

MOSFET - Power, Single N-Channel

40 V, 0.4 mΩ, 553.8 A

NVMTS0D4N04CL

Features

- Small Footprint (8x8 mm) for Compact Design
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Q_G and Capacitance to Minimize Driver Losses
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Typical Applications

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

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}	±20	V
Continuous Drain Current R _{θJC} (Note 2)	Steady State	T _C = 25°C	I _D	553.8	A
		T _C = 100°C	I _D	394.8	A
Power Dissipation R _{θJC} (Note 2)		T _C = 25°C	P _D	244	W
		T _C = 100°C	P _D	122	W
Continuous Drain Current R _{θJA} (Notes 1, 2)	Steady State	T _A = 25°C	I _D	79.8	A
		T _A = 100°C	I _D	56.4	A
Power Dissipation R _{θJA} (Notes 1, 2)		T _A = 25°C	P _D	5.0	W
		T _A = 100°C	P _D	2.5	W
Pulsed Drain Current	T _A = 25°C, t _p = 10 μs		I _{DM}	900	A
Operating Junction and Storage Temperature Range			T _J , T _{stg}	–55 to +175	°C
Source Current (Body Diode)			I _S	203.4	A
Single Pulse Drain-to-Source Avalanche Energy (I _{L(pk)} = 70 A)			E _{AS}	4454	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 (Note 2)	$R_{\theta JC}$	0.61	$^\circ\text{C/W}$
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	30.1	$^\circ\text{C/W}$

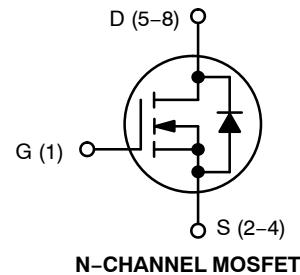
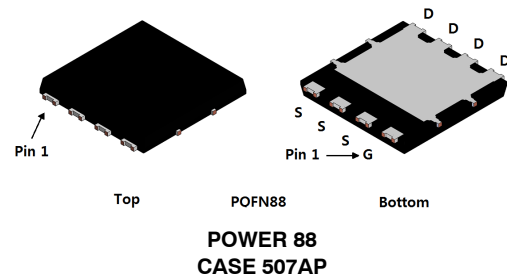
1. Surface-mounted on FR4 board using a 1 in² pad size, 1 oz. Cu pad.
2. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.



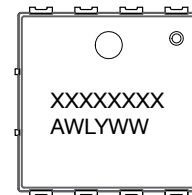
ON Semiconductor®

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$V_{(BR)DSS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$
40 V	0.4 mΩ @ 10 V	553.8 A
	0.64 mΩ @ 4.5 V	



MARKING DIAGRAM



XXX = Device Code
(8 A–N characters max)
A = Assembly Location
WL = 2-digit Wafer Lot Code
Y = Year Code
WW = Work Week Code

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 5 of this data sheet.

NVMTS0D4N04CL

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	40			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V _{(BR)DSS} /T _J	I _D = 250 μA, ref to 25°C		8.86		mV/°C
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V, V _{DS} = 32 V			10	μA
		T _J = 25°C				
		T _J = 125°C			250	
Gate-to-Source Leakage Current	I _{GSS}	V _{DS} = 0 V, V _{GS} = 20 V			100	nA

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	V _{GS(TH)}	V _{GS} = V _{DS} , I _D = 250 μA	1.0		2.5	V
Negative Threshold Temperature Coefficient	V _{GS(TH)} /T _J	I _D = 250 μA, ref to 25°C		-6.24		mV/°C
Drain-to-Source On Resistance	R _{DS(on)}	V _{GS} = 10 V, I _D = 50 A		0.3	0.4	mΩ
		V _{GS} = 4.5 V, I _D = 50 A		0.45	0.64	
Forward Transconductance	g _{FS}	V _{DS} = 5 V, I _D = 50 A		330		S
Gate Resistance	R _G	T _A = 25°C		1.0		Ω

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C _{ISS}	V _{GS} = 0 V, f = 1 MHz, V _{DS} = 20 V		20600		pF
Output Capacitance	C _{OSS}			9500		
Reverse Transfer Capacitance	C _{RSS}			390		
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 4.5 V, V _{DS} = 20 V; I _D = 50 A		163		nC
Threshold Gate Charge	Q _{G(TH)}	V _{GS} = 10 V, V _{DS} = 20 V; I _D = 50 A		29.8		
Gate-to-Source Charge	Q _{GS}			51		
Gate-to-Drain Charge	Q _{GD}			52.1		
Total Gate Charge	Q _{G(TOT)}			341		
Voltage Plateau	V _{GP}			2.7		V

SWITCHING CHARACTERISTICS, V_{GS} = 4.5 V (Note 4)

Turn-On Delay Time	t _{d(ON)}	V _{GS} = 4.5 V, V _{DS} = 20 V, I _D = 50 A, R _G = 6 Ω		110		ns
Rise Time	t _r			147		
Turn-Off Delay Time	t _{d(OFF)}			217		
Fall Time	t _f			107		

SWITCHING CHARACTERISTICS, V_{GS} = 10 V (Note 4)

Turn-On Delay Time	t _{d(ON)}	V _{GS} = 10 V, V _{DS} = 20 V, I _D = 50 A, R _G = 6 Ω		45.6		ns
Rise Time	t _r			39.8		
Turn-Off Delay Time	t _{d(OFF)}			382		
Fall Time	t _f			96.4		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = 50 A	T _J = 25°C		0.75	1.2	V
			T _J = 125°C		0.58		
Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, dI _S /dt = 100 A/μs, I _S = 50 A			117		ns
Charge Time	t _a				87		
Discharge Time	t _b				30		
Reverse Recovery Charge	Q _{RR}				336		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.

3. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.

4. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

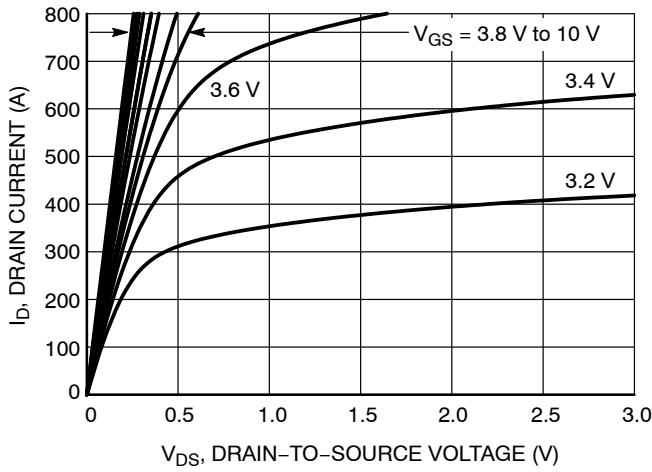


Figure 1. On-Region Characteristics

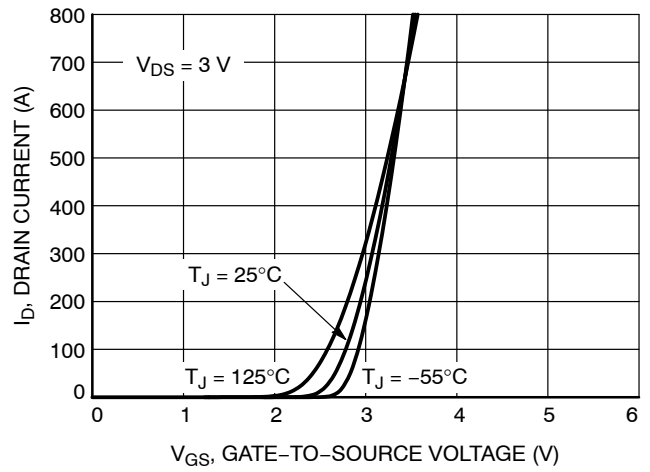


Figure 2. Transfer Characteristics

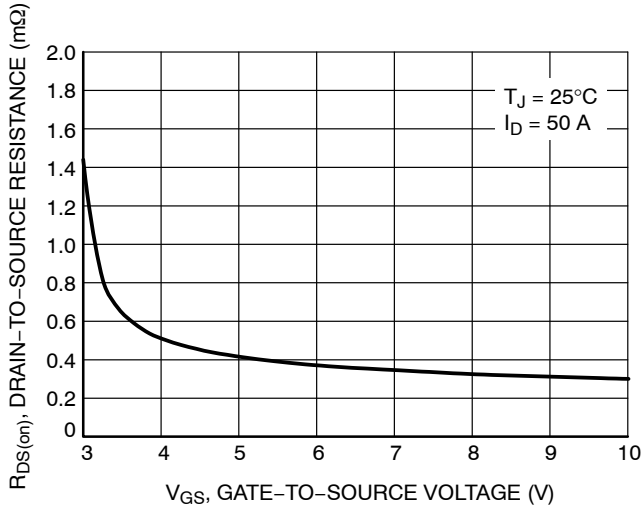


Figure 3. On-Resistance vs. Gate-to-Source Voltage

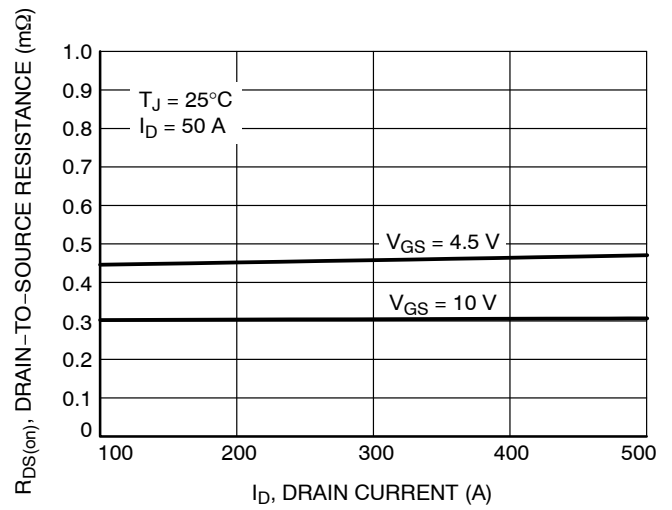


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

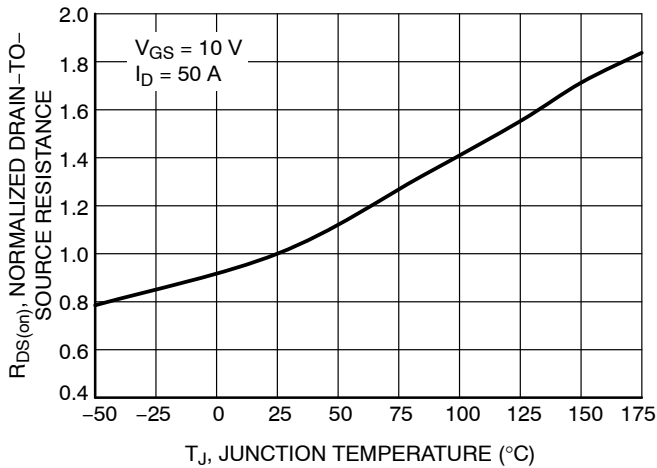


Figure 5. On-Resistance Variation with Temperature

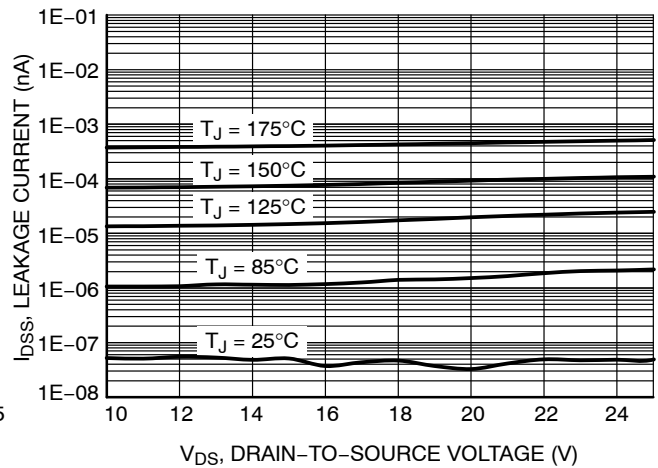


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

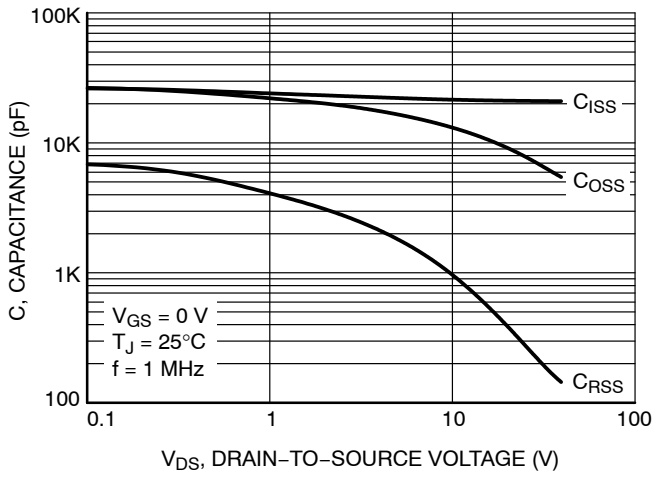


Figure 7. Capacitance Variation

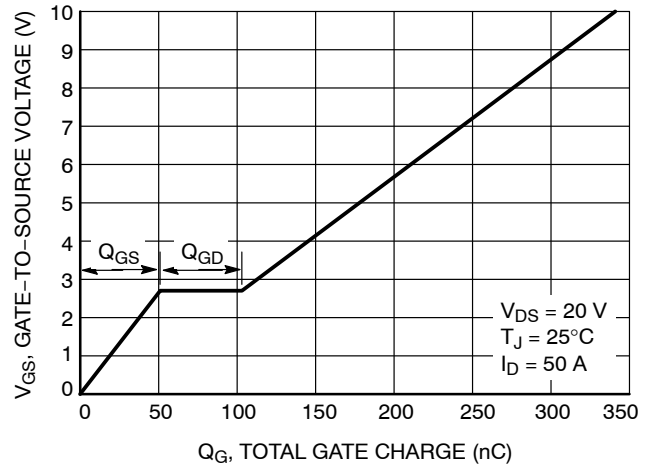


Figure 8. Gate-to-Source Voltage vs. Total Charge

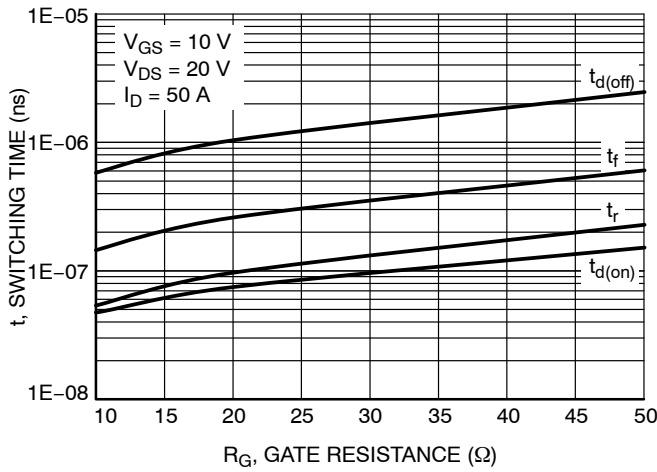


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

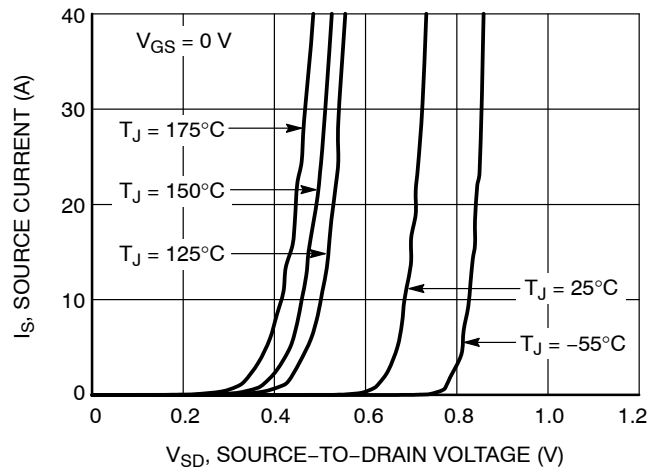


Figure 10. Diode Forward Voltage vs. Current

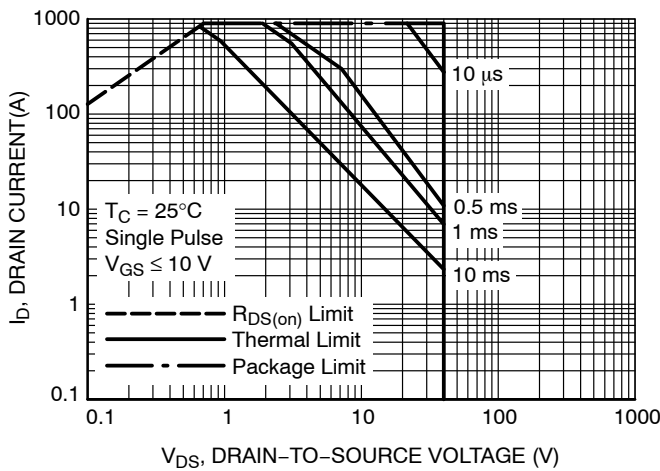


Figure 11. Maximum Rated Forward Biased Safe Operating Area

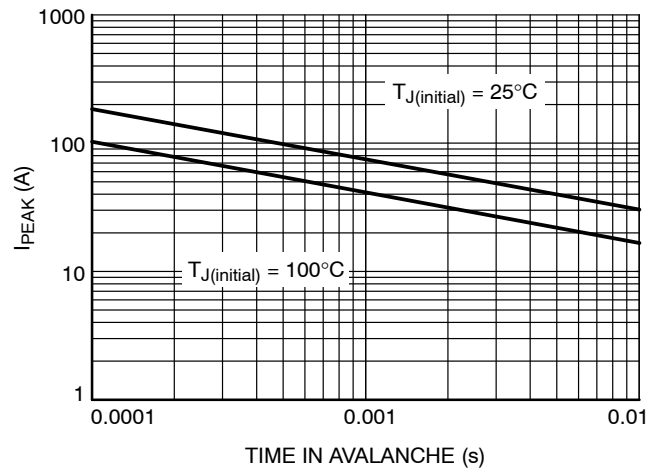


Figure 12. I_{PEAK} vs. Time in Avalanche

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TYPICAL CHARACTERISTICS

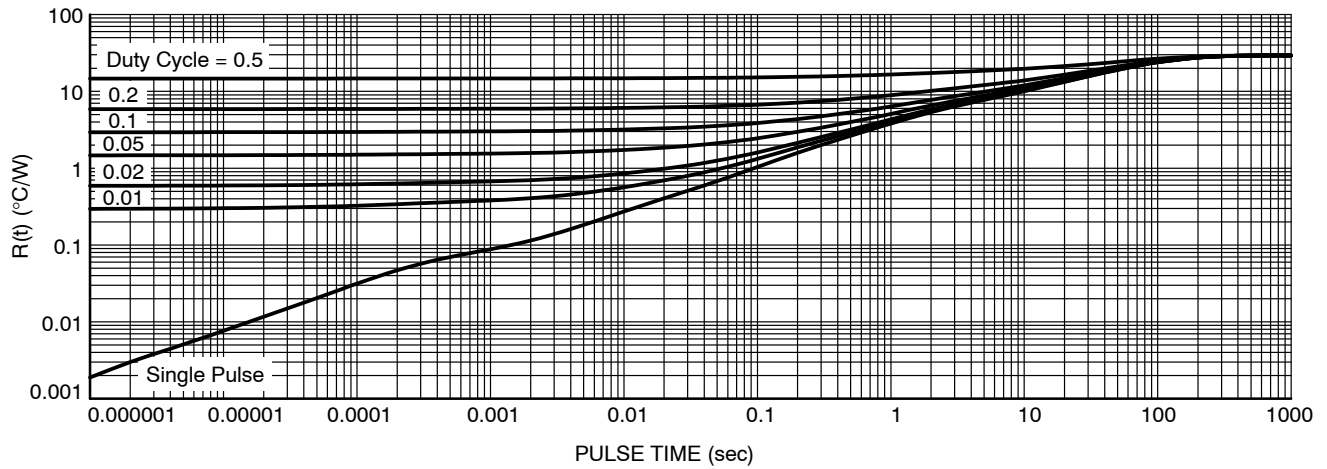


Figure 13. Thermal Characteristics

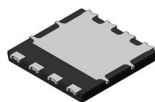
DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping†
NVMTS0D4N04CLTXG	0D4N04CL	POWER 88 (Pb-Free)	TBD / 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.

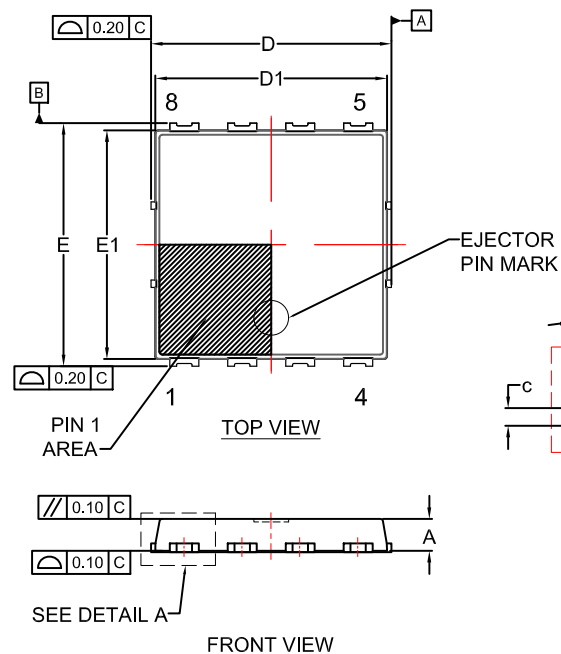
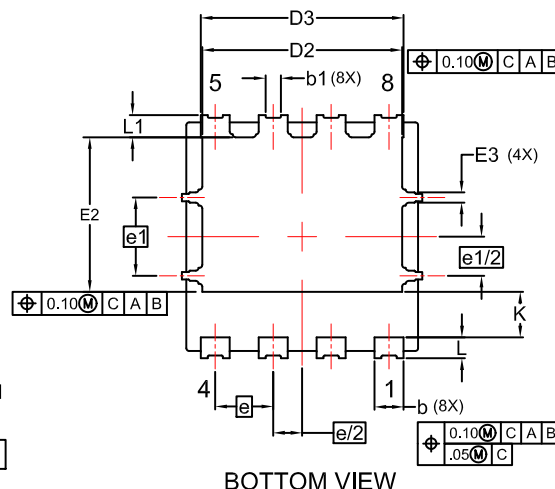
MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

ON Semiconductor®



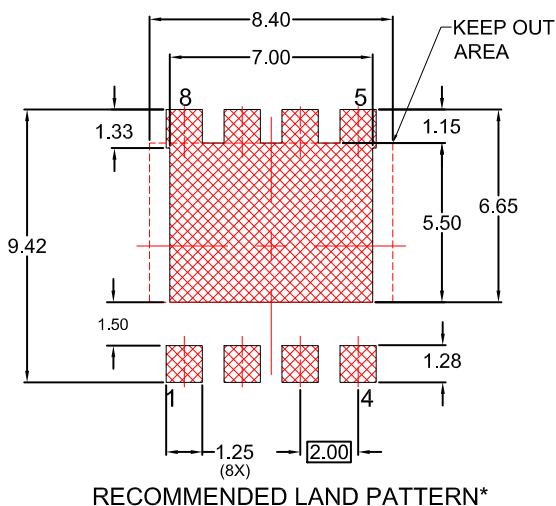
DFNW8 8.3x8.4, 2P
CASE 507AP
ISSUE C

DATE 11 JUN 2020



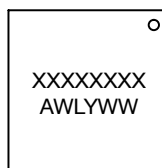
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
4. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
5. SEATING PLANE IS DEFINED BY THE TERMINALS. "A1" IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.



*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERM/D.

GENERIC MARKING DIAGRAM*



XXXX = Specific Device Code
A = Assembly Location
WL = Wafer Lot Code
Y = Year Code
WW = Work Week Code

*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.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	1.00	1.10	1.20
A1	0.00	—	0.05
b	0.90	1.00	1.10
b1	0.43	0.53	0.63
c	0.23	0.28	0.33
D	8.20	8.30	8.40
D1	7.90	8.00	8.10
D2	6.80	6.90	7.00
D3	6.90	7.00	7.10
E	8.30	8.40	8.50
E1	7.80	7.90	8.00
E2	5.24	5.34	5.44
E3	0.25	0.35	0.45
e	2.00 BSC		
e/2	1.00 BSC		
e1	2.70 BSC		
e1/2	1.35 BSC		
K	1.50	1.57	1.70
L	0.64	0.74	0.84
L1	0.67	0.77	0.87
Θ	0°	—	12°

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DESCRIPTION:	DFNW8 8.3x8.4, 2P	PAGE 1 OF 1

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