

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.



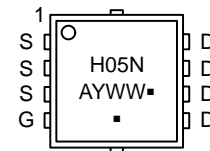
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V_{GS}	MAX $R_{DS(on)}$	TYP Q_{GTOT}
4.5 V	4.8 $\text{m}\Omega$	8.7 nC
10 V	3.3 $\text{m}\Omega$	18.9 nC



MARKING DIAGRAM

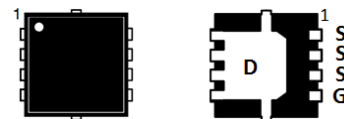


H05N = Specific Device Code
 A = Assembly Location
 Y = Year
 WW = Work Week
 ■ = Pb-Free Package

(Note: Microdot may be in either location)

PIN CONNECTIONS

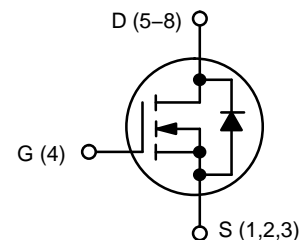
μ 8-FL (3.3 x 3.3 mm)



(Top View)

(Bottom View)

N-CHANNEL MOSFET



ORDERING INFORMATION

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

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ELECTRICAL CHARACTERISTICS (T_J = 25°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 V, I _D = 250 μA	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 V, V _{DS} = 20 V	T _J = 25°C		1.0	μA
			T _J = 125°C		20	
Gate-to-Source Leakage Current	I _{GSS}	V _{DS} = 0 V, V _{GS} = 20 V			100	nA

ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	V _{GS(TH)}	V _{GS} = V _{DS} , I _D = 250 μA	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 V	I _D = 30 A	2.5	3.3	mΩ
		V _{GS} = 4.5 V	I _D = 30 A	3.8	4.8	
Forward Transconductance	g _{FS}	V _{DS} = 12 V, I _D = 15 A		69		S

CHARGES AND CAPACITANCES

Input Capacitance	C _{ISS}	V _{GS} = 0 V, f = 1 MHz, V _{DS} = 12 V		1205	1812	pF
Output Capacitance	C _{OSS}			835	1293	
Reverse Transfer Capacitance	C _{RSS}			45	81	
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 4.5 V, V _{DS} = 12 V; I _D = 30 A		8.7	18.6	nC
Threshold Gate Charge	Q _{G(TH)}			2.7	6.0	
Gate-to-Source Charge	Q _{GS}			3.6	6.2	
Gate-to-Drain Charge	Q _{GD}			1.88	5.6	
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 10 V, V _{DS} = 12 V; I _D = 30 A		18.9	40	nC
Gate Resistance	R _G	T _A = 25°C		1.0	2.0	Ω

SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	t _{d(ON)}	V _{GS} = 4.5 V, V _{DS} = 12 V, I _D = 15 A, R _G = 3.0 Ω		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 V, V _{DS} = 12 V, I _D = 15 A, R _G = 3.0 Ω		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 V, I _S = 10 A	T _J = 25°C	0.78	1.1	V
			T _J = 125°C	0.6		
Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, dI _S /dt = 100 A/μs, I _S = 10 A		30.8	66	ns
Charge Time	t _a			15		
Discharge Time	t _b			15.8		
Reverse Recovery Charge	Q _{RR}			20		

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 ≤ 300 μs, duty cycle ≤ 2%.

6. Switching characteristics are independent of operating junction temperatures.

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TYPICAL CHARACTERISTICS

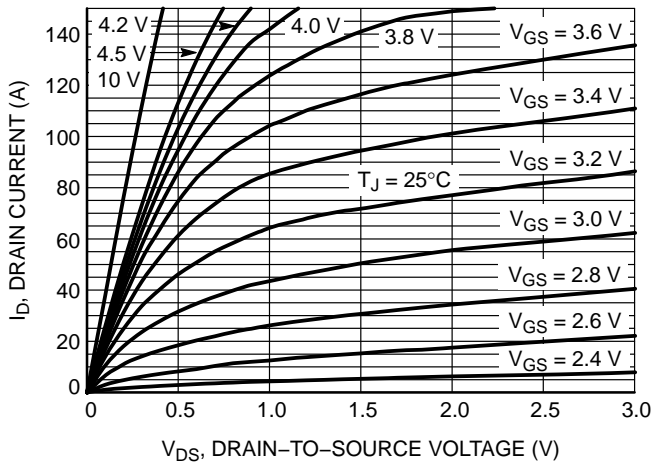


Figure 1. On-Region Characteristics

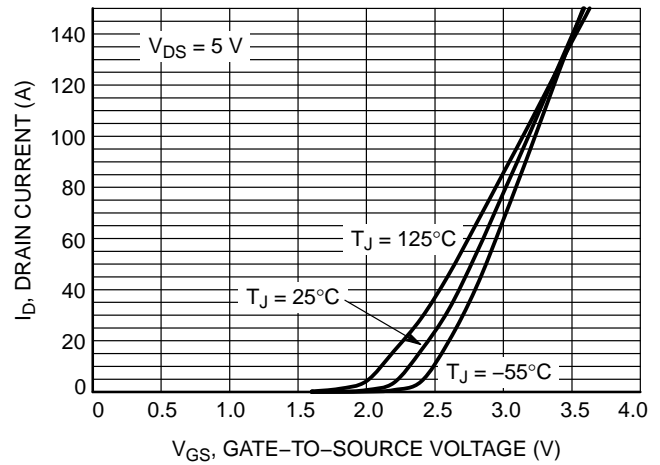


Figure 2. Transfer Characteristics

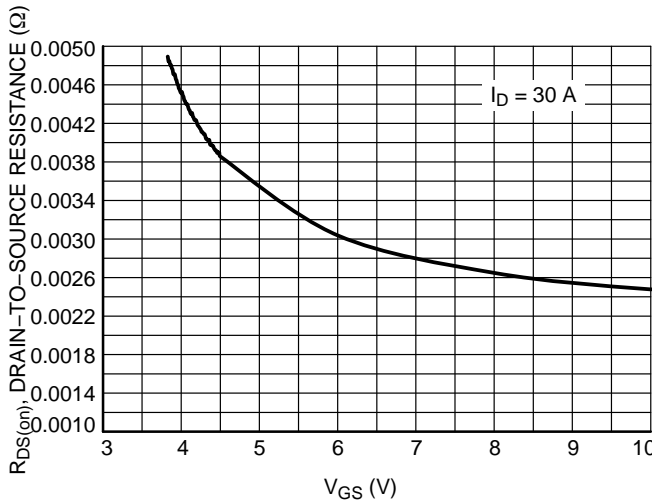


Figure 3. On-Resistance vs. V_{GS}

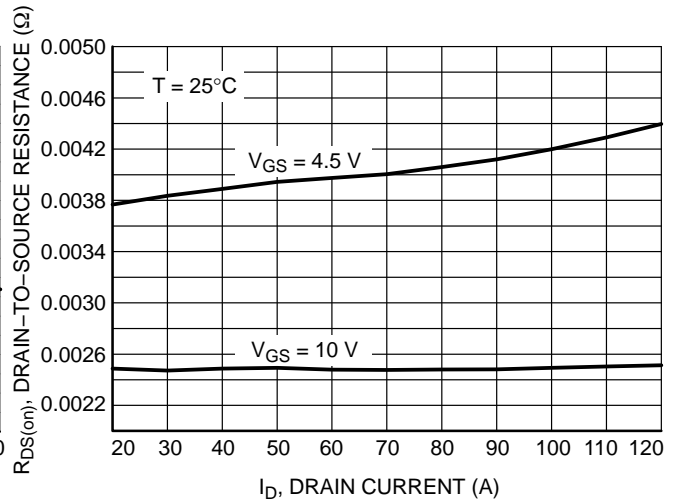


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

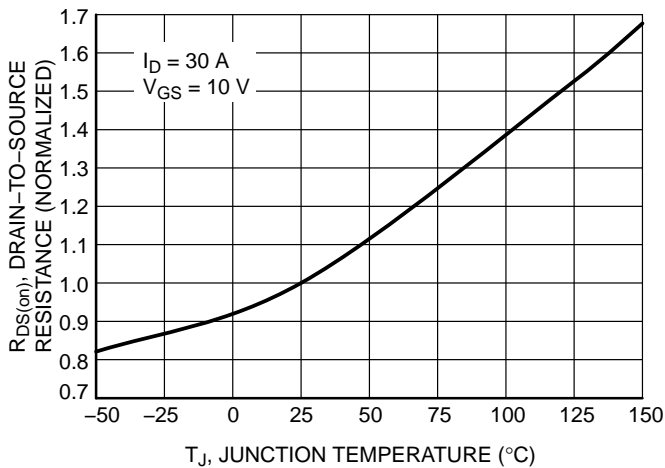


Figure 5. On-Resistance Variation with Temperature

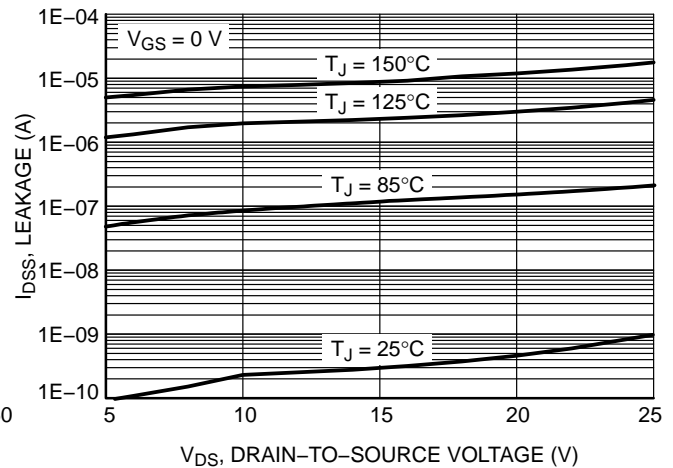


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS

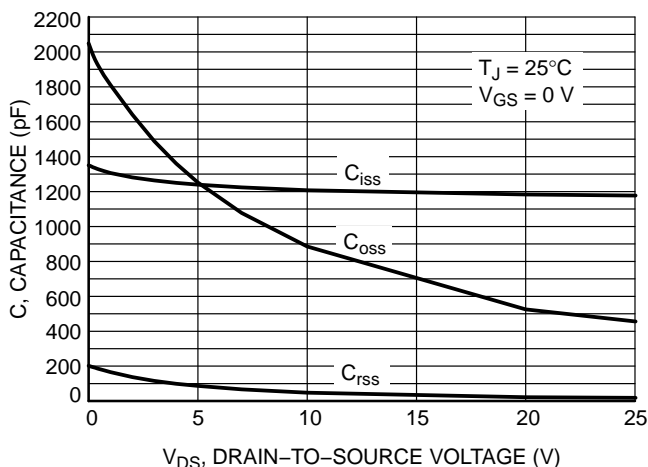


Figure 7. Capacitance Variation

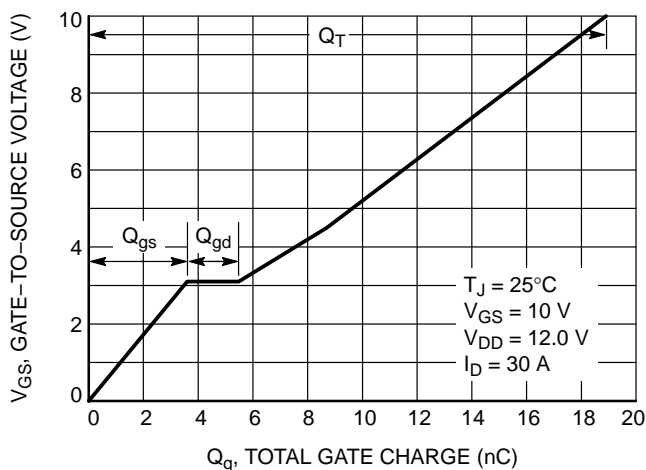


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

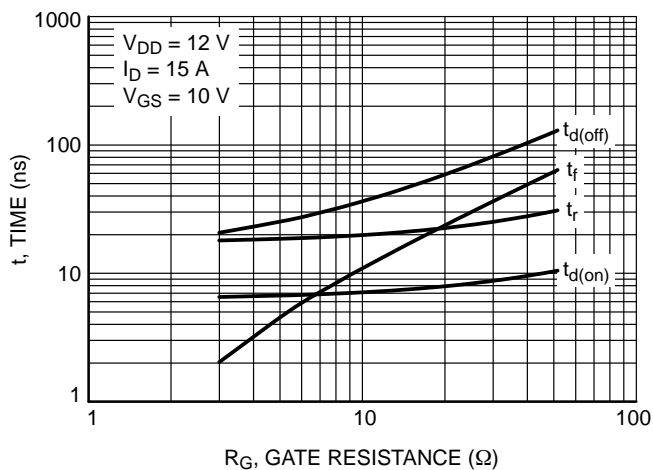


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

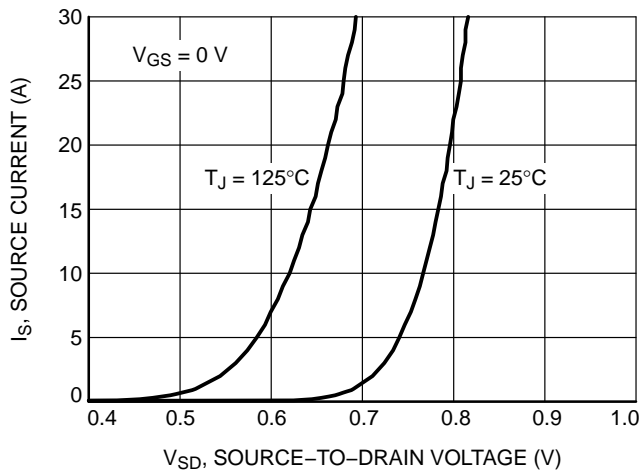


Figure 10. Diode Forward Voltage vs. Current

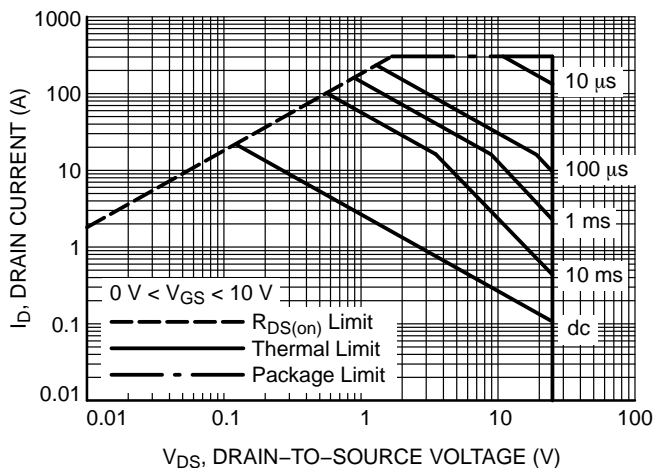


Figure 11. Maximum Rated Forward Biased Safe Operating Area

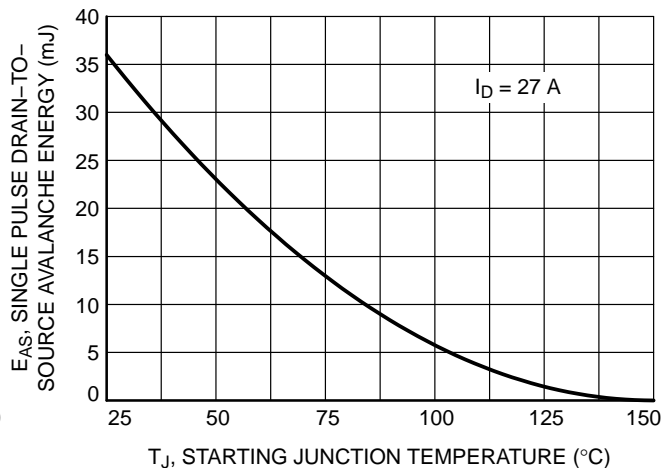


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

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TYPICAL CHARACTERISTICS

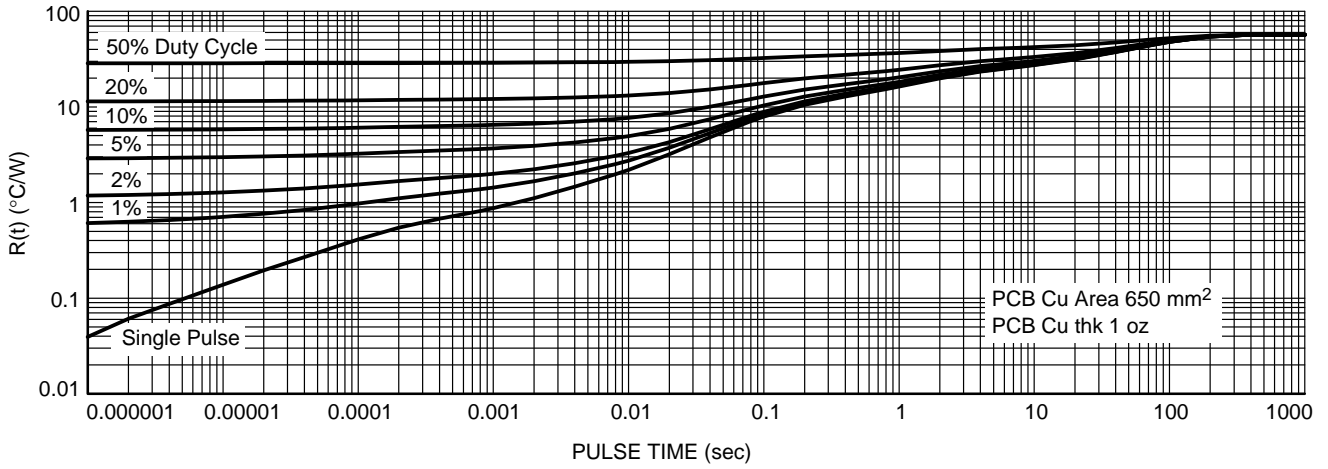


Figure 13. Thermal Characteristics

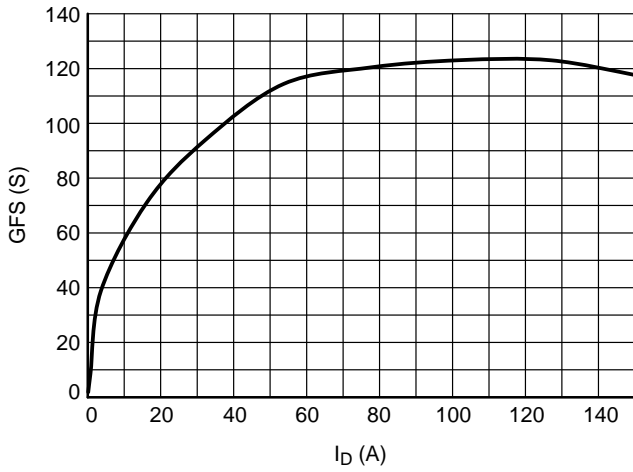


Figure 14. GFS vs. I_D

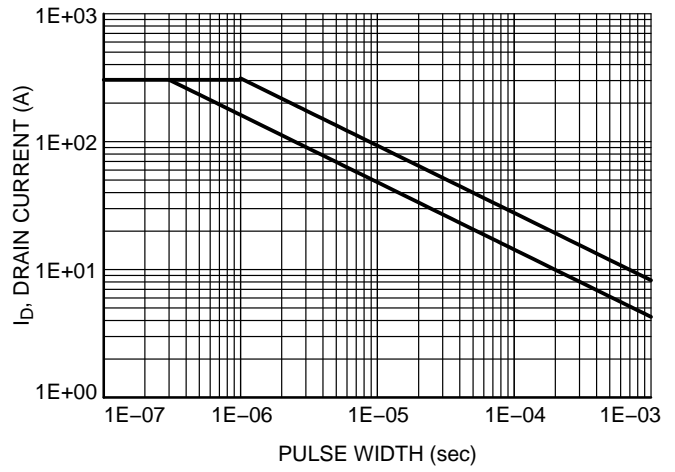


Figure 15. Avalanche Characteristics

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ORDERING INFORMATION

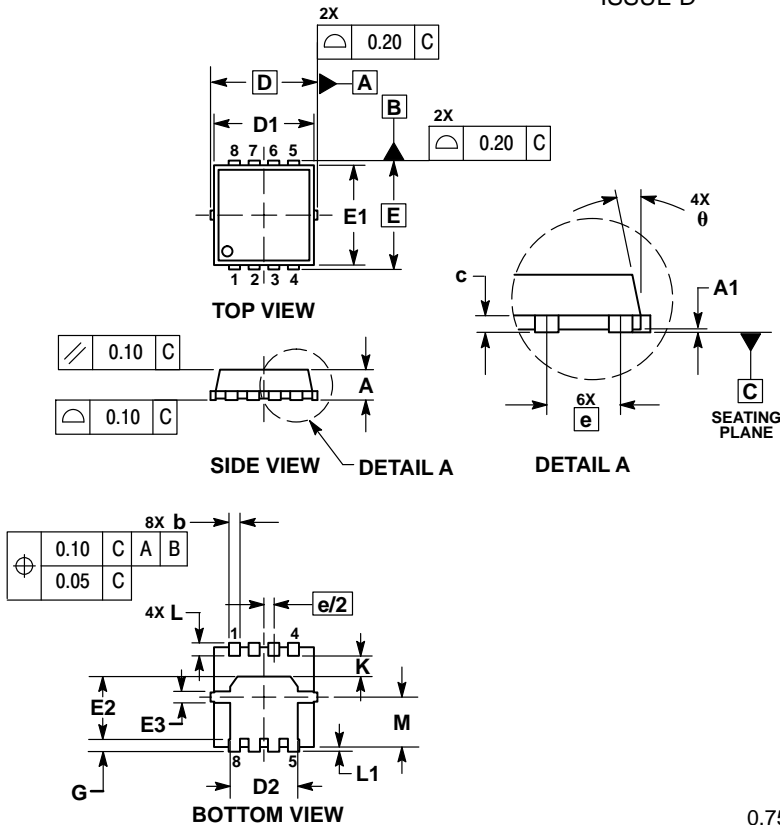
Device	Package	Shipping†
NTTFS4H05NTAG	WDFN8 (Pb-Free)	1500 / Tape & Reel
NTTFS4H05NTWG	WDFN8 (Pb-Free)	5000 / Tape & Reel

†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.

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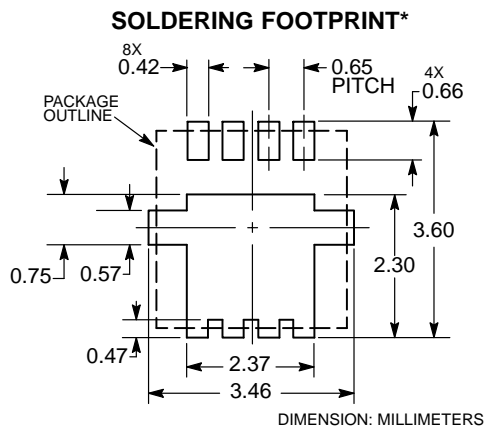
PACKAGE DIMENSIONS

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 °



*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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