

# 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		$V_{GS}$	$\pm 10$	V	
Continuous Drain Current (Note 1)	Steady State	$I_D$	$T_A = 25^\circ\text{C}$	255	mA
			$T_A = 85^\circ\text{C}$	185	
	$t \leq 5$ s	$T_A = 25^\circ\text{C}$	285		
Power Dissipation (Note 1)	Steady State	$P_D$	$T_A = 25^\circ\text{C}$	440	mW
				$t \leq 5$ s	
Continuous Drain Current (Note 2)	Steady State	$I_D$	$T_A = 25^\circ\text{C}$	210	mA
			$T_A = 85^\circ\text{C}$	155	
			$T_A = 25^\circ\text{C}$	310	
Power Dissipation (Note 2)		$P_D$			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.

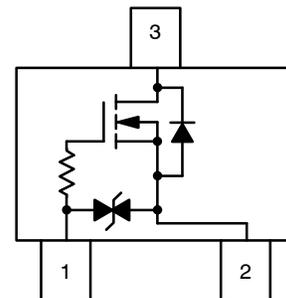


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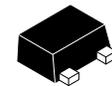
$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	$I_D$ Max
20 V	1.5 $\Omega$ @ 4.5 V	285 mA
	2.4 $\Omega$ @ 2.5 V	
	5.1 $\Omega$ @ 1.8 V	
	6.8 $\Omega$ @ 1.65 V	

Top View

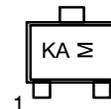


- 1 – Gate
- 2 – Source
- 3 – Drain

### 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.

# NTK3043N

## 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
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{GS} = 0$ V, $I_D = 100$ $\mu$ A	$V_{(BR)DSS}$	20			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$I_D = 100$ $\mu$ A, Reference to $25^\circ\text{C}$	$V_{(BR)DSS}/T_J$		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	$\mu$ 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	$\mu$ A

### ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250$ $\mu$ 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	$\Omega$
	$V_{GS} = 4.5$ 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, $R_G = 6$ $\Omega$	$t_{d(ON)}$		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/ $\mu$ 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  $\leq 300$   $\mu$ s, duty cycle  $\leq 2\%$

6. Switching characteristics are independent of operating junction temperatures

TYPICAL PERFORMANCE CURVES

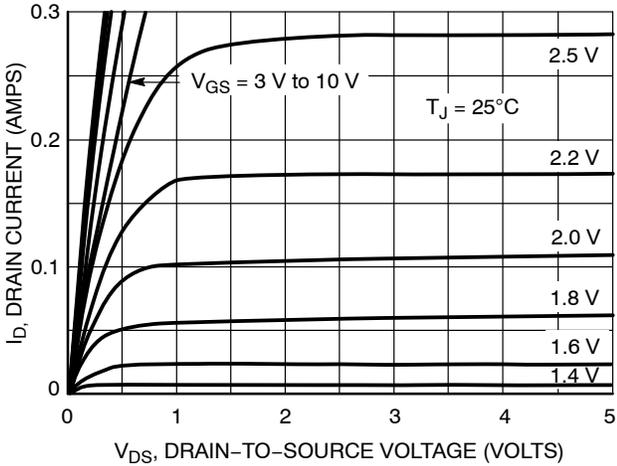


Figure 1. On-Region Characteristics

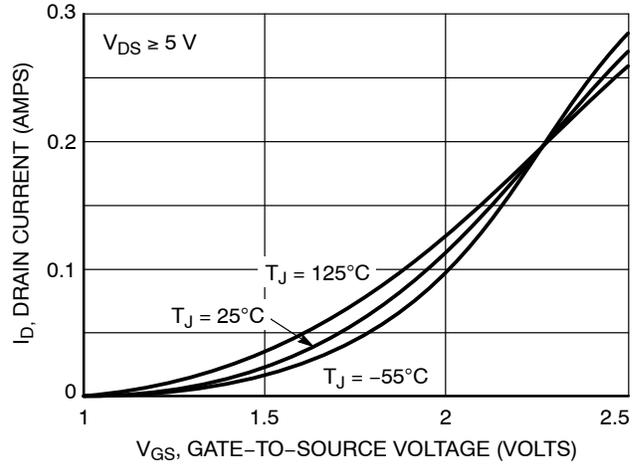


Figure 2. Transfer Characteristics

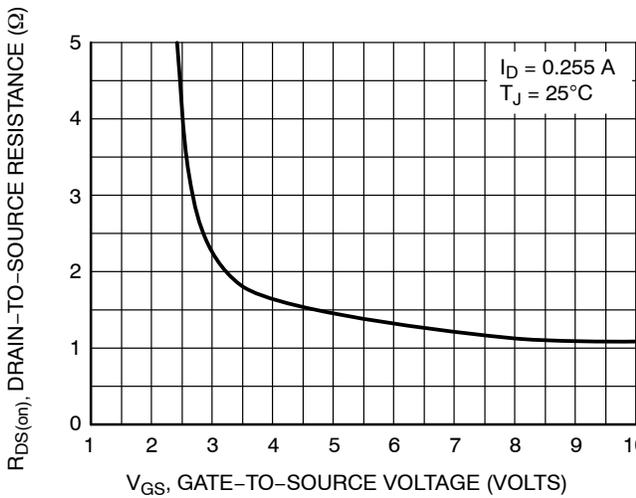


Figure 3. On-Resistance vs. Gate-to-Source Voltage

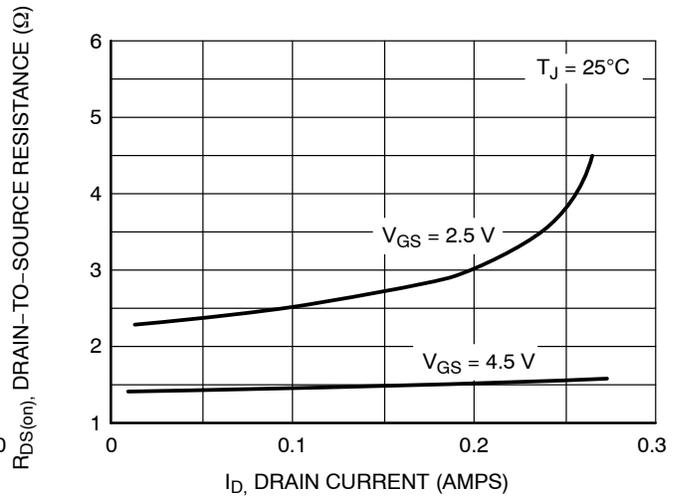


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

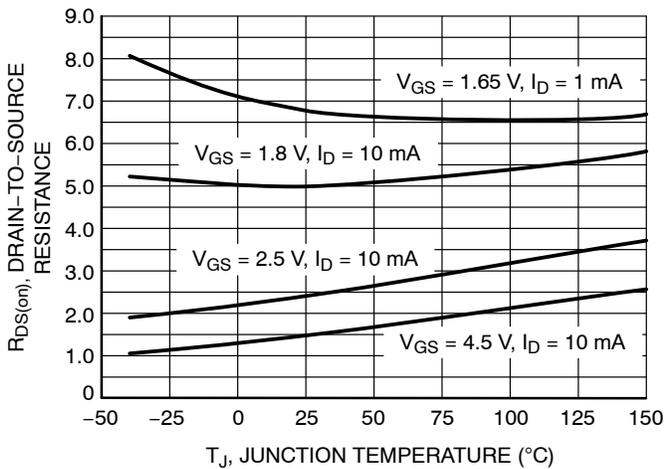


Figure 5. On-Resistance Variation with Temperature

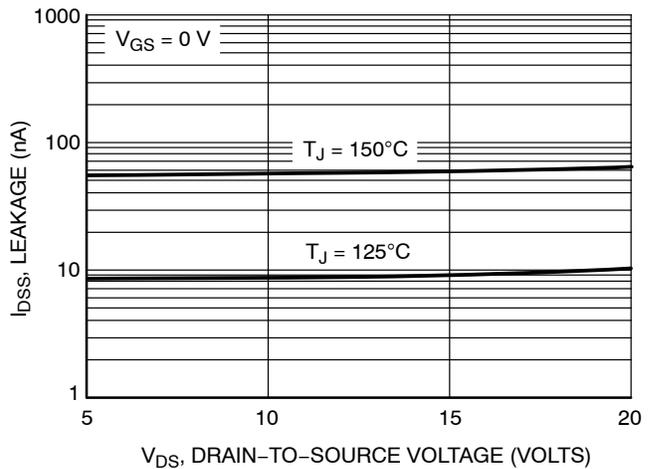
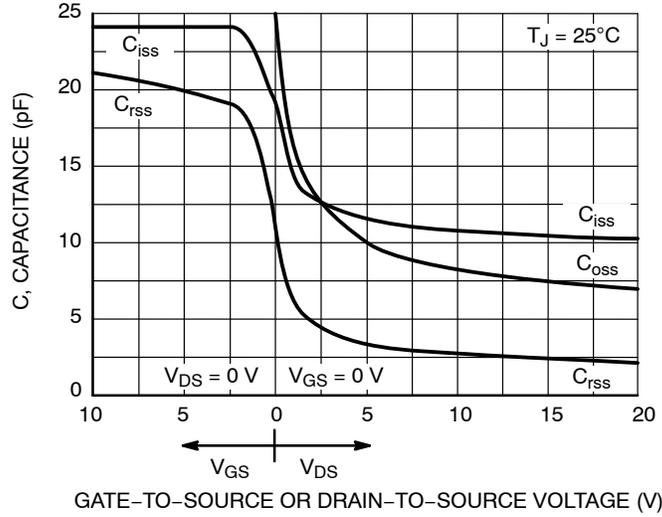


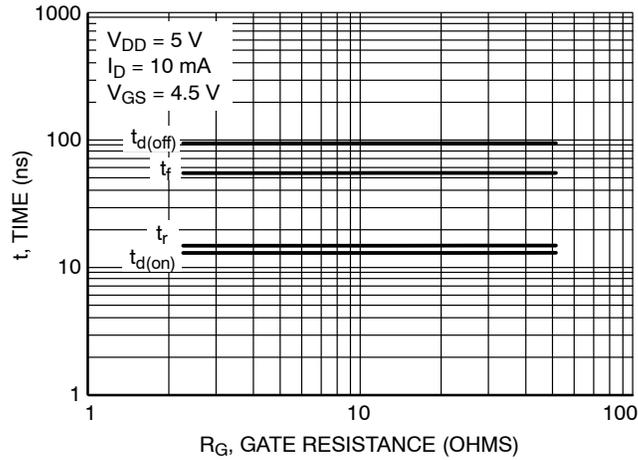
Figure 6. Drain-to-Source Leakage Current vs. Voltage

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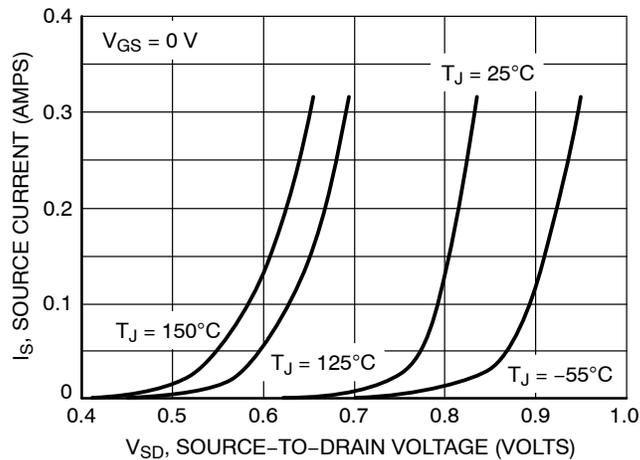
## TYPICAL PERFORMANCE CURVES



**Figure 7. Capacitance Variation**



**Figure 8. Resistive Switching Time Variation vs. Gate Resistance**

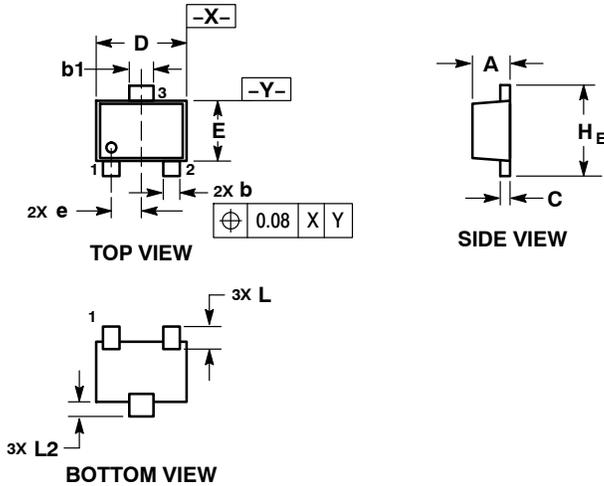


**Figure 9. Diode Forward Voltage vs. Current**

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## PACKAGE DIMENSIONS

**SOT-723**  
CASE 631AA  
ISSUE D



**NOTES:**

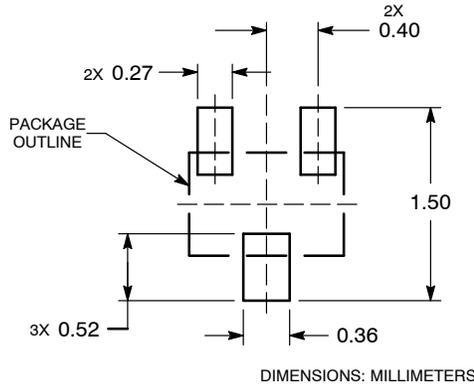
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

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 <sub>E</sub>	1.15	1.20	1.25
L	0.29 REF		
L2	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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