

# NTD30N02

## Power MOSFET 30 Amps, 24 Volts

### N-Channel DPAK

Designed for low voltage, high speed switching applications in power supplies, converters and power motor controls and bridge circuits.

#### Typical Applications

- Power Supplies
- Converters
- Power Motor Controls
- Bridge Circuits

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

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	V <sub>DS</sub>	24	Vdc
Gate-to-Source Voltage – Continuous	V <sub>GS</sub>	±20	Vdc
Drain Current			A <sub>dc</sub>
– Continuous @ T <sub>A</sub> = 25°C	I <sub>D</sub>	30	
– Single Pulse (t <sub>p</sub> ≤ 10 μs)	I <sub>DM</sub>	100	A <sub>pk</sub>
Total Power Dissipation @ T <sub>A</sub> = 25°C	P <sub>D</sub>	75	W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-55 to 150	°C
Single Pulse Drain-to-Source Avalanche Energy – Starting T <sub>J</sub> = 25°C (V <sub>DD</sub> = 24 Vdc, V <sub>GS</sub> = 10 Vdc, L = 1.0 mH, I <sub>L(pk)</sub> = 10 A, R <sub>G</sub> = 25 Ω)	E <sub>AS</sub>	50	mJ
Thermal Resistance			°C/W
– Junction-to-Case	R <sub>θJC</sub>	1.65	
– Junction-to-Ambient (Note 1)	R <sub>θJA</sub>	67	
– Junction-to-Ambient (Note 2)	R <sub>θJA</sub>	120	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T <sub>L</sub>	260	°C

1. When surface mounted to an FR4 board using 1" pad size, (Cu Area 1.127 in<sup>2</sup>).
2. When surface mounted to an FR4 board using minimum recommended pad size, (Cu Area 0.412 in<sup>2</sup>).

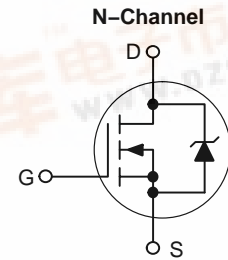


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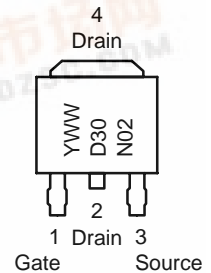
<http://onsemi.com>

**30 AMPERES  
24 VOLTS**

**R<sub>DS(on)</sub> = 11.2 mΩ (Typ.)**



#### MARKING DIAGRAM



D30N02 = Device Code  
Y = Year  
WW = Work Week

#### ORDERING INFORMATION

Device	Package	Shipping†
NTD30N02	DPAK	75 Units/Rail
NTD30N02T4	DPAK	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.

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

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage (Note 3) (V <sub>GS</sub> = 0 Vdc, I <sub>D</sub> = 250 μAdc) Temperature Coefficient (Positive)	V <sub>(BR)DSS</sub>	24 –	26.5 25.5	– –	Vdc mV/°C
Zero Gate Voltage Drain Current (V <sub>DS</sub> = 20 Vdc, V <sub>GS</sub> = 0 Vdc) (V <sub>DS</sub> = 24 Vdc, V <sub>GS</sub> = 0 Vdc) (V <sub>DS</sub> = 20 Vdc, V <sub>GS</sub> = 0 Vdc, T <sub>J</sub> = 125°C)	I <sub>DSS</sub>	– – –	– – –	0.8 1.0 10	μAdc
Gate-Body Leakage Current (V <sub>GS</sub> = ±20 Vdc, V <sub>DS</sub> = 0 Vdc)	I <sub>GSS</sub>	–	–	±100	nAdc

### ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage (Note 3) (V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μAdc) Threshold Temperature Coefficient (Negative)	V <sub>GS(th)</sub>	1.0 –	2.1 –4.1	3.0 –	Vdc mV/°C
Static Drain-to-Source On-Resistance (Note 3) (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 30 Adc) (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 20 Adc) (V <sub>GS</sub> = 4.5 Vdc, I <sub>D</sub> = 15 Adc)	R <sub>DS(on)</sub>	– – –	– 11.2 20	14.5 14.5 24	mΩ
Forward Transconductance (Note 3) (V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 15 Adc)	g <sub>FS</sub>	–	20	–	mhos

### DYNAMIC CHARACTERISTICS

Input Capacitance	(V <sub>DS</sub> = 20 Vdc, V <sub>GS</sub> = 0 Vdc, f = 1.0 MHz)	C <sub>iss</sub>	–	1000	–	pF
Output Capacitance		C <sub>oss</sub>	–	425	–	
Transfer Capacitance		C <sub>rss</sub>	–	175	–	

### SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	(V <sub>DD</sub> = 20 Vdc, I <sub>D</sub> = 30 Adc, V <sub>GS</sub> = 10 Vdc, R <sub>G</sub> = 2.5 Ω)	t <sub>d(on)</sub>	–	7.0	15	ns
Rise Time		t <sub>r</sub>	–	28	55	
Turn-Off Delay Time		t <sub>d(off)</sub>	–	22	35	
Fall Time		t <sub>f</sub>	–	12	20	
Turn-On Delay Time	(V <sub>DD</sub> = 20 Vdc, I <sub>D</sub> = 15 Adc, V <sub>GS</sub> = 4.5 Vdc, R <sub>G</sub> = 2.5 Ω)	t <sub>d(on)</sub>	–	12.5	–	ns
Rise Time		t <sub>r</sub>	–	115	–	
Turn-Off Delay Time		t <sub>d(off)</sub>	–	15	–	
Fall Time		t <sub>f</sub>	–	17	–	
Gate Charge	(V <sub>DS</sub> = 20 Vdc, I <sub>D</sub> = 30 Adc, V <sub>GS</sub> = 4.5 Vdc) (Note 3)	Q <sub>T</sub>	–	14.4	20	nC
		Q <sub>1</sub>	–	4.0	–	
		Q <sub>2</sub>	–	8.5	–	

### SOURCE-DRAIN DIODE CHARACTERISTICS

Forward On-Voltage	(I <sub>S</sub> = 15 Adc, V <sub>GS</sub> = 0 Vdc) (I <sub>S</sub> = 30 Adc, V <sub>GS</sub> = 0 Vdc) (Note 3) (I <sub>S</sub> = 15 Adc, V <sub>GS</sub> = 0 Vdc, T <sub>J</sub> = 125°C)	V <sub>SD</sub>	– – –	0.95 1.10 0.80	1.2 – –	Vdc
Reverse Recovery Time	(I <sub>S</sub> = 30 Adc, V <sub>GS</sub> = 0 Vdc, di <sub>S</sub> /dt = 100 A/μs) (Note 3)	t <sub>rr</sub>	–	30	–	ns
		t <sub>a</sub>	–	14.5	–	
		t <sub>b</sub>	–	15.5	–	
Reverse Recovery Stored Charge		Q <sub>RR</sub>	–	0.013	–	μC

3. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

4. Switching characteristics are independent of operating junction temperatures.

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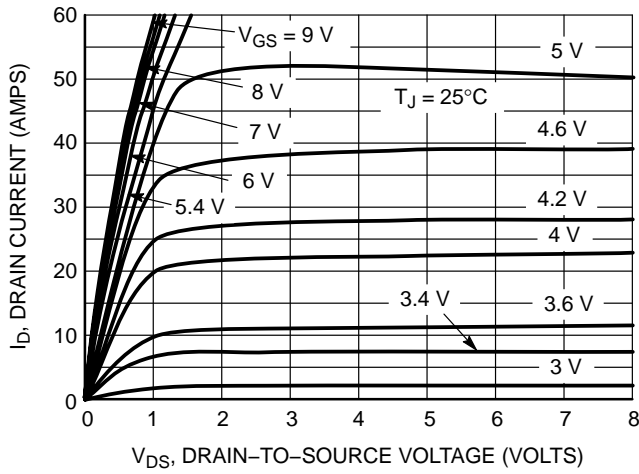


Figure 1. On-Region Characteristics

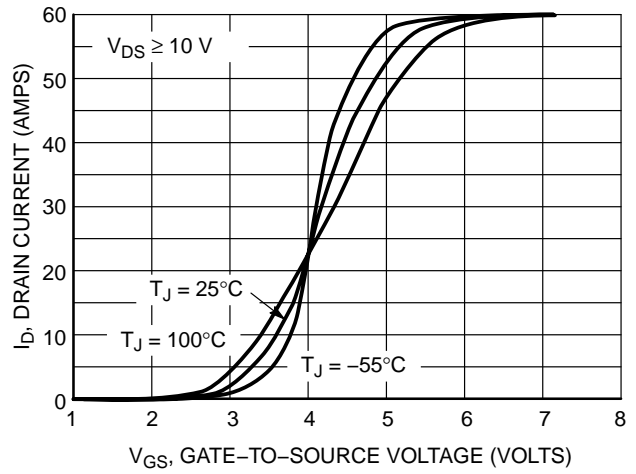


Figure 2. Transfer Characteristics

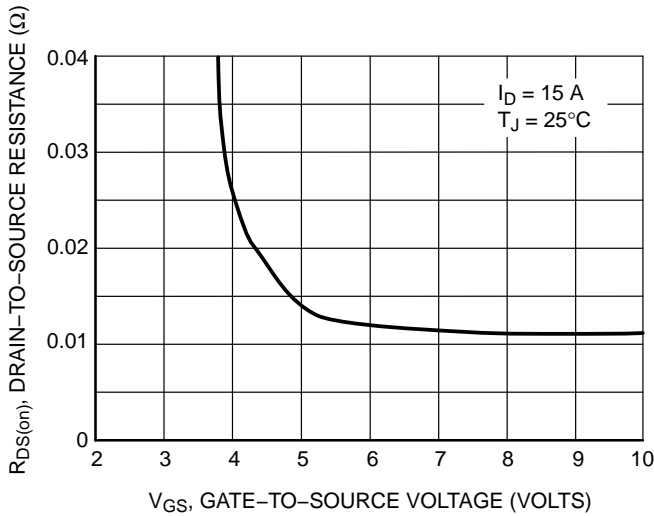


Figure 3. On-Resistance versus Gate-to-Source Voltage

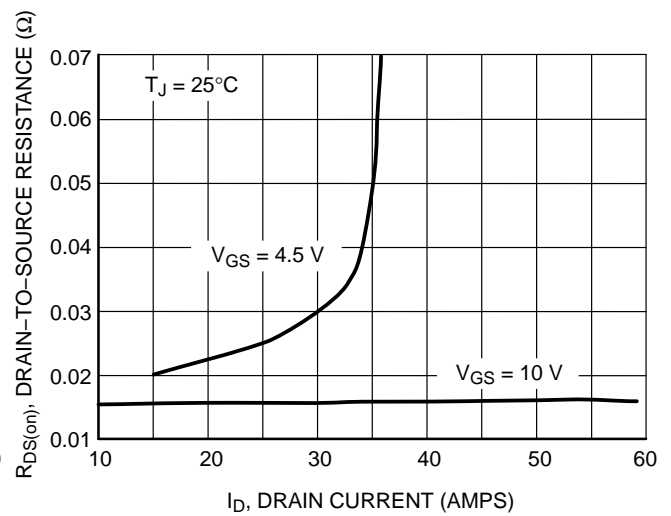


Figure 4. On-Resistance versus Drain Current and Gate Voltage

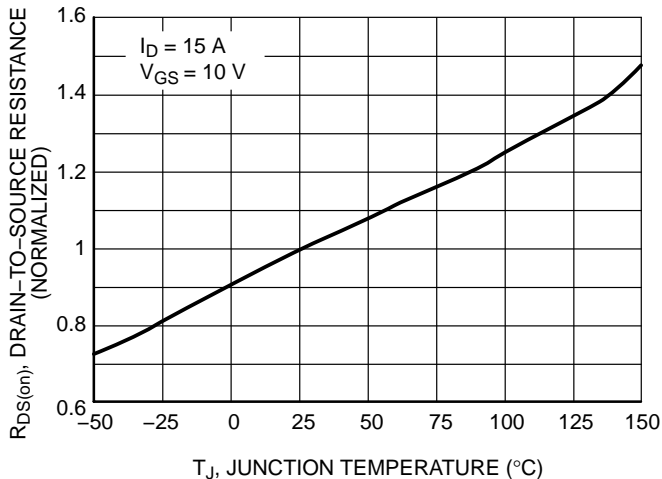


Figure 5. On-Resistance Variation with Temperature

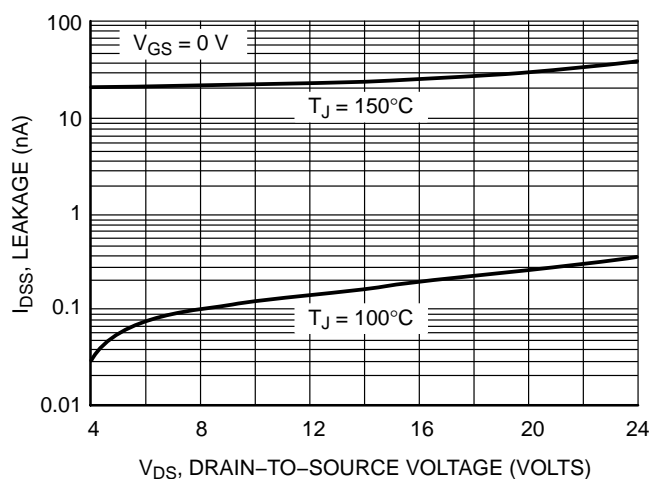


Figure 6. Drain-to-Source Leakage Current versus Voltage

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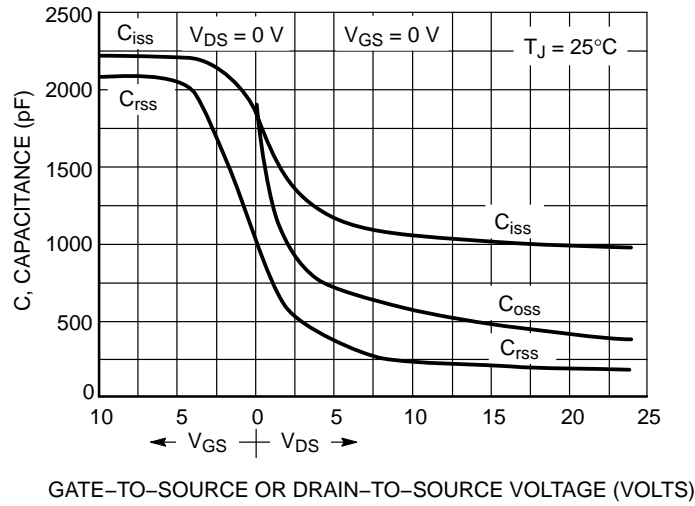


Figure 7. Capacitance Variation

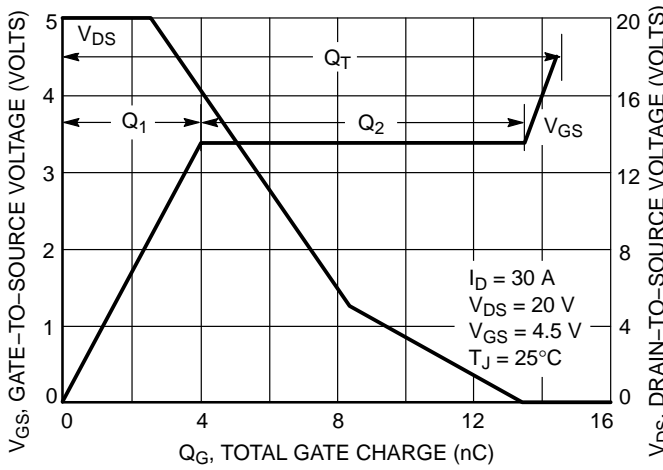


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

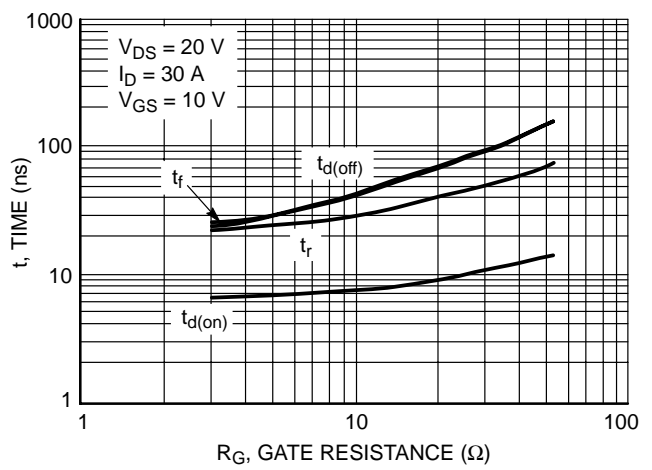


Figure 9. Resistive Switching Time Variation versus Gate Resistance

## DRAIN-TO-SOURCE DIODE CHARACTERISTICS

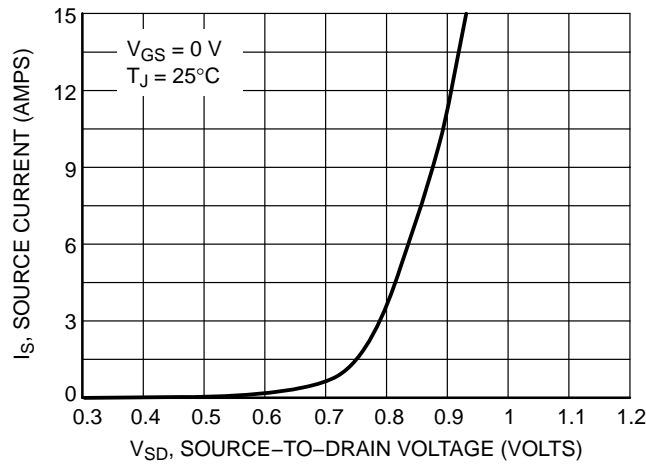
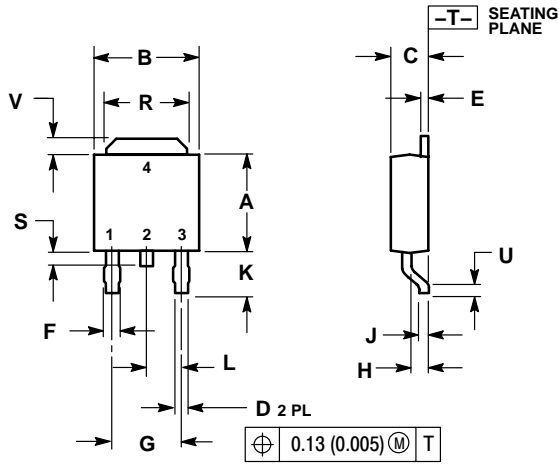


Figure 10. Diode Forward Voltage versus Current

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## PACKAGE DIMENSIONS

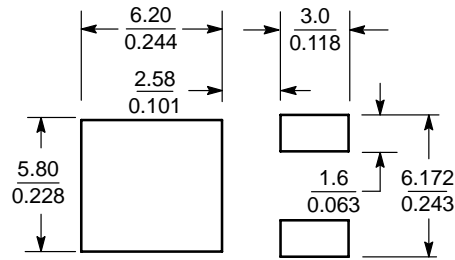
DPAK  
CASE 369C-01  
ISSUE O



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.245	5.97	6.22
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.018	0.023	0.46	0.58
F	0.037	0.045	0.94	1.14
G	0.180 BSC		4.58 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.102	0.114	2.60	2.89
L	0.090 BSC		2.29 BSC	
R	0.180	0.215	4.57	5.45
S	0.025	0.040	0.63	1.01
U	0.020	---	0.51	---
V	0.035	0.050	0.89	1.27
Z	0.155	---	3.93	---

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


### SOLDERING FOOTPRINT\*



SCALE 3:1  $\left(\frac{\text{mm}}{\text{inches}}\right)$

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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