

Product Summary

| BV _{DSS} | R _{DS(ON)} Max | I _D Max T _A = +25°C |
|-------------------|--------------------------------|--|
| 20V | 0.99Ω @ V _{GS} = 4.5V | 0.78A |
| | 1.2Ω @ V _{GS} = 2.5V | 0.71A |
| | 1.8Ω @ V _{GS} = 1.8V | 0.58A |

Features and Benefits

- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Ultra-Small Surface Mount Package
- ESD Protected Gate
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Description and Applications

This MOSFET is designed to minimize the on-state resistance (R_{DS(ON)}) and yet maintain superior switching performance, making it ideal for high-efficiency power-management applications.

- Battery Charging
- Power Management Functions
- DC-DC Converters

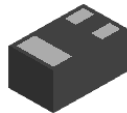
Mechanical Data

- Case: X1-DFN1006-3
- Case Material: Molded Plastic, "Green" Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections Indicator: See Diagram
- Terminals: Finish — NiPdAu over Copper Leadframe; Solderable per MIL-STD-202, Method 208 **e4**
- Weight: 0.001 grams (Approximate)

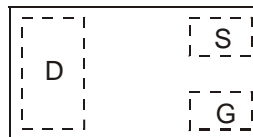


ESD protected Gate

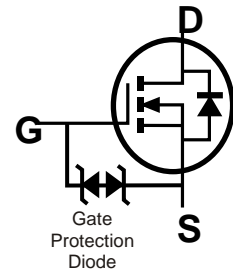
X1-DFN1006-3



Bottom View



Top View
Package Pin Configuration



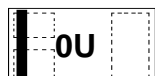
Equivalent Circuit

Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---------------|--------------|--------------------|
| DMN2990UFB-7B | X1-DFN1006-3 | 10,000/Tape & Reel |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 4. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

Marking Information



Top View
Bar Denotes Gate and Source Side

0U = Part Marking Code

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

| Characteristic | | | Symbol | Value | Unit |
|--|--------------|------------------------|------------------|-------|------|
| Drain-Source Voltage | | | V _{DSS} | 20 | V |
| Gate-Source Voltage | | | V _{GSS} | ±8 | V |
| Continuous Drain Current (Note 6) V _{GS} = 4.5V | Steady State | T _A = +25°C | I _D | 0.78 | A |
| | | T _A = +70°C | | 0.62 | |
| Maximum Continuous Body Diode Forward Current (Note 6) | | | I _S | 0.72 | A |
| Pulsed Drain Current (10μs Pulse, Duty Cycle = 1%) | | | I _{DM} | 1.5 | A |

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

| Characteristic | | | Symbol | Value | Unit |
|--|--|--------------|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 5) | | | P _D | 0.52 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | | Steady State | R _{θJA} | 239 | °C/W |
| Total Power Dissipation (Note 6) | | | P _D | 0.92 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | | Steady State | R _{θJA} | 137 | °C/W |
| Operating and Storage Temperature Range | | | T _J , T _{STG} | -55 to +150 | °C |

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--|---------------------|-----|------|------|------|---|
| OFF CHARACTERISTICS (Note 7) | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | 20 | — | — | V | V _{GS} = 0V, I _D = 250μA |
| Zero Gate Voltage Drain Current (T _J = +25°C) | I _{DSS} | — | — | 100 | nA | V _{DS} = 16V, V _{GS} = 0V |
| Gate-Source Leakage | I _{GSS} | — | — | ±1 | μA | V _{GS} = ±5V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 7) | | | | | | |
| Gate Threshold Voltage | V _{GS(TH)} | 0.4 | 0.74 | 1.0 | V | V _{DS} = V _{GS} , I _D = 250A |
| Static Drain-Source On-Resistance | R _{DS(ON)} | — | 496 | 990 | mΩ | V _{GS} = 4.5V, I _D = 100mA |
| | | | 606 | 1200 | | V _{GS} = 2.5V, I _D = 50mA |
| | | | 761 | 1800 | | V _{GS} = 1.8V, I _D = 20mA |
| | | | | | | V _{GS} = 0V, I _S = 150mA |
| Diode Forward Voltage | V _{SD} | — | 0.8 | 1.0 | V | V _{GS} = 0V, I _S = 150mA |
| DYNAMIC CHARACTERISTICS (Note 8) | | | | | | |
| Input Capacitance | C _{iSS} | — | 31 | — | pF | V _{DS} = 15V, V _{GS} = 0V, f = 1.0MHz |
| Output Capacitance | C _{oss} | — | 3.6 | — | pF | |
| Reverse Transfer Capacitance | C _{rSS} | — | 2.5 | — | pF | |
| Gate Resistance | R _g | — | 187 | — | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1MHz |
| Total Gate Charge | Q _g | — | 0.41 | — | nC | V _{GS} = 4.5V, V _{DS} = 10V, I _D = 250mA |
| Gate-Source Charge | Q _{gs} | — | 0.06 | — | nC | |
| Gate-Drain Charge | Q _{gd} | — | 0.05 | — | nC | |
| Turn-On Delay Time | t _{D(ON)} | — | 4.5 | — | ns | V _{DD} = 15V, V _{GS} = 4.5V, R _G = 2Ω, I _D = 200mA |
| Turn-On Rise Time | t _R | — | 3.5 | — | ns | |
| Turn-Off Delay Time | t _{D(OFF)} | — | 24 | — | ns | |
| Turn-Off Fall Time | t _F | — | 12 | — | ns | |
| Reverse Recovery Time | t _{RR} | — | 7.1 | — | ns | I _F = 200mA, di/dt = 100A/μs |
| Reverse Recovery Charge | Q _{RR} | — | 1.2 | — | nC | |

- Notes:
- Device mounted on FR-4 PCB, with minimum recommended pad layout.
 - Device mounted on minimum recommended pad layout test board, 10μs pulse duty cycle = 1%.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.

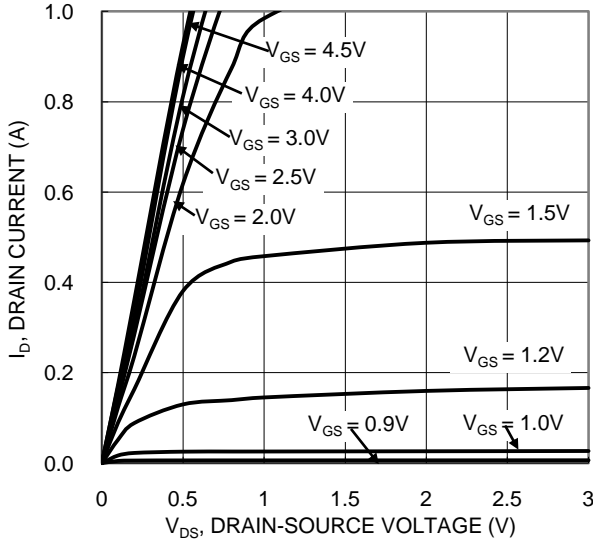


Figure 1. Typical Output Characteristic

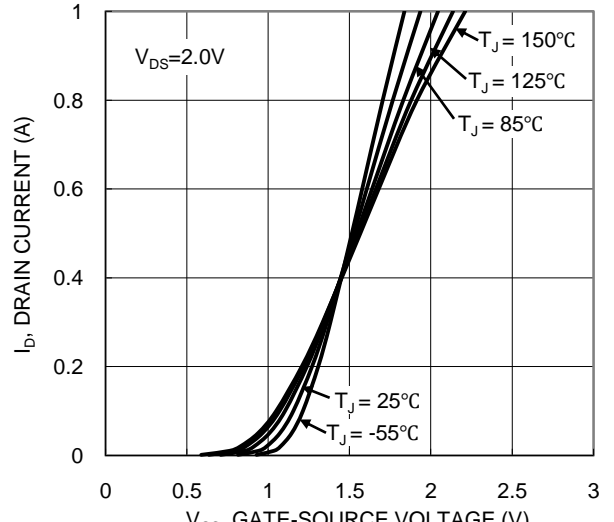


Figure 2. Typical Transfer Characteristic

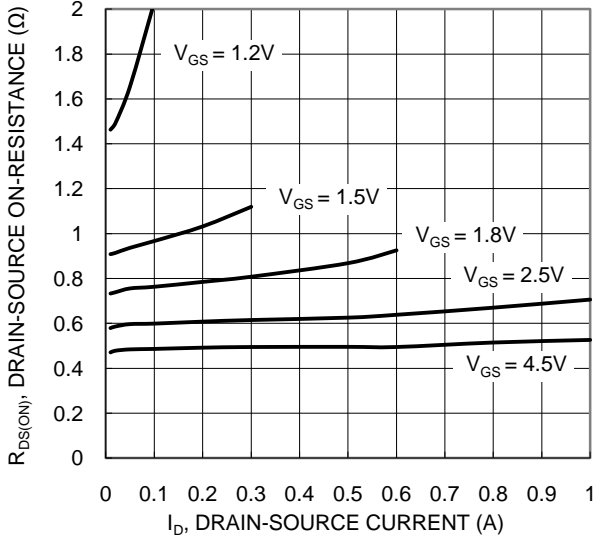


Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

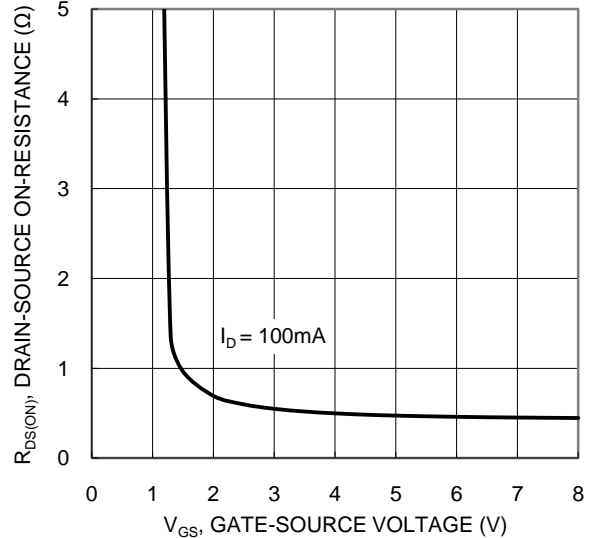


Figure 4. Typical Transfer Characteristic

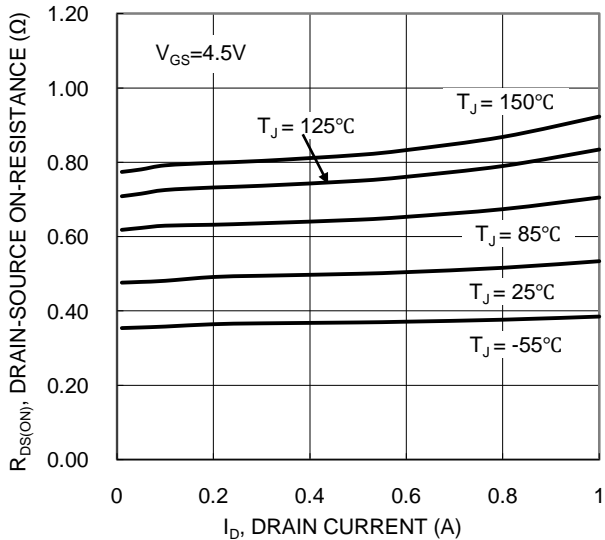


Figure 5. Typical On-Resistance vs. Drain Current and Temperature

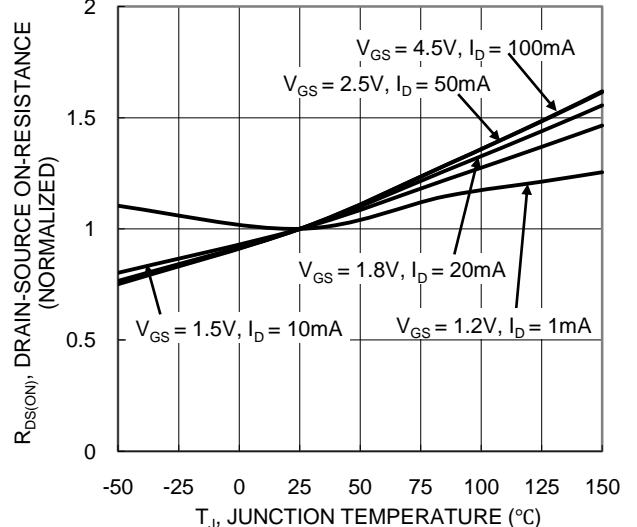
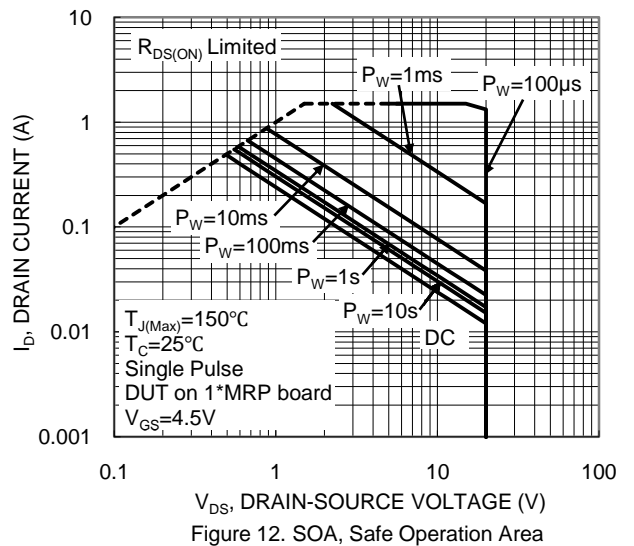
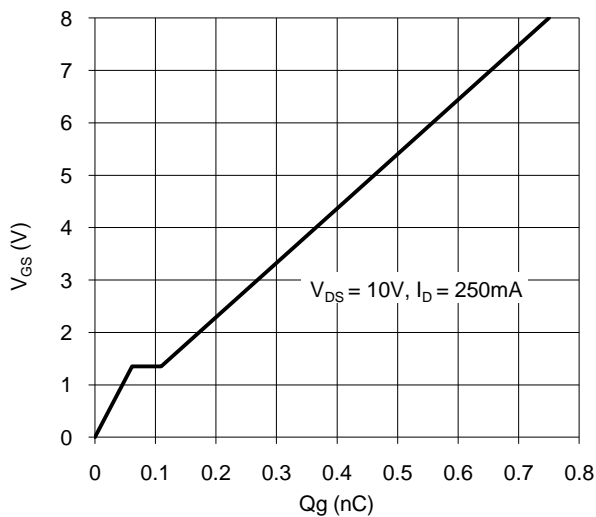
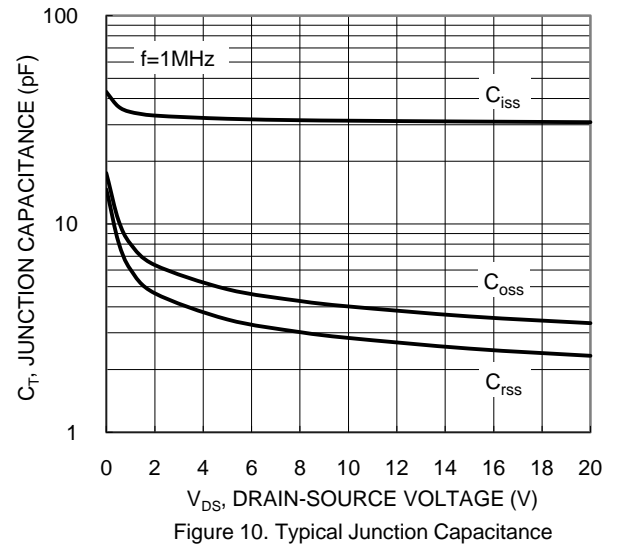
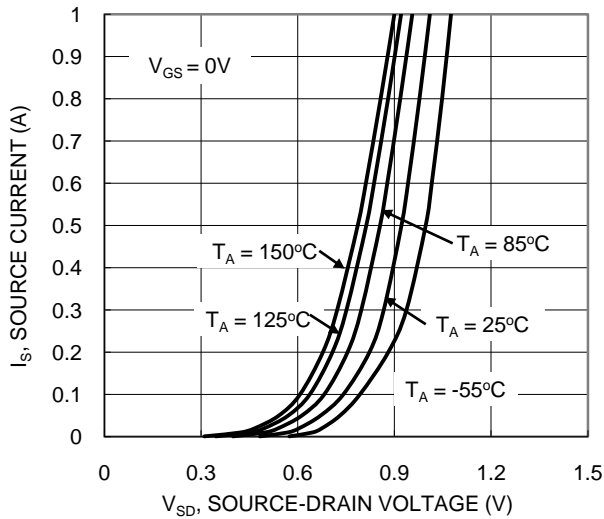
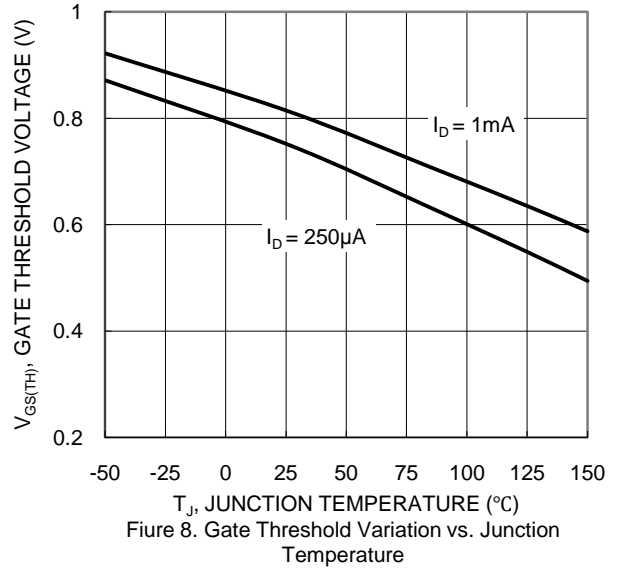
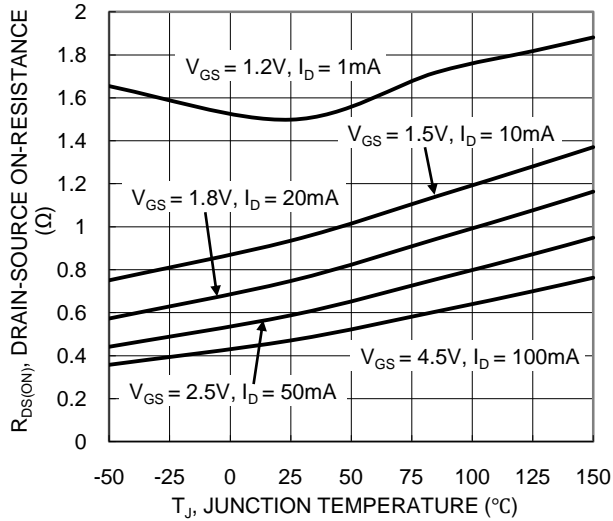


Figure 6. On-Resistance Variation with Temperature



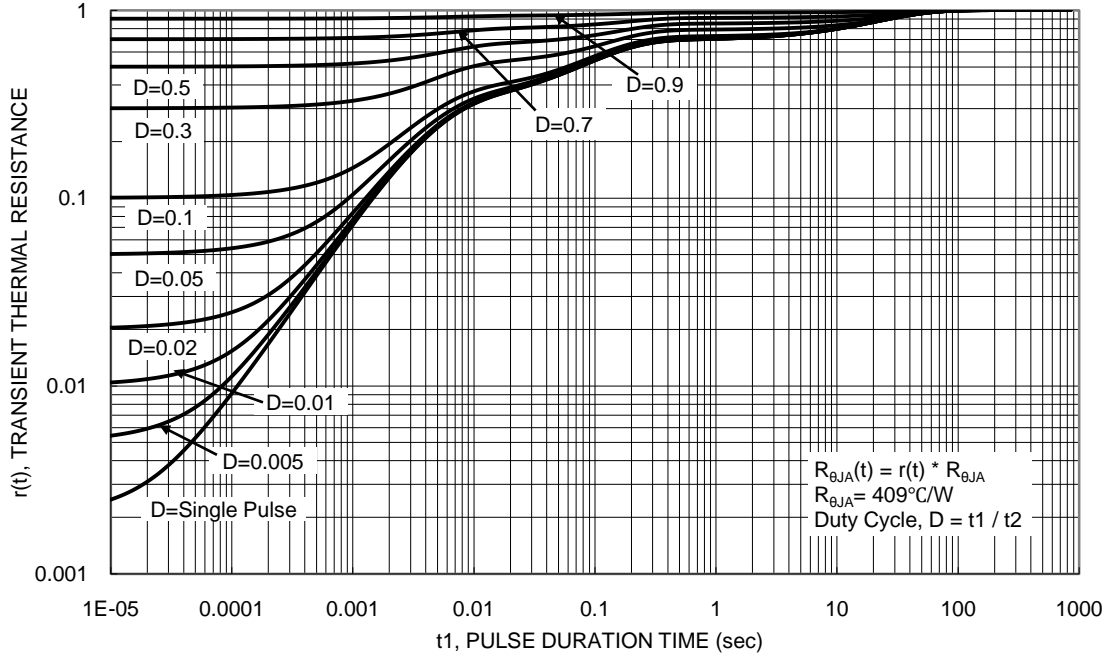
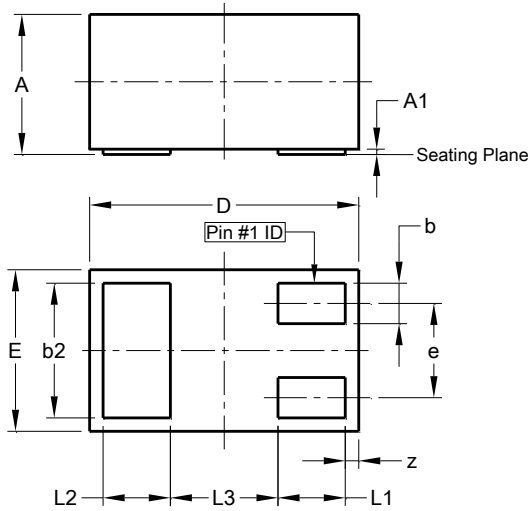


Figure 13. Transient Thermal Resistance

Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

X1-DFN1006-3

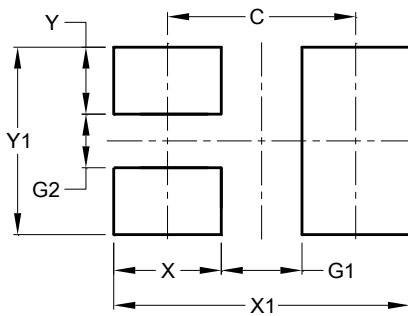


| X1-DFN1006-3 | | | |
|-----------------------------|------|-------|------|
| Dim | Min | Max | Typ |
| A | 0.47 | 0.53 | 0.50 |
| A1 | 0.00 | 0.05 | 0.03 |
| b | 0.10 | 0.20 | 0.15 |
| b2 | 0.45 | 0.55 | 0.50 |
| D | 0.95 | 1.075 | 1.00 |
| E | 0.55 | 0.675 | 0.60 |
| e | - | - | 0.35 |
| L1 | 0.20 | 0.30 | 0.25 |
| L2 | 0.20 | 0.30 | 0.25 |
| L3 | - | - | 0.40 |
| z | 0.02 | 0.08 | 0.05 |
| All Dimensions in mm | | | |

Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

X1-DFN1006-3



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 0.70 |
| G1 | 0.30 |
| G2 | 0.20 |
| X | 0.40 |
| X1 | 1.10 |
| Y | 0.25 |
| Y1 | 0.70 |

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