
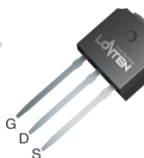
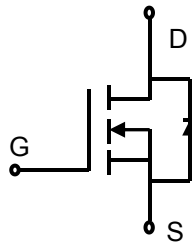



## Lonten N-channel 40V, 39A, 16.5mΩ Power MOSFET

<p><b>Description</b>                  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, 39A, <math>R_{DS(ON),max}=16.5m\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;">16.5mΩ</td> </tr> <tr> <td style="padding: 2px;"><math>I_D</math></td> <td style="padding: 2px;">39A</td> </tr> </table> <p><b>Pin Configuration</b></p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p><b>TO-252</b></p> </div> <div style="text-align: center;">  <p><b>TO-251</b></p> </div> </div> <div style="text-align: right; margin-top: 20px;">  </div> <p style="text-align: center; margin-top: 20px;">N-Channel MOSFET</p> <div style="text-align: right; margin-top: 10px;">  </div>	$V_{DSS}$	40V	$R_{DS(on),max}@V_{GS}=10V$	16.5mΩ	$I_D$	39A
$V_{DSS}$	40V						
$R_{DS(on),max}@V_{GS}=10V$	16.5mΩ						
$I_D$	39A						

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	40	V
Continuous drain current ( $T_C = 25^\circ\text{C}$ )	$I_D$	39	A
Continuous drain current ( $T_C = 100^\circ\text{C}$ )		24.5	A
Pulsed drain current <sup>1)</sup>	$I_{DM}$	156	A
Gate-Source voltage	$V_{GSS}$	$\pm 20$	V
Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_D$	37	W
Avalanche energy <sup>2)</sup>	$E_{AS}$	27.5	mJ
Storage Temperature Range	$T_{STG}$	-55 to +150	$^\circ\text{C}$
Operating Junction Temperature Range	$T_J$	-55 to +150	$^\circ\text{C}$

### Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	3.4	$^\circ\text{C/W}$

**Package Marking and Ordering Information**

Device	Device Package	Marking
LNG04R165	TO-252	LNG04R165
LNH04R165	TO-251	LNH04R165

**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	1.5	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	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=10\text{A}$	---	14.5	16.5	$\text{m}\Omega$
		$V_{GS}=4.5\text{ V}, I_D=5\text{A}$	---	19.5	23	$\text{m}\Omega$
Forward transconductance	$g_{fs}$	$V_{DS} = 5\text{ V}, I_D=10\text{A}$	---	35	---	S
<b>Dynamic characteristics</b>						
Input capacitance	$C_{iss}$	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V},$ $F = 1\text{MHz}$	---	1061	---	pF
Output capacitance	$C_{oss}$		---	127	---	
Reverse transfer capacitance	$C_{rss}$		---	102	---	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 20\text{V}, V_{GS}=10\text{V}, I_D = 20\text{A}$	---	12.3	---	ns
Rise time	$t_r$		---	18.6	---	
Turn-off delay time	$t_{d(off)}$		---	47.2	---	
Fall time	$t_f$		---	16.3	---	
<b>Gate charge characteristics</b>						
Gate to source charge	$Q_{gs}$	$V_{DS}=20\text{V}, I_D=20\text{A},$ $V_{GS}= 10\text{ V}$	---	7.2	---	nC
Gate to drain charge	$Q_{gd}$		---	4.3	---	
Gate charge total	$Q_g$		---	24	---	
<b>Drain-Source diode characteristics and Maximum Ratings</b>						
Continuous Source Current	$I_S$		---	---	39	A
Pulsed Source Current	$I_{SM}$		---	---	156	A
Diode Forward Voltage <sup>2)</sup>	$V_{SD}$	$V_{GS}=0\text{V}, I_S=10\text{A}, T_J=25^\circ\text{C}$	---	---	1.2	V
Reverse Recovery Time	$t_{rr}$	$I_S=20\text{A}, di/dt=100\text{A}/\mu\text{s}, T_J=25^\circ\text{C}$	---	32	---	ns
Reverse Recovery Charge	$Q_{rr}$		---	24	---	nC

**Notes:**

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

 2:  $V_{DD}=20\text{V}, V_{GS}=10\text{V}, L=0.5\text{mH}, I_{AS}=10.5\text{A}, R_G=25\Omega$ , Starting  $T_J=25^\circ\text{C}$ .

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

**Electrical Characteristics Diagrams**

Figure 1. Typ. Output Characteristics

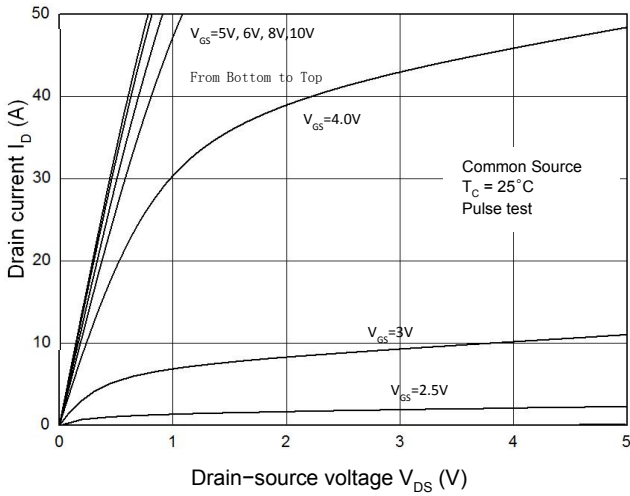


Figure 2. Transfer Characteristics

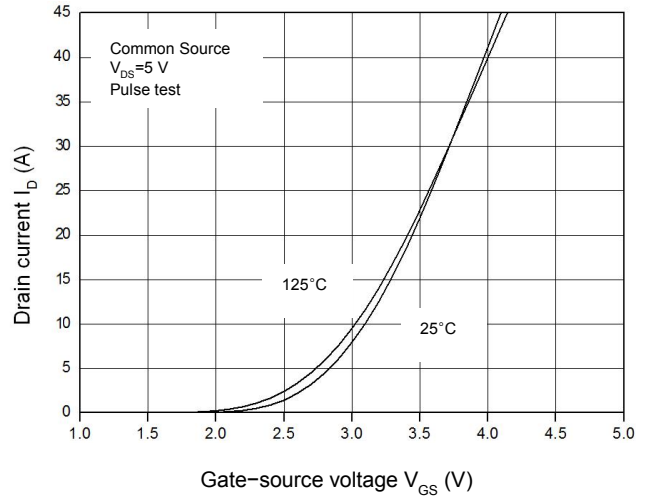


Figure 3. Capacitance Characteristics

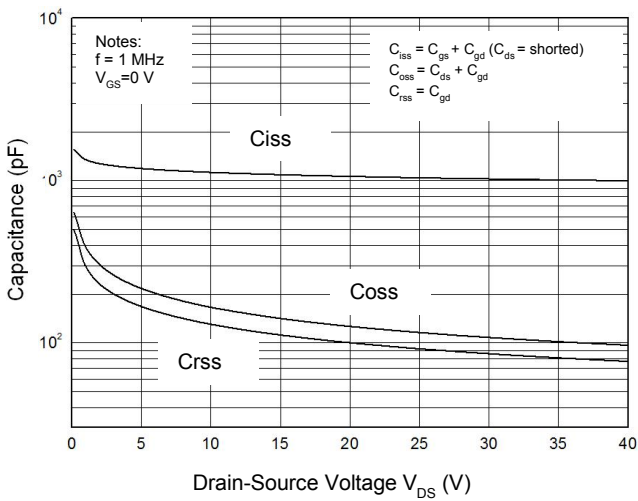


Figure 4. Gate Charge Waveform

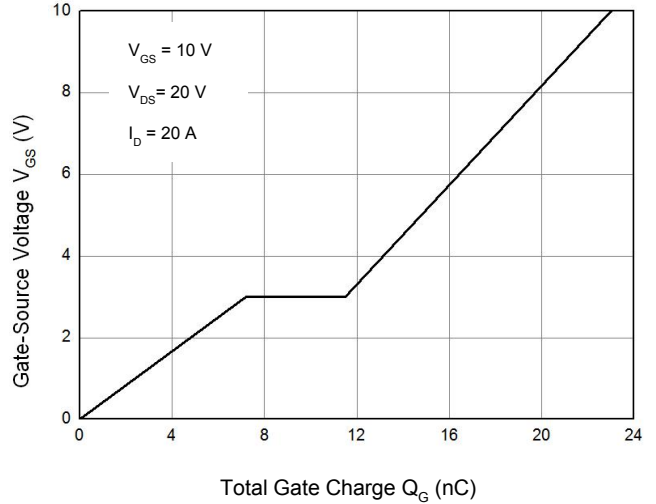


Figure 5. Body-Diode Characteristics

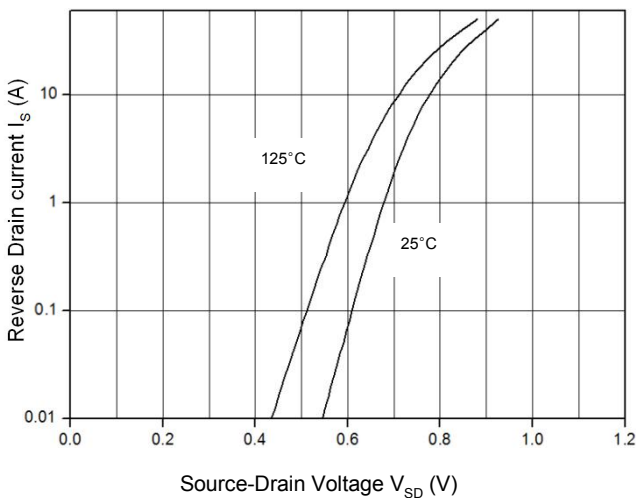


Figure 6. Rds(on)-Drain Current

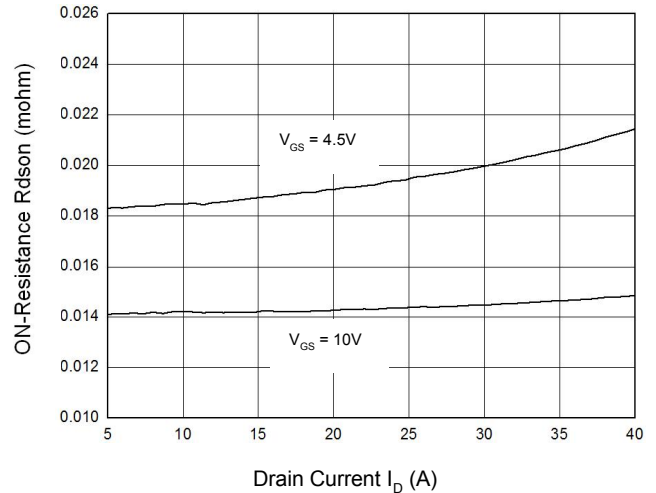


Figure 7. R<sub>ds(on)</sub>-Junction Temperature(°C)

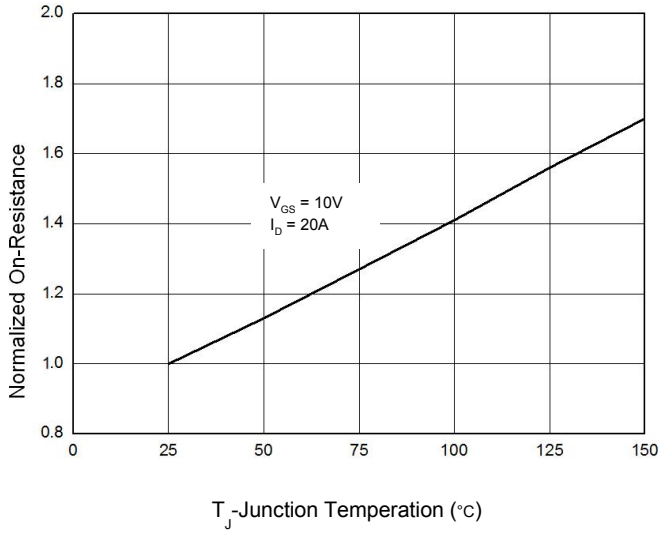


Figure 8. Maximum Safe Operating Area

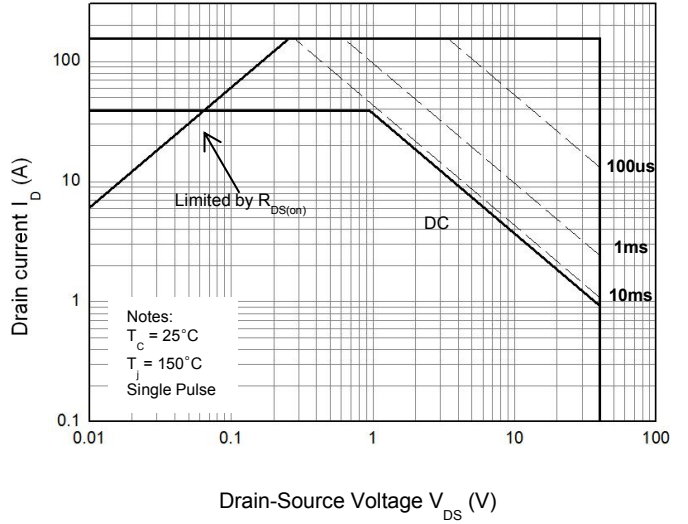
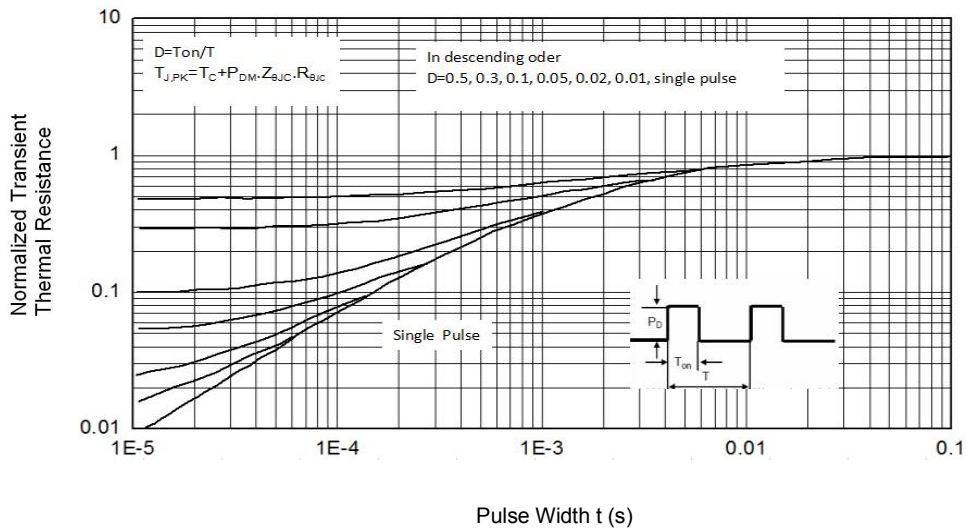


Figure 9. Normalized Maximum Transient Thermal Impedance (R<sub>thJA</sub>)



**Test Circuit & Waveform**

Figure 8. Gate Charge Test Circuit & Waveform

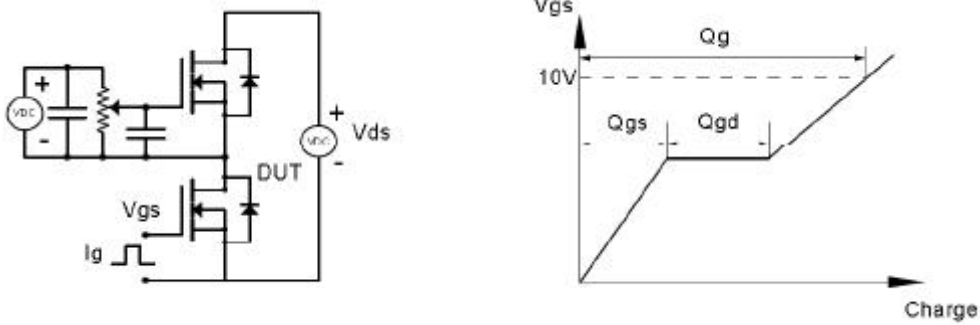


Figure 9. Resistive Switching Test Circuit & Waveforms

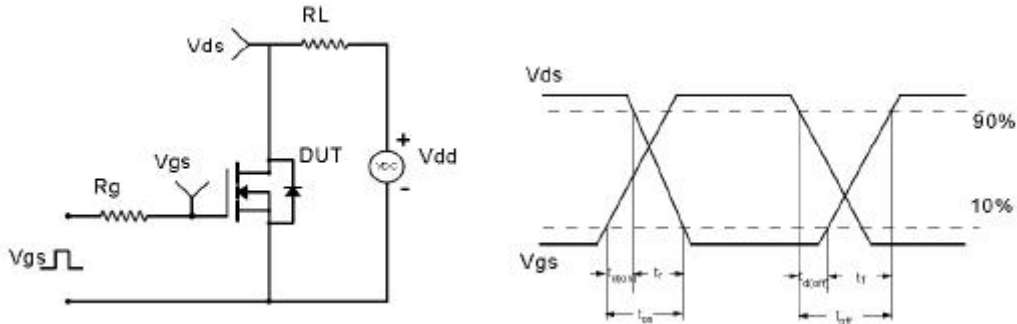


Figure 10. Unclamped Inductive Switching (UIS) Test Circuit & Waveform

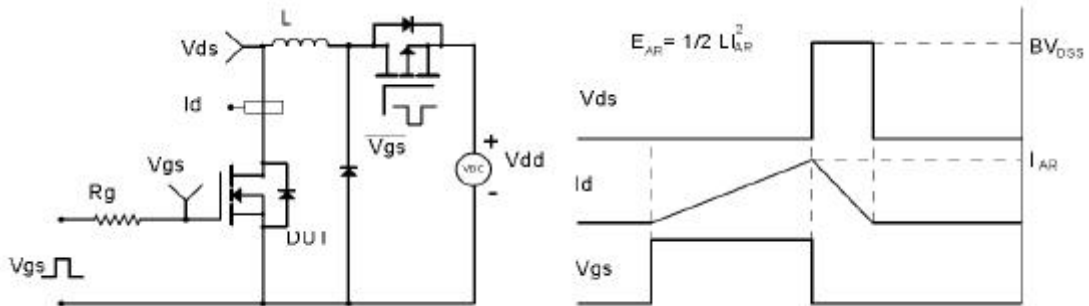
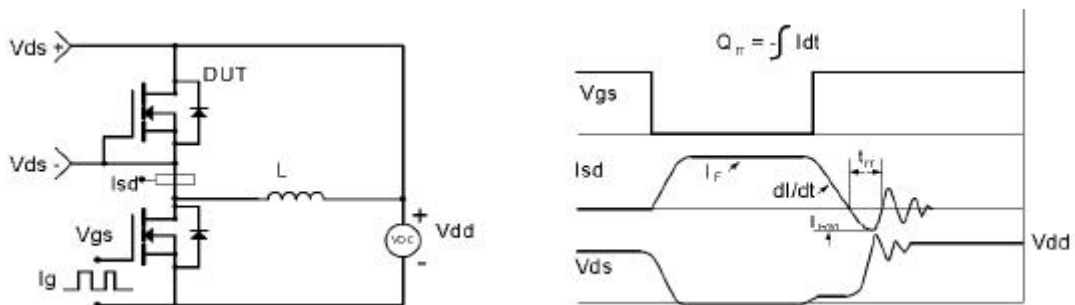
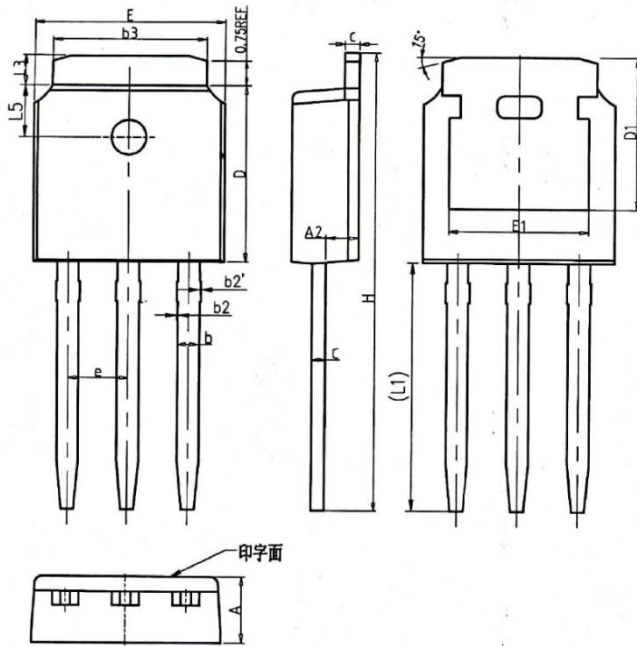


Figure 11. Diode Recovery Circuit & Waveform

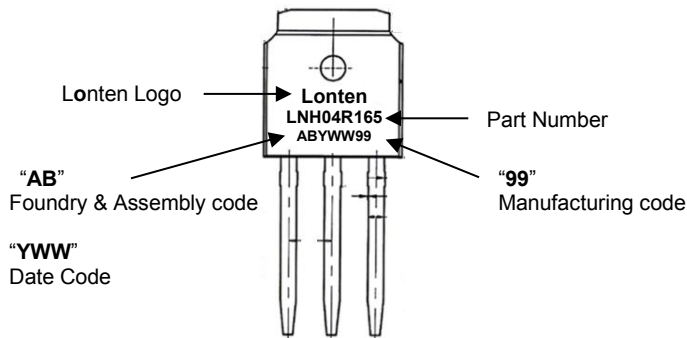


**Mechanical Dimensions for TO-251**

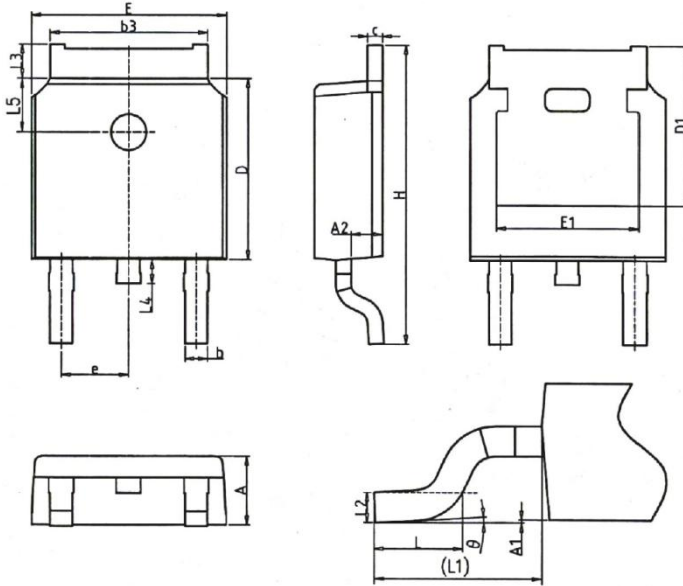


COMMON DIMENSIONS						
SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	2.20	2.30	2.38	0.087	0.091	0.094
A2	0.97	1.07	1.17	0.038	0.042	0.046
b	0.68	0.78	0.90	0.027	0.031	0.035
b2	0.00	0.04	0.10	0.000	0.002	0.004
b2'	0.00	0.04	0.10	0.000	0.002	0.004
b3	5.20	5.33	5.46	0.205	0.210	0.215
c	0.43	0.53	0.61	0.017	0.021	0.024
D	5.98	6.10	6.22	0.235	0.240	0.245
D1	5.30REF			0.209REF		
E	6.40	6.60	6.73	0.252	0.260	0.265
E1	4.63	-	-	0.182	-	-
e	2.286BSC			0.090BSC		
H	16.22	16.52	16.82	0.639	0.650	0.662
L1	9.15	9.40	9.65	0.360	0.370	0.380
L3	0.88	1.02	1.28	0.035	0.040	0.050
L5	1.65	1.80	1.95	0.065	0.071	0.077

**TO-251 Part Marking Information**

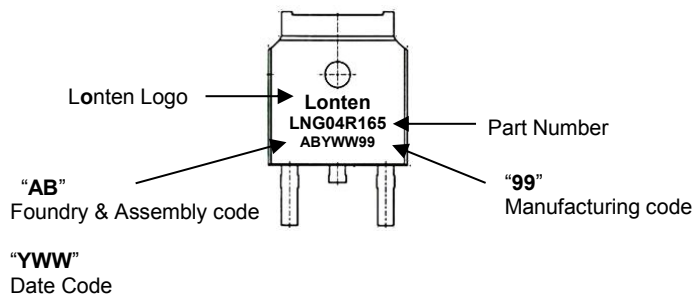


**Mechanical Dimensions for TO-252**



COMMON DIMENSIONS						
SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	2.20	2.30	2.38	0.087	0.091	0.094
A1	0.00	-	0.20	0.000	-	0.008
A2	0.97	1.07	1.17	0.038	0.042	0.046
b	0.68	0.78	0.90	0.027	0.031	0.035
b3	5.20	5.33	5.46	0.205	0.210	0.215
c	0.43	0.53	0.61	0.017	0.021	0.024
D	5.98	6.10	6.22	0.235	0.240	0.245
D1	5.30REF			0.209REF		
E	6.40	6.60	6.73	0.252	0.260	0.265
E1	4.63	-	-	0.182	-	-
e	2.286BSC			0.090BSC		
H	9.40	10.10	10.50	0.370	0.398	0.413
L	1.38	1.50	1.75	0.054	0.059	0.069
L1	2.90REF			0.114REF		
L2	0.51BSC			0.020BSC		
L3	0.88	-	1.28	0.035	-	0.050
L4	0.50	-	1.00	0.020	-	0.039
L5	1.65	1.80	1.95	0.065	0.071	0.077
θ	0°	-	8°	0°	-	8°

**TO-252 Part Marking Information**



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