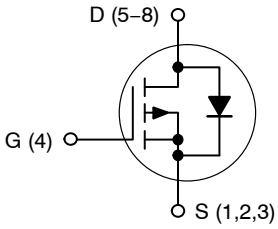
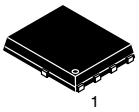
MOSFET - Power, Single P-Channel
-40 V, 9.5 mΩ, -77 A
NVMFS9D6P04M8L

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
−40 V	9.5 mΩ @ −10 V	−77 A
	13.8 mΩ @ −4.5 V	

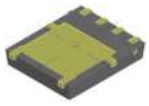
Features
- Small Footprint for Compact Design
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- NVMFWS9D6P04M8L − Wettable Flanks Product
- AEC−Q101 Qualified and PPAP Capable
- These Devices are Pb−Free, Halogen Free/BFR−Free and are RoHS Compliant

P−Channel MOSFET





DFN5 (SO−8FL) CASE 488AA STYLE 1



DFNW5 (FULL−CUT SO8FL WF) CASE 507BA

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, 2, 4)	Steady State	T_C = 25°C	I_D	−77.0	A
		T_C = 100°C		−54.4	
Power Dissipation $R_{\theta JC}$ (Notes 1, 2)		T_C = 25°C	P_D	75	W
		T_C = 100°C		38	
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 3, 4)	Steady State	T_A = 25°C	I_D	−17.1	A
		T_A = 100°C		−12.1	
Power Dissipation $R_{\theta JA}$ (Notes 1, 3)		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}	450	A
Operating Junction and Storage Temperature Range			T_J, T_{stg}	−55 to +175	°C
Source Current (Body Diode)			I_S	−62	A
Single Pulse Drain−to−Source Avalanche Energy ($I_{L(pk)}$ = −8.5 A)			E_{AS}	259	mJ
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)			T_L	260	°C

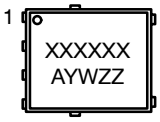
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE MAXIMUM RATINGS (Note 1)

Parameter	Symbol	Value	Unit
Junction−to−Case − Steady State (Drain) (Notes 1, 2, 4)	$R_{\theta JC}$	2	°C/W
Junction−to−Ambient − Steady State (Note 3)	$R_{\theta JA}$	40.7	

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. Assumes heat−sink sufficiently large to maintain constant case temperature independent of device power.
3. Surface−mounted on FR4 board using a 650 mm^2, 2 oz. Cu pad.
4. Continuous DC current rating. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

MARKING DIAGRAM



XXXXXX = Specific Device Code
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.

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

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	$V_{(BR)DSS}/T_J$				21		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = −40 V	T_J = 25°C			−1.0	μA
			T_J = 125°C			−1000	
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V				±100	nA
ON CHARACTERISTICS (Note 5)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = −580 μA		−1.0		−2.4	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				−5.1		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = −10 V, I_D = −20 A			7.15	9.5	mΩ
		V_{GS} = −4.5 V, I_D = −10 A			10.4	13.8	
Forward Transconductance	g_{FS}	V_{DS} = −1.5 V, I_D = −15 A			36		S
CHARGES AND CAPACITANCES							
Input Capacitance	C_{iss}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = −20 V			2002		pF
Output Capacitance	C_{oss}				935		
Reverse Transfer Capacitance	C_{rss}				43		
Total Gate Charge	$Q_{G(TOT)}$	V_{DS} = −20 V, I_D = −20 A	V_{GS} = −4.5 V		15.04		nC
			V_{GS} = −10 V		14.47		
Threshold Gate Charge	$Q_{G(TH)}$	V_{GS} = −10 V, V_{DS} = −20 V, I_D = −20 A			4.27		nC
Gate−to−Source Charge	Q_{GS}				11.94		
Gate−to−Drain Charge	Q_{GD}				12.83		
Plateau Voltage	V_{GP}				3.63		V
SWITCHING CHARACTERISTICS, V_{GS} = −4.5 V (Note 6)							
Turn−On Delay Time	$t_{d(on)}$	V_{GS} = −4.5 V, V_{DS} = −20 V, I_D = −20 A, R_G = 2.5 Ω			13.1		ns
Rise Time	t_r				103		
Turn−Off Delay Time	$t_{d(off)}$				83.3		
Fall Time	t_f				63.0		
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = −20 A	T_J = 25°C		−0.86	−1.25	V
			T_J = 125°C		−0.74		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dI_S/dt = 100 A/μs, I_S = −20 A			54.6		ns
Charge Time	t_a				34.9		
Discharge Time	t_b				19.7		
Reverse Recovery Charge	Q_{RR}				97.9		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.

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

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TYPICAL CHARACTERISTICS

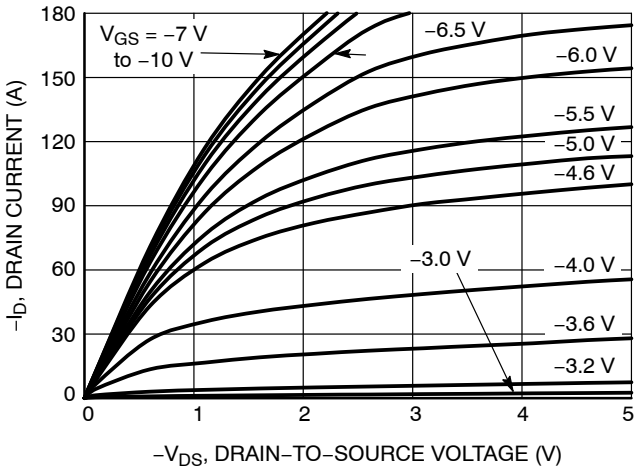

Figure 1. On−Region Characteristics

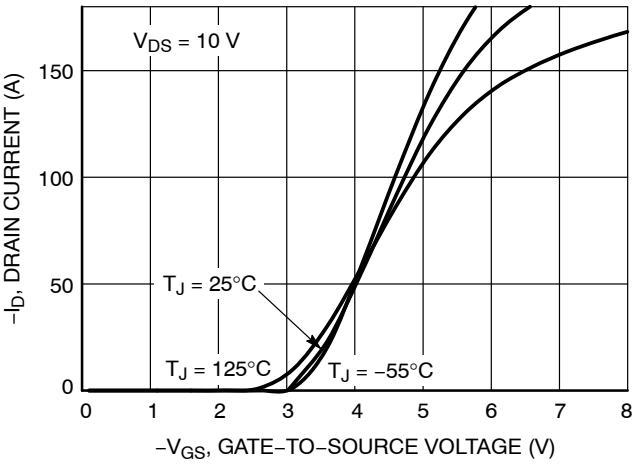

Figure 2. Transfer Characteristics

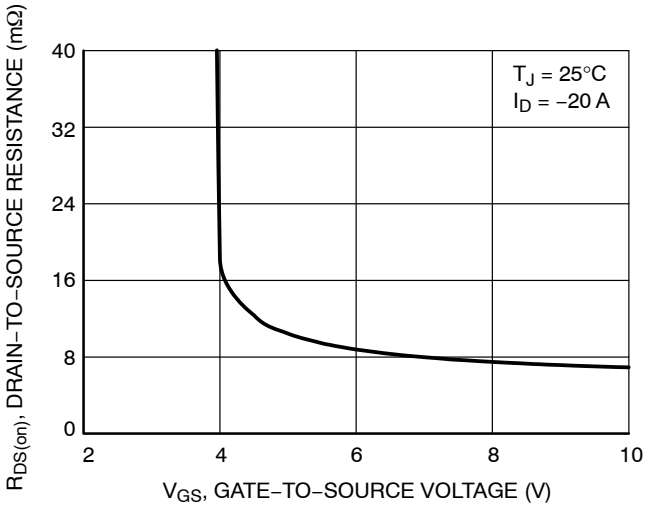

Figure 3. On−Resistance vs. Gate−to−Source Voltage

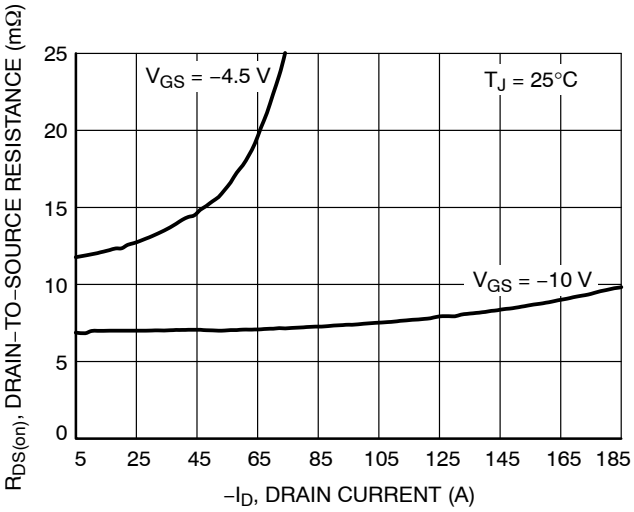

Figure 4. On−Resistance vs. Drain Current and Gate Voltage

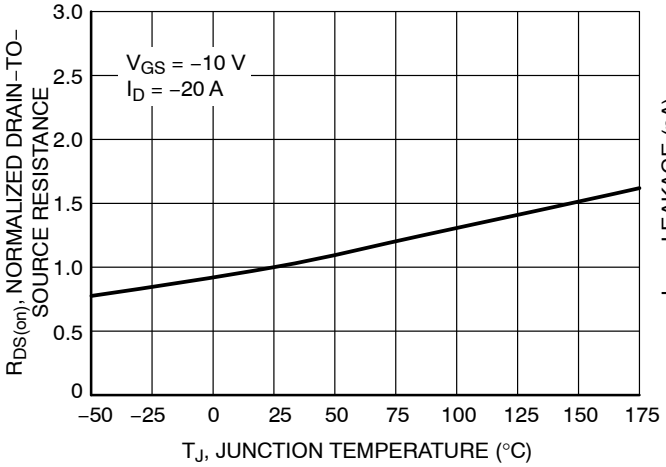

Figure 5. On−Resistance Variation with Temperature

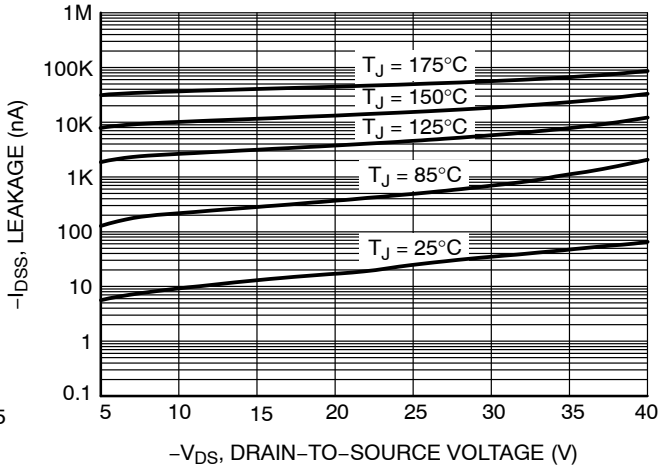

Figure 6. Drain−to−Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS

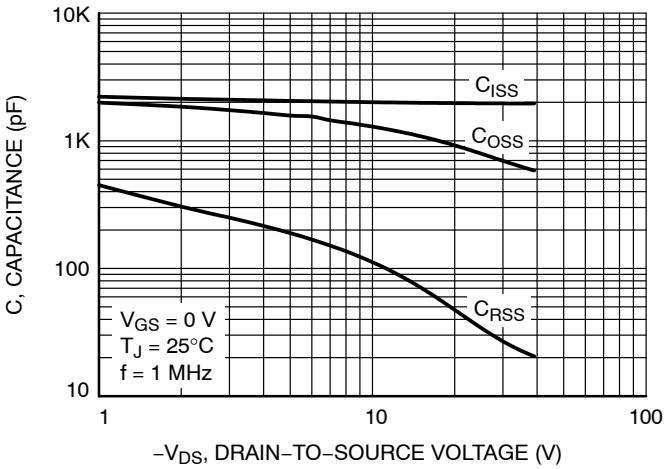

Figure 7. Capacitance Variation

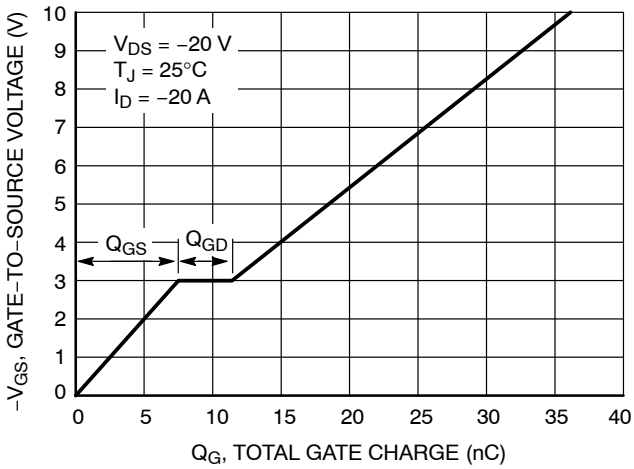

Figure 8. Gate−to−Source vs. Total Charge

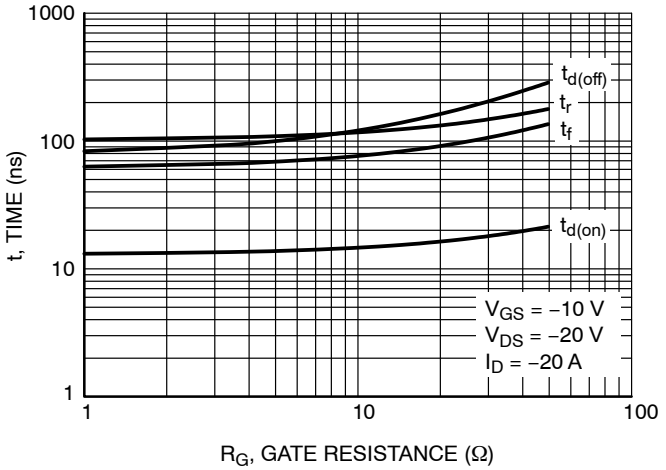

Figure 9. Resistive Switching Time Variation vs. Gate Resistance

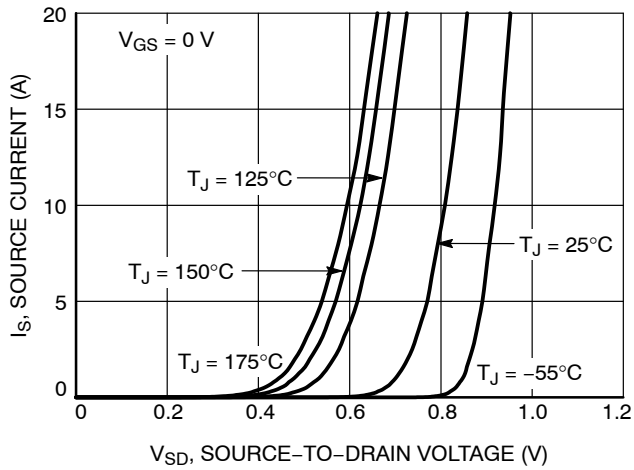

Figure 10. Diode Forward Voltage vs. Current

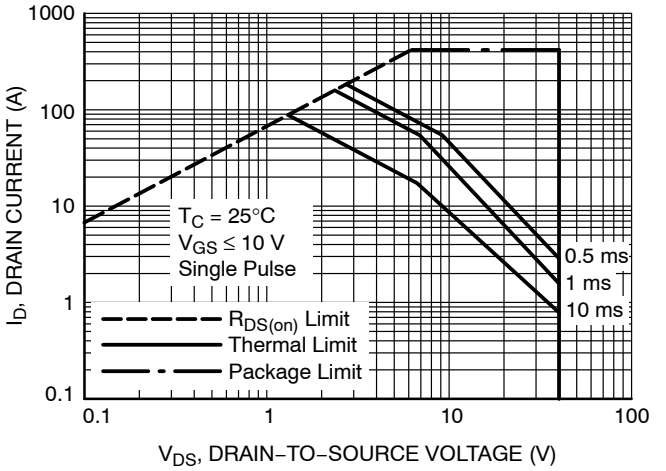

Figure 11. Maximum Rated Forward Biased Safe Operating Area

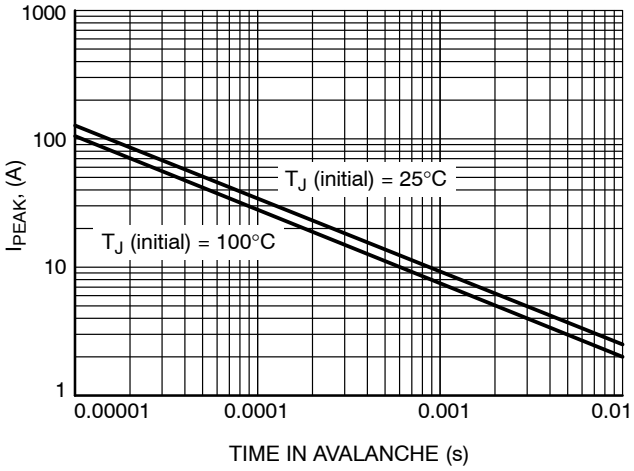

Figure 12. I_{PEAK} vs. Time in Avalanche

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TYPICAL CHARACTERISTICS

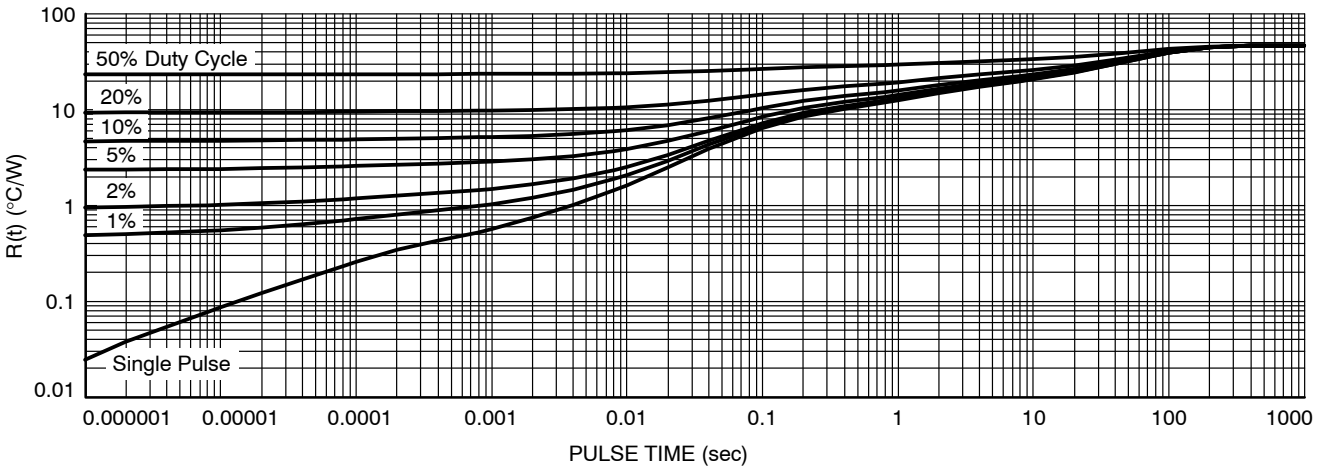

Figure 13. Thermal Characteristics

DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping†
NVMFS9D6P04M8LT1G	V9D6PL	DFNW5 (Pb−Free)	1500 / Tape & Reel
NVMFWS9D6P04M8LT1G	9D6PLW	DFNW5 (Pb−Free, Wettable Flank)	1500 / 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.

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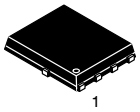
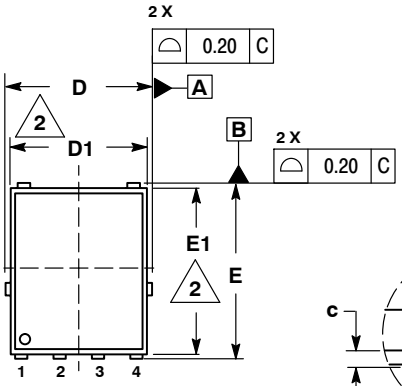


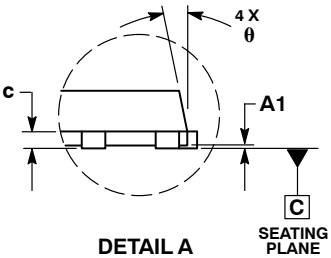
SCALE 2:1

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

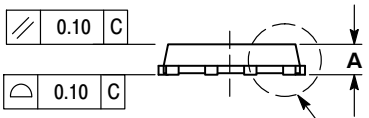
DATE 25 JUN 2018



TOP VIEW



DETAIL A



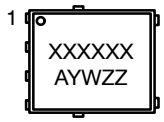
SIDE VIEW

DETAIL A

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.

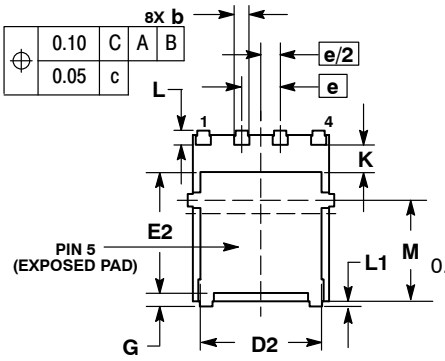
DIM	MILLIMETERS MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.00	–––	0.05
b	0.33	0.41	0.51
c	0.23	0.28	0.33
D	5.00	5.15	5.30
D1	4.70	4.90	5.10
D2	3.80	4.00	4.20
E	6.00	6.15	6.30
E1	5.70	5.90	6.10
E2	3.45	3.65	3.85
e	1.27 BSC		
G	0.51	0.575	0.71
K	1.20	1.35	1.50
L	0.51	0.575	0.71
L1	0.125 REF		
M	3.00	3.40	3.80
θ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

GENERIC MARKING DIAGRAM*



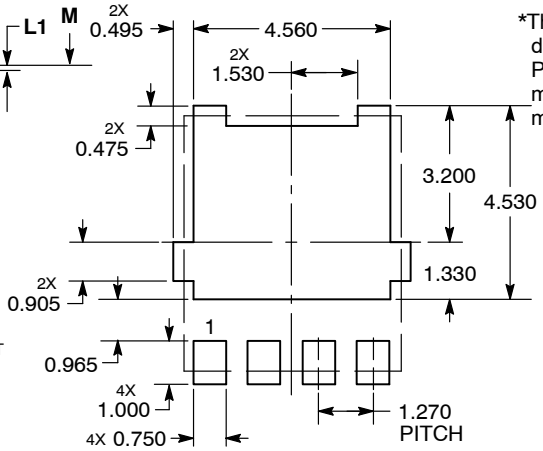
XXXXXX = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

*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.



BOTTOM VIEW

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**

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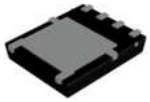
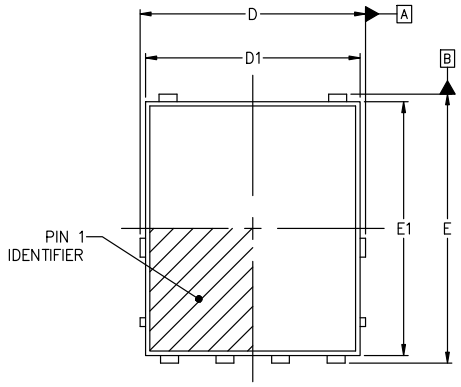
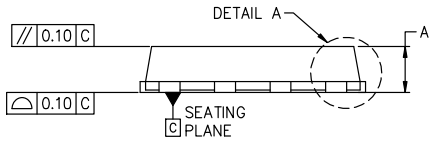


DFNW5 4.90x5.90x1.00, 1.27P
CASE 507BA
ISSUE C

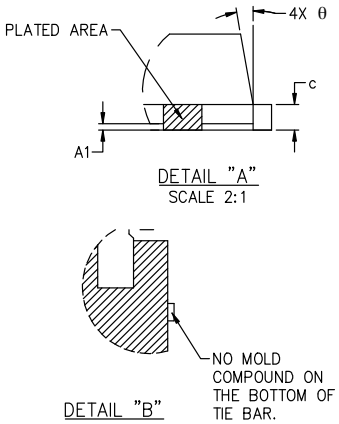
DATE 19 SEP 2024



TOP VIEW



SIDE VIEW



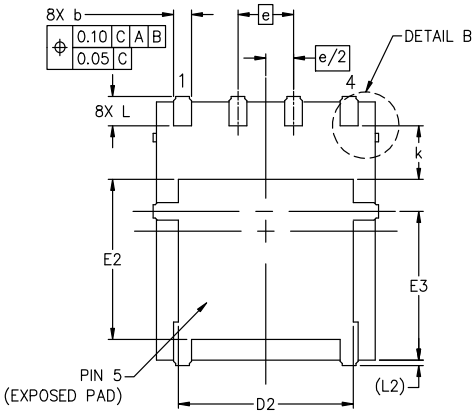
DETAIL "A"
SCALE 2:1

DETAIL "B"
SCALE 2:1

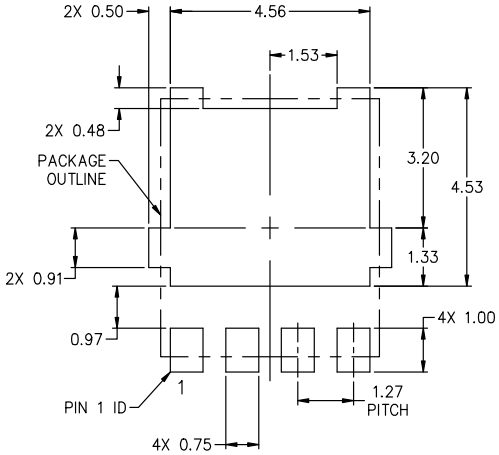
NOTES:

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.

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°

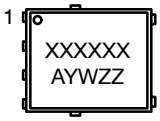


BOTTOM VIEW



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
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.

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