

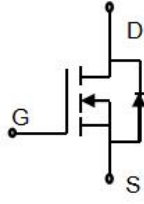



Lonten N-channel 40V, 120A, 2.8mΩ Power MOSFET

<p>Description These N-Channel enhancement mode power field effect transistors are using split gate trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and with stand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.</p> <p>Features</p> <ul style="list-style-type: none"> ◆ 40V, 120A, $R_{DS(on),max} = 2.8m\Omega @ V_{GS} = 10V$ ◆ Improved dv/dt capability ◆ Fast switching ◆ 100% EAS Guaranteed ◆ Green device available <p>Applications</p> <ul style="list-style-type: none"> ◆ Motor Drives ◆ UPS ◆ DC-DC Converter 	<p>Product Summary</p> <table style="width: 100%; border: none;"> <tr> <td style="padding: 2px;">V_{DSS}</td> <td style="padding: 2px;">40V</td> </tr> <tr> <td style="padding: 2px;">$R_{DS(on),max} @ V_{GS}=10V$</td> <td style="padding: 2px;">2.8mΩ</td> </tr> <tr> <td style="padding: 2px;">I_D</td> <td style="padding: 2px;">120A</td> </tr> </table> <p>Pin Configuration</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  TO-251 </div> <div style="text-align: center;">  TO-252 </div> </div> <div style="text-align: right; margin-top: 20px;">  </div> <p style="text-align: center; margin-top: 20px;">N-Channel MOSFET </p>	V_{DSS}	40V	$R_{DS(on),max} @ V_{GS}=10V$	2.8mΩ	I_D	120A
V_{DSS}	40V						
$R_{DS(on),max} @ V_{GS}=10V$	2.8mΩ						
I_D	120A						

Absolute Maximum Ratings $T_C = 25^\circ C$ unless otherwise noted

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	40	V
Continuous drain current ($T_C = 25^\circ C$) ¹⁾	I_D	120	A
Continuous drain current ($T_C = 100^\circ C$)		81	A
Pulsed drain current ²⁾	I_{DM}	360	A
Gate-Source voltage	V_{GSS}	±18	V
Avalanche energy ³⁾	E_{AS}	225	mJ
Power Dissipation ($T_C = 25^\circ C$)	P_D	57.6	W
Storage Temperature Range	T_{STG}	-55 to +150	°C
Operating Junction Temperature Range	T_J	-55 to +150	°C

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.67	°C/W

Package Marking and Ordering Information

Device	Device Package	Marking
LSGH04R028	TO-251	LSGH04R028
LSGG04R028	TO-252	LSGG04R028

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

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static characteristics						
Drain-source breakdown voltage	BV_{DSS}	$V_{GS}=0\text{ V}, I_D=250\mu\text{A}$	40	---	---	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.0	---	2.2	V
Drain-source leakage current	I_{DSS}	$V_{DS}=40\text{ V}, V_{GS}=0\text{ V}, T_J=25^\circ\text{C}$	---	---	1	μA
Gate leakage current, Forward	I_{GSSF}	$V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$	---	---	100	nA
Gate leakage current, Reverse	I_{GSSR}	$V_{GS}=-20\text{ V}, V_{DS}=0\text{ V}$	---	---	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=50\text{ A}$	---	---	2.8	m Ω
		$V_{GS}=4.5\text{ V}, I_D=20\text{ A}$	---	---	5.3	m Ω
Forward transconductance	g_{fs}	$V_{DS}=10\text{ V}, I_D=20\text{ A}$	---	131	---	S
Dynamic characteristics						
Input capacitance	C_{iss}	$V_{DS}=15\text{ V}, V_{GS}=0\text{ V},$ $F=1\text{ MHz}$	---	3210	---	pF
Output capacitance	C_{oss}		---	2130	---	
Reverse transfer capacitance	C_{rss}		---	343	---	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=15\text{ V}, V_{GS}=10\text{ V}, I_D=20\text{ A}$ $R_G=1.6\Omega$	---	9	---	ns
Rise time	t_r		---	4	---	
Turn-off delay time	$t_{d(off)}$		---	45	---	
Fall time	t_f		---	7	---	
Gate charge characteristics						
Gate to source charge	Q_{gs}	$V_{DS}=15\text{ V}, I_D=15\text{ A},$ $V_{GS}=10\text{ V}$	---	7	---	nC
Gate to drain charge	Q_{gd}		---	17.5	---	
Gate charge total	Q_g		---	67	---	
Drain-Source diode characteristics and Maximum Ratings						
Continuous Source Current	I_S		---	---	120	A
Pulsed Source Current ⁴⁾	I_{SM}		---	---	360	A
Diode Forward Voltage	V_{SD}	$V_{GS}=0\text{ V}, I_S=40\text{ A}, T_J=25^\circ\text{C}$	---	0.85	1.2	V
Reverse Recovery Time	t_{rr}	$I_S=I_F, di/dt=100\text{ A}/\mu\text{s}, T_J=25^\circ\text{C}$ ⁵⁾	---	---	26	ns
Reverse Recovery Charge	Q_{rr}		---	---	95	nC

Notes:

- 1: The maximum junction current rating is package limited.
- 2: Repetitive Rating: Pulse width limited by maximum junction temperature.
- 3: $V_{DD}=23\text{ V}, V_{GS}=10\text{ V}, L=0.5\text{ mH}, I_{AS}=30\text{ A}, R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$.
- 4: Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2\%$.
- 5: Guaranteed by design, not subject to production.

Electrical Characteristics Diagrams

Fig 1: Output Characteristics

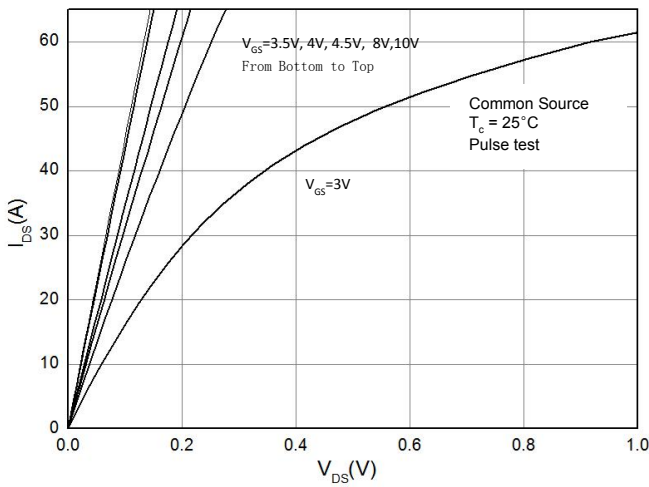


Fig 2: Transfer Characteristics

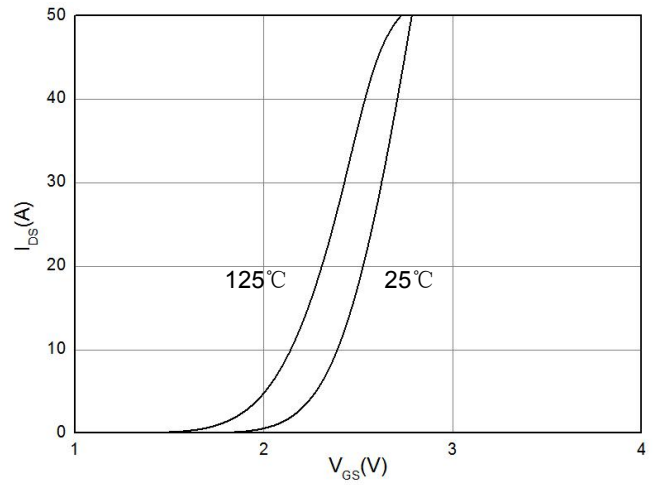


Figure 3. Capacitance Characteristics

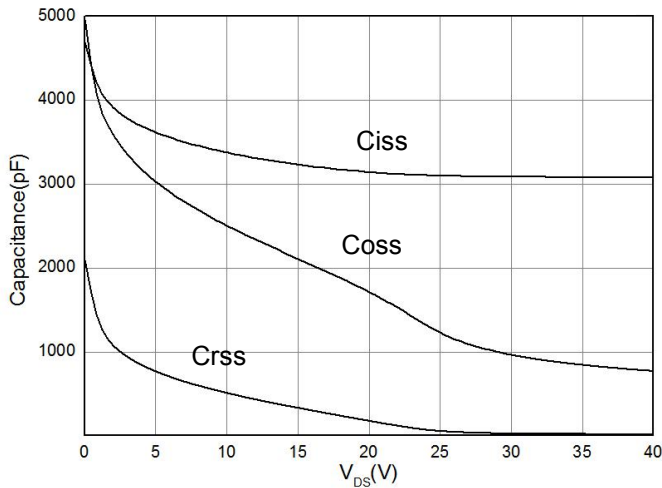


Figure 4. Gate Charge Waveform

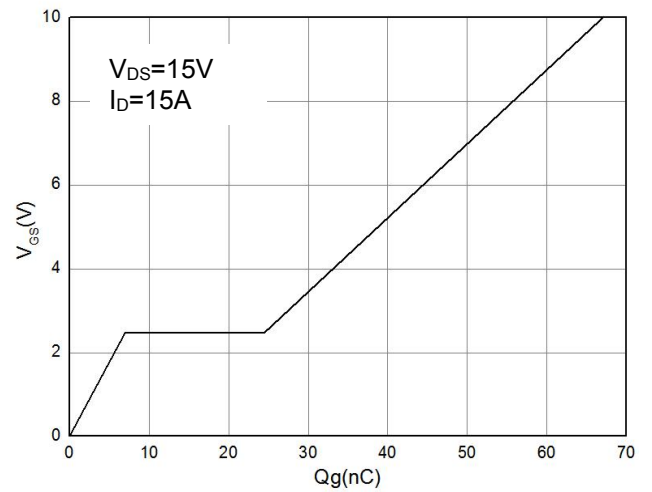


Figure 5. Body-Diode Characteristics

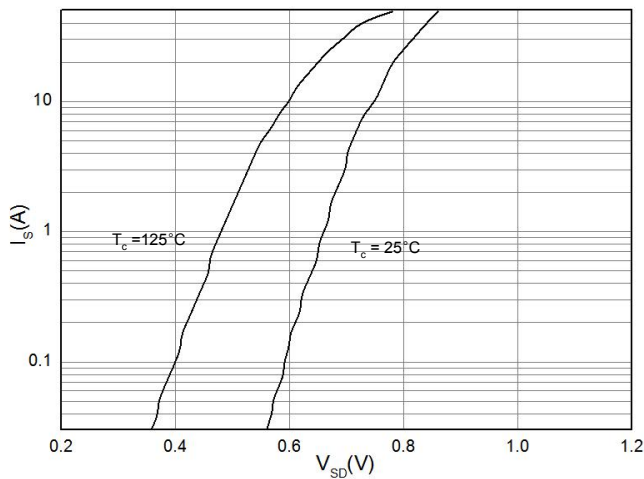


Figure 6. Rds(on)-Drain Current

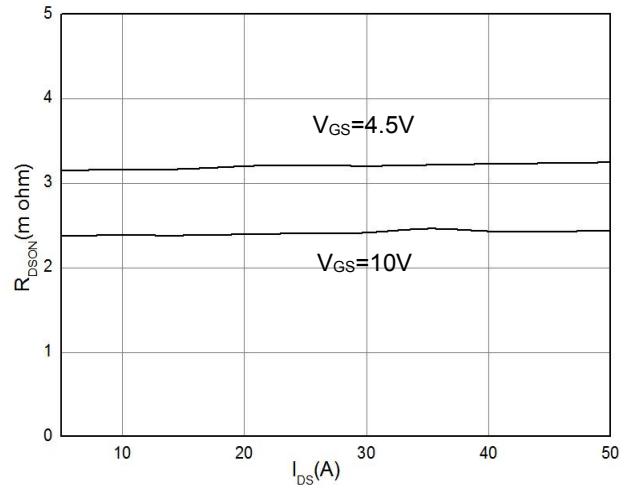


Fig 7: Rds(on) vs Gate Voltage

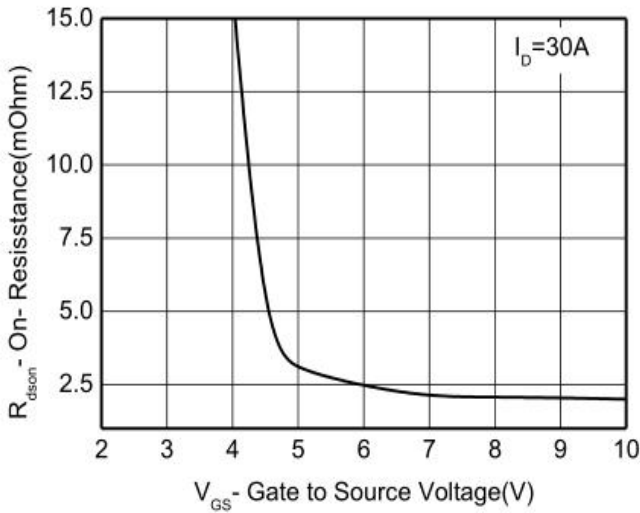


Fig 8: Rds(on)-Junction Temperature(°C)

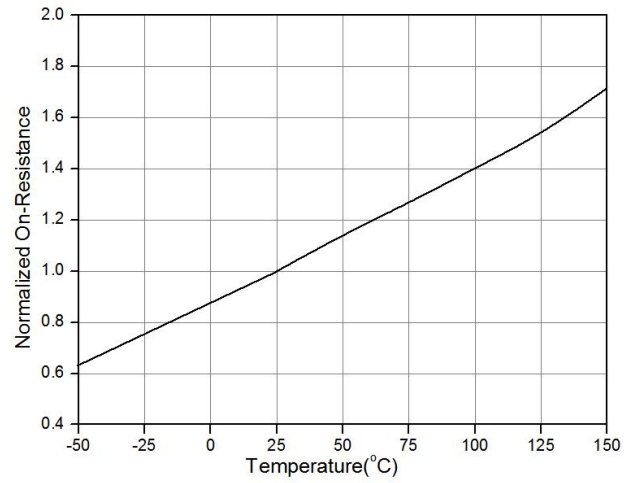


Figure 9. BVdss vs. Junction temperature

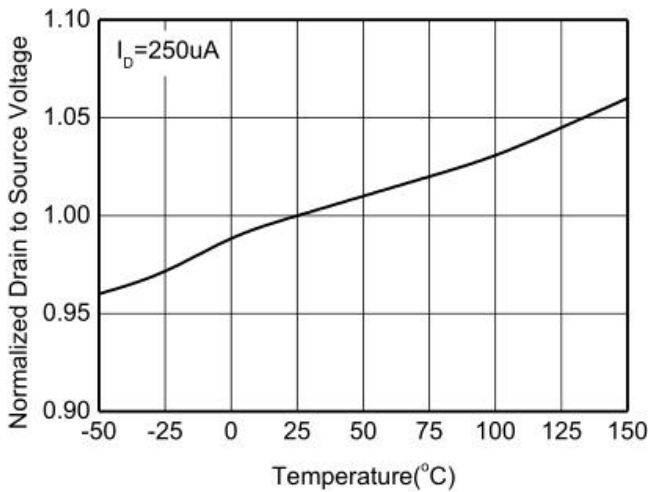


Figure 10. Maximum Safe Operating Area

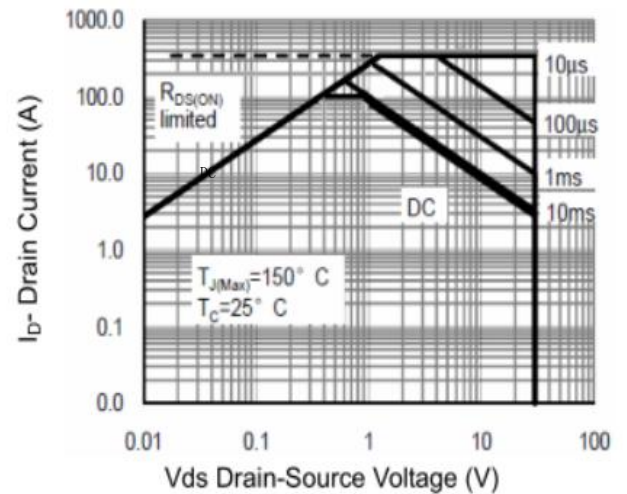
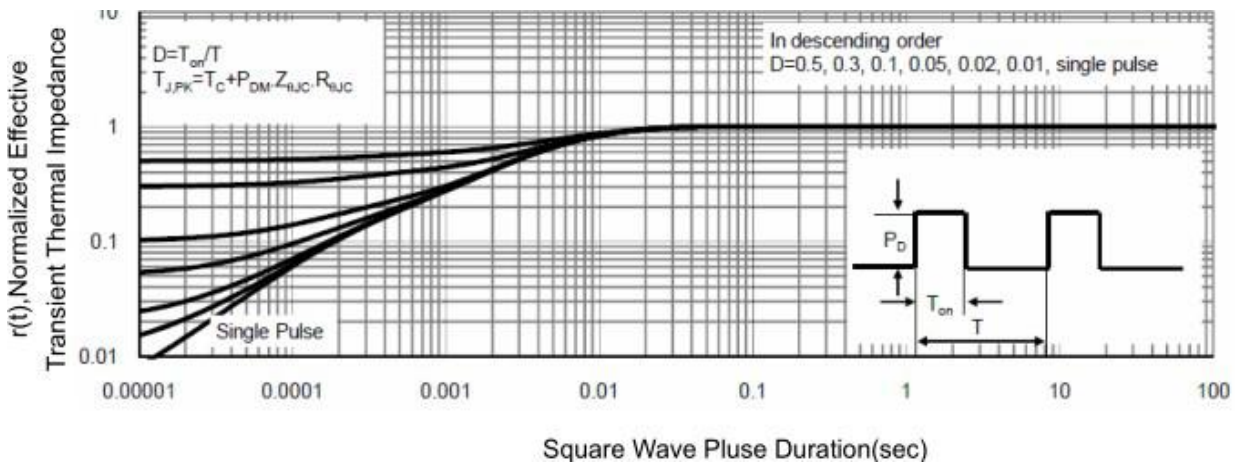


Figure 11. Normalized Maximum Transient Thermal Impedance (RthJC)



Test Circuit & Waveform

Figure 12. Gate Charge Test Circuit & Waveform

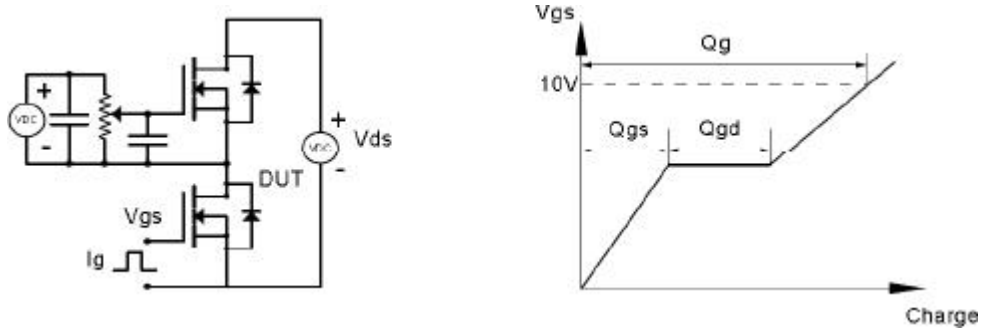


Figure 13. Resistive Switching Test Circuit & Waveforms

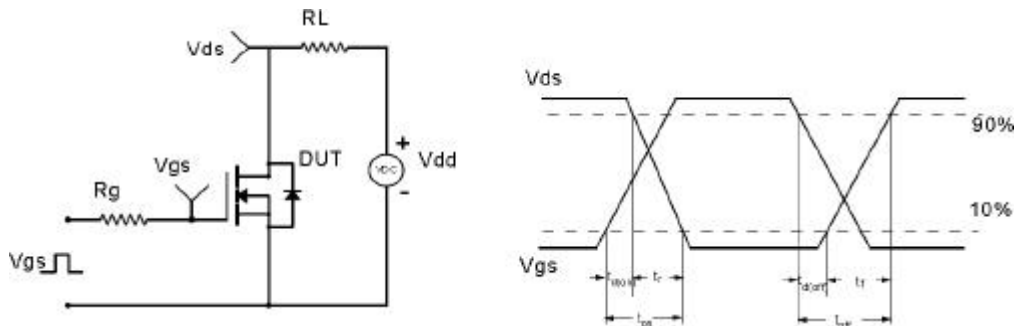


Figure 14. Unclamped Inductive Switching (UIS) Test Circuit & Waveform

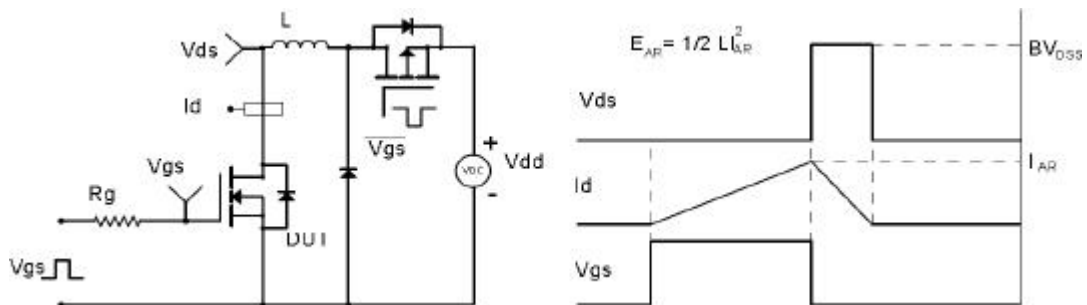
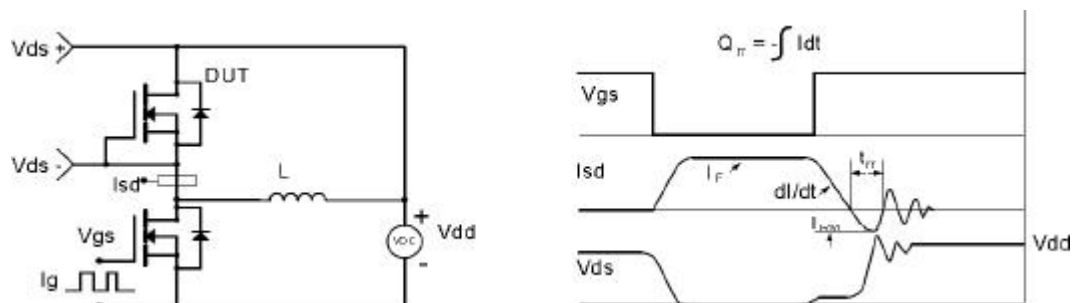
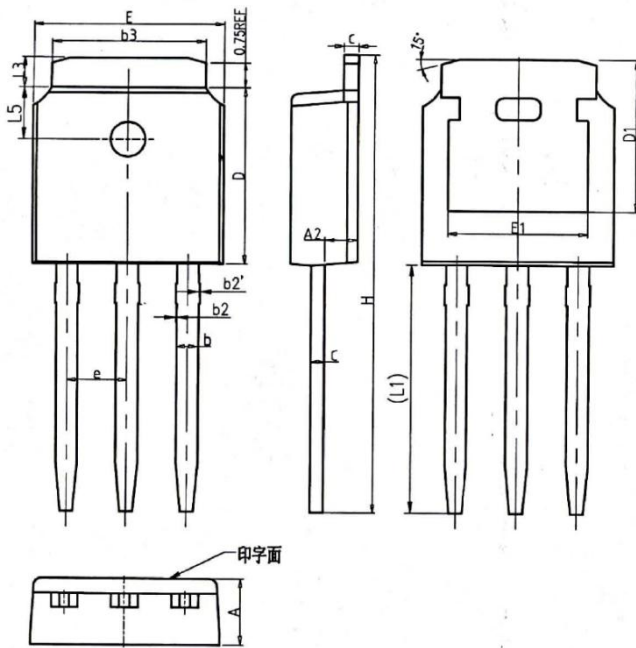


Figure 15. Diode Recovery Circuit & Waveform

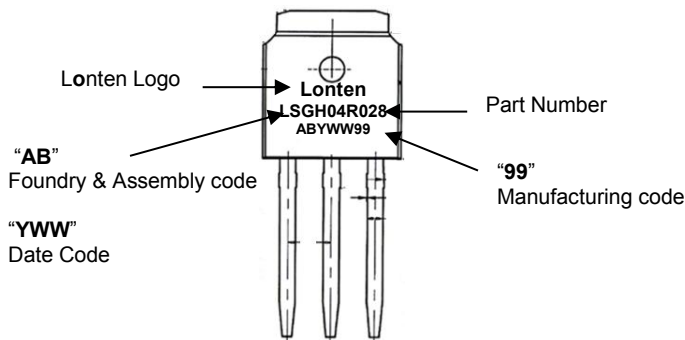


Mechanical Dimensions for TO-251



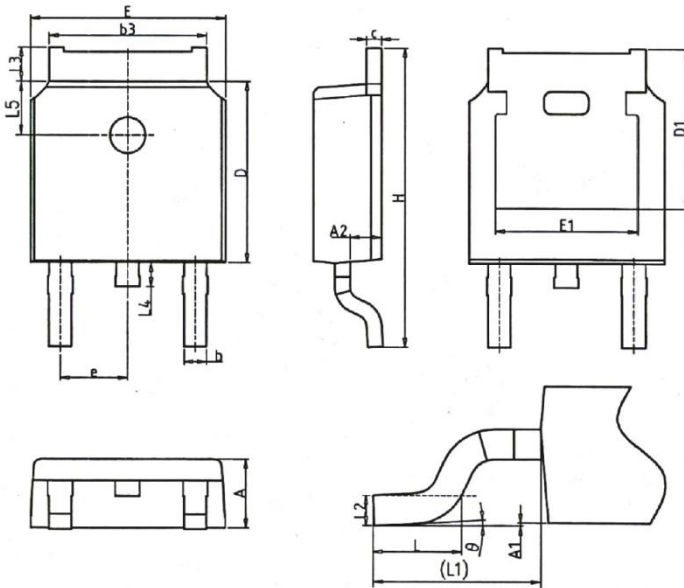
SYMBOL	COMMON DIMENSIONS					
	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	2.20	2.30	2.38	0.087	0.091	0.094
A2	0.97	1.07	1.17	0.038	0.042	0.046
b	0.68	0.78	0.90	0.027	0.031	0.035
b2	0.00	0.04	0.10	0.000	0.002	0.004
b2'	0.00	0.04	0.10	0.000	0.002	0.004
b3	5.20	5.33	5.46	0.205	0.210	0.215
c	0.43	0.53	0.61	0.017	0.021	0.024
D	5.98	6.10	6.22	0.235	0.240	0.245
D1	5.30REF			0.209REF		
E	6.40	6.60	6.73	0.252	0.260	0.265
E1	4.63	-	-	0.182	-	-
e	2.286BSC			0.090BSC		
H	16.22	16.52	16.82	0.639	0.650	0.662
L1	9.15	9.40	9.65	0.360	0.370	0.380
L3	0.88	1.02	1.28	0.035	0.040	0.050
L5	1.65	1.80	1.95	0.065	0.071	0.077

TO-251 Part Marking Information



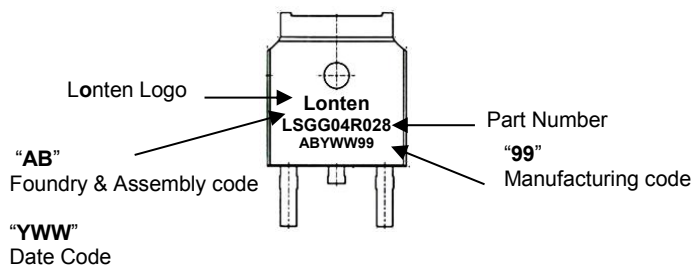
Calendar Year	Year Code	Calendar Week	Week Code
2018	G	Workweek 01	01
2019	H	Workweek 02	02
2020	I	Workweek 03	03
2021	J	Workweek 04	04
2022	K	Workweek 05	05
2023	L	Workweek 06	06
2024	M

Mechanical Dimensions for TO-252



SYMBOL	COMMON DIMENSIONS					
	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	2.20	2.30	2.38	0.087	0.091	0.094
A1	0.00	-	0.20	0.000	-	0.008
A2	0.97	1.07	1.17	0.038	0.042	0.046
b	0.68	0.78	0.90	0.027	0.031	0.035
b3	5.20	5.33	5.46	0.205	0.210	0.215
c	0.43	0.53	0.61	0.017	0.021	0.024
D	5.98	6.10	6.22	0.235	0.240	0.245
D1	5.30REF			0.209REF		
E	6.40	6.60	6.73	0.252	0.260	0.265
E1	4.63	-	-	0.182	-	-
e	2.286BSC			0.090BSC		
H	9.40	10.10	10.50	0.370	0.398	0.413
L	1.38	1.50	1.75	0.054	0.059	0.069
L1	2.90REF			0.114REF		
L2	0.51BSC			0.020BSC		
L3	0.88	-	1.28	0.035	-	0.050
L4	0.50	-	1.00	0.020	-	0.039
L5	1.65	1.80	1.95	0.065	0.071	0.077
θ	0°	-	8°	0°	-	8°

TO-252 Part Marking Information



Calendar Year	Year Code	Calendar Week	Week Code
2018	G	Workweek 01	01
2019	H	Workweek 02	02
2020	I	Workweek 03	03
2021	J	Workweek 04	04
2022	K	Workweek 05	05
2023	L	Workweek 06	06
2024	M

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