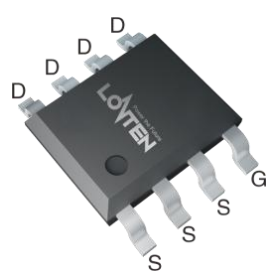
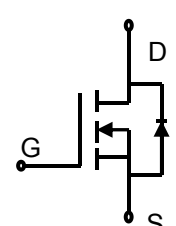



## Lonten N-channel 40V, 12A, 12mΩ Power MOSFET

<p><b>Description</b></p> <p>These N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and with stand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.</p> <p><b>Features</b></p> <ul style="list-style-type: none"> <li>◆ 40V,12A,<math>R_{DS(ON),max}=12m\Omega@V_{GS}=10V</math></li> <li>◆ Improved dv/dt capability</li> <li>◆ Fast switching</li> <li>◆ Green device available</li> </ul> <p><b>Applications</b></p> <ul style="list-style-type: none"> <li>◆ Motor Drives</li> <li>◆ UPS</li> <li>◆ DC-DC Converter</li> </ul>	<p><b>Product Summary</b></p> <table style="width: 100%; border: none;"> <tr> <td style="padding: 2px;"><math>V_{DSS}</math></td> <td style="padding: 2px;">40V</td> </tr> <tr> <td style="padding: 2px;"><math>R_{DS(on),max}@V_{GS}=10V</math></td> <td style="padding: 2px;">12mΩ</td> </tr> <tr> <td style="padding: 2px;"><math>I_D</math></td> <td style="padding: 2px;">12A</td> </tr> </table> <p><b>Pin Configuration</b></p> <div style="text-align: center;">  <p><b>SOP-8</b></p> </div> <div style="text-align: right;">  </div> <p style="text-align: center;">N-Channel MOSFET </p>	$V_{DSS}$	40V	$R_{DS(on),max}@V_{GS}=10V$	12mΩ	$I_D$	12A
$V_{DSS}$	40V						
$R_{DS(on),max}@V_{GS}=10V$	12mΩ						
$I_D$	12A						

### Absolute Maximum Ratings $T_A=25^{\circ}C$ unless otherwise noted

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	40	V
Continuous drain current ( $T_A=25^{\circ}C$ )	$I_D$	12	A
Continuous drain current ( $T_A=100^{\circ}C$ )		7.6	A
Pulsed drain current <sup>1)</sup>	$I_{DM}$	48	A
Gate-Source voltage	$V_{GSS}$	$\pm 20$	V
Power Dissipation ( $T_A=25^{\circ}C$ )	$P_D$	2.1	W
Storage Temperature Range	$T_{STG}$	-55 to +150	$^{\circ}C$
Operating Junction Temperature Range	$T_J$	-55 to +150	$^{\circ}C$

### Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	59.5	$^{\circ}C/W$

**Package Marking and Ordering Information**

Device	Device Package	Marking
LNL04R120	SOP-8	LNL04R120

**Electrical Characteristics**
 $T_J = 25^\circ\text{C}$  unless otherwise noted

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
<b>Static characteristics</b>						
Drain-source breakdown voltage	$BV_{DSS}$	$V_{GS}=0\text{ V}, I_D=250\mu\text{A}$	40	---	---	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.0	---	2.0	V
Drain-source leakage current	$I_{DSS}$	$V_{DS}=40\text{ V}, V_{GS}=0\text{ V}, T_J = 25^\circ\text{C}$	---	---	1	$\mu\text{A}$
		$V_{DS}=32\text{ V}, V_{GS}=0\text{ V}, T_J = 125^\circ\text{C}$	---	---	10	$\mu\text{A}$
Gate leakage current, Forward	$I_{GSSF}$	$V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$	---	---	100	nA
Gate leakage current, Reverse	$I_{GSSR}$	$V_{GS}=-20\text{ V}, V_{DS}=0\text{ V}$	---	---	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=12\text{ A}$	---	9.2	12	m $\Omega$
		$V_{GS}=4.5\text{ V}, I_D=8\text{ A}$	---	11.8	16	m $\Omega$
Forward transconductance	$g_{fs}$	$V_{DS}=5\text{ V}, I_D=20\text{ A}$	---	35	---	S
<b>Dynamic characteristics</b>						
Input capacitance	$C_{iss}$	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V},$ $F = 1\text{ MHz}$	---	1370	---	pF
Output capacitance	$C_{oss}$		---	158	---	
Reverse transfer capacitance	$C_{rss}$		---	125	---	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 20\text{ V}, V_{GS}=10\text{ V}, I_D = 12\text{ A}$	---	14.5	---	ns
Rise time	$t_r$		---	19.2	---	
Turn-off delay time	$t_{d(off)}$		---	61	---	
Fall time	$t_f$		---	27	---	
Gate resistance	$R_g$	$V_{GS}=0\text{ V}, V_{DS}=0\text{ V}, F=1\text{ MHz}$	---	3.5	---	$\Omega$
<b>Gate charge characteristics</b>						
Gate to source charge	$Q_{gs}$	$V_{DS}=20\text{ V}, I_D=12\text{ A},$ $V_{GS}=10\text{ V}$	---	7.1	---	nC
Gate to drain charge	$Q_{gd}$		---	2.9	---	
Gate charge total	$Q_g$		---	27.5	---	
<b>Drain-Source diode characteristics and Maximum Ratings</b>						
Continuous Source Current	$I_S$		---	---	12	A
Pulsed Source Current <sup>(3)</sup>	$I_{SM}$		---	---	48	A
Diode Forward Voltage	$V_{SD}$	$V_{GS}=0\text{ V}, I_S=10\text{ A}, T_J=25^\circ\text{C}$	---	---	1.2	V
Reverse Recovery Time	$t_{rr}$	$I_S=12\text{ A}, di/dt=100\text{ A}/\mu\text{s}, T_J=25^\circ\text{C}$	---	21	---	ns
Reverse Recovery Charge	$Q_{rr}$		---	7.8	---	nC

**Notes:**

1: Repetitive Rating: Pulse width limited by maximum junction temperature.

 2: Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

**Electrical Characteristics Diagrams**

Figure 1. Typ. Output Characteristics

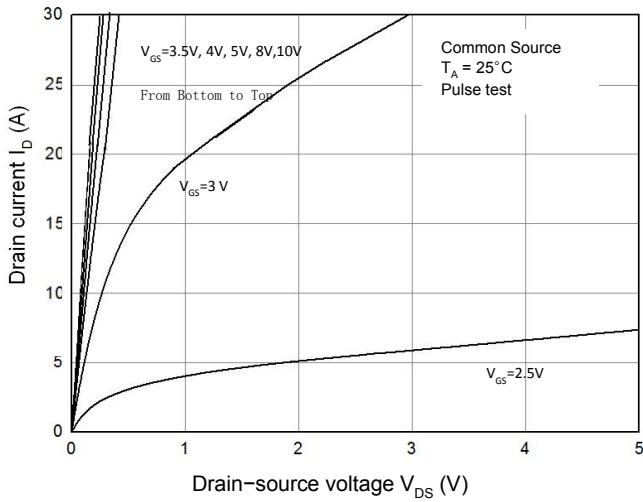


Figure 2. Transfer Characteristics

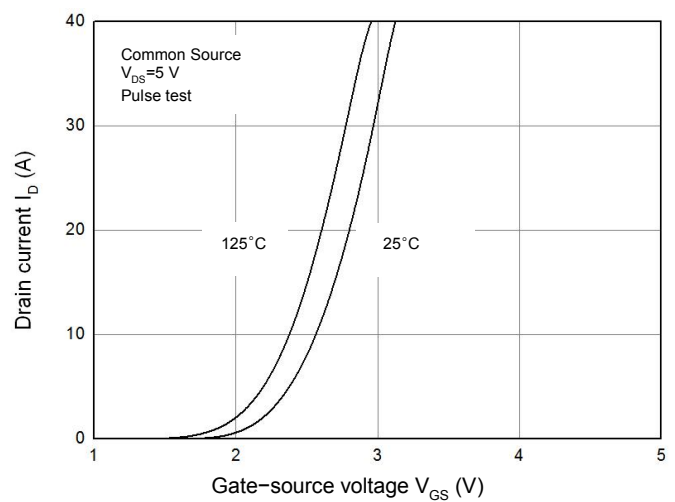


Figure 3. Capacitance Characteristics

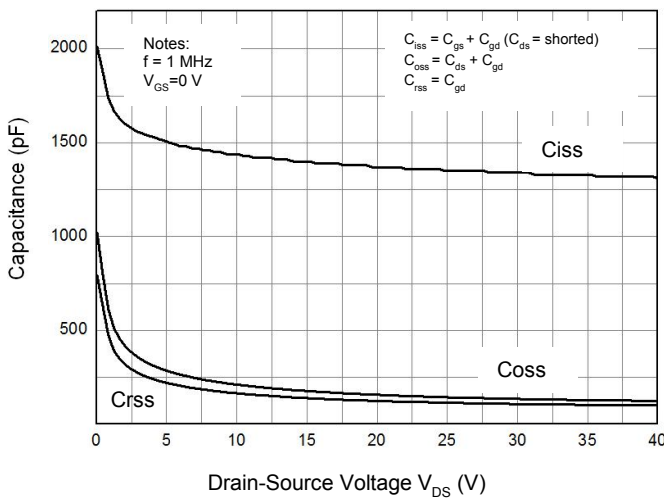


Figure 4. Gate Charge Waveform

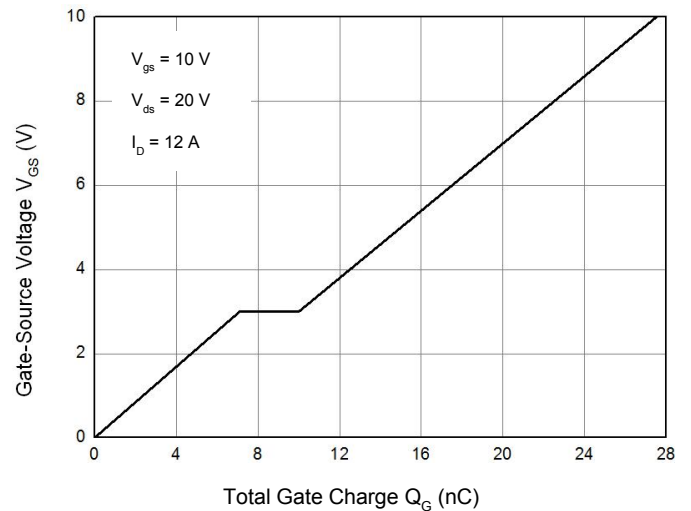


Figure 5. Body-Diode Characteristics

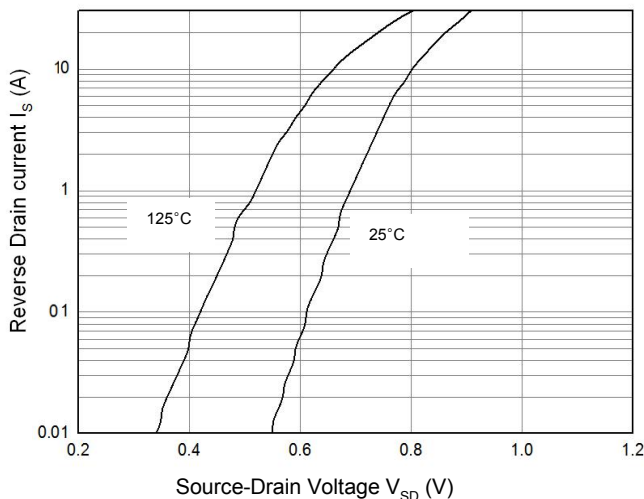


Figure 6. Rdson-Drain Current

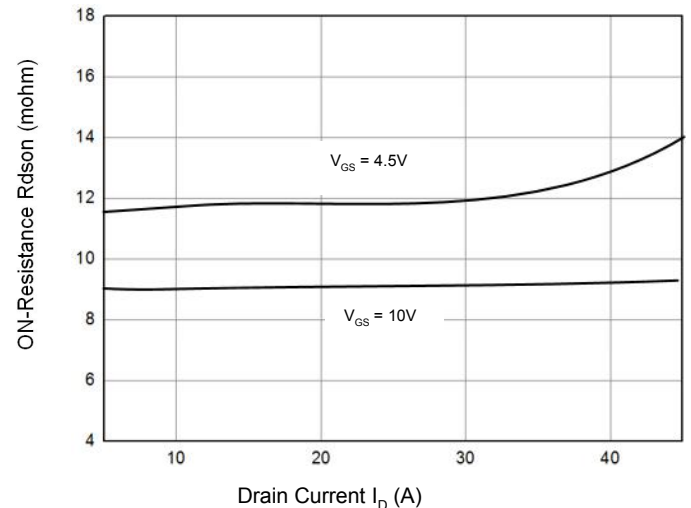


Figure 7. R<sub>ds(on)</sub>-Junction Temperature(°C)

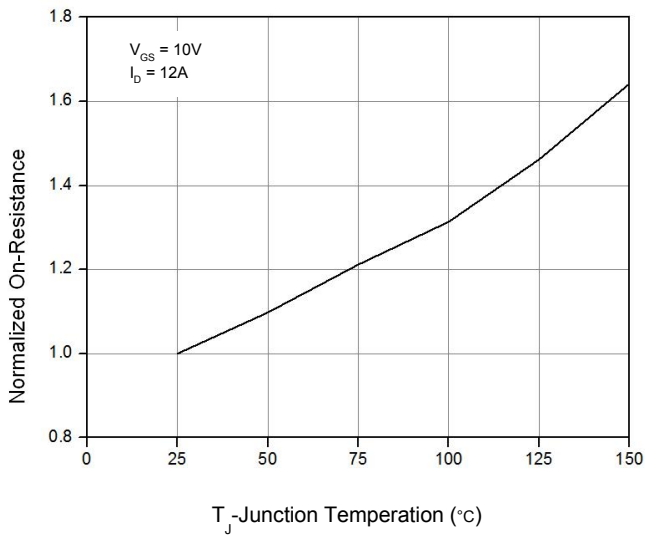


Figure 8. Maximum Safe Operating Area

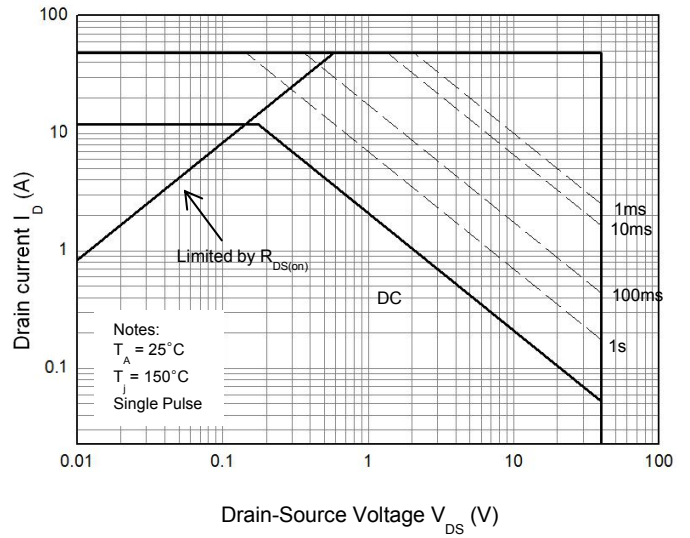
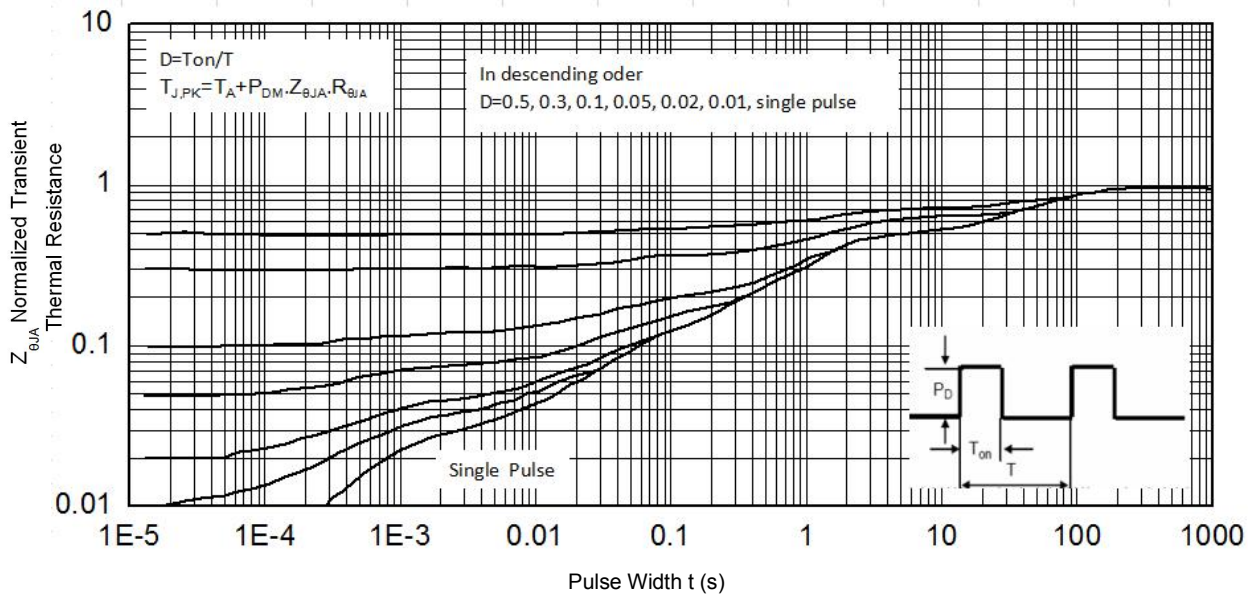


Figure 9. Normalized Maximum Transient Thermal Impedance (R<sub>thJA</sub>)



**Test Circuit & Waveform**

Figure 8. Gate Charge Test Circuit & Waveform

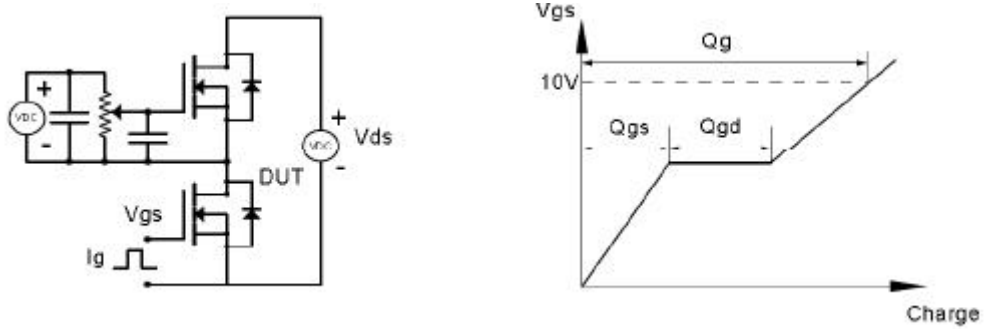


Figure 9. Resistive Switching Test Circuit & Waveforms

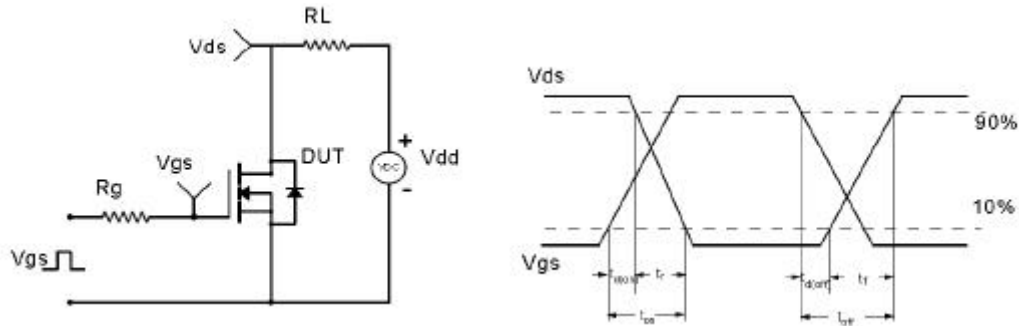


Figure 10. Unclamped Inductive Switching (UIS) Test Circuit & Waveform

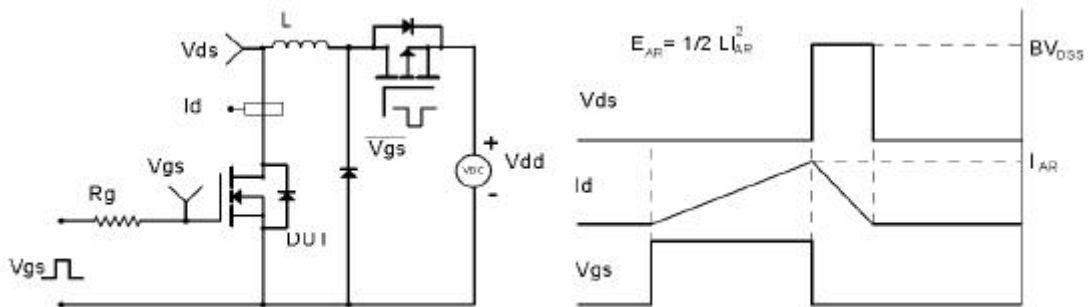
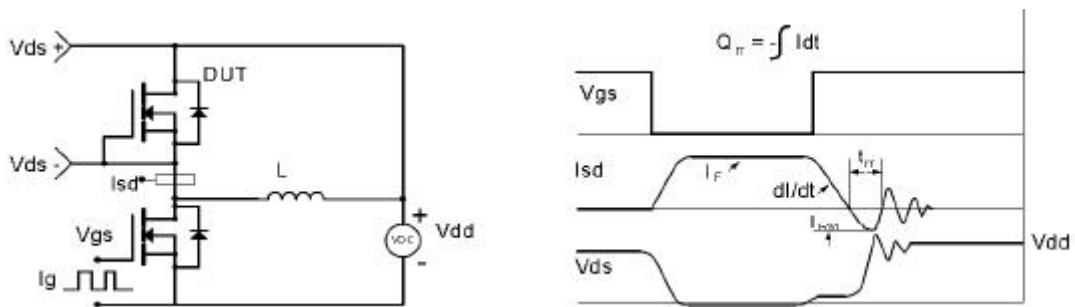
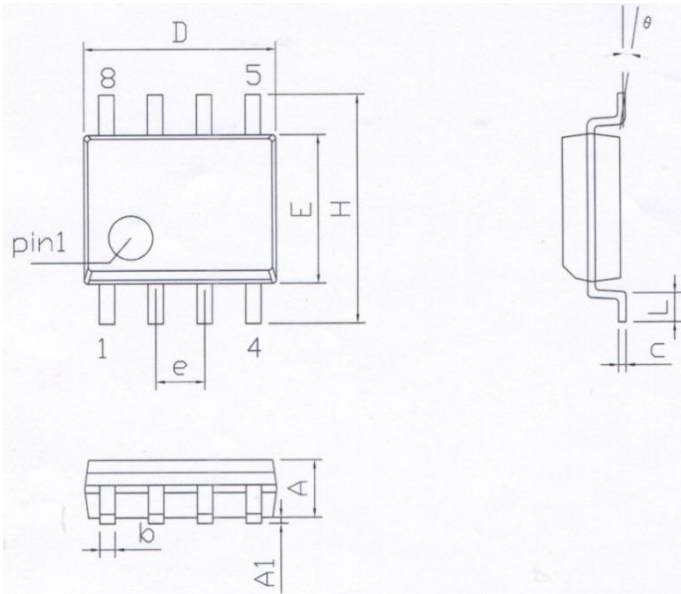


Figure 11. Diode Recovery Circuit & Waveform

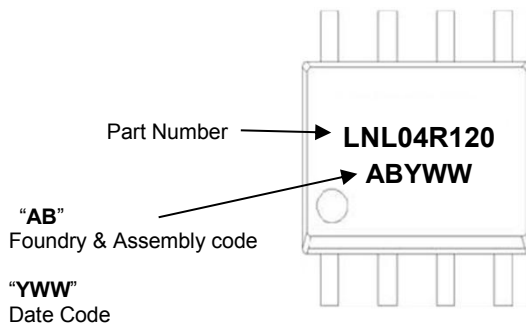


**Mechanical Dimensions for SOP-8**



SYMBOL	COMMON DIMENSIONS			
	MILLIMETERS		INCHS	
	MIN	MAX	MIN	MAX
A	1.35	1.65	0.053	0.065
A1	0.10	0.25	0.004	0.010
b	0.35	0.50	0.014	0.020
c	0.19	0.27	0.007	0.011
D	4.80	5.10	0.189	0.201
E	3.80	4.10	0.150	0.161
e	1.22	1.32	0.048	0.052
H	5.80	6.20	0.228	0.244
L	0.60	0.90	0.024	0.035
$\theta$	0°	8°	0°	8°

**SOP-8 Part Marking Information**



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