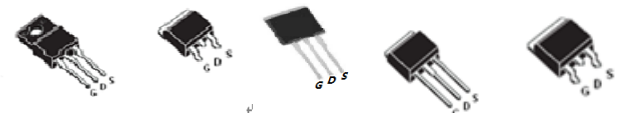
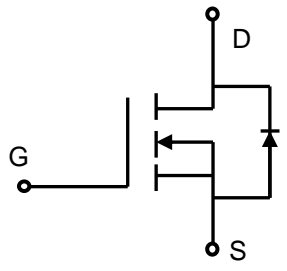



## Lonten N-channel 700V, 11A, 0.45Ω LonFET™ Power MOSFET

<p><b>Description</b> LonFET™ Power MOSFET is fabricated using advanced super junction technology. The resulting device has extremely low on resistance, making it especially suitable for applications which require superior power density and outstanding efficiency.</p> <p><b>Features</b></p> <ul style="list-style-type: none"> <li>◆ Ultra low <math>R_{DS(on)}</math></li> <li>◆ Ultra low gate charge (typ. <math>Q_g = 23nC</math>)</li> <li>◆ 100% UIS tested</li> <li>◆ RoHS compliant</li> </ul> <p><b>Applications</b></p> <ul style="list-style-type: none"> <li>◆ Power factor correction (PFC).</li> <li>◆ Switched mode power supplies (SMPS).</li> <li>◆ Uninterruptible power supply (UPS).</li> </ul>	<p><b>Product Summary</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;"><math>V_{DS} @ T_{j,max}</math></td> <td style="padding: 2px;">750V</td> </tr> <tr> <td style="padding: 2px;"><math>R_{DS(on),max}</math></td> <td style="padding: 2px;">0.45Ω</td> </tr> <tr> <td style="padding: 2px;"><math>I_{DM}</math></td> <td style="padding: 2px;">30A</td> </tr> <tr> <td style="padding: 2px;"><math>Q_{g,typ}</math></td> <td style="padding: 2px;">23nC</td> </tr> </table> <div style="text-align: center; margin-top: 10px;">  <p style="display: flex; justify-content: space-around; font-size: small;"> <span>TO-220MF</span> <span>TO-263</span> <span>TO-262</span> <span>TO-251</span> <span>TO-252</span> </p> </div> <div style="text-align: center; margin-top: 20px;">  <p>N-Channel MOSFET</p> </div> <div style="text-align: right; margin-top: 10px;">  </div>	$V_{DS} @ T_{j,max}$	750V	$R_{DS(on),max}$	0.45Ω	$I_{DM}$	30A	$Q_{g,typ}$	23nC
$V_{DS} @ T_{j,max}$	750V								
$R_{DS(on),max}$	0.45Ω								
$I_{DM}$	30A								
$Q_{g,typ}$	23nC								

### Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	700	V
Continuous drain current ( $T_C = 25^\circ C$ ) ( $T_C = 100^\circ C$ )	$I_D$	11	A
		7	A
Pulsed drain current <sup>1)</sup>	$I_{DM}$	30	A
Gate-Source voltage	$V_{GSS}$	$\pm 30$	V
Avalanche energy, single pulse <sup>2)</sup>	$E_{AS}$	270	mJ
Avalanche energy, repetitive <sup>3)</sup>	$E_{AR}$	0.5	mJ
Avalanche current, repetitive <sup>3)</sup>	$I_{AR}$	11	A
Power Dissipation TO-220MF ( $T_C = 25^\circ C$ ) - Derate above $25^\circ C$	$P_D$	33	W
		0.26	W/ $^\circ C$
Power Dissipation TO-262 ( $T_C = 25^\circ C$ ) - Derate above $25^\circ C$	$P_D$	125	W
		1	W/ $^\circ C$
Mounting torque To-262 ( M3 and M3.5 screws )		60	Ncm
Mounting torque To-220MF ( M2.5 screws )		50	
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ C$
Continuous diode forward current	$I_S$	11	A
Diode pulse current	$I_{S,pulse}$	30	A

**Thermal Characteristics TO-262/TO-252/ TO-251/TO-263**

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	2.5	$^{\circ}C/W$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62	$^{\circ}C/W$
Soldering temperature, wavesoldering only allowed at leads. (1.6mm from case for 10s)	$T_{sold}$	260	$^{\circ}C$

**Thermal Characteristics TO-220MF**

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	3.8	$^{\circ}C/W$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	80	$^{\circ}C/W$
Soldering temperature, wavesoldering only allowed at leads. (1.6mm from case for 10s)	$T_{sold}$	260	$^{\circ}C$

**Package Marking and Ordering Information**

Device	Device Package	Marking	Units/Tube	Units/Real
LSD70R450GT	TO-220MF	LSD70R450GT	50	
LSE70R450GT	TO-263-2L	LSE70R450GT		800
LSF70R450GT	TO-262	LSF70R450GT	50	
LSG70R450GT	TO-252	LSG70R450GT		2500
LSH70R450GT	TO-251	LSH70R450GT	4680	2500

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

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
<b>Static characteristics</b>						
Drain-source breakdown voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=0.25mA$	700	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=0.25mA$	2.5	3.5	4.5	V
Drain cut-off current	$I_{DSS}$	$V_{DS}=700V, V_{GS}=0V,$ $T_j = 25^{\circ}C$ $T_j = 125^{\circ}C$	-	-	1	$\mu A$
Gate leakage current, Forward	$I_{GSSF}$	$V_{GS}=30V, V_{DS}=0V$	-	-	50	nA
Gate leakage current, Reverse	$I_{GSSR}$	$V_{GS}=-30V, V_{DS}=0V$	-	-	-50	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=5.5A$ $T_j = 25^{\circ}C$ $T_j = 150^{\circ}C$	-	0.40 0.94	0.45 -	$\Omega$
Gate resistance	$R_G$	$f=1MHz, open\ drain$	-	4.6	-	$\Omega$
<b>Dynamic characteristics</b>						
Input capacitance	$C_{iss}$	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1MHz$	-	879	-	pF
Output capacitance	$C_{oss}$		-	460	-	
Reverse transfer capacitance	$C_{rss}$		-	6	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 380V, I_D = 5.5A$ $R_G = 4.7\Omega, V_{GS}=10V$	-	15	-	ns
Rise time	$t_r$		-	27	-	
Turn-off delay time	$t_{d(off)}$		-	69	-	

Fall time	$t_f$		-	11	-	
<b>Gate charge characteristics</b>						
Gate to source charge	$Q_{gs}$	$V_{DD}=480\text{ V}, I_D=5.5\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	6.2	-	nC
Gate to drain charge	$Q_{gd}$		-	8.5	-	
Gate charge total	$Q_g$		-	22.8	-	
	$V_{plateau}$		-	5.5	-	V
<b>Reverse diode characteristics</b>						
Diode forward voltage	$V_{SD}$	$V_{GS}=0\text{ V}, I_F=5.5\text{ A}$	-	1.0	-	V
Reverse recovery time	$t_{rr}$	$V_R=50\text{ V}, I_F=11\text{ A},$ $di_F/dt=100\text{ A}/\mu\text{s}$	-	345	-	ns
Reverse recovery charge	$Q_{rr}$		-	3.8	-	$\mu\text{C}$
Peak reverse recovery current	$I_{rrm}$		-	22	-	A

**Notes:**

1. Limited by maximum junction temperature, maximum duty cycle is 0.75.
2.  $I_{AS} = 3\text{ A}, V_{DD} = 60\text{ V},$  Starting  $T_J = 25^\circ\text{C}.$
3. Repetitive Rating: Pulse width limited by maximum junction temperature.

## Electrical Characteristics Diagrams

Figure 1. On-Region Characteristics

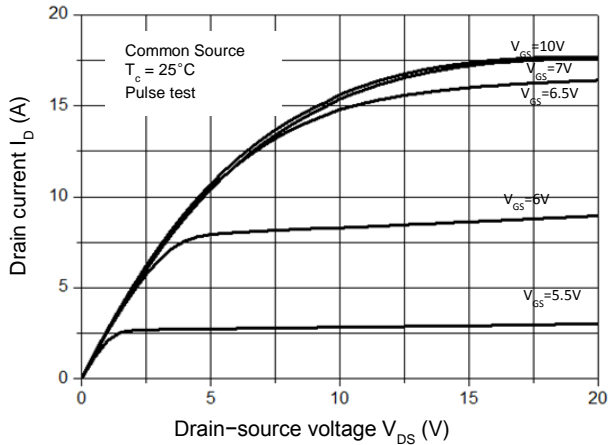


Figure 2. Transfer Characteristics

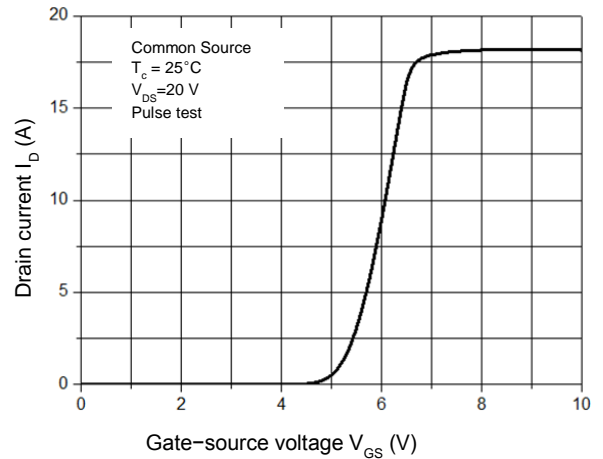


Figure 3. On-Resistance Variation vs. Drain Current

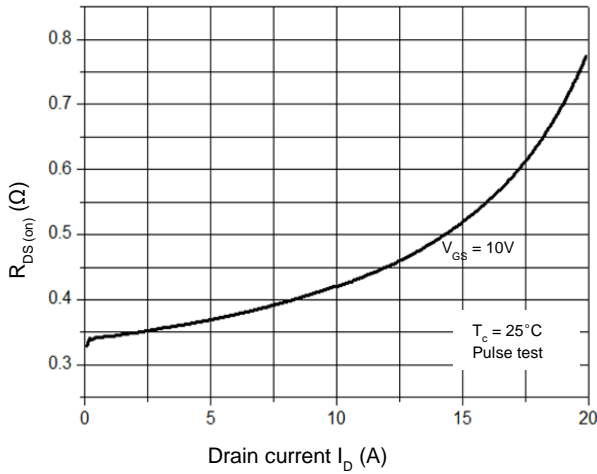


Figure 4. Threshold Voltage vs. Temperature

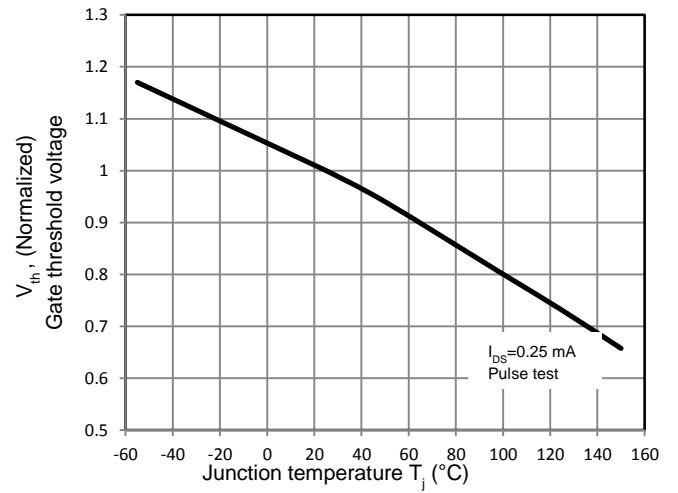


Figure 5. Breakdown Voltage vs. Temperature

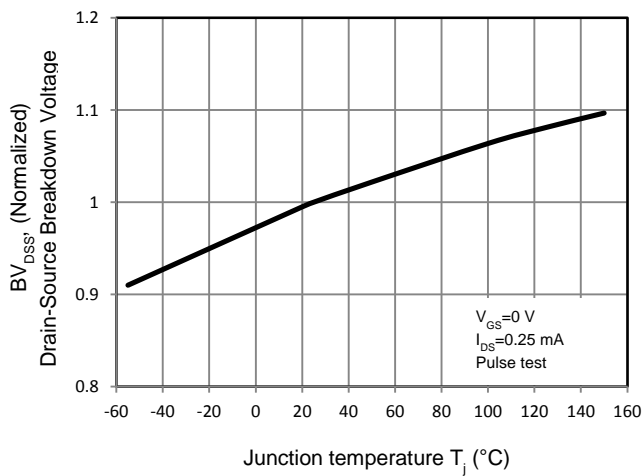


Figure 6. On-Resistance vs. Temperature

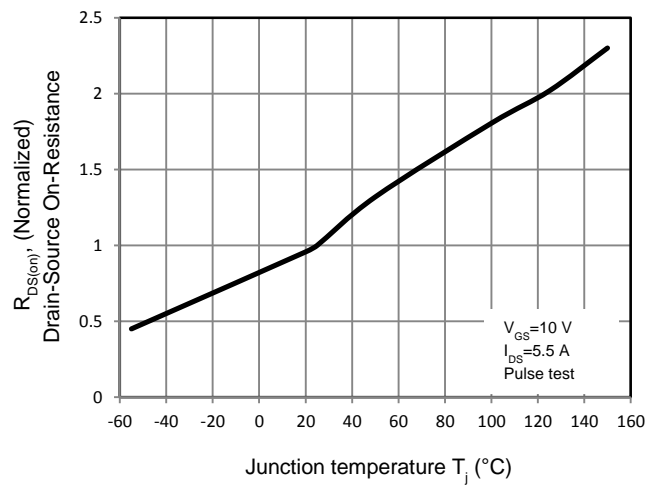


Figure 7. Capacitance Characteristics

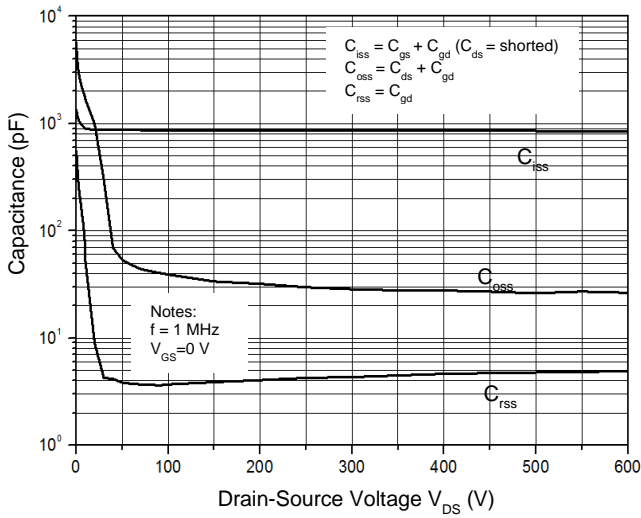


Figure 8. Gate Charge Characterist

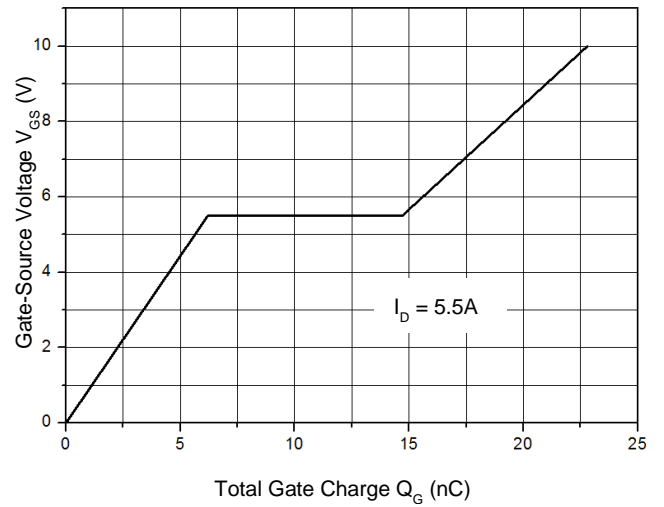


Figure 9.1 Maximum Safe Operating Area TO-220MF

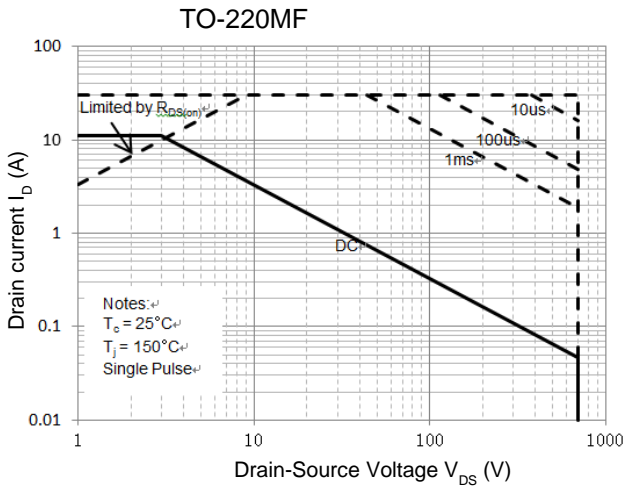


Figure 9.2 Maximum Safe Operating Area TO-263-2L/TO-262/TO-252/TO-251

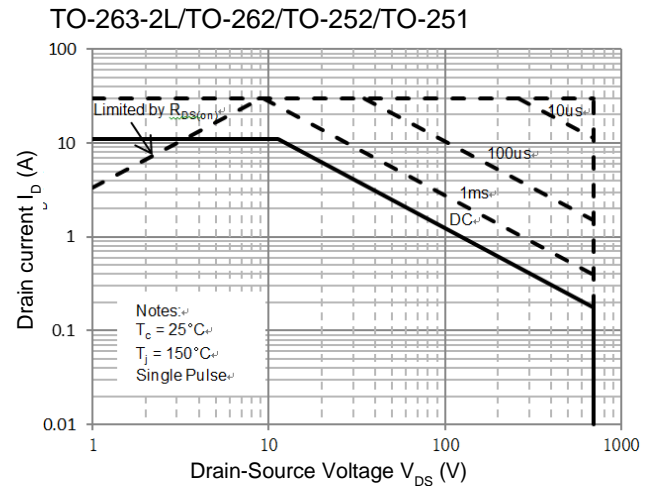


Figure 10.1 Power Dissipation vs. Temperature TO-220MF

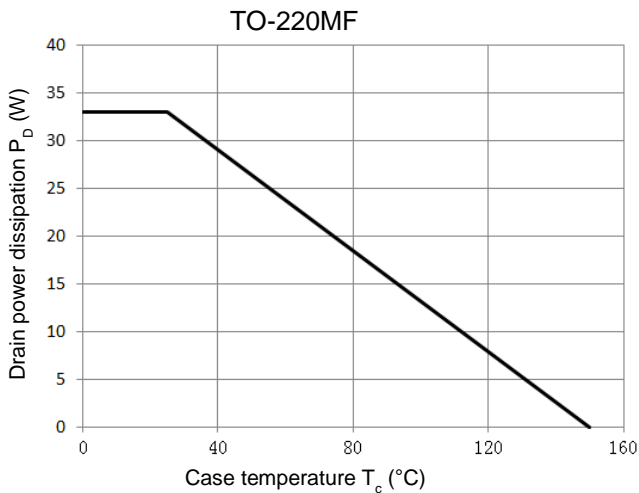


Figure 10.2 Power Dissipation vs. Temperature TO-263-2L/TO-262/TO-252/TO-251

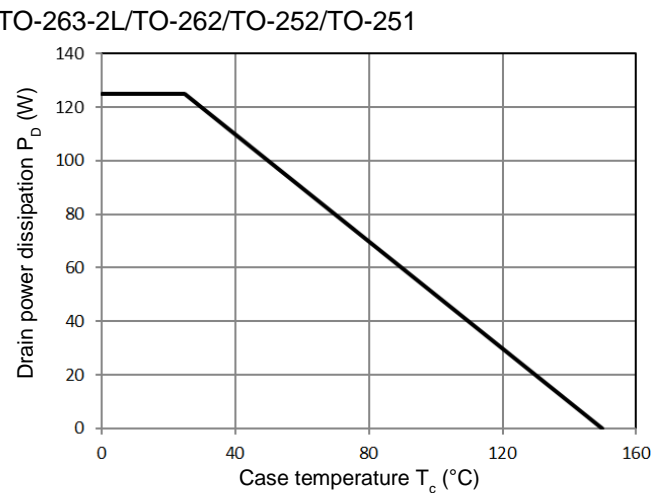


Figure 11.1 Transient Thermal Response Curve  
 TO-220MF

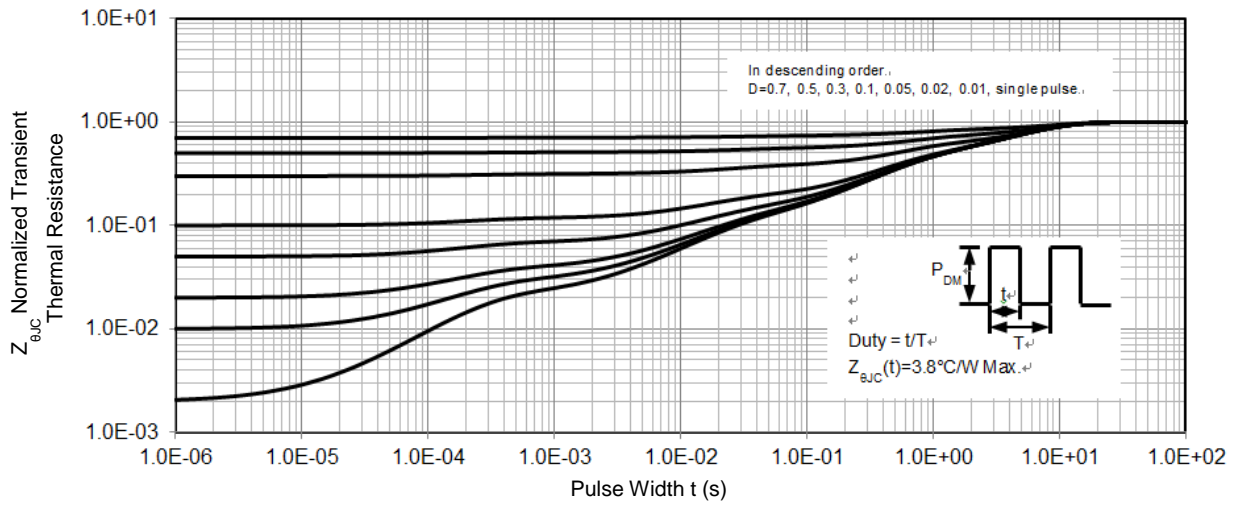
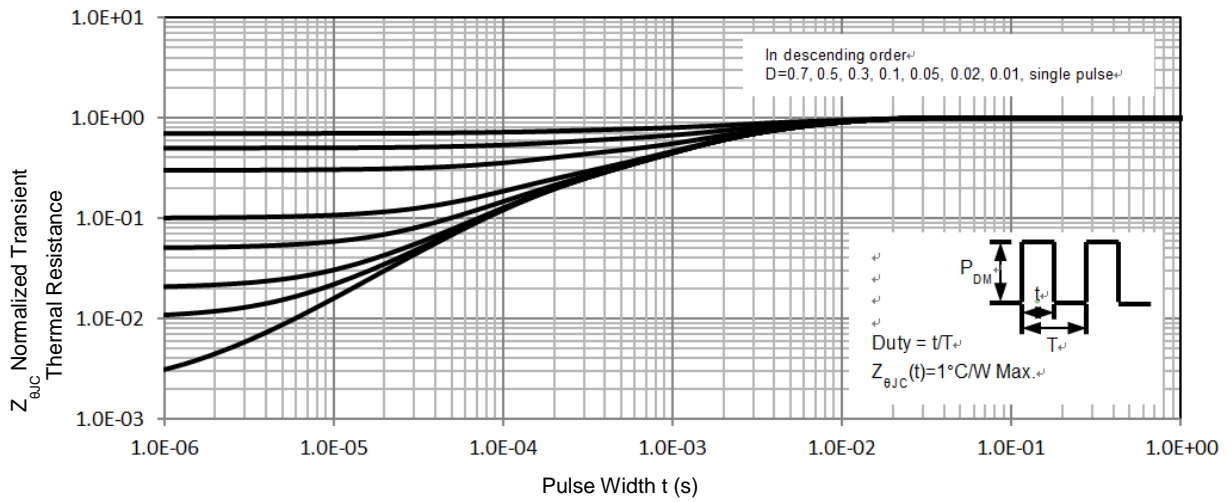
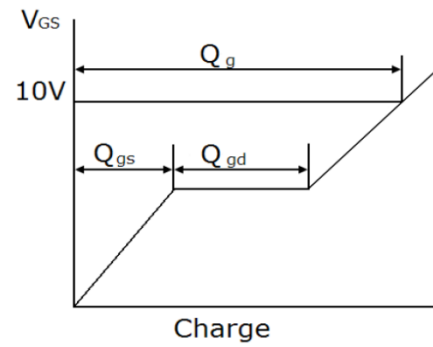
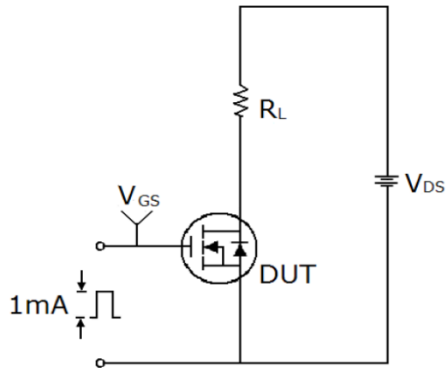


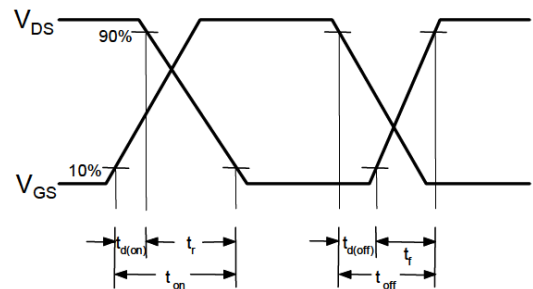
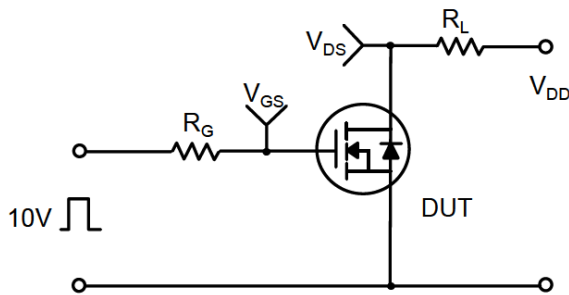
Figure 11.1 Transient Thermal Response Curve  
 TO-263-2L/TO-262/TO-252/TO-251



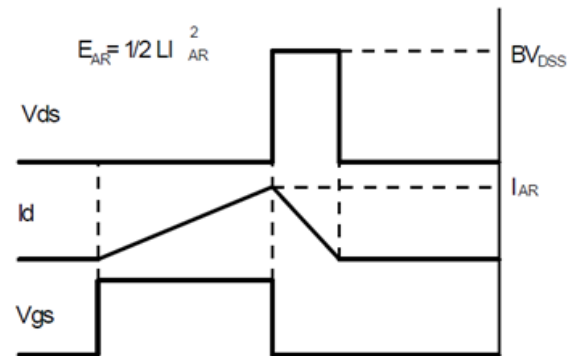
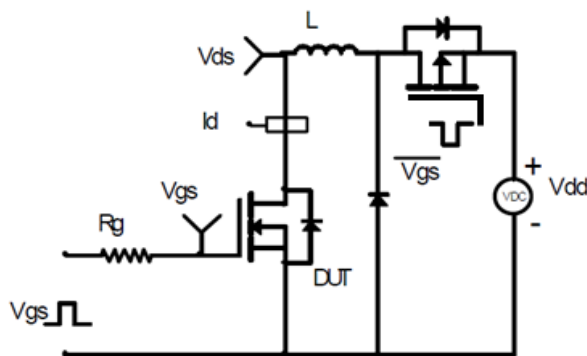
**Gate Charge Test Circuit & Waveform**



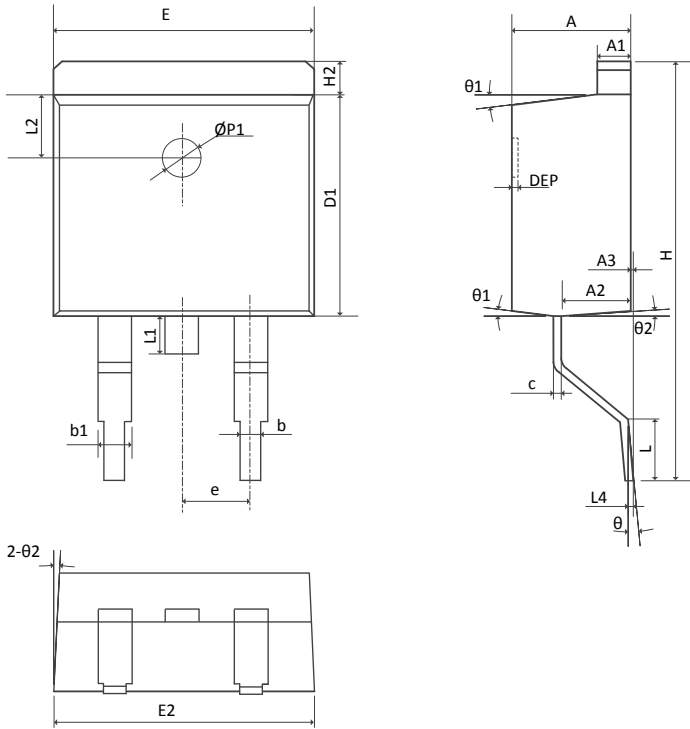
**Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**

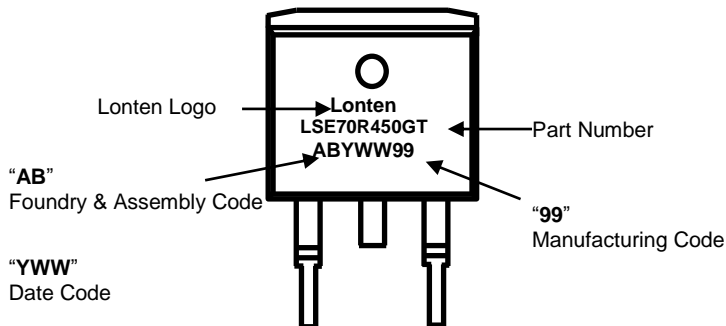


**Mechanical Dimensions for TO-263**



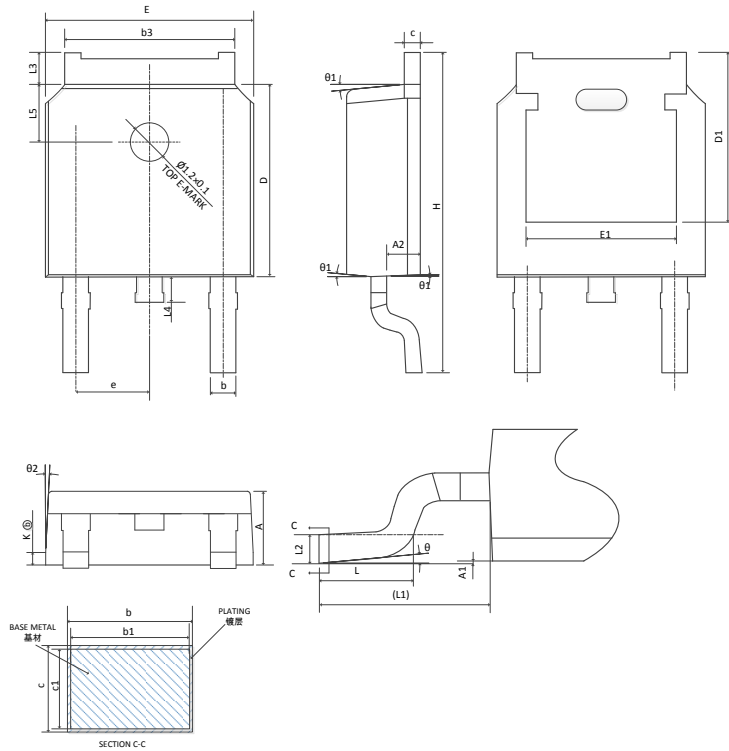
SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.40	4.57	4.70	0.173	0.180	0.185
A1	1.22	1.27	1.32	0.048	0.050	0.052
A2	2.59	2.69	2.79	0.102	0.106	0.110
A3	0.00	0.10	0.20	0.000	0.004	0.008
b	0.77	0.813	0.90	0.030	0.032	0.035
b1	1.20	1.270	1.36	0.047	0.050	0.054
c	0.34	0.381	0.47	0.013	0.015	0.019
D1	8.60	8.70	8.80	0.339	0.343	0.346
E	10.00	10.16	10.26	0.394	0.400	0.404
E2	10.00	10.10	10.20	0.394	0.398	0.402
e	2.54 BSC			0.100 BSC		
H	14.70	15.10	15.50	0.579	0.594	0.610
H2	1.17	1.27	1.40	0.046	0.050	0.055
L	2.00	2.30	2.60	0.079	0.091	0.102
L1	1.45	1.55	1.70	0.057	0.061	0.067
L2	2.50 REF			0.098 REF		
L4	0.25 BSC			0.010 BSC		
$\theta$	0°	5°	8°	0°	5°	8°
$\theta1$	5°	7°	9°	5°	7°	9°
$\theta2$	1°	3°	5°	1°	3°	5°
$\phi P1$	1.40	1.50	1.60	0.055	0.059	0.063
DEP	0.05	0.10	0.20	0.002	0.004	0.008

**TO-263 Part Marking Information**



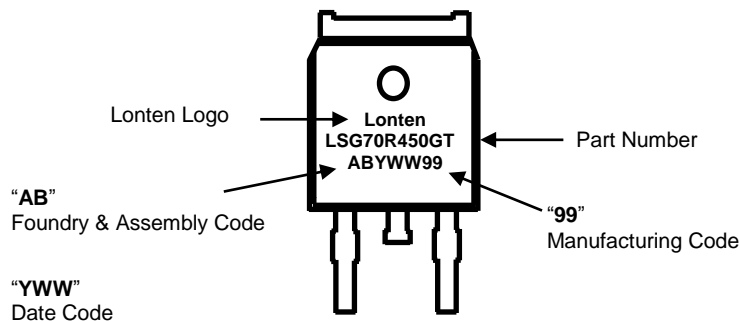


**Mechanical Dimensions for TO-252**

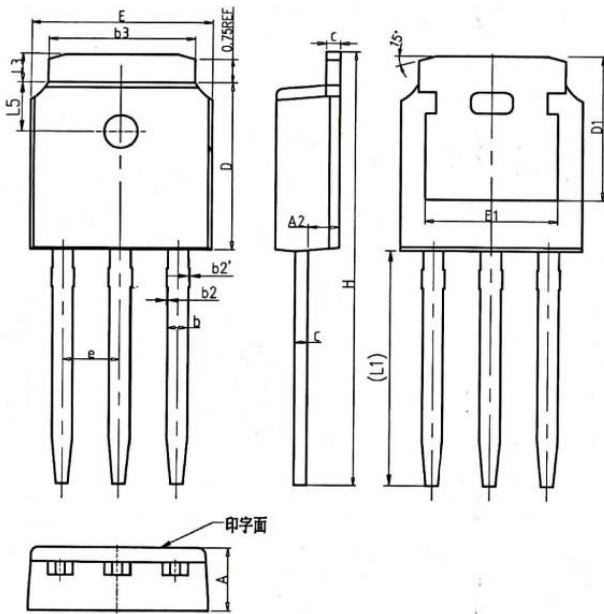


COMMON DIMENSIONS			
SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0.00	—	0.10
A2	0.97	1.07	1.17
b	0.72	0.78	0.85
b1	0.71	0.76	0.81
b3	5.23	5.33	5.46
c	0.47	0.53	0.58
c1	0.46	0.51	0.56
D	6.00	6.10	6.20
D1	5.30REF		
E	6.50	6.60	6.70
E1	4.70	4.83	4.92
e	2.286BSC		
H	9.90	10.10	10.30
L	1.40	1.50	1.70
L1	2.90REF		
L2	0.51BSC		
L3	0.90	—	1.25
L4	0.60	0.80	1.00
L5	1.70	1.80	1.90
theta	0°	—	8°
theta1	5°	7°	9°
theta2	5°	7°	9°
K	0.40REF		

**TO-252 Part Marking Information**

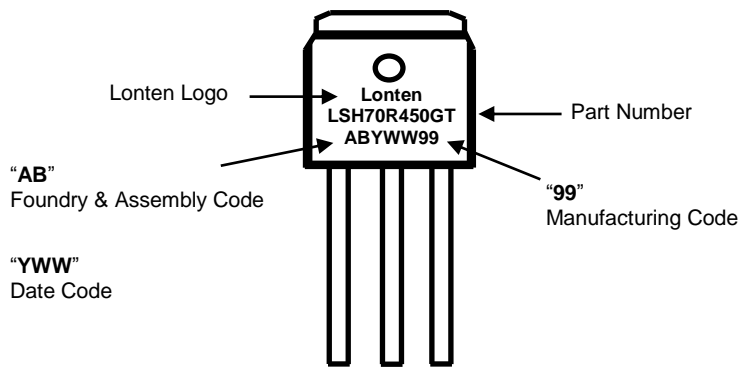


**Mechanical Dimensions for TO-251**

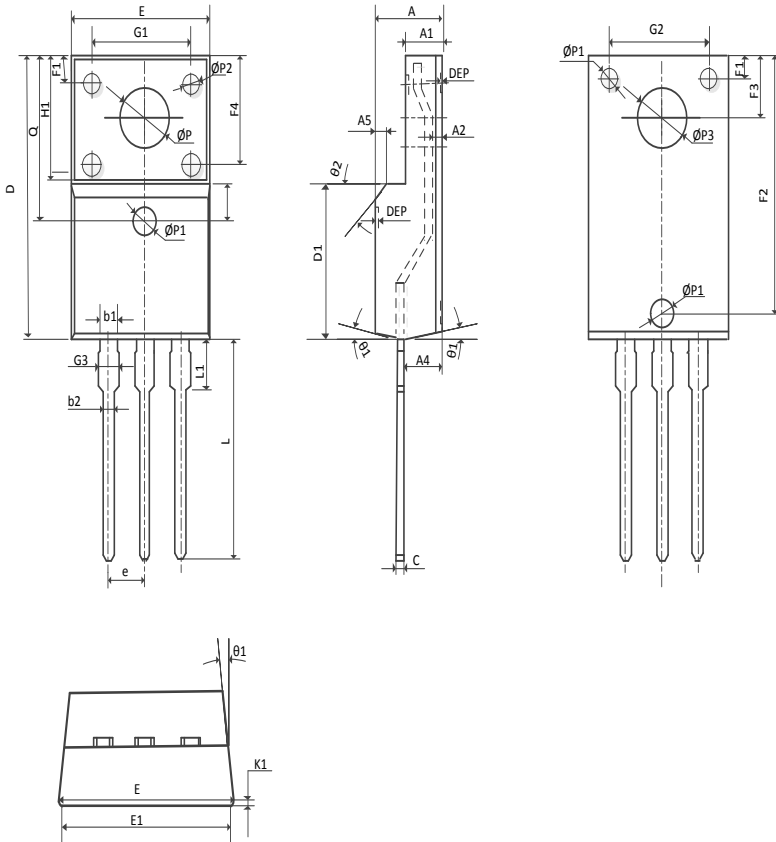


COMMON DIMENSIONS			
SYMBOL	MM		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b2	0.00	0.04	0.10
b2'	0.00	0.04	0.10
b3	5.20	5.33	5.46
c	0.43	0.53	0.61
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.73
E1	4.63	—	—
e	2.286BSC		
H	16.22	16.52	16.82
L1	9.15	9.40	9.65
L3	0.88	1.02	1.28
L5	1.65	1.80	1.95

**TO-251 Part Marking Information**

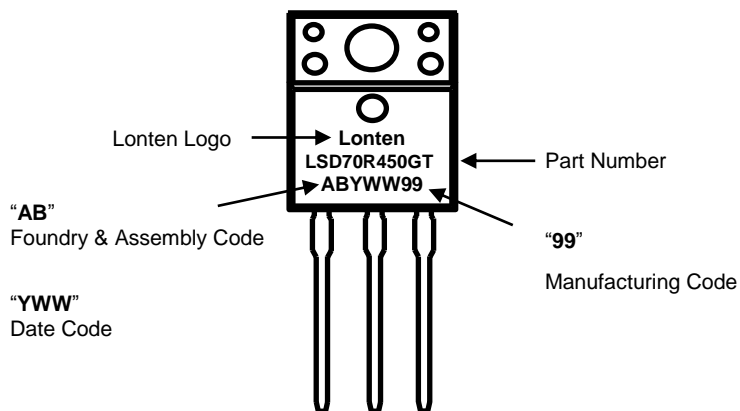


**Mechanical Dimensions for TO-220MF**



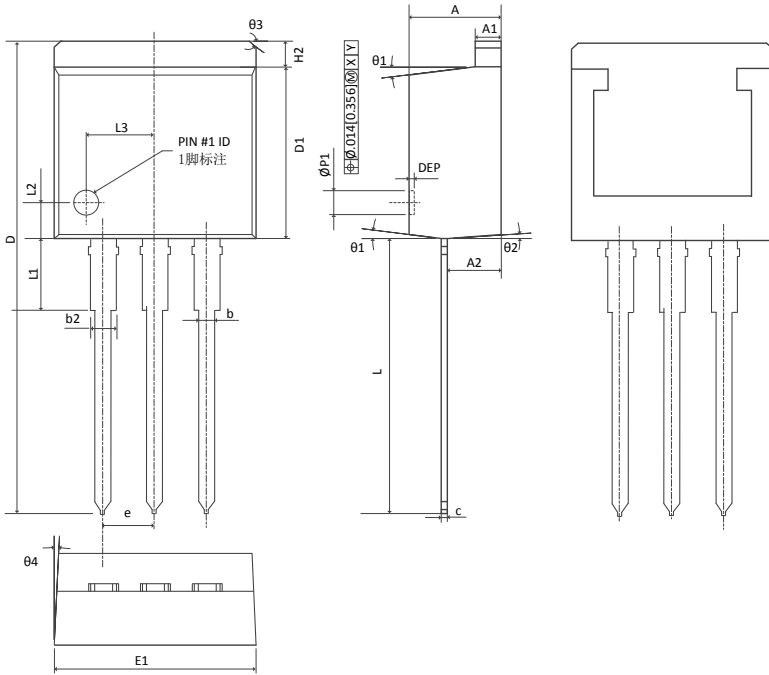
SYMBOL	COMMON DIMENSIONS					
	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
E	10.04	10.20	10.36	0.395	0.402	0.408
A	4.50	4.70	4.90	0.177	0.185	0.193
A1	2.34	2.54	2.74	0.092	0.100	0.108
A2	0.70	0.85	1.00	0.028	0.033	0.039
A4	2.65	2.75	2.85	0.104	0.108	0.112
A5	1.00REF			0.039REF		
C	0.42	0.50	0.58	0.017	0.020	0.023
D	15.67	15.87	16.07	0.617	0.625	0.633
Q	9.20REF			0.362REF		
H1	6.70REF			0.264REF		
e	2.54BSC			0.1BSC		
ØP	3.183REF			0.125REF		
L	12.78	12.98	13.18	0.503	0.511	0.519
L1	3.25	3.45	3.65	0.128	0.136	0.144
D1	9.17REF			0.362REF		
ØP1	1.40	1.50	1.60	0.055	0.059	0.063
ØP2	1.15	1.20	1.25	0.045	0.047	0.049
ØP3	3.45REF			0.136REF		
Ø1	5°	7°	9°	5°	7°	9°
Ø2	-	45°	-	-	45°	-
DEP	0.05	0.10	0.15	0.002	0.004	0.006
F1	1.90	2.00	2.10	0.075	0.079	0.083
F2	13.80	13.90	14.00	0.543	0.547	0.551
F3	3.20	3.30	3.40	0.126	0.130	0.134
F4	5.30	5.40	5.50	0.209	0.213	0.217
G1	6.60	6.70	6.80	0.260	0.264	0.268
G2	6.90	7.00	7.10	0.272	0.276	0.280
G3	1.10	1.30	1.50	0.043	0.051	0.059
b1	1.05	1.20	1.35	0.041	0.047	0.053
b2	0.70	0.80	0.85	0.028	0.031	0.033
E1	9.90	10.00	10.10	0.390	0.394	0.398
K1	0.65	0.70	0.75	0.026	0.028	0.030

**TO-220MF Part Marking Information**



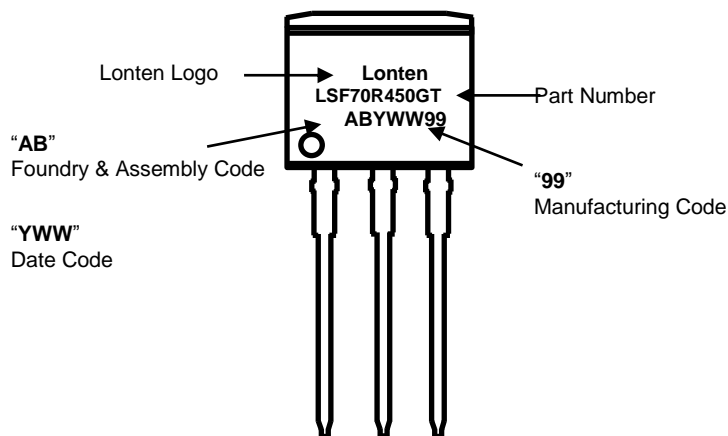
**Mechanical Dimensions for TO-262**

COMMON DIMENSIONS



SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.45	4.57	4.70	0.175	0.180	0.185
A1	1.22	1.27	1.32	0.048	0.050	0.052
A2	2.29	2.67	2.92	0.090	0.105	0.115
b	0.71	0.813	0.97	0.028	0.032	0.038
b2	1.22	1.270	1.40	0.048	0.050	0.055
c	0.38	0.381	0.76	0.015	0.015	0.030
D	23.20	23.61	24.02	0.913	0.930	0.946
D1	8.38	8.70	8.89	0.330	0.343	0.350
E1	10.03	10.16	10.54	0.395	0.400	0.415
e	2.54 BSC			0.100 BSC		
H2	-	-	1.31	-	-	0.052
L	13.34	13.73	14.10	0.525	0.541	0.555
L1	3.30	3.56	4.06	0.130	0.140	0.160
L2	1.49 REF			0.059 REF		
L3	3.4 REF			0.134 REF		
ØP1	1.07	1.20	1.32	0.042	0.047	0.052
θ1	-	7°	-	-	7°	-
θ2	-	3°	-	-	3°	-
θ3	-	-	12°	-	-	12°
θ4	-	-	3°	-	-	3°
DEP	0.10	0.18	0.25	0.004	0.007	0.010

**TO-262 Part Marking Information**



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