

# NTR4502P

## Power MOSFET

-30 V, -1.95 A, Single, P-Channel, SOT-23

### Features

- Leading Planar Technology for Low Gate Charge / Fast Switching
- Low  $R_{DS(on)}$  for Low Conduction Losses
- SOT-23 Surface Mount for Small Footprint (3 X 3 mm)
- Pb-Free Package May be Available. The G-Suffix Denotes a Pb-Free Lead Finish

### Applications

- DC to DC Conversion
- Load/Power Switch for Portables and Computing
- Motherboard, Notebooks, Camcorders, Digital Camera's, etc.
- Battery Charging Circuits

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

Parameter		Symbol	Value	Unit	
Drain-to-Source Voltage		$V_{DSS}$	-30	V	
Gate-to-Source Voltage		$V_{GS}$	-20	V	
Drain Current (Note 1)	t < 10 s	$T_A = 25^\circ\text{C}$	$I_D$	-1.95	A
		$T_A = 70^\circ\text{C}$		-1.56	
Power Dissipation (Note 1)	t < 10 s	$P_D$	1.25	W	
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$	-1.13	A
		$T_A = 70^\circ\text{C}$		-0.90	
Power Dissipation (Note 1)	Steady State	$P_D$	0.4	W	
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	$I_{DM}$	-6.8	A	
Operating Junction and Storage Temperature		$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$	
Source Current (Body Diode)		$I_S$	-1.25	A	
Lead Temperature for Soldering Purposes (1/8 in from case for 10 s)		$T_L$	260	$^\circ\text{C}$	

### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient - Steady State (Note 1)	$R_{\theta JA}$	300	$^\circ\text{C}/\text{W}$
Junction-to-Ambient - t = 10 s (Note 1)	$R_{\theta JA}$	100	

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

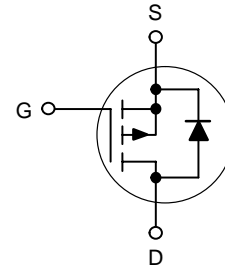


ON Semiconductor®

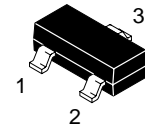
<http://onsemi.com>

$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	$I_D$ Max (Note 1)
-30 V	155 m $\Omega$ @ -10 V	-1.95 A
	240 m $\Omega$ @ -4.5 V	

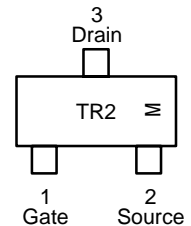
### P-Channel MOSFET



### MARKING DIAGRAM/ PIN ASSIGNMENT



**SOT-23  
CASE 318  
Style 21**



TR2 = Specific Device Code  
M = Date Code

### ORDERING INFORMATION

Device	Package	Shipping†
NTR4502PT1	SOT-23	3000 / Tape & Reel
NTR4502PT1G	SOT-23 (Pb-Free)	3000 / Tape & Reel
NTR4502PT3	SOT-23	10000 / Tape & Reel
NTR4502PT3G	SOT-23 (Pb-Free)	10000 / 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.

# NTR4502P

## Electrical Characteristics ( $T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
-----------	--------	----------------	-----	-----	-----	------

### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$	-30			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, V_{DS} = -30\text{ V}$	$T_J = 25^\circ\text{C}$		-1	$\mu\text{A}$
			$T_J = 55^\circ\text{C}$		-10	
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA

### ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = -250\ \mu\text{A}$	-1.0		-3.0	V
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -1.95\text{ A}$		155	200	$\text{m}\Omega$
		$V_{GS} = -4.5\text{ V}, I_D = -1.5\text{ A}$		240	350	
Forward Transconductance	$g_{FS}$	$V_{DS} = -10\text{ V}, I_D = -1.25\text{ A}$		3		S

### CHARGES AND CAPACITANCES

Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = -15\text{ V}$		200		$\text{pF}$
Output Capacitance	$C_{OSS}$			80		
Reverse Transfer Capacitance	$C_{RSS}$			50		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -10\text{ V}, V_{DS} = -15\text{ V}; I_D = -1.95\text{ A}$		6	10	$\text{nC}$
Threshold Gate Charge	$Q_{G(TH)}$			0.3		
Gate-to-Source Charge	$Q_{GS}$			1		
Gate-to-Drain Charge	$Q_{GD}$			1.7		

### SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = -10\text{ V}, V_{DD} = -15\text{ V}, I_D = -1.95\text{ A}, R_G = 6\ \Omega$		5.2	10	ns
Rise Time	$t_r$			12	20	
Turn-Off Delay Time	$t_{d(OFF)}$			19	35	
Fall Time	$t_f$			17.5	30	

### DRAIN-SOURCE DIODE CHARACTERISTICS (Note 3)

Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = -1.25\text{ A}$		-0.8	-1.2	V
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0\text{ V}, di_{SD}/dt = 100\text{ A}/\mu\text{s}, I_S = -1.25\text{ A}$		23		ns

- Surface-mounted on FR4 board using 1 in sq. pad size (Cu area = 1.127 in sq. [1 oz] including traces).
- Pulse Test: pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$ .
- Switching characteristics are independent of operating junction temperatures.

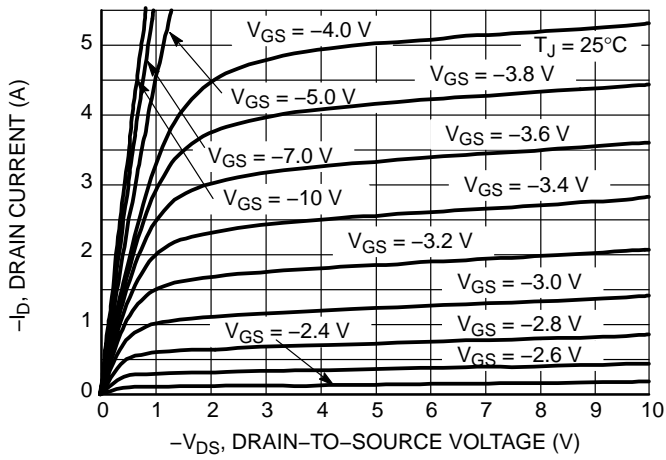


Figure 1. On-Region Characteristics

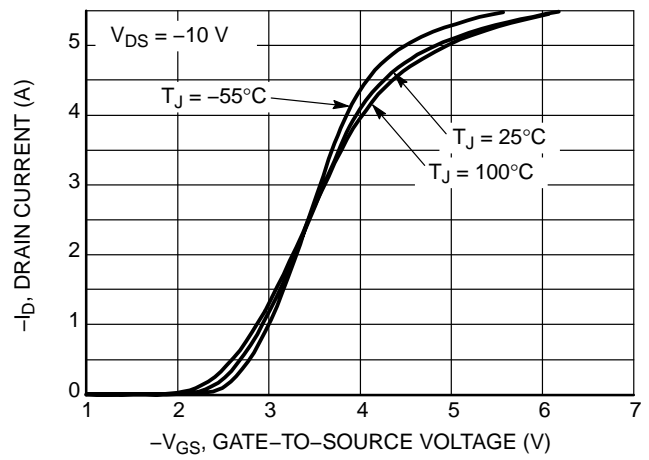


Figure 2. Transfer Characteristics

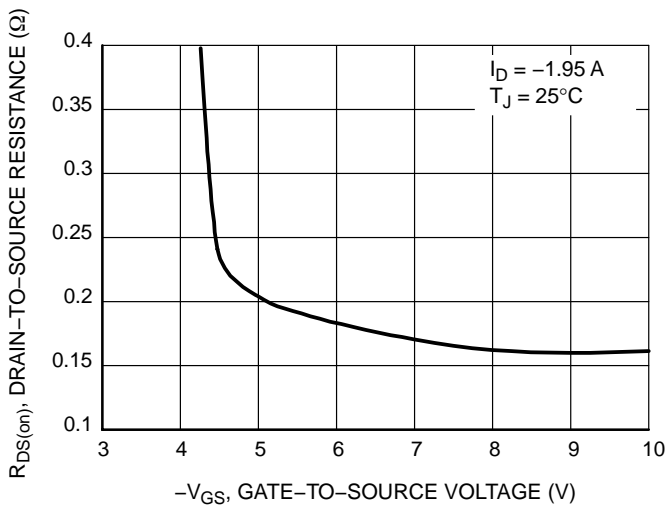


Figure 3. On-Resistance versus Gate-to-Source Voltage

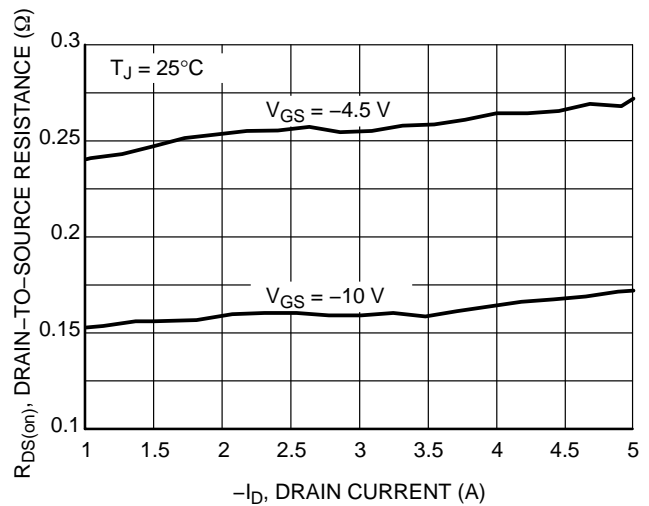


Figure 4. On-Resistance versus Drain Current and Gate Voltage

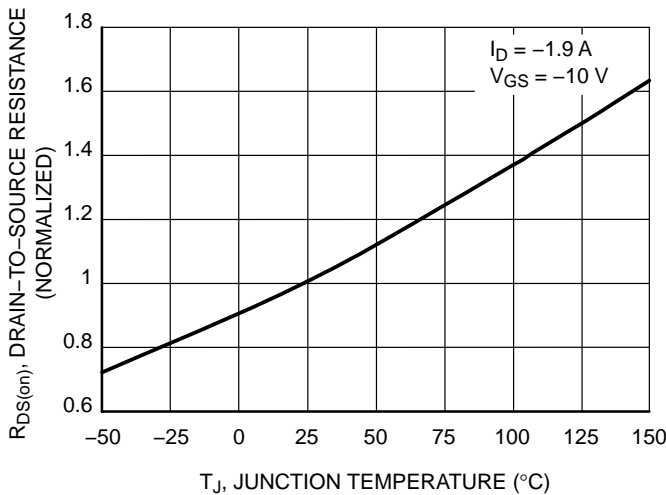


Figure 5. On-Resistance Variation with Temperature

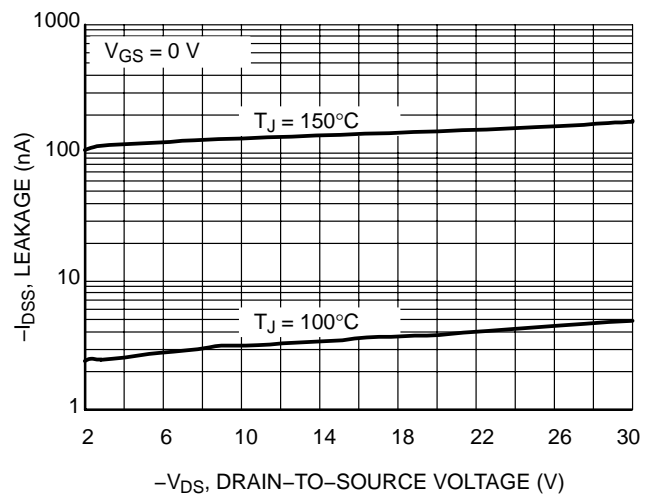
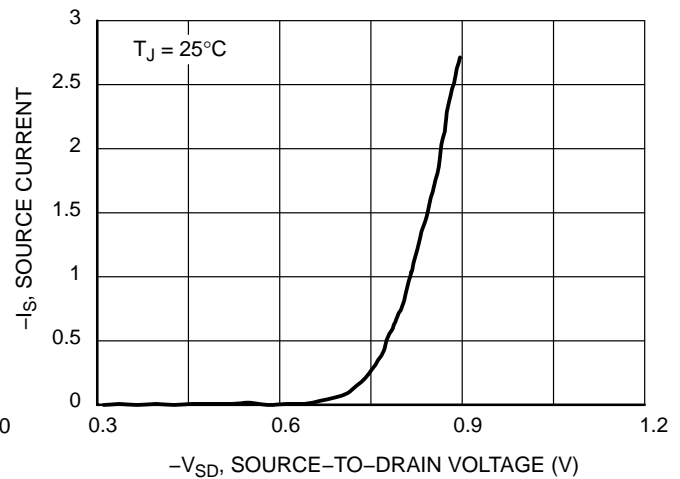
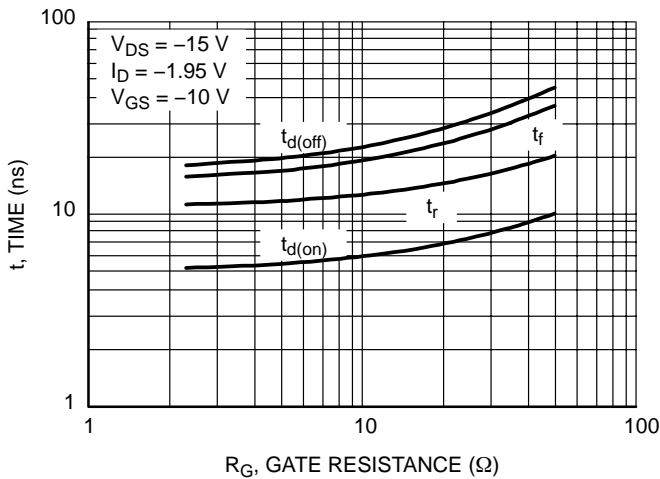
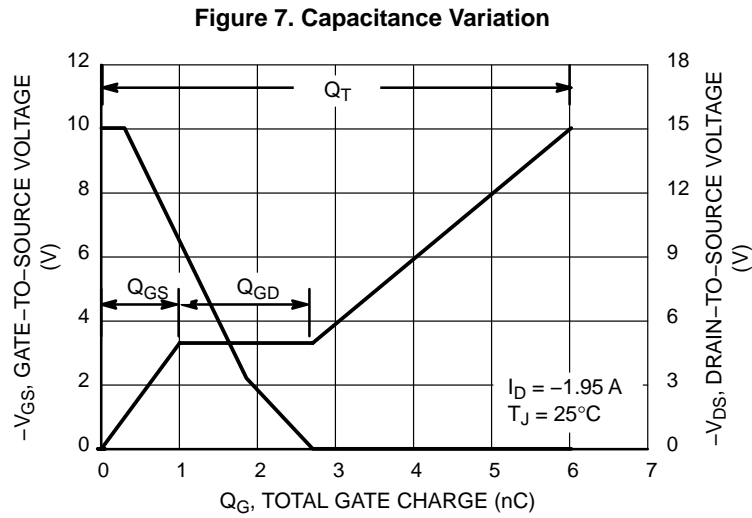
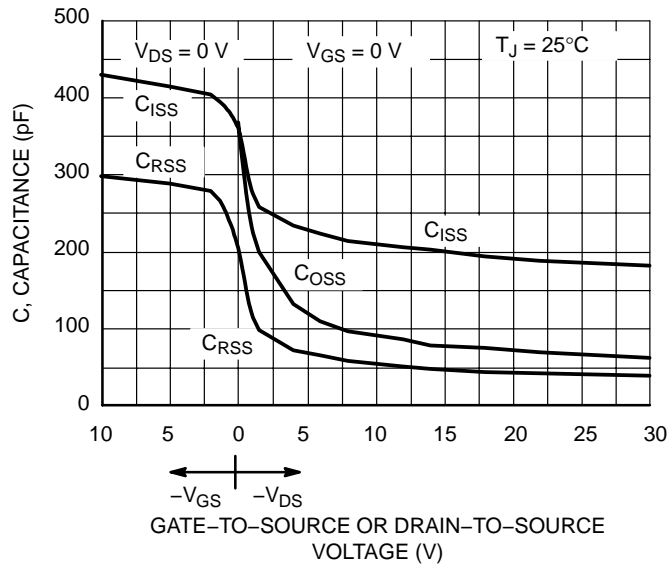


Figure 6. Drain-to-Source Leakage Current versus Voltage

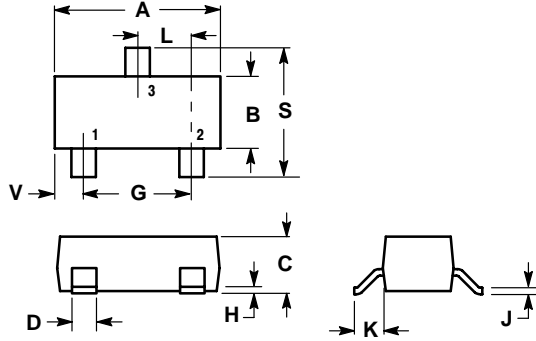
# NTR4502P



# NTR4502P

## PACKAGE DIMENSIONS

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

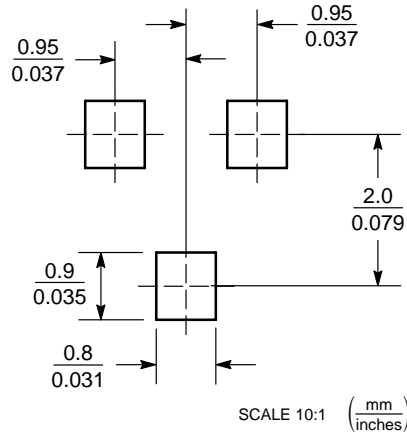


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
  4. 318-01 THRU -07 AND -09 OBSOLETE, NEW STANDARD 318-08.


DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.1102	0.1197	2.80	3.04
B	0.0472	0.0551	1.20	1.40
C	0.0350	0.0440	0.89	1.11
D	0.0150	0.0200	0.37	0.50
G	0.0701	0.0807	1.78	2.04
H	0.0005	0.0040	0.013	0.100
J	0.0034	0.0070	0.085	0.177
K	0.0140	0.0285	0.35	0.69
L	0.0350	0.0401	0.89	1.02
S	0.0830	0.1039	2.10	2.64
V	0.0177	0.0236	0.45	0.60

- 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.

**ON Semiconductor** and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor  
P.O. Box 61312, Phoenix, Arizona 85082-1312 USA  
**Phone:** 480-829-7710 or 800-344-3860 Toll Free USA/Canada  
**Fax:** 480-829-7709 or 800-344-3867 Toll Free USA/Canada  
**Email:** [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

**N. American Technical Support:** 800-282-9855 Toll Free  
USA/Canada

**Japan:** ON Semiconductor, Japan Customer Focus Center  
2-9-1 Kamimeguro, Meguro-ku, Tokyo, Japan 153-0051  
**Phone:** 81-3-5773-3850

**ON Semiconductor Website:** <http://onsemi.com>

**Order Literature:** <http://www.onsemi.com/litorder>

For additional information, please contact your  
local Sales Representative.