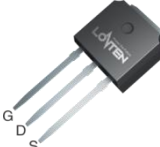


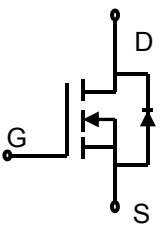



Lonten N-channel 60V, 33A, 23mΩ Power MOSFET

<p>Description</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>Features</p> <ul style="list-style-type: none"> ◆ 60V,33A,$R_{DS(ON),max}=23m\Omega@V_{GS}=10V$ ◆ Improved dv/dt capability ◆ Fast switching ◆ 100% EAS Guaranteed ◆ Green device available <p>Applications</p> <ul style="list-style-type: none"> ◆ Motor Drives ◆ UPS ◆ DC-DC Converter 	<p>Product Summary</p> <table> <tr> <td>V_{DSS}</td> <td>60V</td> </tr> <tr> <td>$R_{DS(on),max}@V_{GS}=10V$</td> <td>23mΩ</td> </tr> <tr> <td>I_D</td> <td>33A</td> </tr> </table> <p>Pin Configuration</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>TO-251</p> </div> <div style="text-align: center;">  <p>TO-252</p> </div> <div style="text-align: center;">  <p>TO-220</p> </div> </div> <div style="text-align: right; margin-top: 20px;">  <p>N-Channel MOSFET</p>  </div>	V_{DSS}	60V	$R_{DS(on),max}@V_{GS}=10V$	23mΩ	I_D	33A
V_{DSS}	60V						
$R_{DS(on),max}@V_{GS}=10V$	23mΩ						
I_D	33A						

Absolute Maximum Ratings $T_C = 25^\circ C$ unless otherwise noted

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	60	V
Continuous drain current ($T_C = 25^\circ C$)	I_D	33	A
Continuous drain current ($T_C = 100^\circ C$)		21	A
Pulsed drain current ¹⁾	I_{DM}	132	A
Gate-Source voltage	V_{GSS}	± 20	V
Avalanche energy ²⁾	E_{AS}	39	mJ
Power Dissipation ($T_C = 25^\circ C$)	P_D	50	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-Case	$R_{\theta JC}$	2.5	$^\circ C/W$

Package Marking and Ordering Information

Device	Device Package	Marking
LNH06R230	TO-251	LNH06R230
LNG06R230	TO-252	LNG06R230
LNC06R230	TO-220	LNC06R230

Electrical Characteristics

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

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static characteristics						
Drain-source breakdown voltage	BV_{DSS}	$V_{GS}=0\text{ V}, I_D=250\mu\text{A}$	60	---	---	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.0	1.6	2.5	V
Drain-source leakage current	I_{DSS}	$V_{DS}=60\text{ V}, V_{GS}=0\text{ V}, T_J = 25^\circ\text{C}$	---	---	1	μA
		$V_{DS}=48\text{ V}, V_{GS}=0\text{ V}, T_J = 125^\circ\text{C}$	---	---	10	μA
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	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=20\text{ A}$	---	17	23	m Ω
		$V_{GS}=4.5\text{ V}, I_D=10\text{ A}$	---	20	27	m Ω
Forward transconductance	g_{fs}	$V_{DS} = 5\text{ V}, I_D=20\text{A}$	---	43	---	S
Dynamic characteristics						
Input capacitance	C_{iss}	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $F = 1\text{MHz}$	---	1463	---	pF
Output capacitance	C_{oss}		---	153	---	
Reverse transfer capacitance	C_{riss}		---	101	---	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 30\text{V}, V_{GS}=10\text{V}, I_D = 20\text{ A}$	---	11	---	ns
Rise time	t_r		---	103	---	
Turn-off delay time	$t_{d(off)}$		---	128	---	
Fall time	t_f		---	29.5	---	
Gate resistance	R_g	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, F=1\text{MHz}$	---	2.6	---	Ω
Gate charge characteristics						
Gate to source charge	Q_{gs}	$V_{DS}=25\text{ V}, I_D=20\text{A},$ $V_{GS}= 10\text{ V}$	---	6.0	---	nC
Gate to drain charge	Q_{gd}		---	6.3	---	
Gate charge total	Q_g		---	29.2	---	
Drain-Source diode characteristics and Maximum Ratings						
Continuous Source Current	I_S		---	---	33	A
Pulsed Source Current ³⁾	I_{SM}		---	---	132	A
Diode Forward Voltage	V_{SD}	$V_{GS}=0\text{V}, I_S=20\text{A}, T_J=25^\circ\text{C}$	---	---	1.2	V
Reverse Recovery Time	t_{rr}	$I_S=20\text{A}, di/dt=100\text{A}/\mu\text{s}, T_J=25^\circ\text{C}$	---	24.6	---	ns
Reverse Recovery Charge	Q_{rr}		---	31	---	nC

Notes:

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

2: $V_{DD}=25\text{V}, V_{GS}=10\text{V}, L=0.5\text{mH}, I_{AS}=12.5\text{A}, R_G=25\Omega,$ 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

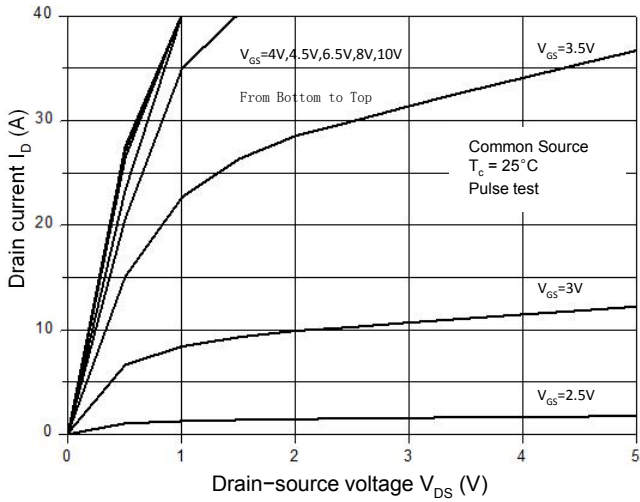


Figure 2. Transfer Characteristics

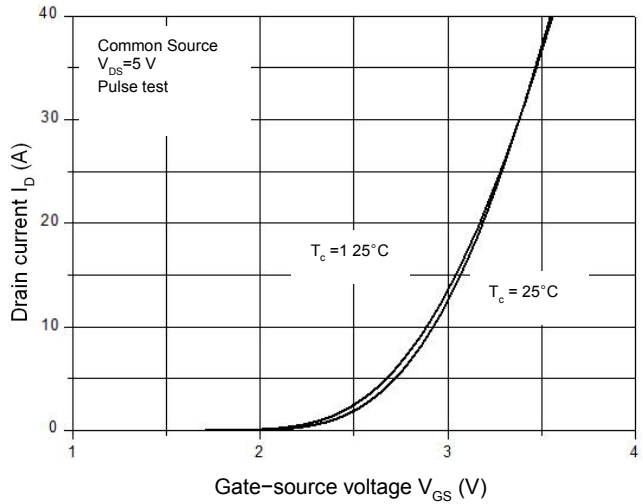


Figure 3. Capacitance Characteristics

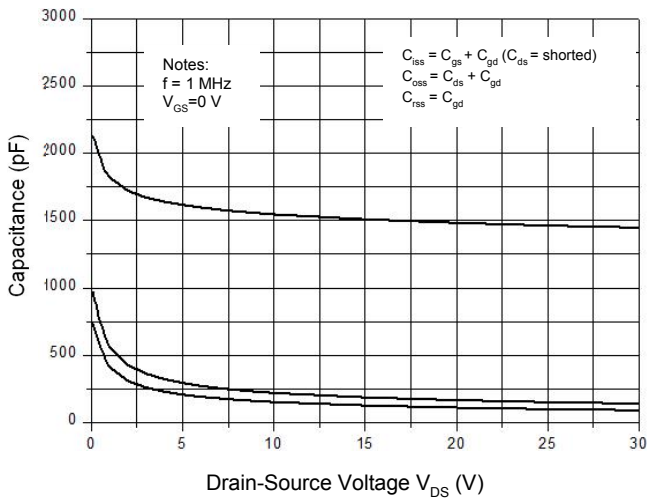


Figure 4. Gate Charge Waveform

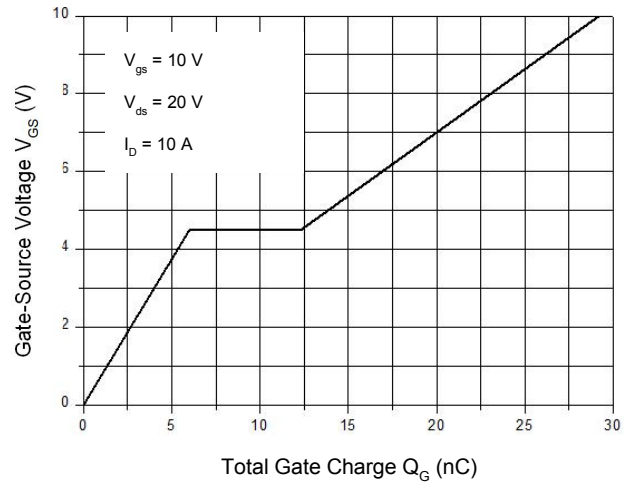


Figure 5. Body-Diode Characteristics

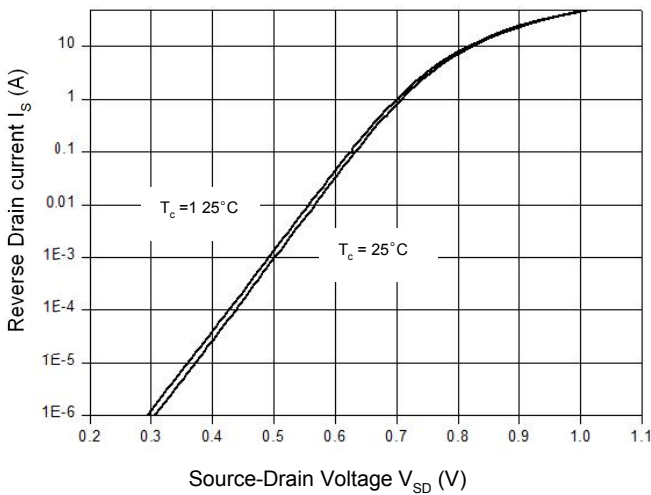


Figure 6. Rdson-Drain Current

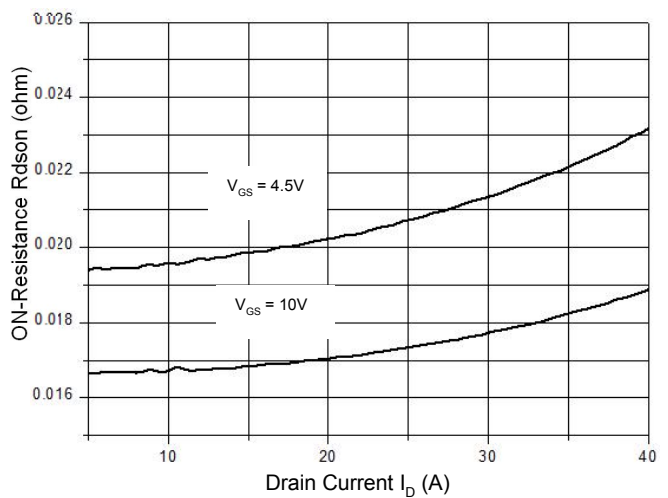


Figure 7. Rdson-Junction Temperature(°C)

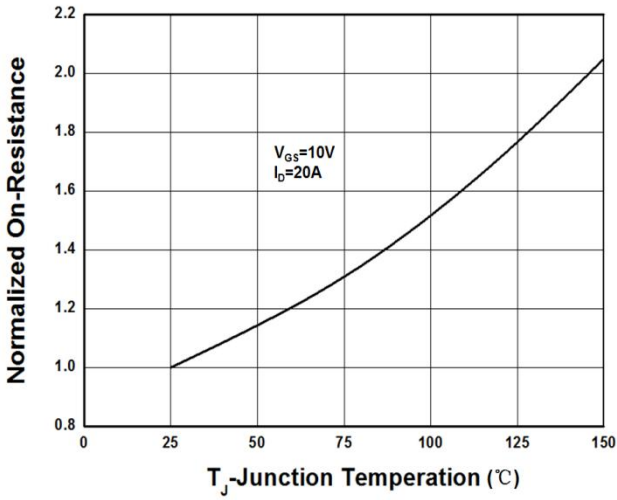


Figure 8. Maximum Safe Operating Area

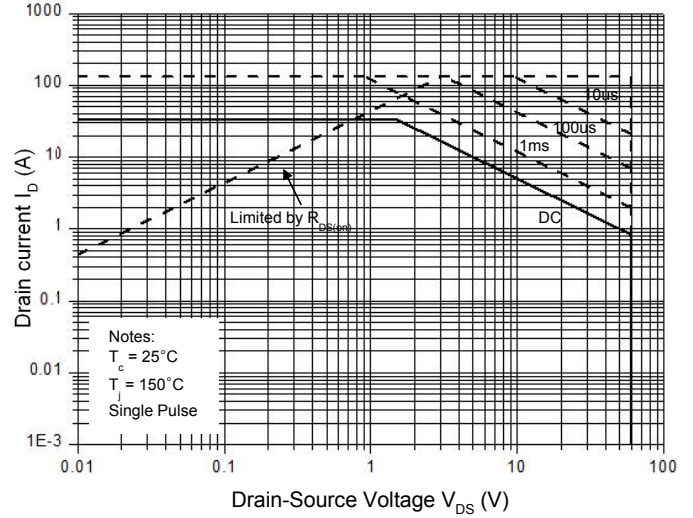
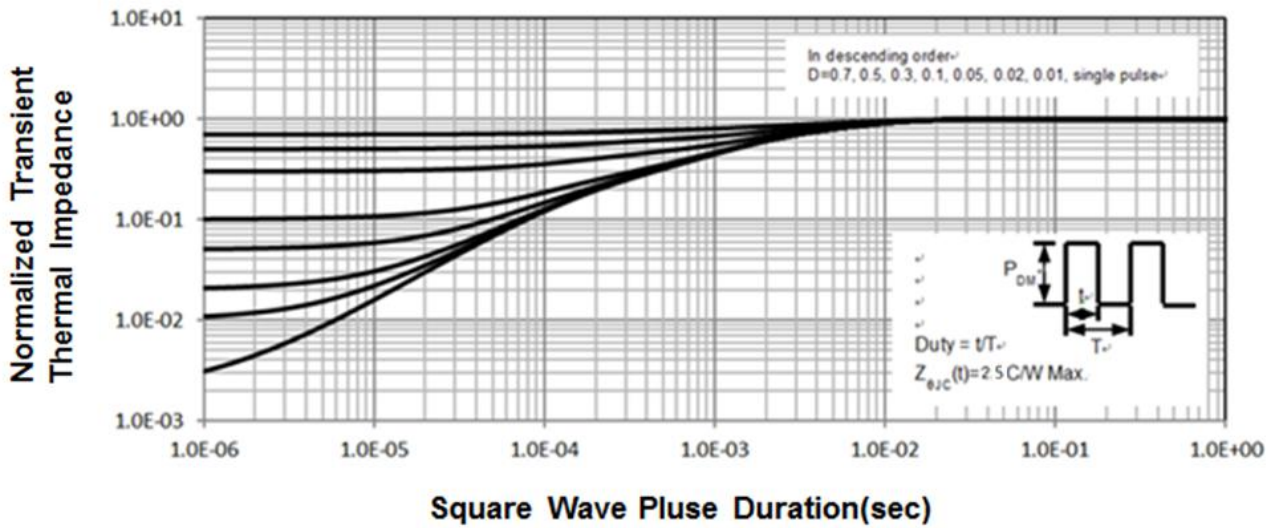


Figure 9. Normalized Maximum Transient Thermal Impedance



Test Circuit & Waveform

Figure 8. Gate Charge Test Circuit & Waveform

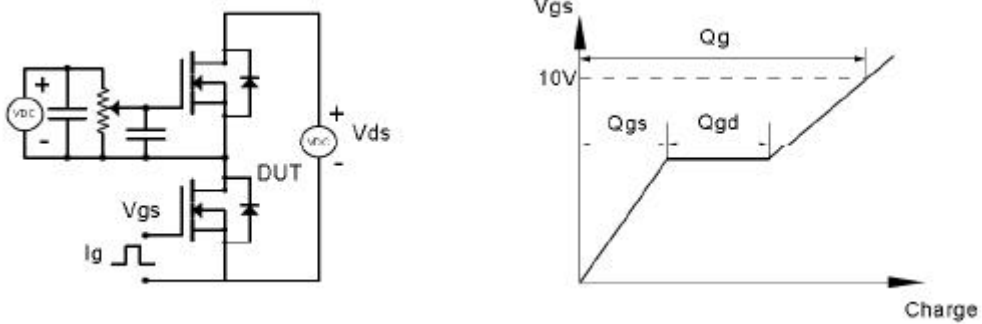


Figure 9. Resistive Switching Test Circuit & Waveforms

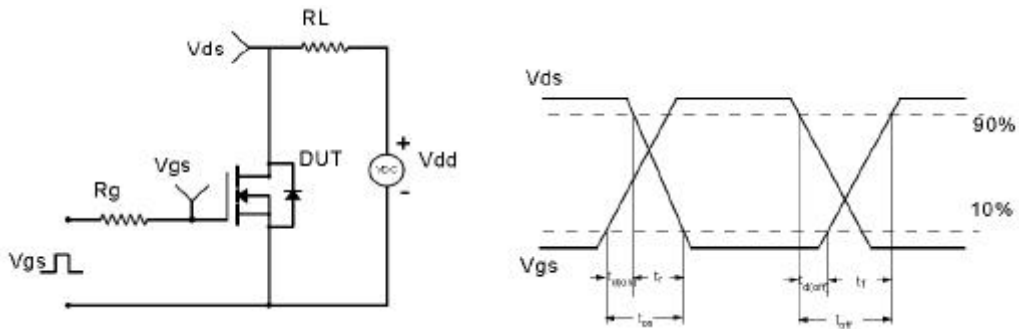


Figure 10. Unclamped Inductive Switching (UIS) Test Circuit & Waveform

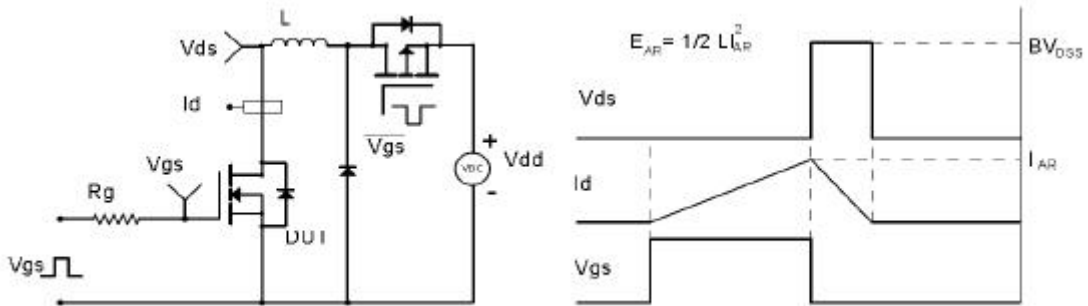
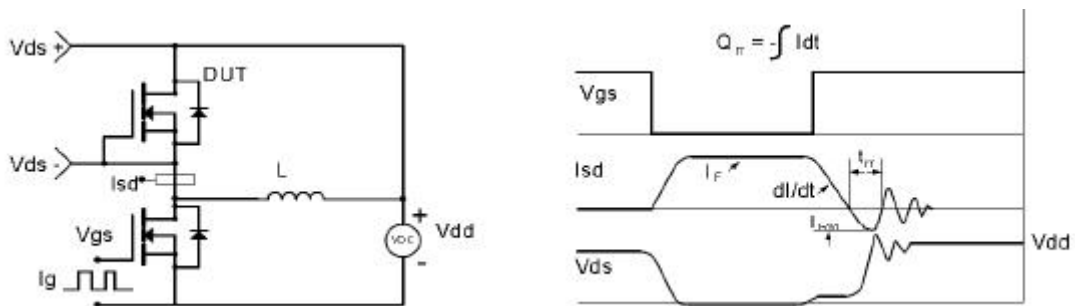
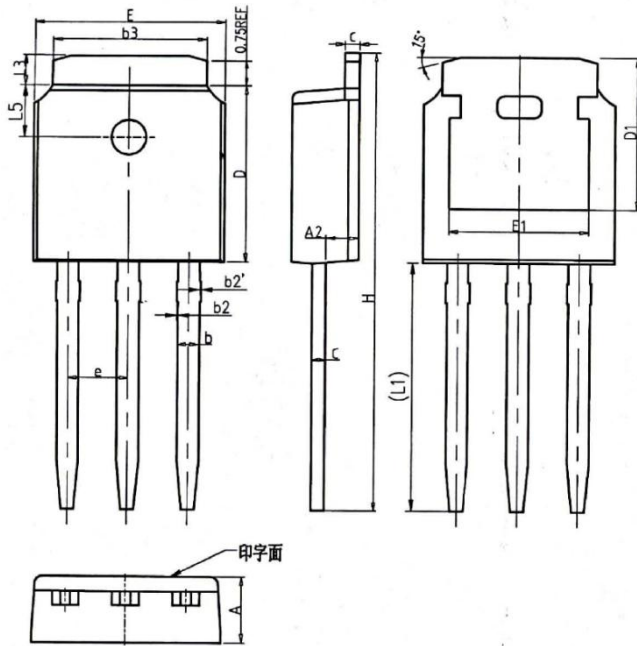


Figure 11. Diode Recovery Circuit & Waveform

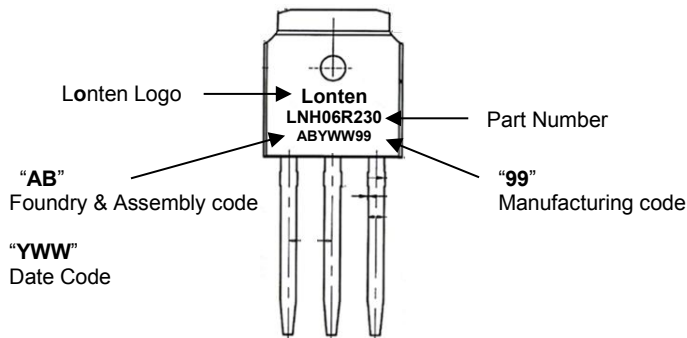


Mechanical Dimensions for TO-251

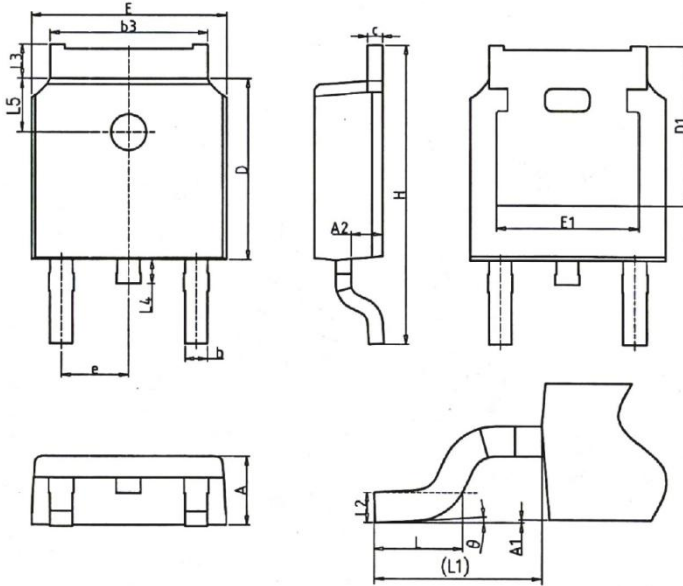


SYMBOL	COMMON DIMENSIONS					
	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	2.20	2.30	2.38	0.087	0.091	0.094
A2	0.97	1.07	1.17	0.038	0.042	0.046
b	0.68	0.78	0.90	0.027	0.031	0.035
b2	0.00	0.04	0.10	0.000	0.002	0.004
b2'	0.00	0.04	0.10	0.000	0.002	0.004
b3	5.20	5.33	5.46	0.205	0.210	0.215
c	0.43	0.53	0.61	0.017	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

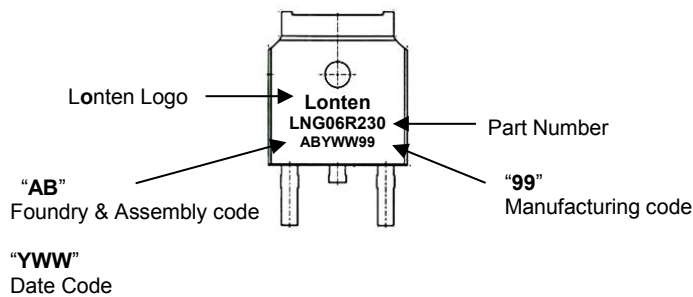


Mechanical Dimensions for TO-252

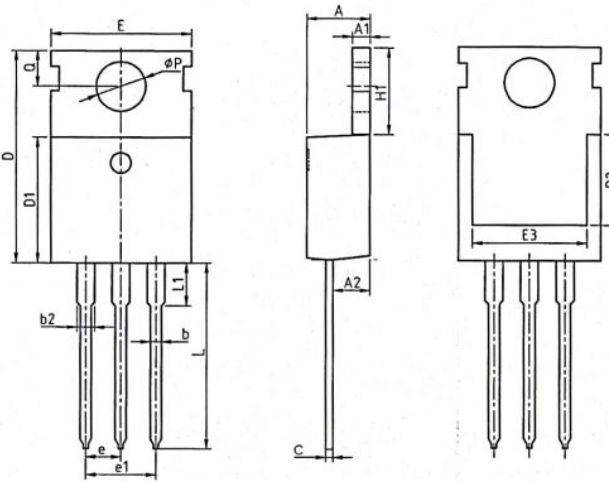


COMMON DIMENSIONS						
SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	2.20	2.30	2.38	0.087	0.091	0.094
A1	0.00	-	0.20	0.000	-	0.008
A2	0.97	1.07	1.17	0.038	0.042	0.046
b	0.68	0.78	0.90	0.027	0.031	0.035
b3	5.20	5.33	5.46	0.205	0.210	0.215
c	0.43	0.53	0.61	0.017	0.021	0.024
D	5.98	6.10	6.22	0.235	0.240	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

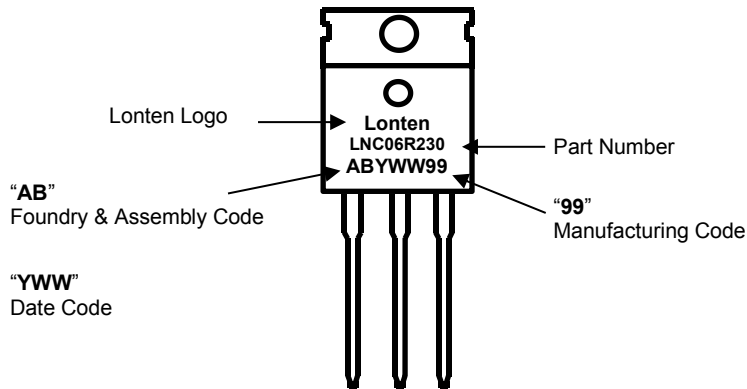


Mechanical Dimensions for TO-220



COMMON DIMENSIONS						
SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
L						
A	4.37	4.57	4.70	0.172	0.180	0.185
A1	1.25	1.30	1.40	0.049	0.051	0.055
A2	2.20	2.40	2.60	0.087	0.094	0.102
b	0.70	0.80	0.95	0.028	0.031	0.037
b2	1.17	1.27	1.47	0.046	0.050	0.058
c	0.45	0.50	0.60	0.018	0.020	0.024
D	15.10	15.60	16.10	0.594	0.614	0.634
D1	8.80	9.10	9.40	0.346	0.358	0.370
D2	5.50	—	—	0.217	—	—
E	9.70	10.00	10.30	0.382	0.394	0.406
E3	7.00	—	—	0.276	—	—
e	2.54BSC			0.1BSC		
e1	5.08BSC			0.2BSC		
H1	6.25	6.50	6.85	0.246	0.256	0.270
L	12.75	13.50	13.80	0.502	0.531	0.543
L1	—	3.10	3.40	—	0.122	0.134
Øp	3.40	3.60	3.80	0.134	0.142	0.150
Q	2.60	2.80	3.00	0.102	0.110	0.118

TO-220 Part Marking Information



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