

## Product Summary

| Device          | BV <sub>DSS</sub> | R <sub>DS(ON)</sub> max         | I <sub>D</sub> MAX<br>T <sub>A</sub> = +25°C |
|-----------------|-------------------|---------------------------------|--|
| Q1<br>N-Channel | 12V               | 34mΩ @ V <sub>GS</sub> = 4.5V   | 5.1A   |
|                 |                   | 40mΩ @ V <sub>GS</sub> = 2.5V   | 4.7A   |
|                 |                   | 50mΩ @ V <sub>GS</sub> = 1.8V   | 4.2A   |
|                 |                   | 70mΩ @ V <sub>GS</sub> = 1.5V   | 3.6A   |
| Q2<br>P-Channel | -12V              | 59mΩ @ V <sub>GS</sub> = -4.5V  | -3.9A  |
|                 |                   | 81mΩ @ V <sub>GS</sub> = -2.5V  | -3.3A  |
|                 |                   | 115mΩ @ V <sub>GS</sub> = -1.8V | -2.8A  |
|                 |                   | 215mΩ @ V <sub>GS</sub> = -1.5V | -2.0A  |

## Description

This MOSFET has been designed to minimize the on-state resistance (R<sub>DS(ON)</sub>) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

## Applications

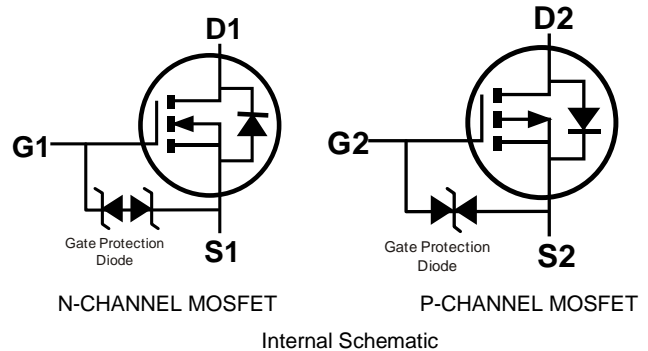
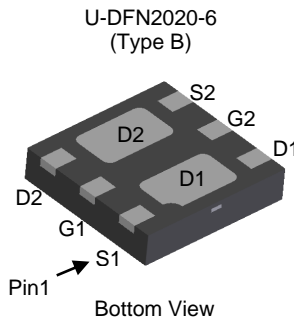
- Load Switch
- Power Management Functions
- Portable Power Adaptors

## Features

- Low On-Resistance
- Low Input Capacitance
- Low Profile, 0.6mm Max Height
- ESD Protected Gate
- **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 refer to the related automotive grade (Q-suffix) part. A listing can be found at <https://www.diodes.com/products/automotive/automotive-products/>.**
- **This part is qualified to JEDEC standards (as references in AEC-Q) for High Reliability. <https://www.diodes.com/quality/product-definitions/>**
- **An Automotive-Compliant Part is Available Under Separate Datasheet ([DMC1030UFDBQ](#))**

## 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
- Terminals Connections: See Diagram Below
- Weight: 0.0065 grams (Approximate)



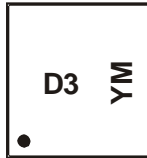
## Ordering Information (Note 4)

| Part Number     | Case                 | Packaging         |
|-----------------|----------------------|-------------------|
| DMC1030UFDB -7  | U-DFN2020-6 (Type B) | 3000/Tape & Reel  |
| DMC1030UFDB -13 | U-DFN2020-6 (Type B) | 10000/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

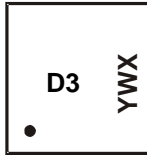


D3 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: H = 2020)  
 M = Month (ex: 9 = September)

Date Code Key

|              |      |     |      |      |      |      |      |      |      |      |      |      |
|--------------|------|-----|------|------|------|------|------|------|------|------|------|------|
| <b>Year</b>  | 2014 | ... | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 |
| <b>Code</b>  | B    | ... | H    | I    | J    | K    | L    | M    | N    | O    | P    | R    |
| <b>Month</b> | Jan  | Feb | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| <b>Code</b>  | 1    | 2   | 3    | 4    | 5    | 6    | 7    | 8    | 9    | O    | N    | D    |

Site 2



D3 = 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

|                      |      |     |      |      |       |      |      |      |      |      |      |      |
|----------------------|------|-----|------|------|-------|------|------|------|------|------|------|------|
| <b>Year</b>          | 2014 | ... | 2020 | 2021 | 2022  | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 |
| <b>Code</b>          | 4    | ... | 0    | 1    | 2     | 3    | 4    | 5    | 6    | 7    | 8    | 9    |
| <b>Week</b>          | 1-26 |     |      |      | 27-52 |      |      |      | 53   |      |      |      |
| <b>Code</b>          | A-Z  |     |      |      | a-z   |      |      |      | z    |      |      |      |
| <b>Internal Code</b> | Sun  | Mon | Tue  | Wed  | Thu   | Fri  | Sat  |      |      |      |      |      |
| <b>Code</b>          | T    | U   | V    | W    | X     | Y    | Z    |      |      |      |      |      |

**Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic   |              |  | Symbol           | Q1<br>N-CHANNEL | Q2<br>P-CHANNEL | Unit |
|--|--------------|--|------------------|-----------------|-----------------|------|
| Drain-Source Voltage   |              |  | V <sub>DSS</sub> | 12              | -12             | V    |
| Gate-Source Voltage  |              |  | V <sub>GSS</sub> | ±8              | ±8              | V    |
| Continuous Drain Current (Note 5)<br>N-Channel: V <sub>GS</sub> = 4.5V<br>P-Channel: V <sub>GS</sub> = -4.5V | Steady State | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | 5.1<br>4.1      | -3.9<br>-3.1    | A    |
|  | t < 5s       | T <sub>A</sub> = +25°C<br>T <sub>A</sub> = +70°C | I <sub>D</sub>   | 6.6<br>5.3      | -5.0<br>-4.0    | A    |
| Maximum Continuous Body Diode Forward Current (Note 5)   |              |  | I <sub>S</sub>   | 2               | -1.7            | A    |
| Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)   |              |  | I <sub>DM</sub>  | 35              | -25             | A    |

**Thermal Characteristics**

| Characteristic                                   |              | Symbol                            | Value       | Unit |
|--|--------------|-----------------------------------|-------------|------|
| Total Power Dissipation (Note 5)                 | Steady State | P <sub>D</sub>                    | 1.36        | W    |
|  | t < 5s       |                                   | 1.89        |      |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | R <sub>θJA</sub>                  | 92          | °C/W |
|  | t < 5s       |                                   | 66          |      |
| Thermal Resistance, Junction to Case (Note 5)    |              | R <sub>θJC</sub>                  | 18          |      |
| Operating and Storage Temperature Range          |              | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

**Electrical Characteristics Q1 N-CHANNEL** (@ T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic   | Symbol              | Min             | Typ  | Max | Unit | Test Condition  |    |
|--|---------------------|-----------------|------|-----|------|---|----|
| <b>OFF CHARACTERISTICS (Note 6)</b>                    |                     |                 |      |     |      |   |    |
| Drain-Source Breakdown Voltage                         | BV <sub>DSS</sub>   | 12              | —    | —   | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250µA  |    |
| Zero Gate Voltage Drain Current T <sub>J</sub> = +25°C | I <sub>DSS</sub>    | —               | —    | 1.0 | µA   | V <sub>DS</sub> = 12V, V <sub>GS</sub> = 0V   |    |
| Gate-Source Leakage                                    | I <sub>GSS</sub>    | —               | —    | ±10 | µA   | V <sub>GS</sub> = ±8V, V <sub>DS</sub> = 0V   |    |
| <b>ON CHARACTERISTICS (Note 6)</b>                     |                     |                 |      |     |      |   |    |
| Gate Threshold Voltage                                 | V <sub>GS(TH)</sub> | 0.4             | —    | 1   | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250µA                                  |    |
| Static Drain-Source On-Resistance                      | R <sub>DS(ON)</sub> | —               | 17   | 34  | mΩ   | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 4.6A   |    |
|  |                     | —               | 20   | 40  |      | V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 4.2A   |    |
|  |                     | —               | 24   | 50  |      | V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 3.8A   |    |
|  |                     | —               | 28   | 70  |      | V <sub>GS</sub> = 1.5V, I <sub>D</sub> = 1.5A   |    |
| Diode Forward Voltage                                  | V <sub>SD</sub>     | —               | 0.7  | 1.2 | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = 4.8A   |    |
| <b>DYNAMIC CHARACTERISTICS (Note 7)</b>                |                     |                 |      |     |      |   |    |
| Input Capacitance                                      | C <sub>ISS</sub>    | —               | 1003 | —   | pF   | V <sub>DS</sub> = 6V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                   |    |
| Output Capacitance                                     | C <sub>OSS</sub>    | —               | 132  | —   | pF   |   |    |
| Reverse Transfer Capacitance                           | C <sub>RSS</sub>    | —               | 115  | —   | pF   |   |    |
| Gate Resistance  | R <sub>g</sub>      | —               | 11.3 | —   | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz  |    |
| Total Gate Charge (V <sub>GS</sub> = 4.5V)             | Q <sub>g</sub>      | —               | 12.2 | —   | nC   | V <sub>DS</sub> = 10V, I <sub>D</sub> = 6.8A  |    |
| Total Gate Charge (V <sub>GS</sub> = 8V)               |                     | —               | 23.1 | —   | nC   |   |    |
| Gate-Source Charge                                     |                     | Q <sub>gs</sub> | —    | 1.3 | —    |   | nC |
| Gate-Drain Charge                                      |                     | Q <sub>gd</sub> | —    | 1.5 | —    |   | nC |
| Turn-On Delay Time                                     | t <sub>D(ON)</sub>  | —               | 4.4  | —   | ns   | V <sub>DD</sub> = 6V, V <sub>GS</sub> = 4.5V,<br>R <sub>L</sub> = 1.1Ω, R <sub>G</sub> = 1Ω |    |
| Turn-On Rise Time                                      | t <sub>r</sub>      | —               | 7.4  | —   | ns   |   |    |
| Turn-Off Delay Time                                    | t <sub>D(OFF)</sub> | —               | 18.8 | —   | ns   |   |    |
| Turn-Off Fall Time                                     | t <sub>f</sub>      | —               | 4.9  | —   | ns   |   |    |
| Body Diode Reverse Recovery Time                       | t <sub>RR</sub>     | —               | 7.6  | —   | ns   | I <sub>S</sub> = 5.4A, dI/dt = 100A/µs  |    |
| Body Diode Reverse Recovery Charge                     | Q <sub>R</sub>      | —               | 0.9  | —   | nC   | I <sub>S</sub> = 5.4A, dI/dt = 100A/µs  |    |

Notes: 5. Device mounted on 1" × 1" FR-4 PCB with high coverage 2oz. Copper, single sided.  
6. Short duration pulse test used to minimize self-heating effect.  
7. Guaranteed by design. Not subject to product testing.

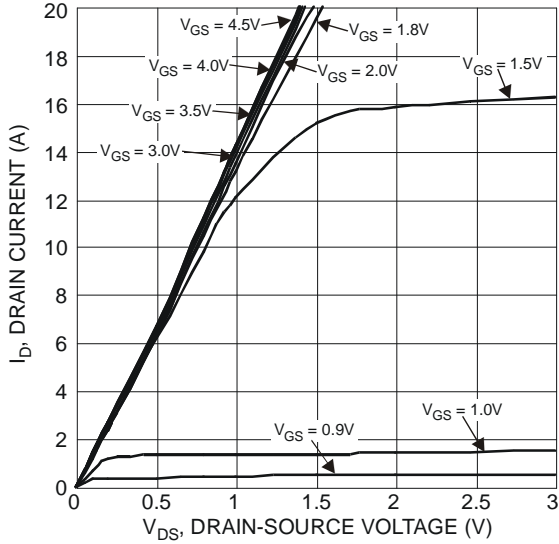


Figure 1 Typical Output Characteristics

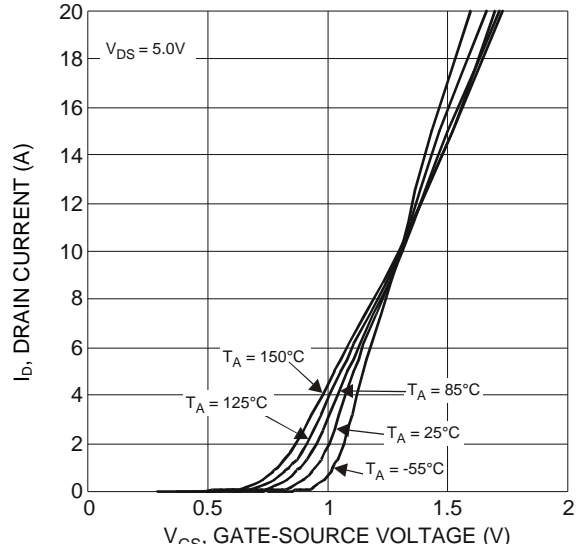


Figure 2 Typical Transfer Characteristics

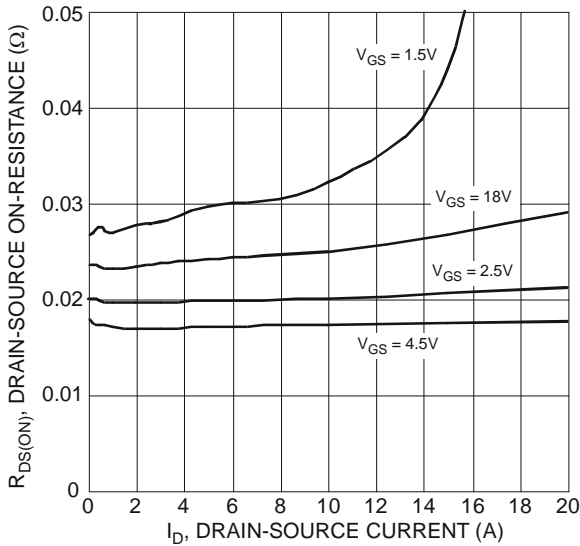


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

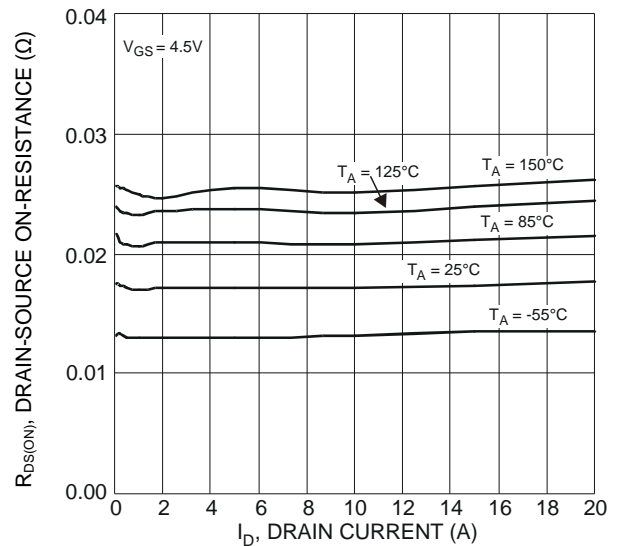


Figure 4 Typical On-Resistance vs. Drain Current and Temperature

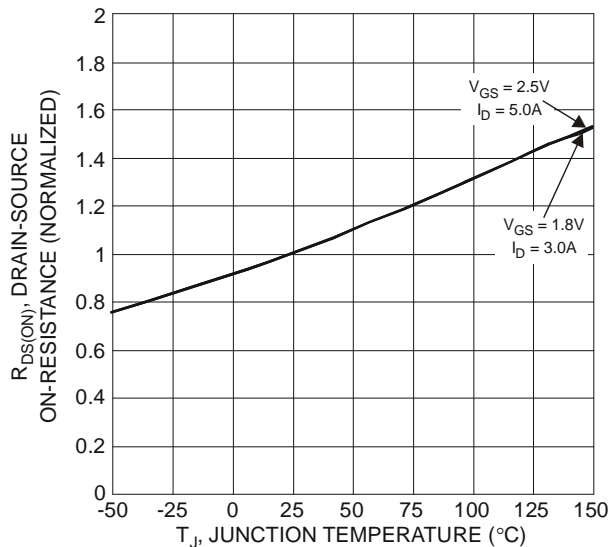


Figure 5 On-Resistance Variation with Temperature

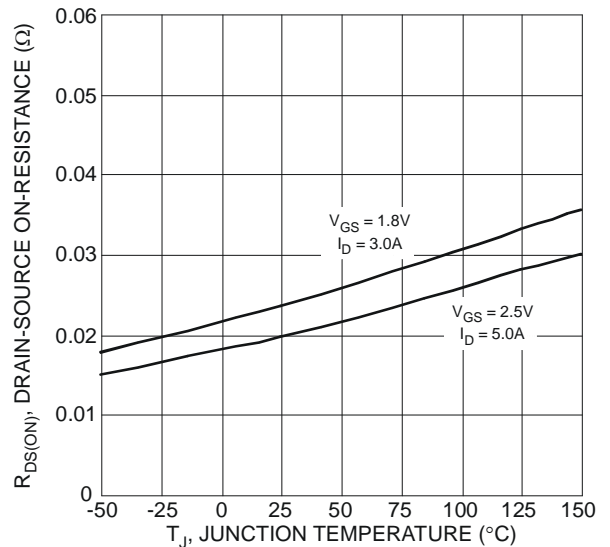


Figure 6 On-Resistance Variation with Temperature

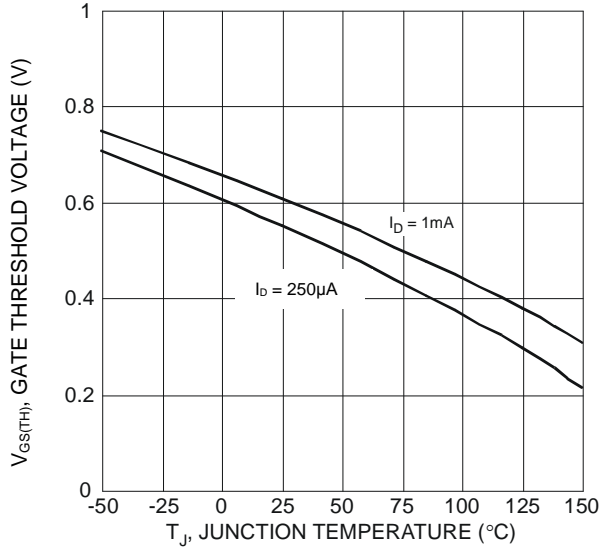


Figure 7 Gate Threshold Variation vs. Junction Temperature

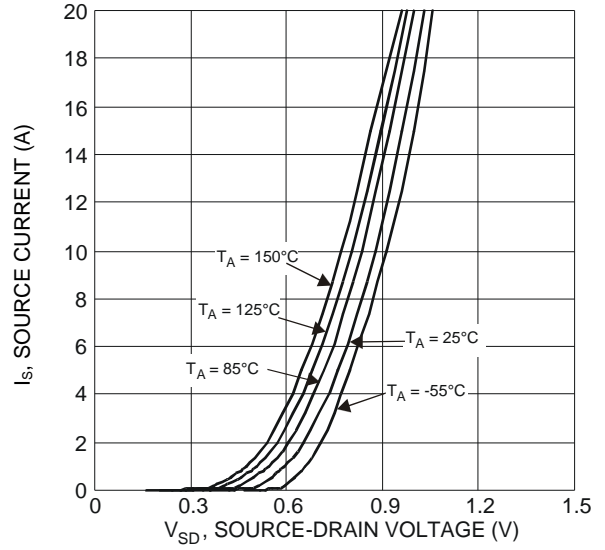


Figure 8 Diode Forward Voltage vs. Current

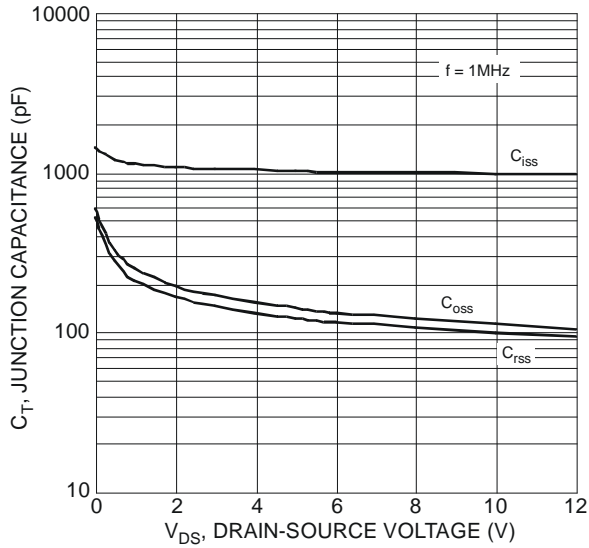


Figure 9 Typical Junction Capacitance

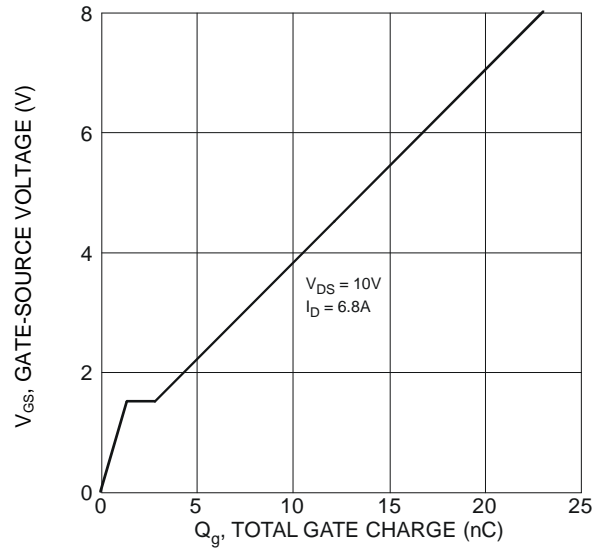


Figure 10 Gate Charge

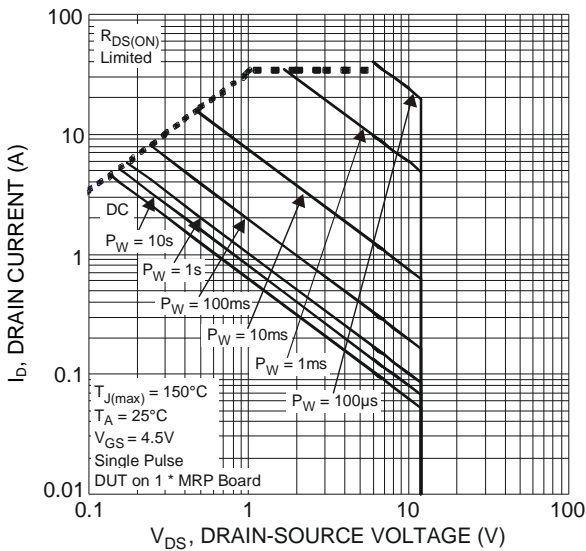


Figure 11 SOA Safe Operation Area

**Electrical Characteristics Q2 P-CHANNEL** (@ T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic   | Symbol              | Min  | Typ  | Max  | Unit | Test Condition  |
|--|---------------------|------|------|------|------|---|
| <b>OFF CHARACTERISTICS (Note 6)</b>                    |                     |      |      |      |      |   |
| Drain-Source Breakdown Voltage                         | BV <sub>DSS</sub>   | -12  | —    | —    | V    | V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA   |
| Zero Gate Voltage Drain Current T <sub>J</sub> = +25°C | I <sub>DSS</sub>    | —    | —    | -1.0 | μA   | V <sub>DS</sub> = -12V, V <sub>GS</sub> = 0V  |
| Gate-Source Leakage                                    | I <sub>GSS</sub>    | —    | —    | ±10  | μA   | V <sub>GS</sub> = ±8V, V <sub>DS</sub> = 0V   |
| <b>ON CHARACTERISTICS (Note 6)</b>                     |                     |      |      |      |      |   |
| Gate Threshold Voltage                                 | V <sub>GS(TH)</sub> | -0.4 | —    | -1   | V    | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA                                   |
| Static Drain-Source On-Resistance                      | R <sub>DS(ON)</sub> | —    | 37   | 59   | mΩ   | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -3.6A   |
|  |                     | —    | 48   | 81   |      | V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -3.1A   |
|  |                     | —    | 69   | 115  |      | V <sub>GS</sub> = -1.8V, I <sub>D</sub> = -2.6A   |
|  |                     | —    | 88   | 215  |      | V <sub>GS</sub> = -1.5V, I <sub>D</sub> = -0.5A   |
|  |                     | —    | —    | —    |      | —   |
| Diode Forward Voltage                                  | V <sub>SD</sub>     | —    | -0.7 | -1.2 | V    | V <sub>GS</sub> = 0V, I <sub>S</sub> = -3.7A  |
| <b>DYNAMIC CHARACTERISTICS (Note 7)</b>                |                     |      |      |      |      |   |
| Input Capacitance                                      | C <sub>iss</sub>    | —    | 1028 | —    | pF   | V <sub>DS</sub> = -6V, V <sub>GS</sub> = 0V,<br>f = 1.0MHz                                    |
| Output Capacitance                                     | C <sub>oss</sub>    | —    | 285  | —    | pF   |   |
| Reverse Transfer Capacitance                           | C <sub>rss</sub>    | —    | 254  | —    | pF   |   |
| Gate Resistance  | R <sub>g</sub>      | —    | 19.6 | —    | Ω    | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz  |
| Total Gate Charge (V <sub>GS</sub> = -4.5V)            | Q <sub>g</sub>      | —    | 13   | —    | nC   | V <sub>DS</sub> = -10V, I <sub>D</sub> = -4.7A  |
| Total Gate Charge (V <sub>GS</sub> = -8V)              |                     | —    | 20.8 | —    | nC   |   |
| Gate-Source Charge                                     | Q <sub>gs</sub>     | —    | 1.8  | —    | nC   |   |
| Gate-Drain Charge                                      | Q <sub>gd</sub>     | —    | 4.5  | —    | nC   |   |
| Turn-On Delay Time                                     | t <sub>d(ON)</sub>  | —    | 5.6  | —    | ns   |   |
| Turn-On Rise Time                                      | t <sub>r</sub>      | —    | 12.8 | —    | ns   | V <sub>DD</sub> = -6V, V <sub>GS</sub> = -4.5V,<br>R <sub>L</sub> = 1.6Ω, R <sub>G</sub> = 1Ω |
| Turn-Off Delay Time                                    | t <sub>d(OFF)</sub> | —    | 30.7 | —    | ns   |   |
| Turn-Off Fall Time                                     | t <sub>f</sub>      | —    | 25.4 | —    | ns   |   |
| Body Diode Reverse Recovery Time                       | t <sub>RR</sub>     | —    | 31.6 | —    | ns   | I <sub>S</sub> = -3.6A, dI/dt = 100A/μs   |
| Body Diode Reverse Recovery Charge                     | Q <sub>RR</sub>     | —    | 7.8  | —    | nC   | I <sub>S</sub> = -3.6A, dI/dt = 100A/μs   |

Notes: 6. Short duration pulse test used to minimize self-heating effect.  
7. Guaranteed by design. Not subject to product testing.

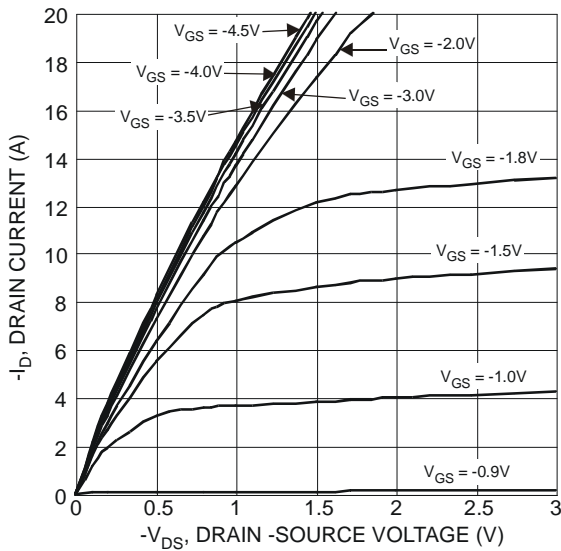


Figure 12 Typical Output Characteristics

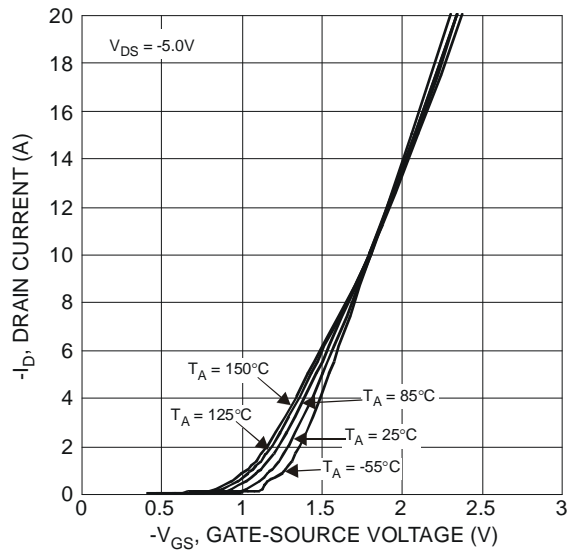


Figure 13 Typical Transfer Characteristics

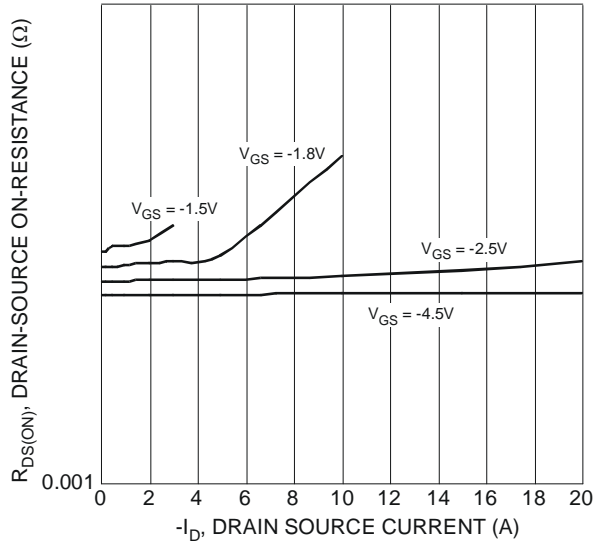


Figure 14 Typical On-Resistance vs. Drain Current and Gate Voltage

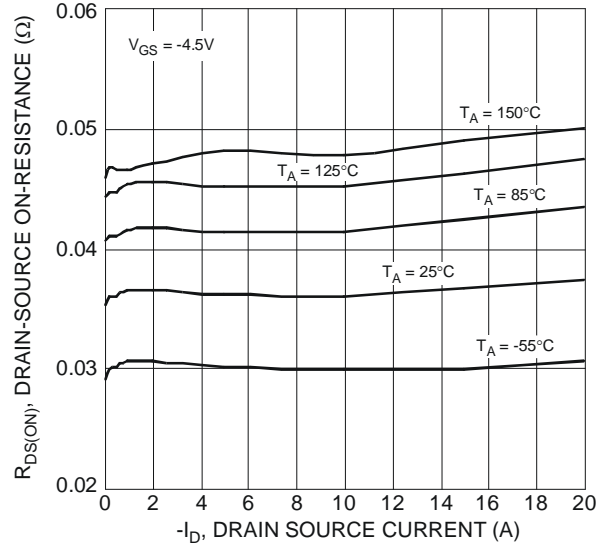


Figure 15 Typical On-Resistance vs. Drain Current and Temperature

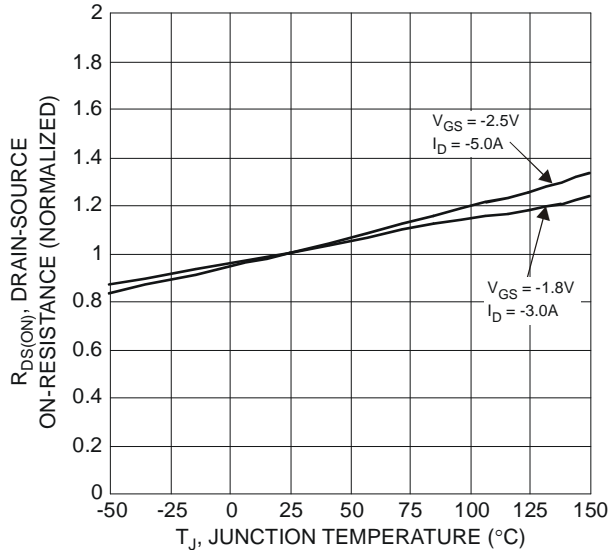


Figure 16 On-Resistance Variation with Temperature

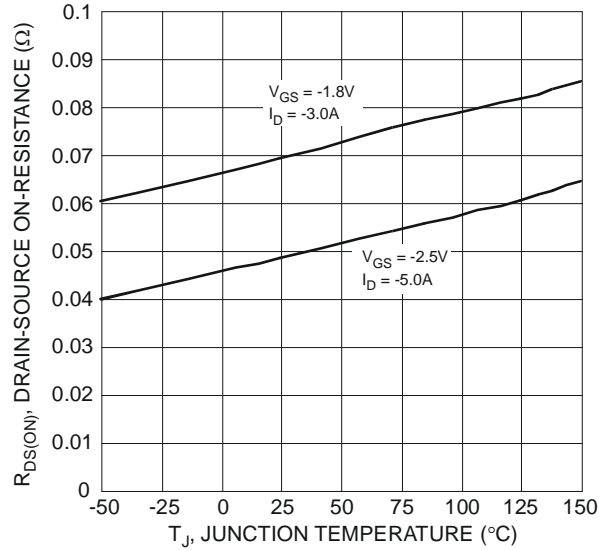


Figure 17 On-Resistance Variation with Temperature

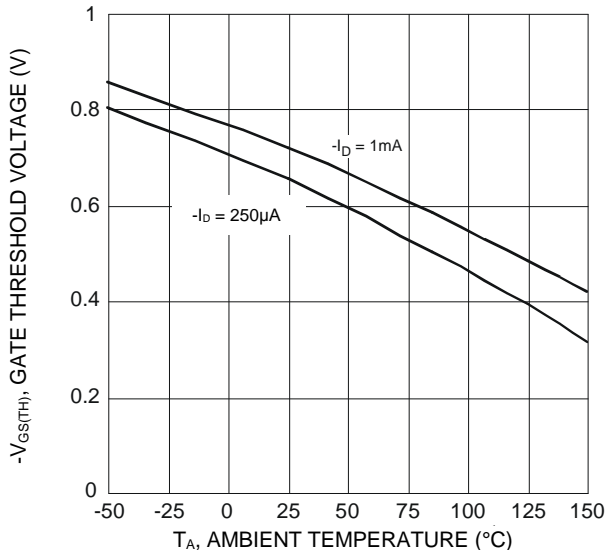


Figure 18 Gate Threshold Variation vs. Ambient Temperature

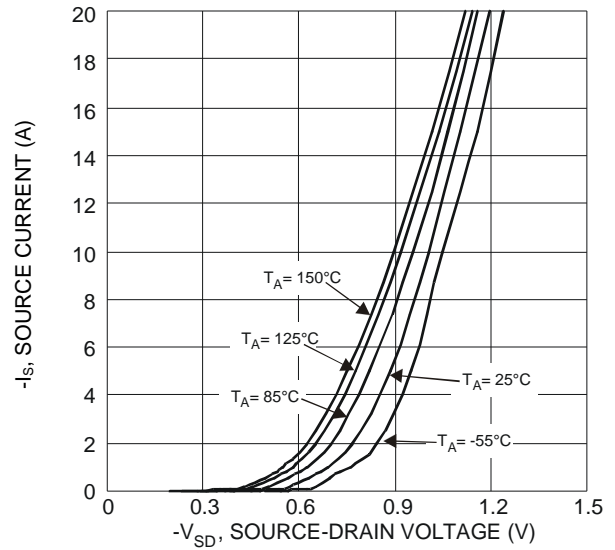
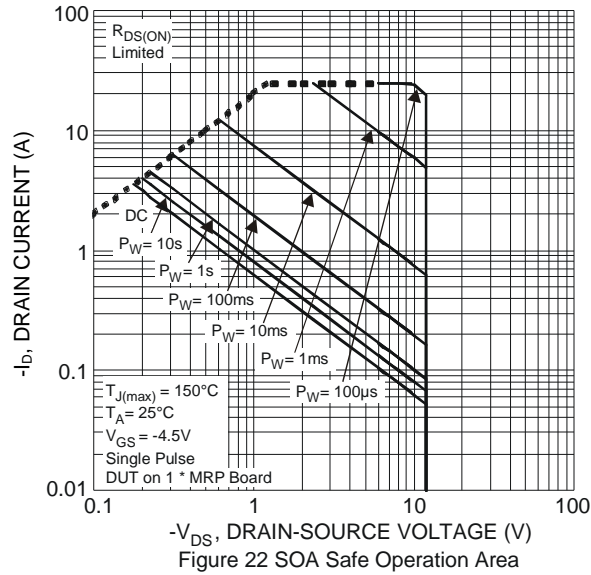
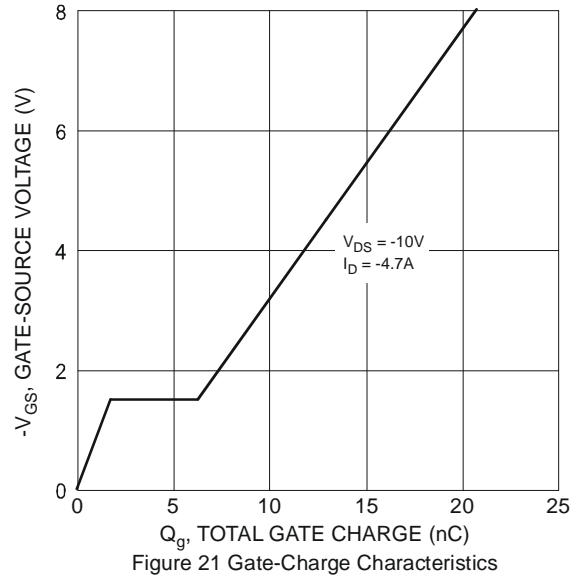
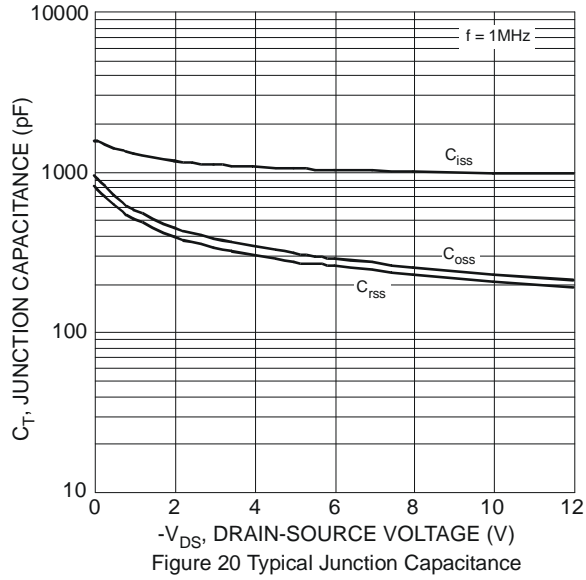


Figure 19 Diode Forward Voltage vs. Current





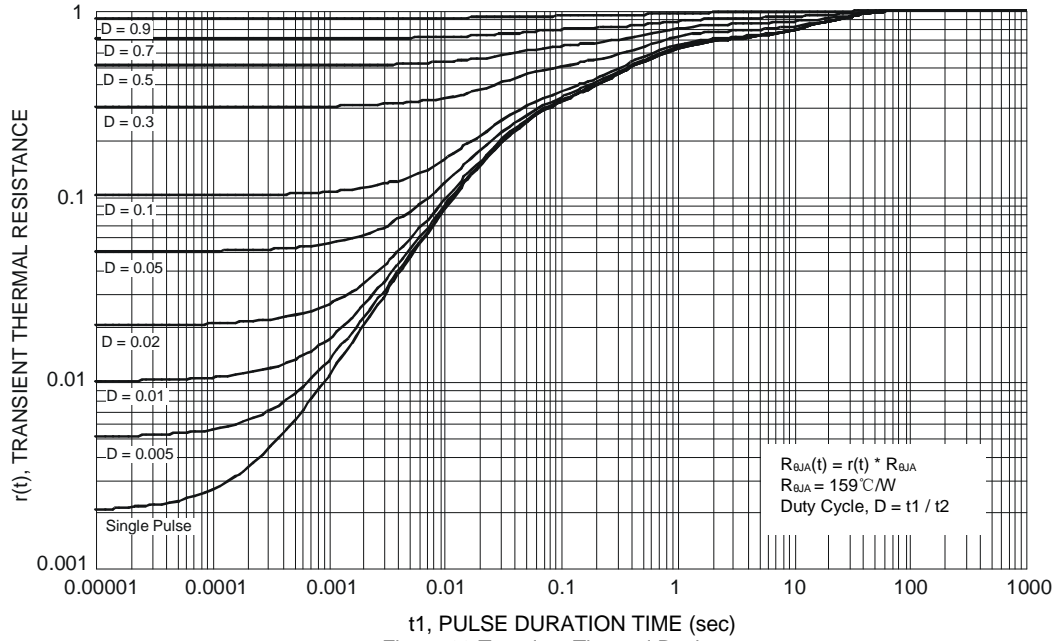
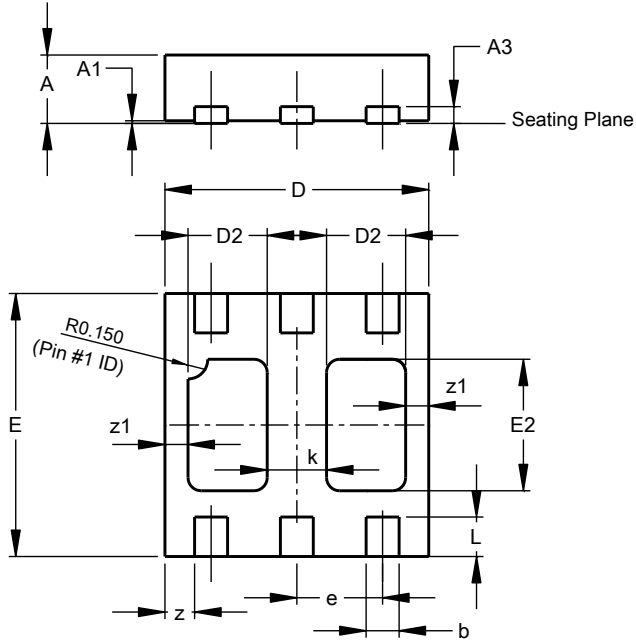


Figure 23 Transient Thermal Resistance

**Package Outline Dimensions**

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

**U-DFN2020-6 (Type B)**

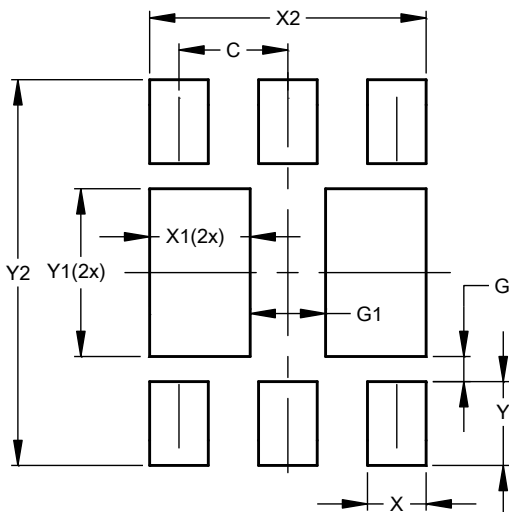


| U-DFN2020-6<br>Type B |       |       |       |
|-----------------------|-------|-------|-------|
| Dim                   | Min   | Max   | Typ   |
| A                     | 0.545 | 0.605 | 0.575 |
| A1                    | 0.00  | 0.05  | 0.02  |
| A3                    | -     | -     | 0.13  |
| 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**

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**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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