

# **MOSFET – Power, Single N-Channel, DFN5/DFNW5**

**40 V, 130 A, 2.5 mΩ**

# NVMFS5C442NL

## Features

- Small Footprint (5x6 mm) for Compact Design
- Low  $R_{DS(on)}$  to Minimize Conduction Losses
- Low  $Q_G$  and Capacitance to Minimize Driver Losses
- NVMFS5C442NLWF – Wettable Flank Option for Enhanced Optical Inspection
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

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

Symbol	Parameter			Value	Unit
V <sub>DSS</sub>	Drain-to-Source Voltage			40	V
V <sub>GS</sub>	Gate-to-Source Voltage			±20	V
I <sub>D</sub>	Continuous Drain Current R <sub>θJC</sub> (Notes 1, 3)	Steady State	T <sub>C</sub> = 25°C	130	A
			T <sub>C</sub> = 100°C	95	
P <sub>D</sub>	Power Dissipation R <sub>θJC</sub> (Note 1)		T <sub>C</sub> = 25°C	83	W
			T <sub>C</sub> = 100°C	42	
I <sub>D</sub>	Continuous Drain Current R <sub>θJA</sub> (Notes 1, 2, 3)	Steady State	T <sub>A</sub> = 25°C	28	A
			T <sub>A</sub> = 100°C	20	
P <sub>D</sub>	Power Dissipation R <sub>θJA</sub> (Notes 1, 2)		T <sub>A</sub> = 25°C	3.7	W
			T <sub>A</sub> = 100°C	1.8	
I <sub>DM</sub>	Pulsed Drain Current	T <sub>A</sub> = 25°C, t <sub>p</sub> = 10 μs		900	A
T <sub>J</sub> , T <sub>stg</sub>	Operating Junction and Storage Temperature Range			−55 to +175	°C
I <sub>S</sub>	Source Current (Body Diode)			81	A
E <sub>AS</sub>	Single Pulse Drain-to-Source Avalanche Energy (I <sub>L(pk)</sub> = 10 A)			265	mJ
T <sub>L</sub>	Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			260	°C

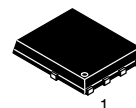
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

## THERMAL RESISTANCE MAXIMUM RATINGS

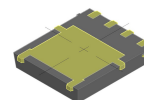
Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Junction-to-Case – Steady State	1.8	°C/W
$R_{\theta JA}$	Junction-to-Ambient – Steady State (Note 2)	41	

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.

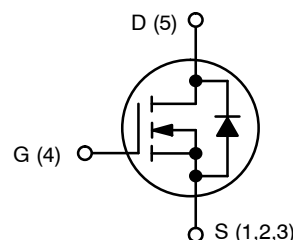
V <sub>(BR)DSS</sub>	R <sub>DS(ON)</sub> MAX	I <sub>D</sub> MAX
40 V	2.5 mΩ @ 10 V	130 A
	3.7 mΩ @ 4.5 V	



**DFN5 (SO-8FL)**  
**CASE 488AA**

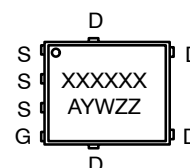


DFNW5  
CASE 507BE



### N-CHANNEL MOSFET

### MARKING DIAGRAM



XXXXXX = 5C442L  
(NVMFS5C442NL) or  
442LWF  
(NVMFS5C442NLWF)

A = Assembly Location  
Y = Year  
W = Work Week  
ZZ = Lot Traceability

## ORDERING INFORMATION

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

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 5.

# NVMFS5C442NL

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

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

V <sub>(BR)DSS</sub>	Drain-to-Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	40			V
V <sub>(BR)DSS</sub> /T <sub>J</sub>	Drain-to-Source Breakdown Voltage Temperature Coefficient			24.8		mV/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 40 V	T <sub>J</sub> = 25 °C		10	μA
			T <sub>J</sub> = 125°C		250	
		V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 20 V, T <sub>J</sub> = 125°C			20	
I <sub>GSS</sub>	Gate-to-Source Leakage Current	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = 20 V			100	nA

### ON CHARACTERISTICS (Note 4)

V <sub>GS(TH)</sub>	Gate Threshold Voltage	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 90 μA	1.2		2.0	V
V <sub>GS(TH)</sub> /T <sub>J</sub>	Threshold Temperature Coefficient			-5.4		mV/°C
R <sub>DS(on)</sub>	Drain-to-Source On Resistance	V <sub>GS</sub> = 10 V	I <sub>D</sub> = 50 A		2.0	mΩ
		V <sub>GS</sub> = 4.5 V	I <sub>D</sub> = 50 A		2.9	
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 50 A		116		S

### CHARGES, CAPACITANCES & GATE RESISTANCE

C <sub>ISS</sub>	Input Capacitance	V <sub>GS</sub> = 0 V, f = 1 MHz, V <sub>DS</sub> = 25 V		3100		pF
C <sub>OSS</sub>	Output Capacitance			1100		
C <sub>RSS</sub>	Reverse Transfer Capacitance			37		
Q <sub>G(TOT)</sub>	Total Gate Charge	V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 32 V; I <sub>D</sub> = 50 A		23		nC
Q <sub>G(TOT)</sub>	Total Gate Charge	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 32 V; I <sub>D</sub> = 50 A		50		
Q <sub>G(TH)</sub>	Threshold Gate Charge	V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 32 V; I <sub>D</sub> = 50 A		5.0		
Q <sub>GS</sub>	Gate-to-Source Charge			9.8		
Q <sub>GD</sub>	Gate-to-Drain Charge			6.7		
V <sub>GP</sub>	Plateau Voltage			3.1		V

### SWITCHING CHARACTERISTICS (Note 5)

t <sub>d(ON)</sub>	Turn-On Delay Time	V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 32 V, I <sub>D</sub> = 50 A, R <sub>G</sub> = 1.0 Ω		12		ns
t <sub>r</sub>	Rise Time			8.3		
t <sub>d(OFF)</sub>	Turn-Off Delay Time			28		
t <sub>f</sub>	Fall Time			9.4		

### DRAIN-SOURCE DIODE CHARACTERISTICS

V <sub>SD</sub>	Forward Diode Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 50 A	T <sub>J</sub> = 25°C		0.85	1.2	V
			T <sub>J</sub> = 125°C		0.73		
t <sub>RR</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, dI <sub>S</sub> /dt = 100 A/μs, I <sub>S</sub> = 50 A			46		ns
t <sub>a</sub>	Charge Time				23		
t <sub>b</sub>	Discharge Time				23		
Q <sub>RR</sub>	Reverse Recovery Charge					40	

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.

5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

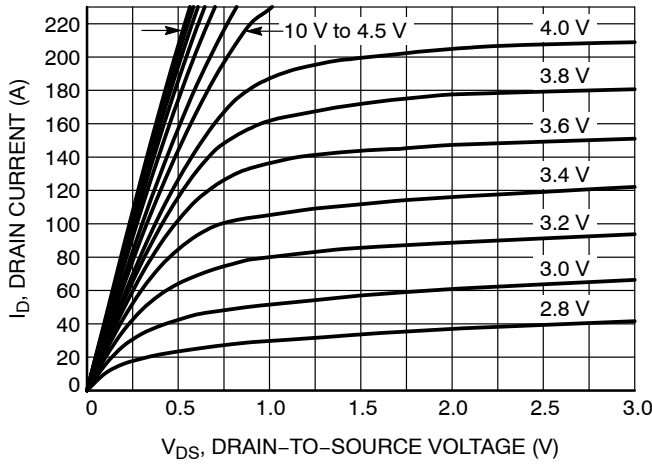


Figure 1. On-Region Characteristics

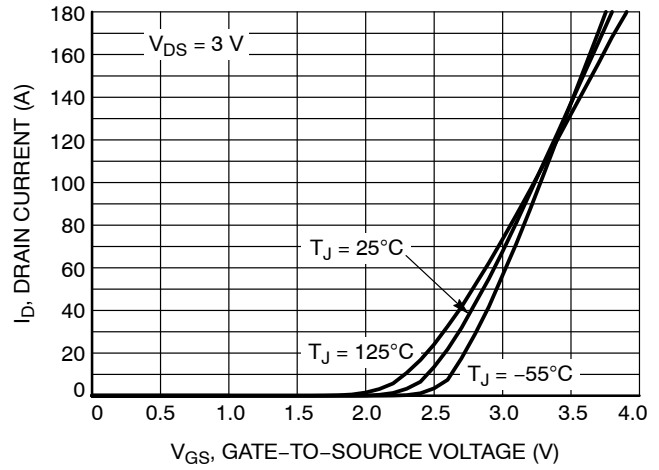


Figure 2. Transfer Characteristics

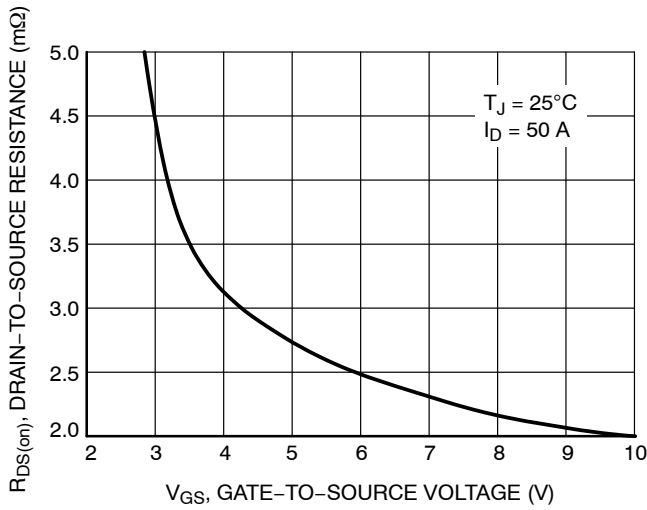


Figure 3. On-Resistance vs. Gate-to-Source Voltage

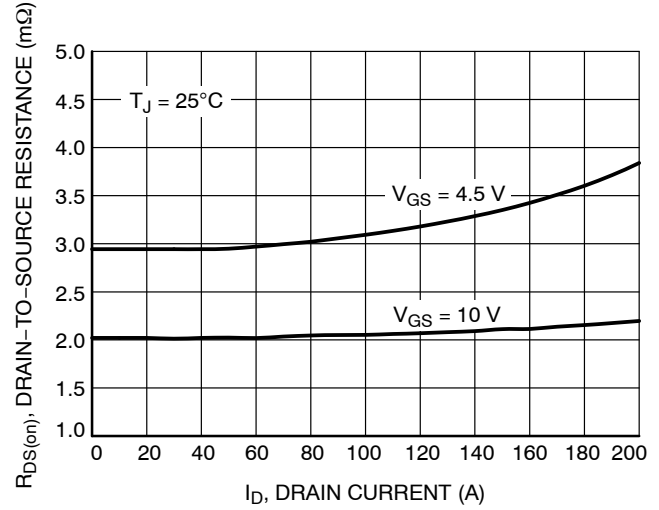


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

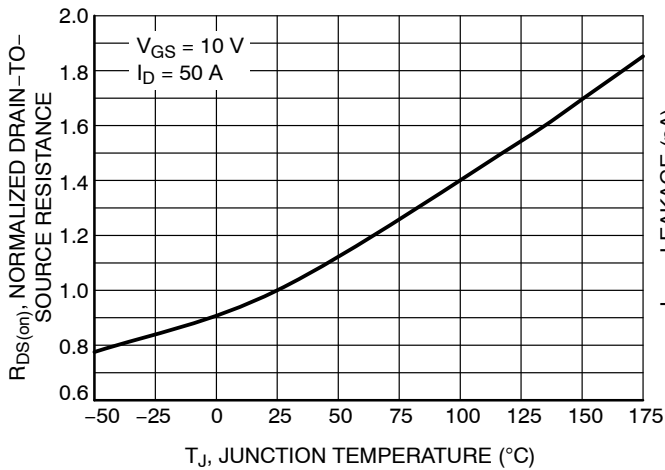


Figure 5. On-Resistance Variation with Temperature

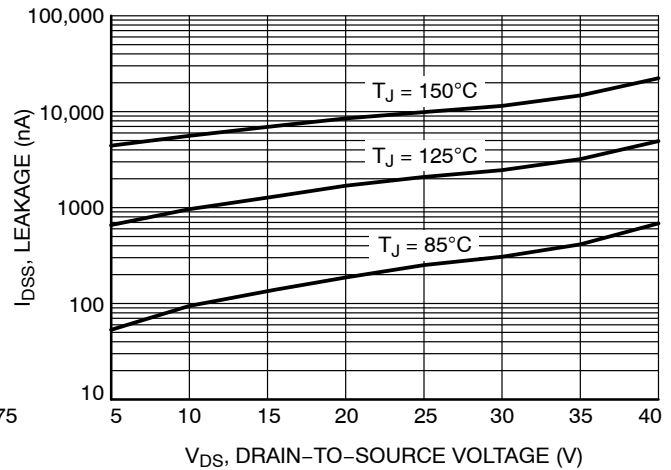


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS (continued)

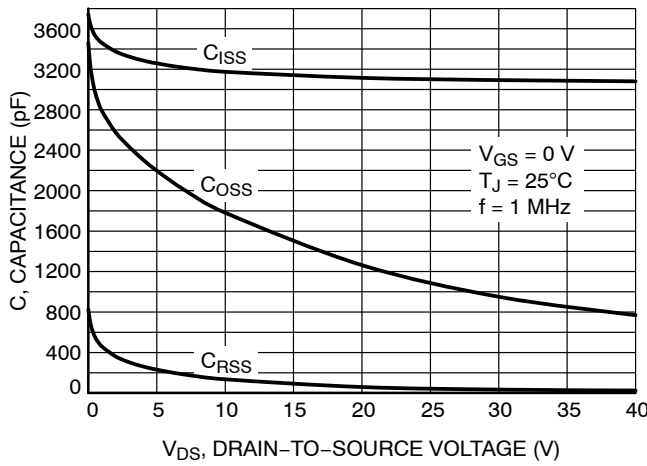


Figure 7. Capacitance Variation

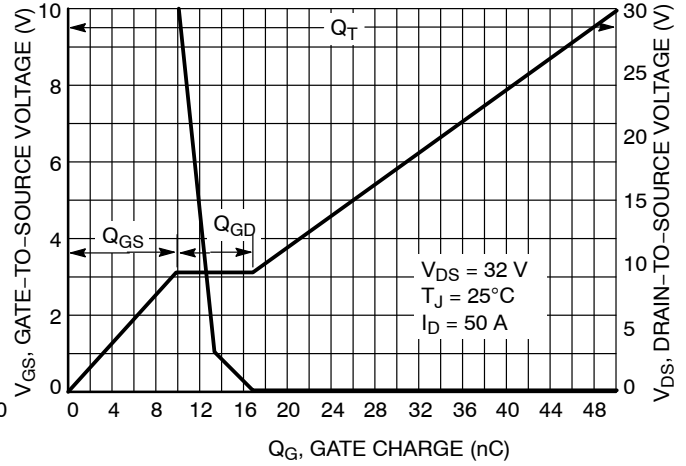


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

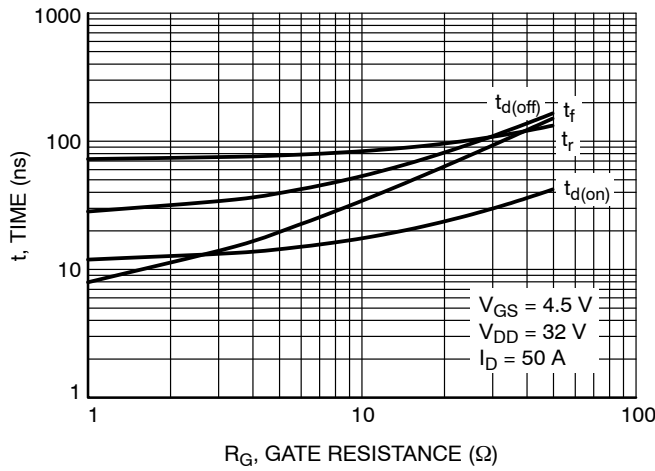


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

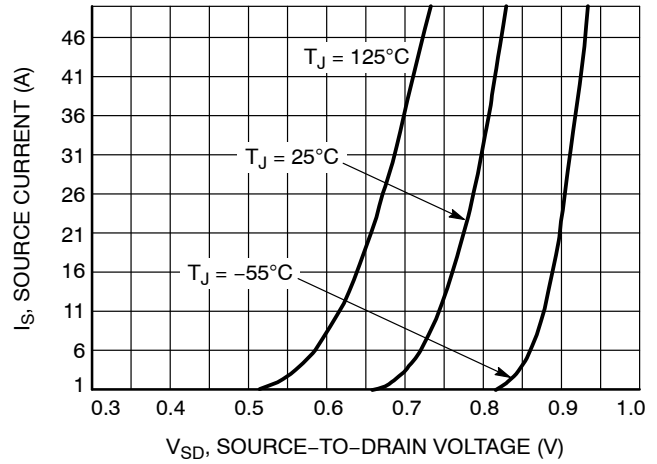


Figure 10. Diode Forward Voltage vs. Current

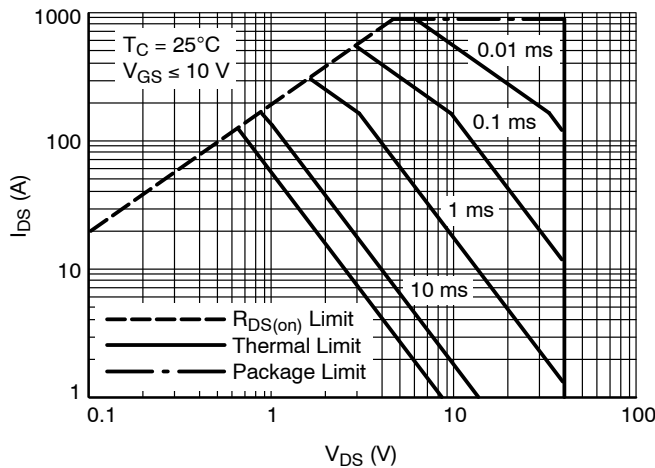


Figure 11. Safe Operating Area

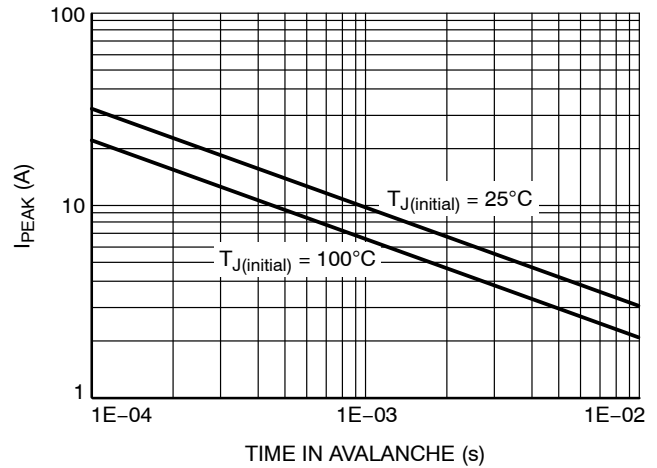


Figure 12.  $I_{PEAK}$  vs. Time in Avalanche

# NVMFS5C442NL

## TYPICAL CHARACTERISTICS (continued)

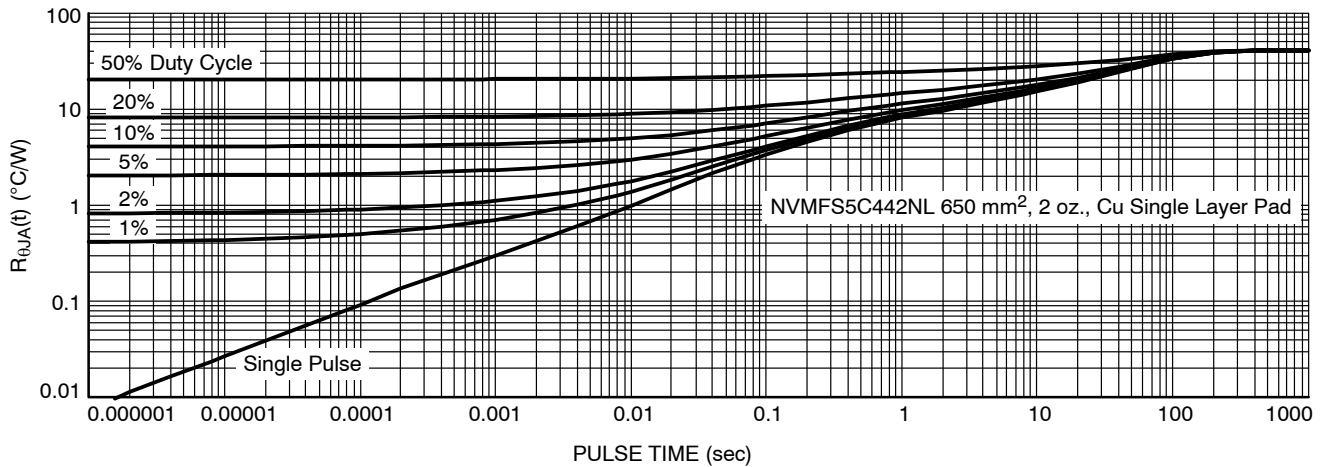


Figure 13. Thermal Characteristics

### DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping <sup>†</sup>
NVMFS5C442NLWFT1G	442LWF	DFNW5 (Pb-Free)	1500 / Tape & Reel
NVMFS5C442NLT3G	5C442L	DFN5 (Pb-Free)	5000 / Tape & Reel
NVMFS5C442NLAFT1G	5C442L	DFN5 (Pb-Free)	1500 / Tape & Reel
NVMFS5C442NLAFT1G-YE	5C442L	DFN5 (Pb-Free)	1500 / Tape & Reel
NVMFS5C442NLWFAFT1G	442LWF	DFNW5 (Pb-Free)	1500 / Tape & Reel
NVMFS5C442NLWFET1G	442LWF	DFNW5 (Pb-Free)	1500 / Tape & Reel

### DISCONTINUED (Note 6)

NVMFS5C442NLT1G	5C442L	DFN5 (Pb-Free)	1500 / Tape & Reel
NVMFS5C442NLWFT3G	442LWF	DFNW5 (Pb-Free, Wettable Flanks)	5000 / 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](#).

6. **DISCONTINUED:** These devices are not recommended for new design. Please contact your **onsemi** representative for information. The most current information on these devices may be available on [www.onsemi.com](http://www.onsemi.com).



SCALE 2:1

**DFN5 5x6, 1.27P**  
**(SO-8FL)**  
**CASE 488AA**  
**ISSUE N**

DATE 25 JUN 2018



## NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.00	---	0.05
b	0.33	0.41	0.51
c	0.23	0.28	0.33
D	5.00	5.15	5.30
D1	4.70	4.90	5.10
D2	3.80	4.00	4.20
E	6.00	6.15	6.30
E1	5.70	5.90	6.10
E2	3.45	3.65	3.85
e	1.27 BSC		
G	0.51	0.575	0.71
K	1.20	1.35	1.50
L	0.51	0.575	0.71
L1	0.125 REF		
M	3.00	3.40	3.80
θ	0°	---	12°

**GENERIC**  
**MARKING DIAGRAM\***


XXXXXX = Specific Device Code  
A = Assembly Location  
Y = Year  
W = Work Week  
ZZ = Lot Traceability

\*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.



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

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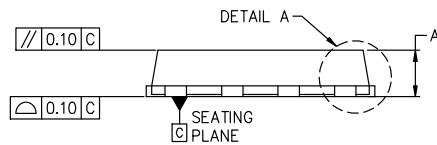


DFNW5 4.90x5.90x1.00, 1.27P  
CASE 507BE  
ISSUE B

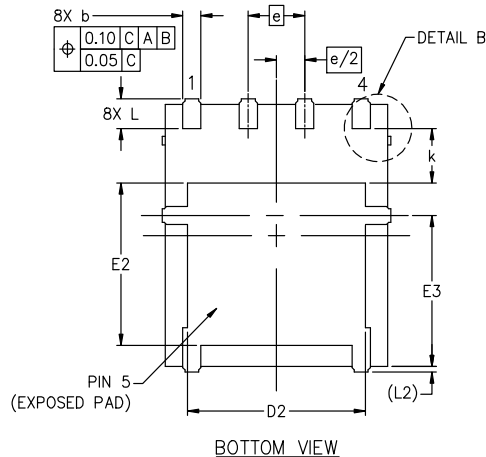
DATE 19 SEP 2024



TOP VIEW

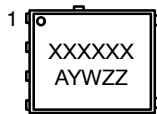


SIDE VIEW



BOTTOM VIEW

GENERIC  
MARKING DIAGRAM\*

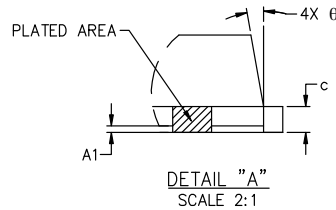


XXXXXX = Specific Device Code  
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\*This information is generic. Please refer to device data sheet for actual part marking.  
Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

NOTES:

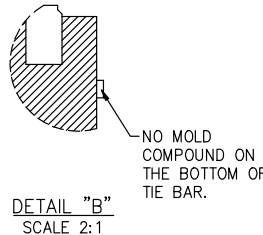
1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5M-2018.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
4. THIS PACKAGE CONTAINS WETTABLE FLANK DESIGN FEATURES TO AID IN FILLET FORMATION ON THE LEADS DURING MOUNTING.



DETAIL "A"  
SCALE 2:1

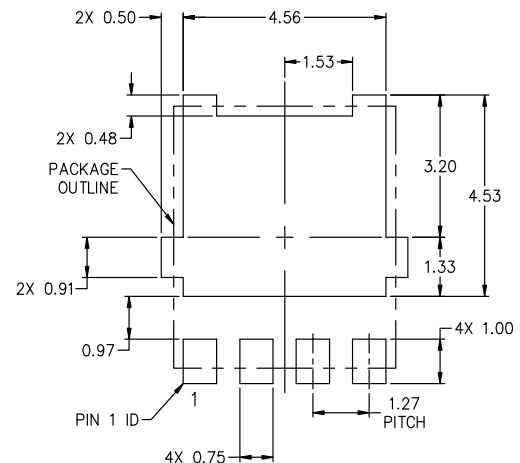


ALTERNATE  
CONSTRUCTION



DETAIL "B"  
SCALE 2:1

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.00	---	0.05
b	0.33	0.41	0.51
c	0.23	0.28	0.33
D	5.00	5.15	5.30
D1	4.70	4.90	5.10
D2	3.80	4.00	4.20
E	6.00	6.15	6.30
E1	5.70	5.90	6.10
E2	3.45	3.65	3.85
E3	3.00	3.40	3.80
e	1.27 BSC		
k	1.20	1.35	1.50
L	0.51	0.57	0.71
L2	0.15 REF.		
θ	0°	6°	12°



RECOMMENDED MOUNTING FOOTPRINT\*  
\*FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ONSEMI SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERM/D.

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