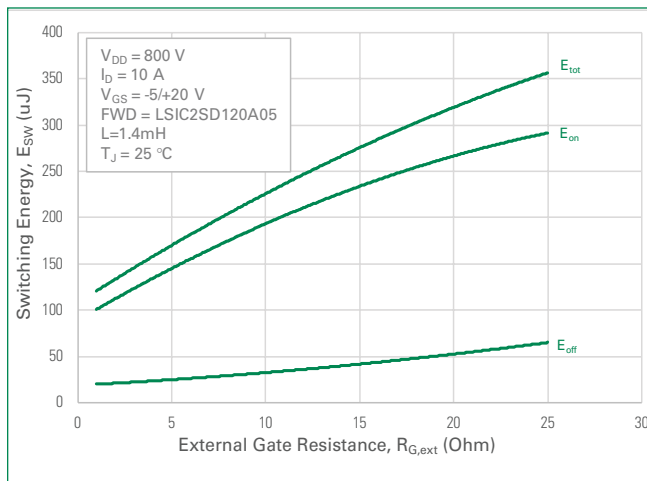
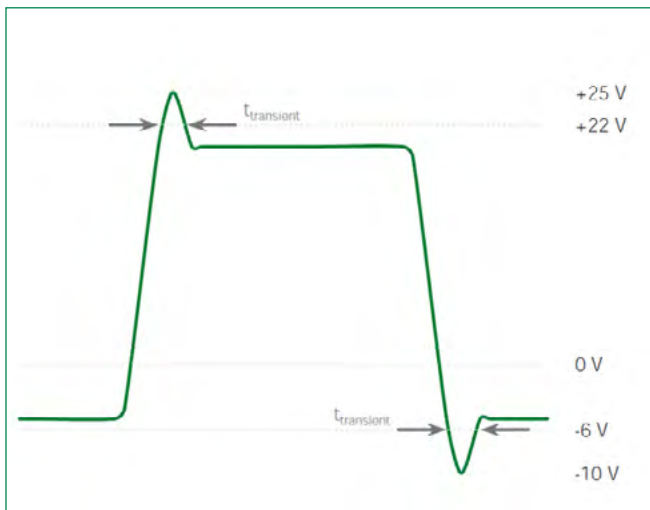


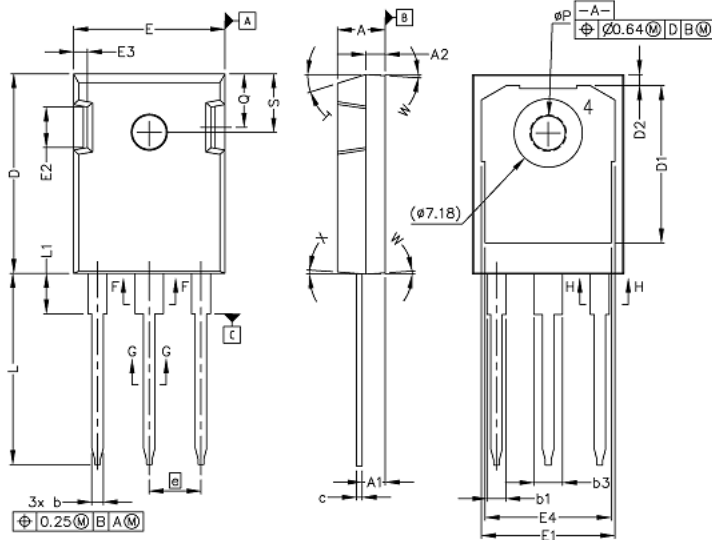
Figure 21. V_{GS} Waveform Definition



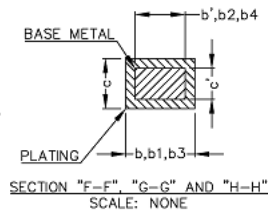
LSIC1MO120E0160

1200V N-Channel, Enhancement-mode SiC MOSFET

Package Dimensions

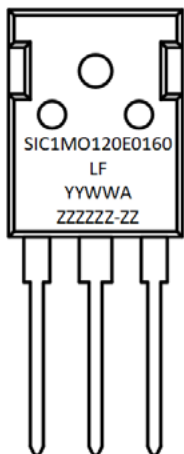


NOTE:
 1. ALL METAL SURFACES: TIN PLATED, EXCEPT AREA OF CUT
 2. DIMENSIONING & TOLERANCING CONFIRM TO ASME Y14.5M-1994
 3. ALL DIMENSIONS ARE IN MILLIMETERS. ANGLES ARE IN DEGREES.
 4. THIS DRAWING WILL MEET ALL DIMENSIONS REQUIREMENT OF JEDEC outlines TO-247 AD.



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



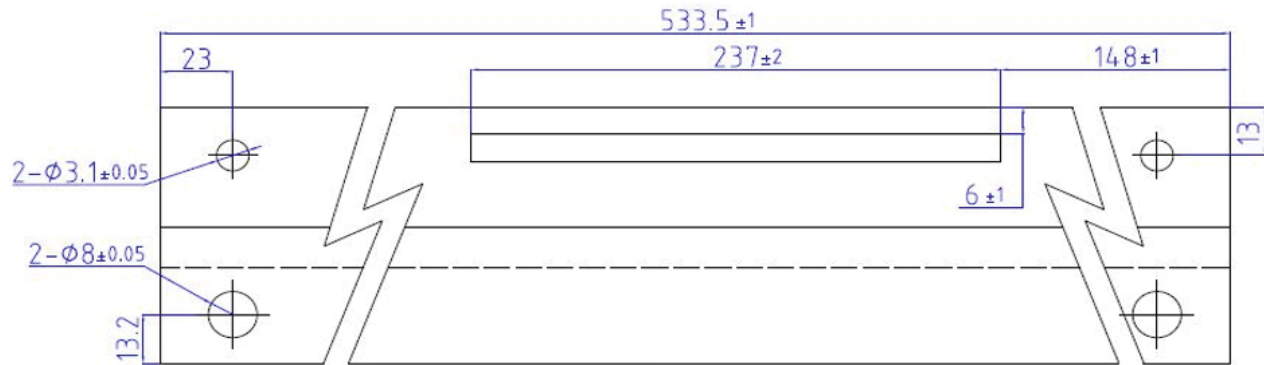
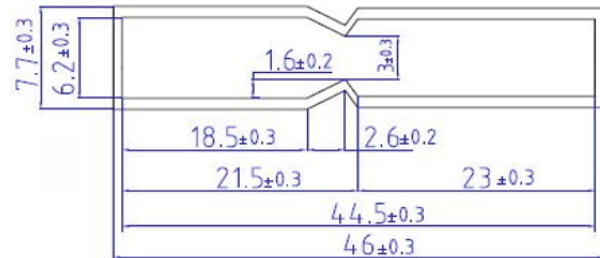
- SiC = SiC
- 1 = Gen 1
- MO = MOSFET
- 120 = Voltage Rating (1200 V)
- E = TO-247-3L
- 0160 = $R_{DS(ON)}$ (160 mOhm)
- YY = Year
- WW = Week
- A = Special Code
- ZZZZZZ-ZZ = Lot Number

Packing Options

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

LSIC1M0120E0160

1200V N-Channel, Enhancement-mode SiC MOSFET

Packing Specifications (Tube Dimensions)**Note: Dimensions in millimeters**

Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at: www.littelfuse.com/disclaimer-electronics