

### Description

The LMAK9N20 is silicon N-channel Enhanced VDMOSFETs, is obtained by the self-aligned planar Technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. The transistor can be used in various power switching circuit for system miniaturization and higher efficiency.

### General Features

$V_{DS} = 200V$   $I_D = 9A$

$R_{DS(ON)} < 300m\Omega$  @  $V_{GS}=10V$  (Typ.230m $\Omega$ )

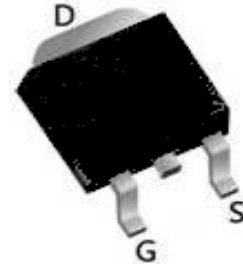
### Application

- Uninterruptible Power Supply(UPS)
- Power Factor Correction (PFC)

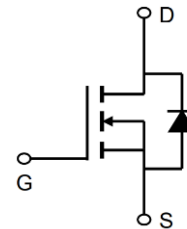
### Package Marking and Ordering Information

Device	Device Marking	Device Package	Reel Size	Tape width	Quantity
LMAK9N20	AP9N20D	TO-252	-	-	2500 units

### Dimensions TO-252



### Pin Configuration



### Absolute Maximum Ratings (TC=25°C unless otherwise noted)

Symbol	Parameter	Value	Unit
		TO-252	
VDSS	Drain-Source Voltage ( $V_{GS} = 0V$ )	200	V
ID	Continuous Drain Current	9	A
IDM	Pulsed Drain Current (note1)	36	A
VGS	Gate-Source Voltage	$\pm 20$	V
EAS	Single Pulse Avalanche Energy (note2)	100	mJ
IAR	Avalanche Current (note1)	7.5	A
EAR	Repetitive Avalanche Energy note1)	8.1	mJ
PD	Power Dissipation ( $T_C = 25^\circ C$ )	74	W
TJ, Tstg	Operating Junction and Storage Temperature Range	-55~+150	°C
RthJC	Thermal Resistance, Junction-to-Case	1.7	°C/W
RthJA	Thermal Resistance, Junction-to-Ambient	62.5	°C/W

**Electrical Characteristics (T<sub>J</sub>=25°C, unless otherwise noted)**

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Unit
V(BR)DSS	Drain-Source Breakdown Voltage	VGS = 0V, ID = 250μA	200	222	--	V
IDSS	Zero Gate Voltage Drain Current	VDS = 200V, VGS = 0V, T <sub>J</sub> = 25°C	--	--	5	μA
IDSS	Zero Gate Voltage Drain Current	VDS = 160V, VGS = 0V, T <sub>J</sub> = 125°C	--	--	100	
IGSS	Gate-Source Leakage	VGS = ±20V	--	--	±100	nA
VGS(th)	Gate-Source Threshold Voltage	VDS = VGS, ID = 250μA	1.0	1.6	3.0	V
RDS(on)	Drain-Source On-Resistance	VGS = 10V, ID = 4.5A	--	230	300	mΩ
Ciss	Input Capacitance	VGS = 0V, VDS = 25V, f = 1.0MHz	--	684	--	pF
Coss	Output Capacitance		--	103	--	
Crss	Reverse Transfer Capacitance		--	37	--	
Qg	Total Gate Charge	VDD = 160V, ID = 9.0A, VGS = 10V	--	23	--	nC
Qgs	Gate-Source Charge		--	2.5	--	
Qgd	Gate-Drain Charge		--	10	--	
td(on)	Turn-on Delay Time	VDD = 100V, ID = 9.0A, RG = 25 Ω	--	12	--	ns
tr	Turn-on Rise Time		--	22	--	
td(off)	Turn-off Delay Time		--	50	--	
tf	Turn-off Fall Time		--	48	--	
IS	Continuous Body Diode Current	TC = 25 °C	--	--	9	A
ISM	Pulsed Diode Forward Current		--	--	36	
VSD	Body Diode Voltage	T <sub>J</sub> = 25°C, ISD = 9A, VGS = 0V	--	--	1.4	V
trr	Reverse Recovery Time	VGS = 0V, IS = 9A, diF/dt = 100A /μs	--	190	--	ns
Qrr	Reverse Recovery Charge		--	1.7	--	μC

**Note :**

- 1、 The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2、 The EAS data shows Max. rating . IAS = 7.5A, VDD = 50V, RG = 25 Ω, Starting T<sub>J</sub> = 25 °C
- 3、 The test condition is Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 1%
- 4、 The power dissipation is limited by 150°C junction temperature
- 5、 The data is theoretically the same as ID and IDM , in real applications , should be limited by total power dissipation.

Typical Electrical and Thermal Characteristics

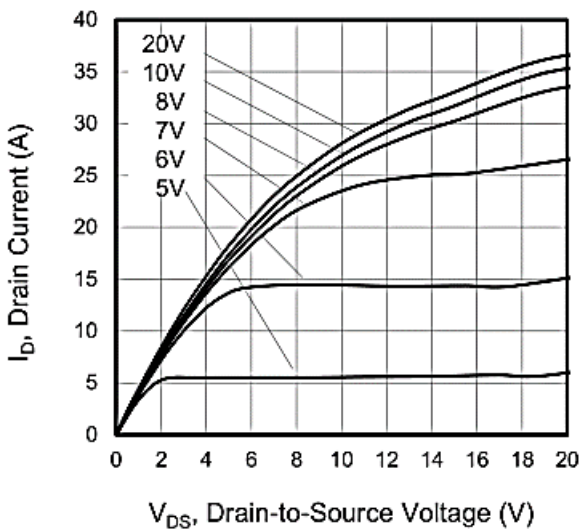


Figure 1. Output Characteristics ( $T_J = 25^\circ\text{C}$ )

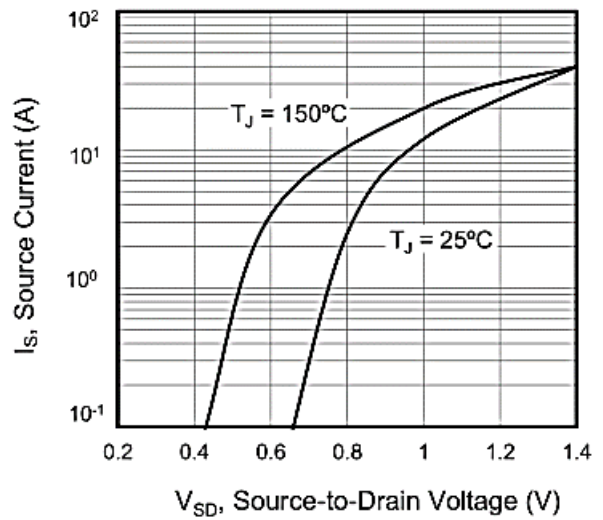


Figure 2. Body Diode Forward Voltage

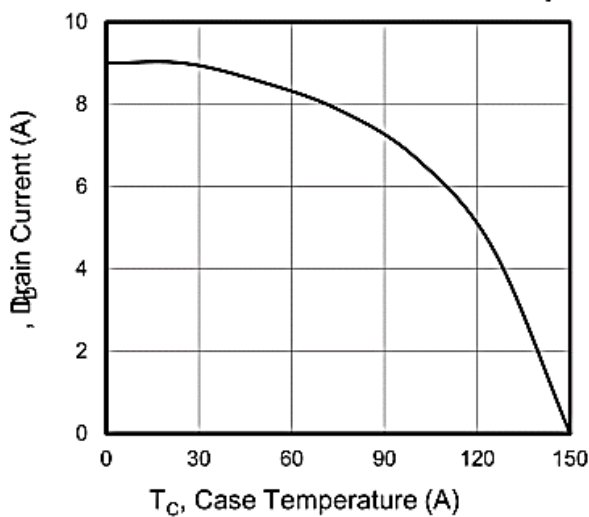


Figure 3. Drain Current vs. Temperature

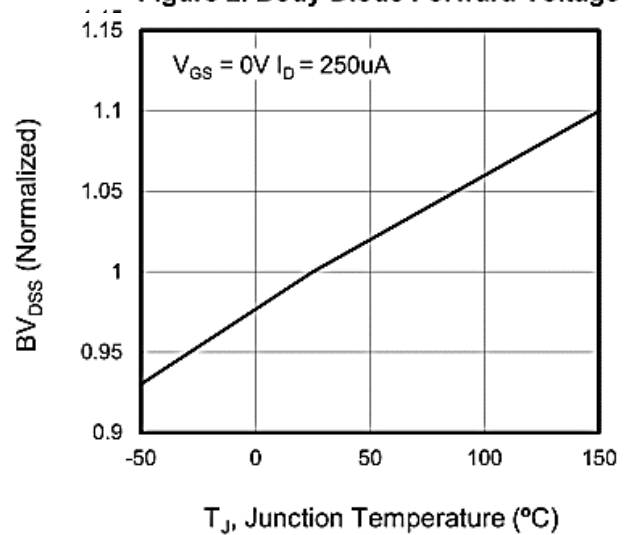


Figure 4.  $BV_{DSS}$  Variation vs. Temperature

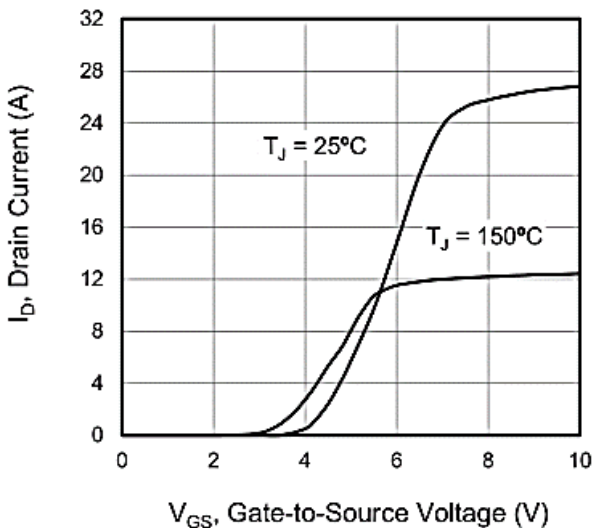


Figure 5. Transfer Characteristics

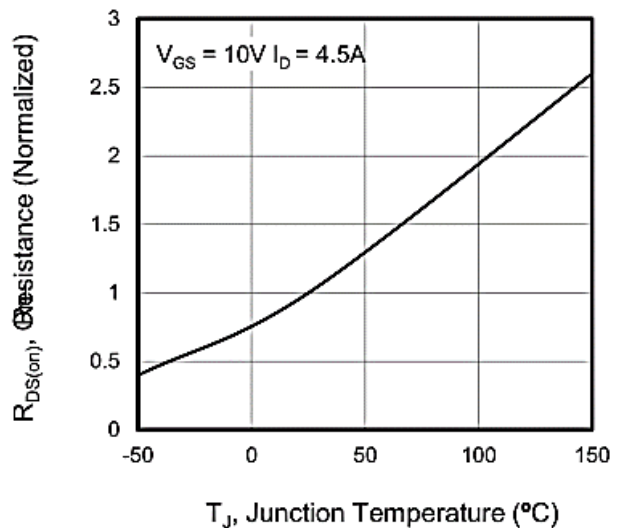


Figure 6. On-Resistance vs. Temperature

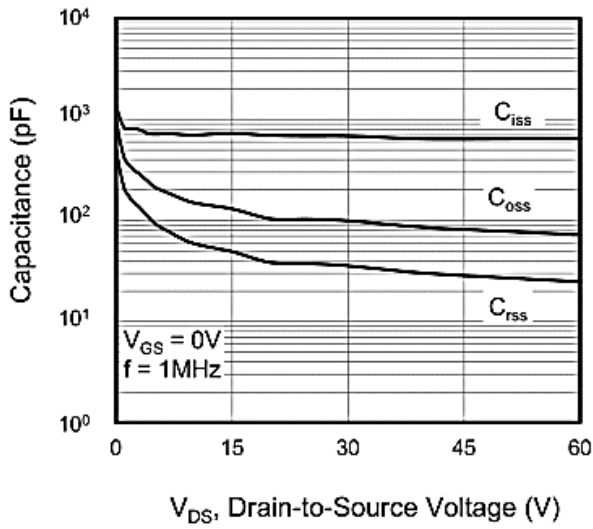


Figure 7. Capacitance

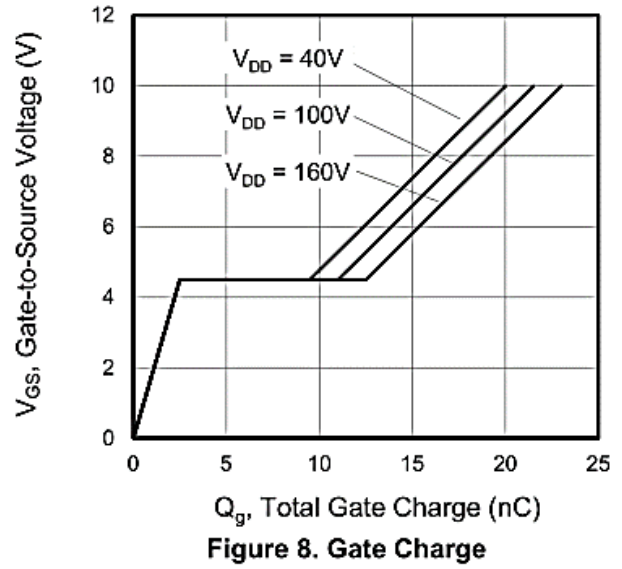


Figure 8. Gate Charge

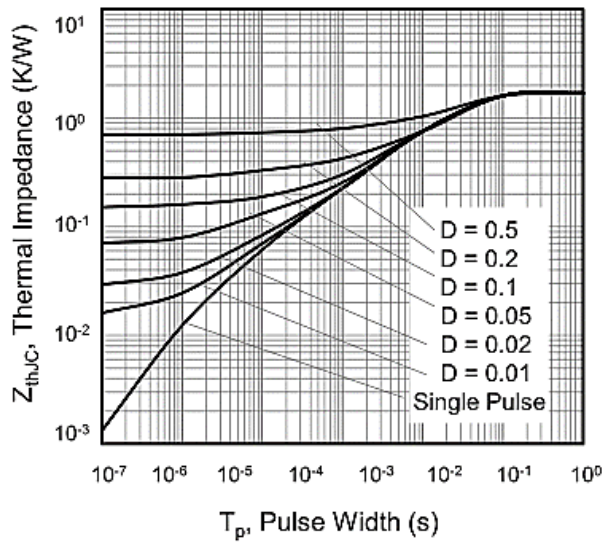
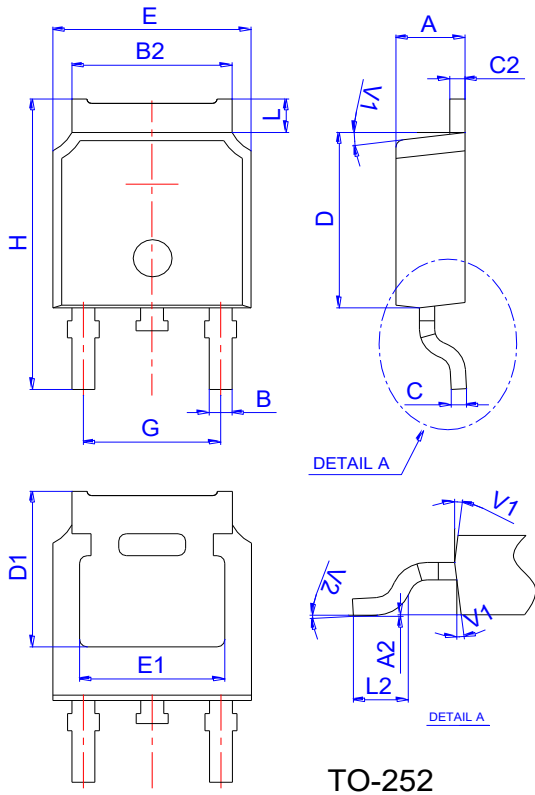


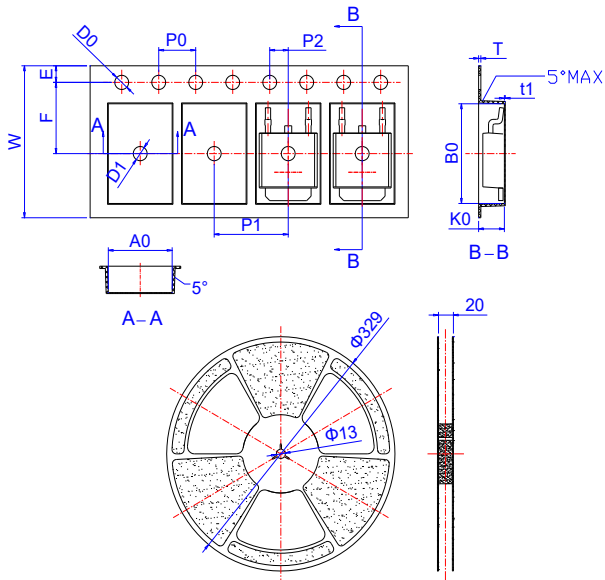
Figure 10. Transient Thermal Impedance

## TO-252 Package Mechanical Data



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.10		2.50	0.083		0.098
A2	0		0.10	0		0.004
B	0.66		0.86	0.026		0.034
B2	5.18		5.48	0.202		0.216
C	0.40		0.60	0.016		0.024
C2	0.44		0.58	0.017		0.023
D	5.90		6.30	0.232		0.248
D1	5.30REF			0.209REF		
E	6.40		6.80	0.252		0.268
E1	4.63			0.182		
G	4.47		4.67	0.176		0.184
H	9.50		10.70	0.374		0.421
L	1.09		1.21	0.043		0.048
L2	1.35		1.65	0.053		0.065
V1		7°			7°	
V2	0°		6°	0°		6°

## Reel Specification



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
W	15.90	16.00	16.10	0.626	0.630	0.634
E	1.65	1.75	1.85	0.065	0.069	0.073
F	7.40	7.50	7.60	0.291	0.295	0.299
D0	1.40	1.50	1.60	0.055	0.059	0.063
D1	1.40	1.50	1.60	0.055	0.059	0.063
P0	3.90	4.00	4.10	0.154	0.157	0.161
P1	7.90	8.00	8.10	0.311	0.315	0.319
P2	1.90	2.00	2.10	0.075	0.079	0.083
A0	6.85	6.90	7.00	0.270	0.271	0.276
B0	10.45	10.50	10.60	0.411	0.413	0.417
K0	2.68	2.78	2.88	0.105	0.109	0.113
T	0.24		0.27	0.009		0.011
t1	0.10			0.004		
10P0	39.80	40.00	40.20	1.567	1.575	1.583