

NTTFS4H05N

MOSFET – Power, Single, N-Channel, μ 8-FL 25 V, 94 A

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_{DSS} | 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 $T_J = 25^\circ\text{C}$, $V_{GS} = 10 \text{ V}$, $I_L = 27 \text{ A}$, $E_{AS} = 36 \text{ mJ}$.



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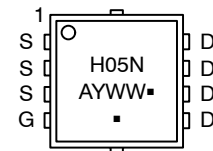
www.onsemi.com

| 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 |



WDFN8
(μ 8FL)
CASE 511AB

MARKING DIAGRAM

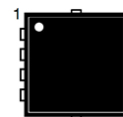


H05N = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
▪ = Pb-Free Package

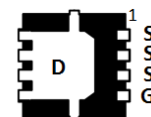
(Note: Microdot may be in either location)

PIN CONNECTIONS

μ 8-FL (3.3 x 3.3 mm)

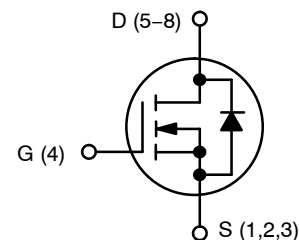


(Top View)



(Bottom View)

N-CHANNEL MOSFET



ORDERING INFORMATION

See detailed ordering and shipping information on page 7 of this data sheet.

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THERMAL CHARACTERISTICS

| Parameter | Symbol | Max | Units |
|---|-----------------|-----|-----------------------------|
| Thermal Resistance, Junction-to-Ambient (Note 1 and 4) | $R_{\theta JA}$ | 47 | $^{\circ}\text{C}/\text{W}$ |
| 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 JE51-3.

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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 | 1812 | pF |
| Output Capacitance | C_{OSS} | | | 835 | 1293 | |
| Reverse Transfer Capacitance | C_{RSS} | | | 45 | 81 | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = 4.5\text{ V}, V_{DS} = 12\text{ V}; I_D = 30\text{ A}$ | | 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 | $Q_{G(TOT)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 12\text{ V}; I_D = 30\text{ A}$ | | 18.9 | 40 | nC |
| Gate Resistance | R_G | $T_A = 25^\circ\text{C}$ | | 1.0 | 2.0 | 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 | 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 $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

6. Switching characteristics are independent of operating junction temperatures.

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TYPICAL CHARACTERISTICS

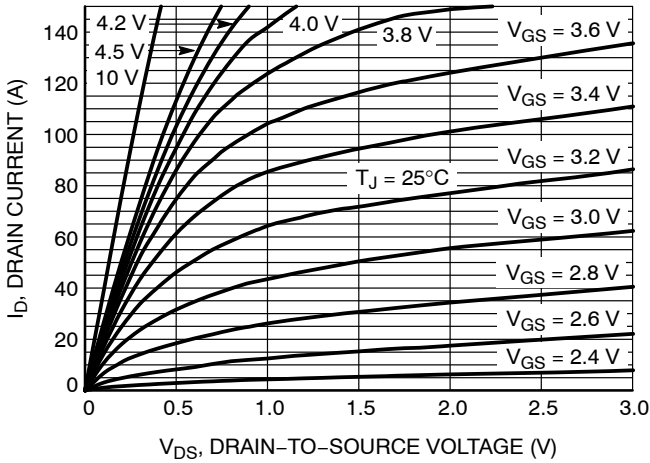


Figure 1. On-Region Characteristics

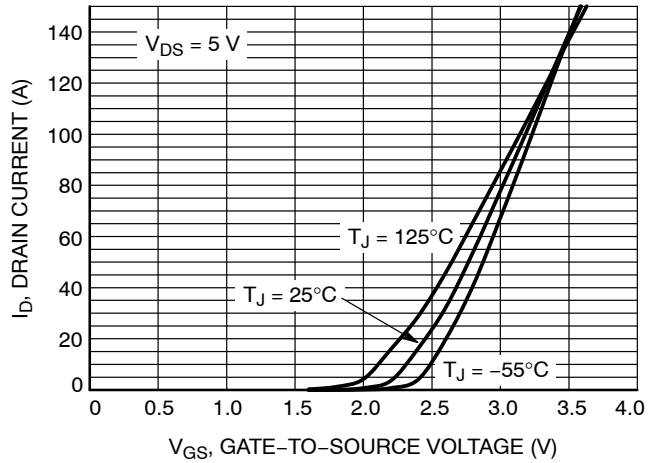


Figure 2. Transfer Characteristics

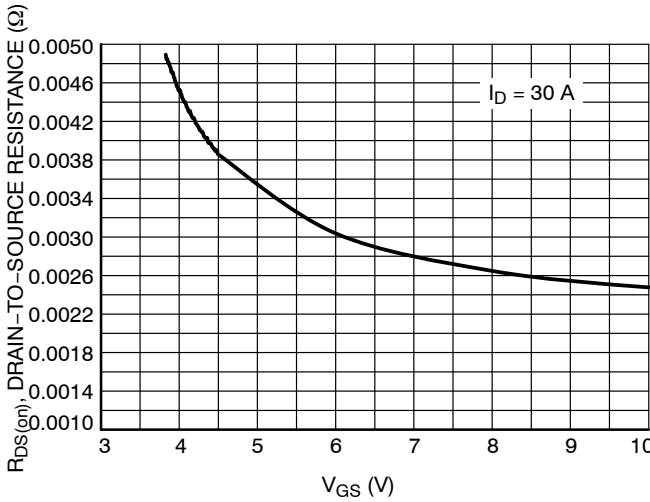


Figure 3. On-Resistance vs. V_{GS}

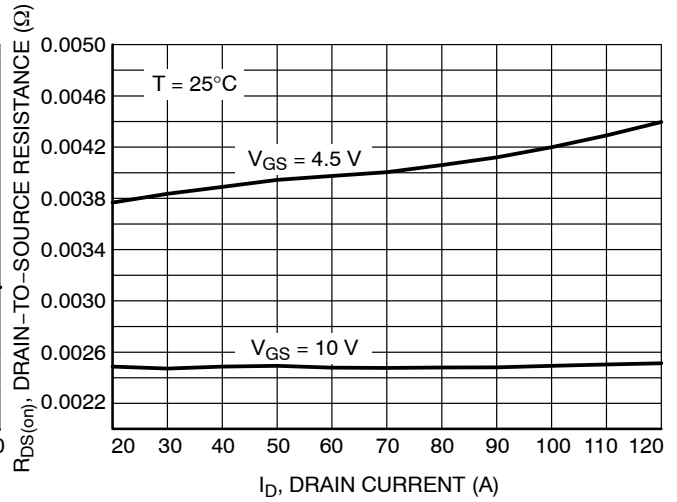


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

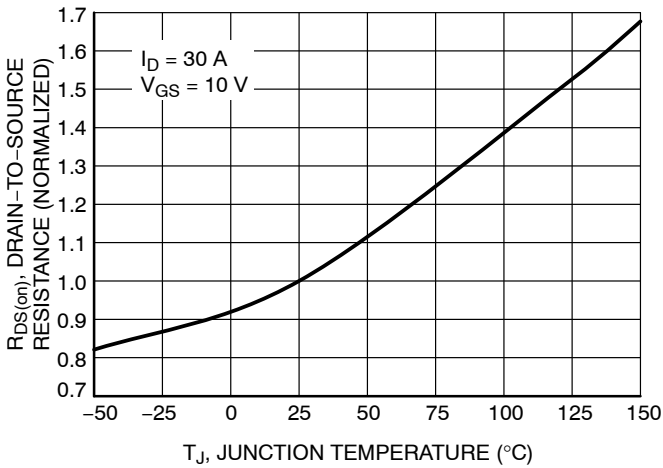


Figure 5. On-Resistance Variation with Temperature

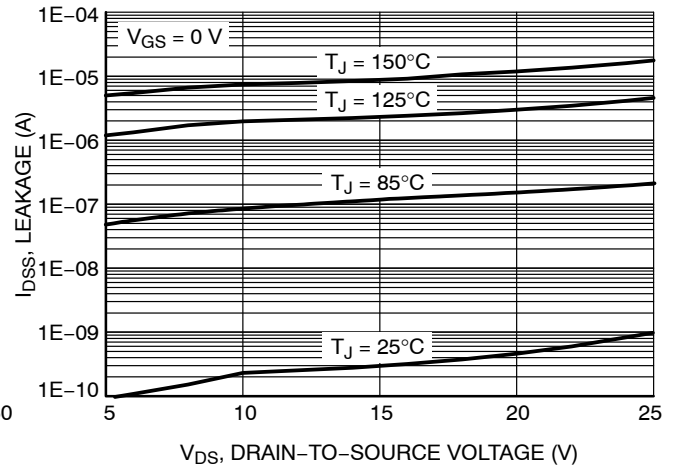


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS

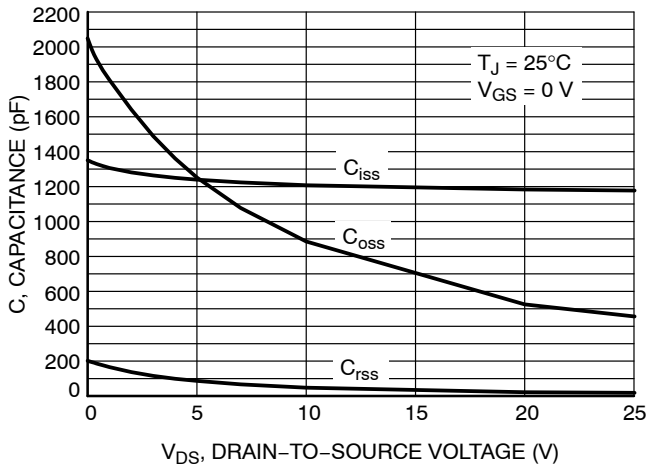


Figure 7. Capacitance Variation

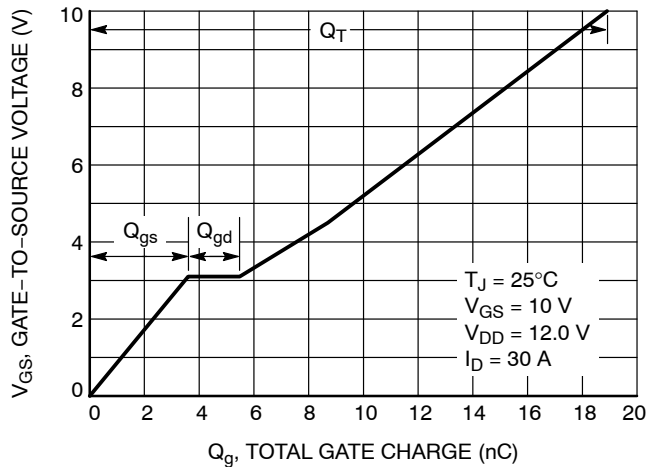


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

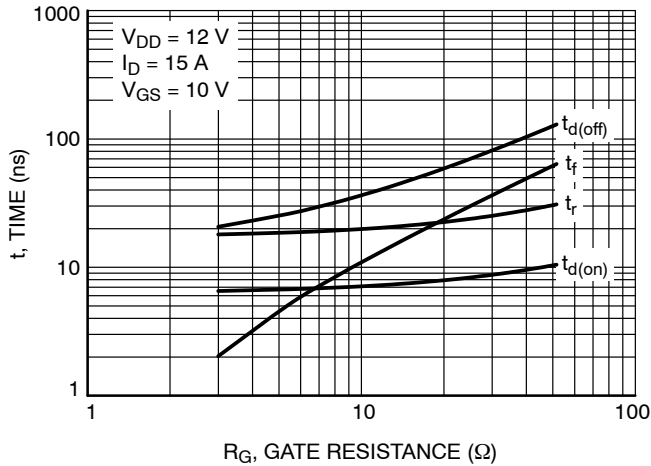


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

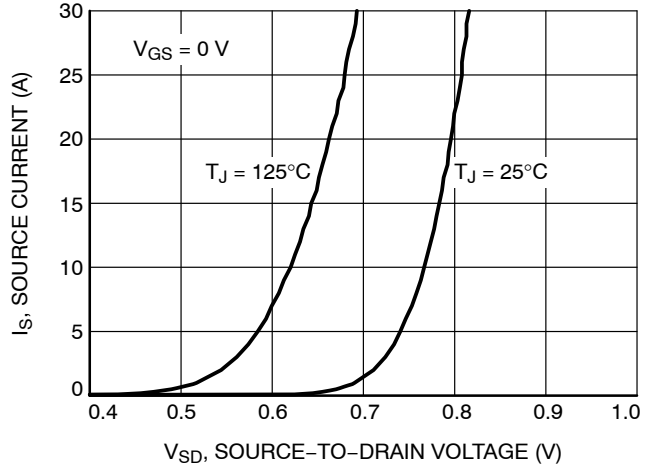


Figure 10. Diode Forward Voltage vs. Current

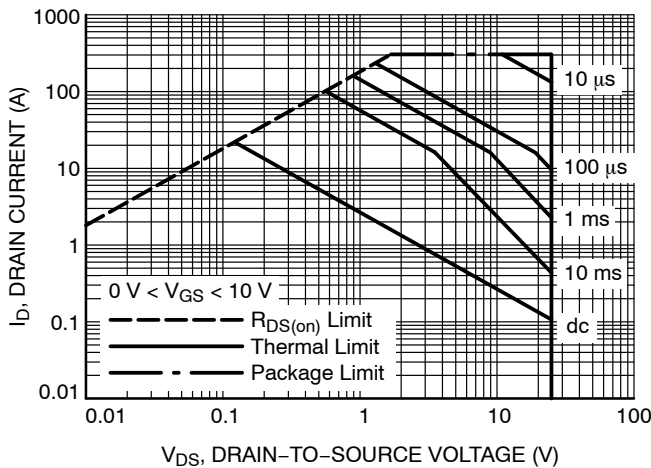


Figure 11. Maximum Rated Forward Biased Safe Operating Area

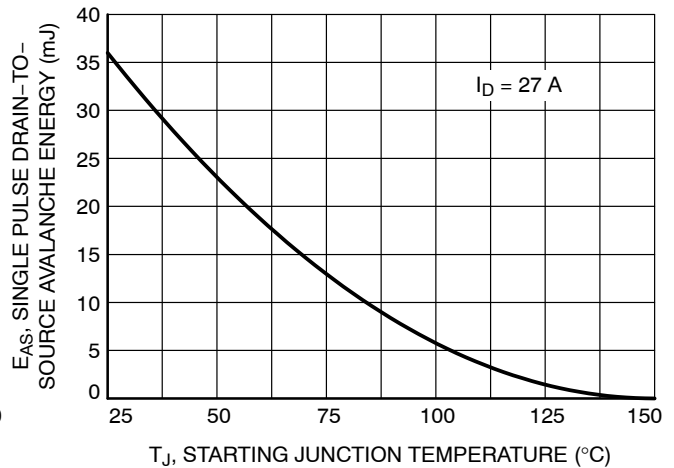


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

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TYPICAL CHARACTERISTICS

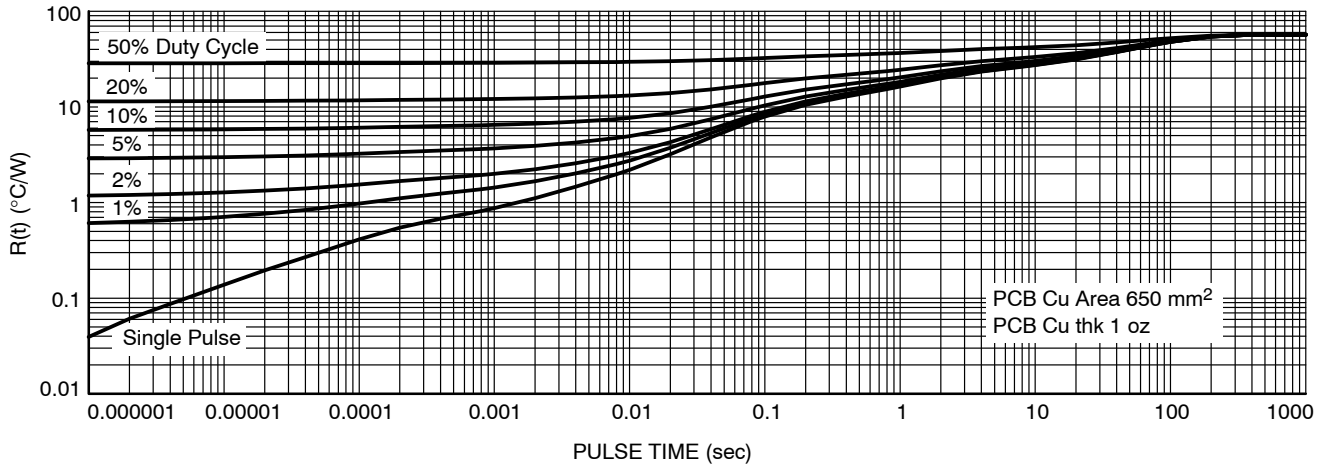


Figure 13. Thermal Characteristics

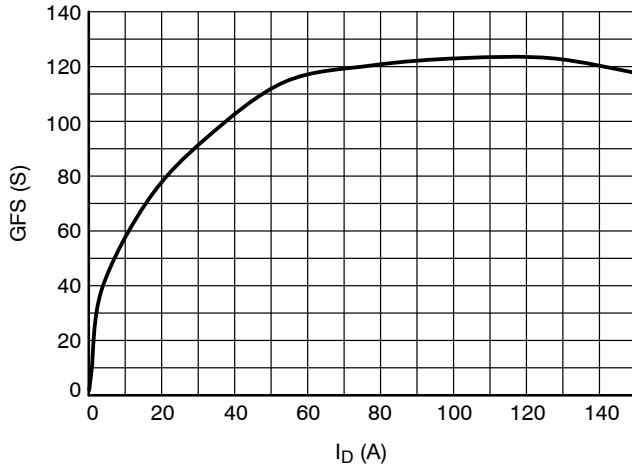


Figure 14. GFS vs. I_D

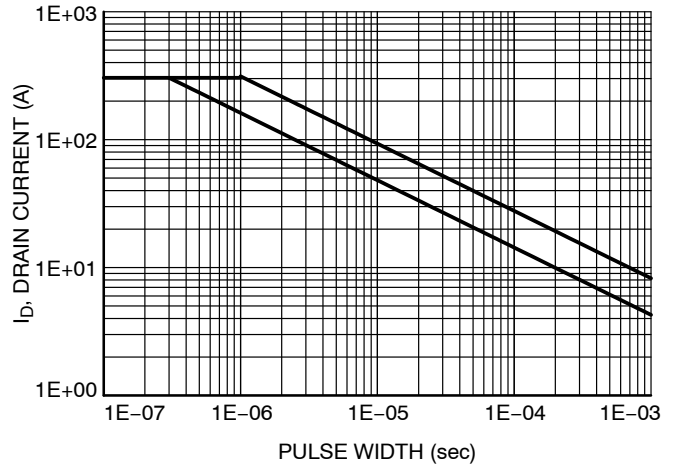


Figure 15. Avalanche Characteristics

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.

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

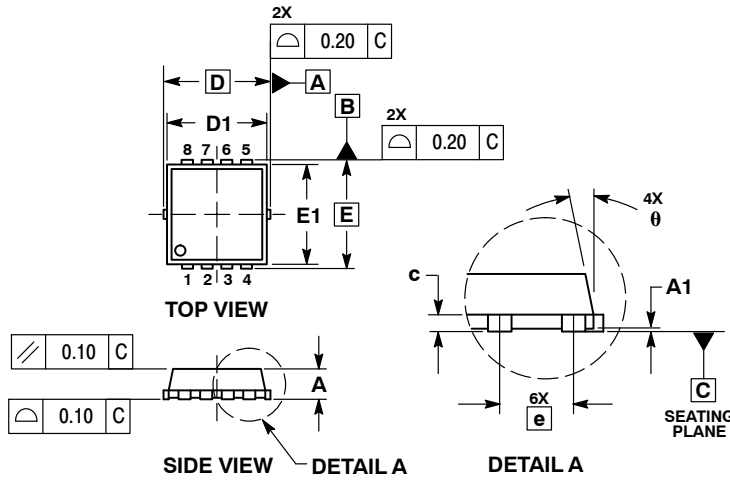
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SCALE 2:1

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

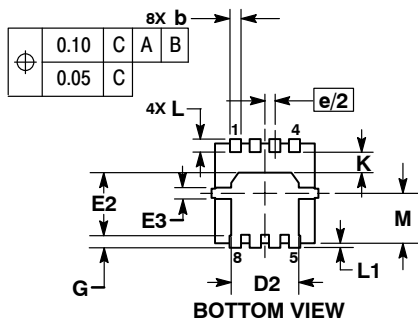
DATE 23 APR 2012



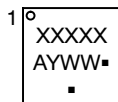
NOTES:

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° |

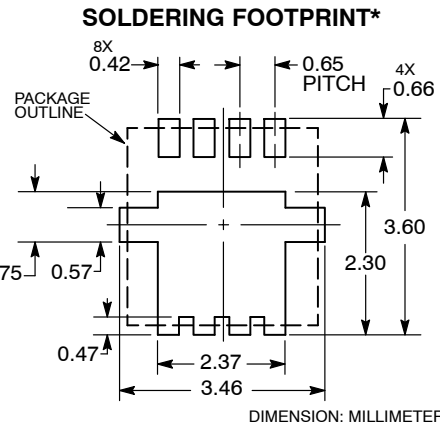


GENERIC MARKING DIAGRAM*



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

*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.



*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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| DESCRIPTION: | WDFN8 3.3X3.3, 0.65P | PAGE 1 OF 1 |

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