

NTMS4704N

Power MOSFET

30 V, 12.3 A, Single N-Channel, SO-8



ON Semiconductor®

<http://onsemi.com>

Features

- Low $R_{DS(on)}$
- Low Gate Charge
- Standard SO-8 Single Package
- Pb-Free Package is Available

Applications

- Notebooks, Graphics Cards
- Synchronous Rectification
- High Side Switch
- DC-DC Converters

$V_{(BR)DSS}$	$R_{DS(ON)}$ TYP	I_D MAX
30 V	7.5 m Ω @ 10 V	12.3 A
	10 m Ω @ 4.5 V	

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

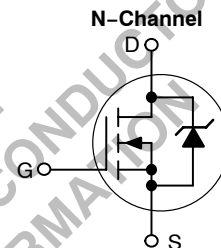
Parameter		Symbol	Value	Unit
Drain-to-Source Voltage		V_{DSS}	30	V
Gate-to-Source Voltage		V_{GS}	± 20	V
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	10	A
		$T_A = 85^\circ\text{C}$	7.3	
	$t \leq 10$ s	$T_A = 25^\circ\text{C}$	12.3	
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	1.6	W
	$t \leq 10$ s		2.3	
Continuous Drain Current (Note 2)	Steady State	$T_A = 25^\circ\text{C}$	7.6	A
		$T_A = 85^\circ\text{C}$	5.4	
Power Dissipation (Note 2)		$T_A = 25^\circ\text{C}$	0.86	W
Pulsed Drain Current	$t_p = 10$ μs	I_{DM}	37	A
Operating Junction and Storage Temperature		T_J, T_{stg}	-55 to 150	$^\circ\text{C}$
Source Current (Body Diode)		I_S	2.3	A
Single Pulse Drain-to-Source Avalanche Energy ($V_{DD} = 25$ V, $V_{GS} = 10$ V, I_L Peak = 7.5 A, $L = 10$ mH, $R_G = 25$ Ω)		E_{AS}	200	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 secs)		T_L	260	$^\circ\text{C}$

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Ambient - Steady State (Note 1)	$R_{\theta JA}$	80.5	$^\circ\text{C/W}$
Junction-to-Ambient - $t \leq 10$ s (Note 1)	$R_{\theta JA}$	55	
Junction-to-Ambient - Steady State (Note 2)	$R_{\theta JA}$	145	

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.

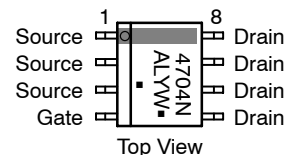
1. Surfaced mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).
2. Surfaced mounted on FR4 board using the minimum recommended pad size.



MARKING DIAGRAM/ PIN ASSIGNMENT



SO-8
CASE 751
STYLE 12



4704N = Device Code
A = Assembly Location
L = WaferLot
Y = Year
WW = Work Week
▪ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
NTMS4704NR2	SO-8	2500/Tape & Reel
NTMS4704NR2G	SO-8 (Pb-Free)	2500/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.

NTMS4704N

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	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			28		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 24\text{ V}$			1.0	μA
					50	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	1.0		2.5	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			5.0		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 12.3\text{ A}$		7.5	9.5	m Ω
		$V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$		10	12.5	
Forward Transconductance	g_{FS}	$V_{DS} = 15\text{ V}, I_D = 10\text{ A}$		20		S

CHARGES, CAPACITANCES AND GATE RESISTANCE

Input Capacitance	C_{iss}			1225		pF
Output Capacitance	C_{oss}	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 20\text{ V}$		580		
Reverse Transfer Capacitance	C_{rss}			125		
Total Gate Charge	$Q_{G(TOT)}$			12	17	nC
Threshold Gate Charge	$Q_{G(TH)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 10\text{ A}$		1.6		
Gate-to-Source Charge	Q_{GS}			3.25		
Gate-to-Drain Charge	Q_{GD}			5.25		
Gate Resistance	R_G			1.8		Ω

SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	$t_{d(on)}$			8.2		ns
Rise Time	t_r	$V_{GS} = 10\text{ V}, V_{DD} = 15\text{ V}, I_D = 1.0\text{ A}, R_G = 3.0\ \Omega$		5.4		
Turn-Off Delay Time	$t_{d(off)}$			28.4		
Fall Time	t_f			10.5		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 2.3\text{ A}$	$T_J = 25^\circ\text{C}$		0.75	1.0	V
			$T_J = 125^\circ\text{C}$		0.56		
Reverse Recovery Time	t_{RR}				35		ns
Charge Time	t_a	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, I_S = 2.3\text{ A}$			18		
Discharge Time	t_b				17		
Reverse Recovery Charge	Q_{RR}				33		nC

3. Pulse Test: pulse width = 300 μs , duty cycle $\leq 2\%$.

4. Switching characteristics are independent of operating junction temperatures.

TYPICAL PERFORMANCE CURVES

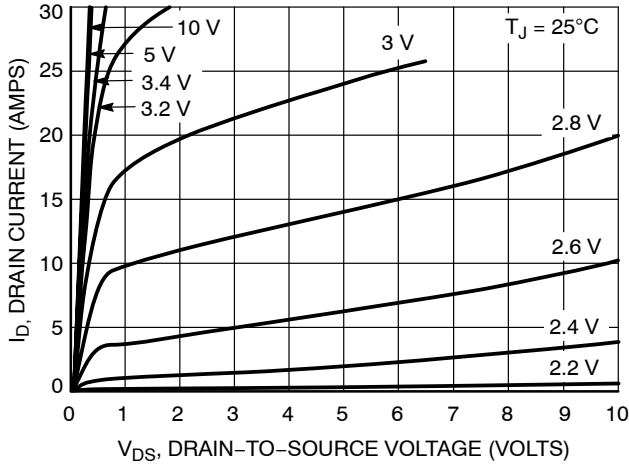


Figure 1. On-Region Characteristics

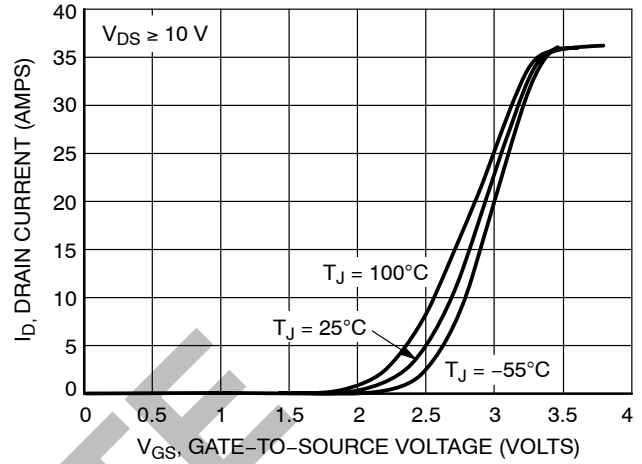


Figure 2. Transfer Characteristics

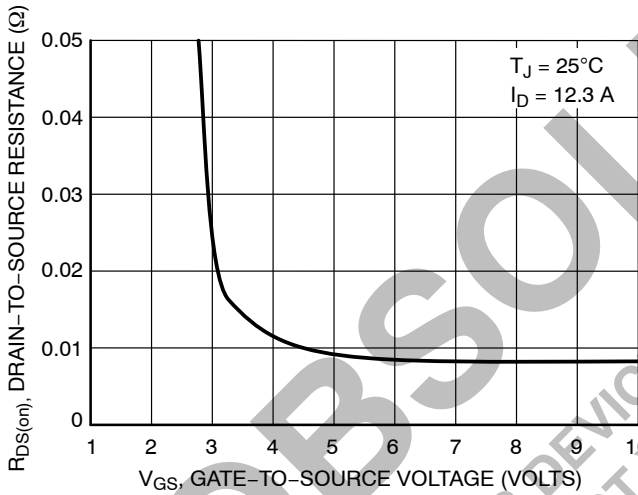


Figure 3. On-Resistance vs. Gate-to-Source Voltage

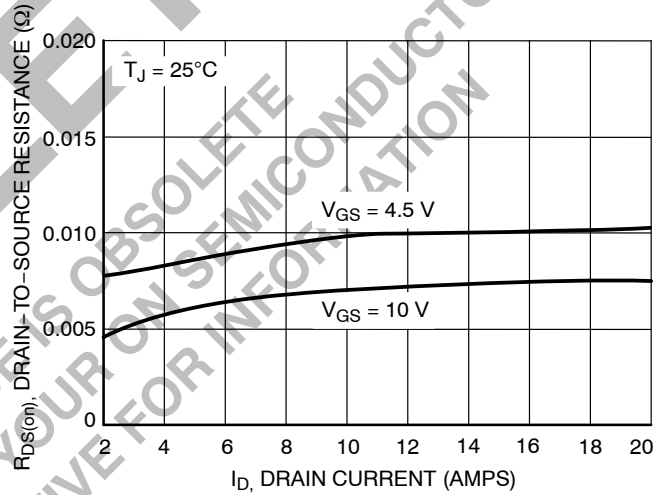


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

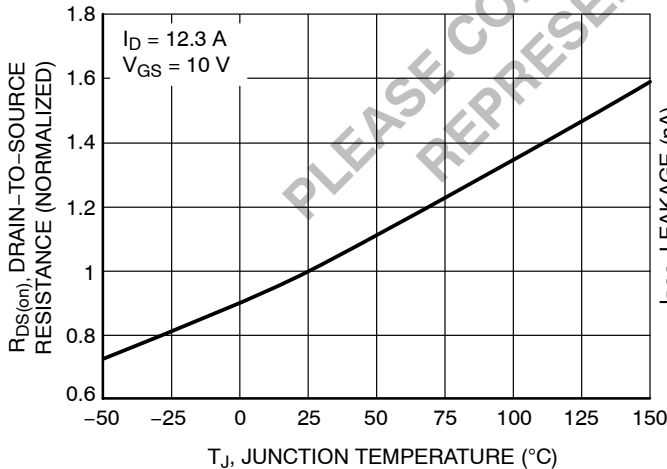


Figure 5. On-Resistance Variation with Temperature

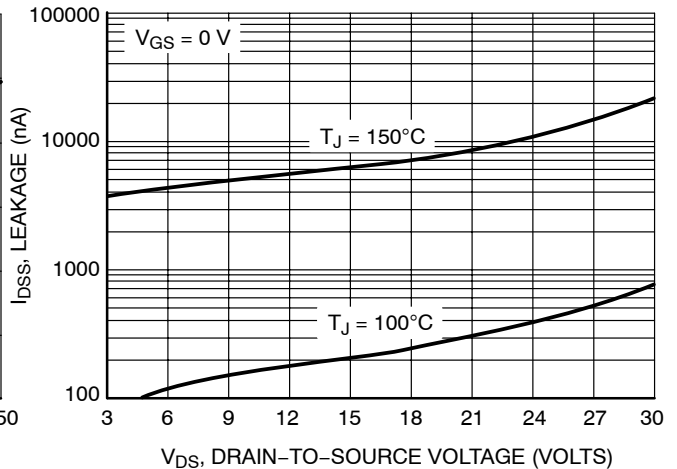
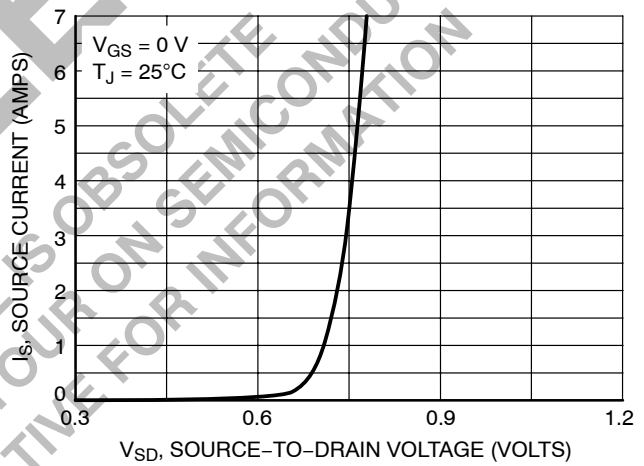
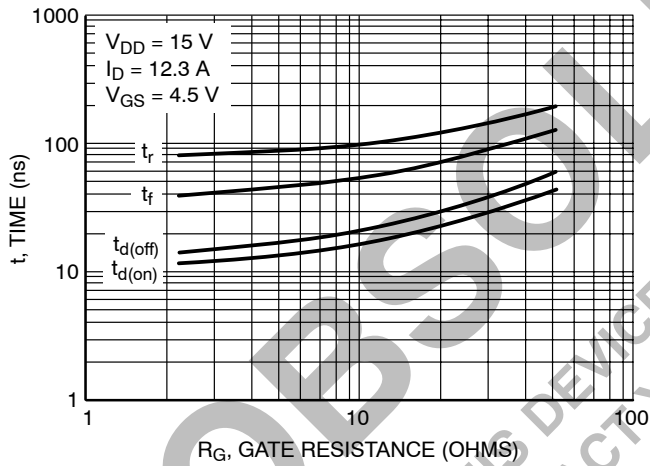
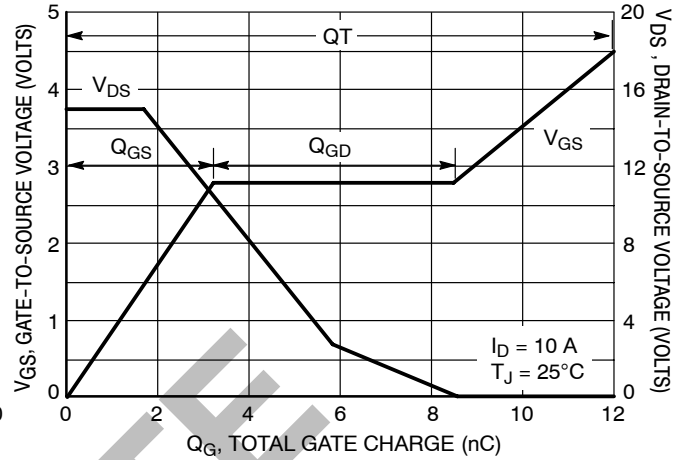
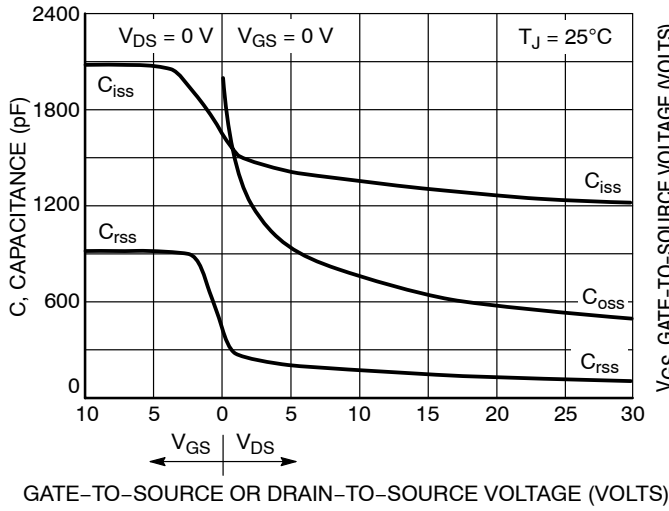


Figure 6. Drain-to-Source Leakage Current vs. Voltage

NTMS4704N

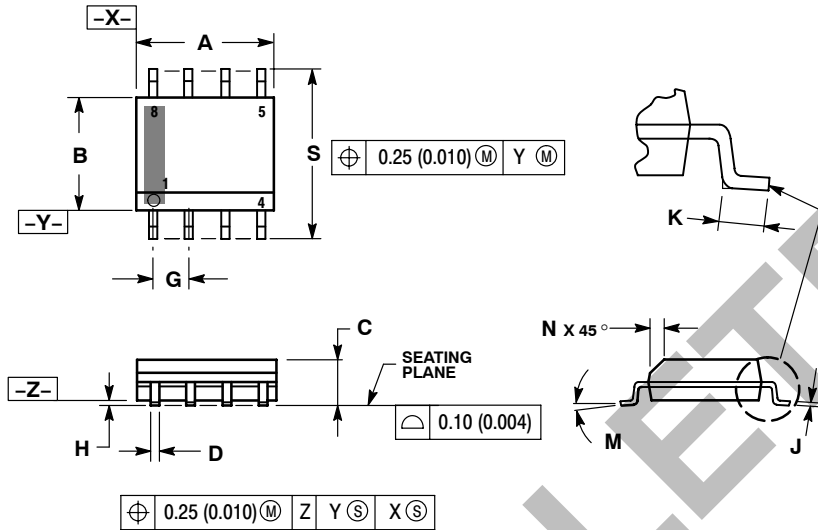
TYPICAL PERFORMANCE CURVES



NTMS4704N

PACKAGE DIMENSIONS

SOIC-8
CASE 751-07
ISSUE AG

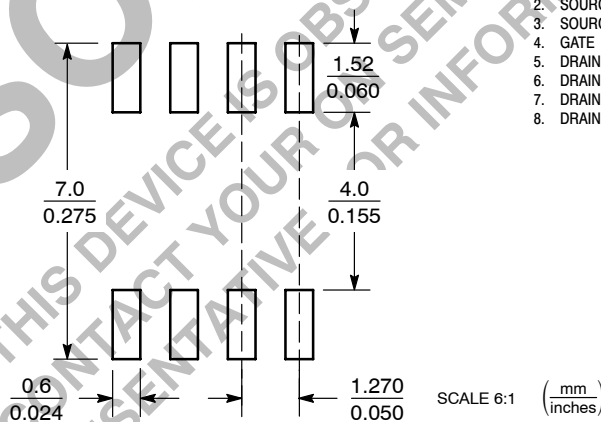


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0°	8°	0°	8°
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

SOLDERING FOOTPRINT*



STYLE 12:

1. SOURCE
2. SOURCE
3. SOURCE
4. GATE
5. DRAIN
6. DRAIN
7. DRAIN
8. DRAIN

*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 registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC 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. "Typical" parameters which may be provided in SCILLC 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. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC 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 SCILLC was negligent regarding the design or manufacture of the part. SCILLC 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
P.O. Box 5163, Denver, Colorado 80217 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
Japan Customer Focus Center
Phone: 81-3-5773-3850

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

For additional information, please contact your local Sales Representative