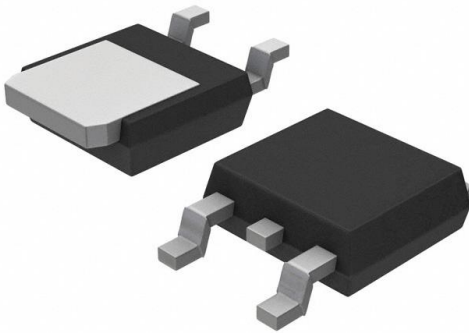


# NID5003NT4 Datasheet

[www.digi-electronics.com](http://www.digi-electronics.com)



<https://www.DiGi-Electronics.com>

DiGi Electronics Part Number	NID5003NT4-DG
Manufacturer	<a href="#">onsemi</a>
Manufacturer Product Number	NID5003NT4
Description	IC PWR DRIVER N-CHANNEL 1:1 DPAK
Detailed Description	Power Switch/Driver 1:1 N-Channel 20A DPAK



Tel: +00 852-30501935

RFQ Email: [Info@DiGi-Electronics.com](mailto:Info@DiGi-Electronics.com)

DiGi is a global authorized distributor of electronic components.

## Purchase and inquiry

Manufacturer Product Number:

NID5003NT4

Series:

HDPlus™

Switch Type:

General Purpose

Ratio - Input:Output:

1:1

Output Type:

N-Channel

Voltage - Load:

42V (Max)

Current - Output (Max):

20A

Input Type:

Non-Inverting

Fault Protection:

Current Limiting (Fixed), Over Temperature, Over Voltage

Mounting Type:

Surface Mount

Package / Case:

TO-252-3, DPAK (2 Leads + Tab), SC-63

Manufacturer:

onsemi

Product Status:

Obsolete

Number of Outputs:

1

Output Configuration:

Low Side

Interface:

On/Off

Voltage - Supply (Vcc/Vdd):

Not Required

Rds On (Typ):

42mOhm

Features:

Auto Restart, Slew Rate Controlled

Operating Temperature:

-55°C ~ 150°C (TJ)

Supplier Device Package:

DPAK

Base Product Number:

NID5003

## Environmental & Export classification

RoHS Status:

RoHS non-compliant

REACH Status:

REACH Unaffected

HTSUS:

8541.29.0095

Moisture Sensitivity Level (MSL):

1 (Unlimited)

ECCN:

EAR99

# NID5003N

Preferred Device

## Self-Protected FET with Temperature and Current Limit

### 42 V, 20 A, Single N-Channel, DPAK

HDPlus™ devices are an advanced series of power MOSFETs which utilize ON Semiconductors latest MOSFET technology process to achieve the lowest possible on-resistance per silicon area while incorporating smart features. Integrated thermal and current limits work together to provide short circuit protection. The devices feature an integrated Drain-to-Gate Clamp that enables them to withstand high energy in the avalanche mode. The Clamp also provides additional safety margin against unexpected voltage transients. Electrostatic Discharge (ESD) protection is provided by an integrated Gate-to-Source Clamp.

#### Features

- Short Circuit Protection/Current Limit
- Thermal Shutdown with Automatic Restart
- $I_{DSS}$  Specified at Elevated Temperature
- Avalanche Energy Specified
- Slew Rate Control for Low Noise Switching
- Overvoltage Clamped Protection

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

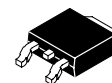
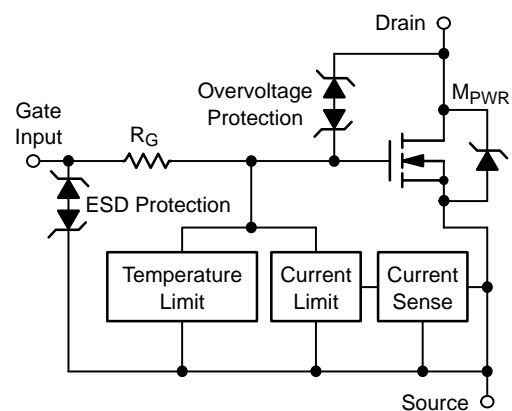
Rating	Symbol	Value	Unit
Drain-to-Source Voltage Internally Clamped	$V_{DSS}$	42	Vdc
Gate-to-Source Voltage	$V_{GS}$	$\pm 14$	Vdc
Drain Current Continuous	$I_D$	Internally Limited	
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ (Note 1) @ $T_A = 25^\circ\text{C}$ (Note 2)	$P_D$	1.3 2.3	W
Thermal Resistance Junction-to-Case Junction-to-Ambient (Note 1) Junction-to-Ambient (Note 2)	$R_{\theta JC}$ $R_{\theta JA}$ $R_{\theta JA}$	3.0 95 54	$^\circ\text{C/W}$
Single Pulse Drain-to-Source Avalanche Energy ( $V_{DD} = 25\text{ Vdc}$ , $V_{GS} = 5.0\text{ Vdc}$ , $I_L = 3.2\text{ Apk}$ , $L = 120\text{ mH}$ , $R_G = 25\ \Omega$ )	$E_{AS}$	600	mJ
Operating and Storage Temperature Range (Note 3)	$T_J$ , $T_{stg}$	-55 to 150	$^\circ\text{C}$

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. Surface mounted onto minimum pad size (0.412" square) FR4 PCB, 1 oz cu.
2. Mounted onto 1" square pad size (1.127" square) FR4 PCB, 1 oz cu.
3. Normal pre-fault operating range. See thermal limit range conditions.

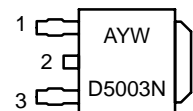

**ON Semiconductor®**
<http://onsemi.com>

$V_{DSS}$ (Clamped)	$R_{DS(on)}$ TYP	$I_D$ MAX (Limited)
42 V	42 m $\Omega$ @ 10 V	20 A*



**DPAK  
CASE 369C  
STYLE 2**

#### MARKING DIAGRAM



D5003N = Device Code

A = Assembly Location

Y = Year

W = Work Week

1 = Gate

2 = Drain

3 = Source

#### ORDERING INFORMATION

Device	Package	Shipping†
NID5003NT4	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.

**Preferred** devices are recommended choices for future use and best overall value.

\*Max current may be limited below this value depending on input conditions.

**NID5003N****MOSFET ELECTRICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Drain-to-Source Clamped Breakdown Voltage ( $V_{GS} = 0\text{ Vdc}$ , $I_D = 250\ \mu\text{Adc}$ ) ( $V_{GS} = 0\text{ Vdc}$ , $I_D = 250\ \mu\text{Adc}$ , $T_J = -40^\circ\text{C}$ to $150^\circ\text{C}$ )	$V_{(BR)DSS}$	42 40	46 45	51 51	Vdc
Zero Gate Voltage Drain Current ( $V_{DS} = 32\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ ) ( $V_{DS} = 32\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ , $T_J = 150^\circ\text{C}$ )	$I_{DSS}$	– –	0.6 2.5	5.0 –	$\mu\text{Adc}$
Gate Input Current ( $V_{GS} = 5.0\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )	$I_{GSSF}$	–	50	125	$\mu\text{Adc}$

**ON CHARACTERISTICS**

Gate Threshold Voltage ( $V_{DS} = V_{GS}$ , $I_D = 1.2\text{ mAdc}$ ) Threshold Temperature Coefficient	$V_{GS(th)}$	1.0 –	1.7 5.0	2.2 –	Vdc –mV/ $^\circ\text{C}$
Static Drain-to-Source On-Resistance (Note 4) ( $V_{GS} = 10\text{ Vdc}$ , $I_D = 3.0\text{ Adc}$ , $T_J @ 25^\circ\text{C}$ ) ( $V_{GS} = 10\text{ Vdc}$ , $I_D = 3.0\text{ Adc}$ , $T_J @ 150^\circ\text{C}$ )	$R_{DS(on)}$	– –	42 76	51 104	m $\Omega$
Static Drain-to-Source On-Resistance (Note 4) ( $V_{GS} = 5.0\text{ Vdc}$ , $I_D = 3.0\text{ Adc}$ , $T_J @ 25^\circ\text{C}$ ) ( $V_{GS} = 5.0\text{ Vdc}$ , $I_D = 3.0\text{ Adc}$ , $T_J @ 150^\circ\text{C}$ )	$R_{DS(on)}$	– –	50 88	58 125	m $\Omega$
Source-Drain Forward On Voltage ( $I_S = 7.0\text{ A}$ , $V_{GS} = 0\text{ V}$ )	$V_{SD}$	–	0.95	1.1	V

**SWITCHING CHARACTERISTICS**

Turn-on Time ( $V_{in}$ to 90% $I_D$ )	$R_L = 4.7\ \Omega$ , $V_{in} = 0$ to $10\text{ V}$ , $V_{DD} = 12\text{ V}$	$T_{(on)}$	–	16	20	$\mu\text{s}$
Turn-off Time ( $V_{in}$ to 10% $I_D$ )	$R_L = 4.7\ \Omega$ , $V_{in} = 0$ to $10\text{ V}$ , $V_{DD} = 12\text{ V}$	$T_{(off)}$	–	80	100	
Slew Rate On	$R_L = 4.7\ \Omega$ , $V_{in} = 0$ to $10\text{ V}$ , $V_{DD} = 12\text{ V}$	$-dV_{DS}/dt_{on}$	–	1.4	–	V/ $\mu\text{s}$
Slew Rate Off	$R_L = 4.7\ \Omega$ , $V_{in} = 10$ to $0\text{ V}$ , $V_{DD} = 12\text{ V}$	$dV_{DS}/dt_{off}$	–	0.5	–	V/ $\mu\text{s}$

**SELF PROTECTION CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$  unless otherwise noted) (Note 5)

Current Limit	$V_{GS} = 5.0\text{ Vdc}$ $V_{DS} = 10\text{ V}$ ( $V_{GS} = 5.0\text{ Vdc}$ , $T_J = 150^\circ\text{C}$ )	$I_{LIM}$	12 7	18 13	24 18	Adc
Current Limit	$V_{GS} = 10\text{ Vdc}$ $V_{DS} = 10\text{ V}$ ( $V_{GS} = 10\text{ Vdc}$ , $T_J = 150^\circ\text{C}$ )	$I_{LIM}$	18 13	22 18	30 25	
Temperature Limit (Turn-off)	$V_{GS} = 5.0\text{ Vdc}$	$T_{LIM(off)}$	150	175	200	$^\circ\text{C}$
Thermal Hysteresis	$V_{GS} = 5.0\text{ Vdc}$	$\Delta T_{LIM(on)}$	–	15	–	$^\circ\text{C}$
Temperature Limit (Turn-off)	$V_{GS} = 10\text{ Vdc}$	$T_{LIM(off)}$	150	165	185	$^\circ\text{C}$
Thermal Hysteresis	$V_{GS} = 10\text{ Vdc}$	$\Delta T_{LIM(on)}$	–	15	–	$^\circ\text{C}$
Input Current during Thermal Fault	$V_{DS} = 35\text{ V}$ , ( $V_{GS} = 5.0\text{ V}$ , $T_J = 150^\circ\text{C}$ )	$I_{g(fault)}$	0.6	–	–	mA
Input Current during Thermal Fault	$V_{DS} = 35\text{ V}$ , ( $V_{GS} = 10\text{ V}$ , $T_J = 150^\circ\text{C}$ )	$I_{g(fault)}$	2.0	–	–	mA

**ESD ELECTRICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

Electro-Static Discharge Capability Human Body Model (HBM) Machine Model (MM)	ESD	4000 400	– –	– –	V
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- Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2\%$ .
- Fault conditions are viewed as beyond the normal operating range of the part.

# NID5003N

## TYPICAL PERFORMANCE CURVES

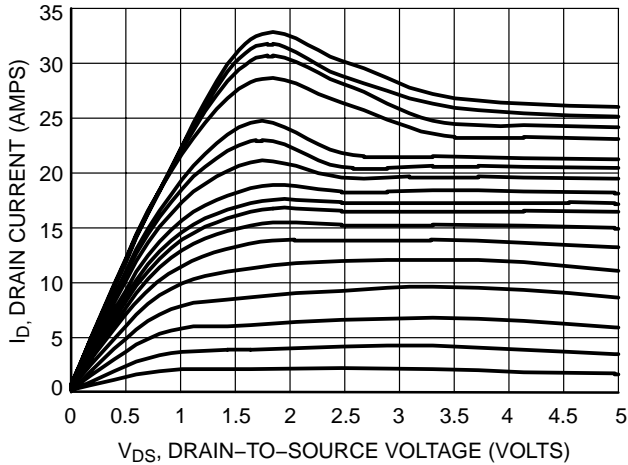


Figure 1. On-Region Characteristics

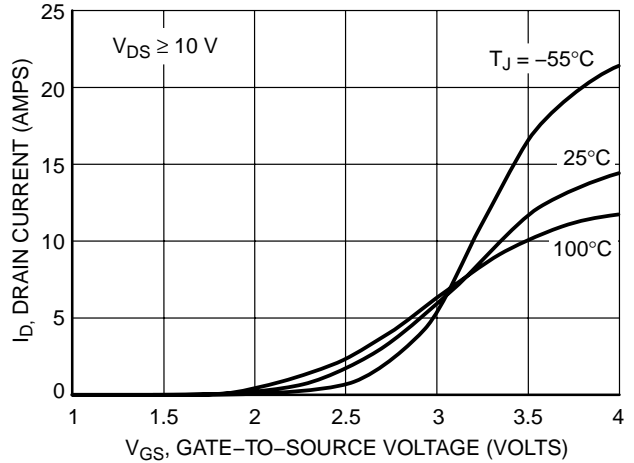


Figure 2. Transfer Characteristics

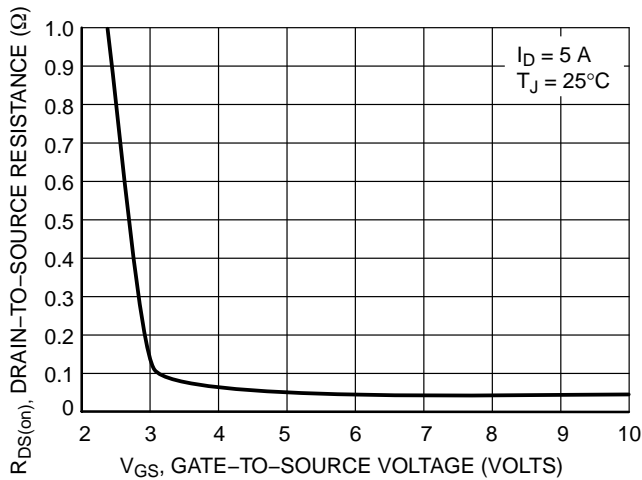


Figure 3. On-Resistance vs. Gate-to-Source Voltage

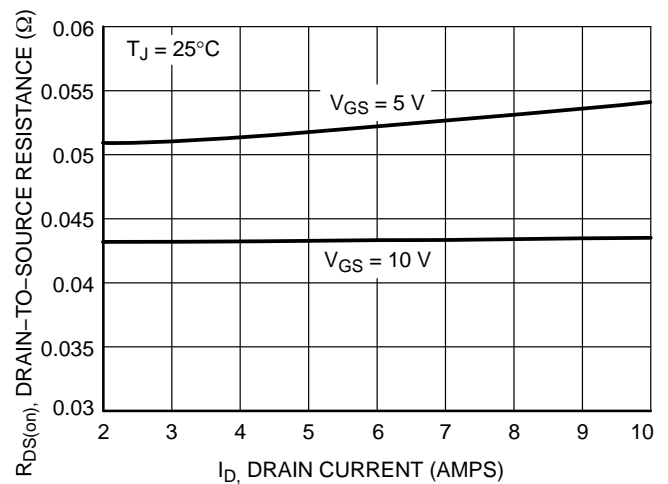


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

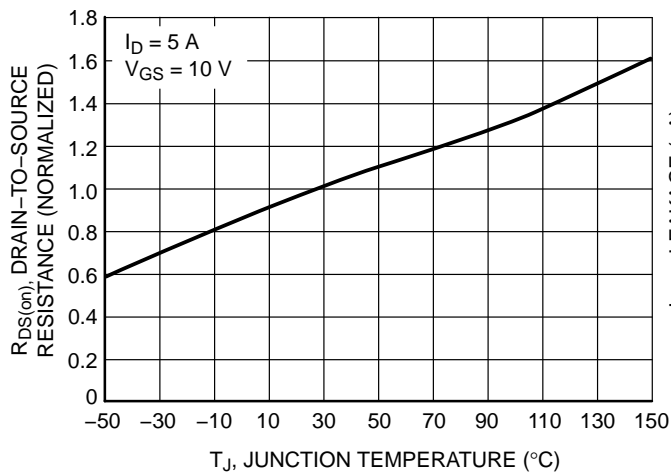


Figure 5. On-Resistance Variation with Temperature

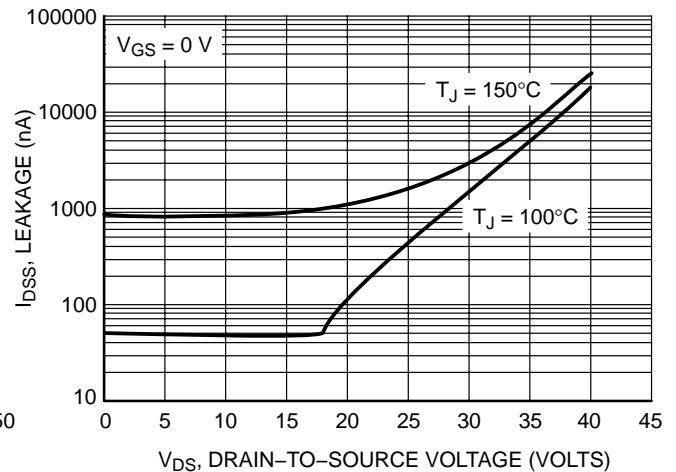


Figure 6. Drain-to-Source Leakage Current vs. Voltage

# NID5003N

## TYPICAL PERFORMANCE CURVES

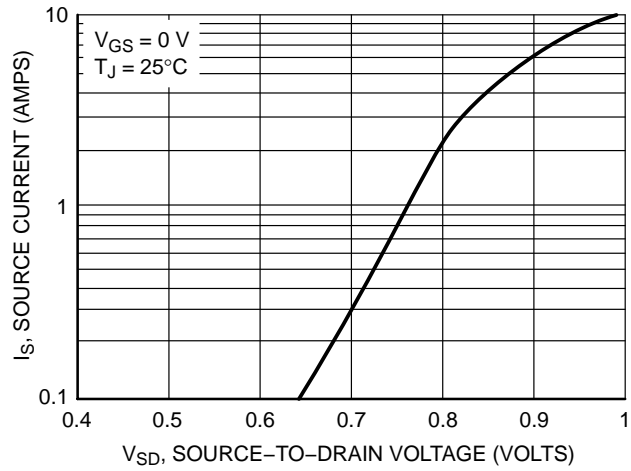
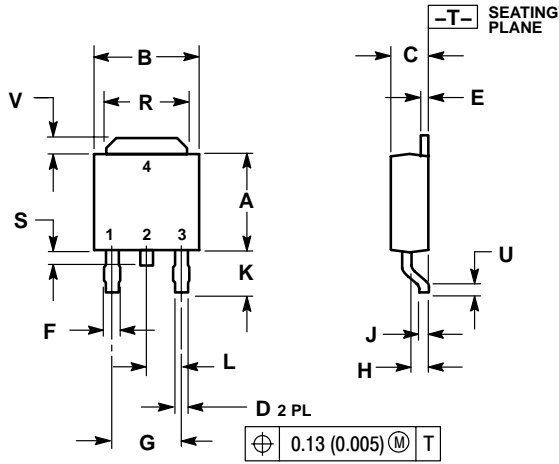


Figure 7. Diode Forward Voltage vs. Current

# NID5003N

## PACKAGE DIMENSIONS

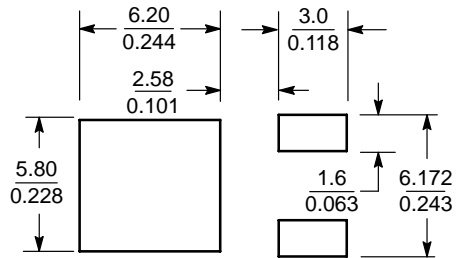
DPAK  
CASE 369C-01  
ISSUE O



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 (mm / inches)

**NID5003N**

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