

Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ max | I_D max $T_A = +25^\circ\text{C}$ |
|---------------|---------------------------------------|--|
| 30V | 12m Ω @ $V_{GS} = 10\text{V}$ | 10A |
| | 16m Ω @ $V_{GS} = 4.5\text{V}$ | 8.5A |

Features and Benefits

- 0.6mm profile – ideal for low profile applications
- PCB footprint of 4mm²
- Low Gate Threshold Voltage
- Low On-Resistance
- **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

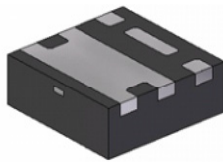
This MOSFET has been designed to minimize the on-state resistance ($R_{DS(on)}$) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- Battery Management Application
- Power Management Functions
- DC-DC Converters

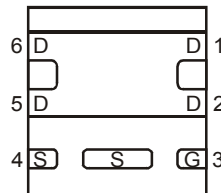
Mechanical Data

- Case: U-DFN2020-6 Type E
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.0065 grams (approximate)

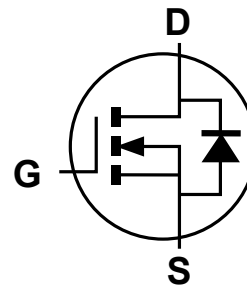
U-DFN2020-6
Type E



Bottom View



Pin Out



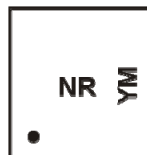
Internal Schematic

Ordering Information (Note 4)

| Part Number | Case | Packaging |
|----------------|--------------------|--------------------|
| DMN3016LFDE-7 | U-DFN2020-6 Type E | 3,000/Tape & Reel |
| DMN3016LFDE-13 | U-DFN2020-6 Type E | 10,000/Tape & Reel |

- 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



- NR = Product Type Marking Code
 YM = Date Code Marking
 Y = Year (ex: Y = 2011)
 M = Month (ex: 9 = September)

Date Code Key

| Year | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|------|------|------|------|------|------|------|------|
| Code | Y | Z | A | B | C | D | E |

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | O | N | D |

Maximum Ratings (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Value | Units |
|--|------------------|---------------------------|-------|
| Drain-Source Voltage | V_{DSS} | 30 | V |
| Gate-Source Voltage | V_{GSS} | ± 20 | V |
| Continuous Drain Current (Note 6) $V_{GS} = 10\text{V}$ | Steady State | $T_A = +25^\circ\text{C}$ | 10 |
| | | $T_A = +70^\circ\text{C}$ | 8 |
| | $t < 10\text{s}$ | $T_A = +25^\circ\text{C}$ | 12 |
| | | $T_A = +70^\circ\text{C}$ | 9 |
| Maximum Continuous Body Diode Forward Current (Note 6) | I_S | 2.5 | A |
| Pulsed Drain Current (10 μs pulse, duty cycle = 1%) | I_{DM} | 90 | A |
| Avalanche Current (Note 7) $L = 0.1\text{mH}$ | I_{AR} | 22 | A |
| Repetitive Avalanche Energy (Note 7) $L = 0.1\text{mH}$ | E_{AR} | 24 | mJ |

Thermal Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Value | Units |
|--|-----------------|---------------------------|--------------------|
| Total Power Dissipation (Note 5) | P_D | $T_A = +25^\circ\text{C}$ | 0.73 |
| | | $T_A = +70^\circ\text{C}$ | 0.47 |
| Thermal Resistance, Junction to Ambient (Note 5) | $R_{\theta JA}$ | Steady state | 171 |
| | | $t < 10\text{s}$ | 121 |
| Total Power Dissipation (Note 6) | P_D | $T_A = +25^\circ\text{C}$ | 2.02 |
| | | $T_A = +70^\circ\text{C}$ | 1.30 |
| Thermal Resistance, Junction to Ambient (Note 6) | $R_{\theta JA}$ | Steady state | 62 |
| | | $t < 10\text{s}$ | 42 |
| Thermal Resistance, Junction to Case (Note 6) | $R_{\theta JC}$ | 9.3 | $^\circ\text{C/W}$ |
| Operating and Storage Temperature Range | T_J, T_{STG} | -55 to +150 | $^\circ\text{C}$ |

Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--|--------------|-----|------|-----------|---------------|--|
| OFF CHARACTERISTICS (Note 8) | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | 30 | - | - | V | $V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$ |
| Zero Gate Voltage Drain Current | I_{DSS} | - | - | 1 | μA | $V_{DS} = 30\text{V}, V_{GS} = 0\text{V}$ |
| Gate-Source Leakage | I_{GSS} | - | - | ± 100 | nA | $V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$ |
| ON CHARACTERISTICS (Note 8) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | 1.4 | - | 2.0 | V | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$ |
| Static Drain-Source On-Resistance | $R_{DS(on)}$ | - | 8 | 12 | m Ω | $V_{GS} = 10\text{V}, I_D = 11\text{A}$ |
| | | - | 12 | 16 | | $V_{GS} = 4.5\text{V}, I_D = 9\text{A}$ |
| Forward Transfer Admittance | $ Y_{fs} $ | - | 32 | - | S | $V_{DS} = 5\text{V}, I_D = 12\text{A}$ |
| Diode Forward Voltage | V_{SD} | - | 0.70 | 1.0 | V | $V_{GS} = 0\text{V}, I_S = 1\text{A}$ |
| DYNAMIC CHARACTERISTICS (Note 9) | | | | | | |
| Input Capacitance | C_{iss} | - | 1415 | - | pF | $V_{DS} = 15\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$ |
| Output Capacitance | C_{oss} | - | 119 | - | | |
| Reverse Transfer Capacitance | C_{rss} | - | 82 | - | | |
| Gate resistance | R_g | - | 2.6 | 3.2 | Ω | $V_{DS} = 0\text{V}, V_{GS} = 0\text{V}, f = 1.0\text{MHz}$ |
| Total Gate Charge ($V_{GS} = 4.5\text{V}$) | Q_g | - | 11.3 | - | nC | $V_{DS} = 15\text{V}, I_D = 12\text{A}$ |
| Total Gate Charge ($V_{GS} = 10\text{V}$) | Q_g | - | 25.1 | - | | |
| Gate-Source Charge | Q_{gs} | - | 3.5 | - | | |
| Gate-Drain Charge | Q_{gd} | - | 3.6 | - | | |
| Turn-On Delay Time | $t_{D(on)}$ | - | 4.8 | - | ns | $V_{DD} = 15\text{V}, V_{GS} = 10\text{V}, R_L = 1.25\Omega, R_G = 3\Omega,$ |
| Turn-On Rise Time | t_r | - | 16.5 | - | | |
| Turn-Off Delay Time | $t_{D(off)}$ | - | 26.1 | - | | |
| Turn-Off Fall Time | t_f | - | 5.6 | - | | |
| Reverse Recovery Time | t_{rr} | - | 12.3 | - | ns | $I_f = 12\text{A}, di/dt = 500\text{A}/\mu\text{s}$ |
| Reverse Recovery Charge | Q_{rr} | - | 10.4 | - | nC | |

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
 - Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
 - I_{AR} and E_{AR} rating are based on low frequency and duty cycles to keep $T_J = +25^\circ\text{C}$
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.

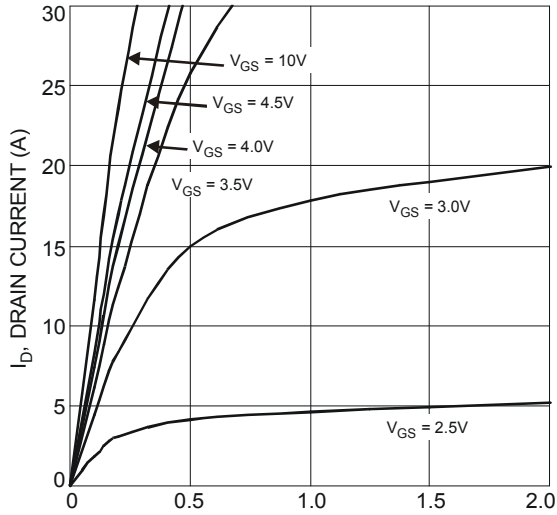


Fig. 1 Typical Output Characteristics

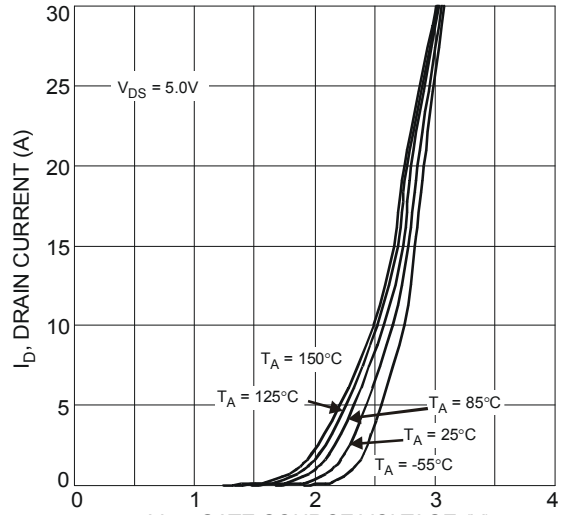


Fig. 2 Typical Transfer Characteristics

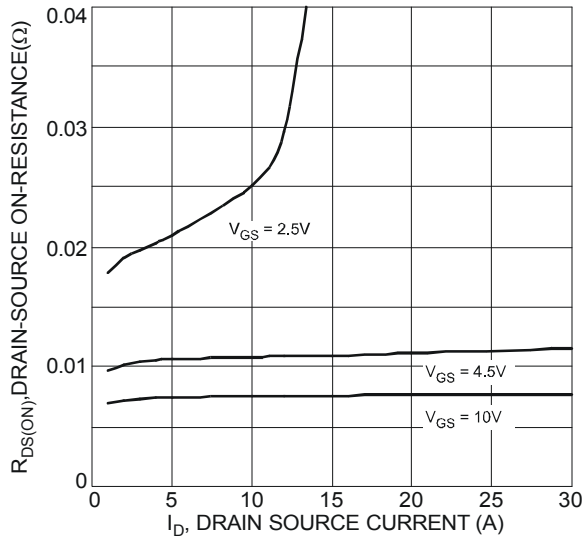


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

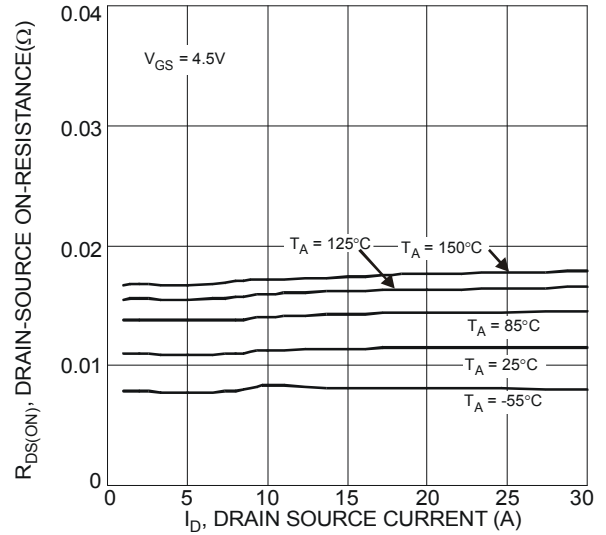


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

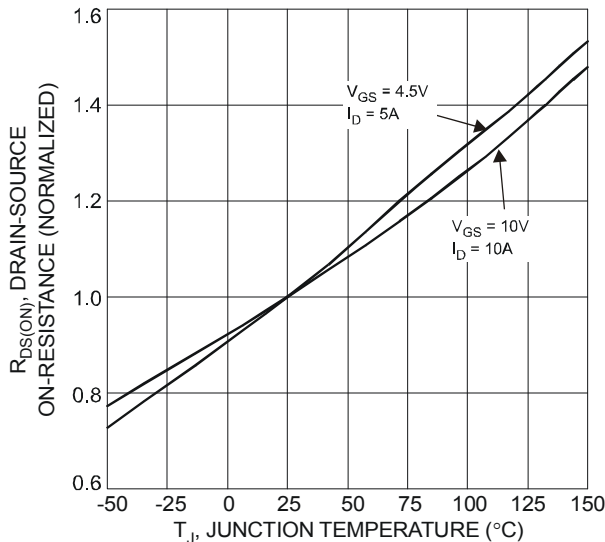


Fig. 5 On-Resistance Variation with Temperature

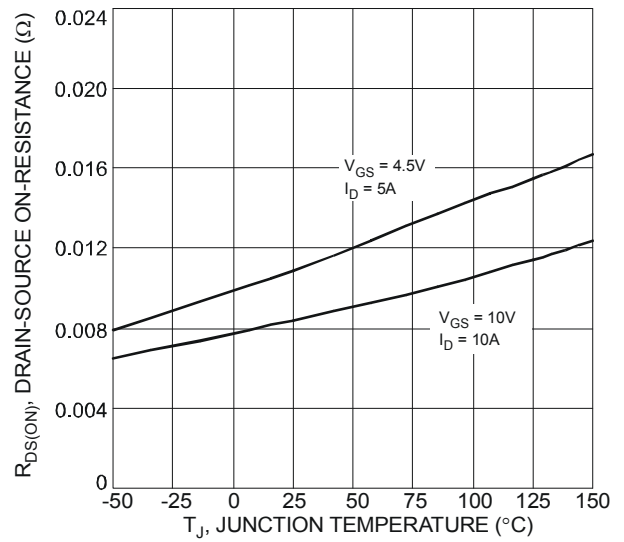


Fig. 6 On-Resistance Variation with Temperature

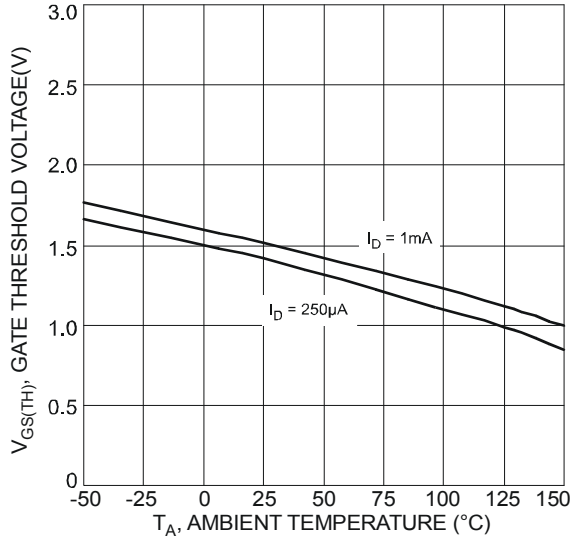


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

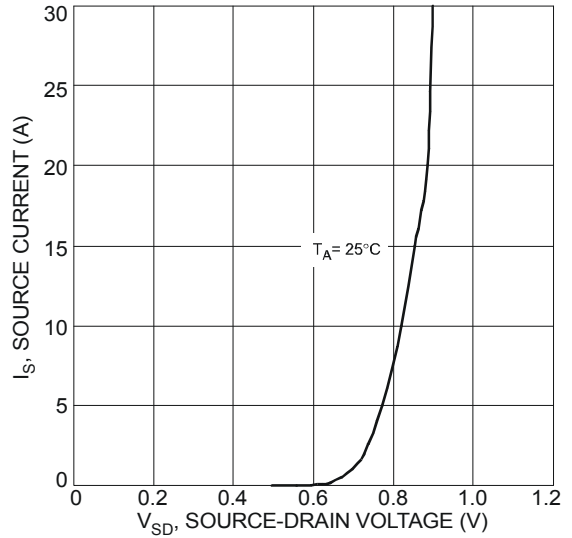


Fig. 8 Diode Forward Voltage vs. Current

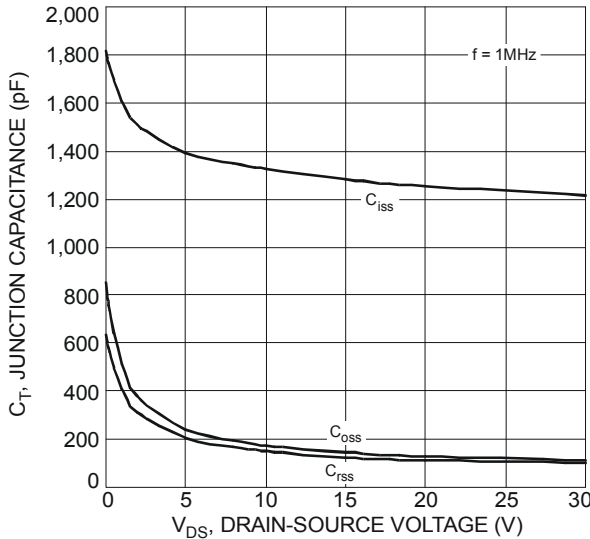


Fig. 9 Typical Junction Capacitance

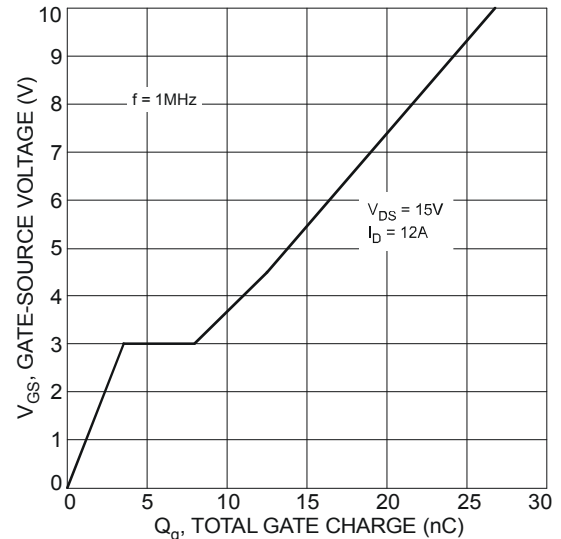


Fig. 10 Gate-Charge Characteristics

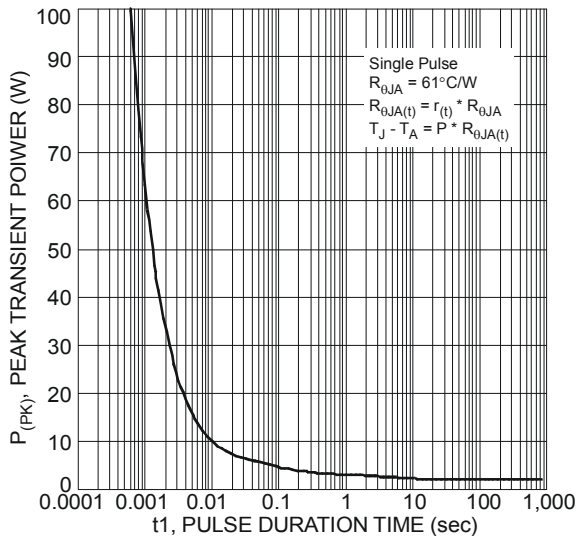
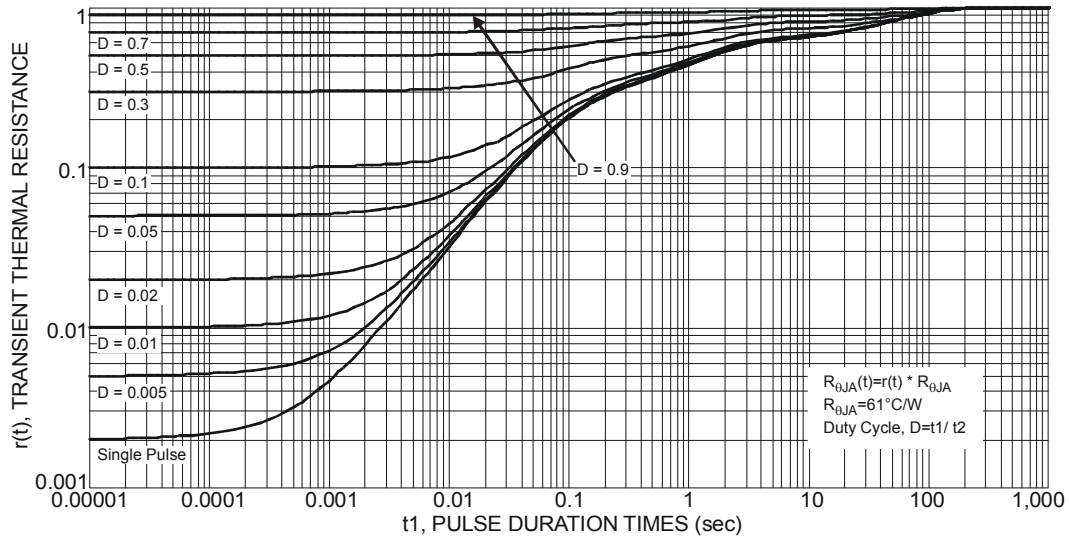
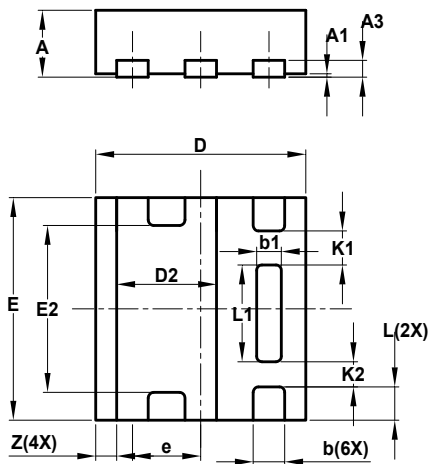


Fig. 11 Single Pulse Maximum Power Dissipation



Package Outline Dimension

Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

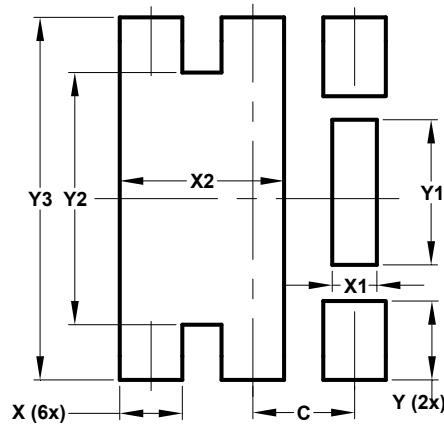


| U-DFN2020-6 Type E | | | |
|-----------------------|-------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.57 | 0.63 | 0.60 |
| A1 | 0 | 0.05 | 0.03 |
| A3 | - | - | 0.15 |
| b | 0.25 | 0.35 | 0.30 |
| b1 | 0.185 | 0.285 | 0.235 |
| D | 1.95 | 2.05 | 2.00 |
| D2 | 0.85 | 1.05 | 0.95 |
| E | 1.95 | 2.05 | 2.00 |
| E2 | 1.40 | 1.60 | 1.50 |
| e | - | - | 0.65 |
| L | 0.25 | 0.35 | 0.30 |
| L1 | 0.82 | 0.92 | 0.87 |
| K1 | - | - | 0.305 |
| K2 | - | - | 0.225 |
| Z | - | - | 0.20 |

All Dimensions in mm

Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 0.650 |
| X | 0.400 |
| X1 | 0.285 |
| X2 | 1.050 |
| Y | 0.500 |
| Y1 | 0.920 |
| Y2 | 1.600 |
| Y3 | 2.300 |

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