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MOSFET - Power, Dual N-Channel, DUAL SO8FL

60 V, 16.3 mΩ, 32 A



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NTMFD016N06C

Features

- Small Footprint (5x6 mm) for Compact Design
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Q_G and Capacitance to Minimize Driver Losses
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Typical Applications

- Power Tools, Battery Operated Vacuums
- UAV/Drones, Material Handling
- BMS/Storage, Home Automation

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

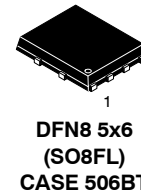
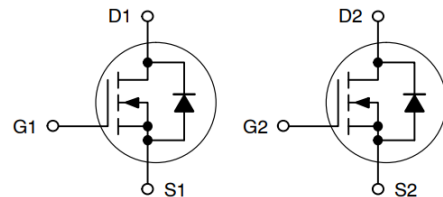
| Parameter | | Symbol | Value | Units | |
|--|--|----------------|---------------------------|------------------|---|
| Drain-to-Source Voltage | | V_{DSS} | 60 | V | |
| Gate-to-Source Voltage | | V_{GS} | ± 20 | V | |
| Continuous Drain Current $R_{\theta JC}$ (Notes 1, 3) | Steady State | I_D | $T_C = 25^\circ\text{C}$ | 32 | A |
| | | | $T_C = 100^\circ\text{C}$ | 23 | |
| Power Dissipation $R_{\theta JC}$ (Note 1) | Steady State | P_D | $T_C = 25^\circ\text{C}$ | 36 | W |
| | | | $T_C = 100^\circ\text{C}$ | 18 | |
| Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2, 3) | Steady State | I_D | $T_A = 25^\circ\text{C}$ | 9 | A |
| | | | $T_A = 100^\circ\text{C}$ | 6 | |
| Power Dissipation $R_{\theta JA}$ (Notes 1, 2) | Steady State | P_D | $T_A = 25^\circ\text{C}$ | 3.1 | W |
| | | | $T_A = 100^\circ\text{C}$ | 1.5 | |
| Pulsed Drain Current | $T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$ | I_{DM} | 128 | A | |
| Operating Junction and Storage Temperature Range | | T_J, T_{stg} | -55 to +175 | $^\circ\text{C}$ | |
| Source Current (Body Diode) | | I_S | 30 | A | |
| Single Pulse Drain-to-Source Avalanche Energy ($I_L = 6.4 \text{ A}_{pk}$) | | E_{AS} | 21 | mJ | |
| Lead Temperature Soldering Reflow 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.

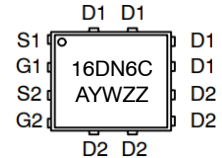
1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Surface-mounted on FR4 board using a 650 mm², 2 oz Cu pad.
3. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

| $V_{(BR)DSS}$ | $R_{DS(ON)} \text{ MAX}$ | $I_D \text{ MAX}$ |
|---------------|--------------------------|-------------------|
| 60 V | 16.3 mΩ @ 10 V | 32 A |

Dual N-Channel



MARKING DIAGRAM



16DN6C = Specific Device Code
 A = Assembly Location
 Y = Year
 W = Work Week
 ZZ = Lot Traceability

ORDERING INFORMATION

| Device | Package | Shipping† |
|-----------------|----------------------|--------------------|
| NTMFD016N06CT1G | SO8FL Dual (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.

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THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Max | Unit |
|---|-----------------|------|------|
| Junction-to-Case – Steady State (Note 2) | $R_{\theta JC}$ | 4.1 | °C/W |
| Junction-to-Ambient – Steady State (Note 2) | $R_{\theta JA}$ | 47.3 | |

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 | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$ | 60 | | | V |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS} / T_J$ | $I_D = 250\ \mu\text{A}, \text{ref to } 25^\circ\text{C}$ | | 29 | | mV/°C |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{GS} = 0\text{ V}, V_{DS} = 60\text{ V}$ | $T_J = 25^\circ\text{C}$ | | 10 | 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 | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = 25\ \mu\text{A}$ | 2.0 | | 4.0 | V |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)} / T_J$ | $I_D = 25\ \mu\text{A}, \text{ref to } 25^\circ\text{C}$ | | -8.2 | | mV/°C |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 5\text{ A}$ | | 13.6 | 16.3 | m Ω |
| Forward Transconductance | g_{FS} | $V_{DS} = 5\text{ V}, I_D = 5\text{ A}$ | | 15 | | S |
| Gate Resistance | R_G | $T_A = 25^\circ\text{C}$ | | 1.4 | | Ω |

CHARGES & CAPACITANCES

| | | | | | | |
|------------------------------|--------------|--|--|------|--|----|
| Input Capacitance | C_{ISS} | $V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 30\text{ V}$ | | 489 | | pF |
| Output Capacitance | C_{OSS} | | | 319 | | |
| Reverse Transfer Capacitance | C_{RSS} | | | 5.7 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 30\text{ V}, I_D = 5\text{ A}$ | | 6.9 | | nC |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | 1.6 | | |
| Gate-to-Source Charge | Q_{GS} | | | 2.6 | | |
| Gate-to-Drain Charge | Q_{GD} | | | 0.62 | | |

SWITCHING CHARACTERISTICS, $V_{GS} = 10\text{ V}$ (Note 5)

| | | | | | | |
|---------------------|--------------|---|--|------|--|----|
| Turn-On Delay Time | $t_{d(ON)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 30\text{ V}, I_D = 5\text{ A}, R_G = 6\ \Omega$ | | 7.2 | | ns |
| Rise Time | t_r | | | 1.7 | | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | | | 11.1 | | |
| Fall Time | t_f | | | 2.7 | | |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | |
|-------------------------|----------|---|---------------------------|------|-----|----|
| Forward Diode Voltage | V_{SD} | $V_{GS} = 0\text{ V}, I_S = 5\text{ A}$ | $T_J = 25^\circ\text{C}$ | 0.81 | 1.2 | V |
| | | | $T_J = 125^\circ\text{C}$ | 0.67 | | |
| Reverse Recovery Time | t_{RR} | $V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, V_{DS} = 30\text{ V}, I_S = 5\text{ A}$ | | 27 | | ns |
| Charge Time | t_a | | | 13 | | |
| Discharge Time | t_b | | | 14 | | |
| Reverse Recovery Charge | Q_{RR} | | | 15 | | |

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 $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

5. Switching characteristics are independent of operating junction temperatures.

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TYPICAL CHARACTERISTICS

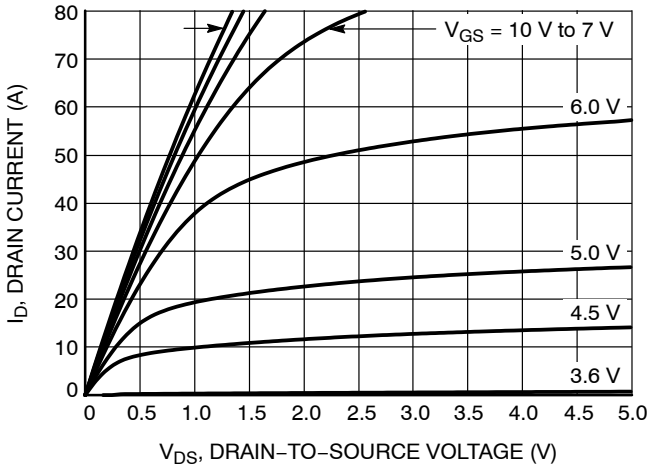


Figure 1. On-Region Characteristics

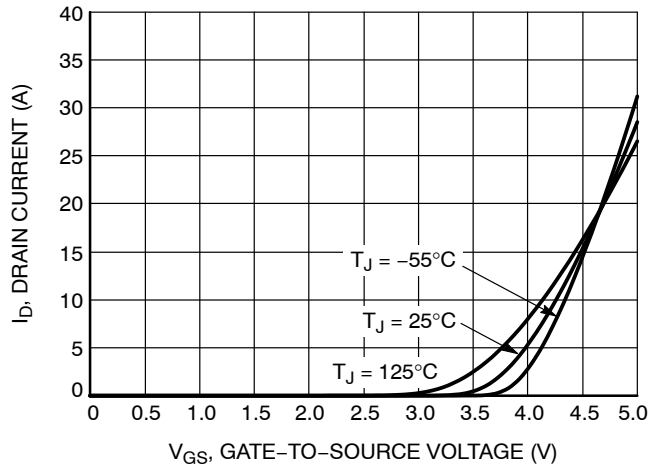


Figure 2. Transfer Characteristics

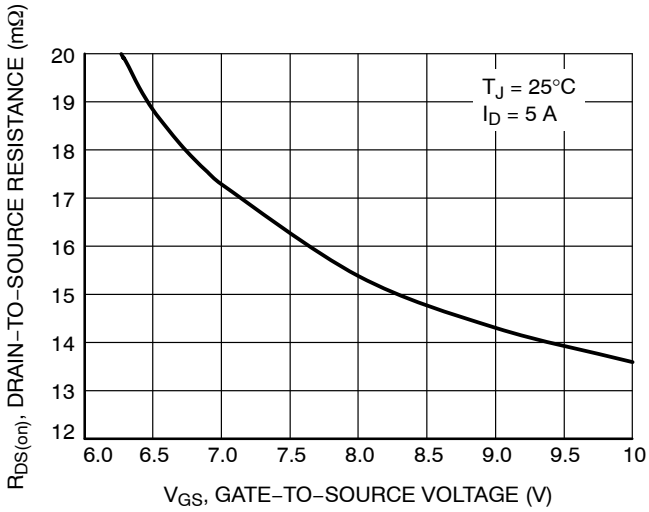


Figure 3. On-Resistance vs. Gate-to-Source Voltage

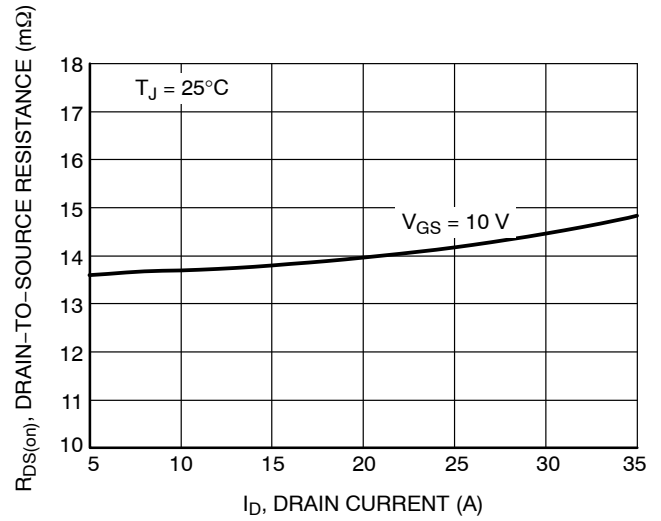


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

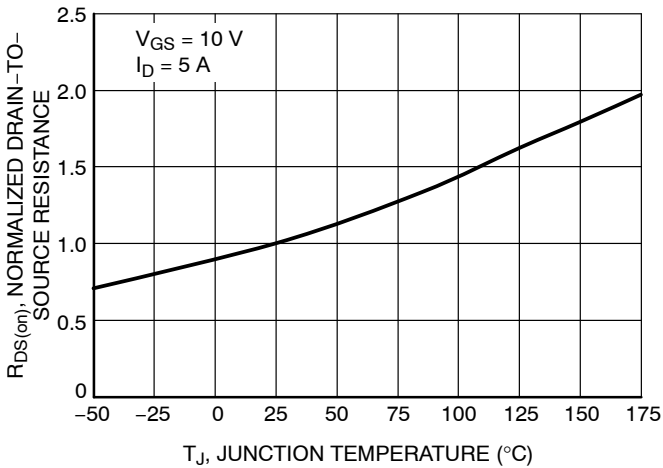


Figure 5. On-Resistance Variation with Temperature

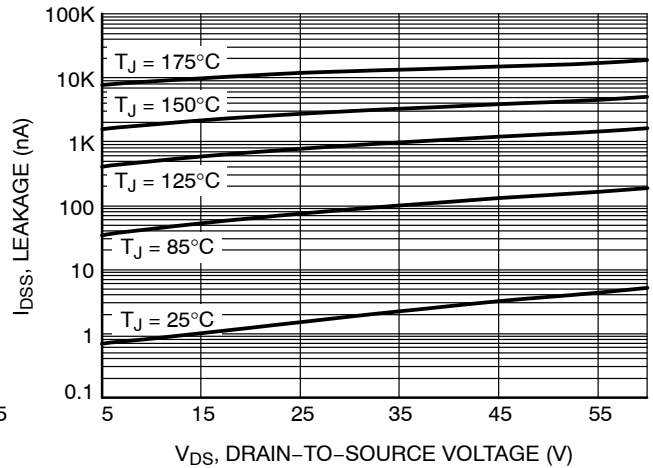


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS

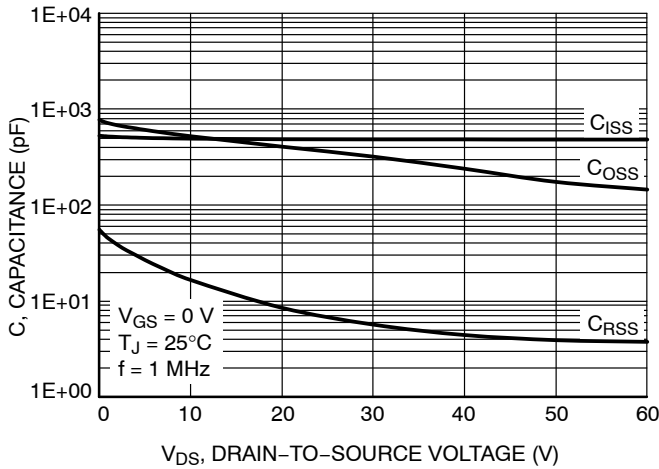


Figure 7. Capacitance Variation

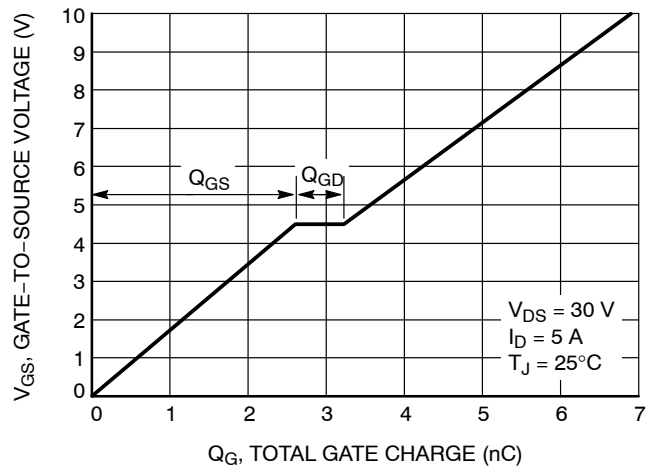


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

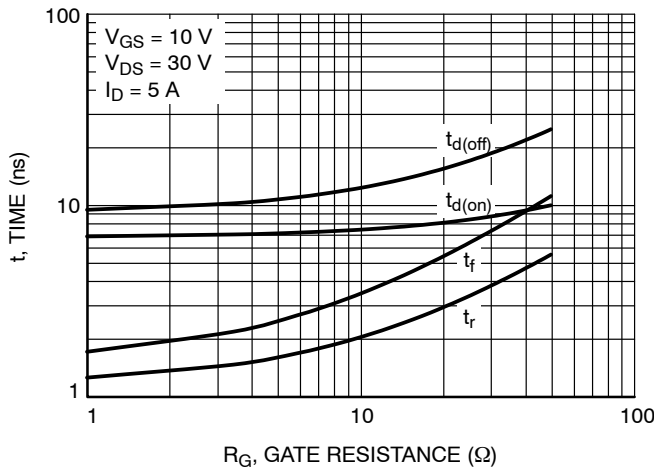


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

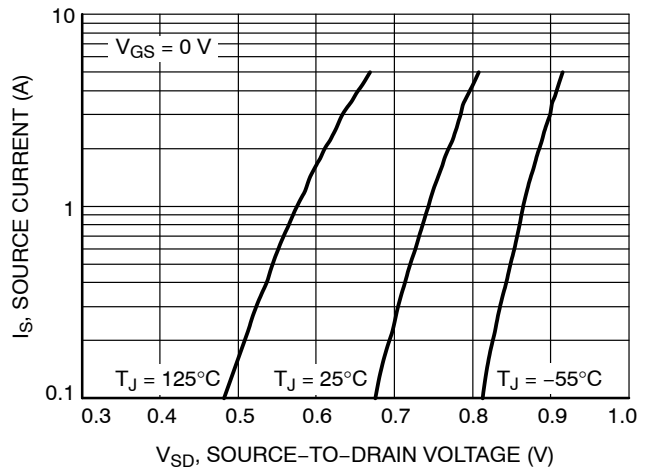


Figure 10. Diode Forward Voltage vs. Current

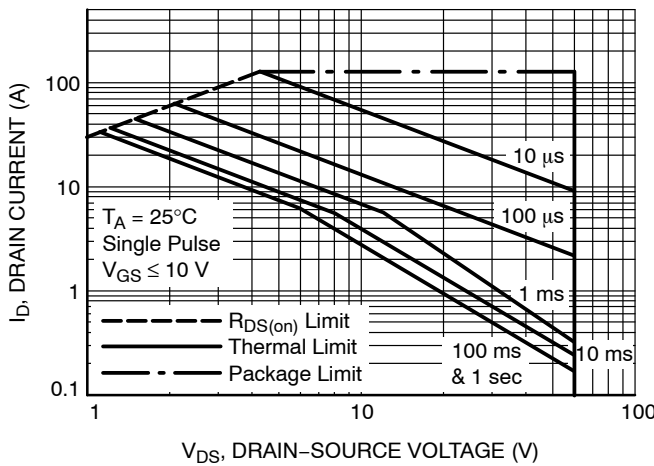


Figure 11. Safe Operating Area

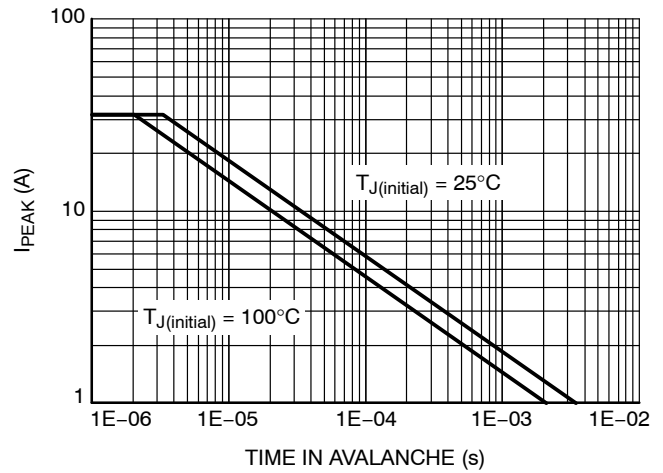


Figure 12. Maximum Drain Current vs. Time in Avalanche

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TYPICAL CHARACTERISTICS

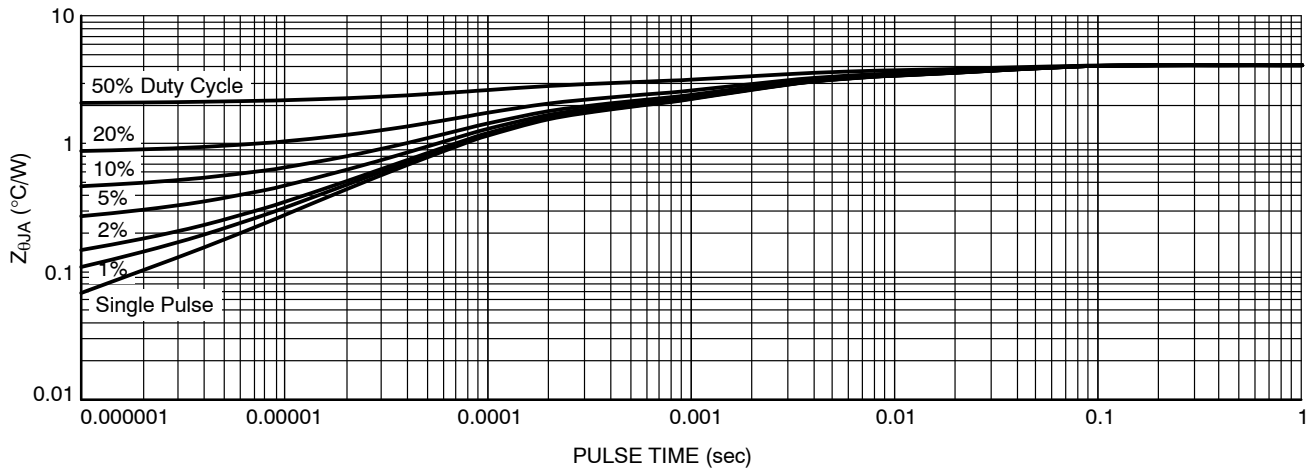
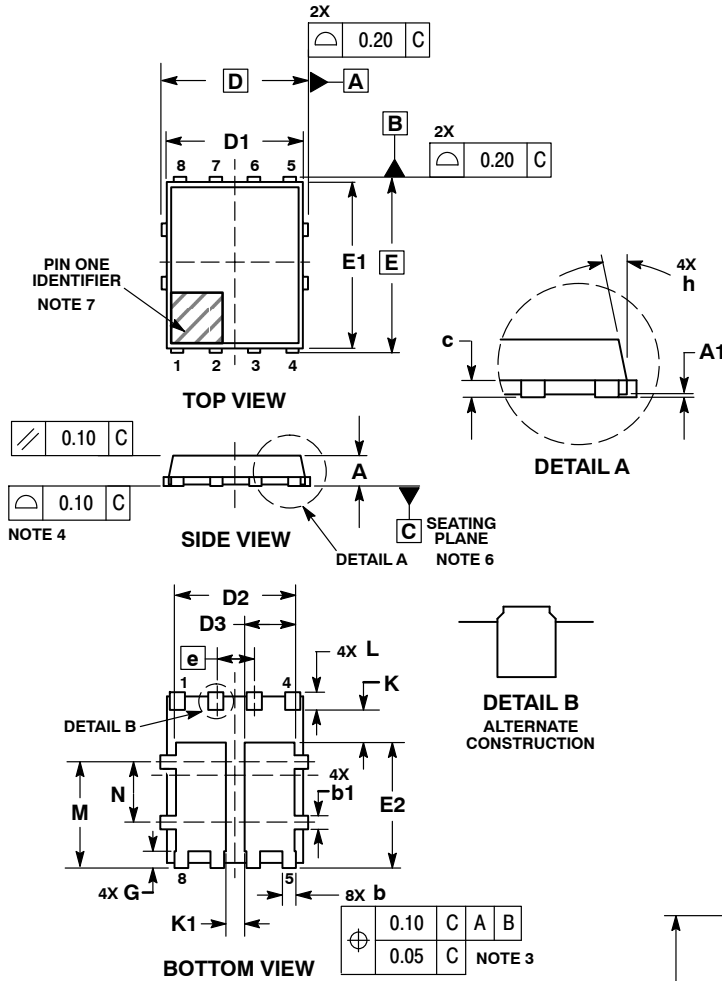


Figure 13. Thermal Characteristics

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PACKAGE DIMENSIONS

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

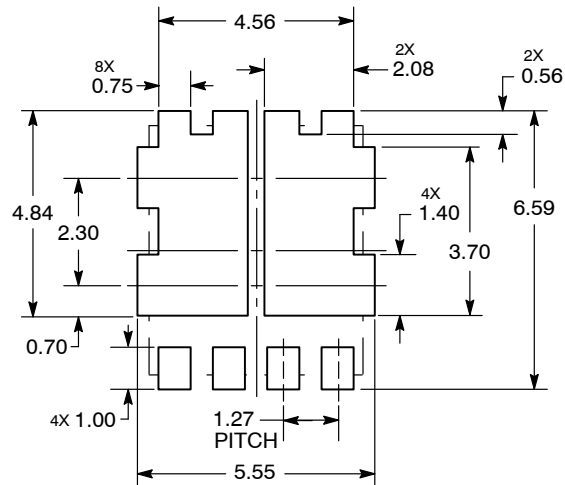


NOTES:

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.


| 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 |

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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