

# NVD5890NL

## Product Preview

### Power MOSFET

#### 40 V, 3.7 mΩ, 123 A, Single N-Channel DPAK

#### Features

- Low  $R_{DS(on)}$  to Minimize Conduction Losses
- MSL 1 @ 260°C
- 100% Avalanche Tested
- AEC Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

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

Parameter	Symbol	Value	Unit		
Drain-to-Source Voltage	$V_{DS}$	40	V		
Gate-to-Source Voltage	$V_{GS}$	$\pm 20$	V		
Continuous Drain Current ( $R_{\theta JC}$ ) (Notes 1 & 3)	$I_D$	$T_C = 25^\circ\text{C}$	123	A	
		$T_C = 85^\circ\text{C}$	95		
Power Dissipation ( $R_{\theta JC}$ ) (Note 1)	Steady State	$T_C = 25^\circ\text{C}$	$P_D$	107	W
Continuous Drain Current ( $R_{\theta JA}$ ) (Notes 1, 2, 3)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$	24	A
		$T_A = 85^\circ\text{C}$		18.5	
Power Dissipation ( $R_{\theta JA}$ ) (Notes 1 & 2)	Steady State	$T_A = 25^\circ\text{C}$	$P_D$	4.0	W
Pulsed Drain Current	$t_p = 10\mu\text{s}$	$T_A = 25^\circ\text{C}$	$I_{DM}$	400	A
Current Limited by Package (Note 3)		$T_A = 25^\circ\text{C}$	$I_{DmaxPkg}$	100	A
Operating Junction and Storage Temperature	$T_J, T_{stg}$	-55 to 175		$^\circ\text{C}$	
Source Current (Body Diode)	$I_S$	100		A	
Single Pulse Drain-to-Source Avalanche Energy ( $V_{GS} = 10\text{ V}$ , $L = 0.3\text{ mH}$ , $I_{L(pk)} = 40\text{ A}$ , $R_G = 25\ \Omega$ )	$E_{AS}$	240		mJ	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	$T_L$	260		$^\circ\text{C}$	

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. 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.
3. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

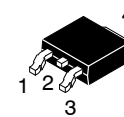
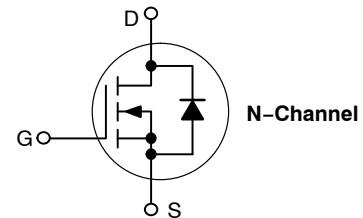
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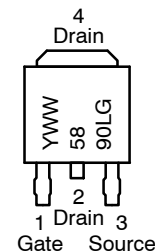
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$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	$I_D$ MAX
40 V	3.7 mΩ @ 10 V	123 A
	5.5 mΩ @ 4.5 V	



CASE 369C  
DPAK  
(Bent Lead)  
STYLE 2

#### MARKING DIAGRAMS & PIN ASSIGNMENT



- Y = Year
- WW = Work Week
- 5890L = Device Code
- G = Pb-Free Package

#### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 3 of this data sheet.

# NVD5890NL

## THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	1.4	°C/W
Junction-to-Ambient - Steady State (Note 2)	$R_{\theta JA}$	37	

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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### 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	$V_{(BR)DSS}/T_J$			40		mV/°C
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, V_{DS} = 40\text{ V}$	$T_J = 25^\circ\text{C}$		1.0	$\mu\text{A}$
			$T_J = 150^\circ\text{C}$		100	
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA

### ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	1.5		2.5	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			TBD		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 50\text{ A}$		2.9	3.7	m $\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 50\text{ A}$		4.4	5.5	
Forward Transconductance	gFS	$V_{DS} = 15\text{ V}, I_D = 15\text{ A}$		TBD		S

### CHARGES AND CAPACITANCES

Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 25\text{ V}$		4760		pF
Output Capacitance	$C_{oss}$			580		
Reverse Transfer Capacitance	$C_{rss}$			385		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}, I_D = 50\text{ A}$		74		nC
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 50\text{ A}$		TBD		nC
Threshold Gate Charge	$Q_{G(TH)}$			TBD		
Gate-to-Source Charge	$Q_{GS}$			TBD		
Gate-to-Drain Charge	$Q_{GD}$			TBD		

### SWITCHING CHARACTERISTICS (Note 5)

Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 10\text{ V}, V_{DS} = 20\text{ V}, I_D = 50\text{ A}, R_G = 2.0\ \Omega$		TBD		ns
Rise Time	$t_r$			TBD		
Turn-Off Delay Time	$t_{d(off)}$			TBD		
Fall Time	$t_f$			TBD		

4. Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

5. Switching characteristics are independent of operating junction temperatures.

# NVD5890NL

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 50 A	T <sub>J</sub> = 25°C		0.9	1.2	V
		V <sub>GS</sub> = 0 V, I <sub>S</sub> = 20 A	T <sub>J</sub> = 25°C		0.8	1.0	
Reverse Recovery Time	t <sub>RR</sub>	V <sub>GS</sub> = 0 V, dI <sub>S</sub> /dt = 100 A/μs, I <sub>S</sub> = 50 A			TBD		ns
Charge Time	t <sub>a</sub>				TBD		
Discharge Time	t <sub>b</sub>				TBD		
Reverse Recovery Charge	Q <sub>RR</sub>				TBD		

## ORDERING INFORMATION

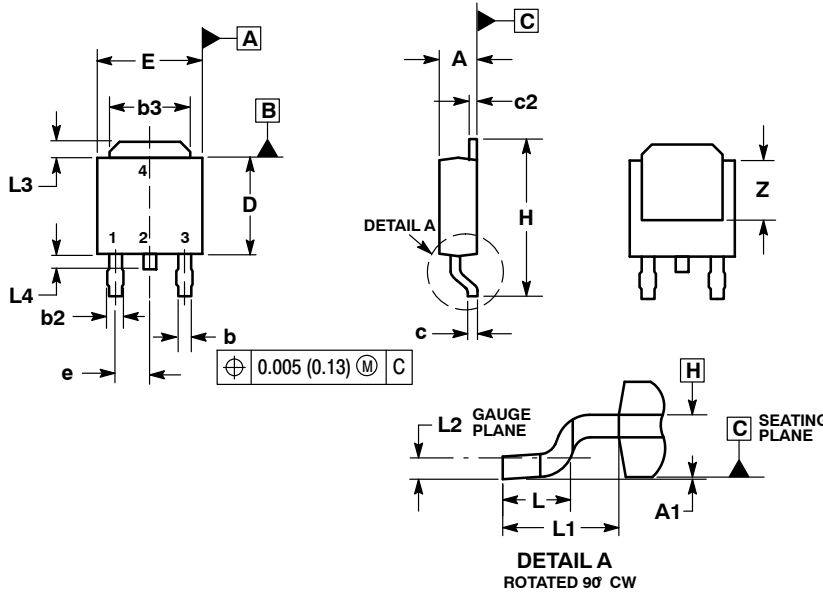
Order Number	Package	Shipping <sup>†</sup>
NVD5890NLT4G	DPAK (Pb-Free)	2500/Tape & Reel

<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.

# NVD5890NL

## PACKAGE DIMENSIONS

### DPAK CASE 369C ISSUE D

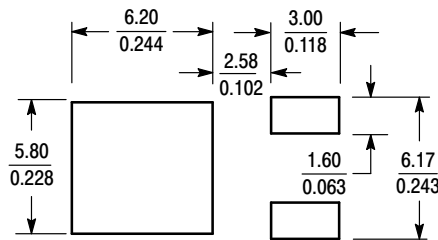


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER 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.

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	0.030	0.045	0.76	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	0.108 REF		2.74 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	---

### 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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