# 30V N-CHANNEL ENHANCEMENT MODE MOSFET
# POWERDI®

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ max | $I_D$ max $T_A$ = 25°C |
|---|---|---|
| 30V | 23mΩ @ $V_{GS}$ = 10V | 7.5A |
| | 33mΩ @ $V_{GS}$ = 4.5V | 6.3 A |

## Features and Benefits

- 100% Unclamped Inductive Switch (UIS) test in production
- Low $R_{DS(ON)}$ – ensures on state losses are minimized
- Small form factor thermally efficient package enables higher density end products
- Occupies just 33% of the board area occupied by SO-8 enabling smaller end product
- **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**

## Description and Applications

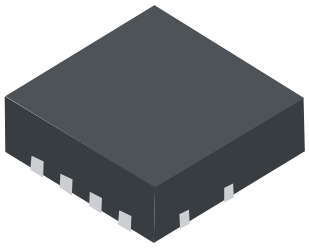
This MOSFET has been designed to minimize the on-state resistance ($R_{DS(on)}$) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- Backlighting
- Power Management Functions
- DC-DC Converters

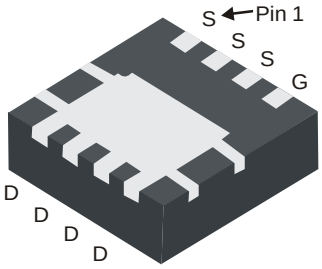
## Mechanical Data

- Case: POWERDI3333-8
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections Indicator: See diagram
- Terminals: Finish — Matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.008 grams (approximate)

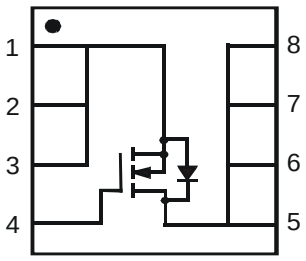
POWERDI3333-8



Top View




Bottom View



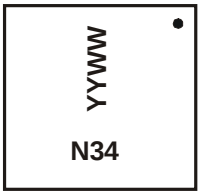

Top View
Internal Schematic

## Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---|---|---|
| DMN3024SFG-7 | POWERDI3333-8 | 2000/Tape & Reel |
| DMN3024SFG-13 | POWERDI3333-8 | 3000/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 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.

## Marking Information




N34 = Product Type Marking Code
YYWW = Date Code Marking
YY = Last digit of year (ex: 11 = 2011)
WW = Week code (01 ~ 53)

## Maximum Ratings @$T_A$ = 25°C unless otherwise specified

| Characteristic | | | Symbol | Value | Units |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | 30 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±25 | V |
| Continuous Drain Current (Note 6) $V_{GS}$ = 10V | Steady State | $T_A$ = 25°C<br>$T_A$ = 70°C | $I_D$ | 7.5<br>6.0 | A |
| | t<10s | $T_A$ = 25°C<br>$T_A$ = 70°C | $I_D$ | 10.5<br>8.5 | A |
| Continuous Drain Current (Note 6) $V_{GS}$ = 4.5V | Steady State | $T_A$ = 25°C<br>$T_A$ = 70°C | $I_D$ | 6.3<br>5.0 | A |
| | t<10s | $T_A$ = 25°C<br>$T_A$ = 70°C | $I_D$ | 8.5<br>7.6 | A |
| Pulsed Drain Current (10µs pulse, duty cycle = 1%) | | | $I_{DM}$ | 60 | A |
| Avalanche Current (Note 7) | | | $I_{AS}$ | 9 | A |
| Repetitive Avalanche Energy (Note 7) | | | $E_{AS}$ | 12 | mJ |

## Thermal Characteristics @$T_A$ = 25°C unless otherwise specified

| Characteristic | | Symbol | Value | Units |
|---|---|---|---|---|
| Total Power Dissipation (Note 5) | $T_A$ = 25°C | $P_D$ | 0.9 | W |
| | $T_A$ = 70°C | | 0.5 | |
| Thermal Resistance, Junction to Ambient (Note 5) | Steady state | $R_{\theta JA}$ | 145 | °C/W |
| | t<10s | | 74 | |
| Total Power Dissipation (Note 6) | $T_A$ = 25°C | $P_D$ | 2.2 | W |
| | $T_A$ = 70°C | | 1.4 | |
| Thermal Resistance, Junction to Ambient (Note 6) | Steady state | $R_{\theta JA}$ | 58 | °C/W |
| | t<10s | | 31 | |
| Thermal Resistance, Junction to Case (Note 6) | | $R_{\theta JC}$ | 11 | |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +150 | °C |

Notes: 5. Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
6. Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
7 .UIS in production with L = 0.3mH, TJ = 25°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 | $BV_{DSS}$ | 30 | - | - | V | $V_{GS}$ = 0V, $I_D$ = 250 µA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | - | - | 1 | µA | $V_{DS}$ = 30V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | - | - | ±100 | nA | $V_{GS}$ = ±25V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 8)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | 1.0 | 1.3 | 2.4 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA |
| Static Drain-Source On-Resistance | $R_{DS\ (ON)}$ | - | 15 | 23 | mΩ | $V_{GS}$ = 10V, $I_D$ = 10A |
| | | - | 24 | 33 | | $V_{GS}$ = 4.5V, $I_D$ = 7.5A |
| Forward Transfer Admittance | $\|Y_{fs}\|$ | - | 11 | - | S | $V_{DS}$ = 5V, $I_D$ = 10.0A |
| Diode Forward Voltage | $V_{SD}$ | - | 0.69 | 1 | V | $V_{GS}$ = 0V, $I_S$ = 1A |
| **DYNAMIC CHARACTERISTICS (Note 9)** | | | | | | |
| Input Capacitance | $C_{iss}$ | - | 479 | - | pF | $V_{DS}$ = 15V, $V_{GS}$ = 0V, f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | - | 97 | - | pF | |
| Reverse Transfer Capacitance | $C_{rss}$ | - | 61 | - | pF | |
| Gate Resistance | $R_g$ | 0.4 | 1.1 | 1.6 | Ω | $V_{DS}$ = 0V, $V_{GS}$ = 0V, f = 1MHz |
| Total Gate Charge $V_{GS}$ = 4.5V | $Q_g$ | - | 5.0 | - | nC | $V_{DS}$ = 15V, $I_D$ = 10A |
| Total Gate Charge $V_{GS}$ = 10V | $Q_g$ | - | 10.5 | - | nC | |
| Gate-Source Charge | $Q_{gs}$ | - | 1.8 | - | nC | |
| Gate-Drain Charge | $Q_{gd}$ | - | 1.6 | - | nC | |
| Turn-On Delay Time | $t_{D(on)}$ | - | 2.9 | - | ns | $V_{GS}$ = 10V, $V_{DS}$ = 15V, $R_G$ = 3Ω, $R_L$= 1.5Ω, |
| Turn-On Rise Time | $t_r$ | - | 7.9 | - | ns | |
| Turn-Off Delay Time | $t_{D(off)}$ | - | 14.6 | - | ns | |
| Turn-Off Fall Time | $t_f$ | - | 3.1 | - | ns | |

Notes: 8. Short duration pulse test used to minimize self-heating effect.
9. Guaranteed by design. Not subject to product testing.

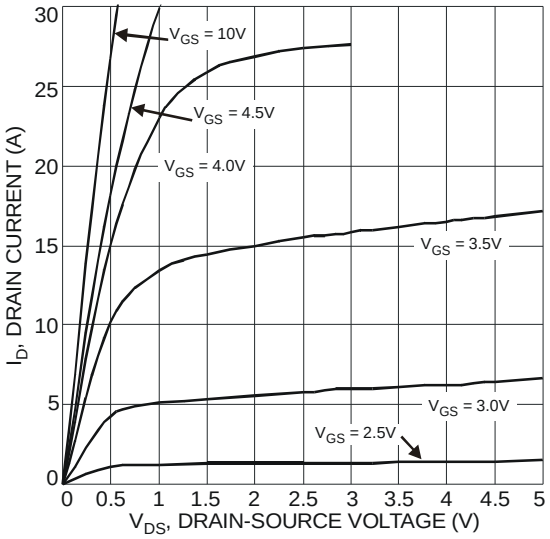


Fig. 1 Typical Output Characteristic

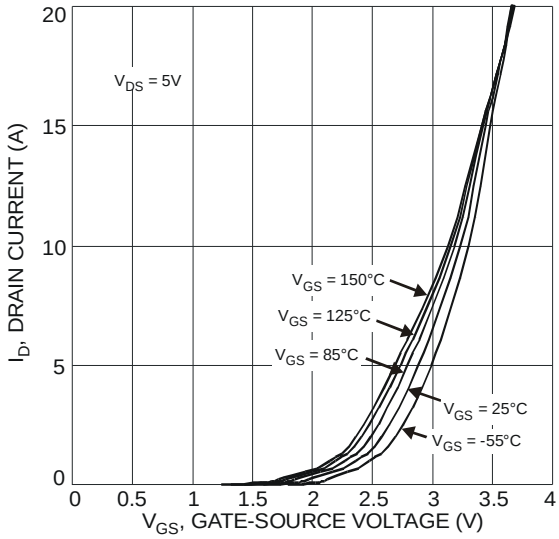


Fig. 2 Typical Transfer Characteristic

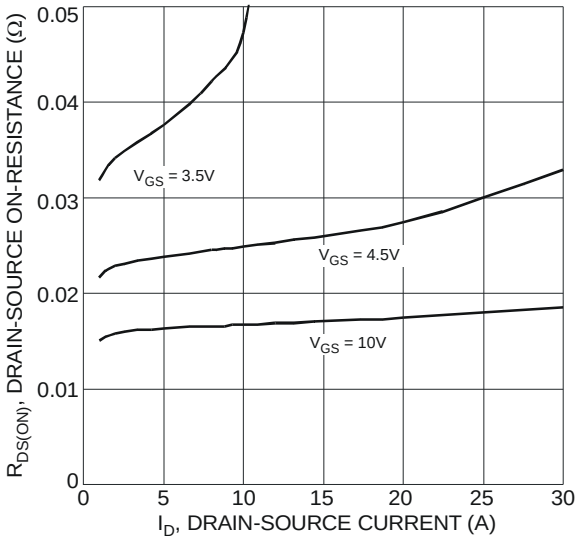



Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

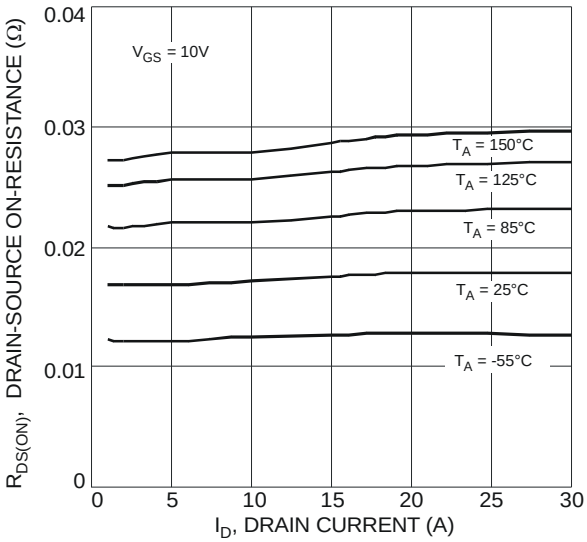



Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

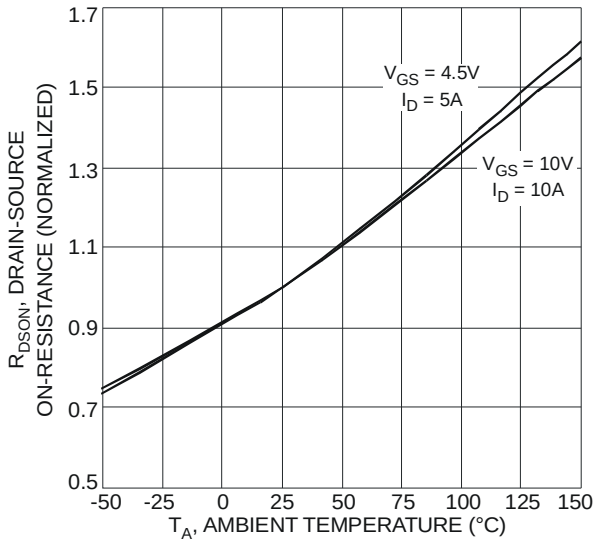



Fig. 5 On-Resistance Variation with Temperature

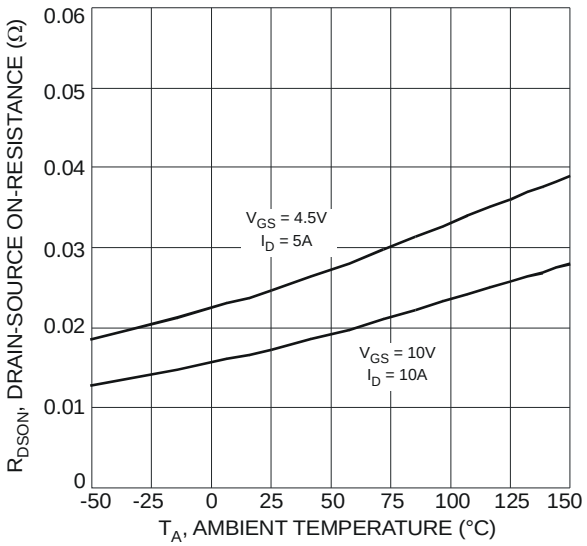



Fig. 6 On-Resistance Variation with Temperature

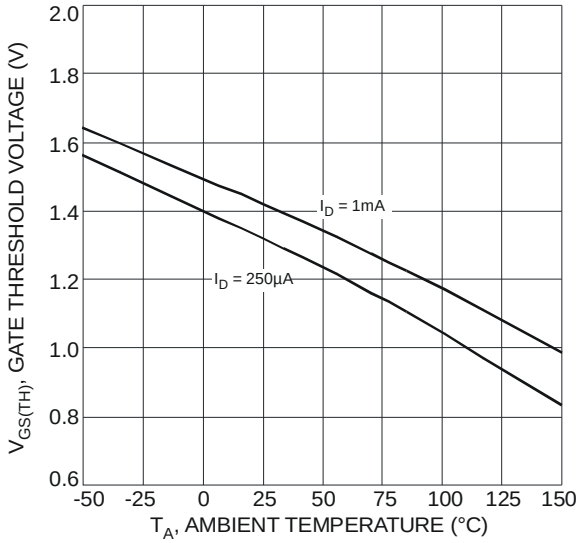



Fig. 7 Gate Threshold Variation vs. Ambient Temperature

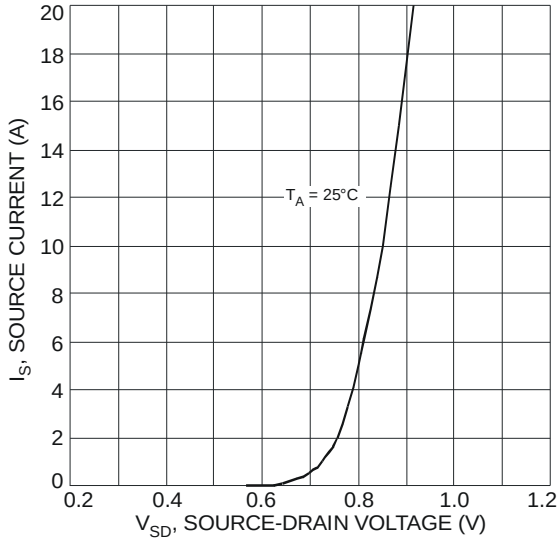



Fig. 8 Diode Forward Voltage vs. Current

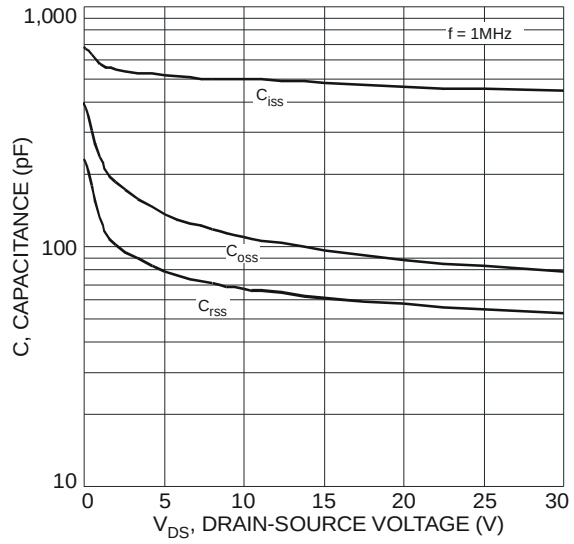



Fig. 9 Typical Total Capacitance

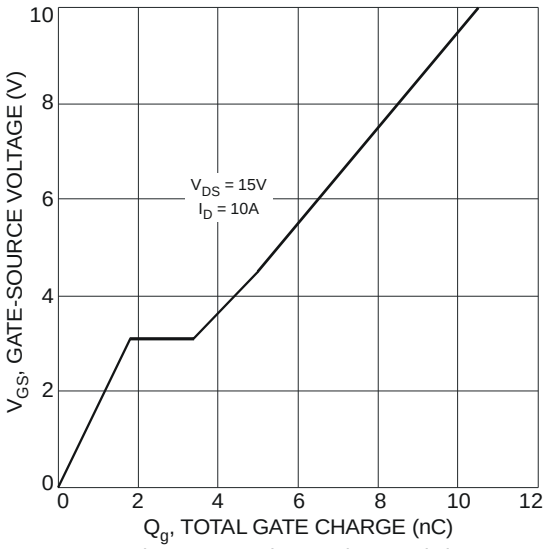



Fig. 10 Gate-Charge Characteristics

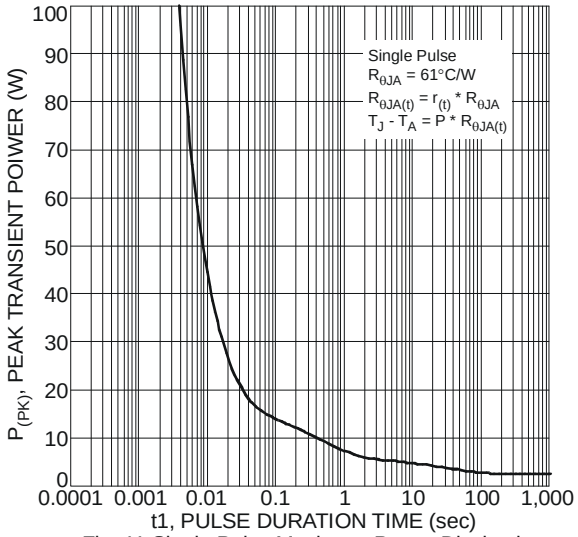



Fig. 11 Single Pulse Maximum Power Dissipation

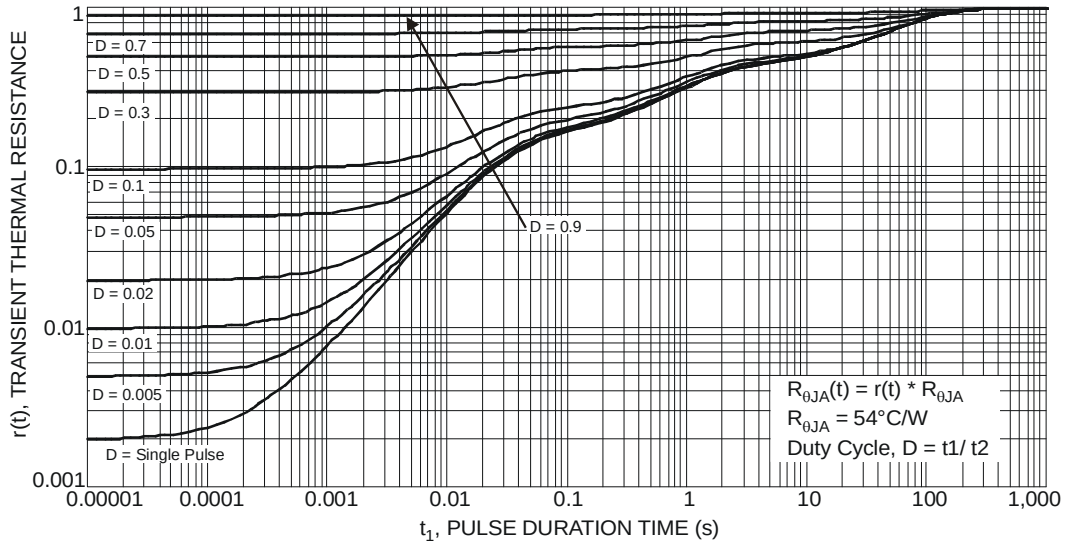
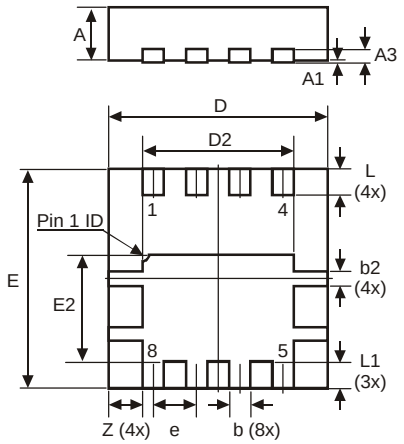


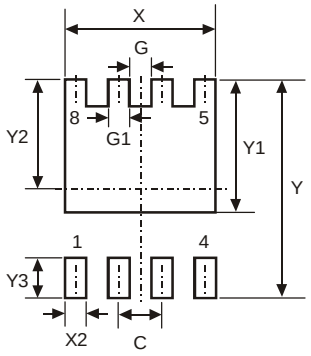

Fig. 12 Transient Thermal Response

## Package Outline Dimensions




| POWERDI3333-8 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **D** | 3.25 | 3.35 | 3.30 |
| **E** | 3.25 | 3.35 | 3.30 |
| **D2** | 2.22 | 2.32 | 2.27 |
| **E2** | 1.56 | 1.66 | 1.61 |
| **A** | 0.75 | 0.85 | 0.80 |
| **A1** | 0 | 0.05 | 0.02 |
| **A3** | – | – | 0.203 |
| **b** | 0.27 | 0.37 | 0.32 |
| **b2** | – | – | 0.20 |
| **L** | 0.35 | 0.45 | 0.40 |
| **L1** | – | – | 0.39 |
| **e** | – | – | 0.65 |
| **Z** | – | – | 0.515 |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout




| Dimensions | Value (in mm) |
|---|---|
| **C** | 0.650 |
| **G** | 0.230 |
| **G1** | 0.420 |
| **Y** | 3.700 |
| **Y1** | 2.250 |
| **Y2** | 1.850 |
| **Y3** | 0.700 |
| **X** | 2.370 |
| **X2** | 0.420 |

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