



**THE DATASHEET OF
NTB23N03RT4**



ON Semiconductor

Is Now

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NTB23N03R

Power MOSFET 23 Amps, 25 Volts N-Channel D²PAK

Designed for low voltage, high speed switching applications in power supplies, converters and power motor controls and bridge circuits.

Features

- Pb-Free Packages are Available

Typical Applications

- Planar HD3e Process for Fast Switching Performance
- Low $R_{DS(on)}$ to Minimize Conduction Loss
- Low C_{iss} to Minimize Driver Loss
- Low Gate Charge
- Optimized for High Side Switching Requirements in High-Efficiency DC-DC Converters

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

| Parameter | Symbol | Value | Unit |
|---|----------------------------|-----------------|--------------------|
| Drain-to-Source Voltage | V_{DSS} | 25 | Vdc |
| Gate-to-Source Voltage - Continuous | V_{GS} | ± 20 | Vdc |
| Drain Current - Continuous @ $T_A = 25^\circ\text{C}$, Limited by Chip - Continuous @ $T_A = 25^\circ\text{C}$, Limited by Package - Single Pulse ($t_p = 10 \mu\text{s}$) | I_D I_D I_{DM} | 23 6.0 60 | A |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ | P_D | 37.5 | W |
| Operating and Storage Temperature Range | T_J, T_{stg} | -55 to 150 | $^\circ\text{C}$ |
| Thermal Resistance - Junction-to-Case | $R_{\theta JC}$ | 3.3 | $^\circ\text{C/W}$ |
| Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds | T_L | 260 | $^\circ\text{C}$ |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

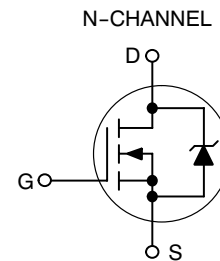


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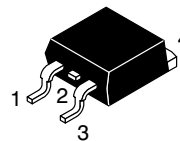
<http://onsemi.com>

23 AMPERES, 25 VOLTS

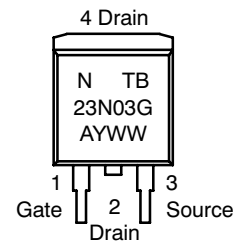
$R_{DS(on)} = 32 \text{ m}\Omega$ (Typ)



MARKING DIAGRAM & PIN ASSIGNMENTS



**D²PAK
CASE 418B
STYLE 2**



NTB23N03 = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
G = Pb-Free Package

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

NTB23N03R

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

| Characteristics | Symbol | Min | Typ | Max | Unit |
|---|----------------------|---------|---------|-----------|--------------|
| OFF CHARACTERISTICS | | | | | |
| Drain-to-Source Breakdown Voltage (Note 1) (V _{GS} = 0 Vdc, I _D = 250 μAdc) Temperature Coefficient (Positive) | V _{(br)DSS} | 25 - | 28 - | - - | Vdc mV/°C |
| Zero Gate Voltage Drain Current (V _{DS} = 20 Vdc, V _{GS} = 0 Vdc) (V _{DS} = 20 Vdc, V _{GS} = 0 Vdc, T _J = 150°C) | I _{DSS} | - - | - - | 1.0 10 | μAdc |
| Gate-Body Leakage Current (V _{GS} = ±20 Vdc, V _{DS} = 0 Vdc) | I _{GSS} | - | - | ±100 | nAdc |

ON CHARACTERISTICS (Note 1)

| | | | | | |
|--|---------------------|----------|--------------|----------|--------------|
| Gate Threshold Voltage (Note 1) (V _{DS} = V _{GS} , I _D = 250 μAdc) Threshold Temperature Coefficient (Negative) | V _{GS(th)} | 1.0 - | 1.8 - | 2.0 - | Vdc mV/°C |
| Static Drain-to-Source On-Resistance (Note 1) (V _{GS} = 4.5 Vdc, I _D = 6 Adc) (V _{GS} = 10 Vdc, I _D = 6 Adc) | R _{DS(on)} | - - | 50.3 32.3 | 60 45 | mΩ |
| Forward Transconductance (Note 1) (V _{DS} = 10 Vdc, I _D = 6 Adc) | g _{FS} | - | 14 | - | Mhos |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|----------------------|--|------------------|---|-----|---|----|
| Input Capacitance | (V _{DS} = 20 Vdc, V _{GS} = 0 V, f = 1 MHz) | C _{iss} | - | 225 | - | pF |
| Output Capacitance | | C _{oss} | - | 108 | - | |
| Transfer Capacitance | | C _{rss} | - | 48 | - | |

SWITCHING CHARACTERISTICS (Note 2)

| | | | | | | |
|---------------------|---|---------------------|---|------|---|----|
| Turn-On Delay Time | (V _{GS} = 10 Vdc, V _{DD} = 10 Vdc, I _D = 6 Adc, R _G = 3 Ω) | t _{d(on)} | - | 2.0 | - | ns |
| Rise Time | | t _r | - | 14.9 | - | |
| Turn-Off Delay Time | | t _{d(off)} | - | 9.9 | - | |
| Fall Time | | t _f | - | 2.0 | - | |
| Gate Charge | (V _{GS} = 4.5 Vdc, I _D = 6 Adc, V _{DS} = 10 Vdc) (Note 1) | Q _T | - | 3.76 | - | nC |
| | | Q ₁ | - | 1.7 | - | |
| | | Q ₂ | - | 1.6 | - | |

SOURCE-DRAIN DIODE CHARACTERISTICS

| | | | | | | |
|--------------------------------|---|-----------------|--------|--------------|----------|-----|
| Forward On-Voltage | (I _S = 6 Adc, V _{GS} = 0 Vdc) (Note 1) (I _S = 6 Adc, V _{GS} = 0 Vdc, T _J = 125°C) | V _{SD} | - - | 0.87 0.74 | 1.2 - | Vdc |
| Reverse Recovery Time | (I _S = 6 Adc, V _{GS} = 0 Vdc, di _S /dt = 100 A/μs) (Note 1) | t _{rr} | - | 8.7 | - | ns |
| | | t _a | - | 5.2 | - | |
| | | t _b | - | 3.5 | - | |
| Reverse Recovery Stored Charge | | Q _{RR} | - | 0.003 | - | μC |

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

ORDERING INFORMATION

| Device | Package | Shipping† |
|--------------|---------------------------------|-------------------------|
| NTB23N03R | D ² PAK | 50 Units / Rail |
| NTB23N03RG | D ² PAK (Pb-Free) | 50 Units / Rail |
| NTB23N03RT4 | D ² PAK | 800 Units / Tape & Reel |
| NTB23N03RT4G | D ² PAK (Pb-Free) | 800 Units / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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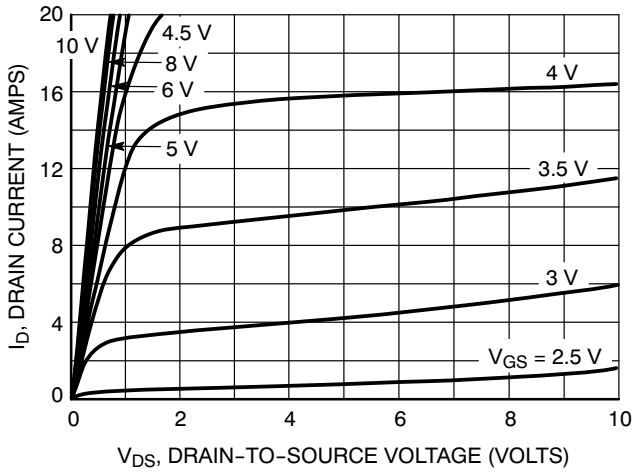


Figure 1. On-Region Characteristics

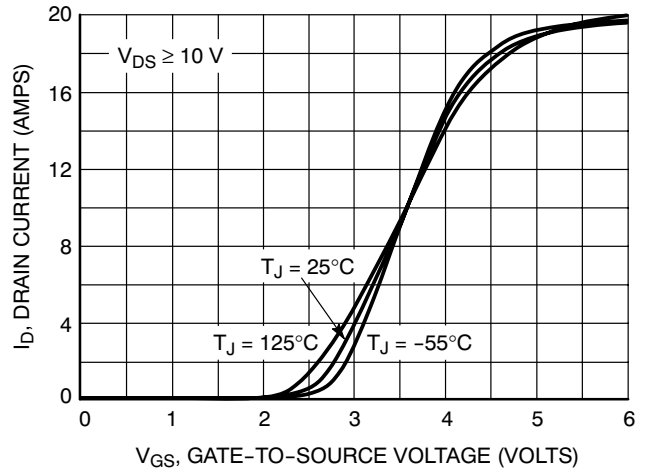


Figure 2. Transfer Characteristics

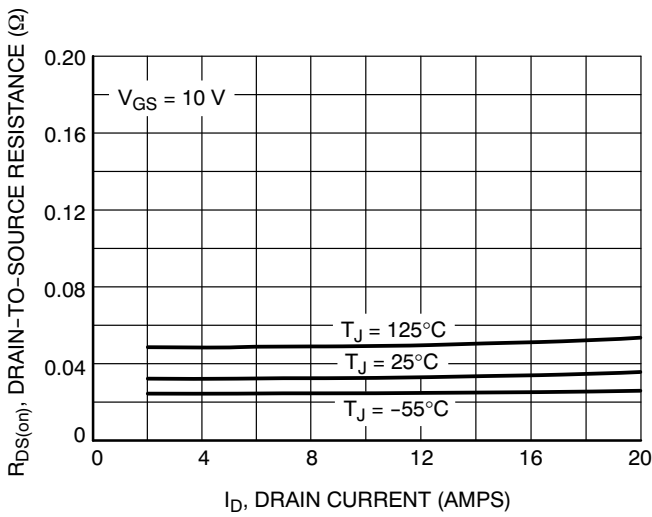


Figure 3. On-Resistance versus Drain Current and Temperature

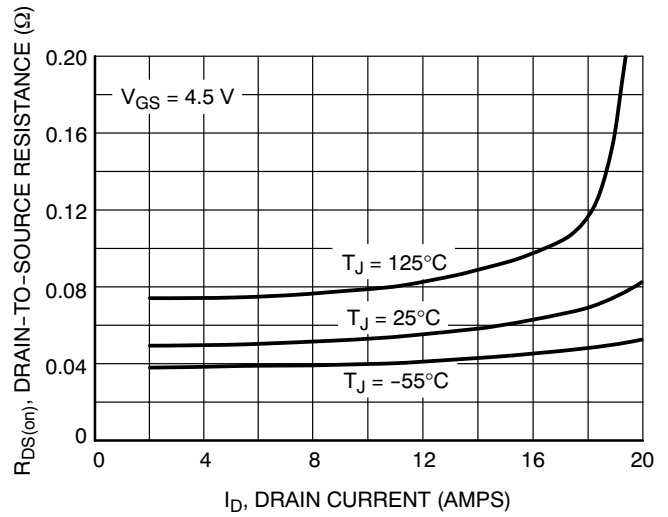


Figure 4. On-Resistance versus Drain Current and Temperature

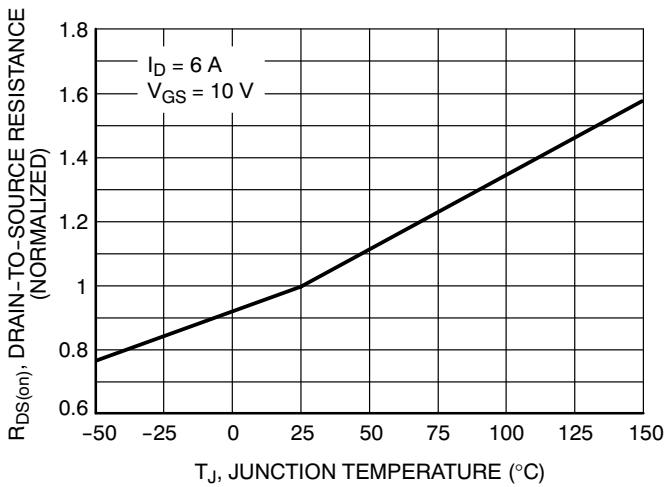


Figure 5. On-Resistance Variation with Temperature

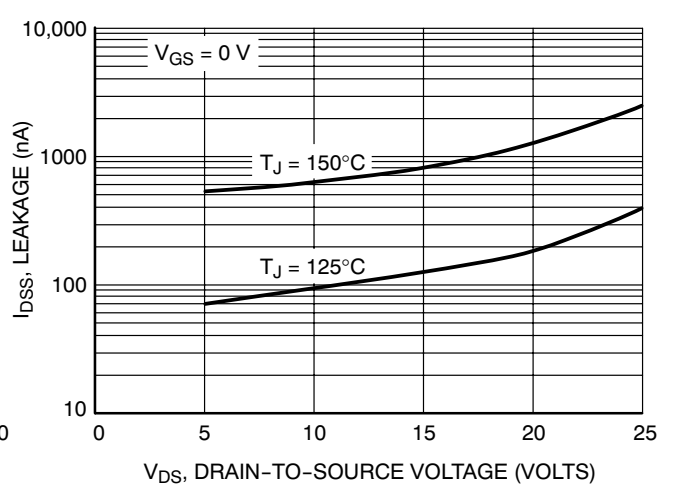


Figure 6. Drain-to-Source Leakage Current versus Voltage

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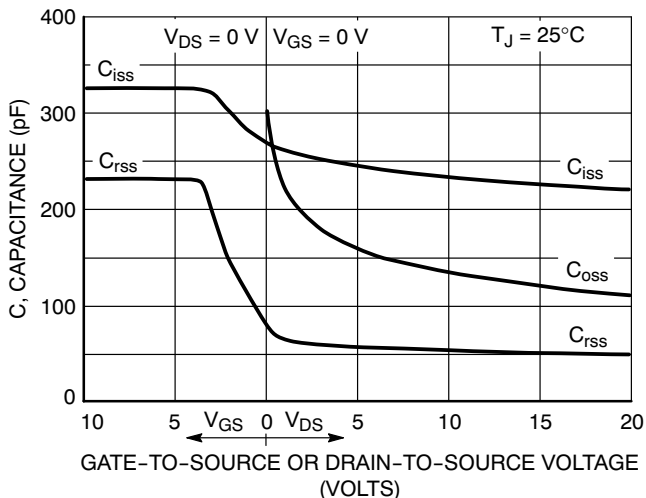


Figure 7. Capacitance Variation

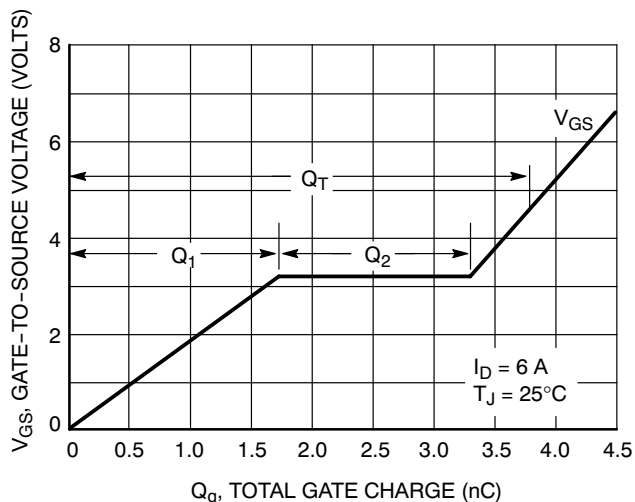


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

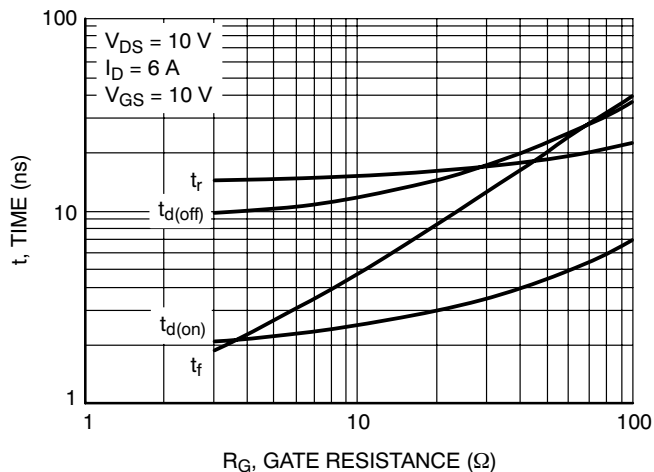


Figure 9. Resistive Switching Time Variation versus Gate Resistance

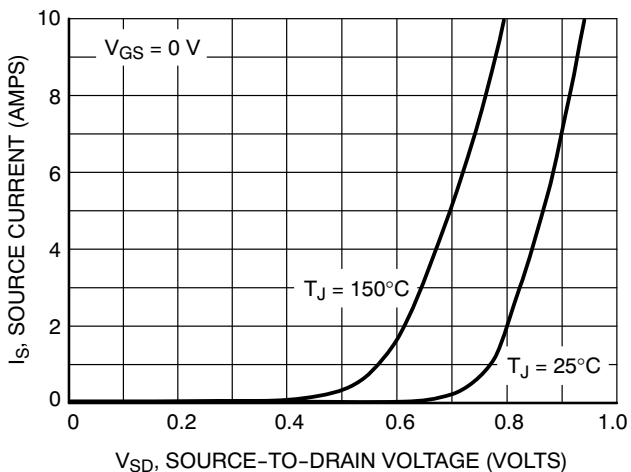
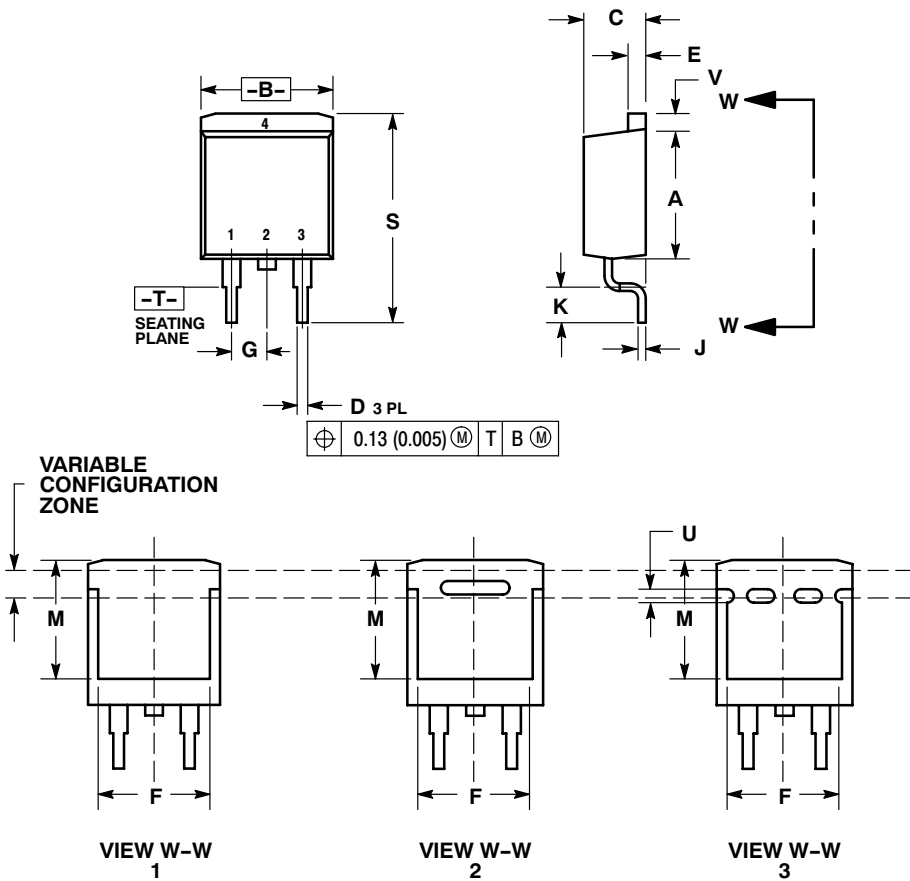


Figure 10. Diode Forward Voltage versus Current

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PACKAGE DIMENSIONS

D²PAK
CASE 418AA-01
ISSUE O

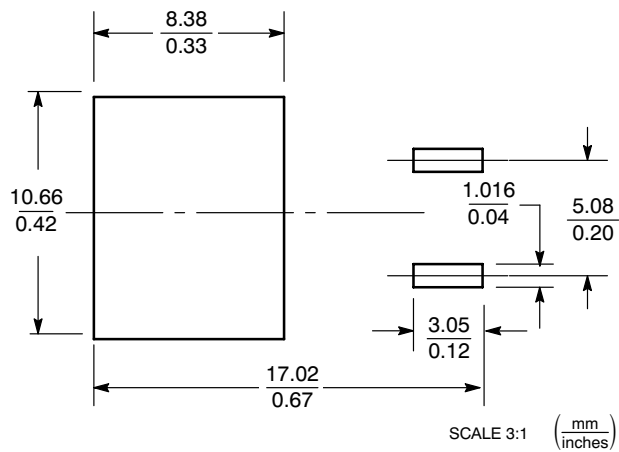


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.340 | 0.380 | 8.64 | 9.65 |
| B | 0.380 | 0.405 | 9.65 | 10.29 |
| C | 0.160 | 0.190 | 4.06 | 4.83 |
| D | 0.020 | 0.036 | 0.51 | 0.92 |
| E | 0.045 | 0.055 | 1.14 | 1.40 |
| F | 0.310 | --- | 7.87 | --- |
| G | 0.100 BSC | --- | 2.54 BSC | --- |
| J | 0.018 | 0.025 | 0.46 | 0.64 |
| K | 0.090 | 0.110 | 2.29 | 2.79 |
| M | 0.280 | --- | 7.11 | --- |
| S | 0.575 | 0.625 | 14.60 | 15.88 |
| V | 0.045 | 0.055 | 1.14 | 1.40 |


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

SOLDERING FOOTPRINT*



*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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