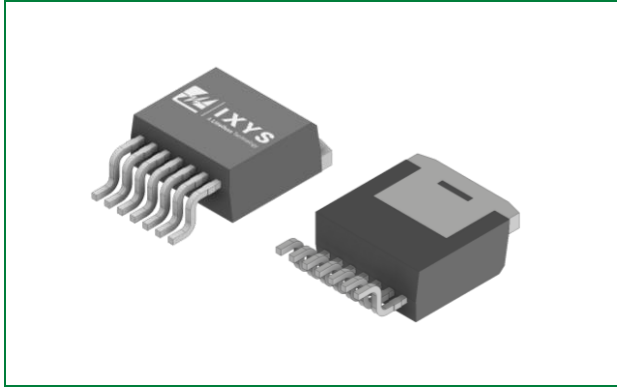


LSIC1MO170T0750  
1700 V, 750 mOhm N-Channel SiC MOSFET

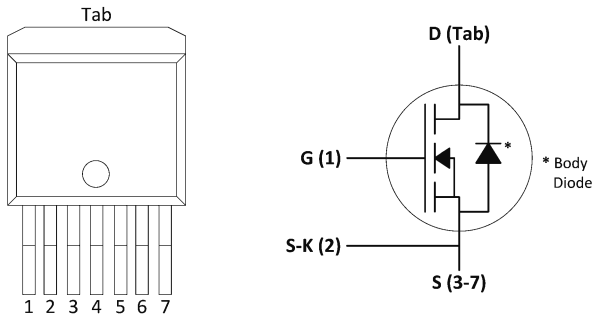


Agency Approvals and Environmental

Environmental Approvals

**RoHS** **PF6** **HF**

Pinout Diagram



Product Summary

Characteristic	Value	Unit
$V_{DS}$	1700	V
Typical $R_{DS(ON)}$	750	mΩ
$I_D$ ( $T_C \leq 100\text{ }^\circ\text{C}$ )	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

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## 1. Maximum Ratings

Characteristic	Symbol	Conditions	Value	Unit
Drain-Source Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}$	1700	V
Continuous Drain Current	$I_D$	$V_{GS} = 20\text{ V}, T_C = 25\text{ °C}$	6.4	A
		$V_{GS} = 20\text{ V}, T_C = 100\text{ °C}$	4.5	
Pulsed Drain Current <sup>1</sup>	$I_{D(pulse)}$	$T_C = 25\text{ °C}$	11	A
Power Dissipation	$P_D$	$T_C = 25\text{ °C}, T_J = 175\text{ °C}$	65	W
Gate-Source Voltage	$V_{GS,MAX}$	Absolute maximum values – Steady state	-6 to +22	V
	$V_{GS,OP,TR}$ <sup>2</sup>	Transient, $t_{transient} < 300\text{ nsec}$	-10 to +25	
	$V_{GS,OP}$ <sup>3</sup>	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  $V_{GS(OFF)} = 0\text{ V}$  – dependent upon PCB layout.  $V_{GS(OFF)} = -5\text{ V}$  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 ( $T_J = 25\text{ °C}$ unless otherwise specified)

Characteristic	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 100\text{ }\mu\text{A}$	1700	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 1700\text{ V}, V_{GS} = 0\text{ V}$	-	<1	10	$\mu\text{A}$
		$V_{DS} = 1700\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ °C}$	-	<1	-	
Gate Leakage Current	$I_{GSS,F}$	$V_{GS} = 22\text{ V}, V_{DS} = 0\text{ V}$	-	-	100	nA
	$I_{GSS,R}$	$V_{GS} = -6\text{ V}, V_{DS} = 0\text{ V}$	-	-	100	
Drain-Source On-State Resistance	$R_{DS(ON)}$	$I_D = 2\text{ A}, V_{GS} = 20\text{ V}$	-	750	1000	m $\Omega$
		$I_D = 2\text{ A}, V_{GS} = 20\text{ V}, T_J = 175\text{ °C}$	-	1550	-	
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 1\text{ mA}$	1.8	2.8	4.0	V
		$V_{DS} = V_{GS}, I_D = 1\text{ mA}, T_J = 175\text{ °C}$	-	1.9	-	
Gate Resistance	$R_G$	Resonance method, Drain-Source shorted <sup>1</sup>	-	29	-	$\Omega$

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<sub>J</sub> = 25 °C unless otherwise specified)

Characteristic	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Turn-On Switching Energy	E <sub>ON</sub>	V <sub>DD</sub> = 1200 V, I <sub>D</sub> = 2 A, V <sub>GS</sub> = -5 / +20 V, R <sub>G,ext</sub> = 2 Ω, L = 1.4 mH, FWD = LSIC1MO170T0750	-	80	-	μJ
Turn-Off Switching Energy	E <sub>OFF</sub>		-	43	-	
Total Per-Cycle Switching Energy	E <sub>TS</sub>		-	123	-	
Input Capacitance	C <sub>ISS</sub>	V <sub>DD</sub> = 1000 V, V <sub>GS</sub> = 0 V, f = 1 MHz, V <sub>AC</sub> = 25 mV	-	200	-	pF
Output Capacitance	C <sub>OSS</sub>		-	11.5	-	
Reverse Transfer Capacitance	C <sub>RSS</sub>		-	1.7	-	
COSS Stored Energy	E <sub>OSS</sub>		-	5.7	-	
Total Gate Charge	Q <sub>g</sub>	V <sub>DD</sub> = 1200 V, I <sub>D</sub> = 2 A, V <sub>GS</sub> = -5 / +20 V	-	11	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	4	-	
Gate-Drain Charge	Q <sub>gd</sub>		-	5	-	
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 1200 V, V <sub>GS</sub> = -5 / +20 V, I <sub>D</sub> = 2 A, R <sub>G,ext</sub> = 2 Ω, R <sub>L</sub> = 600 Ω, Timing relative to V <sub>DS</sub>	-	8	-	ns
Rise Time	t <sub>r</sub>		-	15	-	
Turn-Off Delay Time	t <sub>d(off)</sub>		-	27	-	
Fall Time	t <sub>f</sub>		-	173	-	

4. Reverse Diode Characteristics (T<sub>J</sub> = 25 °C unless otherwise specified)

Characteristic	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> = 1 A, V <sub>GS</sub> = -5 V	-	4.2	-	V
		I <sub>S</sub> = 1 A, V <sub>GS</sub> = -5 V, T <sub>J</sub> = 175 °C	-	3.6	-	
Continuous Diode Forward Current	I <sub>S</sub>	V <sub>GS</sub> = -5 V, T <sub>C</sub> = 25 °C	-	-	9	A
Peak Diode Forward Current <sup>1</sup>	I <sub>SP</sub>		-	-	11	

Footnote 1: Pulse width limited by T<sub>J,MAX</sub>

5. Figure Data

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

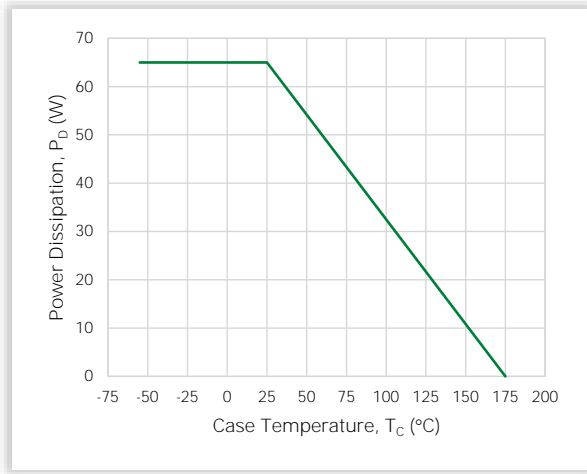


Figure 2. Typical Transfer Characteristics

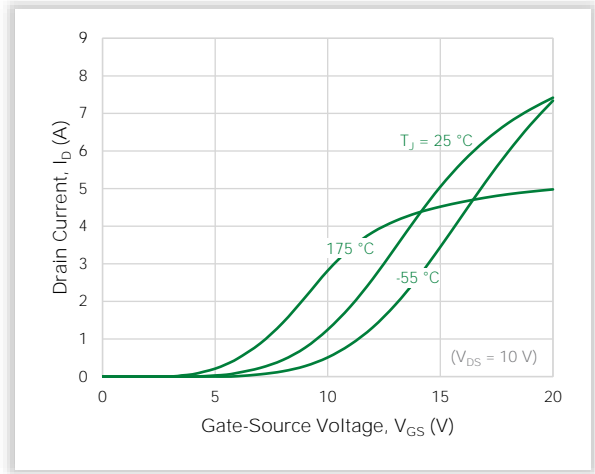


Figure 3. Typical Output Characteristics ( $T_J = 25\text{ }^\circ\text{C}$ )

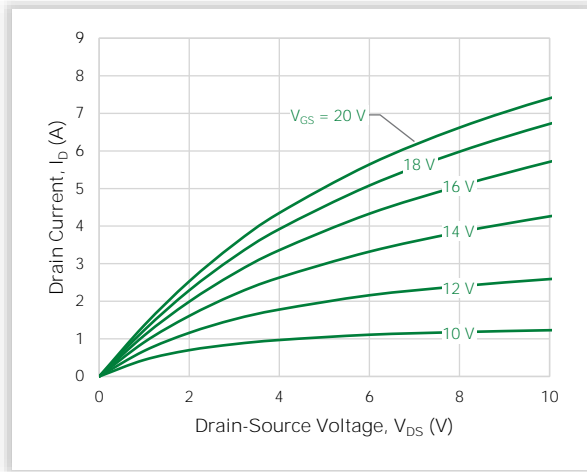


Figure 4. Typical Output Characteristics ( $T_J = 175\text{ }^\circ\text{C}$ )

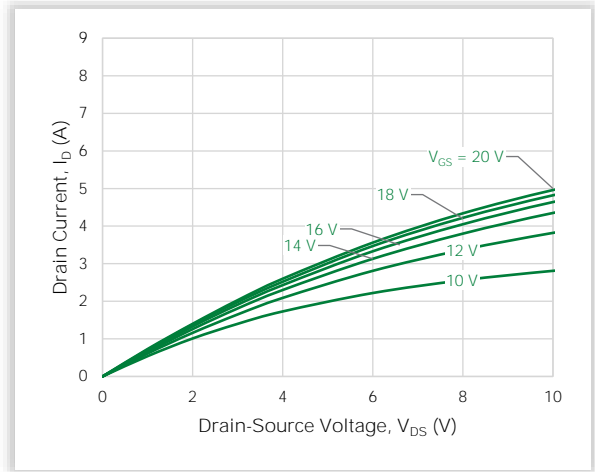


Figure 5. Typical Output Characteristics ( $T_J = -55\text{ }^\circ\text{C}$ )

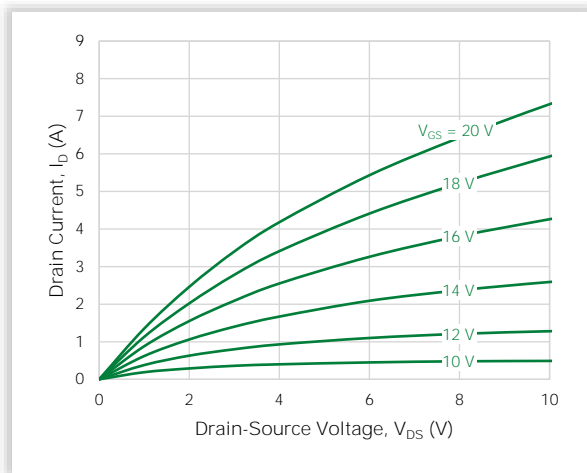


Figure 6. Typical Reverse Conduction Characteristics ( $T_J = 25\text{ }^\circ\text{C}$ )

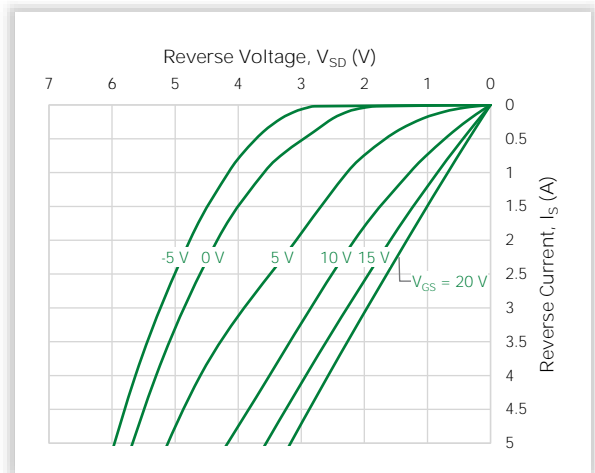


Figure 7. Typical Reverse Conduction Characteristics ( $T_J = 175\text{ }^\circ\text{C}$ )

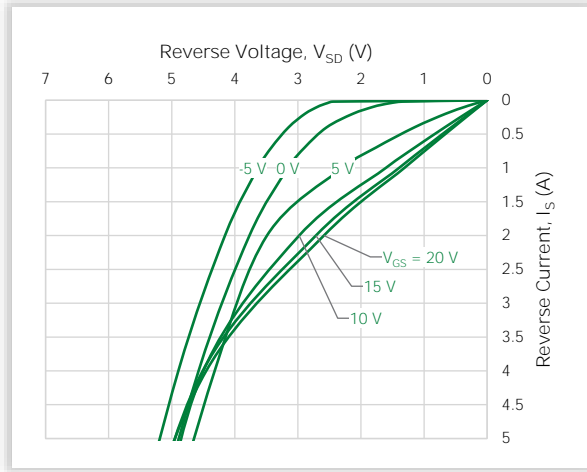


Figure 8. Typical Reverse Conduction Characteristics ( $T_J = -55\text{ }^\circ\text{C}$ )

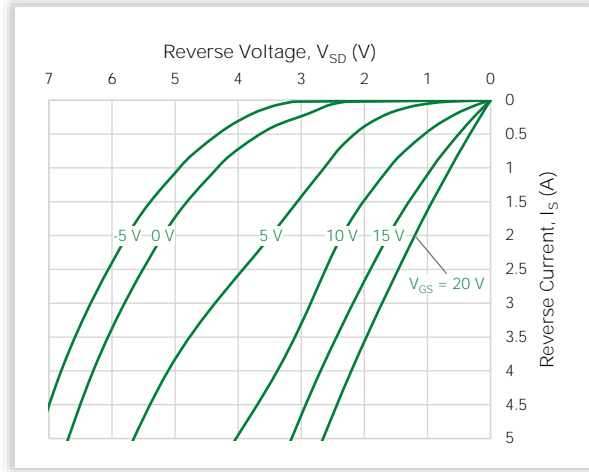


Figure 9. Typical Transient Thermal Impedance

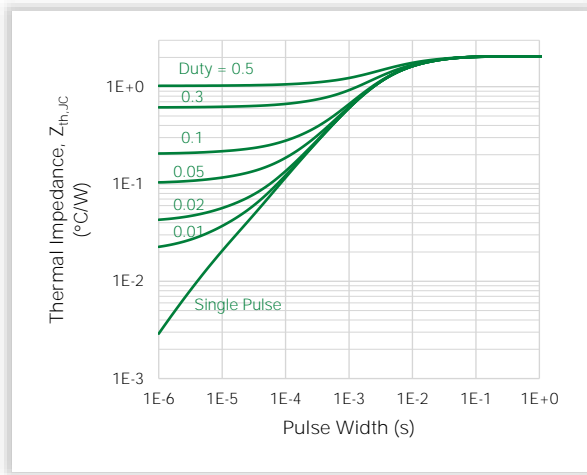


Figure 10. Maximum Safe Operating Area ( $T_C = 25\text{ }^\circ\text{C}$ )

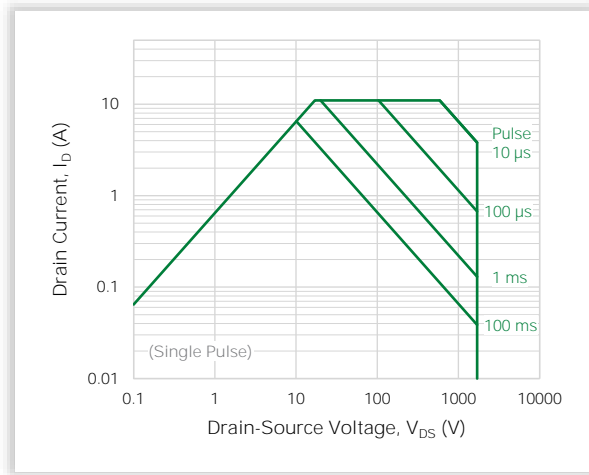


Figure 11. On-resistance vs. Drain Current

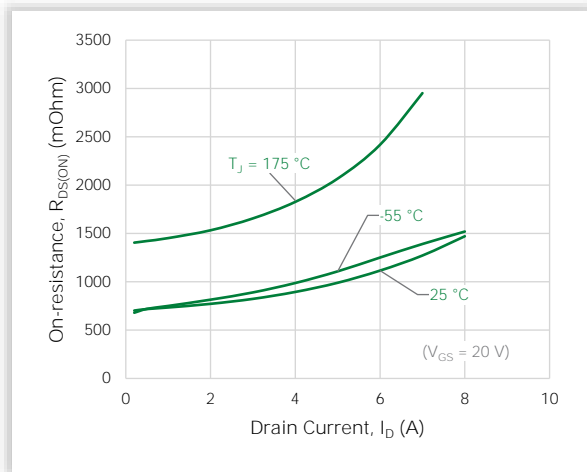


Figure 12. Normalized On-resistance vs. Junction Temperature

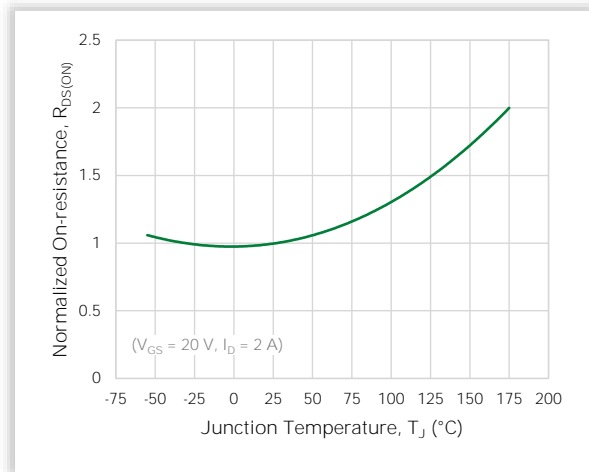


Figure 13. Typical On-resistance vs. Junction Temperature

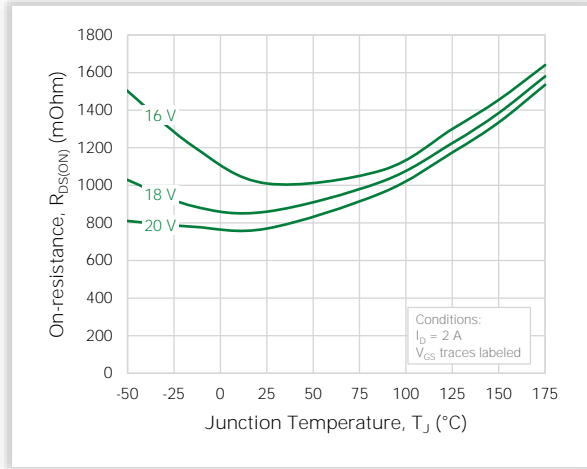


Figure 14. Typical Threshold Voltage

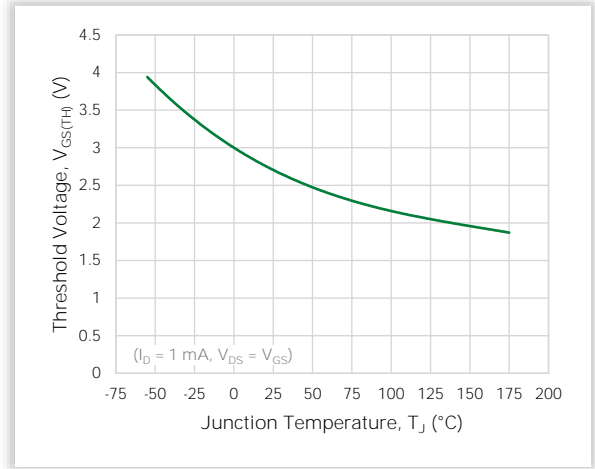


Figure 15. Typical Junction Capacitances up to 1000 V

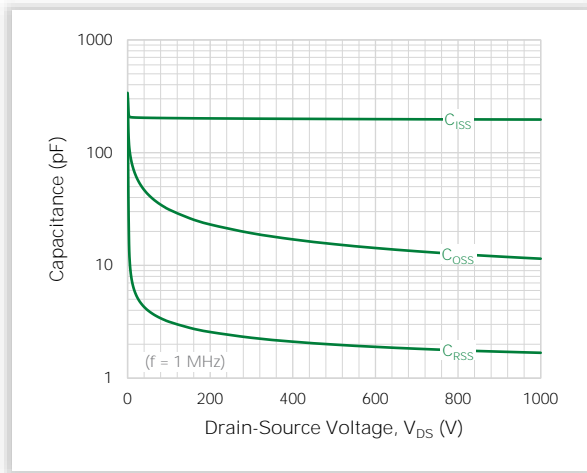
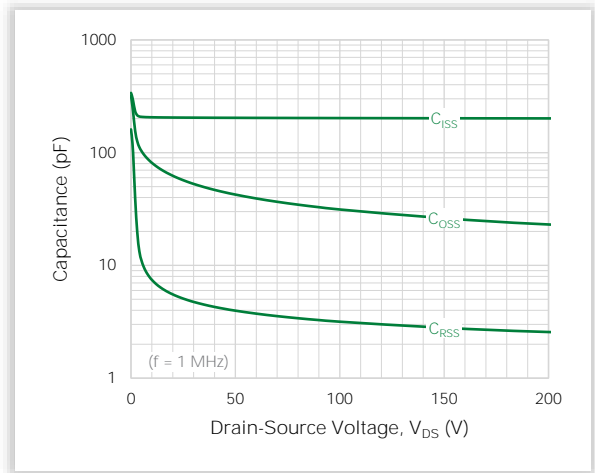


Figure 16. Typical Junction Capacitances up to 200 V



Capacitances up to 200 V

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

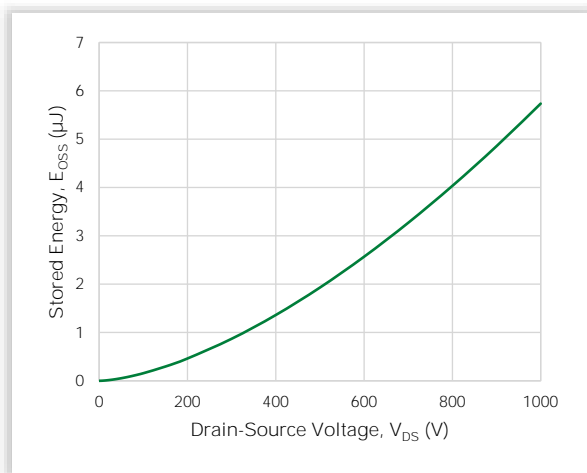


Figure 18. Typical Gate Charge

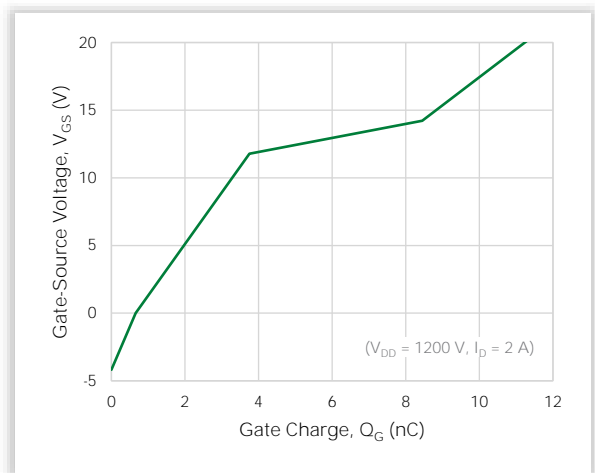


Figure 19. Typical Switching Energy vs. Drain Current

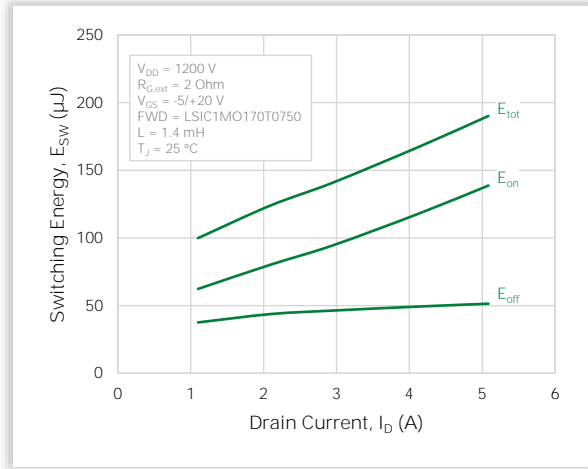


Figure 20. Typical Switching Energy vs. External Gate Resistance

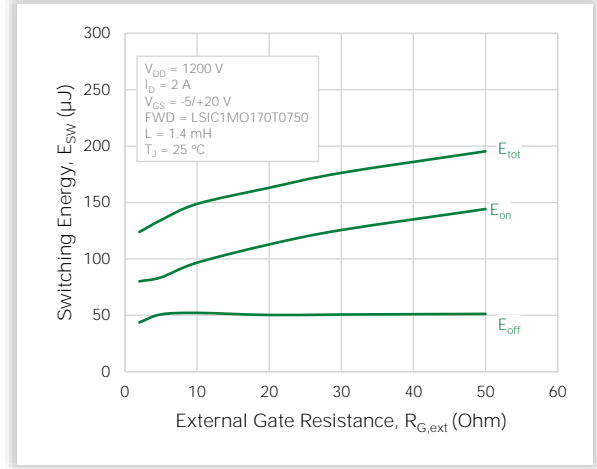
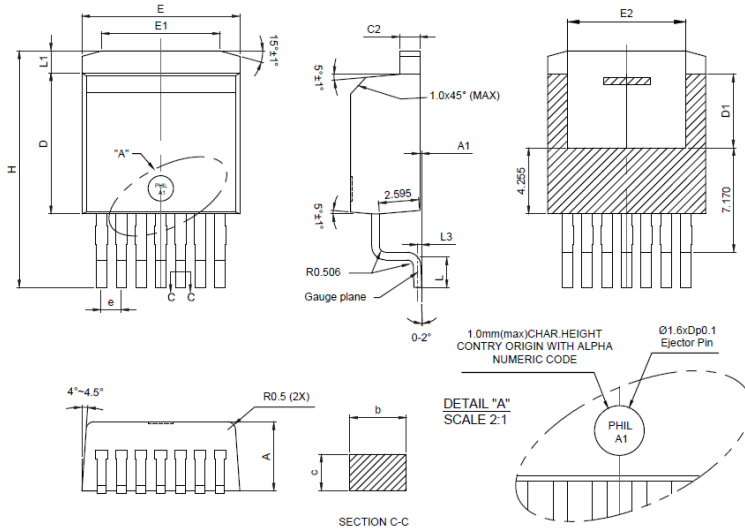


Figure 21.  $V_{GS}$  Waveform Definition



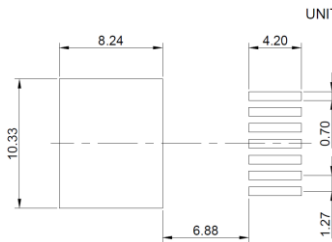


### 6. Package Dimensions



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	

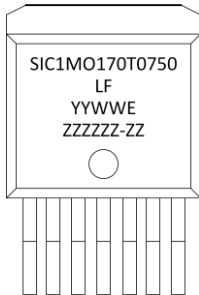
Recommended Solder Pad Layout:



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/marketing surface finish: 16-18 VDI.

### 7. Part Numbering and Marking



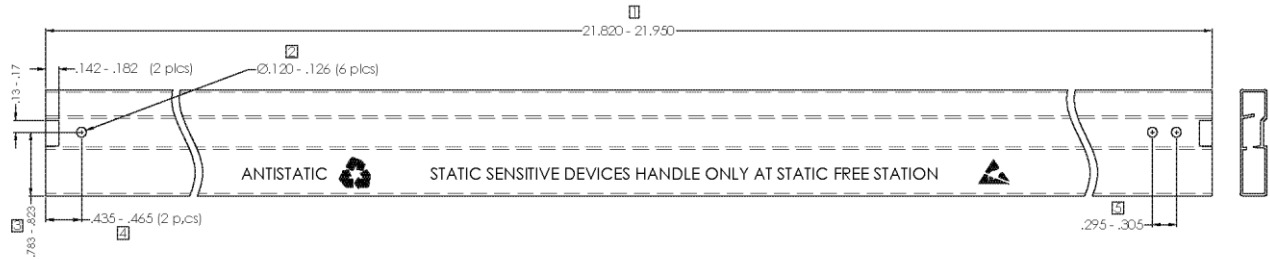
- SiC = SiC
- 1 = Gen 1
- MO = MOSFET
- 170 = Voltage Rating (1700 V)
- T = TO-263-7L
- 0750 = R<sub>DS(ON)</sub> (750 mOhm)
- YY = Year
- WW = Week
- E = Special Code
- ZZZZZZ-ZZ = Lot Number

### 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

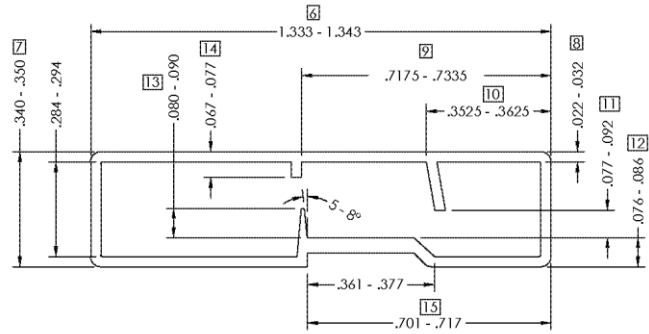
## 9. Packing Specifications

### 9.1. Tube Option



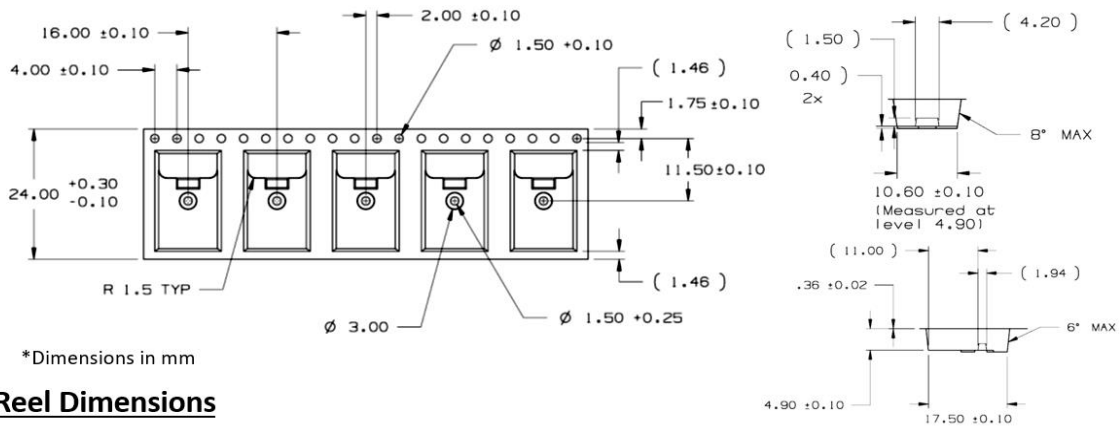
**Notes:**

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

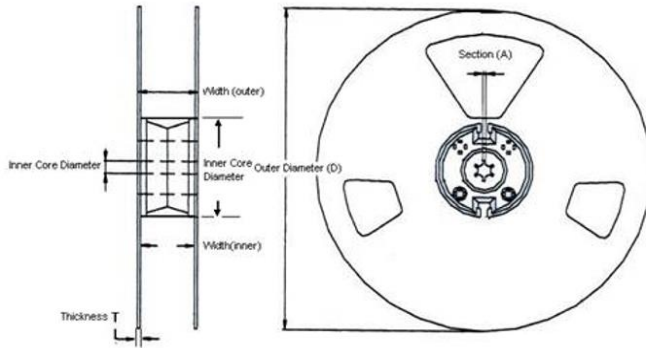


9.2. Tape and Reel Option

**Tape Dimensions**

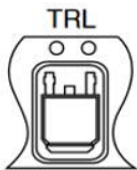


**Reel Dimensions**



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 <sup>9</sup> 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

For additional information please visit [www.Littelfuse.com/powersemi](http://www.Littelfuse.com/powersemi)

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