

NTK3139P

MOSFET – Power, Single, P-Channel with ESD Protection, SOT-723

-20 V, -780 mA

Features

- P-channel Switch with Low $R_{DS(on)}$
- 44% Smaller Footprint and 38% Thinner than SC-89
- Low Threshold Levels Allowing 1.5 V $R_{DS(on)}$ Rating
- Operated at Low Logic Level Gate Drive
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Load/Power Switching
- Interfacing, Logic Switching
- Battery Management for Ultra Small Portable Electronics

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

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V_{DSS}	-20	V
Gate-to-Source Voltage			V_{GS}	± 6	V
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^{\circ}\text{C}$	I_D	-780	mA
		$T_A = 85^{\circ}\text{C}$		-570	
	$t \leq 5 \text{ s}$	$T_A = 25^{\circ}\text{C}$		-870	
Power Dissipation (Note 1)	Steady State	$T_A = 25^{\circ}\text{C}$	P_D	450	mW
	$t \leq 5 \text{ s}$			550	
Continuous Drain Current (Note 2)	Steady State	$T_A = 25^{\circ}\text{C}$	I_D	-660	mA
		$T_A = 85^{\circ}\text{C}$		-480	
Power Dissipation (Note 2)		$T_A = 25^{\circ}\text{C}$	P_D	310	mW
Pulsed Drain Current	$t_p = 10 \mu\text{s}$		I_{DM}	-1.2	A
Operating Junction and Storage Temperature			T_J, T_{STG}	-55 to 150	$^{\circ}\text{C}$
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T_L	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. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces)
2. Surface mounted on FR4 board using the minimum recommended pad size

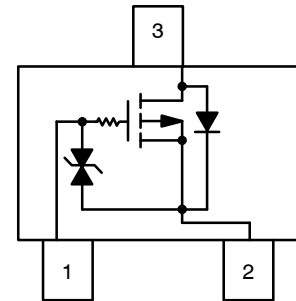


ON Semiconductor®

www.onsemi.com

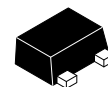
$V_{(BR)DS}$	$R_{DS(on)}$ TYP	I_D Max
-20 V	0.38 Ω @ -4.5 V	-780 mA
	0.52 Ω @ -2.5 V	-660 mA
	0.70 Ω @ -1.8 V	-100 mA
	0.95 Ω @ -1.5 V	-100 mA

SOT-723 (3-LEAD)



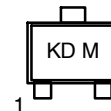
Top View

1 – Gate
2 – Source
3 – Drain



**SOT-723
CASE 631AA
STYLE 5**

MARKING DIAGRAM



KD = Specific Device Code
M = Date Code

ORDERING INFORMATION

Device	Package	Shipping†
NTK3139PT1G	SOT-723 Pb-Free	4000 / Tape & Reel
NTK3139PT1H		
NTK3139PT5G		
NTK3139PT5H		8000 / 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.

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	280	°C/W
Junction-to-Ambient – $t = 5$ s (Note 3)	$R_{\theta JA}$	228	
Junction-to-Ambient – Steady State Minimum Pad (Note 4)	$R_{\theta JA}$	400	

3. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces)
4. Surface mounted on FR4 board using the minimum recommended pad size

MOSFET ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
-----------	--------	----------------	-----	-----	-----	------

OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-20			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$I_D = -250\text{ }\mu\text{A}$, Reference to 25°C		-16.5		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = -16\text{ V}$	$T_J = 25^\circ\text{C}$		-1.0	μA
			$T_J = 125^\circ\text{C}$		-2.0	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 4.5\text{ V}$			± 2.0	μA

ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = -250\text{ }\mu\text{A}$	-0.45		-1.2	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			2.4		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -780\text{ mA}$		0.38	0.48	Ω
		$V_{GS} = -2.5\text{ V}, I_D = -660\text{ mA}$		0.52	0.67	
		$V_{GS} = -1.8\text{ V}, I_D = -100\text{ mA}$		0.70	0.95	
		$V_{GS} = -1.5\text{ V}, I_D = -100\text{ mA}$		0.95	2.20	
Forward Transconductance	g_{FS}	$V_{DS} = -10\text{ V}, I_D = -540\text{ mA}$		1.2		S
Gate Resistance	R_G	$T_A = 25^\circ\text{C}$		112		Ω

CHARGES, CAPACITANCES AND GATE RESISTANCE

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = -16\text{ V}$		113	170	pF
Output Capacitance	C_{OSS}			15	25	
Reverse Transfer Capacitance	C_{RSS}			9.0	15	

SWITCHING CHARACTERISTICS, $V_{GS} = 4.5\text{ V}$ (Note 6)

Turn On Delay Time	$t_{d(ON)}$	$V_{GS} = -4.5\text{ V}, V_{DS} = -10\text{ V}, I_D = -200\text{ mA}, R_G = 10\text{ }\Omega$		9.0		ns
Rise Time	t_r			5.8		
TurnOff Delay Time	$t_{d(OFF)}$			32.7		
Fall Time	t_f			20.3		

DRAIN SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = -350\text{ mA}$	$T_J = 25^\circ\text{C}$		-0.8	-1.2	V
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI_{SD}/dt = 100\text{ A}/\mu\text{s}, I_S = -1.0\text{ A}, V_{DD} = -20\text{ V}$		13.2			ns
Charge Time	t_a			11.8			
Discharge Time	t_b			1.4			
Reverse Recovery Charge	Q_{RR}			5.0			nC

5. Pulse Test: pulse width = 300 μs , duty cycle = 2%
6. Switching characteristics are independent of operating junction temperatures

TYPICAL CHARACTERISTICS

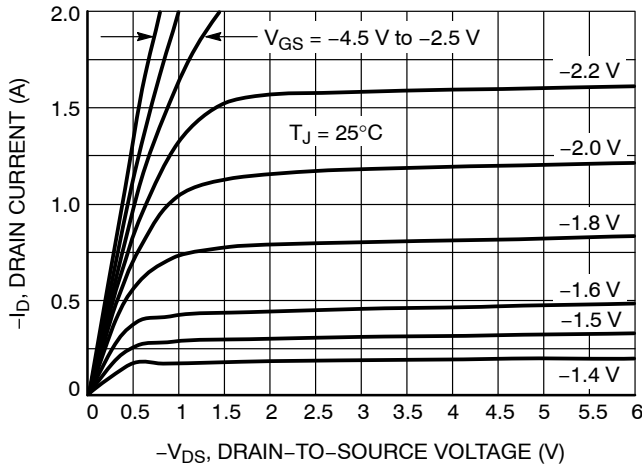


Figure 1. On-Region Characteristics

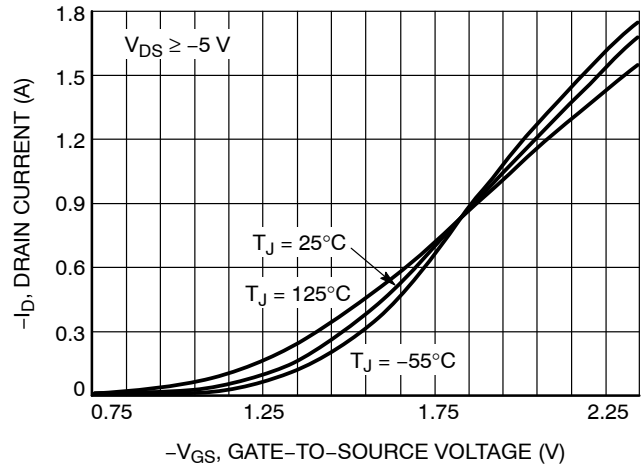


Figure 2. Transfer Characteristics

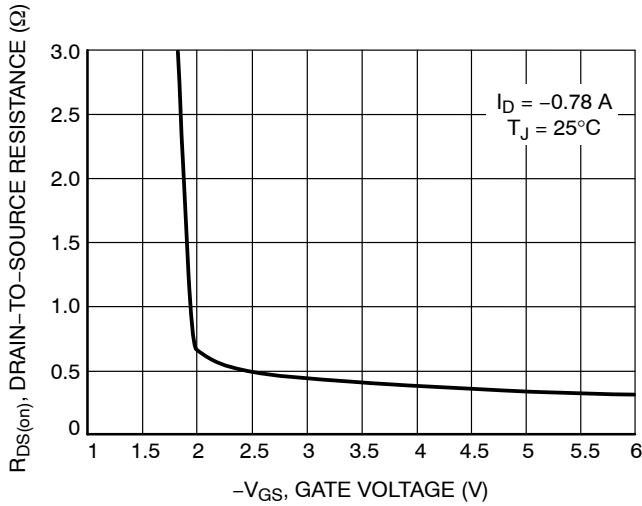


Figure 3. On-Resistance vs. Gate-to-Source Voltage

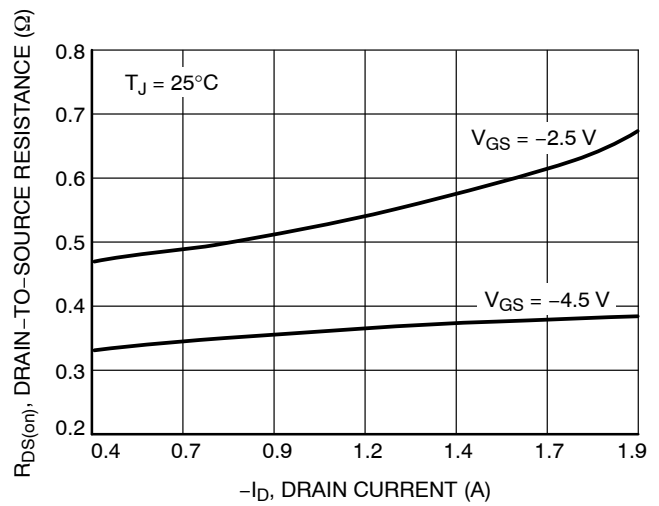


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

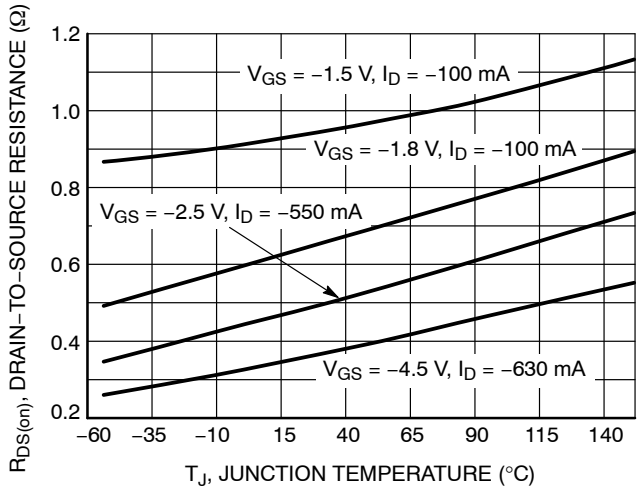


Figure 5. On-Resistance Variation with Temperature

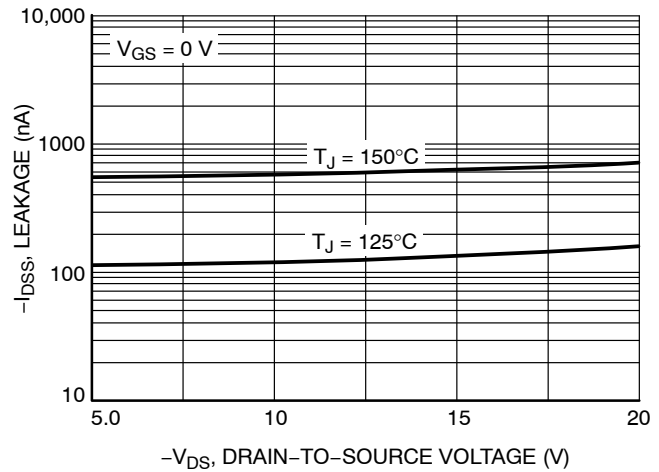


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

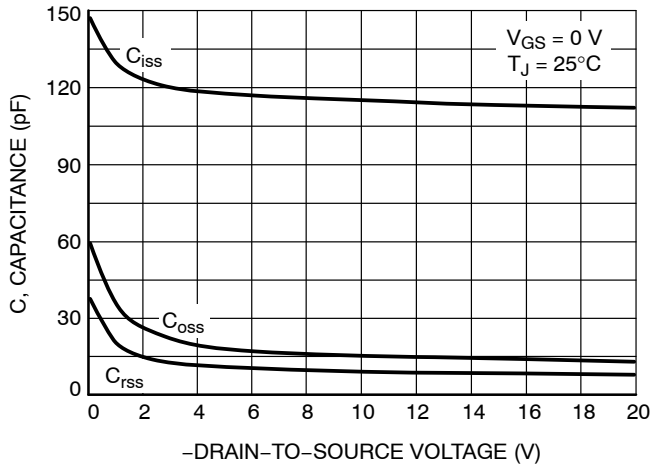


Figure 7. Capacitance Variation

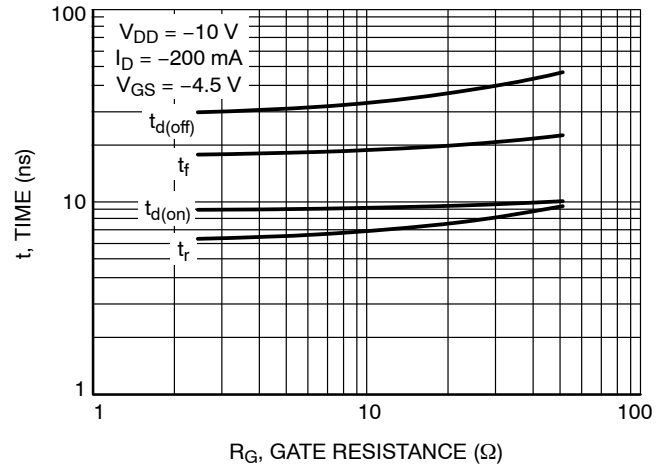


Figure 8. Resistive Switching Time Variation vs. Gate Resistance

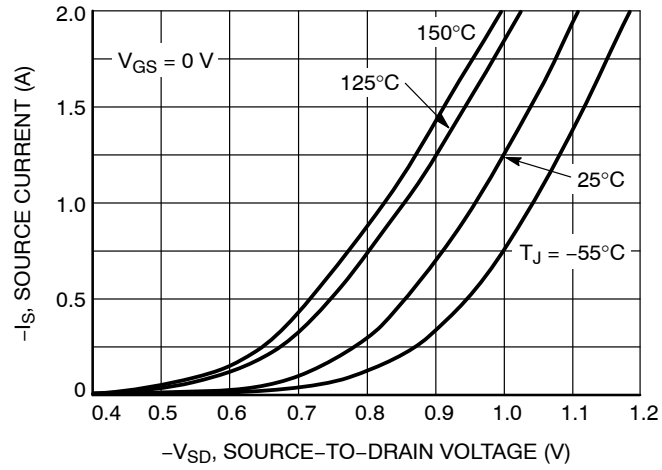
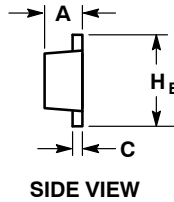
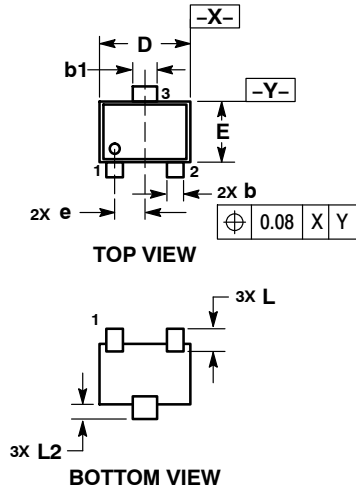


Figure 9. Diode Forward Voltage vs. Current

NTK3139P

PACKAGE DIMENSIONS

SOT-723
CASE 631AA
ISSUE D



NOTES:

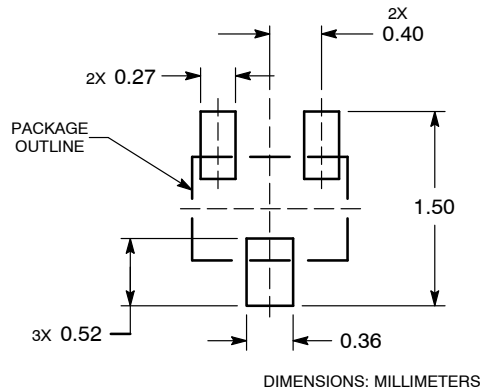
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.45	0.50	0.55
b	0.15	0.21	0.27
b1	0.25	0.31	0.37
C	0.07	0.12	0.17
D	1.15	1.20	1.25
E	0.75	0.80	0.85
e	0.40 BSC		
H_E	1.15	1.20	1.25
L	0.29 REF		
L2	0.15	0.20	0.25

STYLE 5:

1. GATE
2. SOURCE
3. DRAIN

RECOMMENDED 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.

ON Semiconductor and are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marketing.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910

ON Semiconductor Website: www.onsemi.com

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative