

Enhancement Mode Gallium Nitride (GaN) HEMT

700 V, 132 mΩ, 12 A, PTFP-N9 (DFN)

Preliminary Document NTMT170N70GN1

Features

- Low $R_{DS(ON)}$ to Minimize Conduction Losses
- Ultra Low Gate Charge for High Speed Switching
- $FOM-Q_G = 280 \text{ nC} \cdot \text{mW}$
- Small Footprint for High Density PCB Design
- This Device is Halide Free and RoHS Compliant with Exemption 7a, Pb-Free 2LI (on second level interconnection)

Typical Applications

- High Density Power Modules
- High Frequency AC-DC and DC-DC Converters
- High Performance PSU for Consumer and Industrial
- Resonant Conversion

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

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DSS}	700	V
Drain-to-Source Transient Voltage, $t_p < 200 \mu\text{s}$	$V_{DS(TRAN)}$	800	V
Pulsed Drain-to-Source Voltage, $T_J = 25^\circ\text{C}$ ($t_{TOTAL} < 10 \text{ h}$) / $T_J = 125^\circ\text{C}$ ($t_{TOTAL} < 1 \text{ h}$)	$V_{DS(PULSE)}$	750	V
Gate-to-Source Voltage	V_{GS}	-6 to 7	V
Gate-to-Source Transient Voltage, $t_p = 50 \text{ ns}$, $f_p = 100 \text{ kHz}$, Open Drain	$V_{GS(PULSE)}$	-20 to 10	V
Continuous Drain Current, $T_{CASE} = 25^\circ\text{C}$	I_{DS}	12	A
Pulsed Drain Current, $t_p < 10 \mu\text{s}$, $T_C = 25^\circ\text{C}$ / $T_C = 125^\circ\text{C}$	$I_{DS(PULSE)}$	24 / 13	A
Power Dissipation, $V_{GS} = 6 \text{ V}$, $T_{CASE} = 25^\circ\text{C}$	P_{TOT}	69	W
Operating Junction Temperature	T_J	-55 to 150	$^\circ\text{C}$
Storage Temperature	T_{STG}	-55 to 150	$^\circ\text{C}$

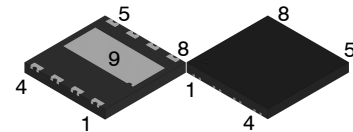
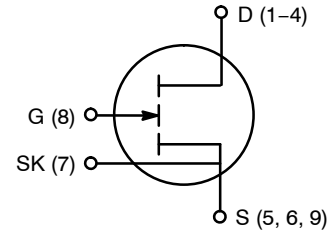
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Junction-to-Case	$R_{\theta JC}$	1.81	$^\circ\text{C/W}$
Junction-to-Ambient (Note 1)	$R_{\theta JA}$	67.3	$^\circ\text{C/W}$
Maximum Soldering Temperature (MSL3)	T_{SLD}	260	$^\circ\text{C}$

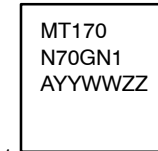
1. Device on 1 in², 2 oz copper pad on single layer FR-4 PCB.

$V_{(BR)DSS}$	$R_{DS(ON)}$ TYP	I_{DS} MAX
700 V	132 mΩ	12 A



PTFO-N9 8.00 x 8.00 x 0.90, 2.00P (DFN) CASE 522AG

MARKING DIAGRAM



1
MT170N70GN1 = Specific Device Code
A = Assembly Location
YY = Year
WW = Work Week
ZZ = Assembly Lot

ORDERING INFORMATION

Device	Package	Shipping [†]
NTMT170N70GN1TXG	PTFO-N9 (DFN)	2500 / Tape & Reel

[†] For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, [BRD8011/D](#).

This Preliminary document is for informational purposes only. onsemi may update or withdraw it without notice. Content and referenced products are under development and subject to change.

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

Parameter	Test Conditions	Symbols	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	V _{GS} = 0 V	V _{(BR)DSS}	700			V
Drain-to-Source Leakage Current	V _{GS} = 0 V, V _{DS} = 700 V	I _{DSS}		0.5	28	μA
	V _{GS} = 0 V, V _{DS} = 700 V, T _J = 125 °C			5.3		
Gate-to-Source Leakage Current	V _{GS} = 6 V, V _{DS} = 0 V	I _{GSS}		26		μA

ON CHARACTERISTICS

Drain-to-Source On Resistance	V _{GS} = 6 V, I _{DS} = 0.5 A	R _{DS(ON)}		132	170	mΩ
	V _{GS} = 6 V, I _{DS} = 4 A			132		
	V _{GS} = 6 V, I _{DS} = 4 A, T _J = 125 °C			254		
Gate Threshold Voltage	V _{DS} = V _{GS} , I _{DS} = 10.7 mA, T _J = 25 °C	V _{GS(TH)}	1.2	1.6	2.5	V
	V _{DS} = V _{GS} , I _{DS} = 10.7 mA, T _J = 125 °C			1.5		

DYNAMIC CHARACTERISTICS

Input Capacitance	V _{DS} = 400 V, V _{GS} = 0 V, f = 100 kHz	C _{ISS}		78		pF	
Output Capacitance		C _{OSS}		27			
Reverse Transfer Capacitance		C _{RSS}		0.3			
Output Capacitance, Energy Related	V _{DS} = 0 V to 400 V, V _{GS} = 0 V	C _{OSS(ER)}		38.6		pF	
Output Capacitance, Time Related		C _{OSS(TR)}		51.1			
Output Charge		Q _{OSS}		20.4			nC
Output Capacitance Stored Energy		E _{OSS}		3.1			μJ
Gate Resistance		f = 5 MHz	R _G		11		
Gate Charge	V _{DS} = 400 V, I _{DS} = 4 A, V _{GS} = 0/6 V	Q _G		2.1		nC	
Gate-to-Source Charge		Q _{GS}		0.2			
Gate-to-Drain Charge		Q _{GD}		0.8			
Gate Plateau Voltage		V _{PLAT}		2.1			V

REVERSE CONDUCTION CHARACTERISTICS

Source-to-Drain Reverse Voltage	V _{GS} = 0 V, I _{SD} = 4 A	V _{SD}		2.4		V
Pulsed Reverse Current	V _{GS} = 6 V, t _{PULSE} = 10 μs	I _{SD(PULSE)}			24	A

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.

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TYPICAL CHARACTERISTICS ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)

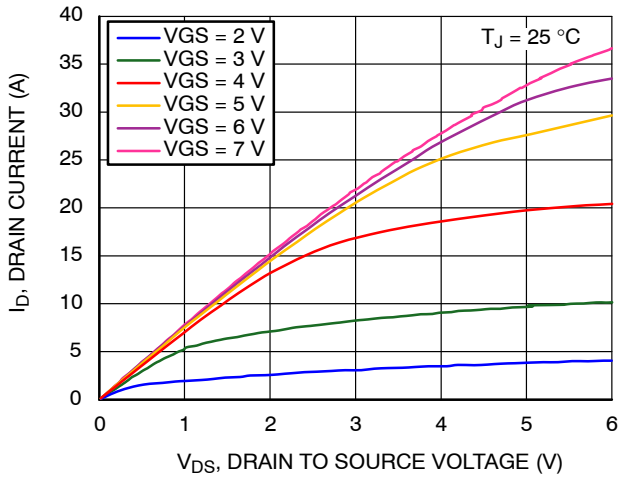


Figure 1. Output Characteristics at $T_J = 25\text{ }^\circ\text{C}$

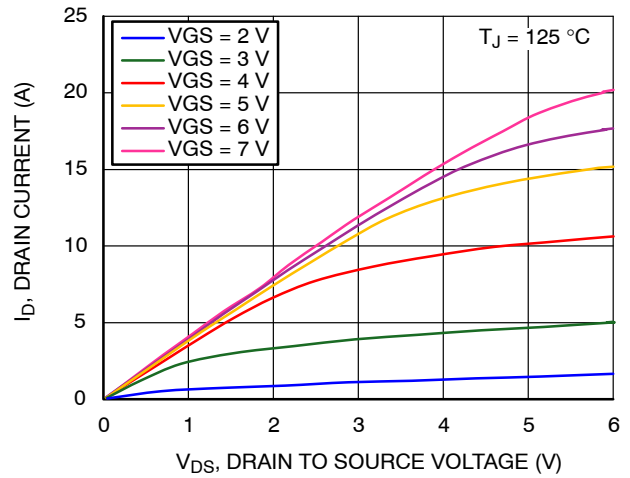


Figure 2. Output Characteristics at $T_J = 125\text{ }^\circ\text{C}$

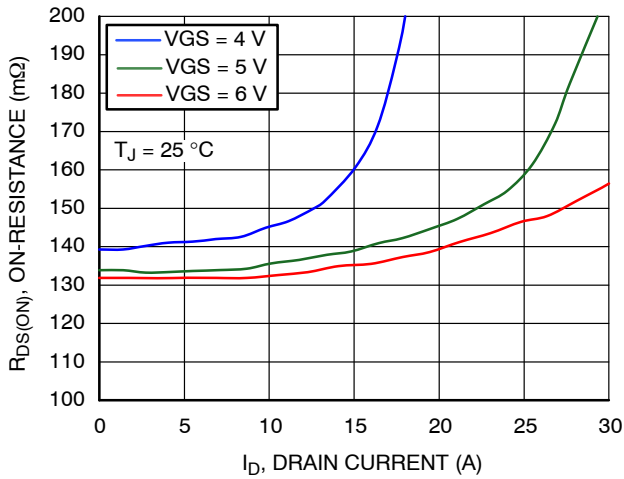


Figure 3. On-Resistance vs. Drain Current at $T_J = 25\text{ }^\circ\text{C}$

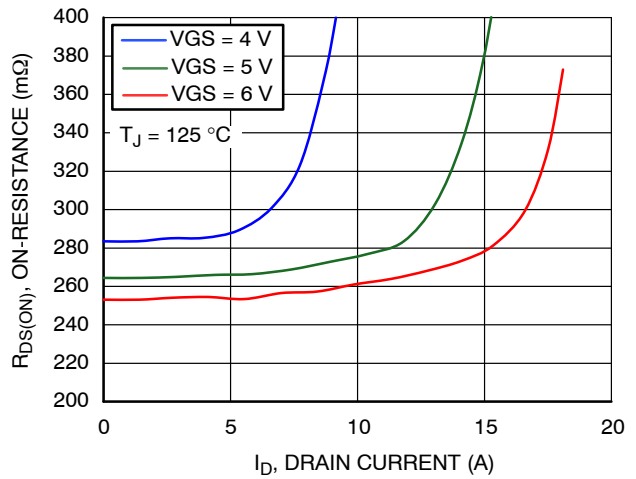


Figure 4. On-Resistance vs. Drain Current at $T_J = 125\text{ }^\circ\text{C}$

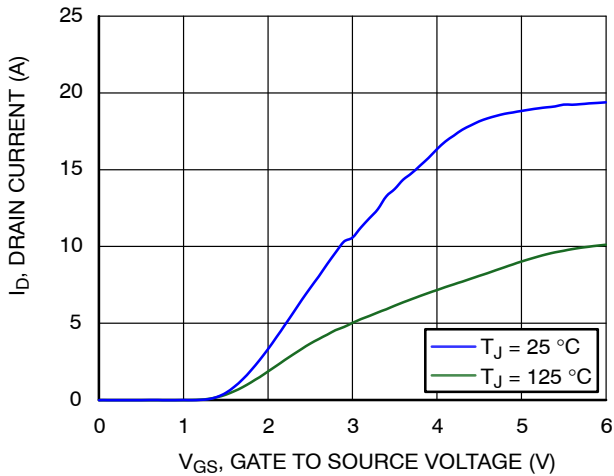


Figure 5. Transfer Characteristics at $V_{DS} = 3\text{ V}$

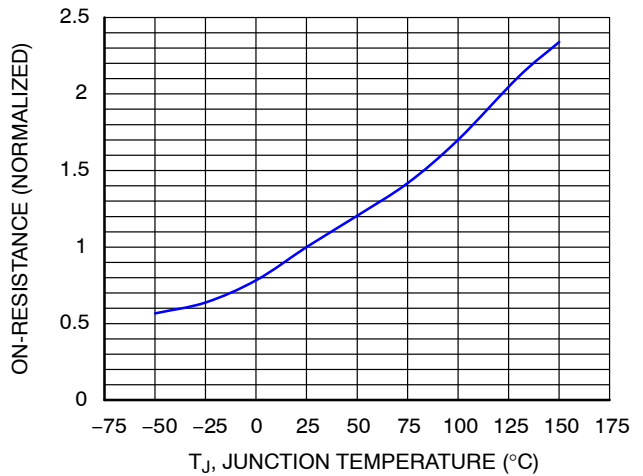


Figure 6. Normalized On-Resistance vs. Temperature at $V_{GS} = 6\text{ V}$

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TYPICAL CHARACTERISTICS ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified) (continued)

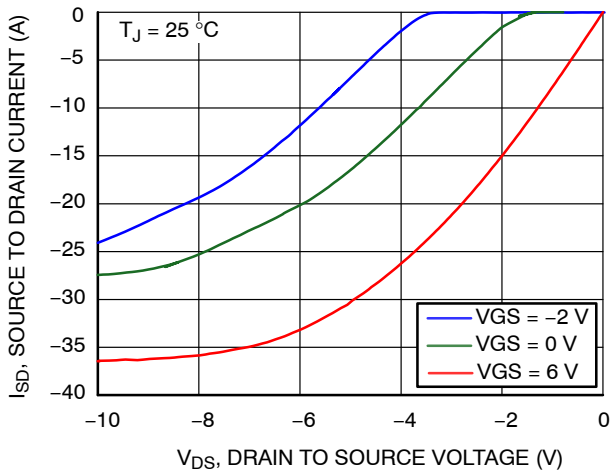


Figure 7. Reverse Conduction Characteristics at $T_J = 25\text{ }^\circ\text{C}$

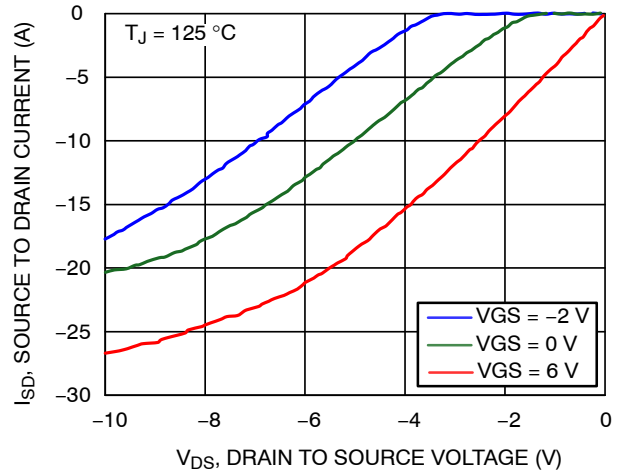


Figure 8. Reverse Conduction Characteristics at $T_J = 125\text{ }^\circ\text{C}$

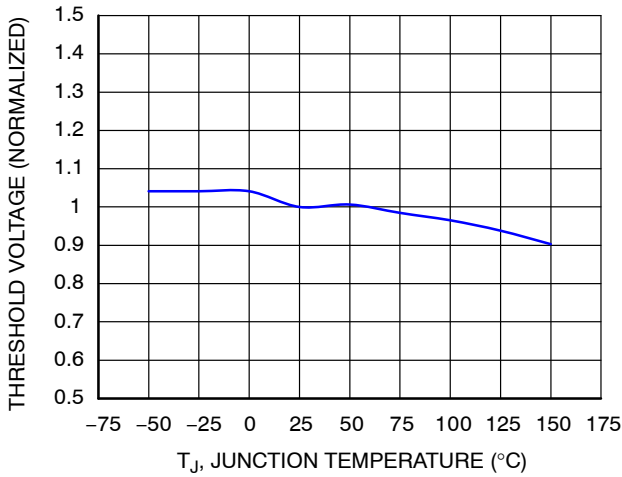


Figure 9. Normalized Threshold Voltage vs. Temperature

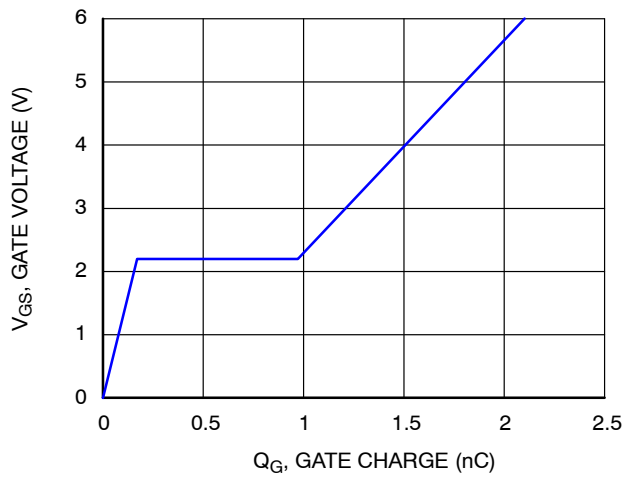


Figure 10. Gate Charge Characteristics at $I_{DS} = 20\text{ A}$

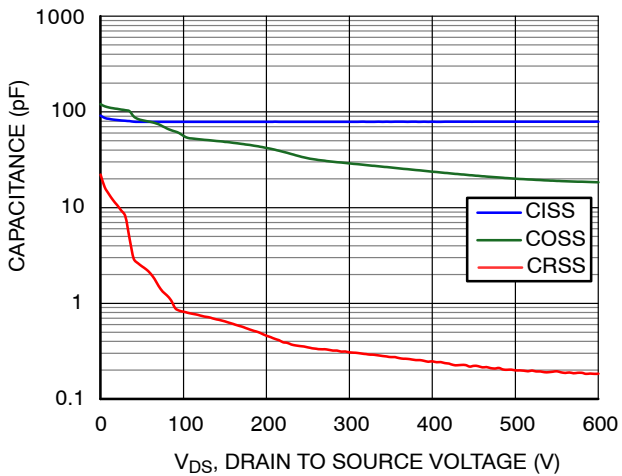


Figure 11. Capacitance Characteristics

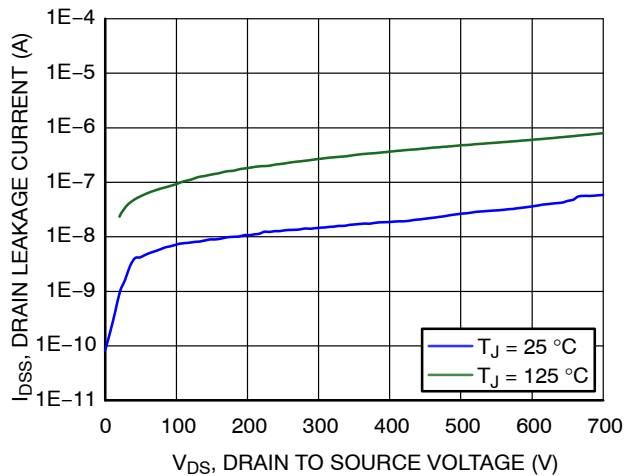


Figure 12. Drain Leakage Characteristics

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TYPICAL CHARACTERISTICS ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified) (continued)

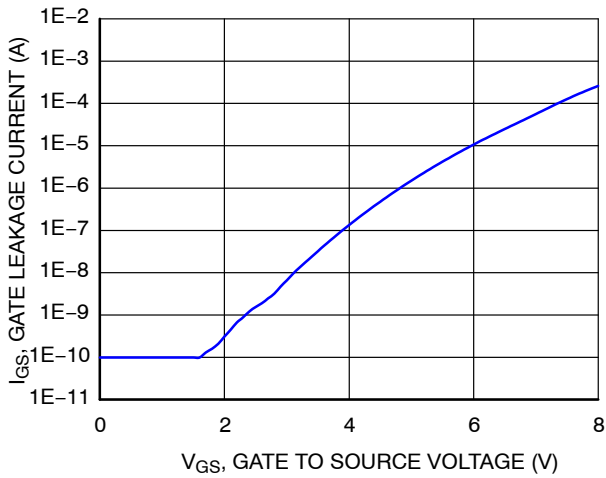


Figure 13. Gate Leakage Characteristics

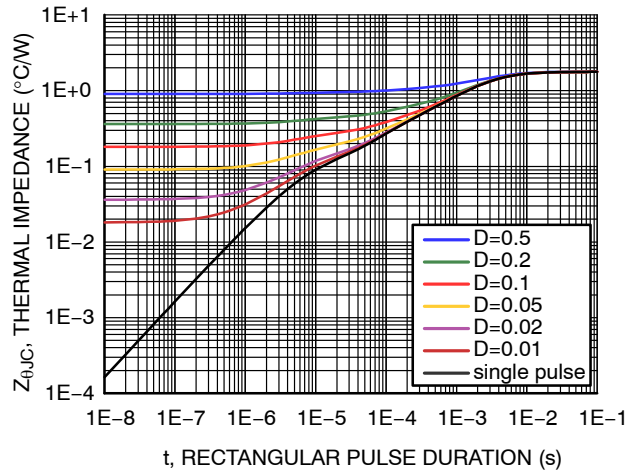


Figure 14. Transient Thermal Impedance

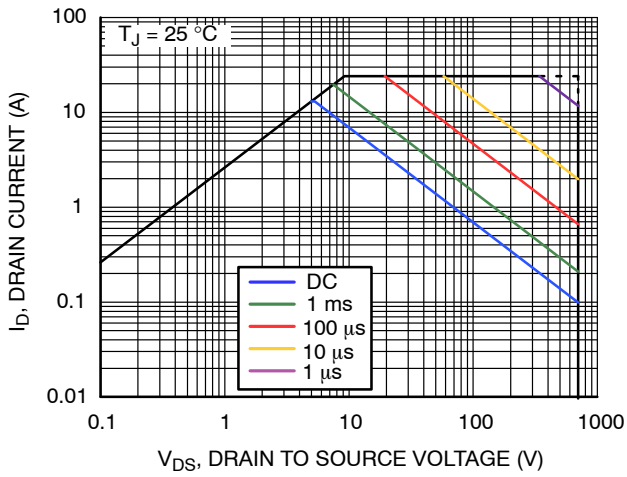


Figure 15. Safe Operating Area at $T_C = 25\text{ }^\circ\text{C}$

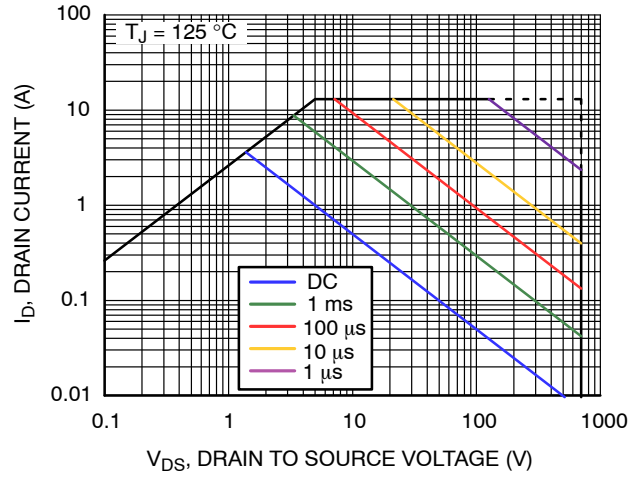


Figure 16. Safe Operating Area at $T_C = 125\text{ }^\circ\text{C}$

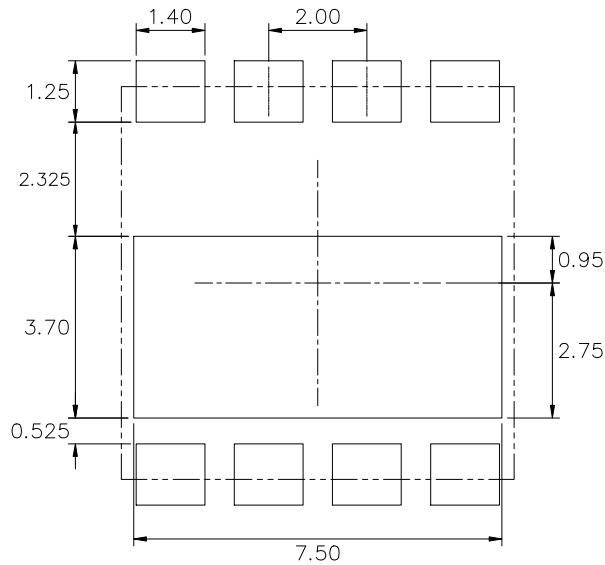
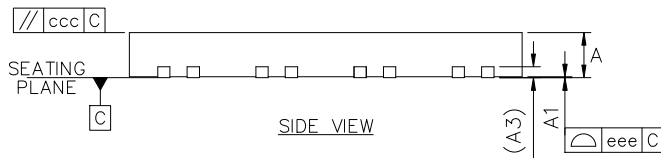
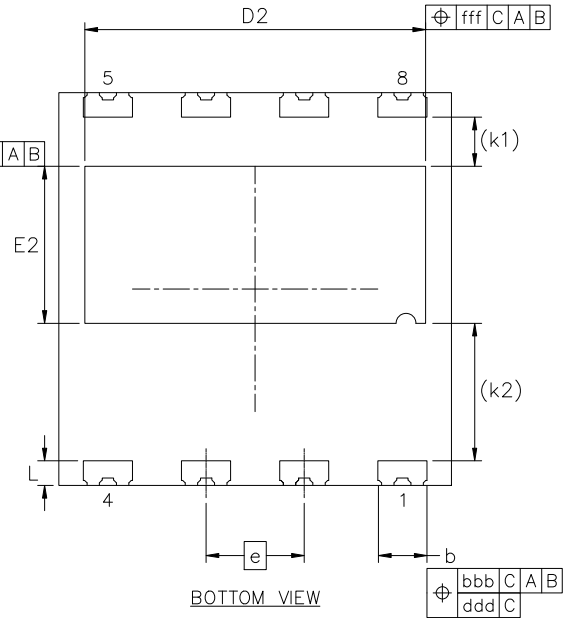
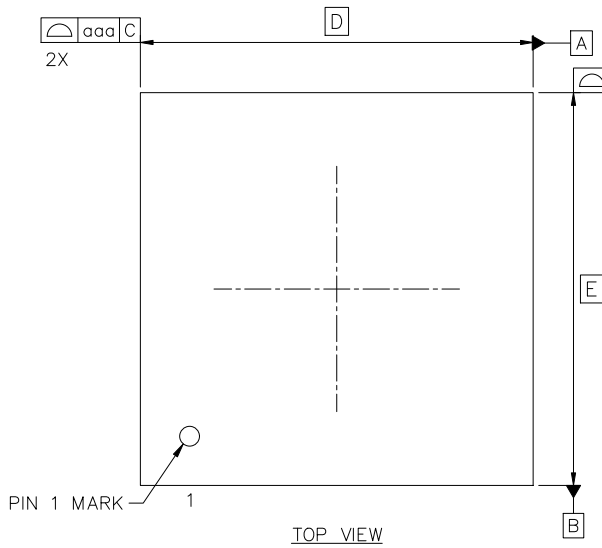
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REVISION HISTORY

Revision	Description of Changes	Date
P0	Initial Preliminary document release.	5/28/2026

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PTFP-N9 8.00x8.00x0.90, 2.00P
CASE 522AG
ISSUE O



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

NOTES:

1. ALL DIMENSION AND TOLERANCE CONFORM TO ASME Y14.5-2018.
2. ALL DIMENSION ARE IN MILLIMETERS
3. DRAWING NOT TO SCALE.
4. DIMENSION DO NOT INCLUDE MOLD PROTRUSION.
5. PACKAGE OUTLINE EXCLUSIVE OF METAL BURR DIMENSIONS.

MILLIMETER			
SYMBOL	MIN.	NOM.	MAX.
A	0.80	0.90	1.00
A1	0.00	0.02	0.05
A3	0.203 REF.		
b	0.95	1.00	1.05
D	8.00 BSC		
D2	6.84	6.94	7.04
E	8.00 BSC		
E2	3.10	3.20	3.30
e	2.00 BSC		
k1	1.00 REF.		
k2	2.80 REF.		
L	0.40	0.50	0.60
TOLERANCE FORM & POSITION			
aaa	0.10		
bbb	0.10		
ccc	0.10		
ddd	0.05		
eee	0.10		
fff	0.10		

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