



# Power MOSFETS

## DATASHEET


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**LM60A05NAO2A**

N-Channel  
Enhancement Mode MOSFET

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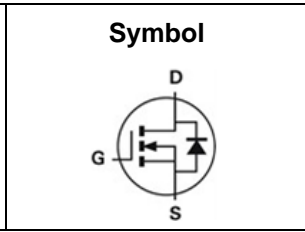
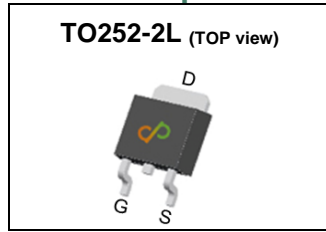


Quality Management Systems

ISO 9001:2015 Certificate

## N-Channel Enhancement Mode MOSFET

### Pin Description



### Product Summary

Symbol	N-Channel	Unit
$V_{DSS}$	60	V
$R_{DS(ON)-Max}$	105	m $\Omega$
$I_D$	9.8	A

### Feature

- Fast switching speed
- Reliable and Rugged
- ROHS Compliant & Halogen-Free
- 100% UIS Tested

### Applications

- DC/DC Converters

### Ordering Information

Orderable Part Number	Package Type	Form	Shipping	Marking
LM60A05NAO2A	TO252-2L	Tape & Reel	3000 / Tape & Reel	60A05 □□□□□□

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

Symbol	Parameter	N-Channel	Unit	
$V_{DSS}$	Drain-Source Voltage	60	V	
$V_{GSS}$	Gate-Source Voltage	±20		
$T_J$	Maximum Junction Temperature	150	°C	
$T_{STG}$	Storage Temperature Range	-55 to 150	°C	
$I_{DM}^{①}$	Pulse Drain Current Tested	T <sub>c</sub> =25°C	16	A
$I_D$	Continuous Drain Current	T <sub>c</sub> =25°C	9.8	A
		T <sub>c</sub> =100°C	6.2	
$P_D$	Maximum Power Dissipation	T <sub>c</sub> =25°C	20.8	W
		T <sub>c</sub> =100°C	8.3	
$I_{AS}^{②}$	Avalanche Current, Single pulse	L=0.1mH	8.5	A
$E_{AS}^{②}$	Avalanche Energy, Single pulse	L=0.1mH	3.6	mJ

### Thermal Characteristics

Symbol	Parameter	Rating	Unit	
$R_{\theta JC}$	Thermal Resistance-Junction to Case	Steady State	6	°C/W
$R_{\theta JA}^{③}$	Thermal Resistance-Junction to Ambient	Steady State	65	°C/W

Note ① : Max. current is limited by junction temperature.

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

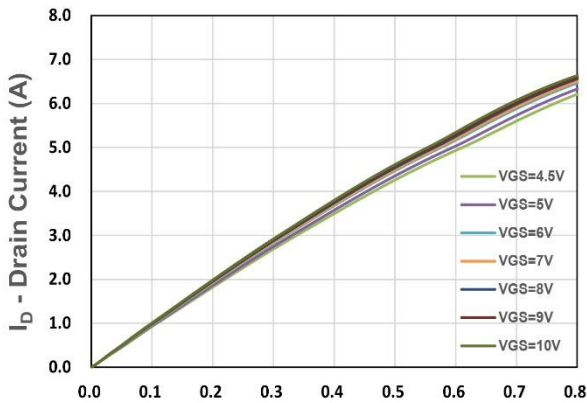
## N-Channel Electrical Characteristics (T<sub>J</sub>=25°C Unless Otherwise Noted)

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	60	-	-	V
<b>I<sub>DSS</sub></b>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =48V, 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><sup>④</sup></b>	Drain-Source On-state Resistance	V <sub>GS</sub> =10V, I <sub>DS</sub> =2.5A	-	88	105	mΩ
		V <sub>GS</sub> =4.5V, I <sub>DS</sub> =2A	-	96	125	
<b>gfs</b>	Forward Transconductance	V <sub>DS</sub> =3V, I <sub>DS</sub> =1.25A	-	5.4	-	S
<b>Dynamic Characteristics<sup>®</sup></b>						
<b>R<sub>G</sub></b>	Gate Resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, Freq.=1MHz	-	3.4	-	Ω
<b>C<sub>ISS</sub></b>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =30V, Freq.=1MHz	-	352	-	pF
<b>C<sub>OSS</sub></b>	Output Capacitance					
<b>C<sub>rSS</sub></b>	Reverse Transfer Capacitance					
<b>td(ON)</b>	Turn-on Delay Time	V <sub>GS</sub> =10V, V <sub>DS</sub> =30V, I <sub>D</sub> =1A, R <sub>GEN</sub> =6Ω	-	4.3	-	nS
<b>t<sub>r</sub></b>	Turn-on Rise Time					
<b>t<sub>d(OFF)</sub></b>	Turn-off Delay Time					
<b>t<sub>f</sub></b>	Turn-off Fall Time					
<b>Q<sub>g</sub></b>	Total Gate Charge	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =30V, I <sub>D</sub> =2.5A	-	4	-	nC
<b>Q<sub>g</sub></b>	Total Gate Charge	V <sub>GS</sub> =10V, V <sub>DS</sub> =30V, I <sub>D</sub> =2.5A	-	8.5	-	
<b>Q<sub>gs</sub></b>	Gate-Source Charge		-	1.92	-	
<b>Q<sub>gd</sub></b>	Gate-Drain Charge		-	1.83	-	
<b>Source-Drain Characteristics</b>						
<b>V<sub>SD</sub><sup>④</sup></b>	Diode Forward Voltage	I <sub>SD</sub> =1.25A, V <sub>GS</sub> =0V	-	0.8	1.1	V
<b>t<sub>rr</sub></b>	Reverse Recovery Time	I <sub>F</sub> =1.25A, V <sub>R</sub> =30V	-	14.5	-	nS
<b>Q<sub>rr</sub></b>	Reverse Recovery Charge	dI <sub>F</sub> /dt=100A/μs	-	9.3	-	nC

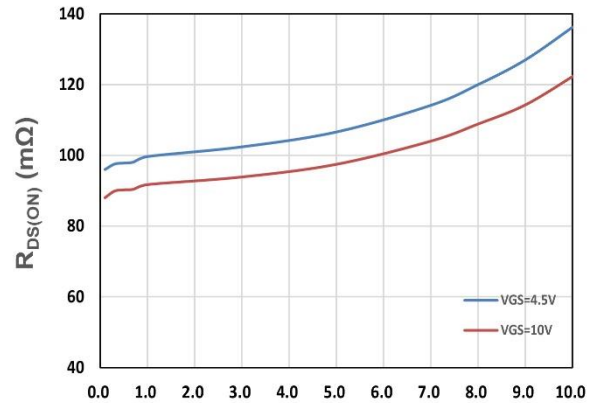
Note ④ : Pulse test (pulse width≤300us, duty cycle≤2%).

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

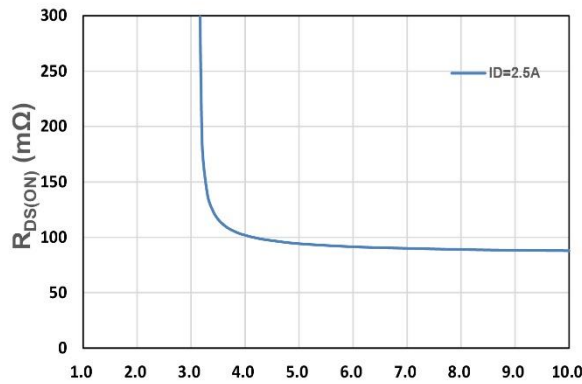
## N-Channel Typical Characteristics



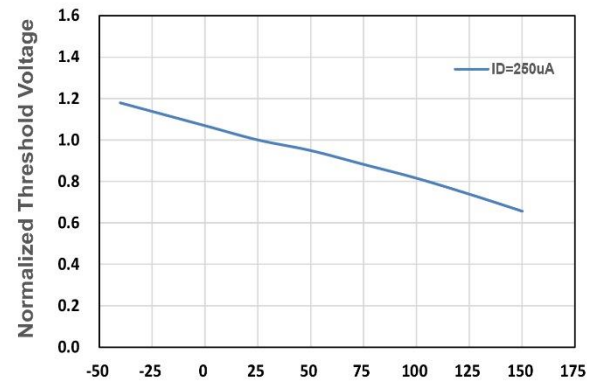
$V_{DS}$  - Drain - Source Voltage (V)  
Figure 1. Output Characteristics



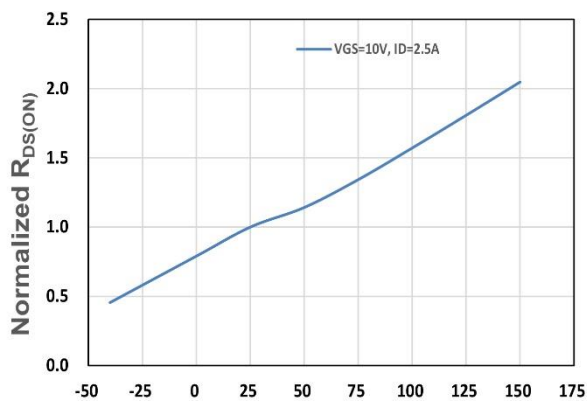
$I_D$  - Drain Current (A)  
Figure 2. On-Resistance vs.  $I_D$



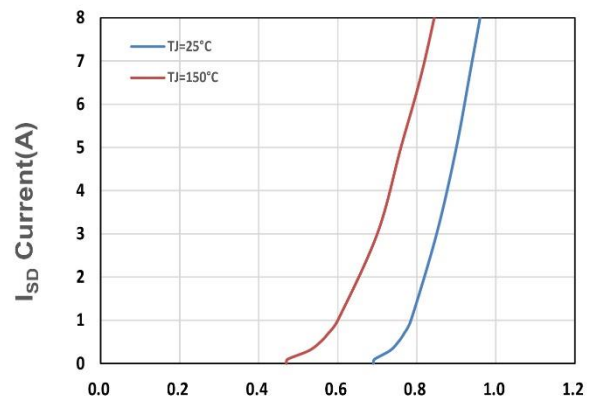
$V_{GS}$  - Gate - Source Voltage (V)  
Figure 3. On-Resistance vs.  $V_{GS}$



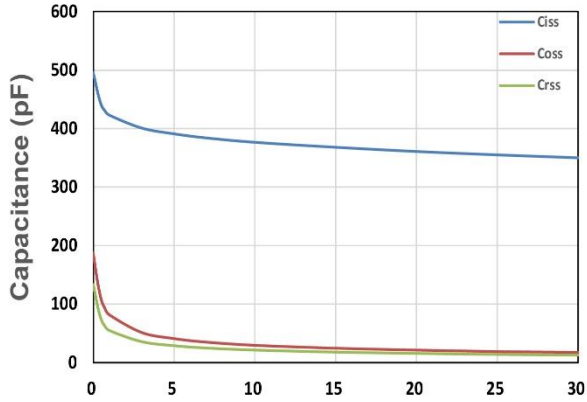
$T_j$ , Junction Temperature( $^\circ C$ )  
Figure 4. Gate Threshold Voltage



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

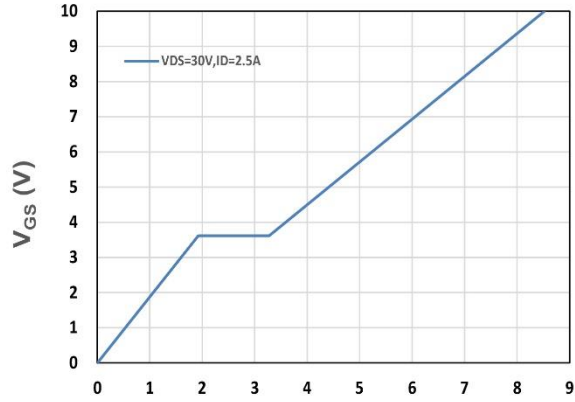


$V_{SD}$ , Source-Drain Voltage(V)  
Figure 6. Source-Drain Diode Forward



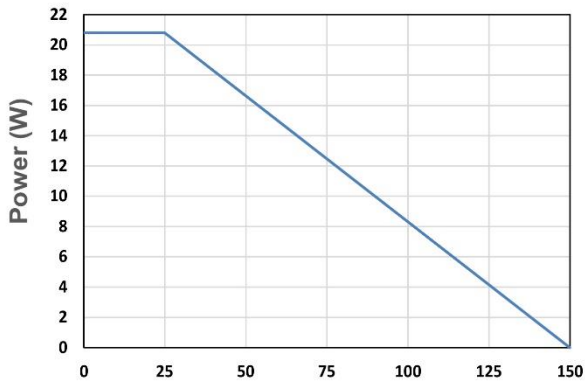
$V_{DS}$  - Drain - Source Voltage (V)

Figure 7. Capacitance



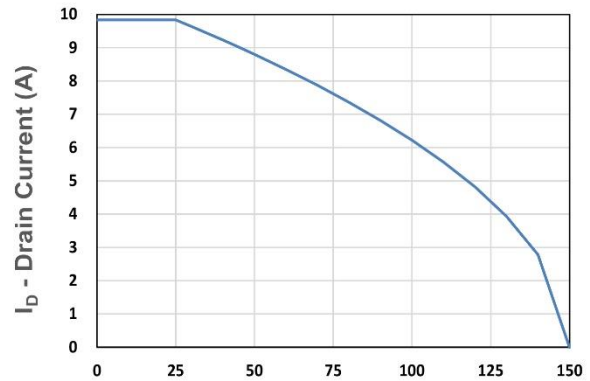
$Q_g$ , Total Gate Charge (nC)

Figure 8. Gate Charge Characteristics



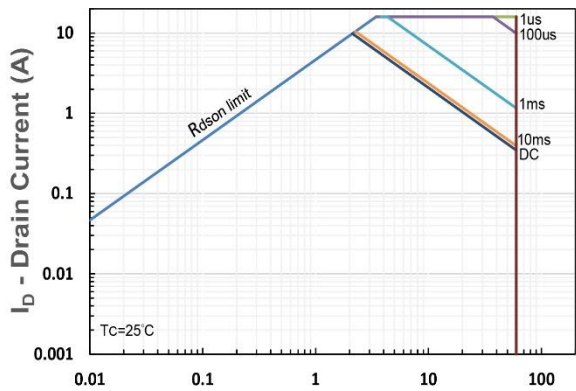
$T_c$  - Case Temperature ( $^{\circ}C$ )

Figure 9. Power Dissipation



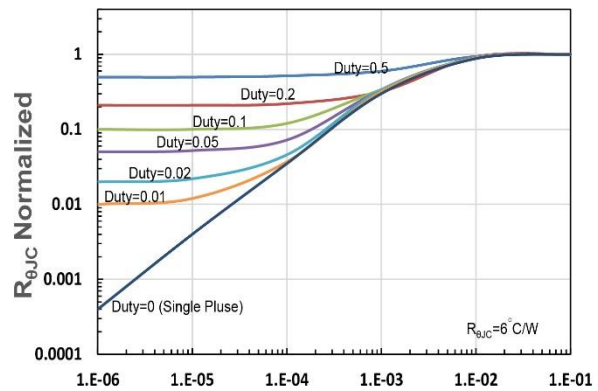
$T_c$  - Case Temperature ( $^{\circ}C$ )

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