

# FDS6676-NL-VB Datasheet N-Channel 30-V (D-S) MOSFET

| PRODUCT SUMMARY     |                                  |                                 |                       |  |  |
|---------------------|----------------------------------|---------------------------------|-----------------------|--|--|
| V <sub>DS</sub> (V) | $R_{DS(on)}(\Omega)$             | I <sub>D</sub> (A) <sup>a</sup> | Q <sub>g</sub> (Typ.) |  |  |
| 30                  | 0.004 at V <sub>GS</sub> = 10 V  | 18                              | 6.8 nC                |  |  |
|                     | 0.005 at V <sub>GS</sub> = 4.5 V | 16                              | 0.0110                |  |  |

**SO-8** 

Top View

D D D

#### **FEATURES**

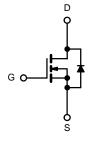
- · Halogen-free
- Trench Power MOSFET



- 100 % R<sub>g</sub> Tested
- 100 % UIS Tested

#### **APPLICATIONS**

- Notebook CPU Core
  - High-Side Switch



N-Channel MOSFET

| <b>ABSOLUTE MAXIMUM RATINGS</b>                    | <b>S</b> T <sub>A</sub> = 25 °C, unles | s otherwise note | ed                  |      |  |
|--|--|------------------|---------------------|------|--|
| Parameter  |  | Symbol           | Limit               | Unit |  |
| Drain-Source Voltage                               | V <sub>DS</sub>                        | 30               | V                   |      |  |
| Gate-Source Voltage                                |  | V <sub>GS</sub>  | ± 20                | ¬    |  |
|  | T <sub>C</sub> = 25 °C                 |                  | 18                  |      |  |
| Continuous Proin Current (T. 450 °C)               | T <sub>C</sub> = 70 °C                 |                  | 16                  |      |  |
| Continuous Drain Current (T <sub>J</sub> = 150 °C) | T <sub>A</sub> = 25 °C                 | I <sub>D</sub>   | 15 <sup>b, c</sup>  |      |  |
|  | T <sub>A</sub> = 70 °C                 |                  | 13 <sup>b, c</sup>  | _    |  |
| Pulsed Drain Current                               |  | I <sub>DM</sub>  | 50                  | A    |  |
| Continuous Course David Diada Courset              | T <sub>C</sub> = 25 °C                 |                  | 3.8                 |      |  |
| Continuous Source-Drain Diode Current              | T <sub>A</sub> = 25 °C                 | I <sub>S</sub>   | 2.1 <sup>b, c</sup> |      |  |
| Single Pulse Avalanche Current                     | L = 0.1 mH                             | I <sub>AS</sub>  | 22                  |      |  |
| Avalanche Energy                                   | L = 0.1 MH                             | E <sub>AS</sub>  | 24                  | mJ   |  |
|  | T <sub>C</sub> = 25 °C                 |                  | 4.5                 |      |  |
| Mandagua Barra Birata atau                         | T <sub>C</sub> = 70 °C                 |                  | 2.8                 |      |  |
| Maximum Power Dissipation                          | T <sub>A</sub> = 25 °C                 | P <sub>D</sub>   | 2.5 <sup>b, c</sup> | W    |  |
|  | T <sub>A</sub> = 70 °C                 |                  | 1.6 <sup>b, c</sup> |      |  |
| Operating Junction and Storage Temperature Ra      | T <sub>J</sub> , T <sub>stq</sub>      | - 55 to 150      | °C                  |      |  |

| THERMAL RESISTANCE RATINGS                  |              |                   |         |         |      |  |  |
|---|--------------|-------------------|---------|---------|------|--|--|
| Parameter                                   |              | Symbol            | Typical | Maximum | Unit |  |  |
| Maximum Junction-to-Ambient <sup>b, d</sup> | t ≤ 10 s     | R <sub>thJA</sub> | 38      | 50      | °C/W |  |  |
| Maximum Junction-to-Foot (Drain)            | Steady State | $R_{thJF}$        | 22      | 28      | C/VV |  |  |

#### Notes:

- a. Base on  $T_C$  = 25 °C.
- b. Surface Mounted on 1" x 1" FR4 board.
- c. t = 10 s.
- d. Maximum under Steady State conditions is 85 °C/W.



| Parameter                                     | Symbol                    | Test Conditions   | Min. | Тур.     | Max.      | Unit     |  |
|---|---------------------------|---|------|----------|-----------|----------|--|
| Static  |                           |   |      | , ,,     | <u>I</u>  | _        |  |
| Drain-Source Breakdown Voltage                | V <sub>DS</sub>           | $V_{GS} = 0 \text{ V}, I_{D} = 250 \mu\text{A}$                             | 30   |          |           | V        |  |
| V <sub>DS</sub> Temperature Coefficient       | $\Delta V_{DS}/T_{J}$     | J 050 A   |      | 28       |           | mV/°C    |  |
| V <sub>GS(th)</sub> Temperature Coefficient   | $\Delta V_{GS(th)}/T_{J}$ | I <sub>D</sub> = 250 μA   |      | - 6      |           |          |  |
| Gate-Source Threshold Voltage                 | V <sub>GS(th)</sub>       | $V_{DS} = V_{GS}, I_{D} = 250 \mu A$  | 1.0  |          | 3.0       | V        |  |
| Gate-Source Leakage                           | I <sub>GSS</sub>          | $V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$                           |      |          | ± 100     | nA       |  |
|   |                           | V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V                               |      |          | 1         | μА       |  |
| Zero Gate Voltage Drain Current               | IDSS                      | V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 55 °C       |      |          | 10        |          |  |
| On-State Drain Current <sup>a</sup>           | I <sub>D(on)</sub>        | $V_{DS} \ge 5 \text{ V}, V_{GS} = 10 \text{ V}$                             | 20   |          |           | Α        |  |
|   |                           | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 11 A                               |      | 0.004    |           |          |  |
| Drain-Source On-State Resistance <sup>a</sup> | R <sub>DS(on)</sub>       | $V_{GS} = 4.5 \text{ V}, I_D = 10 \text{ A}$                                |      | 0.005    |           | Ω        |  |
| Forward Transconductance <sup>a</sup>         | 9 <sub>fs</sub>           | V <sub>DS</sub> = 15 V, I <sub>D</sub> = 11 A                               |      | 52       |           | S        |  |
| Dynamic <sup>b</sup>                          | <u> </u>                  |   |      | L        | L         | <u> </u> |  |
| Input Capacitance                             | C <sub>iss</sub>          |   |      | 820      |           | pF       |  |
| Output Capacitance                            | C <sub>oss</sub>          | $V_{DS} = 15 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$            |      | 195      |           |          |  |
| Reverse Transfer Capacitance                  | C <sub>rss</sub>          |   |      | 73       |           |          |  |
| Tatal Cata Charma                             |                           | V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 11 A       |      | 15       | 23        | nC       |  |
| Total Gate Charge                             | $Q_g$                     |   |      | 6.8      | 10.2      |          |  |
| Gate-Source Charge                            | Q <sub>gs</sub>           | $V_{DS} = 15 \text{ V}, V_{GS} = 5 \text{ V}, I_{D} = 11 \text{ A}$         |      | 2.5      |           |          |  |
| Gate-Drain Charge                             | $Q_{gd}$                  |   |      | 2.3      |           |          |  |
| Gate Resistance                               | $R_g$                     | f = 1 MHz   | 0.36 | 1.8      | 3.6       | Ω        |  |
| Turn-On Delay Time                            | t <sub>d(on)</sub>        |   |      | 16       | 24        |          |  |
| Rise Time                                     | t <sub>r</sub>            | $V_{DD}$ = 15 V, $R_L$ = 1.4 $\Omega$                                       |      | 12       | 18        | 1        |  |
| Turn-Off Delay Time                           | t <sub>d(off)</sub>       | $I_D \cong 9 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_g = 1 \Omega$            |      | 16       | 24        | 1        |  |
| Fall Time                                     | t <sub>f</sub>            |   |      | 10       | 20        | 1        |  |
| Turn-On Delay Time                            | t <sub>d(on)</sub>        |   |      | 8        | 16        | ns       |  |
| Rise Time                                     | t <sub>r</sub>            | $V_{DD}$ = 15 V, $R_L$ = 1.4 $\Omega$                                       |      | 10       | 20        |          |  |
| Turn-Off Delay Time                           | t <sub>d(off)</sub>       | $I_D \cong 9 \text{ A}, V_{GEN} = 10 \text{ V}, R_g = 1 \Omega$             |      | 16       | 24        |          |  |
| Fall Time                                     | t <sub>f</sub>            |   |      | 8        | 15        |          |  |
| <b>Drain-Source Body Diode Characterist</b>   | ics                       |   |      | <u>'</u> | <u>'I</u> |          |  |
| Continuous Source-Drain Diode Current         | I <sub>S</sub>            | T <sub>C</sub> = 25 °C  |      |          | 25        |          |  |
| Pulse Diode Forward Current <sup>a</sup>      | I <sub>SM</sub>           |   |      |          | 50        | _ A      |  |
| Body Diode Voltage                            | $V_{SD}$                  | I <sub>S</sub> = 9 A  |      | 0.8      | 1.2       | V        |  |
| Body Diode Reverse Recovery Time              | t <sub>rr</sub>           |   |      | 15       | 30        | ns       |  |
| Body Diode Reverse Recovery Charge            | Q <sub>rr</sub>           | L 0 A dl/dt 400 A/ T 05 00  |      | 6        | 12        | nC       |  |
| Reverse Recovery Fall Time                    | t <sub>a</sub>            | $I_F = 9 \text{ A}, dI/dt = 100 \text{ A/}\mu\text{s}, T_J = 25 \text{ °C}$ |      | 8        |           |          |  |
| Reverse Recovery Rise Time                    | t <sub>b</sub>            |   |      | 7        |           | ns       |  |

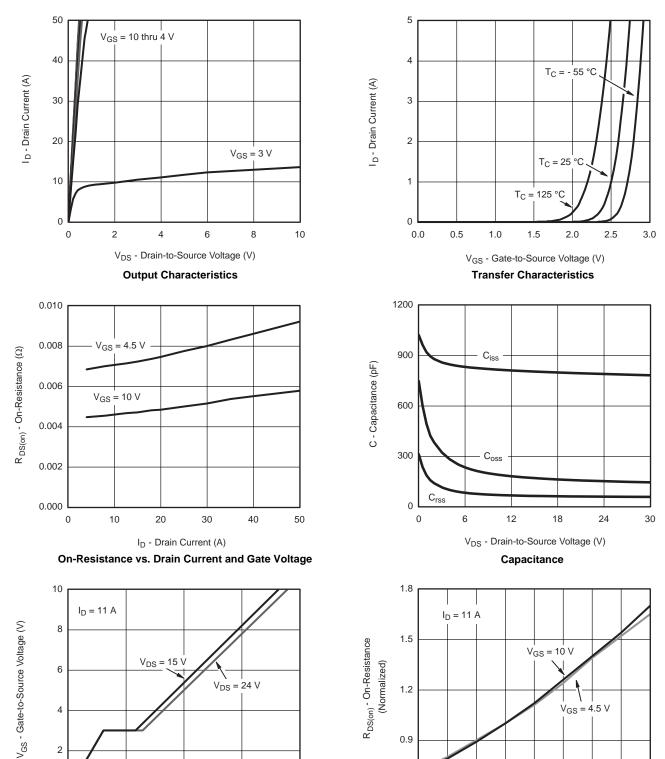
#### Notes:

- a. Pulse test; pulse width  $\leq 300~\mu s,$  duty cycle  $\leq 2~\%.$
- b. Guaranteed by design, not subject to production testing.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



#### TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



0.9

0.6

- 50

- 25

0

25

50

T<sub>J</sub> - Junction Temperature (°C)

On-Resistance vs. Junction Temperature

75

100

125

150

16

服务热线:400-655-8788

2

0

0

8

Q<sub>q</sub> - Total Gate Charge (nC)

**Gate Charge** 

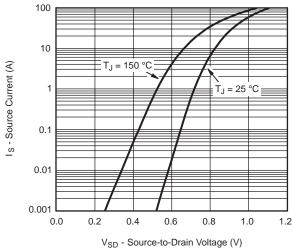
1.0

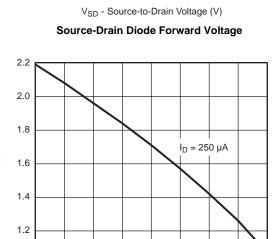
- 50

- 25



#### TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted





T<sub>J</sub> - Temperature (°C)

Threshold Voltage

50

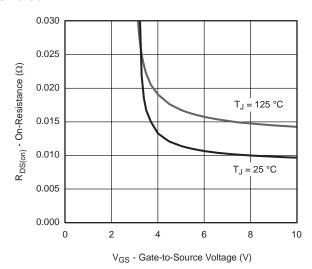
75

100

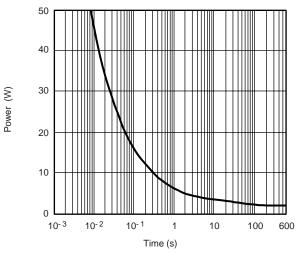
125

150

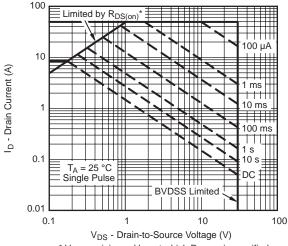
25



On-Resistance vs. Gate-to-Source Voltage



Single Pulse Power, Junction-to-Ambient

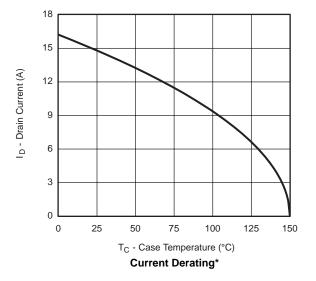


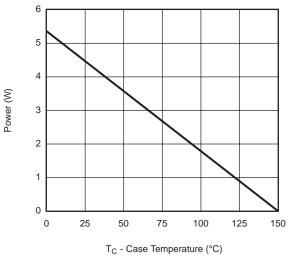
\*  $V_{\mbox{\footnotesize{GS}}} >$  minimum  $V_{\mbox{\footnotesize{GS}}}$  at which  $R_{\mbox{\footnotesize{DS(on)}}}$  is specified

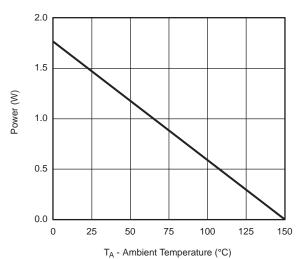
Safe Operating Area, Junction-to-Ambient



#### TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted







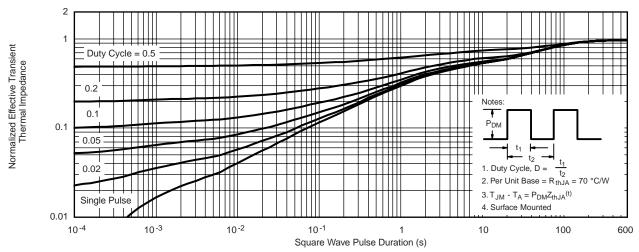
Power Derating, Junction-to-Foot

Power Derating, Junction-to-Ambient

<sup>\*</sup> The power dissipation  $P_D$  is based on  $T_{J(max)}$  = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



#### TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



#### Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot



**SOIC (NARROW): 8-LEAD**JEDEC Part Number: MS-012







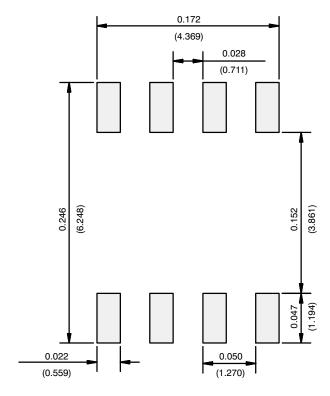
|                              | MILLIM   | IETERS | INC       | HES   |  |
|------------------------------|----------|--------|-----------|-------|--|
| DIM                          | Min      | Max    | Min       | Max   |  |
| Α                            | 1.35     | 1.75   | 0.053     | 0.069 |  |
| A <sub>1</sub>               | 0.10     | 0.20   | 0.004     | 0.008 |  |
| В                            | 0.35     | 0.51   | 0.014     | 0.020 |  |
| С                            | 0.19     | 0.25   | 0.0075    | 0.010 |  |
| D                            | 4.80     | 5.00   | 0.189     | 0.196 |  |
| E                            | 3.80     | 4.00   | 0.150     | 0.157 |  |
| е                            | 1.27 BSC |        | 0.050 BSC |       |  |
| Н                            | 5.80     | 6.20   | 0.228     | 0.244 |  |
| h                            | 0.25     | 0.50   | 0.010     | 0.020 |  |
| L                            | 0.50     | 0.93   | 0.020     | 0.037 |  |
| q                            | 0°       | 8°     | 0°        | 8°    |  |
| S                            | 0.44     | 0.64   | 0.018     | 0.026 |  |
| FCN: C-06527-Rev I 11-Sen-06 |          |        |           |       |  |

ECN: C-06527-Rev. I, 11-Sep-06

DWG: 5498



#### **RECOMMENDED MINIMUM PADS FOR SO-8**



Recommended Minimum Pads Dimensions in Inches/(mm)



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