

Lonten N-channel 650V, 2A Power MOSFET

<p>Description The Power MOSFET is fabricated using the advanced planer 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. $Q_g = 10.2$ 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="padding: 2px;">V_{DSS}</td> <td style="padding: 2px;">650V</td> </tr> <tr> <td style="padding: 2px;">I_D</td> <td style="padding: 2px;">2A</td> </tr> <tr> <td style="padding: 2px;">$R_{DS(on),max}$</td> <td style="padding: 2px;">5.2Ω</td> </tr> <tr> <td style="padding: 2px;">$Q_{g,typ}$</td> <td style="padding: 2px;">10.2 nC</td> </tr> </table> <div style="text-align: center; margin-top: 10px;"> <p style="margin-top: 10px;">TO-220 TO-220F TO-252 TO-251</p> <p style="margin-top: 10px;">TO-126 TO-126F</p> <p style="margin-top: 10px; text-align: right;">N-Channel MOSFET </p> </div>	V_{DSS}	650V	I_D	2A	$R_{DS(on),max}$	5.2 Ω	$Q_{g,typ}$	10.2 nC
V_{DSS}	650V								
I_D	2A								
$R_{DS(on),max}$	5.2 Ω								
$Q_{g,typ}$	10.2 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	2	A
		1.3	A
Pulsed drain current ¹⁾	I_{DM}	8	A
Gate-Source voltage	V_{GSS}	± 30	V
Avalanche energy, single pulse ²⁾	E_{AS}	80	mJ
Peak diode recovery dv/dt ³⁾	dv/dt	5	V/ns
Power Dissipation TO-220F\TO-126 ($T_C = 25^\circ\text{C}$) Derate above 25°C	P_D	27	W
		0.22	W/ $^\circ\text{C}$
Power Dissipation TO-220\ TO-251\ TO-252 ($T_C = 25^\circ\text{C}$) Derate above 25°C	P_D	35	W
		0.28	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	2	A
Diode pulse current	$I_{S,pulse}$	8	A

Thermal Characteristics

Parameter	Symbol	Value		Unit
		TO-220F\TO-126	TO-220\TO-251\TO-252	
Thermal resistance, Junction-to-case	$R_{\theta JC}$	4.63	3.57	$^\circ\text{C}/\text{W}$
Thermal resistance, Junction-to-ambient	$R_{\theta JA}$	100	62	$^\circ\text{C}/\text{W}$

Package Marking and Ordering Information

Device	Device Package	Marking	Units/Tube	Units/Reel
LNC2N65	TO-220	LNC2N65	50	
LND2N65	TO-220F	LND2N65	50	
LNG2N65	TO-252	LNG2N65		2500
LNH2N65	TO-251	LNH2N65	72	
LNU2N65	TO-126	LNU2N65	50	
LNV2N65	TO-126F	LNV2N65	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	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=1\text{ A}$	-	4.2	5.2	Ω
Dynamic characteristics						
Input capacitance	C_{iss}	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$	-	338	-	pF
Output capacitance	C_{oss}	$f = 1\text{ MHz}$	-	36	-	
Reverse transfer capacitance	C_{rss}		-	3.4	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 325\text{ V}, I_D = 2\text{ A}$	-	17.2	-	ns
Rise time	t_r	$R_G = 10\ \Omega, V_{GS}=15\text{ V}$	-	35.6	-	
Turn-off delay time	$t_{d(off)}$		-	33.9	-	
Fall time	t_f		-	29	-	
Gate charge characteristics						
Gate to source charge	Q_{gs}	$V_{DD}=520\text{ V}, I_D=2\text{ A},$	-	2.6	-	nC
Gate to drain charge	Q_{gd}	$V_{GS}=0\text{ to }10\text{ V}$	-	4.7	-	
Gate charge total	Q_g		-	10.2	-	
Gate plateau voltage	$V_{plateau}$		-	5	-	V
Reverse diode characteristics						
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=2\text{ A}$	-	-	1.5	V
Reverse recovery time	t_{rr}	$V_R=400\text{ V}, I_F=2\text{ A},$	-	221.8	-	ns
Reverse recovery charge	Q_{rr}	$di_F/dt=100\text{ A}/\mu\text{s}$	-	0.75	-	μC
Peak reverse recovery current	I_{rrm}		-	7.4	-	A

Notes:

- Pulse width limited by maximum junction temperature.
- $L=10\text{mH}, I_{AS} = 4\text{A},$ Starting $T_j=25^\circ\text{C}.$
- $I_{SD} = 2\text{A}, di/dt \leq 100\text{A}/\mu\text{s}, V_{DD} \leq BV_{DS},$ Starting $T_j=25^\circ\text{C}.$

Electrical Characteristics Diagrams

Figure 1. Typical Output Characteristics

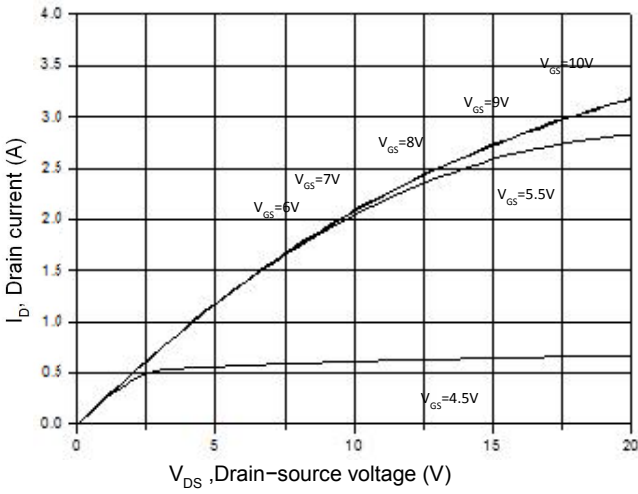


Figure 2. Transfer Characteristics

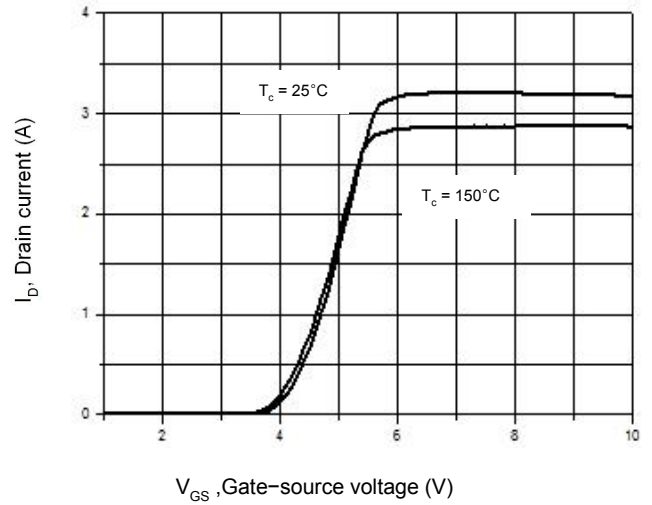


Figure 3. On-Resistance Variation vs. Drain Current

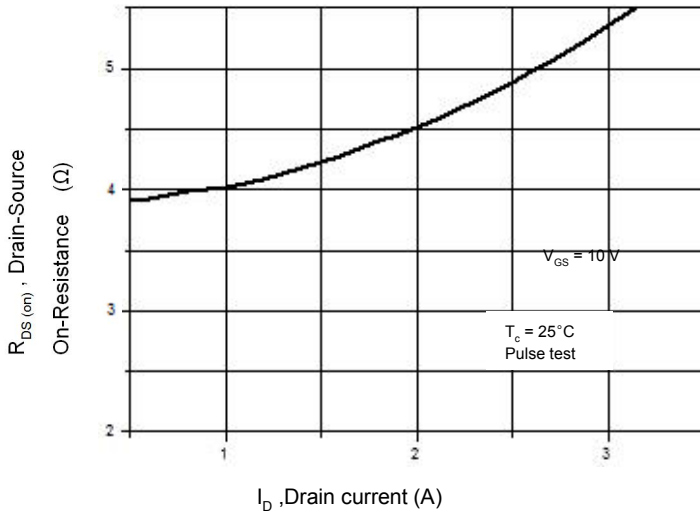


Figure 4. Threshold Voltage vs. Temperature

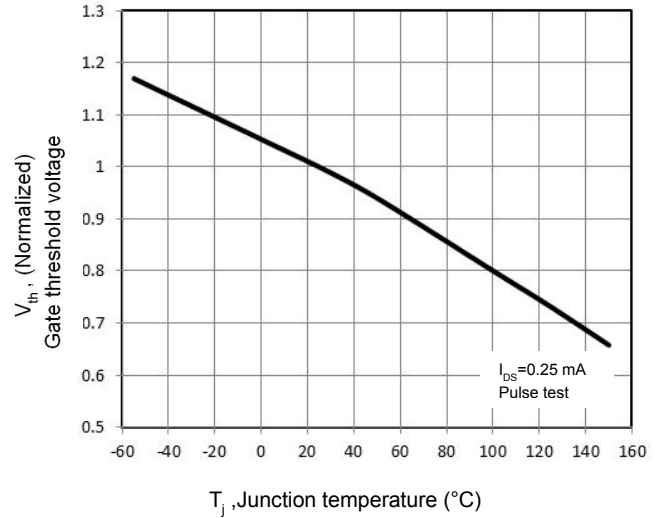


Figure 5. Breakdown Voltage vs. Temperature

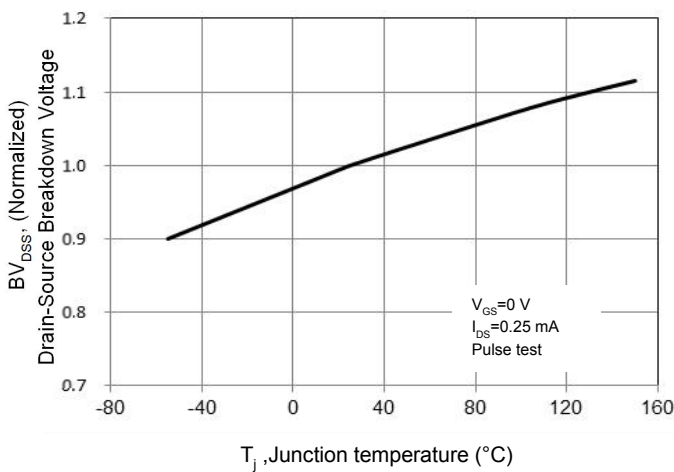


Figure 6. On-Resistance vs. Temperature

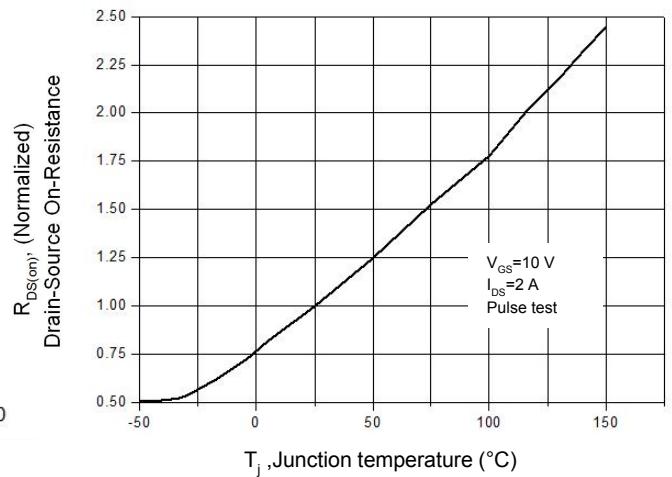


Figure 7. Capacitance Characteristics

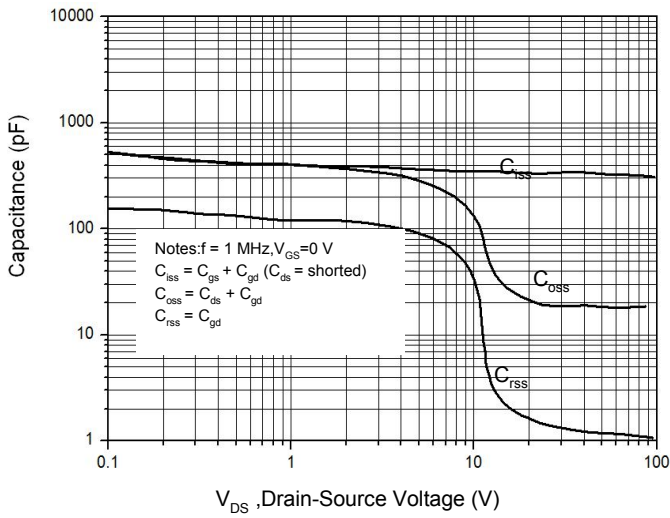


Figure 8. Gate Charge Characteristic

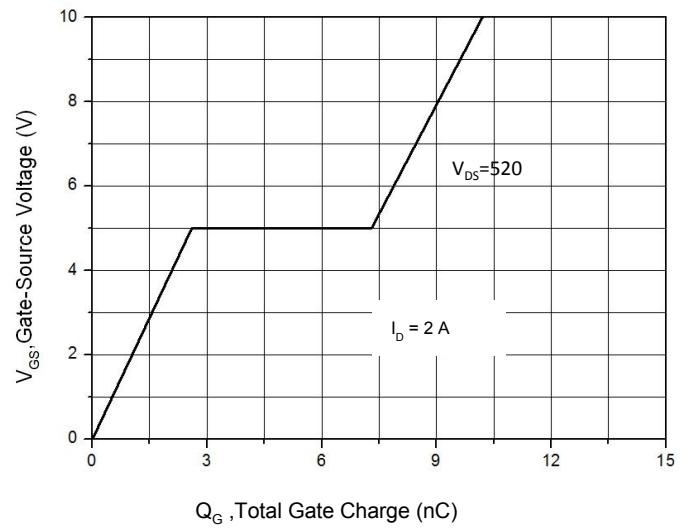


Figure 9. Maximum Safe Operating Area TO-220F

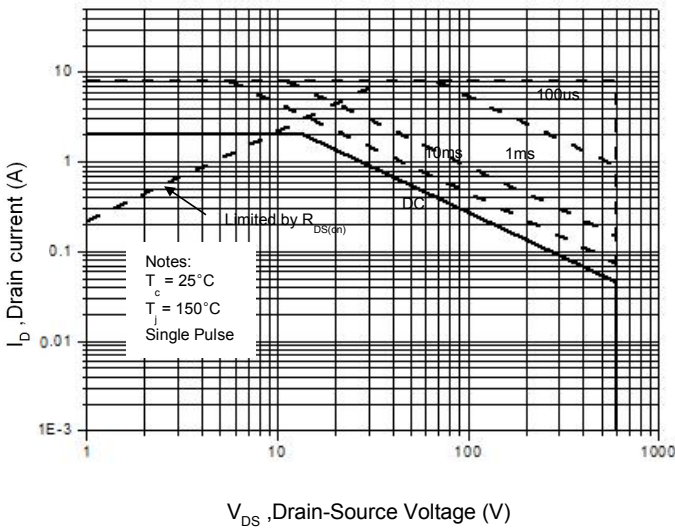


Figure 10. Maximum Safe Operating Area TO-220/ TO-251/TO-252

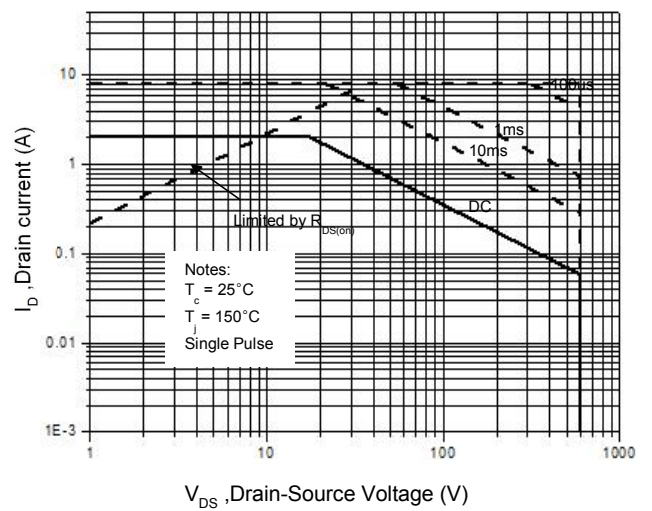


Figure 11. Power Dissipation vs. Temperature TO-220F/TO-126

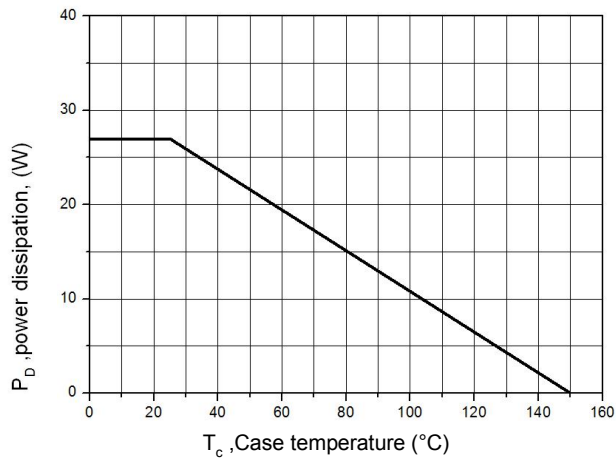


Figure 12. Power Dissipation vs. Temperature TO-220/ TO-251/TO-252

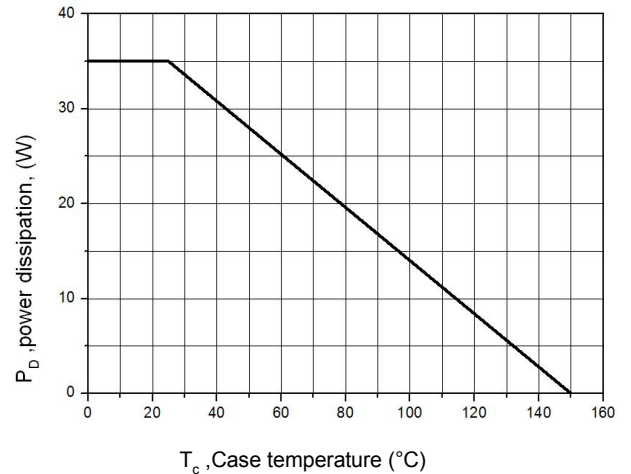


Figure 13. Continuous Drain Current vs. Temperature

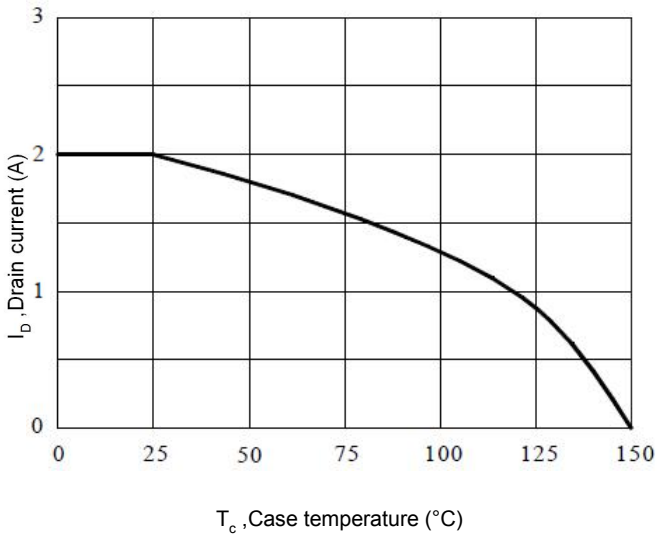


Figure 14. Body Diode Transfer Characteristics

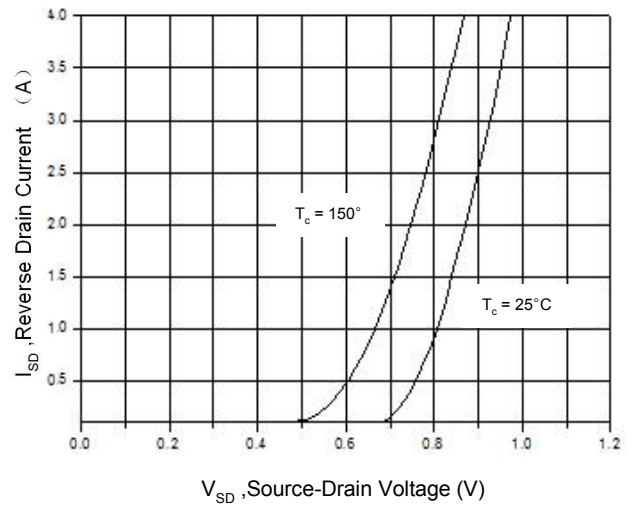


Figure 15 Transient Thermal Impedance, Junction to Case, TO-220F/TO-126

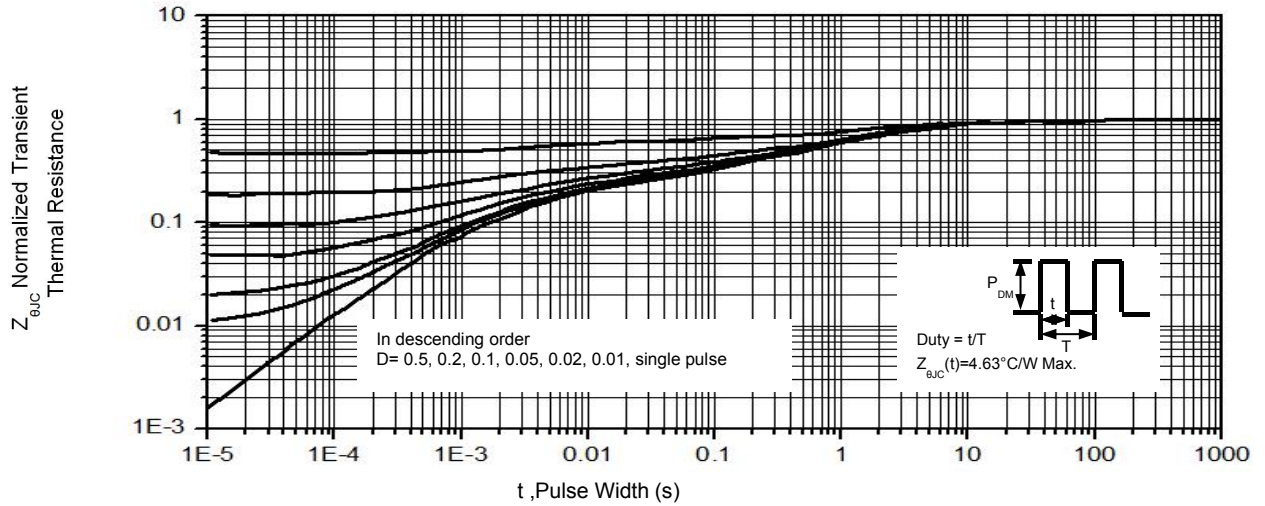
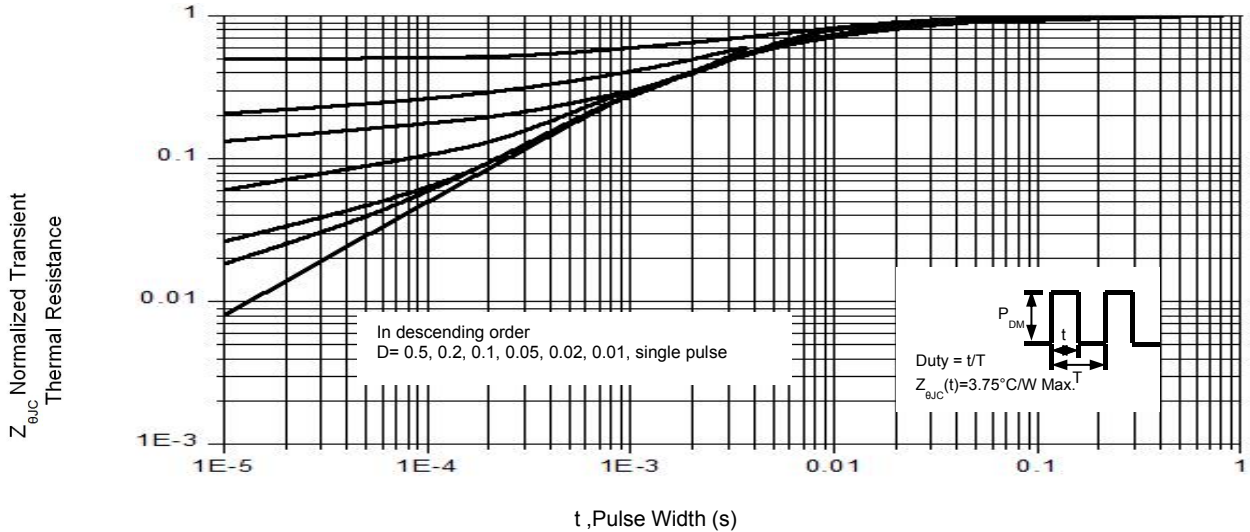
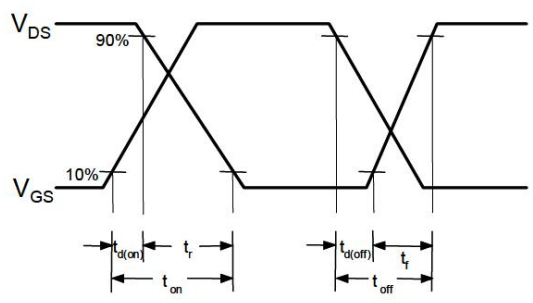
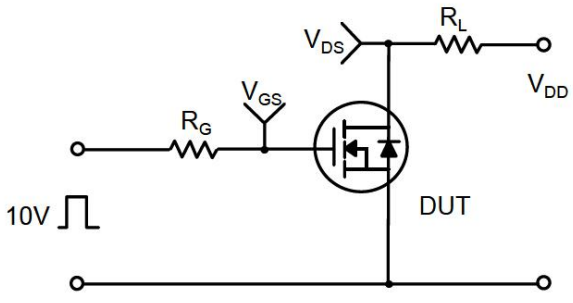
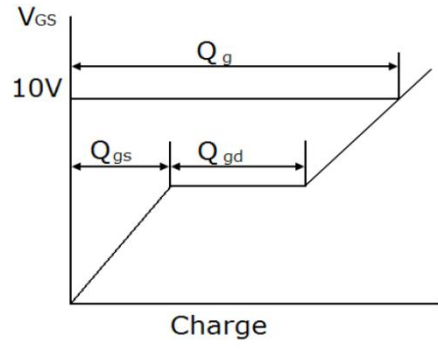
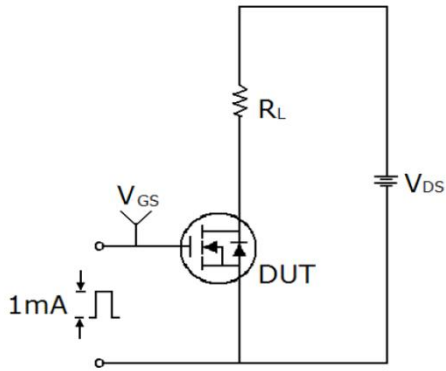


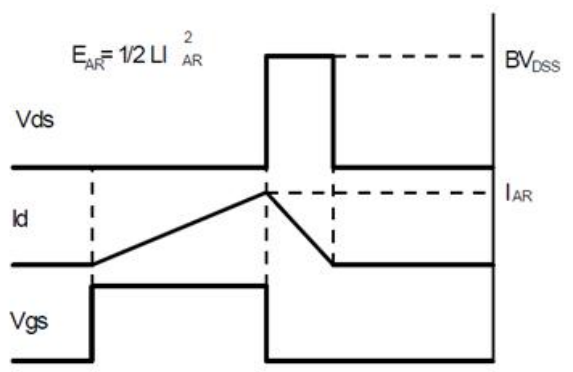
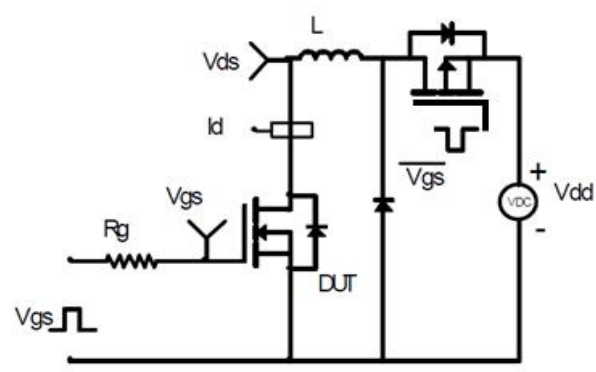
Figure 16. Transient Thermal Impedance, Junction to Case, TO-220/ TO-251/TO-252



Gate Charge Test Circuit & Waveform



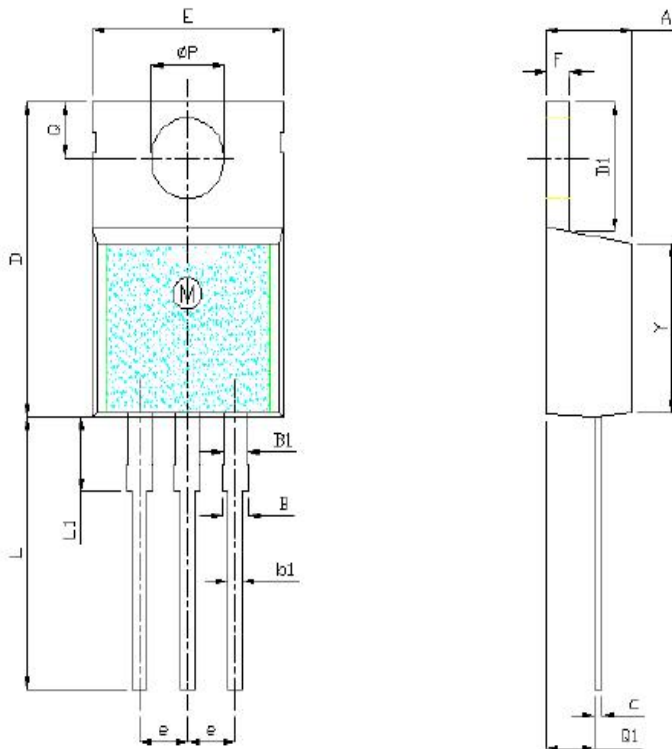
Unclamped Inductive Switching Test Circuit & Waveforms



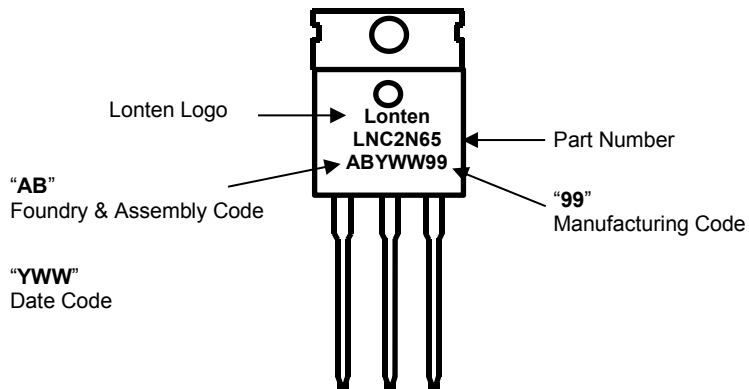
Mechanical Dimensions for TO-220

UNIT: mm

SYMBOL	MIN	NOM	MAX	SYMBOL	MIN	NOM	MAX
A	4		4.8	e	2.44	2.54	2.64
B	1.2		1.4	F	1.1		1.4
B1	1		1.4	L	12.5		14.5
b1	0.75		0.95	L1	3	3.5	4
c	0.4		0.55	ΦP	3.7	3.8	3.9
D	15		16.5	Q	2.5		3
D1	5.9		6.9	Q1	2		2.9
E	9.9		10.7	Y	8.02	8.12	8.22



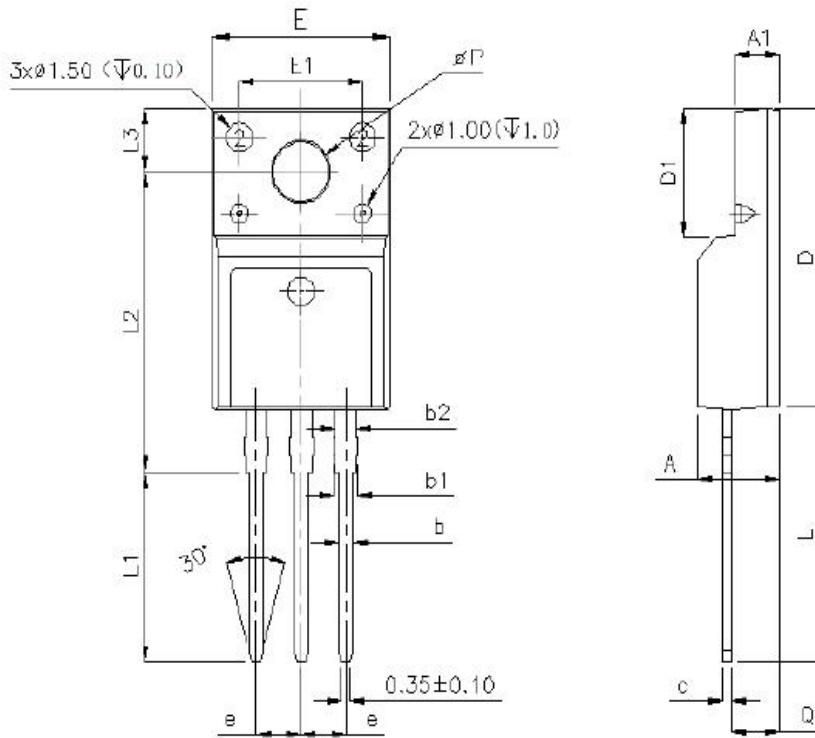
TO-220 Part Marking Information



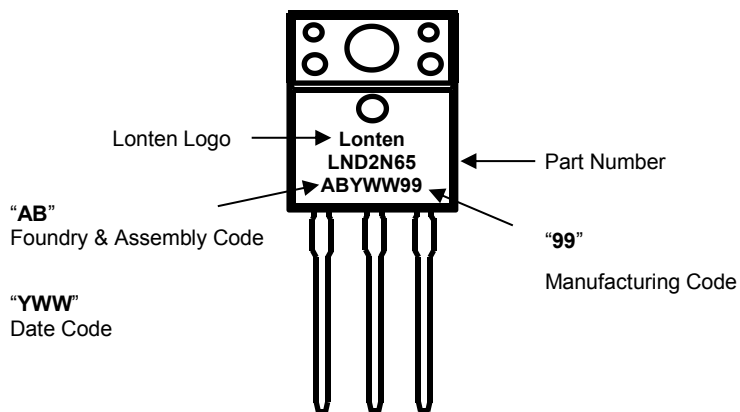
Mechanical Dimensions for TO-220F

UNIT: mm

SYMBOL	MIN	NOM	MAX	SYMBOL	MIN	NOM	MAX
A	4.5		4.9	E1	6.5	7	7.5
A1	2.3		2.9	e	2.44	2.54	2.64
b	0.65		0.9	L	12.5		14.3
b1	1.1		1.7	L1	9.45		10.05
b2	1.2		1.4	L2	15		16
c	0.35		0.65	L3	3.2		4.4
D	14.5		16.5	ΦP	3		3.3
D1	6.1		6.9	Q	2.5		2.9
E	9.6		10.3				



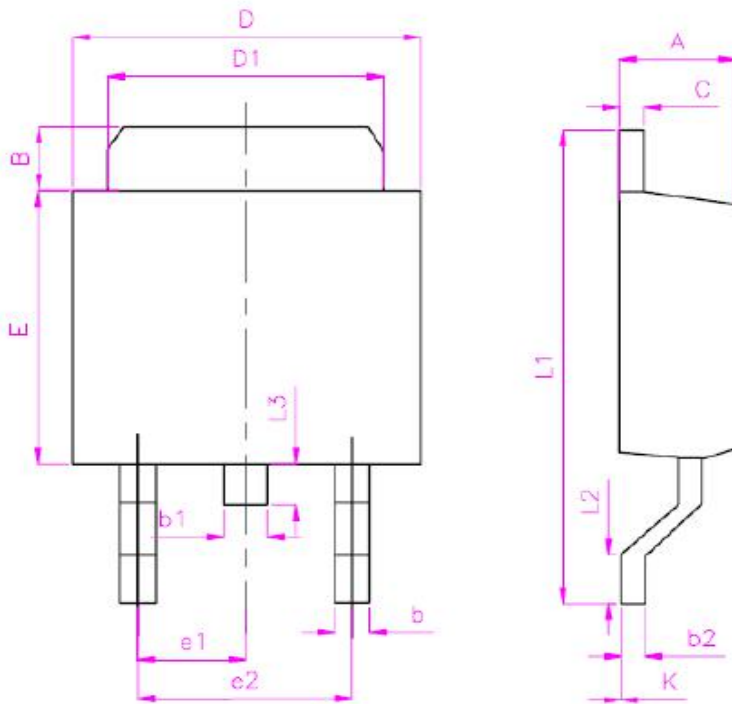
TO-220F Part Marking Information



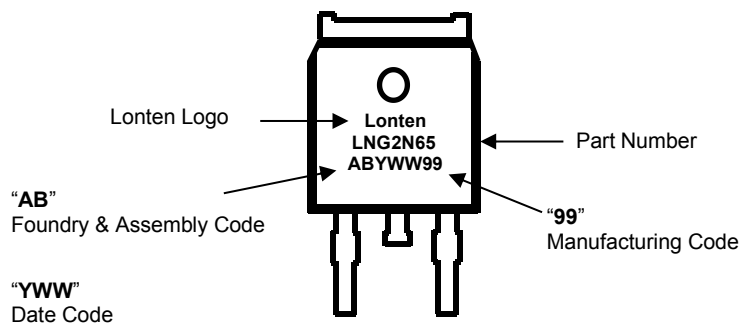
Mechanical Dimensions for TO-252

UNIT: mm

SYMBOL	MIN	NOM	MAX	SYMBOL	MIN	NOM	MAX
A	2.10		2.50	E	5.80		6.30
B	0.80		1.25	e1	2.25	2.30	2.35
b	0.50		0.85	e2	4.45		4.75
b1	0.50		0.90	L1	9.50		10.20
b2	0.45		0.60	L2	0.90		1.45
C	0.45		0.60	L3	0.60		1.10
D	6.35		6.75	K	-0.1		0.10
D1	5.10		5.50				



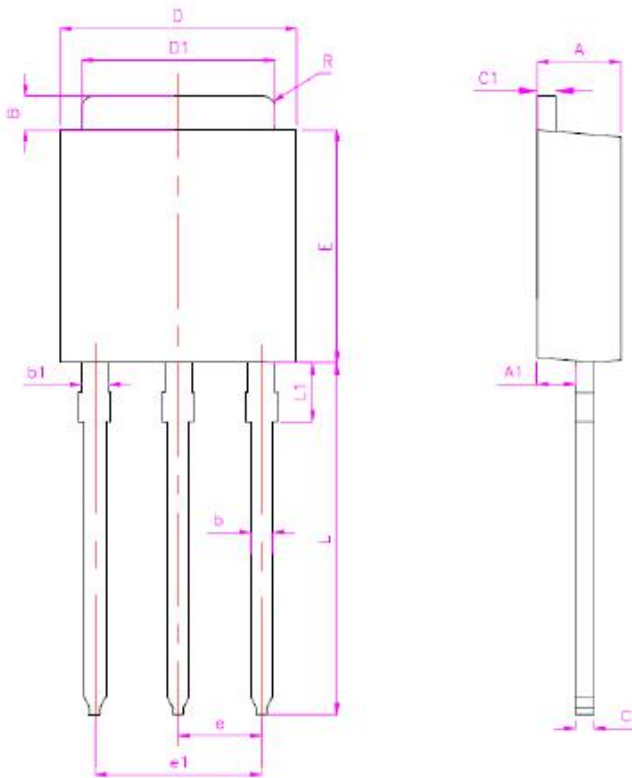
TO-252 Part Marking Information



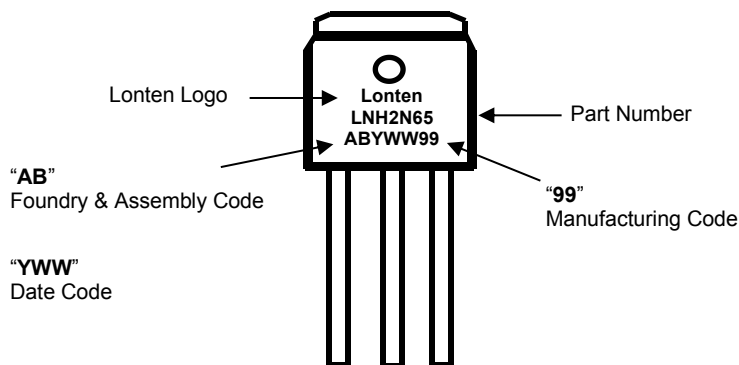
Mechanical Dimensions for TO-251

UNIT: mm

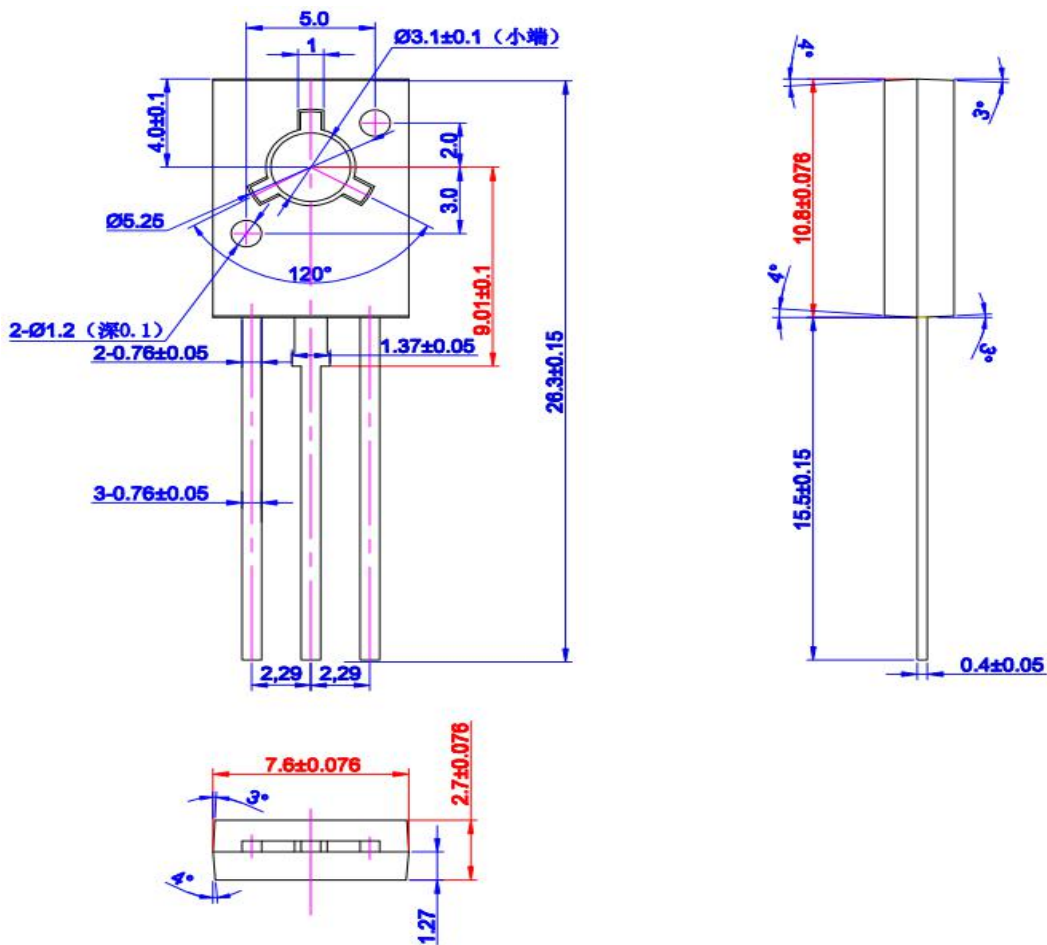
SYMBOL	MIN	NOM	MAX	SYMBOL	MIN	NOM	MAX
A	2.10		2.50	D1	5.10		5.50
A1	0.95		1.30	E	5.80		6.30
B	0.80		1.25	e	2.25	2.30	2.35
b	0.50		0.80	L	7.70		8.50
b1	0.70		0.90	L1	1.45		1.95
C	0.45		0.60	R		0.30	
C1	0.45		0.60				
D	6.35		6.75				



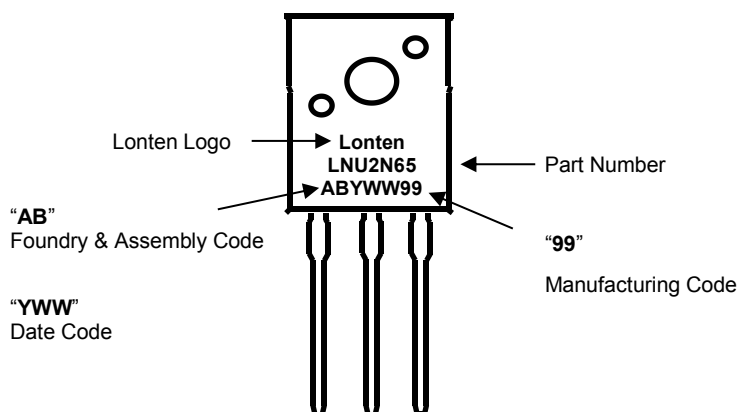
TO-251 Part Marking Information



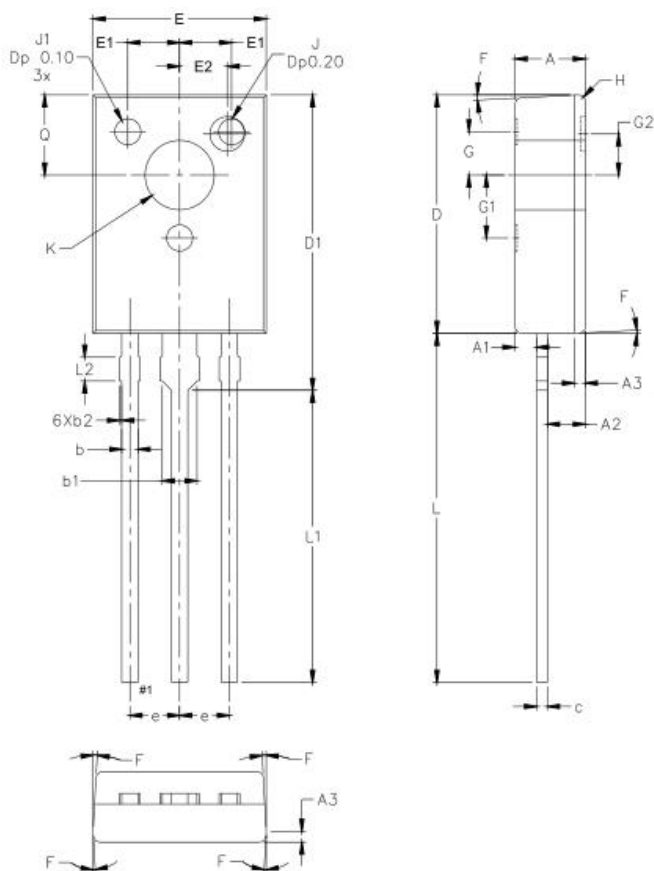
Mechanical Dimensions for TO-126:(unit:mm)



TO-126 Part Marking Information

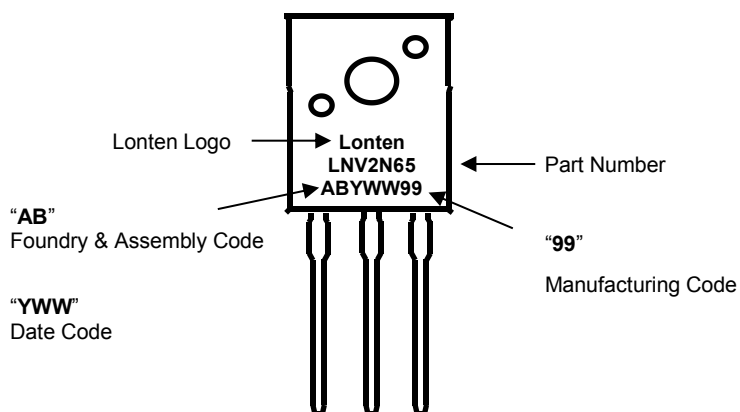


Mechanical Dimensions for TO-126F:(unit:mm)



SYMBOL	MIN	MAX	SYMBOL	MIN	MAX
A	3.05	3.45	e	2.08	2.48
A1	1.00 REF.		F	3° REF.	
A2	1.55	1.95	G	2.00 REF.	
A3	0.50 REF.		G1	2.90 REF.	
b	0.65	0.85	G2	1.90 REF.	
b1	1.50	1.70	H	0.30 REF.	
c	0.45	0.60	L	15.90	16.30
D	10.80	11.20	L1	12.76	13.36
D1	-	14.20	L2	1.00	1.20
E	7.70	8.30	K	3.10	3.30
E1	2.40 REF.		Q	3.55	3.85
E2	2.20 REF.		b2	-	0.20
J	1.60 REF.		J1	1.20 REF.	

TO-126F Part Marking Information



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