

NTR2101P

Small Signal MOSFET

-8.0 V, -3.7 A, Single P-Channel, SOT-23

Features

- Leading Trench Technology for Low $R_{DS(on)}$
- -1.8 V Rated for Low Voltage Gate Drive
- SOT-23 Surface Mount for Small Footprint (3 x 3 mm)
- Pb-Free Package is Available

Applications

- High Side Load Switch
- DC-DC Conversion
- Cell Phone, Notebook, PDAs, etc.

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

Parameter	Symbol	Value	Unit	
Drain-to-Source Voltage	V_{DSS}	-8.0	V	
Gate-to-Source Voltage	V_{GS}	± 8.0	V	
Continuous Drain Current (Note 1)	$t \leq 10$ s	$T_A = 25^\circ\text{C}$	-3.7	A
		$T_A = 70^\circ\text{C}$	-3.0	A
Power Dissipation (Note 1)	$t \leq 10$ s	P_D	0.96	W
Pulsed Drain Current	$t_p = 10$ μs	I_{DM}	-11	A
Operating Junction and Storage Temperature	T_J, T_{STG}	-55 to 150	$^\circ\text{C}$	
Source Current (Body Diode)	I_S	-1.2	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	Unit
Junction-to-Ambient - Steady State	$R_{\theta JA}$	160	$^\circ\text{C}/\text{W}$
Junction-to-Ambient - $t \leq 10$ s	$R_{\theta JA}$	130	

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.

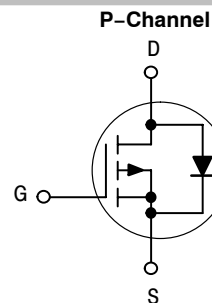
1. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).



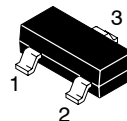
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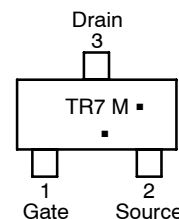
$V_{(BR)DSS}$	$R_{DS(on)}$ Typ	I_D Max
-8.0 V	39 m Ω @ -4.5 V	-3.7 A
	52 m Ω @ -2.5 V	
	79 m Ω @ -1.8 V	



MARKING DIAGRAM & PIN ASSIGNMENT



SOT-23
CASE 318
STYLE 21



TR7 = Specific 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†
NTR2101PT1	SOT-23	3000/Tape & Reel
NTR2101PT1G	SOT-23 (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 ($T_J = 25^\circ\text{C}$ unless otherwise stated)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$	-8.0			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			10		mV/ $^\circ\text{C}$
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = -6.4\text{ V}$	$T_J = 25^\circ\text{C}$		-1.0	μA
			$T_J = 125^\circ\text{C}$		-100	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8.0\text{ V}$			± 100	nA

ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = -250\ \mu\text{A}$	-0.40		-1.0	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			0.0027		mV/ $^\circ\text{C}$
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -3.5\text{ A}$		39	52	m Ω
		$V_{GS} = -2.5\text{ V}, I_D = -3.0\text{ A}$		52	72	
		$V_{GS} = -1.8\text{ V}, I_D = -2.0\text{ A}$		79	120	
Forward Transconductance	g_{FS}	$V_{GS} = -5.0\text{ V}, I_D = -3.5\text{ A}$		9.0		S

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = -4.0\text{ V}$		1173		pF
Output Capacitance	C_{OSS}			289		
Reverse Transfer Capacitance	C_{RSS}			218		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -4.5\text{ V}, V_{DS} = -4.0\text{ V}, I_D = -3.5\text{ A}$		12	15	nC
Gate-to-Source Charge	Q_{GS}			3.8		
Gate-to-Drain Charge	Q_{GD}			2.5		

SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = -4.5\text{ V}, V_{DD} = -4.0\text{ V}, I_D = -1.2\text{ A}, R_G = 6.0\ \Omega$		7.4	15	ns
Rise Time	t_r			15.75	25	
Turn-Off Delay Time	$t_{d(off)}$			38	58	
Fall Time	t_f			31	51	

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = -1.2\text{ A}$	$T_J = 25^\circ\text{C}$		-0.73	-1.2	V
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2. Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

3. Switching characteristics are independent of operating junction temperatures.

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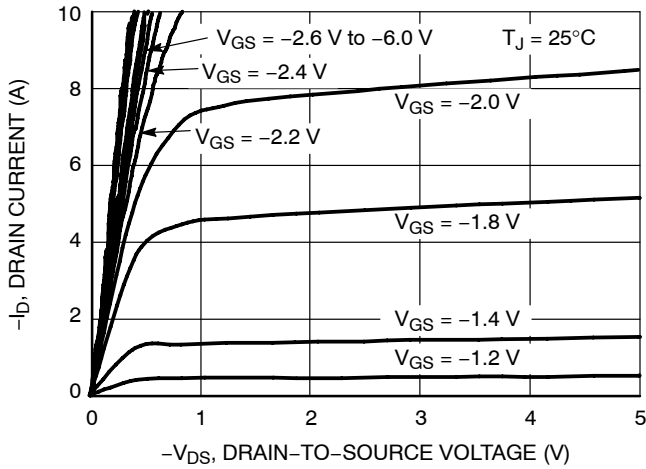


Figure 1. On-Region Characteristics

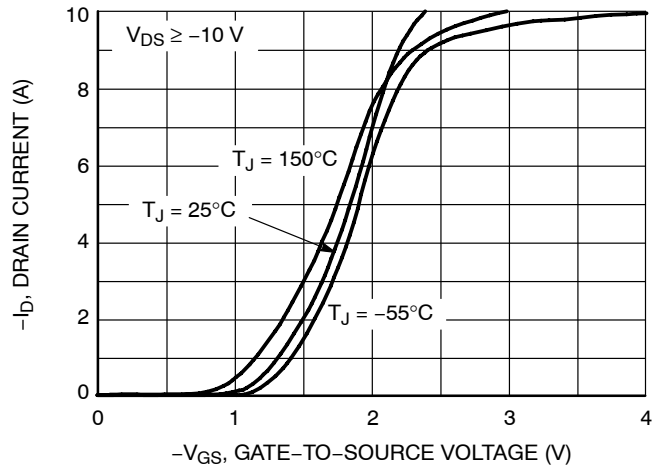


Figure 2. Transfer Characteristics

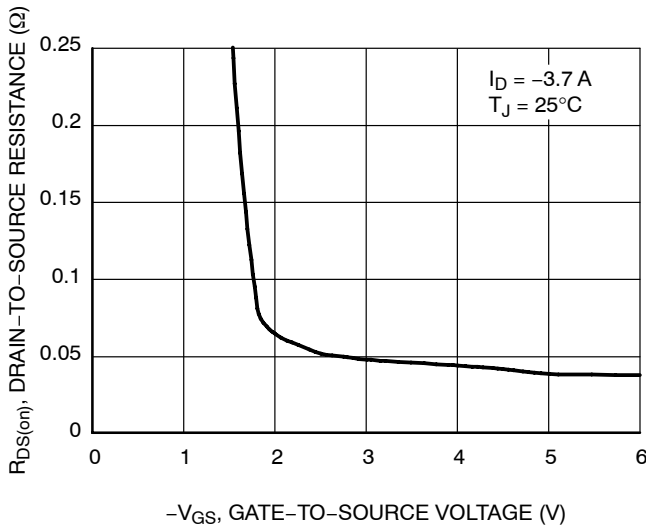


Figure 3. On-Resistance versus Gate-to-Source Voltage

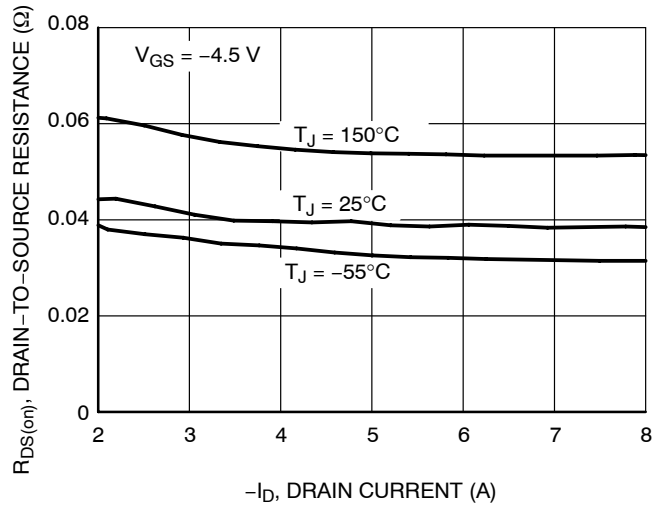


Figure 4. On-Resistance versus Drain Current and Gate Voltage

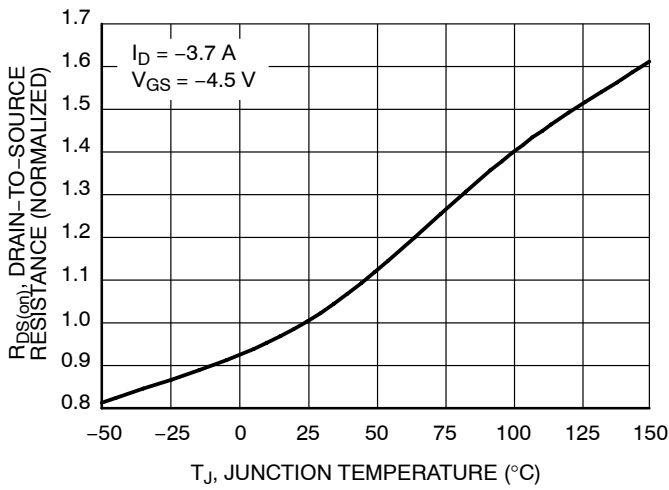


Figure 5. On-Resistance Variation with Temperature

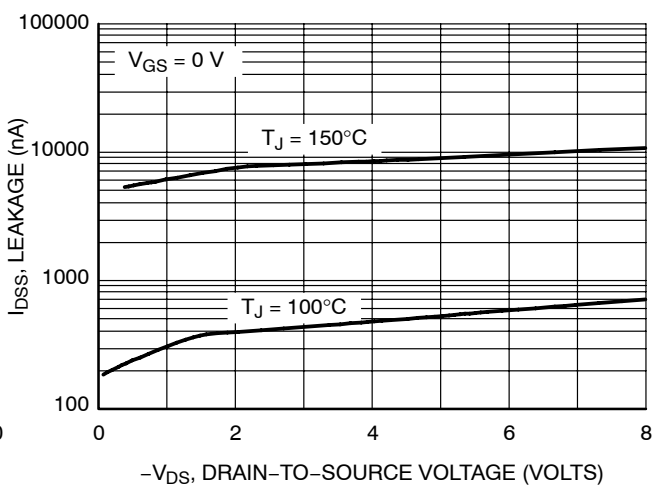


Figure 6. Drain-to-Source Leakage Current versus Voltage

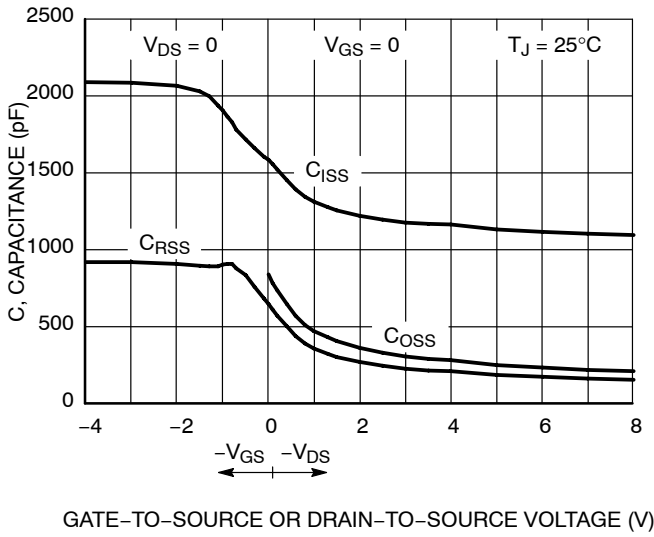


Figure 7. Capacitance Variation

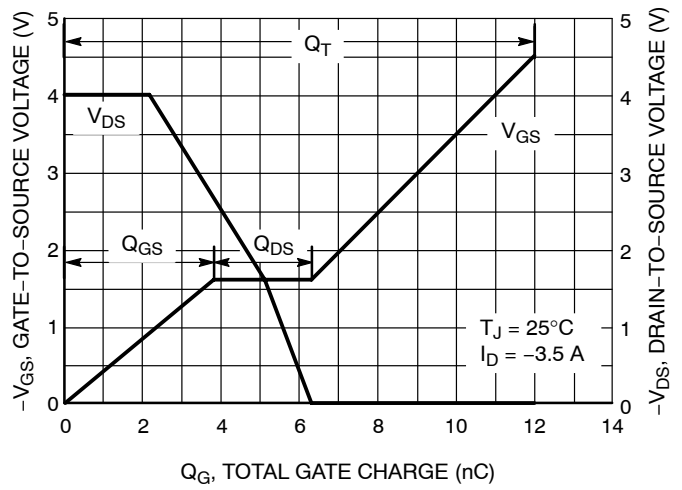


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

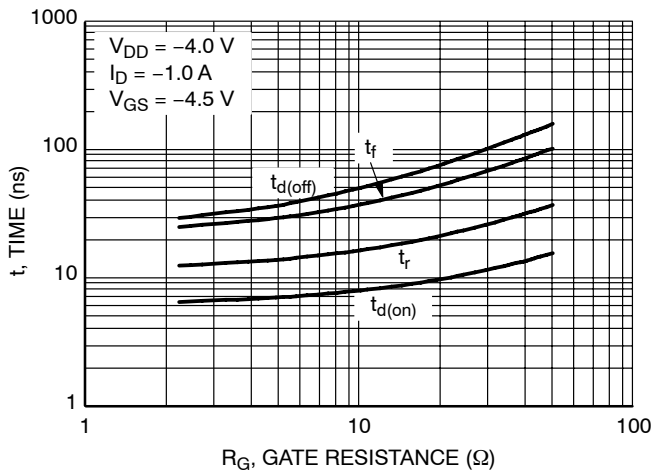


Figure 9. Resistive Switching Time Variation versus Gate Resistance

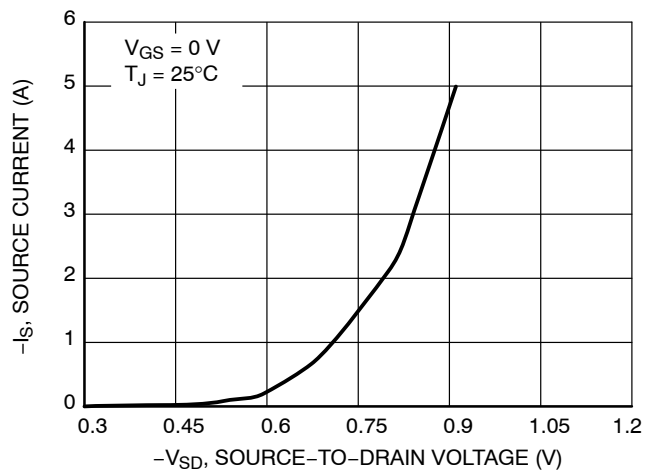
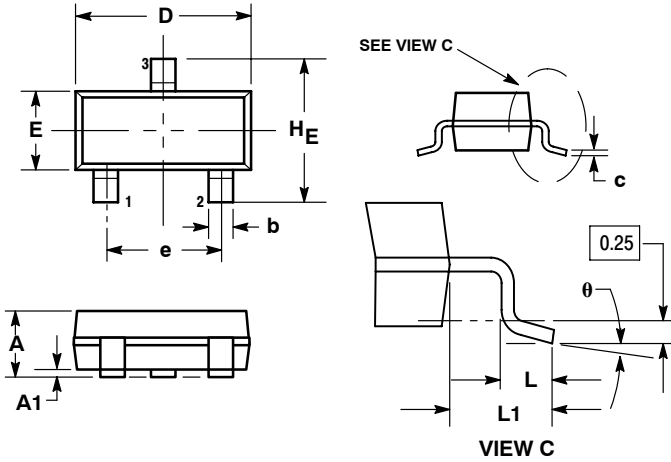


Figure 10. Diode Forward Voltage versus Current

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PACKAGE DIMENSIONS

SOT-23 (TO-236) CASE 318-08 ISSUE AN

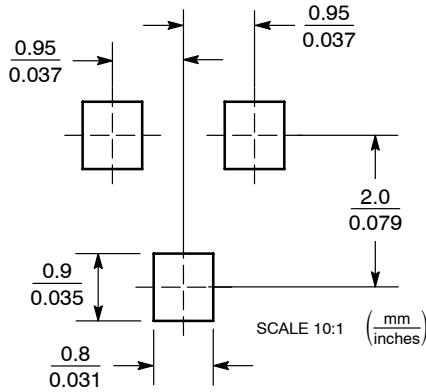


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
 4. 318-01 THRU -07 AND -09 OBSOLETE, NEW STANDARD 318-08.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.040	0.044
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.37	0.44	0.50	0.015	0.018	0.020
c	0.09	0.13	0.18	0.003	0.005	0.007
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
e	1.78	1.90	2.04	0.070	0.075	0.081
L	0.10	0.20	0.30	0.004	0.008	0.012
L1	0.35	0.54	0.69	0.014	0.021	0.029
HE	2.10	2.40	2.64	0.083	0.094	0.104

- STYLE 21:
PIN 1. GATE
2. SOURCE
3. DRAIN

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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