

# MOSFET – Power, Single N-Channel

40 V, 0.45 mΩ, 558 A

## NVMTS0D4N04C

### 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
- Power 88 Package, Industry Standard
- 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			$V_{DSS}$	40	V
Gate-to-Source Voltage			$V_{GS}$	$\pm 20$	V
Continuous Drain Current $R_{\theta JC}$ (Notes 1, 3)	Steady State	$T_C = 25^\circ\text{C}$	$I_D$	558	A
		$T_C = 100^\circ\text{C}$		394.8	
Power Dissipation $R_{\theta JC}$ (Note 1)	Steady State	$T_C = 25^\circ\text{C}$	$P_D$	244	W
		$T_C = 100^\circ\text{C}$		122	
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2, 3)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$	79.8	A
		$T_A = 100^\circ\text{C}$		56.4	
Power Dissipation $R_{\theta JA}$ (Notes 1, 2)	Steady State	$T_A = 25^\circ\text{C}$	$P_D$	5.0	W
		$T_A = 100^\circ\text{C}$		2.5	
Pulsed Drain Current	$T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$		$I_{DM}$	900	A
Operating Junction and Storage Temperature Range			$T_J, T_{stg}$	-55 to +175	$^\circ\text{C}$
Source Current (Body Diode)			$I_S$	203.4	A
Single Pulse Drain-to-Source Avalanche Energy ( $I_{L(pk)} = 70 \text{ A}$ )			$E_{AS}$	2236	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			$T_L$	260	$^\circ\text{C}$

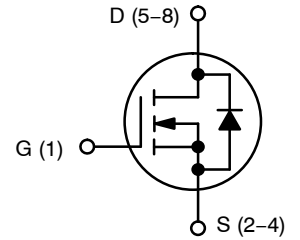
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL RESISTANCE MAXIMUM RATINGS

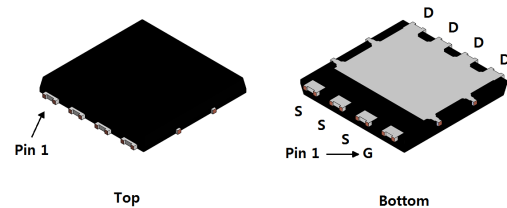
Parameter	Symbol	Value	Unit
Junction-to-Case – Steady State	$R_{\theta JC}$	0.61	$^\circ\text{C/W}$
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	30	

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 mm<sup>2</sup>, 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.

$V_{(BR)DSS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$
40 V	0.45 mΩ @ 10 V	558 A

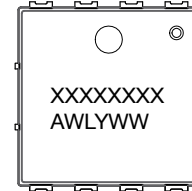


N-CHANNEL MOSFET



TDFNW8  
CASE 507AP

### 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.

# NVMTS0D4N04C

## 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	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	40			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			7.78		mV/ $^\circ\text{C}$
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, V_{DS} = 40\text{ V}$	$T_J = 25\text{ }^\circ\text{C}$		10	$\mu\text{A}$
			$T_J = 125^\circ\text{C}$		250	
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = 20\text{ V}$			100	nA

### ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$	2.0		4.0	V
Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			-8.49		mV/ $^\circ\text{C}$
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 50\text{ A}$		0.38	0.45	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS} = 15\text{ V}, I_D = 50\text{ A}$		300		S

### CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{ V}, f = 0.1\text{ MHz}, V_{DS} = 20\text{ V}$		16500		pF
Output Capacitance	$C_{OSS}$			8310		
Reverse Transfer Capacitance	$C_{RSS}$			390		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DS} = 20\text{ V}; I_D = 50\text{ A}$		251		nC
Threshold Gate Charge	$Q_{G(TH)}$	$V_{GS} = 10\text{ V}, V_{DS} = 20\text{ V}; I_D = 50\text{ A}$		40		
Gate-to-Source Charge	$Q_{GS}$			62.4		
Gate-to-Drain Charge	$Q_{GD}$			49.2		
Plateau Voltage	$V_{GP}$			4.09		V
Gate Resistance	$R_G$			0.9		$\Omega$

### SWITCHING CHARACTERISTICS (Note 5)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 10\text{ V}, V_{DS} = 20\text{ V}, I_D = 50\text{ A}, R_G = 6\text{ }\Omega$		57		ns
Rise Time	$t_r$			51.5		
Turn-Off Delay Time	$t_{d(OFF)}$			201		
Fall Time	$t_f$			76.8		

### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 50\text{ A}$	$T_J = 25^\circ\text{C}$		0.75	1.2	V
			$T_J = 125^\circ\text{C}$		0.58		
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, I_S = 50\text{ A}$			121		ns
Charge Time	$t_a$				71.4		
Discharge Time	$t_b$				49.6		
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.

4. Pulse Test: pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

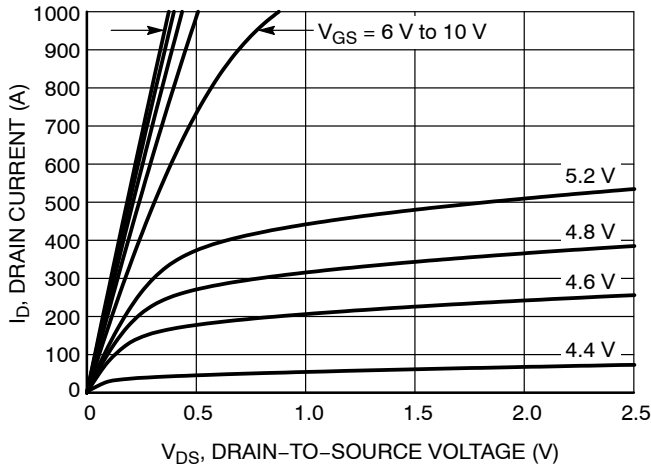


Figure 1. On-Region Characteristics

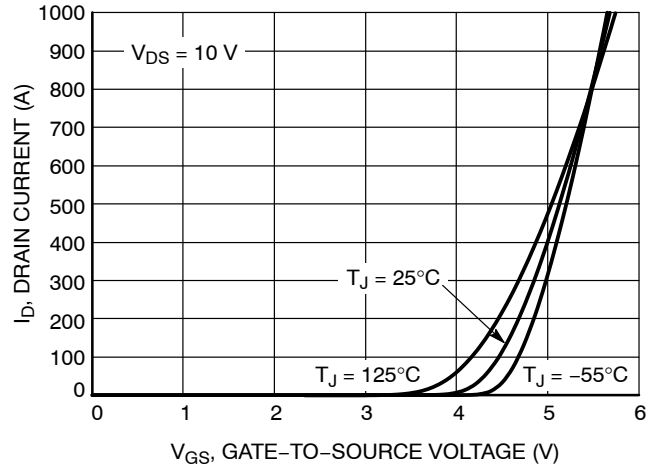


Figure 2. Transfer Characteristics

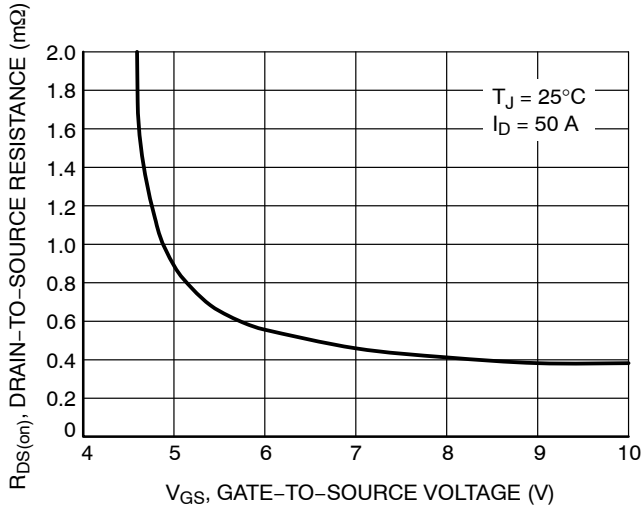


Figure 3. On-Resistance vs. Gate-to-Source Voltage

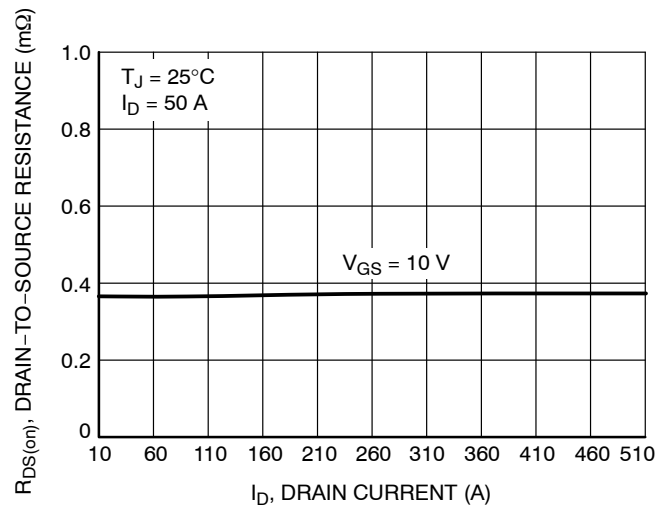


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

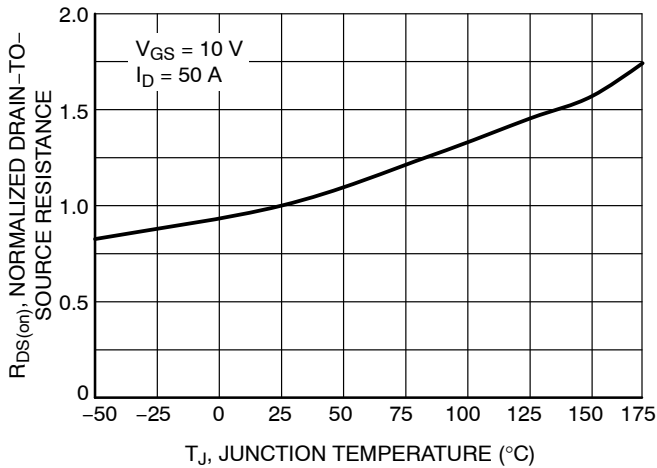


Figure 5. On-Resistance Variation with Temperature

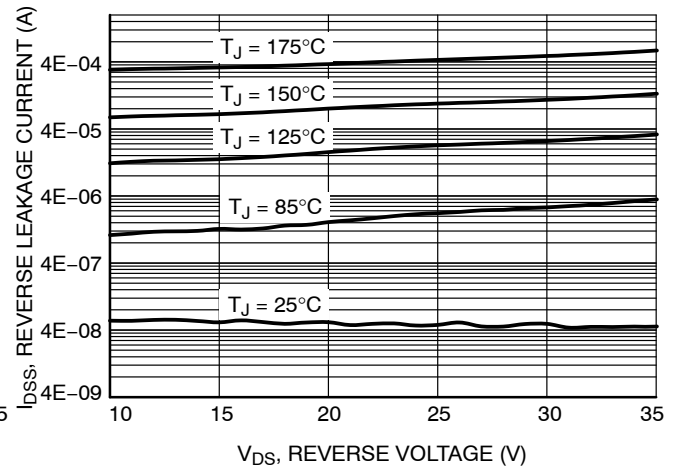


Figure 6. Drain-to-Source Leakage Current vs. Voltage

# NVMTS0D4N04C

## TYPICAL CHARACTERISTICS

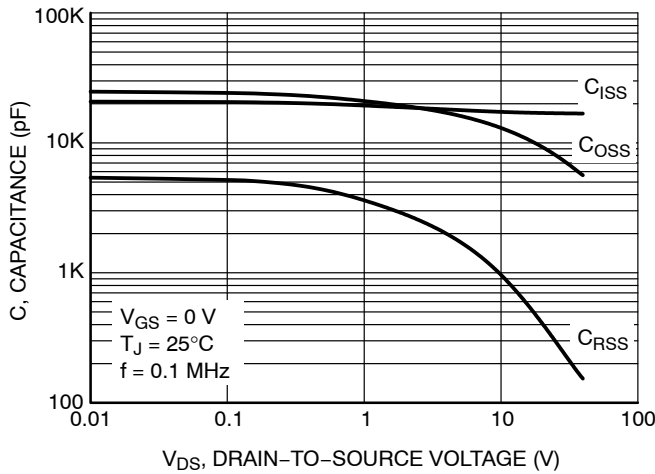


Figure 7. Capacitance Variation

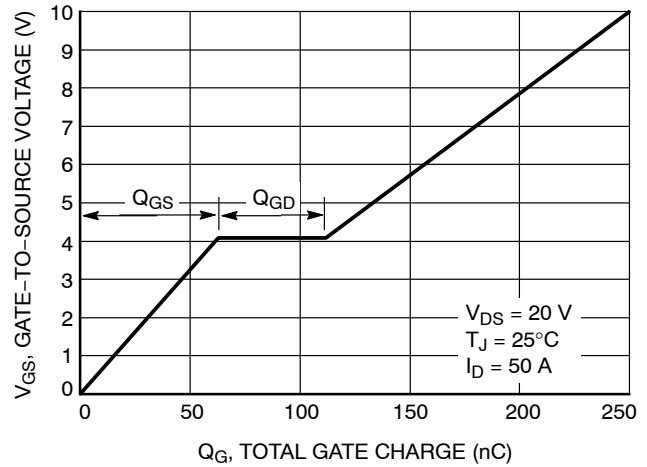


Figure 8. Gate-to-Source Voltage vs. Total Charge

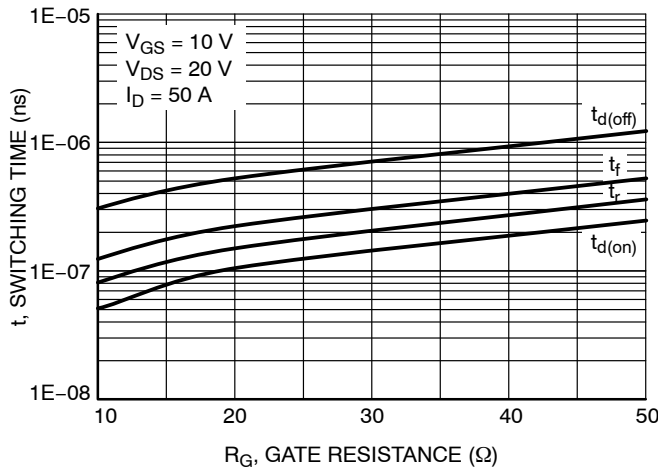


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

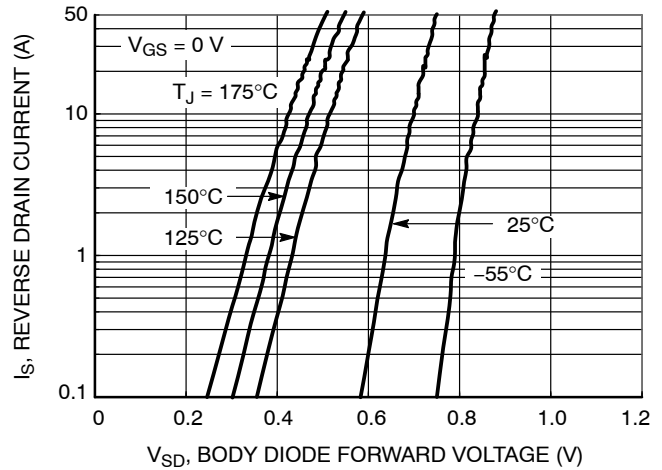


Figure 10. Diode Forward Voltage vs. Current

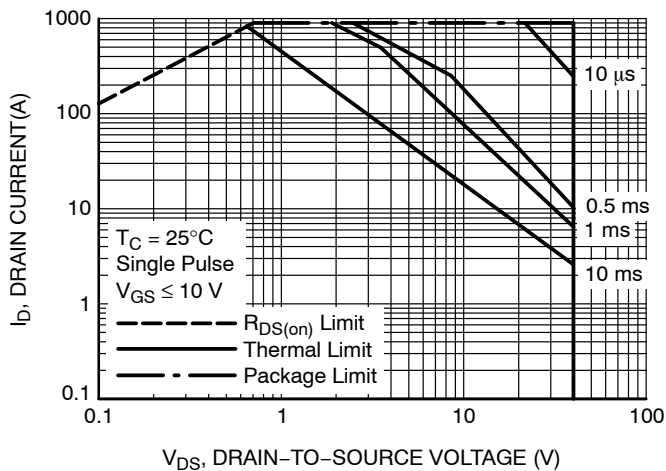


Figure 11. Maximum Rated Forward Biased Safe Operating Area

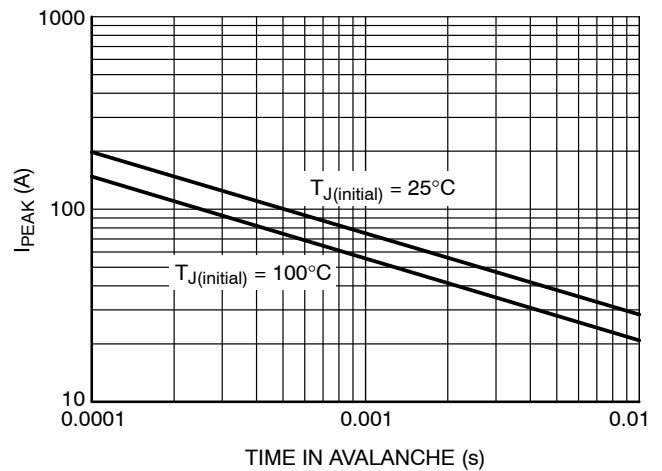


Figure 12.  $I_{PEAK}$  vs. Time in Avalanche

# NVMTS0D4N04C

## TYPICAL CHARACTERISTICS

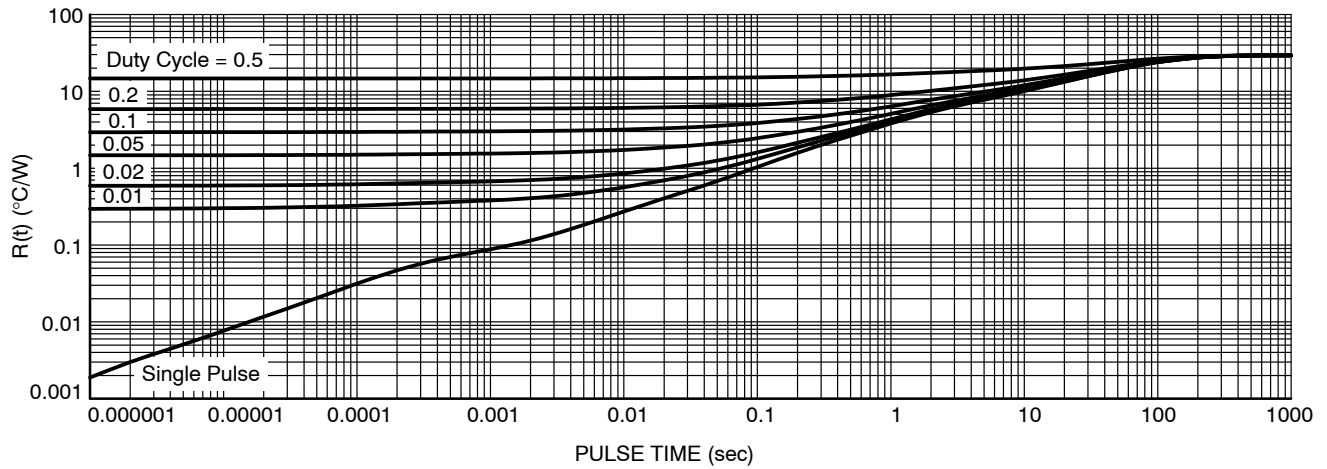


Figure 13. Thermal Characteristics

### DEVICE ORDERING INFORMATION

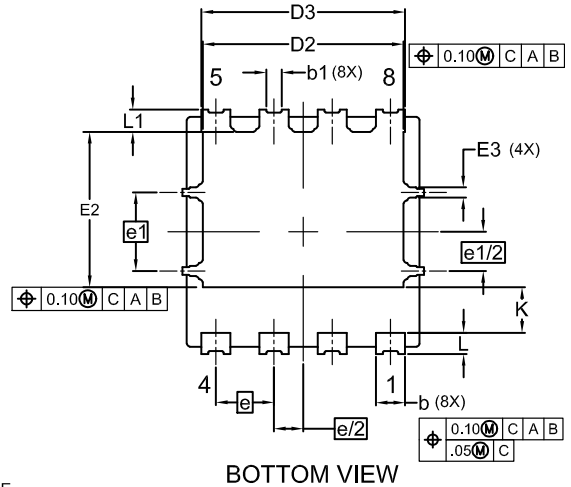
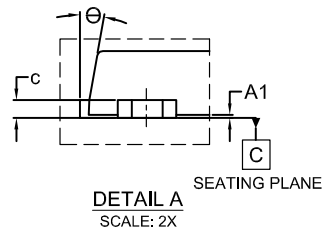
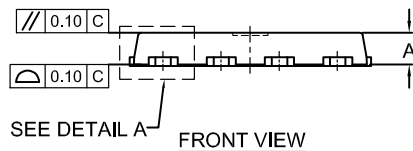
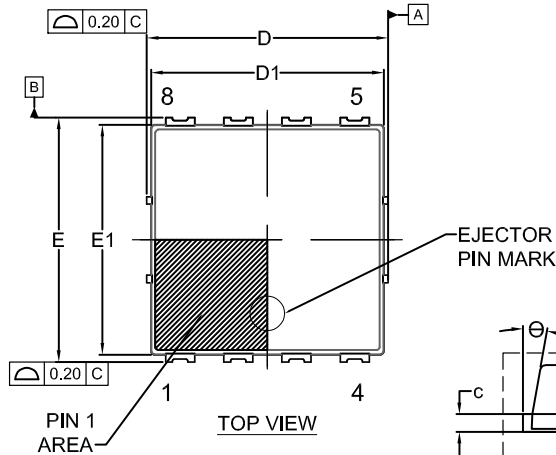
Device	Marking	Package	Shipping <sup>†</sup>
NVMTS0D4N04CTXG	0D4N04C	POWER 88 (Pb-Free)	3000 / Tape & Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



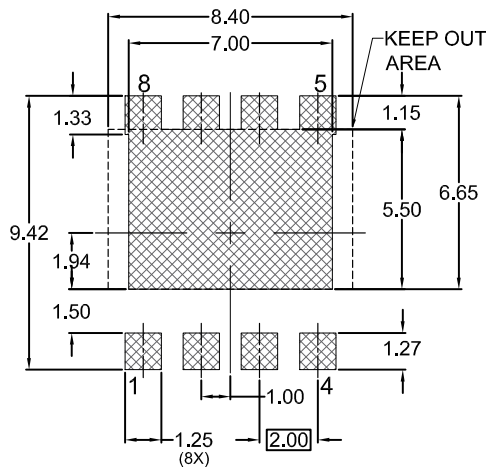
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CASE 507AP  
ISSUE E

DATE 08 MAY 2024



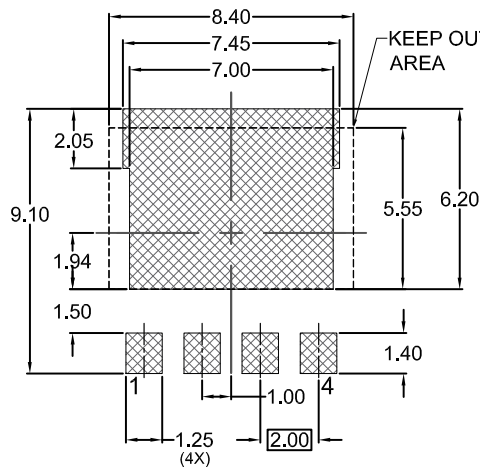
NOTES:

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.



RECOMMENDED LAND PATTERN\*

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



UNIVERSAL LAND PATTERN\*

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	0.35	0.45	0.55
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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**CASE 507AP**  
**ISSUE E**

DATE 08 MAY 2024

**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.

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