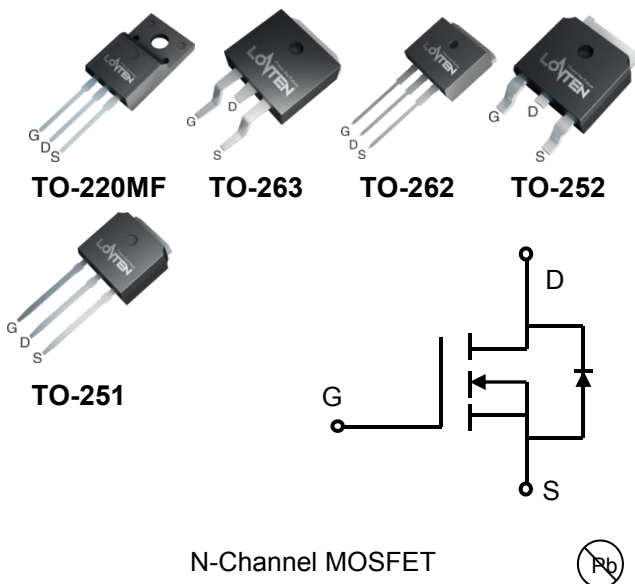


Lonten N-channel 700V, 11A, 0.45Ω LonFET™ Power MOSFET

Description 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. Features ♦ Ultra low $R_{DS(on)}$ ♦ Ultra low gate charge (typ. $Q_g = 23nC$) ♦ 100% UIS tested ♦ RoHS compliant Applications ♦ Power factor correction (PFC). ♦ Switched mode power supplies (SMPS). ♦ Uninterruptible power supply (UPS).	Product Summary $V_{DS} @ T_{j,max}$ 750V $R_{DS(on),max}$ 0.45Ω I_{DM} 30A $Q_{g,typ}$ 23nC  N-Channel MOSFET
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Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	700	V
Continuous drain current ($T_C = 25^{\circ}C$)	I_D	11	A
($T_C = 100^{\circ}C$)		7	A
Pulsed drain current ¹⁾	I_{DM}	30	A
Gate-Source voltage	V_{GSS}	± 30	V
Avalanche energy, single pulse ²⁾	E_{AS}	270	mJ
Avalanche energy, repetitive ³⁾	E_{AR}	0.5	mJ
Avalanche current, repetitive ³⁾	I_{AR}	11	A
Power Dissipation TO-220MF ($T_C = 25^{\circ}C$)	P_D	33	W
- Derate above 25°C		0.26	W/°C
Power Dissipation TO-262 ($T_C = 25^{\circ}C$)		125	W
- Derate above 25°C		1	W/°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	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	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62	$^{\circ}\text{C}/\text{W}$
Soldering temperature, wavesoldering only allowed at leads. (1.6mm from case for 10s)	T_{sold}	260	$^{\circ}\text{C}$

Thermal Characteristics TO-220MF

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

Package Marking and Ordering Information

Device	Device Package	Marking	Units/Tube	Units/Reel
LSD70R450GT	TO-220MF	LSD70R450GT	50	
LSE70R450GT	TO-263	LSE70R450GT		800
LSF70R450GT	TO-262	LSF70R450GT	50	
LSG70R450GT	TO-252	LSG70R450GT		2500
LSH70R450GT	TO-251	LSH70R450GT	72	

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

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static characteristics						
Drain-source breakdown voltage	BV_{DSS}	$V_{\text{GS}}=0\text{ V}$, $I_{\text{D}}=0.25\text{ mA}$	700	-	-	V
Gate threshold voltage	$V_{\text{GS(th)}}$	$V_{\text{DS}}=V_{\text{GS}}$, $I_{\text{D}}=0.25\text{ mA}$	2.5	3.5	4.5	V
Drain cut-off current	I_{DSS}	$V_{\text{DS}}=700\text{ V}$, $V_{\text{GS}}=0\text{ V}$, $T_j = 25^{\circ}\text{C}$ $T_j = 125^{\circ}\text{C}$	- -	- 10	1 -	μA
Gate leakage current, Forward	I_{GSSF}	$V_{\text{GS}}=30\text{ V}$, $V_{\text{DS}}=0\text{ V}$	-	-	100	nA
Gate leakage current, Reverse	I_{GSSR}	$V_{\text{GS}}=-30\text{ V}$, $V_{\text{DS}}=0\text{ V}$	-	-	-100	nA
Drain-source on-state resistance	$R_{\text{DS(on)}}$	$V_{\text{GS}}=10\text{ V}$, $I_{\text{D}}=5.5\text{ A}$ $T_j = 25^{\circ}\text{C}$ $T_j = 150^{\circ}\text{C}$	- - -	0.40 0.94	0.45 -	Ω
Gate resistance	R_{G}	$f=1\text{ MHz}$, open drain	-	4.6	-	Ω
Dynamic characteristics						
Input capacitance	C_{iss}	$V_{\text{DS}} = 100\text{ V}$, $V_{\text{GS}} = 0\text{ V}$, $f = 250\text{ kHz}$	-	845	-	pF
Output capacitance	C_{oss}		-	32.4	-	
Reverse transfer capacitance	C_{rss}		-	1.92	-	
Turn-on delay time	$t_{\text{d(on)}}$	$V_{\text{DD}} = 380\text{ V}$, $I_{\text{D}} = 5.5\text{ A}$ $R_{\text{G}} = 4.7\Omega$, $V_{\text{GS}}=10\text{ V}$	-	15	-	ns
Rise time	t_{r}		-	27	-	
Turn-off delay time	$t_{\text{d(off)}}$		-	69	-	

Fall time	t _f		-	11	-	
Gate charge characteristics						
Gate to source charge	Q _{gs}	V _{DD} =480 V, I _D =5.5A, V _{GS} =0 to 10 V	-	6.2	-	nC
Gate to drain charge	Q _{gd}		-	8.5	-	
Gate charge total	Q _g		-	22.8	-	
	V _{plateau}		-	5.5	-	V
Reverse diode characteristics						
Diode forward voltage	V _{SD}	V _{GS} =0 V, I _F =5.5A	-	1.0	-	V
Reverse recovery time	t _{rr}	V _R =50 V, I _F =11A, dI _F /dt=100 A/μs	-	345	-	ns
Reverse recovery charge	Q _{rr}		-	3.8	-	μC
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

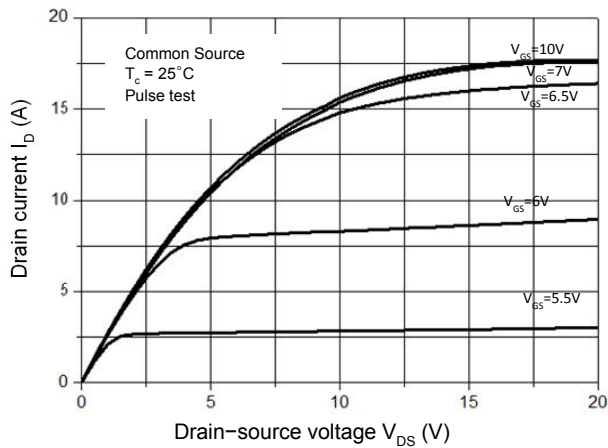


Figure 2. Transfer Characteristics

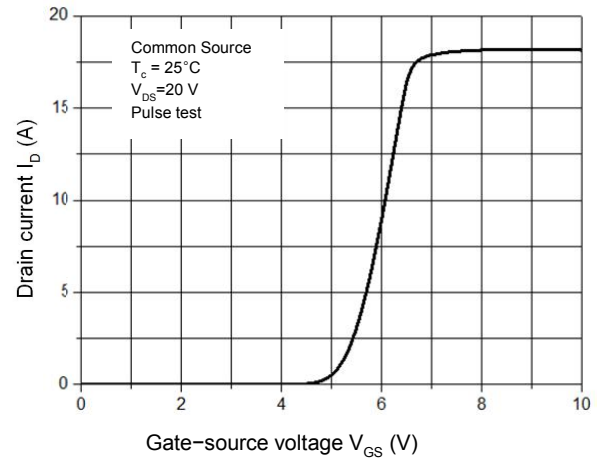


Figure 3. On-Resistance Variation vs. Drain Current

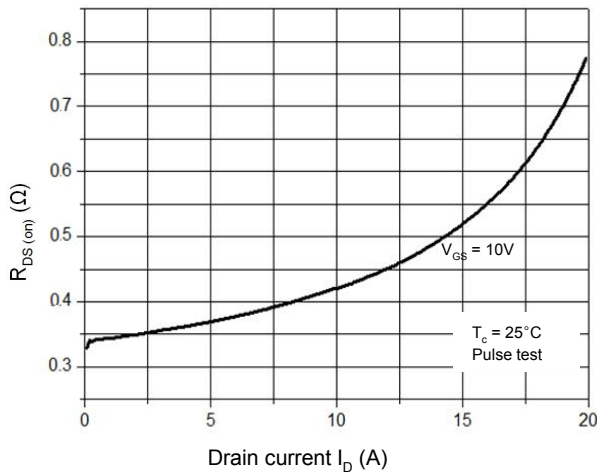


Figure 4. Threshold Voltage vs. Temperature

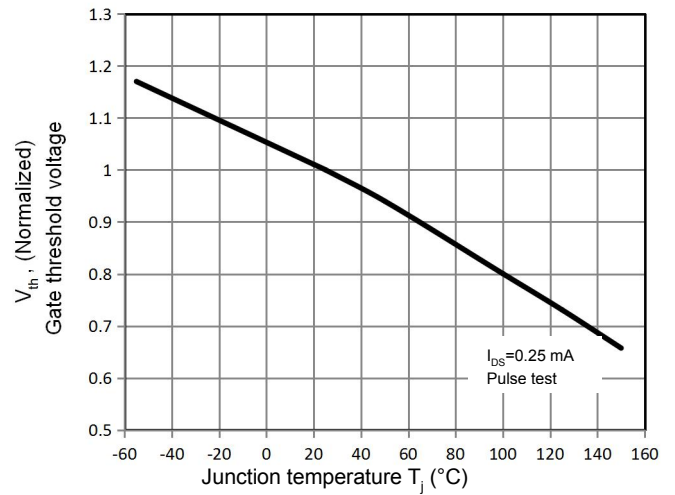


Figure 5. Breakdown Voltage vs. Temperature

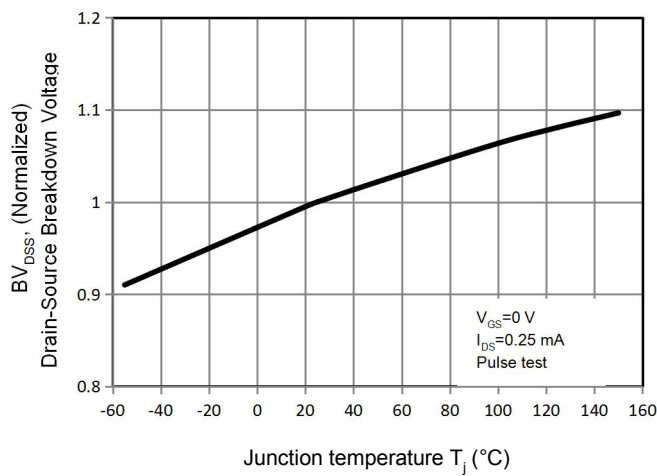


Figure 6. On-Resistance vs. Temperature

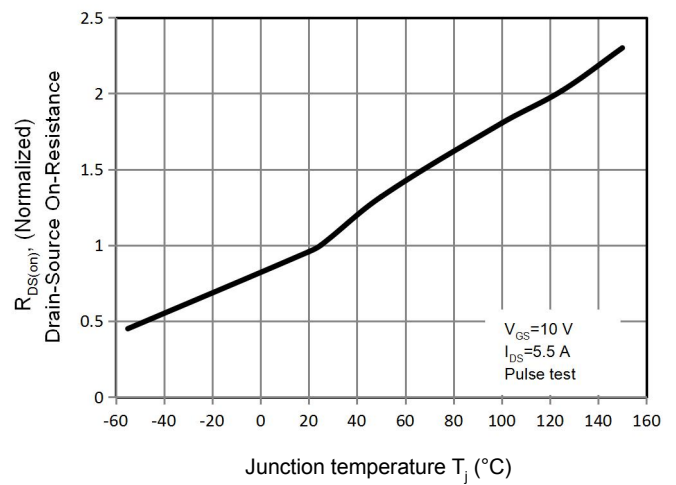


Figure 7. Capacitance Characteristics

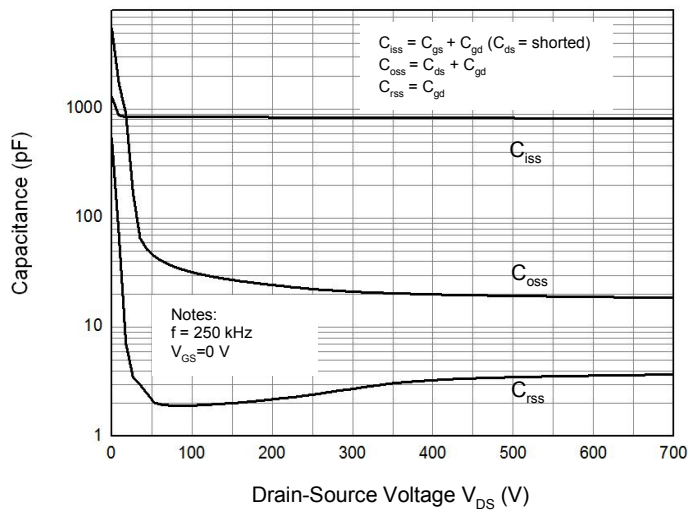


Figure 8. Gate Charge Characterist

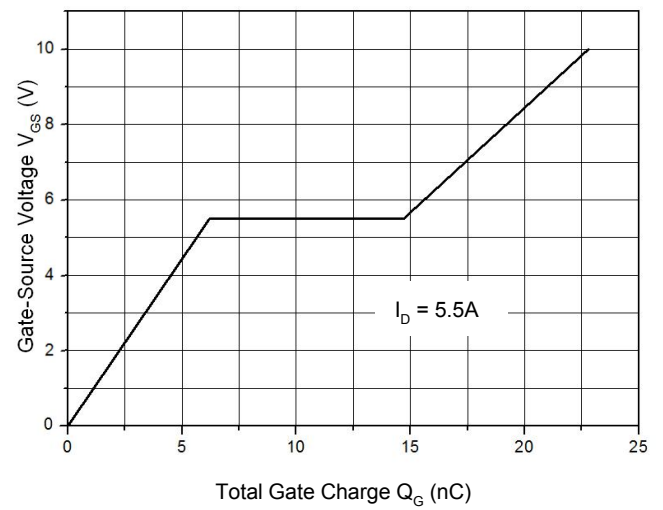


Figure 9.1 Maximum Safe Operating Area

TO-220MF

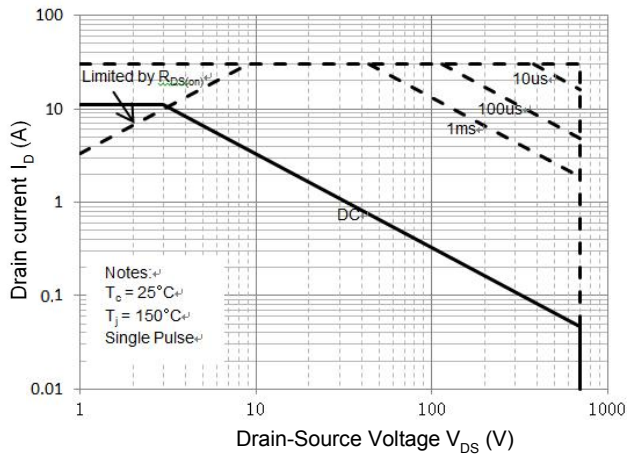


Figure 9.2 Maximum Safe Operating Area

TO-263-2L/TO-262/TO-252/TO-251

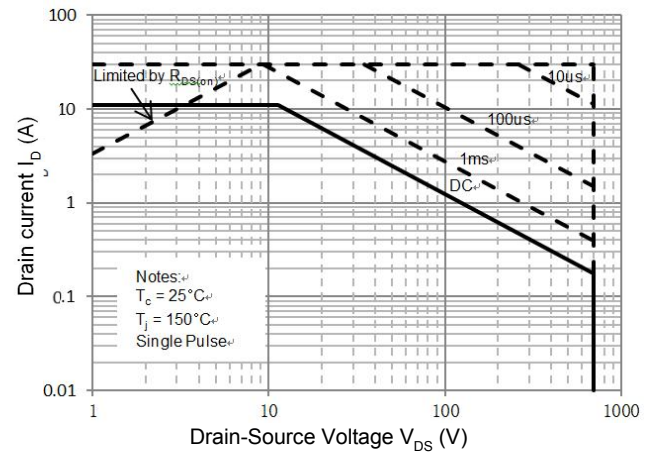


Figure 10.1 Power Dissipation vs. Temperature

TO-220MF

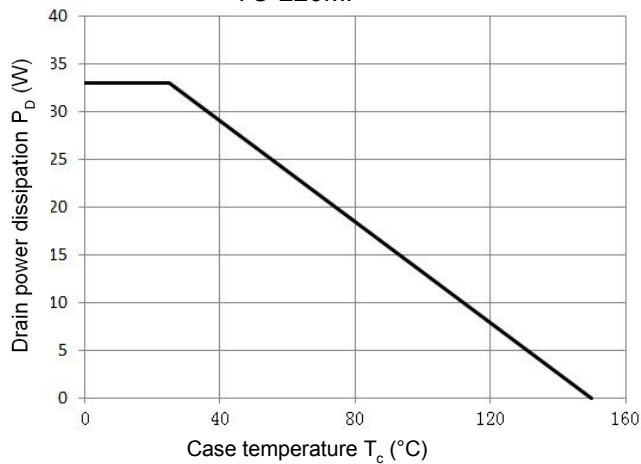


Figure 10.2 Power Dissipation vs. Temperature

TO-263-2L/TO-262/TO-252/TO-251

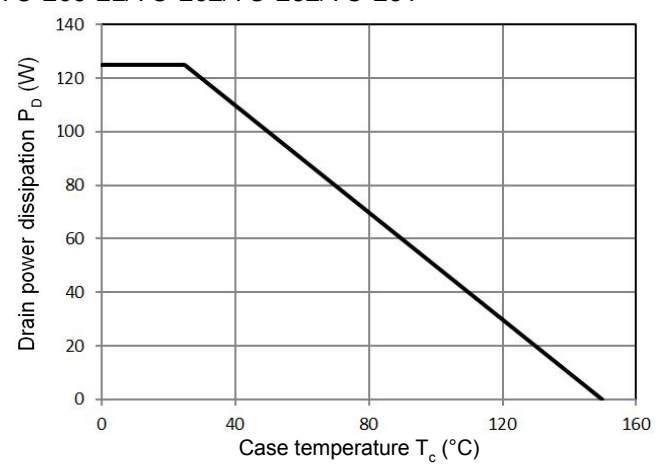


Figure 11.1 Transient Thermal Response Curve
TO-220MF

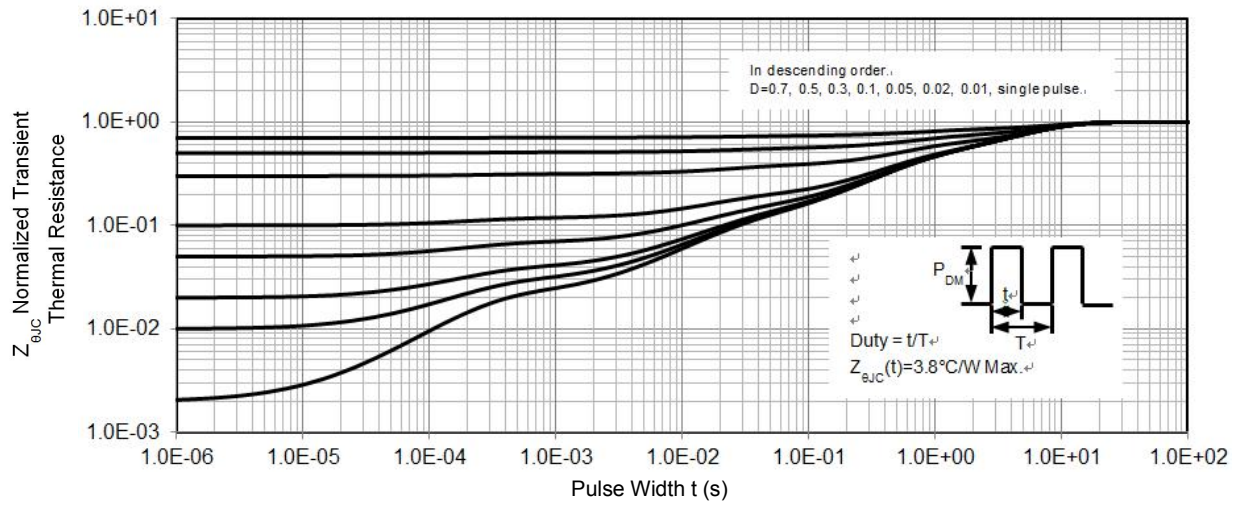
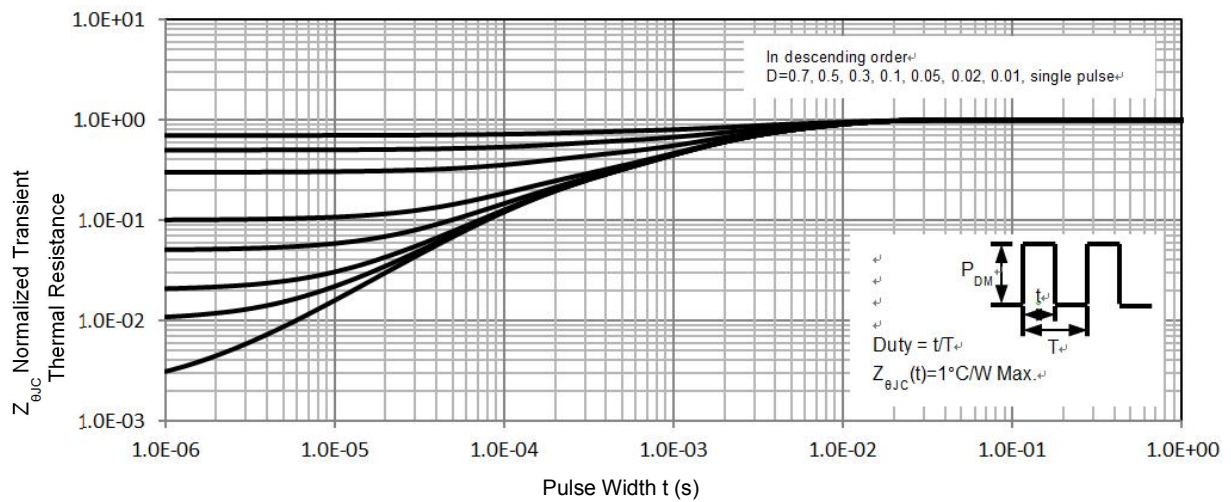
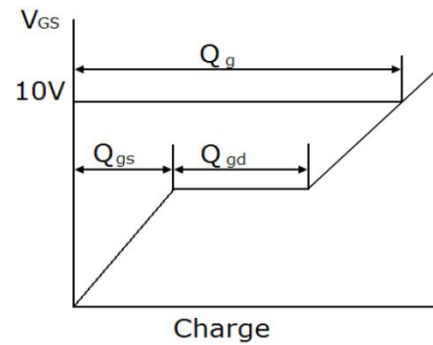
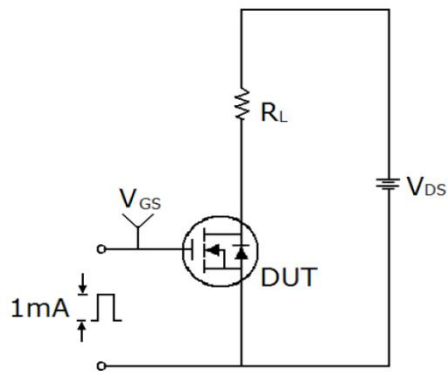


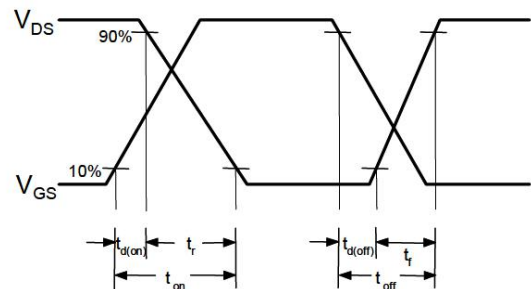
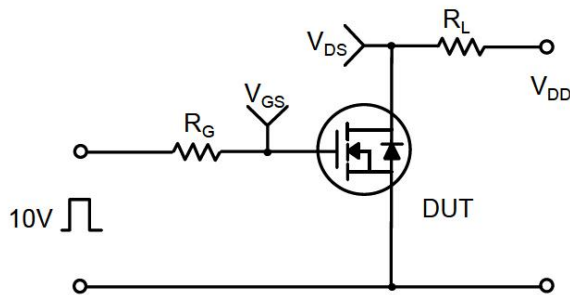
Figure 11.1 Transient Thermal Response Curve
TO-263-2L/TO-262/TO-252/TO-251



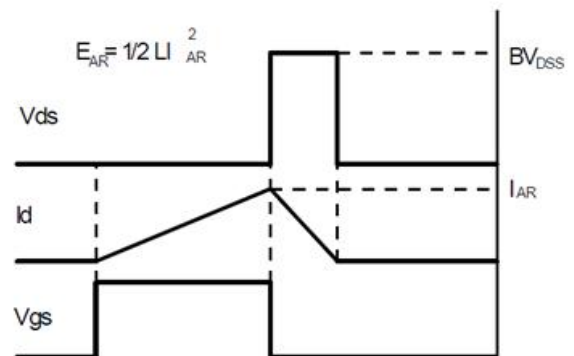
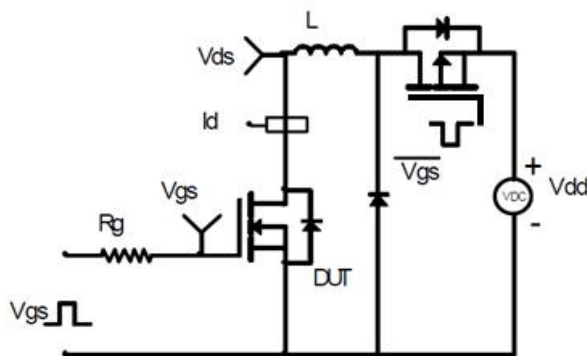
Gate Charge Test Circuit & Waveform



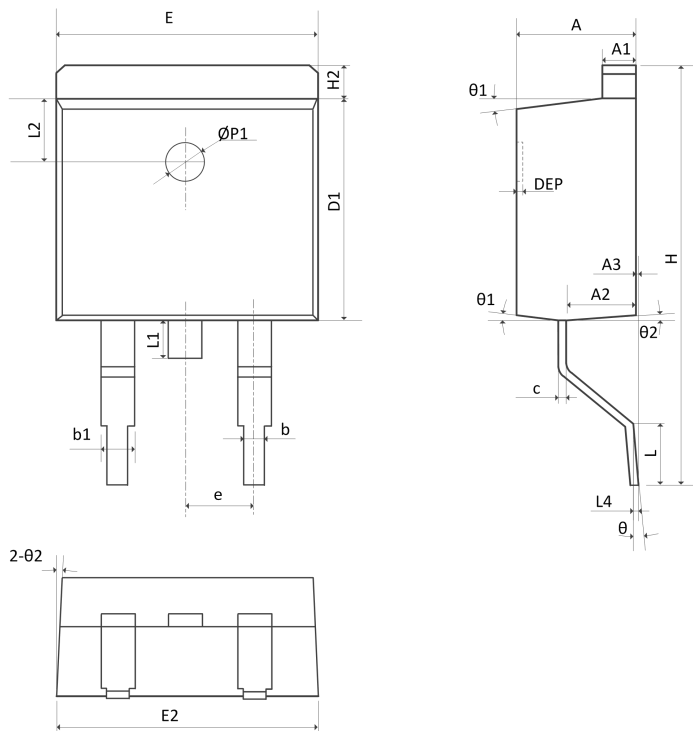
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

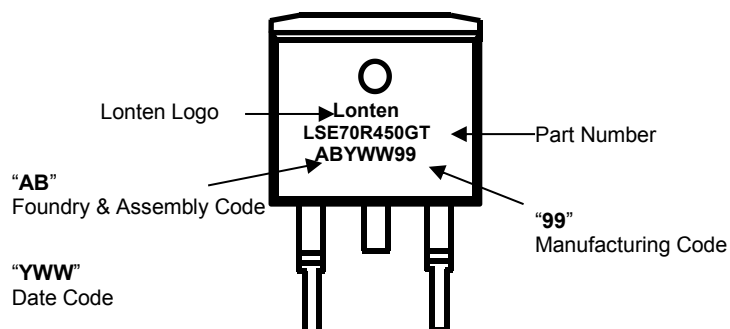


Mechanical Dimensions for TO-263

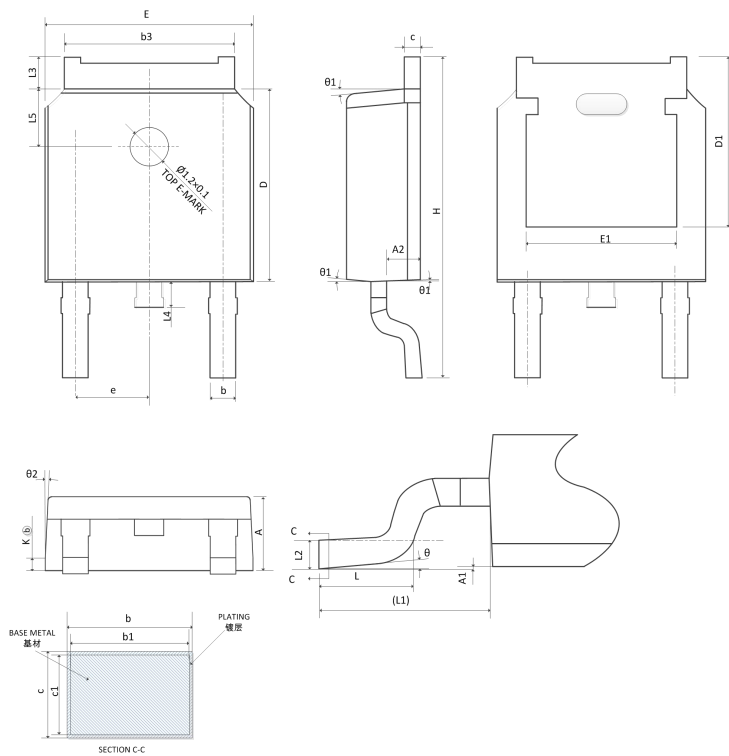


SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.40	4.57	4.70	0.173	0.180	0.185
A1	1.22	1.27	1.32	0.048	0.050	0.052
A2	2.59	2.69	2.79	0.102	0.106	0.110
A3	0.00	0.10	0.20	0.000	0.004	0.008
b	0.77	0.813	0.90	0.030	0.032	0.035
b1	1.20	1.270	1.36	0.047	0.050	0.054
c	0.34	0.381	0.47	0.013	0.015	0.019
D1	8.60	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		
θ	0°	5°	8°	0°	5°	8°
$\theta1$	5°	7°	9°	5°	7°	9°
$\theta2$	1°	3°	5°	1°	3°	5°
$\varnothing P1$	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

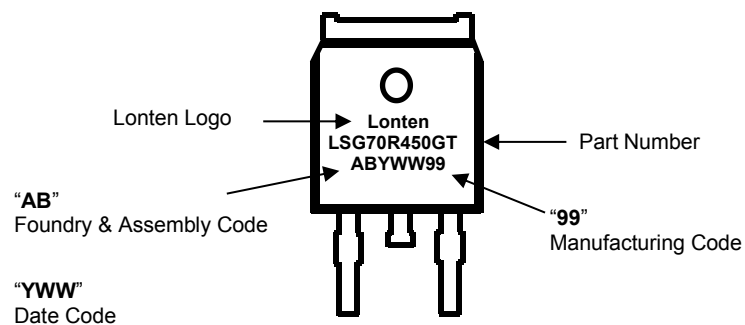


Mechanical Dimensions for TO-252

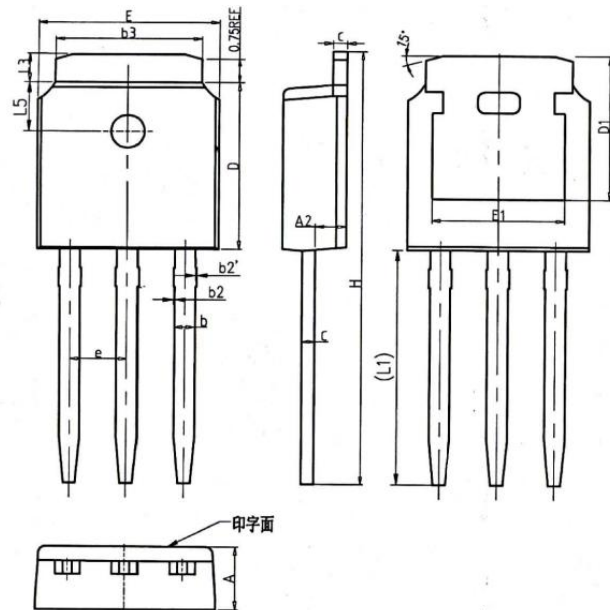


COMMON DIMENSIONS			
SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0.00	—	0.10
A2	0.97	1.07	1.17
b	0.72	0.78	0.85
b1	0.71	0.76	0.81
b3	5.23	5.33	5.46
c	0.47	0.53	0.58
c1	0.46	0.51	0.56
D	6.00	6.10	6.20
D1	5.30REF		
E	6.50	6.60	6.70
E1	4.70	4.83	4.92
e	2.286BSC		
H	9.90	10.10	10.30
L	1.40	1.50	1.70
L1	2.90REF		
L2	0.51BSC		
L3	0.90	—	1.25
L4	0.60	0.80	1.00
L5	1.70	1.80	1.90
θ	0°	—	8°
$\theta 1$	5°	7°	9°
$\theta 2$	5°	7°	9°
K	0.40REF		

TO-252 Part Marking Information

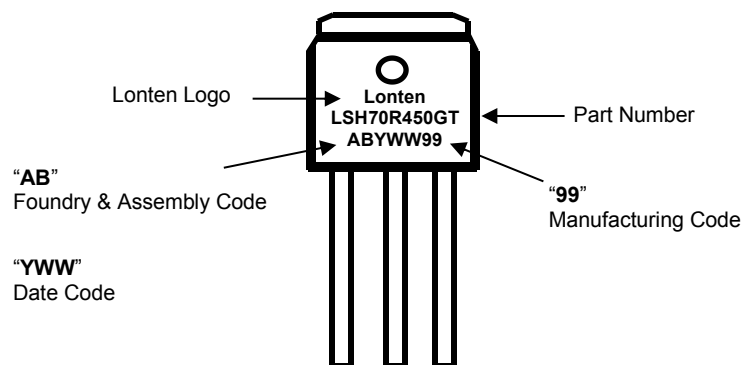


Mechanical Dimensions for TO-251

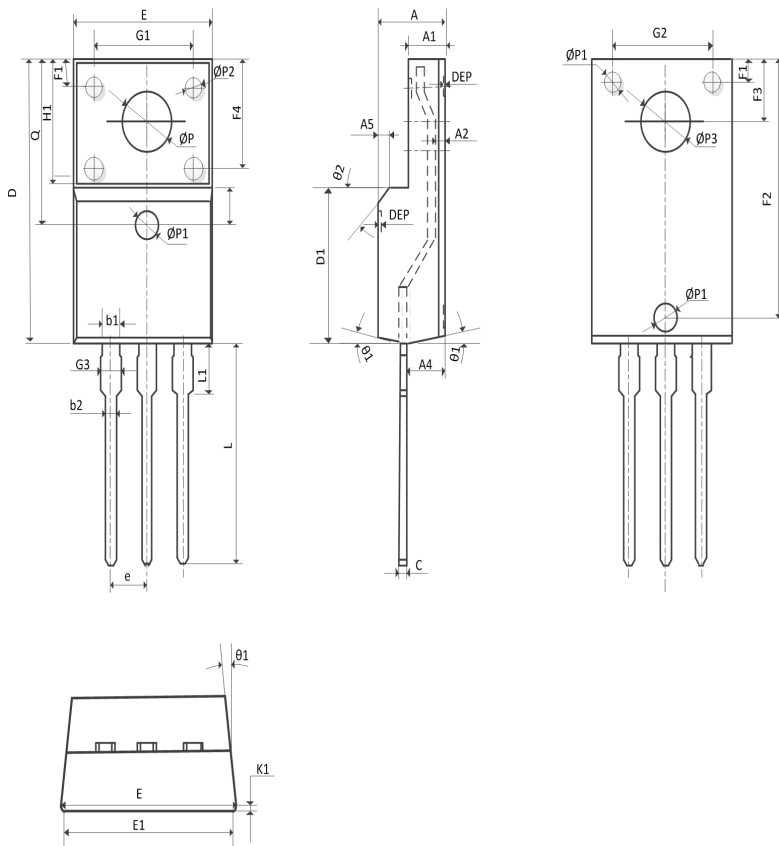


COMMON DIMENSIONS			
SYMBOL	MM		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b2	0.00	0.04	0.10
b2'	0.00	0.04	0.10
b3	5.20	5.33	5.46
c	0.43	0.53	0.61
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.73
E1	4.63	—	—
e	2.286BSC		
H	16.22	16.52	16.82
L1	9.15	9.40	9.65
L3	0.88	1.02	1.28
L5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

TO-251 Part Marking Information

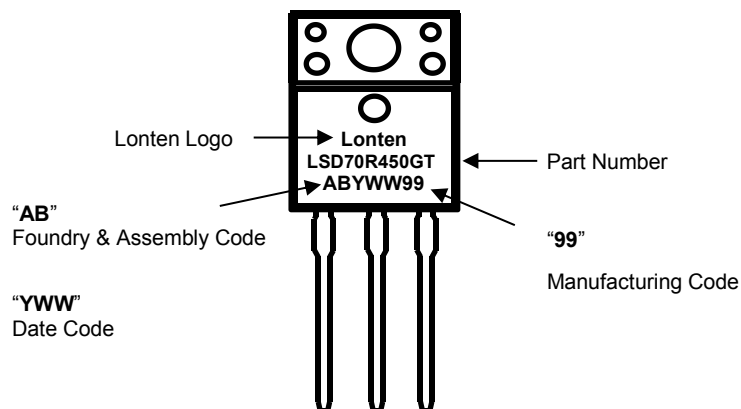


Mechanical Dimensions for TO-220MF



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



Disclaimer

The content specified herein is for the purpose of introducing LONTEN's products (hereinafter "Products"). The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. Examples of application circuits, circuit constants and any other information contained herein illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.

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Although LONTEN endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a LONTEN product.

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