Small Signal MOSFET

60 V, 310 mA, Single, N-Channel, SOT-23

Features

- Low R_{DS(on)}
- Small Footprint Surface Mount Package
- Trench Technology
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Low Side Load Switch
- Level Shift Circuits
- DC-DC Converter
- Portable Applications i.e. DSC, PDA, Cell Phone, etc.

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

Rating		Symbol	Value	Unit
Drain-to-Source Voltage	V_{DSS}	60	V	
Gate-to-Source Voltage		V _{GS}	±30	V
Drain Current (Note 1) Steady State t < 5 s	T _A = 25°C T _A = 85°C T _A = 25°C T _A = 85°C	I _D	260 190 310 220	mA
Power Dissipation (Note 1) Steady State t < 5 s		P _D	300 420	mW
Pulsed Drain Current (t _p = 10 μ	I _{DM}	1.2	Α	
Operating Junction and Storage Temperature Range	T _J , T _{STG}	-55 to +150	°C	
Source Current (Body Diode)	I _S	300	mA	
Lead Temperature for Soldering (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.

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Junction-to-Ambient - Steady State (Note 1)	$R_{ heta JA}$	417	°C/W
Junction-to-Ambient - t ≤ 5 s (Note 1)	$R_{\theta JA}$	300	

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



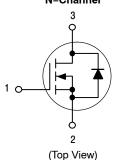
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V _{(BR)DSS}	R _{DS(on)} MAX	I _D MAX (Note 1)		
60 V	3.0 Ω @ 4.5 V	310 mA		
	2.5 Ω @ 10 V			

Simplified Schematic

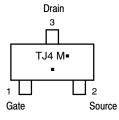
N-Channel



MARKING DIAGRAM & PIN ASSIGNMENT



SOT-23 CASE 318 STYLE 21



TJ4 = Device Code

M = Date Code

Pb-Free Package

(Note: Microdot may be in either location) ORDERING INFORMATION

Device	Package	Shipping [†]		
NTR5103NT1G	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 Specifications Brochure, BRD8011/D.

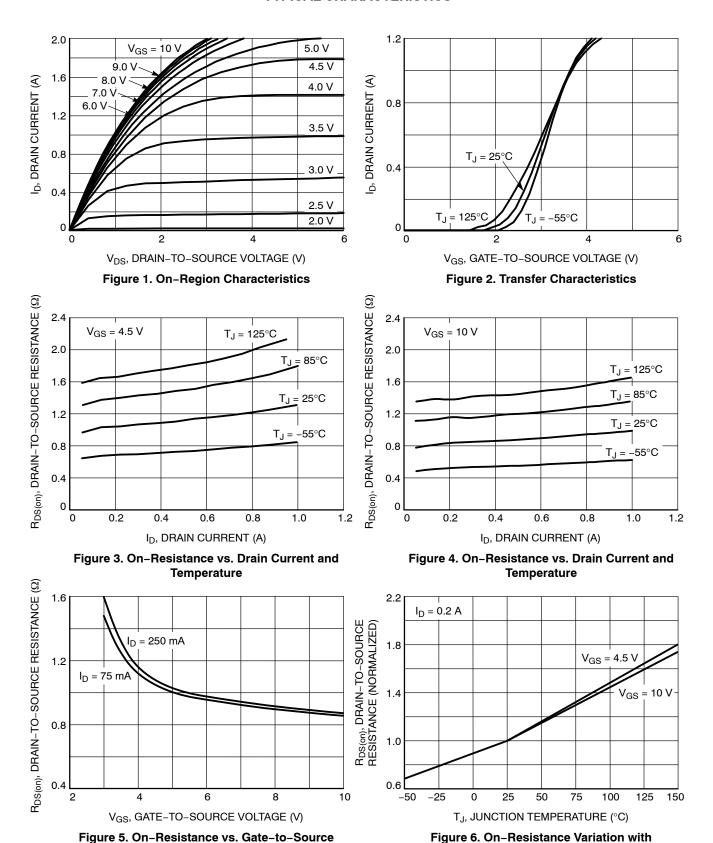
ELECTRICAL CHARACTERISTICS (T_{.1} = 25°C unless otherwise specified)

Parameter	Symbol	Test Co	ondition	Min	Тур	Max	Units	
OFF CHARACTERISTICS	•	•					•	
Drain-to-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0 V, I _D = 250 μA		60			V	
Drain-to-Source Breakdown Voltage Temperature Coefficient	V _{(BR)DSS} /T _J				75		mV/°C	
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V, V _{DS} = 60 V	T _J = 25°C			1	μΑ	
			T _J = 125°C			500		
Gate-to-Source Leakage Current	I _{GSS}	V _{DS} = 0 V, V	/ _{GS} = ±30 V			200	nA	
ON CHARACTERISTICS (Note 2)				•				
Gate Threshold Voltage	V _{GS(TH)}	$V_{GS} = V_{DS}$	I _D = 250 μA	1.9		2.6	V	
Negative Threshold Temperature Coefficient	V _{GS(TH)} /T _J				4.4		mV/°C	
Drain-to-Source On Resistance	R _{DS(on)}	V _{GS} = 10 V, I _D = 240 mA			1.0	2.5	Ω	
		V _{GS} = 4.5 V, I _D = 50 mA			1.4	3.0	1	
Forward Transconductance	9FS	V _{DS} = 5 V,		530		mS		
CHARGES AND CAPACITANCES	•	•					•	
Input Capacitance	C _{ISS}	$V_{GS} = 0 \text{ V, f} = 1 \text{ MHz,}$ $V_{DS} = 25 \text{ V}$			26.7	40	pF	
Output Capacitance	C _{OSS}				4.6		1	
Reverse Transfer Capacitance	C _{RSS}	VDS -		2.9				
Total Gate Charge	Q _{G(TOT)}				0.81		nC	
Threshold Gate Charge	Q _{G(TH)}	V _{GS} = 5 V.	V _{DS} = 10 V;		0.31		1	
Gate-to-Source Charge	Q_{GS}	$I_D = 240 \text{ mA}$		I _D = 240 mA 0.48				
Gate-to-Drain Charge	Q_{GD}			0.08		1		
SWITCHING CHARACTERISTICS, V _{GS}	= V (Note 3)	•					•	
Turn-On Delay Time	t _{d(ON)}				1.7		ns	
Rise Time	t _r	V_{GS} = 10 V, V_{DD} = 30 V, I_{D} = 200 mA, R_{G} = 10 Ω			1.2			
Turn-Off Delay Time	t _{d(OFF)}				4.8			
Fall Time	t _f			3.6				
DRAIN-SOURCE DIODE CHARACTER	ISTICS			-	-		-	
Forward Diode Voltage	V_{SD}	V _{GS} = 0 V,	T _J = 25°C		0.79	1.2	V	
		I _S = 200 mA	T _J = 85°C		0.7		1	

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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

TYPICAL CHARACTERISTICS



Temperature

Voltage

TYPICAL CHARACTERISTICS

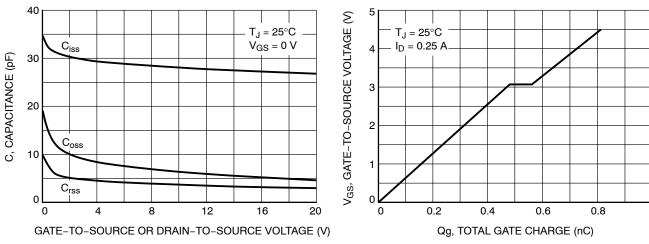


Figure 7. Capacitance Variation

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

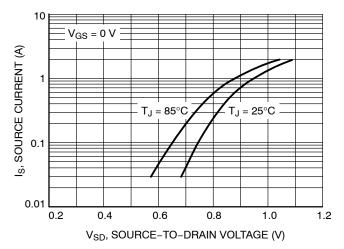
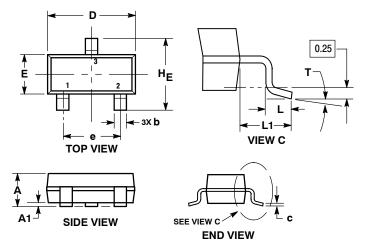


Figure 9. Diode Forward Voltage vs. Current

PACKAGE DIMENSIONS

SOT-23 (TO-236) CASE 318-08 **ISSUE AR**



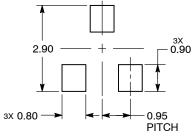
- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 CONTROLLING DIMENSION: MILLIMETERS.
 MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH.
 MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
 DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH,
- PROTRUSIONS, OR GATE BURRS.

		MILLIMETERS			INCHES			
DI	М	MIN	NOM	MAX	MIN	NOM	MAX	
- 4	١.	0.89	1.00	1.11	0.035	0.039	0.044	
Α	1	0.01	0.06	0.10	0.000	0.002	0.004	
b	•	0.37	0.44	0.50	0.015	0.017	0.020	
	``	0.08	0.14	0.20	0.003	0.006	0.008	
		2.80	2.90	3.04	0.110	0.114	0.120	
E	Ξ.	1.20	1.30	1.40	0.047	0.051	0.055	
e	•	1.78	1.90	2.04	0.070	0.075	0.080	
L	_	0.30	0.43	0.55	0.012	0.017	0.022	
L	1	0.35	0.54	0.69	0.014	0.021	0.027	
Н	Е	2.10	2.40	2.64	0.083	0.094	0.104	
T		0°		10 °	0 °		10 °	

STYLE 21:

- PIN 1. GATE
 - 2. SOURCE
 - DRAIN

RECOMMENDED **SOLDERING 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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