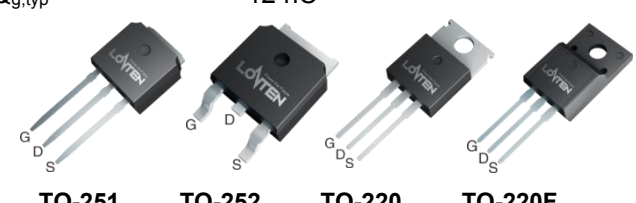




Lonten N-channel 650V, 4A Power MOSFET

<p>Description The Power MOSFET is fabricated using the advanced planar VDMOS technology. The resulting device has low conduction resistance, superior switching performance and high avalanche energy.</p> <p>Features</p> <ul style="list-style-type: none"> ◆ Low $R_{DS(on)}$ ◆ Low gate charge (typ. $Q_g = 12 \text{ nC}$) ◆ 100% UIS tested ◆ RoHS compliant <p>Applications</p> <ul style="list-style-type: none"> ◆ Power factor correction. ◆ Switched mode power supplies. ◆ LED driver. 	<p>Product Summary</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 30%;">V_{DSS}</td> <td>650V</td> </tr> <tr> <td>I_D</td> <td>4A</td> </tr> <tr> <td>$R_{DS(on),max}$</td> <td>2.70Ω</td> </tr> <tr> <td>$Q_{g,typ}$</td> <td>12 nC</td> </tr> </table> <div style="text-align: center; margin-top: 10px;">  <p style="display: flex; justify-content: space-around; font-weight: bold;"> TO-251 TO-252 TO-220 TO-220F </p>  <p style="text-align: center; font-weight: bold;">TO-262</p> <p style="text-align: center;">N-Channel MOSFET </p> </div>	V_{DSS}	650V	I_D	4A	$R_{DS(on),max}$	2.70 Ω	$Q_{g,typ}$	12 nC
V_{DSS}	650V								
I_D	4A								
$R_{DS(on),max}$	2.70 Ω								
$Q_{g,typ}$	12 nC								

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	650	V
Continuous drain current ($T_C = 25^\circ\text{C}$) ($T_C = 100^\circ\text{C}$)	I_D	4	A
		2.5	A
Pulsed drain current ¹⁾	I_{DM}	16	A
Gate-Source voltage	V_{GSS}	± 30	V
Avalanche energy, single pulse ²⁾	E_{AS}	198	mJ
Peak diode recovery dv/dt ³⁾	dv/dt	5	V/ns
Power Dissipation TO-220F ($T_C = 25^\circ\text{C}$) Derate above 25°C	P_D	32	W
		0.26	W/ $^\circ\text{C}$
Power Dissipation TO-220\ TO-251\ TO-252\ TO-262 ($T_C = 25^\circ\text{C}$) Derate above 25°C	P_D	77	W
		0.61	W/ $^\circ\text{C}$
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150	$^\circ\text{C}$
Continuous diode forward current	I_S	4	A
Diode pulse current	$I_{S,pulse}$	16	A

Thermal Characteristics

Parameter	Symbol	Value		Unit
		TO-220F	TO-220\TO-251\TO-252\TO-262	
Thermal resistance, Junction-to-case	$R_{\theta JC}$	3.8	1.62	$^\circ\text{C}/\text{W}$
Thermal resistance, Junction-to-ambient	$R_{\theta JA}$	62.5	110	$^\circ\text{C}/\text{W}$

Package Marking and Ordering Information

Device	Device Package	Marking	Units/Tube	Units/Reel
LNC4N65	TO-220	LNC4N65	50	
LND4N65	TO-220F	LND4N65	50	
LNG4N65	TO-252	LNG4N65		2500
LNH4N65	TO-251	LNH4N65	80	
LNF4N65	TO-262	LNF4N65	50	

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}	$V_{GS}=0\text{ V}, I_D=0.25\text{ mA}$	650	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=0.25\text{ mA}$	2	-	4	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	μA
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	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=2\text{ A}$	-	2.50	2.70	Ω
Dynamic characteristics						
Input capacitance	C_{iss}	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}$	-	600	-	pF
Output capacitance	C_{oss}		-	55	-	
Reverse transfer capacitance	C_{rss}		-	3.2	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 325\text{ V}, I_D = 4\text{ A}$ $R_G = 10\ \Omega, V_{GS}=15\text{ V}$	-	12	-	ns
Rise time	t_r		-	31	-	
Turn-off delay time	$t_{d(off)}$		-	42	-	
Fall time	t_f		-	15	-	
Gate charge characteristics						
Gate to source charge	Q_{gs}	$V_{DD}=520\text{ V}, I_D=4\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	3.2	-	nC
Gate to drain charge	Q_{gd}		-	5.1	-	
Gate charge total	Q_g		-	12	-	
Gate plateau voltage	$V_{plateau}$		-	6	-	V
Reverse diode characteristics						
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=4\text{ A}$	-	-	1.5	V
Reverse recovery time	t_{rr}	$V_R=400\text{ V}, I_F=4\text{ A},$ $di_F/dt=100\text{ A}/\mu\text{s}$	-	282	-	ns
Reverse recovery charge	Q_{rr}		-	1.4	-	μC
Peak reverse recovery current	I_{rrm}		-	10	-	A

Notes:

- Pulse width limited by maximum junction temperature.
- $L=10\text{mH}, I_{AS} = 6.3\text{A}$, Starting $T_j = 25^\circ\text{C}$.
- $I_{SD} = 4\text{A}, di/dt \leq 100\text{A}/\mu\text{s}, V_{DD} \leq BV_{DS}$, Starting $T_j = 25^\circ\text{C}$.

Electrical Characteristics Diagrams

Figure 1. Typical Output Characteristics

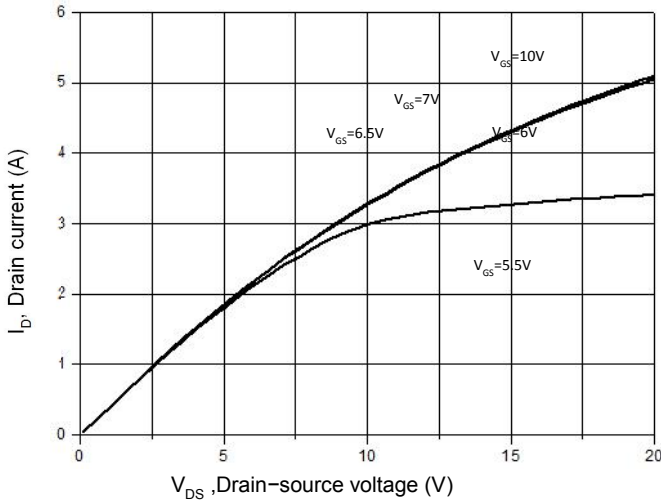


Figure 3. On-Resistance Variation vs. Drain Current

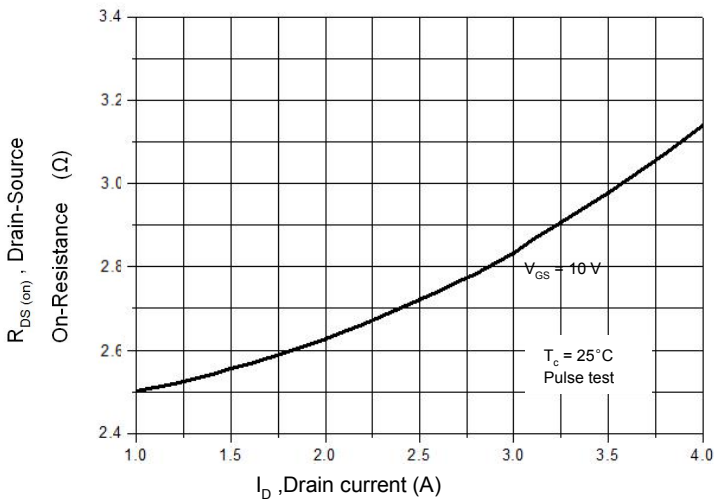


Figure 5. Breakdown Voltage vs. Temperature

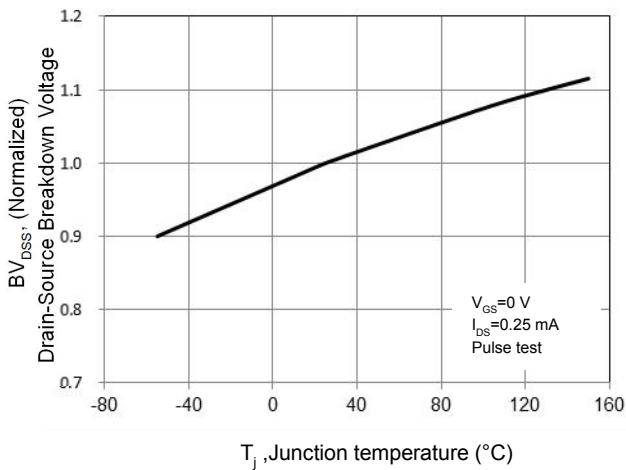


Figure 2. Transfer Characteristics

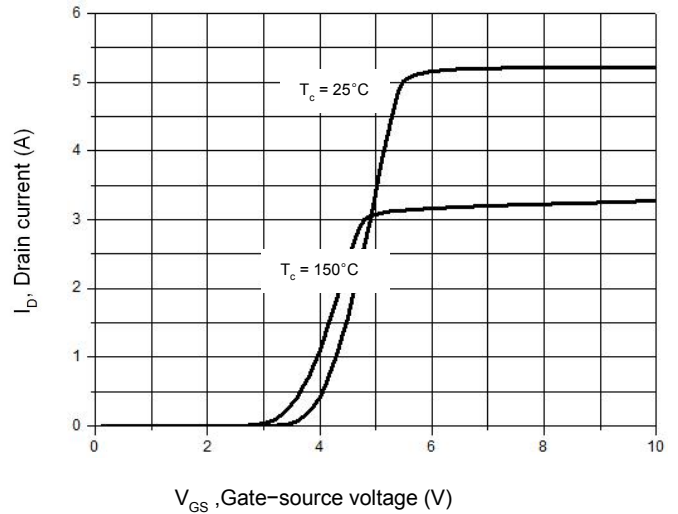


Figure 4. Threshold Voltage vs. Temperature

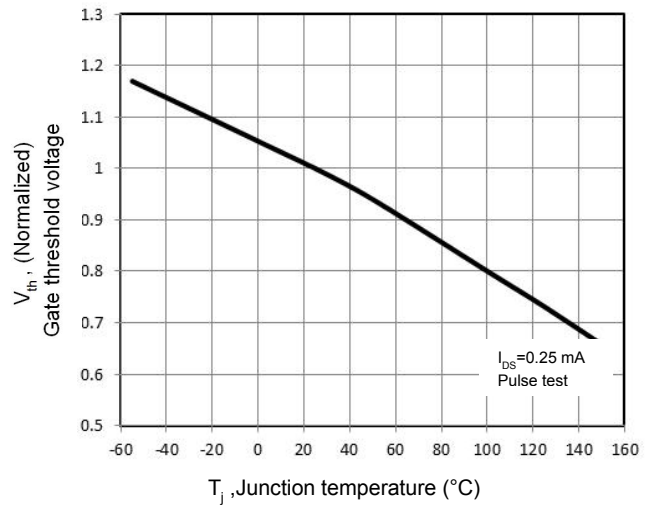


Figure 6. On-Resistance vs. Temperature

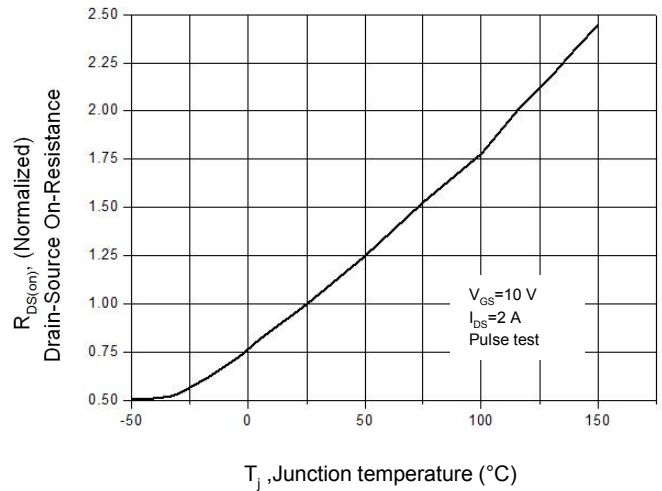


Figure 7. Capacitance Characteristics

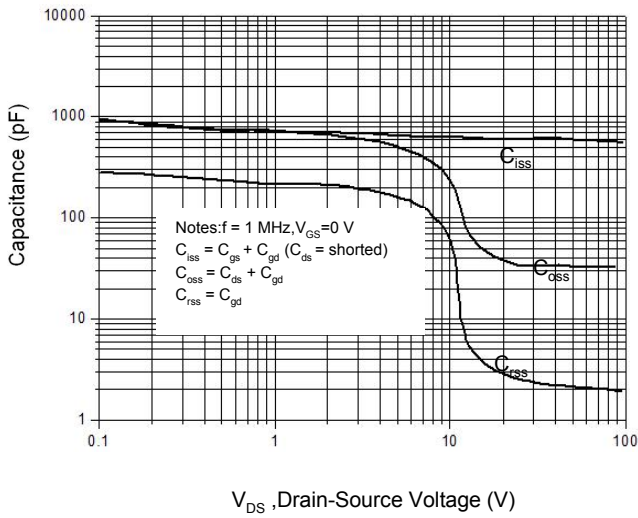


Figure 9. Maximum Safe Operating Area
TO-220F

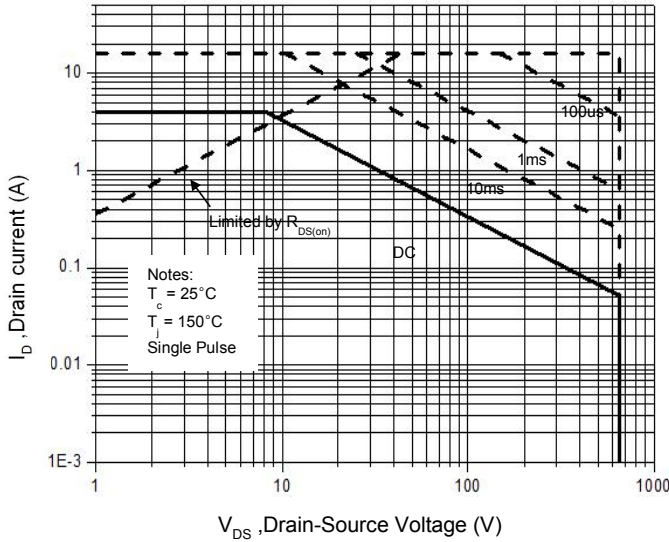


Figure 11. Power Dissipation vs. Temperature
TO-220F

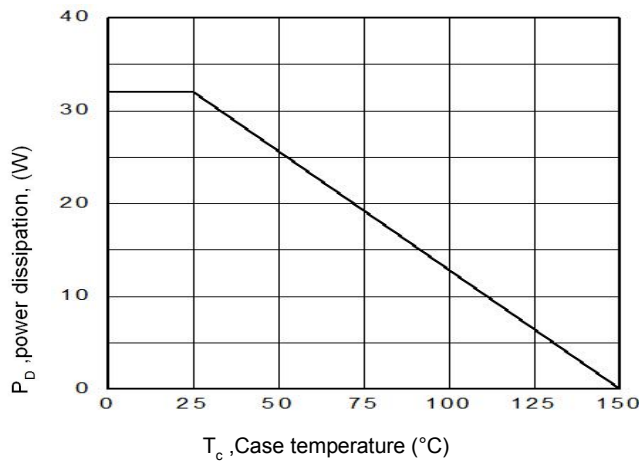


Figure 8. Gate Charge Characterist

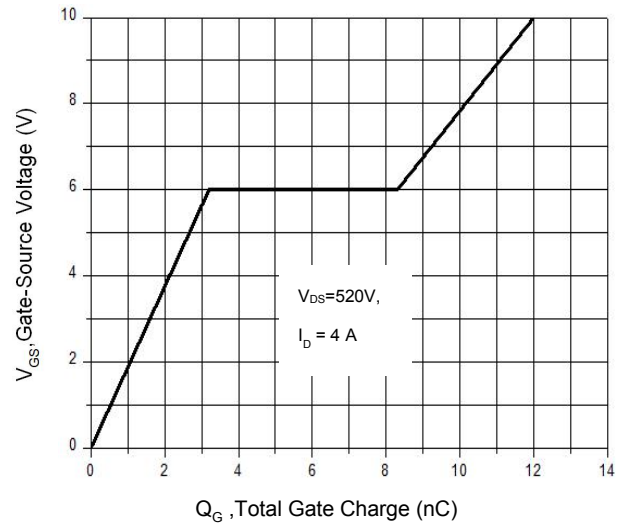


Figure 10. Maximum Safe Operating Area
TO-220/ TO-251/TO-252/TO-262

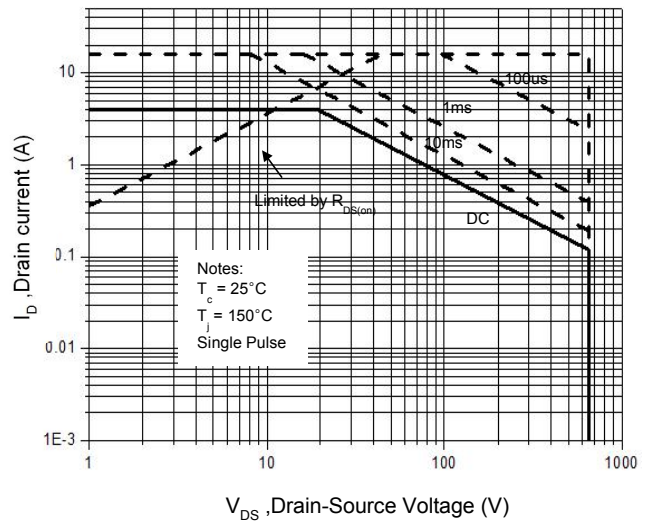


Figure 12. Power Dissipation vs. Temperature
TO-220/ TO-251/TO-252/TO-262

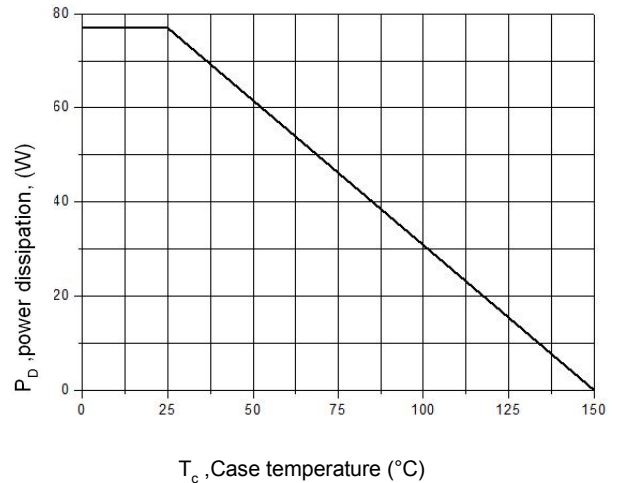


Figure 13. Continuous Drain Current vs. Temperature

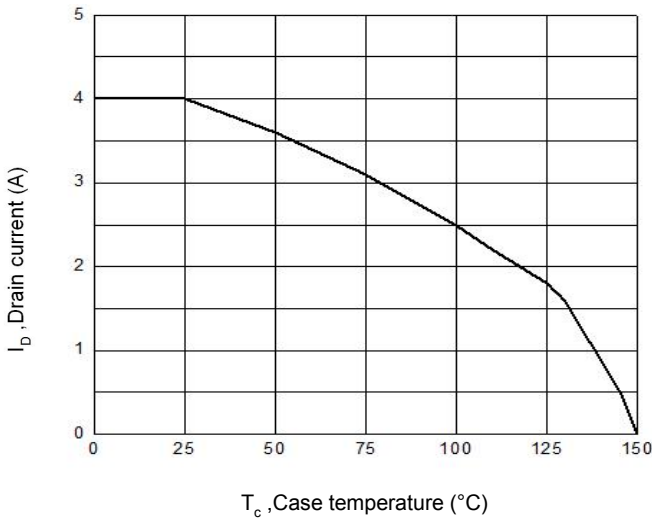


Figure 14. Body Diode Transfer Characteristics

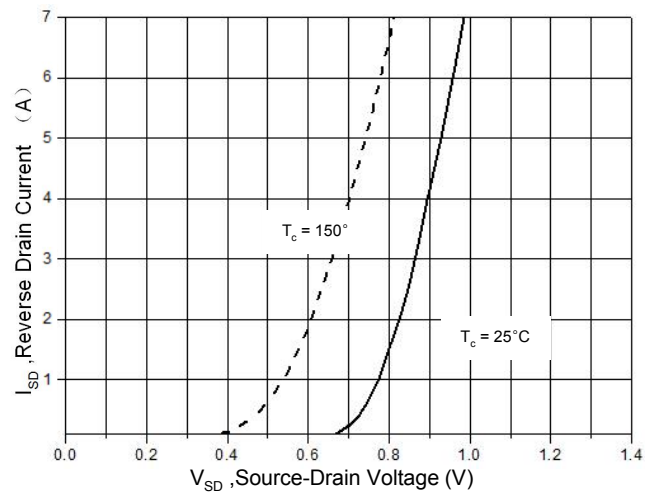


Figure 15 Transient Thermal Impedance, Junction to Case, TO-220F

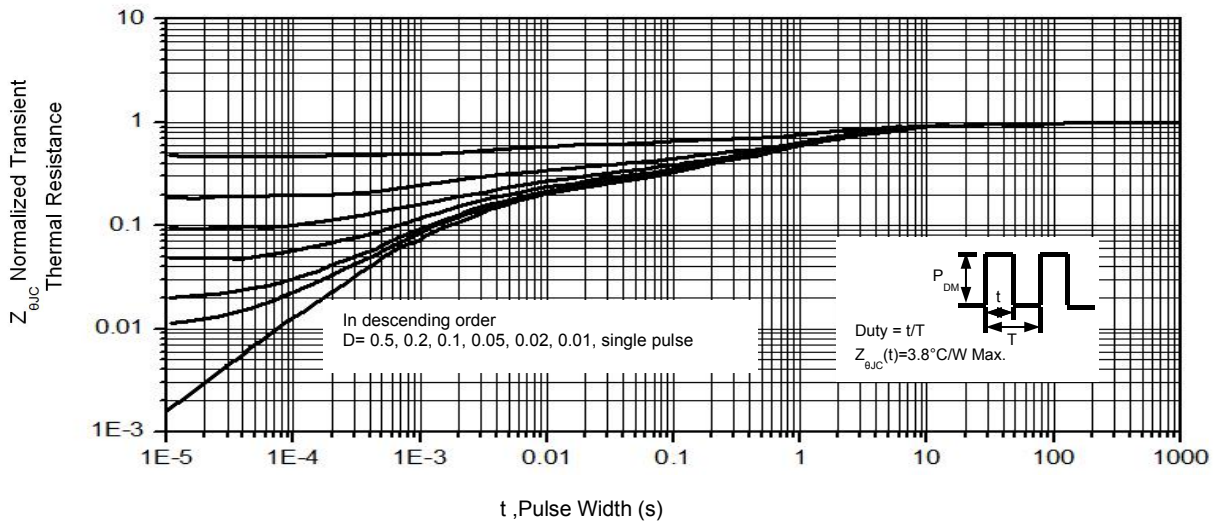
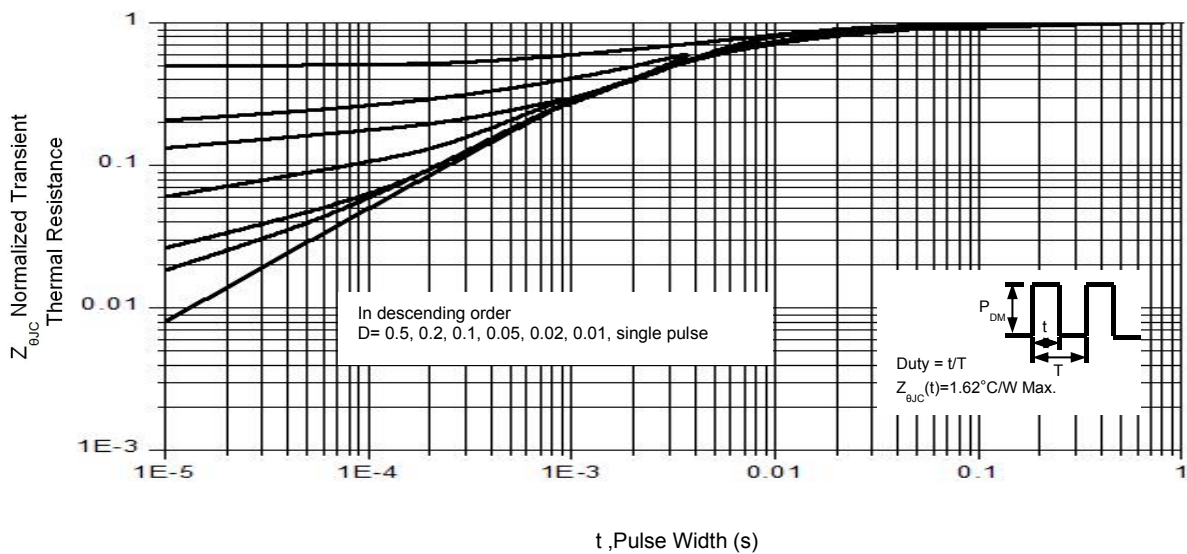
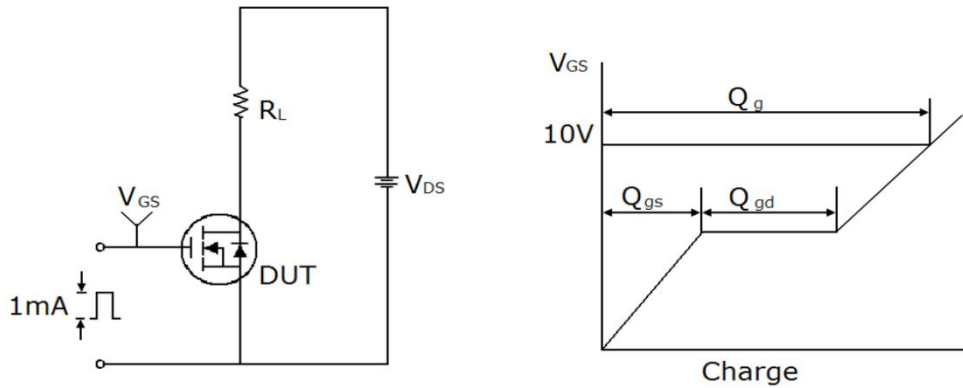


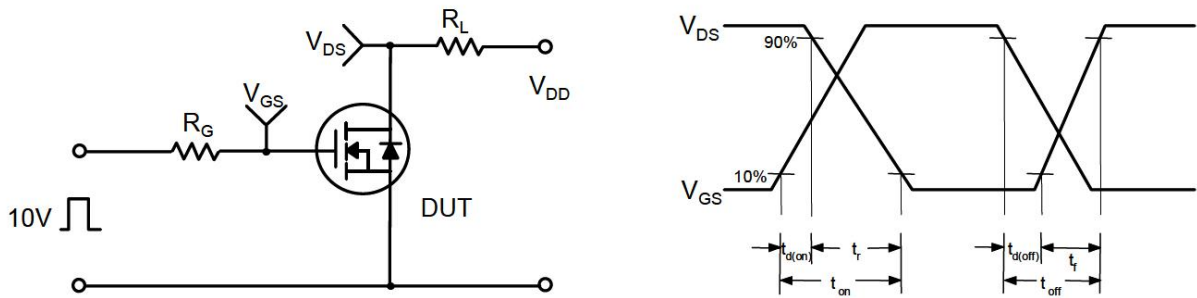
Figure 16. Transient Thermal Impedance, Junction to Case, TO-220/ TO-251/TO-252/TO-262



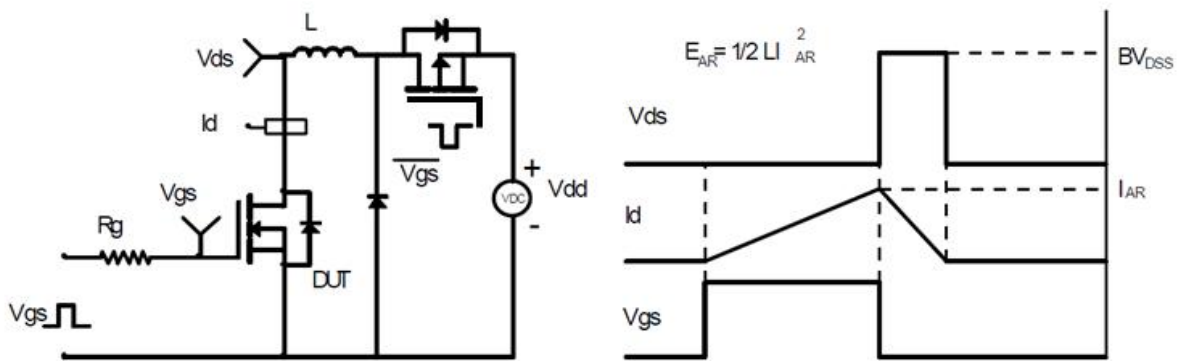
Gate Charge Test Circuit & Waveform



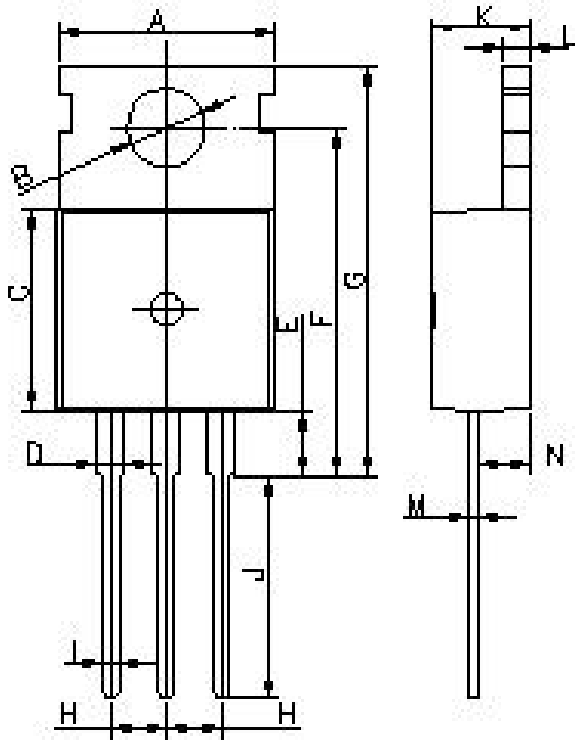
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

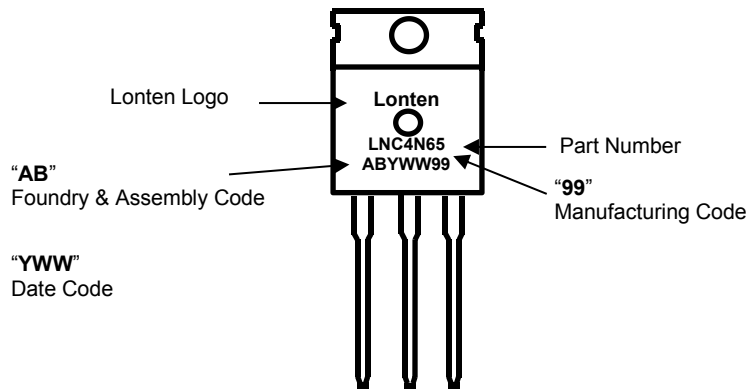


Mechanical Dimensions for TO-220

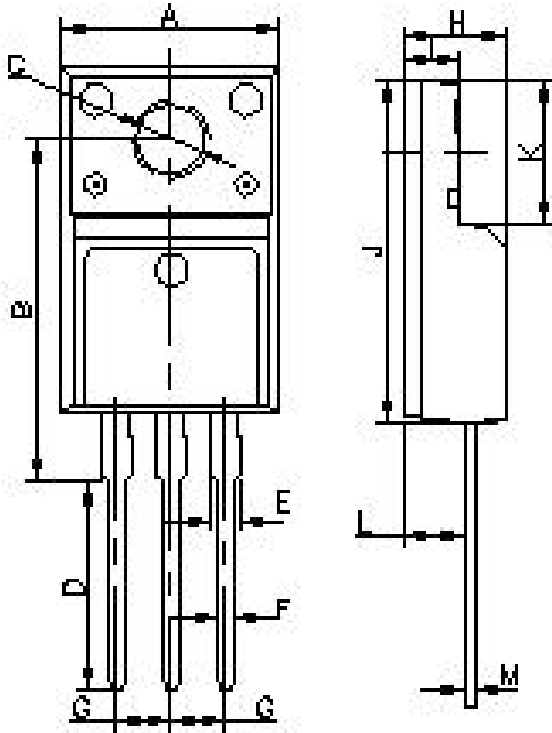


SYMBOL	COMMON DIMENSIONS		
	MIN	NOM	MAX
A	9.70	9.90	10.10
B	3.50	3.60	3.70
C	9.00	9.20	9.40
D	1.17	1.32	1.47
E	2.80	3.00	3.20
F	15.60	15.90	16.20
G			18.950
H	2.44	2.64	2.84
I	0.70	0.80	0.90
J	9.780	10.08	10.380
K	4.30	4.50	4.70
L	1.200	1.30	1.400
M	0.40	0.60	0.80
N	2.25	2.40	2.55

TO-220 Part Marking Information

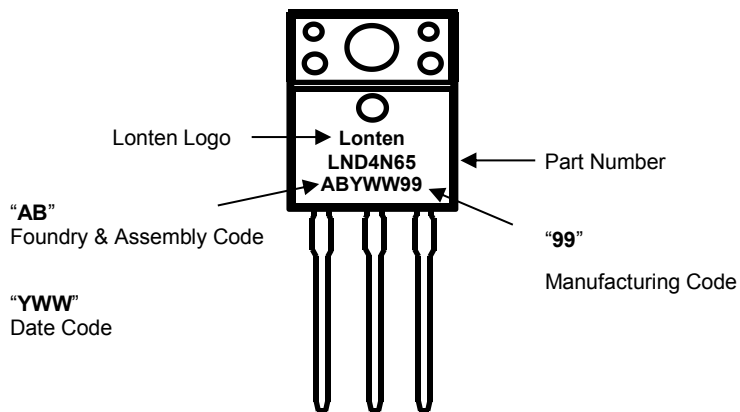


Mechanical Dimensions for TO-220F

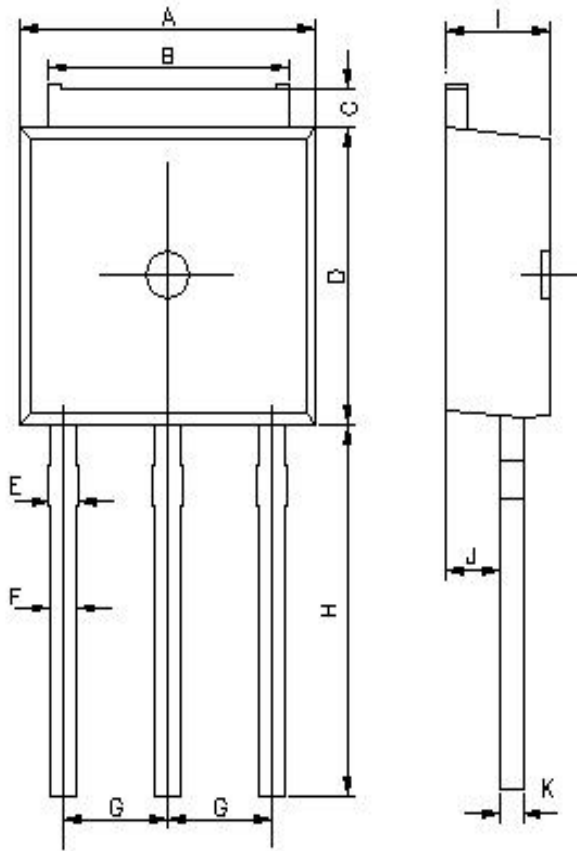


SYMBOL	COMMON DIMENSIONS		
	MIN	NOM	MAX
A	9.96	10.16	10.36
B	15.50	15.80	16.10
C	2.98	3.18	3.28
D	9.41	9.71	10.01
E	1.18	1.38	1.58
F	0.70	0.80	0.90
G	2.54BSC		
H	4.50	4.70	4.90
I	2.44	2.54	2.64
J	15.67	15.87	16.07
K	6.50	6.70	6.90
L	2.56	2.76	2.96
M	0.40	0.50	0.60

TO-220F Part Marking Information

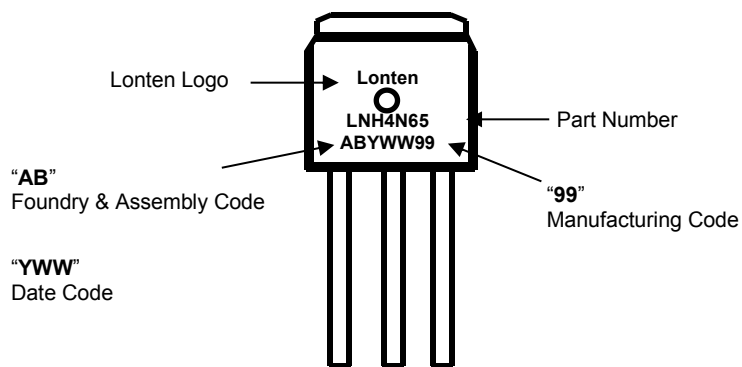


Mechanical Dimensions for TO-251

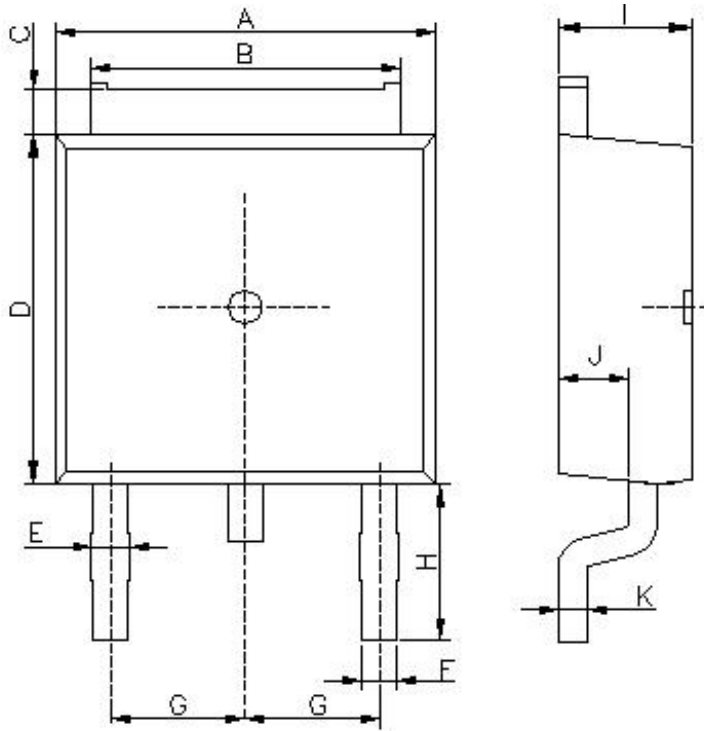


SYMBOL	COMMON DIMENSIONS		
	MIN	NOM	MAX
A	6.40	6.60	6.80
B	5.18	5.33	5.48
C	0.75	0.89	1.02
D	5.95	6.15	6.35
E	0.70	0.85	1.00
F	0.70	0.80	0.90
G	2.140	2.29	2.440
H	6.70	7.00	7.30
I	2.10	2.30	2.50
J	0.85	1.00	1.15
K	0.41	0.51	0.61

TO-251 Part Marking Information

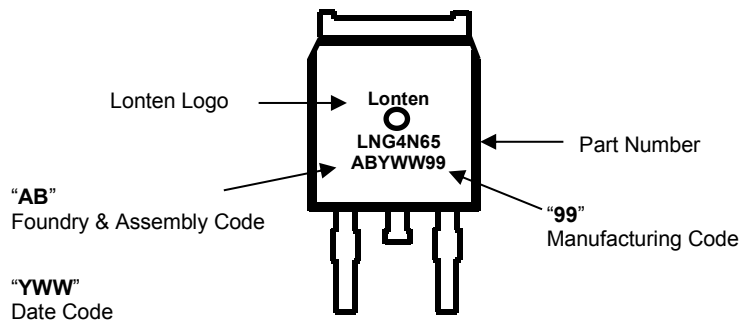


Mechanical Dimensions for TO-252

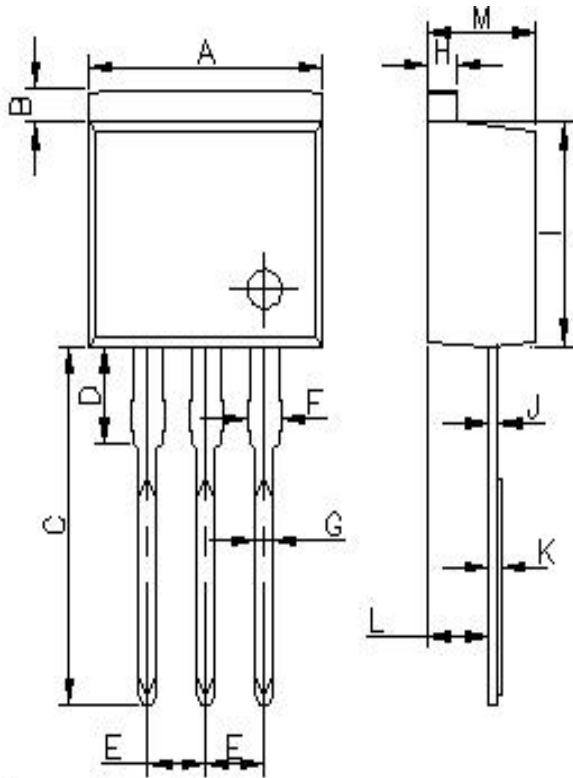


SYMBOL	COMMON DIMENSIONS		
	MIN	NOM	MAX
A	6.40	6.60	6.80
B	5.18	5.33	5.48
C	0.72	0.87	1.02
D	5.95	6.15	6.35
E	0.75	0.90	1.05
F	0.70	0.80	0.90
G	2.14	2.29	2.44
H	2.40	2.70	3.00
I	2.10	2.30	2.50
J	0.85	1.00	1.15
K	0.41	0.51	0.61

TO-252 Part Marking Information

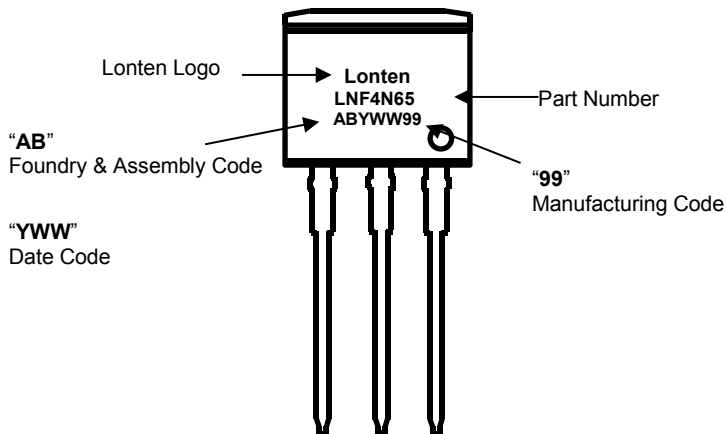


Mechanical Dimensions for TO-262



SYMBOL	COMMON DIMENSIONS		
	MIN	NOM	MAX
A	10.00	10.20	10.40
B	1.11	1.26	1.41
C	13.66	13.86	14.16
D	3.58	3.78	3.98
E	2.54 BSC		
F	1.07	1.27	1.47
G	0.613	0.813	0.713
H	1.17	1.27	1.37
I	8.45	8.65	8.85
J	0.281	0.381	0.481
K	0.32	0.42	0.52
L	2.542	2.692	2.842
M	4.50	4.70	4.90

TO-262 Part Marking Information



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