

NTD20N03L27

Power MOSFET 20 Amps, 30 Volts N-Channel DPAK

This logic level vertical power MOSFET is a general purpose part that provides the “best of design” available today in a low cost power package. Avalanche energy issues make this part an ideal design in. The drain-to-source diode has a ideal fast but soft recovery.

Features

- Ultra-Low $R_{DS(on)}$, single base, advanced technology
- SPICE parameters available
- Diode is characterized for use in bridge circuits
- I_{DSS} and $V_{DS(on)}$ specified at elevated temperatures
- High Avalanche Energy Specified
- ESD JEDAC rated HBM Class 1, MM Class A, CDM Class 0

Typical Applications

- Power Supplies
- Inductive Loads
- PWM Motor Controls
- Replaces MTD20N03L in many applications

MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

| Rating | Symbol | Value | Unit |
|---|-----------------|----------------|--------------------------------|
| Drain-to-Source Voltage | V_{DSS} | 30 | Vdc |
| Drain-to-Gate Voltage ($R_{GS} = 1.0\text{ M}\Omega$) | V_{DGR} | 30 | Vdc |
| Gate-to-Source Voltage | V_{GS} | ± 20 | Vdc |
| – Continuous | V_{GS} | ± 24 | |
| – Non-Repetitive ($t_p \leq 10\text{ ms}$) | | | |
| Drain Current | I_D | 20 | Adc |
| – Continuous @ $T_A = 25^\circ\text{C}$ | I_D | 16 | |
| – Continuous @ $T_A = 100^\circ\text{C}$ | I_{DM} | 60 | Apk |
| – Single Pulse ($t_p \leq 10\text{ }\mu\text{s}$) | | | |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 74 | Watts |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ (Note 1.) | | 0.6 1.75 | $\text{W}/^\circ\text{C}$ W |
| Operating and Storage Temperature Range | T_J, T_{stg} | -55 to 150 | $^\circ\text{C}$ |
| Single Pulse Drain-to-Source Avalanche Energy – Starting $T_J = 25^\circ\text{C}$ ($V_{DD} = 30\text{ Vdc}$, $V_{GS} = 5\text{ Vdc}$, $L = 1.0\text{ mH}$, $I_{L(pk)} = 24\text{ A}$, $V_{DS} = 34\text{ Vdc}$) | E_{AS} | 288 | mJ |
| Thermal Resistance | $R_{\theta JC}$ | 1.67 | $^\circ\text{C}/\text{W}$ |
| – Junction-to-Case | $R_{\theta JA}$ | 100 | |
| – Junction-to-Ambient (Note 1.) | $R_{\theta JA}$ | 71.4 | |
| Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds | T_L | 260 | $^\circ\text{C}$ |

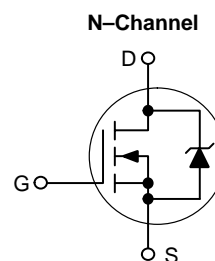
1. When surface mounted to an FR4 board using the minimum recommended pad size and repetitive rating; pulse width limited by maximum junction temperature.



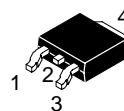
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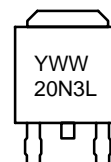
**20 AMPERES
30 VOLTS
 $R_{DS(on)} = 27\text{ m}\Omega$**



MARKING DIAGRAM

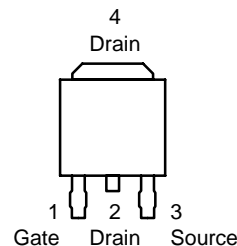


**CASE 369A
DPAK
STYLE 2**



20N3L = Device Code
Y = Year
WW = Work Week

PIN ASSIGNMENT



ORDERING INFORMATION

| Device | Package | Shipping |
|---------------|---------|------------------|
| NTD20N03L27 | DPAK | 75 Units/Rail |
| NTD20N03L27-1 | DPAK | 75 Units/Rail |
| NTD20N03L27T4 | DPAK | 2500 Tape & Reel |

NTD20N03L27

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | |
|---|----------------------|---------|---------|-----------|--------------|
| Drain-to-Source Breakdown Voltage (Note 2.) (V _{GS} = 0 Vdc, I _D = 250 μAdc) Temperature Coefficient (Positive) | V _{(BR)DSS} | 30 – | – 43 | – – | Vdc mV/°C |
| Zero Gate Voltage Drain Current (V _{DS} = 30 Vdc, V _{GS} = 0 Vdc) (V _{DS} = 30 Vdc, V _{GS} = 0 Vdc, T _J = 150°C) | I _{DSS} | – – | – – | 10 100 | μAdc |
| Gate-Body Leakage Current (V _{GS} = ±20 Vdc, V _{DS} = 0 Vdc) | I _{GSS} | – | – | ±100 | nAdc |

ON CHARACTERISTICS (Note 2.)

| | | | | | |
|--|---------------------|----------|--------------|-----------|--------------|
| Gate Threshold Voltage (Note 2.) (V _{DS} = V _{GS} , I _D = 250 μAdc) Threshold Temperature Coefficient (Negative) | V _{GS(th)} | 1.0 – | 1.6 5.0 | 2.0 – | Vdc mV/°C |
| Static Drain-to-Source On-Resistance (Note 2.) (V _{GS} = 4.0 Vdc, I _D = 10 Adc) (V _{GS} = 5.0 Vdc, I _D = 10 Adc) | R _{DS(on)} | – – | 28 23 | 31 27 | mΩ |
| Static Drain-to-Source On-Resistance (Note 2.) (V _{GS} = 5.0 Vdc, I _D = 20 Adc) (V _{GS} = 5.0 Vdc, I _D = 10 Adc, T _J = 150°C) | V _{DS(on)} | – – | 0.48 0.40 | 0.54 – | Vdc |
| Forward Transconductance (Note 2.) (V _{DS} = 5.0 Vdc, I _D = 10 Adc) | g _{FS} | – | 21 | – | mhos |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|----------------------|---|------------------|---|------|------|----|
| Input Capacitance | (V _{DS} = 25 Vdc, V _{GS} = 0 Vdc, f = 1.0 MHz) | C _{iss} | – | 1005 | 1260 | pF |
| Output Capacitance | | C _{oss} | – | 271 | 420 | |
| Transfer Capacitance | | C _{rss} | – | 87 | 112 | |

SWITCHING CHARACTERISTICS (Note 3.)

| | | | | | | |
|---------------------|--|---------------------|---|------|------|----|
| Turn-On Delay Time | (V _{DD} = 20 Vdc, I _D = 20 Adc, V _{GS} = 5.0 Vdc, R _G = 9.1 Ω) (Note 2.) | t _{d(on)} | – | 17 | 25 | ns |
| Rise Time | | t _r | – | 137 | 160 | |
| Turn-Off Delay Time | | t _{d(off)} | – | 38 | 45 | |
| Fall Time | | t _f | – | 31 | 40 | |
| Gate Charge | (V _{DS} = 48 Vdc, I _D = 15 Adc, V _{GS} = 10 Vdc) (Note 2.) | Q _T | – | 13.8 | 18.9 | nC |
| | | Q ₁ | – | 2.8 | – | |
| | | Q ₂ | – | 6.6 | – | |

SOURCE-DRAIN DIODE CHARACTERISTICS

| | | | | | | |
|--------------------------------|--|-----------------|--------|------------|-----------|-----|
| Forward On-Voltage | (I _S = 20 Adc, V _{GS} = 0 Vdc) (Note 2.) (I _S = 20 Adc, V _{GS} = 0 Vdc, T _J = 125°C) | V _{SD} | – – | 1.0 0.9 | 1.15 – | Vdc |
| Reverse Recovery Time | (I _S = 15 Adc, V _{GS} = 0 Vdc, di _S /dt = 100 A/μs) (Note 2.) | t _{rr} | – | 23 | – | ns |
| | | t _a | – | 13 | – | |
| | | t _b | – | 10 | – | |
| Reverse Recovery Stored Charge | | Q _{RR} | – | 0.017 | – | μC |

- Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
- Switching characteristics are independent of operating junction temperature.

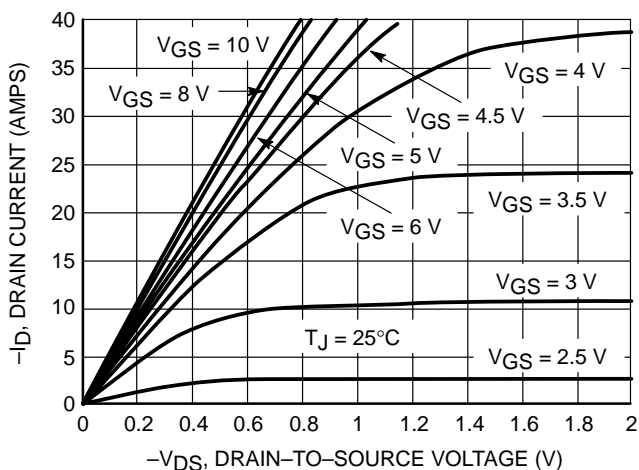


Figure 1. On-Region Characteristics

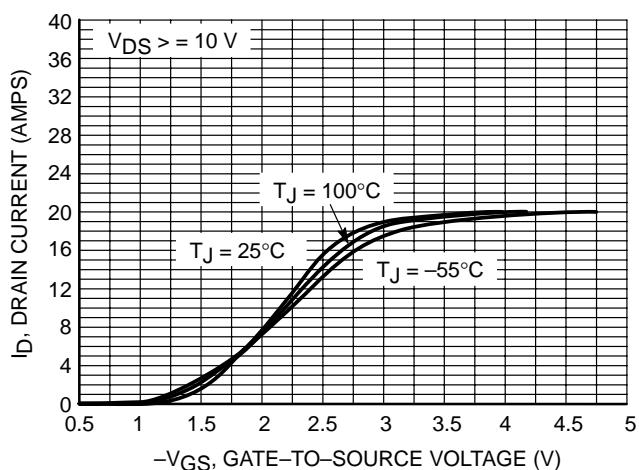


Figure 2. Transfer Characteristics

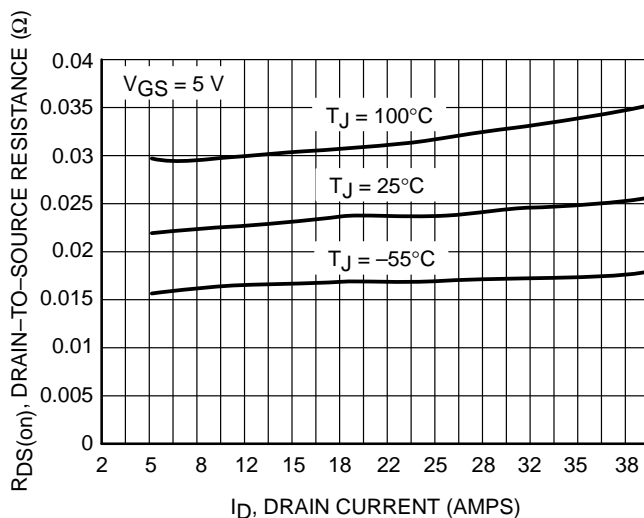


Figure 3. On-Resistance vs. Drain Current and Temperature

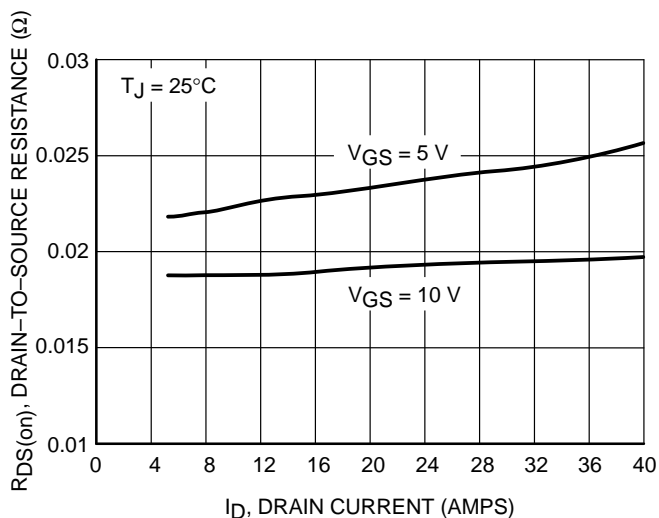


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

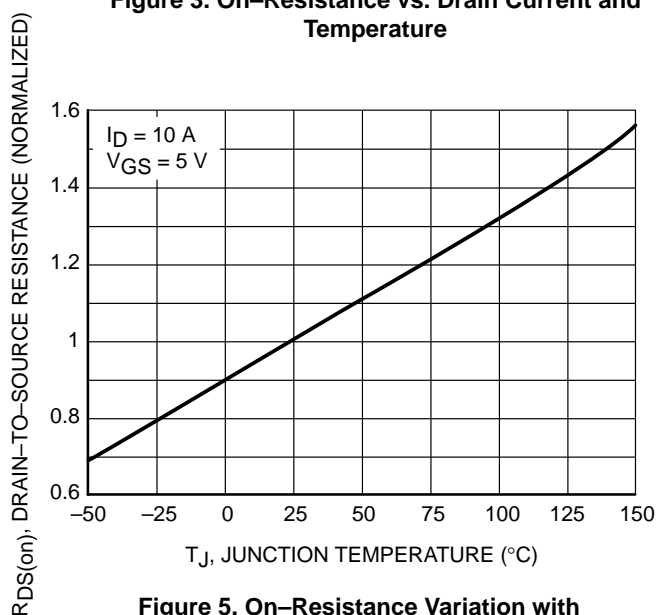


Figure 5. On-Resistance Variation with Temperature

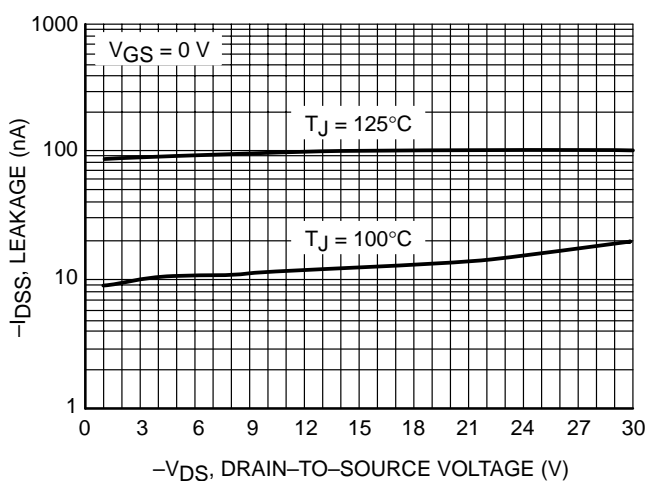


Figure 6. Drain-to-Source Leakage Current vs. Voltage

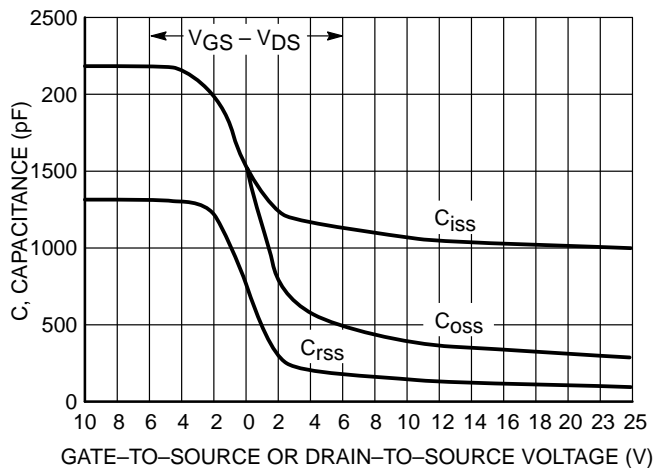


Figure 7. Capacitance Variation

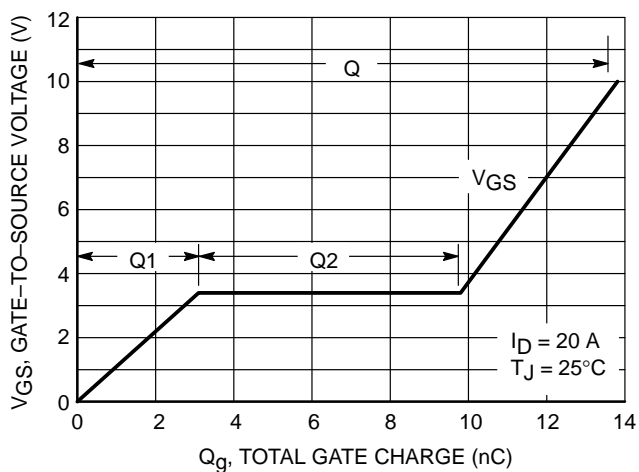


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

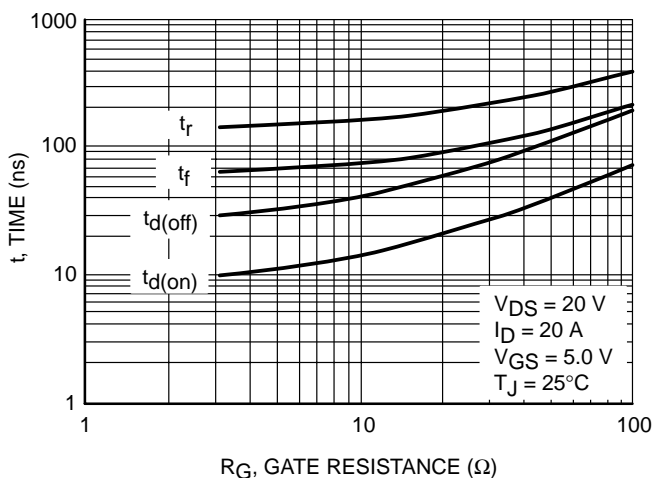


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

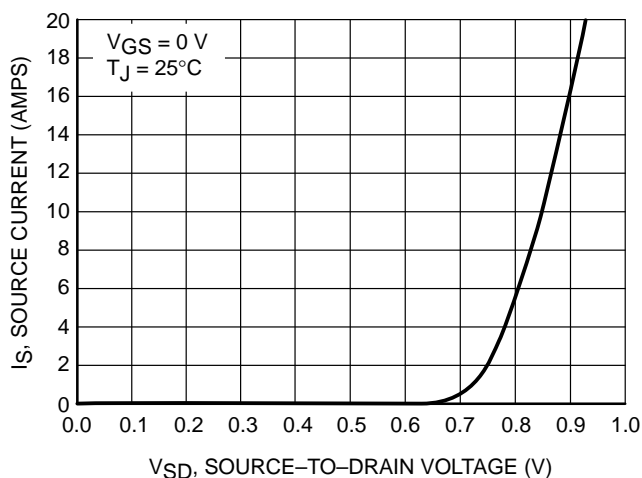


Figure 10. Diode Forward Voltage vs. Current

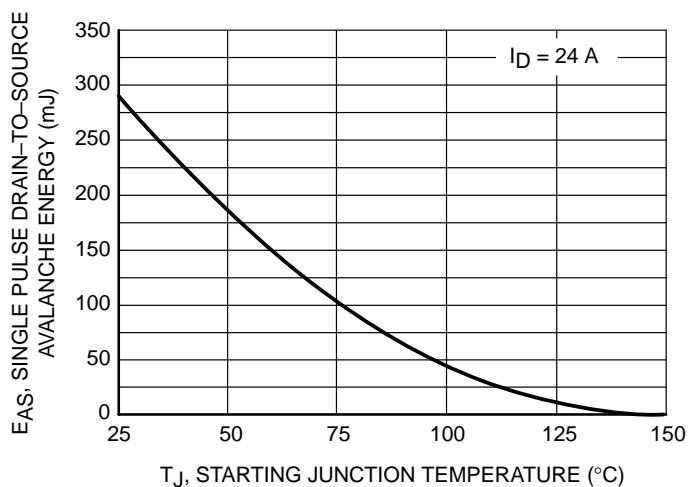
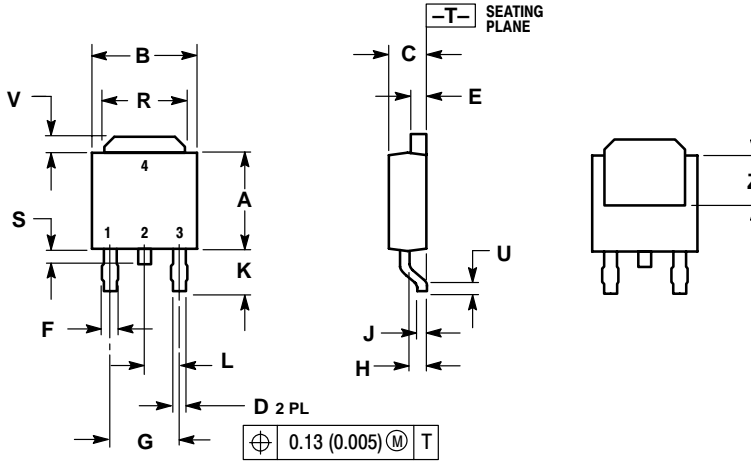


Figure 11. Maximum Avalanche Energy vs. Starting Junction Temperature

NTD20N03L27

PACKAGE DIMENSIONS

DPAK
CASE 369A-13
ISSUE AA



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| A | 0.235 | 0.250 | 5.97 | 6.35 |
| B | 0.250 | 0.265 | 6.35 | 6.73 |
| C | 0.086 | 0.094 | 2.19 | 2.38 |
| D | 0.027 | 0.035 | 0.69 | 0.88 |
| E | 0.033 | 0.040 | 0.84 | 1.01 |
| F | 0.037 | 0.047 | 0.94 | 1.19 |
| G | 0.180 BSC | | 4.58 BSC | |
| H | 0.034 | 0.040 | 0.87 | 1.01 |
| J | 0.018 | 0.023 | 0.46 | 0.58 |
| K | 0.102 | 0.114 | 2.60 | 2.89 |
| L | 0.090 BSC | | 2.29 BSC | |
| R | 0.175 | 0.215 | 4.45 | 5.46 |
| S | 0.020 | 0.050 | 0.51 | 1.27 |
| U | 0.020 | --- | 0.51 | --- |
| V | 0.030 | 0.050 | 0.77 | 1.27 |
| Z | 0.138 | --- | 3.51 | --- |

STYLE 2:

- PIN 1: GATE
2: DRAIN
3: SOURCE
4: DRAIN

Notes

Notes

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Phone: 303-675-2121 (Tue-Fri 9:00am to 1:00pm, Hong Kong Time)
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001-800-4422-3781

Email: ONlit-asia@hibbertco.com

JAPAN: ON Semiconductor, Japan Customer Focus Center

4-32-1 Nishi-Gotanda, Shinagawa-ku, Tokyo, Japan 141-0031
Phone: 81-3-5740-2700
Email: r14525@onsemi.com

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