

NTK3043N

Power MOSFET

20 V, 285 mA, N-Channel with ESD Protection, SOT-723

Features

- Enables High Density PCB Manufacturing
- 44% Smaller Footprint than SC-89 and 38% Thinner than SC-89
- Low Voltage Drive Makes this Device Ideal for Portable Equipment
- Low Threshold Levels, $V_{GS(TH)} < 1.3$ V
- Low Profile (< 0.5 mm) Allows It to Fit Easily into Extremely Thin Environments such as Portable Electronics
- Operated at Standard Logic Level Gate Drive, Facilitating Future Migration to Lower Levels Using the Same Basic Topology
- These are Pb-Free and Halogen Free Devices

Applications

- Interfacing, Switching
- High Speed Switching
- Cellular Phones, PDAs

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

| Parameter | | Symbol | Value | Unit |
|---|------------------------|--------------------------|------------|--------------------------|
| Drain-to-Source Voltage | | V_{DSS} | 20 | V |
| Gate-to-Source Voltage | | V_{GS} | ± 10 | V |
| Continuous Drain Current (Note 1) | Steady State | $T_A = 25^\circ\text{C}$ | I_D | 255 |
| | | | | $T_A = 85^\circ\text{C}$ |
| | $t \leq 5$ s | $T_A = 25^\circ\text{C}$ | | 285 |
| Power Dissipation (Note 1) | Steady State | $T_A = 25^\circ\text{C}$ | P_D | 440 |
| | | | | $t \leq 5$ s |
| Continuous Drain Current (Note 2) | Steady State | $T_A = 25^\circ\text{C}$ | I_D | 210 |
| | | $T_A = 85^\circ\text{C}$ | | 155 |
| | | $T_A = 25^\circ\text{C}$ | P_D | 310 |
| Power Dissipation (Note 2) | | | | mW |
| Pulsed Drain Current | $t_p = 10 \mu\text{s}$ | I_{DM} | 400 | mA |
| Operating Junction and Storage Temperature | | T_J, T_{STG} | -55 to 150 | $^\circ\text{C}$ |
| Source Current (Body Diode) (Note 2) | | I_S | 286 | mA |
| 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.

1. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces)
2. Surface-mounted on FR4 board using the minimum recommended pad size.

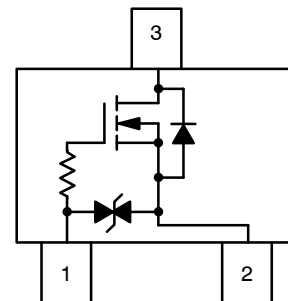


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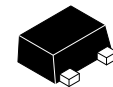
| $V_{(BR)DSS}$ | $R_{DS(on)}$ TYP | I_D Max |
|---------------|-----------------------|-----------|
| 20 V | 1.5 Ω @ 4.5 V | 285 mA |
| | 2.4 Ω @ 2.5 V | |
| | 5.1 Ω @ 1.8 V | |
| | 6.8 Ω @ 1.65 V | |

Top View

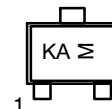


- 1 – Gate
2 – Source
3 – Drain

MARKING DIAGRAM



SOT-723
CASE 631AA
STYLE 5



KA = Device Code
M = Date Code

ORDERING INFORMATION

| Device | Package | Shipping† |
|-------------|----------|--------------------|
| NTK3043NT1G | SOT-723* | 4000 / Tape & Reel |
| NTK3043NT5G | SOT-723* | 8000 / Tape & Reel |

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

*These packages are inherently Pb-Free.

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THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Max | Unit |
|---|-----------------|-----|------|
| Junction-to-Ambient – Steady State (Note 3) | $R_{\theta JA}$ | 280 | °C/W |
| Junction-to-Ambient – $t = 5$ s (Note 3) | $R_{\theta JA}$ | 228 | |
| Junction-to-Ambient – Steady State Minimum Pad (Note 4) | $R_{\theta JA}$ | 400 | |

3. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces)

4. Surface-mounted on FR4 board using the minimum recommended pad size.

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

| Parameter | Test Condition | Symbol | Min | Typ | Max | Unit |
|-----------|----------------|--------|-----|-----|-----|------|
|-----------|----------------|--------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | | |
|---|--|-------------------|---------------------------|----|----|---------|
| Drain-to-Source Breakdown Voltage | $V_{GS} = 0$ V, $I_D = 100$ μ A | $V_{(BR)DSS}$ | 20 | | | V |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $I_D = 100$ μ A, Reference to 25°C | $V_{(BR)DSS}/T_J$ | | 27 | | mV/°C |
| Zero Gate Voltage Drain Current | $V_{GS} = 0$ V, $V_{DS} = 16$ V | I_{DSS} | $T_J = 25^\circ\text{C}$ | | 1 | μ A |
| | | | $T_J = 125^\circ\text{C}$ | | 10 | |
| Gate-to-Source Leakage Current | $V_{DS} = 0$ V, $V_{GS} = \pm 5$ V | I_{GSS} | | | 1 | μ A |

ON CHARACTERISTICS (Note 3)

| | | | | | | |
|--|---|------------------|-----|-------|-----|----------|
| Gate Threshold Voltage | $V_{GS} = V_{DS}$, $I_D = 250$ μ A | $V_{GS(TH)}$ | 0.4 | | 1.3 | V |
| Gate Threshold Temperature Coefficient | | $V_{GS(TH)}/T_J$ | | -2.4 | | mV/°C |
| Drain-to-Source On Resistance | $V_{GS} = 4.5$ V, $I_D = 10$ mA | $R_{DS(ON)}$ | | 1.5 | 3.4 | Ω |
| | $V_{GS} = 4.5$ V, $I_D = 255$ mA | | | 1.6 | 3.8 | |
| | $V_{GS} = 2.5$ V, $I_D = 1$ mA | | | 2.4 | 4.5 | |
| | $V_{GS} = 1.8$ V, $I_D = 1$ mA | | | 5.1 | 10 | |
| | $V_{GS} = 1.65$ V, $I_D = 1$ mA | | | 6.8 | 15 | |
| Forward Transconductance | $V_{DS} = 5$ V, $I_D = 100$ mA | g_{FS} | | 0.275 | | S |

CHARGES, CAPACITANCES AND GATE RESISTANCE

| | | | | | | |
|------------------------------|--|-----------|--|-----|--|----|
| Input Capacitance | $V_{GS} = 0$ V, $f = 1$ MHz, $V_{DS} = 10$ V | C_{ISS} | | 11 | | pF |
| Output Capacitance | | C_{OSS} | | 8.3 | | |
| Reverse Transfer Capacitance | | C_{RSS} | | 2.7 | | |

SWITCHING CHARACTERISTICS, $V_{GS} = 4.5$ V (Note 4)

| | | | | | | |
|---------------------|--|--------------|--|----|--|----|
| Turn-On Delay Time | $V_{GS} = 4.5$ V, $V_{DD} = 5$ V, $I_D = 10$ mA, $R_G = 6$ Ω | $t_{d(ON)}$ | | 13 | | ns |
| Rise Time | | t_r | | 15 | | |
| Turn-Off Delay Time | | $t_{d(OFF)}$ | | 94 | | |
| Fall Time | | t_f | | 55 | | |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | | |
|-------------------------|---|---------------------------|----------|-----|------|-----|----|
| Forward Diode Voltage | $V_{GS} = 0$ V, $I_S = 286$ mA | $T_J = 25^\circ\text{C}$ | V_{SD} | | 0.83 | 1.2 | V |
| | | $T_J = 125^\circ\text{C}$ | | | 0.69 | | |
| Reverse Recovery Time | $V_{GS} = 0$ V, $V_{DD} = 20$ V, $dI_{SD}/dt = 100$ A/ μ s, $I_S = 286$ mA | t_{RR} | | 9.1 | | ns | |
| Charge Time | | t_a | | 7.1 | | | |
| Discharge Time | | t_b | | 2.0 | | | |
| Reverse Recovery Charge | | Q_{RR} | | 3.7 | | | nC |

5. Pulse Test: pulse width ≤ 300 μ s, duty cycle $\leq 2\%$

6. Switching characteristics are independent of operating junction temperatures

TYPICAL PERFORMANCE CURVES

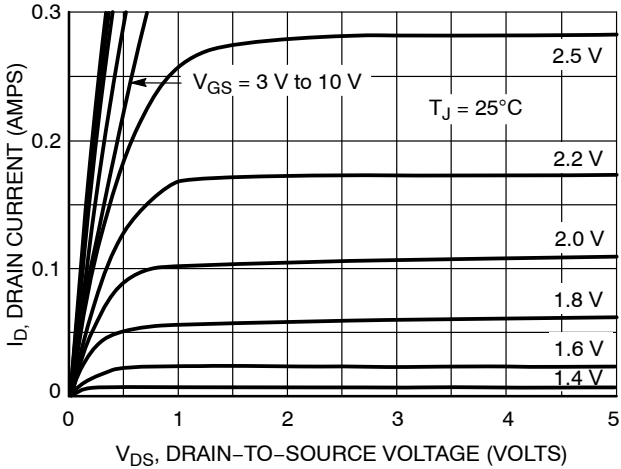


Figure 1. On-Region Characteristics

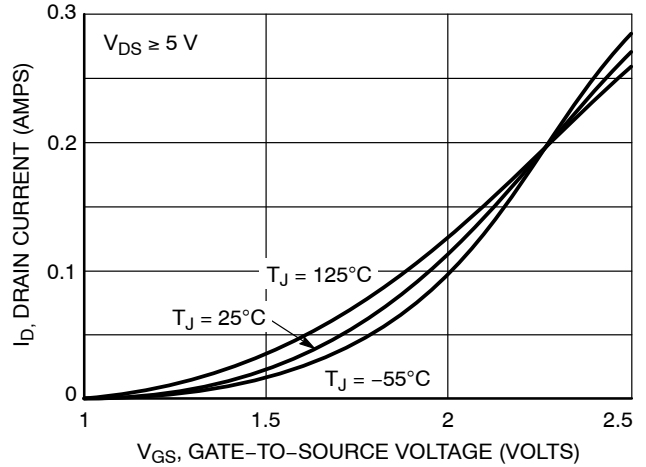


Figure 2. Transfer Characteristics

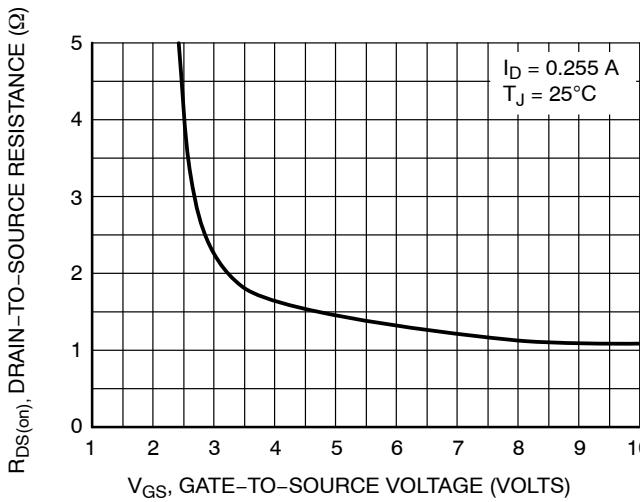


Figure 3. On-Resistance vs. Gate-to-Source Voltage

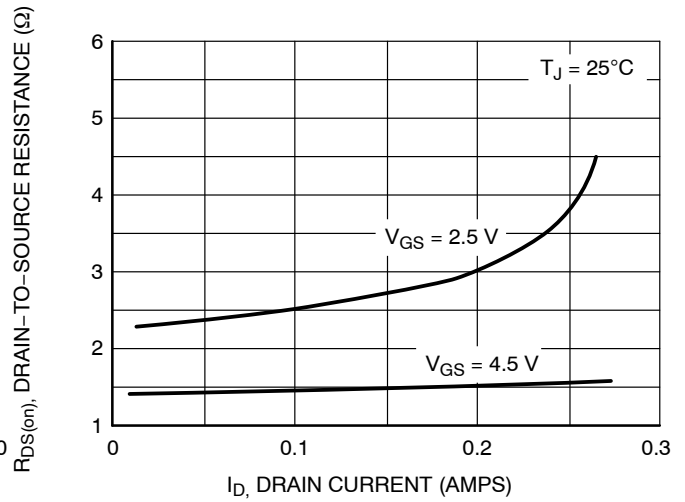


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

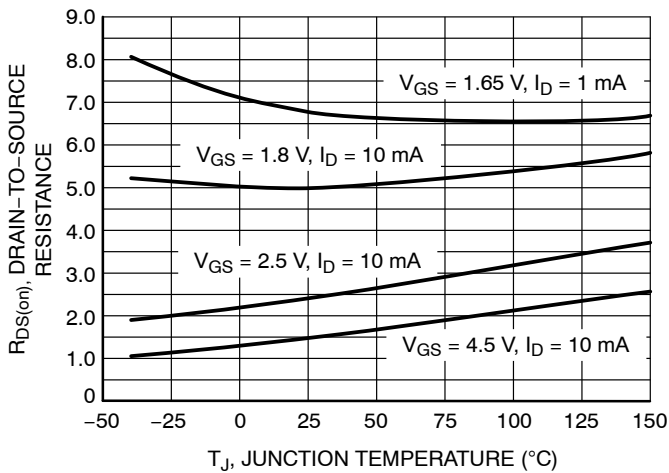


Figure 5. On-Resistance Variation with Temperature

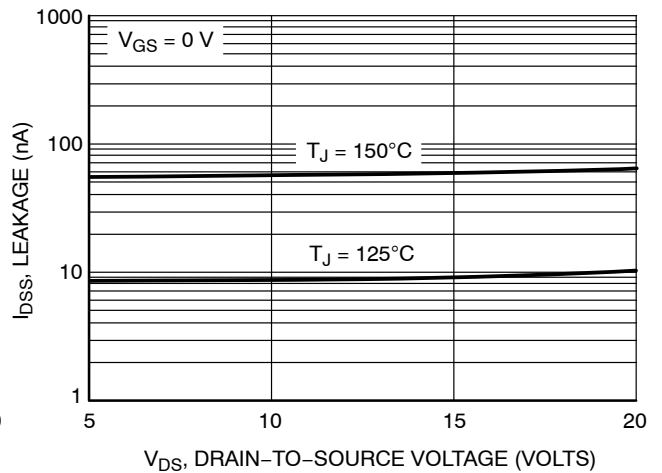


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL PERFORMANCE CURVES

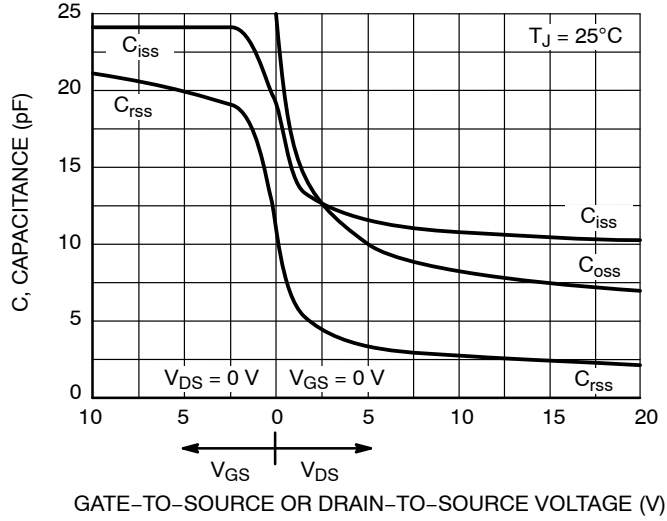


Figure 7. Capacitance Variation

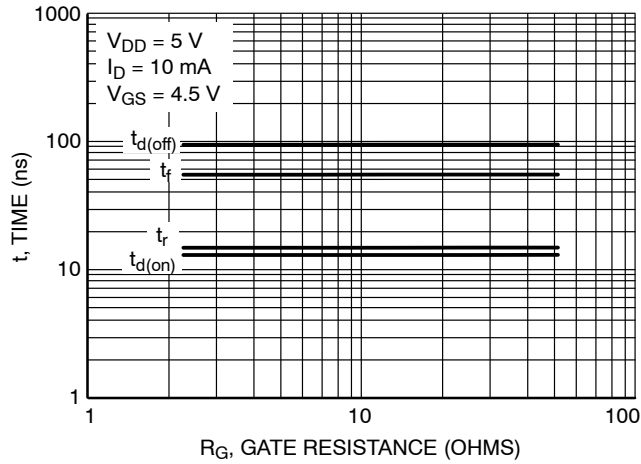


Figure 8. Resistive Switching Time Variation vs. Gate Resistance

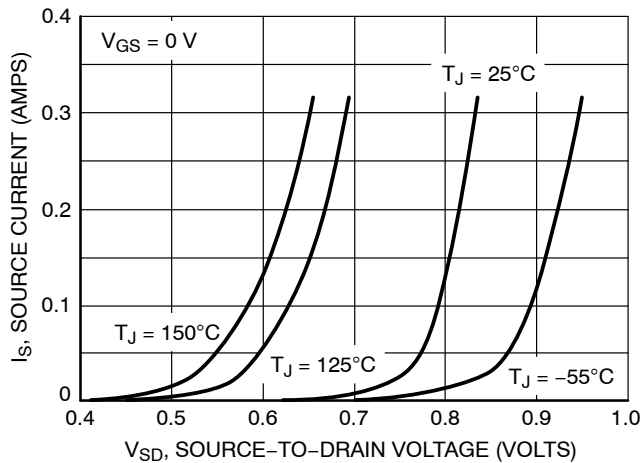
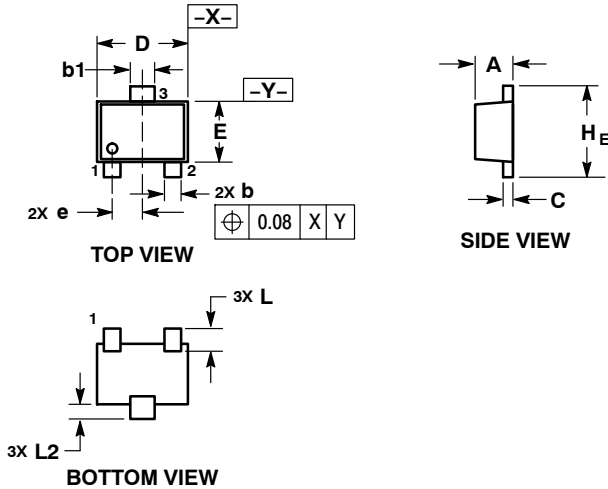


Figure 9. Diode Forward Voltage vs. Current

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PACKAGE DIMENSIONS

SOT-723
CASE 631AA
ISSUE D



NOTES:

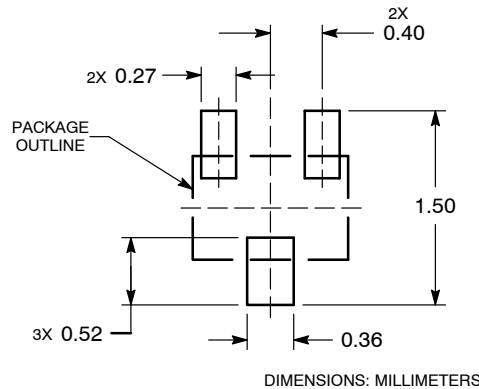
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

| DIM | MILLIMETERS | | |
|----------------|-------------|------|------|
| | MIN | NOM | MAX |
| A | 0.45 | 0.50 | 0.55 |
| b | 0.15 | 0.21 | 0.27 |
| b1 | 0.25 | 0.31 | 0.37 |
| C | 0.07 | 0.12 | 0.17 |
| D | 1.15 | 1.20 | 1.25 |
| E | 0.75 | 0.80 | 0.85 |
| e | 0.40 BSC | | |
| H _E | 1.15 | 1.20 | 1.25 |
| L | 0.29 REF | | |
| L ₂ | 0.15 | 0.20 | 0.25 |

STYLE 5:

1. GATE
2. SOURCE
3. DRAIN

RECOMMENDED 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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