

Description

This Bipolar Junction Transistors (BJT) is designed to meet the stringent requirements of Automotive Applications.

Features

- $BV_{CEO} > -60V$
- $I_C = -2A$ High Continuous Collector Current
- $R_{CE(SAT)} = 250m\Omega$ for a Low Equivalent On-Resistance
- Sidewall Tin Plating for Wettable Flanks in AOI
- P_D Up to 2.47W for Power Demanding Applications
- Low Profile 0.6mm High Package for Thin Applications
- **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**
- **PPAP Capable (Note 4)**

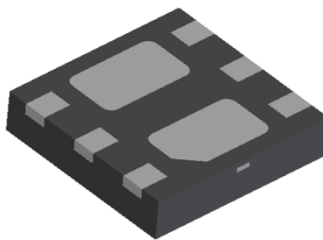
Mechanical Data

- Case: U-DFN2020-6 (SWP) (Type A) with Sidewall Plating
- Case Material: Molded Plastic. "Green" Molding Compound. UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — Matte Tin, Solderable per MIL-STD-202, Method 208③
- Weight: 0.0065 grams (Approximate)

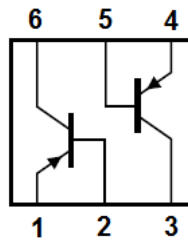
Application

- Matrix LED Lighting
- Power Management

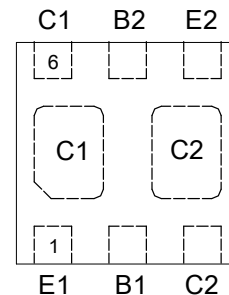
U-DFN2020-6 (SWP) (Type A)



Bottom View



Device Symbol



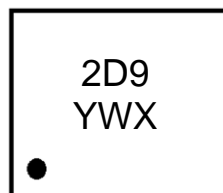
Top View
Pin-Out

Ordering Information (Note 5)

| Part Number | Marking | Reel Size (inches) | Tape Width (mm) | Quantity Per Reel |
|-----------------|---------|--------------------|-----------------|-------------------|
| ZXTP56060FDBQ-7 | 2D9 | 7 | 8 | 3,000 |

- 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. Automotive products are AEC-Q101 qualified and are PPAP capable. Refer to <https://www.diodes.com/quality/>.
 5. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

Marking Information



2D9 = Product Type Marking Code
 Y = Year: 0~9
 W = Week: A~Z: 1~26 week;
 a~z: 27~52 week; z represents
 52 and 53 week
 X = A~Z: Internal code

Absolute Maximum Ratings – Q1 & Q2 (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|------------------------------|------------------|-------|------|
| Collector-Base Voltage | V _{CBO} | -60 | V |
| Collector-Emitter Voltage | V _{CEO} | -60 | V |
| Emitter-Base Voltage | V _{EBO} | -7 | V |
| Continuous Collector Current | I _C | -2 | A |
| Peak Pulse Collector Current | I _{CM} | -3 | A |
| Base Current | I _B | -300 | mA |
| Peak Base Current | I _{BM} | -1 | A |

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

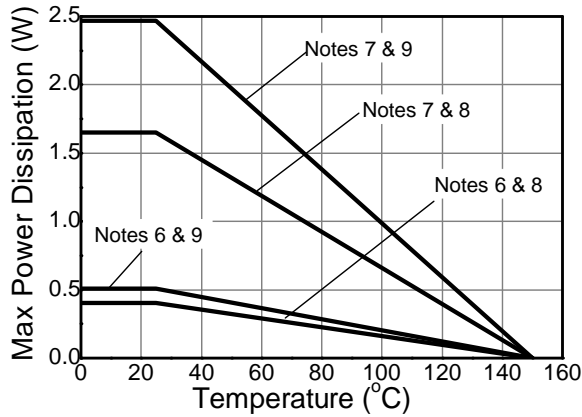
| Characteristic | | Symbol | Value | Unit |
|---|---------------|-----------------------------------|-------------|------|
| Power Dissipation | (Notes 6 & 8) | P _D | 405 | mW |
| | (Notes 6 & 9) | | 510 | |
| | (Notes 7 & 8) | | 1650 | |
| | (Notes 7 & 9) | | 2470 | |
| Thermal Resistance, Junction to Ambient | (Notes 6 & 8) | R _{θJA} | 308 | °C/W |
| | (Notes 6 & 9) | | 245 | |
| | (Notes 7 & 8) | | 76 | |
| | (Notes 7 & 9) | | 51 | |
| Thermal Resistance, Junction to Lead | (Note 10) | R _{θJL} | 18 | °C/W |
| Operating and Storage Temperature Range | | T _J , T _{STG} | -55 to +150 | °C |

ESD Ratings (Note 11)

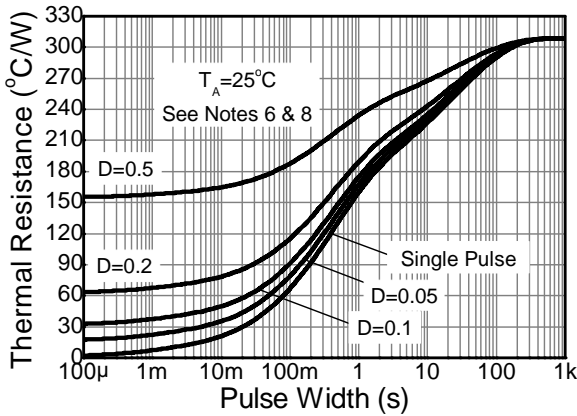
| Characteristic | Symbol | Value | Unit | JEDEC Class |
|--|---------|-------|------|-------------|
| Electrostatic Discharge – Human Body Model | ESD HBM | 4,000 | V | 3A |
| Electrostatic Discharge – Machine Model | ESD MM | 400 | V | C |

- Notes:
6. For a device mounted with the exposed collector pads on minimum recommended pad layout that is on a single-sided 1.6mm FR-4 PCB; device is measured under still air conditions whilst operating in a steady-state.
 7. Same as note (6), except the device is mounted with the collector pad on 28mm x 28mm (8cm²) 2oz copper.
 8. For a dual device with one active die.
 9. For dual device with 2 active die running at equal power.
 10. Thermal resistance from junction to solder-point (on the exposed collector pads).
 11. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

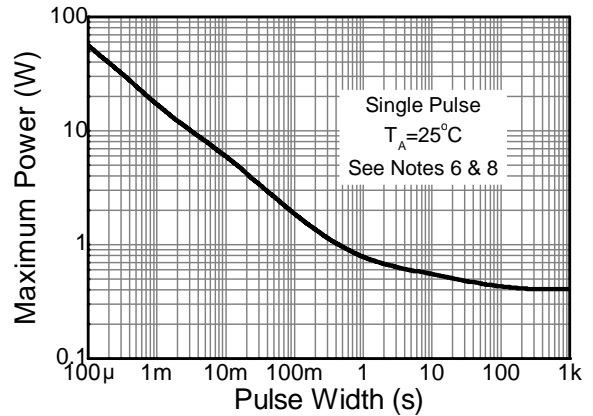
Thermal Characteristics and Derating Information



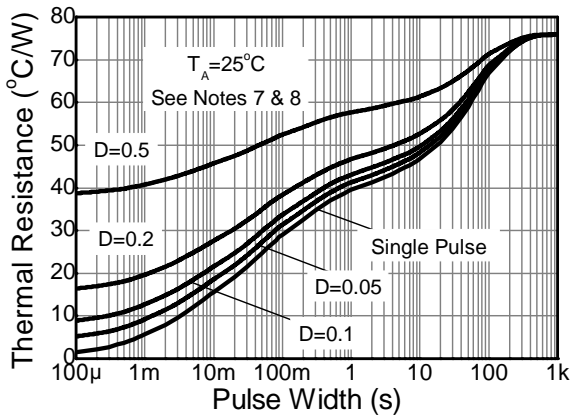
Derating Curve



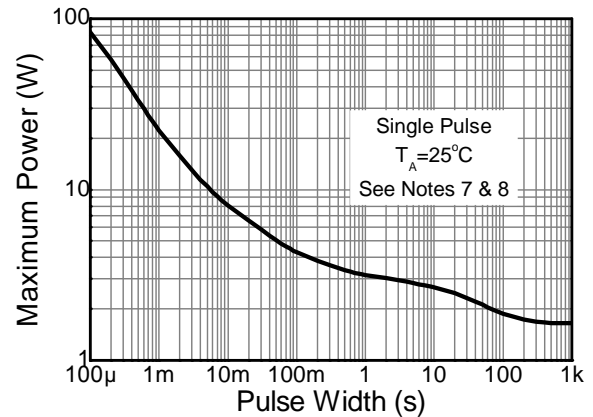
Transient Thermal Impedance



Pulse Power Dissipation



Transient Thermal Impedance



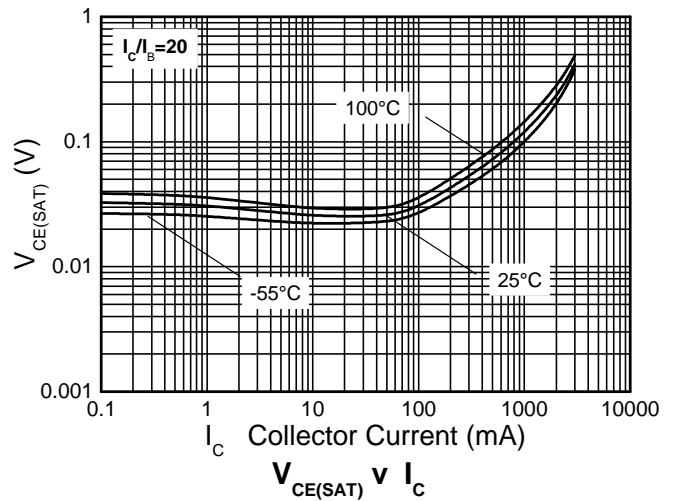
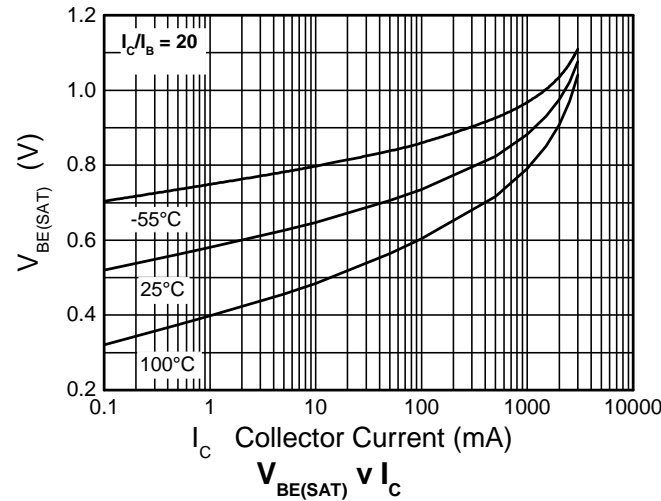
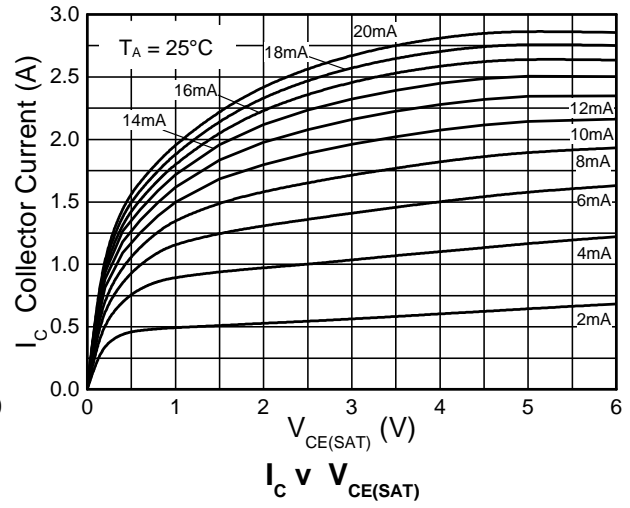
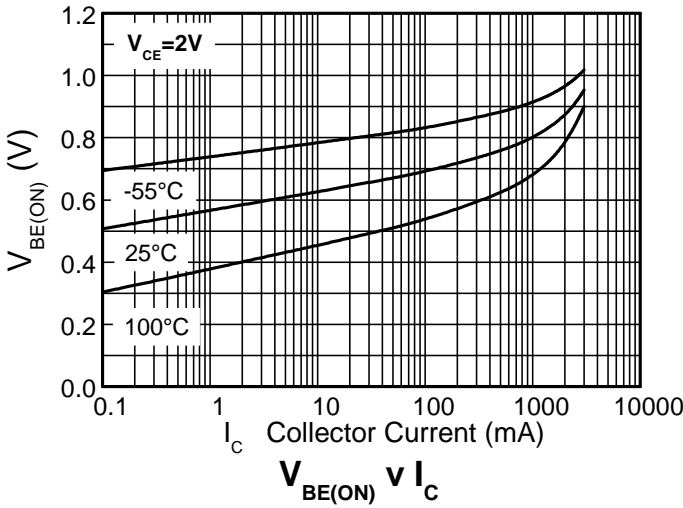
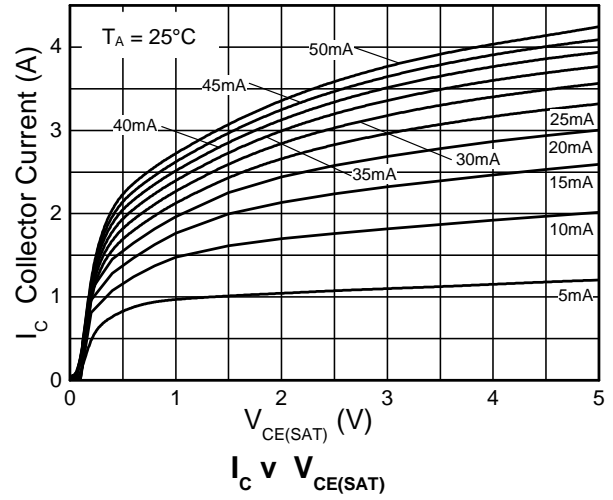
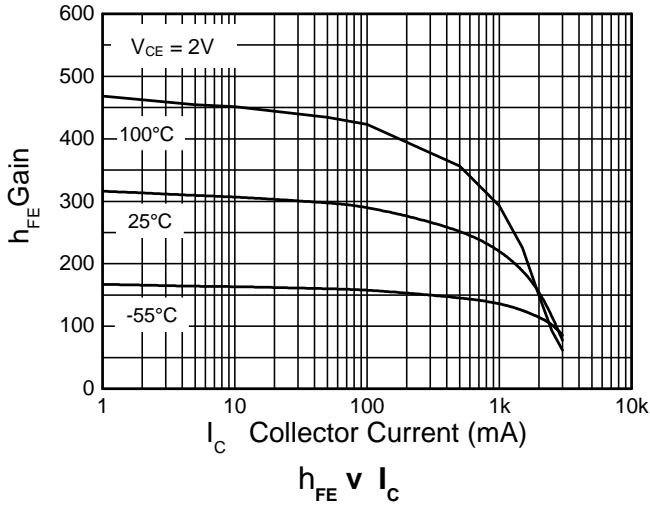
Pulse Power Dissipation

Electrical Characteristics – Q1 & Q2 (@T_A = +25°C, unless otherwise specified.)

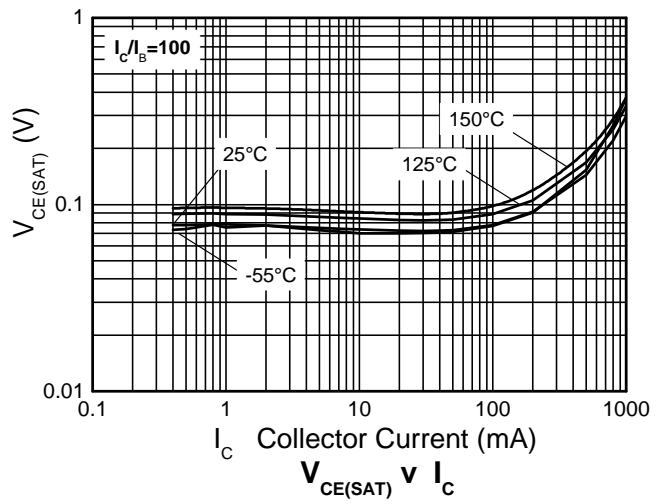
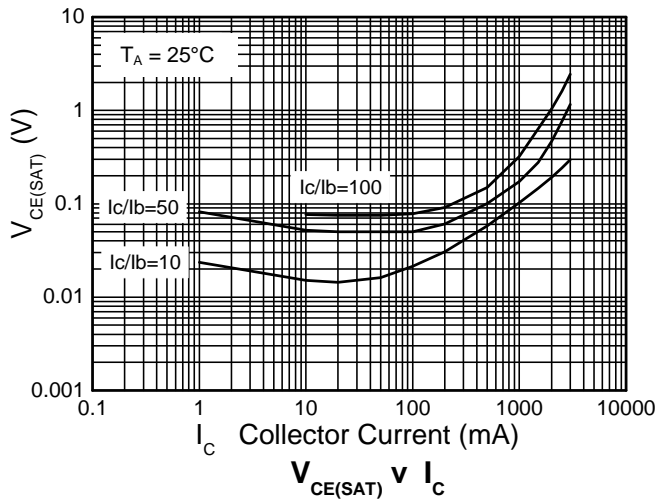
| Characteristic | Symbol | Min | Typ | Max | Unit | Test Conditions |
|--|----------------------|-----|-----|-------|------|--|
| Collector-Base Breakdown Voltage | BV _{CB0} | -60 | — | — | V | I _C = -100μA |
| Collector-Emitter Breakdown Voltage (Note 12) | BV _{CEO} | -60 | — | — | V | I _C = -10mA |
| Emitter-Base Breakdown Voltage | BV _{EBO} | -7 | — | — | V | I _E = -100μA |
| Collector-Base Cutoff Current | I _{CB0} | — | — | -100 | nA | V _{CB} = -48V, I _E = 0 |
| | | — | — | -50 | μA | V _{CB} = -48V, I _E = 0, T _A = +150°C |
| Emitter-Base Cutoff Current | I _{EBO} | — | — | -100 | nA | V _{EB} = -5.6V, I _C = 0 |
| DC Current Gain (Note 12) | h _{FE} | 170 | — | — | — | V _{CE} = -2V, I _C = -100mA |
| | | 140 | — | — | | V _{CE} = -2V, I _C = -500mA |
| | | 110 | — | — | | V _{CE} = -2V, I _C = -1A |
| | | 50 | — | — | | V _{CE} = -2V, I _C = -2A |
| Collector-Emitter Saturation Voltage (Note 12) | V _{CE(SAT)} | — | — | -120 | mV | I _C = -500mA, I _B = -50mA |
| | | — | — | -250 | | I _C = -1A, I _B = -50mA |
| | | — | — | -420 | | I _C = -0.7A, I _B = -7mA |
| | | — | — | -450 | | I _C = -2A, I _B = -200mA |
| Equivalent On-Resistance (Note 12) | R _{CE(SAT)} | — | — | 250 | mΩ | I _E = -1A, I _B = -50mA |
| Base-Emitter Saturation Voltage (Note 12) | V _{BE(SAT)} | — | — | -1 | V | I _C = -0.5A, I _B = -50mA |
| | | — | — | -1 | | I _C = -1A, I _B = -50mA |
| | | — | — | -1.25 | | I _C = -2A, I _B = -200mA |
| Base-Emitter Turn-on Voltage (Note 12) | V _{BE(ON)} | — | — | -0.9 | V | V _{CE} = -2V, I _C = -0.5A |
| Turn-On Time | t _{ON} | — | 90 | — | ns | I _C = -1A, I _{B1} = -I _{B2} = 50mA; T _A = +25°C |
| Delay Time | t _D | — | 10 | — | ns | |
| Rise Time | t _R | — | 80 | — | ns | |

Note: 12. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

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



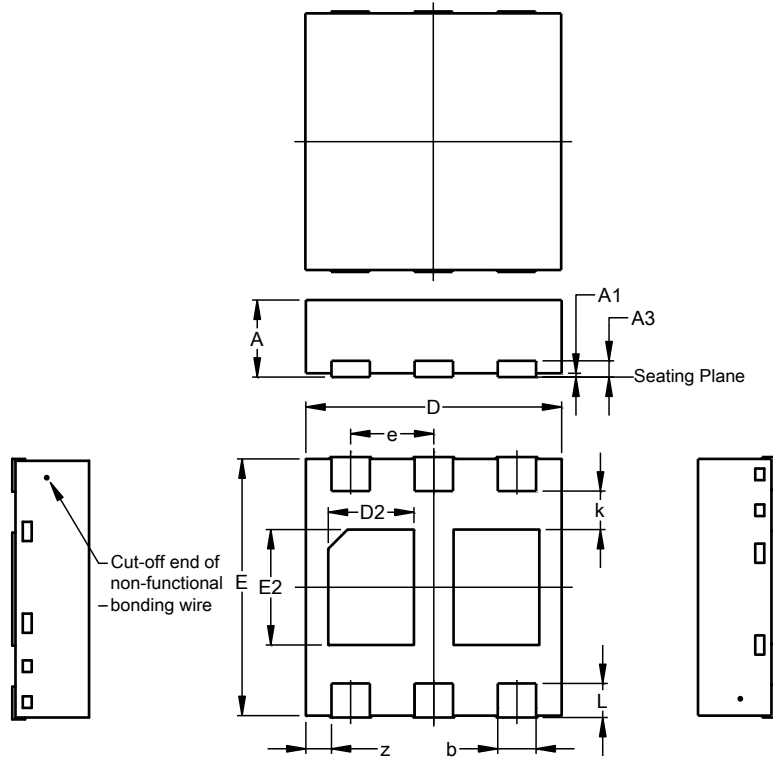
Typical Electrical Characteristics (@ $T_A = +25^\circ\text{C}$, unless otherwise specified.)



Package Outline Dimensions

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

U-DFN2020-6 (SWP) (Type A)

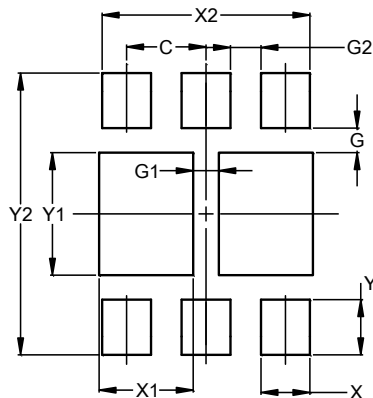


| U-DFN2020-6 (SWP) (Type A) | | | |
|-------------------------------|---------|------|-------|
| Dim | Min | Max | Typ |
| A | 0.55 | 0.65 | 0.60 |
| A1 | 0.00 | 0.05 | 0.03 |
| A3 | -- | -- | 0.127 |
| b | 0.25 | 0.35 | 0.30 |
| D | 1.95 | 2.05 | 2.00 |
| D2 | 0.57 | 0.77 | 0.67 |
| E | 1.95 | 2.05 | 2.00 |
| E2 | 0.80 | 1.00 | 0.90 |
| e | 0.65BSC | | |
| k | 0.30BSC | | |
| L | 0.22 | 0.32 | 0.27 |
| z | 0.20BSC | | |
| All Dimensions in mm | | | |

Suggested Pad Layout

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

U-DFN2020-6 (SWP) (Type A)



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 0.650 |
| G | 0.200 |
| G1 | 0.210 |
| G2 | 0.250 |
| X | 0.400 |
| X1 | 0.770 |
| X2 | 1.700 |
| Y | 0.450 |
| Y1 | 1.000 |
| Y2 | 2.300 |

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