## Product Summary

| Device | $BV_{DSS}$ | $R_{DS(ON)}$ Max | $I_D$ Max $T_A$ = +25°C |
|---|---|---|---|
| N-Channel | 12V | 150mΩ @ $V_{GS}$ = 4.5V | 2.0A |
| | | 185mΩ @ $V_{GS}$ = 2.5V | 1.8A |

## Features and Benefits

- Footprint of just 1.3 $mm^2$
- Ultra-Low Profile Package – 0.35mm Profile
- Low Gate Threshold Voltage
- Fast Switching Speed
- 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

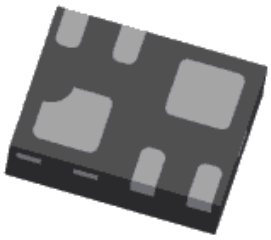
This MOSFET is designed to minimize the on-state resistance ($R_{DS(ON)}$), yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- Motor Control
- Power Management Functions
- Backlighting

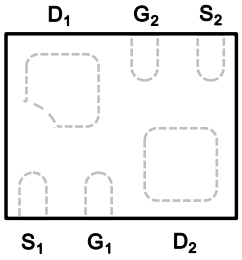
## Mechanical Data

- Case: X2-DFN1310-6 (Type B)
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu Annealed over Copper Leadframe. Solderable per MIL-STD-202, Method 208 e4
- Weight: 0.002 grams (Approximate)

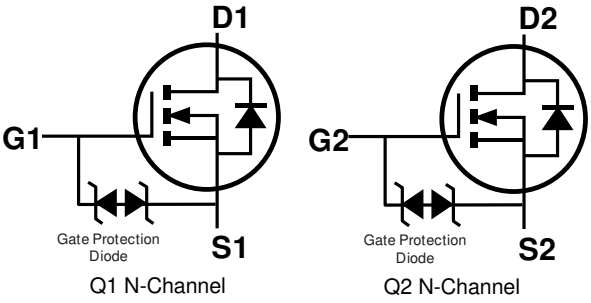

X2-DFN1310-6 (Type B)



Bottom View




Top View
Pin-Out



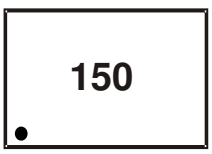

Equivalent Circuit

## Ordering Information (Note 4)

| Part Number | Reel Size (inches) | Tape Width (mm) | Quantity per Reel |
|---|---|---|---|
| DMN1150UFL3-7 | 7 | 8 | 3,000 |

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com/quality/lead_free.html 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 http://www.diodes.com/products/packages.html.

## Marking Information




150 = Product Type Marking Code

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

| Characteristic | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | 12 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±6 | V |
| Continuous Drain Current (Note 5) $V_{GS}$ = 4.5V | Steady State | $T_A$ = +25°C<br>$T_A$ = +70°C | $I_D$ | 2.0<br>1.6 | A |

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

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Total Power Dissipation (Note 5) | $T_A$ = +25°C | $P_D$ | 0.39 | W |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | $R_{\theta JA}$ | 320 | °C/W |
| Total Power Dissipation (Note 6) | $T_A$ = +25°C | $P_D$ | 0.9 | W |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State | $R_{\theta JA}$ | 141 | °C/W |
| Thermal Resistance, Junction to Case (Note 6) | | $R_{\theta JC}$ | 49 | |
| 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 | $BV_{DSS}$ | 12 | — | — | V | $V_{GS}$ = 0V, $I_D$ = 250µA |
| Zero Gate Voltage Drain Current $T_J$ = +25°C | $I_{DSS}$ | — | — | 1 | µA | $V_{DS}$ = 12V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±10 | µA | $V_{GS}$ = ±6V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS** (Note 7) | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | 0.35 | 0.42 | 1.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 119 | 150 | mΩ | $V_{GS}$ = 4.5V, $I_D$ = 1A |
| | | | 141 | 185 | | $V_{GS}$ = 2.5V, $I_D$ = 1A |
| | | | 175 | 210 | | $V_{GS}$ = 1.8V, $I_D$ = 1A |
| Diode Forward Voltage | $V_{SD}$ | — | 0.7 | 1.2 | V | $V_{GS}$ = 0V, $I_S$ = 150mA |
| **DYNAMIC CHARACTERISTICS** (Note 8) | | | | | | |
| Input Capacitance | $C_{ISS}$ | — | 115 | — | pF | $V_{DS}$ = 6V, $V_{GS}$ = 0V, f = 1.0MHz |
| Output Capacitance | $C_{OSS}$ | — | 25 | — | pF | |
| Reverse Transfer Capacitance | $C_{RSS}$ | — | 23 | — | pF | |
| Gate Resistance | $R_G$ | — | 90 | — | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1MHz |
| Total Gate Charge | $Q_G$ | — | 1.4 | — | nC | $V_{DS}$ = 4V, $V_{GS}$ = 4.5V, $I_D$ = 1A |
| Gate-Source Charge | $Q_{GS}$ | — | 0.1 | — | nC | |
| Gate-Drain Charge | $Q_{GD}$ | — | 0.1 | — | nC | |
| Turn-On Delay Time | $t_{D(ON)}$ | — | 4.0 | — | ns | $V_{GS}$ = 6V, $V_{DS}$ = 4V, $R_G$ = 1Ω, $I_D$ = 1A |
| Turn-On Rise Time | $t_R$ | — | 7.4 | — | ns | |
| Turn-Off Delay Time | $t_{D(OFF)}$ | — | 44 | — | ns | |
| Turn-Off Fall Time | $t_F$ | — | 19 | — | ns | |

Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to product testing.

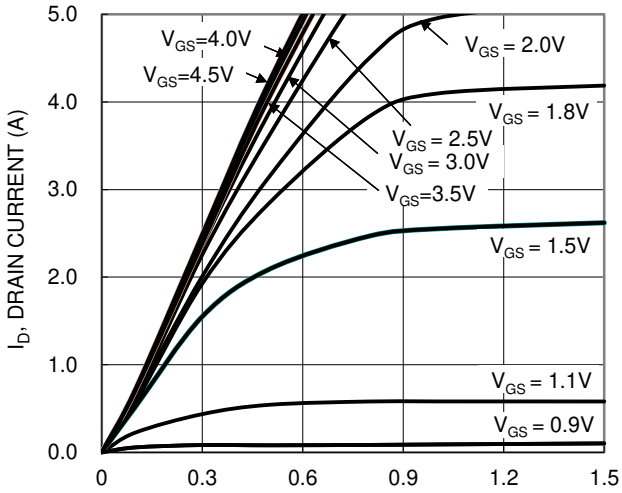



Figure1. Typical Output Characteristic

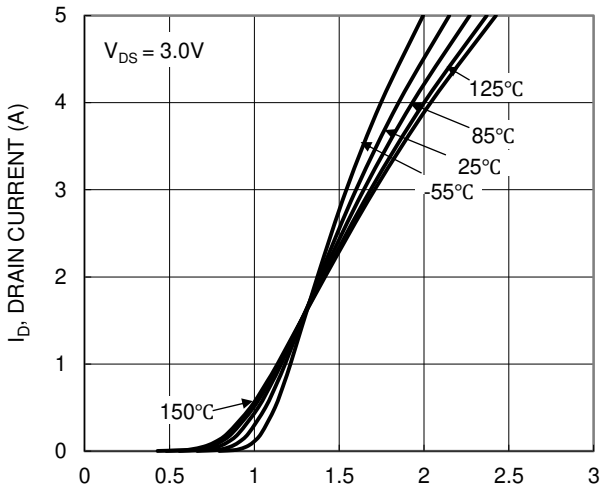



Figure 2. Typical Transfer Characteristic

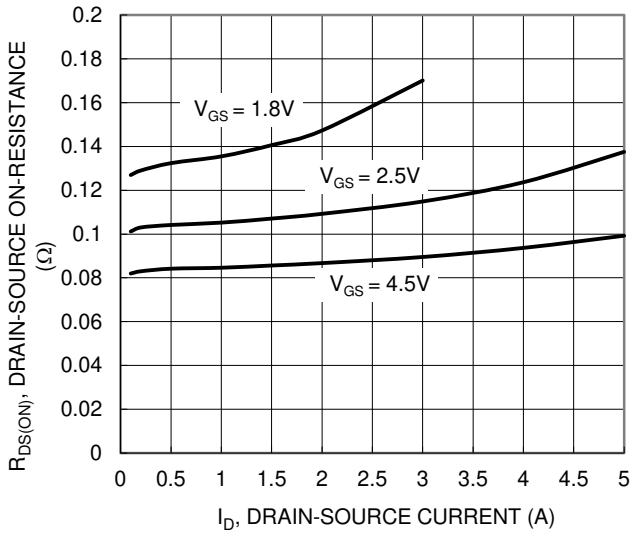



Figure 3. Typical On-Resistance vs. Drain Current and Gate Voltage

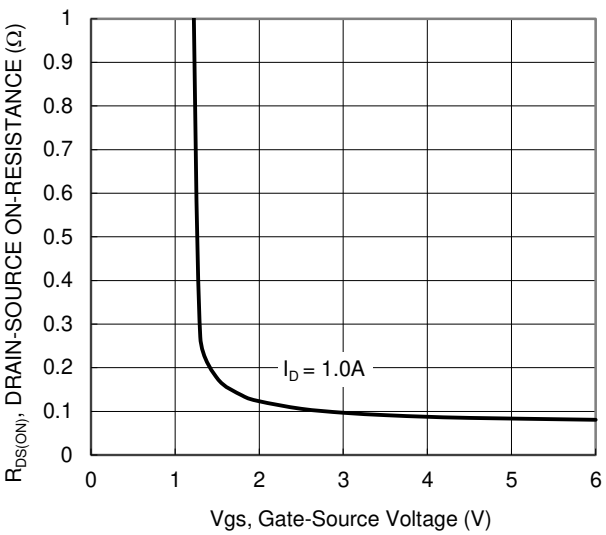



Figure 4. Typical Transfer Characteristic

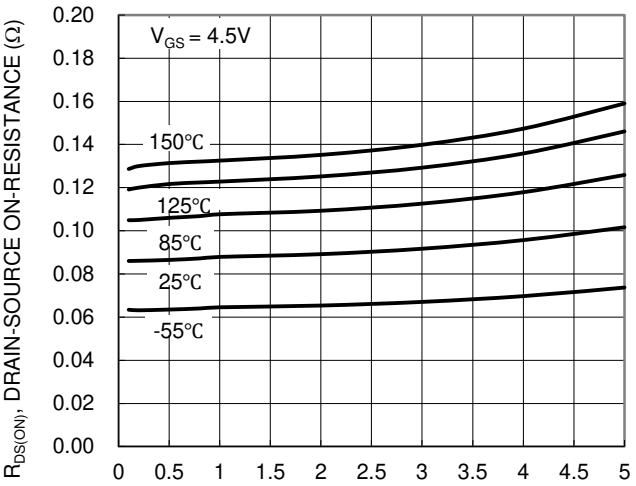



Figure 5. Typical On-Resistance vs. Drain Current and Temperature

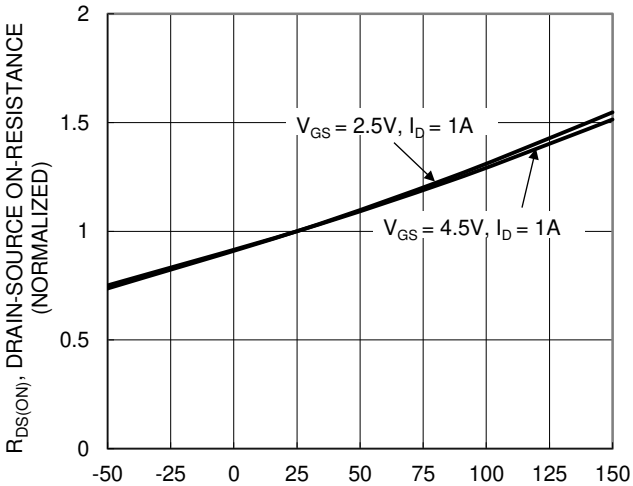



Figure 6. On-Resistance Variation with Temperature

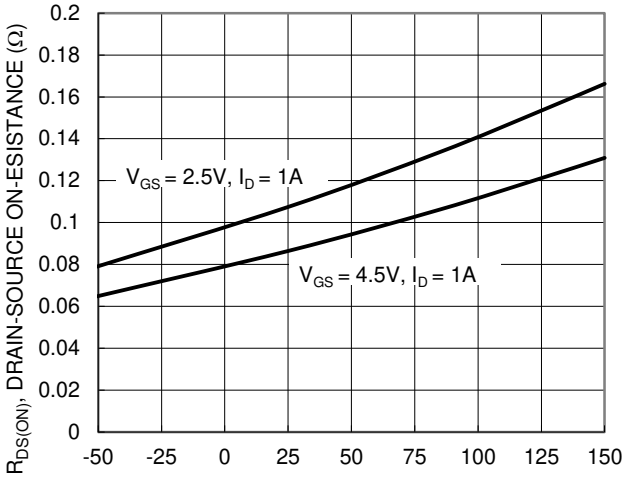



Figure 7. On-Resistance Variation with Temperature

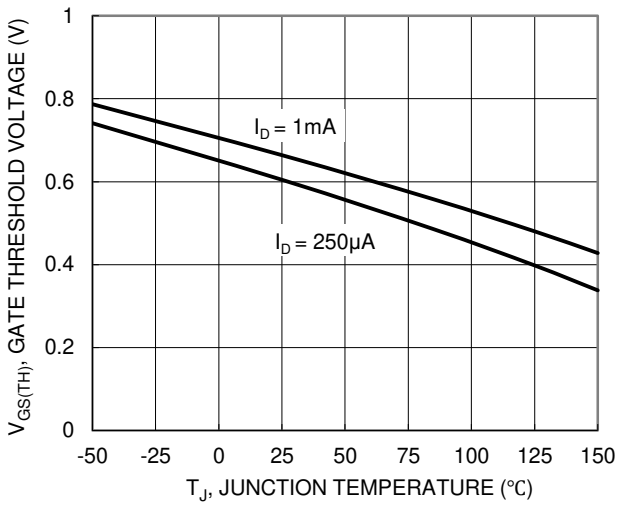



Figure 8. Gate Threshold Variation vs. junction Temperature

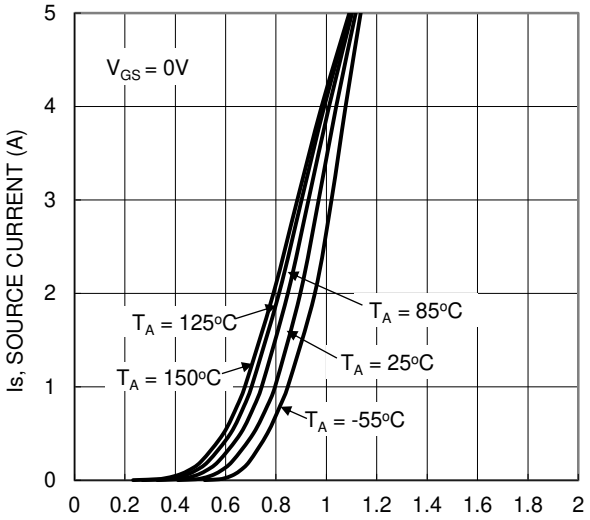



Figure 9. Diode Forward Voltage vs. Current

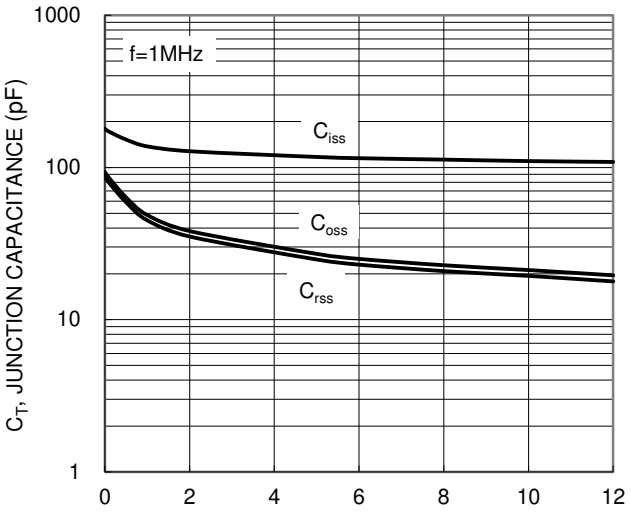



Figure 10. Typical Junction Capacitance

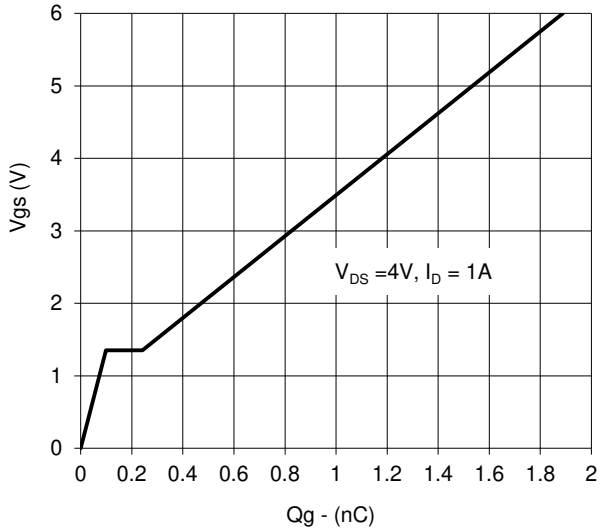



Figure 11. Gate Charge

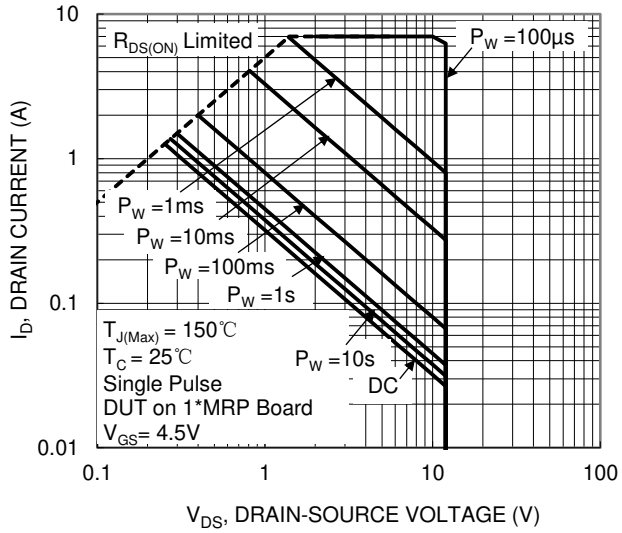



Figure 12. SOA, Safe Operation Area

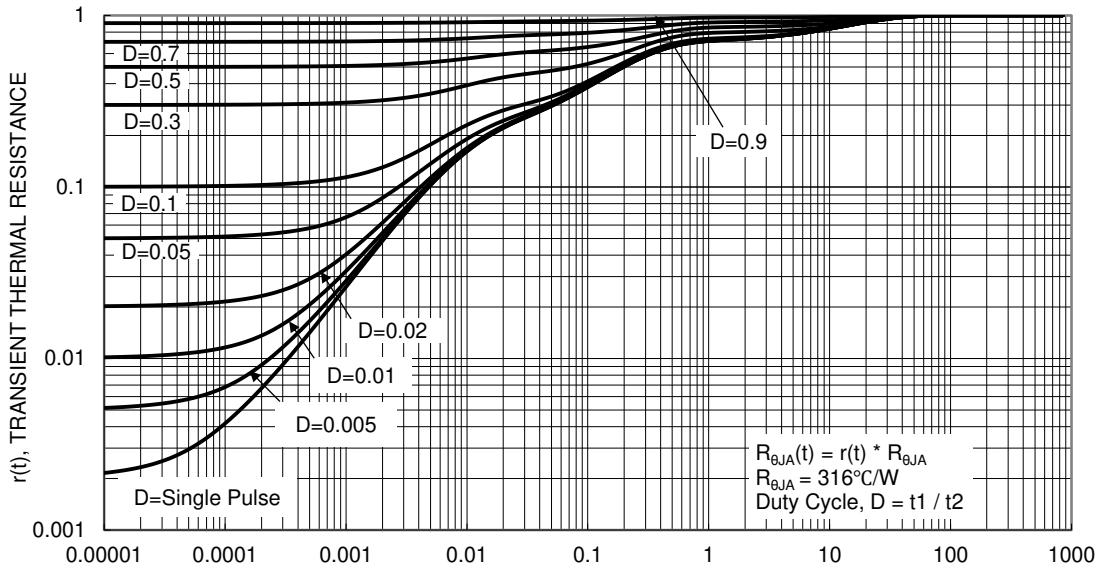
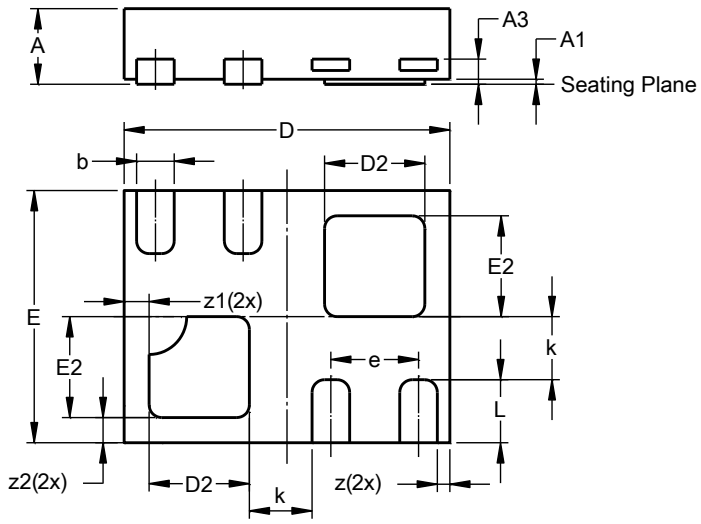



Figure 13. Transient Thermal Resistance

## Package Outline Dimensions

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

**X2-DFN1310-6 (Type B)**

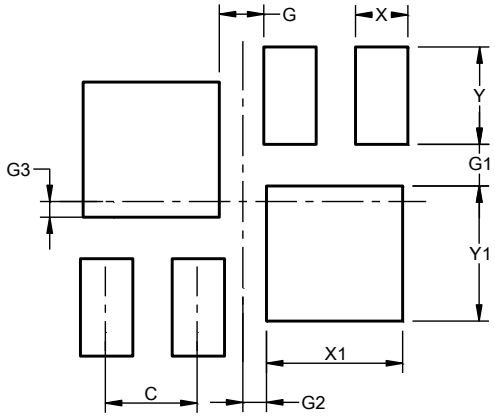



| X2-DFN1310-6 (Type B) | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.25 | 0.35 | 0.30 |
| **A1** | 0 | 0.05 | 0.02 |
| **A3** | -- | -- | 0.100 |
| **b** | 0.10 | 0.20 | 0.15 |
| **D** | 1.25 | 1.35 | 1.30 |
| **D2** | 0.30 | 0.50 | 0.40 |
| **E** | 0.95 | 1.05 | 1.00 |
| **E2** | 0.30 | 0.50 | 0.40 |
| **e** | -- | -- | 0.35 |
| **k** | 0.15 | -- | -- |
| **L** | 0.20 | 0.30 | 0.25 |
| **z** | -- | -- | 0.05 |
| **z1** | -- | -- | 0.10 |
| **z2** | -- | -- | 0.10 |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

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

**X2-DFN1310-6 (Type B)**




| Dimensions | Value (in mm) |
|---|---|
| **C** | 0.350 |
| **G** | 0.17 |
| **G1** | 0.16 |
| **G2** | 0.09 |
| **G3** | 0.06 |
| **X** | 0.20 |
| **X1** | 0.52 |
| **Y** | 0.375 |
| **Y1** | 0.52 |

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