# Power MOSFETS

## DATASHEET

## LM1A092NAK8A-Q

N-Channel

Enhancement Mode MOSFET

Leadpower-semi CO., LTD.

sales@leadpower-semi.com

(03) 6577339　FAX：(03) 6577229

www.leadpower-semi.com

Quality Management Systems

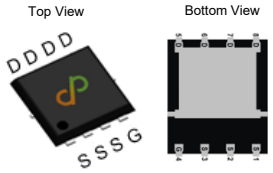
ISO 9001:2015 Certificate

# LM1A092NAK8A-Q

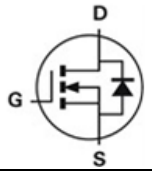
## N-Channel Enhancement Mode MOSFET

### Pin Description

**PDFN5*6**




**Symbol**




### Product Summary

| Symbol | N-Channel | Unit |
|---|---|---|
| $V_{DSS}$ | 100 | V |
| $R_{DS(ON)\text{-}Max}$ | 9.2 | mΩ |
| ID | 63 | A |

### Feature

- Advanced trench cell design
- Reliable and Rugged
- ROHS Compliant & Halogen-Free
- 100% UIS and Rg Tested
- AEC-Q101 qualified

### Applications

- Motor drivers
- DC-DC Converter

### Ordering Information

| Orderable Part Number | Package Type | Form | Shipping | Marking |
|---|---|---|---|---|
| LM1A092NAK8A-Q | PDFN5*6 | Tape & Reel | 5000 / Tape & Reel | 1A092 □□□□□□ |

### Absolute Maximum Ratings ($T_J$=25°C Unless Otherwise Noted)

| Symbol | Parameter | | N-Channel | Unit |
|---|---|---|---|---|
| $V_{DSS}$ | Drain-Source Voltage | | 100 | V |
| $V_{GSS}$ | Gate-Source Voltage | | ±20 | |
| $T_J$ | Maximum Junction Temperature | | 175 | °C |
| $T_{STG}$ | Storage Temperature Range | | -40 to 175 | °C |
| $I_{DM}$① | Pulse Drain Current Tested | $T_C$=25°C | 158 | A |
| $I_D$ | Continuous Drain Current | $T_C$=25°C | 63 | A |
| | | $T_C$=100°C | 45 | |
| $P_D$ | Maximum Power Dissipation | $T_C$=25°C | 60 | W |
| | | $T_C$=100°C | 30 | |
| $I_{AS}$② | Avalanche Current, Single pulse | L=0.1mH | 27 | A |
| $E_{AS}$② | Avalanche Energy, Single pulse | L=0.1mH | 36 | mJ |

### Thermal Characteristics

| Symbol | Parameter | | Rating | Unit |
|---|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance-Junction to Case | Steady State | 2.5 | °C/W |
| $R_{\theta JA}$③ | Thermal Resistance-Junction to Ambient | Steady State | 50 | °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$^2$ FR-4 board with 1oz.

## N-Channel Electrical Characteristics ($T_J$=25°C Unless Otherwise Noted)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Static Electrical Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V, $I_{DS}$=250uA | 100 | - | - | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=80V, $V_{GS}$=0V | - | - | 1 | uA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$, $I_{DS}$=250uA | 1 | 2 | 3 | V |
| $I_{GSS}$ | Gate Leakage Current | $V_{GS}$=±20V, $V_{DS}$=0V | - | - | ±100 | nA |
| $R_{DS(ON)}$④ | Drain-Source On-state Resistance | $V_{GS}$=10V, $I_{DS}$=20A | - | 7.6 | 9.2 | mΩ |
| | | $V_{GS}$=4.5V, $I_{DS}$=20A | - | 11 | 14 | |
| gfs | Forward Transconductance | $V_{DS}$=5V, $I_{DS}$=10A | - | 22.3 | - | S |
| **Dynamic Characteristics** ⑤ | | | | | | |
| $R_G$ | Gate Resistance | $V_{GS}$=0V,$V_{DS}$=0V, Freq.=1MHz | - | 0.7 | - | Ω |
| $C_{iss}$ | Input Capacitance | $V_{GS}$=0V, $V_{DS}$=50V, Freq.=1MHz | - | 1910 | - | pF |
| $C_{oss}$ | Output Capacitance | | - | 506 | - | |
| $C_{rss}$ | Reverse Transfer Capacitance | | - | 36 | - | |
| $td_{(ON)}$ | Turn-on Delay Time | $V_{GS}$=10V,$V_{DS}$=50V, $I_D$=1A,$R_{GEN}$=6Ω | - | 9.2 | - | nS |
| $t_r$ | Turn-on Rise Time | | - | 17.6 | - | |
| $t_{d(OFF)}$ | Turn-off Delay Time | | - | 32.2 | - | |
| $t_f$ | Turn-off Fall Time | | - | 69.9 | - | |
| $Q_g$ | Total Gate Charge | $V_{GS}$=4.5V,$V_{DS}$=50V $I_D$=20A | - | 22 | - | nC |
| $Q_g$ | Total Gate Charge | $V_{GS}$=10V,$V_{DS}$=50V, $I_D$=20A | - | 39.9 | - | |
| $Q_{gs}$ | Gate-Source Charge | | - | 8.92 | - | |
| $Q_{gd}$ | Gate-Drain Charge | | - | 10.4 | - | |
| **Source-Drain Characteristics** | | | | | | |
| $V_{SD}$④ | Diode Forward Voltage | $I_{SD}$=10A, $V_{GS}$=0V | - | 0.8 | 1.1 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_F$=10A, $V_R$=50V dI$_F$/dt=100A/μs | - | 37 | - | nS |
| $Q_{rr}$ | Reverse Recovery Charge | | - | 35 | - | 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

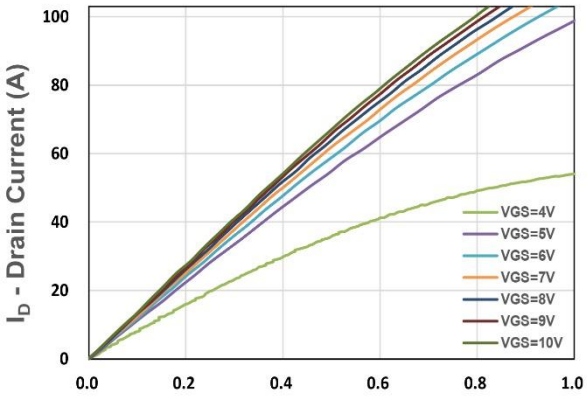



Figure 1. Output Characteristics

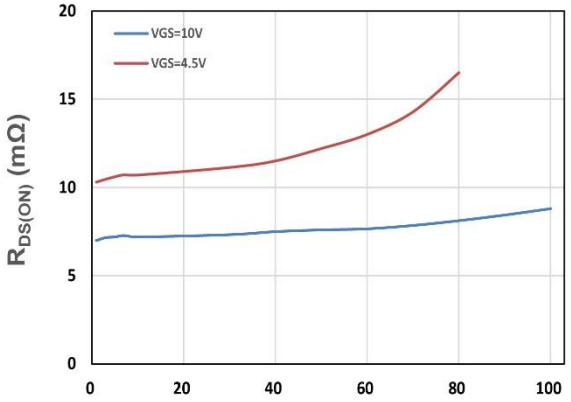



Figure 2. On-Resistance vs. ID

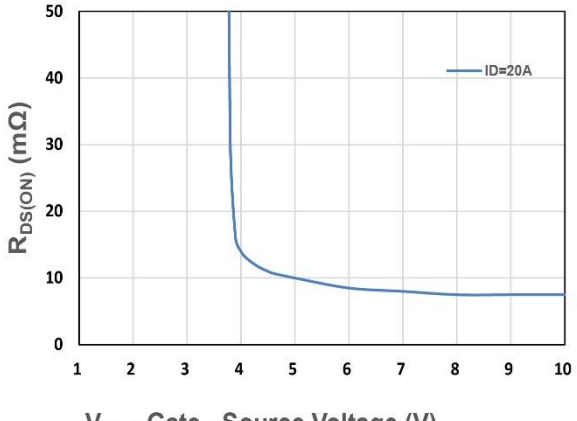



Figure 3. On-Resistance vs. VGS

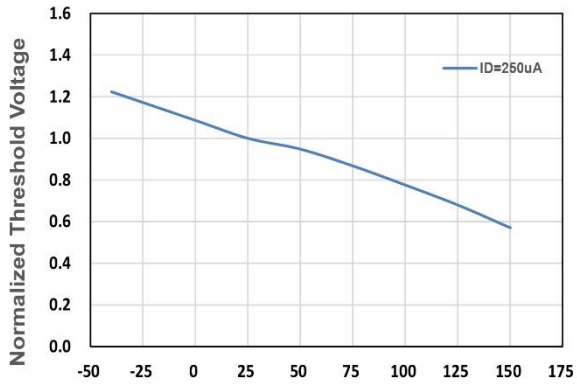



Figure 4. Gate Threshold Voltage

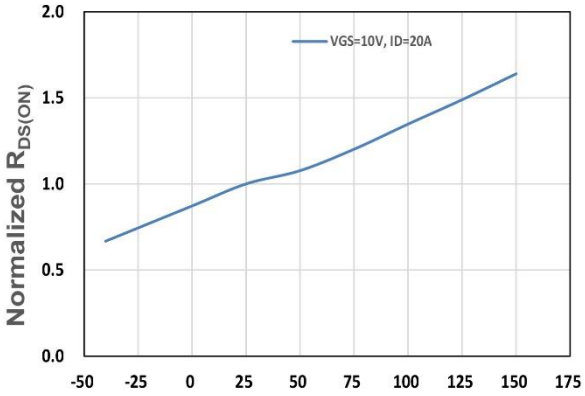



Figure 5. Drain-Source On Resistance

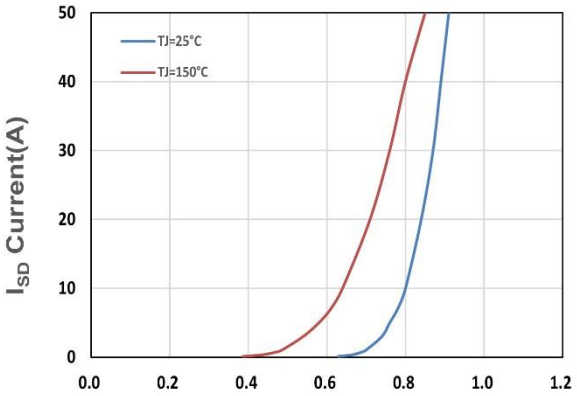
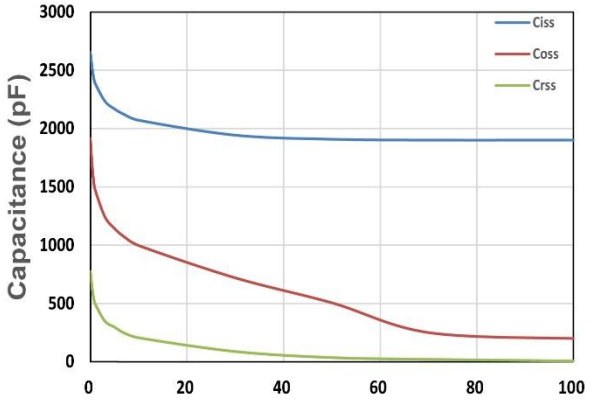
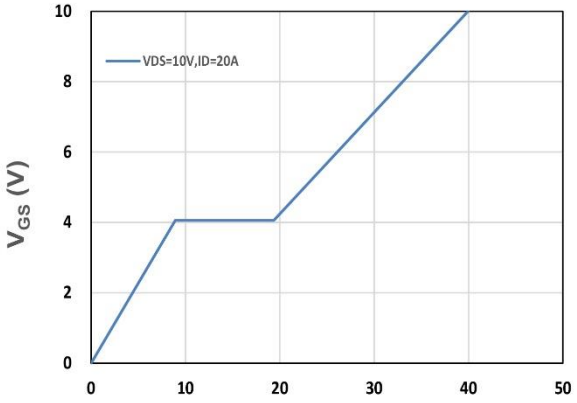



Figure 6. Source-Drain Diode Forward



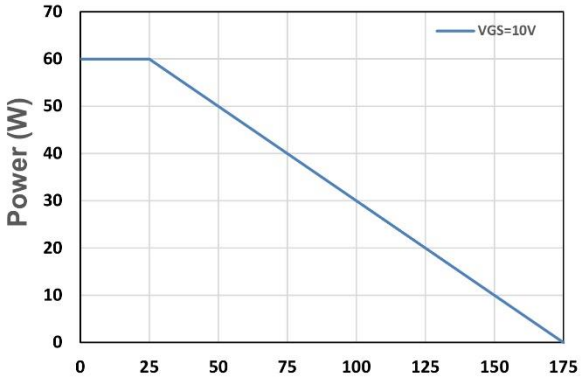

$V_{DS}$ - Drain - Source Voltage (V)

Figure 7. Capacitance



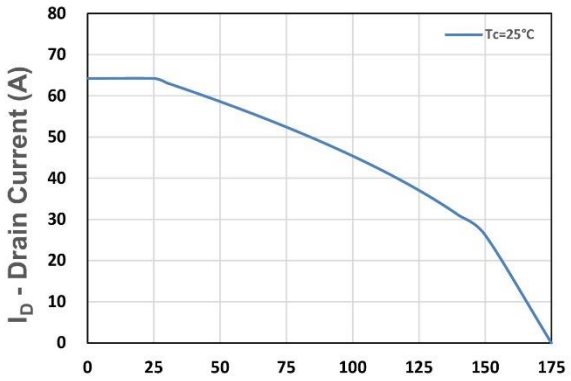

Qg, Total Gate Charge (nC)

Figure 8. Gate Charge Characteristics



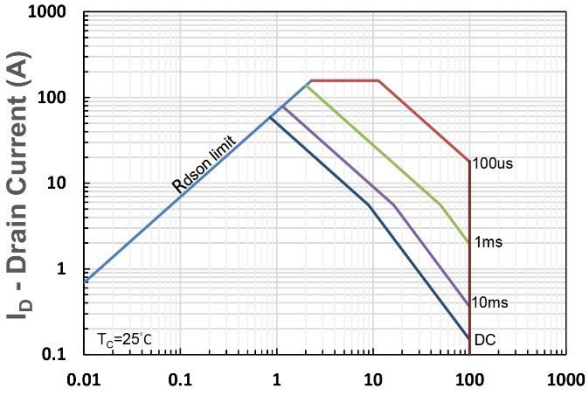

Tc - Junction Temperature (˚C)

Figure 9. Power Dissipation



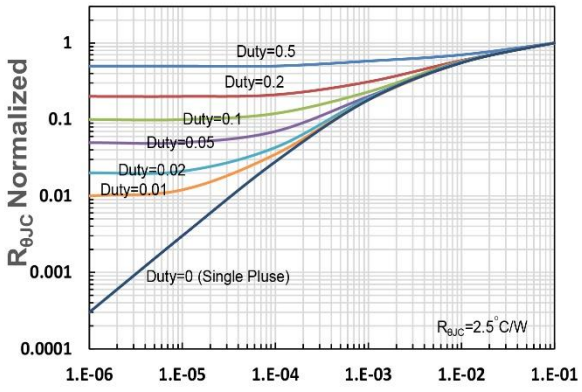

Tj - Junction Temperature (˚C)

Figure 10. Drain Current




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

Figure 11. Safe Operating Area




$t_1$,Square Wave Pulse Duration(s)

Figure 12. RθJC Transient Thermal Impedance