

MOSFET - Power, Single N-Channel, Source-Down 30 V, 1.0 mΩ, 294 A NTMFSS0D9N03P8

Features

- Advance 5x6 mm Package with Source Down and Center Gate Design to Improve Power Density, Efficiency, and Thermal Performance
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Q_G and Capacitance to Minimize Driver Losses
- These Devices are Pb-Free, Halogen-Free / BFR Free and are RoHS Compliant

Typical Applications

- ORing
- Motor Drives
- Power Load Switch
- DC-DC

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

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V_{DSS}	30	V
Gate-to-Source Voltage			V_{GS}	± 20	V
Continuous Drain Current $R_{\theta JC}$ (Note 2)	Steady State	$T_C = 25^{\circ}\text{C}$	I_D	294	A
		$T_C = 85^{\circ}\text{C}$		212	
Power Dissipation $R_{\theta JC}$ (Note 2)		$T_C = 25^{\circ}\text{C}$	P_D	125	W
		$T_C = 85^{\circ}\text{C}$		65	
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2)	Steady State	$T_A = 25^{\circ}\text{C}$	I_D	46	A
		$T_A = 85^{\circ}\text{C}$		33	
Power Dissipation $R_{\theta JA}$ (Notes 1, 2)		$T_A = 25^{\circ}\text{C}$	P_D	3.0	W
		$T_A = 85^{\circ}\text{C}$		1.6	
Pulsed Drain Current	$T_A = 25^{\circ}\text{C}, t_p = 10 \mu\text{s}$		I_{DM}	TBD	A
Operating Junction and Storage Temperature Range			T_J, T_{stg}	-55 to +150	$^{\circ}\text{C}$
Single Pulse Drain-to-Source Avalanche Energy ($I_{L(pk)} = 45 \text{ A}, L = 0.3 \text{ mH}$)			E_{AS}	304	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T_L	260	$^{\circ}\text{C}$

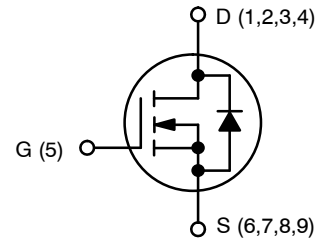
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE MAXIMUM RATINGS

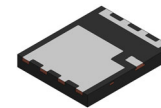
Parameter	Symbol	Value	Unit
Junction-to-Case - Steady State (Note 2)	$R_{\theta JC}$	1.0	$^\circ\text{C}/\text{W}$
Junction-to-Ambient - Steady State (Note 2)	$R_{\theta JA}$	41	

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 1 in² pad size, 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.

$V_{(BR)DSS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$
30 V	1.0 mΩ @ 10 V	294 A
	1.2 mΩ @ 4.5 V	

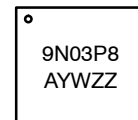


N-CHANNEL MOSFET



TDFN9 5x6
CASE 520AE

MARKING DIAGRAM



- A = Assembly Location
Y = Year Code
W = Work Week Code
ZZ = Assembly Lot Code

ORDERING INFORMATION

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

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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	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 500\text{ }\mu\text{A}$	30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$I_D = 500\text{ }\mu\text{A}$, ref to 25°C		-37		mV/ $^\circ\text{C}$
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
			$T_J = 125^\circ\text{C}$		100	
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	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 500\text{ }\mu\text{A}$	1.0		3.0	V
Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$	$I_D = 500\text{ }\mu\text{A}$, ref to 25°C		12		mV/ $^\circ\text{C}$
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 30\text{ A}$		0.62	1.0	$\text{m}\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 30\text{ A}$		0.86	1.2	
Forward Transconductance	g_{FS}	$V_{DS} = 5\text{ V}, I_D = 30\text{ A}$		175		S
Gate Resistance	R_G	$T_A = 25^\circ\text{C}$		1		Ω

CHARGES & CAPACITANCES

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 15\text{ V}$		9000		pF
Output Capacitance	C_{OSS}			3010		
Reverse Transfer Capacitance	C_{RSS}			275		
Threshold Gate Charge	$Q_{G(TH)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}; I_D = 30\text{ A}$		15		
Gate-to-Source Charge	Q_{GS}			24		
Gate-to-Drain Charge	Q_{GD}			12		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}; I_D = 30\text{ A}$		127		nC

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

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}, I_D = 30\text{ A}, R_G = 6\text{ }\Omega$		20.4		ns
Rise Time	t_r			19.3		
Turn-Off Delay Time	$t_{d(OFF)}$			125.4		
Fall Time	t_f			49.5		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 30\text{ A}$	$T_J = 25^\circ\text{C}$		0.75	1.2	V
			$T_J = 125^\circ\text{C}$		0.58		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, I_S = 30\text{ A}$		68.4		ns	
Charge Time	t_a			35.2			
Discharge Time	t_b			33.2			
Reverse Recovery Charge	Q_{RR}			92			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

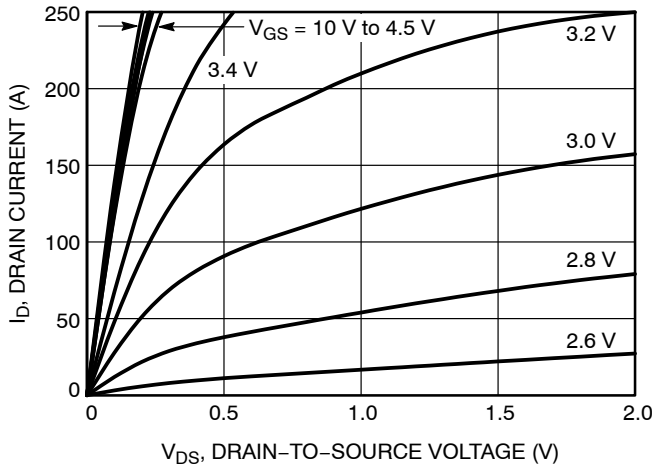


Figure 1. On-Region Characteristics

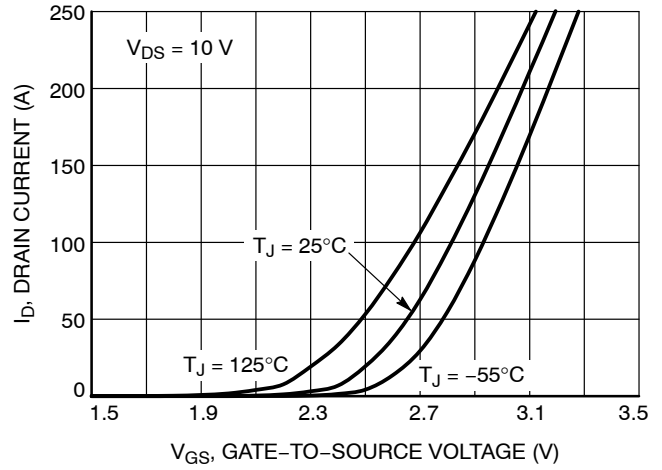


Figure 2. Transfer Characteristics

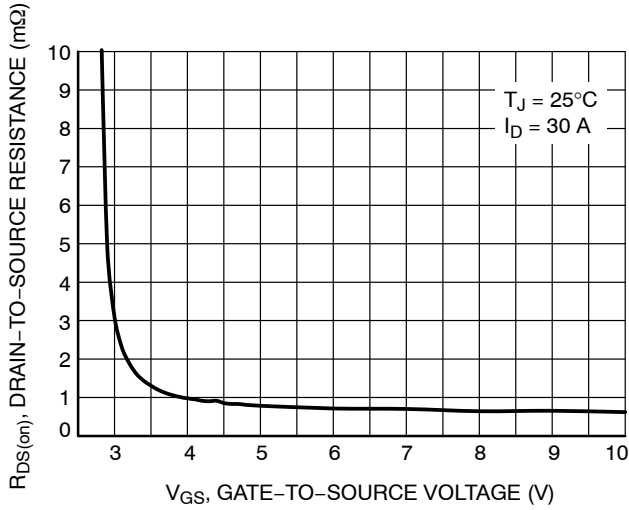


Figure 3. On-Resistance vs. Gate-to-Source Voltage

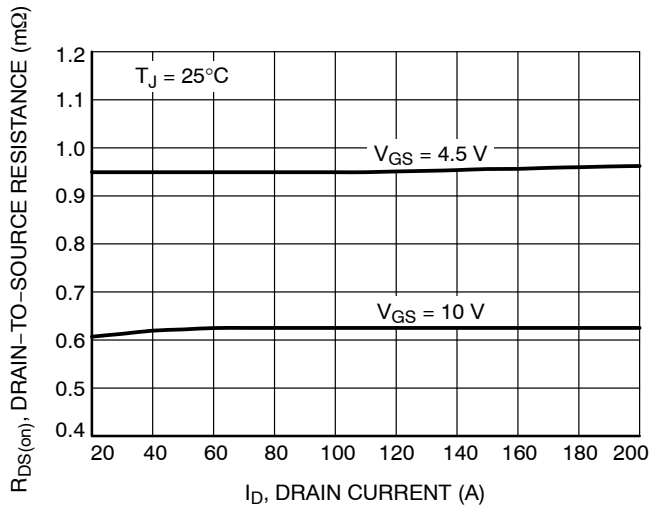


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

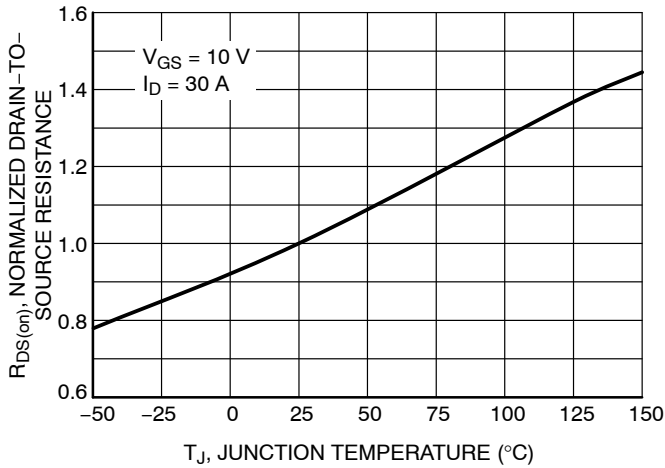


Figure 5. On-Resistance Variation with Temperature

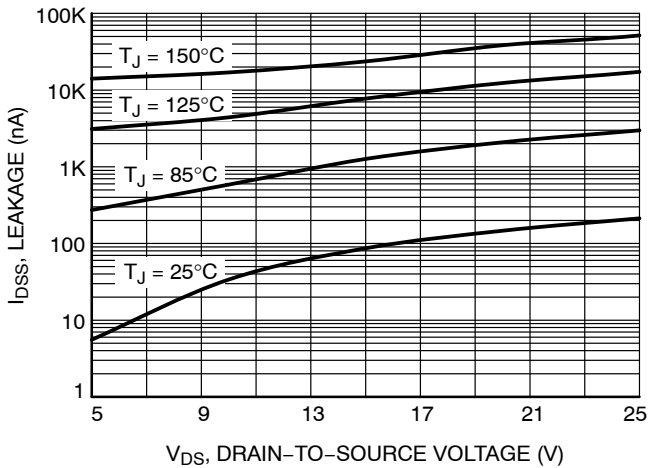


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

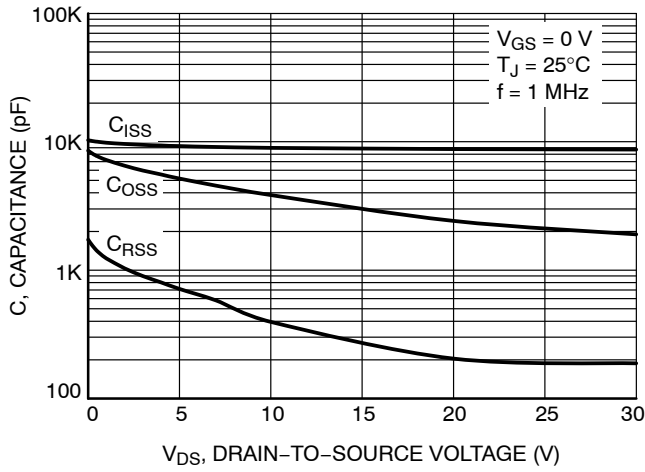


Figure 7. Capacitance Variation

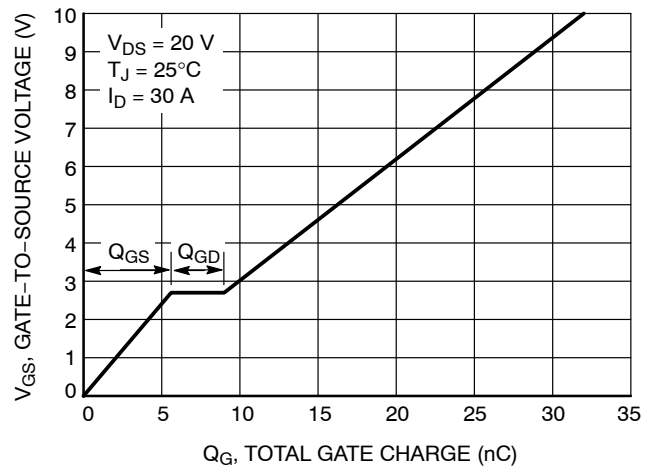


Figure 8. Gate-to-Source vs. Total Charge

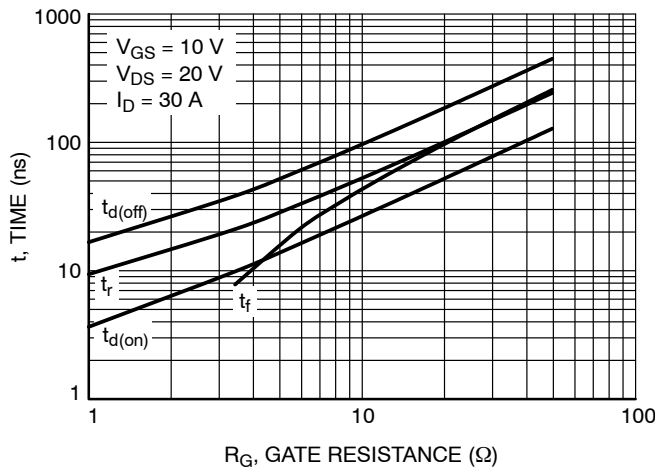


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

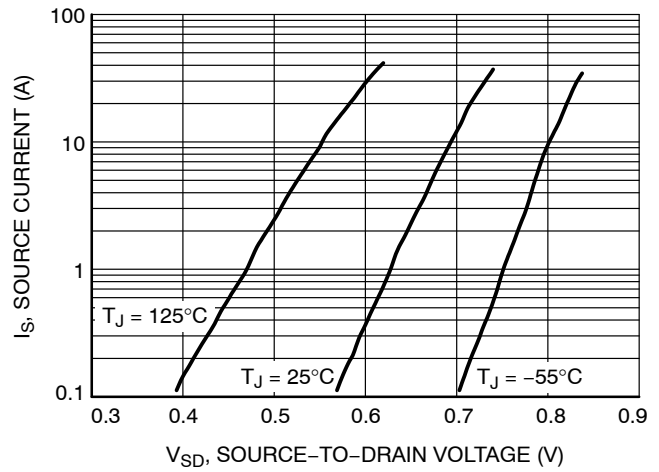


Figure 10. Diode Forward Voltage vs. Current

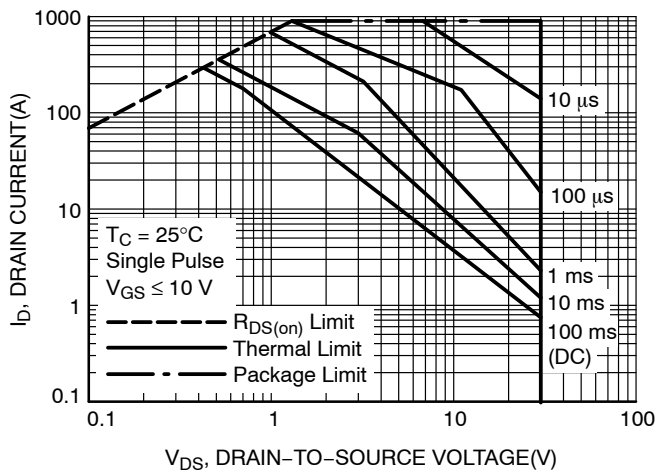


Figure 11. Safe Operating Area

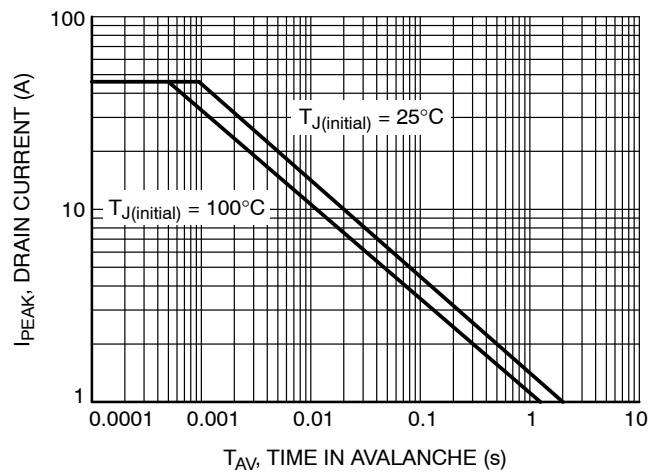


Figure 12. I_{PEAK} vs. Time in Avalanche

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TYPICAL CHARACTERISTICS

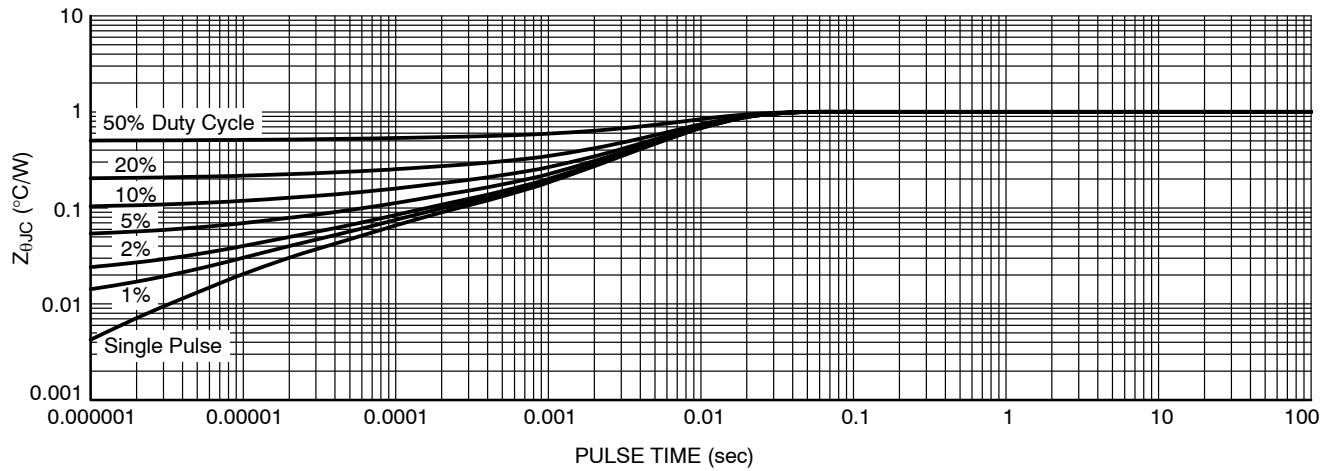


Figure 13. Thermal Characteristics

DEVICE ORDERING INFORMATION

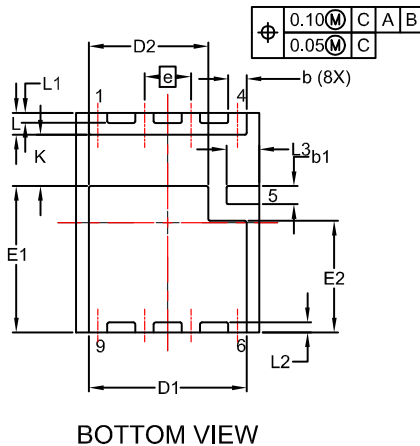
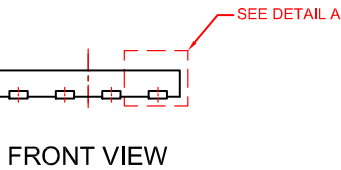
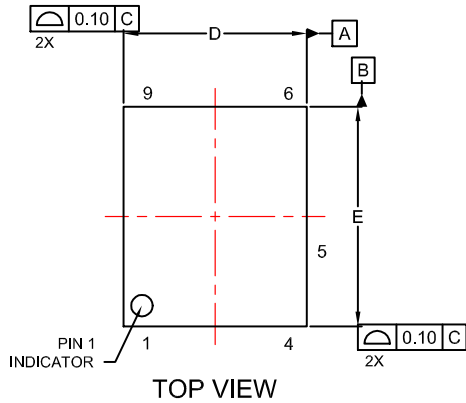
Device	Marking	Package	Shipping [†]
NTMFSS0D9N03P8	9N03P8	TDFN9 (Pb-Free)	3000 / Tape & Reel

[†]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.

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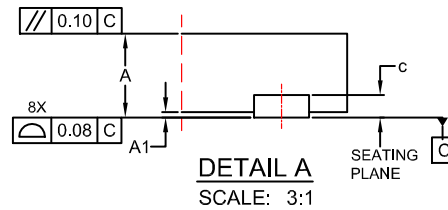
PACKAGE DIMENSIONS

TDFN9 5x6, 1.27P
CASE 520AE
ISSUE A

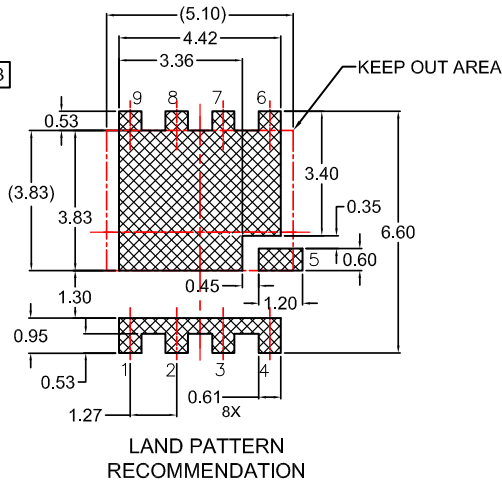


NOTES:

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, D2, E1 AND E2 DO NOT INCLUDE MOLD FLASH.
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.



UNIT IN MILLIMETER			
DIM	MIN	NOM	MAX
A	0.95	1.00	1.05
A1	0.00	0.02	0.05
b	0.45	0.50	0.55
b1	0.45	0.50	0.55
c	0.17	0.22	0.27
D	4.90	5.00	5.10
D1	4.10	4.30	4.50
D2	3.16	3.26	3.36
E	5.90	6.00	6.10
E1	3.90	4.00	4.10
E2	2.95	3.05	3.15
e	1.27 BSC		
K	1.30	1.40	1.50
L	0.50	0.60	0.70
L1	0.18	0.28	0.38
L2	0.18	0.28	0.38
L3	0.75	0.85	0.95



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

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