

# MOSFET – Power, Single, P-Channel, SC-70

## -8.0 V, -1.4 A



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## NTS2101P

### Features

- Leading Trench Technology for Low  $R_{DS(on)}$  Extending Battery Life
- -1.8 V Rated for Low Voltage Gate Drive
- SC-70 Surface Mount for Small Footprint (2 x 2 mm)
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Applications

- High Side Load Switch
- Charging Circuit
- Single Cell Battery Applications such as Cell Phones, Digital Cameras, PDAs, etc.

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

Parameter		Symbol	Value	Units	
Drain-to-Source Voltage		$V_{DSS}$	-8.0	V	
Gate-to-Source Voltage		$V_{GS}$	$\pm 8.0$	V	
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$	-1.4	A
				$T_A = 70^\circ\text{C}$	
	$t \leq 5$ s	$T_A = 25^\circ\text{C}$	-1.5	A	
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$P_D$	0.29	W
	$t \leq 5$ s			0.33	W
Pulsed Drain Current	$tp = 10$ $\mu\text{s}$	$I_{DM}$	-3.0	A	
Operating Junction and Storage Temperature		$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$	
Source Current (Body Diode), Continuous		$I_S$	-0.46	A	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		$T_L$	260	$^\circ\text{C}$	

### THERMAL RESISTANCE RATINGS

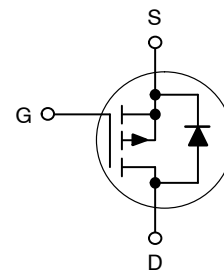
Parameter	Symbol	Max	Units
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	430	$^\circ\text{C}/\text{W}$
Junction-to-Ambient – $t \leq 5$ s (Note 1)	$R_{\theta JA}$	375	

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.

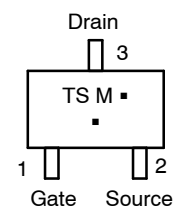
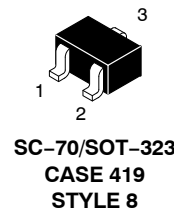
1. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).

$V_{(BR)DSS}$	$R_{DS(on)}$ Typ	$I_D$ Max
-8.0 V	65 m $\Omega$ @ -4.5 V	-1.4 A
	78 m $\Omega$ @ -2.5 V	
	117 m $\Omega$ @ -1.8 V	

### P-Channel MOSFET



### MARKING DIAGRAM & PIN ASSIGNMENT



TS = Device Code  
M = Date Code\*  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation may vary depending upon manufacturing location.

### ORDERING INFORMATION

Device	Package	Shipping†
NTS2101PT1	SOT-323	3000/Tape & Reel
NTS2101PT1G	SOT-323 (Pb-Free)	3000/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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## 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 <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 μA	-8.0	-20		V	
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> /T <sub>J</sub>			-10		mV/°C	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = -6.4 V	T <sub>J</sub> = 25°C			-1.0	μA
			T <sub>J</sub> = 70°C				
Gate-to-Source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±8.0 V				±100	nA

### ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = -250 μA	-0.45	-0.7	-1.0	V
Negative Threshold Temperature Coefficient	V <sub>GS(TH)</sub> /T <sub>J</sub>			2.6		mV/°C
Drain-to-Source On Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -1.0 A		65	100	mΩ
		V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -0.5 A		78	140	
		V <sub>GS</sub> = -1.8 V, I <sub>D</sub> = -0.3 A		117	210	

### CHARGES AND CAPACITANCES

Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> = 0 V, f = 1.0 MHz, V <sub>DS</sub> = -8.0 V		640		pF
Output Capacitance	C <sub>OSS</sub>			120		
Reverse Transfer Capacitance	C <sub>RSS</sub>			82		
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = -5.0 V, V <sub>DD</sub> = -5.0 V, I <sub>D</sub> = -1.0 A		6.4		nC
Threshold Gate Charge	Q <sub>G(TH)</sub>			0.7		
Gate-to-Source Charge	Q <sub>GS</sub>			1.0		
Gate-to-Drain Charge	Q <sub>GD</sub>			1.5		

### SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	t <sub>d(ON)</sub>	V <sub>GS</sub> = -4.5 V, V <sub>DD</sub> = -4.0 V, I <sub>D</sub> = -1.0 A, R <sub>G</sub> = 6.2 Ω		6.2		ns
Rise Time	t <sub>r</sub>			15		
Turn-Off Delay Time	t <sub>d(OFF)</sub>			26		
Fall Time	t <sub>f</sub>			18		

### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = -0.3 A	T <sub>J</sub> = 25°C		-0.62	-1.2	V
			T <sub>J</sub> = 125°C				
Reverse Recovery Time	t <sub>RR</sub>	V <sub>GS</sub> = 0 V, dI <sub>SD</sub> /dt = 100 A/μs, I <sub>S</sub> = -1.0 A		23.4		ns	
Charge Time	T <sub>a</sub>			7.7			
Discharge Time	T <sub>b</sub>			15.7			
Reverse Recovery Charge	Q <sub>RR</sub>			9.5			nC

2. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
3. Switching characteristics are independent of operating junction temperatures.

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## TYPICAL ELECTRICAL CHARACTERISTICS

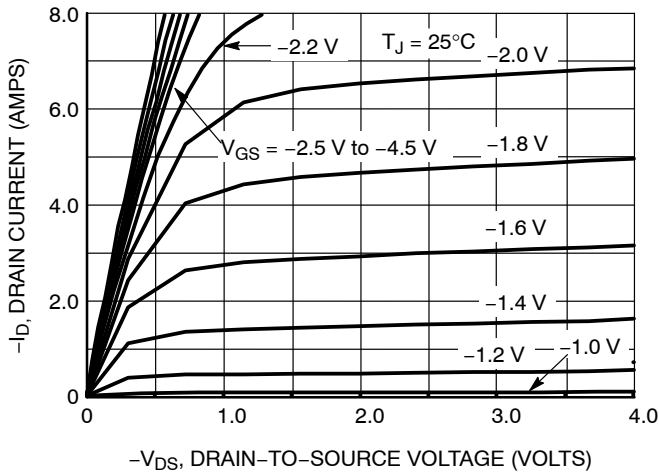


Figure 1. On-Region Characteristics

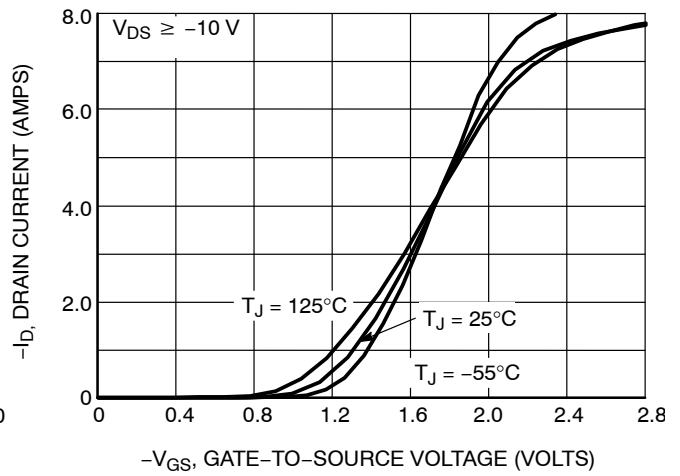


Figure 2. Transfer Characteristics

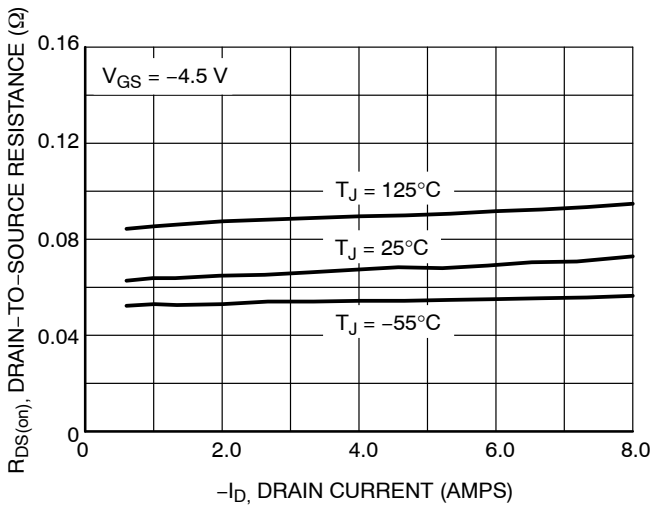


Figure 3. On-Resistance vs. Drain Current and Temperature

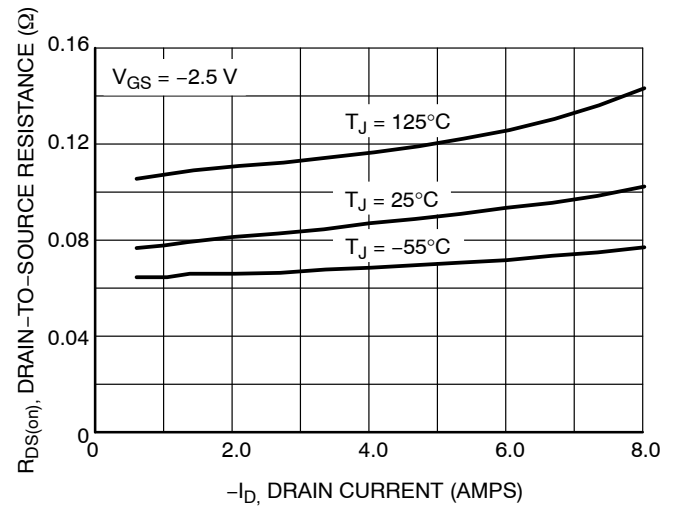


Figure 4. On-Resistance vs. Drain Current and Temperature

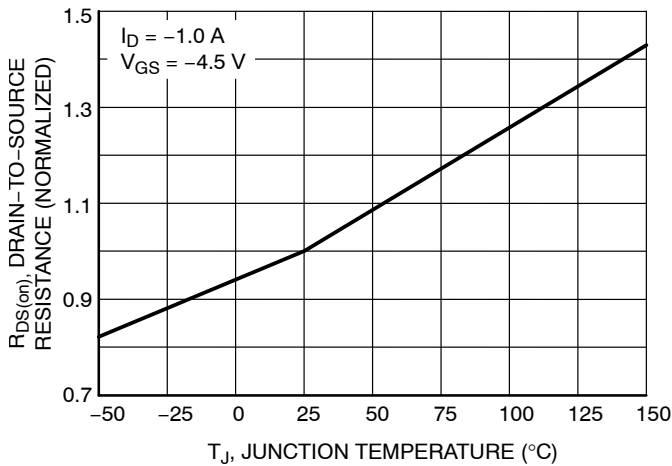


Figure 5. On-Resistance Variation with Temperature

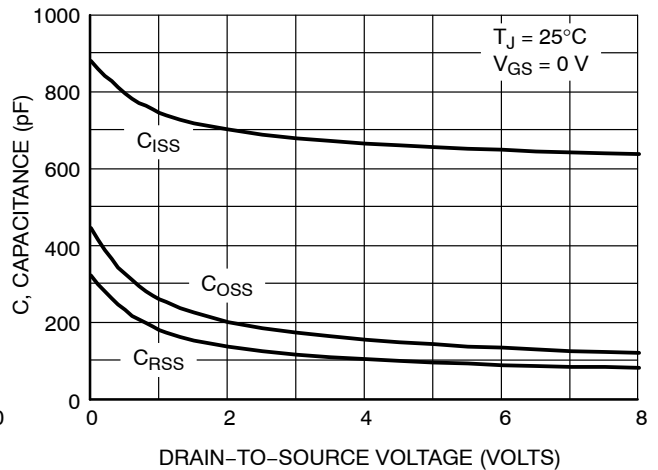
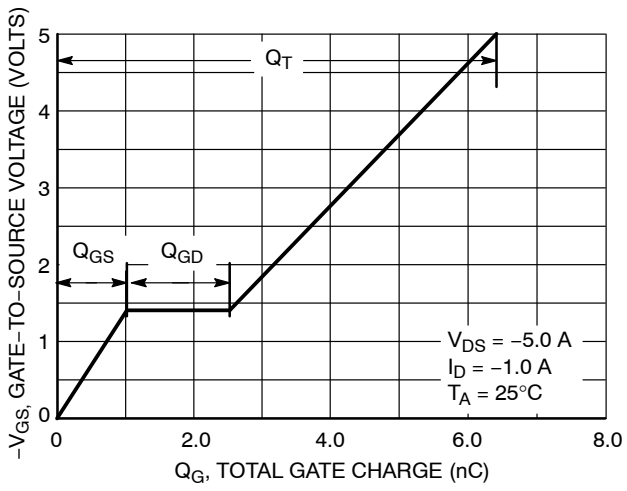


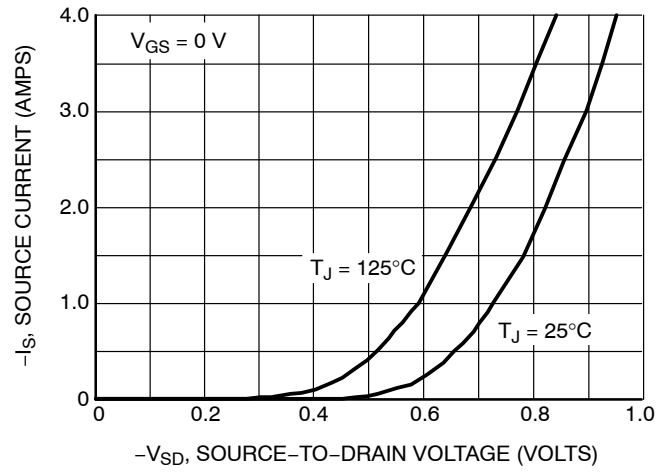
Figure 6. Capacitance Variation

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## TYPICAL ELECTRICAL CHARACTERISTICS



**Figure 7. Gate-to-Source and Drain-to-Source Voltage vs. Total Gate Charge**



**Figure 8. Diode Forward Voltage vs. Current**

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 4:1

SC-70 (SOT-323)  
CASE 419  
ISSUE P

DATE 07 OCT 2021

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH



DIM	MILLIMETERS			INCHES		
	MIN.	NDM.	MAX.	MIN.	NDM.	MAX.
A	0.80	0.90	1.00	0.032	0.035	0.040
A1	0.00	0.05	0.10	0.000	0.002	0.004
A2	0.70 REF			0.028 BSC		
b	0.30	0.35	0.40	0.012	0.014	0.016
c	0.10	0.18	0.25	0.004	0.007	0.010
D	1.80	2.10	2.20	0.071	0.083	0.087
E	1.15	1.24	1.35	0.045	0.049	0.053
e	1.20	1.30	1.40	0.047	0.051	0.055
e1	0.65 BSC			0.026 BSC		
L	0.20	0.38	0.56	0.008	0.015	0.022
H <sub>E</sub>	2.00	2.10	2.40	0.079	0.083	0.095

GENERIC MARKING DIAGRAM



- XX = Specific Device Code
- M = Date Code
- = Pb-Free Package

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



\* For additional information on our Pb-Free strategy and soldering details, please download the IN Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERM/D.

SOLDERING FOOTPRINT

- |   |   |   |  |   |
|---|---|---|--|---|
| STYLE 1:<br>CANCELLED                                 | STYLE 2:<br>PIN 1. ANODE<br>2. N.C.<br>3. CATHODE     | STYLE 3:<br>PIN 1. BASE<br>2. EMITTER<br>3. COLLECTOR | STYLE 4:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. ANODE       | STYLE 5:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE          |
| STYLE 6:<br>PIN 1. EMITTER<br>2. BASE<br>3. COLLECTOR | STYLE 7:<br>PIN 1. BASE<br>2. EMITTER<br>3. COLLECTOR | STYLE 8:<br>PIN 1. GATE<br>2. SOURCE<br>3. DRAIN      | STYLE 9:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE-ANODE | STYLE 10:<br>PIN 1. CATHODE<br>2. ANODE<br>3. ANODE-CATHODE |
|   |   |   |  | STYLE 11:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. CATHODE     |

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