

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

30 V, 6.0 mΩ, 51 A

NVMFS4C310N

Features

- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses
- AEC-Q101 Qualified and PPAP Capable
- NVMFS4C310NWF – Wettable Flanks Option for Enhanced Optical Inspection
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

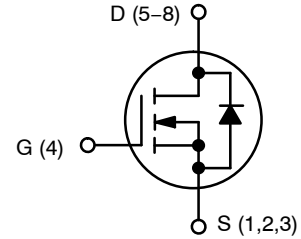
MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise stated)

Parameter	Symbol	Value	Unit	
Drain-to-Source Voltage	V_{DSS}	30	V	
Gate-to-Source Voltage	V_{GS}	± 20	V	
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2 and 4)	I_D	$T_A = 25^\circ\text{C}$	17	A
		$T_A = 100^\circ\text{C}$	12	
Power Dissipation $R_{\theta JA}$ (Notes 1, 2 and 4)	P_D	$T_A = 25^\circ\text{C}$	3.5	W
Continuous Drain Current $R_{\theta JC}$ (Notes 1, 2, 3 and 4)	I_D	$T_C = 25^\circ\text{C}$	51	A
		$T_C = 100^\circ\text{C}$	36	
Power Dissipation $R_{\theta JC}$ (Notes 1, 2, 3 and 4)	P_D	$T_C = 25^\circ\text{C}$	32	W
Pulsed Drain Current	$T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$	I_{DM}	132	A
Operating Junction and Storage Temperature	T_J, T_{STG}	-55 to +175	$^\circ\text{C}$	
Source Current (Body Diode)	I_S	21	A	
Single Pulse Drain-to-Source Avalanche Energy ($I_L = 25 A_{pk}$) (Note 3)	E_{AS}	31	mJ	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	T_L	260	$^\circ\text{C}$	

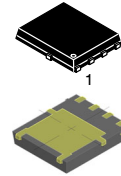
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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 650 mm², 2 oz Cu pad.
3. Assumes heat-sink sufficiently large to maintain constant case temperature independent of device power.
4. Continuous DC current rating. Maximum current for pulses as long as one second is higher but dependent on pulse duration and duty cycle.

$V_{(BR)DSS}$	$R_{DS(ON) MAX}$	$I_D MAX$
30 V	6.0 mΩ @ 10 V	51 A
	9.0 mΩ @ 4.5 V	



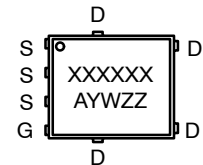
N-CHANNEL MOSFET



DFN5
CASE 488AA

DFNW5
CASE 507BA

MARKING DIAGRAM



4C10N = Specific Device Code for NVMFS4C310N

4C10WF = Specific Device Code of NVMFS4C310NWF

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

ORDERING INFORMATION

Device	Package	Shipping†
NVMFS4C310NT1G	DFN5 (Pb-Free)	1500 / Tape & Reel
NVMFS4C310NWF1G	DFNW5 (Pb-Free)	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.

NVMFS4C310N

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	4.7	°C/W
Junction-to-Ambient – Steady State (Note 5)	$R_{\theta JA}$	43	

5. Surface-mounted on FR4 board using 650 mm², 2 oz Cu pad.

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			14.5		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 24\text{ V}$	$T_J = 25^\circ\text{C}$		1.0	μA
			$T_J = 125^\circ\text{C}$		10	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = 20\text{ V}$			100	nA

ON CHARACTERISTICS (Note 6)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	1.3		2.2	V	
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			4.7		mV/°C	
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 30\text{ A}$		5.0	6.0	m Ω
		$V_{GS} = 4.5\text{ V}$	$I_D = 30\text{ A}$		7.5	9.0	
Forward Transconductance	g_{FS}	$V_{DS} = 1.5\text{ V}, I_D = 15\text{ A}$		43		S	

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 15\text{ V}$		1000		pF
Output Capacitance	C_{OSS}			580		
Reverse Transfer Capacitance	C_{RSS}			160		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}; I_D = 30\text{ A}$		9.7		nC
Threshold Gate Charge	$Q_{G(TH)}$			1.5		
Gate-to-Source Charge	Q_{GS}			2.8		
Gate-to-Drain Charge	Q_{GD}			4.8		
Gate Plateau Voltage	V_{GP}			3.2		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}; I_D = 30\text{ A}$		18.6		nC

SWITCHING CHARACTERISTICS (Note 7)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 15\text{ A}, R_G = 3.0\ \Omega$		9.0		ns
Rise Time	t_r			34		
Turn-Off Delay Time	$t_{d(OFF)}$			14		
Fall Time	t_f			7.0		
Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}, I_D = 15\text{ A}, R_G = 3.0\ \Omega$		7.0		ns
Rise Time	t_r			26		
Turn-Off Delay Time	$t_{d(OFF)}$			18		
Fall Time	t_f			4.0		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 10\text{ A}$	$T_J = 25^\circ\text{C}$		0.80	1.1	V
			$T_J = 125^\circ\text{C}$		0.67		

NVMFS4C310N

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
DRAIN-SOURCE DIODE CHARACTERISTICS						
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s},$ $I_S = 30\text{ A}$		26.7		ns
Charge Time	t_a			14.1		
Discharge Time	t_b			12.6		
Reverse Recovery Charge	Q_{RR}			13.7		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.

6. Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.
7. Switching characteristics are independent of operating junction temperatures.

NVMFS4C310N

TYPICAL CHARACTERISTICS

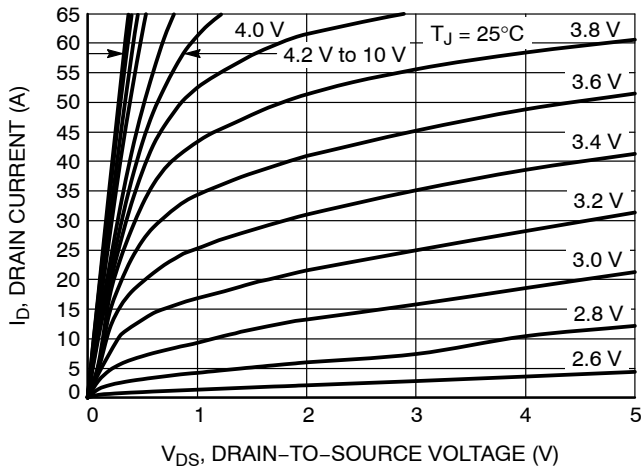


Figure 1. On-Region Characteristics

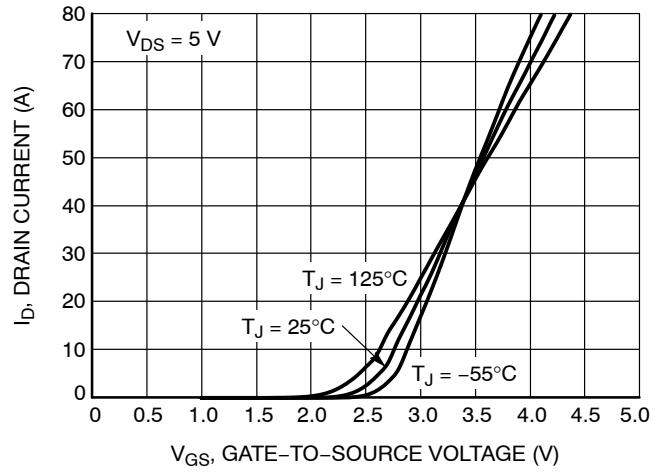


Figure 2. Transfer Characteristics

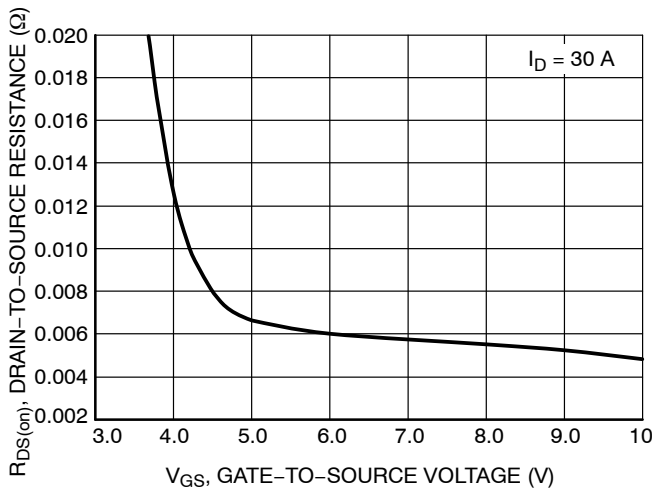


Figure 3. On-Resistance vs. V_{GS}

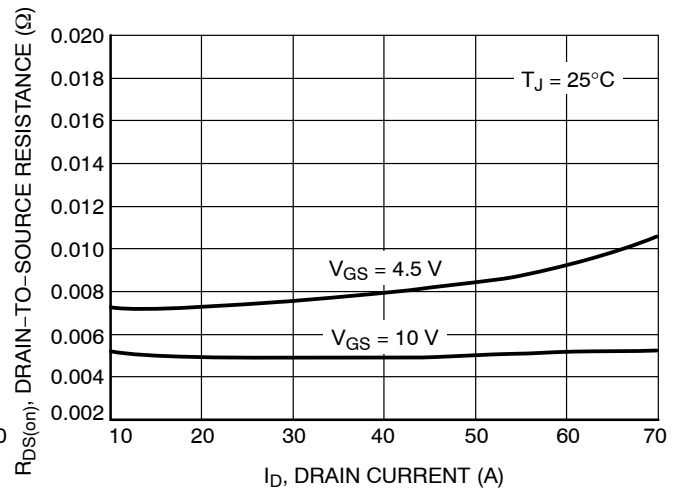


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

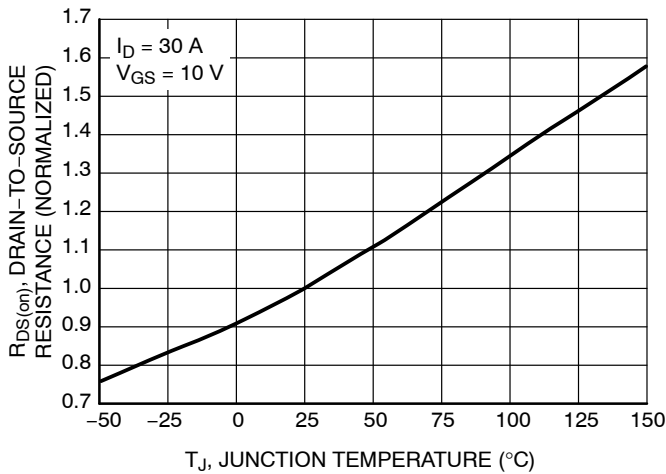


Figure 5. On-Resistance Variation with Temperature

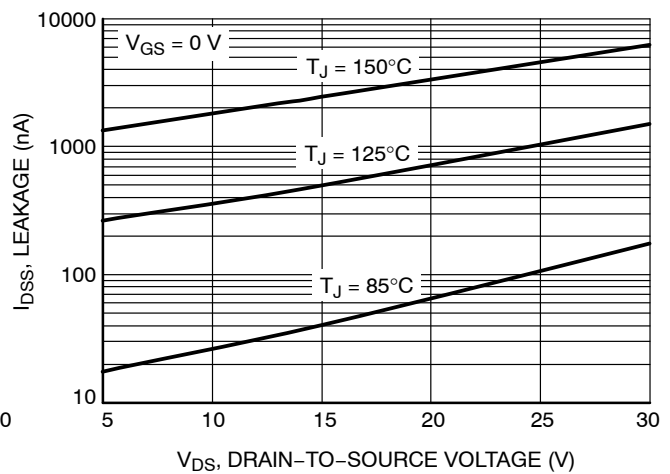


Figure 6. Drain-to-Source Leakage Current vs. Voltage

NVMFS4C310N

TYPICAL CHARACTERISTICS

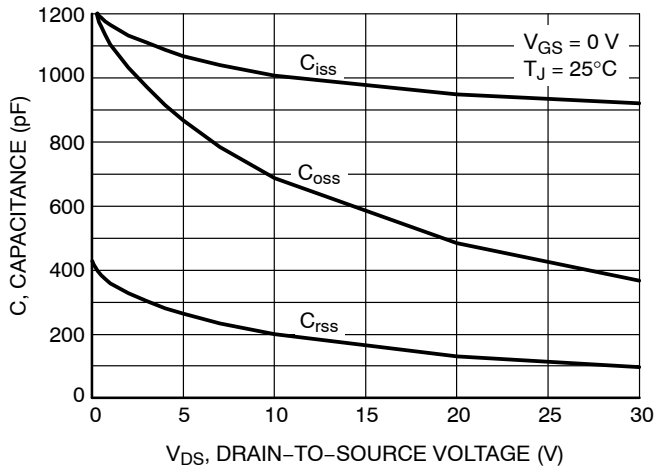


Figure 7. Capacitance Variation

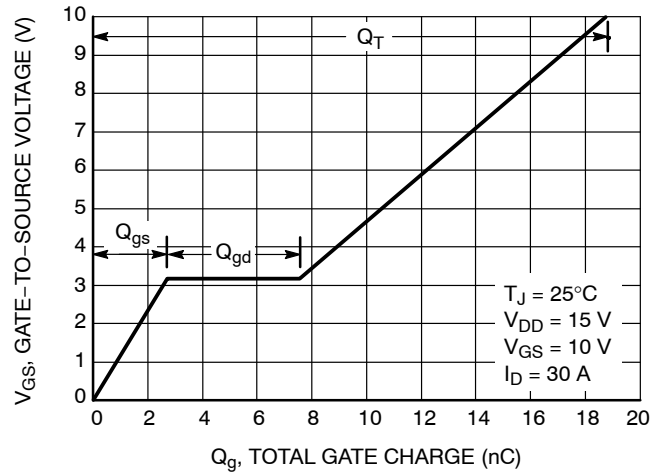


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

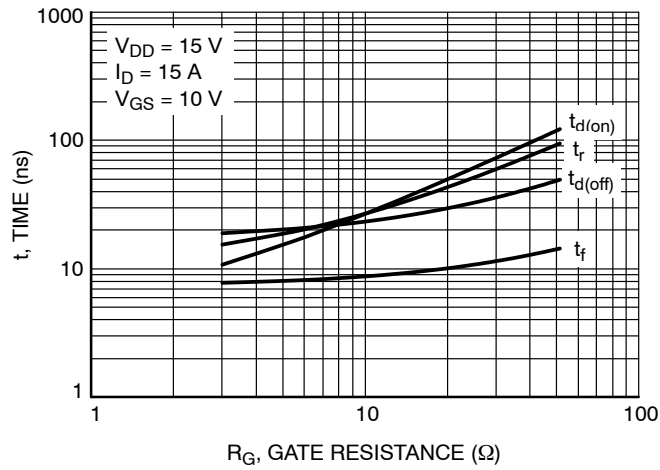


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

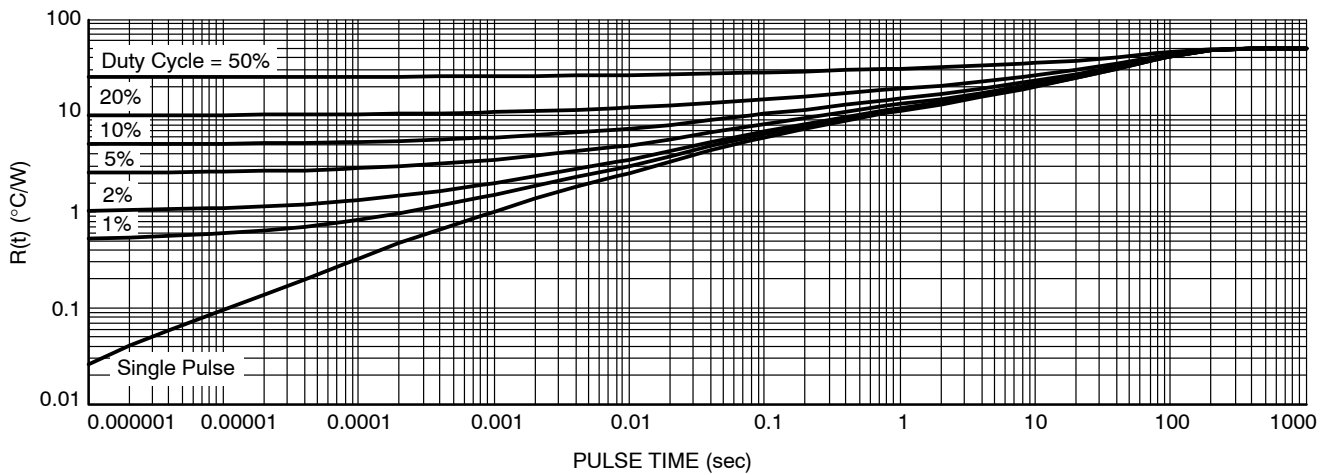


Figure 10. Thermal Response

MECHANICAL CASE OUTLINE

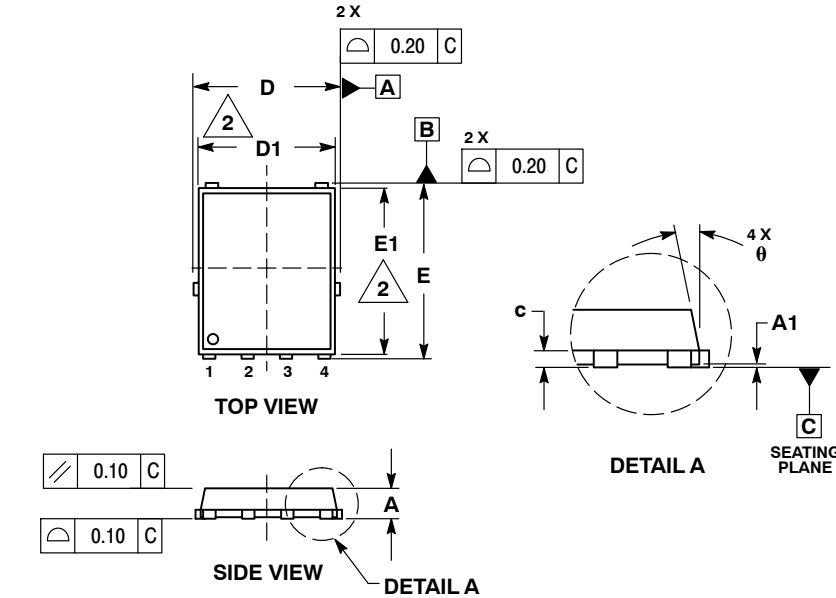
PACKAGE DIMENSIONS



1
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.

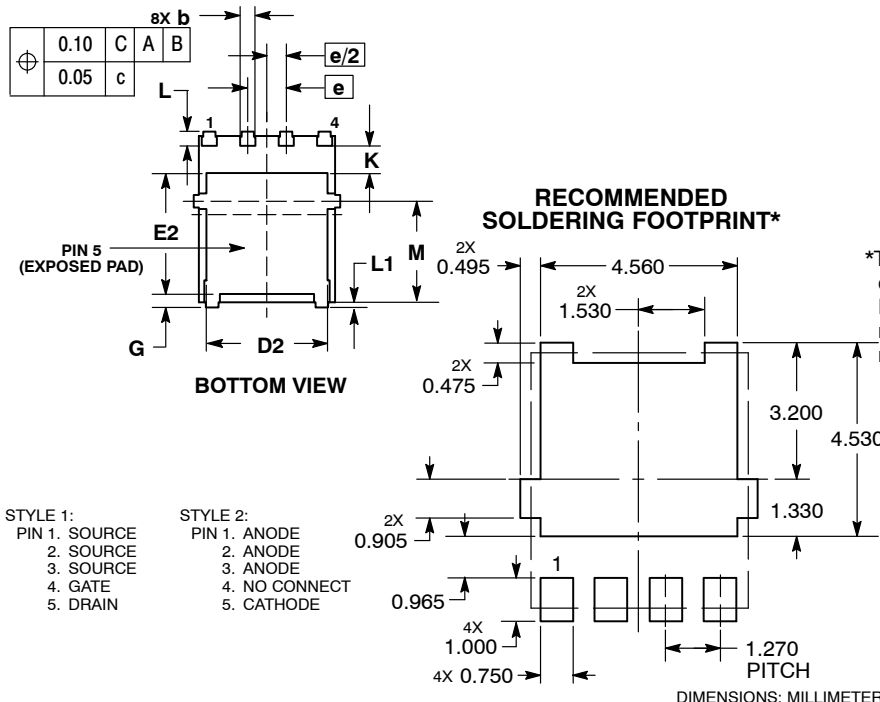
DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.00	---	0.05
b	0.33	0.41	0.51
c	0.23	0.28	0.33
D	5.00	5.15	5.30
D1	4.70	4.90	5.10
D2	3.80	4.00	4.20
E	6.00	6.15	6.30
E1	5.70	5.90	6.10
E2	3.45	3.65	3.85
e	1.27 BSC		
G	0.51	0.575	0.71
K	1.20	1.35	1.50
L	0.51	0.575	0.71
L1	0.125 REF		
M	3.00	3.40	3.80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



- 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

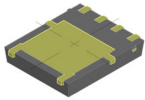
DIMENSIONS: MILLIMETERS

*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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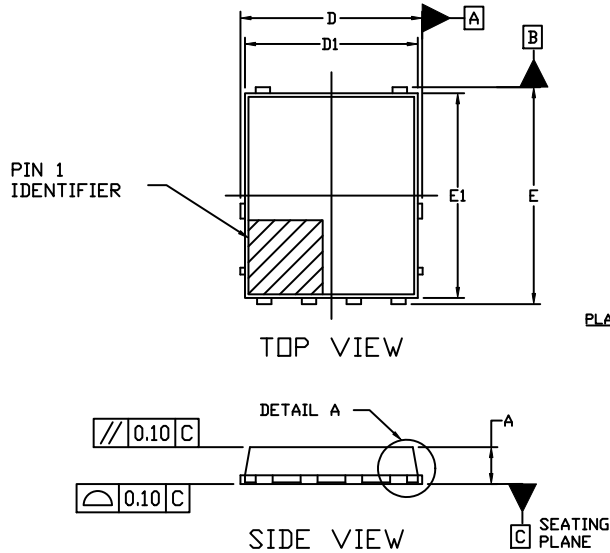
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MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

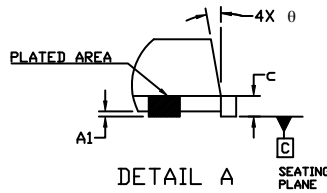


DFNW5 5x6 (FULL-CUT SO8FL WF) CASE 507BA ISSUE A

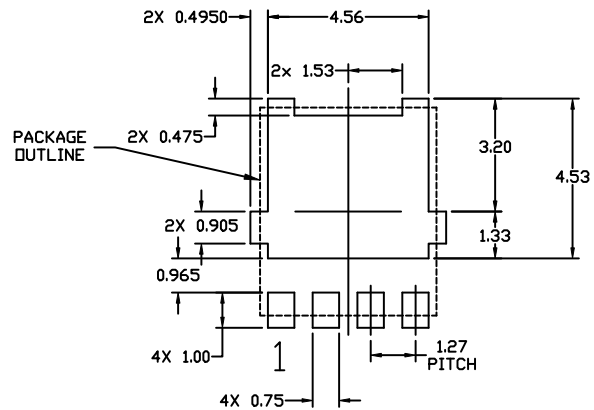
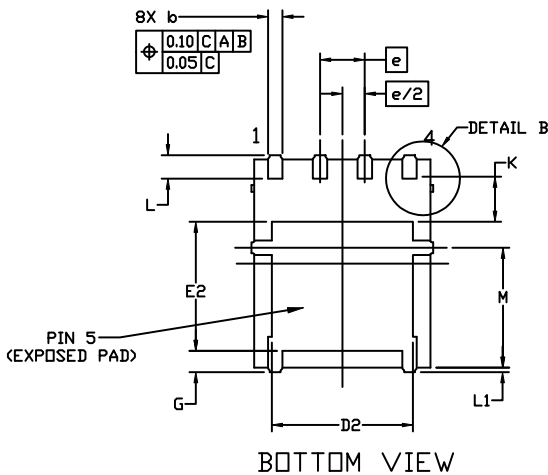
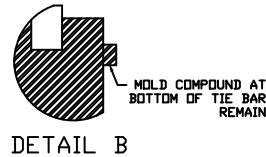
DATE 03 FEB 2021



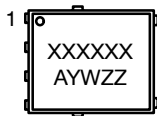
- NOTES:
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 2. CONTROLLING DIMENSION: MILLIMETERS
 3. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
 4. THIS PACKAGE CONTAINS WETTABLE FLANK DESIGN FEATURES TO AID IN FILLET FORMATION ON THE LEADS DURING MOUNTING.



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
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
θ	0°	---	12°



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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.

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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