

# 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).

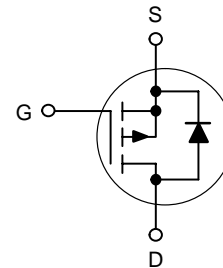


**ON Semiconductor®**

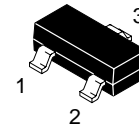
<http://onsemi.com>

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

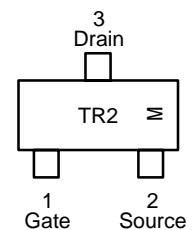
### P-Channel MOSFET



### 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
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### 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		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	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

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

3. Pulse Test: pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$ .

4. Switching characteristics are independent of operating junction temperatures.

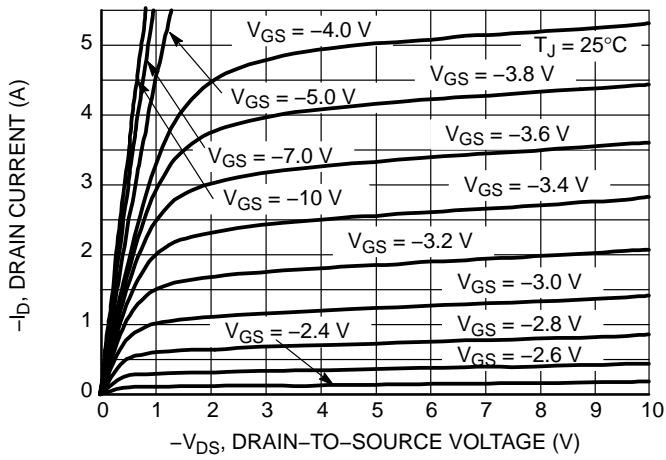


Figure 1. On-Region Characteristics

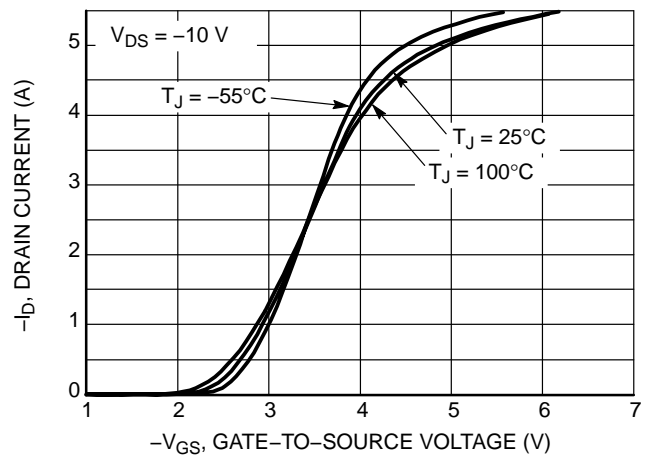


Figure 2. Transfer Characteristics

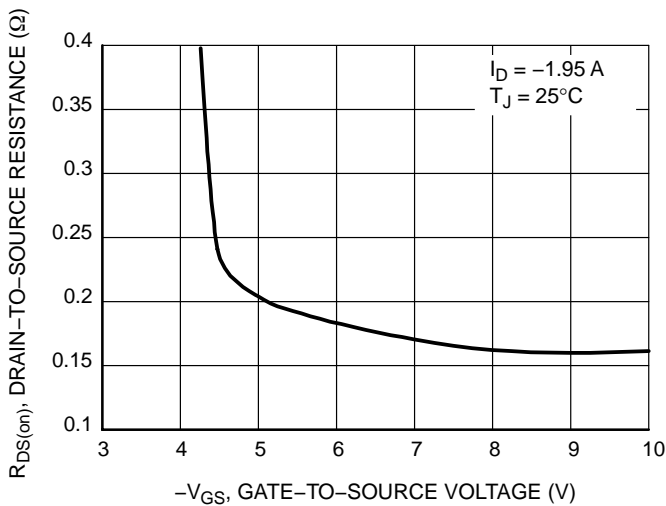


Figure 3. On-Resistance versus Gate-to-Source Voltage

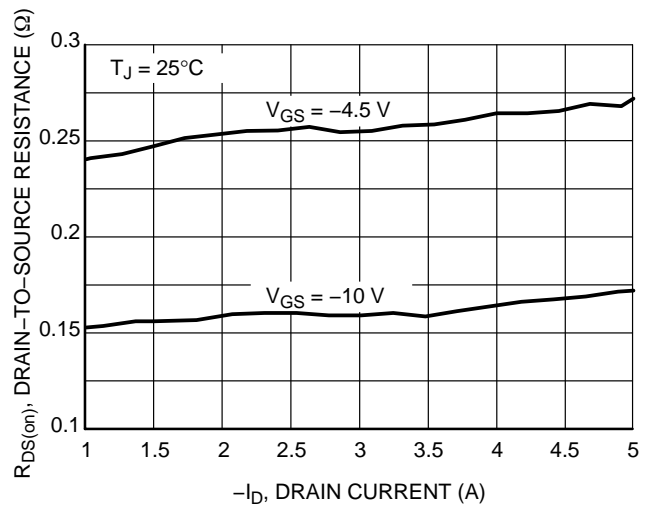


Figure 4. On-Resistance versus Drain Current and Gate Voltage

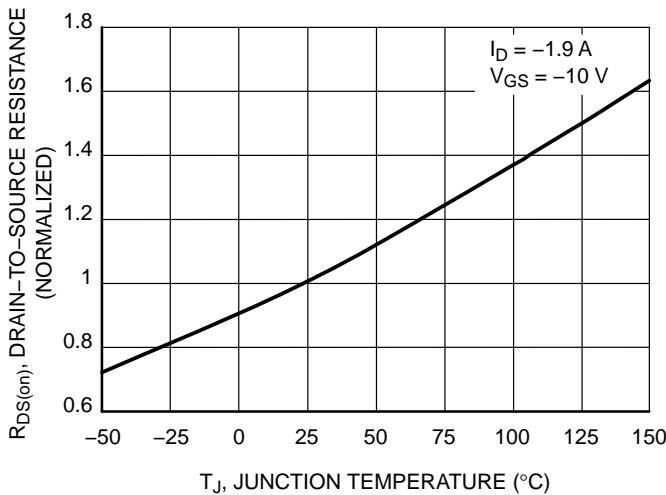


Figure 5. On-Resistance Variation with Temperature

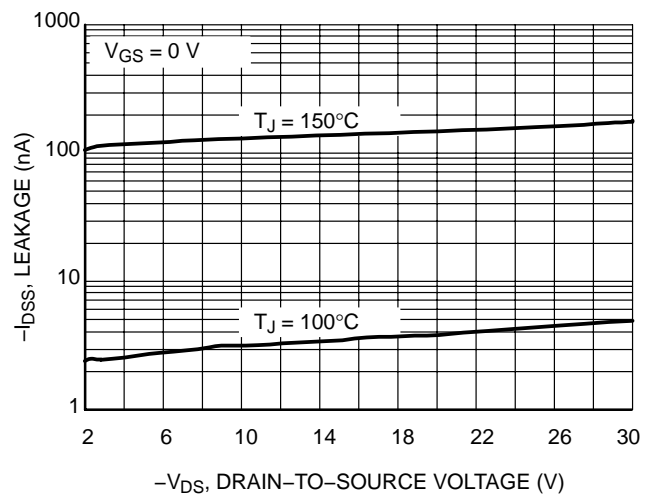


Figure 6. Drain-to-Source Leakage Current versus Voltage

# NTR4502P

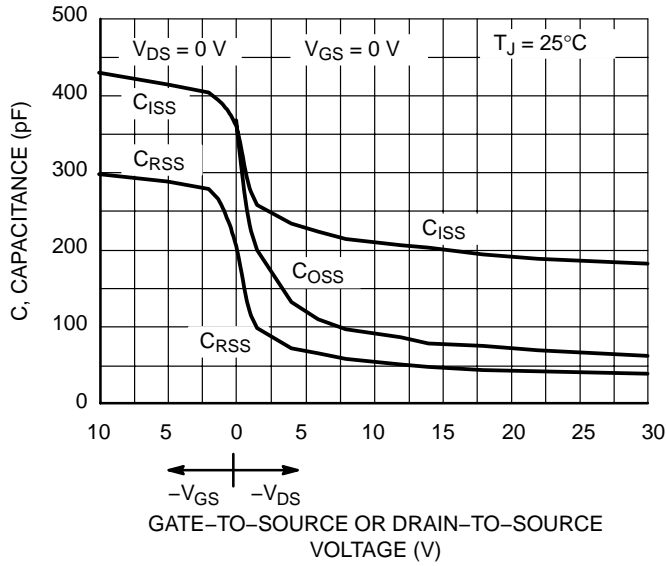


Figure 7. Capacitance Variation

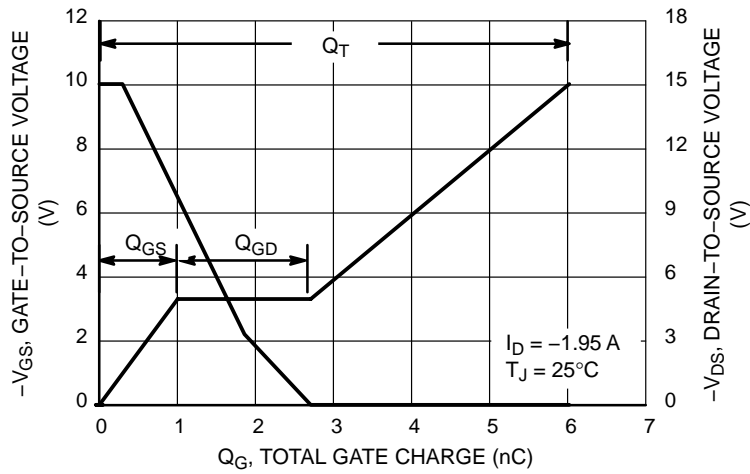


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

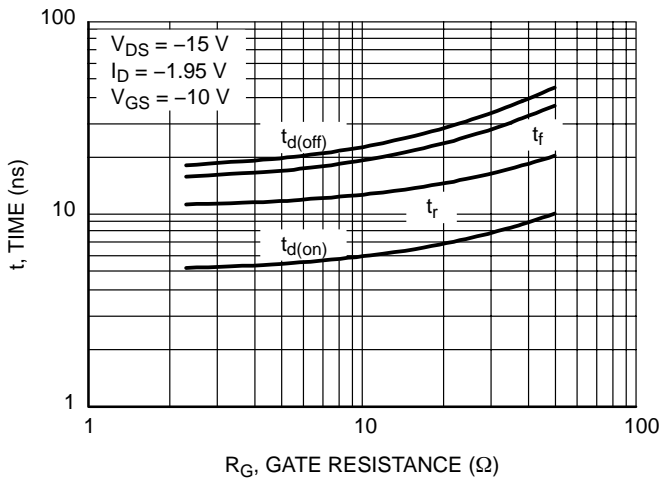


Figure 9. Resistive Switching Time Variation versus Gate Resistance

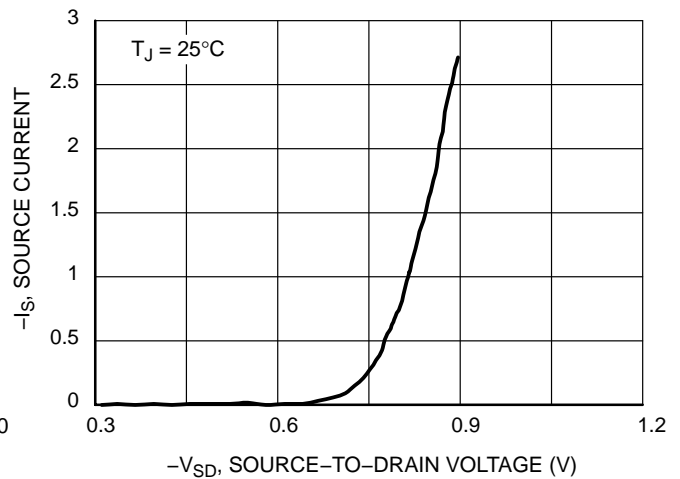
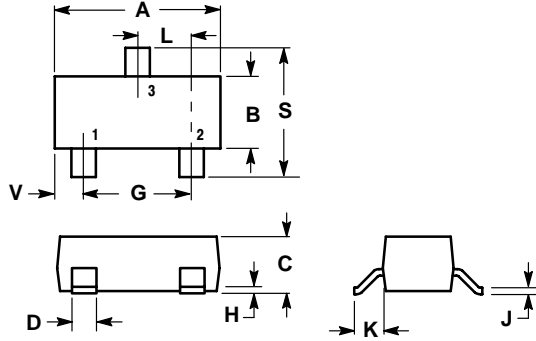


Figure 10. Diode Forward Voltage versus Current

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## PACKAGE DIMENSIONS

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



**NOTES:**

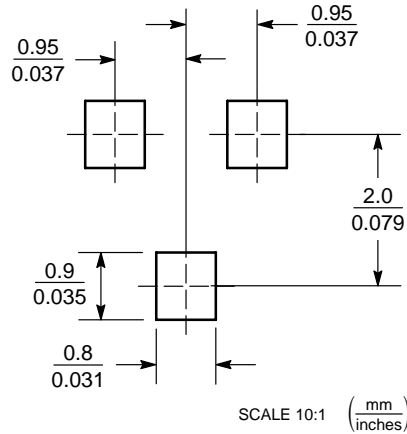
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318-01 THRU -07 AND -09 OBSOLETE, NEW STANDARD 318-08.

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.

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