

MOSFET – Power, Single N-Channel

100 V, 23 mΩ, 31 A

NVMFS021N10MCL

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
- NVMFWS021N10MCL – Wettable Flank Option for Enhanced Optical Inspection
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

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

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DSS}	100	V
Gate-to-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current $R_{\theta JC}$ (Notes 1, 3)	I_D	31	A
		22	
Power Dissipation $R_{\theta JC}$ (Note 1)	P_D	49	W
		24	
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2, 3)	I_D	8.4	A
		5.9	
Power Dissipation $R_{\theta JA}$ (Notes 1, 2)	P_D	3.6	W
		1.8	
Pulsed Drain Current	I_{DM}	159	A
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +175	°C
Source Current (Body Diode)	I_S	37	A
Single Pulse Drain-to-Source Avalanche Energy ($I_{L(pk)} = 1.4$ A)	E_{AS}	179	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	T_L	260	°C

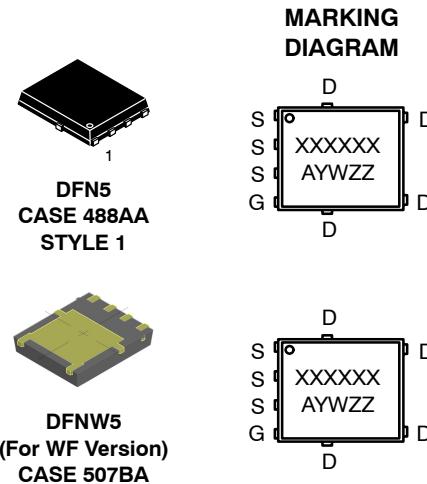
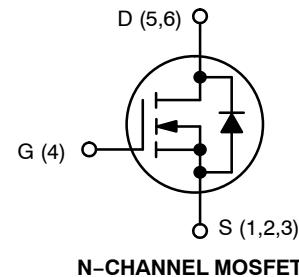
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case – Steady State	$R_{\theta JC}$	3.1	°C/W
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	42	

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 mm², 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.

$V_{(BR)DSS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$
100 V	23 mΩ @ 10 V	31 A
	33 mΩ @ 4.5 V	



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.

NVMFS021N10MCL

ELECTRICAL CHARACTERISTICS (T_J = 25°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 V, I _D = 250 μA		100	—	—	V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V _{(BR)DSS} /T _J			—	48	—	mV/°C
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V, V _{DS} = 100 V	T _J = 25 °C	—	—	1.0	μA
			T _J = 125°C	—	—	100	
Gate-to-Source Leakage Current	I _{GSS}	V _{DS} = 0 V, V _{GS} = 20 V		—	—	100	nA

ON CHARACTERISTICS

Gate Threshold Voltage	V _{GS(TH)}	V _{GS} = V _{DS} , I _D = 42 μA		1	—	3	V
Threshold Temperature Coefficient	V _{GS(TH)} /T _J			—	-5.4	—	mV/°C
Drain-to-Source On Resistance	R _{DS(on)}	V _{GS} = 10 V	I _D = 7 A	—	19	23	mΩ
		V _{GS} = 4.5 V	I _D = 6 A	—	26	33	
Forward Transconductance	g _{FS}	V _{DS} = 10 V, I _D = 7 A		—	24	—	S

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C _{ISS}	V _{GS} = 0 V, f = 1 MHz, V _{DS} = 50 V	—	850	—	pF
Output Capacitance	C _{OSS}		—	310	—	
Reverse Transfer Capacitance	C _{RSS}		—	5	—	
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 4.5 V, V _{DS} = 50 V; I _D = 6 A	—	6	—	nC
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 10 V, V _{DS} = 50 V; I _D = 7 A	—	13	—	nC
Threshold Gate Charge	Q _{G(TH)}	V _{GS} = 10 V, V _{DS} = 50 V; I _D = 7 A	—	1	—	nC
Gate-to-Source Charge	Q _{GS}		—	2.4	—	
Gate-to-Drain Charge	Q _{GD}		—	1.7	—	
Plateau Voltage	V _{GP}		—	2.8	—	V

SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	t _{d(ON)}	V _{GS} = 10 V, V _{DS} = 50 V, I _D = 7 A, R _G = 6.0 Ω	—	6.4	—	ns
Rise Time	t _r		—	2.4	—	
Turn-Off Delay Time	t _{d(OFF)}		—	19	—	
Fall Time	t _f		—	3.3	—	

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = 7 A, T _J = 25 °C	—	0.83	1.3	V
		V _{GS} = 0 V, I _S = 7 A, T _J = 125 °C	—	0.71	—	
Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, dI _S /dt = 100 A/μs, I _S = 4 A	—	29	—	ns
Reverse Recovery Charge	Q _{RR}		—	18	—	
Charge Time	t _a		—	14.8	—	
Discharge Time	t _b		—	14.2	—	

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. Switching characteristics are independent of operating junction temperatures.

TYPICAL PERFORMANCE CHARACTERISTICS

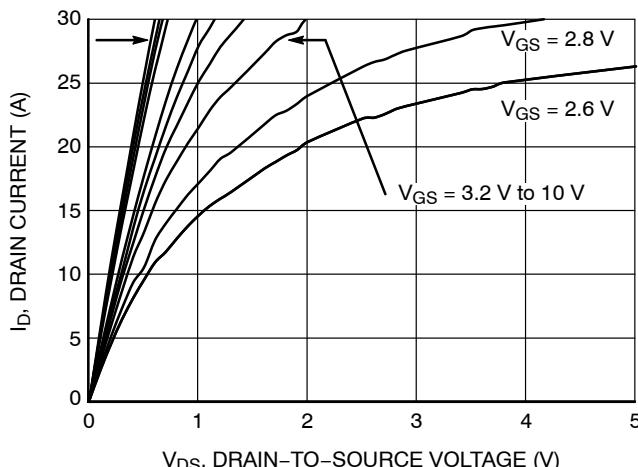


Figure 1. On-Region Characteristics

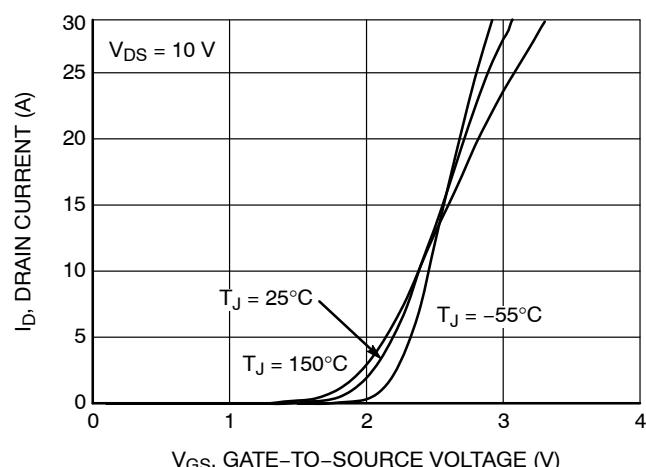


Figure 2. Transfer Characteristics

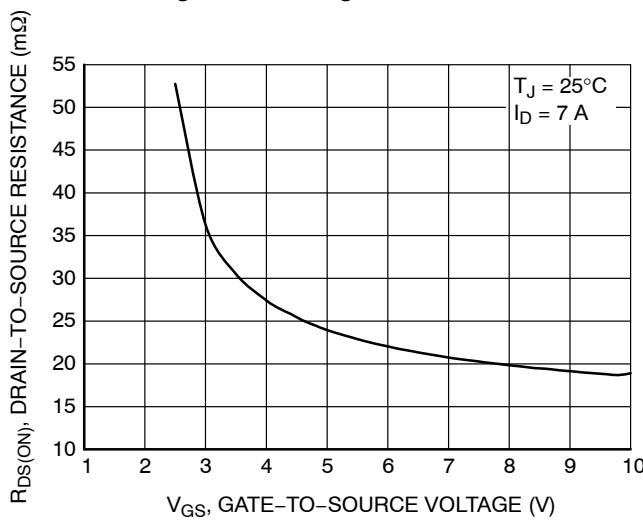


Figure 3. On-Resistance vs. Gate-to-Source Voltage

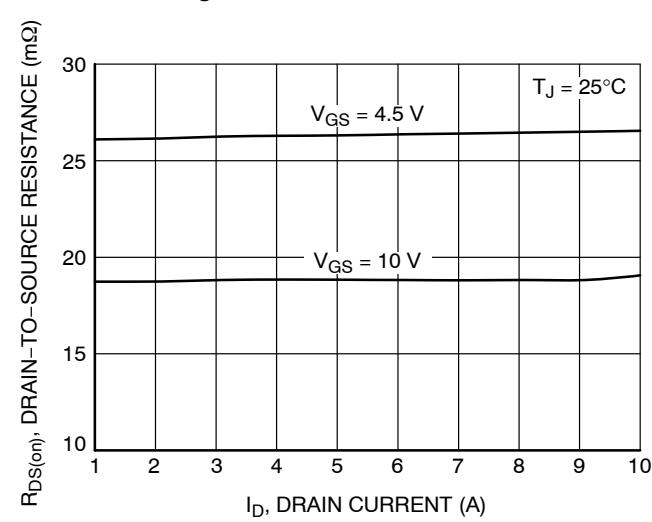


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

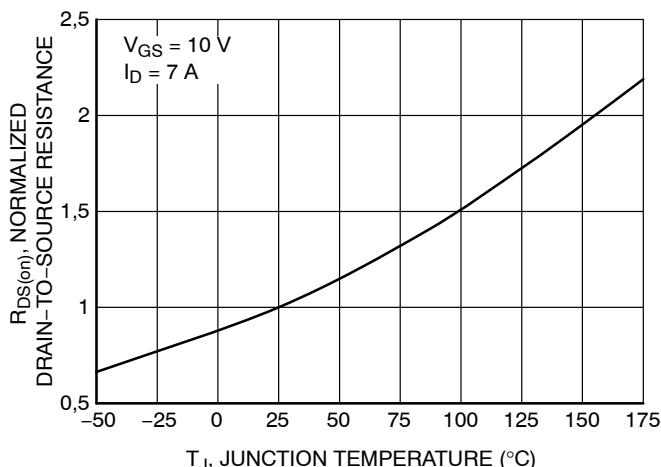


Figure 5. On-Resistance Variation with Temperature

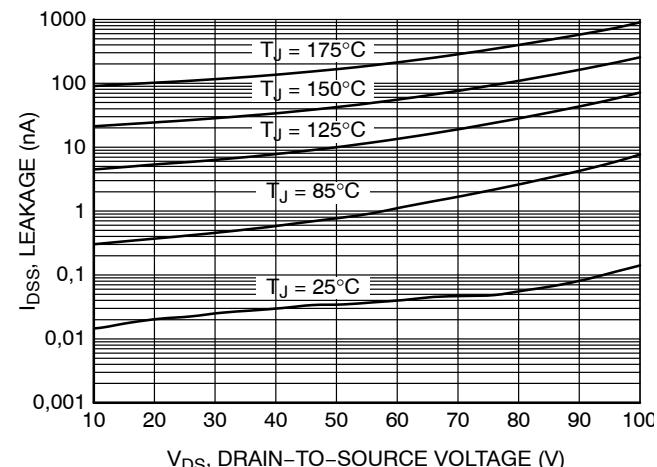


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS (continued)

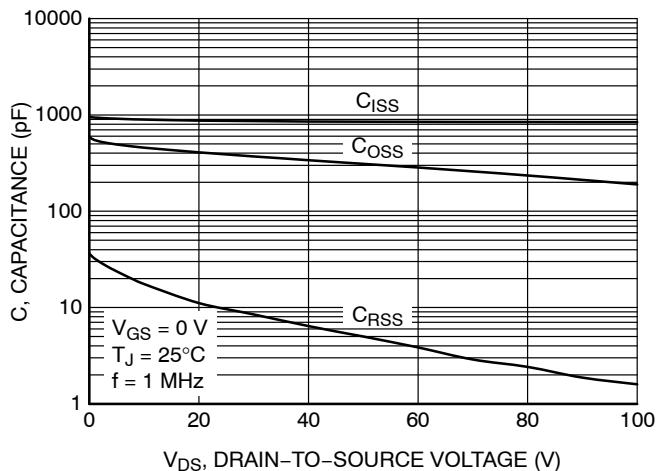


Figure 7. Capacitance Variation

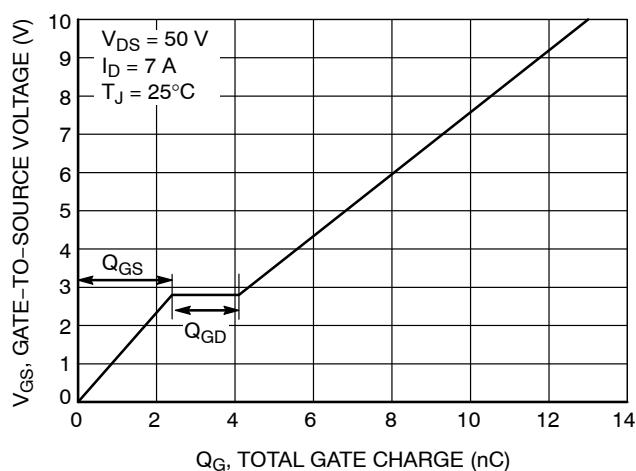


Figure 8. Gate-to-Source Voltage vs. Total Charge

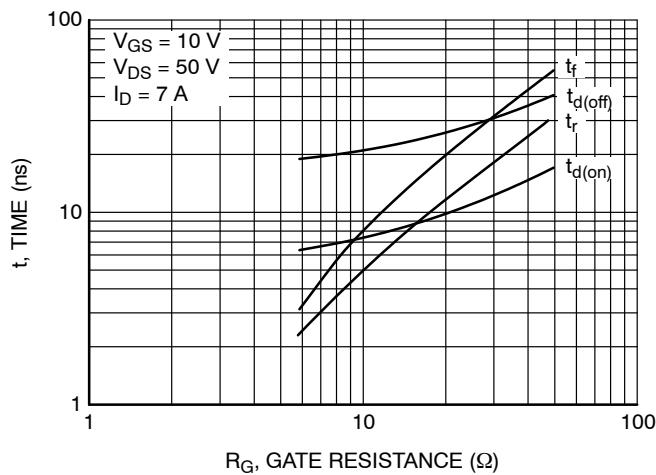


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

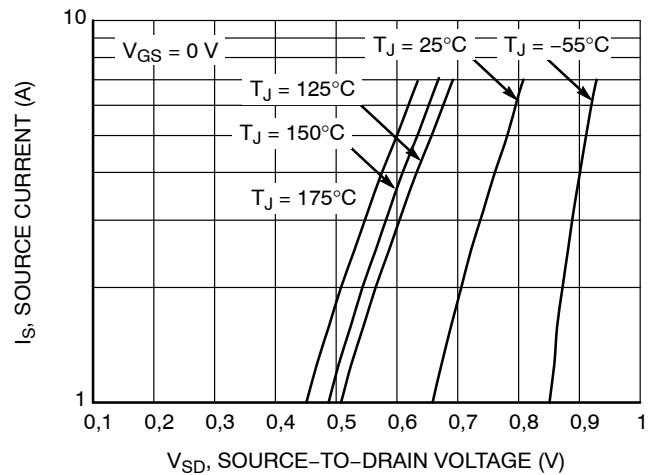


Figure 10. Diode Forward Voltage vs. Current

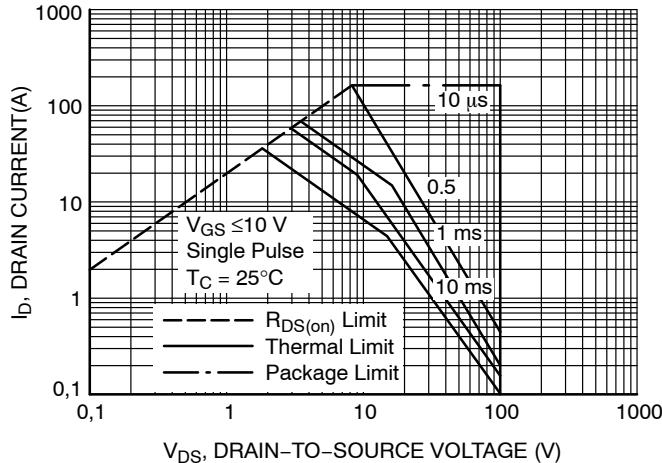


Figure 11. Maximum Rated Forward Biased Safe Operating Area

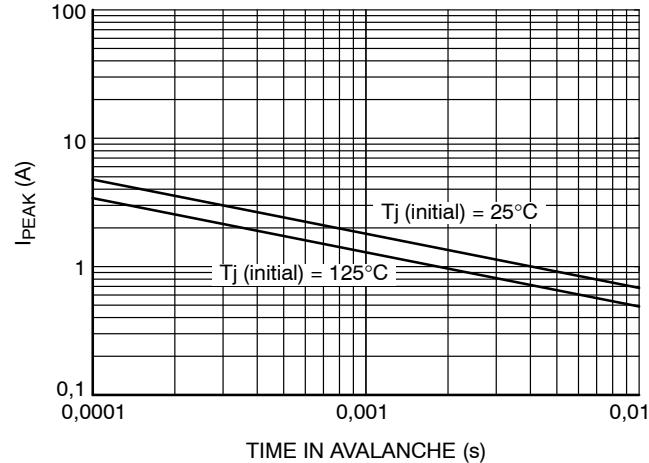


Figure 12. I_{PEAK} vs. Time in Avalanche

TYPICAL CHARACTERISTICS (continued)

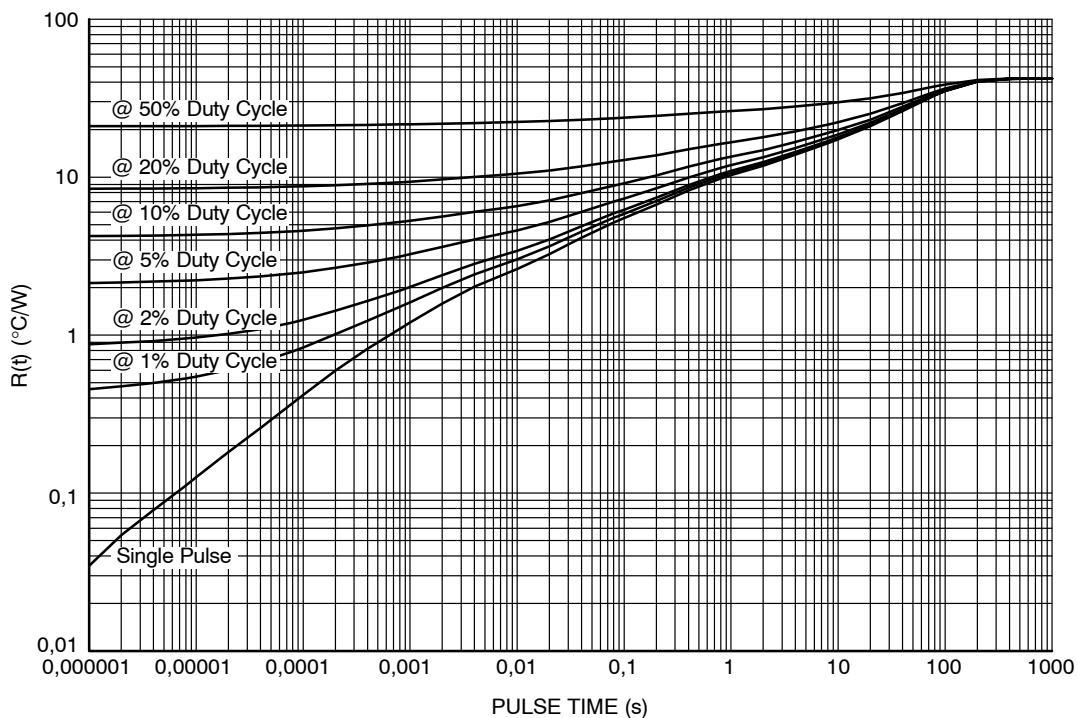
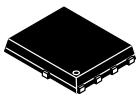


Figure 13. Thermal Characteristics

DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping [†]
NVMFS021N10MCLT1G	021L10	DFN5 (Pb-Free)	1500 / Tape & Reel
NVMFWS021N10MCLT1G	021W10	DFNW5 (Pb-Free, Wettable Flanks)	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.



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.

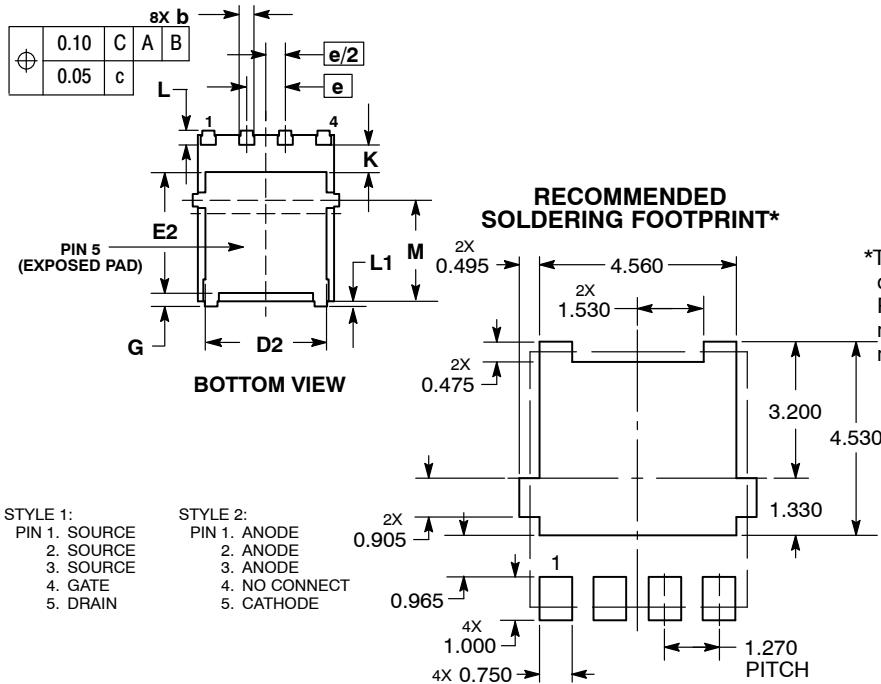
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	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.00	---	0.05
b	0.33	0.41	0.51
c	0.23	0.28	0.33
D	5.00	5.15	5.30
D1	4.70	4.90	5.10
D2	3.80	4.00	4.20
E	6.00	6.15	6.30
E1	5.70	5.90	6.10
E2	3.45	3.65	3.85
e	1.27 BSC		
G	0.51	0.575	0.71
K	1.20	1.35	1.50
L	0.51	0.575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



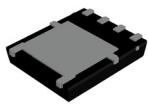
STYLE 1:
PIN 1. SOURCE
2. SOURCE
3. SOURCE
4. GATE
5. DRAIN

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

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

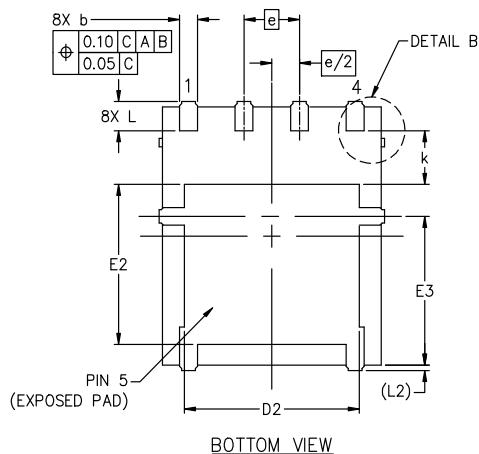
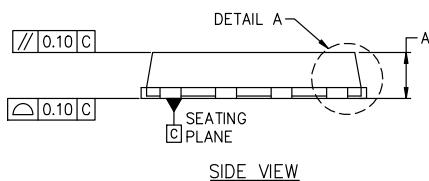
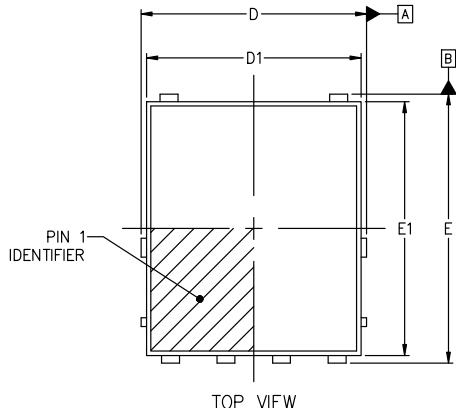
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DESCRIPTION:	DFN5 5x6, 1.27P (SO-8FL)	PAGE 1 OF 1

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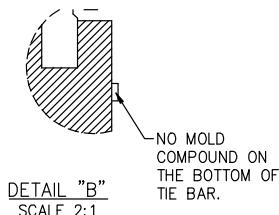
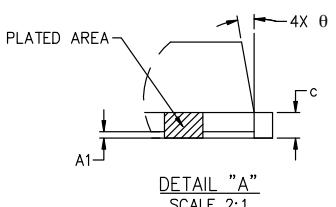
DFNW5 4.90x5.90x1.00, 1.27P
CASE 507BA
ISSUE C

DATE 19 SEP 2024

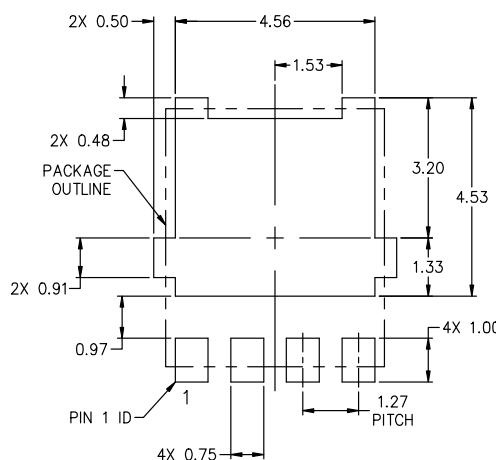


NOTES:

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.



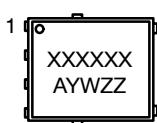
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E	6.00	6.15	6.30
E1	5.70	5.90	6.10
E2	3.45	3.65	3.85
E3	3.00	3.40	3.80
e		1.27 BSC	
k	1.20	1.35	1.50
L	0.51	0.57	0.71
L2		0.15 REF.	
θ	0°	6°	12°



RECOMMENDED MOUNTING FOOTPRINT*

*FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ONSEMI SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, 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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