

## Lonten N-channel 85 V, 120A, 4.1mΩ Power MOSFET

### Features

- Extremely low on-resistance  $R_{DS(on)}$
- Excellent  $Q_g \times R_{DS(on)}$  product(FOM)
- Qualified according to JEDEC criteria

### Product Summary

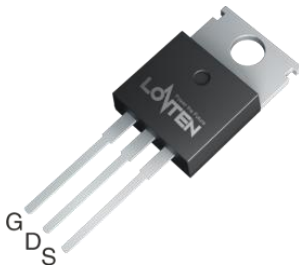
$V_{DS}$	85V
$R_{DS(on)}$	3.4mΩ
$I_D$	120A

### Applications

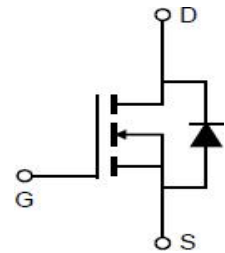
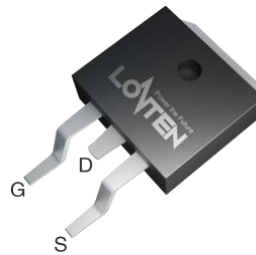
- Motor control and drive
- Battery management
- UPS (Uninterruptible Power Supplies)

*100% Avalanche Tested*

**TO-220**



**TO-263**



### Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	$V_{DS}$	85	V
Continuous drain current	$I_D$	$T_C = 25^\circ\text{C}$ (Silicon limit)	172
$T_C = 25^\circ\text{C}$ (Package limit)		120	
$T_C = 100^\circ\text{C}$ (Silicon limit)		109	
Pulsed drain current ( $T_C = 25^\circ\text{C}$ , $t_p$ limited by $T_{jmax}$ )	$I_{D\ pulse}$	480	A
Avalanche energy, single pulse ( $L=0.5\text{mH}$ , $R_g=25\Omega$ )	$E_{AS(\text{Note 1})}$	272	mJ
Gate-Source voltage	$V_{GS}$	$\pm 20$	V
Power dissipation ( $T_C = 25^\circ\text{C}$ )	$P_{tot}$	208	W
Operating junction and storage temperature	$T_j, T_{stg}$	-55...+150	$^\circ\text{C}$

※. Notes:1.EAS is tested at starting  $T_j = 25^\circ\text{C}$ ,  $L = 0.5\text{mH}$ ,  $I_{AS} = 33\text{A}$ ,  $V_{GS} = 10\text{V}$ .  $E_{AS}(\text{max})=1089\text{mJ}$  under  $I_{AS}(\text{max})=66\text{A}$  and above Conditions;

**Thermal Resistance**

Parameter	Symbol	Max	Unit
Thermal resistance, junction – case.	$R_{thJC}$	0.60	°C/W
Thermal resistance, junction – ambient(min. footprint)	$R_{thJA}$	53	

**Electrical Characteristic (at  $T_j = 25\text{ }^\circ\text{C}$ , unless otherwise specified)**

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		

**Static Characteristic**

Drain-source breakdown voltage	$BV_{DSS}$	85	97	-	V	$V_{GS}=0V, I_D=250\mu A$
Gate threshold voltage	$V_{GS(th)}$	2	3	4	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Zero gate voltage drain current	$I_{DSS}$	-	0.05	1	$\mu A$	$V_{DS}=80V, V_{GS}=0V$ $T_j=25^\circ C$ $T_j=125^\circ C$
Gate-source leakage current	$I_{GSS}$	-	10	100	nA	$V_{GS}=20V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	3.4	4.1	m $\Omega$	$V_{GS}=10V, I_D=50A$ TO-220
Transconductance	$g_{fs}$	-	113	-	S	$V_{DS}=5V, I_D=40A$

**Dynamic Characteristic**

Input Capacitance	$C_{iss}$	-	6050	-	pF	$V_{GS}=0V, V_{DS}=42.5V,$ $f=1MHz$
Output Capacitance	$C_{oss}$	-	1480	-		
Reverse Transfer Capacitance	$C_{rss}$	-	35	-		
Gate Total Charge	$Q_G$	-	74	-	nC	$V_{GS}=10V, V_{DS}=42.5V,$ $I_D=50A, f=1MHz$
Gate-Source charge	$Q_{gs}$	-	23	-		
Gate-Drain charge	$Q_{gd}$	-	21	-		
Turn-on delay time	$t_{d(on)}$	-	32	-	ns	$V_{ds}=42.5V$ $I_d=10A$ $R_g=3.5\Omega$ $V_{gs}=10V;$ (Note 2,3)
Rise time	$t_r$	-	53	-		
Turn-off delay time	$t_{d(off)}$	-	59	-		
Fall time	$t_f$	-	34	-		
Gate resistance	$R_G$	-	3.3	-	$\Omega$	$V_{GS}=0V, V_{DS}=0V,$ $f=1MHz$

**Body Diode Characteristic**

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	$V_{SD}$	-	0.9	1.4	V	$V_{GS}=0V, I_{SD}=50A$
Body Diode Reverse Recovery Time	$t_{rr}$	-	76	-	ns	$I_S=30A, V_{GS}=0V, dI_F/dt=100A/us;$
Body Diode Reverse Recovery Charge	$Q_{rr}$	-	97	-	nC	

※. Notes

2.Pulse Test : Pulse Width  $\leq 300us$ , duty cycle  $\leq 2\%$ .

3.Essentially independent of operating temperature.

Typical Performance Characteristics

Fig 1: Output Characteristics

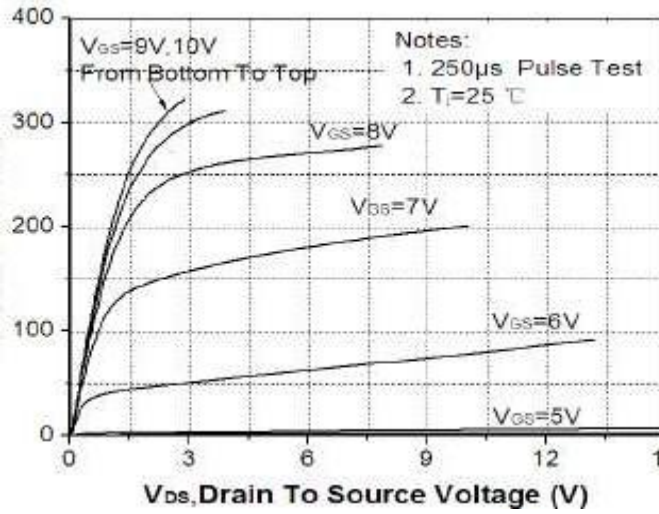


Fig 2: Transfer Characteristics

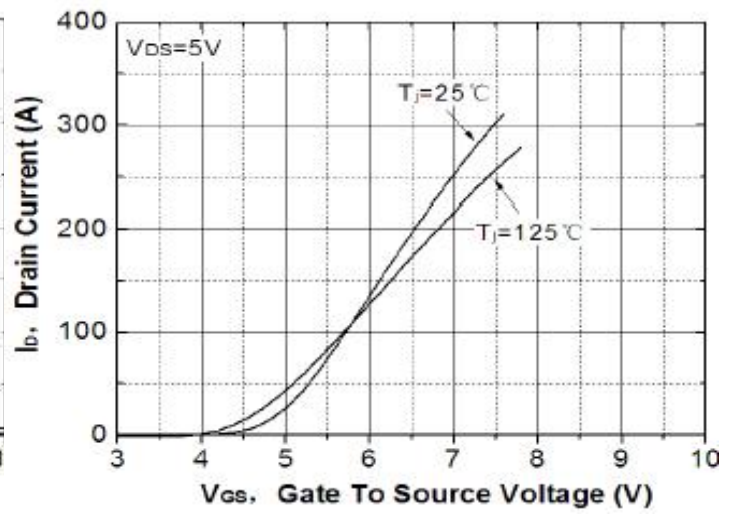


Fig 3: R<sub>ds(on)</sub> vs Drain Current and Gate Voltage

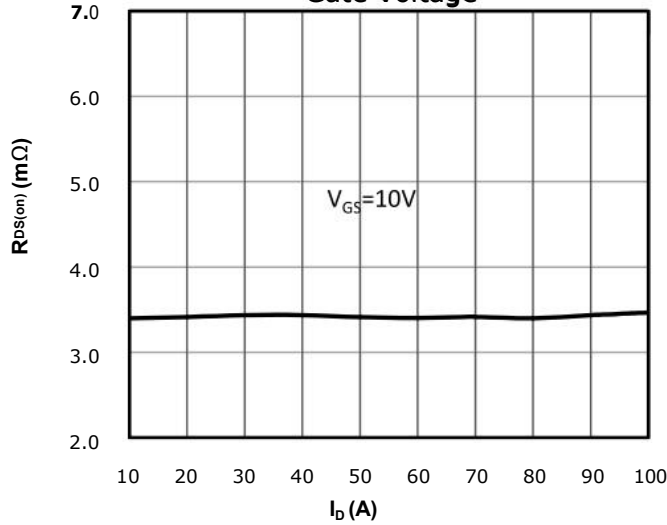


Fig 4: R<sub>ds(on)</sub> vs Gate Voltage

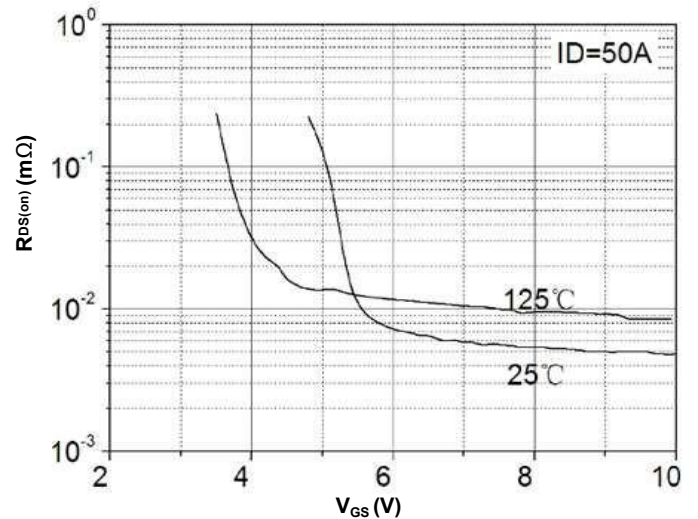


Fig 5: R<sub>ds(on)</sub> vs. Temperature

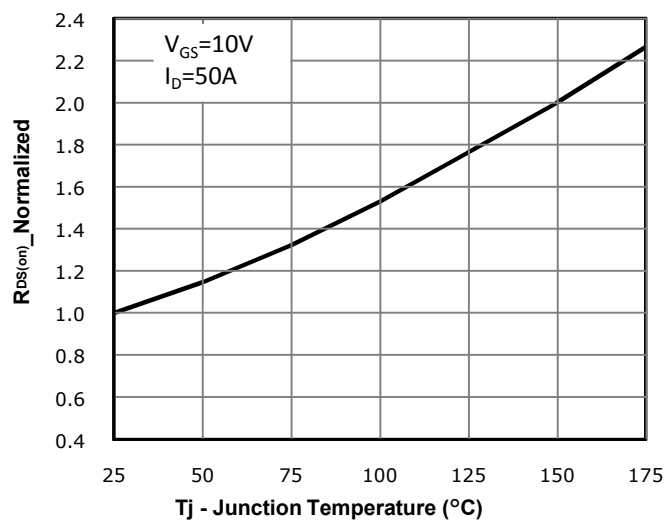


Fig 6: Capacitance Characteristics

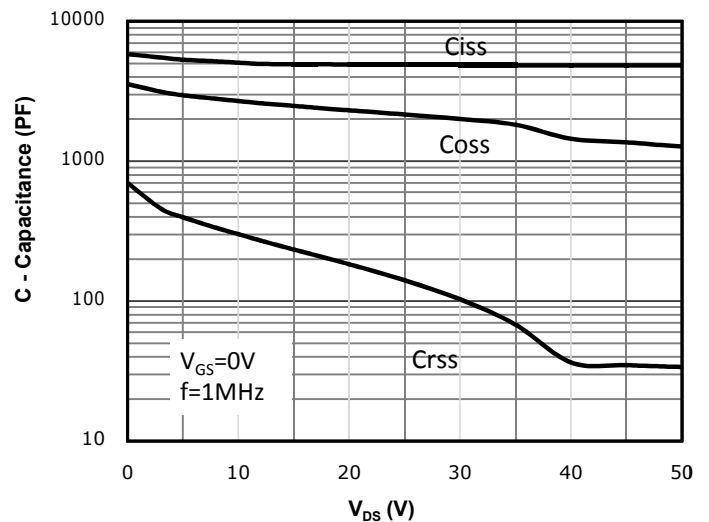


Fig 7: Gate Charge Characteristics

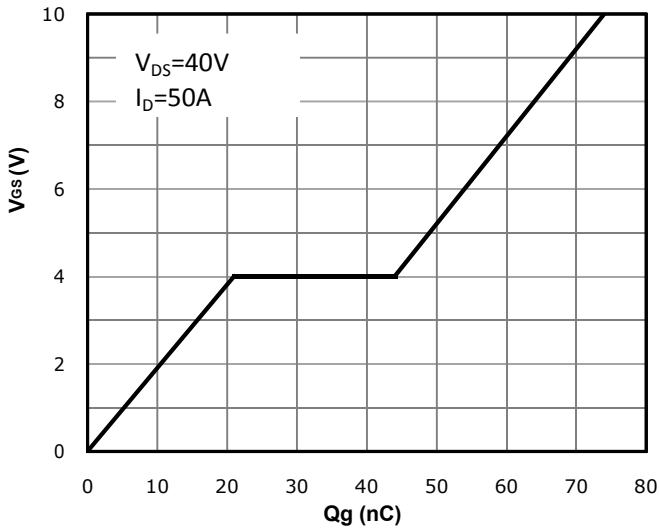


Fig 8: Body-diode Forward Characteristics

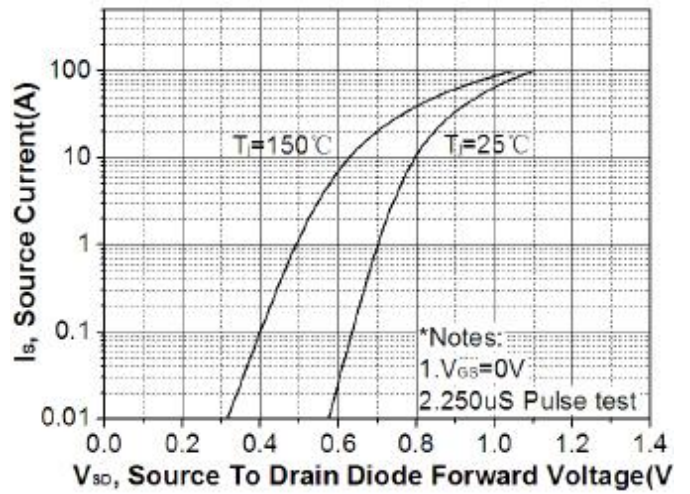


Fig 9: Power Dissipation

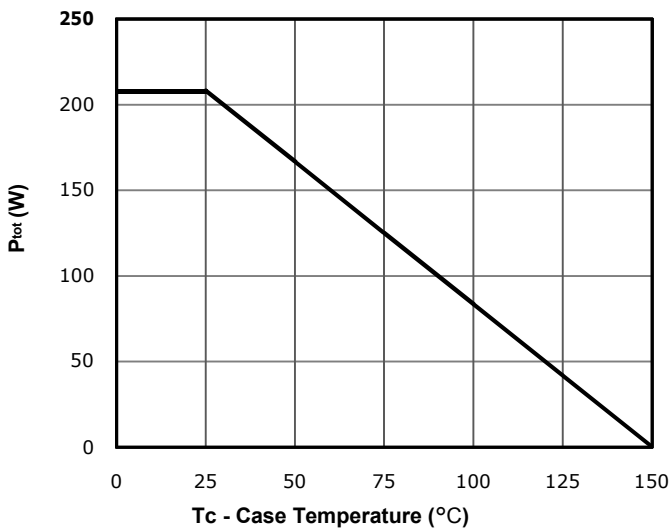


Fig 10: Drain Current Derating

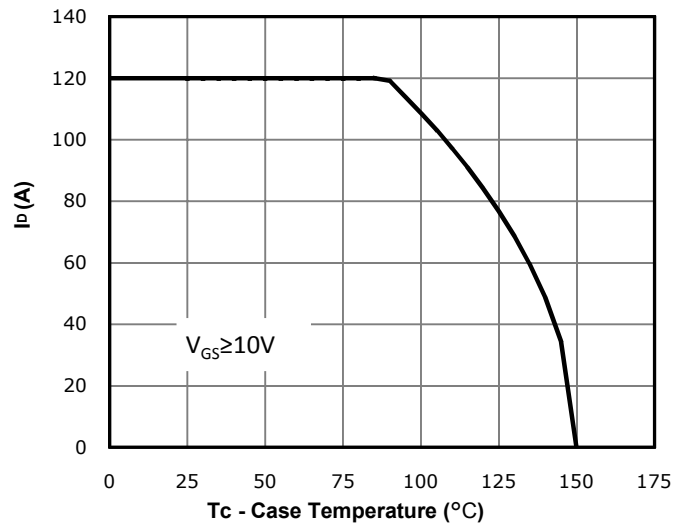


Fig 11: Safe Operating Area

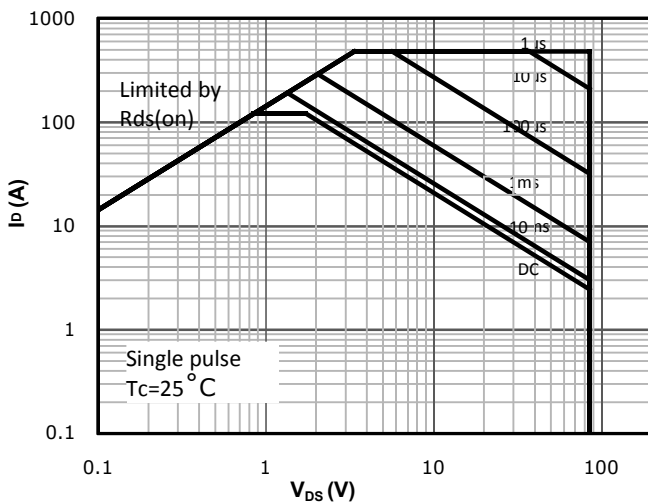
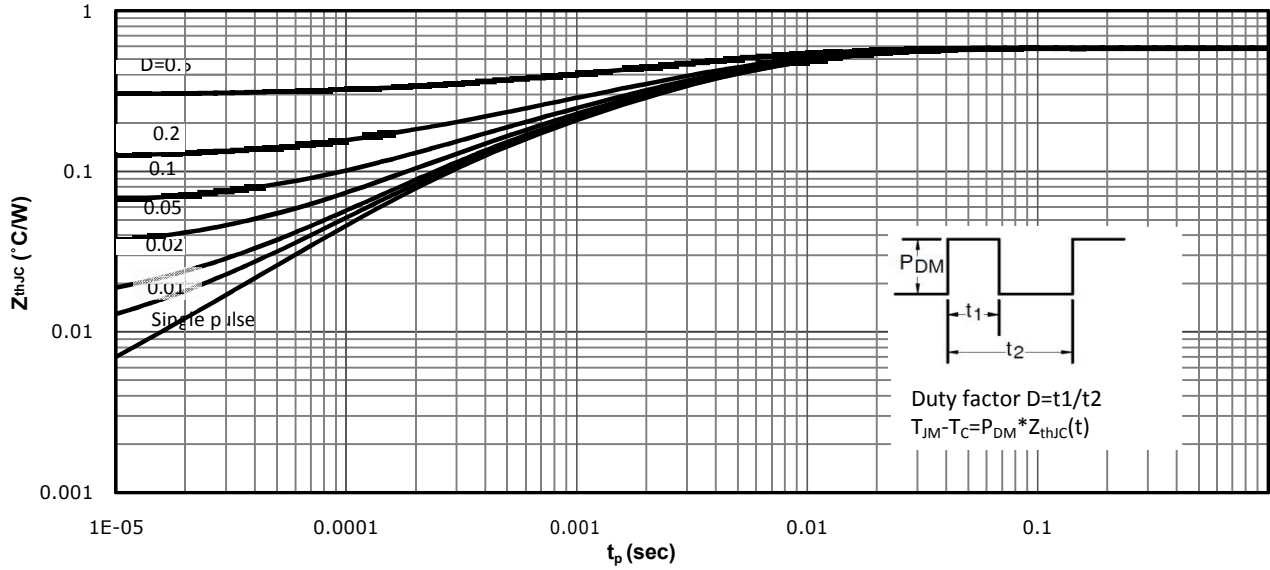
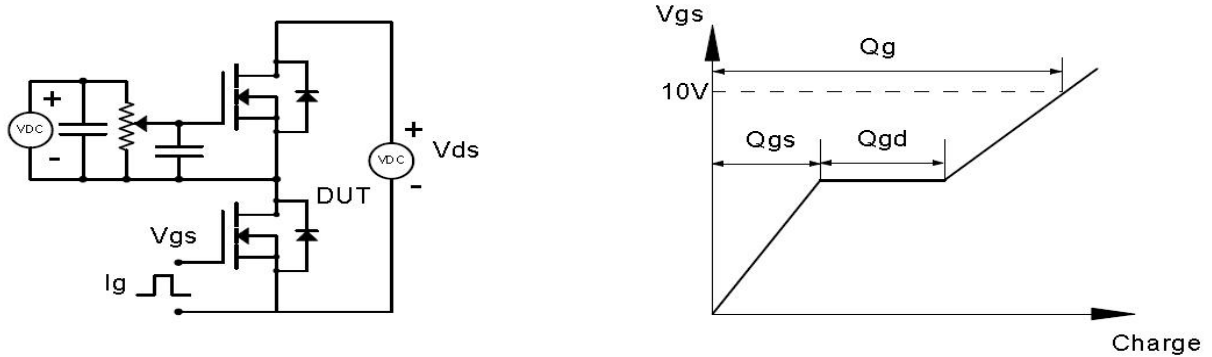


Fig 12: Max. Transient Thermal Impedance

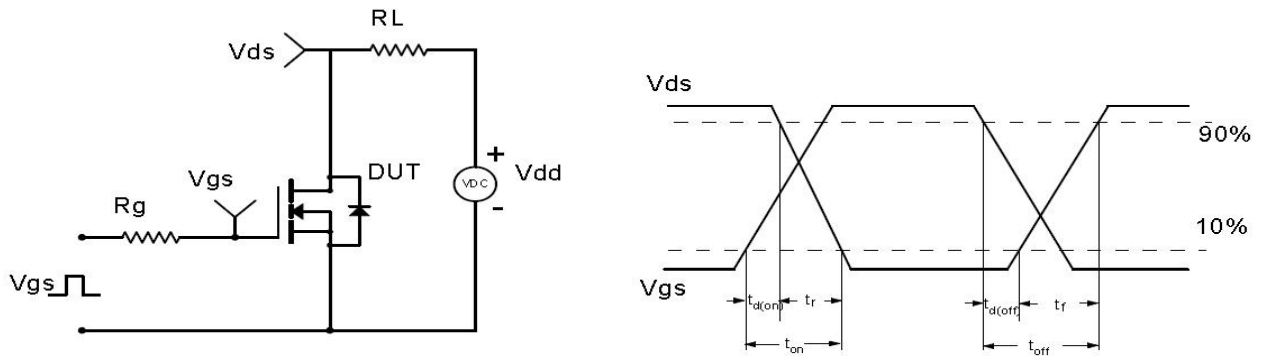


Test Circuit & Waveform

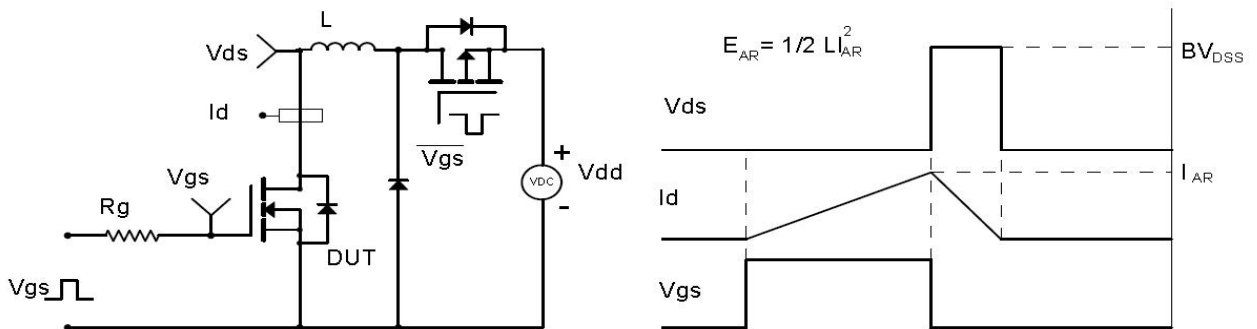
Gate Charge Test Circuit & Waveform



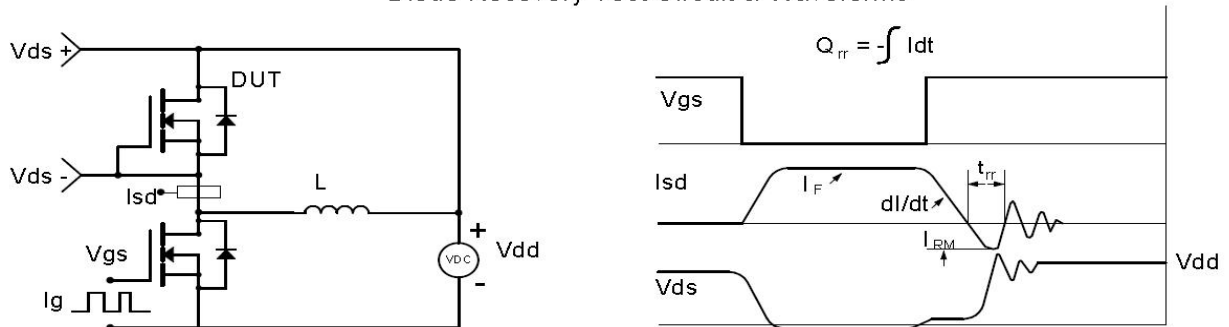
Resistive Switching Test Circuit & Waveforms



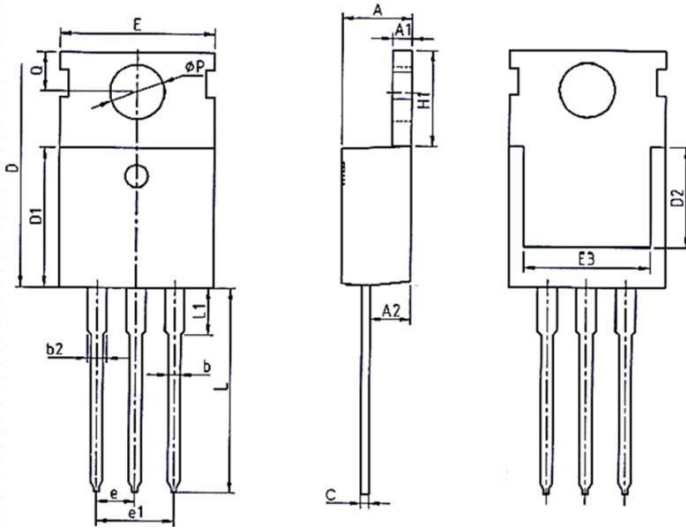
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

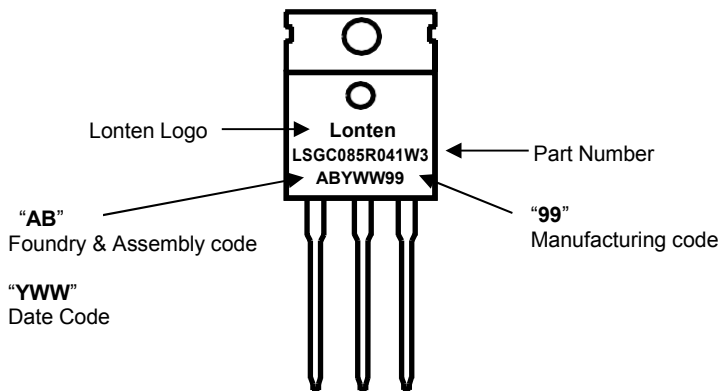


**Mechanical Dimensions for TO-220**



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	2.54BCS			0.1BSC		
e1	5.08BCS			0.2REF		
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

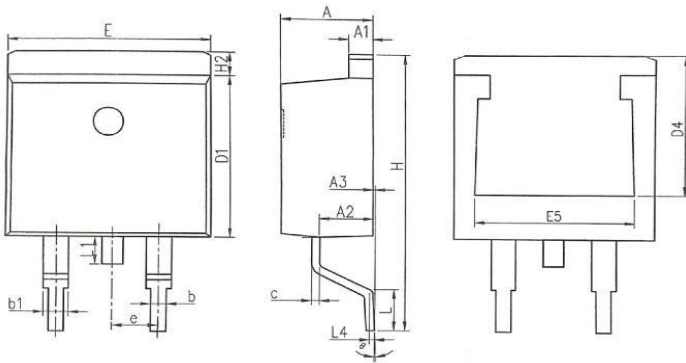
**TO-220 Part Marking Information**



Calendar Year	Year Code	Calendar Week	Week Code
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	.....	.....

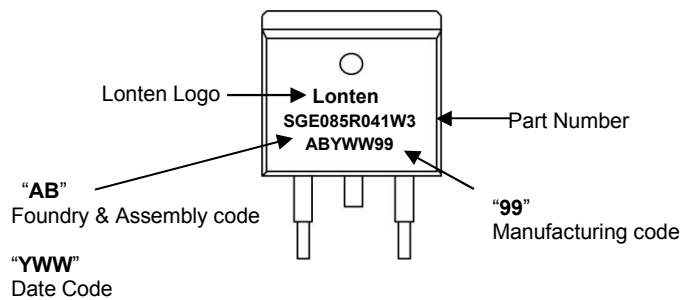


**Mechanical Dimensions for TO-263**



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	2.69	2.89	0.098	0.106	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	0.038
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	0.388	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°	5°	9°

**TO-263 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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