NTR5105P

Power MOSFET

–60 V, –211 mA, Single P–Channel SOT–23 Package

Features

- Trench Technology
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Small Signal Load Switch
- Analog Switch

ON Semiconductor®

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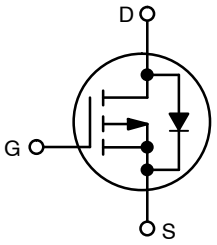
$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
–60 V	5 Ω @ –10 V	–211 mA
	6 Ω @ –4.5 V	

P–Channel



MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

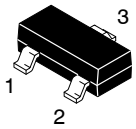
Parameter			Symbol	Value	Unit
Drain–to–Source Voltage			V_{DSS}	–60	V
Gate–to–Source Voltage			V_{GS}	±20	V
Continuous Drain Current (Note 1)	Steady State	T_A = 25°C	I_D	–196	mA
		T_A = 85°C		–141	
	t ≤ 5 s	T_A = 25°C		–211	
		T_A = 85°C		–152	
Power Dissipation (Note 1)	Steady State	T_A = 25°C	P_D	347	mW
	t ≤ 5 s			403	
Pulsed Drain Current	t_p = 10 μs		I_{DM}	–784	mA
Operating Junction and Storage Temperature			T_J, T_{stg}	–55 to 150	°C
Source Current (Body Diode) (Note 2)			I_S	–347	mA
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T_L	260	°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.

THERMAL RESISTANCE RATINGS

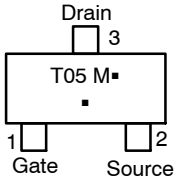
Parameter	Symbol	Max	Unit
Junction–to–Ambient – Steady State (Note 1)	$R_{\theta JA}$	360	°C/W
Junction–to–Ambient – t ≤ 5 s (Note 1)	$R_{\theta JA}$	310	°C/W

1. Surface–mounted on FR4 board using 1 in. sq. pad size (Cu area – 1.127 in. sq. [2 oz.] including traces).
2. Surface–mounted on FR4 board using the minimum recommended pad size of 30 mm2, 2 oz. Cu pad.



SOT–23
CASE 318
STYLE 21

MARKING DIAGRAM/ PIN ASSIGNMENT



T05 = 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†
NTR5105PT1G	SOT–23 (Pb–Free)	3000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = −250 μA		−60			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	Reference to 25°C, I_D = −250 μA			6.5		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = −60 V	T_J = 25°C			−1.0	μA
			T_J = 125°C			−10	
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V				±100	nA
ON CHARACTERISTICS (Note 3)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = −250 μA		−1.0		−3.0	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				4.2		mV/°C
Drain−to−Source On−Resistance	$R_{DS(on)}$	V_{GS} = −10 V, I_D = −100 mA			1.6	5.0	Ω
		V_{GS} = −4.5 V, I_D = −100 mA			2.2	6.0	
Forward Transconductance	g_{FS}	V_{DS} = −5.0 V, I_D = −100 mA			227		mS
CHARGES, CAPACITANCES & GATE RESISTANCE							
Input Capacitance	C_{iss}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = −25 V			30.3		pF
Output Capacitance	C_{oss}				4.7		
Reverse Transfer Capacitance	C_{rss}				3.2		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = −5 V, V_{DS} = −25 V, I_D = −100 mA			1.0		nC
Threshold Gate Charge	$Q_{G(TH)}$				0.2		
Gate−to−Source Charge	Q_{GS}				0.4		
Gate−to−Drain Charge	Q_{GD}				0.3		
SWITCHING CHARACTERISTICS (Note 4)							
Turn−On Delay Time	$t_{d(on)}$	V_{GS} = −5 V, V_{DD} = −48 V, I_D = −100 mA, R_G = 1 Ω			5.8		ns
Rise Time	t_r				4.0		
Turn−Off Delay Time	$t_{d(off)}$				8.8		
Fall Time	t_f				12.8		
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = −100 mA	T_J = 25°C		0.78	1.0	V
			T_J = 125°C		0.59		

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.

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

TYPICAL CHARACTERISTICS

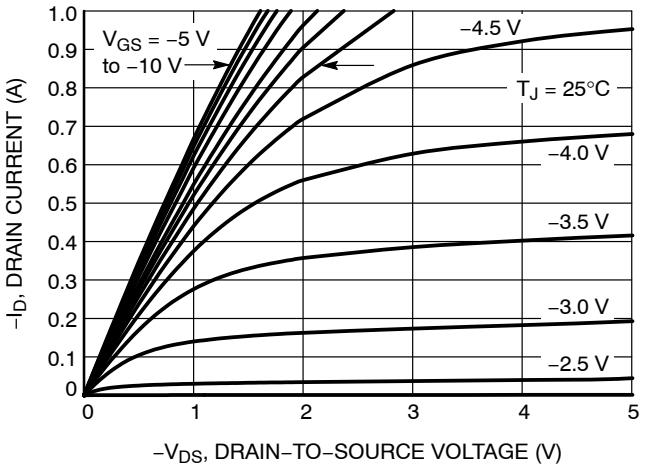


Figure 1. On−Region Characteristics

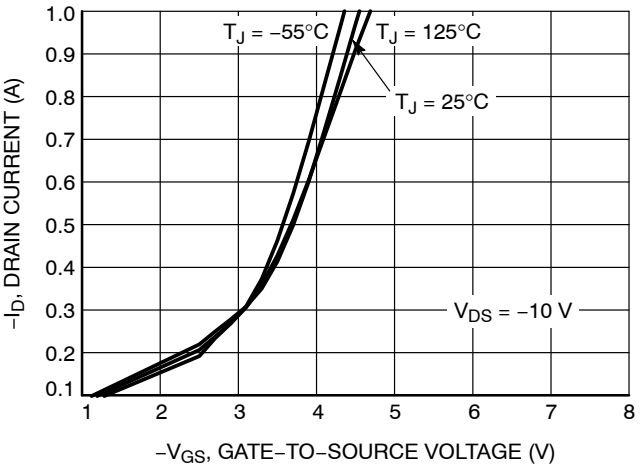


Figure 2. Transfer Characteristics

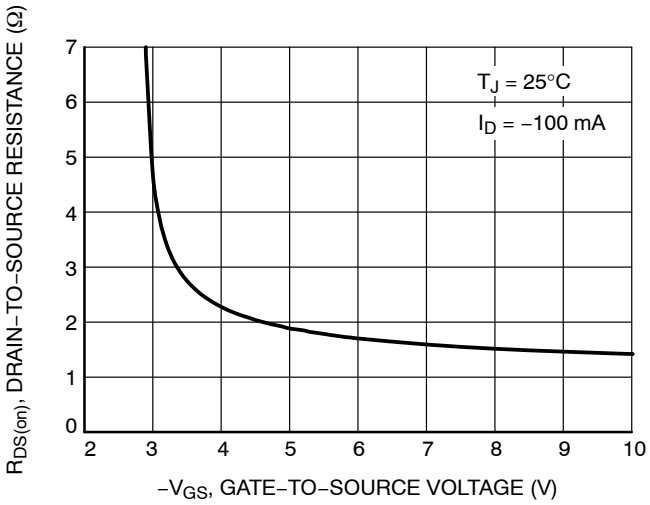


Figure 3. On−Resistance vs. Gate−to−Source Voltage

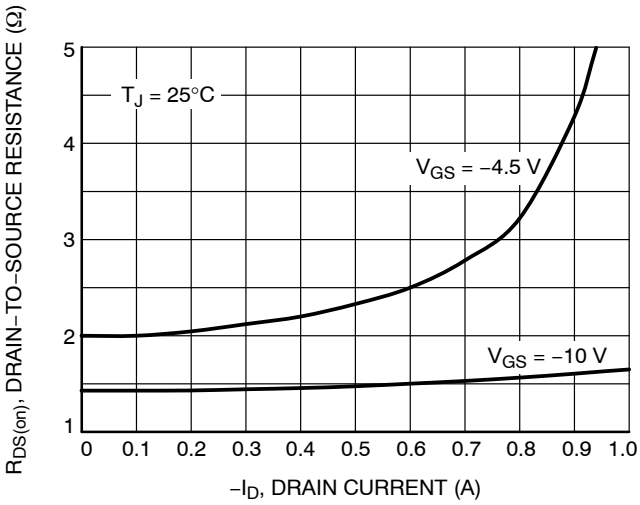


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

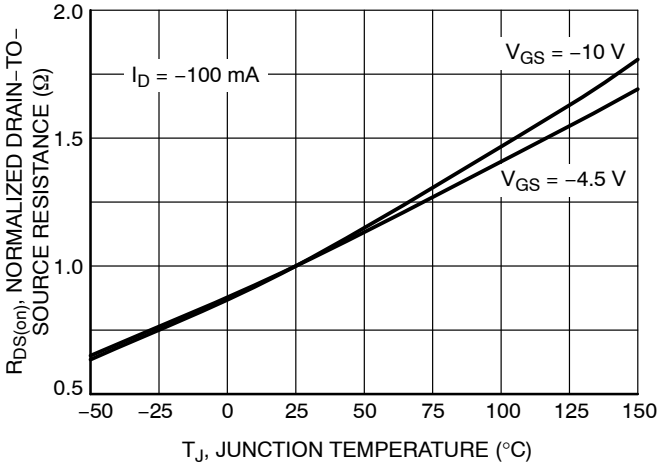


Figure 5. On−Resistance Variation with Temperature

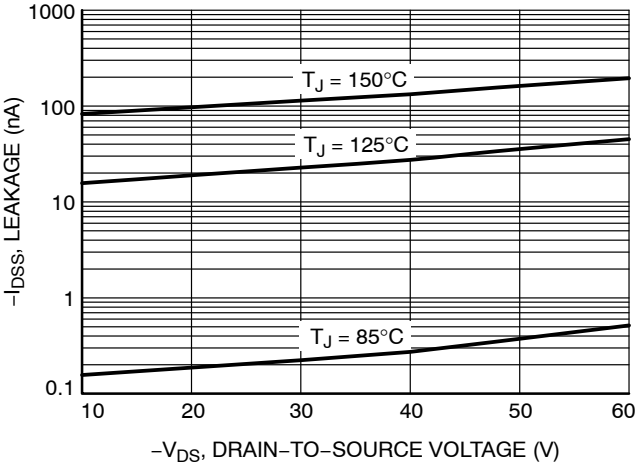


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

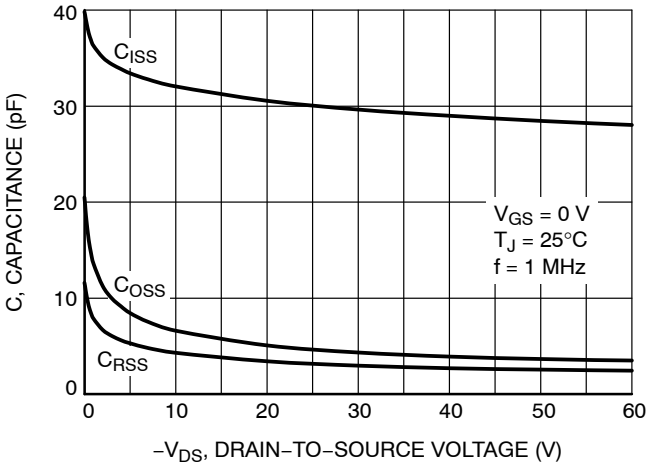


Figure 7. Capacitance Variation

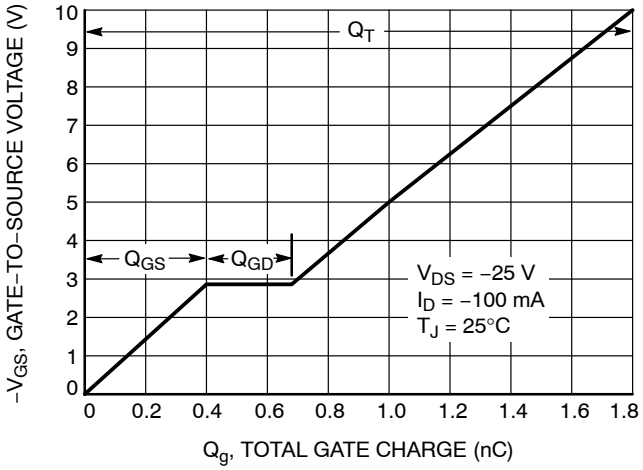


Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

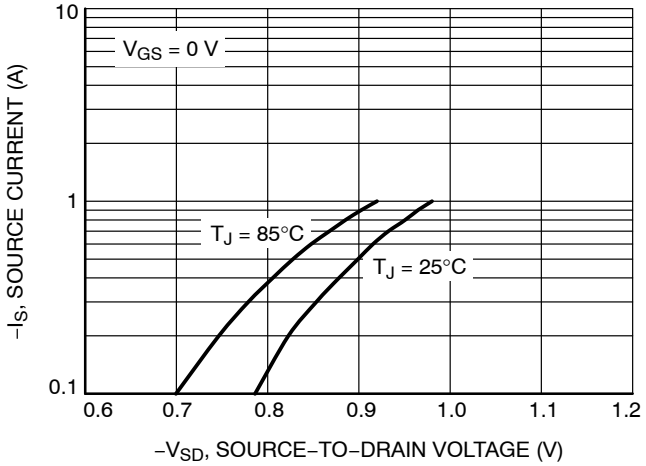


Figure 9. Diode Forward Voltage vs. Current

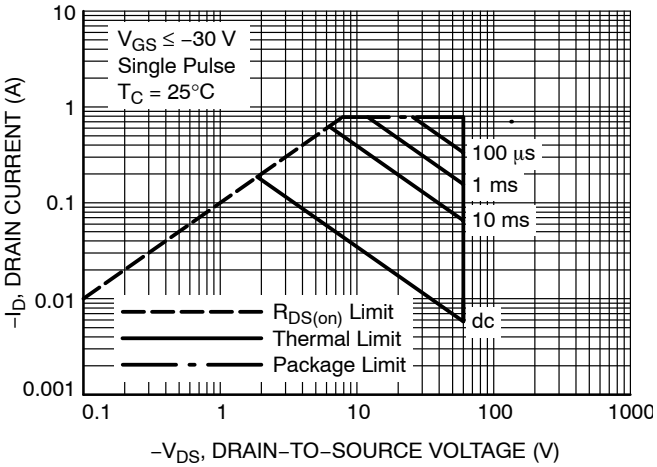


Figure 10. Maximum Rated Forward Biased Safe Operating Area

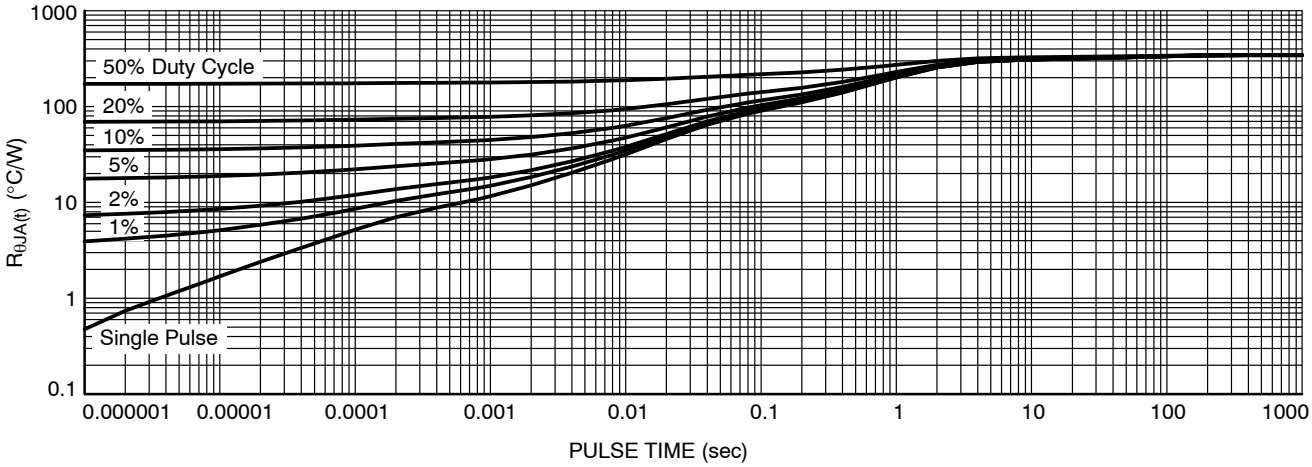
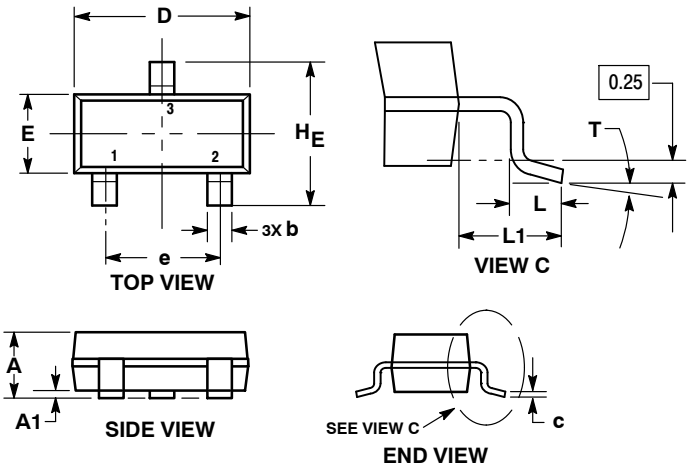


Figure 11. Thermal Response

PACKAGE DIMENSIONS

SOT−23 (TO−236)
CASE 318−08
ISSUE AR

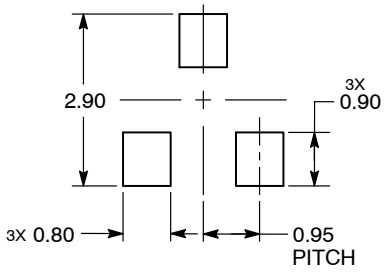


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.039	0.044
A1	0.01	0.06	0.10	0.000	0.002	0.004
b	0.37	0.44	0.50	0.015	0.017	0.020
c	0.08	0.14	0.20	0.003	0.006	0.008
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	0.080
L	0.30	0.43	0.55	0.012	0.017	0.022
L1	0.35	0.54	0.69	0.014	0.021	0.027
H_E	2.10	2.40	2.64	0.083	0.094	0.104
T	0°	−−−	10 °	0 °	−−−	10 °

STYLE 21:
PIN 1. GATE
2. SOURCE
3. DRAIN

RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*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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