

## Lonten N-channel 550V, 15A, 0.29Ω 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: none;"> <tr> <td><math>V_{DS} @ T_{j,max}</math></td> <td style="text-align: right;">600V</td> </tr> <tr> <td><math>R_{DS(on),max}</math></td> <td style="text-align: right;">0.29Ω</td> </tr> <tr> <td><math>I_{DM}</math></td> <td style="text-align: right;">45A</td> </tr> <tr> <td><math>Q_{g,typ}</math></td> <td style="text-align: right;">23nC</td> </tr> </table> <div style="text-align: center;"> <p><b>TO-220    TO-220MF    TO-263    TO-262</b></p> <p><b>TO-220MF Narrow Pin</b></p> <p><b>TO-252</b></p> </div> <div style="text-align: right; margin-top: 20px;"> </div> <div style="text-align: right; margin-top: 20px;"> </div> <p style="text-align: center;">N-Channel MOSFET</p>	$V_{DS} @ T_{j,max}$	600V	$R_{DS(on),max}$	0.29Ω	$I_{DM}$	45A	$Q_{g,typ}$	23nC
$V_{DS} @ T_{j,max}$	600V								
$R_{DS(on),max}$	0.29Ω								
$I_{DM}$	45A								
$Q_{g,typ}$	23nC								

### Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	550	V
Continuous drain current ( $T_C = 25^\circ C$ )	$I_D$	15	A
( $T_C = 100^\circ C$ )		9.5	A
Pulsed drain current <sup>1)</sup>	$I_{DM}$	45	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 /TO-220MF Narrow Pin ( $T_C = 25^\circ C$ )	$P_D$	33	W
- Derate above $25^\circ C$		0.26	W/ $^\circ C$
Power Dissipation TO-262/TO-252/TO-263/TO-220 ( $T_C = 25^\circ C$ )	$P_D$	125	W
- Derate above $25^\circ C$		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	°C
Continuous diode forward current	$I_S$	15	A
Diode pulse current	$I_{S,pulse}$	45	A

**Thermal Characteristics TO-262/TO-252/TO-263/ TO-220**

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	°C/W
Soldering temperature, wavesoldering only allowed at leads. (1.6mm from case for 10s)	$T_{sold}$	260	°C

**Thermal Characteristics TO-220MF/TO-220MF Narrow Pin**

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

**Package Marking and Ordering Information**

Device	Device Package	Marking	Units/Tube	Units/Reel
LSC55R290GT	TO-220	LSC55R290GT	50	
LSD55R290GT	TO-220MF	LSD55R290GT	50	
LSE55R290GT	TO-263-2L	LSE55R290GT		800
LSF55R290GT	TO-262	LSF55R290GT	50	
LSG55R290GT	TO-252	LSG55R290GT		2500
LSDN55R290GT	TO-220MF Narrow Pin	LSDN55R290GT	50	

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

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
<b>Static characteristics</b>						
Drain-source breakdown voltage	$BV_{DSS}$	$V_{GS}=0\text{ V}, I_D=0.25\text{ mA}$	550	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=0.25\text{ mA}$	2.5	3.5	4.5	V
Drain cut-off current	$I_{DSS}$	$V_{DS}=650\text{ V}, V_{GS}=0\text{ V},$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$	-	-	1	$\mu\text{A}$
Gate leakage current, Forward	$I_{GSSF}$	$V_{GS}=30\text{ V}, V_{DS}=0\text{ V}$	-	-	100	nA
Gate leakage current, Reverse	$I_{GSSR}$	$V_{GS}=-30\text{ V}, V_{DS}=0\text{ V}$	-	-	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=7.5\text{ A}$ $T_J = 25^\circ\text{C}$ $T_J = 150^\circ\text{C}$	-	0.25	0.29	$\Omega$
Gate resistance	$R_G$	$f=1\text{ MHz}, \text{open drain}$	-	4.6	-	$\Omega$
<b>Dynamic characteristics</b>						
Input capacitance	$C_{iss}$	$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V},$	-	818	-	

Output capacitance	$C_{oss}$	$f = 250 \text{ kHz}$	-	41.5	-	pF
Reverse transfer capacitance	$C_{rss}$		-	1.85	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 300\text{V}, I_D = 7.5\text{A}$ $R_G = 10\Omega, V_{GS}=10\text{V}$	-	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	$Q_{gs}$	$V_{DD}=440 \text{ V}, I_D=7.5\text{A},$ $V_{GS}=0 \text{ to } 10 \text{ V}$	-	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	$V_{SD}$	$V_{GS}=0 \text{ V}, I_F=7.5\text{A}$	-	1.0	-	V
Reverse recovery time	$t_{rr}$	$V_R=400 \text{ V}, I_F=11\text{A},$ $di_F/dt=100 \text{ A}/\mu\text{s}$	-	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

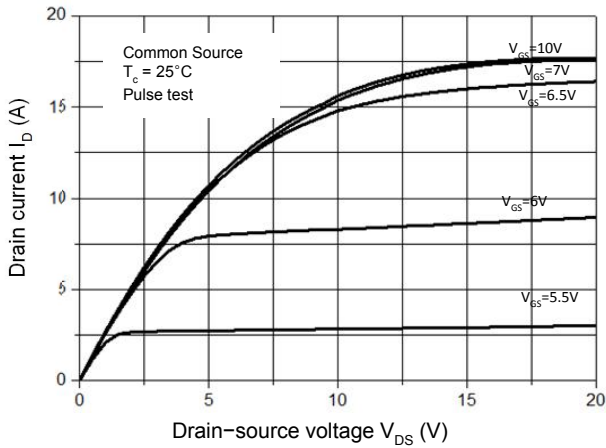


Figure 2. Transfer Characteristics

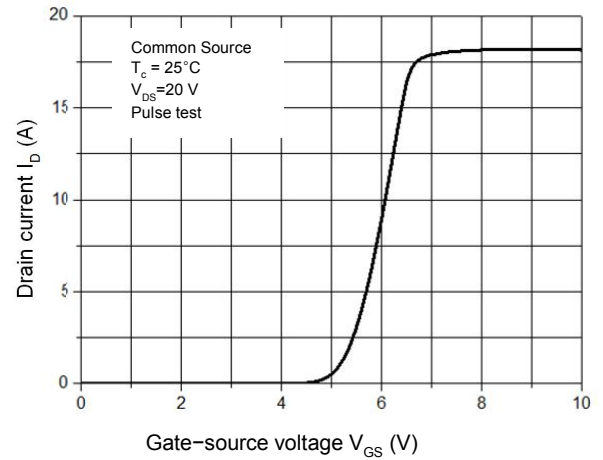


Figure 3. On-Resistance Variation vs. Drain Current

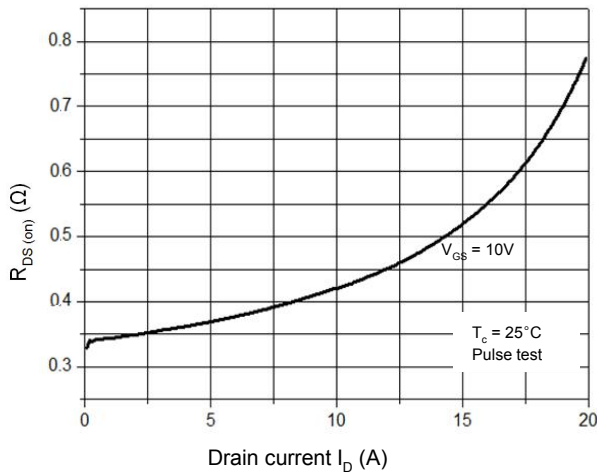


Figure 4. Threshold Voltage vs. Temperature

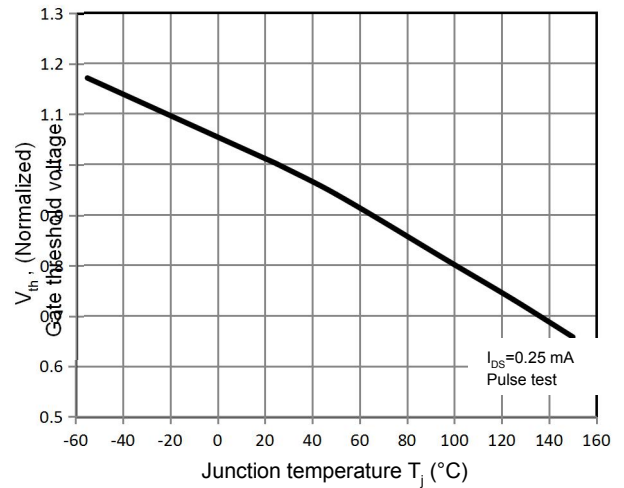


Figure 5. Breakdown Voltage vs. Temperature

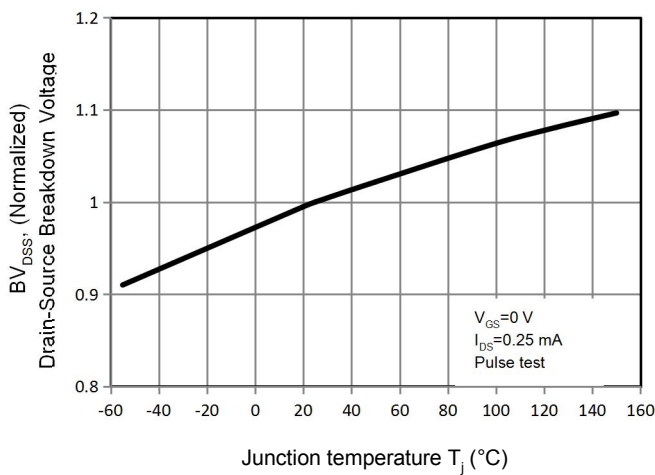


Figure 6. On-Resistance vs. Temperature

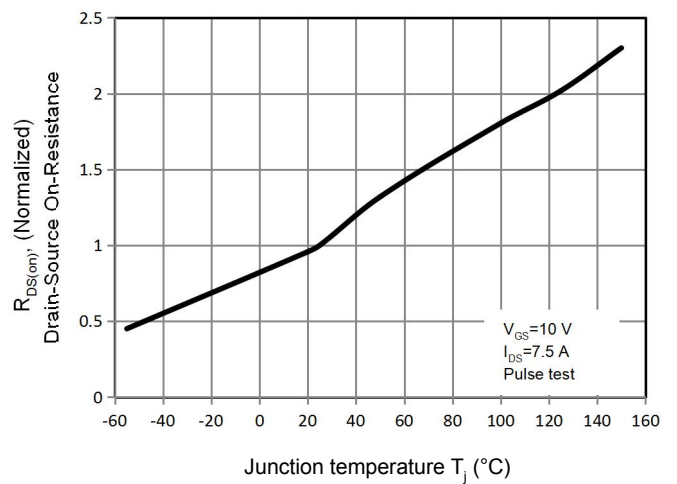


Figure 7. Capacitance Characteristics

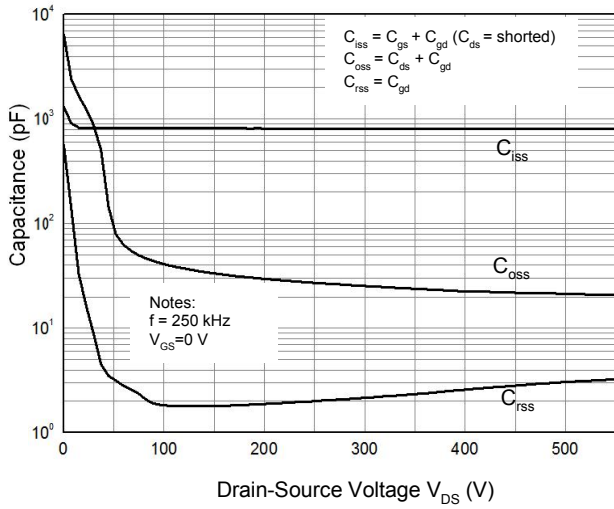


Figure 8. Gate Charge Characterist

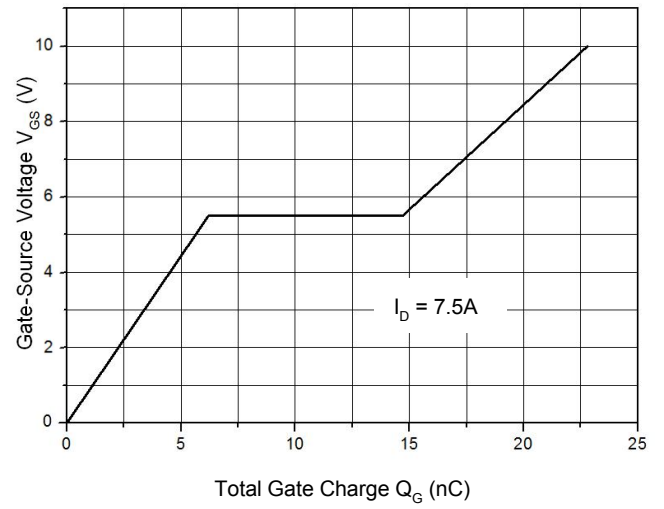


Figure 9.1 Maximum Safe Operating Area  
TO-220MF/TO-220MF Narrow Pin

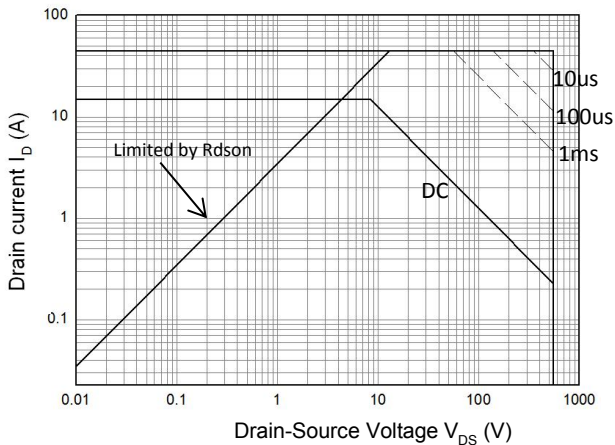


Figure 9.2 Maximum Safe Operating Area  
TO-263-2L/TO-262/TO-252/TO-220

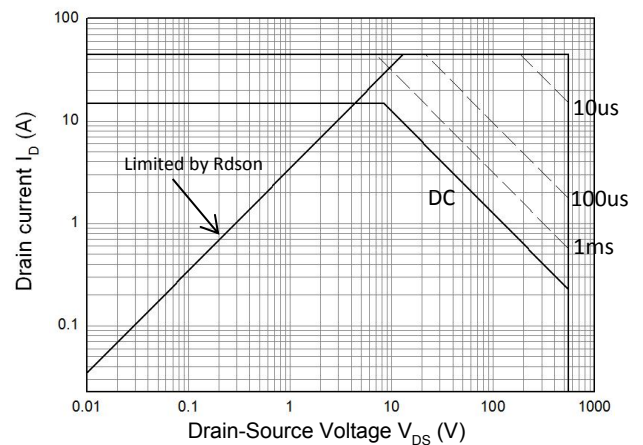


Figure 10.1 Power Dissipation vs. Temperature  
TO-220MF/TO-220MF Narrow Pin

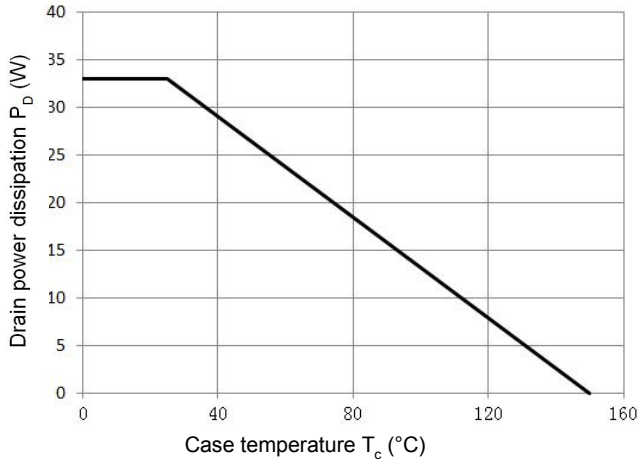


Figure 10.2 Power Dissipation vs. Temperature  
TO-263-2L/TO-262/TO-252/TO-220

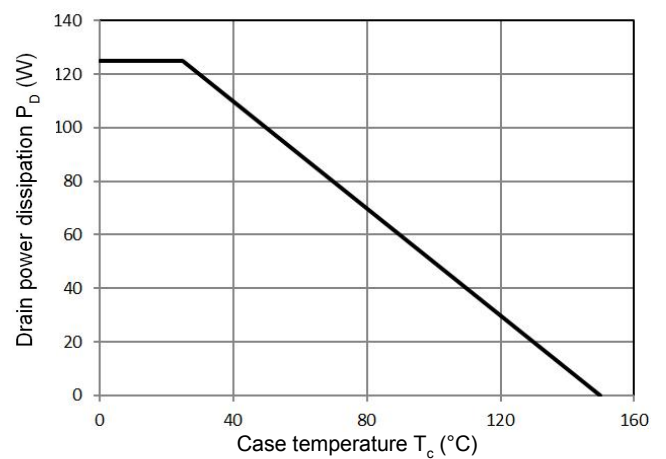


Figure 11.1 Transient Thermal Response Curve  
 TO-220MF/TO-220MF Narrow Pin

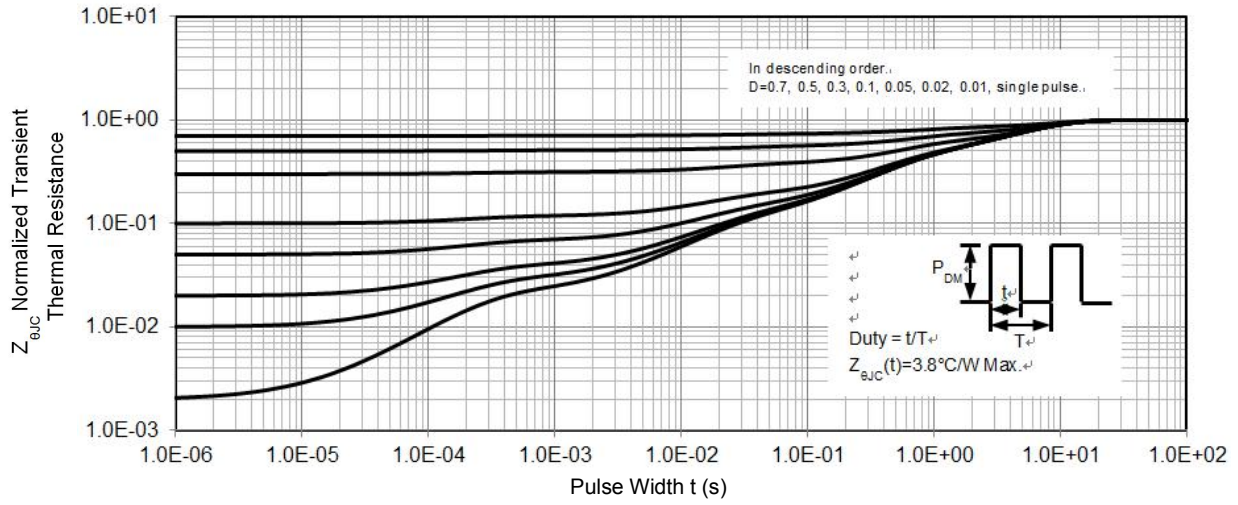
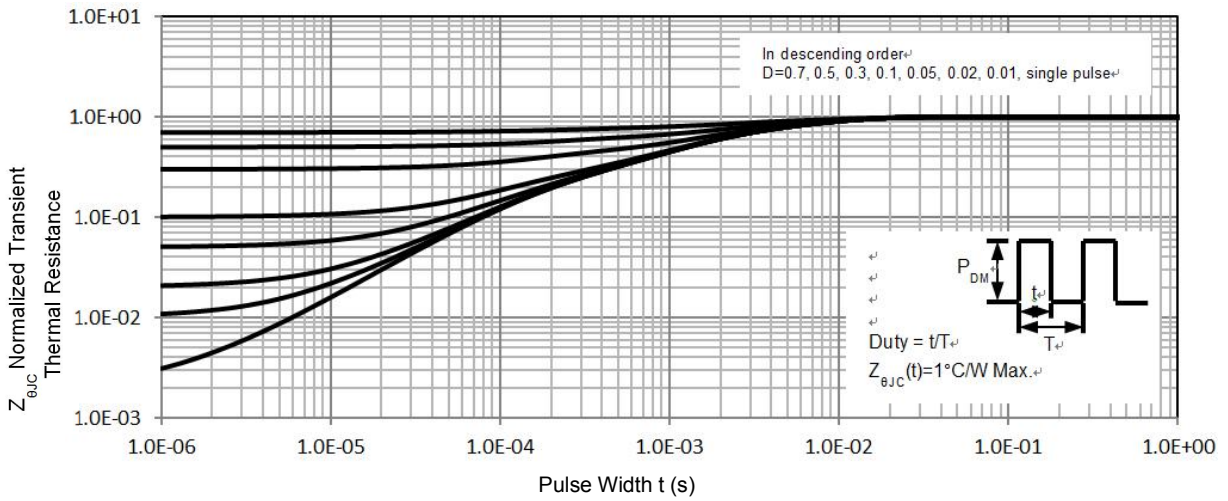
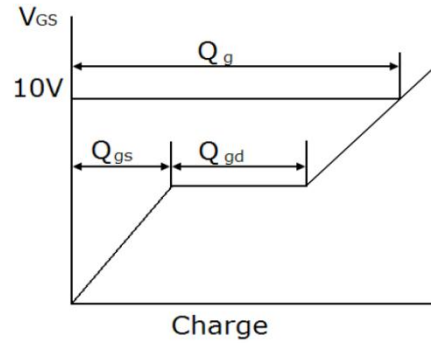
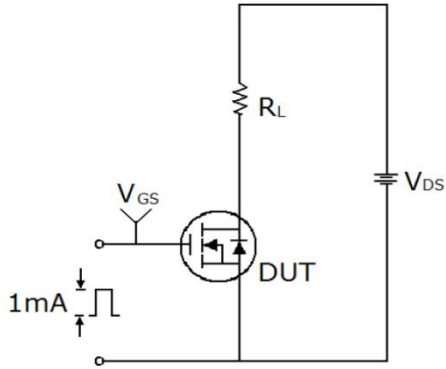


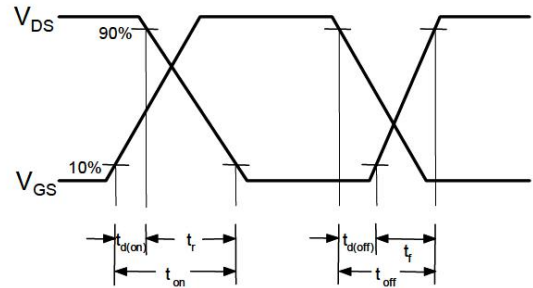
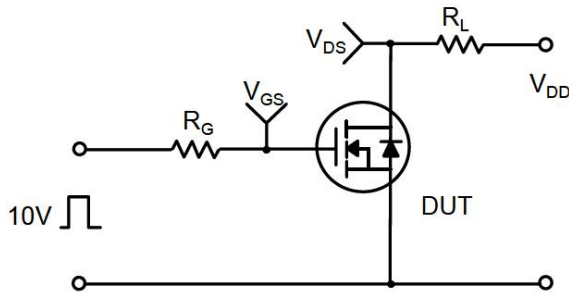
Figure 11.1 Transient Thermal Response Curve  
 TO-263-2L/TO-262/TO-252 TO-220



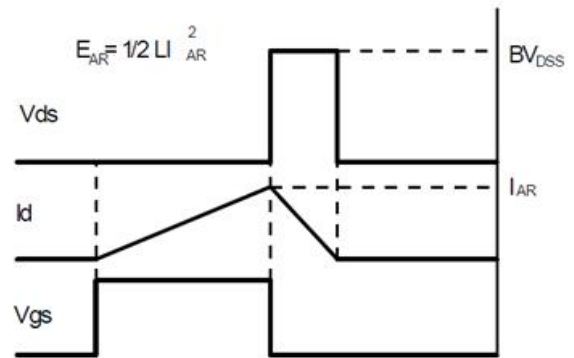
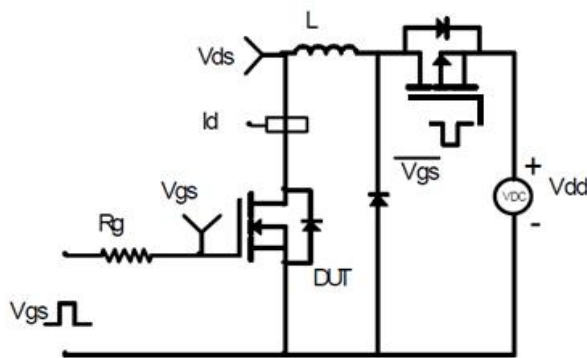
**Gate Charge Test Circuit & Waveform**



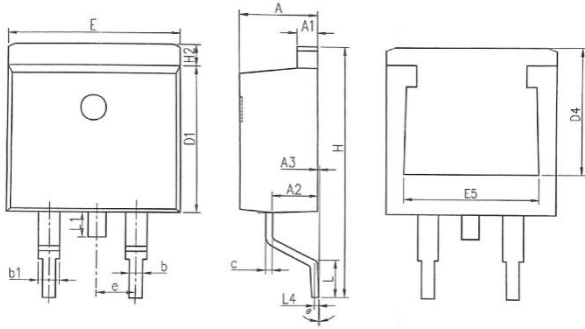
**Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**

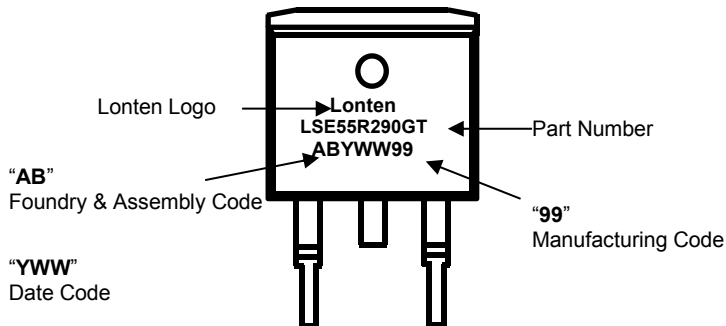


**Mechanical Dimensions for TO-263**



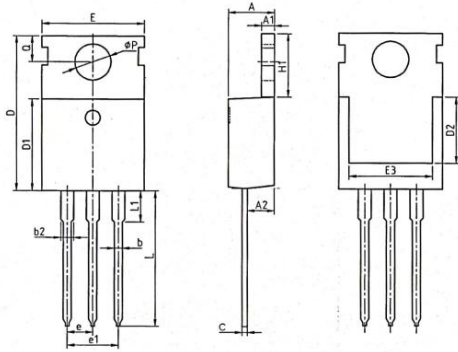
COMMON DIMENSIONS						
SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.37	4.57	4.77	0.172	0.180	0.188
A1	1.22	1.27	1.42	0.048	0.050	0.056
A2	2.49	2.89	2.89	0.098	0.114	0.114
A3	0.00	0.13	0.25	0.000	0.005	0.010
b	0.70	0.81	0.96	0.028	0.032	0.034
b1	1.17	1.27	1.47	0.046	0.050	0.058
c	0.30	0.38	0.53	0.012	0.015	0.021
D1	8.50	8.70	8.90	0.335	0.343	0.350
D4	6.60	—	—	0.260	—	—
E	9.86	10.16	10.36	0.389	0.400	0.408
E5	7.06	—	—	0.278	—	—
e	2.54 BSC			0.100 BSC		
H	14.70	15.10	15.50	0.579	0.594	0.610
H2	1.07	1.27	1.47	0.042	0.050	0.058
L	2.00	2.30	2.60	0.079	0.091	0.102
L1	1.40	1.55	1.70	0.055	0.061	0.067
L4	0.25 BSC			0.010 BSC		
θ	0°	5°	9°	0°	0.197°	0.354°

**TO-263 Part Marking Information**



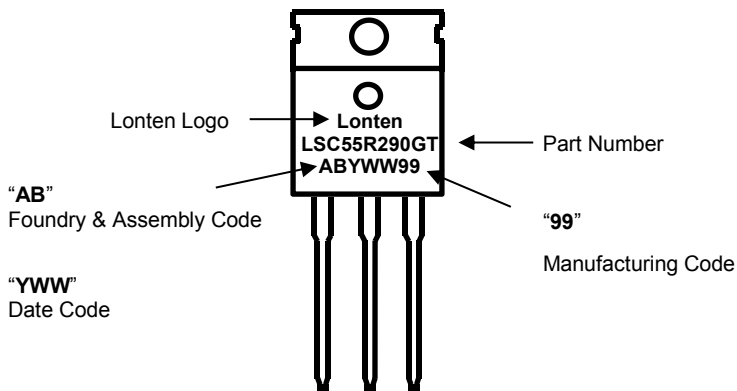


**Mechanical Dimensions for TO-220**

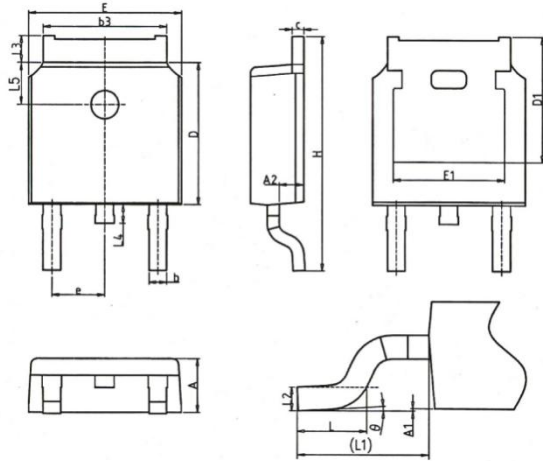


COMMON DIMENSIONS						
SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.37	4.57	4.70	0.172	0.180	0.185
A1	1.25	1.30	1.40	0.049	0.051	0.055
A2	2.20	2.40	2.60	0.087	0.094	0.102
b	0.70	0.80	0.95	0.028	0.031	0.037
b2	1.17	1.27	1.47	0.046	0.050	0.058
c	0.45	0.50	0.60	0.018	0.020	0.024
D	15.10	15.60	16.10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

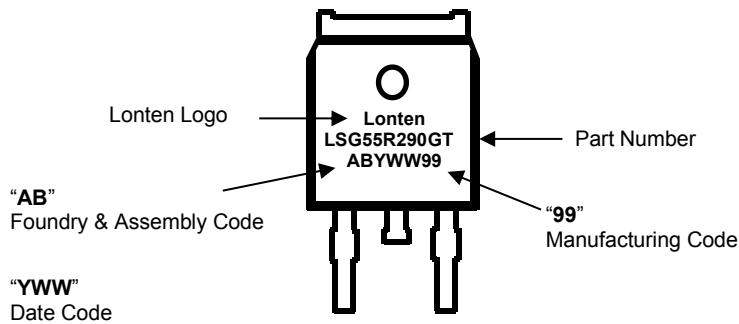


**Mechanical Dimensions for TO-252**

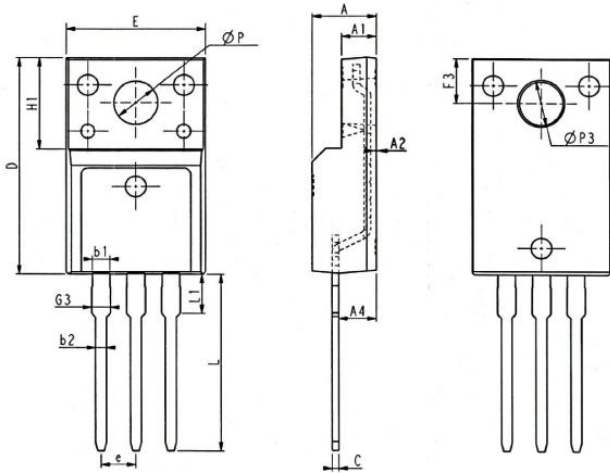


COMMON DIMENSIONS			
SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0.00	—	0.20
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b3	5.20	5.33	5.46
c	0.43	0.53	0.61
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.73
E1	4.63	—	—
e	2.286BSC		
H	9.40	10.10	10.50
L	1.38	1.50	1.75
L1	2.90REF		
L2	0.51BSC		
L3	0.88	—	1.28
L4	0.50	—	1.00
L5	1.65	1.80	1.95
θ	0°	—	8°

**TO-252 Part Marking Information**

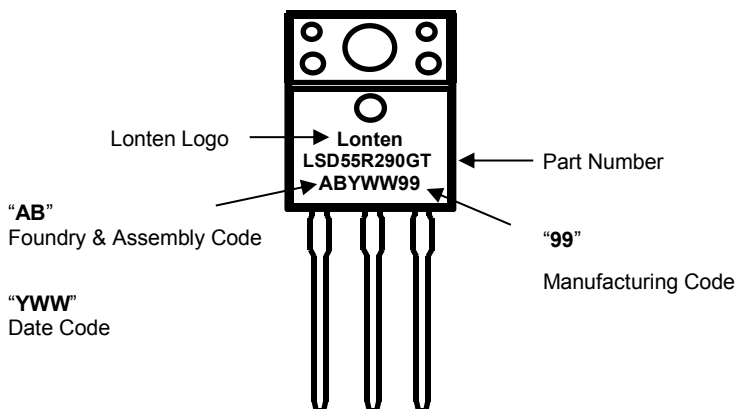


**Mechanical Dimensions for TO-220MF**

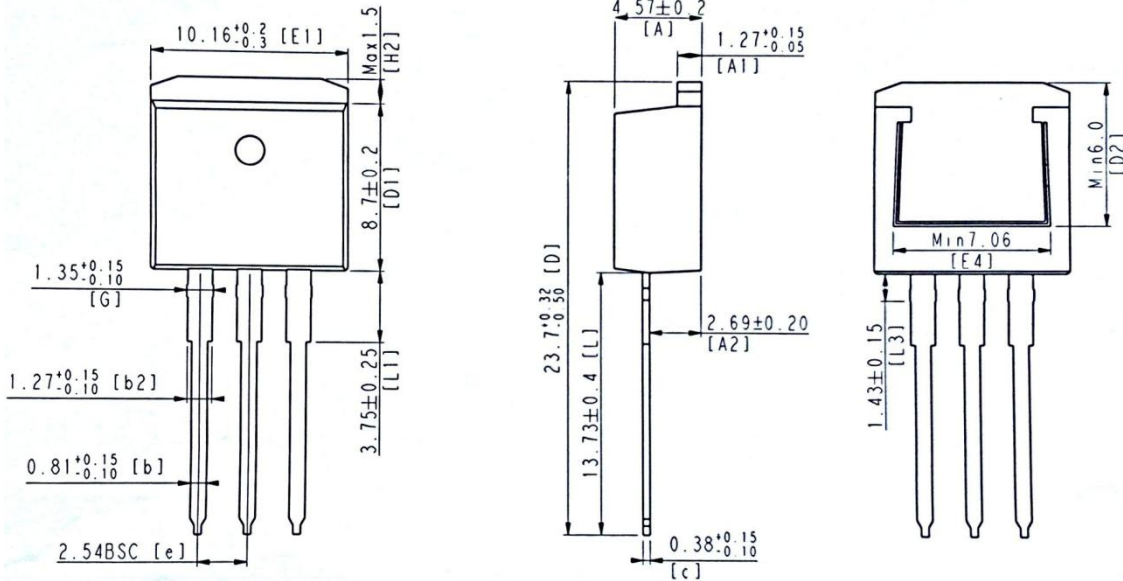


SYMBOL	COMMON DIMENSIONS					
	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
E	9.96	10.16	10.36	0.392	0.400	0.408
A	4.50	4.70	4.90	0.177	0.185	0.193
A1	2.34	2.54	2.74	0.092	0.100	0.108
A2	0.30	0.45	0.60	0.012	0.002	0.024
A4	2.65	2.76	2.96	0.104	0.109	0.117
C	0.40	0.50	0.65	0.016	0.020	0.026
D	15.57	15.87	16.17	0.613	0.625	0.637
H1	6.70REF			0.264REF		
e	2.54BSC			0.1BSC		
ØP	3.03	3.18	3.38	0.119	0.125	0.133
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
ØP3	3.15REF			0.124REF		
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

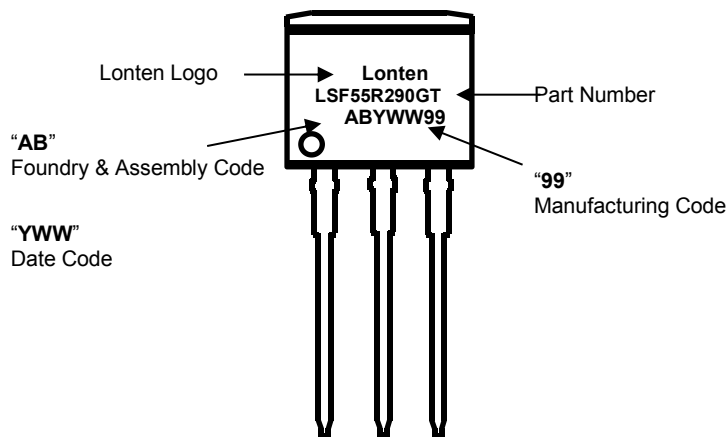
**TO-220MF Part Marking Information**



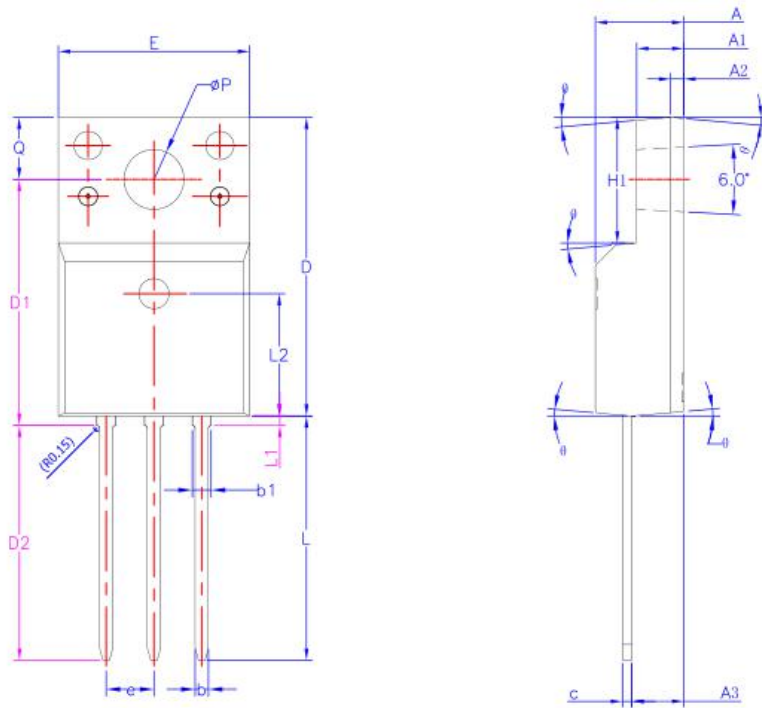
**Mechanical Dimensions for TO-262**



**TO-262 Part Marking Information**



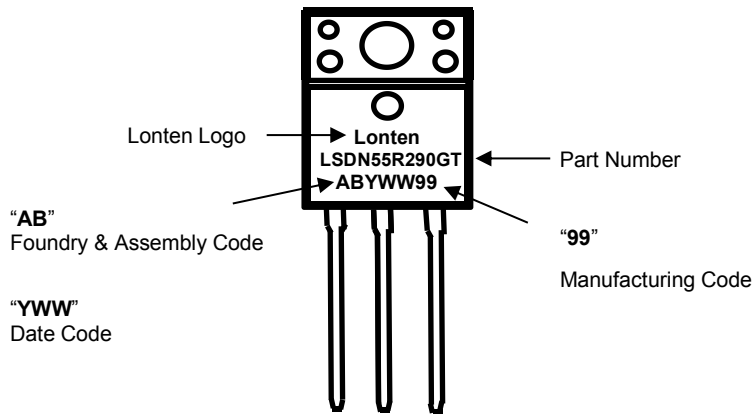
**Mechanical Dimensions for TO-220MF Narrow Pin**



(UNITS:mm)

SYMBOL	MIN	NOM	MAX
A	4.50	4.70	4.83
A1	2.34	2.54	2.74
A2	0.70 REF		
A3	2.56	2.76	2.93
b	0.60	—	0.80
b1	0.90	—	1.10
c	0.45	0.50	0.60
D	15.67	15.87	16.07
D1	12.87	13.07	13.27
D2	12.28	12.48	12.68
E	9.96	10.16	10.36
e	2.54BSC		
H1	6.48	6.68	6.88
L	12.68	12.98	13.28
L1	—	—	0.85
L2	6.50REF		
ØP	3.08	3.18	3.28
Q	3.20	—	3.40
θ 1	1°	3°	5°

**TO-220MF Narrow Pin Part Marking Information**



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**Disclaimer**

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