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MOSFET - Power, Single N-Channel, DUAL COOL™, DFN8 5x6.15

60 V, 1.9 mΩ, 199 A

NTMFSC1D9N06HL

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Features

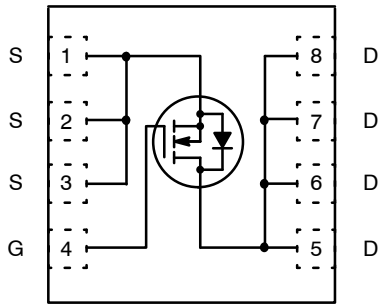
- Advanced Dual−Side Cooled Packaging
- Ultra Low $R_{DS(on)}$ to Minimize Conduction Losses
- MSL1 Robust Packaging Design
- Low Qg and Qoss to Minimize Charge Losses
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

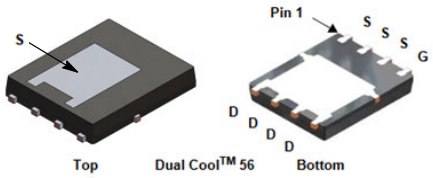
Typical Applications

- DC−DC Conversion
- Orring FET/Load Switching
- Synchronous Rectification

$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	I_D MAX
60 V	1.9 mΩ @ 10 V	199 A

N−Channel MOSFET





DFN8 5x6.15
CASE 506EG

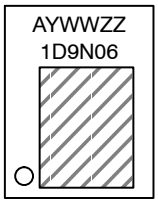
MAXIMUM RATINGS (T_J = 25°C, Unless otherwise specified)

Parameter			Symbol	Value	Unit
Drain−to−Source Breakdown Voltage			$V_{(BR)DSS}$	60	V
Gate−to−Source Voltage			V_{GS}	±20	V
Continuous Drain Current $R_{\theta JC}$ (Note 2)	Steady State	T_C = 25°C	I_D	199	A
Power Dissipation $R_{\theta JC}$ (Note 2)			P_D	166	W
Continuous Drain Current $R_{\theta JA}$ (Note 1, 2)	Steady State	T_A = 25°C	I_D	30	A
Power Dissipation $R_{\theta JA}$ (Note 1, 2)			P_D	3.8	W
Pulsed Drain Current	T_A = 25°C, t_p = 100 μs		I_{DM}	820	A
Operating Junction and Storage Temperature Range			T_J, T_{stg}	−55 to +175	°C
Source Current (Body Diode)			I_S	138	A
Single Pulse Drain−to−Source Avalanche Energy (I_{AV} = 43 A)			E_{AS}	277	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. Surface−mounted on FR4 board using 1 in^2 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.

MARKING DIAGRAM



1D9N06 = Specific Device Code
A = Assembly Plant Code
YWW = Date Code (Year & Week)
ZZ = Lot Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

THERMAL CHARACTERISTICS

Symbol	Parameter	Max	Unit
$R_{\theta JC}$	Junction−to−Case − Steady State (Note 2)	0.9	°C/W
$R_{\theta JT}$	Junction−to−Top Source − Steady State (Note 2)	1.4	
$R_{\theta JA}$	Junction−to−Ambient − Steady State (Note 2)	39	

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 μA		60			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}$ / T_J				38		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 60 V	T_J = 25°C			10	μA
			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		1.2		2.0	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}$ / T_J	I_D = 250 μA, ref to 25°C			−5.6		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 50 A			1.4	1.9	mΩ
		V_{GS} = 4.5 V, I_D = 40 A			1.9	2.6	
Forward Trans−conductance	g_{FS}	V_{DS} = 15V, I_D = 50A			357		S
Gate−Resistance	R_G	V_{GS} = 0 V, f = 1 MHz			1.4	2.6	Ω
CHARGES & CAPACITANCES							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 30 V			4910		pF
Output Capacitance	C_{OSS}				862		
Reverse Transfer Capacitance	C_{RSS}				12		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 10 V, V_{DS} = 30 V, I_D = 50 A			64		nC
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 4.5 V, V_{DS} = 30 V, I_D =50 A			29		
Threshold Gate Charge	$Q_{G(TH)}$				7.2		
Gate−to−Source Charge	Q_{GS}				13.2		nC
Gate−to−Drain Charge	Q_{GD}				5.7		
Output Charge	Q_{OSS}	V_{DD} = 30 V, V_{GS} = 0 V			92		nC
SWITCHING CHARACTERISTICS (Note 3)							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = 4.5 V, V_{DS} = 30 V, I_D = 50 A, R_G = 2.5 Ω			25.4		ns
Rise Time	t_r				16.2		
Turn−Off Delay Time	$t_{d(OFF)}$				30.3		
Fall Time	t_f				10.1		
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 50 A	T_J = 25°C		0.80	1.2	V
			T_J = 150°C		0.63		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dI_S/dt = 100 A/μs, I_S = 50 A			56		ns
Reverse Recovery Charge	Q_{RR}				67		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. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

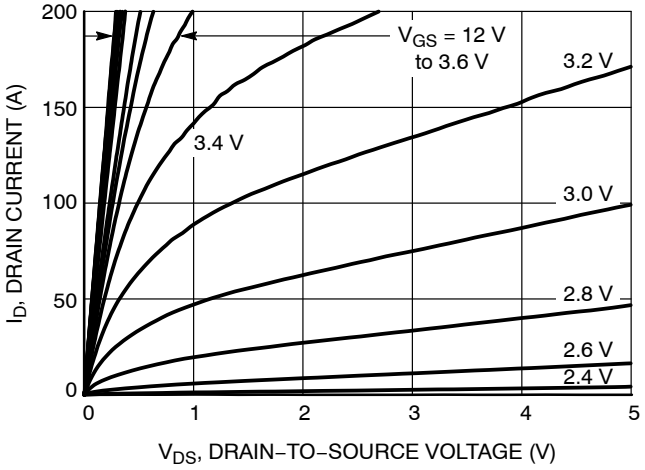


Figure 1. On−Region Characteristics

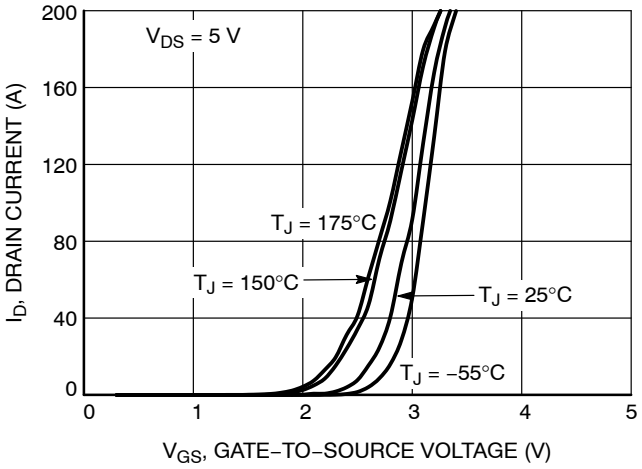


Figure 2. Transfer Characteristics

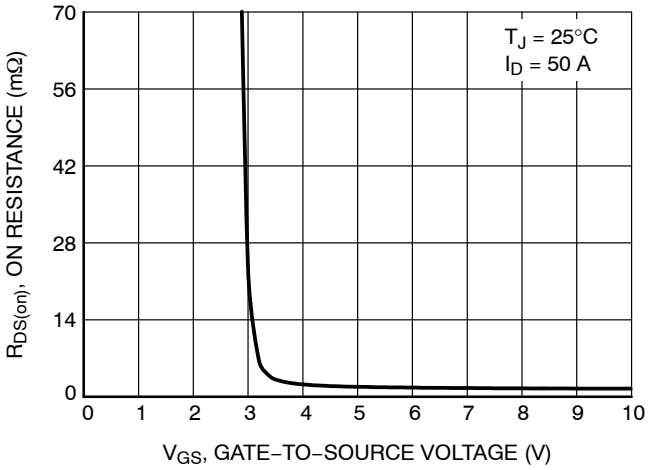


Figure 3. On−Resistance vs. Gate−to−Source Voltage

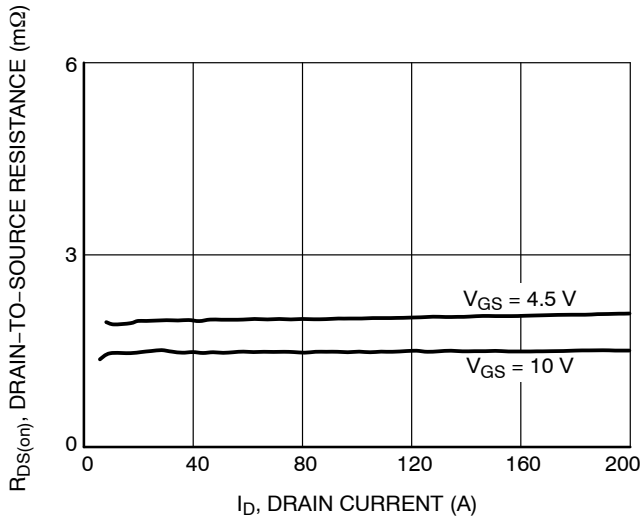


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

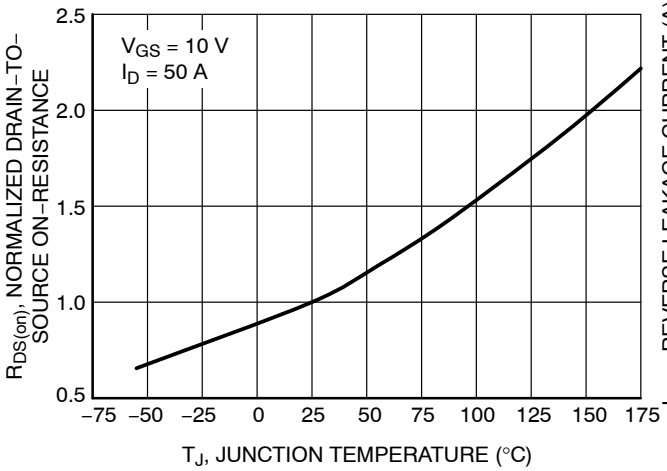


Figure 5. On−Resistance Variation with Temperature

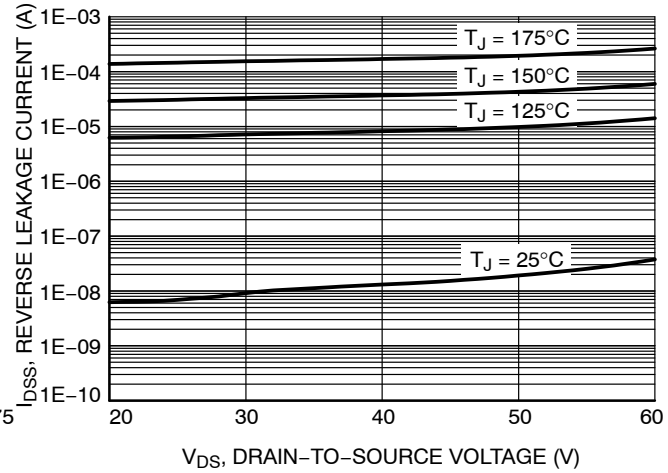


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

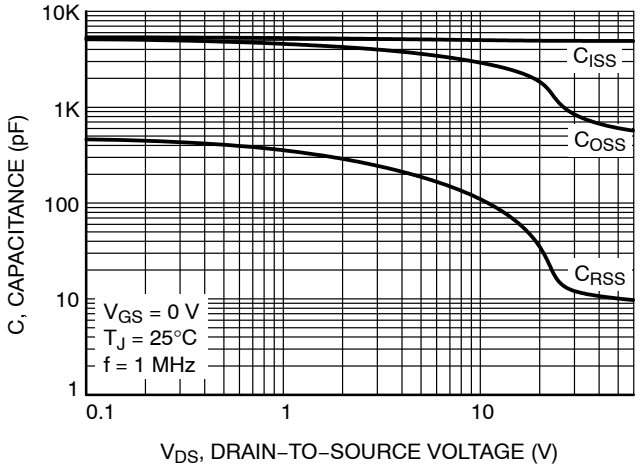


Figure 7. Capacitance Variation

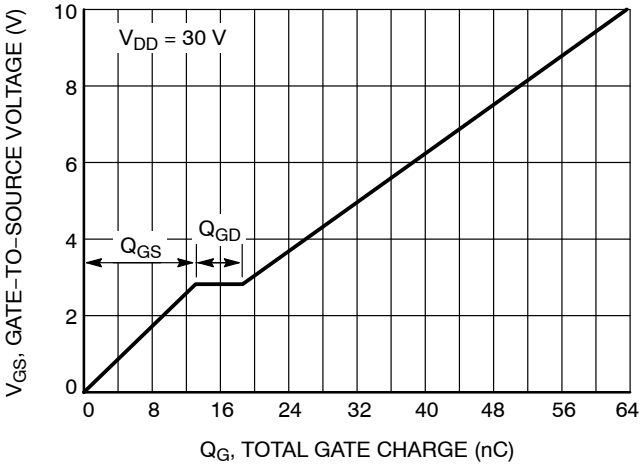


Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

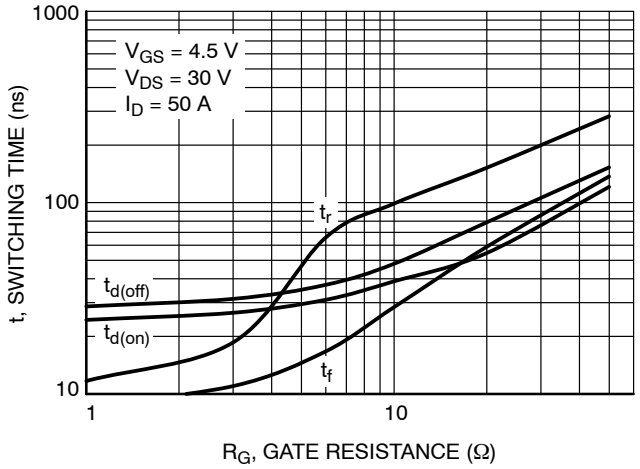


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

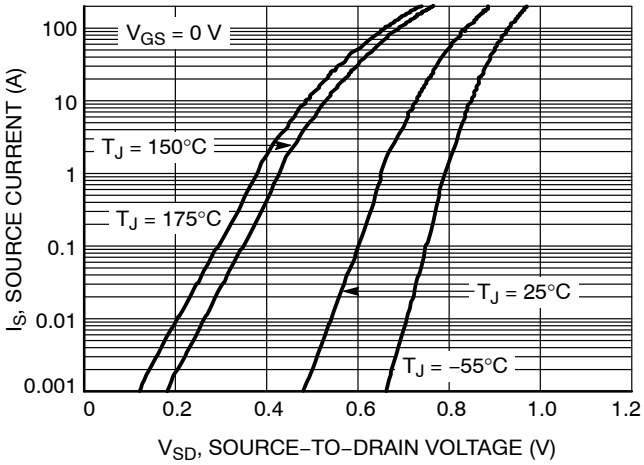


Figure 10. Diode Forward Voltage vs. Current

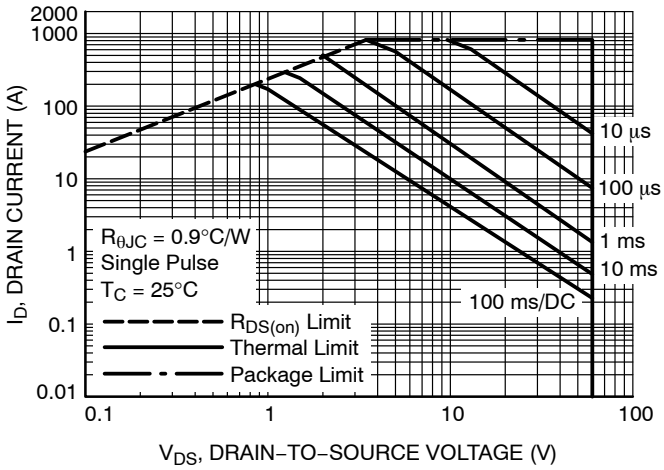


Figure 11. Forward Bias Safe Operating Area

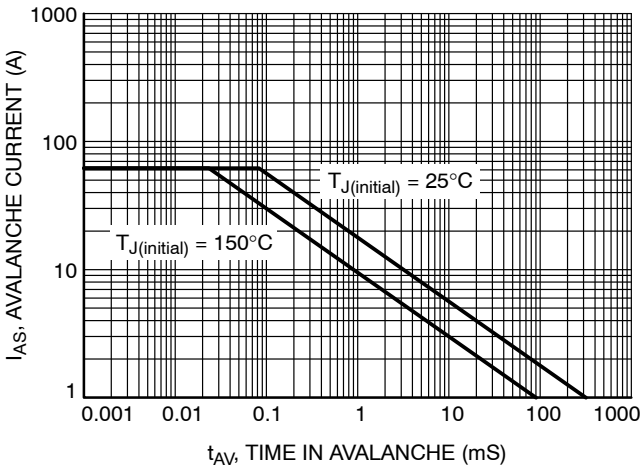


Figure 12. Unclamped Inductive Switching Capability

TYPICAL CHARACTERISTICS

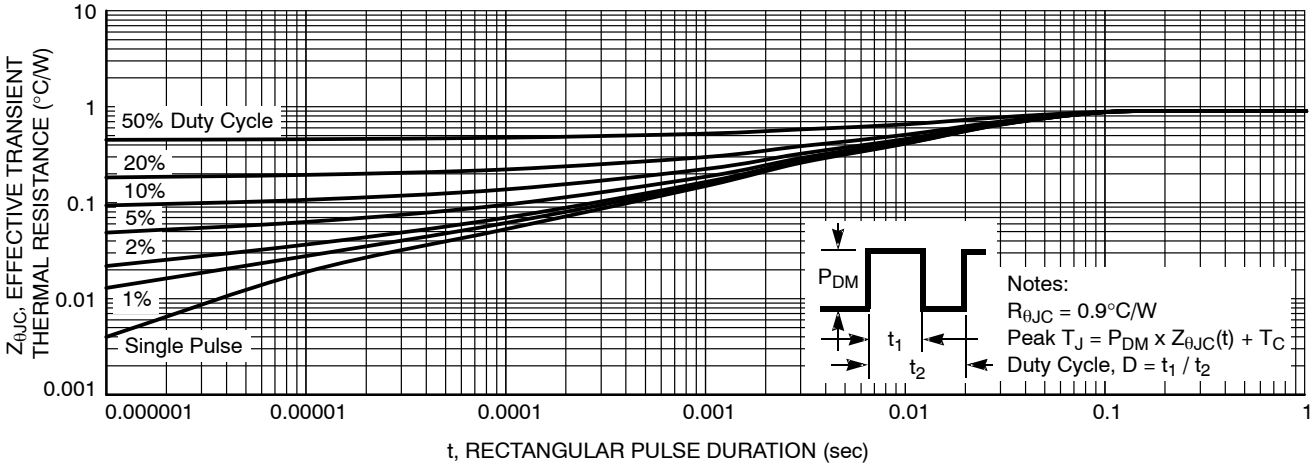


Figure 13. Transient Thermal Impedance

ORDERING INFORMATION

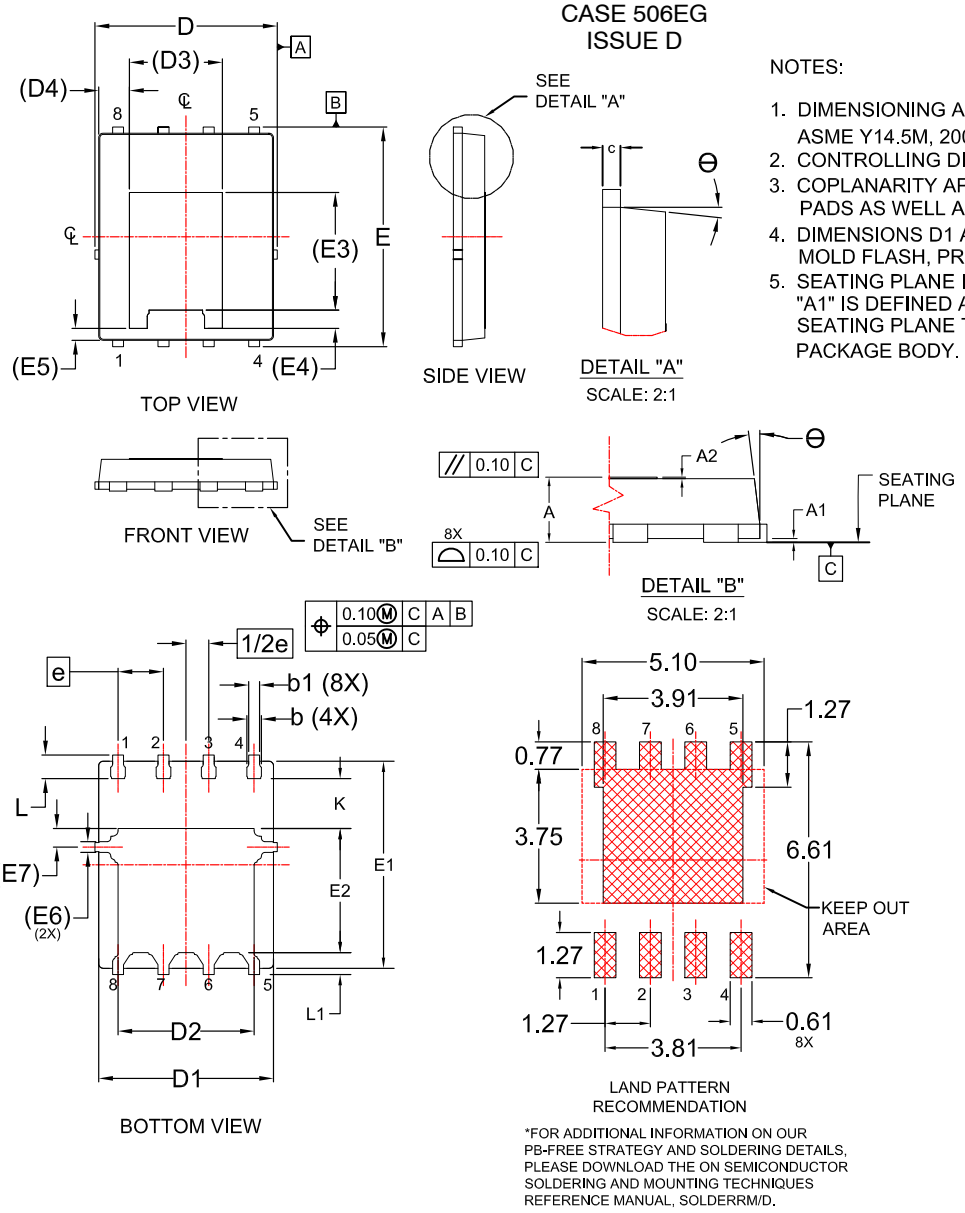
Device	Device Marking	Package	Shipping†
NTMFSC1D9N06HL	1D9N06	DFN8 (Pb−Free/Halogen Free)	3000 / Tape & Reel

†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.

NTMFSC1D9N06HL

PACKAGE DIMENSIONS

DFN8 5x6.15, 1.27P, DUAL COOL
CASE 506EG
ISSUE D



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.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.85	0.90	0.95
A1	-	-	0.05
A2	-	-	0.05
b	0.31	0.41	0.51
b1	0.21	0.31	0.41
c	0.20	0.25	0.30
D	4.90	5.00	5.10
D1	4.80	4.90	5.00
D2	3.67	3.82	3.97
D3	2.60 REF		
D4	0.86 REF		
E	6.05	6.15	6.25
E1	5.70	5.80	5.90
E2	3.38	3.48	3.58
E3	3.30 REF		
E4	0.50 REF		
E5	0.34 REF		
E6	0.30 REF		
E7	0.52 REF		
e	1.27 BSC		
1/2e	0.635 BSC		
K	1.30	1.40	1.50
L	0.56	0.66	0.76
L1	0.52	0.62	0.72
Θ	0°	---	12°

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

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