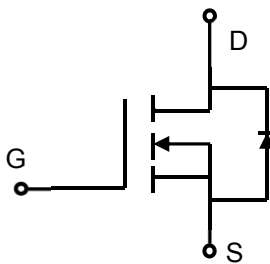


Lonten N-channel 600V, 20A, 0.18Ω LonFET™ Power MOSFET

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. $Q_g = 68\text{nC}$) ◆ 100% UIS tested ◆ RoHS compliant	Product Summary <table> <tr> <td>$V_{DS} @ T_{j,max}$</td><td>650V</td></tr> <tr> <td>$R_{DS(ON),max}$</td><td>0.18Ω</td></tr> <tr> <td>I_{DM}</td><td>60A</td></tr> <tr> <td>$Q_{g,typ}$</td><td>68nC</td></tr> </table>  N-Channel MOSFET	$V_{DS} @ T_{j,max}$	650V	$R_{DS(ON),max}$	0.18Ω	I_{DM}	60A	$Q_{g,typ}$	68nC
$V_{DS} @ T_{j,max}$	650V								
$R_{DS(ON),max}$	0.18Ω								
I_{DM}	60A								
$Q_{g,typ}$	68nC								

Absolute Maximum Ratings

Parameter	Symbol	LSC20N60	Unit
Drain-Source Voltage	V_{DSS}	600	V
Continuous drain current ($T_C = 25^\circ\text{C}$)	I_D	20	A
($T_C = 100^\circ\text{C}$)		13	A
Pulsed drain current ¹⁾	I_{DM}	60	A
Gate-Source voltage	V_{GSS}	± 30	V
Avalanche energy, single pulse ²⁾	E_{AS}	700	mJ
Avalanche energy, repetitive ¹⁾	E_{AR}	20.5	mJ
Avalanche current, repetitive ¹⁾	I_{AR}	20	A
Power Dissipation ($T_C = 25^\circ\text{C}$)	P_D	205	W
- Derate above 25°C		1.64	W/ $^\circ\text{C}$
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	$^\circ\text{C}$
Continuous diode forward current	I_S	20	A
Diode pulse current	$I_{S,pulse}$	60	A

Thermal Characteristics

Parameter	Symbol	LSC20N60	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.61	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	60	$^\circ\text{C/W}$

Package Marking and Ordering Information

Device	Device Package	Marking
LSC20N60	TO-220	LSC20N60

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 V, I _D =0.25 mA	600	-	-	V
Gate threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =0.25mA	2		5	V
Drain cut-off current	I _{DSS}	V _{DS} =600 V, V _{GS} =0 V,	-	-	1	μA
Gate leakage current, Forward	I _{GSSF}	V _{GS} =30 V, V _{DS} =0 V	-	-	100	nA
Gate leakage current, Reverse	I _{GSSR}	V _{GS} =-30 V, V _{DS} =0 V	-	-	-100	nA
Drain-source on-state resistance	R _{DS(on)}	V _{GS} =10 V, I _D =10 A	-			Ω
		T _J = 25°C	-	0.15	0.18	
		T _J = 150°C	-	0.41	-	
Gate resistance	R _G	f=1 MHz, open drain	-	1.8	-	Ω
Dynamic characteristics						
Input capacitance	C _{iss}	V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz	-	2100	-	pF
Output capacitance	C _{oss}		-	1700	-	
Reverse transfer capacitance	C _{rss}		-	17	-	
Turn-on delay time	t _{d(on)}	V _{DD} = 300V, I _D = 20A R _G = 25Ω, V _{GS} =10V	-	70	-	ns
Rise time	t _r		-	60	-	
Turn-off delay time	t _{d(off)}		-	250	-	
Fall time	t _f		-	55	-	
Gate charge characteristics						
Gate to source charge	Q _{gs}	V _{DD} =480 V, I _D =20A, V _{GS} =0 to 10 V	-	27	-	nC
Gate to drain charge	Q _{gd}		-	20	-	
Gate charge total	Q _g		-	68	-	
Gate plateau voltage	V _{plateau}		-	6.2	-	V
Reverse diode characteristics						
Diode forward voltage	V _{SD}	V _{GS} =0 V, I _F =10A	-	-	1.4	V
Reverse recovery time	t _{rr}	V _R =50 V, I _F =20A, dI _F /dt=100 A/μs	-	520	-	ns
Reverse recovery charge	Q _{rr}		-	5.7	-	μC
Peak reverse recovery current	I _{rrm}		-	19	-	A

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $I_{AS} = 7\text{ A}, V_{DD} = 60\text{ V}, R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$

Electrical Characteristics Diagrams

Figure 1. On-Region Characteristics

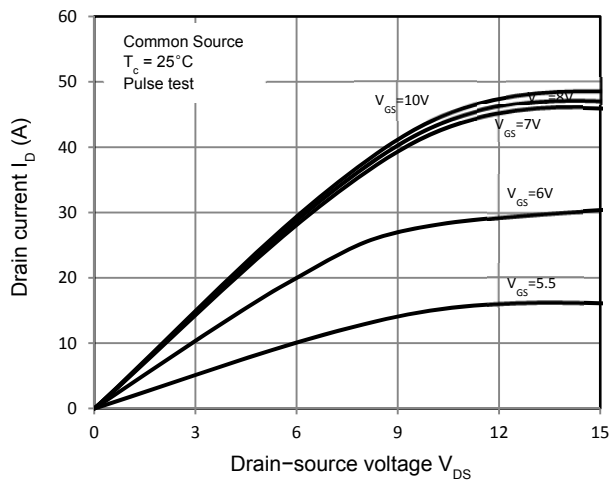


Figure 2. Transfer Characteristics

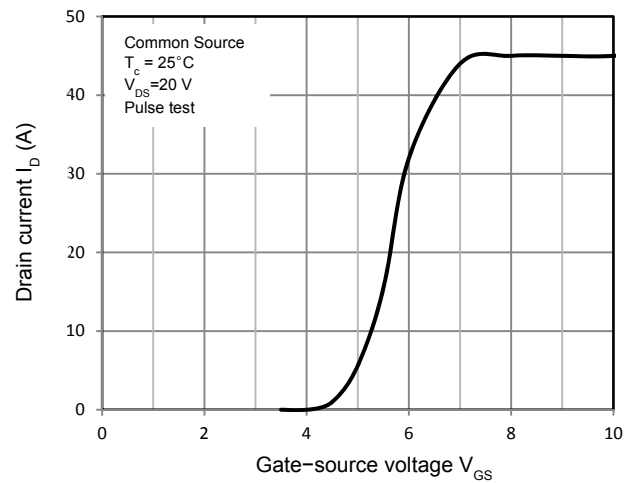


Figure 3. On-Resistance Variation vs. Drain Current

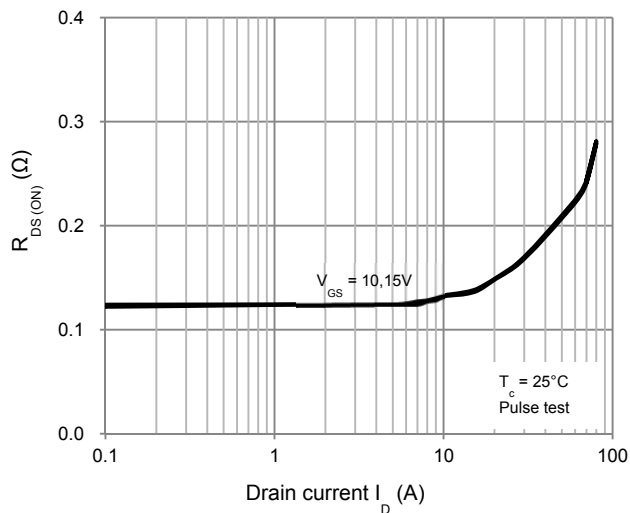


Figure 4. Threshold Voltage vs. Temperature

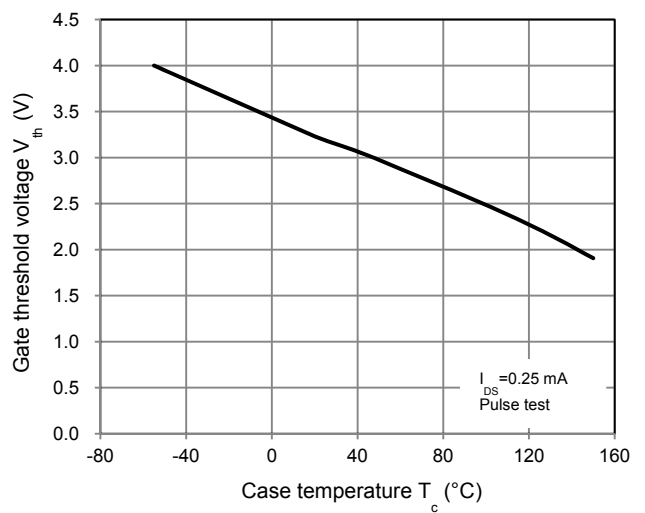


Figure 5. Breakdown Voltage vs. Temperature

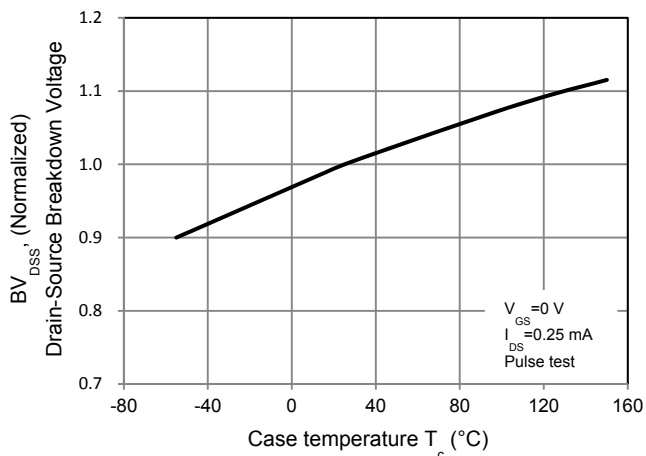


Figure 6. On-Resistance vs. Temperature

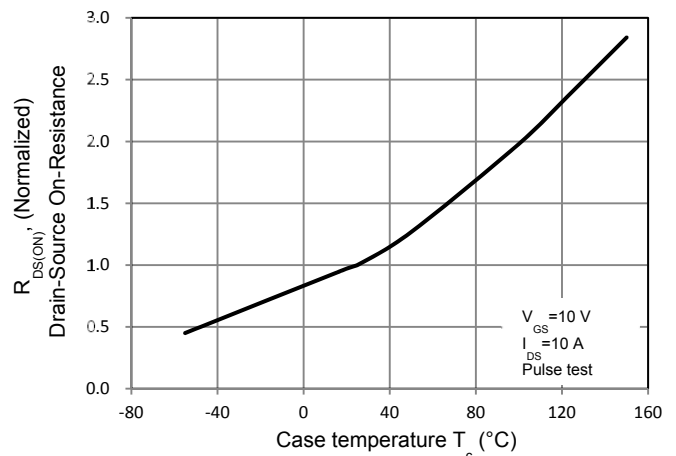


Figure 7. Capacitance Characteristics

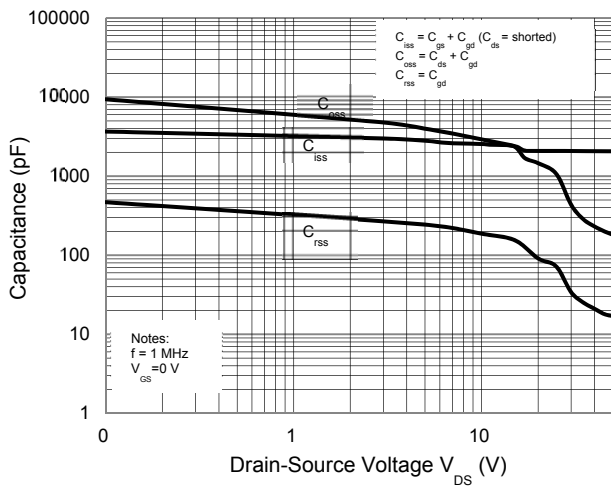


Figure 8. Gate Charge Characteristics

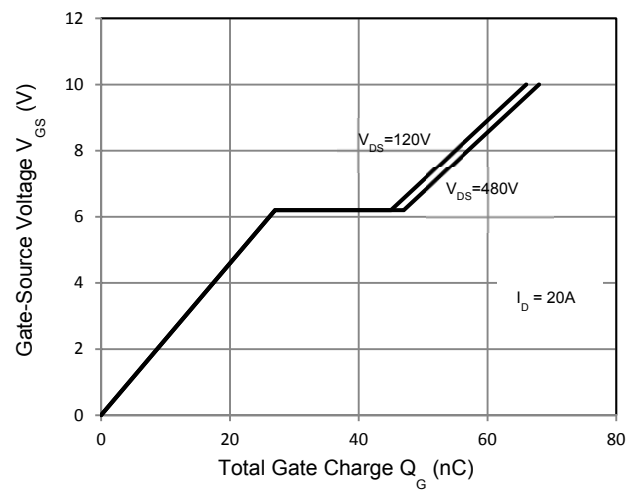


Figure 9. Maximum Safe Operating Area

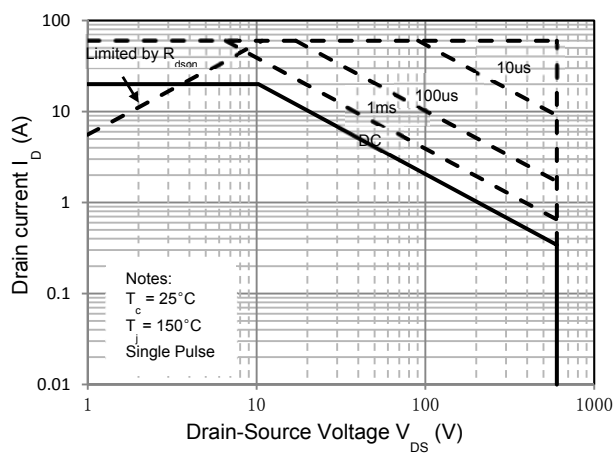


Figure 10. Power Dissipation vs. Temperature

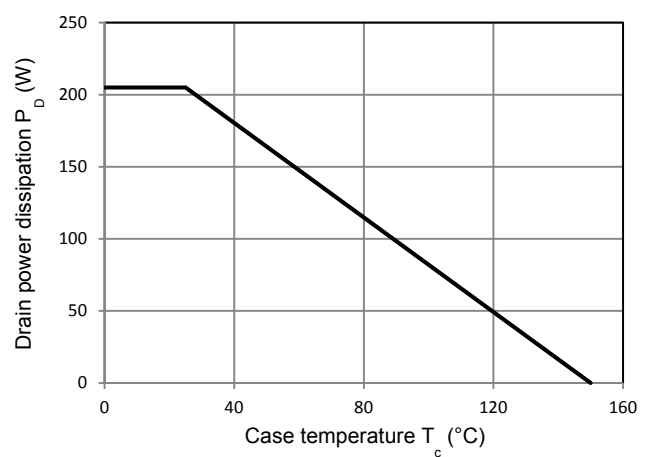
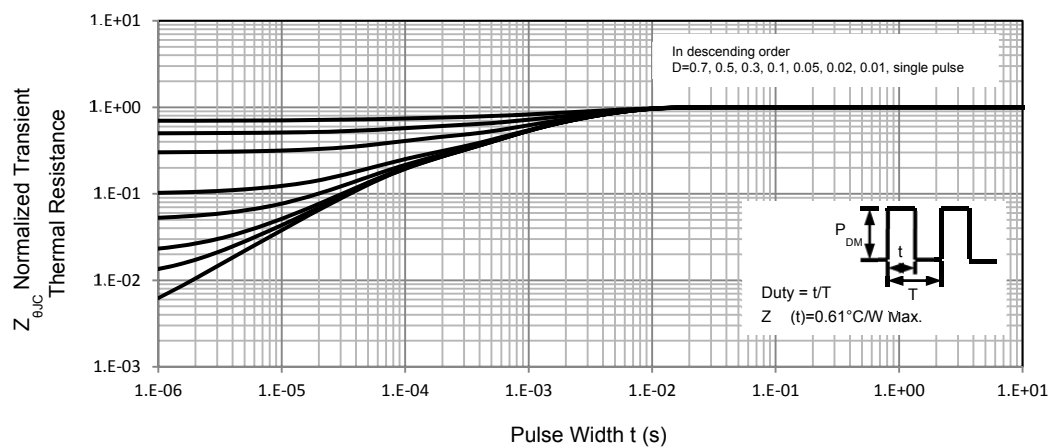
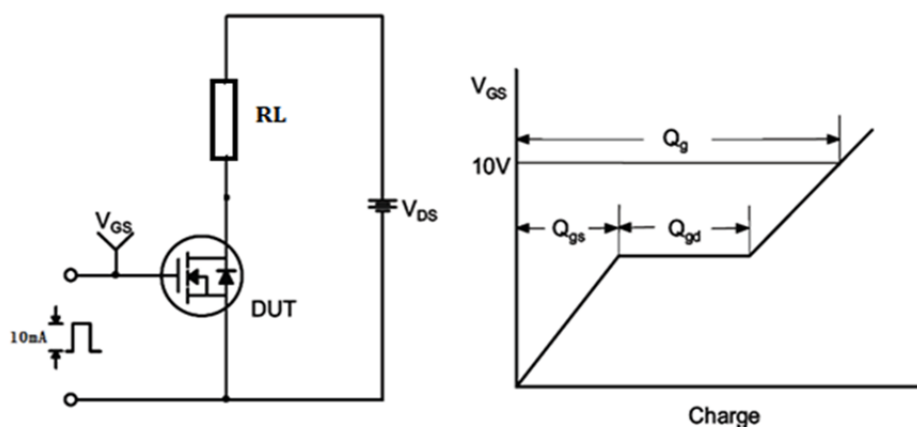


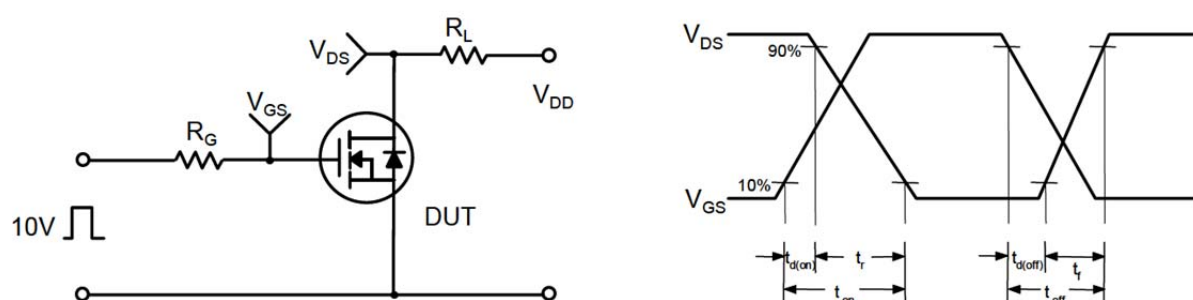
Figure 11. Transient Thermal Response Curve



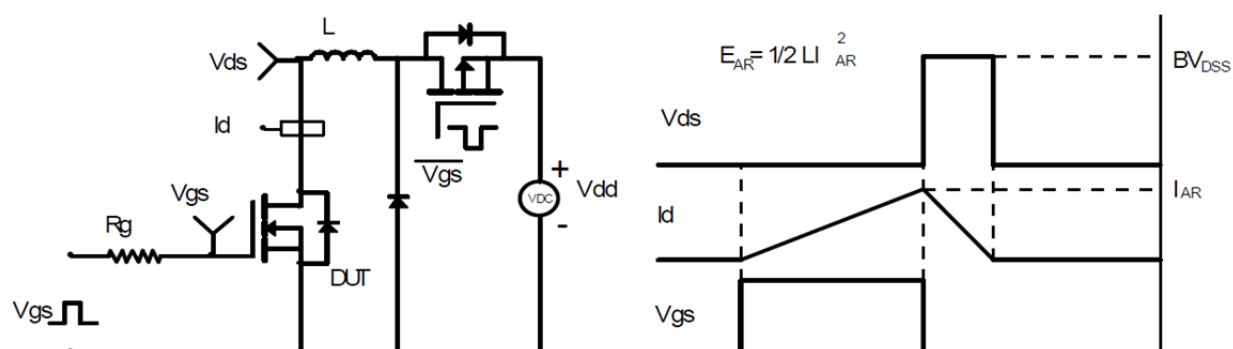
Gate Charge Test Circuit & Waveform



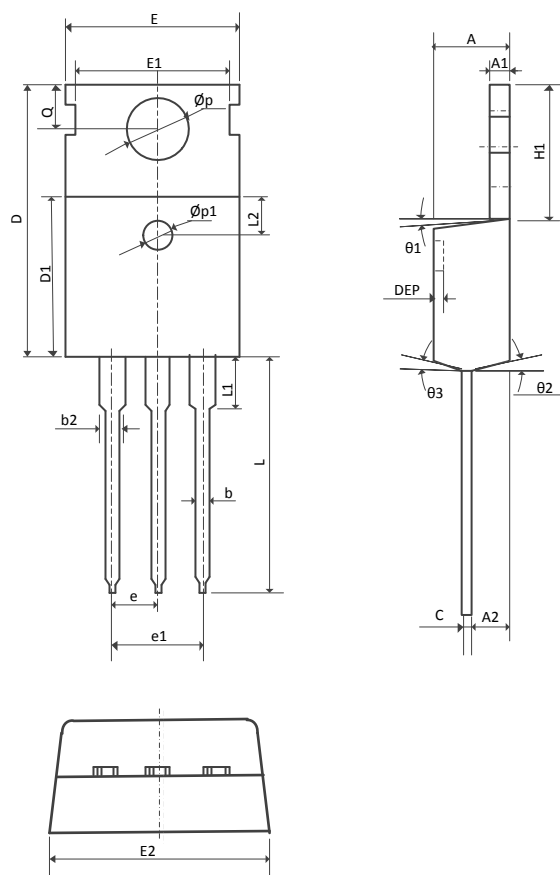
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



Mechanical Dimensions



COMMON DIMENSIONS						
SYMBOL	MM			INCH		
	MIN	NOM	MAX	MIN	NOM	MAX
A	4.40	4.57	4.70	0.173	0.180	0.185
A1	1.27	1.30	1.37	0.050	0.051	0.054
A2	2.35	2.40	2.50	0.091	0.094	0.098
b	0.77	0.80	0.90	0.030	0.031	0.035
b2	1.17	1.27	1.36	0.046	0.050	0.054
c	0.48	0.50	0.56	0.019	0.020	0.022
D	15.40	15.60	15.80	0.606	0.614	0.622
D1	9.00	9.10	9.20	0.354	0.358	0.362
DEP	0.05	0.10	0.20	0.002	0.004	0.008
E	9.80	10.00	10.20	0.386	0.394	0.402
E1	—	8.70	—	—	0.343	—
E2	9.80	10.00	10.20	0.386	0.394	0.401
Øp1	1.40	1.50	1.60	0.055	0.059	0.063
e	2.54BSC			0.1BSC		
e1	5.08BSC			0.2BSC		
H1	6.40	6.50	6.60	0.252	0.256	0.260
L	12.75	13.50	13.65	0.502	0.531	0.537
L1	—	3.10	3.30	—	0.122	0.130
L2	2.50REF			0.098REF		
Øp	3.50	3.60	3.63	0.137	0.142	0.143
Q	2.73	2.80	2.87	0.107	0.110	0.116
θ1	5°	7°	9°	5°	7°	9°
θ2	1°	3°	5°	1°	3°	5°
θ3	1°	3°	5°	1°	3°	5°