NTR1P02LT1

Power MOSFET

–20 V, –1.3 A, P–Channel SOT–23 Package

These miniature surface mount MOSFETs low $R_{DS(on)}$ assure minimal power loss and conserve energy, making these devices ideal for use in space sensitive power management circuitry. Typical applications are DC–DC converters and power management in portable and battery–powered products such as computers, printers, PCMCIA cards, cellular and cordless telephones.

Features

- Low $R_{DS(on)}$ Provides Higher Efficiency and Extends Battery Life
- Miniature SOT–23 Surface Mount Package Saves Board Space
- Pb–Free Packages are Available

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}	±12	V
Drain Current – Continuous @ T_A = 25°C – Pulsed Drain Current ($t_p \le 10$ μs)	 I_D I_{DM}	 –1.3 –4.0	 A 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 Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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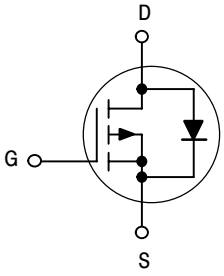
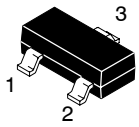
$V_{(BR)DSS}$	$R_{DS(on)}$ Max	I_D Max
–20 V	220 mΩ	–1.3 A

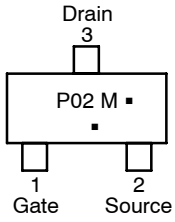
P–Channel



MARKING DIAGRAM & PIN ASSIGNMENT



SOT–23
CASE 318
STYLE 21



P02 = Specific Device Code
M = Date Code*
▪ = Pb–Free Package

(Note: Microdot may be in either location)
*Date Code orientation may vary depending upon manufacturing location.

ORDERING INFORMATION

Device	Package	Shipping†
NTR1P02LT1	SOT–23	3000 Tape & Reel
NTR1P02LT1G	SOT–23 (Pb–Free)	3000 Tape & Reel
NTR1P02LT3	SOT–23	10,000 Tape & Reel
NTR1P02LT3G	SOT–23 (Pb–Free)	10,000 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.

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)		$V_{(BR)DSS}$	−20			V
Zero Gate Voltage Drain Current (V_{DS} = −16 V, V_{GS} = 0 V) (V_{DS} = −16 V, V_{GS} = 0 V, T_J = 125°C)		I_{DSS}			−1.0 −10	μA
Gate−Body Leakage Current (V_{GS} = ± 12 V, V_{DS} = 0 V)		I_{GSS}			±100	nA
ON CHARACTERISTICS (Note 1)						
Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = −250 μA)		$V_{GS(th)}$	−0.7	−1.0	−1.25	V
Static Drain−to−Source On−Resistance (V_{GS} = −4.5 V, I_D = −0.75 A) (V_{GS} = −2.5 V, I_D = −0.5 A)		$r_{DS(on)}$		0.135 0.190	0.22 0.35	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	(V_{DS} = −5.0 V)	C_{iss}		225		pF
Output Capacitance	(V_{DS} = −5.0 V)	C_{oss}		130		
Transfer Capacitance	(V_{DG} = −5.0 V)	C_{rss}		55		
SWITCHING CHARACTERISTICS (Note 2)						
Turn−On Delay Time	(V_{DD} = −5.0 V, I_D = −1.0 A, R_L = 5.0 Ω, R_G = 6.0 Ω)	$t_{d(on)}$		7.0		ns
Rise Time		t_r		15		
Turn−Off Delay Time		$t_{d(off)}$		18		
Fall Time		t_f		20		
Total Gate Charge	(V_{DS} = −16 V, I_D = −1.5 A, V_{GS} = −4.0 V)	Q_T		5500		pC
SOURCE−DRAIN DIODE CHARACTERISTICS						
Continuous Current		I_S			−0.6	A
Pulsed Current		I_{SM}			−0.75	
Forward Voltage (Note 2) (V_{GS} = 0 V, I_S = −0.6 A)		V_{SD}			−1.0	V
Reverse Recovery Time	(I_S = −1.0 A, V_{GS} = 0 V, dI_S/dt = 100 A/μs)	t_{rr}		16		ns
		t_a		11		
		t_b		5.5		
Reverse Recovery Stored Charge		Q_{RR}		0.0085		μC

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

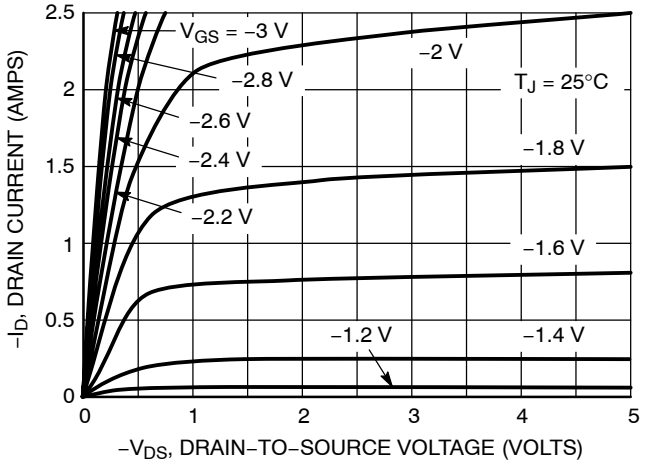


Figure 1. On−Region Characteristics

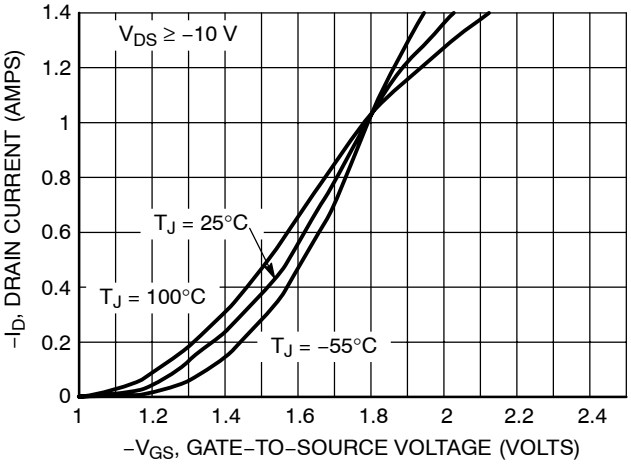


Figure 2. Transfer Characteristics

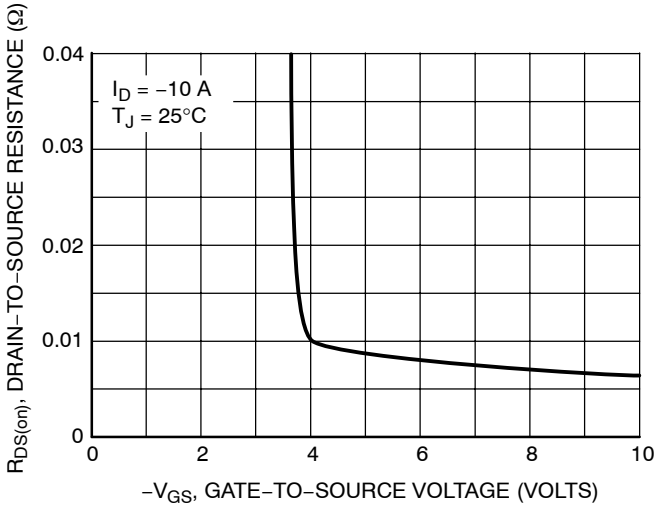


Figure 3. On−Resistance versus Gate−to−Source Voltage

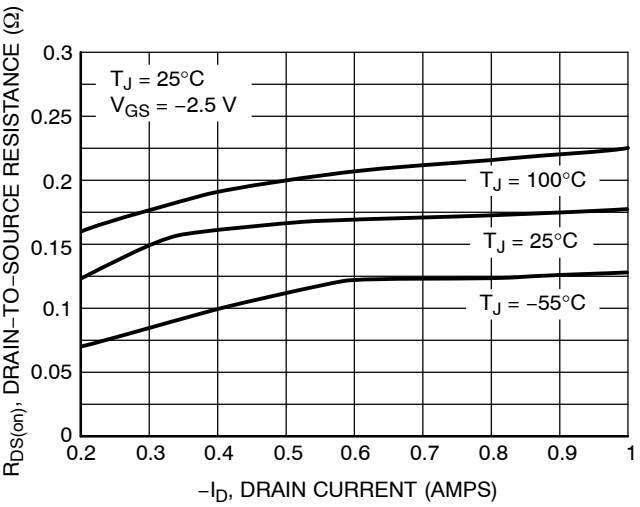


Figure 4. On−Resistance versus Drain Current and Gate Voltage

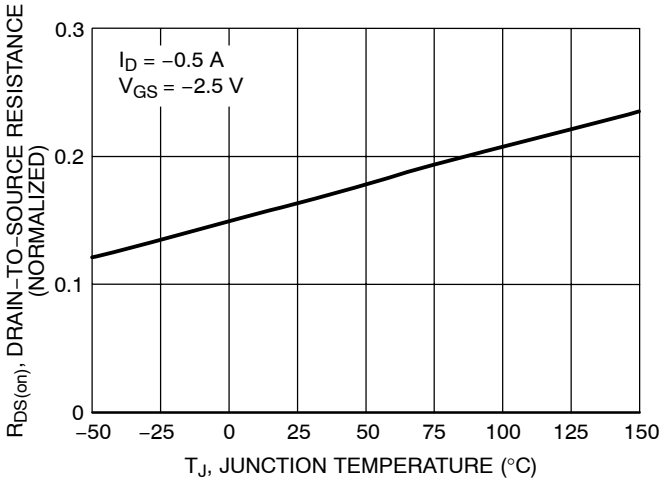


Figure 5. On−Resistance Variation with Temperature

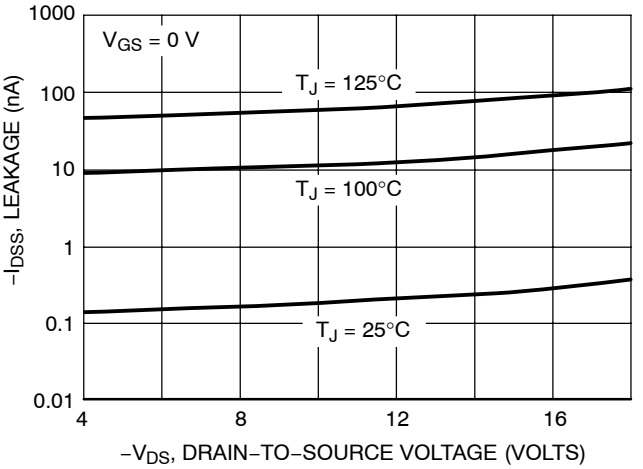


Figure 6. Drain−to−Source Leakage Current versus Voltage

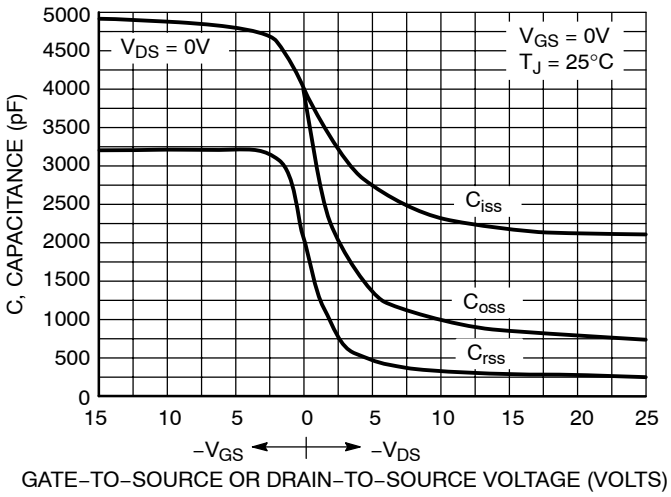


Figure 7. Capacitance Variation

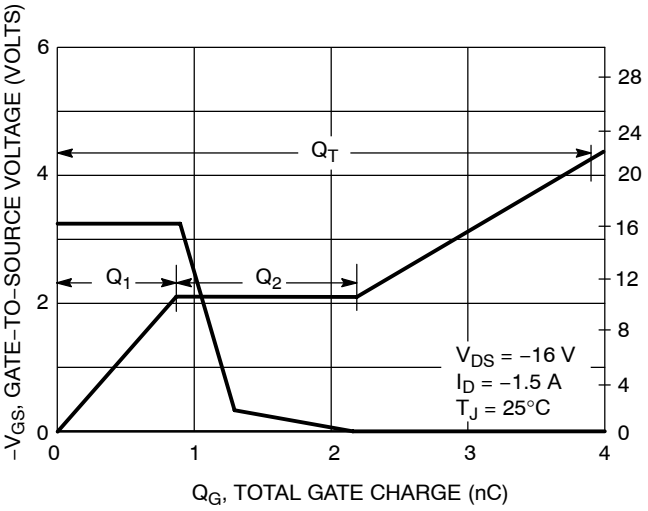


Figure 8. Gate−to−Source and Drain−to−Source Voltage versus Total Charge

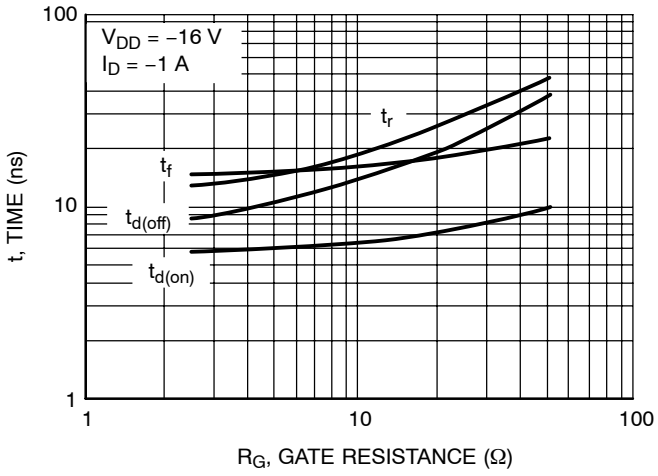


Figure 9. Resistive Switching Time Variation versus Gate Resistance

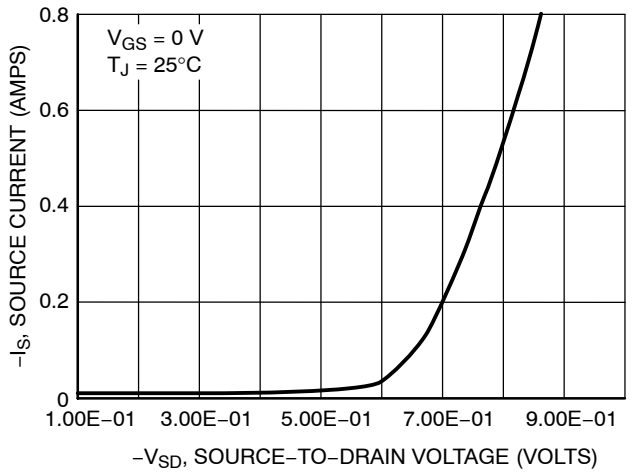
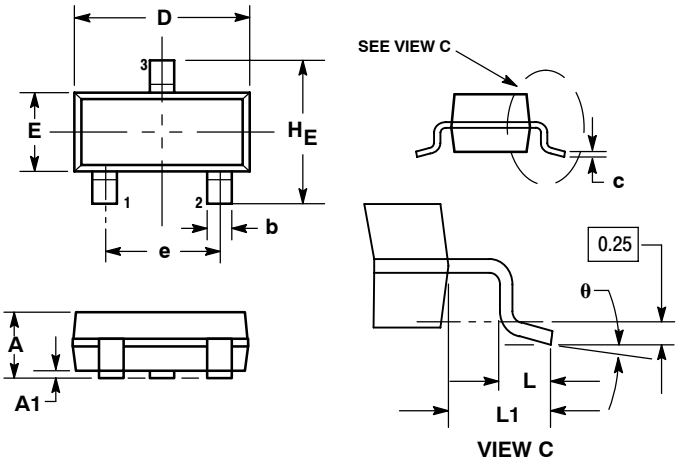


Figure 10. Diode Forward Voltage versus Current

PACKAGE DIMENSIONS

SOT−23 (TO−236)
CASE 318−08
ISSUE AN

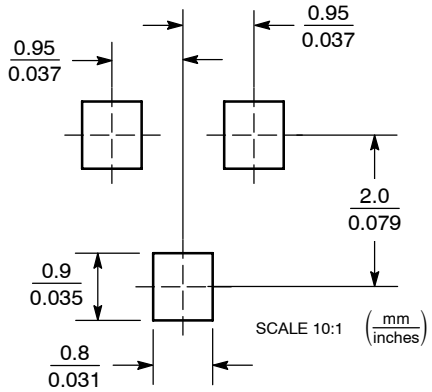


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318−01 THRU −07 AND −09 OBSOLETE, NEW STANDARD 318−08.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.040	0.044
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.37	0.44	0.50	0.015	0.018	0.020
c	0.09	0.13	0.18	0.003	0.005	0.007
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	0.081
L	0.10	0.20	0.30	0.004	0.008	0.012
L1	0.35	0.54	0.69	0.014	0.021	0.029
H_E	2.10	2.40	2.64	0.083	0.094	0.104

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.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
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