



# Power MOSFETS

## DATASHEET

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LM40080NAI8A-Q

N-Channel  
Enhancement Mode MOSFET

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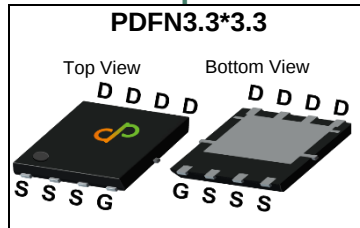


Quality Management Systems

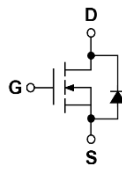
ISO 9001:2015 Certificate

## N-Channel Enhancement Mode MOSFET

### Pin Description



### Symbol



### Product Summary

| Symbol           | N-Channel | Unit |
|------------------|-----------|------|
| $V_{DSS}$        | 40        | V    |
| $R_{DS(ON)-Max}$ | 8         | mΩ   |
| ID               | 46        | A    |

### Feature

- Optimized technology for DC/DC Converter
- Reliable and Rugged
- ROHS Compliant & Halogen-Free
- 100% UIS and Rg Tested
- AEC-Q101 Grade 2 Qualified
- Operating Ambient Temperature: -40°C to 105°C

### Applications

- Portable Equipment
- Battery Powered System

### Ordering Information

| Orderable Part Number | Package Type | Form        | Shipping           | Marking          |
|-----------------------|--------------|-------------|--------------------|------------------|
| LM40080NAI8A-Q        | PDFN3.3*3.3  | Tape & Reel | 5000 / Tape & Reel | 40080Q<br>□□□□□□ |

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

| Symbol                       | Parameter                       |                       | N-Channel  | Unit |
|------------------------------|---------------------------------|-----------------------|------------|------|
| V <sub>DSS</sub>             | Drain-Source Voltage            |                       | 40         | 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   |
| T <sub>OAT</sub>             | Operating Ambient Temperature   |                       | -40 to 105 |      |
| I <sub>DM</sub> <sup>①</sup> | Pulse Drain Current Tested      | T <sub>c</sub> =25°C  | 70         | A    |
| I <sub>D</sub>               | Continuous Drain Current        | T <sub>c</sub> =25°C  | 46         | A    |
|                              |                                 | T <sub>c</sub> =100°C | 29         |      |
| P <sub>D</sub>               | Maximum Power Dissipation       | T <sub>c</sub> =25°C  | 31         | W    |
|                              |                                 | T <sub>c</sub> =100°C | 13         |      |
| I <sub>AS</sub> <sup>②</sup> | Avalanche Current, Single pulse | L=0.1mH               | 23         | A    |
| E <sub>AS</sub> <sup>②</sup> | Avalanche Energy, Single pulse  | L=0.1mH               | 26         | mJ   |

### Thermal Characteristics

| Symbol                        | Parameter                              |              | Rating | Unit |
|-------------------------------|----------------------------------------|--------------|--------|------|
| R <sub>θJC</sub>              | Thermal Resistance-Junction to Case    | Steady State | 4      | °C/W |
| R <sub>θJA</sub> <sup>③</sup> | Thermal Resistance-Junction to Ambient | Steady State | 60     | °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.

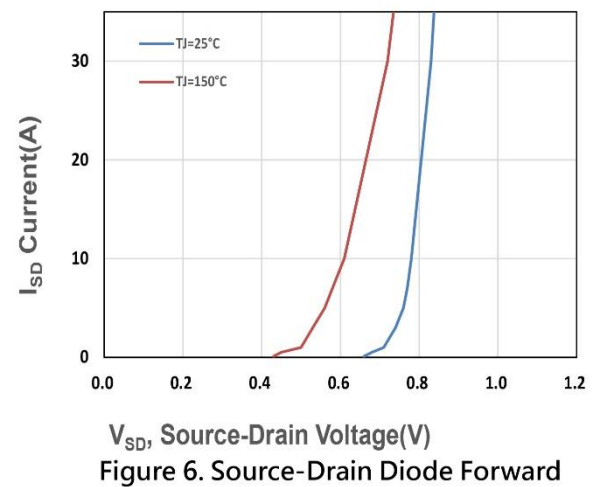
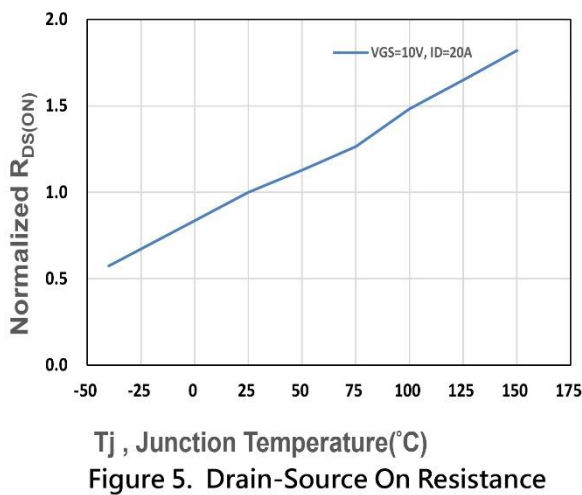
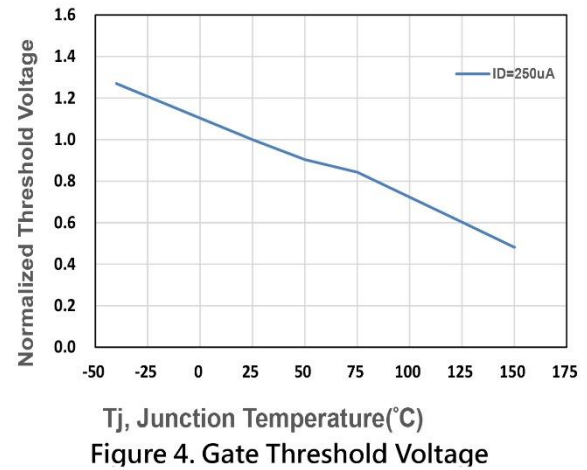
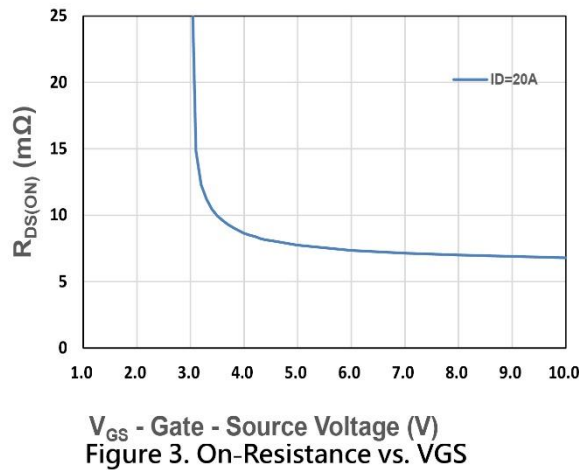
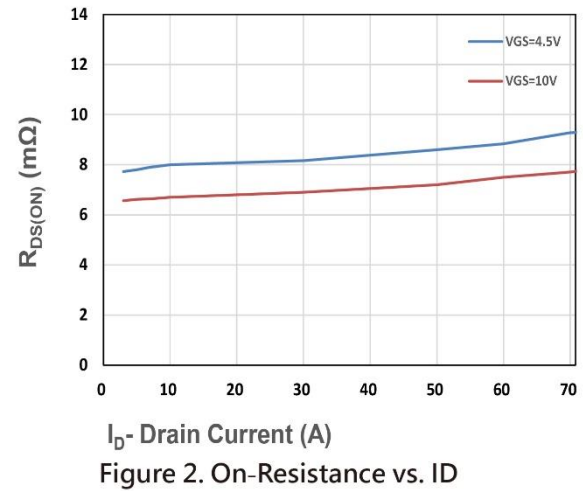
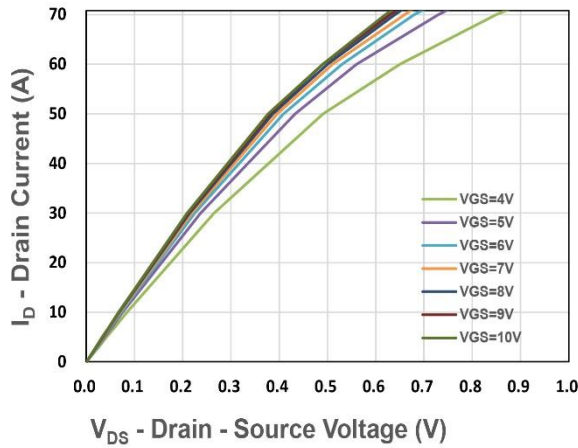
## N-Channel Electrical Characteristics (T<sub>J</sub>=25°C Unless Otherwise Noted)

| Symbol                            | Parameter                        | Test Conditions                                            | Min. | Typ. | Max. | Unit |
|-----------------------------------|----------------------------------|------------------------------------------------------------|------|------|------|------|
| Static Electrical Characteristics |                                  |                                                            |      |      |      |      |
| BV <sub>DSS</sub>                 | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>DS</sub> =250uA                | 40   | -    | -    | V    |
| I <sub>DSS</sub>                  | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =40V, V <sub>GS</sub> =0V                  | -    | -    | 1    | uA   |
| V <sub>GS(th)</sub>               | Gate Threshold Voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250uA  | 1.2  | 1.7  | 2.4  | V    |
| I <sub>GSS</sub>                  | Gate Leakage Current             | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                 | -    | -    | ±100 | nA   |
| R <sub>DS(ON)</sub> ④             | Drain-Source On-state Resistance | V <sub>GS</sub> =10V, I <sub>DS</sub> =20A                 | -    | 6.7  | 8    | mΩ   |
|                                   |                                  | V <sub>GS</sub> =4.5V, I <sub>DS</sub> =15A                | -    | 8    | 10   |      |
| gfs                               | Forward Transconductance         | V <sub>DS</sub> =5V, I <sub>DS</sub> =5A                   | -    | 16   | -    | S    |
| Dynamic Characteristics ⑥         |                                  |                                                            |      |      |      |      |
| R <sub>G</sub>                    | Gate Resistance                  | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, Freq.=1MHz       | -    | 2.2  | -    | Ω    |
| C <sub>iss</sub>                  | Input Capacitance                | V <sub>GS</sub> =0V, V <sub>DS</sub> =20V, Freq.=1MHz      | -    | 1820 | -    | pF   |
| C <sub>oss</sub>                  | Output Capacitance               |                                                            | -    | 150  | -    |      |
| C <sub>rss</sub>                  | Reverse Transfer Capacitance     |                                                            | -    | 120  | -    |      |
| td(ON)                            | Turn-on Delay Time               | V <sub>GS</sub> =10V, V <sub>DS</sub> =20V, Id=1A, RGEN=6Ω | -    | 5.8  | -    | nS   |
| tr                                | Turn-on Rise Time                |                                                            | -    | 22   | -    |      |
| td(OFF)                           | Turn-off Delay Time              |                                                            | -    | 38   | -    |      |
| tf                                | Turn-off Fall Time               |                                                            | -    | 21   | -    |      |
| Qg                                | Total Gate Charge                | V <sub>GS</sub> =4.5V, V <sub>DS</sub> =20V Id=20A         | -    | 22   | -    | nC   |
| Qg                                | Total Gate Charge                | V <sub>GS</sub> =10V, V <sub>DS</sub> =20V, Id=20A         | -    | 44   | -    |      |
| Qgs                               | Gate-Source Charge               |                                                            | -    | 6    | -    |      |
| Qgd                               | Gate-Drain Charge                |                                                            | -    | 10   | -    |      |
| Source-Drain Characteristics      |                                  |                                                            |      |      |      |      |
| VSD④                              | Diode Forward Voltage            | ISD=1A, VGS=0V                                             | -    | 0.7  | 1.1  | V    |
| trr                               | Reverse Recovery Time            | IF=1A, VR=20V                                              | -    | 16.8 | -    | nS   |
| Qrr                               | Reverse Recovery Charge          | dIF/dt=100A/μs                                             | -    | 8.9  | -    | 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



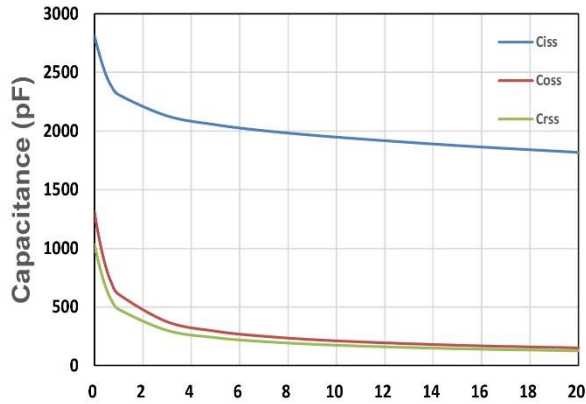


Figure 7. Capacitance

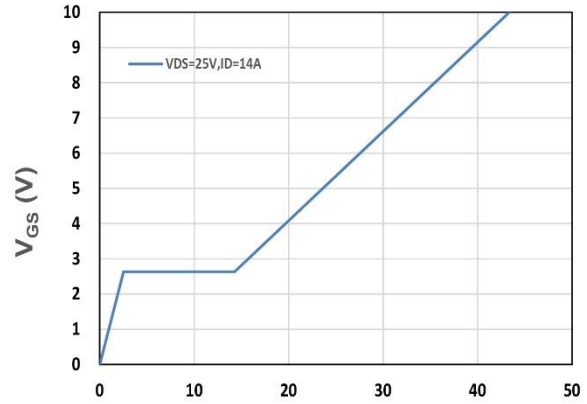


Figure 8. Gate Charge Characteristics

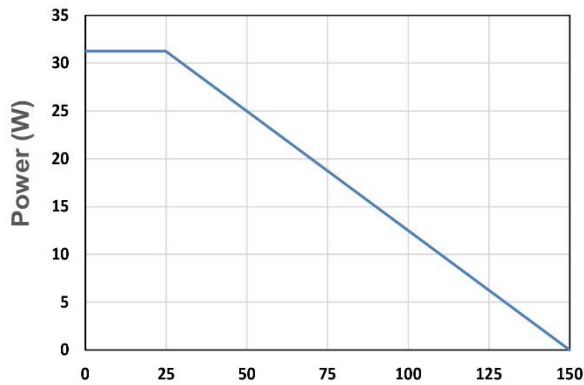


Figure 9. Power Dissipation

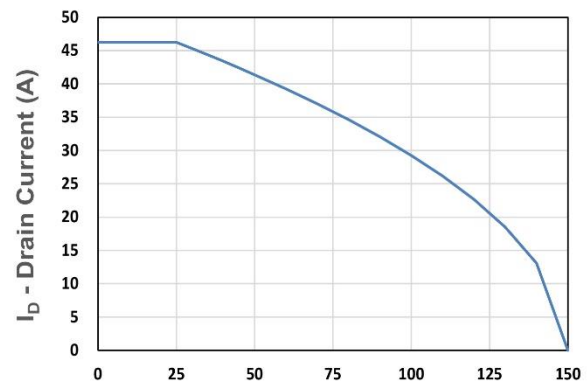


Figure 10. Drain Current

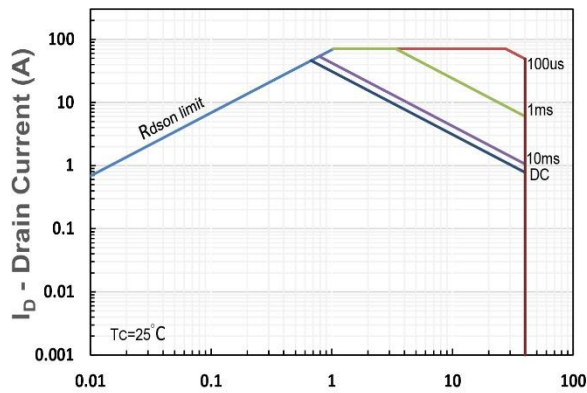


Figure 11. Safe Operating Area

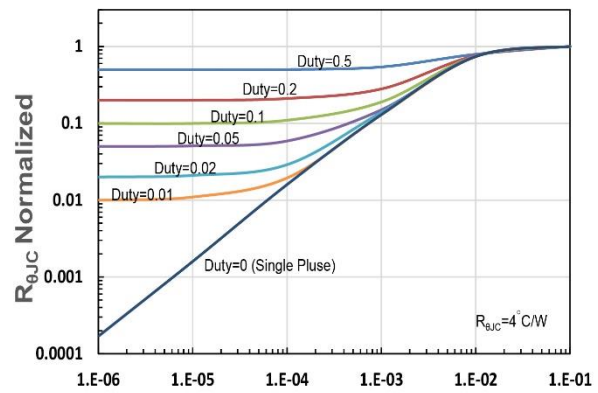


Figure 12.  $R_{\theta JC}$  Transient Thermal Impedance