

# NTMFS4122N

## Power MOSFET

30 V, 23 A, Single N-Channel,  
SO-8 Flat Lead

### Features

- Low  $R_{DS(on)}$
- Low Inductance SO-8 Package
- These are Pb-Free Devices

### Applications

- Notebooks, Graphics Cards
- DC-DC Converters
- Synchronous Rectification

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

| Parameter                                                                                                                                                              |                        | Symbol         | Value                           | Unit             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|----------------|---------------------------------|------------------|
| Drain-to-Source Voltage                                                                                                                                                |                        | $V_{DS}$       | 30                              | V                |
| Gate-to-Source Voltage                                                                                                                                                 |                        | $V_{GS}$       | $\pm 20$                        | V                |
| Continuous Drain Current (Note 1)                                                                                                                                      | Steady State           | $I_D$          | $T_A = 25^\circ\text{C}$<br>14  | A                |
|                                                                                                                                                                        |                        |                | $T_A = 85^\circ\text{C}$<br>10  |                  |
|                                                                                                                                                                        | $t \leq 10 \text{ s}$  |                | $T_A = 25^\circ\text{C}$<br>23  |                  |
| Power Dissipation (Note 1)                                                                                                                                             | Steady State           | $P_D$          | $T_A = 25^\circ\text{C}$<br>2.2 | W                |
|                                                                                                                                                                        | $t \leq 10 \text{ s}$  |                | 5.8                             |                  |
| Continuous Drain Current (Note 2)                                                                                                                                      | Steady State           | $I_D$          | $T_A = 25^\circ\text{C}$<br>9.1 | A                |
|                                                                                                                                                                        |                        |                | $T_A = 85^\circ\text{C}$<br>6.5 |                  |
|                                                                                                                                                                        |                        |                | $T_A = 25^\circ\text{C}$<br>0.9 |                  |
| Power Dissipation (Note 2)                                                                                                                                             |                        | $P_D$          | 0.9                             | W                |
| Pulsed Drain Current                                                                                                                                                   | $t_p = 10 \mu\text{s}$ | $I_{DM}$       | 68                              | A                |
| Operating Junction and Storage Temperature                                                                                                                             |                        | $T_J, T_{stg}$ | -55 to 150                      | $^\circ\text{C}$ |
| Source Current (Body Diode)                                                                                                                                            |                        | $I_S$          | 7.0                             | A                |
| Single Pulse Drain-to-Source Avalanche Energy ( $V_{DD} = 30 \text{ V}$ , $V_{GS} = 10 \text{ V}$ , $I_{PK} = 21 \text{ A}$ , $L = 1 \text{ mH}$ , $R_G = 25 \Omega$ ) |                        | $E_{AS}$       | 220                             | mJ               |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s)                                                                                                      |                        | $T_L$          | 260                             | $^\circ\text{C}$ |

### THERMAL RESISTANCE MAXIMUM RATINGS

| Parameter                                            | Symbol          | Value | Unit               |
|------------------------------------------------------|-----------------|-------|--------------------|
| Junction-to-Ambient - Steady State (Note 1)          | $R_{\theta JA}$ | 56.3  | $^\circ\text{C/W}$ |
| Junction-to-Ambient - $t \leq 10 \text{ s}$ (Note 1) | $R_{\theta JA}$ | 21.5  |                    |
| Junction-to-Ambient - Steady State (Note 2)          | $R_{\theta JA}$ | 141.6 |                    |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

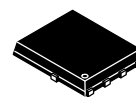
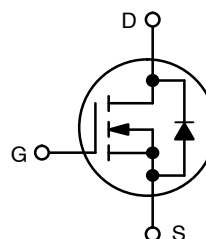
1. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).
2. Surface mounted on FR4 board using the minimum recommended pad size (Cu area = 0.0264 in sq).



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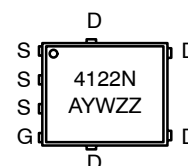
<http://onsemi.com>

| $V_{(BR)DSS}$ | $R_{DS(on)}$ TYP       | $I_D$ MAX (Note 1) |
|---------------|------------------------|--------------------|
| 30 V          | 4.6 m $\Omega$ @ 10 V  | 23 A               |
|               | 6.3 m $\Omega$ @ 4.5 V |                    |



SO-8 FLAT LEAD  
CASE 488AA  
STYLE 1

### MARKING DIAGRAM



4122N = Specific Device Code  
A = Assembly Location  
Y = Year  
W = Work Week  
ZZ = Lot Traceability

### ORDERING INFORMATION

| Device        | Package           | Shipping†        |
|---------------|-------------------|------------------|
| NTMFS4122NT1G | SO-8 FL (Pb-Free) | 1500 Tape & Reel |
| NTMFS4122NT3G | SO-8 FL (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 Specification Brochure, BRD8011/D.

# NTMFS4122N

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

| Characteristic                                            | Symbol            | Test Condition                                      | Min                       | Typ | Max | Unit                 |
|-----------------------------------------------------------|-------------------|-----------------------------------------------------|---------------------------|-----|-----|----------------------|
| <b>OFF CHARACTERISTICS</b>                                |                   |                                                     |                           |     |     |                      |
| Drain-to-Source Breakdown Voltage                         | $V_{(BR)DSS}$     | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$ | 30                        |     |     | V                    |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ |                                                     |                           | 23  |     | mV/ $^\circ\text{C}$ |
| Zero Gate Voltage Drain Current                           | $I_{DSS}$         | $V_{GS} = 0\text{ V}, V_{DS} = 24\text{ V}$         | $T_J = 25^\circ\text{C}$  |     | 1.0 | $\mu\text{A}$        |
|                                                           |                   |                                                     | $T_J = 125^\circ\text{C}$ |     | 10  |                      |
| 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                     | $V_{GS(TH)}$     | $V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$ | 1.0 |      | 2.5 | V                    |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ |                                                 |     | 6.6  |     | mV/ $^\circ\text{C}$ |
| Drain-to-Source On Resistance              | $R_{DS(on)}$     | $V_{GS} = 10\text{ V}, I_D = 14\text{ A}$       |     | 4.6  | 6.0 | m $\Omega$           |
|                                            |                  | $V_{GS} = 4.5\text{ V}, I_D = 12\text{ A}$      |     | 6.3  | 8.5 |                      |
| Forward Transconductance                   | $g_{FS}$         | $V_{DS} = 15\text{ V}, I_D = 10\text{ A}$       |     | 13.2 |     | S                    |

## CHARGES, CAPACITANCES AND GATE RESISTANCE

|                              |              |                                                                  |  |      |    |          |
|------------------------------|--------------|------------------------------------------------------------------|--|------|----|----------|
| Input Capacitance            | $C_{ISS}$    | $V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 24\text{ V}$  |  | 2310 |    | pF       |
| Output Capacitance           | $C_{OSS}$    |                                                                  |  | 460  |    |          |
| Reverse Transfer Capacitance | $C_{RSS}$    |                                                                  |  | 263  |    |          |
| Total Gate Charge            | $Q_{G(TOT)}$ | $V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 12\text{ A}$ |  | 20   | 30 | nC       |
| Threshold Gate Charge        | $Q_{G(TH)}$  |                                                                  |  | 3.0  |    |          |
| Gate-to-Source Charge        | $Q_{GS}$     |                                                                  |  | 6.7  |    |          |
| Gate-to-Drain Charge         | $Q_{GD}$     |                                                                  |  | 8.1  |    |          |
| Gate Resistance              | $R_G$        |                                                                  |  | 0.7  |    | $\Omega$ |

## SWITCHING CHARACTERISTICS (Note 4)

|                     |              |                                                                                                                         |  |    |  |    |
|---------------------|--------------|-------------------------------------------------------------------------------------------------------------------------|--|----|--|----|
| Turn-On Delay Time  | $t_{d(ON)}$  | $V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V},$<br>$I_D = 1.0\text{ A}, R_L = 15\text{ }\Omega, R_G = 3.0\text{ }\Omega$ |  | 20 |  | ns |
| Rise Time           | $t_r$        |                                                                                                                         |  | 20 |  |    |
| Turn-Off Delay Time | $t_{d(OFF)}$ |                                                                                                                         |  | 30 |  |    |
| Fall Time           | $t_f$        |                                                                                                                         |  | 31 |  |    |

## DRAIN-SOURCE DIODE CHARACTERISTICS

|                         |                 |                                                                                  |                        |  |      |     |    |
|-------------------------|-----------------|----------------------------------------------------------------------------------|------------------------|--|------|-----|----|
| Forward Diode Voltage   | V <sub>SD</sub> | V <sub>GS</sub> = 0 V, I <sub>S</sub> = 7.0 A                                    | T <sub>J</sub> = 25°C  |  | 0.75 | 1.0 | V  |
|                         |                 |                                                                                  | T <sub>J</sub> = 125°C |  | 0.6  |     |    |
| 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> = 7.0 A |                        |  | 28   |     | ns |
| Charge Time             | t <sub>a</sub>  |                                                                                  |                        |  | 14   |     |    |
| Discharge Time          | t <sub>b</sub>  |                                                                                  |                        |  | 14   |     |    |
| Reverse Recovery Charge | Q <sub>RR</sub> |                                                                                  |                        |  | 23   |     | nC |

3. Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

4. Switching characteristics are independent of operating junction temperatures.

TYPICAL PERFORMANCE CURVES

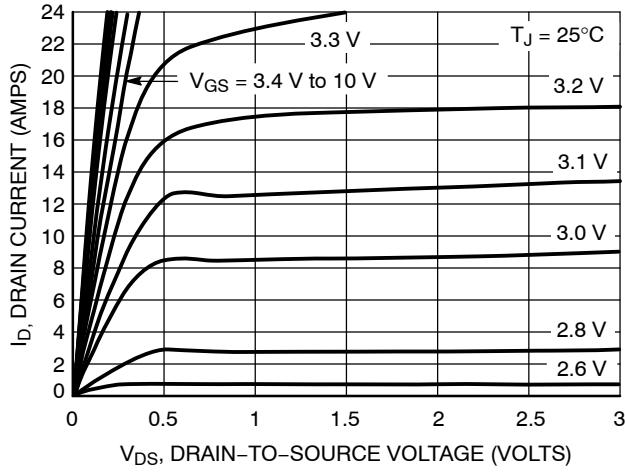


Figure 1. On-Region Characteristics

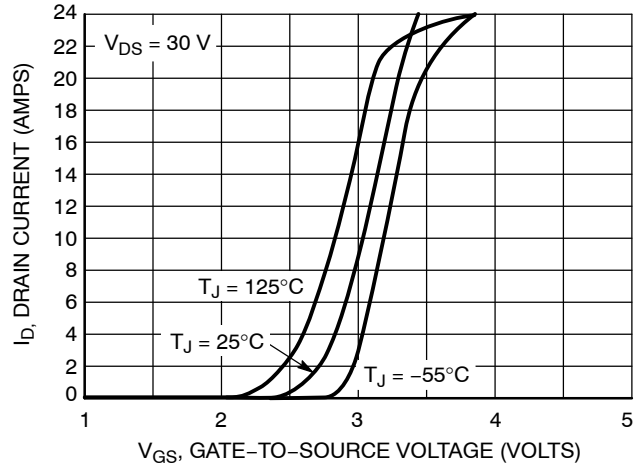


Figure 2. Transfer Characteristics

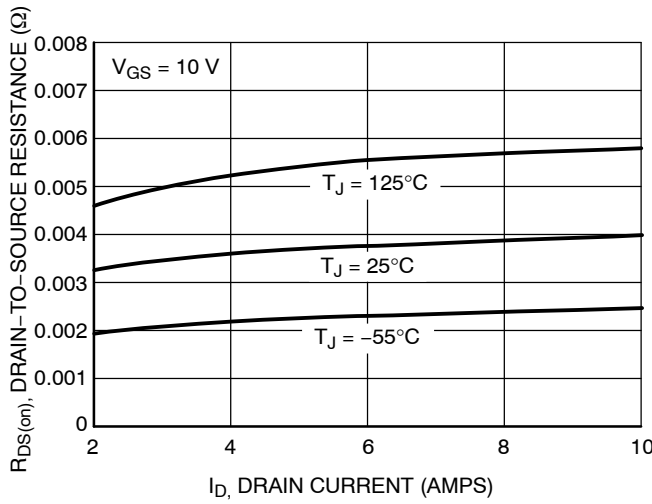


Figure 3. On-Resistance vs. Drain Current

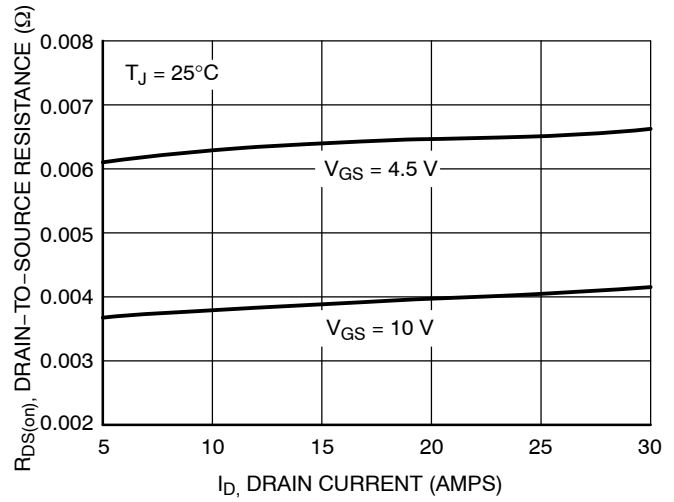


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

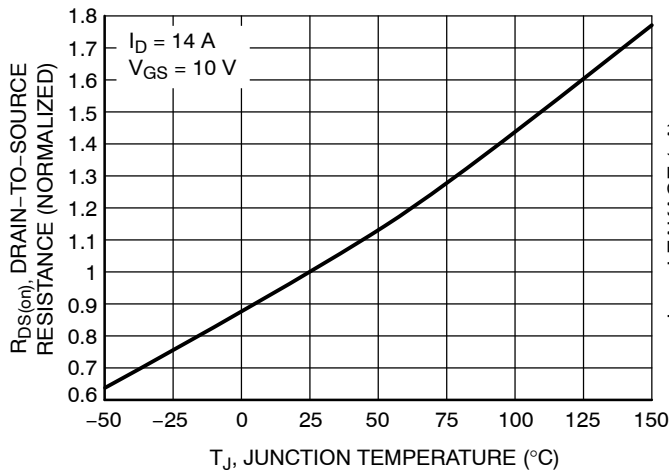


Figure 5. On-Resistance Variation with Temperature

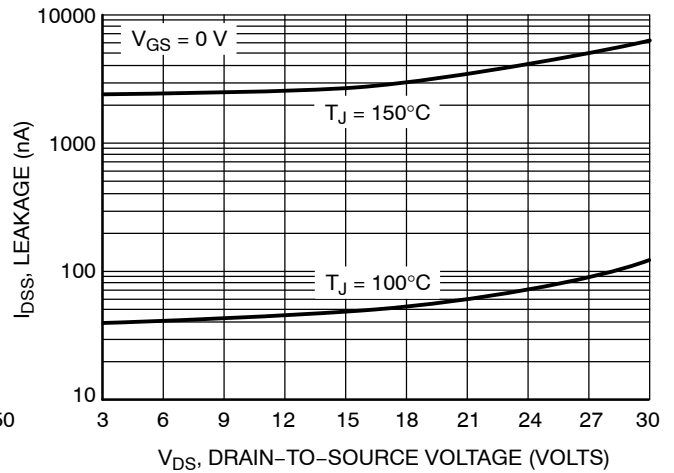


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CURVES

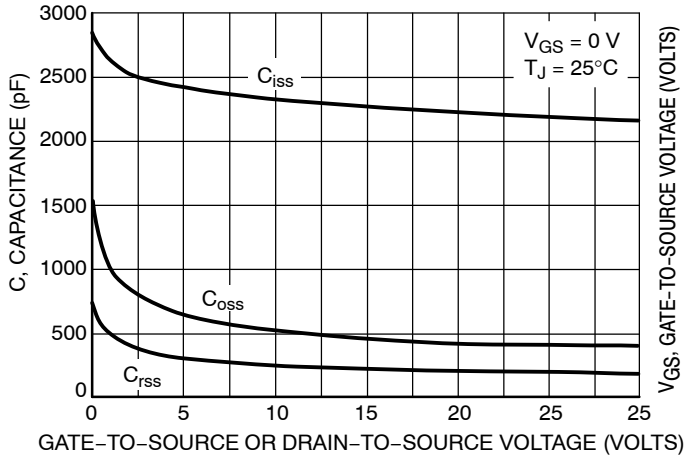


Figure 7. Capacitance Variation

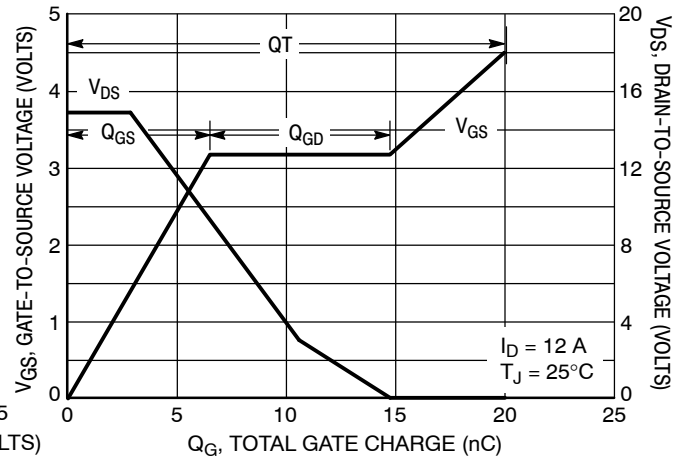


Figure 8. Gate-To-Source and Drain-To-Source Voltage vs. Total Charge

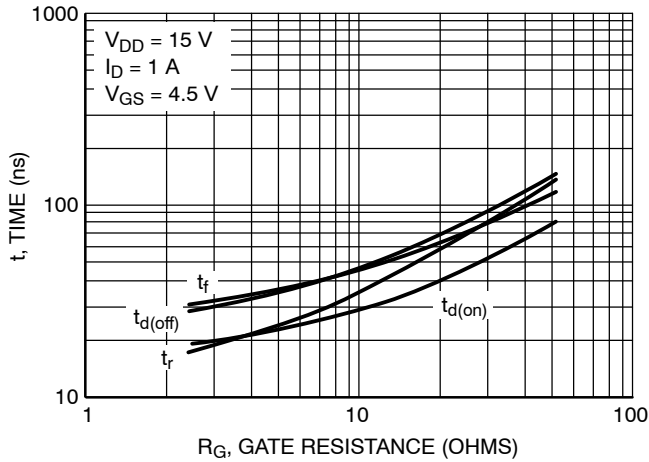


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

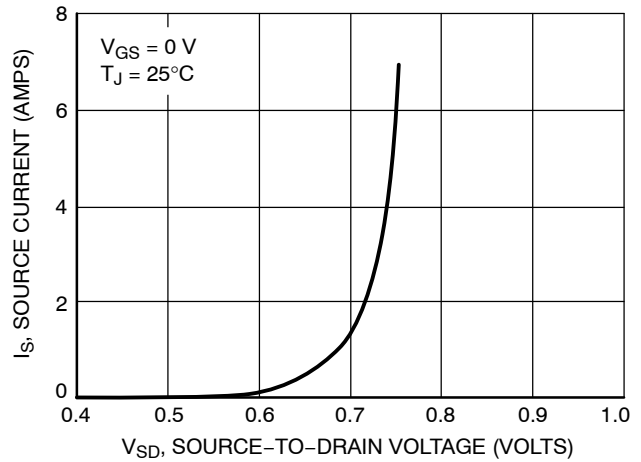


Figure 10. Diode Forward Voltage vs. Current

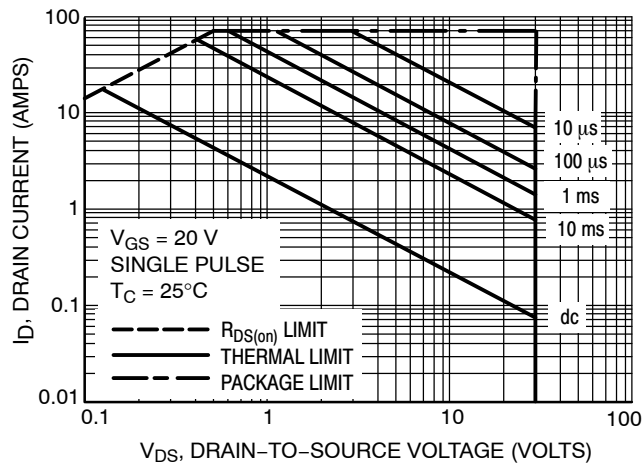
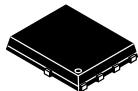


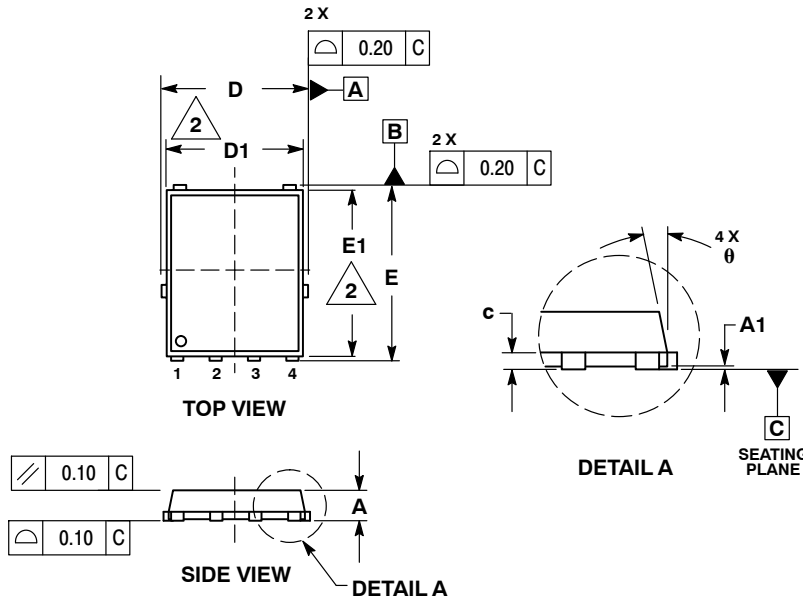
Figure 11. Maximum Rated Forward Biased Safe Operating Area



SCALE 2:1

**DFN5 5x6, 1.27P**  
**(SO-8FL)**  
**CASE 488AA**  
**ISSUE N**

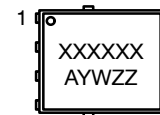
DATE 25 JUN 2018



## NOTES:

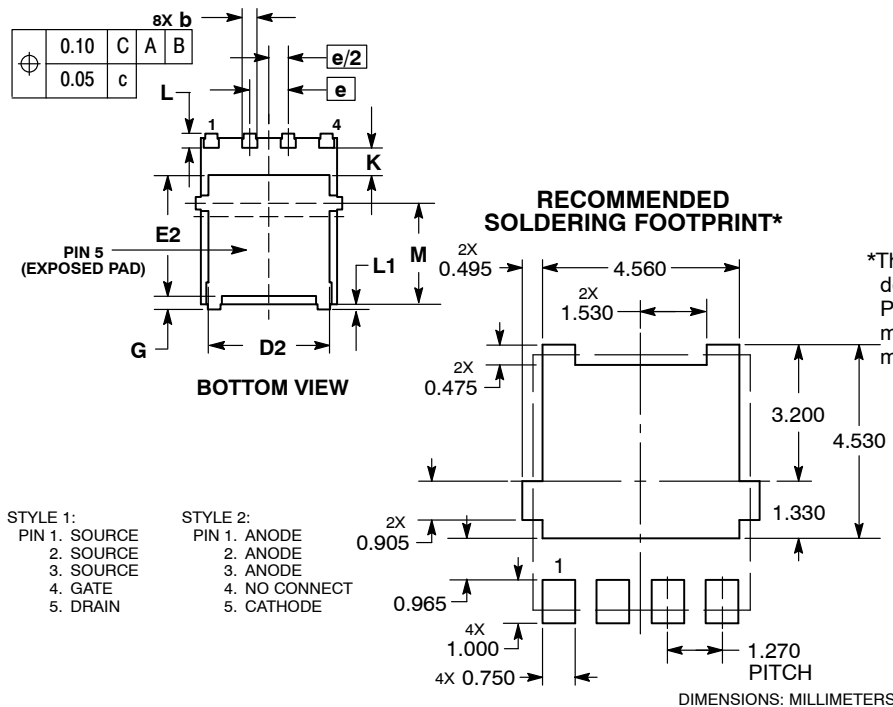
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

| DIM | MILLIMETERS |       |      |
|-----|-------------|-------|------|
|     | 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        | 3.65  | 3.85 |
| e   | 1.27 BSC    |       |      |
| G   | 0.51        | 0.575 | 0.71 |
| K   | 1.20        | 1.35  | 1.50 |
| 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.



\*For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

|                         |                                 |                                                                                                                                                                                  |
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