




# Power MOSFETS


## DATASHEET


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**LM1A039NAP3A**

N-Channel  
Enhancement Mode MOSFET

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Quality Management Systems

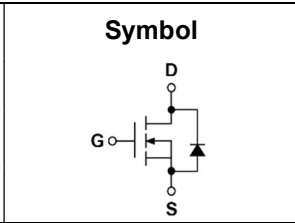
ISO 9001:2015 Certificate

# LM1A039NAP3A



## N-Channel Enhancement Mode MOSFET

### Pin Description



### Product Summary

Symbol	N-Channel	Unit
V <sub>DSS</sub>	100	V
R <sub>DS(ON)-Max</sub>	4.8	mΩ
I <sub>D</sub>	122	A

### Feature

- Fast switching speed
- Reliable and Rugged
- ROHS Compliant & Halogen-Free
- 100% UIS and R<sub>g</sub> Tested

### Applications

- Synchronous Rectification in SMPS
- Hard Switching and High Speed Circuit

### Ordering Information

Orderable Part Number	Package Type	Form	Shipping	Marking
LM1A039NAP3A	TO-220-3L	Tube	50 / Tube	1A039 □□□□□□

Note : □□□□□□ = Lot Code

### Absolute Maximum Ratings (T<sub>J</sub>=25°C Unless Otherwise Noted)

Symbol	Parameter	N-Channel	Unit
V <sub>DSS</sub>	Drain-Source Voltage	100	V
V <sub>GSS</sub>	Gate-Source Voltage	±20	
T <sub>J</sub>	Maximum Junction Temperature	150	°C
T <sub>STG</sub>	Storage Temperature Range	-55 to 150	°C
I <sub>DM</sub> <sup>①</sup>	Pulse Drain Current Tested	T <sub>C</sub> =25°C 400 <sup>①</sup>	A
I <sub>D</sub>	Continuous Drain Current	T <sub>C</sub> =25°C 122 <sup>①</sup>	A
		T <sub>C</sub> =100°C 102	
P <sub>D</sub>	Maximum Power Dissipation	T <sub>C</sub> =25°C 125	W
		T <sub>C</sub> =100°C 50	
I <sub>D</sub>	Continuous Drain Current	T <sub>A</sub> =25°C 20.4	A
		T <sub>A</sub> =70°C 16.3	
P <sub>D</sub>	Maximum Power Dissipation	T <sub>A</sub> =25°C 2.0	W
		T <sub>A</sub> =70°C 1.3	
I <sub>AS</sub> <sup>②</sup>	Avalanche Current, Single pulse	L=0.1mH 45	A
		L=0.5mH 26	
E <sub>AS</sub> <sup>③</sup>	Avalanche Energy, Single pulse	L=0.1mH 101	mJ
		L=0.5mH 169	

### Thermal Characteristics

Symbol	Parameter	Rating	Unit
R <sub>θJC</sub>	Thermal Resistance-Junction to Case	Steady State	1 °C/W
R <sub>θJA</sub> <sup>③</sup>	Thermal Resistance-Junction to Ambient	Steady State	62.5 °C/W

Note ① : Max. current is limited by bonding wire

Note ② : UIS tested and pulse width are limited by maximum junction temperature 150°C

Note ③ : Surface Mounted on 1in<sup>2</sup> FR-4 board with 1oz.

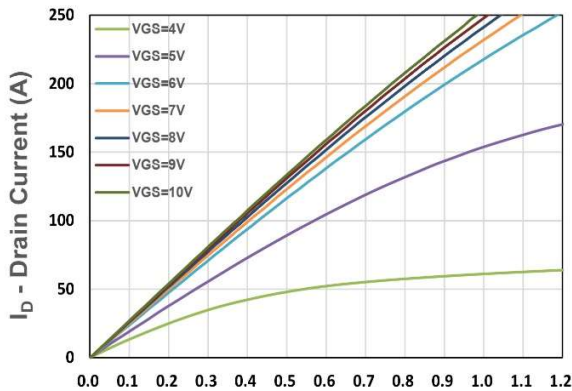
## N-Channel Electrical Characteristics (T<sub>J</sub>=25°C Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static Electrical Characteristics</b>						
<b>BV<sub>DSS</sub></b>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>DS</sub> =250uA	100	-	-	V
<b>I<sub>DSS</sub></b>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =80V, V <sub>GS</sub> =0V	-	-	1	uA
<b>V<sub>GS(th)</sub></b>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250uA	1	2	3	V
<b>I<sub>GSS</sub></b>	Gate Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
<b>R<sub>DS(ON)</sub></b> ④	Drain-Source On-state Resistance	V <sub>GS</sub> =10V, I <sub>DS</sub> =20A	-	4	4.8	mΩ
		V <sub>GS</sub> =4.5V, I <sub>DS</sub> =10A	-	5.5	7	
<b>gfs</b>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>DS</sub> =10A	-	39	-	S
<b>Dynamic Characteristics</b> ⑥						
<b>R<sub>G</sub></b>	Gate Resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, Freq.=1MHz	-	0.52	-	Ω
<b>C<sub>iss</sub></b>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =50V, Freq.=1MHz	-	4930	-	pF
<b>C<sub>oss</sub></b>	Output Capacitance		-	1130	-	
<b>C<sub>rss</sub></b>	Reverse Transfer Capacitance		-	89	-	
<b>td(ON)</b>	Turn-on Delay Time	V <sub>GS</sub> =10V, V <sub>DS</sub> =25V, I <sub>D</sub> =1A, R <sub>GEN</sub> =3Ω	-	16	-	nS
<b>t<sub>r</sub></b>	Turn-on Rise Time		-	5.6	-	
<b>t<sub>d(OFF)</sub></b>	Turn-off Delay Time		-	54.8	-	
<b>t<sub>f</sub></b>	Turn-off Fall Time		-	101	-	
<b>Q<sub>g</sub></b>	Total Gate Charge	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =50V, I <sub>D</sub> =20A	-	47.5	-	nC
<b>Q<sub>g</sub></b>	Total Gate Charge	V <sub>GS</sub> =10V, V <sub>DS</sub> =50V, I <sub>D</sub> =20A	-	93.2	-	
<b>Q<sub>gs</sub></b>	Gate-Source Charge		-	20	-	
<b>Q<sub>gd</sub></b>	Gate-Drain Charge		-	21	-	
<b>Source-Drain Characteristics</b>						
<b>V<sub>SD</sub></b> ④	Diode Forward Voltage	I <sub>SD</sub> =10A, V <sub>GS</sub> =0V	-	0.75	1.1	V
<b>t<sub>rr</sub></b>	Reverse Recovery Time	I <sub>F</sub> =10A, V <sub>R</sub> =50V	-	55	-	nS
<b>Q<sub>rr</sub></b>	Reverse Recovery Charge	dI <sub>F</sub> /dt=100A/μs	-	82	-	nC

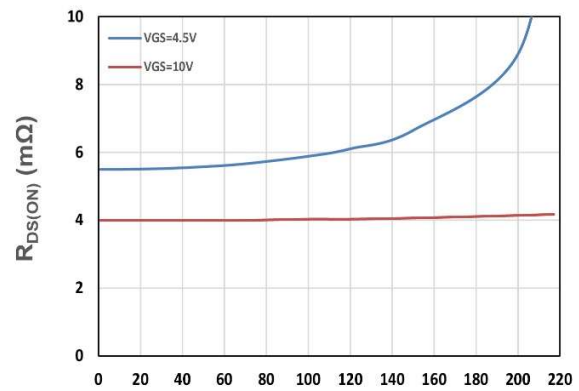
Note ④ : Pulse test (pulse width≤300us, duty cycle≤2%).

Note ⑤ : Guaranteed by design, not subject to production testing.

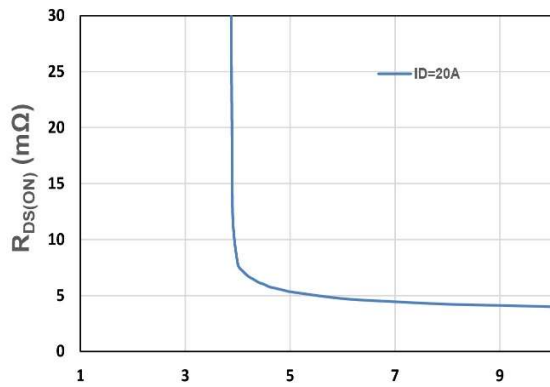
## N-Channel Typical Characteristics



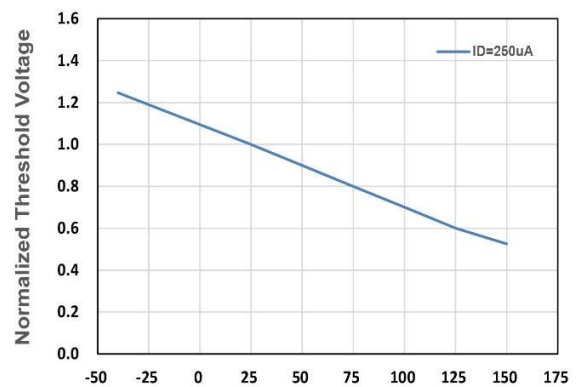
$V_{DS}$  - Drain - Source Voltage (V)  
Figure 1. Output Characteristics



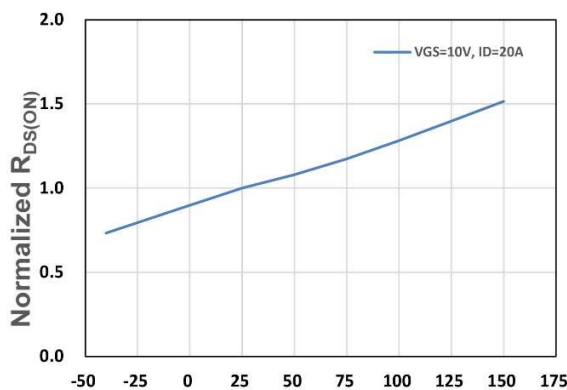
$I_D$  - Drain Current (A)  
Figure 2. On-Resistance vs.  $I_D$



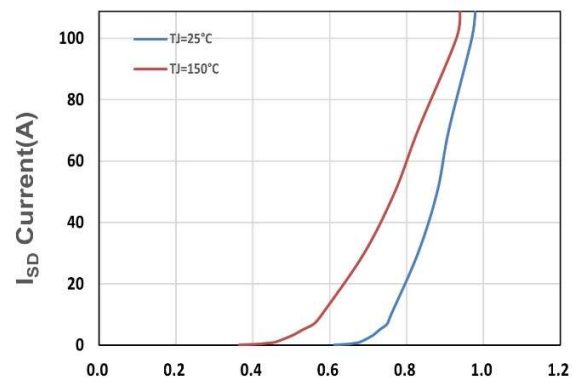
$V_{GS}$  - Gate - Source Voltage (V)  
Figure 3. On-Resistance vs.  $V_{GS}$



$T_j$ , Junction Temperature( $^\circ C$ )  
Figure 4. Gate Threshold Voltage

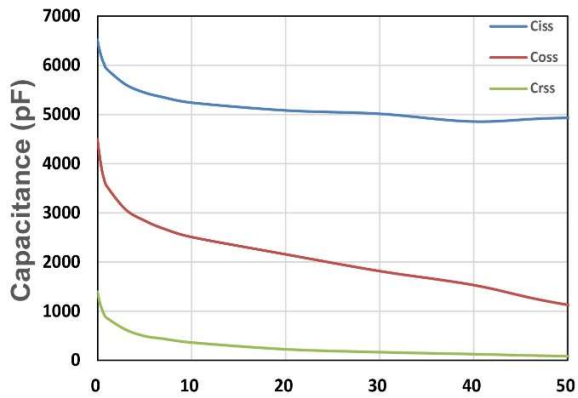


$T_j$ , Junction Temperature( $^\circ C$ )  
Figure 5. Drain-Source On Resistance

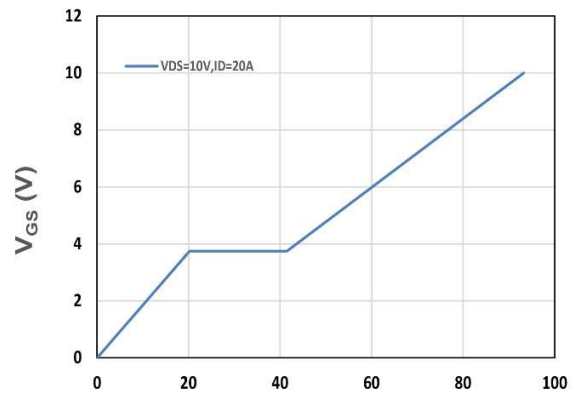


$V_{SD}$ , Source-Drain Voltage(V)  
Figure 6. Source-Drain Diode Forward

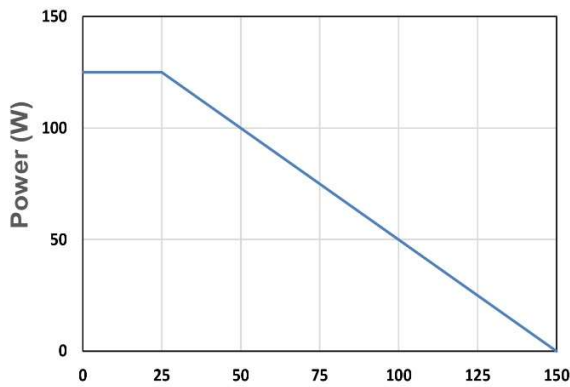
# LM1A039NAP3A



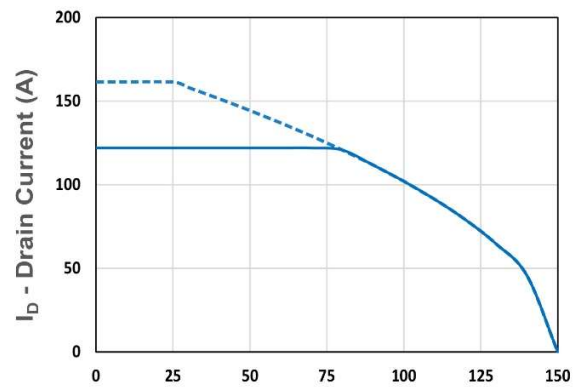
$V_{DS}$  - Drain - Source Voltage (V)  
Figure 7. Capacitance



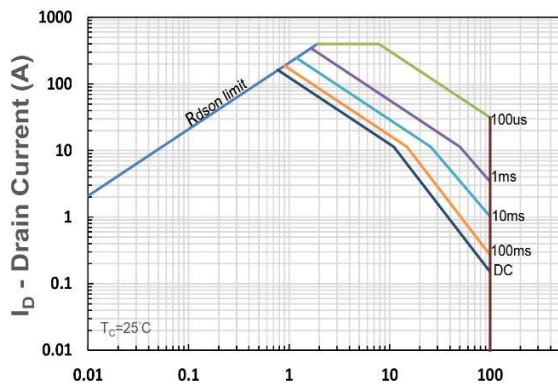
$Q_g$ , Total Gate Charge (nC)  
Figure 8. Gate Charge Characteristics



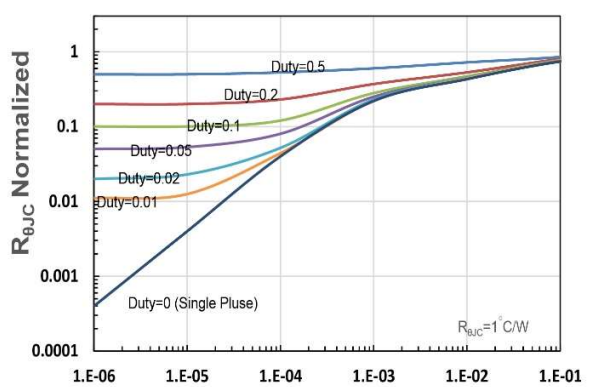
$T_c$  - Case Temperature (°C)  
Figure 9. Power Dissipation



$T_c$  - Case Temperature (°C)  
Figure 10. Drain Current



$V_{DS}$  - Drain-Source Voltage (V)  
Figure 11. Safe Operating Area



$t_1$ , Square Wave Pulse Duration(s)  
Figure 12.  $R_{\theta JC}$  Transient Thermal Impedance