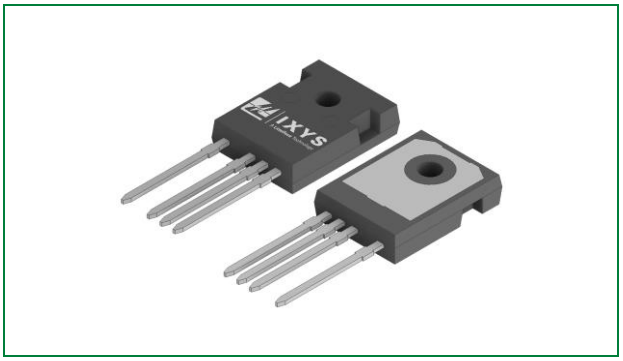
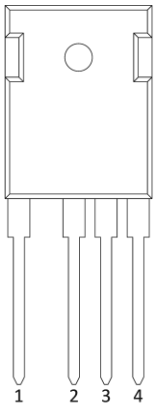
LSIC1MO120G0160
1200 V, 160 mOhm N-Channel SiC MOSFET

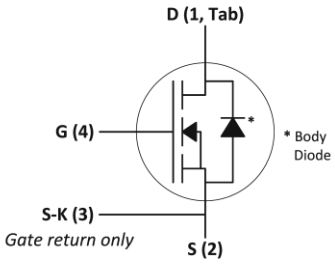


Agency Approvals and Environmental

Environmental Approvals
RoHS HF

Circuit Diagram





Product Summary

Characteristic	Value	Unit
V_{DS}	1200	V
Typical $R_{DS(ON)}$	160	mOhm
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 operations at all temperatures
- Ultra-low on-resistance
- Optimized package with separate driver source pin
- RoHS compliant, lead-free, and halogen-free

Applications

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

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1. Maximum Ratings

Characteristic	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DS}	V_{GS} = 0 V	1200	V
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	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

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

Footnote 2: See Figure 21 for further information

Footnote 3: MOSFET can operate with $V_{GS(OFF)}$ = 0 V. $V_{GS(OFF)}$ = -5 V provides added noise margin and faster turn-off speed

2. 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

3. Electrical Characteristics

3.1. 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

3.2. 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	-	74	-	µJ
Turn-Off Switching Energy	E_{OFF}		-	32	-	
Total Per-Cycle Switching Energy	E_{TS}		-	106	-	
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}	-	11	-	ns
Rise Time	t_r		-	7	-	
Turn-Off Delay Time	$t_{d(off)}$		-	17	-	
Fall Time	t_f		-	9	-	

4. 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	-	-	24	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 = 6.2 A/ns	-	9	-	ns
Reverse Recovery Charge	Q_{rr}		-	140	-	nC
Peak Reverse Recovery Current	I_{rrm}		-	25	-	A

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

5. Performance Curves

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

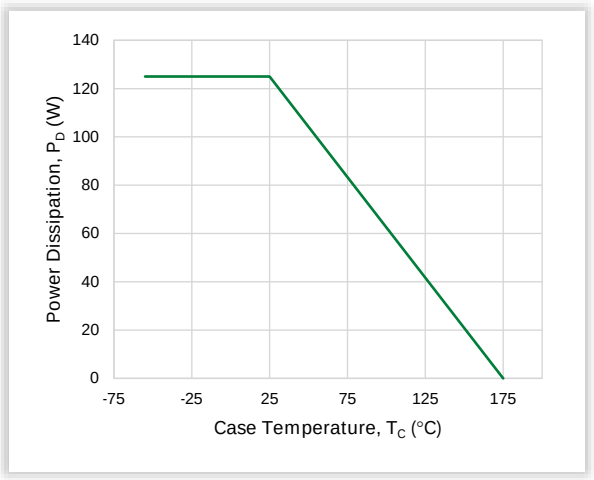


Figure 2. Typical Transfer Characteristics

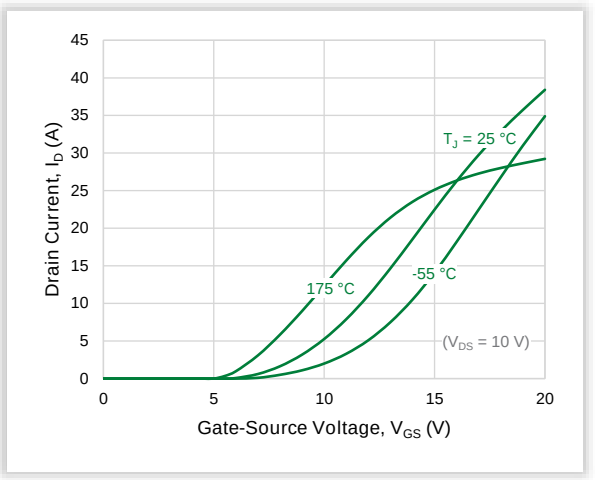


Figure 3. Typical Output Characteristics (T_J = 25 °C)

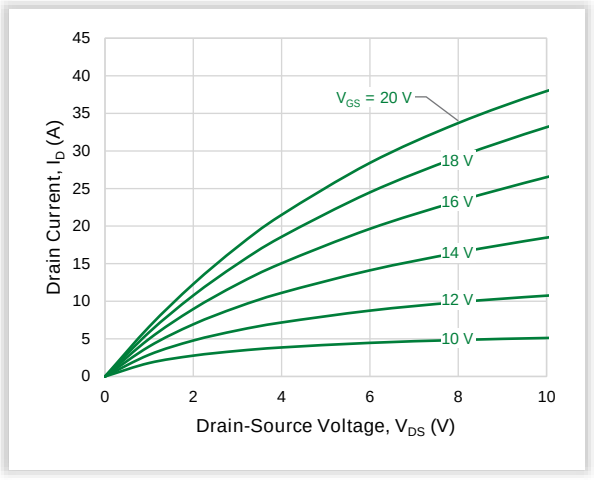


Figure 4. Typical Output Characteristics (T_J = 175 °C)

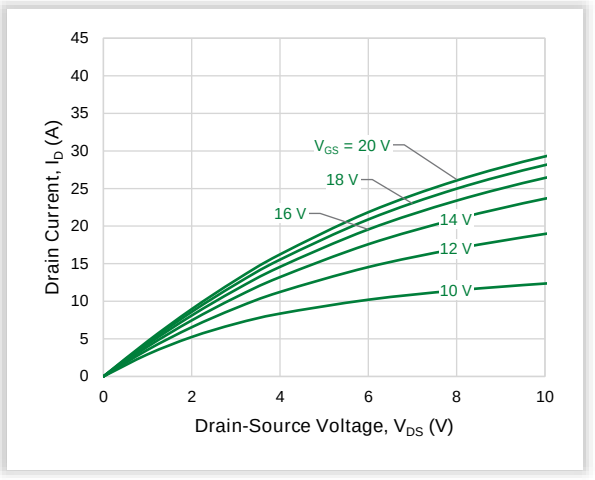


Figure 5. Typical Output Characteristics (T_J = -55 °C)

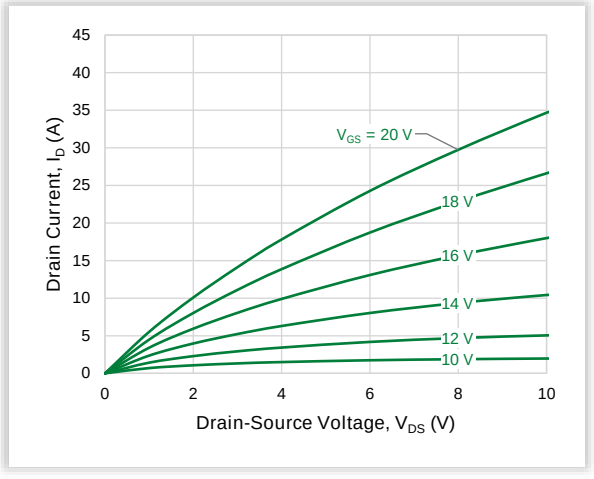


Figure 6. Typical Reverse Conduction Characteristics (T_J = 25 °C)

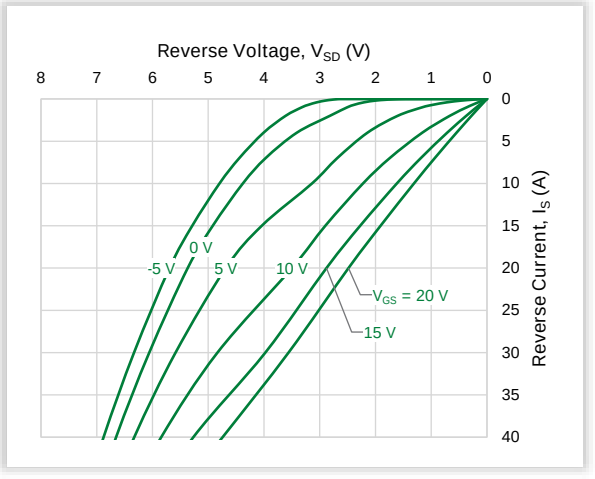


Figure 7. Typical Reverse Conduction Characteristics (T_J = 175 °C)

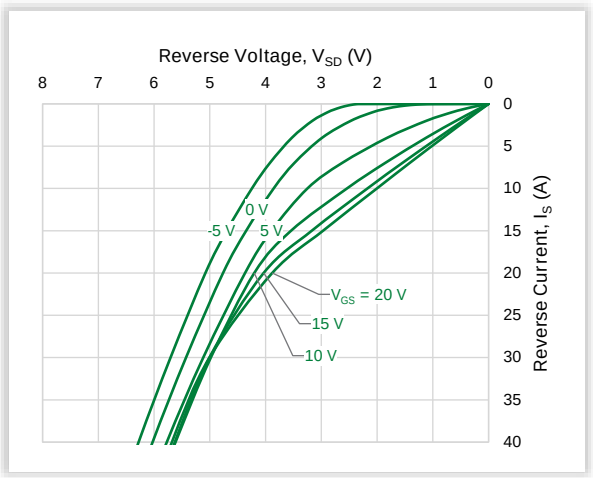


Figure 8. Typical Reverse Conduction Characteristics (T_J = -55 °C)

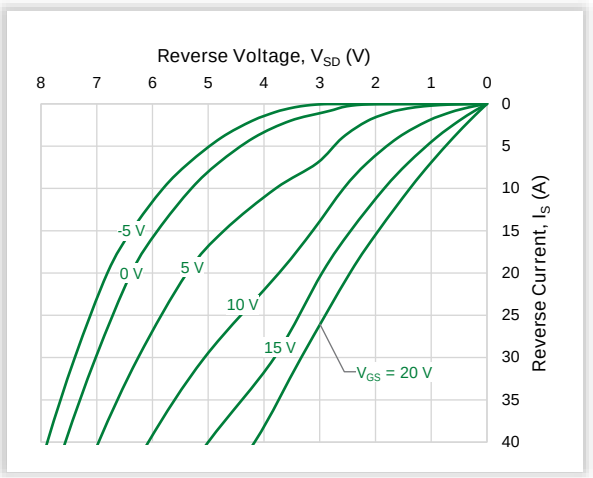


Figure 9. Transient Thermal Impedance

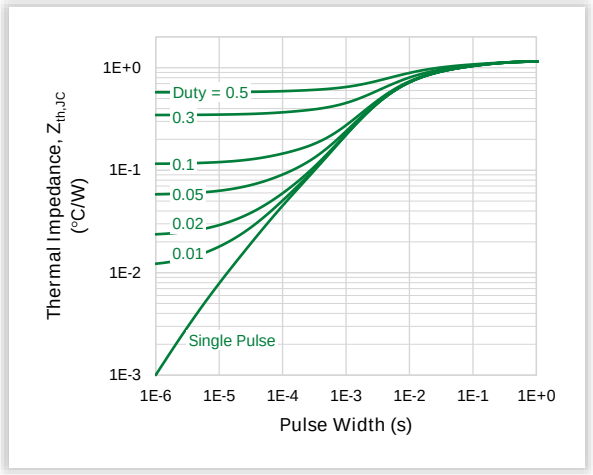


Figure 10. Maximum Safe Operating Area (T_C = 25 °C)

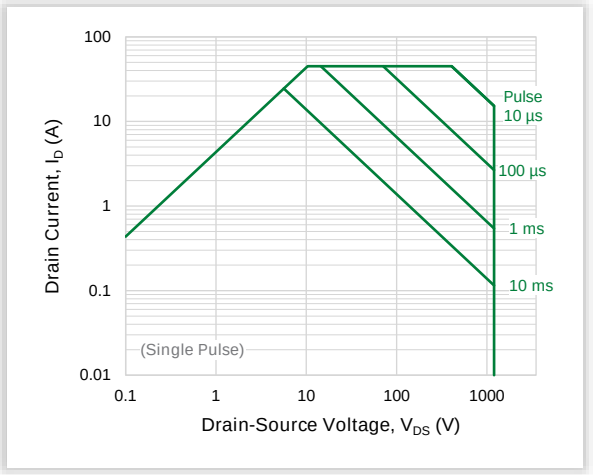


Figure 11. On-resistance vs. Drain Current

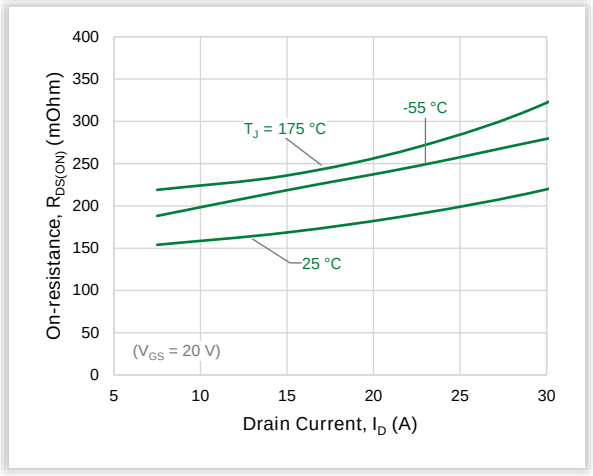


Figure 12. Normalized On-resistance vs. Junction Temperature

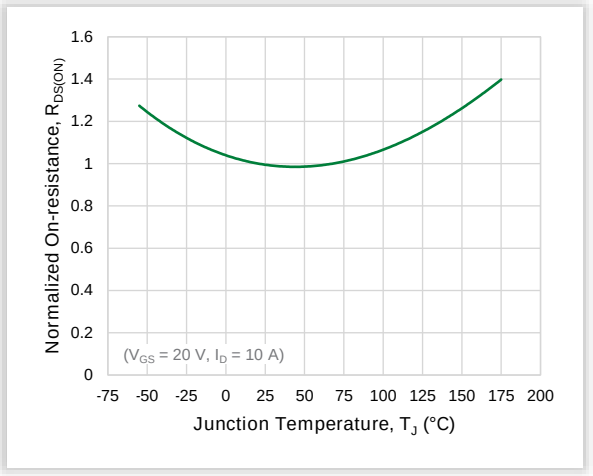


Figure 13. Typical On-resistance vs. Junction Temperature

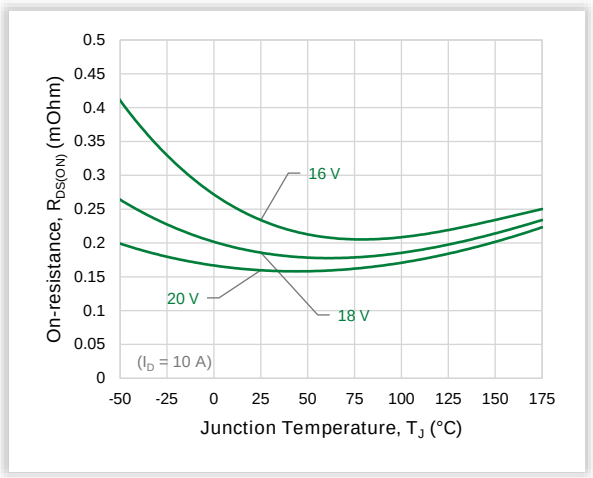


Figure 14. Typical Threshold Voltage

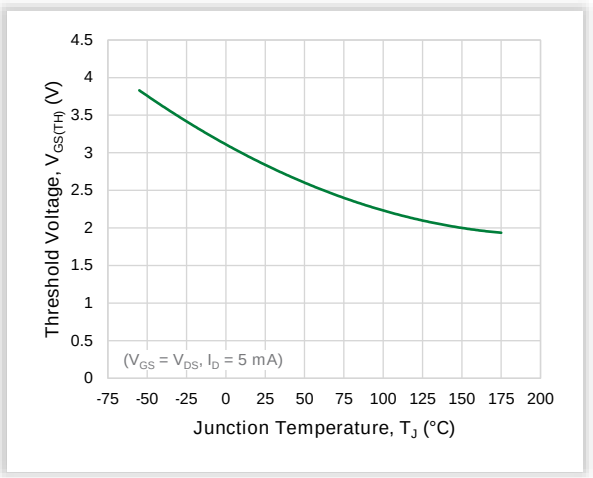


Figure 15. Typical Junction Capacitances up to 1000 V

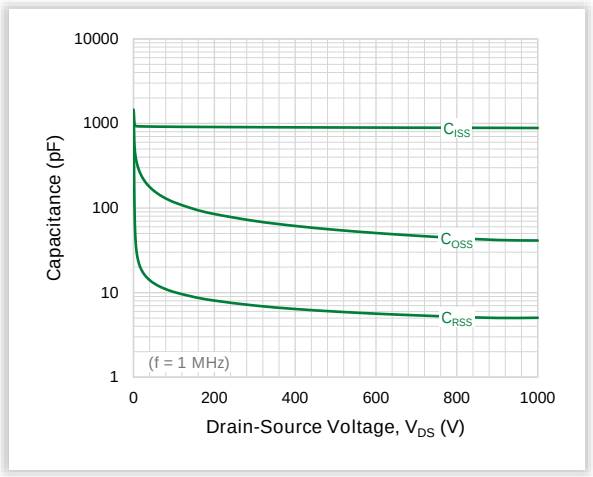


Figure 16. Typical Junction Capacitances up to 200 V

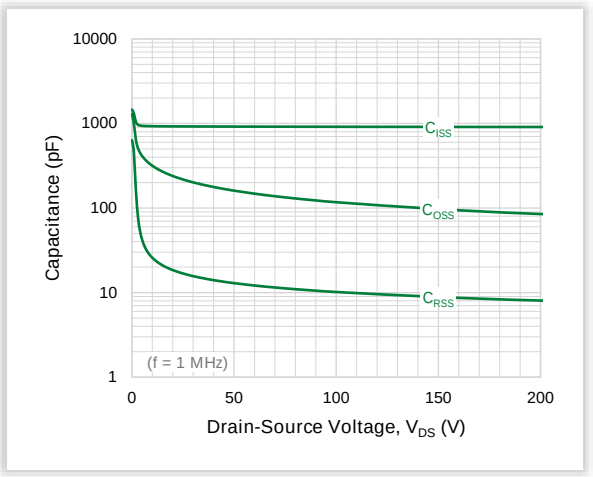


Figure 17. Typical C_{OSS} Stored Energy E_{OSS}

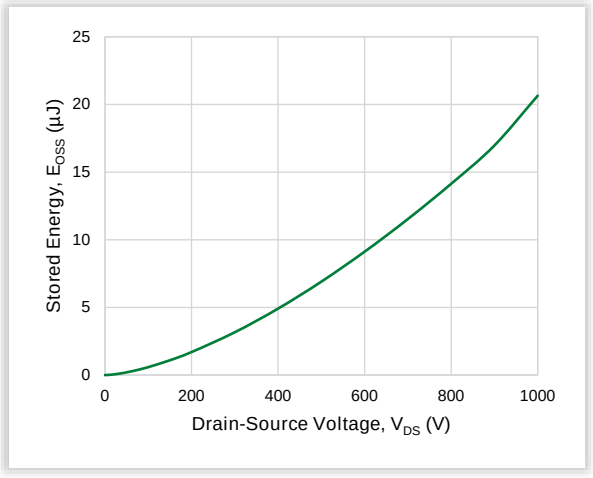


Figure 18. Typical Gate Charge

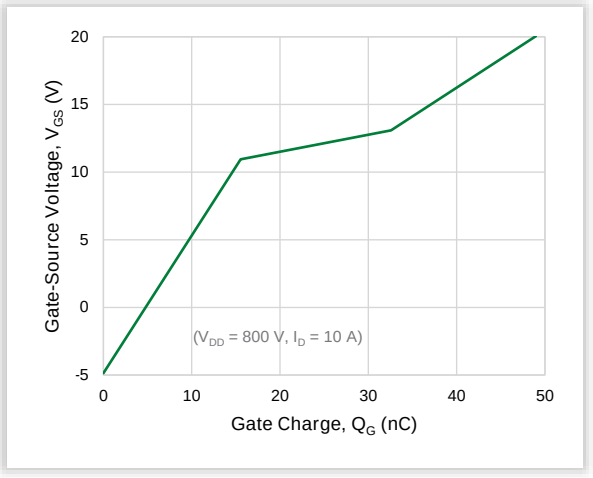


Figure 19. Typical Switching Energy vs. Drain Current

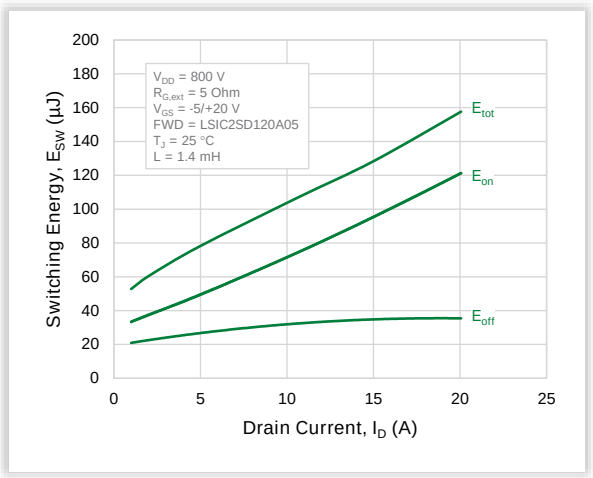


Figure 20. Typical Switching Energy vs. External Gate Resistance

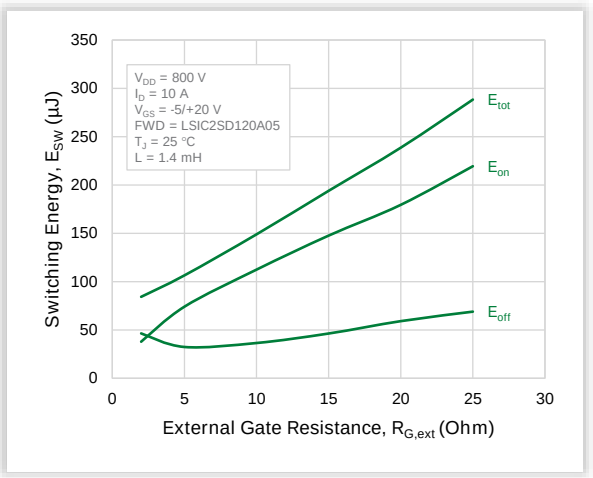
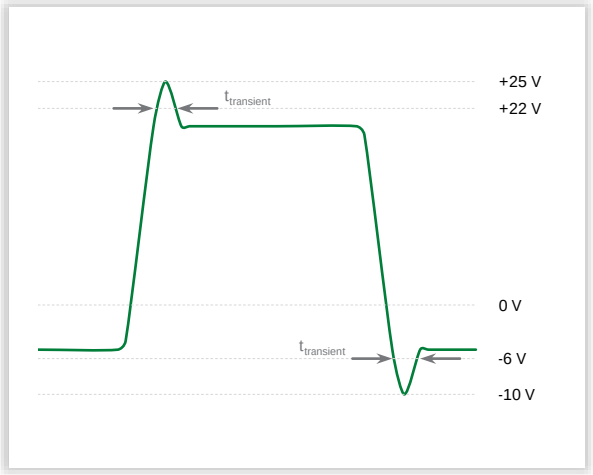
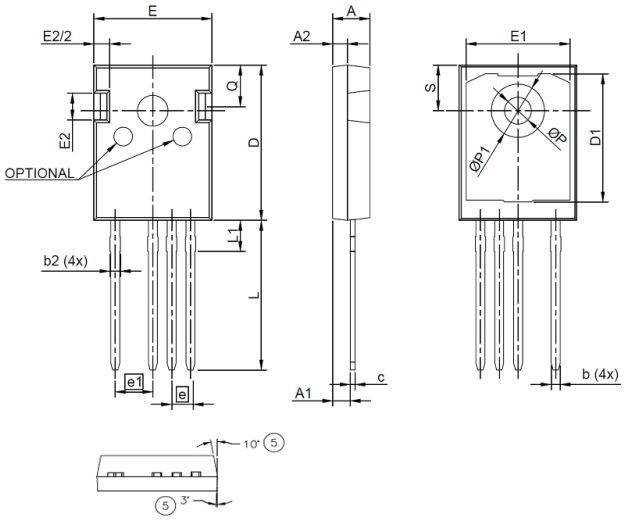


Figure 21. V_{GS} Waveform Definitions

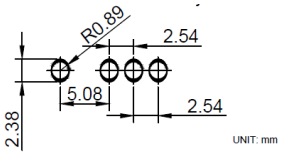


6. Package Dimensions



Symbol	Millimeters	
	Min	Max
A	4.70	5.31
A1	2.21	2.59
A2	1.50	2.49
b	0.99	1.40
b2	1.65	2.39
c	0.38	0.89
D	20.80	21.46
D1	13.08	-
D2	0.51	1.35
E	15.49	16.26
e	2.54 BSC	
e1	4.83	5.33
E1	13.46	-
E2	3.56	4.06
L	19.81	20.32
L1	-	4.50
øP	3.56	3.66
øP1	7.06	7.39
Q	5.38	6.20
S	6.17 BSC	

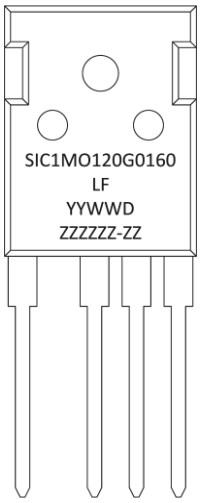
Recommended Hole Pattern Layout:



Notes:

1. Dimensioning and tolerancing as per ASME Y14.5 – 2009.
2. Package outline in compliance with JEDEC Standard Var. Ad.
3. Dimension D, E do not include mold flash.
4. Mold draft angles excluded on the table.
5. øP to have a maximum draft angle of 1.7° to the top with a maximum hole diameter of 3.912 mm.

7. Part Numbering and Marking

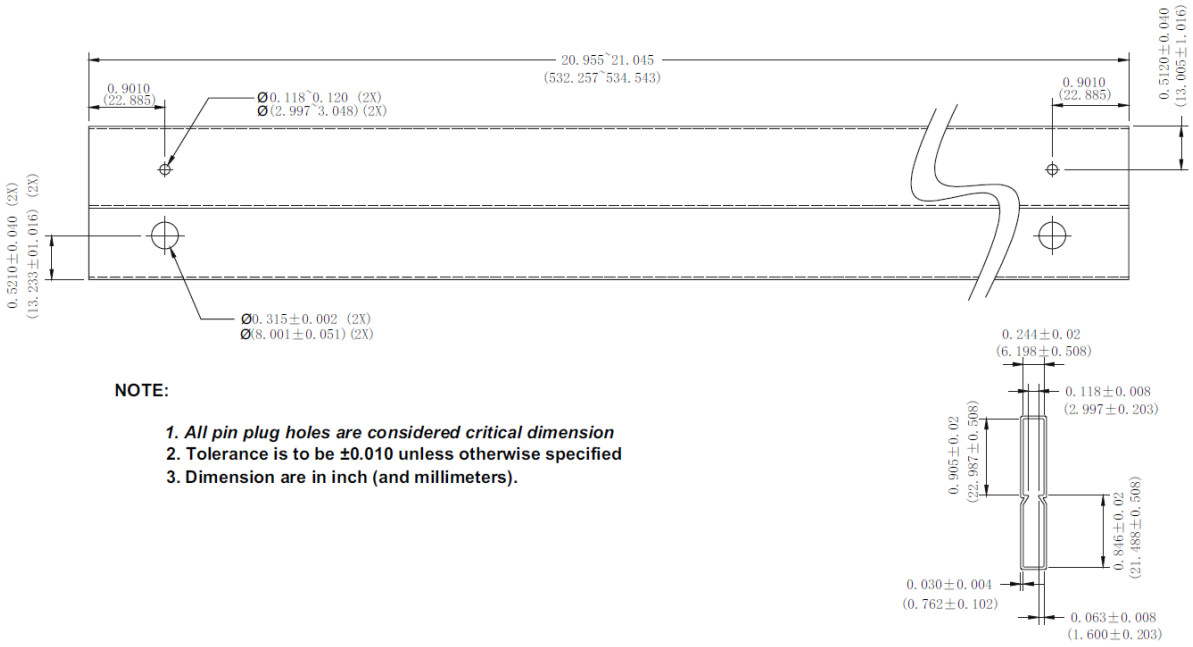


SiC	= SiC
1	= Gen 1
MO	= MOSFET
120	= Voltage Rating (1200 V)
G	= TO-247-4L
0160	= $R_{DS(ON)}$ (160 mOhm)
YY	= Year
WW	= Week
D	= Special Code
ZZZZZZ-ZZ	= Lot Number

8. Packing Options

Part Number	Marking	Packing Mode	M.O.Q.
LSIC1MO120G0160	SIC1MO120G0160	Tube (30 pcs)	450

9. Packing Specifications



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).**