

# NTNS1K5N021Z

## MOSFET – Single, N-Channel, Small Signal, XDFN3, 0.62 x 0.42 x 0.4 mm 20 V, 220 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 ( $T_J = 25^\circ\text{C}$ unless otherwise stated)

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			$V_{DS}$	20	V
Gate-to-Source Voltage			$V_{GS}$	$\pm 8$	V
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$	220	mA
		$T_A = 85^\circ\text{C}$		158	
	$t \leq 5\text{ s}$	$T_A = 25^\circ\text{C}$		253	
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$P_D$	125	mW
	$t \leq 5\text{ s}$			166	
Pulsed Drain Current	$t_p = 10\ \mu\text{s}$		$I_{DM}$	846	mA
Operating Junction and Storage Temperature			$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$
Source Current (Body Diode) (Note 2)			$I_S$	200	mA
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			$T_L$	260	$^\circ\text{C}$

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  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$

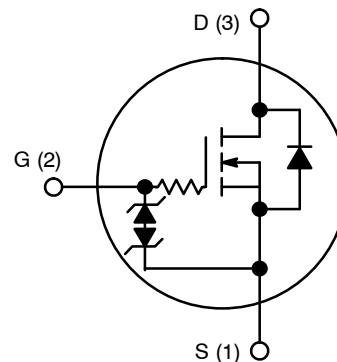


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$V_{(BR)DSS}$	$R_{DS(on)}\text{ MAX}$	$I_D\text{ Max}$
20 V	1.5 $\Omega$ @ 4.5 V	220 mA
	1.8 $\Omega$ @ 3.3 V	
	2.2 $\Omega$ @ 2.5 V	
	3.3 $\Omega$ @ 1.8 V	
	5.0 $\Omega$ @ 1.5 V	

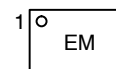
### N-CHANNEL MOSFET



### MARKING DIAGRAM



XDFN3  
CASE 711BH



E = Specific Device Code  
M = Date Code

### ORDERING INFORMATION

Device	Package	Shipping†
NTNS1K5N021ZTCG	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.

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## 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 ( $T_J = 25^\circ\text{C}$ 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, $T_J = 25^\circ\text{C}$			50	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0$ V, $V_{DS} = 16$ V, $T_J = 25^\circ\text{C}$			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		0.8	1.5	$\Omega$
		$V_{GS} = 3.3$ V, $I_D = 100$ mA		1.0	1.8	
		$V_{GS} = 2.5$ V, $I_D = 50$ mA		1.1	2.0	
		$V_{GS} = 1.8$ V, $I_D = 20$ mA		1.4	3.0	
		$V_{GS} = 1.5$ V, $I_D = 10$ mA		1.8	4.5	
Forward Transconductance	$g_{FS}$	$V_{DS} = 5$ V, $I_D = 125$ mA		0.48		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		12.3		pF
Output Capacitance	$C_{OSS}$			3.4		
Reverse Transfer Capacitance	$C_{RSS}$			2.5		

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

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5$ V, $V_{DD} = 15$ V, $I_D = 200$ mA, $R_G = 2$ $\Omega$		16.5		ns
Rise Time	$t_r$			25.5		
Turn-Off Delay Time	$t_{d(OFF)}$			142		
Fall Time	$t_f$			80		

4. Switching characteristics are independent of operating junction temperatures

# NTNS1K5N021Z

## TYPICAL CHARACTERISTICS

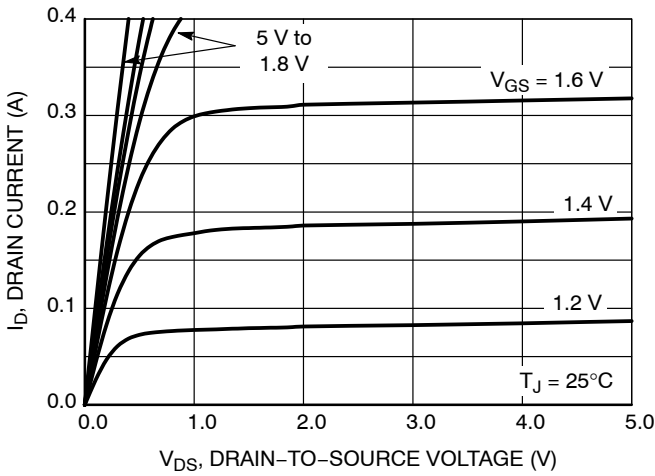


Figure 1. On-Region Characteristics

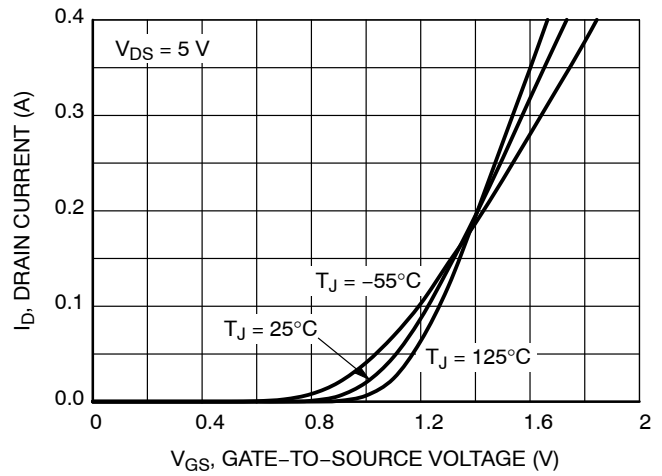


Figure 2. Transfer Characteristics

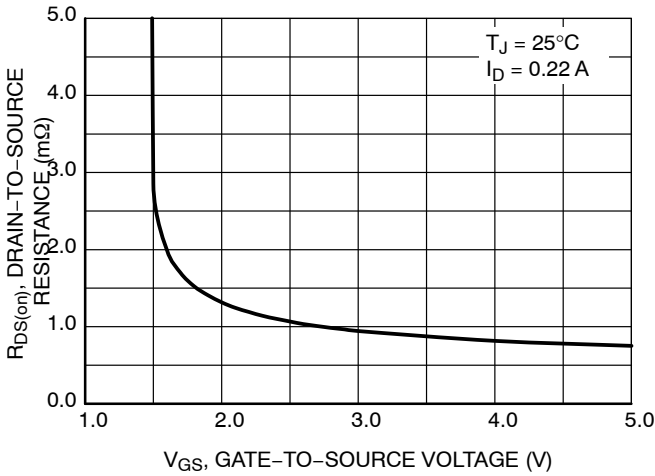


Figure 3. On-Resistance vs. Gate-to-Source Voltage

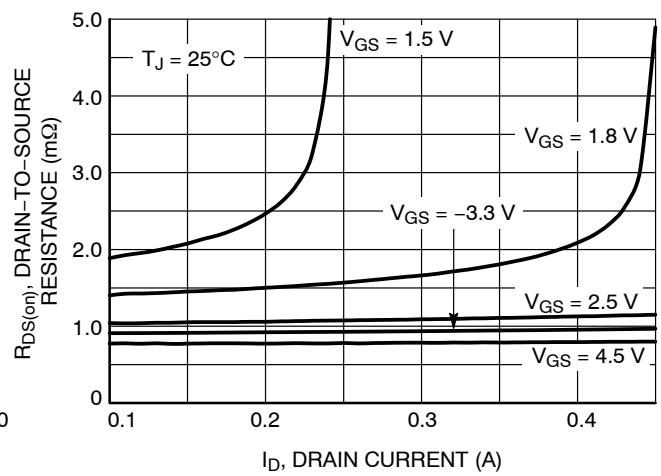


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

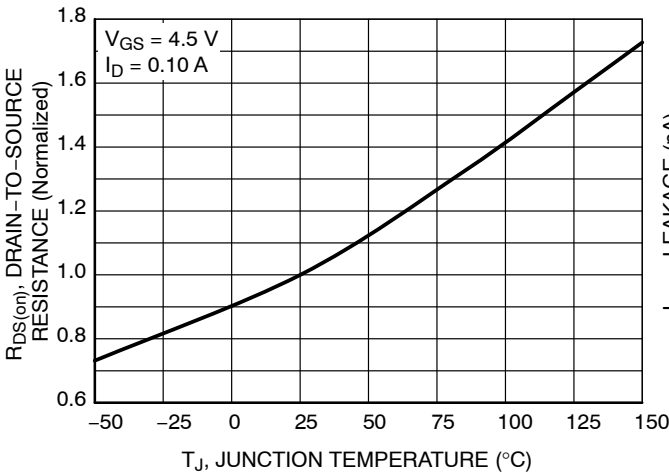


Figure 5. On-Resistance Variation with Temperature

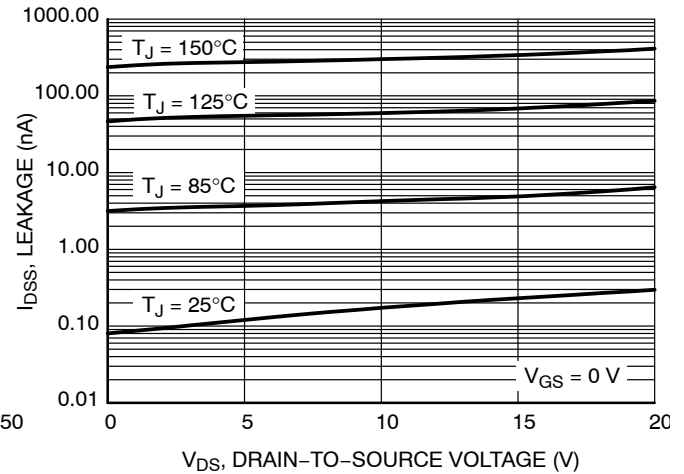


Figure 6. Drain-to-Source Leakage Current vs. Voltage

# NTNS1K5N021Z

## TYPICAL CHARACTERISTICS

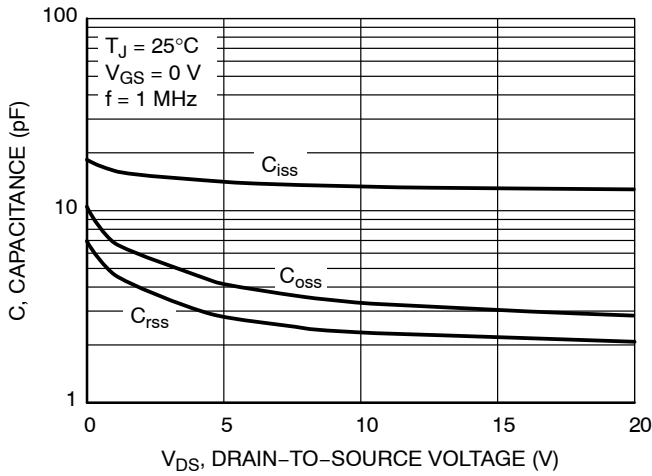


Figure 7. Capacitance Variation

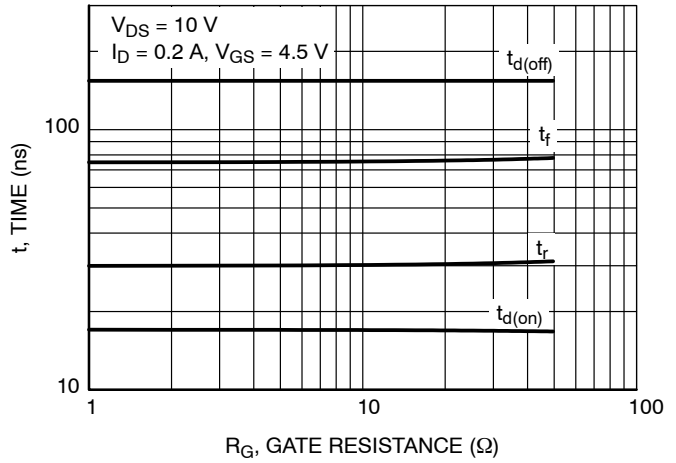


Figure 8. Resistive Switching Time Variation vs. Gate Resistance

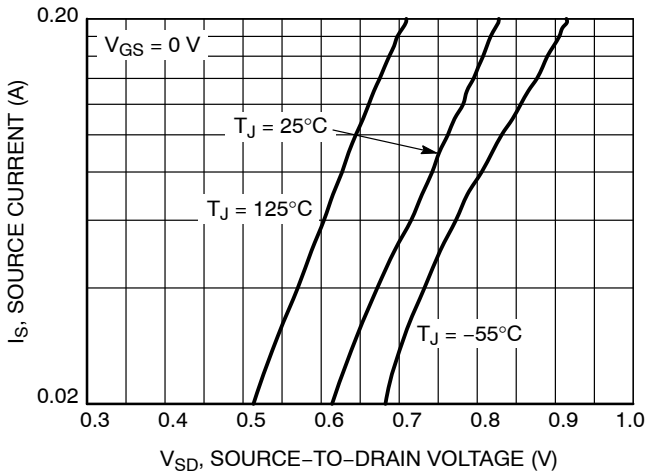


Figure 9. Diode Forward Voltage vs. Current

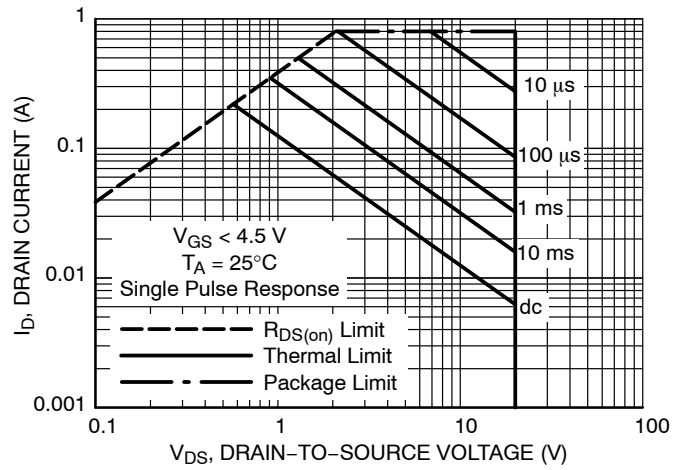


Figure 10. Maximum Rated Forward Biased Safe Operating Area

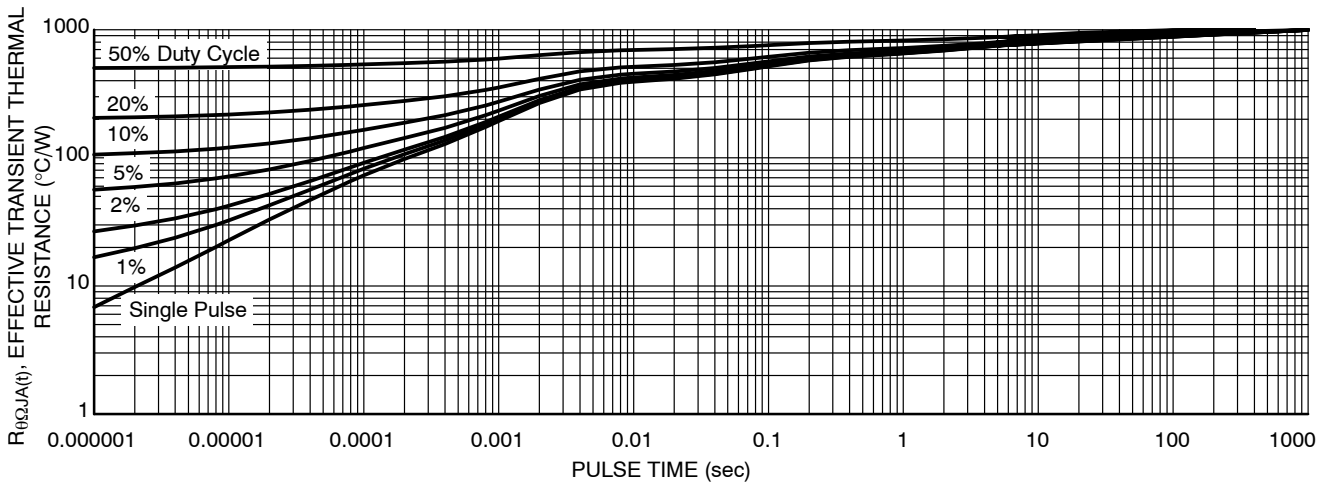
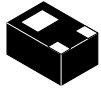


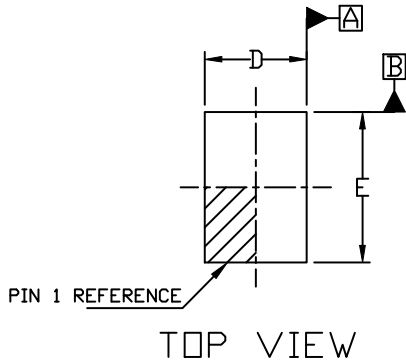
Figure 11. Thermal Response



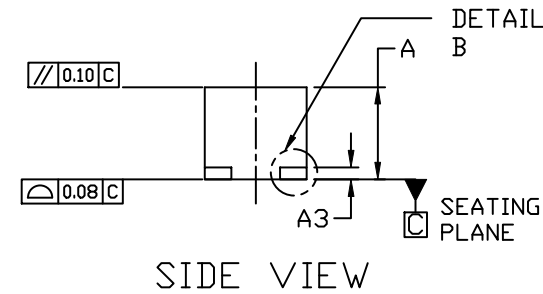
SCALE 8:1

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

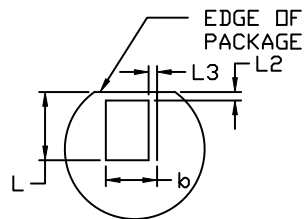
DATE 29 APR 2018



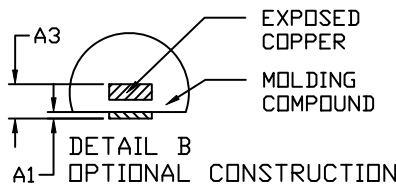
TOP VIEW



SIDE VIEW

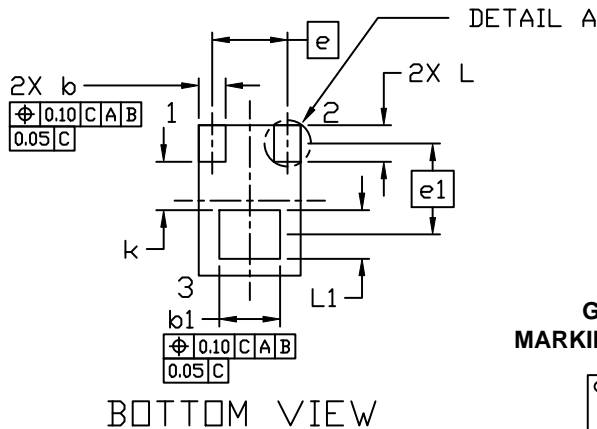


DETAIL A  
OPTIONAL  
CONSTRUCTION



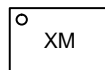
DETAIL B  
OPTIONAL CONSTRUCTION

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.33	0.38	0.43
A1	---	---	0.07
A3	0.13 REF		
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		
e1	0.38 BSC		
L	0.09	0.15	0.21
L1	0.15	0.20	0.25
L2	---	---	0.03
L3	---	---	0.03
k	0.20 REF		



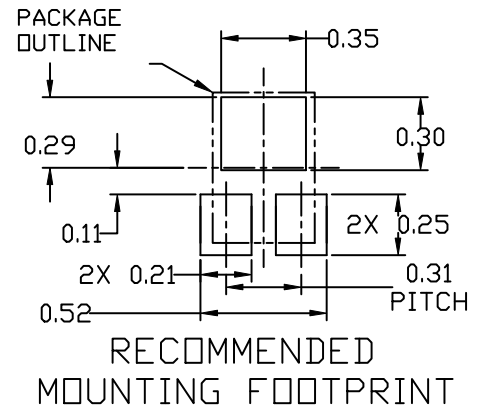
BOTTOM VIEW

**GENERIC MARKING DIAGRAM\***



X = Specific Device Code  
M = Date Code

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G", may or not be present. Some products may not follow the Generic Marking.



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