

# MOSFET – Single P-Channel, Small Signal, XDFN3, 0.62 x 0.42 x 0.4 mm



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## NTNS2K1P021Z -20 V, -127 mA

### Features

- Low Profile Ultra Small Package, XDFN3 (0.62 x 0.42 x 0.4 mm) for Extremely Space-Constrained Applications
- -1.5 V Gate Drive
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Applications

- Small Signal Load Switch
- High Speed Interfacing
- Level Shift

### MAXIMUM RATINGS (T<sub>J</sub> = 25°C unless otherwise stated)

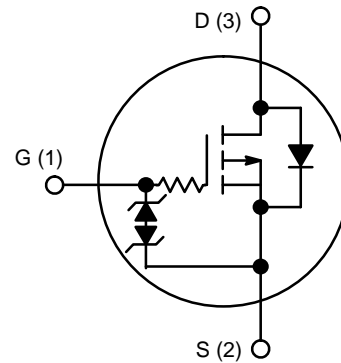
Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V <sub>DSS</sub>	20	V
Gate-to-Source Voltage			V <sub>GS</sub>	±8	V
Continuous Drain Current (Note 1)	Steady State	T <sub>A</sub> = 25°C	I <sub>D</sub>	-127	mA
		T <sub>A</sub> = 85°C		-91	
	t ≤ 5 s	T <sub>A</sub> = 25°C		-146	
Power Dissipation (Note 1)	Steady State	T <sub>A</sub> = 25°C	P <sub>D</sub>	125	mW
	t ≤ 5 s			166	
Pulsed Drain Current	t <sub>p</sub> = 10 μs		I <sub>DM</sub>	-488	mA
Operating Junction and Storage Temperature Range			T <sub>J</sub> , T <sub>STG</sub>	-55 to 150	°C
Source Current (Body Diode) (Note 2)			I <sub>S</sub>	200	mA
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T <sub>L</sub>	260	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Surface-mounted on FR4 board using the minimum recommended pad size, or 2 mm<sup>2</sup>, 1 oz Cu.
2. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%

V <sub>(BR)DSS</sub>	R <sub>DS(on)</sub> MAX	I <sub>D</sub> Max
-20 V	5.0 Ω @ -4.5 V	-127 mA
	5.5 Ω @ -3.3 V	
	6.0 Ω @ -2.5 V	
	7.0 Ω @ -1.8 V	
	10 Ω @ -1.5 V	

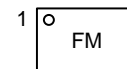
### P-CHANNEL MOSFET



### MARKING DIAGRAM



XDFN3  
CASE 711BH



F = Specific Device Code  
M = Date Code

### ORDERING INFORMATION

Device	Package	Shipping†
NTNS2K1P021ZTCG	XDFN3 (Pb-Free)	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.

# NTNS2K1P021Z

## THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	998	°C/W
Junction-to-Ambient – $t \leq 5$ s (Note 3)	$R_{\theta JA}$	751	

3. Surface-mounted on FR4 board using the minimum recommended pad size, or 2 mm<sup>2</sup>, 1 oz Cu.

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise stated)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0$ V, $I_D = -250$ $\mu$ A	-20			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0$ V, $V_{DS} = -5$ V, $T_J = 25^\circ$ C			-50	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0$ V, $V_{DS} = -16$ V, $T_J = 25^\circ$ C			-100	nA
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0$ V, $V_{GS} = \pm 5$ V			$\pm 100$	nA

### ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}$ , $I_D = -250$ $\mu$ A	-0.4		-1.0	V
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = -4.5$ V, $I_D = -100$ mA		2.1	5.0	$\Omega$
		$V_{GS} = -3.3$ V, $I_D = -100$ mA		2.4	5.5	
		$V_{GS} = -2.5$ V, $I_D = -50$ mA		2.7	6.0	
		$V_{GS} = -1.8$ V, $I_D = -20$ mA		3.6	7.0	
		$V_{GS} = -1.5$ V, $I_D = -10$ mA		4.2	10	
Forward Transconductance	$g_{FS}$	$V_{DS} = -5$ V, $I_D = -125$ mA		0.35		S
Source-Drain Diode Voltage	$V_{SD}$	$V_{GS} = 0$ V, $I_S = -10$ mA		-0.6	-1.0	V

### CHARGES & CAPACITANCES

Input Capacitance	$C_{ISS}$	$V_{GS} = 0$ V, freq = 1 MHz, $V_{DS} = -15$ V		12.8		pF
Output Capacitance	$C_{OSS}$			2.8		
Reverse Transfer Capacitance	$C_{RSS}$			2.0		

### SWITCHING CHARACTERISTICS, V<sub>GS</sub> = 4.5 V (Note 4)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = -4.5$ V, $V_{DD} = -15$ V, $I_D = 200$ mA, $R_G = 2$ $\Omega$		37		ns
Rise Time	$t_r$			71		
Turn-Off Delay Time	$t_{d(OFF)}$			280		
Fall Time	$t_f$			171		

4. Switching characteristics are independent of operating junction temperatures.

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## TYPICAL CHARACTERISTICS

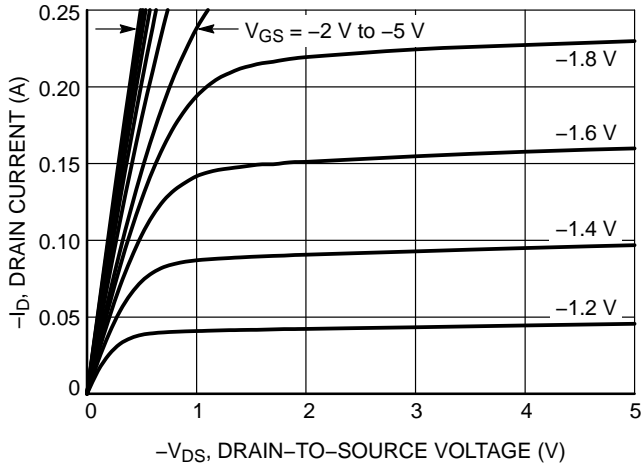


Figure 1. On-Region Characteristics

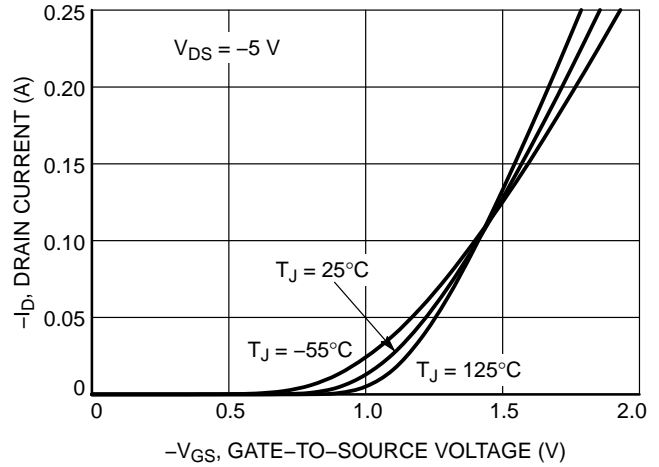


Figure 2. Transfer Characteristics

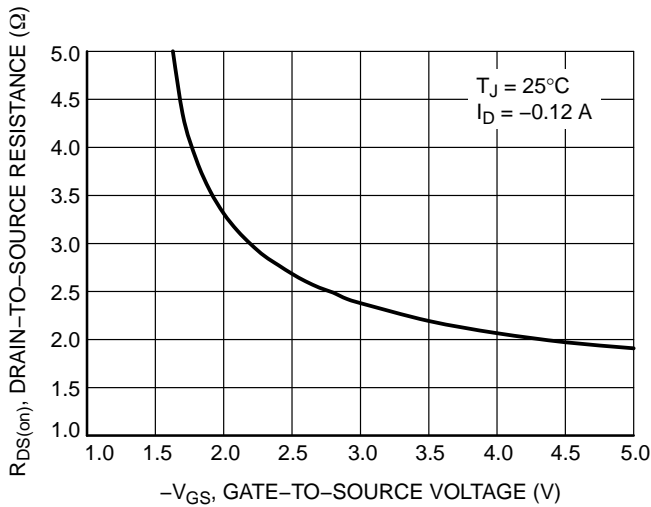


Figure 3. On-Resistance vs. Gate-to-Source Voltage

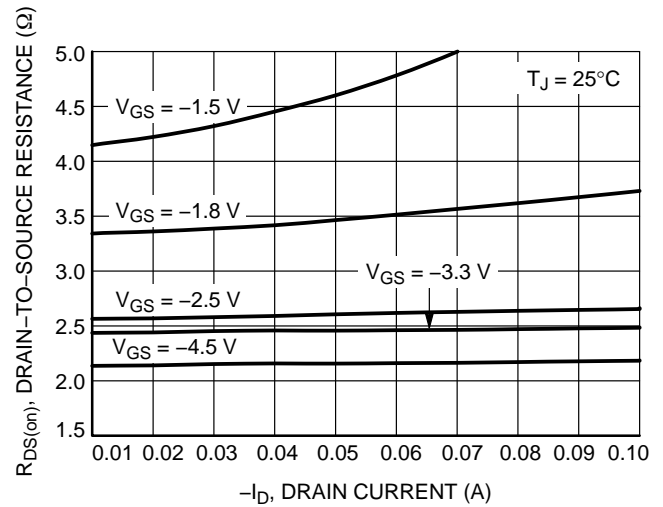


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

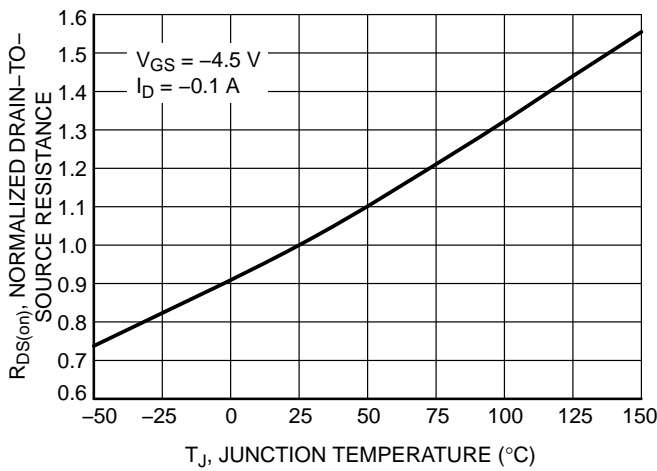


Figure 5. On-Resistance Variation with Temperature

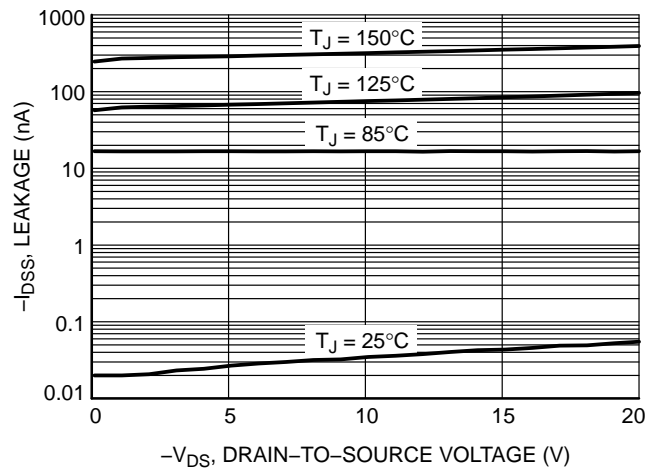


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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## TYPICAL CHARACTERISTICS

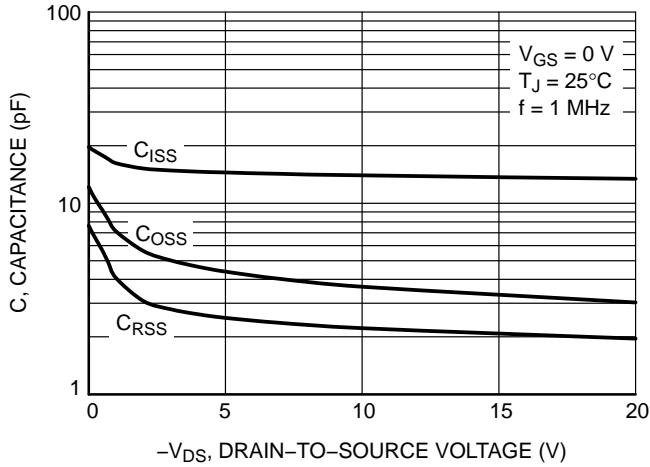


Figure 7. Capacitance Variation

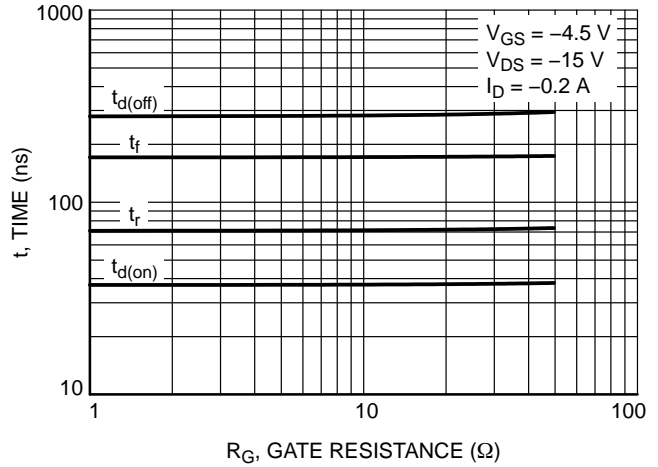


Figure 8. Resistive Switching Time Variation vs. Gate Resistance

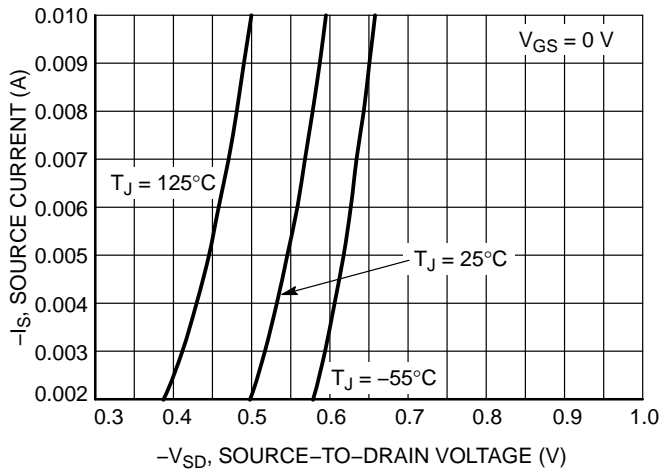


Figure 9. Diode Forward Voltage vs. Current

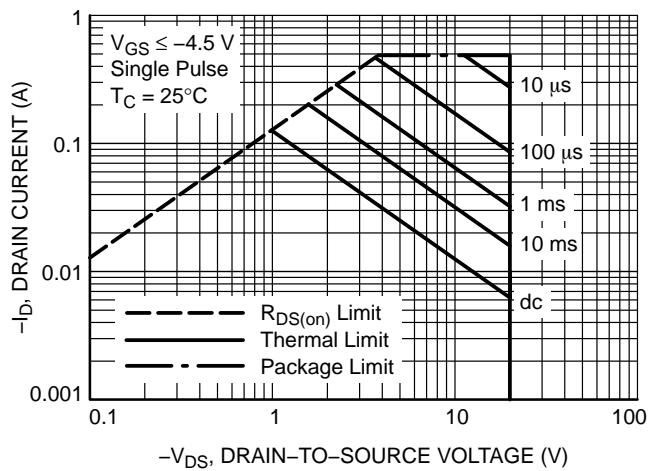


Figure 10. Maximum Rated Forward Biased Safe Operating Area

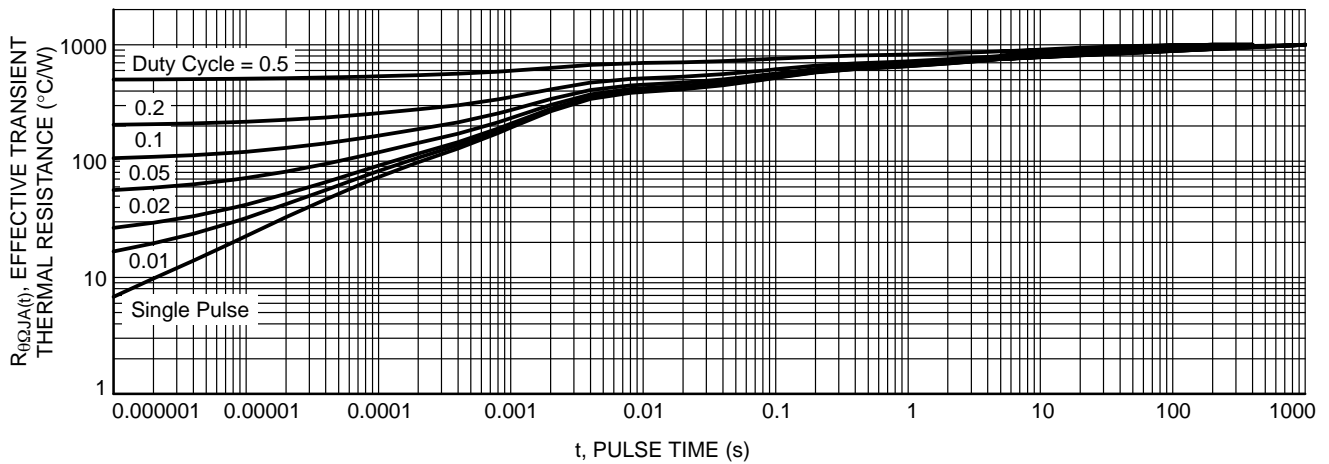
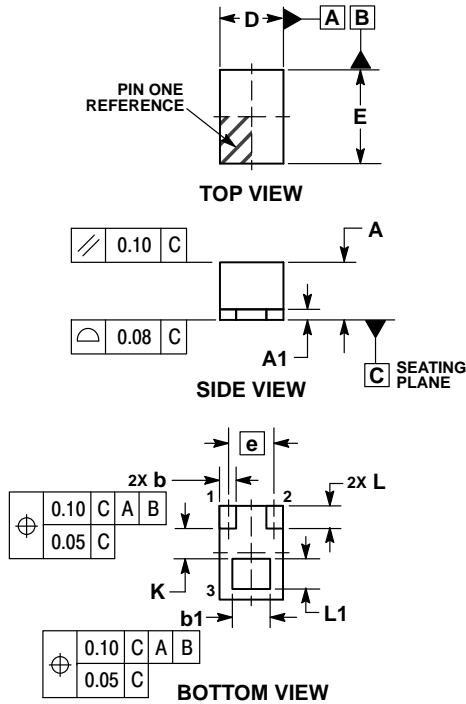


Figure 11. Thermal Response

# NTNS2K1P021Z

## PACKAGE DIMENSIONS

**XDFN3 0.42x0.62, 0.3P**  
**CASE 711BH**  
**ISSUE O**

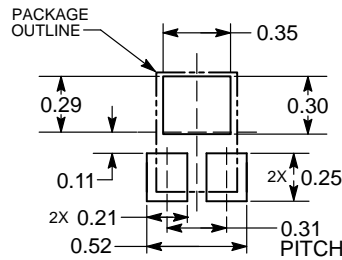


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b AND b1 APPLIES TO THE PLATED TERMINALS AND IS MEASURED BETWEEN 0.20 AND 0.25MM FROM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO THE PLATED TERMINALS.

MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.33	0.38	0.43
A1	---	---	0.07
b	0.05	0.11	0.17
b1	0.20	0.25	0.30
D	0.32	0.42	0.52
E	0.52	0.62	0.72
e	0.30 BSC		
L	0.09	0.15	0.21
L1	0.15	0.20	0.25
K	0.20 REF		

**RECOMMENDED SOLDER FOOTPRINT\***



DIMENSIONS: MILLIMETERS

\*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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