Lonten N-channel 650V, 11A, 0.38Ω 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

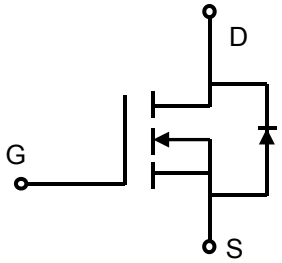
Applications

- Power faction correction (PFC).
- Switched mode power supplies (SMPS).
- Uninterruptible power supply (UPS).

Product Summary

V_{DS} @ $T_{j,max}$	700V
$R_{DS(on),max}$	0.38Ω
I_{DM}	30A
$Q_{g,typ}$	23nC

TO-220F TO-220MF TO-263 TO-262 TO-252



N-Channel MOSFET

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	650	V
Continuous drain current (T_C = 25°C)	I_D	11	A
(T_C = 100°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°C)	P_D	33	W
- Derate above 25°C		0.26	W/°C
Power Dissipation TO-262 (T_C = 25°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-263/TO-220F

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

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/Real
LSC65R380GF	TO-220F	LSC65R380GF	50	
LSD65R380GF	TO-220MF	LSD65R380GF	50	
LSE65R380GF	TO-263-2L	LSE65R380GF		800
LSF65R380GF	TO-262	LSF65R380GF	50	
LSG65R380GF	TO-252	LSG65R380GF		2500

Electrical Characteristics

T_c = 25°C unless otherwise noted

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static characteristics						
Drain-source breakdown voltage	BV_{DSS}	V_{GS}=0 V, I_D=0.25 mA	650	-	-	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}=650 V, V_{GS}=0 V, T_j = 25°C T_j = 125°C	 - -	 - 10	 1 -	µA
Gate leakage current, Forward	I_{GSSF}	V_{GS}=30 V, V_{DS}=0 V	-	-	50	nA
Gate leakage current, Reverse	I_{GSSR}	V_{GS}=-30 V, V_{DS}=0 V	-	-	-50	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=10 V, I_D=5.5 A T_j = 25°C T_j = 150°C	- - -	 0.34 0.86	 0.38 -	Ω
Gate resistance	R_G	f=1 MHz, open drain	-	4.6	-	Ω
Dynamic characteristics						
Input capacitance	C_{iss}	V_{DS} = 100 V, V_{GS} = 0 V,	-	1068	-	
Output capacitance	C_{oss}	f = 250 kHz	-	39	-	pF
Reverse transfer capacitance	C_{rss}		-	1.8	-	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 380V, I_D = 5.5A	-	15	-	

Rise time	t_r	R_G = 4.7Ω, V_{GS}=10V	-	27	-	ns
Turn-off delay time	$t_{d(off)}$		-	69	-	
Fall time	t_f		-	11	-	
Gate charge characteristics						
Gate to source charge	Q_{gs}	V_{DD}=480 V, I_D=5.5A,	-	6.2	-	nC
Gate to drain charge	Q_{gd}	V_{GS}=0 to 10 V	-	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,	-	140	-	ns
Reverse recovery charge	Q_{rr}	dI_F/dt=100 A/μs	-	0.8	-	μC
Peak reverse recovery current	I_{rrm}		-	12	-	A

Notes:

1. Limited by maximum junction temperature, maximum duty cycle is 0.75.

2. I_{AS} = 3A, V_{DD} = 60V, Starting T_j= 25°C.

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

Electrical Characteristics Diagrams

Figure 1. On-Region Characteristics

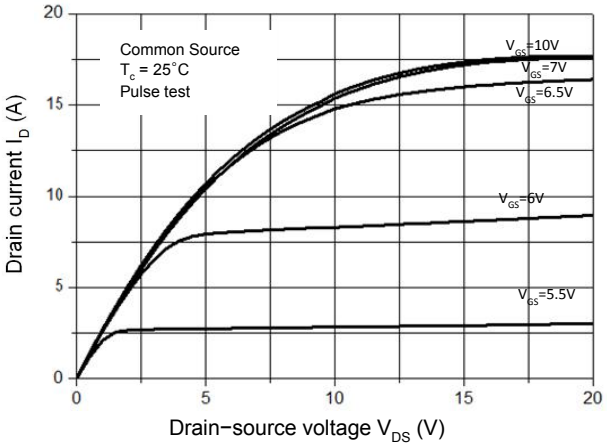


Figure 2. Transfer Characteristics

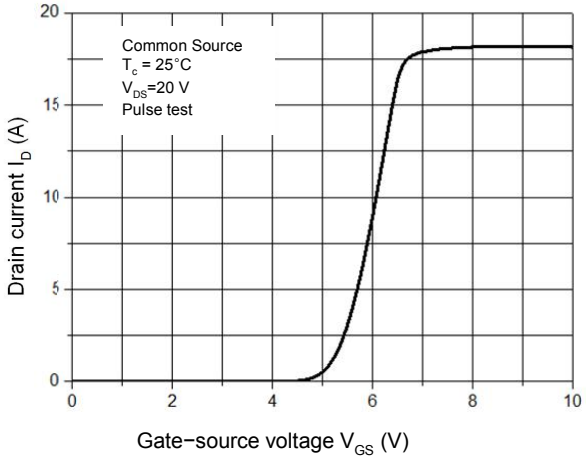


Figure 3. On-Resistance Variation vs. Drain Current

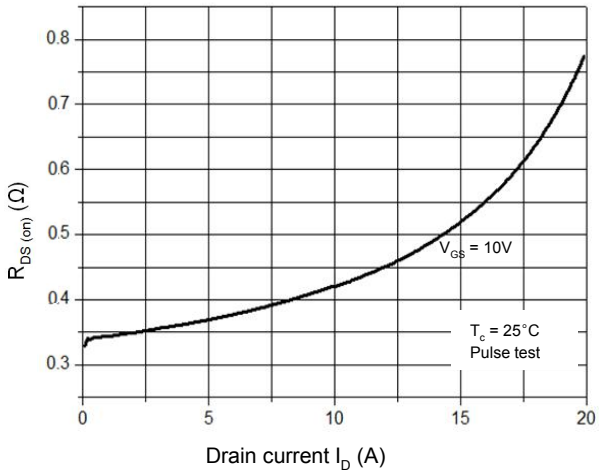


Figure 4. Threshold Voltage vs. Temperatur

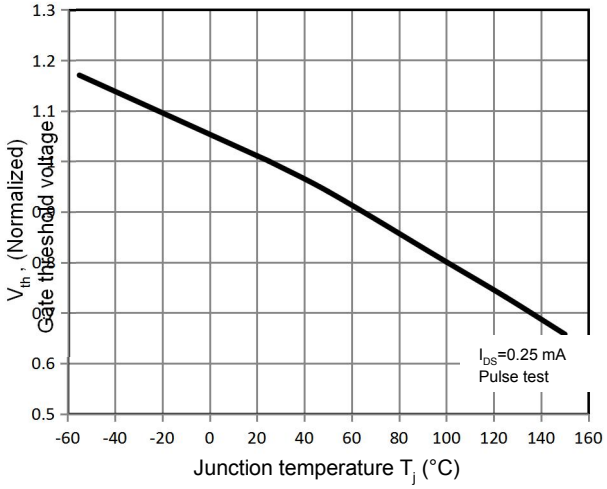


Figure 5. Breakdown Voltage vs. Temperature

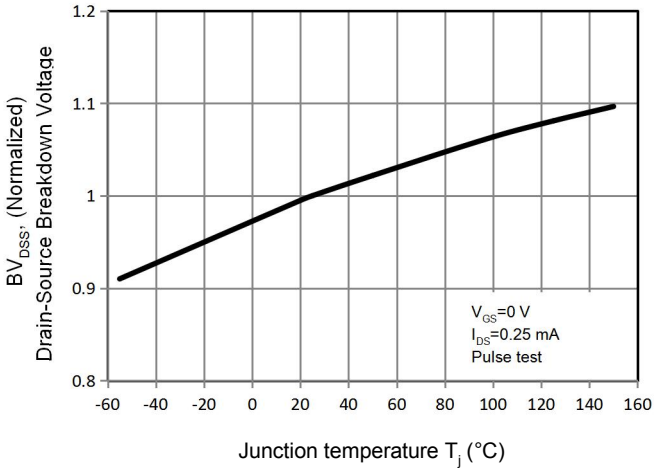


Figure 6. On-Resistance vs. Temperature

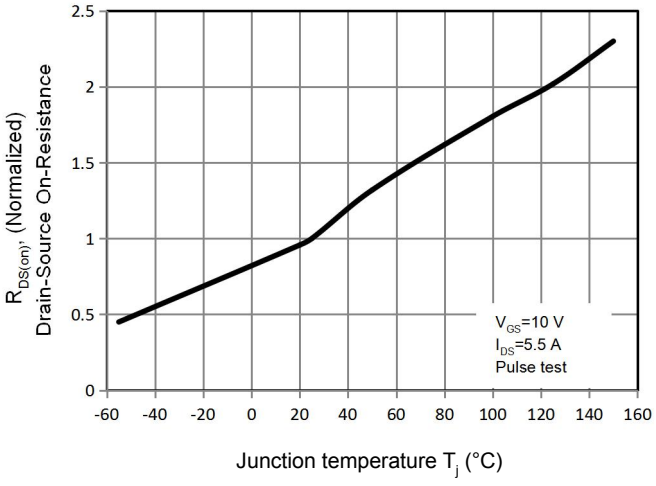


Figure 7. Capacitance Characteristics

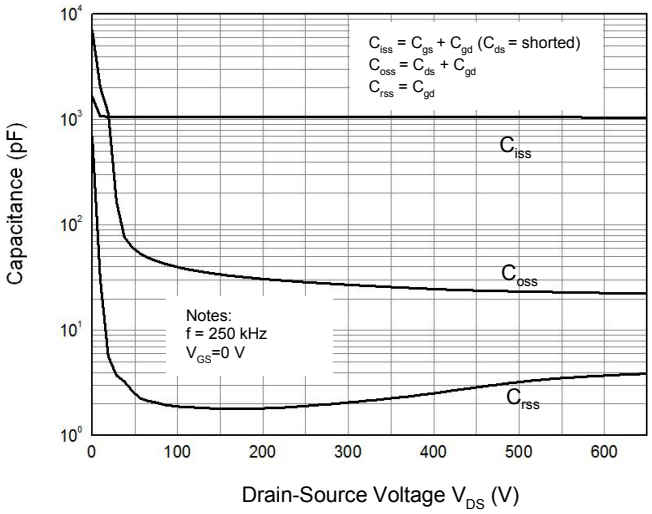


Figure 8. Gate Charge Characterist

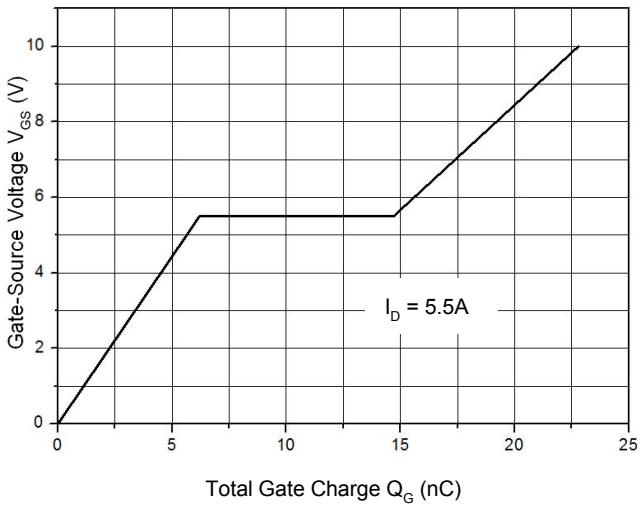


Figure 9.1 Maximum Safe Operating Area
TO-220MF

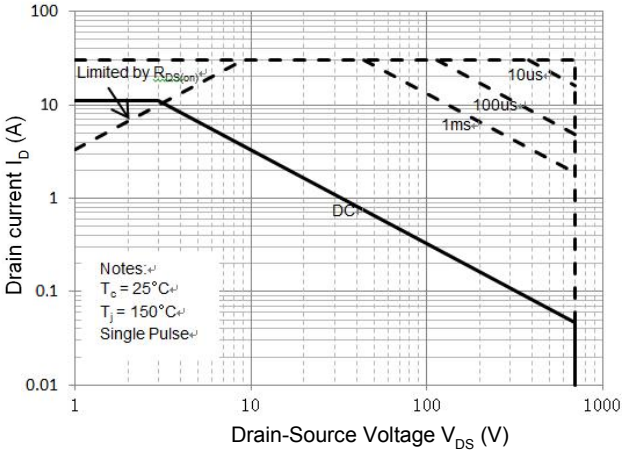


Figure 9.2 Maximum Safe Operating Area
TO-263-2L/TO-262/TO-252/ TO-220F

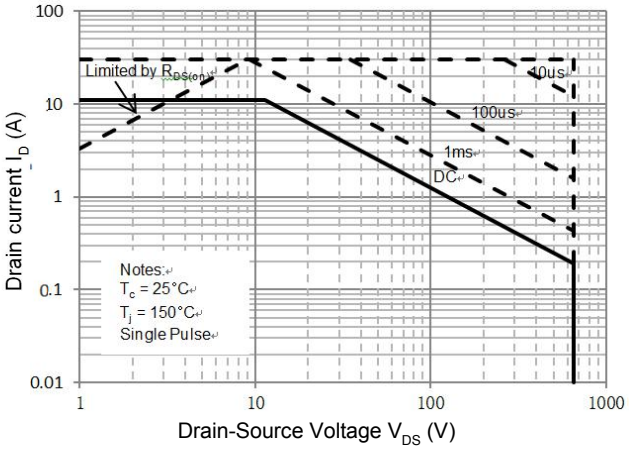


Figure 10.1 Power Dissipation vs. Temperature
TO-220MF

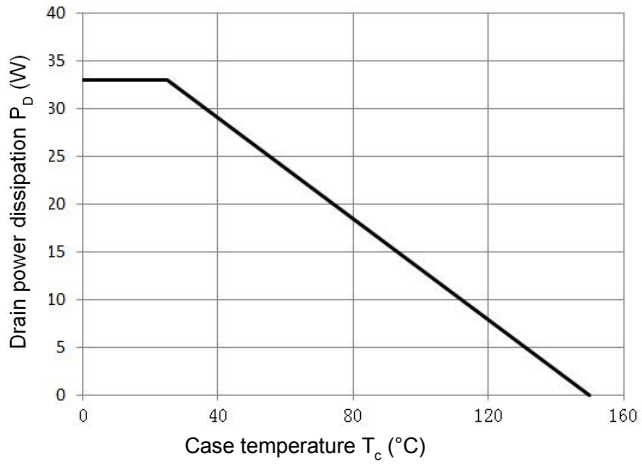


Figure 10.2 Power Dissipation vs. Temperature
TO-263-2L/TO-262/TO-252/ TO-220F

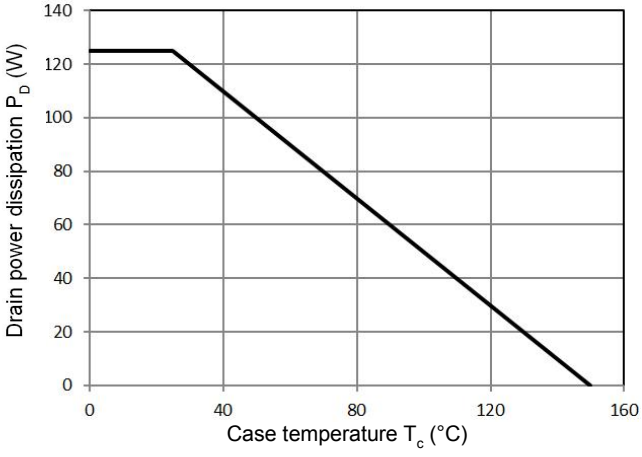


Figure 11.1 Transient Thermal Response Curve

TO-220MF

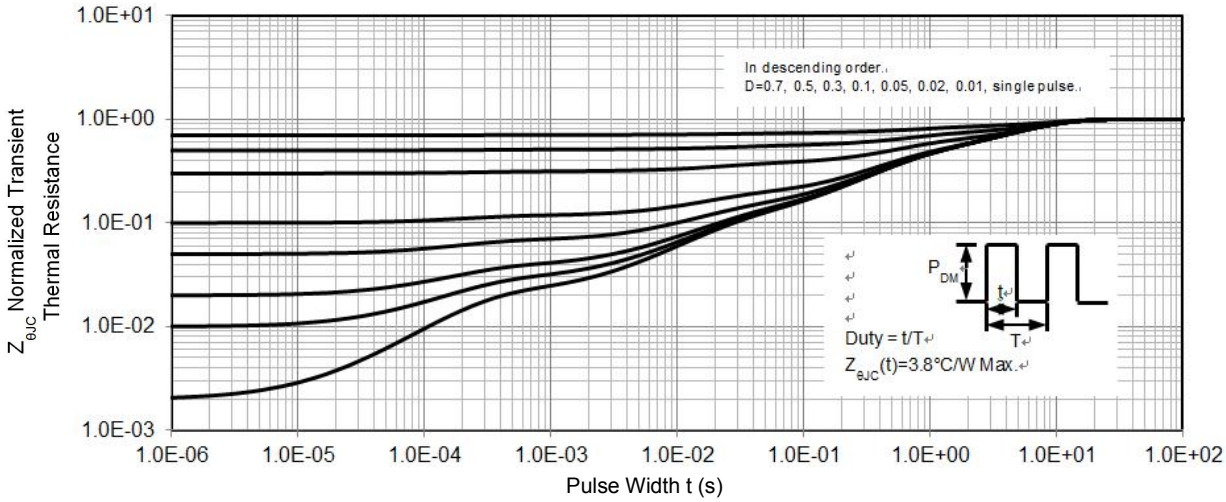
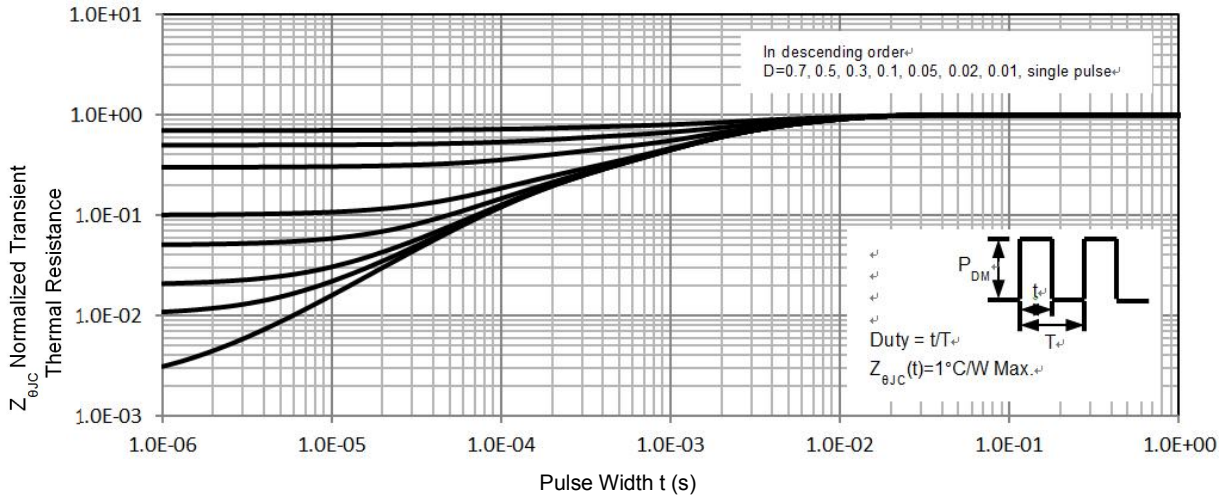
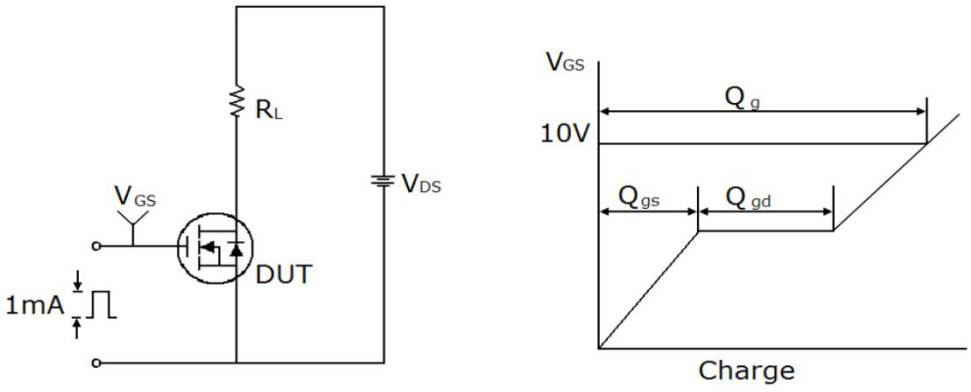


Figure 11.1 Transient Thermal Response Curve

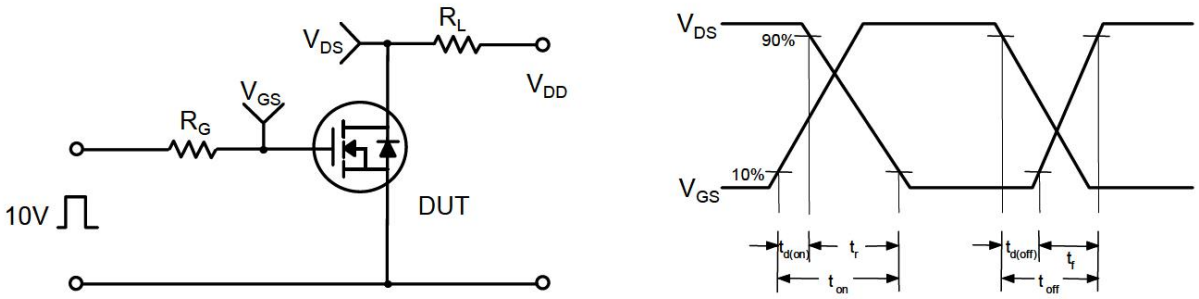
TO-263-2L/TO-262/TO-252/ TO-220F



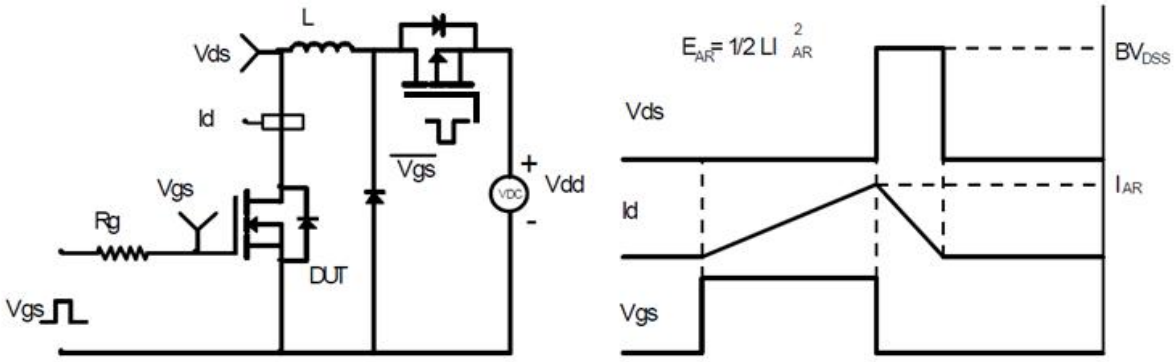
Gate Charge Test Circuit & Waveform



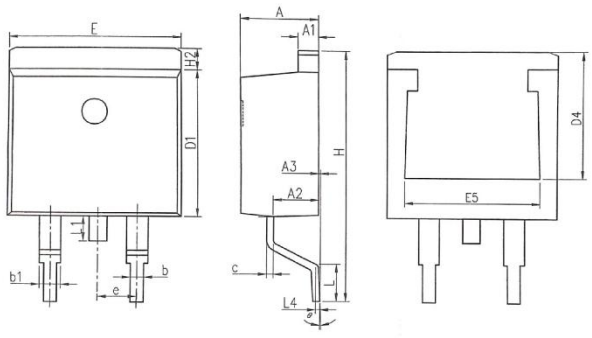
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

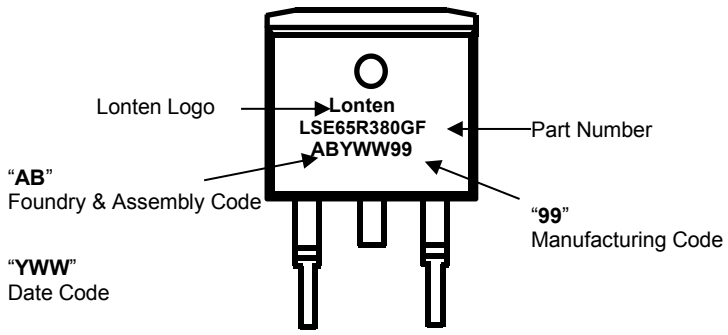


Mechanical Dimensions for TO-263

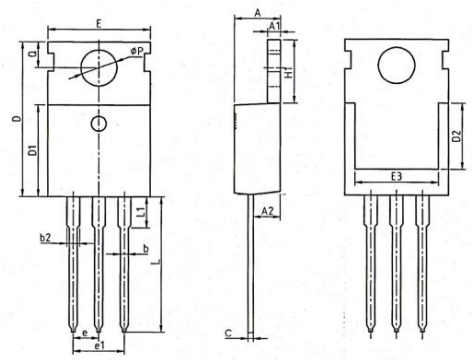


COMMON DIMENSIONS						
SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.37	4.57	4.77	0.172	0.180	0.188
A1	1.22	1.27	1.42	0.048	0.050	0.056
A2	2.49	2.89	2.89	0.098	0.114	0.114
A3	0.00	0.13	0.25	0.000	0.005	0.010
b	0.70	0.81	0.96	0.028	0.032	0.034
b1	1.17	1.27	1.47	0.046	0.050	0.058
c	0.30	0.38	0.53	0.012	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

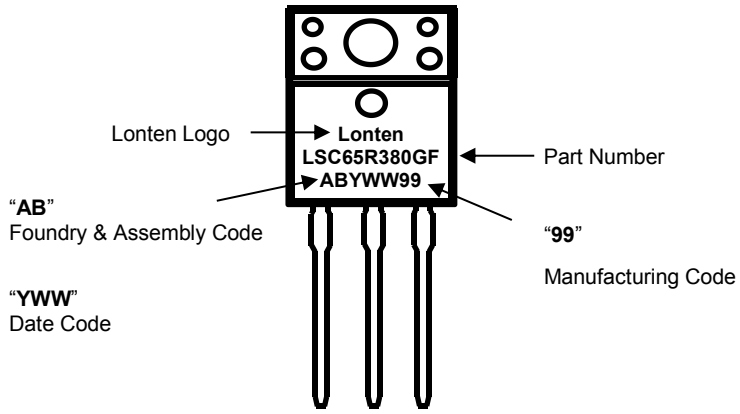


Mechanical Dimensions for TO-220F

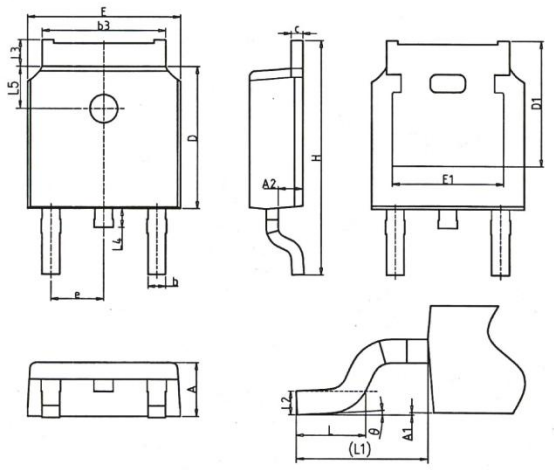


COMMON DIMENSIONS						
SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.37	4.57	4.70	0.172	0.180	0.185
A1	1.25	1.30	1.40	0.049	0.051	0.055
A2	2.20	2.40	2.60	0.087	0.094	0.102
b	0.70	0.80	0.95	0.028	0.031	0.037
b2	1.17	1.27	1.47	0.046	0.050	0.058
c	0.45	0.50	0.60	0.018	0.020	0.024
D	15.10	15.60	16.10	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-220F Part Marking Information

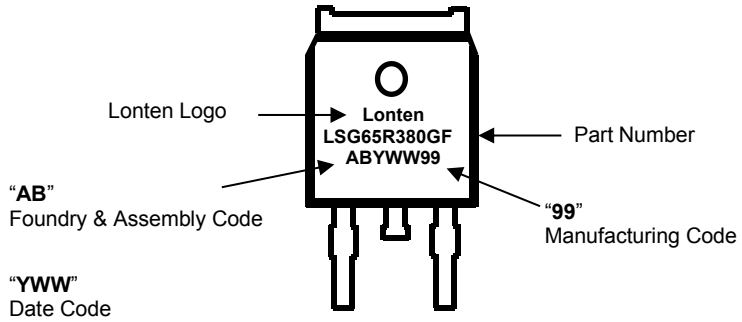


Mechanical Dimensions for TO-252

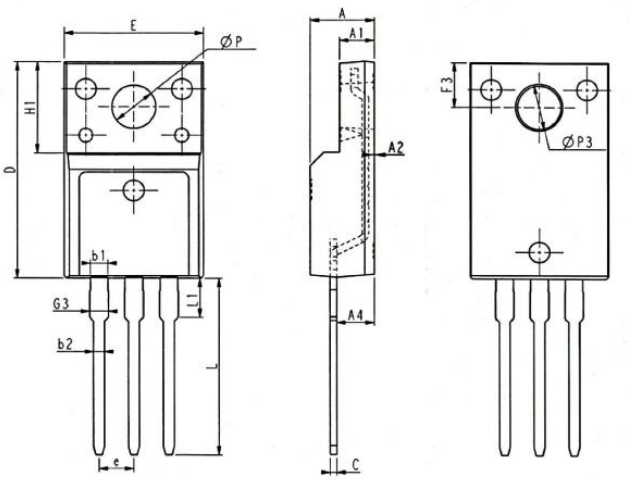


COMMON DIMENSIONS			
SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0.00	—	0.20
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b3	5.20	5.33	5.46
c	0.43	0.53	0.61
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.73
E1	4.63	—	—
e	2.286BSC		
H	9.40	10.10	10.50
L	1.38	1.50	1.75
L1	2.90REF		
L2	0.51BSC		
L3	0.88	—	1.28
L4	0.50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

TO-252 Part Marking Information

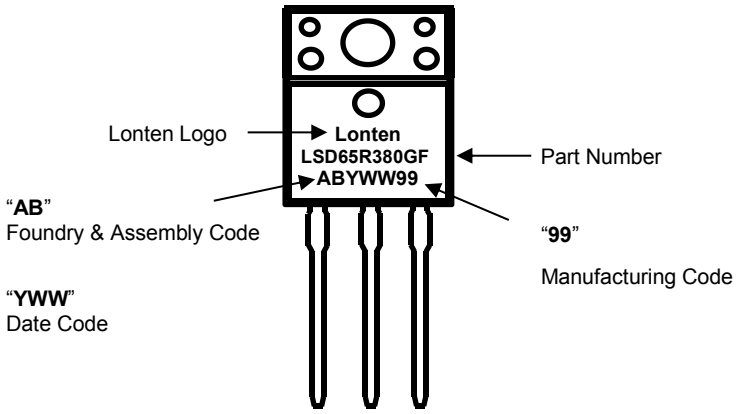


Mechanical Dimensions for TO-220MF

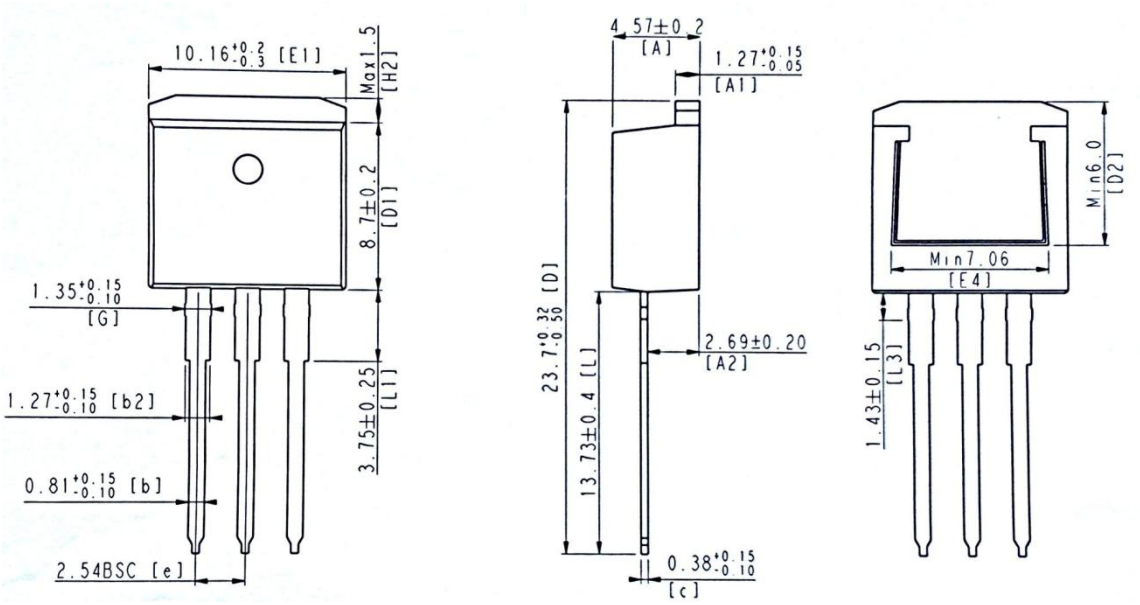


COMMON DIMENSIONS						
SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
E	9.96	10.16	10.36	0.392	0.400	0.408
A	4.50	4.70	4.90	0.177	0.185	0.193
A1	2.34	2.54	2.74	0.092	0.100	0.108
A2	0.30	0.45	0.60	0.012	0.002	0.024
A4	2.65	2.76	2.96	0.104	0.109	0.117
C	0.40	0.50	0.65	0.016	0.020	0.026
D	15.57	15.87	16.17	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

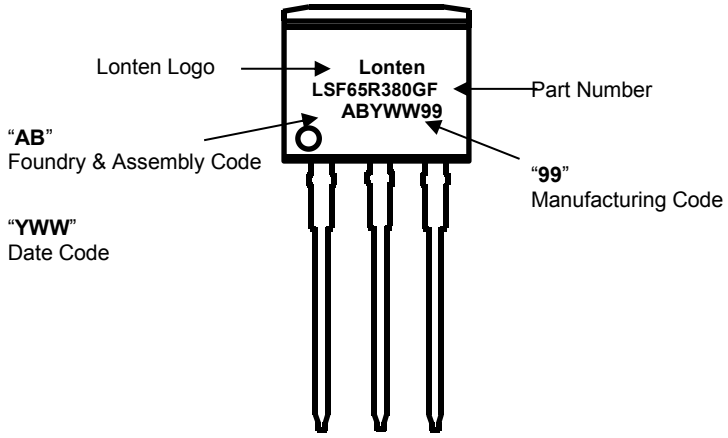
TO-220MF Part Marking Information



Mechanical Dimensions for TO-262



TO-262 Part Marking Information



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Jun. 2018 Revision 2.0

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