NVMFS5C442NT3G Datasheet

https://www.DiGi-Electronics.com

DiGi Electronics Part Number	NVMFS5C442NT3G-DG
Manufacturer	onsemi
Manufacturer Product Number	NVMFS5C442NT3G
Description	MOSFET N-CH 40V 5DFN
Detailed Description	N-Channel 40 V 140A (Tc) 3.7W (Ta), 83W (Tc) Surface Mount 5-DFN (5x6) (8-SOFL)

Purchase and inquiry

Manufacturer Product Number:	NVMFS5C442NT3G	Manufacturer:	onsemi
Series:	-	Product Status:	Discontinued at Digi-Key
FET Type:	N-Channel	Technology:	MOSFET (Metal Oxide)
Drain to Source Voltage (Vdss):	40 V	Current - Continuous Drain (Id) @ 25°C:	140A (Tc)
Drive Voltage (Max Rds On, Min Rds On):	10V	Rds On (Max) @ Id, Vgs:	2.3mOhm @ 50A, 10V
Vgs(th) (Max) @ Id:	4V @ 250µA	Gate Charge (Qg) (Max) @ Vgs:	32 nC @ 10 V
Vgs (Max):	±20V	Input Capacitance (Ciss) (Max) @ Vds:	2100 pF @ 25 V
FET Feature:	-	Power Dissipation (Max):	3.7W (Ta), 83W (Tc)
Operating Temperature:	-55°C ~ 175°C (TJ)	Grade:	Automotive
Qualification:	AEC-Q101	Mounting Type:	Surface Mount
Supplier Device Package:	5-DFN (5x6) (8-SOFL)	Package / Case:	8-PowerTDFN, 5 Leads
Base Product Number:	NVMFS5		

Environmental & Export classification

RoHS Status:	ROHS3 Compliant	Moisture Sensitivity Level (MSL):	1 (Unlimited)
REACH Status:	REACH Unaffected	ECCN:	EAR99
HTSUS:	8541.29.0095		

MOSFET - Power, Single N-Channel, DFN5/DFNW5

40 V, 2.3 mΩ, 140 A

NVMFS5C442N

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
- NVMFS5C442NWF − 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_J = 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 Current $R_{\theta JC}$ (Notes 1, 3)	Steady State	T_C = 25°C	I_D	140	A
		T_C = 100°C		99	
Power Dissipation $R_{\theta JC}$ (Note 1)		T_C = 25°C	P_D	83	W
		T_C = 100°C		42	
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2, 3)	Steady State	T_A = 25°C	I_D	29	A
		T_A = 100°C		21	
Power Dissipation $R_{\theta JA}$ (Notes 1 & 2)		T_A = 25°C	P_D	3.7	W
		T_A = 100°C		1.8	
Pulsed Drain Current	T_A = 25°C, t_p = 10 μs		I_{DM}	900	A
Operating Junction and Storage Temperature			T_J, T_{stg}	−55 to + 175	°C
Source Current (Body Diode)			I_S	92	A
Single Pulse Drain−to−Source Avalanche Energy ($I_{L(pk)}$ = 12 A)			E_{AS}	220	mJ
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)			T_L	260	°C

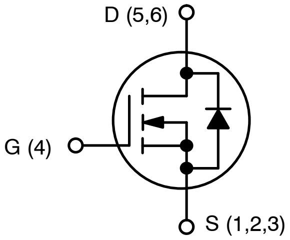
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE MAXIMUM RATINGS

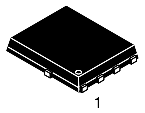
Parameter	Symbol	Value	Unit
Junction−to−Case − Steady State	$R_{\theta JC}$	1.8	°C/W
Junction−to−Ambient − Steady State (Note 2)	$R_{\theta JA}$	41	

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^2, 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.

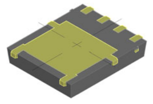
$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	I_D MAX
40 V	2.3 mΩ @ 10 V	140 A



N−CHANNEL MOSFET

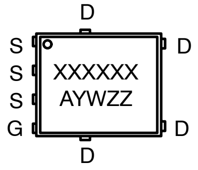


DFN5 (SO−8FL)
CASE 488AA



DFNW5
(FULL−CUT SO8FL WF)
CASE 507BA

MARKING DIAGRAM



XXXXXX = 5C442N
(NVMFS5C442N) or
442NWF
(NVMFS5C442NWF)
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 5 of this data sheet.

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

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Drain–to–Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 μA		40			V
Drain–to–Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$				15.2		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 40 V	T_J = 25 °C			10	μA
			T_J = 125°C			250	
Gate–to–Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = 20 V				100	nA
ON CHARACTERISTICS (Note 4)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 90 μA		2.0		4.0	V
Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				−7.7		mV/°C
Drain–to–Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 50 A		1.9	2.3	mΩ
Forward Transconductance	g_{FS}	V_{DS} = 15 V, I_D = 50 A			92		S
CHARGES, CAPACITANCES & GATE RESISTANCE							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 25 V			2100		pF
Output Capacitance	C_{OSS}				1100		
Reverse Transfer Capacitance	C_{RSS}				40		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 10 V, V_{DS} = 20 V; I_D = 50 A			32		nC
Threshold Gate Charge	$Q_{G(TH)}$	V_{GS} = 10 V, V_{DS} = 20 V; I_D = 50 A			6.6		
Gate–to–Source Charge	Q_{GS}				11		
Gate–to–Drain Charge	Q_{GD}				4.7		
Plateau Voltage	V_{GP}				4.7		V
SWITCHING CHARACTERISTICS (Note 5)							
Turn–On Delay Time	$t_{d(ON)}$	V_{GS} = 10 V, V_{DS} = 20 V, I_D = 50 A, R_G = 2.5 Ω			11		ns
Rise Time	t_r				50		
Turn–Off Delay Time	$t_{d(OFF)}$				23		
Fall Time	t_f				18		
DRAIN–SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 50 A	T_J = 25°C		0.83	1.2	V
			T_J = 125°C		0.71		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dI_S/dt = 100 A/μs, I_S = 50 A			43		ns
Charge Time	t_a				22		
Discharge Time	t_b				22		
Reverse Recovery Charge	Q_{RR}				40		nC

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

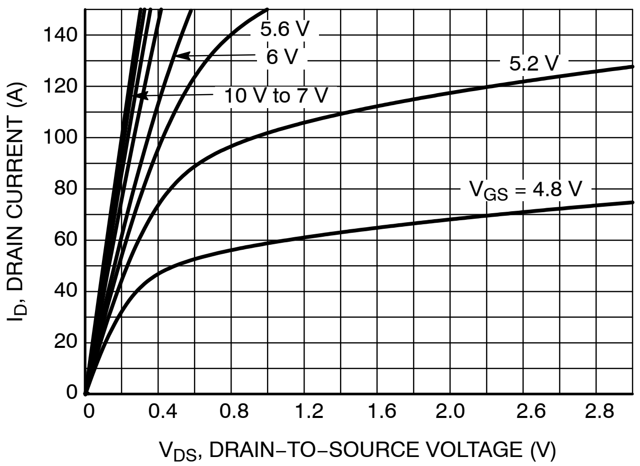


Figure 1. On−Region Characteristics

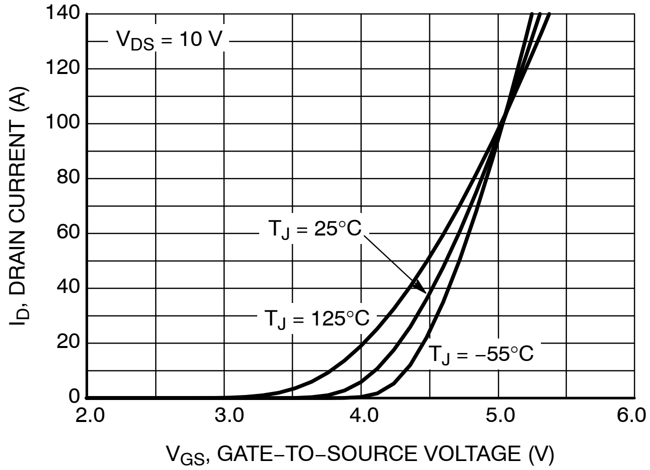


Figure 2. Transfer Characteristics

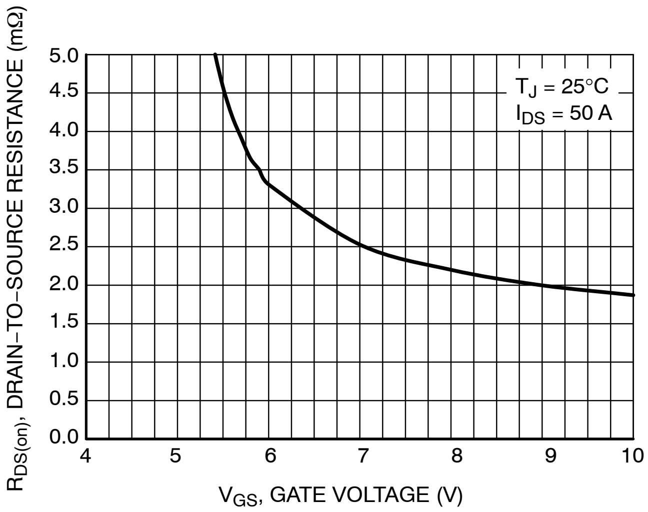


Figure 3. On−Resistance vs. Gate−to−Source Voltage

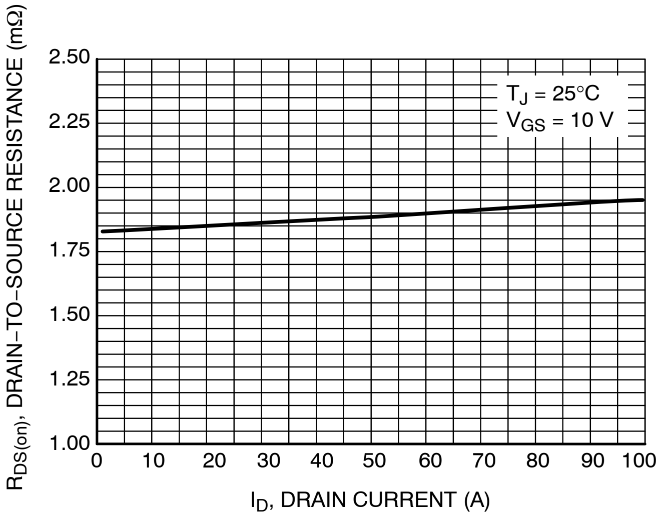


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

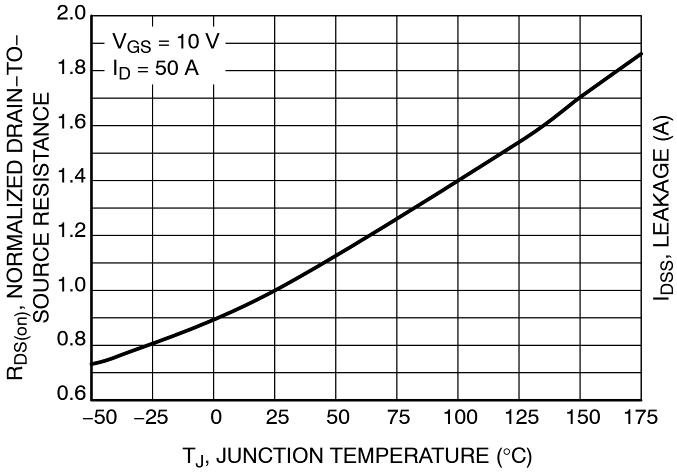


Figure 5. On−Resistance Variation with Temperature

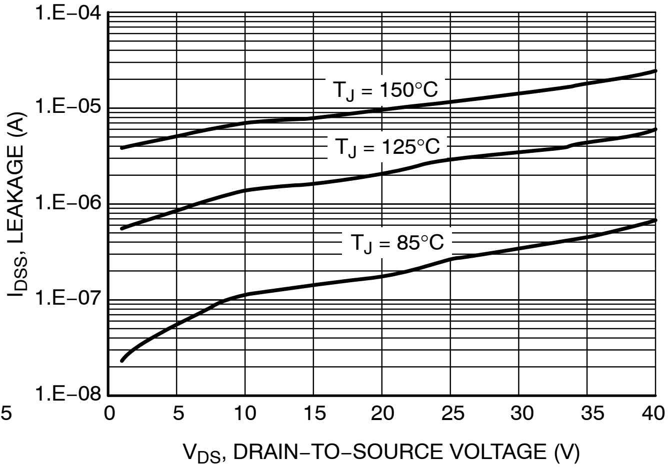


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

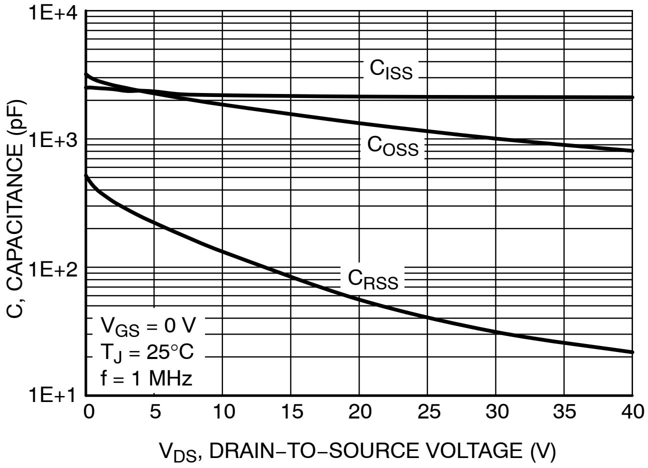


Figure 7. Capacitance Variation

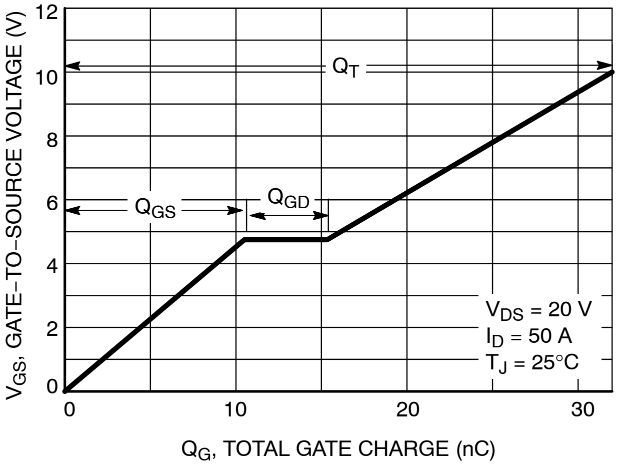


Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

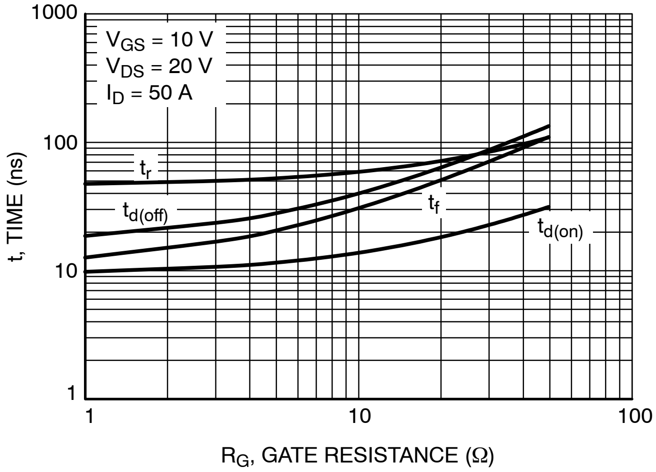


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

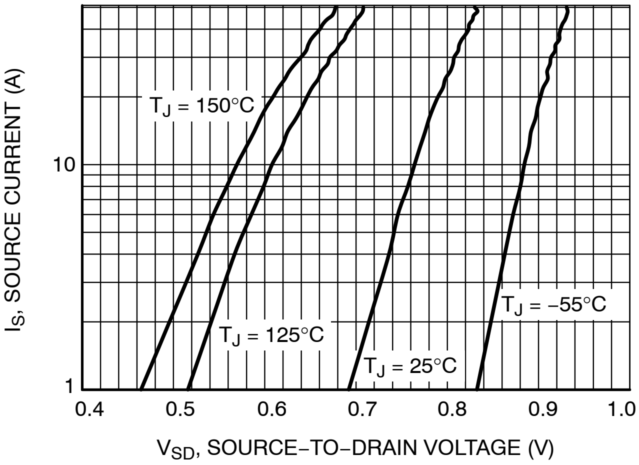


Figure 10. Diode Forward Voltage vs. Current

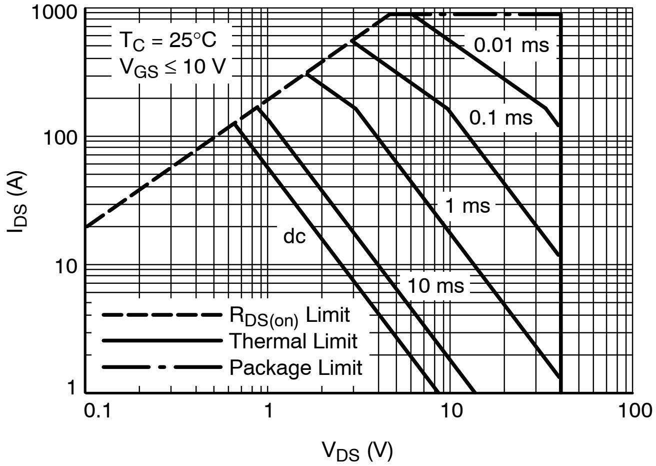


Figure 11. Safe Operating Area

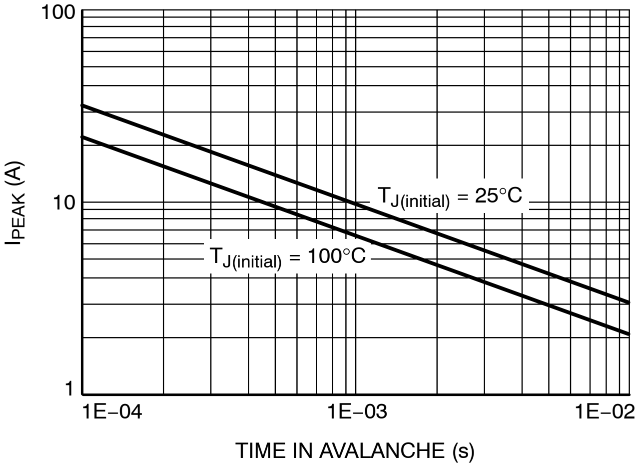


Figure 12. I_{PEAK} vs. Time in Avalanche

TYPICAL CHARACTERISTICS

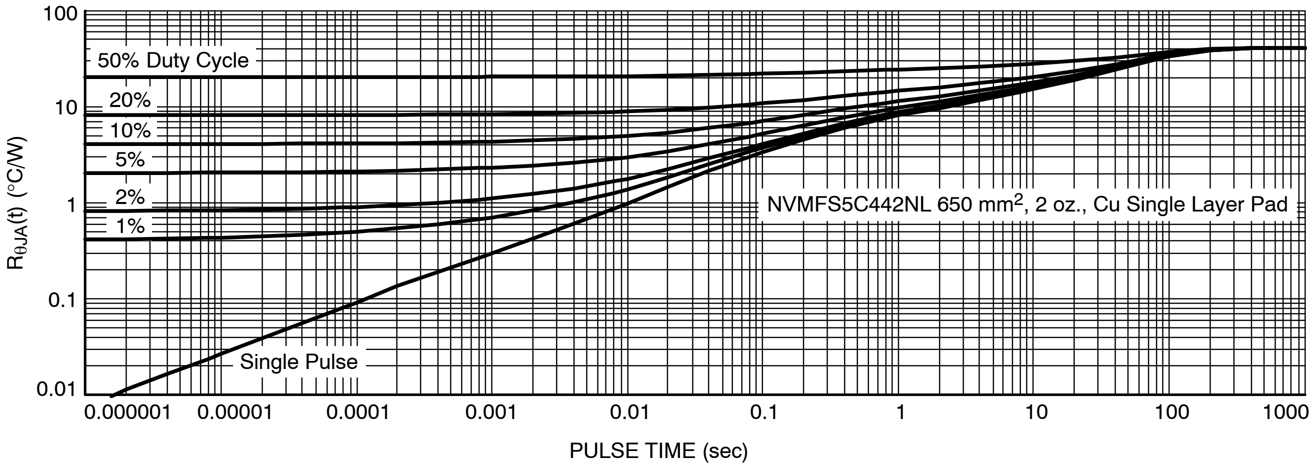


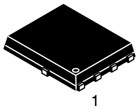
Figure 13. Thermal Characteristics

DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping†
NVMFS5C442NT1G	5C442N	DFN5 (Pb−Free)	1500 / Tape & Reel
NVMFS5C442NET1G−YE	5C442N	DFN5 (Pb−Free)	1500 / Tape & Reel
NVMFS5C442NWFT1G	442NWF	DFNW5 (Pb−Free, Wettable Flanks)	1500 / Tape & Reel
NVMFS5C442NT3G	5C442N	DFN5 (Pb−Free)	5000 / Tape & Reel
NVMFS5C442NWFT3G	442NWF	DFNW5 (Pb−Free, Wettable Flanks)	5000 / Tape & Reel
NVMFS5C442NAFT1G	5C442N	DFN5 (Pb−Free)	1500 / Tape & Reel
NVMFS5C442NAFT1G−YE	5C442N	DFN5 (Pb−Free)	1500 / Tape & Reel
NVMFS5C442NWFAFT1G	442NWF	DFNW5 (Pb−Free, Wettable Flanks)	1500 / Tape & Reel
NVMFS5C442NWFET1G	442NWF	DFNW5 (Pb−Free, Wettable Flanks)	1500 / Tape & Reel
NVMFS5C442NWFET3G	442NWF	DFNW5 (Pb−Free, Wettable Flanks)	5000 / Tape & Reel

†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.

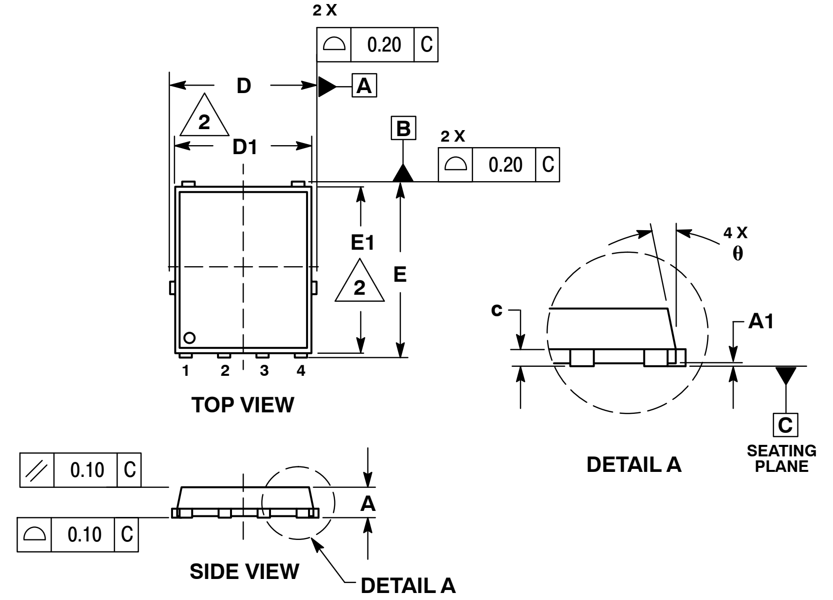
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

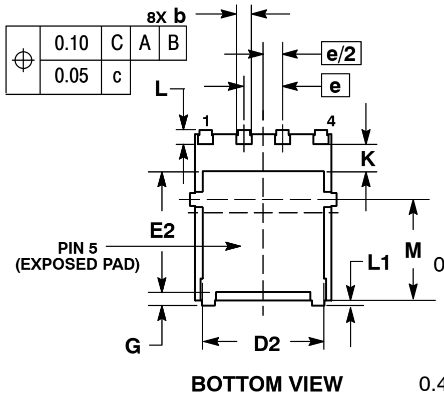


SCALE 2:1

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

DATE 25 JUN 2018

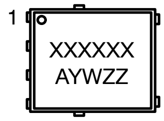




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

	MILLIMETERS		
DIM	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 °

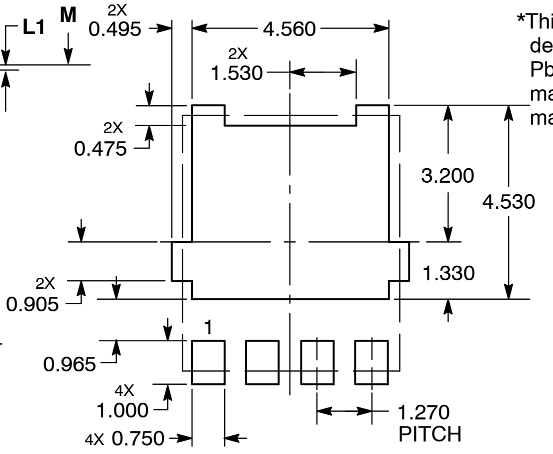
GENERIC MARKING DIAGRAM*



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.

RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

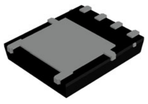
STYLE 1:
PIN 1. SOURCE
2. SOURCE
3. SOURCE
4. GATE
5. DRAIN

STYLE 2:
PIN 1. ANODE
2. ANODE
3. ANODE
4. NO CONNECT
5. CATHODE

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

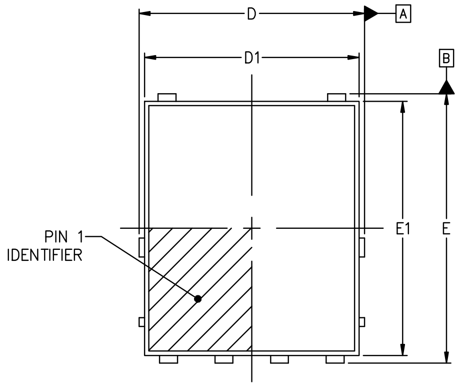
DOCUMENT NUMBER:	**98AON14036D**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.
DESCRIPTION:	**DFN5 5x6, 1.27P (SO−8FL)**	**PAGE 1 OF 1**

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS



DFNW5 4.90x5.90x1.00, 1.27P
CASE 507BA
ISSUE C

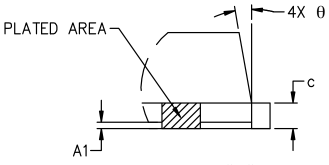
DATE 19 SEP 2024



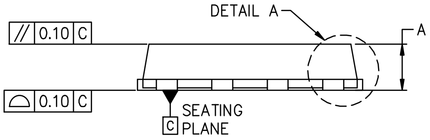
TOP VIEW

NOTES:

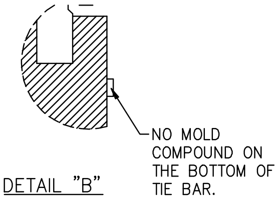
1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5M−2018.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
4. THIS PACKAGE CONTAINS WETTABLE FLANK DESIGN FEATURES TO AID IN FILLET FORMATION ON THE LEADS DURING MOUNTING.



DETAIL "A"
SCALE 2:1

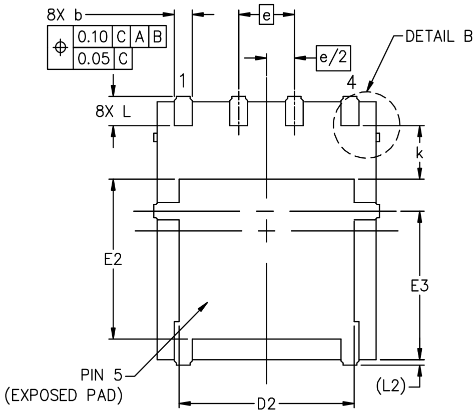


SIDE VIEW

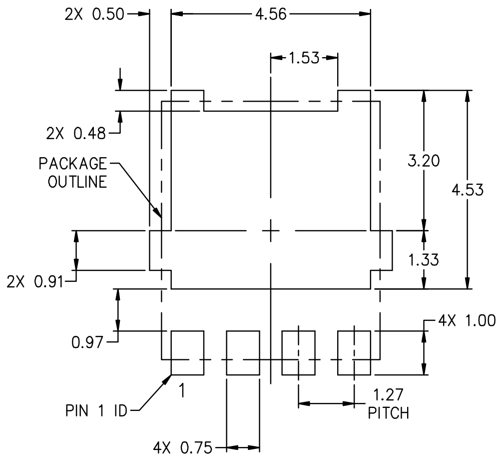


DETAIL "B"
SCALE 2:1

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°

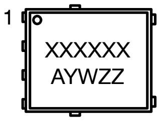


BOTTOM VIEW



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

GENERIC MARKING DIAGRAM*



XXXXXX = Specific Device Code
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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.

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DESCRIPTION:	**DFNW5 4.90x5.90x1.00, 1.27P**	**PAGE 1 OF 1**

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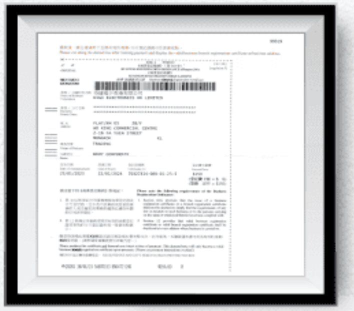

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