

## D40NF03L-VB Datasheet

## N-Channel 30-V (D-S) MOSFET

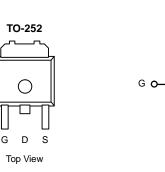
| F | E | A | Т | U | R | E | S |
|---|---|---|---|---|---|---|---|
|   |   |   |   |   |   |   |   |

- Trench Power MOSFET •
- 100 % Rg and UIS Tested ٠
- Compliant to RoHS Directive 2011/65/EU

### APPLICATIONS

- OR-ing
- Server
- DC/DC

| PRODUCT SUMMARY     |                                    |                                    |                      |  |  |  |
|---------------------|------------------------------------|------------------------------------|----------------------|--|--|--|
| V <sub>DS</sub> (V) | R <sub>DS(on)</sub> (Ω)            | I <sub>D</sub> (A) <sup>a, e</sup> | Q <sub>g</sub> (Typ) |  |  |  |
| 30                  | 0.007 at V <sub>GS</sub> = 10 V 70 |                                    | 25 nC                |  |  |  |
| 30                  | 0.009 at V <sub>GS</sub> = 4.5 V   | V 60                               | 25110                |  |  |  |



#### N-Channel MOSFET

D

#### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25 °C, unless otherwise noted) Symbol Parameter Limit Unit V<sub>DS</sub> Drain-Source Voltage 30 V V<sub>GS</sub> Gate-Source Voltage ± 20 T<sub>C</sub> = 25 °C 70 T<sub>C</sub> = 70 °C 50 Continuous Drain Current (T<sub>J</sub> = 175 °C) $I_D$ T<sub>A</sub> = 25 °C 21.8<sup>b, c</sup> А T<sub>A</sub> = 70 °C 18<sup>b, c</sup> Pulsed Drain Current I<sub>DM</sub> 200 Avalanche Current Pulse $I_{AS}$ 39 L = 0.1 mHSingle Pulse Avalanche Energy E<sub>AS</sub> 94.8 mJ T<sub>C</sub> = 25 °C 50<sup>a, e</sup> Continuous Source-Drain Diode Current $I_S$ А T<sub>A</sub> = 25 °C 3.13<sup>b, c</sup> T<sub>C</sub> = 25 °C 100<sup>a</sup> T<sub>C</sub> = 70 °C 75 Maximum Power Dissipation $P_D$ W $T_A = 25 \degree C$ 3.25<sup>b, c</sup> $T_A = 70 \degree C$ 2.33<sup>b, c</sup> Operating Junction and Storage Temperature Range T<sub>J</sub>, T<sub>stg</sub> - 55 to 175 °C

| THERMAL RESISTANCE RATINGS                                 |              |                   |      |      |      |  |  |
|--|--------------|-------------------|------|------|------|--|--|
| Parameter  | Symbol       | Тур.              | Max. | Unit |      |  |  |
| Iaximum Junction-to-Ambient <sup>b, d</sup> $t \le 10$ sec |              | R <sub>thJA</sub> | 32   | 40   | °C/W |  |  |
| Maximum Junction-to-Case                                   | Steady State | R <sub>thJC</sub> | 0.5  | 0.6  | 0,00 |  |  |

Notes:

a. Based on T<sub>C</sub> = 25 °C. b. Surface mounted on 1" x 1" FR4 board.

c. t = 10 sec.
d. Maximum under steady state conditions is 90 °C/W.
e. Calculated based on maximum junction temperature. Package limitation current is 90 A.

COMPLIANT



| Parameter                                     | Symbol                  | Test Conditions  | Min. | Тур.  | Max.  | Unit  |
|---|-------------------------|--|------|-------|-------|-------|
| Static  |                         |  |      |       |       |       |
| Drain-Source Breakdown Voltage                | V <sub>DS</sub>         | $V_{GS} = 0 V, I_{D} = 250 \mu A$  | 30   |       |       | V     |
| V <sub>DS</sub> Temperature Coefficient       | $\Delta V_{DS}/T_{J}$   | I <sub>D</sub> = 250 μA  |      | 35    |       | mV/°C |
| V <sub>GS(th)</sub> Temperature Coefficient   | $\Delta V_{GS(th)}/T_J$ | $I_D = 250 \mu A$  |      | - 7.5 |       |       |
| Gate-Source Threshold Voltage                 | V <sub>GS(th)</sub>     | $V_{DS} = V_{GS}, I_D = 250 \ \mu A$   | 1.5  |       | 2.0   | V     |
| Gate-Source Leakage                           | I <sub>GSS</sub>        | $V_{DS} = 0 \text{ V},  V_{GS} = \pm 20 \text{ V}$   |      |       | ± 100 | nA    |
| Zana Cata Maltana Duain Cumant                |                         | $V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}$  |      |       | 1     |       |
| Zero Gate Voltage Drain Current               | I <sub>DSS</sub>        | $V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}, T_{J} = 55 \text{ °C}$                             |      |       | 10    | μA    |
| On-State Drain Current <sup>a</sup>           | I <sub>D(on)</sub>      | $V_{DS} \ge 5 \text{ V}, \text{ V}_{GS} = 10 \text{ V}$  | 90   |       |       | Α     |
|   | P                       | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 21.8 A  |      | 0.007 |       | Ω     |
| Drain-Source On-State Resistance <sup>a</sup> | R <sub>DS(on)</sub>     | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 18A  |      | 0.009 |       |       |
| Forward Transconductance <sup>a</sup>         | 9 <sub>fs</sub>         | V <sub>DS</sub> = 15 V, I <sub>D</sub> = 21.8 A  |      | 160   |       | S     |
| Dynamic <sup>b</sup>                          |                         |  |      |       |       |       |
| Input Capacitance                             | C <sub>iss</sub>        |  |      | 2201  |       | pF    |
| Output Capacitance                            | C <sub>oss</sub>        | $V_{DS}$ = 15 V, $V_{GS}$ = 0 V, f = 1 MHz   |      | 525   |       |       |
| Reverse Transfer Capacitance                  | C <sub>rss</sub>        |  |      | 370   |       |       |
| Total Gate Charge                             | 0                       | $V_{DS}$ = 15 V, $V_{GS}$ = 10 V, $I_{D}$ = 21.8 A   |      | 35    | 45    | nC    |
|   | Qg                      |  |      | 25    | 35    |       |
| Gate-Source Charge                            | Q <sub>gs</sub>         | $V_{DS}$ = 15 V, $V_{GS}$ = 4.5 V, $I_{D}$ = 21.8 A  |      | 15    |       |       |
| Gate-Drain Charge                             | Q <sub>gd</sub>         |  |      | 20    |       |       |
| Gate Resistance                               | R <sub>g</sub>          | f = 1 MHz  |      | 1.4   | 2.1   | Ω     |
| Turn-On Delay Time                            | t <sub>d(on)</sub>      |  |      | 18    | 27    | - ns  |
| Rise Time                                     | t <sub>r</sub>          | $V_{DD}$ = 15 V, $R_L$ = 0.625 $\Omega$  |      | 11    | 17    |       |
| Turn-Off Delay Time                           | t <sub>d(off)</sub>     | $\text{I}_\text{D} \cong$ 24 A, $\text{V}_\text{GEN}$ = 10 V, $\text{R}_\text{g}$ = 1 $\Omega$   |      | 70    | 105   |       |
| Fall Time                                     | t <sub>f</sub>          |  |      | 10    | 15    |       |
| Turn-On Delay Time                            | t <sub>d(on)</sub>      |  |      | 55    | 83    |       |
| Rise Time                                     | t <sub>r</sub>          | $V_{DD}$ = 15 V, $R_L$ = 0.67 $\Omega$   |      | 180   | 270   |       |
| Turn-Off Delay Time                           | t <sub>d(off)</sub>     | $\text{I}_\text{D}\cong$ 22.5 A, $\text{V}_\text{GEN}$ = 4.5 V, $\text{R}_\text{g}$ = 1 $\Omega$ |      | 55    | 83    |       |
| Fall Time                                     | t <sub>f</sub>          |  |      | 12    | 18    |       |
| Drain-Source Body Diode Characteristic        | cs                      |  |      |       |       |       |
| Continuous Source-Drain Diode Current         | ۱ <sub>S</sub>          | T <sub>C</sub> = 25 °C   |      |       | 120   | A     |
| Pulse Diode Forward Current <sup>a</sup>      | I <sub>SM</sub>         |  |      |       | 120   |       |
| Body Diode Voltage                            | V <sub>SD</sub>         | I <sub>S</sub> = 22 A  |      | 0.8   | 1.2   | V     |
| Body Diode Reverse Recovery Time              | t <sub>rr</sub>         |  |      | 52    | 78    | ns    |
| Body Diode Reverse Recovery Charge            | Q <sub>rr</sub>         | $L_{-} = 20.4$ di/dt = 100.4/m T = 25.00   |      | 70.2  | 105   | nC    |
| Reverse Recovery Fall Time                    | t <sub>a</sub>          | $I_{\rm F} = 20$ A, $u/u_{\rm L} = 100$ A/µS, $I_{\rm T} = 25$ C                                 |      | 27    |       | ns    |
| Reverse Recovery Rise Time                    | t <sub>b</sub>          |  |      | 25    |       |       |

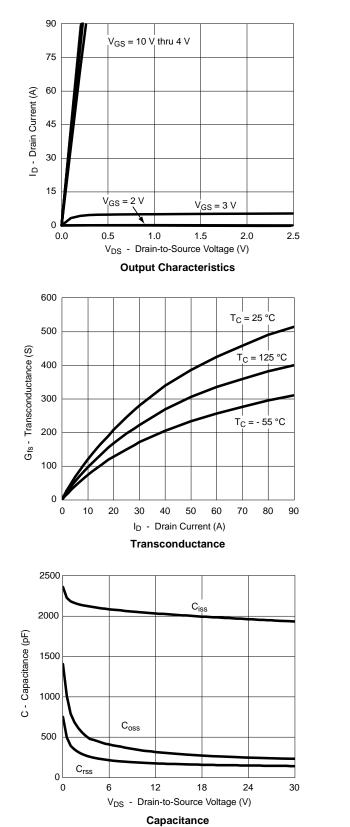
Notes:

a. Pulse test; pulse width  $\leq 300~\mu s,$  duty cycle  $\leq 2$  %.

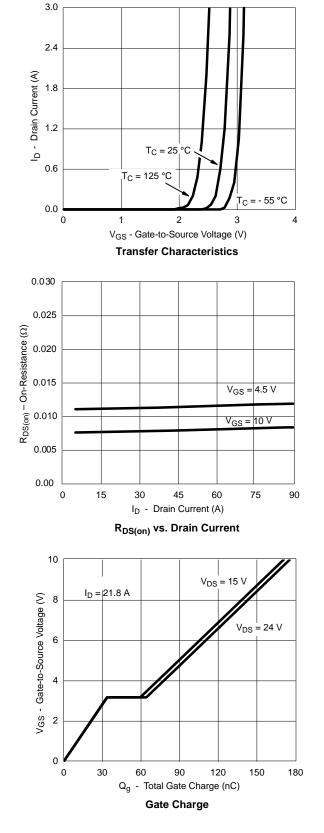
b. Guaranteed by design, not subject to production testing.

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.



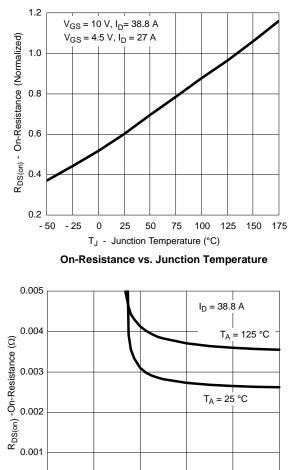


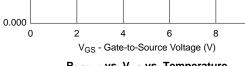
#### TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

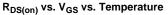


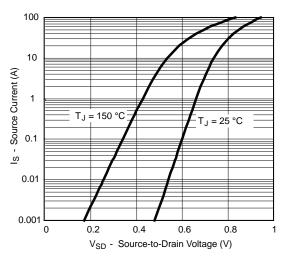


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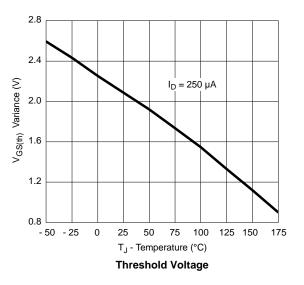


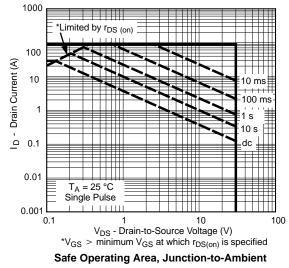






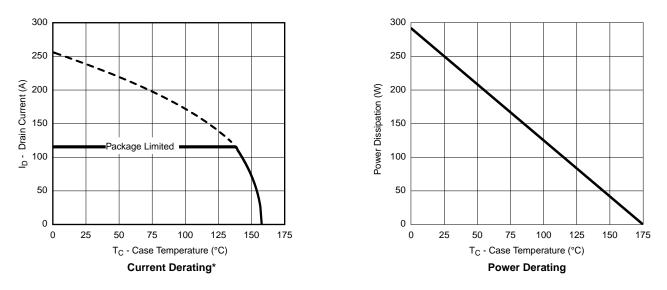
Forward Diode Voltage vs. Temperature





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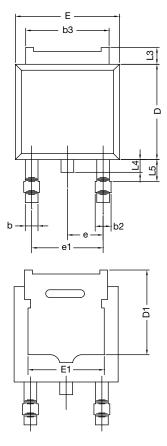
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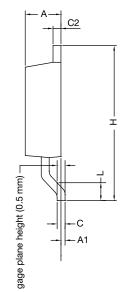
\*The power dissipation  $P_D$  is based on  $T_{J(max)} = 175$  °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.





## **TO-252AA CASE OUTLINE**





|  | MILLIN | METERS | INC       | HES   |  |  |
|--|--------|--------|-----------|-------|--|--|
| DIM.   | MIN.   | MAX.   | MIN.      | MAX.  |  |  |
| А  | 2.18   | 2.38   | 0.086     | 0.094 |  |  |
| A1   | -      | 0.127  | -         | 0.005 |  |  |
| b  | 0.64   | 0.88   | 0.025     | 0.035 |  |  |
| b2   | 0.76   | 1.14   | 0.030     | 0.045 |  |  |
| b3   | 4.95   | 5.46   | 0.195     | 0.215 |  |  |
| С  | 0.46   | 0.61   | 0.018     | 0.024 |  |  |
| C2   | 0.46   | 0.89   | 0.018     | 0.035 |  |  |
| D  | 5.97   | 6.22   | 0.235     | 0.245 |  |  |
| D1   | 5.21   | -      | 0.205     | -     |  |  |
| E  | 6.35   | 6.73   | 0.250     | 0.265 |  |  |
| E1   | 4.32   | -      | 0.170     | -     |  |  |
| Н  | 9.40   | 10.41  | 0.370     | 0.410 |  |  |
| е  | 2.28   | BSC    | 0.090 BSC |       |  |  |
| e1   | 4.56   | BSC    | 0.180 BSC |       |  |  |
| L  | 1.40   | 1.78   | 0.055     | 0.070 |  |  |
| L3   | 0.89   | 1.27   | 0.035     | 0.050 |  |  |
| L4   | -      | 1.02   | -         | 0.040 |  |  |
| L5   | 1.14   | 1.52   | 0.045     | 0.060 |  |  |
| ECN: X12-0247-Rev. M, 24-Dec-12<br>DWG: 5347 |        |        |           |       |  |  |

Note

• Dimension L3 is for reference only.



#### **RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)**



Recommended Minimum Pads Dimensions in Inches/(mm)



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