

NTD5805NG-VB Datasheet N-Channel 40-V (D-S) MOSFET

| PRODUCT SUMMARY | | | | | |
|---------------------|-----------------------------------|------------------------------------|-----------------------|--|--|
| V _{DS} (V) | $R_{DS(on)}$ (Ω) | I _D (A) ^{a, c} | Q _g (Typ.) | | |
| 40 | 0.0050 at V _{GS} = 10 V | 85 | 80 nC | | |
| 40 | 0.0065 at V _{GS} = 4.5 V | 70 | 00 HC | | |

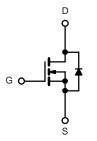
FEATURES

- Trench Power MOSFET
- 100 % R_g and UIS Tested



APPLICATIONS

- Synchronous Rectification
- Power Supplies



N-Channel MOSFET

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| | | |
| G | D | s |

| ABSOLUTE MAXIMUM RATINGS | T _A = 25 °C, unle | ss otherwise not | ted | | |
|---|-----------------------------------|------------------|---------------------|---------------------------------------|--|
| Parameter | Symbol | Limit | Unit | | |
| Drain-Source Voltage | V _{DS} | 40 | V | | |
| Gate-Source Voltage | | V _{GS} | ± 25 | \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ | |
| | T _C = 25 °C | | 85 ^{a, c} | | |
| Continuous Drain Current (T _{.I} = 175 °C) | T _C = 70 °C | | 70 ^c | | |
| Continuous Diain Current (1 _J = 173 C) | T _A = 25 °C | I _D | 59 ^b | A | |
| | T _A = 70 °C | | 53 ^b | | |
| Pulsed Drain Current | | I _{DM} | 250 |] | |
| Avalanche Current Pulse L = 0.1 mH | | I _{AS} | 80 | | |
| Single Pulse Avalanche Energy | L = 0.1 IIII | E _{AS} | 320 | mJ | |
| Continuous Source-Drain Diode Current | T _C = 25 °C | la la | 110 ^{a, c} | A | |
| Continuous Source-Diain Diode Current | T _A = 25 °C | I _S | 2.6 ^b | | |
| | T _C = 25 °C | | 312 ^a | | |
| Maximum Power Dissipation | T _C = 70 °C | P _D | 200 | W | |
| | T _A = 25 °C | r D | 3.13 ^b | - vv | |
| | T _A = 70 °C | | 2.0 ^b | 1 | |
| Operating Junction and Storage Temperature Ra | T _J , T _{stg} | - 55 to 150 | °C | | |

| THERMAL RESISTANCE RATINGS | | | | | | |
|--|--------------|-------------------|---------|---------|------|--|
| Parameter | | Symbol | Typical | Maximum | Unit | |
| Maximum Junction-to-Ambient ^b | Steady State | R _{thJA} | 32 | 40 | °C/W | |
| Maximum Junction-to-Case | Steady State | R_{thJC} | 0.33 | 0.4 |] | |

Notes:

- a. Based on $T_C = 25$ °C.
- b. Surface Mounted on 1" x 1" FR4 board.
- c. Calculated based on maximum junction temperature. Package limitation current is 110 A.



| Parameter | Symbol | Test Conditions | Min. | Тур. | Max. | Unit | |
|---|-------------------------|---|------|--------|-------|----------|--|
| Static | | | | | | | |
| Drain-Source Breakdown Voltage | V _{DS} | $V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$ | 40 | | | V | |
| V _{DS} Temperature Coefficient | $\Delta V_{DS}/T_{J}$ | I _D = 250 μA | | 41 | | mV/°C | |
| V _{GS(th)} Temperature Coefficient | $\Delta V_{GS(th)}/T_J$ | 10 = 200 μΛ | | - 8 | | 11117/ C | |
| Gate-Source Threshold Voltage | V _{GS(th)} | $V_{DS} = V_{GS}$, $I_D = 250 \mu A$ | 1.2 | | 2.5 | V | |
| Gate-Source Leakage | I _{GSS} | $V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$ | | | ± 100 | nA | |
| Zana Oata Valta na Busin Oamant | lace | $V_{DS} = 40 \text{ V}, V_{GS} = 0 \text{ V}$ | | | 1 | | |
| Zero Gate Voltage Drain Current | I _{DSS} | $V_{DS} = 40 \text{ V}, V_{GS} = 0 \text{ V}, T_{J} = 55 ^{\circ}\text{C}$ | | | 10 | μΑ | |
| On-State Drain Current ^a | I _{D(on)} | $V_{DS} \ge 5 \text{ V}, V_{GS} = 10 \text{ V}$ | 120 | | | Α | |
| Drain Course On State Resistance | Rno() | $V_{GS} = 10 \text{ V}, I_D = 30 \text{ A}$ | | 0.0050 | | 0 | |
| Drain-Source On-State Resistance ^a | R _{DS(on)} | $V_{GS} = 4.5 \text{ V}, I_D = 20 \text{ A}$ | | 0.0065 | | Ω | |
| Forward Transconductance ^a | 9 _{fs} | $V_{DS} = 15 \text{ V}, I_{D} = 30 \text{ A}$ | | 180 | | S | |
| Dynamic ^b | | | | | | | |
| Input Capacitance | C _{iss} | | | 2380 | | | |
| Output Capacitance | C _{oss} | $V_{DS} = 20 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$ | | 550 | | pF | |
| Reverse Transfer Capacitance | C _{rss} | | | 250 | | | |
| Total Gate Charge | Q_g | | | 80 | 120 | nC | |
| Gate-Source Charge | Q _{gs} | $V_{DS} = 20 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 20 \text{ A}$ | | 20 | | | |
| Gate-Drain Charge | Q _{gd} | | | 12 | | | |
| Gate Resistance | R _g | f = 1 MHz | | 0.85 | 1.3 | Ω | |
| Turn-On Delay Time | t _{d(on)} | | | 20 | 30 | | |
| Rise Time | t _r | V_{DD} = 20 V, R_L = 1.0 Ω | | 11 | 17 | 1 | |
| Turn-Off Delay Time | t _{d(off)} | $I_D\cong 20$ A, $V_{GEN}=10$ V, $R_g=1$ Ω | | 77 | 115 | | |
| Fall Time | t _f | | | 10 | 15 | | |
| Turn-On Delay Time | t _{d(on)} | | | 102 | 155 | ns | |
| Rise Time | t _r | V_{DD} = 20 V, R_L = 1.0 Ω | | 62 | 95 | | |
| Turn-Off Delay Time | t _{d(off)} | $I_D\cong 20$ A, V_{GEN} = 4.5 V, R_g = 1 Ω | | 180 | 270 | 1 | |
| Fall Time | t _f | | | 60 | 90 | | |
| Drain-Source Body Diode Characteristic | s | | | • | | | |
| Continuous Source-Drain Diode Current | I _S | $T_C = 25 ^{\circ}C$ | | | 110 | А | |
| Pulse Diode Forward Current ^a | I _{SM} | | | | 200 | _ ^ | |
| Body Diode Voltage | V _{SD} | I _S = 20 A | | 0.8 | 1.2 | V | |
| Body Diode Reverse Recovery Time | t _{rr} | | | 50 | 75 | ns | |
| Body Diode Reverse Recovery Charge | Q _{rr} | I _F = 20 A, di/dt = 100 A/µs, T _{.I} = 25 °C | | 70 | 105 | nC | |
| Reverse Recovery Fall Time | t _a | $_{1F} = 20 \text{ A}, \text{ u/u} = 100 \text{ A/}\mu\text{s}, 1 1 = 25 ^{\circ}\text{C}$ | | 30 | | | |
| Reverse Recovery Rise Time | t _b | 7 | | 20 | | ns | |

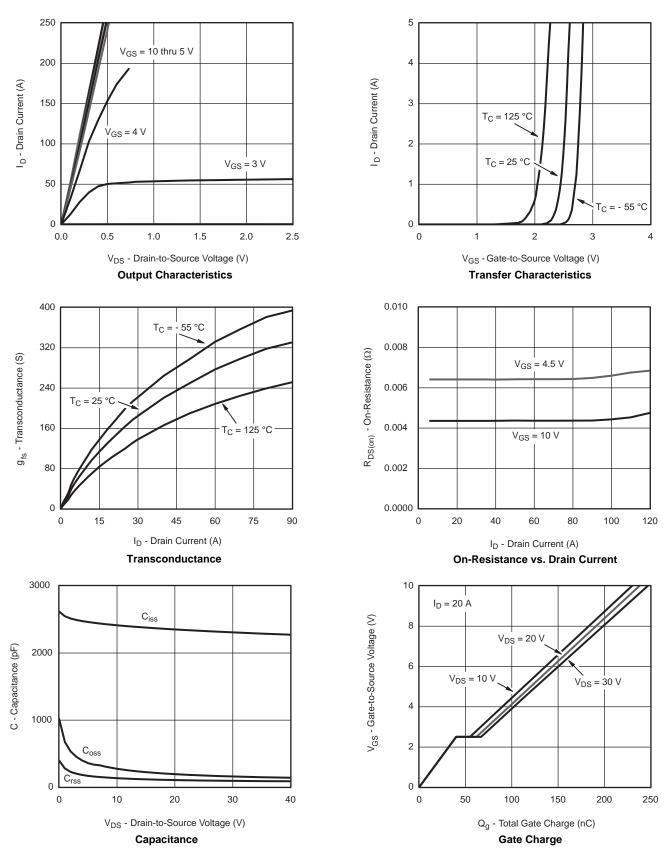
Notes:

- 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.

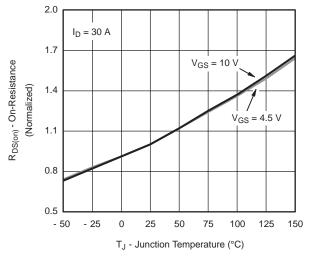


TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

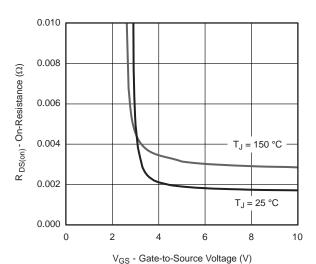




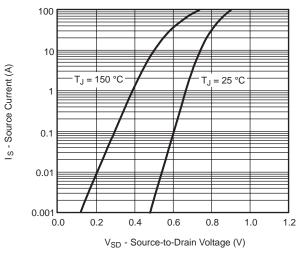
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



On-Resistance vs. Junction Temperature



On-Resistance vs. Gate-to-Source Voltage



Forward Diode Voltage vs. Temperature



Threshold Voltage

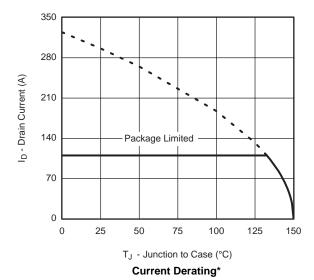


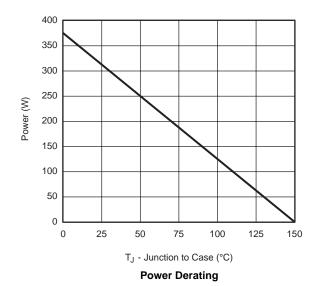
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

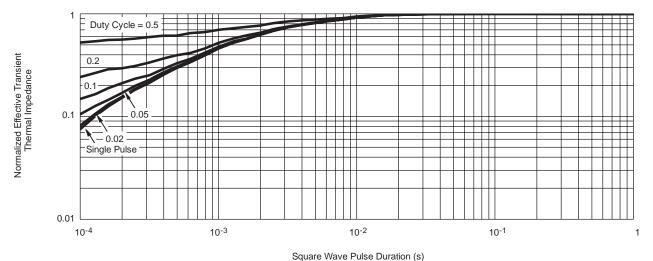


TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted





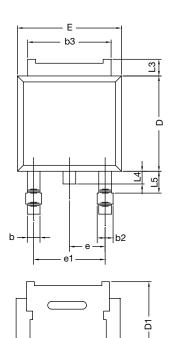
* The power dissipation P_D is based on $T_{J(max)}$ = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

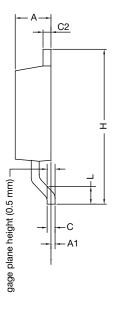


Normalized Thermal Transient Impedance, Junction-to-Case



TO-252AA CASE OUTLINE





| | MILLIMETERS | | 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 | - | |
| 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 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 | | | | | |

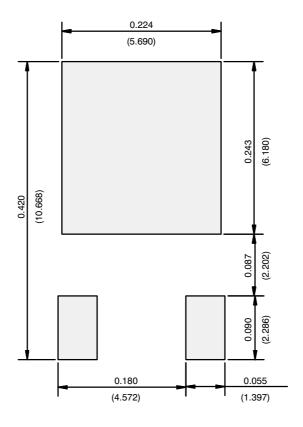
ECN: X12-0247-Rev. M, 24-Dec-12 DWG: 5347

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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