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Diodes Incorporated
DMP2060UFDB-7

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Lead-free Green

**DMP2060UFDB**

**DUAL P-CHANNEL ENHANCEMENT MODE MOSFET**

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ max | $I_D$ MAX $T_A$ = +25°C |
|---|---|---|
| -20V | 90mΩ @ $V_{GS}$ = -4.5V | -3.2A |
| | 137mΩ @ $V_{GS}$ = -2.5V | -2.6A |

## Description

This MOSFET is designed to minimize on-state resistance ($R_{DS(ON)}$) 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

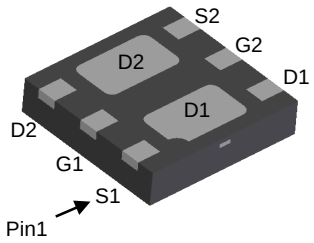
- Low On-Resistance
- Low Input Capacitance
- Low Profile, 0.6mm Max Height
- **ESD protected Gate**
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

## Mechanical Data

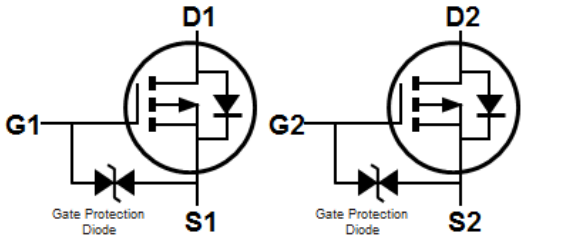
- Case: U-DFN2020-6
- Case Material: Molded Plastic, "Green" Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish NiPdAu over Copper leadframe; Solderable per MIL-STD-202, Method 208 e4
- Terminals Connections: See Diagram Below
- Weight: 0.0065 grams (Approximate)

ESD PROTECTED

U-DFN2020-6




Bottom View




Q1 P-CHANNEL MOSFET O2 P-CHANNEL MOSFET

Internal Schematic

## Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---|---|---|
| DMP2060UFDB -7 | U-DFN2020-6 | 3,000/Tape & Reel |
| DMP2060UFDB -13 | U-DFN2020-6 | 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

U-DFN2020-6


FD = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: B = 2014)
M = Month (ex: 9 = September)

Date Code Key

| Year | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|
| Code | B | C | D | E | F | G | H |

| 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°C, unless otherwise specified.)

| Characteristic | | | Symbol | Value | Units |
|---|---|---|---|---|---|
| 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<br>$T_A$ = +70°C | $I_D$ | -3.2<br>-2.5 | A |
| Maximum Continuous Body Diode Forward Current (Note 5) | | | $I_S$ | -1.5 | A |
| Pulsed Drain Current (10µs pulse, duty cycle = 1%) | | | $I_{DM}$ | -18 | A |

## Thermal Characteristics

| Characteristic | | Symbol | Value | Units |
|---|---|---|---|---|
| Total Power Dissipation (Note 5) | Steady State | $P_D$ | 1.4 | W |
| | t < 5s | | 2.2 | |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady State | $R_{\theta JA}$ | 92 | °C/W |
| | t < 5s | | 55 | |
| Thermal Resistance, Junction to Case (Note 5) | | $R_{\theta JC}$ | 30 | |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to 150 | °C |

## Electrical Characteristics P-CHANNEL (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS (Note 6)** | | | | | | |
| 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 | $V_{DS}$ = -20V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | — | — | ±10 | µA | $V_{GS}$ = ±8V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 6)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | -0.35 | — | -1.4 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = -250µA |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | — | 59 | 90 | mΩ | $V_{GS}$ = -4.5V, $I_D$ = -2.9A |
| | | — | 76 | 137 | | $V_{GS}$ = -2.5V, $I_D$ = -2.3A |
| Diode Forward Voltage | $V_{SD}$ | — | -0.65 | -1.2 | V | $V_{GS}$ = 0V, $I_S$ = -3.0A |
| **DYNAMIC CHARACTERISTICS (Note 7)** | | | | | | |
| Input Capacitance | $C_{iss}$ | — | 881 | — | pF | $V_{DS}$ = -10V, $V_{GS}$ = 0V, f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | — | 84 | — | pF | |
| Reverse Transfer Capacitance | $C_{rss}$ | — | 67 | — | pF | |
| Gate Resistance | $R_g$ | — | 14.3 | — | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1MHz |
| Total Gate Charge ($V_{GS}$ = -4.5V) | $Q_g$ | — | 11 | — | nC | $V_{DS}$ = -10V, $I_D$ = -3.7A |
| Total Gate Charge ($V_{GS}$ = -8V) | | — | 18 | — | nC | |
| Gate-Source Charge | $Q_{gs}$ | — | 1.5 | — | nC | |
| Gate-Drain Charge | $Q_{gd}$ | — | 2.3 | — | nC | |
| Turn-On Delay Time | $t_{D(on)}$ | — | 5.0 | — | ns | $V_{DD}$ = -10V, $V_{GS}$ = -4.5V, $R_L$ = 3.3Ω, $R_G$ = 1Ω |
| Turn-On Rise Time | $t_r$ | — | 9.5 | — | ns | |
| Turn-Off Delay Time | $t_{D(off)}$ | — | 29.7 | — | ns | |
| Turn-Off Fall Time | $t_f$ | — | 20.4 | — | ns | |
| Body Diode Reverse Recovery Time | trr | — | 23.6 | — | nS | $I_S$ = -3.0A, dI/dt = 100A/µs |
| Body Diode Reverse Recovery Charge | Qrr | — | 11.4 | — | nC | $I_S$ = -3.0A, dI/dt = 100A/µs |

Notes:
5. Device mounted on on 1" x 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.

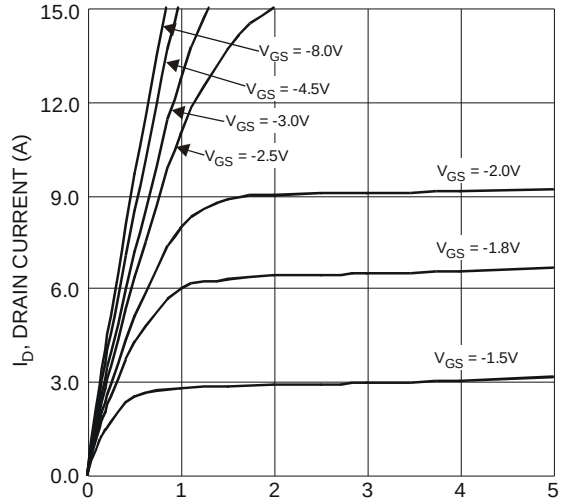



Figure 1 Typical Output Characteristics

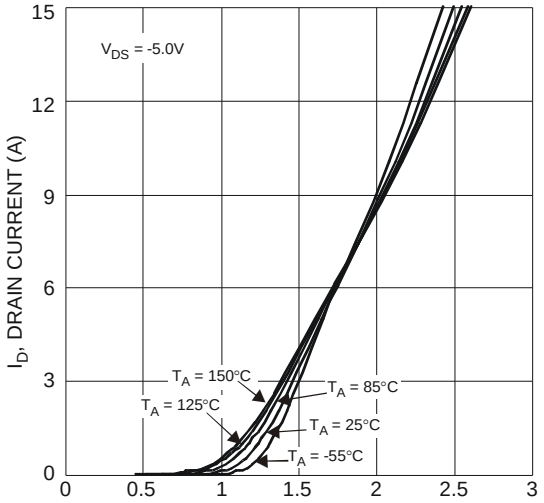



Figure 2 Typical Transfer Characteristics

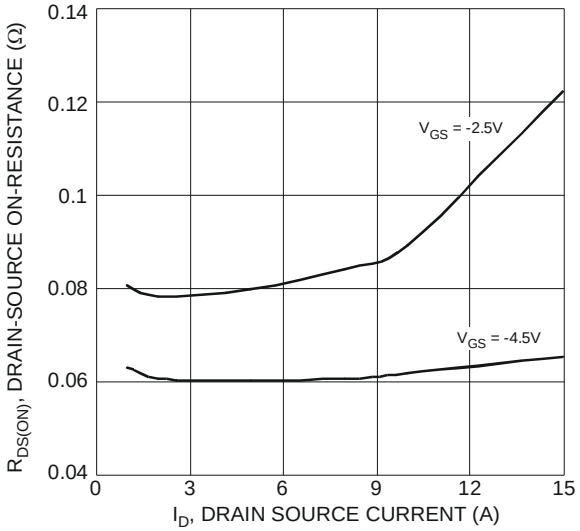



Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

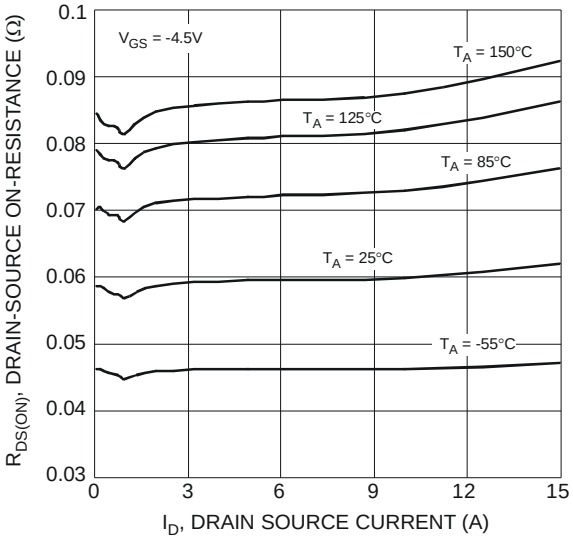



Figure 4 Typical On-Resistance vs. Drain Current and Temperature

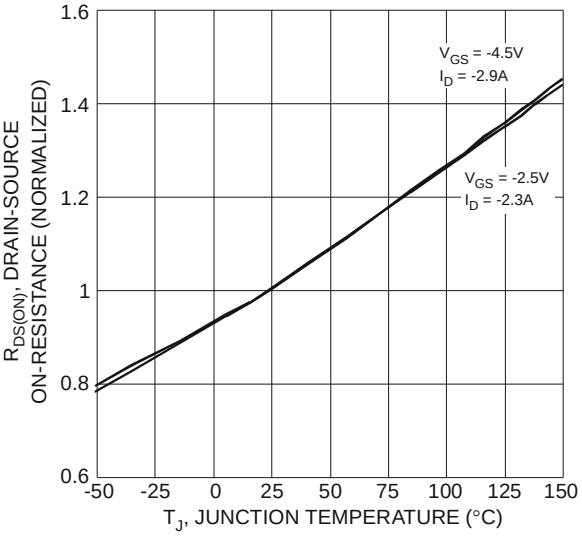



Figure 5 On-Resistance Variation with Temperature

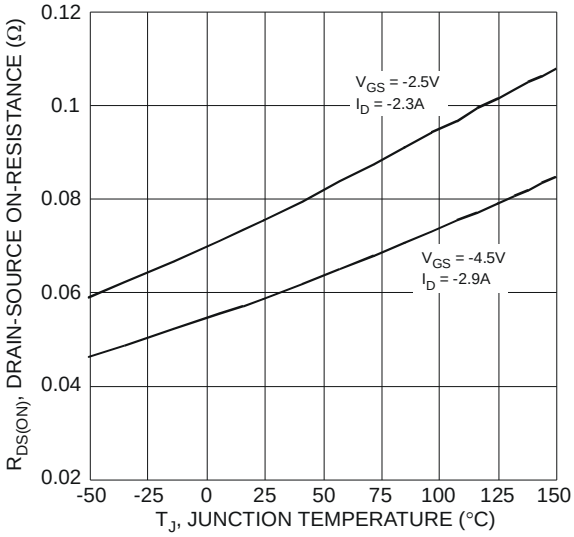



Figure 6 On-Resistance Variation with Temperature

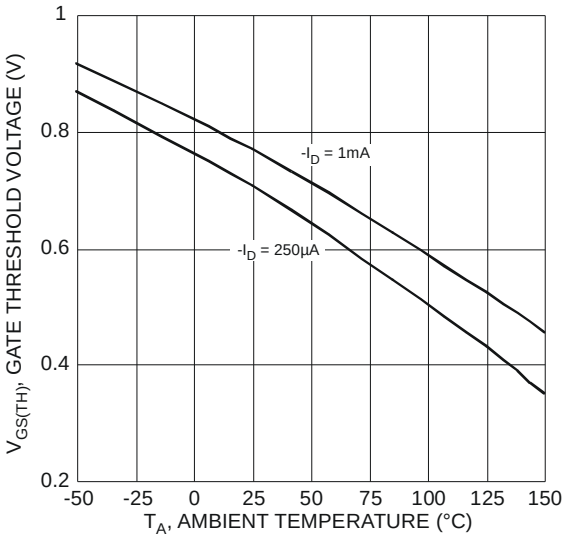



Figure 7 Gate Threshold Variation vs. Ambient Temperature

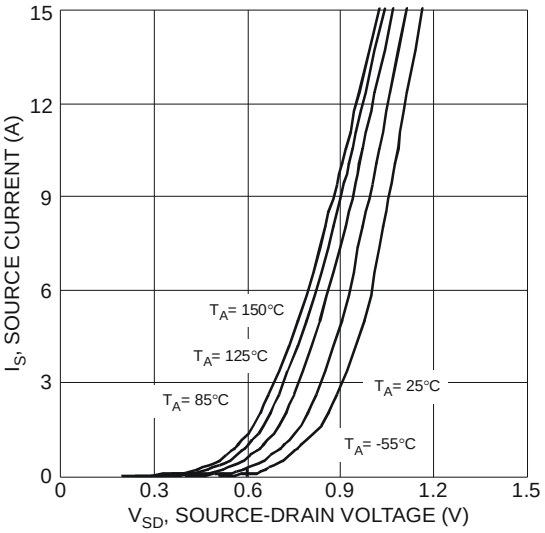



Figure 8 Diode Forward Voltage vs. Current

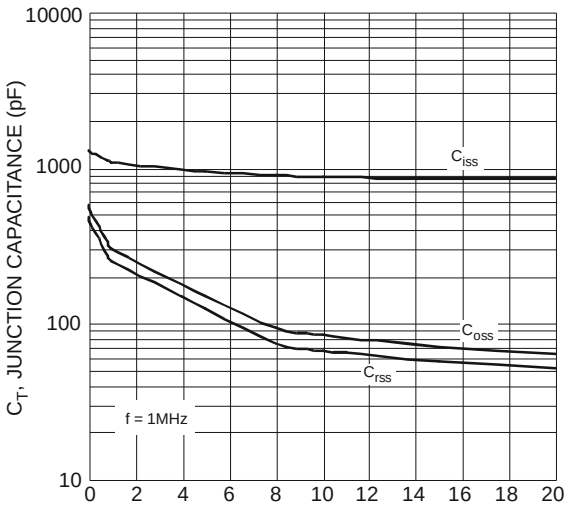



Figure 9 ypical Junction Capacitance

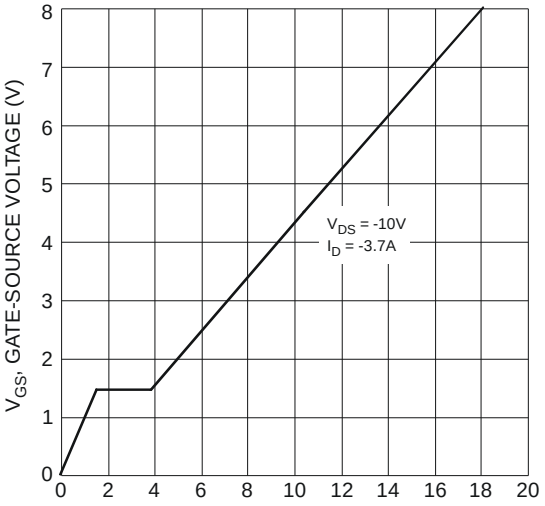



Figure 10 Gate-Charge Characteristics

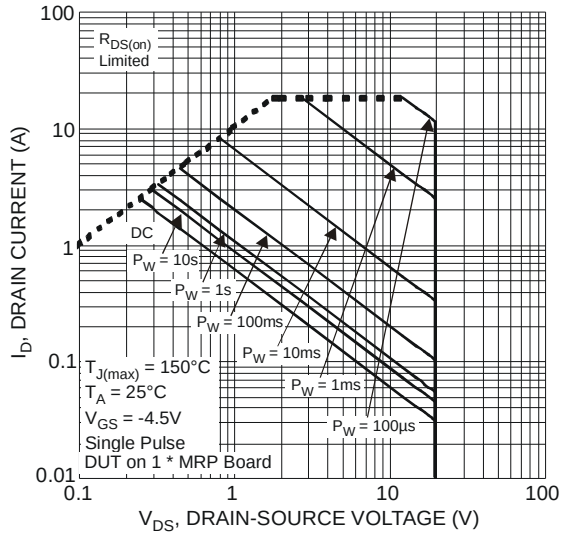



Figure 11 SOA, Safe Operation Area

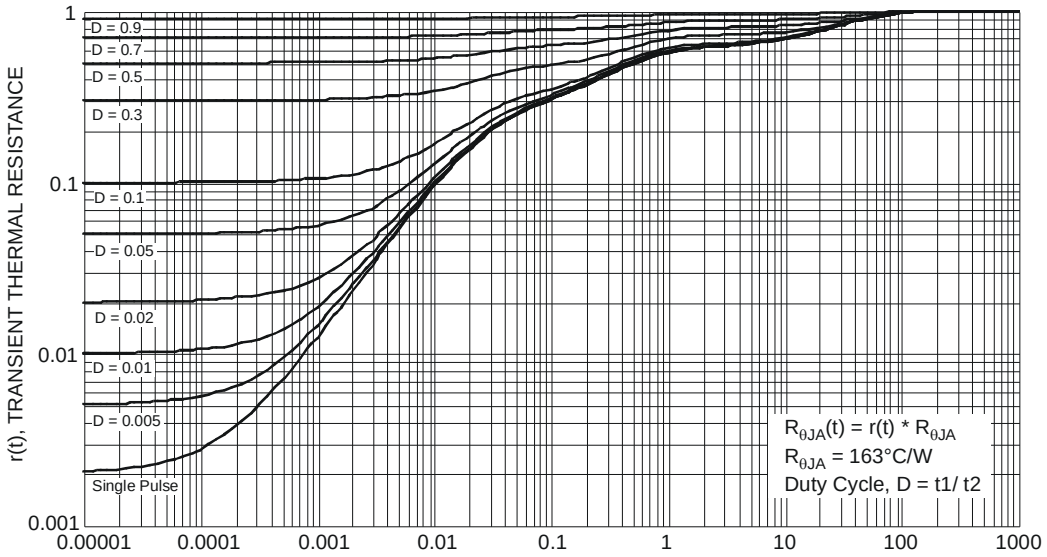
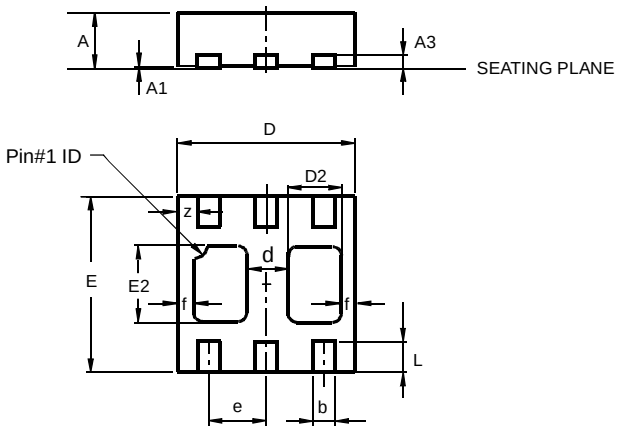


Figure 12 Transient Thermal Resistance

## Package Outline Dimensions

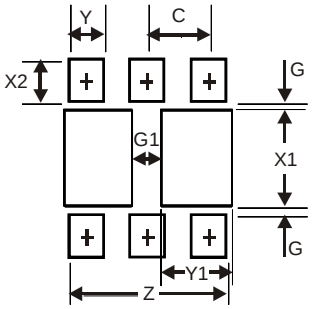
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.




| U-DFN2020-6 Type B | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.545 | 0.605 | 0.575 |
| **A1** | 0 | 0.05 | 0.02 |
| **A3** | — | — | 0.13 |
| **b** | 0.20 | 0.30 | 0.25 |
| **D** | 1.95 | 2.075 | 2.00 |
| **d** | — | — | 0.45 |
| **D2** | 0.50 | 0.70 | 0.60 |
| **e** | — | — | 0.65 |
| **E** | 1.95 | 2.075 | 2.00 |
| **E2** | 0.90 | 1.10 | 1.00 |
| **f** | — | — | 0.15 |
| **L** | 0.25 | 0.35 | 0.30 |
| **z** | — | — | 0.225 |
| **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) |
|---|---|
| **Z** | 1.67 |
| **G** | 0.20 |
| **G1** | 0.40 |
| **X1** | 1.0 |
| **X2** | 0.45 |
| **Y** | 0.37 |
| **Y1** | 0.70 |
| **C** | 0.65 |

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