# 40V PNP LOW VCESAT TRANSISTOR IN PowerDI3333-8

## Features

- $BV_{CEO}$ > -40V
- Small Form Factor Thermally Efficient Package. Enables Higher Density End Products
- $I_C$ = -2A Continuous Collector Current
- $I_{CM}$ = -3A Peak Pulse Current
- Low Saturation Voltage $V_{CE(sat)}$ < -320mV @ -1A
- Complementary NPN Type: DXTN22040DFGQ
- Rated to +175°C – Ideal For High Temperature Environment
- Wettable Flank For Improved Optical Inspection
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The DXTP22040DFGQ is suitable for automotive applications requiring specific change control and is AEC-Q101 qualified, is PPAP capable, and is manufactured in IATF16949:2016 certified facilities.**

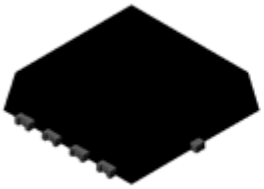
## Mechanical Data

- Case: PowerDI®3333-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.03 grams (Approximate)

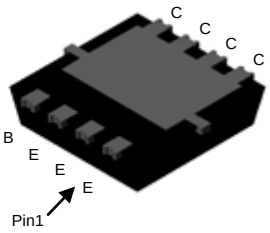
## Applications

- High-Side Switch
- Supply Line Switching
- Motor Driving

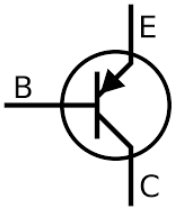
PowerDI3333-8 (SWP) (Type UX)



Top View




Bottom View




Device Symbol

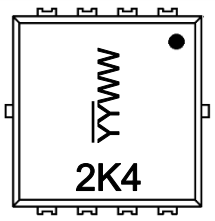
## Ordering Information (Note 4)

| Part Number | Compliance | Marking | Reel Size (inches) | Tape Width (mm) | Quantity Per Reel |
|---|---|---|---|---|---|
| DXTP22040DFGQ-7 | Automotive | 2K4 | 7 | 12 | 2,000 |

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. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

## Marking Information

PowerDI3333-8 (SWP) (Type UX)




2K4 = Product Type Marking Code
YYWW = Date Code Marking
YY = Last Two Digits of Year (ex: 19 = 2019)
WW = Week Code (01 to 53)

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## Absolute Maximum Ratings (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | -50 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | -40 | V |
| Emitter-Base Voltage | $V_{EBO}$ | -7 | V |
| Continuous Collector Current | $I_C$ | -2 | A |
| Peak Pulse Collector Current | $I_{CM}$ | -3 | |
| Continuous Base Current | $I_B$ | -100 | mA |
| Peak Pulse Base Current | $I_{BM}$ | -200 | |

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

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Power Dissipation | (Note 5) | $P_D$ | 1.07 | W |
| | (Note 6) | | 2.3 | W |
| | (Note 7) | | 3.4 | W |
| Thermal Resistance, Junction to Ambient | (Note 5) | $R_{\theta JA}$ | 140 | °C/W |
| | (Note 6) | | 65 | °C/W |
| | (Note 7) | | 44 | °C/W |
| Thermal Resistance, Junction to Leads (Note 8) | | $R_{\theta JL}$ | 11 | °C/W |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +175 | °C |

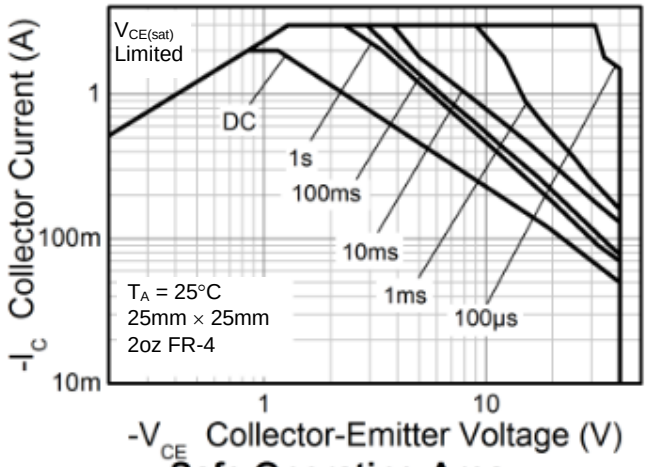
## ESD Ratings (Note 9)

| 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 |

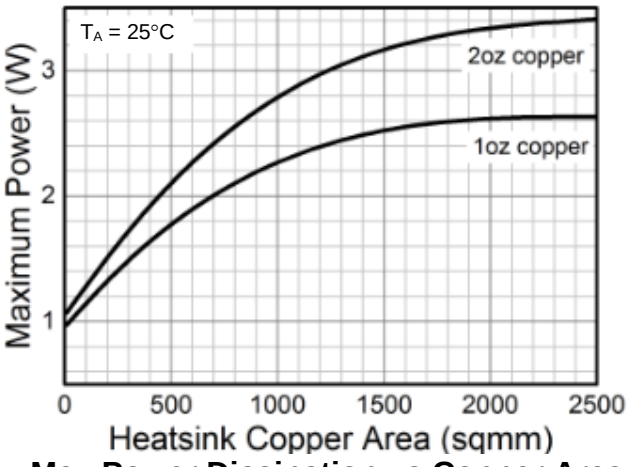
Notes:
5. For a device mounted with the collector tab on MRP FR4-PCB; device is measured under still air conditions whilst operating in a steady-state.
6. Same as Note 5, except the device is mounted on 25mm × 25mm 2oz copper.
7. Same as Note 5, except the device is mounted on 50mm × 50mm 2oz copper.
8. Thermal resistance from junction to solder-point (at the collector tab).
9. Refer to JEDEC specification JESD22-A114 and JESD22-A115.


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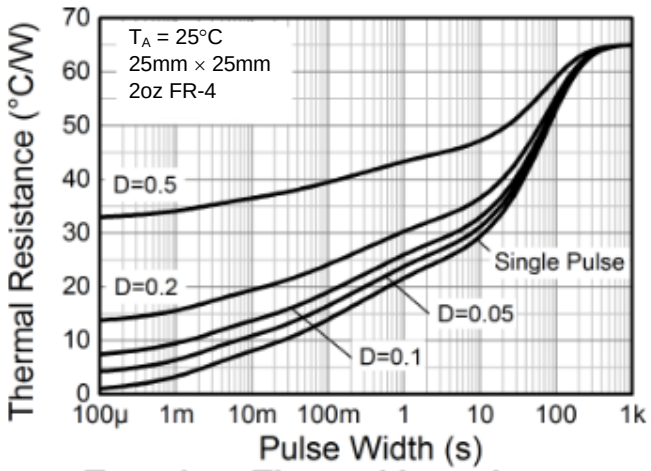
## Thermal Characteristics and Derating Information



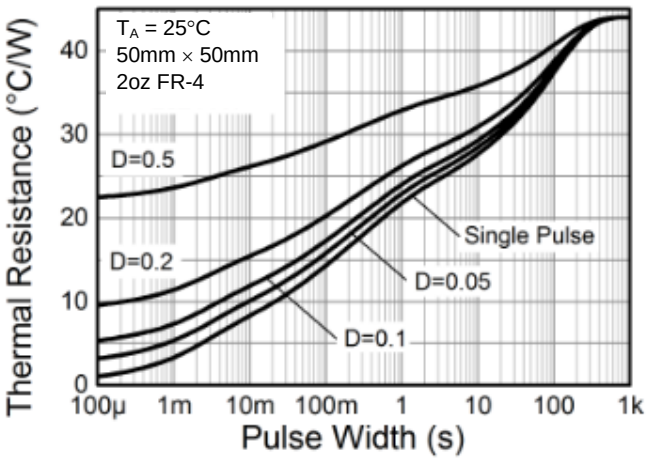

**Safe Operating Area**



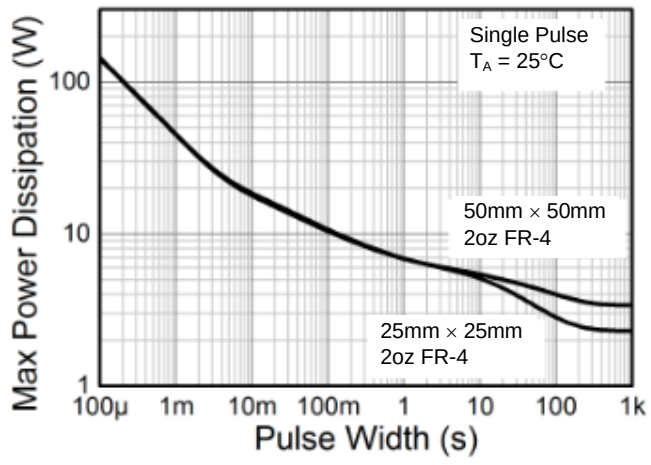

**Max Power Dissipation vs Copper Area**



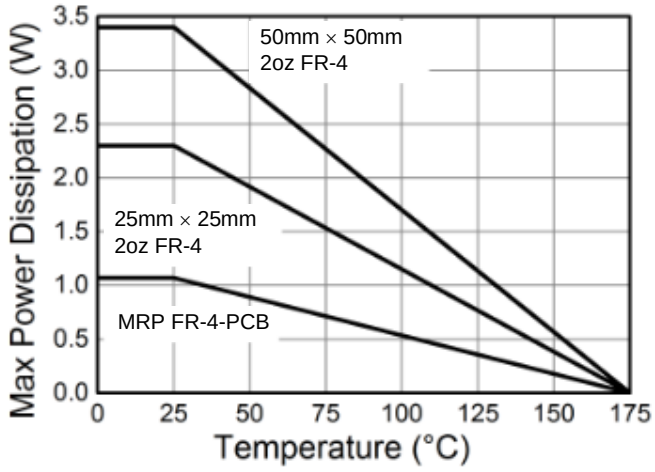

**Transient Thermal Impedance**




**Transient Thermal Impedance**




**Pulse Power Dissipation**




**Derating Curve**


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

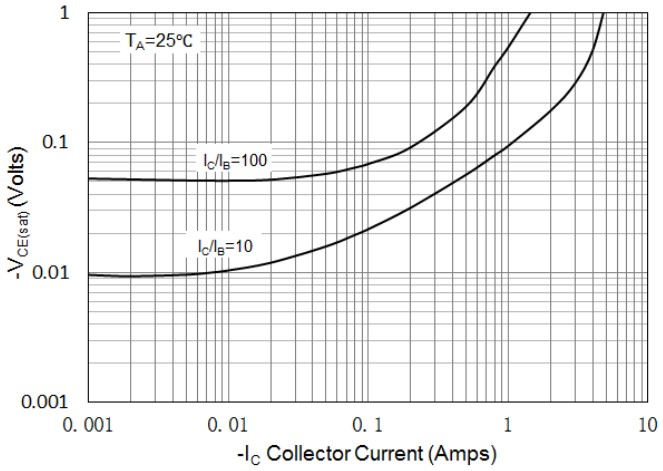
| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| Collector-Base Breakdown Voltage | $BV_{CBO}$ | -50 | -71 | — | V | $I_C$ = -100µA |
| Collector-Emitter Breakdown Voltage (Note 10) | $BV_{CEO}$ | -40 | -58 | — | V | $I_C$ = -10mA |
| Emitter-Base Breakdown Voltage | $BV_{EBO}$ | -7 | -8.5 | — | V | $I_E$ = -100µA |
| Collector-Base Cut-Off Current | $I_{CBO}$ | — | -1<br>-0.1 | -0.1<br>-20 | µA | $V_{CB}$ = -50V<br>$V_{CB}$ = -50V, $T_A$ = +150°C |
| Emitter-Base Cut-Off Current | $I_{EBO}$ | — | -1 | -20 | nA | $V_{EB}$ = -6V |
| Collector-Emitter Cut-Off Current | $I_{CES}$ | — | -1 | -20 | nA | $V_{CE}$ = -40V, $V_{BE}$ = 0V |
| Static Forward Current Transfer Ratio (Note 10) | $h_{FE}$ | 340<br>300<br>200<br>120 | 410<br>354<br>303<br>203 | —<br>900<br>—<br>— | — | $I_C$ = -100mA, $V_{CE}$ = -2V<br>$I_C$ = -500mA, $V_{CE}$ = -2V<br>$I_C$ = -1A, $V_{CE}$ = -2V<br>$I_C$ = -2A, $V_{CE}$ = -2V |
| Collector-Emitter Saturation Voltage (Note 10) | $V_{CE(sat)}$ | — | -56<br>-48<br>-81<br>-146<br>-218 | -140<br>-170<br>-320<br>-400<br>-600 | mV | $I_C$ = -100mA, $I_B$ = -1mA<br>$I_C$ = -500mA, $I_B$ = -50mA<br>$I_C$ = -1A, $I_B$ = -100mA<br>$I_C$ = -2A, $I_B$ = -200mA<br>$I_C$ = -3A, $I_B$ = -300mA |
| Collector-Emitter Saturation Resistance (Note 10) | $R_{CE(sat)}$ | — | — | 320 | mΩ | $I_C$ = -1A, $I_B$ = -100mA |
| Base-Emitter Saturation Voltage (Note 10) | $V_{BE(sat)}$ | — | -0.88 | -1 | V | $I_C$ = -1A, $I_B$ = -100mA |
| Base-Emitter Turn-On Voltage (Note 10) | $V_{BE(on)}$ | — | -0.76 | -0.9 | V | $I_C$ = -1A, $V_{CE}$ = -2V |
| Transition Frequency | $f_T$ | — | 120 | — | MHz | $I_C$ = -50mA, $V_{CE}$ = -10V<br>f = 100MHz |
| Output Capacitance | $C_{obo}$ | — | 12 | — | pF | $V_{CB}$ = -10V, f = 1MHz |
| Switching Characteristics | $t_{delay}$ | — | 10 | — | ns | $V_{CC}$ = -10V, $I_C$ = -500mA<br>$I_{B1}$ = -$I_{B2}$ = -50mA |
| | $t_{rise}$ | — | 144 | — | ns | |
| | $t_{storage}$ | — | 704 | — | ns | |
| | $t_{fall}$ | — | 48.5 | — | ns | |

Note: 10. Measured under pulsed conditions. Pulse width ≤ 300µs. Duty cycle ≤ 2%.

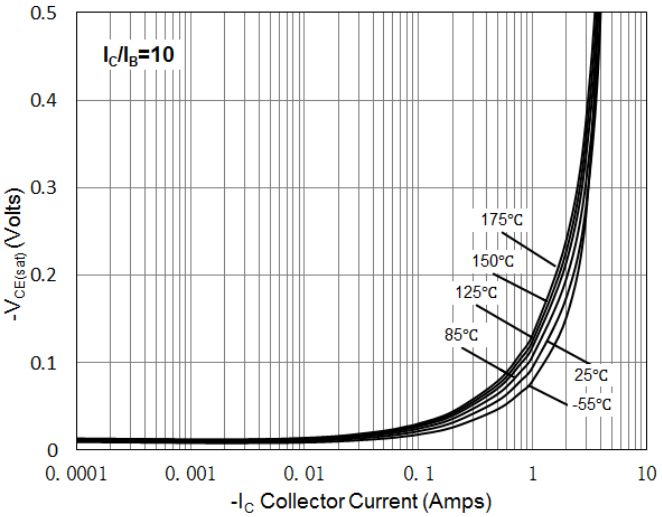

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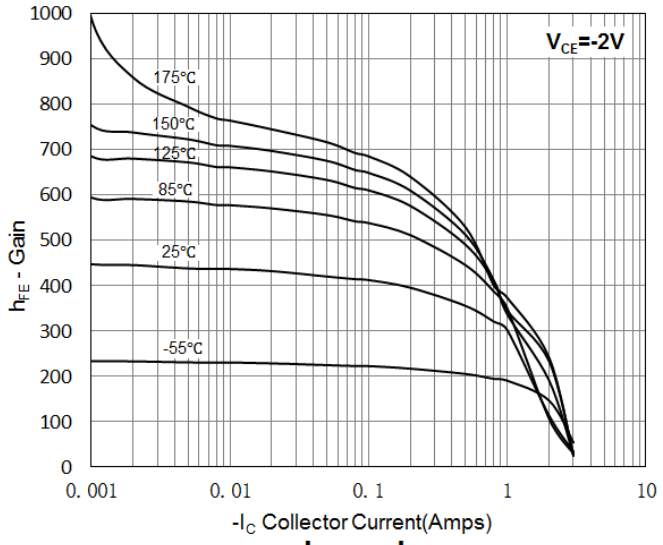
## Typical Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)



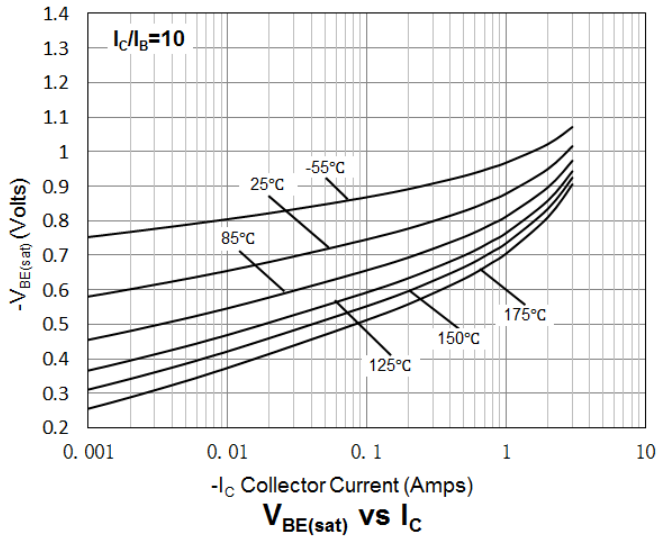

$V_{CE(sat)}$ vs $I_C$



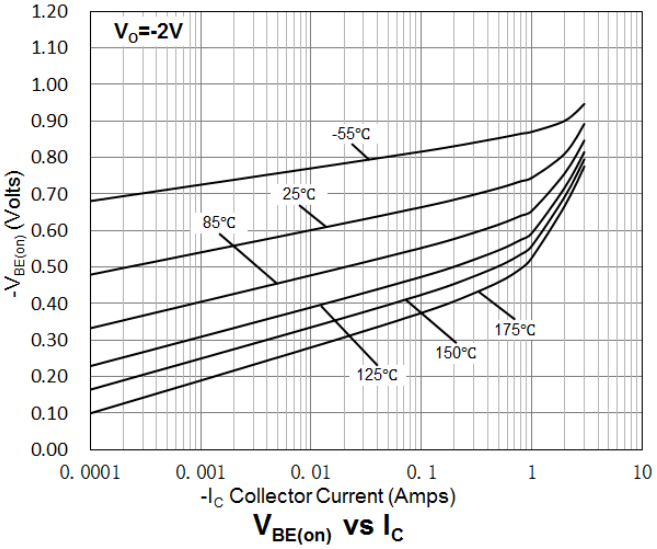

$V_{CE(sat)}$ vs $I_C$




$h_{FE}$ vs $I_C$




$V_{BE(sat)}$ vs $I_C$



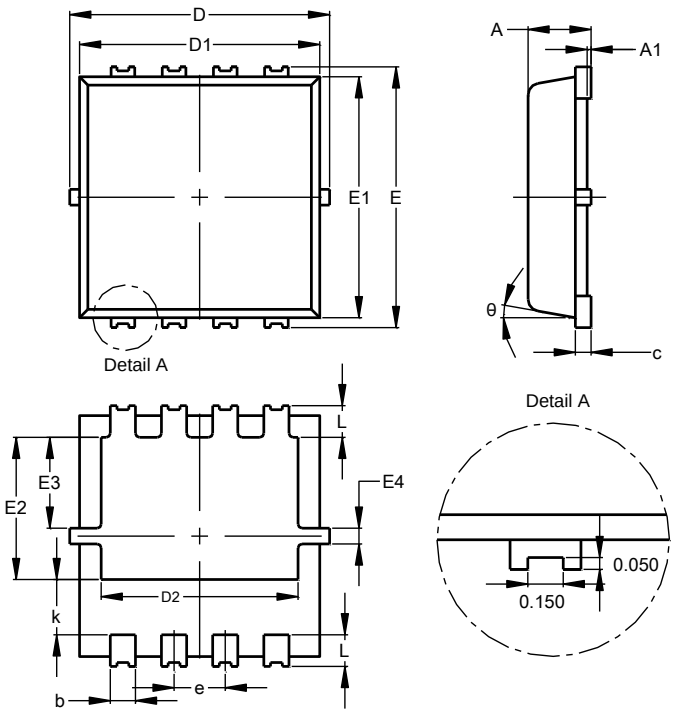

$V_{BE(on)}$ vs $I_C$


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## Package Outline Dimensions

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

**PowerDI3333-8 (SWP) (Type UX)**

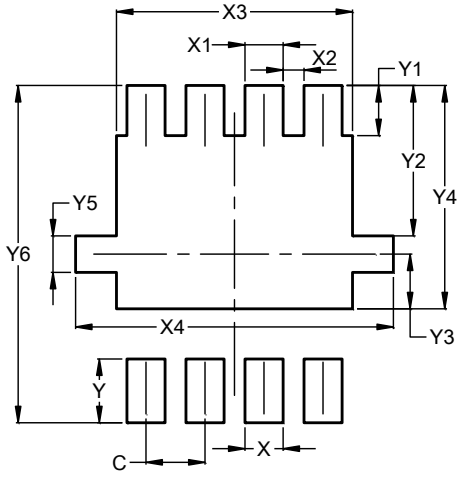



| PowerDI3333-8 (SWP) (Type UX) | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.75 | 0.85 | 0.80 |
| **A1** | 0.00 | 0.05 | -- |
| **b** | 0.25 | 0.40 | 0.32 |
| **c** | 0.10 | 0.25 | 0.15 |
| **D** | 3.20 | 3.40 | 3.30 |
| **D1** | 2.95 | 3.15 | 3.05 |
| **D2** | 2.30 | 2.70 | 2.50 |
| **E** | 3.20 | 3.40 | 3.30 |
| **E1** | 2.95 | 3.15 | 3.05 |
| **E2** | 1.60 | 2.00 | 1.80 |
| **E3** | 0.95 | 1.35 | 1.15 |
| **E4** | 0.10 | 0.30 | 0.20 |
| **e** | – | – | 0.65 |
| **k** | 0.50 | 0.90 | 0.70 |
| **L** | 0.30 | 0.50 | 0.40 |
| **θ** | 0° | 12° | 10° |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

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

**PowerDI3333-8 (SWP) (Type UX)**




| Dimensions | Value (in mm) |
|---|---|
| **C** | 0.650 |
| **X** | 0.420 |
| **X1** | 0.420 |
| **X2** | 0.230 |
| **X3** | 2.600 |
| **X4** | 3.500 |
| **Y** | 0.700 |
| **Y1** | 0.550 |
| **Y2** | 1.650 |
| **Y3** | 0.600 |
| **Y4** | 2.450 |
| **Y5** | 0.400 |
| **Y6** | 3.700 |


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