

NTNS1K5N021Z

Small Signal MOSFET

20 V, 220 mA, Single N-Channel, XDFN3
0.62 x 0.42 x 0.4 mm Package

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°C unless otherwise stated)

Parameter		Symbol	Value	Unit	
Drain-to-Source Voltage		V _{DSS}	20	V	
Gate-to-Source Voltage		V _{GS}	±8	V	
Continuous Drain Current (Note 1)	Steady State	I _D	T _A = 25°C	220	mA
			T _A = 85°C	158	
	t ≤ 5 s	T _A = 25°C	253		
Power Dissipation (Note 1)	Steady State	P _D	T _A = 25°C	125	mW
			t ≤ 5 s	166	
Pulsed Drain Current	t _p = 10 μs	I _{DM}	846	mA	
Operating Junction and Storage Temperature		T _J , T _{STG}	-55 to 150	°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	°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 mm², 1 oz Cu.
2. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%

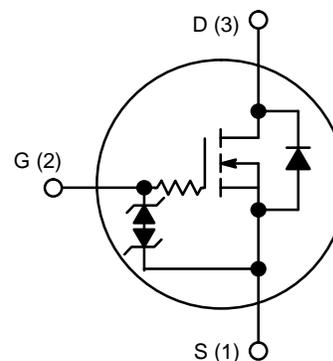


ON Semiconductor®

www.onsemi.com

V _{(BR)DSS}	R _{DS(on)} MAX	I _D Max
20 V	1.5 Ω @ 4.5 V	220 mA
	1.8 Ω @ 3.3 V	
	2.2 Ω @ 2.5 V	
	3.3 Ω @ 1.8 V	
	5.0 Ω @ 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 mm², 1 oz Cu.

ELECTRICAL CHARACTERISTICS (T_J = 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, $I_D = 250$ μ 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			± 100	nA

ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}$, $I_D = 250$ μ 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	Ω
		$V_{GS} = 3.3$ 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, $R_G = 2$ Ω		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

TYPICAL CHARACTERISTICS

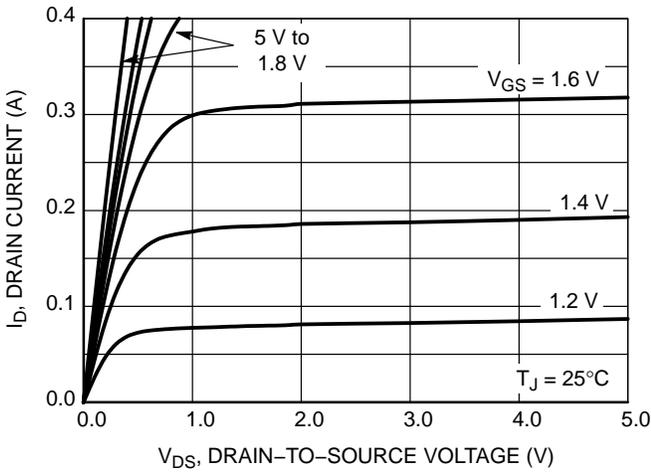


Figure 1. On-Region Characteristics

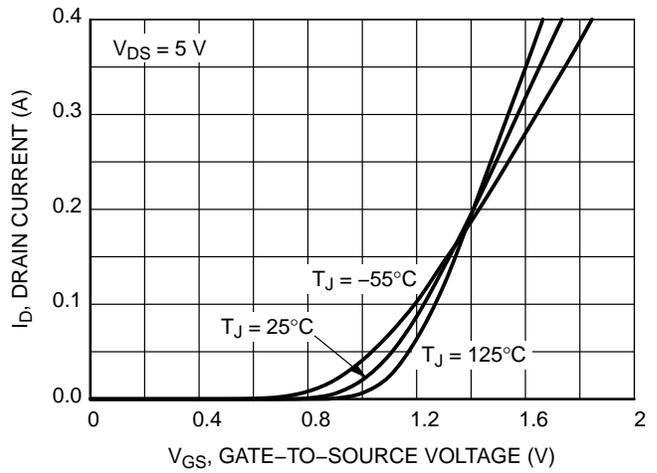


Figure 2. Transfer Characteristics

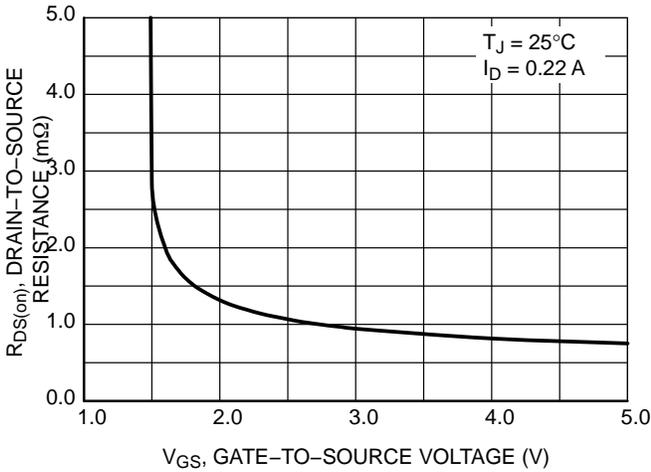


Figure 3. On-Resistance vs. Gate-to-Source Voltage

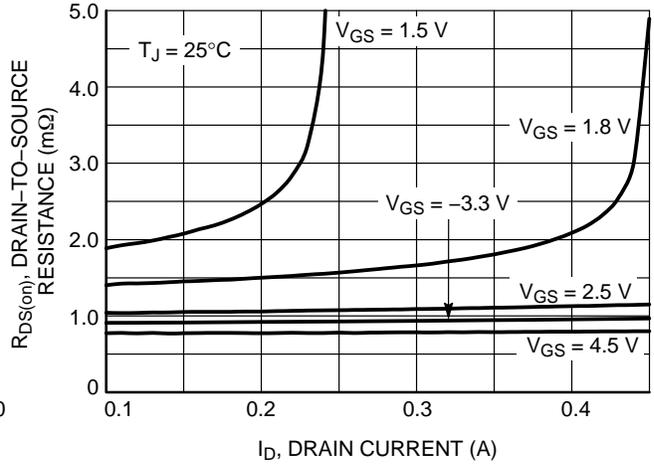


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

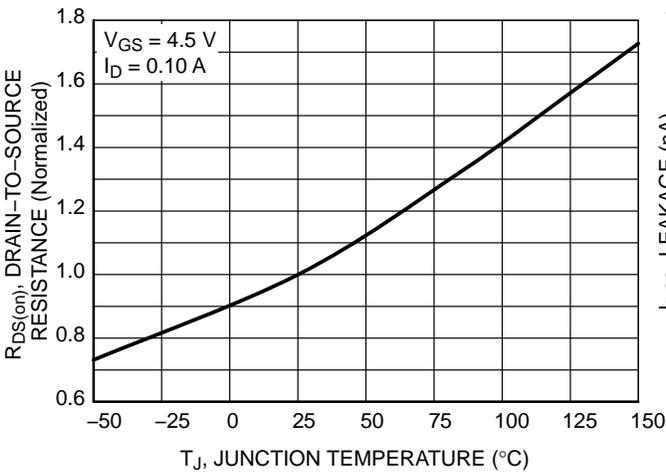


Figure 5. On-Resistance Variation with Temperature

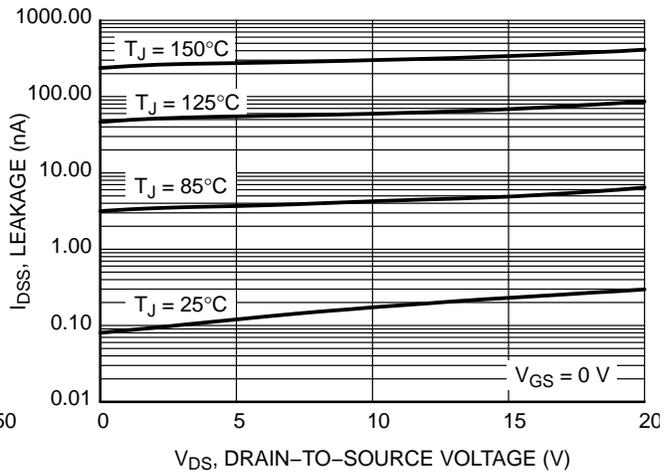


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS

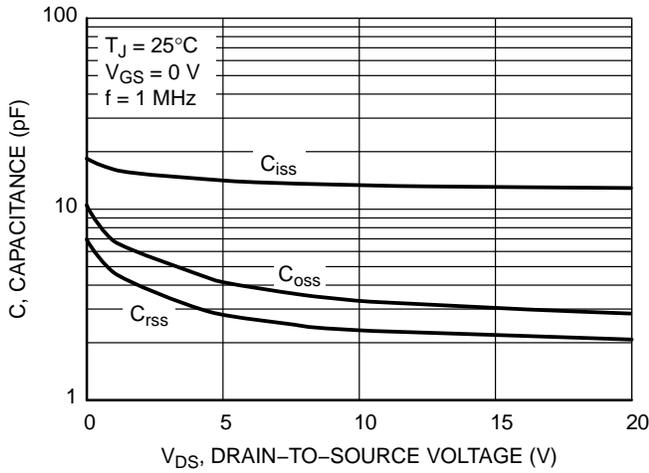


Figure 7. Capacitance Variation

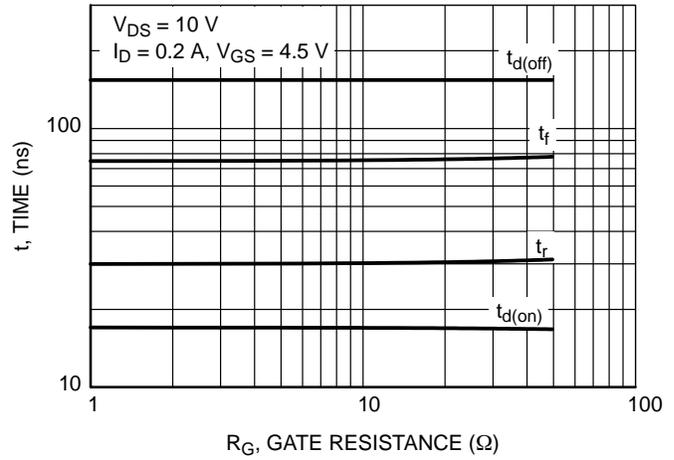


Figure 8. Resistive Switching Time Variation vs. Gate Resistance

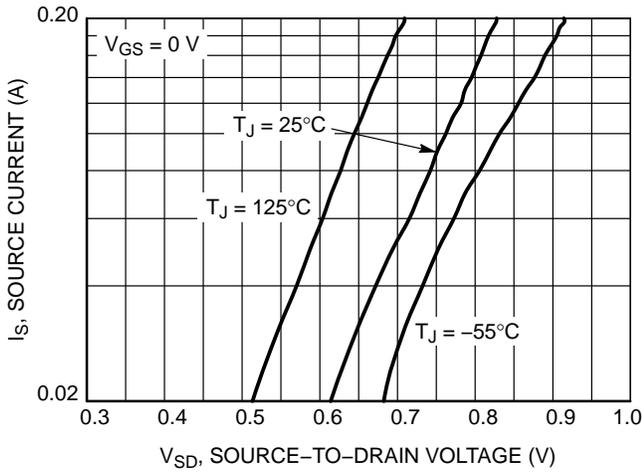


Figure 9. Diode Forward Voltage vs. Current

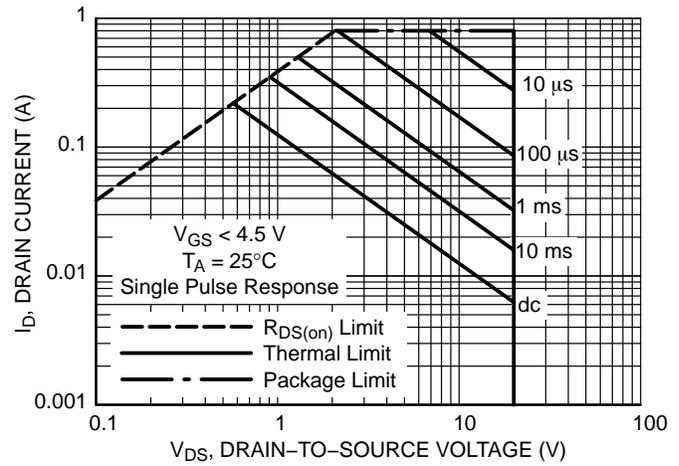


Figure 10. Maximum Rated Forward Biased Safe Operating Area

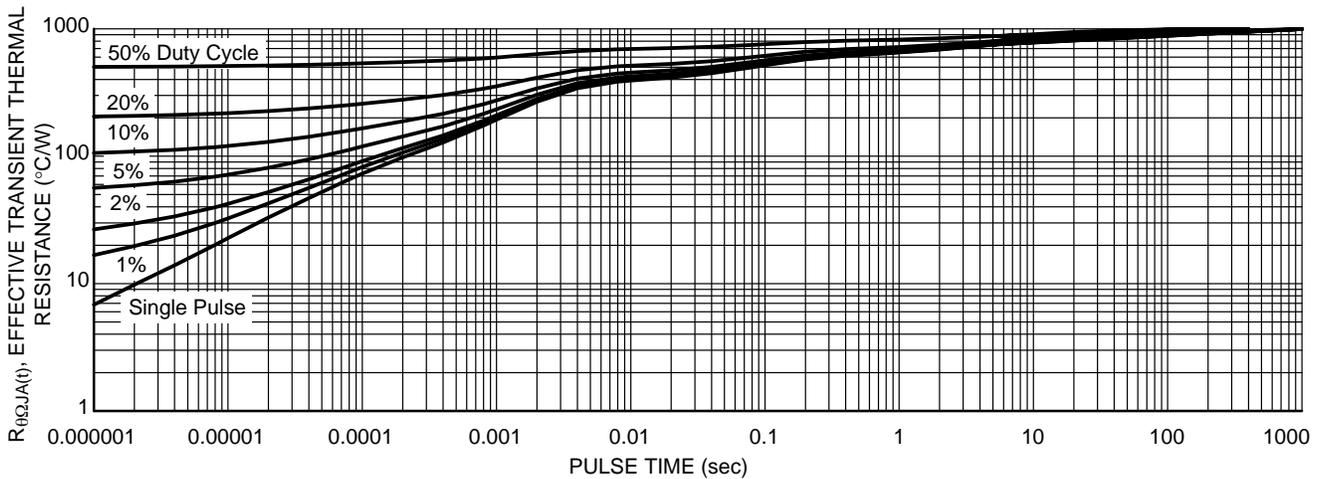
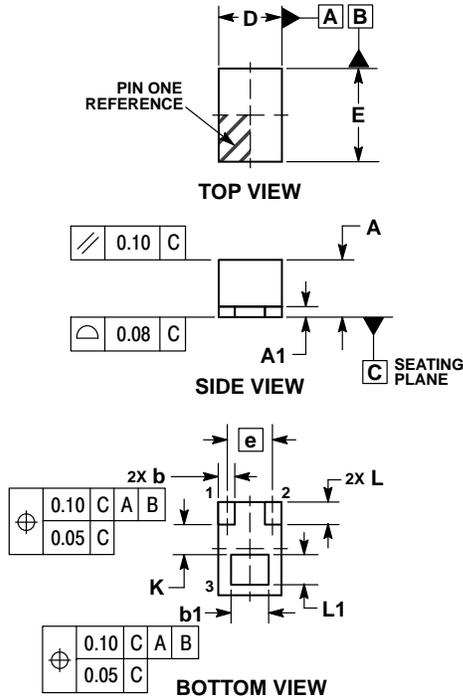


Figure 11. Thermal Response

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PACKAGE DIMENSIONS

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

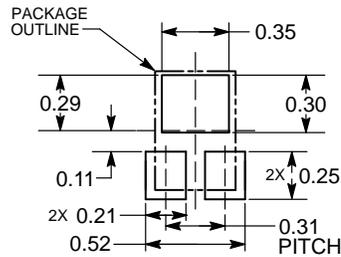


NOTES:

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*



*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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