

MOSFET - Power, Single N-Channel, SO8-FL

30 V, 0.52 mΩ, 464 A

NTMFS0D5N03C

Features

- Advanced Package (5x6mm) with Excellent Thermal Conduction
- Ultra Low $R_{DS(on)}$ to Improve System Efficiency
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- ORing
- Motor Drive
- Power Load Switch
- DC-DC Converters
- Battery Management and Protection

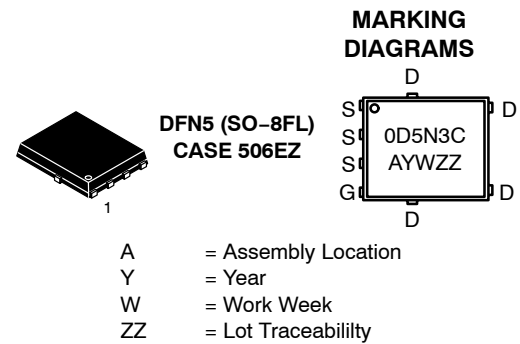
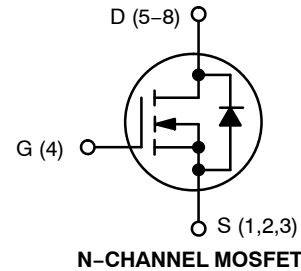
MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise stated)

| Parameter | | Symbol | Value | Unit | |
|---|--|---------------------------|-------------|------------------|---|
| Drain-to-Source Voltage | | V_{DSS} | 30 | V | |
| Gate-to-Source Voltage | | V_{GS} | ± 20 | V | |
| Continuous Drain Current $R_{\theta JC}$ (Note 2) | Steady State | $T_C = 25^\circ\text{C}$ | I_D | 464 | A |
| | | $T_C = 100^\circ\text{C}$ | | 328 | |
| Power Dissipation $R_{\theta JC}$ (Note 2) | | $T_C = 25^\circ\text{C}$ | P_D | 200 | W |
| Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2) | Steady State | $T_A = 25^\circ\text{C}$ | I_D | 65 | A |
| | | $T_A = 100^\circ\text{C}$ | | 46 | |
| Power Dissipation $R_{\theta JA}$ (Notes 1, 2) | | $T_A = 25^\circ\text{C}$ | P_D | 3.9 | W |
| Pulsed Drain Current | $T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$ | I_{DM} | 900 | A | |
| Source Current (Body Diode) | | I_S | 166 | A | |
| Single Pulse Drain-to-Source Avalanche Energy ($I_L = 96 \text{ A}_{pk}$) | | E_{AS} | 467 | mJ | |
| Operating Junction and Storage Temperature Range | | T_J, T_{STG} | -55 to +175 | $^\circ\text{C}$ | |
| 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. Surface-mounted on FR4 board using 1 in² pad, 2 oz Cu pad.
2. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.

| $V_{(BR)DSS}$ | $R_{DS(on)} \text{ MAX}$ | $I_D \text{ MAX}$ |
|---------------|--------------------------|-------------------|
| 30 V | 0.52 mΩ @ 10 V | 464 A |
| | 0.78 mΩ @ 4.5 V | |



ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 5 of this data sheet.

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THERMAL RESISTANCE MAXIMUM RATINGS

| Parameter | Symbol | Value | Unit |
|---|-----------------|-------|------|
| Junction-to-Case – Steady State (Note 1) | $R_{\theta JC}$ | 0.8 | °C/W |
| Junction-to-Ambient – Steady State (Note 1) | $R_{\theta JA}$ | 38 | |

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 | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$ | 30 | | | V |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | $I_D = 250\ \mu\text{A}$, ref to 25°C | | 11 | | mV/°C |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{GS} = 0\text{ V}, V_{DS} = 30\text{ V}$ | $T_J = 25^\circ\text{C}$ | | 1.0 | μA |
| | | | $T_J = 125^\circ\text{C}$ | | 100 | |
| Gate-to-Source Leakage Current | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = 20\text{ V}$ | | | 100 | nA |

ON CHARACTERISTICS (Note 3)

| | | | | | | |
|-----------------------------------|------------------|--|-----|------|------|------------|
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = 330\ \mu\text{A}$ | 1.3 | | 2.2 | V |
| Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | $I_D = 330\ \mu\text{A}$, ref to 25°C | | -5.9 | | mV/°C |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 30\text{ A}$ | | 0.43 | 0.52 | m Ω |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS} = 4.5\text{ V}, I_D = 30\text{ A}$ | | 0.62 | 0.78 | m Ω |
| Forward Transconductance | g_{FS} | $V_{DS} = 3\text{ V}, I_D = 30\text{ A}$ | | 208 | | S |
| Gate Resistance | R_G | $T_A = 25^\circ\text{C}$ | | 0.4 | | Ω |

CHARGES AND CAPACITANCES

| | | | | | | |
|------------------------------|--------------|--|--|-------|--|----|
| Input Capacitance | C_{ISS} | $V_{GS} = 0\text{ V}, V_{DS} = 15\text{ V}, f = 1\text{ MHz}$ | | 13000 | | pF |
| Output Capacitance | C_{OSS} | | | 6540 | | |
| Reverse Transfer Capacitance | C_{RSS} | | | 146 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}; I_D = 30\text{ A}$ | | 80 | | nC |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | 20 | | |
| Gate-to-Drain Charge | Q_{GD} | | | 13 | | |
| Gate-to-Source Charge | Q_{GS} | | | 33 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}; I_D = 30\text{ A}$ | | 178 | | nC |

SWITCHING CHARACTERISTICS (Note 4)

| | | | | | | |
|---------------------|--------------|--|--|-----|--|----|
| Turn-On Delay Time | $t_{d(ON)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}, I_D = 30\text{ A}, R_G = 3.0\ \Omega$ | | 29 | | ns |
| Rise Time | t_r | | | 13 | | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | | | 108 | | |
| Fall Time | t_f | | | 20 | | |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | | |
|-------------------------|----------|--|---------------------------|--|------|-----|----|
| Forward Diode Voltage | V_{SD} | $V_{GS} = 0\text{ V}, I_S = 30\text{ A}$ | $T_J = 25^\circ\text{C}$ | | 0.75 | 1.2 | V |
| | | | $T_J = 125^\circ\text{C}$ | | 0.58 | | |
| Reverse Recovery Time | t_{RR} | $V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, V_{DS} = 15\text{ V}, I_S = 30\text{ A}$ | | | 103 | | ns |
| Reverse Recovery Charge | Q_{RR} | | | | 160 | | 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.

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

4. Switching characteristics are independent of operating junction temperatures.

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TYPICAL CHARACTERISTICS

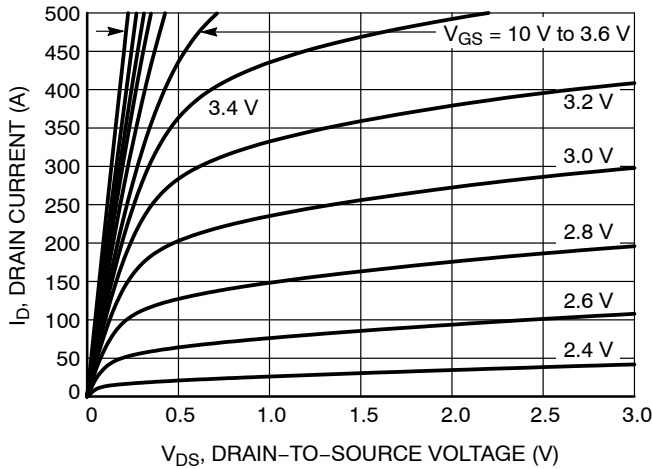


Figure 1. On-Region Characteristics

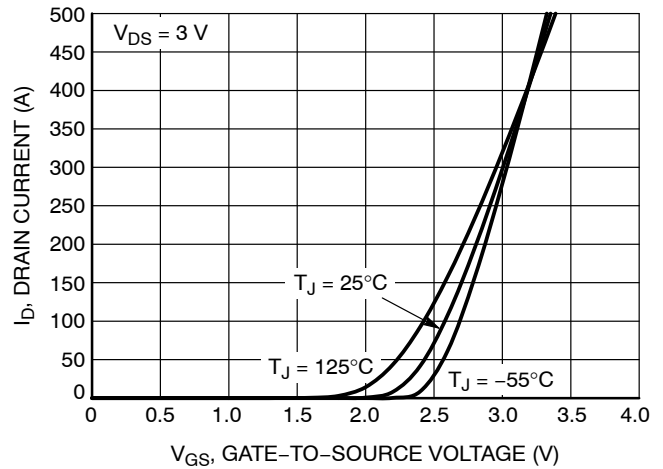


Figure 2. Transfer Characteristics

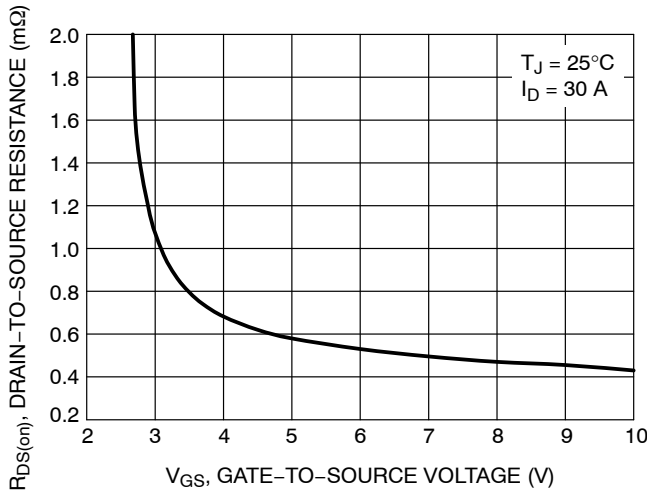


Figure 3. On-Resistance vs. Gate-to-Source Voltage

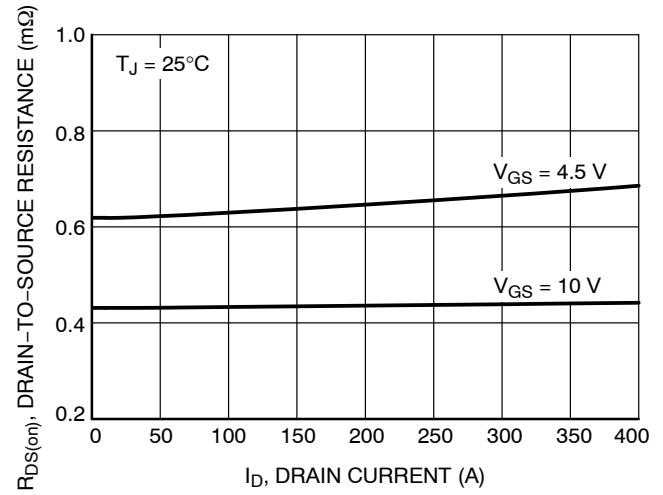


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

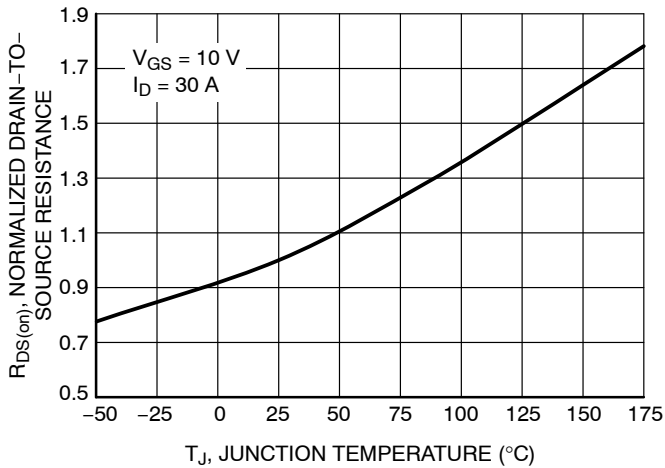


Figure 5. On-Resistance Variation with Temperature

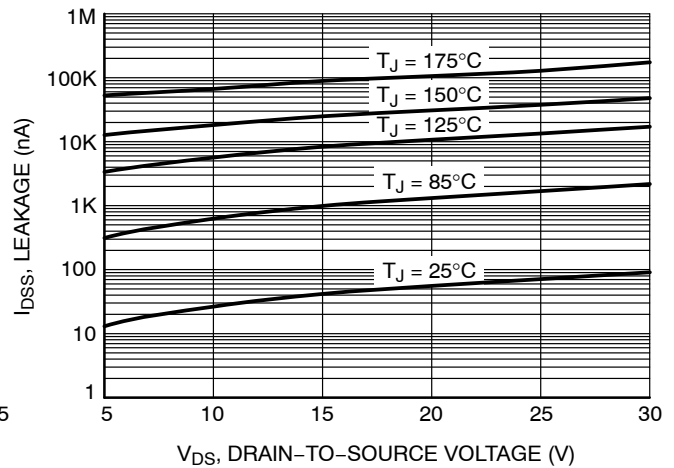


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS

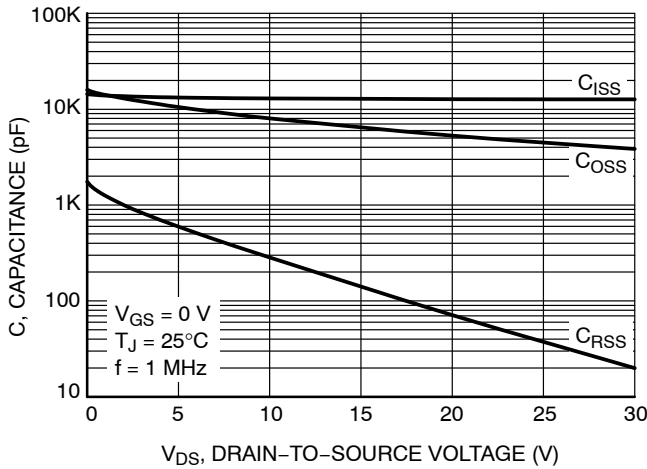


Figure 7. Capacitance Variation

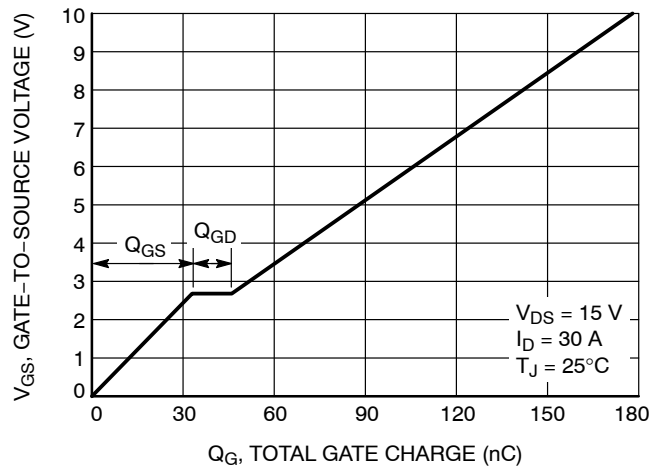


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

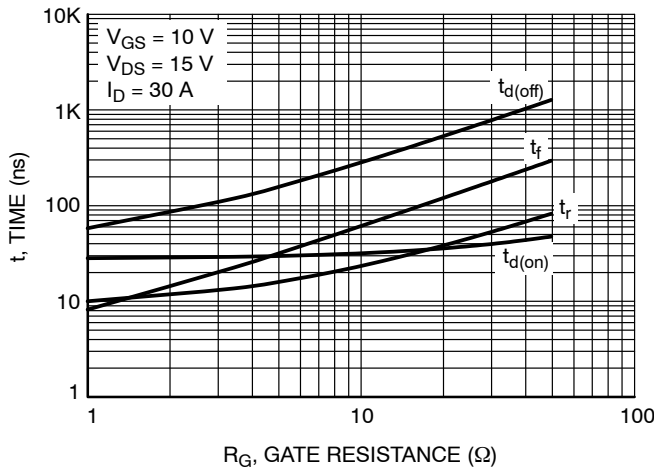


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

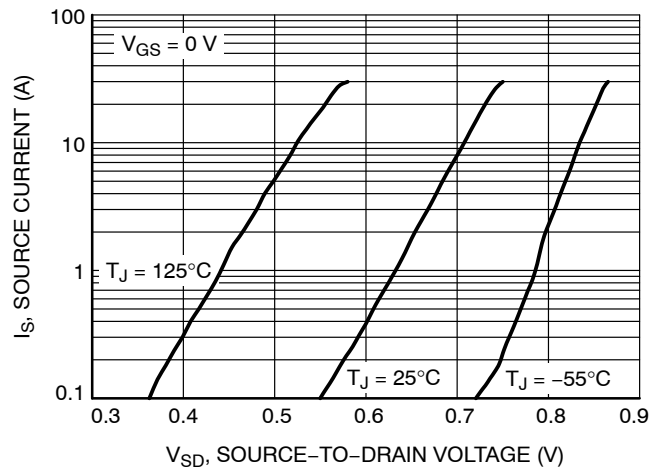


Figure 10. Diode Forward Voltage vs. Current

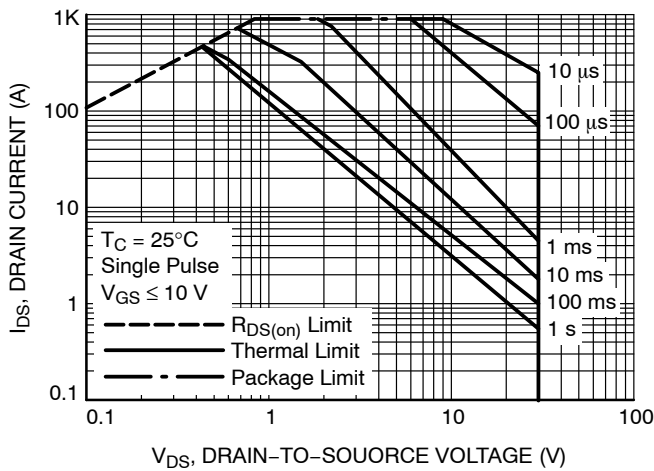


Figure 11. Safe Operating Area

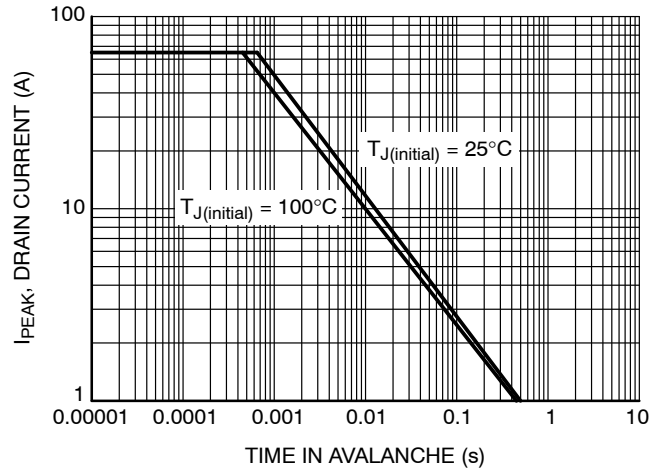


Figure 12. I_{PEAK} vs. Time in Avalanche

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TYPICAL CHARACTERISTICS

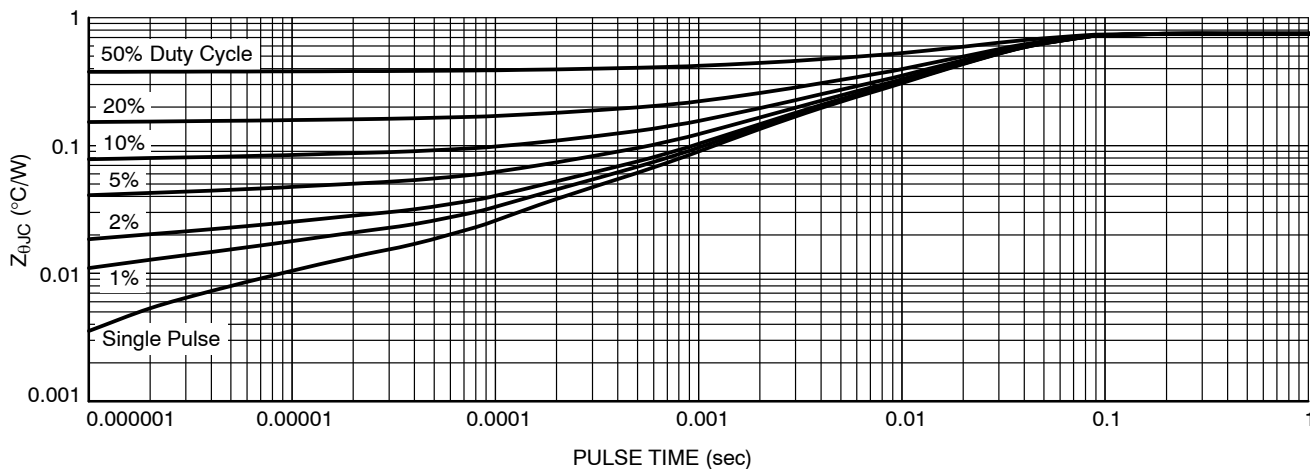


Figure 13. Thermal Characteristics

DEVICE ORDERING INFORMATION

| Device | Marking | Package | Shipping† |
|-----------------|---------|-------------------|--------------------|
| NTMFS0D5N03CT1G | 0D5N3C | DFN5 (Pb-Free) | 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.

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

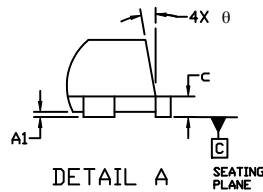
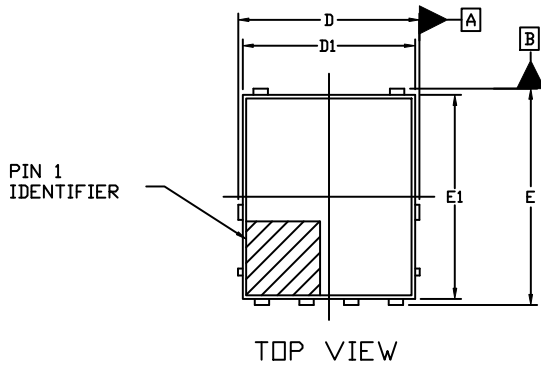
ON Semiconductor®



1
SCALE 2:1

DFN5 5x6, 1.27P (SO-8FL)
CASE 506EZ
ISSUE A

DATE 25 AUG 2021



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
 2. CONTROLLING DIMENSION: MILLIMETERS
 3. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| MILLIMETERS | | | |
|-------------|-----------|-------|------|
| DIM | MIN. | NOM. | MAX. |
| A | 0.90 | 1.00 | 1.10 |
| A1 | 0.00 | --- | 0.05 |
| b | 0.33 | 0.41 | 0.51 |
| c | 0.23 | 0.28 | 0.33 |
| D | 5.00 | 5.15 | 5.30 |
| D1 | 4.70 | 4.90 | 5.10 |
| D2 | 3.80 | 4.00 | 4.20 |
| E | 6.00 | 6.15 | 6.30 |
| E1 | 5.70 | 5.90 | 6.10 |
| E2 | 3.45 | 3.80 | 3.85 |
| e | 1.27 BSC | | |
| G | 0.51 | 0.575 | 0.71 |
| k | 1.10 | 1.20 | 1.40 |
| L | 0.51 | 0.575 | 0.71 |
| L1 | 0.125 REF | | |
| M | 3.00 | 3.40 | 3.80 |
| θ | 0° | --- | 12° |



GENERIC MARKING DIAGRAM*



- XXXXXX = Specific Device Code
- A = Assembly Location
- Y = Year
- W = Work Week
- ZZ = Lot Traceability

*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.

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.

| | | |
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| DESCRIPTION: | DFN5 5x6, 1.27P (SO-8FL) | PAGE 1 OF 1 |

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