

Product Summary

| BV_{DSS} | $R_{DS(ON)}$ max | I_D max $T_A = +25^\circ\text{C}$ |
|------------|---------------------------------------|--|
| 20V | 45m Ω @ $V_{GS} = 4.5\text{V}$ | 4.5A |
| | 55m Ω @ $V_{GS} = 2.5\text{V}$ | 4.1A |

Description

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.

Applications

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

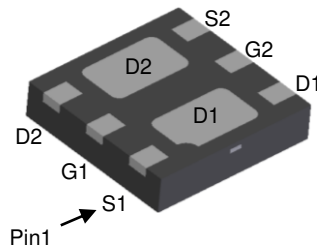
Features and Benefits

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](mailto:contact@diodes.com) or your local Diodes representative. <https://www.diodes.com/quality/product-definitions/>**

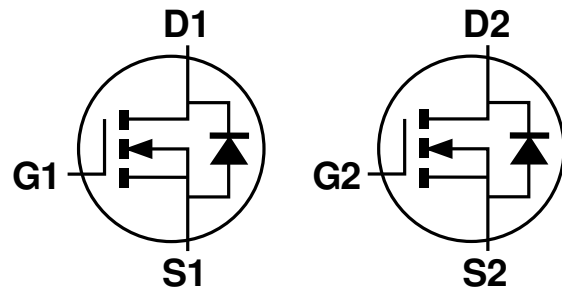
Mechanical Data

- Case: U-DFN2020-6
- 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@4
- Weight: 0.0065 grams (Approximate)

U-DFN2020-6 (Type B)



Bottom View



Internal Schematic

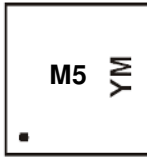
Ordering Information (Note 4)

| Part Number | Case | Packaging |
|-----------------|----------------------|--------------------|
| DMN2050LFDB -7 | U-DFN2020-6 (Type B) | 3,000/Tape & Reel |
| DMN2050LFDB -13 | U-DFN2020-6 (Type B) | 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

Site 1



M5 = Product Type Marking Code
 YM = Date Code Marking
 Y = Year (ex: H = 2020)
 M = Month (ex: 9 = September)

Date Code Key

| | | | | | | | | | | | | |
|--------------|------|-----|------|------|------|------|------|------|------|------|------|------|
| Year | 2013 | ... | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 |
| Code | A | ... | H | I | J | K | L | M | N | O | P | R |
| 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 |

Site 2



M5 = Product Type Marking Code
 YWX = Date Code Marking
 Y = Year (ex: 0 = 2020)
 W = Week (ex: a = week 27; z represents week 52 and 53)
 X = Internal Code (ex: U = Monday)

Date Code Key

| | | | | | | | | | | | | |
|----------------------|------|-----|------|------|-------|------|------|------|------|------|------|------|
| Year | 2013 | ... | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 |
| Code | 3 | ... | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Week | 1-26 | | | | 27-52 | | | | 53 | | | |
| Code | A-Z | | | | a-z | | | | z | | | |
| Internal Code | Sun | Mon | Tue | Wed | Thu | Fri | Sat | | | | | |
| Code | T | U | V | W | X | Y | Z | | | | | |

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} | ±12 | V |
| Continuous Drain Current (Note 5) V _{GS} = 4.5V | Steady State | T _A = +25°C | I _D | 3.3 | A |
| | | T _A = +70°C | | 2.6 | |
| Continuous Drain Current (Note 6) V _{GS} = 4.5V | Steady State | T _A = +25°C | I _D | 4.5 | A |
| | | T _A = +70°C | | 3.6 | |
| Maximum Continuous Body Diode Forward Current (Note 6) | | | I _S | 1 | A |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%) | | | I _{DM} | 25 | A |
| Avalanche Current (Note 7) L = 0.1mH | | | I _{AS} | 9 | A |
| Avalanche Energy (Note 7) L = 0.1mH | | | E _{AS} | 4.5 | mJ |

Thermal Characteristics

| Characteristic | | Symbol | Value | Unit |
|--|------------------------|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 5) | T _A = +25°C | P _D | 0.73 | W |
| | T _A = +70°C | | 0.46 | |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | R _{θJA} | 173 | °C/W |
| | t < 10s | | 110 | |
| Total Power Dissipation (Note 6) | T _A = +25°C | P _D | 1.42 | W |
| | T _A = +70°C | | 0.90 | |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady State | R _{θJA} | 89 | °C/W |
| | t < 10s | | 57 | |
| Thermal Resistance, Junction to Case (Note 6) | | R _{θJC} | 18 | |
| 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 8) | | | | | | |
| 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} | — | — | 1.0 | µA | V _{DS} = 16V, V _{GS} = 0V |
| Gate-Source Leakage | I _{GSS} | — | — | ±100 | nA | V _{GS} = ±12V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 8) | | | | | | |
| Gate Threshold Voltage | V _{GS(TH)} | 0.4 | — | 1.0 | V | V _{DS} = V _{GS} , I _D = 250µA |
| Static Drain-Source On-Resistance | R _{DS(ON)} | — | 28 | 45 | mΩ | V _{GS} = 4.5V, I _D = 5.0A |
| | | — | 36 | 55 | | V _{GS} = 2.5V, I _D = 4.2A |
| Forward Transfer Admittance | Y _{fs} | — | 9 | — | S | V _{DS} = 5V, I _D = 5A |
| Diode Forward Voltage | V _{SD} | — | 0.75 | 1.0 | V | V _{GS} = 0V, I _S = 1A |
| DYNAMIC CHARACTERISTICS (Note 9) | | | | | | |
| Input Capacitance | C _{iss} | — | 389 | — | pF | V _{DS} = 10V, V _{GS} = 0V, f = 1.0MHz |
| Output Capacitance | C _{oss} | — | 72 | — | pF | |
| Reverse Transfer Capacitance | C _{rss} | — | 63 | — | pF | |
| Gate Resistance | R _g | — | 2.1 | — | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1MHz |
| Total Gate Charge (V _{GS} = 4.5V) | Q _g | — | 5.7 | — | nC | V _{DS} = 15V, I _D = 5.8A |
| Total Gate Charge (V _{GS} = 10V) | Q _g | — | 12 | — | nC | |
| Gate-Source Charge | Q _{gs} | — | 0.7 | — | nC | |
| Gate-Drain Charge | Q _{gd} | — | 1.5 | — | nC | |
| Turn-On Delay Time | t _{d(ON)} | — | 5 | — | ns | V _{DS} = 10V, V _{GS} = 4.5V, R _G = 6Ω, I _{DS} = 1A |
| Turn-On Rise Time | t _R | — | 8 | — | ns | |
| Turn-Off Delay Time | t _{d(OFF)} | — | 25 | — | ns | |
| Turn-Off Fall Time | t _F | — | 8 | — | ns | |
| Reverse Recovery Time | t _{RR} | — | 8.5 | — | ns | I _F = 5A, di/dt = 100A/µs |
| Reverse Recovery Charge | Q _{RR} | — | 2.1 | — | 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_{AS} and E_{AS} ratings are based on low frequency and duty cycles to keep T_J = +25°C.
 - Short duration pulse test used to minimize self-heating effect.
 - Guaranteed by design. Not subject to product testing.

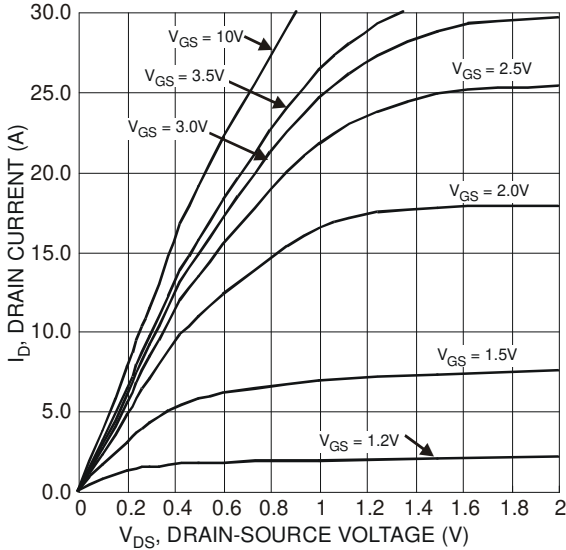


Figure 1 Typical Output Characteristics

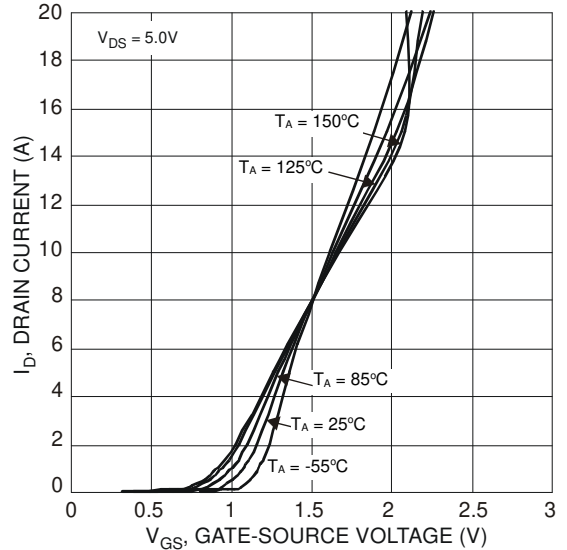


Figure 2 Typical Transfer Characteristics

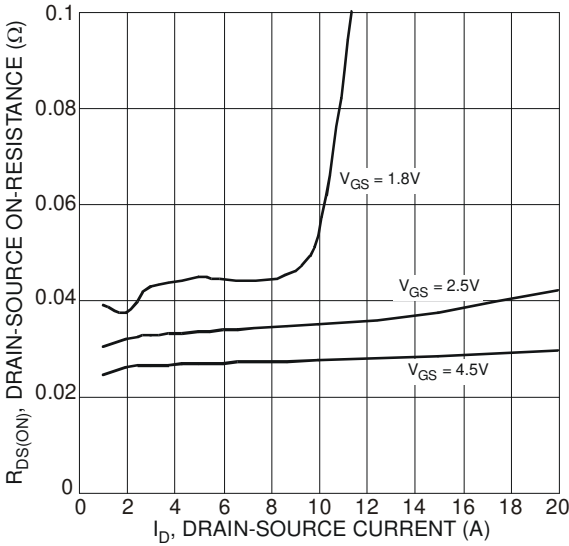


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

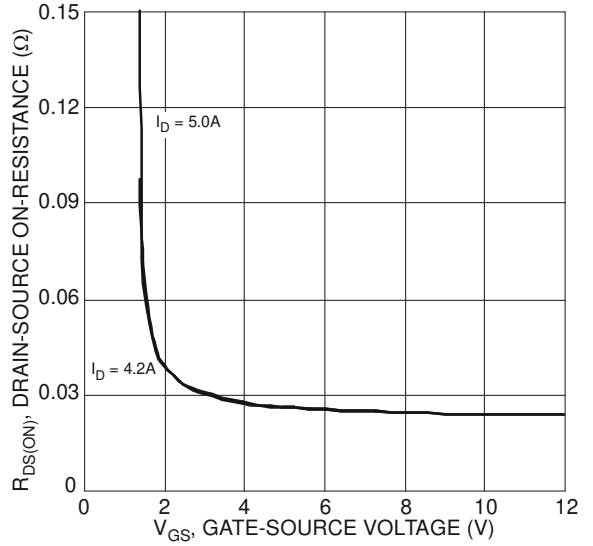


Figure 4 Typical Transfer Characteristics

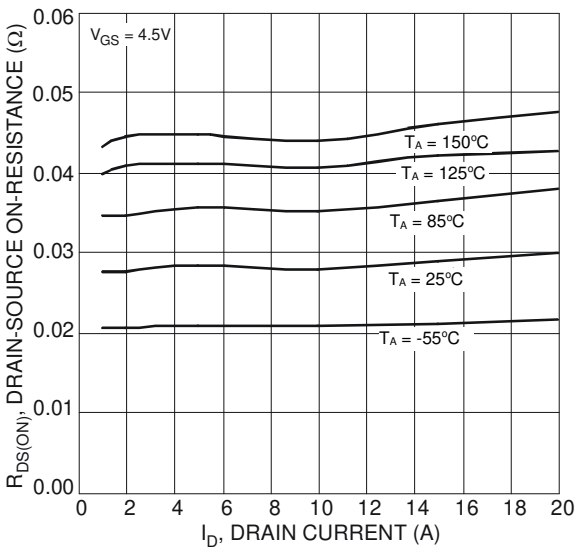


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

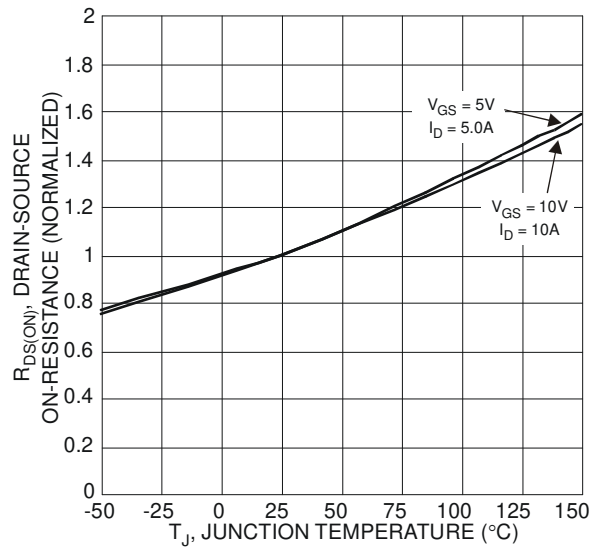


Figure 6 On-Resistance Variation with Temperature

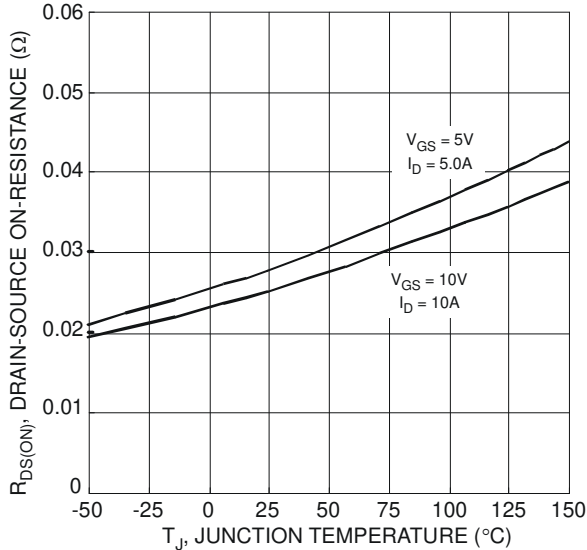


Figure 7 On-Resistance Variation with Temperature

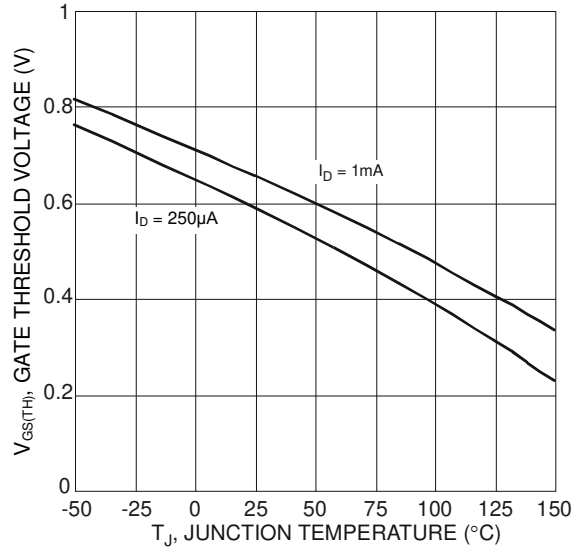


Figure 8 Gate Threshold Variation vs. Junction Temperature

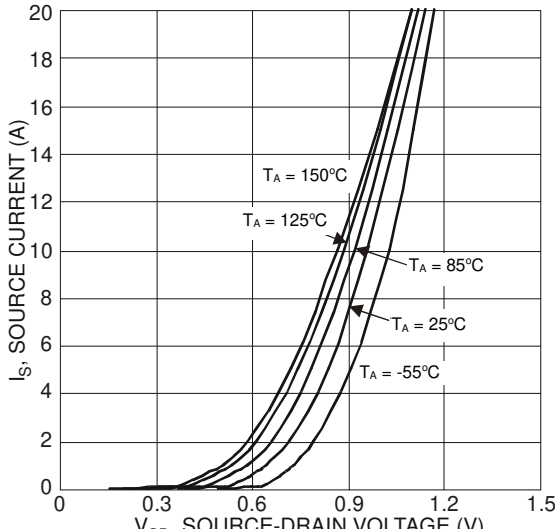


Figure 9 Diode Forward Voltage vs. Current

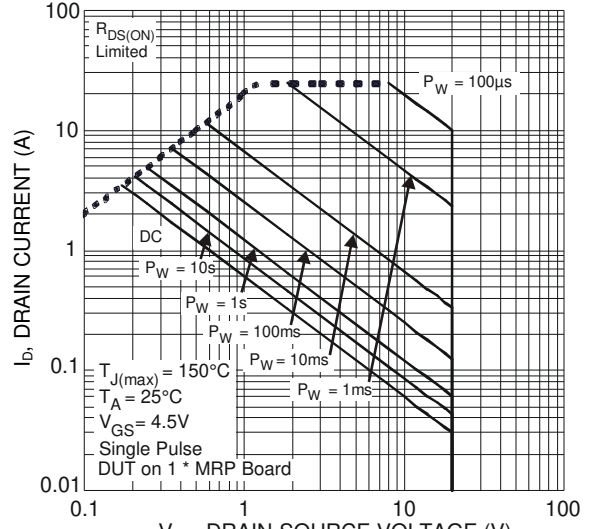


Figure 10 SOA, Safe Operation Area

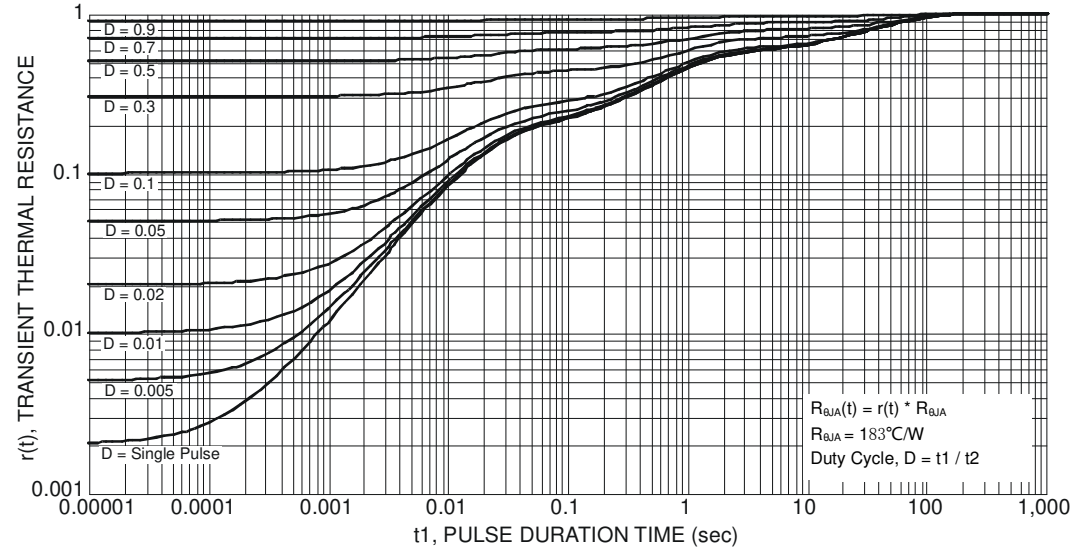
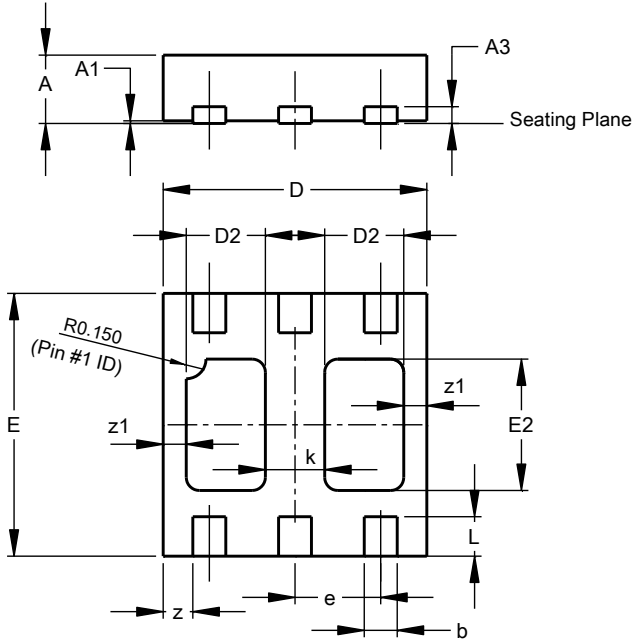


Figure 11 Transient Thermal Resistance

Package Outline Dimensions

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

U-DFN2020-6 (Type B)

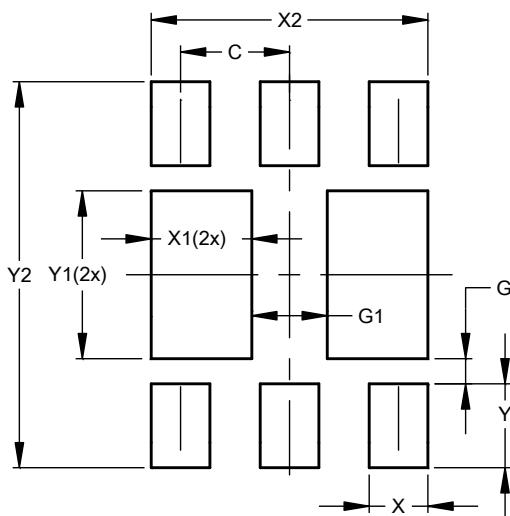


| U-DFN2020-6 Type B | | | |
|-----------------------|-------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.545 | 0.605 | 0.575 |
| A1 | 0.00 | 0.05 | 0.02 |
| A3 | - | - | 0.13 |
| b | 0.20 | 0.30 | 0.25 |
| D | 1.95 | 2.075 | 2.00 |
| D2 | 0.50 | 0.70 | 0.60 |
| e | - | - | 0.65 |
| E | 1.95 | 2.075 | 2.00 |
| E2 | 0.90 | 1.10 | 1.00 |
| k | - | - | 0.45 |
| L | 0.25 | 0.35 | 0.30 |
| z | - | - | 0.225 |
| z1 | - | - | 0.175 |
| All Dimensions in mm | | | |

Suggested Pad Layout

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

U-DFN2020-6 (Type B)



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 0.650 |
| G | 0.150 |
| G1 | 0.450 |
| X | 0.350 |
| X1 | 0.600 |
| X2 | 1.650 |
| Y | 0.500 |
| Y1 | 1.000 |
| Y2 | 2.300 |

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