

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.

Features

- Pb-Free Packages are Available

Typical Applications

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

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

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DS}	24	Vdc
Gate-to-Source Voltage – Continuous	V_{GS}	± 20	Vdc
Drain Current			Adc
– Continuous @ $T_A = 25^\circ\text{C}$	I_D	30	
– Single Pulse ($t_p \leq 10 \mu\text{s}$)	I_{DM}	100	Apk
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	P_D	75	W
Operating and Storage Temperature Range	T_J, T_{stg}	-55 to 150	$^\circ\text{C}$
Single Pulse Drain-to-Source Avalanche Energy – Starting $T_J = 25^\circ\text{C}$ ($V_{DD} = 24 \text{ Vdc}$, $V_{GS} = 10 \text{ Vdc}$, $L = 1.0 \text{ mH}$, $I_L(pk) = 10 \text{ A}$, $R_G = 25 \Omega$)	E_{AS}	50	mJ
Thermal Resistance			$^\circ\text{C/W}$
– Junction-to-Case	$R_{\theta JC}$	1.65	
– Junction-to-Ambient (Note 1)	$R_{\theta JA}$	67	
– Junction-to-Ambient (Note 2)	$R_{\theta JA}$	120	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T_L	260	$^\circ\text{C}$

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. When surface mounted to an FR4 board using 1 in. pad size, (Cu Area 1.127 sq in).
2. When surface mounted to an FR4 board using minimum recommended pad size, (Cu Area 0.412 sq in).

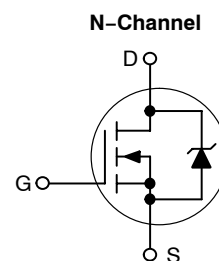


ON Semiconductor®

<http://onsemi.com>

**30 AMPERES
24 VOLTS**

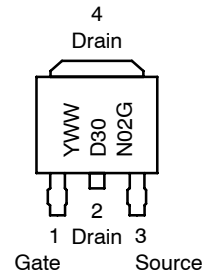
$R_{DS(on)} = 11.2 \text{ m}\Omega$ (Typ.)



MARKING DIAGRAM



**DPAK
CASE 369C
STYLE 2**



D30N02 = Device Code
Y = Year
WW = Work Week
G = Pb-Free Device

ORDERING INFORMATION

Device	Package	Shipping†
NTD30N02	DPAK	75 Units/Rail
NTD30N02G	DPAK (Pb-Free)	75 Units/Rail
NTD30N02T4	DPAK	2500 Tape & Reel
NTD30N02T4G	DPAK (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.

NTD30N02

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Drain-to-Source Breakdown Voltage (Note 3) (V _{GS} = 0 Vdc, I _D = 250 μAdc)	V _{(BR)DSS}	24	26.5	–	Vdc
Temperature Coefficient (Positive)		–	25.5	–	mV/°C
Zero Gate Voltage Drain Current (V _{DS} = 20 Vdc, V _{GS} = 0 Vdc) (V _{DS} = 24 Vdc, V _{GS} = 0 Vdc) (V _{DS} = 20 Vdc, V _{GS} = 0 Vdc, T _J = 125°C)	I _{DSS}	–	–	0.8 1.0 10	μAdc
Gate-Body Leakage Current (V _{GS} = ±20 Vdc, V _{DS} = 0 Vdc)	I _{GSS}	–	–	±100	nAdc

ON CHARACTERISTICS (Note 3)

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

DYNAMIC CHARACTERISTICS

Input Capacitance	(V _{DS} = 20 Vdc, V _{GS} = 0 Vdc, f = 1.0 MHz)	C _{iss}	–	1000	–	pF
Output Capacitance		C _{oss}	–	425	–	
Transfer Capacitance		C _{rss}	–	175	–	

SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	(V _{DD} = 20 Vdc, I _D = 30 Adc, V _{GS} = 10 Vdc, R _G = 2.5 Ω)	t _{d(on)}	–	7.0	15	ns
Rise Time		t _r	–	28	55	
Turn-Off Delay Time		t _{d(off)}	–	22	35	
Fall Time		t _f	–	12	20	
Turn-On Delay Time	(V _{DD} = 20 Vdc, I _D = 15 Adc, V _{GS} = 4.5 Vdc, R _G = 2.5 Ω)	t _{d(on)}	–	12.5	–	ns
Rise Time		t _r	–	115	–	
Turn-Off Delay Time		t _{d(off)}	–	15	–	
Fall Time		t _f	–	17	–	
Gate Charge	(V _{DS} = 20 Vdc, I _D = 30 Adc, V _{GS} = 4.5 Vdc) (Note 3)	Q _T	–	14.4	20	nC
		Q ₁	–	4.0	–	
		Q ₂	–	8.5	–	

SOURCE-DrAIN DIODE CHARACTERISTICS

Forward On-Voltage	(I _S = 15 Adc, V _{GS} = 0 Vdc) (I _S = 30 Adc, V _{GS} = 0 Vdc) (Note 3) (I _S = 15 Adc, V _{GS} = 0 Vdc, T _J = 125°C)	V _{SD}	– – –	0.95 1.10 0.80	1.2 – –	Vdc
Reverse Recovery Time	(I _S = 30 Adc, V _{GS} = 0 Vdc, dI _S /dt = 100 A/μs) (Note 3)	t _{rr}	–	30	–	ns
		t _a	–	14.5	–	
		t _b	–	15.5	–	
Reverse Recovery Stored Charge		Q _{RR}	–	0.013	–	μC

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

4. Switching characteristics are independent of operating junction temperatures.

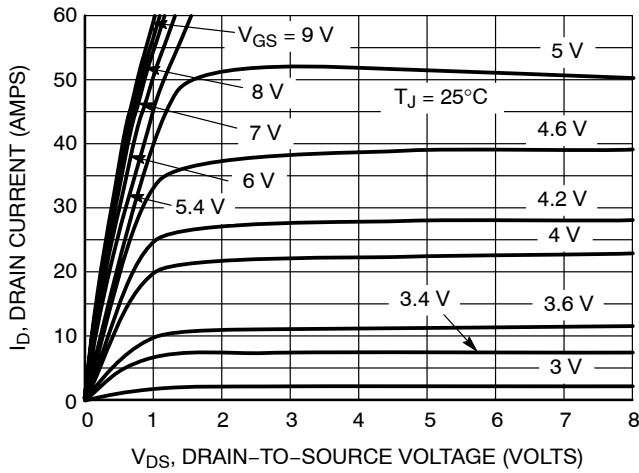


Figure 1. On-Region Characteristics

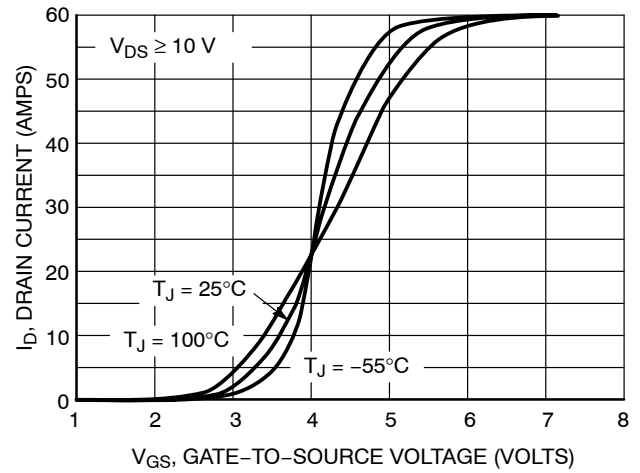


Figure 2. Transfer Characteristics

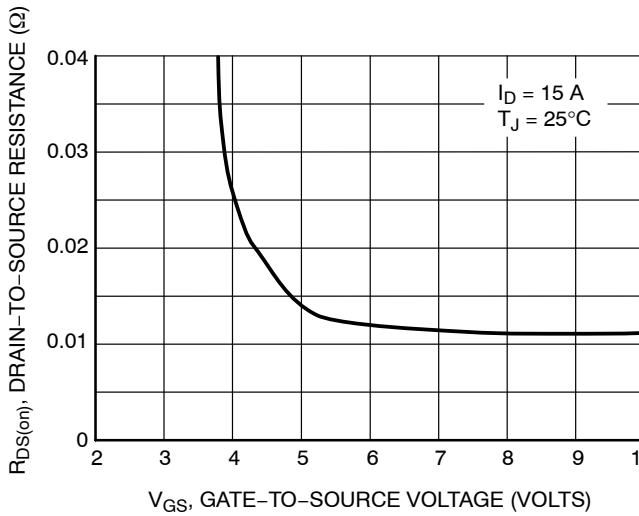


Figure 3. On-Resistance versus Gate-to-Source Voltage

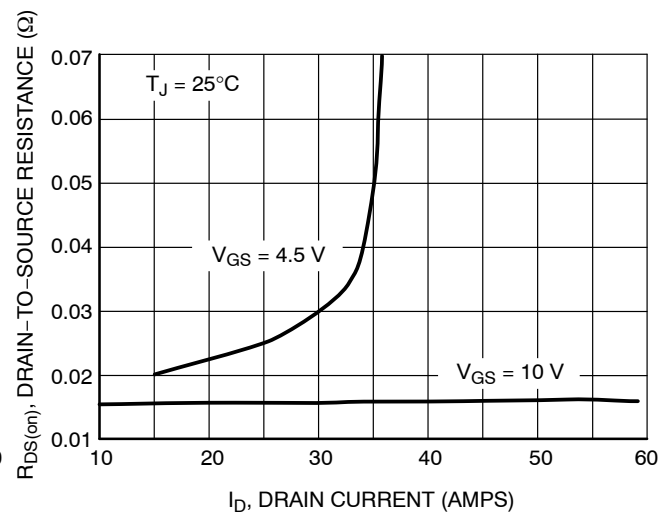


Figure 4. On-Resistance versus Drain Current and Gate Voltage

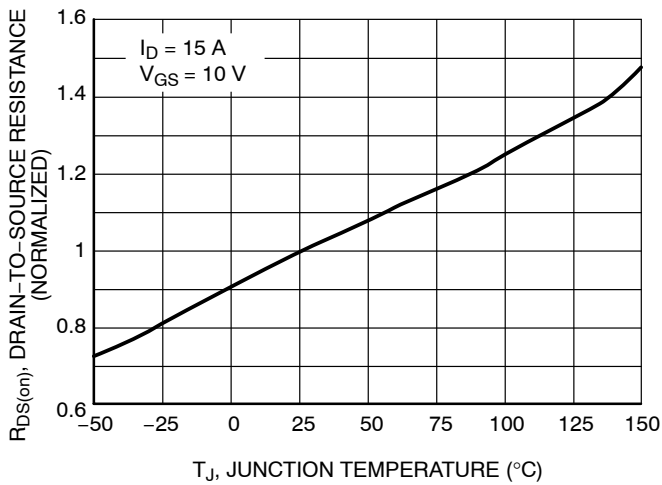


Figure 5. On-Resistance Variation with Temperature

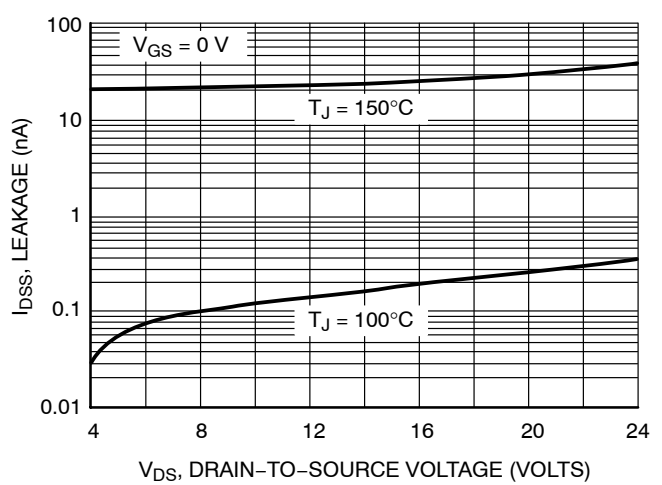


Figure 6. Drain-to-Source Leakage Current versus Voltage

NTD30N02

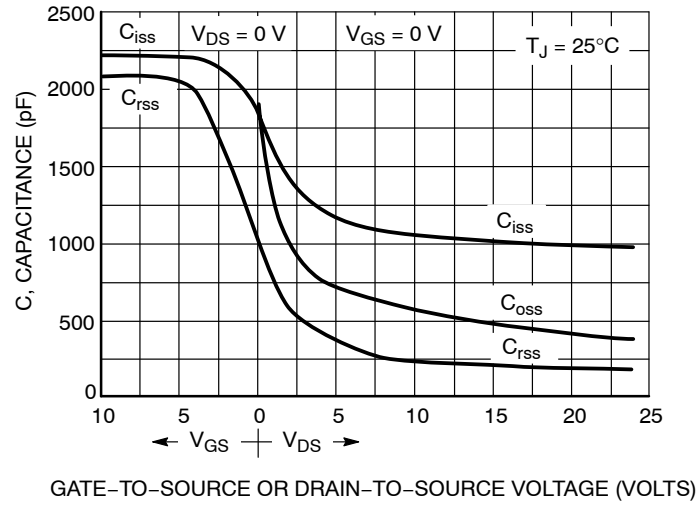


Figure 7. Capacitance Variation

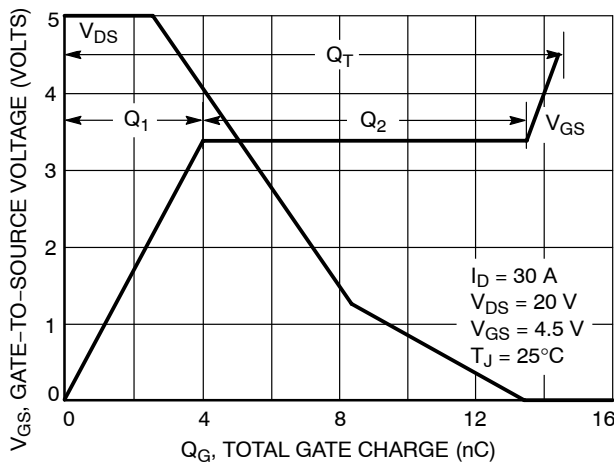


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

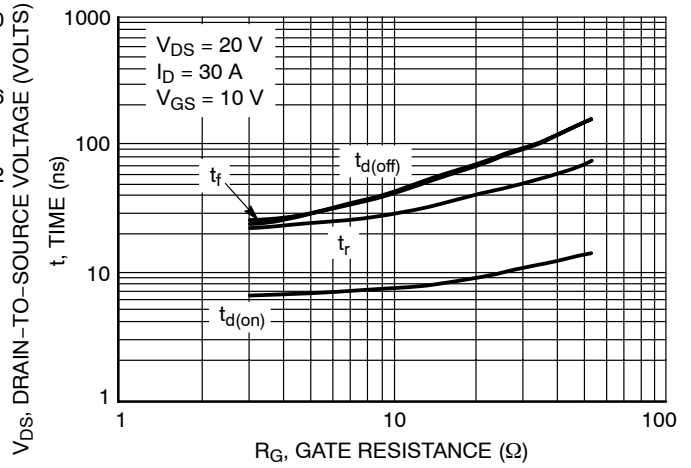


Figure 9. Resistive Switching Time Variation versus Gate Resistance

DRAIN-TO-SOURCE DIODE CHARACTERISTICS

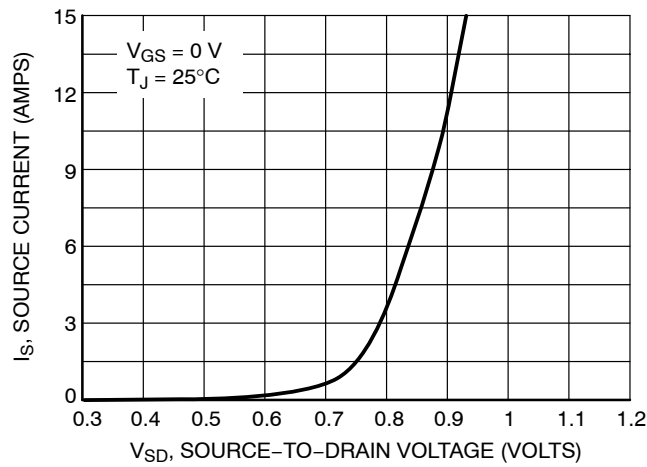
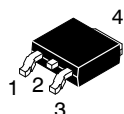


Figure 10. Diode Forward Voltage versus Current

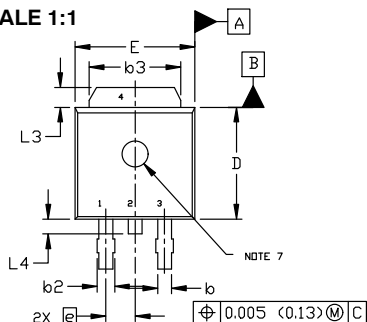
MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



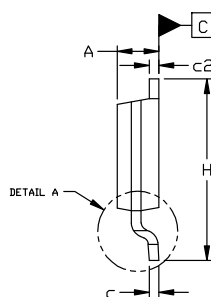
DPAK (SINGLE GAUGE) CASE 369C ISSUE G

DATE 31 MAY 2023

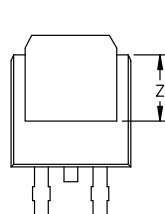
SCALE 1:1



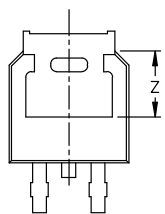
TOP VIEW



SIDE VIEW

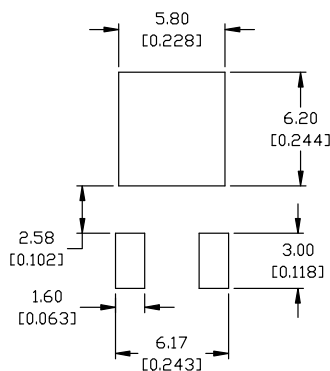


BOTTOM VIEW



BOTTOM VIEW

ALTERNATE
CONSTRUCTIONS



RECOMMENDED MOUNTING 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.

STYLE 1:

PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STYLE 2:

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

STYLE 3:

PIN 1. ANODE
2. CATHODE
3. ANODE
4. CATHODE

STYLE 4:

PIN 1. CATHODE
2. ANODE
3. GATE
4. ANODE

STYLE 5:

PIN 1. GATE
2. ANODE
3. CATHODE
4. ANODE

STYLE 6:

PIN 1. MT1
2. MT2
3. GATE
4. MT2

STYLE 7:

PIN 1. GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STYLE 8:

PIN 1. N/C
2. CATHODE
3. ANODE
4. CATHODE

STYLE 9:

PIN 1. ANODE
2. CATHODE
3. RESISTOR ADJUST
4. CATHODE

STYLE 10:

PIN 1. CATHODE
2. ANODE
3. CATHODE
4. ANODE

NOTES:

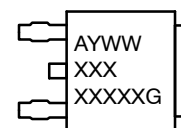
1. DIMENSIONING AND TOLERANCING ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3, AND Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.
7. OPTIONAL MOLD FEATURE.

DIM	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.086	0.094	2.18	2.38
A1	0.000	0.005	0.00	0.13
b	0.025	0.035	0.63	0.89
b2	0.028	0.045	0.72	1.14
b3	0.180	0.215	4.57	5.46
c	0.018	0.024	0.46	0.61
c2	0.018	0.024	0.46	0.61
D	0.235	0.245	5.97	6.22
E	0.250	0.265	6.35	6.73
e	0.090	BSC	2.29	BSC
H	0.370	0.410	9.40	10.41
L	0.055	0.070	1.40	1.78
L1	0.114	REF	2.90	REF
L2	0.020	BSC	0.51	BSC
L3	0.035	0.050	0.89	1.27
L4	----	0.040	---	1.01
Z	0.155	----	3.93	---

GENERIC MARKING DIAGRAM*



IC



Discrete

XXXXXX = Device Code
A = Assembly Location
L = Wafer Lot
Y = Year
WW = Work Week
G = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

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