

MOSFET - Power, Single N-Channel

100 V, 10.6 mΩ, 57.8 A

NVTFS010N10MCL

Features

- Small Footprint (3.3 x 3.3 mm) for Compact Design
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- NVTFS010N10MCLTAG – Wettable Flanks Product
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

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

| Parameter | Symbol | Value | Unit |
|---|----------------|--|------------------|
| Drain-to-Source Voltage | V_{DS} | 100 | V |
| Gate-to-Source Voltage | V_{GS} | ± 20 | V |
| Continuous Drain Current $R_{\theta JC}$ (Notes 1, 2, 3) | I_D | $T_C = 25^\circ\text{C}$ | A |
| | | $T_C = 100^\circ\text{C}$ | |
| Power Dissipation $R_{\theta JC}$ (Notes 1, 2) | P_D | $T_C = 25^\circ\text{C}$ | W |
| | | $T_C = 100^\circ\text{C}$ | |
| Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2, 3) | I_D | $T_A = 25^\circ\text{C}$ | A |
| | | $T_A = 100^\circ\text{C}$ | |
| Power Dissipation $R_{\theta JA}$ (Notes 1, 2) | P_D | $T_A = 25^\circ\text{C}$ | W |
| | | $T_A = 100^\circ\text{C}$ | |
| Pulsed Drain Current | I_{DM} | $T_C = 25^\circ\text{C}, t_p = 10 \mu\text{s}$ | A |
| Source Current | I_S | 64.8 | A |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | -55 to +175 | $^\circ\text{C}$ |
| Single Pulse Drain-to-Source Avalanche Energy ($I_{L(pk)} = 2.9 \text{ A}$) | E_{AS} | 526 | mJ |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | T_L | 260 | $^\circ\text{C}$ |

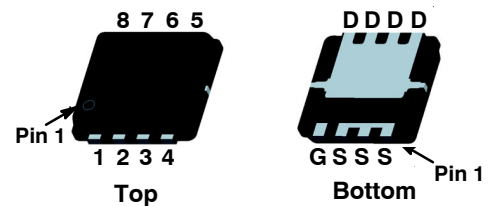
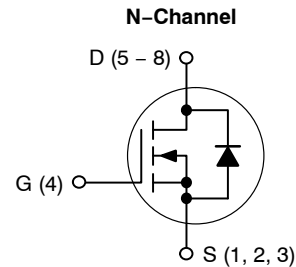
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE MAXIMUM RATINGS (Note 1)

| Parameter | Symbol | Value | Unit |
|---|-----------------|-------|--------------------|
| Junction-to-Case – Steady State (Note 2) | $R_{\theta JC}$ | 1.93 | $^\circ\text{C/W}$ |
| Junction-to-Ambient – Steady State (Note 2) | $R_{\theta JA}$ | 46.6 | |

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. Surface-mounted on FR4 board using a 650 mm², 2 oz. Cu pad.
3. Continuous DC current rating. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

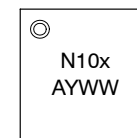
| $V_{(BR)DSS}$ | $R_{DS(on)} \text{ MAX}$ | $I_D \text{ MAX}$ |
|---------------|--------------------------|-------------------|
| 100 V | 10.6 mΩ @ 10 V | 57.8 A |
| | 15.9 mΩ @ 4.5 V | |



WDFN8
(3.3x3.3, 0.65 P)
CASE 511DY



MARKING DIAGRAM



N10x = Specific Device Code
x = L or W
A = Assembly Location
Y = Year Code
WW = Work Week Code

ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 5 of this data sheet.

NVTFS010N10MCL

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 | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$ | 100 | | | V |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | | | 64 | | mV/ $^\circ\text{C}$ |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{GS} = 0\text{ V}, V_{DS} = 80\text{ V}$ | $T_J = 25^\circ\text{C}$ | | 1.0 | μA |
| | | | $T_J = 125^\circ\text{C}$ | | 250 | |
| Gate-to-Source Leakage Current | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = 20\text{ V}$ | | | 100 | nA |

ON CHARACTERISTICS (Note 4)

| | | | | | | |
|-----------------------------------|------------------|--|-----|------|------|----------------------|
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = 85\text{ }\mu\text{A}$ | 1.0 | 1.5 | 3.0 | V |
| Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | | | -5.3 | | mV/ $^\circ\text{C}$ |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 15\text{ A}$ | | 9.1 | 10.6 | m Ω |
| | | $V_{GS} = 4.5\text{ V}, I_D = 12\text{ A}$ | | 13.5 | 15.9 | |
| Forward Transconductance | g_{FS} | $V_{DS} = 5\text{ V}, I_D = 15\text{ A}$ | | 54 | | S |

CHARGES AND CAPACITANCES

| | | | | | | |
|------------------------------|--------------|--|--|------|------|----|
| Input Capacitance | C_{ISS} | $V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 50\text{ V}$ | | 1530 | 2150 | pF |
| Output Capacitance | C_{OSS} | | | 625 | 875 | |
| Reverse Transfer Capacitance | C_{RSS} | | | 10 | 18 | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = 4.5\text{ V}, V_{DS} = 50\text{ V}; I_D = 15\text{ A}$ | | 10 | | nC |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 50\text{ V}; I_D = 15\text{ A}$ | | 22 | 30 | |
| Gate-to-Source Charge | Q_{GS} | $V_{GS} = 10\text{ V}, V_{DS} = 50\text{ V}; I_D = 15\text{ A}$ | | 4.0 | | nC |
| Gate-to-Drain Charge | Q_{GD} | | | 3.0 | | |

SWITCHING CHARACTERISTICS (Note 5)

| | | | | | | |
|---------------------|--------------|--|--|-----|--|----|
| Turn-On Delay Time | $t_{d(ON)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 50\text{ V}, I_D = 15\text{ A}, R_G = 6\text{ }\Omega$ | | 9.0 | | ns |
| Rise Time | t_r | | | 3.0 | | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | | | 28 | | |
| Fall Time | t_f | | | 5.0 | | |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | |
|-------------------------|----------|---|--|-----|-----|----|
| Forward Diode Voltage | V_{SD} | $V_{GS} = 0\text{ V}, I_S = 15\text{ A}$ | | 0.8 | 1.3 | V |
| Reverse Recovery Time | t_{RR} | $I_F = 8\text{ A}, di/dt = 300\text{ A}/\mu\text{s}$ | | 22 | 36 | ns |
| Reverse Recovery Charge | Q_{RR} | | | 35 | 56 | nC |
| Reverse Recovery Time | t_{RR} | $I_F = 8\text{ A}, di/dt = 1000\text{ A}/\mu\text{s}$ | | 17 | 30 | ns |
| Reverse Recovery Charge | Q_{RR} | | | 79 | 126 | 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.

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

5. Switching characteristics are independent of operating junction temperatures.

NVTFS010N10MCL

TYPICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)

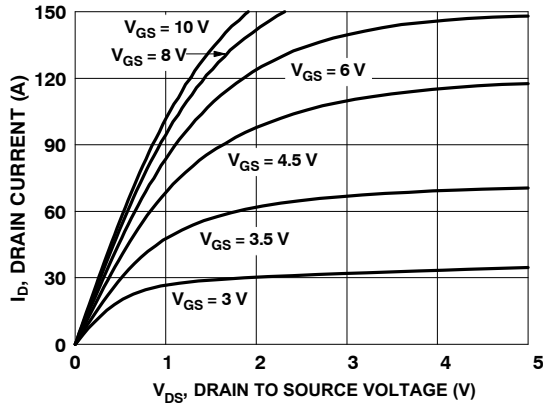


Figure 1. On Region Characteristics

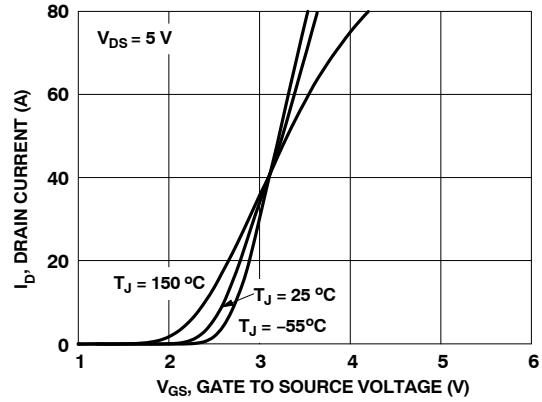


Figure 2. Transfer Characteristics

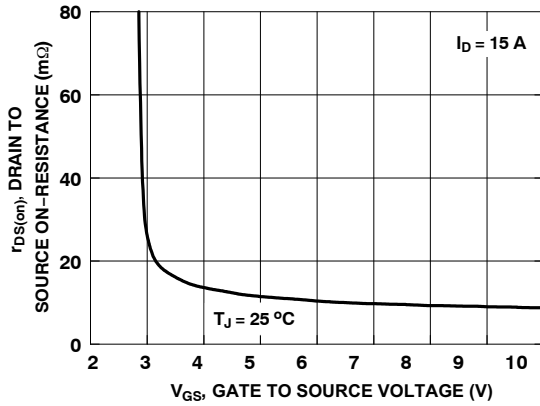


Figure 3. On-Resistance vs. Gate to Source Voltage

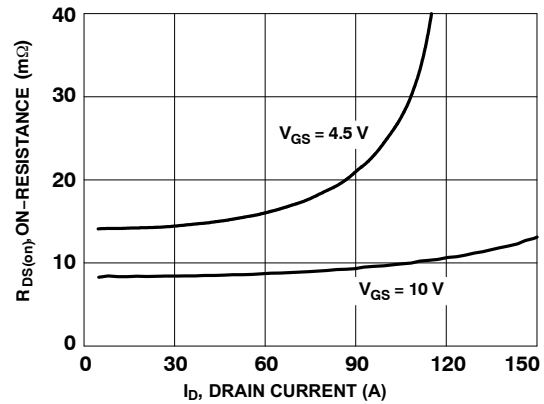


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

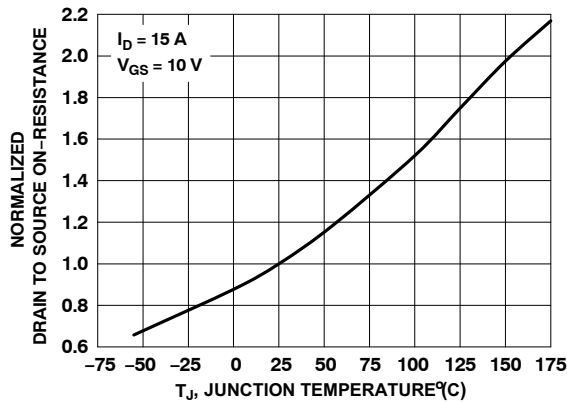


Figure 5. Normalized On Resistance vs. Junction Temperature

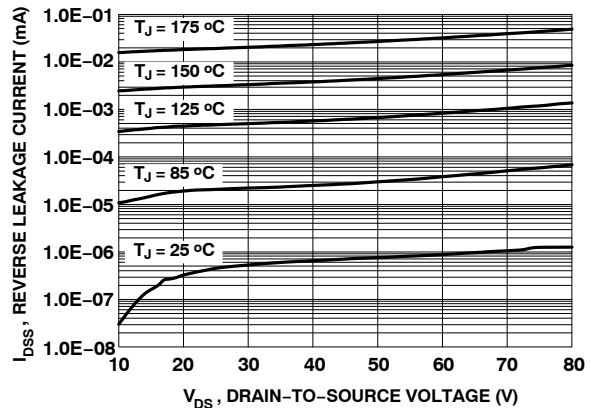


Figure 6. Drain-to-Source Leakage Current vs. Voltage

NVTF5010N10MCL

TYPICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)

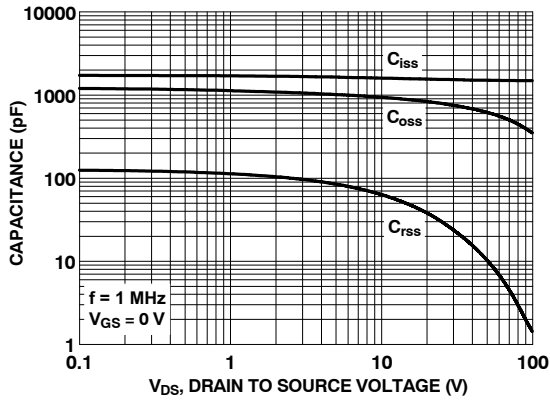


Figure 7. Capacitance vs. Drain to Source Voltage

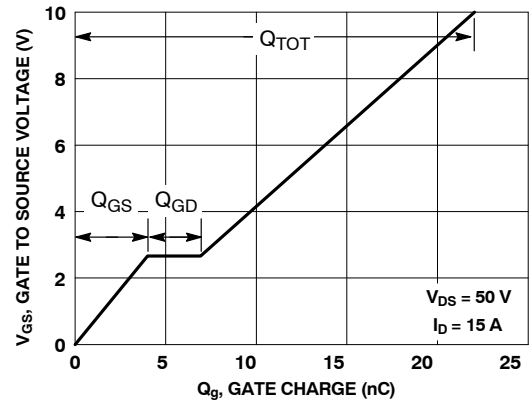


Figure 8. Gate Charge Characteristics

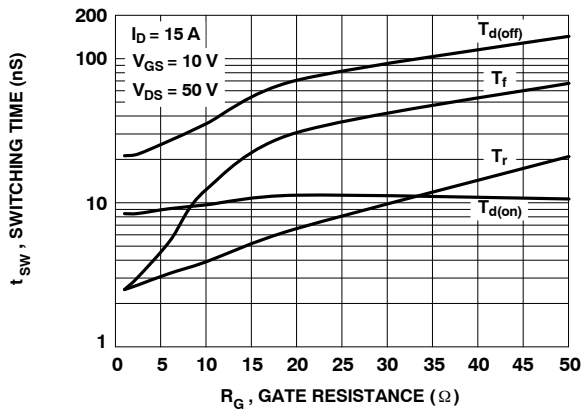


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

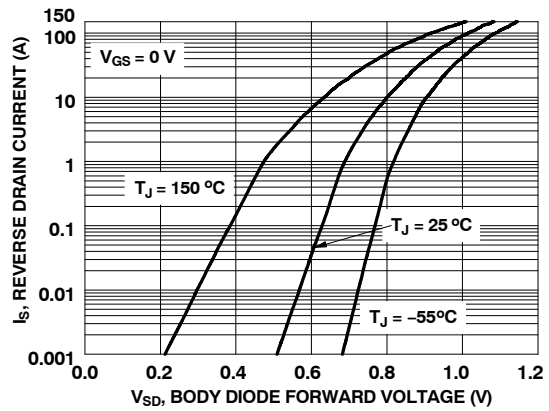


Figure 10. Source to Drain Diode Forward Voltage vs. Source Current

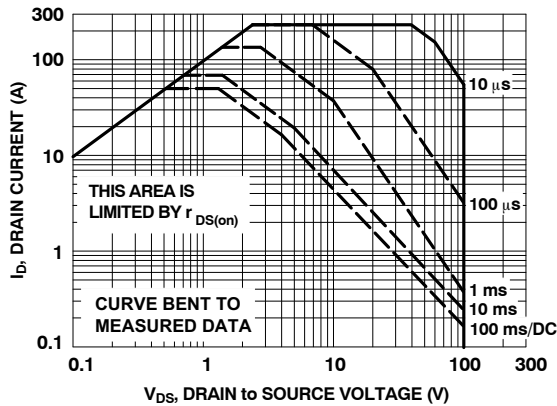


Figure 11. Forward Bias Safe Operating Area

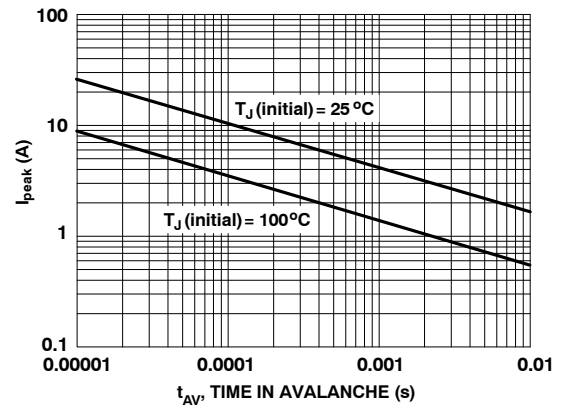


Figure 12. Unclamped Inductive Switching Capability

NVTFS010N10MCL

TYPICAL CHARACTERISTICS (CONTINUED)

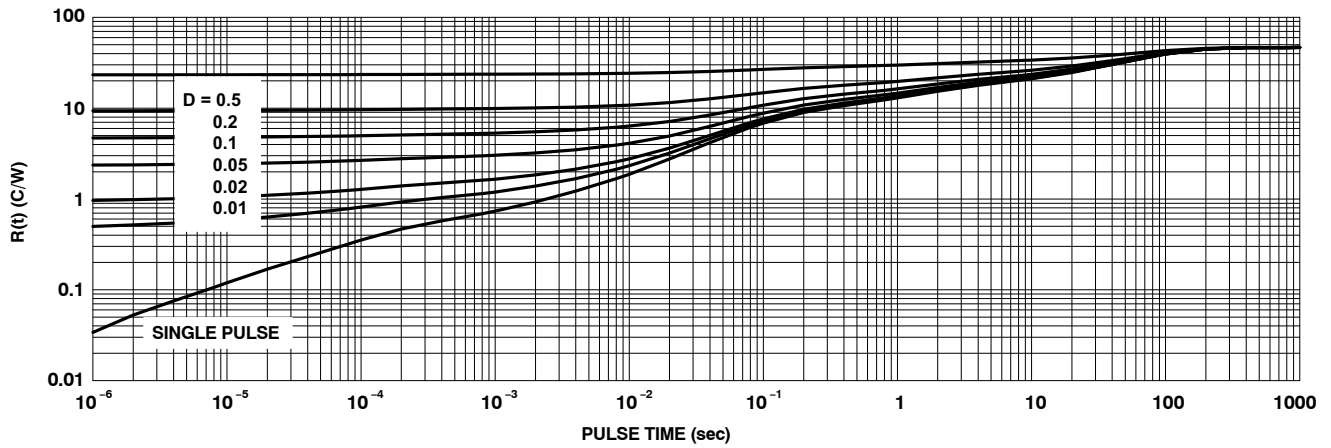


Figure 13. Junction-to-Case Transient Thermal Response Curve

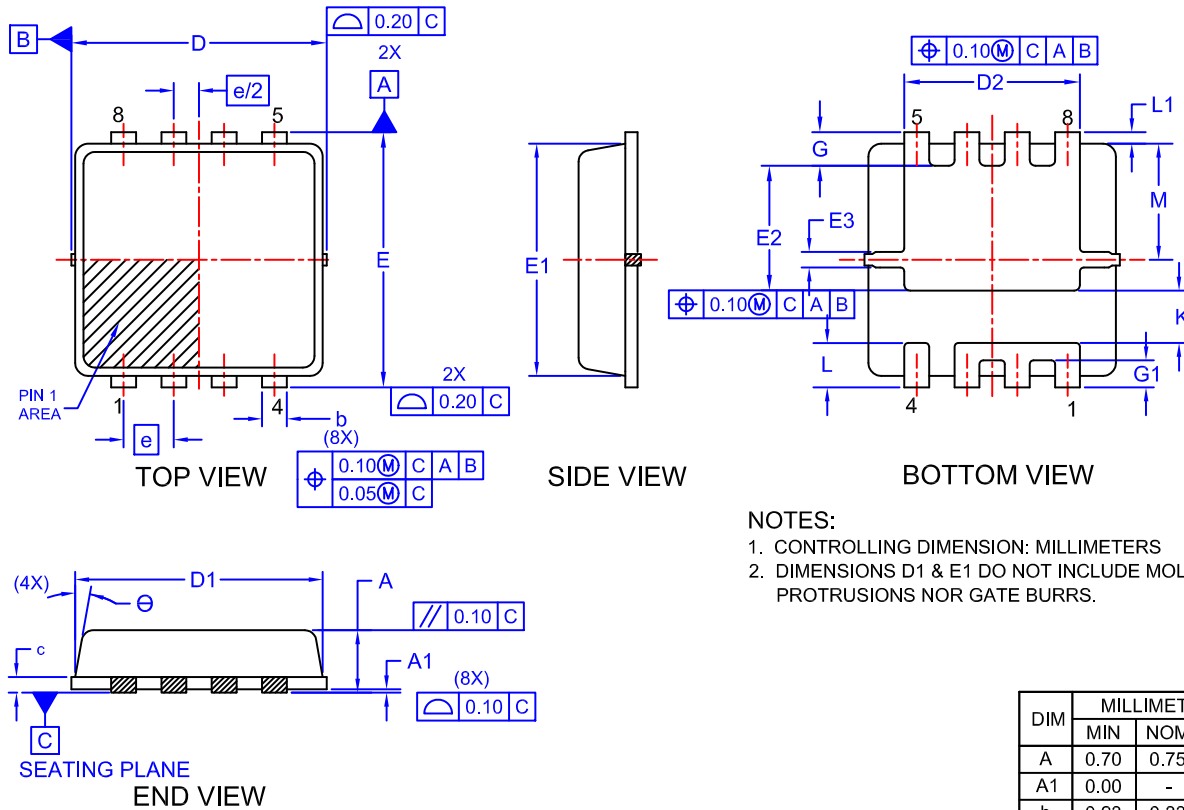
DEVICE ORDERING INFORMATION

| Device | Marking | Package | Shipping [†] |
|--------------------|---------|--------------------------------------|-----------------------|
| NVTFS010N10MCLTAG | N10L | WDFN8 (Pb-Free) | 1500 / Tape & Reel |
| NVTFWS010N10MCLTAG | N10W | WDFNW8 (Pb-Free, Wettable Flanks) | 1500 / 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.

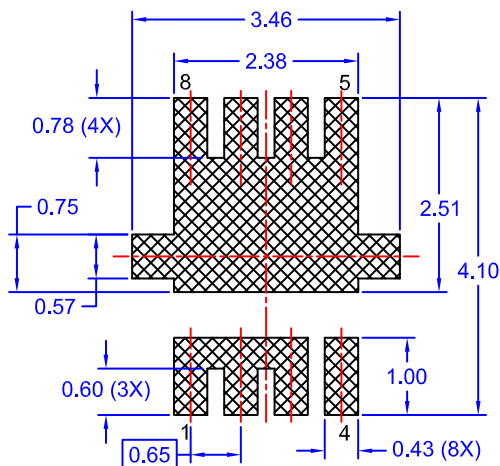
WDFN8 3.3x3.3, 0.65P
CASE 511DY
ISSUE A

DATE 21 AUG 2018

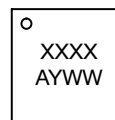


NOTES:

1. CONTROLLING DIMENSION: MILLIMETERS
2. DIMENSIONS D1 & E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS NOR GATE BURRS.



GENERIC MARKING DIAGRAM*



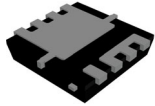
XXXX = Specific Device Code
A = Assembly Location
Y = Year Code
WW = Work Week Code

*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.

| DIM | MILLIMETERS | | |
|-----|-------------|------|------|
| | MIN | NOM | MAX |
| A | 0.70 | 0.75 | 0.80 |
| A1 | 0.00 | - | 0.05 |
| b | 0.23 | 0.33 | 0.43 |
| c | 0.15 | 0.20 | 0.25 |
| D | 3.20 | 3.30 | 3.40 |
| D1 | 2.95 | 3.13 | 3.30 |
| D2 | 1.98 | 2.20 | 2.40 |
| E | 3.20 | 3.30 | 3.40 |
| E1 | 2.80 | 3.00 | 3.15 |
| E2 | 1.40 | 1.60 | 1.80 |
| E3 | 0.15 | 0.25 | 0.40 |
| e | 0.65 BSC | | |
| G | 0.30 | 0.43 | 0.55 |
| G1 | 0.25 | 0.35 | 0.45 |
| K | 0.55 | 0.75 | 0.95 |
| L | 0.35 | 0.52 | 0.65 |
| L1 | 0.06 | 0.15 | 0.30 |
| M | 1.35 | 1.50 | 1.60 |
| θ | 0 | - | 12 |

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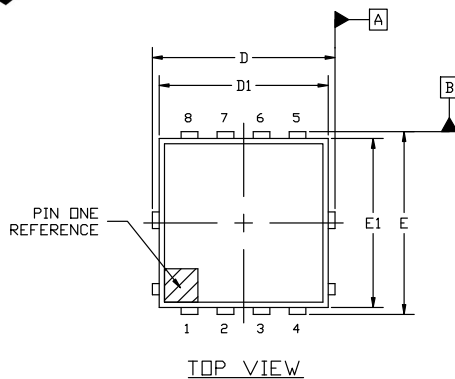
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CASE 515AP
ISSUE A

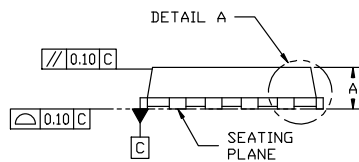
DATE 07 NOV 2023

NOTES:

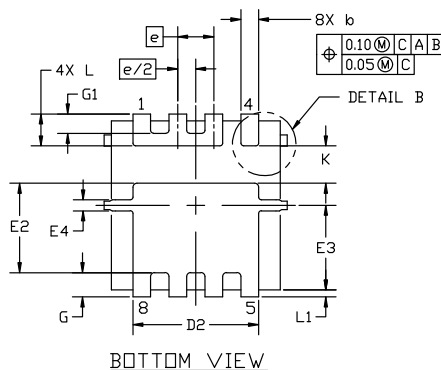
1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5-2018.
2. ALL DIMENSION ARE IN MILLIMETERS.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
4. FULL-CUT u8FL FUSED WF.



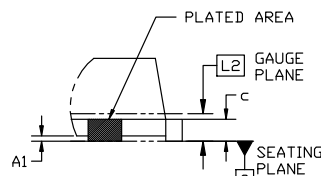
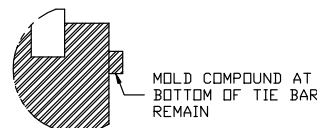
TOP VIEW



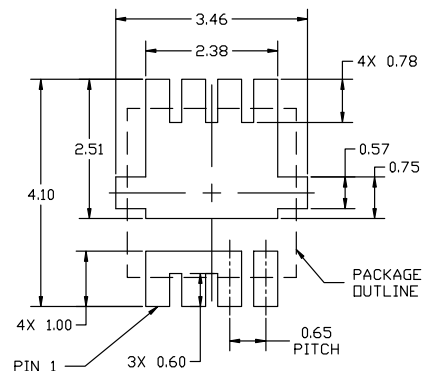
SIDE VIEW



BOTTOM VIEW


DETAIL "A"
SCALE 2:1

DETAIL "B"
SCALE 2:1

| DIM | MILLIMETERS | | |
|-----|-------------|------|------|
| | MIN. | NOM. | MAX. |
| A | 0.70 | 0.75 | 0.80 |
| A1 | 0.00 | ---- | 0.05 |
| b | 0.23 | 0.33 | 0.43 |
| c | 0.15 | 0.20 | 0.25 |
| D | 3.20 | 3.30 | 3.40 |
| D1 | 2.95 | 3.13 | 3.30 |
| D2 | 1.98 | 2.20 | 2.40 |
| E | 3.20 | 3.30 | 3.40 |
| E1 | 2.80 | 3.00 | 3.15 |
| E2 | 1.40 | 1.60 | 1.80 |
| E3 | 1.35 | 1.50 | 1.60 |
| E4 | 0.15 | 0.25 | 0.40 |
| e | 0.65 BSC | | |
| G | 0.30 | 0.43 | 0.55 |
| G1 | 0.25 | 0.35 | 0.45 |
| K | 0.55 | 0.75 | 0.95 |
| L | 0.35 | 0.52 | 0.65 |
| L1 | 0.06 | 0.15 | 0.30 |
| L2 | 0.25 BSC | | |



RECOMMENDED MOUNTING FOOTPRINT*

* FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERM/D.

GENERIC
MARKING DIAGRAM*


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

(Note: Microdot may be in either location)

*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.

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