

# MOSFET – Power, P-Channel, SOT-23

**-20 V, -400 mA**

## NTR0202PL, NVTR0202PL

### Features

- Low  $R_{DS(on)}$  Provides Higher Efficiency and Extends Battery Life  
 $R_{DS(on)} = 0.80 \Omega$ ,  $V_{GS} = -10 \text{ V}$   
 $R_{DS(on)} = 1.10 \Omega$ ,  $V_{GS} = -4.5 \text{ V}$
- Miniature SOT-23 Surface Mount Package Saves Board Space
- NVT 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

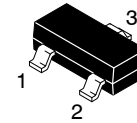
### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Rating	Value	Unit
$V_{DSS}$	Drain-to-Source Voltage	-20	V
$V_{GS}$	Gate-to-Source Voltage - Continuous	$\pm 20$	V
$I_D$ $I_{DM}$	Continuous Drain Current @ $T_A = 25^\circ\text{C}$ Pulsed Drain Current ( $t_p \leq 10 \mu\text{s}$ )	-0.4 -1.0	A
$P_D$	Total Power Dissipation @ $T_A = 25^\circ\text{C}$ (Note 1)	225	mW
$T_J$ , $T_{stg}$	Operating and Storage Temperature Range	-55 to 150	$^\circ\text{C}$
$R_{\theta JA}$	Thermal Resistance - Junction-to-Ambient	556	$^\circ\text{C}/\text{W}$
$I_S$	Source Current (Body Diode)	0.4	A
$T_L$	Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 s	260	$^\circ\text{C}$

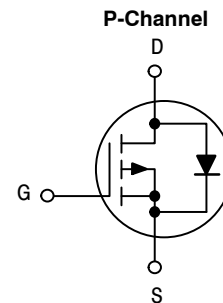
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Pulse Test: Pulse Width  $\leq 300 \mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

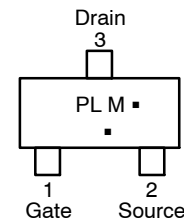
$V_{(BR)DSS}$	$R_{DS(on)}$ Typ	$I_D$ MAX
-20 V	550 m $\Omega$ @ -10 V	-400 mA



**SOT-23  
CASE 318  
STYLE 21**



### MARKING DIAGRAM & PIN ASSIGNMENT



PL = Specific Device Code  
M = Date Code\*  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\* For additional marking information, refer to Application Note [AND8002/D](#).

See detailed ordering, marking and shipping information in the package dimensions section on page 4 of this data sheet.

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 4.

# NTR0202PL, NVTR0202PL

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C unless otherwise noted)

Symbol	Characteristic	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

V <sub>(BR)DSS</sub>	Drain-to-Source Breakdown Voltage (V <sub>GS</sub> = 0 V, I <sub>D</sub> = -10 μA) (Positive Temperature Coefficient)	-20	33		V mV/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current (V <sub>DS</sub> = -20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 25 °C) (V <sub>DS</sub> = -20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 150 °C)			-1.0 -10	μA
I <sub>GSS</sub>	Gate-Body Leakage Current (V <sub>GS</sub> = ± 20 V, V <sub>DS</sub> = 0 V)			±100	nA

### ON CHARACTERISTICS (Note 2)

V <sub>GS(th)</sub>	Gate Threshold Voltage (V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 μA) (Negative Temperature Coefficient)	-1.1	-1.9 3.0	-2.3	V mV/°C
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance (V <sub>GS</sub> = -10 V, I <sub>D</sub> = -200 mA) (V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -50 mA)		0.55 0.80	0.80 1.10	Ω
g <sub>fs</sub>	Forward Transconductance (V <sub>DS</sub> = -10 V, I <sub>D</sub> = -200 mA)		0.5		Mhos

### DYNAMIC CHARACTERISTICS

C <sub>iss</sub>	Input Capacitance	(V <sub>DS</sub> = -5.0 V, V <sub>GS</sub> = 0 V, F = 1.0 MHz)	70		pF
C <sub>oss</sub>	Output Capacitance		74		
C <sub>rss</sub>	Reverse Transfer Capacitance		26		

### SWITCHING CHARACTERISTICS (Note 3)

t <sub>d(on)</sub>	Turn-On Delay Time	(V <sub>DD</sub> = -15 V, I <sub>D</sub> = -200 mA, V <sub>GS</sub> = -10 V, R <sub>G</sub> = 6.0 Ω)	3.0		ns
t <sub>r</sub>	Rise Time		6.0		
t <sub>d(off)</sub>	Turn-Off Delay Time		18		
t <sub>f</sub>	Fall Time		4		
Q <sub>TOT</sub>	Total Gate Charge	(V <sub>DS</sub> = -15 V, I <sub>D</sub> = -200 mA, V <sub>GS</sub> = -10 V)	2.18		nC
Q <sub>GS</sub>	Gate-Source Charge		0.41		
Q <sub>GD</sub>	Gate-Drain Charge		0.40		

### BODY-DRAIN DIODE CHARACTERISTICS (Note 2)

V <sub>SD</sub>	Diode Forward Voltage (Note 2) (I <sub>S</sub> = -400 mA, V <sub>GS</sub> = 0 V) (I <sub>S</sub> = -400 mA, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 150 °C)		-0.8 -0.65	-1.0	V
t <sub>rr</sub>	Reverse Recovery Time	(I <sub>S</sub> = -1.0 A, V <sub>GS</sub> = 0 V, dI <sub>S</sub> /dt = 100 A/μs)	11.8		ns
t <sub>a</sub>			9		
t <sub>b</sub>			3		
Q <sub>RR</sub>	Reverse Recovery Stored Charge	(I <sub>S</sub> = -1.0 A, V <sub>GS</sub> = 0 V, dI <sub>S</sub> /dt = 100 A/μs)	0.007		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.

2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

3. Switching characteristics are independent of operating junction temperature.

TYPICAL CHARACTERISTICS

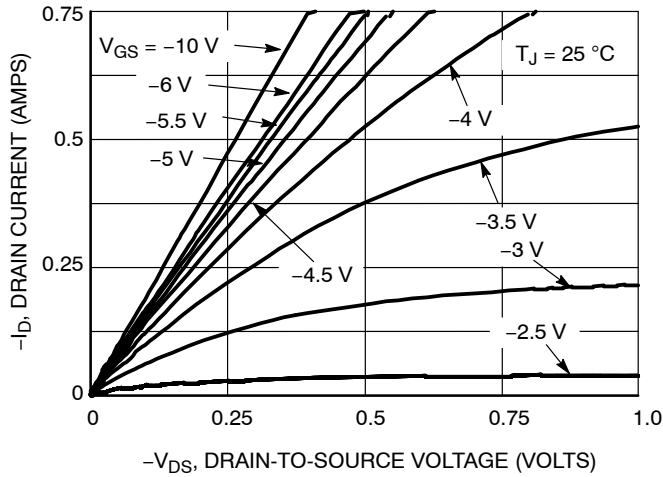


Figure 1. On-Region Characteristics

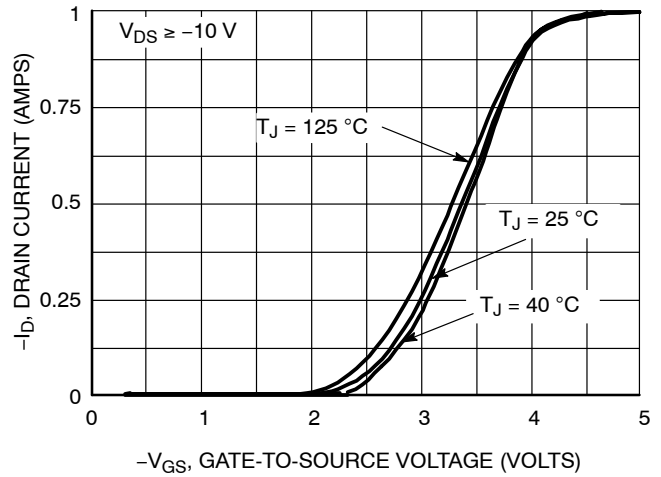


Figure 2. Transfer Characteristics

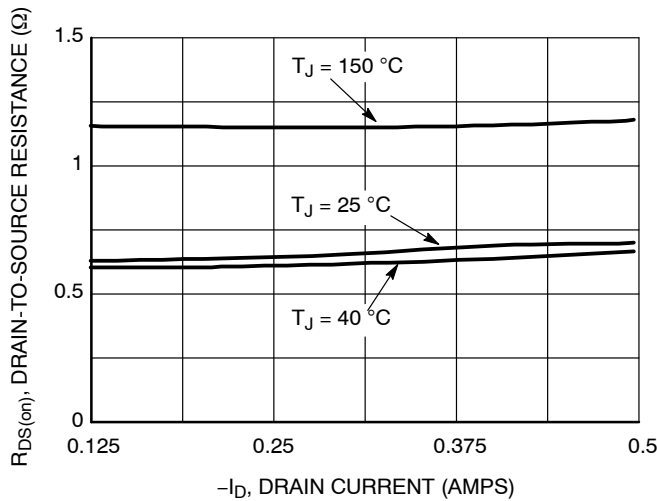


Figure 3. On-Resistance versus Drain Current

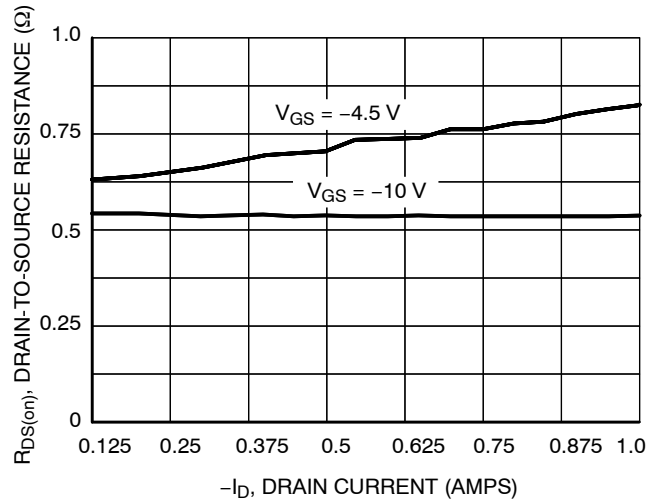


Figure 4. On-Resistance versus Drain Current and Gate Voltage

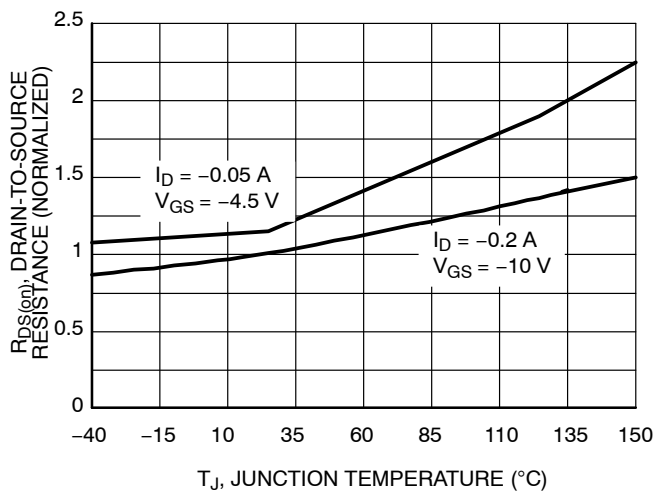


Figure 5. On-Resistance Variation with Temperature

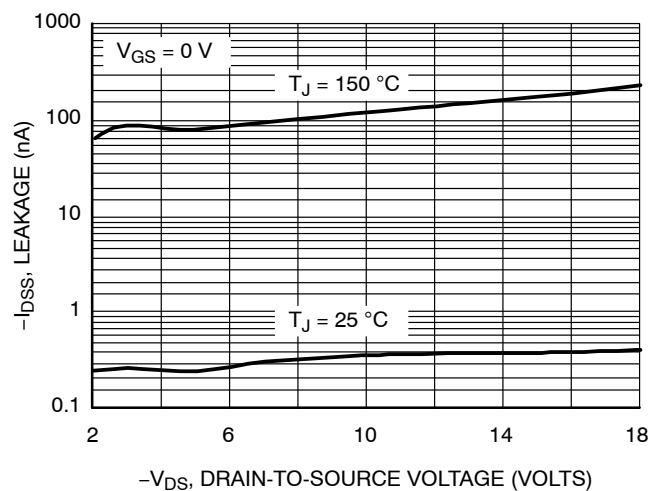


Figure 6. Drain-to-Source Leakage Current versus Voltage

## TYPICAL CHARACTERISTICS (continued)

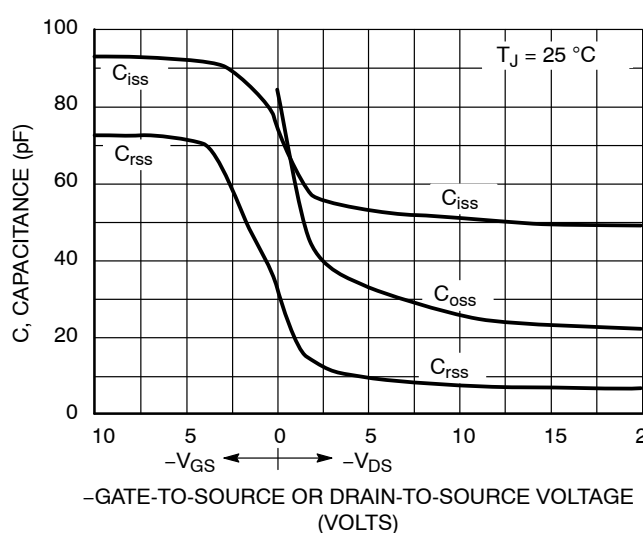


Figure 7. Capacitance Variation

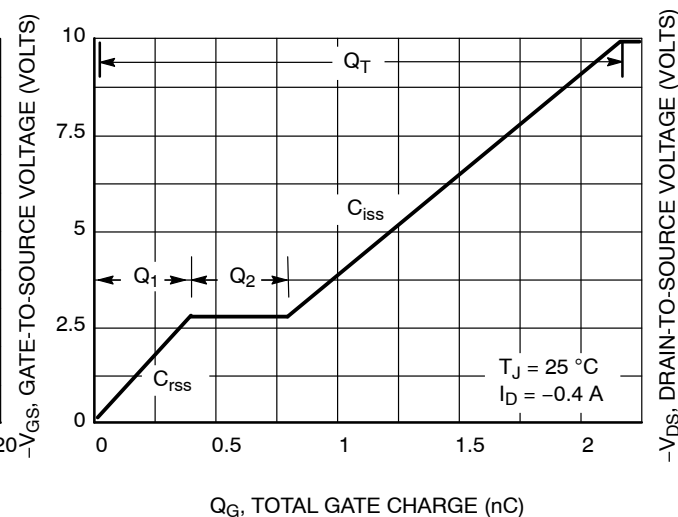


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

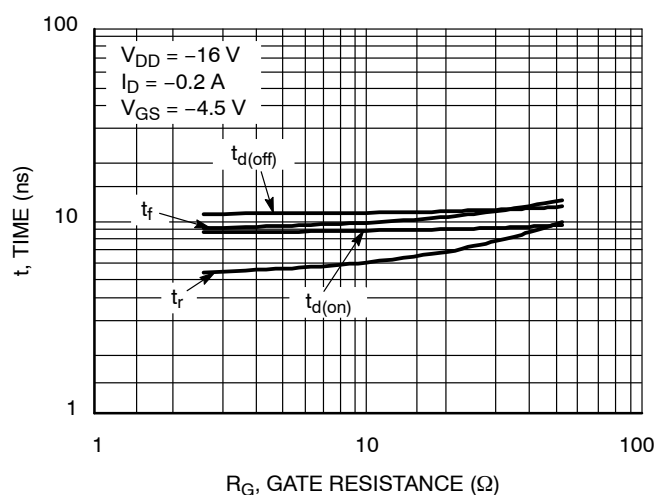


Figure 9. Resistive Switching Time Variation versus Gate Resistance

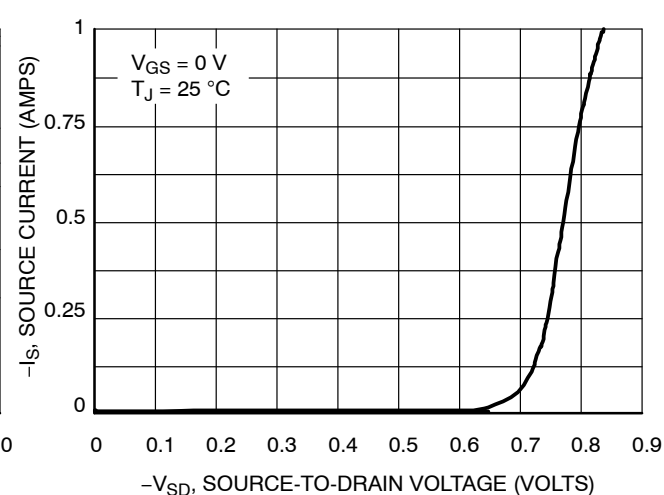


Figure 10. Diode Forward Voltage versus Current

## DEVICE ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
NTR0202PLT1G	SOT-23 (Pb-Free)	3,000 / Tape & Reel

## DISCONTINUED (Note 4)

NTR0202PLT3G	SOT-23 (Pb-Free)	10,000 / Tape & Reel
NVTR0202PLT1G	SOT-23 (Pb-Free)	3,000 / Tape & Reel

<sup>†</sup> 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](#).

4. **DISCONTINUED:** This device is not available. Please contact your onsemi representative for information. The most current information on this device may be available on [www.onsemi.com](http://www.onsemi.com).

## NTR0202PL, NVTR0202PL

### REVISION HISTORY

Revision	Description of Changes	Date
8	NVTR0202PLT1G OPN Marked as Discontinued.	7/15/2025

This document has undergone updates prior to the inclusion of this revision history table. The changes tracked here only reflect updates made on the noted approval dates.



SCALE 4:1

**SOT-23 (TO-236) 2.90x1.30x1.00 1.90P**  
CASE 318  
ISSUE AU

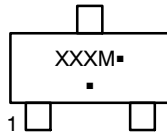
DATE 14 AUG 2024



MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.89	1.00	1.11
A1	0.01	0.06	0.10
b	0.37	0.44	0.50
c	0.08	0.14	0.20
D	2.80	2.90	3.04
E	1.20	1.30	1.40
e	1.78	1.90	2.04
L	0.30	0.43	0.55
L1	0.35	0.54	0.69
HE	2.10	2.40	2.64
T	0°	---	10°

## NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: 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.

**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. Some products may not follow the Generic Marking.



\* For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

**STYLES ON PAGE 2**

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**SOT-23 (TO-236) 2.90x1.30x1.00 1.90P**  
**CASE 318**  
**ISSUE AU**

DATE 14 AUG 2024

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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