Lonten N-channel 650V, 11A, 0.40Ω 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 = 34nC)
- High body diode ruggedness
- Easy to use
- 100% UIS tested
- RoHS compliant

Applications

- PFC stages, hard switching PWM stages and resonant switching PWM stages for e.g. PC Silverbox, Adapter, LCD & PDP TV, LED Driver, Server, Telecom and UPS.

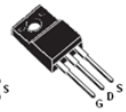
Product Summary

V_{DS} @ $T_{j,max}$	700V
$R_{DS(on),max}$	0.40Ω
I_{DM}	30A
$Q_{g,typ}$	34nC

TO-251

TO-252,TO-263

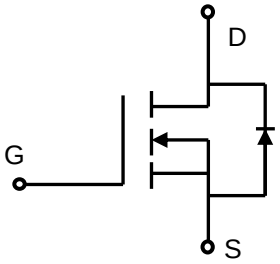
TO-220



TO-220MF

TO-247

TO-262



N-Channel MOSFET

Pb

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}	±20	V
Avalanche energy, single pulse[2]	E_{AS}	210	mJ
Avalanche energy, repetitive[3]	E_{AR}	0.32	mJ
Avalanche current, repetitive[3]	I_{AR}	1.8	A
Power Dissipation TO-220 (T_C = 25°C)	P_D	83	W
Power Dissipation TO-220MF (T_C = 25°C)	P_D	31	W
Operating and Storage Temperature Range	T_j, T_{STG}	-55 to +150	°C
Continuous diode forward current (T_C = 25°C)	I_S	11	A
Diode pulse current (T_C = 25°C)	$I_{S,pulse}$	30	A

Thermal Characteristics TO-247/TO-220/TO-263/TO262/TO-252/TO-251

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.5	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62	°C/W

Thermal Characteristics TO-220MF

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	4.0	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	80	°C/W

Package Marking and Ordering Information

Device	Device Package	Marking
LSB11N65E	TO-247	LSB11N65E
LSC11N65E	TO-220	LSC11N65E
LSD11N65E	TO-220MF	LSD11N65E
LSE11N65E	TO-263	LSE11N65E
LSG11N65E	TO-252	LSG11N65E
LSH11N65E	TO-251	LSH11N65E
LSF11N65E	TO-262	LSF11N65E

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}=0V, I_D=0.25mA	650	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=0.25mA	2.5	3	3.5	V
Drain cut-off current	I_{DSS}	V_{DS}=650V, V_{GS}=0V,	-	-	1	μA
Gate leakage current, Forward	I_{GSSF}	V_{GS}=20V, V_{DS}=0V	-	-	100	nA
Gate leakage current, Reverse	I_{GSSR}	V_{GS}=-20V, V_{DS}=0V	-	-	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=10V, I_D=5.5A T_j = 25°C T_j = 150°C	- - -	 0.35 0.89	 0.40 -	Ω
Gate resistance	R_G	f=1MHz, open drain	-	8.5	-	Ω
Dynamic characteristics						
Input capacitance	C_{iss}	V_{DS} =100V, V_{GS} =0V,	-	760	-	pF
Output capacitance	C_{oss}	f =1MHz	-	54	-	
Reverse transfer capacitance	C_{rss}		-	12	-	
Turn-on delay time	$t_{d(on)}$	V_{DD} =400V, I_D =4.8A	-	11	-	ns
Rise time	t_r	R_G =3.4Ω, V_{GS}=13V	-	9	-	
Turn-off delay time	$t_{d(off)}$		-	56	-	
Fall time	t_f		-	8	-	

Gate charge characteristics						
Gate to source charge	Q_{gs}	V_{DD}=480V, I_D=4.8A,	-	4	-	nC
Gate to drain charge	Q_{gd}	V_{GS}=0 to 10V	-	18	-	
Gate charge total	Q_g		-	34	-	
Gate plateau voltage	$V_{plateau}$		-	5.2	-	V
Reverse diode characteristics						
Diode forward voltage	V_{SD}	V_{GS}=0V, I_F=5.5A	-	0.9	-	V
Reverse recovery time	t_{rr}	V_{DS}=400V, I_F=4.8A,	-	275	-	ns
Reverse recovery charge	Q_{rr}	dI_F/dt=100A/μs	-	3.2	-	μC
Peak reverse recovery current	I_{rrm}		-	23	-	A

Notes:

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

2. I_{AS} = 1.8A, V_{DD} = 50V, Starting T_j= 25°C.

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

Electrical Characteristics Diagrams

Figure 1. Output Characteristics T_c = 25°C

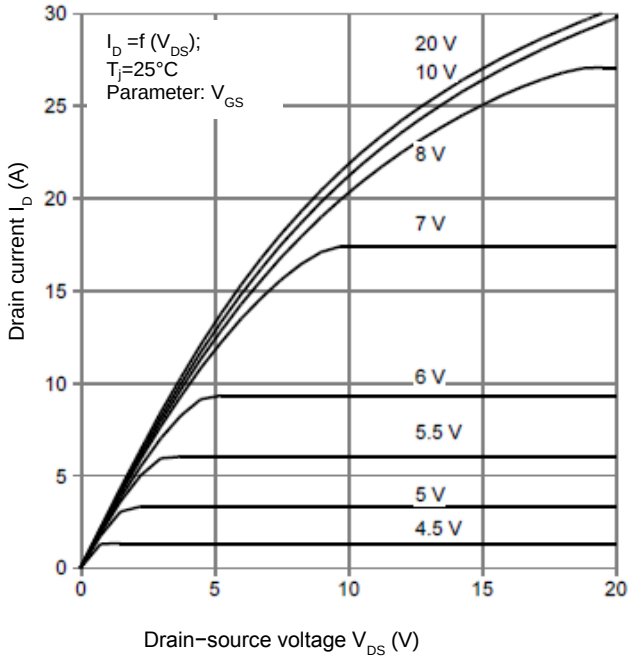


Figure 2. Output Characteristics T_c = 125°C

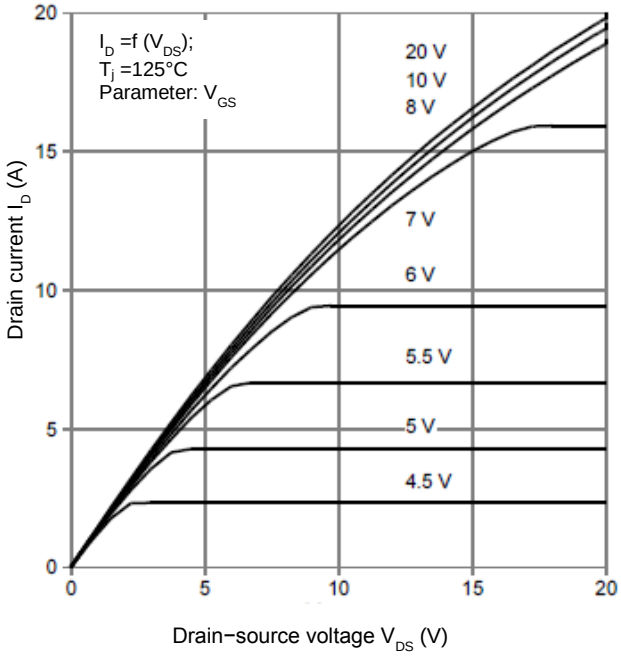


Figure 3. On-Resistance Variation vs. Drain Current

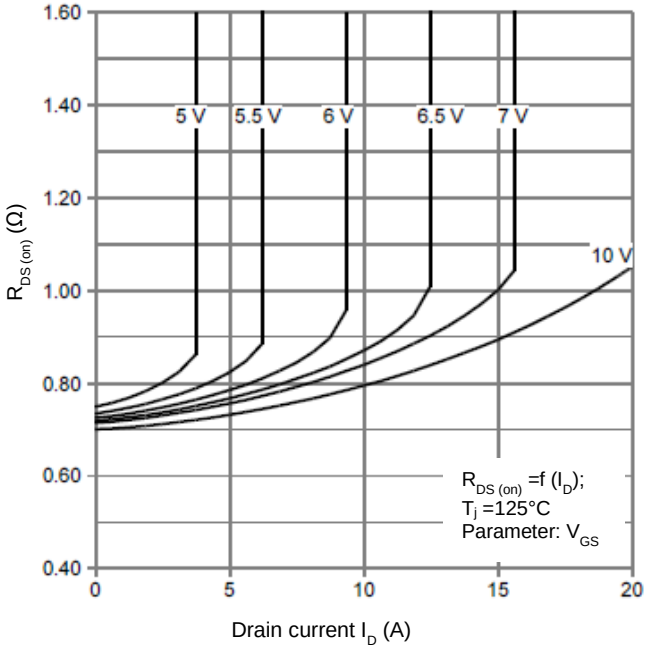


Figure 4. On-Resistance Variation vs. Temperature

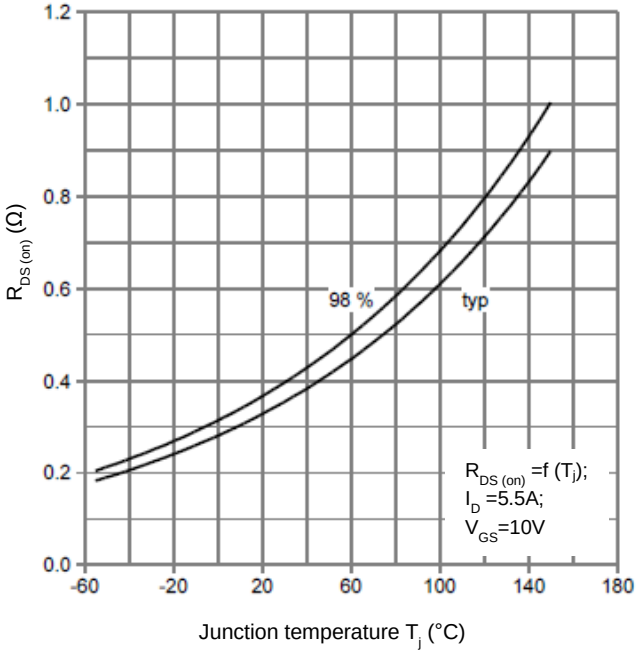


Figure 5. Transfer Characteristics

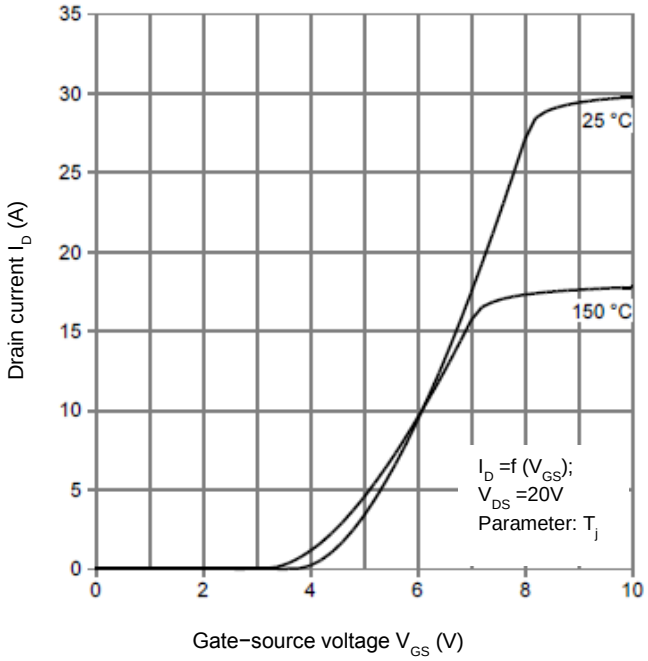


Figure 6. Breakdown Voltage vs. Temperature

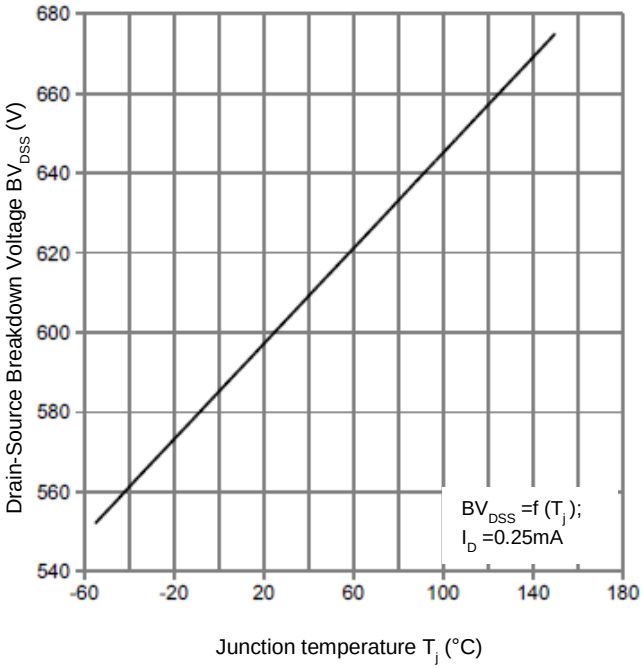


Figure 7. Capacitance Characteristics

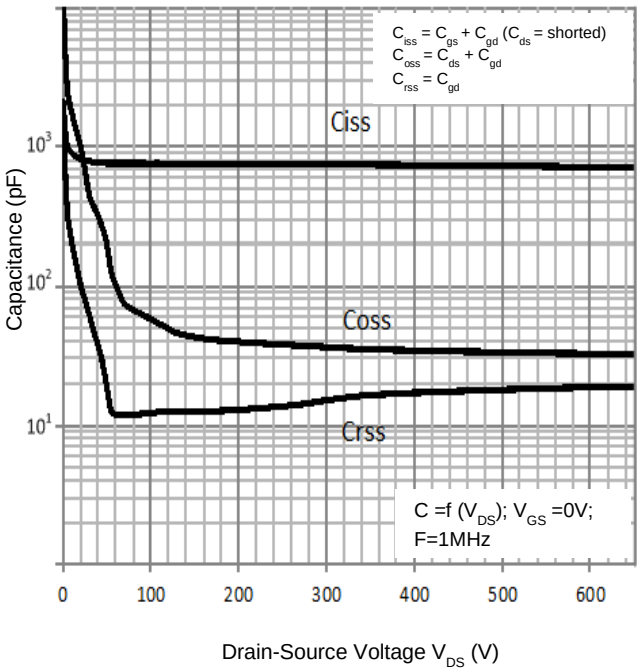


Figure 8. Gate Charge Characteristics

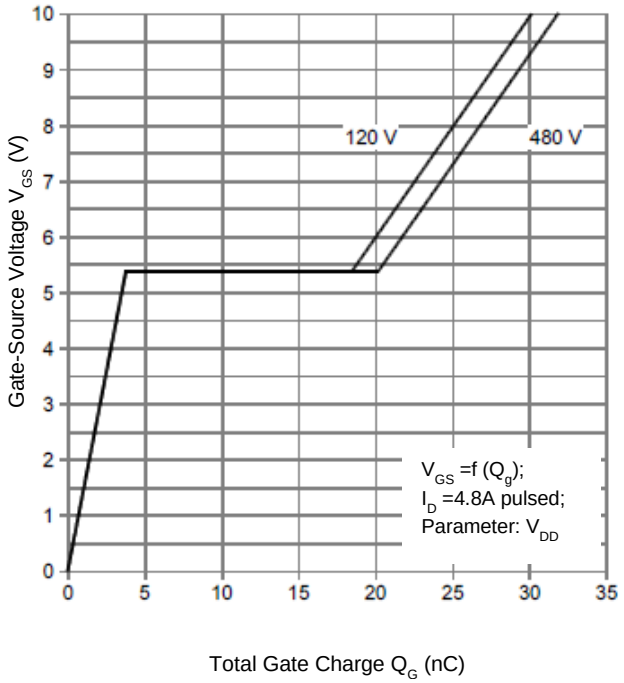


Figure 9. Power Dissipation（Non FullPAK）

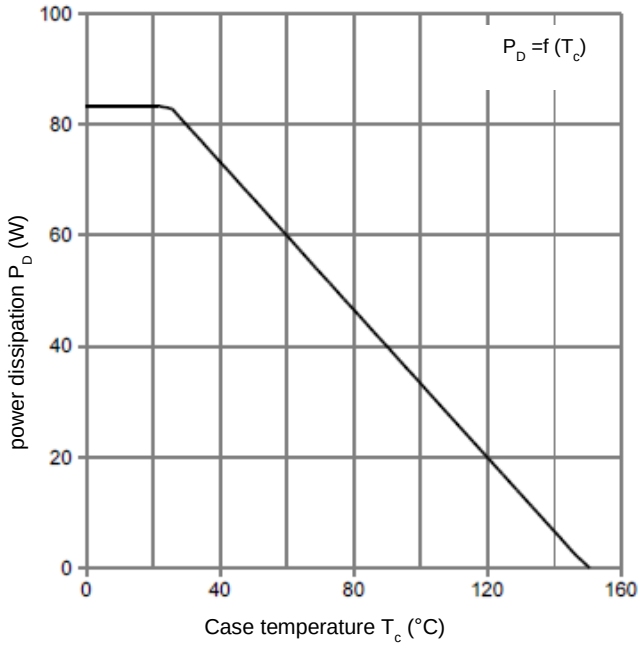


Figure 10. Power Dissipation（FullPAK）

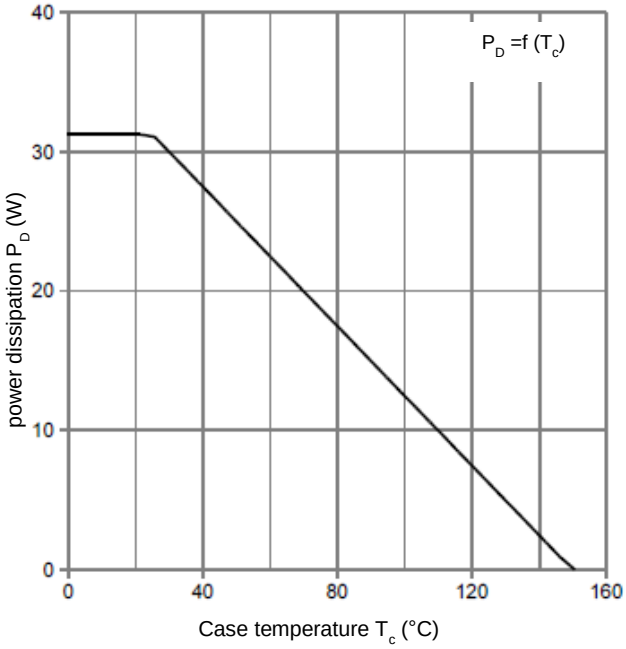


Figure 11. Safe Operating Area（Non FullPAK）

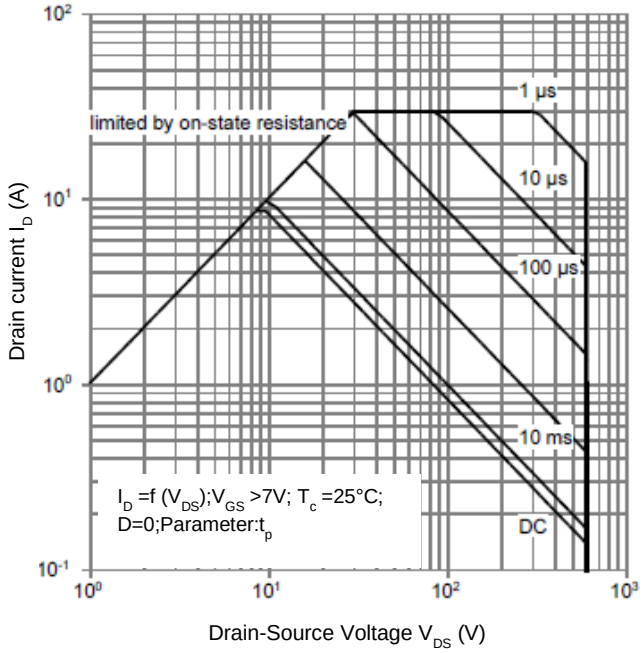


Figure 12. Safe Operating Area（FullPAK）

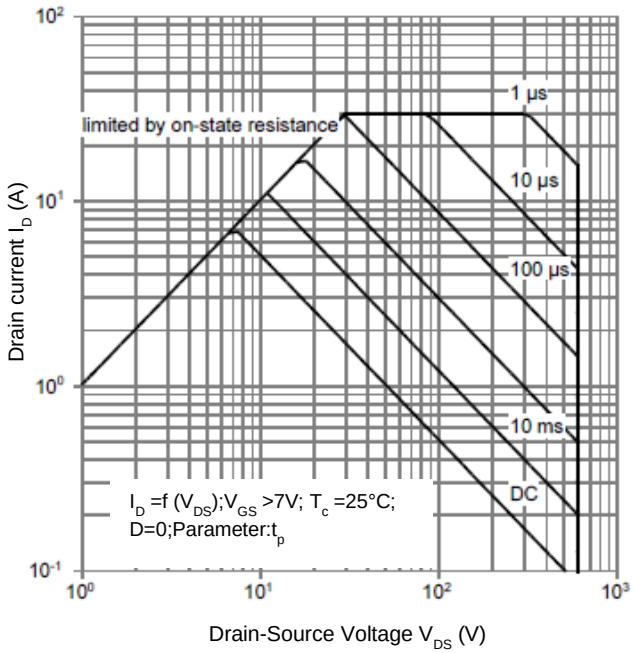


Figure 13. Transient Thermal impedance
（Non FullPAK）

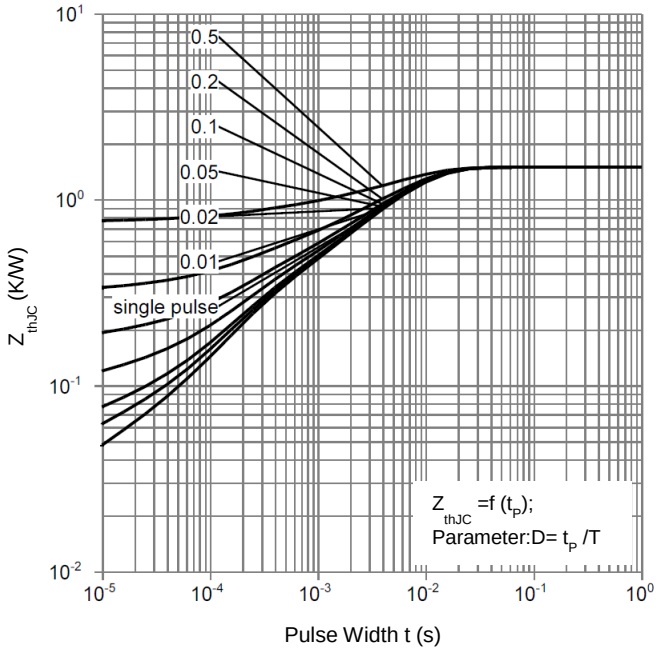
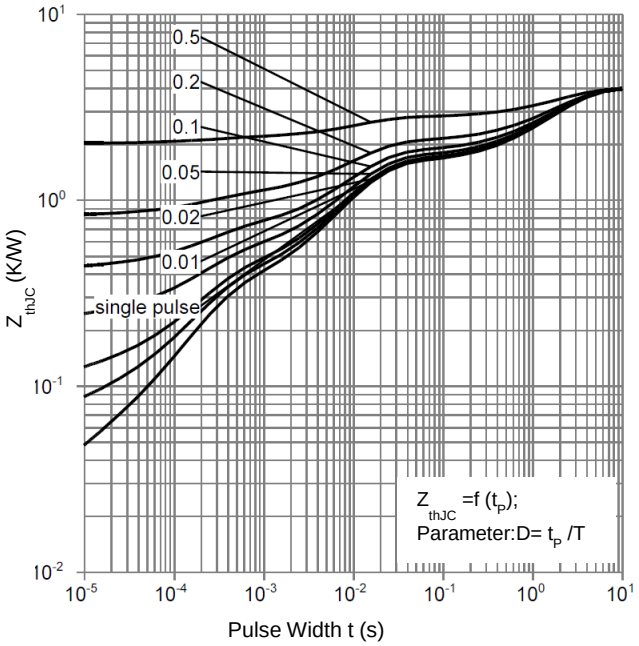
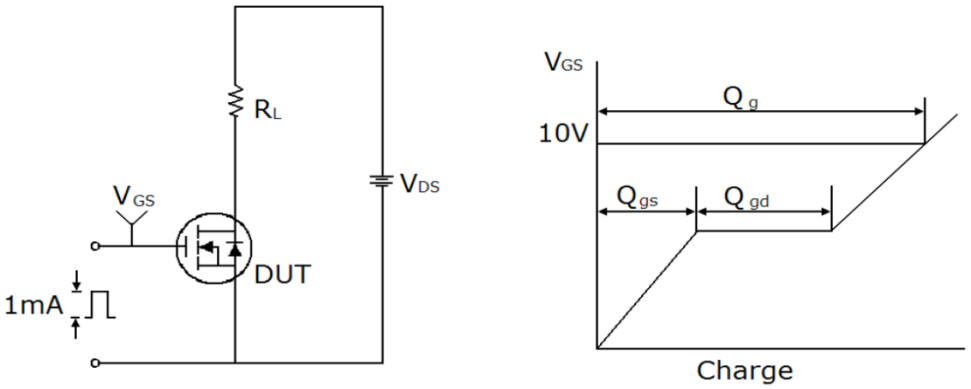


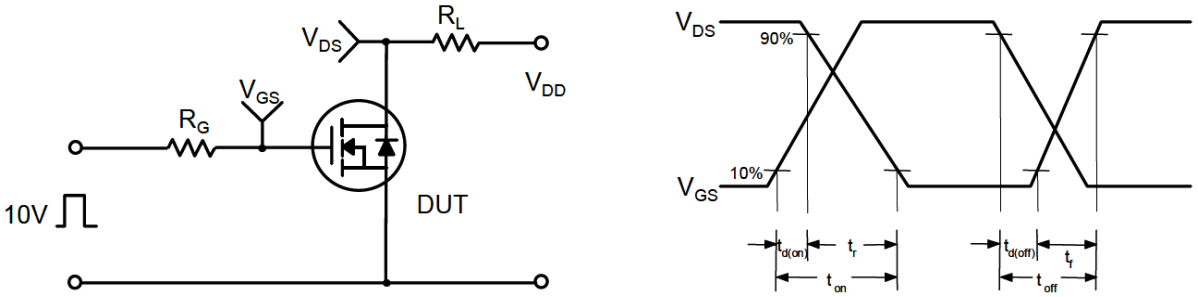
Figure 14. Transient Thermal impedance
（FullPAK）



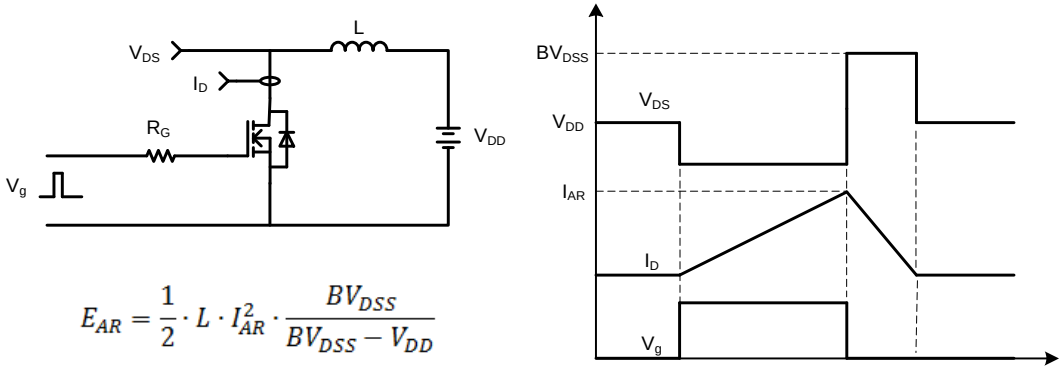
Gate Charge Test Circuit & Waveform



Switching Test Circuit & Waveforms

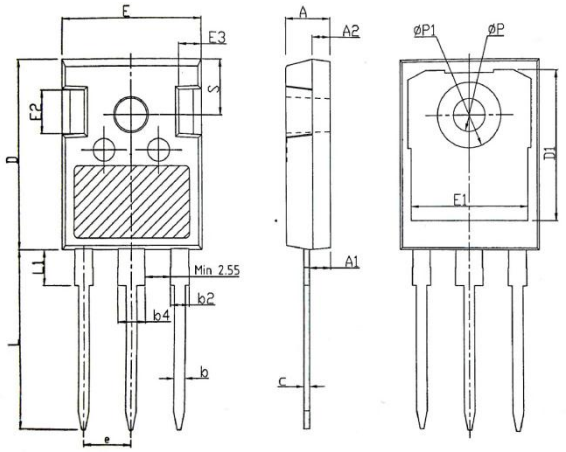


Unclamped Inductive Switching Test Circuit & Waveforms



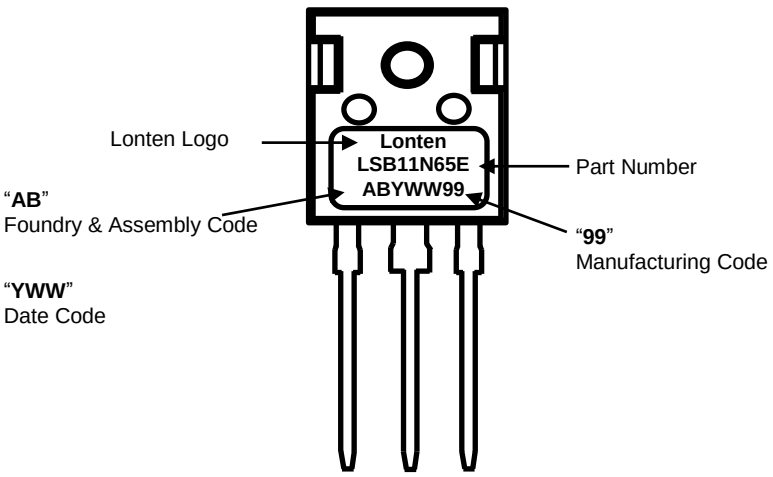
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AR}^2 \cdot \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$

Mechanical Dimensions for TO-247

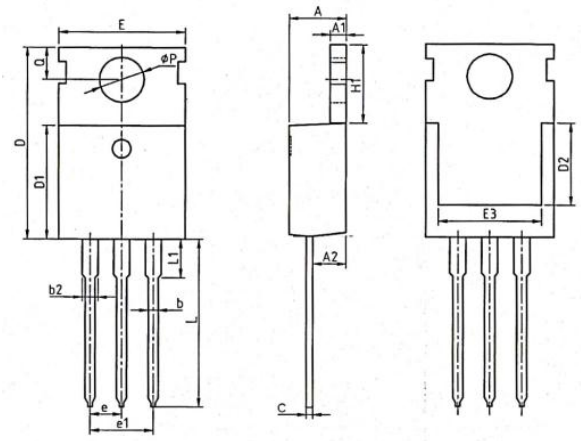


SYMBOL	mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.59
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.80	21.00	21.30
D1	16.25	16.55	16.85
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44BSC		
L	19.82	19.92	20.22
L1	—	—	4.30
ØP	3.40	3.60	3.80
ØP1	—	—	7.30
S	6.15BSC		

TO-247 Part Marking Information

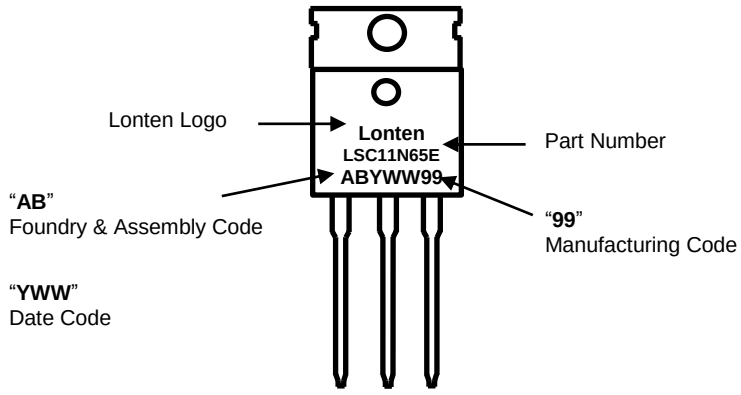


Mechanical Dimensions for TO-220

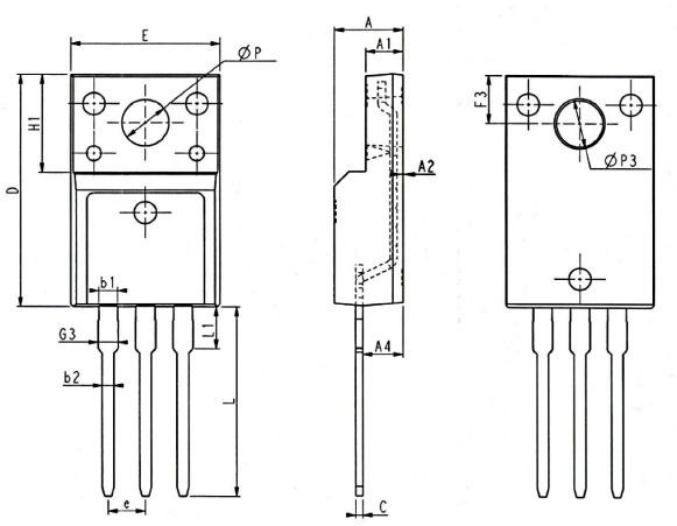


COMMON DIMENSIONS						
SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.37	4.57	4.70	0.172	0.180	0.185
A1	1.25	1.30	1.40	0.049	0.051	0.055
A2	2.20	2.40	2.60	0.087	0.094	0.102
b	0.70	0.80	0.95	0.028	0.031	0.037
b2	1.17	1.27	1.47	0.046	0.050	0.058
c	0.45	0.50	0.60	0.018	0.020	0.024
D	15.10	15.60	16.10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

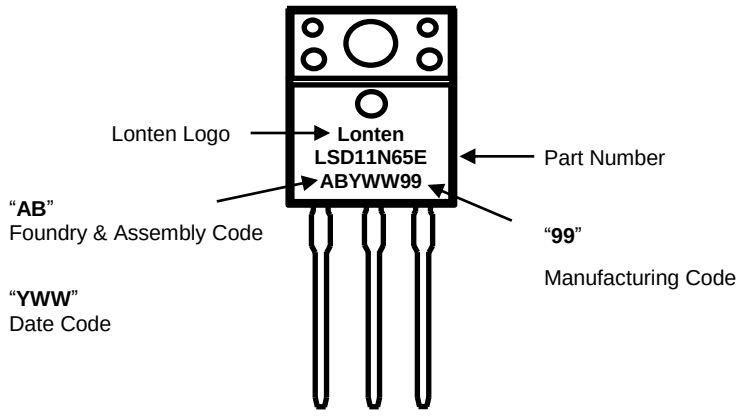


Mechanical Dimensions for TO-220MF

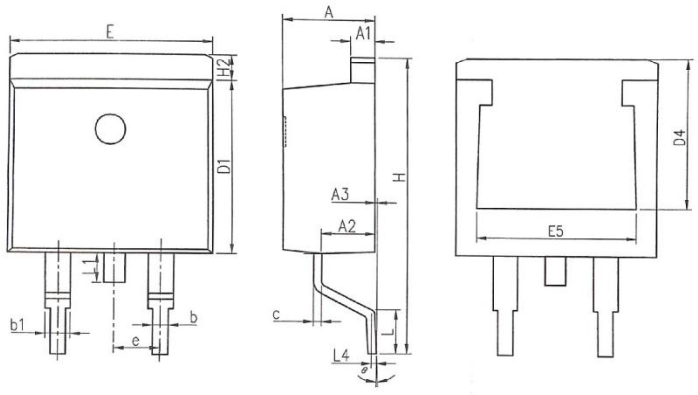


COMMON DIMENSIONS						
SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
E	9.96	10.16	10.36	0.392	0.400	0.408
A	4.50	4.70	4.90	0.177	0.185	0.193
A1	2.34	2.54	2.74	0.092	0.100	0.108
A2	0.30	0.45	0.60	0.012	0.002	0.024
A4	2.65	2.76	2.96	0.104	0.109	0.117
C	0.40	0.50	0.65	0.016	0.020	0.026
D	15.57	15.87	16.17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

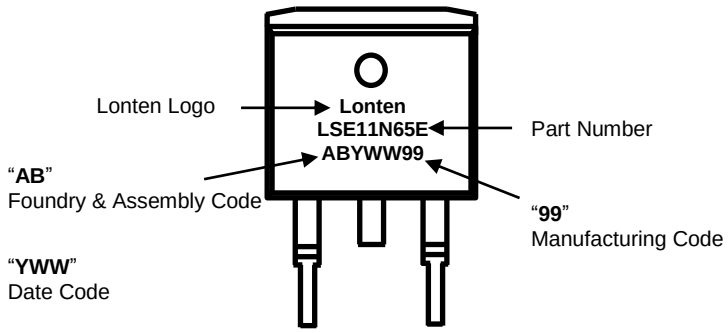


Mechanical Dimensions for TO-263

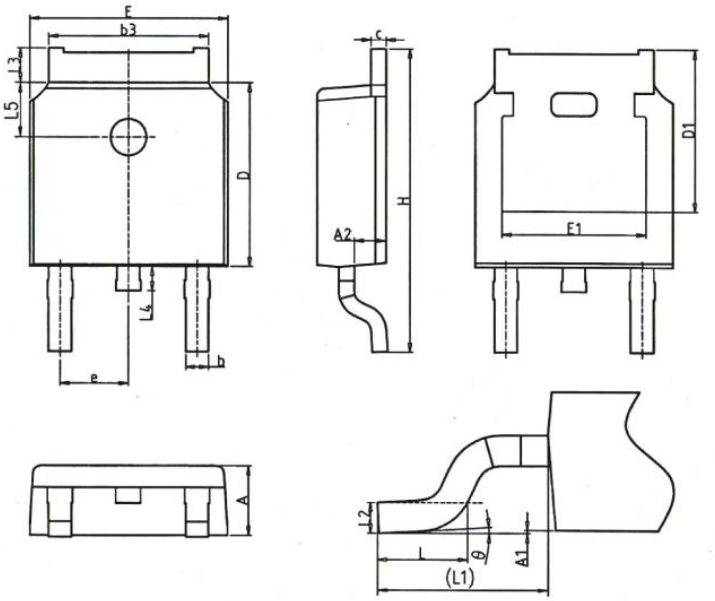


COMMON DIMENSIONS						
SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.37	4.57	4.77	0.172	0.180	0.188
A1	1.22	1.27	1.42	0.048	0.050	0.056
A2	2.49	2.89	2.89	0.098	0.114	0.114
A3	0.00	0.13	0.25	0.000	0.005	0.010
b	0.70	0.81	0.96	0.028	0.032	0.034
b1	1.17	1.27	1.47	0.046	0.050	0.058
c	0.30	0.38	0.53	0.012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

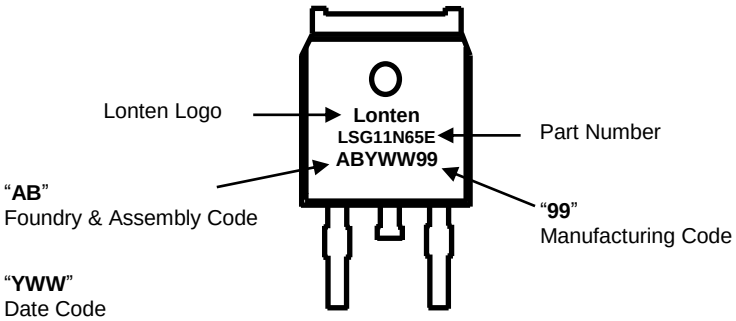


Mechanical Dimensions for TO-252

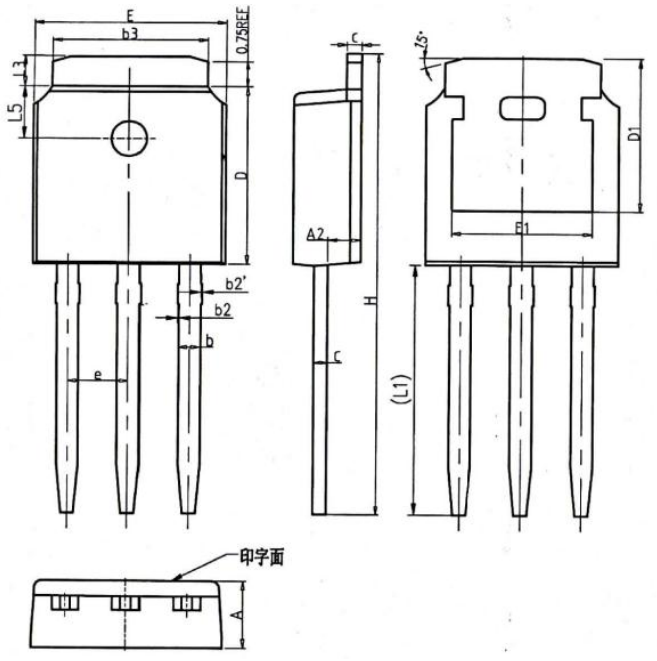


COMMON DIMENSIONS			
SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0.00	—	0.20
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b3	5.20	5.33	5.46
c	0.43	0.53	0.61
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.73
E1	4.63	—	—
e	2.286BSC		
H	9.40	10.10	10.50
L	1.38	1.50	1.75
L1	2.90REF		
L2	0.51BSC		
L3	0.88	—	1.28
L4	0.50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

TO-252 Part Marking Information

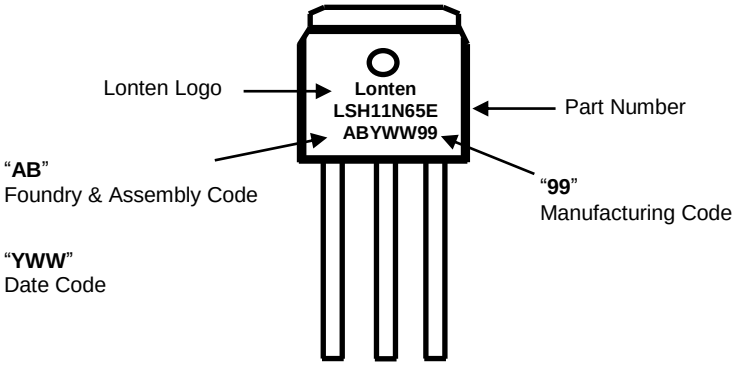


Mechanical Dimensions for TO-251

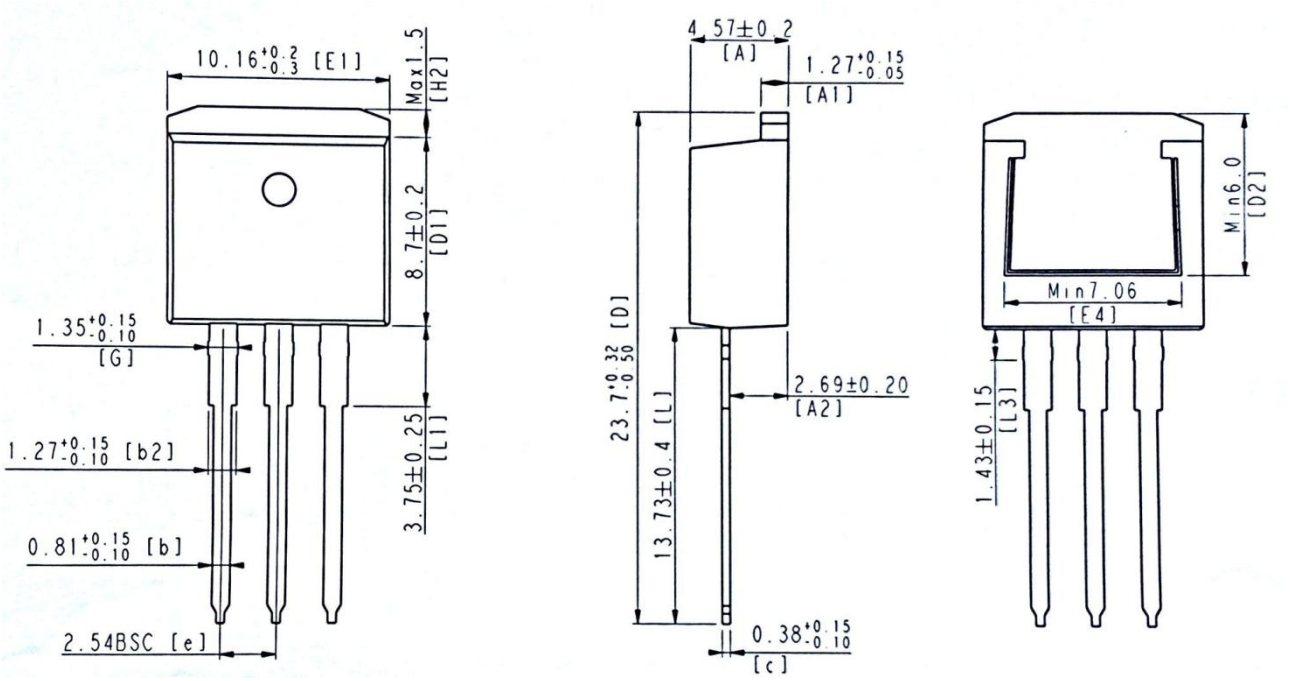


COMMON DIMENSIONS			
SYMBOL	MM		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b2	0.00	0.04	0.10
b2'	0.00	0.04	0.10
b3	5.20	5.33	5.46
c	0.43	0.53	0.61
D	5.98	6.10	6.22
D1		5.30REF	
E	6.40	6.60	6.73
E1	4.63	—	—
e		2.286BSC	
H	16.22	16.52	16.82
L1	9.15	9.40	9.65
L3	0.88	1.02	1.28
L5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

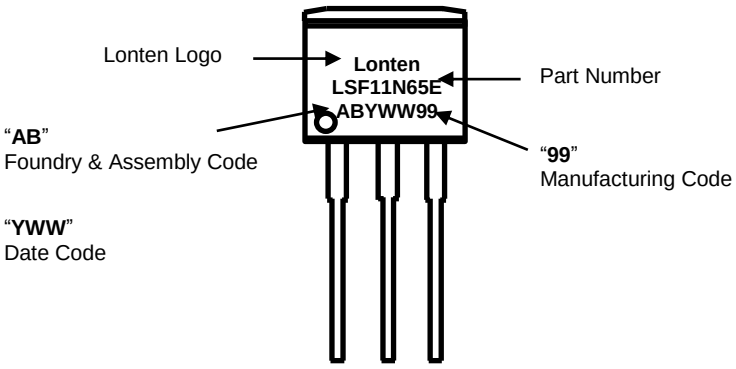
TO-251 Part Marking Information



Mechanical Dimensions for TO-262



TO-262 Part Marking Information



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