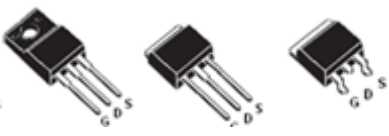
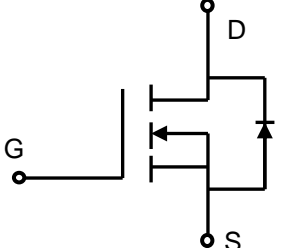



Lonten N-channel 650V, 4A, 950mΩ LonFET™ Power MOSFET

<p>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.</p> <p>Features</p> <ul style="list-style-type: none"> ◆ Ultra low $R_{DS(on)}$ ◆ Ultra low gate charge (typ. $Q_g = 7.6nC$) ◆ 100% UIS tested ◆ RoHS compliant <p>Applications</p> <ul style="list-style-type: none"> ◆ Power factor correction (PFC). ◆ Switched mode power supplies (SMPS). ◆ Uninterruptible power supply (UPS). 	<p>Product Summary</p> <table> <tr> <td>$V_{DS} @ T_{j,max}$</td> <td>700V</td> </tr> <tr> <td>$R_{DS(on),max}$</td> <td>950mΩ</td> </tr> <tr> <td>I_{DM}</td> <td>12A</td> </tr> <tr> <td>$Q_{g,typ}$</td> <td>7.6nC</td> </tr> </table>  <p style="text-align: center;">TO-220FT TO-251 TO-252</p>  <p style="text-align: center;">N-Channel MOSFET</p> <div style="text-align: right;">  </div>	$V_{DS} @ T_{j,max}$	700V	$R_{DS(on),max}$	950mΩ	I_{DM}	12A	$Q_{g,typ}$	7.6nC
$V_{DS} @ T_{j,max}$	700V								
$R_{DS(on),max}$	950mΩ								
I_{DM}	12A								
$Q_{g,typ}$	7.6nC								

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	650	V
Continuous drain current ($T_C = 25^\circ C$)	I_D	4	A
($T_C = 100^\circ C$)		2.5	A
Pulsed drain current ¹⁾	I_{DM}	12	A
Gate-Source voltage	V_{GSS}	± 30	V
Avalanche energy, single pulse ²⁾	E_{AS}	120	mJ
Avalanche energy, repetitive ³⁾	E_{AR} , repetitive	0.6	mJ
Avalanche current, repetitive ³⁾	I_{AR} , repetitive	4	A
Power Dissipation TO-220FT ($T_C = 25^\circ C$) - Derate above 25°C	P_D	25	W
		0.20	W/°C
Power Dissipation TO-251/ TO-252 ($T_C = 25^\circ C$) - Derate above 25°C		40	W
		0.32	W/°C
Mounting torque To-220FT (M2.5 screws)		50	Ncm
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C
Continuous diode forward current	I_S	4	A
Diode pulse current	$I_{S,pulse}$	12	A

Thermal Characteristics TO-251/TO-252

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	3.13	$^{\circ}C/W$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	160	$^{\circ}C/W$
Soldering temperature, wavesoldering only allowed at leads. (1.6mm from case for 10s)	T_{sold}	260	$^{\circ}C$

Thermal Characteristics TO-220FT

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	5.0	$^{\circ}C/W$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	105	$^{\circ}C/W$
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
LSDN65R950HT	TO-220FT	LSDN65R950HT	50	
LSG65R950HT	TO-252	LSG65R950HT	72	2500
LSH65R950HT	TO-251	LSH65R950HT	72	4680

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

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static characteristics						
Drain-source breakdown voltage	BV_{DSS}	$V_{GS}=0V, I_D=0.25mA$	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}	$V_{DS}=650V, V_{GS}=0V,$ $T_j = 25^{\circ}C$ $T_j = 125^{\circ}C$	-	-	1	μA
Gate leakage current, Forward	I_{GSSF}	$V_{GS}=30V, V_{DS}=0V$	-	-	100	nA
Gate leakage current, Reverse	I_{GSSR}	$V_{GS}=-30V, V_{DS}=0V$	-	-	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=2A$ $T_j = 25^{\circ}C$ $T_j = 150^{\circ}C$	-	0.86	0.95	Ω
Gate resistance	R_G	$f=1MHz, open\ drain$	-	8	-	Ω
Dynamic characteristics						
Input capacitance	C_{iss}	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1MHz$	-	305	-	pF
Output capacitance	C_{oss}		-	89	-	
Reverse transfer capacitance	C_{rss}		-	0.5	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 400V, I_D = 2A$ $R_G = 10\Omega, V_{GS}=15V$	-	16.1	-	ns
Rise time	t_r		-	27	-	
Turn-off delay time	$t_{d(off)}$		-	46	-	
Fall time	t_f		-	36.4	-	
Gate charge characteristics						

Gate to source charge	Q_{gs}	$V_{DD}=480\text{ V}$, $I_D=2\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$	-	2.5	-	nC
Gate to drain charge	Q_{gd}		-	2.6	-	
Gate charge total	Q_g		-	7.6	-	
	$V_{plateau}$		-	6	-	V
Reverse diode characteristics						
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}$, $I_F=2\text{ A}$	-	1.0	-	V
Reverse recovery time	t_{rr}	$V_R=480\text{ V}$, $I_F=2\text{ A}$, $dI_F/dt=100\text{ A}/\mu\text{s}$	-	153	-	ns
Reverse recovery charge	Q_{rr}		-	0.8	-	μC
Peak reverse recovery current	I_{rrm}		-	10.5	-	A

Notes:

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

Electrical Characteristics Diagrams

Figure 1. On-Region Characteristics

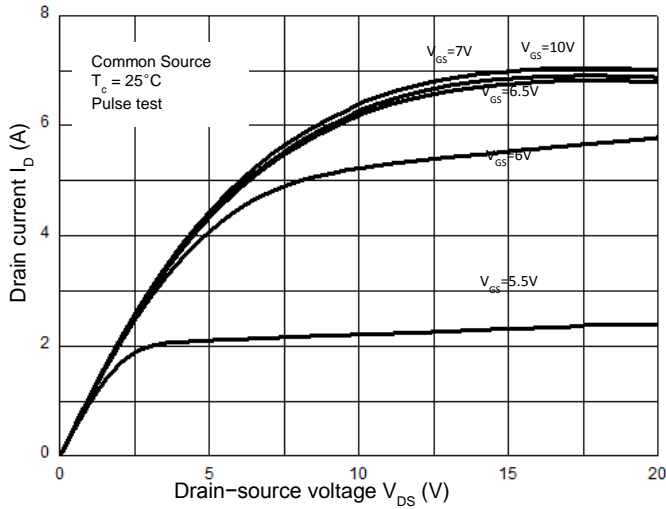


Figure 2. Transfer Characteristics

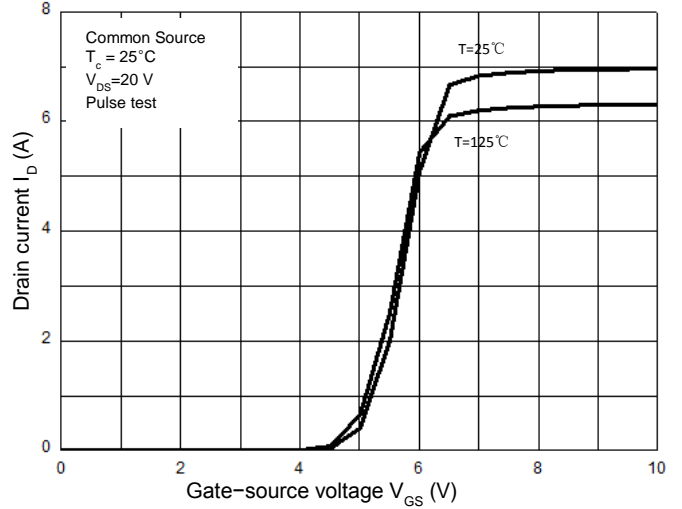


Figure 3. On-Resistance Variation vs. Drain Current

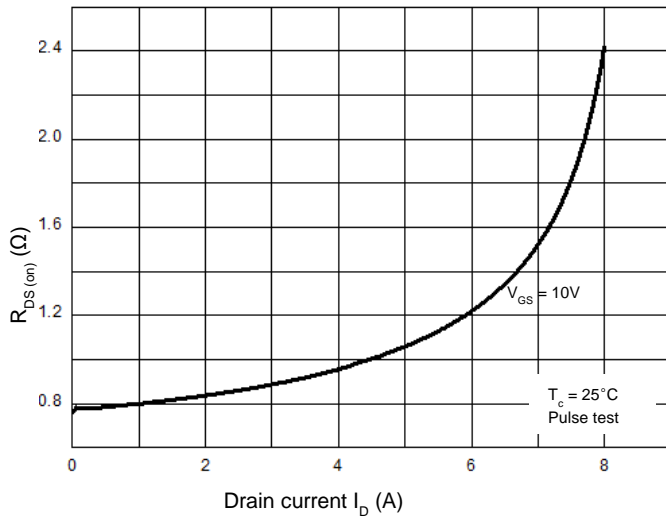


Figure 4. Threshold Voltage vs. Temperature

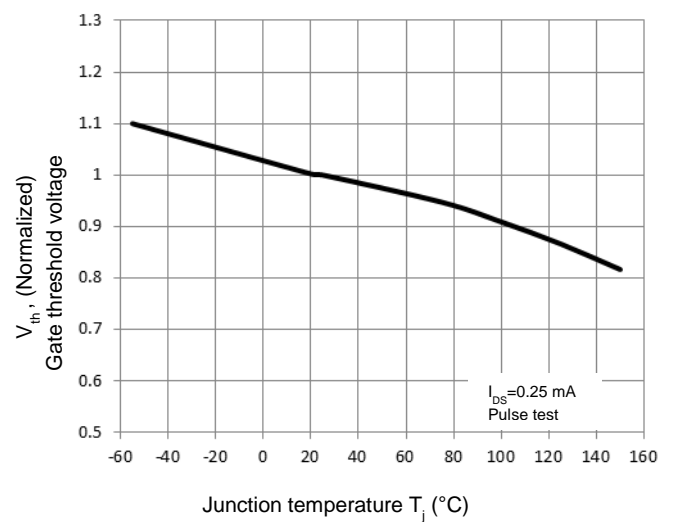


Figure 5. Breakdown Voltage vs. Temperature

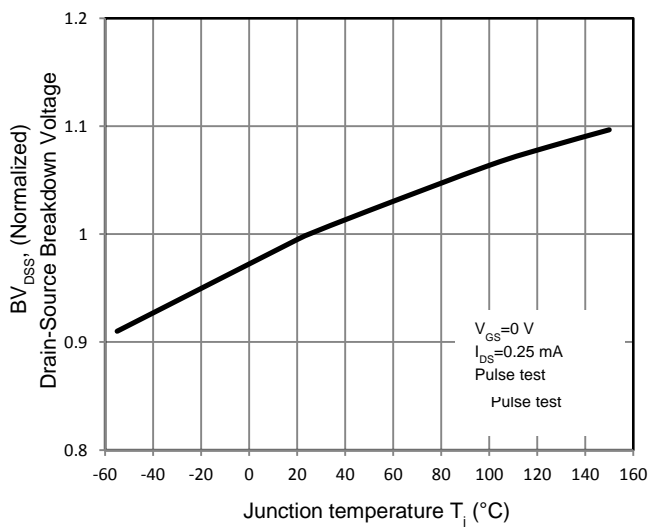


Figure 6. On-Resistance vs. Temperature

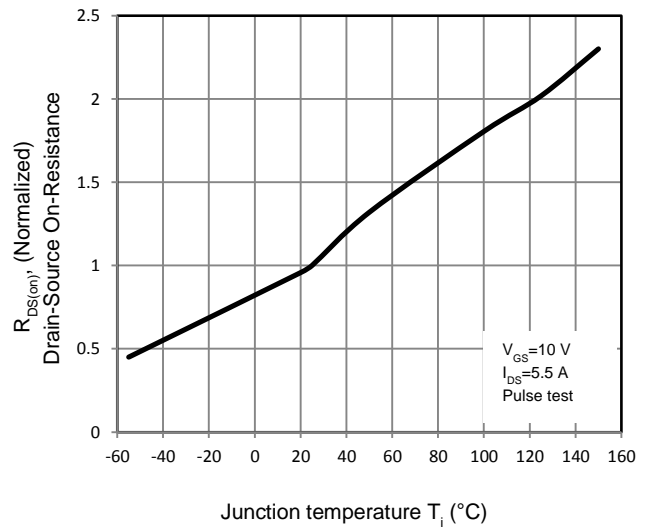


Figure 7. Capacitance Characteristics

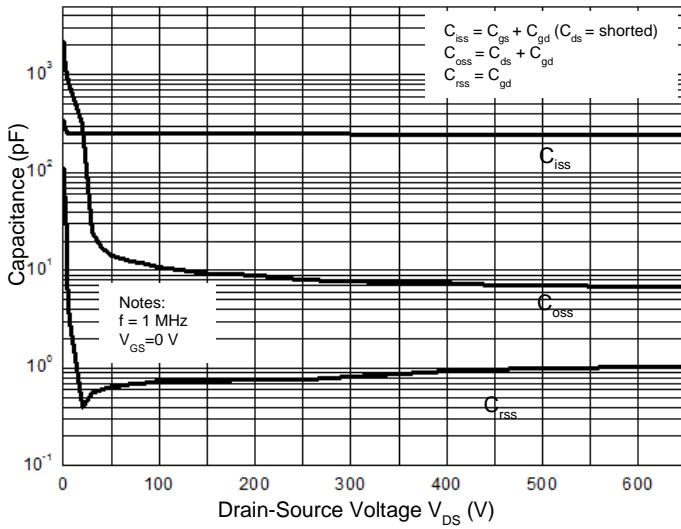


Figure 8. Gate Charge Characterist

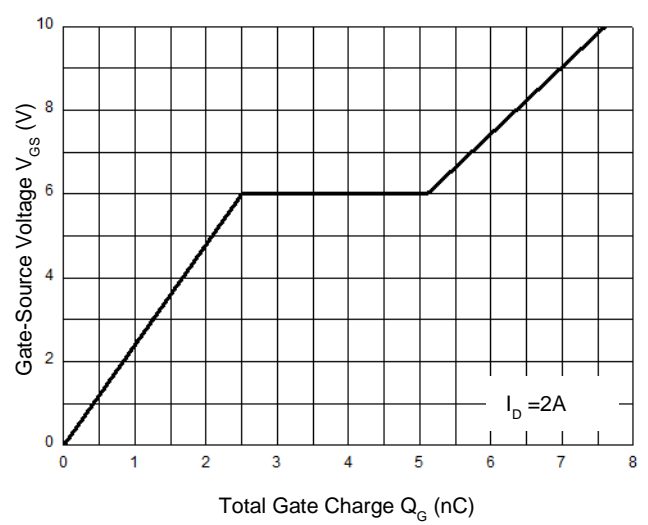


Figure 9.1 Maximum Safe Operating Area TO-220FT

TO-220FT

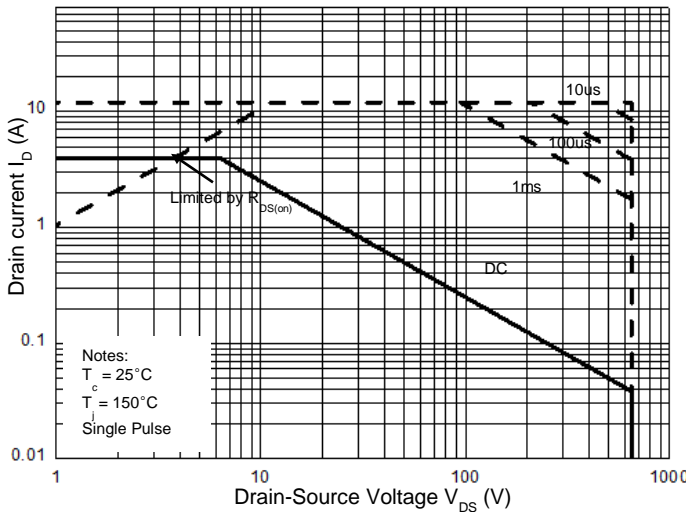


Figure 9.2 Maximum Safe Operating Area TO-251/TO-252

TO-251/TO-252

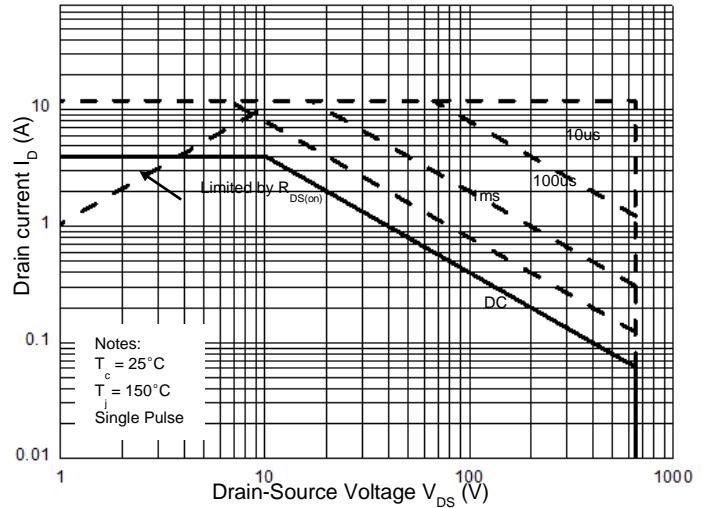


Figure 10.1 Power Dissipation vs. Temperature TO-220FT

TO-220FT

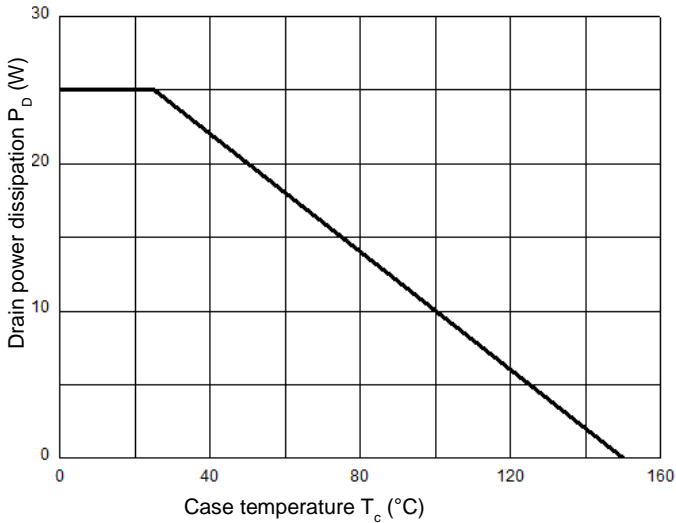
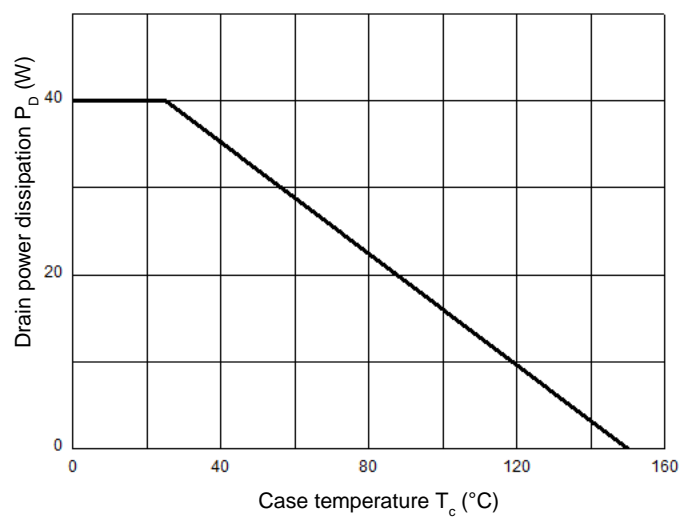
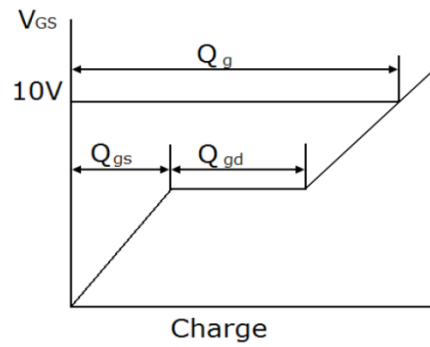
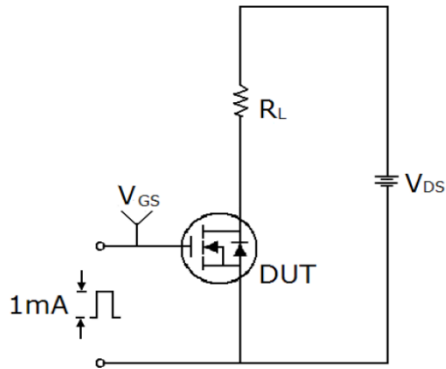


Figure 10.2 Power Dissipation vs. Temperature TO-251/TO-252

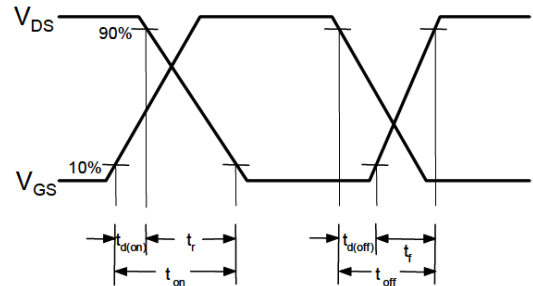
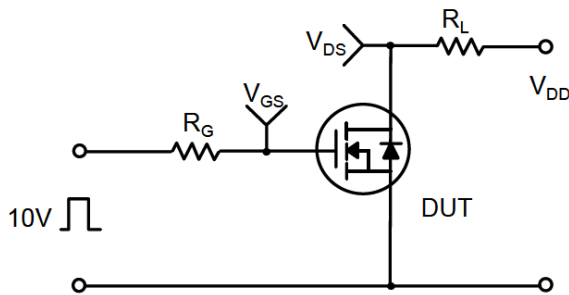
TO-251/TO-252



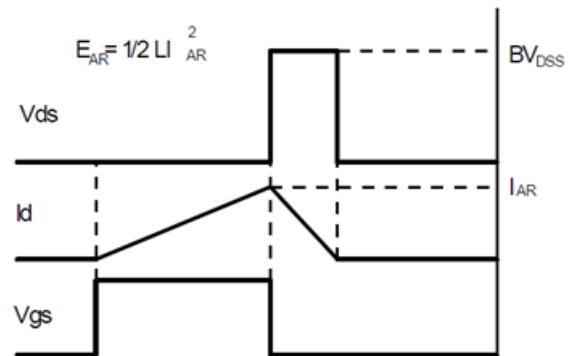
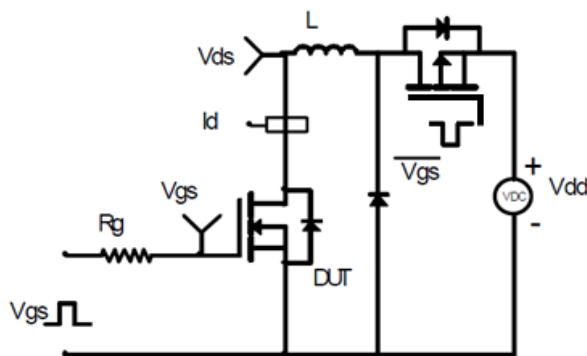
Gate Charge Test Circuit & Waveform



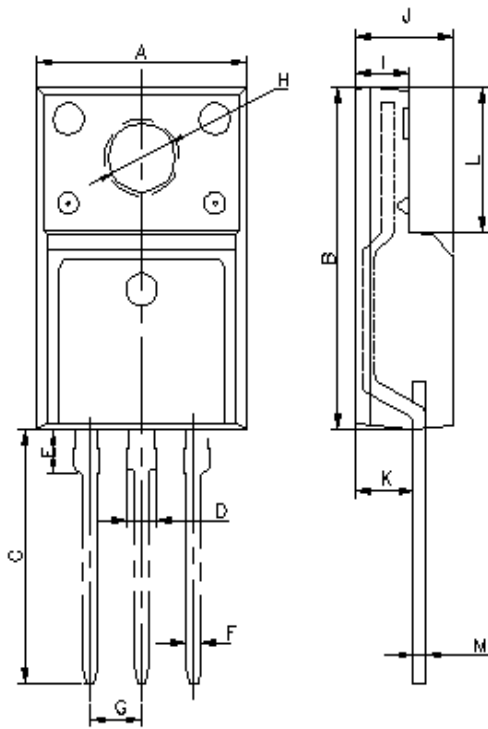
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

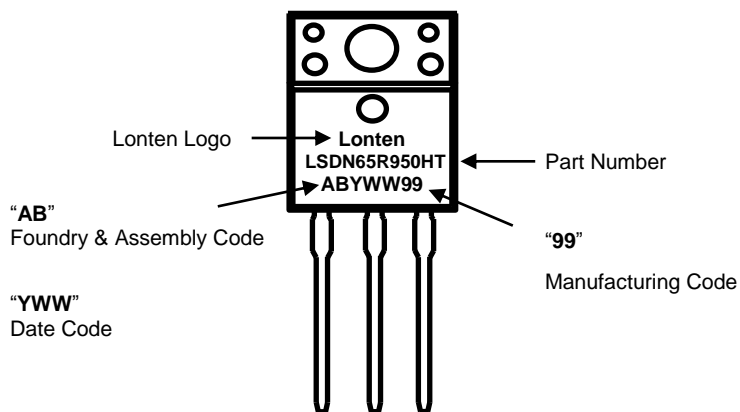


Mechanical Dimensions for TO-220FT

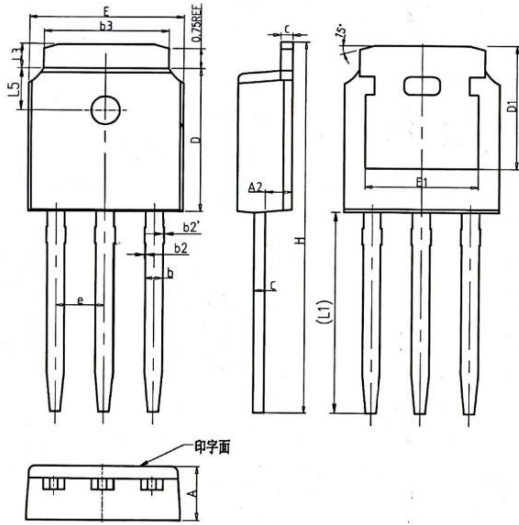


Dim.	mm		
	min.	typ.	max.
A	9.96	10.16	10.36
B	15.67	15.87	16.07
C	12.70	13.00	13.30
D	1.07	1.22	1.37
E	1.85	2.00	2.15
F	0.46	0.69	0.79
G		2.54	
H	3.08	3.18	3.28
I	2.34	2.54	2.74
J	4.50	4.70	4.90
K	2.61	2.76	2.91
L	6.50	6.70	6.90
M	0.40	0.50	0.60

TO-220FT Part Marking Information

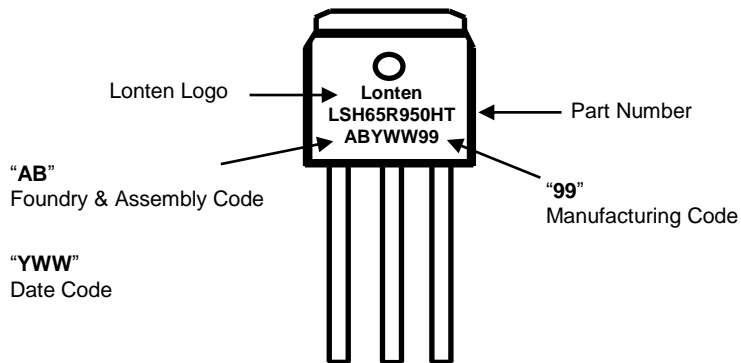


Mechanical Dimensions for TO-251

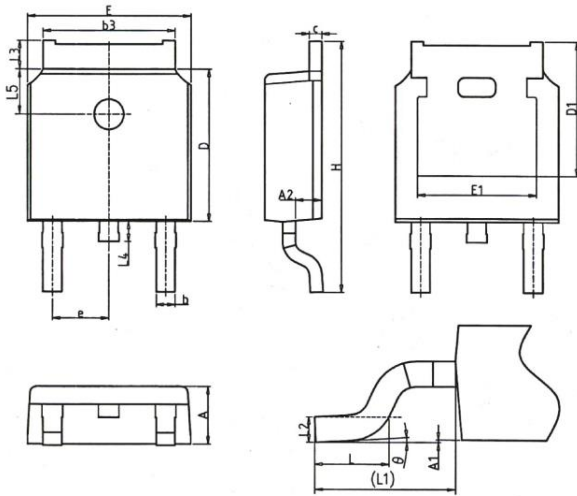


COMMON DIMENSIONS			
SYMBOL	MM		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b2	0.00	0.04	0.10
b2'	0.00	0.04	0.10
b3	5.20	5.33	5.46
c	0.43	0.53	0.61
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.73
E1	4.63	—	—
e	2.286BSC		
H	16.22	16.52	16.82
L1	9.15	9.40	9.65
L3	0.88	1.02	1.28
L5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

TO-251 Part Marking Information

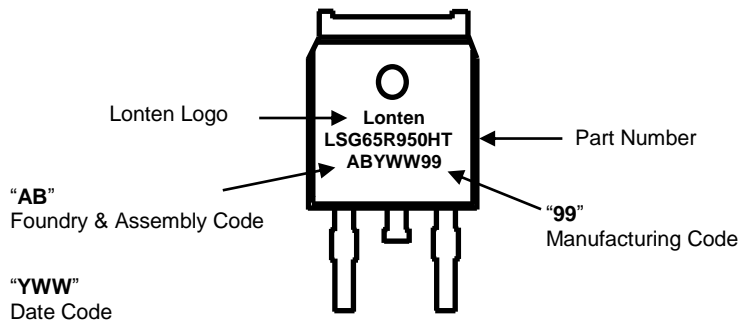


Mechanical Dimensions for TO-252



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



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Feb. 2019 Revision 2.0

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