

NTTFS4H05N

Power MOSFET

25 V, 94 A, Single N-Channel, μ 8-FL

Features

- Optimized Design to Minimize Conduction and Switching Losses
- Optimized Package to Minimize Parasitic Inductances
- Optimized material for improved thermal performance
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- High Performance DC-DC Converters
- System Voltage Rails
- Netcom, Telecom
- Servers & Point of Load

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

Parameter	Symbol	Value	Units
Drain-to-Source Voltage	V_{DS}	25	V
Gate-to-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current $R_{\theta JA}$ ($T_A = 25^\circ\text{C}$, Note 1)	I_D	22.4	A
Power Dissipation $R_{\theta JA}$ ($T_A = 25^\circ\text{C}$, Note 1)	P_D	2.66	W
Continuous Drain Current $R_{\theta JC}$ ($T_C = 25^\circ\text{C}$, Note 1)	I_D	94	A
Power Dissipation $R_{\theta JC}$ ($T_C = 25^\circ\text{C}$, Note 1)	P_D	46.3	W
Pulsed Drain Current ($t_p = 10 \mu\text{s}$)	I_{DM}	304	A
Single Pulse Drain-to-Source Avalanche Energy (Note 1) ($I_L = 41 \text{ A}_{pk}$, $L = 0.1 \text{ mH}$) (Note 3)	E_{AS}	84	mJ
Drain to Source dV/dt	dV/dt	7	V/ns
Maximum Junction Temperature	$T_{J(max)}$	150	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-55 to 150	$^\circ\text{C}$
Lead Temperature Soldering Reflow (SMD Styles Only), Pb-Free Versions (Note 2)	T_{SLD}	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. Values based on copper area of 645 mm^2 (or 1 in^2) of 2 oz copper thickness and FR4 PCB substrate.
2. For more information, please refer to our Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.
3. This is the absolute maximum rating. Parts are 100% UIS tested at $T_J = 25^\circ\text{C}$, $V_{GS} = 10 \text{ V}$, $I_L = 27 \text{ A}$, $E_{AS} = 36 \text{ mJ}$.

THERMAL CHARACTERISTICS

Parameter	Symbol	Max	Units
Thermal Resistance, Junction-to-Ambient (Note 1 and 4)	$R_{\theta JA}$	47	$^\circ\text{C/W}$
Junction-to-Case (Note 1 and 4)	$R_{\theta JC}$	2.7	

4. Thermal Resistance $R_{\theta JA}$ and $R_{\theta JC}$ as defined in JESD51-3.



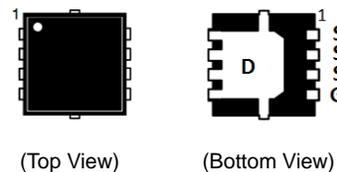
ON Semiconductor®

<http://onsemi.com>

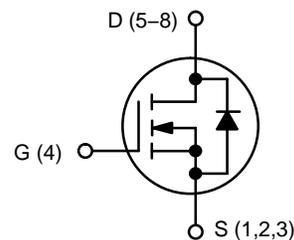
V_{GS}	MAX $R_{DS(on)}$	TYP Q_{GTOT}
4.5 V	4.8 $\text{m}\Omega$	8.7 nC
10 V	3.3 $\text{m}\Omega$	18.9 nC

PIN CONNECTIONS

μ 8-FL (3.3 x 3.3 mm)



N-CHANNEL MOSFET



ORDERING INFORMATION

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

NTTFS4H05N

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	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	25			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			15		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 20\text{ V}$	$T_J = 25^\circ\text{C}$		1.0	μA
			$T_J = 125^\circ\text{C}$		20	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = 20\text{ V}$			100	nA

ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	1.2		2.1	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			3.8		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 30\text{ A}$		2.5	3.3	m Ω
		$V_{GS} = 4.5\text{ V}, I_D = 30\text{ A}$		3.8	4.8	
Forward Transconductance	g_{FS}	$V_{DS} = 12\text{ V}, I_D = 15\text{ A}$		69		S

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 12\text{ V}$		1205		pF
Output Capacitance	C_{OSS}			835		
Reverse Transfer Capacitance	C_{RSS}			45		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 12\text{ V}; I_D = 30\text{ A}$		8.7		nC
Threshold Gate Charge	$Q_{G(TH)}$			2.7		
Gate-to-Source Charge	Q_{GS}			3.6		
Gate-to-Drain Charge	Q_{GD}			1.88		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DS} = 12\text{ V}; I_D = 30\text{ A}$		18.9		nC
Gate Resistance	R_G	$T_A = 25^\circ\text{C}$		1.0	2	Ω

SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 12\text{ V}, I_D = 15\text{ A}, R_G = 3.0\ \Omega$		8.9		ns
Rise Time	t_r			32		
Turn-Off Delay Time	$t_{d(OFF)}$			14.6		
Fall Time	t_f			3		

SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 10\text{ V}, V_{DS} = 12\text{ V}, I_D = 15\text{ A}, R_G = 3.0\ \Omega$		6.0		ns
Rise Time	t_r			27		
Turn-Off Delay Time	$t_{d(OFF)}$			18.6		
Fall Time	t_f			2.3		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 10\text{ A}$	$T_J = 25^\circ\text{C}$		0.78	1.1	V
			$T_J = 125^\circ\text{C}$		0.6		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, I_S = 10\text{ A}$		30.8		ns	
Charge Time	t_a			15			
Discharge Time	t_b			15.8			
Reverse Recovery Charge	Q_{RR}			20			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.

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

6. Switching characteristics are independent of operating junction temperatures.

NTTFS4H05N

TYPICAL CHARACTERISTICS

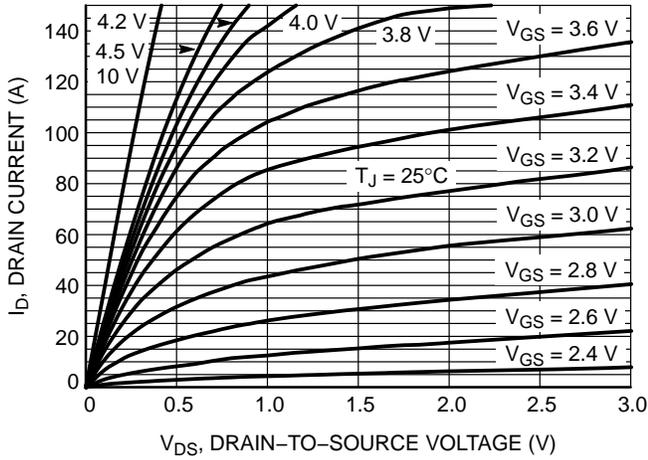


Figure 1. On-Region Characteristics

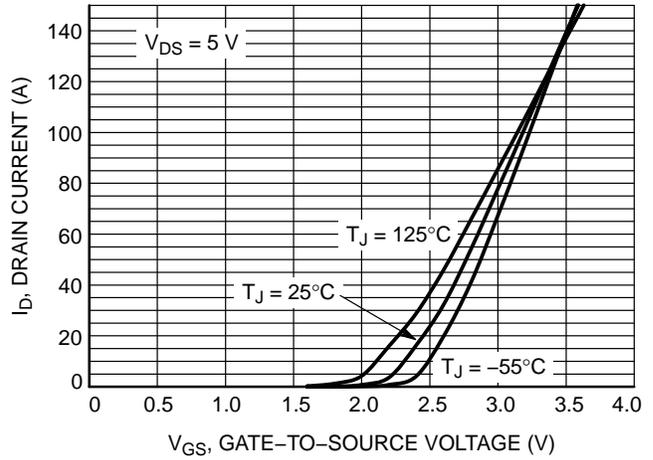


Figure 2. Transfer Characteristics

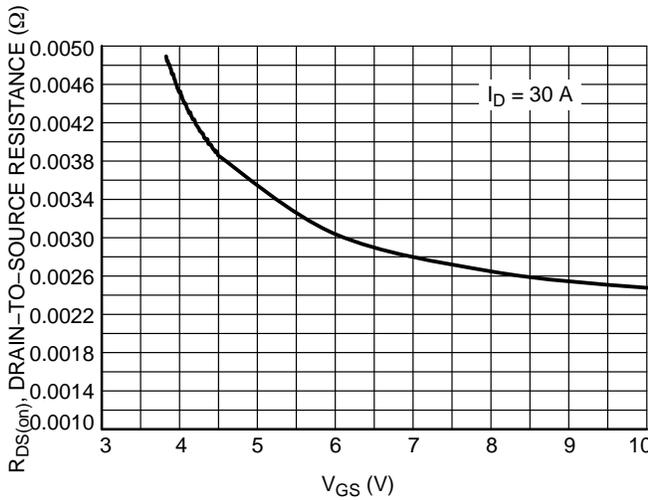


Figure 3. On-Resistance vs. V_{GS}

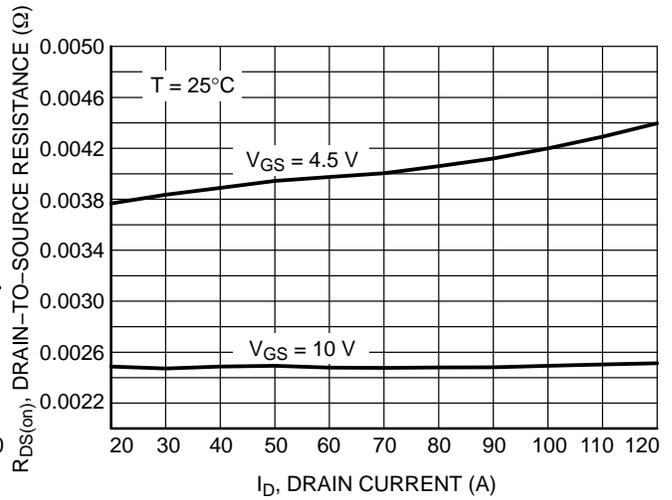


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

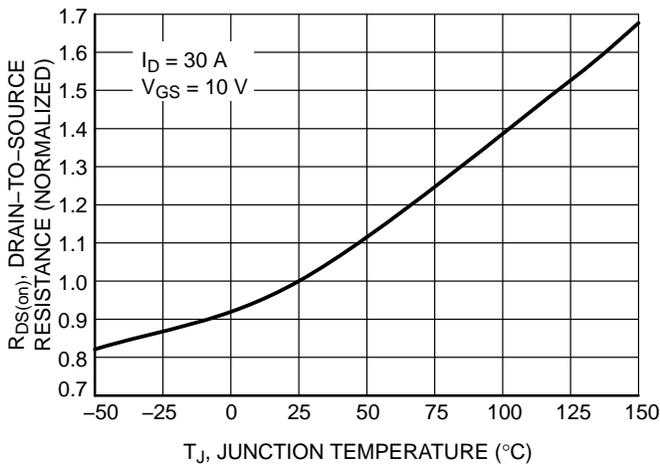


Figure 5. On-Resistance Variation with Temperature

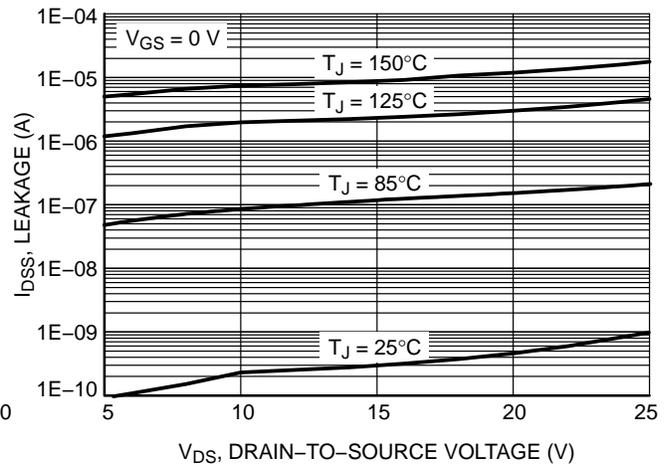


Figure 6. Drain-to-Source Leakage Current vs. Voltage

NTTFS4H05N

TYPICAL CHARACTERISTICS

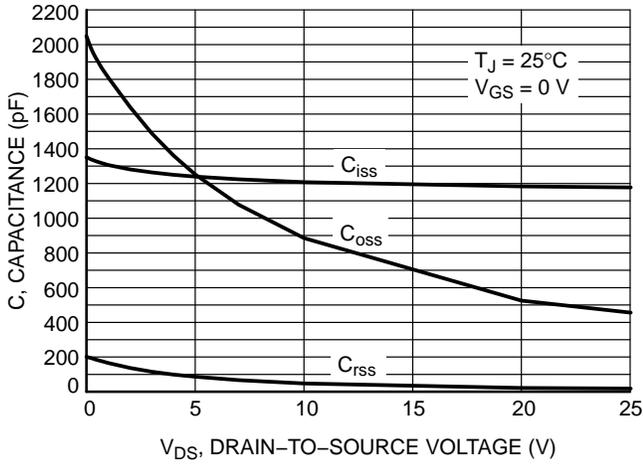


Figure 7. Capacitance Variation

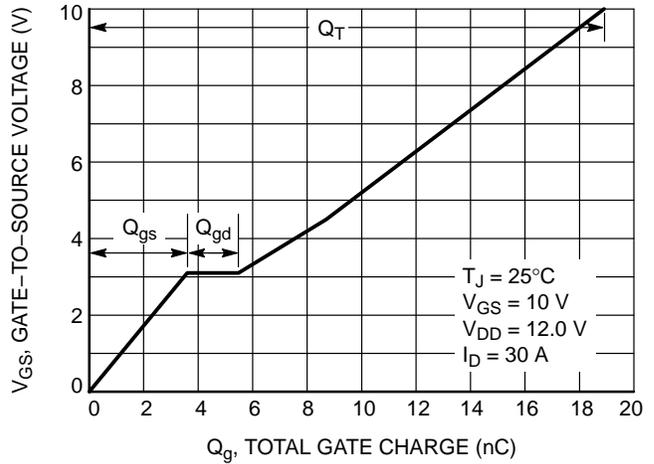


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

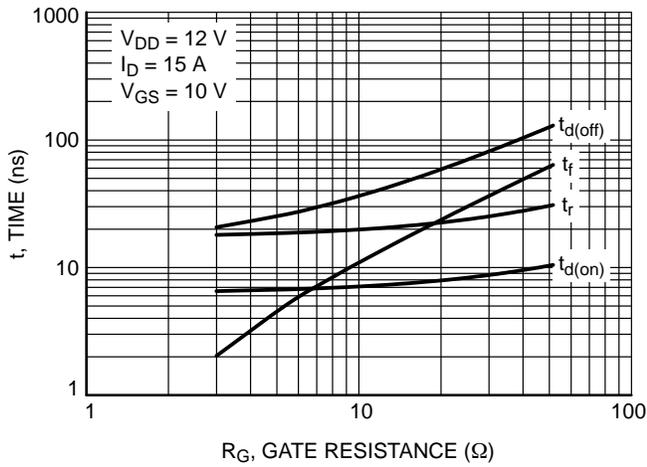


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

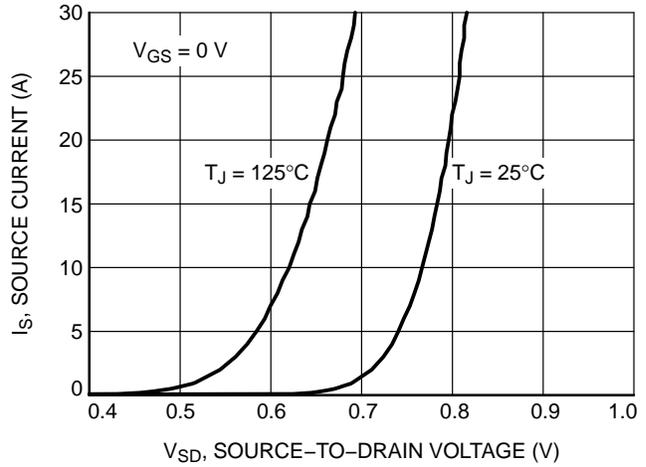


Figure 10. Diode Forward Voltage vs. Current

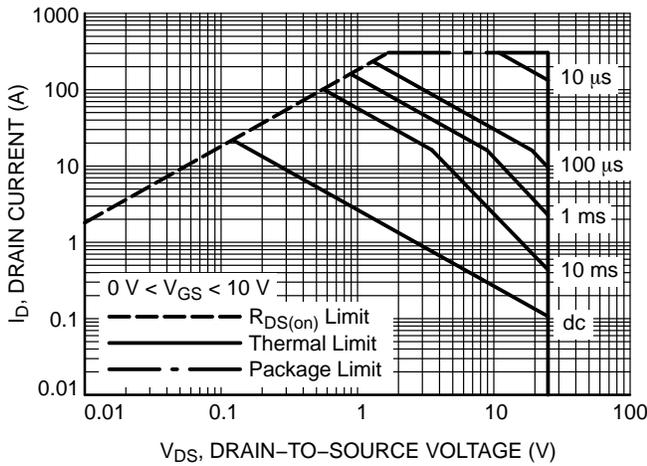


Figure 11. Maximum Rated Forward Biased Safe Operating Area

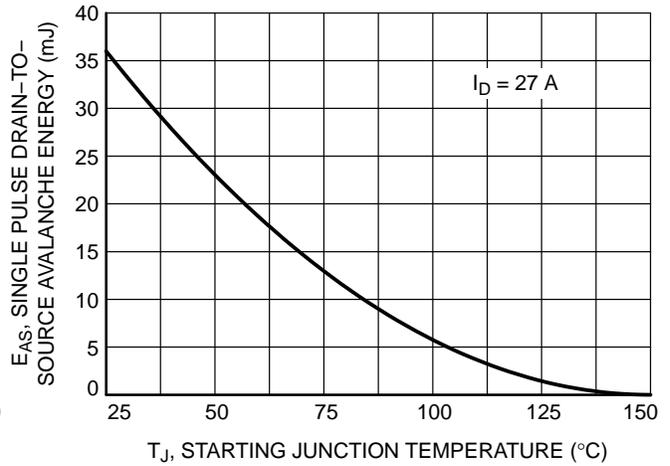


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

NTTFS4H05N

TYPICAL CHARACTERISTICS

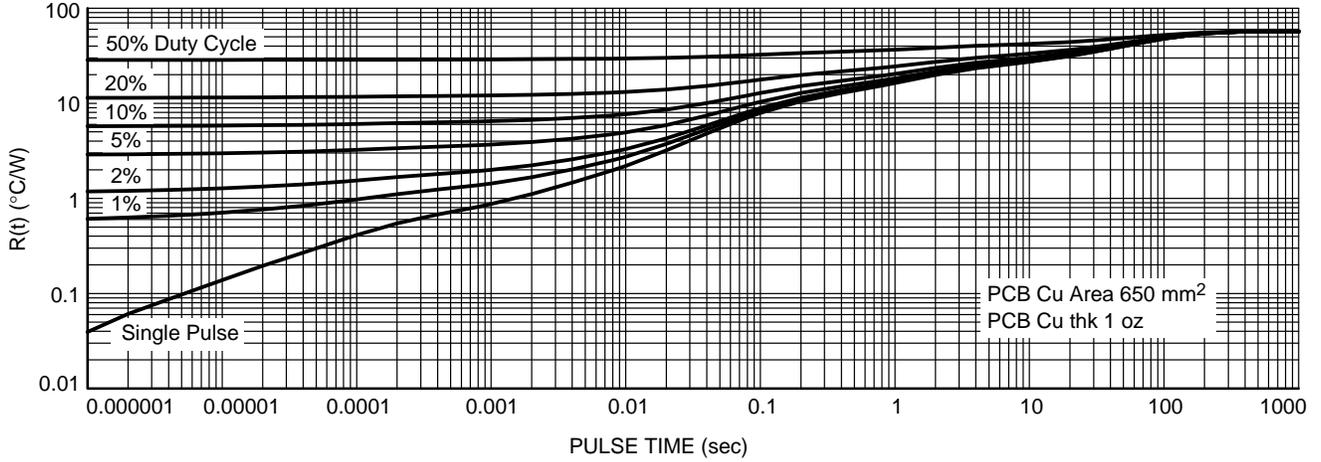


Figure 13. Thermal Characteristics

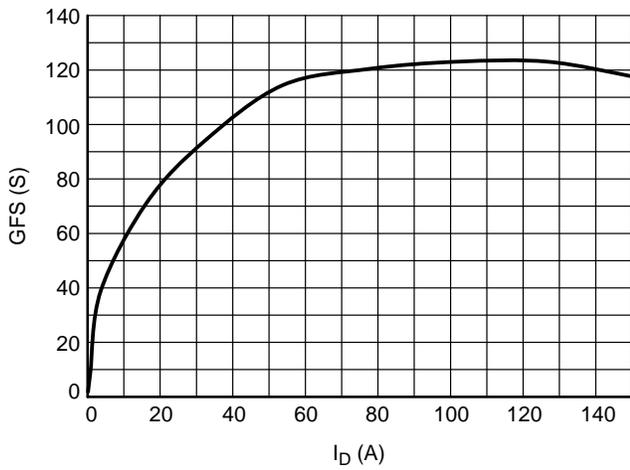


Figure 14. GFS vs. I_D

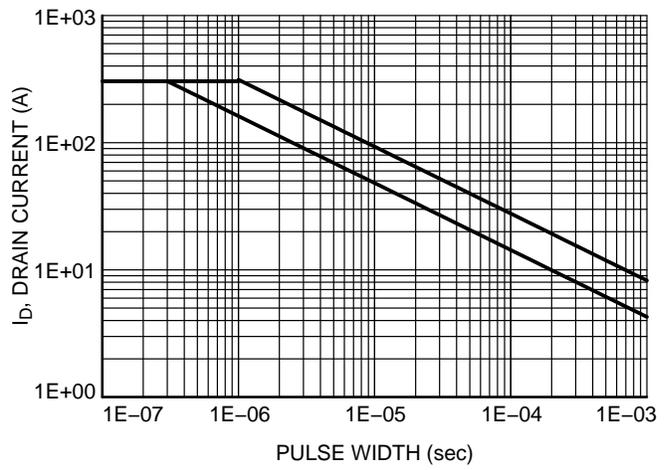


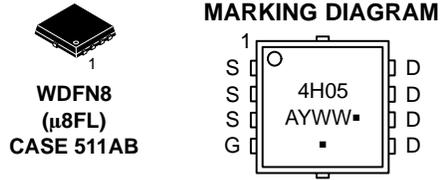
Figure 15. Avalanche Characteristics

NTTFS4H05N

ORDERING INFORMATION

Device	Package	Shipping†
NTTFS4H05NTAG	WDFN8 (Pb-Free)	1500 / Tape & Reel
NTTFS4H05NTWG	WDFN8 (Pb-Free)	5000 / 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.



4H05 = Specific Device Code
 A = Assembly Location
 Y = Year
 WW = Work Week
 ▪ = Pb-Free Package

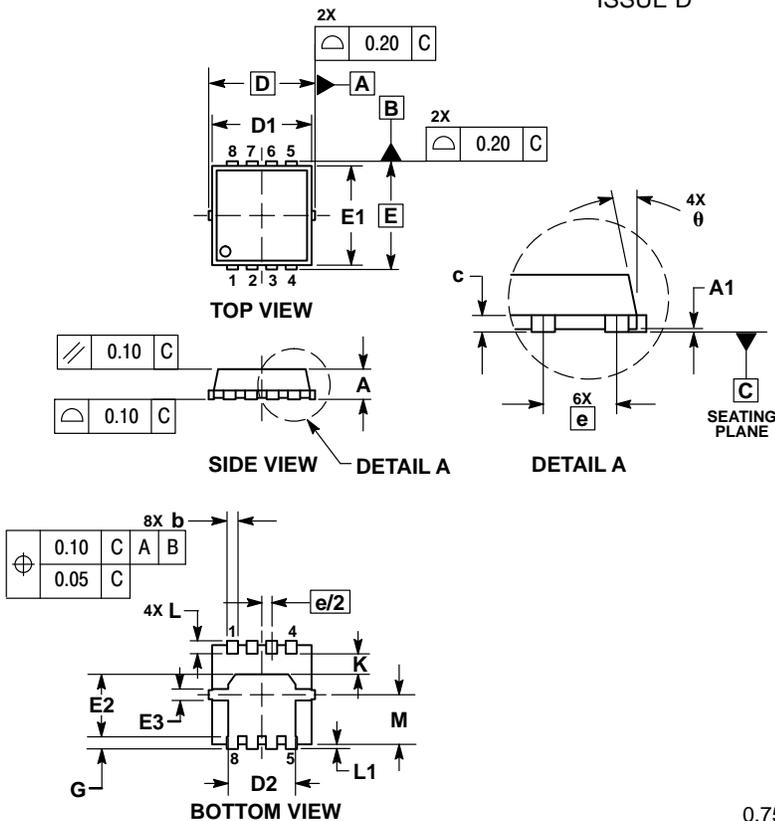
(Note: Microdot may be in either location)

-

NTTFS4H05N

PACKAGE DIMENSIONS

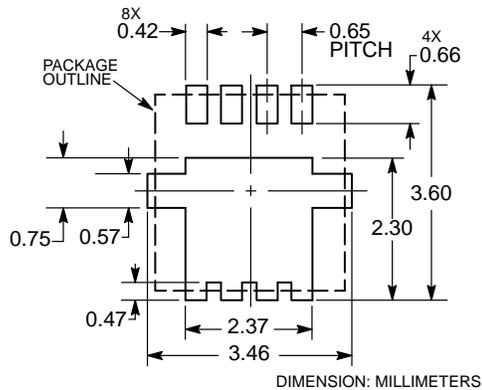
WDFN8 3.3x3.3, 0.65P
CASE 511AB
ISSUE D



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.70	0.75	0.80	0.028	0.030	0.031
A1	0.00	---	0.05	0.000	---	0.002
b	0.23	0.30	0.40	0.009	0.012	0.016
c	0.15	0.20	0.25	0.006	0.008	0.010
D	3.30 BSC			0.130 BSC		
D1	2.95	3.05	3.15	0.116	0.120	0.124
D2	1.98	2.11	2.24	0.078	0.083	0.088
E	3.30 BSC			0.130 BSC		
E1	2.95	3.05	3.15	0.116	0.120	0.124
E2	1.47	1.60	1.73	0.058	0.063	0.068
E3	0.23	0.30	0.40	0.009	0.012	0.016
e	0.65 BSC			0.026 BSC		
G	0.30	0.41	0.51	0.012	0.016	0.020
K	0.65	0.80	0.95	0.026	0.032	0.037
L	0.30	0.43	0.56	0.012	0.017	0.022
L1	0.06	0.13	0.20	0.002	0.005	0.008
M	1.40	1.50	1.60	0.055	0.059	0.063
θ	0°	---	12°	0°	---	12°

SOLDERING FOOTPRINT*



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

ON Semiconductor and are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of SCILLC's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC 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. "Typical" parameters which may be provided in SCILLC 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. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC 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 SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81-3-5817-1050

ON Semiconductor Website: www.onsemi.com
Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative

AMEYA360

Components Supply Platform

Authorized Distribution Brand :



Website :

Welcome to visit www.ameya360.com

Contact Us :

➤ Address :

401 Building No.5, JiuGe Business Center, Lane 2301, Yishan Rd
Minhang District, Shanghai , China

➤ Sales :

Direct +86 (21) 6401-6692

Email amall@ameya360.com

QQ 800077892

Skype [ameyasales1](#) [ameyasales2](#)

➤ Customer Service :

Email service@ameya360.com

➤ Partnership :

Tel +86 (21) 64016692-8333

Email mkt@ameya360.com