

# NVMFD5853N, NVMFD5853NWF

## MOSFET – Dual N-Channel, Dual SO-8FL 40 V, 10 mΩ, 53 A

### Features

- Small Footprint (5x6 mm) for Compact Designs
- Low  $R_{DS(on)}$  to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- NVMFD5853NWF – Wettable Flanks Product
- AEC-Q101 Qualified and PPAP Capable
- This is a Pb-Free and Halogen-Free Device

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

| Parameter  | Symbol   | Value                     | Unit             |   |
|--|--|---------------------------|------------------|---|
| Drain-to-Source Voltage  | $V_{DSS}$                                      | 40                        | V                |   |
| Gate-to-Source Voltage   | $V_{GS}$                                       | $\pm 20$                  | V                |   |
| Continuous Drain Current $R_{\theta JC}$<br>(Notes 1, 2, 3)  | Steady State                                   | $T_C = 25^\circ\text{C}$  | $I_D$ 53         | A |
|  |  | $T_C = 100^\circ\text{C}$ | 37               |   |
| Power Dissipation $R_{\theta JC}$<br>(Notes 1, 2)  | Steady State                                   | $T_C = 25^\circ\text{C}$  | $P_D$ 58         | W |
|  |  | $T_C = 100^\circ\text{C}$ | 29               |   |
| Continuous Drain Current $R_{\theta JA}$<br>(Notes 1, 2 & 3)   | Steady State                                   | $T_A = 25^\circ\text{C}$  | $I_D$ 12         | A |
|  |  | $T_A = 100^\circ\text{C}$ | 8.7              |   |
| Power Dissipation $R_{\theta JA}$<br>(Notes 1 & 2)   | Steady State                                   | $T_A = 25^\circ\text{C}$  | $P_D$ 3.1        | W |
|  |  | $T_A = 100^\circ\text{C}$ | 1.6              |   |
| Pulsed Drain Current   | $T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$ | $I_{DM}$ 165              | A                |   |
| Operating Junction and Storage Temperature   | $T_J, T_{stg}$                                 | -55 to 175                | $^\circ\text{C}$ |   |
| Source Current (Body Diode)  | $I_S$  | 53                        | A                |   |
| Single Pulse Drain-to-Source Avalanche Energy ( $T_J = 25^\circ\text{C}, I_{L(pk)} = 28.3 \text{ A}, L = 0.1 \text{ mH}$ ) | $E_{AS}$                                       | 40                        | mJ               |   |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s)  | $T_L$  | 260                       | $^\circ\text{C}$ |   |

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.

### THERMAL RESISTANCE MAXIMUM RATINGS (Note 1)

| Parameter                                   | Symbol          | Value | Unit                      |
|---|-----------------|-------|---------------------------|
| Junction-to-Case – Steady State (Note 2)    | $R_{\theta JC}$ | 2.6   | $^\circ\text{C}/\text{W}$ |
| Junction-to-Ambient – Steady State (Note 2) | $R_{\theta JA}$ | 48    |                           |

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 mm<sup>2</sup>, 2 oz. Cu pad.
3. Continuous DC current rating. Maximum current for pulses as long as 1 second are higher but are dependent on pulse duration and duty cycle.

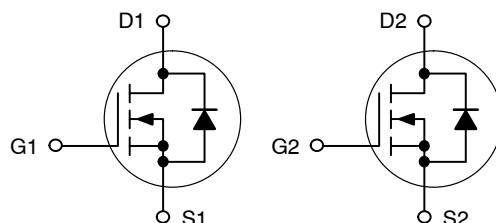


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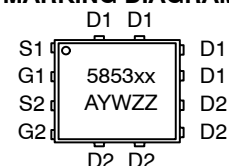
| $V_{(BR)DSS}$ | $R_{DS(on)}$ MAX | $I_D$ MAX |
|---------------|------------------|-----------|
| 40 V          | 10 mΩ @ 10 V     | 53 A      |

### Dual N-Channel



DFN8 5x6  
(SO8FL)  
CASE 506BT

### MARKING DIAGRAM



5853N = NVMFD5853N  
5853WF = NVMFD5853NWF  
A = Assembly Location  
Y = Year  
W = Work Week  
ZZ = Lot Traceability

### ORDERING INFORMATION

| Device          | Package           | Shipping†             |
|-----------------|-------------------|-----------------------|
| NVMFD5853NT1G   | DFN8<br>(Pb-Free) | 1500 / Tape &<br>Reel |
| NVMFD5853NWFT1G | DFN8<br>(Pb-Free) | 1500 / Tape &<br>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.

# NVMFD5853N, NVMFD5853NWF

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

| Parameter   | Symbol            | Test Condition                                  | Min                       | Typ  | Max       | Unit          |
|---|-------------------|---|---------------------------|------|-----------|---------------|
| <b>OFF CHARACTERISTICS</b>                                |                   |   |                           |      |           |               |
| Drain-to-Source Breakdown Voltage                         | $V_{(BR)DSS}$     | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$   | 40                        |      |           | V             |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ |   |                           | 41.5 |           | mV/°C         |
| Zero Gate Voltage Drain Current                           | $I_{DSS}$         | $V_{GS} = 0\text{ V}, V_{DS} = 40\text{ V}$     | $T_J = 25^\circ\text{C}$  |      | 1.0       | $\mu\text{A}$ |
|   |                   |   | $T_J = 125^\circ\text{C}$ |      | 100       |               |
| Gate-to-Source Leakage Current                            | $I_{GSS}$         | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$ |                           |      | $\pm 100$ | nA            |

## ON CHARACTERISTICS (Note 4)

|                                   |                  |   |     |      |     |            |
|-----------------------------------|------------------|---|-----|------|-----|------------|
| Gate Threshold Voltage            | $V_{GS(TH)}$     | $V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$ | 2.0 |      | 4.0 | V          |
| Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ |   |     | -7.2 |     | mV/°C      |
| Drain-to-Source On Resistance     | $R_{DS(on)}$     | $V_{GS} = 10\text{ V}, I_D = 15\text{ A}$ |     | 8.4  | 10  | m $\Omega$ |
| Forward Transconductance          | $g_{FS}$         | $V_{DS} = 5\text{ V}, I_D = 15\text{ A}$  |     | 44   |     | S          |

## CHARGES AND CAPACITANCES

|                              |              |   |  |      |  |    |
|------------------------------|--------------|---|--|------|--|----|
| Input Capacitance            | $C_{iss}$    | $V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 25\text{ V}$ |  | 1225 |  | pF |
| Output Capacitance           | $C_{oss}$    |   |  | 150  |  |    |
| Reverse Transfer Capacitance | $C_{rss}$    |   |  | 100  |  |    |
| Total Gate Charge            | $Q_{G(TOT)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 32\text{ V}, I_D = 15\text{ A}$ |  | 24   |  | nC |
| Threshold Gate Charge        | $Q_{G(TH)}$  |   |  | 1.5  |  |    |
| Gate-to-Source Charge        | $Q_{GS}$     |   |  | 5.2  |  |    |
| Gate-to-Drain Charge         | $Q_{GD}$     |   |  | 6.6  |  |    |
| Plateau Voltage              | $V_{GP}$     |   |  | 4.1  |  | V  |

## SWITCHING CHARACTERISTICS (Note 5)

|                     |              |  |  |    |  |    |
|---------------------|--------------|--|--|----|--|----|
| Turn-On Delay Time  | $t_{d(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 20\text{ V}, I_D = 15\text{ A}, R_G = 2.5\ \Omega$ |  | 9  |  | ns |
| Rise Time           | $t_r$        |  |  | 20 |  |    |
| Turn-Off Delay Time | $t_{d(off)}$ |  |  | 21 |  |    |
| Fall Time           | $t_f$        |  |  | 3  |  |    |

## DRAIN-SOURCE DIODE CHARACTERISTICS

|                         |          |  |                           |      |     |    |
|-------------------------|----------|--|---------------------------|------|-----|----|
| Forward Diode Voltage   | $V_{SD}$ | $V_{GS} = 0\text{ V}, I_S = 15\text{ A}$                                     | $T_J = 25^\circ\text{C}$  | 0.82 | 1.1 | V  |
|                         |          |  | $T_J = 125^\circ\text{C}$ | 0.72 |     |    |
| Reverse Recovery Time   | $t_{RR}$ | $V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, I_S = 15\text{ A}$ |                           | 16   |     | ns |
| Charge Time             | $t_a$    |  |                           | 10   |     |    |
| Discharge Time          | $t_b$    |  |                           | 6    |     |    |
| Reverse Recovery Charge | $Q_{RR}$ |  |                           | 9    |     | nC |

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

5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

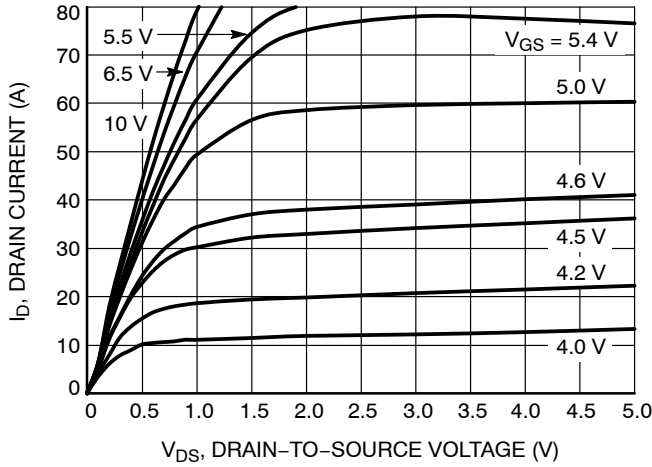


Figure 1. On-Region Characteristics

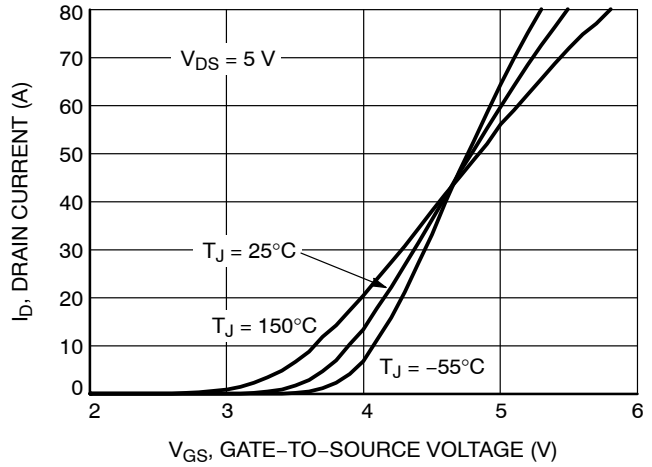


Figure 2. Transfer Characteristics

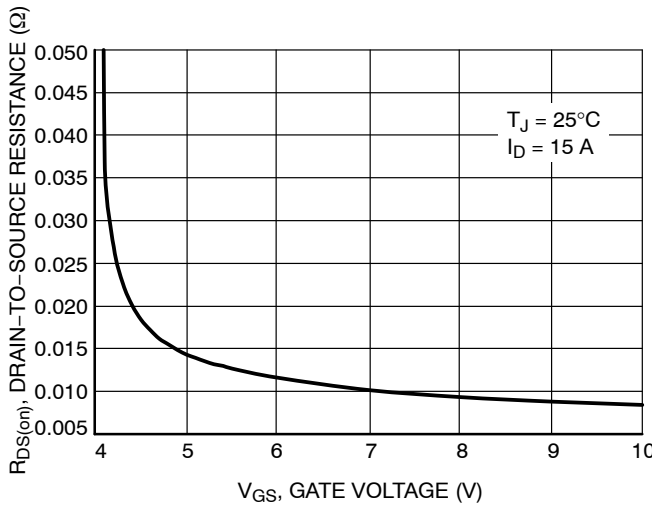


Figure 3. On-Resistance vs. Gate-to-Source Voltage

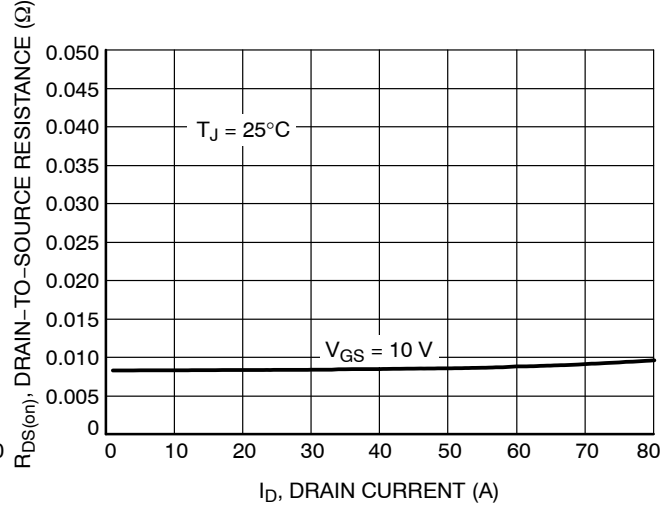


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

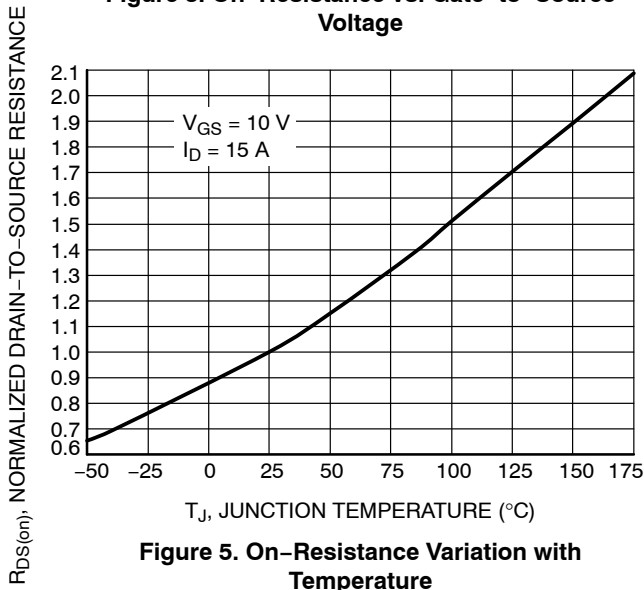


Figure 5. On-Resistance Variation with Temperature

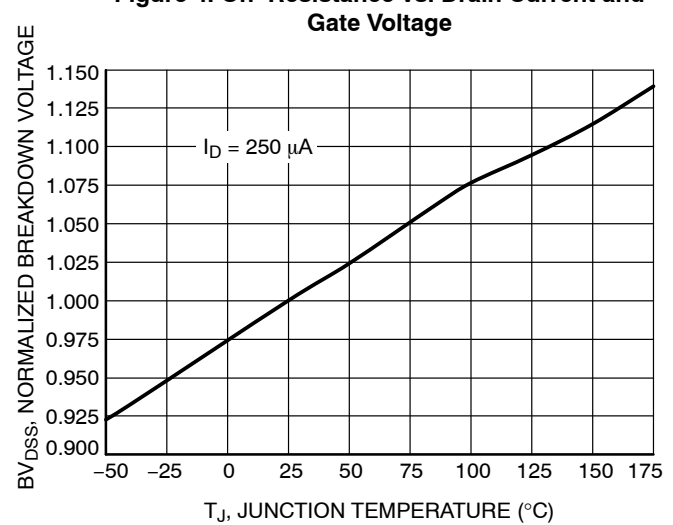


Figure 6. Breakdown Voltage Variation with Temperature

TYPICAL CHARACTERISTICS

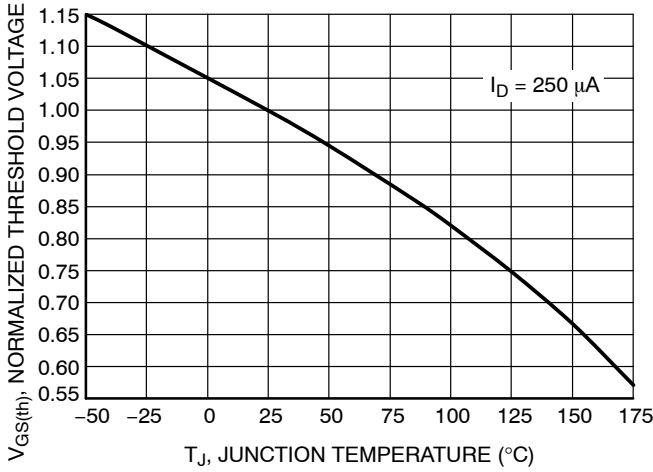


Figure 7. Threshold Voltage Variation with Temperature

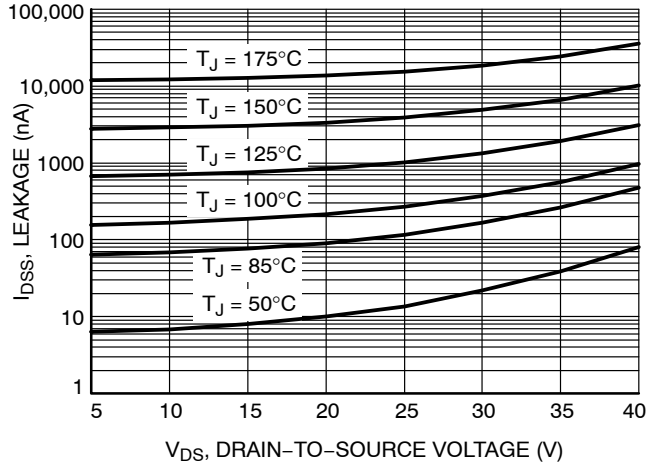


Figure 8. Drain-to-Source Leakage Current vs. Voltage

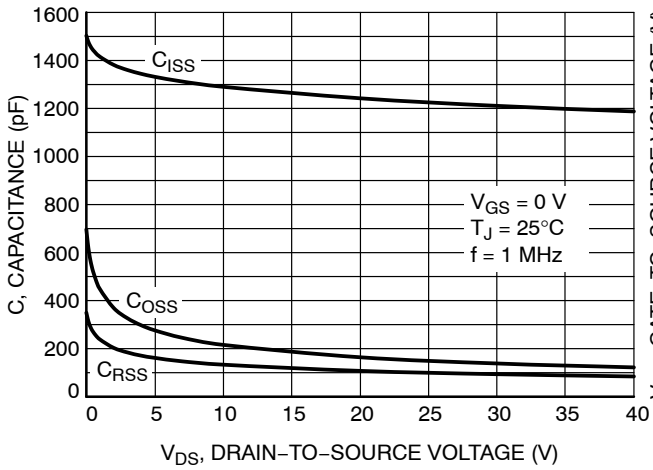


Figure 9. Capacitance Variation

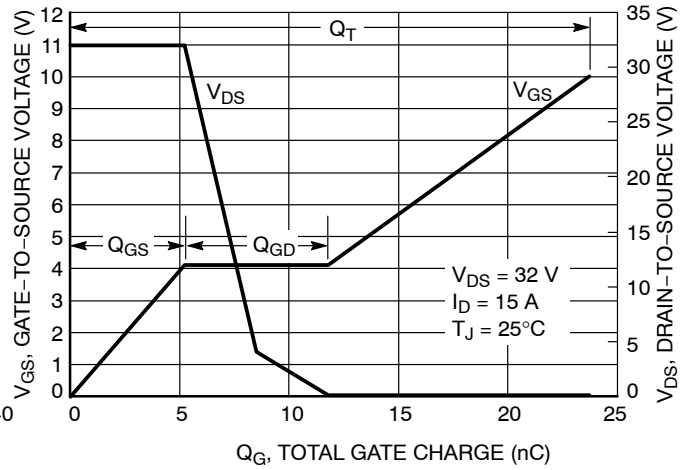


Figure 10. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

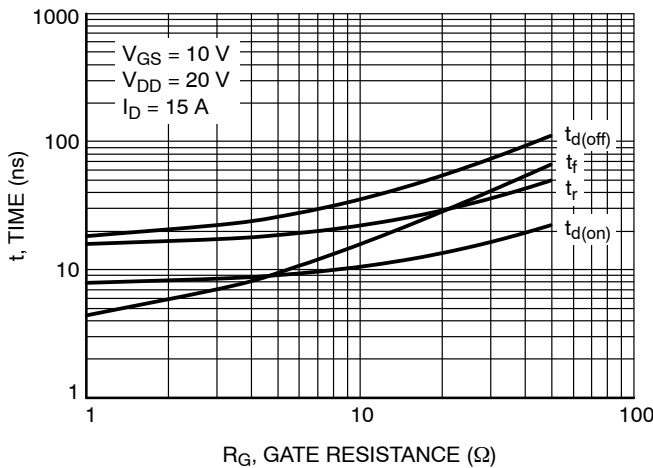


Figure 11. Resistive Switching Time Variation vs. Gate Resistance

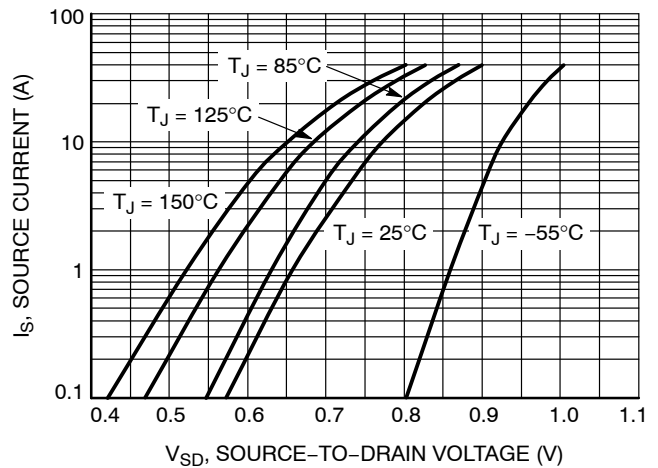


Figure 12. Diode Forward Voltage vs. Current

TYPICAL CHARACTERISTICS

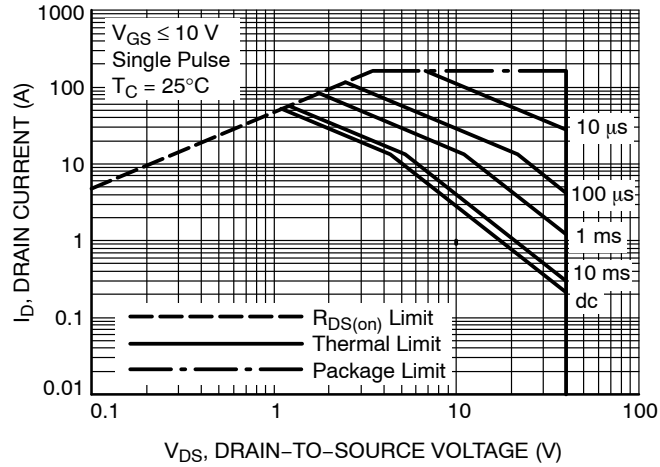


Figure 13. Maximum Rated Forward Biased Safe Operating Area

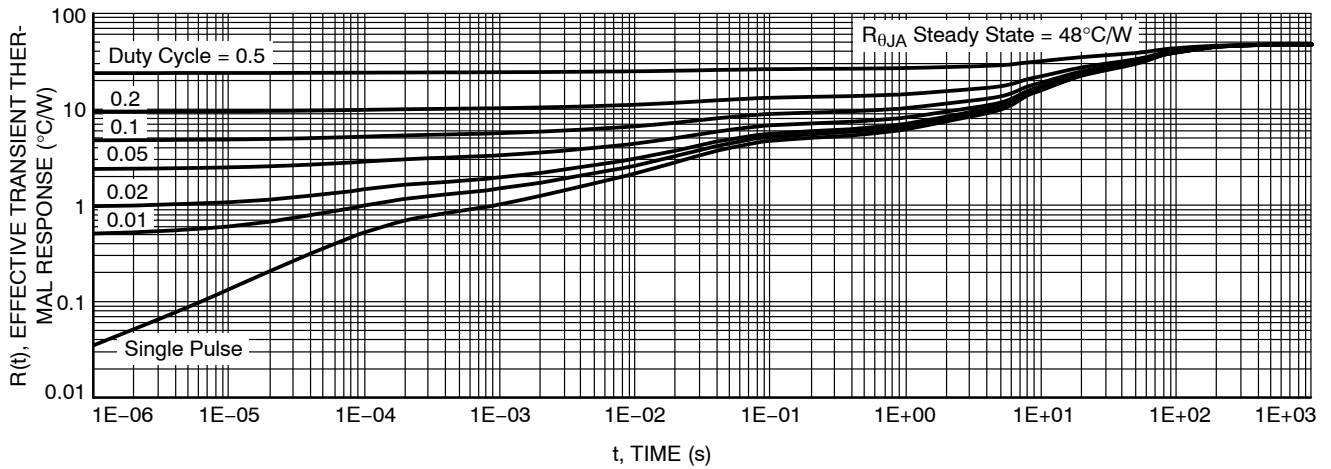
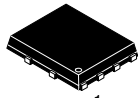


Figure 14. Thermal Impedance (Junction-to-Ambient)

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

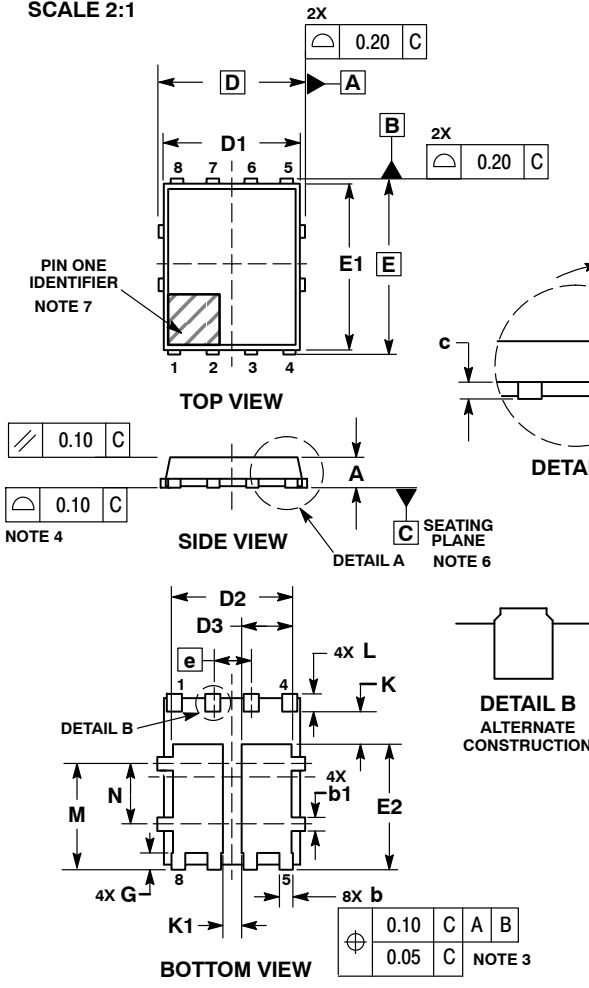
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SCALE 2:1

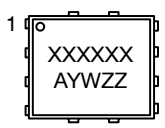
### DFN8 5x6, 1.27P Dual Flag (SO8FL-Dual) CASE 506BT ISSUE E

DATE 26 FEB 2013



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
  2. CONTROLLING DIMENSION: MILLIMETERS.
  3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 MM FROM THE TERMINAL TIP.
  4. PROFILE TOLERANCE APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.
  5. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
  6. SEATING PLANE IS DEFINED BY THE TERMINALS. A1 IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.
  7. A VISUAL INDICATOR FOR PIN 1 MUST BE LOCATED IN THIS AREA.

#### GENERIC MARKING DIAGRAM\*

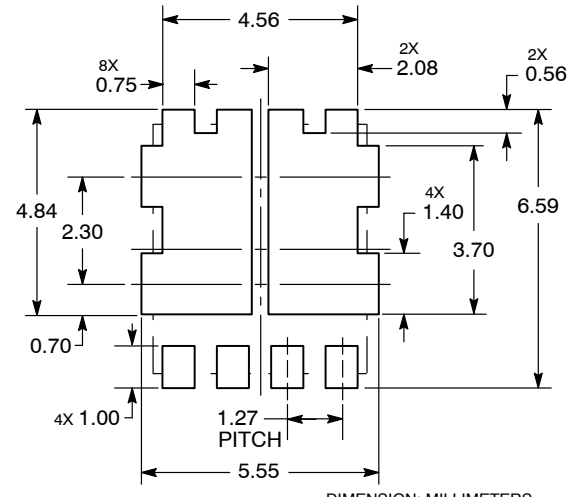


XXXXXX = Specific Device Code  
 A = Assembly Location  
 Y = Year  
 W = Work Week  
 ZZ = Lot Traceability

| DIM | MILLIMETERS |      |      |
|-----|-------------|------|------|
|     | MIN         | MAX  | MAX  |
| A   | 0.90        | ---  | 1.10 |
| A1  | ---         | ---  | 0.05 |
| b   | 0.33        | 0.42 | 0.51 |
| b1  | 0.33        | 0.42 | 0.51 |
| c   | 0.20        | ---  | 0.33 |
| D   | 5.15 BSC    |      |      |
| D1  | 4.70        | 4.90 | 5.10 |
| D2  | 3.90        | 4.10 | 4.30 |
| D3  | 1.50        | 1.70 | 1.90 |
| E   | 6.15 BSC    |      |      |
| E1  | 5.70        | 5.90 | 6.10 |
| E2  | 3.90        | 4.15 | 4.40 |
| e   | 1.27 BSC    |      |      |
| G   | 0.45        | 0.55 | 0.65 |
| h   | ---         | ---  | 12 ° |
| K   | 0.51        | ---  | ---  |
| K1  | 0.56        | ---  | ---  |
| L   | 0.48        | 0.61 | 0.71 |
| M   | 3.25        | 3.50 | 3.75 |
| N   | 1.80        | 2.00 | 2.20 |

\*This information is generic. Please refer to device data sheet for actual part marking.

#### SOLDERING FOOTPRINT\*



DIMENSION: MILLIMETERS

\*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:     | DFN8 5X6, 1.27P DUAL FLAG (SO8FL-DUAL) | PAGE 1 OF 1  |

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