

MOSFET – Power, Single N-Channel, STD Gate, DUAL COOL[®] DFN8 5x6 80 V, 1.9 mΩ, 201 A

NTMFSC1D9N08X

Features

- Advanced Dual-Sided Cooled Packaging
- Low QRR, Soft Recovery Body Diode
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low QG and Capacitance to Minimize Driver Losses
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Synchronous Rectification (SR) in DC-DC and AC-DC
- Primary Switch in Isolated DC-DC Converter
- Motor Drives

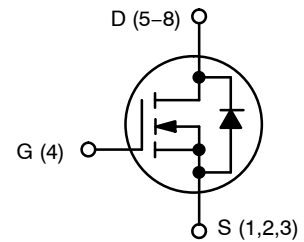
MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise stated)

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DS}	80	V
Gate-to-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current (Note 1)	I_D	$T_C = 25^\circ\text{C}$	A
		$T_C = 100^\circ\text{C}$	
Power Dissipation (Note 1)	P_D	$T_C = 25^\circ\text{C}$	W
Pulsed Drain Current	I_{DM}	$T_C = 25^\circ\text{C}, t_p = 100 \mu\text{s}$	A
Pulsed Source Current (Body Diode)			
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to $+175$	$^\circ\text{C}$
Source Current (Body Diode)	I_S	248	A
Single Pulse Avalanche Energy	E_{AS}	$I_{PK} = 58 \text{ A}$ (Note 3)	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	T_L	260	$^\circ\text{C}$

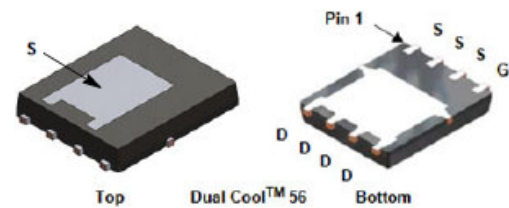
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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. Actual continuous current will be limited by thermal and electromechanical application board design.
3. E_{AS} of 168 mJ is based on started $T_J = 25^\circ\text{C}$, $I_{AS} = 58 \text{ A}$, $V_{DD} = 64 \text{ V}$, $V_{GS} = 10 \text{ V}$, 100% avalanche tested.

$V_{(BR)DS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$
80 V	1.9 mΩ @ 10 V	201 A

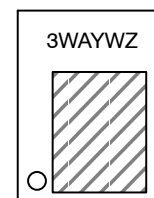


N-CHANNEL MOSFET



DFN8 5x6.15
CASE 506EG

MARKING DIAGRAM



- 3W = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
Z = Assembly Lot Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

NTMFSC1D9N08X

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Bottom)	$R_{\theta JC}$	0.91	°C/W
Thermal Resistance, Junction-to-Case (Top)	$R_{\theta JC}$	1.4	
Thermal Resistance, Junction-to-Ambient (Notes 4 and 5)	$R_{\theta JA}$	39	

4. Surface-mounted on FR4 board using 1 sq-in pad, 1 oz Cu.
5. $R_{\theta JA}$ is determined by the user's board design.

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
-----------	--------	----------------	-----	-----	-----	------

OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	80			V
Drain-to-Source Breakdown Voltage (transient)	$\Delta V_{(BR)DSS} / \Delta T_J$	$I_D = 1\text{ mA}$, Referenced to 25°C		31.6		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 80\text{ V}, T_J = 25^\circ\text{C}$			10	μA
		$V_{DS} = 80\text{ V}, T_J = 125^\circ\text{C}$			250	
Gate-to-Source Leakage Current	I_{GSS}	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$			100	nA

ON CHARACTERISTICS

Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 50\text{ A}$		1.7	1.9	m Ω
		$V_{GS} = 6\text{ V}, I_D = 25\text{ A}$		2.5	3.8	
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 252\text{ }\mu\text{A}$	2.4		3.6	V
Negative Threshold Temperature Coefficient	$\Delta V_{GS(TH)} / \Delta T_J$	$V_{GS} = V_{DS}, I_D = 252\text{ }\mu\text{A}$		-7.5		mV/°C
Forward Transconductance	g_{FS}	$V_{DS} = 5\text{ V}, I_D = 50\text{ A}$		158		S

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		4470		pF
Output Capacitance	C_{OSS}			1290		
Reverse Transfer Capacitance	C_{RSS}			20		
Output Charge	Q_{OSS}			93		
Total Gate Charge	$Q_{G(TOT)}$	$V_{DD} = 40\text{ V}, I_D = 50\text{ A}, V_{GS} = 6\text{ V}$		39		nC
Threshold Gate Charge	$Q_{G(TH)}$	$V_{DD} = 40\text{ V}, I_D = 50\text{ A}, V_{GS} = 10\text{ V}$		63		nC
Gate-to-Source Charge	Q_{GS}			14		
Gate-to-Drain Charge	Q_{GD}			21		
Gate Plateau Voltage	V_{GP}			10		
Gate Resistance	R_G			4.7		
		$f = 1\text{ MHz}$		0.8		Ω

SWITCHING CHARACTERISTICS

Turn-On Delay Time	$t_{d(ON)}$	Resistive Load, $V_{GS} = 0/10\text{ V}$, $V_{DD} = 40\text{ V}, I_D = 50\text{ A}, R_G = 2.5\text{ }\Omega$		29		ns
Rise Time	t_r			9		
Turn-Off Delay Time	$t_{d(OFF)}$			42		
Fall Time	t_f			7		

NTMFSC1D9N08X

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
DRAIN-SOURCE DIODE CHARACTERISTICS						
Forward Diode Voltage	V_{SD}	$I_S = 50\text{ A}$, $V_{GS} = 0\text{ V}$, $T_J = 25^\circ\text{C}$		0.82	1.2	V
		$I_S = 50\text{ A}$, $V_{GS} = 0\text{ V}$, $T_J = 125^\circ\text{C}$		0.66		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}$, $I_S = 50\text{ A}$, $dI_S/dt = 1000\text{ A}/\mu\text{s}$, $V_{DD} = 40\text{ V}$		26		ns
Charge Time	t_a			15		
Discharge Time	t_b			11		
Reverse Recovery Charge	Q_{RR}			202		

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.

NTMFSC1D9N08X

TYPICAL CHARACTERISTICS

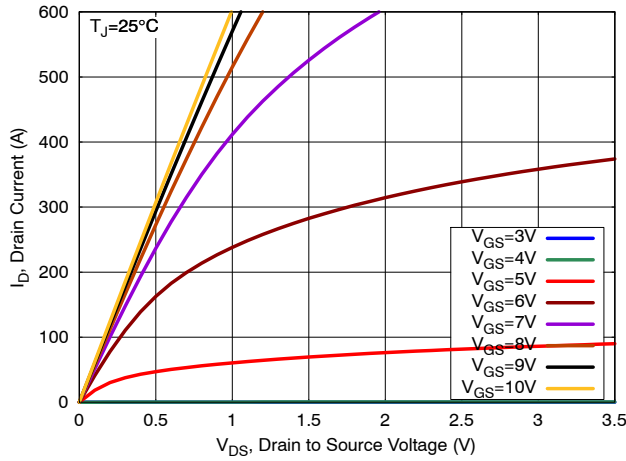


Figure 1. On-Region Characteristics

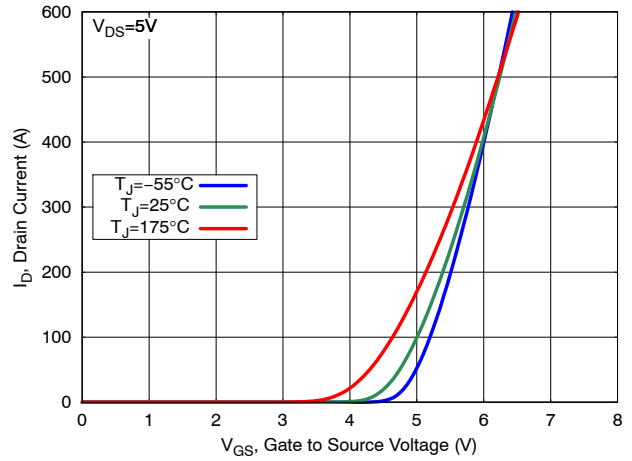


Figure 2. Transfer Characteristics

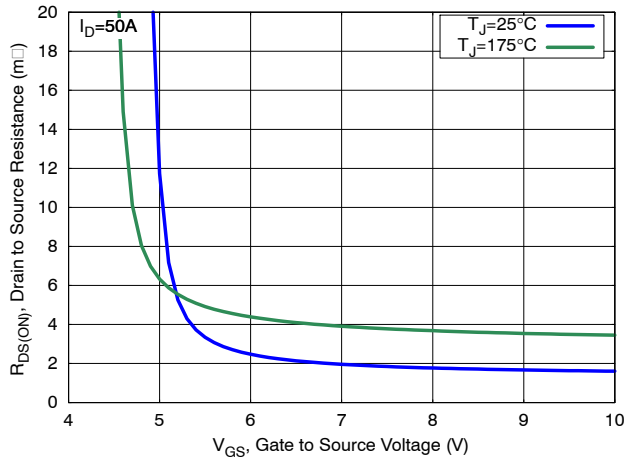


Figure 3. On-Resistance vs. Gate Voltage

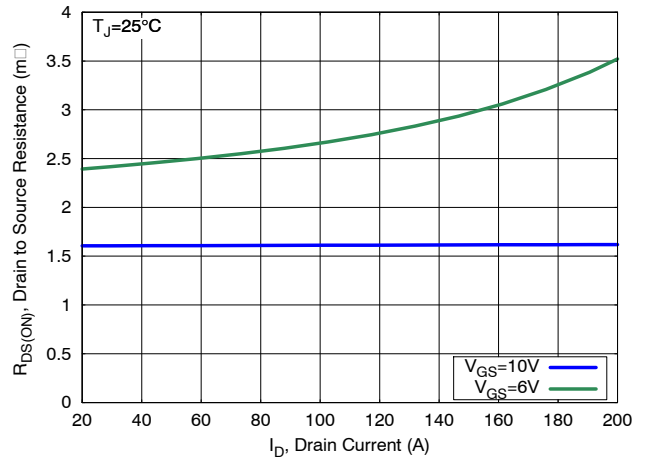


Figure 4. On-Resistance vs. Drain Current

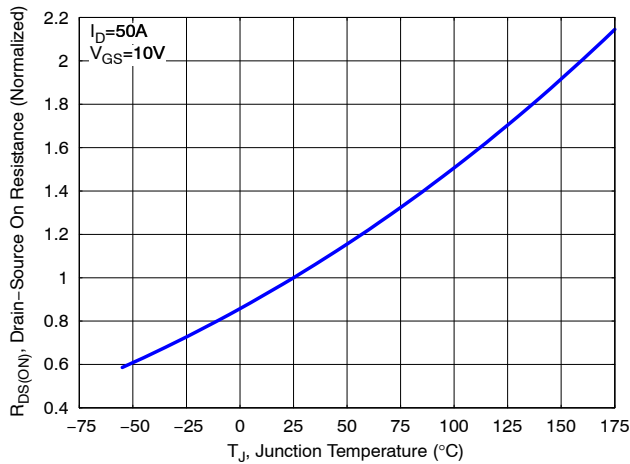


Figure 5. Normalized ON Resistance vs. Junction Temperature

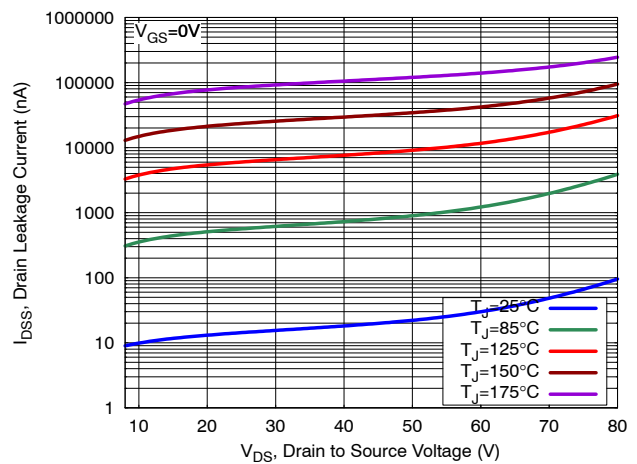


Figure 6. Drain Leakage Current vs. Drain Voltage

NTMFSC1D9N08X

TYPICAL CHARACTERISTICS

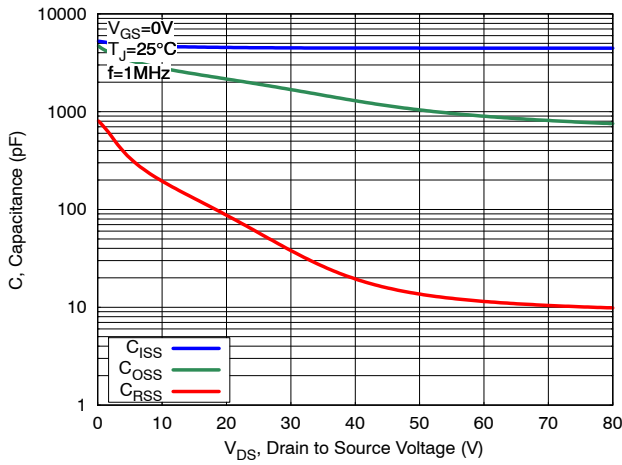


Figure 7. Capacitance Characteristics

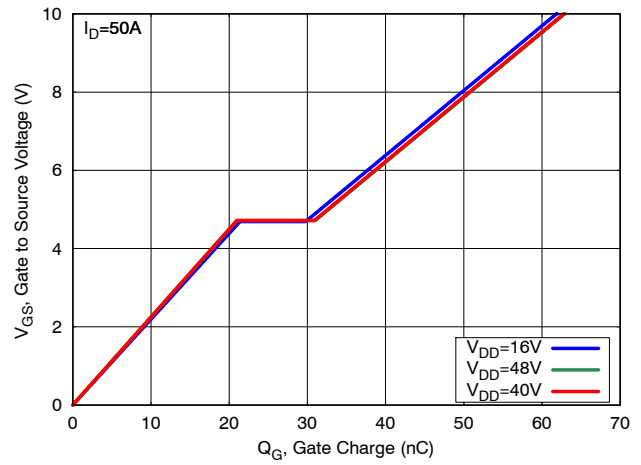


Figure 8. Gate Charge Characteristics

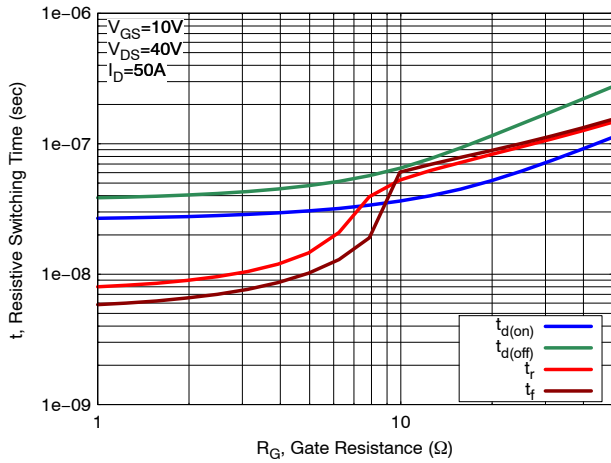


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

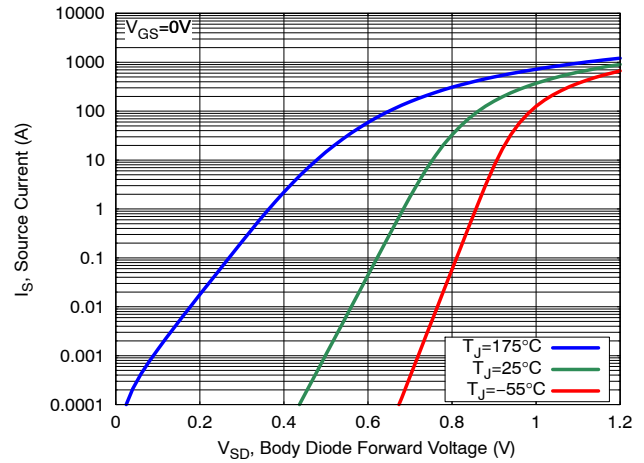


Figure 10. Diode Forward Characteristics

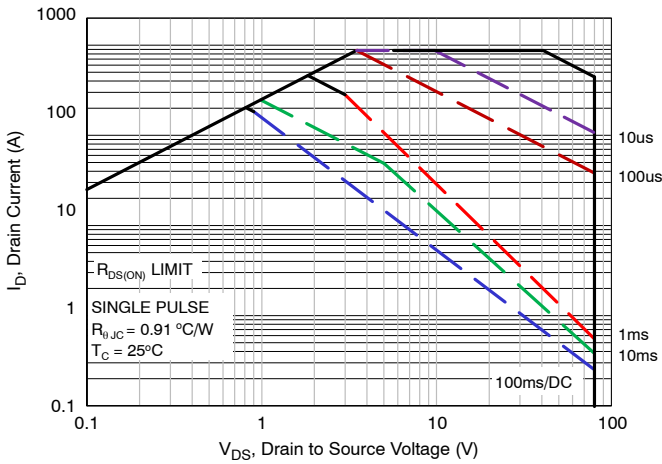


Figure 11. Safe Operating Area (SOA)

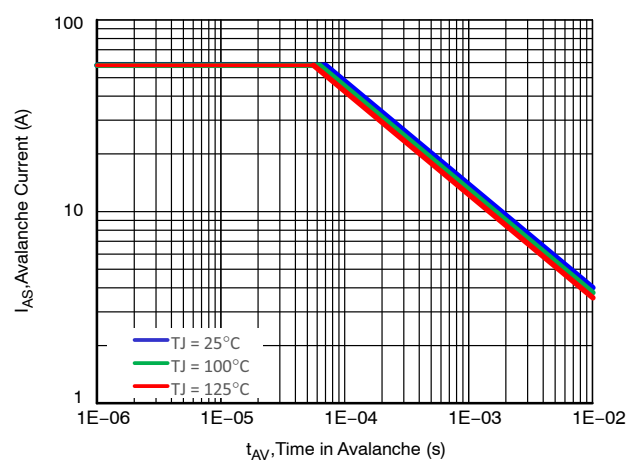


Figure 12. Avalanche Current vs Pulse Time (UIS)

NTMFSC1D9N08X

TYPICAL CHARACTERISTICS

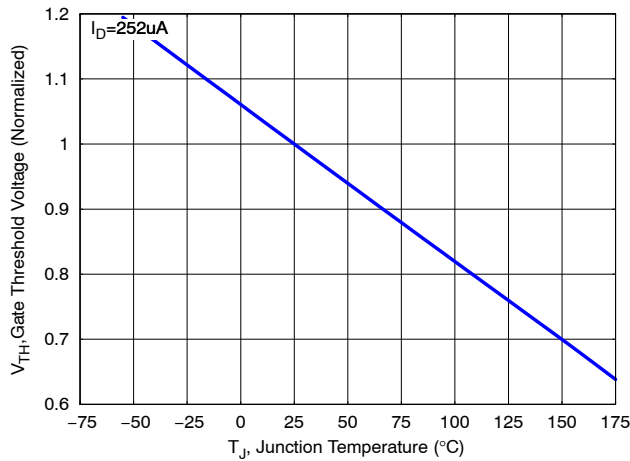


Figure 13. Gate Threshold Voltage vs Junction Temperature

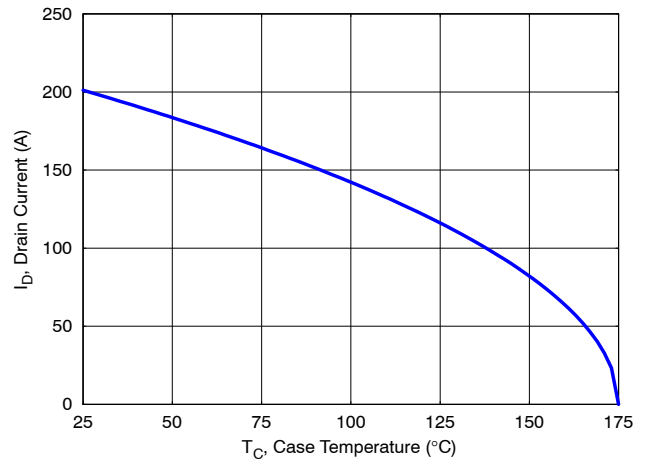


Figure 14. Maximum Current vs. Case Temperature

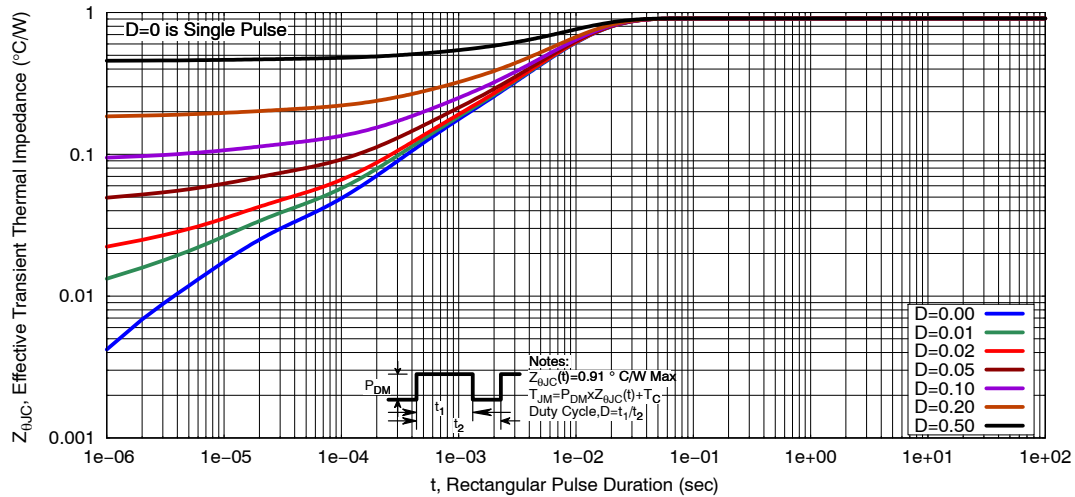


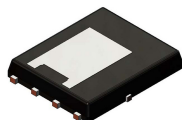
Figure 15. Transient Thermal Response

ORDERING INFORMATION

Device	Device Marking	Package	Shipping [†]
NTMFSC1D9N08XTWG	3W	DFN8 5x6 (Pb-Free/Halogen Free)	3000 / Tape & Reel

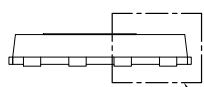
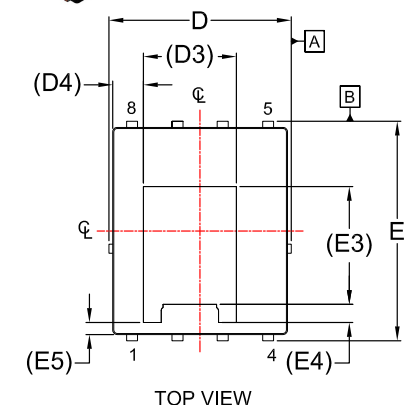
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).

DUAL COOL is a registered trademark of Semiconductor Components Industries, LLC dba "onsemi" or its affiliates and/or subsidiaries in the United States and/or other countries.



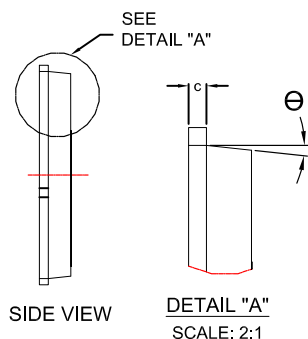
DFN8 5x6.15, 1.27P, DUAL COOL
CASE 506EG
ISSUE D

DATE 25 AUG 2020



FRONT VIEW

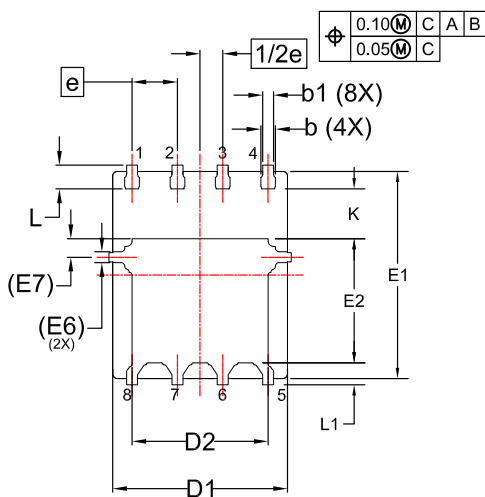
SEE
DETAIL "B"



NOTES:

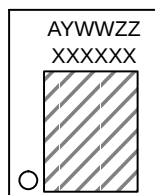
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
4. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
5. SEATING PLANE IS DEFINED BY THE TERMINALS. "A1" IS DEFINED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



BOTTOM VIEW

GENERIC MARKING DIAGRAM*



XXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
ZZ = Assembly Lot 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.

DOCUMENT NUMBER:	98AON84257G	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	DFN8 5x6.15, 1.27P, DUAL COOL	PAGE 1 OF 1

onsemi and **onsemi** are trademarks of Semiconductor Components Industries, LLC dba **onsemi** or its subsidiaries in the United States and/or other countries. **onsemi** reserves the right to make changes without further notice to any products herein. **onsemi** makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. **onsemi** does not convey any license under its patent rights nor the rights of others.

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at
www.onsemi.com/support/sales