Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

NTR1P02, NVR1P02

Power MOSFET

–20 V, –1 A, P–Channel SOT–23 Package

Features

- Ultra Low On–Resistance Provides Higher Efficiency and Extends Battery Life
  $R_{DS(on)}$ = 0.180 Ω, V_{GS} = –10 V
  $R_{DS(on)}$ = 0.280 Ω, V_{GS} = –4.5 V
- Power Management in Portable and Battery–Powered Products
- Miniature SOT–23 Surface Mount Package Saves Board Space
- Mounting Information for SOT–23 Package Provided
- 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

- DC–DC Converters
- Computers
- Printers
- PCMCIA Cards
- Cellular and Cordless Telephones

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

Rating	Symbol	Value	Unit
Drain–to–Source Voltage	V_{DSS}	–20	V
Gate–to–Source Voltage – Continuous	V_{GS}	±20	V
Drain Current – Continuous @ T_A = 25°C – Pulsed Drain Current ($t_p \le 1$ μs)	 I_D I_{DM}	 –1.0 –2.67	A
Total Power Dissipation @ T_A = 25°C	P_D	400	mW
Operating and Storage Temperature Range	T_J, T_{stg}	– 55 to 150	°C
Thermal Resistance; Junction–to–Ambient	$R_{\theta JA}$	300	°C/W
Maximum Lead Temperature for Soldering Purposes, (1/8″ from case for 10 s)	T_L	260	°C

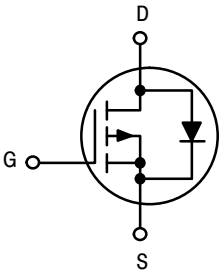
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

ON Semiconductor®

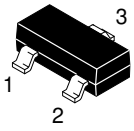
www.onsemi.com

$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D MAX
–20 V	148 mΩ @ –10 V	–1.0 A

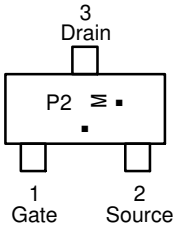
P–Channel



MARKING DIAGRAM/ PIN ASSIGNMENT



SOT–23
CASE 318
STYLE 21



P2 = Specific Device Code
M = Date Code
▪ = Pb–Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
NTR1P02T1G	SOT–23 (Pb–Free)	3000 / Tape & Reel
NTR1P02T3G	SOT–23 (Pb–Free)	10000 / Tape & Reel
NVR1P02T1G	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.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Drain−to−Source Breakdown Voltage (V_{GS} = 0 V, I_D = −10 μA) (Positive Temperature Coefficient)	$V_{(BR)DSS}$	−20	 32		V mV/°C
Zero Gate Voltage Drain Current (V_{DS} = −20 V, V_{GS} = 0 V, T_J = 25°C) (V_{DS} = −20 V, V_{GS} = 0 V, T_J = 150°C)	I_{DSS}			 −1.0 −10	μA
Gate−Body Leakage Current (V_{GS} = ±20 V, V_{DS} = 0 V)	I_{GSS}			±100	nA
ON CHARACTERISTICS (Note 1)					
Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = −250 μA) (Negative Temperature Coefficient)	$V_{GS(th)}$	−1.1	−1.9 −4.0	−2.3	V mV/°C
Static Drain−to−Source On−State Resistance (V_{GS} = −10 V, I_D = −1.5 A) (V_{GS} = −4.5 V, I_D = −0.75 A)	$R_{DS(on)}$		 0.148 0.235	 0.180 0.280	Ω
DYNAMIC CHARACTERISTICS					
Input Capacitance (V_{DS} = −5 V, V_{GS} = 0 V, f = 1.0 MHz)	C_{iss}		165		pF
Output Capacitance (V_{DS} = −5 V, V_{GS} = 0 V, f = 1.0 MHz)	C_{oss}		110		
Reverse Transfer Capacitance (V_{DS} = −5 V, V_{GS} = 0 V, f = 1.0 MHz)	C_{rss}		35		
SWITCHING CHARACTERISTICS (Note 2)					
Turn−On Delay Time (V_{DD} = −15 V, I_D = −1 A, V_{GS} = −5 V, R_G = 2.5 Ω)	$t_{d(on)}$		7.0		ns
Rise Time (V_{DD} = −15 V, I_D = −1 A, V_{GS} = −5 V, R_G = 2.5 Ω)	t_r		9.0		
Turn−Off Delay Time (V_{DD} = −15 V, I_D = −1 A, V_{GS} = −5 V, R_G = 2.5 Ω)	$t_{d(off)}$		9.0		
Fall Time (V_{DD} = −15 V, I_D = −1 A, V_{GS} = −5 V, R_G = 2.5 Ω)	t_f		3.0		
Total Gate Charge (V_{DS} = −15 V, V_{GS} = −5 V, I_D = −0.8 A)	Q_{tot}		2.5		nC
Gate−Source Charge (V_{DS} = −15 V, V_{GS} = −5 V, I_D = −0.8 A)	Q_{gs}		0.75		
Gate−Drain Charge (V_{DS} = −15 V, V_{GS} = −5 V, I_D = −0.8 A)	Q_{gd}		1.0		
BODY−DRAIN DIODE RATINGS (Note 1)					
Diode Forward On−Voltage (Note 2) (I_S = −0.6 A, V_{GS} = 0 V) (I_S = −0.6 A, V_{GS} = 0 V, T_J = 150°C)	V_{SD}		 −0.8 −0.6	−1.0	V
Reverse Recovery Time (I_S = −1 A, dI_S/dt = 100 A/μs, V_{GS} = 0 V)	t_{rr}		13.5		ns
	t_a		10.5		
	t_b		3.0		
Reverse Recovery Stored Charge (I_S = −1 A, dI_S/dt = 100 A/μs, V_{GS} = 0 V)	Q_{RR}		0.008		μC

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.

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
2. Switching characteristics are independent of operating junction temperature.

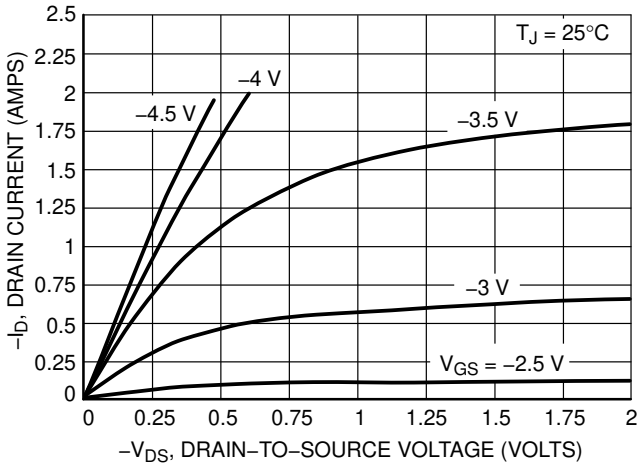


Figure 1. On–Region Characteristics

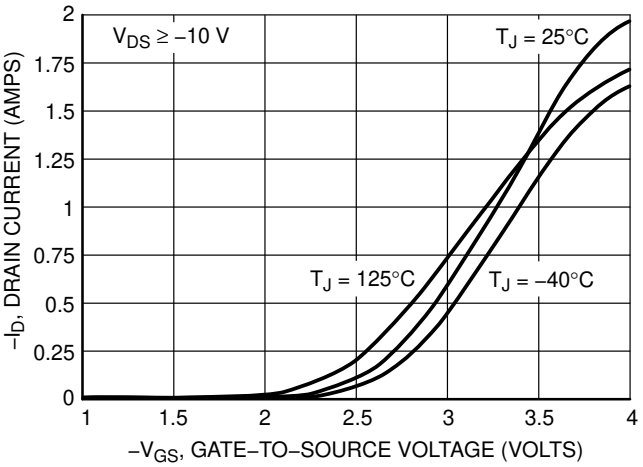


Figure 2. Transfer Characteristics

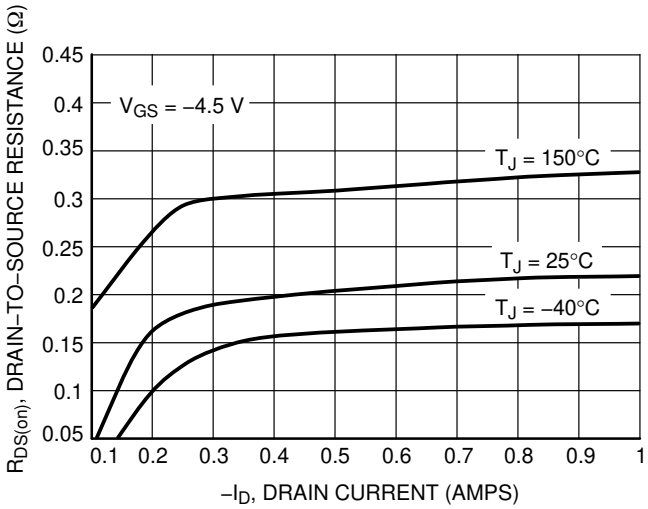


Figure 3. On–Resistance versus Drain Current and Temperature

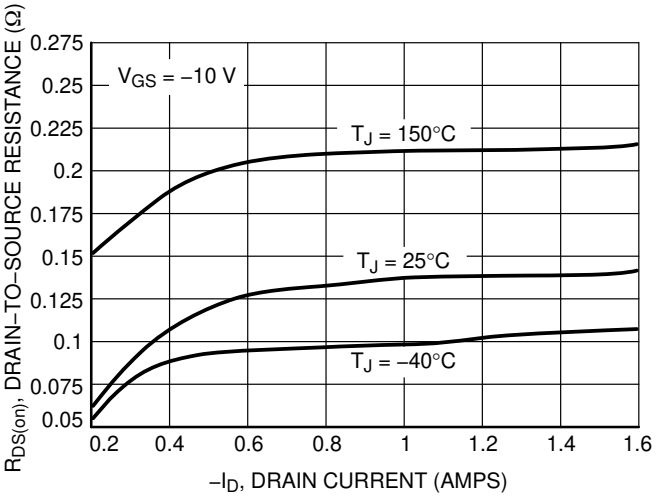


Figure 4. On–Resistance versus Drain Current and Temperature

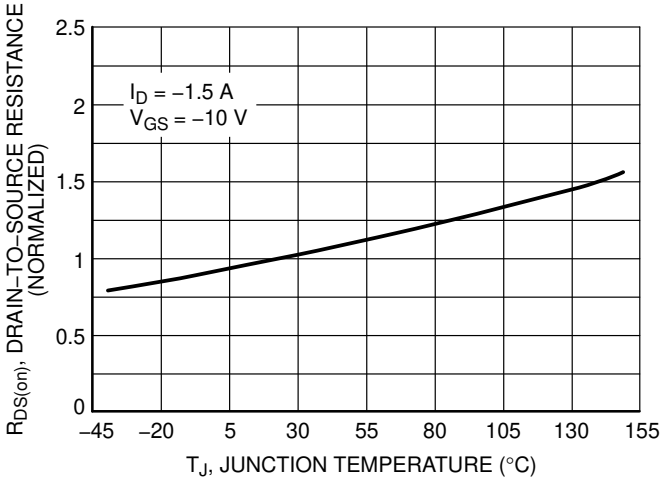


Figure 5. On–Resistance Variation with Temperature

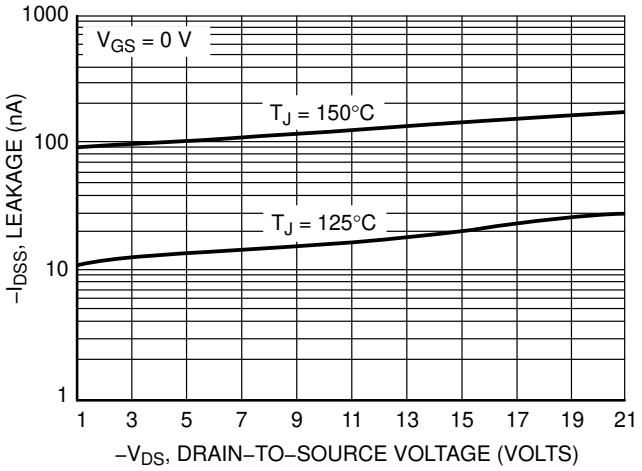


Figure 6. Drain–to–Source Leakage Current versus Voltage

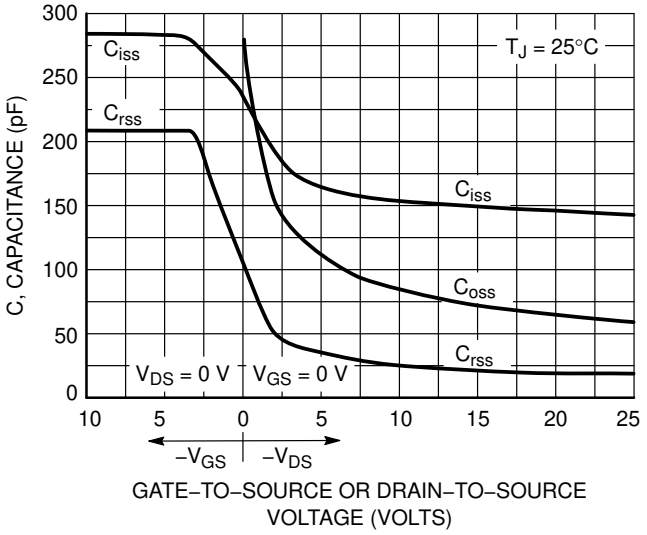


Figure 7. Capacitance Variation

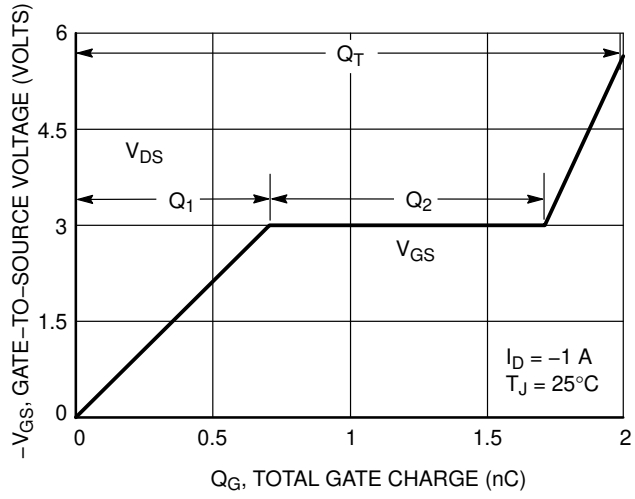


Figure 8. Gate−to−Source and Drain−to−Source Voltage versus Total Charge

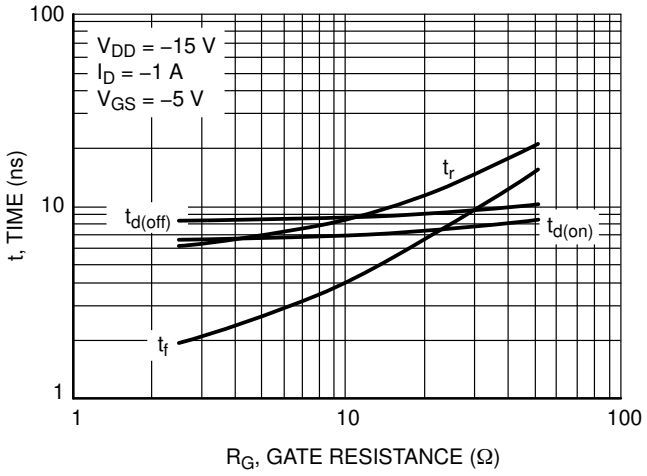


Figure 9. Resistive Switching Time Variation versus Gate Resistance

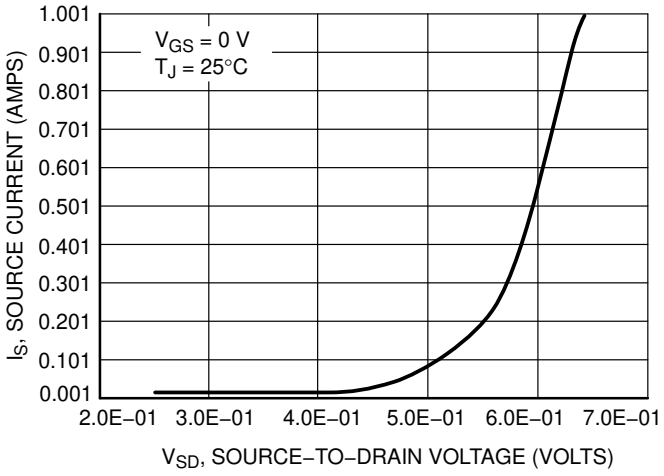
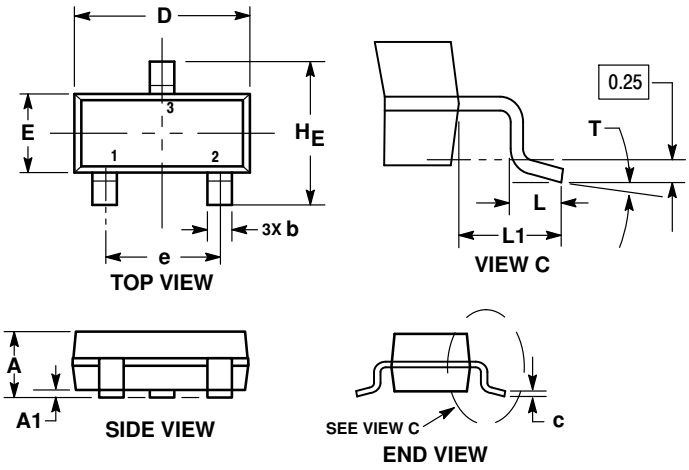


Figure 10. Diode Forward Voltage versus Current

PACKAGE DIMENSIONS

SOT−23 (TO−236)
CASE 318−08
ISSUE AR

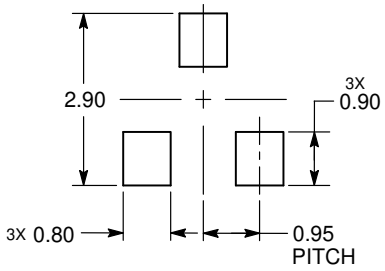


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

	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°

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

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5817−1050

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative