# MOSFET – Power, Single, N-Channel 40 V, 4.9 mΩ, 70 A

### **Features**

- Low R<sub>DS(on)</sub> to Minimize Conduction Losses
- Low Q<sub>G</sub> and Capacitance to Minimize Driver Losses
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

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

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			$V_{DSS}$	40	V
Gate-to-Source Voltage			$V_{GS}$	±20	V
Continuous Drain Cur-		T <sub>C</sub> = 25°C	I <sub>D</sub>	70	Α
rent R <sub>θJC</sub> (Notes 1 & 3)	Steady	T <sub>C</sub> = 100°C		50	
Power Dissipation R <sub>θJC</sub>	State	T <sub>C</sub> = 25°C	$P_{D}$	47	W
(Note 1)		T <sub>C</sub> = 100°C		23	
Continuous Drain		T <sub>A</sub> = 25°C	I <sub>D</sub>	18	Α
Current R <sub>0JA</sub> (Notes 1, 2 & 3)	Steady	T <sub>A</sub> = 100°C		13	
Power Dissipation R <sub>θJA</sub>	State	T <sub>A</sub> = 25°C	$P_{D}$	3.0	W
(Notes 1 & 2)		T <sub>A</sub> = 100°C		1.5	
Pulsed Drain Current	T <sub>A</sub> = 25°	C, t <sub>p</sub> = 10 μs	I <sub>DM</sub>	379	Α
Operating Junction and Storage Temperature			T <sub>J</sub> , T <sub>stg</sub>	-55 to 175	°C
Source Current (Body Diode)			I <sub>S</sub>	39	Α
Single Pulse Drain-to-Source Avalanche Energy (T <sub>J</sub> = 25°C, I <sub>L(pk)</sub> = 6.5 A)			E <sub>AS</sub>	147	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			TL	260	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain) (Note 1)	$R_{\theta JC}$	3.2	°C/W
Junction-to-Ambient - Steady State (Note 2)	$R_{\theta JA}$	48.6	

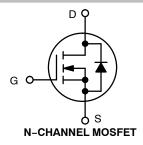
- The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
- 2. Surface-mounted on FR4 board using a 650 mm<sup>2</sup>, 2 oz. Cu pad.
- Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.



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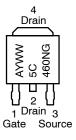
V <sub>(BR)DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
40 V	4.9 m $\Omega$ @ 10 V	70 A





DPAK CASE 369C STYLE 2

## MARKING DIAGRAM & PIN ASSIGNMENT



A = Assembly Location

Y = Year

WW = Work Week

5C460N = Device Code

G = Pb-Free Package

### **ORDERING INFORMATION**

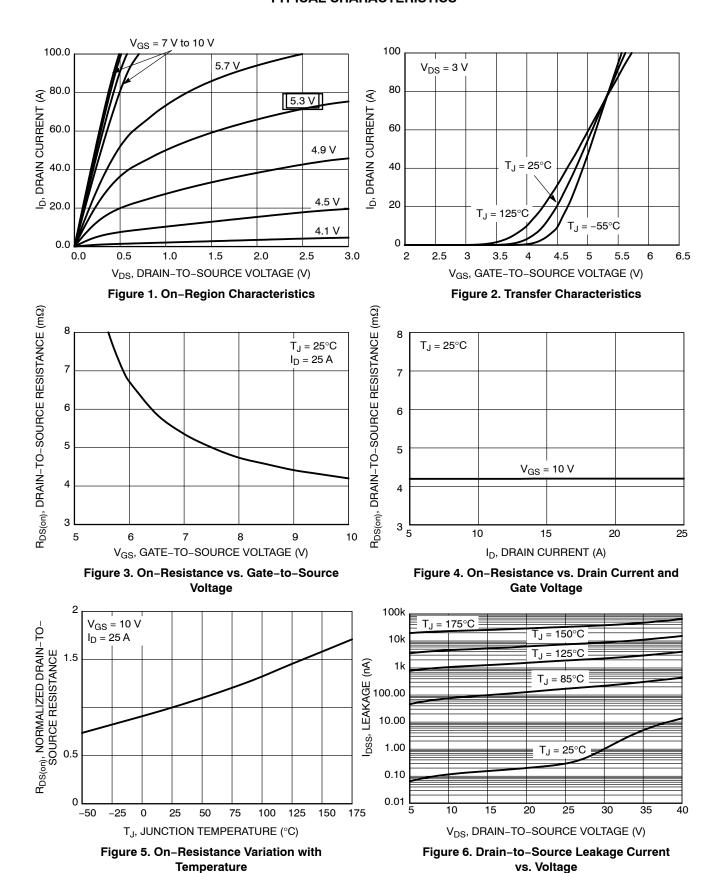
See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

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

Parameter	Symbol	Test Condition		Min	Тур	Max	Unit
OFF CHARACTERISTICS					•	•	•
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0 \text{ V, } I_D = 250 \mu\text{A}$		40			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> /T <sub>J</sub>				20		mV/°C
Zero Gate Voltage Drain Current	$I_{\mathrm{DSS}}$	V <sub>GS</sub> = 0 V,	T <sub>J</sub> = 25°C			10	μΑ
		$V_{GS} = 0 V$ , $V_{DS} = 40 V$	T <sub>J</sub> = 125°C			250	
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0 \text{ V}, V_{GS}$	<sub>S</sub> = 20 V			100	nA
ON CHARACTERISTICS (Note 4)							
Gate Threshold Voltage	V <sub>GS(TH)</sub>	$V_{GS} = V_{DS}, I_D$	= 60 μΑ	2.0		4.0	V
Negative Threshold Temperature Coefficient	V <sub>GS(TH)</sub> /T <sub>J</sub>				6.8		mV/°C
Drain-to-Source On Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub>	<sub>0</sub> = 25 A		4.2	4.9	mΩ
Forward Transconductance	9FS	$V_{DS} = 3 \text{ V}, I_{D}$	= 25 A		62		S
CHARGES, CAPACITANCES AND GATE RE	SISTANCES						
Input Capacitance	C <sub>iss</sub>	$V_{GS} = 0 \text{ V, f} = 1.0 \text{ MHz,}$ $V_{DS} = 25 \text{ V}$			1600		pF
Output Capacitance	C <sub>oss</sub>				800		1
Reverse Transfer Capacitance	C <sub>rss</sub>				38		1
Total Gate Charge	Q <sub>G(TOT)</sub>				26		nC
Threshold Gate Charge	Q <sub>G(TH)</sub>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 32 V, I <sub>D</sub> = 25 A			4.7		1
Gate-to-Source Charge	$Q_{GS}$				7.5		1
Gate-to-Drain Charge	$Q_{GD}$				5.1		1
Plateau Voltage	$V_{GP}$				4.6		V
SWITCHING CHARACTERISTICS (Note 5)							
Turn-On Delay Time	t <sub>d(on)</sub>				11		ns
Rise Time	t <sub>r</sub>	V <sub>GS</sub> = 10 V, V <sub>D</sub>	e = 32 V.		27		1
Turn-Off Delay Time	t <sub>d(off)</sub>	$I_D = 25 \text{ A}, R_G$	= 2.5 Ω		21		1
Fall Time	t <sub>f</sub>				5		
DRAIN-SOURCE DIODE CHARACTERISTIC	s						
Forward Diode Voltage	$V_{SD}$	Voc = 0 V	T <sub>J</sub> = 25°C		0.85	1.2	V
		$V_{GS} = 0 \text{ V},$ $I_{S} = 25 \text{ A}$	T <sub>J</sub> = 125°C		0.73		1
Reverse Recovery Time	t <sub>RR</sub>	$V_{GS}$ = 0 V, dls/dt = 100 A/ $\mu$ s, $I_{S}$ = 25 A			30		ns
Charge Time	ta				15		1
Discharge Time	tb				15		1
Reverse Recovery Charge	Q <sub>RR</sub>				10		nC

Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
 Switching characteristics are independent of operating junction temperatures.

### **TYPICAL CHARACTERISTICS**



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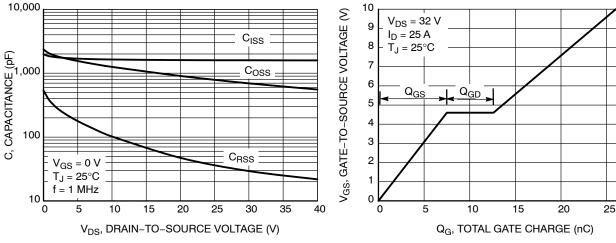


Figure 7. Capacitance Variation

Figure 8. Gate-to-Source vs. Total Charge

30

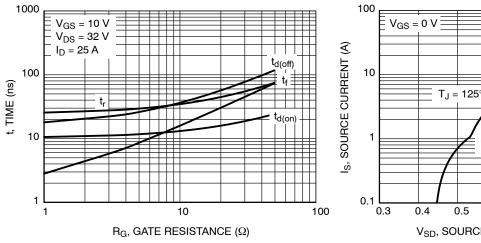


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

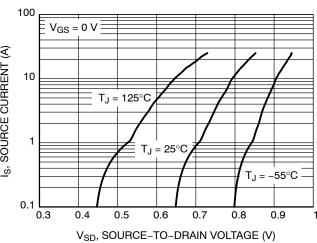


Figure 10. Diode Forward Voltage vs. Current

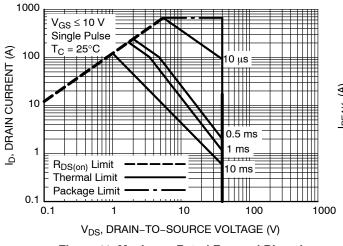


Figure 11. Maximum Rated Forward Biased Safe Operating Area

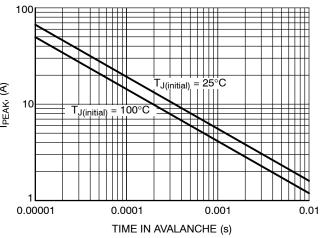


Figure 12. Maximum Drain Current vs. Time in Avalanche

### **TYPICAL CHARACTERISTICS**

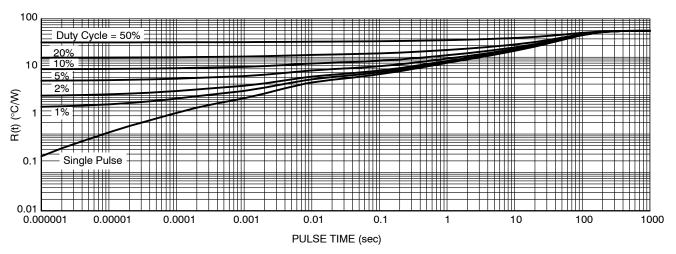


Figure 13. Thermal Response

### **ORDERING INFORMATION**

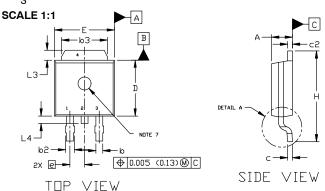
Order Number	Package	Shipping <sup>†</sup>
NVD5C460NT4G	DPAK (Pb-Free)	2500 / Tape & Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.





**DATE 31 MAY 2023** 



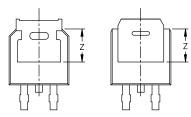


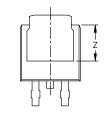
- DIMENSIONING AND TOLERANCING ASME Y14.5M, 1994. CONTROLLING DIMENSION: INCHES
- THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS 63,
- L3. AND Z. L3, AND Z.

  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.
  DIMENSIONS D AND E ARE DETERMINED AT THE
  OUTERMOST EXTREMES OF THE PLASTIC BODY.
  DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.
  DETININAL MOLD ESCALUPE.

- OPTIONAL MOLD FEATURE.

DIM INCHES		MILLIM	ETERS	
MIM	MIN.	MAX.	MIN.	MAX.
Α	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	
Н	0.370	0.410	9.40	10.41
L	0.055	0.070	1.40	1.78
L1	0.114	REF	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	

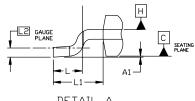




BOTTOM VIEW

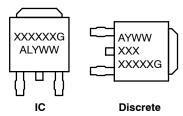
BOTTOM VIEW ALTERNATE CONSTRUCTIONS

5.80 [0.228] 6.20 [0.244] 2.58 3.00 [0.102] [0.118] 1.60 [0.063] 6.17 [0.243]



DETAIL A ROTATED 90° CW

**GENERIC MARKING DIAGRAM\*** 



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

\*This information is generic. Please refer to

\*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DUWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

3 FMITTER

4. COLLECTOR

s

3 GATE

RECOMMENDED MOUNTING FOOTPRINT\*

STYLE 1: STYLE 2: PIN 1. BASE PIN 1. GATE 2. COLLECTOR 2. DRAIL 3. EMITTER 3. SOUF 4. COLLECTOR 4. DRAIL	N 2. CATHODE RCE 3. ANODE	3. GATE	STYLE 5: PIN 1. GATE 2. ANODE 3. CATHODE 4. ANODE
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STYLE 7: PIN 1. GATE 2. COLLECTOR STYLE 6: STYLE 8: STYLE 9: STYLE 10: PIN 1. MT1 2. MT2 PIN 1. N/C 2. CATHODE 3. ANODE PIN 1. ANODE 2. CATHODE

4. CATHODE

device data sheet for actual part marking. PIN 1. CATHODE 2. ANODE 3. CATHODE Pb-Free indicator, "G" or microdot "■", may or may not be present. Some products may 3 RESISTOR ADJUST not follow the Generic Marking. 4. ANODE

DOCUMENT NUMBER:	98AON10527D	Electronic versions are uncontrolled except when accessed directly from Printed versions are uncontrolled except when stamped "CONTROLLED of the control of	
DESCRIPTION:	DPAK (SINGLE GAUGE)		PAGE 1 OF 1

4. CATHODE

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