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The logo for onsemi, featuring the word "onsemi" in a dark teal, lowercase, sans-serif font. The letter "i" is stylized with a white dot and a teal vertical bar. A small orange triangle is positioned above the top right of the "i". A trademark symbol (TM) is located to the right of the logo.

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MOSFET – Power, Single, N-Channel

30 V, 140 A



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NVTYS002N03CL

Features

- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

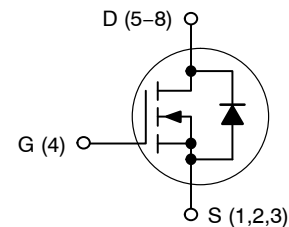
MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise stated)

| Parameter | Symbol | Value | Unit | |
|--|--|---------------------------|------------------|---|
| Drain-to-Source Voltage | V_{DSS} | 30 | V | |
| Gate-to-Source Voltage | V_{GS} | ± 20 | V | |
| Continuous Drain Current $R_{\theta JA}$ | I_D | $T_A = 25^\circ\text{C}$ | 29 | A |
| | | $T_A = 100^\circ\text{C}$ | 20.5 | |
| Power Dissipation $R_{\theta JA}$ | P_D | $T_A = 25^\circ\text{C}$ | 3.2 | W |
| | | $T_A = 100^\circ\text{C}$ | 1.6 | |
| Continuous Drain Current $R_{\theta JC}$ | I_D | $T_C = 25^\circ\text{C}$ | 140 | A |
| | | $T_C = 100^\circ\text{C}$ | 99 | |
| Power Dissipation $R_{\theta JC}$ | P_D | $T_C = 25^\circ\text{C}$ | 75 | W |
| | | $T_C = 100^\circ\text{C}$ | 37 | |
| Pulsed Drain Current | $T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$ | I_{DM} | 675 | A |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | -55 to +175 | $^\circ\text{C}$ | |
| Source Current (Body Diode) | I_S | 62 | A | |
| Single Pulse Drain-to-Source Avalanche Energy ($I_L = 10.6 \text{ A}$) | E_{AS} | 320 | mJ | |
| 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.

| $V_{(BR)DSS}$ | $R_{DS(on)}$ MAX | I_D MAX |
|---------------|------------------------|-----------|
| 30 V | 2.25 m Ω @ 10 V | 140 A |
| | 3.1 m Ω @ 4.5 V | |

N-Channel MOSFET



LFPAK8
3.3x3.3
CASE 760AD

MARKING DIAGRAM

| |
|-----------------------|
| 002N 03CL AWLYW |
|-----------------------|

002N03CL = Specific Device Code
 A = Assembly Location
 WL = Wafer Lot
 Y = Year
 W = Work Week

ORDERING INFORMATION

| Device | Package | Shipping† |
|------------------|-------------------|--------------------|
| NVTYS002N03CLTWG | LFPAK33 (Pb-Free) | 3000 / 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 MAXIMUM RATINGS

| Parameter | Symbol | Value | Unit |
|---|-----------------|-------|------|
| Junction-to-Case (Drain) | $R_{\theta JC}$ | 2 | °C/W |
| Junction-to-Ambient – Steady State (Note 2) | $R_{\theta JA}$ | 47 | |

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

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 | $V_{(BR)DSS}/T_J$ | | | 17.1 | | mV/°C |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{GS} = 0\text{ V}, V_{DS} = 24\text{ V}$ | | | 1.0 | μA |
| | | | | | 10 | |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{GS} = 0\text{ V}, V_{DS} = 30\text{ V}$ | | | 10 | μA |
| 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 | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$ | 1.3 | | 2.2 | V |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | | | -5.6 | | mV/°C |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 50\text{ A}$ | | 1.9 | 2.25 | m Ω |
| | | $V_{GS} = 4.5\text{ V}, I_D = 50\text{ A}$ | | 2.8 | 3.1 | |
| Forward Transconductance | g_{FS} | $V_{DS} = 1.5\text{ V}, I_D = 50\text{ A}$ | | 130 | | S |
| Gate Resistance | R_G | | | 0.9 | | Ω |

CHARGES AND CAPACITANCES

| | | | | | | |
|------------------------------|--------------|--|--|------|--|----|
| Input Capacitance | C_{ISS} | $V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 15\text{ V}$ | | 2697 | | pF |
| Output Capacitance | C_{OSS} | | | 1548 | | |
| Reverse Transfer Capacitance | C_{RSS} | | | 43 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}; I_D = 50\text{ A}$ | | 17 | | nC |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | 3.8 | | |
| Gate-to-Source Charge | Q_{GS} | | | 7 | | |
| Gate-to-Drain Charge | Q_{GD} | | | 3.8 | | |
| Gate Plateau Voltage | V_{GP} | | | 3 | | V |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}; I_D = 50\text{ A}$ | | 37 | | nC |

SWITCHING CHARACTERISTICS (Note 5)

| | | | | | | |
|---------------------|--------------|---|--|----|--|----|
| Turn-On Delay Time | $t_{d(ON)}$ | $V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 50\text{ A}, R_G = 3.0\ \Omega$ | | 18 | | ns |
| Rise Time | t_r | | | 9 | | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | | | 22 | | |
| Fall Time | t_f | | | 9 | | |

- Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.
- Switching characteristics are independent of operating junction temperatures.

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

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|-----------|--------|----------------|-----|-----|-----|------|
|-----------|--------|----------------|-----|-----|-----|------|

SWITCHING CHARACTERISTICS (Note 5)

| | | | | | | |
|---------------------|--------------|---|--|------|--|----|
| Turn-On Delay Time | $t_{d(ON)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V},$ $I_D = 50\text{ A}, R_G = 3.0\ \Omega$ | | 11.5 | | ns |
| Rise Time | t_r | | | 4 | | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | | | 32 | | |
| Fall Time | t_f | | | 5 | | |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | | |
|-------------------------|----------|---|---------------------------|--|-----|-----|----|
| Forward Diode Voltage | V_{SD} | $V_{GS} = 0\text{ V},$ $I_S = 50\text{ A}$ | $T_J = 25^\circ\text{C}$ | | 0.8 | 1.1 | V |
| | | | $T_J = 125^\circ\text{C}$ | | 0.7 | | |
| Reverse Recovery Time | t_{RR} | $V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s},$ $I_S = 50\text{ A}$ | | | 44 | | ns |
| Charge Time | t_a | | | | 28 | | |
| Discharge Time | t_b | | | | 13 | | |
| Reverse Recovery Charge | Q_{RR} | | | | 28 | | |

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

5. Switching characteristics are independent of operating junction temperatures.

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.

TYPICAL CHARACTERISTICS

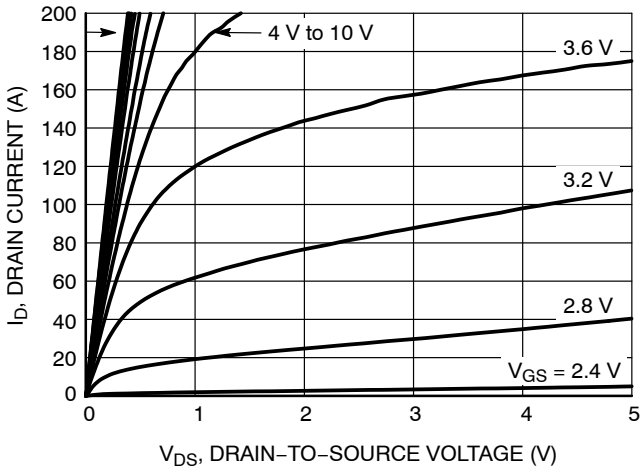


Figure 1. On-Region Characteristics

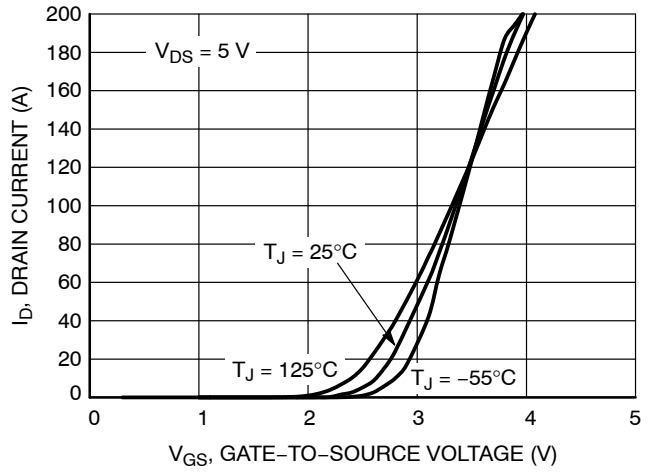


Figure 2. Transfer Characteristics

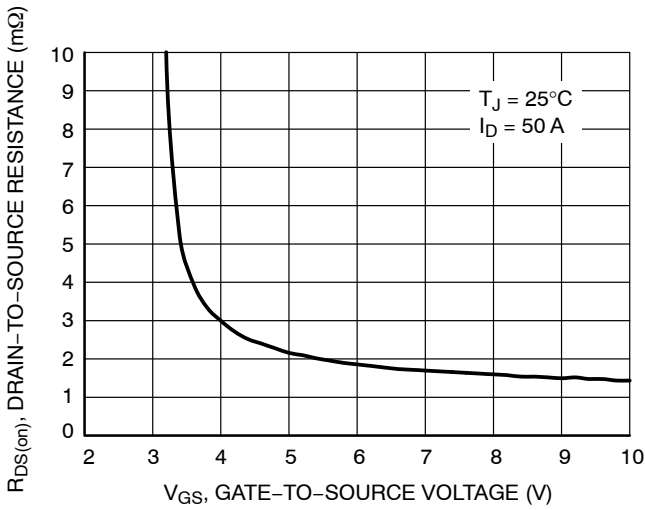


Figure 3. On-Resistance vs. Gate-to-Source Voltage

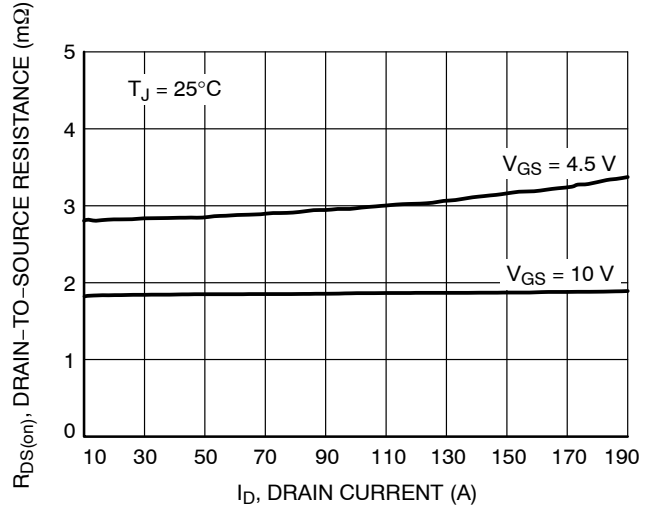


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

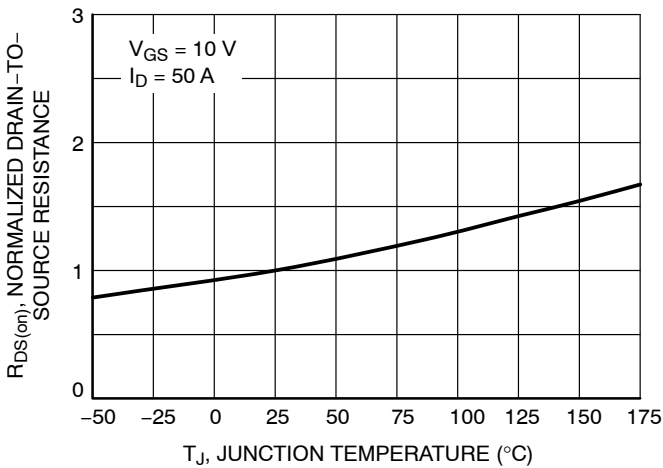


Figure 5. On-Resistance Variation with Temperature

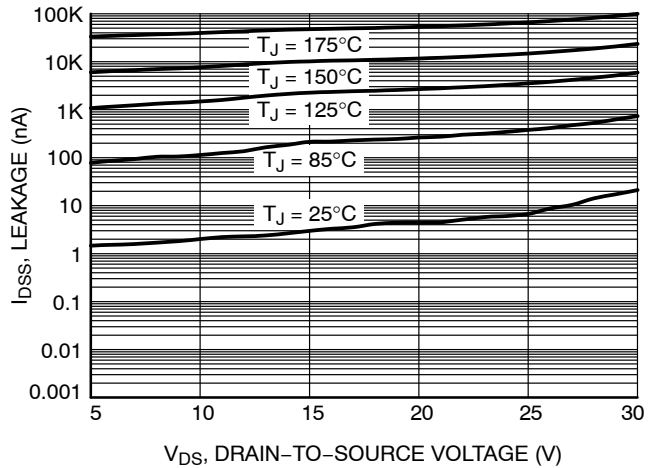


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

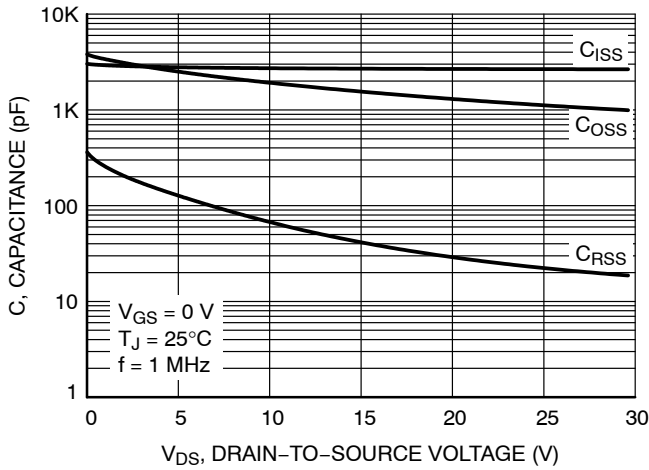


Figure 7. Capacitance Variation

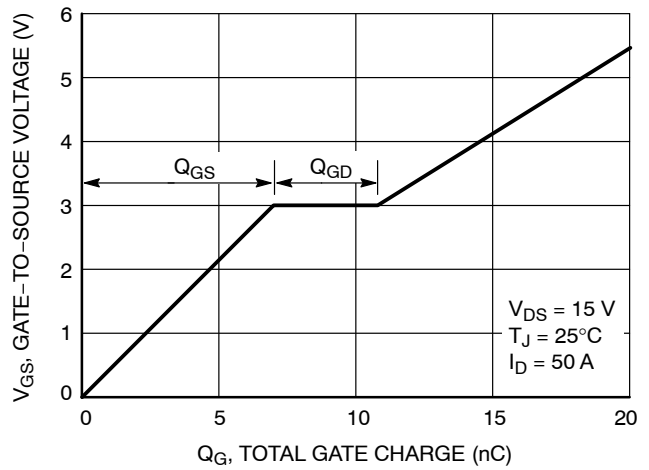


Figure 8. Gate-to-Source vs. Total Charge

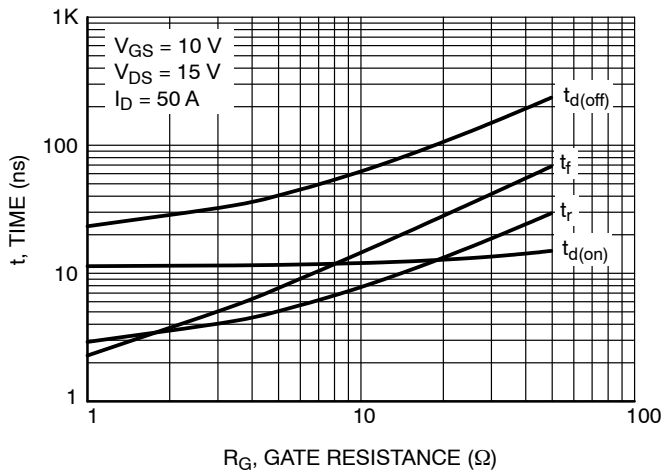


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

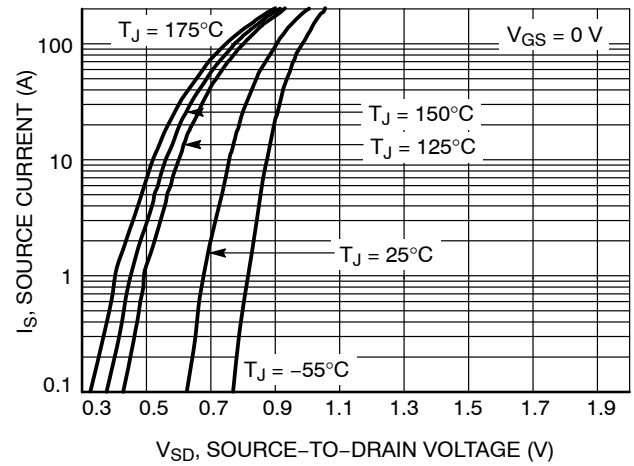


Figure 10. Diode Forward Voltage vs. Current

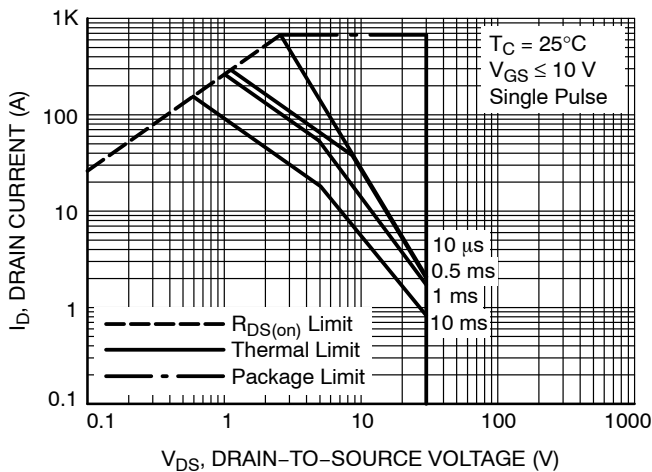


Figure 11. Maximum Rated Forward Biased Safe Operating Area

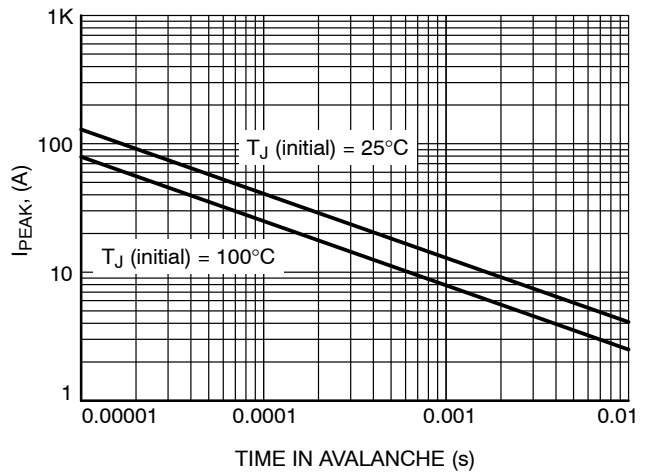


Figure 12. I_{PEAK} vs. Time in Avalanche

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TYPICAL CHARACTERISTICS

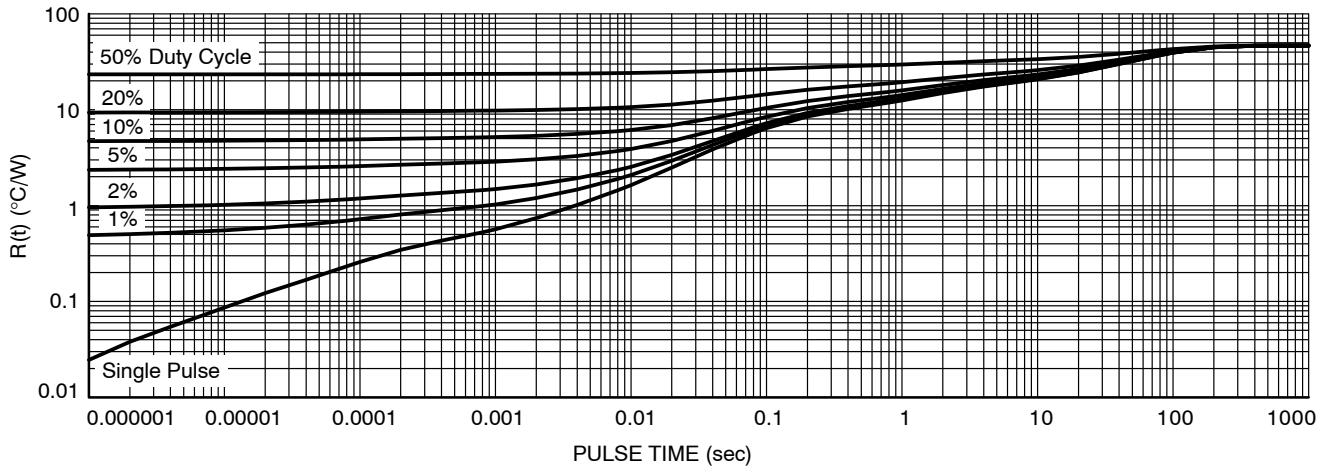
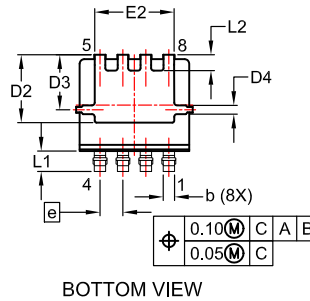
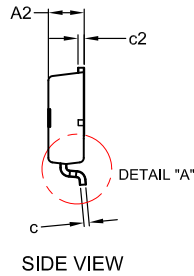
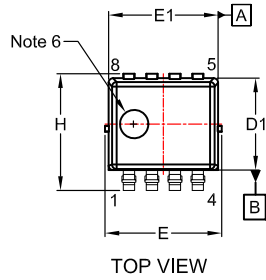


Figure 13. Thermal Characteristics

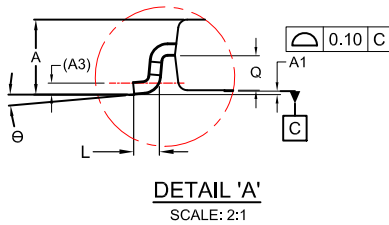
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PACKAGE DIMENSIONS

LFPAK8 3.3x3.3, 0.65P CASE 760AD ISSUE E

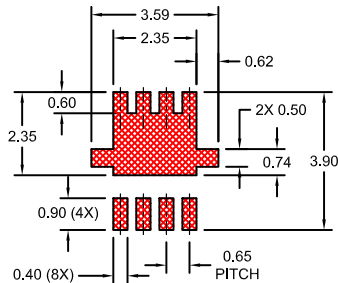


| DIM | MILLIMETERS | | |
|-----|-------------|------|------|
| | MIN. | NOM. | MAX. |
| A | 0.95 | 1.05 | 1.15 |
| A1 | 0.00 | 0.05 | 0.10 |
| A2 | 0.95 | 1.00 | 1.05 |
| A3 | 0.15 REF | | |
| b | 0.27 | 0.32 | 0.37 |
| c | 0.12 | 0.17 | 0.22 |
| c2 | 0.12 | 0.17 | 0.22 |
| D1 | 2.50 | 2.60 | 2.70 |
| D2 | 1.82 | 1.92 | 2.02 |
| D3 | 1.46 | 1.56 | 1.66 |
| D4 | 0.20 | 0.25 | 0.30 |
| E | 3.20 | 3.30 | 3.40 |
| E1 | 3.00 | 3.10 | 3.20 |
| E2 | 2.15 | 2.25 | 2.35 |
| e | 0.65 BSC | | |
| H | 3.20 | 3.30 | 3.40 |
| L | 0.25 | 0.37 | 0.50 |
| L1 | 0.48 | 0.58 | 0.68 |
| L2 | 0.35 | 0.45 | 0.55 |
| Q | 0.45 | 0.50 | 0.55 |
| θ | 0° | 4° | 8° |



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS OR BURRS SHALL NOT EXCEED 0.150mm PER SIDE.
4. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
5. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.
6. OPTIONAL MOLD FEATURE.



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