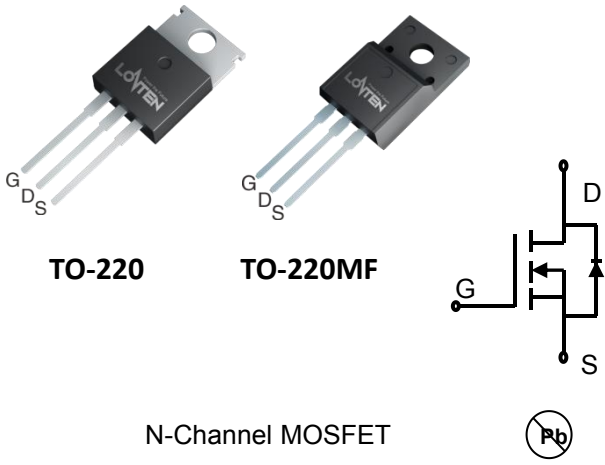


Lonten N-channel 40V, 120A, 3.5mΩ Power MOSFET

<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"> ◆ 40V,120A,$R_{DS(on),max}=3.5m\Omega@V_{GS} = 10V$ ◆ 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 style="width: 100%; border: none;"> <tr> <td style="padding: 2px;">V_{DSS}</td> <td style="padding: 2px;">40V</td> </tr> <tr> <td style="padding: 2px;">$R_{DS(on),max}@V_{GS}=10V$</td> <td style="padding: 2px;">3.5mΩ</td> </tr> <tr> <td style="padding: 2px;">I_D</td> <td style="padding: 2px;">120A</td> </tr> </table> <p>Pin Configuration</p> <div style="text-align: center;">  <p style="margin: 0;">TO-220 TO-220MF</p> <p style="margin: 0;">N-Channel MOSFET</p> </div>	V_{DSS}	40V	$R_{DS(on),max}@V_{GS}=10V$	3.5mΩ	I_D	120A
V_{DSS}	40V						
$R_{DS(on),max}@V_{GS}=10V$	3.5mΩ						
I_D	120A						

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	40	V
Continuous drain current ($T_C = 25^\circ C$) ¹⁾	I_D	120	A
Continuous drain current ($T_C = 100^\circ C$) ¹⁾		82	A
Pulsed drain current ²⁾	I_{DM}	480	A
Gate-Source voltage	V_{GSS}	± 20	V
Avalanche energy ³⁾	E_{AS}	1040	mJ
Power Dissipation ($T_C = 25^\circ C$) TO-220	P_D	150	W
Power Dissipation ($T_C = 25^\circ C$) TO-220MF		48	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 TO-220	$R_{\theta JC}$	0.83	$^\circ C/W$
Thermal Resistance, Junction-to-Case TO-220MF		2.6	$^\circ C/W$
Thermal Resistance, Junction-to-Ambient TO-220	$R_{\theta JA}$	62	$^\circ C/W$
Thermal Resistance, Junction-to-Ambient TO-220MF		80	$^\circ C/W$

Package Marking and Ordering Information

Device	Device Package	Marking
LNC04R035B	TO-220	LNC04R035B
LND04R035B	TO-220MF	LND04R035B

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}	$V_{GS}=0\text{ V}, I_D=250\mu\text{A}$	40	---	---	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.3	---	2.5	V
Drain-source leakage current	I_{DSS}	$V_{DS}=40\text{ V}, V_{GS}=0\text{ V}, T_J = 25^\circ\text{C}$	---	---	1	μA
		$V_{DS}=40\text{ V}, V_{GS}=0\text{ V}, T_J = 125^\circ\text{C}$	---	---	5	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	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=20\text{ A}$	---	2.7	3.5	m Ω
		$V_{GS}=4.5\text{ V}, I_D=10\text{ A}$	---	3.8	6.0	m Ω
Forward transconductance	g_{fs}	$V_{DS}=5\text{ V}, I_D=50\text{ A}$	26	---	---	S
Dynamic characteristics						
Input capacitance	C_{iss}	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V},$ $F = 1\text{ MHz}$	---	7810	---	pF
Output capacitance	C_{oss}		---	677	---	
Reverse transfer capacitance	C_{riss}		---	370	---	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 20\text{ V}, V_{GS}=10\text{ V}, I_D = 20\text{ A}$	---	15	---	ns
Rise time	t_r		---	17	---	
Turn-off delay time	$t_{d(off)}$		---	52	---	
Fall time	t_f		---	23	---	
Gate resistance	R_g	$V_{GS}=0\text{ V}, V_{DS}=0\text{ V}, F=1\text{ MHz}$	---	2.12	---	Ω
Gate charge characteristics						
Gate to source charge	Q_{gs}	$V_{DS}=20\text{ V}, I_D=100\text{ A},$ $V_{GS}= 10\text{ V}$	---	36.4	---	nC
Gate to drain charge	Q_{gd}		---	37.3	---	
Gate charge total	Q_g		---	139	---	
Drain-Source diode characteristics and Maximum Ratings						
Continuous Source Current	I_S		---	---	120	A
Pulsed Source Current ⁴⁾	I_{SM}		---	---	480	A
Diode Forward Voltage	V_{SD}	$V_{GS}=0\text{ V}, I_S=50\text{ A}, T_J=25^\circ\text{C}$	---	---	1.2	V
Reverse Recovery Time	t_{rr}	$I_S=100\text{ A}, di/dt=100\text{ A}/\mu\text{s},$ $T_J=25^\circ\text{C}$	---	42	---	ns
Reverse Recovery Charge	Q_{rr}		---	120	---	nC

Notes:

- 1: The maximum junction current rating is package limited.
- 2: Repetitive Rating: Pulse width limited by maximum junction temperature.
- 3: $V_{DD}=20\text{ V}, V_{GS}=10\text{ V}, L=1\text{ mH}, I_{AS}=45.6\text{ A}, R_G=25\Omega,$ Starting $T_J=25^\circ\text{C}$.
- 4: Pulse Test: Pulse Width $\leq 300\ \mu\text{s},$ Duty Cycle $\leq 2\%$.

Electrical Characteristics Diagrams

Figure 1. Typ. Output Characteristics

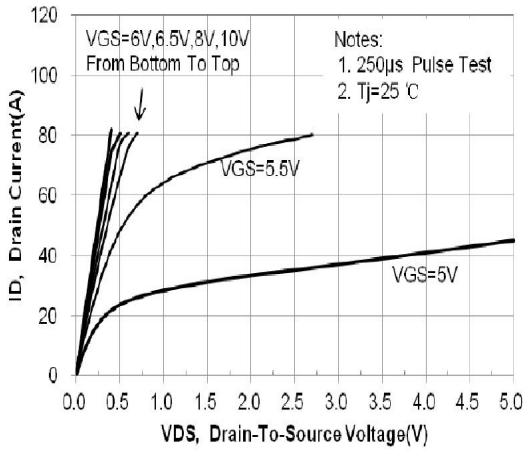


Figure 2. Transfer Characteristics

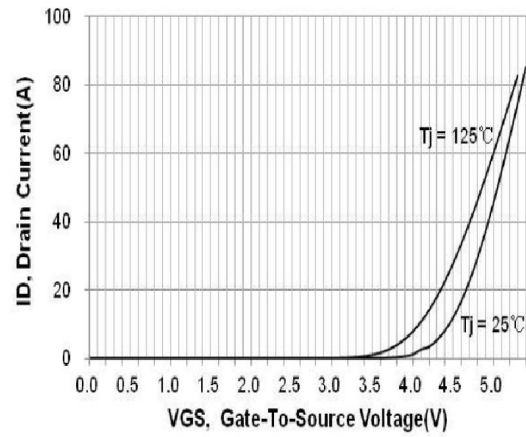


Figure 3. Capacitance Characteristics

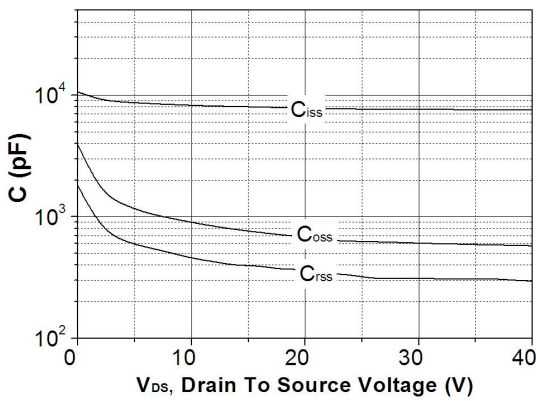


Figure 4. Gate Charge Waveform

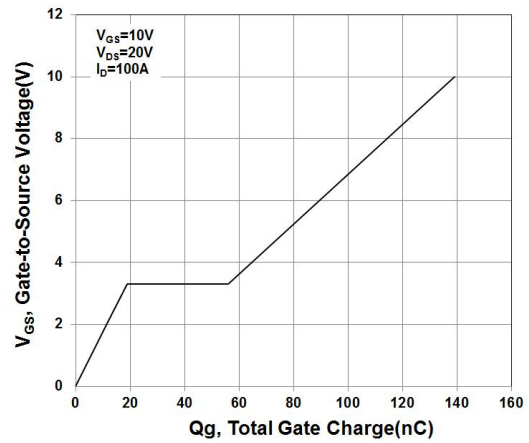


Figure 5. Body-Diode Characteristics

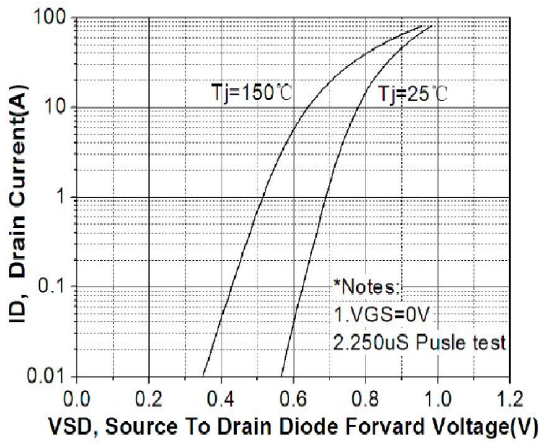


Figure 6. Normalized Maximum Transient Thermal Impedance (RthJC)

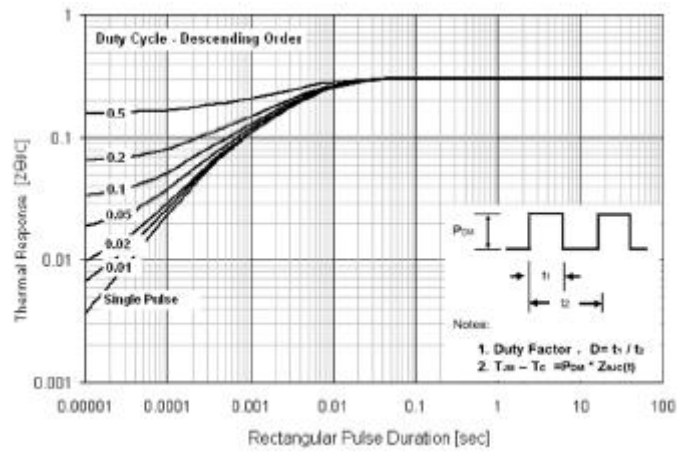
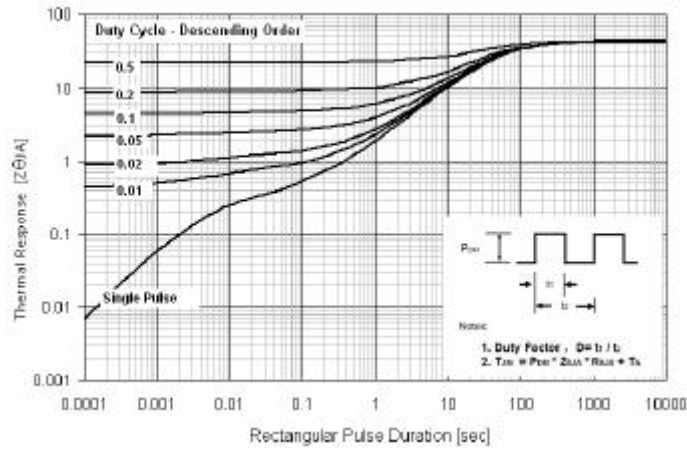


Figure 7. Normalized Maximum Transient Thermal Impedance (RthJA)



Test Circuit & Waveform

Figure 8. Gate Charge Test Circuit & Waveform

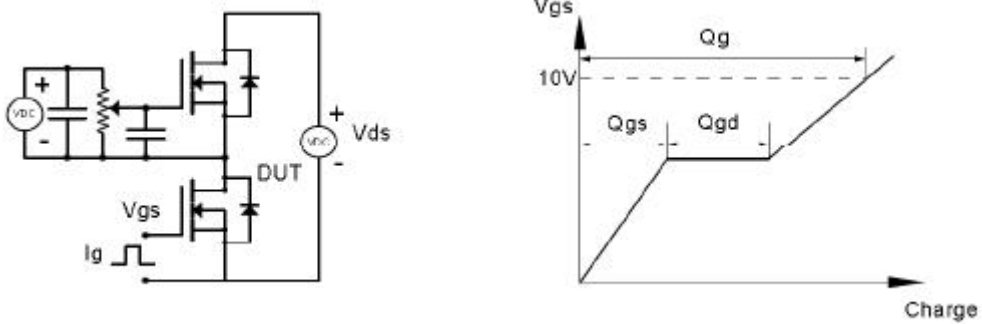


Figure 9. Resistive Switching Test Circuit & Waveforms

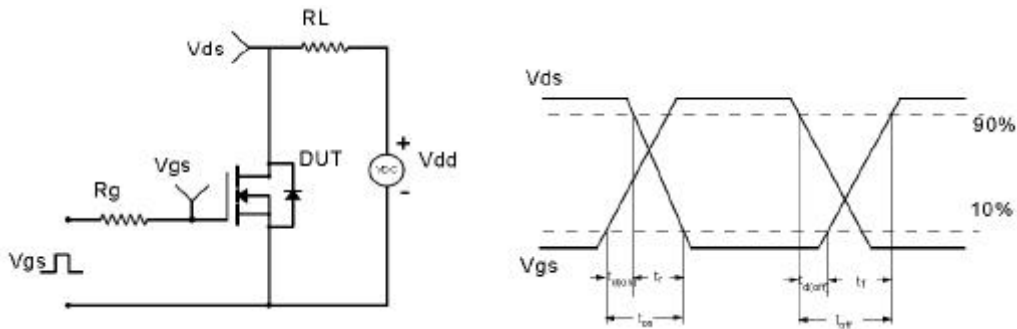


Figure 10. Unclamped Inductive Switching (UIS) Test Circuit & Waveform

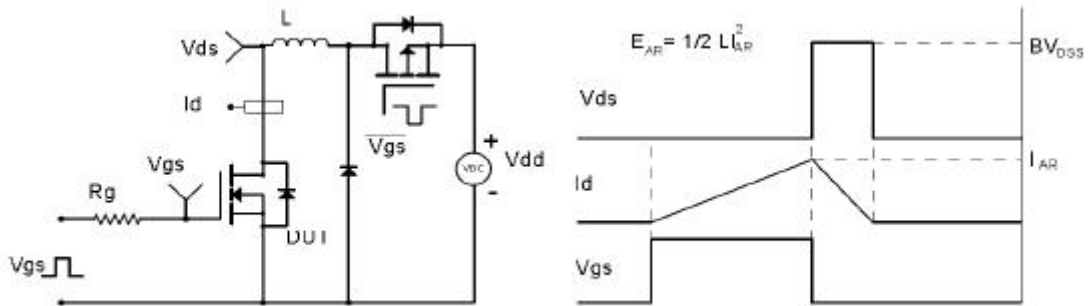
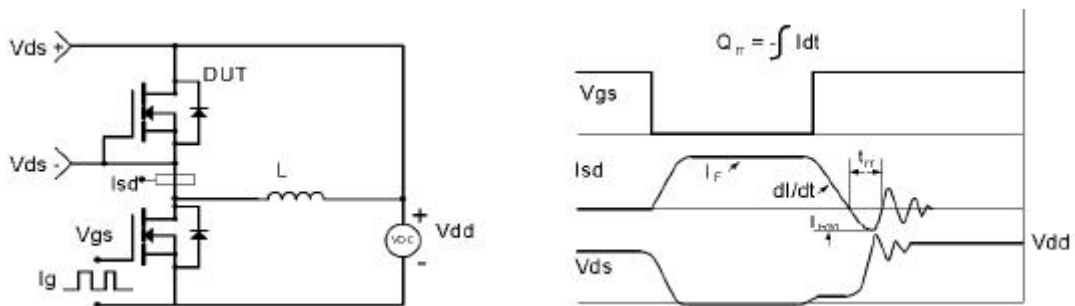
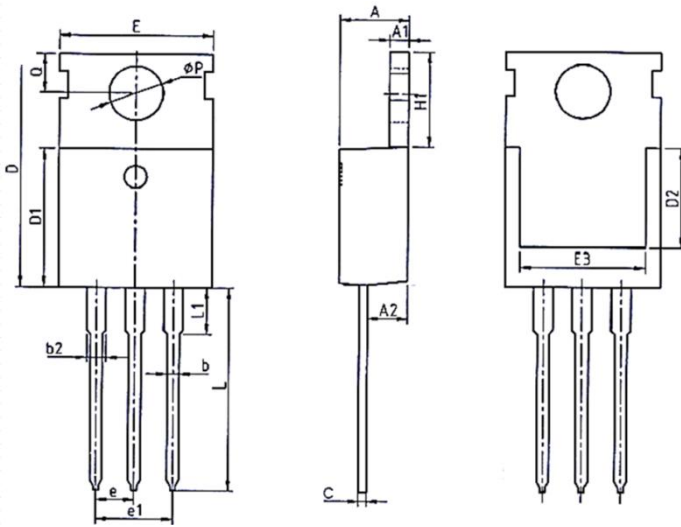


Figure 11. Diode Recovery Circuit & Waveform

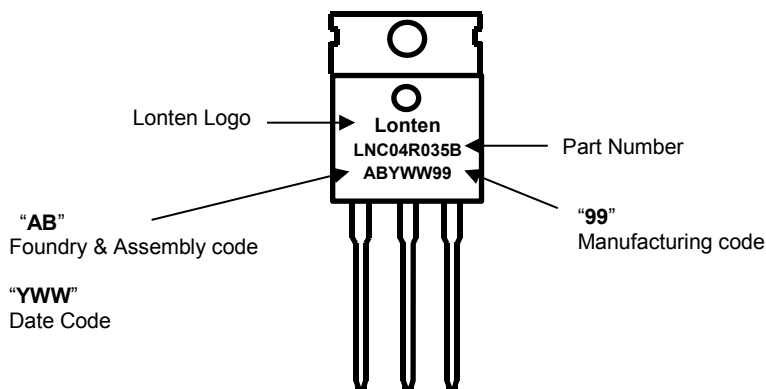


Mechanical Dimensions for TO-220

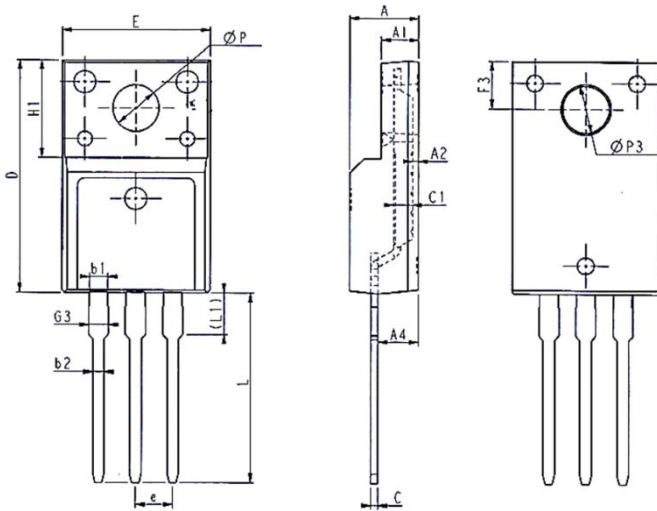


COMMON DIMENSIONS						
SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.37	4.57	4.70	0.172	0.180	0.185
A1	1.25	1.30	1.40	0.049	0.051	0.055
A2	2.20	2.40	2.60	0.087	0.094	0.102
b	0.70	0.80	0.95	0.028	0.031	0.037
b2	1.17	1.27	1.47	0.046	0.050	0.058
c	0.45	0.50	0.60	0.018	0.020	0.024
D	15.10	15.60	16.10	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	2.54BCS			0.1BSC		
e1	5.08BCS			0.2REF		
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

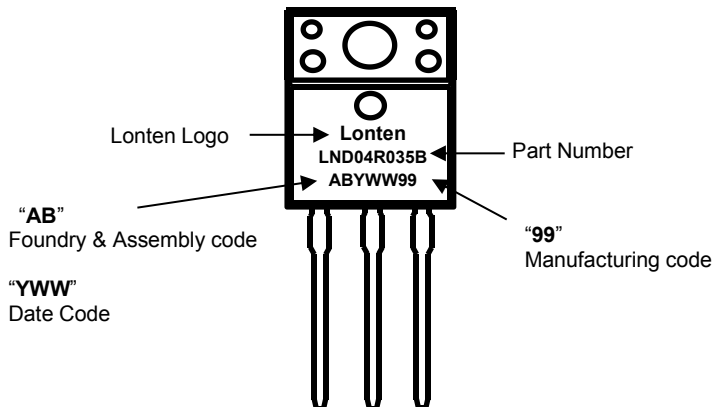


Mechanical Dimensions for TO-220MF



COMMON DIMENSIONS						
SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
E	9.96	10.16	10.36	0.392	0.400	0.408
A	4.50	4.70	4.90	0.177	0.185	0.193
A1	2.34	2.54	2.74	0.092	0.100	0.108
A2	0.30	0.45	0.60	0.012	0.018	0.024
A4	2.56	2.76	2.96	0.101	0.109	0.117
c	0.40	0.50	0.65	0.016	0.020	0.026
c1	1.20	1.30	1.35	0.047	0.051	0.053
D	15.57	15.87	16.17	0.613	0.625	0.637
H1	6.70REF			0.264REF		
e	2.54BSC			0.1BSC		
L	12.68	12.98	13.28	0.499	0.511	0.523
L1	2.88	3.03	3.18	0.113	0.119	0.125
ØP	3.03	3.18	3.38	0.119	0.125	0.133
ØP3	3.15	3.45	3.65	0.124	0.136	0.144
F3	3.15	3.30	3.45	0.124	0.130	0.136
G3	1.25	1.35	1.55	0.049	0.053	0.061
b1	1.18	1.28	1.43	0.046	0.050	0.056
b2	0.70	0.80	0.95	0.028	0.031	0.037

TO-220MF Part Marking Information



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