NTR4003N, NVR4003N

MOSFET – Single, N-Channel, Small Signal, SOT-23

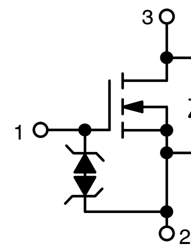
30 V, 0.56 A

ON Semiconductor®

www.onsemi.com

$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D MAX
30 V	1.0 Ω @ 4.0 V	0.56 A
	1.5 Ω @ 2.5 V	

N−Channel



Features

- Low Gate Voltage Threshold ($V_{GS(TH)}$) to Facilitate Drive Circuit Design
- Low Gate Charge for Fast Switching
- ESD Protected Gate
- SOT−23 Package Provides Excellent Thermal Performance
- Minimum Breakdown Voltage Rating of 30 V
- NVR Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable
- These Devices are Pb−Free and are RoHS Compliant

Applications

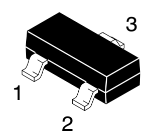
- Notebooks:
  - Level Shifters
  - Logic Switches
  - Low Side Load Switches
- Portable Applications

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

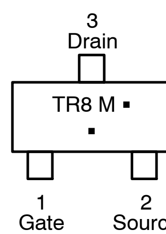
Parameter			Symbol	Value	Unit
Drain−to−Source Voltage			V_{DSS}	30	V
Gate−to−Source Voltage			V_{GS}	±20	V
Continuous Drain Current (Note 1)	Steady State	T_A = 25°C	I_D	0.5	A
		T_A = 85°C		0.37	
Power Dissipation (Note 1)	Steady State		P_D	0.69	W
Continuous Drain Current (Note 1)	t < 10 s	T_A = 25°C	I_D	0.56	A
		T_A = 85°C		0.40	
Power Dissipation (Note 1)	t < 5 s		P_D	0.83	W
Pulsed Drain Current	t_p = 10 μs		I_{DM}	1.7	A
Operating Junction and Storage Temperature			T_J, Tstg	−55 to 150	°C
Source Current (Body Diode)			I_S	1.0	A
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.

MARKING DIAGRAM/ PIN ASSIGNMENT



SOT−23 CASE 318 STYLE 21



TR8 = Specific Device Code
M = Date Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*Date Code orientation and overbar may vary depending upon manufacturing location.

ORDERING INFORMATION

Device	Package	Shipping†
NTR4003NT1G	SOT−23 (Pb−Free)	3000 / Tape & Reel
NTR4003NT3G	SOT−23 (Pb−Free)	10,000 / Tape & Reel
NVR4003NT3G	SOT−23 (Pb−Free)	10,000 / 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.

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction−to−Ambient − Steady State (Note 1)	$R_{\theta JA}$	180	°C/W
Junction−to−Ambient − t < 10 s (Note 1)	$R_{\theta JA}$	150	
Junction−to−Ambient − Steady State (Note 2)	$R_{\theta JA}$	300	

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

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition		Min	Typ	Max	Units
OFF CHARACTERISTICS							
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 100 μA		30			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$				40		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 30 V	T_J = 25°C			1.0	μA
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±10 V				±1.0	μA
ON CHARACTERISTICS (Note 3)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 250 μA		0.8		1.4	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				3.4		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 4.0 V, I_D = 10 mA			1.0	1.5	Ω
		V_{GS} = 2.5 V, I_D = 10 mA			1.5	2.0	
Forward Transconductance	g_{FS}	V_{DS} = 3.0 V, I_D = 10 mA			0.33		S
CHARGES AND CAPACITANCES							
Input Capacitance	C_{iss}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = 5.0 V			21	42	pF
Output Capacitance	C_{oss}				19.7	40	
Reverse Transfer Capacitance	C_{rss}				8.1	16	
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 5.0 V, V_{DS} = 24 V, I_D = 0.1 A			1.15		nC
Threshold Gate Charge	$Q_{G(TH)}$				0.15		
Gate−to−Source Gate Charge	Q_{GS}				0.32		
Gate−to−Drain Charge	Q_{GD}				0.23		
SWITCHING CHARACTERISTICS (Note 4)							
Turn−On Delay Time	$t_{d(on)}$	V_{GS} = 4.5 V, V_{DD} = 5.0 V, I_D = 0.1 A, R_G = 50 Ω			16.7		ns
Rise Time	t_r				47.9		
Turn−Off Delay Time	$t_{d(off)}$				65.1		
Fall Time	t_f				64.2		
SOURCE−DRAIN DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 10 mA	T_J = 25°C		0.65	0.7	V
			T_J = 125°C		0.45		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dI_S/dt = 8A/μs, I_S = 10 mA			14		ns

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

TYPICAL PERFORMANCE CURVES (T_J = 25°C unless otherwise noted)

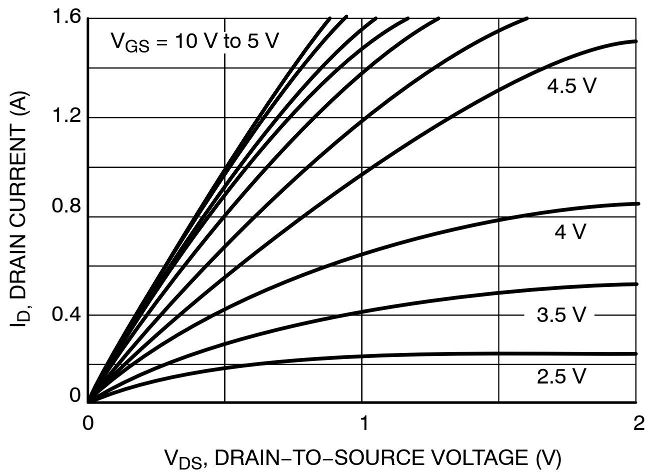


Figure 1. On−Region Characteristics

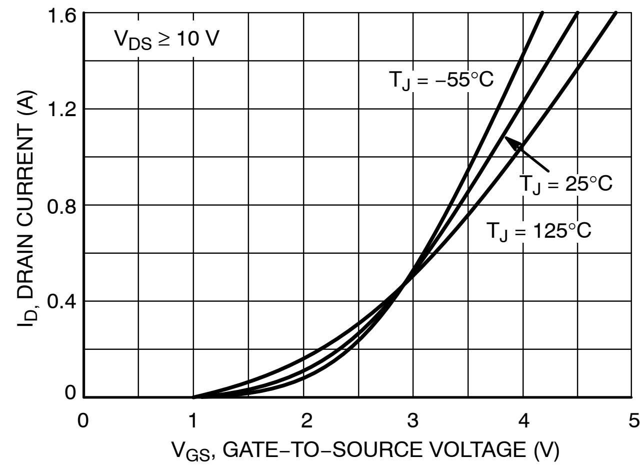


Figure 2. Transfer Characteristics

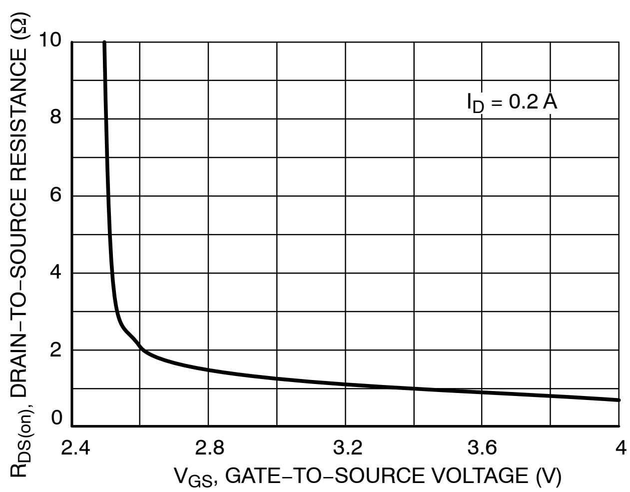


Figure 3. On−Resistance vs. Gate−to−Source Voltage

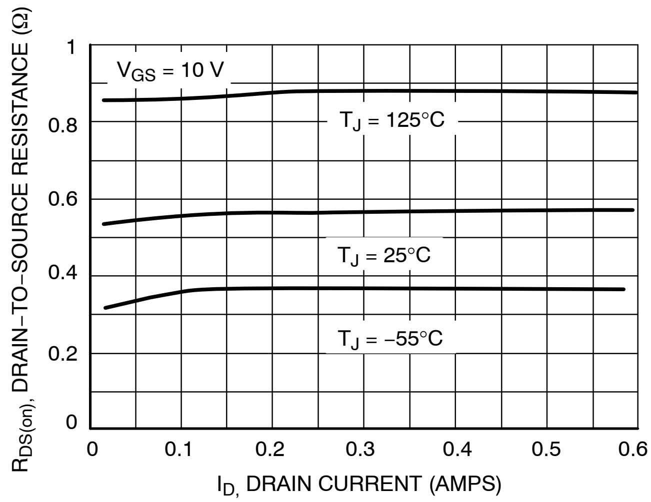


Figure 4. On−Resistance vs. Drain Current and Temperature

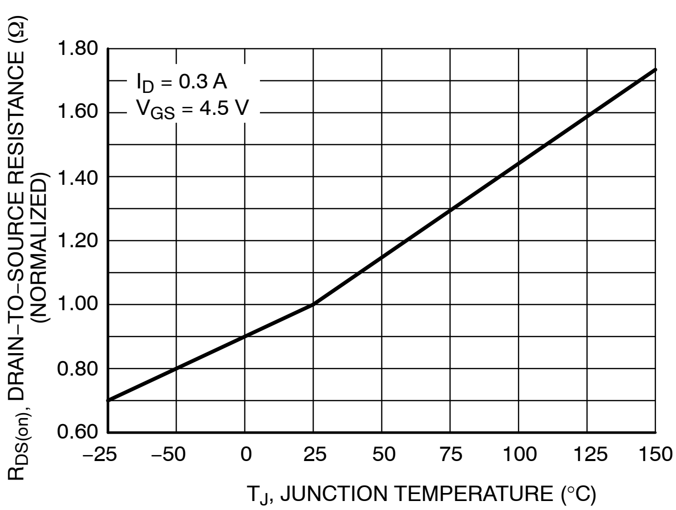


Figure 5. On−Resistance Variation with Temperature

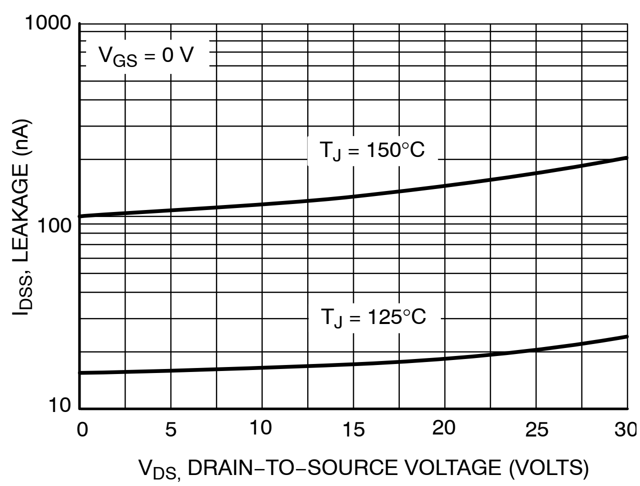


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CURVES (T_J = 25°C unless otherwise noted)

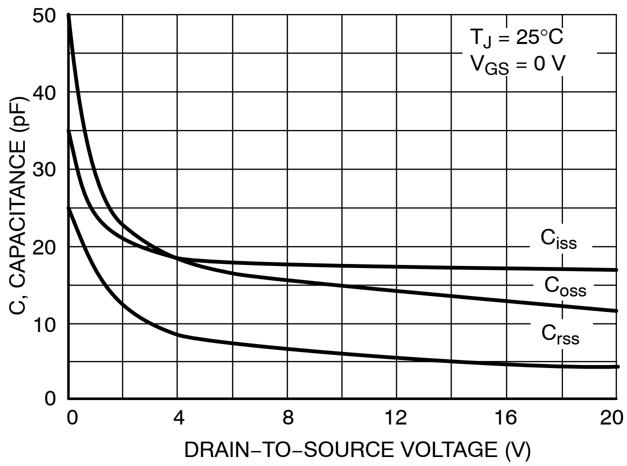


Figure 7. Capacitance Variation

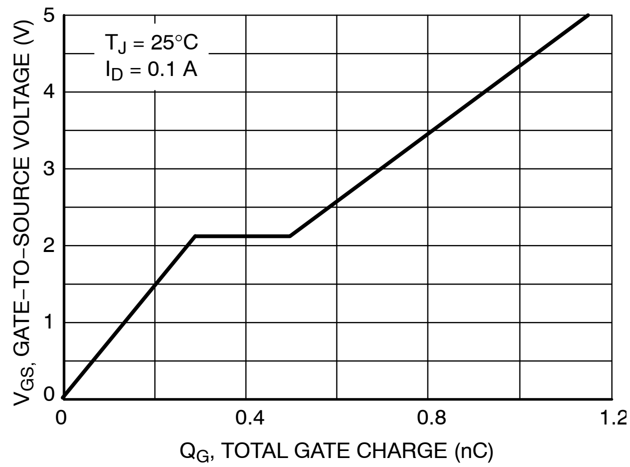


Figure 8. Gate−to−Source & Drain−to−Source Voltage vs. Total Charge

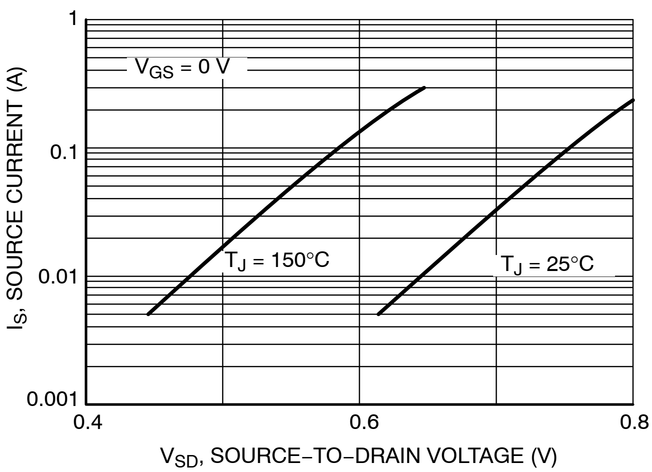
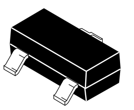


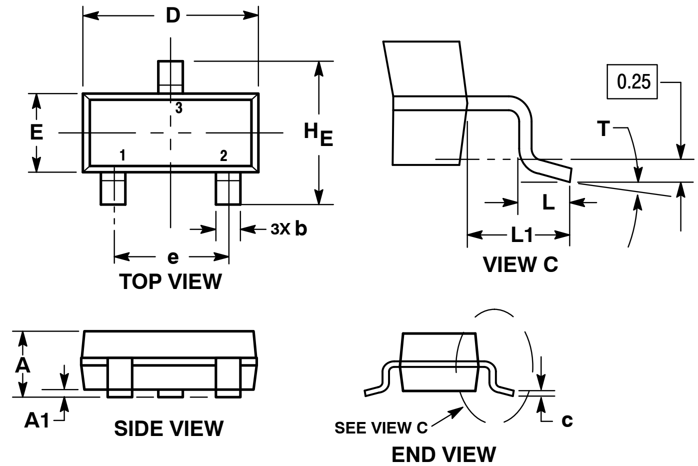
Figure 9. Diode Forward Voltage vs. Current



SCALE 4:1

SOT−23 (TO−236)
CASE 318−08
ISSUE AS

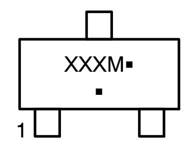
DATE 30 JAN 2018



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

	MILLIMETERS			INCHES		
DIM	**MIN**	**NOM**	**MAX**	**MIN**	**NOM**	**MAX**
A	0.89	1.00	1.11	0.035	0.039	0.044
A1	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
c	0.08	0.14	0.20	0.003	0.006	0.008
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	0.080
L	0.30	0.43	0.55	0.012	0.017	0.022
L1	0.35	0.54	0.69	0.014	0.021	0.027
H_E	2.10	2.40	2.64	0.083	0.094	0.104
T	0°	−−−	10°	0°	−−−	10°

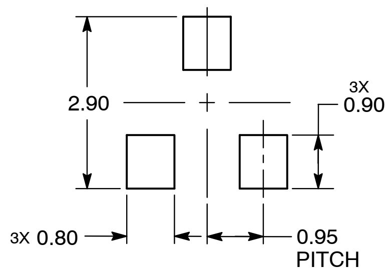
GENERIC MARKING DIAGRAM*



XXX = 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.

RECOMMENDED SOLDERING FOOTPRINT



DIMENSIONS: MILLIMETERS

STYLE 1 THRU 5:
CANCELLED

STYLE 6:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

STYLE 7:
PIN 1. EMITTER
2. BASE
3. COLLECTOR

STYLE 8:
PIN 1. ANODE
2. NO CONNECTION
3. CATHODE

STYLE 9:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 10:
PIN 1. DRAIN
2. SOURCE
3. GATE

STYLE 11:
PIN 1. ANODE
2. CATHODE
3. CATHODE−ANODE

STYLE 12:
PIN 1. CATHODE
2. CATHODE
3. ANODE

STYLE 13:
PIN 1. SOURCE
2. DRAIN
3. GATE

STYLE 14:
PIN 1. CATHODE
2. GATE
3. ANODE

STYLE 15:
PIN 1. GATE
2. CATHODE
3. ANODE

STYLE 16:
PIN 1. ANODE
2. CATHODE
3. CATHODE

STYLE 17:
PIN 1. NO CONNECTION
2. ANODE
3. CATHODE

STYLE 18:
PIN 1. NO CONNECTION
2. CATHODE
3. ANODE

STYLE 19:
PIN 1. CATHODE
2. ANODE
3. CATHODE−ANODE

STYLE 20:
PIN 1. CATHODE
2. ANODE
3. GATE

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

STYLE 22:
PIN 1. RETURN
2. OUTPUT
3. INPUT

STYLE 23:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 24:
PIN 1. GATE
2. DRAIN
3. SOURCE

STYLE 25:
PIN 1. ANODE
2. CATHODE
3. GATE

STYLE 26:
PIN 1. CATHODE
2. ANODE
3. NO CONNECTION

STYLE 27:
PIN 1. CATHODE
2. CATHODE
3. CATHODE

STYLE 28:
PIN 1. ANODE
2. ANODE
3. ANODE

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PUBLICATION ORDERING INFORMATION

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For additional information, please contact your local Sales Representative

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