

# MOSFET - Power, Single N-Channel, STD Gate, SO8FL

**40 V, 4.7 mΩ, 66 A****NVMFWS004N04XM****Features**

- Low  $R_{DS(on)}$  to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Small Footprint (5x6 mm) for Compact Design
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

**Applications**

- Motor Drive
- Battery Protection
- Synchronous Rectification

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

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	$V_{DSS}$	40	V
Gate-to-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current	$T_C = 25^\circ\text{C}$	$I_D$	A
	$T_C = 100^\circ\text{C}$	47	
Power Dissipation	$T_C = 25^\circ\text{C}$	$P_D$	W
Pulsed Drain Current	$T_C = 25^\circ\text{C}$ , $t_p = 10 \mu\text{s}$	$I_{DM}$	A
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +175	°C
Source Current (Body Diode)	$I_S$	32	A
Single Pulse Avalanche Energy ( $I_{PK} = 32 \text{ A}$ )	$E_{AS}$	68	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	$T_L$	260	°C

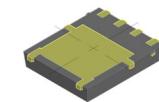
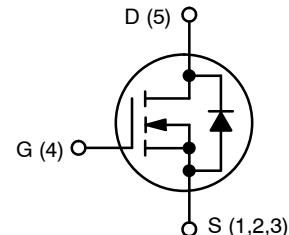
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

**THERMAL CHARACTERISTICS**

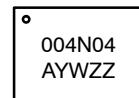
Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Note 2)	$R_{\theta JC}$	3.9	°C/W
Thermal Resistance, Junction-to-Ambient (Notes 1, 2)	$R_{\theta JA}$	42	

1. Surface-mounted on FR4 board using 650 mm<sup>2</sup>, 2 oz. Cu pad.
2. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.

$V_{(BR)DSS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$
40 V	4.7 mΩ @ 10 V	66 A



DFNW5 (SO-8FL)  
CASE 507BA



004N04 = Specific Device Code

A = Assembly Location

Y = Year

W = Work Week

ZZ = Assembly Lot Code

**ORDERING INFORMATION**

Device	Package	Shipping <sup>†</sup>
NVMFWS004N04XMT1G	DFN5 (Pb-Free)	1500 / 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 Specification Brochure, BRD8011/D.

# NVMFWS004N04XM

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 1 mA, T <sub>J</sub> = 25°C	40	—	—	V
Drain-to-Source Breakdown Voltage Temperature Coefficient	ΔV <sub>(BR)DSS</sub> /ΔT <sub>J</sub>	I <sub>D</sub> = 1 mA, Referenced to 25°C	—	15	—	mV/°C
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 40 V, T <sub>J</sub> = 25°C	—	—	10	μA
		V <sub>DS</sub> = 40 V, T <sub>J</sub> = 125°C	—	—	100	
Gate-to-Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = 20 V, V <sub>DS</sub> = 0 V	—	—	100	nA
<b>ON CHARACTERISTICS</b>						
Drain-to-Source On Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10 A, T <sub>J</sub> = 25°C	—	4.1	4.7	mΩ
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 30 μA, T <sub>J</sub> = 25°C	2.5	—	3.5	V
Gate Threshold Voltage Temperature Coefficient	ΔV <sub>GS(TH)</sub> /ΔT <sub>J</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 30 μA	—	-7.29	—	mV/°C
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = 5 V, I <sub>D</sub> = 10 A	—	45.5	—	S
<b>CHARGES, CAPACITANCES &amp; GATE RESISTANCE</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1 MHz	—	669	—	pF
Output Capacitance	C <sub>OSS</sub>		—	431	—	
Reverse Transfer Capacitance	C <sub>RSS</sub>		—	9.4	—	
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>DD</sub> = 32 V, I <sub>D</sub> = 30 A, V <sub>GS</sub> = 10 V	—	10.6	—	nC
Threshold Gate Charge	Q <sub>G(TH)</sub>		—	2.0	—	
Gate-to-Source Charge	Q <sub>GS</sub>		—	3.2	—	
Gate-to-Drain Charge	Q <sub>GD</sub>		—	2.1	—	
Gate-Resistance	R <sub>G</sub>	f = 1 MHz	—	1.6	—	Ω
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	t <sub>d(ON)</sub>	Resistive Load, V <sub>GS</sub> = 0/10 V, V <sub>DD</sub> = 32 V, I <sub>D</sub> = 30 A, R <sub>G</sub> = 0 Ω	—	11.9	—	ns
Rise Time	t <sub>r</sub>		—	4.0	—	
Turn-Off Delay Time	t <sub>d(OFF)</sub>		—	17.2	—	
Fall Time	t <sub>f</sub>		—	3.6	—	
<b>SOURCE-TO-DRAIN DIODE CHARACTERISTICS</b>						
Forward Diode Voltage	V <sub>SD</sub>	I <sub>S</sub> = 10 A, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 25°C	—	0.8	1.2	V
		I <sub>S</sub> = 10 A, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125°C	—	0.7	—	
Reverse Recovery Time	t <sub>RR</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 30 A, dI/dt = 100 A/μs, V <sub>DD</sub> = 32 V	—	28	—	ns
Charge Time	t <sub>a</sub>		—	11	—	
Discharge Time	t <sub>b</sub>		—	17	—	
Reverse Recovery Charge	Q <sub>RR</sub>		—	9.5	—	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.

## TYPICAL CHARACTERISTICS

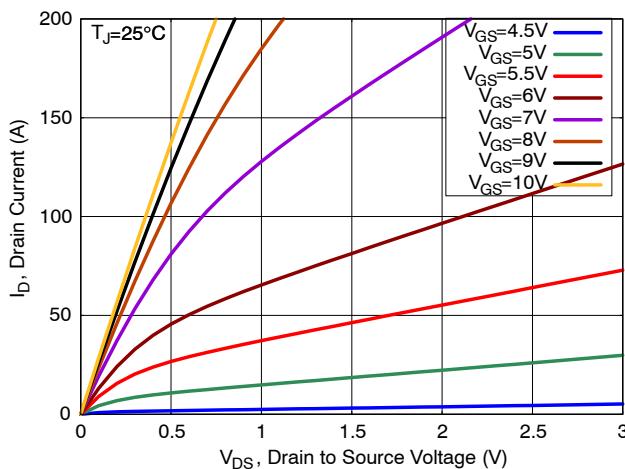


Figure 1. On-Region Characteristics

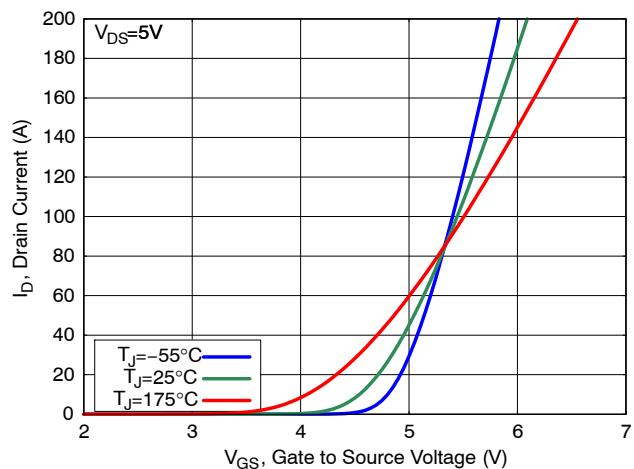


Figure 2. Transfer Characteristics

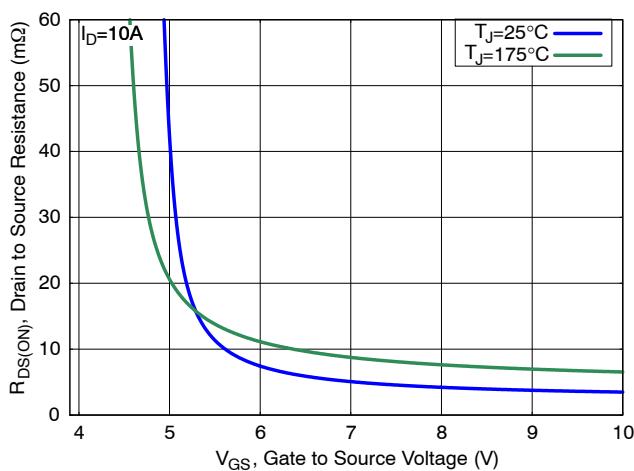


Figure 3. On-Resistance vs. Gate Voltage

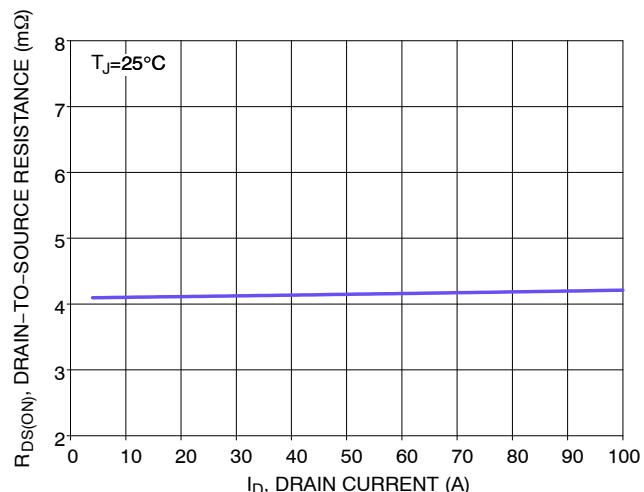


Figure 4. On-Resistance vs. Drain Current

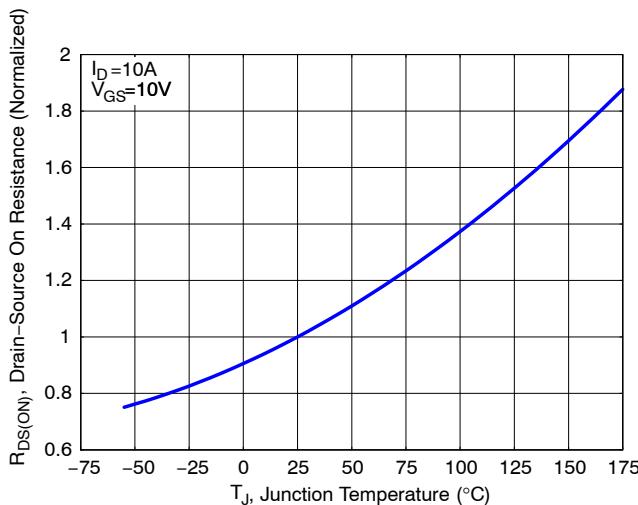


Figure 5. Normalized On-Resistance vs. Junction Temperature

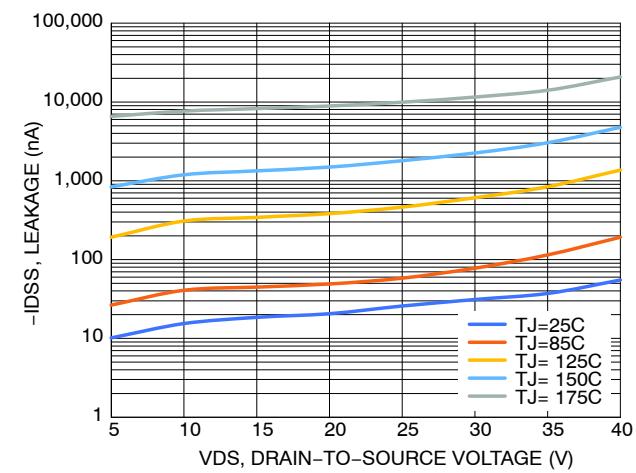
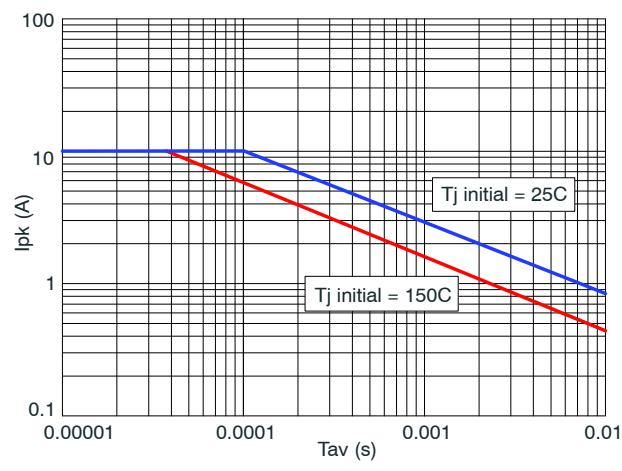
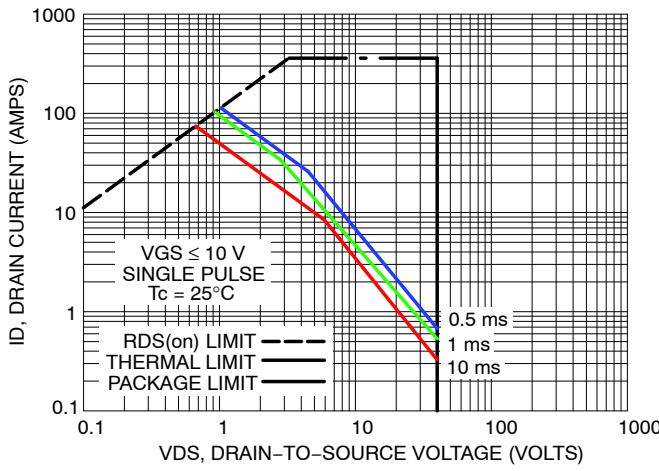
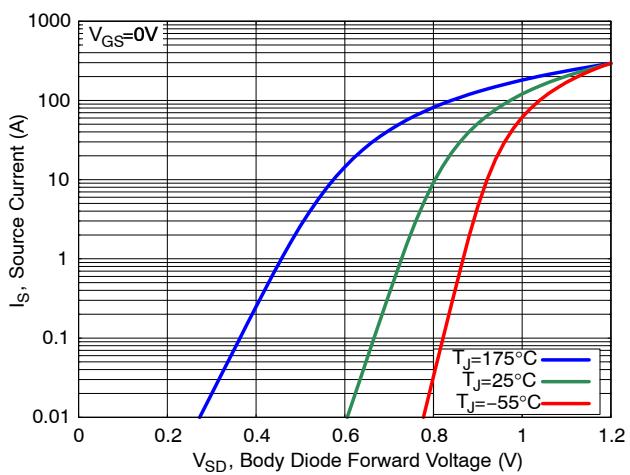
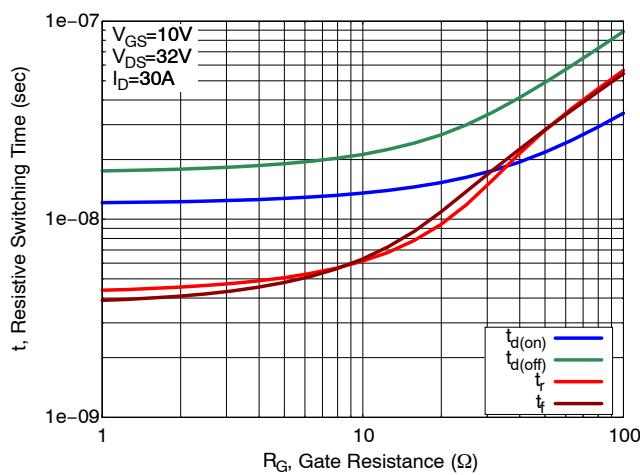
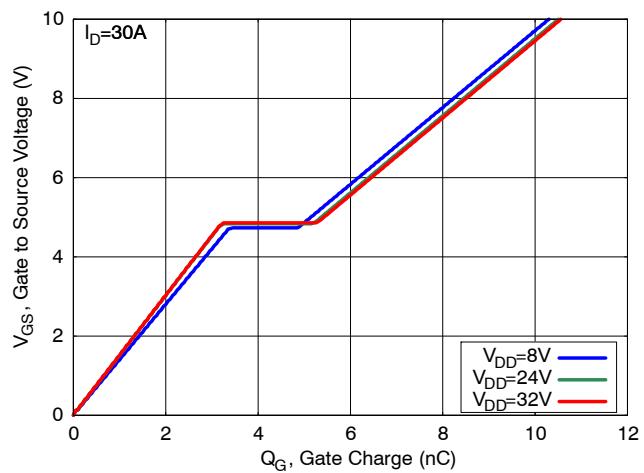
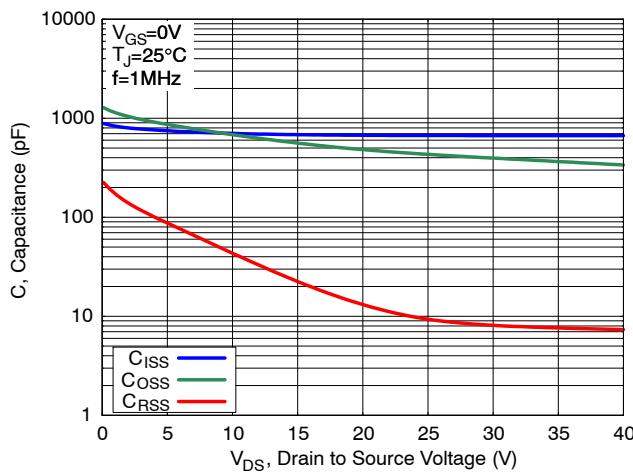


Figure 6. Drain Leakage Current vs. Drain Voltage

## TYPICAL CHARACTERISTICS



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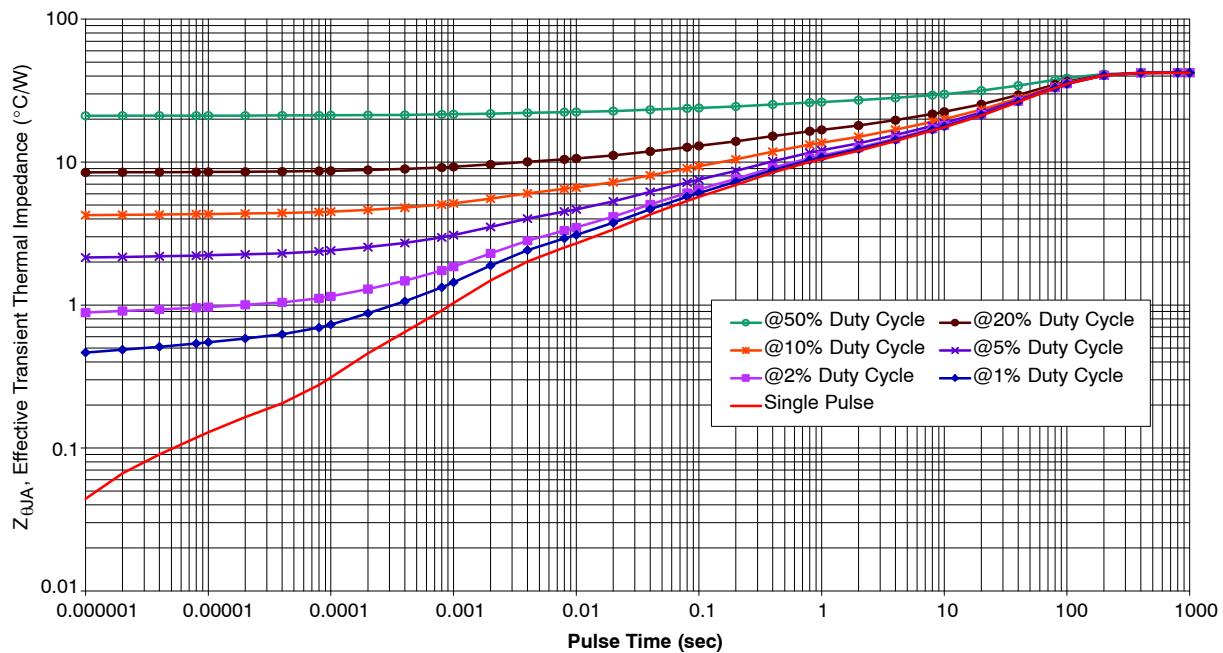
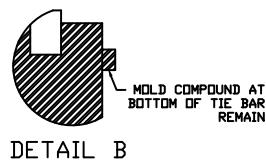
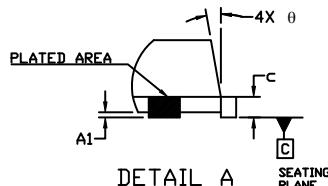
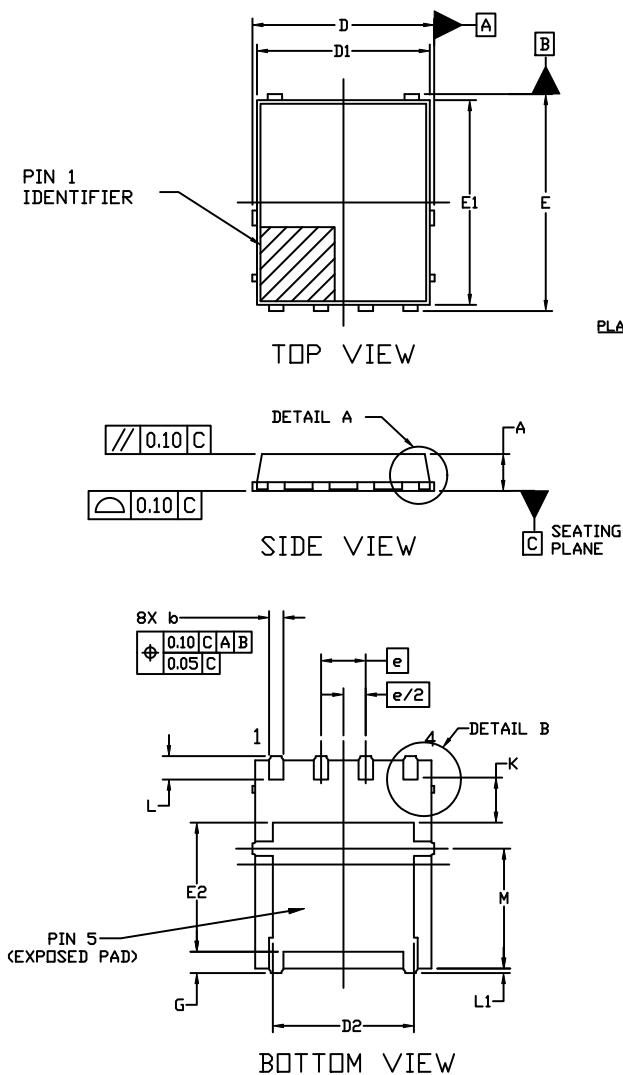


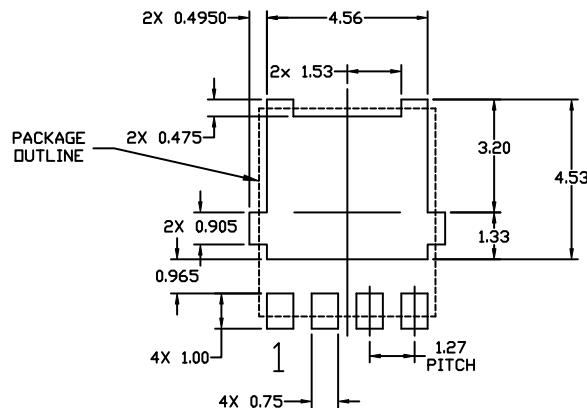
Figure 13. Transient Thermal Response

## PACKAGE DIMENSIONS

DFNW5 5x6 (FULL-CUT SO8FL WF)  
CASE 507BA  
ISSUE A

NOTES:  
 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.  
 2. CONTROLLING DIMENSION: 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
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	0.150 REF		
M	3.00	3.40	3.80
$\theta$	0°	---	12°

RECOMMENDED  
MOUNTING FOOTPRINT

\* 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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