

PHD36NQ03LT-VB Datasheet

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

| PRODUCT SUMMARY | | | | | | | |
|---------------------|---|------------------------------------|----------------------|--|--|--|--|
| V _{DS} (V) | $R_{DS(on)}$ (Ω) | I _D (A) ^{a, e} | Q _g (Typ) | | | | |
| 30 | 0.007 at V _{GS} = 10 V | 70 | 25 nC | | | | |
| 30 | $0.009 \text{ at V}_{GS} = 4.5 \text{ V}$ | 60 | 23110 | | | | |

TO-252

N-Channel MOSFET

FEATURES

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



APPLICATIONS

- OR-ing
- Server
- DC/DC

| Parameter | | Symbol | Limit | Unit | |
|--|-----------------------------------|-----------------|----------------------|------|--|
| Drain-Source Voltage | V _{DS} | 30 | V | | |
| Gate-Source Voltage | | V _{GS} | | ± 20 | |
| | T _C = 25 °C | | 70 | | |
| Continuous Drain Current (T _J = 175 °C) | T _C = 70 °C | | 50 | | |
| Continuous Diain Current (1 j = 173 C) | T _A = 25 °C | I _D | 21.8 ^{b, c} | A | |
| | T _A = 70 °C | | 18 ^{b, c} | ^ | |
| Pulsed Drain Current | I _{DM} | 200 | | | |
| Avalanche Current Pulse | | I _{AS} | 39 | | |
| Single Pulse Avalanche Energy | L = 0.1 mH | E _{AS} | 94.8 | mJ | |
| Continuous Source-Drain Diode Current | T _C = 25 °C | I. | 50 ^{a, e} | ^ | |
| Continuous Source-Diam Diode Current | T _A = 25 °C | I _S | 3.13 ^{b, c} | A . | |
| | T _C = 25 °C | | 100 ^a | | |
| Manipular Davida Disain ation | T _C = 70 °C | ь | 75 | 10/ | |
| Maximum Power Dissipation | T _A = 25 °C | P _D | 3.25 ^{b, c} | W | |
| | T _A = 70 °C | | 2.33 ^{b, c} | | |
| Operating Junction and Storage Temperature R | T _J , T _{stq} | - 55 to 175 | °C | | |

| THERMAL RESISTANCE RATINGS | | | | | | |
|---|--------------|-------------------|------|------|------|--|
| Parameter | | Symbol | Тур. | Max. | Unit | |
| Maximum Junction-to-Ambient ^{b, d} | t ≤ 10 sec | R _{thJA} | 32 | 40 | °C/W | |
| Maximum Junction-to-Case | Steady State | R _{thJC} | 0.5 | 0.6 | | |

Notes:

- a. Based on T_C = 25 °C.
 b. Surface mounted on 1" x 1" FR4 board.

Top View

- b. Surface in the first policy.

 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.



| Parameter | Symbol | Test Conditions | Min. | Тур. | Max. | Unit |
|---|-------------------------|--|--|-------|-------|-------------|
| Static | | | | | | • |
| Drain-Source Breakdown Voltage | V _{DS} | $V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$ | 30 | | | V |
| V _{DS} Temperature Coefficient | $\Delta V_{DS}/T_{J}$ | L = 250 uA | | 35 | | m\//º(|
| V _{GS(th)} Temperature Coefficient | $\Delta V_{GS(th)}/T_J$ | I _D = 250 μA | | - 7.5 | | mV/°C |
| Gate-Source Threshold Voltage | V _{GS(th)} | $V_{DS} = V_{GS}, I_D = 250 \mu A$ | 1.5 | | 2.0 | V |
| Gate-Source Leakage | I _{GSS} | $V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$ | | | ± 100 | nA |
| Zara Oata Wallana Basis Oamad | | $V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}$ | $I_{1} = 250 \mu A$ 30 35 35 7.5 $I_{2} = 250 \mu A$ 3.6 $I_{3} = 250 \mu A$ 3.7 $I_{4} = 250 \mu A$ 3.7 $I_{5} = 250 \mu A$ 3.7 $I_{5} = 250 \mu A$ 3.8 $I_{5} = 250 \mu A$ 3.9 $I_{5} = 250 \mu A$ 3.9 $I_{5} = 250 \mu A$ 3.0 $I_{5} = 250 \mu A$ 3.1 $I_{5} = 200 \mu A$ 3.1 $I_{5} = 200 \mu A$ 3.1 $I_{5} = 21.8 A$ 3.1 $I_{5} = 200 \mu A$ 3.2 $I_{5} = 200 \mu A$ 3.2 $I_{5} = 200 \mu A$ 3.2 $I_{5} = 200 \mu A$ 3.3 $I_{5} = 200 \mu A$ | 1 | | |
| Zero Gate Voltage Drain Current | I _{DSS} | $V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}, T_{J} = 55 \text{ °C}$ | | | 10 | μA |
| On-State Drain Current ^a | I _{D(on)} | $V_{DS} \ge 5 \text{ V}, V_{GS} = 10 \text{ V}$ | 90 | | | Α |
| | D | $V_{GS} = 10 \text{ V}, I_D = 21.8 \text{ A}$ | | 0.007 | | _ |
| Drain-Source On-State Resistance ^a | R _{DS(on)} | $V_{GS} = 4.5 \text{ V}, I_D = 18A$ | | 0.009 | | Ω |
| Forward Transconductance ^a | 9 _{fs} | V _{DS} = 15 V, I _D = 21.8 A | | 160 | | S |
| Dynamic ^b | | | | | | |
| Input Capacitance | C _{iss} | | | 2201 | | pF |
| Output Capacitance | C _{oss} | $V_{DS} = 15 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ | | 525 | | |
| Reverse Transfer Capacitance | C _{rss} | | | 370 | | |
| Total Cata Charma | 0 | $V_{DS} = 15 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 21.8 \text{ A}$ | | 45 | 0 | |
| Total Gate Charge | Charge Q _g | | 25 | 35 | | |
| Gate-Source Charge | Q _{gs} | $V_{DS} = 15 \text{ V}, V_{GS} = 4.5 \text{ V}, I_{D} = 21.8 \text{ A}$ | | 15 | | nC |
| Gate-Drain Charge | Q _{gd} | | | 20 | | |
| Gate Resistance | R _g | f = 1 MHz | | 1.4 | 2.1 | Ω |
| Turn-On Delay Time | t _{d(on)} | | | 18 | 27 | |
| Rise Time | t _r | V_{DD} = 15 V, R_L = 0.625 Ω | | 11 | 17 | |
| Turn-Off Delay Time | t _{d(off)} | $I_D\cong 24$ A, V_{GEN} = 10 V, R_g = 1 Ω | | 70 | 105 | |
| Fall Time | t _f | | | 10 | 15 | |
| Turn-On Delay Time | t _{d(on)} | | | 55 | 83 | ns |
| Rise Time | t _r | V_{DD} = 15 V, R_L = 0.67 Ω | | 180 | 270 | - - - |
| Turn-Off Delay Time | t _{d(off)} | $I_D\cong 22.5~A,~V_{GEN}$ = 4.5 V, R_g = 1 Ω | | 55 | 83 | |
| Fall Time | t _f | | | 12 | 18 | |
| Drain-Source Body Diode Characteristic | es | | | | | |
| Continuous Source-Drain Diode Current | I _S | T _C = 25 °C | | | 120 | Λ |
| Pulse Diode Forward Current ^a | I _{SM} | | | | 120 | Α |
| Body Diode Voltage | V_{SD} | I _S = 22 A | | 0.8 | 1.2 | V |
| Body Diode Reverse Recovery Time | t _{rr} | | | 52 | 78 | ns |
| Body Diode Reverse Recovery Charge | Q _{rr} | 1 00 A di/d+ 100 A/:- T 05 00 | | 70.2 | 105 | nC |
| Reverse Recovery Fall Time | t _a | $I_F = 20 \text{ A}, \text{ di/dt} = 100 \text{ A/}\mu\text{s}, T_J = 25 \text{ °C}$ | | 27 | | |
| Reverse Recovery Rise Time | t _b | | | 25 | | ns |

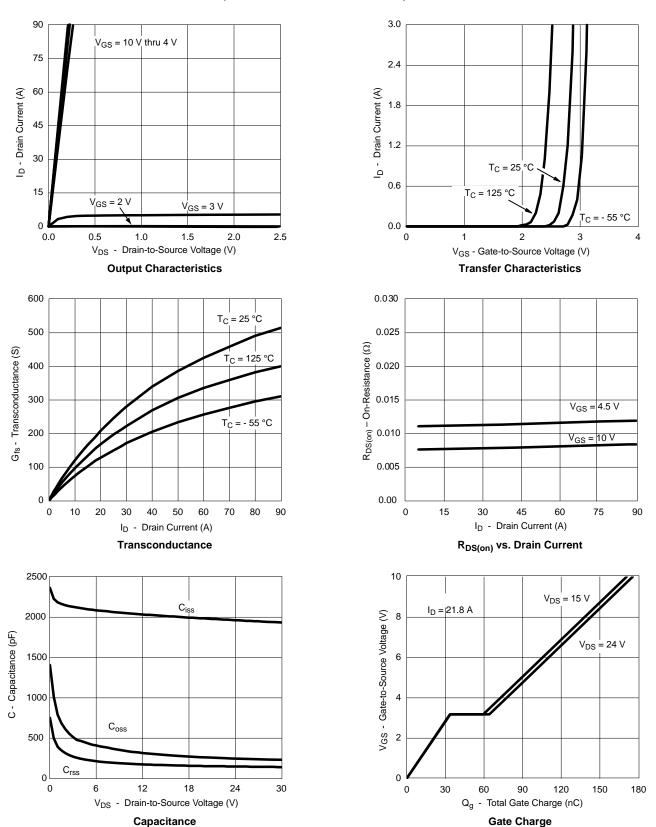
Notes:

- 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.

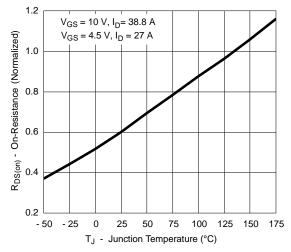


TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)





TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



On-Resistance vs. Junction Temperature



 $\rm R_{\rm DS(on)}$ vs. $\rm V_{\rm GS}$ vs. Temperature



Forward Diode Voltage vs. Temperature



Threshold Voltage

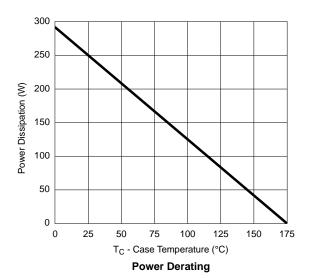


Safe Operating Area, Junction-to-Ambient

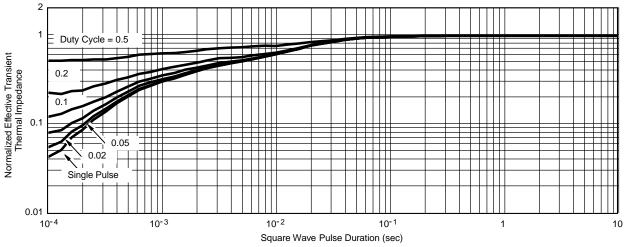


TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)





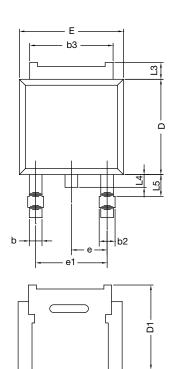
*The power dissipation P_D is based on $T_{J(max)}$ = 175 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

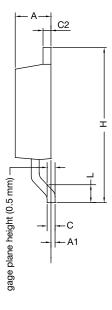


Normalized Thermal Transient Impedance, Junction-to-Case



TO-252AA CASE OUTLINE





| | MILLIN | MILLIMETERS | | HES | | | |
|-----------|---------------------------------|-------------|-----------|-------|--|--|--|
| DIM. | MIN. | MAX. | MIN. | MAX. | | | |
| Α | 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 | - | | | |
| Е | 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 | 2.28 BSC | | 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- | ECN: X12-0247-Rev. M, 24-Dec-12 | | | | | | |

ECN: X12-0247-Rev. M, 24-Dec-12 DWG: 5347

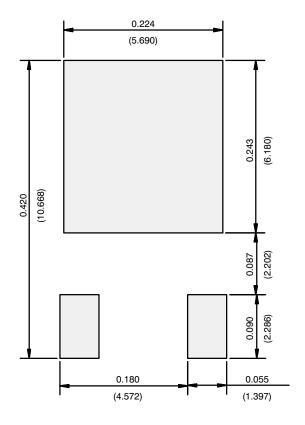
Note

• Dimension L3 is for reference only.



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RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)



Recommended Minimum Pads Dimensions in Inches/(mm)



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