

# MOSFET - Power, Single P-Channel, SO8-FL -30 V, 1.4 mΩ, -263 A

## NTMFS002P03P8Z

### Features

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

### Typical Applications

- Power Load Switch
- Protection: Reverse Current, Over Voltage, and Reverse Negative Voltage
- Battery Management

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

| Parameter                                                              |                                                            |                            | Symbol            | Value       | Unit               |
|------------------------------------------------------------------------|------------------------------------------------------------|----------------------------|-------------------|-------------|--------------------|
| Drain-to-Source Voltage                                                |                                                            |                            | $V_{DSS}$         | -30         | V                  |
| Gate-to-Source Voltage                                                 |                                                            |                            | $V_{GS}$          | $\pm 25$    | V                  |
| Continuous Drain Current $R_{\theta JC}$ (Notes 1, 2)                  | Steady State                                               | $T_C = 25^{\circ}\text{C}$ | $I_D$             | -263        | A                  |
|                                                                        |                                                            | $T_C = 85^{\circ}\text{C}$ |                   | -189        |                    |
| Power Dissipation $R_{\theta JC}$ (Notes 1, 2)                         |                                                            | $T_C = 25^{\circ}\text{C}$ | $P_D$             | 138.9       | W                  |
| Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2)                  | Steady State                                               | $T_A = 25^{\circ}\text{C}$ | $I_D$             | -40.2       | A                  |
|                                                                        |                                                            | $T_A = 85^{\circ}\text{C}$ |                   | -29         |                    |
| Power Dissipation $R_{\theta JA}$ (Notes 1, 2)                         |                                                            | $T_A = 25^{\circ}\text{C}$ | $P_D$             | 3.3         | W                  |
| Pulsed Drain Current                                                   | $T_A = 25^{\circ}\text{C}$ , $t_p = 10\text{ }\mu\text{s}$ |                            | $I_{DM}$          | -648        | A                  |
| Single Pulse Drain-to-Source Avalanche Energy ( $I_L=65.16\text{ A}$ ) |                                                            |                            | $E_{AS}$          | 212.3       | mJ                 |
| Operating Junction and Storage Temperature Range                       |                                                            |                            | $T_J$ , $T_{stg}$ | -55 to +150 | $^{\circ}\text{C}$ |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s)      |                                                            |                            | $T_L$             | 260         | $^{\circ}\text{C}$ |

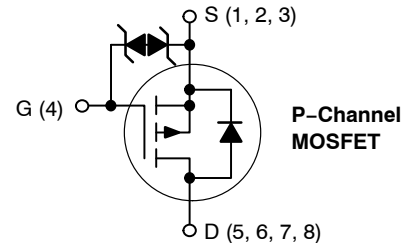
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL RESISTANCE MAXIMUM RATINGS

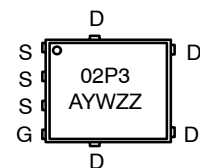
| Parameter                                        | Symbol          | Value | Unit               |
|--------------------------------------------------|-----------------|-------|--------------------|
| Junction-to-Case - Steady State (Drain) (Note 2) | $R_{\theta JC}$ | 0.9   | $^\circ\text{C/W}$ |
| Junction-to-Ambient - Steady State (Note 2)      | $R_{\theta JA}$ | 38.3  | $^\circ\text{C/W}$ |

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 1 in<sup>2</sup>, 2 oz. Cu pad. Assuming a 76 mm x 76 mm x 1.6 mm board.

| $V_{(BR)DSS}$ | $R_{DS(on)}$    | $I_D$  |
|---------------|-----------------|--------|
| -30 V         | 1.4 mΩ @ -10 V  | -263 A |
|               | 2.3 mΩ @ -4.5 V |        |



### MARKING DIAGRAM



- A = Assembly Location
- Y = Year
- W = Work Week
- ZZ = Lot Traceability

### ORDERING INFORMATION

| Device            | Package          | Shipping†          |
|-------------------|------------------|--------------------|
| NTMFS002P03P8ZT1G | SO8-FL (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 Specification Brochure, BRD8011/D.

# NTMFS002P03P8Z

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

| Parameter                                                 | Symbol                               | Test Condition                                                        | Min | Typ  | Max  | Unit  |
|-----------------------------------------------------------|--------------------------------------|-----------------------------------------------------------------------|-----|------|------|-------|
| <b>OFF CHARACTERISTICS</b>                                |                                      |                                                                       |     |      |      |       |
| Drain-to-Source Breakdown Voltage                         | V <sub>(BR)DSS</sub>                 | V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 μA                       | -30 |      |      | V     |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | V <sub>(BR)DSS</sub> /T <sub>J</sub> | I <sub>D</sub> = -250 μA, ref to 25°C                                 |     | -3.3 |      | mV/°C |
| Zero Gate Voltage Drain Current                           | I <sub>DSS</sub>                     | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = -24 V, T <sub>J</sub> = 25°C |     |      | -1.0 | μA    |
| Gate-to-Source Leakage Current                            | I <sub>GSS</sub>                     | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±25 V                        |     |      | ±10  | μA    |

## ON CHARACTERISTICS (Note 3)

|                                   |                                     |                                                              |      |     |      |       |
|-----------------------------------|-------------------------------------|--------------------------------------------------------------|------|-----|------|-------|
| Gate Threshold Voltage            | V <sub>GS(TH)</sub>                 | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = -250 μA | -1.0 |     | -3.0 | V     |
| Threshold Temperature Coefficient | V <sub>GS(TH)</sub> /T <sub>J</sub> | I <sub>D</sub> = -250 μA, ref to 25°C                        |      | 5.7 |      | mV/°C |
| Drain-to-Source On Resistance     | R <sub>DS(on)</sub>                 | V <sub>GS</sub> = -10 V, I <sub>D</sub> = -23 A              |      | 0.9 | 1.4  | mΩ    |
|                                   |                                     | V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -20 A             |      | 1.5 | 2.3  |       |
| Foward Transconductance           | g <sub>FS</sub>                     | V <sub>DS</sub> = -5 V, I <sub>D</sub> = -20 A               |      | 129 |      | S     |

## CHARGES AND CAPACITANCES

|                              |                     |                                                                           |  |       |  |    |
|------------------------------|---------------------|---------------------------------------------------------------------------|--|-------|--|----|
| Input Capacitance            | C <sub>iss</sub>    | V <sub>GS</sub> = 0 V, f = 1.0 MHz, V <sub>DS</sub> = -15 V               |  | 14950 |  | pF |
| Output Capacitance           | C <sub>oss</sub>    |                                                                           |  | 5280  |  |    |
| Reverse Transfer Capacitance | C <sub>rss</sub>    |                                                                           |  | 4870  |  |    |
| Total Gate Charge            | Q <sub>G(TOT)</sub> | V <sub>GS</sub> = -4.5 V, V <sub>DS</sub> = -15 V, I <sub>D</sub> = -23 A |  | 217   |  | nC |
| Threshold Gate Charge        | Q <sub>G(TH)</sub>  |                                                                           |  | 13    |  |    |
| Gate-to-Source Charge        | Q <sub>GS</sub>     |                                                                           |  | 35    |  |    |
| Gate-to-Drain Charge         | Q <sub>GD</sub>     |                                                                           |  | 145   |  |    |
| Total Gate Charge            | Q <sub>G(TOT)</sub> | V <sub>GS</sub> = -10 V, V <sub>DS</sub> = -15 V, I <sub>D</sub> = -23 A  |  | 365   |  |    |

## SWITCHING CHARACTERISTICS, V<sub>GS</sub> = 4.5 V (Note 3)

|                     |                     |                                                                                                 |  |     |  |    |
|---------------------|---------------------|-------------------------------------------------------------------------------------------------|--|-----|--|----|
| Turn-On Delay Time  | t <sub>d(on)</sub>  | V <sub>GS</sub> = -4.5 V, V <sub>DS</sub> = -15 V, I <sub>D</sub> = -23 A, R <sub>G</sub> = 6 Ω |  | 68  |  | ns |
| Rise Time           | t <sub>r</sub>      |                                                                                                 |  | 375 |  |    |
| Turn-Off Delay Time | t <sub>d(off)</sub> |                                                                                                 |  | 160 |  |    |
| Fall Time           | t <sub>f</sub>      |                                                                                                 |  | 317 |  |    |

## SWITCHING CHARACTERISTICS, V<sub>GS</sub> = 10 V (Note 3)

|                     |                     |                                                                                                |  |     |  |    |
|---------------------|---------------------|------------------------------------------------------------------------------------------------|--|-----|--|----|
| Turn-On Delay Time  | t <sub>d(on)</sub>  | V <sub>GS</sub> = -10 V, V <sub>DS</sub> = -15 V, I <sub>D</sub> = -23 A, R <sub>G</sub> = 6 Ω |  | 27  |  | ns |
| Rise Time           | t <sub>r</sub>      |                                                                                                |  | 78  |  |    |
| Turn-Off Delay Time | t <sub>d(off)</sub> |                                                                                                |  | 280 |  |    |
| Fall Time           | t <sub>f</sub>      |                                                                                                |  | 295 |  |    |

## DRAIN-SOURCE DIODE CHARACTERISTICS

|                         |                 |                                                                                  |                        |     |       |      |   |
|-------------------------|-----------------|----------------------------------------------------------------------------------|------------------------|-----|-------|------|---|
| Forward Diode Voltage   | V <sub>SD</sub> | V <sub>GS</sub> = 0 V,<br>I <sub>S</sub> = -23 A                                 | T <sub>J</sub> = 25°C  |     | -0.65 | -1.3 | V |
|                         |                 |                                                                                  | T <sub>J</sub> = 125°C |     | -0.48 |      |   |
| Reverse Recovery Time   | t <sub>RR</sub> | V <sub>GS</sub> = 0 V, dI <sub>S</sub> /dt = 100 A/μs,<br>I <sub>S</sub> = -23 A |                        | 82  |       | ns   |   |
| Charge Time             | t <sub>a</sub>  |                                                                                  |                        | 47  |       |      |   |
| Discharge Time          | t <sub>b</sub>  |                                                                                  |                        | 36  |       |      |   |
| Reverse Recovery Charge | Q <sub>RR</sub> |                                                                                  |                        | 180 |       | 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 ≤ 300 μs, Duty Cycle ≤ 2%.

TYPICAL CHARACTERISTICS

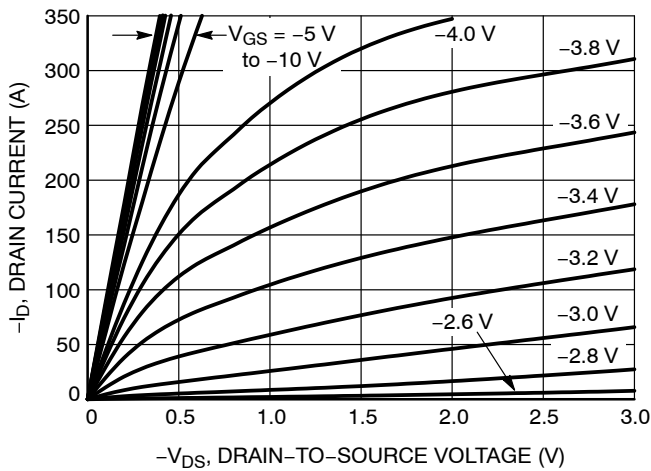


Figure 1. On-Region Characteristics

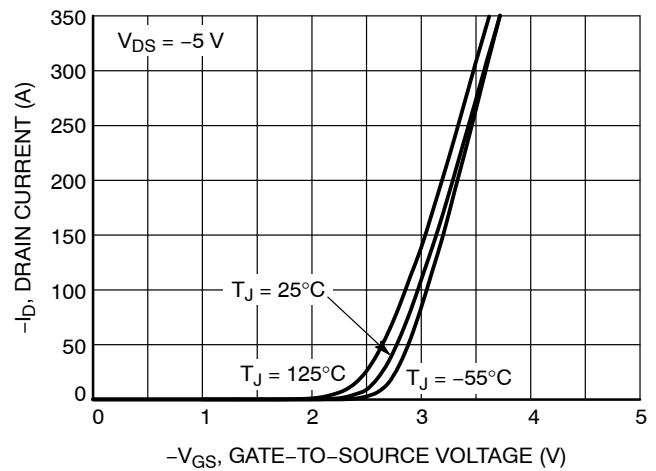


Figure 2. Transfer Characteristics

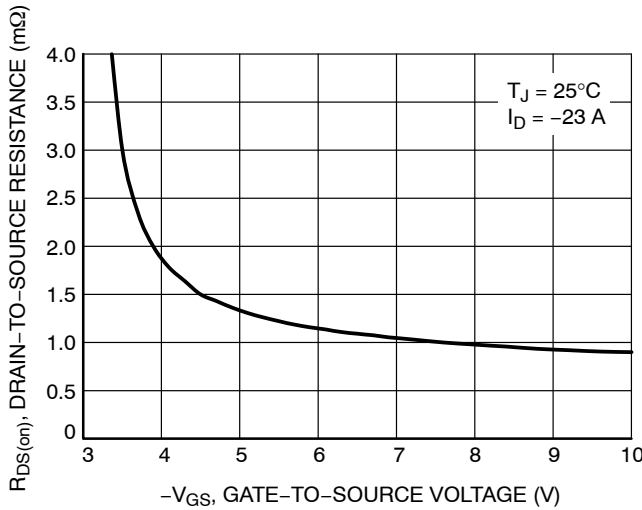


Figure 3. On-Resistance vs. Gate-to-Source Voltage

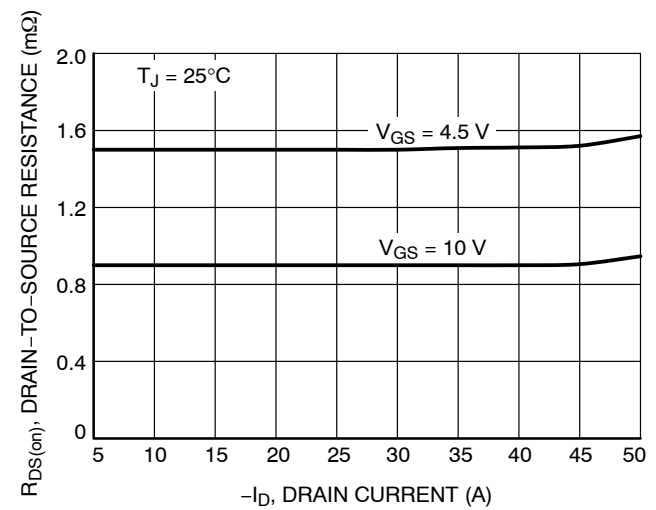


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

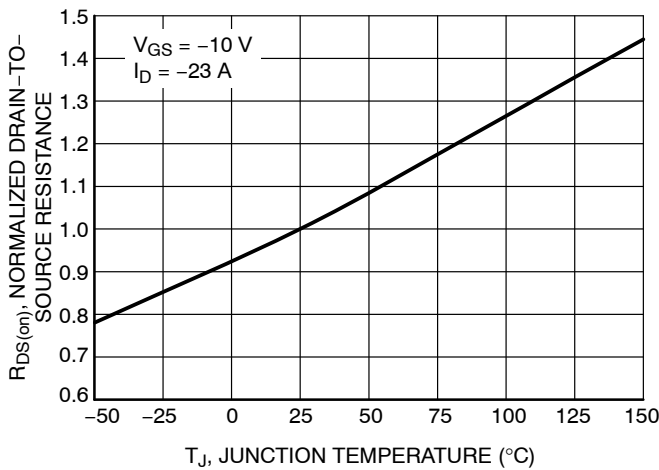


Figure 5. On-Resistance Variation with Temperature

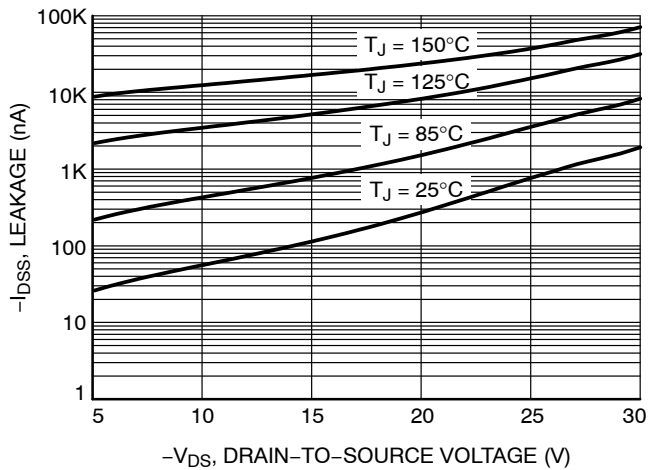


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

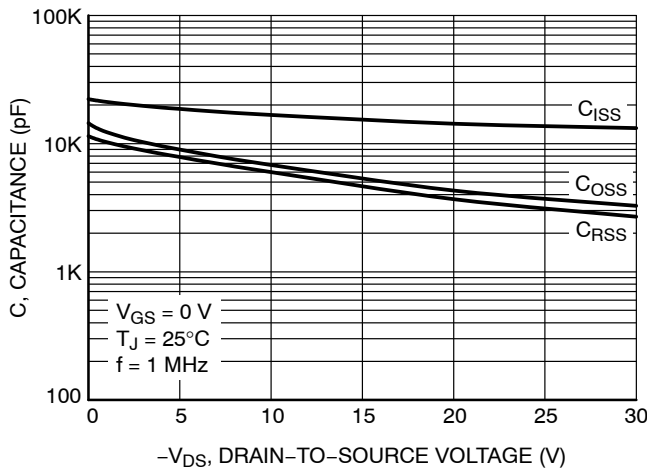


Figure 7. Capacitance Variation

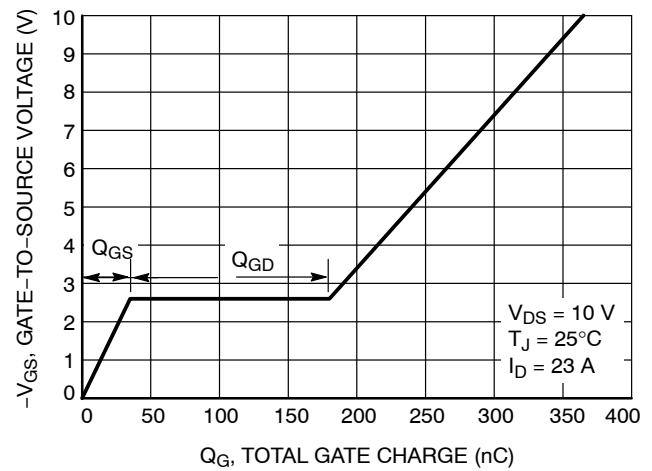


Figure 8. Gate-to-Source Voltage vs. Total Charge

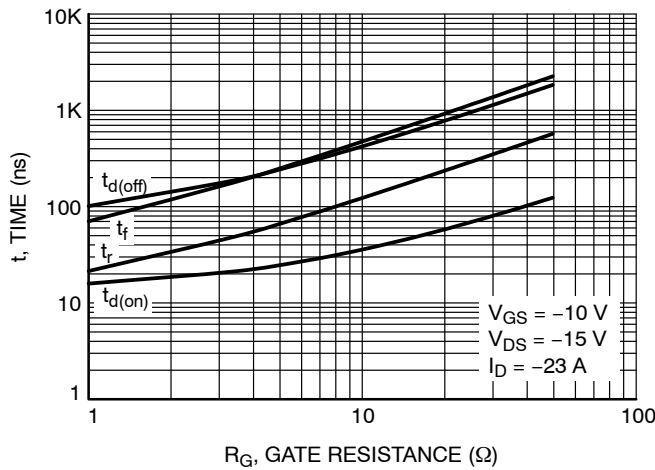


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

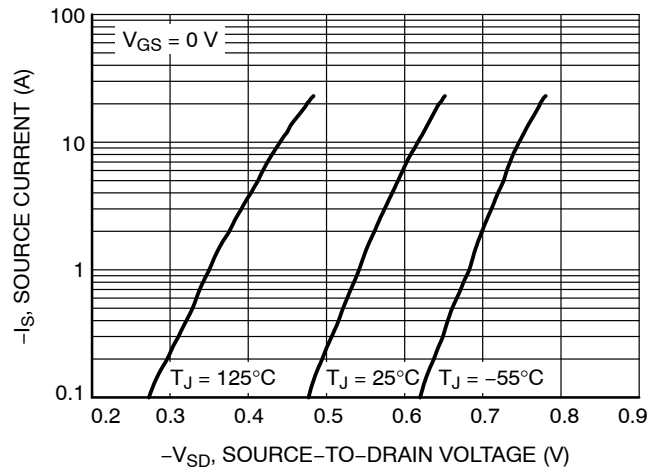


Figure 10. Diode Forward Voltage vs. Current

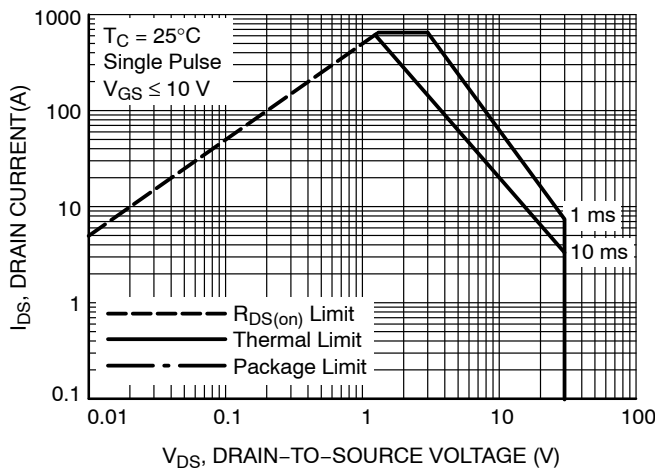


Figure 11. Maximum Rated Forward Biased Safe Operating Area

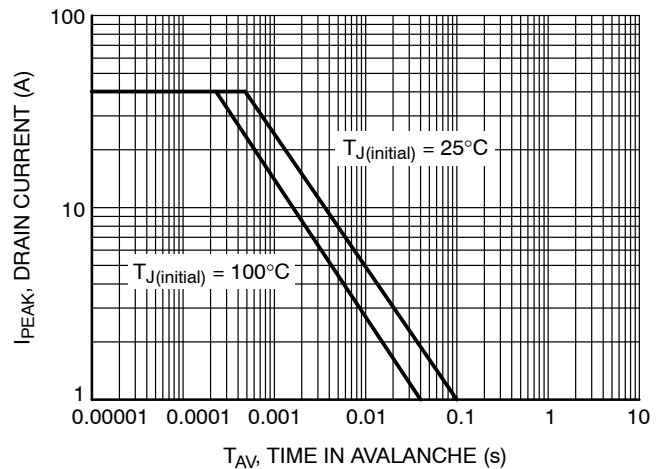


Figure 12.  $I_{PEAK}$  vs. Time in Avalanche

# NTMFS002P03P8Z

## TYPICAL CHARACTERISTICS

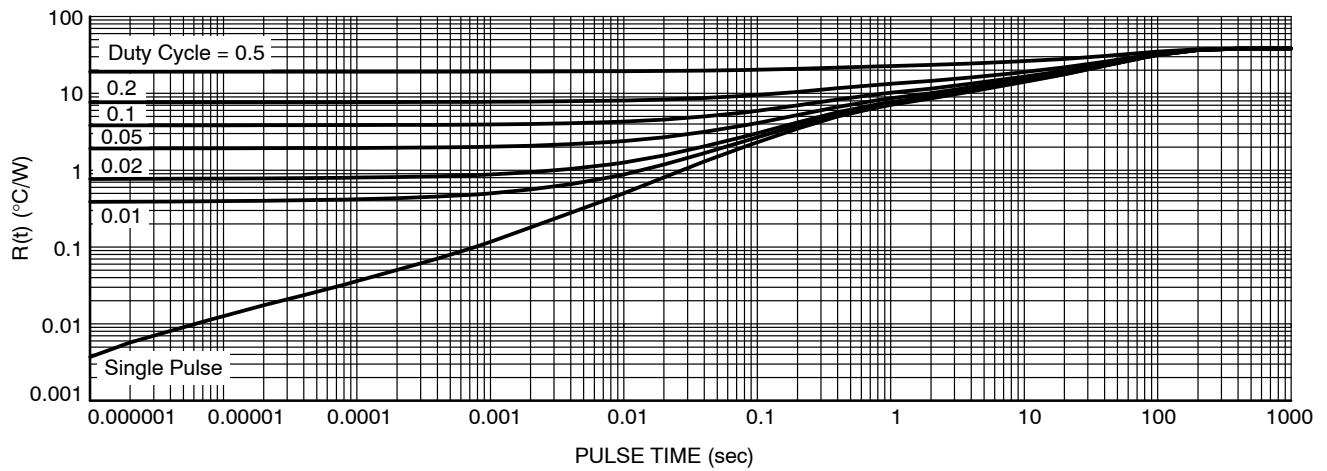


Figure 13. Thermal Characteristics

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

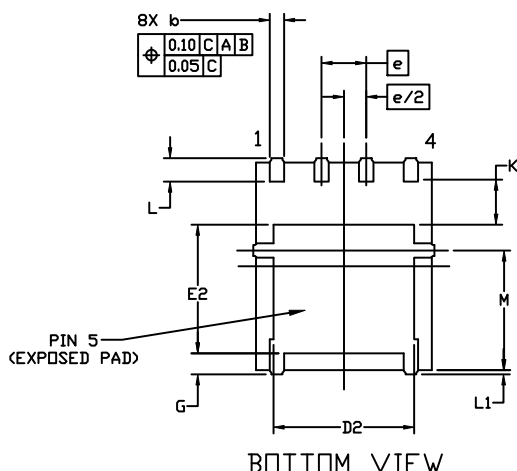
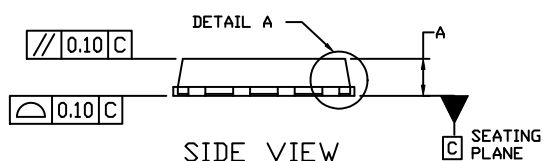
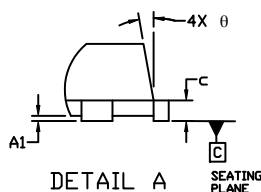
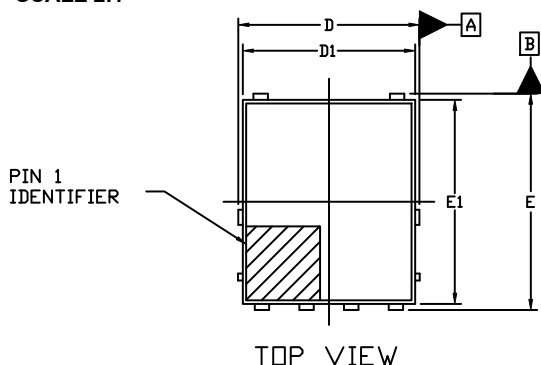
ON Semiconductor®



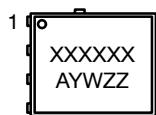
1  
SCALE 2:1

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

DATE 25 AUG 2021



### GENERIC MARKING DIAGRAM\*

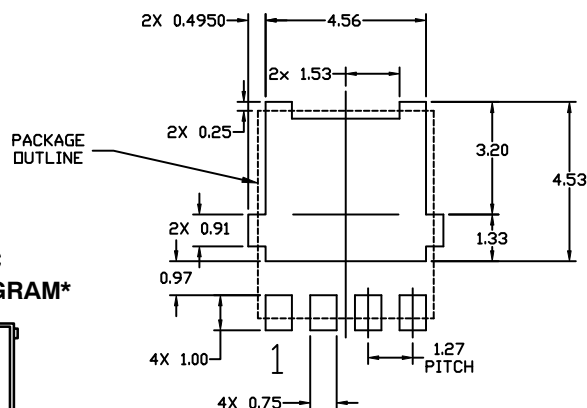


XXXXXX = Specific Device Code  
A = Assembly Location  
Y = Year  
W = Work Week  
ZZ = Lot Traceability

\*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.

- 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°  |



\* 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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