

MOSFET- Power, Single N-Channel, SO-8FL

60 V, 19.6 mΩ, 28 A

NVMFS020N06C

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
- NVMFWS020N06C – 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

Applications

- Power Tools, Battery Operated Vacuums
- UAV/Drones, Material Handling
- BMS/Storage, Home Automation

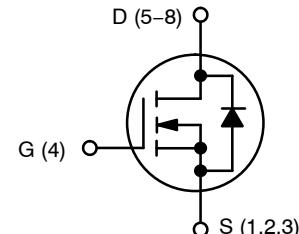
MAXIMUM RATINGS (T_J = 25°C unless otherwise stated)

Parameter		Symbol	Value	Unit
Drain-to-Source Voltage		V _{DSS}	60	V
Gate-to-Source Voltage		V _{GS}	±20	V
Continuous Drain Current R _{θJC} (Notes 1, 3)	Steady State	I _D	28	A
			19	
Power Dissipation R _{θJC} (Note 1)	Steady State	P _D	31	W
			15	
Continuous Drain Current R _{θJA} (Notes 1, 2, 3)	Steady State	I _D	9	A
			6	
Power Dissipation R _{θJA} (Notes 1, 2)	Steady State	P _D	3.4	W
			1.7	
Pulsed Drain Current	T _A = 25°C, t _p = 10 μs	I _{DM}	181	A
Operating Junction and Storage Temperature Range		T _J , T _{STG}	-55 to +175	°C
Source Current (Body Diode)		I _S	25	A
Single Pulse Drain-to-Source Avalanche Energy (I _L = 5.6 A _{pk})		E _{AS}	15	mJ
Lead Temperature Soldering Reflow for Soldering Purposes (1/8" from case for 10 s)		T _L	260	°C

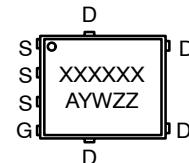
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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) MAX}	I _{D MAX}
60 V	19.6 mΩ @ 10 V	28 A



MARKING DIAGRAM



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.

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case – Steady State (Note 2)	$R_{\theta JC}$	4.8	$^{\circ}\text{C}/\text{W}$
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	43.2	

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	$V_{(\text{BR})\text{DSS}}$	$V_{\text{GS}} = 0 \text{ V}, I_D = 250 \mu\text{A}$	60			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(\text{BR})\text{DSS}/T_J}$	$I_D = 250 \mu\text{A}$, ref to 25°C		29		$\text{mV}/^{\circ}\text{C}$
Zero Gate Voltage Drain Current	I_{DSS}	$V_{\text{GS}} = 0 \text{ V}, V_{\text{DS}} = 60 \text{ V}$	$T_J = 25^{\circ}\text{C}$		10	μA
			$T_J = 125^{\circ}\text{C}$		250	
Gate-to-Source Leakage Current	I_{GSS}	$V_{\text{DS}} = 0 \text{ V}, V_{\text{GS}} = 20 \text{ V}$			100	nA

ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage	$V_{\text{GS}(\text{TH})}$	$V_{\text{GS}} = V_{\text{DS}}, I_D = 20 \mu\text{A}$	2.0		4.0	V
Negative Threshold Temperature Coefficient	$V_{\text{GS}(\text{TH})/T_J}$	$I_D = 20 \mu\text{A}$, ref to 25°C		-7.8		$\text{mV}/^{\circ}\text{C}$
Drain-to-Source On Resistance	$R_{\text{DS}(\text{on})}$	$V_{\text{GS}} = 10 \text{ V}, I_D = 4 \text{ A}$		16.3	19.6	$\text{m}\Omega$
Forward Transconductance	g_{FS}	$V_{\text{DS}} = 5 \text{ V}, I_D = 4 \text{ A}$		12		S
Gate Resistance	R_G	$T_A = 25^{\circ}\text{C}$		1.0		Ω

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{\text{GS}} = 0 \text{ V}, f = 1 \text{ MHz}, V_{\text{DS}} = 30 \text{ V}$		355		pF
Output Capacitance	C_{OSS}			260		
Reverse Transfer Capacitance	C_{RSS}			4.9		
Total Gate Charge	$Q_{\text{G}(\text{TOT})}$	$V_{\text{GS}} = 10 \text{ V}, V_{\text{DS}} = 48 \text{ V}, I_D = 4 \text{ A}$		5.8		nC
Threshold Gate Charge	$Q_{\text{G}(\text{TH})}$			1.4		
Gate-to-Source Charge	Q_{GS}			2.3		
Gate-to-Drain Charge	Q_{GD}			0.53		

SWITCHING CHARACTERISTICS, $V_{\text{GS}} = 10 \text{ V}$ (Note 5)

Turn-On Delay Time	$t_{\text{d}(\text{ON})}$	$V_{\text{GS}} = 10 \text{ V}, V_{\text{DS}} = 48 \text{ V}, I_D = 4 \text{ A}, R_G = 6 \Omega$		6.5		ns
Rise Time	t_r			1.4		
Turn-Off Delay Time	$t_{\text{d}(\text{OFF})}$			9.7		
Fall Time	t_f			4.0		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{\text{GS}} = 0 \text{ V}, I_S = 4 \text{ A}$	$T_J = 25^{\circ}\text{C}$		0.81	1.2	V
			$T_J = 125^{\circ}\text{C}$		0.67		
Reverse Recovery Time	t_{RR}	$V_{\text{GS}} = 0 \text{ V}, dI_S/dt = 100 \text{ A}/\mu\text{s}, V_{\text{DS}} = 30 \text{ V}, I_S = 4 \text{ A}$			24		ns
Charge Time	t_a				12		
Discharge Time	t_b				12		
Reverse Recovery Charge	Q_{RR}				12		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 $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$.
5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

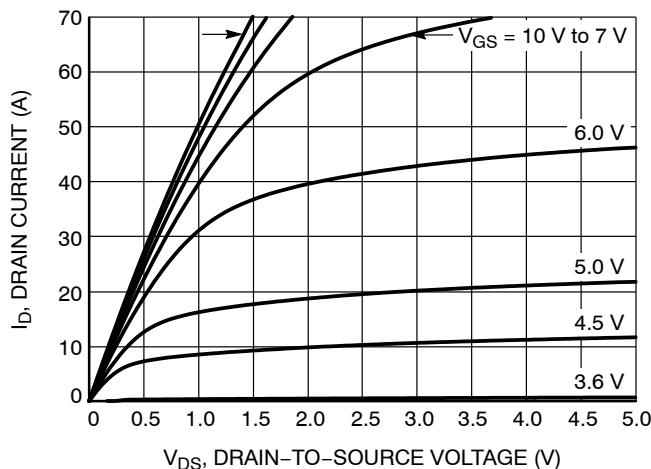


Figure 1. On-Region Characteristics

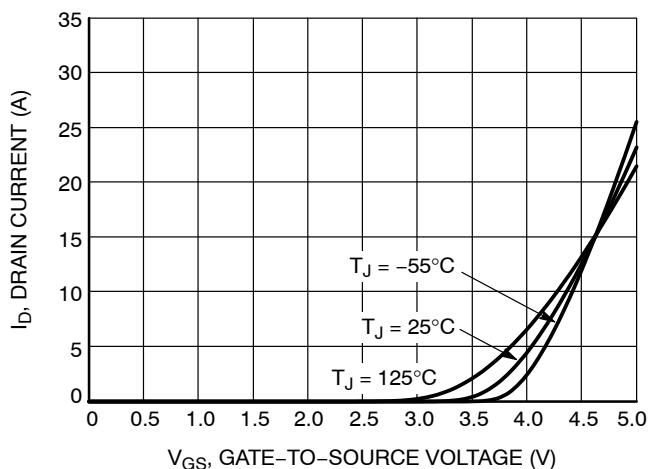


Figure 2. Transfer Characteristics

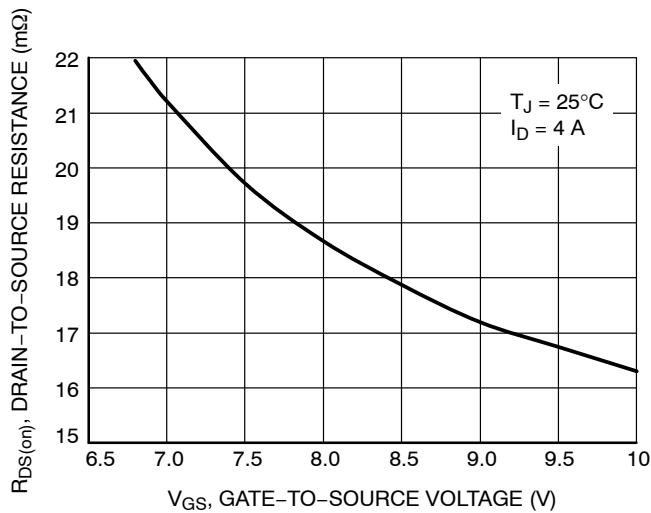


Figure 3. On-Resistance vs. Gate-to-Source Voltage

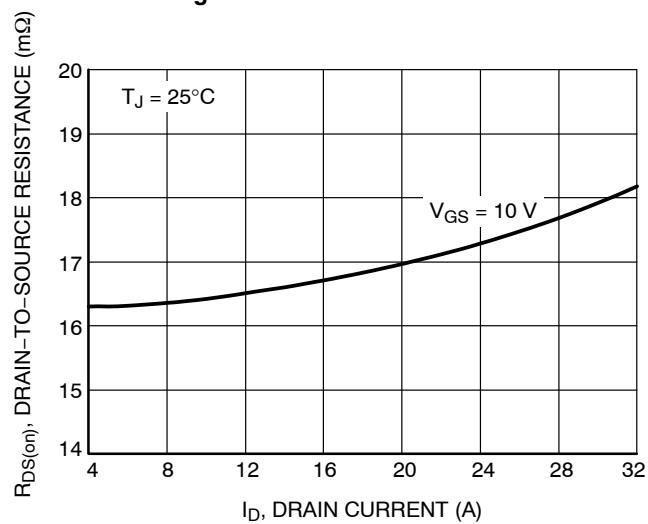


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

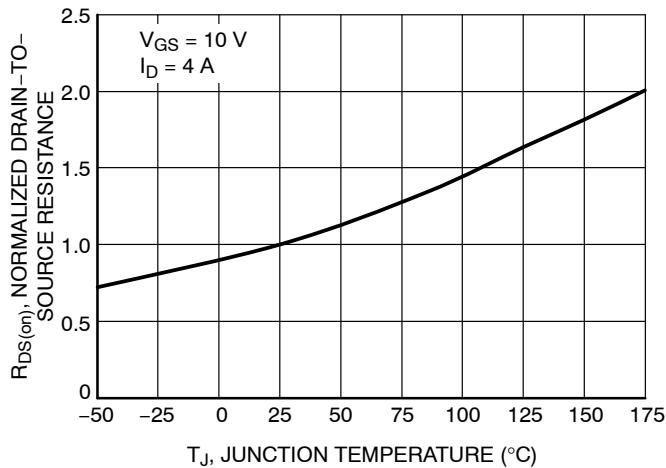


Figure 5. On-Resistance Variation with Temperature

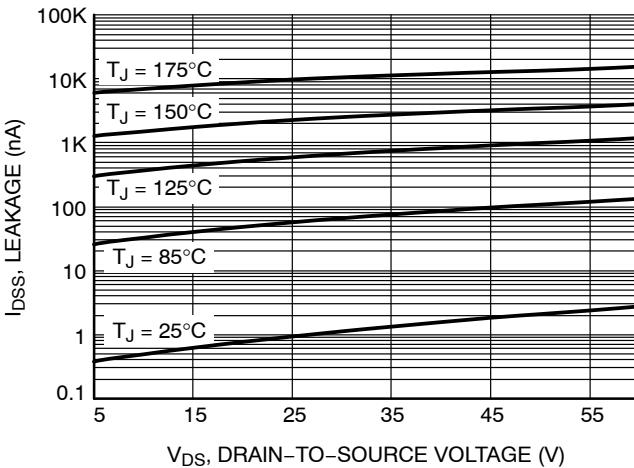


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

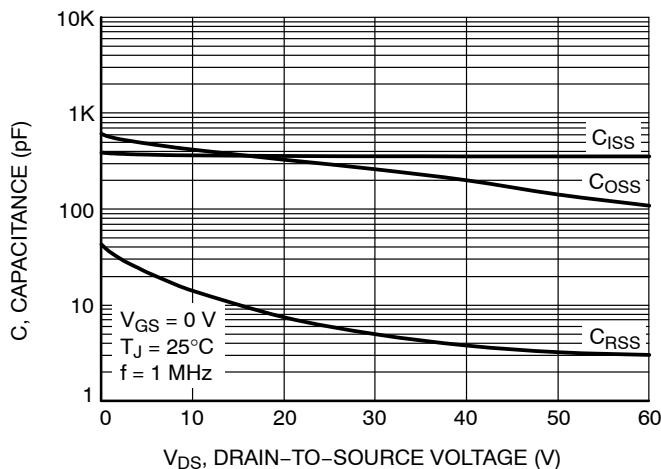


Figure 7. Capacitance Variation

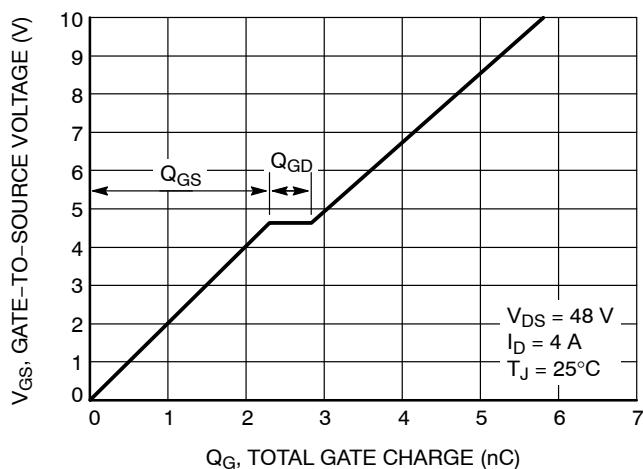


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

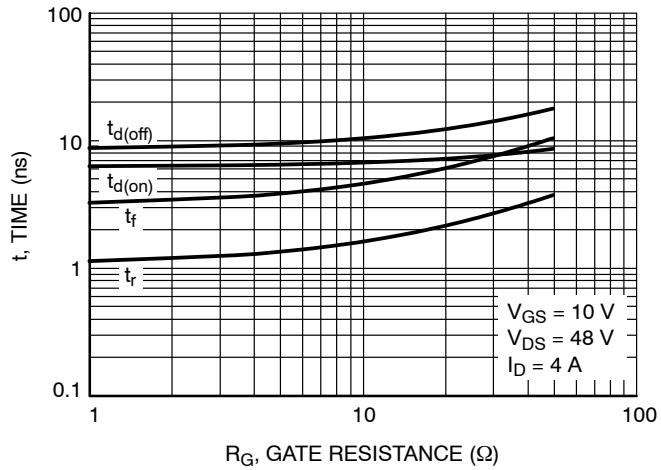


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

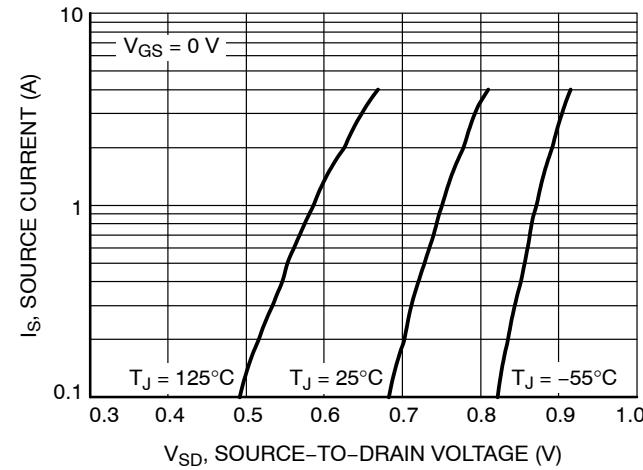


Figure 10. Diode Forward Voltage vs. Current

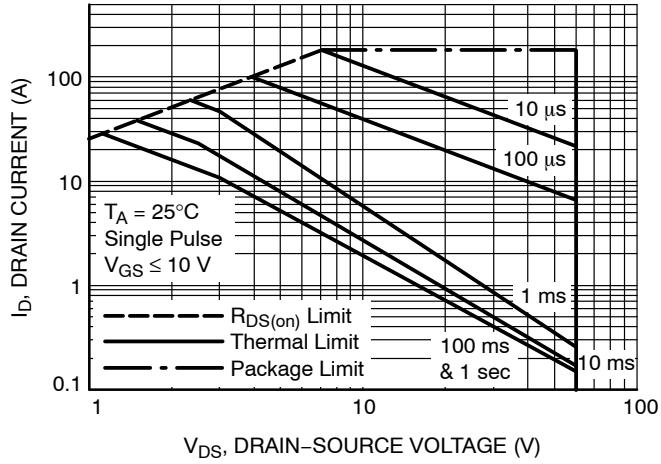


Figure 11. Safe Operating Area

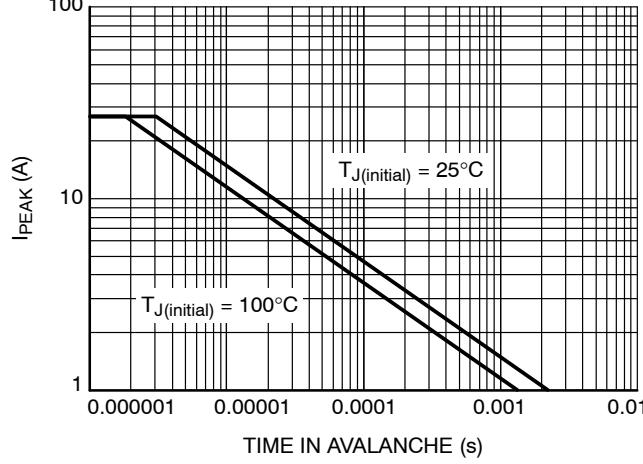


Figure 12. Maximum Drain Current vs. Time in Avalanche

TYPICAL CHARACTERISTICS

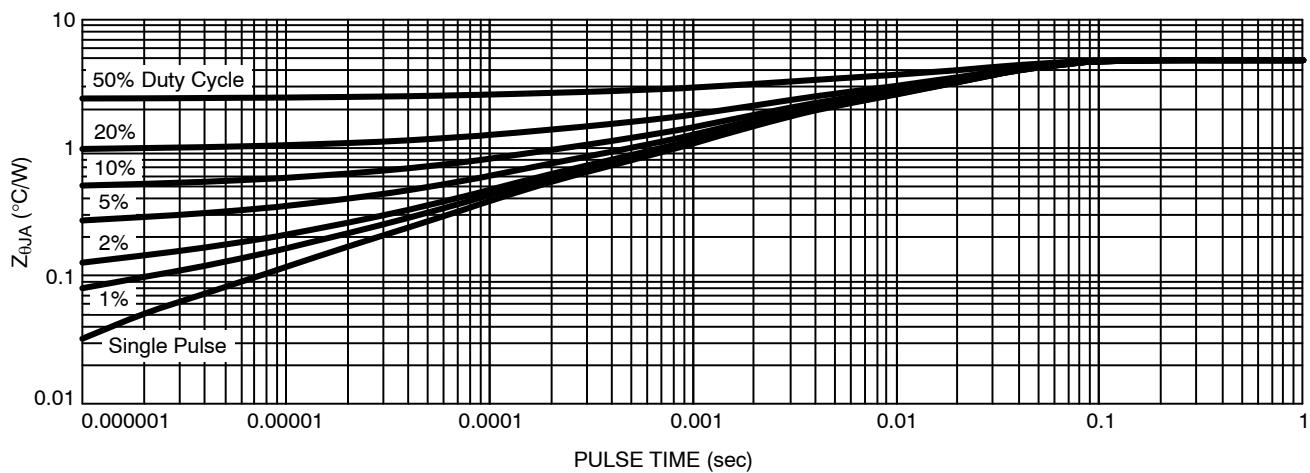
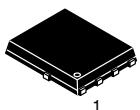


Figure 13. Thermal Response

DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping [†]
NVMFS020N06CT1G	20N06C	DFN5 5x6, 1.27P (Pb-Free)	1500 / Tape & Reel
NVMFWS020N06CT1G	20N06W	DFNW5, 5x6 (FULL-CUT SO8FL WF) (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

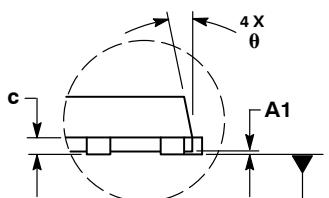
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(SO-8FL)
CASE 488AA
ISSUE N

DATE 25 JUN 2018

NOTES:

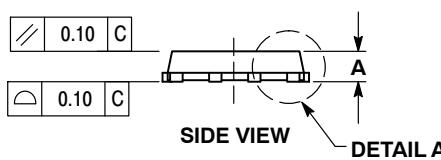
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

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 °

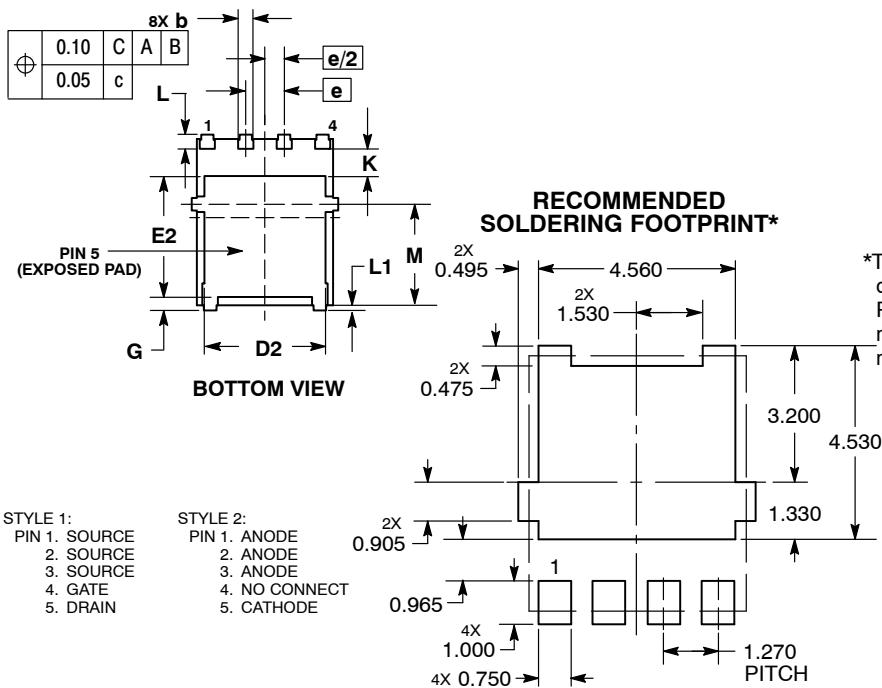


DETAIL A

SEATING PLANE



DETAIL A



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

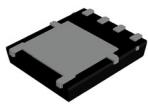
DIMENSIONS: MILLIMETERS

*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.

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

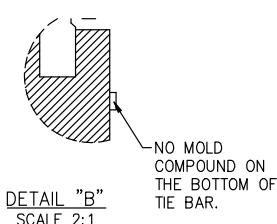
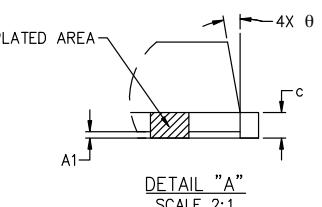
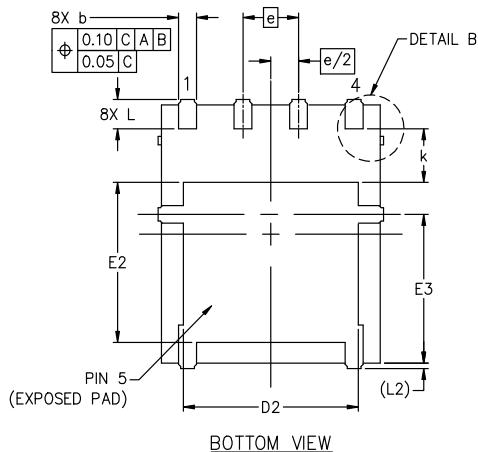
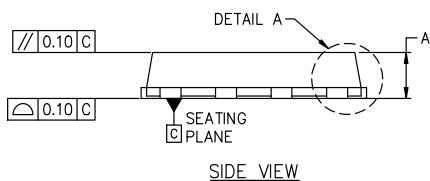
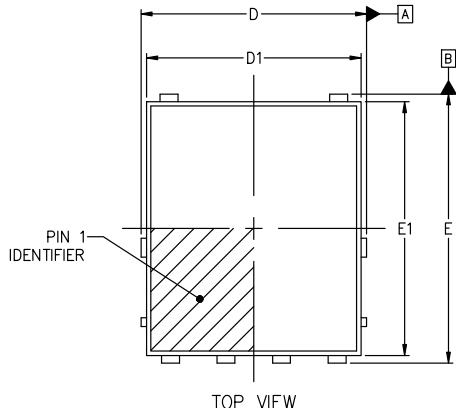
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DFNW5 4.90x5.90x1.00, 1.27P
CASE 507BA
ISSUE C

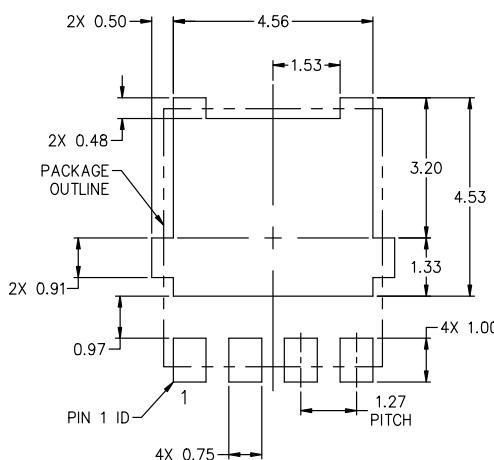
DATE 19 SEP 2024



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.

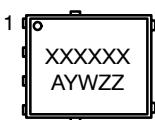
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D2	3.80	4.00	4.20
E	6.00	6.15	6.30
E1	5.70	5.90	6.10
E2	3.45	3.65	3.85
E3	3.00	3.40	3.80
e		1.27 BSC	
k	1.20	1.35	1.50
L	0.51	0.57	0.71
L2		0.15 REF.	
θ	0°	6°	12°



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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