

# NTR0202PL

### Features

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

### Applications

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

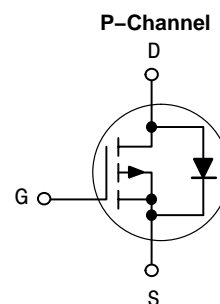
### MAXIMUM RATINGS ( $T_J = 25^\circ C$ unless otherwise noted)

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

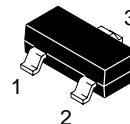
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

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

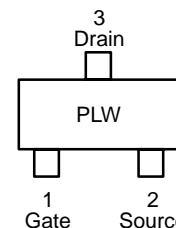
$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	$I_D$ MAX
-20 V	550 m $\Omega$ @ -10 V	-400 mA



### MARKING DIAGRAM/ PIN ASSIGNMENT



SOT-23  
CASE 318  
STYLE 21



PL = Specific Device Code  
W = Work Week

### ORDERING INFORMATION

Device	Package	Shipping†
NTR0202PLT1	SOT-23	3000 Tape & Reel
NTR0202PLT1G	SOT-23 (Pb-Free)	3000 Tape & Reel
NTR0202PLT3	SOT-23	10,000 Tape & Reel
NTR0202PLT3G	SOT-23 (Pb-Free)	10,000 Tape & Reel

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
----------------	--------	-----	-----	-----	------

**OFF CHARACTERISTICS**

Drain-to-Source Breakdown Voltage ( $V_{GS} = 0\text{ V}$ , $I_D = -10\ \mu\text{A}$ ) (Positive Temperature Coefficient)	$V_{(BR)DSS}$	-20	33		V mV/ $^\circ\text{C}$
Zero Gate Voltage Drain Current ( $V_{DS} = -20\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 25^\circ\text{C}$ ) ( $V_{DS} = -20\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 150^\circ\text{C}$ )	$I_{DSS}$			-1.0 -10	$\mu\text{A}$
Gate-Body Leakage Current ( $V_{GS} = \pm 20\text{ V}$ , $V_{DS} = 0\text{ V}$ )	$I_{GSS}$			$\pm 100$	nA

**ON CHARACTERISTICS** (Note 2)

Gate Threshold Voltage ( $V_{DS} = V_{GS}$ , $I_D = -250\ \mu\text{A}$ ) (Negative Temperature Coefficient)	$V_{GS(th)}$	-1.1	-1.9 3.0	-2.3	V mV/ $^\circ\text{C}$
Static Drain-to-Source On-Resistance ( $V_{GS} = -10\text{ V}$ , $I_D = -200\text{ mA}$ ) ( $V_{GS} = -4.5\text{ V}$ , $I_D = -50\text{ mA}$ )	$R_{DS(on)}$		0.55 0.80	0.80 1.10	$\Omega$
Forward Transconductance ( $V_{DS} = -10\text{ V}$ , $I_D = -200\text{ mA}$ )	$g_{fs}$		0.5		Mhos

**DYNAMIC CHARACTERISTICS**

Input Capacitance	$(V_{DS} = -5.0\text{ V}$ , $V_{GS} = 0\text{ V}$ , $F = 1.0\text{ MHz}$ )	$C_{iss}$		70	pF
Output Capacitance		$C_{oss}$		74	
Reverse Transfer Capacitance		$C_{rss}$		26	

**SWITCHING CHARACTERISTICS** (Note 3)

Turn-On Delay Time	$(V_{DD} = -15\text{ V}$ , $I_D = -200\text{ mA}$ , $V_{GS} = -10\text{ V}$ , $R_G = 6.0\ \Omega$ )	$t_{d(on)}$		3.0	ns
Rise Time		$t_r$		6.0	
Turn-Off Delay Time		$t_{d(off)}$		18	
Fall Time		$t_f$		4	
Total Gate Charge	$(V_{DS} = -15\text{ V}$ , $I_D = -200\text{ mA}$ , $V_{GS} = -10\text{ V}$ )	$Q_{TOT}$		2.18	nC
Gate-Source Charge		$Q_{GS}$		0.41	
Gate-Drain Charge		$Q_{GD}$		0.40	

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

Diode Forward Voltage (Note 2) ( $I_S = -400\text{ mA}$ , $V_{GS} = 0\text{ V}$ ) ( $I_S = -400\text{ mA}$ , $V_{GS} = 0\text{ V}$ , $T_J = 150^\circ\text{C}$ )	$V_{SD}$		-0.8 -0.65	-1.0	V
Reverse Recovery Time	$(I_S = -1.0\text{ A}$ , $V_{GS} = 0\text{ V}$ , $di_S/dt = 100\text{ A}/\mu\text{s}$ )	$t_{rr}$		11.8	ns
		$t_a$		9	
		$t_b$		3	
Reverse Recovery Stored Charge	$Q_{RR}$		0.007		$\mu\text{C}$

- Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2\%$ .
- Switching characteristics are independent of operating junction temperature.