

# NTH4302

## Product Preview HD3e Quad N-Channel

The NTH4302 is the first integrated Quad FET in a single package. It is the integration of 4 planar TMOS devices. It uses the latest HD3e TMOS technology from ON Semiconductor, with very high cell density and improved switching capability

The NTH4302 is a 16-pin leadless device packaged in the new PInPAK™ from ON Semiconductor. The PInPAK is a new flexible power package that uses the MAP process. The NTH4302 uses the same MOSFET as the NTD60N02R. However, with the PInPAK package, various other pairs of MOSFETs can be used to create additional custom applications.

### Features

- Ultra Low  $R_{DS(on)}$  Provides Higher Efficiency
- Very Fast Switching due to Planar Technology and Leadless Package
- 200% Footprint Reduction Compared to Similar DPAK Solution for the Same Power
- Up to 80 Amp per FET
- Very Low  $V_f$  (0.8 mV) Ideal for Synchronous Rectification
- Specifically Designed for DC-DC Buck Converter in VRM9.1 Application (80 Amp Per Phase, 500 khz)

### Application

- DC-DC Converter
- Motherboard/Server Buck Converter
- Telecom/Industrial Power Supply
- Automotive Motor Drive
- H-Bridge

Application Note AND8086/D, "Board Mounting Notes for Quad Flat-Pack No-Lead Package (QFN)", is available on our web site [www.onsemi.com](http://www.onsemi.com).



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### QUAD TMOS POWER MOSFET

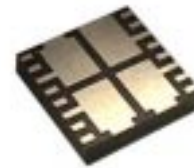
**40 AMPERES**

**24 VOLTS**

$R_{DS(on)} = 7.5 \text{ m}\Omega$

$C_{iss} = 2050 \text{ pF}$

$R_{\theta JC} = 1.3 \text{ }^\circ\text{C/W}$



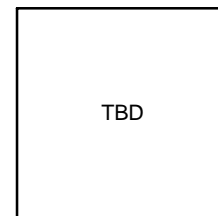
CASE TBD  
PInPAK

### MARKING DIAGRAM



xx = Specific Device Code  
A = Assembly Location  
WL, L = Wafer Lot  
YY, Y = Year  
WW, W = Work Week

### PINOUT DIAGRAM



### ORDERING INFORMATION

Device	Package	Shipping
NTH4301	ONIPAK	TBD

This document contains information on a product under development. ON Semiconductor reserves the right to change or discontinue this product without notice.

# NTH4302

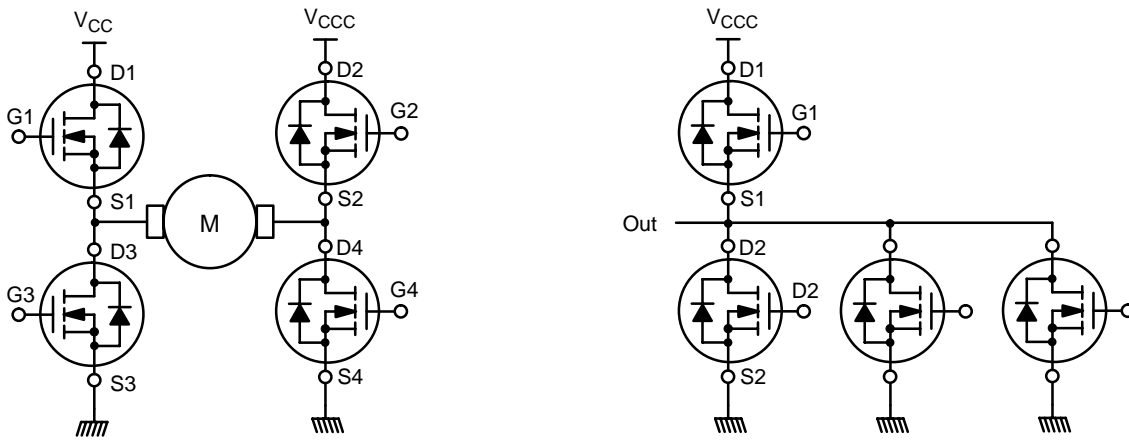


Figure 1.

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

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	$V_{DSS}$	24	Vdc
Drain-to-Gate Voltage	$V_{DGR}$	24	Vdc
Gate-to-Source Voltage	$V_{GS}$	$\pm 20$	Vdc
Operating and Storage Temperature	$T_J$ and $T_{stg}$	-55 to 150	$^\circ\text{C}$
Single Pulse Drain-to-Source Avalanche Energy - Starting $T_J = 25^\circ\text{C}$ (Note 1) ( $V_{DD} = 25 V_{dc}$ , $V_{GS} = 5 V_{dc}$ , $L = 0.1 \text{ mH}$ , $I_L(\text{pk}) = 20 \text{ A}$ , $R_g = 1 \text{ K}\Omega$ )	$E_{AS}$	450	mJ
Drain Current - Continuous @ $T_A = 25^\circ\text{C}$ - Continuous @ $T_A = 70^\circ\text{C}$ - Single Pulse ( $t_p \leq 10 \mu\text{s}$ )	$I_D$ $I_D$ $I_{DM}$	30 TBD TBD	A <sub>dc</sub>
Total Power Dissipation, $t \leq 10$ seconds Linear Derating Factor	$P_D @ T_A = 25^\circ\text{C}$	TBD	W mW/ $^\circ\text{C}$
Thermal Resistance - Junction-to-Case - Junction-to-Ambient - Junction-to-Ambient (Note 1)	$R_{\theta JC}$ $R_{\theta JA}$ $R_{\theta JA}$	1.5 30 TBD	$^\circ\text{C}/\text{W}$

1. When surface mounted to an FR4 board using 1" pad size, (Cu Area 1.127 in<sup>2</sup>).

# NTH4302

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Drain-to-Source Breakdown Voltage (V <sub>GS</sub> = 0 Vdc, I <sub>D</sub> = 250 μA)	V <sub>(BR)DSS</sub>	24	-	-	Vdc
Positive Temperature Coefficient		-	25	-	mV/°C
Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0 Vdc, V <sub>DS</sub> = 30 Vdc, T <sub>J</sub> = 25°C)	I <sub>DSS</sub>	-	-	1.0	μAdc
(V <sub>GS</sub> = 0 Vdc, V <sub>DS</sub> = 30 Vdc, T <sub>J</sub> = 125°C)		-	-	10	
Gate-Body Leakage Current (V <sub>GS</sub> = ±20 Vdc, V <sub>DS</sub> = 0 Vdc)	I <sub>GSS</sub>	-	-	±100	nAdc

## ON CHARACTERISTICS

Gate Threshold Voltage (V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μAdc)	V <sub>GS(th)</sub>	1.0	1.9	3.0	Vdc
Negative Threshold Temperature Coefficient		-	-3.8	-	
Static Drain-to-Source On-Resistance (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 20 Adc)	R <sub>DS(on)</sub>	-	0.0078	0.010	Ω
(V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 10 Adc)		-	0.0078	0.010	
(V <sub>GS</sub> = 4.5 Vdc, I <sub>D</sub> = 5.0 Adc)		-	0.010	0.013	
Forward Transconductance (V <sub>DS</sub> = 15 Vdc, I <sub>D</sub> = 10 Adc)	g <sub>FS</sub>	-	20	-	Mhos

## DYNAMIC CHARACTERISTICS

Input Capacitance	(V <sub>DS</sub> = 24 Vdc, V <sub>GS</sub> = 0 Vdc, f = 1.0 MHz)	C <sub>iss</sub>	-	2050	2400	pF
Output Capacitance		C <sub>oss</sub>	-	640	800	
Reverse Transfer Capacitance		C <sub>rss</sub>	-	225	310	

## SWITCHING CHARACTERISTICS (Note 2)

Turn-On Delay Time	(V <sub>DD</sub> = 25 Vdc, I <sub>D</sub> = 1.0 Vdc, V <sub>GS</sub> = 10 Adc, R <sub>G</sub> = 6.0 Ω)	t <sub>d(on)</sub>	-	11	20	ns
Rise Time		t <sub>r</sub>	-	15	25	
Turn-Off Delay Time		t <sub>d(off)</sub>	-	85	130	
Fall Time		t <sub>f</sub>	-	55	90	
Turn-On Delay Time	(V <sub>DD</sub> = 25 Vdc, I <sub>D</sub> = 1.0 Vdc, V <sub>GS</sub> = 10 Adc, R <sub>G</sub> = 2.5 Ω)	t <sub>d(on)</sub>	-	11	20	ns
Rise Time		t <sub>r</sub>	-	13	20	
Turn-Off Delay Time		t <sub>d(off)</sub>	-	55	90	
Fall Time		t <sub>f</sub>	-	40	75	
Turn-On Delay Time	(V <sub>DD</sub> = 24 Vdc, I <sub>D</sub> = 20 Vdc, V <sub>GS</sub> = 10 Adc, R <sub>G</sub> = 2.5 Ω)	t <sub>d(on)</sub>	-	15	-	ns
Rise Time		t <sub>r</sub>	-	25	-	
Turn-Off Delay Time		t <sub>d(off)</sub>	-	40	-	
Fall Time		t <sub>f</sub>	-	58	-	
Gate Charge	(V <sub>DS</sub> = 24 Vdc, I <sub>D</sub> = 2.0 Adc, V <sub>GS</sub> = 10 Vdc)	Q <sub>T</sub>	-	55	80	nC
		Q <sub>gs</sub> (Q1)	-	5.5	-	
		Q <sub>gd</sub> (Q2)	-	15	-	

## BODY-DRAIN DIODE RATINGS (Note 3)

Diode Forward On-Voltage (I <sub>S</sub> = 2.3 Adc, V <sub>GS</sub> = 0 Vdc)	V <sub>SD</sub>	-	0.75	1.0	Vdc	
(I <sub>S</sub> = 20 Adc, V <sub>GS</sub> = 0 Vdc)		-	0.90	-		
(I <sub>S</sub> = 2.3 Adc, V <sub>GS</sub> = 0 Vdc, T <sub>J</sub> = 125°C)		-	0.65	-		
Reverse Recovery Time	(I <sub>S</sub> = 2.3 Adc, V <sub>GS</sub> = 0 Vdc, dI <sub>S</sub> /dt = 100 A/μs)	t <sub>rr</sub>	-	30	65	ns
		t <sub>a</sub>	-	20	-	
		t <sub>b</sub>	-	19	-	
Reverse Recovery Stored Charge	Q <sub>rr</sub>	-	0.043	-	μC	

- Switching characteristics are independent of operating junction temperature.
- Indicates Pulse Test: Pulse Width ≤ 300 μsec max, Duty Cycle ≤ 2%.

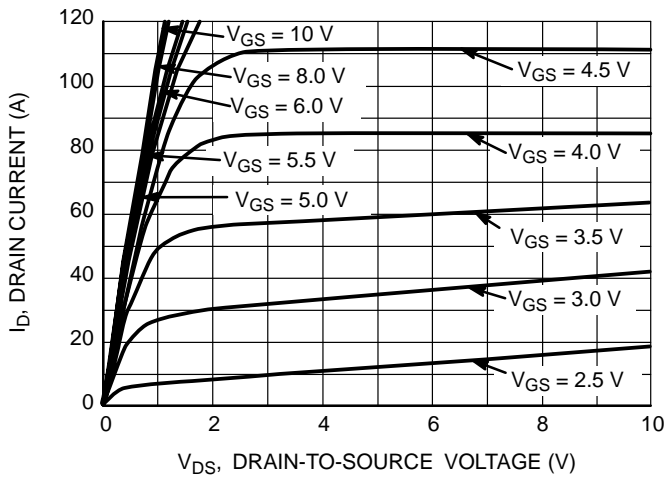


Figure 2. On-Region Characteristics

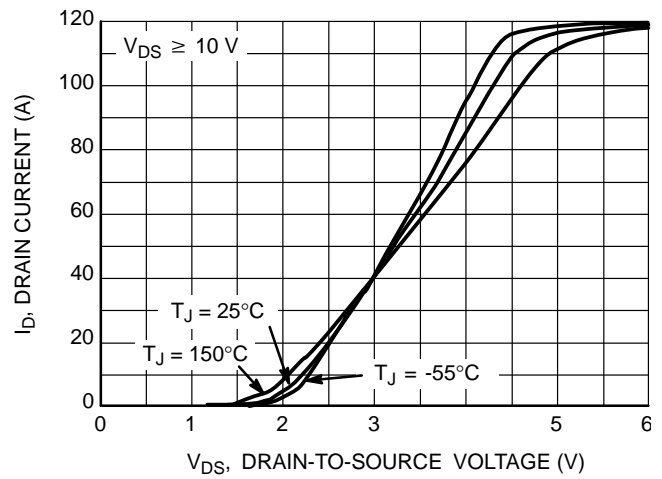


Figure 3. Transfer Characteristics

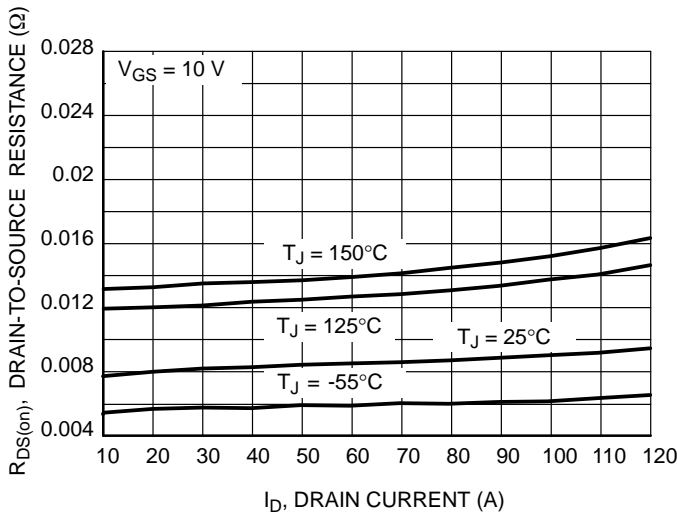


Figure 4. On-Resistance versus Drain Current and Temperature

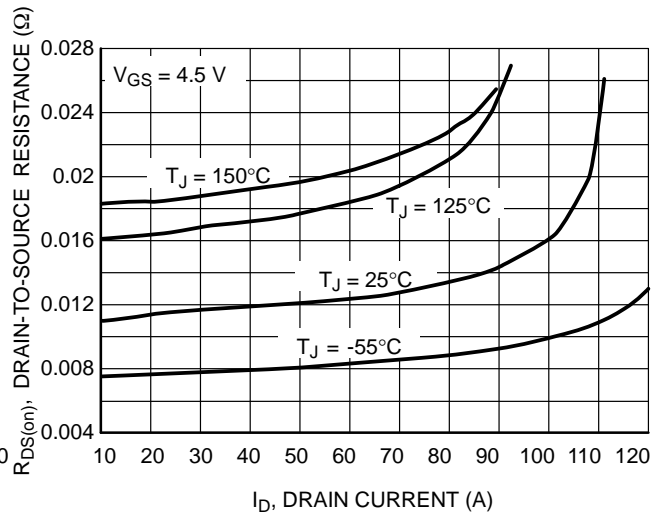


Figure 5. On-Resistance versus Drain Current and Temperature

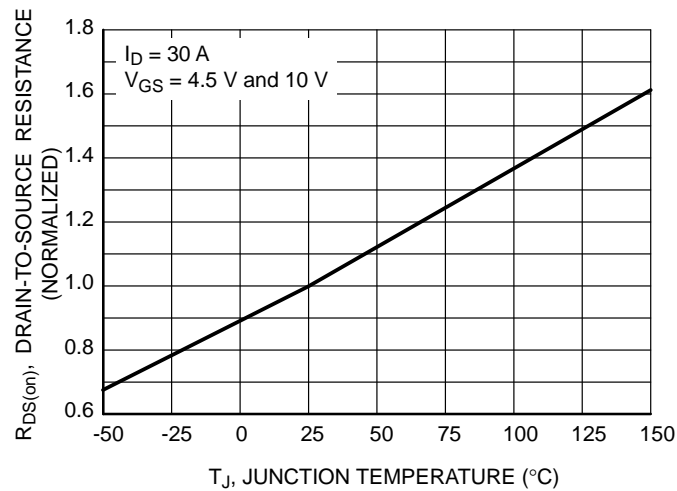


Figure 6. On-Resistance Variation with Temperature

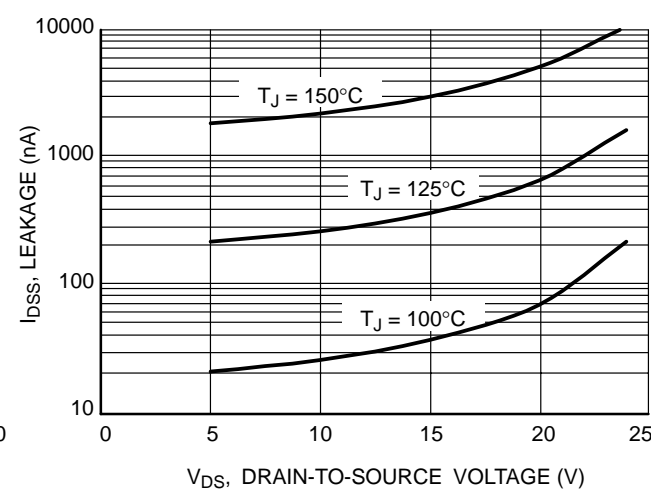


Figure 7. Drain-to-Source Leakage Current versus Voltage

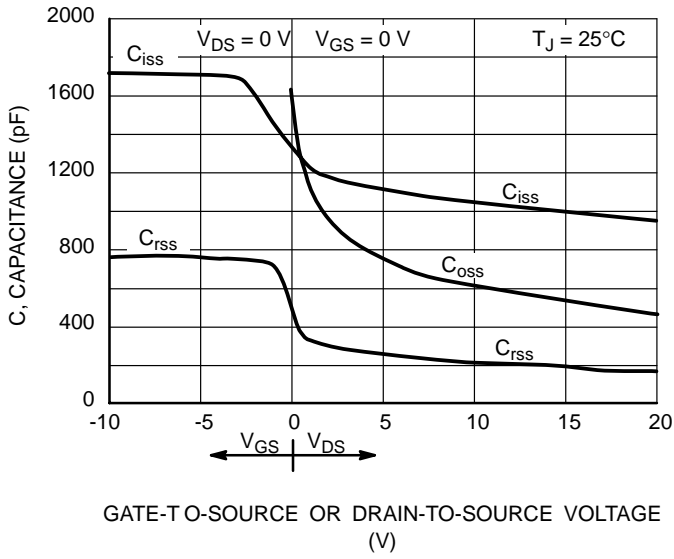


Figure 8. Capacitance Variation

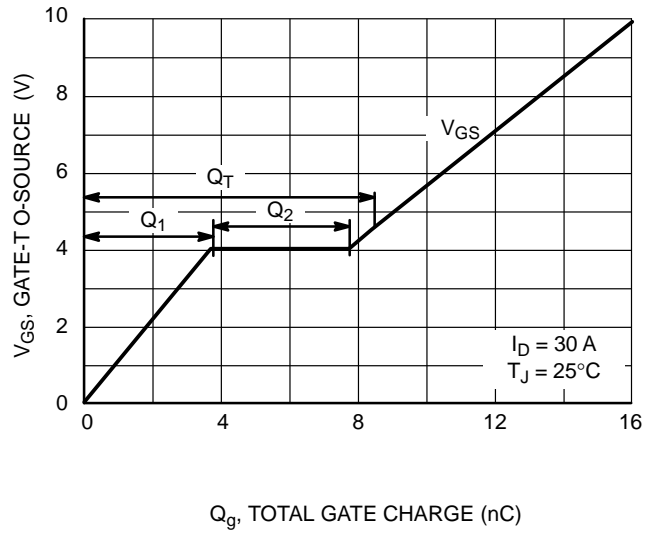


Figure 9. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

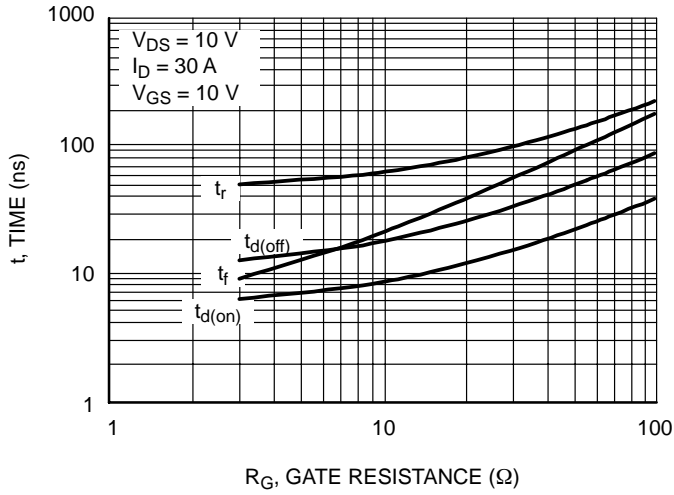


Figure 10. Resistive Switching Time Variation versus Gate Resistance

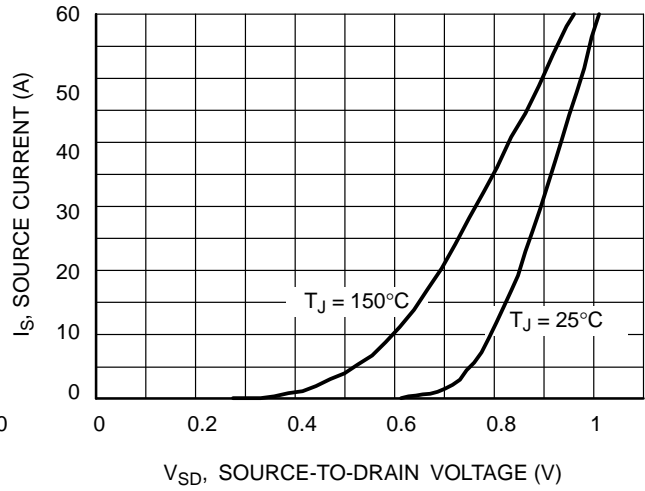



Figure 11. Diode Forward Voltage versus Current

**NTH4302**

**PACKAGE DIMENSIONS**

**PlnPAK**  
CASE TBD  
ISSUE O

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