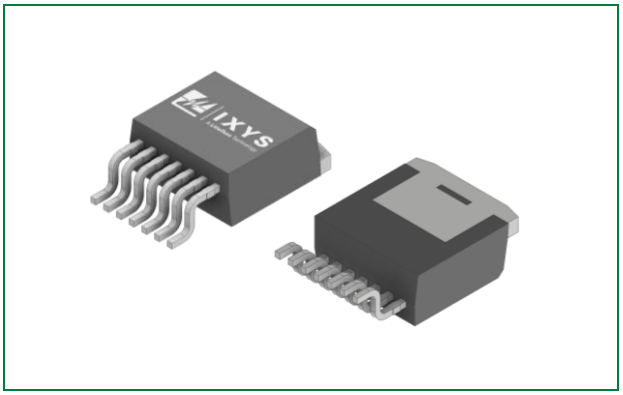
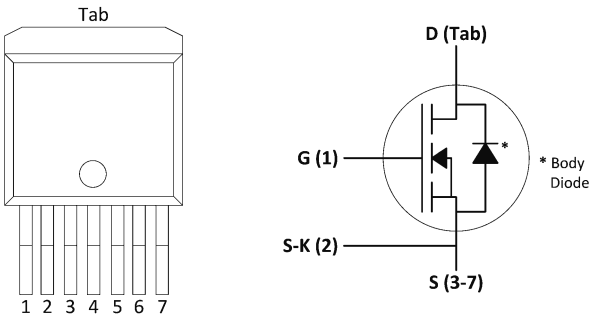
LSIC1MO170T0750
1700 V, 750 mOhm N-Channel SiC MOSFET



Agency Approvals and Environmental

Environmental Approvals
RoHS HF

Pinout Diagram



Product Summary

Characteristic	Value	Unit
V_{DS}	1700	V
Typical $R_{DS(ON)}$	750	mΩ
I_D ($T_C \leq 100$ °C)	4.5	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
- Optimized package with separate driver source pin and enhanced creepage
- RoHS compliant, lead-free, and halogen-free
- MSL 1 Rated

Applications

- Auxiliary Power Supplies
  - PV Inverters
  - UPS and Battery Chargers
  - Motor Drives
  - xEV Chargers
  - Industrial DC/DC and Inverters
- High-frequency Switch Mode Power Supplies

1. Maximum Ratings

Characteristic	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DS}	V_{GS} = 0 V	1700	V
Continuous Drain Current	I_D	V_{GS} = 20 V, T_C = 25 °C	6.4	A
		V_{GS} = 20 V, T_C = 100 °C	4.5	
Pulsed Drain Current [1]	$I_{D(pulse)}$	T_C = 25 °C	11	A
Power Dissipation	P_D	T_C = 25 °C, T_J = 175 °C	65	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 (MSL1 Rated)	T_{SOLD}	-	260	°C
ESD Sensitivity Rating	HBM ESD	Maximum Withstand Voltage	250	V
	CDM ESD		1000	

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 – dependent upon PCB layout. $V_{GS(OFF)}$ = –5 V provides added noise margin and faster turn-off speed

2. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Maximum Thermal Resistance, junction-to-case	$R_{th,JC,MAX}$	2.3	°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	1700	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 1700, V_{GS} = 0 V	-	<1	10	µA
		V_{DS} = 1700 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 = 2 A, V_{GS} = 20 V	-	750	1000	mΩ
		I_D = 2 A, V_{GS} = 20 V, T_J = 175 °C	-	1550	-	
Gate Threshold Voltage	$V_{GS(TH)}$	V_{DS} = V_{GS}, I_D = 1 mA	1.8	2.8	4.0	V
		V_{DS} = V_{GS}, I_D = 1 mA, T_J = 175 °C	-	1.9	-	
Gate Resistance	R_G	Resonance method, Drain-Source shorted[1]	-	29	-	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} = 1200 V, I_D = 2 A, V_{GS} = −5 / +20 V, $R_{G,ext}$ = 2 Ω, L = 1.4 mH, FWD = LSIC1MO170T0750	-	80	-	uJ
Turn-Off Switching Energy	E_{OFF}		-	43	-	
Total Per-Cycle Switching Energy	E_{TS}		-	123	-	
Input Capacitance	C_{ISS}	V_{DD} = 1000 V, V_{GS} = 0 V, f = 1 MHz, V_{AC} = 25 mV	-	200	-	pF
Output Capacitance	C_{OSS}		-	11.5	-	
Reverse Transfer Capacitance	C_{RSS}		-	1.7	-	
COSS Stored Energy	E_{OSS}		-	5.7	-	µJ
Total Gate Charge	Q_g	V_{DD} = 1200 V, I_D = 2 A, V_{GS} = −5 / +20 V	-	11	-	nC
Gate-Source Charge	Q_{gs}		-	4	-	
Gate-Drain Charge	Q_{gd}		-	5	-	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 1200 V, V_{GS} = −5 / +20 V, I_D = 2 A, $R_{G,ext}$ = 2 Ω, R_L = 600 Ω, Timing relative to V_{DS}	-	8	-	ns
Rise Time	t_r		-	15	-	
Turn-Off Delay Time	$t_{d(off)}$		-	27	-	
Fall Time	t_f		-	173	-	

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 = 1 A, V_{GS} = −5 V	-	4.2	-	V
		I_S = 1 A, V_{GS} = −5 V, T_J = 175 °C	-	3.6	-	
Continuous Diode Forward Current	I_S	V_{GS} = −5 V, T_C = 25 °C	-	-	9	A
Peak Diode Forward Current [1]	I_{SP}		-	-	11	

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

5. Figure Data

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

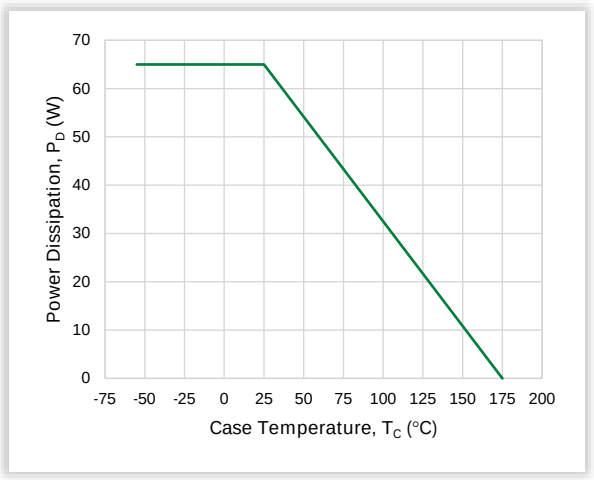


Figure 2. Typical Transfer Characteristics

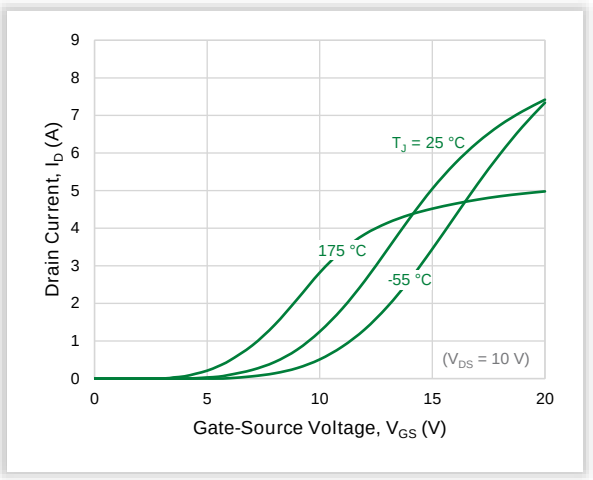


Figure 3. Typical Output Characteristics (T_J = 25 °C)

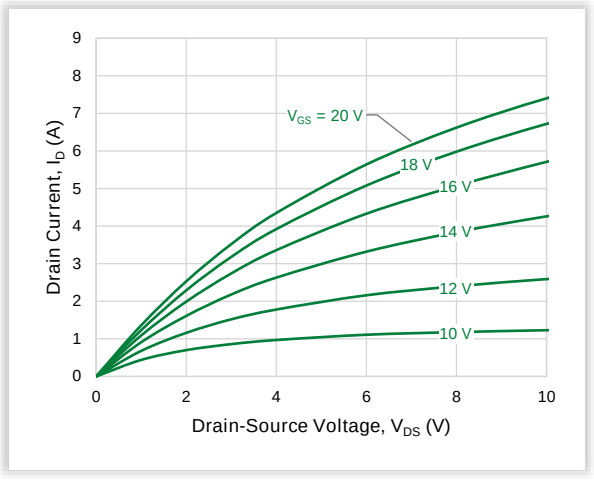


Figure 4. Typical Output Characteristics (T_J = 175 °C)

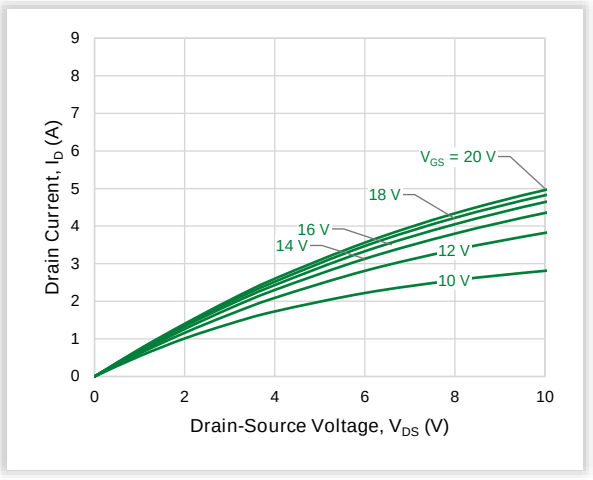


Figure 5. Typical Output Characteristics (T_J = -55 °C)

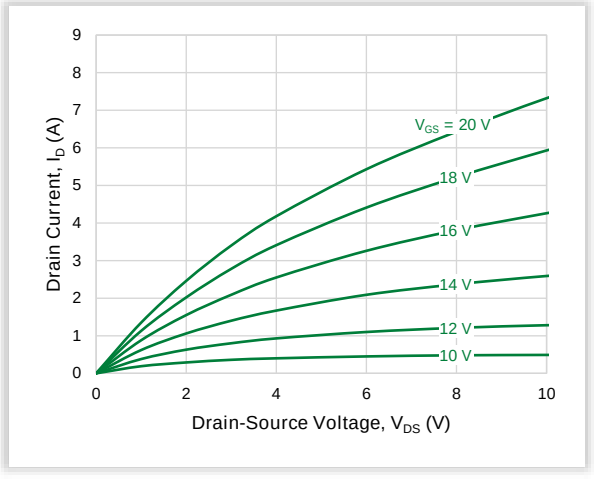


Figure 6. Typical Reverse Conduction Characteristics (T_J = 25 °C)

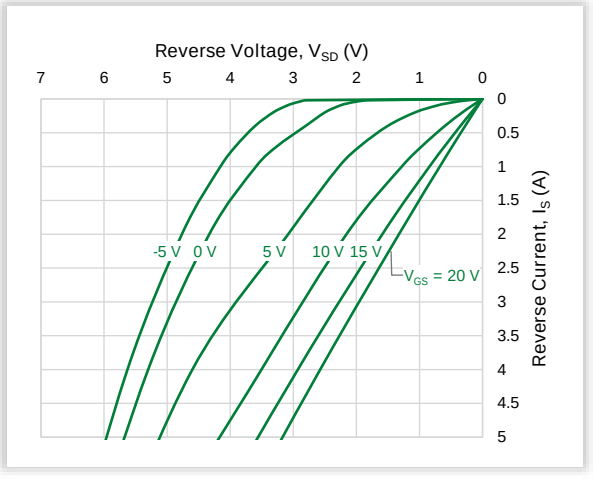


Figure 7. Typical Reverse Conduction Characteristics (T_J = 175 °C)

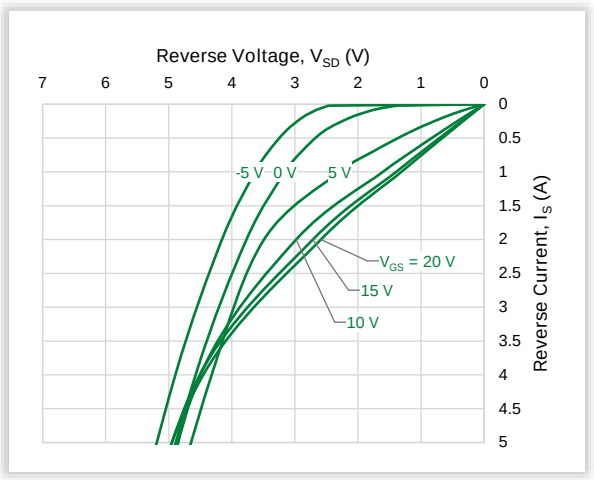


Figure 8. Typical Reverse Conduction Characteristics (T_J = -55 °C)

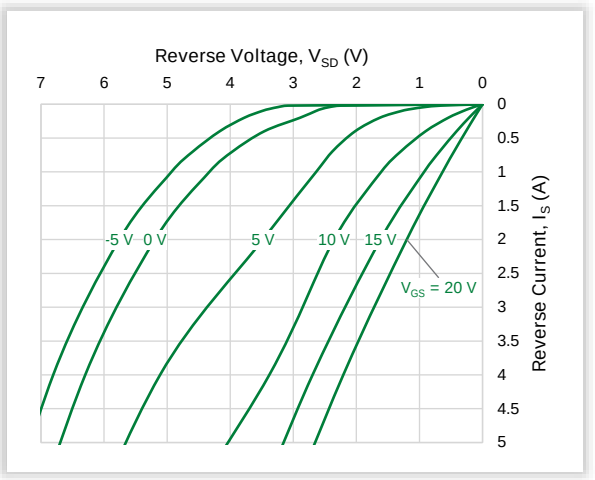


Figure 9. Typical Transient Thermal Impedance

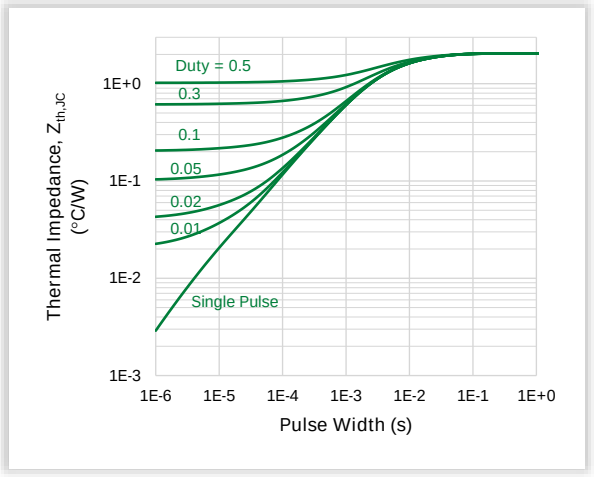


Figure 10. Maximum Safe Operating Area (T_C = 25 °C)

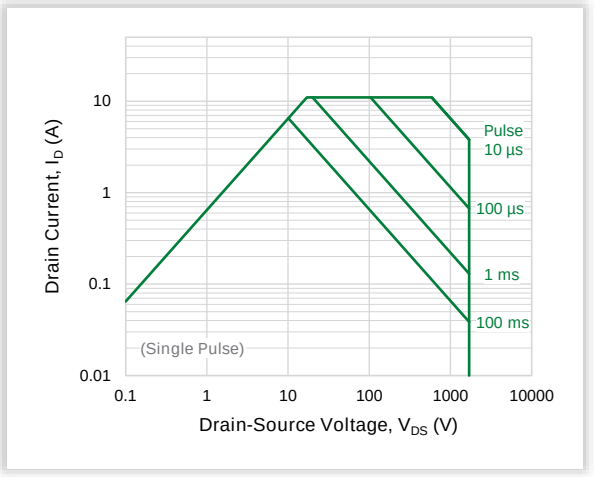


Figure 11. On-resistance vs. Drain Current

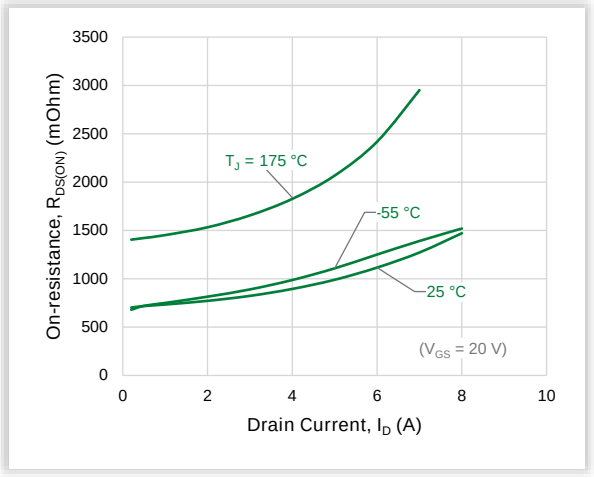


Figure 12. Normalized On-resistance vs. Junction Temperature

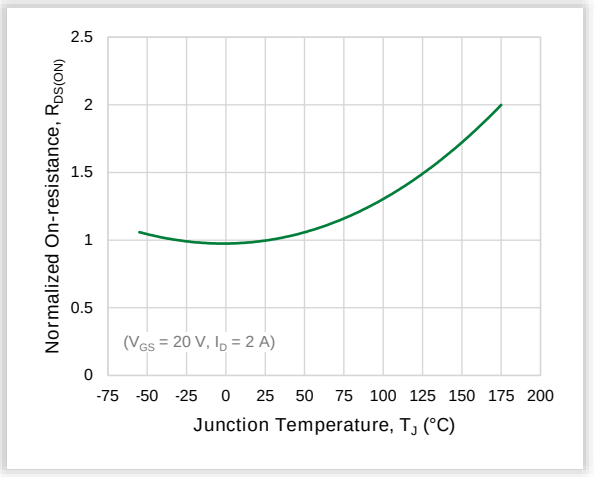


Figure 13. Typical On-resistance vs. Junction Temperature

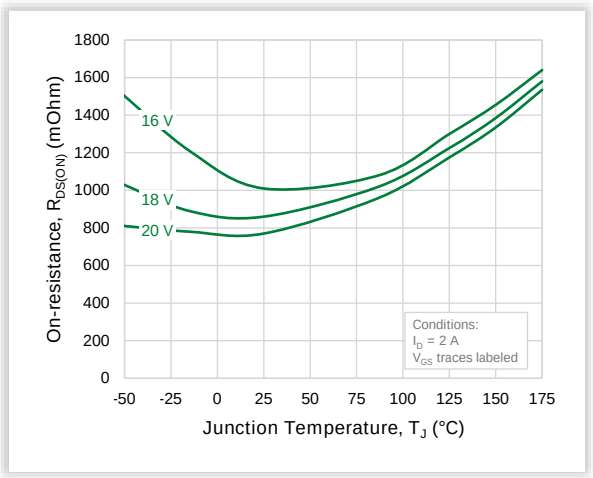


Figure 14. Typical Threshold Voltage

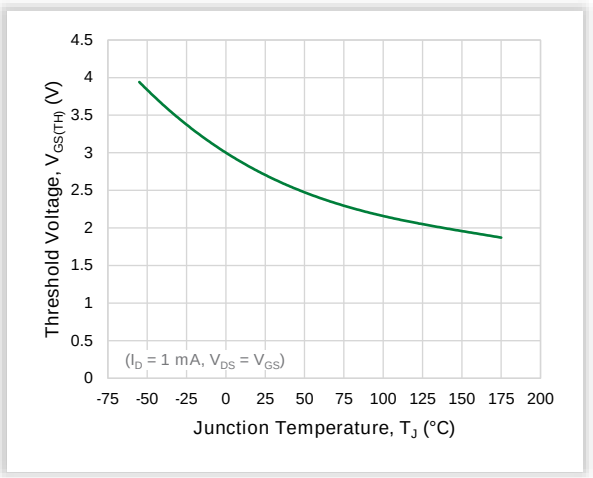


Figure 15. Typical Junction Capacitances up to 1000 V

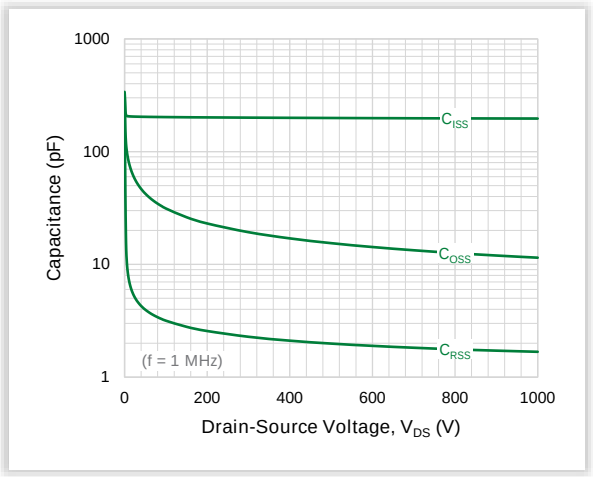
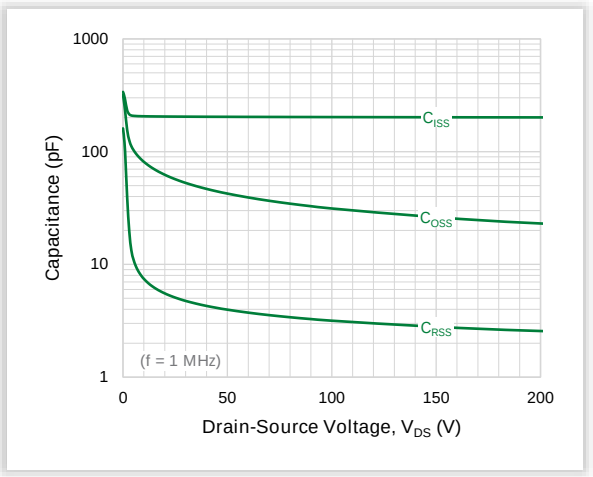


Figure 16. Typical Junction Capacitances up to 200 V



acitances up to 200 V

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

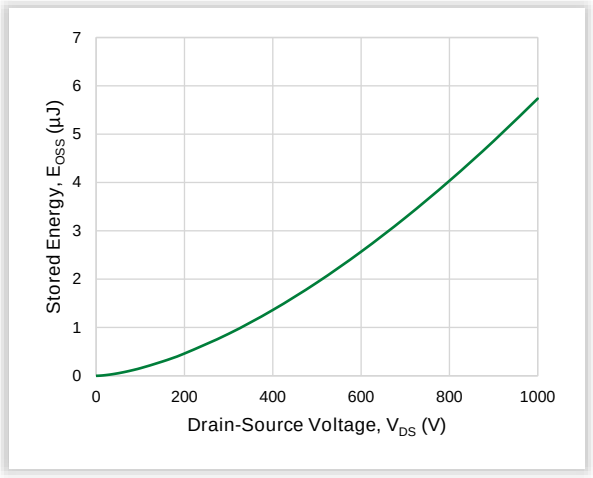


Figure 18. Typical Gate Charge

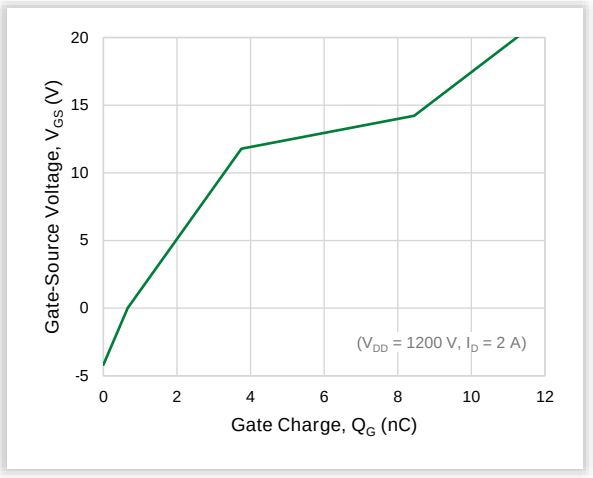


Figure 19. Typical Switching Energy vs. Drain Current

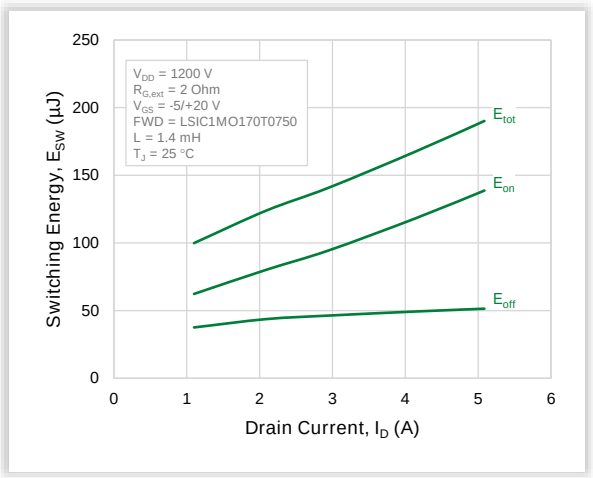


Figure 20. Typical Switching Energy vs. External Gate Resistance

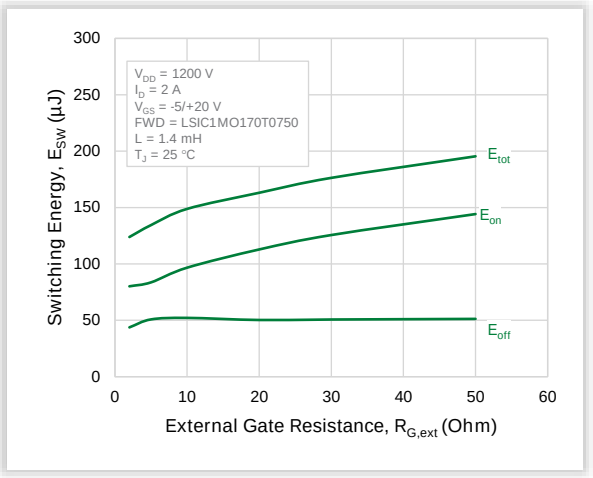
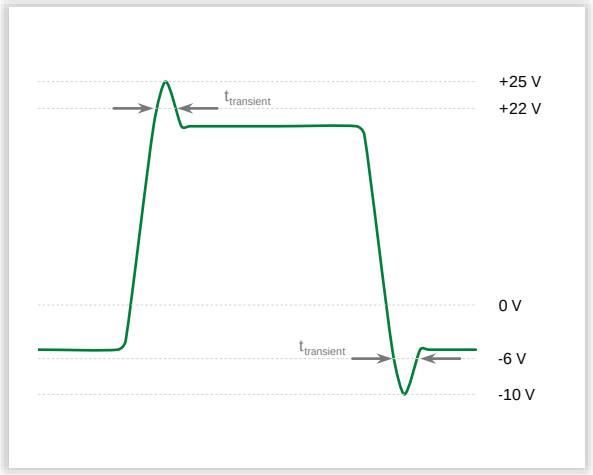
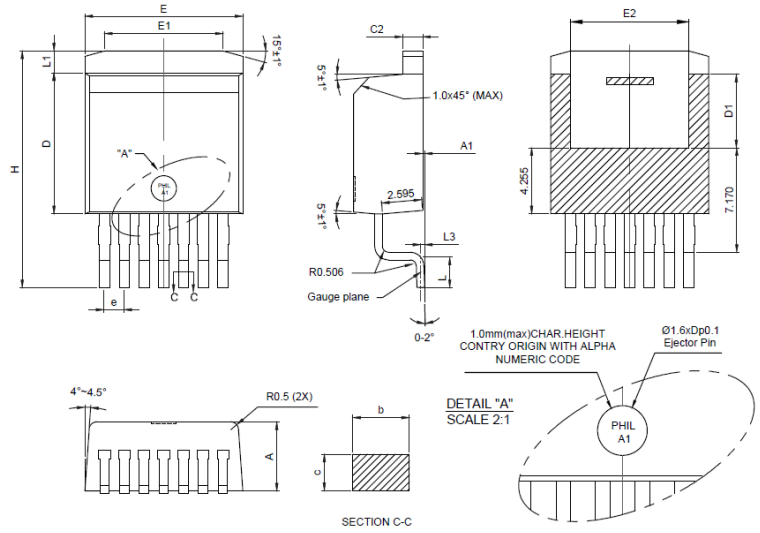


Figure 21. V_{GS} Waveform Definition



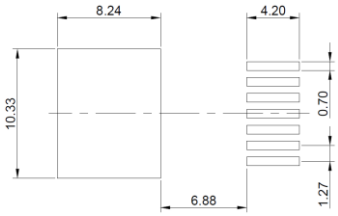
6. Package Dimensions



Symbol	Millimeters		
	Min	Nom	Max
A	4.300	4.435	4.570
A1	0.000	0.125	0.250
b	0.500	0.600	0.700
c	0.330	0.490	0.650
C2	1.170	1.285	1.400
D	9.025	9.075	9.125
D1	4.656	4.733	4.810
E	10.130	10.180	10.230
E1	6.500	7.550	8.600
E2	6.778	7.223	7.665
e	1.220	1.270	1.320
H	15.043	16.178	17.121
L	2.324	2.512	2.700
L1	1.160	1.418	1.676
L3		0.254	

Recommended Solder Pad Layout:

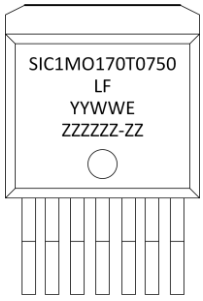
UNIT: mm



Notes:

1. Dimensions D & E do not include mold flash. Mold flash shall not exceed 0.127 mm per side. These dimensions are measured at the outermost extreme of the plastic body.
2. Package is designed for high voltage and does not conform to JEDEC std.
3. Top package/marking surface finish: 16-18 VDI.

7. Part Numbering and Marking



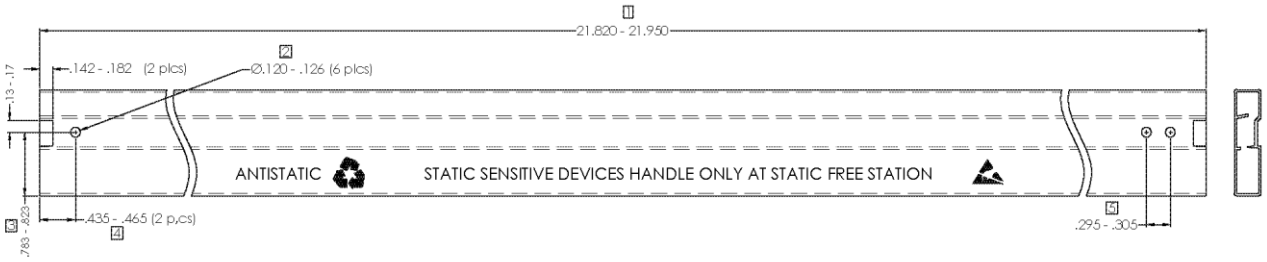
SiC	= SiC
1	= Gen 1
MO	= MOSFET
170	= Voltage Rating (1700 V)
T	= TO-263-7L
0750	= $R_{DS(ON)}$ (750 mOhm)
YY	= Year
WW	= Week
E	= Special Code
ZZZZZZ-ZZ	= Lot Number

8. Packing Options

Part Number	Marking	Packing Mode	M.O.Q.
LSIC1MO170T0750-TU	SIC1MO170T0750	Tube (50 pcs)	400
LSIC1MO170T0750-TR	SIC1MO170T0750	Tape & Reel (800 pcs/reel)	800

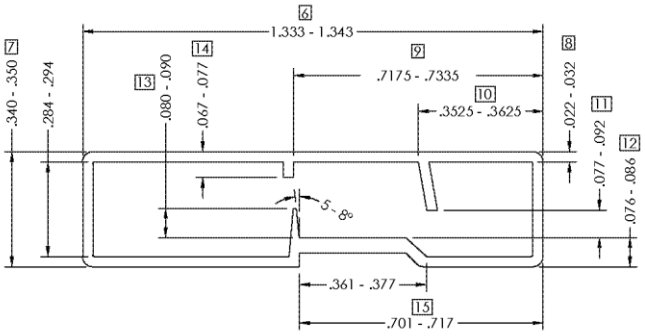
9. Packing Specifications

9.1. Tube Option



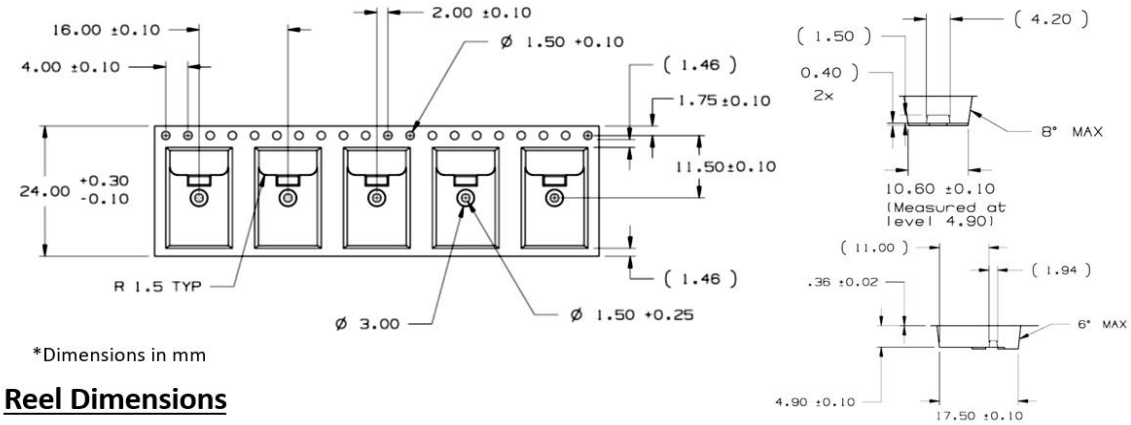
Notes:

1. Clear PVC material with anti-static coating
2. Radius is a maximum of 0.5 unless otherwise specified
3. Critical areas are labeled in box
4. All pin plug holes are considered critical dimension
5. Material thickness is 0.75 ±0.10
6. Tolerance unless otherwise specified is : Decimal ±0.05 Angle ±1°
7. Dimensions are in inches



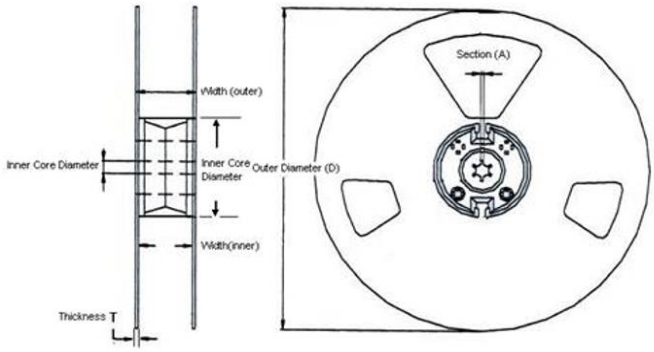
9.2. Tape and Reel Option

Tape Dimensions



*Dimensions in mm

Reel Dimensions



Parameter	Value
Width (inner)	25.2 mm
Width (outer)	29.20 mm
Inner Core Dia. (d)	13.40 mm
Hub Diameter	96 mm
Outer Diameter (D)	329.0 mm (12.95 in.)
Surface Resistivity	1x10^9 Ohms/square
Material Type	HIPS + GPS
Section (A)	2.30 mm
Thickness (T)	2.1 mm

Part Orientation in Tape

Leads are facing sprocket holes